

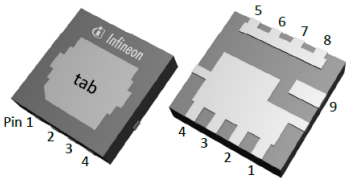
英飞凌MOSFET

OptiMOS™ 7 功率晶体管，40 V

特性

- N沟道，逻辑电平
- 极低的导通电阻 $R_{DS(on)}$
- 卓越的热阻
- 100% 雪崩测试
- 无铅镀层；符合 RoHS 标准
- 符合 IEC61249-2-21 标准的无卤素

PG-WHTFN-9 (3x3)

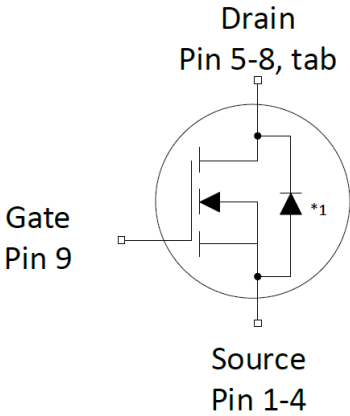


产品验证

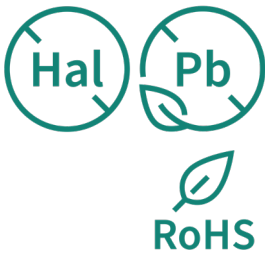
已通过 JEDEC 相关测试。

表 1 主要性能参数

Parameter	Value	Unit
V_{DS}	40	V
$R_{DS(on),max}$	1.0	mΩ
I_D	270	A
Q_{oss}	43	nC
$Q_G(0V, 4.5V)$	18.9	nC



*1: Internal body diode



Part number	Package	Marking	Related links
IQE010N04LM7CGSC	PG-WHTFN-9	A	-

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1 最大额定值

除非另有规定, $T_A=25\text{ }^{\circ}\text{C}$

表 2 最大额定值

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Continuous drain current ¹⁾	I_D	-	-	270	A	$V_{GS}=10\text{ V}, T_C=25\text{ }^{\circ}\text{C}$
				191		$V_{GS}=10\text{ V}, T_C=100\text{ }^{\circ}\text{C}$
				168		$V_{GS}=4.5\text{ V}, T_C=100\text{ }^{\circ}\text{C}$
				35		$V_{GS}=10\text{ V}, T_A=25\text{ }^{\circ}\text{C}, R_{thJA}=60\text{ }^{\circ}\text{C/W}^{2)}$
Pulsed drain current ³⁾	$I_{D,pulse}$	-	-	1080	A	$T_A=25\text{ }^{\circ}\text{C}$
Avalanche energy, single pulse ⁴⁾	E_{AS}	-	-	255	mJ	$I_D=20\text{ A}, R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-12	-	12	V	-
Power dissipation	P_{tot}	-	-	150	W	$T_C=25\text{ }^{\circ}\text{C}$
				2.5		$T_A=25\text{ }^{\circ}\text{C}, R_{thJA}=60\text{ }^{\circ}\text{C/W}^{2)}$
Operating and storage temperature	T_j, T_{stg}	-55	-	175	$^{\circ}\text{C}$	-

1) 额定值指产品仅具有数据手册指定的绝对最大值, 保持外壳温度符合规定要求。其他外壳温度请参见图 2。需要根据实际环境条件降低额定值。

2) 器件置于 $40\text{ mm} \times 40\text{ mm} \times 1.5\text{ mm}$ 环氧树脂 PCB FR4 上, 配有 6 cm^2 (单层, $70\text{ }\mu\text{m}$ 厚) 铜层面积用于漏极连接。PCB 在静止空气中垂直放置。

3) 详细信息请参见图 3

4) 详细信息请参见图 13

2 热特性

表 3 热特性

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case, bottom	R_{thJC}	-	-	1.0	$^{\circ}\text{C/W}$	-
Thermal resistance, junction - case, top	R_{thJC}			1.4		
Thermal resistance, junction - ambient, 6 cm^2 cooling area ⁵⁾	R_{thJA}			60		

5) 器件置于 $40\text{ mm} \times 40\text{ mm} \times 1.5\text{ mm}$ 环氧树脂 PCB FR4 上, 配有 6 cm^2 (单层, $70\text{ }\mu\text{m}$ 厚) 铜层面积用于漏极连接。PCB 在静止空气中垂直放置。

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3 电气特性

除非另有规定, $T_j = 25^\circ\text{C}$

表 4 静态特性

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	40	-	-	V	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	1.1	1.4	1.7	V	$V_{DS}=V_{GS}, I_D=458\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.1	1	μA	$V_{DS}=32\text{ V}, V_{GS}=0\text{ V}, T_j=25^\circ\text{C}$
			10	100		$V_{DS}=32\text{ V}, V_{GS}=0\text{ V}, T_j=125^\circ\text{C}$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS}=12\text{ V}, V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	0.85	1.0	m Ω	$V_{GS}=10\text{ V}, I_D=20\text{ A}$
			0.93	1.1		$V_{GS}=6\text{ V}, I_D=20\text{ A}$
			1.04	1.3		$V_{GS}=4.5\text{ V}, I_D=20\text{ A}$
Gate resistance ⁶⁾	R_G	-	0.8	-	Ω	-
Transconductance ⁶⁾	g_{fs}	66	130	-	S	$ V_{DS} \geq 2 I_D R_{DS(on)max}, I_D=20\text{ A}$

⁶⁾ 由设计指定, 未经过生产测试。

表 5 动态特性

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Input capacitance ⁷⁾	C_{iss}	-	3000	3900	pF	$V_{GS}=0\text{ V}, V_{DS}=20\text{ V}, f=1\text{ MHz}$
Output capacitance ⁷⁾	C_{oss}		980	1300		
Reverse transfer capacitance ⁷⁾	C_{rss}		50	88		
Turn-on delay time	$t_{d(on)}$	-	4	-	ns	$V_{DD}=20\text{ V}, V_{GS}=10\text{ V}, I_D=20\text{ A},$ $R_{G,ext}=1.6\text{ }\Omega$
Rise time	t_r		2			
Turn-off delay time	$t_{d(off)}$		19			
Fall time	t_f		3			

⁷⁾ 由设计指定, 未经过生产测试。

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表 6 栅极电荷特性⁸⁾

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	7.1	-	nC	$V_{DD}=20\text{ V}$, $I_D=20\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$
Gate charge at threshold	$Q_{g(th)}$		4.2	-	nC	
Gate to drain charge ⁹⁾	Q_{gd}		3.9	5.9	nC	
Switching charge	Q_{sw}		6.7	-	nC	
Gate charge total ⁹⁾	Q_g		18.9	24	nC	
Gate plateau voltage	$V_{plateau}$		2.4	-	V	
Gate charge total ⁹⁾	Q_g	-	39	52	nC	$V_{DD}=20\text{ V}$, $I_D=20\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total, sync. FET	$Q_{g(sync)}$	-	16.6	-	nC	$V_{DS}=0.1\text{ V}$, $V_{GS}=0\text{ to }10\text{ V}$
Output charge ⁹⁾	Q_{oss}	-	43	57	nC	$V_{DS}=20\text{ V}$, $V_{GS}=0\text{ V}$

⁸⁾ 参数定义请参见“栅极电荷波形”

⁹⁾ 由设计指定, 未经过生产测试。

表 7 反向二极管

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	136	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$			1080		
Diode forward voltage	V_{SD}	-	0.74	1.0	V	$V_{GS}=0\text{ V}$, $I_F=20\text{ A}$, $T_j=25\text{ °C}$
Reverse recovery time ¹⁰⁾	t_{rr}	-	33	65	ns	$V_R=20\text{ V}$, $I_F=20\text{ A}$, $di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge ¹⁰⁾	Q_{rr}		29	58	nC	
Reverse recovery time ¹⁰⁾	t_{rr}	-	23	46	ns	$V_R=20\text{ V}$, $I_F=20\text{ A}$, $di_F/dt=500\text{ A}/\mu\text{s}$
Reverse recovery charge ¹⁰⁾	Q_{rr}		87	174	nC	
Reverse recovery time ¹⁰⁾	t_{rr}	-	19	38	ns	$V_R=20\text{ V}$, $I_F=20\text{ A}$, $di_F/dt=1000\text{ A}/\mu\text{s}$
Reverse recovery charge ¹⁰⁾	Q_{rr}		124	249	nC	

¹⁰⁾ 由设计指定, 未经过生产测试。

4 电气特性图

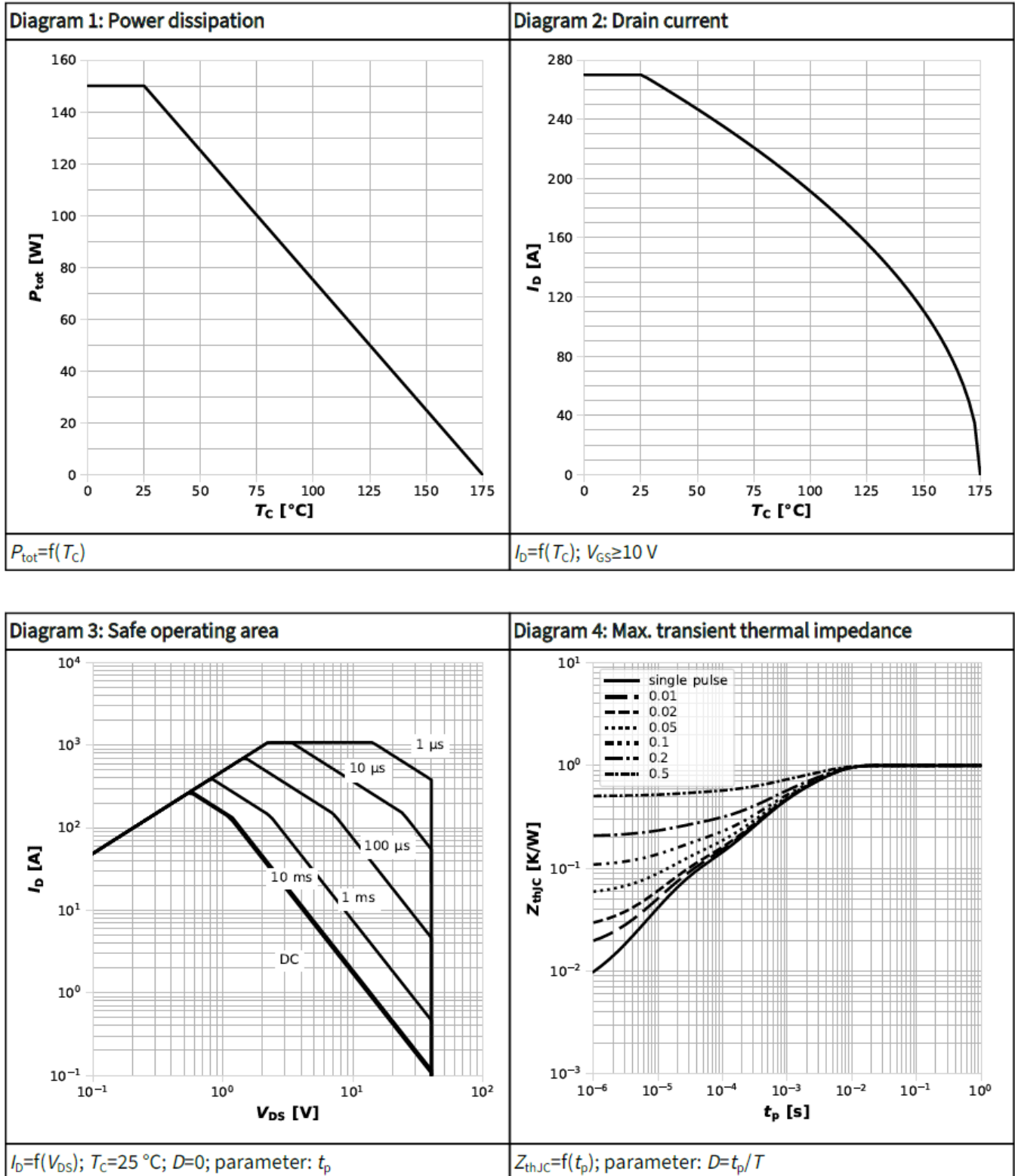


Diagram 5: Typ. output characteristics

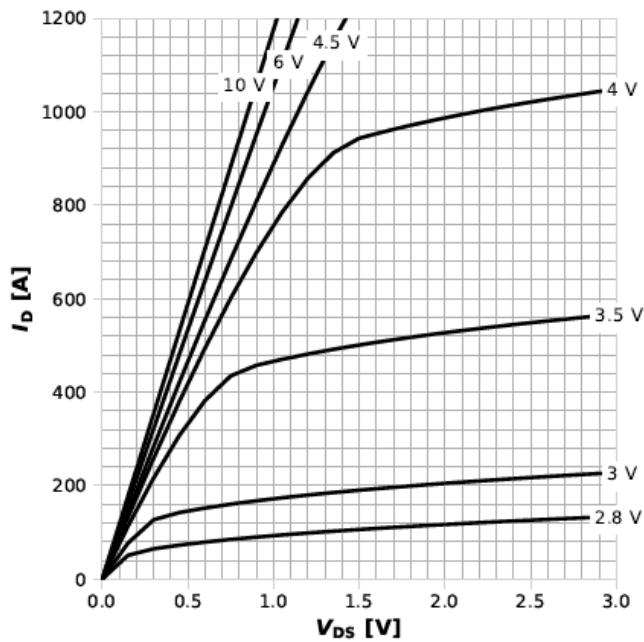

 $I_D = f(V_{DS}), T_j = 25^\circ\text{C}; \text{parameter: } V_{GS}$

Diagram 6: Typ. drain-source on resistance

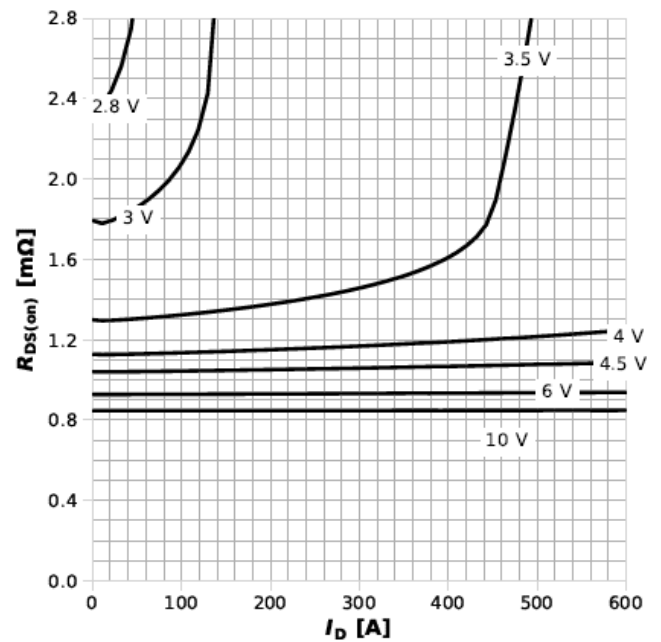

 $R_{DS(on)} = f(I_D), T_j = 25^\circ\text{C}; \text{parameter: } V_{GS}$

Diagram 7: Typ. transfer characteristics

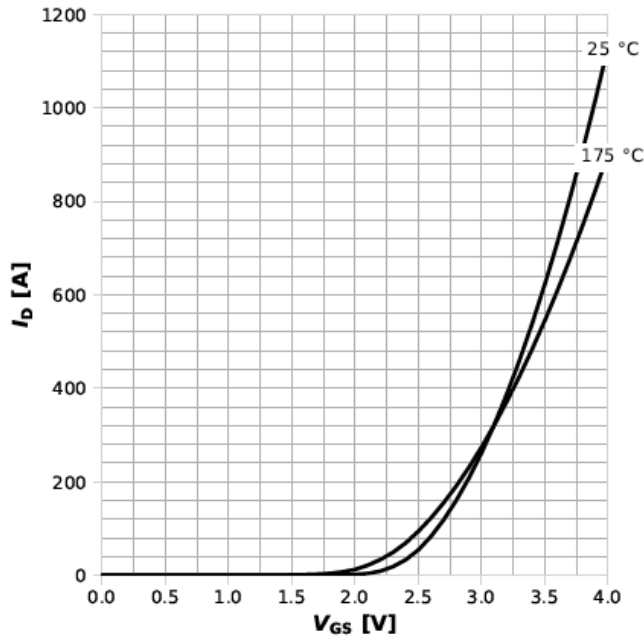
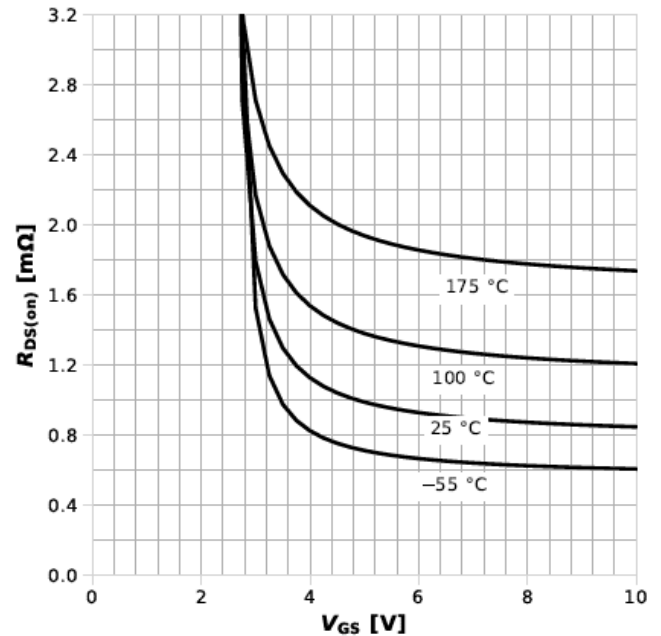
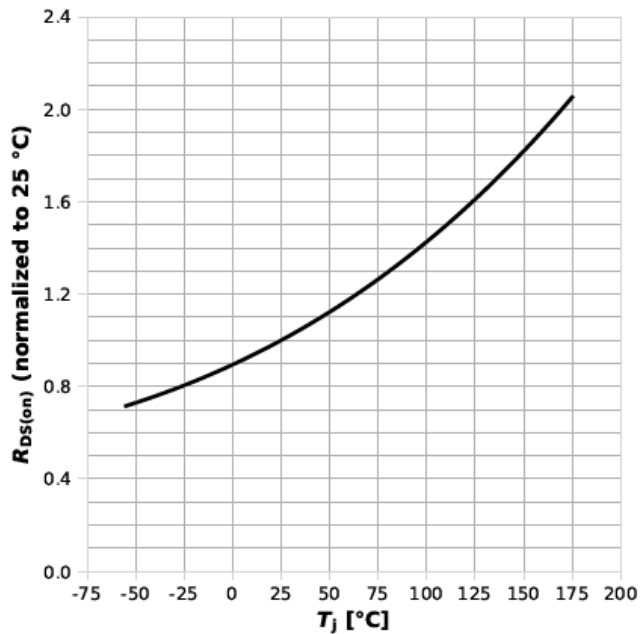
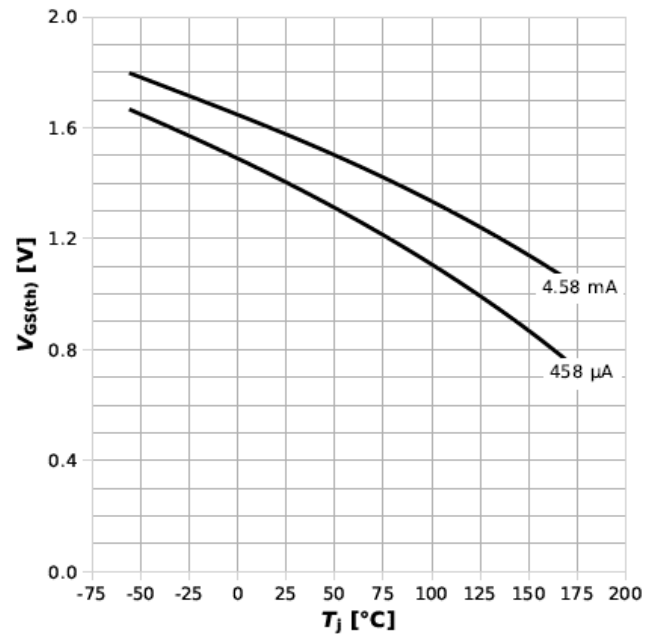

 $I_D = f(V_{GS}), |V_{DS}| > 2|I_D|R_{DS(on)max}; \text{parameter: } T_j$

Diagram 8: Typ. drain-source on resistance

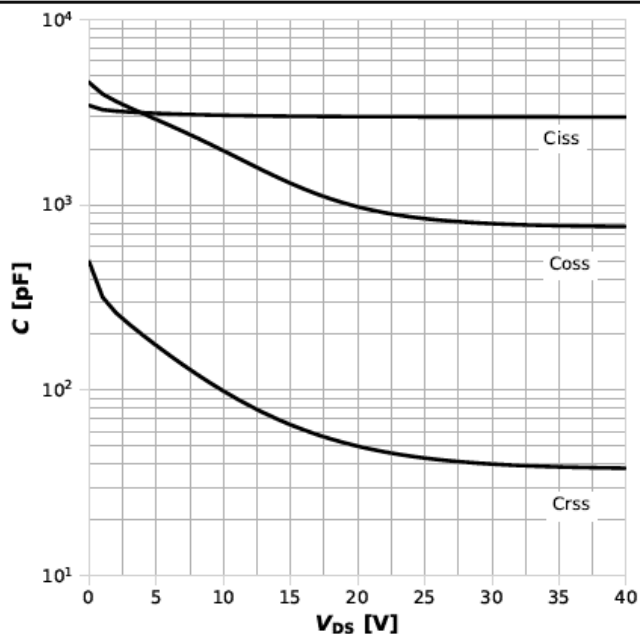

 $R_{DS(on)} = f(V_{GS}), I_D = 20\text{ A}; \text{parameter: } T_j$

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Diagram 9: Normalized drain-source on resistance


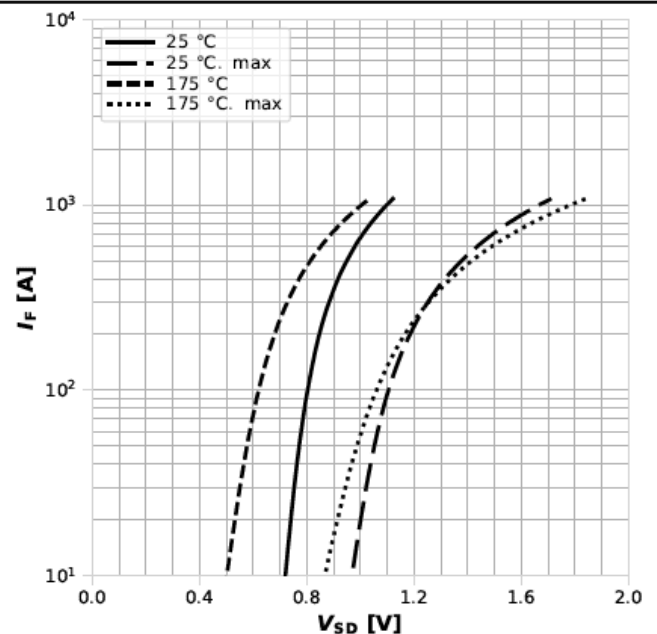
$$R_{DS(on)} = f(T_j), I_D = 20 \text{ A}, V_{GS} = 10 \text{ V}$$

Diagram 10: Typ. gate threshold voltage


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

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

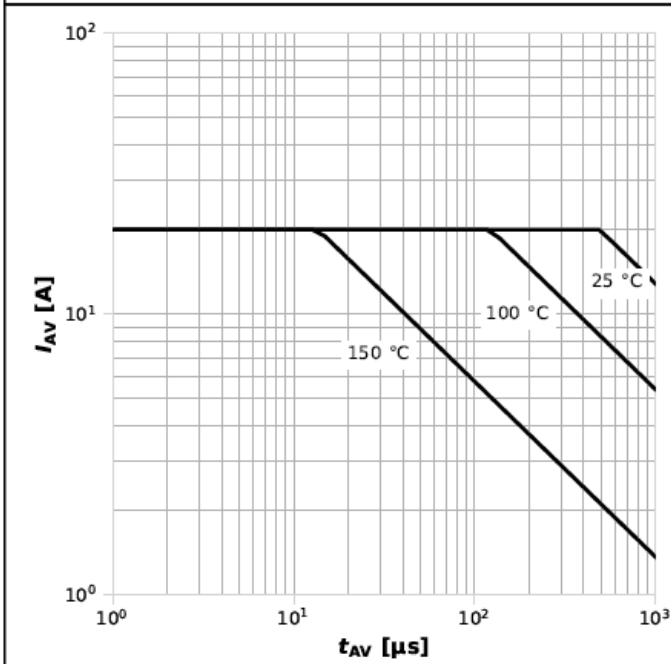

 $I_{AS}=f(t_{AV}); R_{GS}=25\ \Omega; \text{parameter: } T_{j,start}$

Diagram 14: Typ. gate charge

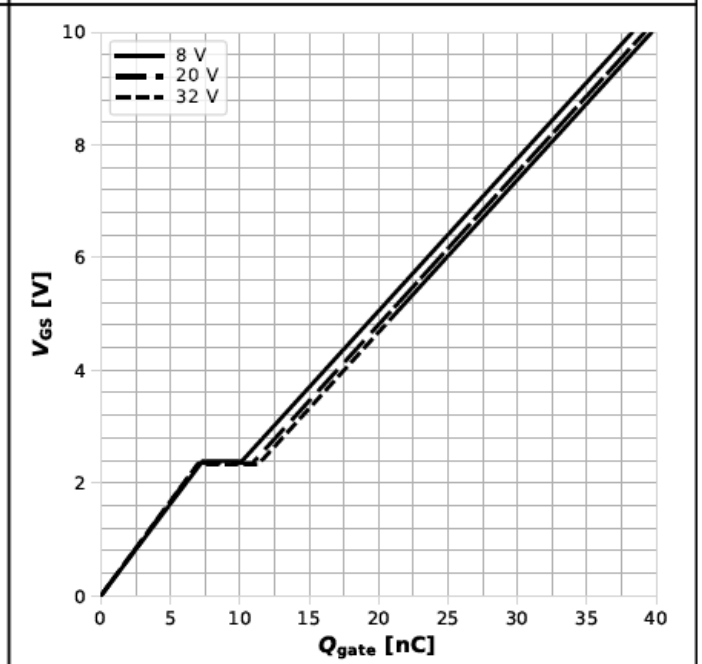
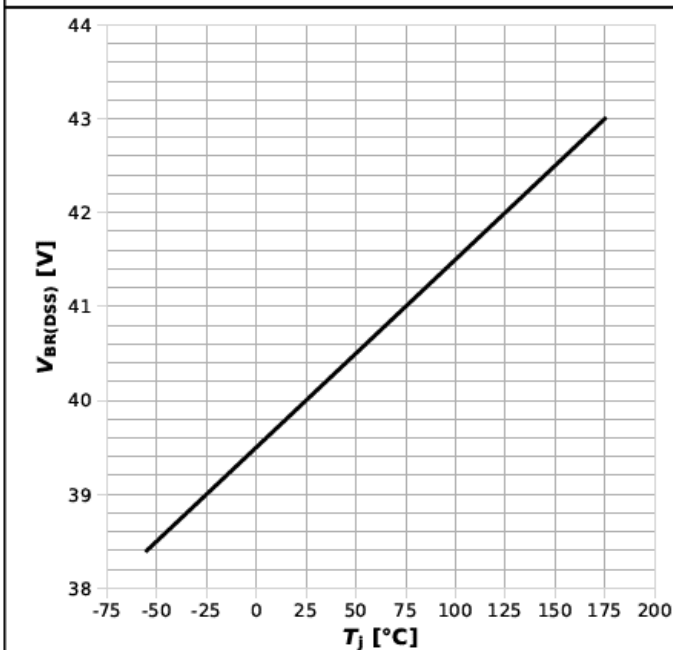
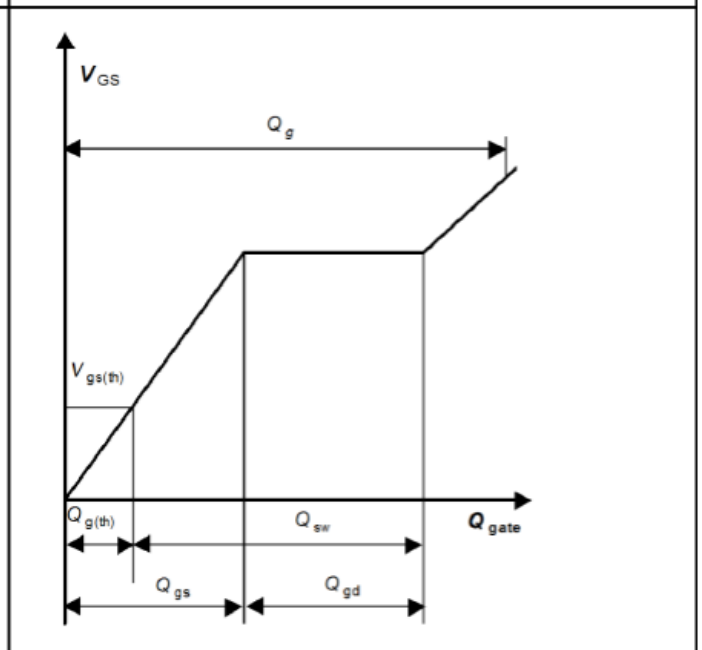

 $V_{GS}=f(Q_{gate}), I_D=20\ \text{A pulsed}, T_j=25\ ^\circ\text{C}; \text{parameter: } V_{DD}$

Diagram 15: Min. drain-source breakdown voltage


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

Gate charge waveforms



-

5 封装外形

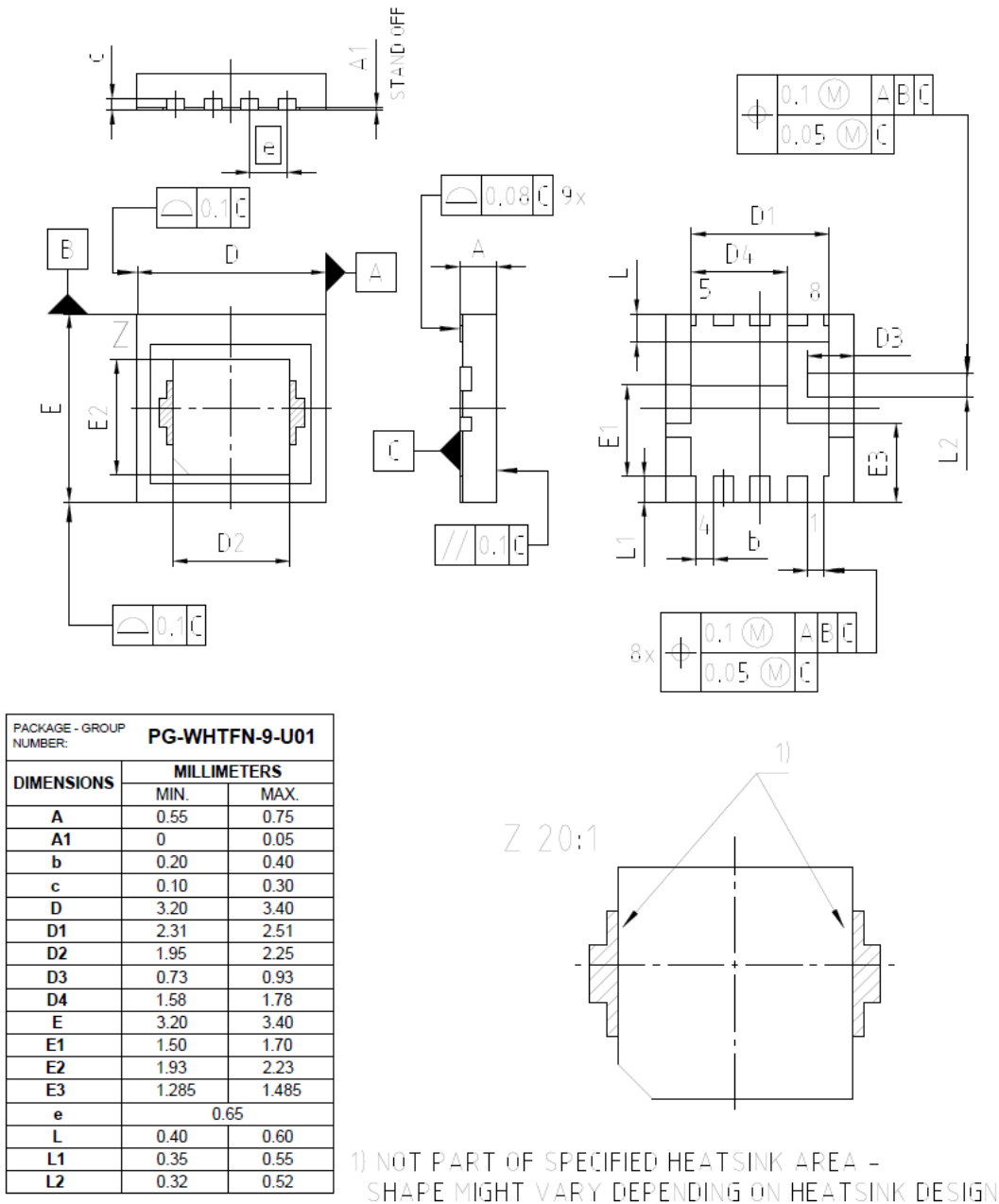


图 1 PG- WHTFN- 9 封装外形，尺寸单位为毫米

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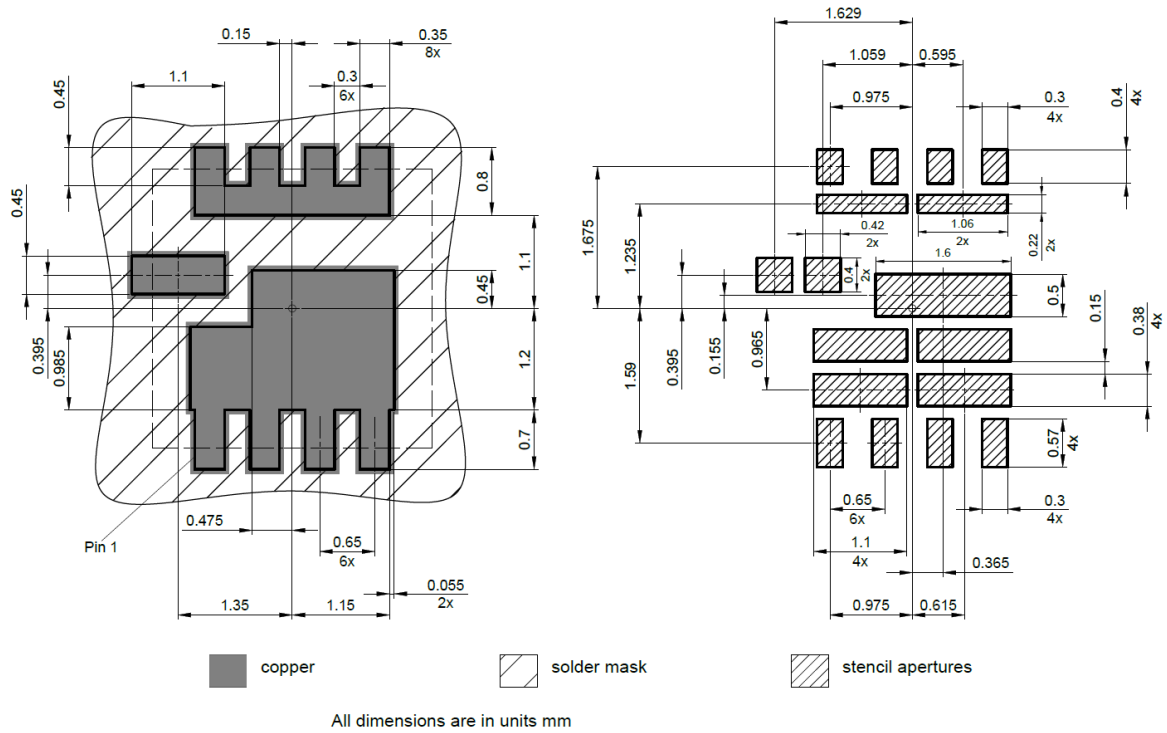


图 2 PG- WHTFN- 9封装图，尺寸单位为毫米

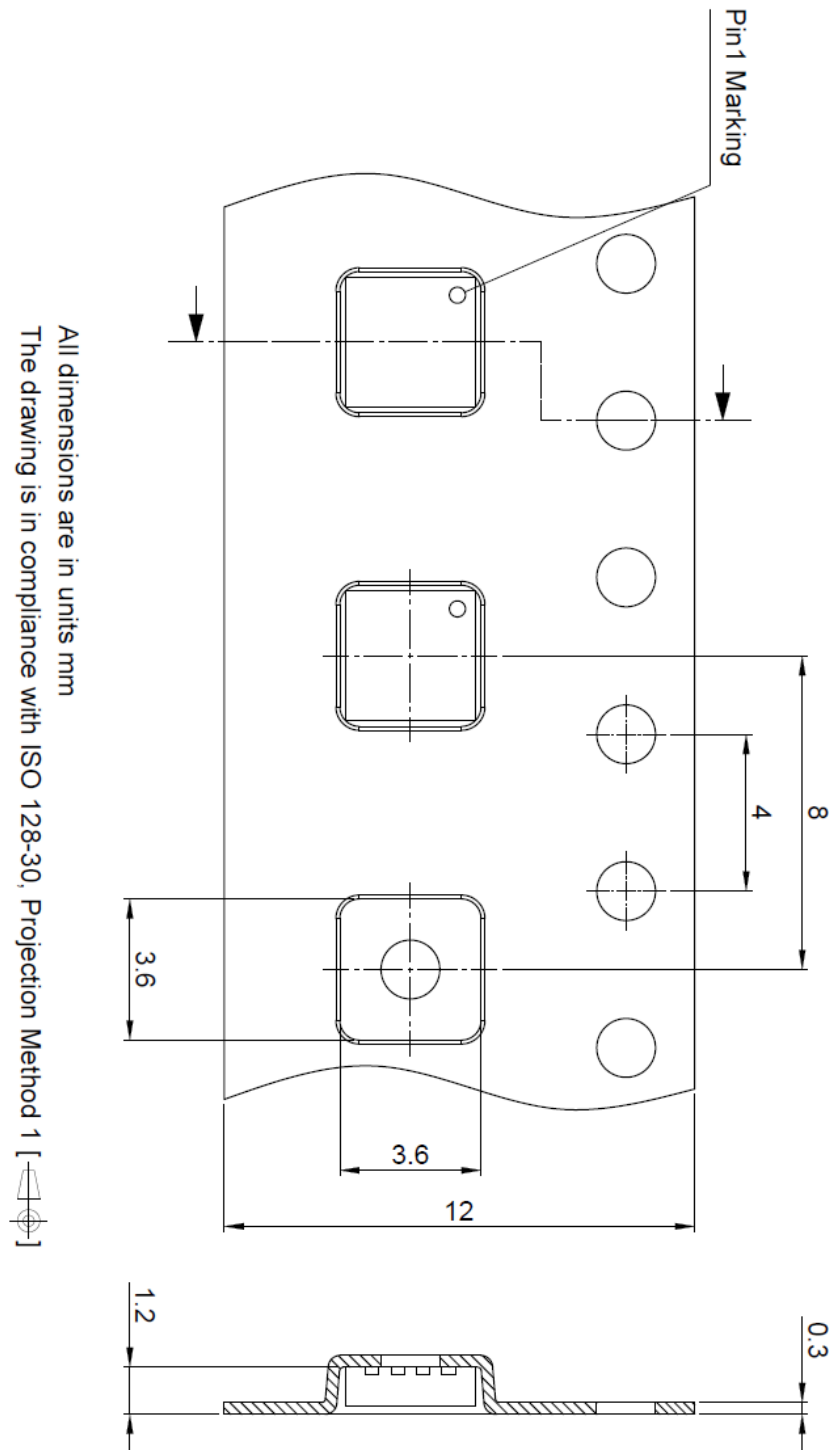


图 3 PG- WHTFN- 9封装变体，尺寸单位为毫米

OptiMOS™ 7 功率晶体管，40 V**IQE010N04LM7CGSC**

修订记录

IQE010N04LM7CGSC**Revision 2026-02-09, Rev. 1.0**

Previous revisions

Revision	Date	Subjects (major changes since last revision)
1.0	2026-02-09	Release of final datasheet

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