

OptiMOSTM3 Power-Transistor

Features

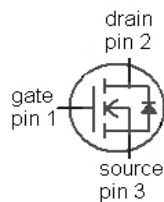
- Ideal for high frequency switching and sync. rec.
- Optimized technology for DC/DC converters
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- N-channel, normal level
- 100% avalanche tested
- Pb-free plating; RoHS compliant
- Qualified according to JEDEC¹⁾ for target applications



Product Summary

V_{DS}	80	V
$R_{DS(on),max}$	13.5	m Ω
I_D	50	A

Type	IPU135N08N3 G
	
Package	PG-TO251-3
Marking	135N08N



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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$T_C=25\text{ °C}^{2)}$	50	A
		$T_C=100\text{ °C}$	39	
Pulsed drain current ²⁾	$I_{D,pulse}$	$T_C=25\text{ °C}$	200	
Avalanche energy, single pulse ³⁾	E_{AS}	$I_D=50\text{ A}$, $R_{GS}=25\text{ }\Omega$	40	mJ
Gate source voltage	V_{GS}		± 20	V
Power dissipation	P_{tot}	$T_C=25\text{ °C}$	79	W
Operating and storage temperature	T_J , T_{stg}		-55 ... 175	°C
IEC climatic category; DIN IEC 68-1			55/175/56	

¹⁾ J-STD20 and JESD22

²⁾ See figure 3 for more detailed information

³⁾ See figure 13 for more detailed information

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Thermal characteristics

Thermal resistance, junction - case	R_{thJC}		-	-	1.9	K/W
Thermal resistance, junction - ambient	R_{thJA}	minimal footprint	-	-	75	
		6 cm ² cooling area ⁴⁾	-	-	50	

Electrical characteristics, at $T_j=25\text{ °C}$, unless otherwise specified

Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$	80	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=33\text{ }\mu\text{A}$	2	2.8	3.5	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=80\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$	-	0.1	1	μA
		$V_{DS}=80\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ °C}$	-	10	100	
Gate-source leakage current	I_{GSS}	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$	-	1	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=50\text{ A}$	-	11.3	13.5	m Ω
		$V_{GS}=6\text{ V}, I_D=25\text{ A}$	-	15.5	26	
Gate resistance	R_G		-	2	-	Ω
Transconductance	g_{fs}	$ V_{DS} >2 I_D R_{DS(on)max}, I_D=50\text{ A}$	26	51	-	S

⁴⁾ 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}	$V_{GS}=0\text{ V}, V_{DS}=40\text{ V},$ $f=1\text{ MHz}$	-	1300	1730	pF
Output capacitance	C_{oss}		-	353	469	
Reverse transfer capacitance	C_{rss}		-	15	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=40\text{ V}, V_{GS}=10\text{ V},$ $I_D=45\text{ A}, R_G=1.6\ \Omega$	-	12	-	ns
Rise time	t_r		-	35	-	
Turn-off delay time	$t_{d(off)}$		-	18	-	
Fall time	t_f		-	5	-	

Gate Charge Characteristics⁵⁾

Gate to source charge	Q_{gs}	$V_{DD}=40\text{ V}, I_D=50\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	7	-	nC
Gate to drain charge	Q_{gd}		-	4	-	
Switching charge	Q_{sw}		-	8	-	
Gate charge total	Q_g		-	19	25	
Gate plateau voltage	$V_{plateau}$		-	5.6	-	V
Output charge	Q_{oss}	$V_{DD}=40\text{ V}, V_{GS}=0\text{ V}$	-	25	34	nC

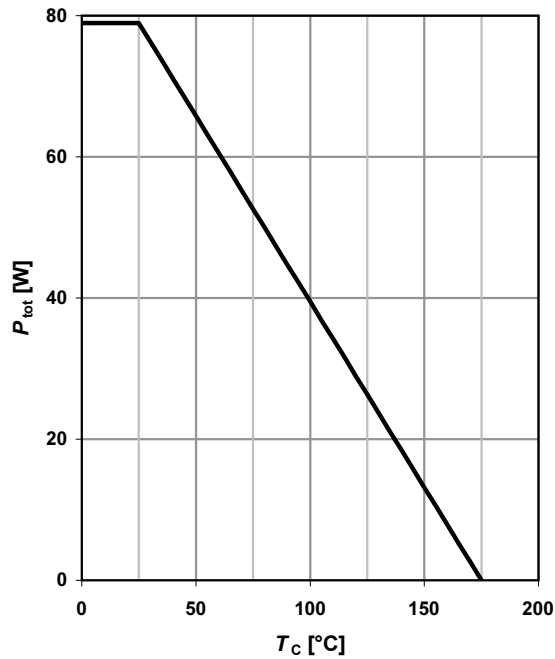
Reverse Diode

Diode continuous forward current	I_S	$T_C=25\text{ °C}$	-	-	50	A
Diode pulse current	$I_{S,pulse}$		-	-	200	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=50\text{ A},$ $T_j=25\text{ °C}$	-	1.0	1.2	V
Reverse recovery time	t_{rr}	$V_R=40\text{ V}, I_F=45\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	50	-	ns
Reverse recovery charge	Q_{rr}		-	74	-	nC

⁵⁾ See figure 16 for gate charge parameter definition

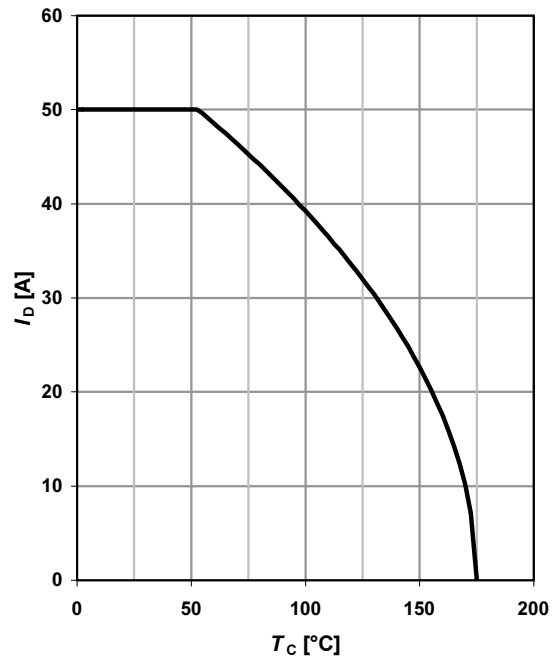
1 Power dissipation

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



2 Drain current

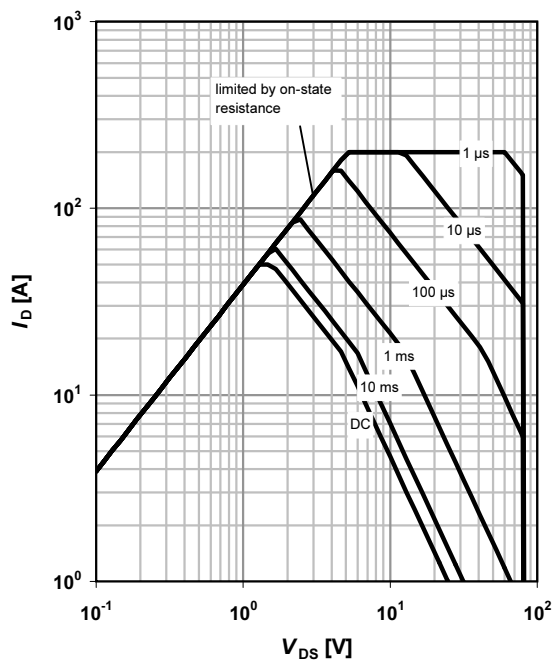
$$I_D = f(T_C); V_{GS} \geq 10 \text{ V}$$



3 Safe operating area

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

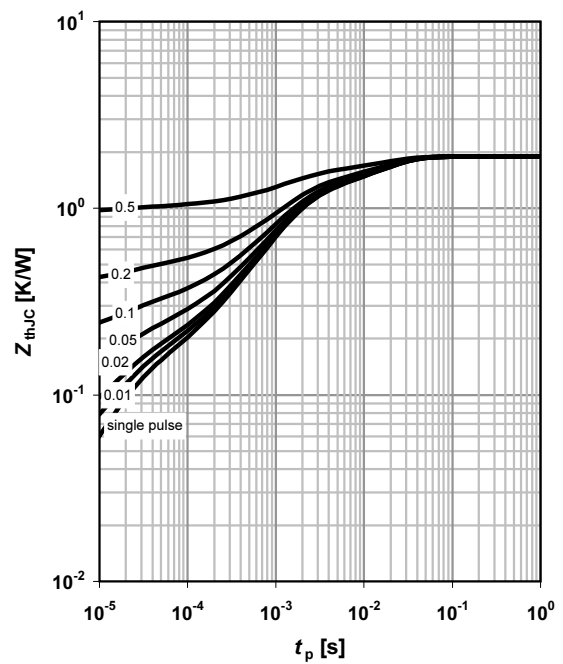
parameter: t_p



4 Max. transient thermal impedance

$$Z_{\text{thJC}} = f(t_p)$$

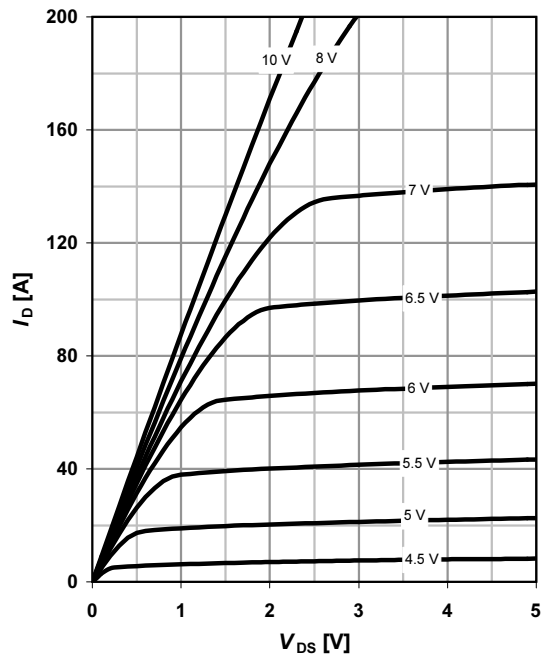
parameter: $D = t_p/T$



5 Typ. output characteristics

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

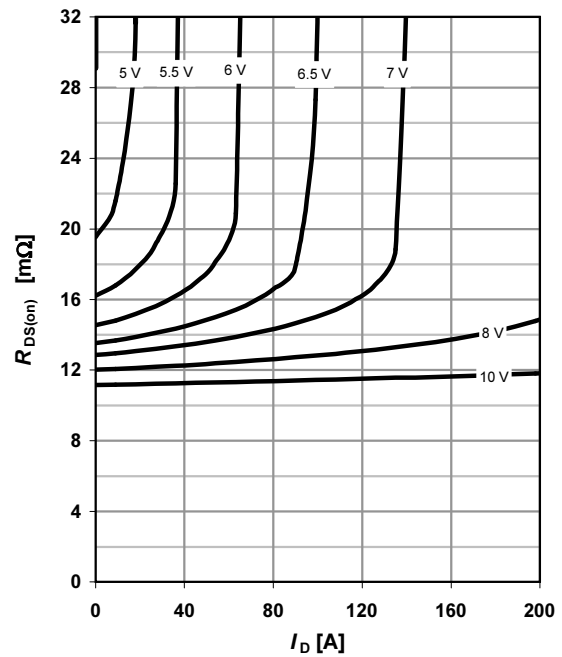
parameter: V_{GS}



6 Typ. drain-source on resistance

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

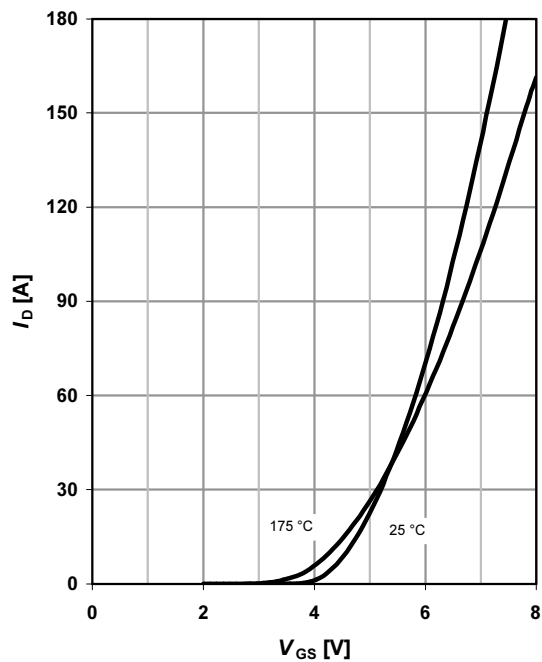
parameter: V_{GS}



7 Typ. transfer characteristics

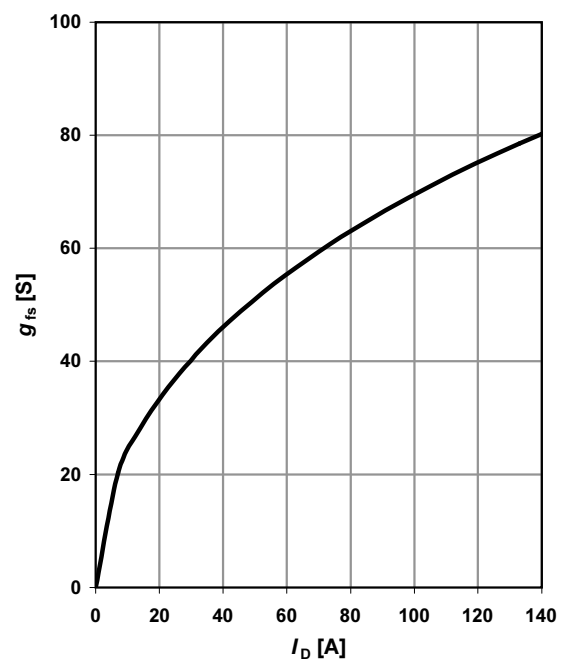
$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$$

parameter: T_J



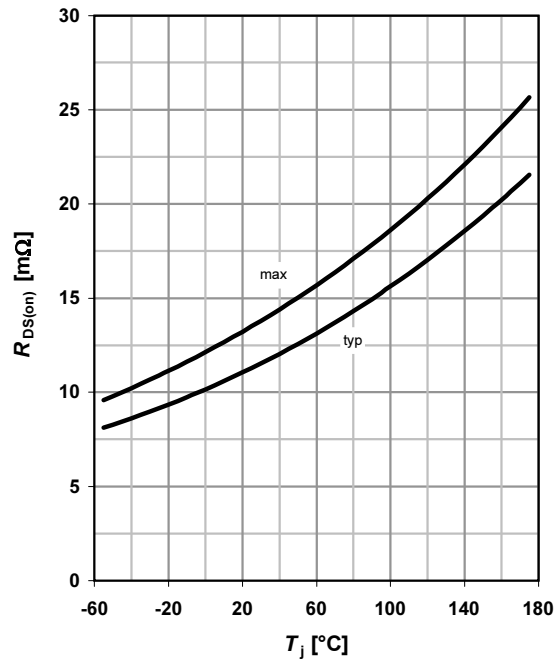
8 Typ. forward transconductance

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



9 Drain-source on-state resistance

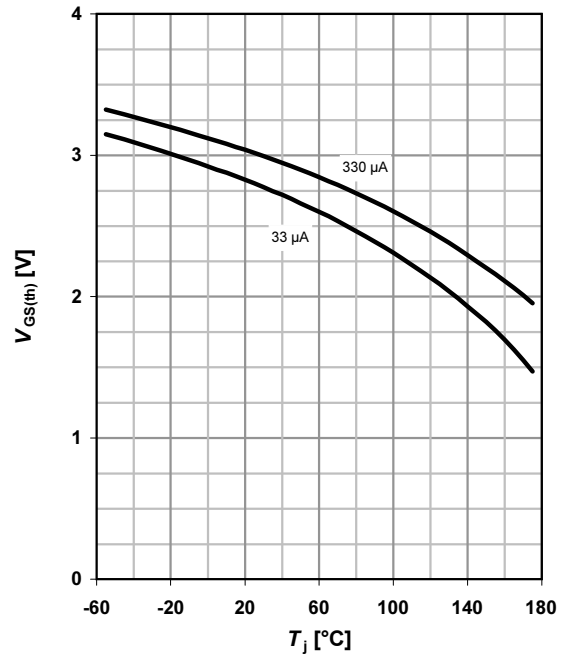
$$R_{DS(on)} = f(T_j); I_D = 50 \text{ A}; V_{GS} = 10 \text{ V}$$



10 Typ. gate threshold voltage

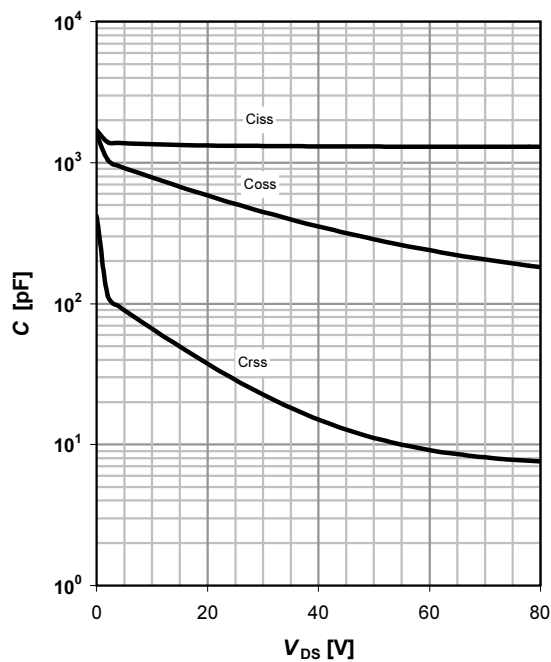
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter: I_D



11 Typ. capacitances

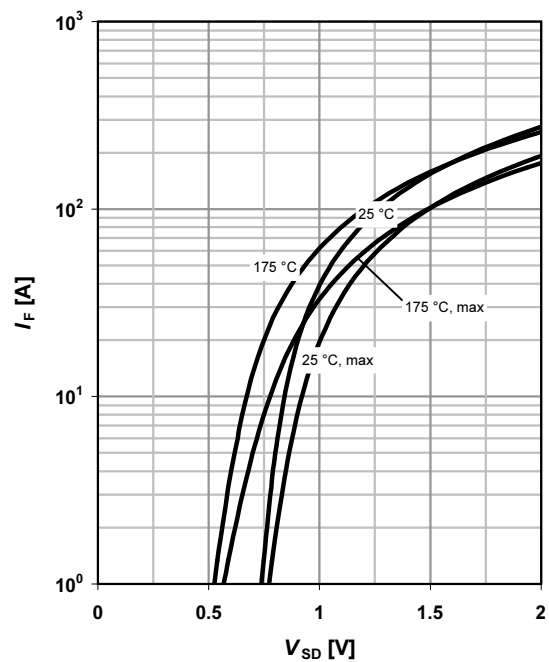
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



12 Forward characteristics of reverse diode

$$I_F = f(V_{SD})$$

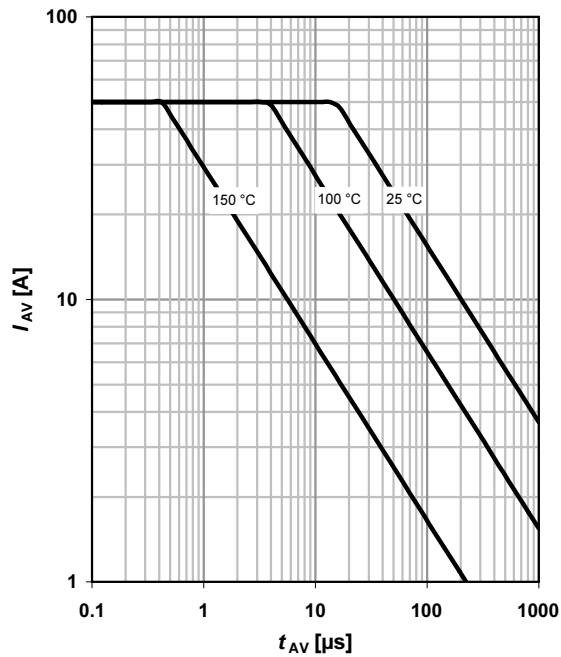
parameter: T_j



13 Avalanche characteristics

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

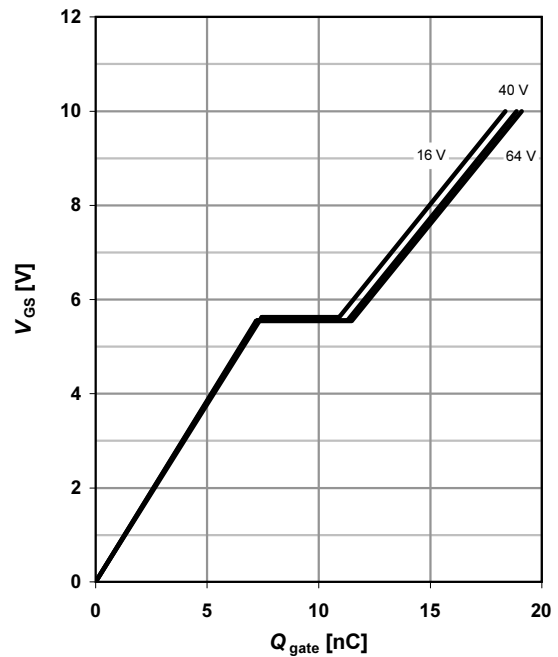
parameter: $T_{j(\text{start})}$



14 Typ. gate charge

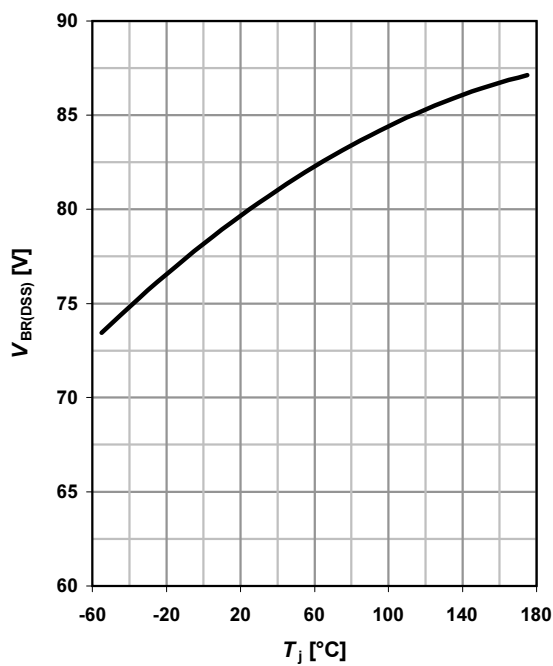
$$V_{GS}=f(Q_{\text{gate}}); I_D=50\ \text{A pulsed}$$

parameter: V_{DD}

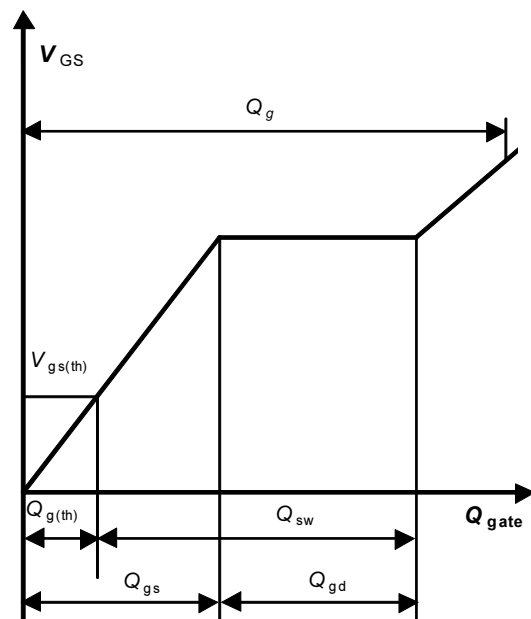


15 Drain-source breakdown voltage

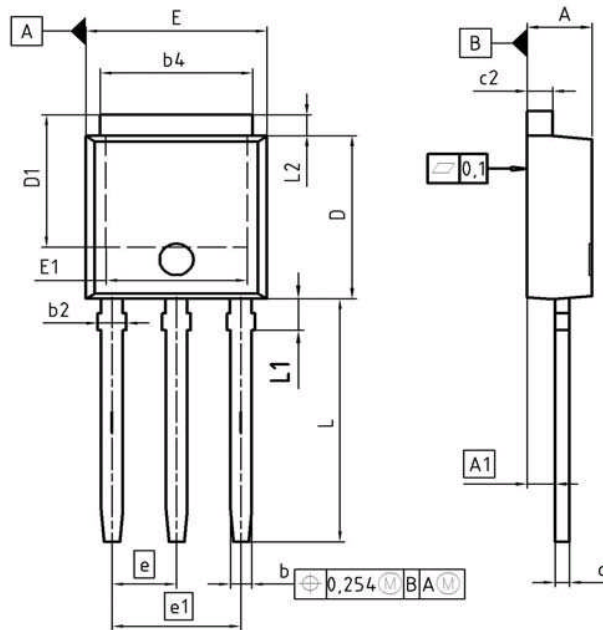
$$V_{BR(DSS)}=f(T_j); I_D=1\ \text{mA}$$



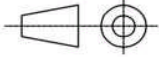
16 Gate charge waveforms



PG-TO251-3: Outline



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.16	2.41	0.085	0.095
A1	0.90	1.14	0.035	0.045
b	0.64	0.89	0.025	0.035
b2	0.65	1.15	0.026	0.045
b4	4.95	5.50	0.195	0.217
c	0.46	0.60	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.04	5.77	0.198	0.227
E	6.35	6.73	0.250	0.265
E1	4.70	5.21	0.185	0.205
e	2.29		0.090	
e1	4.57		0.180	
N	3		3	
L	8.89	9.65	0.350	0.380
L1	1.90	2.29	0.075	0.090
L2	0.89	1.37	0.035	0.054

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