

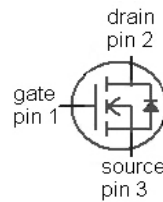
**OptiMOS<sup>(TM)</sup>3 Power-Transistor**
**Features**

- 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 JEDEC<sup>1)</sup> for target applications


**Product Summary**

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

<b>Type</b>	IPU135N08N3 G
<b>Package</b>	PG-TO251-3
<b>Marking</b>	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 <sup>2)</sup>	$I_{D,pulse}$	$T_C=25\text{ °C}$	200	
Avalanche energy, single pulse <sup>3)</sup>	$E_{AS}$	$I_D=50\text{ A}, R_{GS}=25\text{ }\Omega$	40	mJ
Gate source voltage	$V_{GS}$		$\pm 20$	V
Power dissipation	$P_{tot}$	$T_C=25\text{ °C}$	79	W
Operating and storage temperature	$T_j, T_{stg}$		-55 ... 175	$^{\circ}\text{C}$
IEC climatic category; DIN IEC 68-1			55/175/56	

<sup>1)</sup>J-STD20 and JESD22

<sup>2)</sup> See figure 3 for more detailed information

<sup>3)</sup> 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 <sup>2</sup> cooling area <sup>4)</sup>	-	-	50	

**Electrical characteristics, at  $T_j=25\text{ }^\circ\text{C}$ , unless otherwise specified**
**Static characteristics**

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$	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	$I_{DSS}$	$V_{DS}=80\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^\circ\text{C}$	-	0.1	1	$\mu\text{A}$
		$V_{DS}=80\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ }^\circ\text{C}$	-	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	$\text{m}\Omega$
		$V_{GS}=6\text{ V}, I_D=25\text{ A}$	-	15.5	26	
Gate resistance	$R_G$		-	2	-	$\Omega$
Transconductance	$g_{fs}$	$ V_{DS} >2 I_D R_{DS(on)max}, I_D=50\text{ A}$	26	51	-	S

<sup>4)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  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 Characteristics<sup>5)</sup>**

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

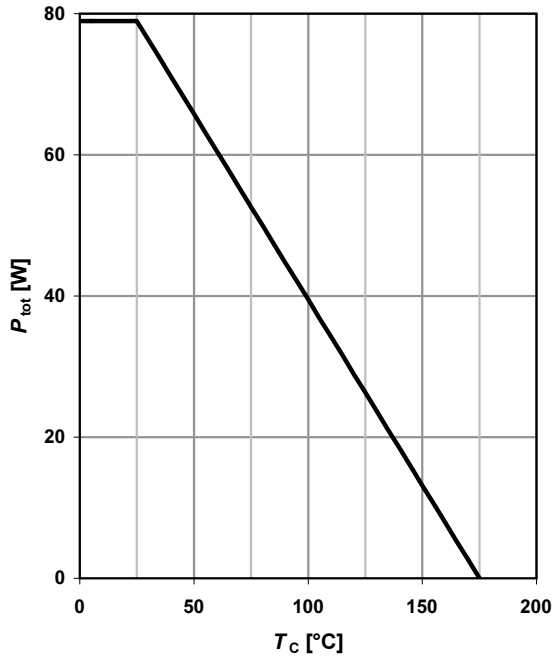
**Reverse Diode**

Diode continuous forward current	$I_S$	$T_C=25\text{ }^\circ\text{C}$	-	-	50	A
Diode pulse current	$I_{S,pulse}$		-	-	200	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=50\text{ A},$ $T_J=25\text{ }^\circ\text{C}$	-	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

<sup>5)</sup> See figure 16 for gate charge parameter definition

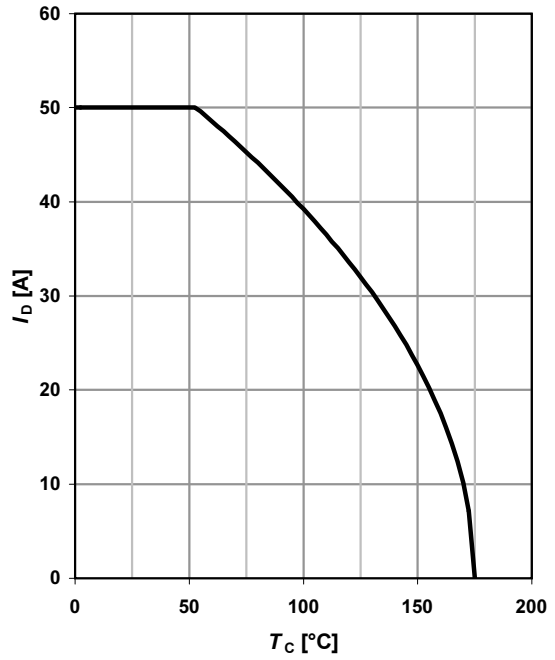
**1 Power dissipation**

$P_{tot}=f(T_c)$



**2 Drain current**

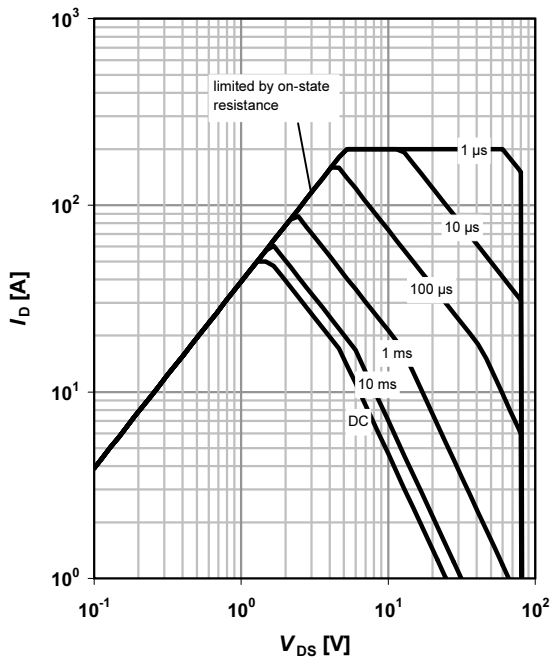
$I_D=f(T_c); V_{GS} \geq 10 V$



**3 Safe operating area**

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

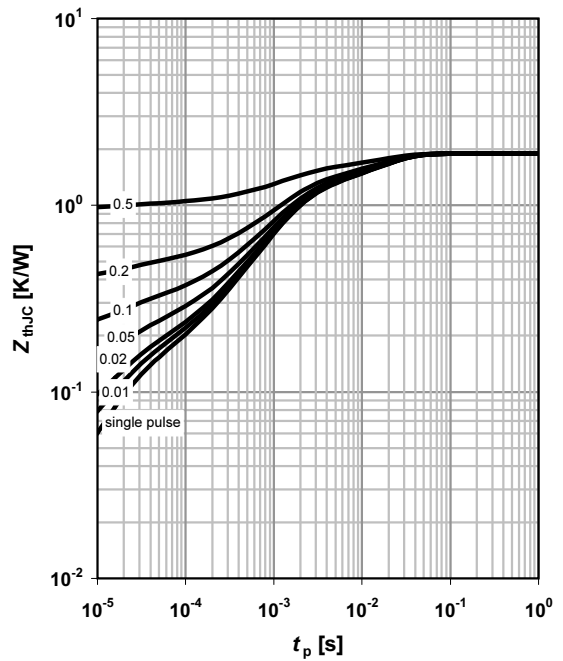
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJC}=f(t_p)$

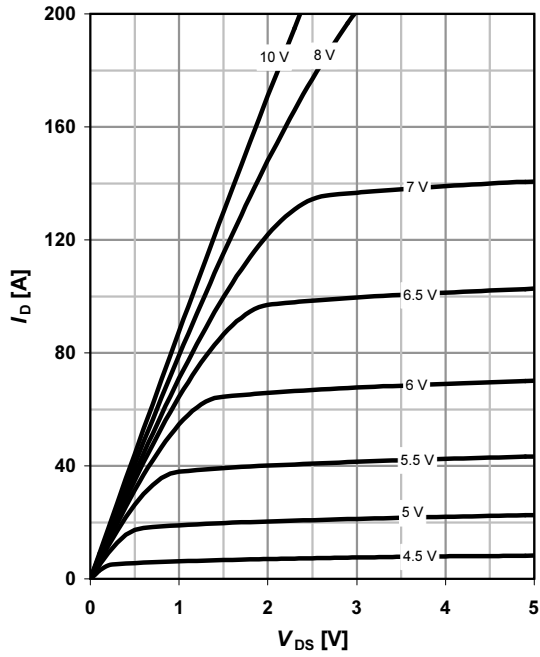
parameter:  $D=t_p/T$



**5 Typ. output characteristics**

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

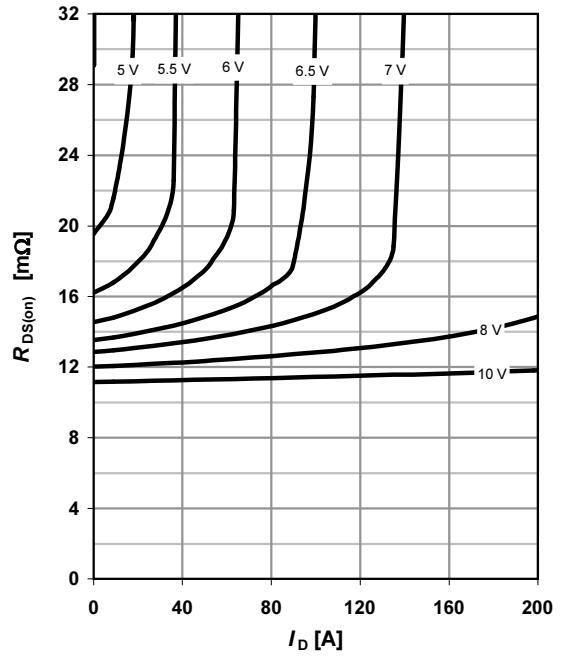
parameter:  $V_{GS}$



**6 Typ. drain-source on resistance**

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

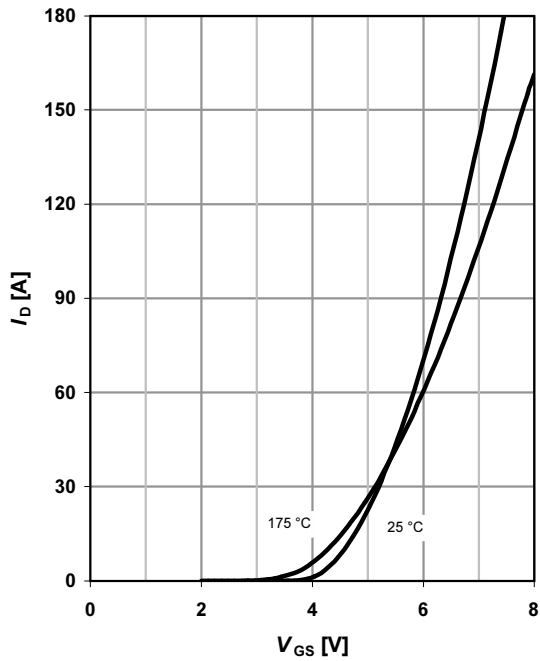
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

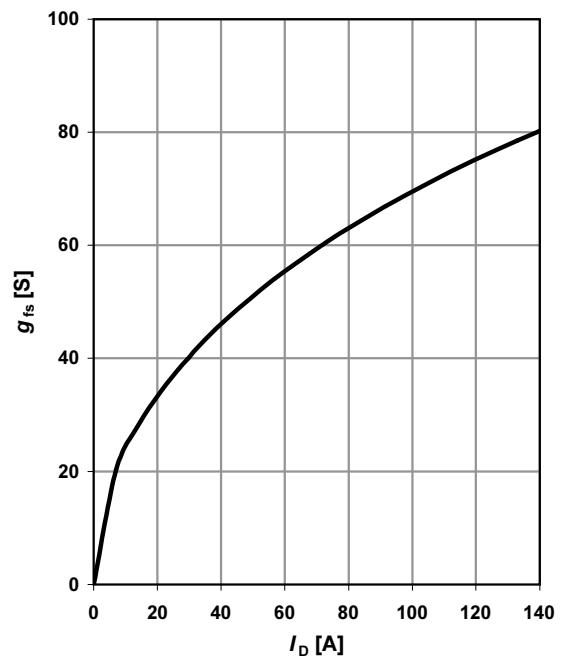
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



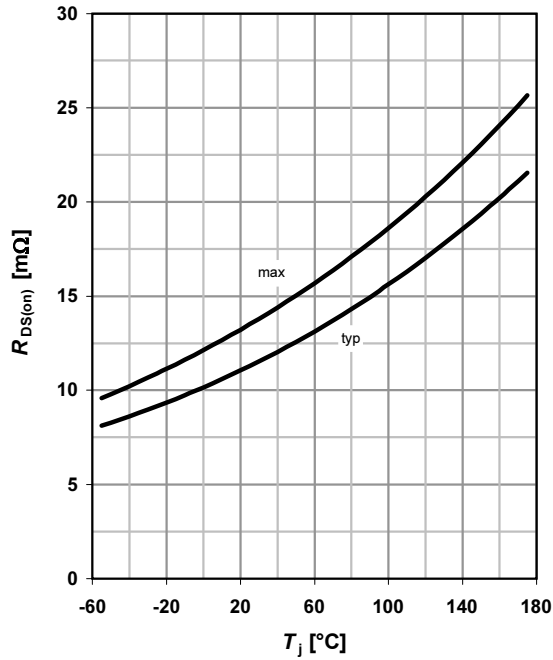
**8 Typ. forward transconductance**

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



**9 Drain-source on-state resistance**

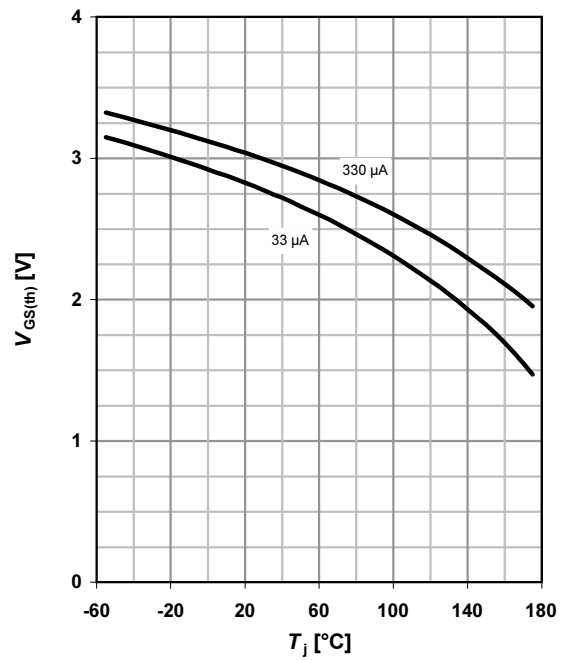
$R_{DS(on)} = f(T_j); I_D = 50 \text{ A}; V_{GS} = 10 \text{ V}$



**10 Typ. gate threshold voltage**

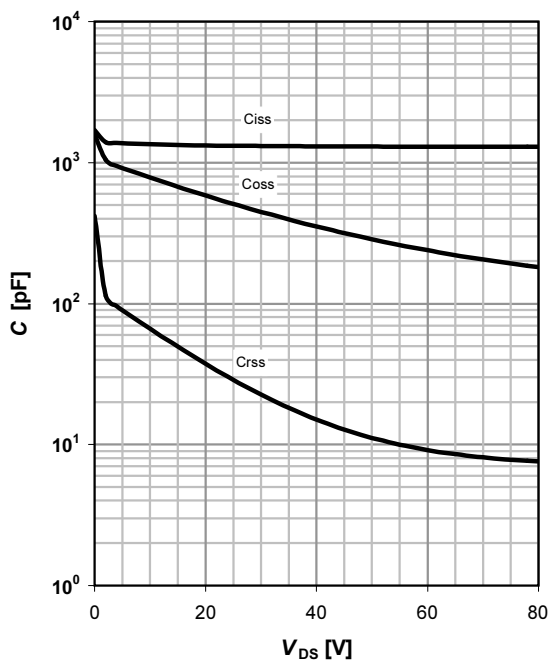
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter:  $I_D$



**11 Typ. capacitances**

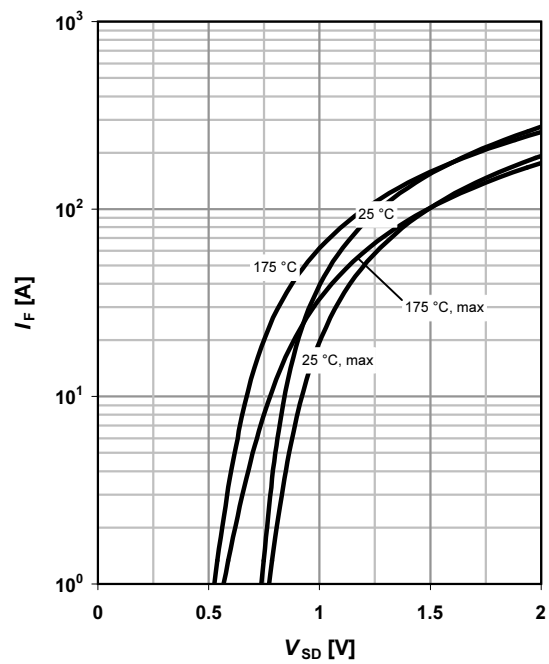
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

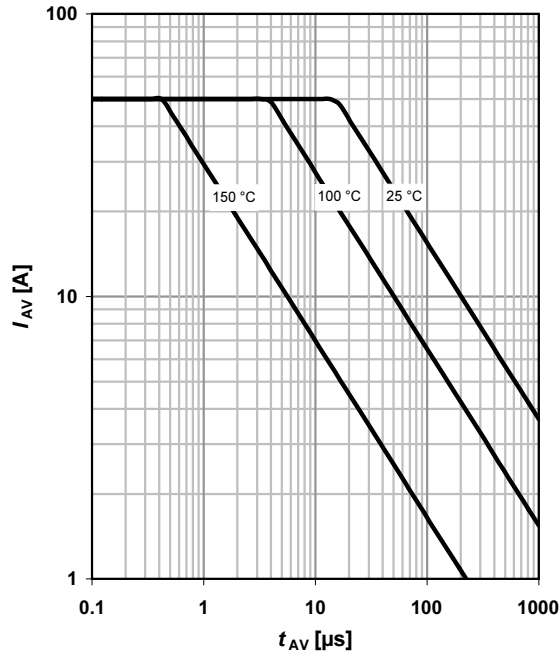
parameter:  $T_j$



**13 Avalanche characteristics**

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

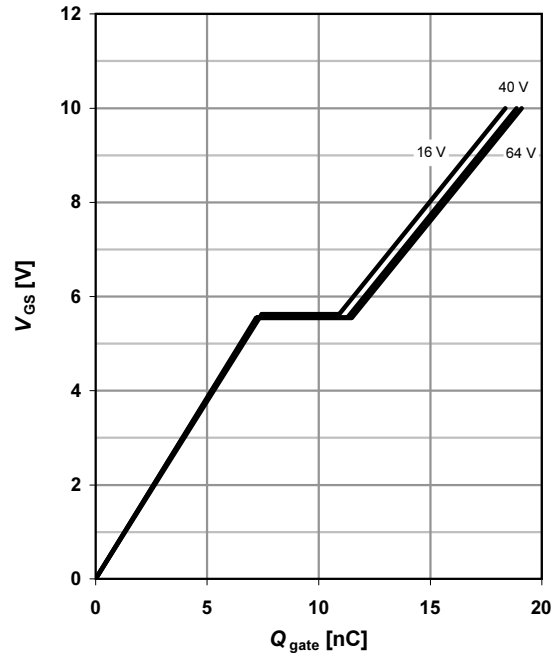
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

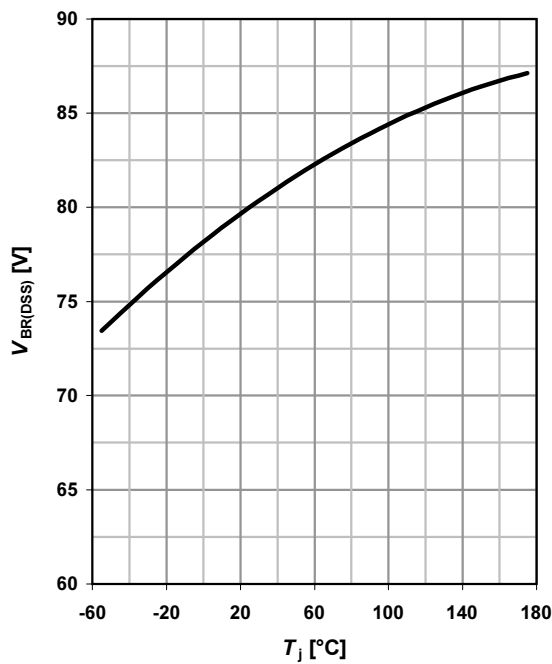
$V_{GS}=f(Q_{gate}); I_D=50 \text{ A pulsed}$

parameter:  $V_{DD}$

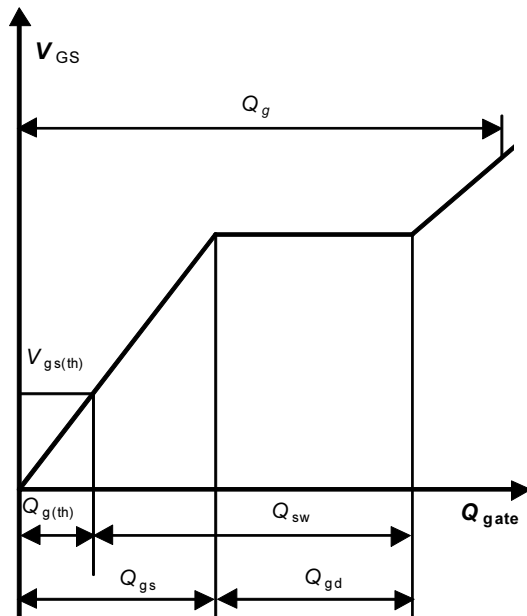


**15 Drain-source breakdown voltage**

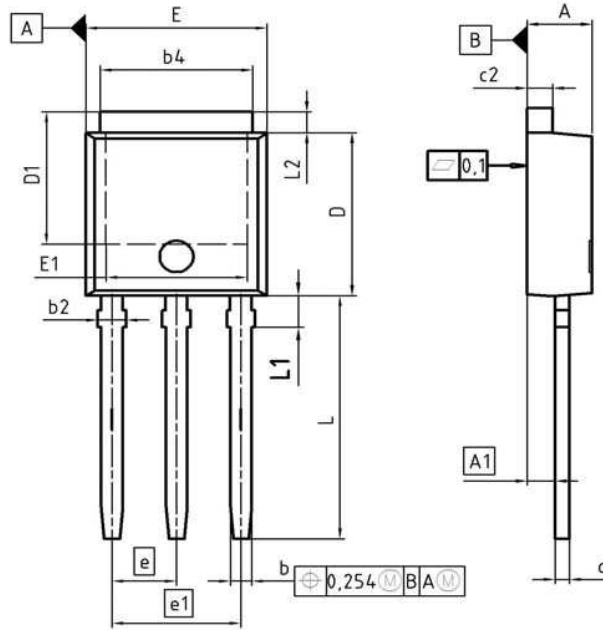
$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$



**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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