

**OptiMOS™ 3 Power-Transistor**
**Features**

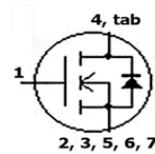
- N-channel, normal level
- Excellent gate charge x  $R_{DS(on)}$  product (FOM)
- Extremely low on-resistance  $R_{DS(on)}$
- High current capability
- 175 °C operating temperature
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC<sup>1)</sup> for target application
- Halogen-free according to IEC61249-2-21

**Product Summary**

$V_{DS}$	100	V
$R_{DS(on),max}$	2.5	mΩ
$I_D$	180	A



<b>Type</b>	IPB025N10N3 G
	
<b>Package</b>	PG-TO263-7
<b>Marking</b>	025N10N



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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$T_C=25\text{ °C}^{2)}$	180	A
		$T_C=100\text{ °C}$	167	
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	$T_C=25\text{ °C}$	720	
Avalanche energy, single pulse	$E_{AS}$	$I_D=100\text{ A}, R_{GS}=25\text{ Ω}$	1000	mJ
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	

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

<sup>2)</sup> See figure 3

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Thermal characteristics**

Thermal resistance, junction - case	$R_{thJC}$		-	-	0.5	K/W
Thermal resistance, junction - ambient	$R_{thJA}$	minimal footprint	-	-	62	
		6 cm <sup>2</sup> cooling area <sup>3)</sup>	-	-	40	

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

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$	100	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=275\text{ }\mu\text{A}$	2	2.7	3.5	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=100\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$	-	0.1	1	$\mu\text{A}$
		$V_{DS}=100\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ °C}$	-	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	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=100\text{ A}$	-	2.0	2.5	m $\Omega$
		$V_{GS}=6\text{ V}, I_D=50\text{ A}$	-	2.5	4.4	
Gate resistance	$R_G$		-	1.9	-	$\Omega$
Transconductance	$g_{fs}$	$ V_{DS} >2 I_D R_{DS(on)max}, I_D=100\text{ A}$	100	200	-	S

<sup>3)</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	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=50\text{ V},$ $f=1\text{ MHz}$	-	11100	14800	pF
Output capacitance	$C_{oss}$		-	1940	2580	
Reverse transfer capacitance	$C_{rss}$		-	69	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=50\text{ V}, V_{GS}=10\text{ V},$ $I_D=100\text{ A}, R_G=1.6\ \Omega$	-	34	-	ns
Rise time	$t_r$		-	58	-	
Turn-off delay time	$t_{d(off)}$		-	84	-	
Fall time	$t_f$		-	28	-	

**Gate Charge Characteristics<sup>4)</sup>**

Gate to source charge	$Q_{gs}$	$V_{DD}=50\text{ V}, I_D=100\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	48	64	nC
Gate to drain charge	$Q_{gd}$		-	27	-	
Switching charge	$Q_{sw}$		-	42	-	
Gate charge total	$Q_g$		-	155	206	
Gate plateau voltage	$V_{plateau}$		-	4.3	-	V
Output charge	$Q_{oss}$	$V_{DD}=50\text{ V}, V_{GS}=0\text{ V}$	-	205	273	nC

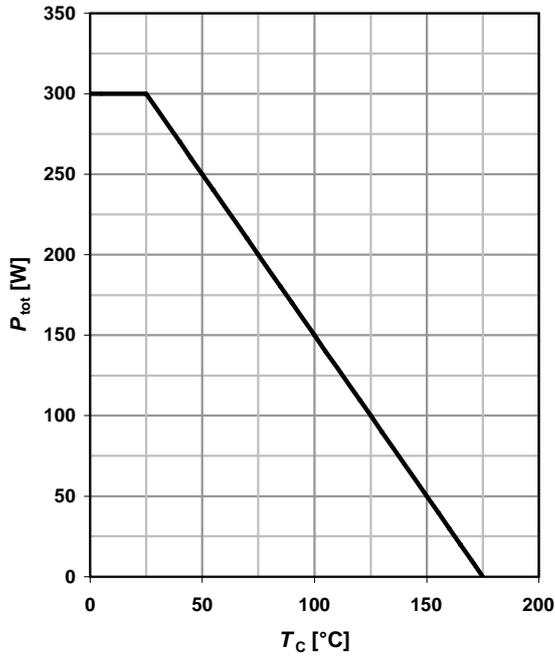
**Reverse Diode**

Diode continuous forward current	$I_S$	$T_C=25\text{ }^\circ\text{C}$	-	-	180	A
Diode pulse current	$I_{S,pulse}$		-	-	720	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=100\text{ A},$ $T_j=25\text{ }^\circ\text{C}$	-	1	1.2	V
Reverse recovery time	$t_{rr}$	$V_R=50\text{ V}, I_F=100\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	86	-	ns
Reverse recovery charge	$Q_{rr}$		-	232	-	nC

<sup>4)</sup> See figure 16 for gate charge parameter definition

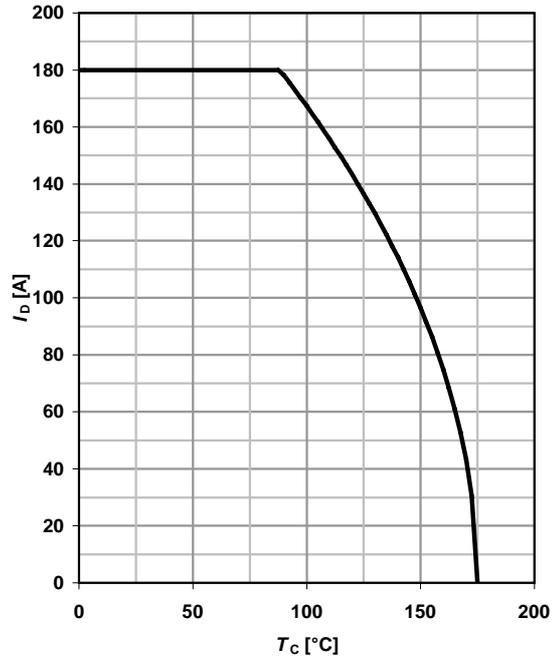
**1 Power dissipation**

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



**2 Drain current**

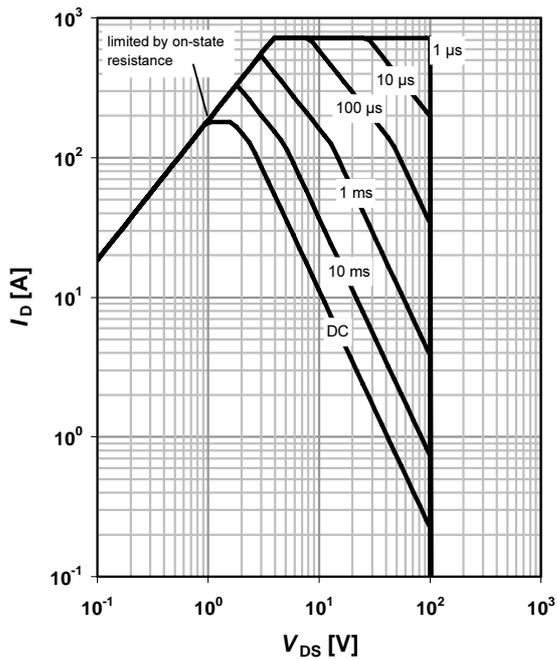
$$I_D=f(T_C); V_{GS} \geq 10 \text{ V}$$



**3 Safe operating area**

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

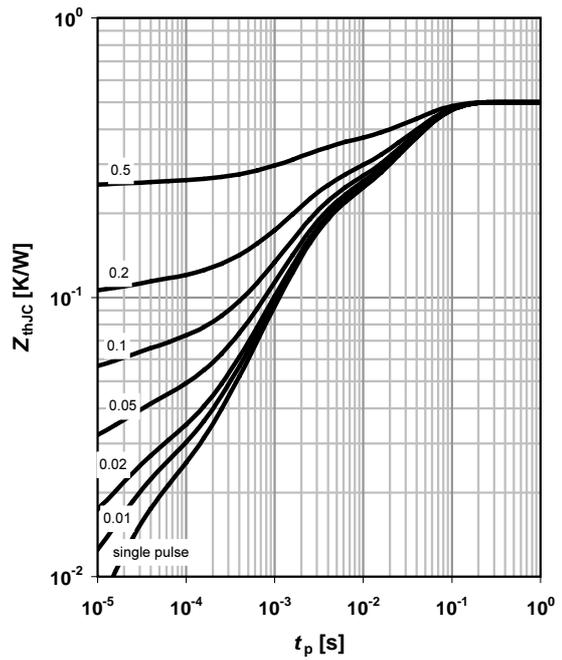
parameter:  $t_p$



**4 Max. transient thermal impedance**

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

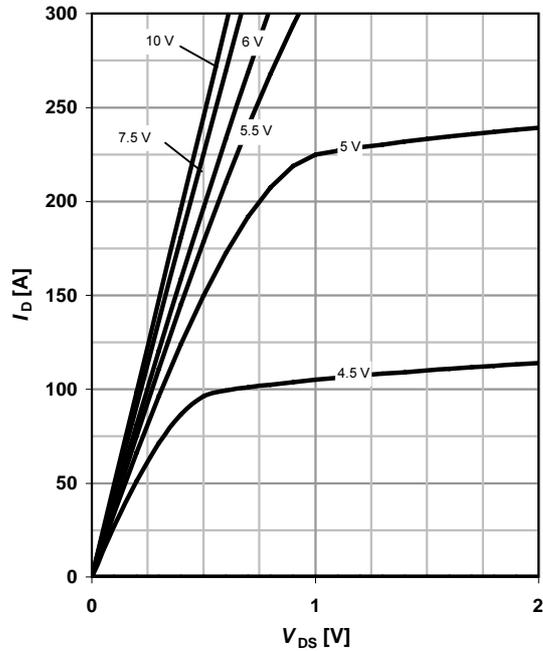
parameter:  $D=t_p/T$



**5 Typ. output characteristics**

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

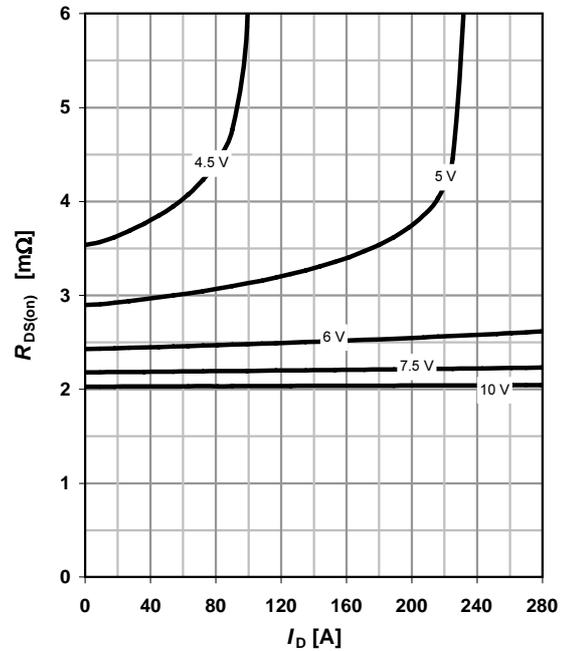
parameter:  $V_{GS}$



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

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

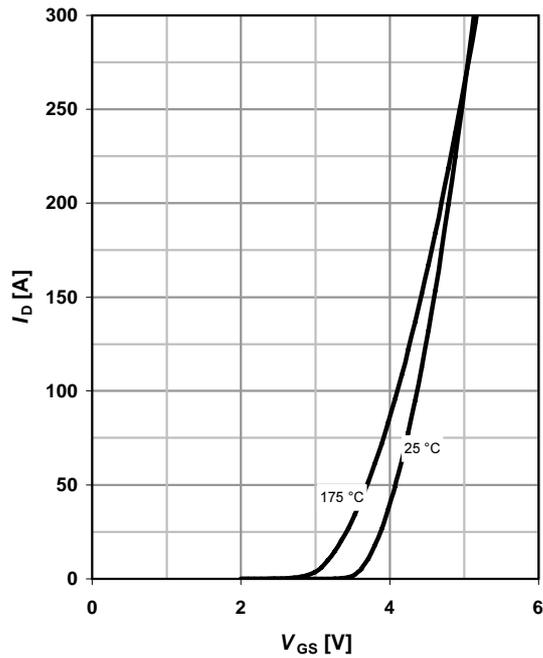
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

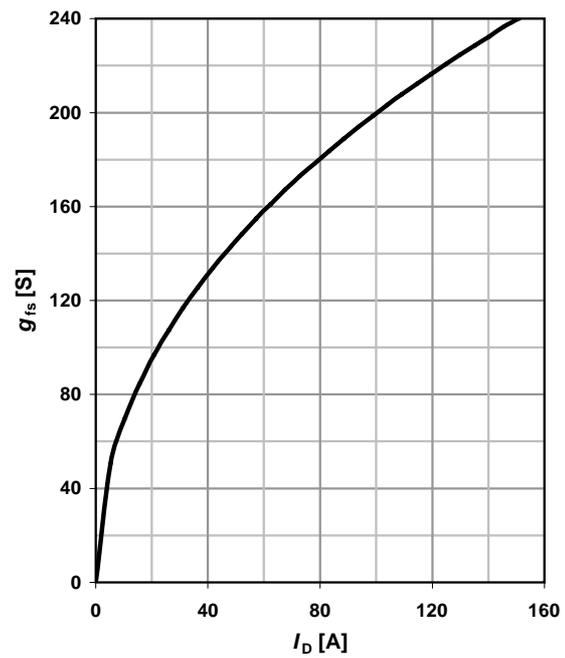
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



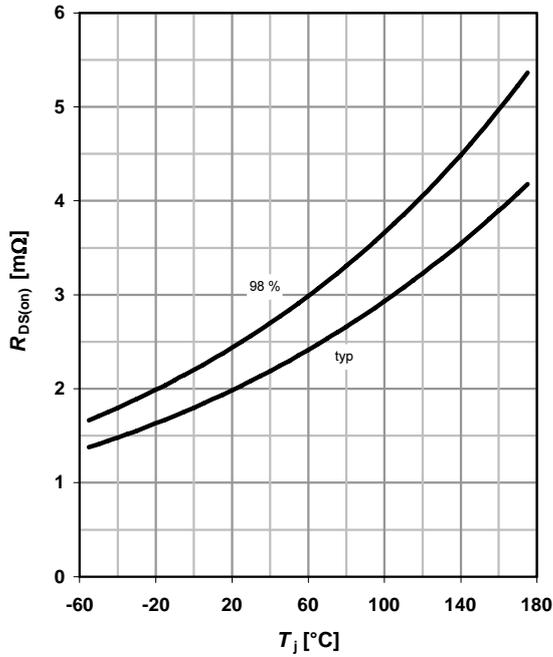
**8 Typ. forward transconductance**

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



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

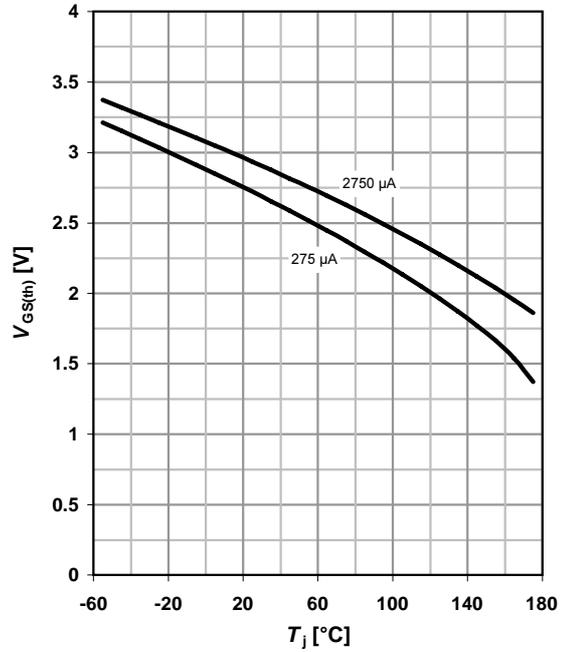
$R_{DS(on)} = f(T_j); I_D = 100 \text{ A}; V_{GS} = 10 \text{ V}$



**10 Typ. gate threshold voltage**

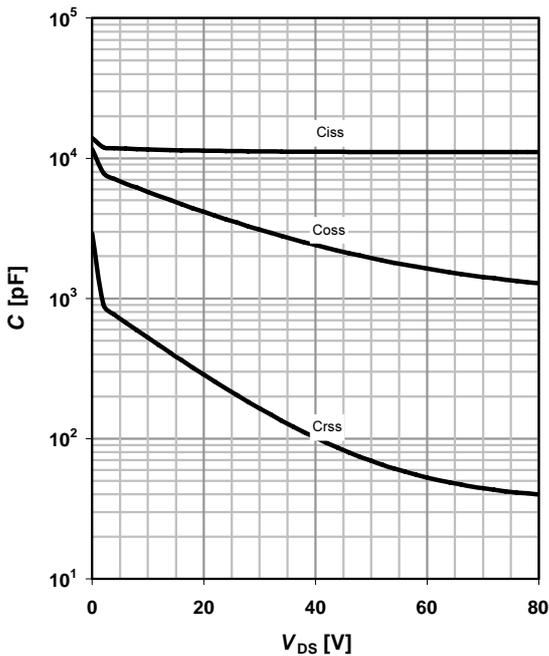
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter:  $I_D$



**11 Typ. capacitances**

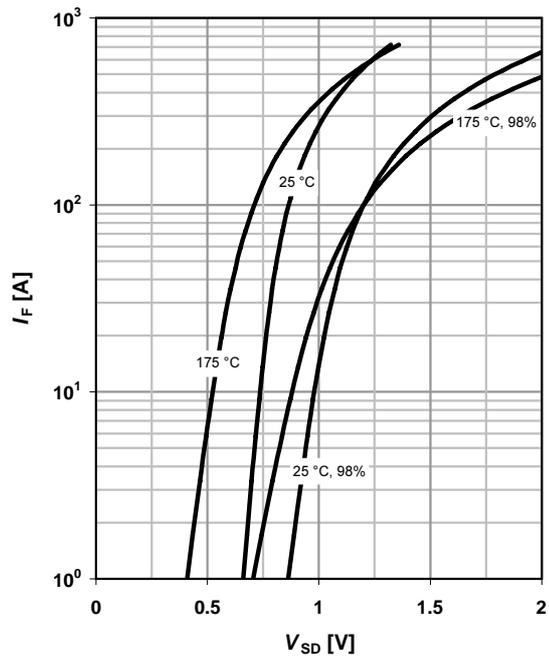
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

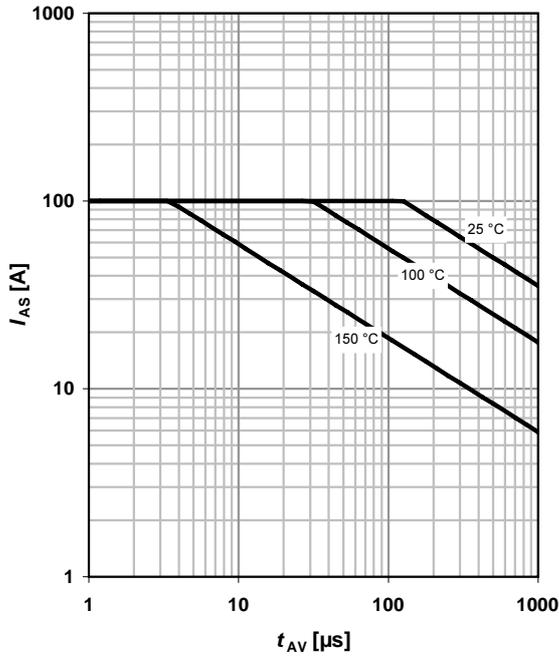
parameter:  $T_j$



**13 Avalanche characteristics**

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

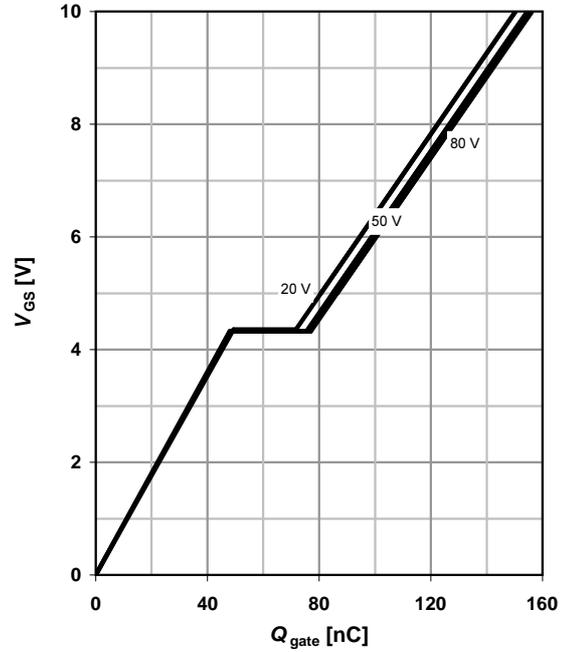
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

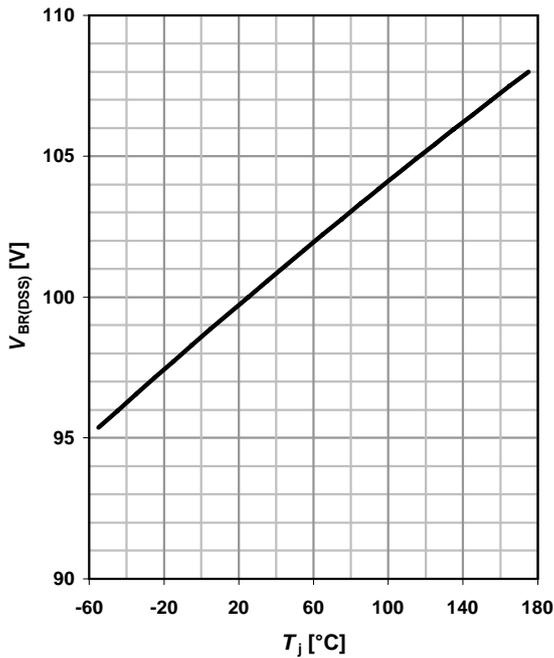
$V_{GS}=f(Q_{gate}); I_D=100 \text{ A pulsed}$

parameter:  $V_{DD}$

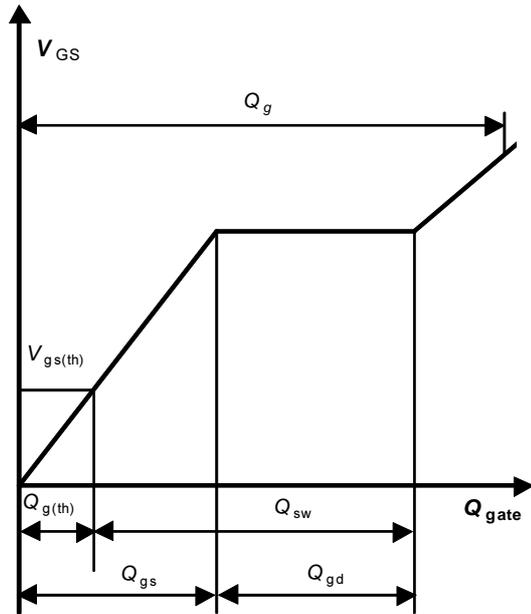


**15 Drain-source breakdown voltage**

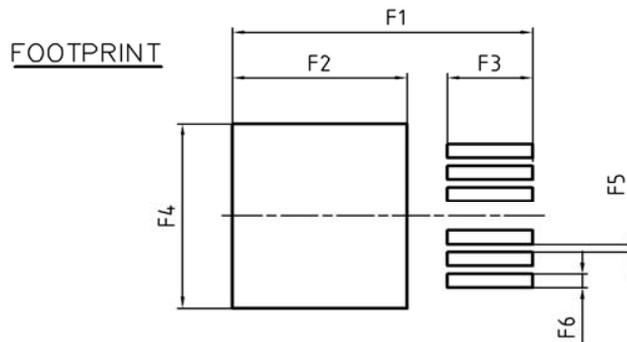
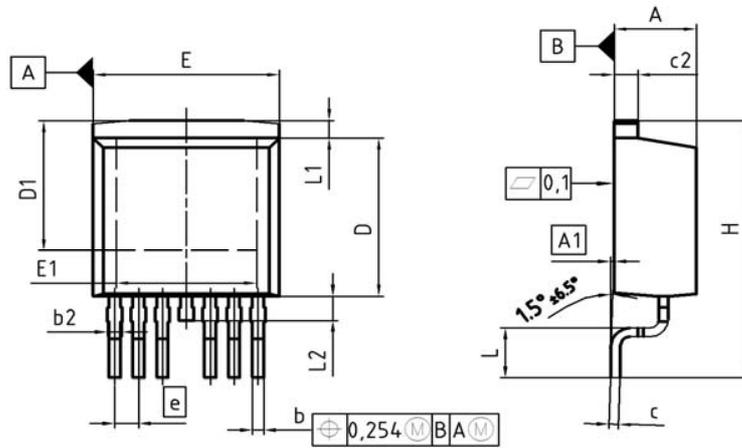
$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$



**16 Gate charge waveforms**



PG-TO263-3: Outline



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.57	0.169	0.180
A1	0.00	0.25	0.000	0.010
b	0.50	0.70	0.020	0.028
b2	0.50	1.00	0.020	0.039
c	0.33	0.65	0.013	0.026
c2	1.17	1.40	0.046	0.055
D	8.51	9.45	0.335	0.372
D1	6.90	7.90	0.272	0.311
E	9.80	10.31	0.386	0.406
E1	6.50	8.60	0.256	0.339
e	1.27		0.050	
N	6		6	
H	14.61	15.88	0.575	0.625
L	2.29	3.00	0.090	0.118
L1	0.70	1.60	0.028	0.063
L2	1.00	1.78	0.039	0.070
F1	16.05	16.25	0.632	0.640
F2	9.30	9.50	0.366	0.374
F3	4.50	4.70	0.177	0.185
F4	10.70	10.90	0.421	0.429
F5	0.37	0.57	0.015	0.022
F6	0.70	0.90	0.028	0.035

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