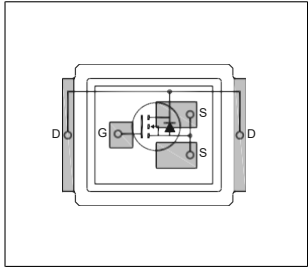
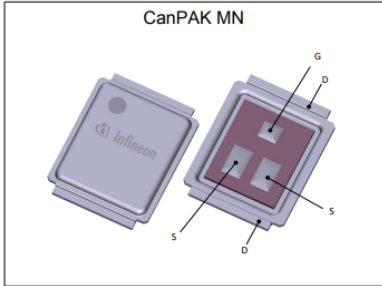


英飞凌MOSFET功率晶体管

英飞凌 OptiMOS™3 100 V 功率晶体管 BSB056N10NN3 G

特性

- 无铅镀层；符合RoHS标准
- 双面冷却
- 薄封装 (<0.7 mm)
- 出色的栅极电荷与 $R_{DS(on)}$ (FOM)乘积
- 极低的导通电阻 $R_{DS(on)}$
- 针对高开关频率 DC/DC 转换器进行了优化
- 低寄生电感
- 符合 IEC61249-2-21 标准的无卤素



RoHS

表 1 主要性能参数

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-WDSO5-5	0110	-

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1 最大额定值

除非另有规定, $T_A = 25\text{ °C}$

表 2 最大额定值

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	I_D	-	-	83 52 9	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⁾	$I_{D,pulse}$	-	-	332	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse	E_{AS}	-	-	450	mJ	$I_D=30\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	78 2.8	-	$T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{thJA}=45\text{ K/W}^{(1)}$
Operating and storage temperature	T_j , T_{stg}	-40	-	150	°C	-

2 热特性

表 3 热特性

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⁾器件位于 40 mm x 40 mm x 1.5 mm 环氧树脂PCB FR4 上, 具有 6 cm² (一层, 70 μm 厚) 的铜面积用于漏极连接。PCB 在静止空气中垂直放置。

⁽²⁾详细信息请参见图 3

3 电气特性

除非另有规定, $T_j = 25\text{ °C}$

表4 静态特性

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	100	-	-	V	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	2	2.7	3.5	V	$V_{DS}=V_{GS}$, $I_D=100\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.1 10	10 100	μA	$V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	5 6.2	5.6 8.1	m Ω	$V_{GS}=10\text{ V}$, $I_D=30\text{ A}$ $V_{GS}=6\text{ V}$, $I_D=15\text{ A}$
Gate resistance	R_G	-	0.5	-	Ω	-
Transconductance	g_{fs}	34	69	-	S	$ V_{DS} > 2 I_D R_{DS(on)max}$, $I_D=30\text{ A}$

表5 动态特性

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	4100	5500	pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}	-	750	1000	pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance	C_{rss}	-	27	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	15	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_G=1.6\text{ }\Omega$
Rise time	t_r	-	9	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_G=1.6\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	25	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_G=1.6\text{ }\Omega$
Fall time	t_f	-	8	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_G=1.6\text{ }\Omega$

表6 栅极电荷特性¹⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	17	-	nC	$V_{DD}=50\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge	Q_{gd}	-	9.7	-	nC	$V_{DD}=50\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Switching charge	Q_{sw}	-	20	-	nC	$V_{DD}=50\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total	Q_g	-	56	74	nC	$V_{DD}=50\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	4.2	-	V	$V_{DD}=50\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Output charge	Q_{oss}	-	73	97	-	$V_{DD}=50\text{ V}$, $V_{GS}=0\text{ V}$

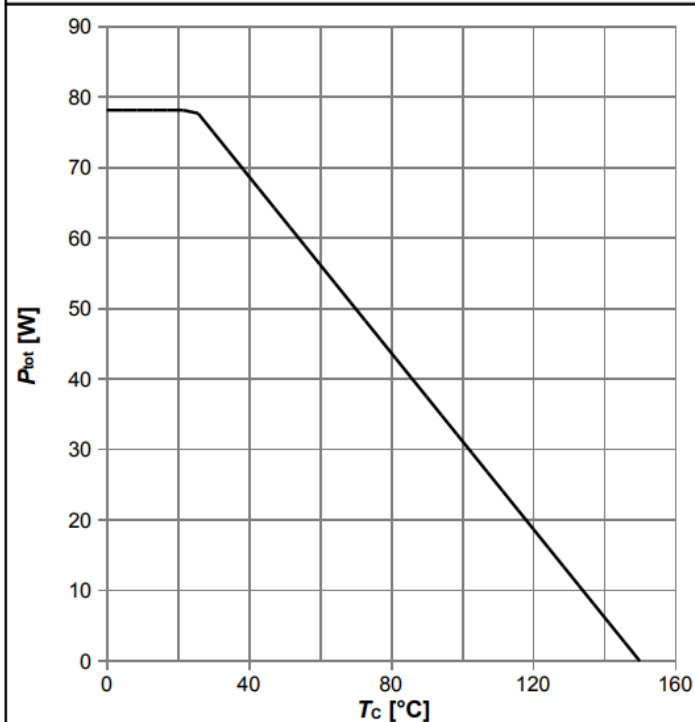
¹⁾参数定义请参见“栅极充电波形”

表 7 反向二极管

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

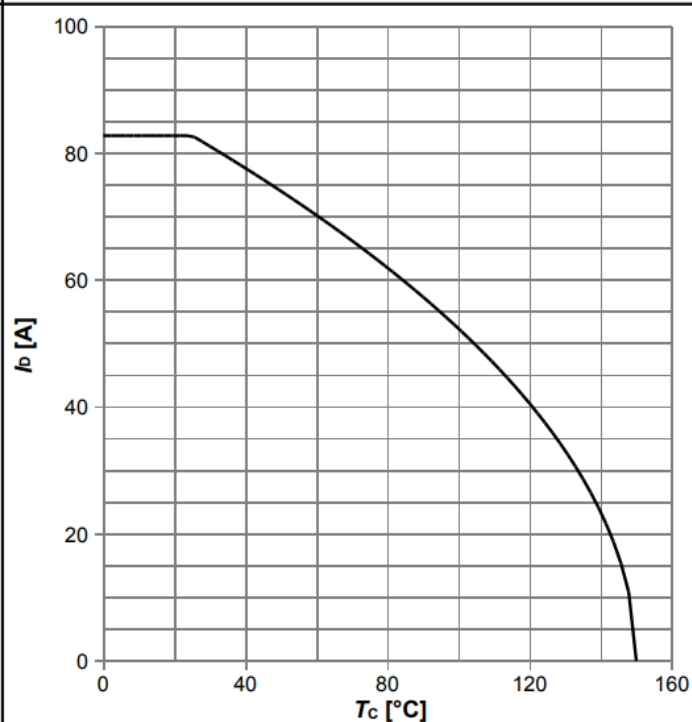
4 电气特性图

Diagram 1: Power dissipation



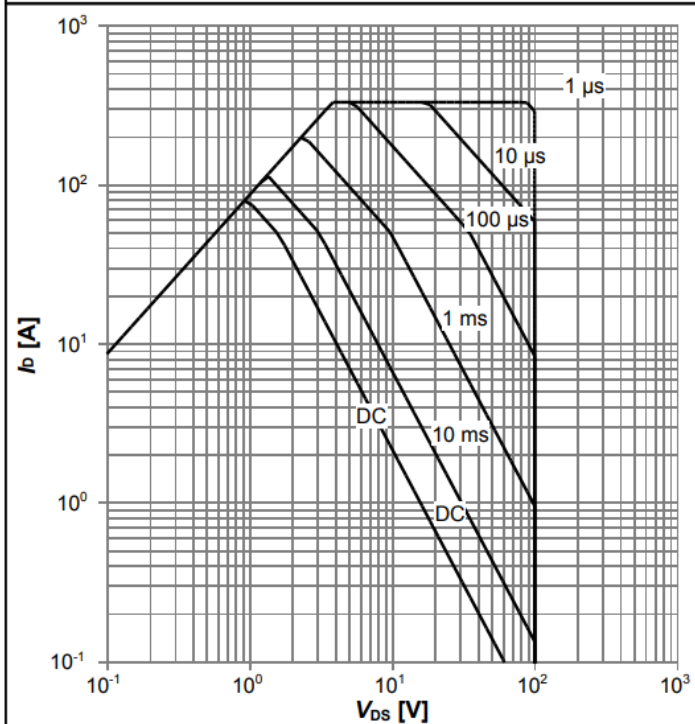
$$P_{\text{tot}} = f(T_c)$$

Diagram 2: Drain current



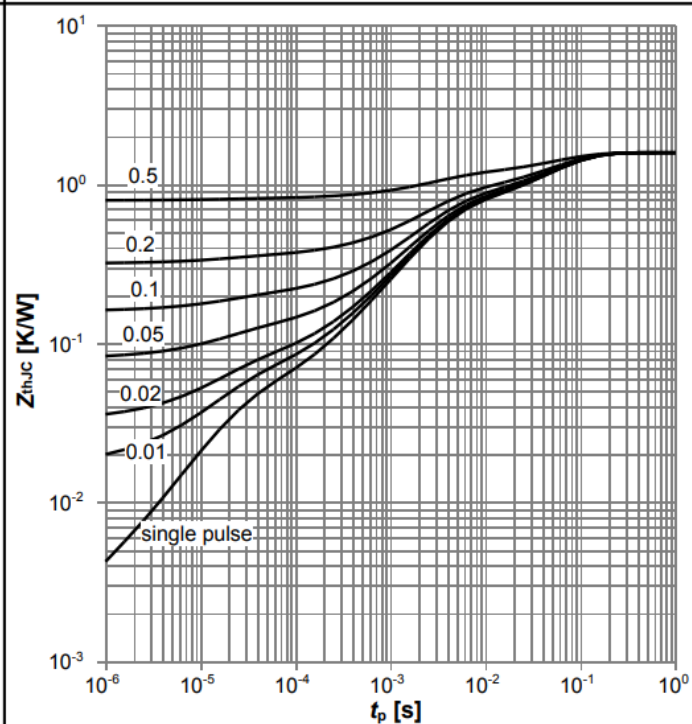
$$I_D = f(T_c); V_{\text{GS}} \geq 10 \text{ V}$$

Diagram 3: Safe operating area



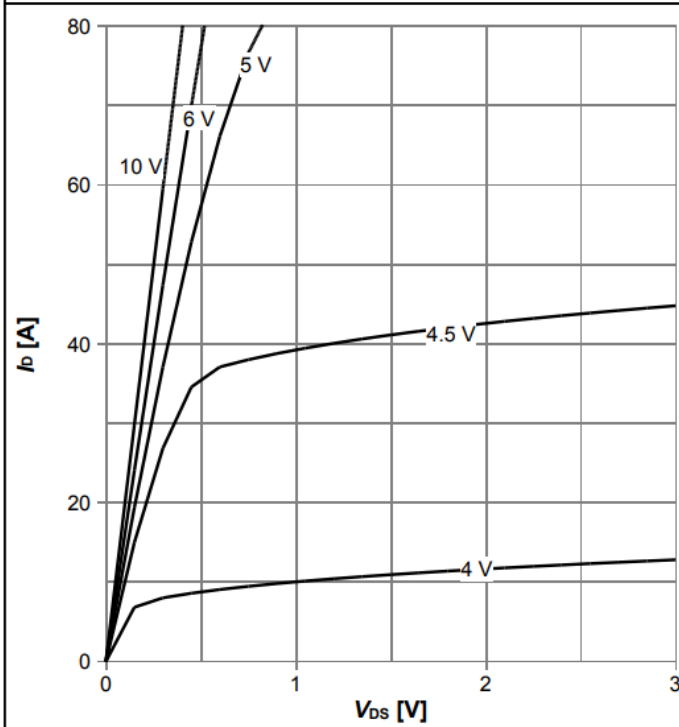
$$I_D = f(V_{\text{DS}}); T_c = 25^\circ\text{C}; D = 0; \text{parameter: } t_p$$

Diagram 4: Max. transient thermal impedance



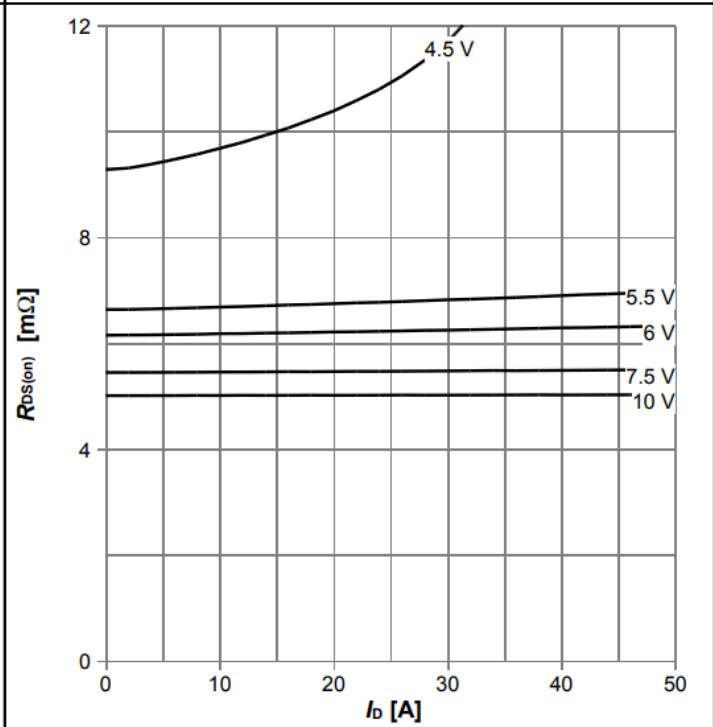
$$Z_{\text{thJC}} = f(t_p); \text{parameter: } D = t_p / T$$

Diagram 5: Typ. output characteristics



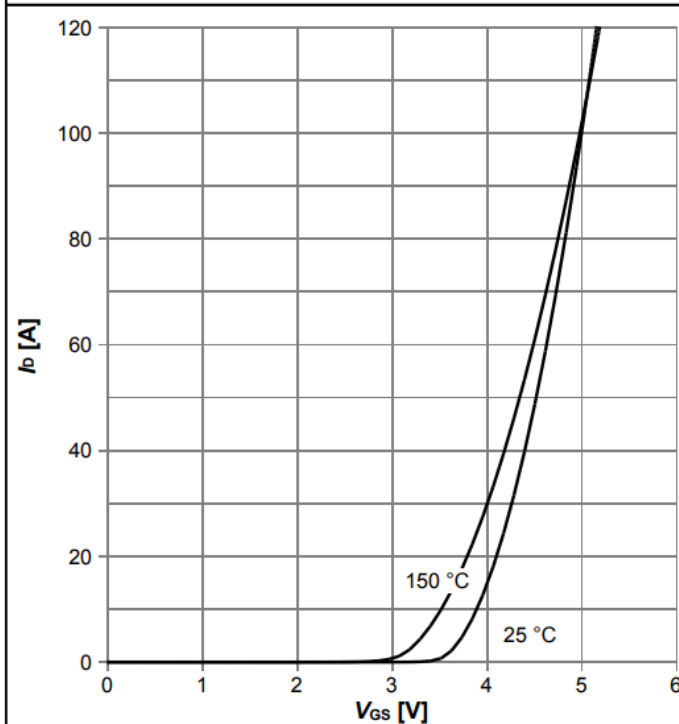
$I_D = f(V_{DS}); T_j = 25^\circ\text{C}; \text{parameter: } V_{GS}$

Diagram 6: Typ. drain-source on resistance



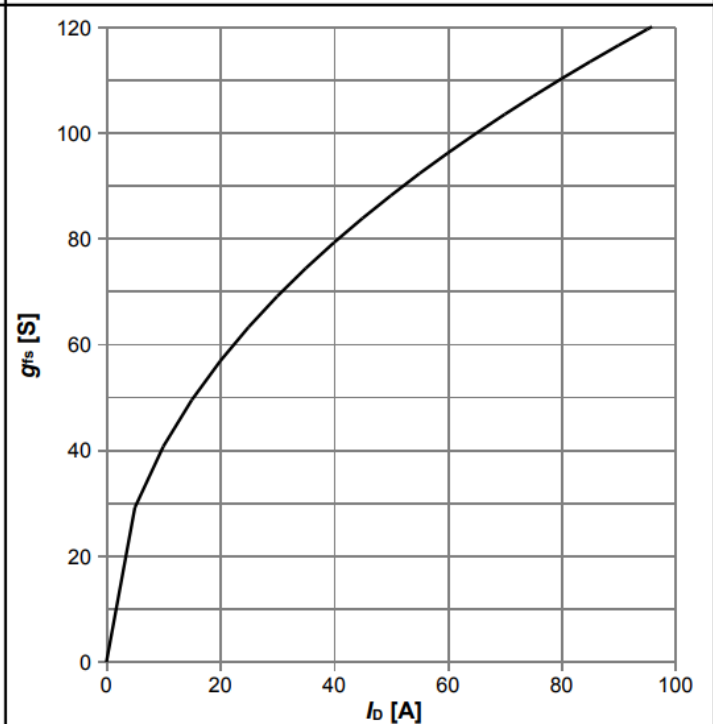
$R_{DS(on)} = f(I_D); T_j = 25^\circ\text{C}; \text{parameter: } V_{GS}$

Diagram 7: Typ. transfer characteristics



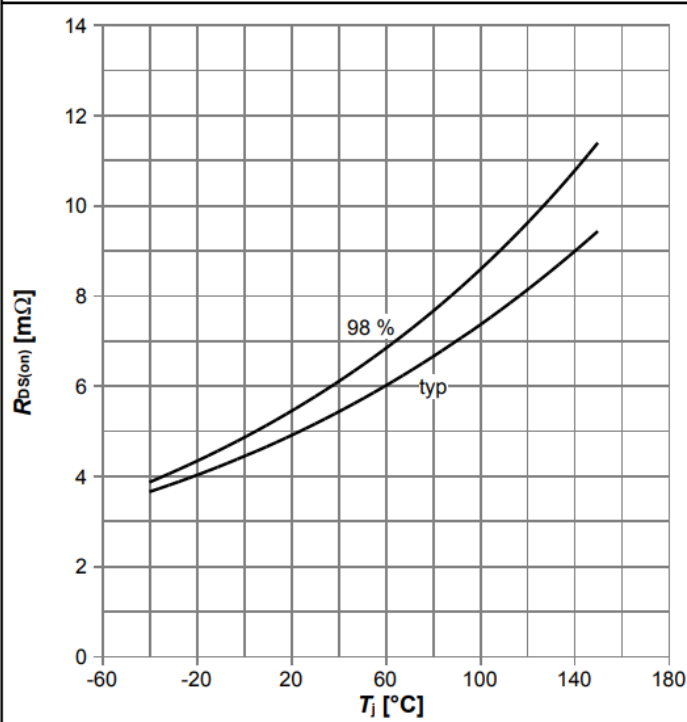
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}; \text{parameter: } T_j$

Diagram 8: Typ. forward transconductance



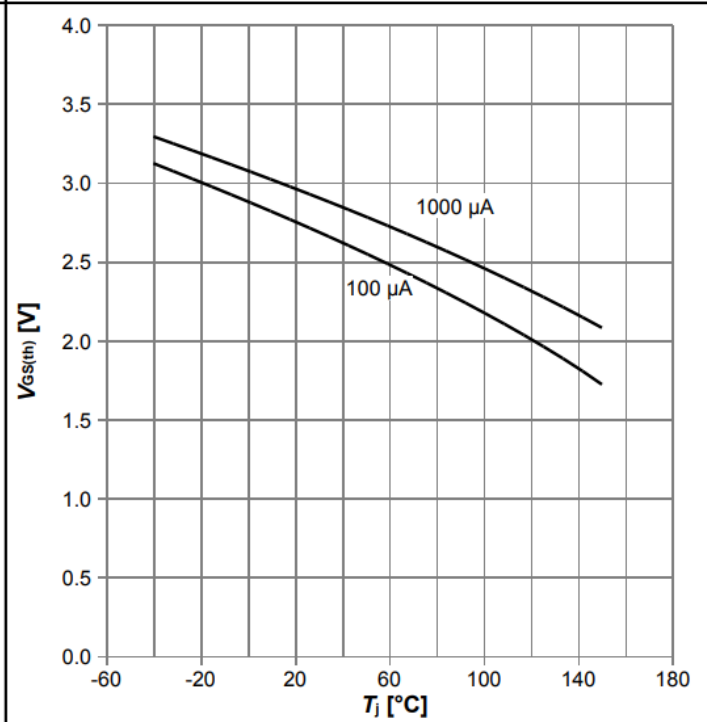
$g_{fs} = f(I_D); T_j = 25^\circ\text{C}$

Diagram 9: Drain-source on-state resistance



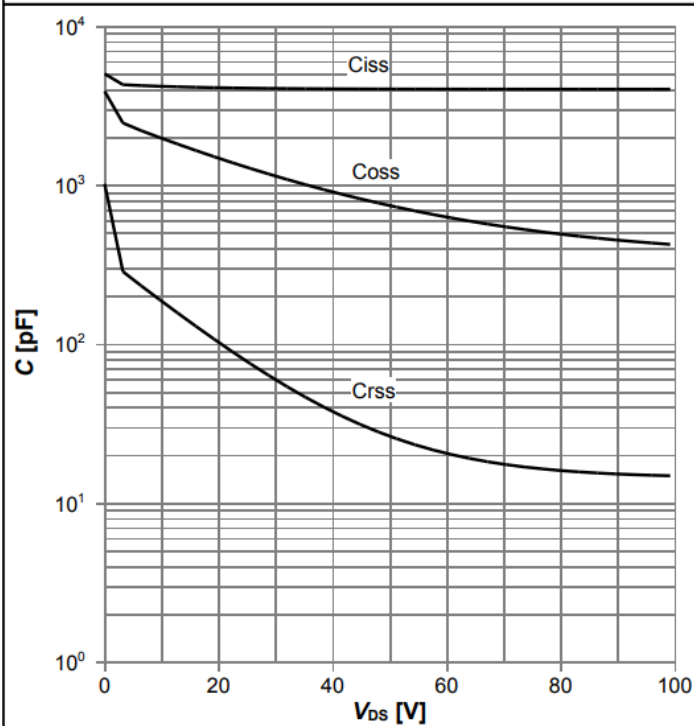
$$R_{DS(on)} = f(T_J); I_D = 30 \text{ A}; V_{GS} = 10 \text{ V}$$

Diagram 10: Typ. gate threshold voltage



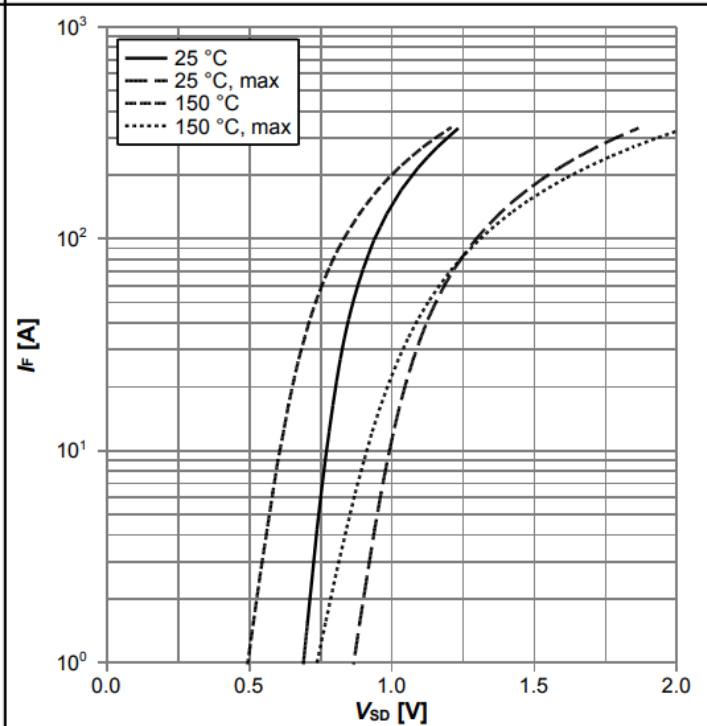
$$V_{GS(th)} = f(T_J); V_{GS} = V_{DS}$$

Diagram 11: Typ. capacitances



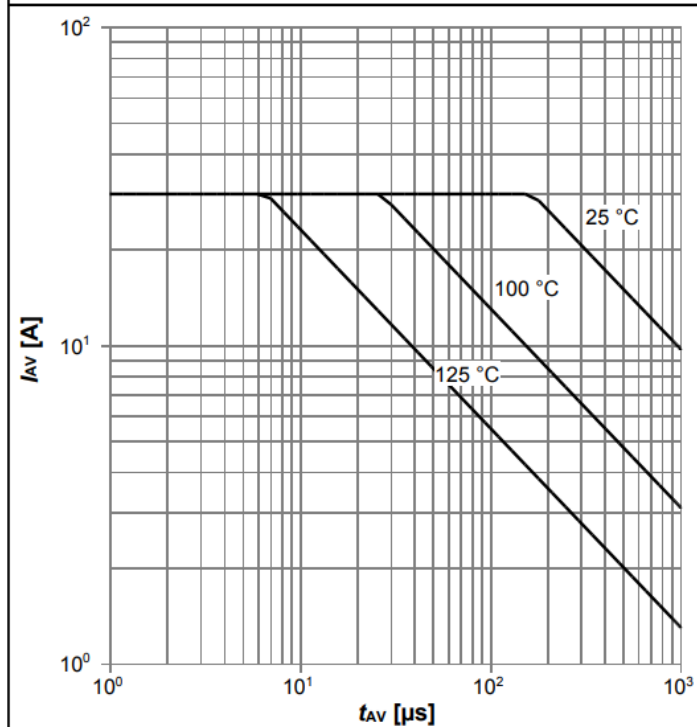
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$

Diagram 12: Forward characteristics of reverse diode



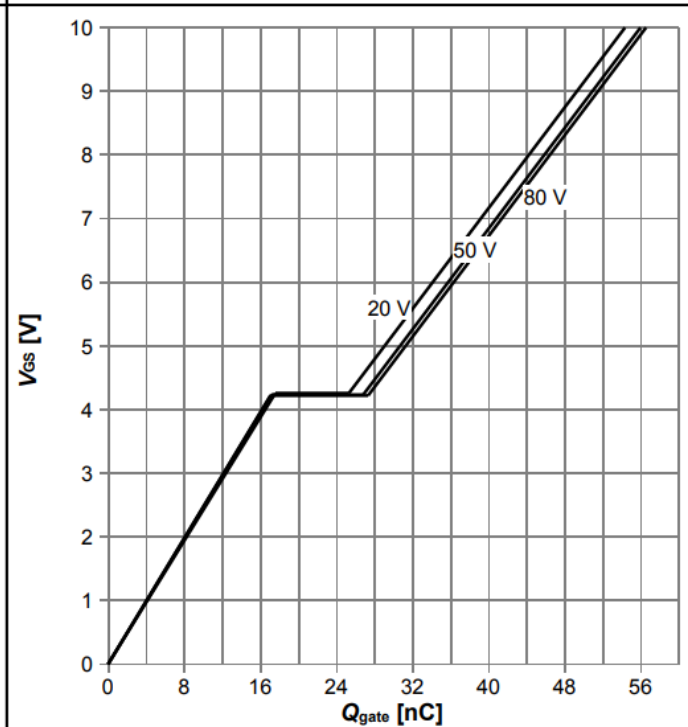
$$I_F = f(V_{SD}); \text{parameter: } T_J$$

Diagram 13: Avalanche characteristics



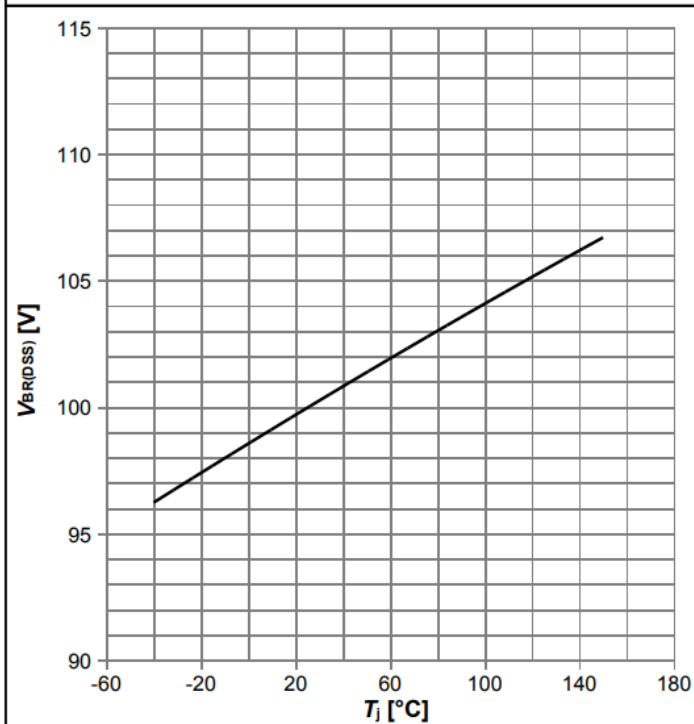
$I_{AS}=f(t_{AV})$; $R_{GS}=25\ \Omega$; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



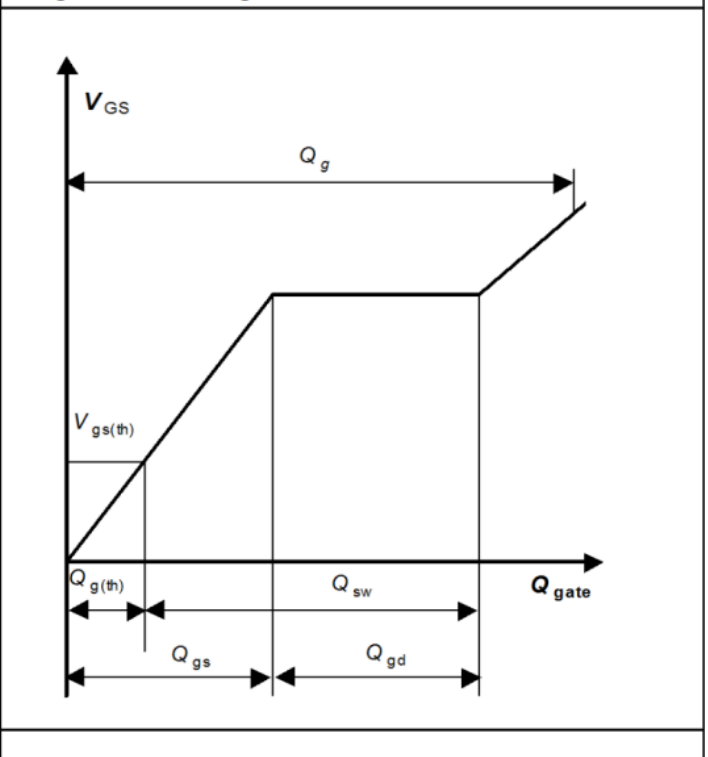
$V_{GS}=f(Q_{gate})$; $I_D=30\text{ A}$ pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

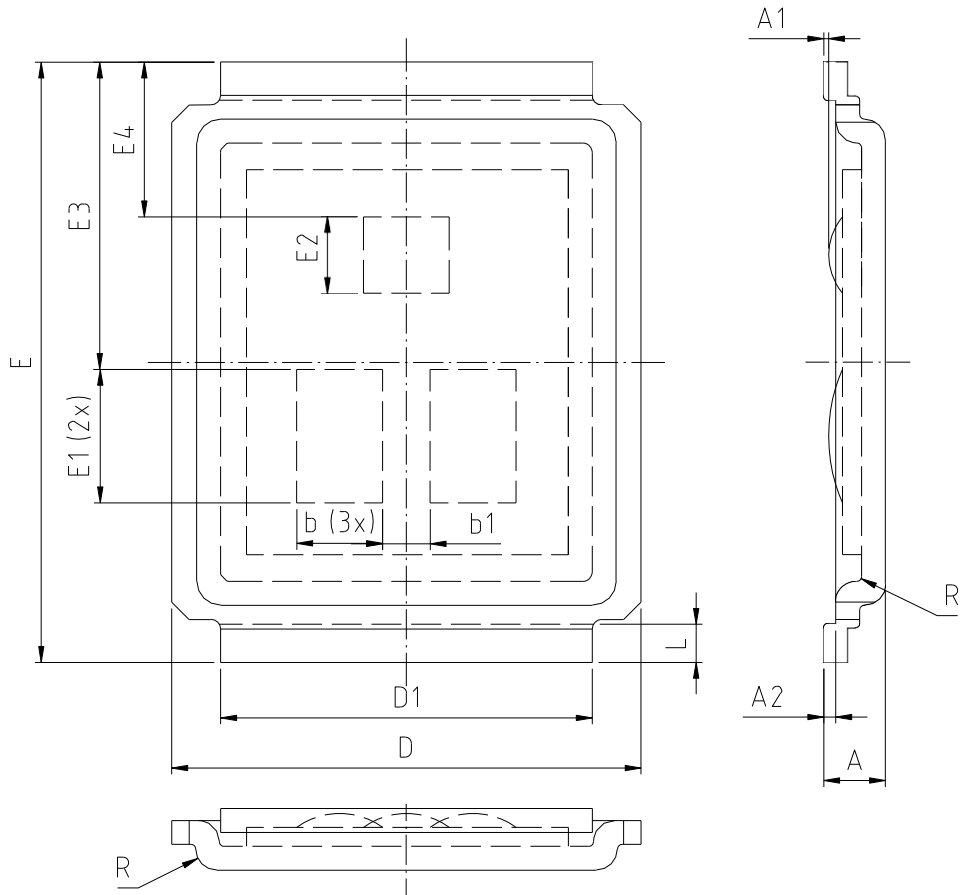


$V_{BR(DSS)}=f(T_j)$; $I_D=1\text{ mA}$

Diagram Gate charge waveforms

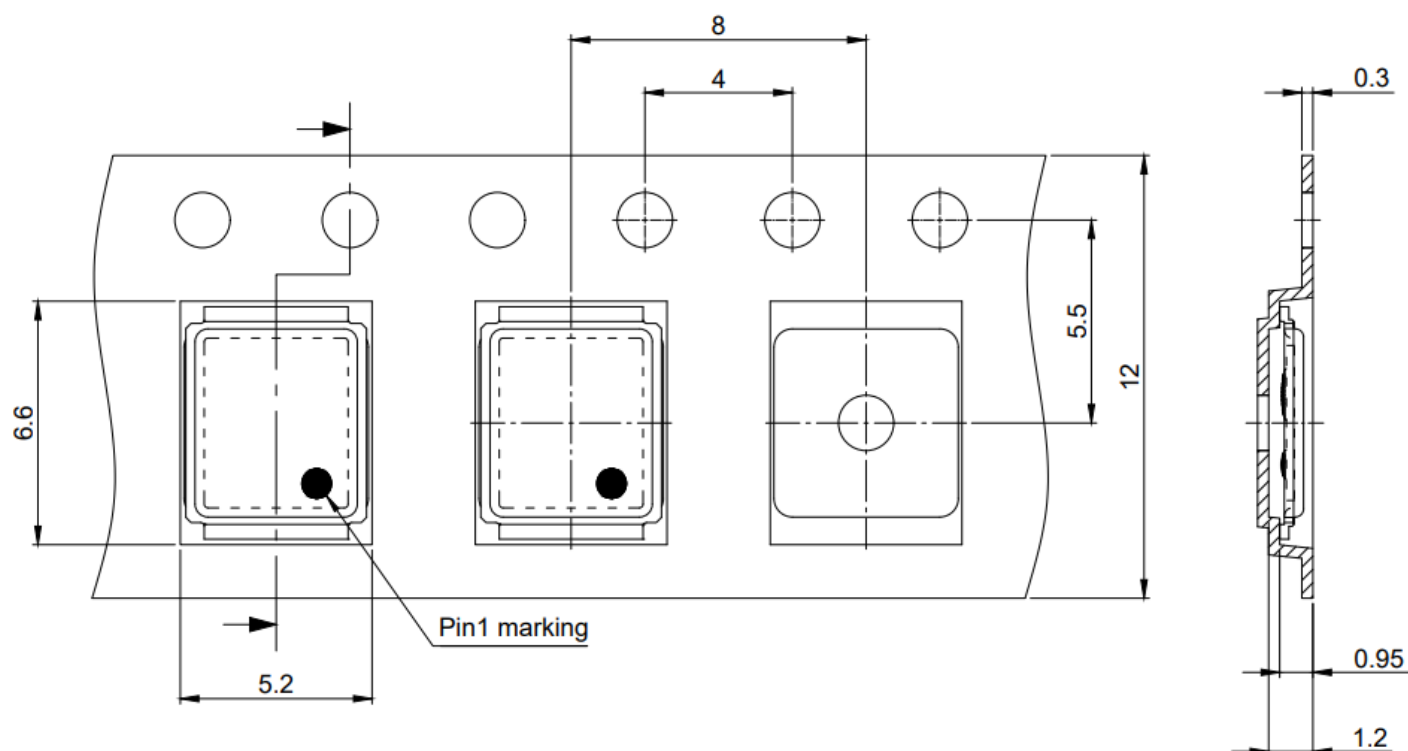


5 封装外形



PACKAGE - GROUP NUMBER: MG-WDSO-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	

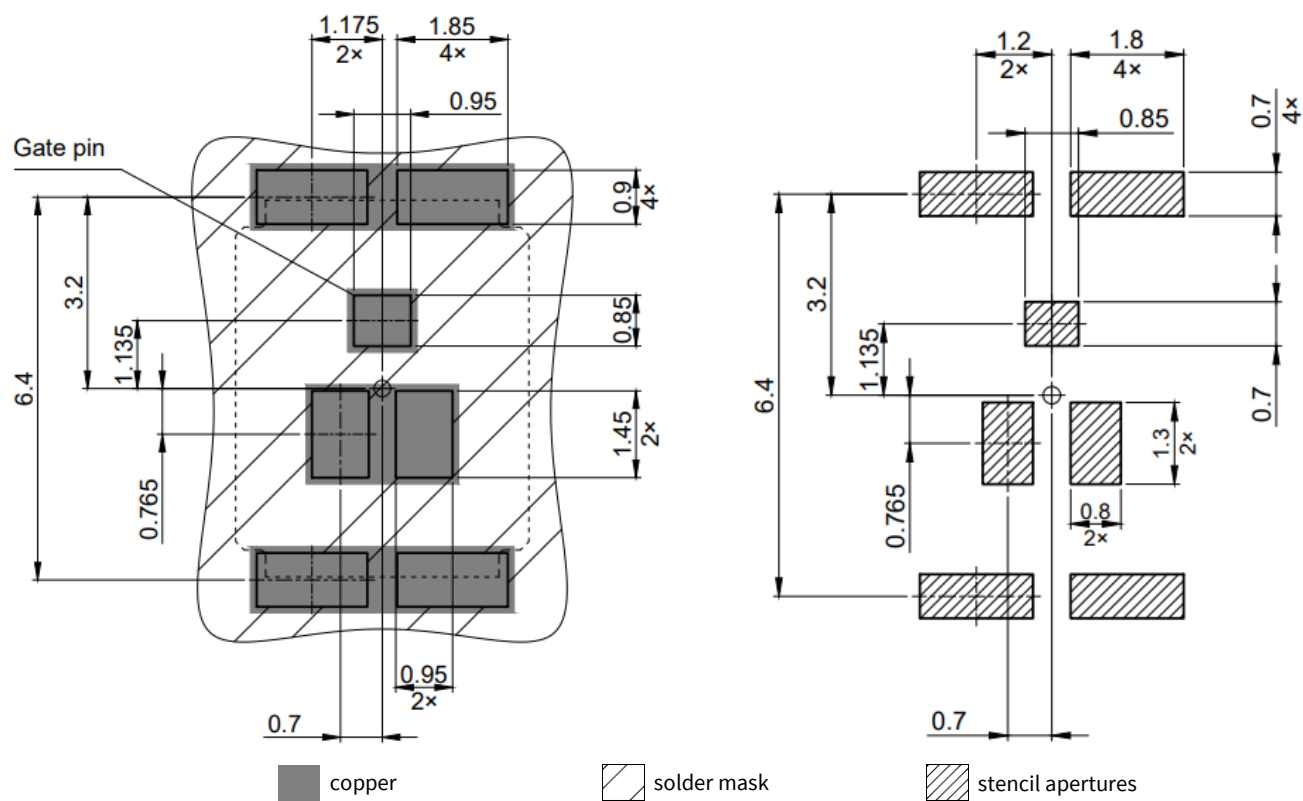
图 1 MG-WDSO-5 外形图, 尺寸单位为毫米



All dimensions are in units mm

The drawing is in compliance with ISO 128-30, Projection Method 1[

图2 封装外形胶带 (MG-WDSO5-5), 尺寸单位为毫米



All dimensions are in units mm

所有焊盘均经过阻焊处理

图 3 封装外形 (MG-WDSO-5), 尺寸单位为毫米

修订记录

BSB056N10NN3 G

Revision: 2023-10-12, Rev. 2.6

历史修订版本

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

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Infineon Technologies AG 81726

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版本 2025-10-30

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