

MOSFET

OptiMOS™ 5 Power-MOSFET, 30 V

Features

- Optimized for high performance buck converters
- Monolithically integrated Schottky-like diode
- Very low on-resistance $R_{DS(on)}$ @ $V_{GS}=4.5\text{ V}$
- 100% avalanche tested
- N-channel
- Qualified according to JEDEC¹⁾ for target applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

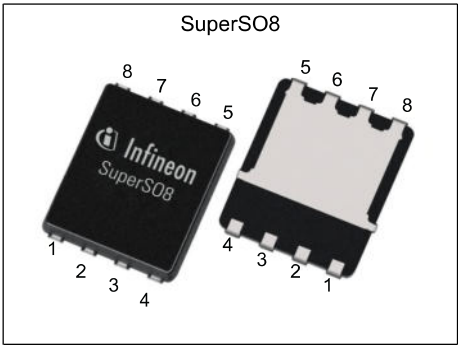
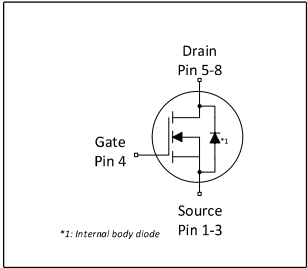


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	30	V
$R_{DS(on),max}$	2.3	mΩ
I_D	110	A
Q_{OSS}	13.5	nC
$Q_G(0V..4.5V)$	9.0	nC



RoHS

Type / Ordering Code	Package	Marking	Related Links
BSC0502NSI	PG-TDSON-8	0502NSI	-

¹⁾ J-STD20 and JESD22

Table of Contents

Description 1

Maximum ratings 3

Thermal characteristics 3

Electrical characteristics 4

Electrical characteristics diagrams 6

Package Outlines 10

Revision History 12

Trademarks 12

Disclaimer 12

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	-	-	110 70 100 63 26	A	$V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=4.5\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=4.5\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=10\text{ V}$, $T_A=25\text{ °C}$, $R_{thJA}=50\text{ K/W}^{(2)}$
Pulsed drain current ³⁾	$I_{D,pulse}$	-	-	440	A	$T_C=25\text{ °C}$
Avalanche current, single pulse ⁴⁾	I_{AS}	-	-	45	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse	E_{AS}	-	-	14	mJ	$I_D=45\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	43 2.5	W	$T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{thJA}=50\text{ K/W}^{(2)}$
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	R_{thJC}	-	-	2.9	K/W	-
Thermal resistance, junction - case, top	R_{thJC}	-	-	20	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 as specified. For other case temperatures 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 Diagram 3 for more detailed information

⁴⁾ See Diagram 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	$V_{GS}=0\text{ V}$, $I_D=10\text{ mA}$
Breakdown voltage temperature coefficient	$dV_{(BR)DSS}/dT_j$	-	15	-	mV/K	$I_D=10\text{ mA}$, referenced to 25 °C
Gate threshold voltage	$V_{GS(th)}$	1.2	-	2.0	V	$V_{DS}=V_{GS}$, $I_D=250\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	-	0.5	mA	$V_{DS}=24\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=24\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	2.4	2.8	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	-	1.4	2.3	Ω	-
Transconductance	g_{fs}	65	130	-	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 ¹⁾	C_{iss}	-	1200	1600	pF	$V_{GS}=0\text{ V}$, $V_{DS}=15\text{ V}$, $f=1\text{ MHz}$
Output capacitance ¹⁾	C_{oss}	-	420	570	pF	$V_{GS}=0\text{ V}$, $V_{DS}=15\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance	C_{rss}	-	44	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=15\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	3.6	-	ns	$V_{DD}=15\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Rise time	t_r	-	3.8	-	ns	$V_{DD}=15\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	19	-	ns	$V_{DD}=15\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Fall time	t_f	-	2.6	-	ns	$V_{DD}=15\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$

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

Table 6 Gate charge characteristics¹⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	3.1	-	nC	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0$ to 4.5 V
Gate charge at threshold	$Q_{g(th)}$	-	2.0	-	nC	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0$ to 4.5 V
Gate to drain charge	Q_{gd}	-	2.3	-	nC	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0$ to 4.5 V
Switching charge	Q_{sw}	-	3.4	-	nC	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0$ to 4.5 V
Gate charge total ²⁾	Q_g	-	9.0	12	nC	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0$ to 4.5 V
Gate plateau voltage	$V_{plateau}$	-	2.5	-	V	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0$ to 4.5 V
Gate charge total ²⁾	Q_g	-	19	26	nC	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0$ to 10 V
Gate charge total, sync. FET	$Q_{g(sync)}$	-	8.3	-	nC	$V_{DS}=0.1\text{ V}$, $V_{GS}=0$ to 4.5 V
Output charge ²⁾	Q_{oss}	-	13.5	18	nC	$V_{DD}=15\text{ V}$, $V_{GS}=0\text{ V}$

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	50	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	440	A	$T_C=25\text{ °C}$
Diode forward voltage	V_{SD}	-	0.54	0.65	V	$V_{GS}=0\text{ V}$, $I_F=5\text{ A}$, $T_j=25\text{ °C}$
Reverse recovery charge	Q_{rr}	-	15	-	nC	$V_R=15\text{ V}$, $I_F=I_S$, $di_F/dt=400\text{ A}/\mu\text{s}$

¹⁾ See "Gate charge waveforms" for parameter definition

²⁾ Defined by design. Not subject to production test.

4 Electrical characteristics diagrams

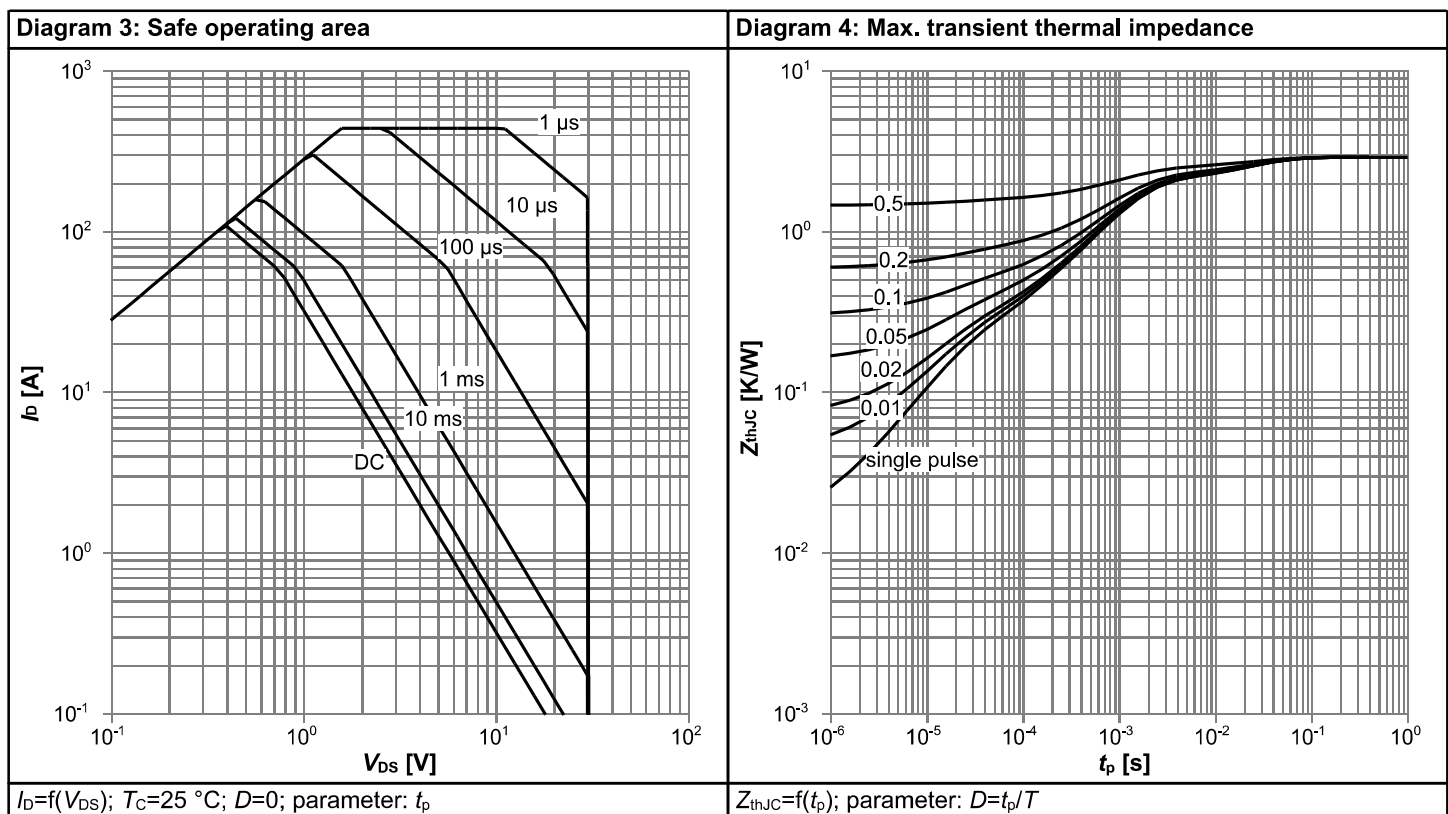
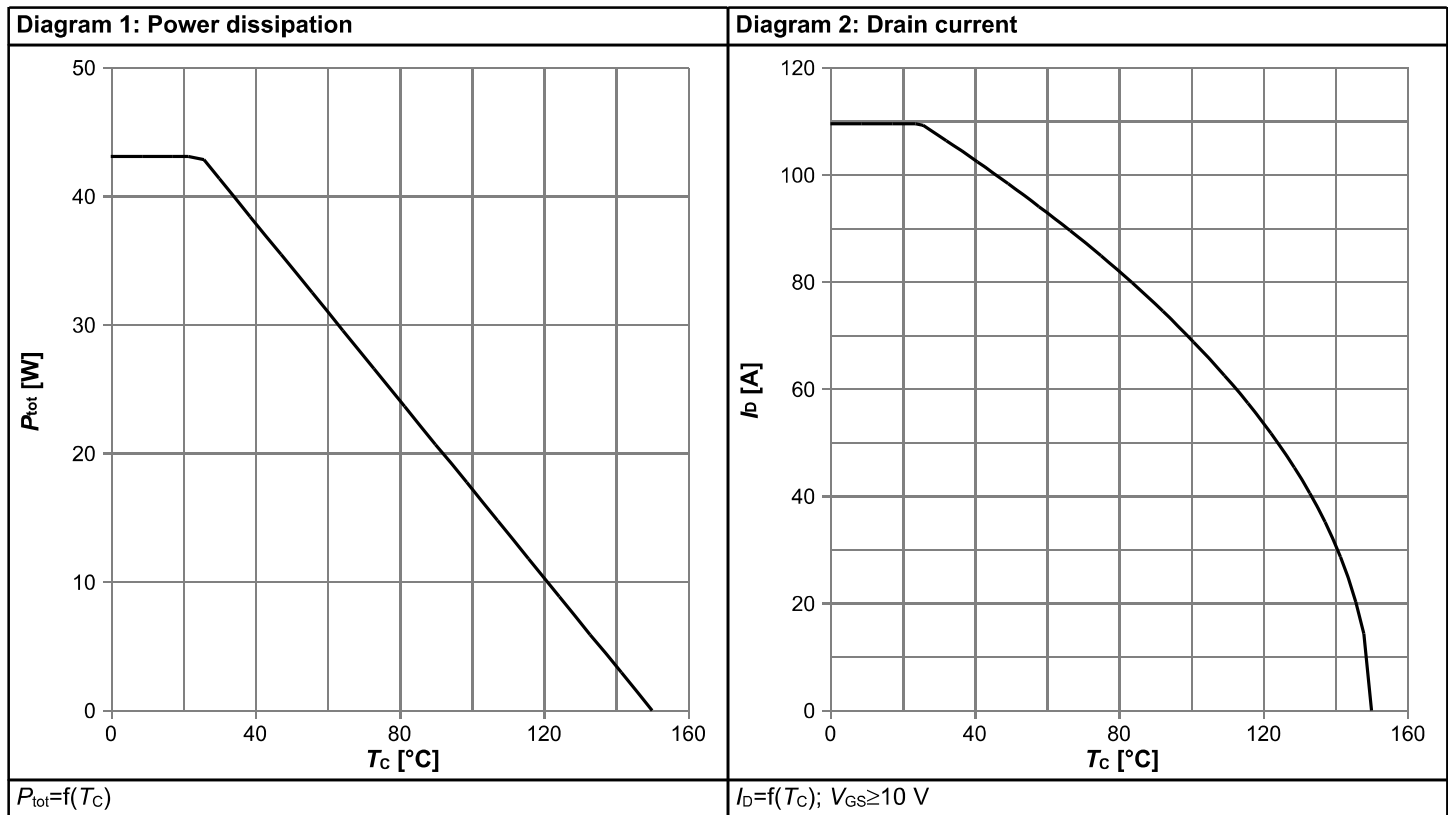
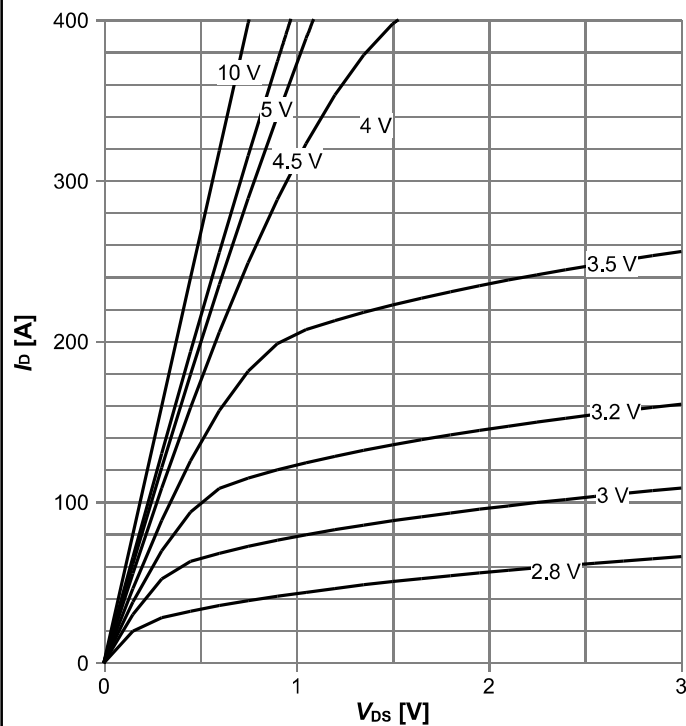
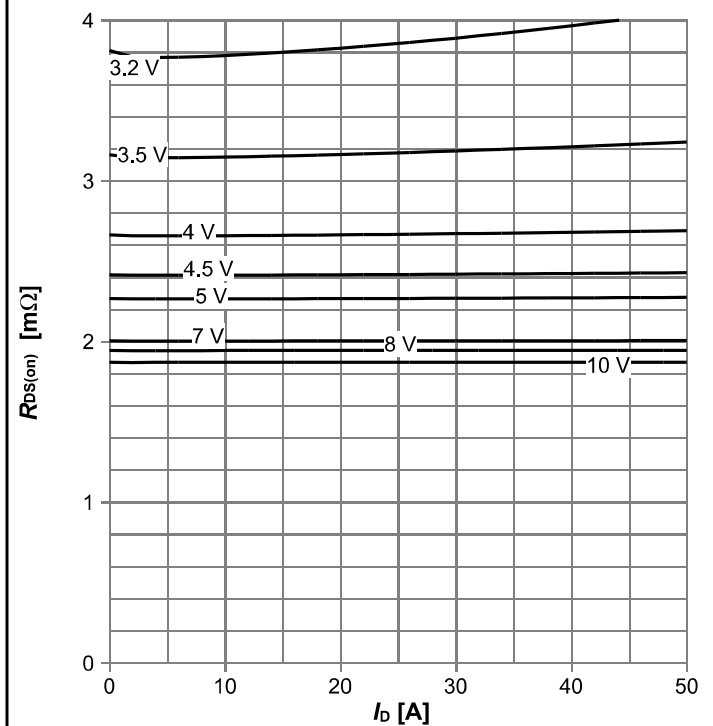


Diagram 5: Typ. output characteristics



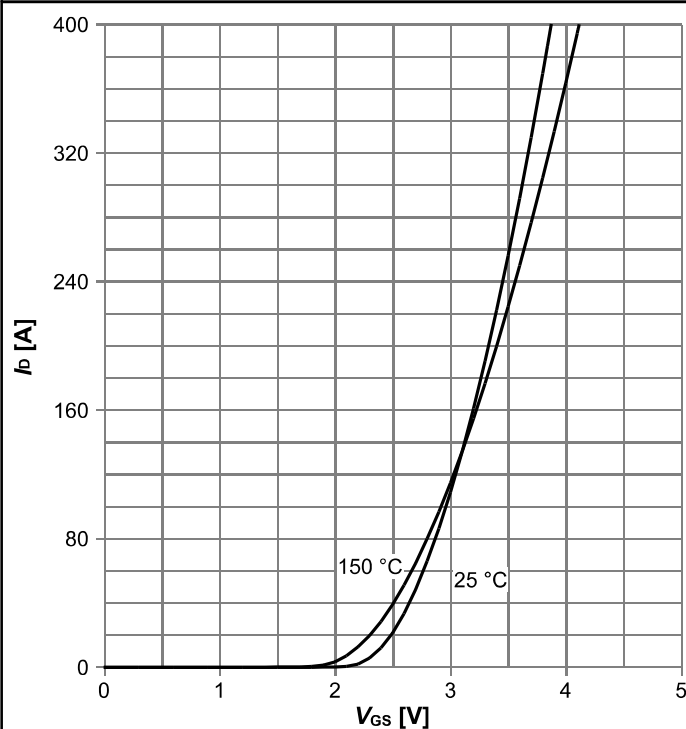
$I_D = f(V_{DS})$; $T_J = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



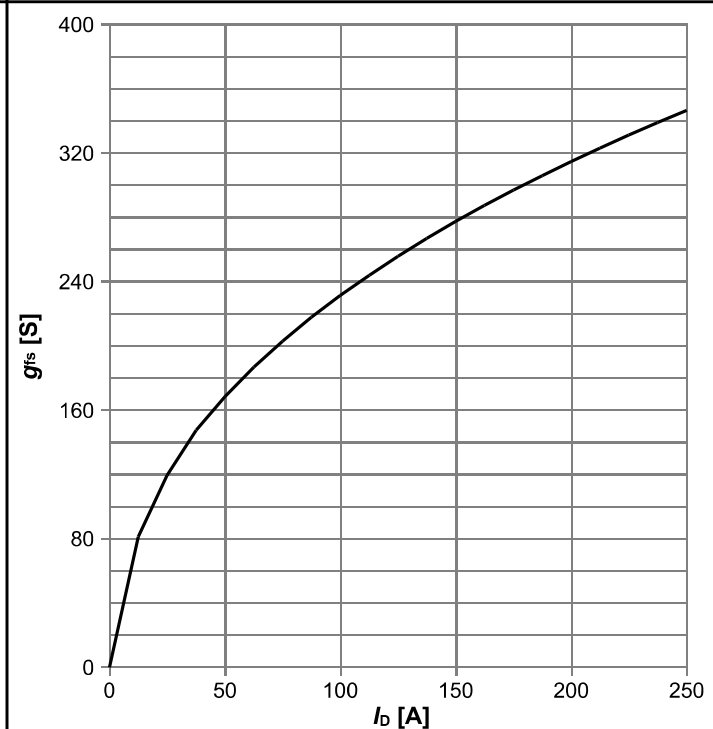
$R_{DS(on)} = f(I_D)$; $T_J = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



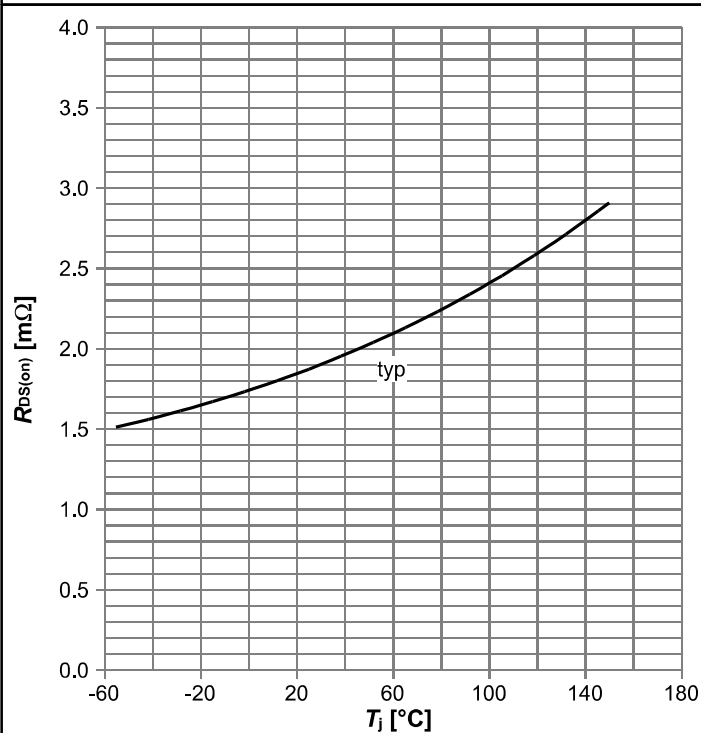
$I_D = f(V_{GS})$; $|V_{DS}| > 2|I_D|R_{DS(on)max}$; parameter: T_J

Diagram 8: Typ. forward transconductance



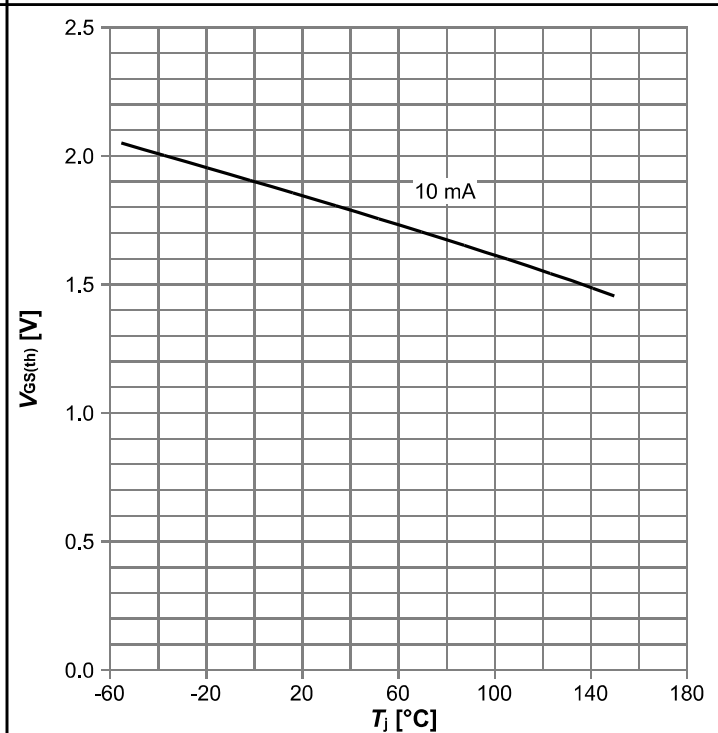
$g_{fs} = f(I_D)$; $T_J = 25^\circ\text{C}$

Diagram 9: Drain-source on-state resistance



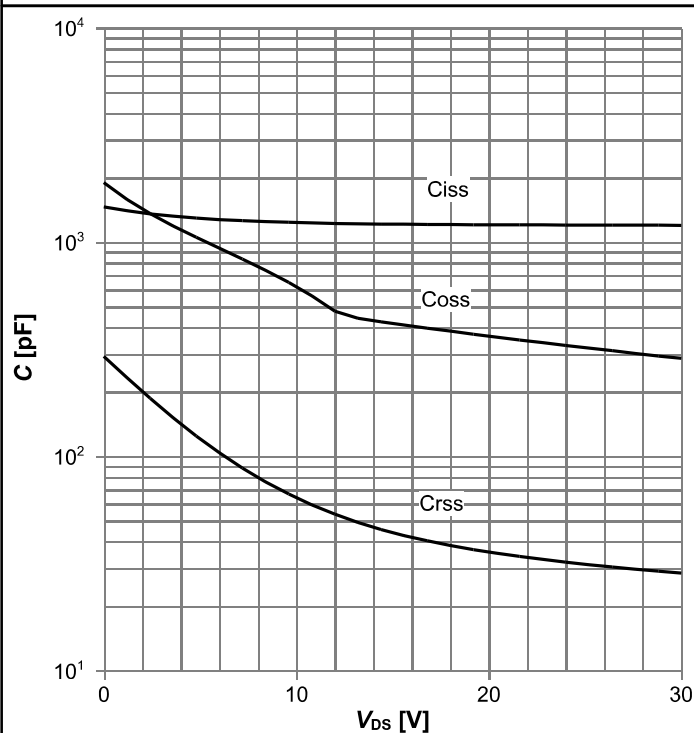
$R_{DS(on)} = f(T_j)$; $I_D = 30 \text{ A}$; $V_{GS} = 10 \text{ V}$

Diagram 10: Typ. gate threshold voltage



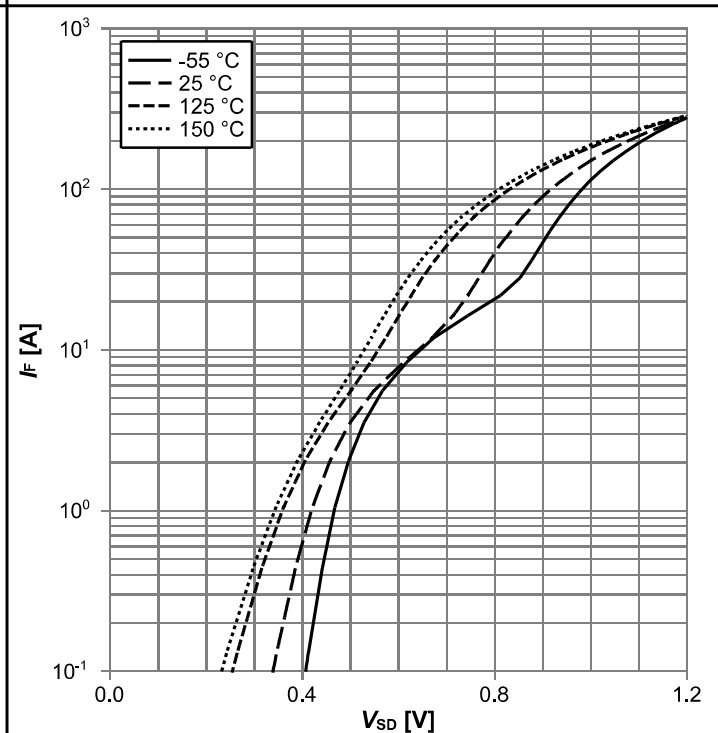
$V_{GS(th)} = f(T_j)$; $V_{GS} = V_{DS}$

Diagram 11: Typ. capacitances



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

Diagram 12: Forward characteristics of reverse diode

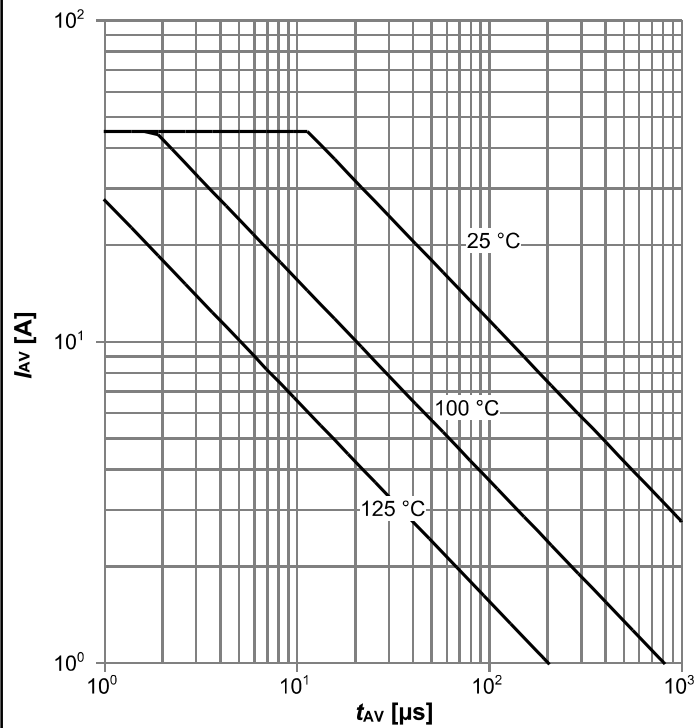


$I_F = f(V_{SD})$; parameter: T_j

OptiMOS™ 5 Power-MOSFET, 30 V

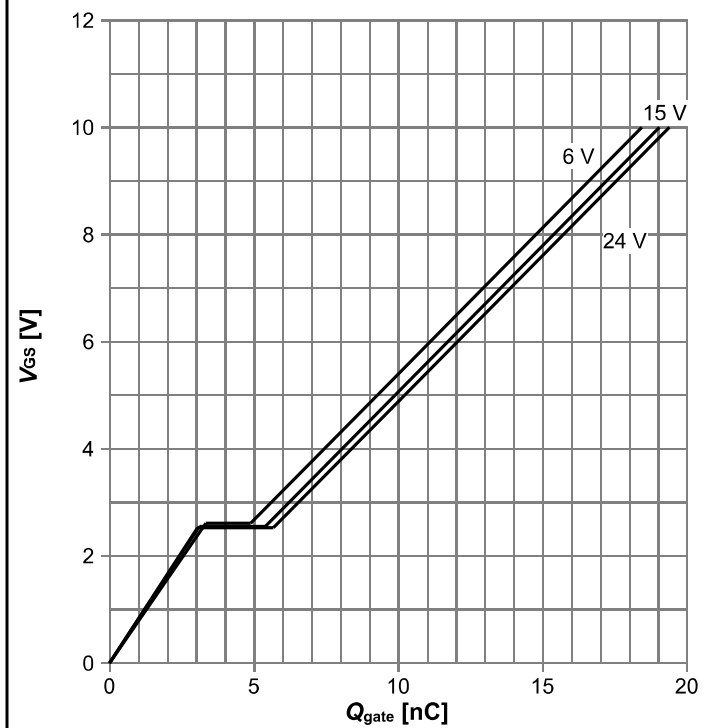
BSC0502NSI

Diagram 13: Avalanche characteristics



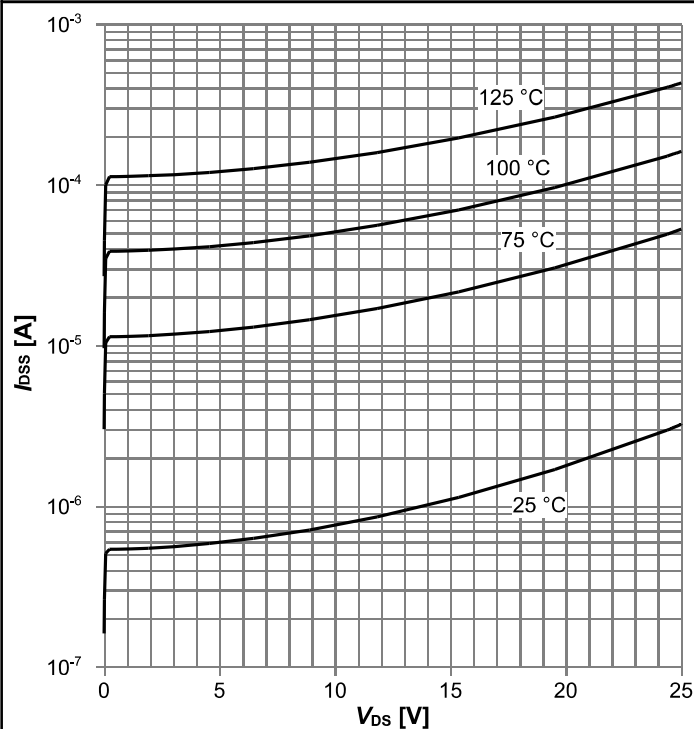
$I_{AS}=f(t_{AV})$; $R_{GS}=25\ \Omega$; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



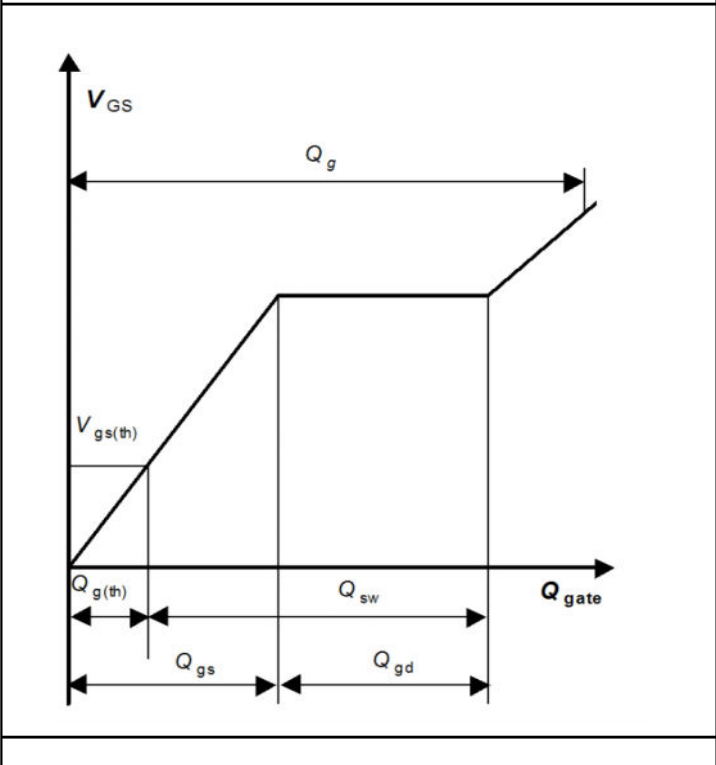
$V_{GS}=f(Q_{gate})$; $I_D=30\text{ A}$ pulsed; parameter: V_{DD}

Diagram 15: Typ. drain-source leakage current

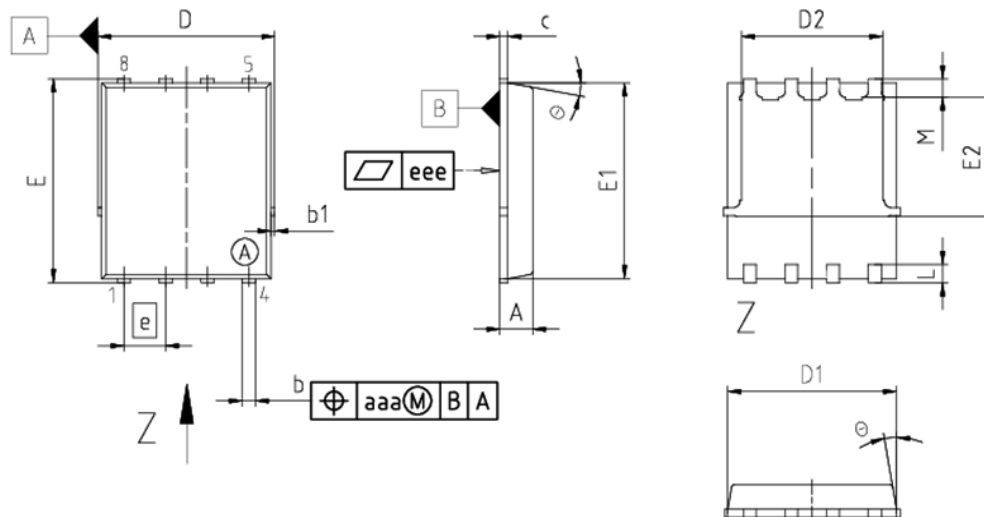


$I_{DSS}=f(V_{DS})$; $V_{GS}=0\text{ V}$; parameter: T_j

Diagram Gate charge waveforms



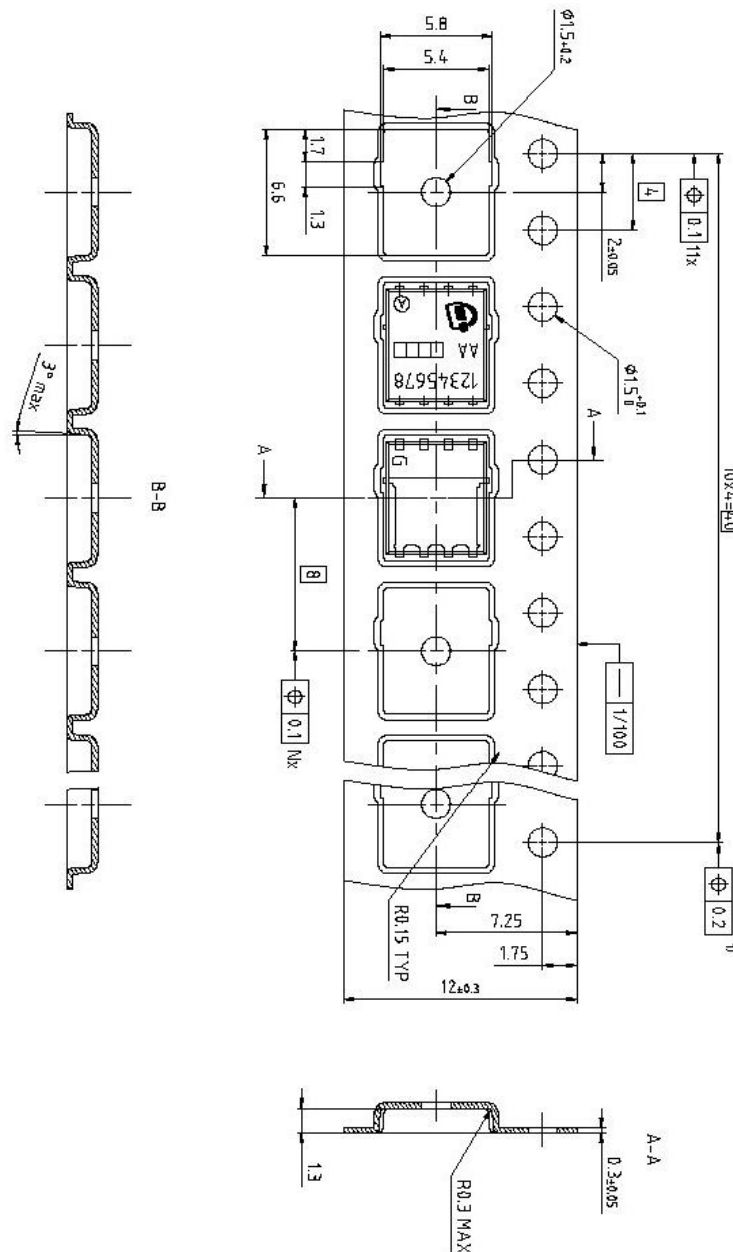
5 Package Outlines



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
ø	8.5°	12°
aaa	0.25	
eee	0.08	

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REVISION 04

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



Dimension in mm

Figure 2 Outline Tape (TDSON-8)

Revision History

BSC0502NSI

Revision: 2021-08-03, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2015-07-13	Release of final version
2.1	2021-08-03	Update current rating and footnotes

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