OptiMOS™ Power-Transistor

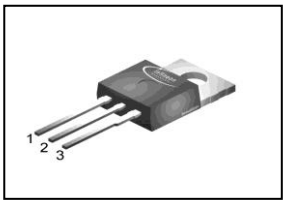
Features

- Optimized for high performance SMPS, e.g. sync. rec.
- 100% avalanche tested
- Superior thermal resistance
- N-channel
- Qualified according to JEDEC[1] for target applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

Product Summary

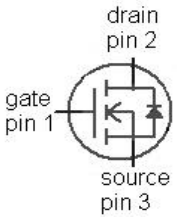
V_{DS}	60	V
$R_{DS(on),max}$	2.0	mΩ
I_D	120	A
Q_{OSS}	119	nC
Q_G(0V..10V)	106	nC

PG-TO220-3



RoHS Halogen-Free Pb-Free

Type	Package	Marking
IPP020N06N	PG-TO220-3	020N06N



Maximum ratings, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	V_{GS}=10 V, T_C=25 °C	120	A
		V_{GS}=10 V, T_C=100 °C	120	
		V_{GS}=10 V, T_C=25 °C, R_{thJA} =50K/W	29	
Pulsed drain current[2]	$I_{D,pulse}$	T_C=25 °C	480	
Avalanche energy, single pulse[3]	E_{AS}	I_D=100 A, R_{GS}=25 Ω	420	mJ
Gate source voltage	V_{GS}		±20	V

[1] J-STD20 and JESD22

[2] See figure 3 for more detailed information

[3] See figure 13 for more detailed information

[4] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm^2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

Maximum ratings, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Power dissipation	P_{tot}	T_C=25 °C	214	W
		T_A=25 °C, R_{thJA}=50 K/W	3.0	
Operating and storage temperature	T_j, T_{stg}		-55 ... 175	°C
IEC climatic category; DIN IEC 68-1			55/175/56	

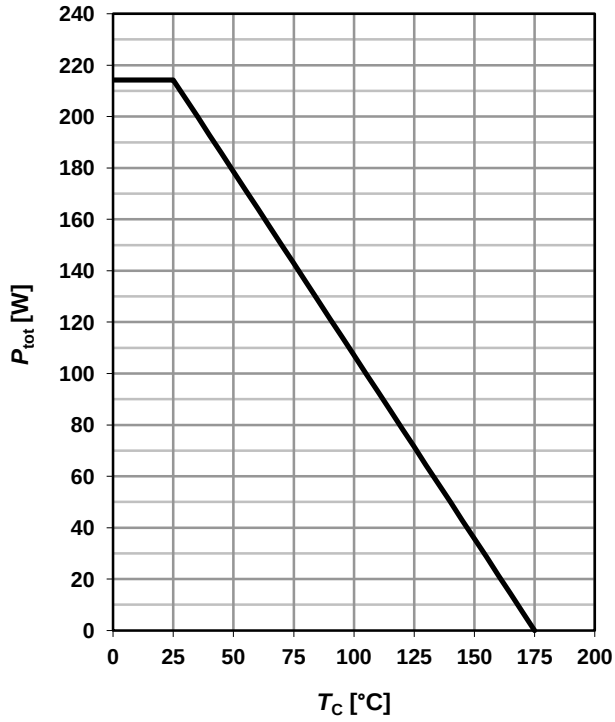
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics						
Thermal resistance, junction - case	R_{thJC}	bottom	-	-	0.7	K/W
Device on PCB	R_{thJA}	minimal footprint	-	-	62	
		6 cm² cooling area[4)]	-	-	40	
Electrical characteristics, at T_j=25 °C, unless otherwise specified						
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0 V, I_D=1 mA	60	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=143 µA	2.1	2.8	3.3	
Zero gate voltage drain current	I_{DSS}	V_{DS}=60 V, V_{GS}=0 V, T_j=25 °C	-	0.5	1	µA
		V_{DS}=60 V, V_{GS}=0 V, T_j=125 °C	-	10	100	
Gate-source leakage current	I_{GSS}	V_{GS}=20 V, V_{DS}=0 V	-	10	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=100 A	-	1.8	2	mΩ
		V_{GS}=6 V, I_D=25 A	-	2.1	3	
Gate resistance	R_G		-	1.6	2.4	Ω
Transconductance	g_{fs}	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=100 A	100	210	-	S

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=30 V, f=1 MHz	-	7800	9750	pF
Output capacitance	C_{oss}		-	1800	2250	
Reverse transfer capacitance	C_{rss}		-	69	138	
Turn-on delay time	$t_{d(on)}$	V_{DD}=30 V, V_{GS}=10 V, I_D=100 A, $R_{G,ext}$,ext=3 Ω	-	24	-	ns
Rise time	t_r		-	45	-	
Turn-off delay time	$t_{d(off)}$		-	51	-	
Fall time	t_f		-	19	-	
Gate Charge Characteristics[5)]						
Gate to source charge	Q_{gs}	V_{DD}=30 V, I_D=100 A, V_{GS}=0 to 10 V	-	35	-	nC
Gate charge at threshold	$Q_{g(th)}$		-	22	-	
Gate to drain charge	Q_{gd}		-	19	25	
Switching charge	Q_{sw}		-	33	-	
Gate charge total	Q_g		-	106	124	
Gate plateau voltage	$V_{plateau}$		-	4.5	-	V
Gate charge total, sync. FET	$Q_{g(sync)}$	V_{DS}=0.1 V, V_{GS}=0 to 10 V	-	94	-	nC
Output charge	Q_{oss}	V_{DD}=30 V, V_{GS}=0 V	-	119	-	
Reverse Diode						
Diode continuous forward current	I_S	T_C=25 °C	-	-	120	A
Diode pulse current	$I_{S,pulse}$		-	-	480	
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=100 A, T_j=25 °C	-	0.9	1.2	V
Reverse recovery time	t_{rr}	V_R=30 V, I_F=100 A, di_F/dt=100 A/µs	-	76	122	ns
Reverse recovery charge	Q_{rr}		-	97	-	nC

[5)] See figure 16 for gate charge parameter definition

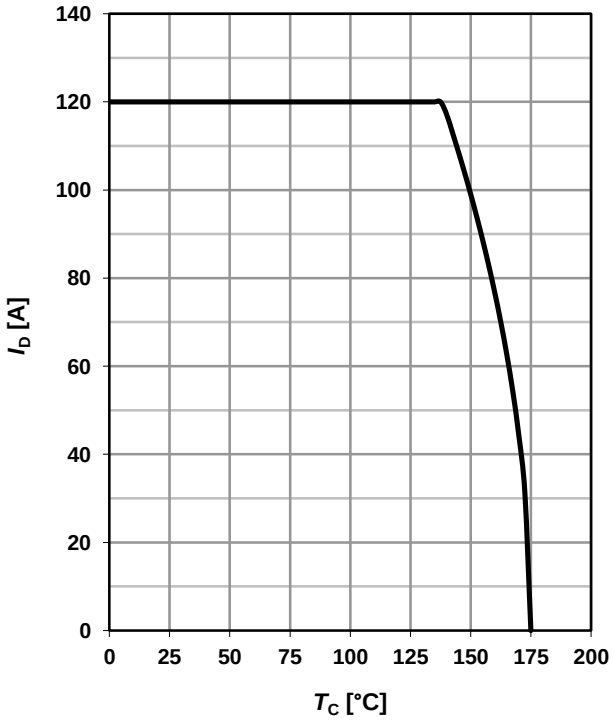
1 Power dissipation

$P_{tot}=f(T_C)$



2 Drain current

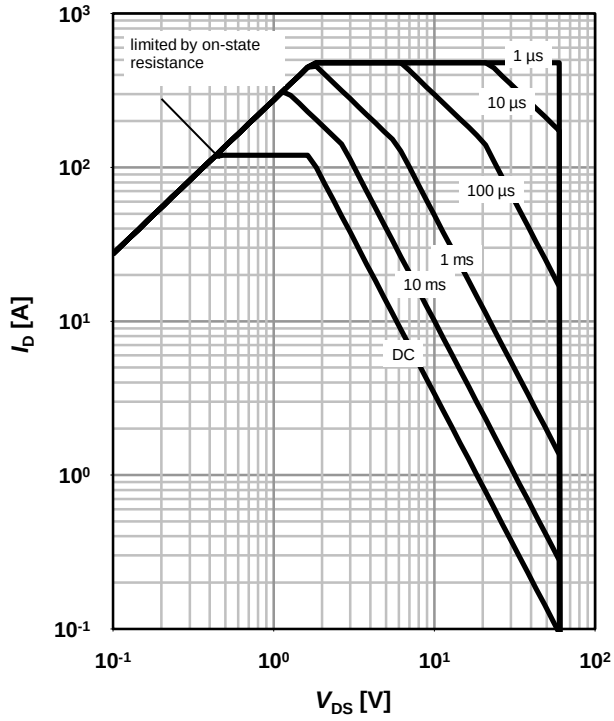
$I_D=f(T_C)$; $V_{GS}\geq 10$ V



3 Safe operating area

$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$

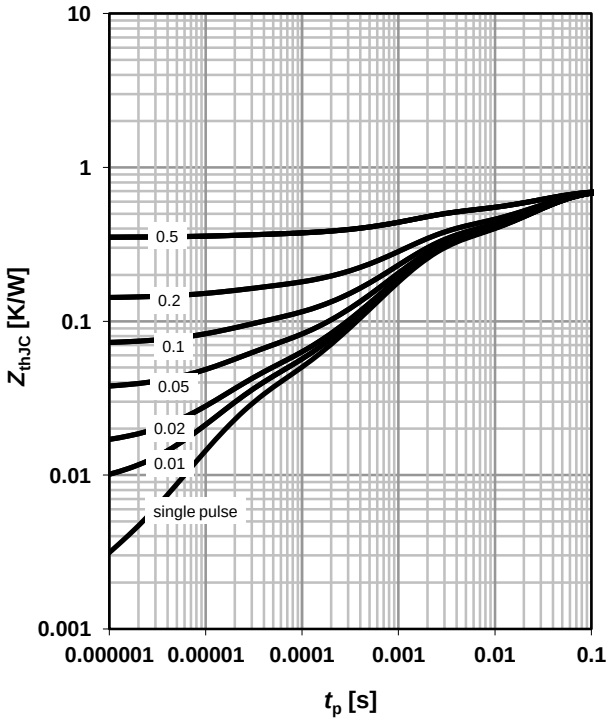
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

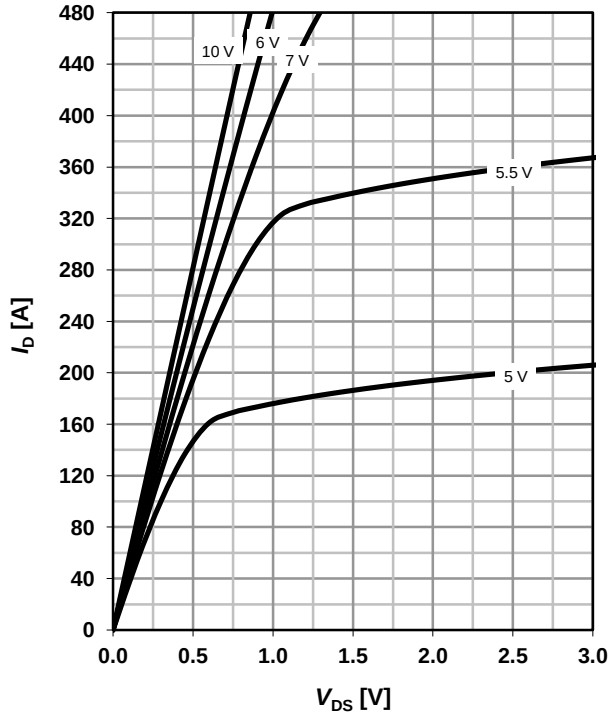
parameter: $D=t_p/T$



5 Typ. output characteristics

$I_D=f(V_{DS})$; $T_j=25$ °C

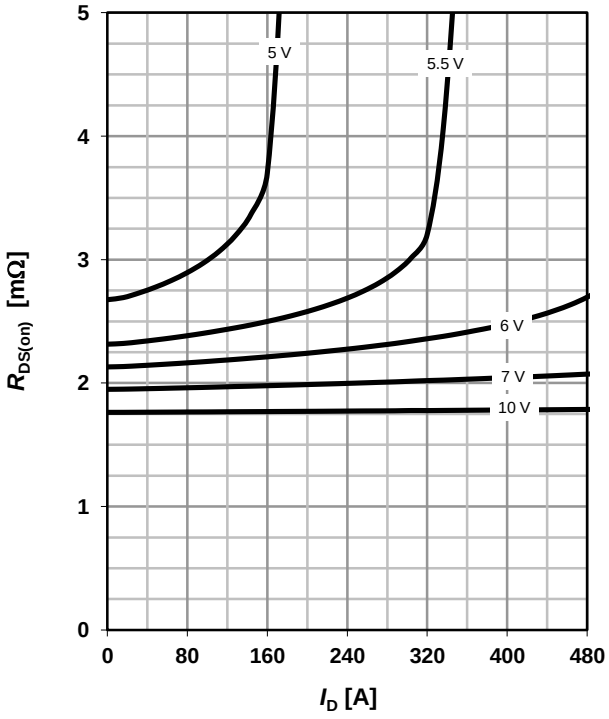
parameter: V_{GS}



6 Typ. drain-source on resistance

$R_{DS(on)}=f(I_D)$; $T_j=25$ °C

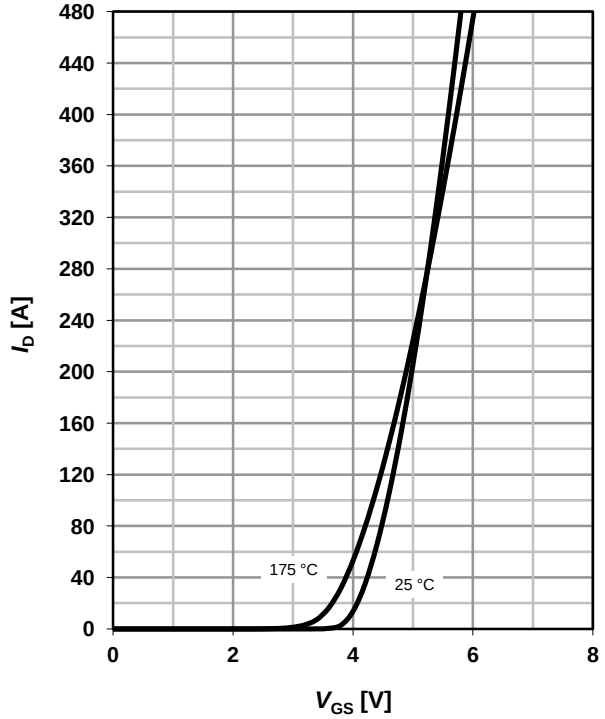
parameter: V_{GS}



7 Typ. transfer characteristics

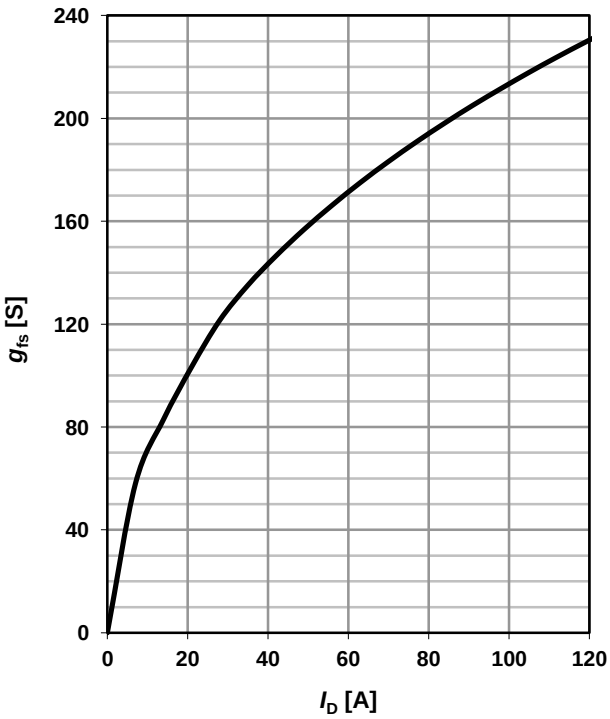
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$

parameter: T_j



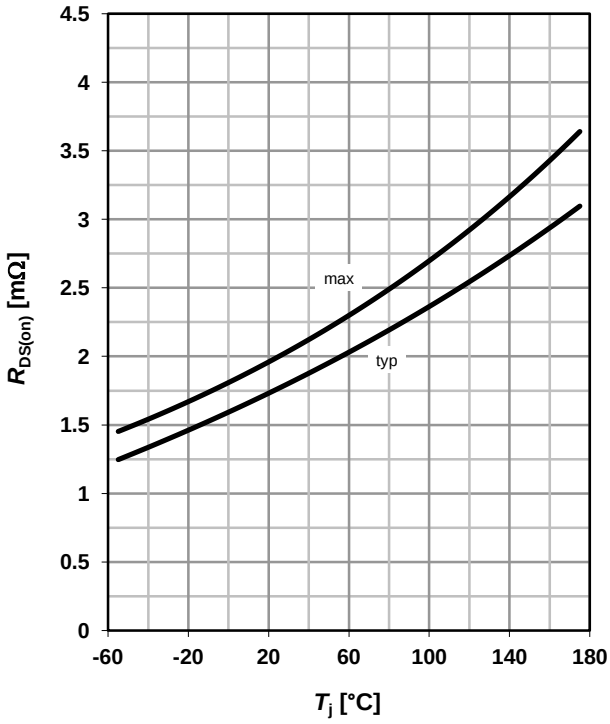
8 Typ. forward transconductance

$g_{fs}=f(I_D)$; $T_j=25$ °C



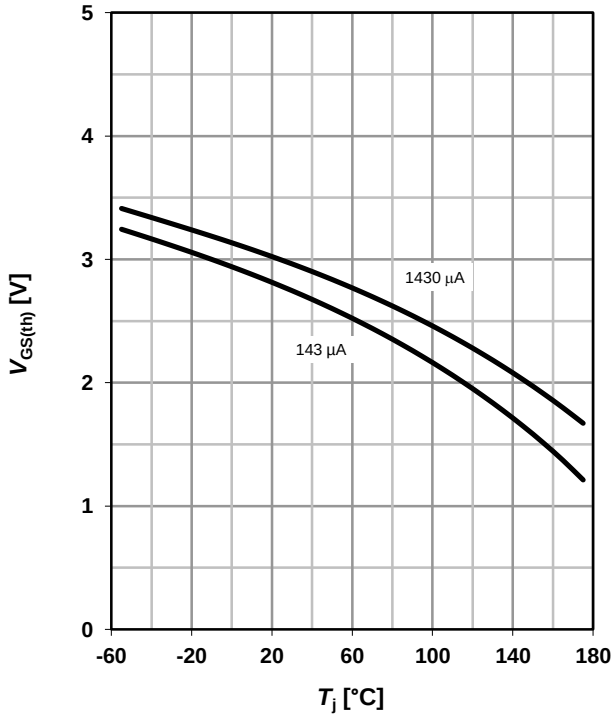
9 Drain-source on-state resistance

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



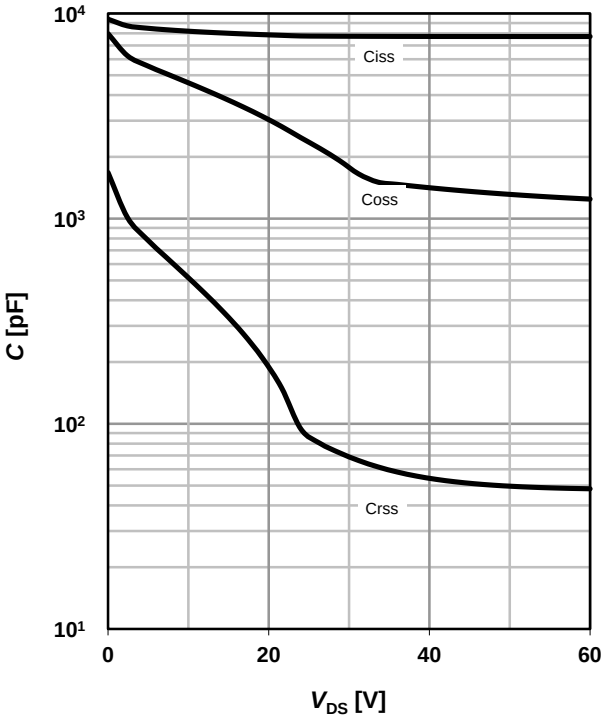
10 Typ. gate threshold voltage

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



11 Typ. capacitances

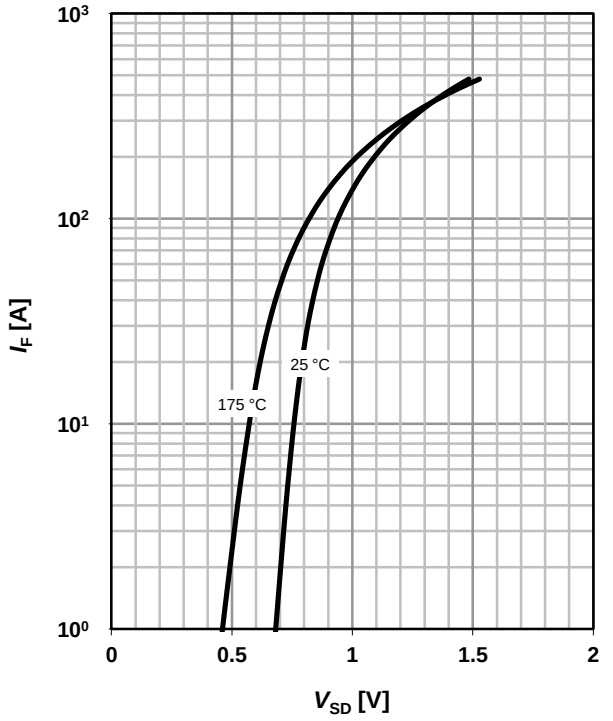
$C=f(V_{DS})$; $V_{GS}=0$ V; $f=1$ MHz



12 Forward characteristics of reverse diode

$I_F=f(V_{SD})$

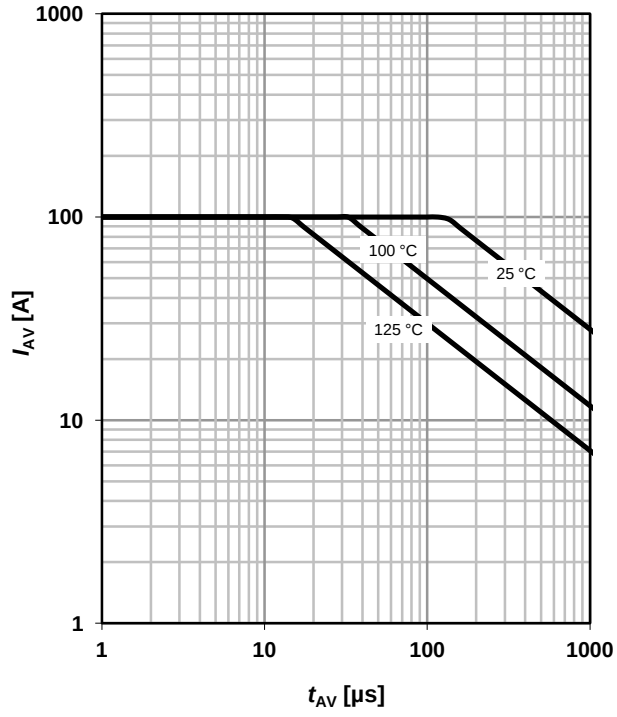
parameter: T_j



13 Avalanche characteristics

I_{AS}=f(t_{AV}); R_{GS}=25 Ω

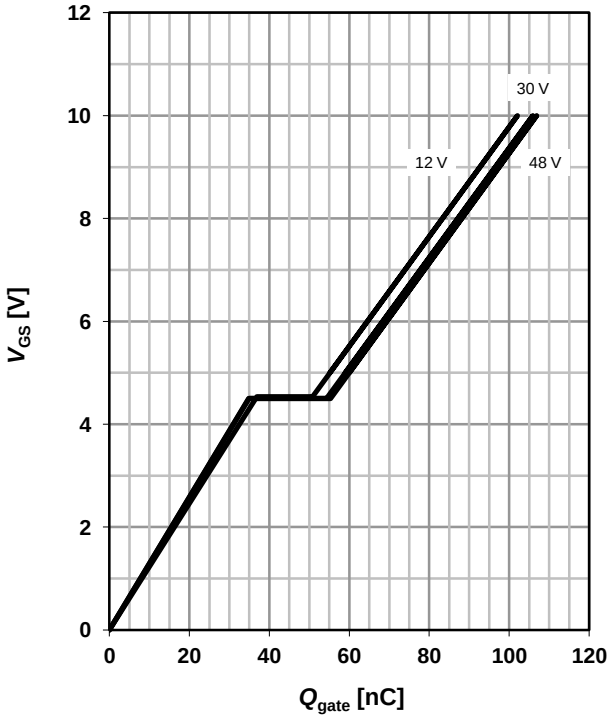
parameter: $T_{j(start)}$



14 Typ. gate charge

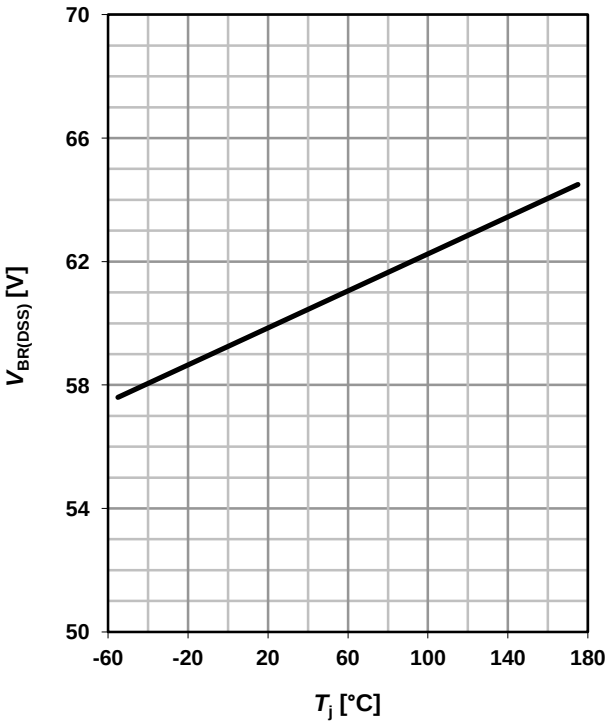
V_{GS}=f(Q_{gate}); I_D=100 A pulsed

parameter: V_{DD}

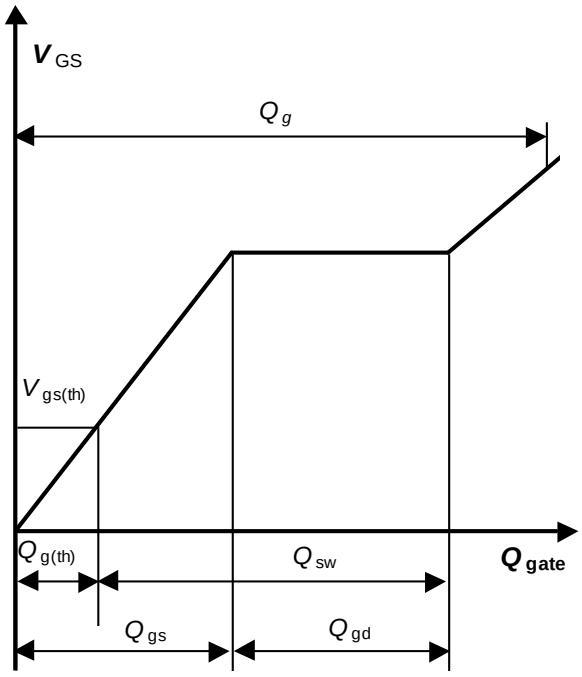


15 Drain-source breakdown voltage

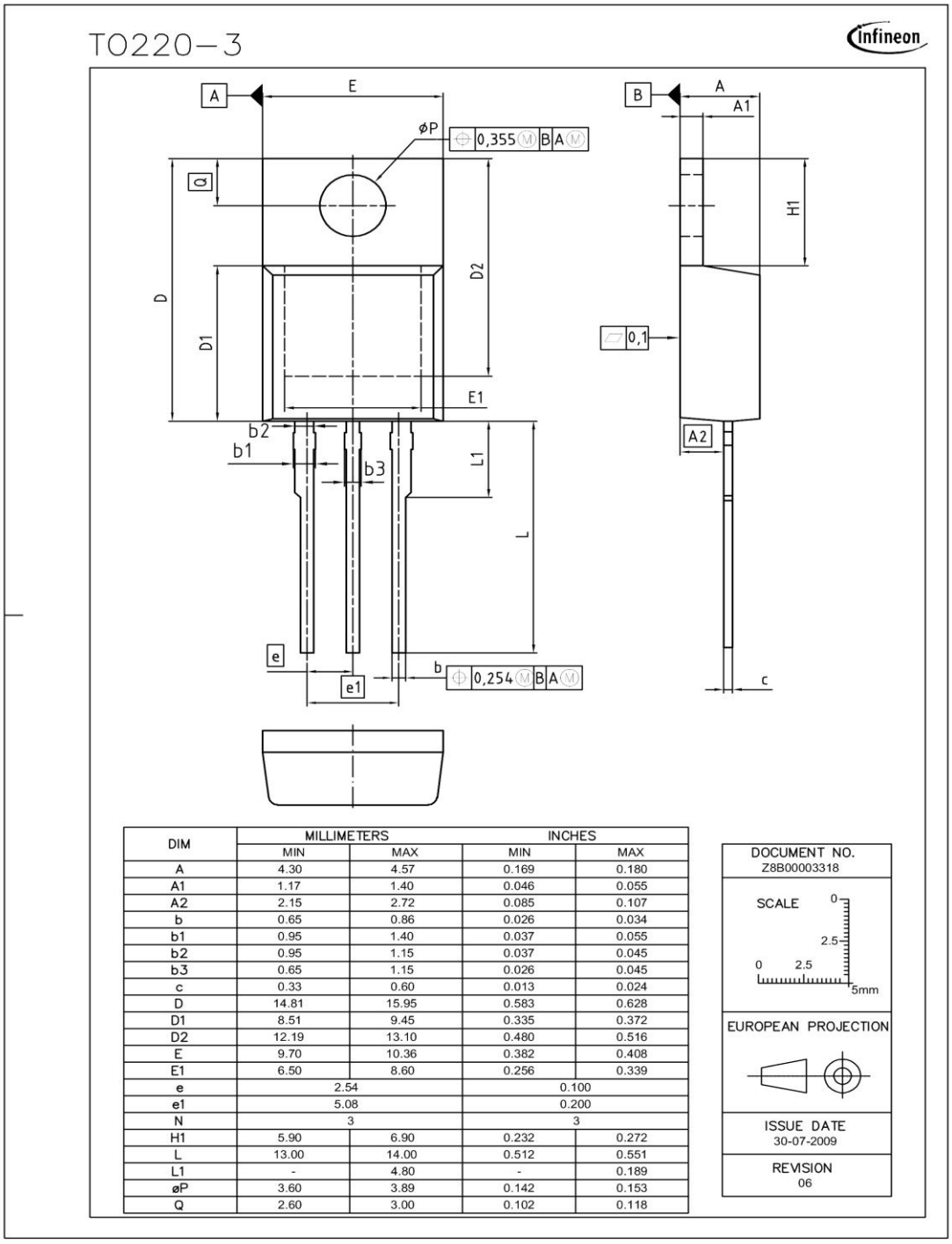
$V_{BR(DSS)}$=f(T_j); I_D=1 mA



16 Gate charge waveforms



Package Outline **PG-TO220-3**



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.57	0.169	0.180
A1	1.17	1.40	0.046	0.055
A2	2.15	2.72	0.085	0.107
b	0.65	0.86	0.026	0.034
b1	0.95	1.40	0.037	0.055
b2	0.95	1.15	0.037	0.045
b3	0.65	1.15	0.026	0.045
c	0.33	0.60	0.013	0.024
D	14.81	15.95	0.583	0.628
D1	8.51	9.45	0.335	0.372
D2	12.19	13.10	0.480	0.516
E	9.70	10.36	0.382	0.408
E1	6.50	8.60	0.256	0.339
e	2.54		0.100	
e1	5.08		0.200	
N	3		3	
H1	5.90	6.90	0.232	0.272
L	13.00	14.00	0.512	0.551
L1	-	4.80	-	0.189
øP	3.60	3.89	0.142	0.153
Q	2.60	3.00	0.102	0.118

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SCALE 0 2.5 0 2.5 5mm

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