

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Thermal characteristics

Thermal resistance, junction - case	R_{thJC}		-	-	3.7	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 $T_j=25\text{ °C}$, unless otherwise specified
Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}$, $I_D=250\text{ }\mu\text{A}$	600	-	-	V
Avalanche breakdown voltage	$V_{(BR)DS}$	$V_{GS}=0\text{ V}$, $I_D=13.4\text{ A}$	-	700	-	
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=750\text{ }\mu\text{A}$	3	4	5	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=600\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$	-	1.4	-	μA
		$V_{DS}=600\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=150\text{ °C}$	-	1200	-	
Gate-source leakage current	I_{GSS}	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}$, $I_D=9.4\text{ A}$, $T_j=25\text{ °C}$	-	0.28	0.33	Ω
		$V_{GS}=10\text{ V}$, $I_D=9.4\text{ A}$, $T_j=150\text{ °C}$	-	0.78	-	
Gate resistance	R_G	$f=1\text{ MHz}$, open drain	-	1.3	-	
Transconductance	g_{fs}	$ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=9.4\text{ A}$	-	8	-	S

Parameter	Symbol	Conditions	Values			Unit
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Dynamic characteristics						
Input capacitance	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=25\text{ V},$ $f=1\text{ MHz}$	-	1820	-	pF
Output capacitance	C_{oss}		-	520	-	
Reverse transfer capacitance	C_{rss}		-	21	-	
Effective output capacitance, energy related ⁵⁾	$C_{o(er)}$	$V_{GS}=0\text{ V}, V_{DS}=0\text{ V}$ to 480 V	-	61	-	
Effective output capacitance, time related ⁶⁾	$C_{o(tr)}$		-	110	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=400\text{ V},$ $V_{GS}=10\text{ V}, I_D=13.4\text{ A},$ $R_G=3.6\text{ }\Omega$	-	43	-	ns
Rise time	t_r		-	24	-	
Turn-off delay time	$t_{d(off)}$		-	47	-	
Fall time	t_f		-	5	-	

Gate Charge Characteristics

Gate to source charge	Q_{gs}	$V_{DD}=480\text{ V},$ $I_D=13.4\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	11	-	nC
Gate to drain charge	Q_{gd}		-	38	-	
Gate charge total	Q_g		-	63	84	
Gate plateau voltage	$V_{plateau}$		-	7.3	-	V

¹⁾ J-STD20 and JESD22

²⁾ Limited only by maximum temperature

³⁾ Pulse width t_p limited by $T_{j,max}$
⁴⁾ Repetitive avalanche causes additional power losses that can be calculated as $P_{AV}=E_{AR} \cdot f$.

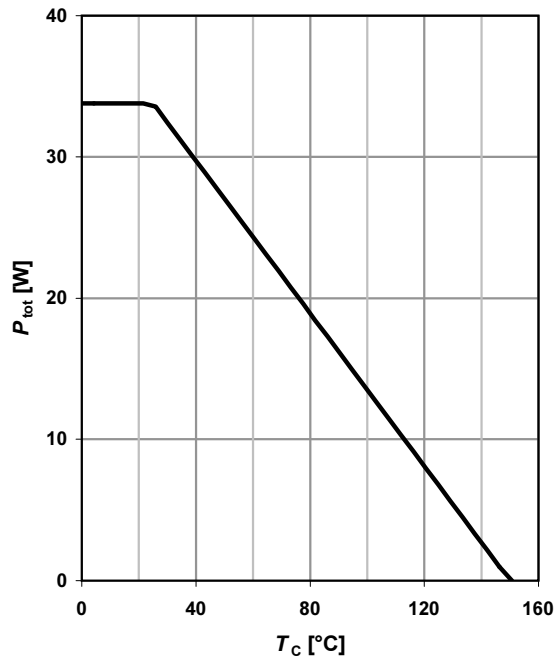
⁵⁾ $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .

⁶⁾ $C_{o(tr)}$ 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						
Diode continuous forward current ²⁾	I_S	$T_C=25\text{ }^{\circ}\text{C}$	-	-	13.4	A
Diode pulse current ³⁾	$I_{S,pulse}$		-	-	33	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=I_S,$ $T_j=25\text{ }^{\circ}\text{C}$	-	1.0	1.2	V
Reverse recovery time	t_{rr}	$V_R=480\text{ V}, I_F=I_S,$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	147	-	ns
Reverse recovery charge	Q_{rr}		-	1	-	μC
Peak reverse recovery current	I_{rrm}		-	12	-	A
Peak rate of fall of reverse recovery current	di_{rr}/dt	$T_j=25\text{ }^{\circ}\text{C}$	-	1200	-	A/ μs

1 Power dissipation

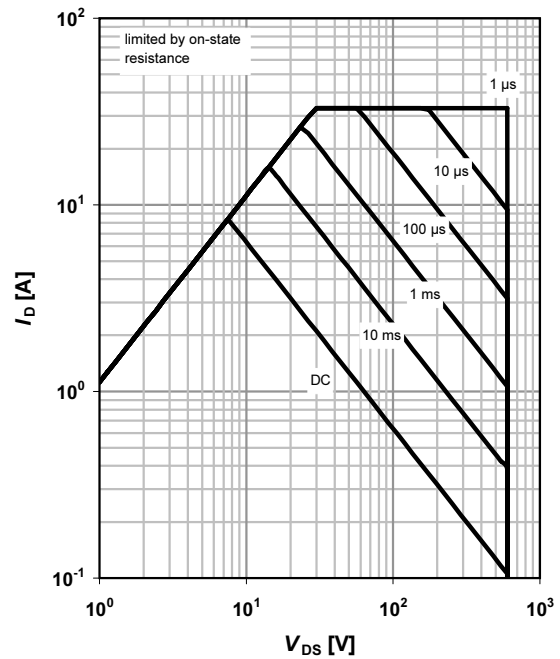
$$P_{\text{tot}} = f(T_C)$$



2 Safe operating area

$$I_D = f(V_{DS}); T_C = 25^\circ\text{C}; D = 0$$

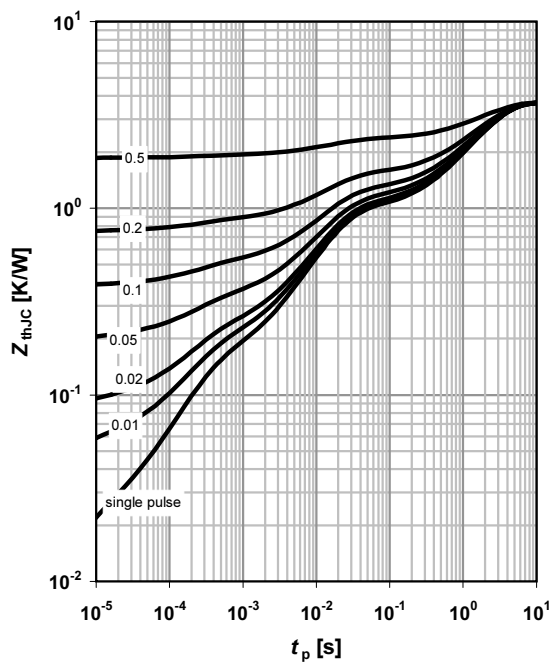
parameter: t_p



3 Max. transient thermal impedance

$$I_D = f(V_{DS}); T_J = 25^\circ\text{C}$$

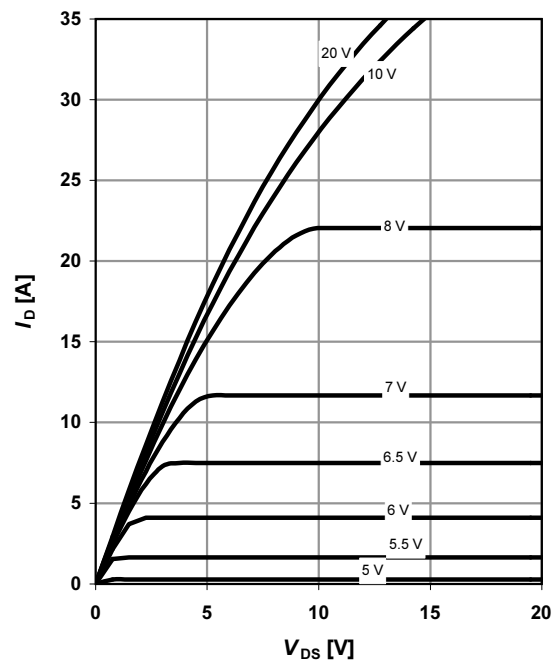
parameter: $D = t_p / T$



4 Typ. output characteristics

$$I_D = f(V_{DS}); T_J = 25^\circ\text{C}$$

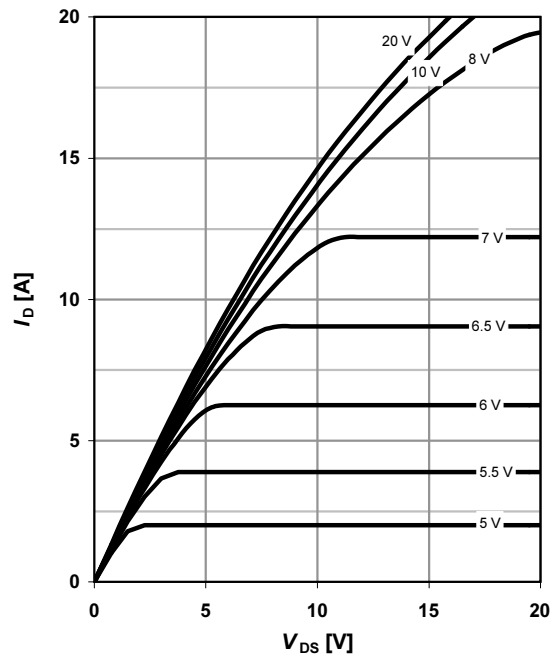
parameter: V_{GS}



5 Typ. output characteristics

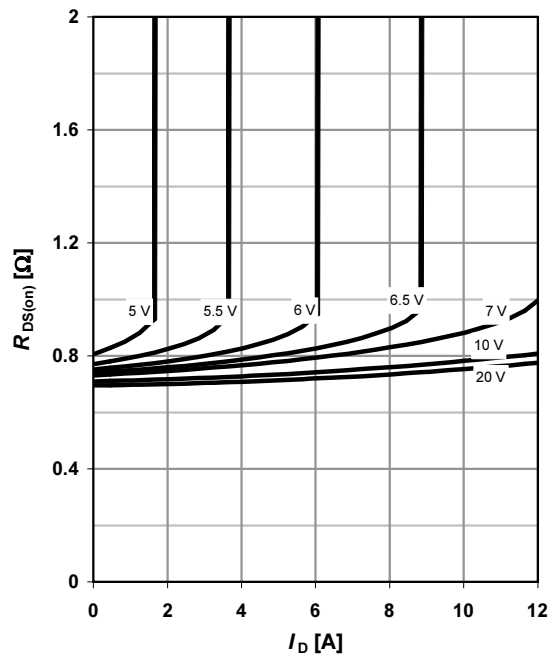
$$I_D = f(V_{DS}); T_J = 150^\circ\text{C}$$

parameter: V_{GS}

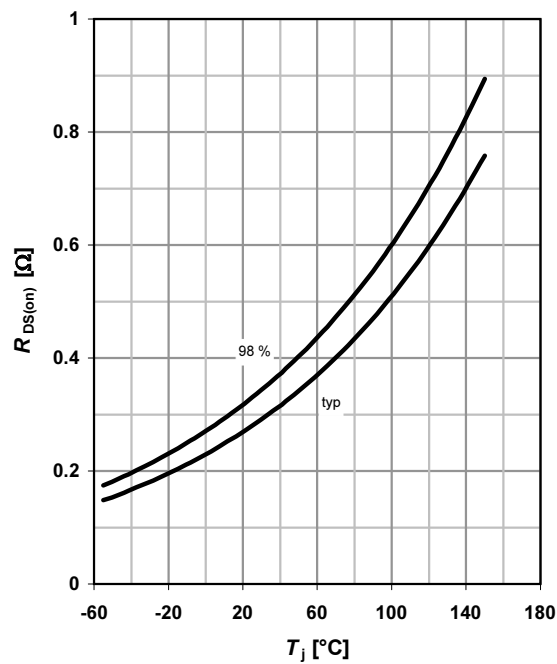

6 Typ. drain-source on-state resistance

$$R_{DS(on)} = f(I_D); T_J = 150^\circ\text{C}$$

parameter: V_{GS}

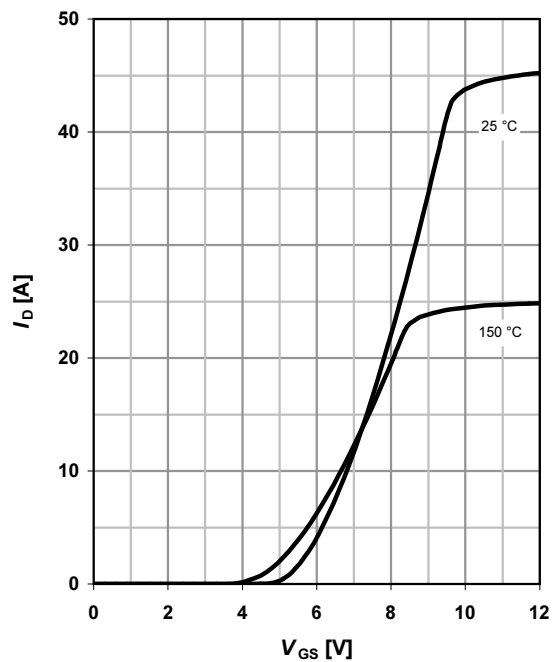

7 Drain-source on-state resistance

$$R_{DS(on)} = f(T_J); I_D = 9.4\text{ A}; V_{GS} = 10\text{ V}$$


8 Typ. transfer characteristics

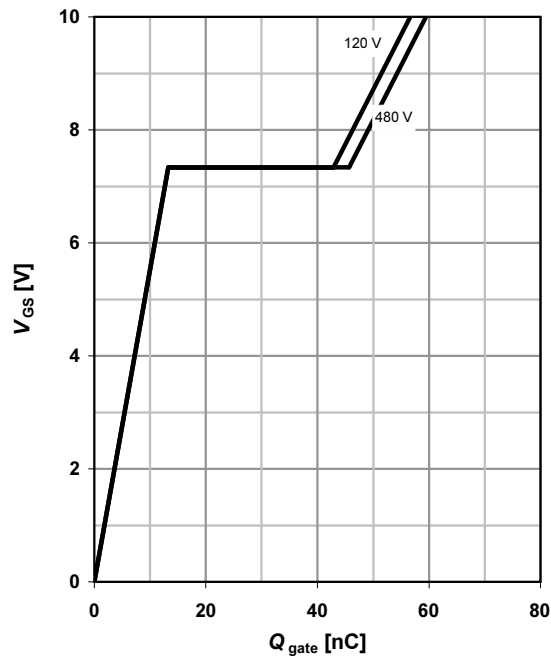
$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)\max}$$

parameter: T_J



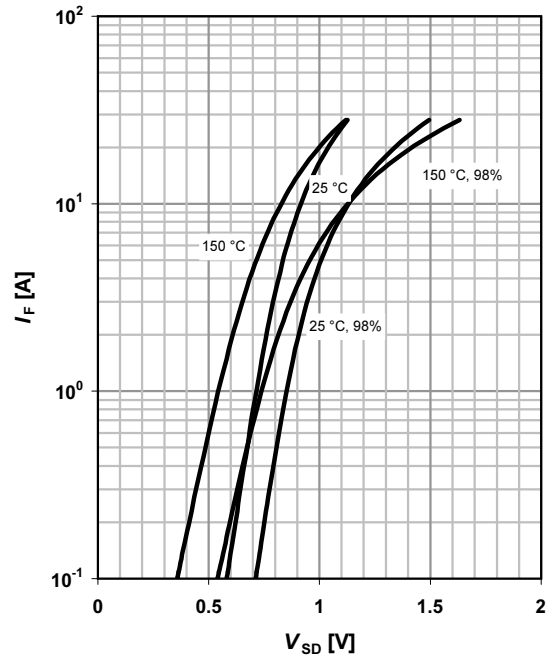
9 Typ. gate charge

 $V_{GS}=f(Q_{gate}); I_D=13.4 \text{ A pulsed}$

parameter: V_{DD}


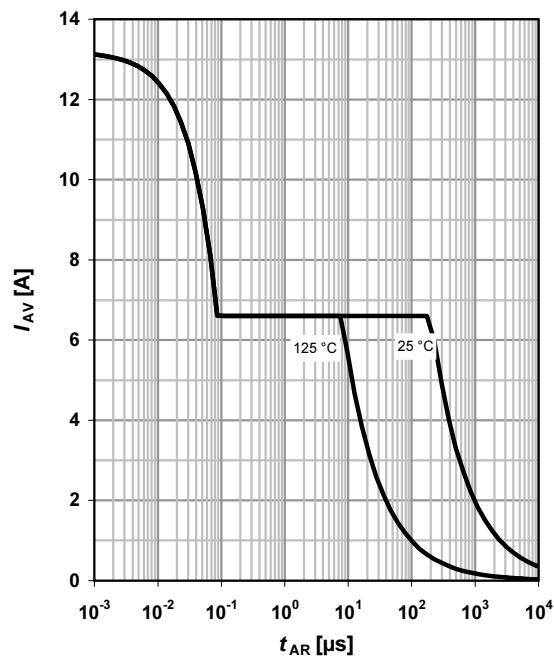
10 Forward characteristics of reverse diode

 $I_F=f(V_{SD})$

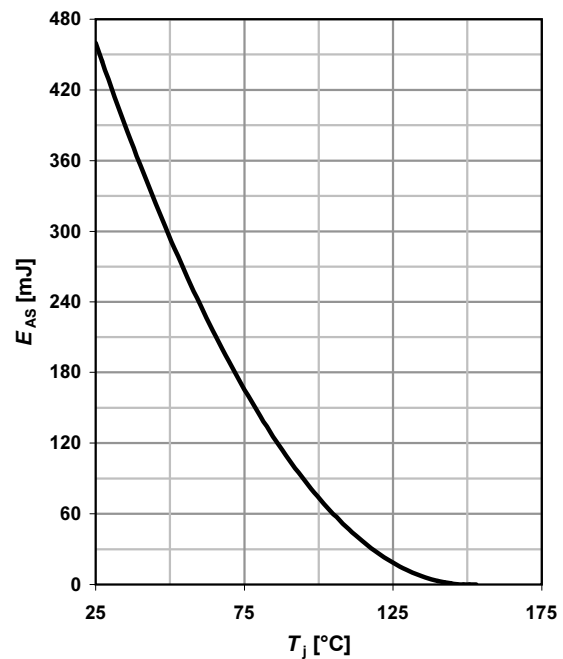
parameter: T_j


11 Avalanche SOA

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

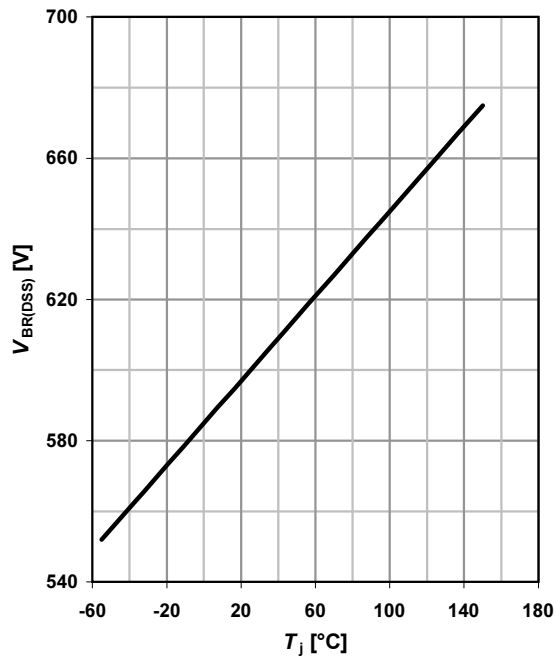
parameter: $T_{j(\text{start})}$


12 Avalanche energy

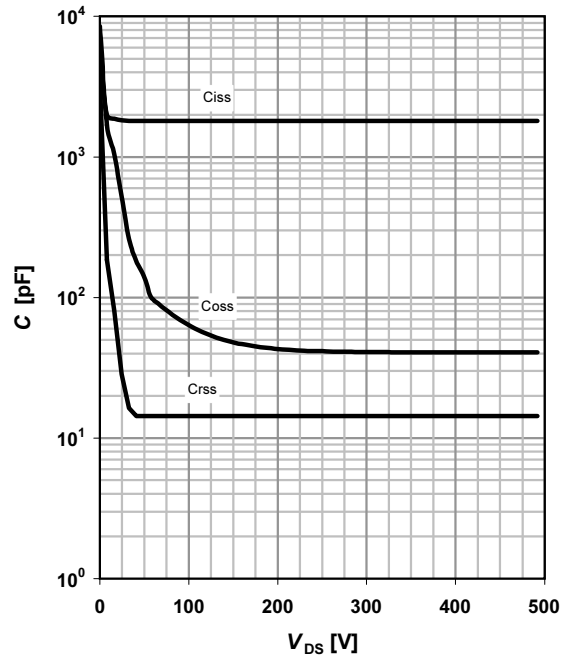
 $E_{AS}=f(T_j); I_D=6.7 \text{ A}; V_{DD}=50 \text{ V}$


13 Drain-source breakdown voltage

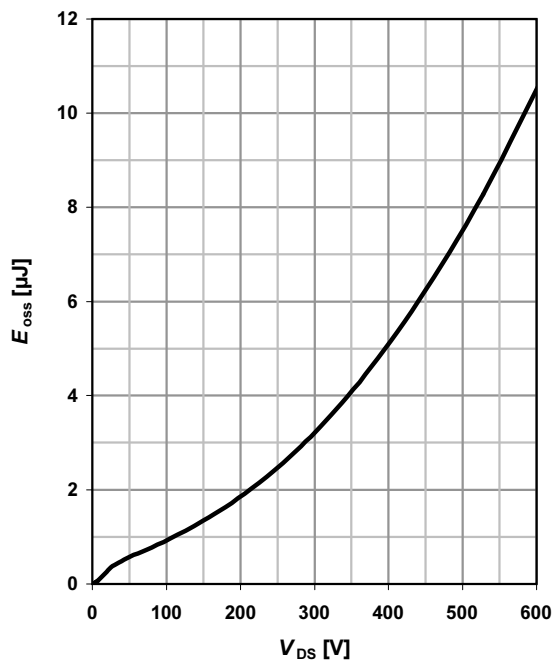
$$V_{BR(DSS)} = f(T_j)$$


14 Typ. capacitances

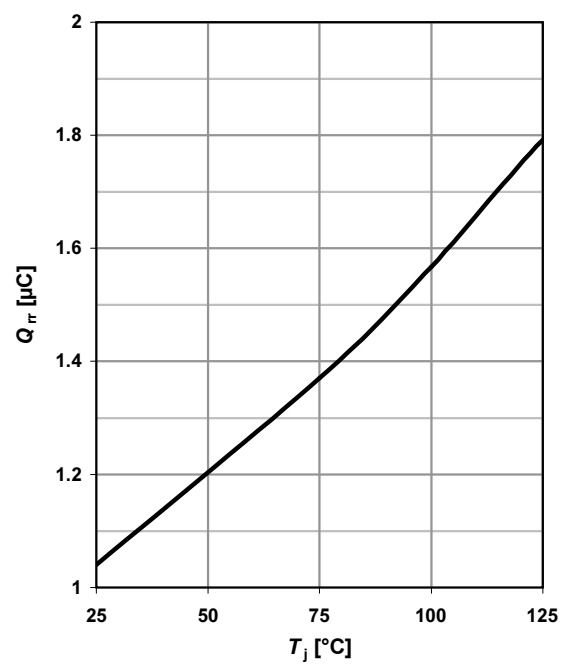
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$

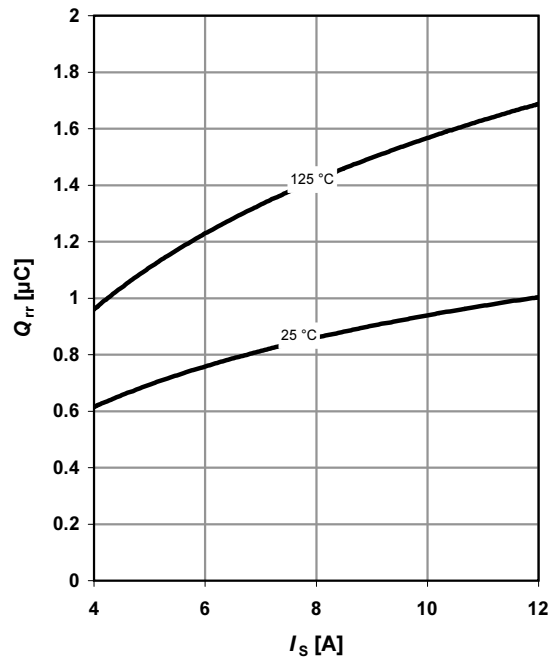
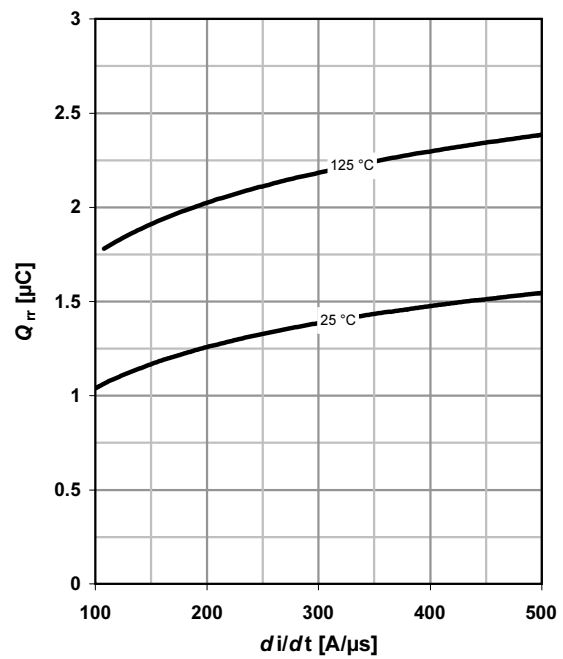

15 Typ. C_{oss} stored energy

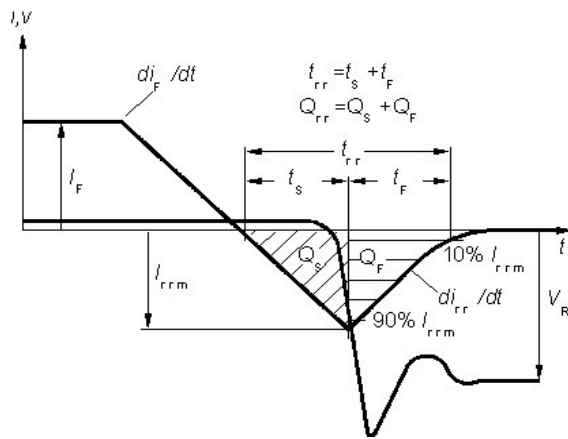
$$E_{oss} = f(V_{DS})$$

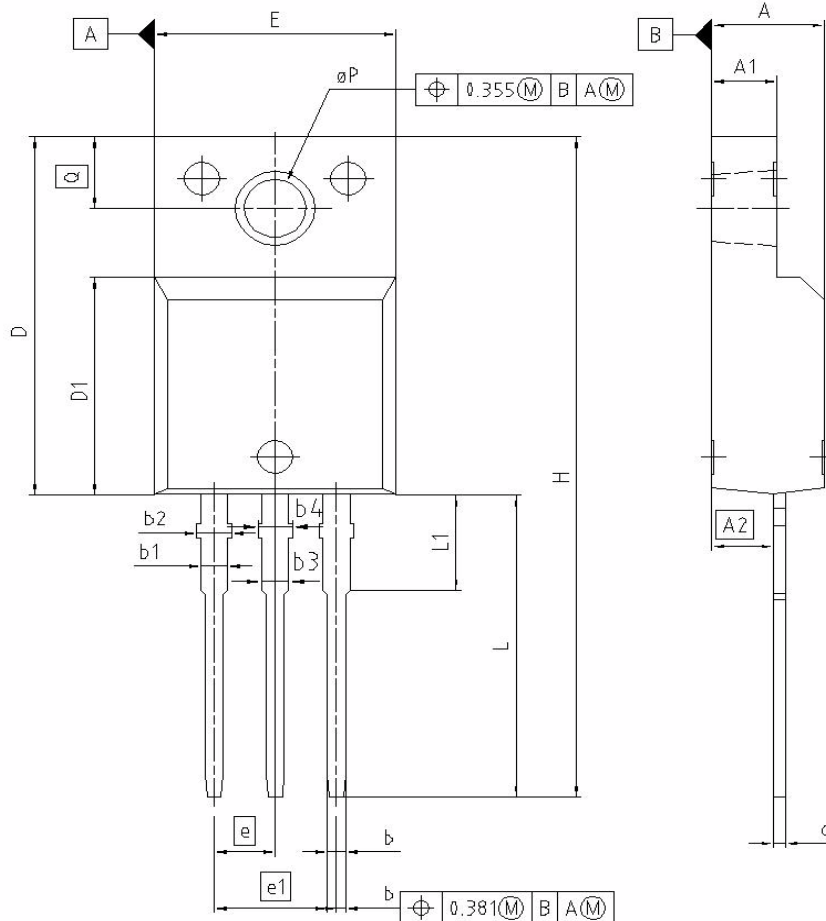

16 Typ. reverse recovery charge

$$Q_{rr} = f(T_j); \text{parameter: } I_D = 13.4 \text{ A}$$

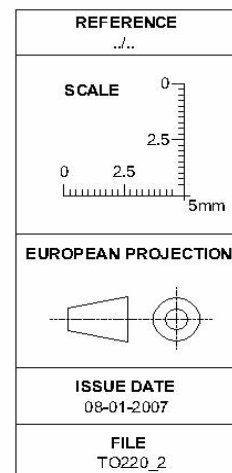


17 Typ. reverse recovery charge
 $Q_{rr}=f(I_S)$; parameter: $di/dt=100\text{ A}/\mu\text{s}$

18 Typ. reverse recovery charge
 $Q_{rr}=f(di/dt)$; parameter: $I_D=13.4\text{ A}$


Definition of diode switching characteristics


PG-TO-220-3--31; -3-111: Outlines/Fully isolated package (2500VAC; 1minute)


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.55	4.85	0.179	0.191
A1	2.55	2.85	0.100	0.112
A2	2.42	2.72	0.095	0.107
b	0.65	0.85	0.026	0.033
b1	0.95	1.33	0.037	0.052
b2	0.95	1.51	0.037	0.059
b3	0.65	1.33	0.026	0.052
b4	0.65	1.51	0.026	0.059
c	0.40	0.63	0.016	0.025
D	15.85	16.15	0.624	0.636
D1	9.53	9.83	0.375	0.387
E	10.35	10.65	0.407	0.419
e	2.54		0.100	
e1	5.08		0.200	
N	3		3	
H	29.45	29.75	1.159	1.171
L	13.45	13.75	0.530	0.541
L1	3.15	3.45	0.124	0.136
øP	2.95	3.20	0.116	0.126
Q	3.15	3.50	0.124	0.138



Dimensions in mm/ inches

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