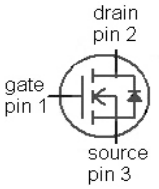
OptiMOS®2 Power-Transistor

Features

- N-channel, logic 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 JEDEC[1] for target application
- Ideal for high-frequency switching and synchronous rectification

Product Summary

V_{DS}	100	V
$R_{DS(on),max}$	12	mΩ
I_D	69	A



Type	IPP12CN10L G	IPS12CN10L G
		
Package	PG-TO220-3	PG-TO251-3-11
Marking	12CN10L	12CN10L

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

Parameter	**Symbol**	**Conditions**	**Value**	**Unit**
Continuous drain current	I_D	T_C=25 °C	69	A
		T_C=100 °C	49	
Pulsed drain current[2]	$I_{D,pulse}$	T_C=25 °C	276	
Avalanche energy, single pulse	E_{AS}	I_D=69 A, R_{GS}=25 Ω	150	mJ
Reverse diode dv/dt	dv/dt	I_D=69 A, V_{DS}=80 V, di/dt=100 A/µs, $T_{j,max}$=175 °C	6	kV/µs
Gate source voltage[3]	V_{GS}		±20	V
Power dissipation	P_{tot}	T_C=25 °C	125	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

[3] T_{jmax}=150°C and duty cycle D=0.01 for V_{gs}<-5V

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics						
Thermal resistance, junction - case	R_{thJC}		-	-	1.2	K/W
Thermal resistance, junction - ambient	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	100	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=83 µA	1.2	1.84	2.4	
Zero gate voltage drain current	I_{DSS}	V_{DS}=80 V, V_{GS}=0 V, T_j=25 °C	-	0.1	1	µA
		V_{DS}=80 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	-	1	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=4.5 V, I_D=34.5 A, (TO220)	-	11.7	15.8	mΩ
		V_{GS}=10 V, I_D=69 A, (TO220)	-	9.9	12	
		V_{GS}=4.5 V, I_D=34.5 A, (TO251)	-	11.7	15.8	
		V_{GS}=10 V, I_D=69 A, (TO251)	-	9.9	11.8	
Gate resistance	R_G		-	1.3	-	Ω
Transconductance	g_{fs}	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=69 A	57	113	-	S

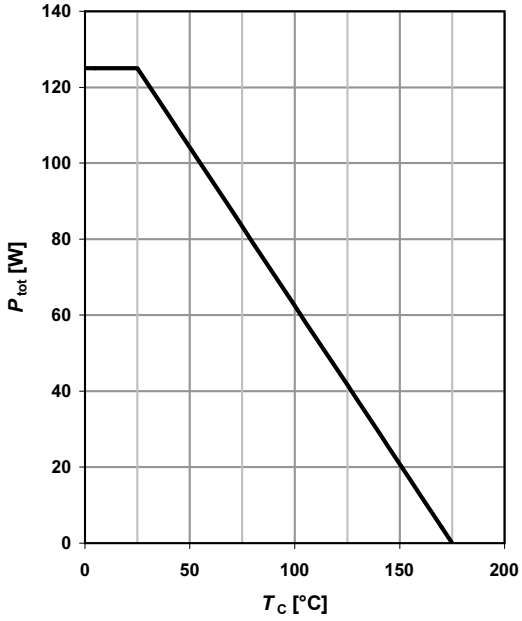
[4)] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm^2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz	-	4210	5600	pF
Output capacitance	C_{oss}		-	528	702	
Reverse transfer capacitance	C_{rss}		-	29	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=50 V, V_{GS}=10 V, I_D=34.5 A, R_G=1.6 Ω	-	14	-	ns
Rise time	t_r		-	9	-	
Turn-off delay time	$t_{d(off)}$		-	39	-	
Fall time	t_f		-	5	-	
Gate Charge Characteristics[5)]						
Gate to source charge	Q_{gs}	V_{DD}=50 V, I_D=69 A, V_{GS}=0 to 10 V	-	16	-	nC
Gate to drain charge	Q_{gd}		-	10	-	
Switching charge	Q_{sw}		-	13	-	
Gate charge total	Q_g		-	58	-	
Gate plateau voltage	$V_{plateau}$		-	3.7	-	V
Output charge	Q_{oss}	V_{DD}=50 V, V_{GS}=0 V	-	54	-	nC
Reverse Diode						
Diode continous forward current	I_S	T_C=25 °C	-	-	69	A
Diode pulse current	$I_{S,pulse}$		-	-	276	
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=69 A, T_j=25 °C	-	1	1.2	V
Reverse recovery time	t_{rr}	V_R=50 V, I_F=I_S, di_F/dt=100 A/µs	-	101	-	ns
Reverse recovery charge	Q_{rr}		-	193	-	nC

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

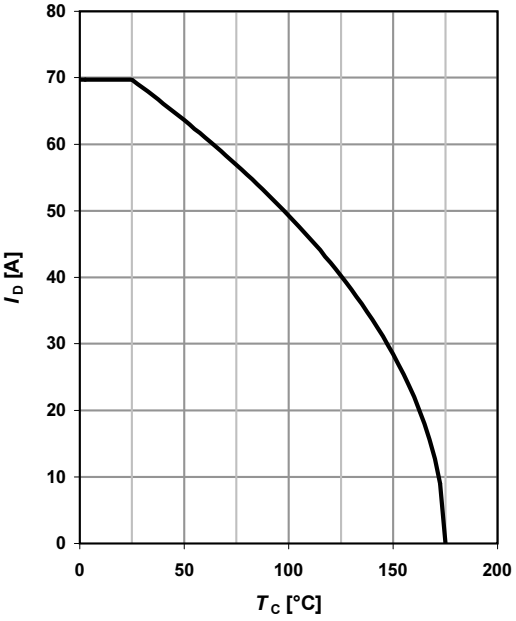
1 Power dissipation

$P_{tot}=f(T_C)$



2 Drain current

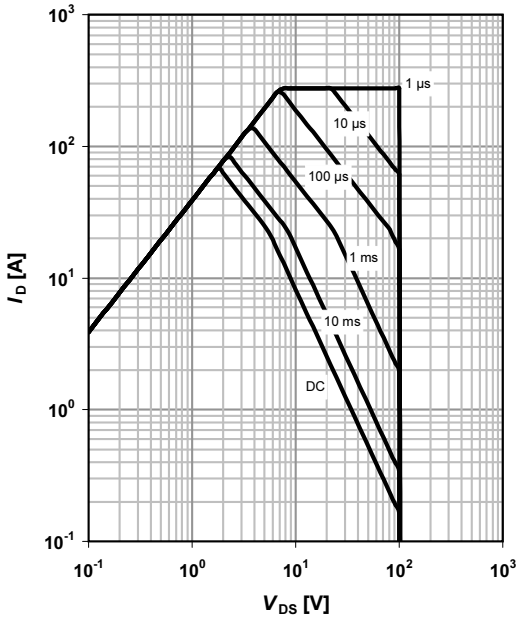
$I_D=f(T_C)$; $V_{GS}\geq 10$ V



3 Safe operating area

$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$

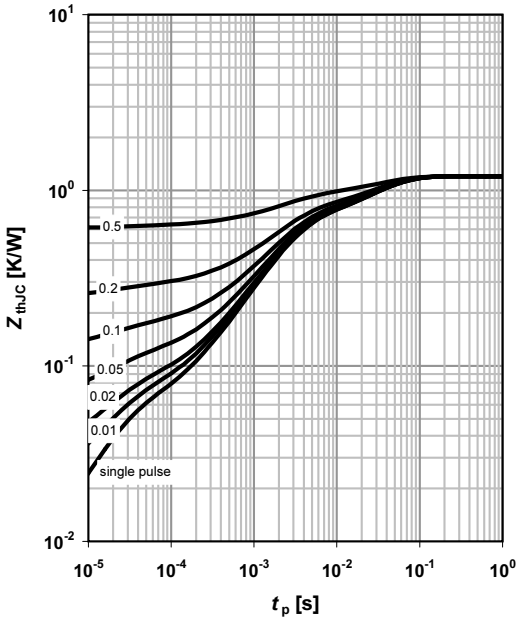
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

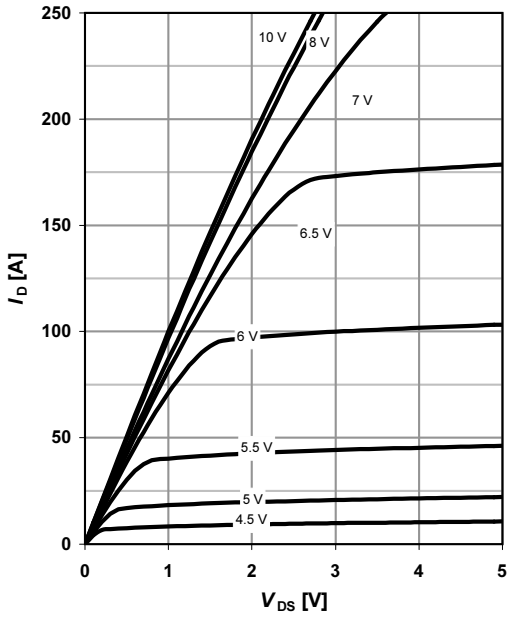
parameter: $D=t_p/T$



5 Typ. output characteristics

I_D=f(V_{DS}); T_j=25 °C

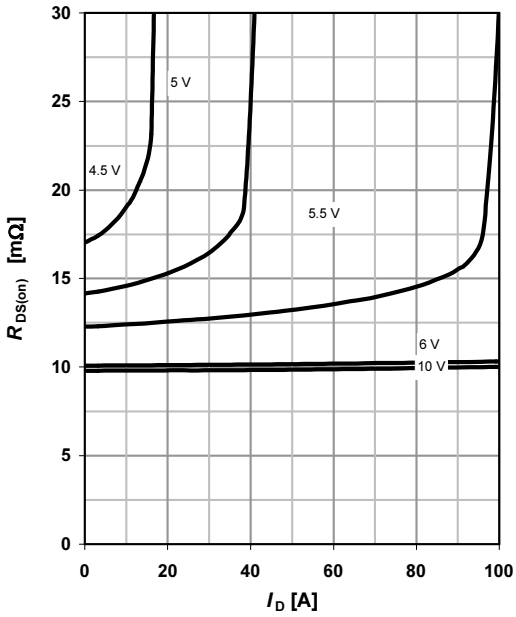
parameter: V_{GS}



6 Typ. drain-source on resistance

$R_{DS(on)}$=f(I_D); T_j=25 °C

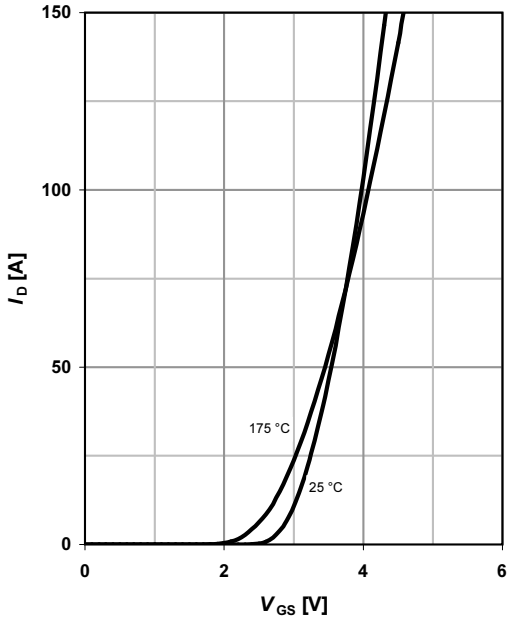
parameter: V_{GS}



7 Typ. transfer characteristics

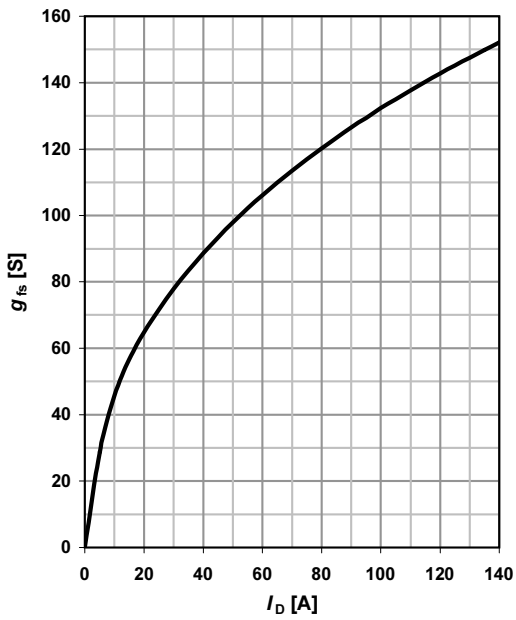
I_D=f(V_{GS}); |V_{DS}|>2|I_D|$R_{DS(on)max}$

parameter: T_j



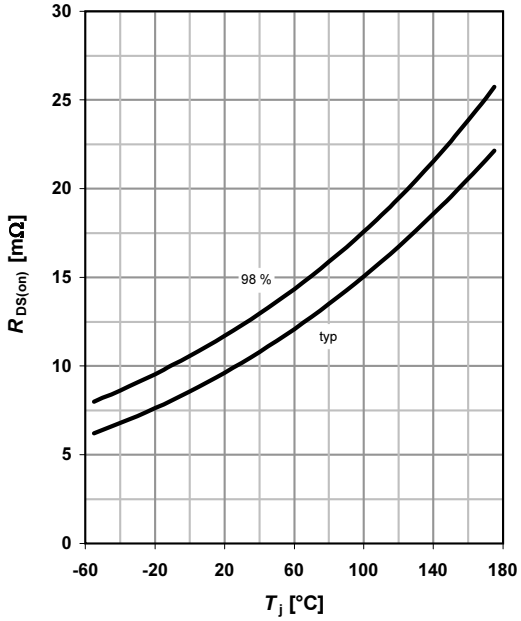
8 Typ. forward transconductance

g_{fs}=f(I_D); T_j=25 °C



9 Drain-source on-state resistance

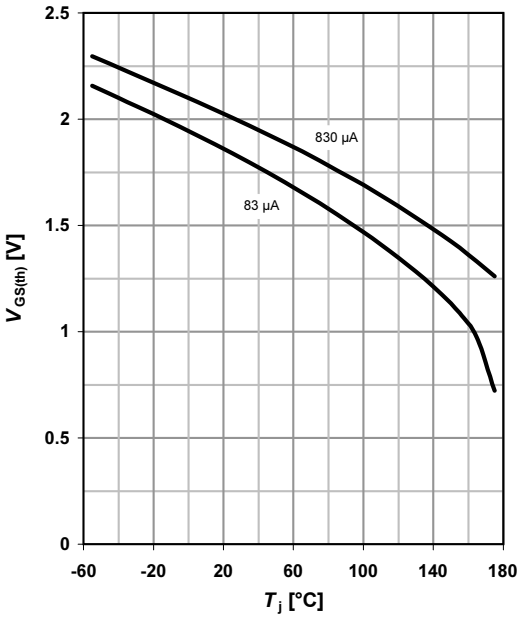
$R_{DS(on)}=f(T_j)$; $I_D=69$ A; $V_{GS}=10$ V



10 Typ. gate threshold voltage

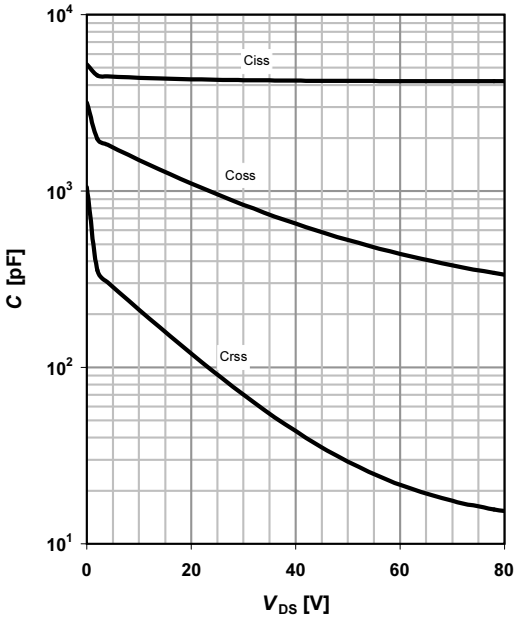
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$

parameter: I_D



11 Typ. capacitances

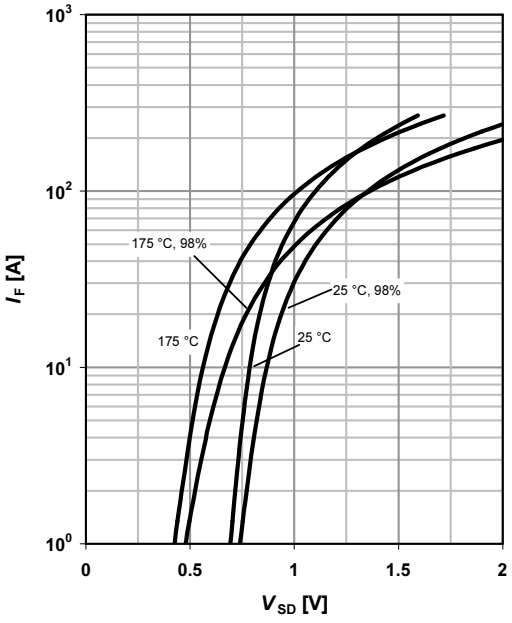
$C=f(V_{DS})$; $V_{GS}=0$ V; $f=1$ MHz



12 Forward characteristics of reverse diode

$I_F=f(V_{SD})$

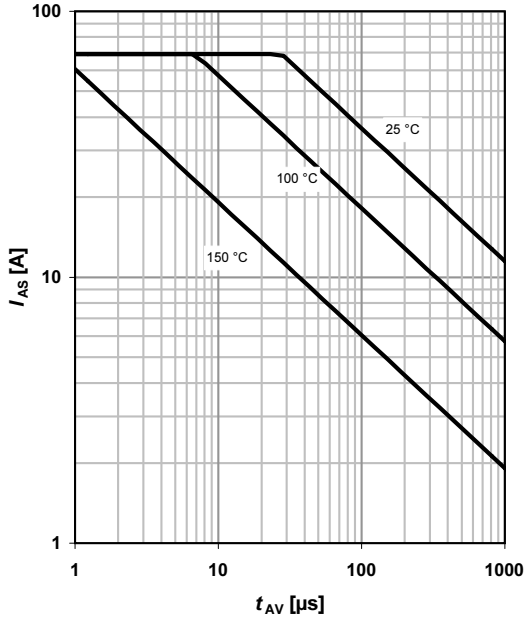
parameter: T_j



13 Avalanche characteristics

I_{AS}=f(t_{AV}); R_{GS}=25 Ω

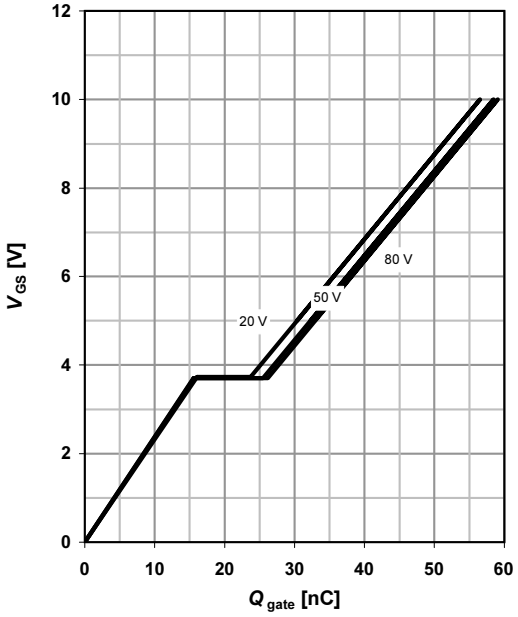
parameter: $T_{j(start)}$



14 Typ. gate charge

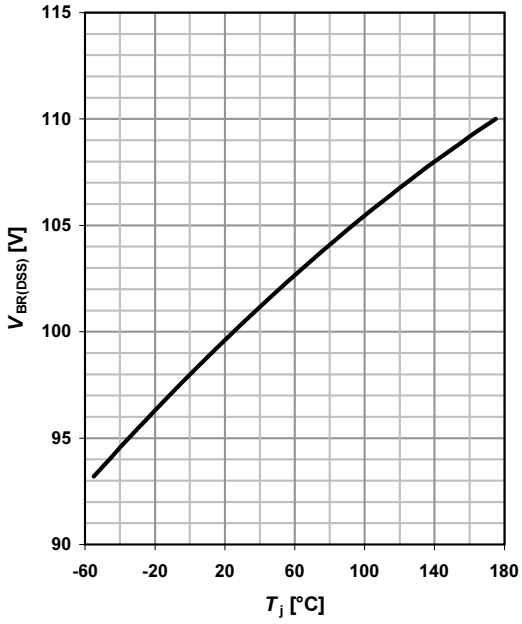
V_{GS}=f(Q_{gate}); I_D=69 A pulsed

parameter: V_{DD}

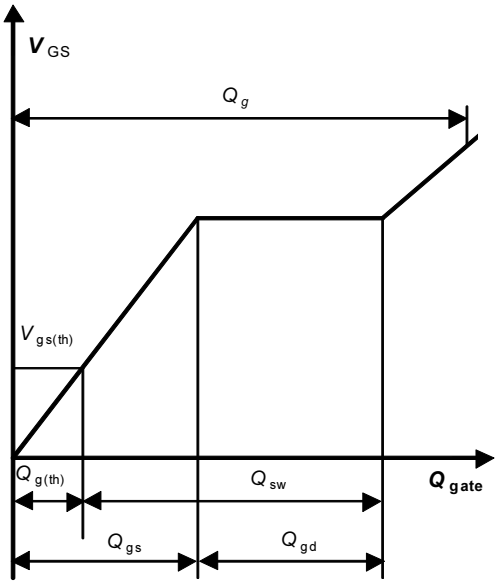


15 Drain-source breakdown voltage

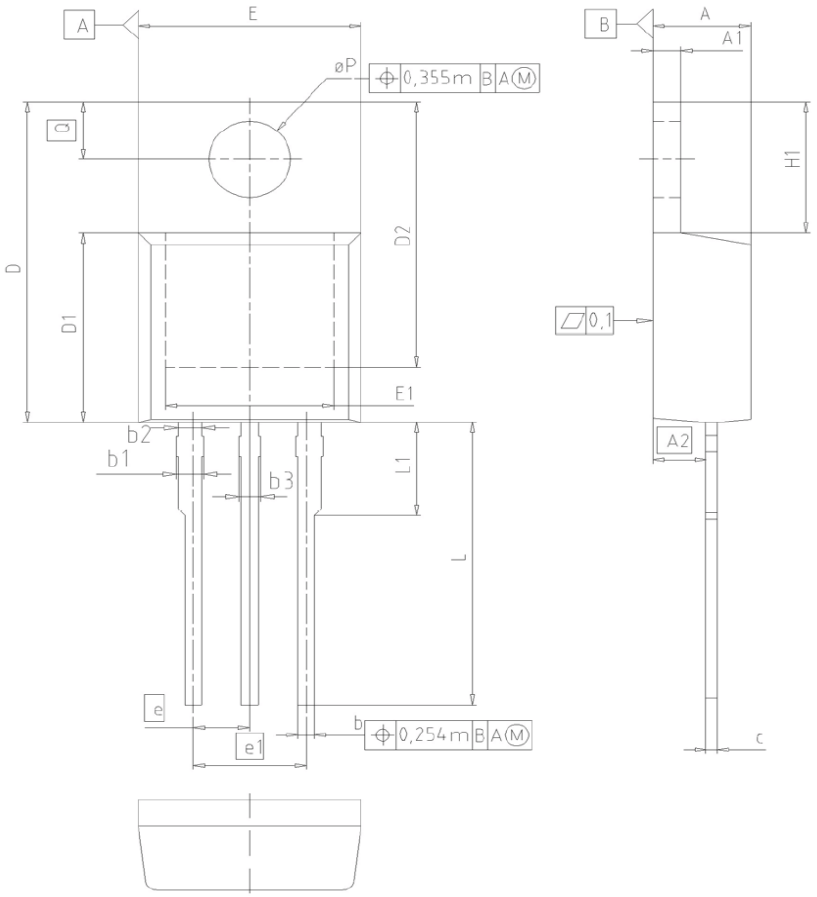
$V_{BR(DSS)}$=f(T_j); I_D=1 mA



16 Gate charge waveforms



PG-TO220-3: Outline



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
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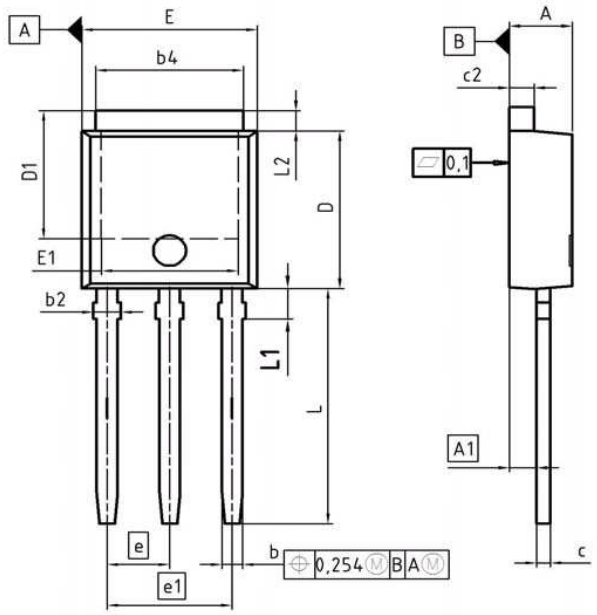

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.16	2.41	0.085	0.095
A1	0.90	1.14	0.035	0.045
b	0.64	0.89	0.025	0.035
b2	0.65	1.15	0.026	0.045
b4	4.95	5.50	0.195	0.217
c	0.46	0.60	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.04	5.77	0.198	0.227
E	6.35	6.73	0.250	0.265
E1	4.70	5.21	0.185	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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