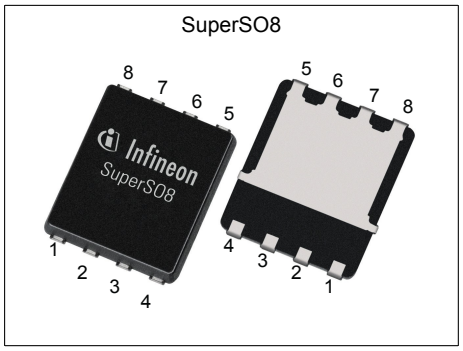
MOSFET

OptiMOS™3 Power-Transistor, 120 V



Features

- N-channel, normal level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- 150 °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
- Halogen-free according to IEC61249-2-21

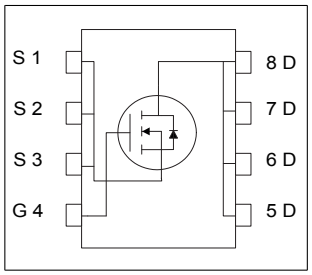


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	120	V
$R_{DS(on),max}$	7.7	mΩ
I_D	98	A

Type / Ordering Code	Package	Marking	Related Links
BSC077N12NS3 G	PG-TDSON-8	077N12NS	-

[1] J-STD20 and JESD22

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1 Maximum ratings

at T_A=25 °C, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	I_D	- - -	- - -	98 61 13.4	A	T_C=25 °C T_C=100 °C T_A=25 °C, R_{thJA}=45 K/W[1]
Pulsed drain current[2]	$I_{D,pulse}$	-	-	392	A	T_C=25 °C
Avalanche energy, single pulse	E_{AS}	-	-	330	mJ	I_D=50 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	139	W	T_C=25 °C
Operating and storage temperature	T_j, T_{stg}	-55	-	150	°C	IEC climatic category; DIN IEC 68-1: 55/150/56

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case, bottom	R_{thJC}	-	0.5	0.9	K/W	-
Thermal resistance, junction - case, top	R_{thJC}	-	-	18	K/W	-
Thermal resistance, junction - ambient, minimal footprint	R_{thJA}	-	-	75	K/W	-
Thermal resistance, junction - ambient, 6 cm^2 cooling area[1]	R_{thJA}	-	-	50	K/W	-

[1] 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.
[2] see Diagram 3

3 Electrical characteristics

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	120	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	2	3	4	V	V_{DS}=V_{GS}, I_D=110 µA
Zero gate voltage drain current	I_{DSS}	- -	0.01 10	1 100	µA	V_{DS}=100 V, V_{GS}=0 V, T_j=25 °C V_{DS}=100 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	1	100	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	-	6.6	7.7	mΩ	V_{GS}=10 V, I_D=50 A
Gate resistance[1)]	R_G	-	1	1.5	Ω	-
Transconductance	g_{fs}	40	80	-	S	|V_{DS}|>2|I_D|$R_{DS(on)max}$, I_D=50 A

Table 5 Dynamic characteristics[1)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	4300	5700	pF	V_{GS}=0 V, V_{DS}=60 V, f=1 MHz
Output capacitance	C_{oss}	-	550	730	pF	V_{GS}=0 V, V_{DS}=60 V, f=1 MHz
Reverse transfer capacitance	C_{rss}	-	28	49	pF	V_{GS}=0 V, V_{DS}=60 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	15	-	ns	V_{DD}=60 V, V_{GS}=10 V, I_D=25 A, $R_{G,ext}$=2.7 Ω
Rise time	t_r	-	8	-	ns	V_{DD}=60 V, V_{GS}=10 V, I_D=25 A, $R_{G,ext}$=2.7 Ω
Turn-off delay time	$t_{d(off)}$	-	26	-	ns	V_{DD}=60 V, V_{GS}=10 V, I_D=25 A, $R_{G,ext}$=2.7 Ω
Fall time	t_f	-	7	-	ns	V_{DD}=60 V, V_{GS}=10 V, I_D=25 A, $R_{G,ext}$=2.7 Ω

Table 6 Gate charge characteristics[2)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	21	-	nC	V_{DD}=60 V, I_D=25 A, V_{GS}=0 to 10 V
Gate to drain charge	Q_{gd}	-	15	-	nC	V_{DD}=60 V, I_D=25 A, V_{GS}=0 to 10 V
Switching charge	Q_{sw}	-	29	-	nC	V_{DD}=60 V, I_D=25 A, V_{GS}=0 to 10 V
Gate charge total[1)]	Q_g	-	66	88	nC	V_{DD}=60 V, I_D=25 A, V_{GS}=0 to 10 V
Gate plateau voltage	$V_{plateau}$	-	4.7	-	V	V_{DD}=60 V, I_D=25 A, V_{GS}=0 to 10 V
Output charge[1)]	Q_{oss}	-	76	100	nC	V_{DD}=60 V, V_{GS}=0 V

[1)] Defined by design. Not subject to production test.
[2)] See ″Gate charge waveforms″ for parameter definition.

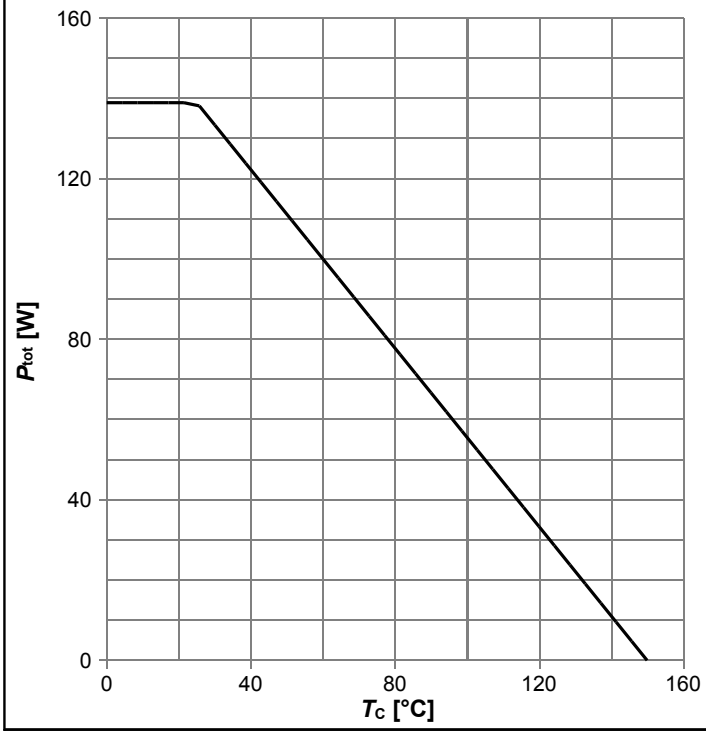
Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continous forward current	I_S	-	-	98	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	392	A	T_C=25 °C
Diode forward voltage	V_{SD}	-	0.9	1.2	V	V_{GS}=0 V, I_F=50 A, T_j=25 °C
Reverse recovery time[1)]	t_{rr}	-	98	-	ns	V_R=60 V, I_F=*25*, di_F/dt=100 A/µs
Reverse recovery charge[1)]	Q_{rr}	-	264	-	nC	V_R=60 V, I_F=*25*, di_F/dt=100 A/µs

[1)] Defined by design. Not subject to production test.

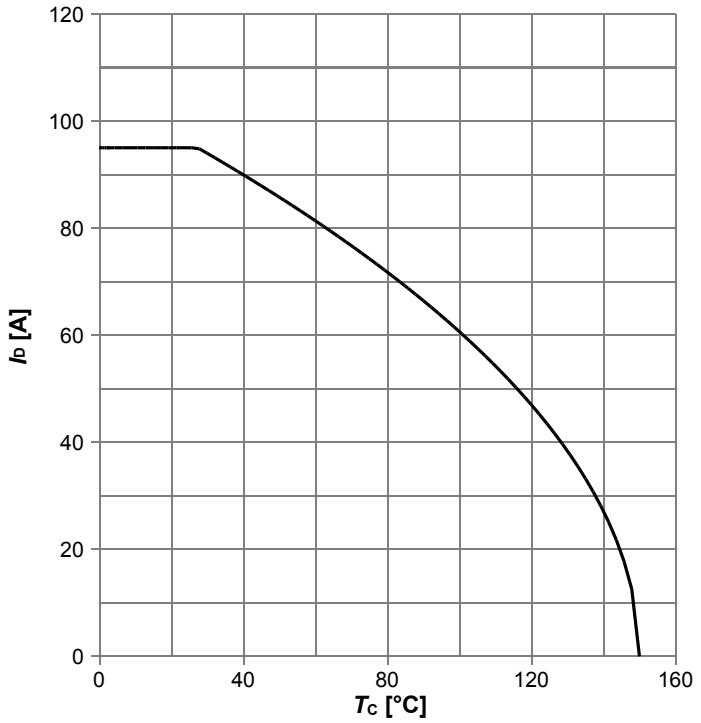
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



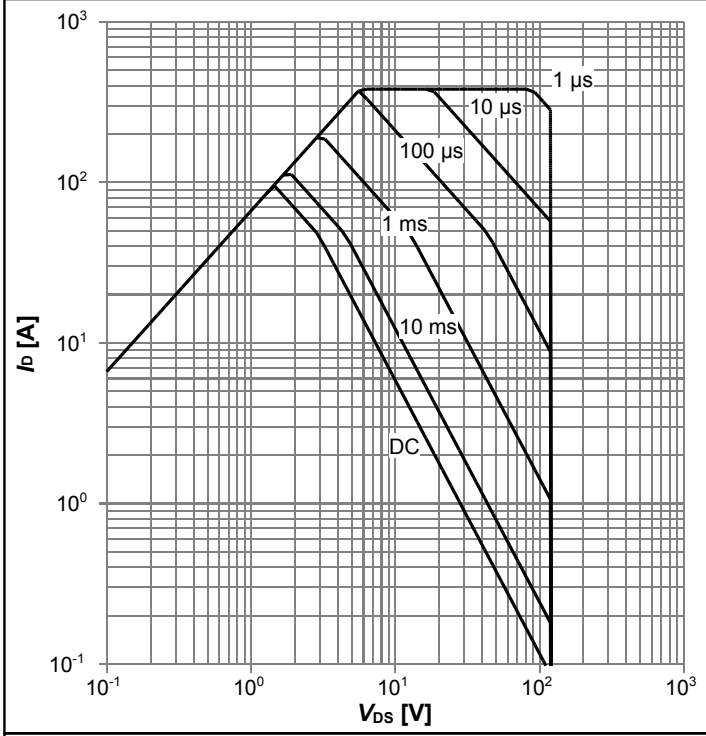
$P_{tot}=f(T_C)$

Diagram 2: Drain current



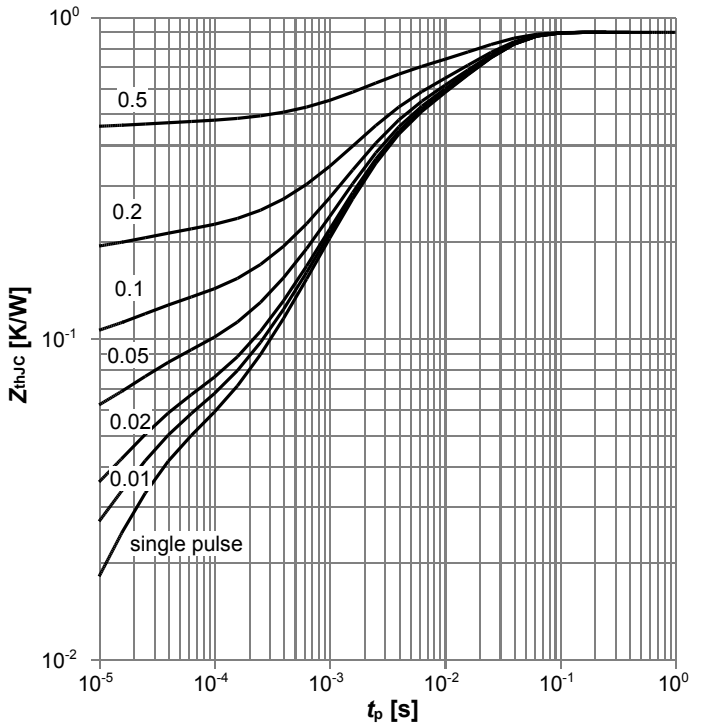
$I_D=f(T_C)$; $V_{GS}\geq 10$ V

Diagram 3: Safe operating area



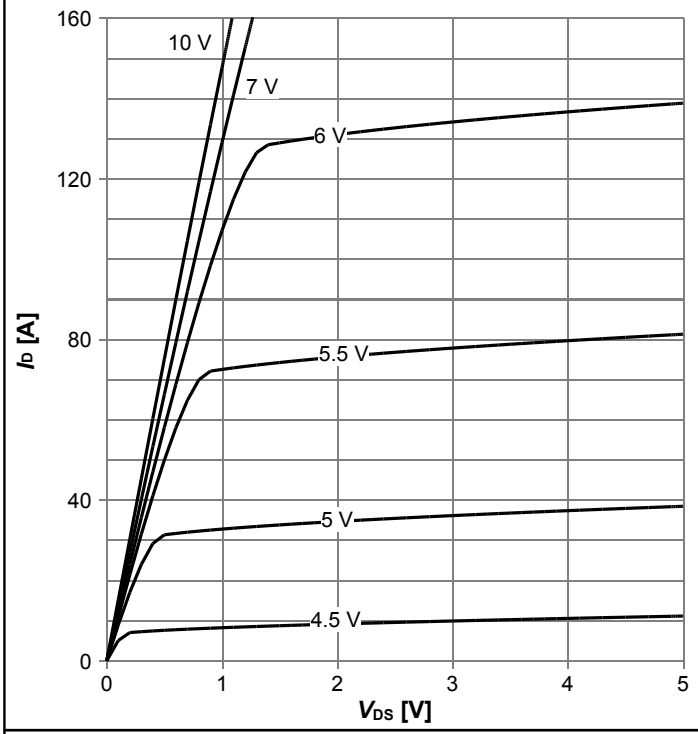
$I_D=f(V_{DS})$; T_C=25 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



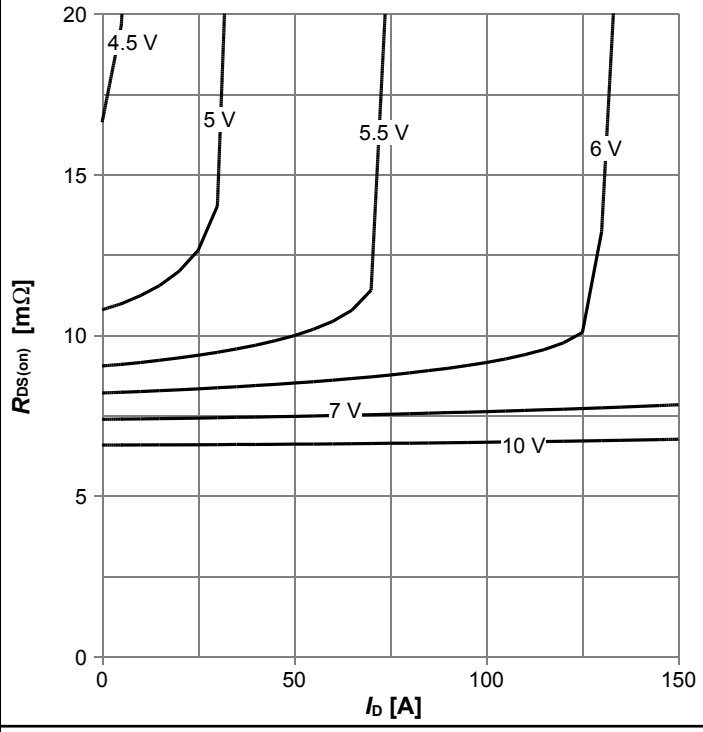
$Z_{thJC}=f(t_p)$; parameter: $D=t_p/T$

Diagram 5: Typ. output characteristics



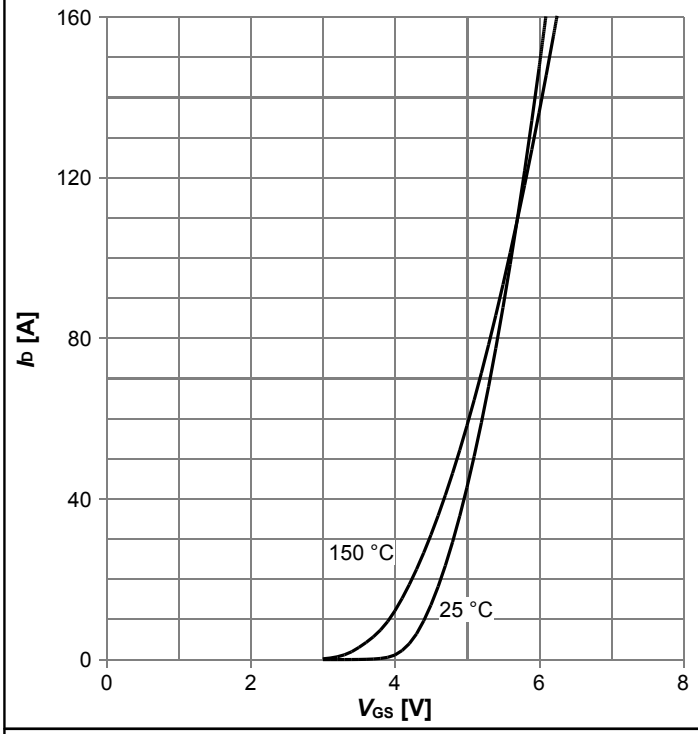
$I_D=f(V_{DS})$; $T_j=25$ °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



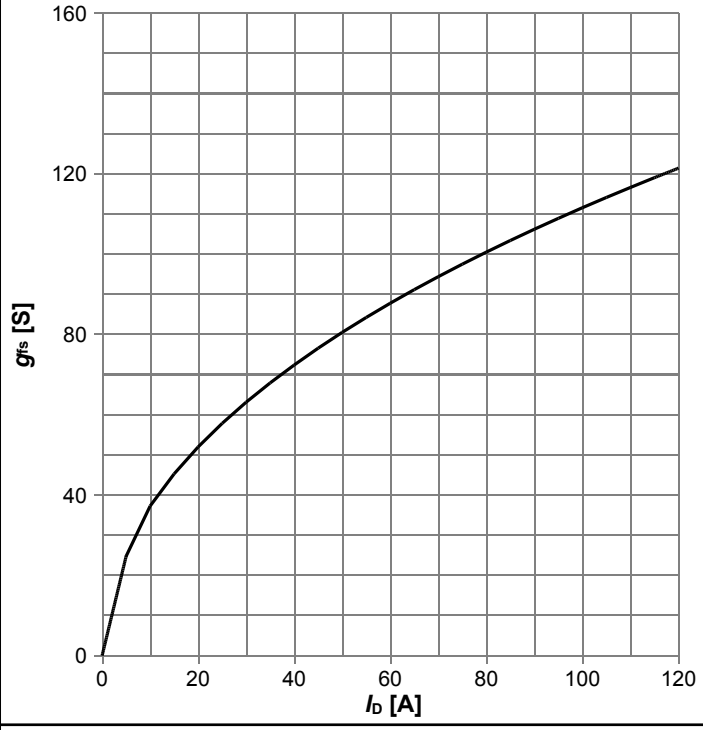
$R_{DS(on)}=f(I_D)$; $T_j=25$ °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



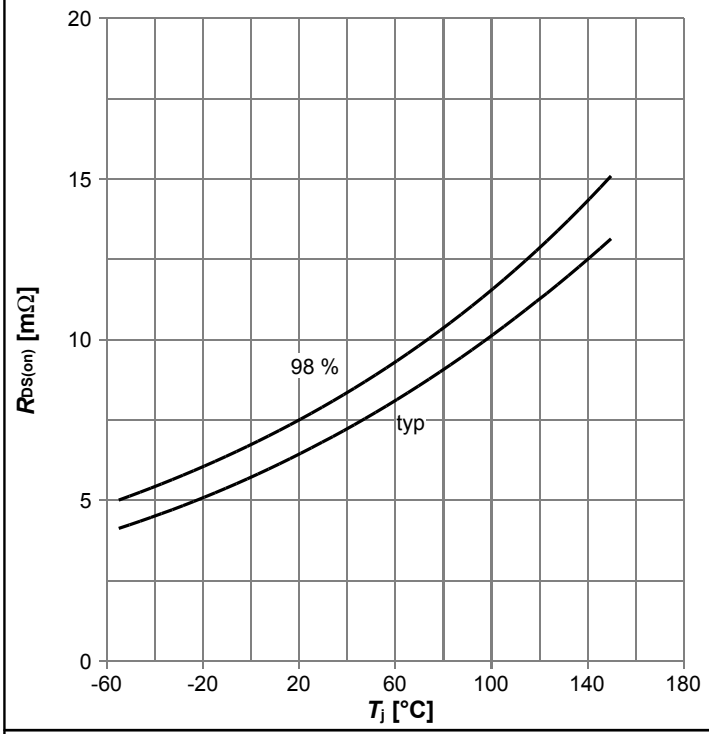
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



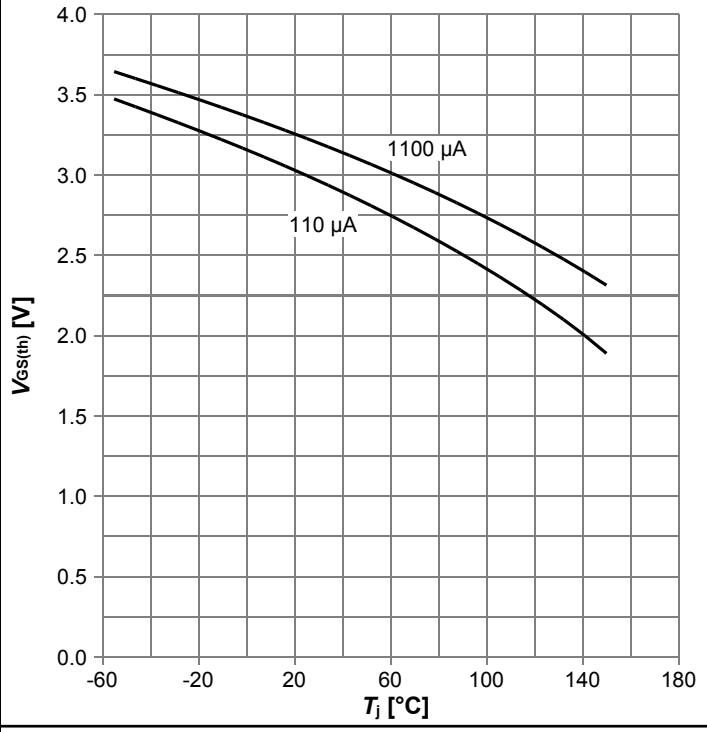
$g_{fs}=f(I_D)$; $T_j=25$ °C

Diagram 9: Drain-source on-state resistance



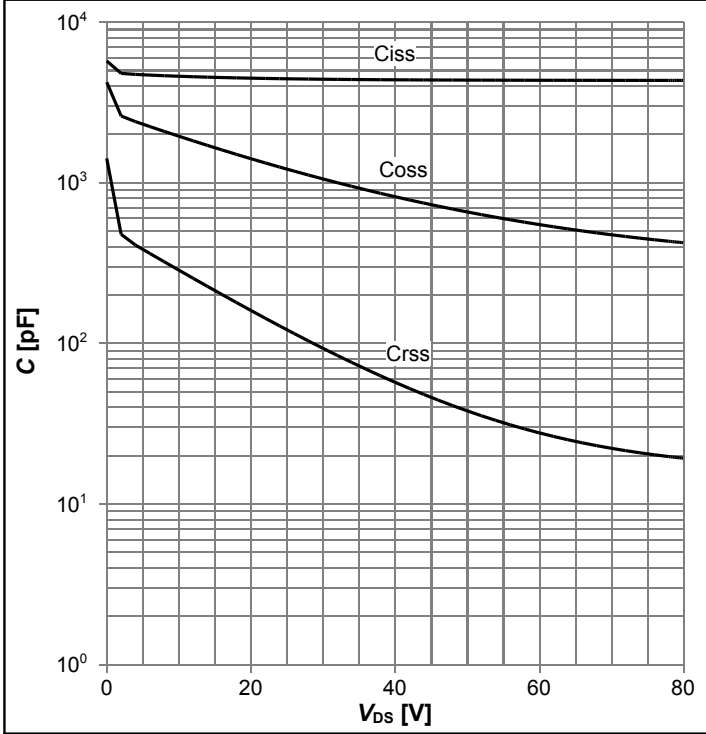
$R_{DS(on)}$=f(T_j); I_D=50 A; V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



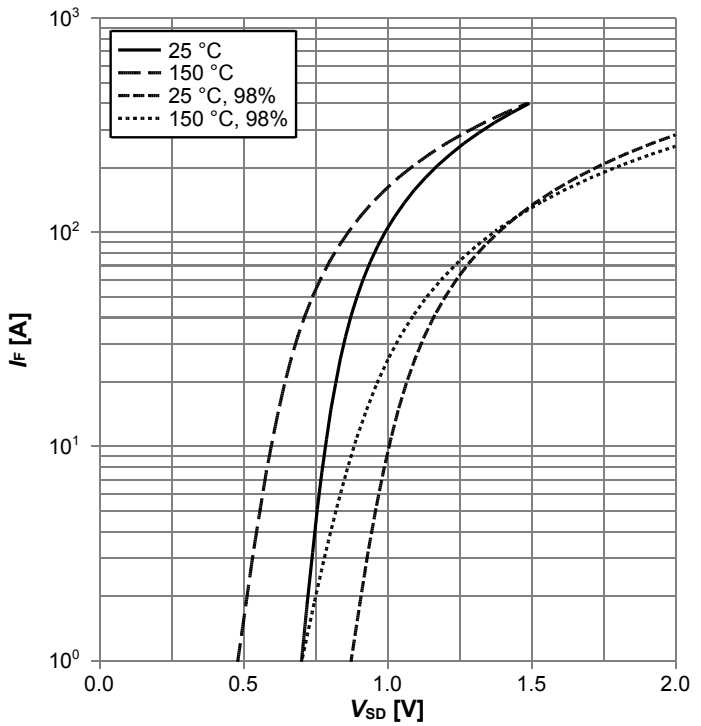
$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}; parameter: I_D

Diagram 11: Typ. capacitances



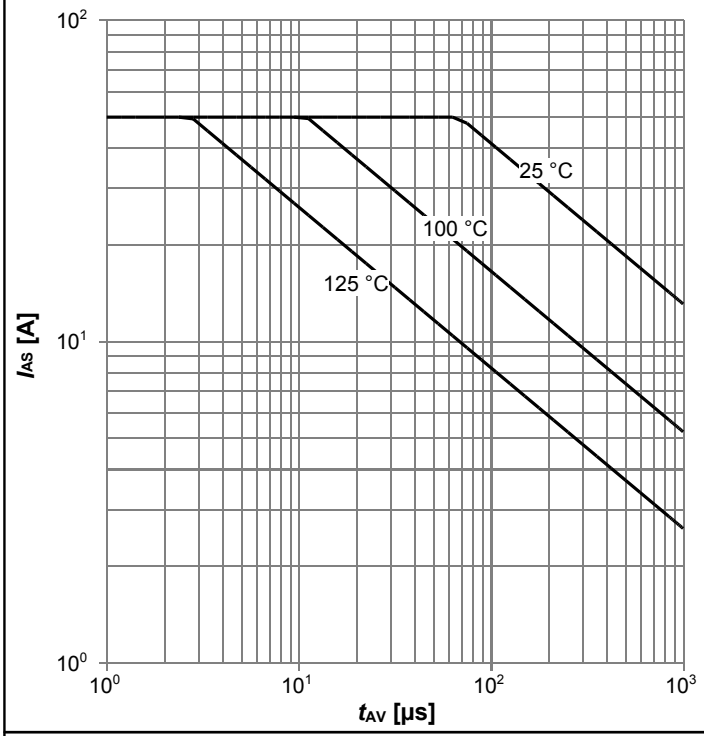
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Diagram 12: Forward characteristics of reverse diode



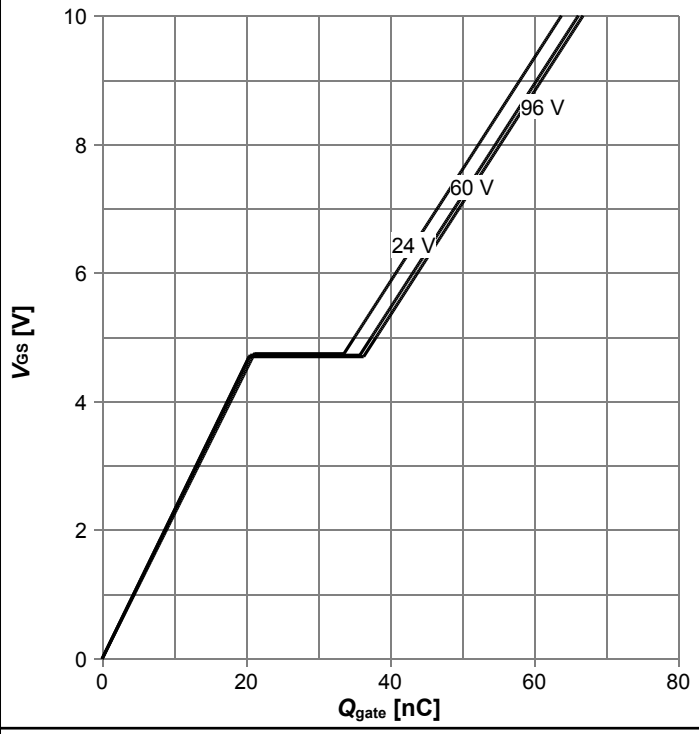
I_F=f(V_{SD}); parameter: T_j

Diagram 13: Avalanche characteristics



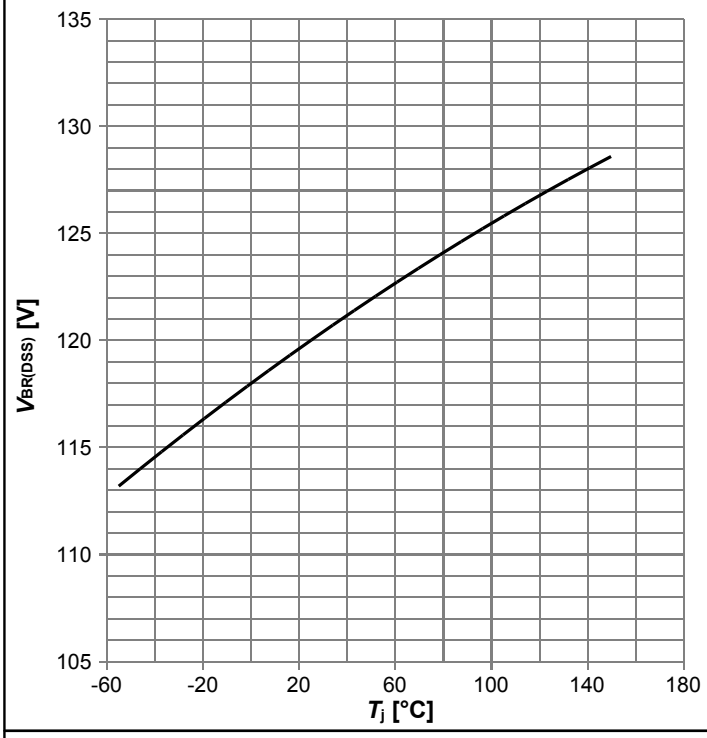
$I_{AS}=f(t_{AV})$; $R_{GS}=25\ \Omega$; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



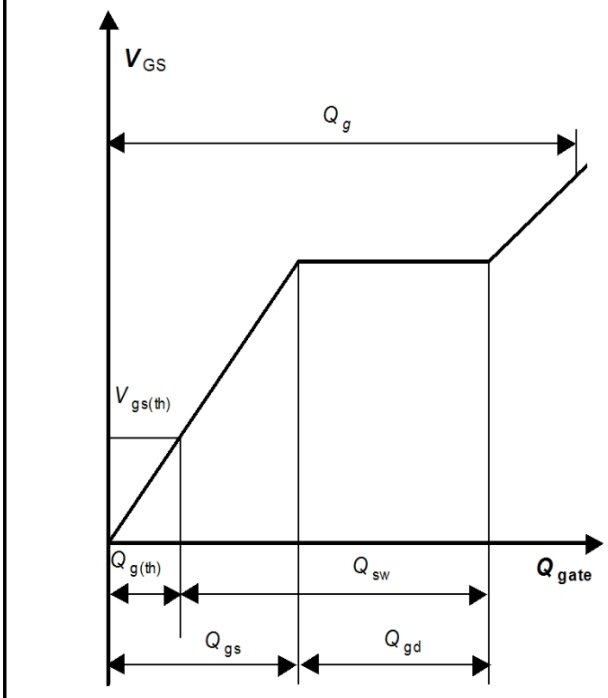
$V_{GS}=f(Q_{gate})$; $I_D=25$ A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

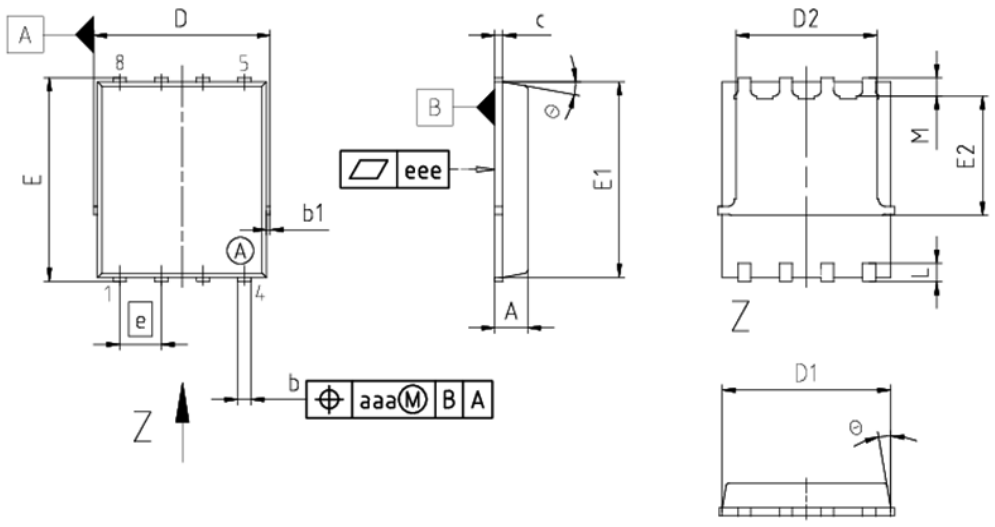


$V_{BR(DSS)}=f(T_j)$; $I_D=1$ mA

Gate charge waveforms



5 Package Outlines



DIM	MILLIMETERS	
	MIN	MAX
A	0.90	1.10
b	0.31	0.54
b1	0.02	0.22
c	0.15	0.35
D	5.15	5.49
D1	4.95	5.35
D2	3.70	4.40
E	5.95	6.35
E1	5.70	6.10
E2	3.40	3.80
e	1.27	
N	8	
L	0.45	0.71
M	0.45	0.75
Θ	8.5°	12°
aaa	0.25	
eee	0.08	

DOCUMENT NO.
Z8B00003332

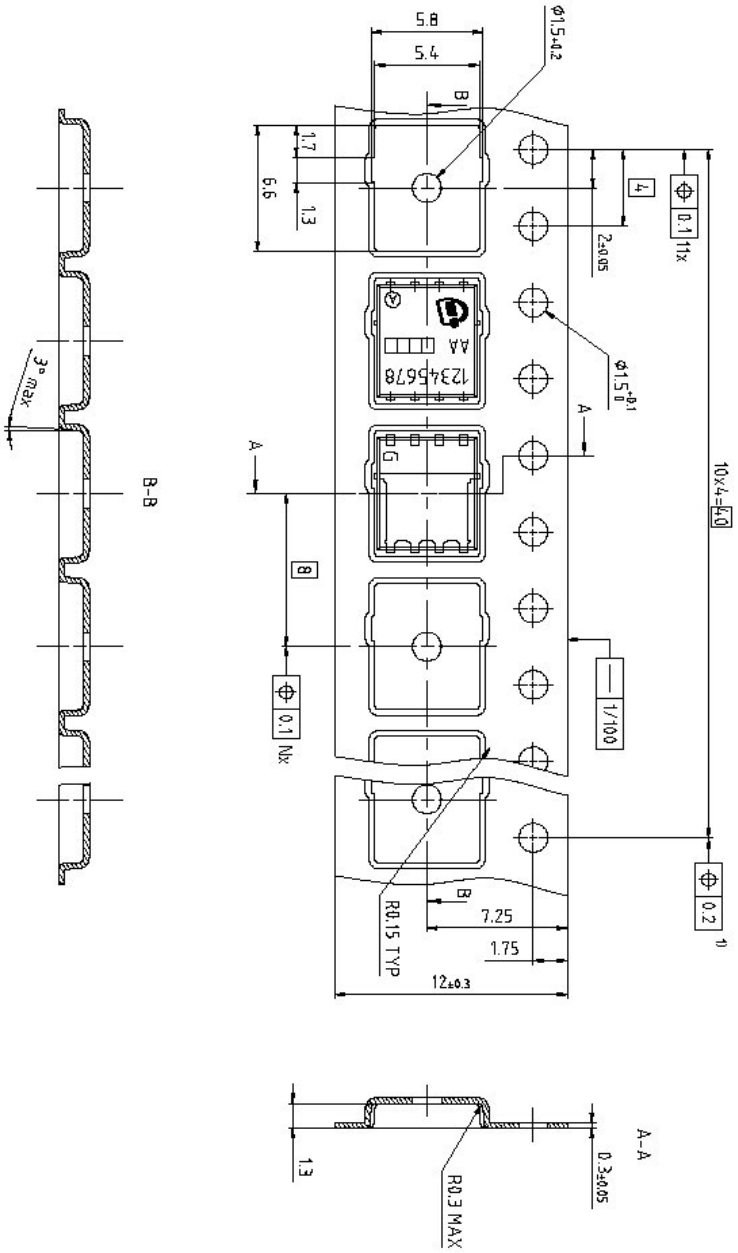
SCALE 0 2 0 2 4mm

EUROPEAN PROJECTION

ISSUE DATE
10-04-2013

REVISION
04

Figure 1 Outline PG-TDSON-8, dimensions in mm



Dimension in mm

Figure 2 Outline TDSON-8 Tape

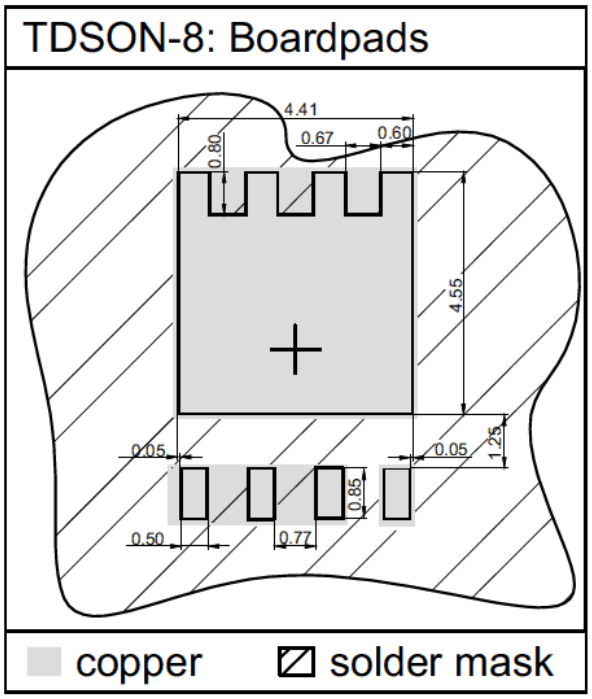


Figure 3 Outline Footprint TDSON-8

Revision History

BSC077N12NS3 G

Revision: 2015-12-15, Rev. 2.8

Previous Revision		
Revision	Date	Subjects (major changes since last revision)
2.7	2014-10-02	Rev. 2.7
2.8	2015-12-15	Update of dynamic parameters td(on), td(off), tr, tf

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