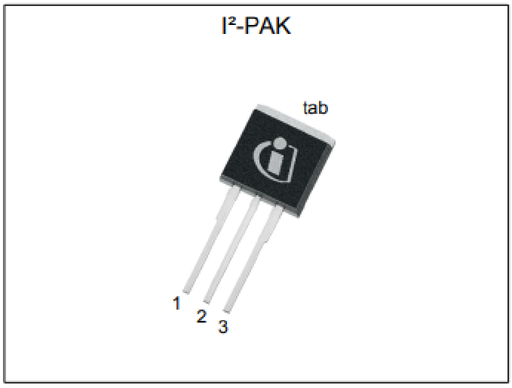
英飞凌MOSFET功率晶体管

英飞凌 IPI051N15N5 OptiMOS™5 150 V 功率晶体管



特性

封装

- 出色的栅极电荷 x $R_{DS(on)}$乘积 (FOM)
- 极低的导通电阻$R_{DS(on)}$
- 工作温度 175°C
- 无铅镀层；符合RoHS标准
- 符合 JEDEC [1] 的目标应用要求
- 非常适合高频开关和同步整流
- 符合 IEC61249-2-21 标准的无卤素

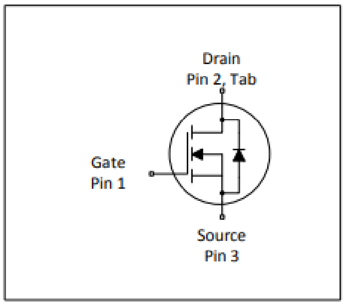


表 1 主要性能参数

Parameter	Value	Unit
V_{DS}	150	V
$R_{DS(on),max\ (TO262)}$	5.1	mΩ
I_D	120	A

Type / Ordering Code	Package	Marking	Related Links
IPI051N15N5	PG-TO262-3	051N15N5	-

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[1] J-STD20 和 JESD22

目录

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	I_D	- -	- -	120 115	A	T_C=25 °C T_C=100 °C
Pulsed drain current[1]	$I_{D,pulse}$	-	-	480	A	T_C=25 °C
Avalanche energy, single pulse[2]	E_{AS}	-	-	230	mJ	I_D=100 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	300	W	T_C=25 °C
Operating and storage temperature	T_j, T_{stg}	-55	-	175	°C	IEC climatic category; DIN IEC 68-1: 55/175/56

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}	-	0.3	0.5	K/W	-
Thermal resistance, junction - ambient, minimal footprint	R_{thJA}	-	-	62	K/W	-

3 电气特性

表 4 静态特性

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	150	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	3.0	3.8	4.6	V	V_{DS}=V_{GS}, I_D=264 µA
Zero gate voltage drain current	I_{DSS}	- -	0.1 10	1 100	µA	V_{DS}=120 V, V_{GS}=0 V, T_j=25 °C V_{DS}=120 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	1	100	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	- -	4.0 4.3	5.1 5.7	mΩ	V_{GS}=10 V, I_D=60 A V_{GS}=8 V, I_D=30 A
Gate resistance[3]	R_G	-	1.1	1.6	Ω	-
Transconductance	g_{fs}	59	117	-	S	$\lvert V_{DS}\rvert>2\lvert I_D\rvert R_{DS(on)max}$, I_D=60 A

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[1] 请参见图 3
[2] 请参见图 13
[3] 由设计标定，不受制于生产测试。

表 5 动态特性

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance[1]	C_{iss}	-	6000	7800	pF	$V_{GS}=0$ V, $V_{DS}=75$ V, $f=1$ MHz
Output capacitance[1]	C_{oss}	-	1500	1950	pF	$V_{GS}=0$ V, $V_{DS}=75$ V, $f=1$ MHz
Reverse transfer capacitance[1]	C_{rss}	-	34	60	pF	$V_{GS}=0$ V, $V_{DS}=75$ V, $f=1$ MHz
Turn-on delay time	$t_{d(on)}$	-	19.6	-	ns	$V_{DD}=75$ V, $V_{GS}=10$ V, $I_D=60$ A, $R_{G,ext}=1.6\ \Omega$
Rise time	t_r	-	5.3	-	ns	$V_{DD}=75$ V, $V_{GS}=10$ V, $I_D=60$ A, $R_{G,ext}=1.6\ \Omega$
Turn-off delay time	$t_{d(off)}$	-	4.5	-	ns	$V_{DD}=75$ V, $V_{GS}=10$ V, $I_D=60$ A, $R_{G,ext}=1.6\ \Omega$
Fall time	t_f	-	37	-	ns	$V_{DD}=75$ V, $V_{GS}=10$ V, $I_D=60$ A, $R_{G,ext}=1.6\ \Omega$

表 6 栅极电荷特性[2]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	33	-	nC	$V_{DD}=75$ V, $I_D=60$ A, $V_{GS}=0$ to 10 V
Gate to drain charge[1]	Q_{gd}	-	16	24	nC	$V_{DD}=75$ V, $I_D=60$ A, $V_{GS}=0$ to 10 V
Switching charge	Q_{sw}	-	31	-	nC	$V_{DD}=75$ V, $I_D=60$ A, $V_{GS}=0$ to 10 V
Gate charge total[1]	Q_g	-	80	100	nC	$V_{DD}=75$ V, $I_D=60$ A, $V_{GS}=0$ to 10 V
Gate plateau voltage	$V_{plateau}$	-	5.4	-	V	$V_{DD}=75$ V, $I_D=60$ A, $V_{GS}=0$ to 10 V
Output charge[1]	Q_{oss}	-	225	299	nC	$V_{DD}=75$ V, $V_{GS}=0$ V

表 7 反向二极管

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continous forward current	I_S	-	-	120	A	$T_C=25$ °C
Diode pulse current	$I_{S,pulse}$	-	-	480	A	$T_C=25$ °C
Diode forward voltage	V_{SD}	-	0.87	1.1	V	$V_{GS}=0$ V, $I_F=60$ A, $T_j=25$ °C
Reverse recovery time[1]	t_{rr}	-	72	144	ns	$V_R=75$ V, $I_F=60$ A, $di_F/dt=100$ A/µs
Reverse recovery charge[1]	Q_{rr}	-	106	212	nC	$V_R=75$ V, $I_F=60$ A, $di_F/dt=100$ A/µs

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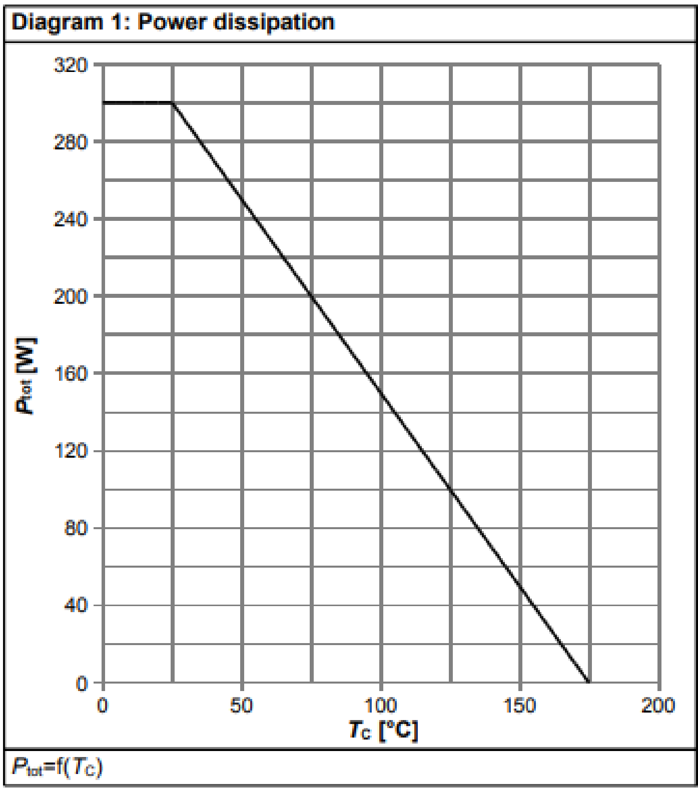
[1] 由设计标定，不受制于生产测试。

[2] 参数定义 请参见" 栅极充电波形 "

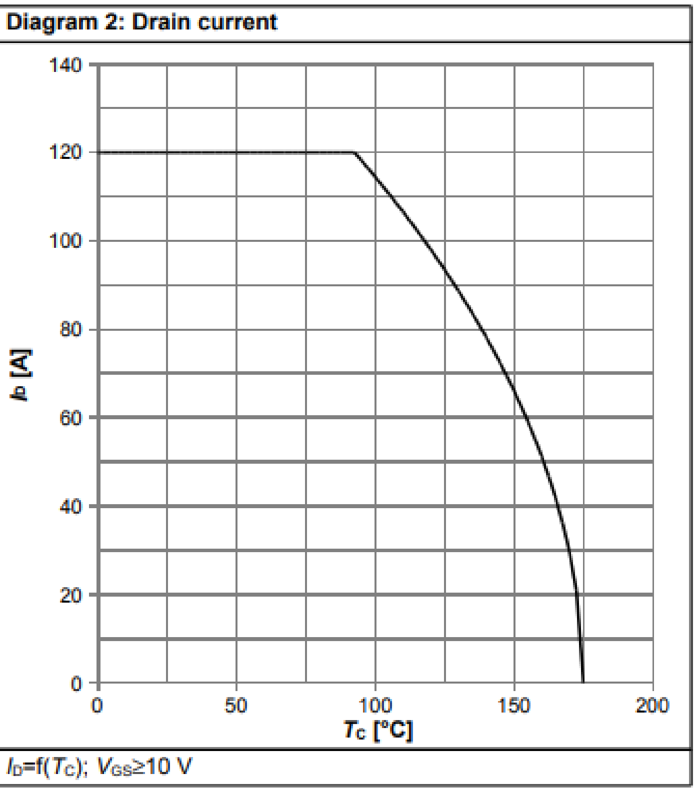
4 电气特性图

Diagram 1: Power dissipation



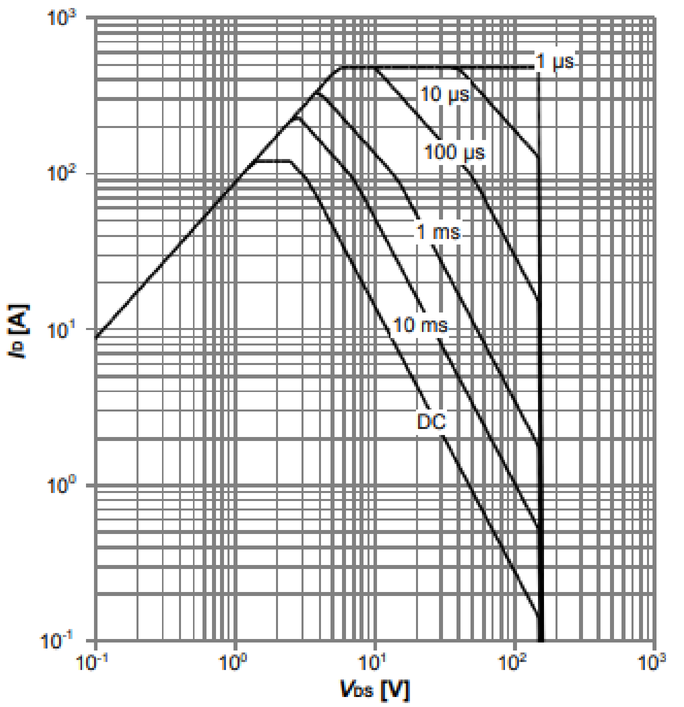
P_{tot}=f(T_C)

Diagram 2: Drain current



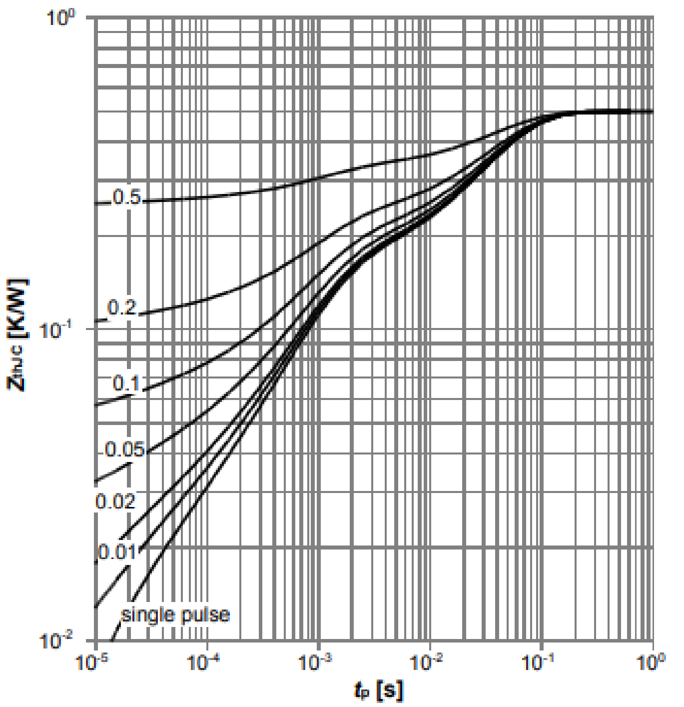
I_D=f(T_C); V_{GS}≥10 V

Diagram 3: Safe operating area



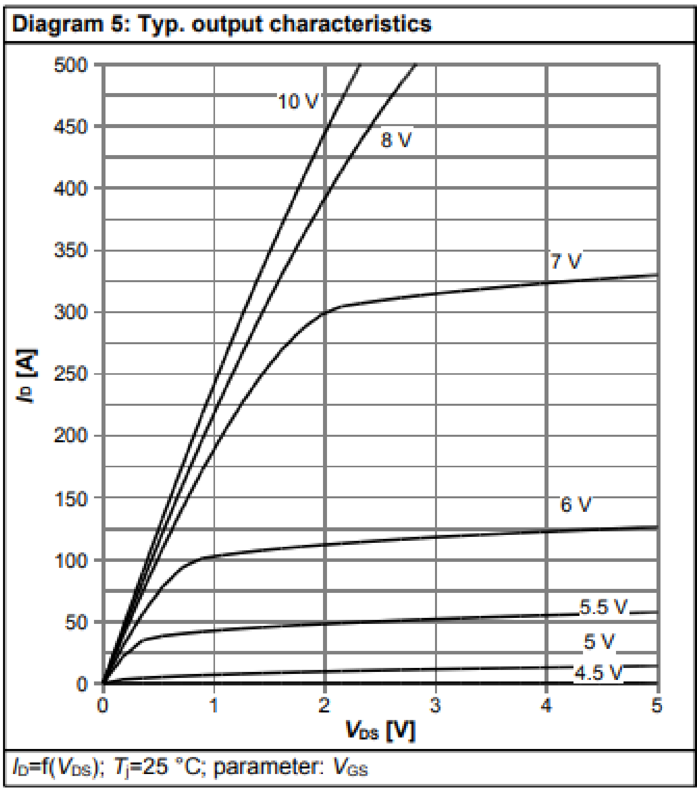
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



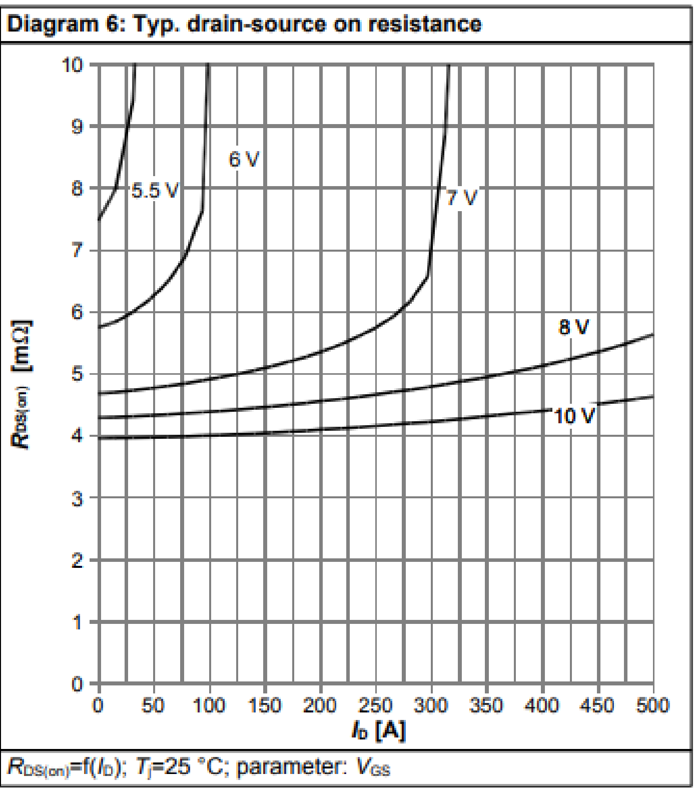
Z_{thJC}=f(t_p); parameter: D=t_p/T

Diagram 5: Typ. output characteristics



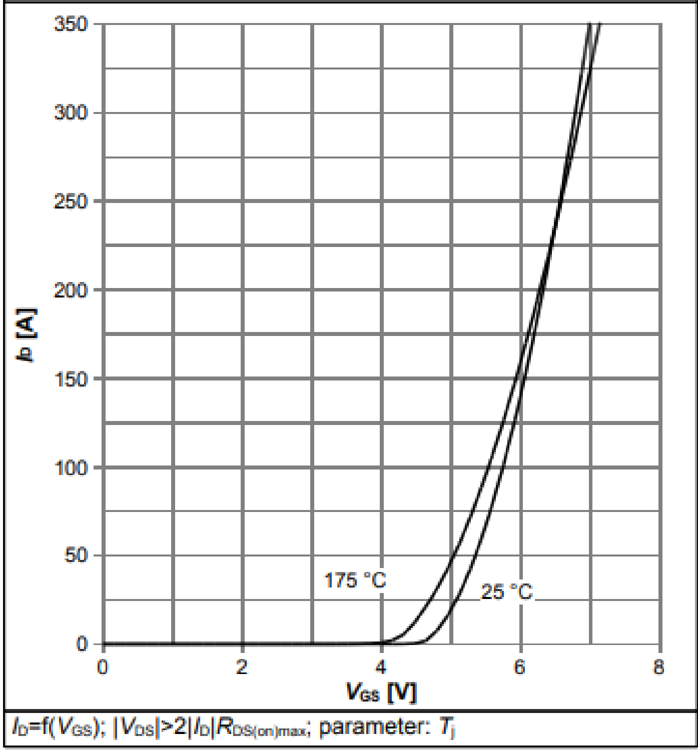
I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



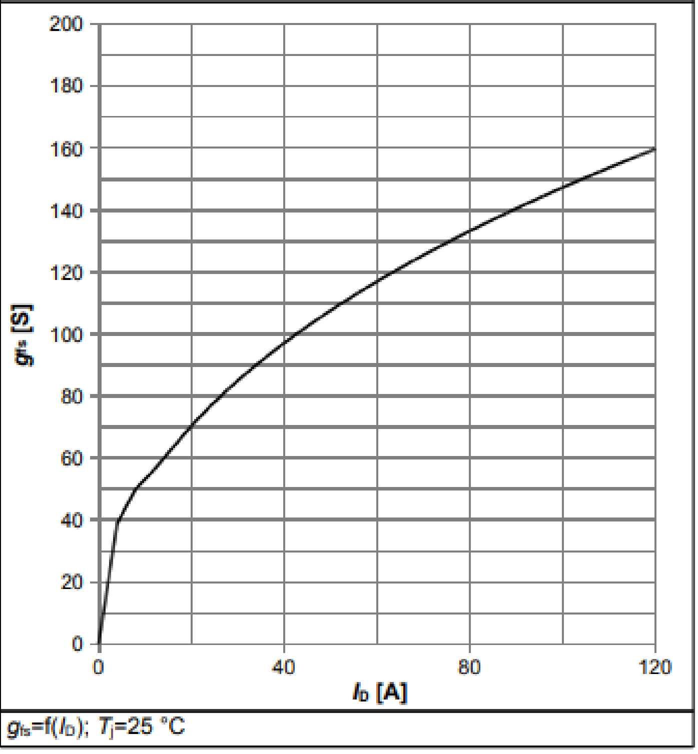
$R_{DS(on)}$=f(I_D); T_j=25 °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



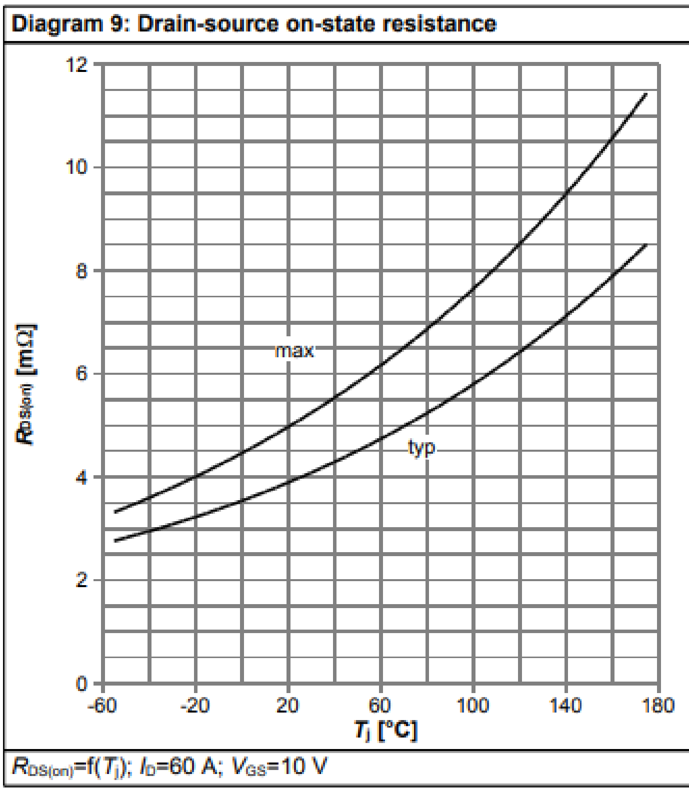
I_D=f(V_{GS}); |V_{DS}|>2|I_D|$R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



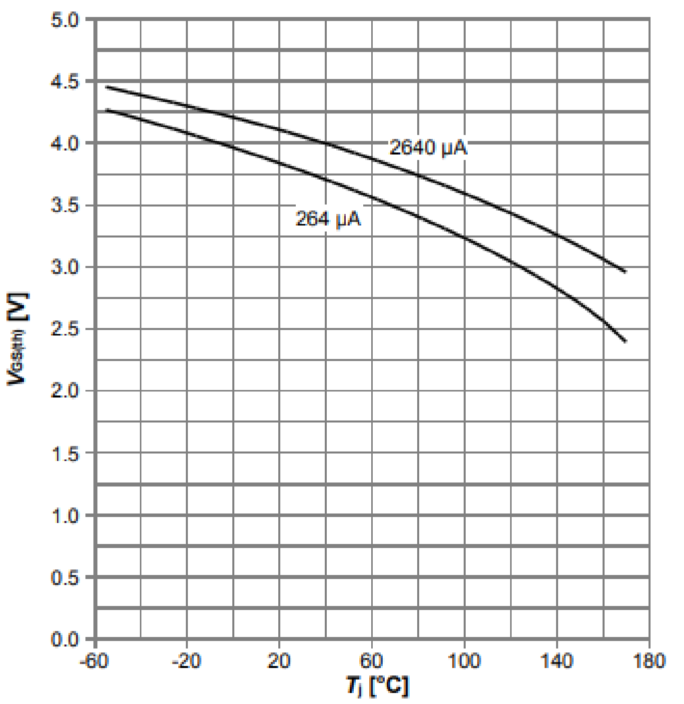
g_{fs}=f(I_D); T_j=25 °C

Diagram 9: Drain-source on-state resistance



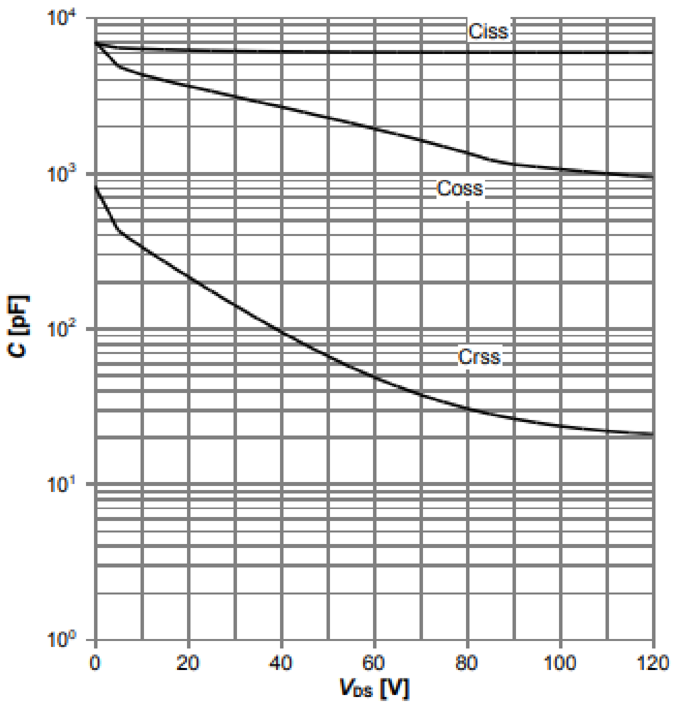
$R_{DS(on)}$=f(T_j); I_D=60 A; V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



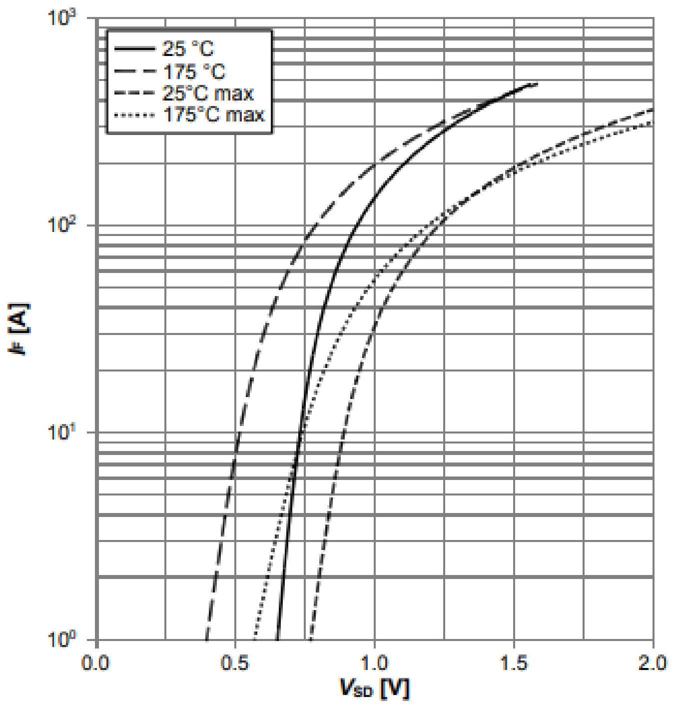
$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}; parameter: I_D

Diagram 11: Typ. capacitances



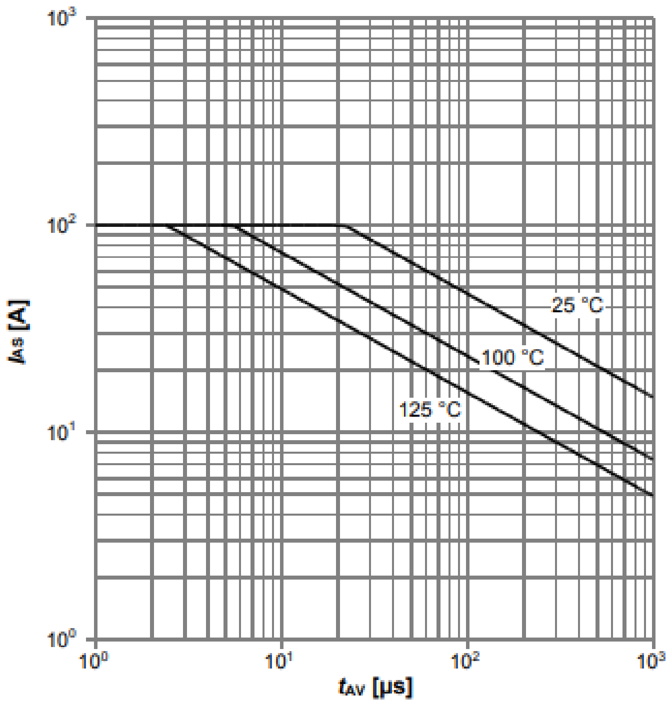
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Diagram 12: Forward characteristics of reverse diode



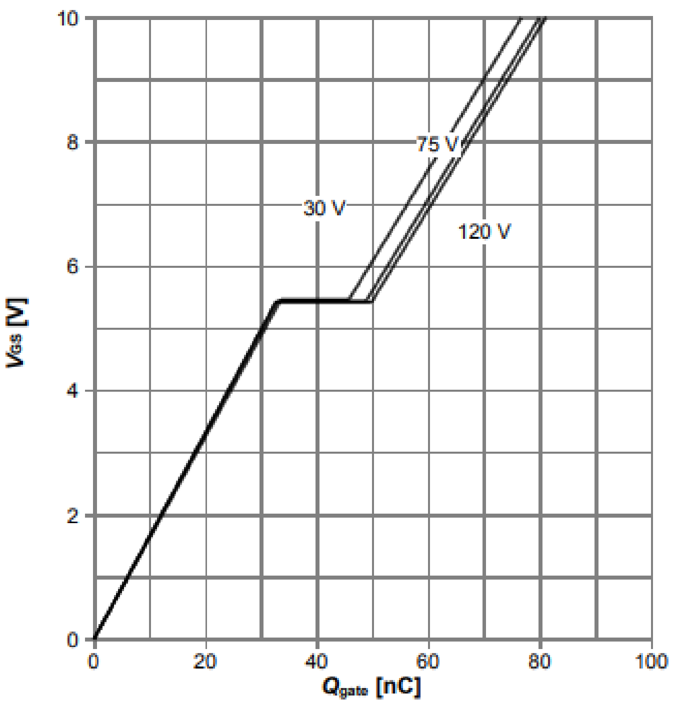
I_F=f(V_{SD}); parameter: T_j

Diagram 13: Avalanche characteristics



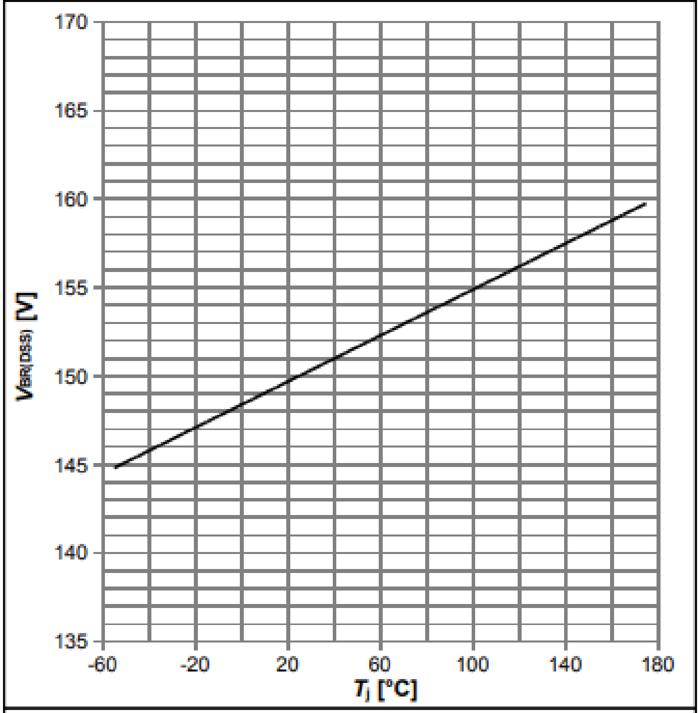
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



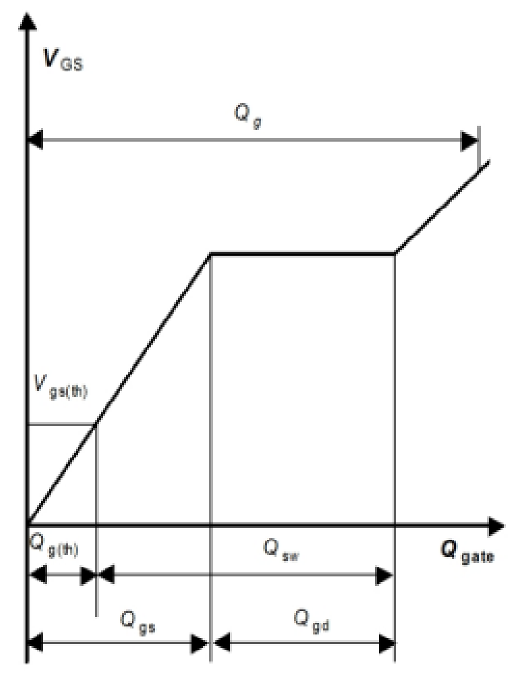
V_{GS}=f(Q_{gate}); I_D=60 A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

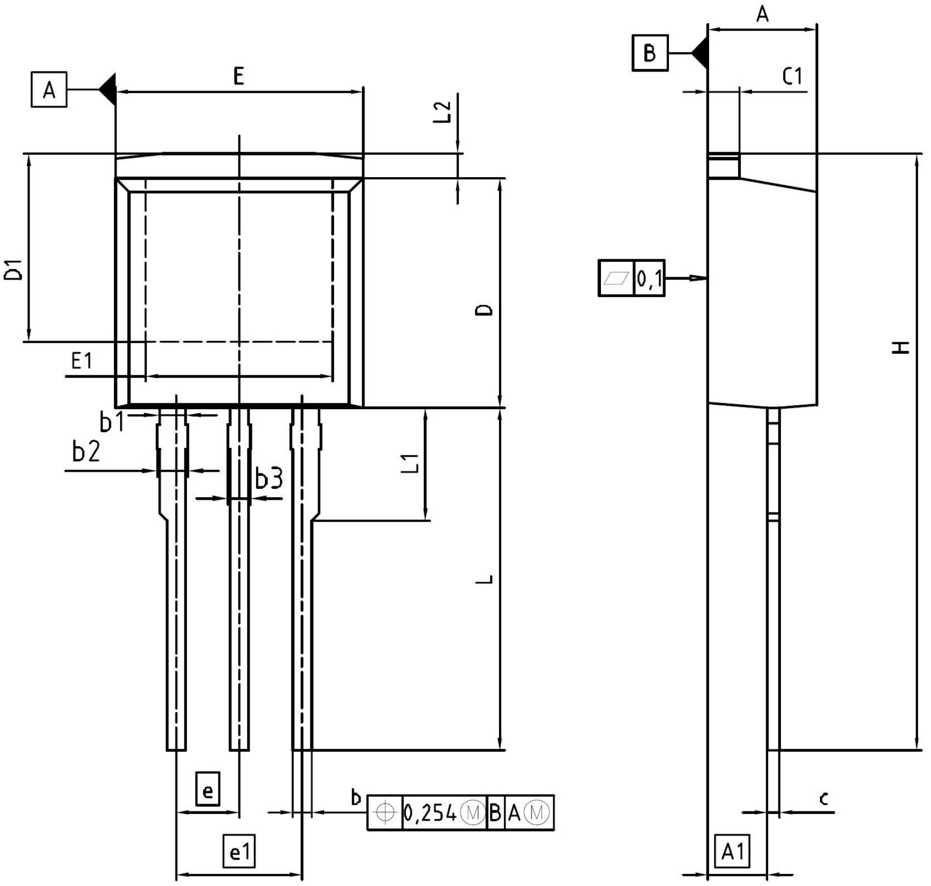


$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Gate charge waveforms

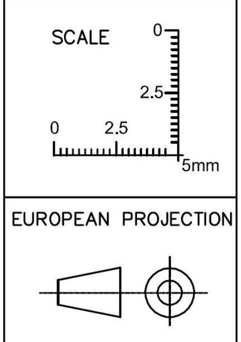


5 封装外形



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.300	4.572	0.169	0.180
A1	2.150	2.718	0.085	0.107
b	0.650	0.864	0.026	0.034
b1	0.950	1.093	0.037	0.043
b2	0.950	1.400	0.037	0.055
b3	0.650	1.118	0.026	0.044
c	0.330	0.600	0.013	0.024
c1	1.170	1.400	0.046	0.055
D	8.509	9.450	0.335	0.372
D1	6.900	-	0.272	-
E	9.700	10.363	0.382	0.408
E1	6.500	8.600	0.256	0.339
e	2.540		0.100	
e1	5.080		0.200	
N	3		3	
L	13.000	14.000	0.512	0.551
L1	-	4.800	-	0.189
L2	-	1.727	-	0.068

REFERENCE
Z8B00003325



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REVISION
03

图 1 **PG-TO262-3 外形图，尺寸单位为毫米/英寸**

修订记录

IPI051N15N5

Revision: 2016-02-01, Rev. 2.0

历史修订版本

Revision	Date	Subjects (major changes since last revision)
2.0	2016-02-01	Release of final version

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