

Product Summary

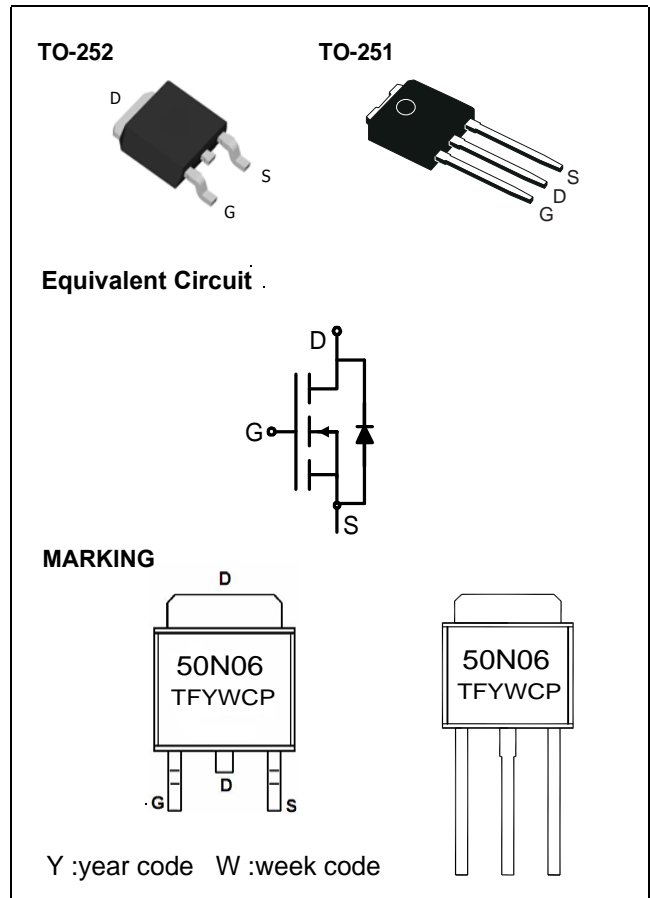
V_{DS}	60	V
$R_{DS(on),max}$ SMDversion	15	mΩ
I_D	50	A

Features

- For fast switching converters and sync. rectification
- N-channel enhancement - normal level
- 175 °C operating temperature
- Avalanche rated
- Pb-free lead plating, RoHS compliant

Typical Applications

- Power Supplies
- Converters
- Power Motor Controls
- Bridge Circuits



Maximum ratings, at $T_j=25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$T_C=25\text{ °C}^1)$	50	A
Pulsed drain current	$I_{D,pulse}$	$T_C=25\text{ °C}^2)$	400	
Avalanche energy, single pulse	E_{AS}	$I_D=50\text{ A}, R_{GS}=25\text{ }\Omega$	810	mJ
Reverse diode dv/dt	dv/dt	$I_D=50\text{ A}, V_{DS}=48\text{ V},$ $di/dt=100\text{ A}/\mu\text{s},$ $T_{j,max}=175\text{ °C}$	6	kV/ μs
Gate source voltage	V_{GS}		± 20	V
Power dissipation	P_{tot}	$T_C=25\text{ °C}$	300	W
Operating and storage temperature	T_j, T_{stg}		-55 ... 175	°C
IEC climatic category; DIN IEC 68-1			55/175/56	

¹⁾ Current is limited by bondwire; with an $R_{thjC}=0.5$ the chip is able to carry 160A

²⁾ See figure 3

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics						
Thermal resistance, junction - case	R_{thJC}		-	-	0.5	K/W
SMD version, device on PCB	R_{thJA}	minimal footprint	-	-	62	
		6 cm ² cooling area ³⁾	-	-	40	
Electrical characteristics, at $T_j=25\text{ }^\circ\text{C}$, unless otherwise specified						
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=250\mu\text{A}$	60	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	2.1	3	4	
Zero gate voltage drain current	I_{DSS}	$V_{DS}^j=48\text{ V}, V_{GS}=0\text{ V}, T=25\text{ }^\circ\text{C}$	-	0.01	1	μA
Gate-source leakage current	I_{GSS}	$V_{GS}=\pm 20\text{ V}, V_{DS}=0\text{ V}$	-		± 50	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=30\text{ A}$			15	m Ω
Gate resistance	R_G		-	1.9	-	Ω
Transconductance	g_{fs}	$ V_{DS} >2 I_D R_{DS(on)max}, I_D=50\text{ A}$	74	148	-	S

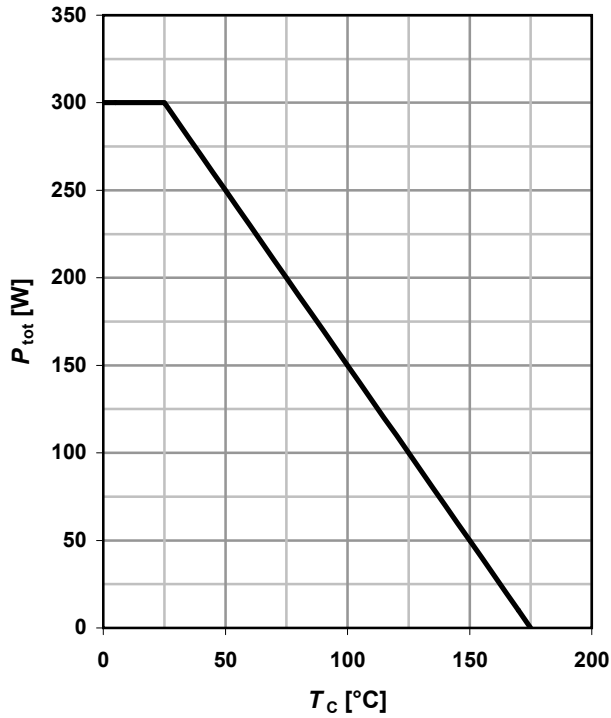
³⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=30\text{ V},$ $f=1\text{ MHz}$	-	4600	6100	pF
Output capacitance	C_{oss}		-	1500	2000	
Reverse transfer capacitance	C_{rss}		-	350	525	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=30\text{ V}, V_{GS}=10\text{ V},$ $I_D=30\text{ A}, R_G=2.2\ \Omega$	-	21	32	ns
Rise time	t_r		-	31	47	
Turn-off delay time	$t_{d(off)}$		-	59	88	
Fall time	t_f		-	30	45	
Gate Charge Characteristics⁴⁾						
Gate to source charge	Q_{gs}	$V_{DD}=30\text{ V}, I_D=50\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	24	32	nC
Gate charge at threshold	$Q_{g(th)}$		-	9.7	13	
Gate to drain charge	Q_{gd}		-	51	76	
Switching charge	Q_{sw}		-	65	95	
Gate charge total	Q_g		-	126	167	
Gate plateau voltage	$V_{plateau}$		-	5.2	-	V
Output charge	Q_{oss}	$V_{DD}=30\text{ V}, V_{GS}=0\text{ V}$	-	47	62	
Reverse Diode						
Diode continuous forward current	I_S	$T_C=25\text{ }^\circ\text{C}$	-	-	100	A
Diode pulse current	$I_{S,pulse}$		-	-	400	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=30\text{ A},$ $T_j=25\text{ }^\circ\text{C}$	-	0.93	1.3	V
Reverse recovery time	t_{rr}	$V_R=30\text{ V}, I_F=I_S,$ $di_F/dt=30\text{ A}/\mu\text{s}$	-	60	75	ns
Reverse recovery charge	Q_{rr}		-	130	160	

⁴⁾ See figure 16 for gate charge parameter definition

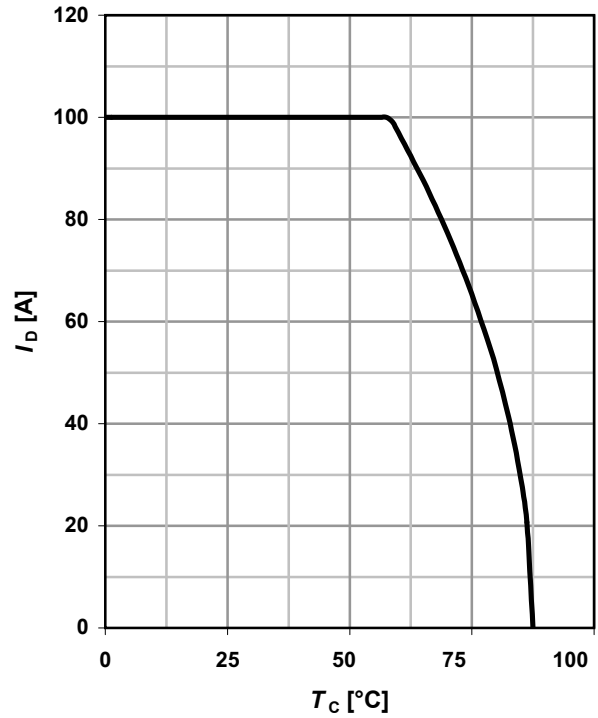
1 Power dissipation

$P_{tot}=f(T_C); V_{GS} \geq 6V$



2 Drain current

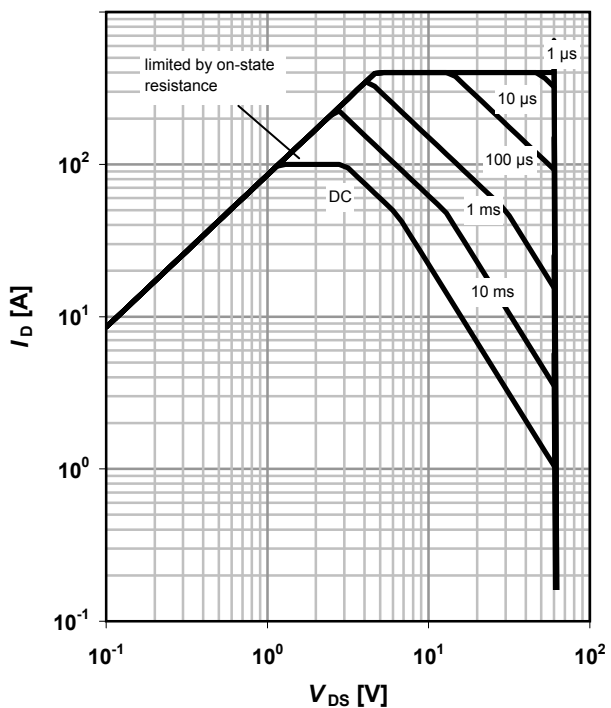
$I_D=f(T_C); V_{GS} \geq 10V$



3 Safe operating area

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

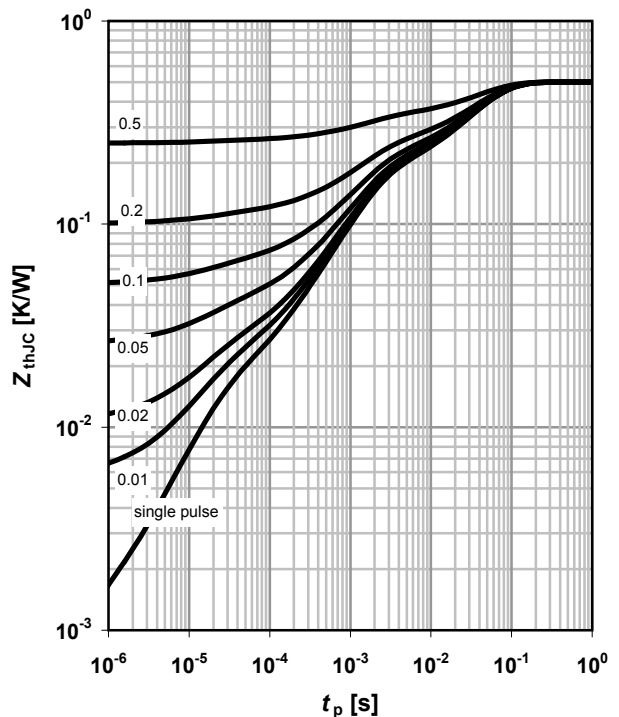
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

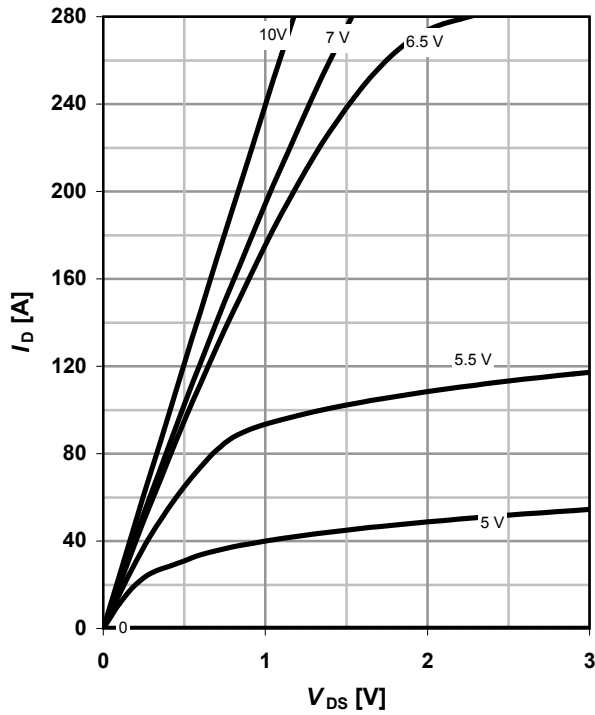
parameter: $D=t_p/T$



5 Typ. output characteristics

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

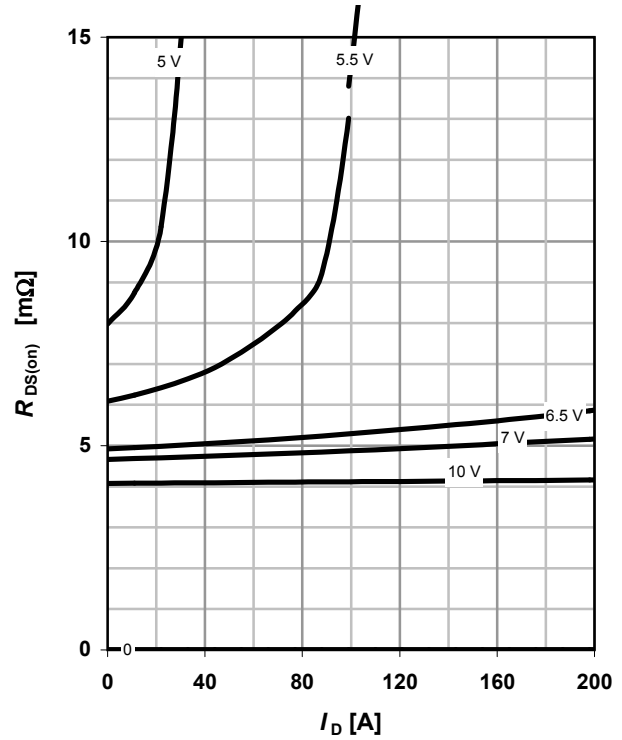
parameter: V_{GS}



6 Typ. drain-source on resistance

$R_{DS(on)} = f(I_D); T_j = 25\text{ }^\circ\text{C}$

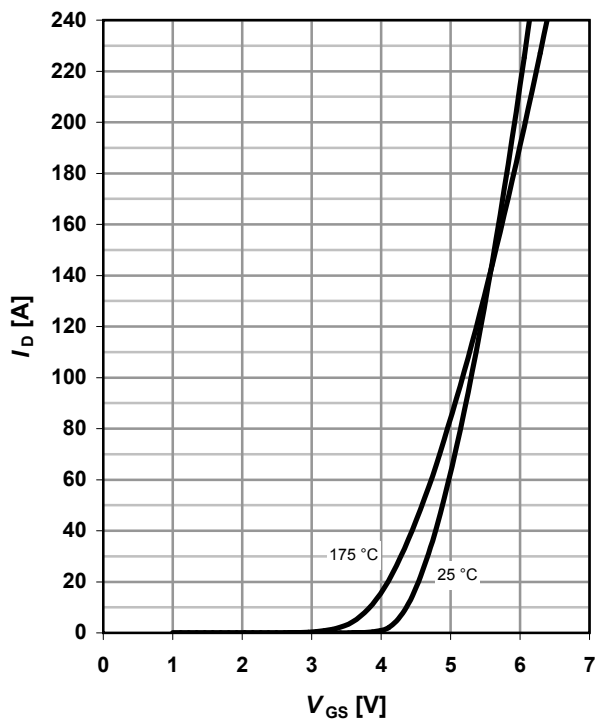
parameter: V_{GS}



7 Typ. transfer characteristics

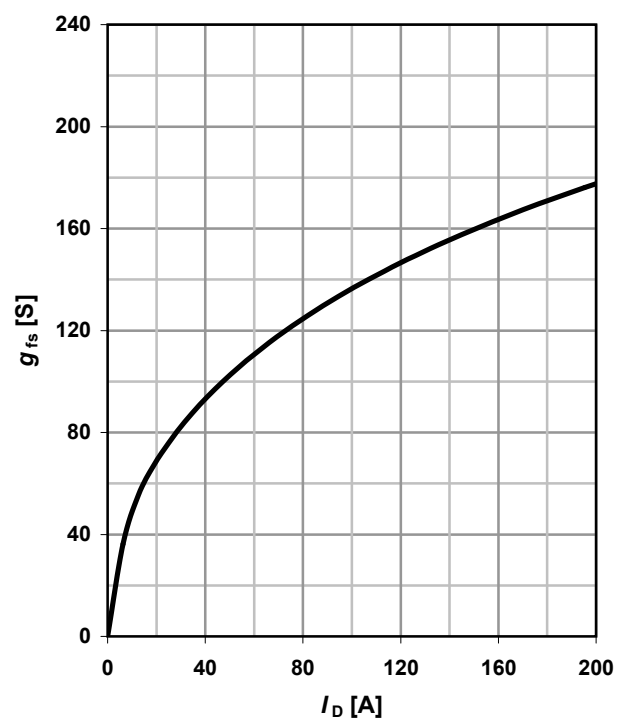
$I_D = f(V_{GS}); |V_{DS}| > 2I_D R_{DS(on)max}$

parameter: T_j



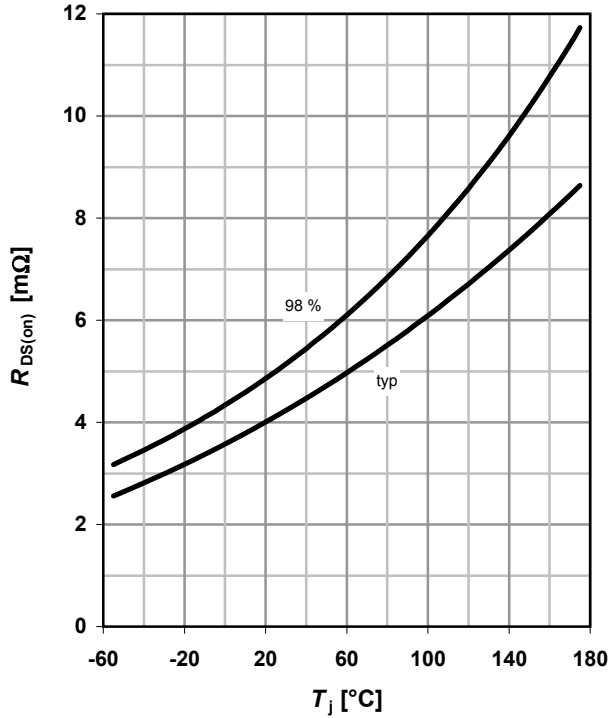
8 Typ. forward transconductance

$g_{fs} = f(I_D); T_j = 25\text{ }^\circ\text{C}$



9 Drain-source on-state resistance

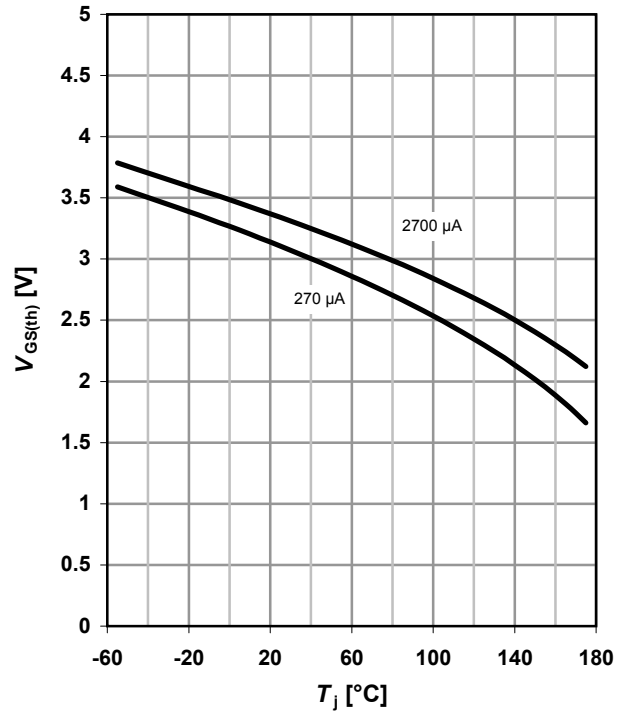
$R_{DS(on)}=f(T_j); I_D=30\text{ A}; V_{GS}=10\text{ V}$



10 Typ. gate threshold voltage

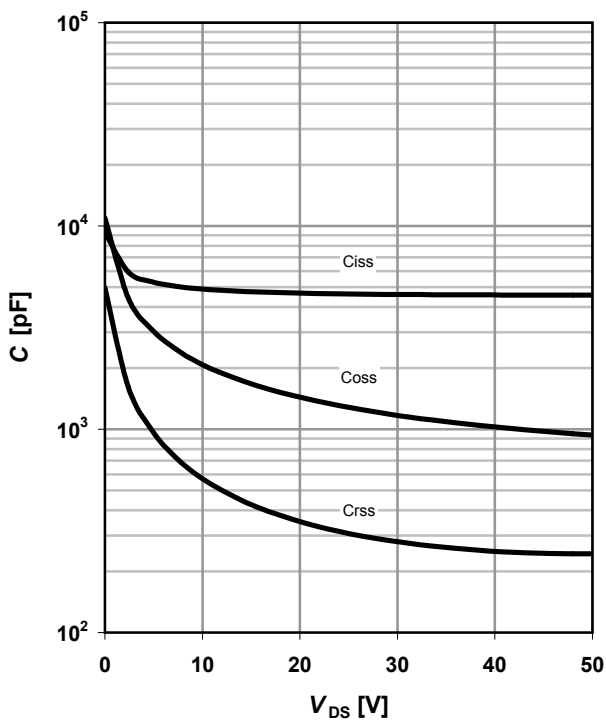
$V_{GS(th)}=f(T_j) \quad V_{GS}=V_{DS}$

parameter: I_D



11 Typ. capacitances

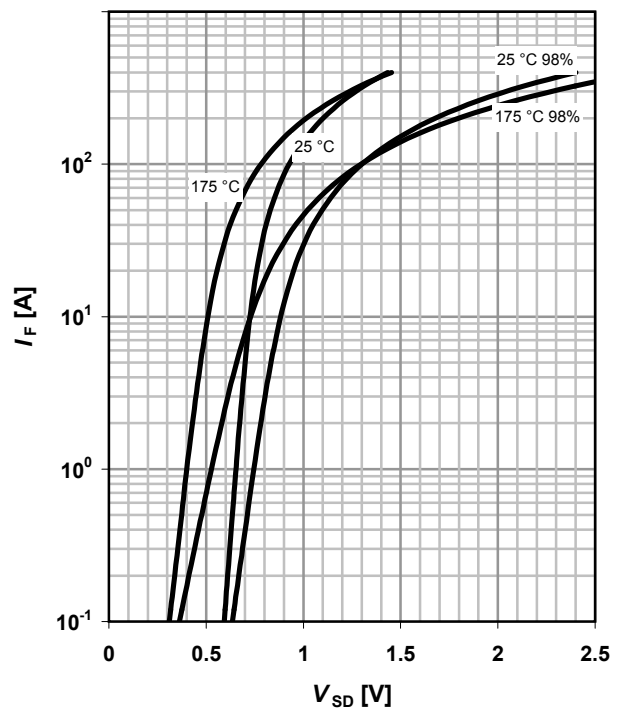
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$



12 Forward characteristics of reverse diode

$I_F=f(V_{SD})$

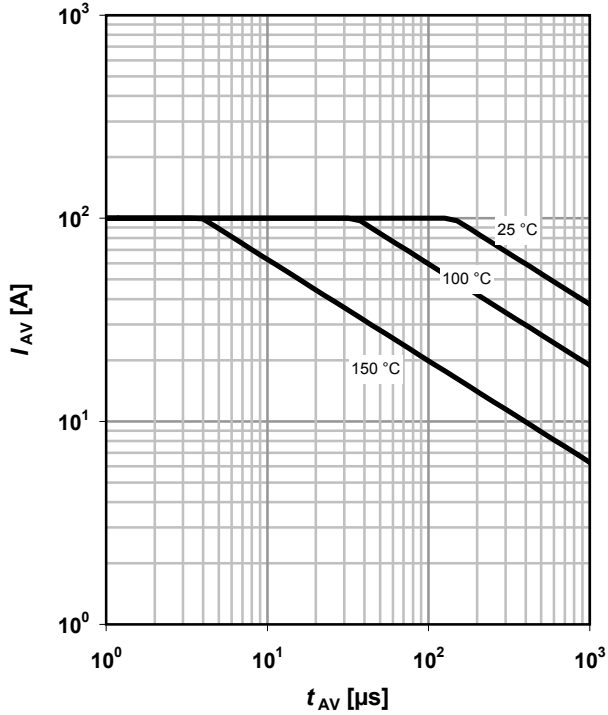
parameter: T_j



13 Avalanche characteristics

$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$

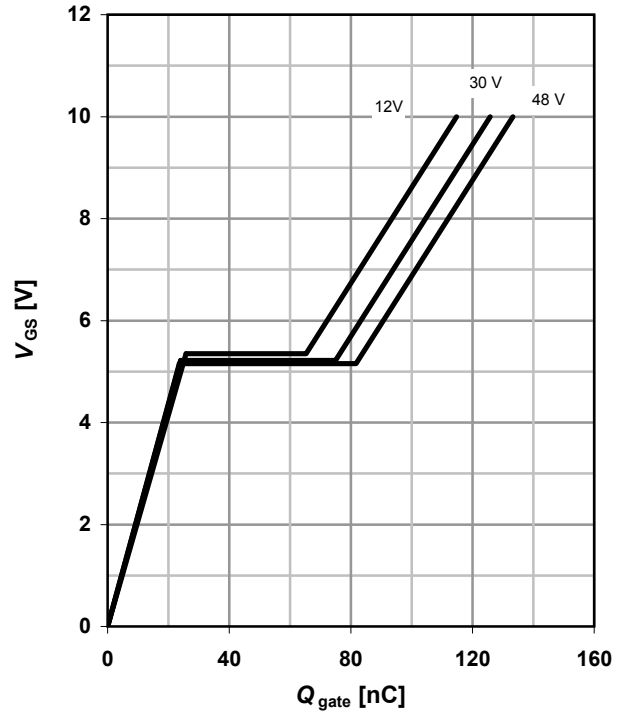
parameter: $T_{j(\text{start})}$



14 Typ. gate charge

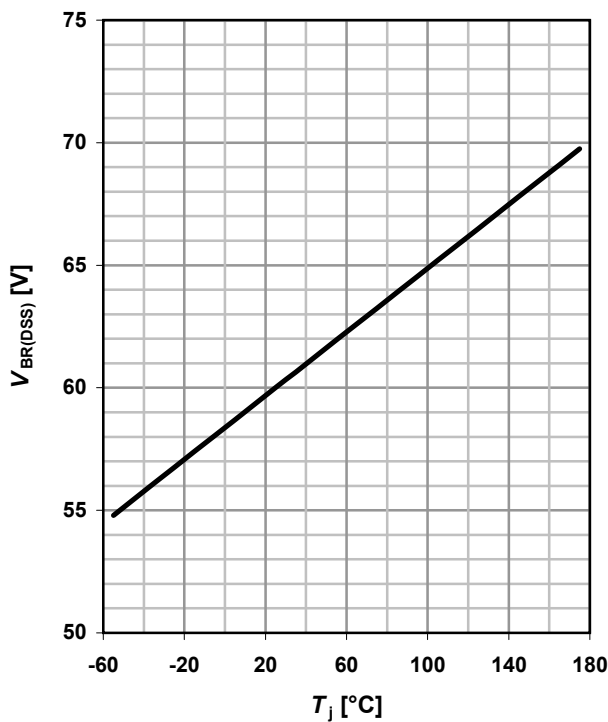
$V_{GS}=f(Q_{\text{gate}}); I_D=30 \text{ A pulsed}$

parameter: V_{DD}

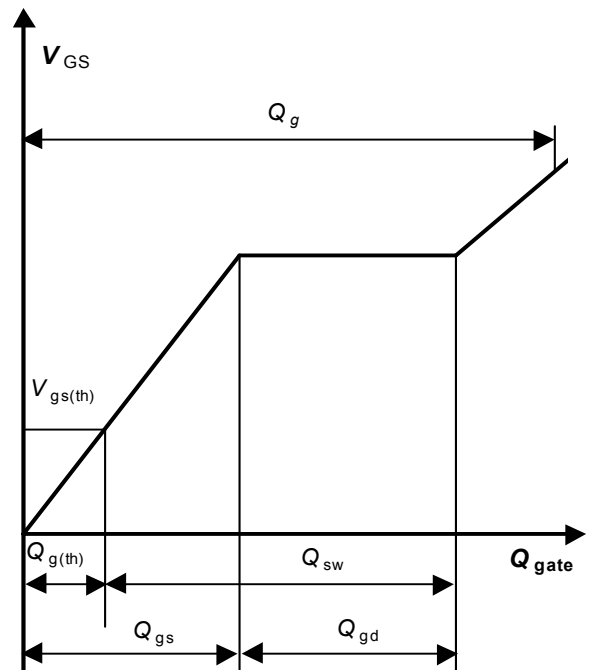


15 Drain-source breakdown voltage

$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$

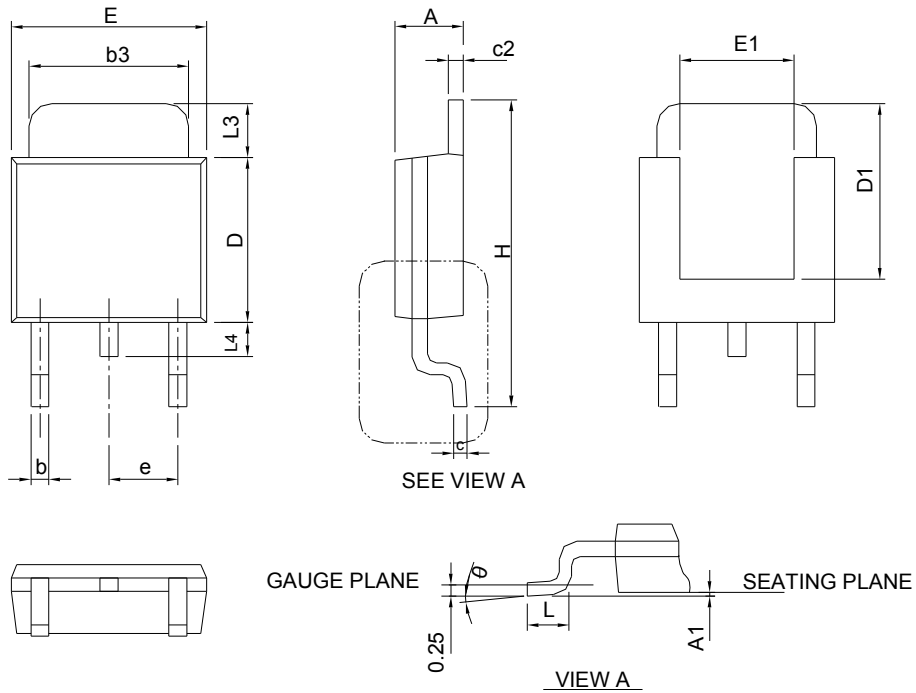


16 Gate charge waveforms



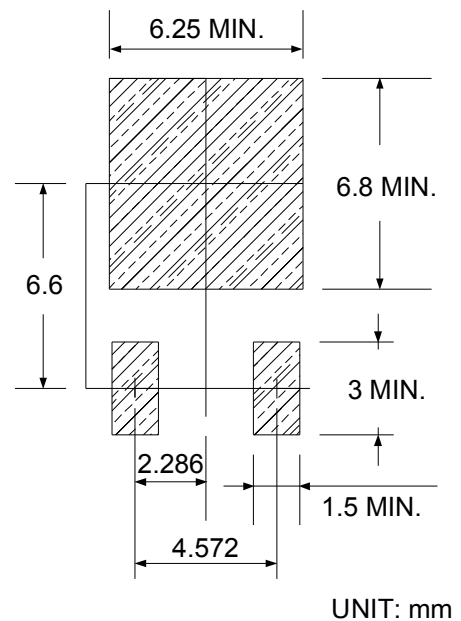
Package Information

TO-252



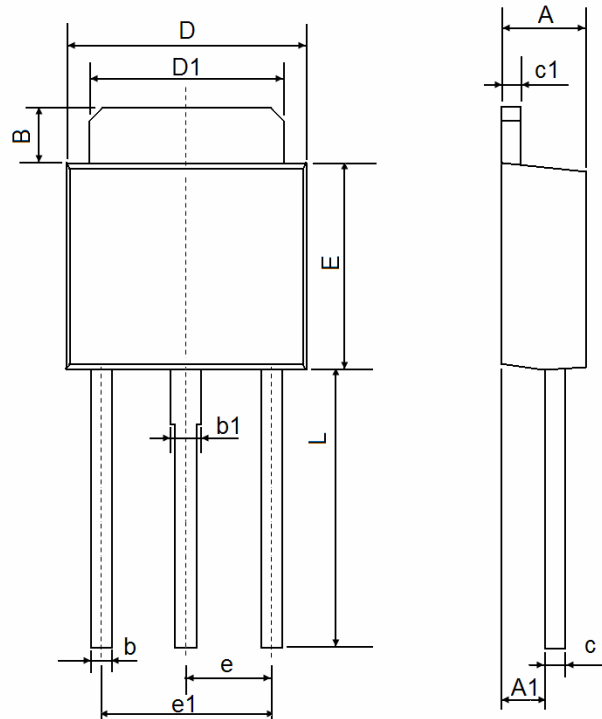
DIMENSIONS	TO-252			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1		0.13		0.005
b	0.50	0.89	0.020	0.035
b3	4.95	5.46	0.195	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.236
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.236
e	2.29 BSC		0.090 BSC	
H	9.40	10.41	0.370	0.410
L	0.90	1.78	0.035	0.070
L3	0.89	2.03	0.035	0.080
L4		1.02		0.040
θ	0°	8°	0°	8°

RECOMMENDED LAND PATTERN



Note : Follow JEDEC TO-252 .

TO-251 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	1.050	1.350	0.042	0.054
B	0.700	1.000	0.028	0.040
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	6.000	0.213	0.237
e	2.300 TYP.		0.091 TYP.	
e1	4.500	4.700	0.177	0.185
L	4.900	9.400	0.194	0.372

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact