DATA SHEET

NEC

MOS FIELD EFFECT TRANSISTOR

μPA1707

SWITCHING
N-CHANNEL POWER MOS FET
INDUSTRIAL USE

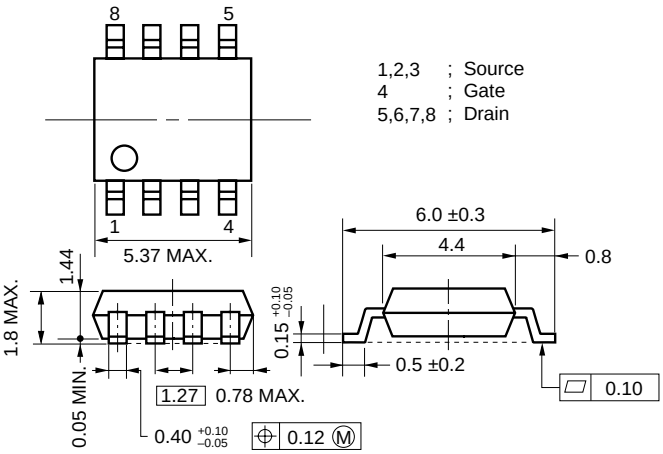
DESCRIPTION

The μPA1707 is N-Channel MOS Field Effect Transistor designed for DC/DC converters and power management applications of notebook computers.

FEATURES

- Low on-resistance
  $R_{DS(on)1}$ = 10.0 mΩ TYP. (V_{GS} = 10 V, I_D = 5.0 A)
  $R_{DS(on)2}$ = 12.5 mΩ TYP. (V_{GS} = 4.5 V, I_D = 5.0 A)
  $R_{DS(on)3}$ = 14.0 mΩ TYP. (V_{GS} = 4.0 V, I_D = 5.0 A)
- Low C_{iss}: C_{iss} = 1400 pF TYP.
- Built-in G-S protection diode
- Small and surface mount package (Power SOP8)

PACKAGE DRAWING (Unit : mm)



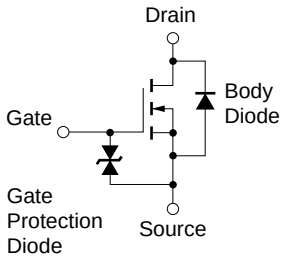
ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1707G	Power SOP8

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, All terminals are connected.)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	30	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±20	V
Drain Current (DC) (T_C= 25°C)	$I_{D(DC)}$	±10	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	±40	A
Total Power Dissipation (T_A = 25°C) Note2	P_T	2.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C

EQUIVALENT CIRCUIT



Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

2. Mounted on ceramic substrate of 1200 mm^2 x 1.7 mm

Remark The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

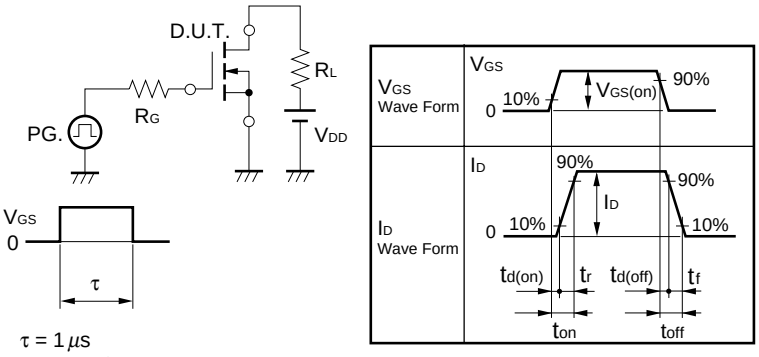
Document No. G13084EJ2V0DS00 (2nd edition)
Date Published December 2000 NS CP(K)
Printed in Japan

The mark ★ shows major revised points.

ELECTRICAL CHARACTERISTICS (T_A = 25°C, All terminals are connected.)

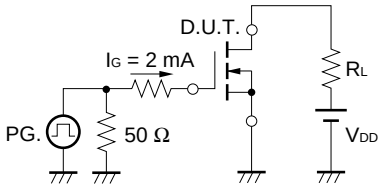
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V			10	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10 V, I_D = 1 mA	1.5	2.0	2.5	V
Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = 10 V, I_D = 5.0 A	5.0	13		S
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 5.0 A		10.0	13.5	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.5 V, I_D = 5.0 A		12.5	18	mΩ
	$R_{DS(on)3}$	V_{GS} = 4.0 V, I_D = 5.0 A		14.0	21	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10 V		1400		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		450		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		180		pF
Turn-on Delay Time	$t_{d(on)}$	I_D = 5.0 A		20		ns
Rise Time	t_r	$V_{GS(on)}$ = 10 V		185		ns
Turn-off Delay Time	$t_{d(off)}$	V_{DD} = 15 V		65		ns
Fall Time	t_f	R_G = 10 Ω		40		ns
Total Gate Charge	Q_G	I_D = 10 A		26		nC
Gate to Source Charge	Q_{GS}	V_{DD} = 24 V		4.2		nC
Gate to Drain Charge	Q_{GD}	V_{GS} = 10 V		6.5		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 10 A, V_{GS} = 0 V		0.8		V
Reverse Recovery Time	t_{rr}	I_F = 10 A, V_{GS} = 0 V		30		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100 A/μs		25		nC

TEST CIRCUIT 1 SWITCHING TIME



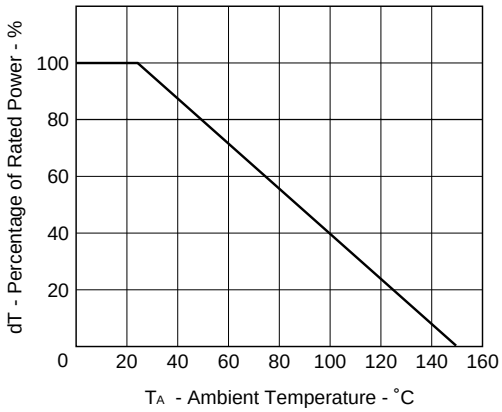
τ = 1 μs
Duty Cycle ≤ 1%

TEST CIRCUIT 2 GATE CHARGE

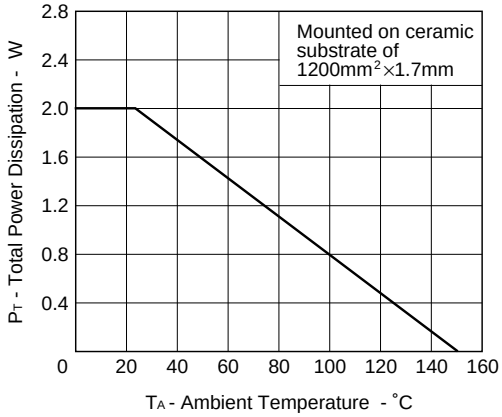


TYPICAL CHARACTERISTICS (T_A = 25°C)

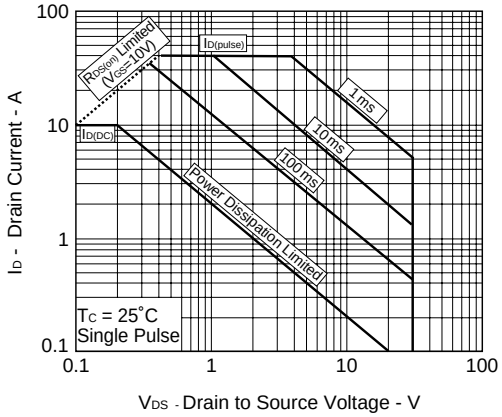
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



FORWARD BIAS SAFE OPERATING AREA



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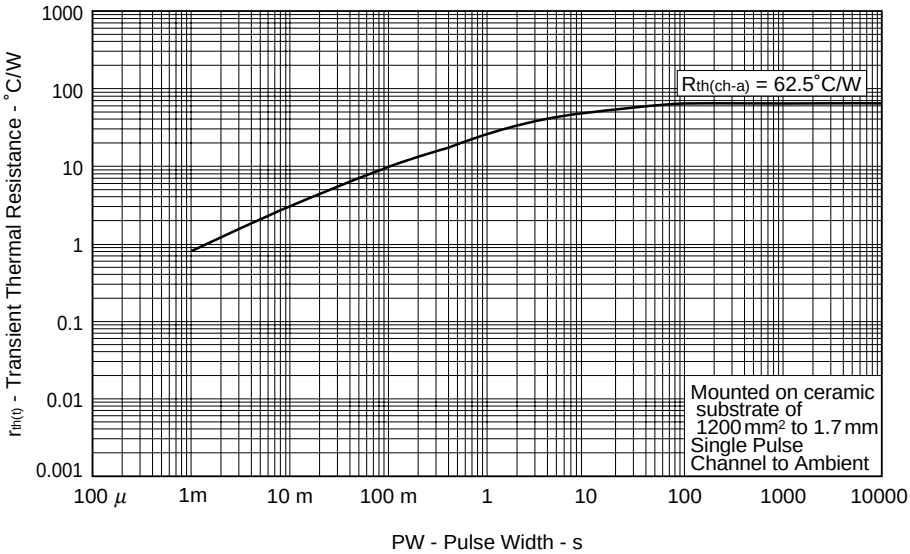
Remark

Mounted on ceramicsubstrate of 1200 mm^2 × 1.7 mm

TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



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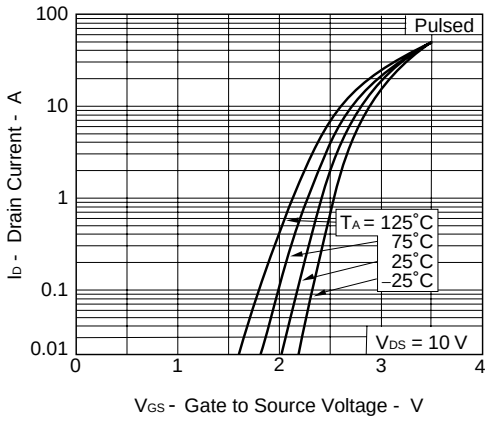
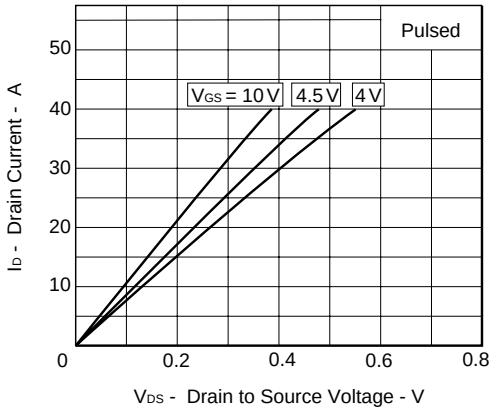
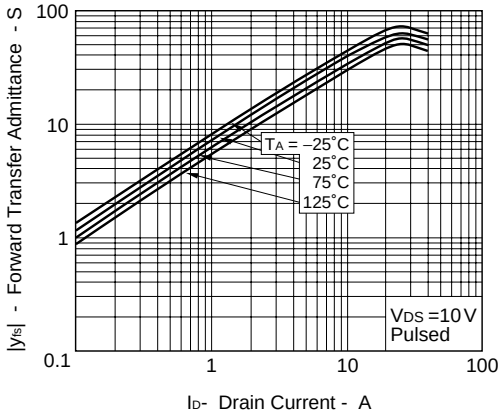
FORWARD TRANSFER CHARACTERISTICS



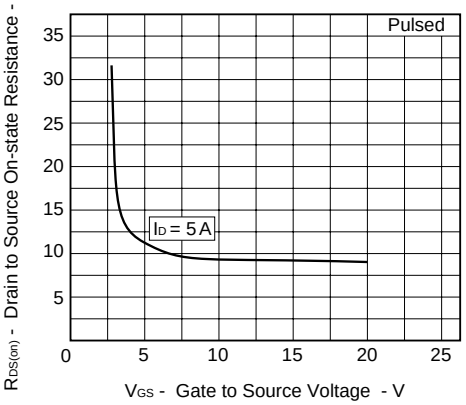
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



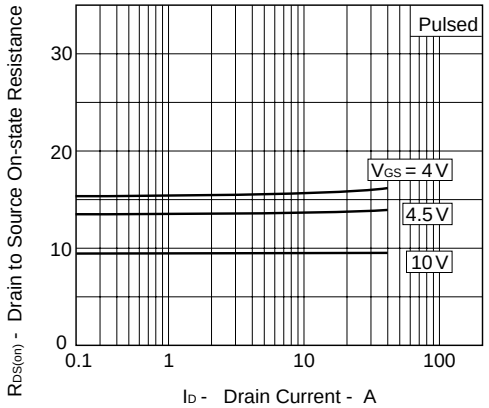
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



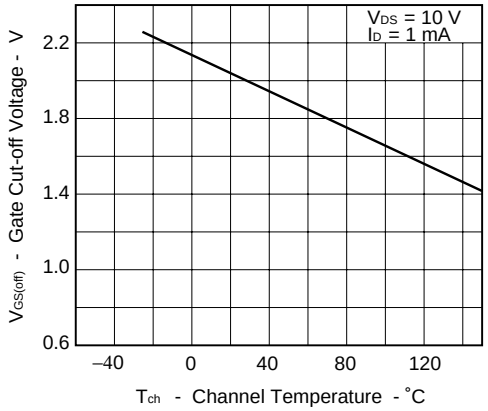
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



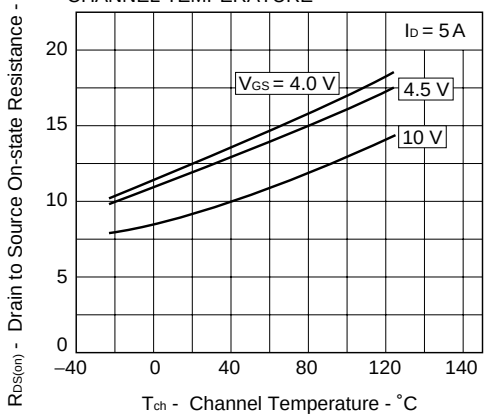
DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT



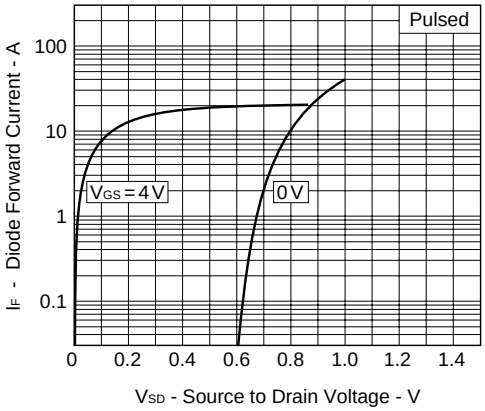
GATE CUT-OFF VOLTAGE vs.CHANNEL
TEMPERATURE



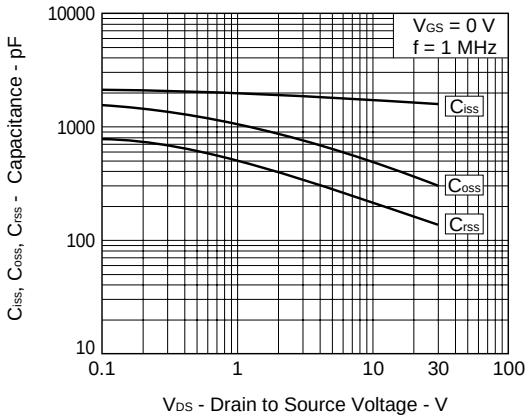
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



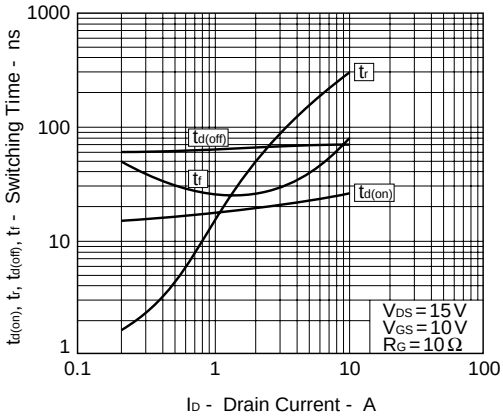
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



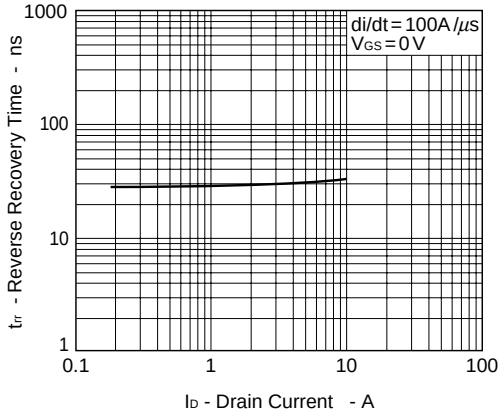
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



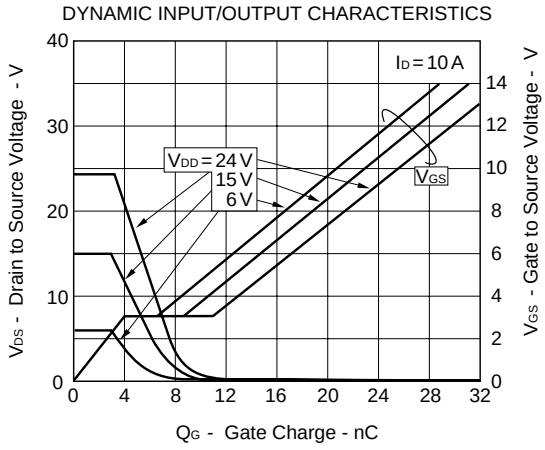
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



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