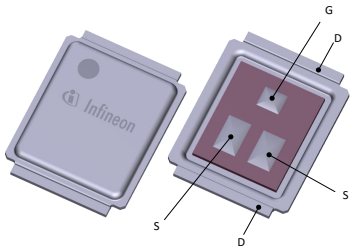
MOSFET

OptiMOS™ 3 Power-MOSFET, 100 V

CanPAK MN



Features

- Pb-free plating; RoHS compliant
- Dual sided cooling
- Low profile (<0.7 mm)
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- Optimized for high switching frequency DC/DC converter
- Low parasitic inductance
- Halogen-free according to IEC61249-2-21

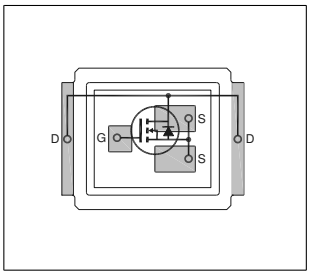


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	100	V
$R_{DS(on),max}$	5.6	mΩ
I_D	83	A
Q_{OSS}	73	A
$Q_{g\ (typ)}$	56	A

Type / Ordering Code	Package	Marking	Related Links
BSB056N10NN3 G	MG-WDSON-5	0110	-

Table of Contents

1 Maximum ratings

at T_A=25 °C, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	I_D	- - -	- - -	83 52 9	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}=45 K/W[1]
Pulsed drain current[2]	$I_{D,pulse}$	-	-	332	A	T_C=25 °C
Avalanche energy, single pulse	E_{AS}	-	-	450	mJ	I_D=30 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	- -	- -	78 2.8	-	T_C=25 °C T_A=25 °C, R_{thJA}=45 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, top	R_{thJC}	-	-	1.6	K/W	-
Thermal resistance, junction - case, bottom	R_{thJC}	-	1	-	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 figure 3 for more detailed information

3 Electrical characteristics

at T_j=25 °C, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	100	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	2	2.7	3.5	V	V_{DS}=V_{GS}, I_D=100 µA
Zero gate voltage drain current	I_{DSS}	- -	0.1 10	10 100	µA	V_{DS}=100 V, V_{GS}=0 V, T_j=25 °C V_{DS}=100 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	$R_{DS(on)}$	- -	5 6.2	5.6 8.1	mΩ	V_{GS}=10 V, I_D=30 A V_{GS}=6 V, I_D=15 A
Gate resistance	R_G	-	0.5	-	Ω	-
Transconductance	g_{fs}	34	69	-	S	|V_{DS}|>2|I_D|$R_{DS(on)max}$, I_D=30 A

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	4100	5500	pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Output capacitance	C_{oss}	-	750	1000	pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Reverse transfer capacitance	C_{rss}	-	27	-	pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	15	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=30 A, R_G=1.6 Ω
Rise time	t_r	-	9	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=30 A, R_G=1.6 Ω
Turn-off delay time	$t_{d(off)}$	-	25	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=30 A, R_G=1.6 Ω
Fall time	t_f	-	8	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=30 A, R_G=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}	-	17	-	nC	V_{DD}=50 V, I_D=30 A, V_{GS}=0 to 10 V
Gate to drain charge	Q_{gd}	-	9.7	-	nC	V_{DD}=50 V, I_D=30 A, V_{GS}=0 to 10 V
Switching charge	Q_{sw}	-	20	-	nC	V_{DD}=50 V, I_D=30 A, V_{GS}=0 to 10 V
Gate charge total	Q_g	-	56	74	nC	V_{DD}=50 V, I_D=30 A, V_{GS}=0 to 10 V
Gate plateau voltage	$V_{plateau}$	-	4.2	-	V	V_{DD}=50 V, I_D=30 A, V_{GS}=0 to 10 V
Output charge	Q_{oss}	-	73	97	-	V_{DD}=50 V, V_{GS}=0 V

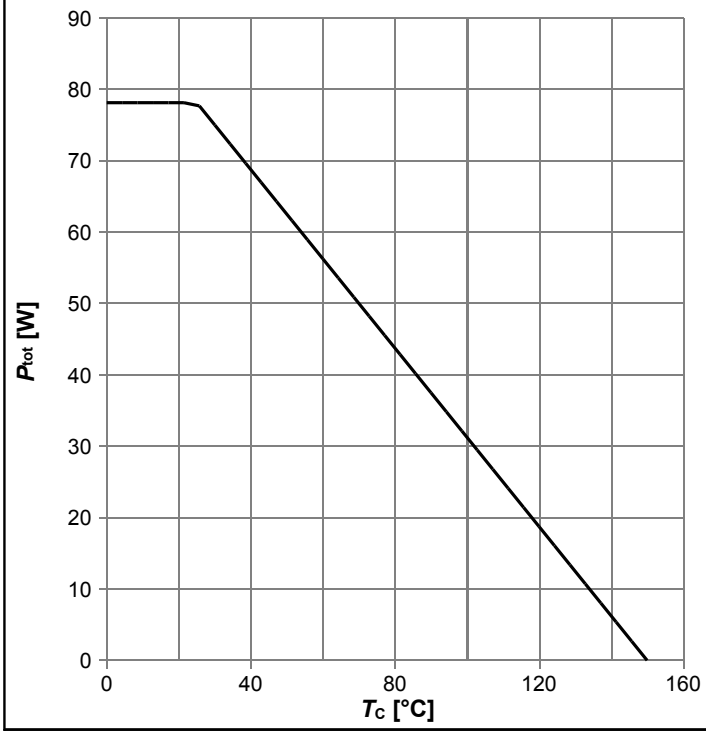
[1)] See ″Gate charge waveforms″ for parameter definition

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	65	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	316	A	T_C=25 °C
Diode forward voltage	V_{SD}	-	0.9	1.2	V	V_{GS}=0 V, I_F=I_S, T_j=25 °C
Reverse recovery time	t_{rr}	-	64	-	ns	V_R=50 V, I_F=*30A*, di_F/dt=100 A/µs
Reverse recovery charge	Q_{rr}	-	174	-	nC	V_R=50 V, I_F=*30A*, di_F/dt=100 A/µs

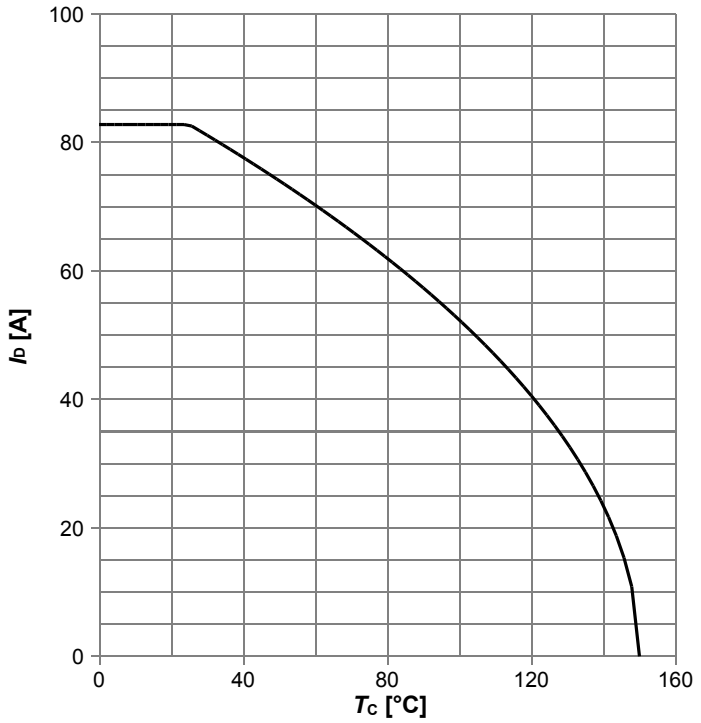
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



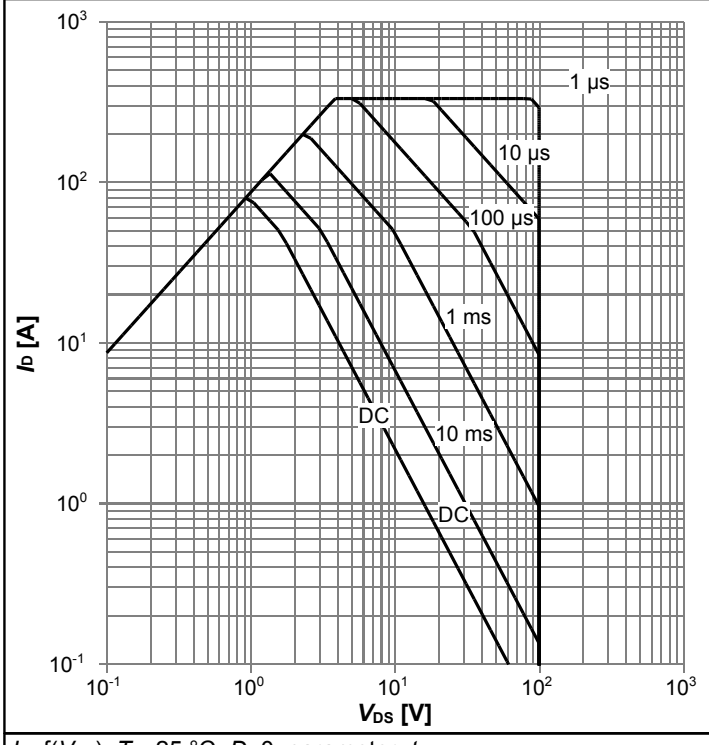
$P_{tot}=f(T_C)$

Diagram 2: Drain current



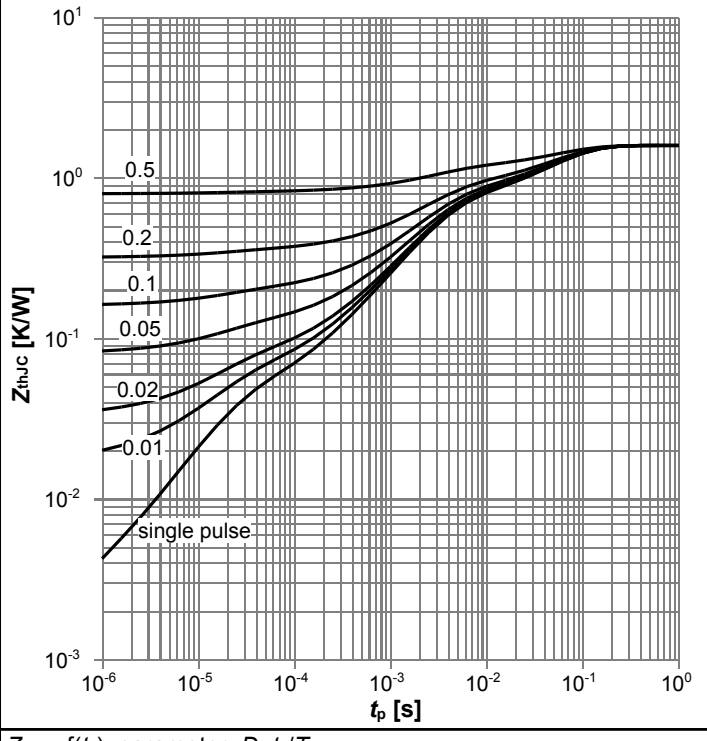
$I_D=f(T_C)$; $V_{GS}\geq 10$ V

Diagram 3: Safe operating area



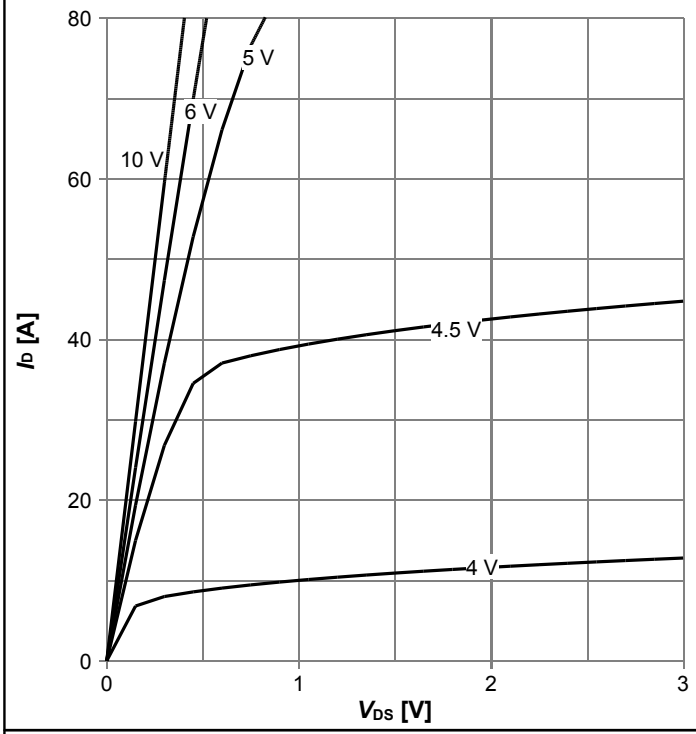
$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$; parameter: t_p

Diagram 4: Max. transient thermal impedance



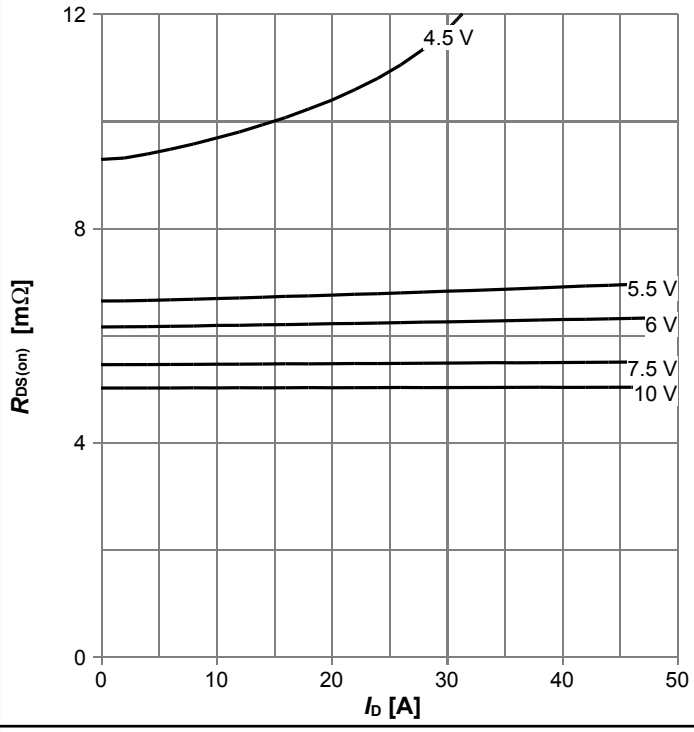
$Z_{thJC}=f(t_p)$; parameter: $D=t_p/T$

Diagram 5: Typ. output characteristics



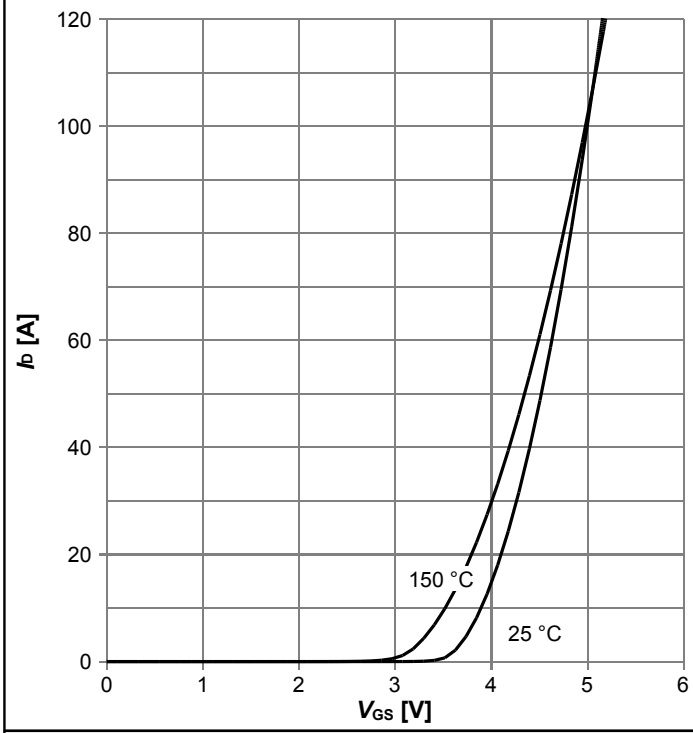
$I_D=f(V_{DS})$; $T_j=25$ °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



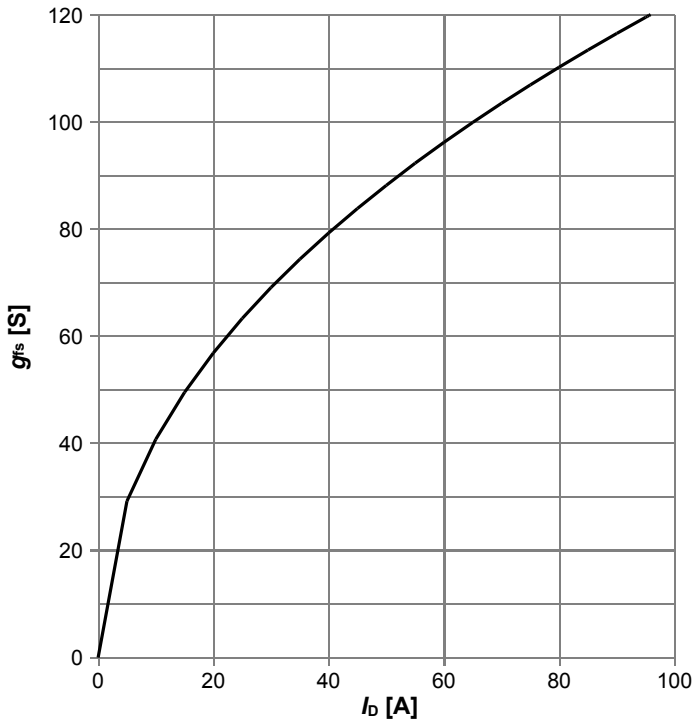
$R_{DS(on)}=f(I_D)$; $T_j=25$ °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



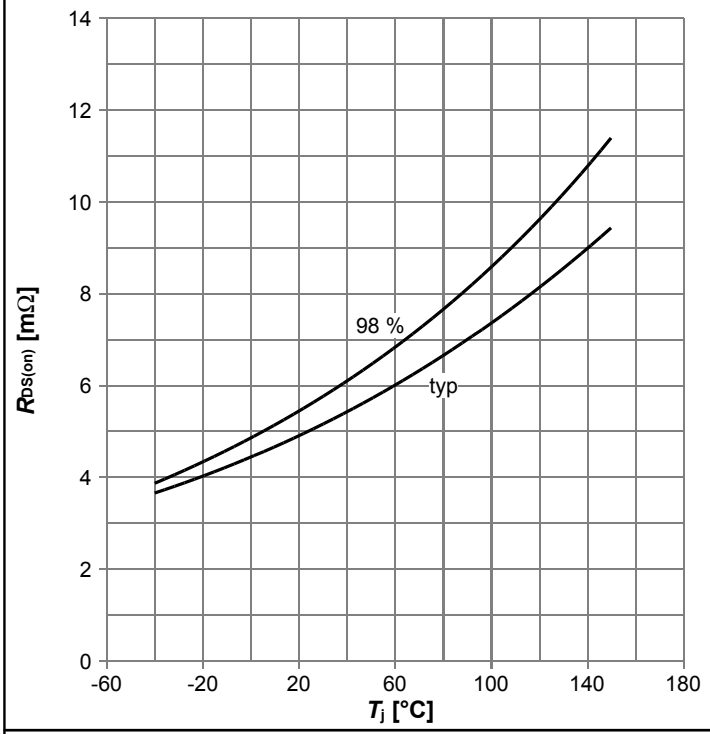
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



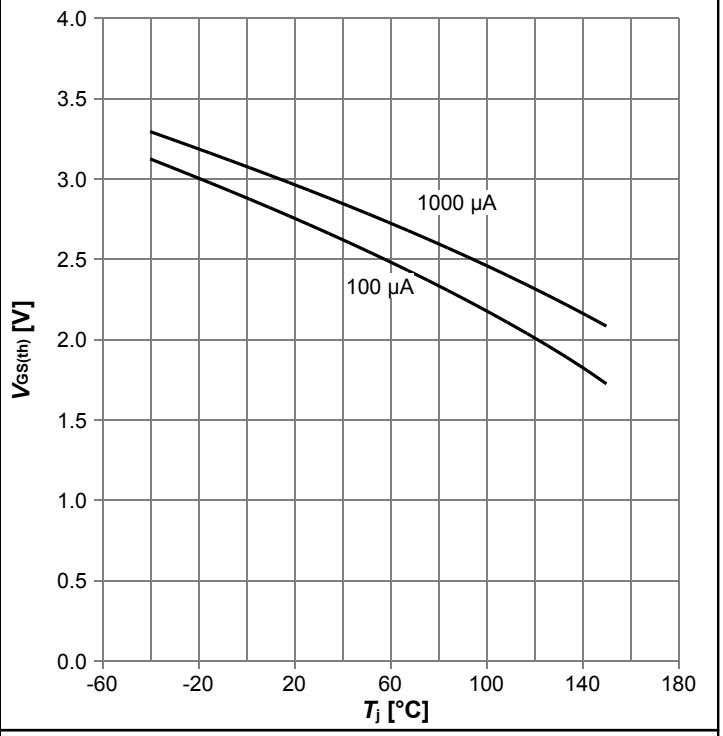
$g_{fs}=f(I_D)$; $T_j=25$ °C

Diagram 9: Drain-source on-state resistance



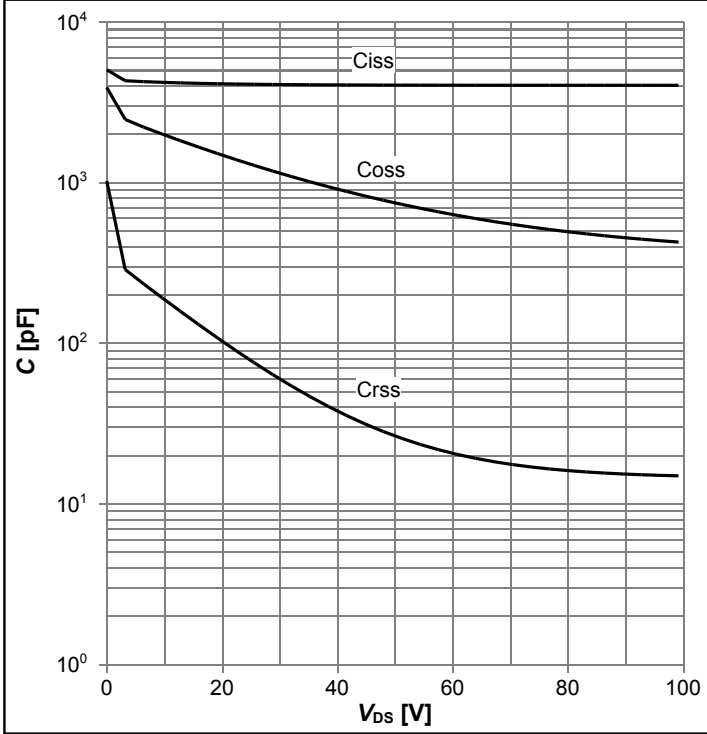
$R_{DS(on)}$=f(T_j); I_D=30 A; V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



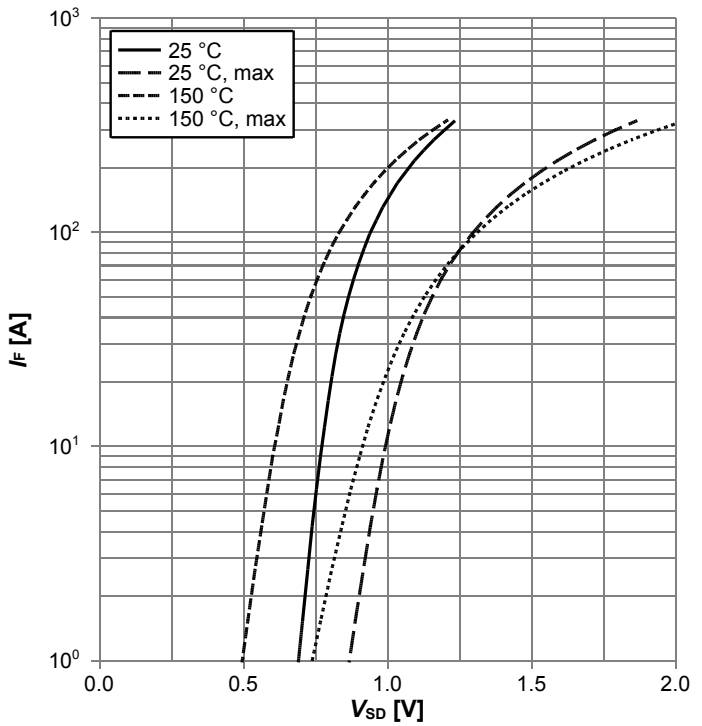
$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}

Diagram 11: Typ. capacitances



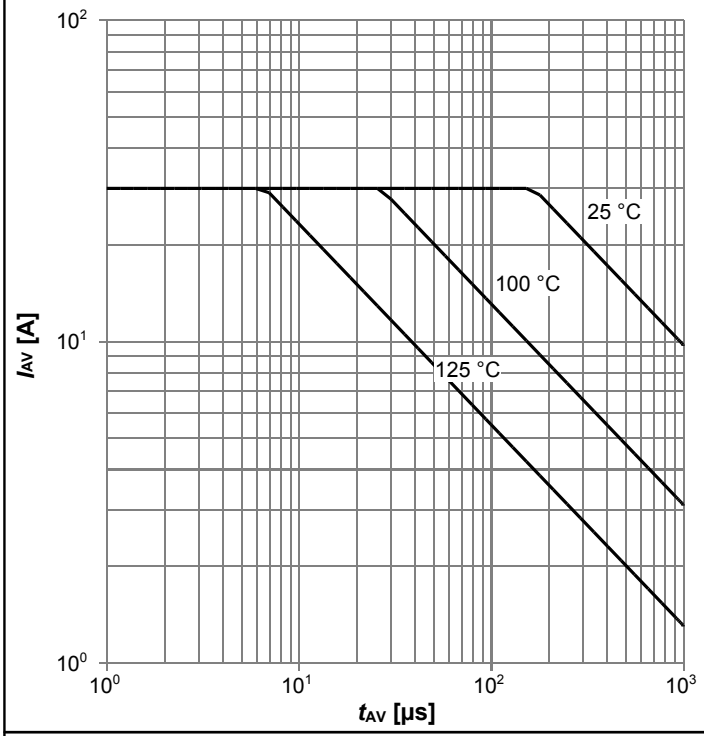
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Diagram 12: Forward characteristics of reverse diode



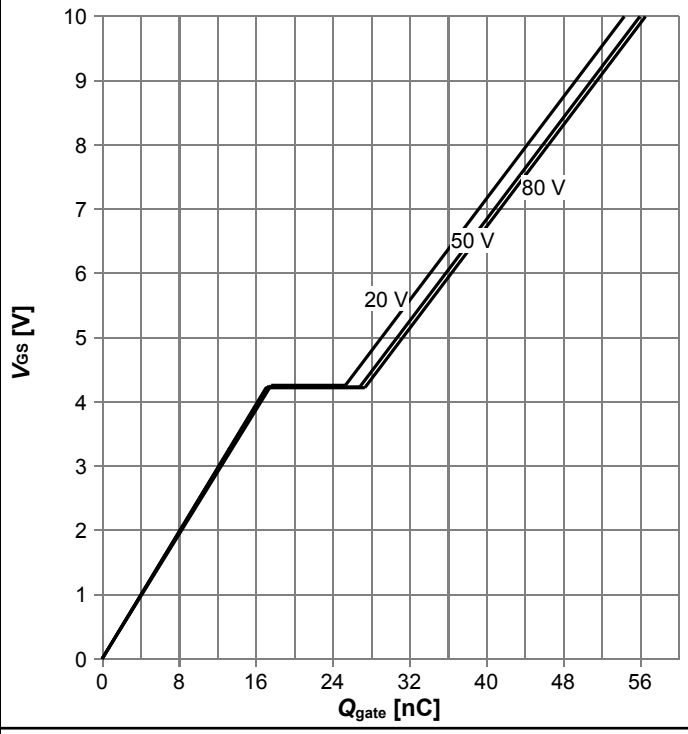
I_F=f(V_{SD}); parameter: T_j

Diagram 13: Avalanche characteristics



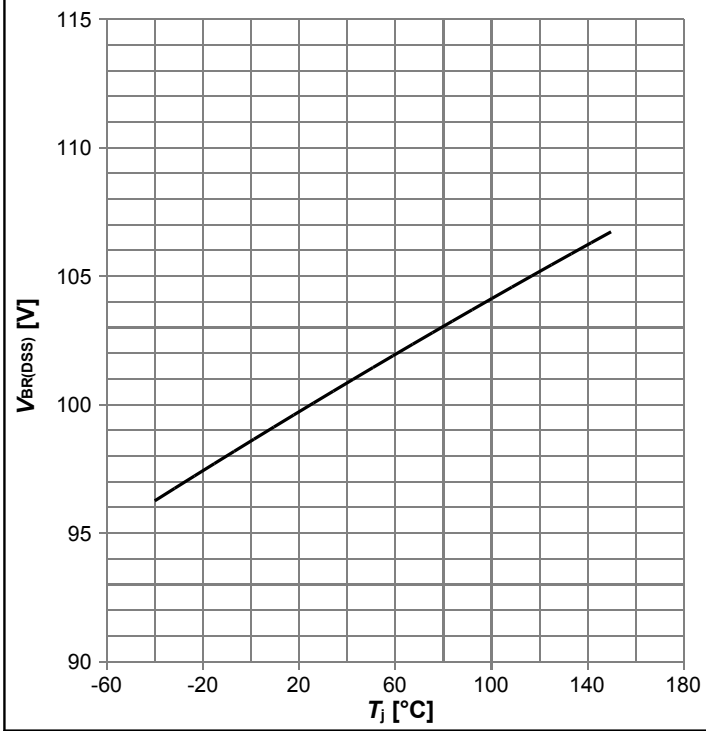
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



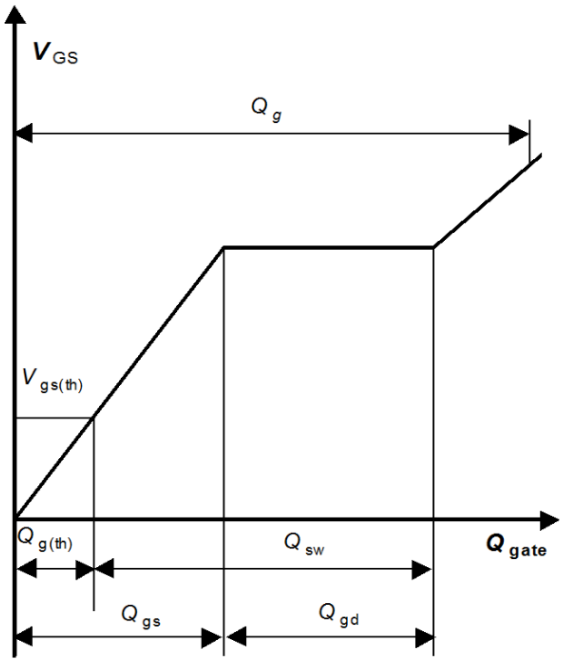
V_{GS}=f(Q_{gate}); I_D=30 A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

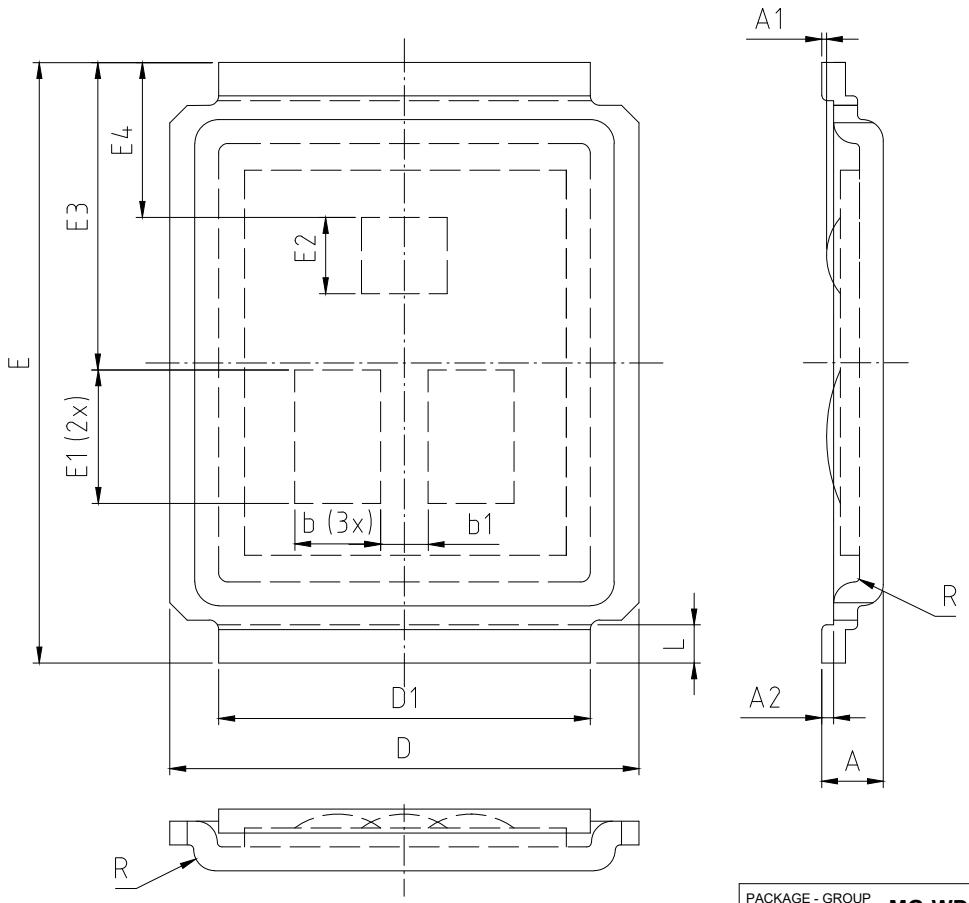


$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Diagram Gate charge waveforms

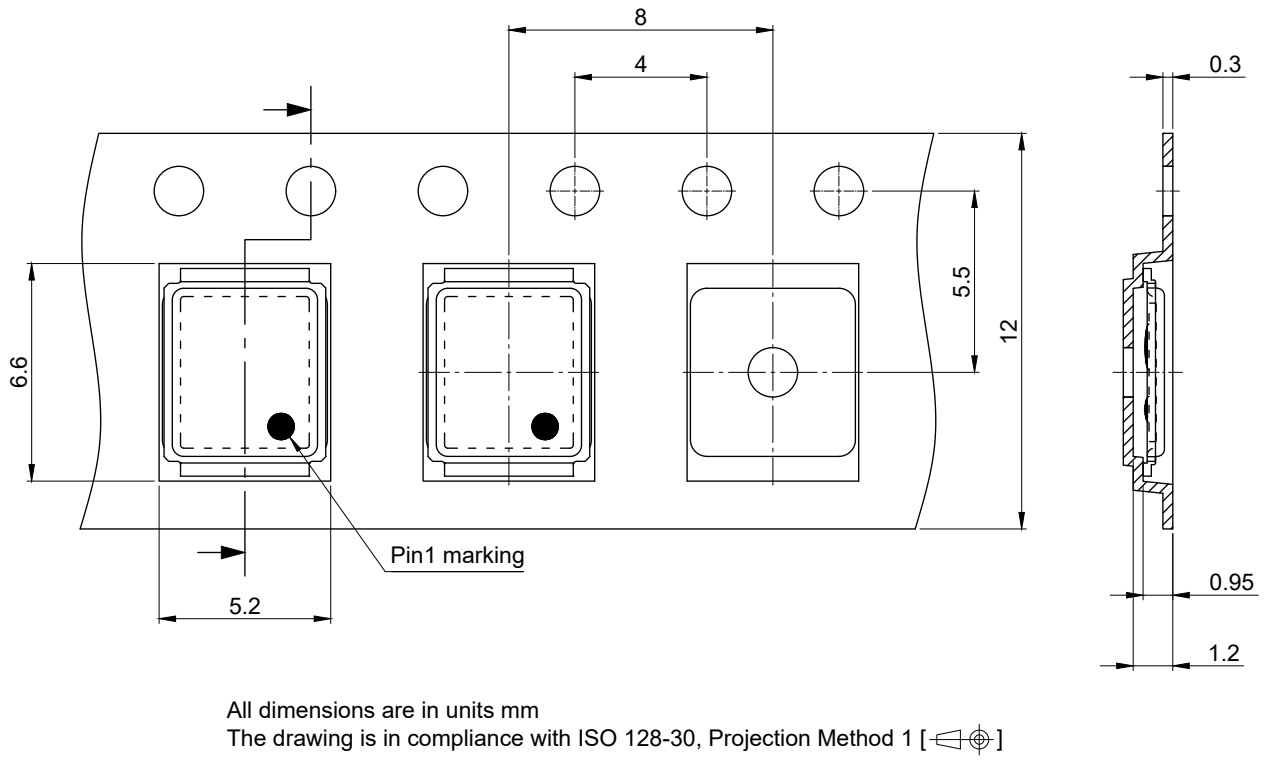


5 Package Outlines



PACKAGE - GROUP NUMBER:	MG-WDSON-5-U02	
DIMENSIONS	**MILLIMETERS**	
	MIN.	MAX.
A	0.59	0.70
A1	0.00	0.10
A2	0.08	0.17
b	0.88	0.92
b1	0.48	0.52
D	4.80	5.05
D1	3.85	3.95
E	6.25	6.35
E1	1.38	1.42
E2	0.78	0.82
E3	3.125	3.33
E4	1.525	1.73
L	0.35	0.45
R	---	0.10
N	5	

Figure 1 Outline MG-WDSON-5, dimensions in mm



All dimensions are in units mm
The drawing is in compliance with ISO 128-30, Projection Method 1 [ ]

Figure 2 Outline Tape (MG-WDSON-5), dimensions in mm

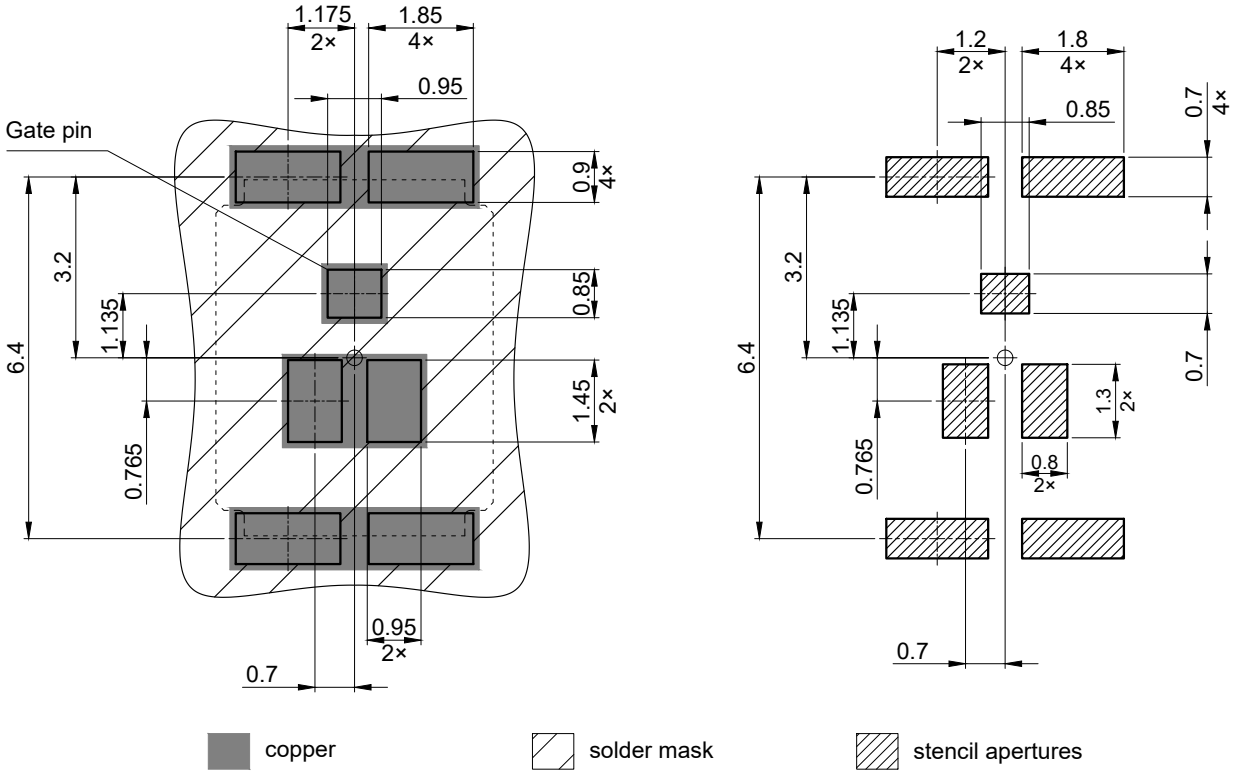


Figure 3 Outline Footprint (MG-WDSON-5), dimensions in mm

Revision History

BSB056N10NN3 G

Revision: 2023-10-12, Rev. 2.6

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.6	2023-10-12	Update package nomenclature

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