

OptiMOS™3 Power-Transistor

Features

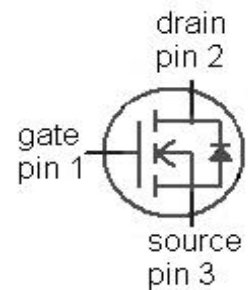
- N-channel, normal level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21
- Ideal for high-frequency switching and synchronous rectification

Product Summary

V_{DS}	200	V
$R_{DS(on),max}$ (TO263)	10.7	mΩ
I_D	88	A



Type	IPB107N20NA	IPP110N20NA
		
Package	PG-TO263-3	PG-TO220-3
Marking	107N20NA	110N20NA



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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$T_C=25\text{ °C}$	88	A
		$T_C=100\text{ °C}$	63	
Pulsed drain current ¹⁾	$I_{D,pulse}$	$T_C=25\text{ °C}$	352	
Avalanche energy, single pulse	E_{AS}	$I_D=80\text{ A}$, $R_{GS}=25\text{ Ω}$	560	mJ
Reverse diode dv/dt	dv/dt		10	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⁾ 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 ² cooling area ²⁾	-	-	40	

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

Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$	200	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=270\text{ }\mu\text{A}$	2	3	4	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=160\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$	-	0.1	1	μA
		$V_{DS}=160\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$	-	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	$R_{DS(on)}$	$V_{GS}=10\text{ V}$, $I_D=88\text{ A}$, (TO220)	-	9.9	11	m Ω
		$V_{GS}=10\text{ V}$, $I_D=88\text{ A}$, (TO263)	-	9.6	10.7	

²⁾ 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 characteristic⁴⁾

Input capacitance	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=100\text{ V},$ $f=1\text{ MHz}$	-	5340	7100	pF
Output capacitance	C_{oss}		-	401	533	
Reverse transfer capacitance	C_{rss}		-	5	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=100\text{ V},$ $V_{GS}=10\text{ V}, I_D=44\text{ A},$ $R_G=1.6\ \Omega$	-	18	-	ns
Rise time	t_r		-	26	-	
Turn-off delay time	$t_{d(off)}$		-	41	-	
Fall time	t_f		-	11	-	

Gate Charge Characteristics³⁾

Gate to source charge	Q_{gs}	$V_{DD}=100\text{ V}, I_D=44\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	23	-	nC
Gate to drain charge	Q_{gd}		-	8	-	
Switching charge	Q_{sw}		-	15	-	
Gate charge total	Q_g		-	65	87	
Gate plateau voltage	$V_{plateau}$		-	4.4	-	V
Output charge	Q_{oss}	$V_{DD}=100\text{ V}, V_{GS}=0\text{ V}$	-	162	216	nC

Reverse Diode⁴⁾

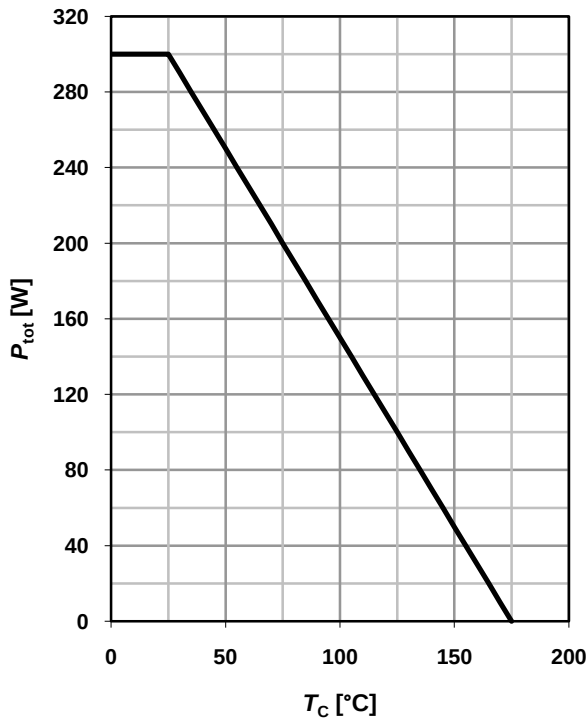
Diode continuous forward current	I_S	$T_C=25\text{ °C}$	-	-	88	A
Diode pulse current	$I_{S,pulse}$		-	-	352	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=88\text{ A},$ $T_J=25\text{ °C}$	-	1	1.2	V
Reverse recovery time	t_{rr}	$V_R=100\text{ V}, I_F=44\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	142	-	ns
Reverse recovery charge	Q_{rr}		-	640	-	nC

³⁾ See figure 16 for gate charge parameter definition

⁴⁾ Not subjected to production test - verified by design/characterization

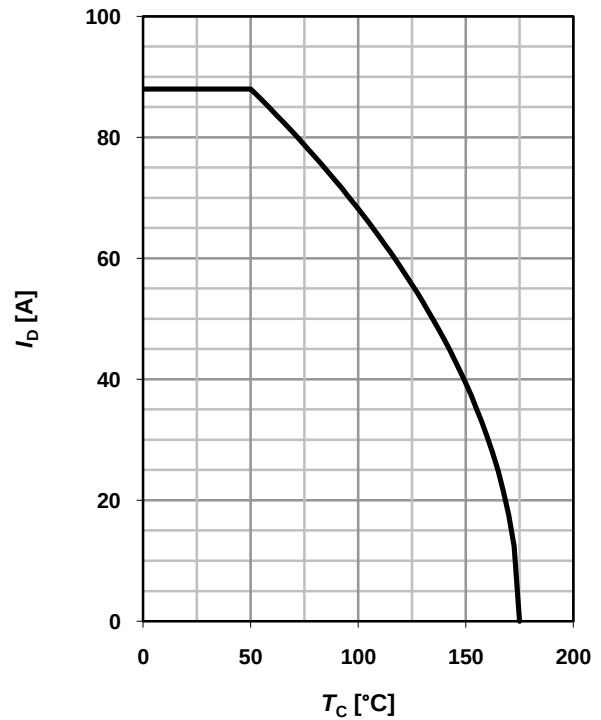
1 Power dissipation

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



2 Drain current

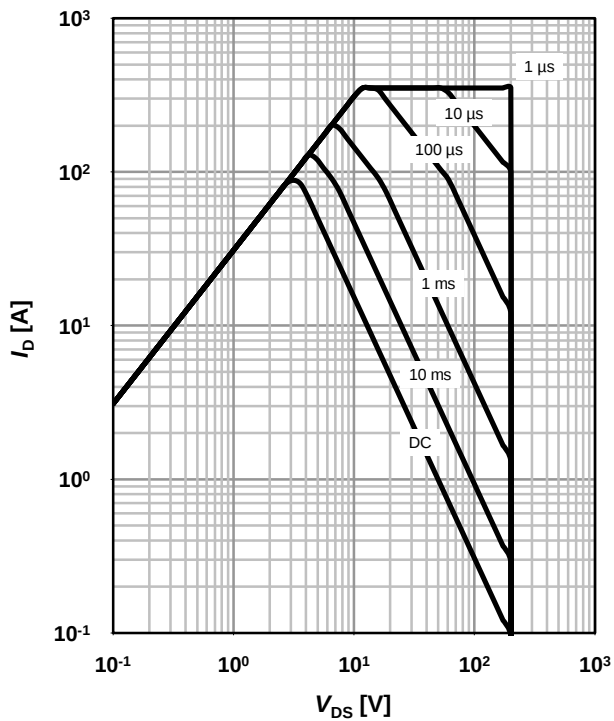
$$I_D = f(T_C); V_{GS} \geq 10 \text{ V}$$



3 Safe operating area

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

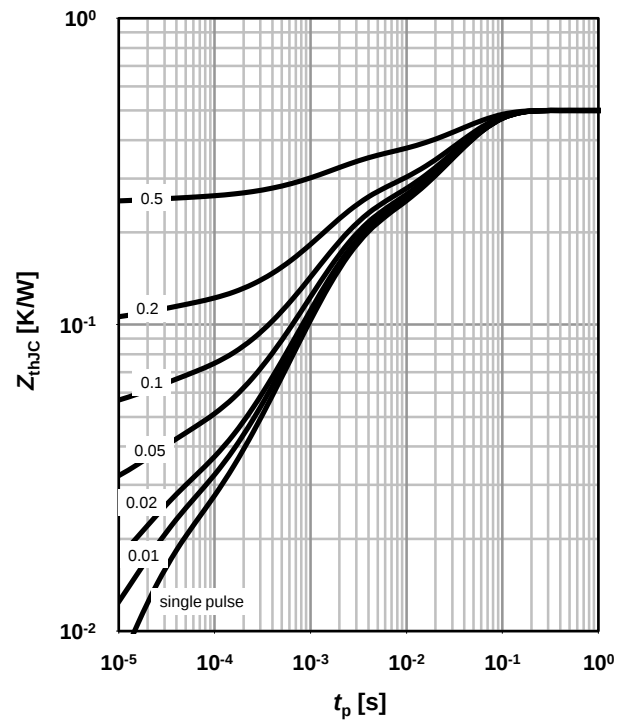
parameter: t_p



4 Max. transient thermal impedance

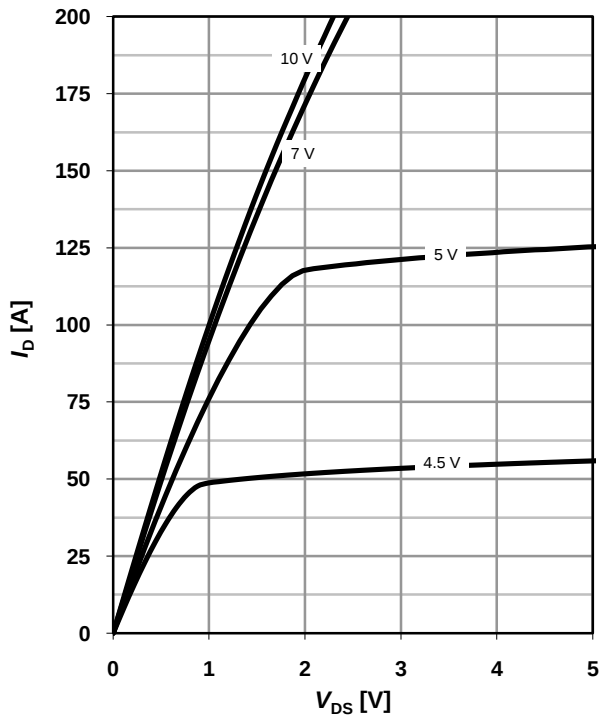
$$Z_{\text{thJC}} = f(t_p)$$

parameter: $D = t_p/T$



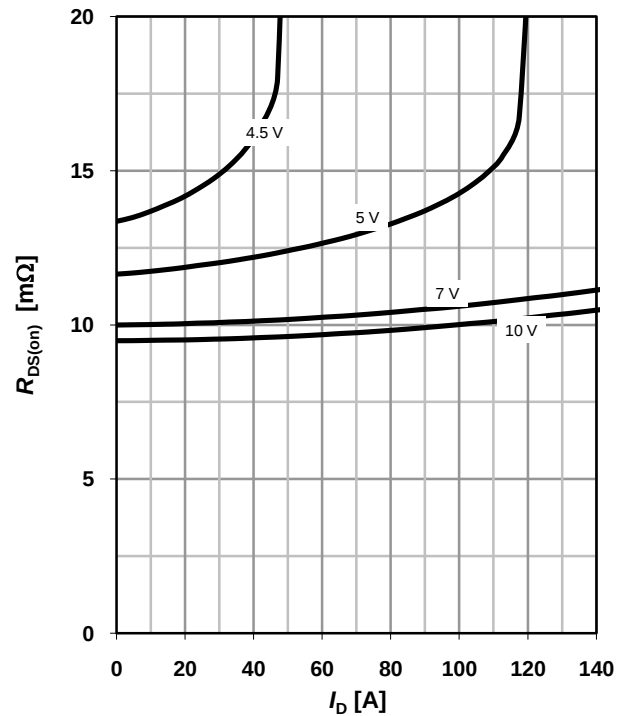
5 Typ. output characteristics

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

parameter: V_{GS}


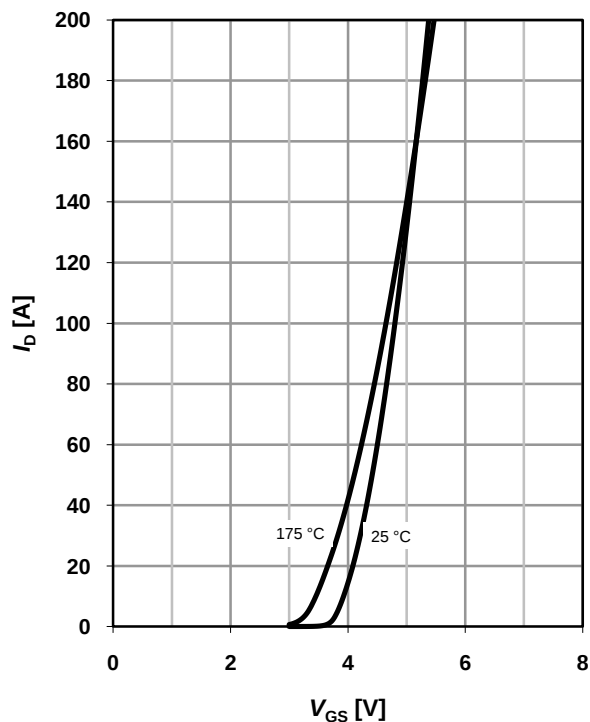
6 Typ. drain-source on resistance

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

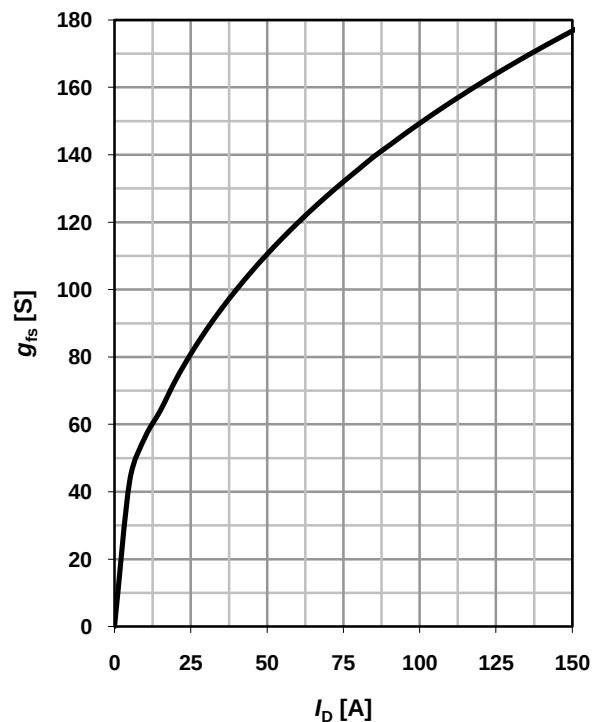
parameter: V_{GS}


7 Typ. transfer characteristics

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

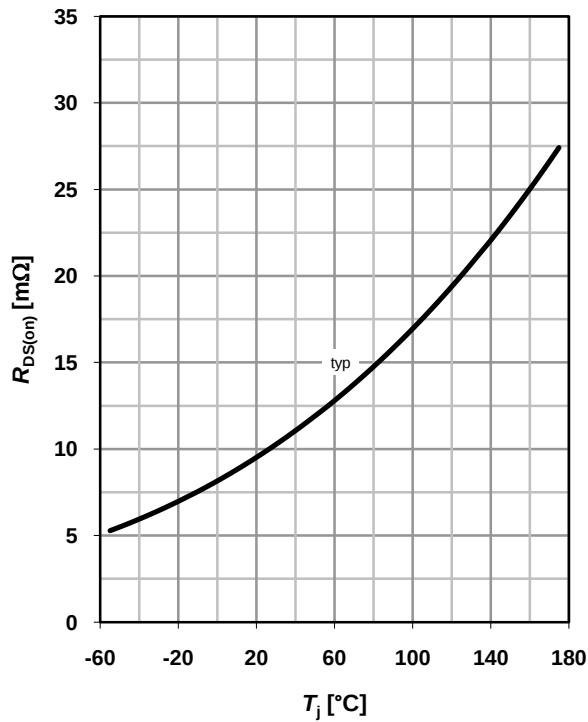
parameter: T_j


8 Typ. forward transconductance

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


9 Drain-source on-state resistance

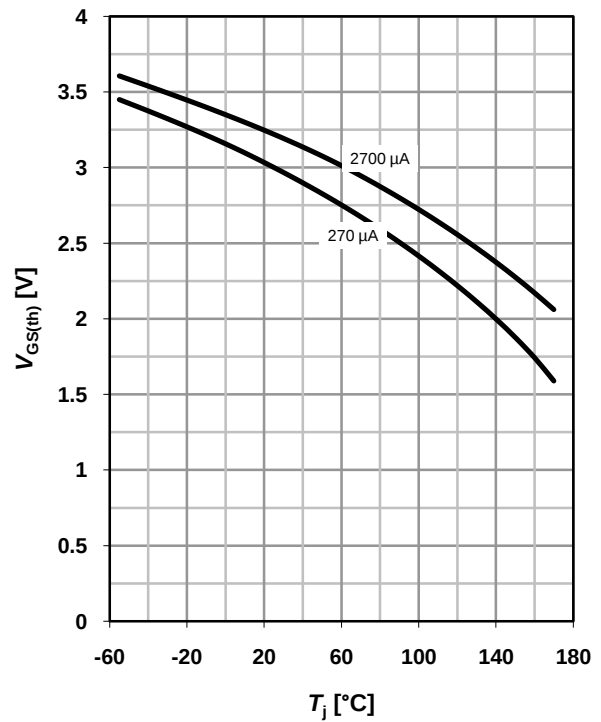
$$R_{DS(on)} = f(T_j); I_D = 88 \text{ A}; V_{GS} = 10 \text{ V}$$



10 Typ. gate threshold voltage

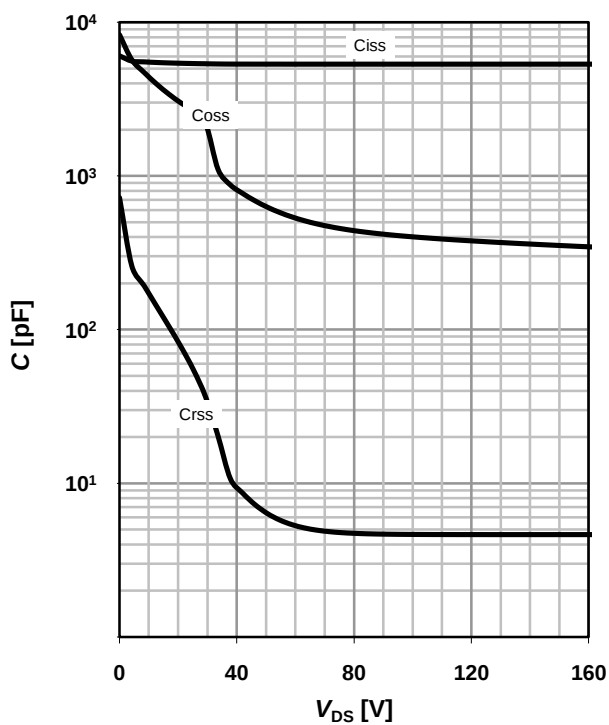
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter: I_D



11 Typ. capacitances

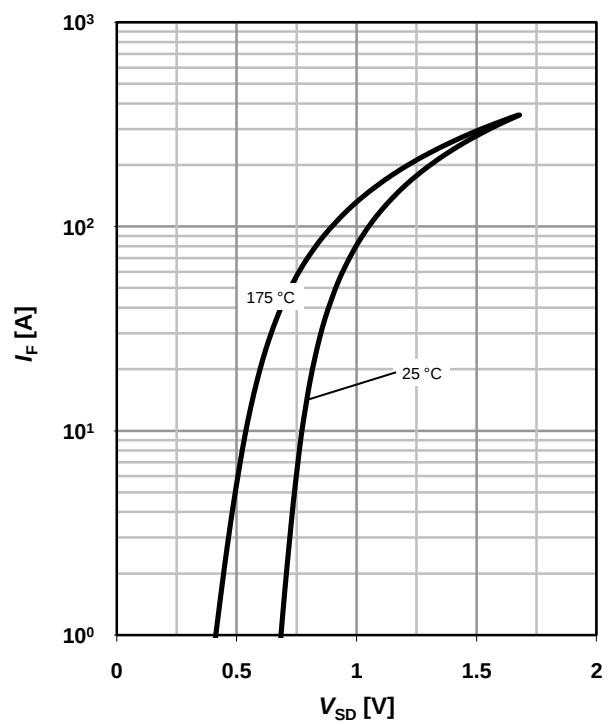
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



12 Forward characteristics of reverse diode

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

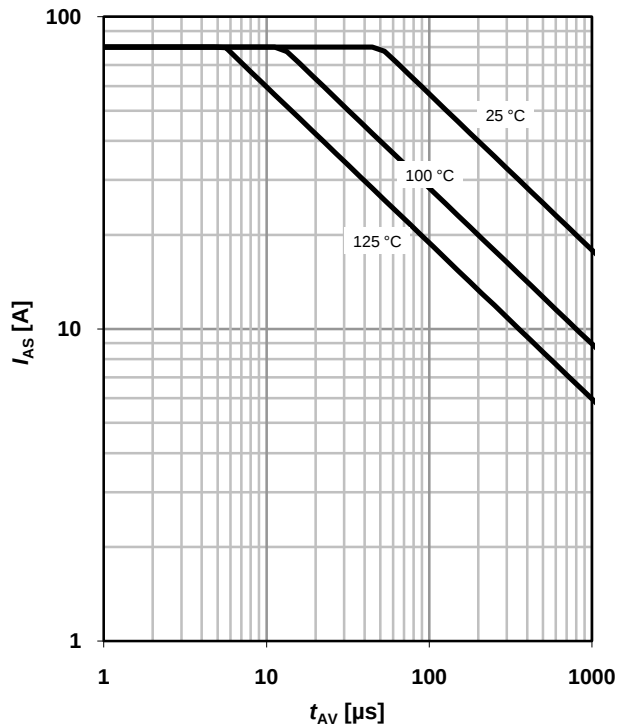
parameter: T_j



13 Avalanche characteristics

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

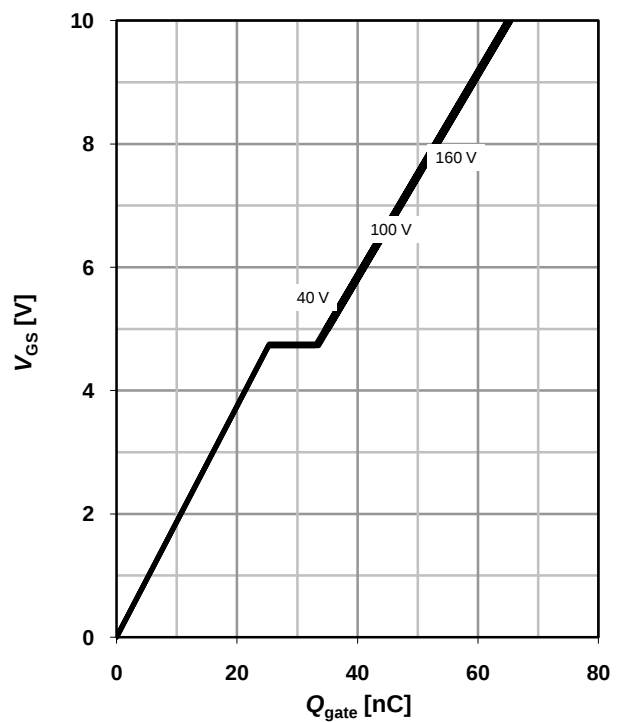
parameter: $T_{j(\text{start})}$



14 Typ. gate charge

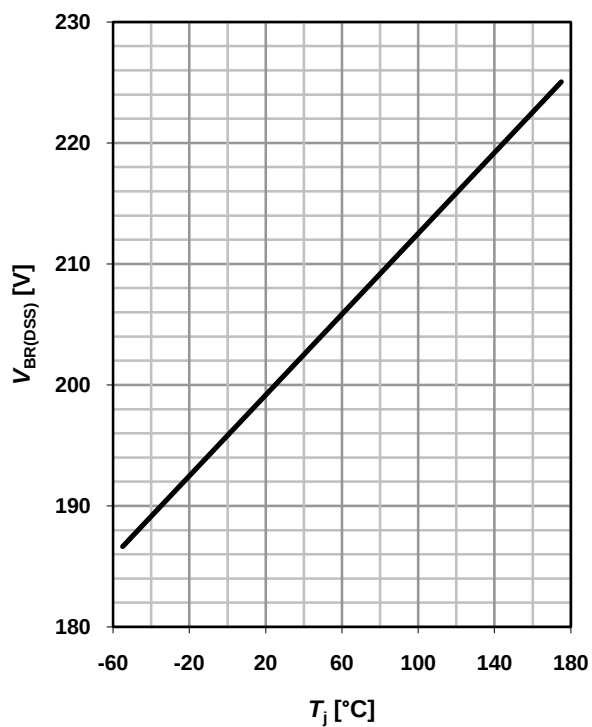
$$V_{GS}=f(Q_{\text{gate}}); I_D=44\ \text{A pulsed}$$

parameter: V_{DD}

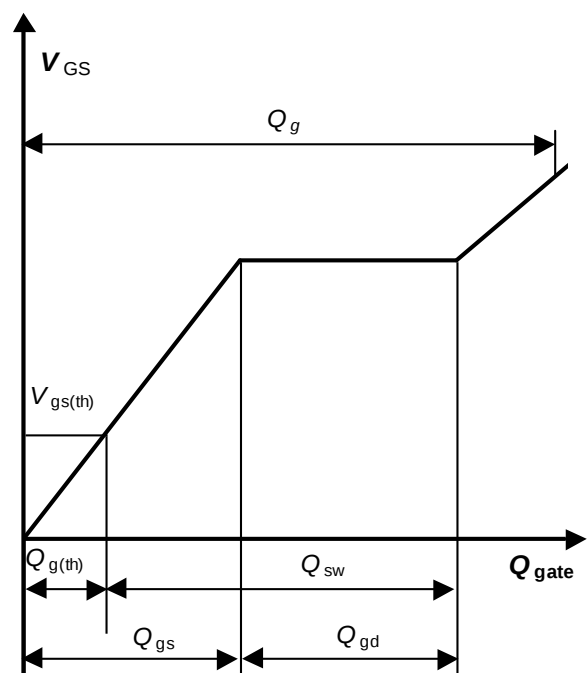


15 Drain-source breakdown voltage

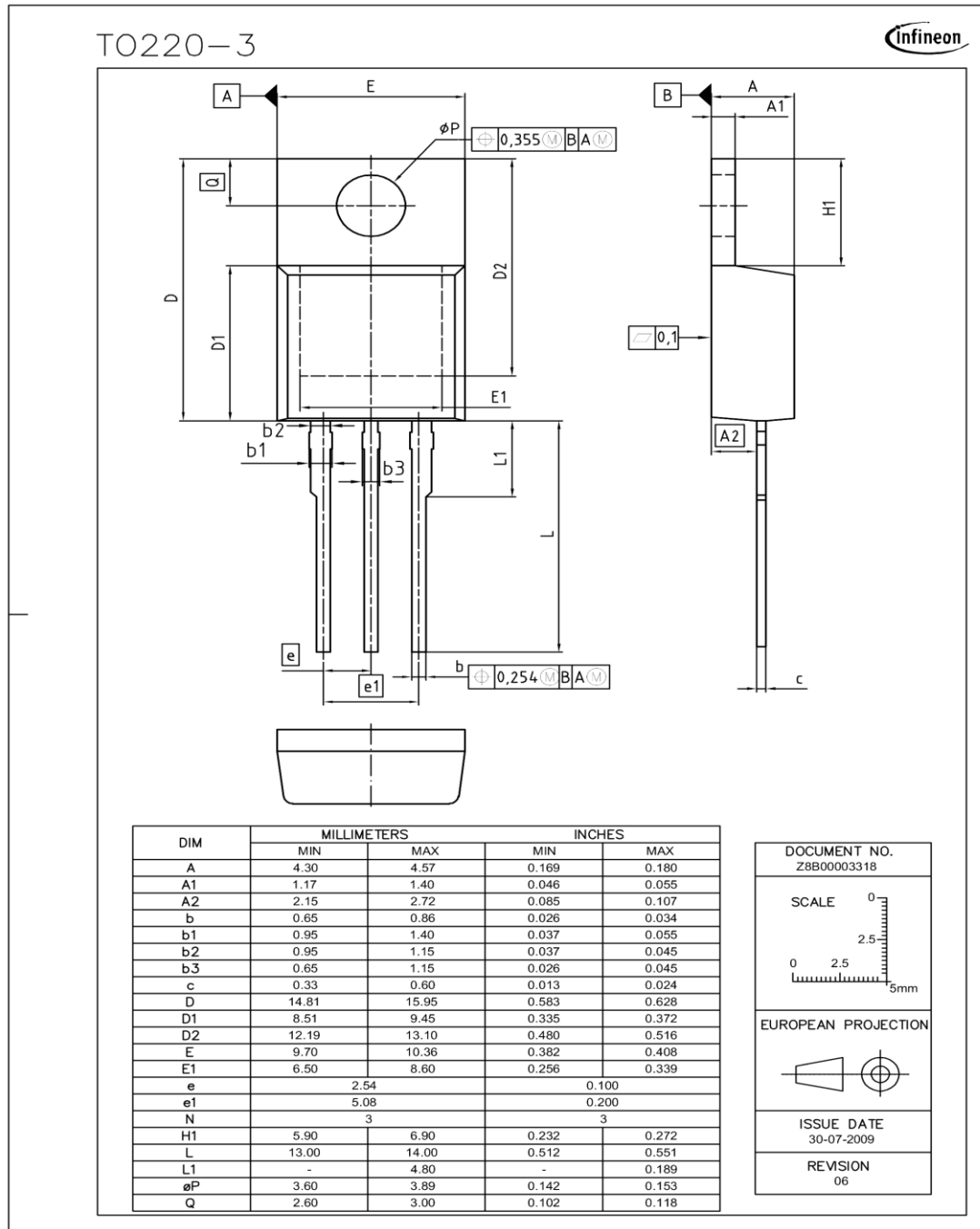
$$V_{BR(DSS)}=f(T_j); I_D=1\ \text{mA}$$



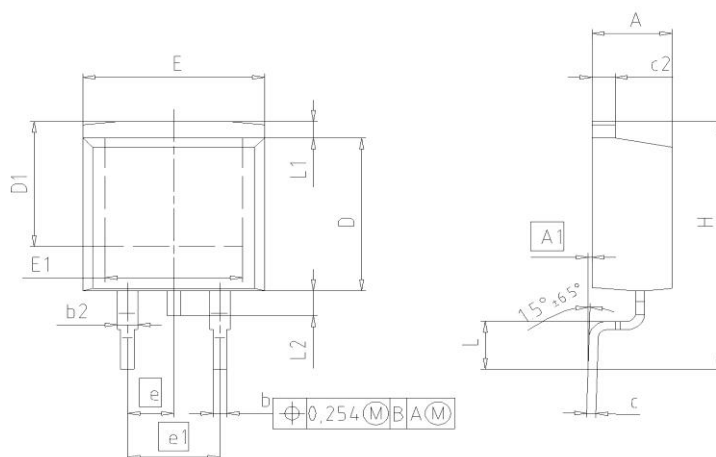
16 Gate charge waveforms



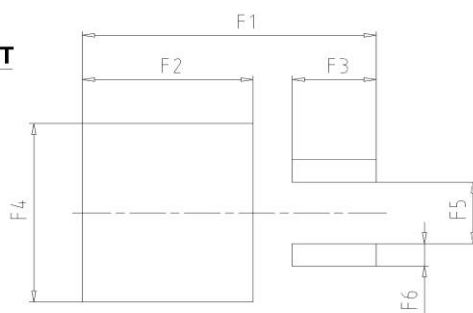
PG-TO220-3: Outline



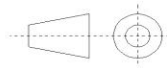
PG-TO263-3: Outline



FOOTPRINT



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	0.65	0.85	0.026	0.033
b2	0.95	1.15	0.037	0.045
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	7.10	7.90	0.280	0.311
E	9.80	10.31	0.386	0.406
E1	6.50	8.60	0.256	0.339
e	2.54		0.100	
e1	5.08		0.200	
N	2		2	
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	3.65	3.85	0.144	0.152
F6	1.25	1.45	0.049	0.057

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