

英飞凌MOSFET功率晶体管

PG-TO220-3

英飞凌IPP130N20NM6 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})
- 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
- 100% 雪崩测试

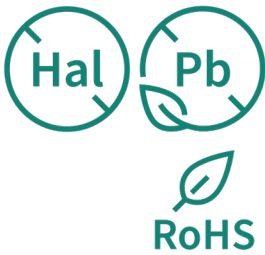
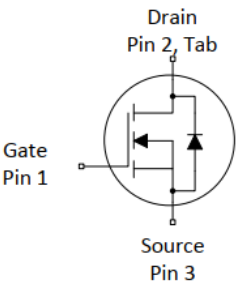
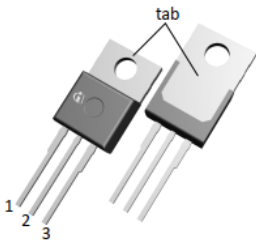
产品验证

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
$R_{DS(on),max}$	13	mΩ
I_D	87	A
Q_{oss}	116	nC
Q_G	37	nC
$Q_{rr}(1000A/\mu)$	271	nC

Part number	Package	Marking	Related links
IPP130N20NM6	PG-TO220-3	130N20N6	-



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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	-	-	87	A	$V_{GS}=10\text{ V}, T_C=25\text{ °C}$
				62		$V_{GS}=10\text{ V}, T_C=100\text{ °C}$
				64		$V_{GS}=15\text{ V}, T_C=100\text{ °C}$
				11		$V_{GS}=10\text{ V}, T_A=25\text{ °C}, R_{thJA}=40\text{ °C/W}^{2)}$
Pulsed drain current ³⁾	$I_{D,pulse}$	-	-	348	A	$T_A=25\text{ °C}$
Avalanche energy, single pulse ⁴⁾	E_{AS}	-	-	258	mJ	$I_D=39\text{ A}, R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	234	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	R_{thJC}	-	0.51	0.64	°C/W	-
Thermal resistance, junction - ambient, 6 cm^2 cooling area ⁵⁾	R_{thJA}		-	40		
Thermal resistance, junction - ambient, minimal footprint	R_{thJA}		-	62		

5) 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 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	$V_{DS}=V_{GS}, I_D=129\text{ }\mu\text{A}$
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	$R_{DS(on)}$	-	10.0	12.0	m Ω	$V_{GS}=15\text{ V}, I_D=65\text{ A}$
			11.5	13.0		$V_{GS}=10\text{ V}, I_D=65\text{ A}$
Gate resistance	R_G	-	3.2	-	Ω	-
Transconductance ⁶⁾	g_{fs}	18	36	-	S	$ V_{DS} \geq 2 I_D R_{DS(on)max}, I_D=65\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	C_{iss}	-	2900	3800	pF	$V_{GS}=0\text{ V}, V_{DS}=100\text{ V}, f=1\text{ MHz}$
Output capacitance ⁷⁾	C_{oss}		460	600		
Reverse transfer capacitance ⁷⁾	C_{rss}		19	33		
Turn-on delay time	$t_{d(on)}$	-	12	-	ns	$V_{DD}=100\text{ V}, V_{GS}=10\text{ V}, I_D=32.5\text{ A},$ $R_{G,ext}=1.6\text{ }\Omega$
Rise time	t_r		13			
Turn-off delay time	$t_{d(off)}$		20			
Fall time	t_f		7			

⁷⁾ 由设计指定, 未经过生产测试。

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}	-	20	-	nC	$V_{DD}=100\text{ V}, I_D=32.5\text{ A}, V_{GS}=0\text{ to }10\text{ V}$
Gate charge at threshold	$Q_{g(th)}$		10.7	-	nC	
Gate to drain charge ⁹⁾	Q_{gd}		7.5	11.3	nC	
Switching charge	Q_{sw}		16.9	-	nC	
Gate charge total ⁹⁾	Q_g		37	56	nC	
Gate plateau voltage	$V_{plateau}$		6.9	-	V	
Output charge ⁹⁾	Q_{oss}	-	116	151	nC	$V_{DS}=100\text{ V}, V_{GS}=0\text{ V}$

⁸⁾ 参数定义请参见“栅极充电波形”。

⁹⁾ 由设计指定, 未经过生产测试。

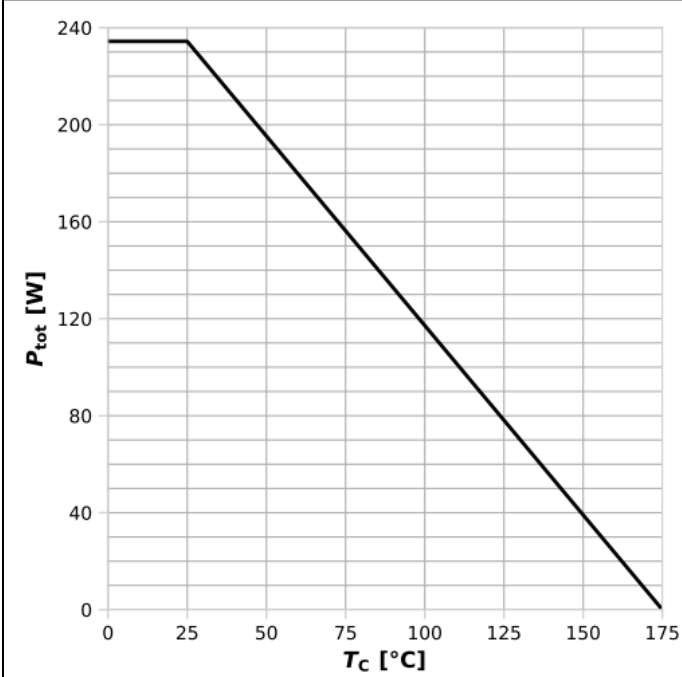
表 7 反向二极管

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	87	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$			348		
Diode forward voltage	V_{SD}	-	0.94	1.0	V	$V_{GS}=0\text{ V}, I_F=65\text{ A}, T_J=25\text{ °C}$
Reverse recovery time	t_{rr}	-	46	-	ns	$V_R=100\text{ V}, I_F=32.5\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge ¹⁰⁾	Q_{rr}		43	86	nC	
Reverse recovery time	t_{rr}	-	30	-	ns	$V_R=100\text{ V}, I_F=32.5\text{ A}, di_F/dt=1000\text{ A}/\mu\text{s}$
Reverse recovery charge ¹⁰⁾	Q_{rr}		271	542	nC	

¹⁰⁾ 由设计指定, 未经过生产测试。

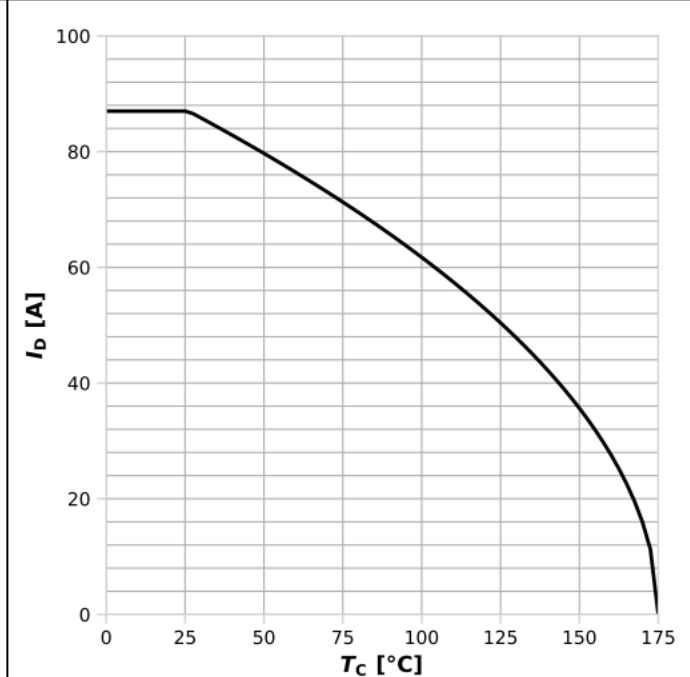
4 电气特性图

图1: 功率耗散



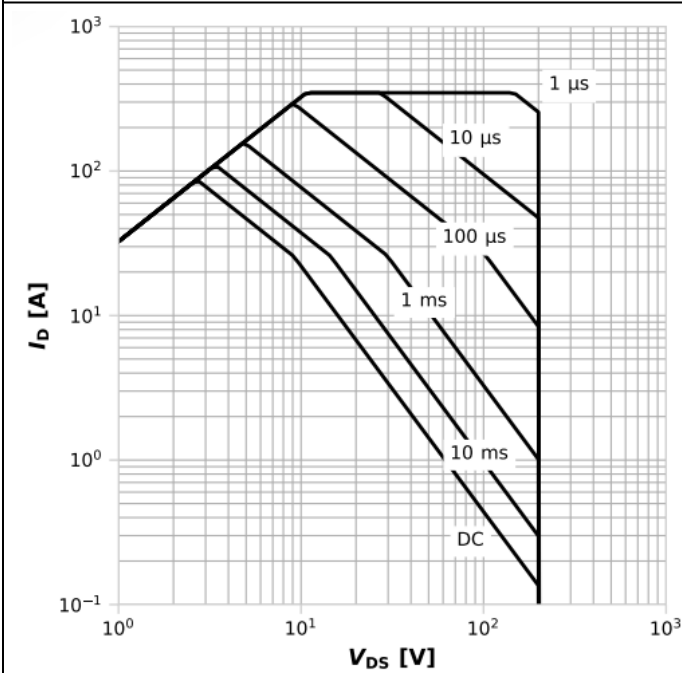
$$P_{tot}=f(T_c)$$

图2: 漏极电流



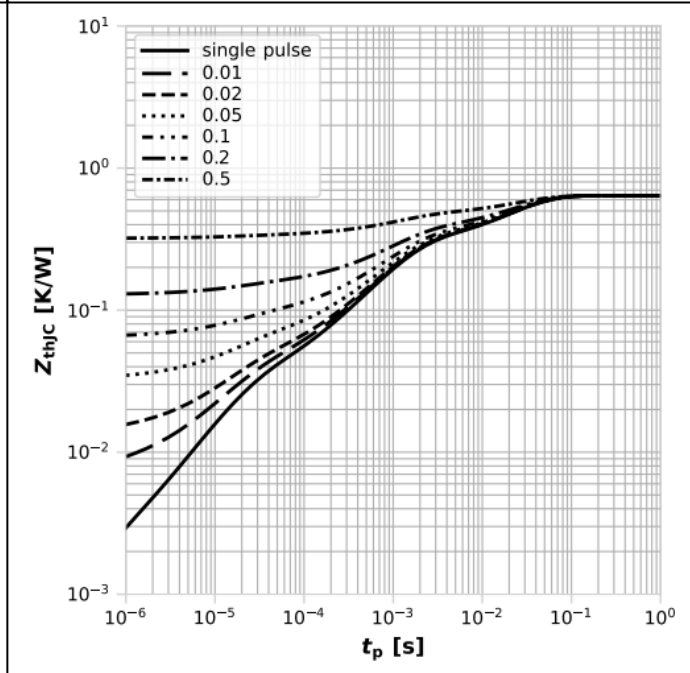
$$I_D=f(T_c); V_{GS} \geq 10 \text{ V}$$

图3: 安全操作区



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

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

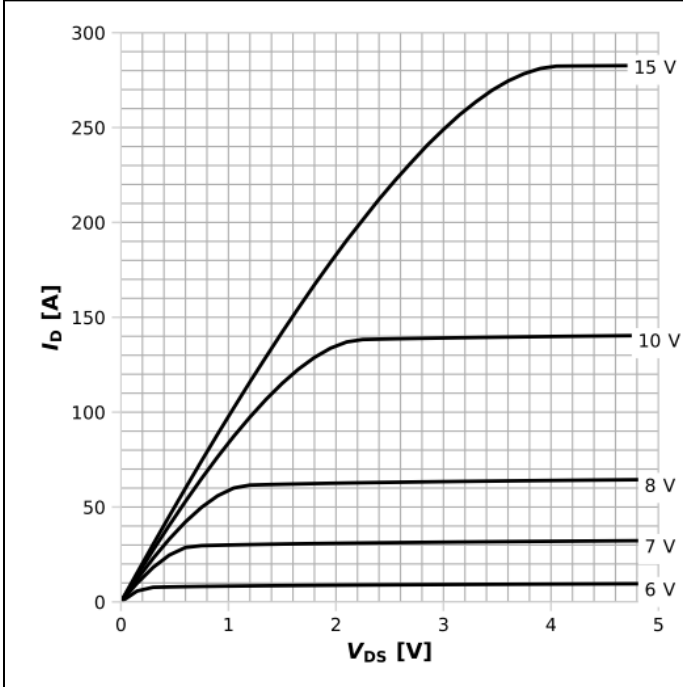

 $I_D = f(V_{DS}), T_J = 25^\circ\text{C}; \text{parameter: } V_{GS}$

图 6: 典型漏源导通电阻

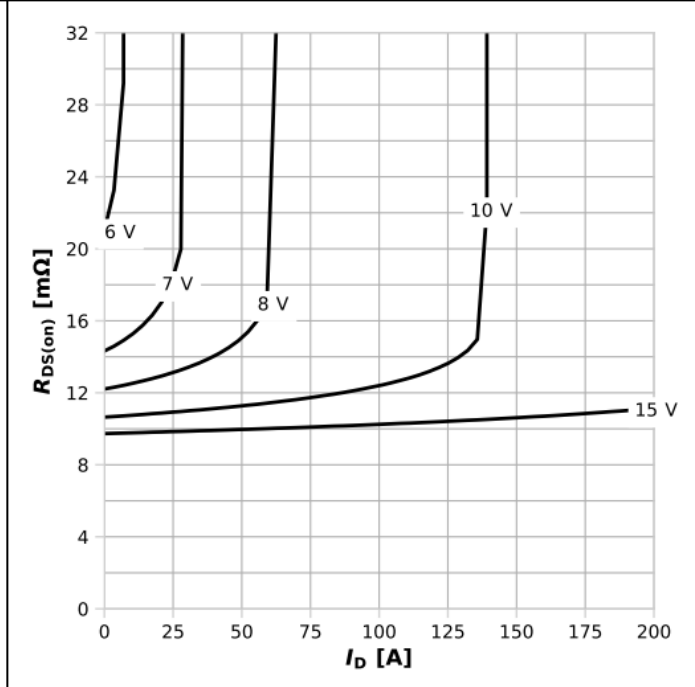

 $R_{DS(on)} = f(I_D), T_J = 25^\circ\text{C}; \text{parameter: } V_{GS}$

图 7: 典型转移特性

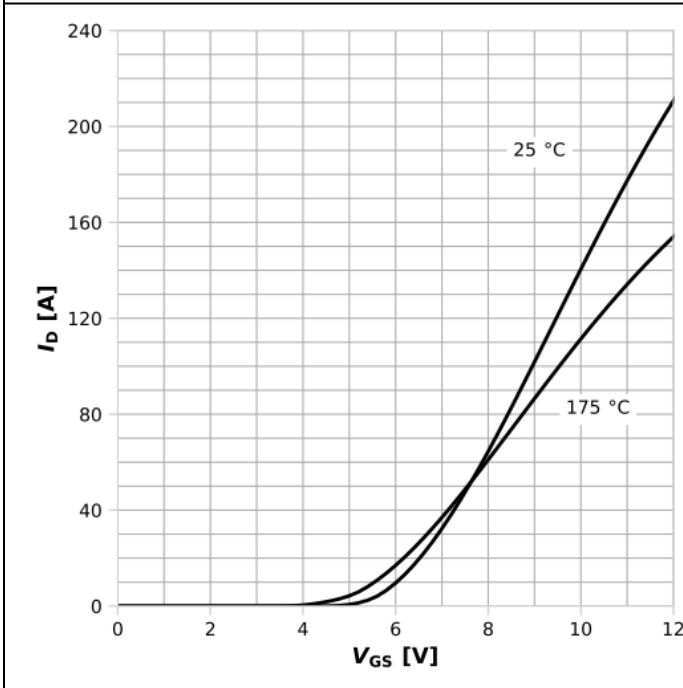

 $I_D = f(V_{GS}), |V_{DS}| > 2|I_D|R_{DS(on)\max}; \text{parameter: } T_J$

图 8: 典型漏源导通电阻

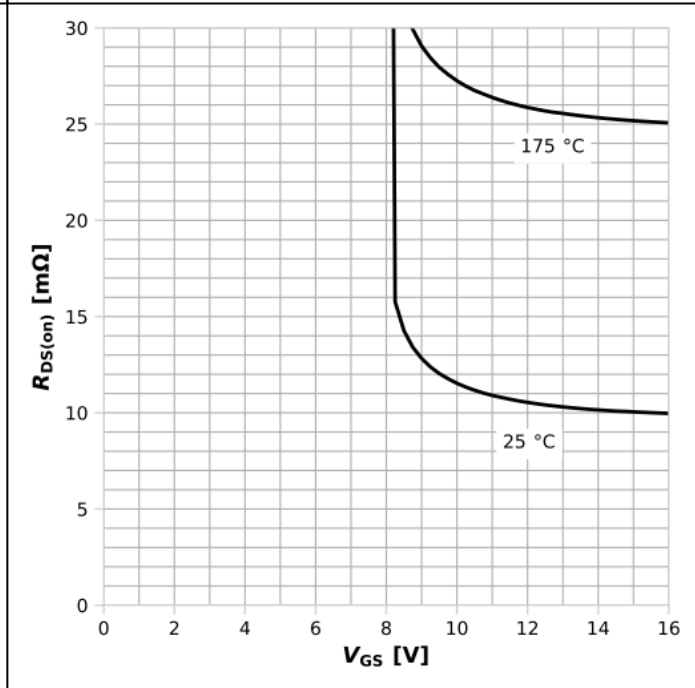
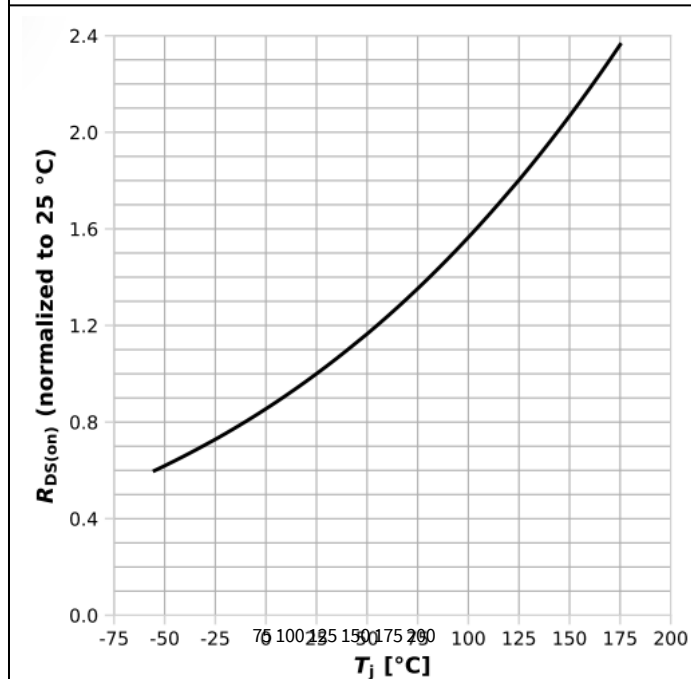
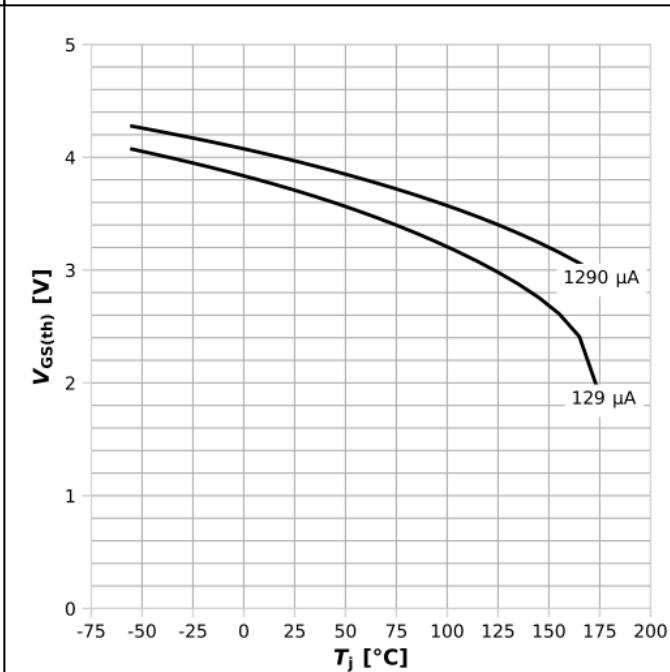

 $R_{DS(on)} = f(V_{GS}), I_D = 65\text{ A}; \text{parameter: } T_J$

图9: 归一化漏通电阻



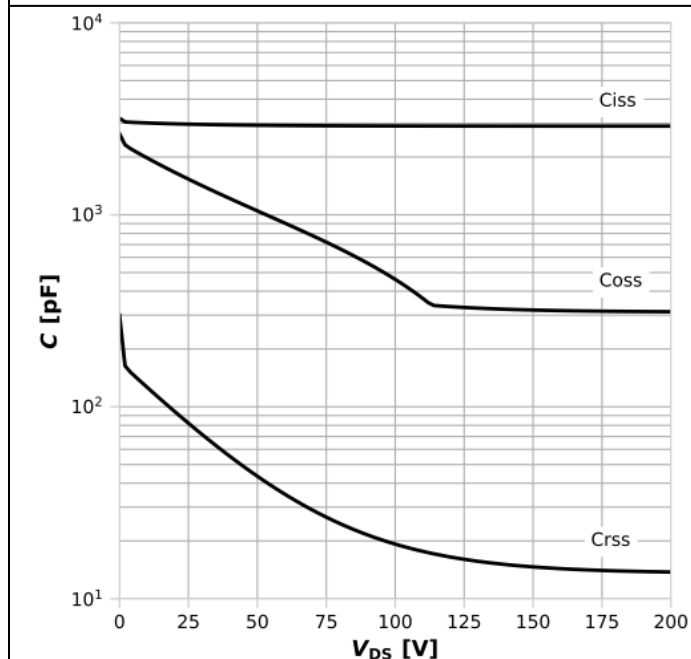
$$R_{DS(on)} = f(T_j), I_D = 65 \text{ A}, V_{GS} = 10 \text{ V}$$

图10: 典型栅极阈值电压



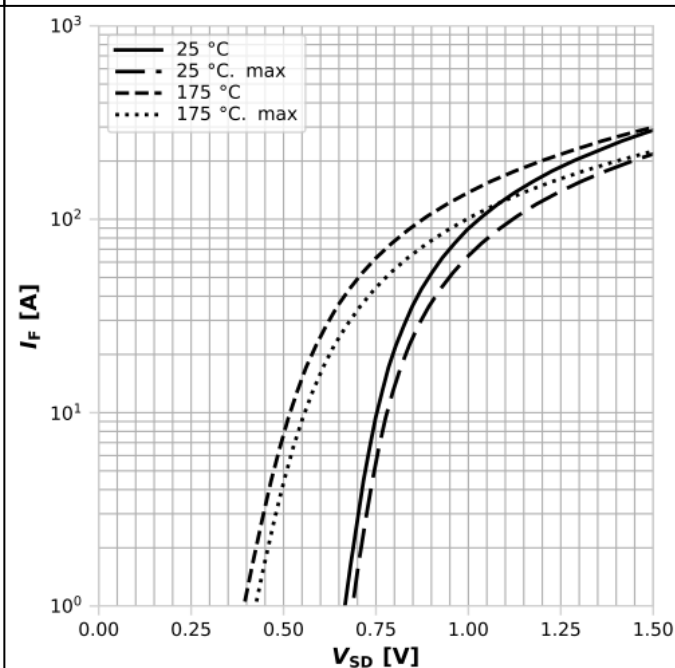
$$V_{GS(th)} = f(T_j), V_{GS} = V_{DS}; \text{ parameter: } I_D$$

图11: 典型电容值



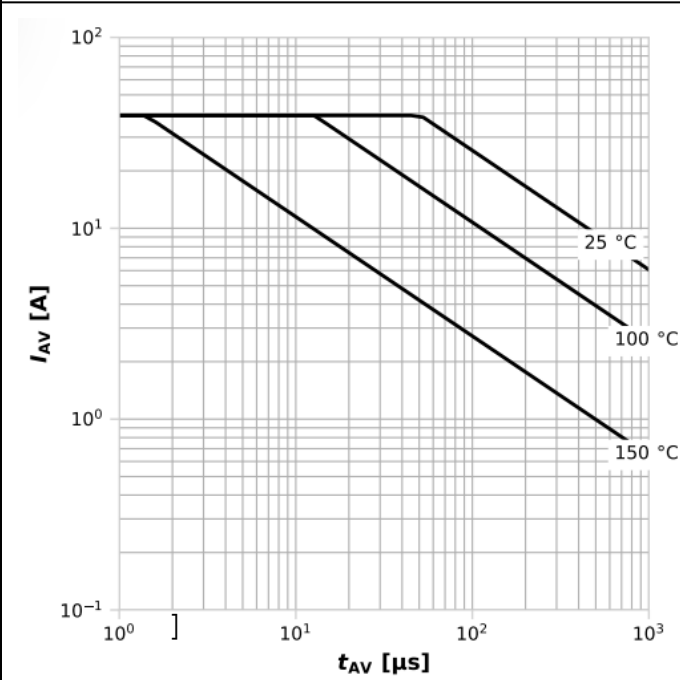
$$C = f(V_{DS}), V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$

图12: 反向二极管的正向特性



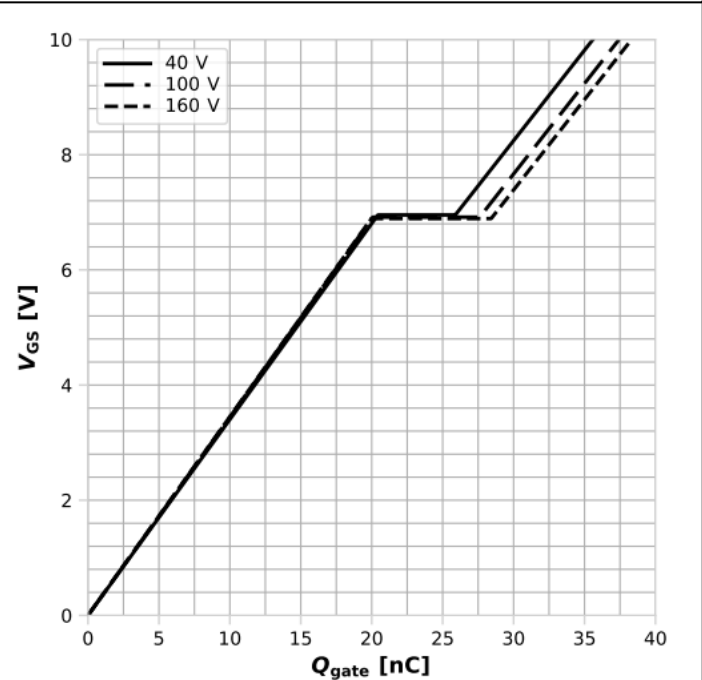
$$I_F = f(V_{SD}); \text{ parameter: } T_j$$

图 13: 雪崩特性



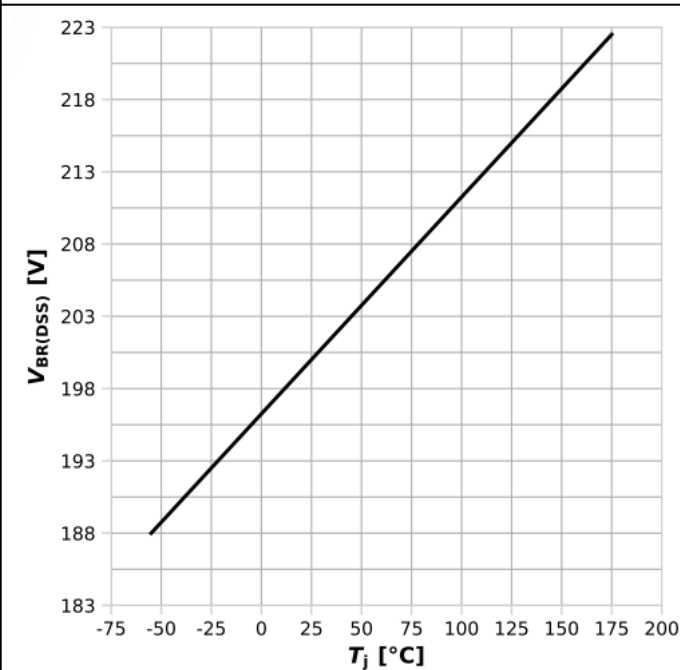
$I_{AS}=f(t_{AV})$; $R_{GS}=25\ \Omega$; parameter: $T_{j,start}$

图 14: 典型栅极电荷



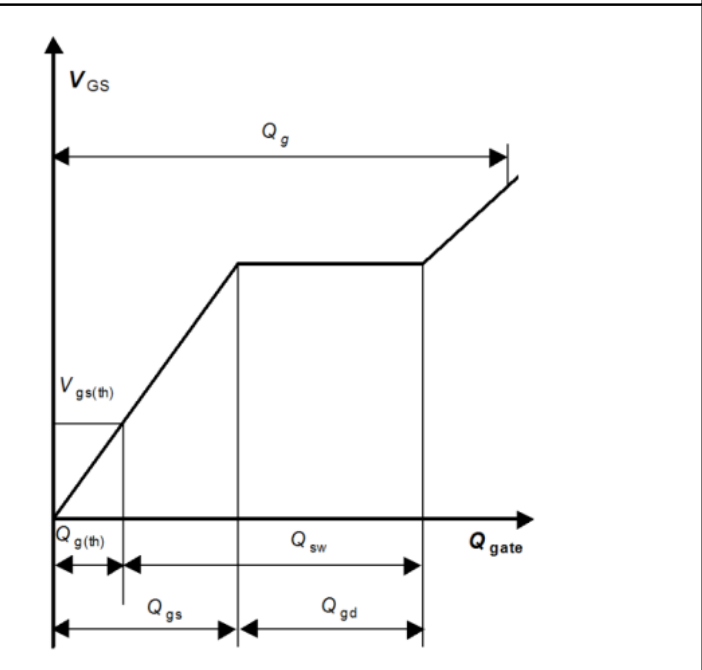
$V_{GS}=f(Q_{gate})$, $I_D=32.5\text{ A}$ pulsed, $T_j=25\text{ °C}$; parameter: V_{DD}

图 15: 最小漏源击穿电压



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

栅极充电波形



-

5 封装外形

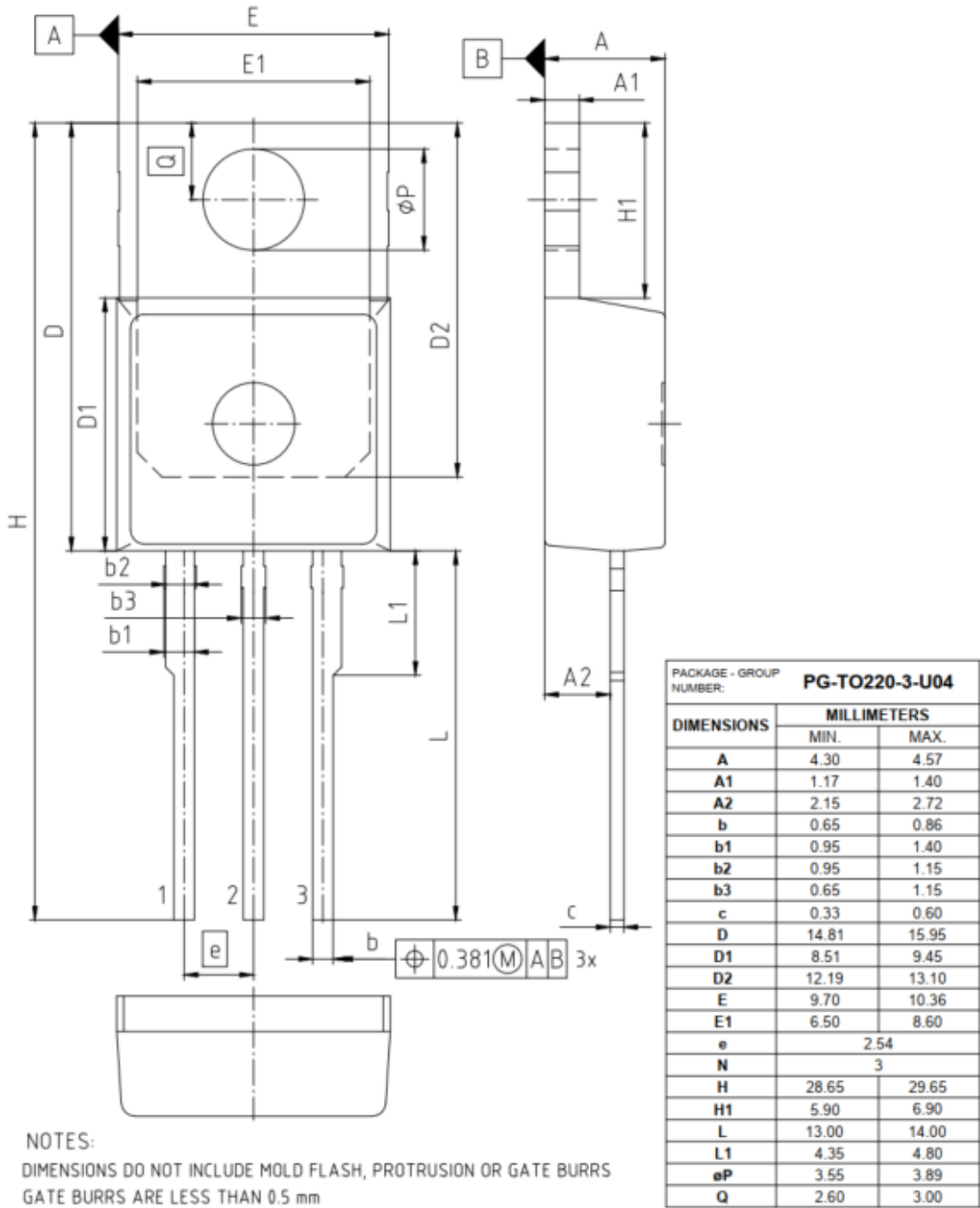


图 1 PG- TO 220 - 3 外形图，尺寸单位为毫米

修订记录

IPP130N20NM6

Revision: 2025 - 03 - 27, Rev. 1.0

历史修订版本

Revision	Date	Subjects (major changes since last revision)
1.0	2025-03-27	Release of final datasheet

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