

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 JEDEC¹⁾ 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 $T_A=25\text{ °C}$, 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	$T_C=25\text{ °C}$ $T_C=100\text{ °C}$ $T_A=25\text{ °C}$, $R_{thJA}=45\text{ K/W}^{(1)}$
Pulsed drain current ⁽²⁾	$I_{D,pulse}$	-	-	392	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse	E_{AS}	-	-	330	mJ	$I_D=50\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	139	W	$T_C=25\text{ °C}$
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 cm² (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	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	2	3	4	V	$V_{DS}=V_{GS}$, $I_D=110\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.01 10	1 100	μA	$V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ }^\circ\text{C}$ $V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ }^\circ\text{C}$
Gate-source leakage current	I_{GSS}	-	1	100	nA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	6.6	7.7	m Ω	$V_{GS}=10\text{ V}$, $I_D=50\text{ A}$
Gate resistance ¹⁾	R_G	-	1	1.5	Ω	-
Transconductance	g_{fs}	40	80	-	S	$ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=50\text{ A}$

Table 5 Dynamic characteristics¹⁾

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

Table 6 Gate charge characteristics²⁾

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

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 continuous forward current	I_S	-	-	98	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	392	A	$T_C=25\text{ °C}$
Diode forward voltage	V_{SD}	-	0.9	1.2	V	$V_{GS}=0\text{ V}$, $I_F=50\text{ A}$, $T_j=25\text{ °C}$
Reverse recovery time ¹⁾	t_{rr}	-	98	-	ns	$V_R=60\text{ V}$, $I_F=25$, $di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge ¹⁾	Q_{rr}	-	264	-	nC	$V_R=60\text{ V}$, $I_F=25$, $di_F/dt=100\text{ A}/\mu\text{s}$

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

4 Electrical characteristics diagrams

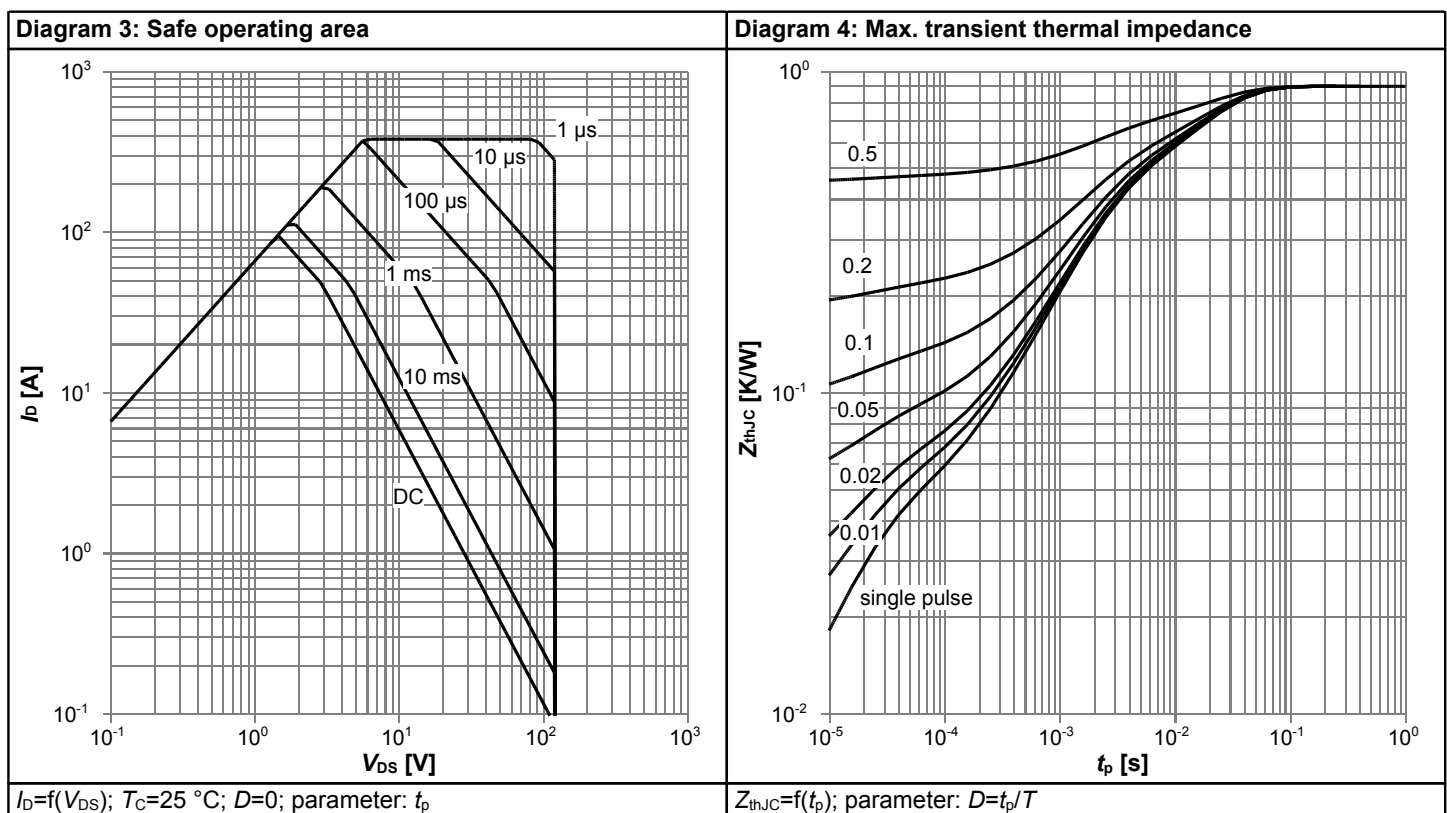
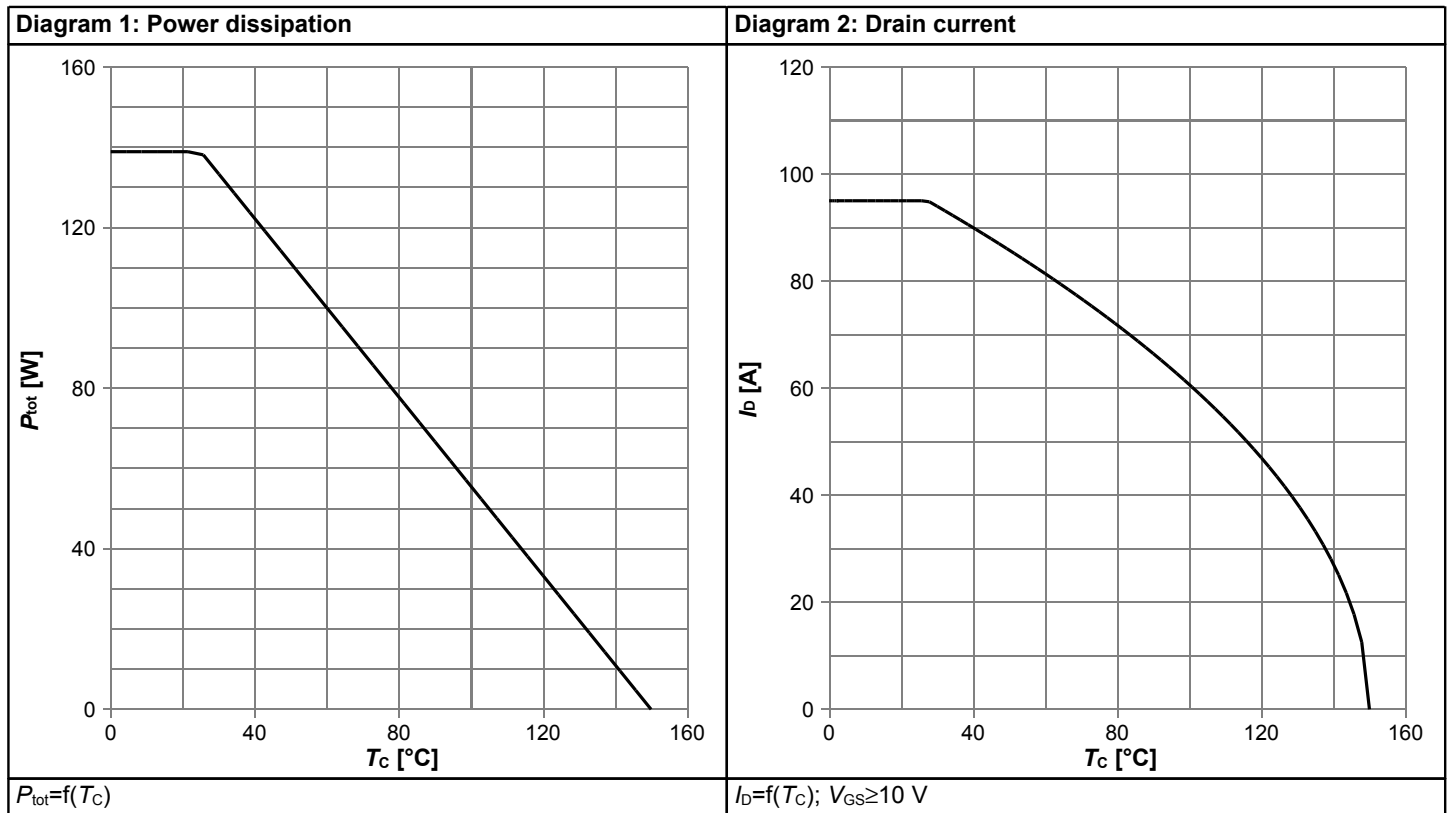
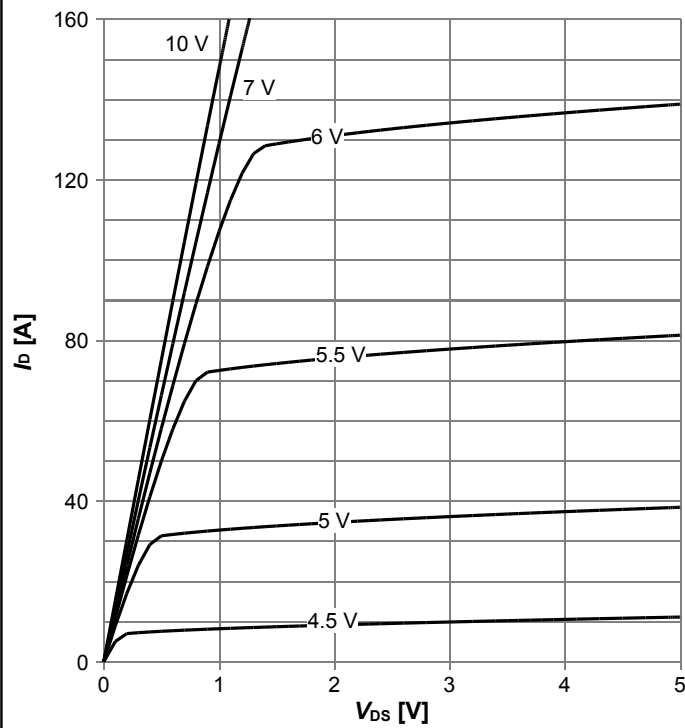
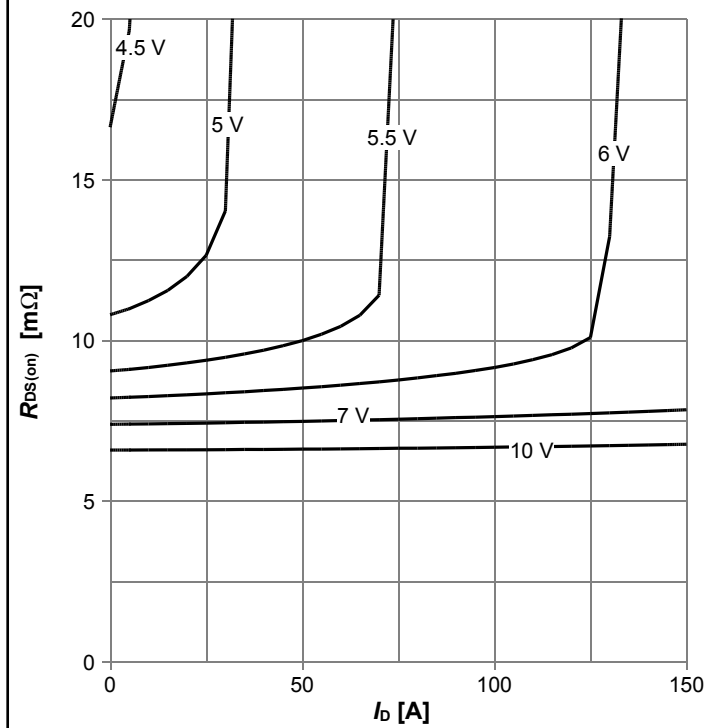


Diagram 5: Typ. output characteristics



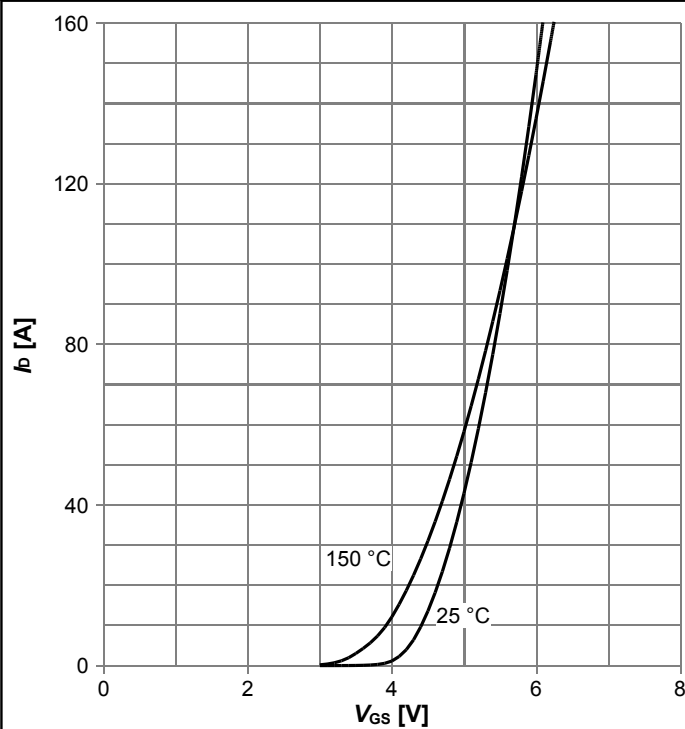
$I_D = f(V_{DS})$; $T_j = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



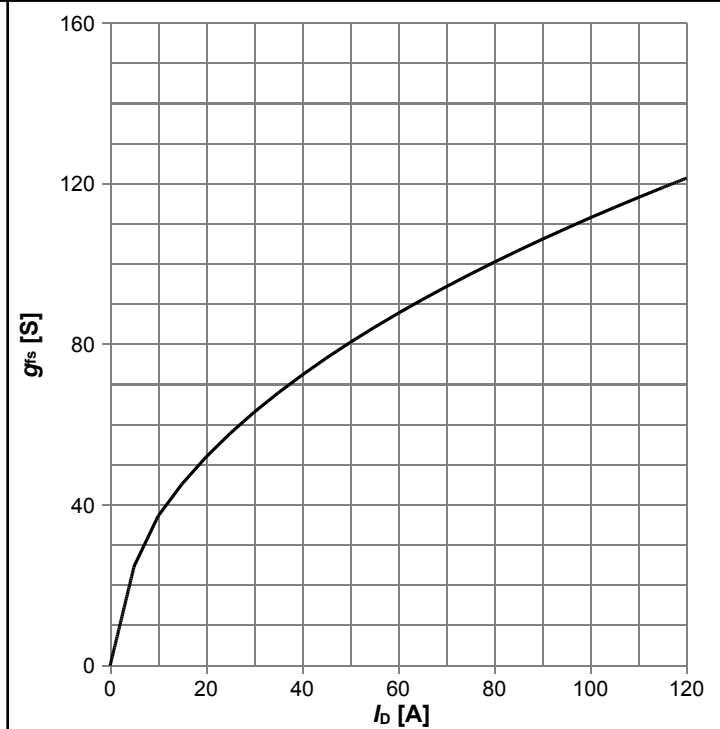
$R_{DS(on)} = f(I_D)$; $T_j = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



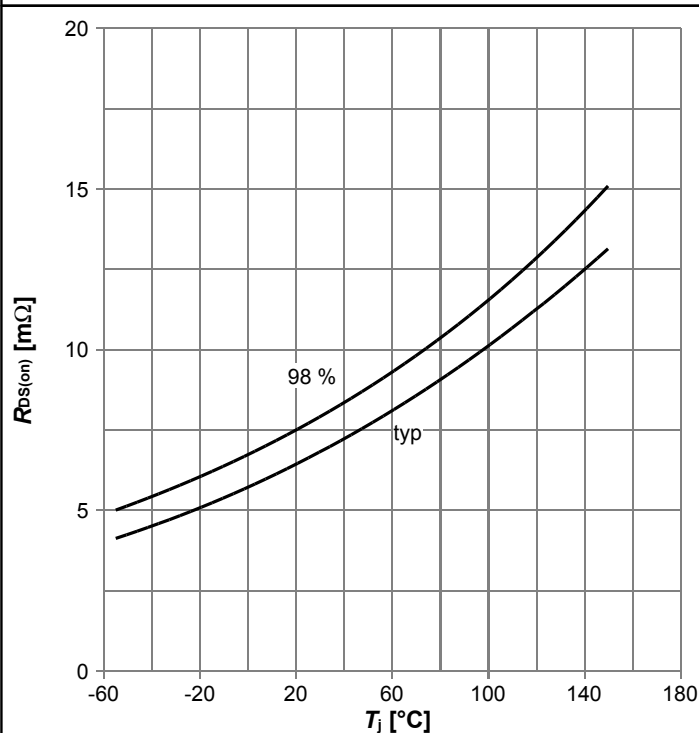
$I_D = f(V_{GS})$; $|V_{DS}| > 2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



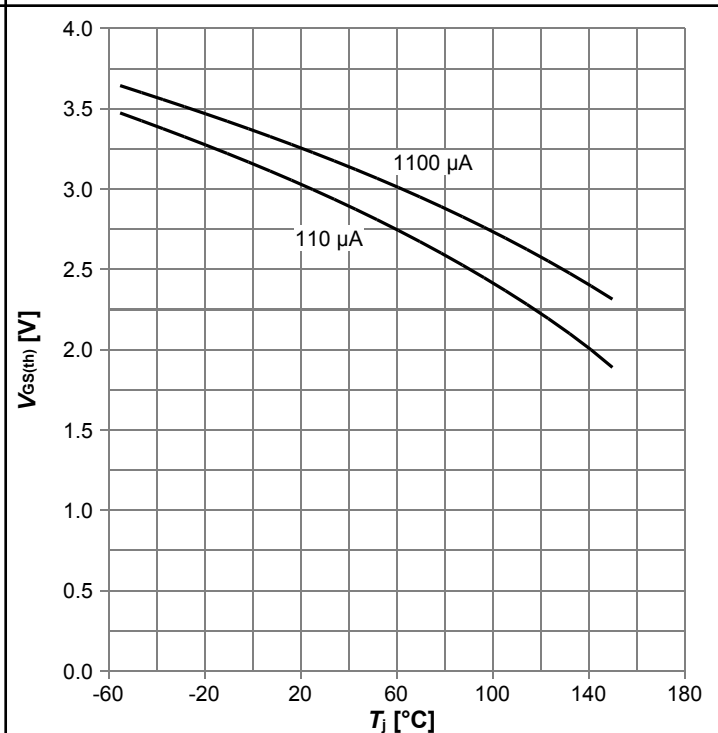
$g_{fs} = f(I_D)$; $T_j = 25^\circ\text{C}$

Diagram 9: Drain-source on-state resistance



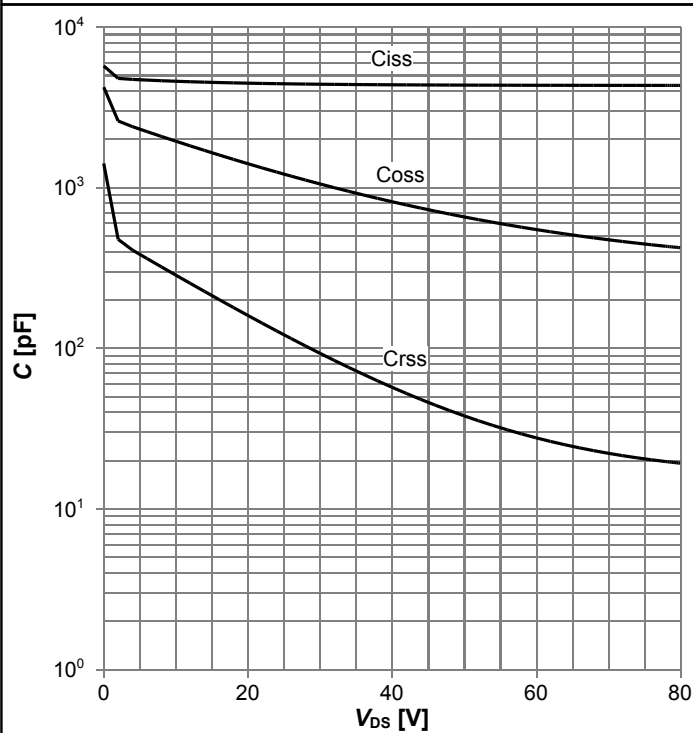
$R_{DS(on)} = f(T_j)$; $I_D = 50 \text{ A}$; $V_{GS} = 10 \text{ V}$

Diagram 10: Typ. gate threshold voltage



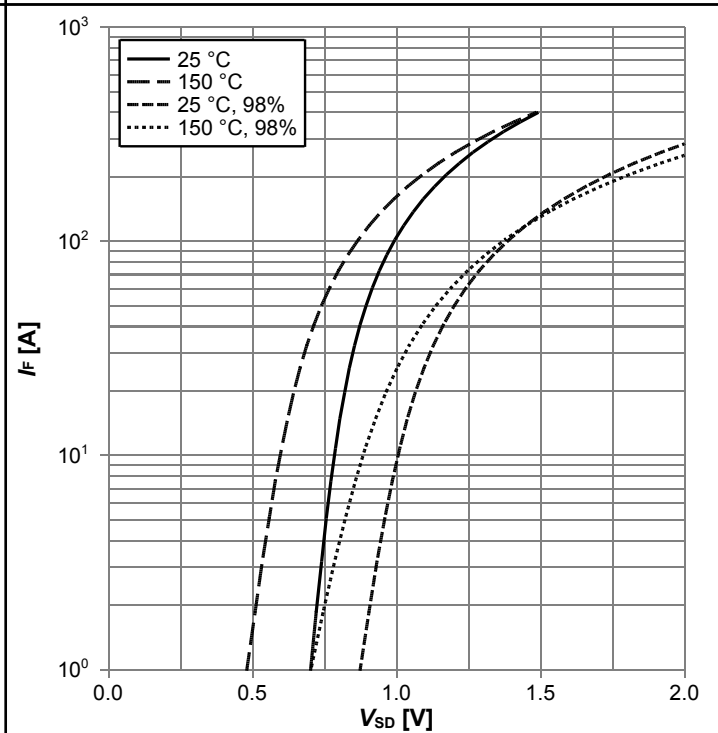
$V_{GS(th)} = f(T_j)$; $V_{GS} = V_{DS}$; parameter: I_D

Diagram 11: Typ. capacitances



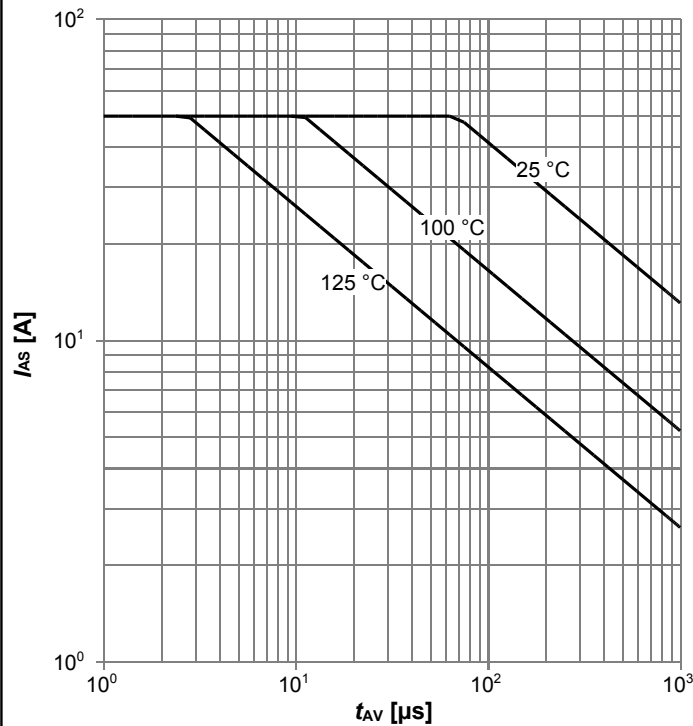
$C = f(V_{DS})$; $V_{GS} = 0 \text{ V}$; $f = 1 \text{ MHz}$

Diagram 12: Forward characteristics of reverse diode



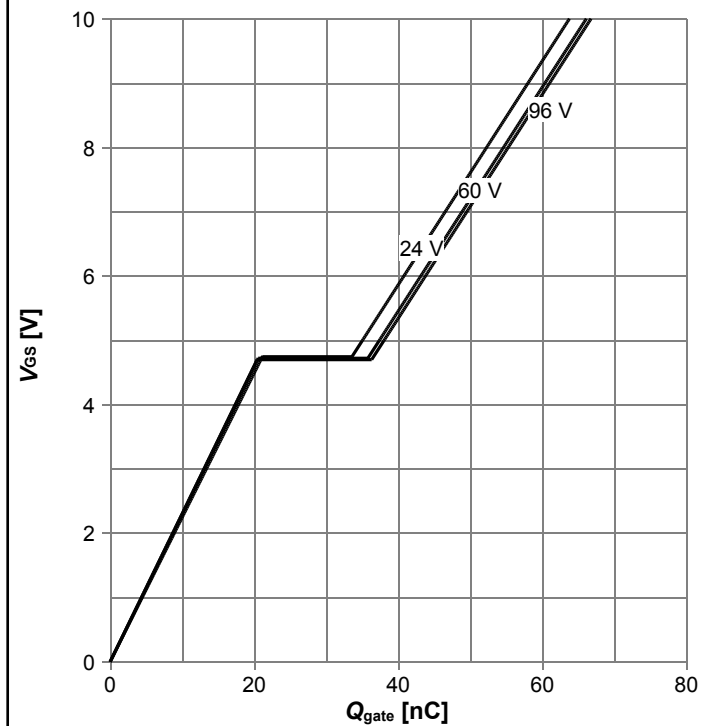
$I_F = f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



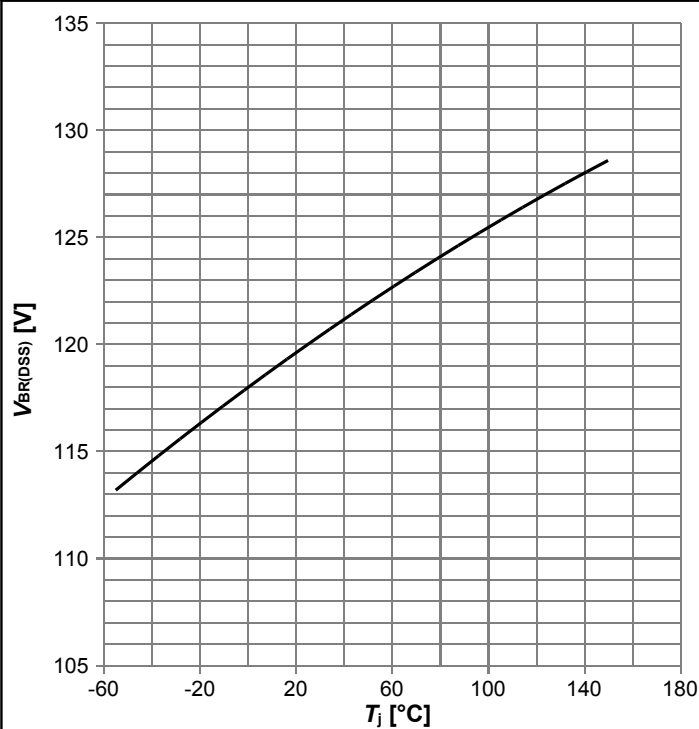
$I_{AS}=f(t_{AV})$; $R_{GS}=25\ \Omega$; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



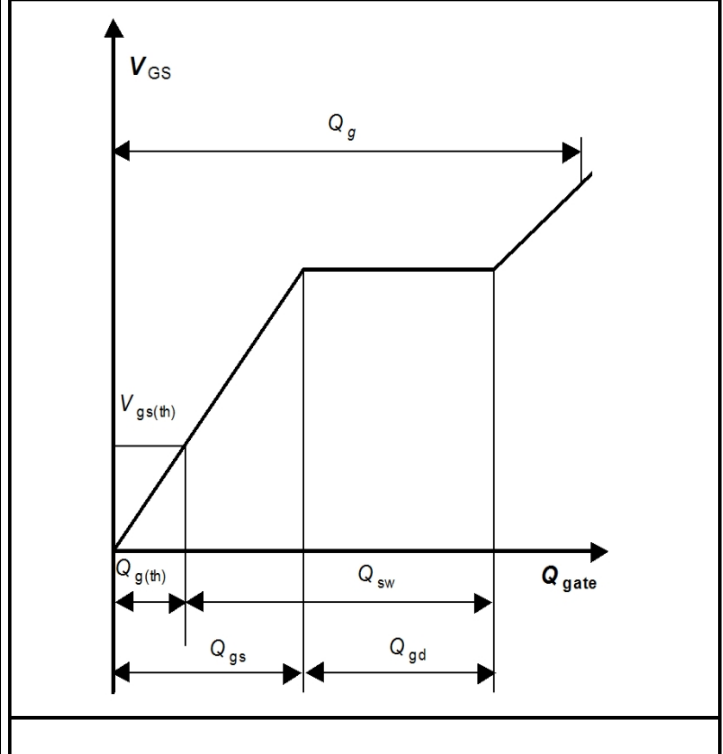
$V_{GS}=f(Q_{gate})$; $I_D=25\text{ A}$ pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage



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

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
ø	8.5°	12°
aaa	0.25	
eee	0.08	

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



Rev. 2.8, 2015-12-15



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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