MOSFET

Metal Oxide Semiconductor Field Effect Transistor

OptiMOS™

OptiMOS™3 Power-MOSFET, 75 V
BSF450NE7NH3 G

Data Sheet

Rev. 2.2
Final

Power Management & Multimarket

1 Description

Features

- Optimized technology for DC/DC converters
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Superior thermal resistance
- Dual sided cooling
- Low parasitic inductance
- Low profile (<0.7mm)
- N-channel, normal level
- 100% avalanche tested
- Pb-free plating; RoHS compliant
- Qualified according to JEDEC[1)] for target applications
- Compatible with DirectFET® package ST footprint and outline

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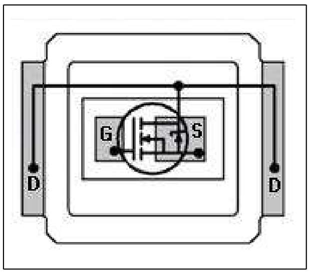


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	75	V
$R_{DS(on),max}$	45	mΩ
I_D	15	A

Type / Ordering Code	Package	Marking	Related Links
BSF450NE7NH3 G	MG-WDSON-2	0307	-

[1)] J-STD20 and JESD22

Table of Contents

2 Maximum ratings

at T_j = 25 °C, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	I_D	- - -	- - -	15 10 5	A	V_{GS}=10 V, T_C=25 °C V_{GS}=10 V, T_C=100 °C V_{GS}=10 V, T_A=25 °C, R_{thJA}=58 K/W[1]
Pulsed drain current[2]	$I_{D,pulse}$	-	-	60	A	T_C=25 °C
Avalanche energy, single pulse[3]	E_{AS}	-	-	17	mJ	I_D=8 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	- -	- -	18 2.2	W	T_C=25 °C T_A=25 °C, R_{thJA}=58 K/W[1]
Operating and storage temperature	T_j, T_{stg}	-40	-	150	°C	IEC climatic category; DIN IEC 68-1: 55/150/56

3 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case, bottom	R_{thJC}	-	1.0	-	K/W	-
Thermal resistance, junction - case, top	R_{thJC}	-	-	7	K/W	-
Device on PCB, 6 cm^2 cooling area[1]	R_{thJA}	-	-	58	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 figure 3 for more detailed information
[3] See figure 13 for more detailed information

4 Electrical characteristics

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	75	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	2.3	2.9	3.5	V	V_{DS}=V_{GS}, I_D=8 µA
Zero gate voltage drain current	I_{DSS}	- -	0.1 10	10 100	µA	V_{DS}=75 V, V_{GS}=0 V, T_j=25 °C V_{DS}=75 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	10	100	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	- -	37.6 46.5	45 62	mΩ	V_{GS}=10 V, I_D=8 A V_{GS}=7 V, I_D=4 A
Gate resistance	R_G	-	1.5	-	Ω	-
Transconductance	g_{fs}	5.5	11	-	S	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=8 A

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	390	-	pF	V_{GS}=0 V, V_{DS}=37.5 V, f=1 MHz
Output capacitance	C_{oss}	-	110	-	pF	V_{GS}=0 V, V_{DS}=37.5 V, f=1 MHz
Reverse transfer capacitance	C_{rss}	-	22	-	pF	V_{GS}=0 V, V_{DS}=37.5 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	8.0	-	ns	V_{DD}=37.5 V, V_{GS}=10 V, I_D=8 A, $R_{G,ext}$=1.6 Ω
Rise time	t_r	-	11.3	-	ns	V_{DD}=37.5 V, V_{GS}=10 V, I_D=8 A, $R_{G,ext}$=1.6 Ω
Turn-off delay time	$t_{d(off)}$	-	11	-	ns	V_{DD}=37.5 V, V_{GS}=10 V, I_D=8 A, $R_{G,ext}$=1.6 Ω
Fall time	t_f	-	3.2	-	ns	V_{DD}=37.5 V, V_{GS}=10 V, I_D=8 A, $R_{G,ext}$=1.6 Ω

Table 6 Gate charge characteristics[1)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	2	-	nC	V_{DD}=37.5 V, I_D=8 A, V_{GS}=0 to 10 V
Gate to drain charge	Q_{gd}	-	2	-	nC	V_{DD}=37.5 V, I_D=8 A, V_{GS}=0 to 10 V
Switching charge	Q_{sw}	-	3	-	nC	V_{DD}=37.5 V, I_D=8 A, V_{GS}=0 to 10 V
Gate charge total	Q_g	-	6	-	nC	V_{DD}=37.5 V, I_D=8 A, V_{GS}=0 to 10 V
Gate plateau voltage	$V_{plateau}$	-	5.5	-	V	V_{DD}=37.5 V, I_D=8 A, V_{GS}=0 to 10 V
Output charge	Q_{oss}	-	7	-	nC	V_{DD}=37.5 V, V_{GS}=0 V

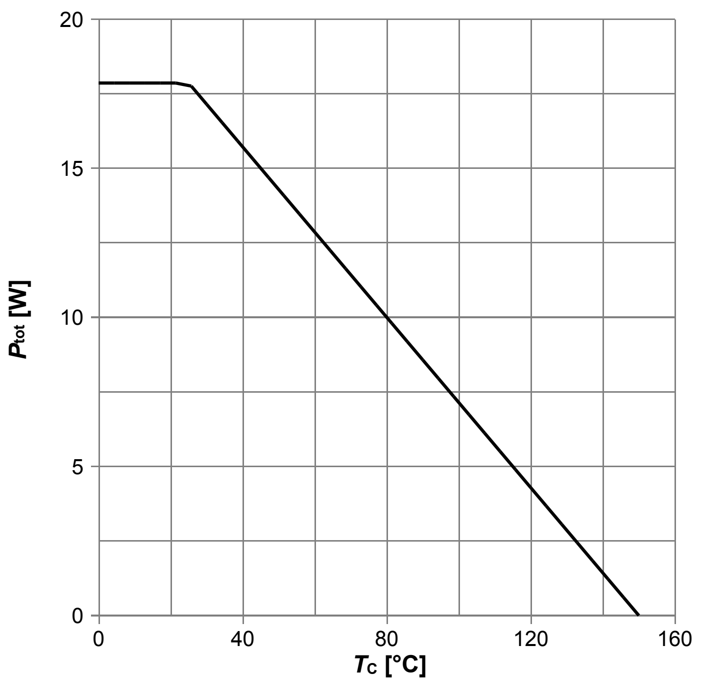
[1)] See "Gate charge waveforms" for parameter definition

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	15	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	60	A	T_C=25 °C
Diode forward voltage	V_{SD}	-	0.9	1.2	V	V_{GS}=0 V, I_F=8 A, T_j=25 °C
Reverse recovery time	t_{rr}	-	24	-	ns	V_R=37.5 V, I_F=I_S, di_F/dt=400 A/µs
Reverse recovery charge	Q_{rr}	-	87	-	nC	V_R=37.5 V, I_F=I_S, di_F/dt=400 A/µs

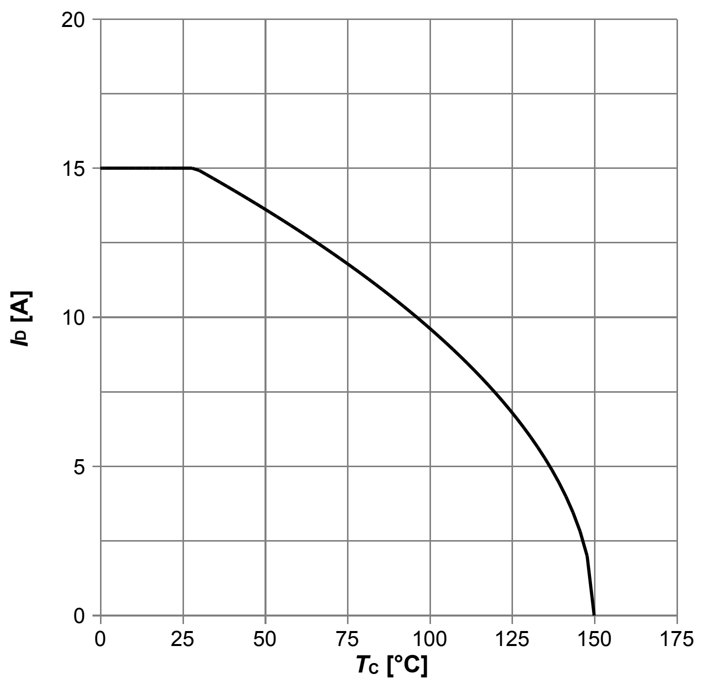
5 Electrical characteristics diagrams

Diagram 1: Power dissipation



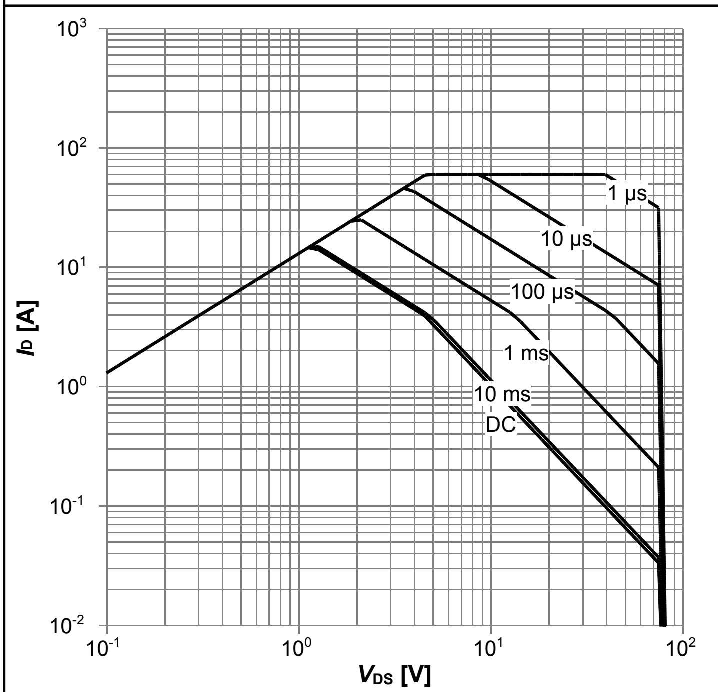
P_{tot}=f(T_C)

Diagram 2: Drain current



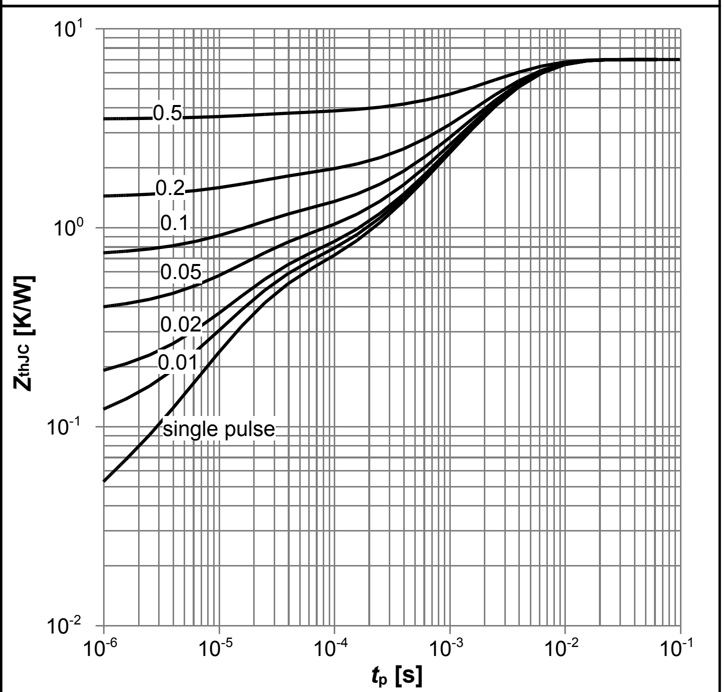
I_D=f(T_C); V_{GS}≥10 V

Diagram 3: Safe operating area



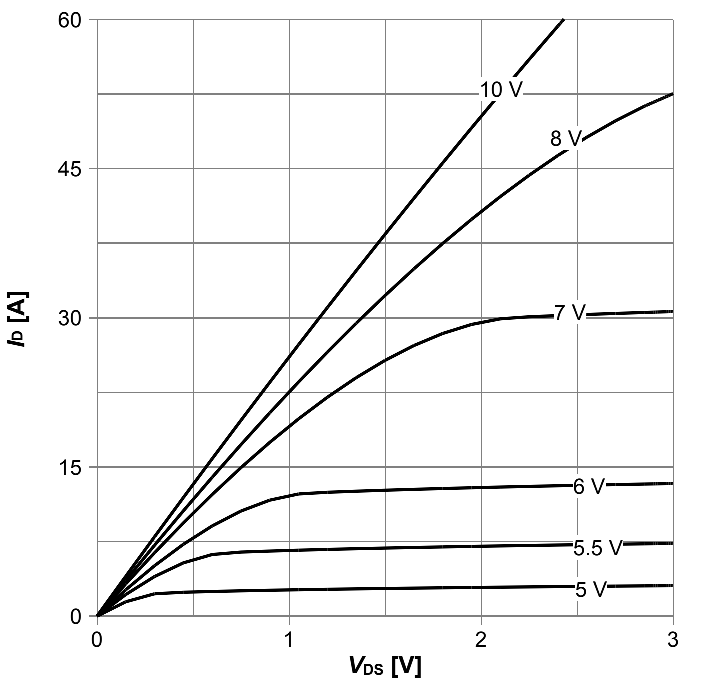
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



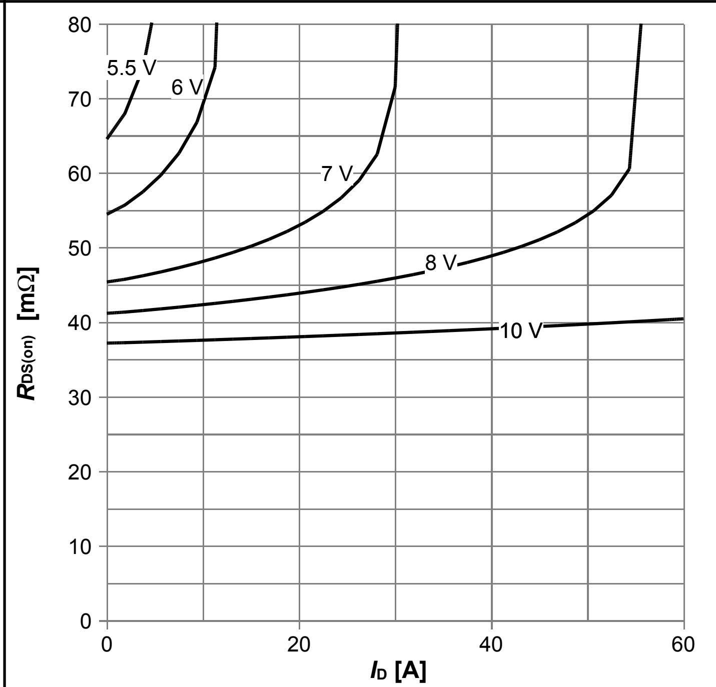
Z_{thJC}=f(t_p); parameter: D=t_p/T

Diagram 5: Typ. output characteristics



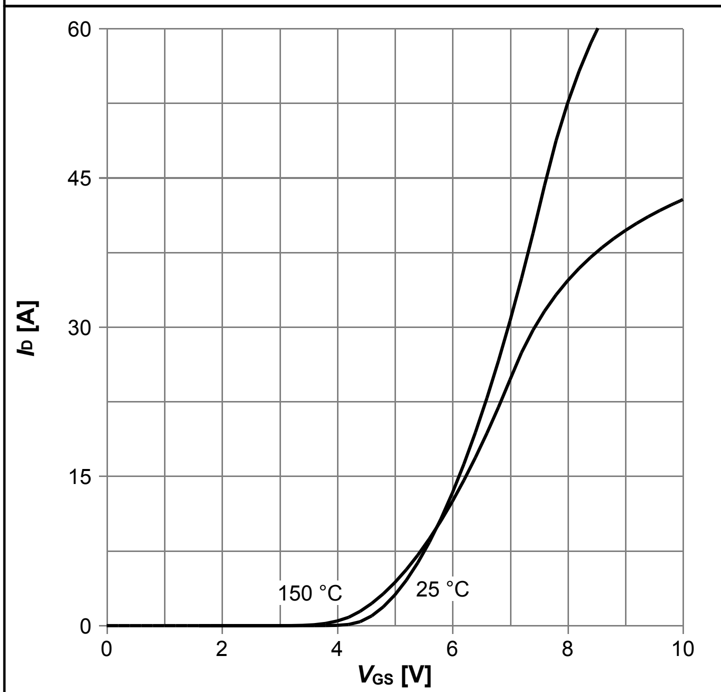
I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



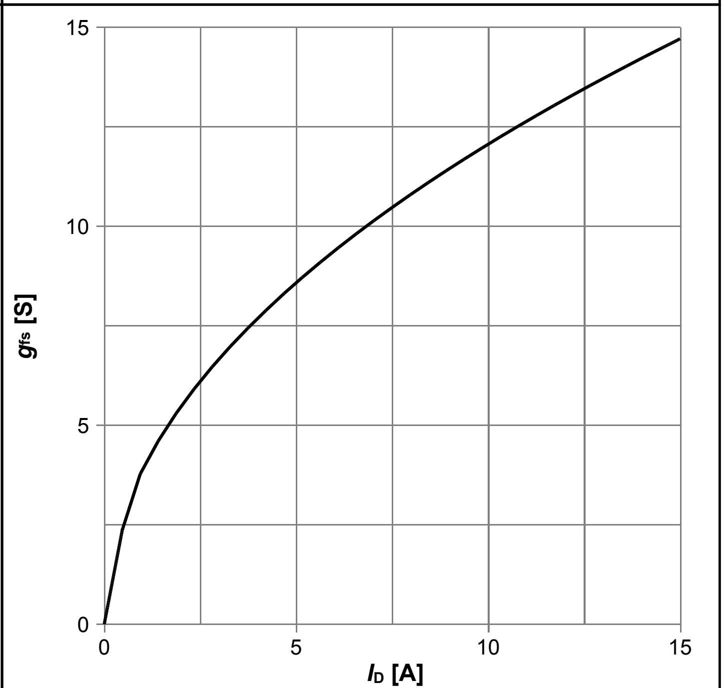
$R_{DS(on)}$=f(I_D); T_j=25 °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



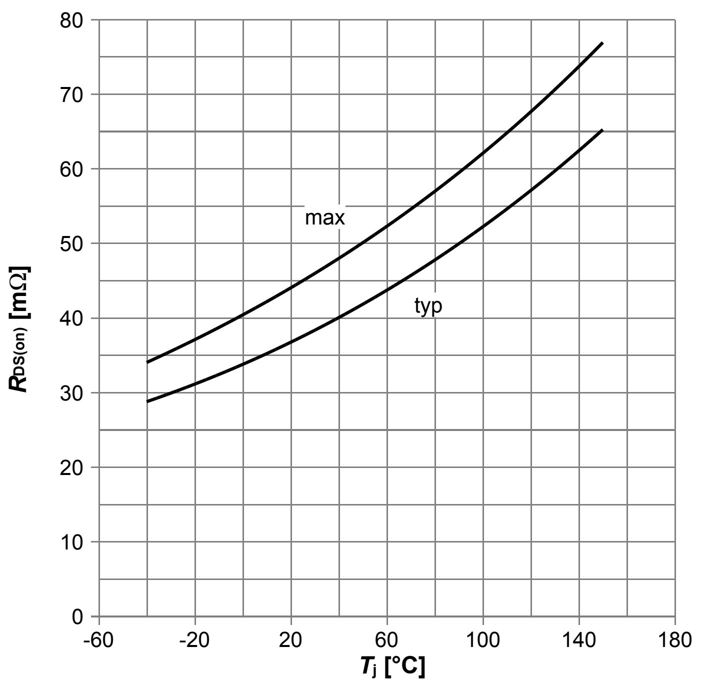
I_D=f(V_{GS}); $|V_{DS}|$>2$|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



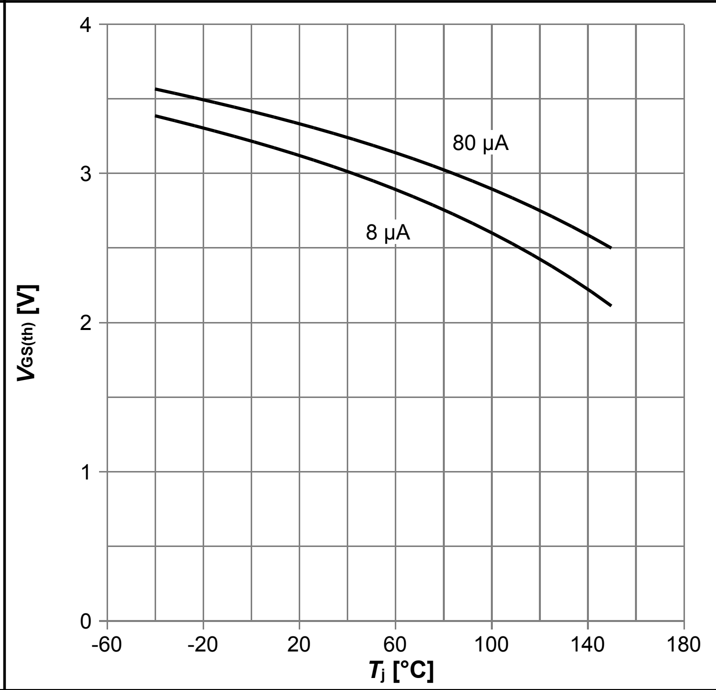
g_{fs}=f(I_D); T_j=25 °C

Diagram 9: Drain-source on-state resistance



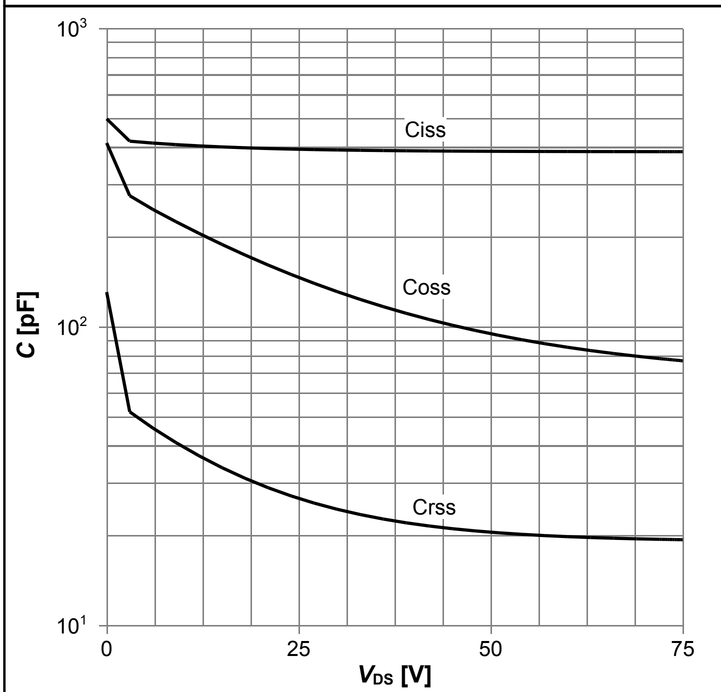
$R_{DS(on)}$=f(T_j); I_D=8 A; V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



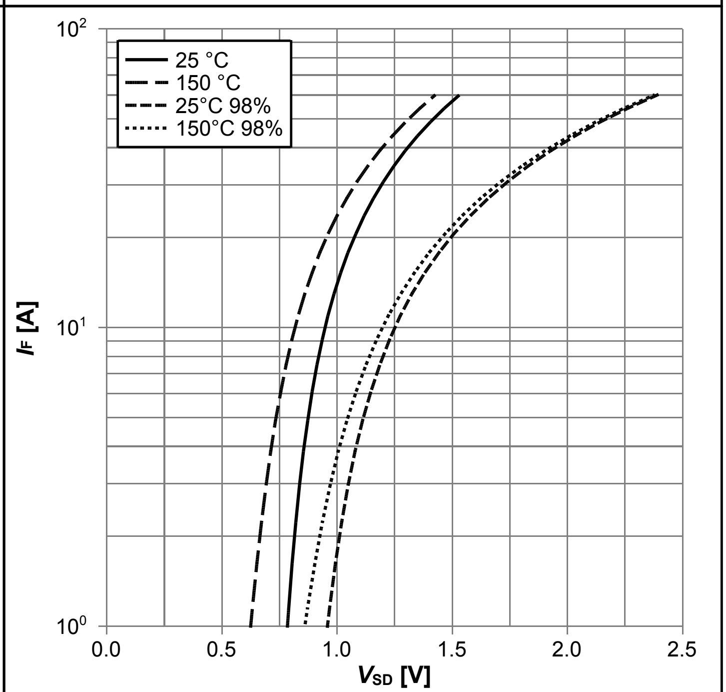
$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}

Diagram 11: Typ. capacitances



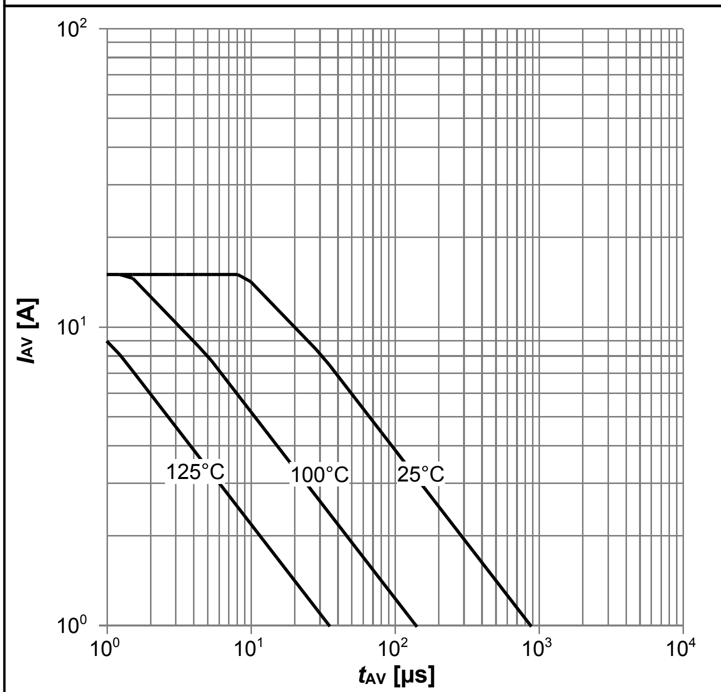
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Diagram 12: Forward characteristics of reverse diode



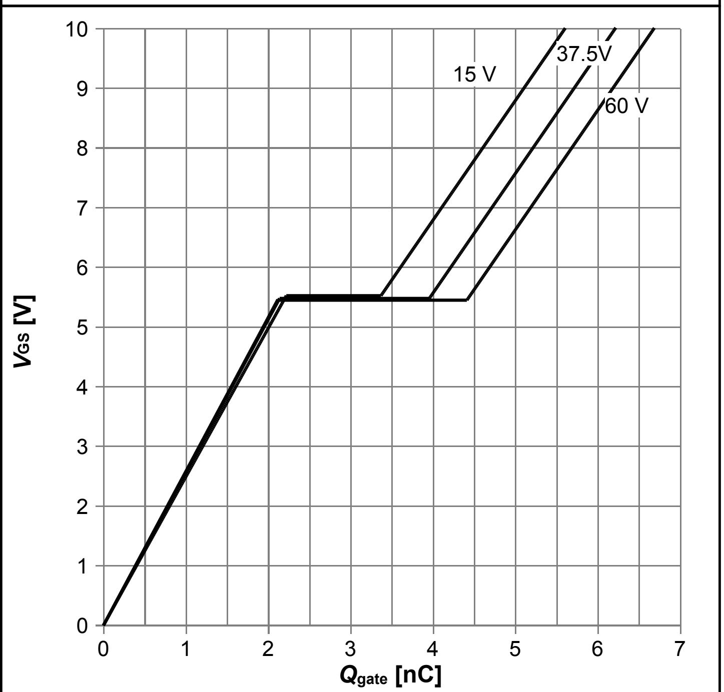
I_F=f(V_{SD}); parameter: T_j

Diagram 13: Avalanche characteristics



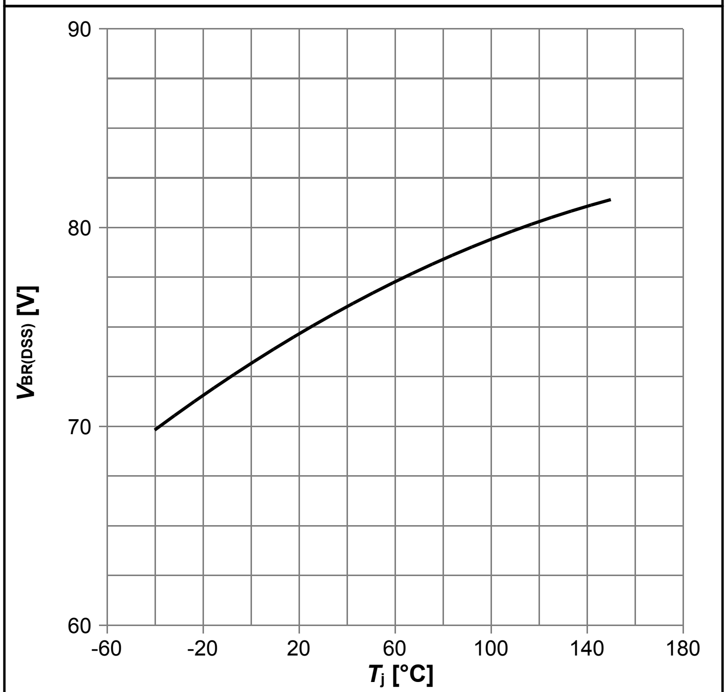
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



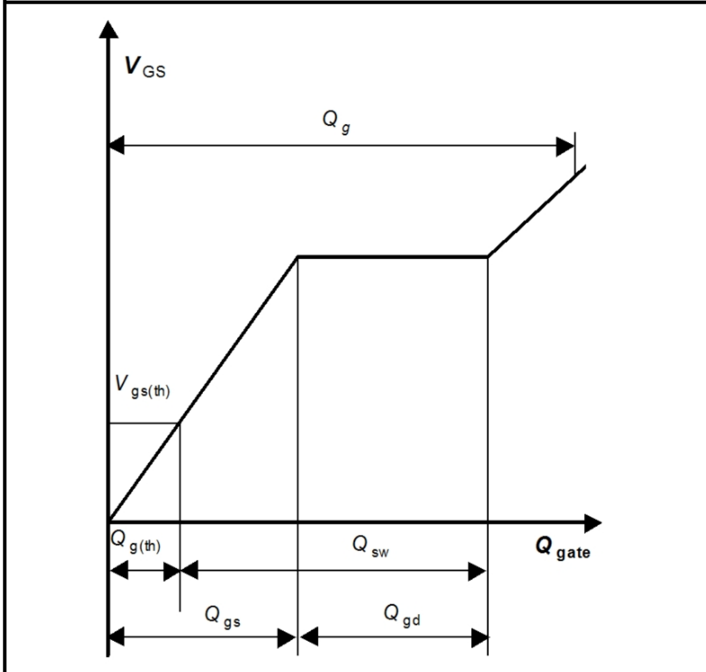
V_{GS}=f(Q_{gate}); I_D=8 A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

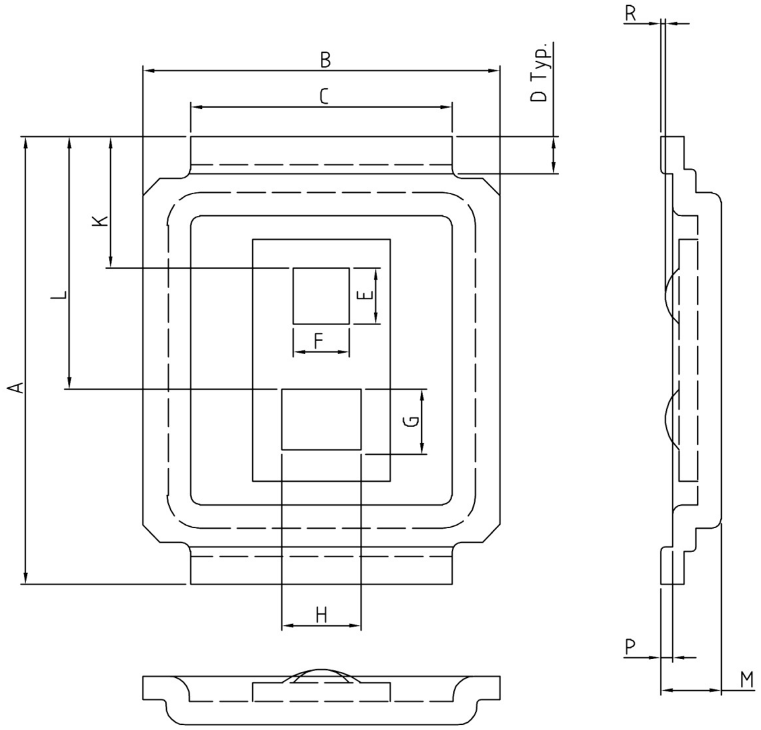


$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Gate charge waveforms



6 Package Outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.75	4.88	0.187	0.192
B	3.70	3.95	0.146	0.156
C	2.75	2.85	0.108	0.112
D	0.35	0.45	0.014	0.018
E	0.58	0.62	0.023	0.024
F	0.58	0.62	0.023	0.024
G	0.63	0.67	0.025	0.026
H	0.83	0.87	0.033	0.034
K	1.31	1.51	0.052	0.059
L	2.61	2.81	0.103	0.111
M	0.60	0.70	0.024	0.028
R	0.00	0.10	0.000	0.004
P	0.08	0.17	0.003	0.007

DOCUMENT NO.
Z8B00134586

SCALE
0 5 7.5mm

EUROPEAN PROJECTION

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REVISION
02

Figure 1 Outline MG-WDSON-2, dimensions in mm/inches

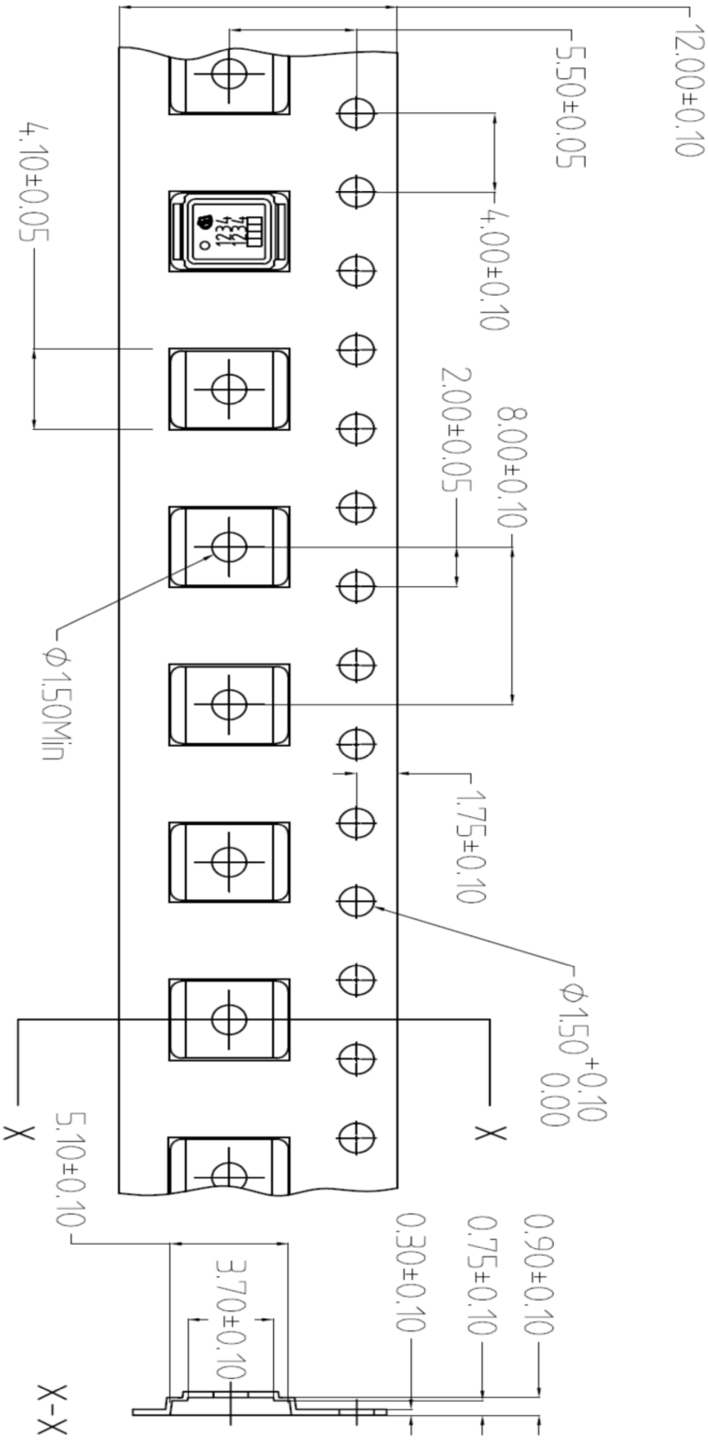

Figure 2 Outline MG-WDSON-2 Tape

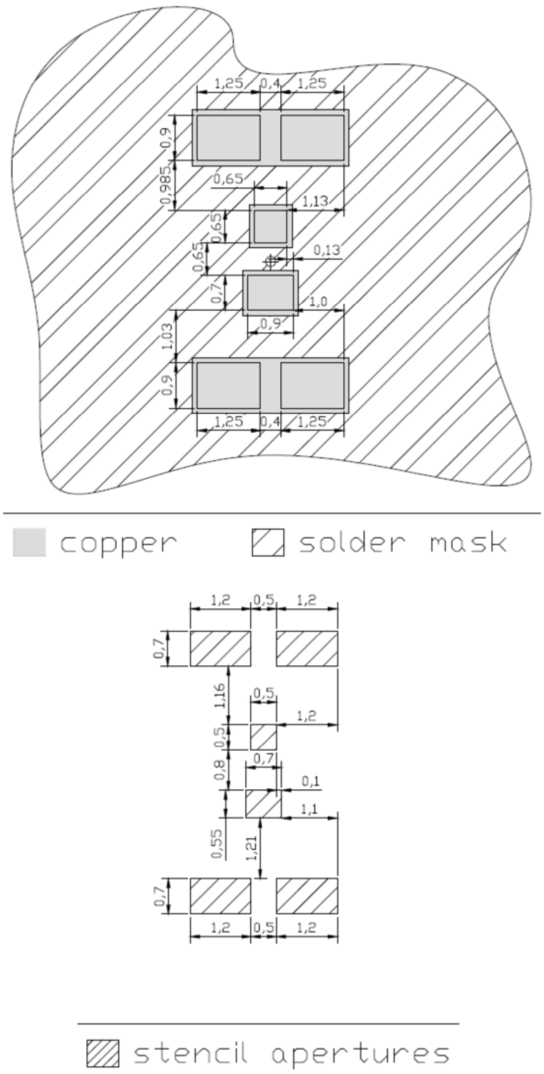

Figure 3 Outline MG-WDSON-2 Boardpad

Revision History

BSF450NE7NH3 G

Revision: 2015-03-30, Rev. 2.2

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.2	2015-03-30	Release of Final version

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