

英飞凌CoolGaNTM G5

PG-DSO-20

英飞凌CoolGaNTM晶体管 650 V G5

英飞凌的 CoolGaNTM是一款高效氮化镓 (GaN) 晶体管，专为 650 V 的功率转换而设计。它可实现更高的功率密度，降低系统 BOM 成本，并有助于实现小型化外形尺寸。它采用 200 毫米（8 英寸）晶圆技术和全自动生产线生产，具有生产公差小的特点，这使其适用于从消费电子到工业的广泛应用。

特性

- 增强型晶体管
- 超快速开关
- 无反向恢复电荷
- 能够反向传导
- 低栅极和输出电荷
- 出色的换向耐用性
- 2kV HBM ESD 标准

优点

- 常闭晶体管技术确保安全运行
- 实现快速、精确的电力输送控制
- 提高系统效率和可靠性
- 确保在严苛条件下的稳健表现

这些共性使 CoolGaNTM成为电源转换领域的游戏规则颠覆者，提供了一个令人叹服的高效、紧凑和可靠的完美组合。

潜在的应用

基于半桥硬开关和软开关拓扑（例如图腾柱 PFC 和 高频 LLC）的工业、通信、数据中心 SMPS，以及充电器和适配器。

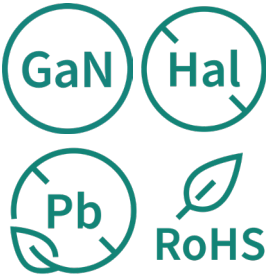
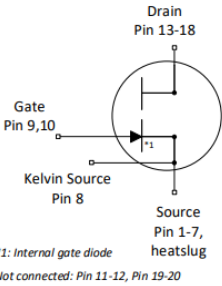
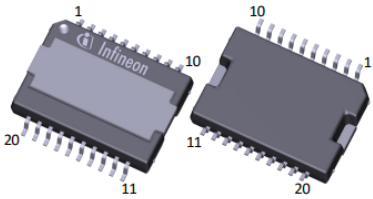
产品认证

完全符合 JEDEC 工业应用标准

表1 主要性能参数

Parameter	Value	Unit
$V_{DS,max}$	650	V
$V_{DS,trans-max}$	900	V
$R_{DS(on),max}$	30	mΩ
$Q_{g,typ}$	11	nC
$I_{D,pulse}$	120	A
$Q_{oss} @ 400 V$	82	nC
Q_{rr}	0	nC

Type / Ordering code	Package	Marking	Related links
IGOT65R025D2	PG-DSO-20	65R025D2	see Appendix A



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）。



目录

说明..... 1

最大额定值 3

热特性..... 4

电气特征 5

电气特性图..... 7

测试电路 12

封装外形 13

附录 A 14

修订历史 15

商标..... 15

免责声明..... 15

1 最大额定值

除非另有说明，否则 $T_j = 25^\circ\text{C}$ 。超过最大额定值的应力可能会对器件造成永久性损坏。为获得最佳使用寿命和可靠性，英飞凌建议工作条件不要持续超过所述最大额定值的 80%（除非另有明确说明）。如需更多信息，请联系您当地的英飞凌销售办事处。

表 2 最大额定值

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Drain source voltage, continuous	$V_{DS,max}$	-	-	650	V	$V_{GS} = 0\text{ V}$, derating recommendation according JEDEC JEP198
Leakage current at drain source transient voltage	$I_{DS,trans}$	-	-	28	mA	$V_{GS} = 0\text{ V}$, $V_{DS,trans} = 900\text{ V}$
Drain source voltage transient	$V_{DS,trans}$	-	-	900	V	<1% duty cycle, <1 μs , 1 million pulses
Drain source voltage, pulsed	$V_{DS,pulsed}$	-	-	750 650	V	$T_j = 25^\circ\text{C}$; $V_{GS} \leq 0\text{ V}$; cumulated stress time $\leq 1\text{ h}$ $T_j = 125^\circ\text{C}$; $V_{GS} \leq 0\text{ V}$; cumulated stress time $\leq 1\text{ h}$
Switching surge voltage, pulsed	$V_{DS,surge}$	-	-	750	V	DC bus voltage = 700 V; turn off $V_{DS,pulse} = 750\text{ V}$; turn on $I_{D,pulse} = 63\text{ A}$; $T_j = 105^\circ\text{C}$; $f \leq 100\text{ kHz}$, $t \leq 100\text{ s}$ (10 million pulses)
Continuous current, drain source ¹⁾	I_D	-	-	61	A	$T_c = 25^\circ\text{C}$; $T_j = T_{j,max}$
Pulsed current, drain source	$I_{D,pulse}$	-120 -84	-	120 84	A	$T_j = 25^\circ\text{C}$; $I_G = 60\text{ mA}$; See Diagram 3, 5 $T_j = 125^\circ\text{C}$; $I_G = 60\text{ mA}$; See Diagram 4, 6
Gate current, continuous ²⁾	$I_{G,avg}$	-	-	46	mA	$T_j = -55^\circ\text{C}$ to $T_j = 150^\circ\text{C}$; See Table 9
Gate current, pulsed ²⁾	$I_{G,pulsed}$	-4.6	-	4.6	A	$T_j = -55^\circ\text{C}$ to $T_j = 150^\circ\text{C}$; $t_{pulse} = 50\text{ ns}$, $f = 100\text{ kHz}$; See Table 9
Gate source voltage, continuous ²⁾	V_{GS}	-10	-	-	V	$T_j = -55^\circ\text{C}$ to $T_j = 150^\circ\text{C}$; See Diagram 12
Gate source voltage, pulsed ²⁾	$V_{GS,pulse}$	-25	-	-	V	$T_j = -55^\circ\text{C}$ to $T_j = 150^\circ\text{C}$; $t_{pulse} = 50\text{ ns}$, $f = 100\text{ kHz}$; open drain
Power dissipation	P_{tot}	-	-	184	W	$T_c = 25^\circ\text{C}$
Operating junction temperature	T_j	-55	-	150	$^\circ\text{C}$	-
Storage temperature	T_{stg}	-55	-	150	$^\circ\text{C}$	Max shelf life depends on storage conditions
Drain-source voltage slew-rate	dv/dt	-	-	200	V/ns	-

¹⁾ 受 $T_{j,max}$ 限制。最大占空比 $D = 0.75$

²⁾ 我们建议使用先进的驱动技术来优化器件性能。请参阅栅极驱动器应用说明了解更多详细内容。

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}	-	-	0.68	°C/W	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	70	°C/W	Device on PCB, minimum footprint
Thermal resistance, junction - ambient for SMD version	R_{thJA}	-	-	61	°C/W	Device on 40 mm*40 mm*1.5 mm epoxy PCB FR4 with 6 cm ² (one layer, 70 μm thickness) copper area. PCB is vertical without air stream cooling.
Reflow soldering temperature	T_{sold}	-	-	260	°C	reflow MSL3

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.		
Gate threshold voltage	$V_{GS(th)}$	0.9 -	1.2 1	1.6 -	V	$I_{DS}=6.1\text{ mA}$; $V_{DS}=10\text{ V}$; $T_j=25^\circ\text{C}$ $I_{DS}=6.1\text{ mA}$; $V_{DS}=10\text{ V}$; $T_j=150^\circ\text{C}$
Gate-Source reverse clamping voltage	$V_{GS, clamp}$	-	-	-8	V	$I_{GS}=-1\text{ mA}$
Drain-Source leakage current	I_{DSS}	-	2.3 46	230 -	μA	$V_{DS}=650\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25^\circ\text{C}$ $V_{DS}=650\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=150^\circ\text{C}$
Drain-Source on-state resistance	$R_{DS(on)}$	-	0.025 0.053	0.030 -	Ω	$I_G=60\text{ mA}$; $I_D=18\text{ A}$; $T_j=25^\circ\text{C}$ $I_G=60\text{ mA}$; $I_D=18\text{ A}$; $T_j=150^\circ\text{C}$
Gate resistance	$R_{G,int}$	-	0.7	-	Ω	LCR impedance measurement; $f=f_{res}$, open drain;

表 5 动态特性

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	780	-	pF	$V_{GS}=0\text{ V}$; $V_{DS}=400\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}	-	130	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=400\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance	C_{rss}	-	1.8	-	pF	$V_{GS}=0\text{ V}$, $V_{DS}=400\text{ V}$, $f=1\text{ MHz}$
Effective output capacitance, energy related ³⁾	$C_{o(er)}$	-	150	-	pF	$V_{DS}=0\text{ to }400\text{ V}$
Effective output capacitance, time related ⁴⁾	$C_{o(tr)}$	-	204	-	pF	$V_{GS}=0\text{ V}$; $V_{DS}=0\text{ to }400\text{ V}$; $I_D=\text{const}$
Output charge	Q_{oss}	-	82	-	nC	$V_{DS}=0\text{ to }400\text{ V}$
Coss stored energy	E_{oss}	-	12	-	μJ	$V_{DS}=0\text{ to }400\text{ V}$
Turn-on delay time	$t_{d(on)}$	-	11	-	ns	$I_D=18\text{ A}$; $R_{ON}=2.2\text{ Ohm}$; $R_{OFF}=2.2\text{ Ohm}$; $R_{SS}=150\text{ Ohm}$; $C_C=6.8\text{ nF}$; $V_{DRV}=12\text{ V}$; see Table 8
Turn-off delay time	$t_{d(off)}$	-	18	-	ns	$I_D=18\text{ A}$; $R_{ON}=2.2\text{ Ohm}$; $R_{OFF}=2.2\text{ Ohm}$; $R_{SS}=150\text{ Ohm}$; $C_C=6.8\text{ nF}$; $V_{DRV}=12\text{ V}$; see Table 8
Rise time	t_r	-	12	-	ns	$I_D=18\text{ A}$; $R_{ON}=2.2\text{ Ohm}$; $R_{OFF}=2.2\text{ Ohm}$; $R_{SS}=150\text{ Ohm}$; $C_C=6.8\text{ nF}$; $V_{DRV}=12\text{ V}$; see Table 8
Fall time	t_f	-	9	-	ns	$I_D=18\text{ A}$; $R_{ON}=2.2\text{ Ohm}$; $R_{OFF}=2.2\text{ Ohm}$; $R_{SS}=150\text{ Ohm}$; $C_C=6.8\text{ nF}$; $V_{DRV}=12\text{ V}$; see Table 8



- 3) $C_{o(er)}$ 是固定电容，当 V_{DS} 从 0 升至 400 V 时，其存储能量与 C_{oss} 相同
4) $C_{o(tr)}$ 是一个固定电容，当 V_{DS} 从 0 升至 400 V 时，其充电时间与 C_{oss} 相同

表6 栅极电荷特性

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate charge	Q_G	-	11	-	nC	$V_{GS}=0$ to 3 V; $V_{DS}=400$ V, $I_D=18$ A

表7 反向传导特性

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Source-Drain reverse voltage	V_{SD}	-	2.0	2.4	V	$V_{GS}=0$ V; $I_{SD}=18$ A
Pulsed current, reverse	$I_{SD,pulse}$	-	-	120	A	$I_G=60$ mA
Reverse recovery charge ⁵⁾	Q_{rr}	-	0	-	nC	$I_{SD}=18$ A; $V_{DS}=400$ V

5) 不包括 Q_{oss}

4 电气特性图

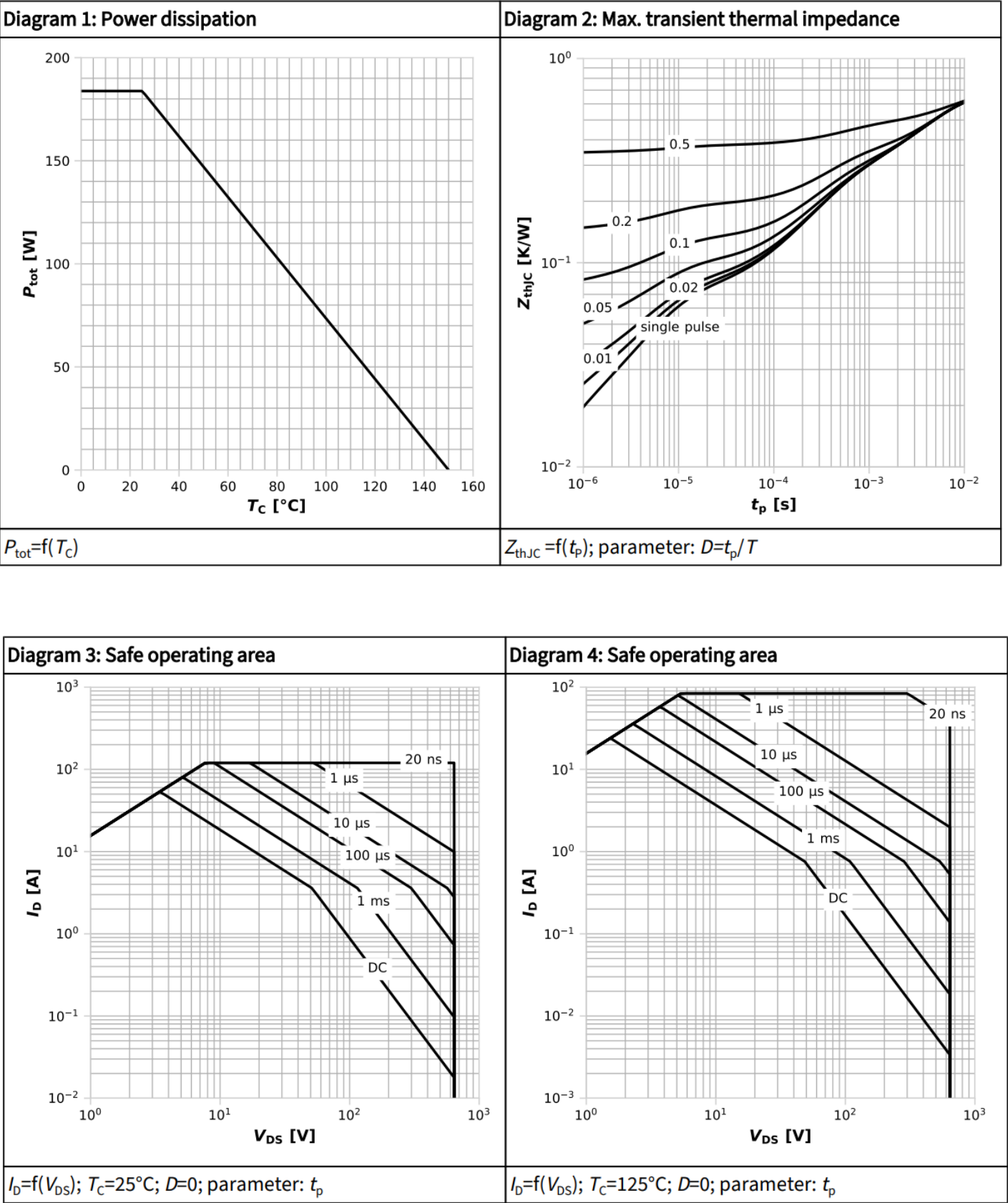
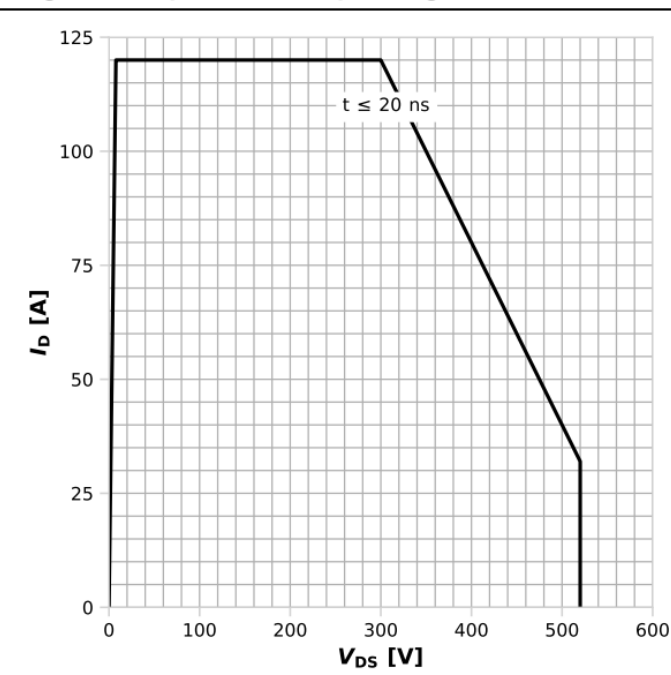
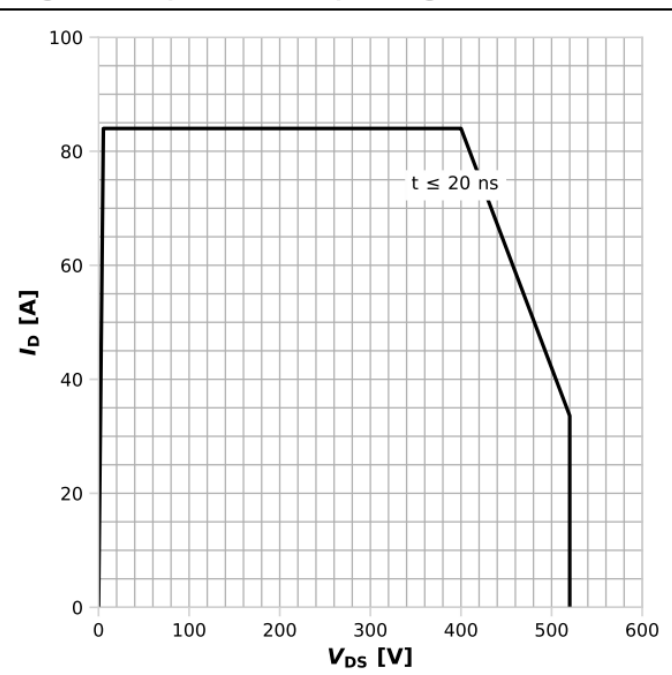


Diagram 5: Repetitive safe operating area



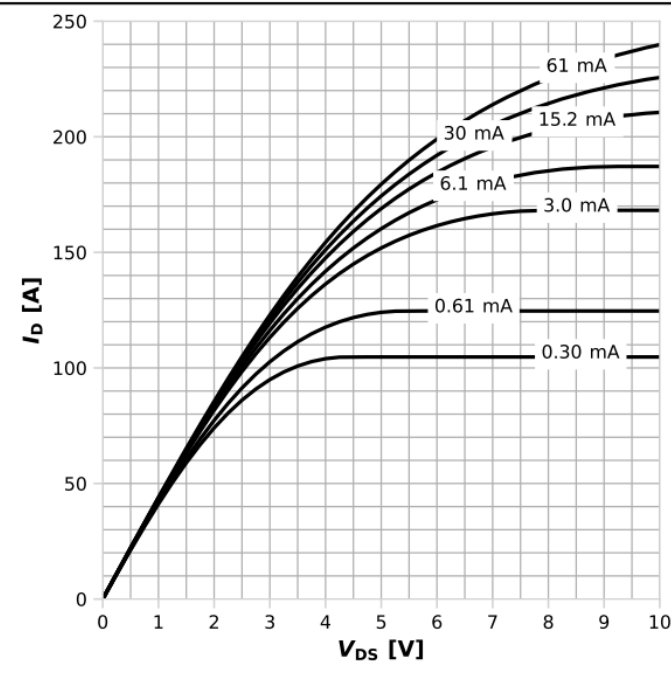
$I_D = f(V_{DS})$; $T_C = 25^\circ\text{C}$; $T_J \leq 150^\circ\text{C}$; parameter: t_p

Diagram 6: Repetitive safe operating area



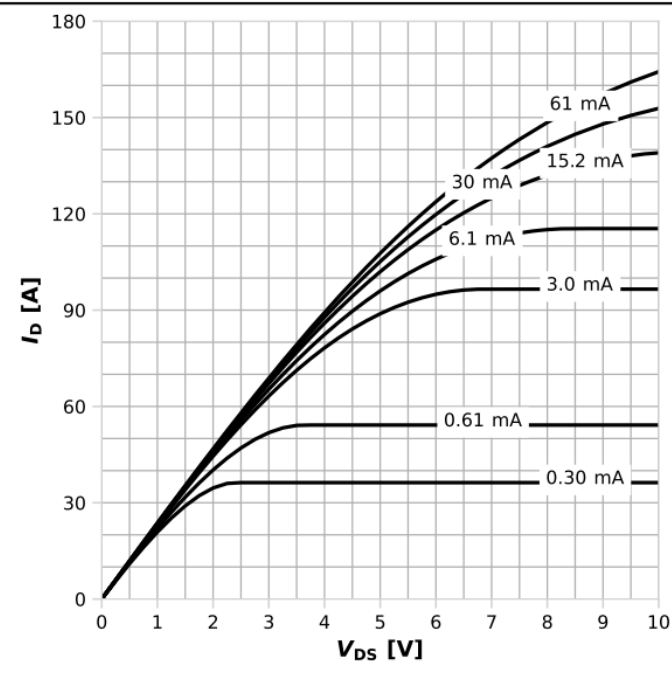
$I_D = f(V_{DS})$; $T_C = 125^\circ\text{C}$; $T_J \leq 150^\circ\text{C}$; parameter: t_p

Diagram 7: Typ. output characteristics



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

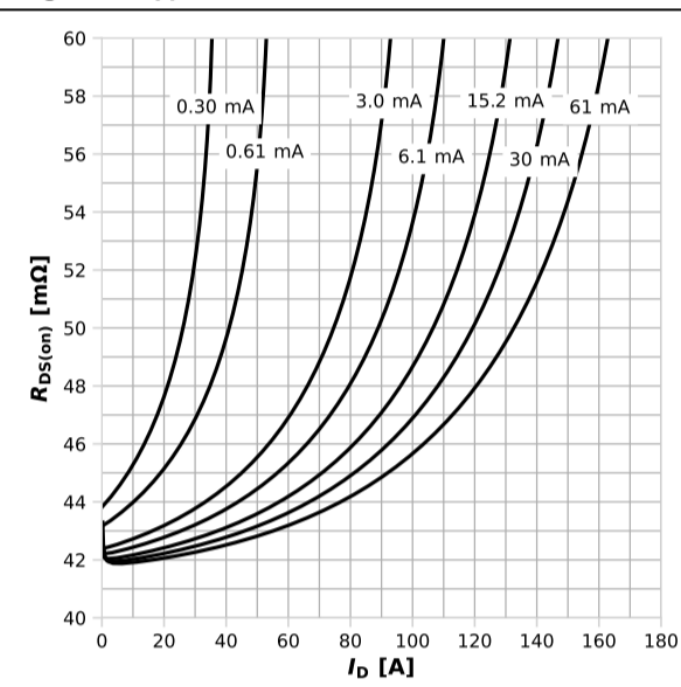
Diagram 8: Typ. output characteristics



$I_D = f(V_{DS})$; $T_J = 125^\circ\text{C}$; parameter: I_{GS}

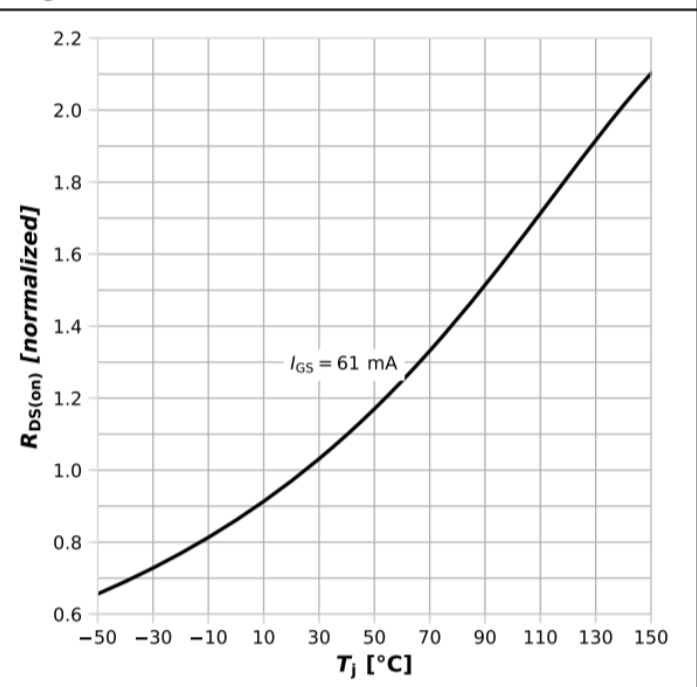


Diagram 9: Typ. Drain-source on-state resistance



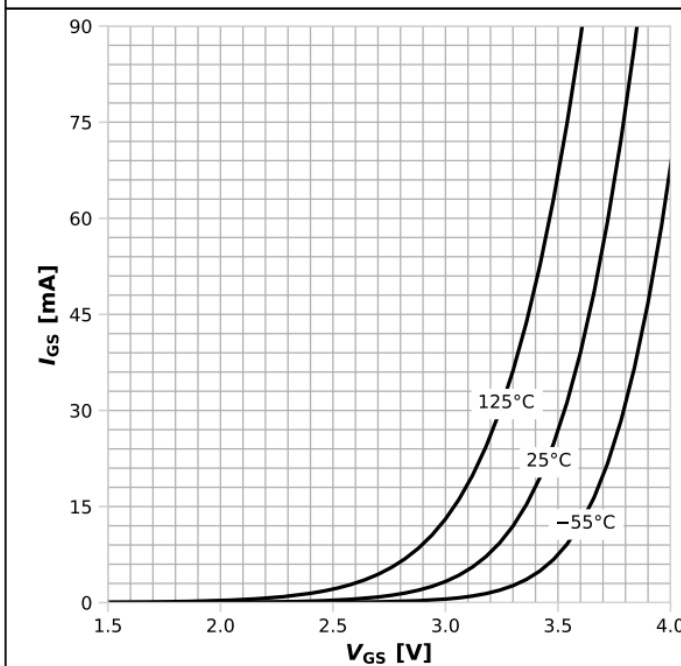
$R_{DS(on)} = f(I_D); T_j = 125^\circ\text{C}; \text{parameter: } I_{GS}$

Diagram 10: Drain-source on-state resistance



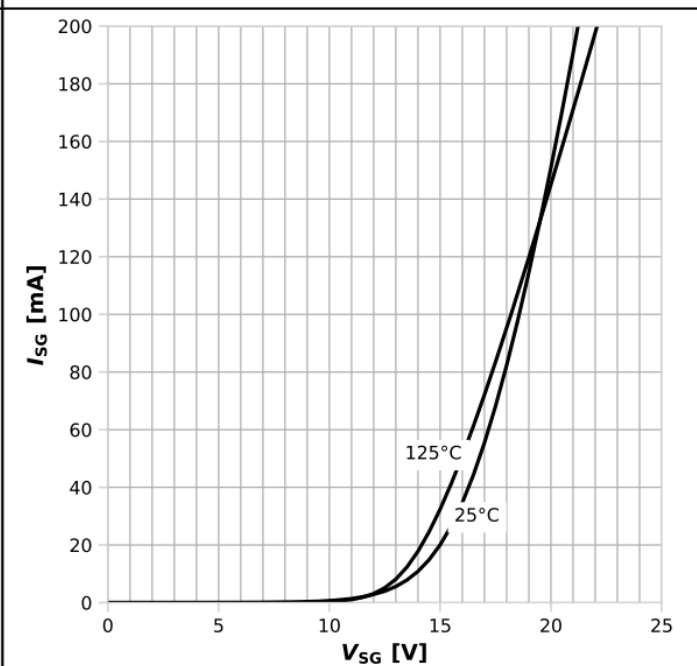
$R_{DS(on)} = f(T_j); I_D = 18$ A

Diagram 11: Typ. gate characteristics forward



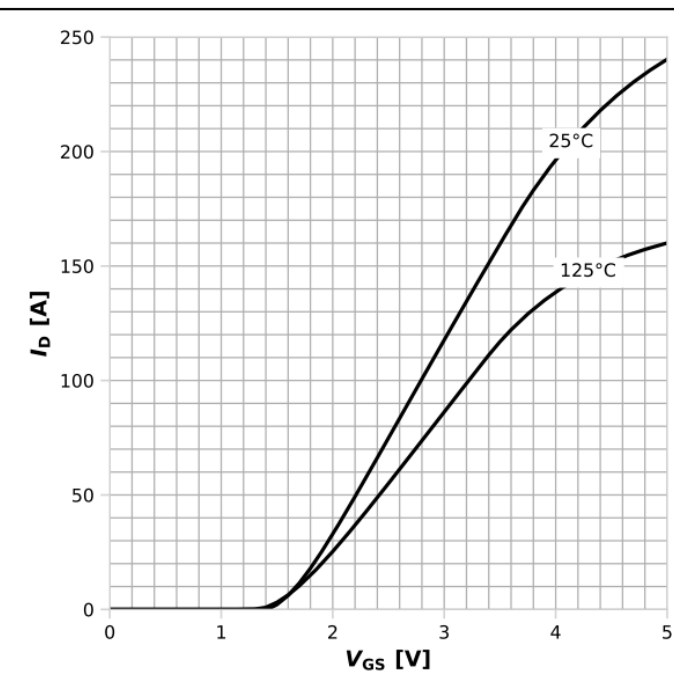
$I_{GS} = f(V_{GS}); \text{open drain}; \text{parameter: } T_j$

Diagram 12: Typ. gate characteristics reverse



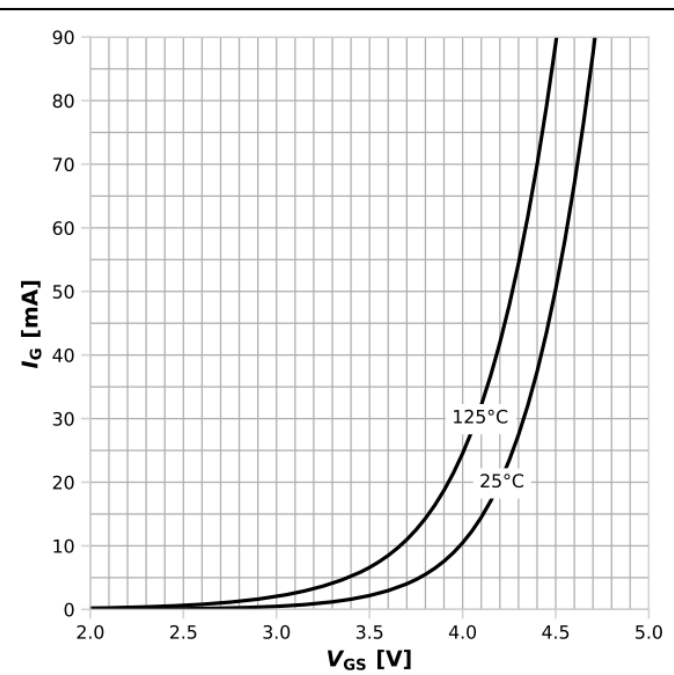
$I_{SG} = f(V_{SG}); \text{parameter: } T_j$

Diagram 13: Typ. transfer characteristics



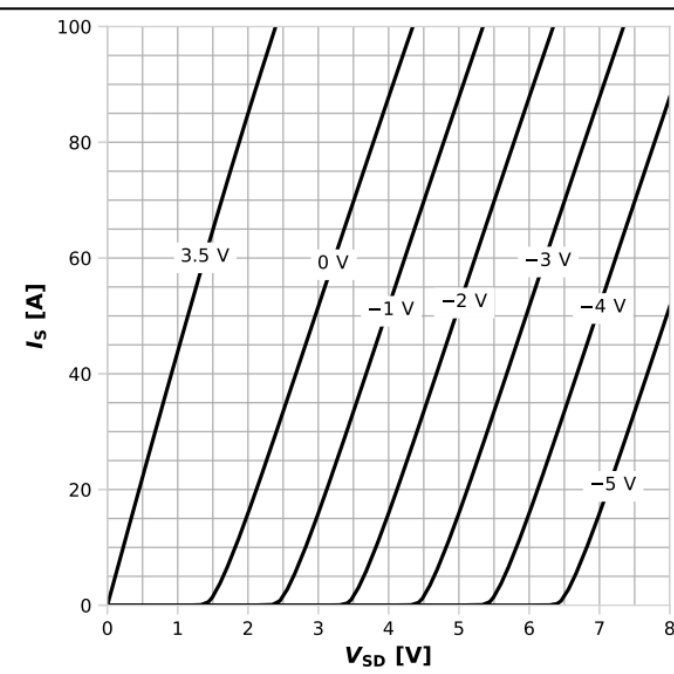
$I_D = f(I_{GS}); V_{DS} = 8V; \text{parameter: } T_j$

Diagram 14: Typ. transfer gate current characteristic



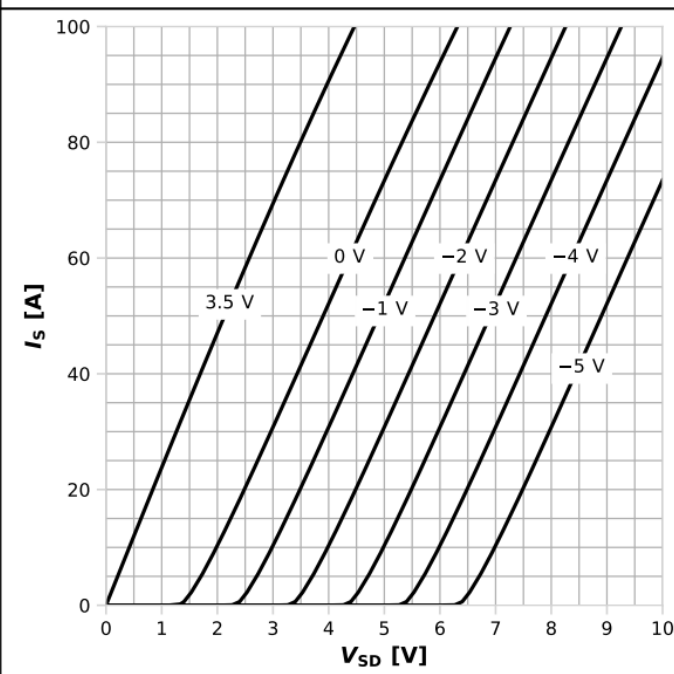
$I_G = f(V_{GS}); V_{DS} = 8V; \text{parameter: } T_j$

Diagram 15: Typ. channel reverse characteristics



$I_S = f(V_{SD}); T_j = 25^\circ\text{C}; \text{parameter: } V_{GS}$

Diagram 16: Typ. channel reverse characteristics



$I_S = f(V_{SD}); T_j = 125^\circ\text{C}; \text{parameter: } V_{GS}$

Diagram 17 Typ. gate charge

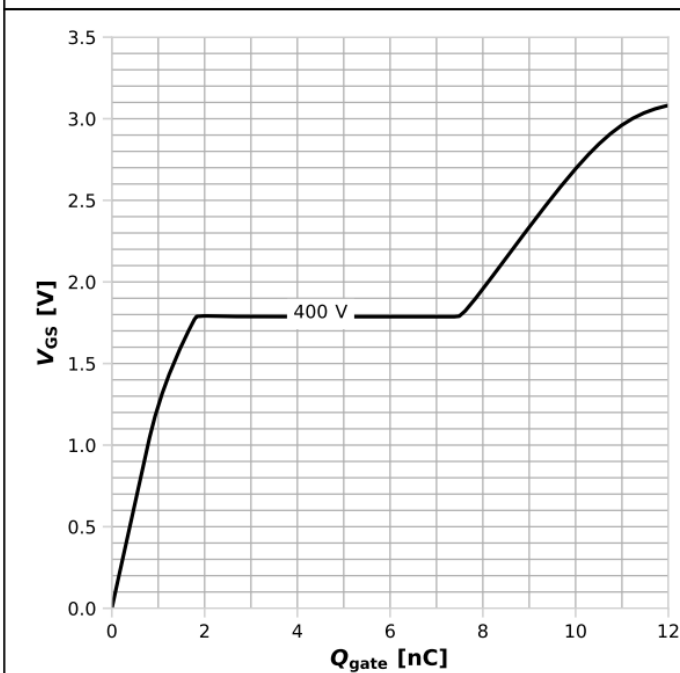

 $V_{GS}=f(Q_{gate}); I_D=18\text{ A pulsed}; I_G=4.5\text{ mA}; \text{parameter: } V_{DD}$

Diagram 18: Typ. capacitances

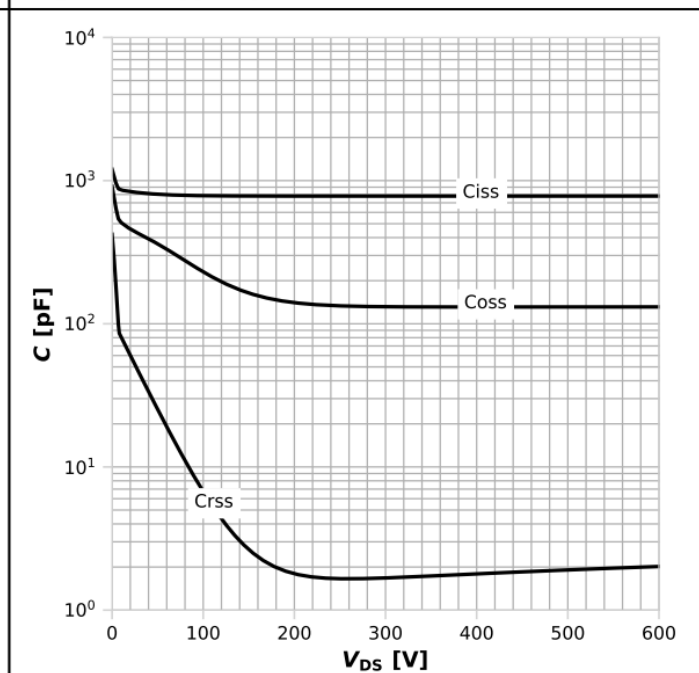

 $C=f(V_{DS}); V_{GS}=0\text{ V}$

Diagram 19: Typ. output charge

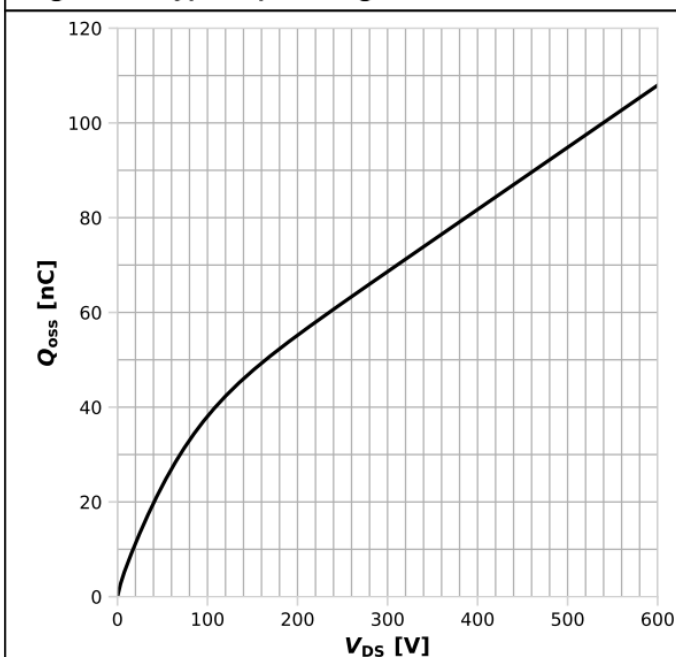
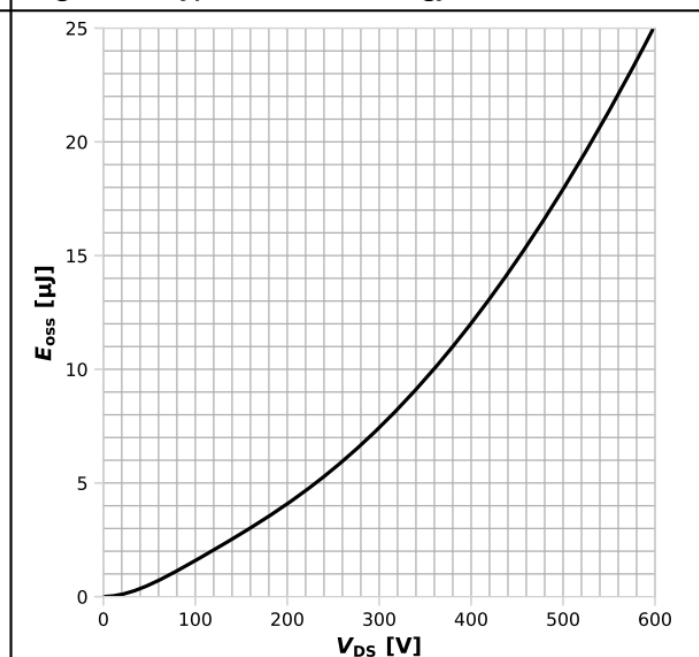

 $Q_{oss}=f(V_{DS})$

Diagram 20: Typ. Coss stored energy


 $E_{oss}=f(V_{DS})$

5 测试电路

表8 反向通道特性测试

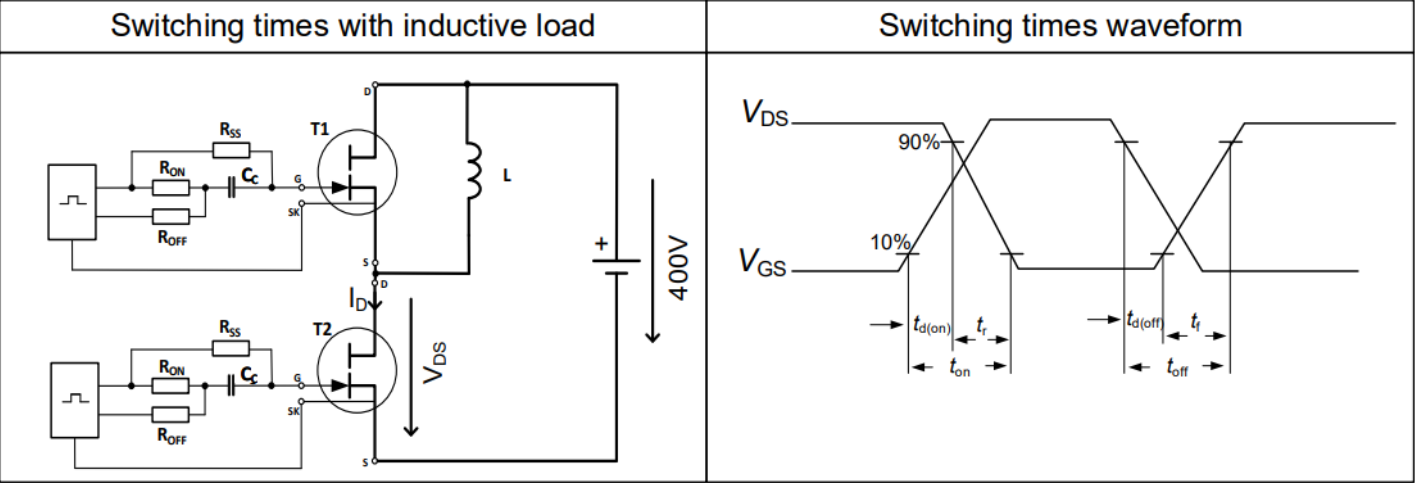
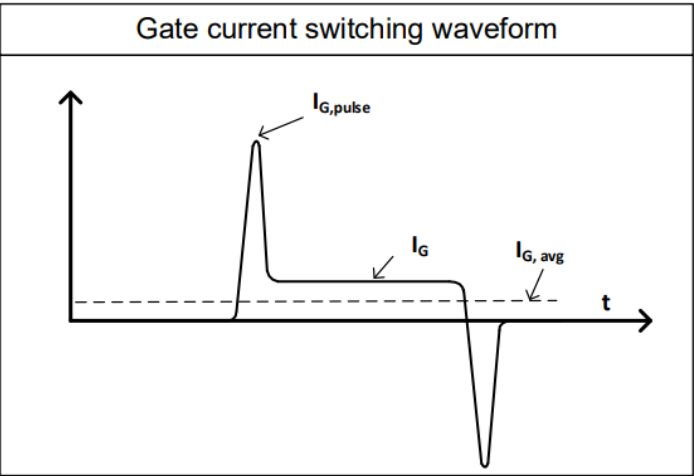
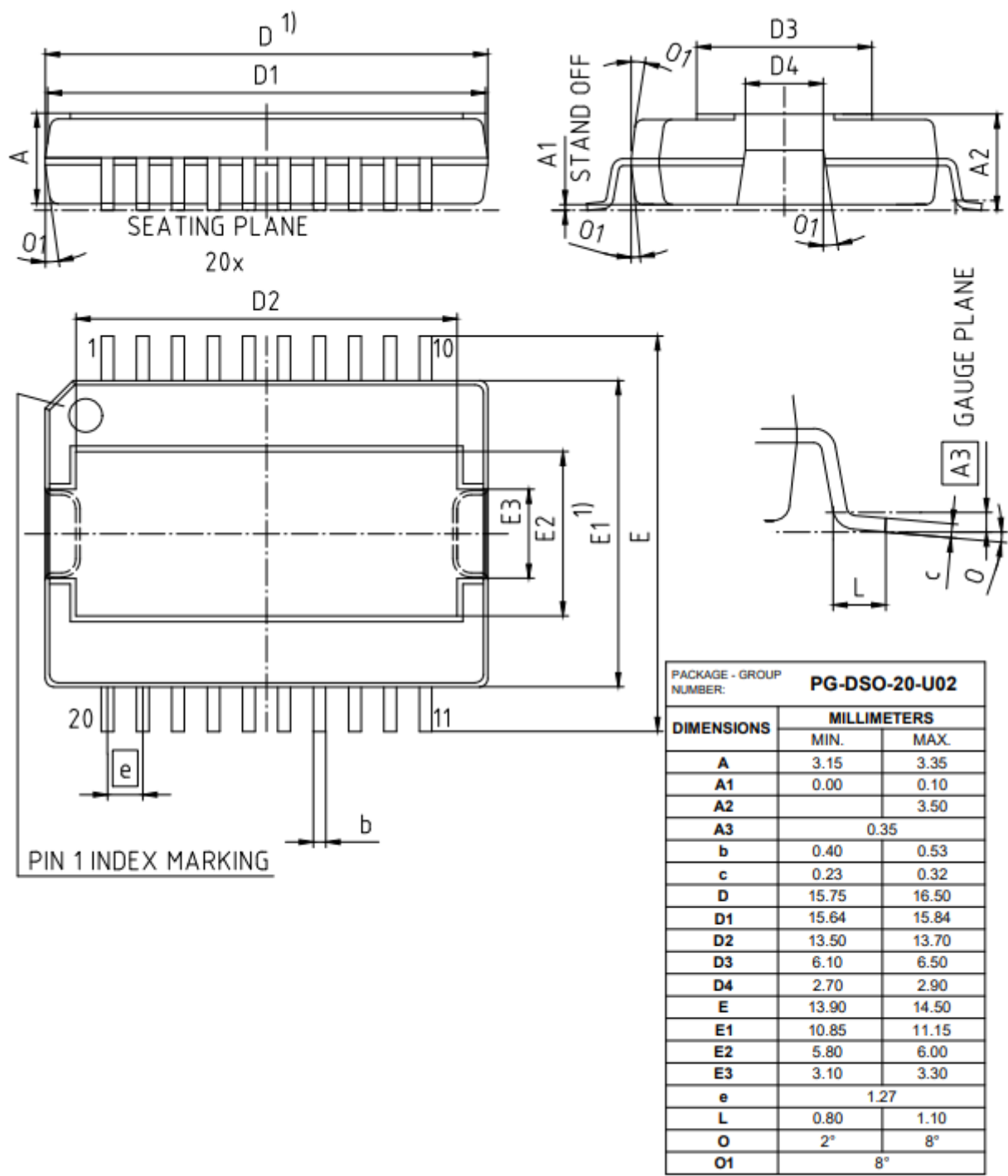


表9 栅极电流开关波形



6 封装外形



1) DOES NOT INCLUDE PLASTIC OR METAL PRUTRUSION OF 0.15 MAX. PER SIDE

图 1 PG- DSO- 20 外形图，尺寸单位为毫米

7 附录A

表 10 相关链接

- [CoolGaN™ GaN 650 V 网页](#)
- [CoolGaN™ GaN 650 V 可靠性白皮书](#)
- [CoolGaN™ GaN 650 V 栅极驱动器应用手册](#)
- [CoolGaN™ GaN 650 V 应用信息](#)

修订记录

IGOT65R025D2

修订 2024 - 10 - 24 , Rev. 1 .0

历史修订记录

Revision	Date	Subjects (major changes since last revision)
1.0	2024-10-24	Release of final

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

We Listen to Your Comments Any information within this document that you feel is wrong, unclear or missing at all? Your feedback will help us to continuously improve the quality of this document. Please send your proposal (including a reference to this document) to: erratum@infineon.com

Published by

Infineon Technologies AG

81726 Munich, Germany

© 2024 Infineon Technologies AG.

All Rights Reserved.

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie"). With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

Information

For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office (www.infineon.com).

Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.



免责声明

请注意，本文件的原文使用英文撰写，为方便客户浏览英飞凌提供了中文译文。该中文译文仅供参考，并不可作为任何论点之依据。

由于翻译过程中可能使用了自动化程序，以及语言翻译和转换过程中的差异，最后的中文译文与最新的英文版本原文含义可能存在不尽相同之处。

因此，我们同时提供该中文译文版本的最新英文原文供您阅读，请参见 <http://www.infineon.com>

英文原文和中文译文版本之间若存有任何歧异，以最新的英文版本为准，并且仅认可英文版本为正式文件。

您如果使用本文件，即表示您同意并理解上述说明。英飞凌不对因翻译过程中可能存在的任何不完整或不准确信息而产生的任何直接或间接损失或损害负责。英飞凌不承担中文译文版本的完整性和准确性责任。如果您不同意上述说明，请不要使用本文件。

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

Edition 2025-04-21

Published by

Infineon Technologies AG

81726 Munich, Germany

© 2025 Infineon Technologies AG.

All Rights Reserved.

Do you have a question about this document?

Email:

erratum@infineon.com

重要提示

本文件所提供的任何信息绝不应被视为针对任何条件或者品质而做出的保证（质量保证）。英飞凌对于本文件中所提及的任何事例、提示或者任何特定数值及/或任何关于产品应用方面的信息均在此明确声明其不承担任何保证或者责任，包括但不限于其不侵犯任何第三方知识产权的保证均在此排除。此外，本文件所提供的任何信息均取决于客户履行本文件所载明的义务和客户遵守适用于客户产品以及与客户对于英飞凌产品的应用所相关的任何法律要求、规范和标准。

本文件所含的数据仅供经过专业技术培训的人员使用。客户自身的技术部门有义务对于产品是否适宜于其预期的应用和针对该等应用而言本文件中所提供的信息是否充分自行予以评估。

警告事项

由于技术所需产品可能含有危险物质。如需了解该等物质的类型，请向离您最近的英飞凌科技办公室接洽。

除非由经英飞凌科技授权代表签署的书面文件中做出另行明确批准的情况外，英飞凌科技的产品不应当被用于任何一项一旦产品失效或者产品使用的后果可被合理地预料到可能导致人身伤害的任何应用领域。