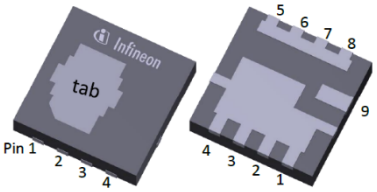
MOSFET

OptiMOS™ 6 功率晶体管，40 V

PG-WHTFN-9 (3x3)

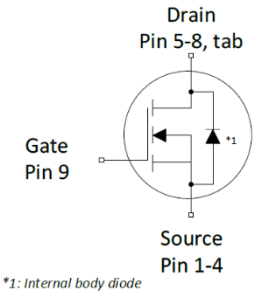
特性

- 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



产品验证

已通过 JEDEC 相关测试。



*1: Internal body diode

表 1　　主要性能参数

Parameter	Value	Unit
V_{DS}	40	V
$R_{DS(on),max}$	2.05	mΩ
I_D	166	A
Q_{oss}	27	nC
Q_G	25	nC

Part number	Package	Marking	Related links
IQE020N04LM6CGSC	PG-WHTFN-9	V	-

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1 最大额定值

除非另有规定，T_A =25 °C

表 2 最大额定值

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Continuous drain current [1]	I_D	-	-	166	A	V_{GS}=10 V, T_C=25 °C
				117		V_{GS}=10 V, T_C=100 °C
				99		V_{GS}=4.5 V, T_C=100 °C
				25		V_{GS}=10 V,T_A=25 °C,R_{thJA}=60 °C/W [2]
Pulsed drain current [3]	$I_{D,pulse}$	-	-	664	A	T_C=25 °C
Avalanche energy, single pulse [4]	E_{AS}	-	-	135	mJ	I_D=20 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	107	W	T_C=25 °C
				2.5		T_A=25 °C, R_{thJA}=60 °C/W [2]
Operating and storage temperature	T_j, T_{stg}	-55	-	175	°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 mm × 40 mm × 1.5 mm 环氧树脂 PCB FR4 上，配有6 cm^2（单层，70 µm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}	-	-	1.4	°C/W	-
Thermal resistance, junction - case, top	R_{thJC}		2.3	-		
Thermal resistance, junction – ambient, 6 cm^2 cooling area [5]	R_{thJA}		-	60		

5) 器件置于40 mm × 40 mm × 1.5 mm 环氧树脂印刷电路板 FR4 上，配有6 cm^2（单层，70 µm厚）铜层面积用于漏极连接。印刷电路板垂直放置在静止空气中。

3 电气特性

除非另有规定，T_j = 25°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 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	1.3	1.6	2.3	V	V_{DS}=V_{GS}, I_D=250 µA
Zero gate voltage drain current	I_{DSS}	-	0.1	1	µA	V_{DS}=40 V, V_{GS}=0 V, T_j=25 °C
			10	100		V_{DS}=40 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	$R_{DS(on)}$	-	1.8	2.05	mΩ	V_{GS}=10 V, I_D=20 A
			2.4	2.9		V_{GS}=4.5 V, I_D=20 A
Gate resistance	R_G	-	1.3	-	Ω	-
Transconductance	g_{fs}	55	110	-	S	$\|V_{DS}\|\geq 2\|I_D\|R_{DS(on)max}$, I_D=20 A

表 5 动态特性

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Input capacitance [6]	C_{iss}	-	1700	2200	pF	V_{GS}=0 V, V_{DS}=20 V, f=1 MHz
Output capacitance [6]	C_{oss}		570	740		
Reverse transfer capacitance [6]	C_{rss}		19	33		
Turn-on delay time	$t_{d(on)}$	-	4	-	ns	V_{DD}=20 V, V_{GS}=10 V, I_D=20 A, $R_{G,ext}$=1.6 Ω
Rise time	t_r		1.6			
Turn-off delay time	$t_{d(off)}$		14.7			
Fall time	t_f		2.9			

[6] 由设计指定，未经过生产测试。

表 6 栅极电荷特性[7)]

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	4.6	-	nC	V_{DD}=20 V, I_D=20 A, V_{GS}=0 to 4.5 V
Gate charge at threshold	$Q_{g(th)}$		2.8	-	nC	
Gate to drain charge [8)]	Q_{gd}		3.1	4.7	nC	
Switching charge	Q_{sw}		4.9	-	nC	
Gate charge total [8)]	Q_g		12.1	15.1	nC	
Gate plateau voltage	$V_{plateau}$		2.6	-	V	
Gate charge total [8)]	Q_g	-	25	33	nC	V_{DD}=20 V, I_D=20 A, V_{GS}=0 to 10 V
Output charge [8)]	Q_{oss}	-	27	36	nC	V_{DS}=20 V, V_{GS}=0 V

7) 参数定义请参数见“栅极电荷波形”

8) 由设计指定，未经过生产测试。

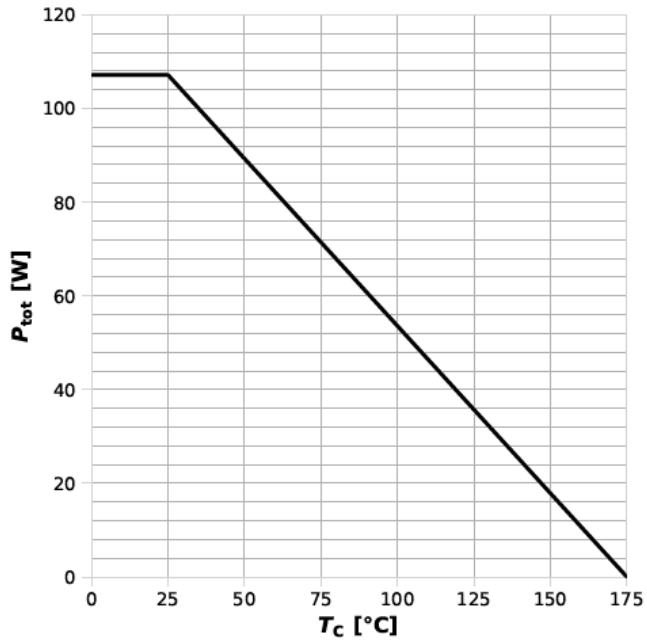
表 7 反向二极管

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	89	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$			664		
Diode forward voltage	V_{SD}	-	0.78	1.0	V	V_{GS}=0 V, I_F=20 A, T_j=25 °C
Reverse recovery time [9)]	t_{rr}	-	28	56	ns	V_R=20 V, I_F=20 A, di_F/dt=100 A/µs
Reverse recovery charge [9)]	Q_{rr}		19	38	nC	
Reverse recovery time [9)]	t_{rr}	-	20	40	ns	V_R=20 V, I_F=20 A, di_F/dt=500 A/µs
Reverse recovery charge [9)]	Q_{rr}		60	119	nC	

9) 由设计指定，未经过生产测试。

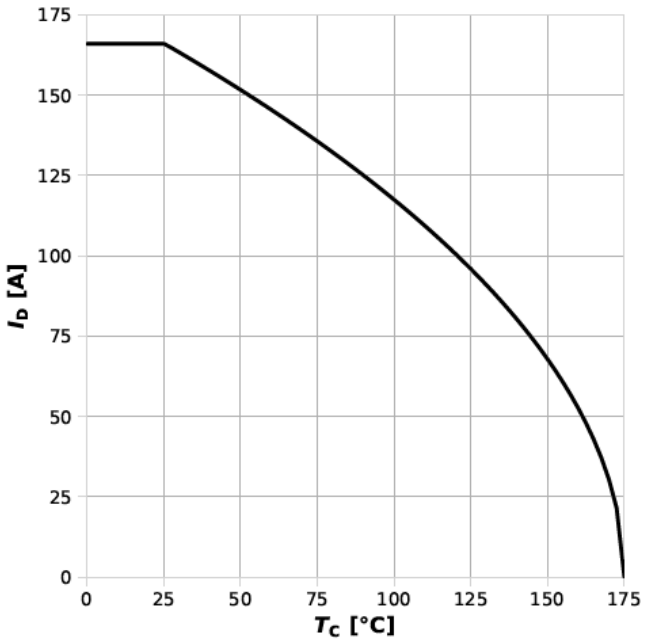
4 电气特性图

Diagram 1: Power dissipation



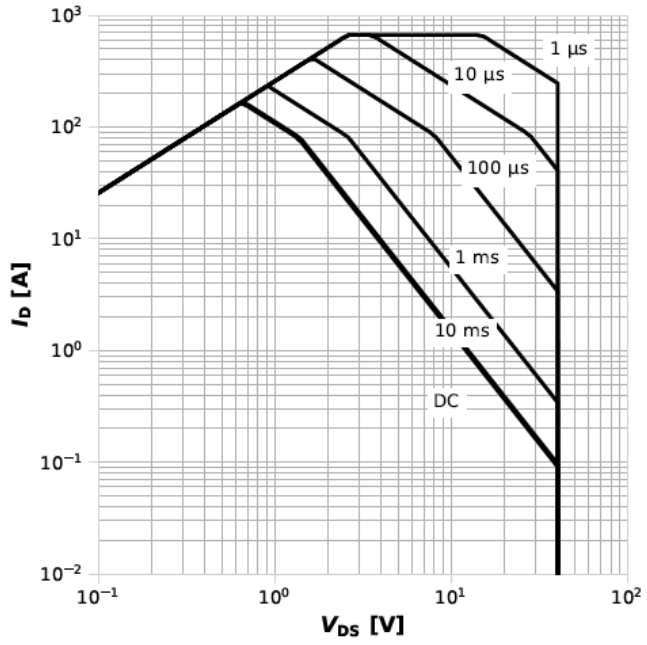
$P_{tot}=f(T_C)$

Diagram 2: Drain current



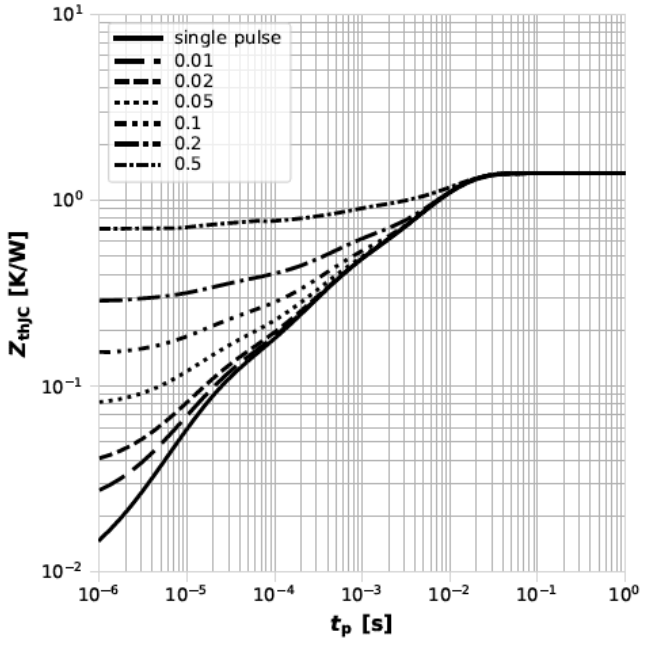
$I_D=f(T_C)$; $V_{GS}\geq 10$ V

Diagram 3: Safe operating area



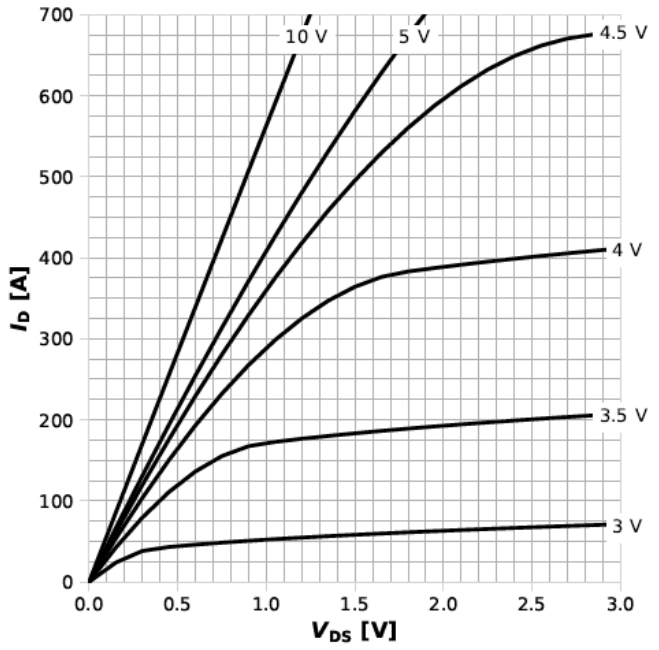
$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$; parameter: t_p

Diagram 4: Max. transient thermal impedance



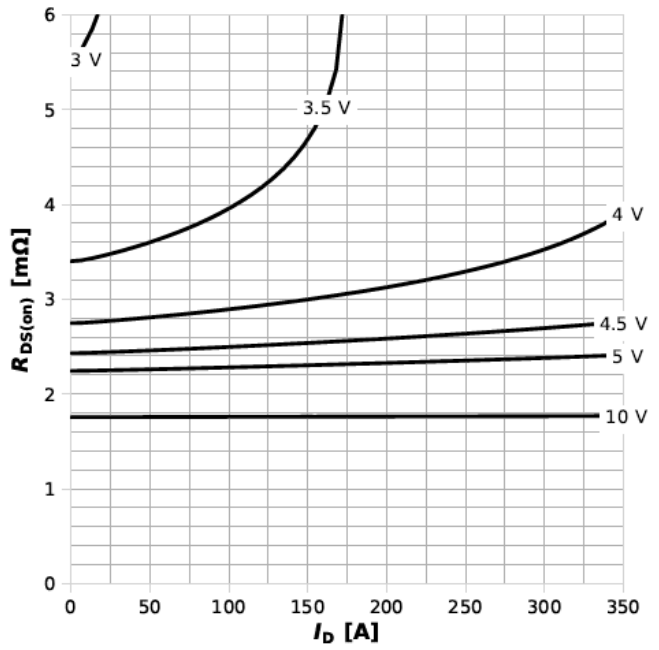
$Z_{thJC}=f(t_p)$; parameter: $D=t_p/T$

Diagram 5: Typ. output characteristics



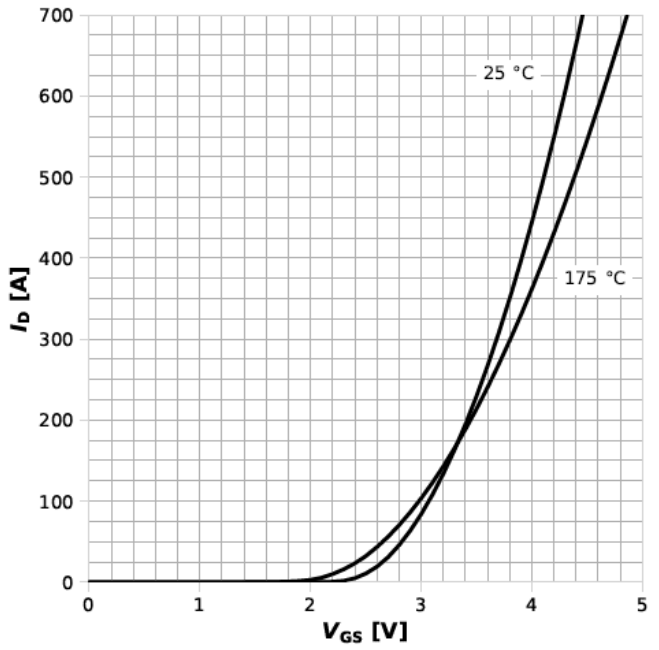
$I_D=f(V_{DS})$, $T_j=25$ °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



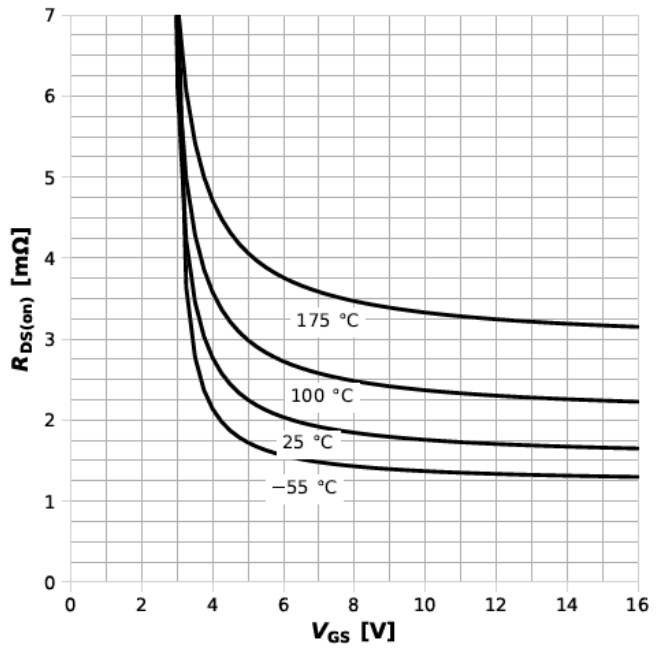
$R_{DS(on)}=f(I_D)$, $T_j=25$ °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



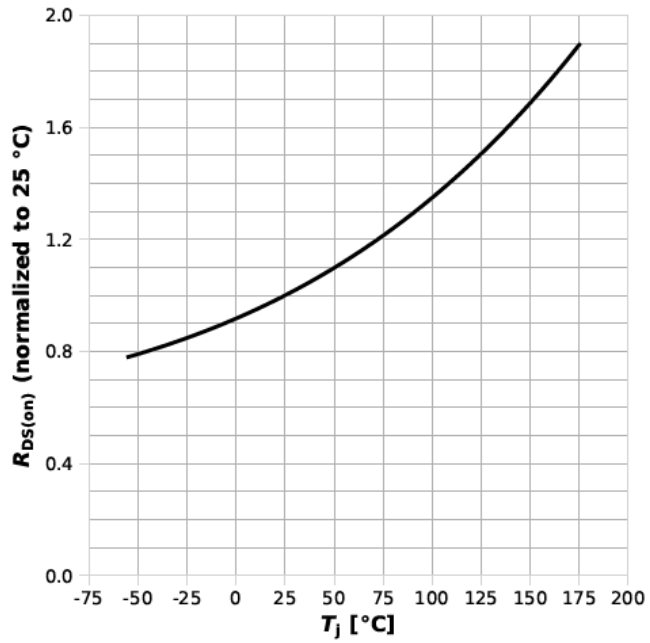
$I_D=f(V_{GS})$, $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. drain-source on resistance



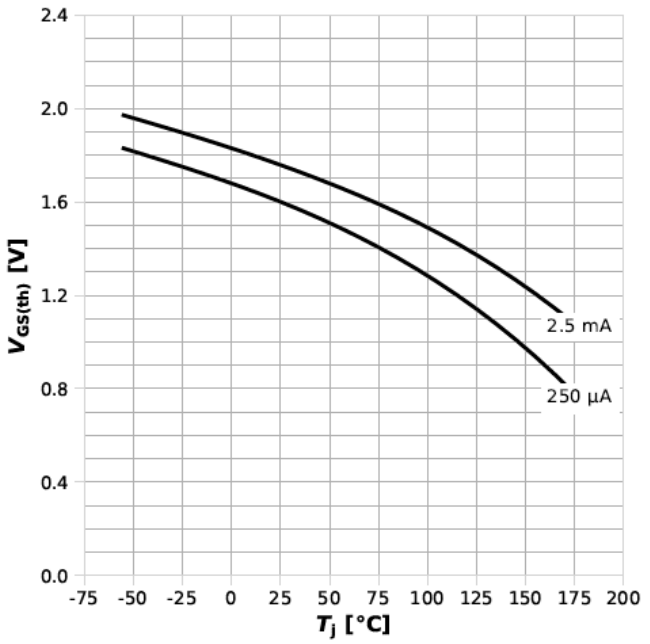
$R_{DS(on)}=f(V_{GS})$, $I_D=20$ A; parameter: T_j

Diagram 9: Normalized drain-source on resistance



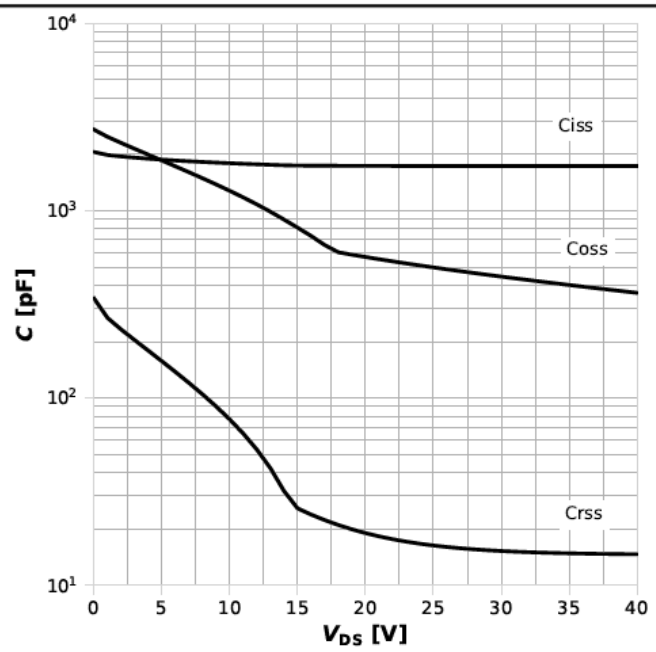
$R_{DS(on)}$=f(T_j), I_D=20 A, V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



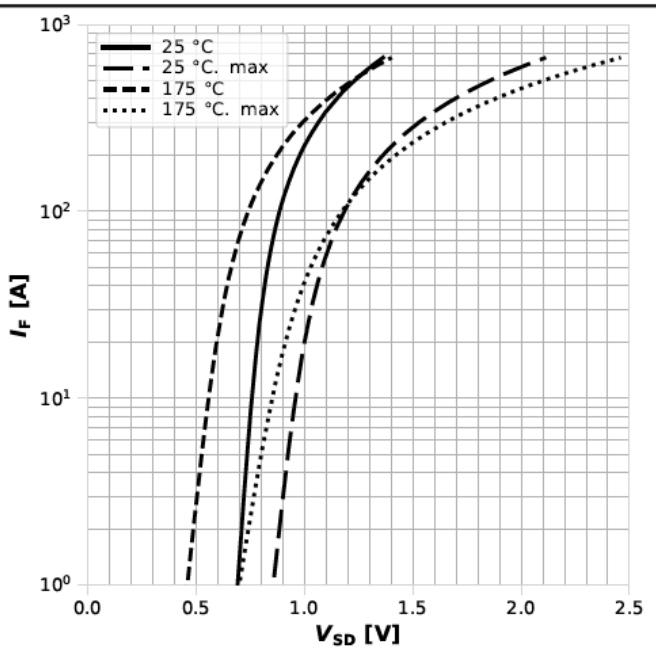
$V_{GS(th}$=f(T_j), V_{GS}=V_{DS}; parameter: I_D

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

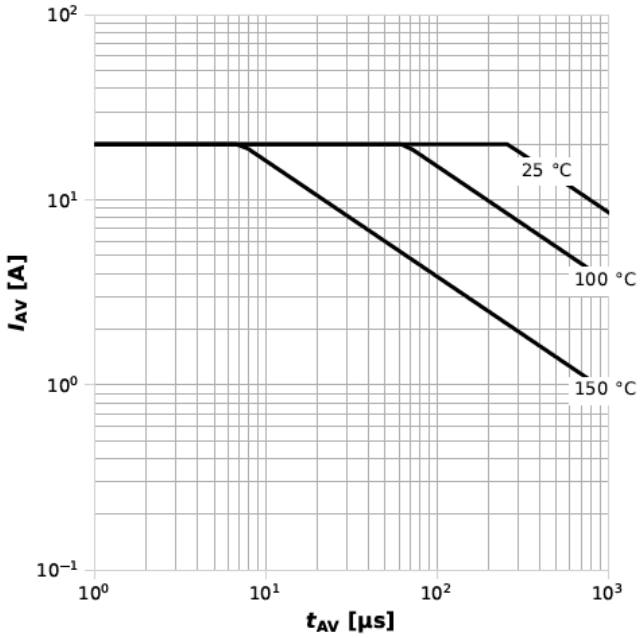
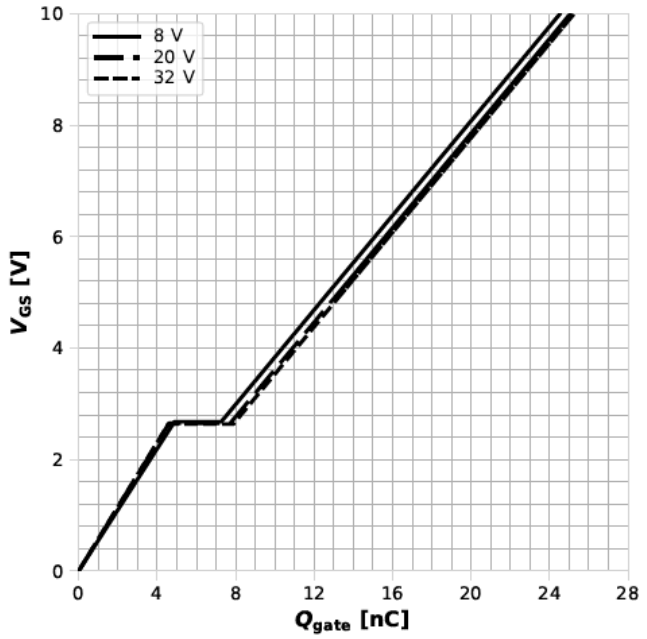
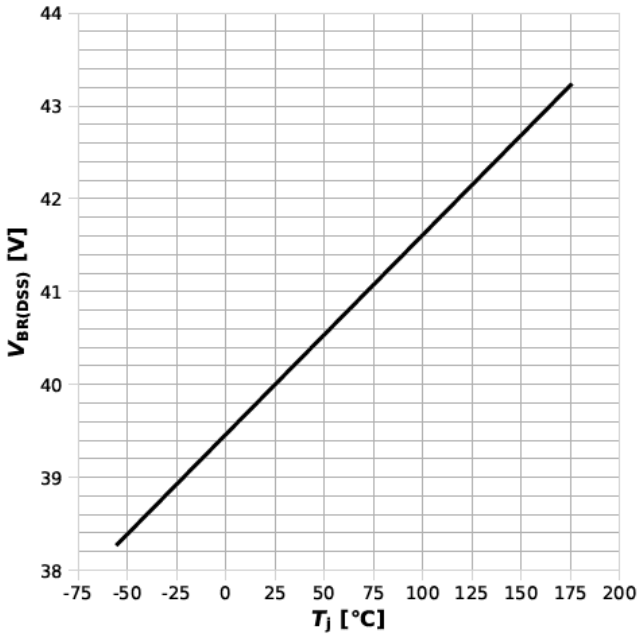
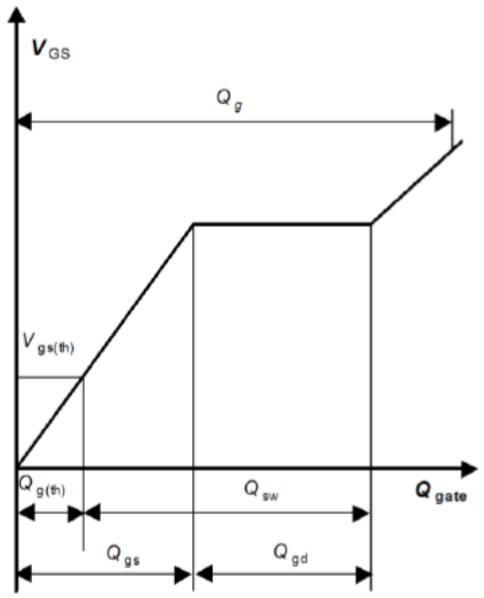
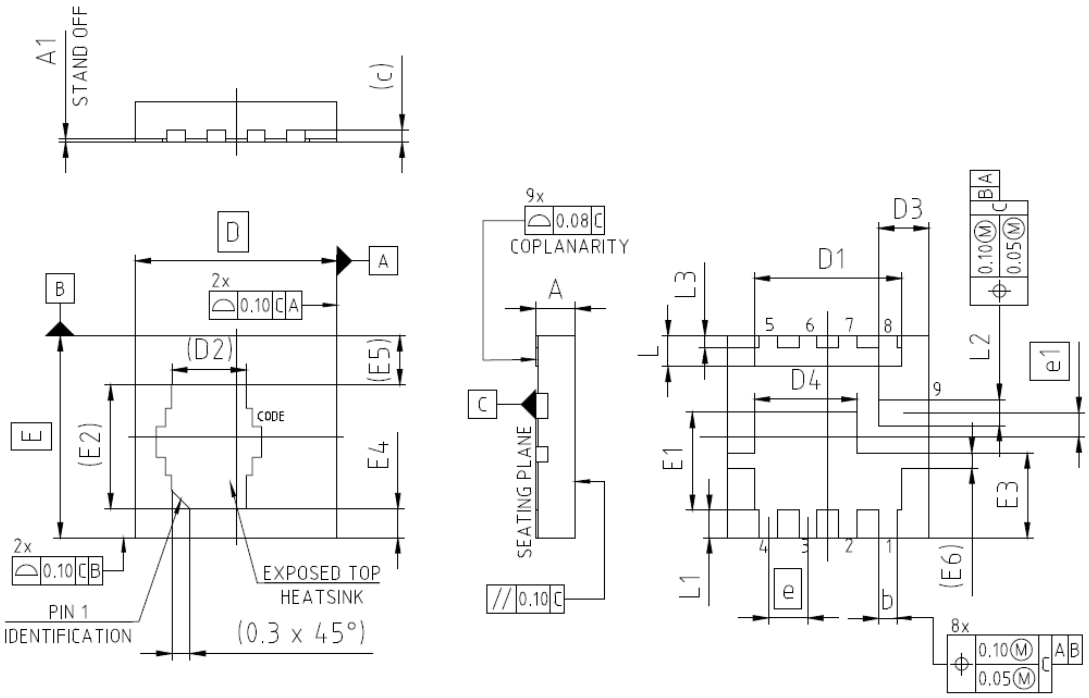
Diagram 13: Avalanche characteristics	Diagram 14: Typ. gate charge
	
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j,start}$	V_{GS}=f(Q_{gate}), I_D=20 A pulsed, T_j=25 °C; parameter: V_{DD}

Diagram 15: Min. drain-source breakdown voltage	Gate charge waveforms
	
$V_{BR(DSS)}$=f(T_j); I_D=1 mA	-

2.0 2.5

5 封装外形



PACKAGE - GROUP NUMBER:	PG-WHTFN-9-U03				
DIMENSIONS	MILLIMETERS		DIMENSIONS	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.55	0.75	E4	0.27	0.67
A1	---	0.05	E5	0.80	
b	0.20	0.40	E6	0.25	
c	0.20		e	0.65	
D	3.30		e1	0.395	
D1	2.31	2.51	L	0.40	0.60
D2	1.22		L1	0.35	0.55
D3	0.73	0.93	L2	0.32	0.52
D4	1.58	1.78	L3	0.10	0.30
E	3.30				
E1	1.50	1.70			
E2	2.03				
E3	1.285	1.485			

NOTE: DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURRS

图 1　　PG- WHTFN- 9 封装外形，尺寸单位为毫米

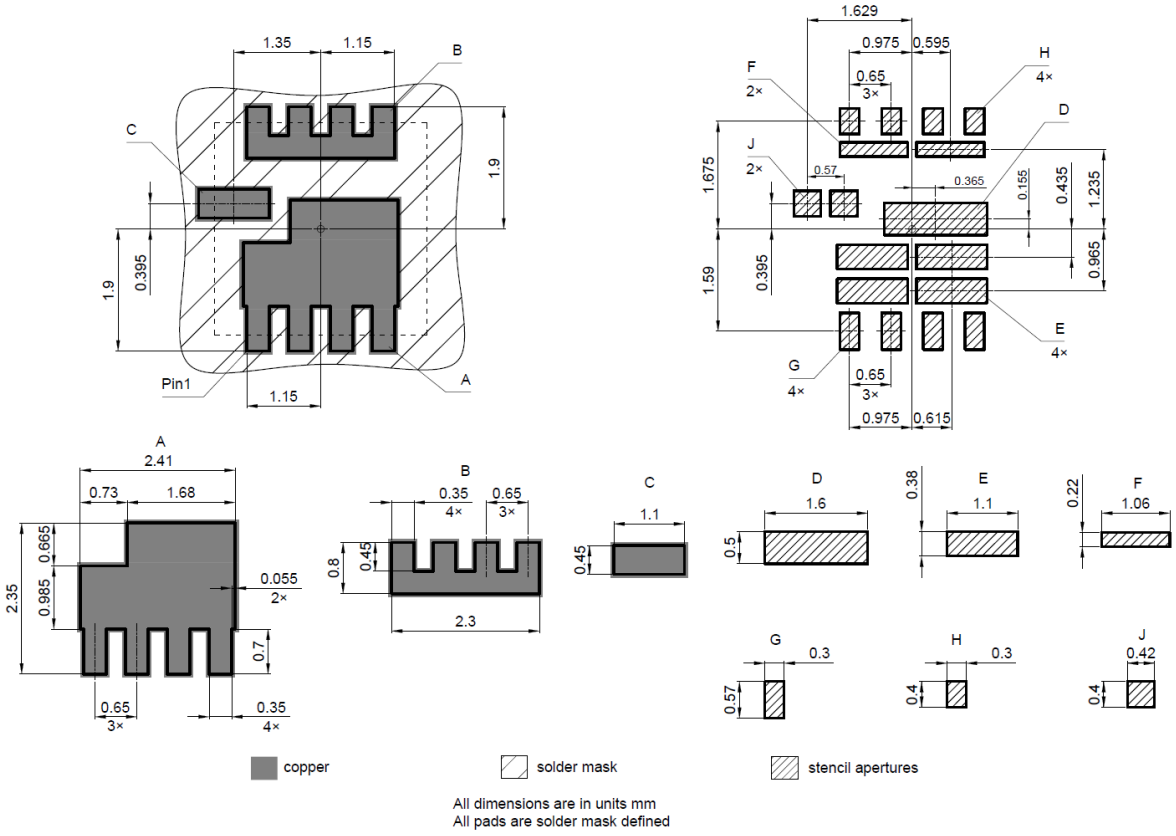


图 2　　PG- WHTFN- 9封装图，尺寸单位为毫米

修订记录

IQE020N04LM6CGSC

Revision 2025-12-17, Rev. 1. 0

Previous revisions

Revision	Date	Subjects (major changes since last revision)
1.0	2025-12-17	Release of final datasheet

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版本 **2026-09-22**

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