# CoolMOS™ Power Transistor

Features

- Intrinsic fast-recovery body diode

- Extremely low reverse recovery charge

- Ultra low gate charge

- Extreme dv/dt rated

- High peak current capability

- Qualified according to JEDEC[1] for target applications

CoolMOS CFD designed for:

- Soft switching PWM Stages

- LCD & CRT TV

Product Summary

V_{DS} @T$_{jmax}$	650	V
$R_{DS(on),max}$	0.7	Ω
I_D	6.6	A

PG-TO247

drain
pin 2

gate
pin 1

source
pin 3

Type	Package	Marking
SPW07N60CFD	PG-TO247	07N60CFD
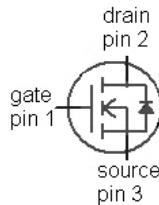
Maximum ratings, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	T_C=25 °C	6.6	A
		T_C=100 °C	4.3	
Pulsed drain current[2]	$I_{D,pulse}$	T_C=25 °C	17	
Avalanche energy, single pulse	E_{AS}	I_D=3.3 A, V_{DD}=50 V	230	mJ
Avalanche energy, repetitive[2],[3]	E_{AR}	I_D=6.6 A, V_{DD}=50 V	0.5	
Avalanche current, repetitive[2],[3]	I_{AR}		6.6	A
Drain source voltage slope	dv/dt	I_D=6.6 A, V_{DS}=480 V, T_j=125°C	80	V/ns
Reverse diode dv/dt	dv/dt	I_S=6.6 A, V_{DS}=480 V, T_j=125 °C	40	V/ns
Maximum diode commutation speed	di/dt		600	A/µs
Gate source voltage	V_{GS}	static	±20	V
		AC (f>1 Hz)	±30	
Power dissipation	P_{tot}	T_C=25 °C	83	W
Operating and storage temperature	T_j, T_{stg}		-55 ... 150	°C
Mounting torque		M3 & M3.5 screws	60	Ncm

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Thermal characteristics

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	-	1.5	K/W
Thermal resistance, junction - ambient	R_{thJA}	leaded	-	-	62	
Soldering temperature, wave soldering only allowed at leads	T_{sold}	1.6 mm (0.063 in.) from case for 10 s	-	-	260	°C

Electrical characteristics, at T_j=25 °C, unless otherwise specified

Static characteristics

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0 V, I_D=250 µA	600	-	-	V
Avalanche breakdown voltage	$V_{(BR)DS}$	V_{GS}=0 V, I_D=6.6 A	-	700	-	
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=300 µA	3	4	5	
Zero gate voltage drain current	I_{DSS}	V_{DS}=600 V, V_{GS}=0 V, T_j=25 °C	-	0.6	-	µA
		V_{DS}=600 V, V_{GS}=0 V, T_j=150 °C	-	630	-	
Gate-source leakage current	I_{GSS}	V_{GS}=20 V, V_{DS}=0 V	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=4.6 A, T_j=25 °C	-	0.59	0.7	Ω
		V_{GS}=10 V, I_D=4.6 A, T_j=150 °C	-	1.6	-	
Gate resistance	R_G	f=1 MHz, open drain	-	1.2	-	
Transconductance	g_{fs}	$|V_{DS}|$>2$|I_D|R_{DS(on)max}$, I_D=4.6 A	-	5.0	-	S

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=25 V, f=1 MHz	-	790	-	pF
Output capacitance	C_{oss}		-	260	-	
Reverse transfer capacitance	C_{rss}		-	16	-	
Effective output capacitance, energy related[4]	$C_{o(er)}$	V_{GS}=0 V, V_{DS}=0 V to 480 V	-	30	-	
Effective output capacitance, time related[5]	$C_{o(tr)}$		-	55	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=400 V, V_{GS}=10 V, I_{D}=6.6 A, R_{G}=6.8 Ω	-	12	-	ns
Rise time	t_{r}		-	25	-	
Turn-off delay time	$t_{d(off)}$		-	36	-	
Fall time	t_{f}		-	9	-	

Gate Charge Characteristics

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Gate to source charge	Q_{gs}	V_{DD}=480 V, I_{D}=6.6A, V_{GS}=0 to 10 V	-	6.6	-	nC
Gate to drain charge	Q_{gd}		-	20	-	
Gate charge total	Q_{g}		-	35	47	
Gate plateau voltage	$V_{plateau}$		-	7.2	-	V

[1] J-STD20 and JESD22

[2] Pulse width t_{p} limited by $T_{j,max}$

[3] Repetitive avalanche causes additional power losses that can be calculated as P_{AV}=E_{AR}*f.

[4] $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

[5] $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Reverse Diode

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Diode continuous forward current	I_S	T_C=25 °C	-	-	6.6	A
Diode pulse current[2]	$I_{S,pulse}$		-	-	17	
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=I_S, T_j=25 °C	-	1.0	1.2	V
Reverse recovery time	t_{rr}	V_R=480 V, I_F=I_S, di_F/dt=100 A/µs	-	104	-	ns
Reverse recovery charge	Q_{rr}		-	0.5	-	µC
Peak reverse recovery current	I_{rrm}		-	8	-	A
Peak rate of fall of reverse recovery current	di_{rr}/dt	T_j=25 °C	-	1000	-	A/µs

1 Power dissipation

P_{tot}=f(T_C)
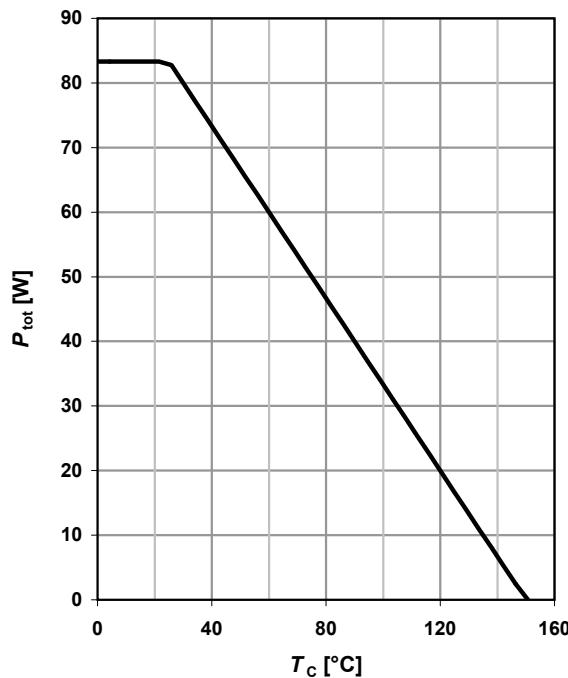
2 Safe operating area

I_D=f(V_{DS}); T_C=25 °C; D=0

parameter: t_p
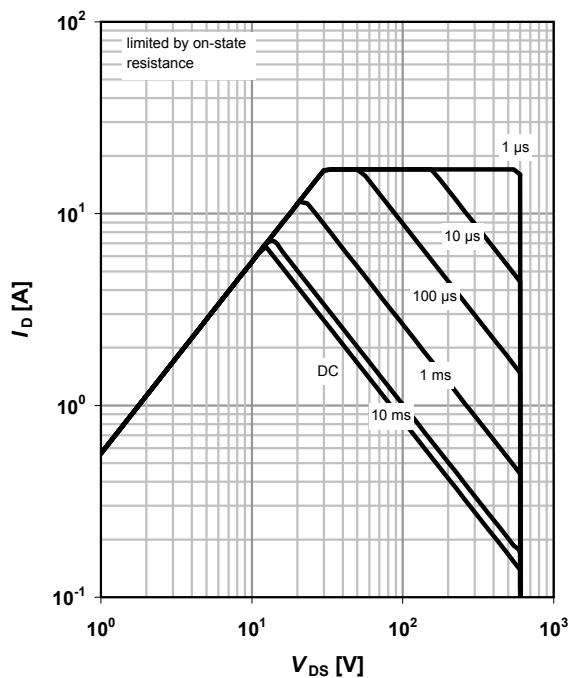
3 Max. transient thermal impedance

I_D=f(V_{DS}); T_j=25 °C

parameter: D=t_p/T
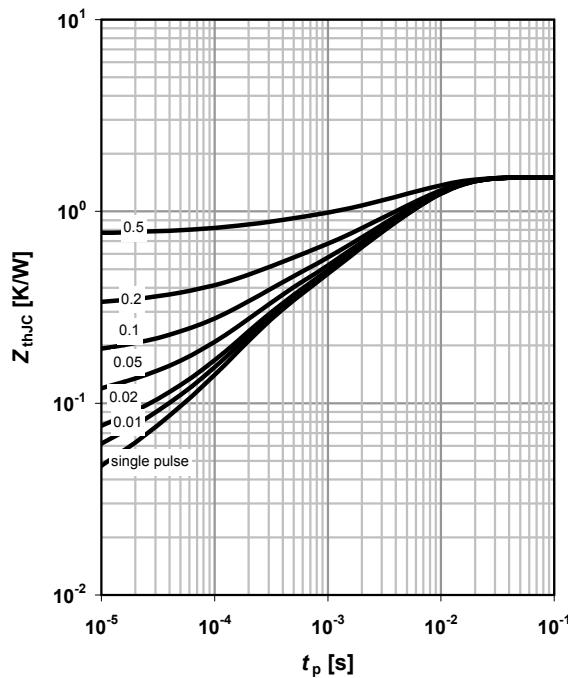
4 Typ. output characteristics

I_D=f(V_{DS}); T_j=25 °C

parameter: V_{GS}
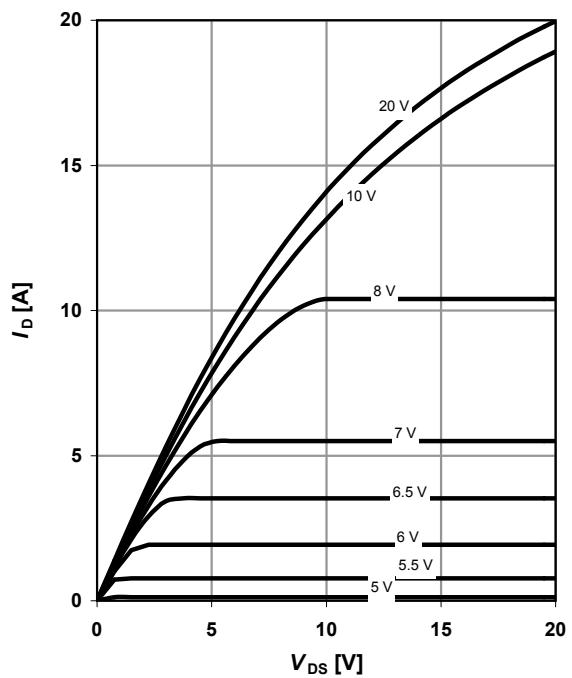
5 Typ. output characteristics

I_D=f(V_{DS}); T_j=150 °C

parameter: V_{GS}
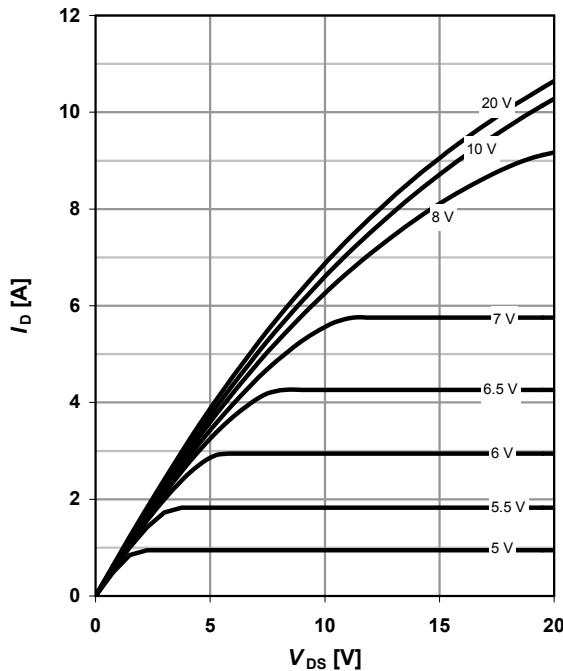
6 Typ. drain-source on-state resistance

$R_{DS(on)}$=f(I_D); T_j=150 °C

parameter: V_{GS}
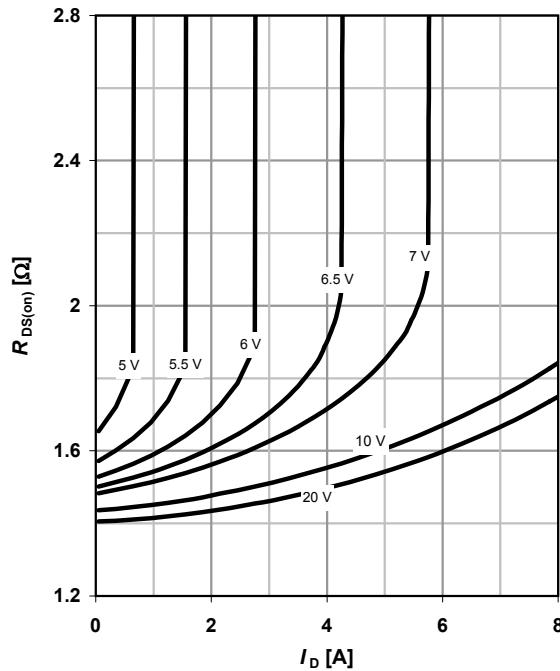
7 Drain-source on-state resistance

$R_{DS(on)}$=f(T_j); I_D=4.6 A; V_{GS}=10 V
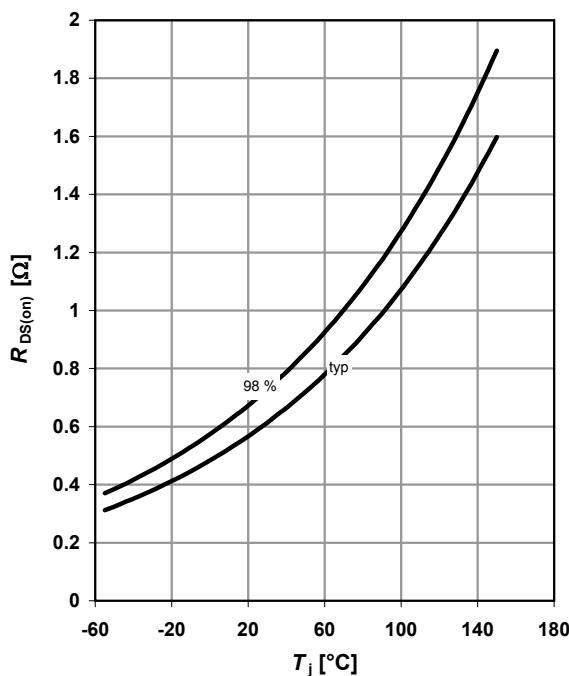
8 Typ. transfer characteristics

I_D=f(V_{GS}); $|V_{DS}|$>2$|I_D|R_{DS(on)max}$

parameter: T_j
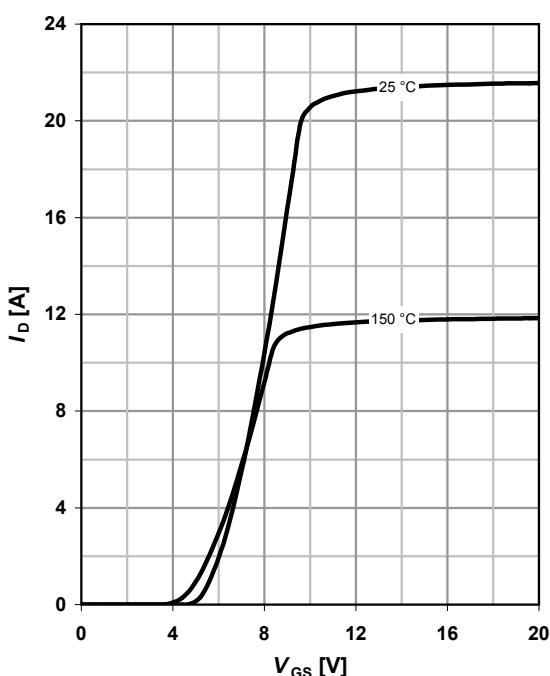
**9 Typ. gate charge**

V_{GS}=f(Q_{gate}); I_D=6.6 A pulsed

parameter: V_{DD}
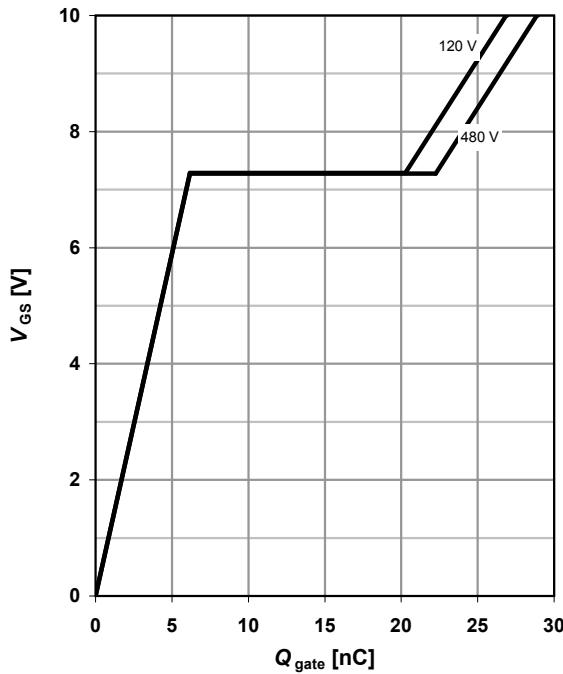
10 Forward characteristics of reverse diode

I_F=f(V_{SD})

parameter: T_j
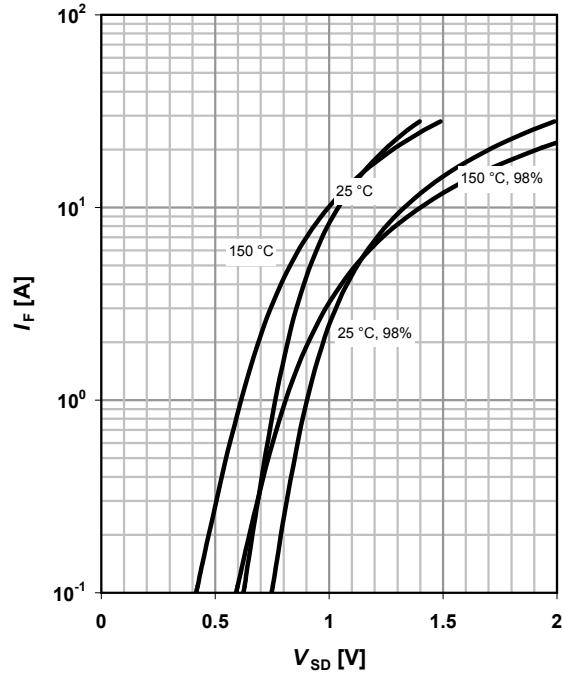
**11 Avalanche SOA**

I_{AR}=f(t_{AR})

parameter: $T_{j(start)}$
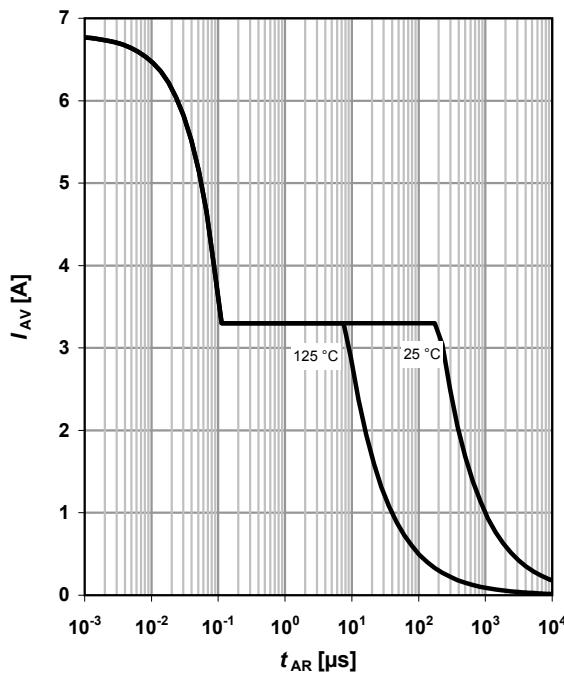
**12 Avalanche energy**

E_{AS}=f(T_j); I_D=3.3 A; V_{DD}=50 V
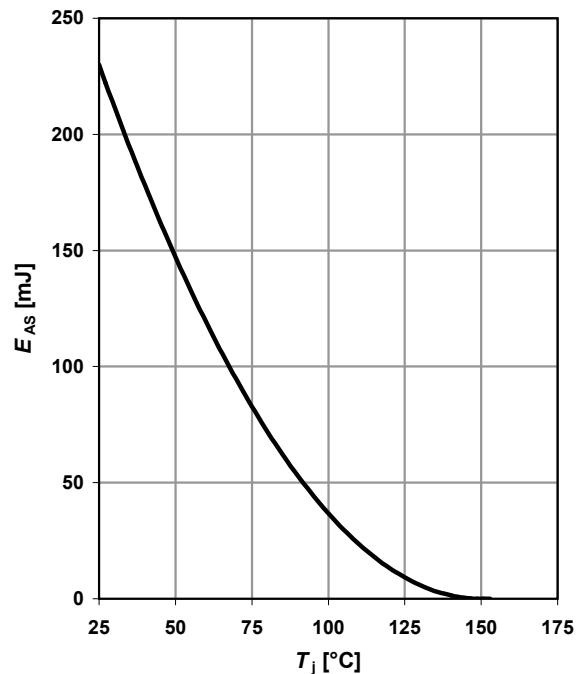
**13 Drain-source breakdown voltage**

$V_{BR(DSS)}$=f(T_j);
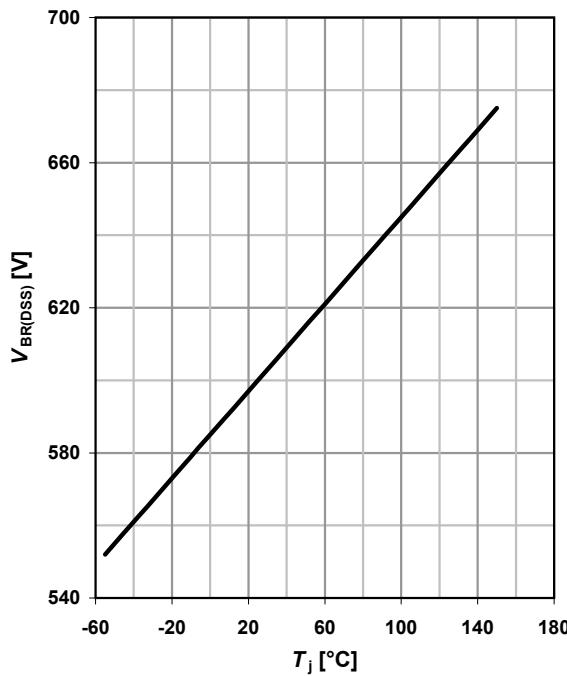
14 Typ. capacitances

C=f(V_{DS}); V_{GS}=0 V; f=1 MHz
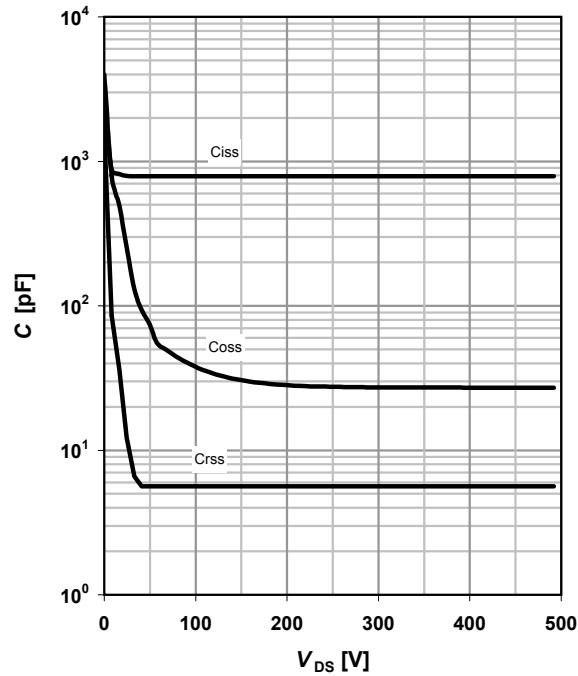
**15 Typ. C_{oss} stored energy**

E_{oss}=f(V_{DS})
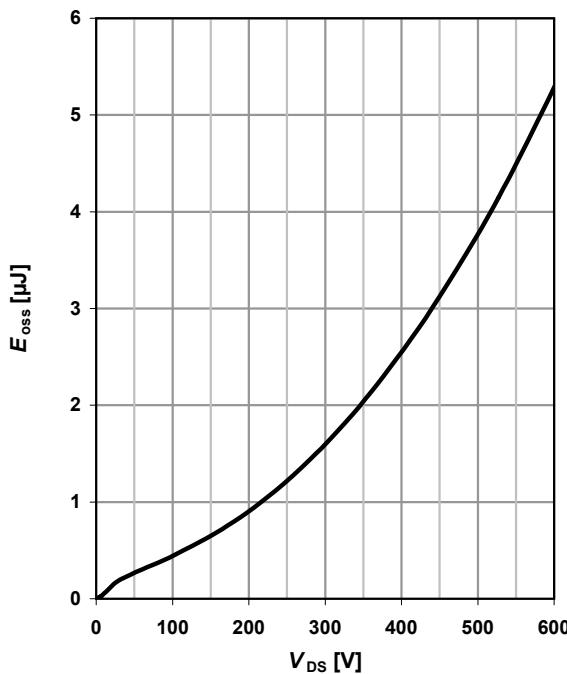
16 Typ. reverse recovery charge

Q_{rr}=f(T_j);parameter: I_D =6.6 A
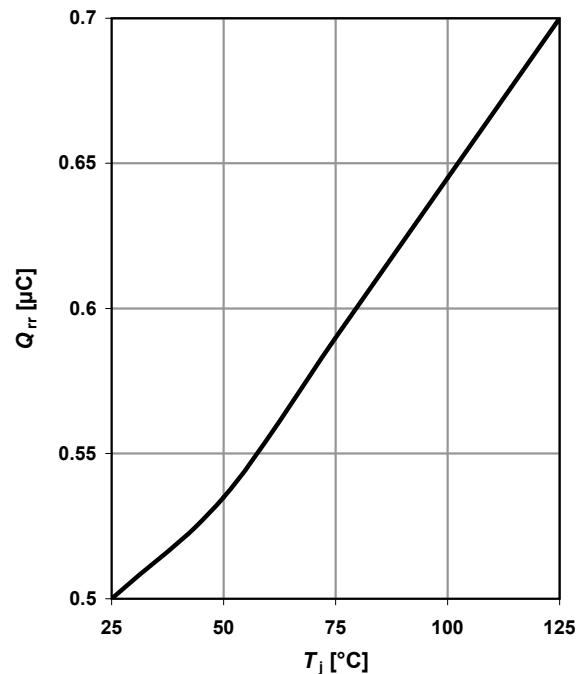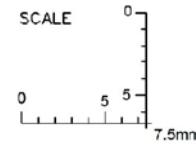
**17 Typ. reverse recovery charge**

Q_{rr}=f(I_S); parameter: di/dt=100 A/µs
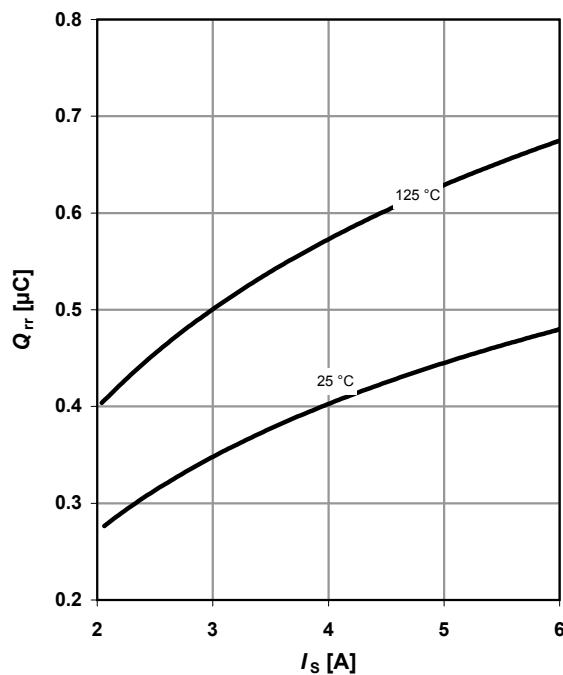
18 Typ. reverse recovery charge

Q_{rr}=f(di/dt); parameter: I_D=6.6 A
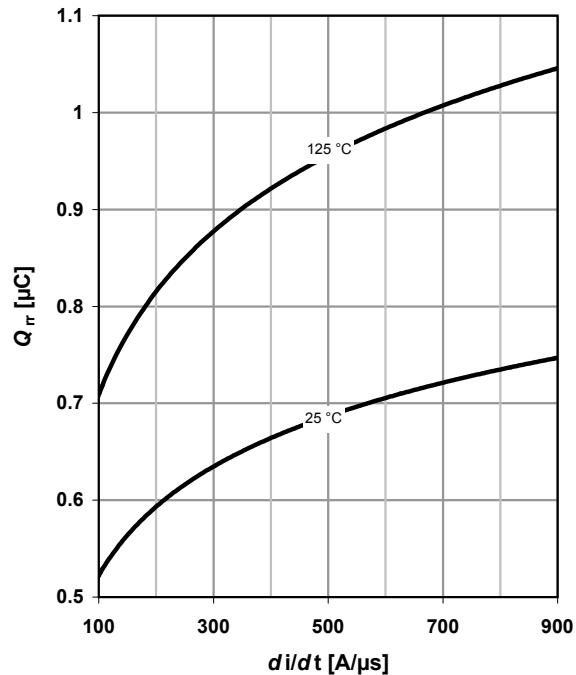
Definition of diode switching characteristics

PG-TO-247-3-1
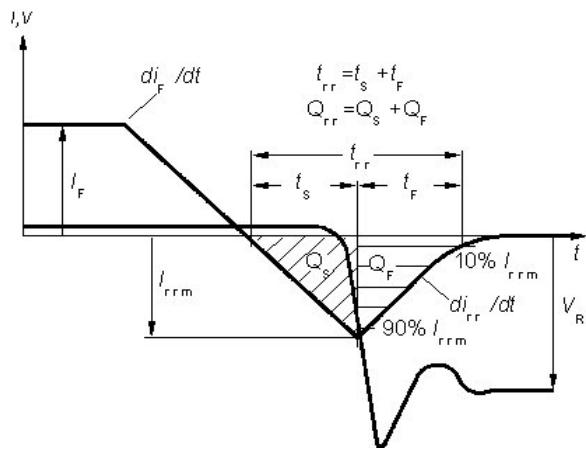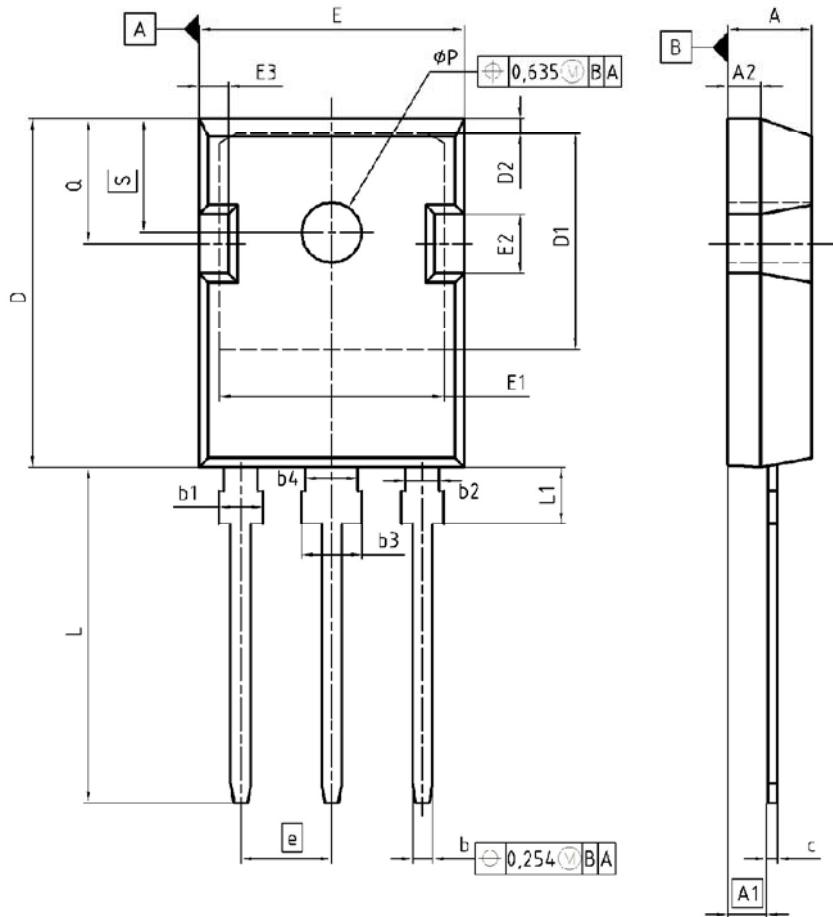
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.16	0.193	0.203
A1	2.27	2.53	0.089	0.099
A2	1.85	2.11	0.073	0.083
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.82	21.10	0.820	0.831
D1	16.25	17.65	0.640	0.695
D2	1.05	1.35	0.041	0.053
E	15.70	16.03	0.618	0.631
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.68	2.60	0.066	0.102
e	5.44		0.214	
N	3		3	
L	19.80	20.31	0.780	0.799
L1	4.17	4.47	0.164	0.176
øP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248

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SCALE

0

0   5   5
7.5mm

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03

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