

MOSFET

OptiMOS™3 Power-MOSFET, 80 V

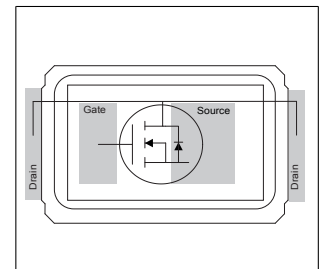
Features

- Optimized technology for DC/DC converters
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Low profile (<0.7mm)
- Dual sided cooling
- Low parasitic inductance
- N-channel, normal level



Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	80	V
$R_{DS(on),max}$	10.4	mΩ
I_D	50	A



Type / Ordering Code	Package	Marking	Related Links
BSB104N08NP3 G	MG-WDSON-2	0308	-

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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	-	-	50 32 13	A	$V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=10\text{ V}$, $T_A=25\text{ °C}$, $R_{thJA}=45\text{ K/W}^{(1)}$
Pulsed drain current ⁽²⁾	$I_{D,pulse}$	-	-	200	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse ⁽³⁾	E_{AS}	-	-	110	mJ	$I_D=30\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	42 2.8	W	$T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{thJA}=45\text{ K/W}^{(1)}$
Operating and storage temperature	T_j , T_{stg}	-40	-	150	°C	-

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case, bottom	R_{thJC}	-	1.0	-	K/W	-
Thermal resistance, junction - case, top	R_{thJC}	-	-	3.0	K/W	-
Device on PCB, 6 cm ² cooling area ⁽¹⁾	R_{thJA}	-	-	45	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 for more detailed information

⁽³⁾ 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	$V_{(BR)DSS}$	80	-	-	V	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	2.0	2.7	3.5	V	$V_{DS}=V_{GS}$, $I_D=40\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.1 10	10 100	μA	$V_{DS}=80\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=80\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	9.3	10.4	m Ω	$V_{GS}=10\text{ V}$, $I_D=10\text{ A}$
Gate resistance	R_G	-	2	-	Ω	-
Transconductance	g_{fs}	23	46	-	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}	-	1600	2100	pF	$V_{GS}=0\text{ V}$, $V_{DS}=40\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}	-	430	570	pF	$V_{GS}=0\text{ V}$, $V_{DS}=40\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance	C_{rss}	-	29	44	pF	$V_{GS}=0\text{ V}$, $V_{DS}=40\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	9	-	ns	$V_{DD}=40\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Rise time	t_r	-	4	-	ns	$V_{DD}=40\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	19	-	ns	$V_{DD}=40\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Fall time	t_f	-	4	-	ns	$V_{DD}=40\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$

Table 6 Gate charge characteristics¹⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	8	11	nC	$V_{DD}=40\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge	Q_{gd}	-	5	8	nC	$V_{DD}=40\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Switching charge	Q_{sw}	-	8	13	nC	$V_{DD}=40\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total	Q_g	-	23	31	nC	$V_{DD}=40\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	5.0	-	V	$V_{DD}=40\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Output charge	Q_{oss}	-	31	42	nC	$V_{DD}=40\text{ V}$, $V_{GS}=0\text{ V}$

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	-	-	30	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	200	A	$T_C=25\text{ °C}$
Diode forward voltage	V_{SD}	-	0.9	1.2	V	$V_{GS}=0\text{ V}$, $I_F=30\text{ A}$, $T_j=25\text{ °C}$
Reverse recovery time	t_{rr}	-	43	-	ns	$V_R=40\text{ V}$, $I_F=30\text{ A}$, $di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}	-	55	-	nC	$V_R=40\text{ V}$, $I_F=30\text{ A}$, $di_F/dt=100\text{ A}/\mu\text{s}$

4 Electrical characteristics diagrams

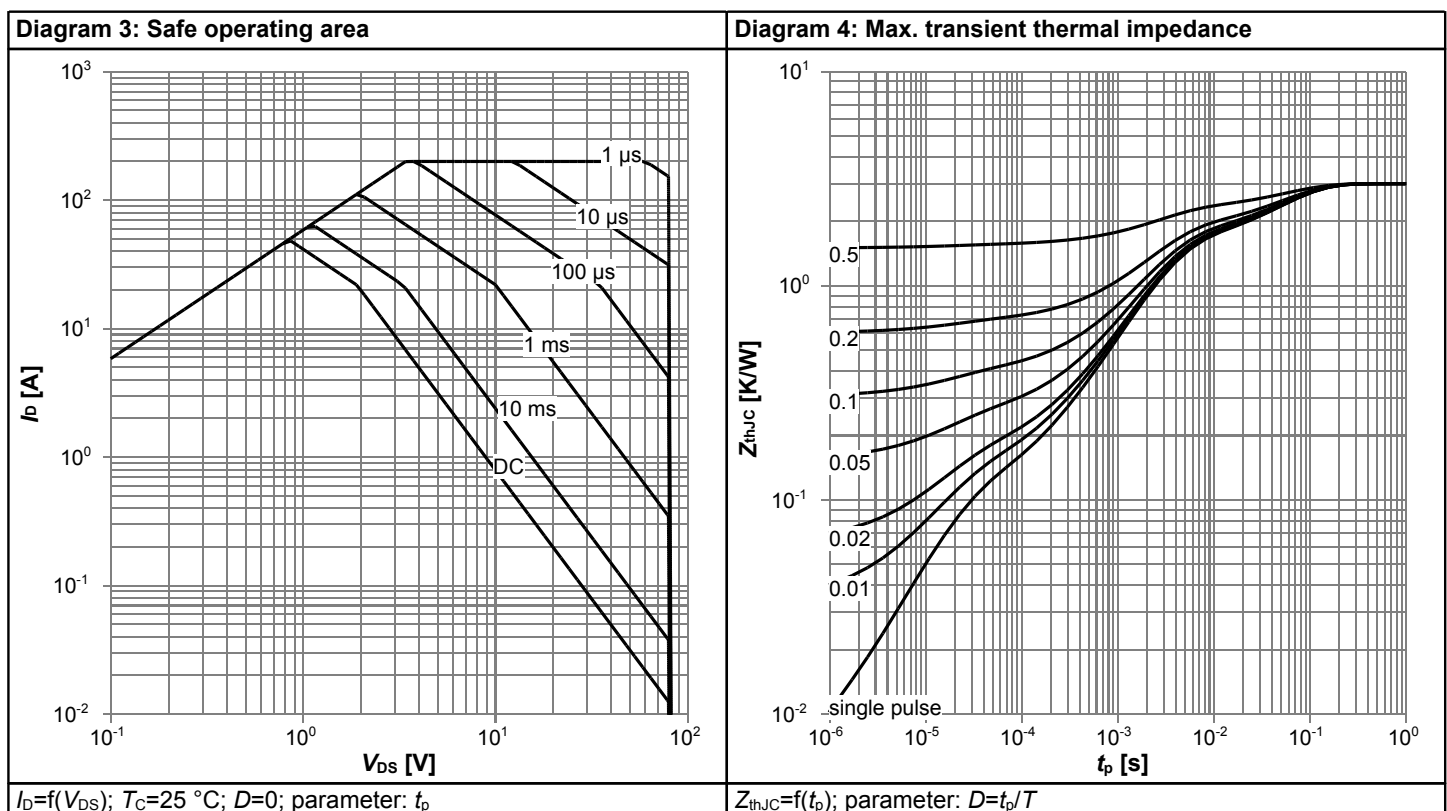
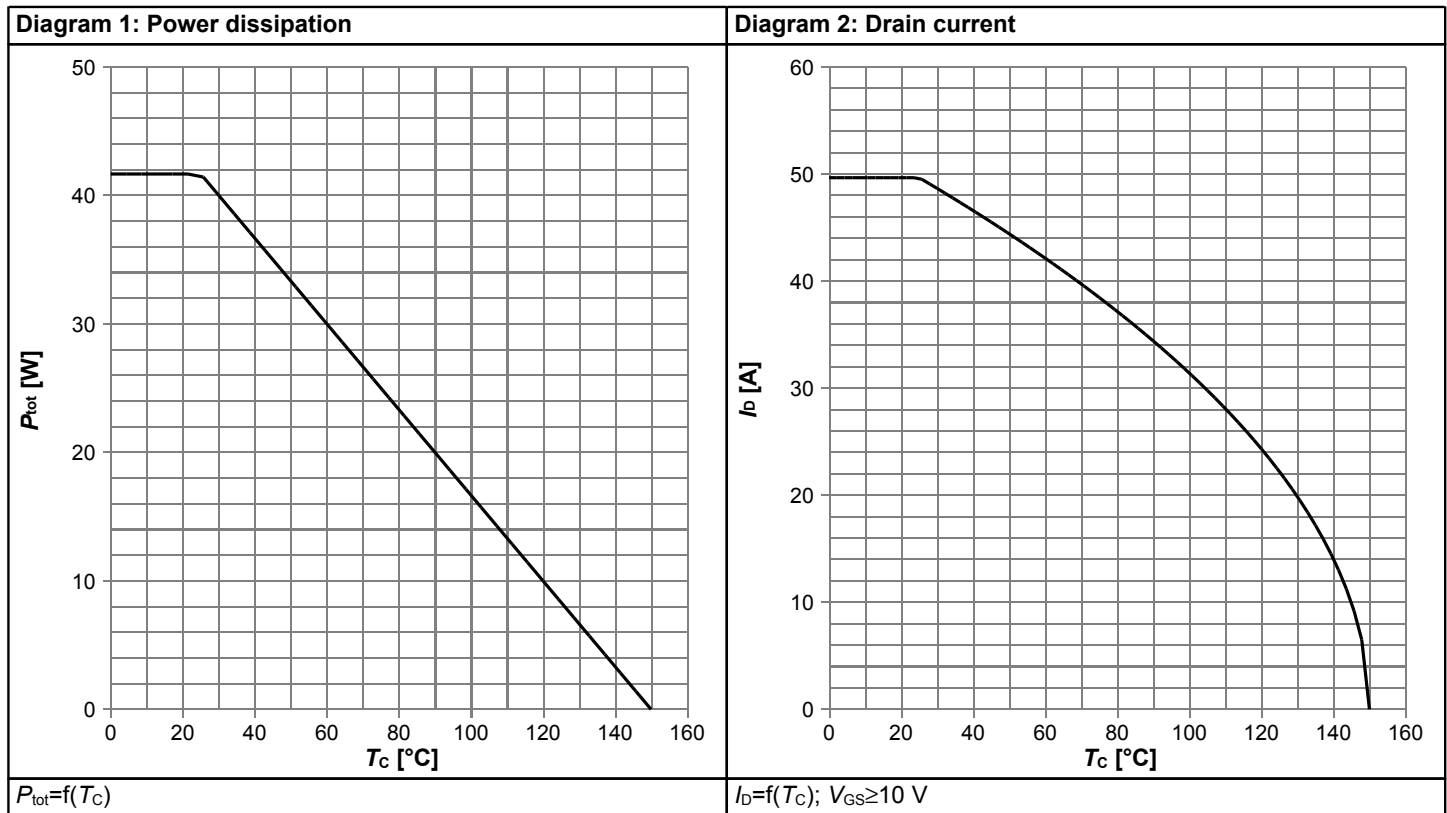
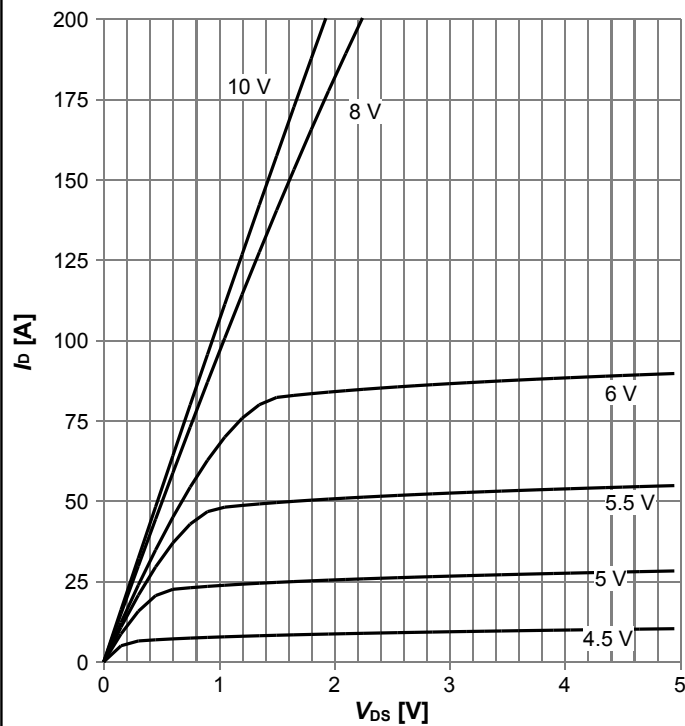
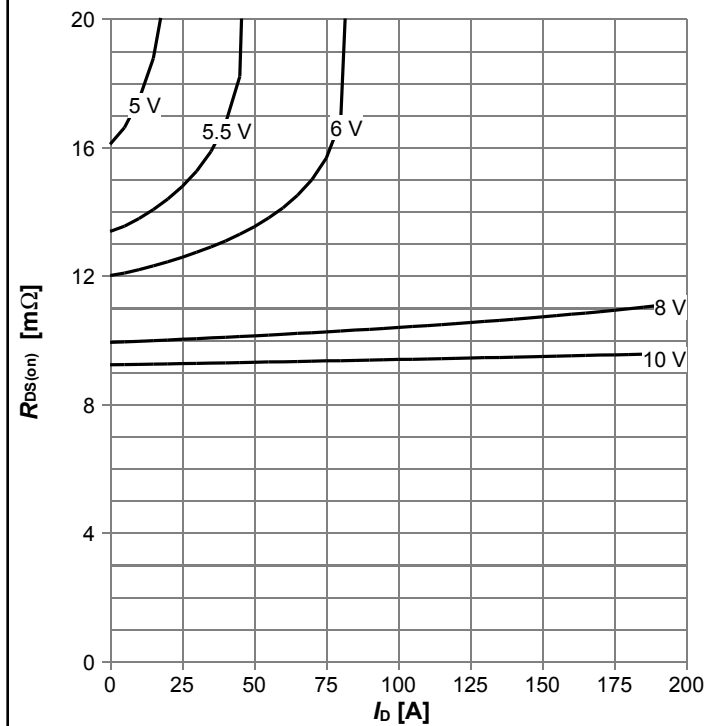


Diagram 5: Typ. output characteristics



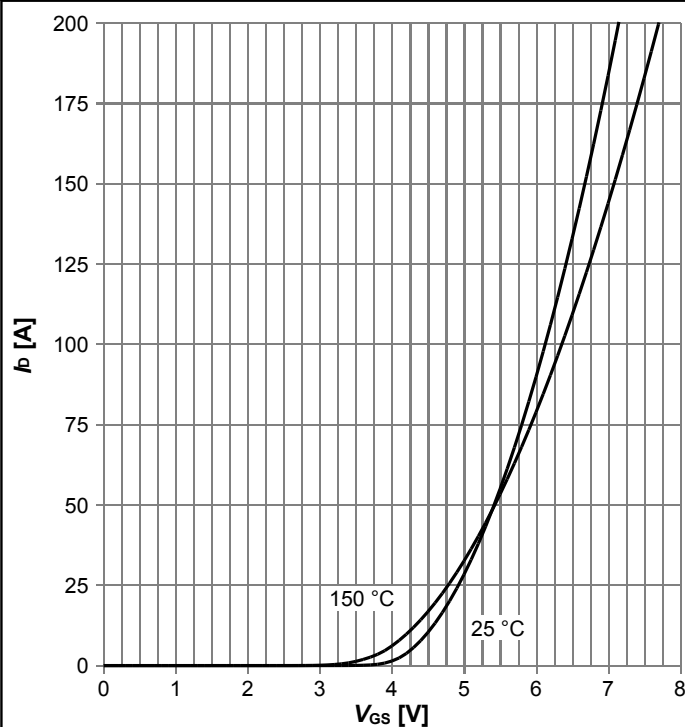
$I_D = f(V_{DS})$, $T_J = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



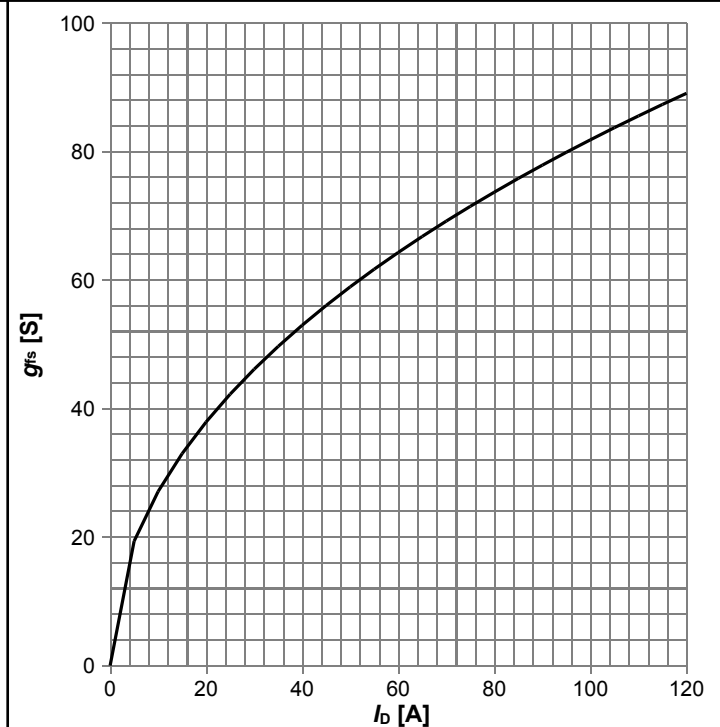
$R_{DS(on)} = f(I_D)$, $T_J = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



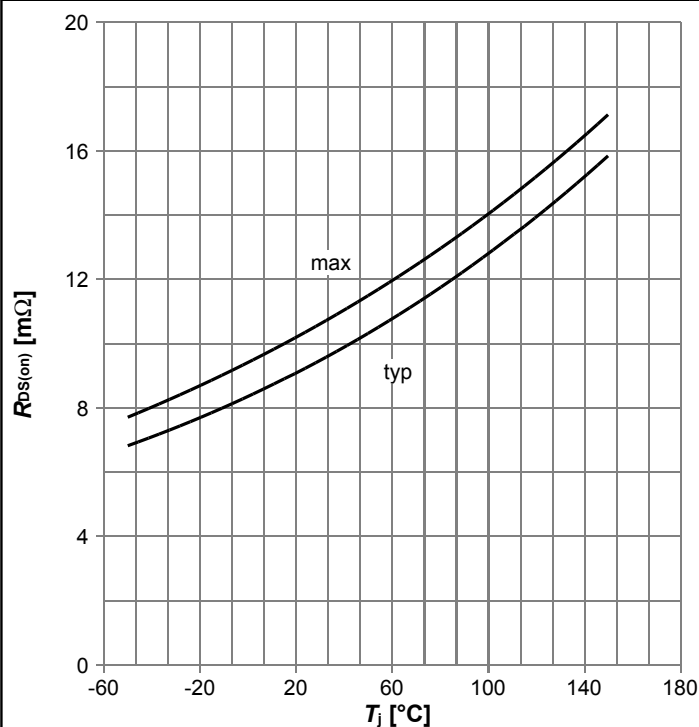
$I_D = f(V_{GS})$, $|V_{DS}| > 2|I_D|R_{DS(on)max}$, $T_J = 25^\circ\text{C}$

Diagram 8: Typ. forward transconductance



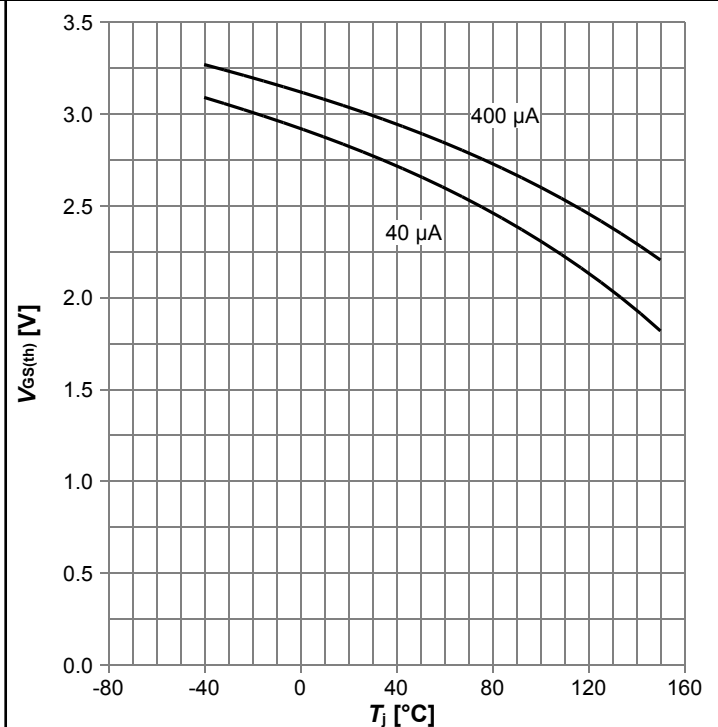
$g_{fs} = f(I_D)$, $V_{DS} = 3\text{ V}$, $T_J = 25^\circ\text{C}$

Diagram 9: Drain-source on-state resistance



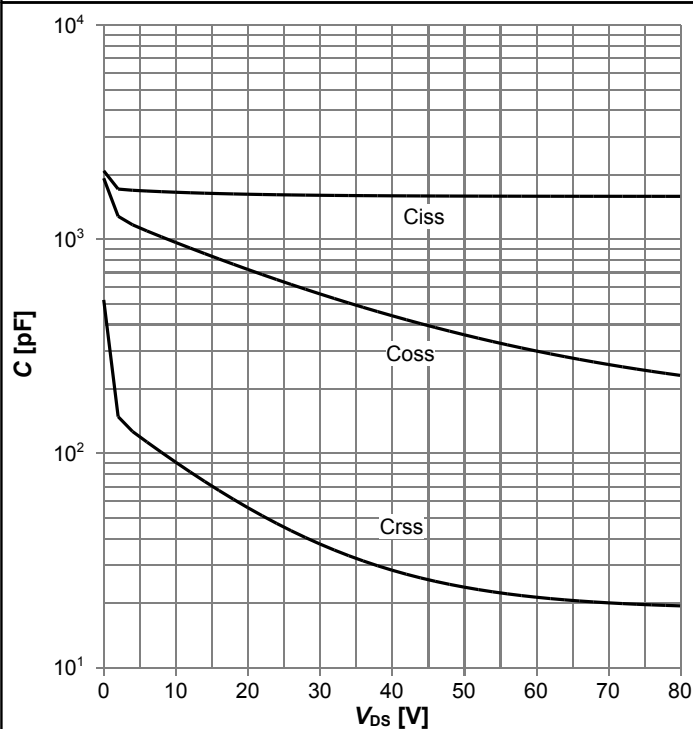
$R_{DS(on)} = f(T_j)$, $I_D = 20$ A, $V_{GS} = 10$ V

Diagram 10: Typ. gate threshold voltage



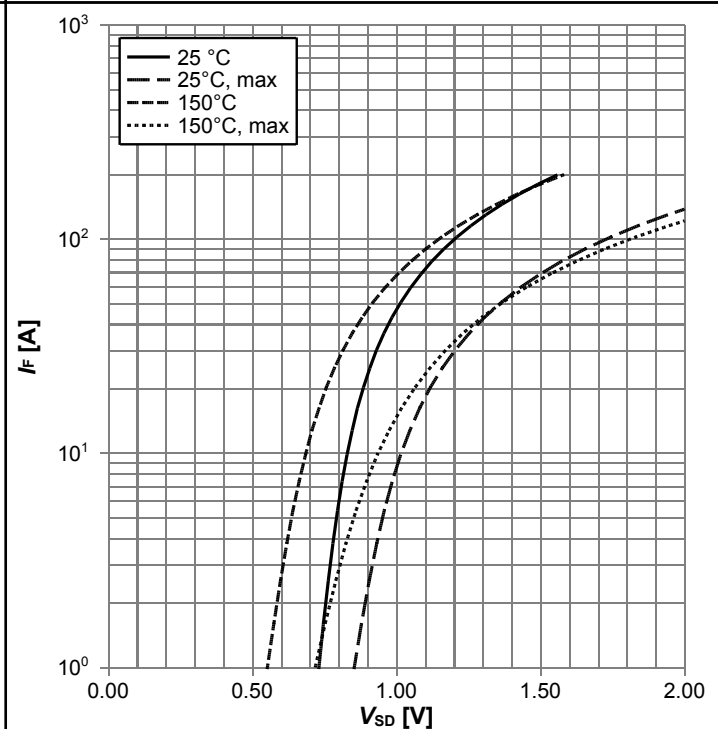
$V_{GS(th)} = f(T_j)$, $V_{GS} = V_{DS}$; parameter: I_D

Diagram 11: Typ. capacitances



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

Diagram 12: Forward characteristics of reverse diode

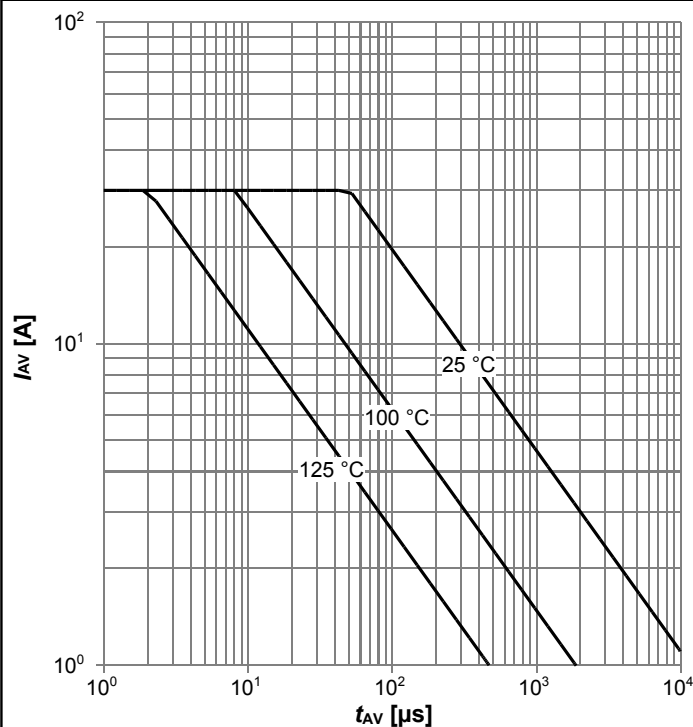


$I_F = f(V_{SD})$; parameter: T_j

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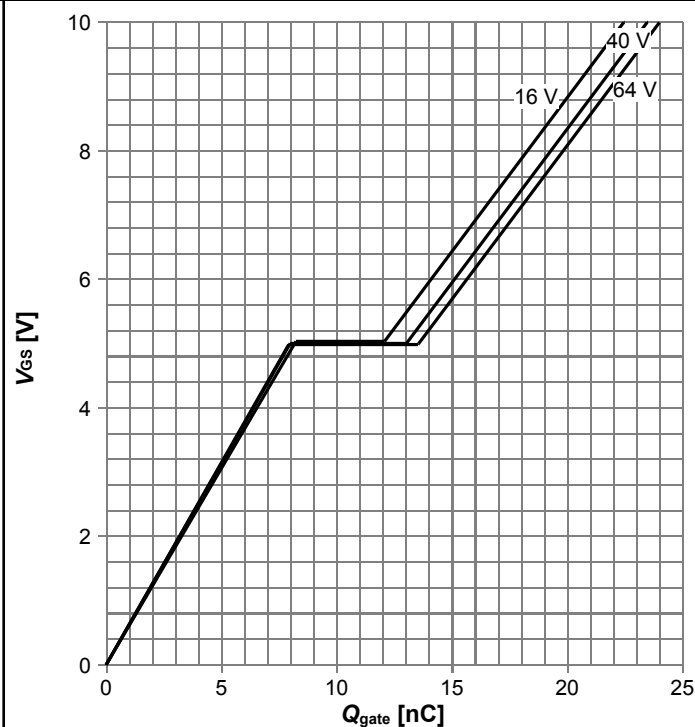
BSB104N08NP3 G

Diagram 13: Avalanche characteristics



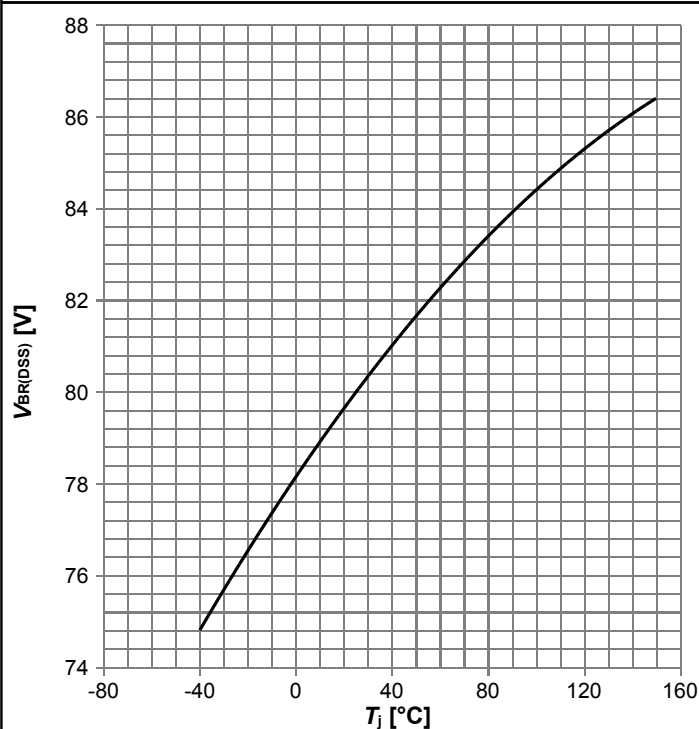
$I_{AS}=f(t_{AV})$; $R_{GS}=25\ \Omega$; parameter: $T_{j,start}$

Diagram 14: Typ. gate charge



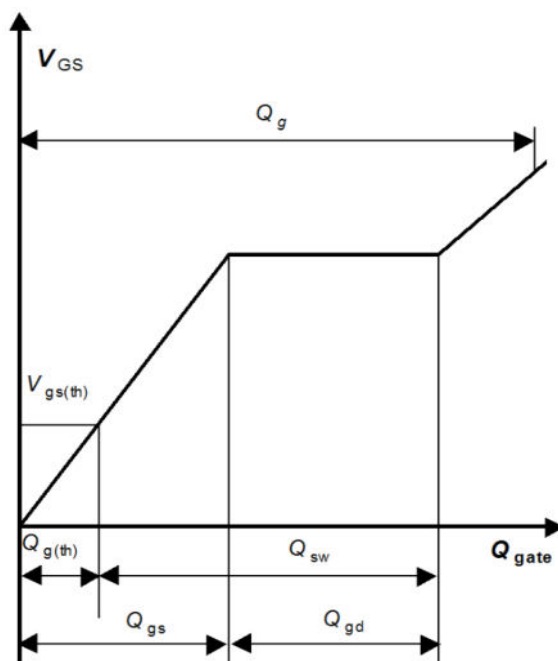
$V_{GS}=f(Q_{gate})$, $I_D=30\text{ A}$ pulsed, $T_j=25\text{ °C}$; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage



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

Diagram Gate charge waveforms



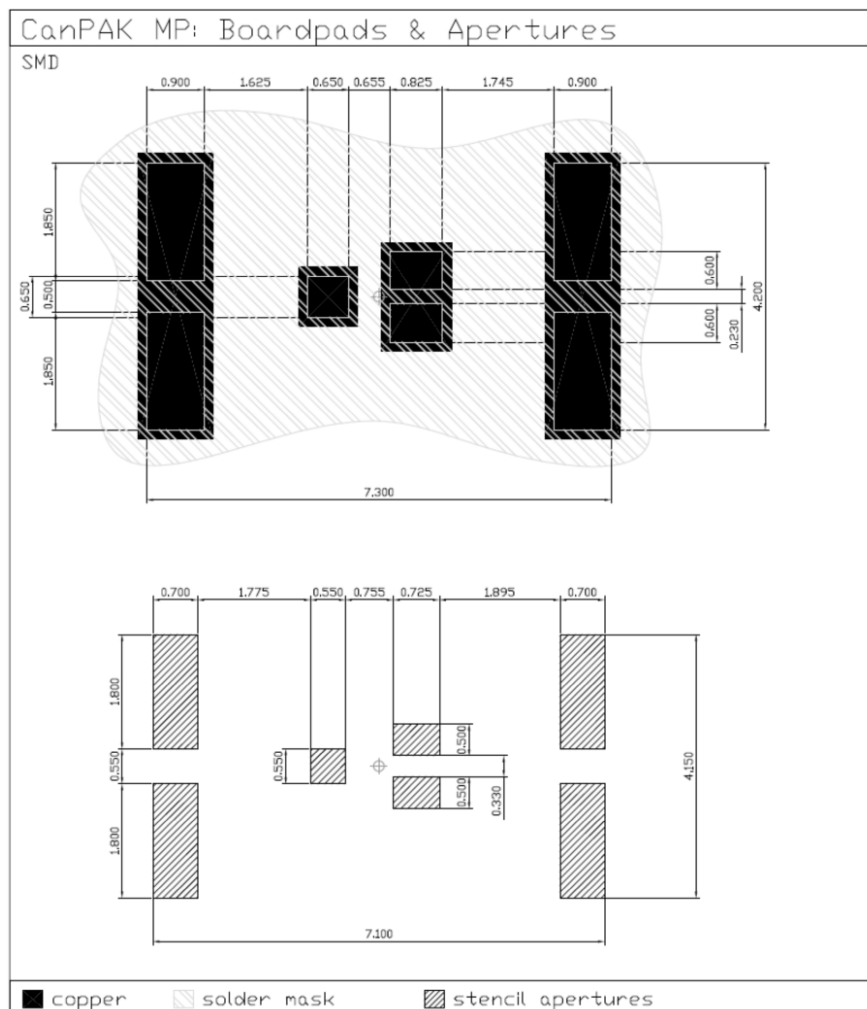


Figure 2 Outline Boardpads (CanPAK M)

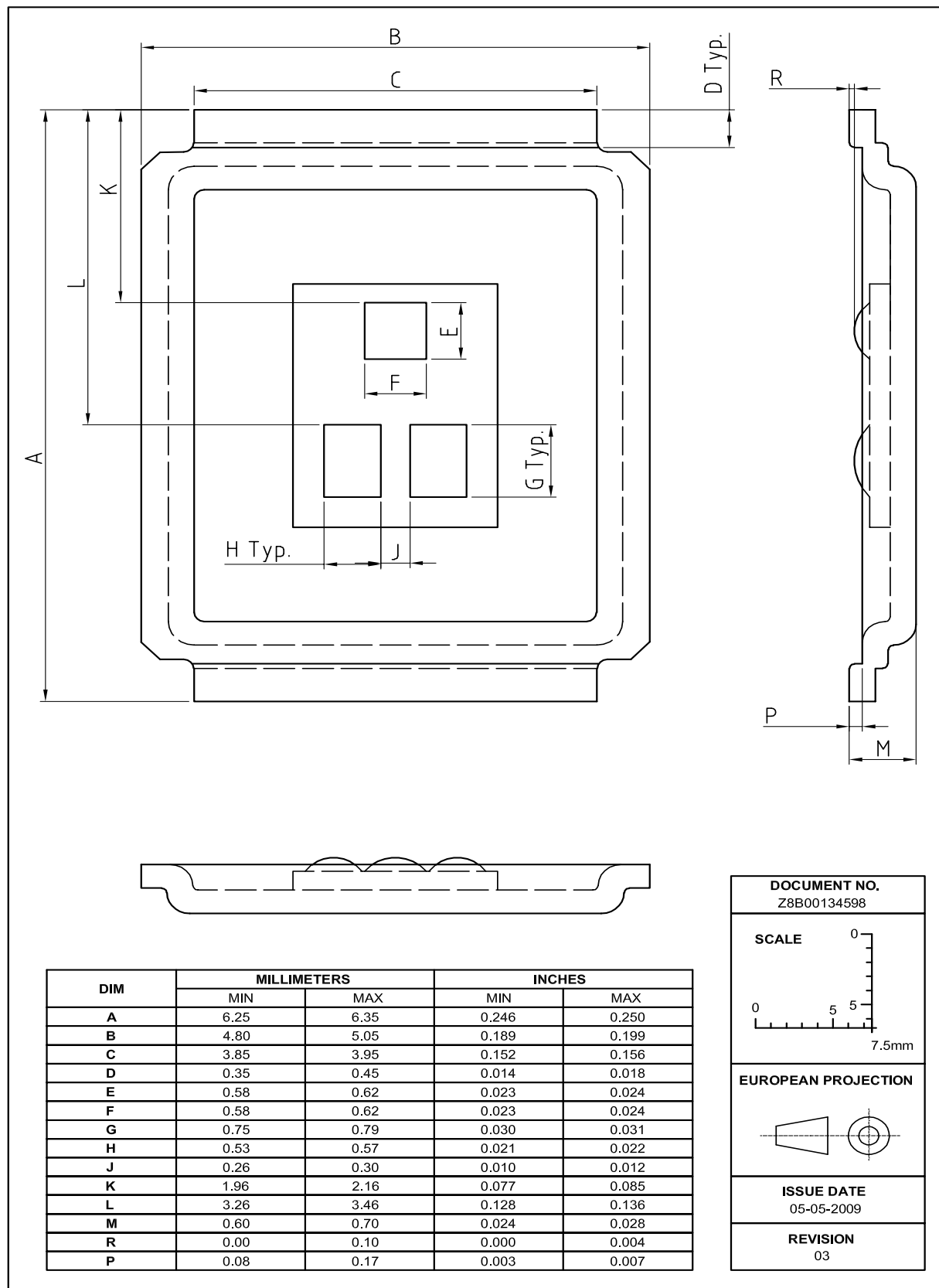


Figure 3 Outline MG-WDSO-2, dimensions in mm/inches

Revision History

BSB104N08NP3 G

Revision: 2018-11-15, Rev. 2.2

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.2	2018-11-15	Update model

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