

英飞凌MOSFET功率晶体管

英飞凌IPTC068N20NM6 OptiMOS™ 6功率晶体管，200 V

特性

- N沟道，标准电平
- 极低的导通电阻 $R_{DS(on)}$
- 出色的栅极电荷 $\times R_{DS(on)}$ 乘积 (FOM)
- 极低的反向恢复电荷 (Q_{rr})
- 高等级雪崩能量
- 工作温度 175°C
- 无铅镀层；符合 RoHS 标准
- 符合 IEC61249-2-21 标准的无卤素
- 基于 J-STD-020 的 MSL 1 分类
- 100% 雪崩测试

产品验证

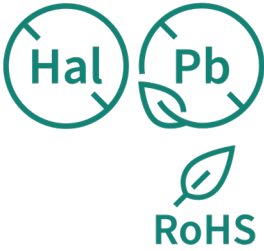
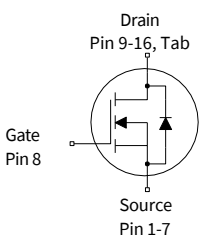
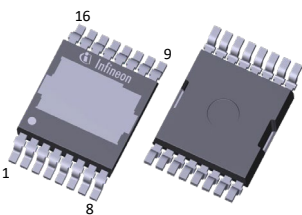
完全符合 JEDEC 工业应用标准

表 1 主要性能参数

Parameter	Value	Unit
V_{DS}	200	V
$R_{DS(on),max}$	6.8	mΩ
I_D	140	A
Q_{oss}	226	nC
Q_G	71	nC
$Q_{rr}(1000A/\mu s)$	339	nC

Part number	Package	Marking	Related links
IPTC068N20NM6	PG-HDSOP-16	068N20N6	-

TOLT



本数据手册的原文使用英文撰写。为方便起见，英飞凌提供了译文；由于翻译过程中可能使用了自动化工具，英飞凌不保证译文的准确性。为确认准确性，请务必访问infineon.com 参考最新的英文版本（控制文档）。

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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 ¹⁾	I_D	-	-	140	A	$V_{GS}=10\text{ V}, T_C=25\text{ °C}$
				99		$V_{GS}=10\text{ V}, T_C=100\text{ °C}$
				103		$V_{GS}=15\text{ V}, T_C=100\text{ °C}$
				15.2		$V_{GS}=10\text{ V}, T_A=25\text{ °C}, R_{thJA}=40\text{ °C/W}^{2)}$
Pulsed drain current ³⁾	$I_{D,pulse}$	-	-	560	A	$T_C=25\text{ °C}$
Avalanche current, single pulse ⁴⁾	I_{AS}			75		
Avalanche energy, single pulse	E_{AS}	-	-	503	mJ	$I_D=75\text{ A}, R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	319	W	$T_C=25\text{ °C}$
				3.8		$T_A=25\text{ °C}, R_{thJA}=40\text{ °C/W}^{2)}$
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 $40\text{ mm} \times 40\text{ mm} \times 1.5\text{ mm}$ 环氧树脂 PCB FR4 基板上, 配有 6 cm^2 (单层, $70\text{ }\mu\text{m}$ 厚) 铜层, 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, Top	R_{thJC}	-	0.24	0.47	°C/W	-
Thermal characterization parameter, junction to lead (Pin 1-7) ⁵⁾	ψ_{JL}		9	-		
Thermal characterization parameter, junction to lead (Pin 9-16) ⁵⁾	ψ_{JL}		3	-		
Thermal resistance, junction - ambient	R_{thJA}	-	40	-	°C	6 cm ² cooling area ⁶⁾

⁵⁾ ψ_{JL} 是 JE5D51-12 标准中的一项温度特性参数，指自然对流情况下结点和引线之间的温差。它可以通过测量所述应用环境中引线的温度来估算应用中的组件结温。

⁶⁾ 器件置于 40 mm × 40 mm × 1.5 mm 环氧树脂 PCB FR4 基板上，配有 6 cm²（单层，70 μm 厚）铜层，用于漏极连接。PCB 在静止空气中垂直放置。

3 电气特性

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

表 4 静态特性

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	200	-	-	V	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	3.0	3.7	4.5	V	$V_{DS}=V_{GS}, I_D=251\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.1	1	μA	$V_{DS}=160\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^{\circ}\text{C}$
			10	100		$V_{DS}=160\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ }^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	5.7	6.8	m Ω	$V_{GS}=10\text{ V}, I_D=126\text{ A}$
			4.9	6.25		$V_{GS}=15\text{ V}, I_D=126\text{ A}$
Gate resistance	R_G	-	2.2	-	Ω	-
Transconductance ⁷⁾	g_{fs}	33	65	-	S	$ V_{DS} \geq 2 I_D R_{DS(on)max}, I_D=100\text{ A}$

⁷⁾ 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 ⁸⁾	C_{iss}	-	5600	7300	pF	$V_{GS}=0\text{ V}, V_{DS}=100\text{ V}, f=1\text{ MHz}$
Output capacitance ⁸⁾	C_{oss}		890	1200		
Reverse transfer capacitance ⁸⁾	C_{rss}		29	51		
Turn-on delay time	$t_{d(on)}$	-	19	-	ns	$V_{DD}=100\text{ V}, V_{GS}=10\text{ V}, I_D=50\text{ A},$ $R_{G,ext}=3\text{ }\Omega$
Rise time	t_r		15			
Turn-off delay time	$t_{d(off)}$		28			
Fall time	t_f		9			

⁸⁾ 由设计指定, 未经过生产测试。

表 6 栅极电荷特性⁹⁾

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	37	-	nC	$V_{DD}=100\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge at threshold	$Q_{g(th)}$		21	-	nC	
Gate to drain charge ¹⁰⁾	Q_{gd}		14	21	nC	
Switching charge	Q_{sw}		30	-	nC	
Gate charge total ¹⁰⁾	Q_g		71	107	nC	
Gate plateau voltage	$V_{plateau}$		6.6	-	V	
Gate charge total, sync. FET	$Q_{g(sync)}$	-	61	-	nC	$V_{DS}=0.1\text{ V}$, $V_{GS}=0\text{ to }10\text{ V}$
Output charge ¹⁰⁾	Q_{oss}	-	226	294	nC	$V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$

9) 参数定义请参见“栅极充电波形”。

10) 由设计指定, 未经过生产测试。

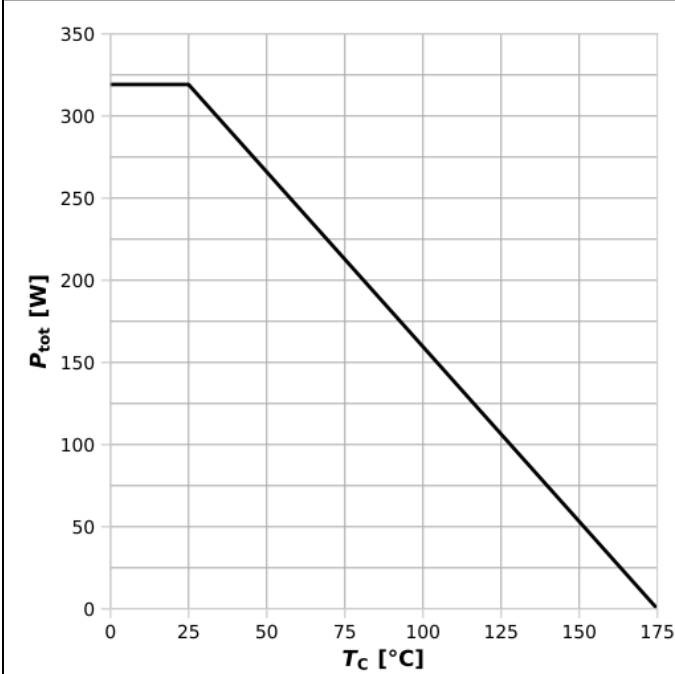
表 7 反向二极管

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	140	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$			560		
Diode forward voltage	V_{SD}	-	0.91	1.0	V	$V_{GS}=0\text{ V}$, $I_F=126\text{ A}$, $T_J=25\text{ °C}$
Reverse recovery time	t_{rr}	-	56	-	ns	$V_R=100\text{ V}$, $I_F=50\text{ A}$, $di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge ¹¹⁾	Q_{rr}		63	126	nC	
Reverse recovery time	t_{rr}	-	36	-	ns	$V_R=100\text{ V}$, $I_F=50\text{ A}$, $di_F/dt=1000\text{ A}/\mu\text{s}$
Reverse recovery charge ¹¹⁾	Q_{rr}		339	678	nC	

11) 由设计指定, 未经过生产测试。

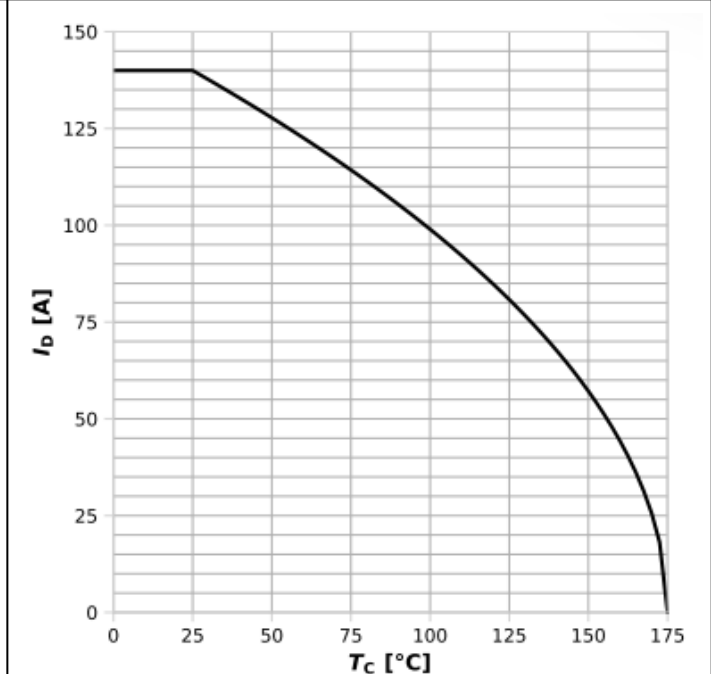
4 电气特性图

图 1: 功率耗散



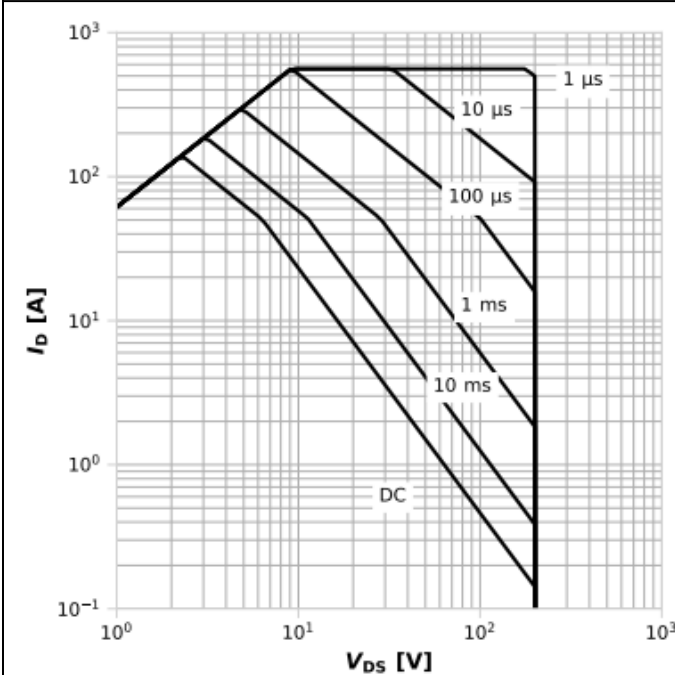
$$P_{tot}=f(T_c)$$

图 2: 漏极电流



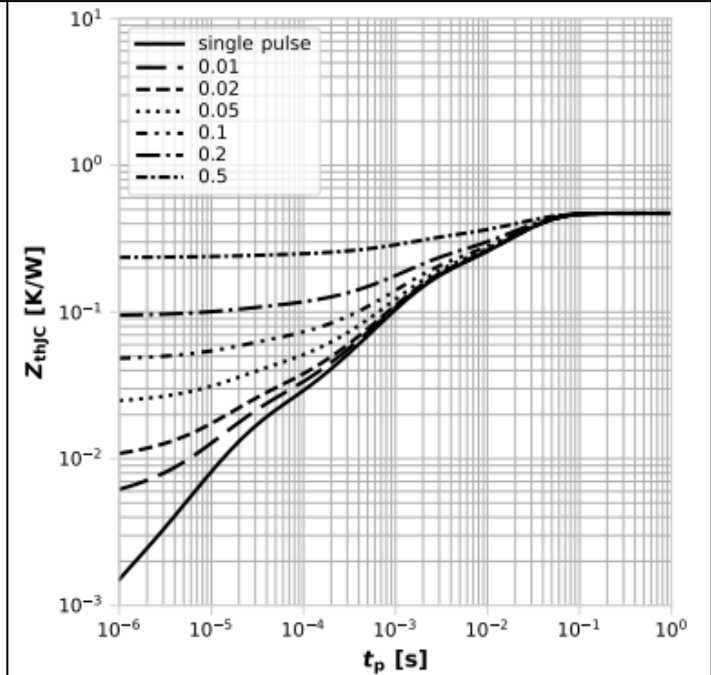
$$I_b=f(T_c); V_{GS} \geq 10 \text{ V}$$

图 3: 安全操作区



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

图 4: 最大瞬态热阻抗



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

图 5: 典型输出特性

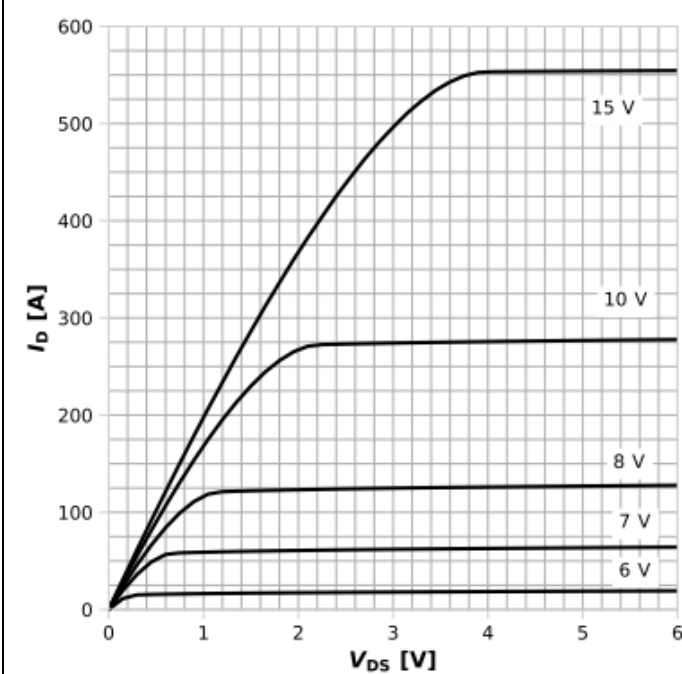

 $I_D = f(V_{DS}), T_J = 25^\circ\text{C}; \text{parameter: } V_{GS}$

图 6: 典型漏源导通电阻

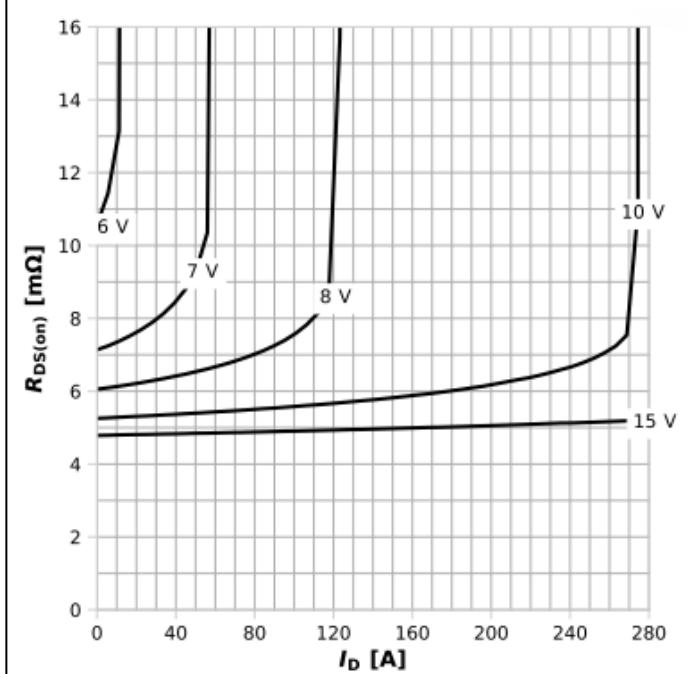

 $R_{DS(on)} = f(I_D), T_J = 25^\circ\text{C}; \text{parameter: } V_{GS}$

图 7: 典型转移特性

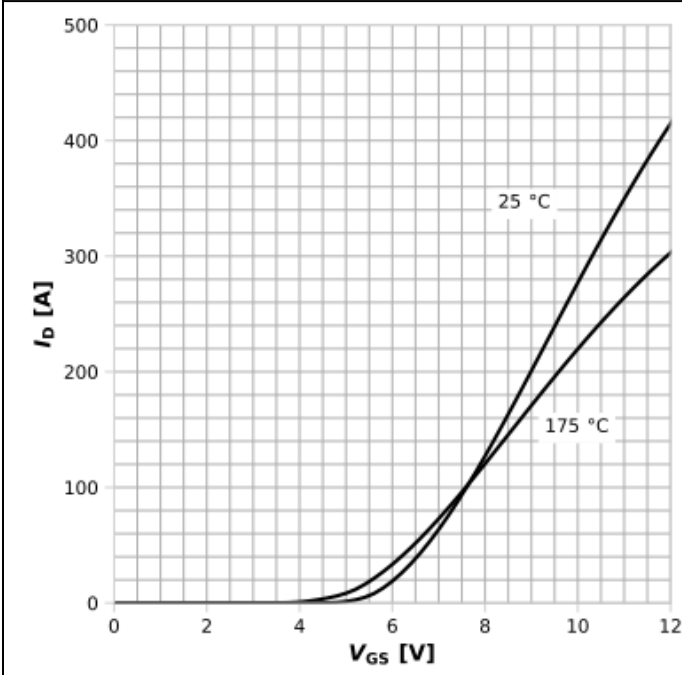

 $I_D = f(V_{GS}), |V_{DS}| > 2|I_D|R_{DS(on)max}; \text{parameter: } T_J$

图 8: 典型漏源导通电阻

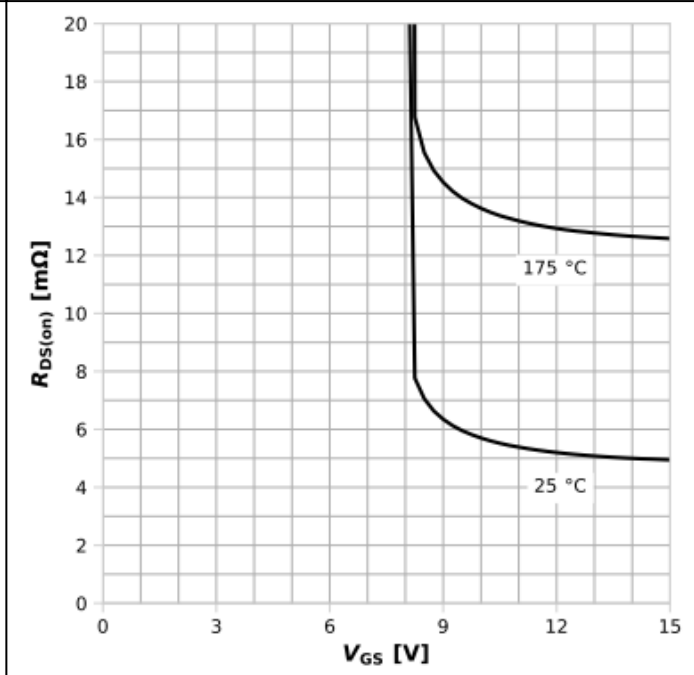
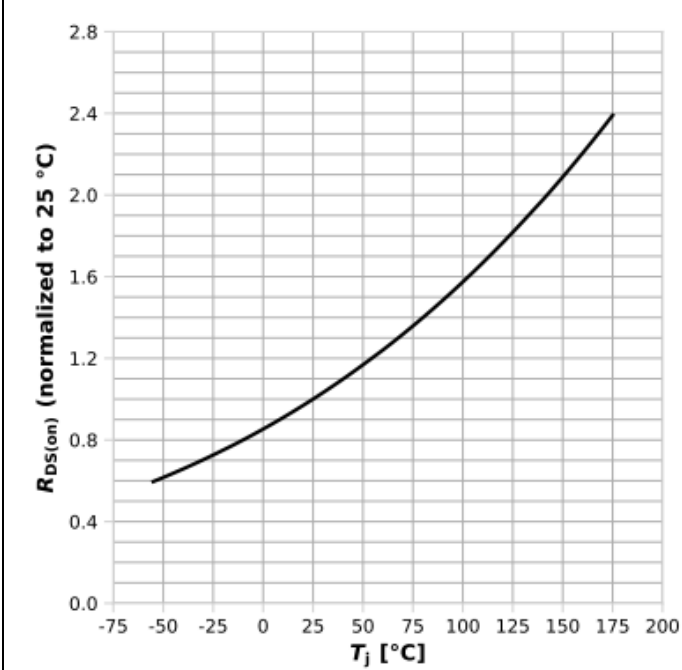
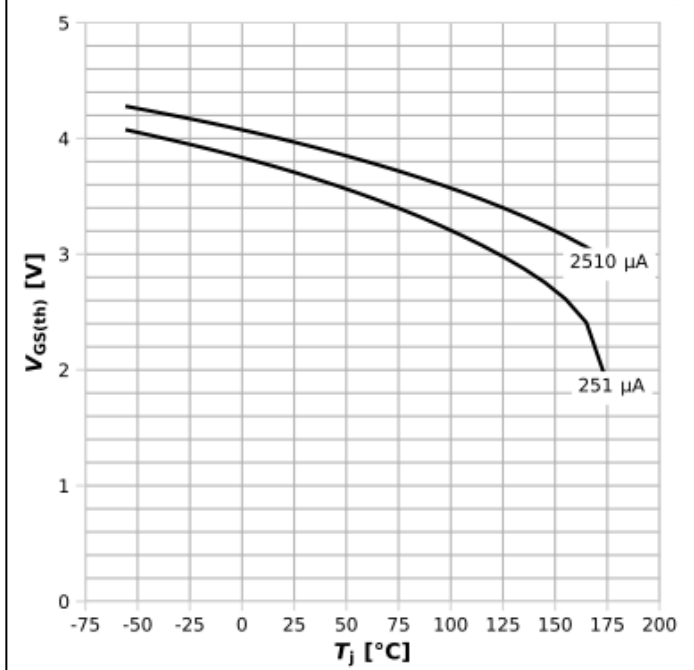

 $R_{DS(on)} = f(V_{GS}), I_D = 126 \text{ A}; \text{parameter: } T_J$

图 9：归一化漏通电阻



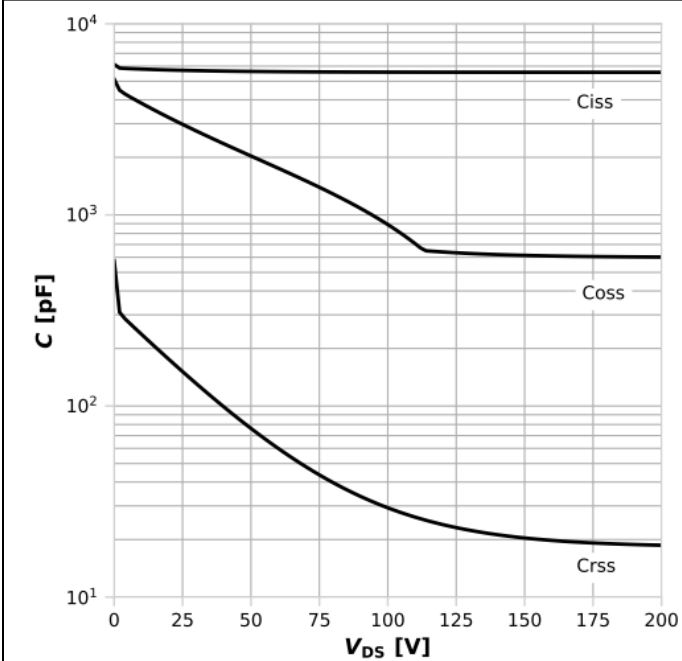
$$R_{DS(on)} = f(T_j), I_D = 126 \text{ A}, V_{GS} = 10 \text{ V}$$

图 10：典型栅极阈值电压



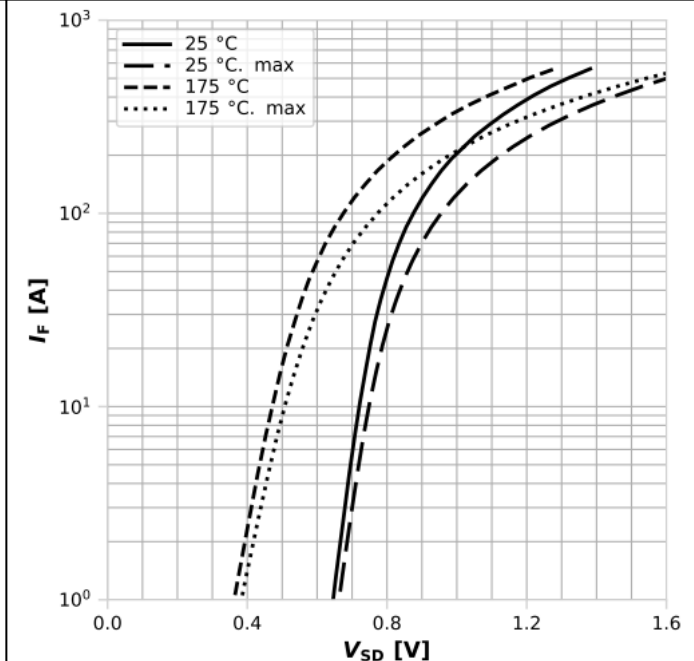
$$V_{GS(th)} = f(T_j), V_{GS} = V_{DS}; \text{ parameter: } I_D$$

图 11：典型电容值



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

图 12：反向二极管的正向特性



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

图 13: 雪崩特性

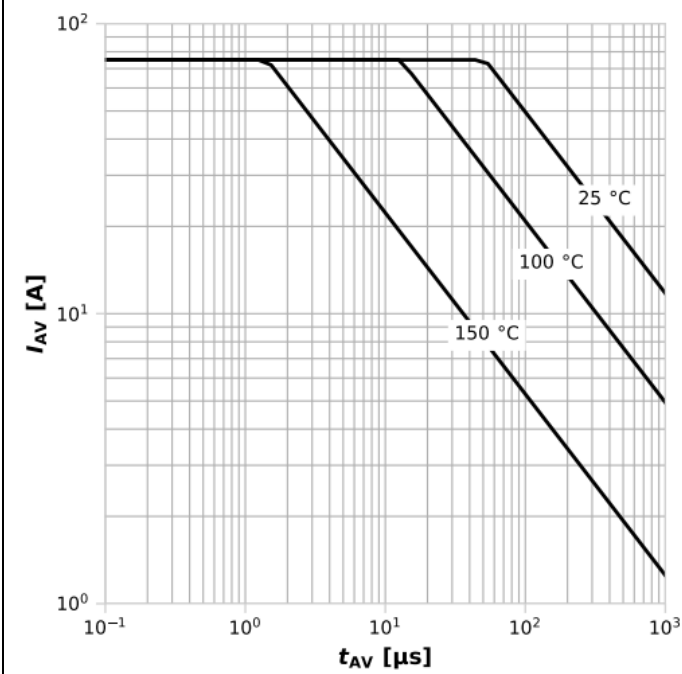

 $I_{AS}=f(t_{AV}); R_{GS}=25\ \Omega; \text{parameter: } T_{j,start}$

图 14: 典型栅极电荷

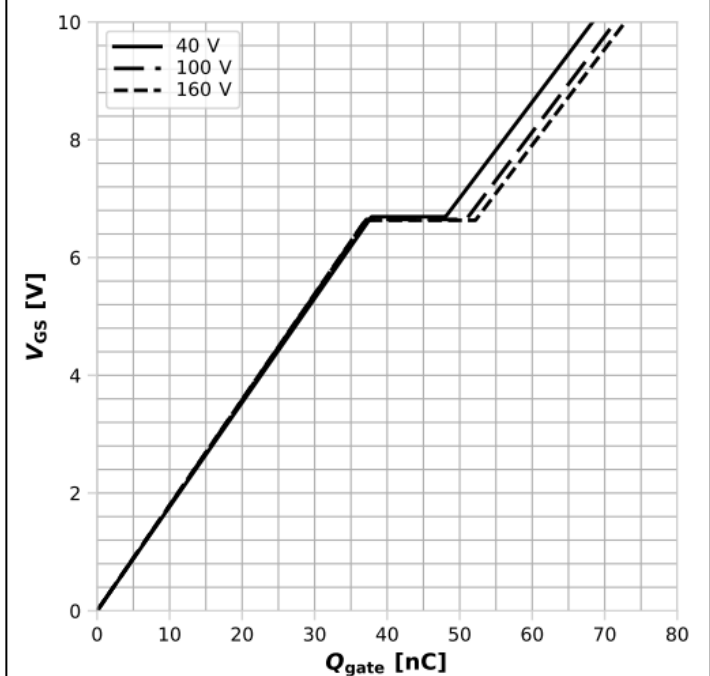
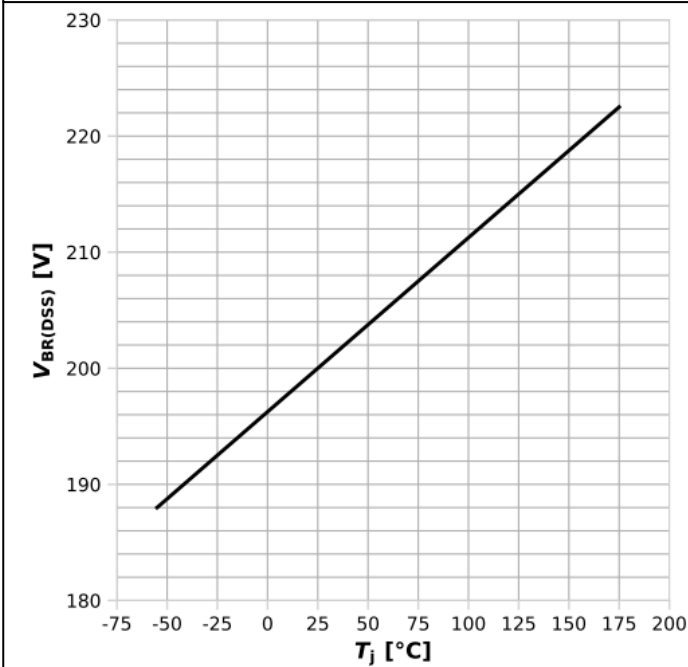
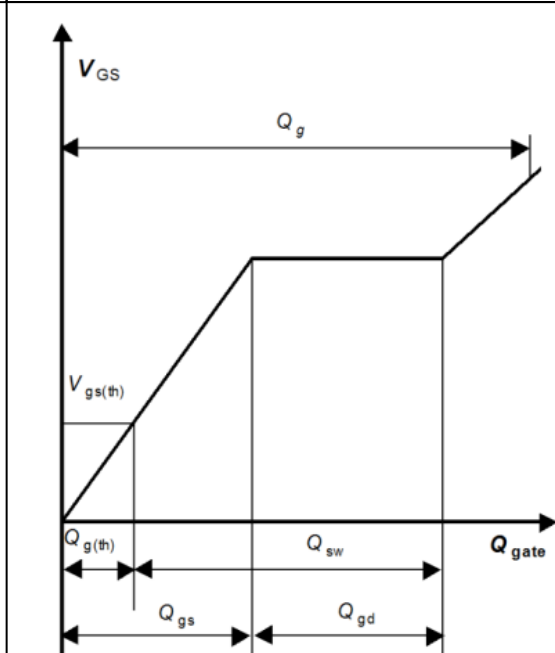

 $V_{GS}=f(Q_{gate}), I_D=50\ \text{A pulsed}, T_j=25\ ^\circ\text{C}; \text{parameter: } V_{DD}$

图 15: 漏源击穿电压


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

栅极充电波形



-

5 封装外形

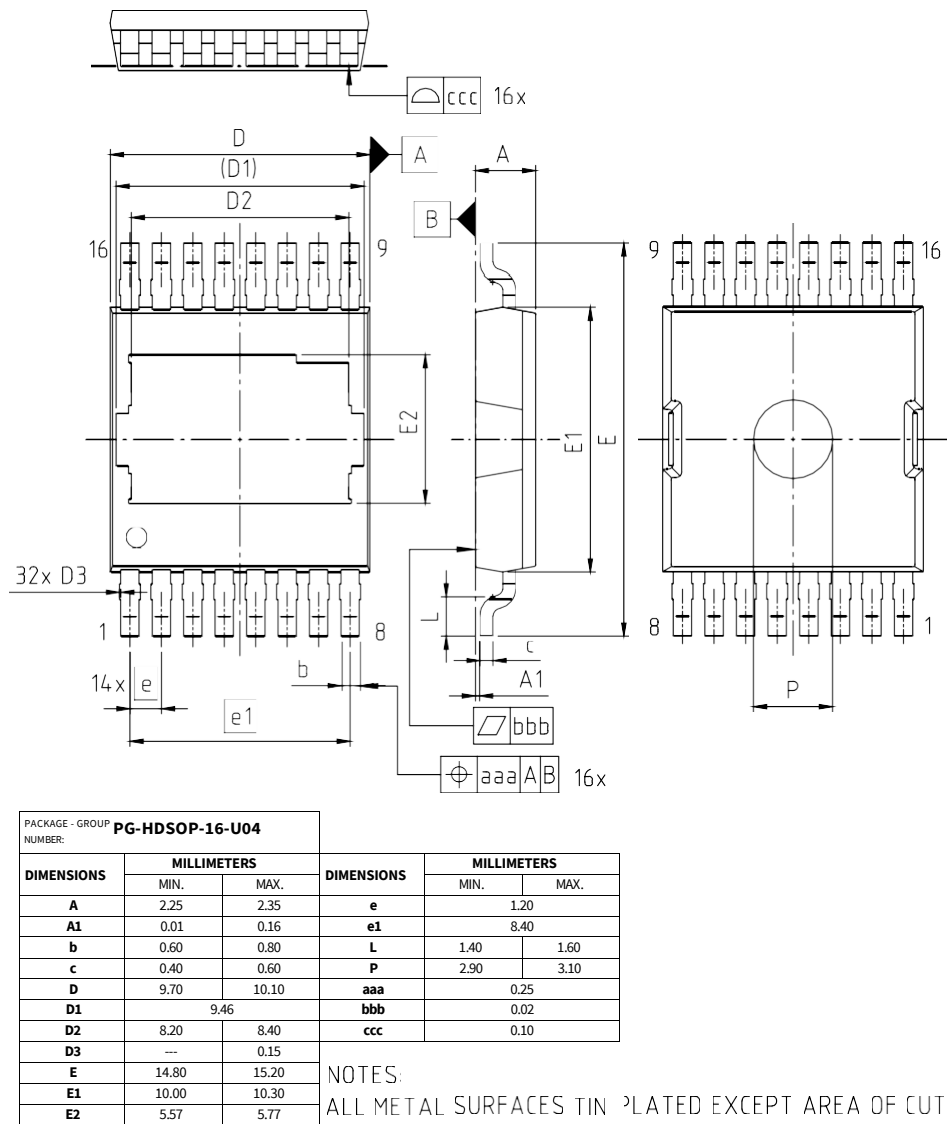


图 1 PG-HDSOP-16 外形图，尺寸单位为毫米

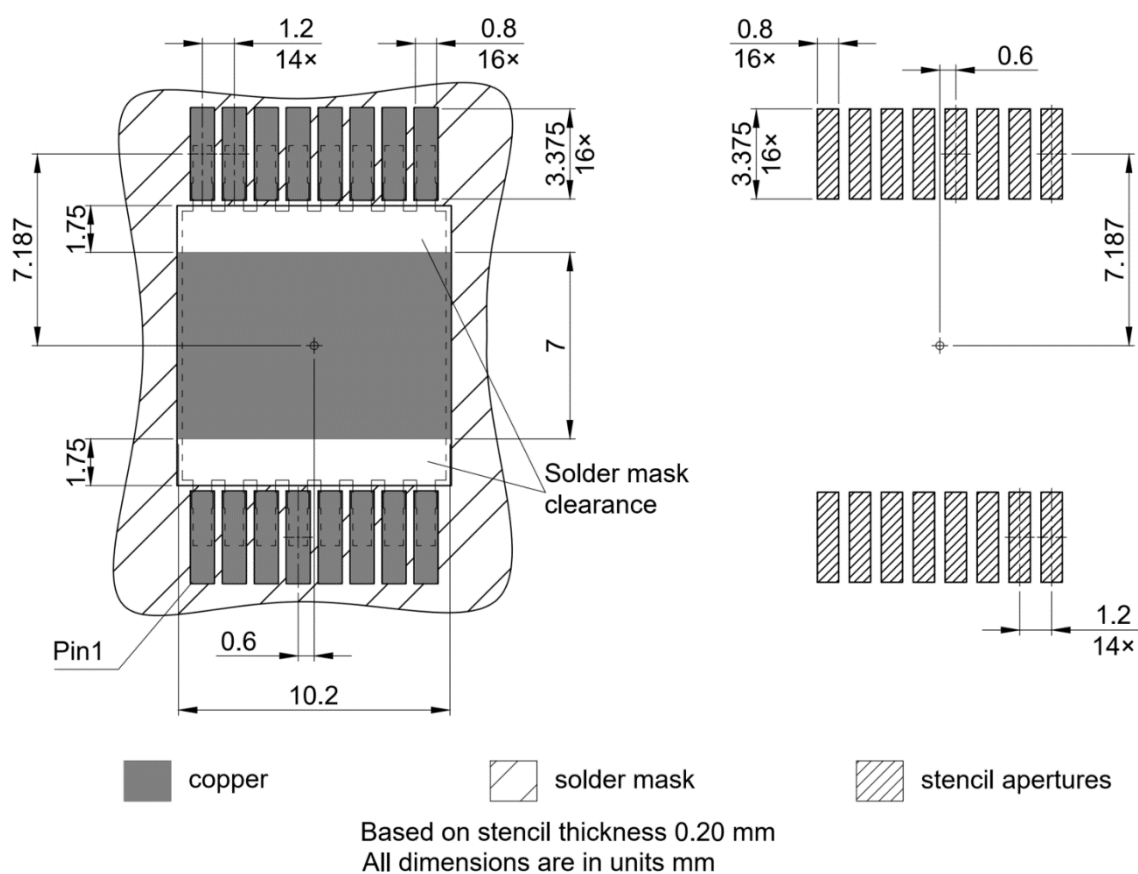
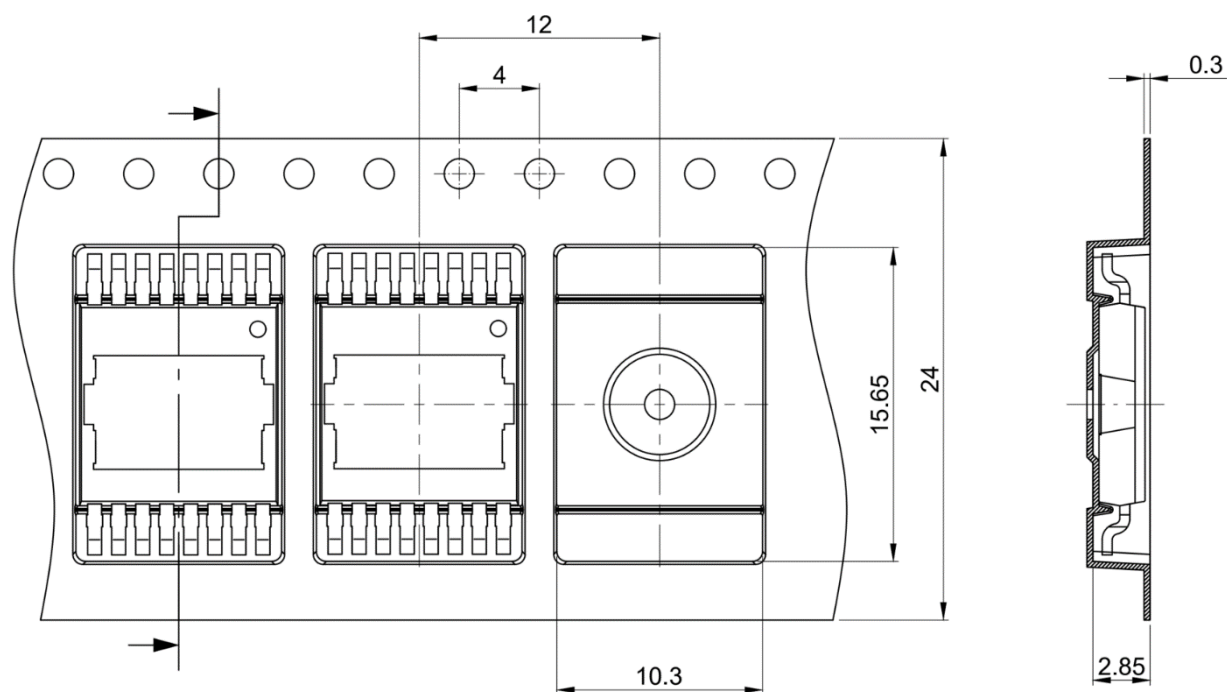


图 2 PG-HDSOP-16 封装图，尺寸单位为毫米



All dimensions are in units mm

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

图 3 PG-HDSOP-16 包装型号，尺寸单位为毫米

修订记录

IPTC068N20NM6

Revision: 2025 - 03 - 27, Rev. 1.0

历史修订版本

Revision	Date	Subjects (major changes since last revision)
2.0	2025-03-27	Release of final datasheet

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版本 2026-06-25

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