

MOSFET

OptiMOS™3 M-Series Power-MOSFET, 30 V

Features

- Optimized for 5V driver application (Notebook, VGA, POL)
- Low FOM_{SW} for High Frequency SMPS
- 100% avalanche tested
- N-channel
- Very low on-resistance $R_{DS(on)}$ @ $V_{GS}=4.5\text{ V}$
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Qualified according to JEDEC¹⁾ for target applications
- Superior thermal resistance
- Pb-free plating; RoHS compliant;
- Halogen-free according to IEC61249-2-21

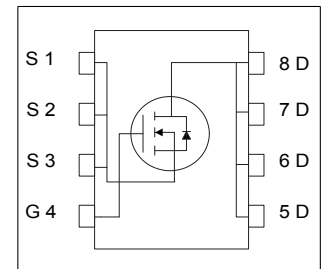
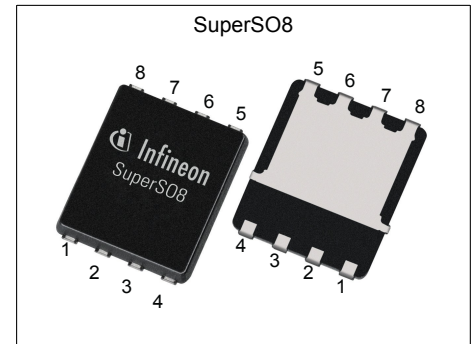


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	30	V
$R_{DS(on),max}@10V}$	1.6	m Ω
$R_{DS(on),max}@4.5V}$	2	m Ω
I_D	225	A

Type / Ordering Code	Package	Marking	Related Links
BSC016N03MS G	PG-TDSON-8	016N03MS	-

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 ¹⁾	I_D	-	-	225	A	$V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=4.5\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=4.5\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=4.5\text{ V}$, $T_A=25\text{ °C}$, $R_{thJA}=50\text{ K/W}^2)$
		-	-	142		
		-	-	201		
		-	-	127		
		-	-	28		
Pulsed drain current ³⁾	$I_{D,pulse}$	-	-	900	A	$T_C=25\text{ °C}$
Avalanche current, single pulse ⁴⁾	I_{AS}	-	-	50	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse	E_{AS}	-	-	340	mJ	$I_D=50\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	125	W	$T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{thJA}=50\text{ K/W}^2)$
		-	-	2.5		
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}	-	-	1	K/W	-
Thermal resistance, junction - case, top	R_{thJC}	-	-	18	K/W	-
Device on PCB, 6 cm ² cooling area ²⁾	R_{thJA}	-	-	50	K/W	-

¹⁾ Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature at 25°C. For higher case temperature please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.

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.

³⁾ See figure 3 for more detailed information

⁴⁾ See figure 13 for more detailed information

3 Electrical characteristics

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

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	30	-	-	V	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	1	-	2	V	$V_{DS}=V_{GS}$, $I_D=250\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.1 10	1 100	μA	$V_{DS}=30\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=30\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS}=16\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	1.6 1.3	2 1.6	m Ω	$V_{GS}=4.5\text{ V}$, $I_D=30\text{ A}$ $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$
Gate resistance	R_G	0.6	1.3	2.3	Ω	-
Transconductance	g_{fs}	70	140	-	S	$ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=30\text{ A}$

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	10000	13000	pF	$V_{GS}=0\text{ V}$, $V_{DS}=15\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}	-	2600	3500	pF	$V_{GS}=0\text{ V}$, $V_{DS}=15\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance	C_{rss}	-	210	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=15\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	31	-	ns	$V_{DD}=15\text{ V}$, $V_{GS}=4.5\text{ V}$, $I_D=30\text{ A}$, $R_G=1.6\text{ }\Omega$
Rise time	t_r	-	16	-	ns	$V_{DD}=15\text{ V}$, $V_{GS}=4.5\text{ V}$, $I_D=30\text{ A}$, $R_G=1.6\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	42	-	ns	$V_{DD}=15\text{ V}$, $V_{GS}=4.5\text{ V}$, $I_D=30\text{ A}$, $R_G=1.6\text{ }\Omega$
Fall time	t_f	-	16	-	ns	$V_{DD}=15\text{ V}$, $V_{GS}=4.5\text{ V}$, $I_D=30\text{ A}$, $R_G=1.6\text{ }\Omega$

Table 6 Gate charge characteristics¹⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	26	34	nC	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$
Gate charge at threshold	$Q_{g(th)}$	-	14	19	nC	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$
Gate to drain charge	Q_{gd}	-	13	22	nC	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$
Switching charge	Q_{sw}	-	25	37	nC	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$
Gate charge total	Q_g	-	63	84	nC	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	2.6	-	V	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$
Gate charge total	Q_g	-	130	173	-	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total, sync. FET	$Q_{g(sync)}$	-	55	73	nC	$V_{DS}=0.1\text{ V}$, $V_{GS}=0\text{ to }4.5\text{ V}$
Output charge	Q_{oss}	-	70	93	-	$V_{DD}=15\text{ V}$, $V_{GS}=0\text{ V}$

¹⁾ 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	-	-	114	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	900	A	$T_C=25\text{ °C}$
Diode forward voltage	V_{SD}	-	0.8	1.1	V	$V_{GS}=0\text{ V}, I_F=30\text{ A}, T_j=25\text{ °C}$
Reverse recovery charge	Q_{rr}	-	-	30	nC	$V_R=15\text{ V}, I_F=I_S, di_F/dt=400\text{ A}/\mu\text{s}$

4 Electrical characteristics diagrams

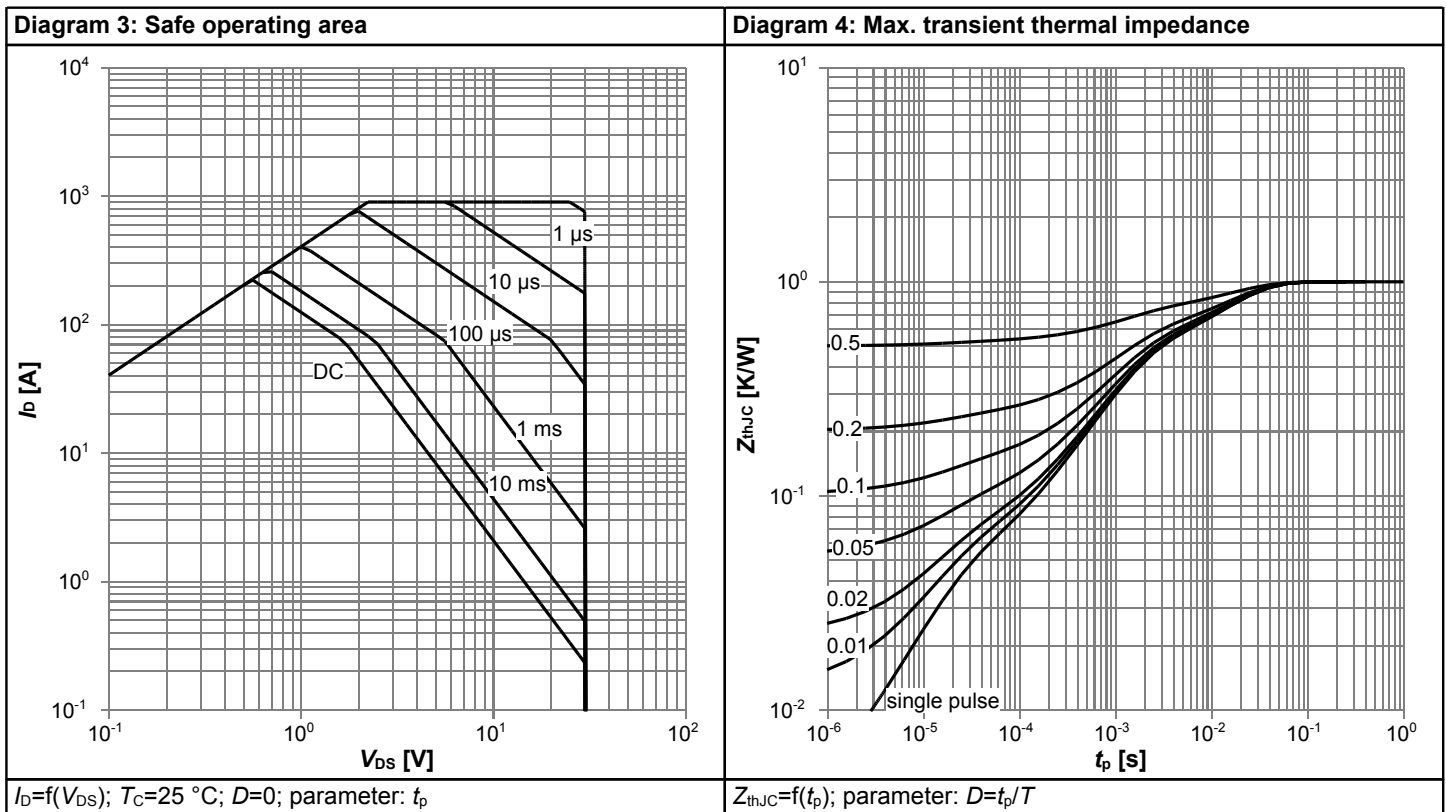
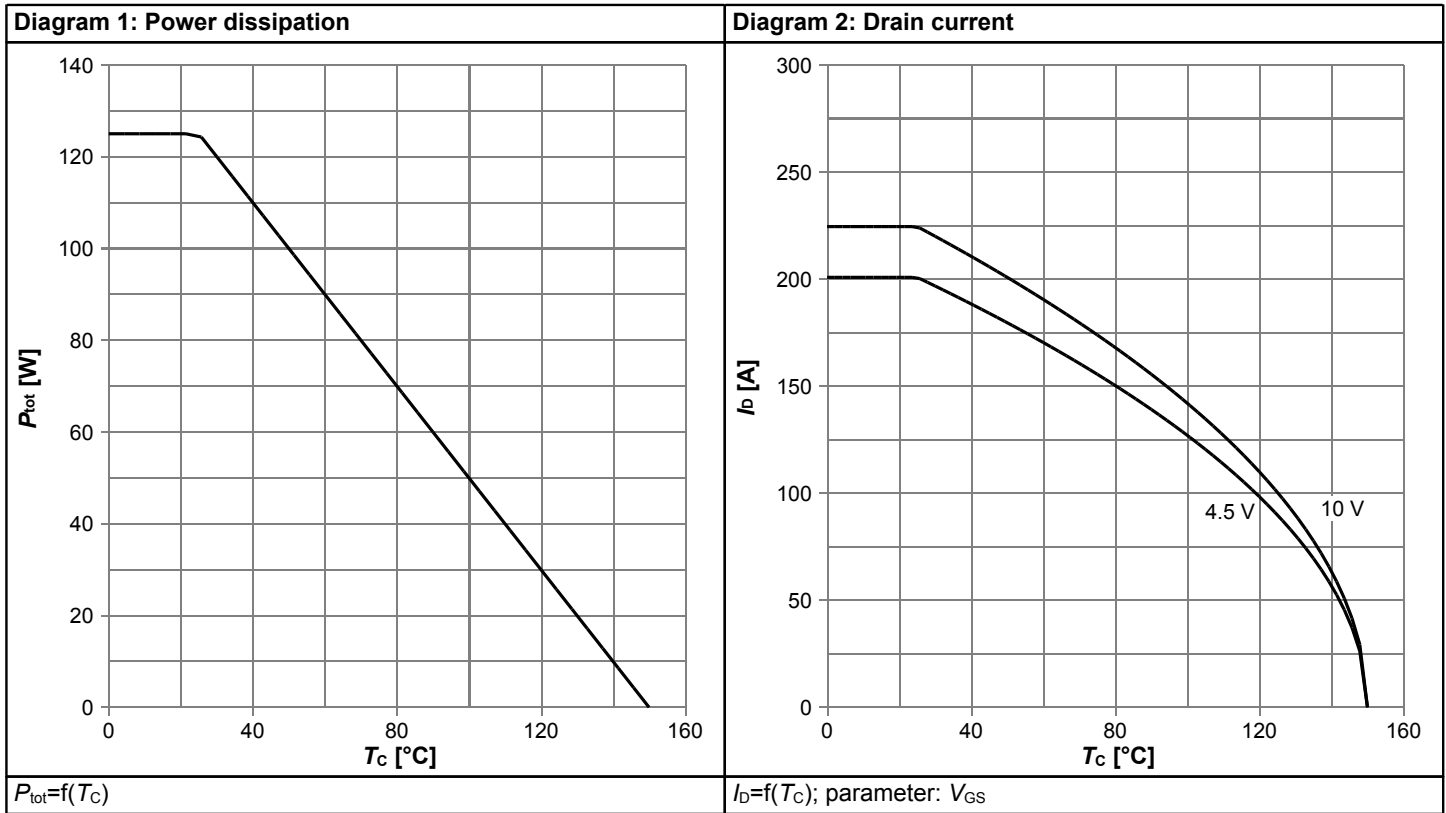
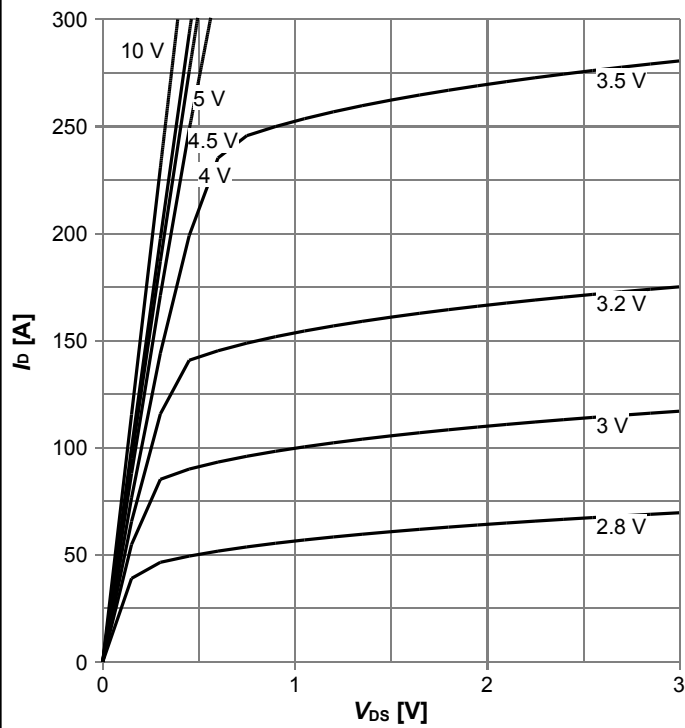
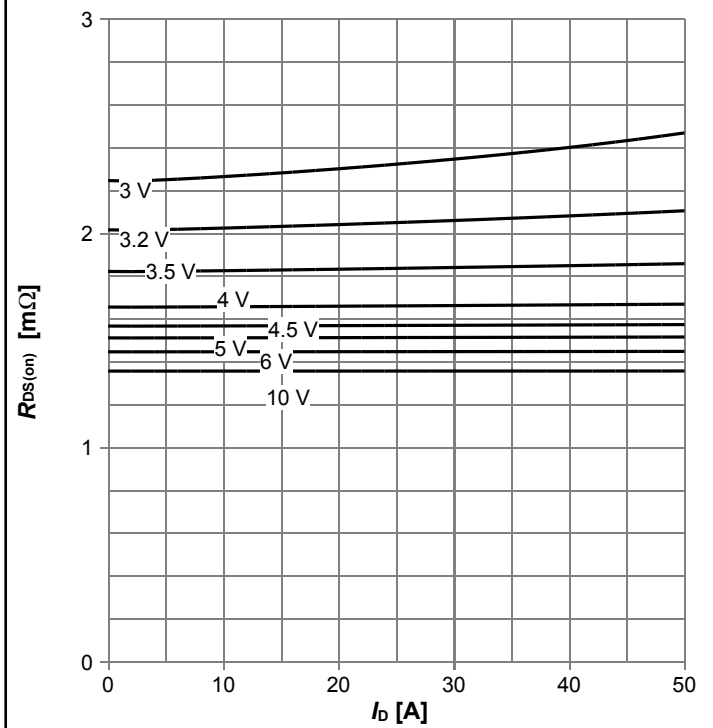


Diagram 5: Typ. output characteristics



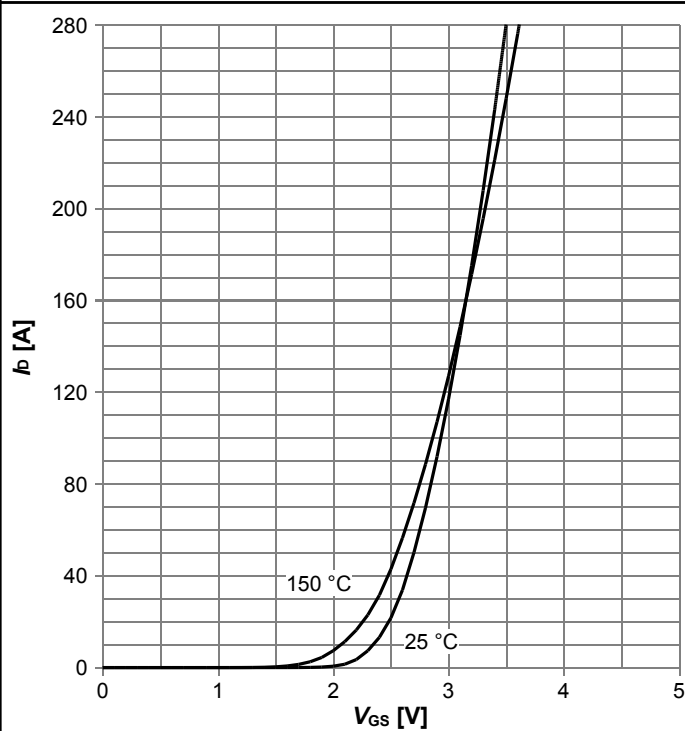
$I_D=f(V_{DS}); T_j=25\text{ °C};$ parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



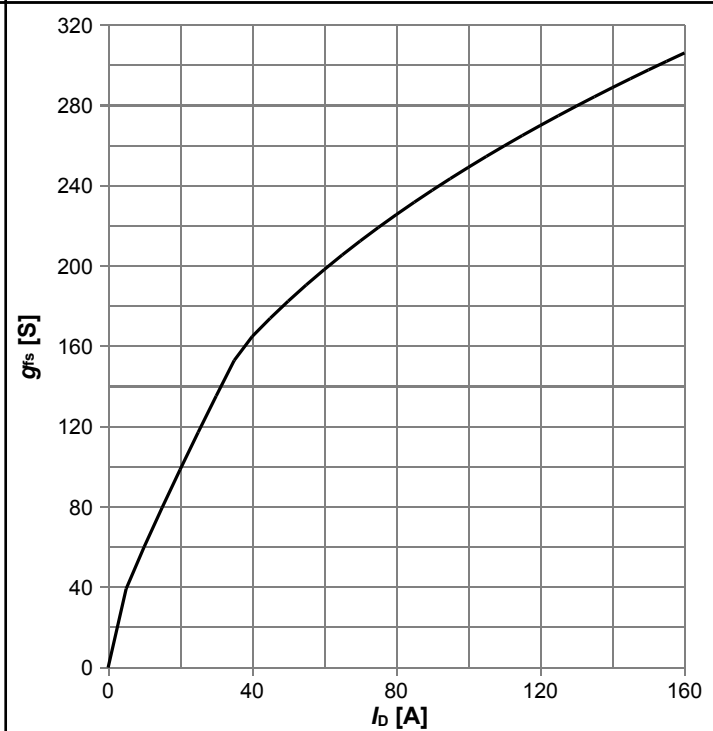
$R_{DS(on)}=f(I_D); T_j=25\text{ °C};$ parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



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

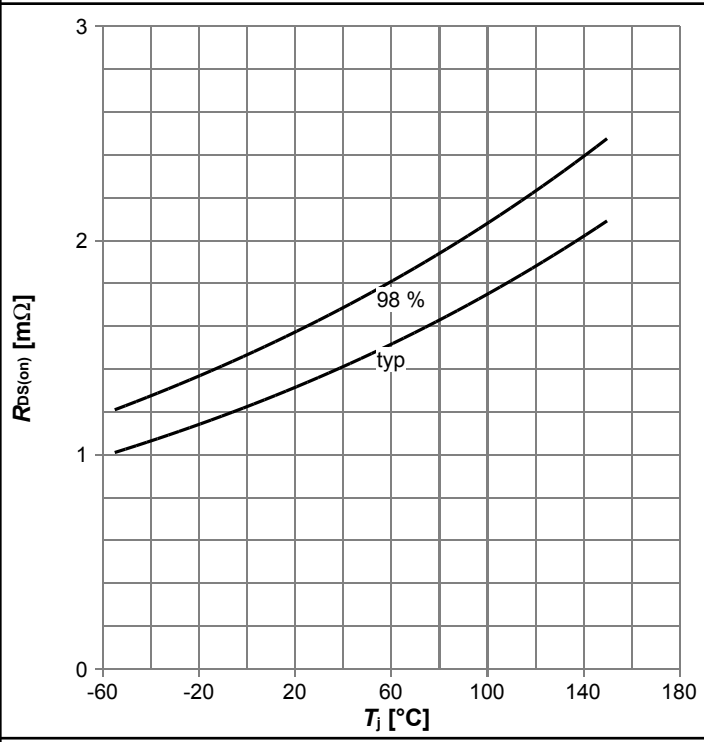
Diagram 8: Typ. forward transconductance



$g_{fs}=f(I_D); T_j=25\text{ °C}$

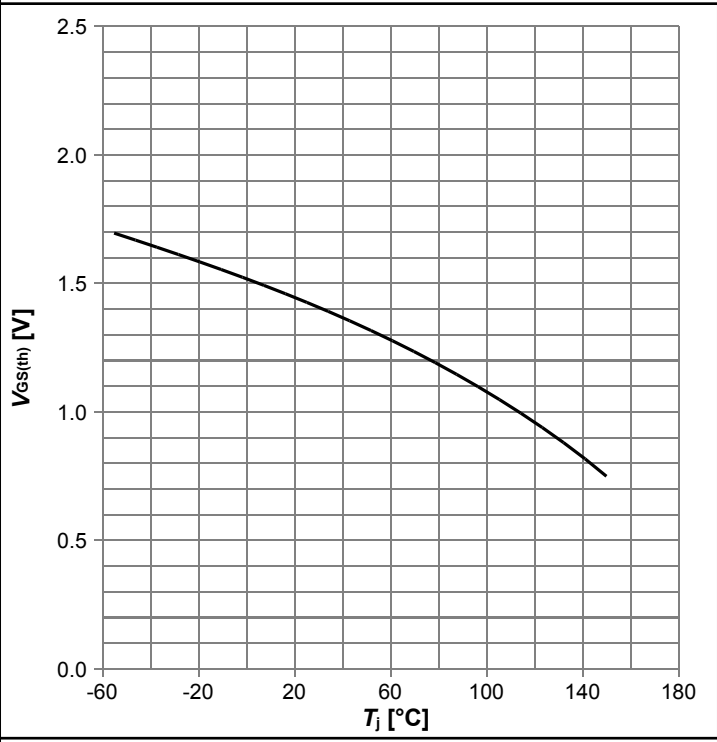


Diagram 9: Drain-source on-state resistance



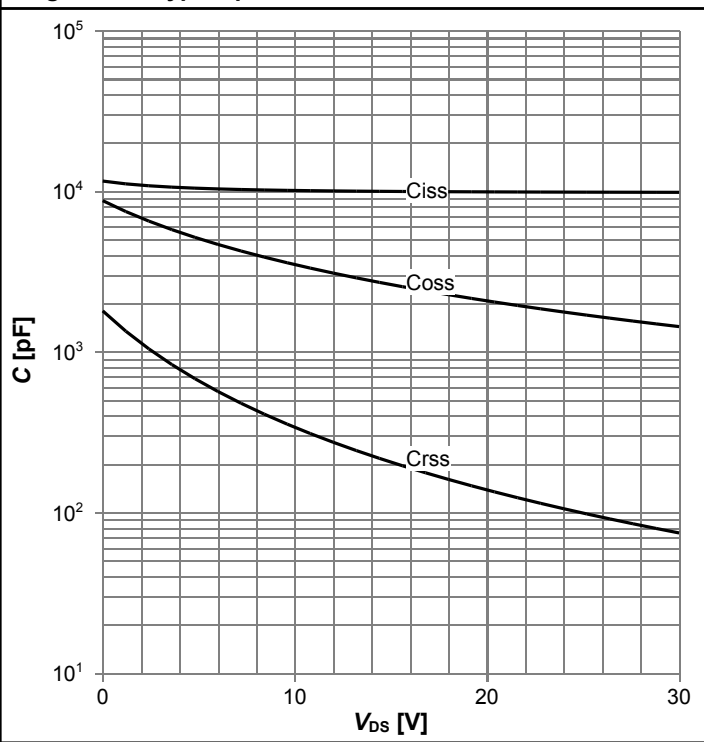
$R_{DS(on)}=f(T_j)$; $I_D=30\text{ A}$; $V_{GS}=10\text{ V}$

Diagram 10: Typ. gate threshold voltage



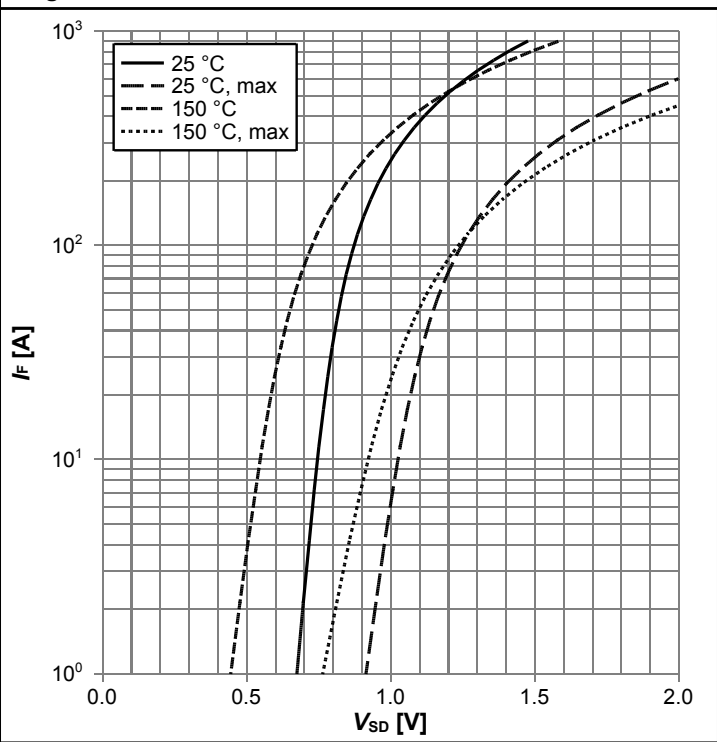
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; $I_D=250\text{ }\mu\text{A}$

Diagram 11: Typ. capacitances



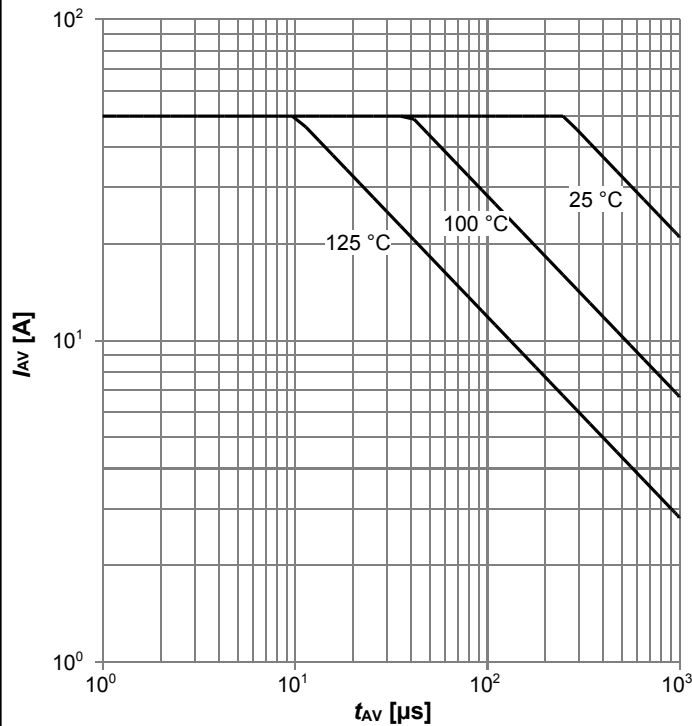
$C=f(V_{DS})$; $V_{GS}=0\text{ V}$; $f=1\text{ MHz}$

Diagram 12: Forward characteristics of reverse diode



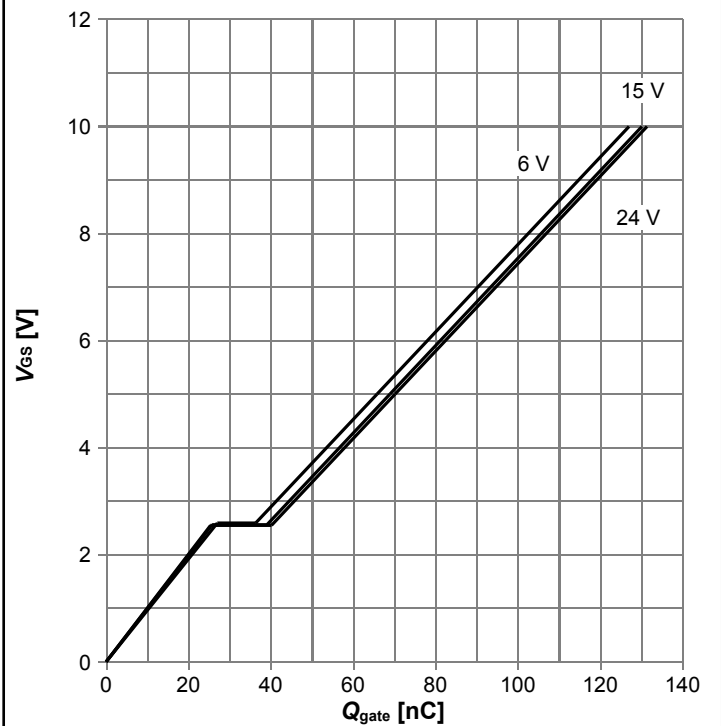
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



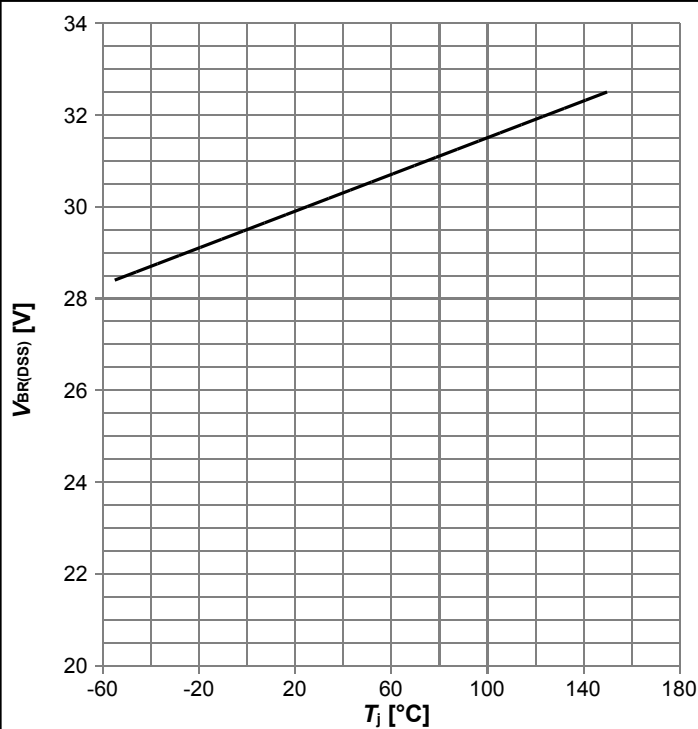
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



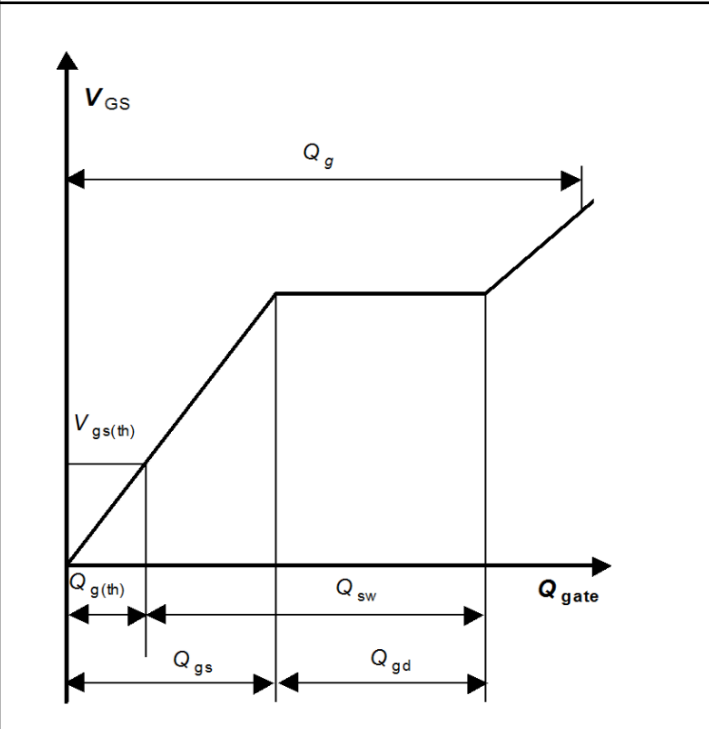
$V_{GS}=f(Q_{gate}); I_D=30$ A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

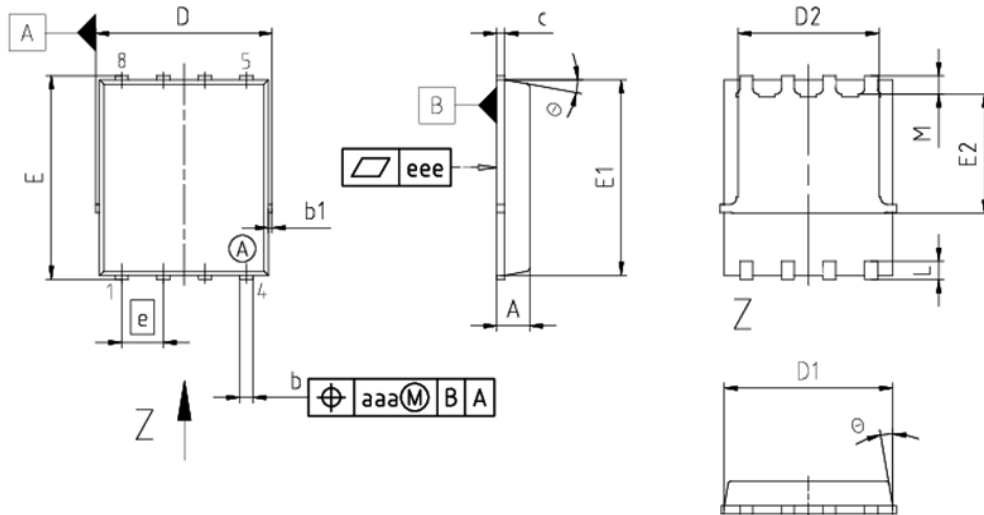


$V_{BR(DSS)}=f(T_j); I_D=1$ mA

Diagram 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
theta	8.5°	12°
aaa	0.25	
eee	0.08	

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REVISION
04

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

Revision History

BSC016N03MS G

Revision: 2020-03-13, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.1	2020-03-13	Update current rating

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