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# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2S J 115

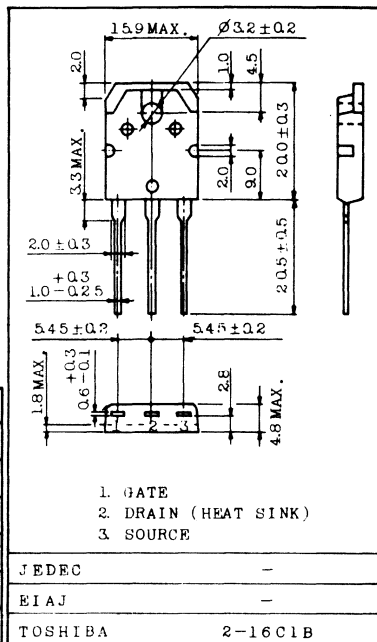
SILICON P CHANNEL MOS TYPE

AUDIO FREQUENCY POWER AMPLIFIER APPLICATION.

Unit in mm

**FEATURES:**

- . High Breakdown Voltage :  $V_{DS} = -160V$
- . High Forward Transfer Admittance :  $|Y_{fs}| = 2.0S$  (Typ.)
- . Complementary to 2SK405



**MAXIMUM RATINGS ( $T_a = 25^\circ C$ )**

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DS}$	-160	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current	$I_D$	-8	A
Power Dissipation ( $T_c = 25^\circ C$ )	$P_D$	100	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	-55 ~ 150	$^\circ C$

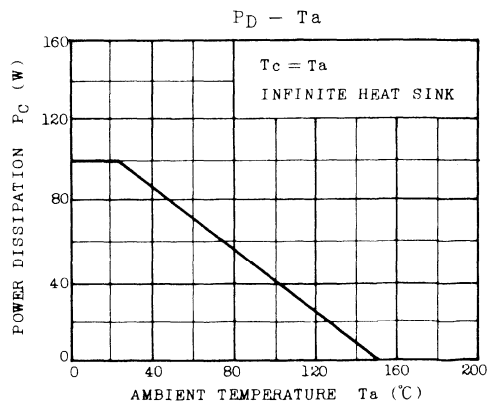
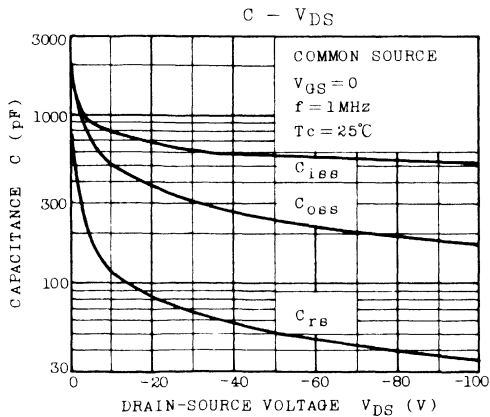
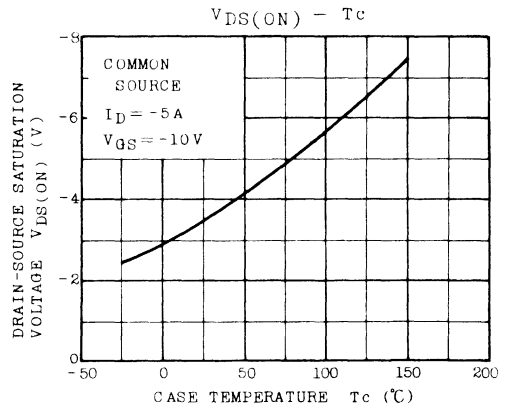
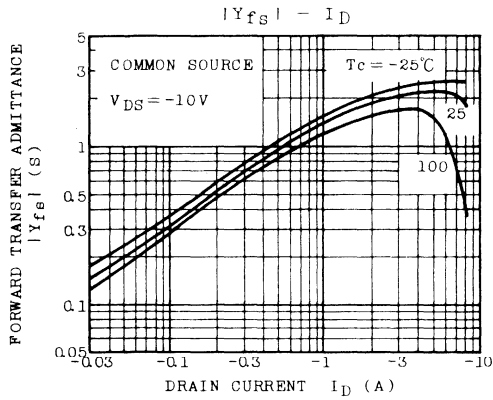
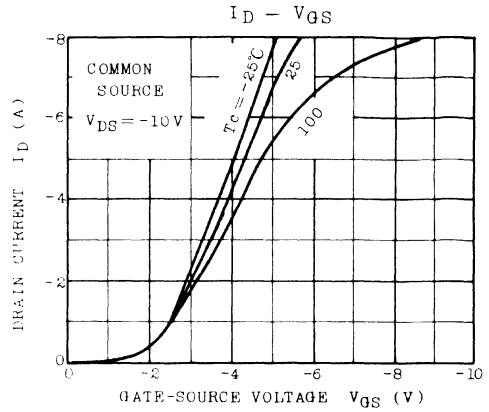
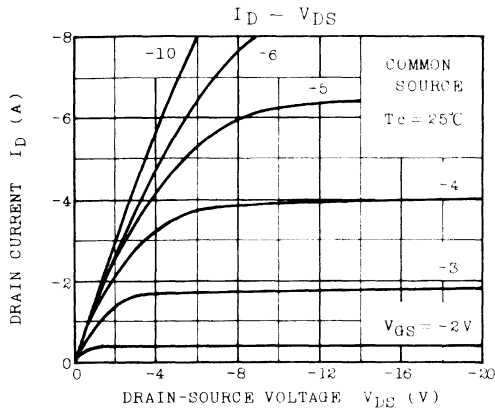
Weight : 4.6g

**ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ C$ )**

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current	$I_{GSS}$	$V_{DS} = 0, V_{GS} = \pm 20V$	-	-	$\pm 1.0$	$\mu A$
Drain-Source Breakdown Voltage	$V_{(BR)DS}$	$I_D = -5mA, V_{GS} = 0$	-160	-	-	V
Gate-Source Cut-off Voltage	$V_{GS(OFF)}$ (Note)	$V_{DS} = -10V, I_D = -0.1A$	-0.8	-	-2.8	V
Drain-Source Saturation Voltage	$V_{DS(ON)}$	$I_D = -5A, V_{GS} = -10V$	-	-3.5	-7.0	V
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS} = -10V, I_D = -2A$	1.0	2.0	-	S
Input Capacitance	$C_{iss}$	$V_{DS} = -10V, V_{GS} = 0, f = 1MHz$	-	800	-	pF
Output Capacitance	$C_{oss}$	$V_{DS} = -10V, V_{GS} = 0, f = 1MHz$	-	500	-	pF
Reverse Transfer Capacitance	$C_{rs}$	$V_{DS} = -10V, V_{GS} = 0, f = 1MHz$	-	110	-	pF

Note :  $V_{GS(OFF)}$  Classification 0 : -0.8 ~ -1.6, Y : -1.4 ~ -2.8

TOSHIBA CORPORATION

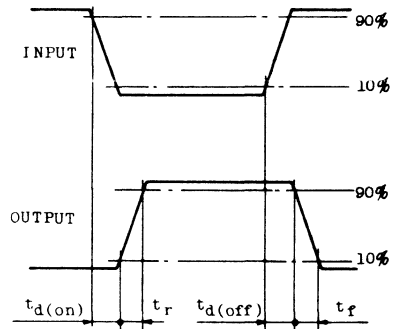
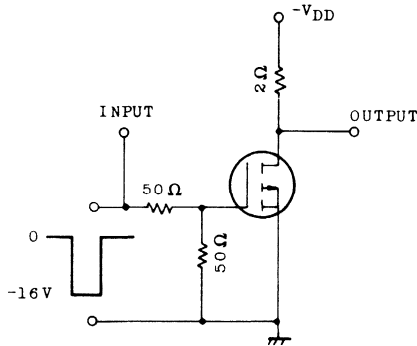
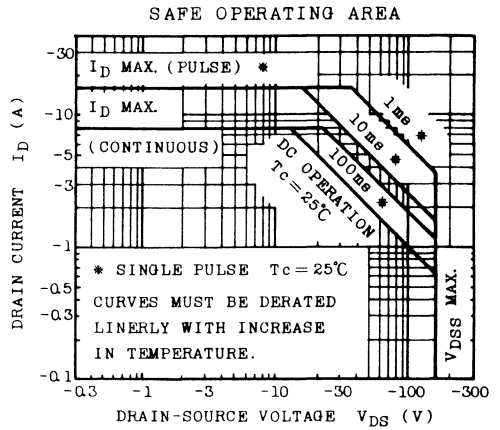
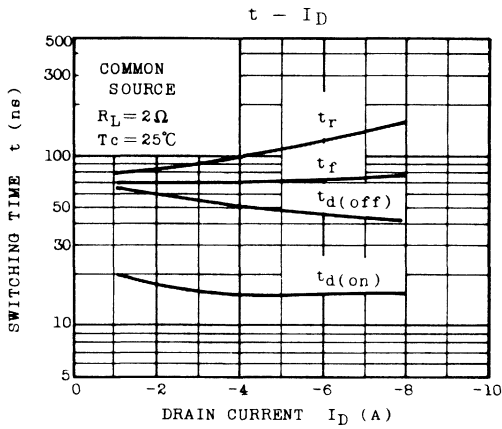




# SEMICONDUCTOR

## TECHNICAL DATA

2 S J 1 1 5





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2 S J 1 2 3

SILICON P CHANNEL MOS TYPE

HIGH SPEED SWITCHING APPLICATION.

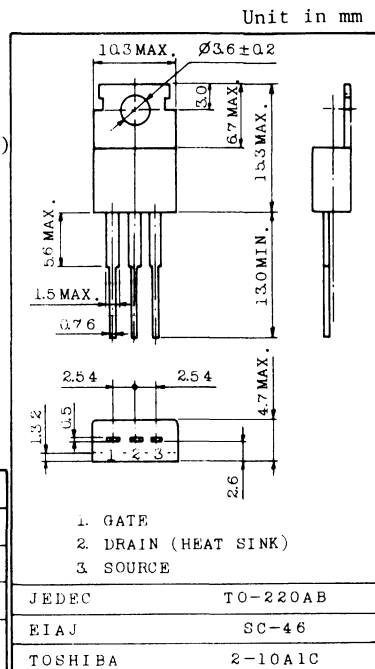
DC-DC CONVERTER APPLICATION.

### FEATURES:

- Low Drain-Source Saturation Voltage :  $V_{DS(ON)}=1.4V(Typ.)$
- High Forward Transfer Admittance :  $|Y_{fs}|=1.7S(Typ.)$
- Complementary to 2SK442.

### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSS}$	-70	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	$I_D$	-10	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	30	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	-55 ~ 150	$^\circ C$



Weight : 1.9g

### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current	$I_{GSS}$	$V_{DS}=0, V_{GS}=\pm 20V$	-	-	$\pm 1.0$	$\mu A$
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=-70V, V_{GS}=0$	-	-	-1.0	mA
Drain-Source Breakdown Voltage	$V(BR)_{DSS}$	$I_D=-1mA, V_{GS}=0$	-70	-	-	V
Gate-Source Cut-off Voltage	$V_{GS(OFF)}$	$V_{DS}=-5V, I_D=-1mA$	-1.0	-	-3.0	V
Drain-Source Saturation Voltage	$V_{DS(ON)}$	$I_D=-7A, V_{GS}=-15V$	-	-1.4	-2.8	V
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=-5V, I_D=-2A$	1.0	1.7	-	S
Input Capacitance	$C_{iss}$	$V_{DS}=-10V, V_{GS}=0, f=1MHz$	-	650	-	pF
Output Capacitance	$C_{oss}$	$V_{DS}=-10V, V_{GS}=0, f=1MHz$	-	600	-	pF
Reverse Transfer Capacitance	$C_{rs}$	$V_{DS}=-10V, V_{GS}=0, f=1MHz$	-	250	-	pF

TOSHIBA CORPORATION

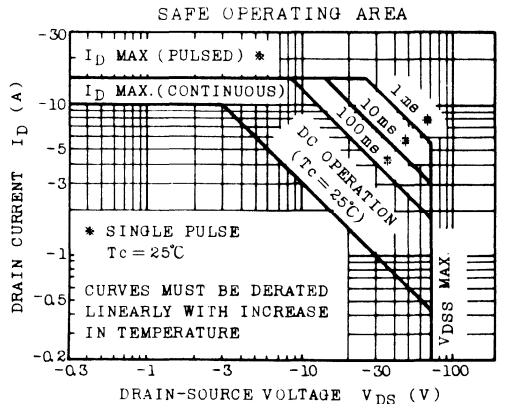
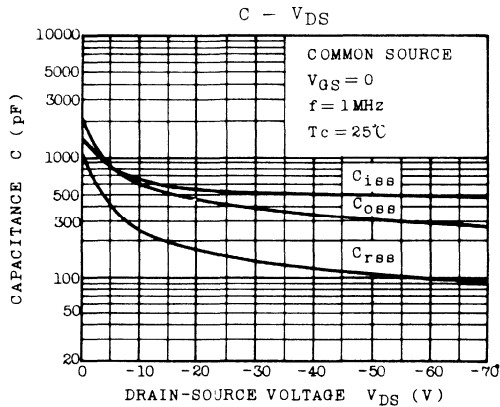
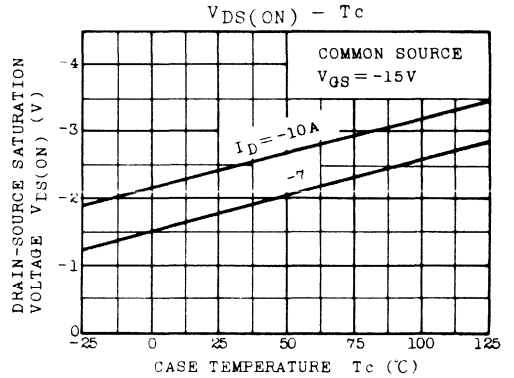
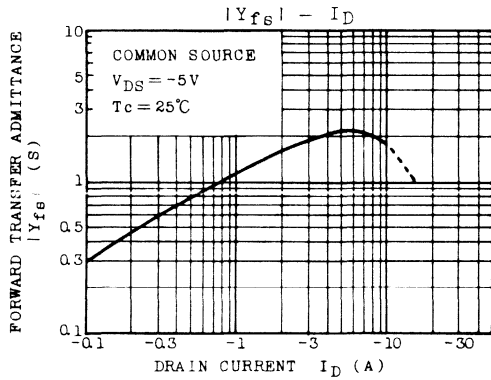
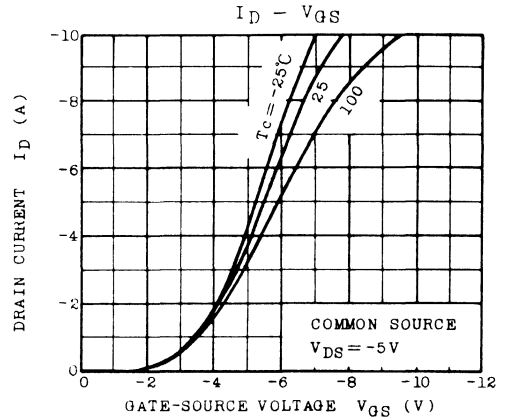
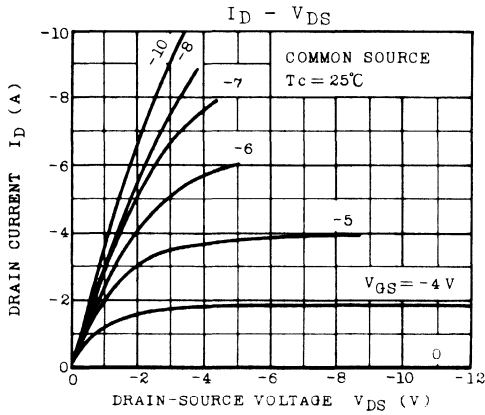




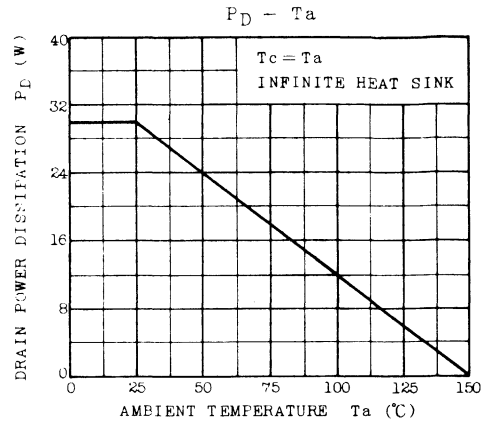
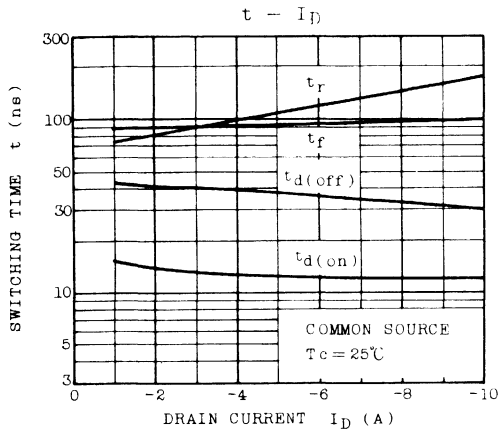
# SEMICONDUCTOR

## TECHNICAL DATA

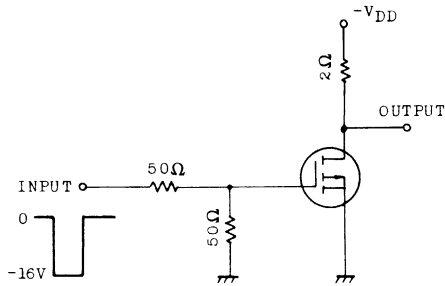
2S J 123



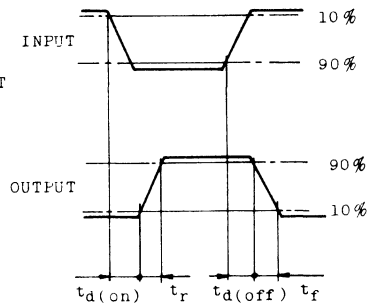
TOSHIBA CORPORATION



#### SWITCHING TIME TEST CIRCUIT



#### RESPONSE WAVE FORM





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
**2 S J 1 2 6**  
 SILICON P CHANNEL MOS TYPE  
 (  $\pi$  - MOS )

INDUSTRIAL APPLICATIONS

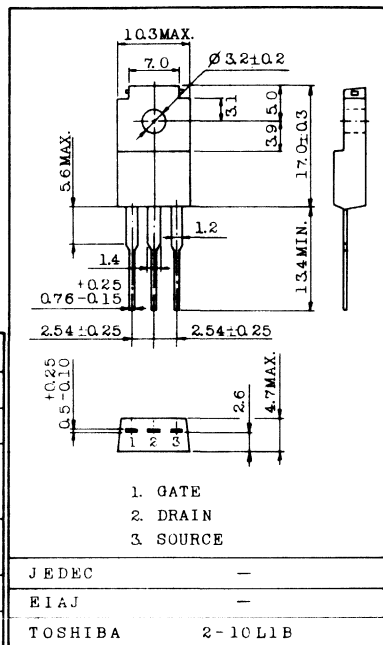
HIGH SPEED SWITCHING APPLICATIONS.  
 SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

**FEATURES:**

- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.27\Omega(\text{Typ.})$
- . High Forward Transfer Admittance :  $|Y_{fs}|=2.5S(\text{Typ.})$
- . Low Leakage Current :  $I_{GSS}=\pm 100\text{nA}(\text{Max.})$  ( $V_{GS}=\pm 20\text{V}$ )  
 $I_{DSS}=-1\text{mA}(\text{Max.})$  ( $V_{DS}=-60\text{V}$ )
- . Enhancement-Mode :  $V_{th}=-1.5 \sim -3.5\text{V}$  ( $I_D=-1\text{mA}$ )
- . TO-220 Isolation Package which Requires Neither  
 Insulating Bushing Nor Mica Insulator.

**MAXIMUM RATINGS** ( $T_a=25^\circ\text{C}$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	-60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	-10	A
	Pulse	$I_{DP}$	-15	
Drain Power Dissipation ( $T_c=25^\circ\text{C}$ )		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature Range		$T_{stg}$	-55 ~ 150	$^\circ\text{C}$



Unit in mm

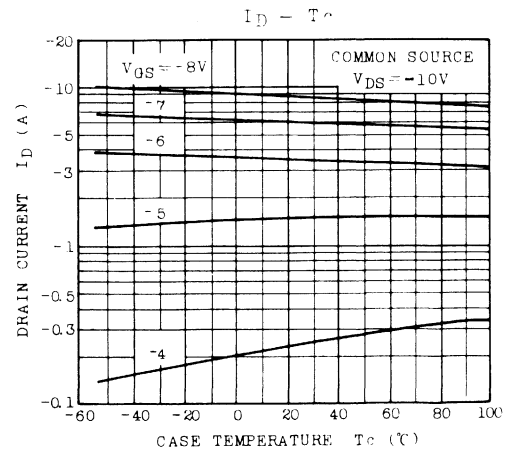
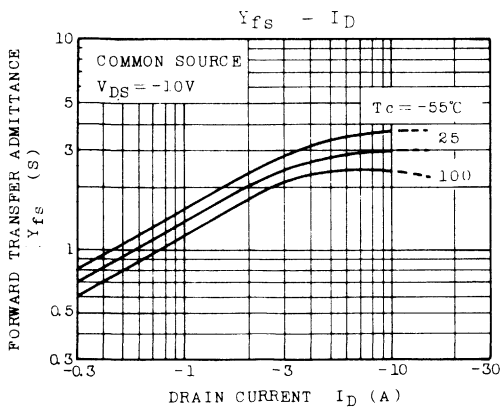
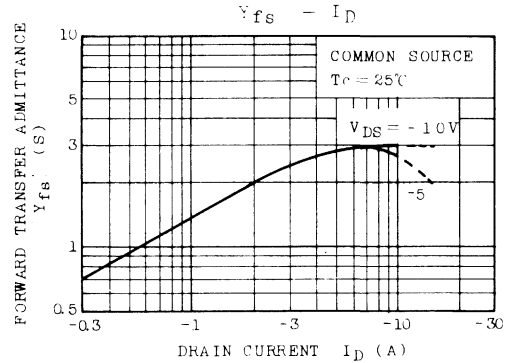
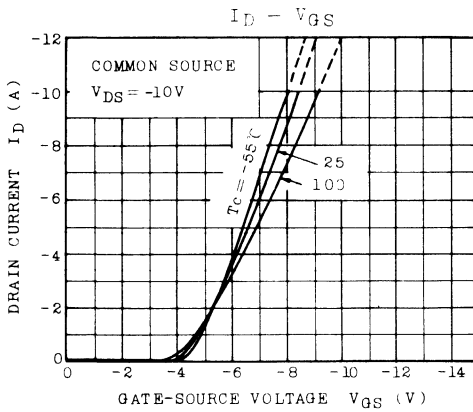
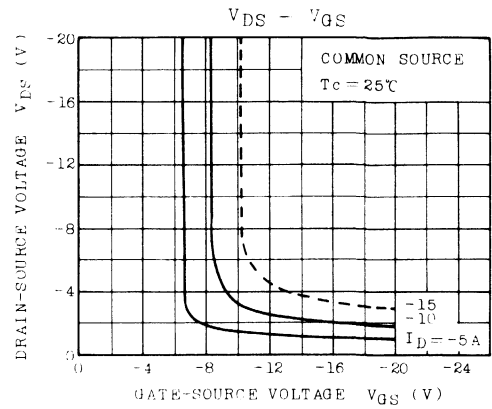
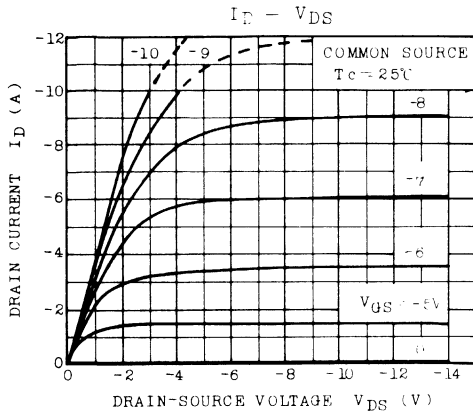
**ELECTRICAL CHARACTERISTICS** ( $T_a=25^\circ\text{C}$ )

Weight: 2.1g

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20\text{V}, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=-60\text{V}, V_{GS}=0$	-	-	-1.0	mA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=-10\text{mA}, V_{GS}=0$	-60	-	-	V
Gate Thershold Voltage		$V_{th}$	$V_{DS}=-10\text{V}, I_D=-1\text{mA}$	-1.5	-	-3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=-10\text{V}, I_D=-5\text{A}$	1.5	2.5	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=-5\text{A}, V_{GS}=-10\text{V}$	-	0.27	0.4	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=-10\text{A}, V_{GS}=-10\text{V}$	-	-3.0	-4.5	V
Input Capacitance		$C_{iss}$	$V_{DS}=-10\text{V}, V_{GS}=0, f=1\text{MHz}$	-	880	1200	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=-10\text{V}, V_{GS}=0, f=1\text{MHz}$	-	280	600	pF
Output Capacitance		$C_{oss}$	$V_{DS}=-10\text{V}, V_{GS}=0, f=1\text{MHz}$	-	670	1000	pF
Switching Time	Rise Time	$t_r$		-	70	140	ns
	Turn-on Time	$t_{on}$		-	80	160	ns
	Fall Time	$t_f$		-	60	120	ns
	Turn-off Time	$t_{off}$		-	120	240	ns

THIS TRANSISTOR IS THE ELECTROSTATIC SENSITIVE DEVICE. PLEASE HANDLE WITH CAUTION.

**TOSHIBA CORPORATION**

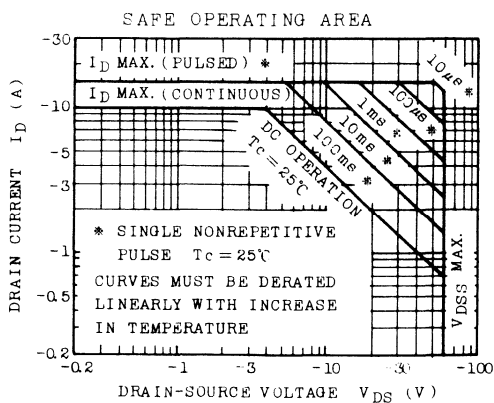
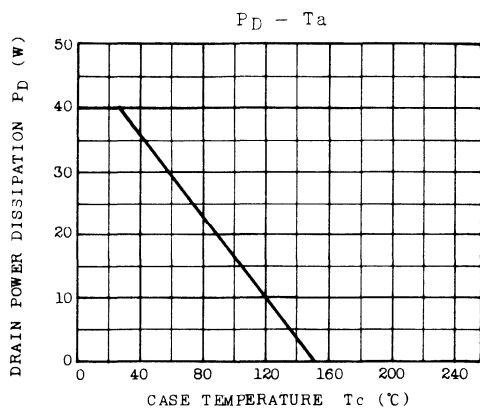
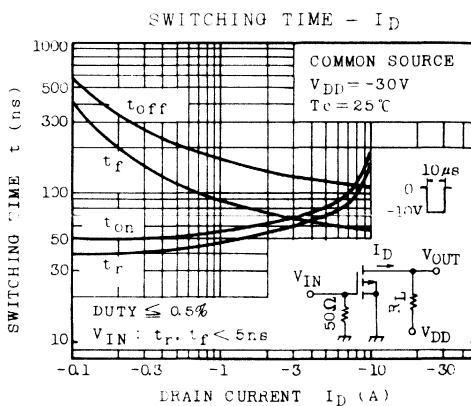
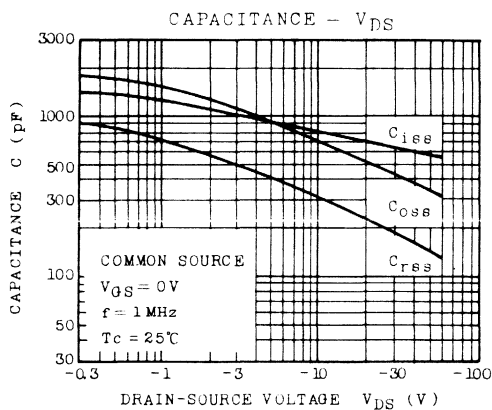
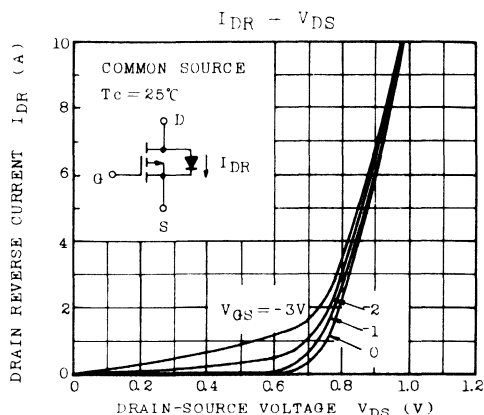
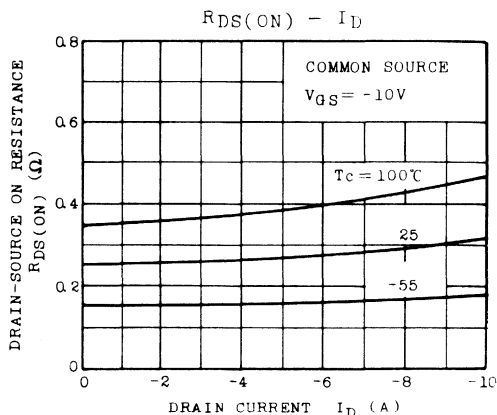




# SEMICONDUCTOR

## TECHNICAL DATA

2S J 126





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
**2SK324**  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS)

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
 SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

### FEATURES:

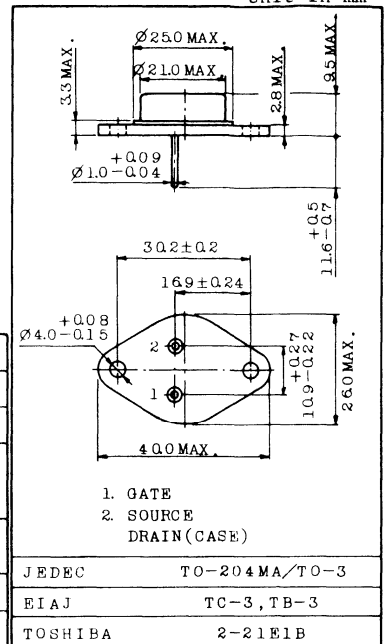
- High Breakdown Voltage :  $V_{(BR)DSS}=400V$
- High Forward Transfer Admittance :  $|Y_{fs}|=5S(Typ.)$
- Low Leakage Current :  $I_{GSS}=\pm 100nA(Max.)$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=1mA(Max.)$  @  $V_{DS}=400V$
- Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V$  @  $I_D=1mA$

### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	400	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	10
	Pulse	$I_{DP}$	15
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	120	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-65 \sim 150$	$^\circ C$

### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=400V, V_{GS}=0$	-	-	1.0	mA	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	400	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	3.0	5.0	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.45	0.6	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	5	7	V	
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	1500	2000	pF	
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	140	300	pF	
Output Capacitance	$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	400	600	pF	
Switching Time	Rise Time	$t_r$		-	50	100	ns
	Turn-on Time	$t_{on}$		-	80	150	ns
	Fall Time	$t_f$		-	80	150	ns
	Turn-off Time	$t_{off}$		-	350	700	ns

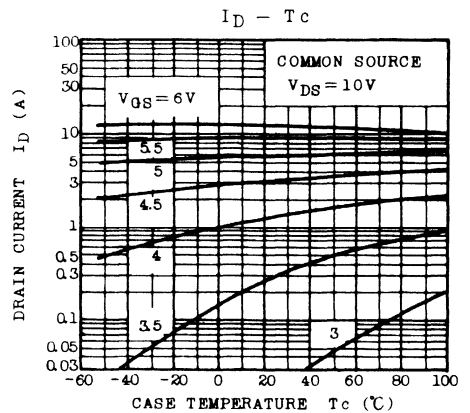
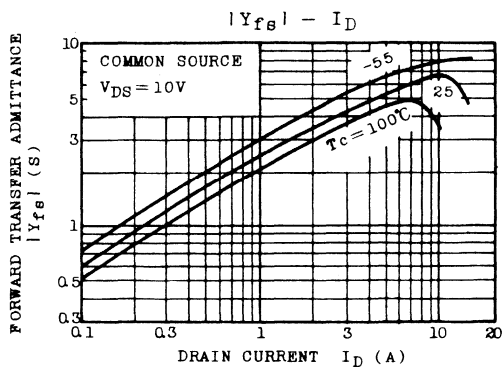
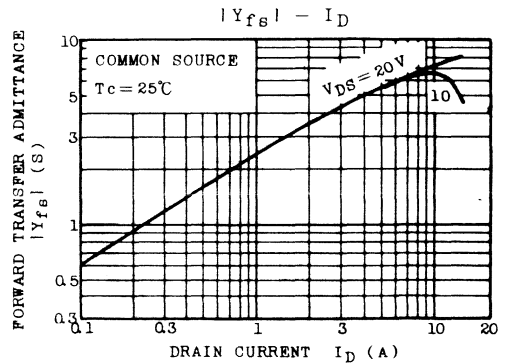
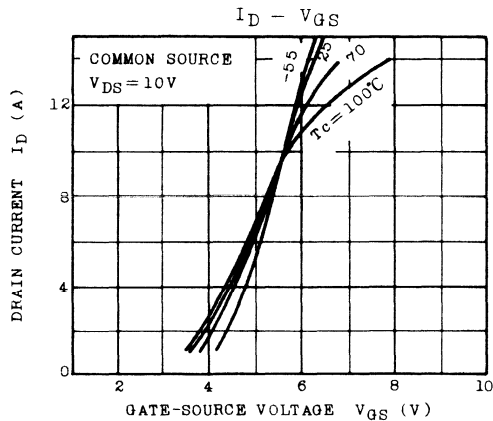
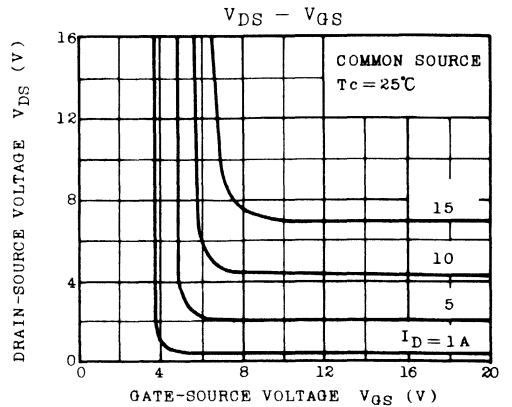
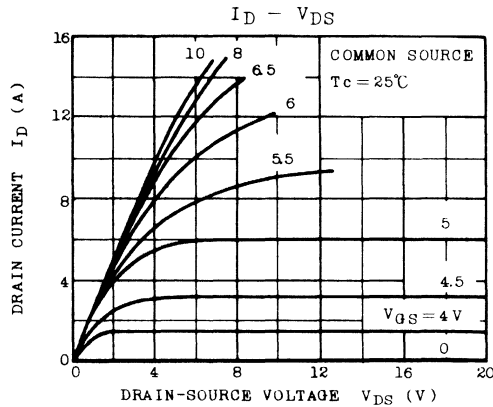
TOSHIBA CORPORATION



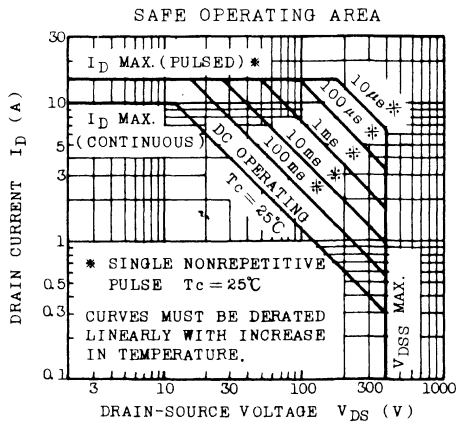
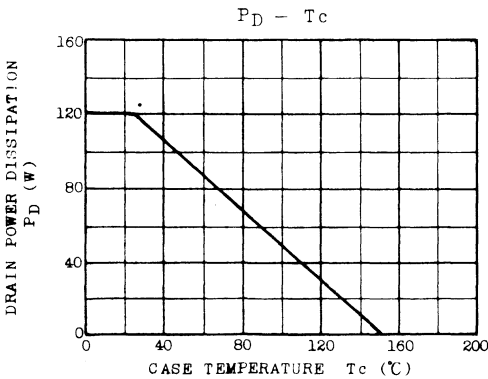
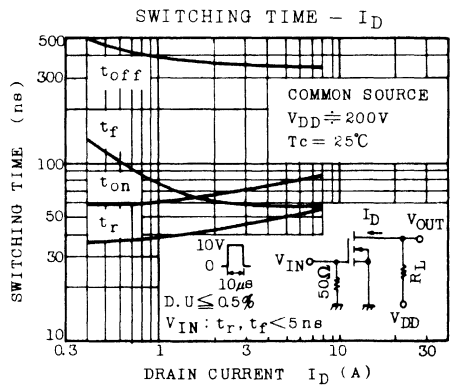
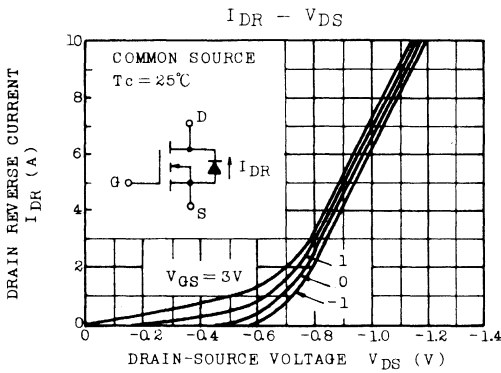
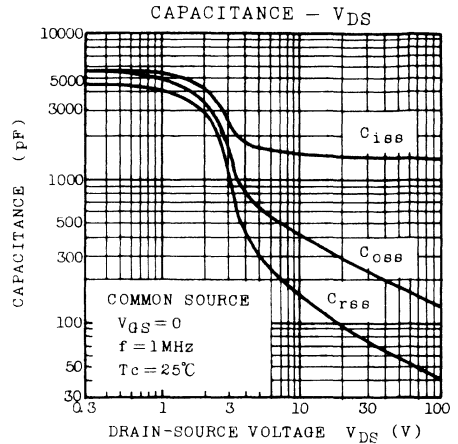
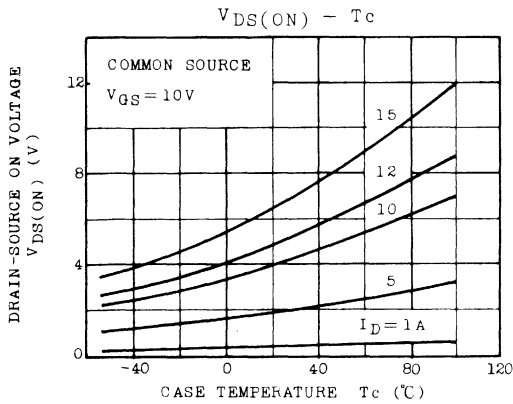
# SEMICONDUCTOR

## TECHNICAL DATA

2SK324



TOSHIBA CORPORATION







SEMICONDUCTOR

TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
**2SK325**  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS)

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
 SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

FEATURES:

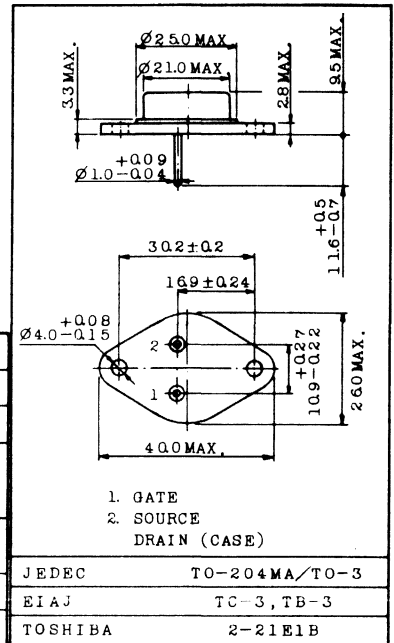
- . High Breakdown Voltage :  $V_{(BR)DSS}=450V$
- . High Forward Transfer Admittance :  $|Y_{fs}|=5S(Typ.)$
- . Low Leakage Current :  $I_{GSS}=\pm 100nA(Max.) @ V_{GS}=\pm 20V$   
 $I_{DSS}=1mA(Max.) @ V_{DS}=450V$
- . Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V @ I_D=1mA$

MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	10	A
	Pulse	$I_{DP}$	15	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	120	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	-65 ~ 150	$^\circ C$

INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=450V, V_{GS}=0$	-	-	1.0	mA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	450	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	3.0	5.0	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.5	0.7	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	5.5	8	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	1500	2000	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	140	300	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	400	600	pF
Switching Time	Rise Time	$t_r$		-	50	100	ns
	Turn-on Time	$t_{on}$		-	80	150	ns
	Fall Time	$t_f$		-	80	150	ns
	Turn-off Time	$t_{off}$		-	350	700	ns

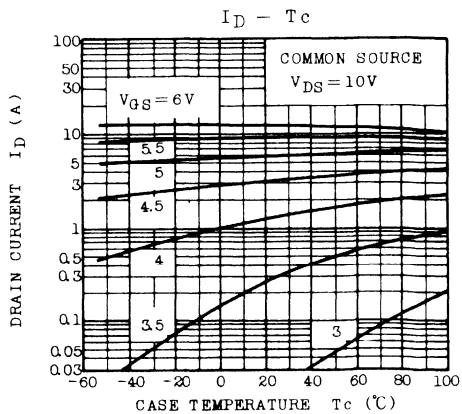
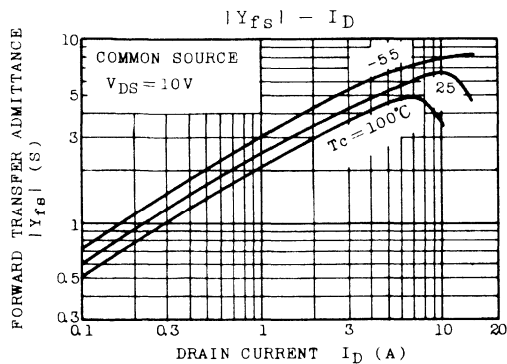
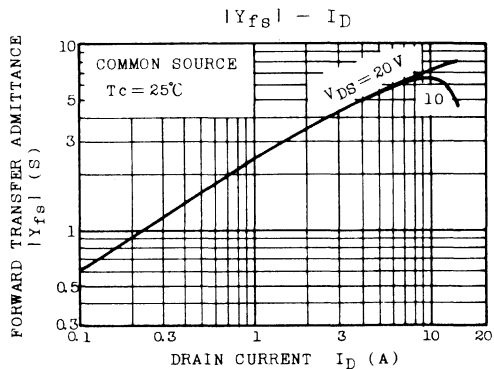
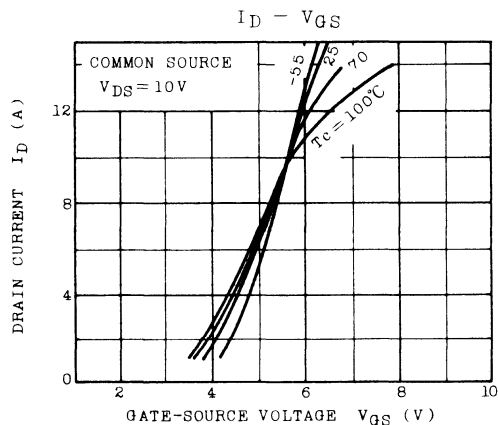
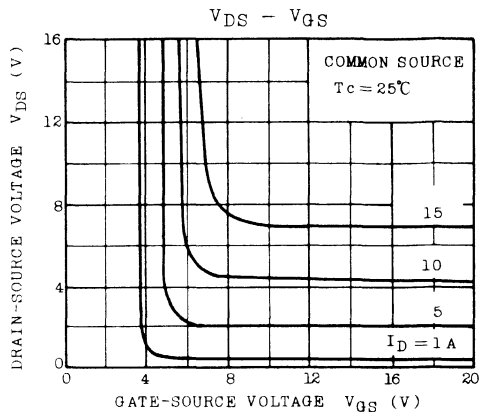
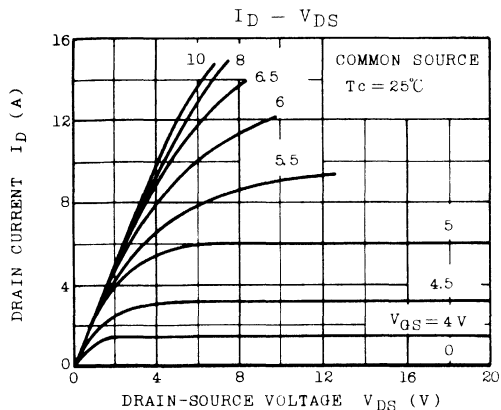
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK325



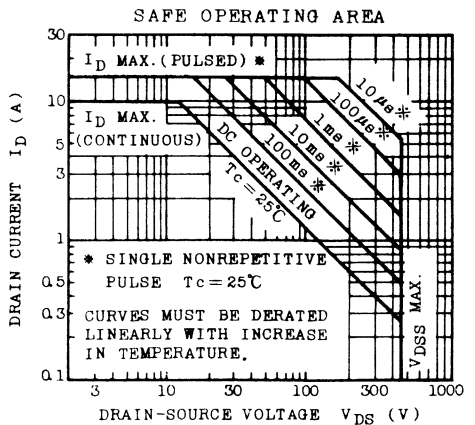
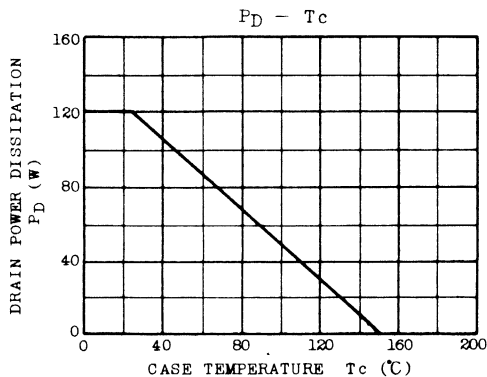
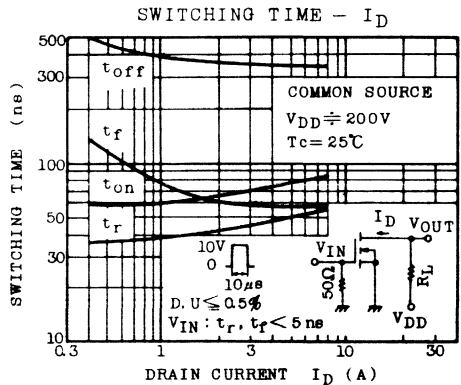
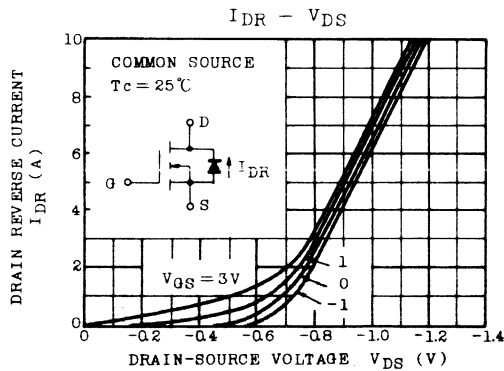
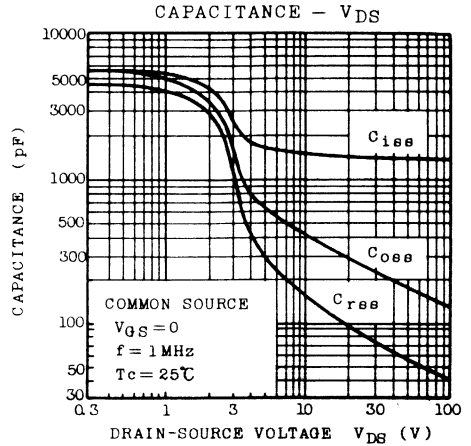
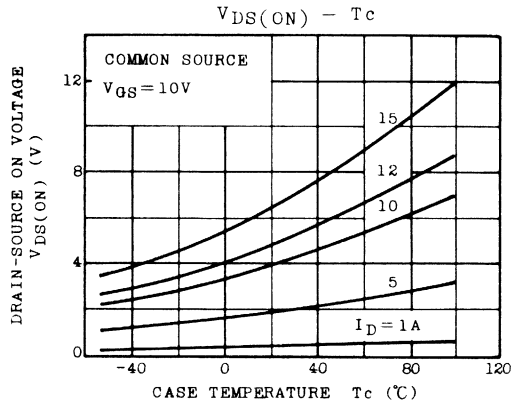
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK325





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
**2SK355**  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS)

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
 SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

### FEATURES:

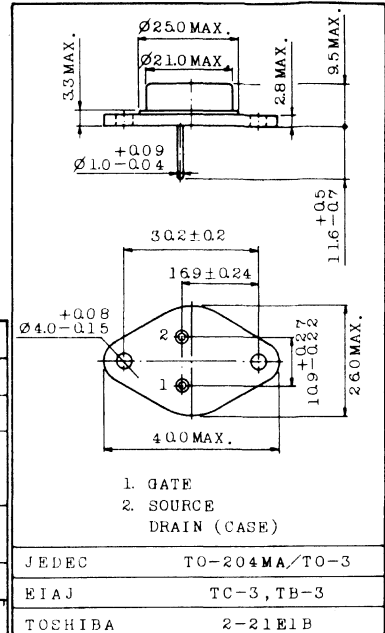
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.12\Omega$ (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=6S$ (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=1mA$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V$  @  $I_D=1mA$

### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	150	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	12
	Pulse	$I_{DP}$	40
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	120	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-65 \sim 150$	$^\circ C$

### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=150V, V_{GS}=0$	-	-	1.0	mA	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	150	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=10A$	3	6	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	0.12	0.18	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	1.2	1.8	V	
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	1600	2200	pF	
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	350	600	pF	
Output Capacitance	$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	800	1300	pF	
Switching Time	Rise Time	$t_r$		-	120	240	ns
	Turn-on Time	$t_{on}$		-	150	300	ns
	Fall Time	$t_f$		-	120	240	ns
	Turn-off Time	$t_{off}$		-	300	600	ns

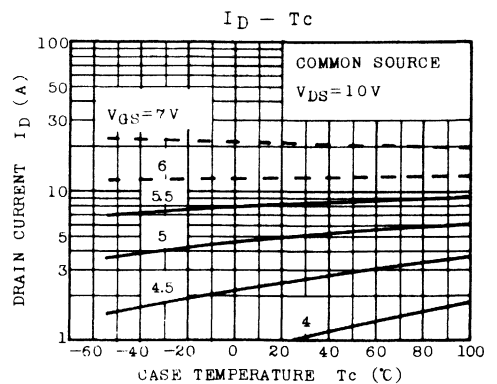
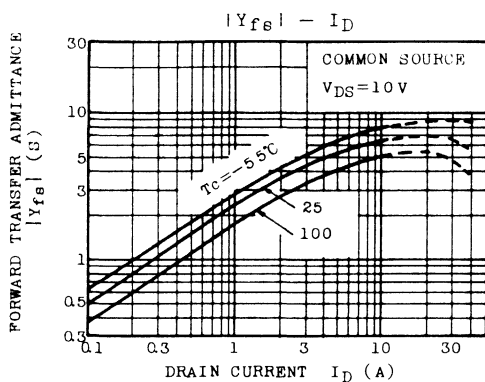
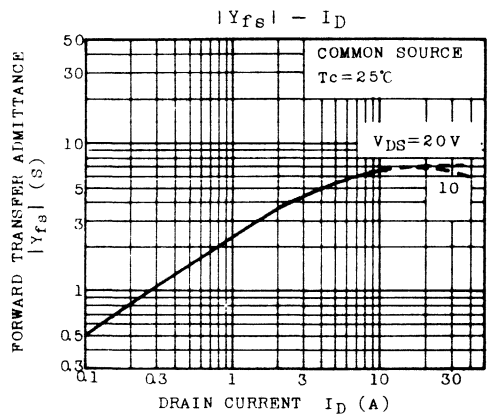
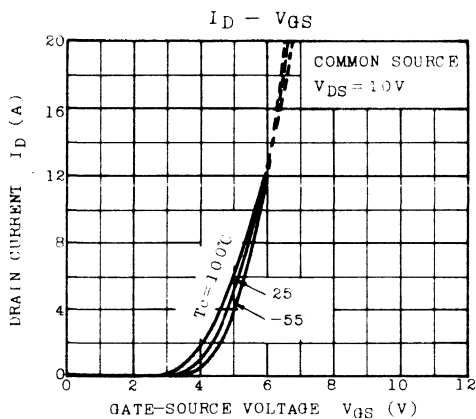
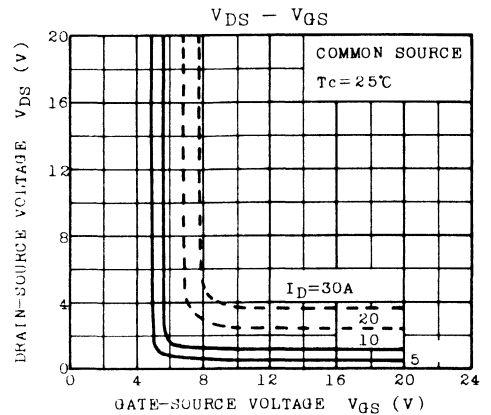
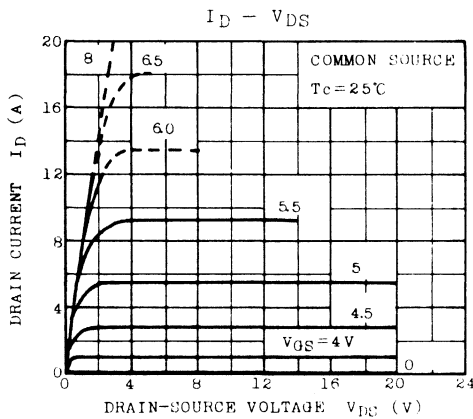
TOSHIBA CORPORATION



# SEMICONDUCTOR

2SK355

## TECHNICAL DATA



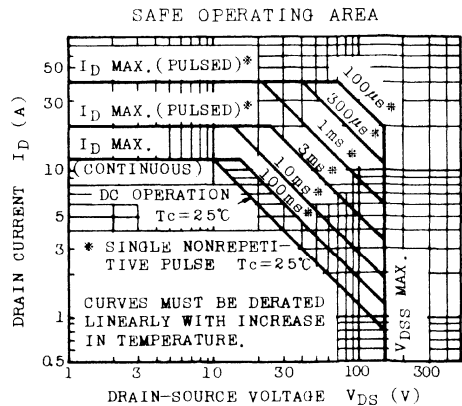
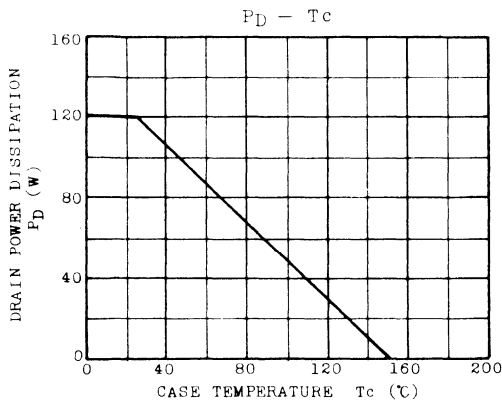
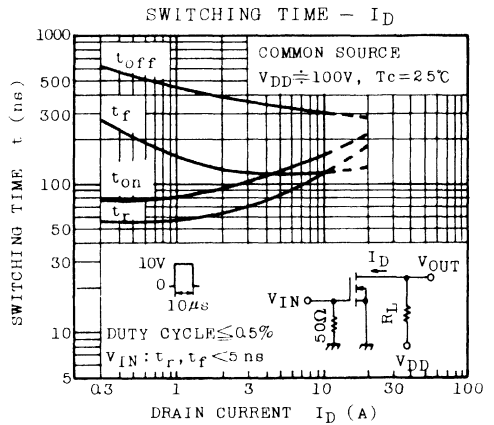
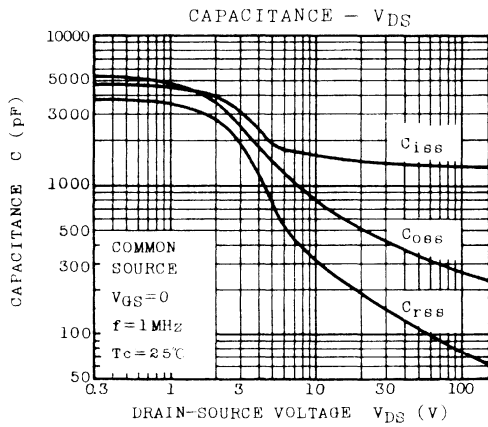
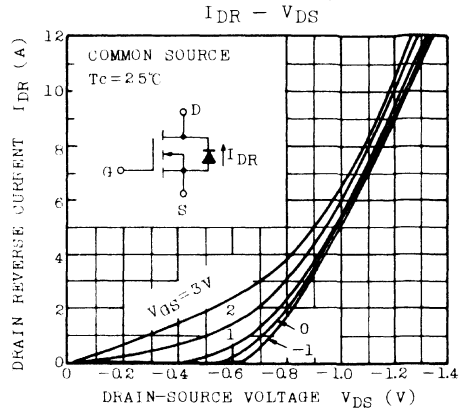
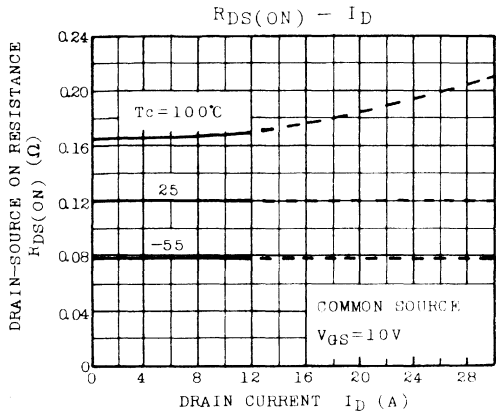
TOSHIBA CORPORATION



# SEMICONDUCTOR

2SK355

## TECHNICAL DATA



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2SK356

SILICON N CHANNEL MOS TYPE  
( $\pi$ -MOS)

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.

SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

### FEATURES:

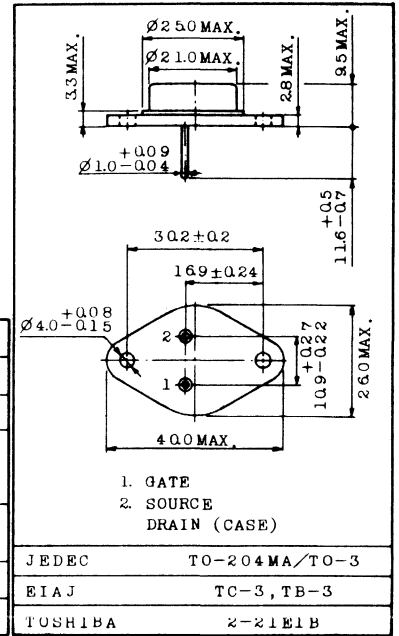
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.2\Omega$ (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=6S$ (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=1mA$ (Max.) @  $V_{DS}=250V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $I_D=1mA$

### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	250	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	12	A
	Pulse	$I_{DP}$	30	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	120	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	-65 ~ 150	$^\circ C$

### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

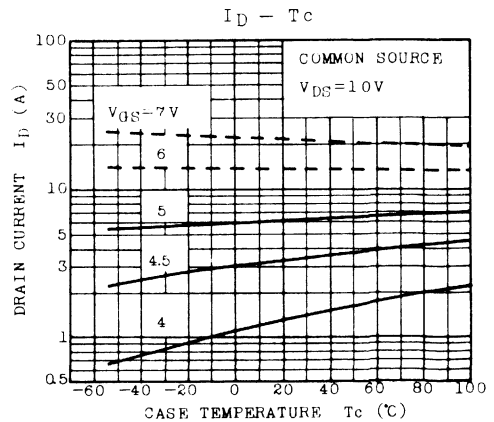
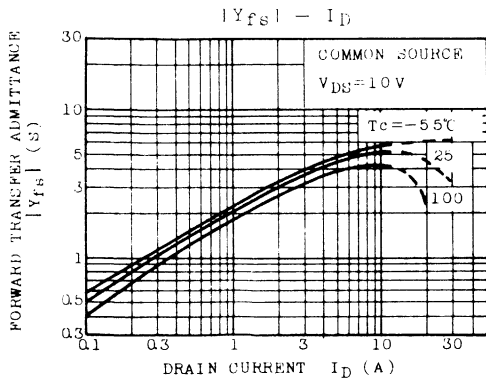
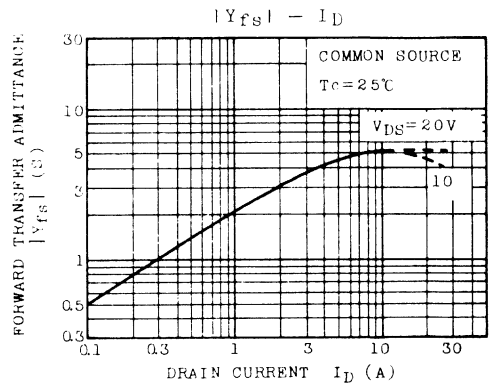
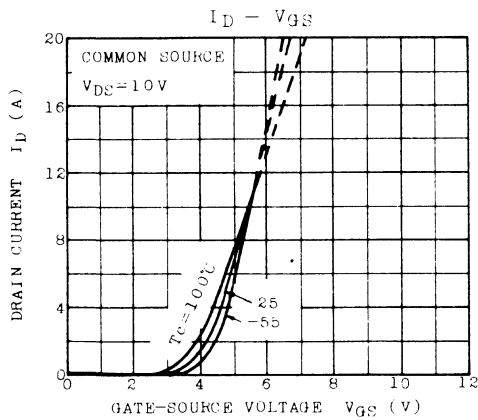
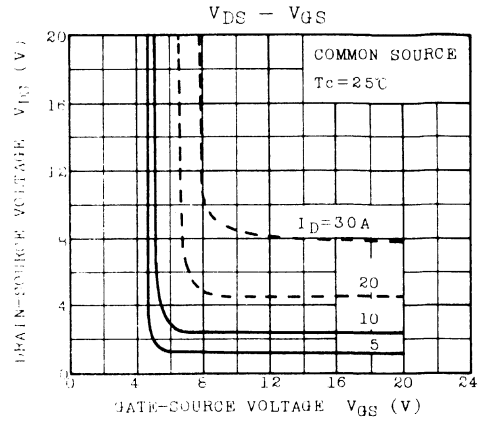
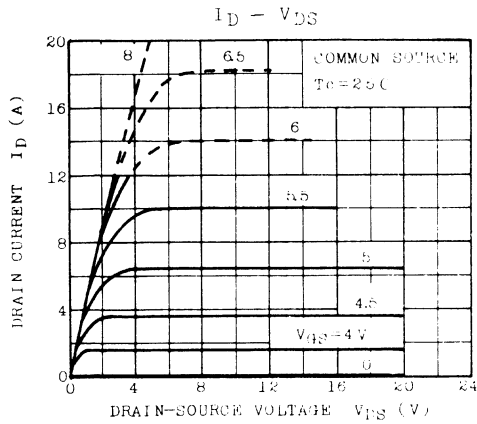
### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=250V, V_{GS}=0$	-	-	1.0	mA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	250	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=10A$	3	6	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	0.2	0.25	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	2.0	2.5	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	1600	2000	pF
Reverse Transfer Capacitance		$C_{riss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	220	320	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	570	700	pF
Switching Time	Rise Time	$t_r$		-	110	220	ns
	Turn-on Time	$t_{on}$		-	130	260	ns
	Fall Time	$t_f$		-	100	200	ns
	Turn-off Time	$t_{off}$		-	320	640	ns

TOSHIBA CORPORATION



### TECHNICAL DATA



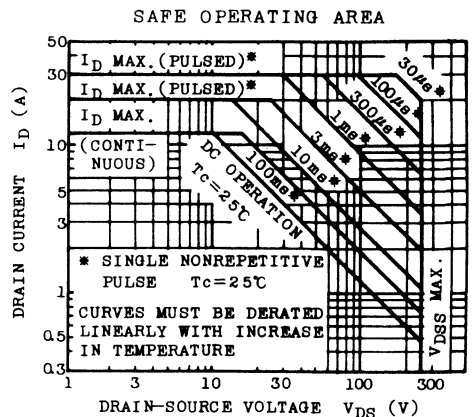
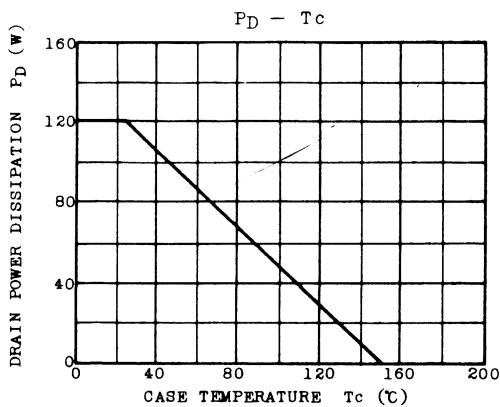
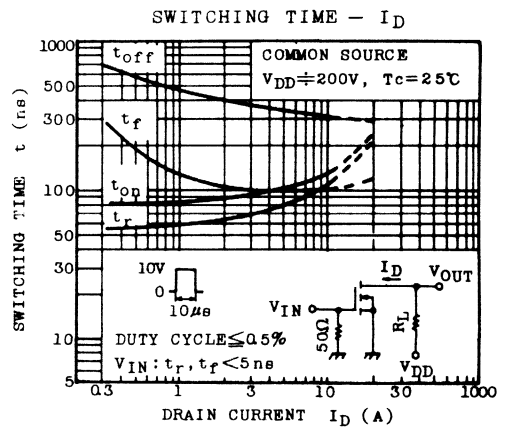
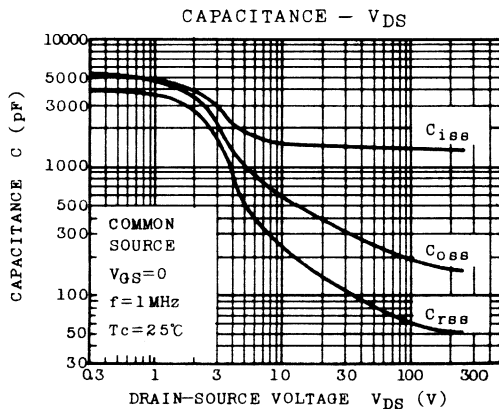
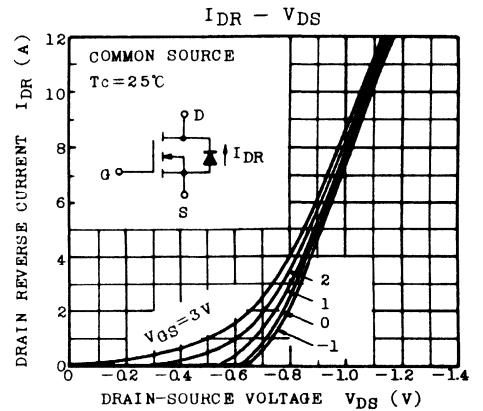
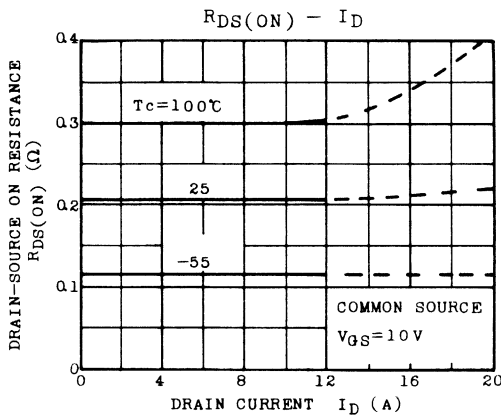




# SEMICONDUCTOR

2SK356

## TECHNICAL DATA



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

### 2SK357

### SILICON N CHANNEL MOS TYPE

### ( $\pi$ -MOS)

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
DC-DC CONVERTER, MOTOR AND SOLENOID DRIVE APPLICATIONS.

#### FEATURES:

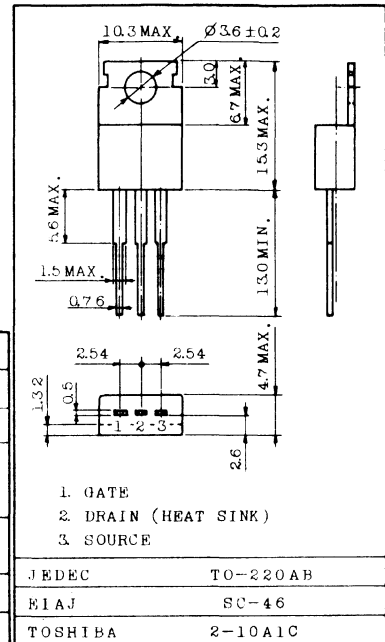
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.6\Omega$  (Typ.)
- High Forward Transfer Admittance:  $|Y_{fs}|=1.8S$  (Typ.)
- High Drain Current :  $I_{DP}=8A$  (Max.)
- Low Leakage Current:  $I_{GSS}=\pm 100nA$  (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=1mA$  (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V$  @  $I_D=1mA$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	5	A
	Pulse	$I_{DP}$	8	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55 \sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0$	-	-	1.0	mA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=3A$	0.8	1.8	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=3A, V_{GS}=10V$	-	0.6	0.9	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	5.5	9.5	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	260	350	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	50	100	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	160	250	pF
Switching Time	Rise Time	$t_r$		-	30	60	ns
	Turn-on Time	$t_{on}$		-	40	80	
	Fall Time	$t_f$		-	20	50	
	Turn-off Time	$t_{off}$		-	60	120	

THIS TRANSISTOR IS THE ELECTROSTATIC SENSITIVE DEVICE. PLEASE HANDLE WITH CAUTION.

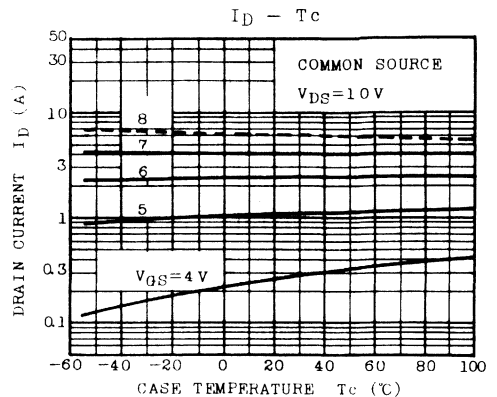
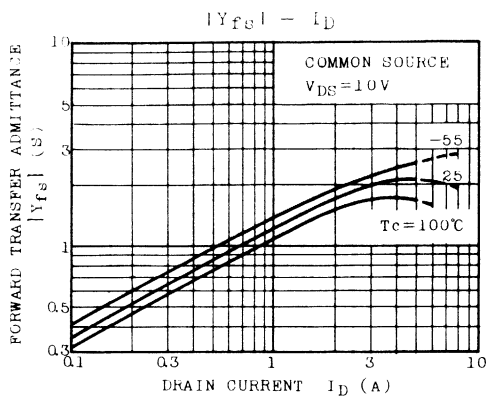
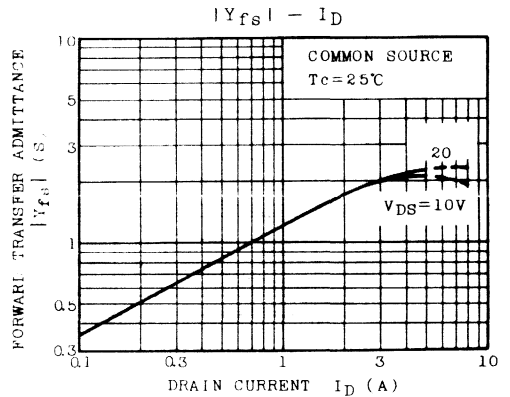
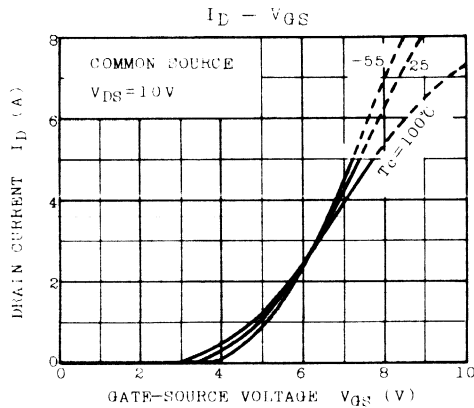
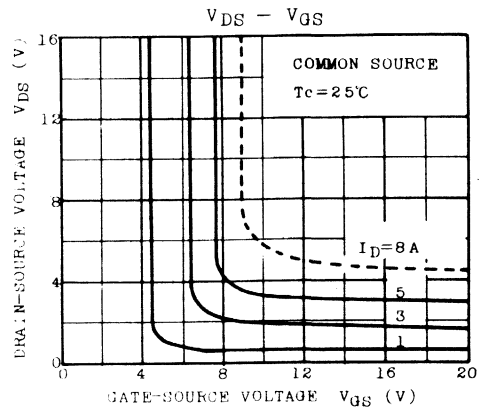
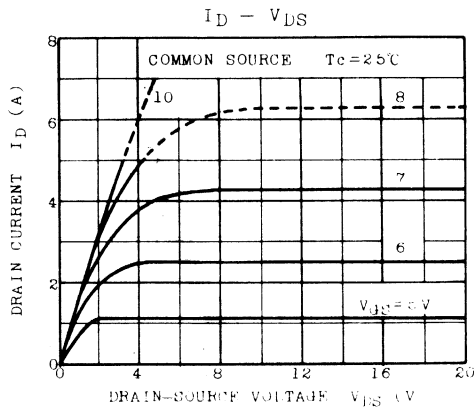
### TOSHIBA CORPORATION

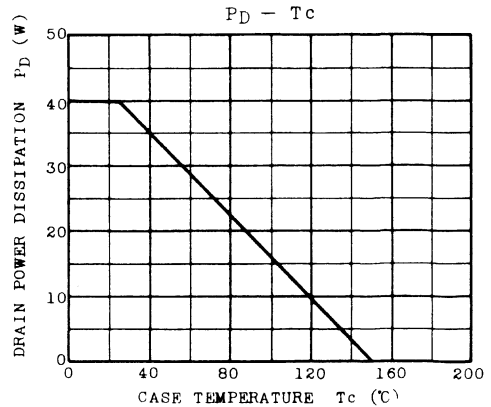
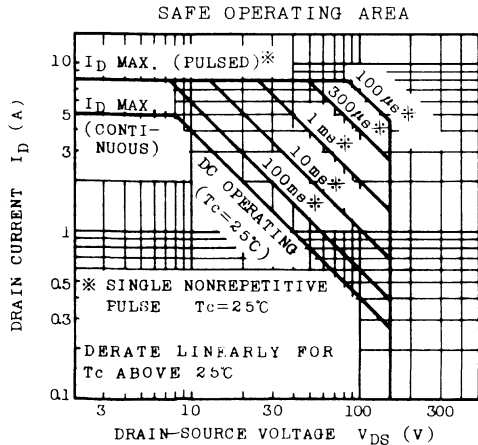
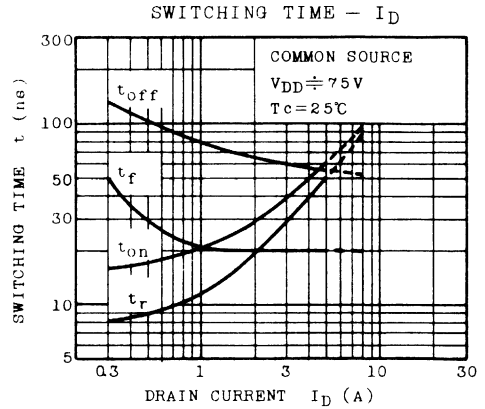
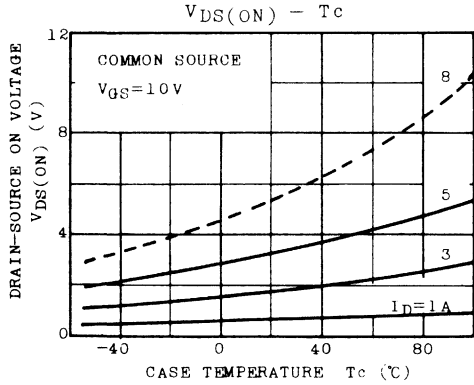
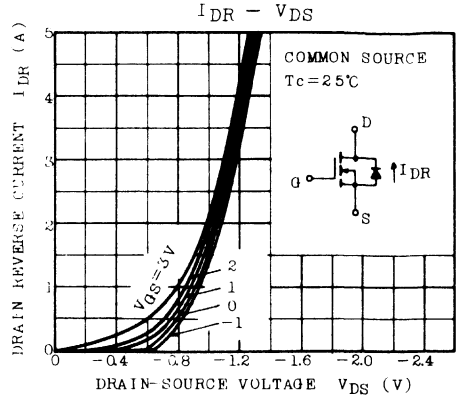
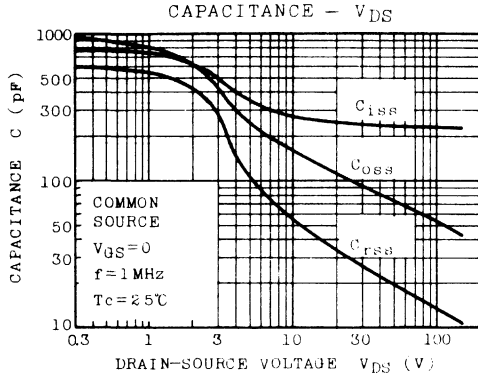


# SEMICONDUCTOR

## TECHNICAL DATA

2SK357







# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2SK358

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS)

INDUSTRIAL APPLICATIONS

Unit in mm

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.

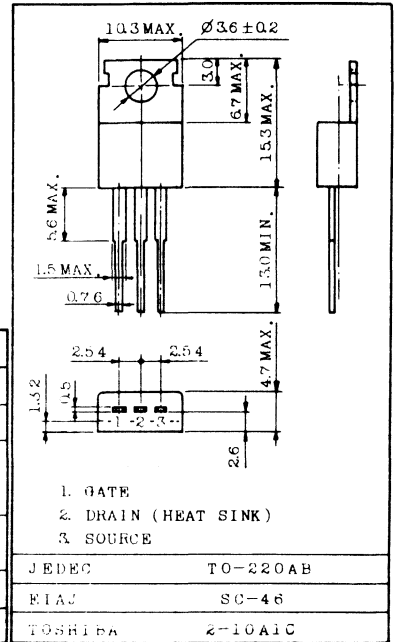
DC-DC CONVERTER, MOTOR AND SOLENOID DRIVE APPLICATIONS.

### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.7\Omega$  (Typ.)
- High Forward Transfer Admittance:  $|Y_{fs}|=2.3S$  (Typ.)
- High Drain Current :  $I_{DP}=8A$  (Max.)
- Low Leakage Current:  $I_{GSS}=\pm 100nA$  (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=1mA$  (Max.) @  $V_{DS}=250V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $I_D=1mA$

### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

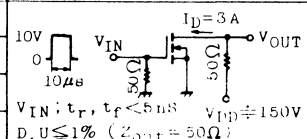
CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	250	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	5
	Pulse	$I_{DP}$	8
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	40	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	-55 ~ 150	$^\circ C$



Weight : 1.9g

### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=250V, V_{GS}=0$	-	-	1.0	mA
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	250	-	-	V
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=3A$	1.0	2.3	-	S
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=3A, V_{GS}=10V$	-	0.7	1.0	$\Omega$
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	7.2	12	V
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	380	500	pF
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	60	120	pF
Output Capacitance	$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	185	300	pF
Switching Time	Rise Time	$t_r$	-	20	40	ns
	Turn-on Time	$t_{on}$	-	30	60	
	Fall Time	$t_f$	-	30	60	
	Turn-off Time	$t_{off}$	-	80	160	

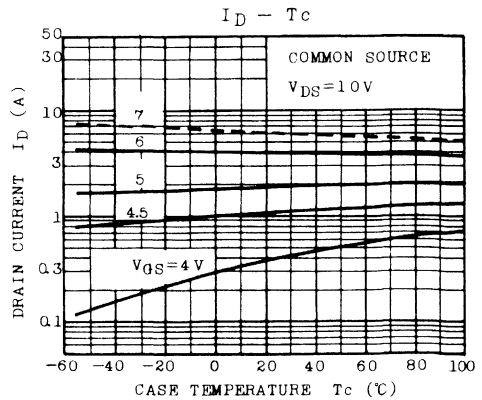
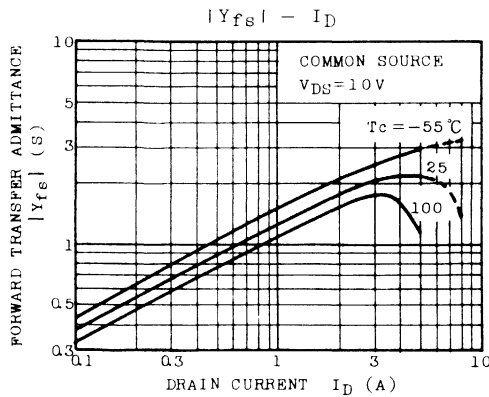
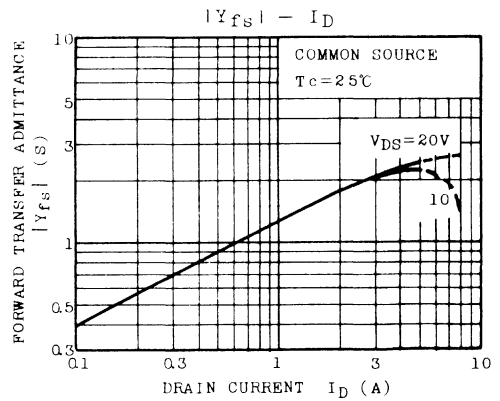
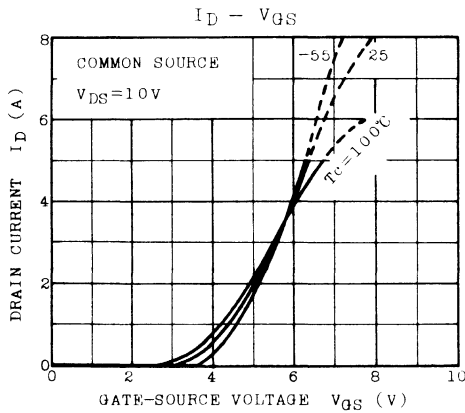
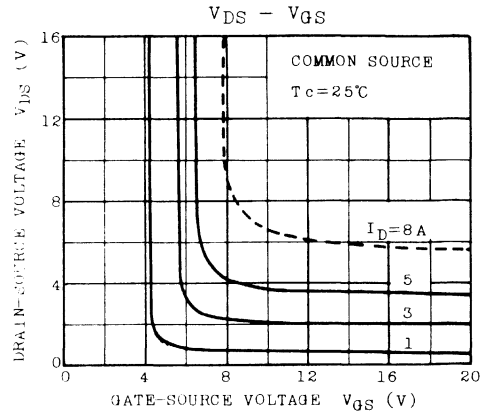
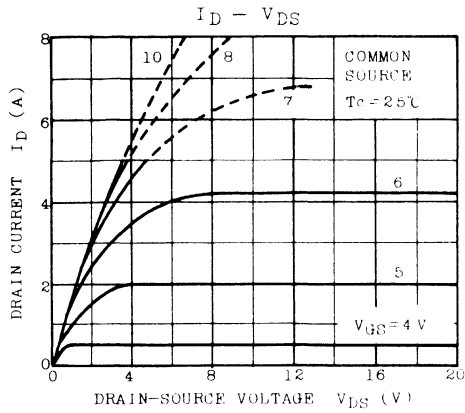


THIS TRANSISTOR IS THE ELECTROSTATIC SENSITIVE DEVICE. PLEASE HANDLE WITH CAUTION.

TOSHIBA CORPORATION



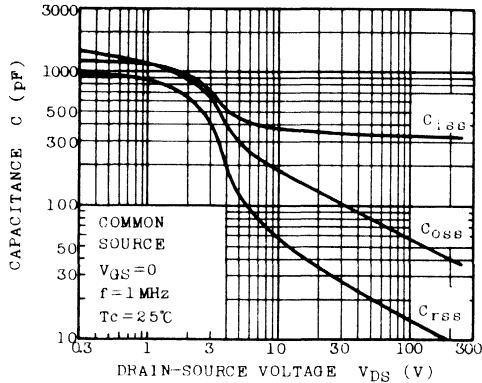
### TECHNICAL DATA



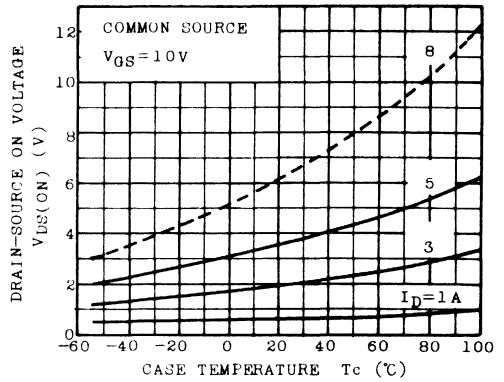


### TECHNICAL DATA

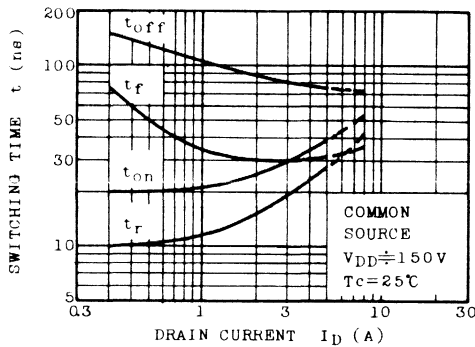
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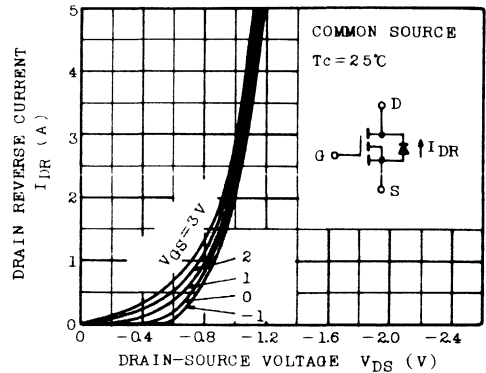
#### $V_{DS(ON)} - T_c$



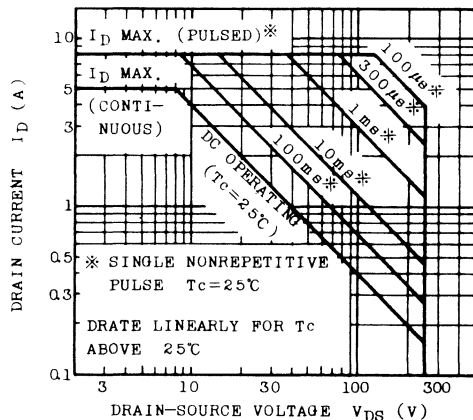
#### SWITCHING TIME - $I_D$



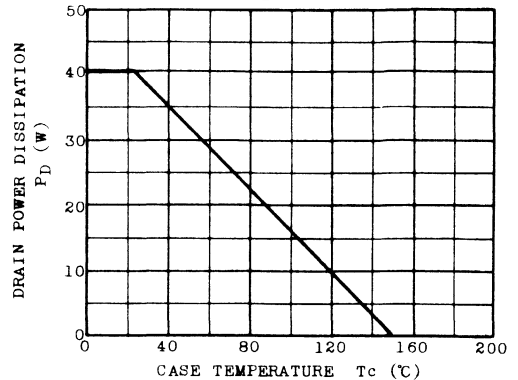
#### $I_{DR} - V_{DS}$



#### SAFE OPERATING AREA



#### $P_D - T_c$





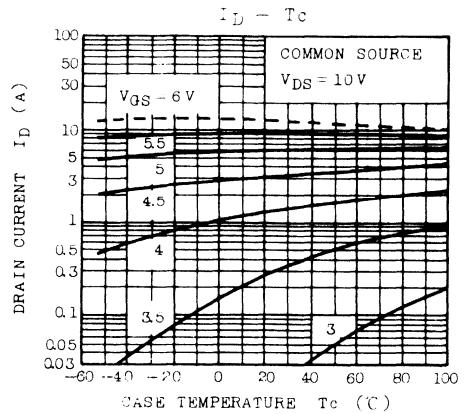
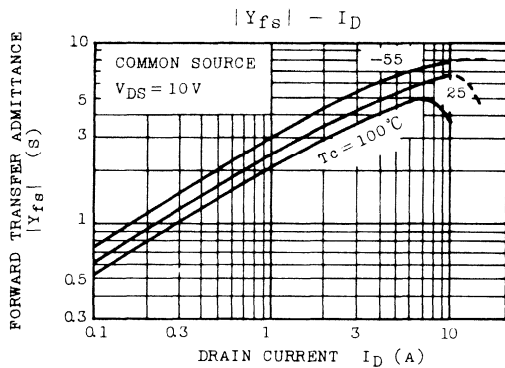
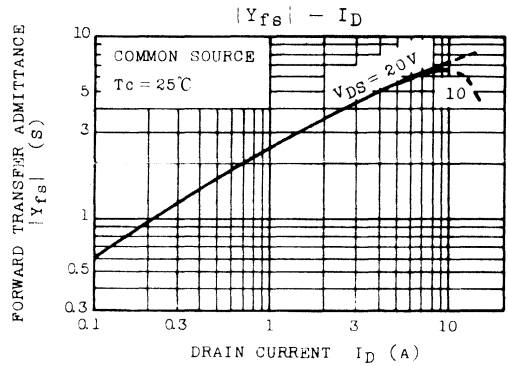
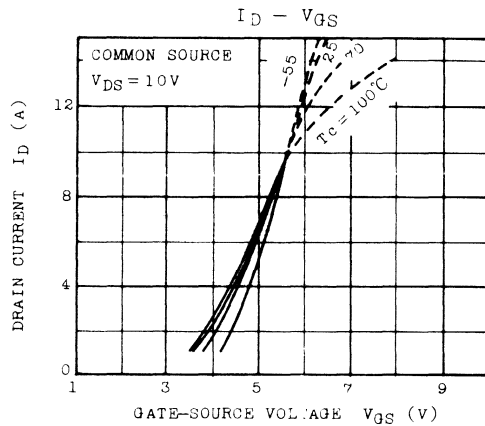
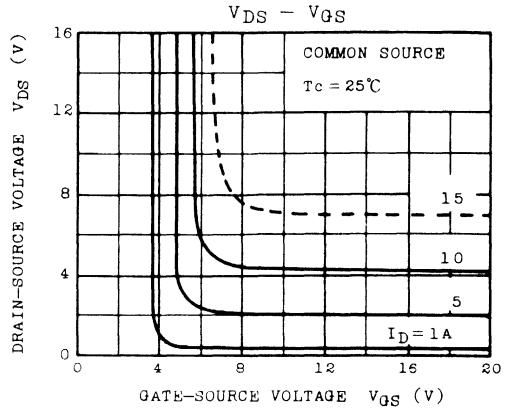
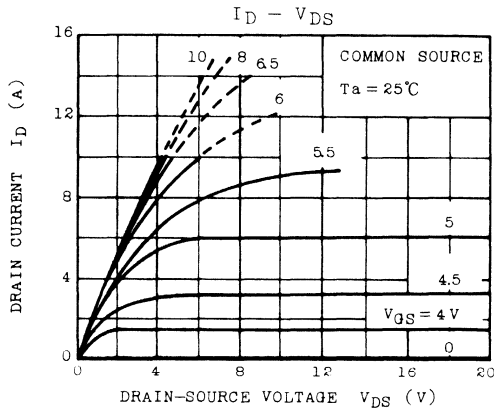




# SEMICONDUCTOR

## TECHNICAL DATA

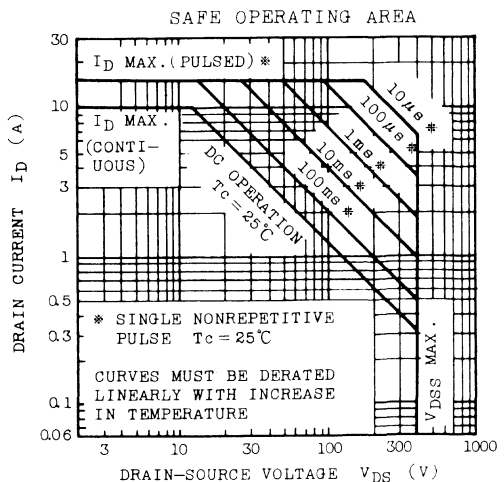
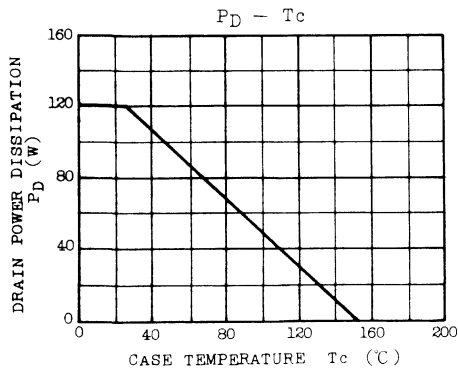
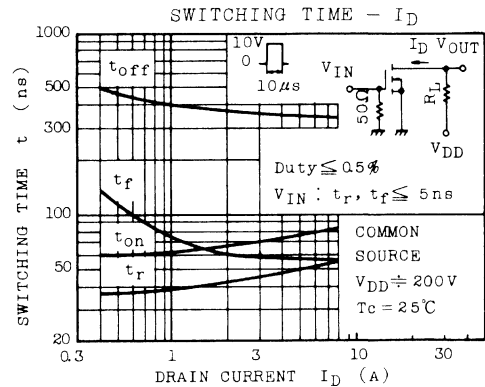
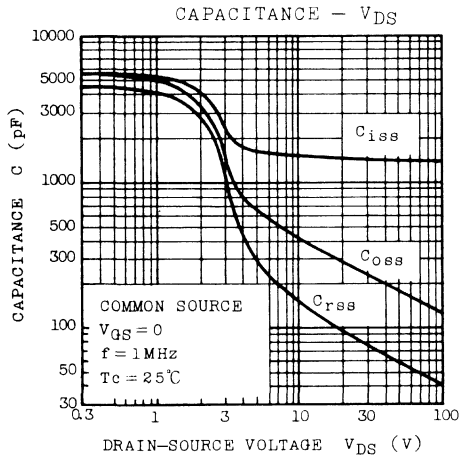
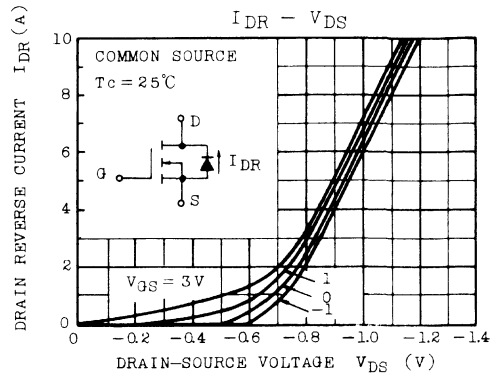
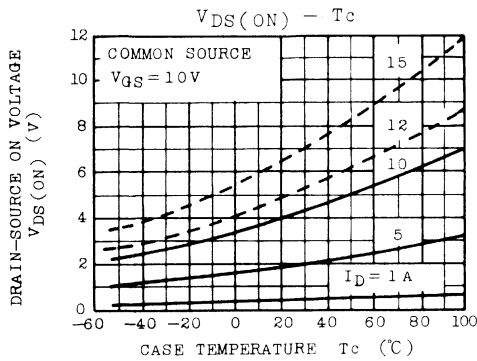
2SK385



TOSHIBA CORPORATION



## TECHNICAL DATA





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2SK386

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS)

INDUSTRIAL APPLICATIONS

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.

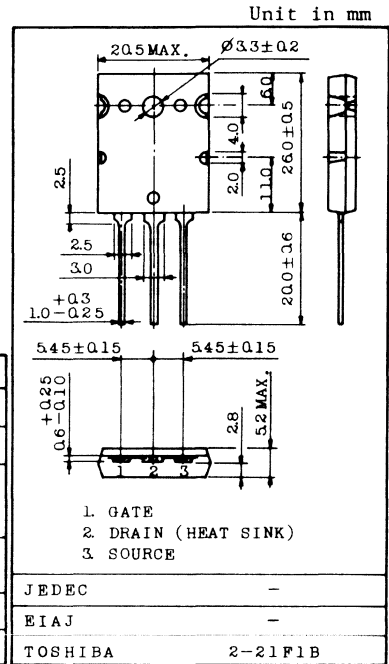
SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

**FEATURES:**

- High Breakdown Voltage :  $V_{(BR)DSS}=450V$
- High Forward Transfer Admittance :  $|Y_{fs}|=5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=1mA$ (Max.) @  $V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V$  @  $I_D=1mA$

**MAXIMUM RATINGS (Ta=25°C)**

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	450	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	10
	Pulse	$I_{DP}$	15
Drain Power Dissipation (Tc=25°C)	$P_D$	120	W
Channel Temperature	$T_{ch}$	150	°C
Storage Temperature Range	$T_{stg}$	-55 ~ 150	°C



**ELECTRICAL CHARACTERISTICS (Ta=25°C)**

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=450V, V_{GS}=0$	-	-	1.0	mA	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	450	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	3.0	5.0	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.5	0.7	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	5.5	8	V	
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	1500	2000	pF	
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	140	300	pF	
Output Capacitance	$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	400	600	pF	
Switching Time	Rise Time	$t_r$		-	50	100	ns
	Turn-on Time	$t_{on}$		-	80	150	ns
	Fall Time	$t_f$		-	80	150	ns
	Turn-off Time	$t_{off}$		-	350	700	ns

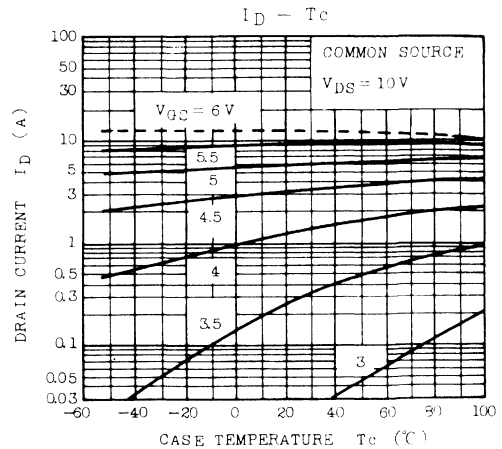
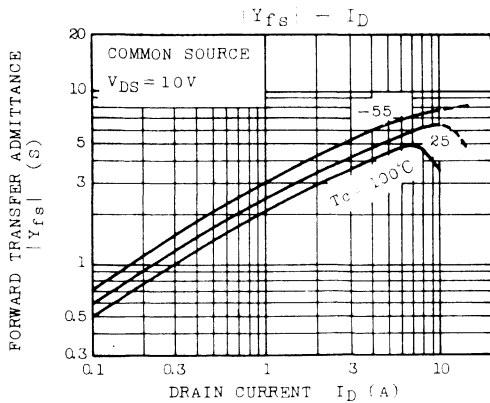
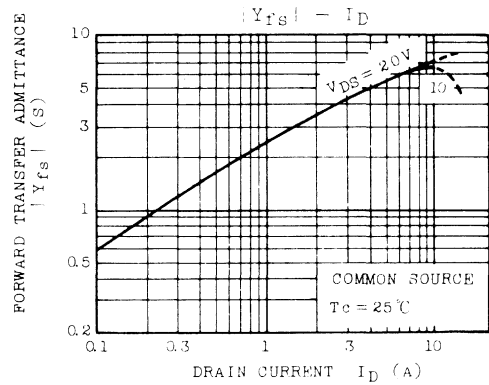
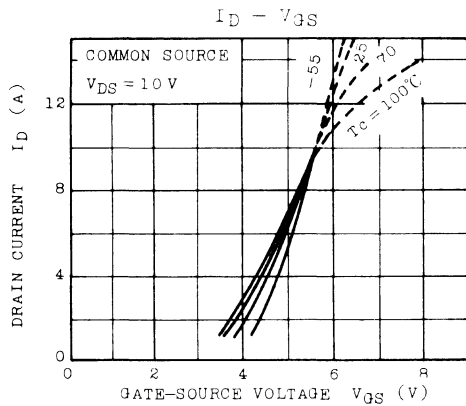
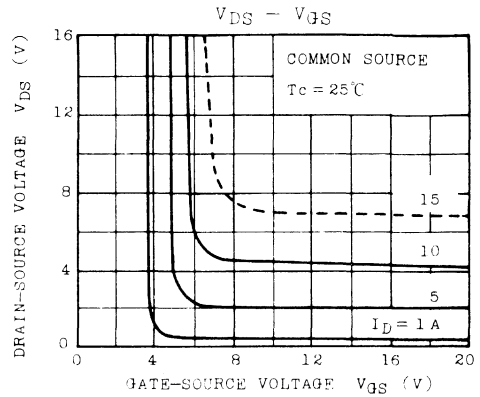
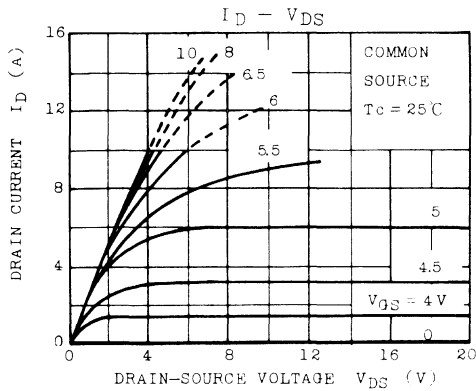
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

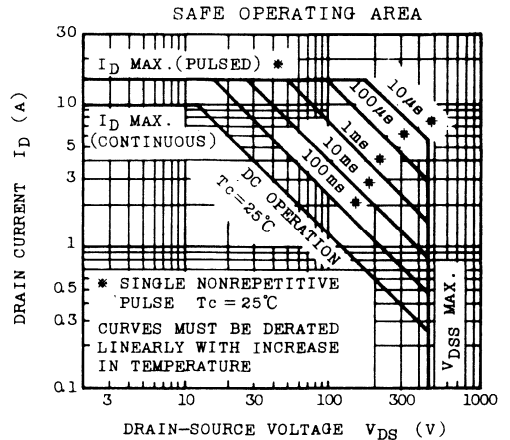
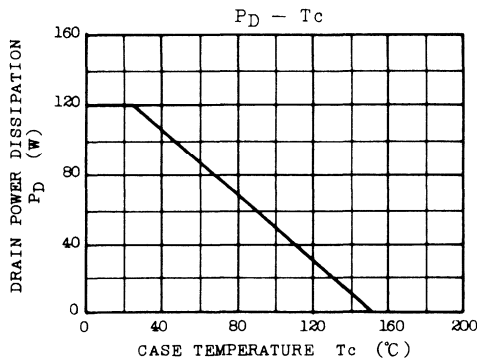
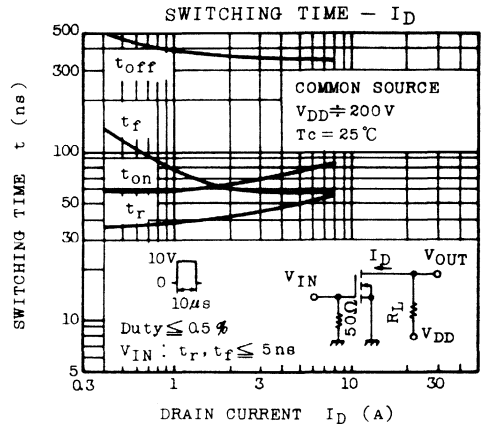
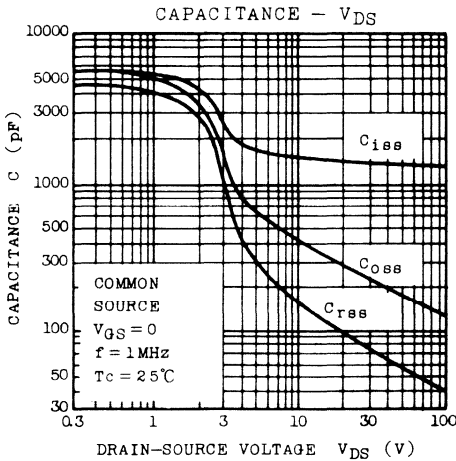
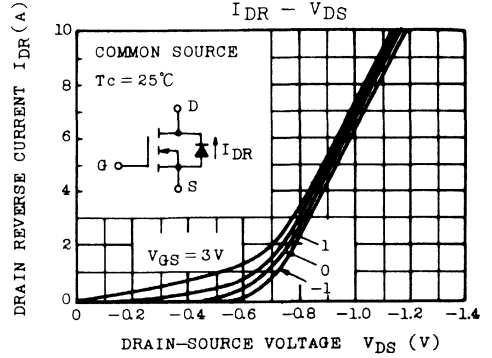
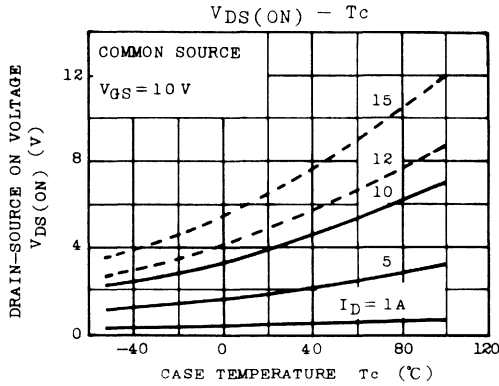
2SK386



TOSHIBA CORPORATION



## TECHNICAL DATA





## TECHNICAL DATA

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

**FEATURES:**

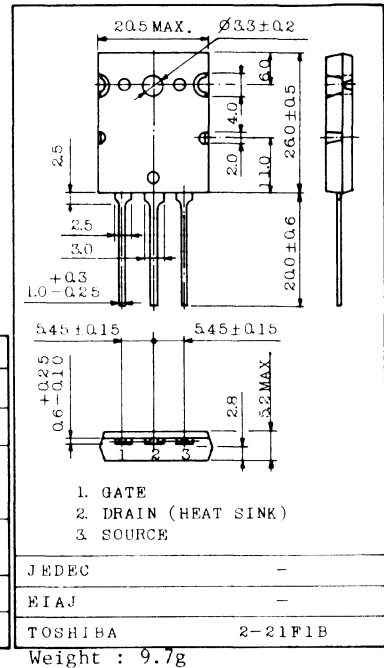
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.12\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{FS}|=6S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=1mA$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $I_D=1mA$

**MAXIMUM RATINGS (Ta=25°C)**

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	12	A
	Pulse	$I_{DP}$	40	
Drain Power Dissipation (Tc=25°C)		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	°C
Storage Temperature Range		$T_{stg}$	-55 ~ 150	°C

**INDUSTRIAL APPLICATIONS**

Unit in mm



**ELECTRICAL CHARACTERISTICS (Ta=25°C)**

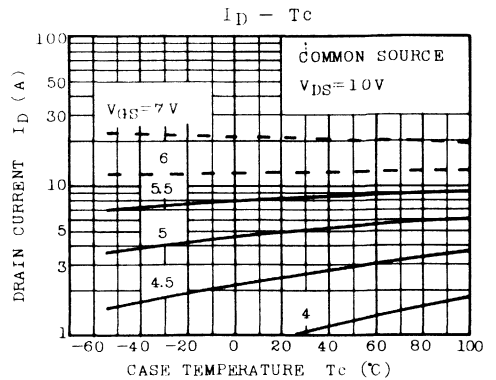
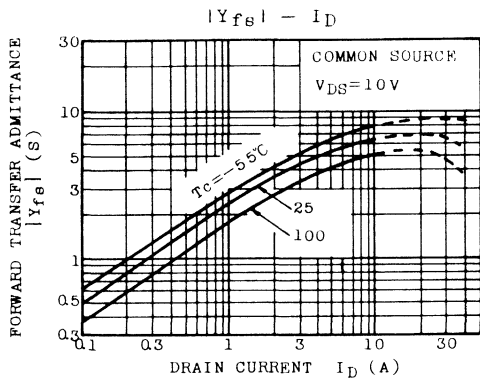
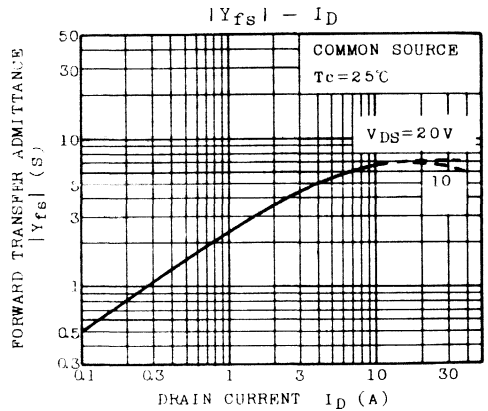
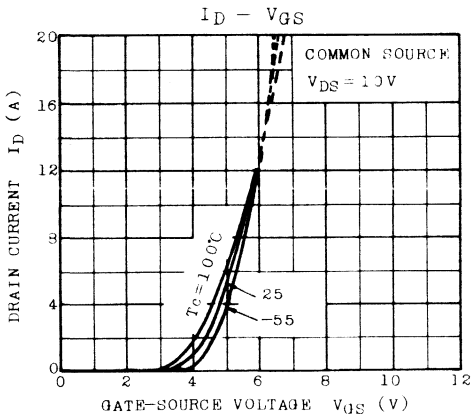
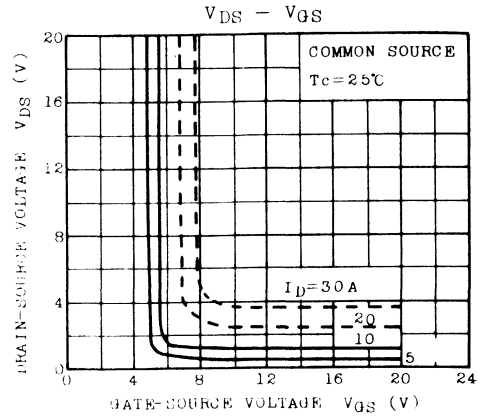
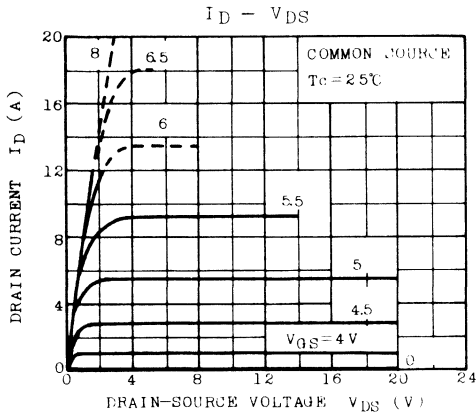
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0$	-	-	1.0	mA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{FS} $	$V_{DS}=10V, I_D=10A$	3	6	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	0.12	0.18	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	1.2	1.8	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	1600	2200	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	350	600	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	800	1300	pF
Switching Time	Rise Time	$t_r$		-	120	260	ns
	Turn-on Time	$t_{on}$		-	150	300	ns
	Fall Time	$t_f$		-	120	240	ns
	Turn-off Time	$t_{off}$		-	300	600	ns



# SEMICONDUCTOR

## TECHNICAL DATA

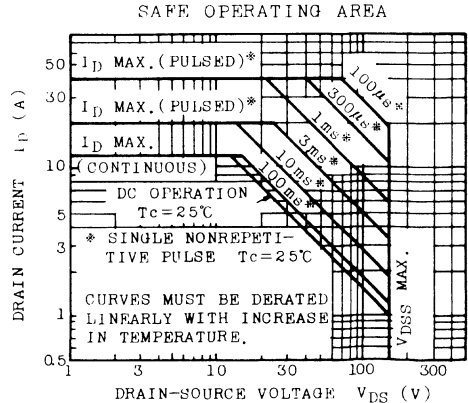
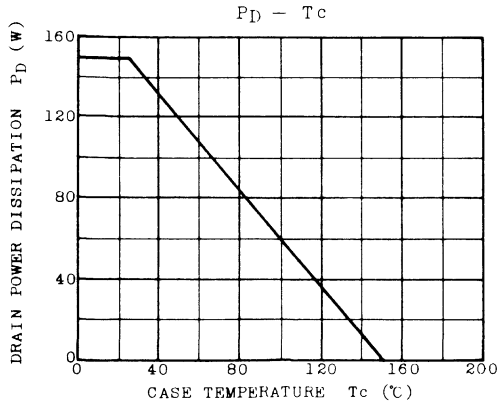
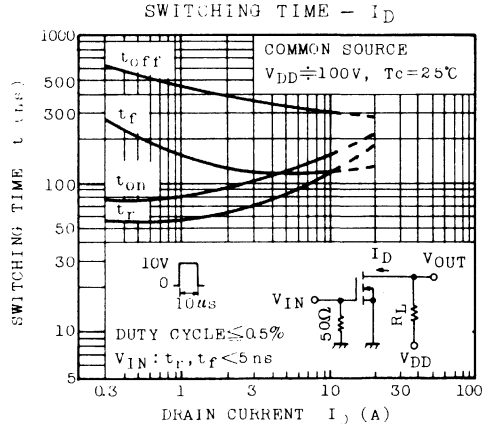
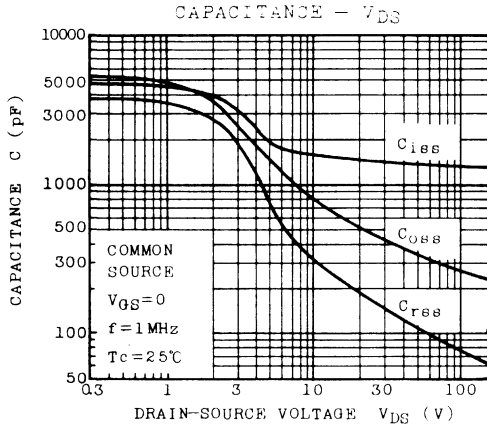
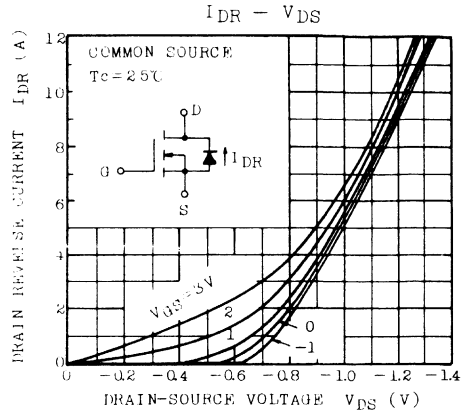
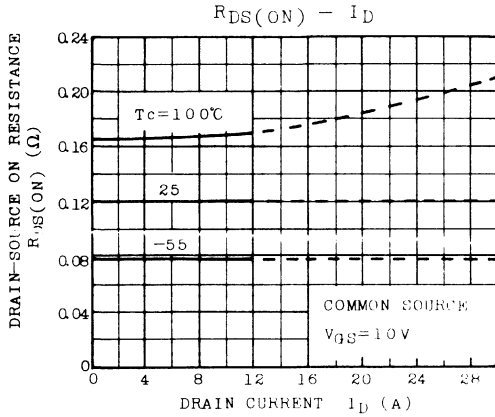
2SK387



TOSHIBA CORPORATION



### TECHNICAL DATA







# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2SK388

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS)

INDUSTRIAL APPLICATIONS

Unit in mm

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.

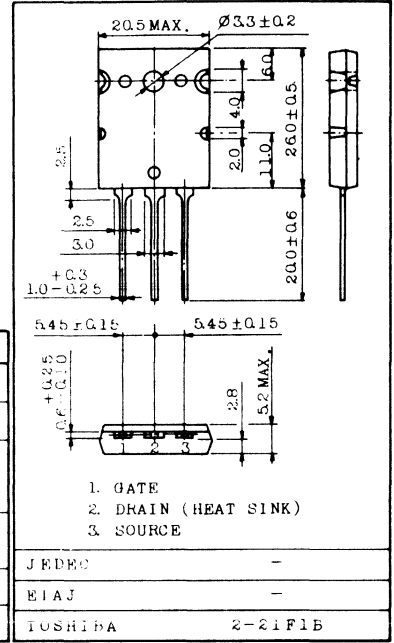
SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

**FEATURES:**

- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 0.2 \Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 6S$  (Typ.)
- Low Leakage Current :  $I_{GSS} = \pm 100nA$  (Max.) @  $V_{GS} = \pm 20V$   
 $I_{DSS} = 1mA$  (Max.) @  $V_{DS} = 250V$
- Enhancement-Mode :  $V_{th} = 1.5 \sim 3.5V$  @  $I_D = 1mA$

**MAXIMUM RATINGS ( $T_a = 25^\circ C$ )**

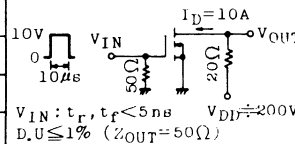
CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	250	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	12
	Pulse	$I_{DP}$	30
Drain Power Dissipation ( $T_c = 25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$t_{stg}$	-55 ~ 150	$^\circ C$



Weight : 9.7g

**ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ C$ )**

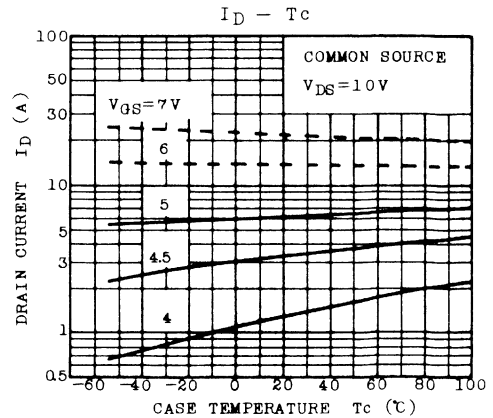
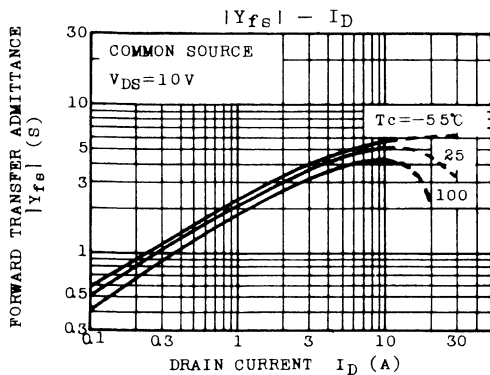
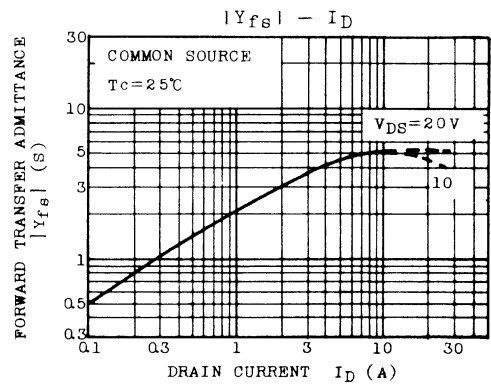
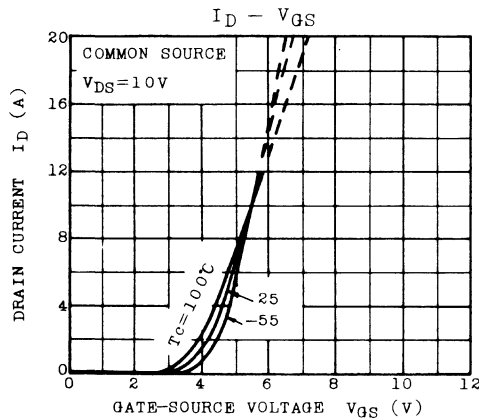
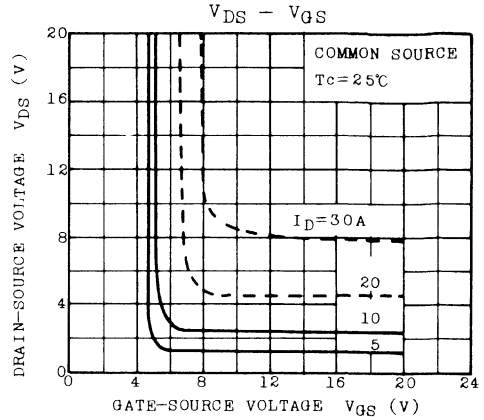
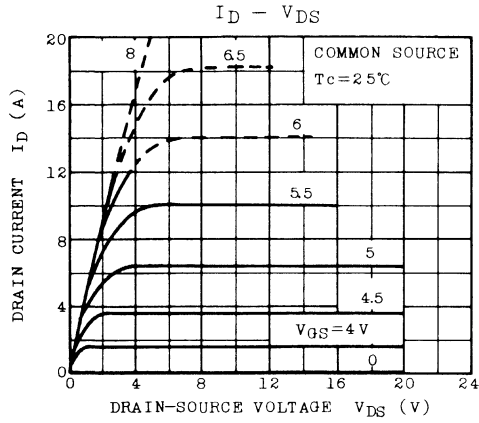
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0$	-	-	$\pm 100$	nA
Drain Cut-off Current	$I_{DSS}$	$V_{DS} = 250V, V_{GS} = 0$	-	-	1.0	mA
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = 10mA, V_{GS} = 0$	250	-	-	V
Gate Threshold Voltage	$V_{th}$	$V_{DS} = 10V, I_D = 1mA$	1.5	-	3.5	V
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS} = 10V, I_D = 10A$	3	6	-	S
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D = 10A, V_{GS} = 10V$	-	0.20	0.25	$\Omega$
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D = 10A, V_{GS} = 10V$	-	2.0	2.5	V
Input Capacitance	$C_{iss}$	$V_{DS} = 10V, V_{GS} = 0, f = 1MHz$	-	1600	2000	pF
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS} = 10V, V_{GS} = 0, f = 1MHz$	-	220	320	pF
Output Capacitance	$C_{oss}$	$V_{DS} = 10V, V_{GS} = 0, f = 1MHz$	-	570	700	pF
Switching Time	Rise Time	$t_r$	-	110	220	ns
	Turn-on Time	$t_{on}$	-	130	260	ns
	Fall Time	$t_f$	-	100	200	ns
	Turn-off Time	$t_{off}$	-	320	640	ns



TOSHIBA CORPORATION



### TECHNICAL DATA

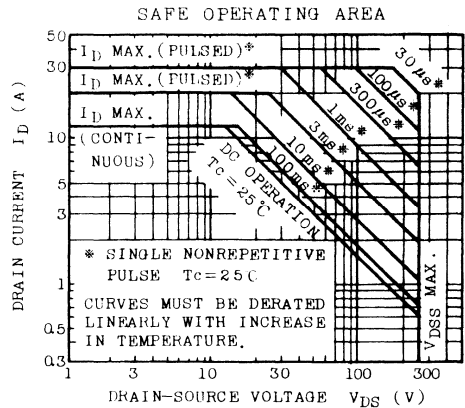
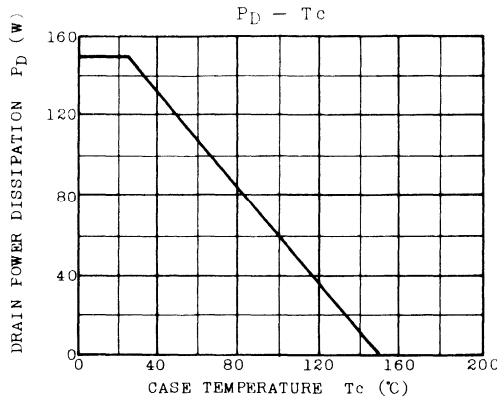
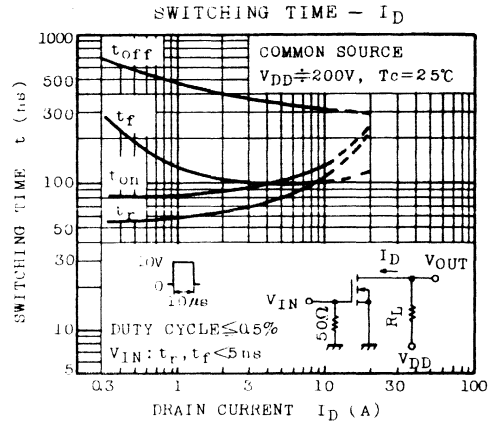
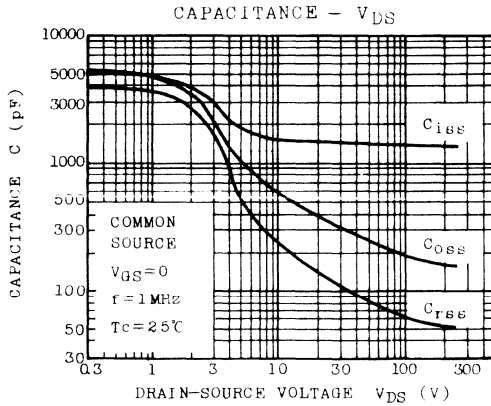
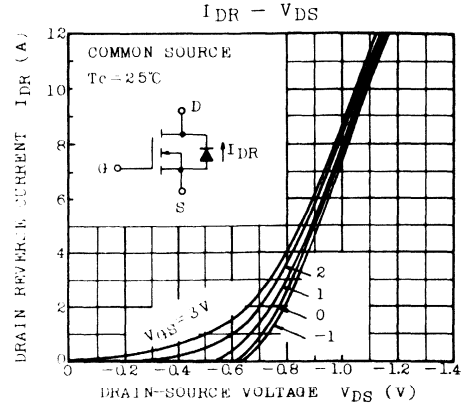
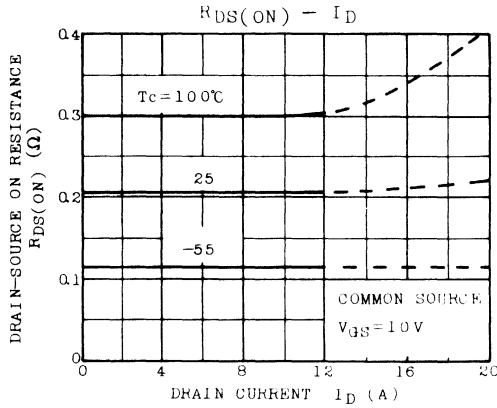




# SEMICONDUCTOR

2SK388

## TECHNICAL DATA





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

### 2SK405

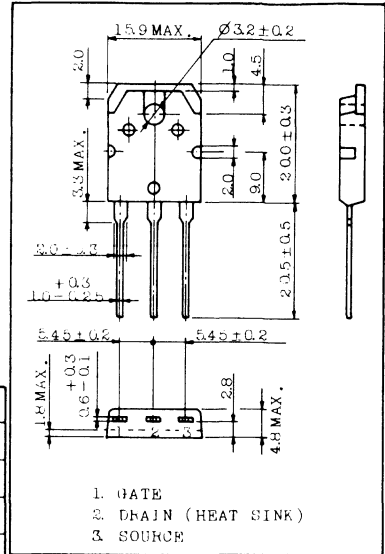
### SILICON N CHANNEL MOS TYPE

#### AUDIO FREQUENCY POWER AMPLIFIER APPLICATION.

Unit in mm

#### FEATURES:

- High Breakdown Voltage :  $V_{DSS}=160V$
- High Forward Transfer Admittance :  $|Y_{fs}|=2.0S$  (Typ.)
- Complementary to 2SJ115



J E D E C	-
E I A J	-
T O S H I B A	2-16C1B

Weight : 4.6g

#### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSS}$	160	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	$I_D$	8	A
Power Dissipation (Tc=25°C)	$P_D$	100	W
Channel Temperature	$T_{ch}$	150	°C
Storage Temperature Range	$T_{stg}$	-55 ~ 150	°C

#### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current	$I_{GSS}$	$V_{DS}=0, V_{GS}=\pm 20V$	-	-	$\pm 1.0$	$\mu A$
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=5mA, V_{GS}=0$	160	-	-	V
Gate-Source Cut-off Voltage	$V_{GS(OFF)}$ (Note)	$V_{DS}=10V, I_D=0.1A$	0.8	-	2.8	V
Drain-Source Saturation Voltage	$V_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	2.5	7.0	V
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=2A$	1.0	2.0	-	S
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	430	-	pF
Output Capacitance	$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	260	-	pF
Reverse Transfer Capacitance	$C_{rs}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	80	-	pF

Note :  $V_{GS(OFF)}$  Classification 0 : 0.8 ~ 1.6, Y : 1.4 ~ 2.8

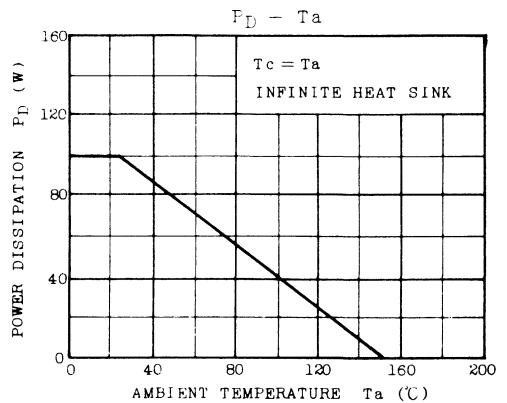
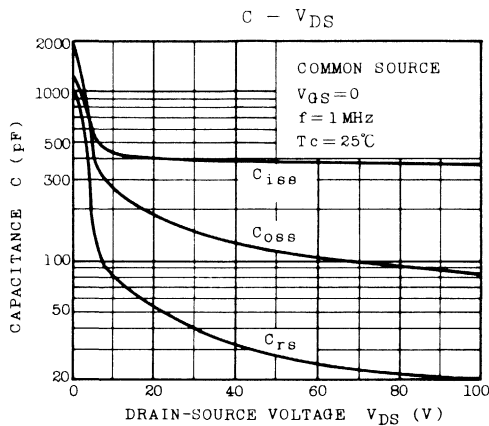
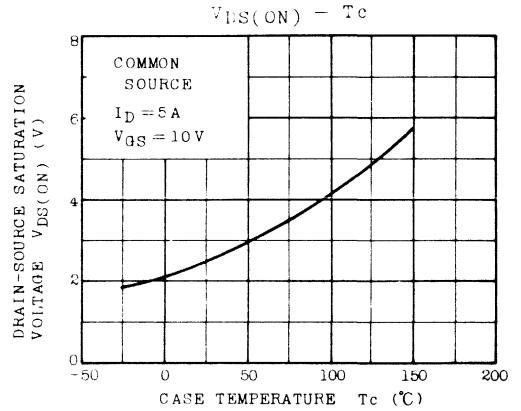
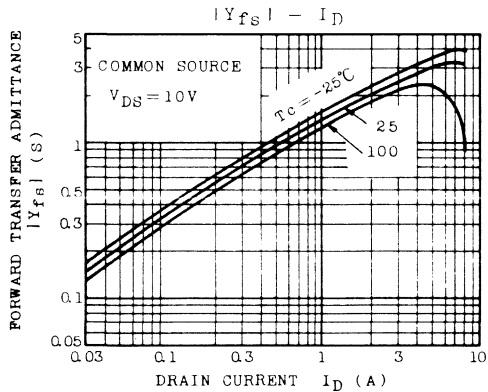
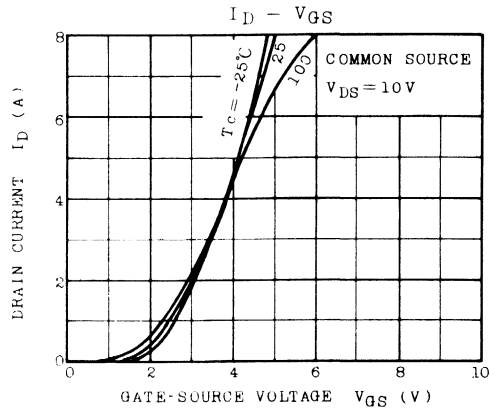
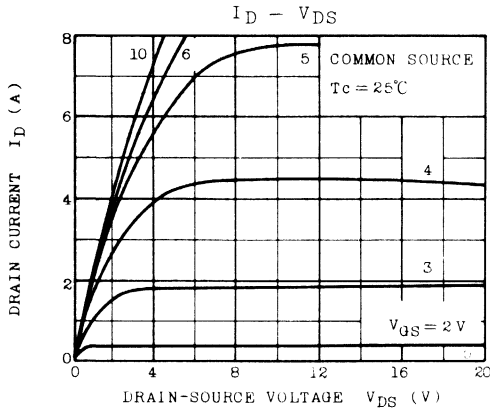
### TOSHIBA CORPORATION



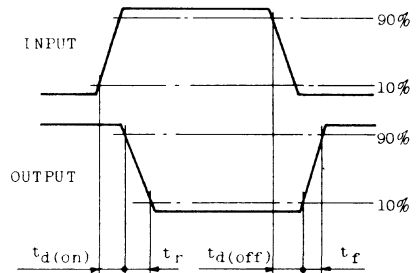
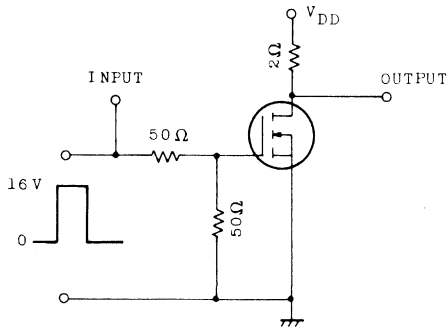
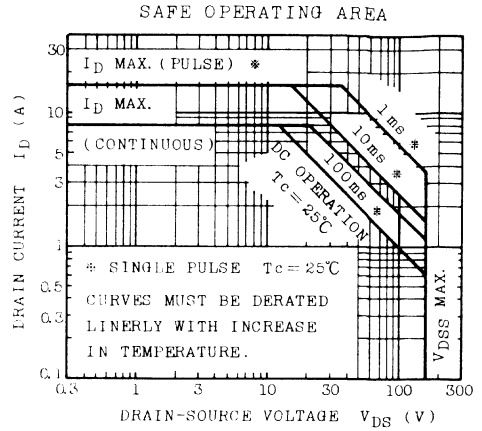
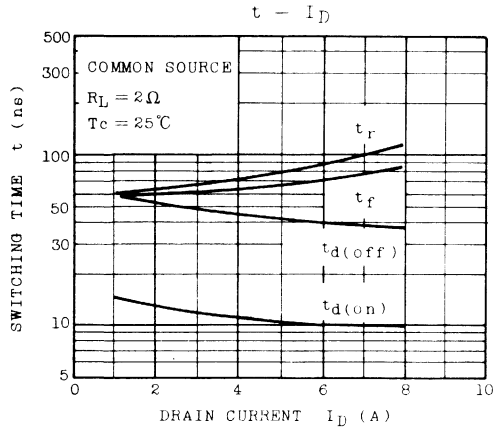
# SEMICONDUCTOR

## TECHNICAL DATA

2SK405



TOSHIBA CORPORATION





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2SK422

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS)

INDUSTRIAL APPLICATIONS

Unit in mm

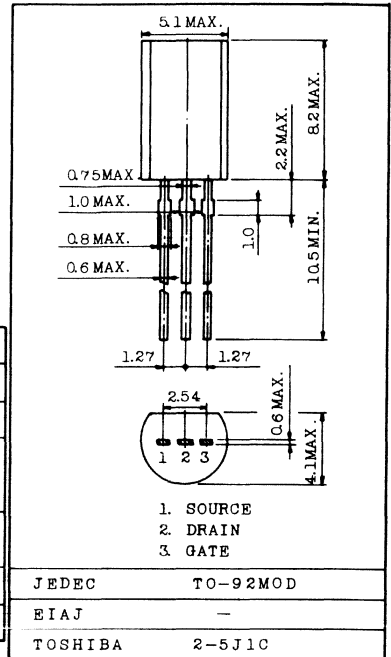
HIGH SPEED SWITCHING APPLICATIONS.  
DC-DC CONVERTER AND INTERFACE APPLICATIONS.

### FEATURES:

- . Excellent Switching Times :  $t_{off}=12\text{ns}(\text{Typ.})$
- . High Forward Transfer Admittance :  $|Y_{fs}|=220\text{mS}(\text{Typ.})$   
@ $I_D=0.5\text{A}$
- . Low Leakage Current :  $I_{GSS}=\pm 100\text{nA}(\text{Max.})$  @ $V_{GS}=\pm 20\text{V}$   
 $I_{DSS}=1\text{mA}(\text{Max.})$  @ $V_{DS}=60\text{V}$
- . Enhancement-Mode :  $V_{th}=1.5\sim 3.5\text{V}$  @ $I_D=1\text{mA}$

### MAXIMUM RATINGS ( $T_a=25^\circ\text{C}$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	0.7	A
	Pulse	$I_{DP}$	1.0	
Drain Power Dissipation ( $T_a=25^\circ\text{C}$ )		$P_D$	900	mW
Channel Temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ\text{C}$

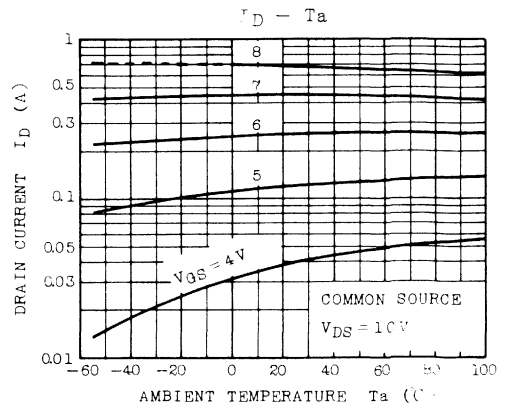
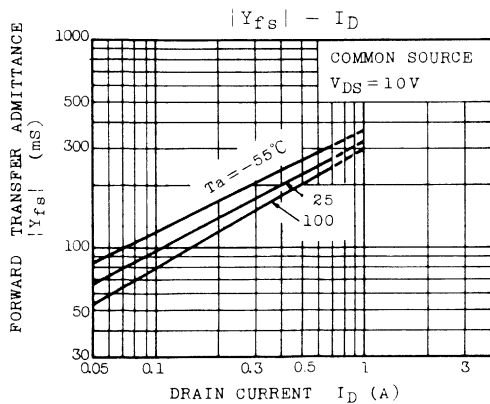
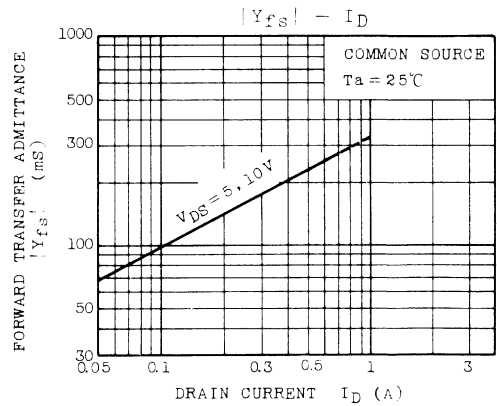
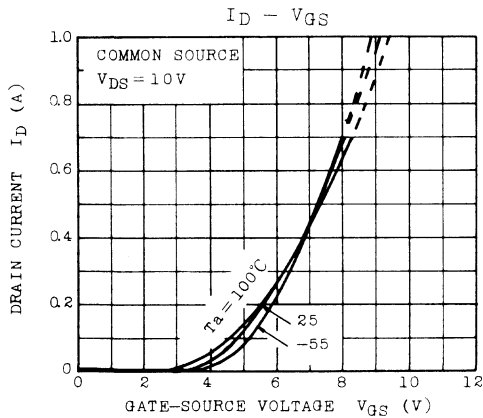
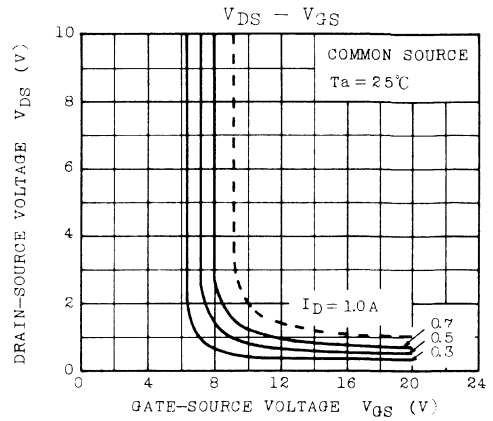
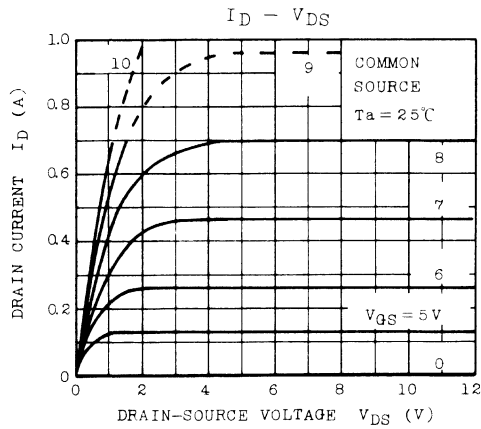


### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ\text{C}$ )

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20\text{V}, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=60\text{V}, V_{GS}=0$	-	-	1.0	mA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10\text{mA}, V_{GS}=0$	60	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10\text{V}, I_D=1\text{mA}$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10\text{V}, I_D=0.5\text{A}$	80	220	-	nS
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=0.5\text{A}, V_{GS}=10\text{V}$	-	1.4	2.8	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=1\text{A}, V_{GS}=10\text{V}$	-	2	4	V
Input Capacitance		$C_{iss}$	$V_{DS}=10\text{V}, V_{GS}=0, f=1\text{MHz}$	-	45	70	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=10\text{V}, V_{GS}=0, f=1\text{MHz}$	-	20	35	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10\text{V}, V_{GS}=0, f=1\text{MHz}$	-	60	100	pF
Switching Time	Rise Time	$t_r$		-	11	20	ns
	Turn-on Time	$t_{on}$		-	17	35	
	Fall Time	$t_f$		-	6	10	
	Turn-off Time	$t_{off}$		-	12	25	

THIS TRANSISTOR IS THE ELECTROSTATIC SENSITIVE DEVICE. PLEASE HANDLE WITH CAUTION.

TOSHIBA CORPORATION



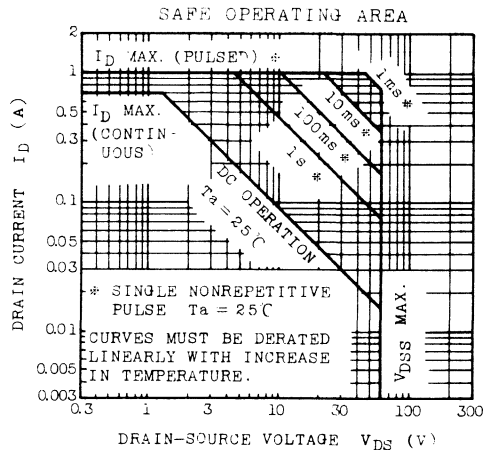
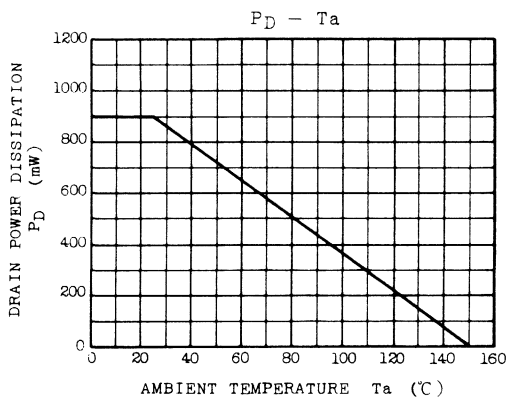
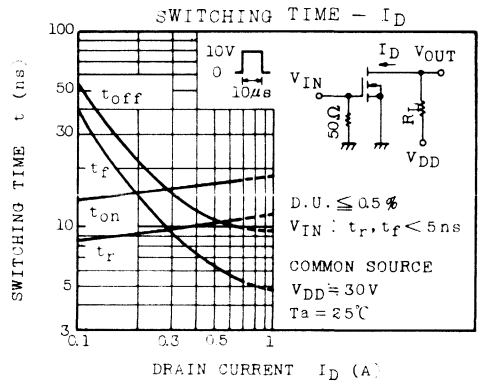
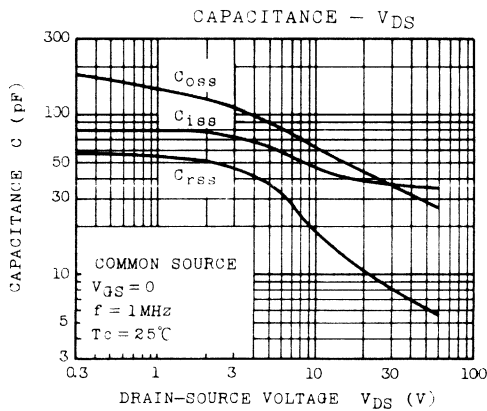
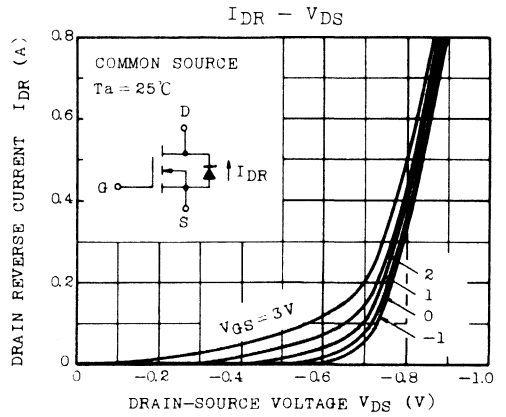
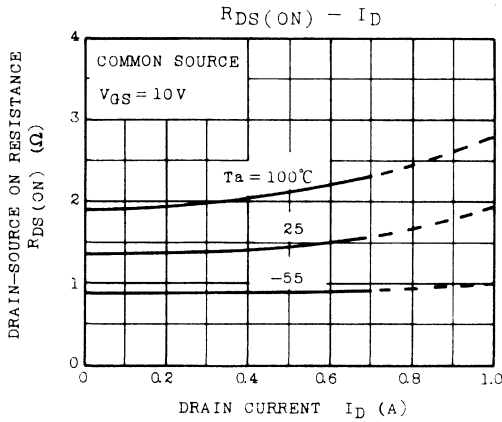




# SEMICONDUCTOR

## TECHNICAL DATA

2SK422





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2SK423

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS)

INDUSTRIAL APPLICATIONS

Unit in mm

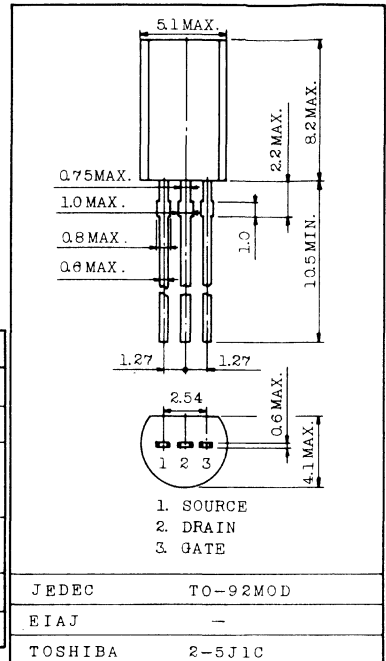
HIGH SPEED SWITCHING APPLICATIONS.  
DC-DC CONVERTER AND INTERFACE APPLICATIONS.

### FEATURES:

- Excellent Switching Times :  $t_{off}=20\text{ns}(\text{Typ.})$
- High Forward Transfer Admittance :  $|Y_{fs}|=150\text{mS}(\text{Typ.})$   
@ $I_D=0.3\text{A}$
- Low Leakage Current :  $I_{GSS}=\pm 100\text{nA}(\text{Max.})$  @ $V_{GS}=\pm 20\text{V}$   
 $I_{DSS}=1\text{mA}(\text{Max.})$  @ $V_{DS}=100\text{V}$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5\text{V}$  @ $I_D=1\text{mA}$

### MAXIMUM RATINGS ( $T_a=25^\circ\text{C}$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	100	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	0.5
	Pulse	$I_{DP}$	0.8
Drain Power Dissipation ( $T_a=25^\circ\text{C}$ )	$P_D$	900	mW
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ\text{C}$



### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ\text{C}$ )

Weight : 0.36g

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT		
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20\text{V}, V_{DS}=0$	-	-	$\pm 100$	nA		
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=100\text{V}, V_{GS}=0$	-	-	1.0	mA		
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10\text{mA}, V_{GS}=0$	100	-	-	V		
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10\text{V}, I_D=1\text{mA}$	1.5	-	3.5	V		
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10\text{V}, I_D=0.3\text{A}$	50	150	-	$\mu\text{S}$		
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=0.3\text{A}, V_{GS}=10\text{V}$	-	2.4	4.5	$\Omega$		
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=0.8\text{A}, V_{GS}=10\text{V}$	-	2.5	4.3	V		
Input Capacitance	$C_{iss}$	$V_{DS}=10\text{V}, V_{GS}=0, f=1\text{MHz}$	-	40	70	pF		
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=10\text{V}, V_{GS}=0, f=1\text{MHz}$	-	14	30	pF		
Output Capacitance	$C_{oss}$	$V_{DS}=10\text{V}, V_{GS}=0, f=1\text{MHz}$	-	50	80	pF		
Switching Time	Rise Time	$t_r$			-	10	20	ns
	Turn-on Time	$t_{on}$	-	15	30			
	Fall Time	$t_f$	-	13	25			
	Turn-off Time	$t_{off}$	-	20	40			

THIS TRANSISTOR IS THE ELECTROSTATIC SENSITIVE DEVICE. PLEASE HANDLE WITH CAUTION.

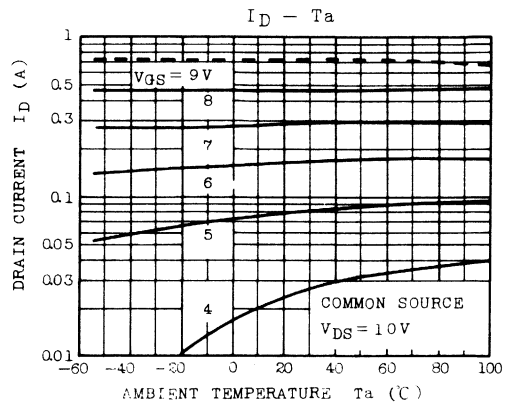
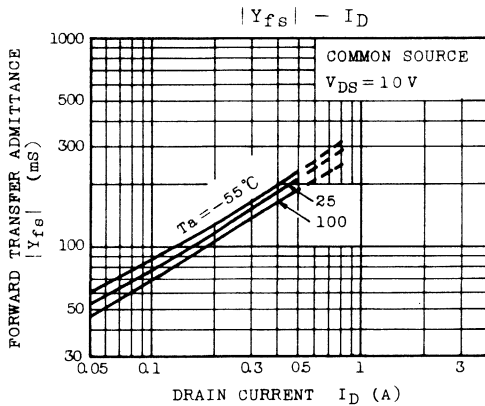
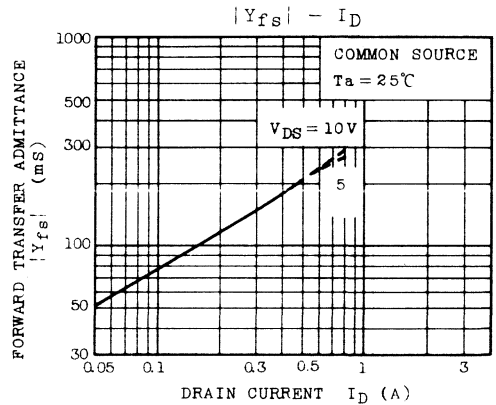
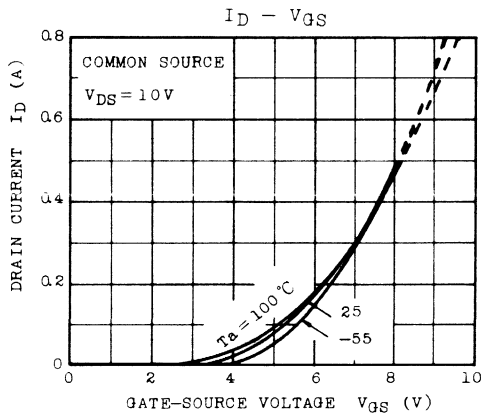
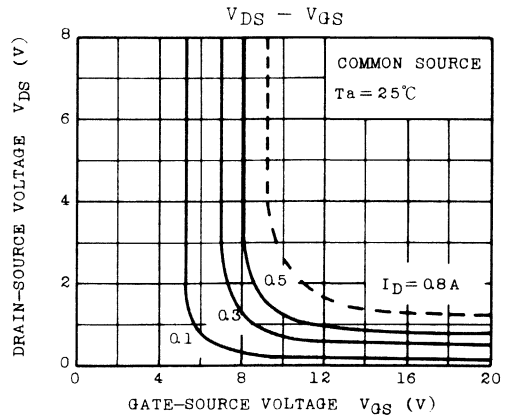
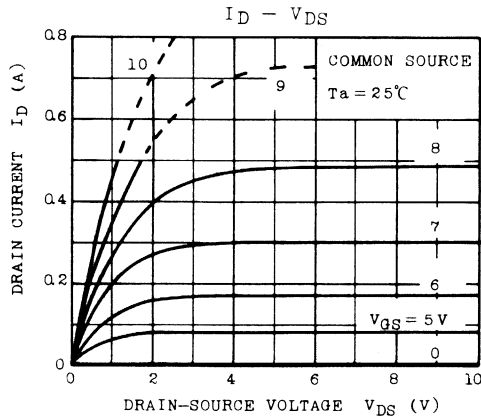
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

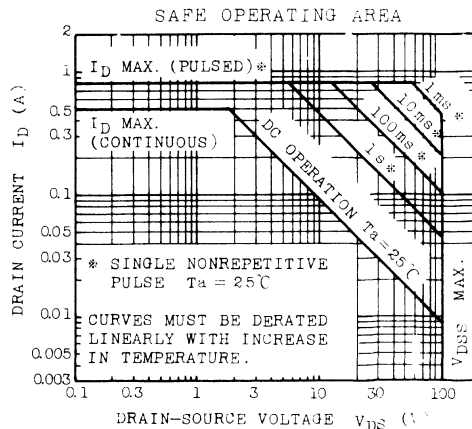
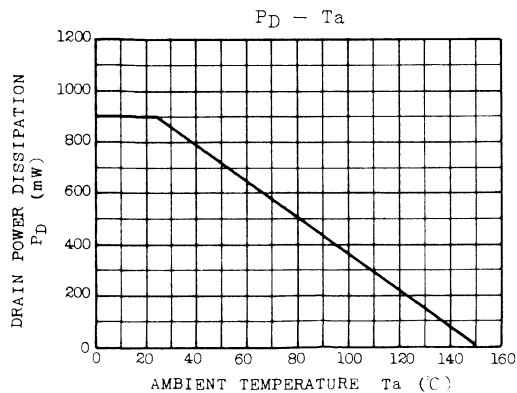
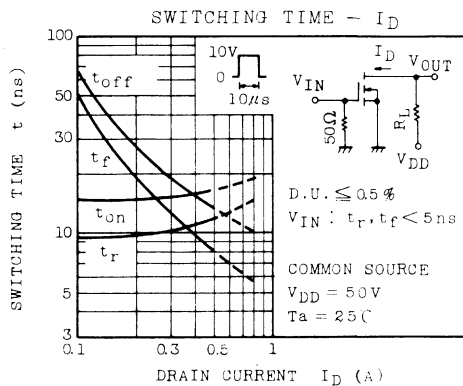
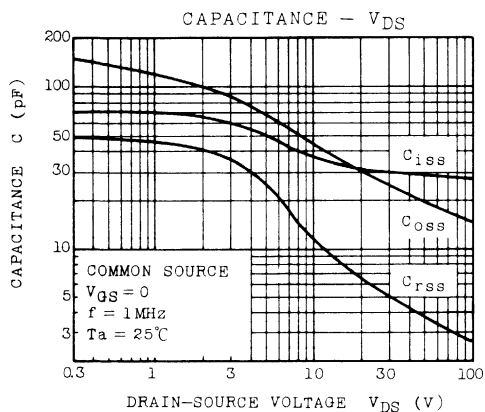
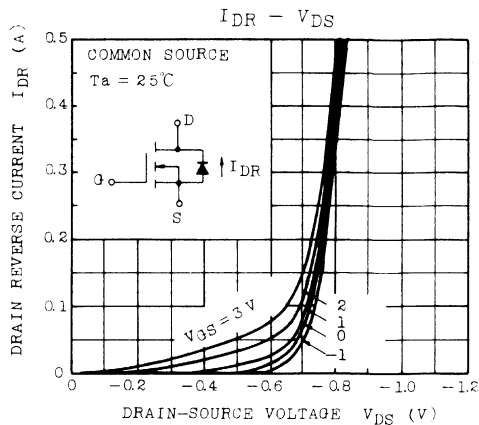
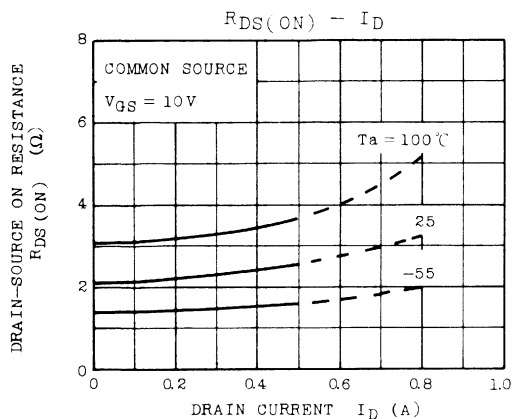
2SK423



TOSHIBA CORPORATION



### TECHNICAL DATA





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
**2SK442**  
 SILICON N CHANNEL MOS TYPE

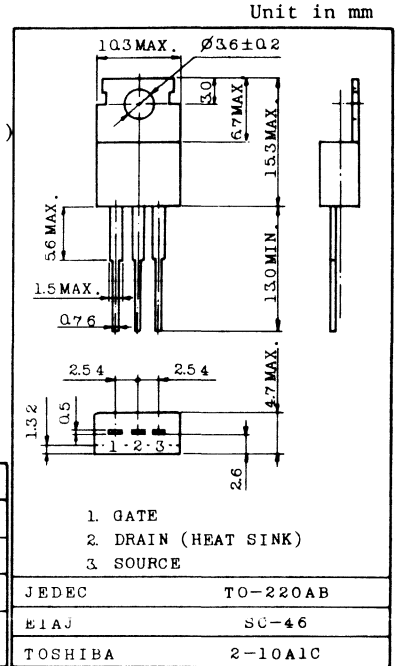
HIGH SPEED SWITCHING APPLICATION.  
 DC-DC CONVERTER APPLICATION.

**FEATURES:**

- Low Drain-Source Saturation Voltage :  $V_{DS(ON)}=1.4V(Typ.)$
- High Forward Transfer Admittance :  $|Y_{fs}|=1.9S(Typ.)$
- Complementary to 2SJ123.

**MAXIMUM RATINGS (Ta=25°C)**

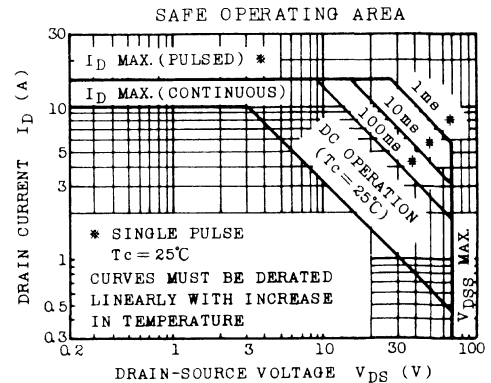
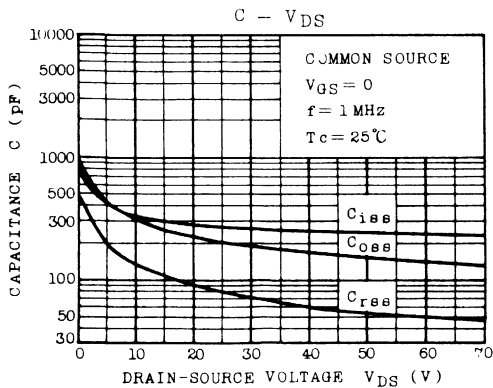
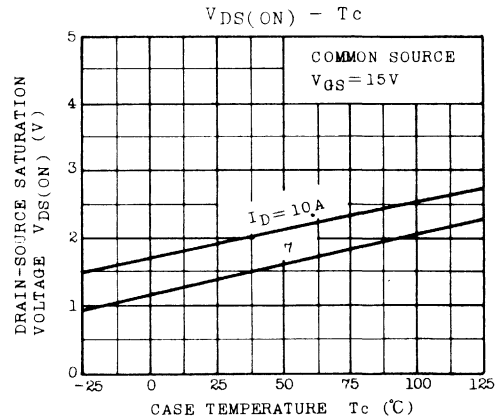
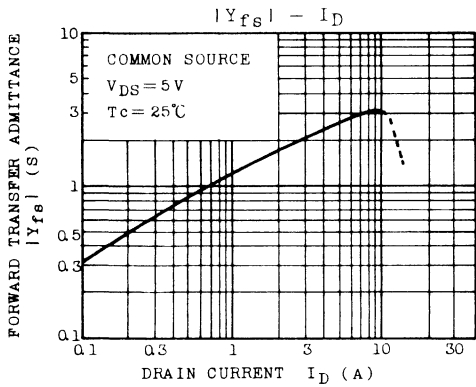
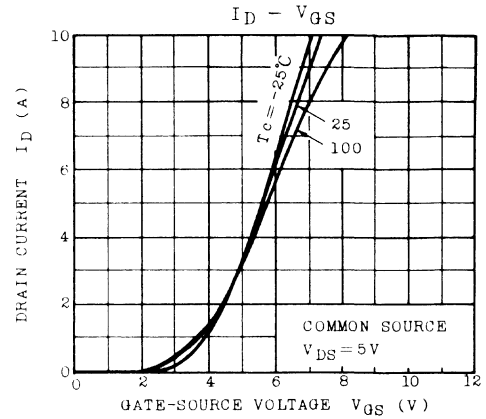
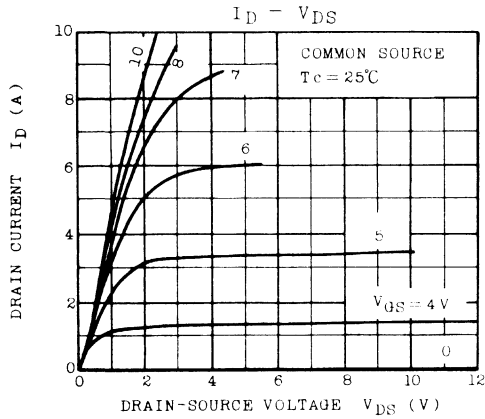
CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSS}$	70	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	$I_D$	10	A
Drain Power Dissipation (Tc=25°C)	$P_D$	30	W
Channel Temperature	$T_{ch}$	150	°C
Storage Temperature Range	$T_{stg}$	-55 ~ 150	°C



Weight : 1.9g

**ELECTRICAL CHARACTERISTICS (Ta=25°C)**

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current	$I_{GSS}$	$V_{DS}=0, V_{GS}=\pm 20V$	-	-	$\pm 1.0$	$\mu A$
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=70V, V_{GS}=0$	-	-	1.0	mA
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=1mA, V_{GS}=0$	70	-	-	V
Gate-Source Cut-off Voltage	$V_{GS(OFF)}$	$V_{DS}=5V, I_D=1mA$	1.0	-	3.0	V
Drain-Source Saturation Voltage	$V_{DS(ON)}$	$I_D=7A, V_{GS}=15V$	-	1.4	2.8	V
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=5V, I_D=2A$	1.0	1.9	-	S
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	330	-	pF
Output Capacitance	$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	300	-	pF
Reverse Transfer Capacitance	$C_{rs}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	130	-	pF

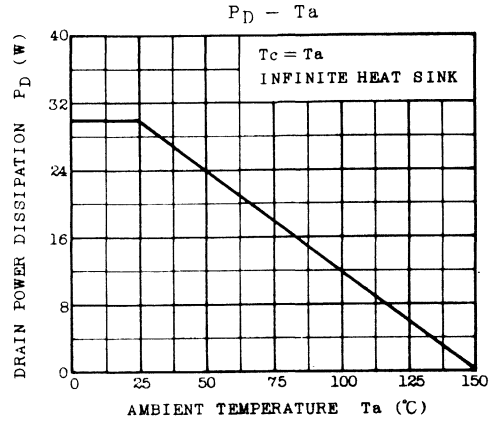
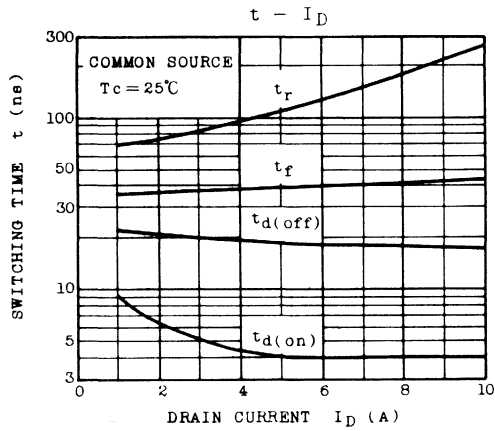




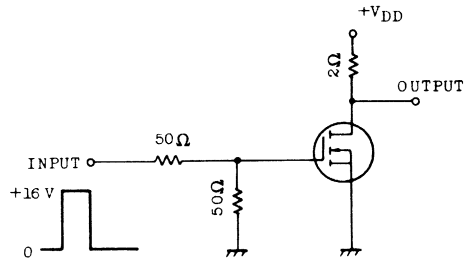
# SEMICONDUCTOR

## TECHNICAL DATA

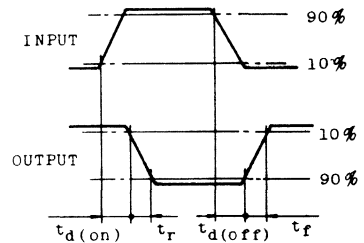
2SK442



### SWITCHING TIME TEST CIRCUIT



### RESPONSE WAVE FORM





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
**2SK447**  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS)

HIGH SPEED, HIGH POWER SWITCHING APPLICATIONS.  
 MOTOR DRIVE, DC-DC CONVERTER AND SWITCHING REGULATOR APPLICATIONS.

### FEATURES:

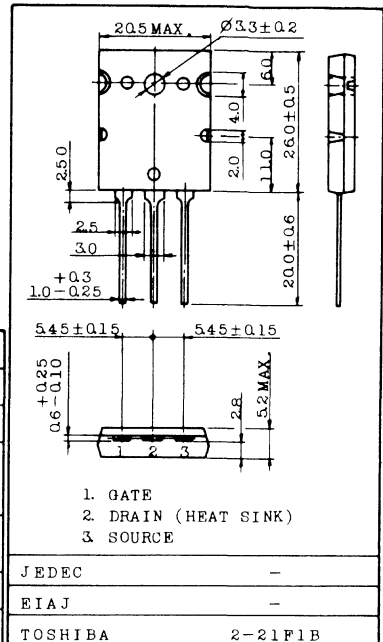
- . Low Drain-Source ON Resistance  
     :  $R_{DS(ON)} = 0.24\Omega$  (Max.) ( $I_D = 15A$ )
- . With Built-in Free Wheeling Diode
- . Enhancement-Mode

### MAXIMUM RATINGS ( $T_a = 25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSS}$	250	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	$\pm 15$	A
	Peak		$\pm 30$	
Drain Power Dissipation ( $T_c = 25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55 \sim 150$	$^\circ C$

### INDUSTRIAL APPLICATIONS

Unit in mm



### ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ C$ )

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS} = 250V, V_{GS} = 0$	-	-	1.0	mA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D = 10mA, V_{GS} = 0$	250	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS} = 10V, I_D = 1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS} = 10V, I_D = 15A$	4.0	7.0	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D = 15A, V_{GS} = 10V$	-	-	0.24	$\Omega$
Source Drain Forward Voltage		$V_{SDF}$	$I_S = 15A, V_{GS} = 0$	-	-	1.8	V
Input Capacitance		$C_{iss}$	$V_{DS} = 10V, V_{GS} = 0, f = 1MHz$	-	2000	-	pF
Switching Time	Rise Time	$t_r$		-	300	600	ns
	Turn-on Time	$t_{on}$		-	350	700	ns
	Fall Time	$t_f$		-	200	400	ns
	Turn-off Time	$t_{off}$		-	600	-	ns
Reverse Recovery		$t_{rr}$	$I_D = -15A, R_G = 220\Omega, V_{GS} = -15V, di/dt = 60A/\mu s$	-	250	600	ns

TOSHIBA CORPORATION

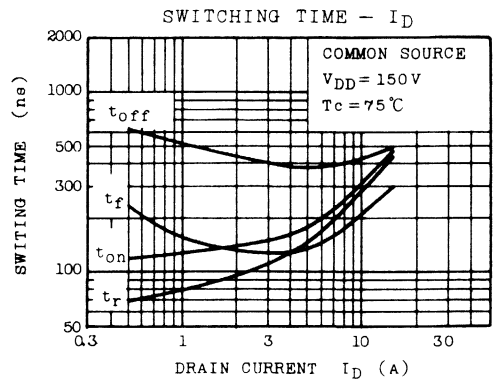
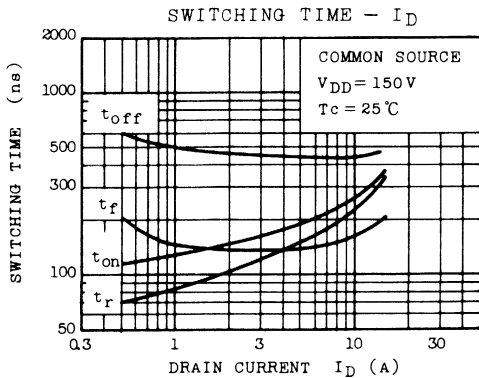
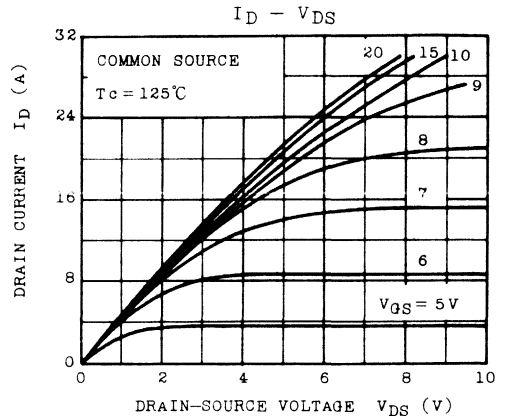
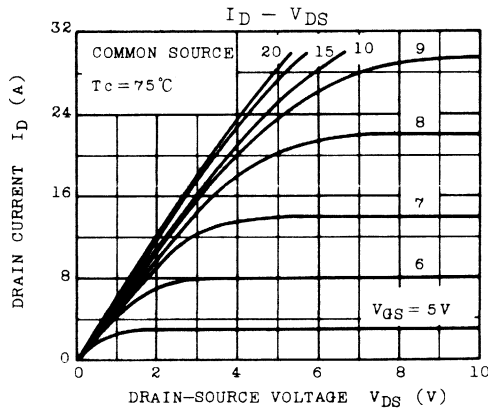
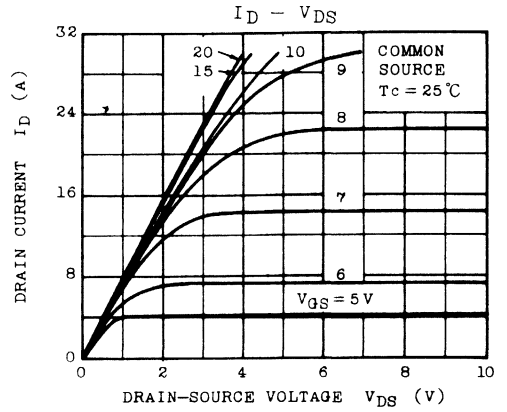
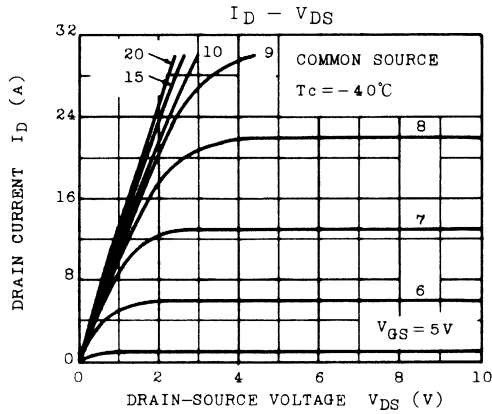




# SEMICONDUCTOR

## TECHNICAL DATA

2SK447



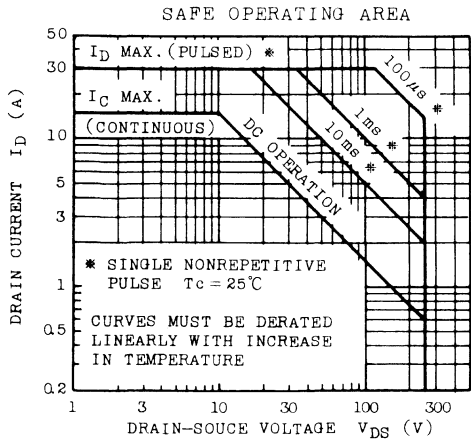
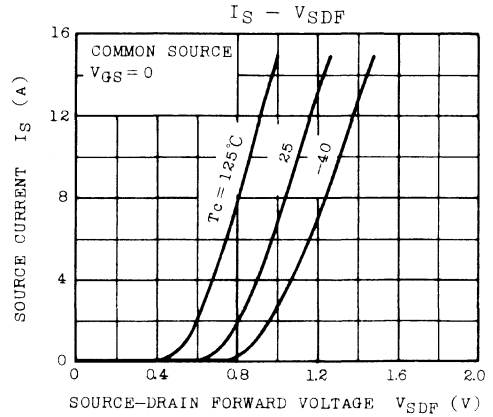
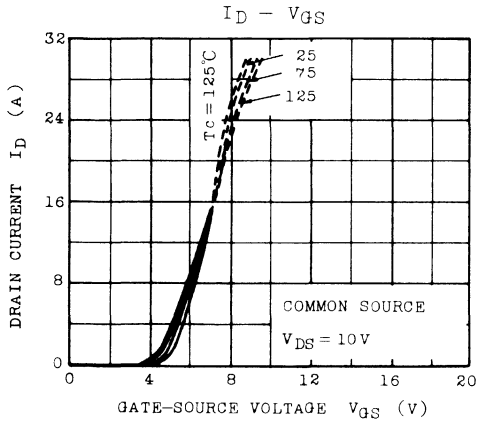
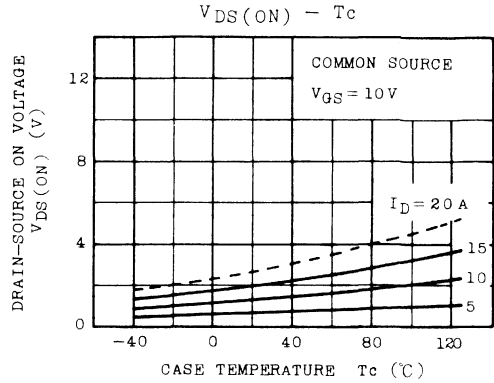
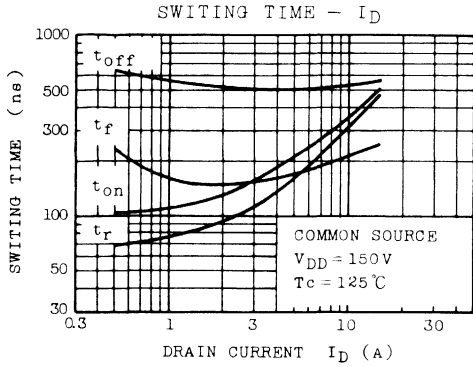
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK447



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
**2SK525**  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS)

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
 DC-DC CONVERTER, MOTOR AND SOLENOID DRIVE APPLICATIONS.

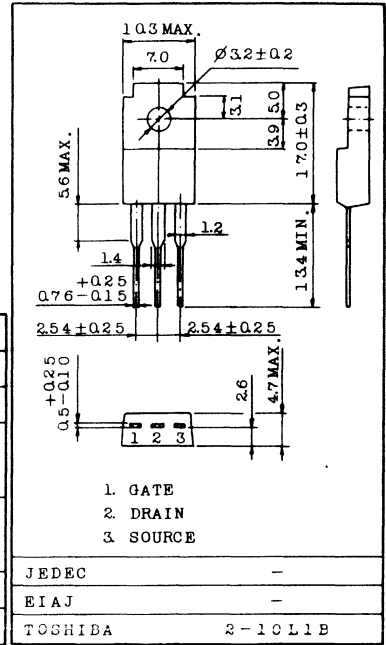
INDUSTRIAL APPLICATIONS  
 Unit in mm

### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.2\Omega$ (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=4S$ (Typ.)
- High Drain Current :  $I_{DP}=15A$ (Max.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=1mA$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $I_D=1mA$
- TO-220 Isolation Package Which Requires Neither Insulating Bushing Nor Mica Insulator.

### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	10	A
	Pulse	$I_{DP}$	15	
Drain Power Dissipation	$T_a=25^\circ C$	$P_D$	2.0	W
	$T_c=25^\circ C$		40	
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$



Weight : 2.1g

### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0$	-	-	1.0	mA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	2.0	4.0	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.20	0.28	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	2.2	3.0	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	720	900	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	140	250	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	390	500	pF
Switching Time	Rise Time	$t_r$		-	70	140	ns
	Turn-on Time	$t_{on}$		-	85	170	
	Fall Time	$t_f$		-	55	110	
	Turn-off Time	$t_{off}$		-	160	320	

THIS TRANSISTOR IS THE ELECTROSTATIC SENSITIVE DEVICE. PLEASE HANDLE WITH CAUTION.

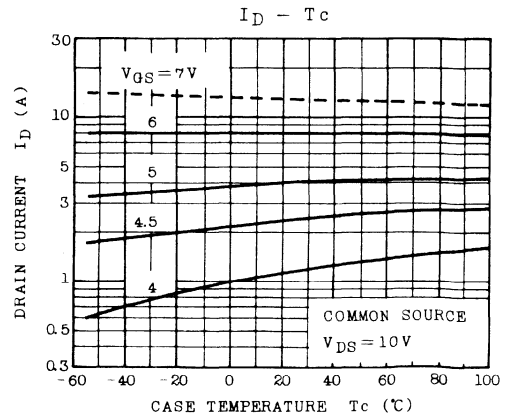
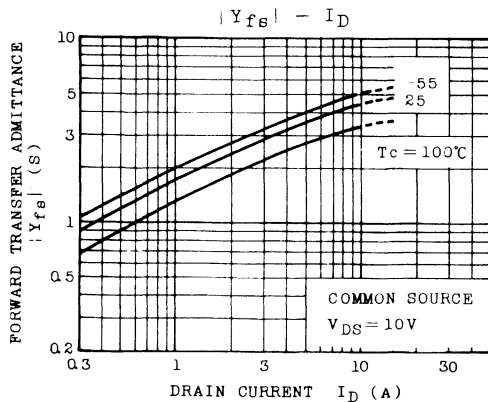
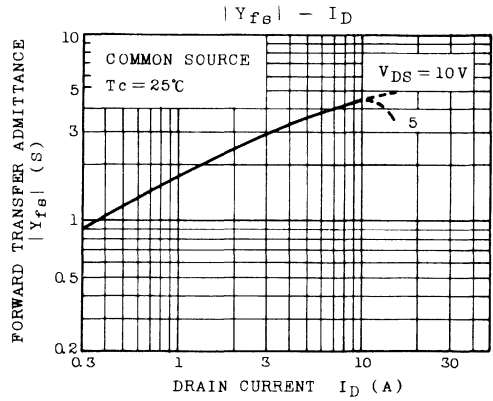
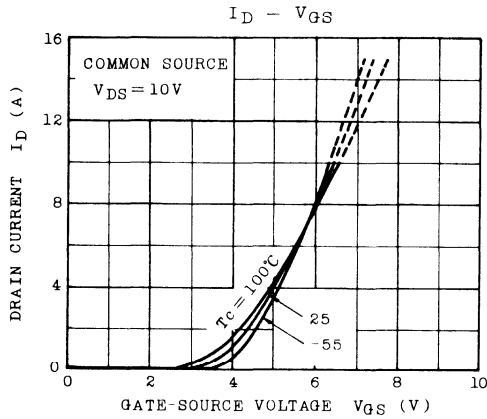
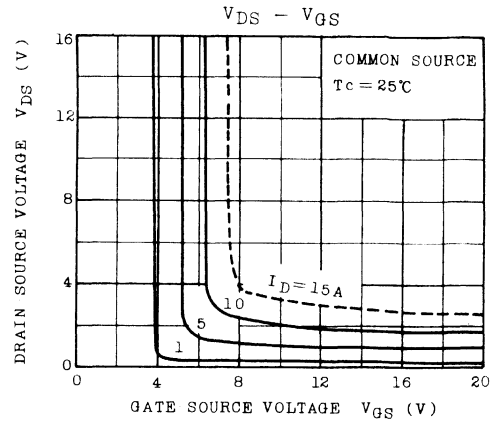
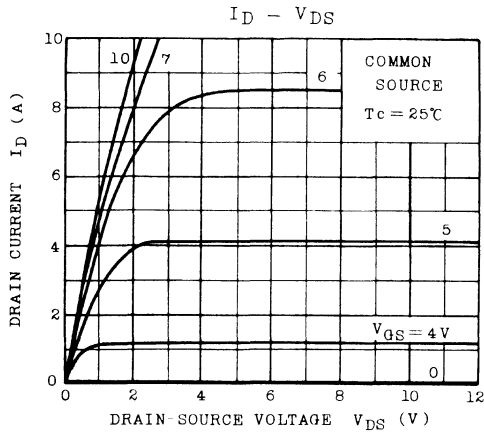
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK525



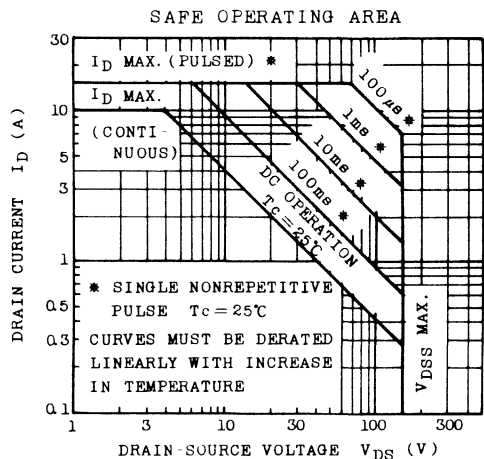
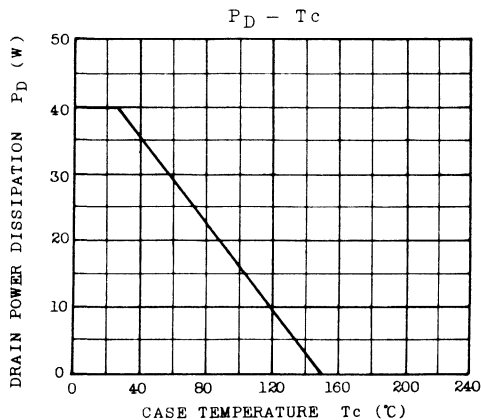
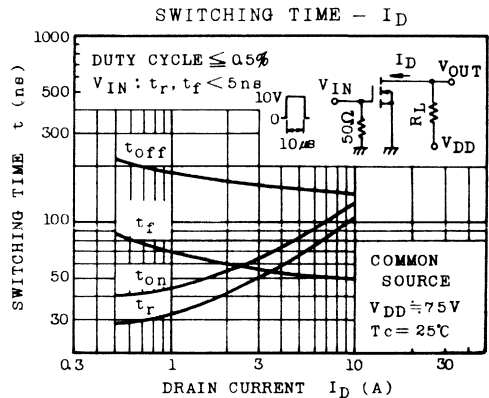
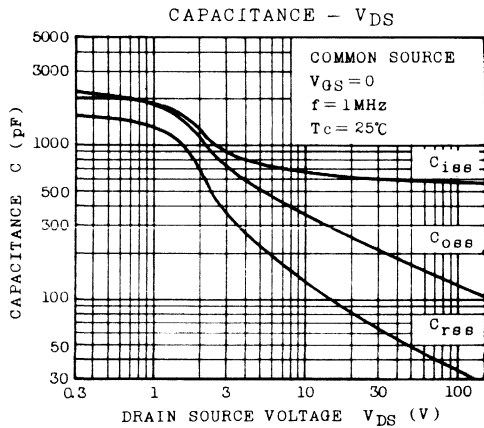
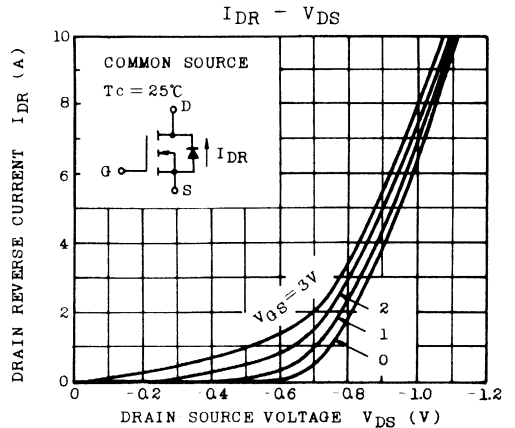
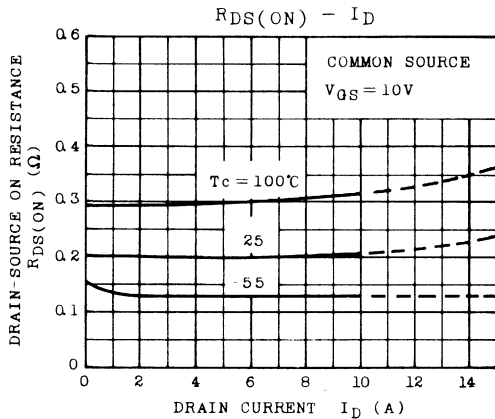
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK525





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2SK526

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS)

INDUSTRIAL APPLICATIONS

Unit in mm

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.

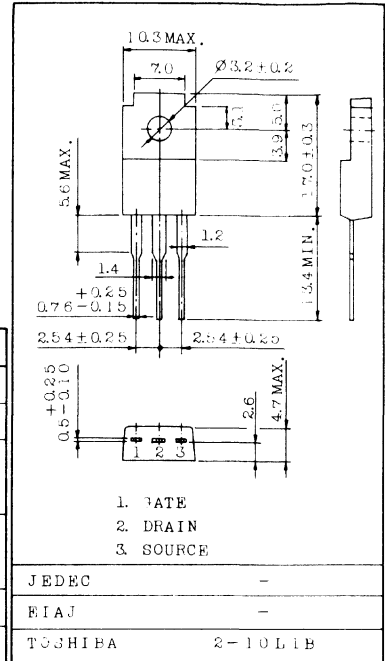
DC-DC CONVERTER, MOTOR AND SOLENOID DRIVE APPLICATIONS.

### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.4\ \Omega$  (Typ.)
- High Forward Transfer Admittance:  $|Y_{fs}|=4S$  (Typ.)
- High Drain Current :  $I_{DP}=15A$  (Max.)
- Low Leakage Current:  $I_{GSS}=\pm 100nA$  (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=1mA$  (Max.) @  $V_{DS}=250V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $I_D=1mA$

### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	250	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	10
	Pulse	$I_{DP}$	15
Drain Power Dissipation	Ta=25°C	$P_D$	2.0
	Tc=25°C		40
Channel Temperature	$T_{ch}$	150	°C
Storage Temperature Range	$T_{stg}$	-55 ~ 150	°C



Weight : 2.1g

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=250V, V_{GS}=0$	-	-	1.0	mA	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	250	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	2.0	4.0	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.4	0.6	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	4.5	7	V	
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	660	900	pF	
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	80	150	pF	
Output Capacitance	$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	260	400	pF	
Switching Time	Rise Time	$t_r$		-	50	100	ns
	Turn-on Time	$t_{on}$		-	70	140	
	Fall Time	$t_f$		-	60	120	
	Turn-off Time	$t_{off}$		-	160	320	

THIS TRANSISTOR IS THE ELECTROSTATIC SENSITIVE DEVICE. PLEASE HANDLE WITH CAUTION.

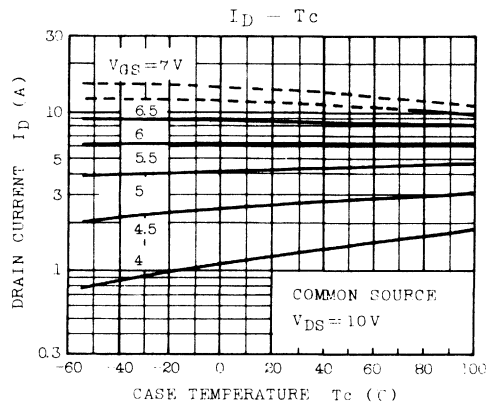
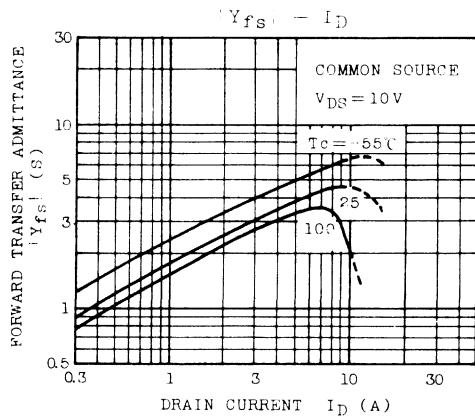
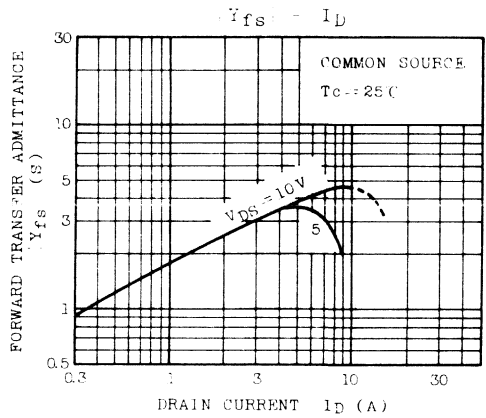
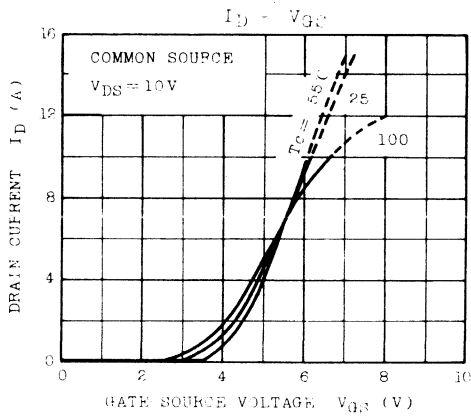
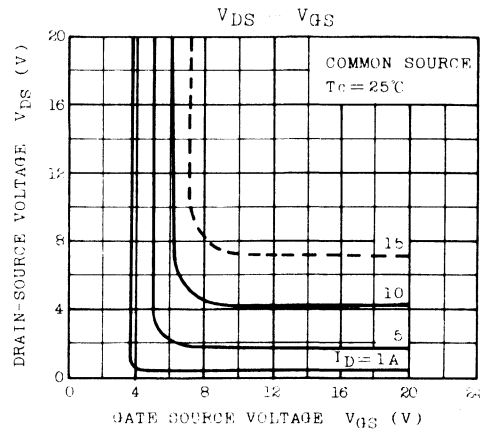
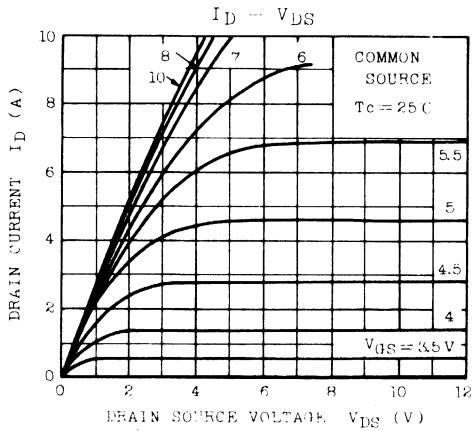
**TOSHIBA CORPORATION**



# SEMICONDUCTOR

## TECHNICAL DATA

2SK526



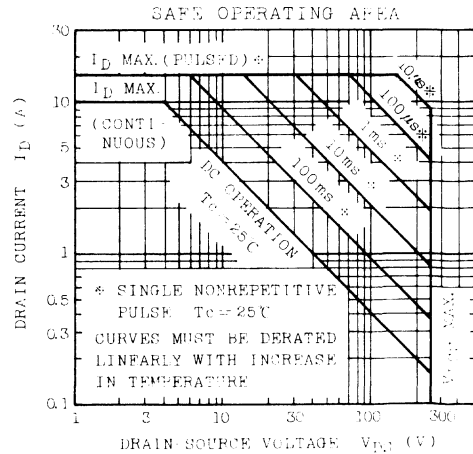
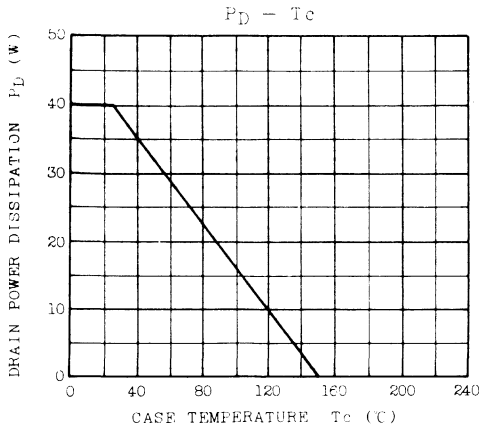
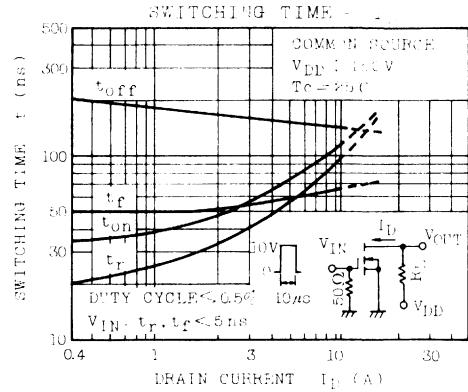
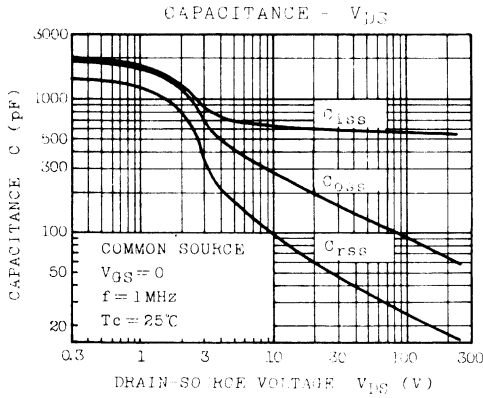
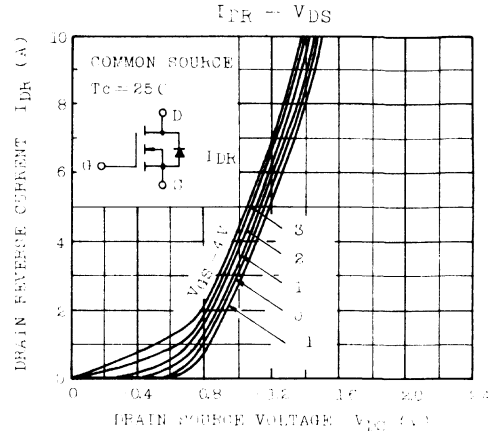
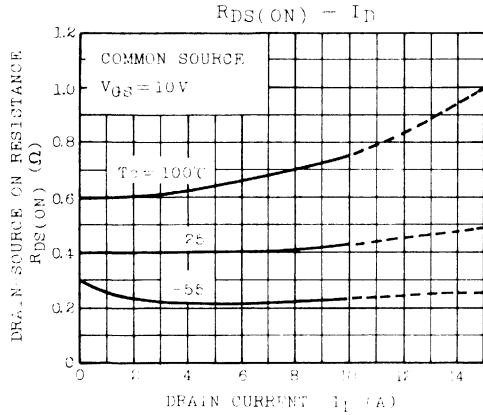
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK526



TOSHIBA CORPORATION





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
2SK527

SILICON N CHANNEL MOS TYPE  
( $\pi$ -MOS)

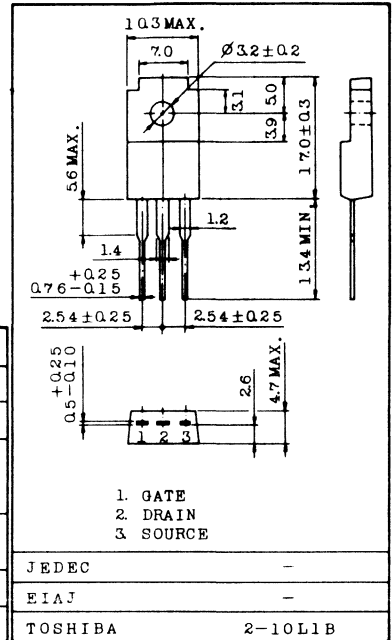
HIGH SPEED SWITCHING APPLICATIONS.  
SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.1\Omega$ (Typ.)
- High Forward Transfer Admittance:  $|Y_{fs}|=4S$ (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=1mA$ (Max.) @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $I_D=1mA$
- TO-220 Isolation Package Which Requires Neither  
Insulating Bushing Nor Mica Insulator.

INDUSTRIAL APPLICATIONS

Unit in mm



### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	60	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	10
	Pulse	$I_{DP}$	15
Drain Power Dissipation (Tc=25°C)	$P_D$	40	W
Channel Temperature	$T_{ch}$	150	°C
Storage Temperature Range	$T_{stg}$	-55 ~ 150	°C

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

Weight : 2.1g

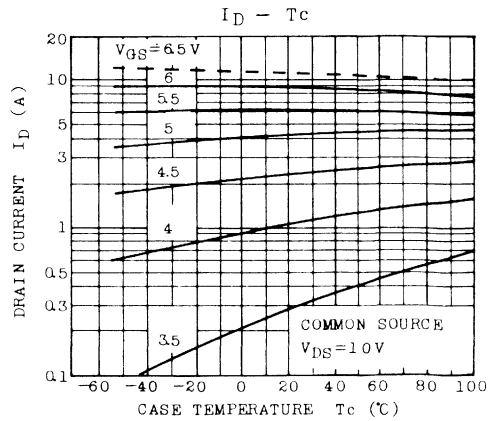
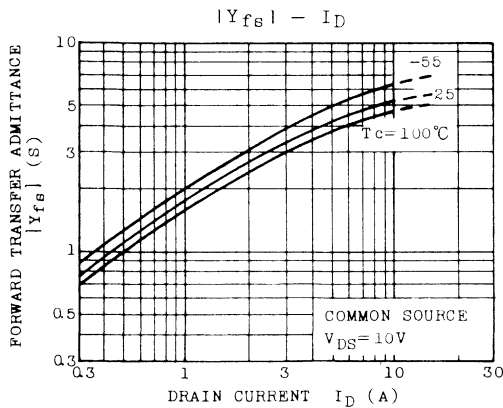
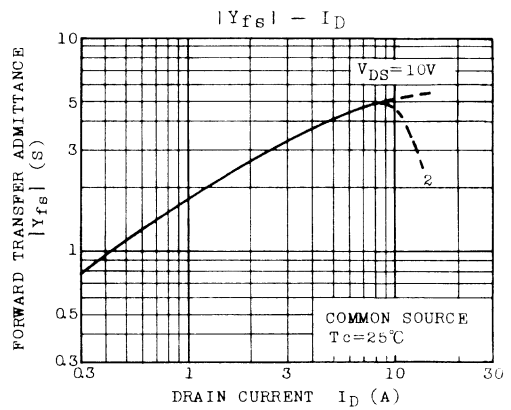
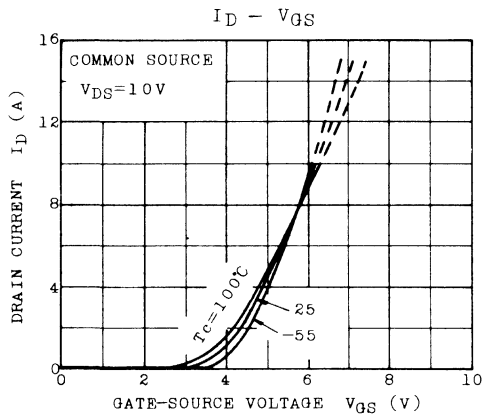
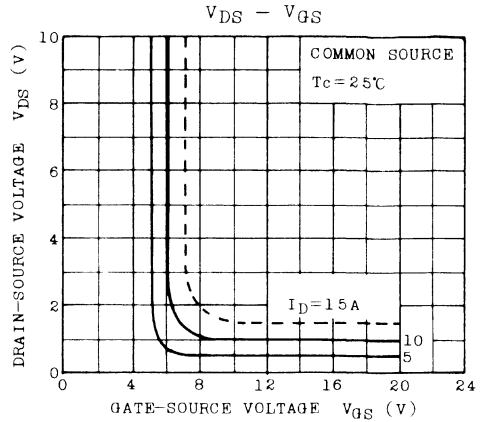
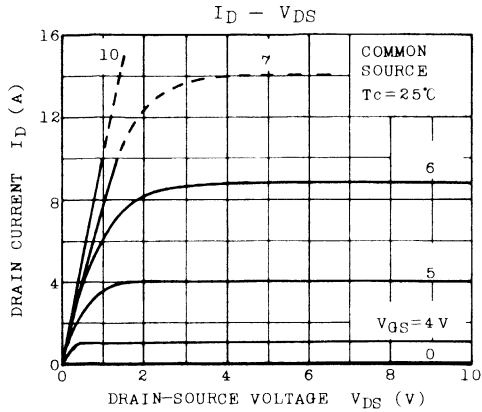
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT		
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA		
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0$	-	-	1.0	mA		
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	60	-	-	V		
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V		
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	2	4	-	S		
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.10	0.14	$\Omega$		
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	1.0	1.5	V		
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	850	1100	pF		
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	370	600	pF		
Output Capacitance	$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	800	1100	pF		
Switching Time	Rise Time	$t_r$			-	100	200	ns
	Turn-on Time	$t_{on}$			-	120	240	ns
	Fall Time	$t_f$			-	85	170	ns
	Turn-off Time	$t_{off}$			-	160	320	ns

THIS TRANSISTOR IS AN ELECTROSTATIC SENSITIVE DEVICE. PLEASE HANDLE WITH CAUTION.

TOSHIBA CORPORATION



### TECHNICAL DATA

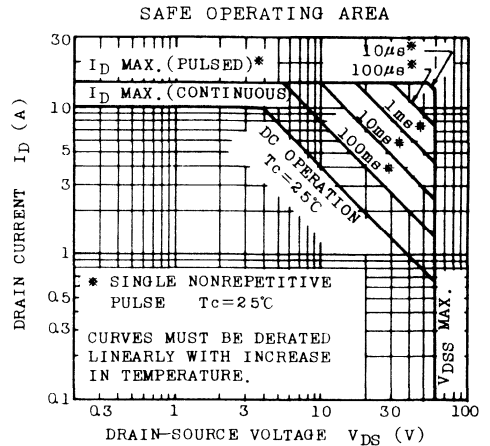
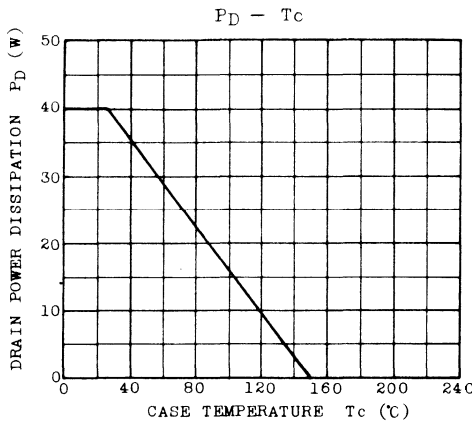
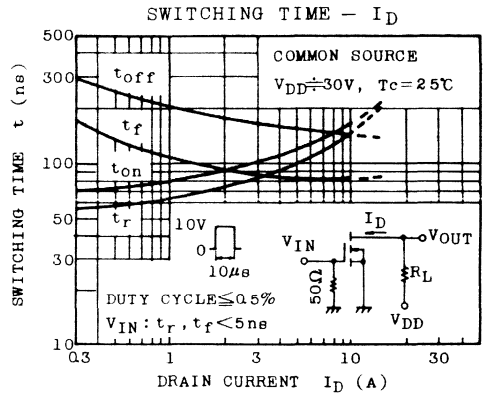
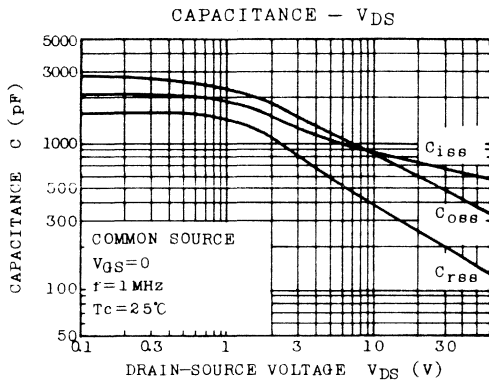
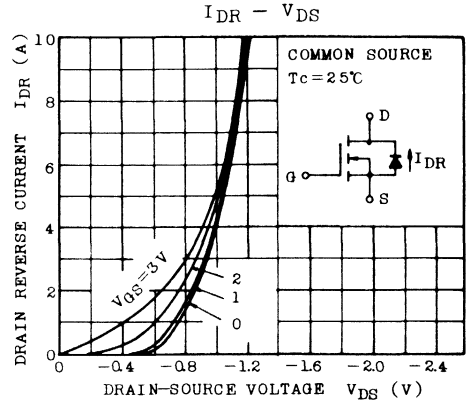
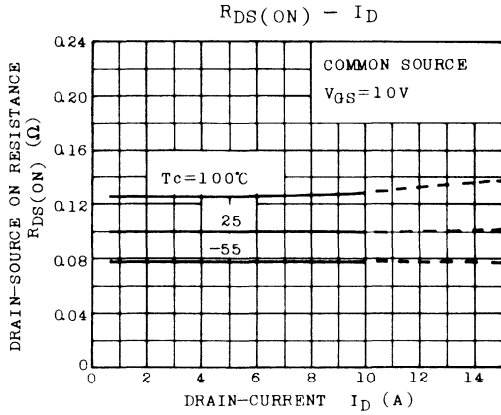




# SEMICONDUCTOR

2SK527

## TECHNICAL DATA



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2SK528

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS)

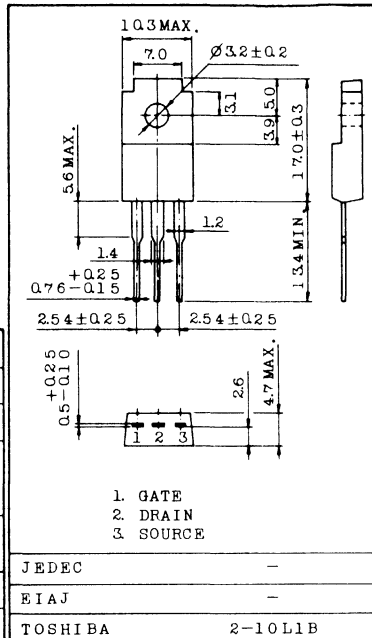
HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

**FEATURES:**

- High Breakdown Voltage :  $V_{(BR)DSS}=400V$
- High Forward Transfer Admittance :  $|Y_{fs}|=1.2S(Typ.)$
- Low Leakage Current :  $I_{GSS}=\pm 100nA(Max.)$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=1mA(Max.)$  @  $V_{DS}=400V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $I_D=1mA$
- TO-220 Isolation Package Which Requires Neither Insulating Bushing Nor Mica Insulator.

INDUSTRIAL APPLICATIONS

Unit in mm



MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	400	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	2
	Pulse	$I_{DP}$	4
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	30	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	-55 ~ 150	$^\circ C$

ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=400V, V_{GS}=0$	-	-	1.0	mA	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	400	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=1A$	0.6	1.2	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=1A, V_{GS}=10V$	-	1.6	2.2	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	8.5	12	V	
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	410	600	pF	
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	35	70	pF	
Output Capacitance	$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	115	170	pF	
Switching Time	Rise Time	$t_r$		-	20	40	ns
	Turn-on Time	$t_{on}$		-	30	60	ns
	Fall Time	$t_f$		-	35	70	ns
	Turn-off Time	$t_{off}$		-	100	200	ns

THIS TRANSISTOR IS AN ELECTROSTATIC SENSITIVE DEVICE. PLEASE HANDLE WITH CAUTION.

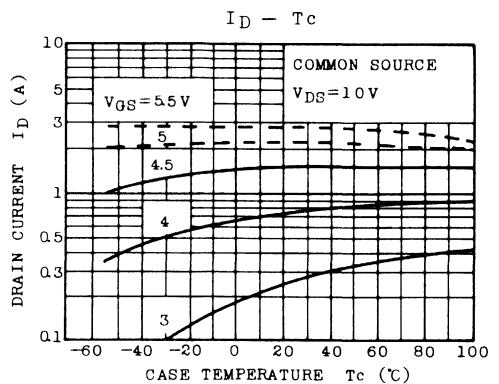
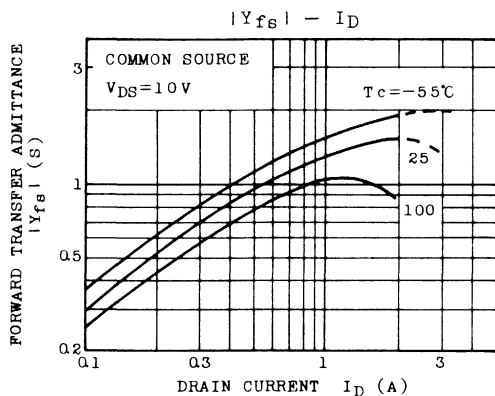
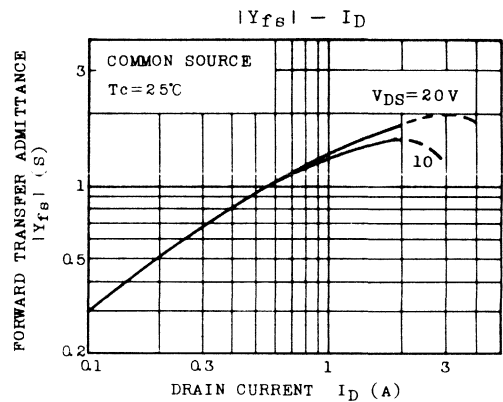
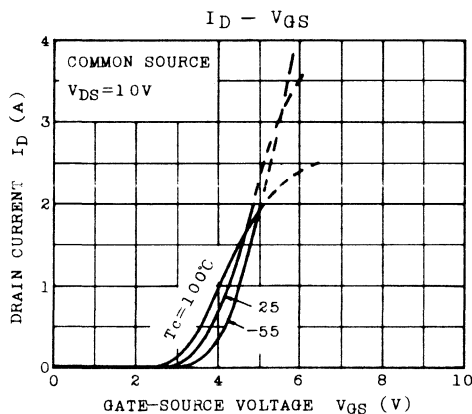
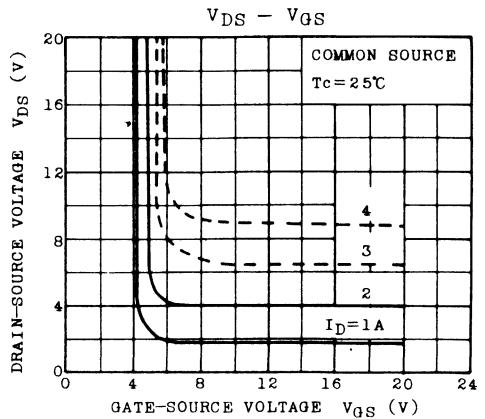
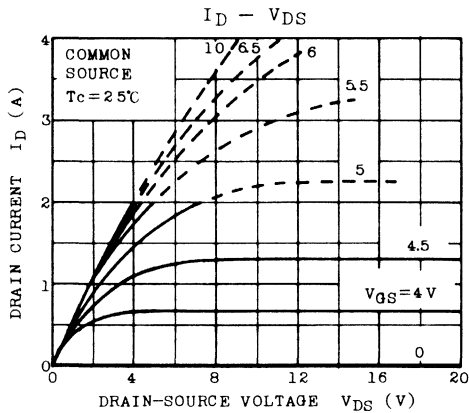
TOSHIBA CORPORATION



# SEMICONDUCTOR

2SK528

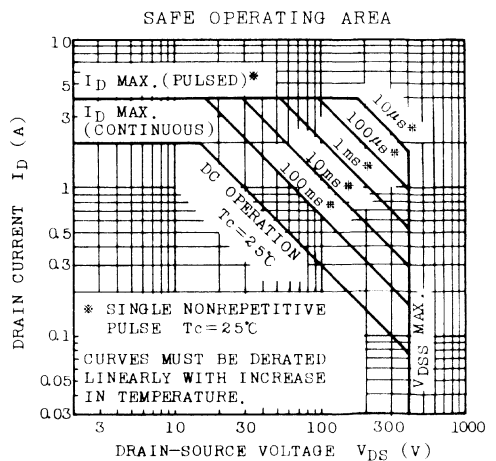
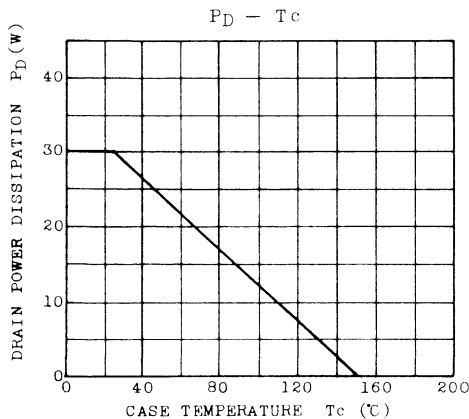
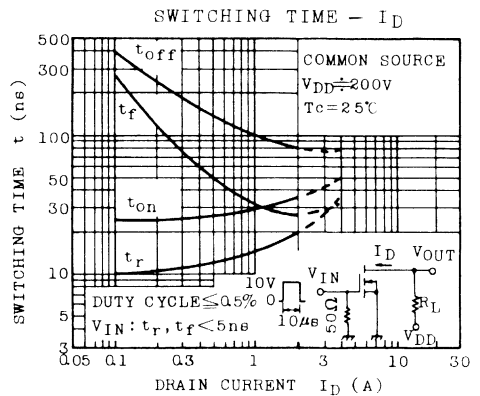
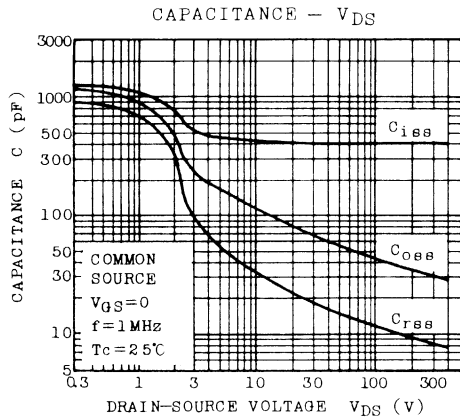
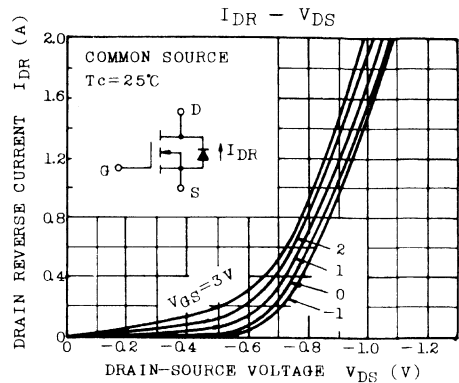
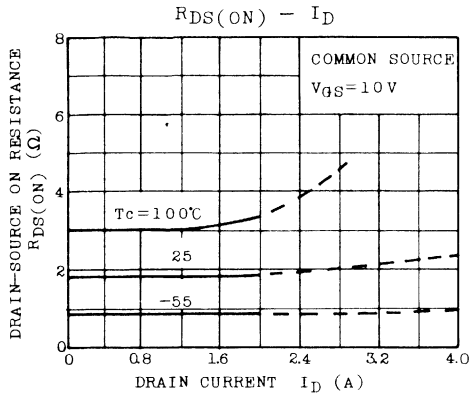
## TECHNICAL DATA



TOSHIBA CORPORATION



## TECHNICAL DATA





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2SK529

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS)

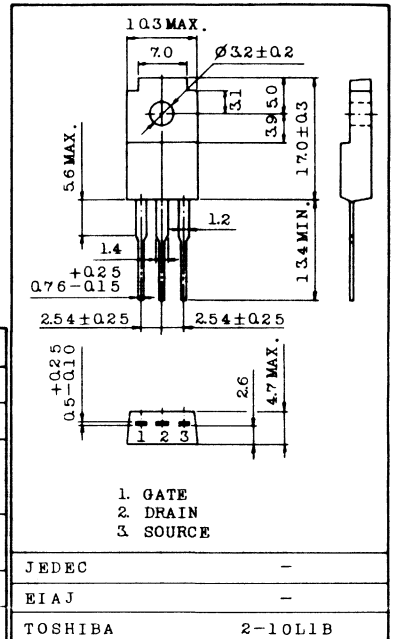
HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

**FEATURES:**

- High Breakdown Voltage :  $V_{(BR)DSS}=450V$
- High Forward Transfer Admittance:  $|Y_{fs}|=1.2S(Typ.)$
- Low Leakage Current :  $I_{GSS}=\pm 100nA(Max.) @ V_{GS}=\pm 20V$   
 $I_{DSS}=1mA(Max.) @ V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V @ I_D=1mA$
- TO-220 Isolation Package Which Requires Neither  
Insulating Bushing Nor Mica Insulator.

**INDUSTRIAL APPLICATIONS**

Unit in mm



**MAXIMUM RATINGS (Ta=25°C)**

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	2	A
	Pulse	$I_{DP}$	4	
Drain Power Dissipation (Tc=25°C)		$P_D$	30	W
Channel Temperature		$T_{ch}$	150	°C
Storage Temperature Range		$T_{stg}$	-55 ~ 150	°C

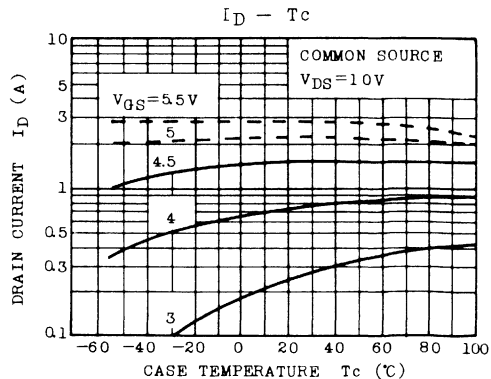
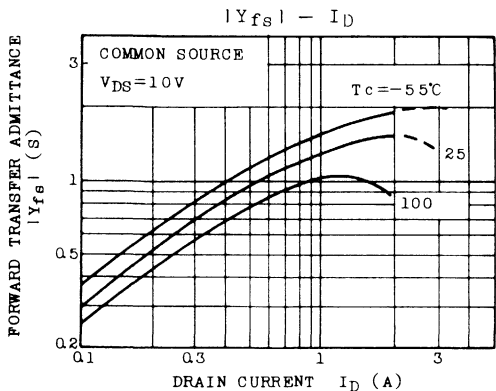
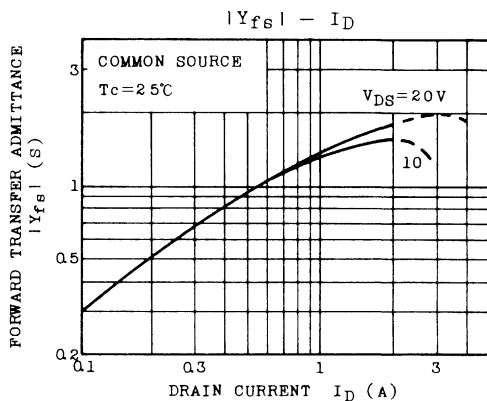
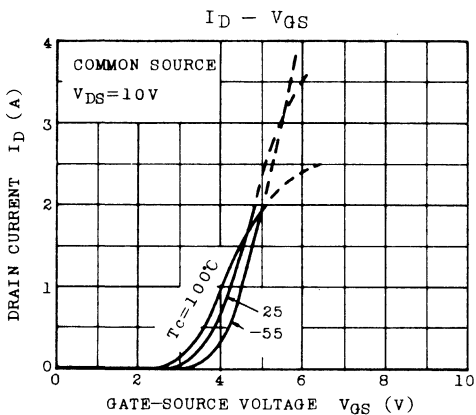
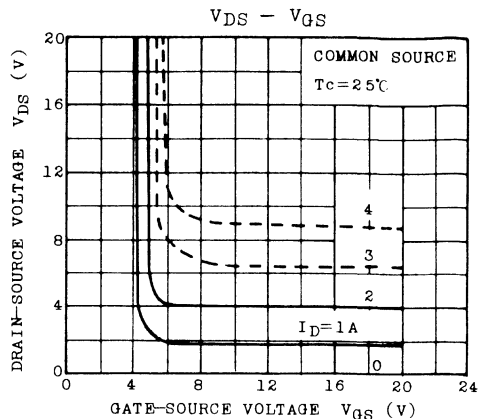
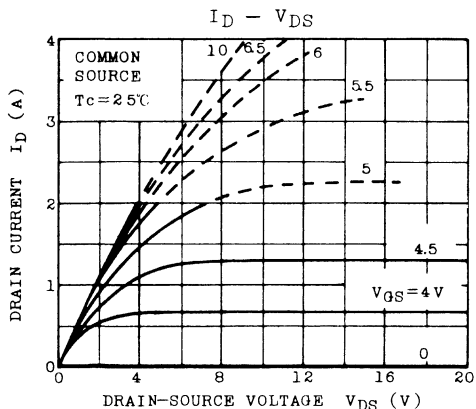
**ELECTRICAL CHARACTERISTICS (Ta=25°C)**

Weight : 2.1g

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=450V, V_{GS}=0$	-	-	1.0	mA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	450	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=1A$	0.6	1.2	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=1A, V_{GS}=10V$	-	1.8	2.6	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	9.0	15	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	410	600	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	35	70	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	115	170	pF
Switching Time	Rise Time	$t_r$		-	20	40	ns
	Turn-on Time	$t_{on}$		-	30	60	ns
	Fall Time	$t_f$		-	35	70	ns
	Turn-off Time	$t_{off}$		-	100	200	ns

THIS TRANSISTOR IS AN ELECTROSTATIC SENSITIVE DEVICE. PLEASE HANDLE WITH CAUTION.

**TOSHIBA CORPORATION**



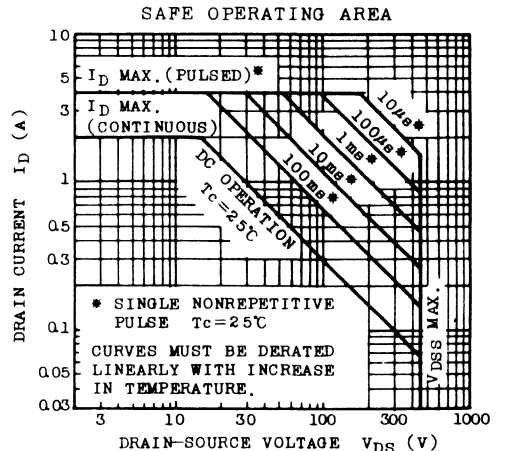
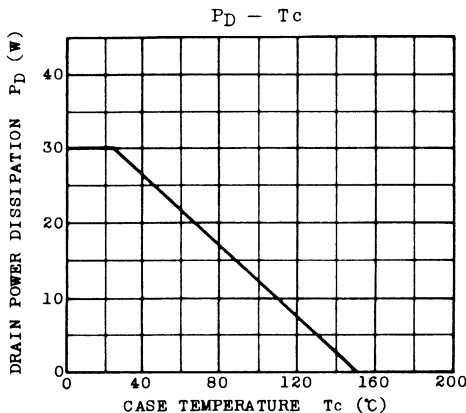
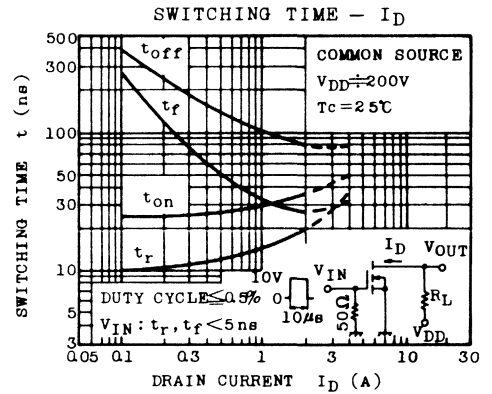
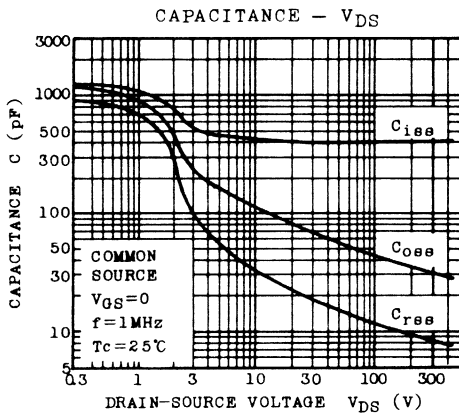
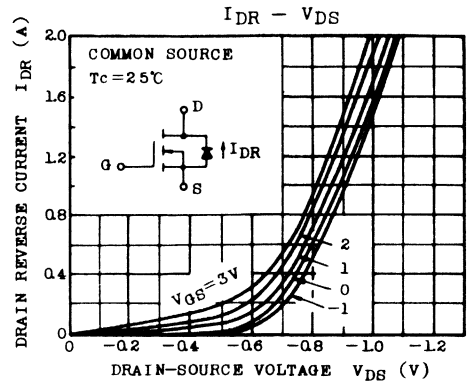
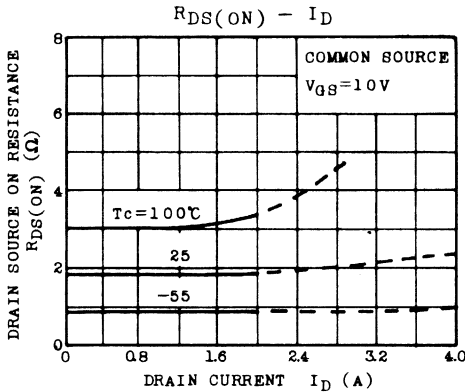




# SEMICONDUCTOR

2SK529

## TECHNICAL DATA





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

### 2SK530

### SILICON N CHANNEL MOS TYPE

### ( $\pi$ -MOS)

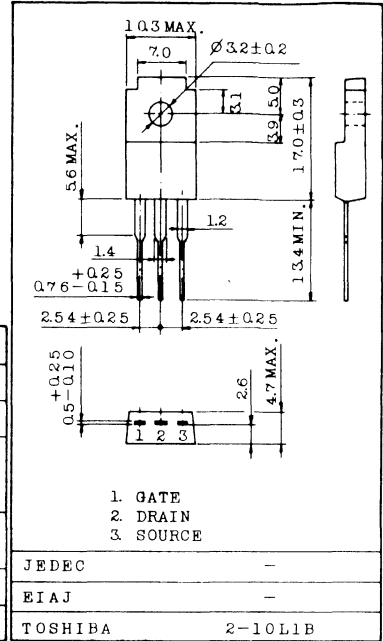
HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- High Breakdown Voltage :  $V_{(BR)DSS}=400V$
- High Forward Transfer Admittance :  $|Y_{fs}|=2.5S$ (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=1mA$ (Max.) @  $V_{DS}=400V$
- Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V$  @  $I_D=1mA$
- TO-220 Isolation Package Which Requires Neither Insulating Bushing Nor Mica Insulator.

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	400	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	5	A
	Pulse	$I_{DP}$	8	
Drain Power Dissipation (Tc=25°C)		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	°C
Storage Temperature Range		$T_{stg}$	-55 ~ 150	°C

#### ELECTRICAL CHARACTERISTICS (Ta=25°C)

Weight : 2.1g

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=400V, V_{GS}=0$	-	-	1.0	mA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	400	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=3A$	1.0	2.5	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=3A, V_{GS}=10V$	-	1.0	1.4	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	10	18	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	670	900	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	50	90	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	180	250	pF
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	80	ns
	Fall Time	$t_f$		-	35	70	ns
	Turn-off Time	$t_{off}$		-	140	280	ns

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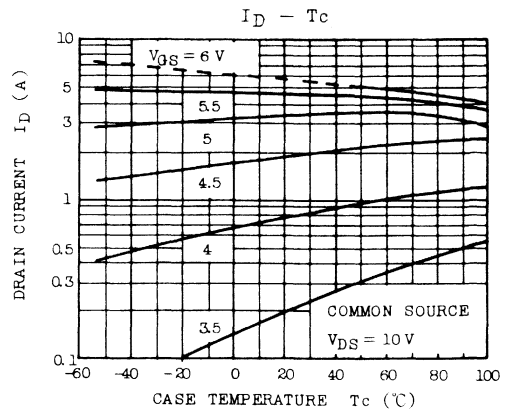
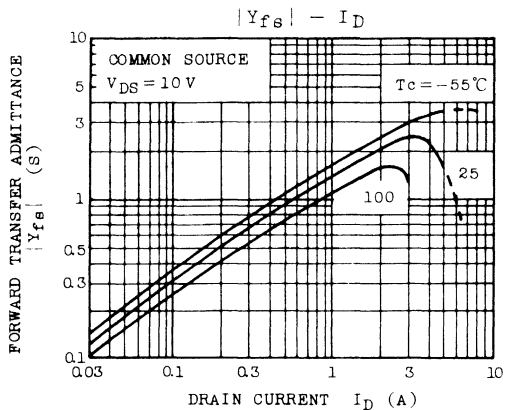
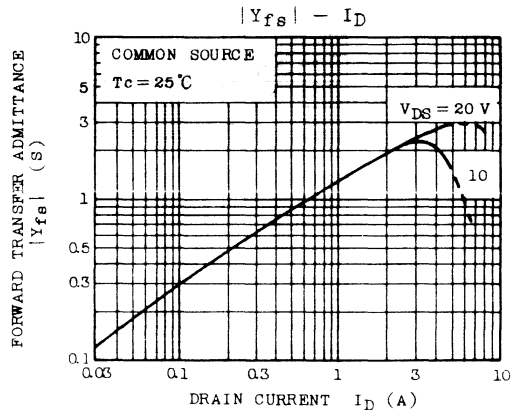
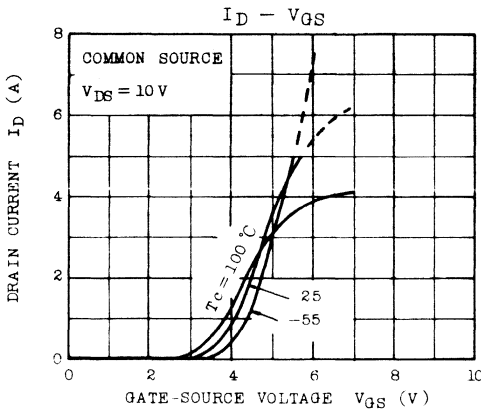
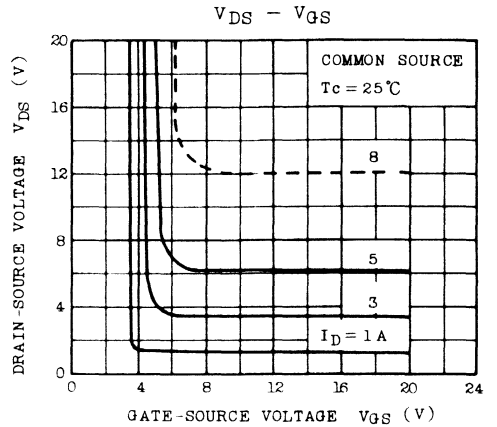
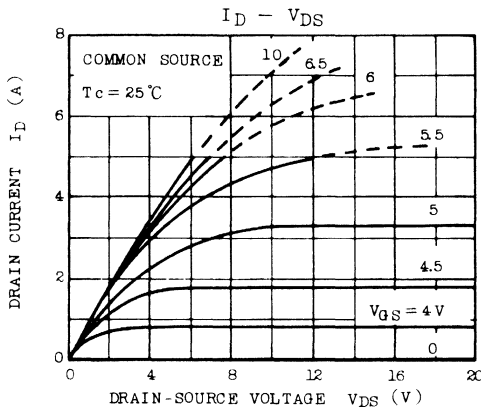
## TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

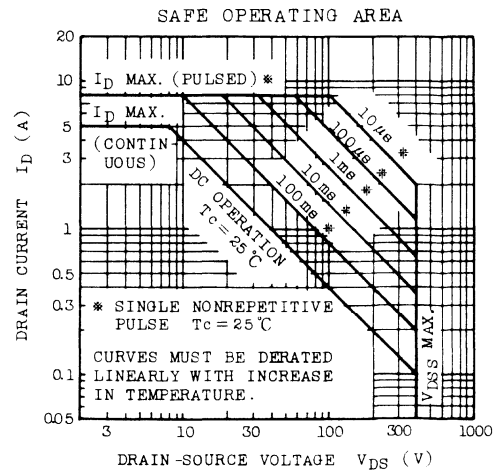
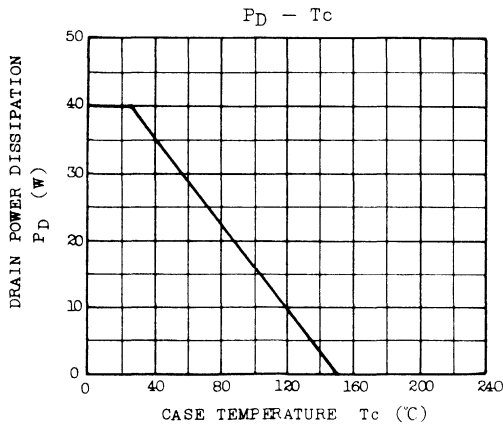
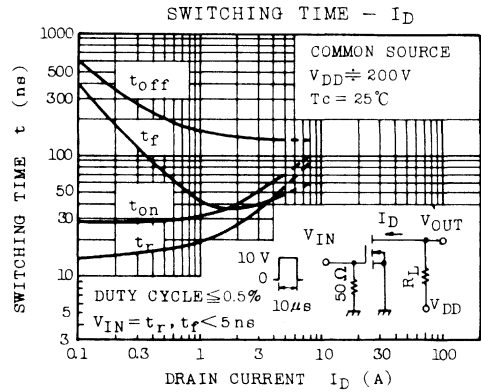
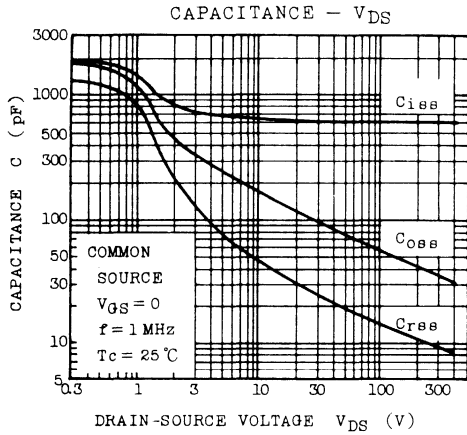
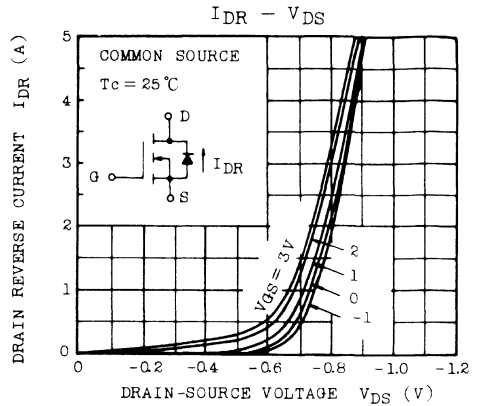
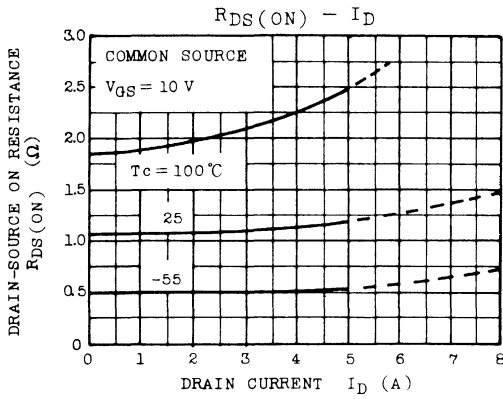
2SK530



TOSHIBA CORPORATION



### TECHNICAL DATA





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
**2SK531**  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS)

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
 SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

### FEATURES:

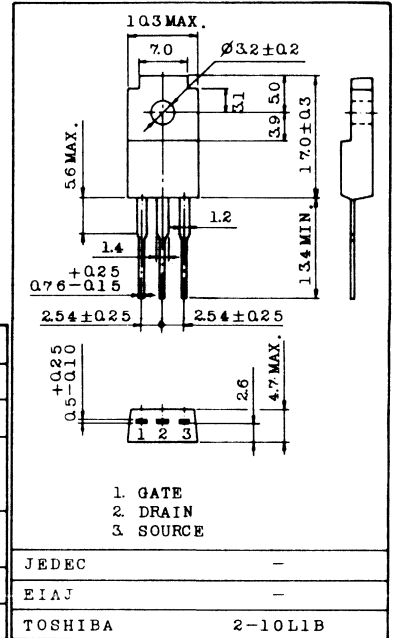
- High Breakdown Voltage :  $V_{(BR)DSS}=450V$
- High Forward Transfer Admittance :  $|Y_{fs}|=2.5S(\text{Typ.})$
- Low Leakage Current :  $I_{GSS}=\pm 100nA(\text{Max.}) @ V_{GS}=\pm 20V$   
 $I_{DSS}=1mA(\text{Max.}) @ V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V @ I_D=1mA$
- TO-220 Isolation Package Which Requires Neither  
 Insulating Bushing Nor Mica Insulator.

### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	5	A
	Pulse	$I_{DP}$	8	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55 \sim 150$	$^\circ C$

### INDUSTRIAL APPLICATIONS

Unit in mm



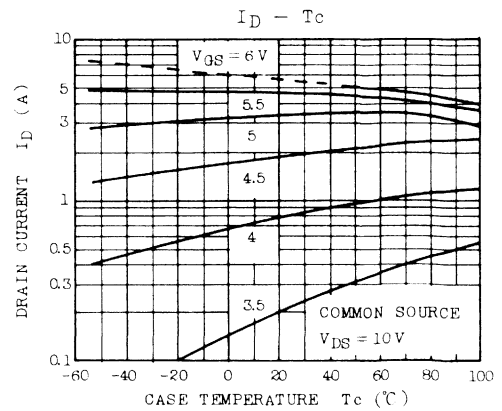
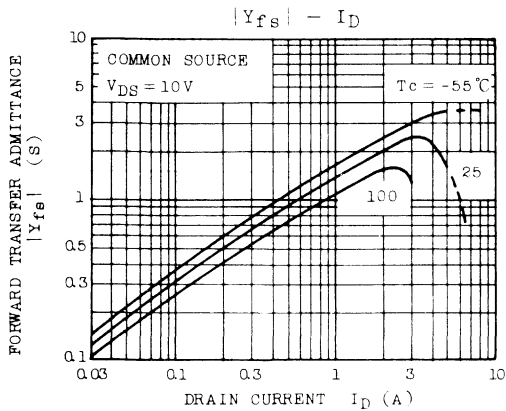
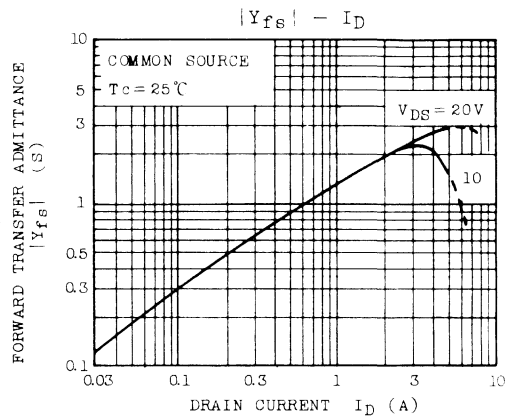
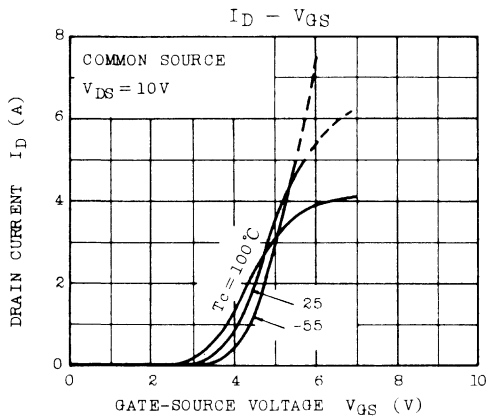
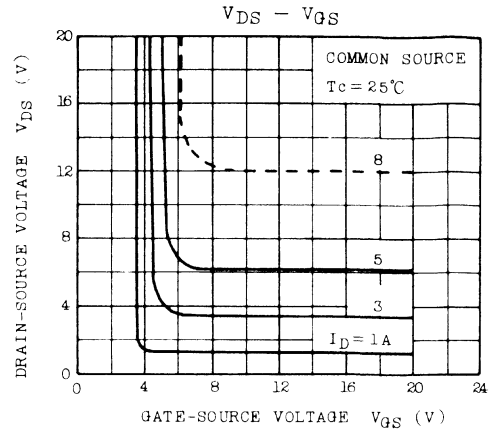
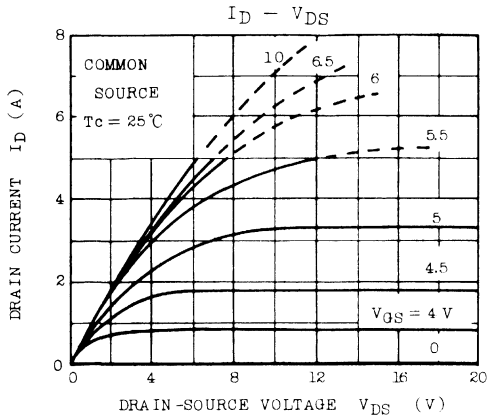
### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

Weight : 2.1g

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=450V, V_{GS}=0$	-	-	1.0	mA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	450	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=3A$	1.0	2.5	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=3A, V_{GS}=10V$	-	1.1	1.6	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	12	22	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	670	900	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	50	90	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	180	250	pF
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	80	ns
	Fall Time	$t_f$		-	35	70	ns
	Turn-off Time	$t_{off}$		-	140	280	ns

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TOSHIBA CORPORATION

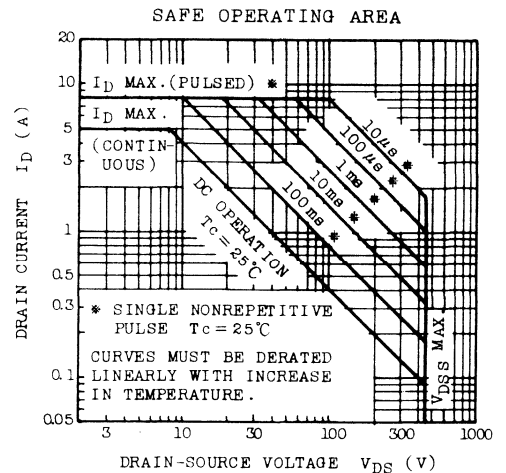
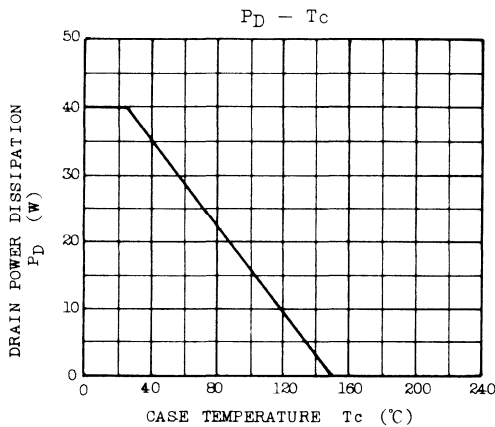
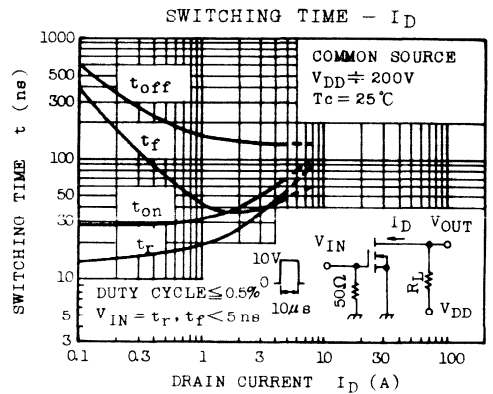
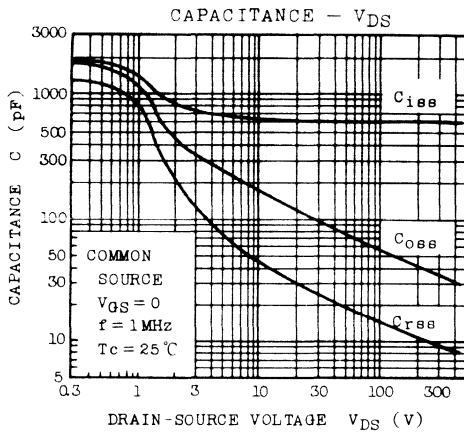
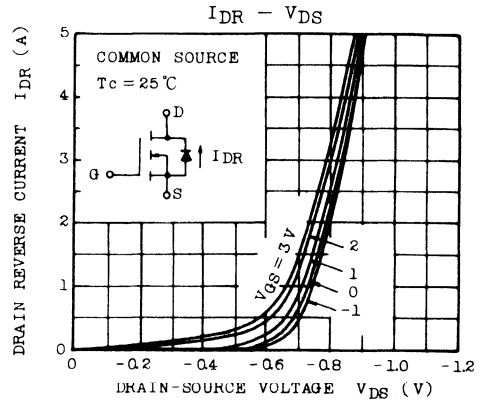
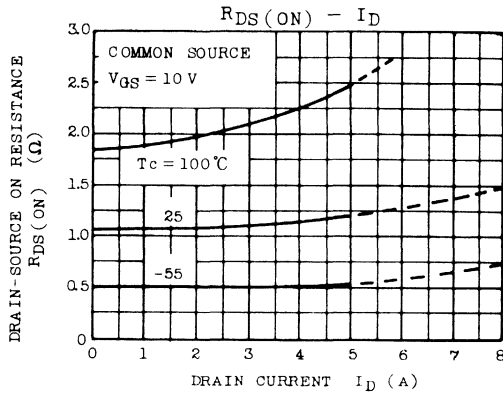




# SEMICONDUCTOR

## TECHNICAL DATA

2SK531





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2SK532

SILICON N CHANNEL MOS TYPE  
( $\pi$ -MOS II)

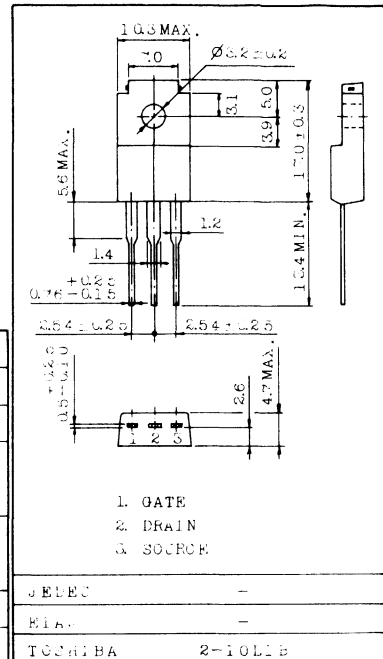
HIGH SPEED SWITCHING APPLICATIONS.  
SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

**FEATURES:**

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.07\Omega$ (Typ.)
- High Forward Transfer Admittance:  $|Y_{fs}|=5S$ (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=1mA$ (Max.) @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V$  @  $I_D=1mA$
- TO-220 Isolation Package Which Requires Neither Insulating Bushing Nor Mica Insulator.

INDUSTRIAL APPLICATIONS

Unit in mm



MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	60	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	12
	Pulse	$I_{DP}$	25
Drain Power Dissipation	$T_a=25^\circ C$	$P_D$	2.0
	$T_c=25^\circ C$		40
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	-55 ~ 150	$^\circ C$

ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

Weight : 2.1g

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0$	-	-	1.0	mA	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	60	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=6A$	2	5	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=6A, V_{GS}=10V$	-	0.070	0.085	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=12A, V_{GS}=10V$	-	0.9	1.1	V	
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	930	1300	pF	
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	400	700	pF	
Output Capacitance	$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	980	1400	pF	
Switching Time	Rise Time	$t_r$			-	100	200
	Turn-on Time	$t_{on}$			-	120	240
	Fall Time	$t_f$			-	110	220
	Turn-off Time	$t_{off}$			-	190	380

$I_D=6A$   
 $V_{IN}: t_r, t_f < 5ns$   
 $D, U \leq 1\%$  ( $C_{OUT}=50\Omega$ )

THIS TRANSISTOR IS AN ELECTROSTATIC SENSITIVE DEVICE. PLEASE HANDLE WITH CAUTION.

TOSHIBA CORPORATION

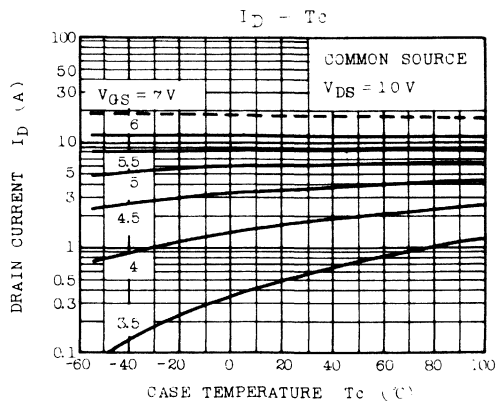
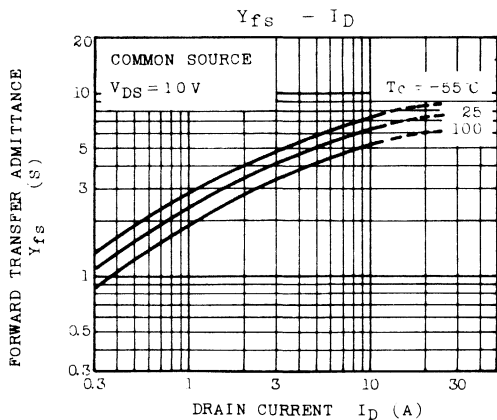
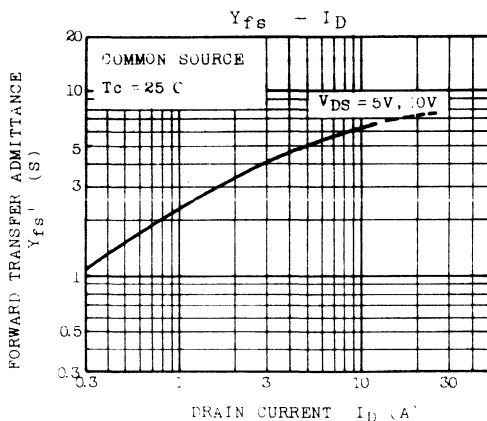
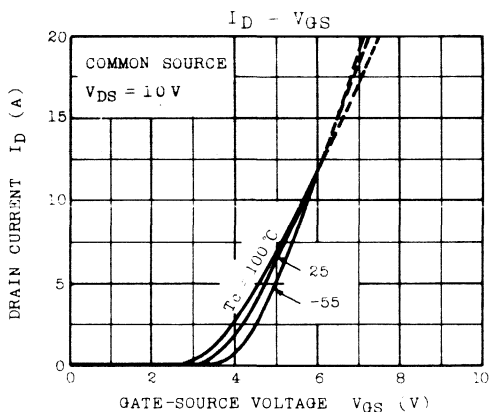
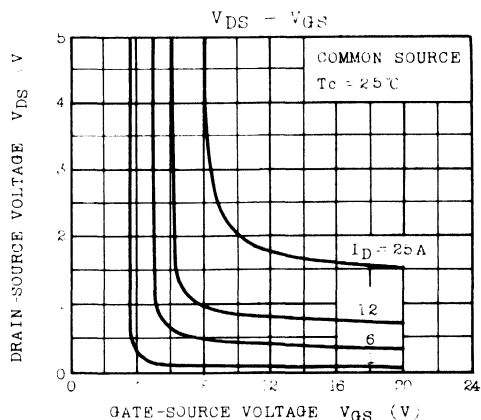
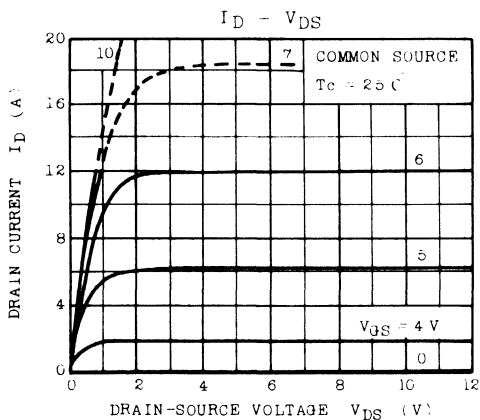




# SEMICONDUCTOR

## TECHNICAL DATA

2SK532



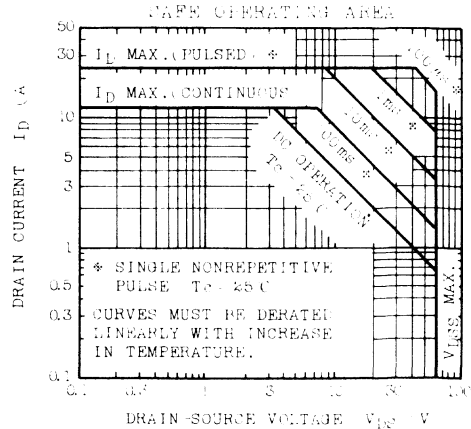
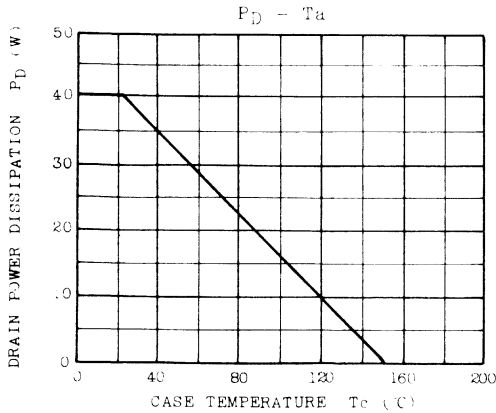
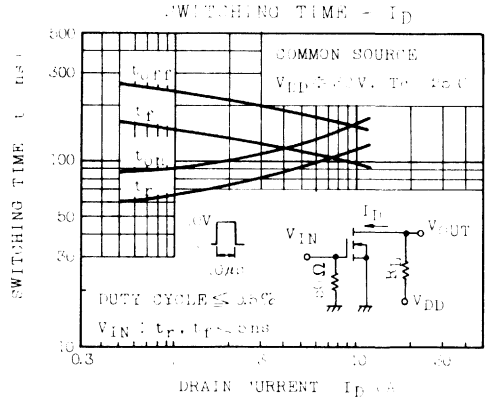
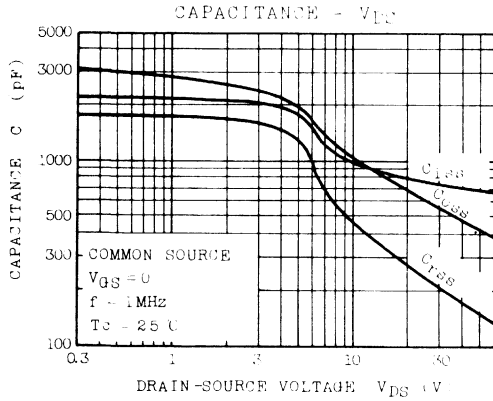
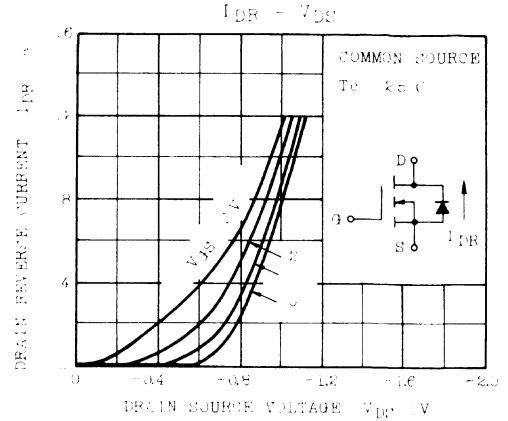
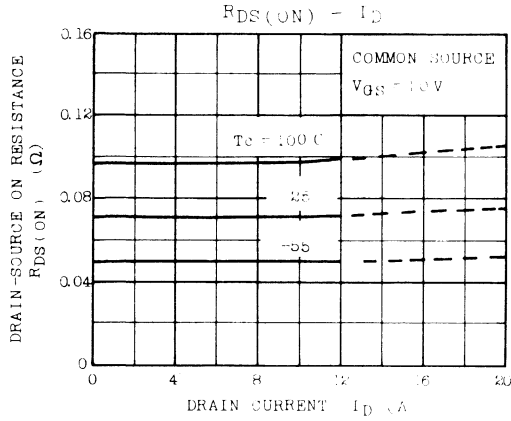
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK532



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
**2SK537**  
 SILICON N CHANNEL MOS TYPE

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
 SWITCHING REGULATOR AND MOTOR DRIVE APPLICATIONS.

### FEATURES:

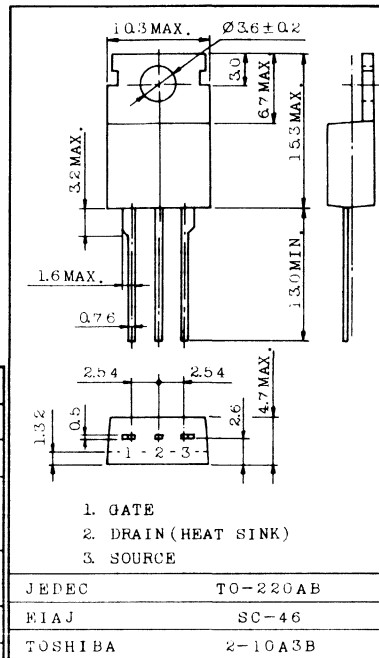
- High Breakdown Voltage :  $V_{(BR)DSS}=900V$
- High Forward Transfer Admittance :  $|Y_{fs}|=0.4S(\text{Typ.})$
- Low Leakage Current :  $I_{GSS}=\pm 100nA(\text{Max.})$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu A(\text{Max.})$  @  $V_{DS}=900V$
- Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V$  (@  $I_D=1mA$ )

### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	900	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	1
	Pulse	$I_{DP}$	3
Drain Power Dissipation (Tc=25°C)	$P_D$	60	W
Channel Temperature	$T_{ch}$	150	°C
Storage Temperature Range	$T_{stg}$	-55 ~ 150	°C

### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT		
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA		
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=900V, V_{GS}=0$	-	-	300	$\mu A$		
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	900	-	-	V		
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V		
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=0.5A$	0.2	0.4	-	S		
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=0.5A, V_{GS}=10V$	-	8.2	9.0	$\Omega$		
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=1A, V_{GS}=10V$	-	8.8	10	V		
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	450	600	pF		
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	30	60	pF		
Output Capacitance	$C_{oss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	70	120	pF		
Switching Time	Rise Time	$t_r$			-	30	90	ns
	Turn-on Time	$t_{on}$			-	45	120	
	Fall Time	$t_f$			-	35	90	
	Turn-off Time	$t_{off}$			-	150	340	

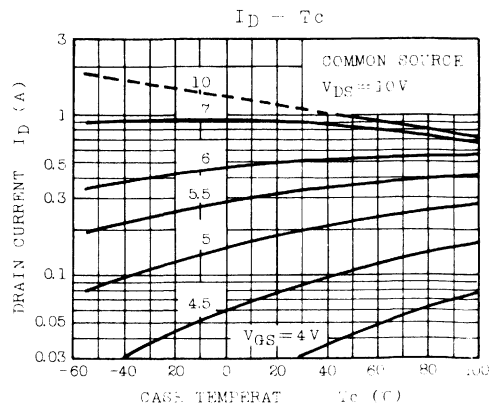
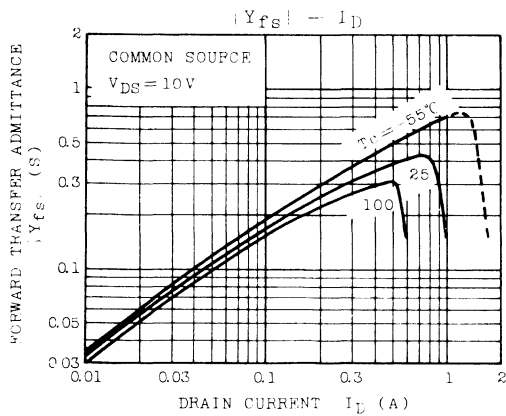
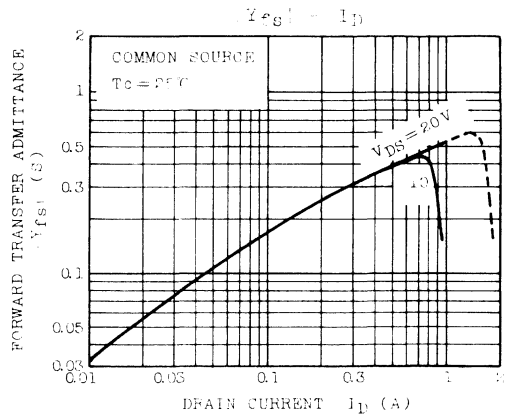
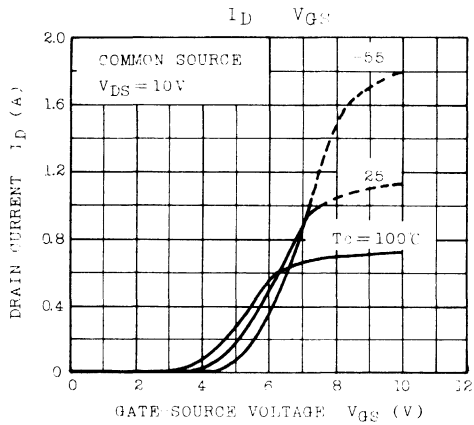
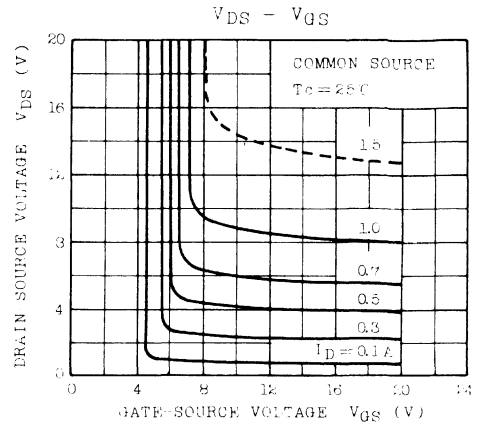
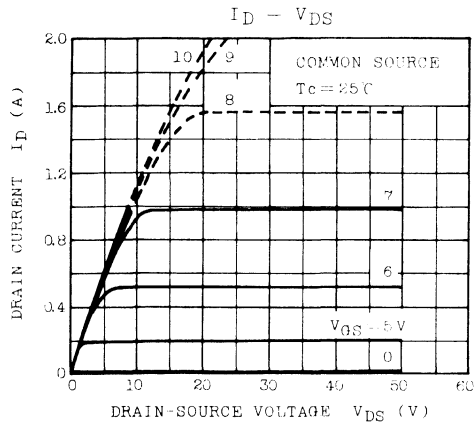
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK537



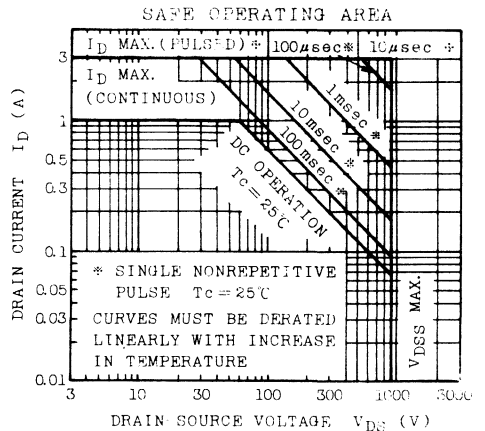
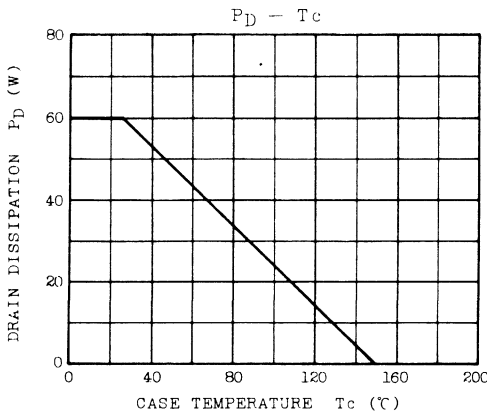
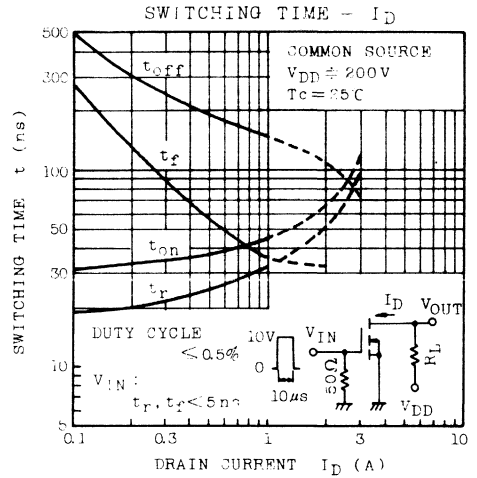
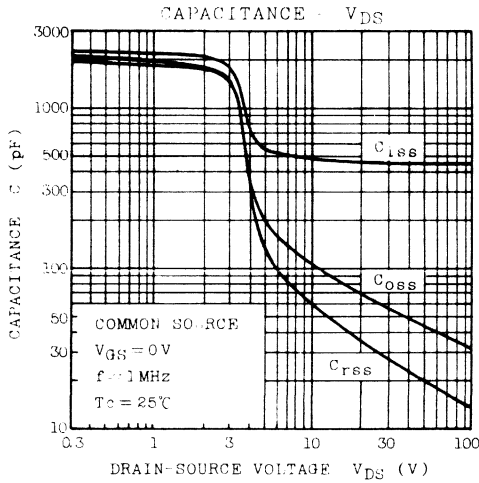
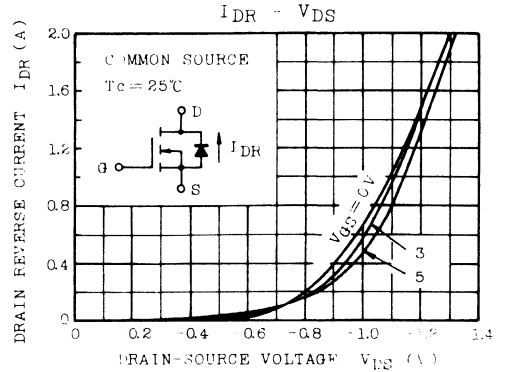
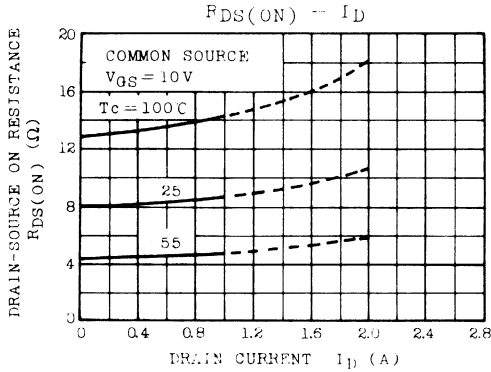
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK537





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
**2SK538**  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS)

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
 SWITCHING REGULATOR AND MOTOR DRIVE APPLICATIONS.

### FEATURES:

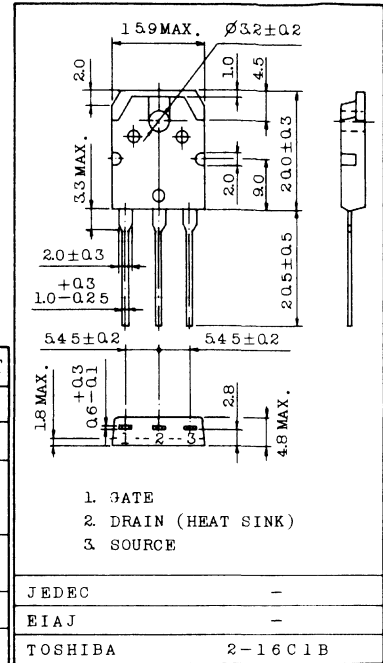
- High Breakdown Voltage :  $V_{(BR)DSS}=900V$
- High Forward Transfer Admittance :  $|Y_{fs}|=1.0S(Typ.)$
- Low Leakage Current :  $I_{GSS}=\pm 100nA(Max.) @V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu A(Max.) @V_{DS}=900V$
- Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V @I_D=1mA$

### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	900	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	3	A
	Pulse	$I_{DP}$	5	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	100	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55 \sim 150$	$^\circ C$

### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 4.6g

### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=900V, V_{GS}=0$	-	-	300	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	900	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=1.5A$	0.5	1.0	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=1.5A, V_{GS}=10V$	-	3.3	4.5	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=3A, V_{GS}=10V$	-	12	15	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	800	1100	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	70	120	pF
Output Capacitance		$C_{oss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	120	200	pF
Switching Time	Rise Time	$t_r$		-	55	120	ns
	Turn-on Time	$t_{on}$		-	70	165	
	Fall Time	$t_f$		-	60	120	
	Turn-off Time	$t_{off}$		-	280	550	

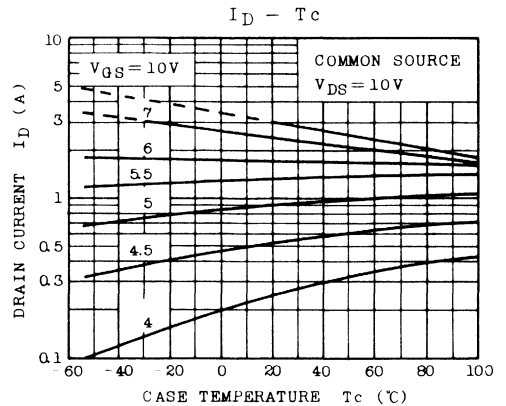
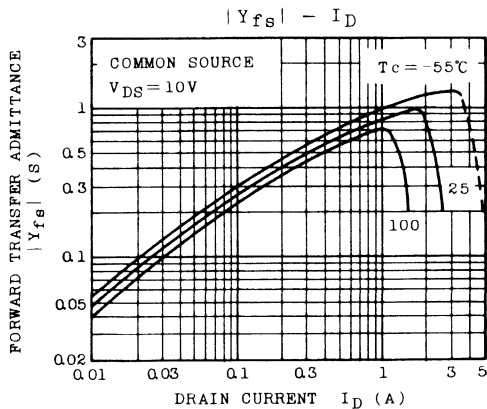
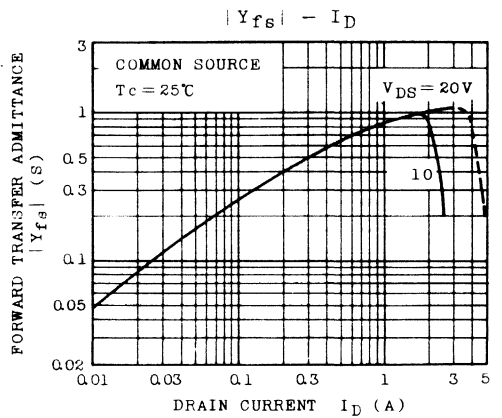
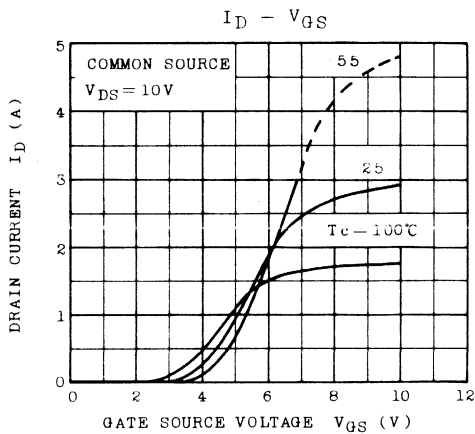
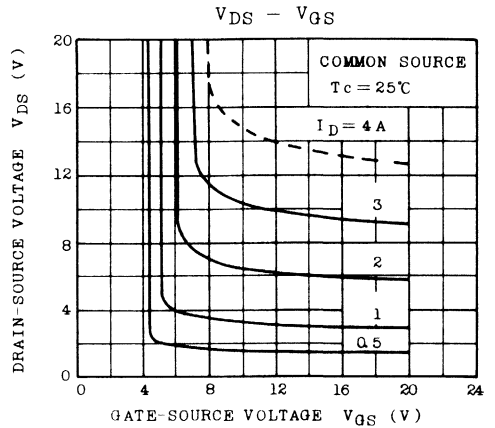
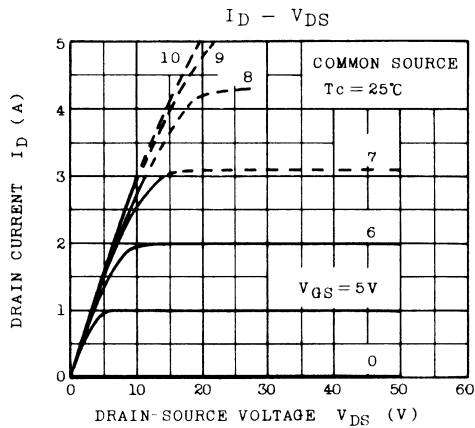
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK538



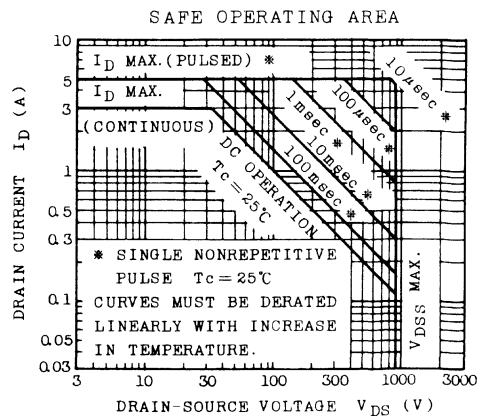
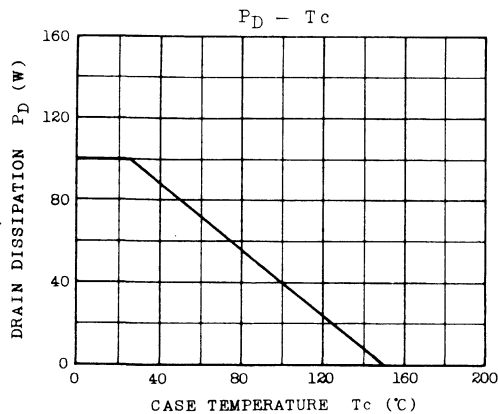
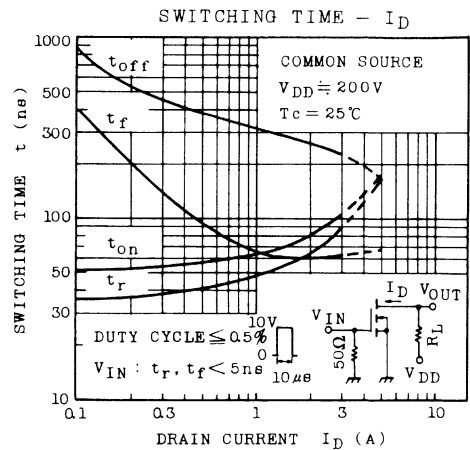
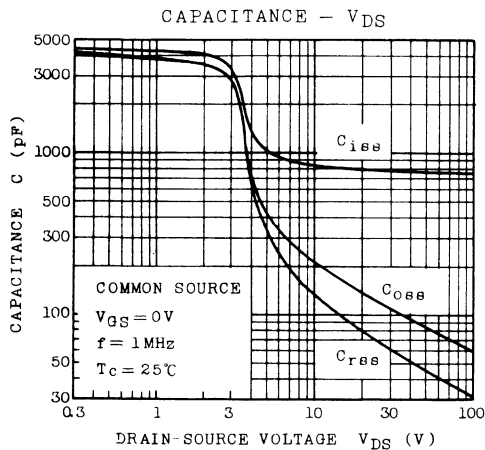
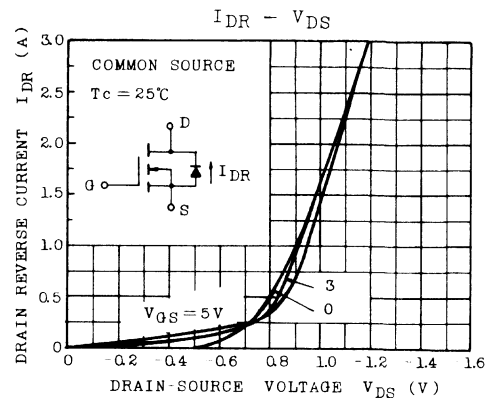
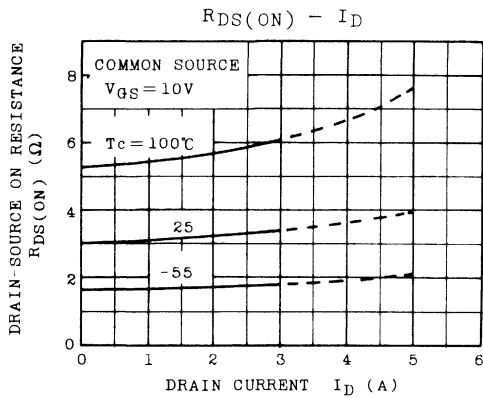
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK538



TOSHIBA CORPORATION





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
**2SK539**  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS)

INDUSTRIAL APPLICATIONS

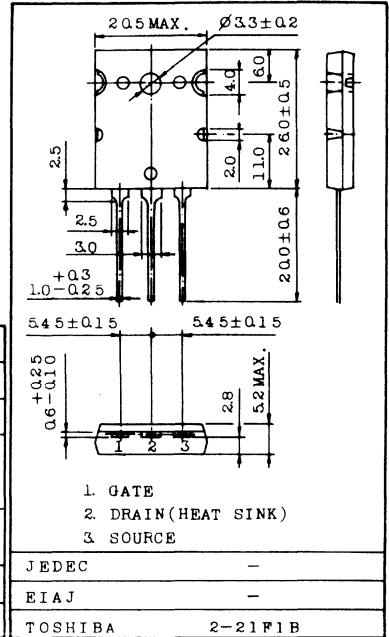
HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
 SWITCHING REGULATOR AND MOTOR DRIVE APPLICATIONS.

**FEATURES:**

- High Breakdown Voltage :  $V_{(BR)DSS}=900V$
- High Forward Transfer Admittance :  $|Y_{fs}|=1.7S(\text{Typ.})$
- Low Leakage Current :  $I_{GSS}=\pm 100nA(\text{Max.})$  ( $V_{GS}=\pm 20V$ )  
 $I_{DSS}=300\mu A(\text{Max.})$  ( $V_{DS}=900V$ )
- Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V$  ( $I_D=1mA$ )

**MAXIMUM RATINGS** ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	900	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	5	A
	Pulse	$I_{DP}$	10	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55 \sim 150$	$^\circ C$



**ELECTRICAL CHARACTERISTICS** ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=900V, V_{GS}=0$	-	-	300	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	900	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=3A$	1.0	1.7	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=3A, V_{GS}=10V$	-	2.1	2.5	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	11	13	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	1400	1900	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	110	200	pF
Output Capacitance		$C_{oss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	190	300	pF
Switching Time	Rise Time	$t_r$		-	110	220	ns
	Turn-on Time	$t_{on}$		-	130	260	
	Fall Time	$t_f$		-	90	260	
	Turn-off Time	$t_{off}$		-	480	900	

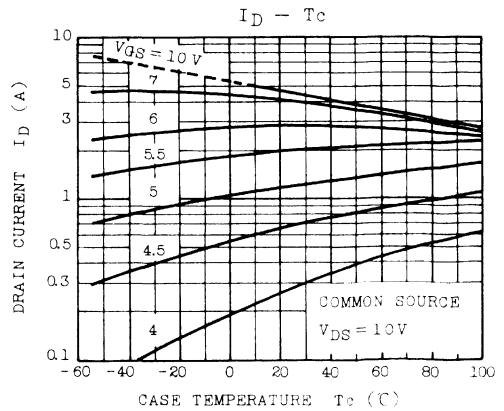
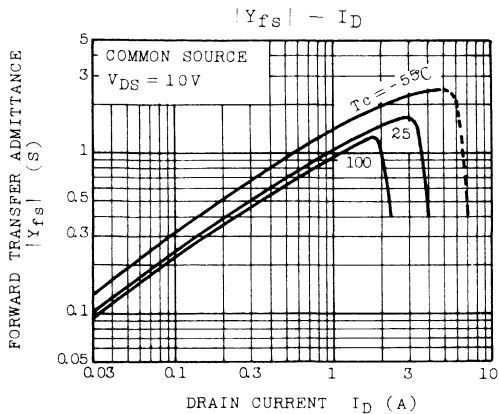
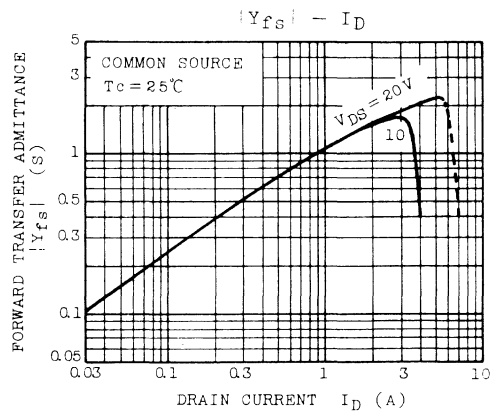
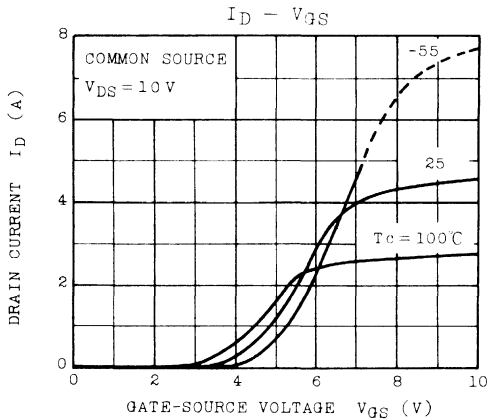
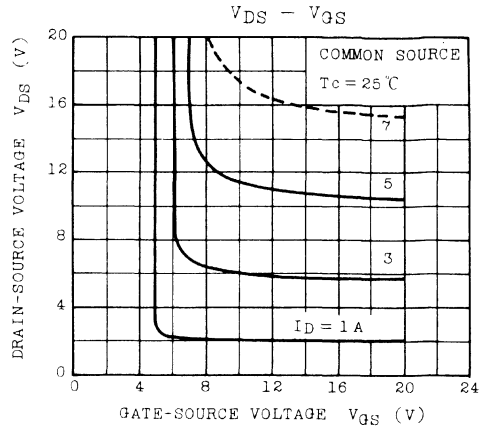
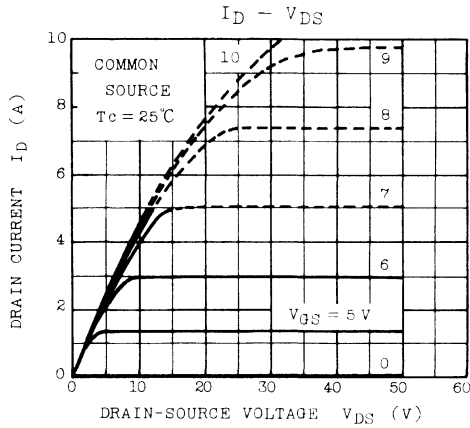
**TOSHIBA CORPORATION**



# SEMICONDUCTOR

## TECHNICAL DATA

2SK539



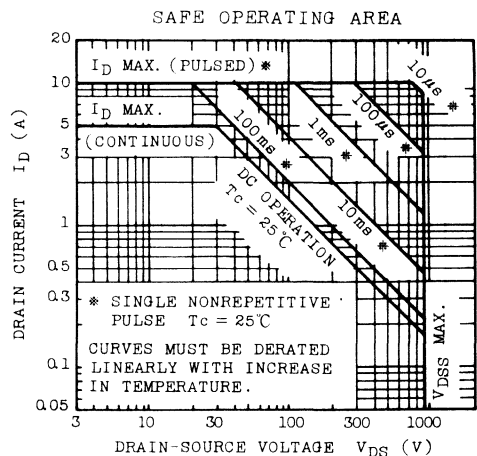
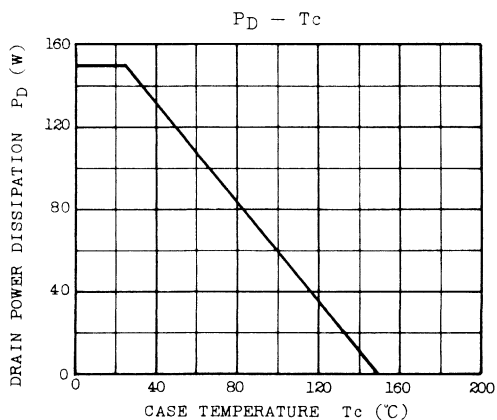
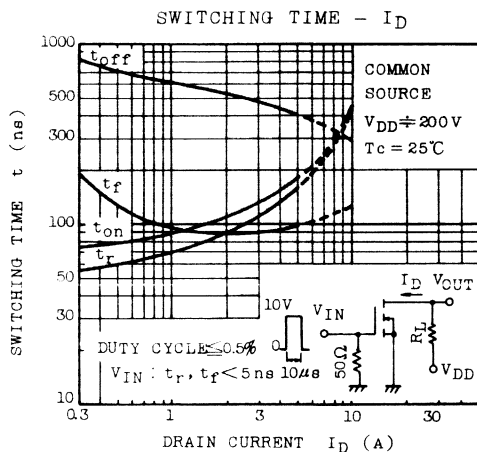
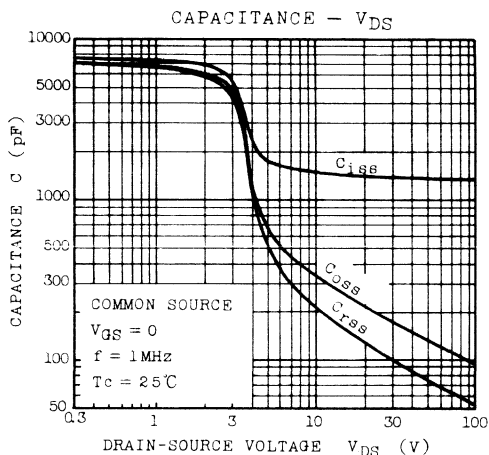
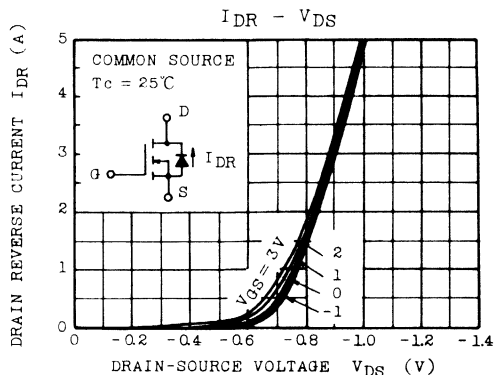
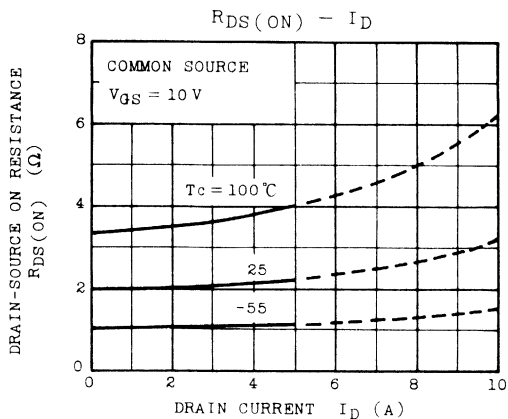
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK539



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
**2SK568**  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS)

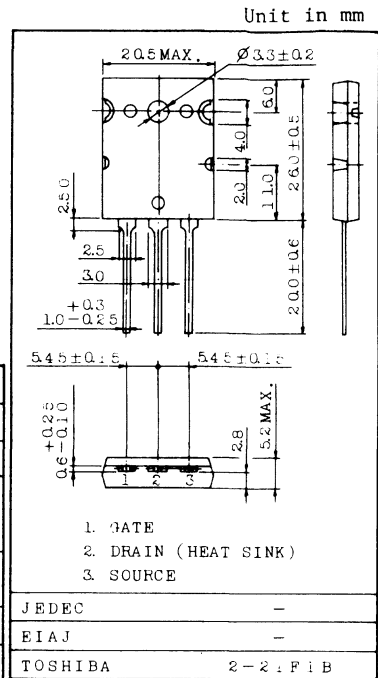
HIGH SPEED, HIGH POWER SWITCHING APPLICATIONS.  
 MOTOR DRIVE, DC-DC CONVERTER AND SWITCHING REGULATOR  
 APPLICATIONS.

**FEATURES:**

- . Low Drain-Source ON Resistance  
     :  $R_{DS(ON)}=0.75\Omega(\text{Max.}) (I_D=8A)$
- . With Built-in Free Wheeling Diode
- . Enhancement-Mode

**MAXIMUM RATINGS ( $T_a=25^\circ\text{C}$ )**

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSS}$	450	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$\pm 8$	A
	Peak	$\pm 16$	
Drain Power Dissipation ( $T_c=25^\circ\text{C}$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55 ~ 150	$^\circ\text{C}$



Weight : 9.75g

**ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ\text{C}$ )**

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=450V, V_{GS}=0$	-	-	1.0	mA	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	450	-	-	V	
Gate-Source Cut-off Voltage	$V_{GS(OFF)}$	$V_{DS}=10V, I_D=8mA$	1.8	2.8	3.8	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=8A$	4.0	6.5	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	0.47	0.75	$\Omega$	
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	3100	-	pF	
Switching Time	Rise Time		-	200	400	ns	
	Turn-on Time		$t_{on}$	-	250		500
	Fall Time		$t_f$	-	110		250
	Turn-off Time		$t_{off}$	-	600		1000
Source Drain Forward Voltage	$V_{DSF}$	$I_D=-8A, V_{GS}=0$	-	1.0	1.8	V	
Reverse Recovery Time	$t_{rr}$	$I_D=-8A, R_G=220\Omega$ $V_{GS}=-15V, di/dt=60A/\mu s$	-	140	250	ns	

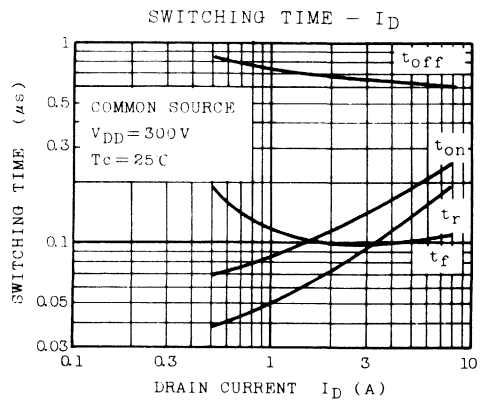
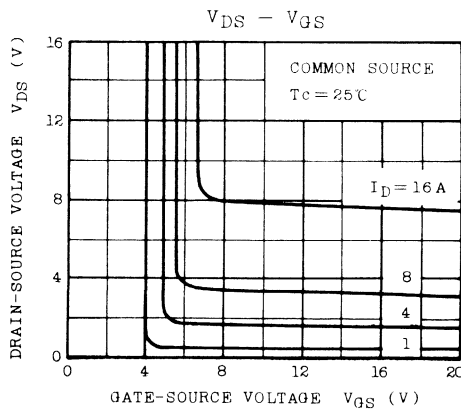
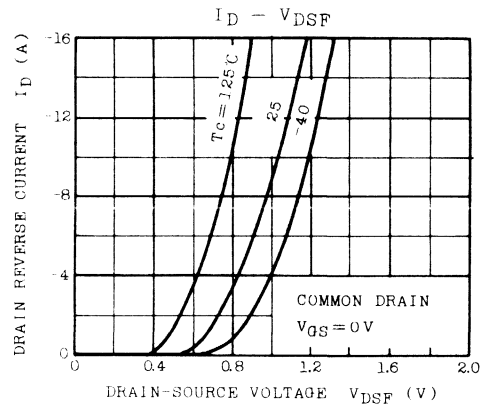
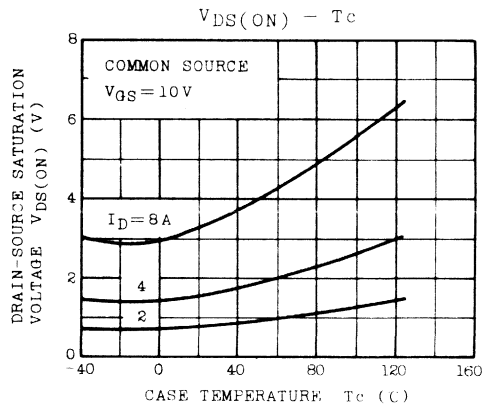
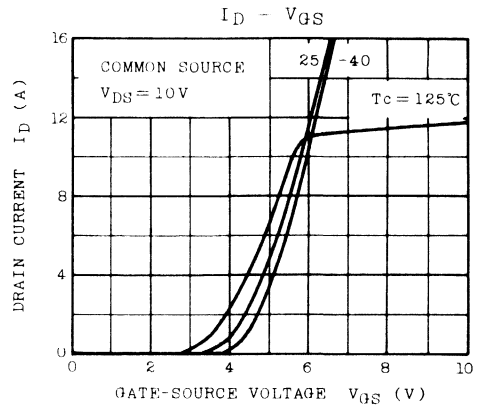
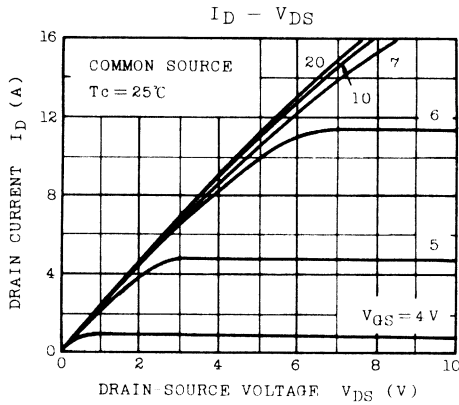
**TOSHIBA CORPORATION**



# SEMICONDUCTOR

## TECHNICAL DATA

2SK568



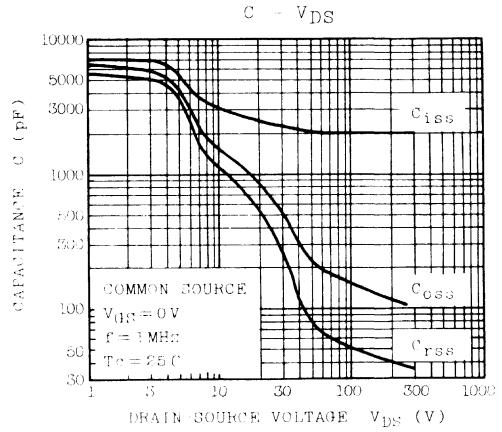
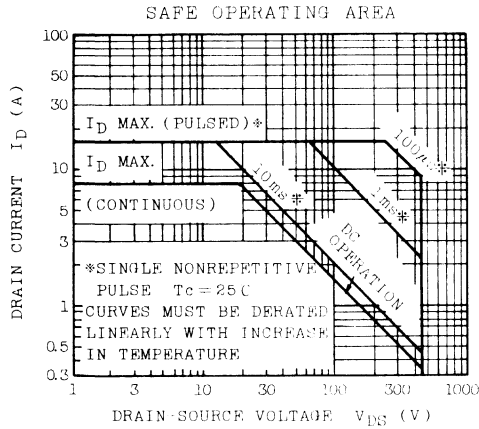
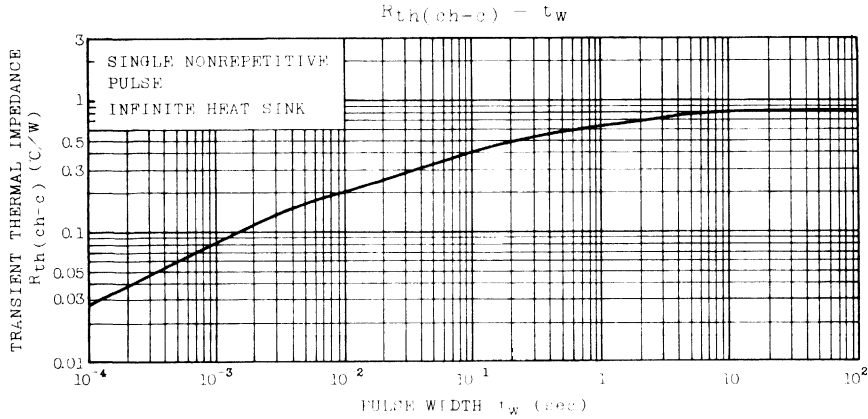
TOSHIBA CORPORATION



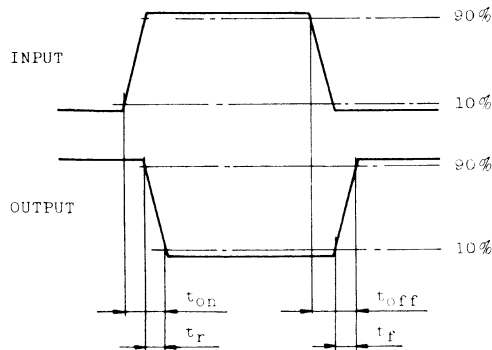
# SEMICONDUCTOR

## TECHNICAL DATA

2SK568



### SWITCHING TIME TEST (WAVEFORM)



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

### 2SK572

### SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS)

## TENTATIVE

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.

SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

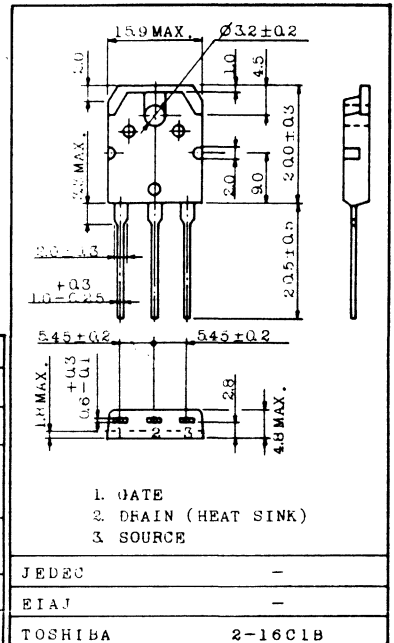
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.12\Omega(\text{Typ.})$
- High Forward Transfer Admittance :  $|Y_{FS}|=6.5S(\text{Typ.})$
- Low Leakage Current :  $I_{GSS}=\pm 100\text{nA}(\text{Max.})$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu\text{A}(\text{Max.})$  @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $I_D=1\text{mA}$

#### MAXIMUM RATINGS ( $T_a=25^\circ\text{C}$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	15	A
	Pulse	$I_{DP}$	30	
Drain Power Dissipation ( $T_c=25^\circ\text{C}$ )		$P_D$	100	W
Channel Temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ\text{C}$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 4.6g

#### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ\text{C}$ )

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0$	-	-	300	$\mu\text{A}$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10\text{mA}, V_{GS}=0$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1\text{mA}$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=10\text{A}$	3.5	6.5	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=10\text{A}, V_{GS}=10V$	-	0.12	0.18	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=15\text{A}, V_{GS}=10V$	-	1.8	2.8	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1\text{MHz}$	-	1100	1500	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1\text{MHz}$	-	310	430	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1\text{MHz}$	-	630	850	pF
Switching Time	Rise Time	$t_r$		-	110	220	ns
	Turn-on Time	$t_{on}$		-	130	260	ns
	Fall Time	$t_f$		-	100	200	ns
	Turn-off Time	$t_{off}$		-	300	600	ns

TOSHIBA CORPORATION



**TENTATIVE**

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
 SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

**FEATURES:**

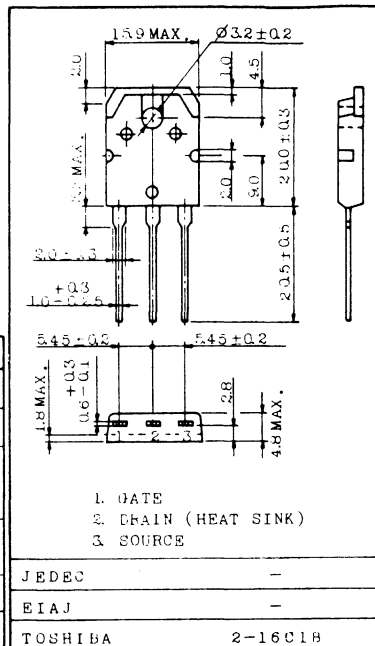
- . Low Drain-Source ON Resistance :  $R_{DS(ON)} = 0.24\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}| = 6.5S$  (Typ.)
- . Low Leakage Current :  $I_{GSS} = \pm 100nA$  (Max.) @  $V_{GS} = \pm 20V$   
 $I_{DSS} = 300\mu A$  (Max.) @  $V_{DS} = 250V$
- . Enhancement-Mode :  $V_{th} = 1.5 \sim 3.5V$  @  $I_D = 1mA$

**MAXIMUM RATINGS (Ta=25°C)**

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	250	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	15	A
	Pulse	$I_{DP}$	25	
Drain Power Dissipation (Tc=25°C)		$P_D$	100	W
Channel Temperature		$T_{ch}$	150	°C
Storage Temperature Range		$T_{stg}$	-55 ~ 150	°C

**INDUSTRIAL APPLICATIONS**

Unit in mm



Weight : 4.6g

**ELECTRICAL CHARACTERISTICS (Ta=25°C)**

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS} = 250V, V_{GS} = 0$	-	-	300	$\mu A$
Drain-Source Breakdown Voltage		$V(BR)_{DSS}$	$I_D = 10mA, V_{GS} = 0$	250	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS} = 10V, I_D = 1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS} = 10V, I_D = 10A$	3.5	6.5	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D = 10A, V_{GS} = 10V$	-	0.24	0.32	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D = 15A, V_{GS} = 10V$	-	3.7	4.9	V
Input Capacitance		$C_{iss}$	$V_{DS} = 10V, V_{GS} = 0, f = 1MHz$	-	1100	1500	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS} = 10V, V_{GS} = 0, f = 1MHz$	-	240	350	pF
Output Capacitance		$C_{oss}$	$V_{DS} = 10V, V_{GS} = 0, f = 1MHz$	-	500	700	pF
Switching Time	Rise Time	$t_r$		-	110	220	ns
	Turn-on Time	$t_{on}$		-	130	260	ns
	Fall Time	$t_f$		-	90	180	ns
	Turn-off Time	$t_{off}$		-	320	640	ns





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
**2SK578**  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS)

HIGH SPEED, HIGH POWER SWITCHING APPLICATIONS.  
 MOTOR DRIVE, DC-DC CONVERTER AND SWITCHING REGULATOR  
 APPLICATIONS.

### FEATURES:

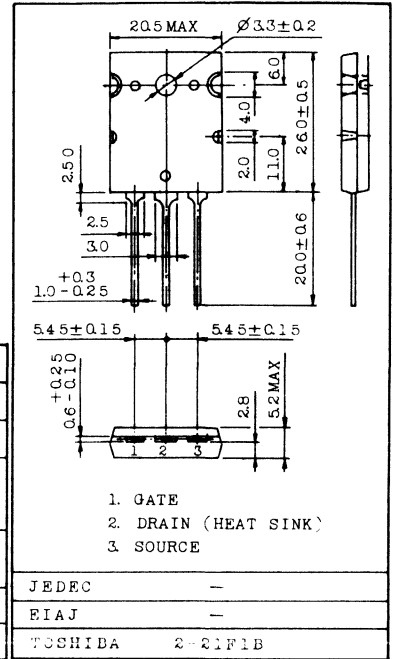
- Low Drain-Source ON Resistance  
 $R_{DS(ON)} = 0.22\Omega(\text{Max.}) (I_D = 15A)$
- With Built-in Free Wheeling Diode
- Enhancement-Mode

### MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSS}$	150	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$\pm 15$	A
	Peak	$\pm 30$	
Drain Power Dissipation ( $T_c = 25^\circ\text{C}$ )	$P_D$	120	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55 ~ 150	$^\circ\text{C}$

### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 9.75g

### ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS} = 150V, V_{GS} = 0$	-	-	1.0	mA	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = 10mA, V_{GS} = 0$	150	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS} = 10V, I_D = 1mA$	1.5	-	3.5	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS} = 10V, I_D = 15A$	4.0	7.0	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D = 15A, V_{GS} = 10V$	-	0.15	0.22	$\Omega$	
Source Drain Forward Voltage	$V_{SDF}$	$I_S = 15A, V_{GS} = 0$	-	1.3	1.8	V	
Input Capacitance	$C_{iss}$	$V_{DS} = 10V, V_{GS} = 0, f = 1MHz$	-	1300	-	pF	
Switching Time	Rise Time		-	400	800	ns	
	Turn-on Time		$t_{on}$	-	500	1000	ns
	Fall Time		$t_f$	-	100	200	ns
	Turn-off Time		$t_{off}$	-	300	600	ns
Reverse Recovery Time	$t_{rr}$	$I_D = -15A, R_G = 220\Omega$ $V_{GS} = -15V, di/dt = 60A/\mu s$	-	200	400	ns	

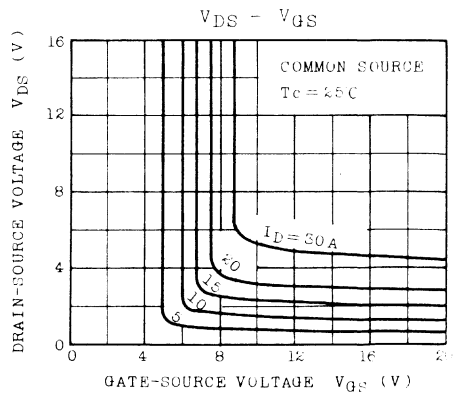
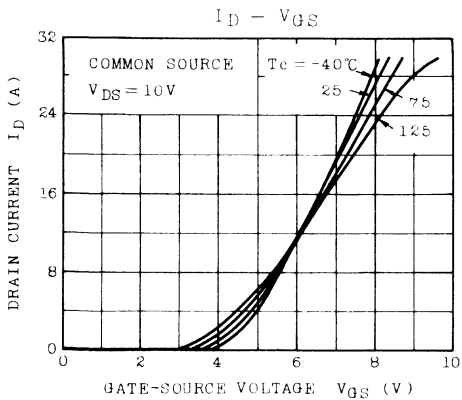
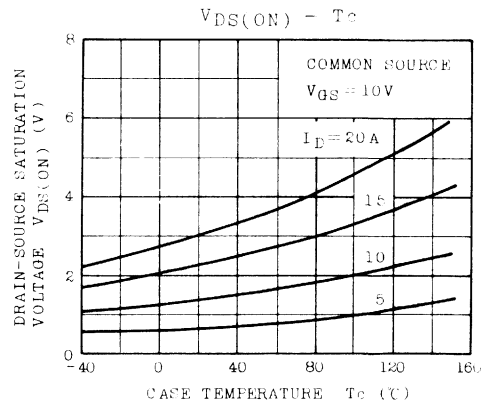
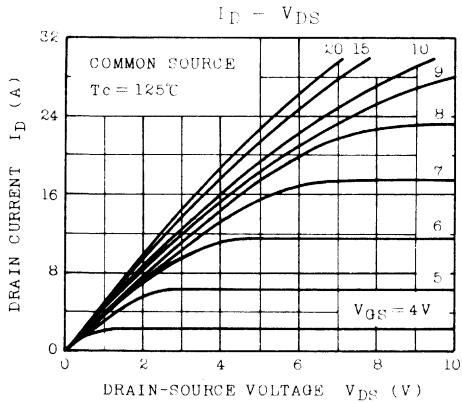
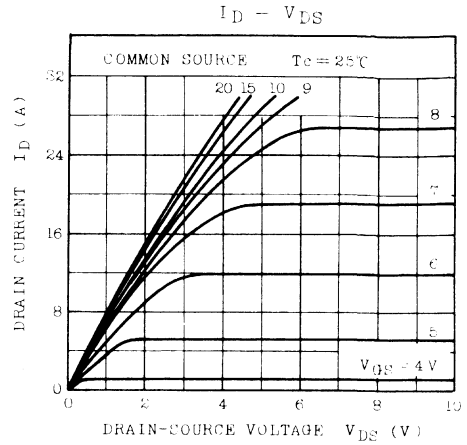
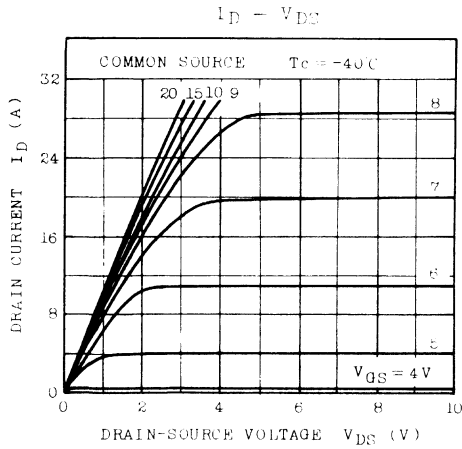
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK578



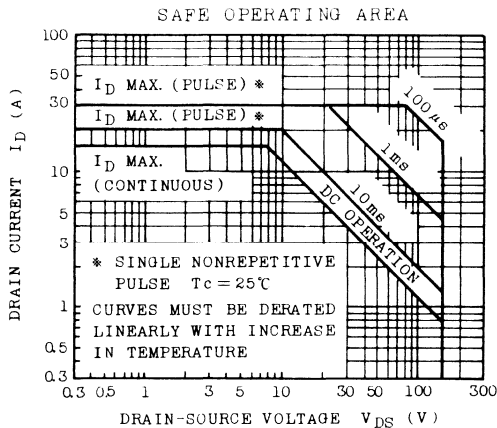
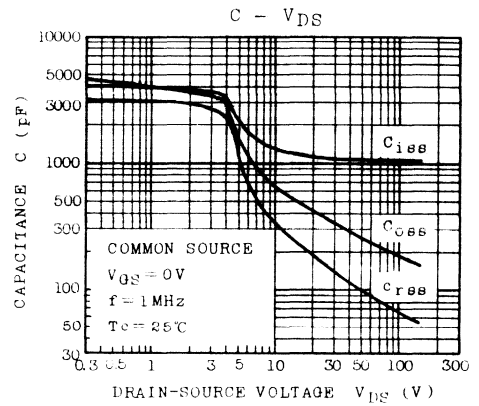
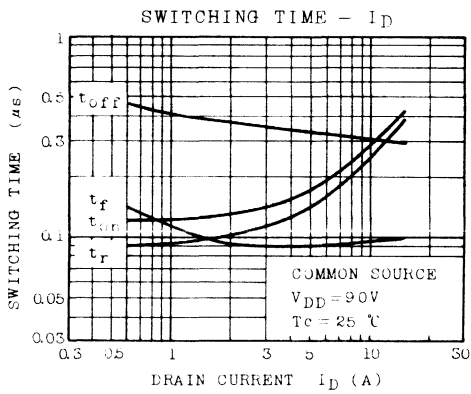
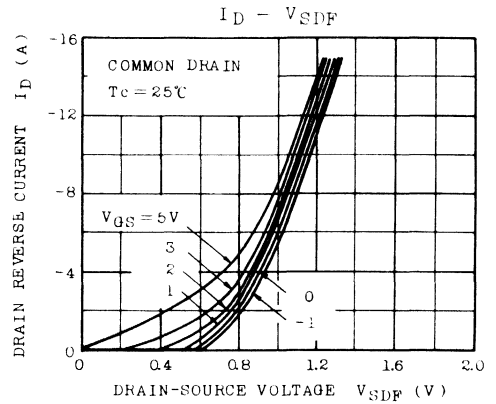
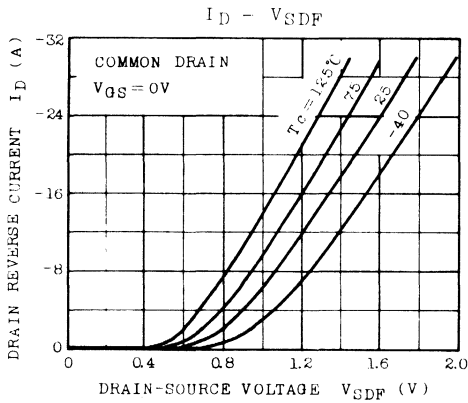
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK578





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

2 S K 6 4 3

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

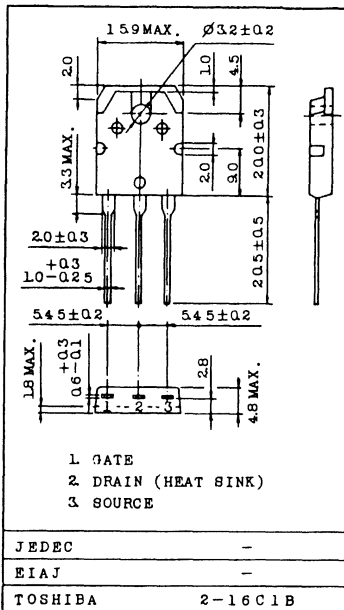
#### INDUSTRIAL APPLICATIONS

Unit in mm

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 0.6 \Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 6.0S$  (Typ.)
- Low Leakage Current :  $I_{GSS} = \pm 100nA$  (Max.) @  $V_{GS} = \pm 20V$   
 $I_{DSS} = 300 \mu A$  (Max.) @  $V_{DS} = 450V$
- Enhancement-Mode :  $V_{th} = 2.0 \sim 4.0V$  @  $V_{DS} = 10V, I_D = 1mA$



Weight : 4.6g

#### MAXIMUM RATINGS ( $T_a = 25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS} = 20k\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	10	A
	Pulse	$I_{DP}$	40	
Drain Power Dissipation ( $T_c = 25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55 \sim 150$	$^\circ C$

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

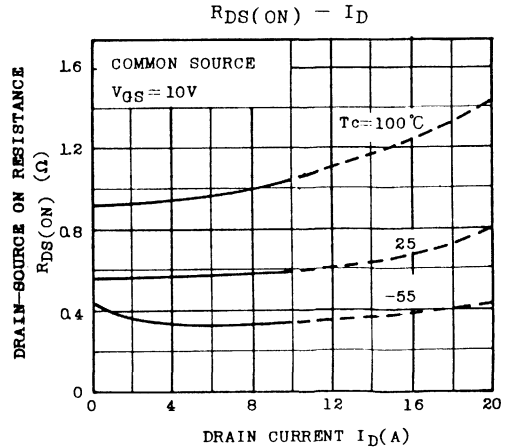
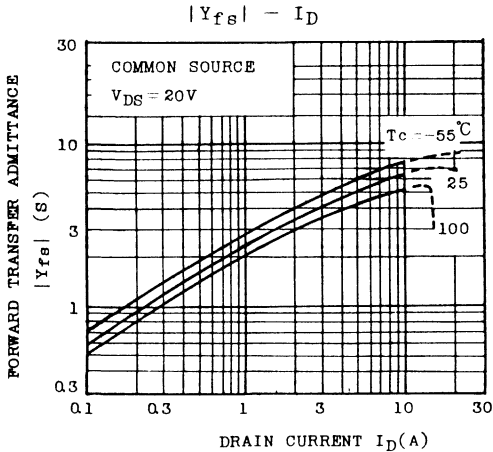
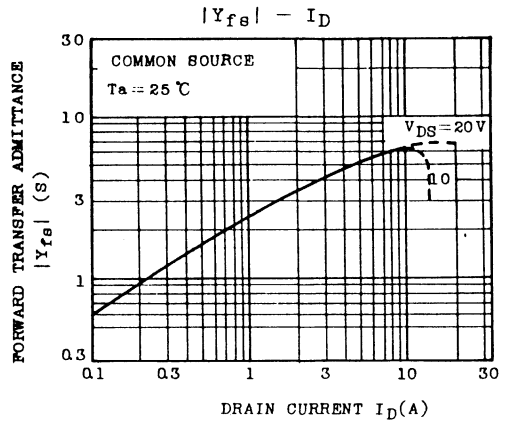
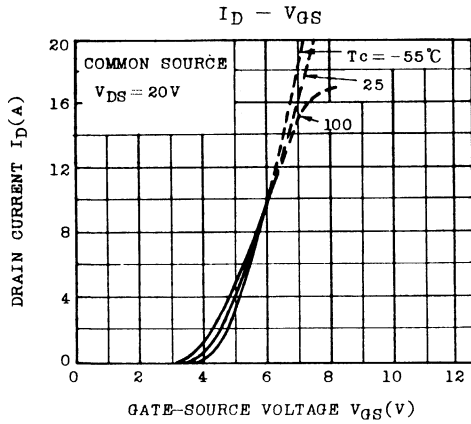
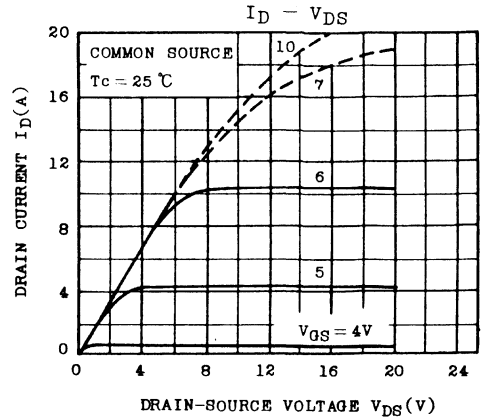
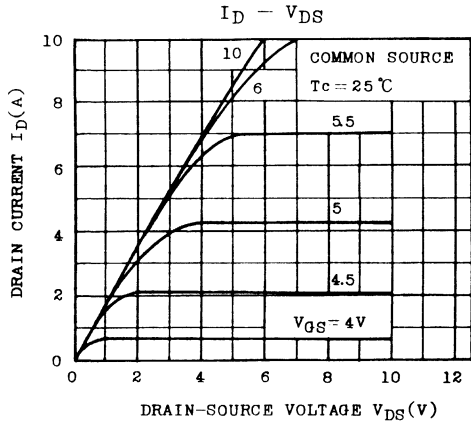
2 S K 6 4 3

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

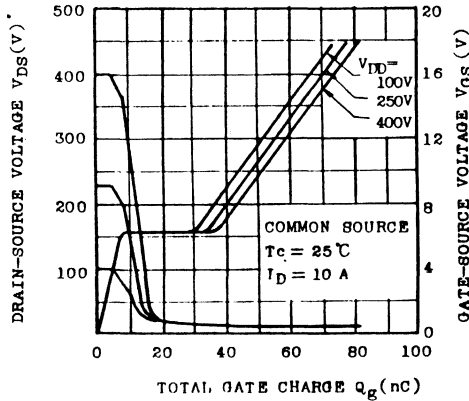
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V$	-	-	300	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0V$	450	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	3.0	6.0	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.6	0.8	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	6.8	10	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0V, f=1MHz$	-	1350	1800	pF
Reverse Transfer Capacitance		$C_{rss}$		-	260	450	
Output Capacitance		$C_{oss}$		-	560	750	
Switching Time	Rise Time	$t_r$		-	35	70	ns
	Turn-on Time	$t_{on}$		-	50	100	
	Fall Time	$t_f$		-	35	70	
	Turn-off Time	$t_{off}$		-	200	400	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=10A, V_{GS}=10V, V_{DD}=360V$	-	47	60	nC
Gate-Source Charge		$Q_{gs}$		-	22	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	25	-	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

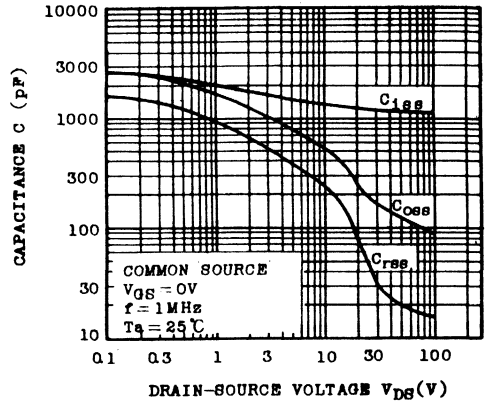
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	10	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	40	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=10A, V_{GS}=0V$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=10A$	-	350	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	2.4	-	$\mu C$



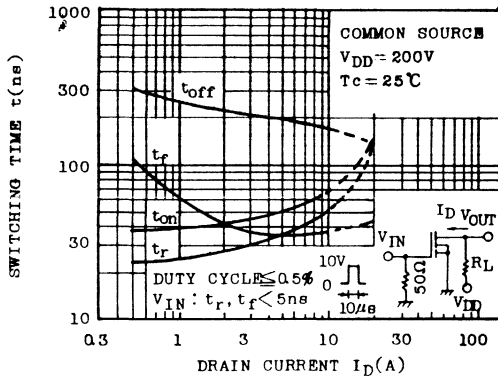
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



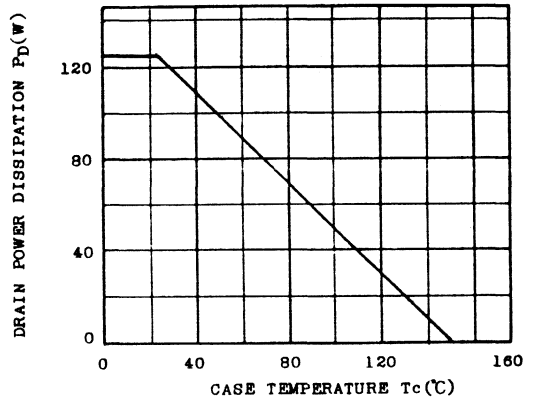
CAPACITANCE -  $V_{DS}$



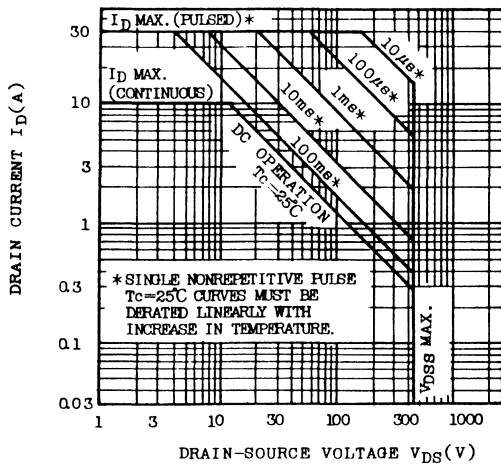
SWITCHING TIME -  $I_D$



$P_D - T_c$



SAFE OPERATING AREA





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2 S K 6 4 4

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS I)

INDUSTRIAL APPLICATIONS

Unit in mm

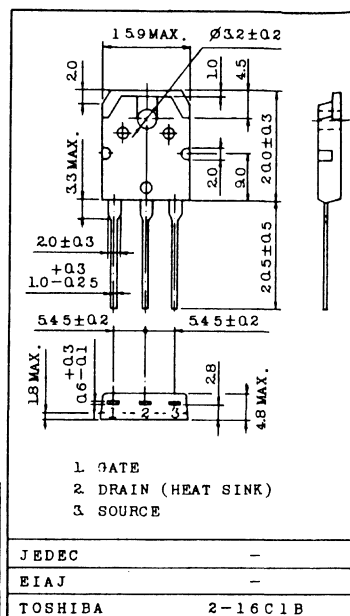
HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.7\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=6.0S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$  (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$  (Max.) @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=10V, I_D=1mA$

### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )		$V_{DGR}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	10	A
	Pulse	$I_{DP}$	30	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$



Weight : 4.6g

### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION





# SEMICONDUCTOR

## TECHNICAL DATA

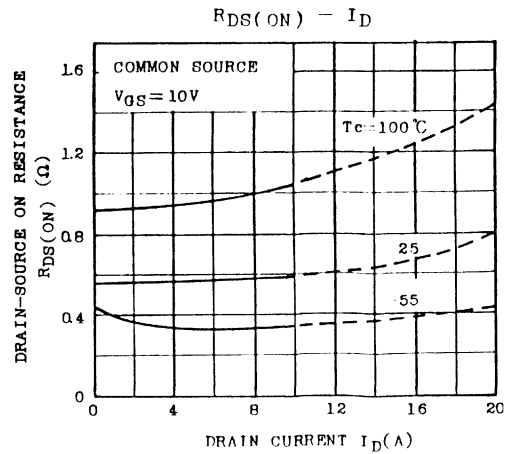
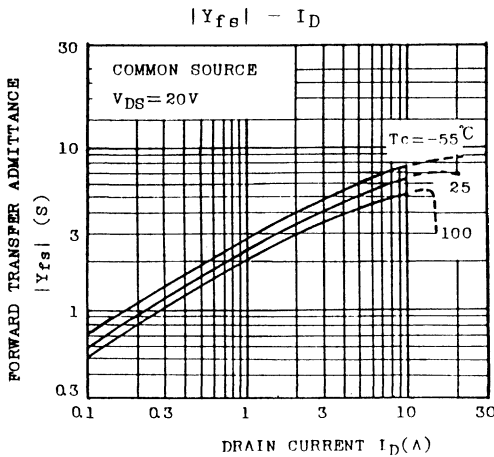
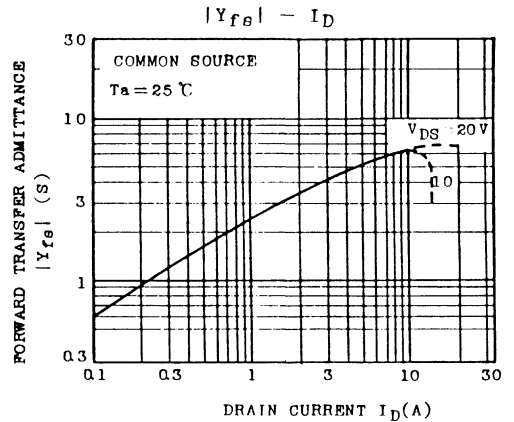
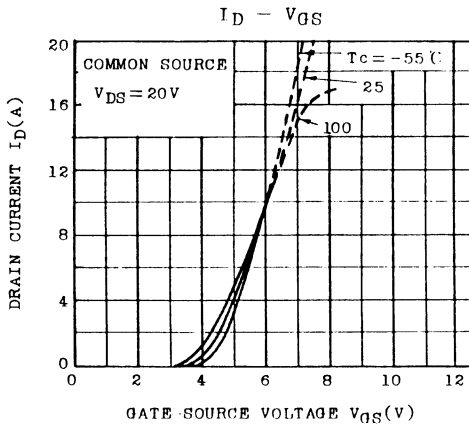
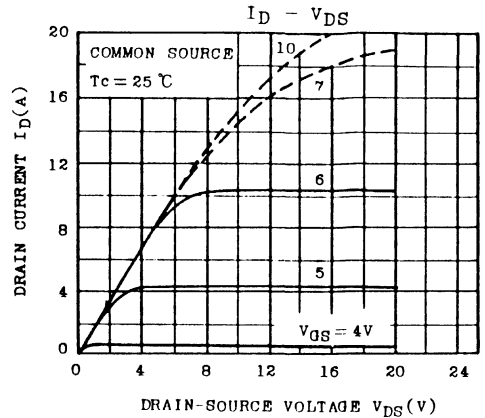
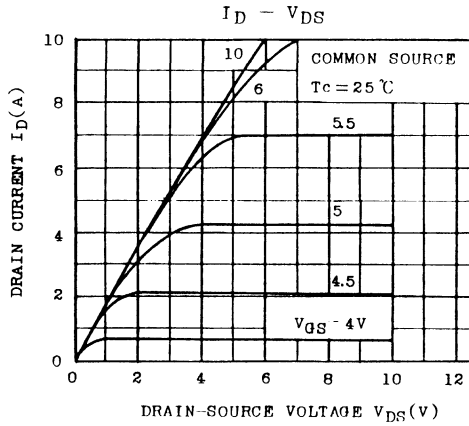
2 S K 6 4 4

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$	-	-	300	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0V$	500	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	3.0	6.0	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.7	1.0	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	8.5	12.5	V	
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0V, f=1MHz$	-	1350	1800	pF	
Reverse Transfer Capacitance	$C_{rss}$		-	260	450		
Output Capacitance	$C_{oss}$		-	560	750		
Switching Time	Rise Time	$t_r$		-	35	70	ns
	Turn-on Time	$t_{on}$		-	50	100	
	Fall Time	$t_f$		-	35	70	
	Turn-off Time	$t_{off}$		$V_{IN}: t_r, t_f < 5ns$ $Duty \leq 1\%$	-	200	
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$I_D=10A, V_{GS}=10V$ $V_{DD}=400V$	-	47	60	nC	
Gate-Source Charge	$Q_{gs}$		-	22	-		
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	25	-		

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	10	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	30	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=10A, V_{GS}=0V$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=10A$	-	350	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	2.4	-	$\mu C$



EGA-2SK644-3

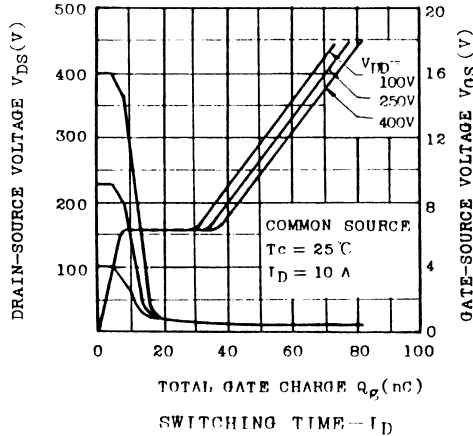
TOSHIBA CORPORATION

# TOSHIBA SEMICONDUCTOR

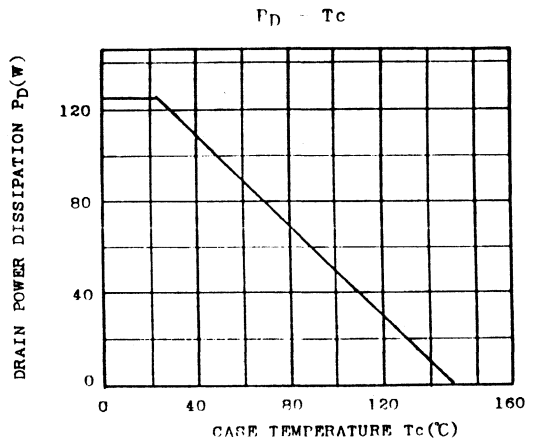
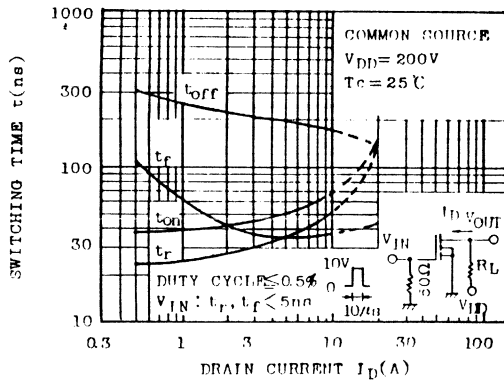
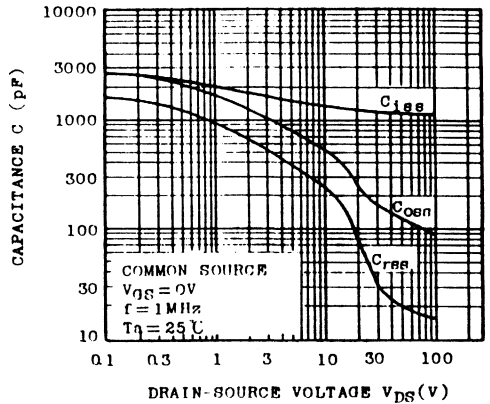
## TECHNICAL DATA

2SK644

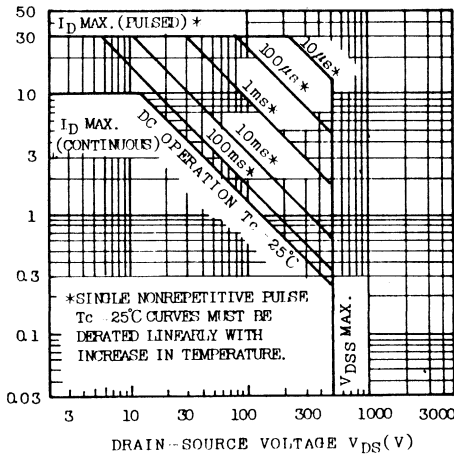
### DYNAMIC INPUT/OUTPUT CHARACTERISTICS



### CAPACITANCE - $V_{DS}$



### SAFE OPERATING AREA



EGA-2SK644-4

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### 2 S K 6 7 3

#### SILICON N CHANNEL MOS TYPE

#### ( $\pi$ -MOS $\bar{I}$ )

#### INDUSTRIAL APPLICATIONS

Unit in mm

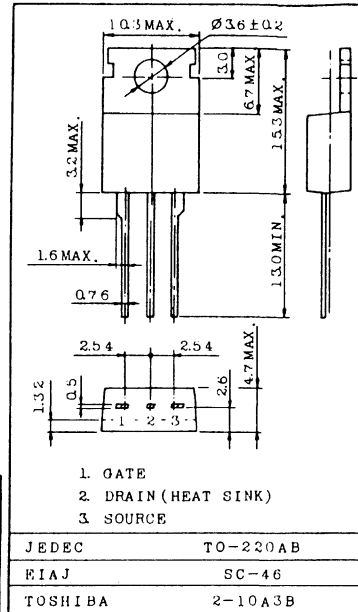
HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.085\Omega$ (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=5.0S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu A$  (Max.) @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $V_{DS}=10V, I_D=1mA$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	60	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )		$V_{DGR}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	15	A
	Pulse	$I_{DP}$	60	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	75	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	83.3	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2 S K 6 7 3

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$	-	-	300	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0V$	60	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=8A$	3.5	5.0	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	0.085	0.11	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=15A, V_{GS}=10V$	-	1.3	1.8	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0V, f=1MHz$	-	650	900	pF
Reverse Transfer Capacitance		$C_{rss}$		-	150	240	
Output Capacitance		$C_{oss}$		-	600	900	
Switching Time	Rise Time	$t_r$		-	35	70	ns
	Turn-on Time	$t_{on}$		-	45	90	
	Fall Time	$t_f$		-	45	90	
	Turn-off Time	$t_{off}$		-	100	200	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=15A, V_{GS}=10V, V_{DD}=48V$	-	20	33	nC
Gate-Source Charge		$Q_{gs}$		-	12	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	8	-	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	15	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	60	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=15A, V_{GS}=0V$	-	-	1.7	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=15A$	-	130	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=50A/\mu s$	-	0.22	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA TENTATIVE

### TOSHIBA FIELD EFFECT TRANSISTOR 2 S K 6 7 4 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

#### INDUSTRIAL APPLICATIONS

Unit in mm

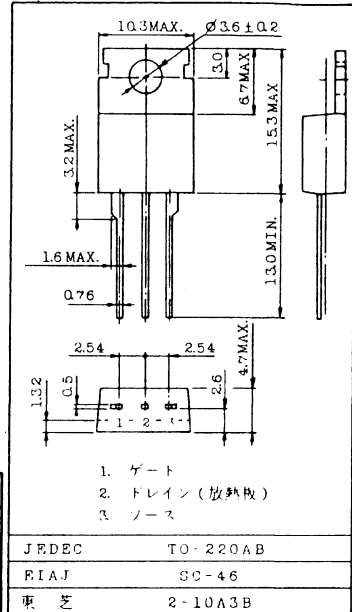
HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.040\Omega$ (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu A$ (Max.) @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $V_{DS}=10V, I_D=1mA$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	60	V
Drain-Gate Voltage		$V_{DGR}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	25	A
	Pulse	$I_{DP}$	100	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	100	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.25	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	83.3	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA TENTATIVE

2 S K 6 7 4

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$	-	-	300	$\mu A$
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0V$	60	-	-	V
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=15A$	8.0	11	-	S
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=15A, V_{GS}=10V$	-	0.040	0.060	$\Omega$
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=25A, V_{GS}=10V$	-	1.1	1.65	V
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF
Reverse Transfer Capacitance	$C_{rss}$		-	320	450	
Output Capacitance	$C_{oss}$		-	1200	1600	
Switching Time	Rise Time	$t_r$	-	80	160	ns
	Turn-on Time	$t_{on}$	-	100	200	
	Fall Time	$t_f$	-	85	170	
	Turn-off Time	$t_{off}$	-	165	330	
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$I_D=25A, V_{GS}=10V, V_{DD}=48V$	-	38	60	nC
Gate-Source Charge	$Q_{gs}$		-	20	-	
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	18	-	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	25	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	100	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=25A, V_{GS}=0V$	-	-	1.7	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=25A$	-	160	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	0.6	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2 S K 6 7 8

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

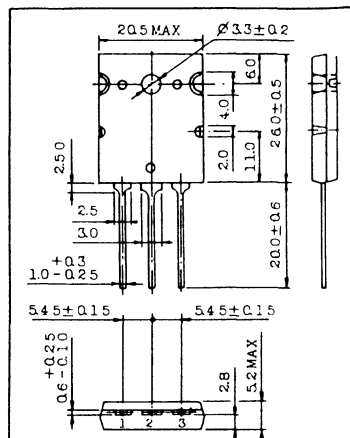
INDUSTRIAL APPLICATIONS

Unit in mm

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.32\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=9.0S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu A$ (Max.) @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=10V, I_D=1mA$



1. GATE
2. DRAIN (HEAT SINK)
3. SOURCE

JEDEC

EIAJ

TOSHIBA 2-21F1B

Weight : 9.75g

### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )		$V_{DGR}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	13	A
	Pulse	$I_{DP}$	52	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION





# SEMICONDUCTOR

## TECHNICAL DATA

2 S K 6 7 8

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$	-	-	300	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0V$	500	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=7A$	6.0	9.0	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	0.32	0.40	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=13A, V_{GS}=10V$	-	4.8	6.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0V, f=1MHz$	-	2300	3600	pF
Reverse Transfer Capacitance		$C_{rss}$		-	450	680	
Output Capacitance		$C_{oss}$		-	1000	1400	
Switching Time	Rise Time	$t_r$		-	70	140	ns
	Turn-on Time	$t_{on}$		-	100	200	
	Fall Time	$t_f$		-	75	150	
	Turn-off Time	$t_{off}$		-	350	700	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=13A, V_{GS}=10V, V_{DD}=400V$	-	82	110	nC
Gate-Source Charge		$Q_{gs}$		-	47	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	35	-	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	13	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	52	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=13A, V_{GS}=0V$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=13A, dI_{DR}/dt=100A/\mu s$	-	400	-	ns
Reverse Recovered Charge	$Q_{rr}$		-	4.0	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

2 S K 6 9 3

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

INDUSTRIAL APPLICATIONS

Unit in mm

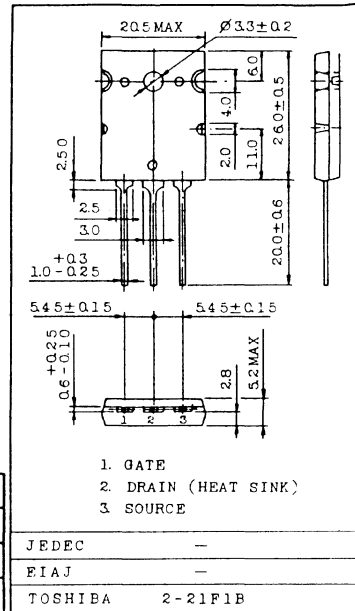
HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.32\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=9.0S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu A$ (Max.) @  $V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=10V, I_D=1mA$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	13	A
	Pulse	$I_{DP}$	52	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$



Weight : 9.75g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2 S K 6 9 3

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V$	-	-	300	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0V$	450	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=7A$	6.0	9.0	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	0.32	0.40	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=13A, V_{GS}=10V$	-	4.8	6.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0V, f=1MHz$	-	2300	3600	pF
Reverse Transfer Capacitance		$C_{rss}$		-	450	680	
Output Capacitance		$C_{oss}$		-	1000	1400	
Switching Time	Rise Time	$t_r$		-	70	140	ns
	Turn-on Time	$t_{on}$		-	100	200	
	Fall Time	$t_f$		-	75	150	
	Turn-off Time	$t_{off}$		-	350	700	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=13A, V_{GS}=10V, V_{DD}=360V$	-	82	110	nC
Gate-Source Charge		$Q_{gs}$		-	47	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	35	-	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	13	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	52	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=13A, V_{GS}=0V$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=13A$	-	400	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	4.0	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2 S K 6 9 4

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS I)

INDUSTRIAL APPLICATIONS

Unit in mm

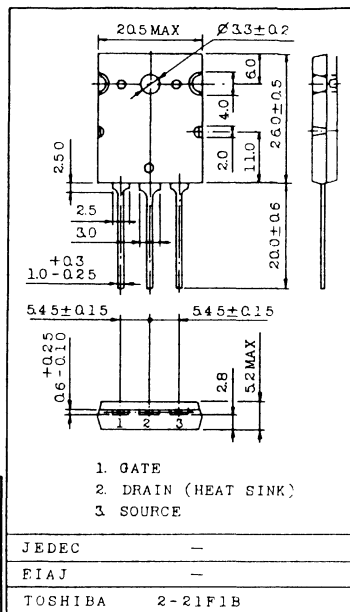
HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.40\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=9.0S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu A$ (Max.) @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=10V, I_D=1mA$

### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )	$V_{DGR}$	500	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	12
	Pulse	$I_{DP}$	48
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$



Weight : 9.75g

### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2 S K 6 9 4

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$	-	-	300	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0V$	500	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=7A$	6.0	9.0	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	0.40	0.50	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=12A, V_{GS}=10V$	-	5.3	7.0	V	
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0V, f=1MHz$	-	2300	3600	pF	
Reverse Transfer Capacitance	$C_{rss}$		-	450	680		
Output Capacitance	$C_{oss}$		-	1000	1400		
Switching Time	Rise Time	$t_r$		-	70	140	ns
	Turn-on Time	$t_{on}$		-	100	200	
	Fall Time	$t_f$		-	75	150	
	Turn-off Time	$t_{off}$		-	350	700	
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$I_D=12A, V_{GS}=10V$ $V_{DD}=400V$	-	82	110	nC	
Gate-Source Charge	$Q_{gs}$		-	47	-		
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	35	-		

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	12	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	48	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=12A, V_{GS}=0V$	-	-	1.7	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=12A$	-	400	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	4.0	-	$\mu C$

# TOSHIBA SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD TRANSISTOR  
 2 S K 7 8 8  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS I)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

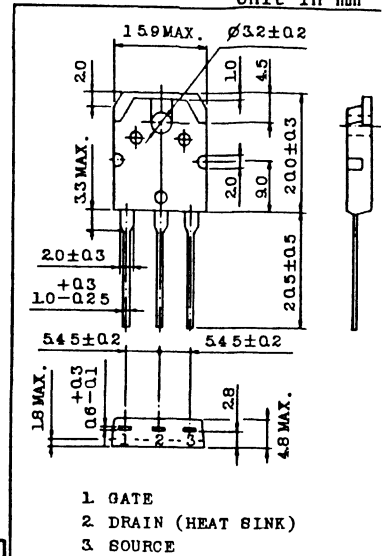
**FEATURES:**

- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 0.38\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 8.0S$  (Typ.)
- Low Leakage Current :  $I_{GSS} = 100nA$  (Max.) @  $V_{GS} = \pm 20V$   
 $I_{DSS} = 300nA$  (Max.) @  $V_{DS} = 500V$
- Enhancement-Mode :  $V_{th} = 2.0 \sim 4.0S$  @  $V_{DS} = 10V, I_D = 1mA$

**MAXIMUM RATINGS ( $T_a = 25^\circ C$ )**

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS} = 20k\Omega$ )	$V_{DGR}$	500	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	13
	Pulse	$I_{DP}$	52
Drain Power Dissipation ( $T_c = 25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55 \sim 150$	$^\circ C$

**INDUSTRIAL APPLICATIONS**  
 Unit in mm



JEDEC	-
EIAJ	-
TOSHIBA	2-16C1B
Weight :	4.6g

**THERMAL CHARACTERISTICS**

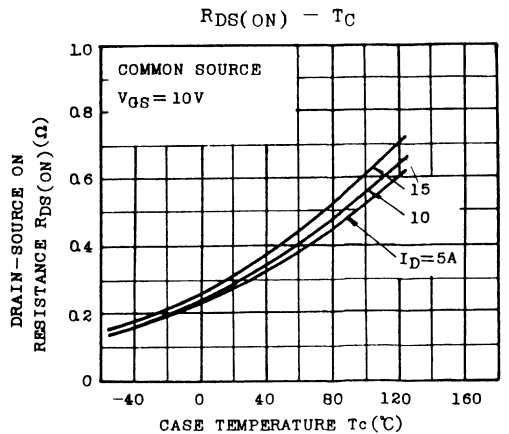
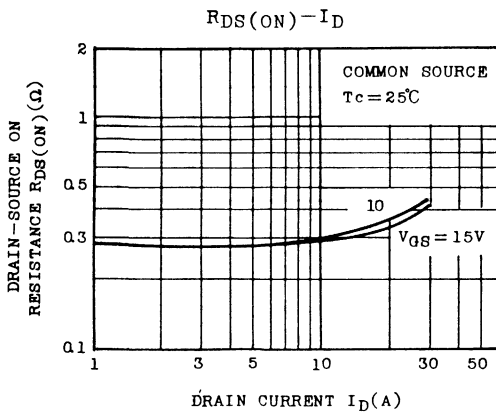
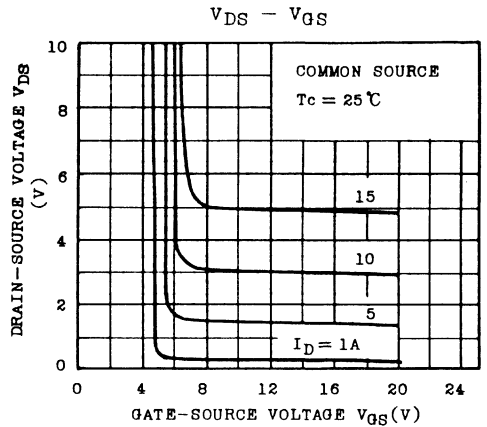
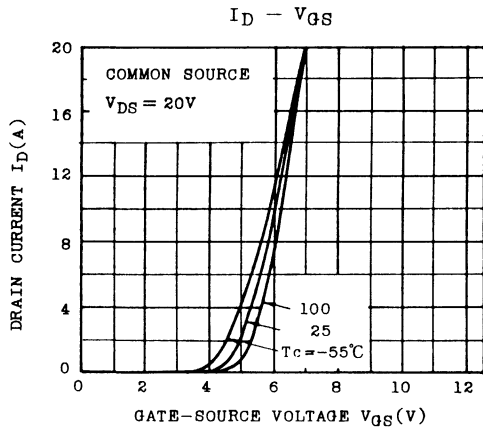
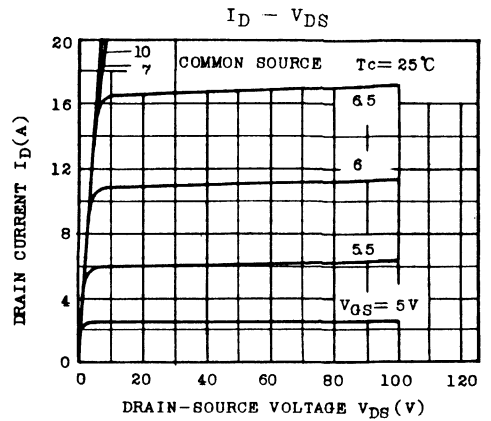
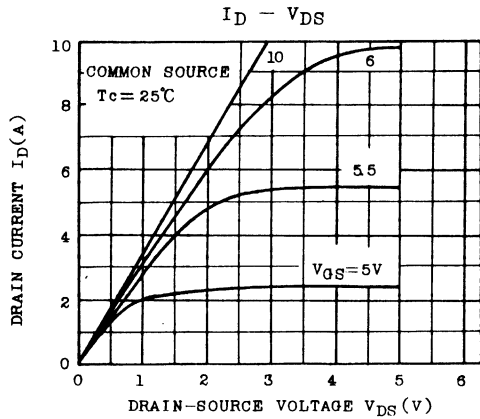
CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

ELECTRICAL CHARACTERISTICS (Ta=25°C)

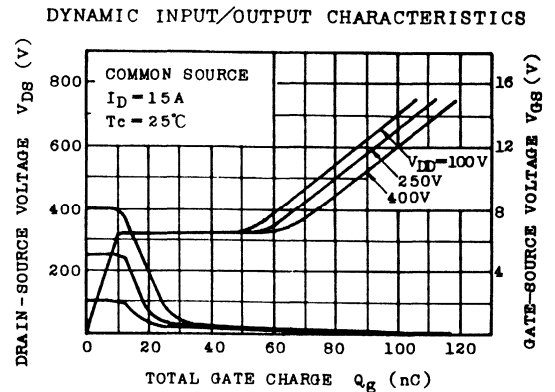
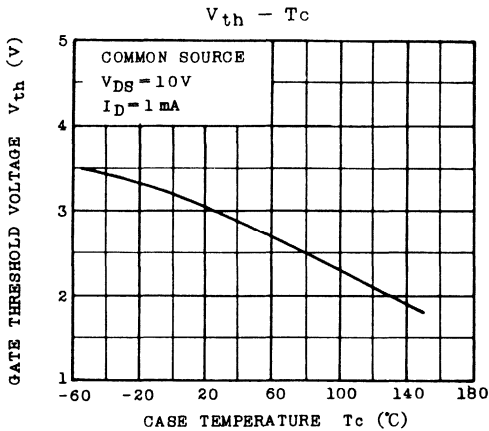
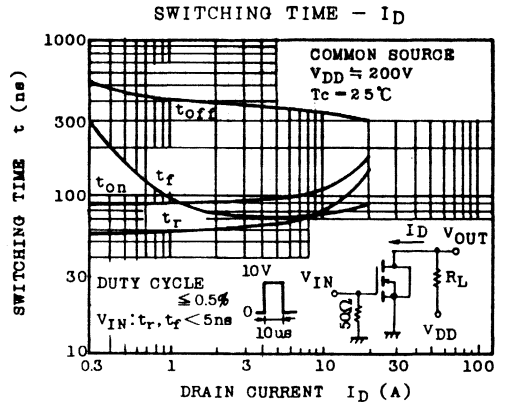
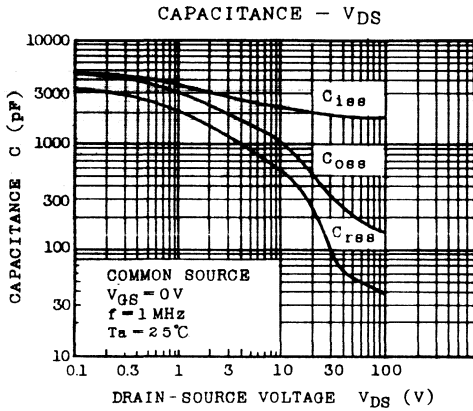
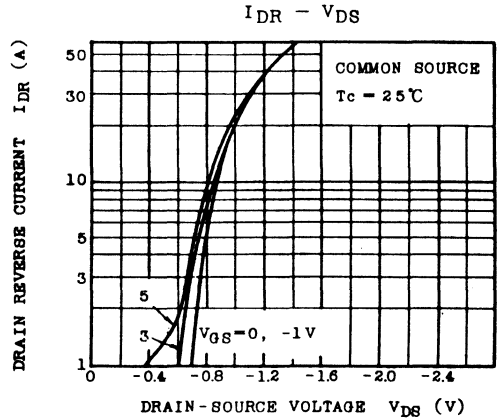
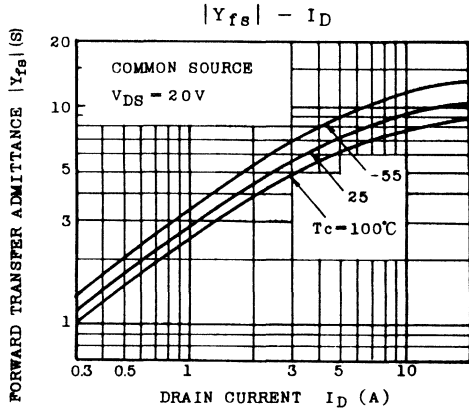
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$	-	-	300	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0V$	500	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=7A$	6.0	8.0	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	0.38	0.50	$\Omega$	
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0V, f=1MHz$	-	2300	3600	pF	
Reverse Transfer Capacitance	$C_{rss}$		-	570	680		
Output Capacitance	$C_{oss}$		-	1000	1400		
Switching Time	Rise Time	$t_r$		-	70	140	ns
	Turn-on Time	$t_{on}$		-	100	200	
	Fall Time	$t_f$		-	75	150	
	Turn-off Time	$t_{off}$		-	350	700	
Total Gate charge (Gate-Source Plus Gate-Drain)	$Q_g$	$I_D=15A, V_{GS}=10V$ $V_{DD}=400V$	-	87	110	nC	
Gate-Source Charge	$Q_{gs}$		-	35	-		
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	52	-		

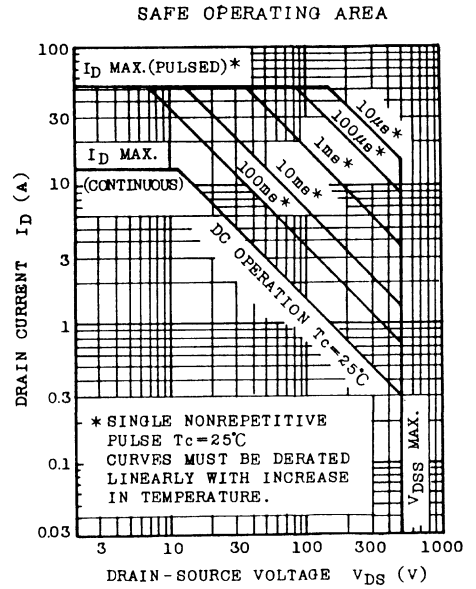
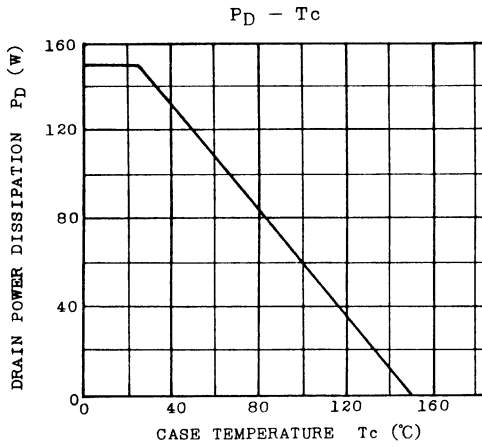
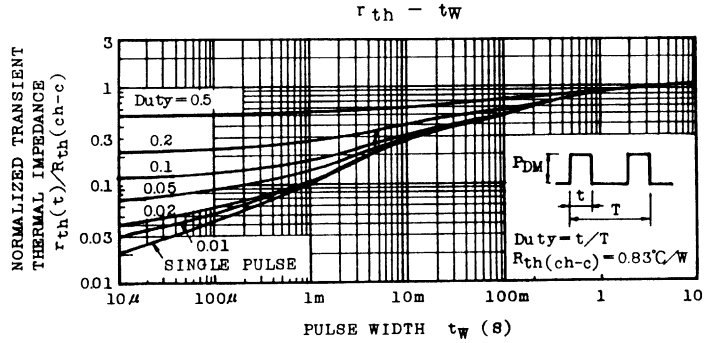
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	13	A
Rulse Drain Reverse Current	$I_{DRP}$	--	-	-	52	A
Diode Foward Voltage	$V_{DSF}$	$I_{DR}=13A, V_{GS}=0V$	-	-	1.9	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=13A$	-	400	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	4.0	-	$\mu C$









# TOSHIBA SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

2 S K 7 8 9

#### SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS I)

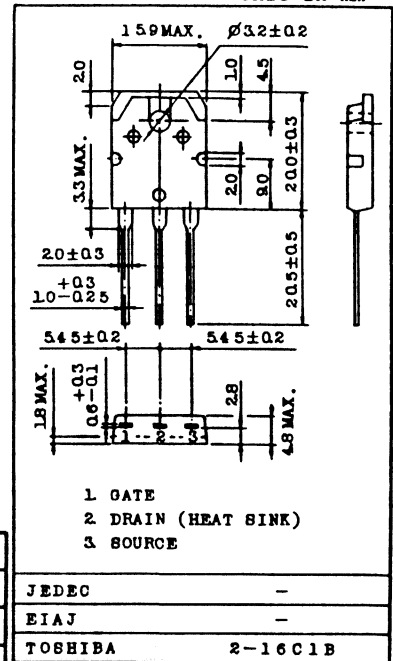
#### INDUSTRIAL APPLICATIONS

Unit in mm

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.29\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=8.0S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$  (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu A$  (Max.) @  $V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=10V, I_D=1mA$



JEDEC	-
EIAJ	-
TOSHIBA	2-16C1B

Weight : 4.6g

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	15	A
	Pulse	$I_{DP}$	60	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### THERMAL CHARACTERISTICS

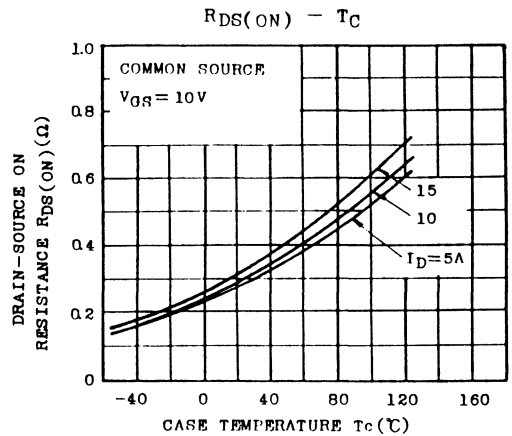
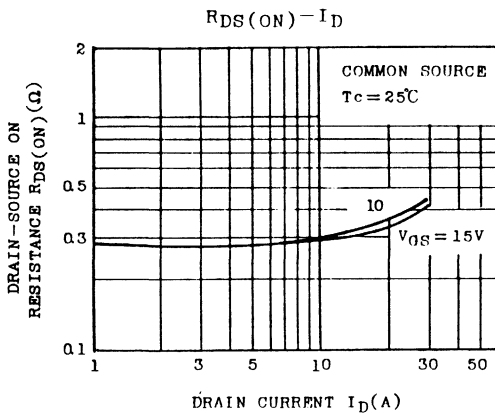
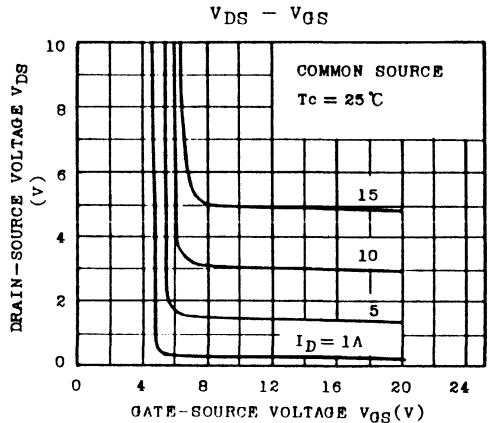
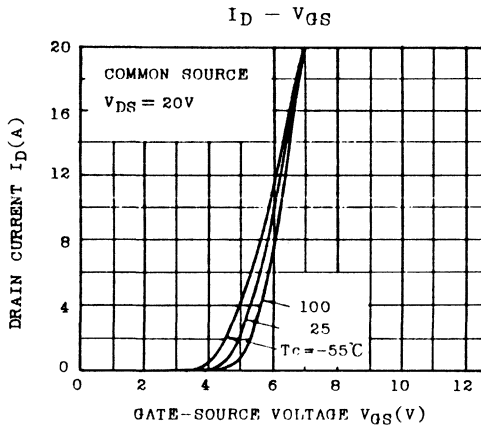
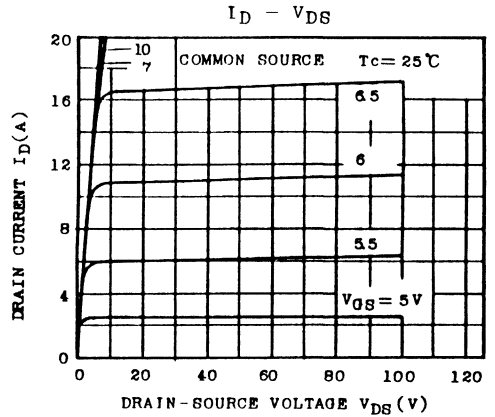
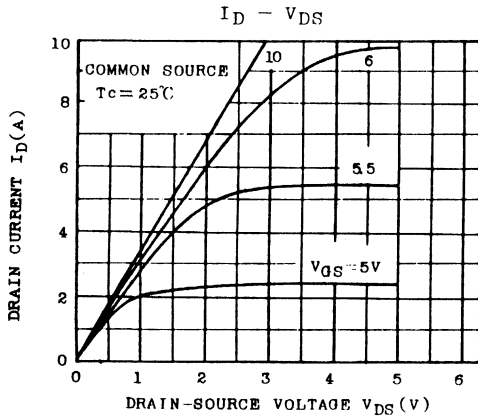
CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

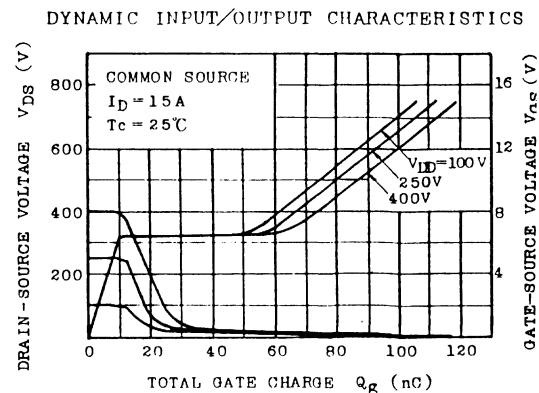
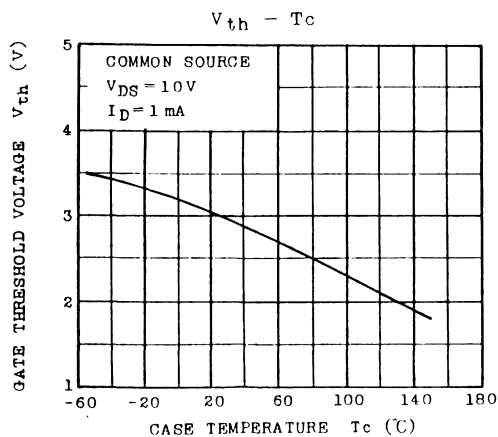
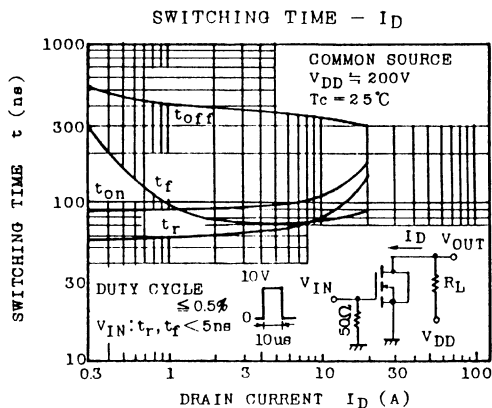
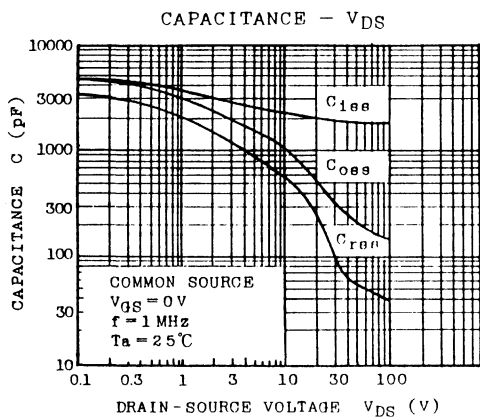
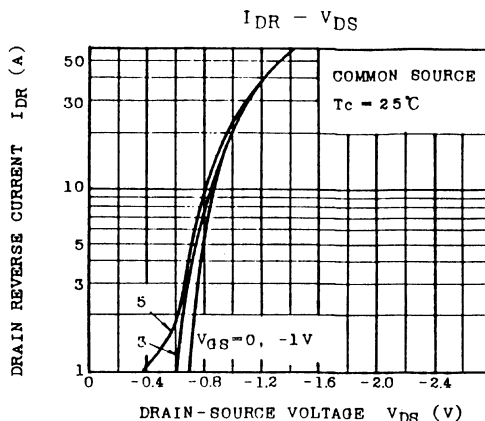
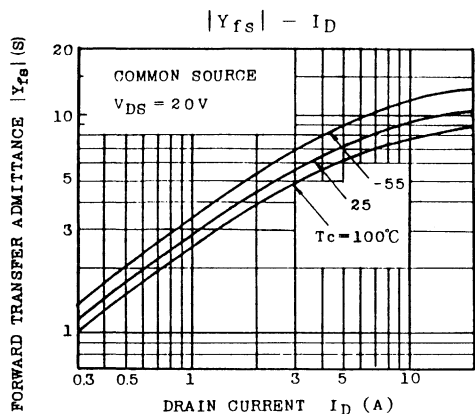
ELECTRICAL CHARACTERISTICS (Ta=25°C)

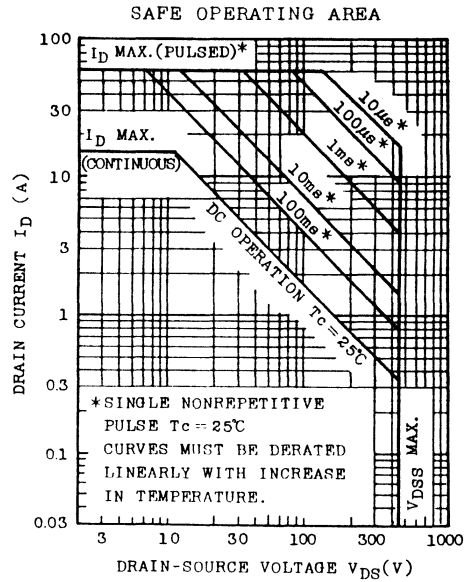
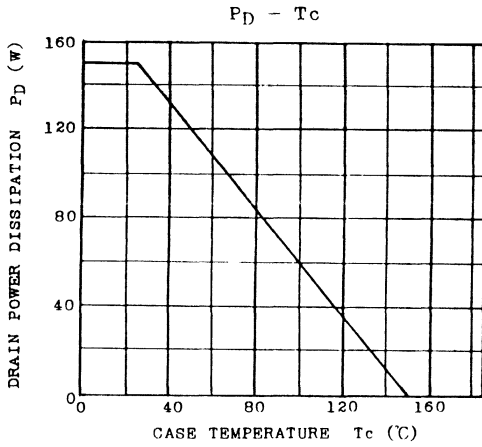
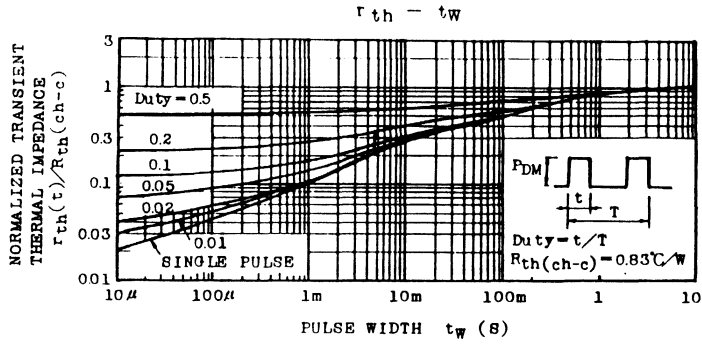
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		IGSS	VGS=±20V, VDS=0V	-	-	±100	nA
Drain Cut-off Current		IDSS	VDS=450V, VGS=0V	-	-	300	µA
Drain-Source Breakdown Voltage		V(BR)DSS	ID=10mA, VGS=0V	450	-	-	V
Gate Threshold Voltage		Vth	VDS=10V, ID=1mA	2.0	-	4.0	V
Forward Transfer Admittance		Yfs	VDS=10V, ID=7A	6.0	8.0	-	S
Drain-Source ON Resistance		RDS(ON)	ID=7A, VGS=10V	-	0.29	0.40	Ω
Input Capacitance		Ciss	VDS=10V, VGS=0V, f=1MHz	-	2300	3600	pF
Reverse Transfer Capacitance		Crss		-	570	680	
Output Capacitance		Coss		-	1000	1400	
Switching Time	Rise Time	tr		-	70	140	ns
	Turn-on Time	ton		-	100	200	
	Fall Time	tf		-	75	150	
	Turn-off Time	toff		-	350	700	
Total Gate charge (Gate-Source Plus Gate-Drain)		Qg	ID=15A, VGS=10V VDD≧400V	-	87	110	nC
Gate-Source Charge		Qgs		-	35	-	
Gate-Drain ("Miller") Charge		Qgd		-	52	-	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	IDR	--	-	-	15	A
Rulse Drain Reverse Current	IDRP	--	-	-	60	A
Diode Foward Voltage	VDSF	IDR=15A, VGS=0V	-	-	2.0	V
Reverse Recovery Time	trr	IDR=15A	-	400	-	ns
Reverse Recovered Charge	Qrr	dIDR/dt=100A/µs	-	4.0	-	µC







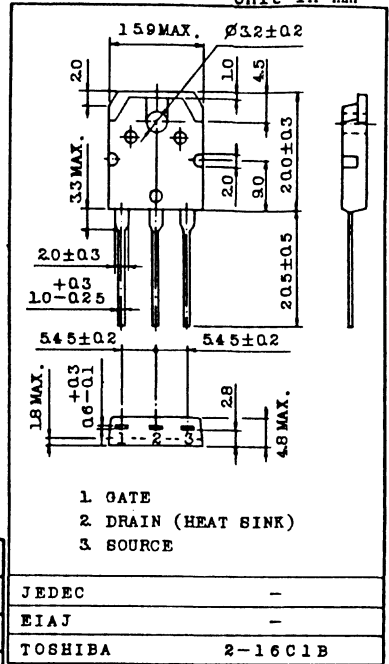
INDUSTRIAL APPLICATIONS

Unit in mm

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.29\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=8.0S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu A$  (Max.) @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=10V, I_D=1mA$



MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )	$V_{DGR}$	500	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	15
	Pulse	$I_{DP}$	60
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

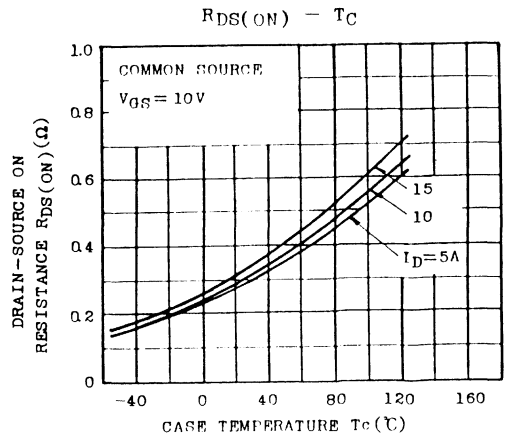
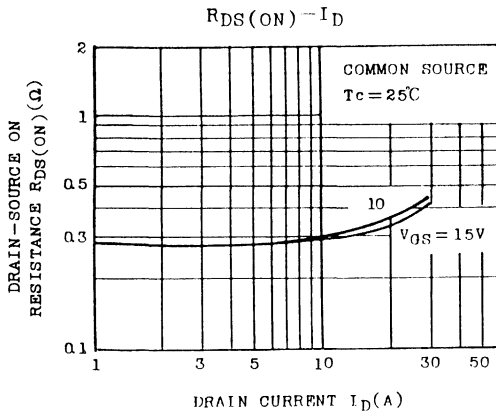
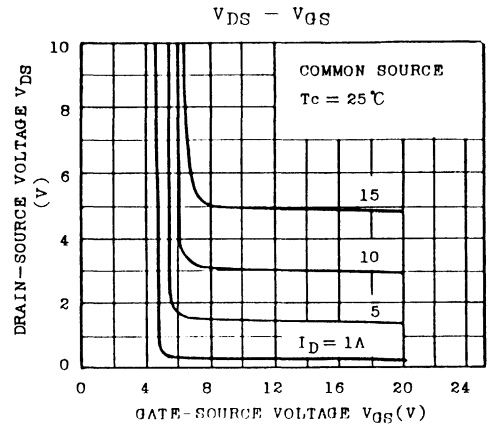
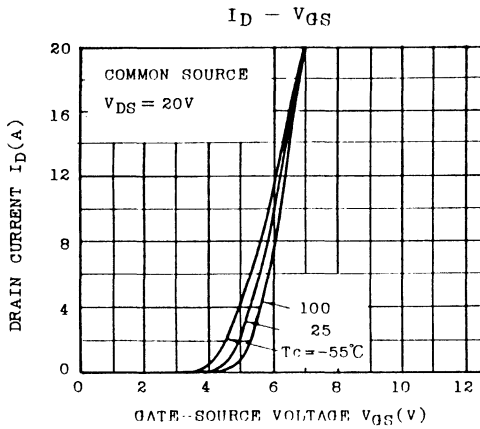
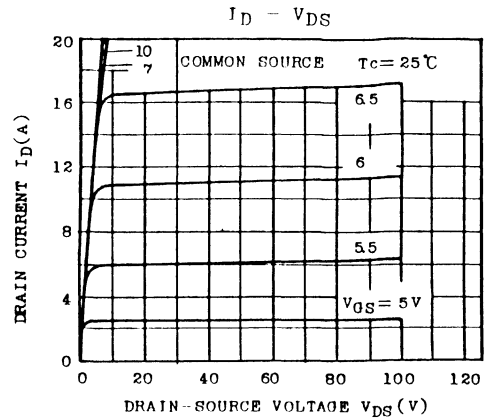
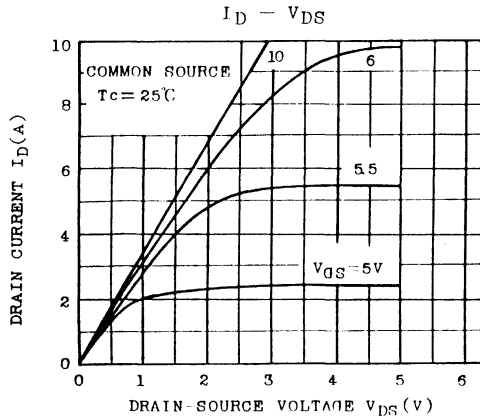


ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		IGSS	VGS=±20V, VDS=0V	-	-	±100	nA
Drain Cut-off Current		IDSS	VDS=500V, VGS=0V	-	-	300	µA
Drain-Source Breakdown Voltage		V(BR)DSS	ID=10mA, VGS=0V	500	-	-	V
Gate Threshold Voltage		Vth	VDS=10V, ID=1mA	2.0	-	4.0	V
Forward Transfer Admittance		Yfs	VDS=10V, ID=7A	6.0	8.0	-	S
Drain-Source ON Resistance		RDS(ON)	ID=7A, VGS=10V	-	0.29	0.40	Ω
Input Capacitance		Ciss	VDS=10V, VGS=0V, f=1MHz	-	2300	3600	pF
Reverse Transfer Capacitance		Crss		-	570	680	
Output Capacitance		Coss		-	1000	1400	
Switching Time	Rise Time	tr		-	70	140	ns
	Turn-on Time	ton		-	100	200	
	Fall Time	tf		-	75	150	
	Turn-off Time	toff		-	350	700	
Total Gate charge (Gate-Source Plus Gate-Drain)		Qg	ID=15A, VGS=10V VDD=400V	-	87	110	nC
Gate-Source Charge		Qgs		-	35	-	
Gate-Drain ("Miller") Charge		Qgd		-	52	-	

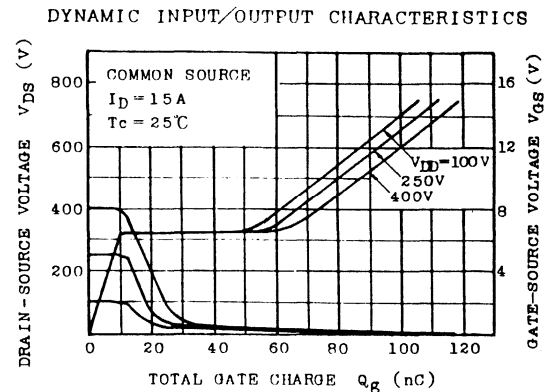
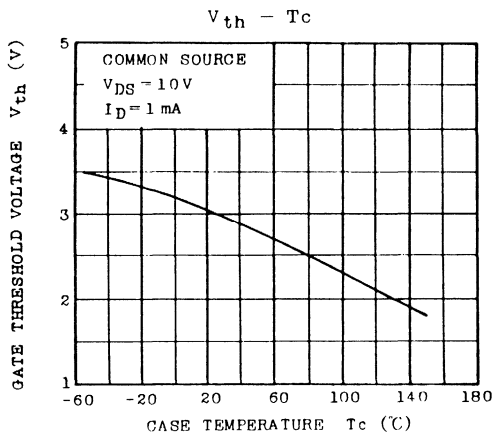
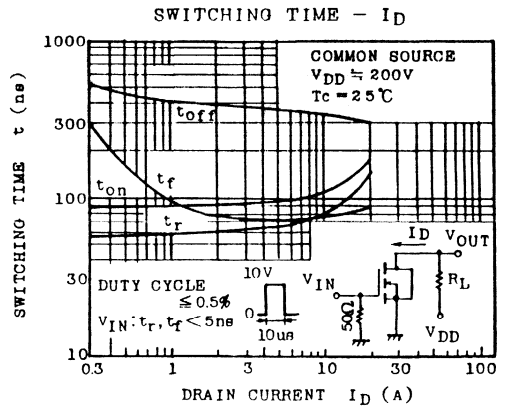
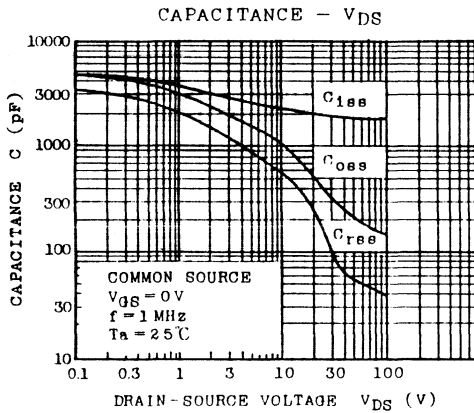
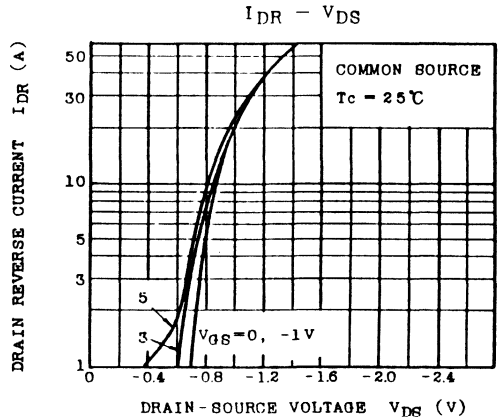
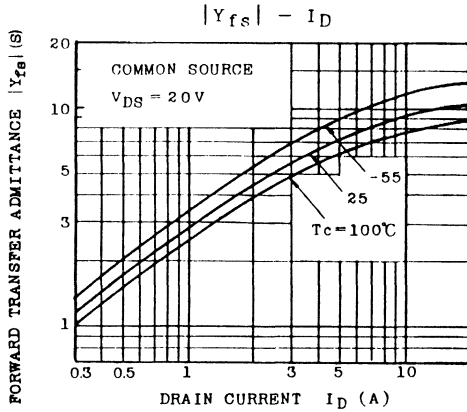
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	IDR	--	-	-	15	A
Rulse Drain Reverse Current	IDRP	--	-	-	60	A
Diode Foward Voltage	VDSF	IDR=15A, VGS=0V	-	-	2.0	V
Reverse Recovery Time	trr	IDR=15A	-	400	-	ns
Reverse Recovered Charge	Qrr	dIDR/dt=100A/us	-	4.0	-	µC



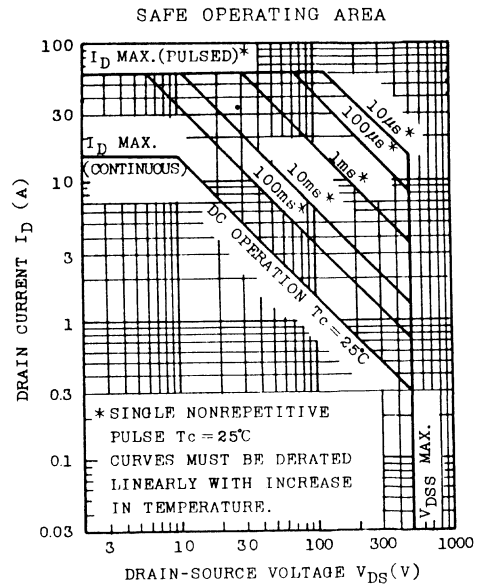
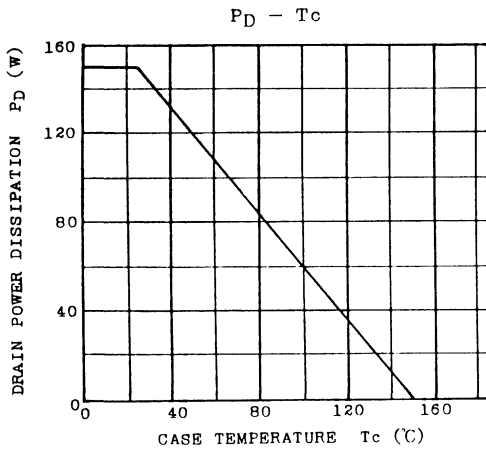
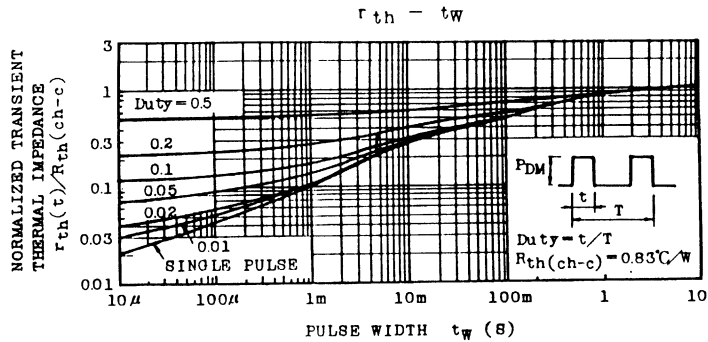
# TOSHIBA SEMICONDUCTOR TECHNICAL DATA

2SK790



EGA-2SK790-4

TOSHIBA CORPORATION





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
 2SK791  
 SILICON N CHANNEL MOS TYPE  
 (π-MOS)

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
 SWITCHING REGULATOR AND MOTOR DRIVE APPLICATIONS.

### FEATURES:

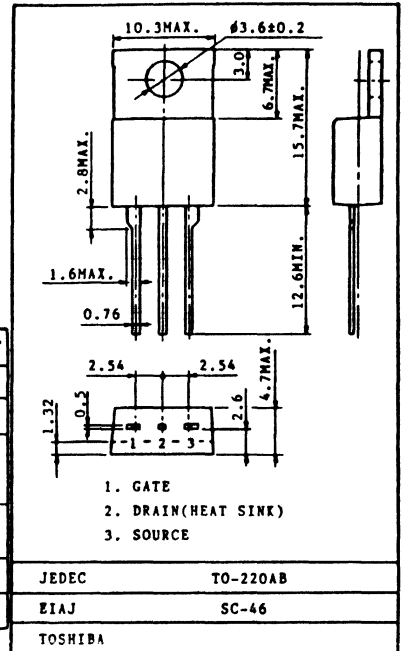
- High Breakdown Voltage :  $V_{(BR)DSS}=850V$
- High Forward Transfer Admittance :  $|Y_{fs}|=1.0S(Typ.)$
- Low Leakage Current :  $I_{GSS}=\pm 100nA(Max.) @V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu A(Max.) @V_{DS}=850V$
- Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V @I_D=1mA$

### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	850	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	3
	Pulse	$I_{DP}$	5
Drain Power Dissipation (Tc=25°C)	$P_D$	100	W
Channel Temperature	$T_{ch}$	150	°C
Storage Temperature Range	$T_{stg}$	-55 ~ 150	°C

### INDUSTRIAL APPLICATIONS

Unit in mm



### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=850V, V_{GS}=0$	-	-	300	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	850	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=1.5A$	0.5	1.0	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=1.5A, V_{GS}=10V$	-	3.3	4.5	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=3A, V_{GS}=10V$	-	12	15	V	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	800	1100	pF	
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	70	120	pF	
Output Capacitance	$C_{oss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	120	200	pF	
Switching Time	Rise Time	$t_r$		-	55	120	ns
	Turn-on Time	$t_{on}$		-	70	165	
	Fall Time	$t_f$		-	60	120	
	Turn-off Time	$t_{off}$		-	280	550	

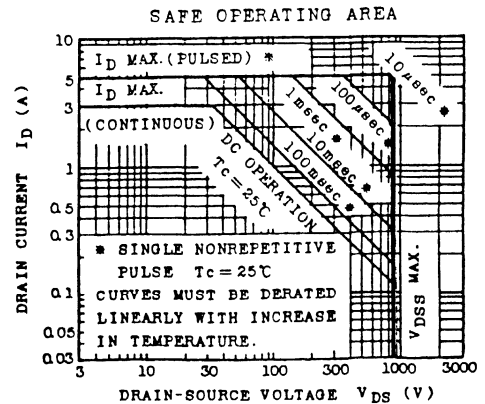
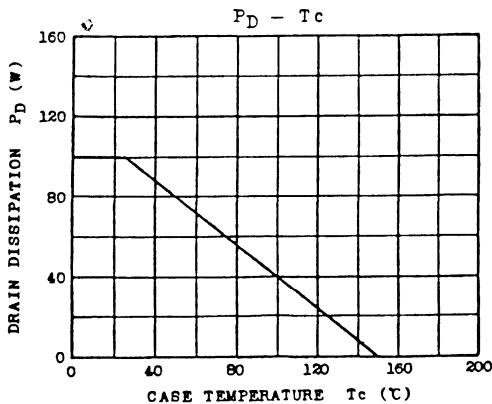
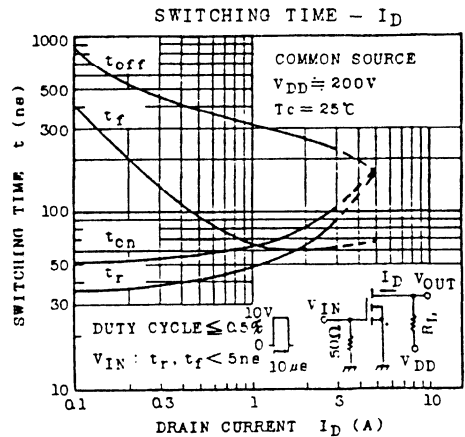
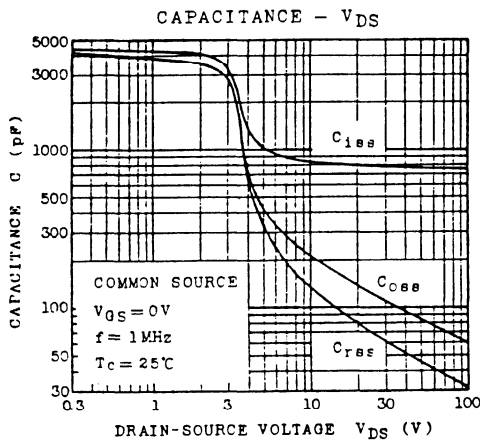
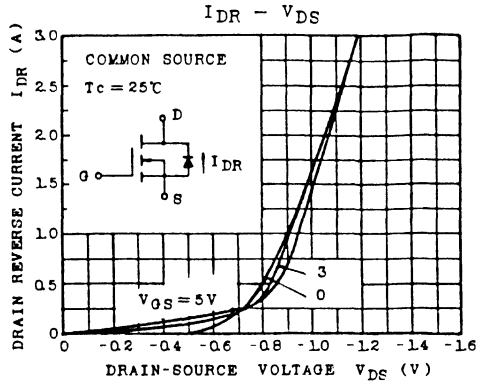
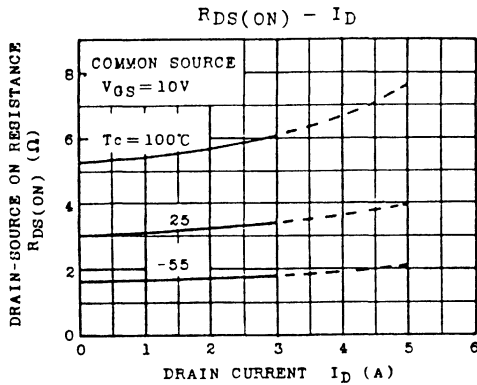
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK791



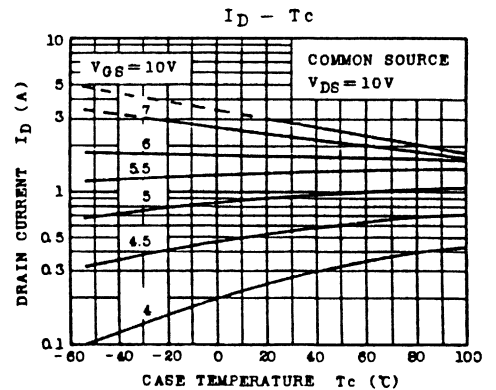
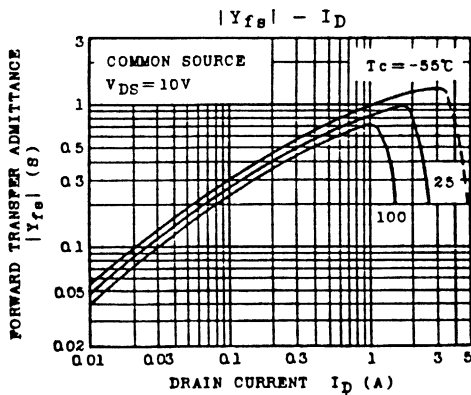
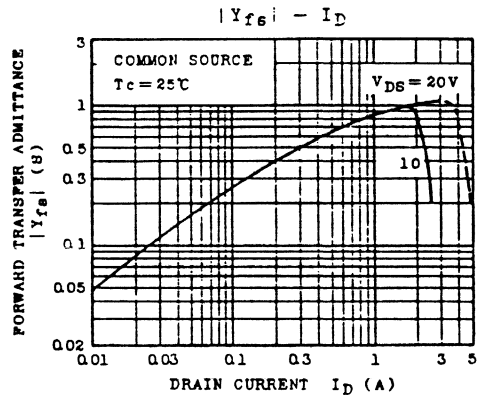
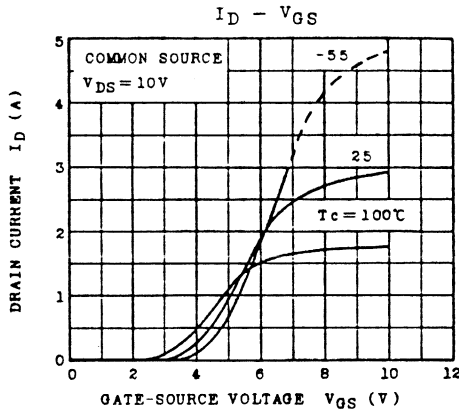
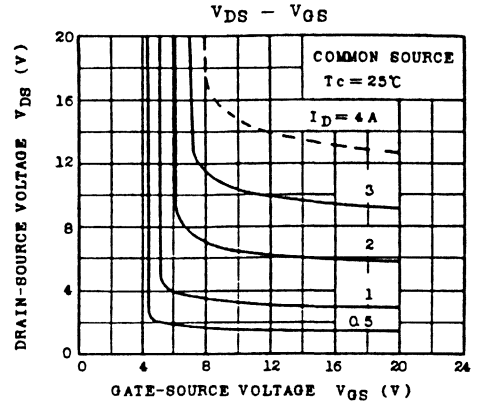
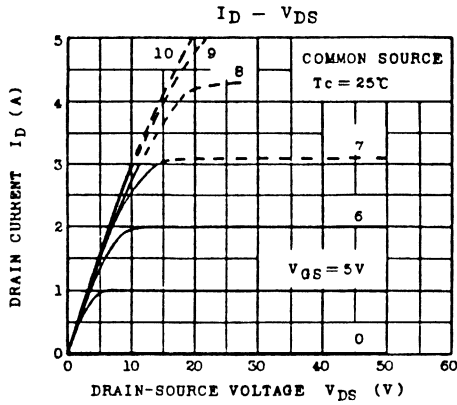
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK791



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2SK792

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS)

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
SWITCHING REGULATOR AND MOTOR DRIVE APPLICATIONS.

**FEATURES:**

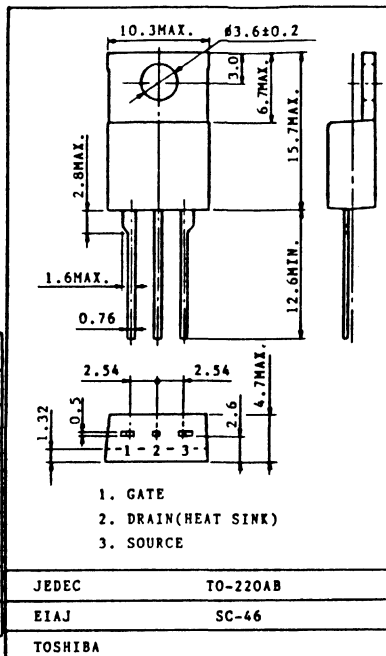
- . High Breakdown Voltage :  $V_{(BR)DSS}=900V$
- . High Forward Transfer Admittance :  $|Y_{fs}|=1.0S(Typ.)$
- . Low Leakage Current :  $I_{GSS}=\pm 100nA(Max.)$  @ $V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu A(Max.)$  @ $V_{DS}=900V$
- . Enhancement-Mode :  $V_{th}=1.5 \sim 3.5V$  @ $I_D=1mA$

**MAXIMUM RATINGS (Ta=25°C)**

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	900	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	3	A
	Pulse	$I_{DP}$	5	
Drain Power Dissipation (Tc=25°C)		$P_D$	100	W
Channel Temperature		$T_{ch}$	150	°C
Storage Temperature Range		$T_{stg}$	-55 ~ 150	°C

**INDUSTRIAL APPLICATIONS**

Unit in mm



**ELECTRICAL CHARACTERISTICS (Ta=25°C)**

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=900V, V_{GS}=0$	-	-	300	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	900	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=1.5A$	0.5	1.0	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=1.5A, V_{GS}=10V$	-	3.3	4.5	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=3A, V_{GS}=10V$	-	12	15	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	800	1100	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	70	120	pF
Output Capacitance		$C_{oss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	120	200	pF
Switching Time	Rise Time	$t_r$		-	55	120	ns
	Turn-on Time	$t_{on}$		-	70	165	
	Fall Time	$t_f$		-	60	120	
	Turn-off Time	$t_{off}$		-	280	550	

TOSHIBA CORPORATION

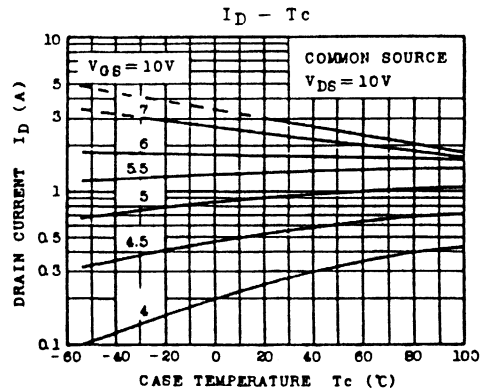
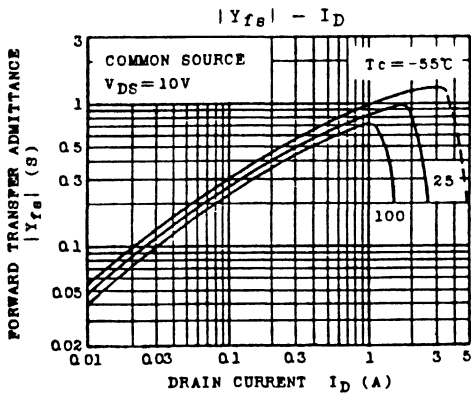
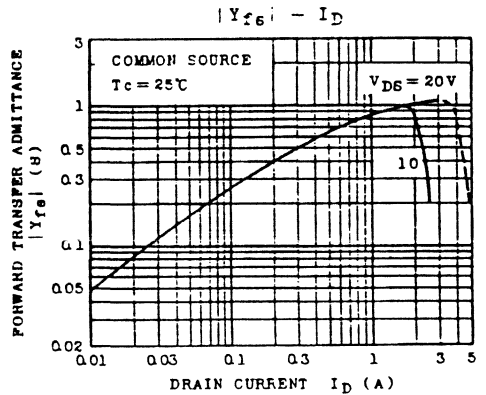
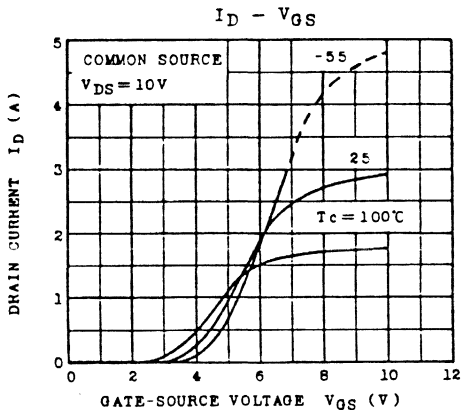
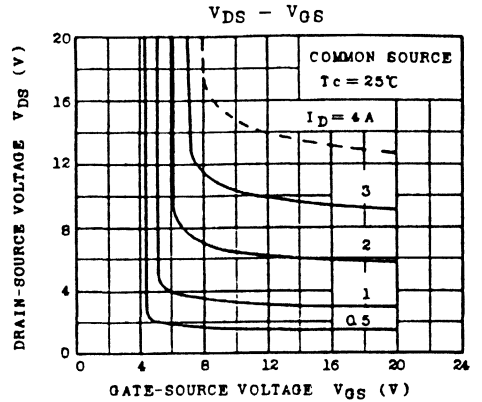
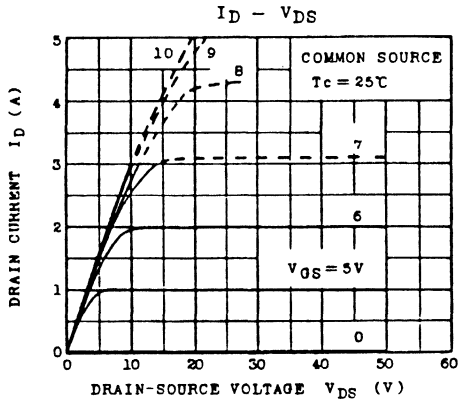




# SEMICONDUCTOR

## TECHNICAL DATA

2SK792



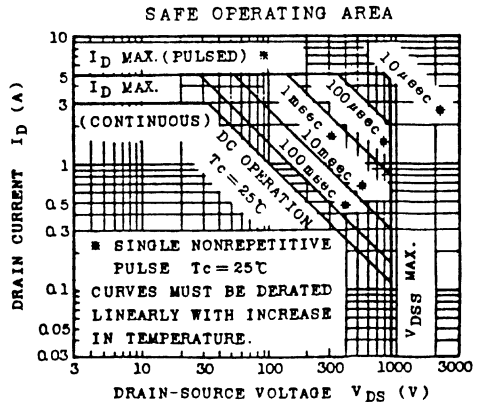
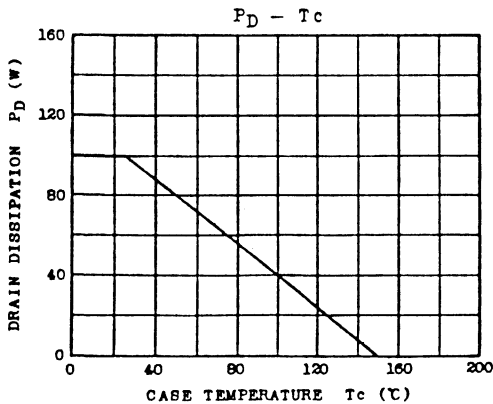
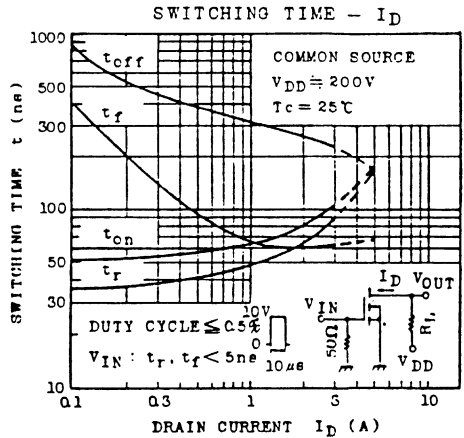
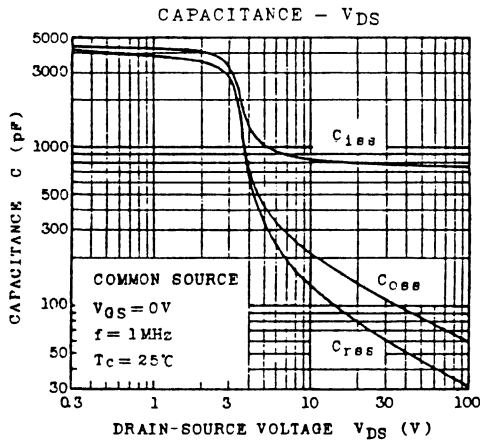
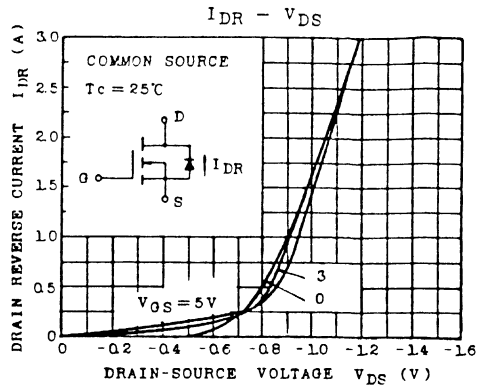
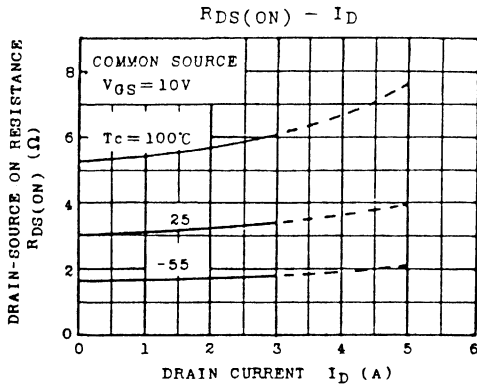
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK792



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

2SK793

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS)

INDUSTRIAL APPLICATIONS

Unit in mm

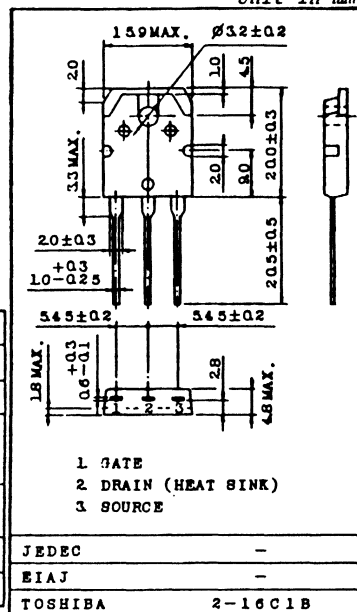
HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
SWITCHING REGULATOR AND MOTOR DRIVE APPLICATIONS.

FEATURES:

- High Breakdown Voltage :  $V_{(BR)DSS} = 850V$
- High Forward Transfer Admittance :  $|Y_{fs}| = 1.7S(Typ.)$
- Low Leakage Current :  $I_{GSS} = \pm 100nA(Max.)$  ( $V_{GS} = \pm 20V$ )  
 $I_{DSS} = 300\mu A(Max.)$  ( $V_{DS} = 850V$ )
- Enhancement-Mode :  $V_{th} = 1.5 \sim 3.5V$  ( $I_D = 1mA$ )

MAXIMUM RATINGS ( $T_a = 25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	850	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	5
	Pulse	$I_{DP}$	10
Drain Power Dissipation ( $T_c = 25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55 \sim 150$	$^\circ C$



Weight : 4.6g

ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ C$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS} = 850V, V_{GS} = 0$	-	-	300	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = 10mA, V_{GS} = 0$	850	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS} = 10V, I_D = 1mA$	1.5	-	3.5	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS} = 10V, I_D = 3A$	1.0	1.7	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D = 3A, V_{GS} = 10V$	-	2.1	2.5	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D = 5A, V_{GS} = 10V$	-	11	13	V	
Input Capacitance	$C_{iss}$	$V_{DS} = 25V, V_{GS} = 0, f = 1MHz$	-	1400	1900	pF	
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS} = 25V, V_{GS} = 0, f = 1MHz$	-	110	200	pF	
Output Capacitance	$C_{oss}$	$V_{DS} = 25V, V_{GS} = 0, f = 1MHz$	-	190	300	pF	
Switching Time	Rise Time	$t_r$		-	110	220	ns
	Turn-on Time	$t_{on}$		-	130	260	
	Fall Time	$t_f$		-	90	260	
	Turn-off Time	$t_{off}$		-	480	900	

$V_{IN}: t_r, t_f < 5ns$   
 $D, U \leq 1\%$  ( $Z_{OUT} = 50\Omega$ )

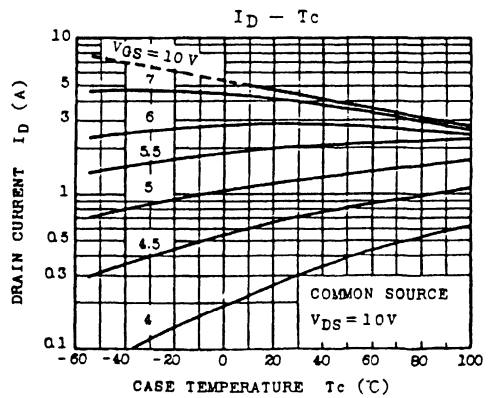
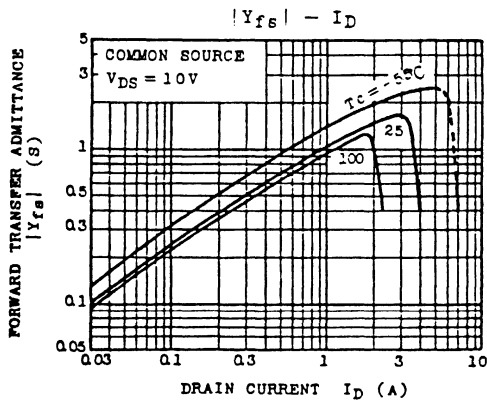
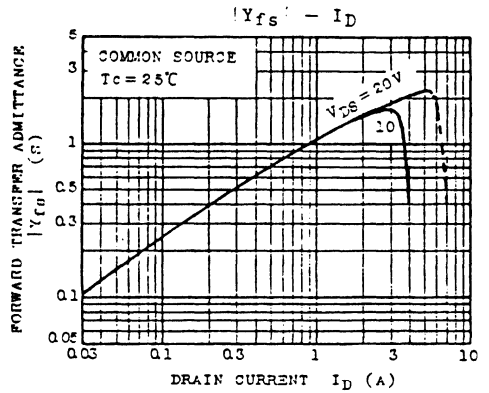
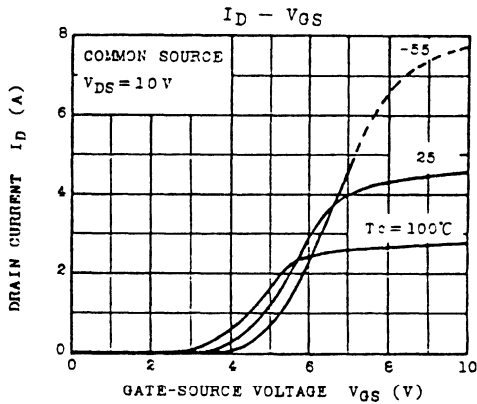
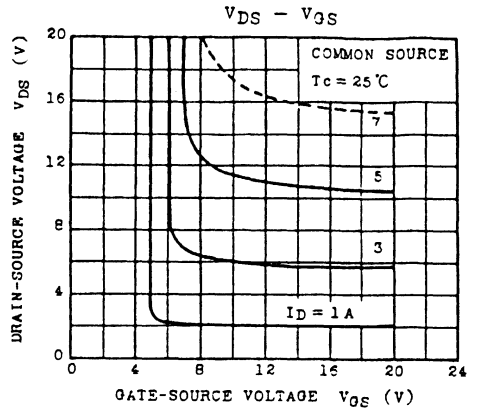
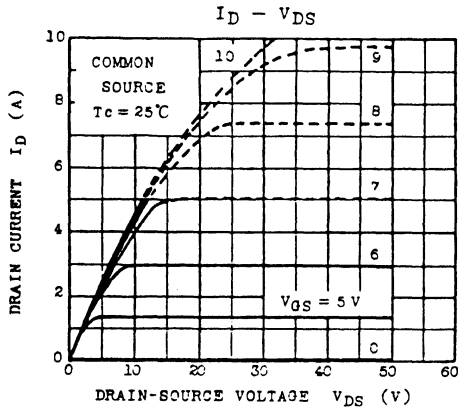
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

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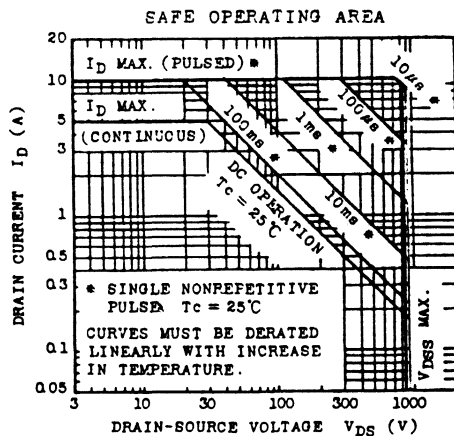
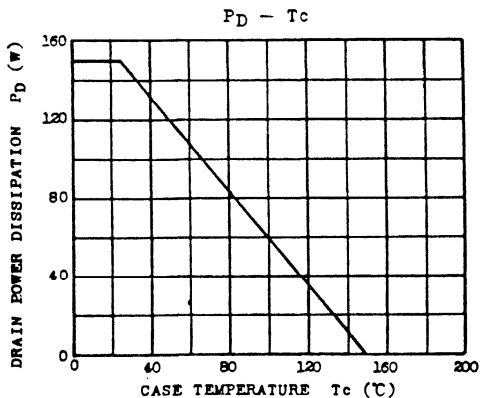
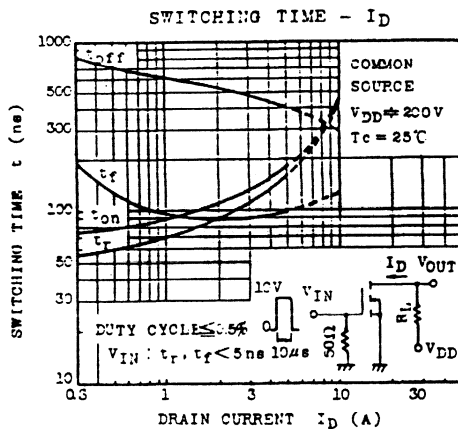
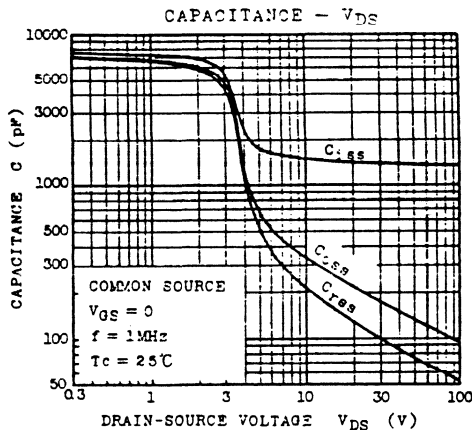
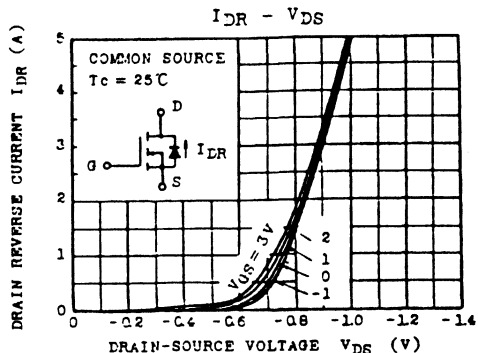
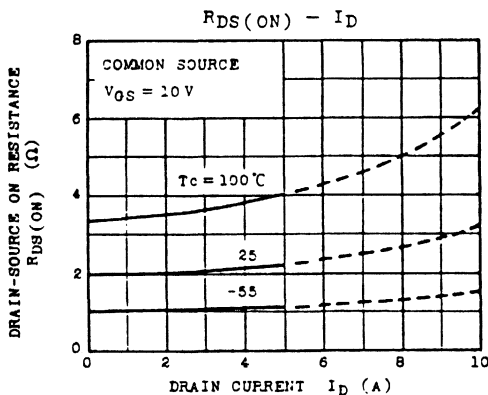
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

2SK793



HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS.  
SWITCHING REGULATOR AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

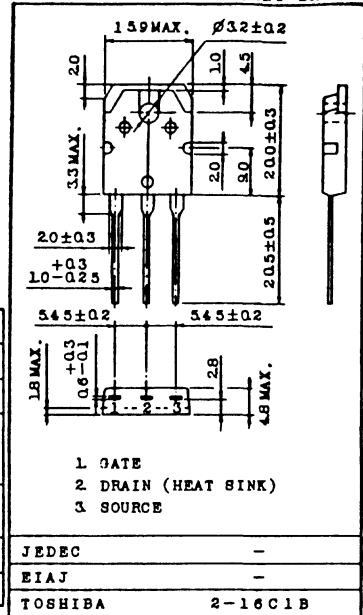
- High Breakdown Voltage :  $V_{(BR)DSS}=900V$
- High Forward Transfer Admittance :  $|Y_{fs}|=1.7S(Typ.)$
- Low Leakage Current :  $I_{GSS}=\pm 100nA(Max.)$  ( $V_{GS}=\pm 20V$ )  
 $I_{DSS}=300\mu A(Max.)$  ( $V_{DS}=900V$ )
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  ( $I_D=1mA$ )

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	900	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	5
	Pulse	$I_{DP}$	10
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ C$ )

Weight : 4.6g

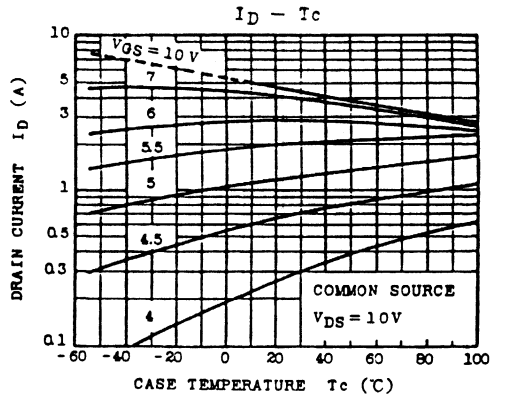
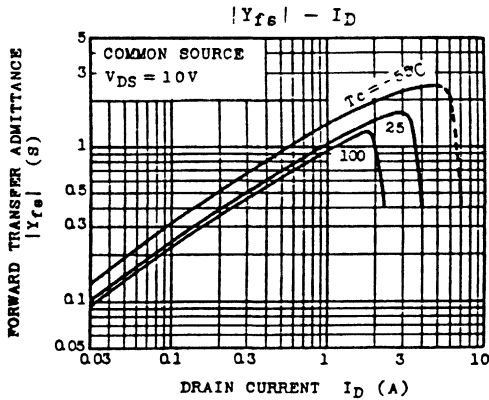
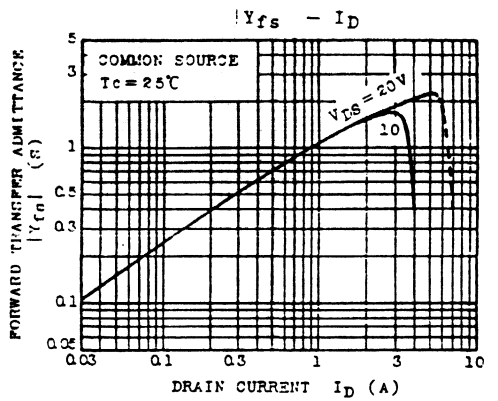
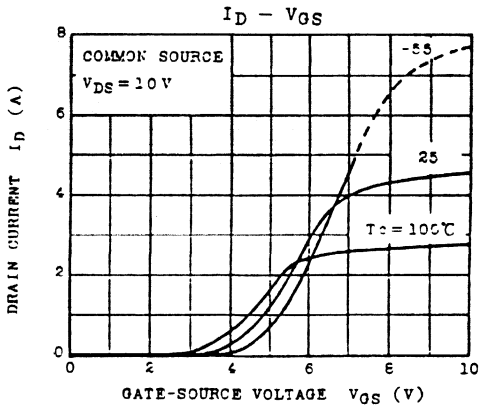
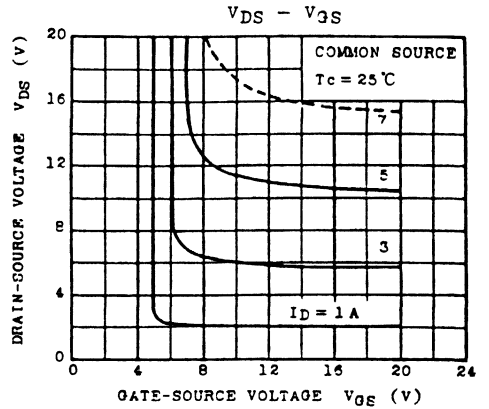
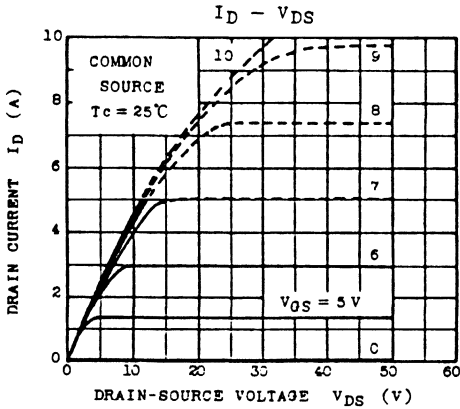
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=900V, V_{GS}=0$	-	-	300	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	900	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=3A$	1.0	1.7	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=3A, V_{GS}=10V$	-	2.1	2.5	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	11	13	V	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	1400	1900	pF	
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	110	200	pF	
Output Capacitance	$C_{oss}$	$V_{DS}=25V, V_{GS}=0, f=1MHz$	-	190	300	pF	
Switching Time	Rise Time	$t_r$		-	110	220	ns
	Turn-on Time	$t_{on}$		-	130	260	
	Fall Time	$t_f$		-	90	260	
	Turn-off Time	$t_{off}$		-	480	900	

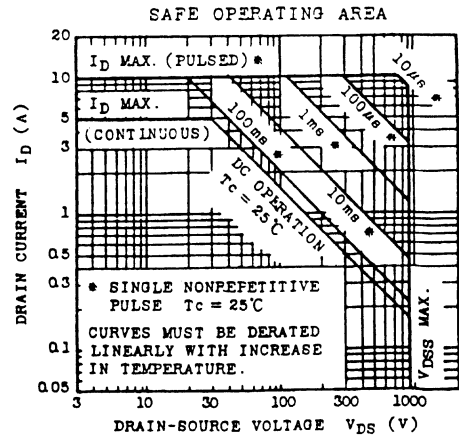
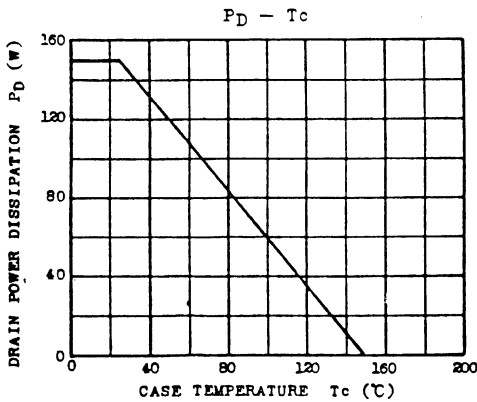
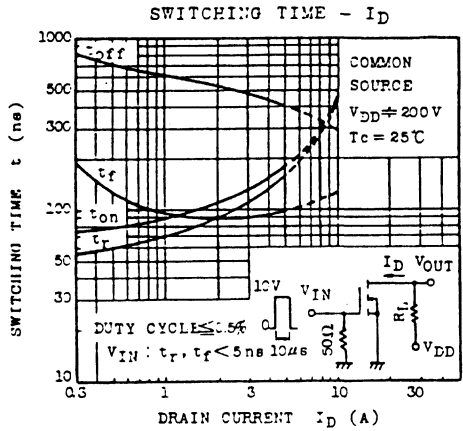
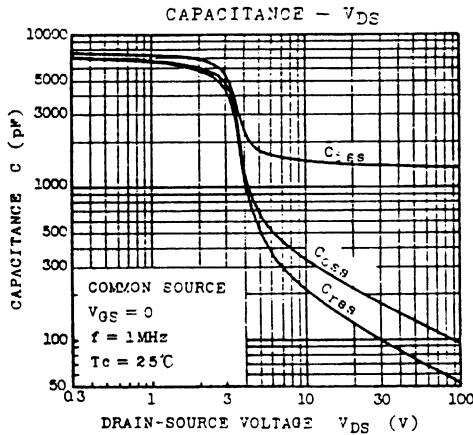
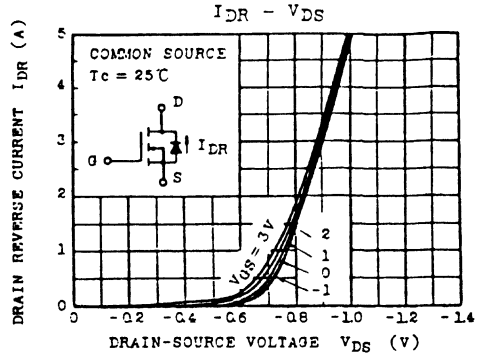
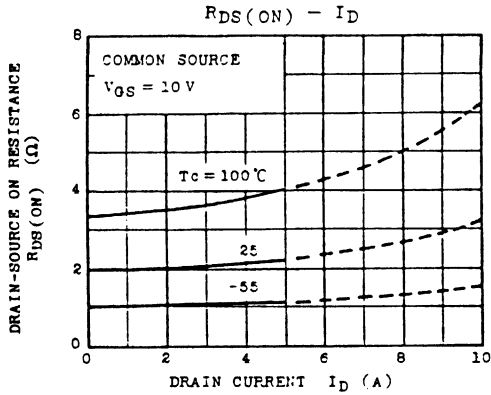


# SEMICONDUCTOR

## TECHNICAL DATA

2SK794









# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF150 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

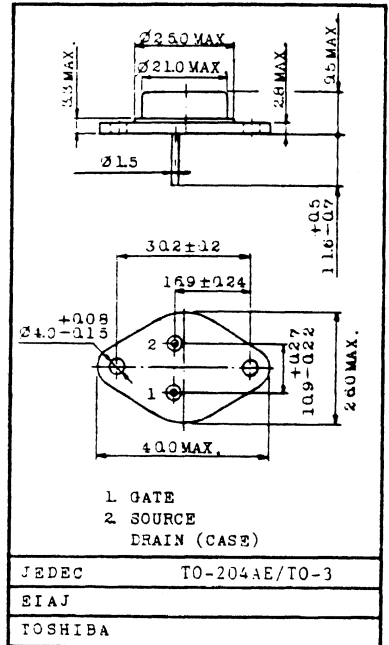
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.045\Omega$ (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=100V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	100	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	100	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	40
	DC( $T_c=100^\circ C$ )	$I_D$	25
	Pulse	$I_{DP}$	160
Inductive Current (Clamped)	$I_{LP}$	160	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	100	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=20A$	9	11	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	40	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=20A, V_{GS}=10V$	-	0.045	0.055	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=40A, V_{GS}=10V$	-	2.0	3.0	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1700	3000	pF
Reverse Transfer Capacitance		$C_{rss}$		-	180	500	pF
Output Capacitance		$C_{oss}$		-	850	1500	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=20A</math>  <math>V_{IN}</math>  <math>V_{OUT}</math>  <math>V_{GS}=10V</math>  <math>V_{DS}=24V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\%</math> (<math>Z_{out}=4.7\Omega</math>)         </p>	-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	ns
	Fall Time	$t_f$		-	50	100	ns
	Turn-off Time	$t_{off}$		-	110	225	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=50A,$	-	63	120	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=80V$	-	27	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	36	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	40	A
Pulse Source Current	$I_{SP}$	—	-	-	160	A
Diode Forward Voltage	$V_{SD}$	$I_S=40A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.5	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=40A,$	-	600	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.3	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

YTF151

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

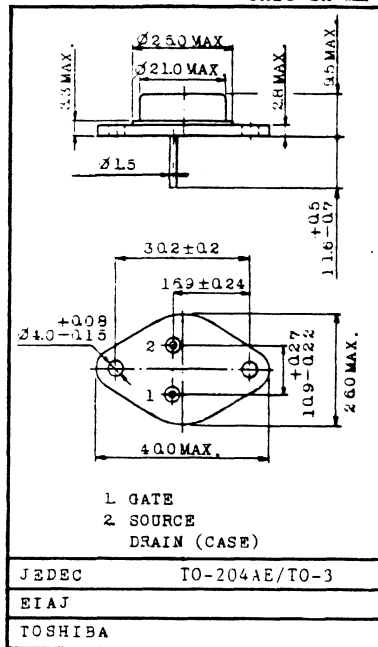
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.045\Omega$ (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	60	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	60	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	40
	DC( $T_c=100^\circ C$ )	$I_D$	25
	Pulse	$I_{DP}$	160
Inductive Current (Clamped)	$I_{LP}$	160	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	60	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=20A$	9	11	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	40	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=20A, V_{GS}=10V$	-	0.045	0.055	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=40A, V_{GS}=10V$	-	2.0	3.0	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1700	3000	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	180	500	pF
Output Capacitance		$C_{oss}$		-	850	1500	pF
Switching Time	Rise Time	$t_r$		-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	ns
	Fall Time	$t_f$		-	50	100	ns
	Turn-off Time	$t_{off}$		-	110	225	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=50A,$	-	63	120	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=48V$	-	27	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	36	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	40	A
Pulse Source Current	$I_{SP}$	—	-	-	160	A
Diode Forward Voltage	$V_{SD}$	$I_S=40A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.5	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=40A,$	-	600	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.3	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR Y T F 1 5 2 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

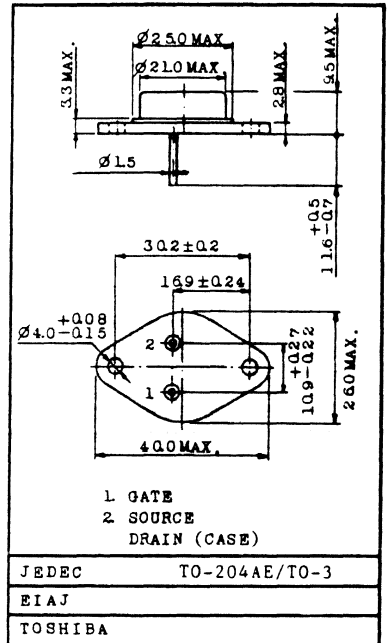
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.06\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA(\text{Max.})$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A(\text{Max.})$  @  $V_{DS}=100V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	100	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	100	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	33
	DC ( $T_c=100^\circ C$ )	$I_D$	20
	Pulse	$I_{DP}$	132
Inductive Current (Clamped)	$I_{LP}$	132	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

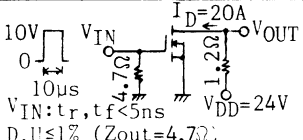
#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	100	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=20A$	9	11	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	33	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=20A, V_{GS}=10V$	-	0.06	0.08	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=33A, V_{GS}=10V$	-	2.2	3.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1700	3000	pF
Reverse Transfer Capacitance		$C_{rss}$		-	180	500	pF
Output Capacitance		$C_{oss}$		-	850	1500	pF
Switching Time	Rise Time	$t_r$		-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	ns
	Fall Time	$t_f$		-	50	100	ns
	Turn-off Time	$t_{off}$		-	110	225	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=50A,$	-	63	120	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=80V$	-	27	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	36	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	33	A
Pulse Source Current	$I_{SP}$	—	-	-	132	A
Diode Forward Voltage	$V_{SD}$	$I_S=33A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.3	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=40A,$	-	600	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.3	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF153 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

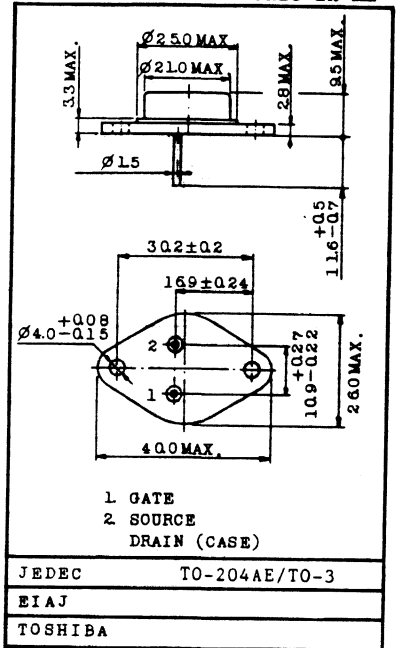
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.06\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	60	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	33	A
	DC( $T_c=100^\circ C$ )	$I_D$	20	
	Pulse	$I_{DP}$	132	
Inductive Current (Clamped)		$I_{LP}$	132	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	60	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=20A$	9	11	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	33	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=20A, V_{GS}=10V$	-	0.06	0.08	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=33A, V_{GS}=10V$	-	2.2	3.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1700	3000	pF
Reverse Transfer Capacitance		$C_{rss}$		-	180	500	pF
Output Capacitance		$C_{oss}$		-	850	1500	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=20A</math>  <math>V_{IN}</math>  <math>V_{OUT}</math>  <math>V_{DD}=24V</math>  <math>D.U.\leq 1\%</math> (<math>Z_{out}=4.7\Omega</math>)         </p>	-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	ns
	Fall Time	$t_f$		-	50	100	ns
	Turn-off Time	$t_{off}$		-	110	225	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=50A,$	-	63	120	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=48V$	-	27	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	36	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	33	A
Pulse Source Current	$I_{SP}$	—	-	-	132	A
Diode Forward Voltage	$V_{SD}$	$I_S=33A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.3	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=40A,$	-	600	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.3	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF220 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

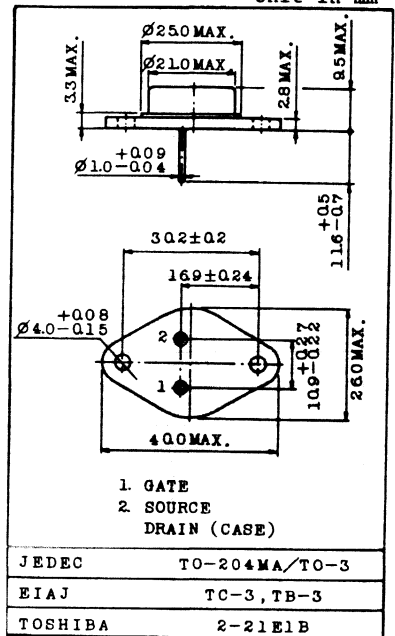
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.5\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=2.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA(\text{Max.})$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A(\text{Max.})$  @  $V_{DS}=200V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	200	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	5
	DC( $T_c=100^\circ C$ )	$I_D$	3
	Pulse	$I_{DP}$	20
Inductive Current (Clamped)	$I_{LP}$	20	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	40	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=2.5A$	1.3	2.5	-	S	
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	5	-	-	A	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	0.5	0.8	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	2.7	4.1	V	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	460	600	pF	
Reverse Transfer Capacitance	$C_{rss}$		-	50	80	pF	
Output Capacitance	$C_{oss}$		-	230	300	pF	
Switching Time	Rise Time	$t_r$	<p><math>I_D=2.5A</math> <math>V_{DD}=100V</math> <math>V_{IN}: t_r, t_f &lt; 5ns</math> <math>D.U \leq 1\% (Z_{out}=50\Omega)</math></p>	-	30	60	ns
	Turn-on Time	$t_{on}$		-	50	100	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	80	160	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{GS}=10V, I_D=6A,$	-	11	15	nC	
Gate Source Charge	$Q_{gs}$	$V_{DS}=160V$	-	5	-	nC	
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	6	-	nC	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	5	A
Pulse Source Current	$I_{SP}$	—	-	-	20	A
Diode Forward Voltage	$V_{SD}$	$I_S=5A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=5A,$	-	350	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.3	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF221 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

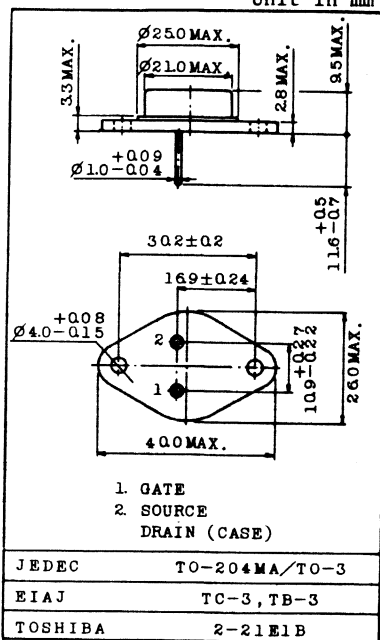
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.5\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=2.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	150	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	5
	DC ( $T_c=100^\circ C$ )	$I_D$	3
	Pulse	$I_{DP}$	20
Inductive Current (Clamped)	$I_{LP}$	20	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	40	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Load Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=2.5A$	1.3	2.5	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	5	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	0.5	0.8	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	2.7	4.1	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	460	600	pF
Reverse Transfer Capacitance		$C_{rss}$		-	50	80	pF
Output Capacitance		$C_{oss}$		-	230	300	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=2.5A</math>  <math>V_{IN}</math>  <math>10V</math>  <math>10\mu s</math>  <math>30\Omega</math>  <math>30\Omega</math>  <math>30\Omega</math>  <math>V_{OUT}</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>V_{DS}=75V</math>  <math>D.U \le 1\%</math> (<math>Z_{out}=50\Omega</math>)         </p>	-	30	60	ns
	Turn-on Time	$t_{on}$		-	50	100	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	80	160	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=6A,$	-	11	15	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=120V$	-	5	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	6	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	5	A
Pulse Source Current	$I_{SP}$	—	-	-	20	A
Diode Forward Voltage	$V_{SD}$	$I_S=5A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=5A,$	-	350	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.3	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF222 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

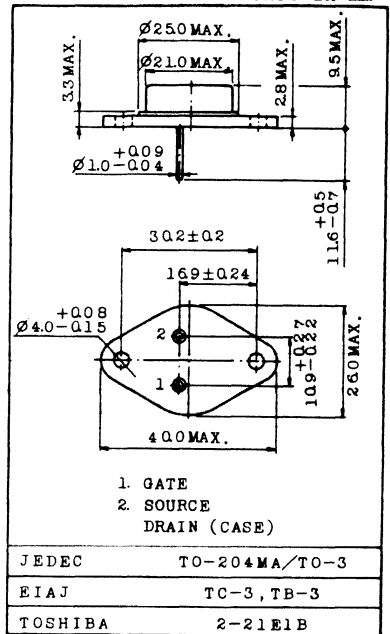
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.8\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=2.5S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	200	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	4	A
	DC( $T_c=100^\circ C$ )	$I_D$	2.5	
	Pulse	$I_{DP}$	16	
Inductive Current (Clamped)		$I_{LP}$	16	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

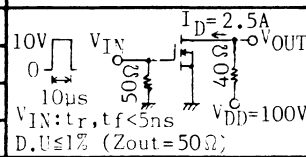
CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=2.5A$	1.3	2.5	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	4	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	0.8	1.2	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	3.5	5.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	460	600	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	50	80	pF
Output Capacitance		$C_{oss}$		-	230	300	pF
Switching Time	Rise Time	$t_r$		-	30	60	ns
	Turn-on Time	$t_{on}$		-	50	100	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	80	160	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=6A,$	-	11	15	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=160V$	-	5	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	6	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	4	A
Pulse Source Current	$I_{SP}$	—	-	-	16	A
Diode Forward Voltage	$V_{SD}$	$I_S=4A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=5A,$	-	350	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.3	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF223 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

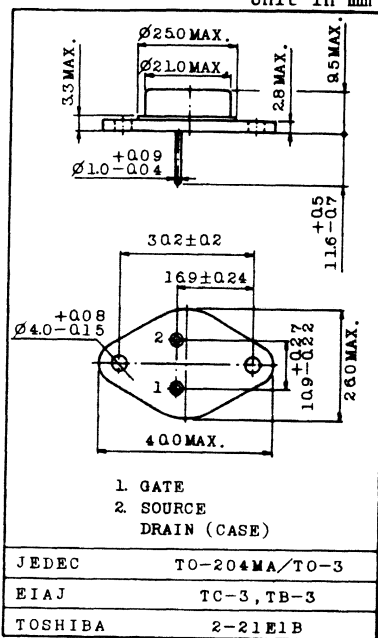
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.8\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=2.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	150	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	4
	DC( $T_c=100^\circ C$ )	$I_D$	2.5
	Pulse	$I_{DP}$	16
Inductive Current (Clamped)	$I_{LP}$	16	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	40	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=2.5A$	1.3	2.5	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	4	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	0.8	1.2	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	3.5	5.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	460	600	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	50	80	pF
Output Capacitance		$C_{oss}$		-	230	300	pF
Switching Time	Rise Time	$t_r$	<p> <math>10V</math> <math>V_{IN}</math> <math>I_D=2.5A</math> <math>V_{OUT}</math>  <math>10\mu s</math> <math>50\Omega</math> <math>30\Omega</math> <math>V_{DD}=75V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math> <math>D.U \leq 1\%</math> (<math>Z_{out}=50\Omega</math>)         </p>	-	30	60	ns
	Turn-on Time	$t_{on}$		-	50	100	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	80	160	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=6A,$	-	11	15	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=120V$	-	5	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	6	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	4	A
Pulse Source Current	$I_{SP}$	—	-	-	16	A
Diode Forward Voltage	$V_{SD}$	$I_S=4A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_P=5A,$	-	350	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_P/dt=100A/\mu s$	-	2.3	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF230 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

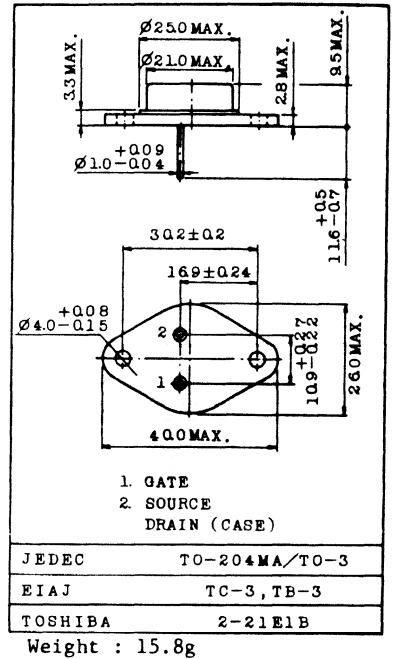
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.25\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=4.8S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	200	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	9
	DC( $T_c=100^\circ C$ )	$I_D$	6
	Pulse	$I_{DP}$	36
Inductive Current (Clamped)	$I_{LP}$	36	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	75	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	3.0	4.8	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	9	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.25	0.40	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=9A, V_{GS}=10V$	-	2.5	3.8	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	620	800	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	100	150	pF
Output Capacitance		$C_{oss}$		-	350	450	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=5A</math>  <math>V_{IN}</math>  <math>10\mu s</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>V_{DS}=90V</math>  <math>D, U \leq 1\% (Z_{out}=15\Omega)</math> </p>	-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	80	ns
	Fall Time	$t_f$		-	20	40	ns
	Turn-off Time	$t_{off}$		-	45	90	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=12A,$	-	19	30	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=160V$	-	10	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	9	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	9	A
Pulse Source Current	$I_{SP}$	—	-	-	36	A
Diode Forward Voltage	$V_{SD}$	$I_S=9A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=9A,$	-	450	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.0	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF231 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

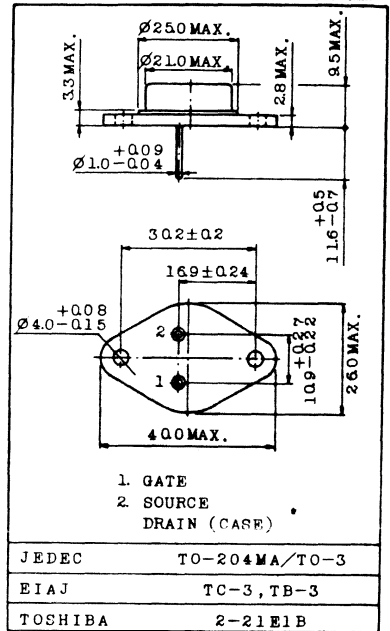
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.25\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=4.8S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$i_D$	9	A
	DC ( $T_c=100^\circ C$ )	$I_D$	6	
	Pulse	$I_{DP}$	36	
Inductive Current (Clamped)		$I_{LP}$	36	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	75	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	3.0	4.8	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	9	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.25	0.40	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=9A, V_{GS}=10V$	-	2.5	3.8	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	620	800	pF
Reverse Transfer Capacitance		$C_{rss}$		-	100	150	pF
Output Capacitance		$C_{oss}$		-	350	450	pF
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	80	ns
	Fall Time	$t_f$		-	20	40	ns
	Turn-off Time	$t_{off}$		-	45	90	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=12A.$	-	19	30	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=120V$	-	10	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	9	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	9	A
Pulse Source Current	$I_{SP}$	—	-	-	36	A
Diode Forward Voltage	$V_{SD}$	$I_S=9A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=9A,$	-	450	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.0	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR Y T F 2 3 2 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

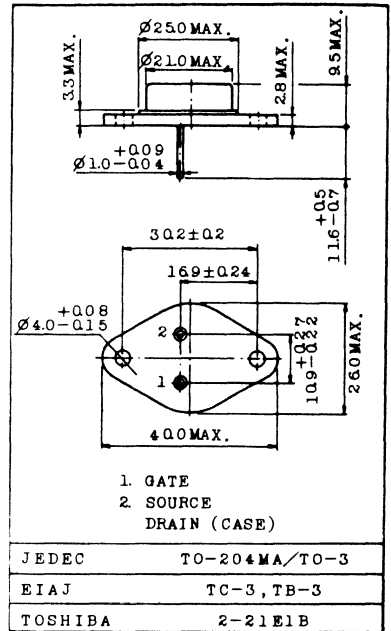
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.4\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=4.8S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA(\text{Max.})$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A(\text{Max.})$  @  $V_{DS}=200V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $I_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	200	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_{D}$	8
	DC ( $T_c=100^\circ C$ )	$I_D$	5
	Pulse	$I_{DP}$	32
Inductive Current (Clamped)	$I_{LP}$	32	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	75	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	3.0	4.8	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	8	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.4	0.6	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	3.5	5.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	620	800	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	100	150	pF
Output Capacitance		$C_{oss}$		-	350	450	pF
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	80	ns
	Fall Time	$t_f$		-	20	40	ns
	Turn-off Time	$t_{off}$		-	45	90	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=12A.$	-	19	30	nC
Gate Source Charge		$Q_{GS}$	$V_{DS}=160V$	-	10	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	9	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	8	A
Pulse Source Current	$I_{SP}$	—	-	-	32	A
Diode Forward Voltage	$V_{SD}$	$I_S=8A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=9A.$	-	450	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.0	-	$\mu C$



SEMICONDUCTOR

TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
 YTF233  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

FEATURES:

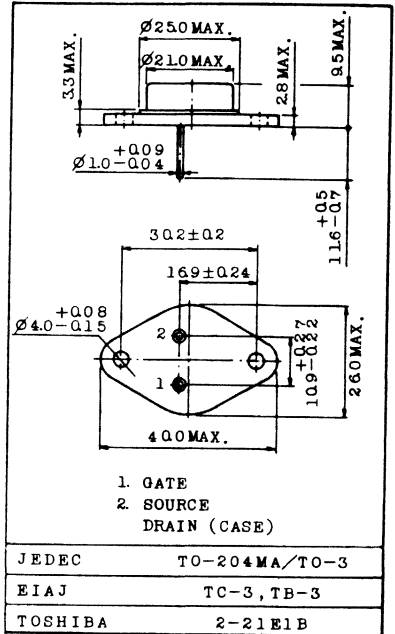
- Low Drain-Source ON resistance :  $R_{DS(ON)}=0.4\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=4.8S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	8	A
	DC( $T_c=100^\circ C$ )	$I_D$	5	
	Pulse	$I_{DP}$	32	
Inductive Current (Clamped)		$I_{LP}$	32	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	75	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	3.0	4.8	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	8	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.4	0.6	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	3.5	5.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	620	800	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	100	150	pF
Output Capacitance		$C_{oss}$		-	350	450	pF
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	80	ns
	Fall Time	$t_f$		-	20	40	ns
	Turn-off Time	$t_{off}$		-	45	90	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=12A,$	-	19	30	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=120V$	-	10	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	9	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	8	A
Pulse Source Current	$I_{SP}$	—	-	-	32	A
Diode Forward Voltage	$V_{SD}$	$I_S=8A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=9A,$	-	450	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.0	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR Y T F 2 4 0 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

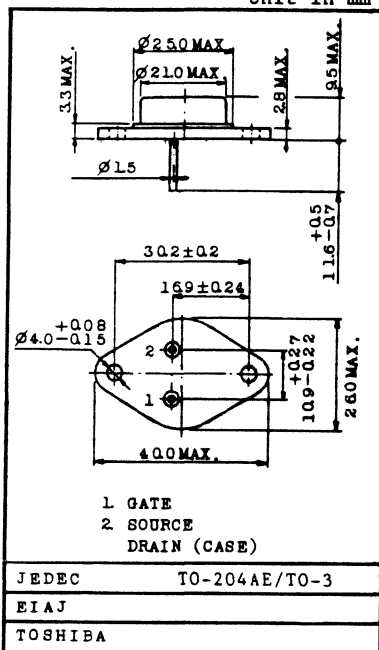
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.14\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=9.0S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	200	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	18
	DC ( $T_c=100^\circ C$ )	$I_D$	11
	Pulse	$I_{DP}$	72
Inductive Current (Clamped)	$I_{LP}$	72	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	125	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=10A$	6	9	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	18	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	0.14	0.18	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=18A, V_{GS}=10V$	-	2.8	4.2	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF
Reverse Transfer Capacitance		$C_{rss}$		-	230	300	pF
Output Capacitance		$C_{oss}$		-	580	750	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=10A</math>  <math>V_{IN}</math>  <math>10V</math>  <math>10\mu s</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\% (Z_{out}=4.7\Omega)</math>  <math>V_{DD}=75V</math>  <math>7.5\Omega</math>  <math>V_{OUT}</math> </p>	-	30	60	ns
	Turn-on Time	$t_{on}$		-	45	90	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	70	140	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=22A,$	-	43	60	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=160V$	-	16	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	27	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	18	A
Pulse Source Current	$I_{SP}$	—	-	-	72	A
Diode Forward Voltage	$V_{SD}$	$I_S=18A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=18A,$	-	650	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.1	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF241 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

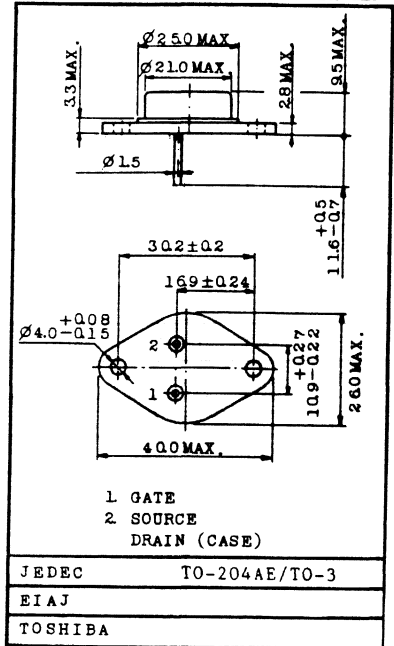
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.14\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=9.0S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	150	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	18
	DC ( $T_c=100^\circ C$ )	$I_D$	11
	Pulse	$I_{DP}$	72
Inductive Current (Clamped)	$I_{LP}$	72	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	125	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=10A$	6	9	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	18	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	0.14	0.18	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=18A, V_{GS}=10V$	-	2.8	4.2	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	230	300	pF
Output Capacitance		$C_{oss}$		-	580	750	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=10A, V_{DD}=75V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\% (Z_{out}=4.7\Omega)</math> </p>	-	30	60	ns
	Turn-on Time	$t_{on}$		-	45	90	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	70	140	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=22A,$	-	43	60	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=120V$	-	1.6	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	27	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	18	A
Pulse Source Current	$I_{SP}$	—	-	-	72	A
Diode Forward Voltage	$V_{SD}$	$I_S=18A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=18A,$	-	650	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.1	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF242 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

FEATURES:

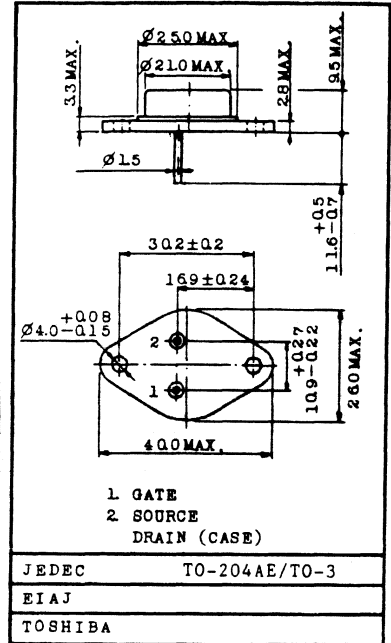
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.20\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=9.0S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	200	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	16
	DC ( $T_c=100^\circ C$ )	$I_D$	10
	Pulse	$I_{DP}$	64
Inductive Current (Clamped)	$I_{LP}$	64	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	125	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=10A$	6	9	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	16	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	0.20	0.22	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=16A, V_{GS}=10V$	-	3.5	5.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	230	300	pF
Output Capacitance		$C_{oss}$		-	580	750	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=10A</math>  <math>V_{IN}</math>  <math>0</math>  <math>10\mu s</math>  <math>4.7\Omega</math>  <math>7.5\Omega</math>  <math>V_{DD}=75V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\% (Z_{out}=4.7\Omega)</math> </p>	-	30	60	ns
	Turn-on Time	$t_{on}$		-	45	90	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	70	140	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=22A$	-	43	60	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=160V$	-	16	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	27	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	16	A
Pulse Source Current	$I_{SP}$	—	-	-	64	A
Diode Forward Voltage	$V_{SD}$	$I_S=16A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.9	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=18A$	-	650	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.1	-	$\mu C$



SEMICONDUCTOR

TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

YTF243

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

FEATURES:

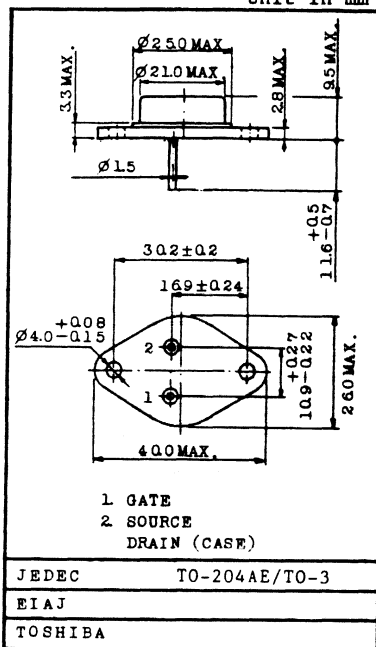
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.20\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=9.0S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	150	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	16
	DC( $T_c=100^\circ C$ )	$I_D$	10
	Pulse	$I_{DP}$	64
Inductive Current (Clamped)	$I_{LP}$	64	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	125	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

INDUSTRIAL APPLICATIONS

Unit in mm



JEDEC TO-204AE/TO-3

EIAJ

TOSHIBA

Weight : 15.8g

THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=10A$	6	9	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	16	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	0.20	0.22	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=16A, V_{GS}=10V$	-	3.5	5.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF
Reverse Transfer Capacitance		$C_{rss}$		-	230	300	pF
Output Capacitance		$C_{oss}$		-	580	750	pF
Switching Time	Rise Time	$t_r$	<p><math>I_D=10A</math>  <math>V_{IN}</math>  <math>V_{OUT}</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D.U \leq 1\% (Z_{out}=4.7\Omega)</math></p>	-	30	60	ns
	Turn-on Time	$t_{on}$		-	45	90	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	70	140	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=22A$	-	43	60	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=120V$	-	16	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	27	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	16	A
Pulse Source Current	$I_{SP}$	—	-	-	64	A
Diode Forward Voltage	$V_{SD}$	$I_S=16A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.9	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=18A$	-	650	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.1	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR Y T F 2 5 0 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

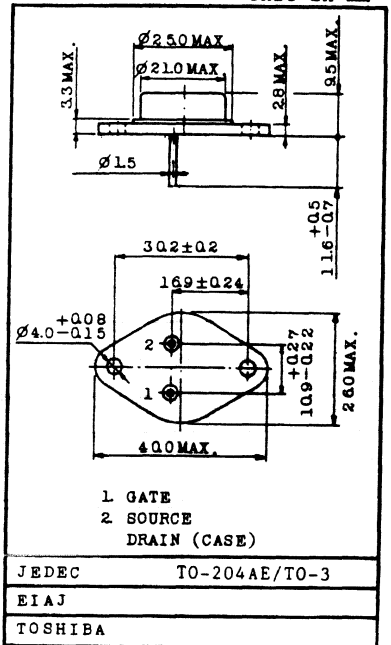
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.07\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=14S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	200	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	30
	DC ( $T_c=100^\circ C$ )	$I_D$	19
	Pulse	$I_{DP}$	120
Inductive Current (Clamped)	$I_{LP}$	120	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=16A$	8	14	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	30	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=16A, V_{GS}=10V$	-	0.070	0.085	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=30A, V_{GS}=10V$	-	2.3	3.5	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2300	3000	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	390	500	pF
Output Capacitance		$C_{oss}$		-	920	1200	pF
Switching Time	Rise Time	$t_r$	<p><math>I_D=16A, V_{DD}=95V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D.U. \leq 1\% (Z_{out}=4.7\Omega)</math></p>	-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	ns
	Fall Time	$t_f$		-	50	100	ns
	Turn-off Time	$t_{off}$		-	110	225	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=38A,$	-	79	120	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=160V$	-	37	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	42	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	30	A
Pulse Source Current	$I_{SP}$	—	-	-	120	A
Diode Forward Voltage	$V_{SD}$	$I_S=30A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=30A,$	-	750	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.7	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF251 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

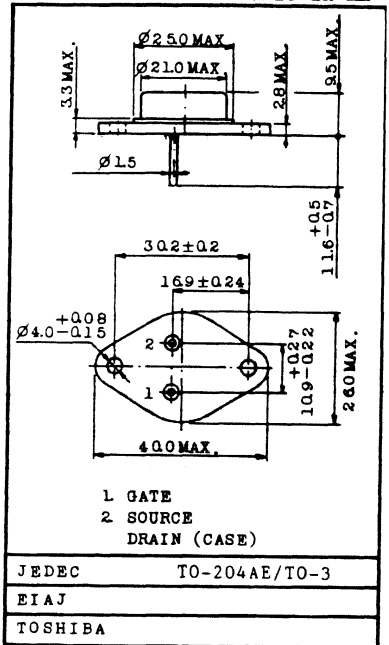
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.07\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=14S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	150	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	30
	DC ( $T_c=100^\circ C$ )	$I_D$	19
	Pulse	$I_{DP}$	120
Inductive Current (Clamped)	$I_{LP}$	120	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=16A$	8	14	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	30	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=16A, V_{GS}=10V$	-	0.070	0.085	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=30A, V_{GS}=10V$	-	2.3	3.5	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2300	3000	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	390	500	pF
Output Capacitance		$C_{oss}$		-	920	1200	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=16A, V_{DD}=95V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D.U \leq 1\% (Z_{out}=4.7\Omega)</math> </p>	-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	ns
	Fall Time	$t_f$		-	50	100	ns
	Turn-off Time	$t_{off}$		-	110	225	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=38A,$	-	79	120	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=120V$	-	37	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	42	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	30	A
Pulse Source Current	$I_{SP}$	—	-	-	120	A
Diode Forward Voltage	$V_{SD}$	$I_S=30A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=30A,$	-	750	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.7	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF252 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

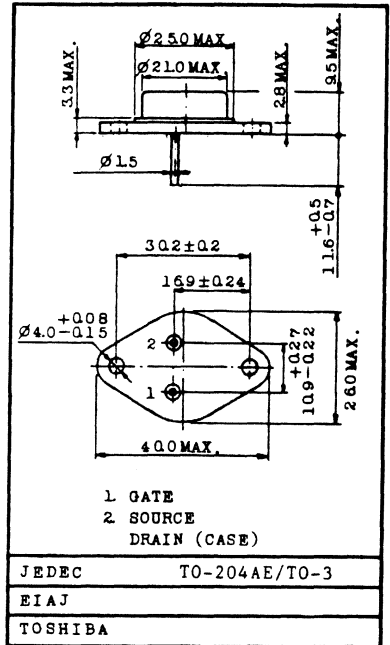
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.09\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=14S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DS}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	200	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	25
	DC ( $T_c=100^\circ C$ )	$I_D$	16
	Pulse	$I_{DP}$	100
Inductive Current (Clamped)	$I_{LP}$	100	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=16A$	8	14	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	25	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=16A, V_{GS}=10V$	-	0.09	0.12	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=25A, V_{GS}=10V$	-	2.5	3.8	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2300	3000	pF
Reverse Transfer Capacitance		$C_{rss}$		-	390	500	pF
Output Capacitance		$C_{oss}$		-	920	1200	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=16A</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>V_{DD}=95V</math>  <math>D, U \leq 1\%</math> (<math>Z_{out}=4.7\Omega</math>)         </p>	-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	ns
	Fall Time	$t_f$		-	50	100	ns
	Turn-off Time	$t_{off}$		-	110	225	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=38A.$	-	79	120	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=160V$	-	39	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	42	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	25	A
Pulse Source Current	$I_{SP}$	—	-	-	100	A
Diode Forward Voltage	$V_{SD}$	$I_S=25A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=30A,$	-	750	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.7	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF253 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

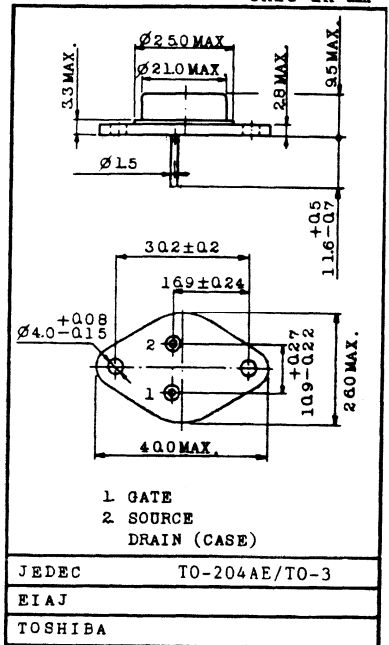
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.09\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=14S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	25	A
	DC( $T_c=100^\circ C$ )	$I_D$	16	
	Pulse	$I_{DP}$	100	
Inductive Current (Clamped)		$I_{LP}$	100	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=16A$	8	14	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	25	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=16A, V_{GS}=10V$	-	0.09	0.12	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=25A, V_{GS}=10V$	-	2.5	3.8	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2300	3000	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	390	500	pF
Output Capacitance		$C_{oss}$		-	920	1200	pF
Switching Time	Rise Time	$t_r$		-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	ns
	Fall Time	$t_f$		-	50	100	ns
	Turn-off Time	$t_{off}$		-	110	225	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=38A,$	-	79	120	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=120V$	-	37	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	42	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	25	A
Pulse Source Current	$I_{SP}$	—	-	-	100	A
Diode Forward Voltage	$V_{SD}$	$I_S=25A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=30A.$	-	750	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.7	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF440 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

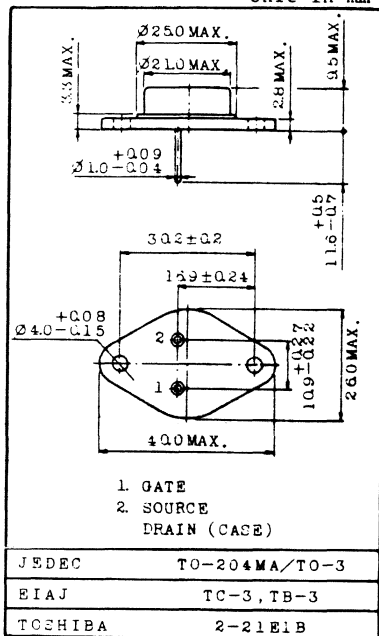
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.8\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=6.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA(\text{Max.})$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A(\text{Max.})$  @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	500	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	8
	DC( $T_c=100^\circ C$ )	$I_D$	5
	Pulse	$I_{DP}$	32
Inductive Current (Clamped)	$I_{LP}$	32	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	125	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	500	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=4A$	4	6.5	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	8	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	0.8	0.85	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	7.0	8.6	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF
Reverse Transfer Capacitance		$C_{rss}$		-	60	150	pF
Output Capacitance		$C_{oss}$		-	250	350	pF
Switching Time	Rise Time	$t_r$		-	7	15	ns
	Turn-on Time	$t_{on}$		-	25	50	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	60	120	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=10A.$	-	42	60	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=400V$	-	20	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	22	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	8	A
Pulse Source Current	$I_{SP}$	—	-	-	32	A
Diode Forward Voltage	$V_{SD}$	$I_S=8A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=8A,$	-	1100	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	6.4	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

YTF441

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

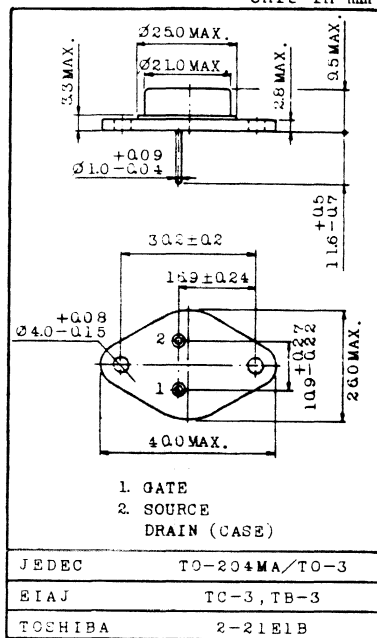
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.8\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=6.5S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 100nA(\text{Max.})$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A(\text{Max.})$  @  $V_{DS}=450V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	8	A
	DC( $T_c=100^\circ C$ )	$I_D$	5	
	Pulse	$I_{DP}$	32	
Inductive Current (Clamped)		$I_{LP}$	32	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	450	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=4A$	4	6.5	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	8	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	0.8	0.85	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	7.0	8.6	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	60	150	pF
Output Capacitance		$C_{oss}$		-	250	350	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=4A</math>  <math>V_{IN}</math>  <math>V_{OUT}</math>  <math>V_{DD}=200V</math>  <math>D.L \leq 1\%</math> (<math>Z_{out}=4.7\Omega</math>)  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>10\mu s</math> </p>	-	7	15	ns
	Turn-on Time	$t_{on}$		-	25	50	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	60	120	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=10A,$	-	42	60	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=360V$	-	20	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	22	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	8	A
Pulse Source Current	$I_{SP}$	—	-	-	32	A
Diode Forward Voltage	$V_{SD}$	$I_S=8A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=8A,$	-	1100	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	6.4	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

Y T F 4 4 2

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

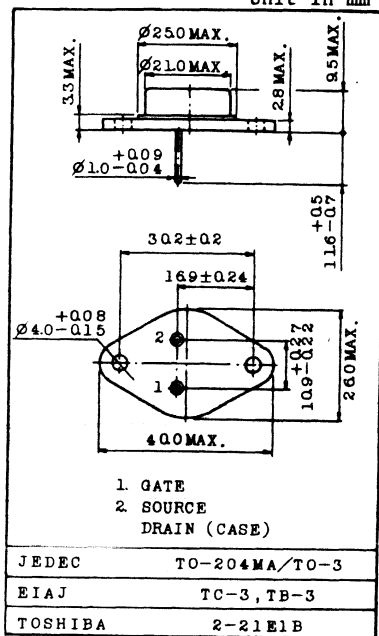
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.8\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=6.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA(\text{Max.})$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A(\text{Max.})$  @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	7	A
	DC ( $T_c=100^\circ C$ )	$I_D$	4	
	Pulse	$I_{DP}$	28	
Inductive Current (Clamped)		$I_{LP}$	28	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	500	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=4A$	4.0	6.5	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	7	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	1.0	1.1	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	7.7	9.4	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	60	150	pF
Output Capacitance		$C_{oss}$		-	250	350	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=4A</math>  <math>V_{IN}</math>  <math>V_{OUT}</math>  <math>10\mu s</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>V_{DD}=200V</math>  <math>D.U \leq 1\% (Z_{out}=4.7\Omega)</math> </p>	-	7	15	ns
	Turn-on Time	$t_{on}$		-	25	50	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	60	120	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=10A,$	-	42	60	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=400V$	-	20	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	22	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	7	A
Pulse Source Current	$I_{SP}$	—	-	-	28	A
Diode Forward Voltage	$V_{SD}$	$I_S=7A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.9	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=8A,$	-	1100	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	6.4	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

Y T F 4 4 3

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

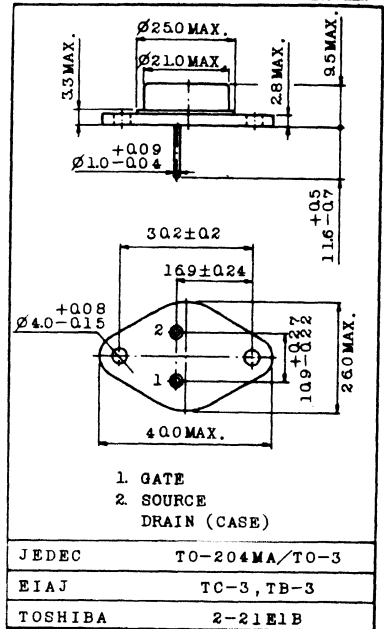
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.8\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=6.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	7	A
	DC( $T_c=100^\circ C$ )	$I_D$	4	
	Pulse	$I_{DP}$	28	
Inductive Current (Clamped)		$I_{LP}$	28	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		IGSS	VGS=±20V, VDS=0V	-	-	±100	nA
Drain Cut-off Current		IDSS	VDS=450V, VGS=0V, Tc=25°C	-	-	250	µA
Drain-Source Breakdown Voltage		V(BR)DSS	ID=250µA, VGS=0V	450	-	-	V
Gate Threshold Voltage		Vth	VDS=VGS, ID=250µA	2.0	-	4.0	V
Forward Transfer Admittance		Yfs	VDS=10V, ID=4A	4.0	6.5	-	S
On-State Drain Current		ID(ON)	VDS=10V, VGS=10V	7	-	-	A
Drain-Source ON Resistance		RDS(ON)	ID=4A, VGS=10V	-	1.0	1.1	Ω
Drain-Source ON Voltage		VDS(ON)	ID=7A, VGS=10V	-	7.7	9.4	V
Input Capacitance		Ciss	VDS=25V, VGS=0V, f=1MHz	-	1200	1600	pF
Reverse Transfer Capacitance		Crss		-	60	150	pF
Output Capacitance		Coss		-	250	350	pF
Switching Time	Rise Time	tr	<p> <math>I_D = 4A</math>  <math>V_{GS} = 10V</math>  <math>V_{DS} = 200V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\%</math> (<math>Z_{out} = 4.7\Omega</math>)         </p>	-	7	15	ns
	Turn-on Time	ton		-	25	50	ns
	Fall Time	tf		-	15	30	ns
	Turn-off Time	t <sub>off</sub>		-	60	120	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		Qg	VGS=10V, ID=10A,	-	42	60	nC
Gate Source Charge		Qgs	VDS=360V	-	20	-	nC
Gate-Drain ("Miller") Charge		Qgd		-	22	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	IS	—	-	-	7	A
Pulse Source Current	ISP	—	-	-	28	A
Diode Forward Voltage	VSD	IS=7A, VGS=0V, Tc=25°C	-	-	1.9	V
Reverse Recovery Time	trr	Tj=150°C, IF=8A,	-	1100	-	ns
Reverse Recovered Charge	Qrr	dIF/dt=100A/µs	-	6.4	-	µC







## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	500	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=7A$	6	11	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	13	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	0.3	0.4	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=13A, V_{GS}=10V$	-	4.3	6.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2000	3000	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	100	200	pF
Output Capacitance		$C_{oss}$		-	370	600	pF
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	85	ns
	Fall Time	$t_f$		-	35	70	ns
	Turn-off Time	$t_{off}$		-	110	220	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=16A,$	-	82	120	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=400V$	-	40	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	42	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	13	A
Pulse Source Current	$I_{SP}$	—	-	-	52	A
Diode Forward Voltage	$V_{SD}$	$I_S=13A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.4	V
Reverse Recovery Time	$t_{rr}$	$T_J=150^\circ C, I_F=13A,$	-	1300	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	7.4	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF451 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

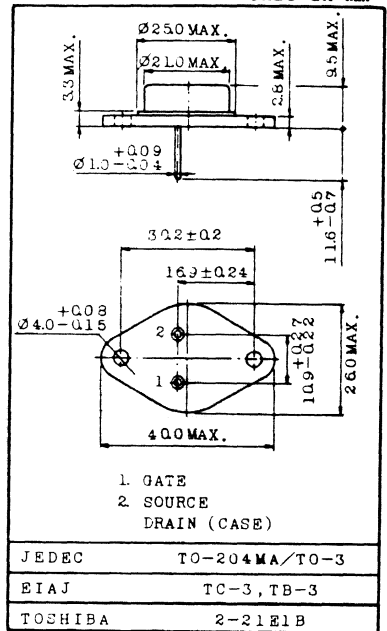
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.3\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 100nA(\text{Max.})$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A(\text{Max.})$  @  $V_{DS}=450V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	450	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	13
	DC ( $T_c=100^\circ C$ )	$I_D$	8
	Pulse	$I_{DP}$	52
Inductive Current (Clamped)	$I_{LP}$	52	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	450	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=7A$	6	11	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	13	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	0.3	0.4	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=13A, V_{GS}=10V$	-	4.3	6.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2000	3000	pF
Reverse Transfer Capacitance		$C_{rss}$		-	100	200	pF
Output Capacitance		$C_{oss}$		-	370	600	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=7A</math>  <math>V_{IN}</math>  <math>V_{OUT}</math>  <math>V_{DD}=210V</math>  <math>D, U \leq 1\%</math> (<math>Z_{out}=4.7\Omega</math>)         </p>	-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	85	ns
	Fall Time	$t_f$		-	35	70	ns
	Turn-off Time	$t_{off}$		-	110	220	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=16A,$	-	82	120	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=360V$	-	40	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	42	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	13	A
Pulse Source Current	$I_{Sp}$	—	-	-	52	A
Diode Forward Voltage	$V_{SD}$	$I_S=13A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.4	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=13A.$	-	1300	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	7.4	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

Y T F 4 5 2

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

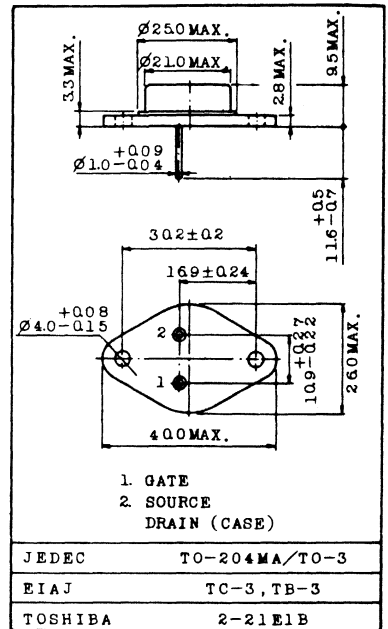
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.4\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA(Max.)$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A(Max.)$  @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT	
Drain-Source Voltage	$V_{DSX}$	500	V	
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	500	V	
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V	
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	12	A
	DC ( $T_c=100^\circ C$ )	$I_D$	7	
	Pulse	$I_{DP}$	48	
Inductive Current (Clamped)	$I_{LP}$	48	A	
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W	
Channel Temperature	$T_{ch}$	150	$^\circ C$	
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$	

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	500	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=7A$	6	11	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	12	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	0.4	0.5	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=12A, V_{GS}=10V$	-	5.3	7.0	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2000	3000	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	100	200	pF
Output Capacitance		$C_{oss}$		-	370	600	pF
Switching Time	Rise Time	$t_r$		<p><math>I_D=7A</math> <math>V_{DD}=210V</math> <math>V_{IN}: t_r, t_f &lt; 5ns</math> <math>D, U \leq 1\%</math> (<math>Z_{out}=4.7\Omega</math>)</p>	-	25	50
	Turn-on Time	$t_{on}$	-		40	85	ns
	Fall Time	$t_f$	-		35	70	ns
	Turn-off Time	$t_{off}$	-		110	220	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=16A,$	-	82	120	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=400V$	-	40	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	42	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	12	A
Pulse Source Current	$I_{SP}$	—	-	-	48	A
Diode Forward Voltage	$V_{SD}$	$I_S=12A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.3	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=13A,$	-	1300	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	7.4	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF453 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

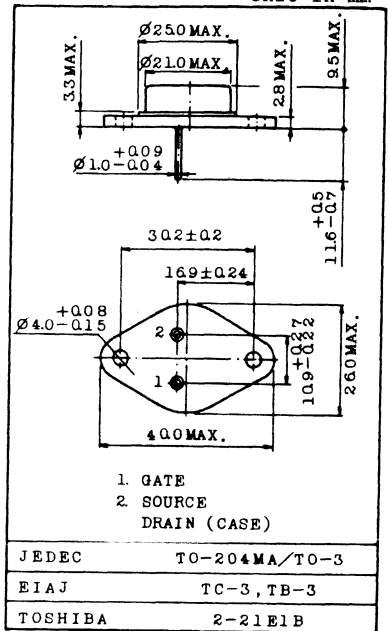
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.4\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	12	A
	DC( $T_c=100^\circ C$ )	$I_D$	7	
	Pulse	$I_{DP}$	48	
Inductive Current (Clamped)		$I_{LP}$	48	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 15.8g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	450	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=7A$	6	11	-	S	
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	12	-	-	A	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	0.4	0.5	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=12A, V_{GS}=10V$	-	5.3	7.0	V	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2000	3000	pF	
Reverse Transfer Capacitance	$C_{rSS}$		-	100	200	pF	
Output Capacitance	$C_{oss}$		-	370	600	pF	
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	85	ns
	Fall Time	$t_f$		-	35	70	ns
	Turn-off Time	$t_{off}$		-	110	220	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{GS}=10V, I_D=16A,$	-	82	120	nC	
Gate Source Charge	$Q_{gs}$	$V_{DS}=360V$	-	40	-	nC	
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	42	-	nC	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	12	A
Pulse Source Current	$I_{SP}$	—	-	-	48	A
Diode Forward Voltage	$V_{SD}$	$I_S=12A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.3	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=13A,$	-	1300	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	7.4	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF520 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

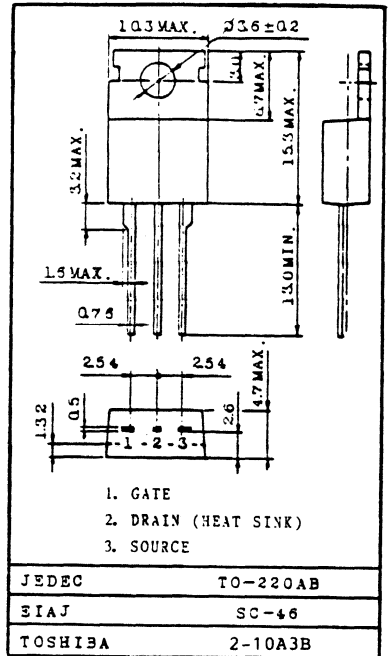
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.25\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=2.9S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=100V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	100	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	100	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	8	A
	DC( $T_c=100^\circ C$ )	$I_D$	5	
	Pulse	$I_{DP}$	32	
Inductive Current (Clamped)		$I_{LP}$	32	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	100	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=4A$	1.5	2.9	-	S	
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	8	-	-	A	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	0.25	0.30	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	2.2	3.3	V	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	460	600	pF	
Reverse Transfer Capacitance	$C_{rss}$		-	70	100	pF	
Output Capacitance	$C_{oss}$		-	300	400	pF	
Switching Time	Rise Time	$t_r$	<p> <math>I_D=4A</math>  <math>V_{IN}</math>  <math>V_{OUT}</math>  <math>V_{DD}=50V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\%</math> (<math>Z_{out}=50\Omega</math>)         </p>	-	35	70	ns
	Turn-on Time	$t_{on}$		-	55	110	ns
	Fall Time	$t_f$		-	35	70	ns
	Turn-off Time	$t_{off}$		-	85	170	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{GS}=10V, I_D=10A$	-	10	15	nC	
Gate Source Charge	$Q_{gs}$	$V_{DS}=80V$	-	6	-	nC	
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	4	-	nC	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	8	A
Pulse Source Current	$I_{Sp}$	—	-	-	32	A
Diode Forward Voltage	$V_{SD}$	$I_S=8A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.5	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=8A$	-	280	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	1.6	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF521 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOSII)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

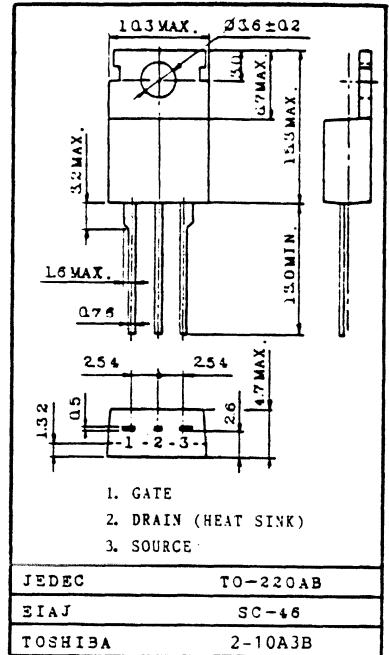
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.25\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=2.9S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	60	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	60	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	8
	DC( $T_c=100^\circ C$ )	$I_D$	5
	Pulse	$I_{DP}$	32
Inductive Current (Clamped)	$I_{LP}$	32	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	40	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	60	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=4A$	1.5	2.9	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	8	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	0.25	0.30	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	2.2	3.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	460	600	pF
Reverse Transfer Capacitance		$C_{rss}$		-	70	100	pF
Output Capacitance		$C_{oss}$		-	300	400	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=4A</math>  <math>V_{IN}</math>  <math>V_{OUT}</math>  <math>V_{DD}=30V</math>  <math>50\mu H</math>  <math>10V</math>  <math>0</math>  <math>10\mu s</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\%</math> (<math>Z_{out}=50\Omega</math>)         </p>	-	35	70	ns
	Turn-on Time	$t_{on}$		-	55	110	ns
	Fall Time	$t_f$		-	35	70	ns
	Turn-off Time	$t_{off}$		-	85	170	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=10A,$	-	10	15	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=48V$	-	6	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	4	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	8	A
Pulse Source Current	$I_{SP}$	—	-	-	32	A
Diode Forward Voltage	$V_{SD}$	$I_S=8A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.5	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=8A,$	-	280	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	1.6	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR Y T F 5 2 2 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

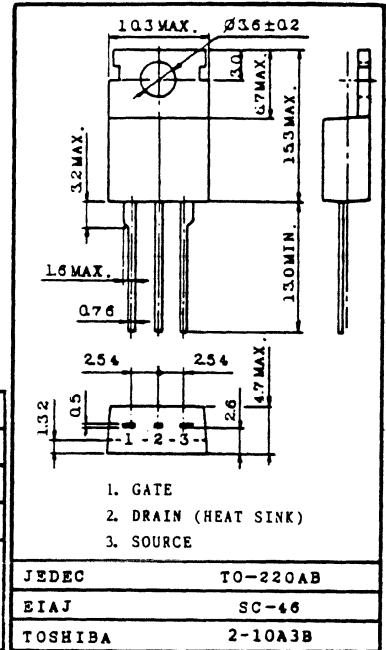
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.30\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=2.9S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=100V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	100	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	100	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	7
	DC ( $T_c=100^\circ C$ )	$I_D$	4
	Pulse	$I_{DP}$	28
Inductive Current (Clamped)	$I_{LP}$	28	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	40	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

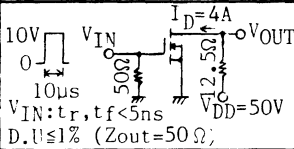
#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	100	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=4A$	1.5	2.9	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	7	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	0.3	0.4	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	2.3	3.5	V
Input Capacitance		$C_{iss}$		-	460	600	pF
Reverse Transfer Capacitance		$C_{rSS}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	70	100	pF
Output Capacitance		$C_{oss}$		-	300	400	pF
Switching Time	Rise Time	$t_r$		-	35	70	ns
	Turn-on Time	$t_{on}$		-	55	110	ns
	Fall Time	$t_f$		-	35	70	ns
	Turn-off Time	$t_{off}$		-	85	170	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=10A,$	-	10	15	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=80V$	-	6	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	4	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	7	A
Pulse Source Current	$I_{SP}$	—	-	-	28	A
Diode Forward Voltage	$V_{SD}$	$I_S=8A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.3	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=8A,$	-	280	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	1.6	-	$\mu C$



**SEMICONDUCTOR**

**TECHNICAL DATA**

**TOSHIBA FIELD EFFECT TRANSISTOR**  
**Y T F 5 2 3**  
**SILICON N CHANNEL MOS TYPE**  
**( $\pi$ -MOS II)**

**HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.**

**CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.**

**FEATURES:**

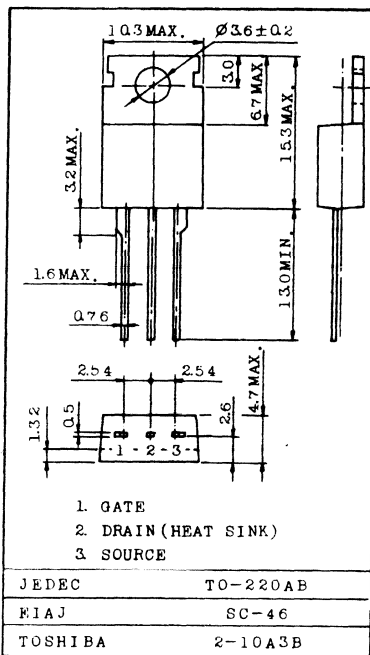
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.3\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=2.9S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=60V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

**MAXIMUM RATINGS ( $T_a=25^\circ C$ )**

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	60	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	7	A
	DC( $T_c=100^\circ C$ )	$I_D$	4	
	Pulse	$I_{DP}$	28	
Inductive Current (Clamped)		$I_{LP}$	28	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

**INDUSTRIAL APPLICATIONS**

Unit in mm



Weight : 1.9g

**THERMAL CHARACTERISTICS**

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

**TOSHIBA CORPORATION**



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	60	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=4A$	1.5	2.9	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	7	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	0.3	0.4	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	2.3	3.5	V
Input Capacitance		$C_{iss}$		-	460	600	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	70	100	pF
Output Capacitance		$C_{oss}$		-	300	400	pF
Switching Time	Rise Time	$t_r$		-	35	70	ns
	Turn-on Time	$t_{on}$	-	55	110	ns	
	Fall Time	$t_f$	-	35	70	ns	
	Turn-off Time	$t_{off}$	-	85	170	ns	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=10A,$	-	10	15	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=48V$	-	6	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	4	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	7	A
Pulse Source Current	$I_{SP}$	—	-	-	28	A
Diode Forward Voltage	$V_{SD}$	$I_S=7A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.3	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=8A,$	-	280	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	1.6	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF530 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

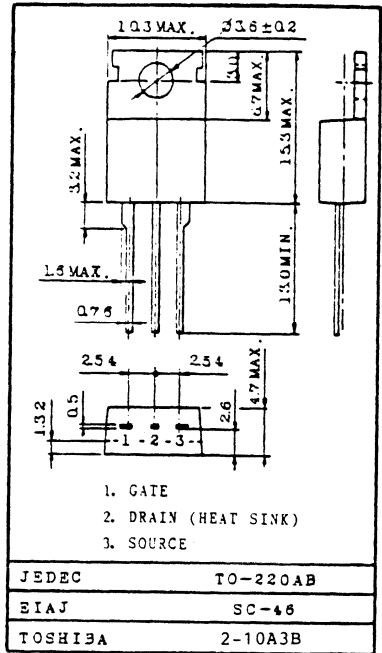
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.14\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=5.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 50nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=100V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	100	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	100	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	14	A
	DC( $T_c=100^\circ C$ )	$I_D$	9	
	Pulse	$I_{DP}$	56	
Inductive Current (Clamped)		$I_{LP}$	56	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	75	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



TECHNICAL DATA

ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	±500	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	µA	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	100	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=8A$	4.0	5.5	-	S	
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	14	-	-	A	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	0.14	0.18	Ω	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=14A, V_{GS}=10V$	-	2.2	3.3	V	
Input Capacitance	$C_{iss}$		-	600	800	pF	
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	120	150	pF	
Output Capacitance	$C_{oss}$		-	390	500	pF	
Switching Time	Rise Time	$t_r$		-	35	75	ns
	Turn-on Time	$t_{on}$		-	50	105	ns
	Fall Time	$t_f$		-	20	45	ns
	Turn-off Time	$t_{off}$		-	40	85	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{GS}=10V, I_D=18A,$	-	18	30	nC	
Gate Source Charge	$Q_{gs}$	$V_{DS}=80V$	-	9	-	nC	
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	9	-	nC	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	14	A
Pulse Source Current	$I_{SP}$	—	-	-	56	A
Diode Forward Voltage	$V_{SD}$	$I_S=14A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.5	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=14A,$	-	360	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.1	-	µC



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF531 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

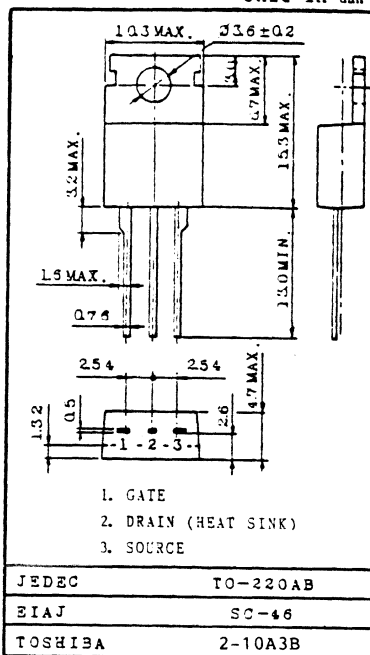
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.14\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=5.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	60	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	60	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	14
	DC( $T_c=100^\circ C$ )	$I_D$	9
	Pulse	$I_{DP}$	56
Inductive Current (Clamped)	$I_{LP}$	56	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	75	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

Y T F 5 3 2

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

#### FEATURES:

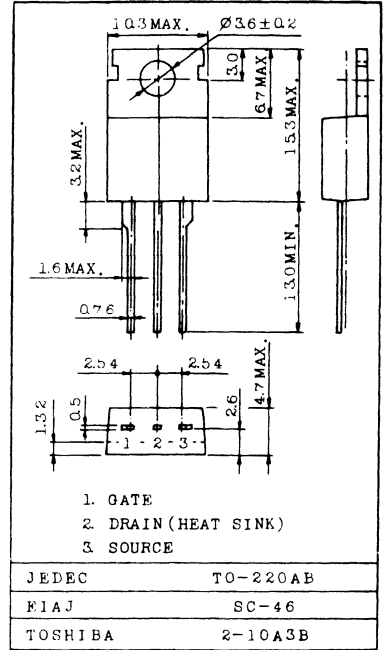
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.2\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=5.5S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=100V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	100	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	100	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	12
	DC( $T_c=100^\circ C$ )	$I_D$	8
	Pulse	$I_{DP}$	48
Inductive Current (Clamped)	$I_{LP}$	48	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	75	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



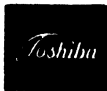
## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	100	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=8A$	4.0	5.5	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	12	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	0.2	0.25	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=12A, V_{GS}=10V$	-	2.6	3.9	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	600	800	pF
Reverse Transfer Capacitance		$C_{rss}$		-	120	150	pF
Output Capacitance		$C_{oss}$		-	390	500	pF
Switching Time	Rise Time	$t_r$	<p><math>I_D=8A</math> <math>V_{DD}=36V</math> <math>V_{IN}: t_r, t_f &lt; 5ns</math> <math>D.U \leq 1\% (Z_{out}=15\Omega)</math></p>	-	35	75	ns
	Turn-on Time	$t_{on}$		-	50	105	ns
	Fall Time	$t_f$		-	20	45	ns
	Turn-off Time	$t_{off}$		-	40	85	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=18A,$	-	18	30	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=80A$	-	9	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	9	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	12	A
Pulse Source Current	$I_{SP}$	—	-	-	48	A
Diode Forward Voltage	$V_{SD}$	$I_S=12A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.3	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=14A,$	-	360	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.1	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR Y T F 5 3 3 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.2\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=5.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA(Max.)$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A(Max.)$  @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

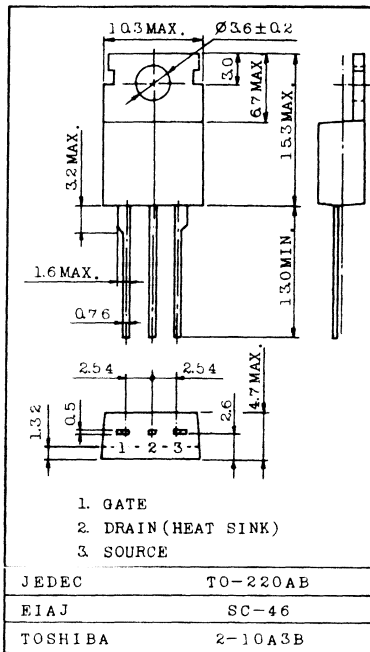
CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	60	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	12	A
	DC( $T_c=100^\circ C$ )	$I_D$	8	
	Pulse	$I_{DP}$	48	
Inductive Current (Clamped)		$I_{LP}$	48	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	75	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	60	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=8A$	4.0	5.5	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	12	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	0.20	0.25	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=12A, V_{GS}=10V$	-	2.6	3.9	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	600	800	pF
Reverse Transfer Capacitance		$C_{rss}$		-	120	150	pF
Output Capacitance		$C_{oss}$		-	390	500	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=8A</math>  <math>V_{IN}</math>  <math>10V</math>  <math>0</math>  <math>10\mu s</math>  <math>15\Omega</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\%</math> (<math>Z_{out}=15\Omega</math>)  <math>V_{DD}=36V</math>  <math>4.5\Omega</math>  <math>V_{OUT}</math> </p>	-	35	75	ns
	Turn-on Time	$t_{on}$		-	50	105	ns
	Fall Time	$t_f$		-	20	45	ns
	Turn-off Time	$t_{off}$		-	40	85	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=18A,$	-	18	30	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=48V$	-	9	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	9	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	12	A
Pulse Source Current	$I_{SP}$	—	-	-	48	A
Diode Forward Voltage	$V_{SD}$	$I_S=12A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.3	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=14A,$	-	360	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.1	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

YTF540

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOSII)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

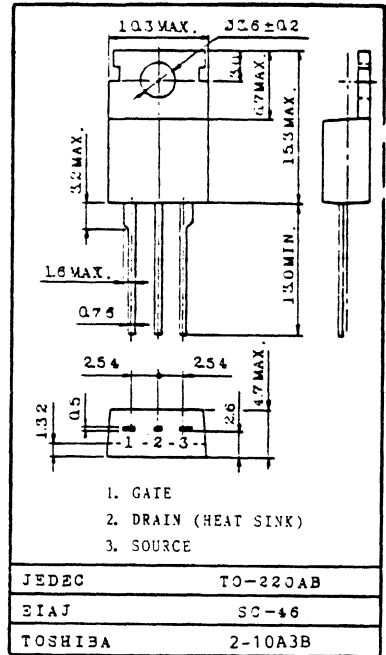
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.07\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=10S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=100V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	100	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	100	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	27	A
	DC( $T_c=100^\circ C$ )	$I_D$	17	
	Pulse	$I_{DP}$	108	
Inductive Current (Clamped)		$I_{LP}$	108	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	±500	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	μA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	100	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=15A$	6	10	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	27	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=15A, V_{GS}=10V$	-	0.07	0.085	Ω
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=27A, V_{GS}=10V$	-	2.1	3.2	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF
Reverse Transfer Capacitance		$C_{rss}$		-	230	300	pF
Output Capacitance		$C_{oss}$		-	600	800	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=15A</math>  <math>V_{IN}</math>  <math>10V</math>  <math>0</math>  <math>10\mu s</math>  <math>4.7\Omega</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\%</math> (<math>Z_{out}=4.7\Omega</math>)  <math>V_{DD}=30V</math> </p>	-	30	60	ns
	Turn-on Time	$t_{on}$		-	45	90	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	55	110	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=34A$	-	38	60	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=80V$	-	17	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	21	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	27	A
Pulse Source Current	$I_{SP}$	—	-	-	108	A
Diode Forward Voltage	$V_{SD}$	$I_S=27A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.5	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=27A$	-	500	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.9	-	μC



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF541 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOSII)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

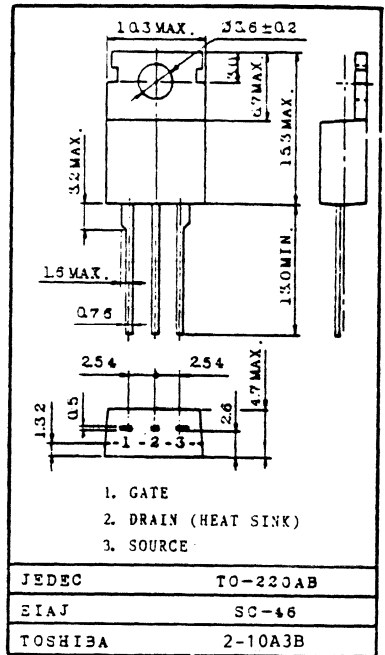
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.07\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=10S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 50nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	60	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	27	A
	DC ( $T_c=100^\circ C$ )	$I_D$	17	
	Pulse	$I_{DP}$	108	
Inductive Current (Clamped)		$I_{LP}$	108	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

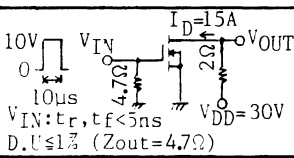
CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	60	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=15A$	6	10	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	27	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=15A, V_{GS}=10V$	-	0.07	0.085	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=27A, V_{GS}=10V$	-	2.1	3.2	V
Input Capacitance		$C_{iss}$		-	1200	1600	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	230	300	pF
Output Capacitance		$C_{oss}$		-	600	800	pF
Switching Time	Rise Time	$t_r$		-	30	60	ns
	Turn-on Time	$t_{on}$		-	45	90	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	55	110	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=34A$	-	38	60	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=48V$	-	17	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	21	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	27	A
Pulse Source Current	$I_{SP}$	—	-	-	108	A
Diode Forward Voltage	$V_{SD}$	$I_S=27A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.5	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=27A$	-	500	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.9	-	$\mu C$



**SEMICONDUCTOR**

**TECHNICAL DATA**

**TOSHIBA FIELD EFFECT TRANSISTOR**

Y T F 5 4 2

**SILICON N CHANNEL MOS TYPE**

**( $\pi$ -MOS II)**

**HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.**

**FEATURES:**

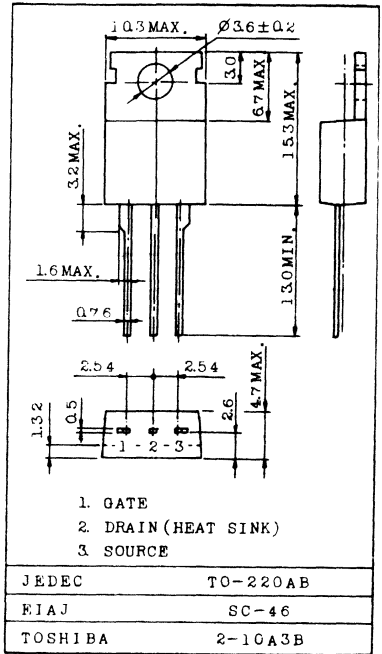
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.09\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=10S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=100V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

**MAXIMUM RATINGS (Ta=25°C)**

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	100	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	100	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	24
	DC( $T_c=100^\circ C$ )	$I_D$	15
	Pulse	$I_{DP}$	96
Inductive Current (Clamped)	$I_{LP}$	96	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	125	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

**INDUSTRIAL APPLICATIONS**

Unit in mm



Weight : 1.9g

**THERMAL CHARACTERISTICS**

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

**TOSHIBA CORPORATION**



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	±500	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	μA	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	100	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=15A$	6	10	-	S	
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	24	-	-	A	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=15A, V_{GS}=10V$	-	0.09	0.11	Ω	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=24A, V_{GS}=10V$	-	2.4	3.6	V	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF	
Reverse Transfer Capacitance	$C_{rss}$		-	230	300	pF	
Output Capacitance	$C_{oss}$		-	600	800	pF	
Switching Time	Rise Time	$t_r$		-	30	60	ns
	Turn-on Time	$t_{on}$		-	45	90	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	55	110	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{GS}=10V, I_D=34A,$	-	38	60	nC	
Gate Source Charge	$Q_{gs}$	$V_{DS}=80V$	-	17	-	nC	
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	21	-	nC	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	24	A
Pulse Source Current	$I_{Sp}$	—	-	-	96	A
Diode Forward Voltage	$V_{SD}$	$I_S=24A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.5	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=27A$	-	500	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.9	-	μC



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

Y T F 5 4 3

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.09\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=10S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

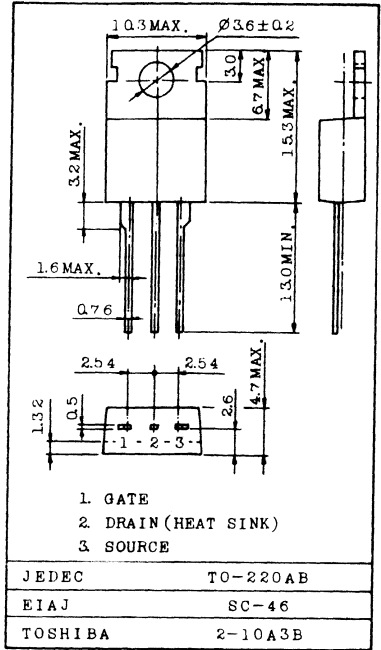
CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	60	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	24	A
	DC( $T_c=100^\circ C$ )	$I_D$	15	
	Pulse	$I_{DP}$	96	
Inductive Current (Clamped)		$I_{LP}$	96	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	60	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=15A$	6	10	-	S	
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	24	-	-	A	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=15A, V_{GS}=10V$	-	0.09	0.11	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=24A, V_{GS}=10V$	-	2.4	3.6	V	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF	
Reverse Transfer Capacitance	$C_{rSS}$		-	230	300	pF	
Output Capacitance	$C_{oss}$		-	600	800	pF	
Switching Time	Rise Time	$t_r$	<p> <math>I_D=15A, V_{DD}=30V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D.U \leq 1\% (Z_{out}=4.7\Omega)</math> </p>	-	30	60	ns
	Turn-on Time	$t_{on}$		-	45	90	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	55	110	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{GS}=10V, I_D=34A,$	-	38	60	nC	
Gate Source Charge	$Q_{gs}$	$V_{DS}=48V$	-	17	-	nC	
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	21	-	nC	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	---	-	-	24	A
Pulse Source Current	$I_{SP}$	---	-	-	96	A
Diode Forward Voltage	$V_{SD}$	$I_S=24A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.5	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=27A,$	-	500	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.9	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF610 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

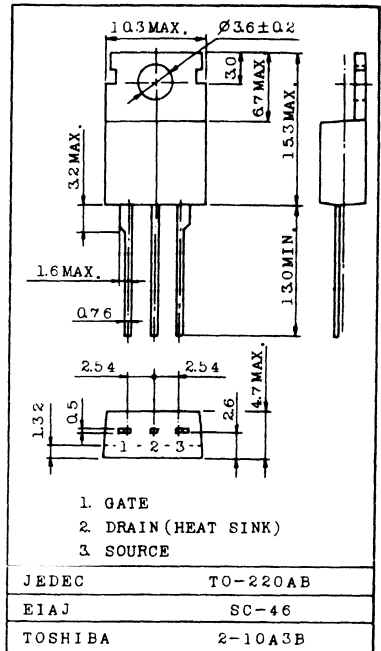
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=1.0\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=1.3S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	200	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	2.5
	DC( $T_c=100^\circ C$ )	$I_D$	1.5
	Pulse	$I_{DP}$	10
Inductive Current (Clamped)	$I_{LP}$	10	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	20	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	6.4	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=1.25A$	0.8	1.3	-	S	
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	2.5	-	-	A	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=1.25A, V_{GS}=10V$	-	1.0	1.5	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	2.7	4.1	V	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	120	150	pF	
Reverse Transfer Capacitance	$C_{rss}$		-	18	25	pF	
Output Capacitance	$C_{oss}$		-	60	80	pF	
Switching Time	Rise Time	$t_r$		-	10	25	ns
	Turn-on Time	$t_{on}$		-	20	40	ns
	Fall Time	$t_f$		-	7	15	ns
	Turn-off Time	$t_{off}$		-	15	30	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{GS}=10V, I_D=3A, V_{DS}=160V$	-	5	7.5	nC	
Gate Source Charge	$Q_{gs}$		-	2	-	nC	
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	3	-	nC	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	2.5	A
Pulse Source Current	$I_{SP}$	—	-	-	10	A
Diode Forward Voltage	$V_{SD}$	$I_S=2.5A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=2.5A$	-	290	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.0	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF611 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOSII)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

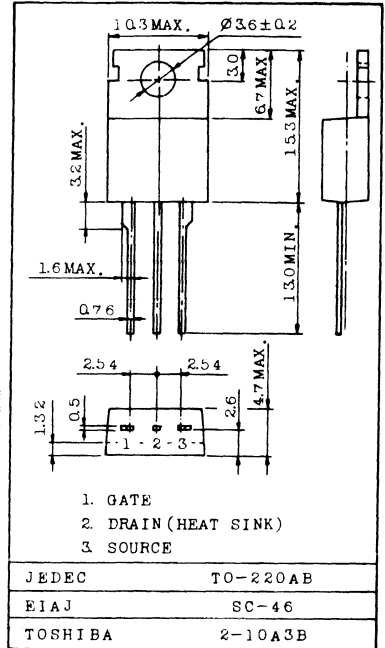
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=1.0\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=1.3S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	2.5	A
	DC( $T_c=100^\circ C$ )	$I_D$	1.5	
	Pulse	$I_{DP}$	10	
Inductive Current (Clamped)		$I_{LP}$	10	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	20	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	6.4	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=1.25A$	0.8	1.3	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	2.5	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=1.25A, V_{GS}=10V$	-	1.0	1.5	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	2.7	4.1	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	120	150	pF
Reverse Transfer Capacitance		$C_{rss}$		-	18	25	pF
Output Capacitance		$C_{oss}$		-	60	80	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=1.25A</math>  <math>V_{IN}</math>  <math>10V</math>  <math>10\mu s</math>  <math>50\Omega</math>  <math>60\Omega</math>  <math>V_{GS}</math>  <math>V_{DS}=75V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\%</math> (<math>Z_{out}=50\Omega</math>)         </p>	-	10	25	ns
	Turn-on Time	$t_{on}$		-	20	40	ns
	Fall Time	$t_f$		-	7	15	ns
	Turn-off Time	$t_{off}$		-	15	30	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=3A.$	-	5	7.5	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=120V$	-	2	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	3	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	2.5	A
Pulse Source Current	$I_{SP}$	—	-	-	10	A
Diode Forward Voltage	$V_{SD}$	$I_S=2.5A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=2.5A.$	-	290	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.0	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### YTF612

#### SILICON N CHANNEL MOS TYPE

#### ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

FEATURES:

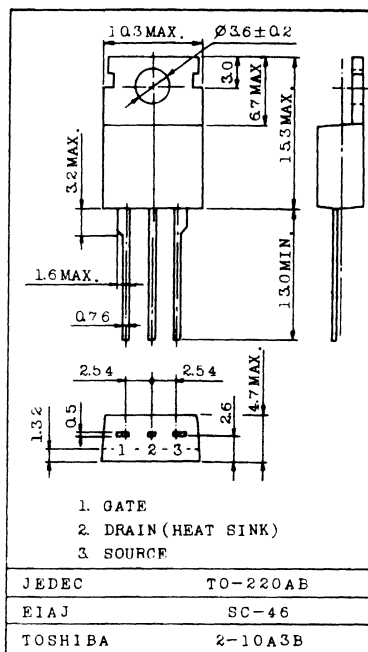
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=1.5\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=1.3S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	200	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	2
	DC( $T_c=100^\circ C$ )	$I_D$	1.25
	Pulse	$I_{DP}$	8
Inductive Current (Clamped)	$I_{LP}$	8	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	20	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

INDUSTRIAL APPLICATIONS

Unit in mm



THERMAL CHARACTERISTICS

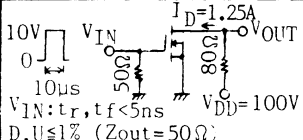
CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	6.4	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=1.25A$	0.8	1.3	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	2	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=1.25A, V_{GS}=10V$	-	1.5	2.4	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=2A, V_{GS}=10V$	-	3.3	5.0	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	120	150	pF
Reverse Transfer Capacitance		$C_{rss}$		-	18	25	pF
Output Capacitance		$C_{oss}$		-	60	80	pF
Switching Time	Rise Time	$t_r$			-	10	25
	Turn-on Time	$t_{on}$	-		20	40	ns
	Fall Time	$t_f$	-		7	15	ns
	Turn-off Time	$t_{off}$	-		15	30	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=3A$	-	5	7.5	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=160V$	-	2	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	3	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	2	A
Pulse Source Current	$I_{SP}$	—	-	-	8	A
Diode Forward Voltage	$V_{SD}$	$I_S=2A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=2.5A$	-	290	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.0	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF613 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS $\Pi$ )

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

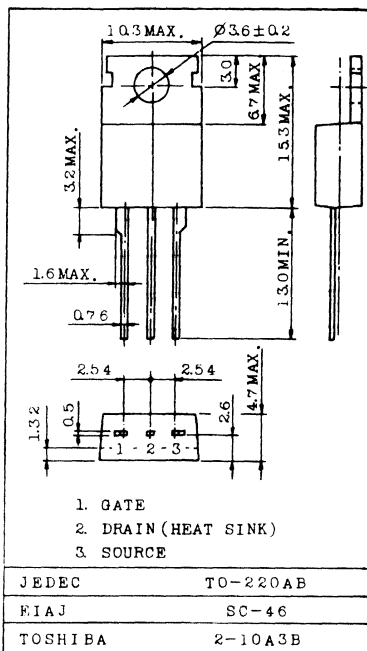
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=1.5\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=1.3S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	2	A
	DC( $T_c=100^\circ C$ )	$I_D$	1.25	
	Pulse	$I_{DP}$	8	
Inductive Current (Clamped)		$I_{LP}$	8	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	20	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	-55~150	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	6.4	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=1.25A$	0.8	1.3	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	2	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=1.25A, V_{GS}=10V$	-	1.5	2.4	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=2A, V_{GS}=10V$	-	3.3	5.0	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	120	150	pF
Reverse Transfer Capacitance		$C_{rss}$		-	18	25	pF
Output Capacitance		$C_{oss}$		-	60	80	pF
Switching Time	Rise Time	$t_r$		-	10	25	ns
	Turn-on Time	$t_{on}$		-	20	40	ns
	Fall Time	$t_f$		-	7	15	ns
	Turn-off Time	$t_{off}$		-	15	30	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=3A$	-	5	7.5	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=120V$	-	2	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	3	-	nC

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	2	A
Pulse Source Current	$I_{SP}$	—	-	-	8	A
Diode Forward Voltage	$V_{SD}$	$I_S=2A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=2.5A$	-	290	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.0	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
 YTF620  
 SILICON N CHANNEL MOS TYPE  
 ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.5\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=2.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

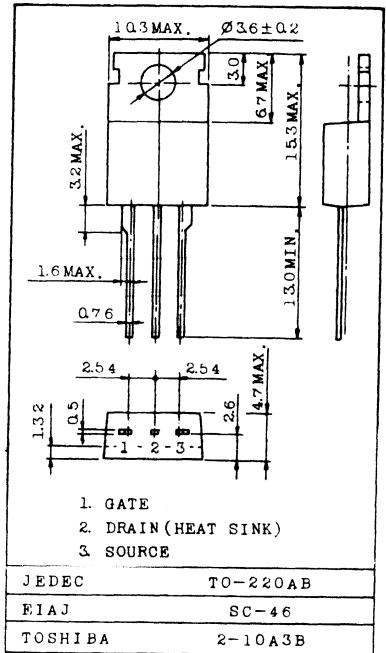
### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	200	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	5	A
	DC( $T_c=100^\circ C$ )	$I_D$	3	
	Pulse	$I_{DP}$	20	
Inductive Current (Clamped)		$I_{LP}$	20	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

INDUSTRIAL APPLICATIONS  
 Unit in mm



Weight : 1.9g

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		IGSS	VGS=±20V, VDS=0V	-	-	±500	nA
Drain Cut-off Current		IDSS	VDS=200V, VGS=0V, Tc=25°C	-	-	250	µA
Drain-Source Breakdown Voltage		V(BR)DSS	ID=250µA, VGS=0V	200	-	-	V
Gate Threshold Voltage		Vth	VDS=VGS, ID=250µA	2.0	-	4.0	V
Forward Transfer Admittance		Yfs	VDS=10V, ID=2.5A	1.3	2.5	-	S
On-State Drain Current		ID(ON)	VDS=10V, VGS=10V	5	-	-	A
Drain-Source ON Resistance		RDS(ON)	ID=2.5A, VGS=10V	-	0.5	0.8	Ω
Drain-Source ON Voltage		VDS(ON)	ID=5A, VGS=10V	-	2.7	4.1	V
Input Capacitance		Ciss	VDS=25V, VGS=0V, f=1MHz	-	460	600	pF
Reverse Transfer Capacitance		Crss		-	50	80	pF
Output Capacitance		Coss		-	230	300	pF
Switching Time	Rise Time	tr	<p> <math>I_D=2.5A</math>  <math>V_{IN}</math>  <math>10V</math>  <math>0</math>  <math>10\mu s</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\%</math> (<math>Z_{out}=50\Omega</math>)  <math>V_{DD}=100V</math> </p>	-	30	60	ns
	Turn-on Time	ton		-	50	100	ns
	Fall Time	tf		-	30	60	ns
	Turn-off Time	t <sub>off</sub>		-	80	160	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		Qg	VGS=10V, ID=6A,	-	11	15	nC
Gate Source Charge		Qgs	VDS=160V	-	5	-	nC
Gate-Drain ("Miller") Charge		Qgd		-	6	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	IS	—	-	-	5	A
Pulse Source Current	ISP	—	-	-	20	A
Diode Forward Voltage	VSD	IS=5A, VGS=0V, Tc=25°C	-	-	2.0	V
Reverse Recovery Time	trr	Tj=150°C, IF=5A,	-	350	-	ns
Reverse Recovered Charge	Qrr	dIF/dt=100A/µs	-	2.3	-	µC



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF621 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.5\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=2.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA(Max.)$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A(Max.)$  @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

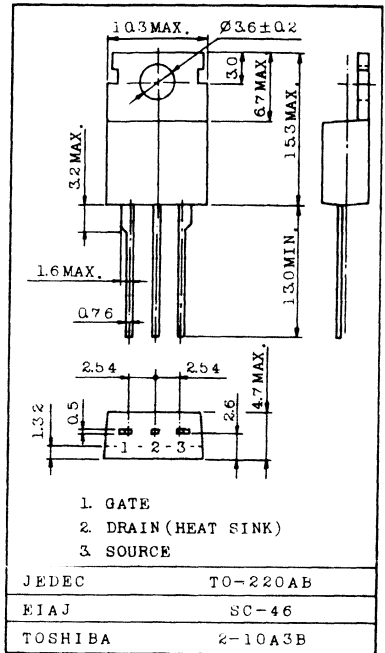
CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	5	A
	DC ( $T_c=100^\circ C$ )	$I_D$	3	
	Pulse	$I_{DP}$	20	
Inductive Current (Clamped)		$I_{LP}$	20	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=2.5A$	1.3	2.5	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	5	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	0.5	0.8	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	2.7	4.1	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	460	600	pF
Reverse Transfer Capacitance		$C_{rss}$		-	50	80	pF
Output Capacitance		$C_{oss}$		-	230	300	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=2.5A</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>V_{DD}=75A</math>  <math>D.U \leq 1\%</math> (<math>Z_{out}=50\Omega</math>)         </p>	-	30	60	ns
	Turn-on Time	$t_{on}$		-	50	100	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	80	160	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=6A,$	-	11	15	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=120V$	-	5	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	6	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	5	A
Pulse Source Current	$I_{SP}$	—	-	-	20	A
Diode Forward Voltage	$V_{SD}$	$I_S=5A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=5A.$	-	350	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.3	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF622 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOSII)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

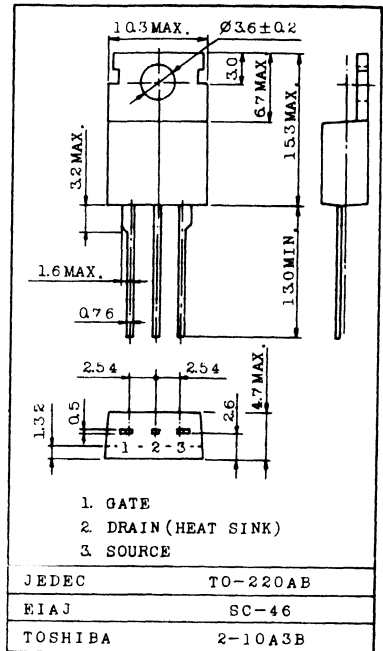
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.8\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=2.5S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	200	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	4	A
	DC( $T_c=100^\circ C$ )	$I_D$	2.5	
	Pulse	$I_{DP}$	16	
Inductive Current (Clamped)		$I_{LP}$	16	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=2.5A$	1.3	2.5	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	4	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	0.8	1.2	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	3.5	5.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	460	600	pF
Reverse Transfer Capacitance		$C_{rss}$		-	50	80	pF
Output Capacitance		$C_{oss}$		-	230	300	pF
Switching Time	Rise Time	$t_r$		-	30	60	ns
	Turn-on Time	$t_{on}$		-	50	100	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	80	160	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=6A,$	-	11	15	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=160V$	-	5	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	6	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	4	A
Pulse Source Current	$I_{SP}$	—	-	-	16	A
Diode Forward Voltage	$V_{SD}$	$I_S=4A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=5A,$	-	350	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.3	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF623 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.8\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=2.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

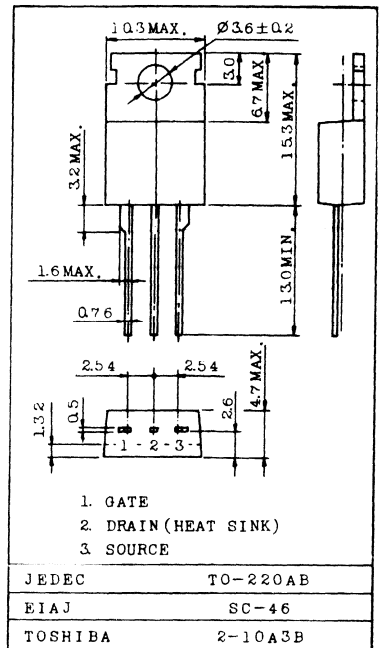
CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	4	A
	DC ( $T_c=100^\circ C$ )	$I_D$	2.5	
	Pulse	$I_{DP}$	16	
Inductive Current (Clamped)		$I_{LP}$	16	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=2.5A$	1.3	2.5	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	4	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	0.8	1.2	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	3.5	5.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	460	600	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	50	80	pF
Output Capacitance		$C_{oss}$		-	230	300	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=2.5A</math>  <math>V_{IN}</math>  <math>10\mu s</math>  <math>50\Omega</math>  <math>30\Omega</math>  <math>V_{OUT}</math>  <math>V_{DD}=75V</math> </p>	-	30	60	ns
	Turn-on Time	$t_{on}$		-	50	100	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	80	160	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=6A$	-	11	15	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=120V$	-	5	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	6	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	4	A
Pulse Source Current	$I_{SP}$	—	-	-	16	A
Diode Forward Voltage	$V_{SD}$	$I_S=4A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=5A$	-	350	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	2.3	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR Y T F 6 3 0 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

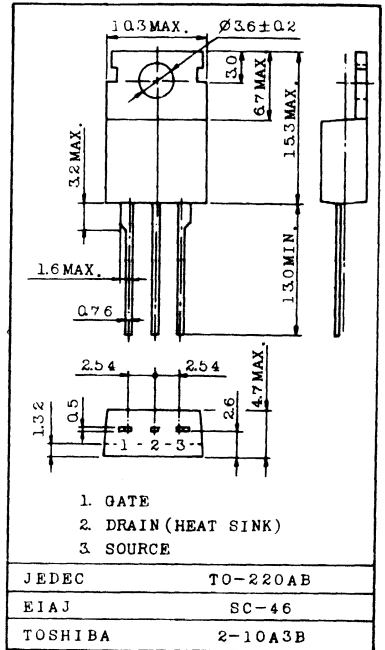
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.25\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=4.8S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	200	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	9
	DC( $T_c=100^\circ C$ )	$I_D$	6
	Pulse	$I_{DP}$	36
Inductive Current (Clamped)	$I_{LP}$	36	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	75	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	3.0	4.8	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	9	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.25	0.40	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=9A, V_{GS}=10V$	-	2.5	3.8	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	620	800	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	100	150	pF
Output Capacitance		$C_{oss}$		-	350	450	pF
Switching Time	Rise Time	$t_r$	<p><math>I_D=5A</math> <math>V_{DD}=90V</math> <math>V_{IN}: t_r, t_f &lt; 5ns</math> <math>D.U \leq 1\% (Z_{out}=15\Omega)</math></p>	-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	80	ns
	Fall Time	$t_f$		-	20	40	ns
	Turn-off Time	$t_{off}$		-	45	90	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=12A,$	-	19	30	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=160V$	-	10	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	9	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	9	A
Pulse Source Current	$I_{SP}$	—	-	-	36	A
Diode Forward Voltage	$V_{SD}$	$I_S=9A, V_{GS}=0V, T_c=25^\circ C$	-	-	3.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=9A,$	-	450	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.0	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF631 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.25\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=4.8S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

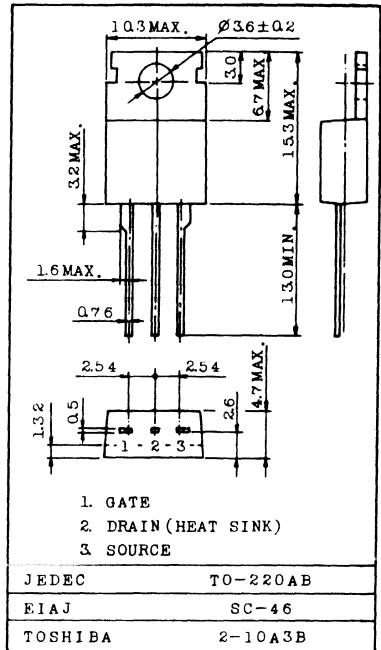
CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	9	A
	DC( $T_c=100^\circ C$ )	$I_D$	6	
	Pulse	$I_{DP}$	36	
Inductive Current (Clamped)		$I_{LP}$	36	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	75	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	3.0	4.8	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	9	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.25	0.40	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=9A, V_{GS}=10V$	-	2.5	3.8	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	620	800	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	100	150	pF
Output Capacitance		$C_{oss}$		-	350	450	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=5A</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>V_{DD}=90V</math>  <math>D.U \leq 1\%</math> (<math>Z_{out}=15\Omega</math>)         </p>	-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	80	ns
	Fall Time	$t_f$		-	20	40	ns
	Turn-off Time	$t_{off}$		-	45	90	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=12A$	-	19	30	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=120V$	-	10	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	9	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	9	A
Pulse Source Current	$I_{SP}$	—	-	-	36	A
Diode Forward Voltage	$V_{SD}$	$I_S=9A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=9A$	-	450	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.0	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF632 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOSII)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

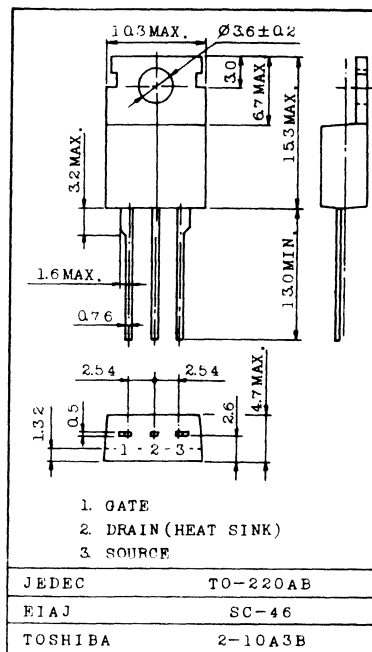
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.4\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=4.8S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	200	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	8
	DC( $T_c=100^\circ C$ )	$I_D$	5
	Pulse	$I_{DP}$	32
Inductive Current (Clamped)	$I_{LP}$	32	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	75	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	3.0	4.8	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	8	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.4	0.6	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	3.5	5.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	620	800	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	100	150	pF
Output Capacitance		$C_{oss}$		-	350	450	pF
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	80	ns
	Fall Time	$t_f$		-	20	40	ns
	Turn-off Time	$t_{off}$		-	45	90	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=12A,$	-	19	30	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=160V$	-	10	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	9	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	8	A
Pulse Source Current	$I_{SP}$	—	-	-	32	A
Diode Forward Voltage	$V_{SD}$	$I_S=8A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=9A.$	-	450	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.0	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### YTF633

#### SILICON N CHANNEL MOS TYPE

#### ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

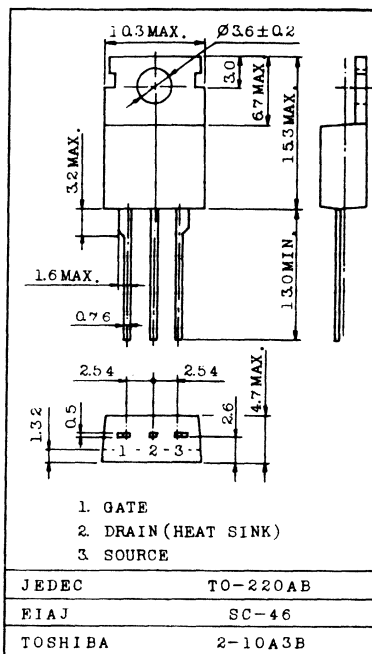
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.4\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=4.8S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	150	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	8
	DC ( $T_c=100^\circ C$ )	$I_D$	5
	Pulse	$I_{DP}$	32
Inductive Current (Clamped)	$I_{LP}$	32	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	75	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	±500	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	μA	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=5A$	3.0	4.8	-	S	
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	8	-	-	A	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	0.4	0.6	Ω	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	3.5	5.3	V	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	620	800	pF	
Reverse Transfer Capacitance	$C_{rss}$		-	100	150	pF	
Output Capacitance	$C_{oss}$		-	350	450	pF	
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	80	ns
	Fall Time	$t_f$		-	20	40	ns
	Turn-off Time	$t_{off}$		-	45	90	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{GS}=10V, I_D=12A,$	-	19	30	nC	
Gate Source Charge	$Q_{gs}$	$V_{DS}=120V$	-	10	-	nC	
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	9	-	nC	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	8	A
Pulse Source Current	$I_{SP}$	—	-	-	32	A
Diode Forward Voltage	$V_{SD}$	$I_S=8A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=9A$	-	450	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.0	-	μC





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### Y T F 6 4 0

#### SILICON N CHANNEL MOS TYPE

#### ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

#### FEATURES:

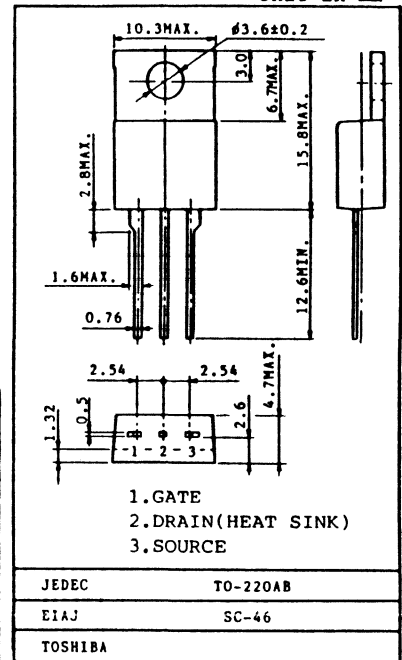
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.14\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=9.0S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	200	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	18
	DC( $T_c=100^\circ C$ )	$I_D$	11
	Pulse	$I_{DP}$	72
Inductive Current (Clamped)	$I_{LP}$	72	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	125	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=10A$	6	9	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	18	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	0.14	0.18	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=18A, V_{GS}=10V$	-	2.8	4.2	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	230	300	pF
Output Capacitance		$C_{oss}$		-	580	750	pF
Switching Time	Rise Time	$t_r$		-	30	60	ns
	Turn-on Time	$t_{on}$		-	45	90	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	70	140	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=22A,$	-	43	60	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=160V$	-	16	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	27	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	18	A
Pulse Source Current	$I_{SP}$	—	-	-	72	A
Diode Forward Voltage	$V_{SD}$	$I_S=18A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=18A,$	-	650	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.1	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### YTF641

#### SILICON-N CHANNEL MOS TYPE

#### ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

#### FEATURES:

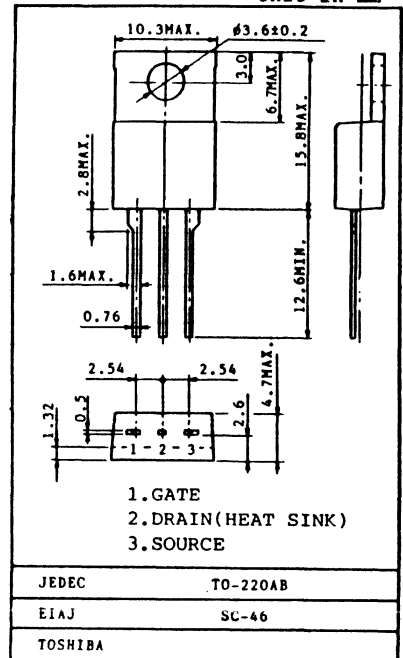
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.14\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=9.0S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	150	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	18
	DC( $T_c=100^\circ C$ )	$I_D$	11
	Pulse	$I_{DP}$	72
Inductive Current (Clamped)	$I_{LP}$	72	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	125	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



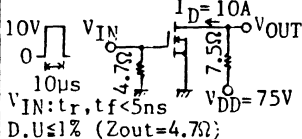
#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



### ELECTRICAL CHARACTERISTICS (T<sub>a</sub>=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
Drain Cut-off Current		I <sub>DSS</sub>	V <sub>DS</sub> =150V, V <sub>GS</sub> =0V, T <sub>c</sub> =25°C	-	-	250	μA
Drain-Source Breakdown Voltage		V <sub>(BR)DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	150	-	-	V
Gate Threshold Voltage		V <sub>th</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	-	4.0	V
Forward Transfer Admittance		Y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =10A	6	9	-	S
On-State Drain Current		I <sub>D(ON)</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =10V	18	-	-	A
Drain-Source ON Resistance		R <sub>DS(ON)</sub>	I <sub>D</sub> =10A, V <sub>GS</sub> =10V	-	0.14	0.18	Ω
Drain-Source ON Voltage		V <sub>DS(ON)</sub>	I <sub>D</sub> =18A, V <sub>GS</sub> =10V	-	2.8	4.2	V
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	-	1200	1600	pF
Reverse Transfer Capacitance		C <sub>rss</sub>		-	230	300	pF
Output Capacitance		C <sub>oss</sub>		-	580	750	pF
Switching Time	Rise Time	t <sub>r</sub>		-	30	60	ns
	Turn-on Time	t <sub>on</sub>		-	45	90	ns
	Fall Time	t <sub>f</sub>		-	30	60	ns
	Turn-off Time	t <sub>off</sub>		-	70	140	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q <sub>g</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =22A,	-	43	60	nC
Gate Source Charge		Q <sub>gs</sub>	V <sub>DS</sub> =120V	-	1.6	-	nC
Gate-Drain ("Miller") Charge		Q <sub>gd</sub>		-	27	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (T<sub>a</sub>=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	I <sub>S</sub>	—	-	-	18	A
Pulse Source Current	I <sub>SP</sub>	—	-	-	72	A
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =18A, V <sub>GS</sub> =0V, T <sub>c</sub> =25°C	-	-	2.0	V
Reverse Recovery Time	t <sub>rr</sub>	T <sub>j</sub> =150°C, I <sub>F</sub> =18A,	-	650	-	ns
Reverse Recovered Charge	Q <sub>rr</sub>	dI <sub>F</sub> /dt=100A/μs	-	4.1	-	μC



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

YTF642

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

FEATURES:

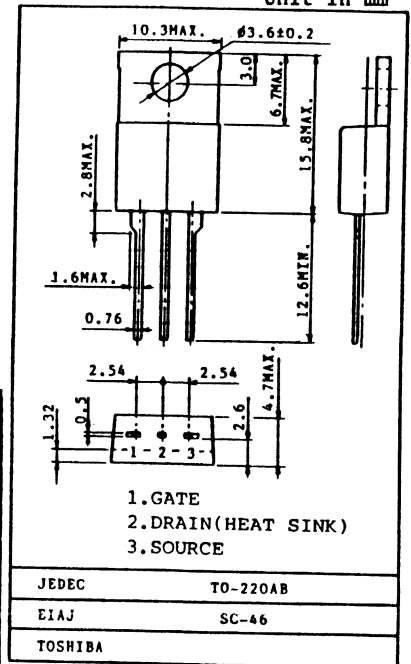
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.20\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=9.0S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	200	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	16	A
	DC( $T_c=100^\circ C$ )	$I_D$	10	
	Pulse	$I_{DP}$	64	
Inductive Current (Clamped)		$I_{LP}$	64	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

INDUSTRIAL APPLICATIONS

Unit in mm



THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=10A$	6	9	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	16	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	0.20	0.22	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=16A, V_{GS}=10V$	-	3.5	5.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	230	300	pF
Output Capacitance		$C_{oss}$		-	580	750	pF
Switching Time	Rise Time	$t_r$		-	30	60	ns
	Turn-on Time	$t_{on}$		-	45	90	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	70	140	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=22A, V_{DS}=160V$	-	43	60	nC
Gate Source Charge		$Q_{gs}$		-	16	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	27	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	16	A
Pulse Source Current	$I_{SP}$	—	-	-	64	A
Diode Forward Voltage	$V_{SD}$	$I_S=16A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.9	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=18A,$	-	650	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.1	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF643 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

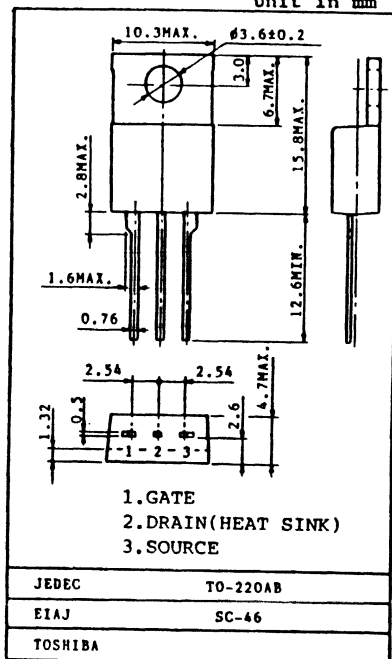
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.20\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=9.0S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	16	A
	DC( $T_c=100^\circ C$ )	$I_D$	10	
	Pulse	$I_{DP}$	64	
Inductive Current (Clamped)		$I_{LP}$	64	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=10A$	6	9	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	16	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	0.20	0.22	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=16A, V_{GS}=10V$	-	3.5	5.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	230	300	pF
Output Capacitance		$C_{oss}$		-	580	750	pF
Switching Time	Rise Time	$t_r$		-	30	60	ns
	Turn-on Time	$t_{on}$		-	45	90	ns
	Fall Time	$t_f$		-	30	60	ns
	Turn-off Time	$t_{off}$		-	70	140	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=22A,$	-	43	60	nC
Gate Source Charge		$Q_{GS}$	$V_{DS}=120V$	-	16	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	27	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	16	A
Pulse Source Current	$I_{SP}$	—	-	-	64	A
Diode Forward Voltage	$V_{SD}$	$I_S=16A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.9	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=18A,$	-	650	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.1	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### Y T F 8 2 0

#### SILICON N CHANNEL MOS TYPE

#### ( $\pi$ -MOS II)

INDUSTRIAL APPLICATIONS

Unit in mm

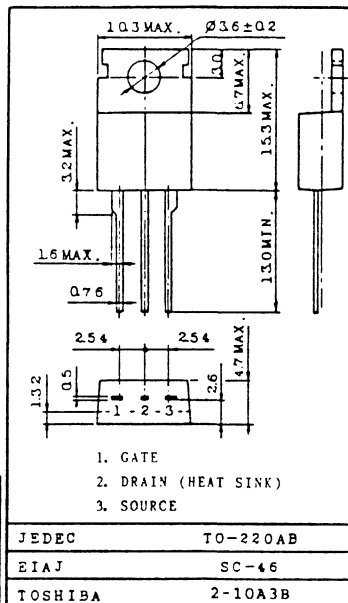
HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=2.5\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=1.75S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$  (Max.) @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )		$V_{DGR}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	2.5	A
	Pulse	$I_{DP}$	10	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

Y T F 8 2 0

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	500	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=1A$	1.0	1.75	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=1A, V_{GS}=10V$	-	2.5	3.0	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	6.9	9.1	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	300	400	pF
Reverse Transfer Capacitance		$C_{rss}$		-	30	40	
Output Capacitance		$C_{oss}$		-	120	150	
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	55	110	
	Fall Time	$t_f$		-	15	30	
	Turn-off Time	$t_{off}$		-	45	90	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=3A, V_{GS}=10V, V_{DD}=400V$	-	11	15	nC
Gate-Source Charge		$Q_{gs}$		-	5	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	6	-	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	2.5	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	10	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=2.5A, V_{GS}=0V$	-	-	1.6	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=2.5A, dI_{DR}/dt=100A/\mu s$	-	600	-	ns
Reverse Recovered Charge	$Q_{rr}$		-	3.5	-	$\mu C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
YTF821  
SILICON N CHANNEL MOS TYPE  
( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

### FEATURES:

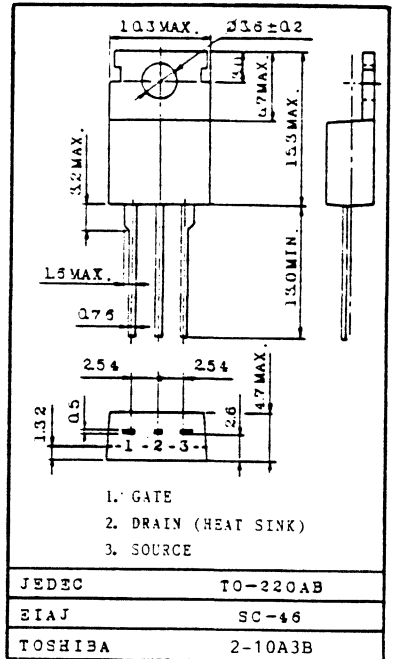
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=2.5\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=1.75S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 50nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC(Tc=25°C)	$I_D$	2.5	A
	DC(Tc=100°C)	$I_D$	1.5	
	Pulse	$I_{DP}$	10	
Inductive Current (Clamped)		$I_{LP}$	10	A
Drain Power Dissipation (Tc=25°C)		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	°C
Storage Temperature Range		$T_{stg}$	-55~150	°C

### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	°C/W
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	°C/W
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	°C

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	450	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=1A$	1.0	1.75	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	2.5	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=1A, V_{GS}=10V$	-	2.5	3.0	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	6.9	9.1	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	300	400	pF
Reverse Transfer Capacitance		$C_{rss}$		-	30	40	pF
Output Capacitance		$C_{oss}$		-	120	150	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=1A</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D \cdot U \leq 1\%</math> (<math>Z_{out}=50\Omega</math>)         </p>	-	25	50	ns
	Turn-on Time	$t_{on}$		-	55	110	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	45	90	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=3A,$	-	11	15	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=360V$	-	5	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	6	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	2.5	A
Pulse Source Current	$I_{Sp}$	—	-	-	10	A
Diode Forward Voltage	$V_{SD}$	$I_S=2.5A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.6	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=2.5A,$	-	600	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.5	-	nC



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR Y T F 8 2 2 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

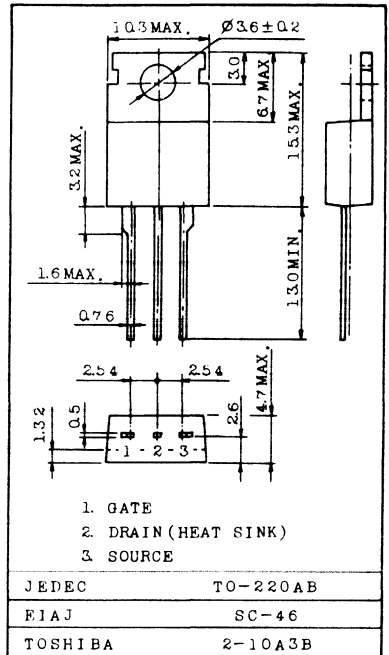
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=3.0\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=1.75S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	500	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	?
	DC( $T_c=100^\circ C$ )	$I_D$	1
	Pulse	$I_{DP}$	8
Inductive Current (Clamped)	$I_{LP}$	8	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	40	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



1. GATE
2. DRAIN (HEAT SINK)
3. SOURCE

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	500	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=1A$	1.0	1.75	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	2.0	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=1A, V_{GS}=10V$	-	3.0	4.0	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=2A, V_{GS}=10V$	-	6.6	9.4	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	300	400	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	30	40	pF
Output Capacitance		$C_{oss}$		-	120	150	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=1A</math>  <math>V_{IN}</math>  <math>10\mu s</math>  <math>50\Omega</math>  <math>250\Omega</math>  <math>V_{DD}=250V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D.U \leq 1\%</math> (<math>Z_{out}=50\Omega</math>)         </p>	-	25	50	ns
	Turn-on Time	$t_{on}$		-	55	110	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	45	90	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=3A,$	-	11	15	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=400V$	-	5	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	6	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	2	A
Pulse Source Current	$I_{SP}$	—	-	-	8	A
Diode Forward Voltage	$V_{SD}$	$I_S=2A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.5	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=2.5A,$	-	600	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.5	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### Y T F 8 2 3

#### SILICON N CHANNEL MOS TYPE

#### ( $\pi$ -MOS II)

**HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.**

**CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.**

**FEATURES:**

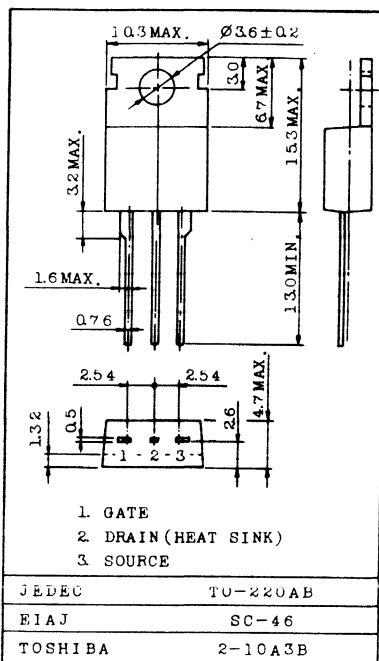
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=3.0\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=1.75S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

**MAXIMUM RATINGS (Ta=25°C)**

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC(Tc=25°C)	$I_D$	2	A
	DC(Tc=100°C)	$I_D$	1	
	Pulse	$I_{DP}$	8	
Inductive Current (Clamped)		$I_{LP}$	8	A
Drain Power Dissipation (Tc=25°C)		$P_D$	40	W
Channel Temperature		$T_{ch}$	150	°C
Storage Temperature Range		$T_{stg}$	-55~150	°C

**INDUSTRIAL APPLICATIONS**

Unit in mm



Weight : 1.9g

**THERMAL CHARACTERISTICS**

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	3.12	°C/W
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	°C/W
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	°C

**TOSHIBA CORPORATION**



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	450	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=1A$	1.0	1.75	-	S	
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	2.0	-	-	A	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=1A, V_{GS}=10V$	-	3.0	4.0	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=2A, V_{GS}=10V$	-	6.6	9.4	V	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	300	400	pF	
Reverse Transfer Capacitance	$C_{rSS}$		-	30	40	pF	
Output Capacitance	$C_{oss}$		-	120	150	pF	
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	55	110	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	45	90	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{GS}=10V, I_D=3A,$	-	11	15	nC	
Gate Source Charge	$Q_{gs}$	$V_{DS}=360V$	-	5	-	nC	
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	6	-	nC	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	2	A
Pulse Source Current	$I_{SP}$	—	-	-	8	A
Diode Forward Voltage	$V_{SD}$	$I_S=2A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.5	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=2.5A,$	-	600	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	3.5	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

YTF830

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

### FEATURES:

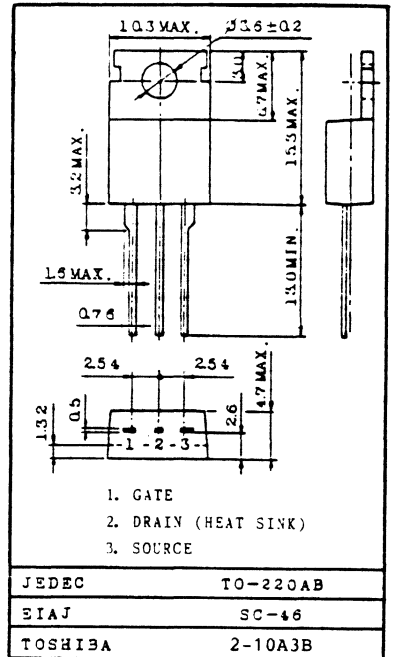
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=1.3\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=3.25S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 50nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	4.5	A
	DC( $T_c=100^\circ C$ )	$I_D$	3	
	Pulse	$I_{DP}$	18	
Inductive Current (Clamped)		$I_{LP}$	18	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	75	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	500	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=2.5A$	2.5	3.25	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	4.5	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	1.3	1.5	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=4.5A, V_{GS}=10V$	-	6.4	8.7	V
Input Capacitance		$C_{iss}$		-	600	800	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	40	60	pF
Output Capacitance		$C_{oss}$		-	150	200	pF
Switching Time	Rise Time	$t_r$	<p><math>I_D=2.5A</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>V_{DD}=225V</math>  <math>D.U \le 1\%</math> (<math>Z_{out}=15\Omega</math>)</p>	-	15	30	ns
	Turn-on Time	$t_{on}$		-	30	60	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	40	85	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=6A,$	-	22	30	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=400V$	-	11	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	11	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	4.5	A
Pulse Source Current	$I_{SP}$	—	-	-	18	A
Diode Forward Voltage	$V_{SD}$	$I_S=4.5A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.6	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=4.5A,$	-	800	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.6	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

YTF831

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

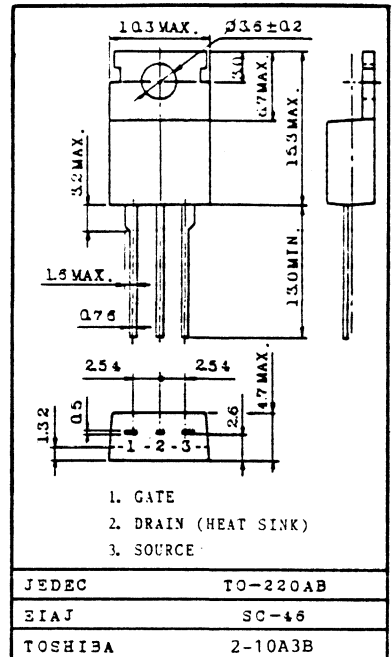
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=1.3\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=3.25S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 50nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	4.5	A
	DC( $T_c=100^\circ C$ )	$I_D$	3	
	Pulse	$I_{DP}$	18	
Inductive Current (Clamped)		$I_{LP}$	18	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	75	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	450	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=2.5A$	2.5	3.25	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	4.5	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	1.3	1.5	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=4.5A, V_{GS}=10V$	-	6.4	8.7	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	600	800	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	40	60	pF
Output Capacitance		$C_{oss}$		-	150	200	pF
Switching Time	Rise Time	$t_r$		-	15	30	ns
	Turn-on Time	$t_{on}$		-	30	60	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	40	85	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=6A.$	-	22	30	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=360V$	-	11	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	11	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	4.5	A
Pulse Source Current	$I_{SP}$	—	-	-	18	A
Diode Forward Voltage	$V_{SD}$	$I_S=4.5A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.6	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=4.5A.$	-	800	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.6	-	nC



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR YTF832 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

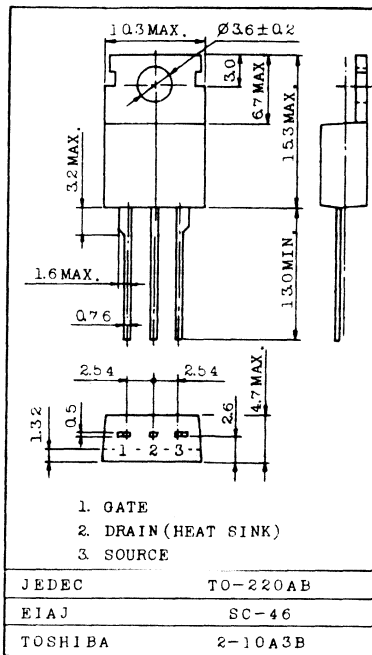
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=1.5\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=3.25S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA(Max.)$  @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A(Max.)$  @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	4	A
	DC ( $T_c=100^\circ C$ )	$I_D$	2.5	
	Pulse	$I_{DP}$	16	
Inductive Current (Clamped)		$I_{LP}$	16	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	75	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weiget : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	500	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=2.5A$	2.5	3.25	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	4	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	1.5	2.0	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=4.5A, V_{GS}=10V$	-	7.4	9.4	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	600	800	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	40	60	pF
Output Capacitance		$C_{oss}$		-	150	200	pF
Switching Time	Rise Time	$t_r$		-	15	30	ns
	Turn-on Time	$t_{on}$		-	30	60	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	40	85	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=6A,$	-	22	30	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=400V$	-	11	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	11	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	4	A
Pulse Source Current	$I_{SP}$	—	-	-	16	A
Diode Forward Voltage	$V_{SD}$	$I_S=4A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.5	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=4.5A,$	-	800	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.6	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

Y T F 8 3 3  
SILICON N CHANNEL MOS TYPE  
( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

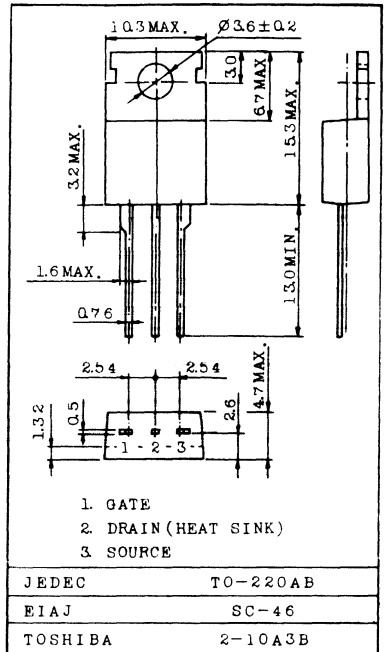
- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 1.5\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 3.25S$  (Typ.)
- Low Leakage Current :  $I_{GSS} = \pm 500nA$  (Max.) @  $V_{GS} = \pm 20V$   
 $I_{DSS} = 250\mu A$  (Max.) @  $V_{DS} = 450V$
- Enhancement-Mode :  $V_{th} = 2.0 \sim 4.0V$  @  $V_{DS} = V_{GS}, I_D = 250\mu A$

#### MAXIMUM RATINGS ( $T_a = 25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS} = 1M\Omega$ )	$V_{DGR}$	450	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c = 25^\circ C$ )	$I_D$	4
	DC ( $T_c = 100^\circ C$ )	$I_D$	2.5
	Pulse	$I_{DP}$	16
Inductive Current (Clamped)	$I_{LP}$	16	A
Drain Power Dissipation ( $T_c = 25^\circ C$ )	$P_D$	75	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55 \sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.67	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	450	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=2.5A$	2.5	3.25	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	4	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=2.5A, V_{GS}=10V$	-	1.5	2.0	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=4.5A, V_{GS}=10V$	-	7.4	9.4	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	600	800	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	40	60	pF
Output Capacitance		$C_{oss}$		-	150	200	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=2.5A</math>  <math>V_{IN}</math>  <math>V_{OUT}</math>  <math>10V</math>  <math>0</math>  <math>10\mu s</math>  <math>15\Omega</math>  <math>90\Omega</math>  <math>V_{DD}=225V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\% (Z_{out}=15\Omega)</math> </p>	-	15	30	ns
	Turn-on Time	$t_{on}$		-	30	60	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	40	85	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=6A,$ $V_{DS}=360V$	-	22	30	nC
Gate Source Charge		$Q_{GS}$		-	11	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	11	-	nC

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	4	A
Pulse Source Current	$I_{SP}$	—	-	-	16	A
Diode Forward Voltage	$V_{SD}$	$I_S=4A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.5	V
Reverse Recovery Time	$t_{rr}$	$T_J=150^\circ C, I_F=4.5A,$	-	800	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.6	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

YTF840

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

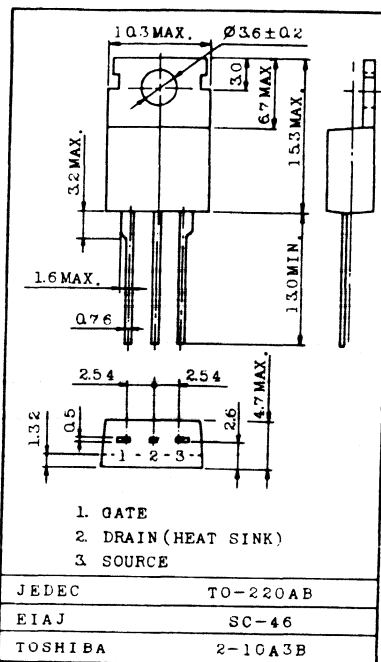
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.8\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=6.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	8	A
	DC( $T_c=100^\circ C$ )	$I_D$	5	
	Pulse	$I_{DP}$	32	
Inductive Current (Clamped)		$I_{LP}$	32	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

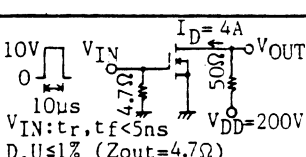
CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

## ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA	
Drain Cut-off Current	I <sub>DSS</sub>	V <sub>DS</sub> =500V, V <sub>GS</sub> =0V, T <sub>c</sub> =25°C	-	-	250	μA	
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	500	-	-	V	
Gate Threshold Voltage	V <sub>th</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	-	4.0	V	
Forward Transfer Admittance	Y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =4A	4	6.5	-	S	
On-State Drain Current	I <sub>D(ON)</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =10V	8	-	-	A	
Drain-Source ON Resistance	R <sub>DS(ON)</sub>	I <sub>D</sub> =4A, V <sub>GS</sub> =10V	-	0.8	0.85	Ω	
Drain-Source ON Voltage	V <sub>DS(ON)</sub>	I <sub>D</sub> =8A, V <sub>GS</sub> =10V	-	7.0	8.6	V	
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	-	1200	1600	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	60	150	pF	
Output Capacitance	C <sub>oss</sub>		-	250	350	pF	
Switching Time	Rise Time	t <sub>r</sub>		-	7	15	ns
	Turn-on Time	t <sub>on</sub>		-	25	50	ns
	Fall Time	t <sub>f</sub>		-	15	30	ns
	Turn-off Time	t <sub>off</sub>		-	60	120	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q <sub>g</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =10A.	-	42	60	nC	
Gate Source Charge	Q <sub>gs</sub>	V <sub>DS</sub> =400V	-	20	-	nC	
Gate-Drain ("Miller") Charge	Q <sub>gd</sub>		-	22	-	nC	

## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	I <sub>S</sub>	—	-	-	8	A
Pulse Source Current	I <sub>SP</sub>	—	-	-	32	A
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =8A, V <sub>GS</sub> =0V, T <sub>c</sub> =25°C	-	-	2.0	V
Reverse Recovery Time	t <sub>rr</sub>	T <sub>j</sub> =150°C, I <sub>F</sub> =8A,	-	1100	-	ns
Reverse Recovered Charge	Q <sub>rr</sub>	dI <sub>F</sub> /dt=100A/μs	-	6.4	-	μC



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### YTF841

#### SILICON N CHANNEL MOS TYPE

#### ( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

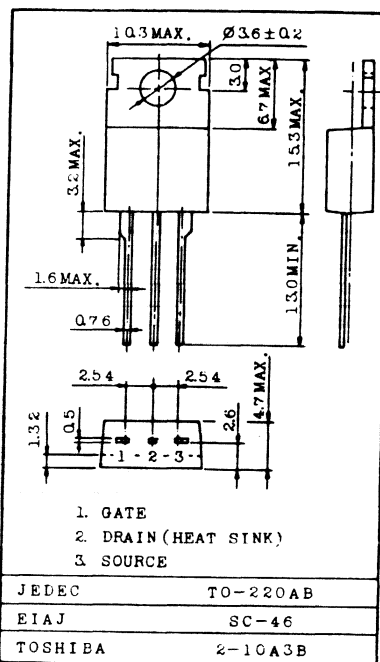
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.8\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=6.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	8	A
	DC ( $T_c=100^\circ C$ )	$I_D$	5	
	Pulse	$I_{DP}$	32	
Inductive Current (Clamped)		$I_{LP}$	32	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	450	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=4A$	4	6.5	-	S	
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	8	-	-	A	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	0.8	0.85	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=8A, V_{GS}=10V$	-	7.0	8.6	V	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF	
Reverse Transfer Capacitance	$C_{rss}$		-	60	150	pF	
Output Capacitance	$C_{oss}$		-	250	350	pF	
Switching Time	Rise Time	$t_r$		-	7	15	ns
	Turn-on Time	$t_{on}$		-	25	50	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	60	120	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{GS}=10V, I_D=10A,$	-	42	60	nC	
Gate Source Charge	$Q_{gs}$	$V_{DS}=360V$	-	20	-	nC	
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	22	-	nC	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	8	A
Pulse Source Current	$I_{SP}$	—	-	-	32	A
Diode Forward Voltage	$V_{SD}$	$I_S=8A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=8A,$	-	1100	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	6.4	-	nC



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

YTF842

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

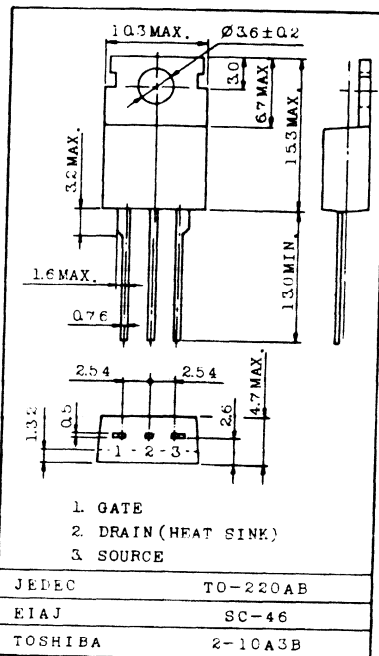
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=1.0\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=6.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	7	A
	DC( $T_c=100^\circ C$ )	$I_D$	4	
	Pulse	$I_{DP}$	28	
Inductive Current (Clamped)		$I_{LP}$	28	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	500	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=4A$	4.0	6.5	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	7	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	1.0	1.1	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	7.7	9.4	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	60	150	pF
Output Capacitance		$C_{oss}$		-	250	350	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=4A</math>  <math>V_{IN}</math>  <math>V_{OUT}</math>  <math>10\mu s</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D.U \le 1\%</math> (<math>Z_{out}=4.7\Omega</math>)  <math>V_{DD}=200V</math> </p>	-	7	15	ns
	Turn-on Time	$t_{on}$		-	25	50	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	60	120	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=10A,$	-	42	60	nC
Gate Source Charge		$Q_{gs}$	$V_{DS}=400V$	-	20	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	22	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	7	A
Pulse Source Current	$I_{SP}$	—	-	-	28	A
Diode Forward Voltage	$V_{SD}$	$I_S=7A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.9	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_p=8A,$	-	1100	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_p/dt=100A/\mu s$	-	6.4	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

YTF843

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

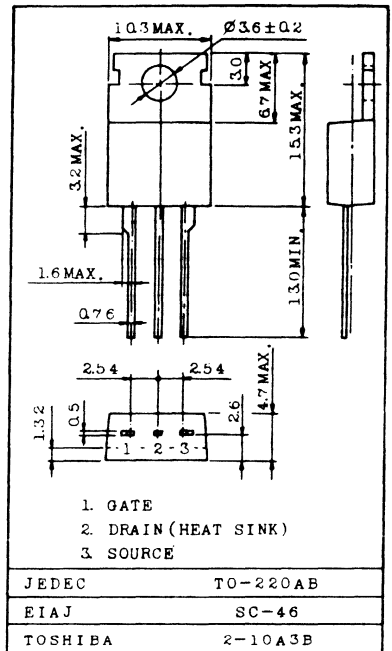
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=1.0\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=6.5S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	7	A
	DC( $T_c=100^\circ C$ )	$I_D$	4	
	Pulse	$I_{DP}$	28	
Inductive Current (Clamped)		$I_{LP}$	28	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	125	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 1.9g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.0	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	80	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



## TECHNICAL DATA

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	450	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=4A$	4.0	6.5	-	S	
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	7	-	-	A	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=4A, V_{GS}=10V$	-	1.0	1.1	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	7.7	9.4	V	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1200	1600	pF	
Reverse Transfer Capacitance	$C_{rSS}$		-	60	150	pF	
Output Capacitance	$C_{oss}$		-	250	350	pF	
Switching Time	Rise Time	$t_r$		-	7	15	ns
	Turn-on Time	$t_{on}$		-	25	50	ns
	Fall Time	$t_f$		-	15	30	ns
	Turn-off Time	$t_{off}$		-	60	120	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{GS}=10V, I_D=10A,$	-	42	60	nC	
Gate Source Charge	$Q_{gs}$	$V_{DS}=360V$	-	20	-	nC	
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	22	-	nC	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	7	A
Pulse Source Current	$I_{SP}$	—	-	-	28	A
Diode Forward Voltage	$V_{SD}$	$I_S=7A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.9	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=8A,$	-	1100	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	6.4	-	$\mu C$





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### Y T F P 1 5 0

#### SILICON N CHANNEL MOS TYPE

#### ( $\pi$ -MOS I)

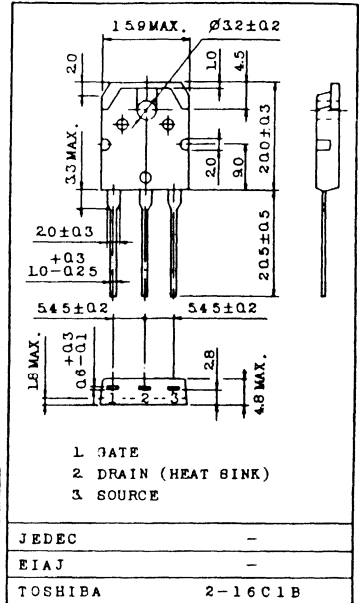
INDUSTRIAL APPLICATIONS

Unit in mm

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.045\Omega$ (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$  (Max.) @  $V_{DS}=100V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$



Weight : 4.6g

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	100	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )	$V_{DGR}$	100	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	40
	Pulse	$I_{DP}$	160
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



# SEMICONDUCTOR

## TECHNICAL DATA

Y T F P 1 5 0

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	100	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=20A$	9.0	11	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=20A, V_{GS}=10V$	-	0.045	0.055	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=40A, V_{GS}=10V$	-	2.0	3.0	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1700	3000	pF
Reverse Transfer Capacitance		$C_{rss}$		-	180	500	
Output Capacitance		$C_{oss}$		-	850	1500	
Switching Time	Rise Time	$t_r$	<p><math>I_D=20A</math>  <math>V_{IN}</math>  <math>10V</math>  <math>0</math>  <math>10\mu s</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>Duty \leq 1\%</math>  <math>V_{DD} \approx 24V</math></p>	-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	
	Fall Time	$t_f$		-	50	100	
	Turn-off Time	$t_{off}$		-	110	225	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=50A, V_{GS}=10V$ $V_{DD} \approx 80V$	-	63	120	nC
Gate-Source Charge		$Q_{gs}$		-	27	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	36	-	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	40	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	160	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=40A, V_{GS}=0V$	-	-	2.5	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=40A$	-	600	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	3.3	-	$\mu C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### Y T F P 1 5 1

#### SILICON N CHANNEL MOS TYPE

#### ( $\pi$ -MOS I)

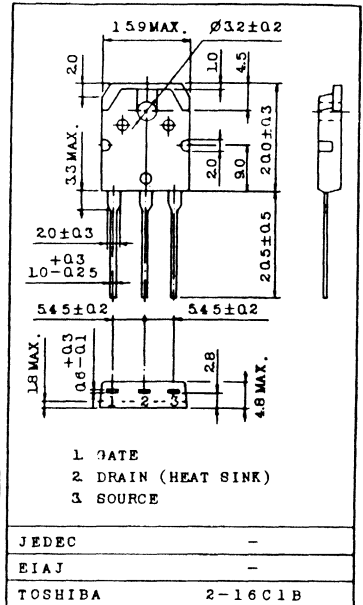
INDUSTRIAL APPLICATIONS

Unit in mm

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.045\Omega$ (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$  (Max.) @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$



Weight : 4.6g

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	60	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )	$V_{DGR}$	60	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	40
	Pulse	$I_{DP}$	160
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

Y T F P 1 5 1

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	60	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=20A$	9.0	11	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=20A, V_{GS}=10V$	-	0.045	0.055	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=40A, V_{GS}=10V$	-	2.0	3.0	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1700	3000	pF
Reverse Transfer Capacitance		$C_{rss}$		-	180	500	
Output Capacitance		$C_{oss}$		-	850	1500	
Switching Time	Rise Time	$t_r$		-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	
	Fall Time	$t_f$		-	50	100	
	Turn-off Time	$t_{off}$		-	110	225	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=50A, V_{GS}=10V, V_{DD}=48V$	-	63	120	nC
Gate-Source Charge		$Q_{gs}$		-	27	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	36	-	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	40	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	160	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=40A, V_{GS}=0V$	-	-	2.5	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=40A$	-	600	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	3.3	-	$\mu C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### Y T F P 1 5 2

#### SILICON N CHANNEL MOS TYPE

#### ( $\pi$ -MOS I)

INDUSTRIAL APPLICATIONS

Unit in mm

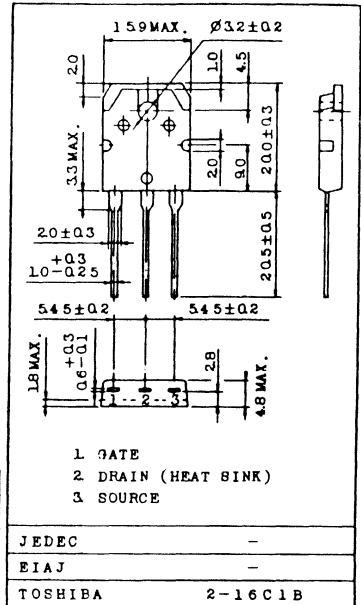
HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.06\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$  (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$  (Max.) @  $V_{DS}=100V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	100	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )		$V_{DGR}$	100	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	33	A
	Pulse	$I_{DP}$	132	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$



Weight : 4.6g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

Y T F P 1 5 2

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	100	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=20A$	9.0	11	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=20A, V_{GS}=10V$	-	0.06	0.08	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=33A, V_{GS}=10V$	-	2.2	3.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1700	3000	pF
Reverse Transfer Capacitance		$C_{rss}$		-	180	500	
Output Capacitance		$C_{oss}$		-	850	1500	
Switching Time	Rise Time	$t_r$	<p><math>I_D=20A</math>  <math>V_{IN}</math>  <math>10V</math>  <math>0</math>  <math>10\mu s</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>Duty \leq 1\%</math>  <math>V_{DD}=24V</math></p>	-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	
	Fall Time	$t_f$		-	50	100	
	Turn-off Time	$t_{off}$		-	110	225	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=50A, V_{GS}=10V$ $V_{DD}=80V$	-	63	120	nC
Gate-Source Charge		$Q_{gs}$		-	27	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	36	-	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	33	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	132	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=33A, V_{GS}=0V$	-	-	2.3	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=33A$	-	600	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	3.3	-	$\mu C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### Y T F P 1 5 3

#### SILICON N CHANNEL MOS TYPE

#### (7-MOS1)

INDUSTRIAL APPLICATIONS

Unit in mm

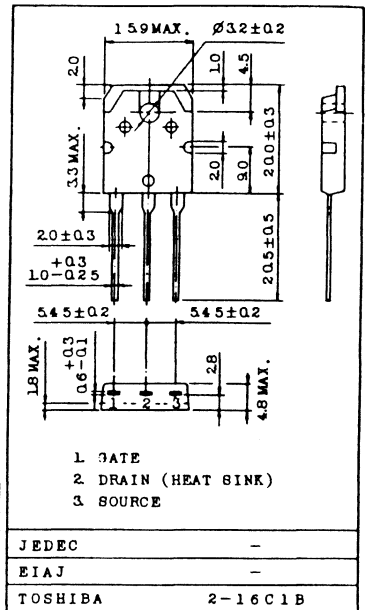
HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.06\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$  (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$  (Max.) @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	60	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )		$V_{DGR}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	33	A
	Pulse	$I_{DP}$	132	
Drain Power Dissipation (Tc=25°C)		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	°C
Storage Temperature Range		$T_{stg}$	-55~150	°C



Weight : 4.6g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	°C/W
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	°C/W
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	°C



# SEMICONDUCTOR

## TECHNICAL DATA

Y T F P 1 5 3

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	60	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=20A$	9.0	11	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=20A, V_{GS}=10V$	-	0.06	0.08	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=33A, V_{GS}=10V$	-	2.2	3.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	1700	3000	pF
Reverse Transfer Capacitance		$C_{rss}$		-	180	500	
Output Capacitance		$C_{oss}$		-	850	1500	
Switching Time	Rise Time	$t_r$		-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	
	Fall Time	$t_f$		-	50	100	
	Turn-off Time	$t_{off}$		-	110	225	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=50A, V_{GS}=10V, V_{DD}=48V$	-	63	120	nC
Gate-Source Charge		$Q_{gs}$		-	27	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	36	-	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	33	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	132	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=33A, V_{GS}=0V$	-	-	2.3	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=33A$	-	600	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	3.3	-	$\mu C$

TOSHIBA CORPORATION





# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
 YTFP250  
 SILICON N CHANNEL MOS TYPE  
 (N-MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

### FEATURES:

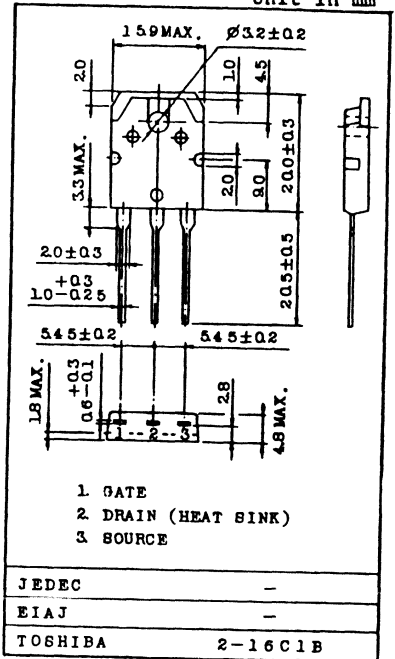
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.07\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=14S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	200	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	30	A
	DC ( $T_c=100^\circ C$ )	$I_D$	19	
	Pulse	$I_{DP}$	120	
Inductive Current (Clamped)		$I_{LP}$	120	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

### INDUSTRIAL APPLICATIONS

Unit in mm



### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



# SEMICONDUCTOR

## TECHNICAL DATA

Y T F P 2 5 0

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, I_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=16A$	8	14	-	S
On-State Drain Current		$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	30	-	-	A
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=16A, V_{GS}=10V$	-	0.070	0.085	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=30A, V_{GS}=10V$	-	2.3	3.5	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2300	3000	pF
Reverse Transfer Capacitance		$C_{rss}$		-	390	500	pF
Output Capacitance		$C_{oss}$		-	920	1200	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=16A, V_{DD}=95V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\%</math> (<math>Z_{out}=4.7\Omega</math>)         </p>	-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	ns
	Fall Time	$t_f$		-	50	100	ns
	Turn-off Time	$t_{off}$		-	110	225	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{GS}=10V, I_D=38A,$	-	79	120	nC
Gate Source Charge		$Q_{GS}$	$V_{DS}=160V$	-	37	-	nC
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	42	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	30	A
Pulse Source Current	$I_{SP}$	—	-	-	120	A
Diode Forward Voltage	$V_{SD}$	$I_S=30A, V_{GS}=0V, T_c=25^\circ C$	-	-	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=30A,$	-	750	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.7	-	$\mu C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR  
 YTFP251  
 SILICON N CHANNEL MOS TYPE  
 (N-MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

### FEATURES:

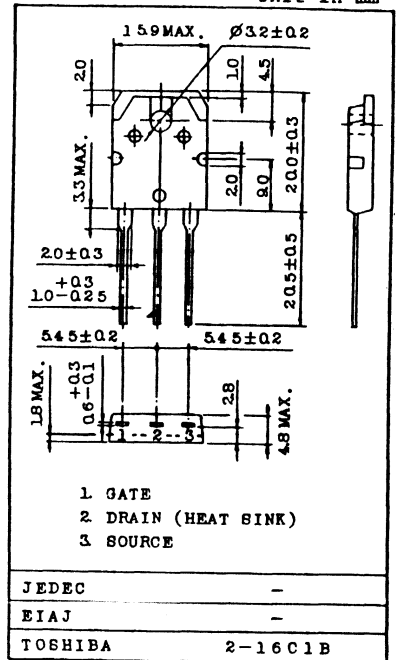
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.07\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=14S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )	$V_{DGR}$	150	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC ( $T_c=25^\circ C$ )	$I_D$	30
	DC ( $T_c=100^\circ C$ )	$I_D$	19
	Pulse	$I_{DP}$	120
Inductive Current (Clamped)	$I_{LP}$	120	A
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	150	W
Channel Temperature	$T_{ch}$	150	°C
Storage Temperature Range	$T_{stg}$	-55~150	°C

### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 4.6g

### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	°C/W
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	°C/W
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_l$	300	°C

TOSHIBA CORPORATION



### ELECTRICAL CHARACTERISTICS (T<sub>a</sub>=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
Drain Cut-off Current		I <sub>DSS</sub>	V <sub>DS</sub> =150V, V <sub>GS</sub> =0V, T <sub>c</sub> =25°C	-	-	250	μA
Drain-Source Breakdown Voltage		V <sub>(BR)DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	150	-	-	V
Gate Threshold Voltage		V <sub>th</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	-	4.0	V
Forward Transfer Admittance		y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =16A	8	14	-	S
On-State Drain Current		I <sub>D(ON)</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =10V	30	-	-	A
Drain-Source ON Resistance		R <sub>DS(ON)</sub>	I <sub>D</sub> =16A, V <sub>GS</sub> =10V	-	0.070	0.085	Ω
Drain-Source ON Voltage		V <sub>DS(ON)</sub>	I <sub>D</sub> =30A, V <sub>GS</sub> =10V	-	2.3	3.5	V
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	-	2300	3000	pF
Reverse Transfer Capacitance		C <sub>rss</sub>		-	390	500	pF
Output Capacitance		C <sub>oss</sub>		-	920	1200	pF
Switching Time	Rise Time	t <sub>r</sub>		-	50	100	ns
	Turn-on Time	t <sub>on</sub>		-	65	135	ns
	Fall Time	t <sub>f</sub>		-	50	100	ns
	Turn-off Time	t <sub>off</sub>		-	110	225	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q <sub>g</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =38A,	-	79	120	nC
Gate Source Charge		Q <sub>gs</sub>	V <sub>DS</sub> =120V	-	37	-	nC
Gate-Drain ("Miller") Charge		Q <sub>gd</sub>		-	42	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (T<sub>a</sub>=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	I <sub>S</sub>	—	-	-	30	A
Pulse Source Current	I <sub>SP</sub>	—	-	-	120	A
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =30A, V <sub>GS</sub> =0V, T <sub>c</sub> =25°C	-	-	2.0	V
Reverse Recovery Time	t <sub>rr</sub>	T <sub>j</sub> =150°C, I <sub>F</sub> =30A,	-	750	-	ns
Reverse Recovered Charge	Q <sub>rr</sub>	dI <sub>F</sub> /dt=100A/μs	-	4.7	-	μC



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

Y T F P 2 5 2

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

### FEATURES:

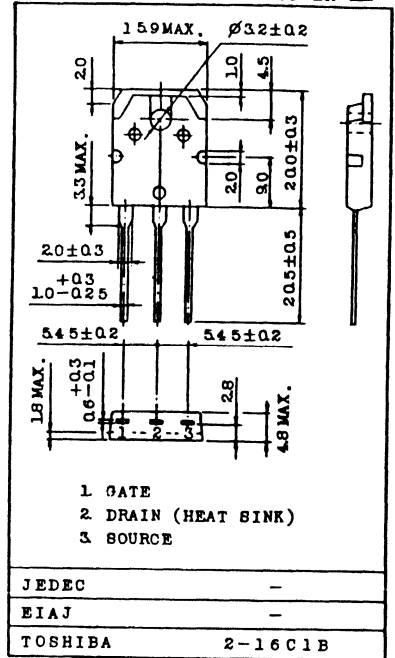
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.09\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=14S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=200V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	200	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	200	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	25	A
	DC( $T_c=100^\circ C$ )	$I_D$	16	
	Pulse	$I_{DP}$	100	
Inductive Current (Clamped)		$I_{LP}$	100	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

### INDUSTRIAL APPLICATIONS

Unit in mm



### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

Y T F P 2 5 2

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=200V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=16A$	8	14	-	S	
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	25	-	-	A	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=16A, V_{GS}=10V$	-	0.09	0.12	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=25A, V_{GS}=10V$	-	2.5	3.8	V	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2300	3000	pF	
Reverse Transfer Capacitance	$C_{rSS}$		-	390	500	pF	
Output Capacitance	$C_{oss}$		-	920	1200	pF	
Switching Time	Rise Time	$t_r$	<p><math>I_D=16A, V_{DD}=95V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D, U \leq 1\% (Z_{out}=4.7\Omega)</math></p>	-	50	100	ns
	Turn-on Time	$t_{on}$		-	65	135	ns
	Fall Time	$t_f$		-	50	100	ns
	Turn-off Time	$t_{off}$		-	110	225	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{GS}=10V, I_D=38A,$	-	79	120	nC	
Gate Source Charge	$Q_{gs}$	$V_{DS}=160V$	-	39	-	nC	
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	42	-	nC	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	25	A
Pulse Source Current	$I_{SP}$	—	-	-	100	A
Diode Forward Voltage	$V_{SD}$	$I_S=25A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=30A,$	-	750	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.7	-	$\mu C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

Y T F P 2 5 3

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS II)

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS.

#### FEATURES:

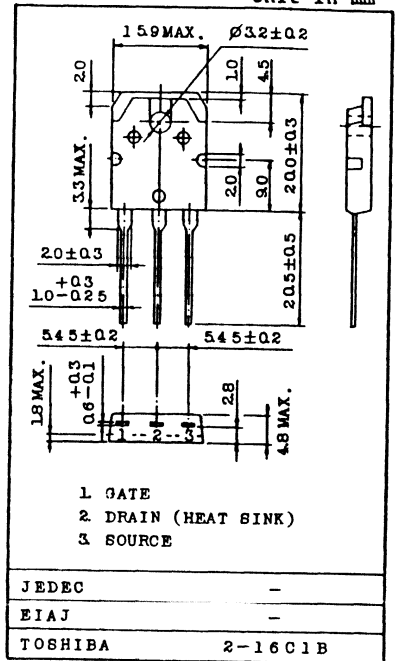
- . Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.09\Omega$  (Typ.)
- . High Forward Transfer Admittance :  $|Y_{fs}|=14S$  (Typ.)
- . Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$ (Max.) @  $V_{DS}=150V$
- . Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	150	V
Drain-Gate Voltage ( $R_{GS}=1M\Omega$ )		$V_{DGR}$	150	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC( $T_c=25^\circ C$ )	$I_D$	25	A
	DC( $T_c=100^\circ C$ )	$I_D$	16	
	Pulse	$I_{DP}$	100	
Inductive Current (Clamped)		$I_{LP}$	100	A
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$

#### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 4.6g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	30	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

Y T F P 2 5 3

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V, T_c=25^\circ C$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	150	-	-	V
Gate Threshold Voltage	$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=16A$	8	14	-	S
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	25	-	-	A
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=16A, V_{GS}=10V$	-	0.09	0.12	$\Omega$
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=25A, V_{GS}=10V$	-	2.5	3.8	V
Input Capacitance	$C_{iss}$	<p><math>V_{DS}=25V, V_{GS}=0V, f=1MHz</math></p>	-	2300	3000	pF
Reverse Transfer Capacitance	$C_{rss}$		-	390	500	pF
Output Capacitance	$C_{oss}$		-	920	1200	pF
Switching Time	Rise Time	$t_r$	-	50	100	ns
	Turn-on Time	$t_{on}$	-	65	135	ns
	Fall Time	$t_f$	-	50	100	ns
	Turn-off Time	$t_{off}$	-	110	225	ns
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{GS}=10V, I_D=38A,$ $V_{DS}=120V$	-	79	120	nC
Gate Source Charge	$Q_{gs}$		-	37	-	nC
Gate-Drain ("Miller") Charge	$Q_{gd}$		-	42	-	nC

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Source Current	$I_S$	—	-	-	25	A
Pulse Source Current	$I_{SP}$	—	-	-	100	A
Diode Forward Voltage	$V_{SD}$	$I_S=25A, V_{GS}=0V, T_c=25^\circ C$	-	-	1.8	V
Reverse Recovery Time	$t_{rr}$	$T_j=150^\circ C, I_F=30A,$	-	750	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_F/dt=100A/\mu s$	-	4.7	-	$\mu C$

TOSHIBA CORPORATION





# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### Y T F P 4 5 0

#### SILICON N CHANNEL MOS TYPE

#### (7-MOS I)

INDUSTRIAL APPLICATIONS

Unit in mm

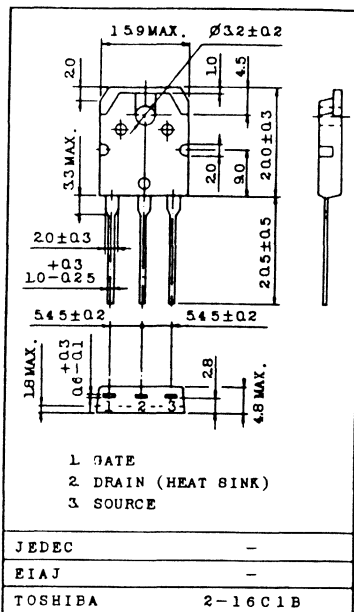
HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.3\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$  (Max.) @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )		$V_{DGR}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	13	A
	Pulse	$I_{DP}$	52	
Drain Power Dissipation (Tc=25°C)		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	°C
Storage Temperature Range		$T_{stg}$	-55~150	°C



TOSHIBA 2-16C1B  
 Weight : 4.6g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	°C/W
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	°C/W
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	°C



# SEMICONDUCTOR

## TECHNICAL DATA

Y T F P 4 5 0

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	500	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=7A$	6.0	11	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	0.3	0.4	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=13A, V_{GS}=10V$	-	4.3	6.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2000	3000	pF
Reverse Transfer Capacitance		$C_{rss}$		-	100	200	
Output Capacitance		$C_{oss}$		-	370	600	
Switching Time	Rise Time	$t_r$	<p> <math>I_D=7A</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>Duty \leq 1\%</math>  <math>V_{DD}=210V</math> </p>	-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	85	
	Fall Time	$t_f$		-	35	70	
	Turn-off Time	$t_{off}$		-	110	220	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=16A, V_{GS}=10V$ $V_{DD}=400V$	-	82	120	nC
Gate-Source Charge		$Q_{gs}$		-	40	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	42	-	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	13	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	52	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=13A, V_{GS}=0V$	-	-	1.4	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=13A$	-	1300	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	7.4	-	$\mu C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### Y T F P 4 5 1

#### SILICON N CHANNEL MOS TYPE

#### ( $\pi$ -MOS I)

INDUSTRIAL APPLICATIONS

Unit in mm

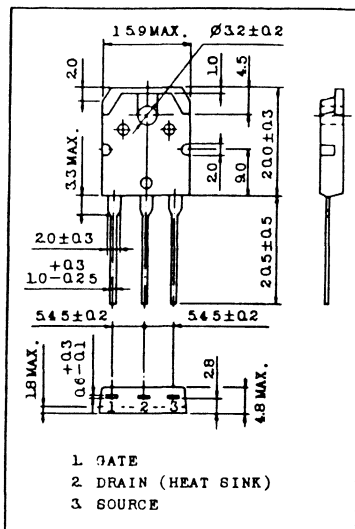
HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS,  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.3\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$  (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$  (Max.) @  $V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	13	A
	Pulse	$I_{DP}$	52	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$



JEDEC	-
EIAJ	-
TOSHIBA	2-16C1B

Weight : 4.6g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	450	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=7A$	6.0	11	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	0.3	0.4	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=13A, V_{GS}=10V$	-	4.3	6.3	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2000	3000	pF
Reverse Transfer Capacitance		$C_{rSS}$		-	100	200	
Output Capacitance		$C_{oss}$		-	370	600	
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	85	
	Fall Time	$t_f$		-	35	70	
	Turn-off Time	$t_{off}$		-	110	220	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=16A, V_{GS}=10V, V_{DD}=360V$	-	82	120	nC
Gate-Source Charge		$Q_{gs}$		-	40	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	42	-	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	13	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	52	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=13A, V_{GS}=0V$	-	-	1.4	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=13A$	-	1300	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	7.4	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### Y T F P 4 5 2

#### SILICON N CHANNEL MOS TYPE

#### ( $\pi$ -MOS I)

INDUSTRIAL APPLICATIONS

Unit in mm

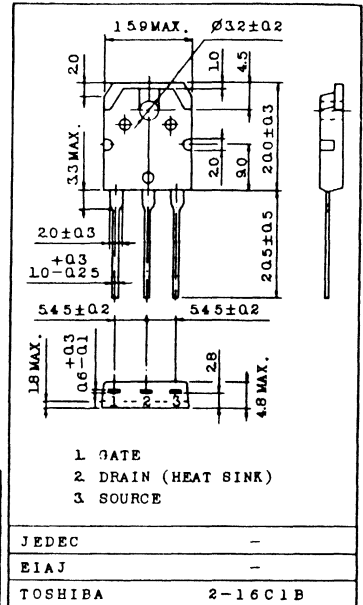
HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.4\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$  (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$  (Max.) @  $V_{DS}=500V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	500	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )		$V_{DGR}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	12	A
	Pulse	$I_{DP}$	48	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$



Weight : 4.6g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

Y T F P 4 5 2

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	500	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=7A$	6.0	11	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	0.4	0.5	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=12A, V_{GS}=10V$	-	5.3	7.0	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2000	3000	pF
Reverse Transfer Capacitance		$C_{rss}$		-	100	200	
Output Capacitance		$C_{oss}$		-	370	600	
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	85	
	Fall Time	$t_f$		-	35	70	
	Turn-off Time	$t_{off}$		-	110	220	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=16A, V_{GS}=10V, V_{DD}=400V$	-	82	120	nC
Gate-Source Charge		$Q_{gs}$		-	40	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	42	-	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	12	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	48	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=12A, V_{GS}=0V$	-	-	1.3	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=12A$	-	1300	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	7.4	-	$\mu C$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR

#### Y T F P 4 5 3

#### SILICON N CHANNEL MOS TYPE

#### ( $\pi$ -MOS I)

INDUSTRIAL APPLICATIONS

Unit in mm

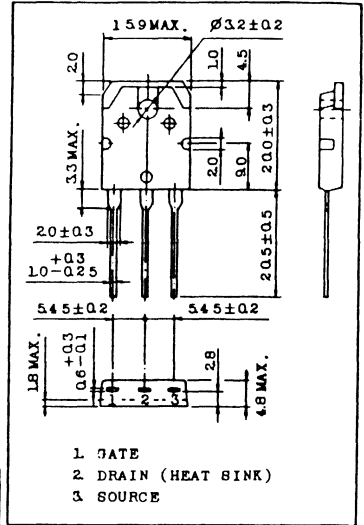
HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.4\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=11S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 500nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=250\mu A$  (Max.) @  $V_{DS}=450V$
- Enhancement-Mode :  $V_{th}=2.0\sim 4.0V$  @  $V_{DS}=V_{GS}, I_D=250\mu A$

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	450	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )		$V_{DGR}$	450	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	12	A
	Pulse	$I_{DP}$	48	
Drain Power Dissipation ( $T_c=25^\circ C$ )		$P_D$	150	W
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55\sim 150$	$^\circ C$



JEDEC	-
EIAJ	-
TOSHIBA	2-16C1B

Weight : 4.6g

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.83	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$



# SEMICONDUCTOR

## TECHNICAL DATA

Y T F P 4 5 3

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 500$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=450V, V_{GS}=0V$	-	-	250	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=250\mu A, V_{GS}=0V$	450	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=7A$	6.0	11	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=7A, V_{GS}=10V$	-	0.4	0.5	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=12A, V_{GS}=10V$	-	5.3	7.0	V
Input Capacitance		$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	-	2000	3000	pF
Reverse Transfer Capacitance		$C_{rss}$		-	100	200	
Output Capacitance		$C_{oss}$		-	370	600	
Switching Time	Rise Time	$t_r$		-	25	50	ns
	Turn-on Time	$t_{on}$		-	40	85	
	Fall Time	$t_f$		-	35	70	
	Turn-off Time	$t_{off}$		-	110	220	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$I_D=16A, V_{GS}=10V, V_{DD}=360V$	-	82	120	nC
Gate-Source Charge		$Q_{gs}$		-	40	-	
Gate-Drain ("Miller") Charge		$Q_{gd}$		-	42	-	

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	--	-	-	12	A
Pulse Drain Reverse Current	$I_{DRP}$	--	-	-	48	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR}=12A, V_{GS}=0V$	-	-	1.3	V
Reverse Recovery Time	$t_{rr}$	$I_{DR}=12A$	-	1300	-	ns
Reverse Recovered Charge	$Q_{rr}$	$dI_{DR}/dt=100A/\mu s$	-	7.4	-	$\mu C$

TOSHIBA CORPORATION



# TOSHIBA SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR S 2 3 7 0 SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS)

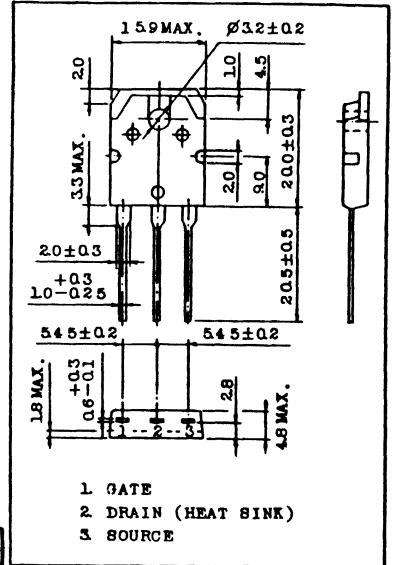
#### INDUSTRIAL APPLICATIONS

Unit in mm

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS.  
CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

#### FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.030\Omega$ (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}|=13S$  (Typ.)
- Low Leakage Current :  $I_{GSS}=\pm 100nA$ (Max.) @  $V_{GS}=\pm 20V$   
 $I_{DSS}=300\mu A$  (Max.) @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $V_{DS}=10V, I_D=1mA$



JEDEC	-
EIAJ	-
TOSHIBA	2-16C1B

Weight : 4.6g

#### MAXIMUM RATINGS ( $T_a=25^\circ C$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	60	V
Drain-Gate Voltage ( $R_{GS}=20k\Omega$ )	$V_{DGR}$	60	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	40
	Pulse	$I_{DP}$	160
Drain Power Dissipation ( $T_c=25^\circ C$ )	$P_D$	125	W
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55\sim 150$	$^\circ C$

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	1.00	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(j-a)}$	50	$^\circ C/W$
Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10 seconds)	$T_L$	300	$^\circ C$

ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		IGSS	VGS=±20V, VDS=0V	-	-	±100	nA
Drain Cut-off Current		IDSS	VDS=60V, VGS=0V	-	-	300	µA
Drain-Source Breakdown Voltage		V(BR)DSS	ID=10mA, VGS=0V	60	-	-	V
Gate Threshold Voltage		Vth	VDS=10V, ID=1mA	1.5	-	3.5	V
Forward Transfer Admittance		Yfs	VDS=10V, ID=20A	9.0	13	-	S
Drain-Source ON Resistance		RDS(ON)	ID=20A, VGS=10V	-	0.030	0.045	Ω
Input Capacitance		Ciss	VDS=10V, VGS=0V, f=1MHz	-	2100	2700	pF
Reverse Transfer Capacitance		Crss		-	-	1000	
Output Capacitance		Coss		-	2000	2800	
Switching Time	Rise Time	tr		-	45	-	ns
	Turn-on Time	ton		-	65	-	
	Fall Time	tf		-	25	-	
	Turn-off Time	toff		-	80	-	
Total Gate charge (Gate-Source Plus Gate-Drain)		Qg	ID=40A, VGS=10V VDD=48V	-	65	-	nC
Gate-Source Charge		Qgs		-	35	-	
Gate-Drain ("Miller") Charge		Qgd		-	30	-	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	IDR	--	-	-	40	A
Rulse Drain Reverse Current	IDRP	--	-	-	160	A
Diode Foward Voltage	VDSF	IDR=40A, VGS=0V	-	-	1.8	V
Reverse Recovery Time	trr	IDR=40A	-	150	-	ns
Reverse Recovered Charge	Qrr	dIDR/dt=50A/µs	-	0.35	-	µC



# SEMICONDUCTOR

## TECHNICAL DATA

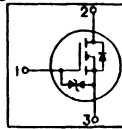
TOSHIBA FIELD EFFECT TRANSISTOR  
 S 3 5 7 8  
 SILICON N CHANNEL MOS TYPE  
 (  $\pi$ -MOS )

INDUSTRIAL APPLICATIONS

HIGH SPEED SWITCHING APPLICATIONS.  
 SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
 DRIVE APPLICATIONS.

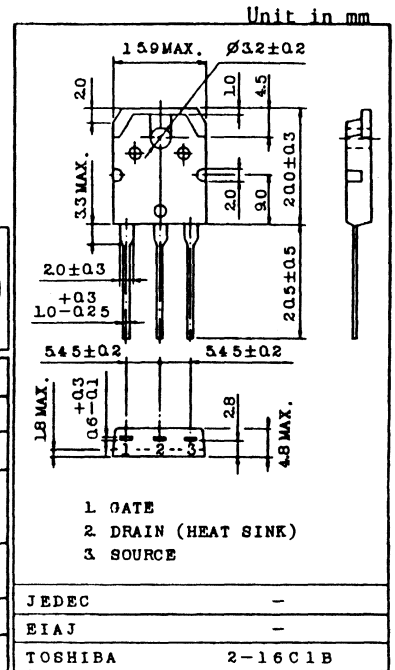
FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.022\Omega(\text{Typ.})$
- High Forward Transfer Admittance :  $|Y_{fs}|=16S(\text{Typ.})$
- Low Leakage Current :  $I_{GSS}=\pm 10\mu A$  (Max.) @  $V_{GS}=\pm 16V$   
 $I_{DSS}=300\mu A$  @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $I_D=1mA$



MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	45	A
	Pulse	$I_{DP}$	180	
Drain Power Dissipation (Tc=25°C)		$P_D$	100	W
Channel Temperature		Tch	150	°C
Storage Temperature Range		Tstg	-55~150	°C



Weight : 4.6g

ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 16V, V_{DS}=0$	-	-	$\pm 10$	$\mu A$
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=60V, V_{GS}=0$	-	-	300	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	60	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=25A$	11	16	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=25A, V_{GS}=10V$	-	0.022	0.030	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=45A, V_{GS}=10V$	-	1.0	1.4	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	2600	3300	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	560	700	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	1400	1800	pF
Switching Time	Rise Time	$t_r$		-	55		ns
	Turn-on Time	$t_{on}$		-	80		
	Fall Time	$t_f$		-	75		
	Turn-off Time	$t_{off}$		$V_{IN}: t_r, t_f < 5ns$ $Duty \leq 1\%$	-	170	

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR

S 3 6 7 5

SILICON N CHANNEL MOS TYPE

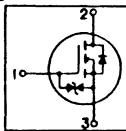
( $\pi$ -MOS $\square$ )

INDUSTRIAL APPLICATIONS

HIGH SPEED SWITCHING APPLICATIONS.  
SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR  
DRIVE APPLICATIONS.

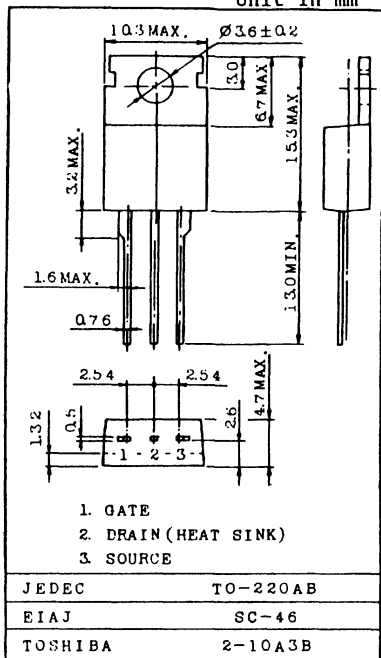
FEATURES:

- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.022\Omega$ (TYP.)
- High Forward Transfer Admittance :  $|Y_{fs}|=18S$ (TYP.)
- Low Leakage Current :  $I_{GSS}=\pm 10\mu A$  (Max.) @  $V_{GS}=\pm 16V$   
 $I_{DSS}=300\mu A$  @  $V_{DS}=60V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $I_D=1mA$



MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	60	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	45
	Pulse	$I_{DP}$	180
Drain Power Dissipation (Tc=25°C)	$P_D$	75	W
Channel Temperature	$T_{ch}$	150	°C
Storage Temperature Range	$T_{stg}$	-55~150	°C



Weight : 1.9g

ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 16V, V_{DS}=0$	-	-	$\pm 10$	$\mu A$	
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0$	-	-	300	$\mu A$	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	60	-	-	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=25A$	11	16	-	S	
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=25A, V_{GS}=10V$	-	0.022	0.030	$\Omega$	
Drain-Source ON Voltage	$V_{DS(ON)}$	$I_D=45A, V_{GS}=10V$	-	1.0	1.4	V	
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	2600	3300	pF	
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	560	700	pF	
Output Capacitance	$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	1400	1800	pF	
Switching Time	Rise Time	$t_r$			-	55	ns
	Turn-on Time	$t_{on}$			-	80	
	Fall Time	$t_f$			-	75	
	Turn-off Time	$t_{off}$	$V_{IN}: t_r, t_f < 5ns$ $Duty \leq 1\%$		-	170	

TOSHIBA CORPORATION

# TOSHIBA SEMICONDUCTOR

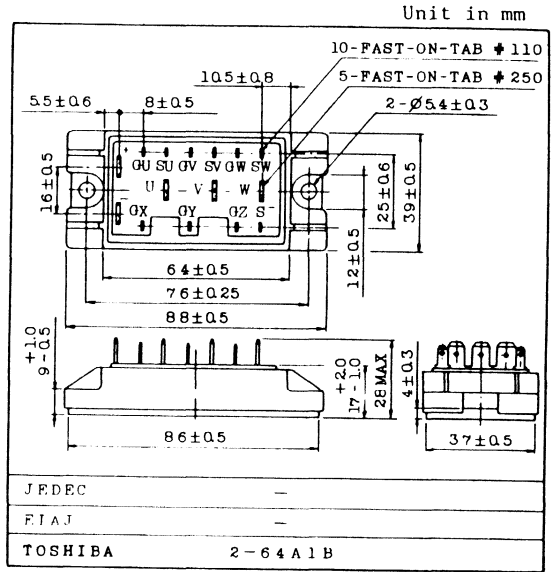
## TECHNICAL DATA

TOSHIBA GTR MODULE  
**MG8D6EM1**  
 SILICON N CHANNEL MOS TYPE

HIGH POWER SWITCHING APPLICATIONS.  
 MOTOR CONTROL APPLICATIONS.

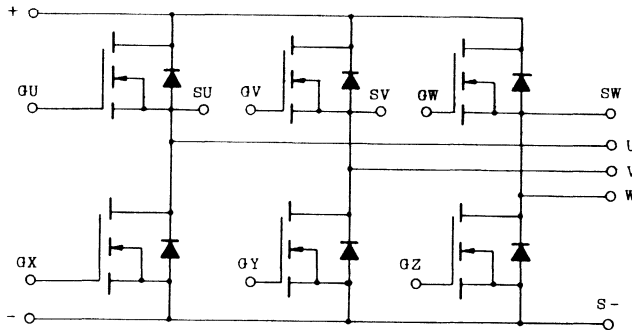
**FEATURES:**

- The Drain is Isolated from Case.
- 6 MOS FETs are Built-in to 1 Package.
- With Built-in Free Wheeling Diode.
- Low Drain-Source ON Resistance  
 :  $R_{DS(ON)} = 0.45\Omega(\text{Max.})(I_D = 8A)$
- Enhancement-Mode.



Weight : 180gr

**EQUIVALENT CIRCUIT**

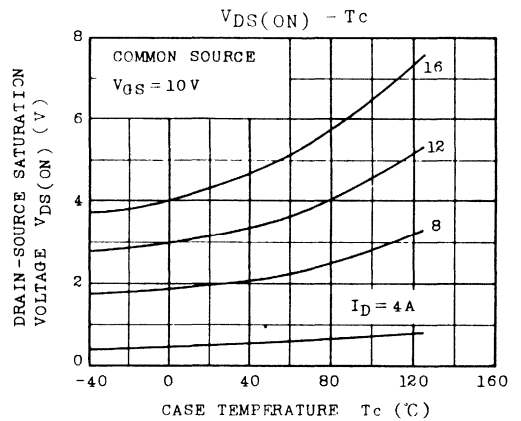
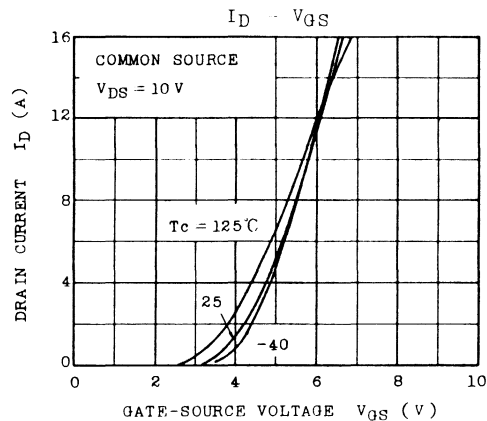
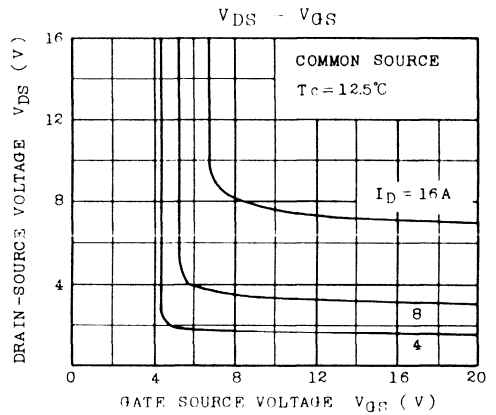
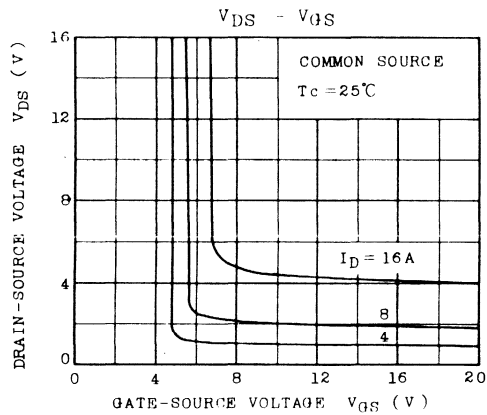
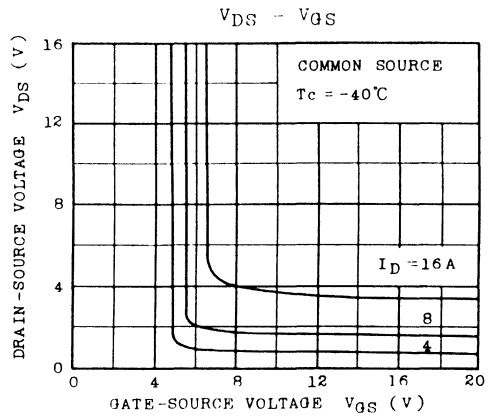
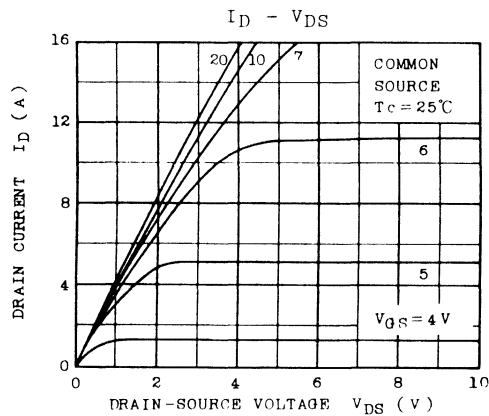


MAXIMUM RATINGS (Ta=25°C)

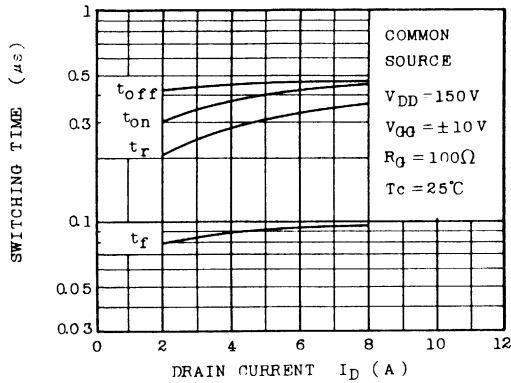
CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	250	V
Gate-Source Voltage		V <sub>GSS</sub>	±20	V
Drain Current	DC	I <sub>D</sub>	±8	A
	1ms		±16	
Drain Power Dissipation (Tc=25°C)		P <sub>D</sub>	65	W
Channel Temperature		T <sub>ch</sub>	150	°C
Storage Temperature Range		T <sub>stg</sub>	-40~125	°C
Isolation Voltage		V <sub>Isol</sub>	2500 (AC, 1 Minute)	V
Screw Torque		-	30	kg·cm

ELECTRICAL CHARACTERISTICS (Ta=25°C)

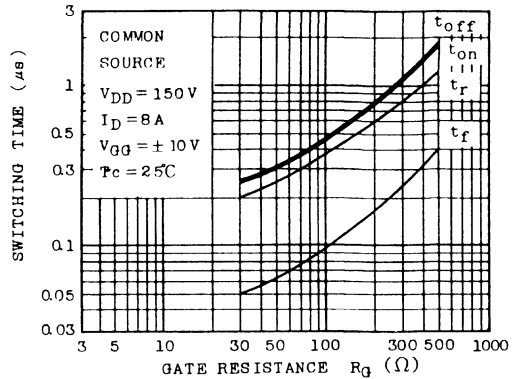
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0	-	-	±100	nA
Drain Cut-off Current		I <sub>DSS</sub>	V <sub>DS</sub> =250V, V <sub>GS</sub> =0	-	-	1.0	mA
Drain-Source Breakdown Voltage		V(BR) <sub>DSS</sub>	I <sub>D</sub> =10mA, V <sub>GS</sub> =0	250	-	-	V
Gate-Source Cut-off Voltage		V <sub>GS(OFF)</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =8mA	1.8	2.8	3.8	V
Forward Transfer Admittance		Y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =8A	3.5	6.0	-	S
Drain-Source ON Resistance		R <sub>DS(ON)</sub>	I <sub>D</sub> =8A, V <sub>GS</sub> =10V	-	0.30	0.45	Ω
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0, f=1MHz	-	1200	-	pF
Switching Time	Rise Time	t <sub>r</sub>		-	350	700	ns
	Turn-on Time	t <sub>on</sub>		-	450	800	
	Fall Time	t <sub>f</sub>		-	100	200	
	Turn-off Time	t <sub>off</sub>		-	450	800	
Source Drain Forward Voltage		V <sub>D<sub>SF</sub></sub>	I <sub>D</sub> =-8A, V <sub>GS</sub> =0	-	1.2	1.8	V
Reverse Recovery Time		t <sub>rr</sub>	I <sub>D</sub> =-8A, R <sub>G</sub> =100Ω V <sub>GS</sub> =-10V, di/dt=60A/µs	-	130	300	ns
Thermal Resistance		R <sub>th(ch-c)</sub>		-	-	1.92	°C/W



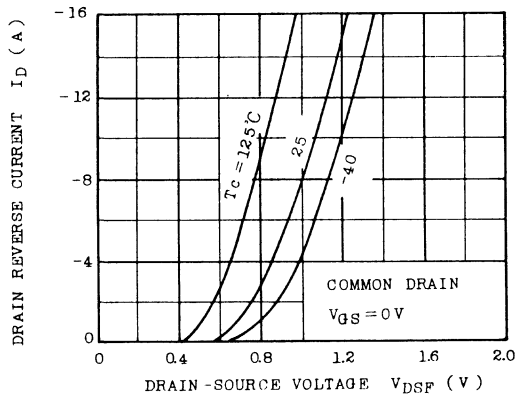
SWITCHING TIME -  $I_D$



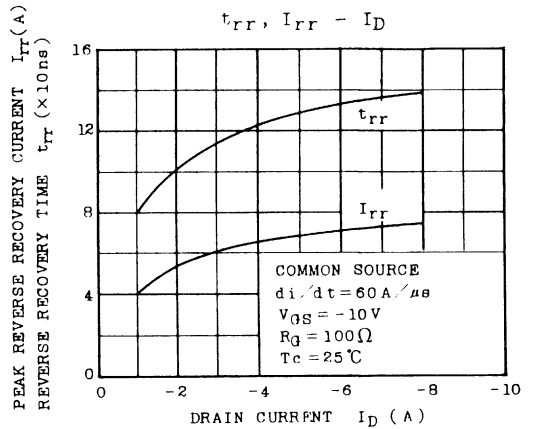
SWITCHING TIME -  $R_G$



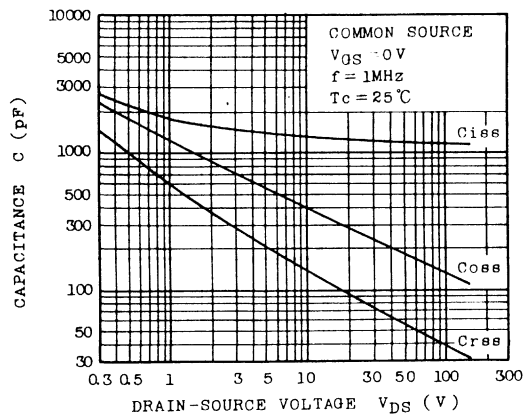
$I_D - V_{DSF}$



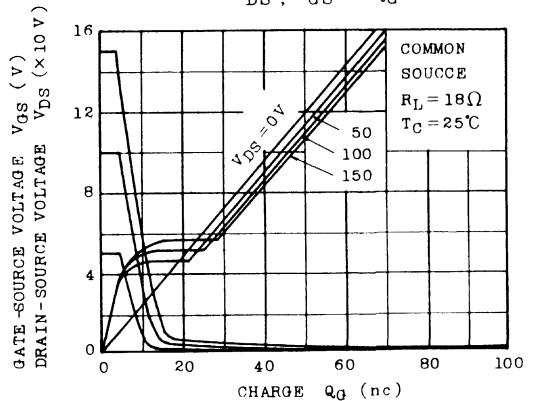
$t_{rr}, I_{rr} - I_D$



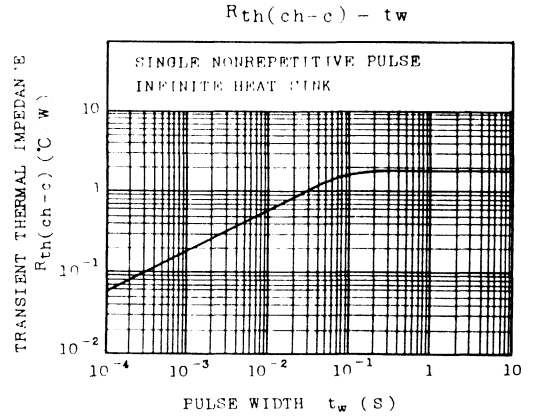
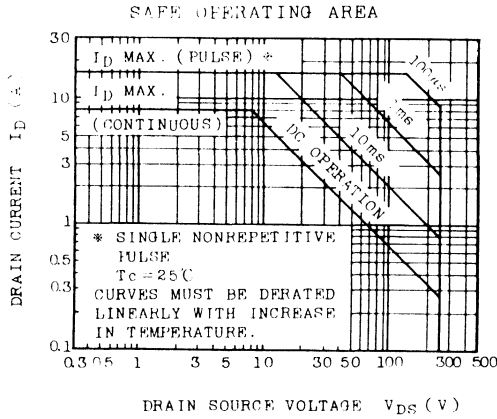
$C - V_{DS}$



$V_{DS}, V_{GS} - Q_G$









# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA GTR MODULE

MG8G4GM1

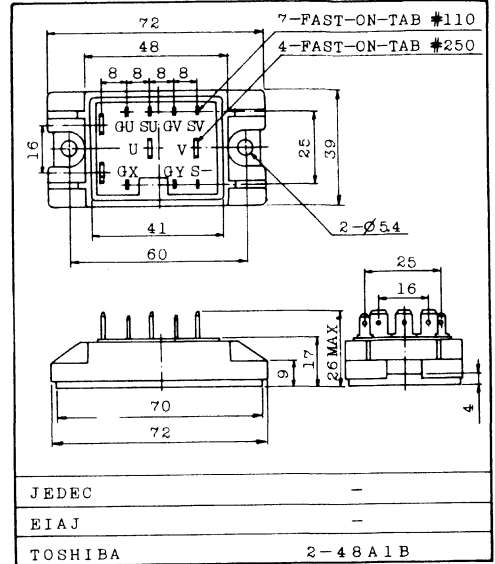
SILICON N CHANNEL MOS TYPE

HIGH POWER SWITCHING APPLICATIONS.  
MOTOR CONTROL APPLICATIONS.

### FEATURES:

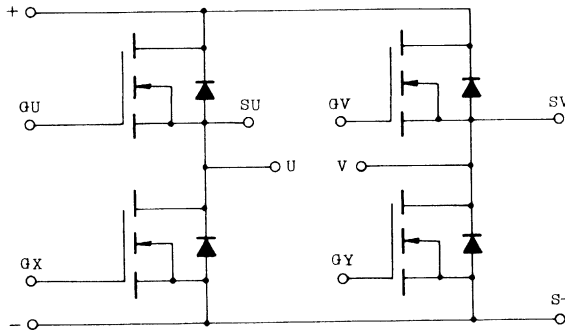
- . The Drain is Isolated from Case.
- . 4 MOS FETs are Built-in to 1 Package.
- . With Built-in Free Wheeling Diode.
- . Low Drain-Source ON Resistance  
:  $R_{DS(ON)}=0.75\Omega(\text{Max.}) (I_D=8A)$
- . Enhancement-Mode.

Unit in mm



Weight : 140gr

### EQUIVALENT CIRCUIT



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

MG8G4GM1

### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	450	V
Gate-Source Voltage		V <sub>GSS</sub>	±20	V
Drain Current	DC	I <sub>D</sub>	±8	A
	Peak		±16	
Drain Power Dissipation (Tc=25°C)		P <sub>D</sub>	100	W
Channel Temperature		T <sub>ch</sub>	150	°C
Storage Temperature Range		T <sub>stg</sub>	-40 ~ 125	°C
Isolation Voltage		V <sub>Isol</sub>	2500 (AC 1 Minute)	V
Screw Torque		-	30	kg·cm

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

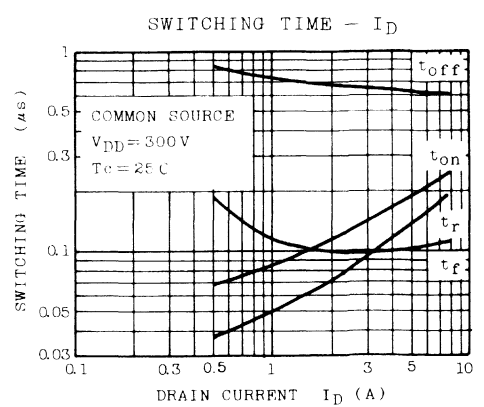
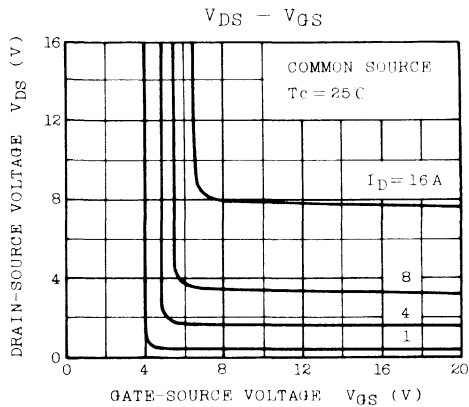
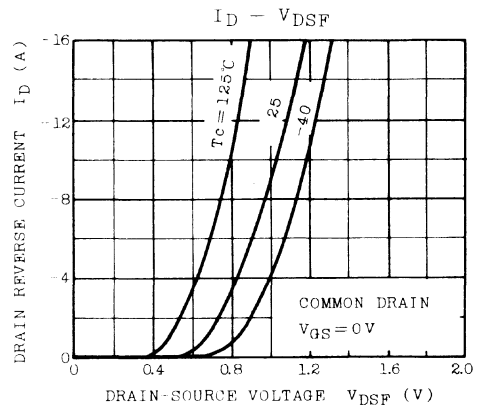
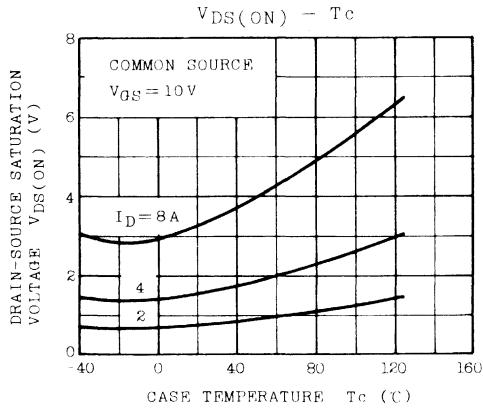
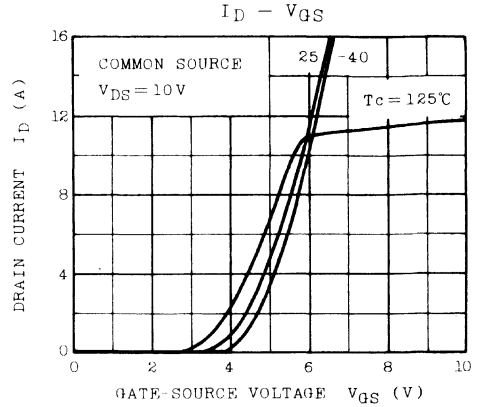
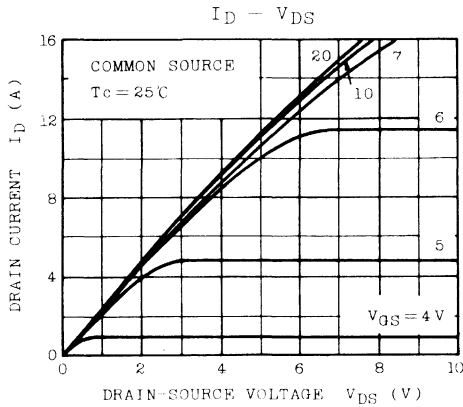
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0	-	-	±100	nA
Drain Cut-off Current		I <sub>DSS</sub>	V <sub>DS</sub> =450V, V <sub>GS</sub> =0	-	-	1.0	mA
Drain-Source Breakdown Voltage		V <sub>(BR)DSS</sub>	I <sub>D</sub> =10mA, V <sub>GS</sub> =0	450	-	-	V
Gate-Source Cut-off Voltage		V <sub>GS(OFF)</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =8mA	1.8	2.8	3.8	V
Forward Transfer Admittance		Y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =8A	4.0	6.5	-	S
Drain-Source ON Resistance		R <sub>DS(ON)</sub>	I <sub>D</sub> =8A, V <sub>GS</sub> =10V	-	0.48	0.75	Ω
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0, f=1MHz	-	3100	-	pF
Switching Time	Rise Time	t <sub>r</sub>	<p> <math>I_D=8A</math>  <math>V_{DS}=10V</math>  <math>V_{GS}=0</math>  <math>V_{DD}=\pm 300V</math> </p>	-	200	400	ns
	Turn-on Time	t <sub>on</sub>		-	250	500	
	Fall Time	t <sub>f</sub>		-	110	250	
	Turn-off Time	t <sub>off</sub>		$V_{IN}: t_r, t_f < 5ns$ $D, U \leq 1\%$ ( $Z_{OUT}=50\Omega$ )	-	600	
Source Drain Forward Voltage		V <sub>DSF</sub>	I <sub>D</sub> =-8A, V <sub>GS</sub> =0	-	1.0	1.8	V
Reverse Recovery Time		t <sub>rr</sub>	$I_D=-8A, R_G=220\Omega$ $V_{GS}=-15V, di/dt=60A/\mu s$	-	140	250	ns



# SEMICONDUCTOR

## TECHNICAL DATA

MG8G4GM1



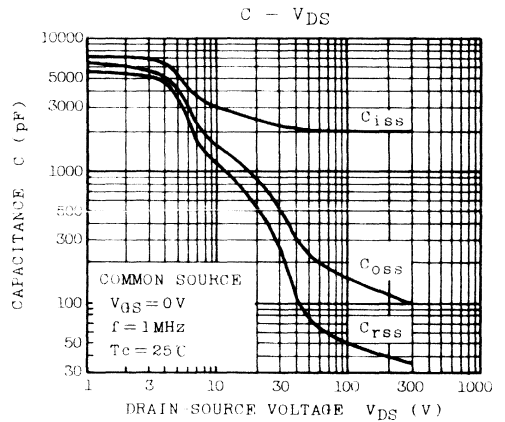
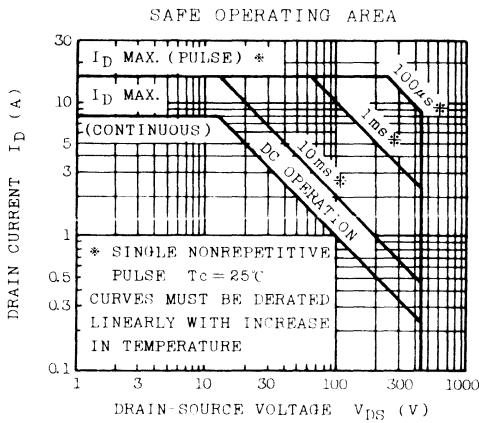
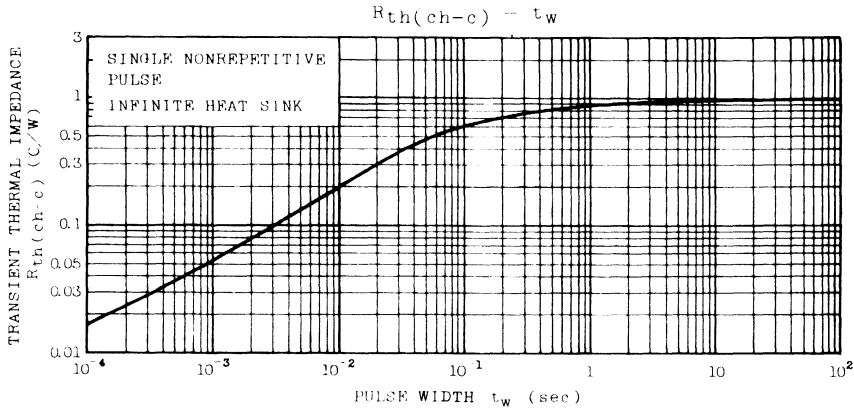
TOSHIBA CORPORATION



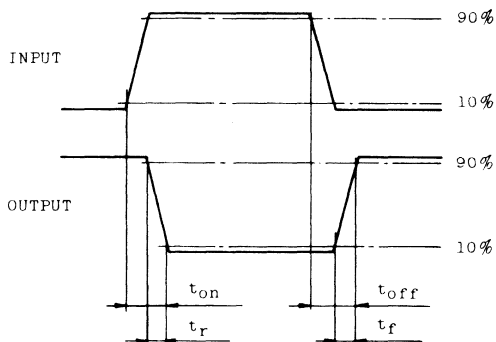
# SEMICONDUCTOR

## TECHNICAL DATA

MG8G4GM1



### SWITCHING TIME TEST (WAVEFORM)



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA GTR MODULE  
MG8G6EM1

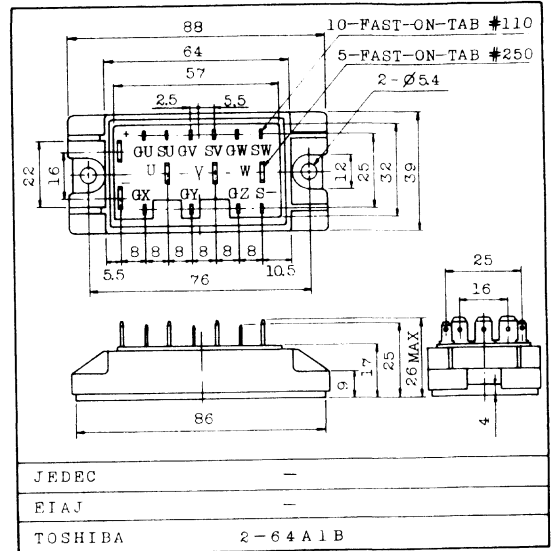
SILICON N CHANNEL MOS TYPE

HIGH POWER SWITCHING APPLICATIONS.  
MOTOR CONTROL APPLICATIONS.

### FEATURES:

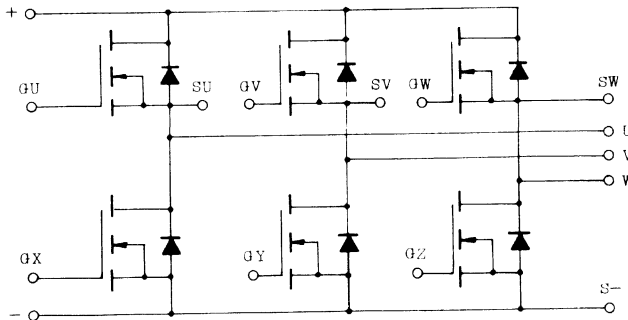
- . The Drain is Isolated from Case.
- . 6 MOS FETs are Built-in to 1 Package.
- . With Built-in Free Wheeling Diode.
- . Low Drain-Source ON Resistance  
:  $R_{DS(ON)} = 0.75\Omega(\text{Max.}) (I_D = 8A)$
- . Enhancement-Mode.

Unit in mm



Weight : 180gr

### EQUIVALENT CIRCUIT



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

MG8G6EM1

### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	450	V
Gate-Source Voltage		V <sub>GSS</sub>	±20	V
Drain Current	DC	I <sub>D</sub>	±8	A
	Peak		±16	
Drain Power Dissipation (Tc=25°C)		P <sub>D</sub>	100	W
Channel Temperature		T <sub>ch</sub>	150	°C
Storage Temperature Range		T <sub>stg</sub>	-40 ~ 125	°C
Isolation Voltage		V <sub>Iso1</sub>	2500 (AC 1 Minute)	V
Screw Torque		-	30	kg·cm

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

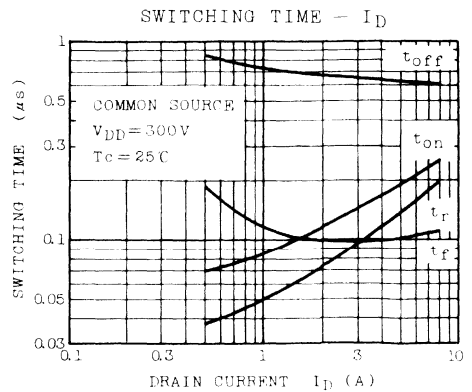
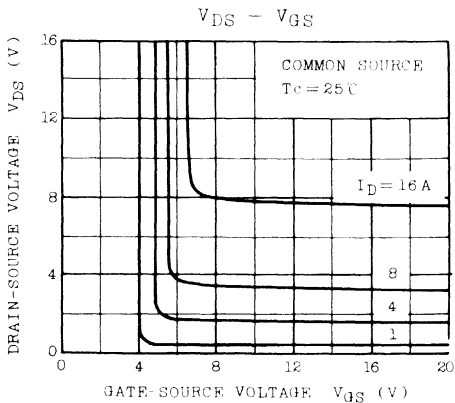
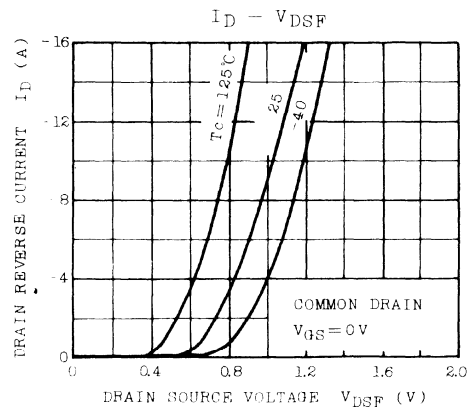
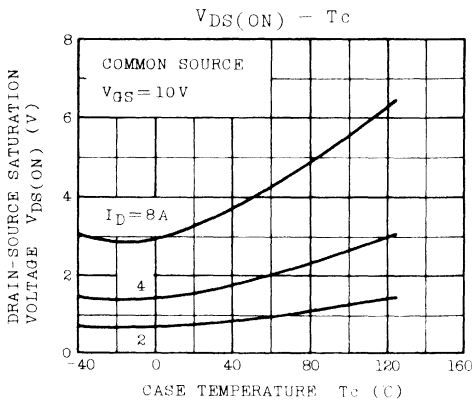
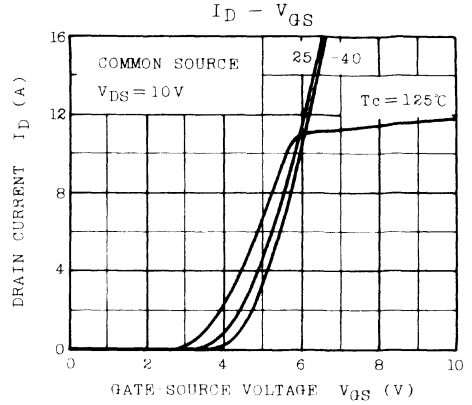
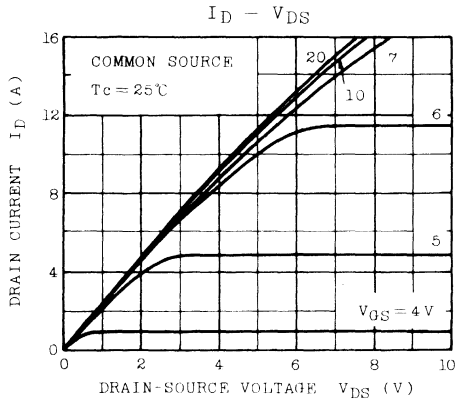
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0	-	-	±100	nA
Drain Cut off Current		I <sub>DSS</sub>	V <sub>DS</sub> =450V, V <sub>GS</sub> =0	-	-	1.0	mA
Drain-Source Breakdown Voltage		V(BR) <sub>DSS</sub>	I <sub>D</sub> =10mA, V <sub>GS</sub> =0	450	-	-	V
Gate-Source Cut-off Voltage		V <sub>GS(OFF)</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =8mA	1.8	2.8	3.8	V
Forward Transfer Admittance		Y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =8A	4.0	6.5	-	S
Drain-Source ON Resistance		R <sub>DS(ON)</sub>	I <sub>D</sub> =8A, V <sub>GS</sub> =10V	-	0.47	0.75	Ω
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0, f=1MHz	-	3100	-	pF
Switching Time	Rise Time	t <sub>r</sub>		-	200	400	ns
	Turn-on Time	t <sub>on</sub>		-	250	500	
	Fall Time	t <sub>f</sub>		-	110	250	
	Turn-off Time	t <sub>off</sub>		-	600	1000	
Source Drain Forward Voltage		V <sub>DSF</sub>	I <sub>D</sub> =-8A, V <sub>GS</sub> =0	-	1.0	1.8	V
Reverse Recovery Time		t <sub>rr</sub>	I <sub>D</sub> =-8A, R <sub>G</sub> =220Ω V <sub>GS</sub> =-15V, di/dt=60A/µs	-	140	250	ns



# SEMICONDUCTOR

## TECHNICAL DATA

MG8G6EM1



1985-9-30

TOSHIBA CORPORATION

EGA-MG8G6EM1-3

GT1A2A

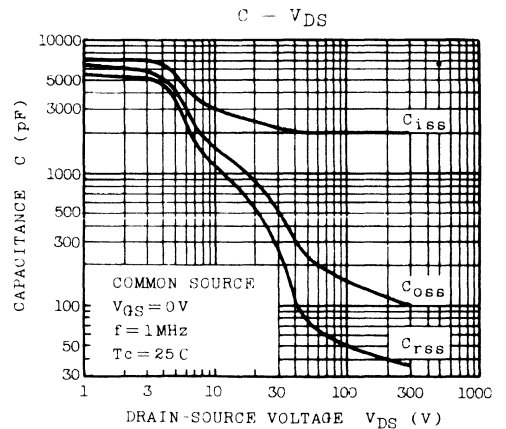
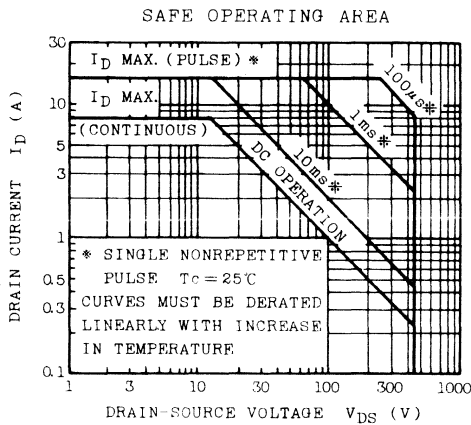
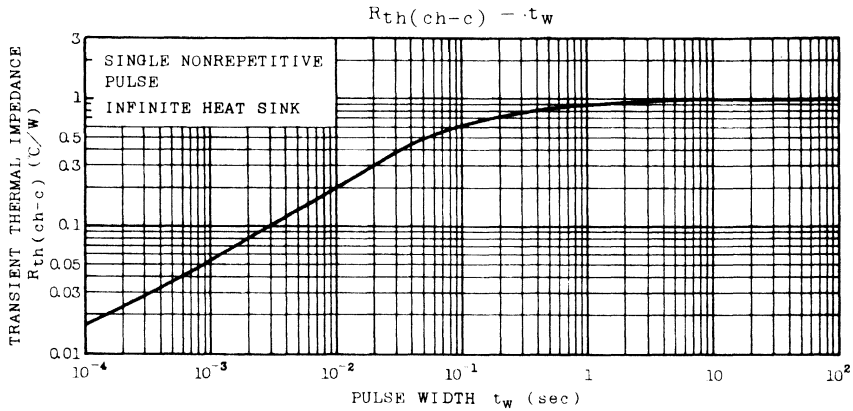




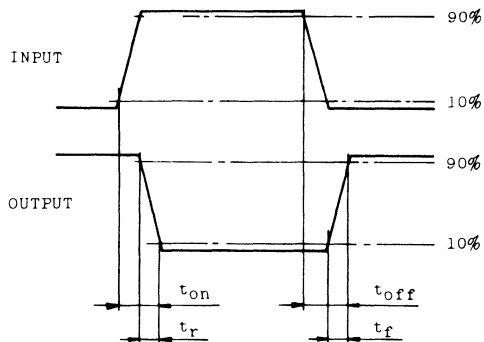
# SEMICONDUCTOR

## TECHNICAL DATA

MG8G6EM1



### SWITCHING TIME TEST (WAVEFORM)



# TOSHIBA SEMICONDUCTOR

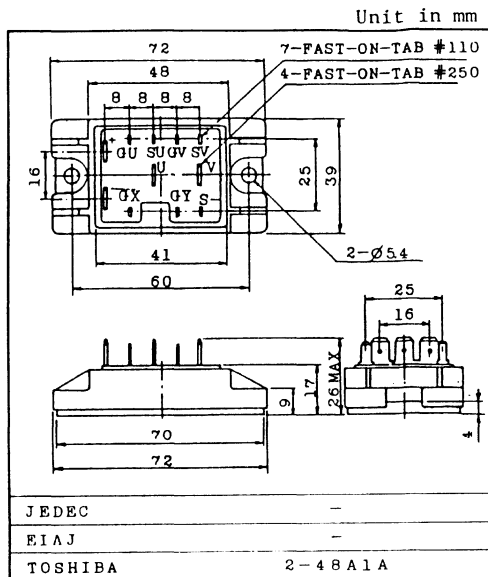
## TECHNICAL DATA

TOSHIBA GTR MODULE  
 MG10G4GM1  
 SILICON N CHANNEL MOS TYPE

HIGH POWER SWITCHING APPLICATIONS.  
 MOTOR CONTROL APPLICATIONS.

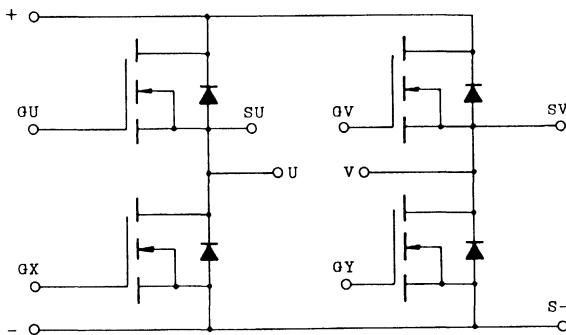
**FEATURES:**

- . The Drain is Isolated from Case.
- . 4 MOS FETs are Built-in to 1 Package.
- . With Built-in Free Wheeling Diode.
- . Low Drain-Source ON Resistance  
 :  $R_{DS(ON)} = 0.6\Omega(\text{Max.})(I_D=10A)$
- . Enhancement-Mode
- . High Speed :  $t_f = 0.3\mu s(\text{Max.})(I_D=10A)$



Weight : 140gr

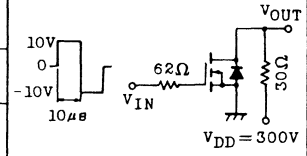
**EQUIVALENT CIRCUIT**

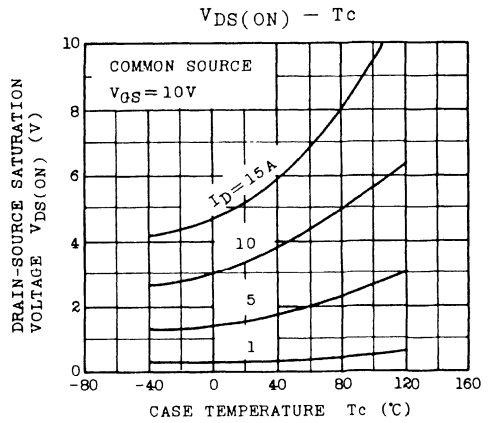
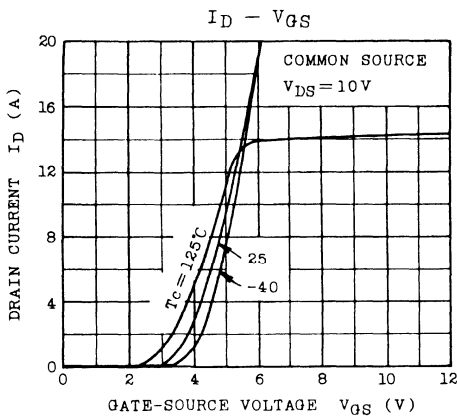
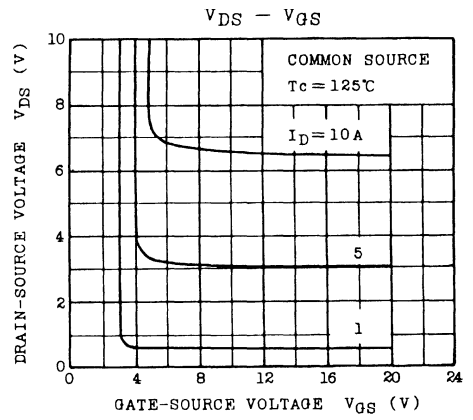
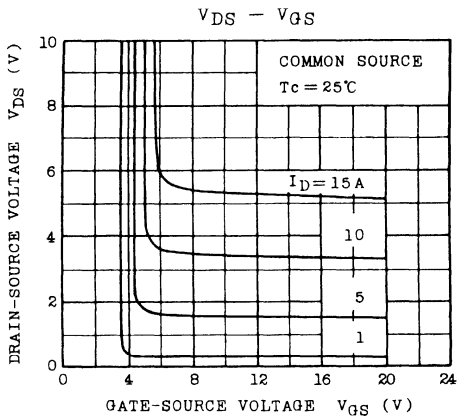
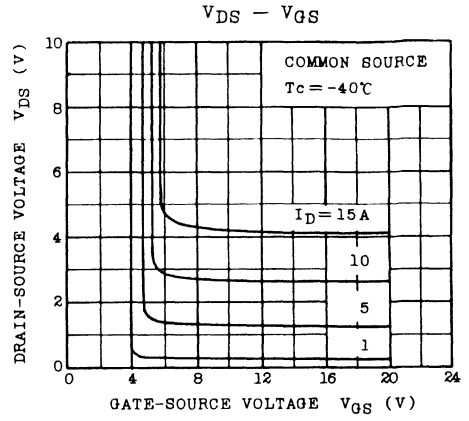
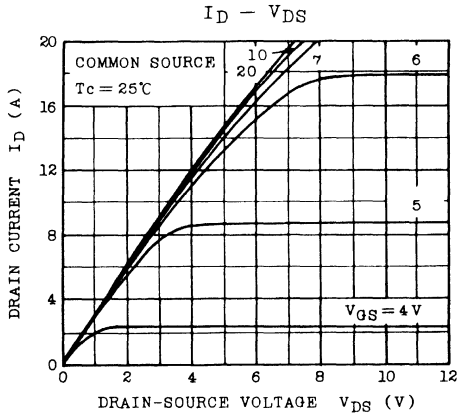


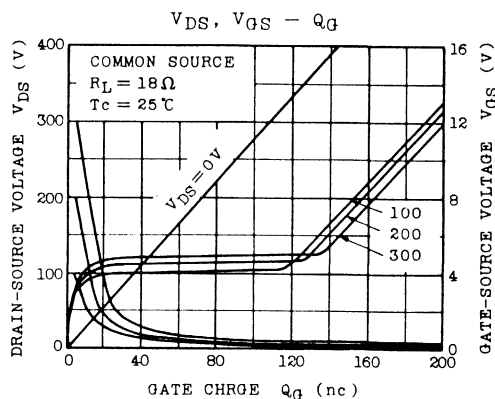
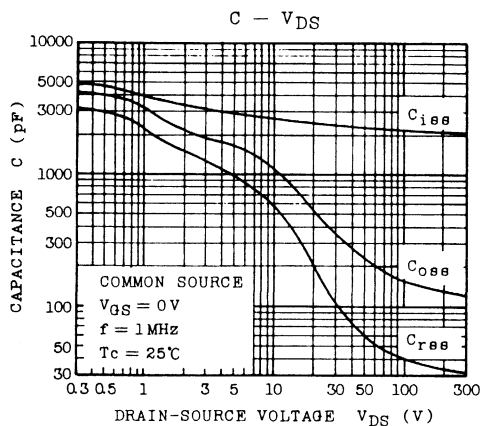
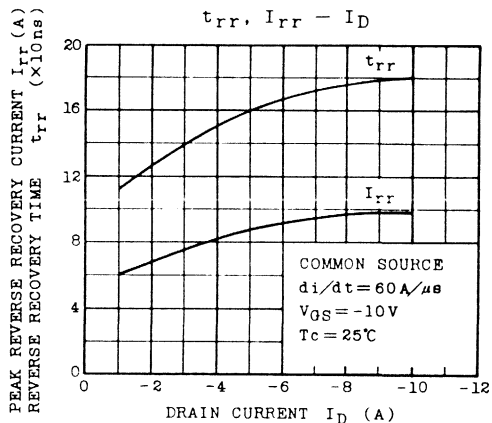
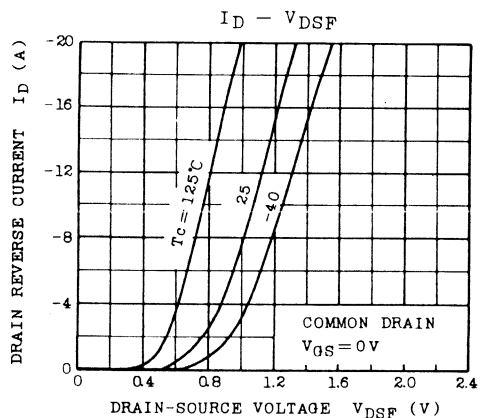
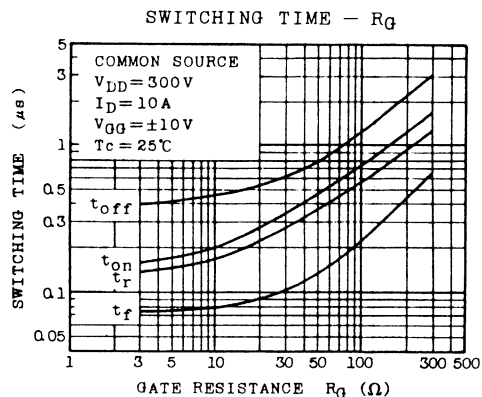
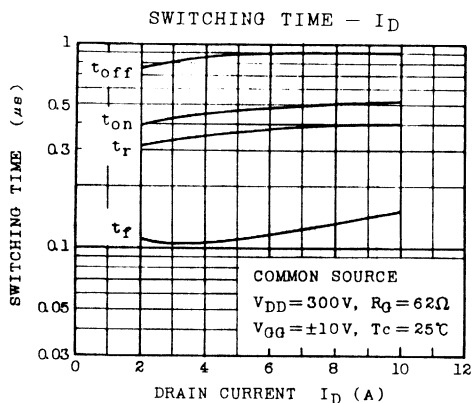
MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	450	V
Gate-Source Voltage		V <sub>GSS</sub>	±20	V
Drain Current	DC	I <sub>D</sub>	±10	A
	1ms		±20	
Drain Power Dissipation (Tc=25°C)		P <sub>D</sub>	125	W
Channel Temperature		T <sub>ch</sub>	150	°C
Storage Temperature Range		T <sub>stg</sub>	-40~125	°C
Isolation Voltage		V <sub>isol</sub>	2500 (AC, 1Minute)	V
Screw Torque		-	30	kg·cm

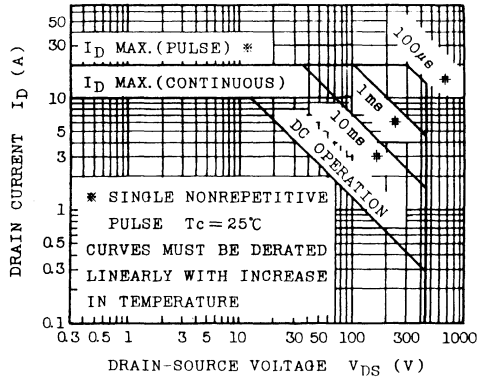
ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0	-	-	±100	nA
Drain Cut Off Current		I <sub>DSS</sub>	V <sub>DS</sub> =450V, V <sub>GS</sub> =0	-	-	1.0	mA
Drain-Source Breakdown Voltage		V <sub>(BR)DSS</sub>	I <sub>D</sub> =10mA, V <sub>GS</sub> =0	450	-	-	V
Gate-Source Cut-off Voltage		V <sub>GS(OFF)</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =10mA	1.8	2.8	3.8	V
Forward Transfer Admittance		Y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =10A	4.0	6.5	-	S
Drain-Source ON Resistance		R <sub>DS(ON)</sub>	I <sub>D</sub> =10A, V <sub>GS</sub> =10V	-	0.35	0.60	Ω
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0, f=1MHz	-	3000	-	pF
Switching Time	Rise Time	t <sub>r</sub>		-	500	1000	ns
	Turn-on Time	t <sub>on</sub>		-	600	1200	
	Fall Time	t <sub>f</sub>		-	150	300	
	Turn-off Time	t <sub>off</sub>		DUTY CYCLE ≤ 1%	-	1000	
Source Drain Forward Voltage		V <sub>DSF</sub>	I <sub>D</sub> =-10A, V <sub>GS</sub> =0	-	1.0	1.8	V
Reverse Recovery Time		t <sub>rr</sub>	I <sub>D</sub> =-10A, R <sub>C</sub> =62Ω V <sub>GS</sub> =-10V, di/dt=60A/µs	-	200	400	ns
Thermal Resistance		R <sub>th(ch-c)</sub>		-	-	1.0	°C/W

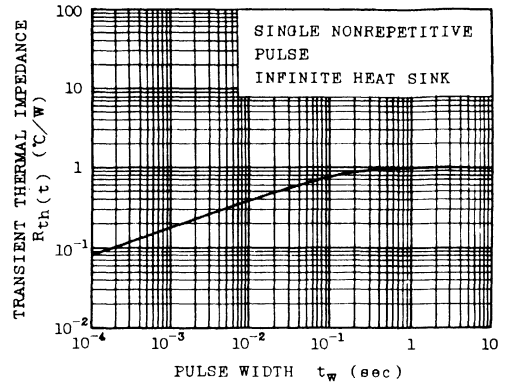




SAFE OPERATING AREA



$R_{th}(t) - t_w$



# TOSHIBA SEMICONDUCTOR

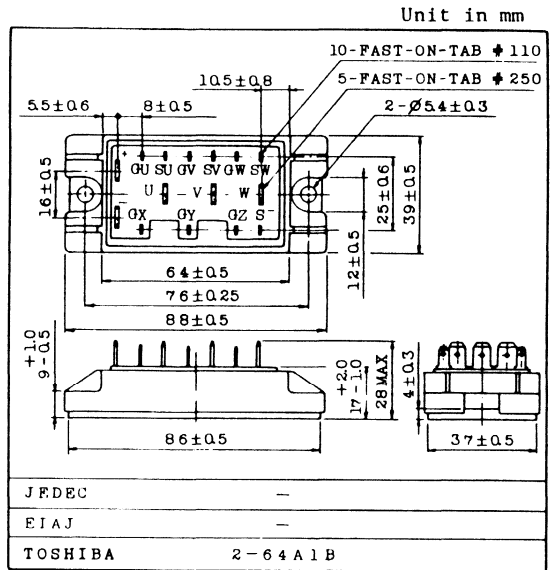
## TECHNICAL DATA

TOSHIBA GTR MODULE  
**MG10G6EM1**  
 SILICON N CHANNEL MOS TYPE

HIGH POWER SWITCHING APPLICATIONS.  
 MOTOR CONTROL APPLICATIONS.

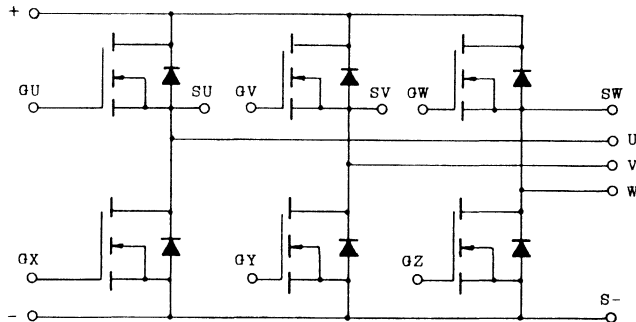
**FEATURES:**

- The Drain is Isolated from Case.
- 6 MOS FETs are Built-in to 1 Package.
- With Built-in Free Wheeling Diode.
- Low Drain-Source ON Resistance  
 :  $R_{DS(ON)}=0.6\Omega(\text{Max.}), (I_D=10A)$
- Enhancement-Mode.
- High Speed :  $t_f=0.3\mu s(\text{Max.}) (I_D=10A)$



Weight : 180gr

**EQUIVALENT CIRCUIT**



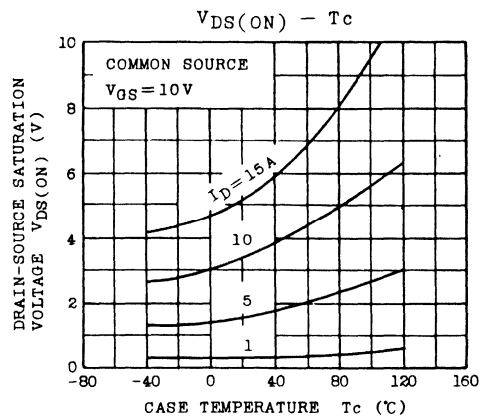
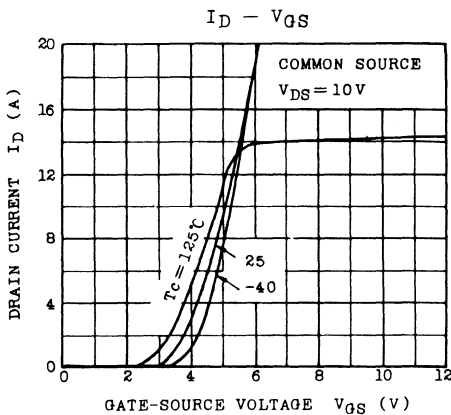
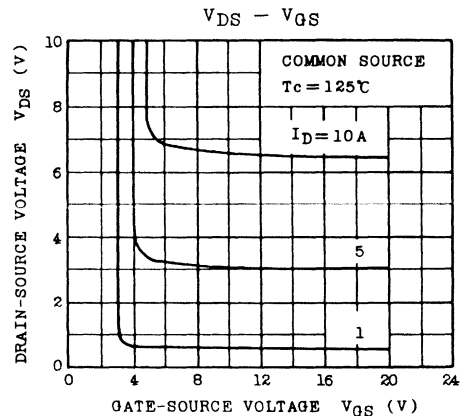
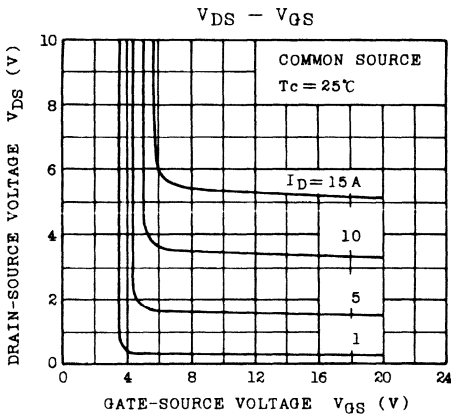
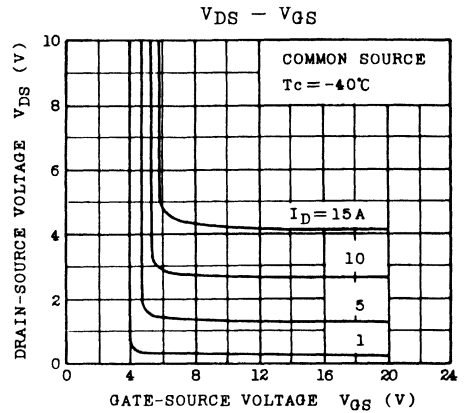
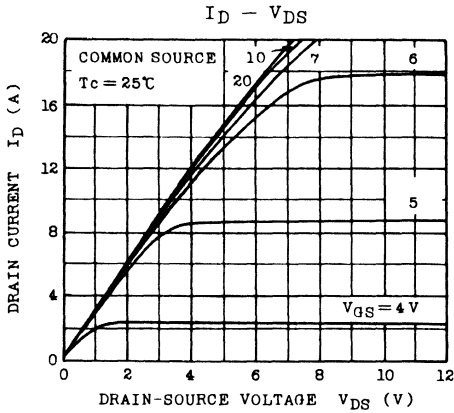
MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	450	V
Gate-Source Voltage		V <sub>GSS</sub>	±20	V
Drain Current	DC	I <sub>D</sub>	±10	A
	1ms		±20	
Drain Power Dissipation (Tc=25°C)		P <sub>D</sub>	125	W
Channel Temperature		T <sub>ch</sub>	150	°C
Storage Temperature Range		T <sub>stg</sub>	-40~125	°C
Isolation Voltage		V <sub>Isol</sub>	2500 (AC, 1 Minute)	V
Screw Torque		-	30	kg·cm

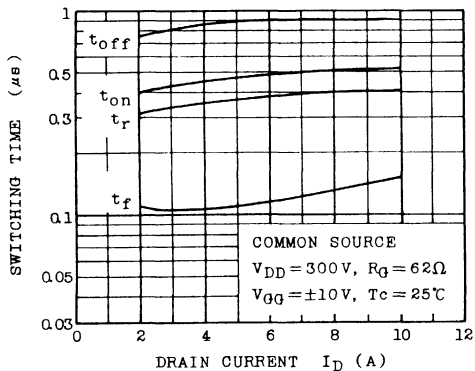
ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0	-	-	±100	nA
Drain Cut Off Current		I <sub>DSS</sub>	V <sub>DS</sub> =450V, V <sub>GS</sub> =0	-	-	1.0	mA
Drain-Source Breakdown Voltage		V(BR)DSS	I <sub>D</sub> =10mA, V <sub>GS</sub> =0	450	-	-	V
Gate-Source Cut-off Voltage		V <sub>GS(OFF)</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =10mA	1.8	2.8	3.8	V
Forward Transfer Admittance		Y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =10A	4.0	6.5	-	S
Drain-Source ON Resistance		R <sub>DS(ON)</sub>	I <sub>D</sub> =10A, V <sub>GS</sub> =10V	-	0.35	0.60	Ω
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0, f=1MHz	-	3000	-	pF
Switching Time	Rise Time	t <sub>r</sub>		-	500	1000	ns
	Turn-on Time	t <sub>on</sub>		-	600	1200	
	Fall Time	t <sub>f</sub>		-	150	300	
	Turn-off Time	t <sub>off</sub>		-	1000	2000	
Source Drain Forward Voltage		V <sub>DSF</sub>	I <sub>D</sub> =-10A, V <sub>GS</sub> =0	-	1.0	1.8	V
Reverse Recovery Time		t <sub>rr</sub>	I <sub>D</sub> =-10A, R <sub>G</sub> =62Ω V <sub>GS</sub> =-10V, di/dt=60A/µs	-	200	400	ns
Thermal Resistance		R <sub>th(ch-c)</sub>		-	-	1.0	°C/W

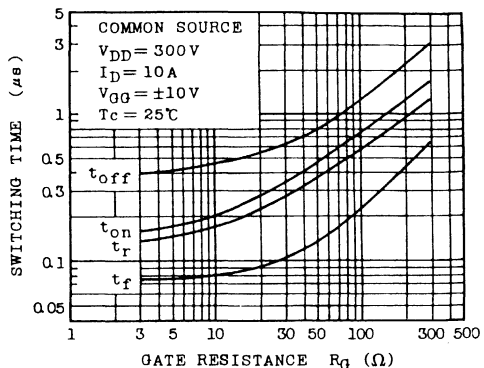




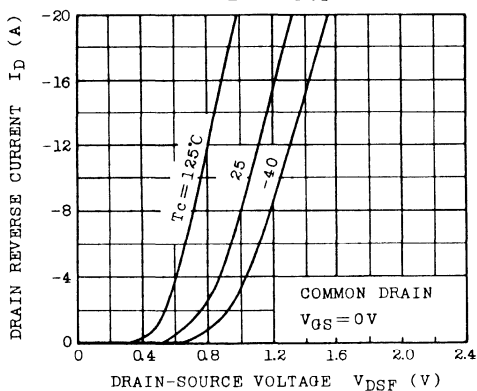
SWITCHING TIME -  $I_D$



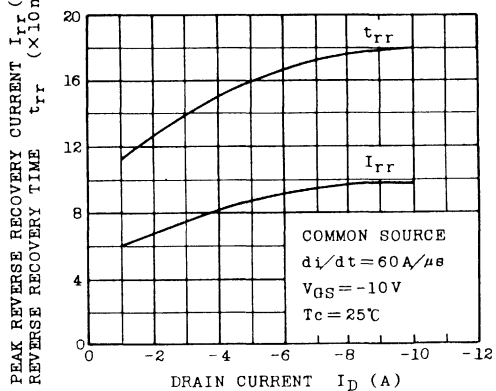
SWITCHING TIME -  $R_G$



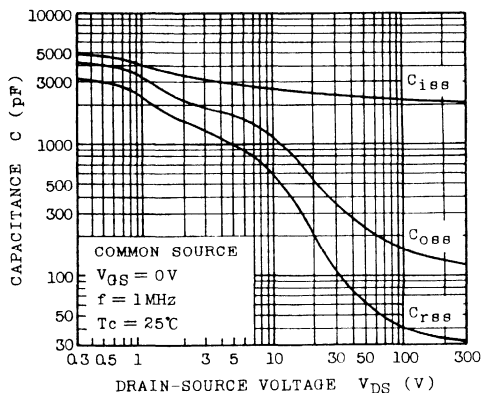
$I_D - V_{DSF}$



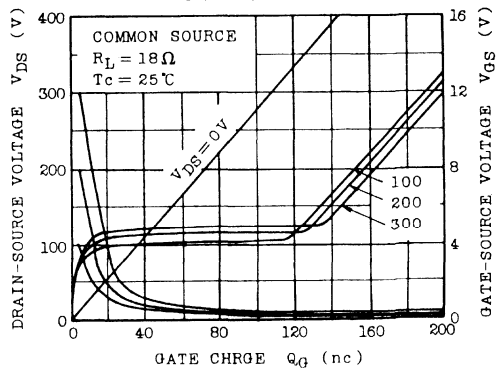
$t_{rr}, I_{rr} - I_D$

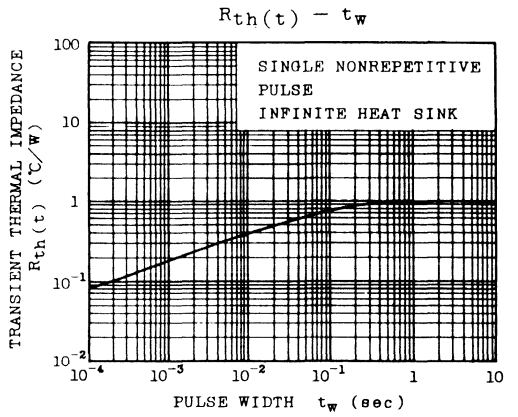
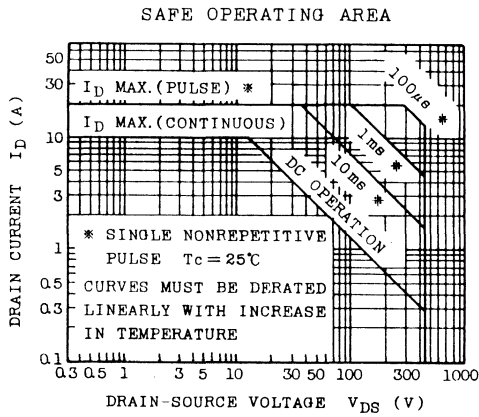


$C - V_{DS}$



$V_{DS}, V_{GS} - Q_G$







# SEMICONDUCTOR

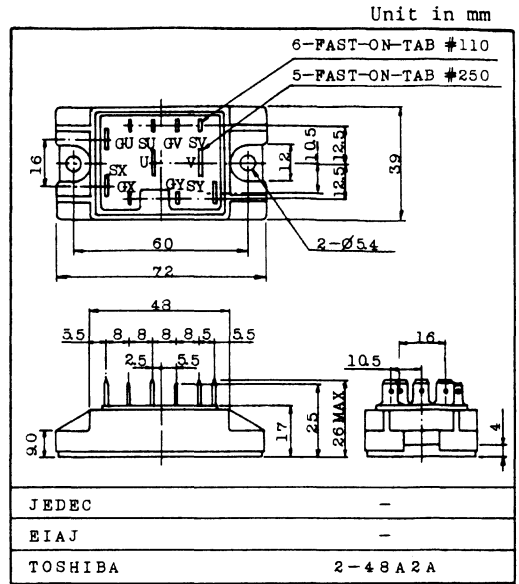
## TECHNICAL DATA

TOSHIBA GTR MODULE  
**MG15C4HM1**  
 SILICON N CHANNEL MOS TYPE

HIGH POWER SWITCHING APPLICATIONS.  
 MOTOR CONTROL APPLICATIONS.

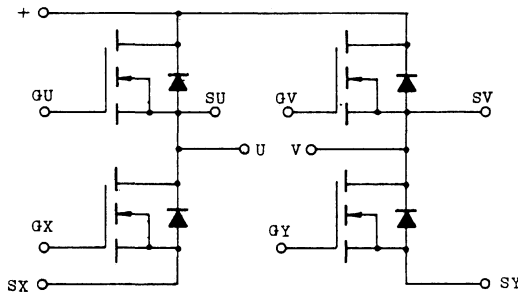
**FEATURES:**

- . The Drain is Isolated from Case.
- . 4 MOS FETs are Built-in to 1 Package.
- . With Built-in Free Wheeling Diode.
- . Low Drain-Source ON Resistance  
     :  $R_{DS(ON)}=0.22\Omega(\text{Max.}) (I_D=15A)$
- . Enhancement-Mode.



Weight : 140g

**EQUIVALENT CIRCUIT**



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

MG15C4HM1

### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	150	V
Gate-Source Voltage		V <sub>GSS</sub>	±20	V
Drain Current	DC	I <sub>D</sub>	±15	A
	1ms		±30	
Drain Power Dissipation (Tc=25°C)		P <sub>D</sub>	65	W
Channel Temperature		T <sub>ch</sub>	150	°C
Storage Temperature Range		T <sub>stg</sub>	-40 ~ 125	°C
Isolation Voltage		V <sub>Isol</sub>	2500 (AC 1 Minute)	V
Screw Torque		-	30	kg·cm

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0	-	-	±100	nA
Drain Cut-off Current		I <sub>DSS</sub>	V <sub>DS</sub> =150V, V <sub>GS</sub> =0	-	-	1.0	mA
Drain-Source Breakdown Voltage		V(BR) <sub>DSS</sub>	I <sub>D</sub> =10mA, V <sub>GS</sub> =0	150	-	-	V
Gate Threshold Voltage		V <sub>th</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =1mA	1.5	-	3.5	V
Forward Transfer Admittance		Y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =15A	4.0	7.0	-	S
Drain-Source ON Resistance		R <sub>DS(ON)</sub>	I <sub>D</sub> =15A, V <sub>GS</sub> =10V	-	0.15	0.22	Ω
Source Drain Forward Voltage		V <sub>SDF</sub>	I <sub>S</sub> =15A, V <sub>GS</sub> =0	-	1.3	1.8	V
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0, f=1MHz	-	1300	-	pF
Switching Time	Rise Time	t <sub>r</sub>	<p> <math>I_D=15</math>  <math>V_{IN}</math>  <math>V_{DS}=10V</math>  <math>V_{GS}=10V</math>  <math>V_{DD}=90V</math> </p>	-	200	400	ns
	Turn-on Time	t <sub>on</sub>		-	250	500	ns
	Fall Time	t <sub>f</sub>		-	100	200	ns
	Turn-off Time	t <sub>off</sub>		$V_{IN}: t_r, t_f < 5ns$ $D, U \leq 1\% (Z_{OUT}=50\Omega)$	-	300	600
Reverse Recovery Time		t <sub>rr</sub>	$I_D=-15A, R_G=220\Omega$ $V_{GS}=-15V, di/dt=60A/\mu s$	-	200	400	ns

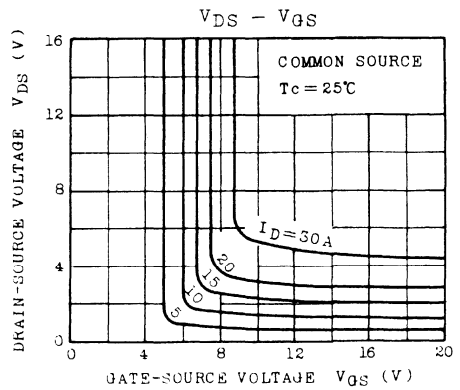
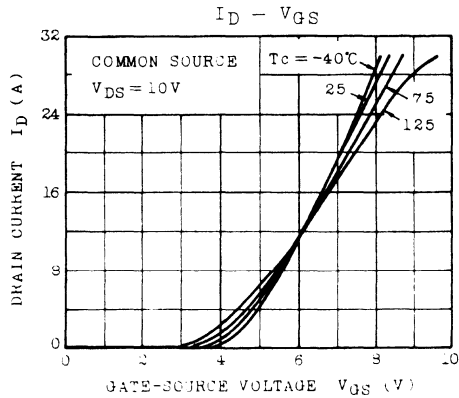
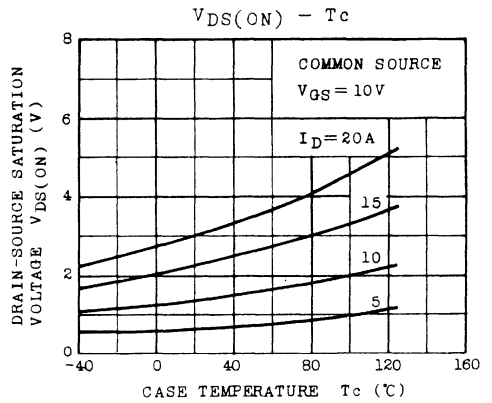
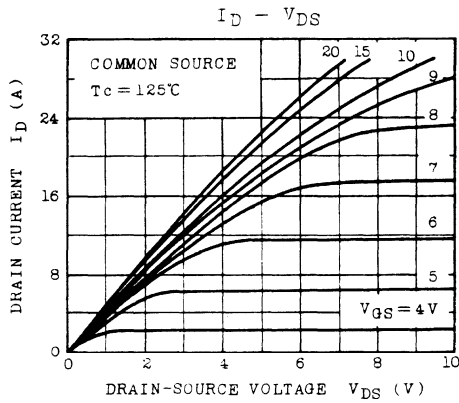
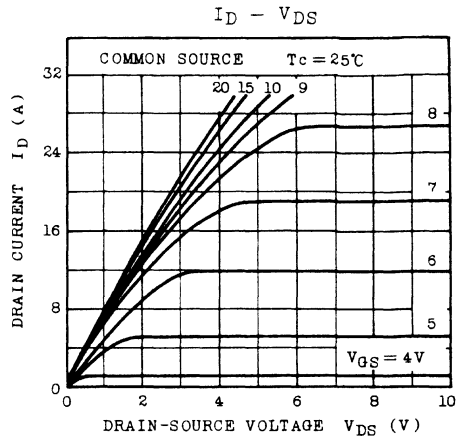
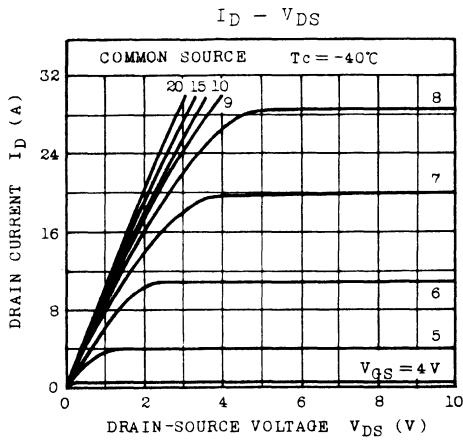
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

MG15C4HM1



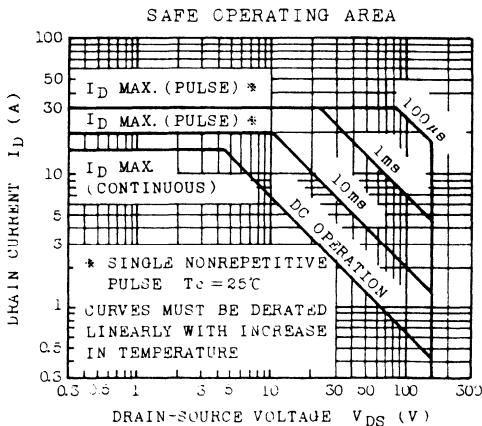
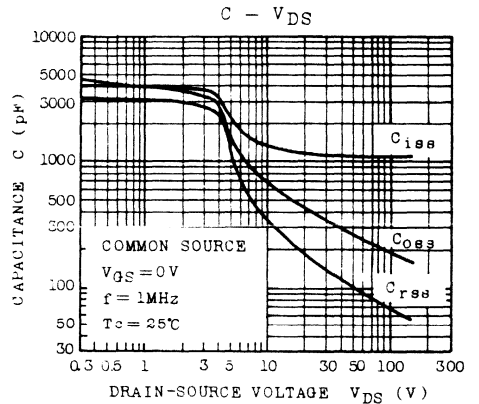
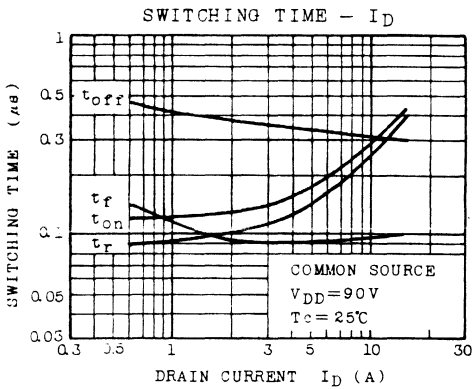
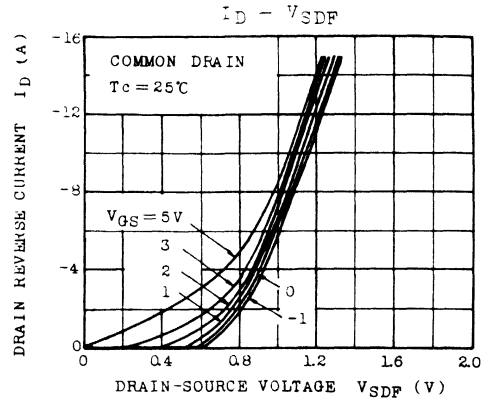
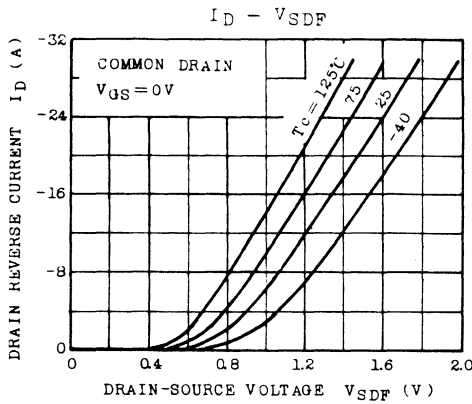
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

MG15C4HM1





# SEMICONDUCTOR

## TECHNICAL DATA

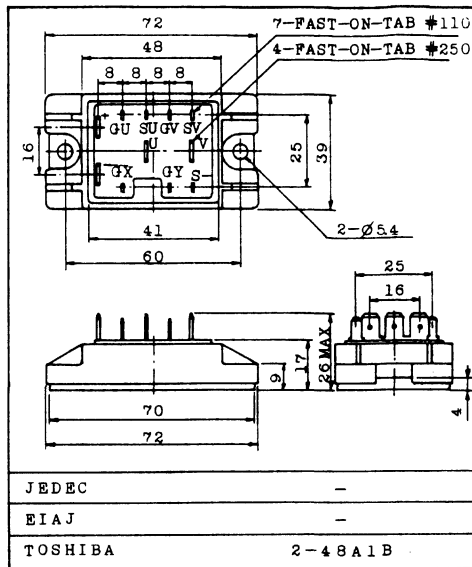
TOSHIBA GTR MODULE  
**MG15D4GM1**  
 SILICON N CHANNEL MOS TYPE

HIGH POWER SWITCHING APPLICATIONS.  
 MOTOR CONTROL APPLICATIONS.

### FEATURES:

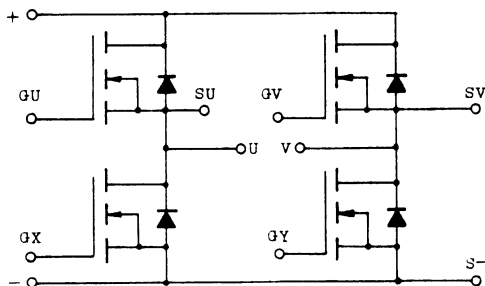
- . The Drain is Isolated from Case.
- . 4 MOS FETs are Built-in to 1 Package.
- . With Built-in Free Wheeling Diode.
- . Low Drain-Source ON Resistance  
 :  $R_{DS(ON)}=0.24\Omega$  (Max.) ( $I_D=15A$ )
- . Enhancement-mode.

Unit in mm



Weight : 140gr

### EQUIVALENT CIRCUIT



TOSHIBA CORPORATION





### TECHNICAL DATA

#### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	250	V
Gate-Source Voltage		V <sub>GSS</sub>	±20	V
Drain Current	DC	I <sub>D</sub>	±15	A
	1ms		±30	
Drain Power Dissipation (Tc=25°C)		P <sub>D</sub>	100	W
Channel Temperature		T <sub>ch</sub>	150	°C
Storage Temperature Range		T <sub>stg</sub>	-40 ~ 125	°C
Isolation Voltage		V <sub>Isol</sub>	2500 (AC 1 Minute)	V
Screw Torque		-	30	kg·cm

#### ELECTRICAL CHARACTERISTICS (Ta=25°C)

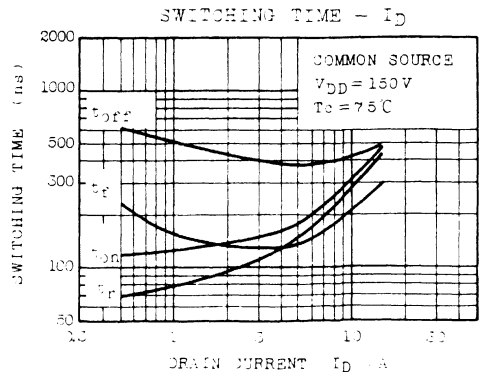
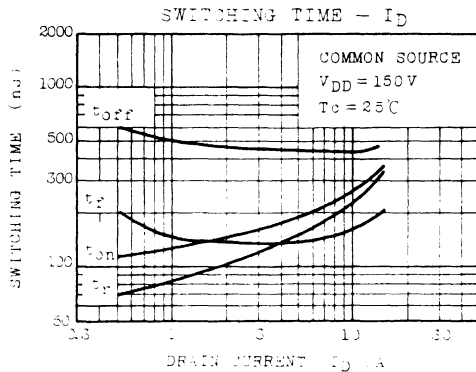
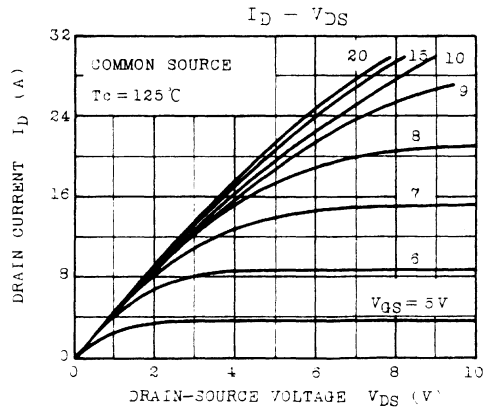
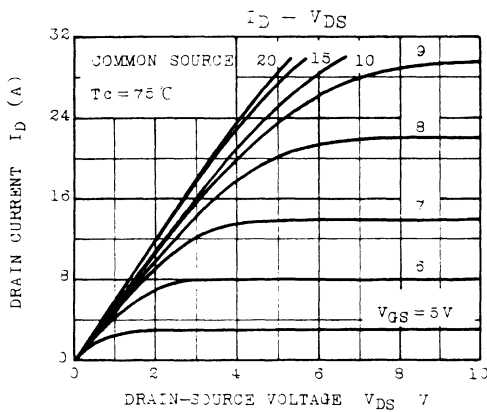
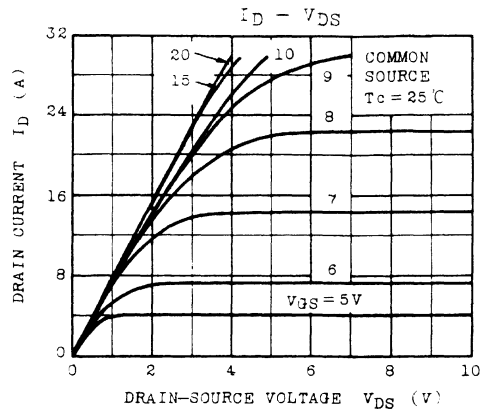
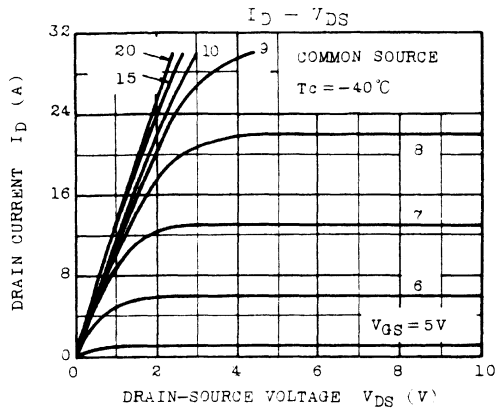
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0	-	-	±100	nA
Drain Cut-off Current		I <sub>DSS</sub>	V <sub>DS</sub> =250V, V <sub>GS</sub> =0	-	-	1.0	mA
Drain-Source Breakdown Voltage		V(BR) <sub>DSS</sub>	I <sub>D</sub> =10mA, V <sub>GS</sub> =0	250	-	-	V
Gate Threshold Voltage		V <sub>th</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =1mA	1.5	-	3.5	V
Forward Transfer Admittance		Y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =15A	4.0	7.0	-	S
Drain-Source ON Resistance		R <sub>DS(ON)</sub>	I <sub>D</sub> =15A, V <sub>GS</sub> =10V	-	-	0.24	Ω
Source Drain Forward Voltage		V <sub>SDF</sub>	I <sub>S</sub> =15A, V <sub>GS</sub> =0	-	-	1.8	V
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0, f=1MHz	-	2000	-	pF
Switching Time	Rise Time	t <sub>r</sub>	<p> <math>V_{IN} : t_r, t_r &lt; 5\text{ns}</math>  <math>D.U \leq 1\% (Z_{OUT} = 50\Omega)</math> </p>	-	300	600	ns
	Turn-on Time	t <sub>on</sub>		-	350	700	ns
	Fall Time	t <sub>f</sub>		-	200	400	ns
	Turn-off Time	t <sub>off</sub>		-	600	1000	ns
Reverse Recovery Time		t <sub>rr</sub>	I <sub>D</sub> =-15A, R <sub>C</sub> =220Ω V <sub>CS</sub> =-15V, di/dt=60A/µs	-	250	600	ns



# SEMICONDUCTOR

## TECHNICAL DATA

MG15D4GM1



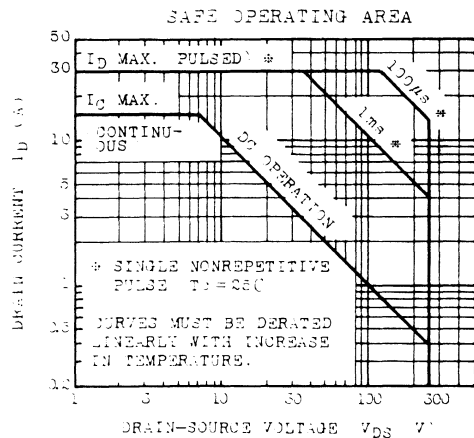
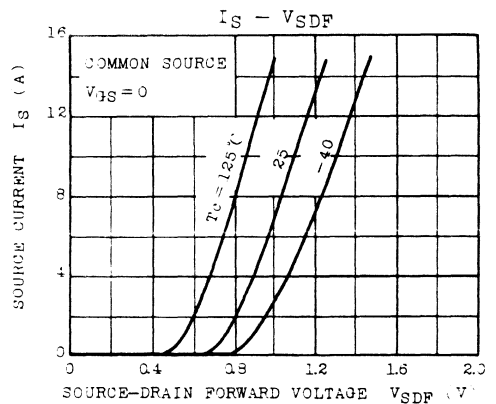
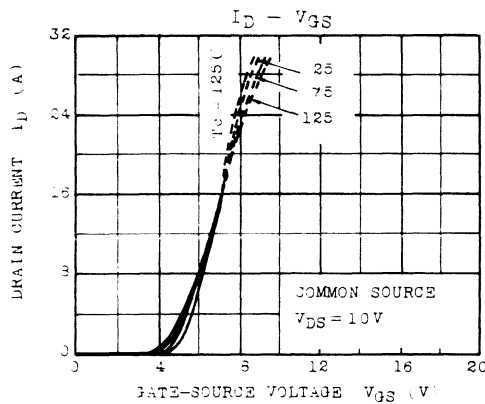
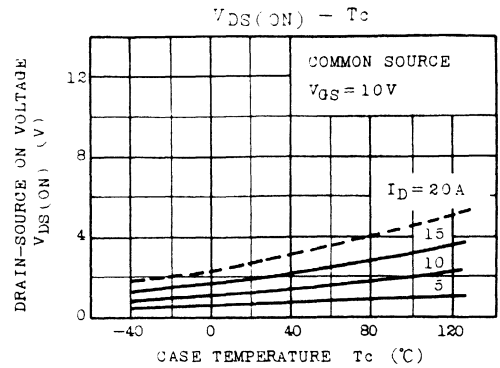
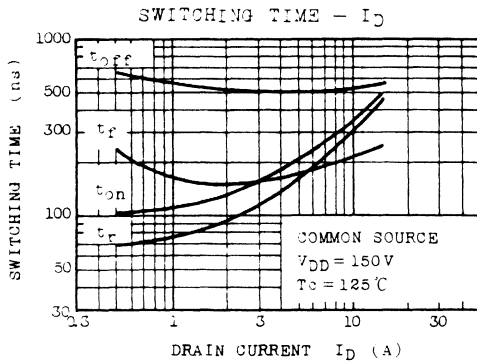
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

MG15D4GM1



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR MODULE

MG15D4HM1

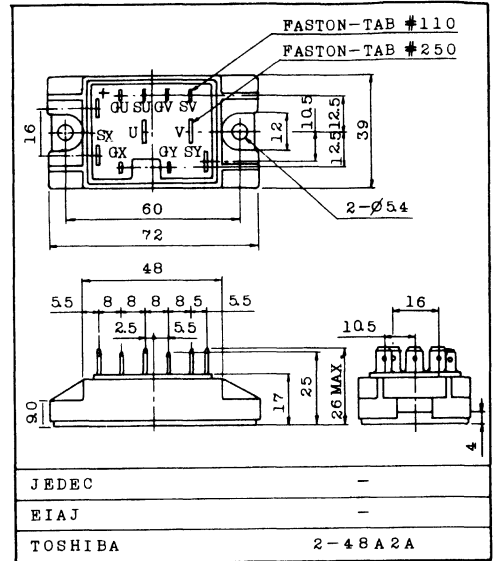
SILICON N CHANNEL MOS TYPE

HIGH POWER SWITCHING APPLICATIONS.  
MOTOR CONTROL APPLICATIONS.

**FEATURES:**

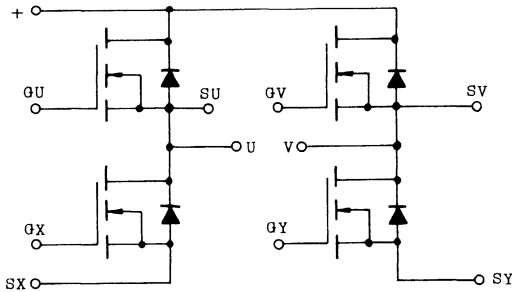
- . The Drain is Isolated from Case.
- . 4 MOS FETs are Built-in to 1 Package.
- . With Built-in Free Wheeling Diode.
- . Low Drain-Source ON Resistance  
:  $R_{DS(ON)} = 0.24\Omega$  (Max.) ( $I_D = 15A$ )
- . Enhancement-Mode.

Unit in mm



Weight : 140gr

**EQUIVALENT CIRCUIT**



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

MG15D4HM1

### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	V <sub>DSS</sub>	250	V
Gate-Source Voltage	V <sub>GSS</sub>	±20	V
Drain Current	DC	±15	A
	Peak	±30	
Drain Power Dissipation (Tc=25°C)	P <sub>D</sub>	100	W
Channel Temperature	T <sub>ch</sub>	150	°C
Storage Temperature Range	T <sub>stg</sub>	-40 ~ 125	°C
Isolation Voltage	V <sub>Isol</sub>	2500 (AC 1 Minute)	V
Screw Torque	-	30	kg·cm

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0	-	-	±100	nA	
Drain Cut-off Current	I <sub>DSS</sub>	V <sub>DS</sub> =250V, V <sub>GS</sub> =0	-	-	1.0	mA	
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	I <sub>D</sub> =10mA, V <sub>GS</sub> =0	250	-	-	V	
Gate Threshold Voltage	V <sub>th</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =1mA	1.5	-	3.5	V	
Forward Transfer Admittance	Y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =15A	4.0	7.0	-	S	
Drain-Source ON Resistance	R <sub>DS(ON)</sub>	I <sub>D</sub> =15A, V <sub>GS</sub> =10V	-	0.13	0.24	Ω	
Source Drain Forward Voltage	V <sub>SDF</sub>	I <sub>S</sub> =15A, V <sub>GS</sub> =0	-	1.3	1.8	V	
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0, f=1MHz	-	2000	-	pF	
Switching Time	Rise Time	t <sub>r</sub>	<p>V<sub>IN</sub>: t<sub>r</sub>, t<sub>f</sub> &lt; 5ns D. U ≤ 1% (Z<sub>OUT</sub> = 50Ω)</p>	-	300	600	ns
	Turn-on Time	t <sub>on</sub>		-	350	700	ns
	Fall Time	t <sub>f</sub>		-	200	400	ns
	Turn-off Time	t <sub>off</sub>		-	600	1000	ns
Reverse Recovery Time	t <sub>rr</sub>	I <sub>D</sub> =-15A, R <sub>C</sub> =220Ω V <sub>GS</sub> =-15V, di/dt=60A/μs	-	250	600	ns	

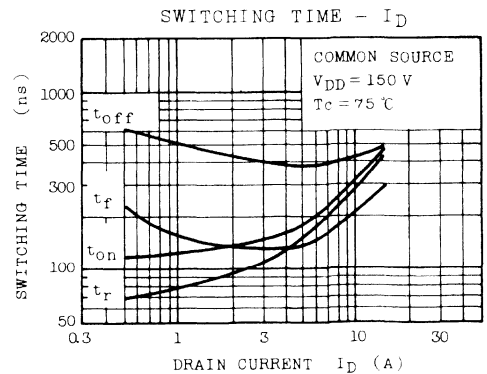
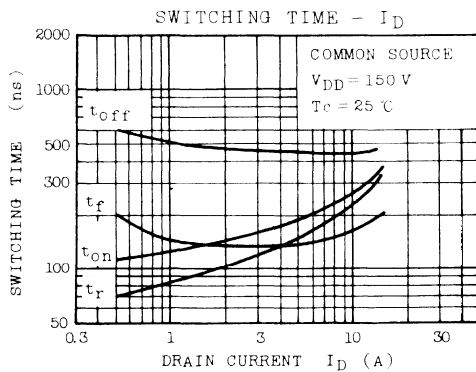
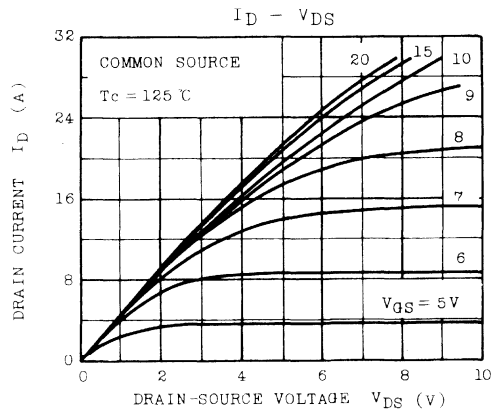
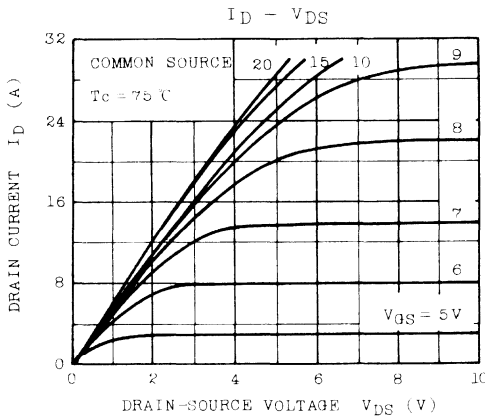
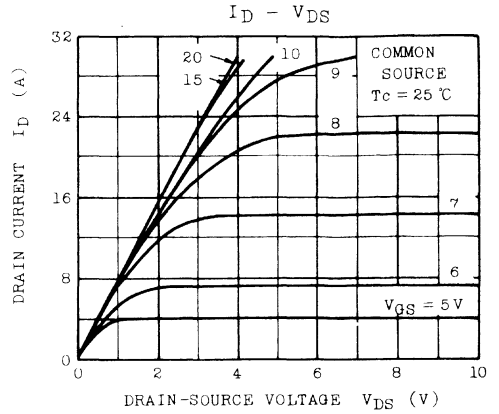
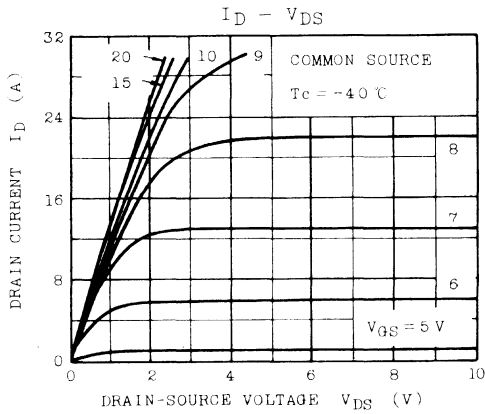
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

MG15D4HM1



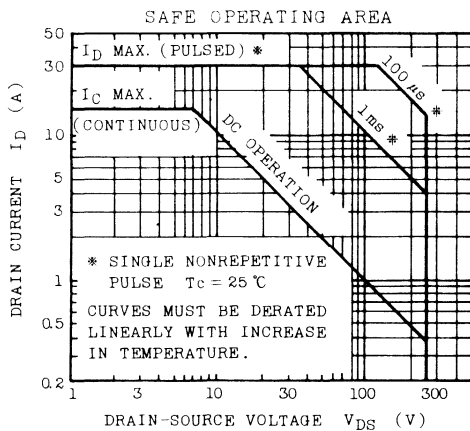
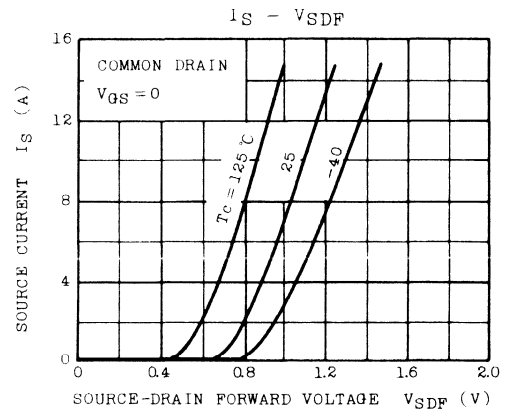
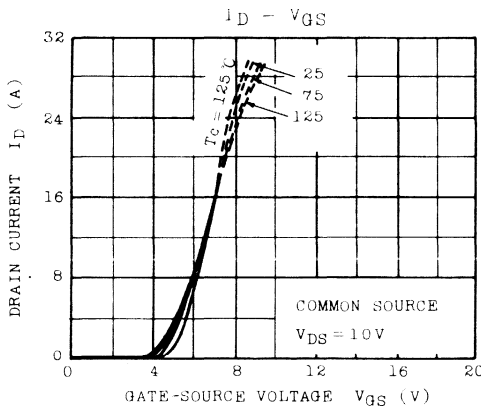
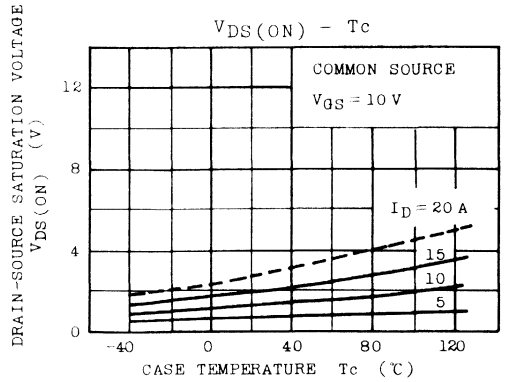
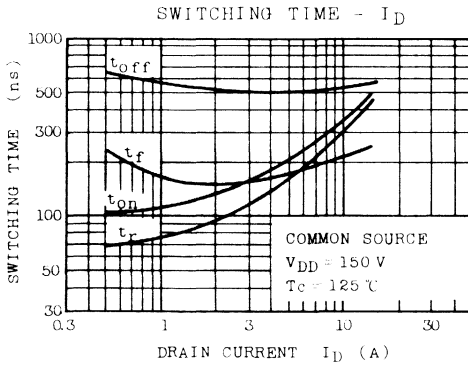
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

MG15D4HM1



TOSHIBA CORPORATION



# SEMICONDUCTOR

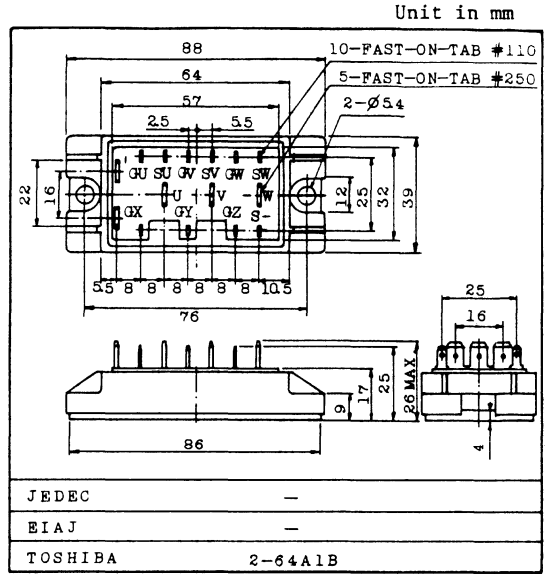
## TECHNICAL DATA

TOSHIBA GTR MODULE  
 MG15D6EM1  
 SILICON N CHANNEL MOS TYPE

HIGH POWER SWITCHING APPLICATIONS.  
 MOTOR CONTROL APPLICATIONS.

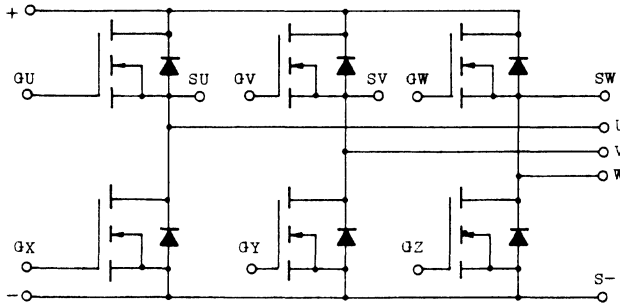
### FEATURES:

- The Drain is Isolated from Case.
- 6 MOS FETs are Built-in to 1 Package.
- With Built-in Free Wheeling Diode.
- Low Drain-Source ON Resistance  
 :  $R_{DS(ON)} = 0.24\Omega$  (Max.) ( $I_D = 15A$ )
- Enhancement-Mode.



Weight : 180gr

### EQUIVALENT CIRCUIT



TOSHIBA CORPORATION





#### MAXIMUM RATINGS (Ta=25°C)

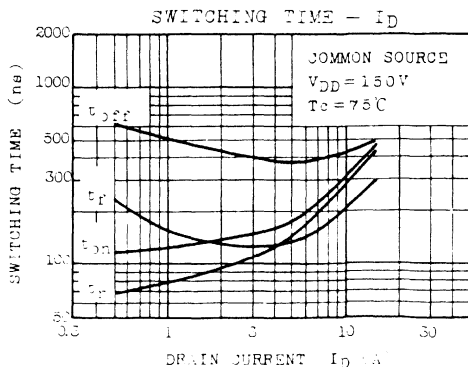
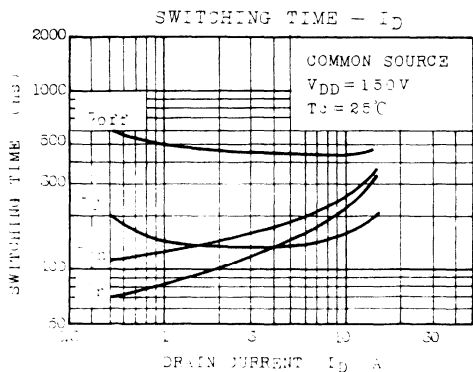
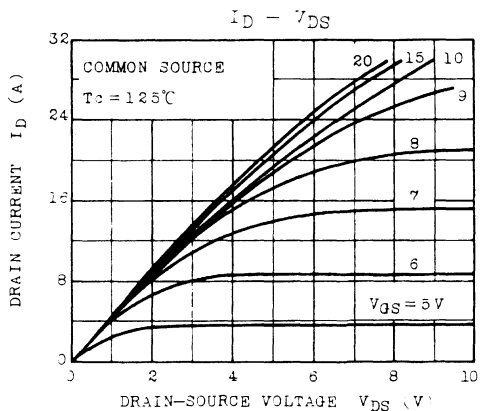
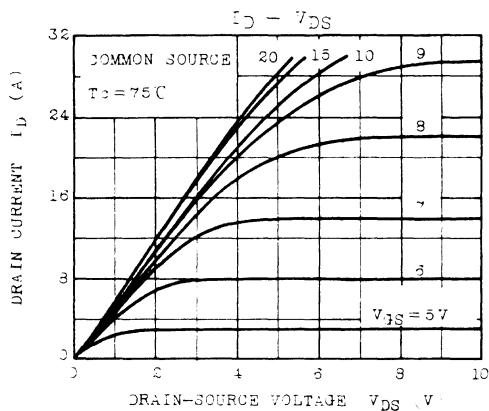
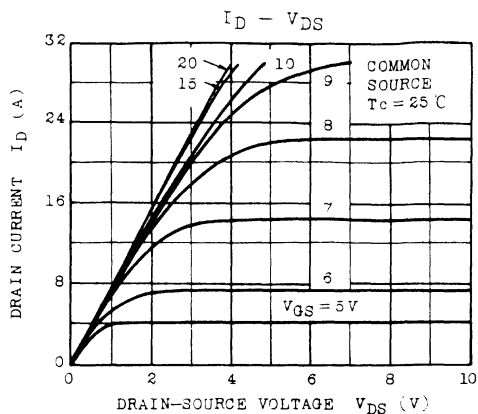
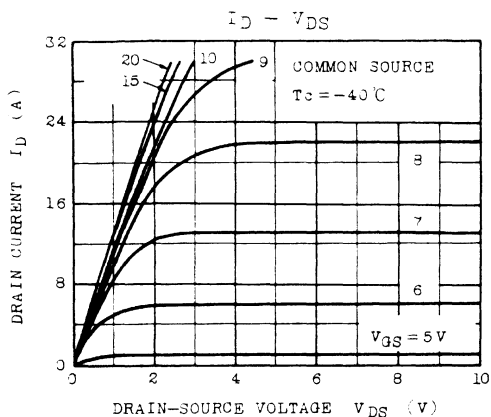
CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	250	V
Gate-Source Voltage		V <sub>GSS</sub>	±20	V
Drain Current	DC	I <sub>D</sub>	±15	A
	lms		±30	
Drain Power Dissipation (Tc=25°C)		P <sub>D</sub>	100	W
Channel Temperature		T <sub>ch</sub>	150	°C
Storage Temperature Range		T <sub>stg</sub>	-40 ~ 125	°C
Isolation Voltage		V <sub>Isol</sub>	2500 (AC 1 Minute)	V
Screw Torque		-	30	kg·cm

#### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0	-	-	±100	nA
Drain Cut-off Current		I <sub>DSS</sub>	V <sub>DS</sub> =250V, V <sub>GS</sub> =0	-	-	1.0	mA
Drain-Source Breakdown Voltage		V <sub>(BR)DSS</sub>	I <sub>D</sub> =10mA, V <sub>GS</sub> =0	250	-	-	V
Gate Threshold Voltage		V <sub>th</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =1mA	1.5	-	3.5	V
Forward Transfer Admittance		Y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =15A	4.0	7.0	-	S
Drain-Source ON Resistance		R <sub>DS(ON)</sub>	I <sub>D</sub> =15A, V <sub>GS</sub> =10V	-	-	0.24	Ω
Source Drain Forward Voltage		V <sub>SDF</sub>	I <sub>S</sub> =15A, V <sub>GS</sub> =0	-	-	1.8	V
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0, f=1MHz	-	2000	-	pF
Switching Time	Rise Time	t <sub>r</sub>	<p> <math>I_D = 15</math>  <math>V_{IN} : t_r, t_f &lt; 5 \text{ ns}</math>  <math>D, U \leq 1\% ; Z_{OUT} = 50 \Omega</math>  <math>V_{DD} = 150 \text{ V}</math> </p>	-	300	600	ns
	Turn-on Time	t <sub>on</sub>		-	350	700	ns
	Fall Time	t <sub>f</sub>		-	200	400	ns
	Turn-off Time	t <sub>off</sub>		-	600	1000	ns
Reverse Recovery Time		t <sub>rr</sub>	I <sub>D</sub> =-15A, R <sub>C</sub> =220Ω V <sub>GS</sub> =-15V, di/dt=60A/μs	-	250	600	ns



### TECHNICAL DATA

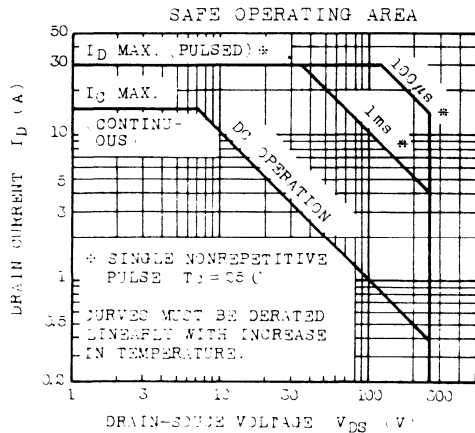
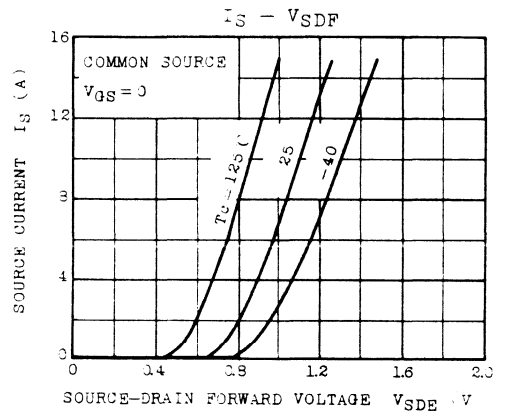
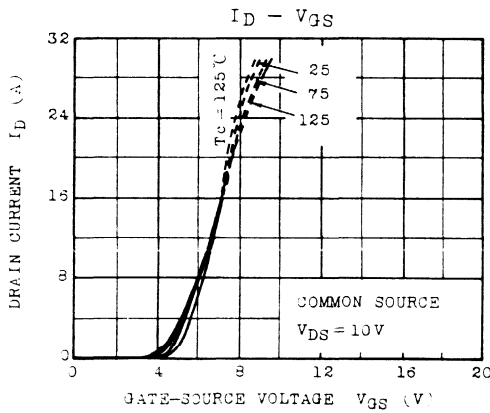
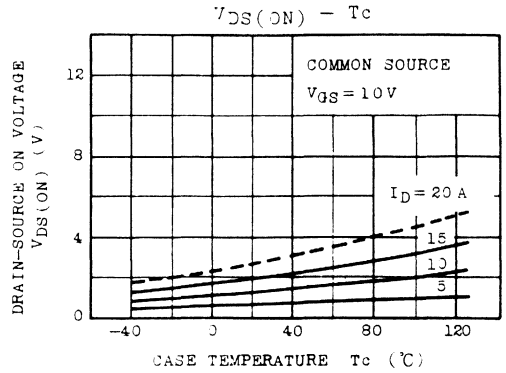
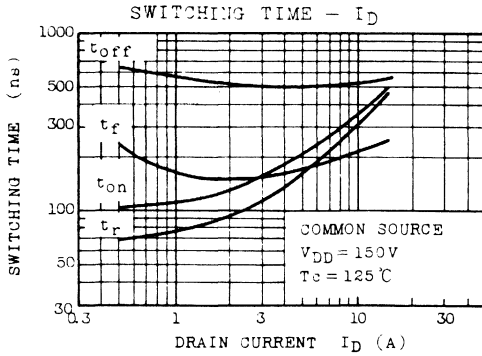




# SEMICONDUCTOR

## TECHNICAL DATA

MG15D6EM1



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR MODULE

MG15G1AM1

SILICON N CHANNEL MOS TYPE

( $\pi$ -MOS)

HIGH SPEED, HIGH POWER SWITCHING APPLICATIONS.  
MOTOR DRIVE, DC-DC CONVERTER AND SWITCHING REGULATOR APPLICATIONS.

FEATURES:

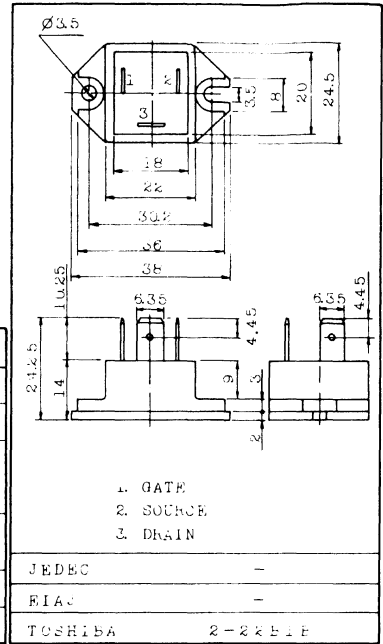
- Low Drain-Source ON Resistance  
:  $R_{DS(ON)}=0.4\Omega(\text{Max.}) (I_D=15A)$
- With Built-in Free Wheeling Diode
- Enhancement-Mode

MAXIMUM RATINGS ( $T_a=25^\circ\text{C}$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSS}$	450	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	A
Drain Power Dissipation ( $T_c=25^\circ\text{C}$ )	$P_D$	125	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-40 ~ 125	$^\circ\text{C}$

INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 28g

ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ\text{C}$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current	$I_{DSS}$	$V_{DS}=450V, V_{GS}=0$	-	-	1.0	mA
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	450	-	-	V
Gate Threshold Voltage	$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS}=10V, I_D=15A$	4.0	7.0	-	S
Drain-Source ON Resistance	$R_{DS(ON)}$	$I_D=15A, V_{GS}=10V$	-	-	0.4	$\Omega$
Source Drain Forward Voltage	$V_{SDF}$	$I_D=-15A, V_{GS}=0$	-	-	1.8	V
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	4500	-	pF
Switching Time	Rise Time		-	250	500	ns
	Turn-on Time		-	300	600	ns
	Fall Time		-	250	500	ns
	Turn-off Time		-	1000	2000	ns
Reverse Recovery Time	$t_{rr}$	$I_D=-15A, R_G=220\Omega, V_{GS}=-15V, di/dt=60A/\mu s$	-	300	600	ns

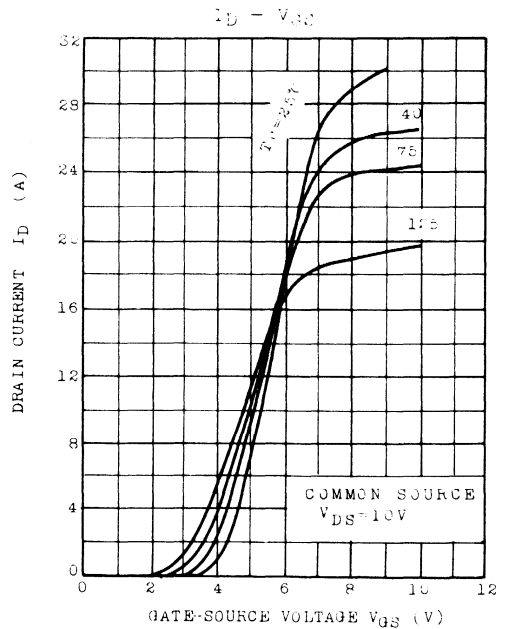
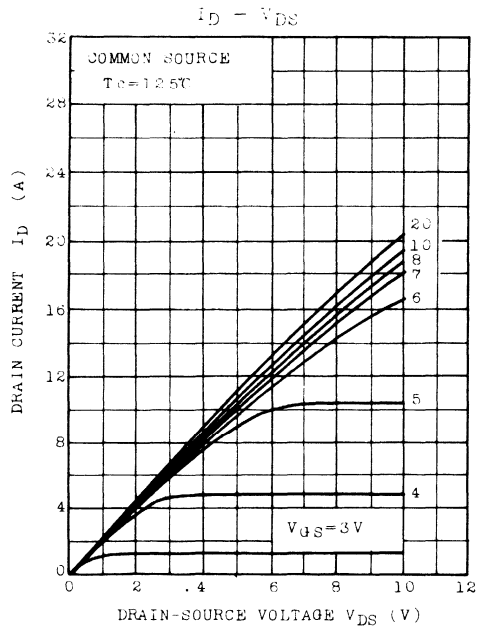
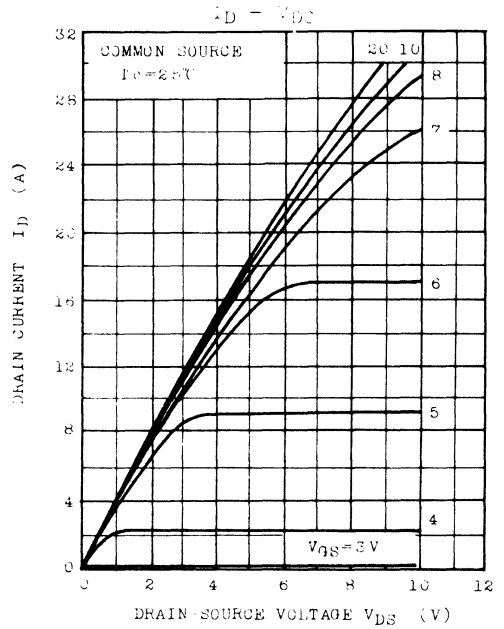
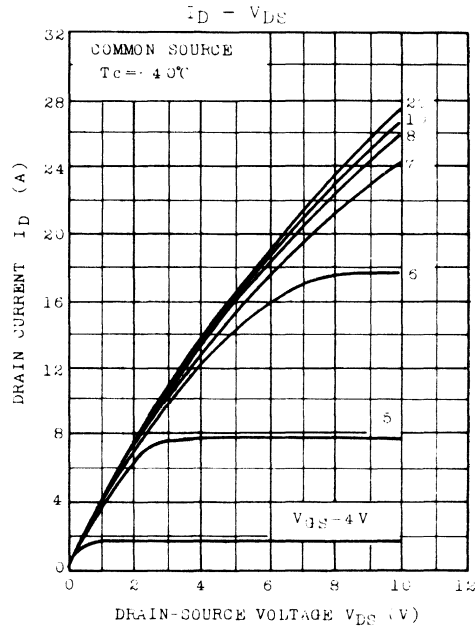
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

MG15G1AM1



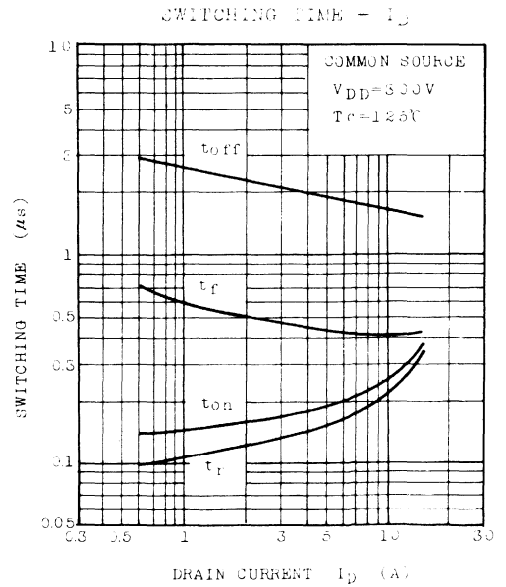
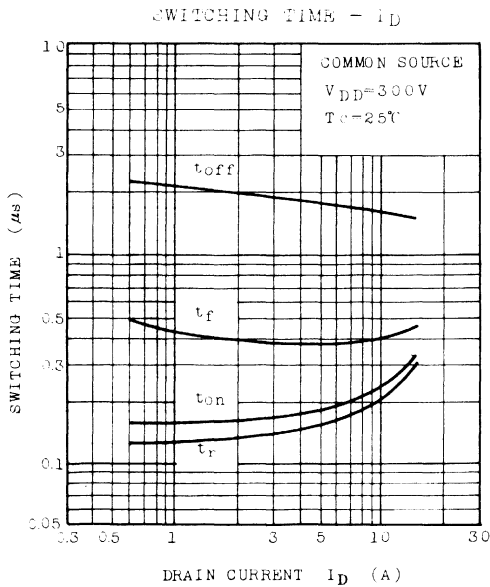
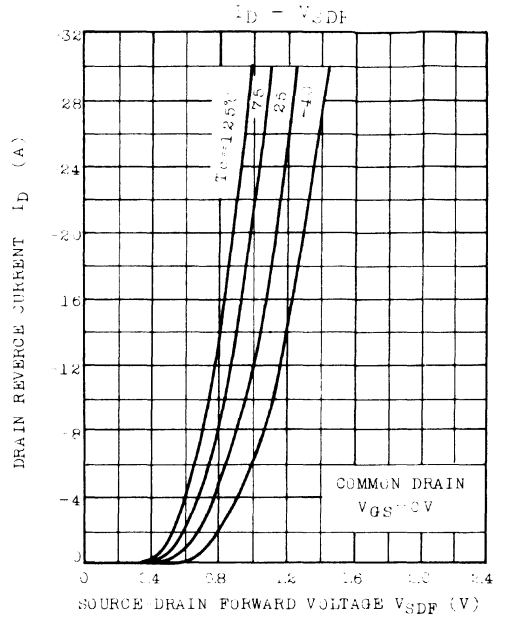
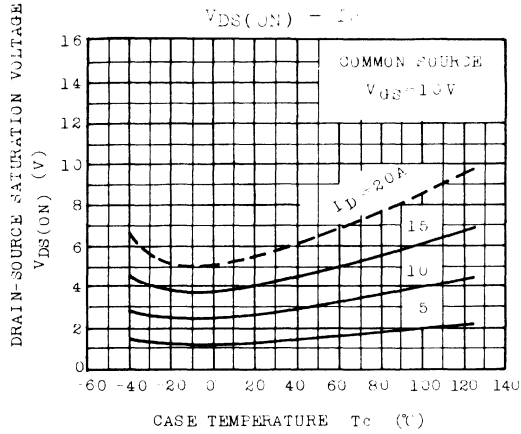
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

MG15G1AM1



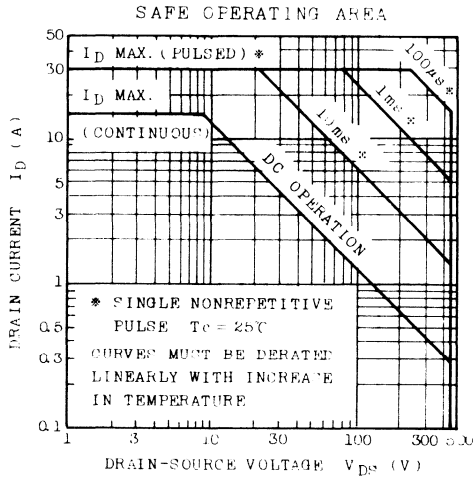
TOSHIBA CORPORATION



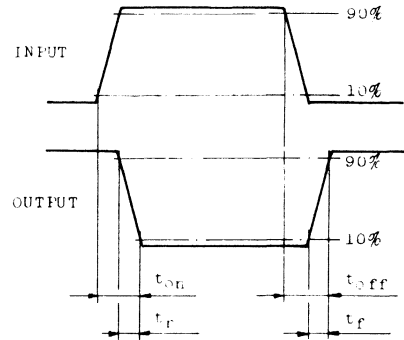
# SEMICONDUCTOR

## TECHNICAL DATA

MG15G1AM1



SWITCHING TIME TEST (WAVEFORM)





# SEMICONDUCTOR

## TECHNICAL DATA

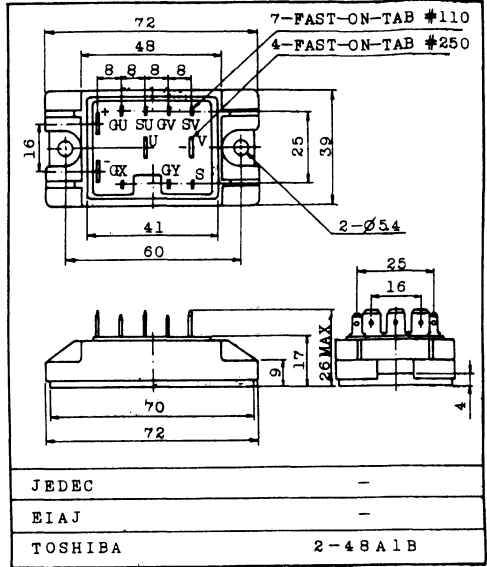
TOSHIBA GTR MODULE  
 MG15G4GM1  
 SILICON N CHANNEL MOS TYPE

HIGH POWER SWITCHING APPLICATIONS.  
 MOTOR CONTROL APPLICATIONS.

**FEATURES:**

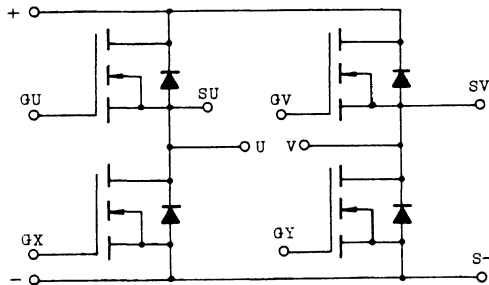
- . The Drain is Isolated from Case.
- . 4 MOS FETs are Built-in to 1 Package.
- . With Built-in Free Wheeling Diode.
- . Low Drain-Source ON Resistance  
 :  $R_{DS(ON)}=0.4\Omega(\text{Max.}) (I_D=15A)$
- . Enhancement-Mode.

Unit in mm



Weight : 140g

**EQUIVALENT CIRCUIT**



TOSHIBA CORPORATION





# SEMICONDUCTOR

## TECHNICAL DATA

MG15G4GM1

### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	450	V
Gate-Source Voltage		V <sub>GSS</sub>	±20	V
Drain Current	DC	I <sub>D</sub>	±15	A
	1ms		±30	
Drain Power Dissipation (Tc=25°C)		P <sub>D</sub>	125	W
Channel Temperature		T <sub>ch</sub>	150	°C
Storage Temperature Range		T <sub>stg</sub>	-40 ~ 125	°C
Isolation Voltage		V <sub>isol</sub>	2500 (AC 1 Minute)	V
Screw Torque		-	30	kg·cm

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

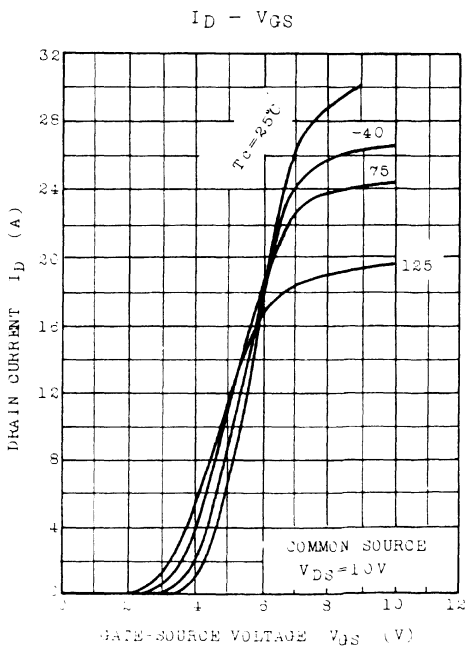
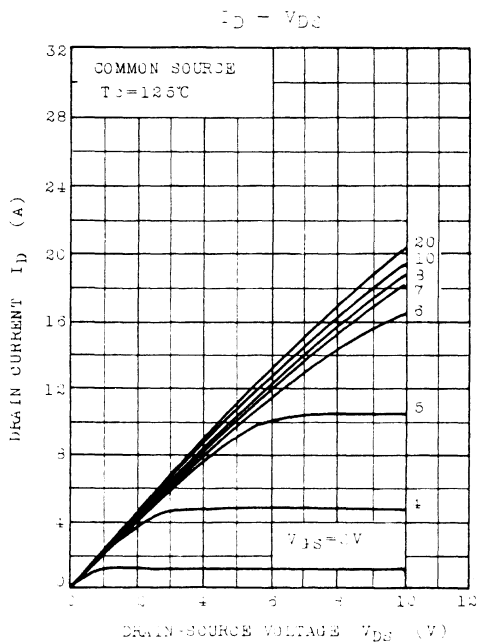
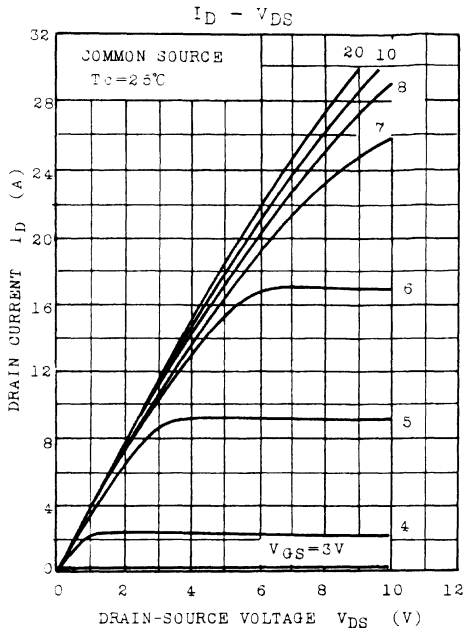
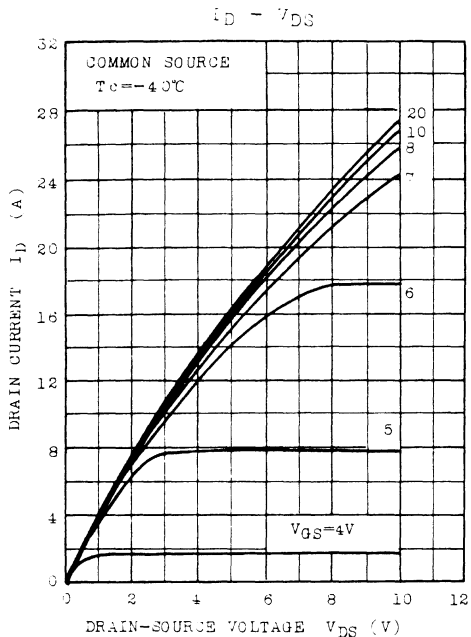
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0	-	-	±100	nA
Drain Cut-off Current		I <sub>DSS</sub>	V <sub>DS</sub> =450V, V <sub>GS</sub> =0	-	-	1.0	mA
Drain-Source Breakdown Voltage		V <sub>(BR)DSS</sub>	I <sub>D</sub> =10mA, V <sub>GS</sub> =0	450	-	-	V
Gate Threshold Voltage		V <sub>th</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =1mA	1.5	-	3.5	V
Forward Transfer Admittance		Y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =15A	4.0	7.0	-	S
Drain-Source ON Resistance		R <sub>DS(ON)</sub>	I <sub>D</sub> =15A, V <sub>GS</sub> =10V	-	-	0.4	Ω
Source Drain Forward Voltage		V <sub>SDF</sub>	I <sub>D</sub> =-15A, V <sub>GS</sub> =0	-	-	1.8	V
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0, f=1MHz	-	4500	-	pF
Switching Time	Rise Time	t <sub>r</sub>	<p> <math>I_D=15A</math>  <math>V_{IN}</math>  <math>V_{OUT}</math>  <math>V_{DD}=300V</math> </p>	-	250	500	ns
	Turn-on Time	t <sub>on</sub>		-	300	600	ns
	Fall Time	t <sub>f</sub>		-	250	500	ns
	Turn-off Time	t <sub>off</sub>		$V_{IN}: t_r, t_f < 5ns$ $D \leq 1\%$ (I <sub>OUT</sub> =50mA)	-	1000	2000
Reverse Recovery Time		t <sub>rr</sub>	$I_D=-15A, R_G=220\Omega$ $V_{GS}=-15V, di/dt=60A/\mu s$	-	300	600	ns



# SEMICONDUCTOR

## TECHNICAL DATA

MG15G4GM1



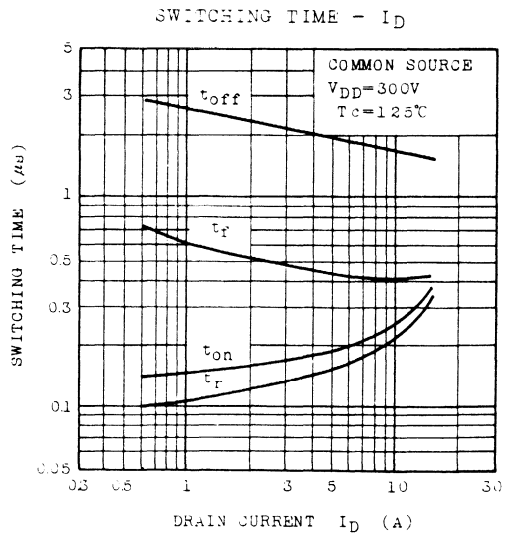
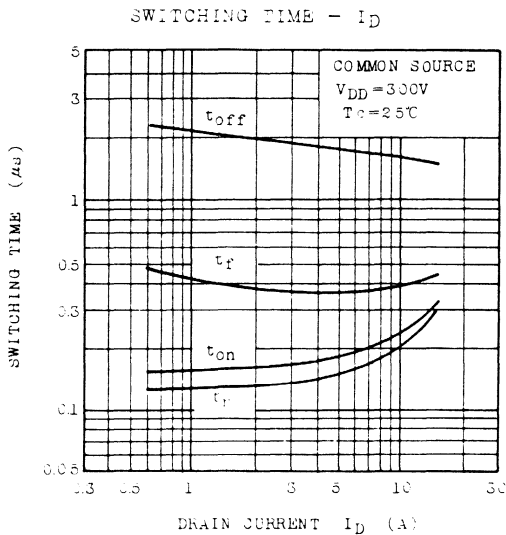
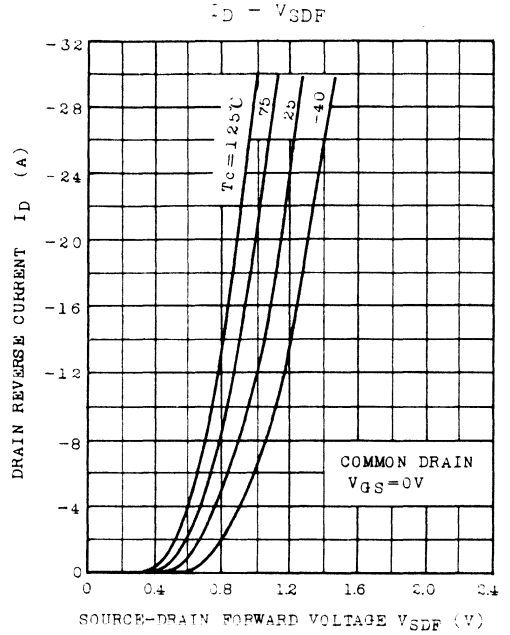
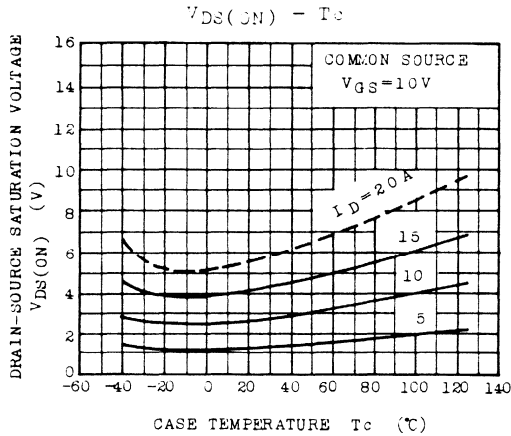
TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

MG15G4GM1



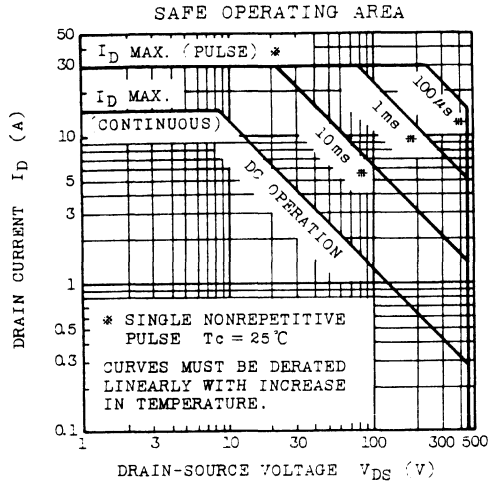
TOSHIBA CORPORATION



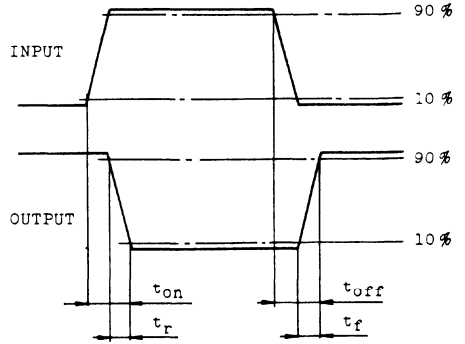
# SEMICONDUCTOR

## TECHNICAL DATA

MG15G4GM1



SWITCHING TIME TEST (WAVEFORM)



TOSHIBA CORPORATION



# SEMICONDUCTOR

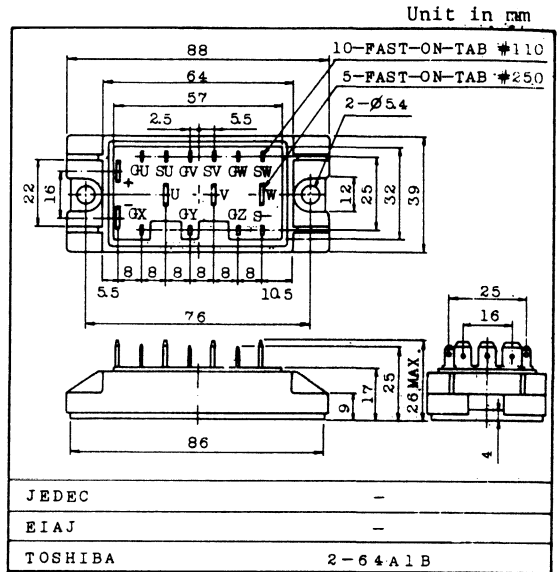
## TECHNICAL DATA

TOSHIBA GTR MODULE  
 MG15G6EM1  
 SILICON N CHANNEL MOS TYPE

HIGH POWER SWITCHING APPLICATIONS.  
 MOTOR CONTROL APPLICATIONS.

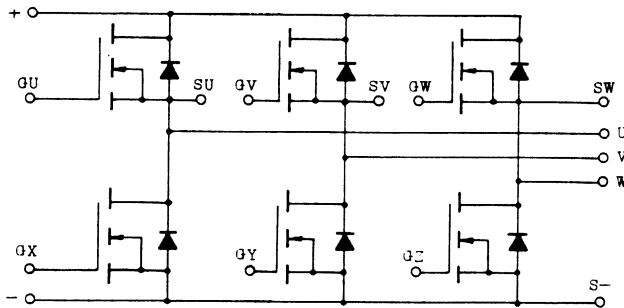
**FEATURES:**

- . The Drain is Isolated from Case.
- . 6 MOS FETs are Built-in to 1 Package.
- . With Built-in Free Wheeling Diode.
- . Low Drain-Source ON Resistance  
 :  $R_{DS(ON)} = 0.4\Omega(\text{Max.}) (I_D = 15A)$
- . Enhancement-Mode.



Weight : 180gr

**EQUIVALENT CIRCUIT**

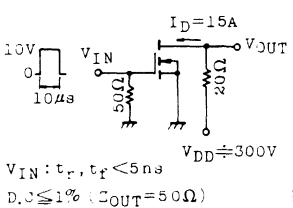




MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	450	V
Gate-Source Voltage		V <sub>GSS</sub>	±20	V
Drain Current	DC	I <sub>D</sub>	±15	A
	1ms		±30	
Drain Power Dissipation (Tc=25°C)		P <sub>D</sub>	125	W
Channel Temperature		T <sub>ch</sub>	150	°C
Storage Temperature Range		T <sub>stg</sub>	-40 ~ 125	°C
Isolation Voltage		V <sub>isol</sub>	2500 (AC 1 Minute)	V
Screw Torque		-	30	kg·cm

ELECTRICAL CHARACTERISTICS (Ta=25°C)

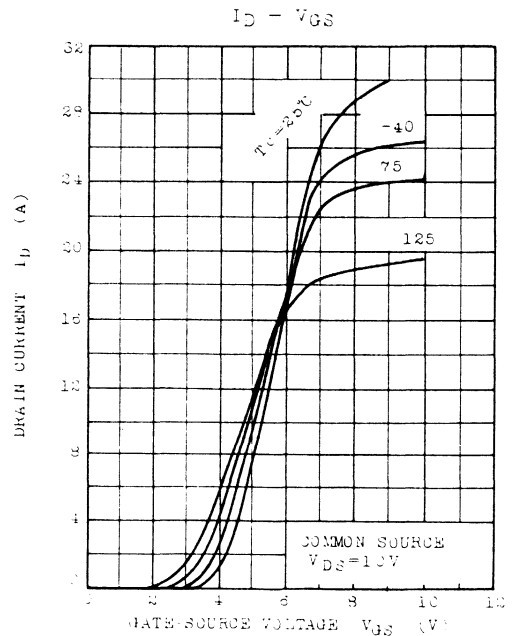
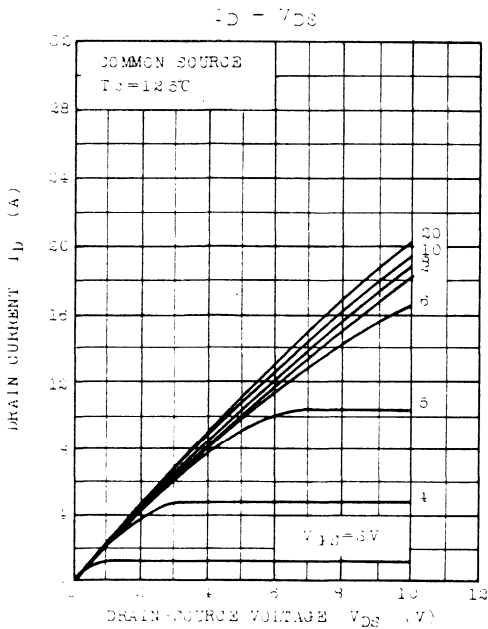
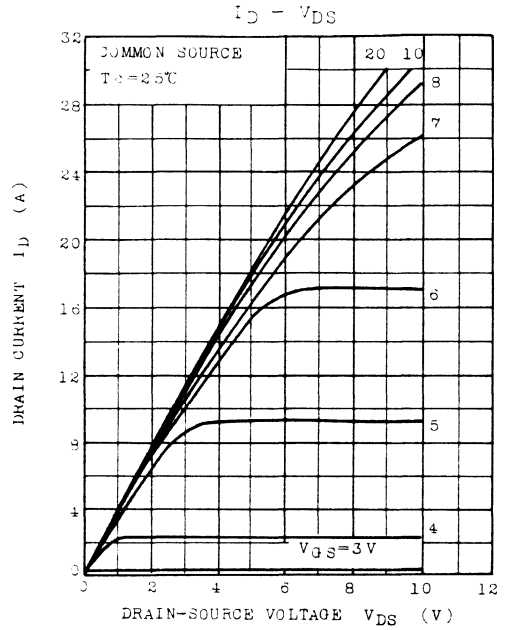
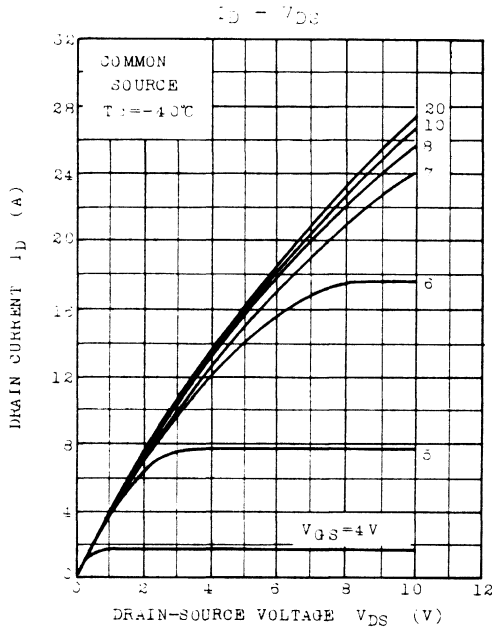
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0	-	-	±100	nA
Drain Cut-off Current		I <sub>DSS</sub>	V <sub>DS</sub> =450V, V <sub>GS</sub> =0	-	-	1.0	mA
Drain-Source Breakdown Voltage		V(BR) <sub>DSS</sub>	I <sub>D</sub> =10mA, V <sub>GS</sub> =0	450	-	-	V
Gate Threshold Voltage		V <sub>th</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =1mA	1.5	-	3.5	V
Forward Transfer Admittance		Y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =15A	4.0	7.0	-	S
Drain-Source ON Resistance		R <sub>DS(ON)</sub>	I <sub>D</sub> =15A, V <sub>GS</sub> =10V	-	-	0.4	Ω
Source Drain Forward Voltage		V <sub>SDF</sub>	I <sub>D</sub> =-15A, V <sub>GS</sub> =0	-	-	1.8	V
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0, f=1MHz	-	4500	-	pF
Switching Time	Rise Time	t <sub>r</sub>		-	250	500	ns
	Turn-on Time	t <sub>on</sub>		-	300	600	ns
	Fall Time	t <sub>f</sub>		-	250	500	ns
	Turn-off Time	t <sub>off</sub>		-	1000	2000	ns
Reverse Recovery Time		t <sub>rr</sub>	I <sub>D</sub> =-15A, R <sub>G</sub> =220Ω V <sub>GS</sub> =-15V, di/dt=60A/µs	-	300	600	ns



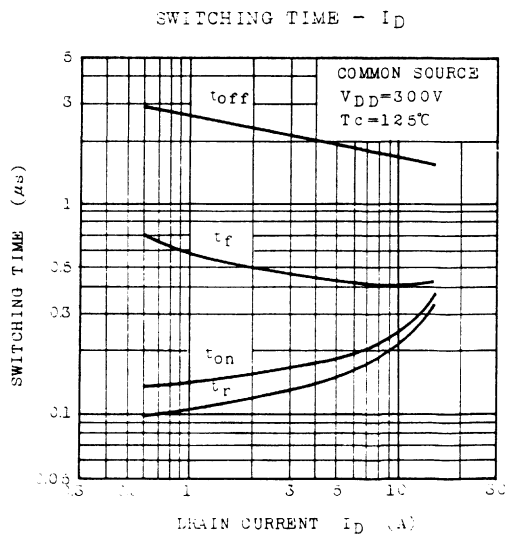
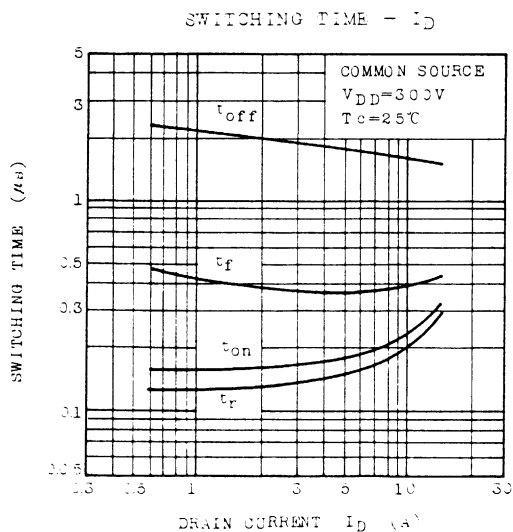
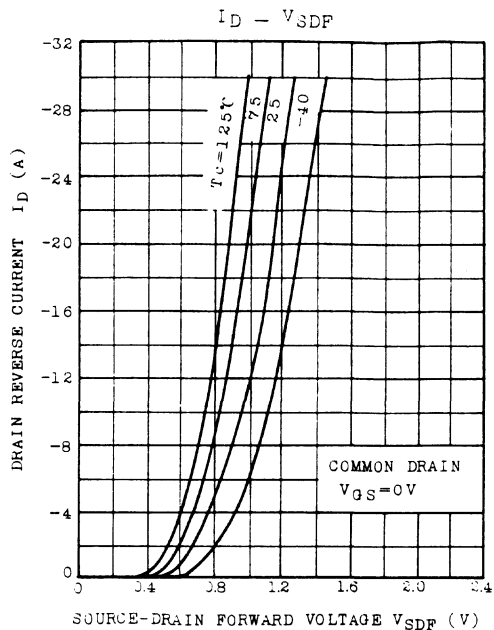
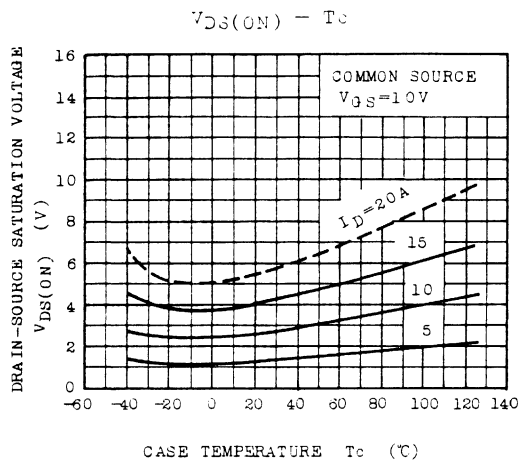
# SEMICONDUCTOR

## TECHNICAL DATA

MG15G6EM1



TOSHIBA CORPORATION



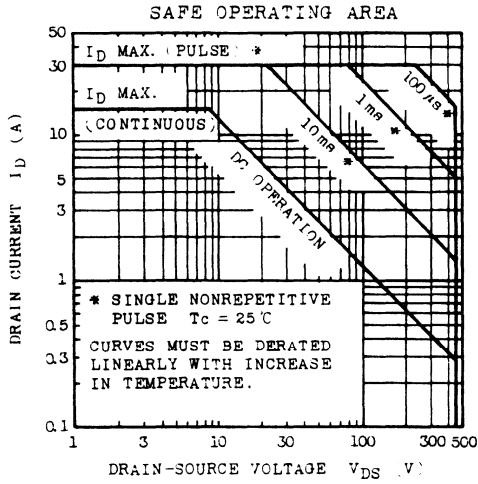




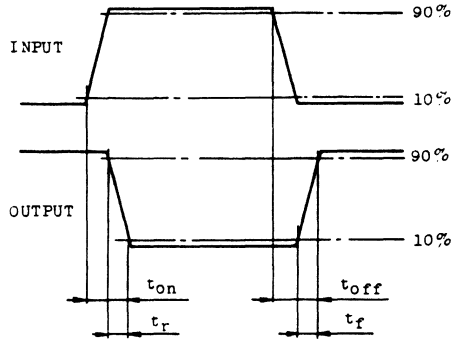
# SEMICONDUCTOR

## TECHNICAL DATA

MG15G6EM1



SWITCHING TIME TEST (WAVEFORM)



TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR ARRAY

S 2 4 8 7

SILICON N CHANNEL MOS TYPE (6 in 1)

TENTATIVE ( $\pi$ -MOS)

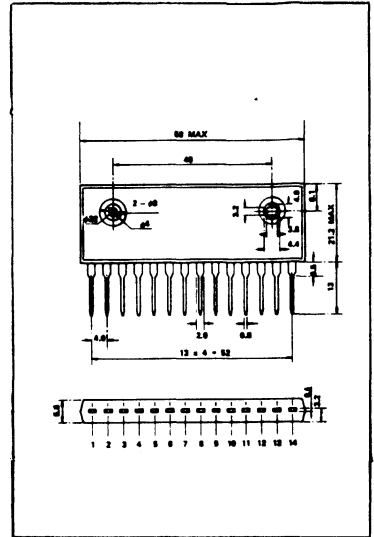
HIGH POWER SWITCHING APPLICATIONS.  
MOTOR DRIVE APPLICATIONS.

INDUSTRIAL APPLICATIONS

Unit in mm

### FEATURES :

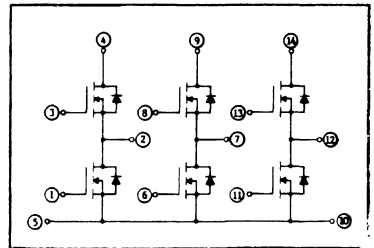
- High Reliability Small-Sized Available (6 in 1)
- Firmly Packed Single-Inline Package (14 pin)
- High Drain Power Dissipation :  $P_D=120W$  @  $T_c=25^\circ C$   
(Six Device Action)
- Low Drain-Source ON Resistance :  $R_{DS(ON)}=0.24\Omega$  (Typ.)
- Low Leakage Current :  $I_{DSS}=300\mu A$  (Max.) @  $V_{DS}=250V$
- Enhancement-Mode :  $V_{th}=1.5\sim 3.5V$  @  $V_{DS}=10V, I_D=1mA$



### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	250	v
Gate-Source Voltage		$V_{GSS}$	±20	v
Drain Current	DC	$I_D$	15	A
	Pulse	$I_{DP}$	25	
Drain Power Dissipation (One Device Action, $T_c=25^\circ C$ )		$P_D$	35	W
Drain Power Dissipation (Six Device Action)	$T_a=25^\circ C$	$P_{DT}$	10	W
	$T_c=25^\circ C$		120	
Channel Temperature		$T_{ch}$	150	°C
Storage Temperature Range		$T_{stg}$	-55 ~ 150	°C

### ARRAY CONFIGURATION



### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Case (Six Device Action)	$\Sigma R_{th(ch-c)}$	1.04	°C/W
Thermal Resistance, Channel to Ambient (Six Device Action)	$\Sigma R_{th(ch-a)}$	12.5	°C/W
Maximum Lead Temperature for Soldering Purposes (3.2mm from case for 10 seconds)	$T_L$	260	°C

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

S 2 4 8 7

TENTATIVE

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=250V, V_{GS}=0$	-	-	300	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	250	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=10A$	3.5	6.5	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=10A, V_{GS}=10V$	-	0.29	0.35	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=15A, V_{GS}=10V$	-	4.5	5.4	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	1100	1400	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	240	320	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	500	600	pF
Switching Time	Rise Time	$t_r$	<p> <math>I_D=10A</math>  <math>V_{IN}</math>  <math>10\mu s</math>  <math>10\mu s</math>  <math>20C</math>  <math>V_{OUT}</math>  <math>V_{DD}=200V</math>  <math>V_{IN}: t_r, t_f &lt; 5ns</math>  <math>D.U. 1\% (Z_{OUT}=50\Omega)</math> </p>	-	140	280	ns
	Turn-on Time	$t_{on}$		-	170	340	ns
	Fall Time	$t_f$		-	120	240	ns
	Turn-off Time	$t_{off}$		-	320	640	ns

### SOURCE-DRAIN DIODE RATING AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Drain Reverse Current	DC	$I_{DR}$	—	-	-	15	A
	Pulse	$I_{DRP}$	—	-	-	25	A
Drain-Source Forward Voltage		$V_{DSF}$	$I_{DR}=15A, V_{GS}=0V$	-	1.5	2.0	V
Reverse Recovery Time		$t_{rr}$	$I_{DR}=15A, V_{GS}=0V$	-	250	-	ns
Reverse Recovered Charge		$Q_{rr}$		$dI_{DR}/dt=100A/\mu s$	-	1.5	-



# SEMICONDUCTOR

## TECHNICAL DATA

TOSHIBA FIELD EFFECT TRANSISTOR ARRAY

S 3 5 1 3

SILICON N CHANNEL MOS TYPE (4 in 1)  
( $\pi$ -MOS)

HIGH POWER SWITCHING APPLICATIONS.  
HAMMER DRIVE, PULSE MOTOR DRIVE AND INDUCTIVE  
LOAD DRIVE APPLICATIONS.

**TENTATIVE**

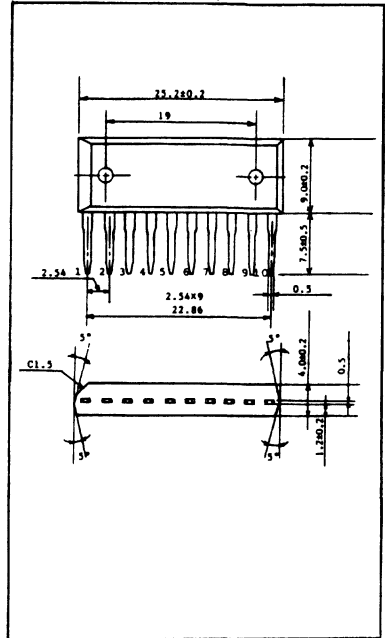
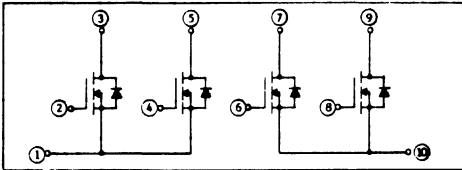
INDUSTRIAL APPLICATIONS

Unit in mm

### FEATURES :

- High Reliability Small-Sized Available (4 in 1)
- Firmly Packed Single-Inline Package (10 pin)
- High Drain Power Dissipation :  $P_D = 4 \text{ W} @ T_a = 25^\circ\text{C}$   
(Four Device action)
- Low Drain- Source ON Resistance :  $R_{DS(ON)} = 1.0\Omega(\text{Typ.})$
- Low Leakage Current :  $I_{DSS} = 1000\mu\text{A}(\text{Max.}) @ V_{DS} = 120\text{V}$
- Enhancement-Mode :  $V_{th} = 1.5 \sim 3.5 \text{ V} @ V_{DS} = 10\text{V}, I_D = 1\text{mA}$

### ARRAY CONFIGURATION



### MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSX}$	120	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	3	A
	Pulse	$I_{DP}$	5	
Drain Power Dissipation (One Device Action, $T_a = 25^\circ\text{C}$ )		$P_D$	2.0	W
Drain Power Dissipation (Four Device Action, $T_a = 25^\circ\text{C}$ )		$P_{DT}$	4.0	W
Channel Temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature Range		$T_{stg}$	$-55 \sim 150$	$^\circ\text{C}$

### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Ambient (Four Device Action)	$\Sigma R_{th(ch-a)}$	31.3	$^\circ\text{C}/\text{W}$
Maximum Lead Temperature for Soldering Purposes (3.2mm from case for 10 seconds)	$T_L$	260	$^\circ\text{C}$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

S 3 5 1 3

TENTATIVE

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=120V, V_{GS}=0$	-	-	1000	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	120	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=3A$	0.5	1.0	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=1A, V_{GS}=10V$	-	1.0	1.3	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=3A, V_{GS}=10V$	-	5.0	6.5	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	150	200	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	12	25	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	100	130	pF
Switching Time	Rise Time	$t_r$		-	15	30	ns
	Turn-on Time	$t_{on}$		-	25	50	ns
	Fall Time	$t_f$		-	20	40	ns
	Turn-off Time	$t_{off}$		-	40	80	ns

### SOURCE-DRAIN DIODE RATING AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Drain Reverse Current	DC	$I_{DR}$	—	-	-	3	A
	Pulse	$I_{DRP}$	—	-	-	5	A
Drain-Source Forward Voltage		$V_{DSF}$	$I_{DR}=3A, V_{GS}=0V$	-	1.1	1.6	V
Reverse Recovery Time		$t_{rr}$	$I_{DR}=3A, V_{GS}=0V$	-	120	-	ns
Reverse Recovered Charge		$Q_{rr}$	$dI_{DR}/dt=20A/\mu s$	-	0.11	-	$\mu C$



# SEMICONDUCTOR

## TECHNICAL DATA

### TOSHIBA FIELD EFFECT TRANSISTOR ARRAY

S 3 5 1 4

SILICON N CHANNEL MOS TYPE (4 in 1)  
( $\bar{N}$ -MOS)

HIGH POWER SWITCHING APPLICATIONS. **TENTATIVE**  
HAMMER DRIVE, PULSE MOTOR DRIVE AND INDUCTIVE  
LOAD DRIVE APPLICATIONS.

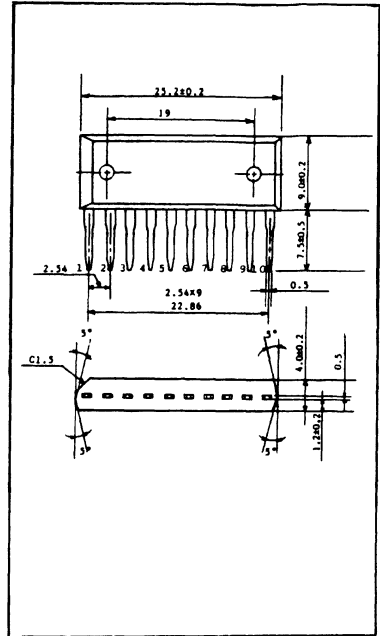
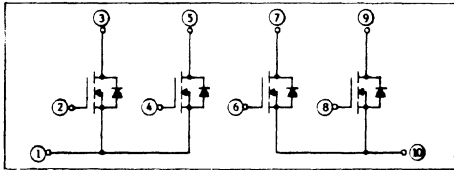
INDUSTRIAL APPLICATIONS

Unit in mm

#### FEATURES :

- High Reliability Small-Sized Available (4 in 1)
- Firmly Packed Single-Inline Package (10 pin)
- High Drain Power Dissipation :  $P_D = 4 \text{ W}$  @  $T_a = 25^\circ\text{C}$   
(Four Device action)
- Low Drain- Source ON Resistance :  $R_{DS(ON)} = 0.38 \Omega$  (Typ.)
- Low Leakage Current :  $I_{DSS} = 1000 \mu\text{A}$  (Max.) @  $V_{DS} = 60\text{V}$
- Enhancement-Mode :  $V_{th} = 1.5 \sim 3.5 \text{ V}$  @  $V_{DS} = 10\text{V}$ ,  $I_D = 1 \text{ mA}$

#### ARRAY CONFIGURATION



#### MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSX}$	60	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	5
	Pulse	$I_{DP}$	8
Drain Power Dissipation (One Device Action, $T_a = 25^\circ\text{C}$ )	$P_D$	2.0	W
Drain Power Dissipation (Four Device Action, $T_a = 25^\circ\text{C}$ )	$P_{DT}$	4.0	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	$-55 \sim 150$	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Ambient (Four Device Action)	$\Sigma R_{th(ch-a)}$	31.3	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes (3.2mm from case for 10 seconds)	$T_L$	260	$^\circ\text{C}$

TOSHIBA CORPORATION



# SEMICONDUCTOR

## TECHNICAL DATA

S 3 5 1 4

TENTATIVE

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0$	-	-	$\pm 100$	nA
Drain Cut-off Current		$I_{DSS}$	$V_{DS}=60V, V_{GS}=0$	-	-	1000	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D=10mA, V_{GS}=0$	60	-	-	V
Gate Threshold Voltage		$V_{th}$	$V_{DS}=10V, I_D=1mA$	1.5	-	3.5	V
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS}=10V, I_D=3A$	0.6	1.2	-	S
Drain-Source ON Resistance		$R_{DS(ON)}$	$I_D=3A, V_{GS}=10V$	-	0.38	0.50	$\Omega$
Drain-Source ON Voltage		$V_{DS(ON)}$	$I_D=5A, V_{GS}=10V$	-	2.1	2.8	V
Input Capacitance		$C_{iss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	170	220	pF
Reverse Transfer Capacitance		$C_{rss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	40	80	pF
Output Capacitance		$C_{oss}$	$V_{DS}=10V, V_{GS}=0, f=1MHz$	-	190	250	pF
Switching Time	Rise Time	$t_r$		-	20	40	ns
	Turn-on Time	$t_{on}$		-	25	50	ns
	Fall Time	$t_f$		-	20	40	ns
	Turn-off Time	$t_{off}$		-	30	60	ns

### SOURCE-DRAIN DIODE RATING AND CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Drain Reverse Current	DC	$I_{DR}$	—	-	-	5	A
	Pulse	$I_{DRP}$	—	-	-	8	A
Drain-Source Forward Voltage		$V_{DSF}$	$I_{DR}=5A, V_{GS}=0V$	-	1.2	1.8	V
Reverse Recovery Time		$t_{rr}$	$I_{DR}=5A, V_{GS}=0V$	-	150	-	ns
Reverse Recovered Charge		$Q_{rr}$	$dI_{DR}/dt=20A/\mu s$	-	0.25	-	$\mu C$