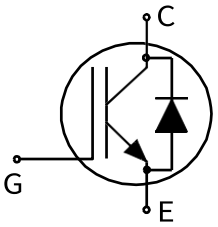
英飞凌TRENCHSTOP™ 系列

低损耗 DuoPack：采用 TRENCHSTOP ™和 Fieldstop 技术的 IGBT，搭配软、快速恢复反并联发射器控制二极管



特性：

- 符合汽车级 AEC Q101 标准
- 专为汽车应用设计的DC/AC转换器
- 极低 $V_{CE(sat)}$ 1.5V（典型值）
- 最高结温 175°C
- 经过动态压力测试
- 短路耐受时间 5 µs
- 100% 短路测试
- 100% 的器件都经过动态测试
- $V_{CE(sat)}$ 正温度系数
- 低电磁干扰
- 低栅极电荷Q_G
- 绿色封装
- 非常软、快速恢复的反并联发射极控制 HE 二极管
- 适用于 600V 应用的TRENCHSTOP ™和 Fieldstop 技术提供：
  - 参数分布紧密
  - 高稳健性、温度稳定性
  - 非常高的开关速度

应用：

- 主逆变器
- 空调压缩机
- PTC 加热器
- 电机驱动

AEC Qualified

Green

Halogen-Free

RoHS

关键性能和封装参数

Type	V_{CE}	I_C	V_{CEsat}, T_{vj}=25°C	T_{vjmax}	Marking	Package
AIKW20N60CT	600V	20A	1.5V	175°C	AK20DCT	PG-TO247-3

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

最大额定值

Parameter	Symbol	Value	Unit
Collector-emitter voltage, $T_{vj} \geq 25°C$	V_{CE}	600	V
DC collector current, limited by T_{vjmax} T_C = 25°C T_C = 100°C	I_C	40.0 20.0	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	60.0	A
Turn off safe operating area $V_{CE} \leq 600V$, $T_{vj} \leq 175°C$, $t_p = 1\mu s$	-	60.0	A
Diode forward current, limited by T_{vjmax} T_C = 25°C value limited by bondwire T_C = 100°C	I_F	40.0 20.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	60.0	A
Gate-emitter voltage	V_{GE}	±20	V
Short circuit withstand time V_{GE} = 15.0V, $V_{CC} \leq 400V$ Allowed number of short circuits < 1000 Time between short circuits: ≥ 1.0s T_{vj} = 150°C	t_{SC}	5	µs
Power dissipation T_C = 25°C	P_{tot}	166.0	W
Operating junction temperature	T_{vj}	-40...+175	°C
Storage temperature	T_{stg}	-55...+150	°C
Soldering temperature,[1] wave soldering 1.6mm (0.063in.) from case for 10s		260	°C
Mounting torque, M3 screw Maximum of mounting processes: 3	M	0.6	Nm

热阻抗

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
R_{th} 特性						
IGBT thermal resistance,[2] junction - case	$R_{th(j-c)}$		-	-	0.90	K/W
Diode thermal resistance,[2] junction - case	$R_{th(j-c)}$		-	-	1.50	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		-	-	40	K/W

[1]封装不推荐用于表面贴装应用
[2]热阻抗$R_{th(c-s)}$（外壳到散热器）大于0.1K/W的导热硅脂不包括在内。

除非另有规定，特性均为 T_{vj} = 25°C。

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
静态特性						
Collector-emitter breakdown voltage	$V_{(BR)CES}$	V_{GE} = 0V, I_C = 0.20mA	600	-	-	V
Collector-emitter saturation voltage	V_{CEsat}	V_{GE} = 15.0V, I_C = 20.0A T_{vj} = 25°C T_{vj} = 175°C	 - -	 1.50 1.90	 2.05 -	V
Diode forward voltage	V_F	V_{GE} = 0V, I_F = 20.0A T_{vj} = 25°C T_{vj} = 175°C	 - -	 1.65 1.60	 2.05 -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C = 0.29mA, V_{CE} = V_{GE}	4.1	4.9	5.7	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 600V, V_{GE} = 0V T_{vj} = 25°C T_{vj} = 175°C	 - -	 - 550	 40 -	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = 20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE} = 20V, I_C = 20.0A	-	11.0	-	S

电气特性，测于 T_{vj} = 25°C的条件下，除非另有说明

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
动态特性						
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	1100	-	pF
Output capacitance	C_{oes}		-	71	-	
Reverse transfer capacitance	C_{res}		-	32	-	
Gate charge	Q_G	V_{CC} = 480V, I_C = 20.0A, V_{GE} = 15V	-	120.0	-	nC
Short circuit collector current Max. 1000 short circuits Time between short circuits: ≥ 1.0s	$I_{C(SC)}$	V_{GE} = 15.0V, V_{CC} ≤ 400V, t_{SC} ≤ 5µs T_{vj} = 150°C	-	183	-	A

开关特性、感性负载

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT 特性，测于T_{vj} = 25°C的条件下						
Turn-on delay time	$t_{d(on)}$	T_{vj} = 25°C, V_{CC} = 400V, I_C = 20.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 12.0Ω, $R_{G(off)}$ = 12.0Ω, Lσ = 131nH, Cσ = 31pF Lσ, Cσ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	18	-	ns
Rise time	t_r		-	14	-	ns
Turn-off delay time	$t_{d(off)}$		-	199	-	ns
Fall time	t_f		-	42	-	ns
Turn-on energy	E_{on}		-	0.31	-	mJ
Turn-off energy	E_{off}		-	0.46	-	mJ
Total switching energy	E_{ts}		-	0.77	-	mJ

二极管特性，测于 T_{vj} = 25°C的条件下

Diode reverse recovery time	t_{rr}	T_{vj} = 25°C, V_R = 400V, I_F = 20.0A, di_F/dt = 880A/µs	-	41	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.31	-	µC
Diode peak reverse recovery current	I_{rrm}		-	13.3	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-711	-	A/µs

开关特性、感性负载

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT 特性，测于 T_{vj} = 175°C的条件						
Turn-on delay time	$t_{d(on)}$	T_{vj} = 175°C, V_{CC} = 400V, I_C = 20.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 12.0Ω, $R_{G(off)}$ = 12.0Ω, $L\sigma$ = 131nH, $C\sigma$ = 31pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	18	-	ns
Rise time	t_r		-	18	-	ns
Turn-off delay time	$t_{d(off)}$		-	223	-	ns
Fall time	t_f		-	76	-	ns
Turn-on energy	E_{on}		-	0.51	-	mJ
Turn-off energy	E_{off}		-	0.64	-	mJ
Total switching energy	E_{ts}		-	1.15	-	mJ

二极管特性，测于 T_{vj} = 175°C的条件下

Diode reverse recovery time	t_{rr}	T_{vj} = 175°C, V_R = 400V, I_F = 20.0A, di_F/dt = 880A/µs	-	176	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.46	-	µC
Diode peak reverse recovery current	I_{rrm}		-	18.9	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-467	-	A/µs

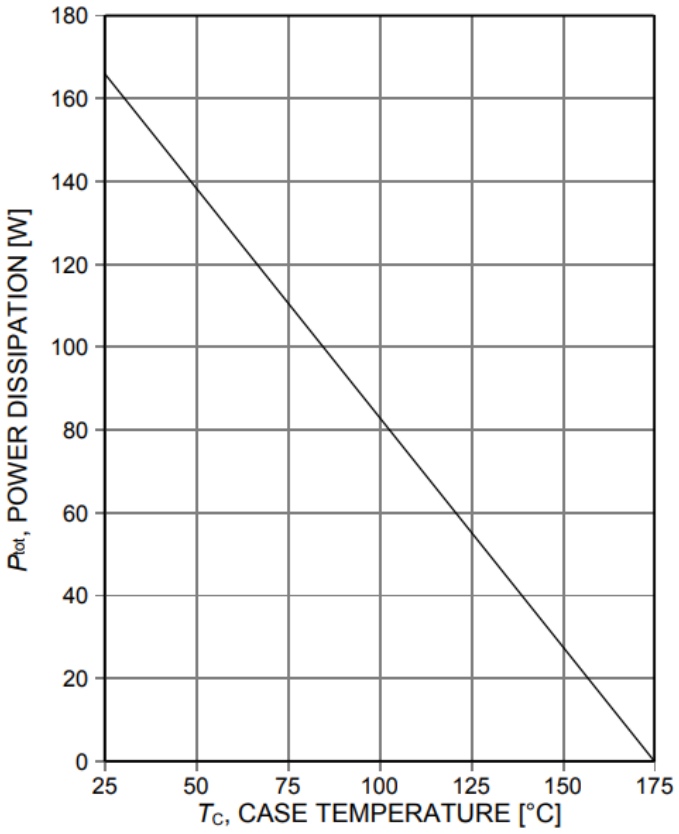


Figure 1. **Power dissipation as a function of case temperature**
($T_j \leq 175°C$)

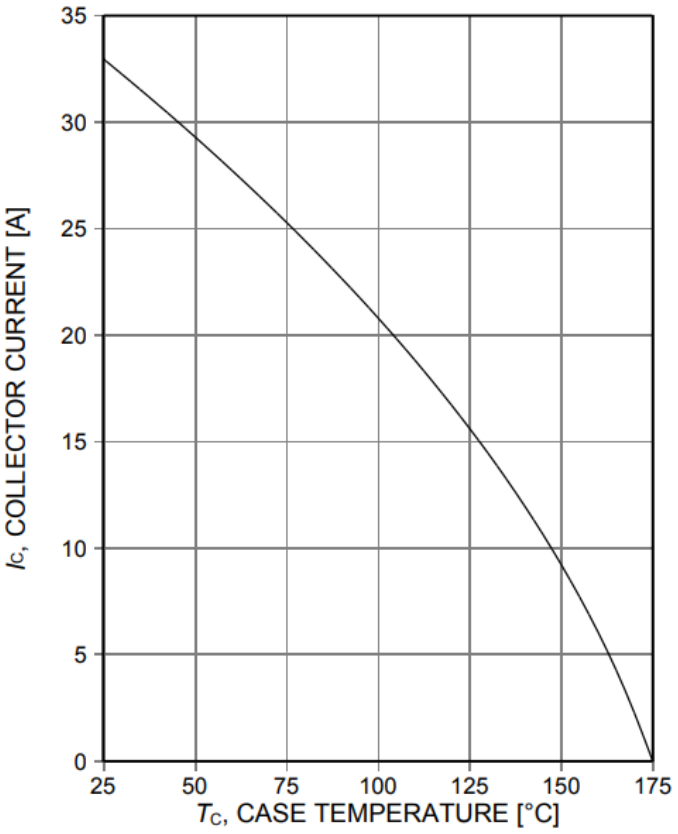


Figure 2. **Collector current as a function of case temperature**
($V_{GE} \geq 15V$, $T_j \leq 175°C$)

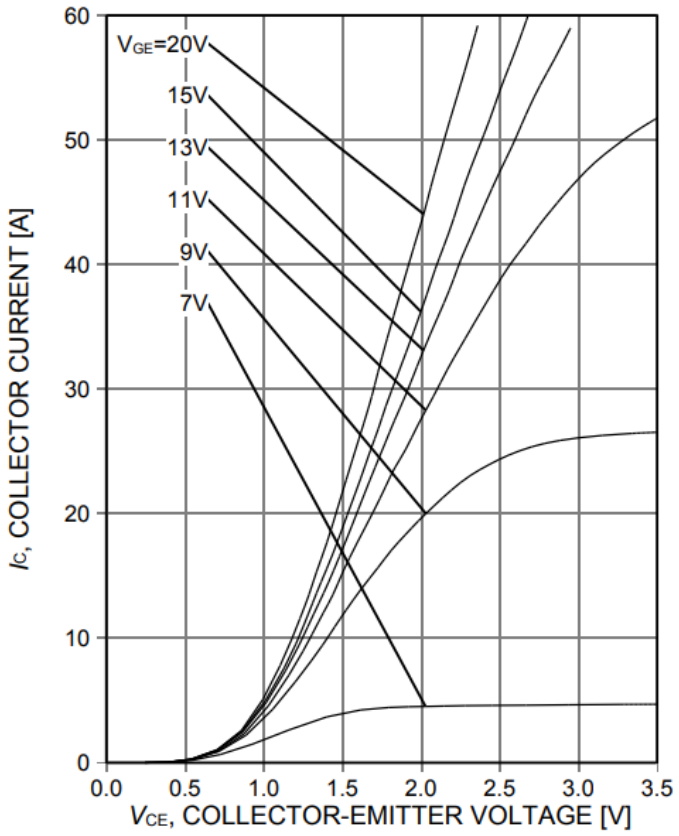


Figure 3. **Typical output characteristic**
(T_j=25°C)

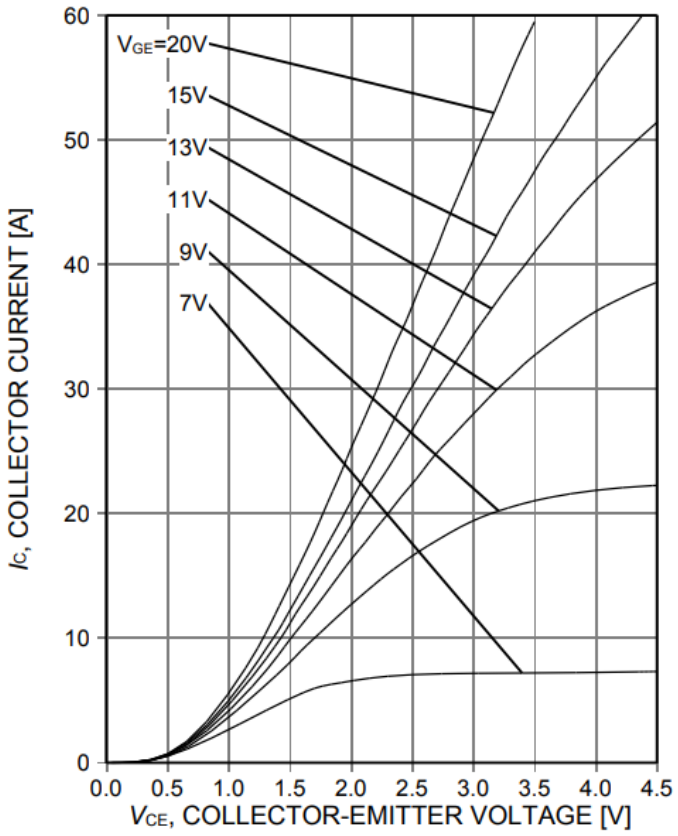


Figure 4. **Typical output characteristic**
(T_j=175°C)

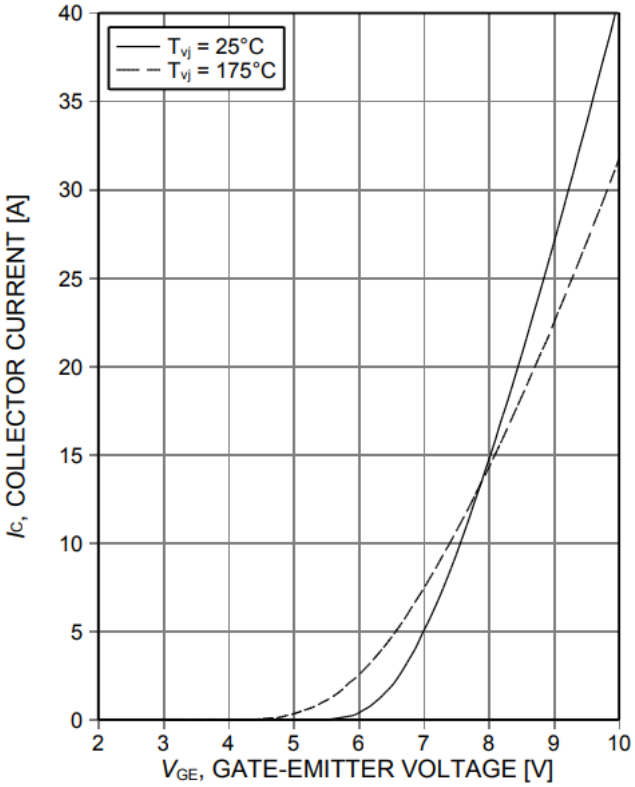


Figure 5. **Typical transfer characteristic** (V_{CE}=20V)

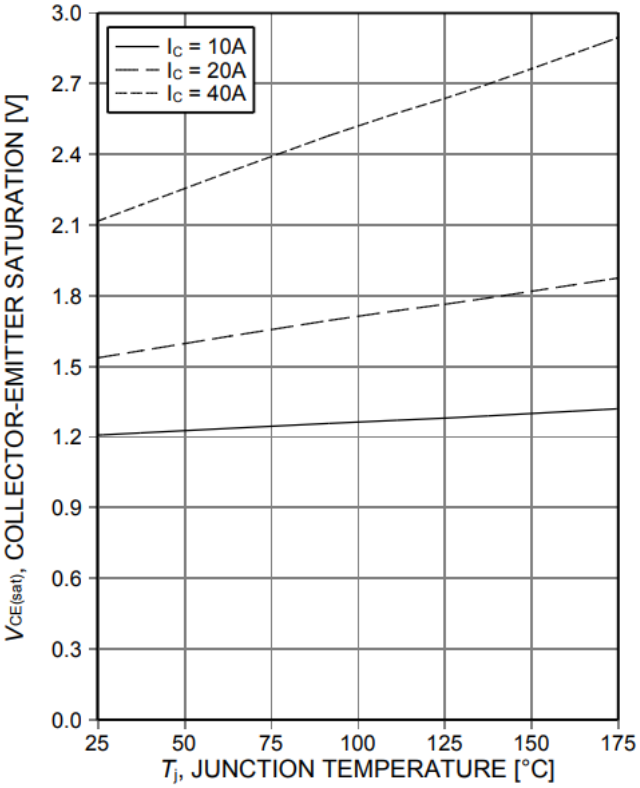


Figure 6. **Typical collector-emitter saturation voltage as a function of junction temperature** (V_{GE}=15V)

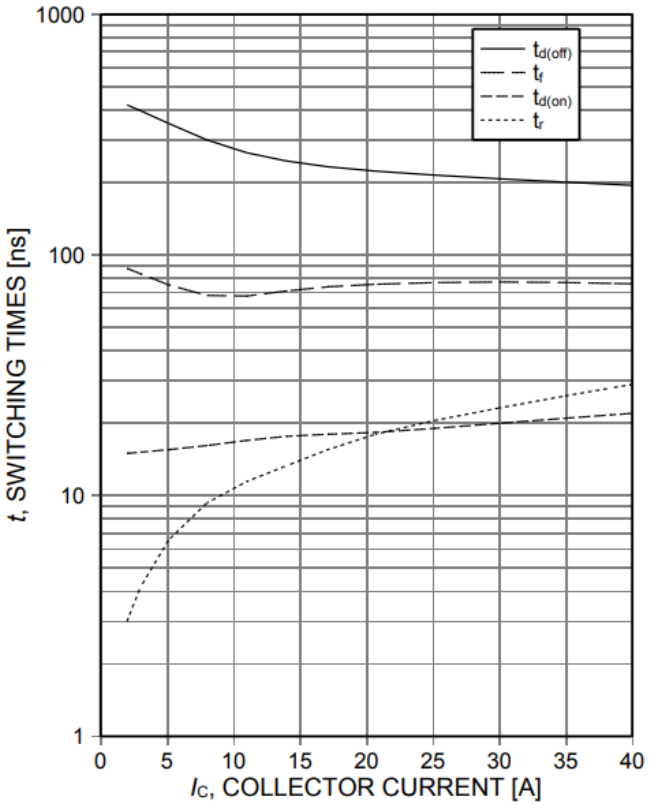


Figure 7. **Typical switching times as a function of collector current** (inductive load, T_j=175°C, V_{CE}=400V, V_{GE}=0/15V, r_G=12Ω, Dynamic test circuit in Figure E)

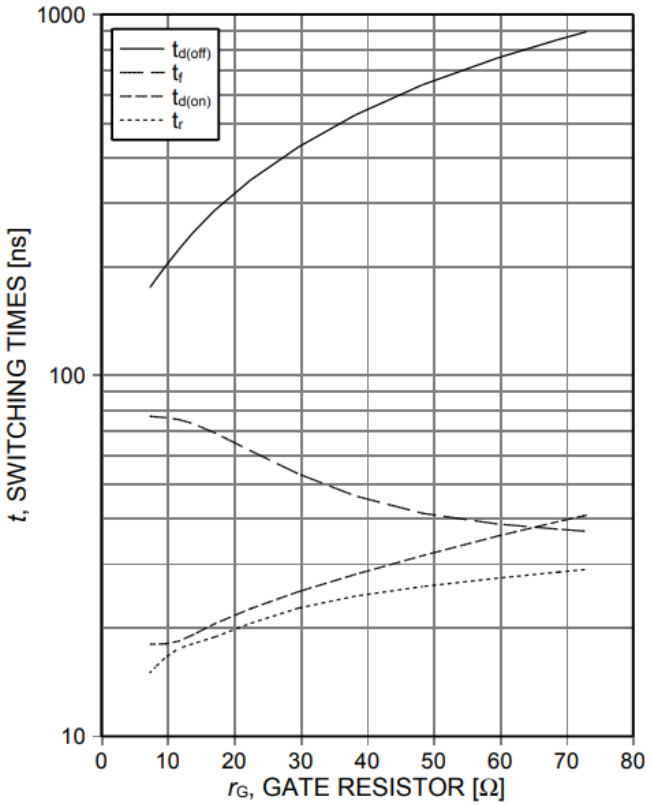


Figure 8. **Typical switching times as a function of gate resistor** (inductive load, T_j=175°C, V_{CE}=400V, V_{GE}=0/15V, I_C=20A, Dynamic test circuit in Figure E)

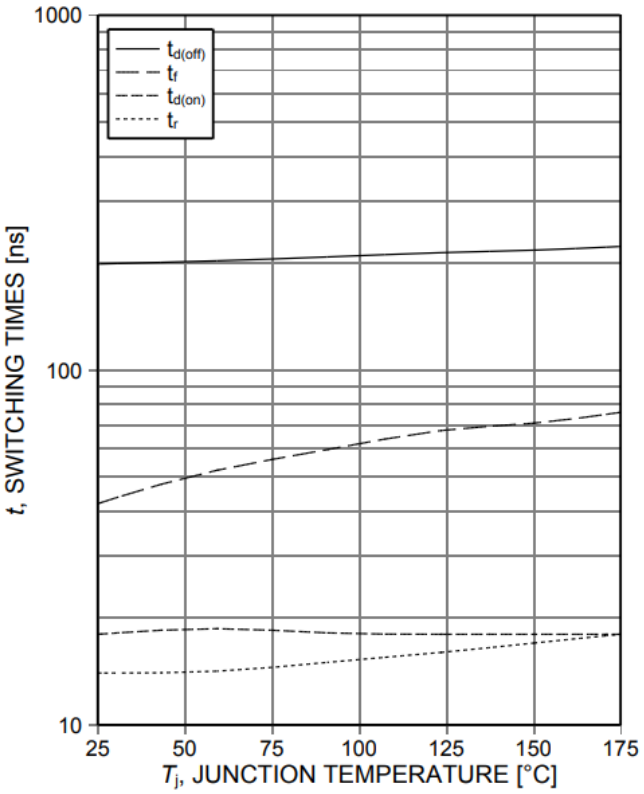


Figure 9. **Typical switching times as a function of junction temperature**
(inductive load, V_{CE}=400V, V_{GE}=0/15V, I_C=20A, r_G=12Ω, Dynamic test circuit in Figure E)

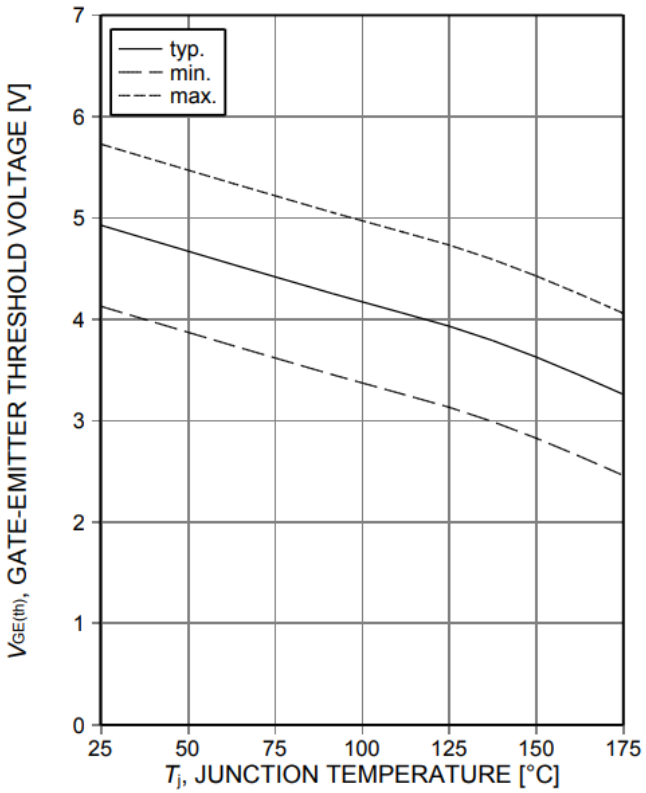


Figure 10. **Gate-emitter threshold voltage as a function of junction temperature**
(I_C=0,29mA)

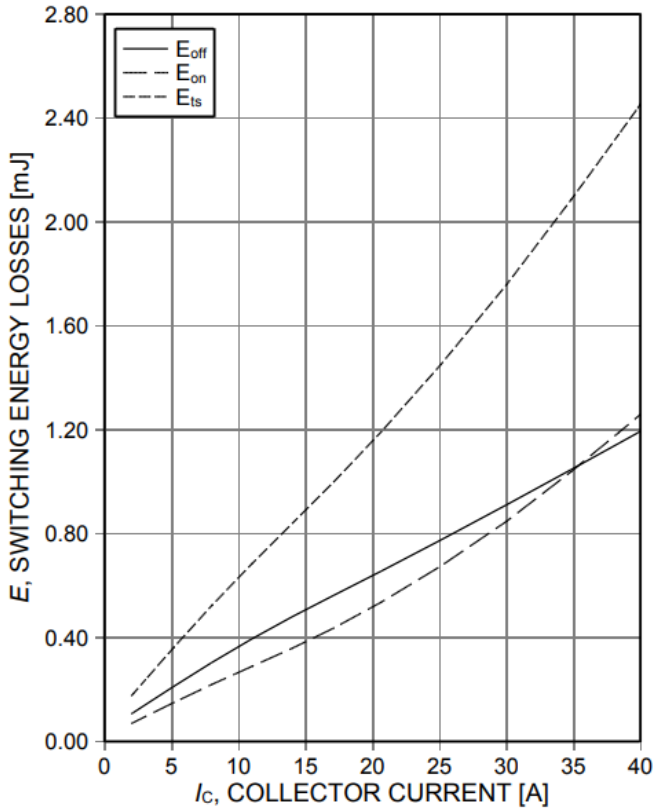


Figure 11. **Typical switching energy losses as a function of collector current**
(inductive load, T_j=175°C, V_{CE}=400V, V_{GE}=0/15V, r_G=12Ω, Dynamic test circuit in Figure E)

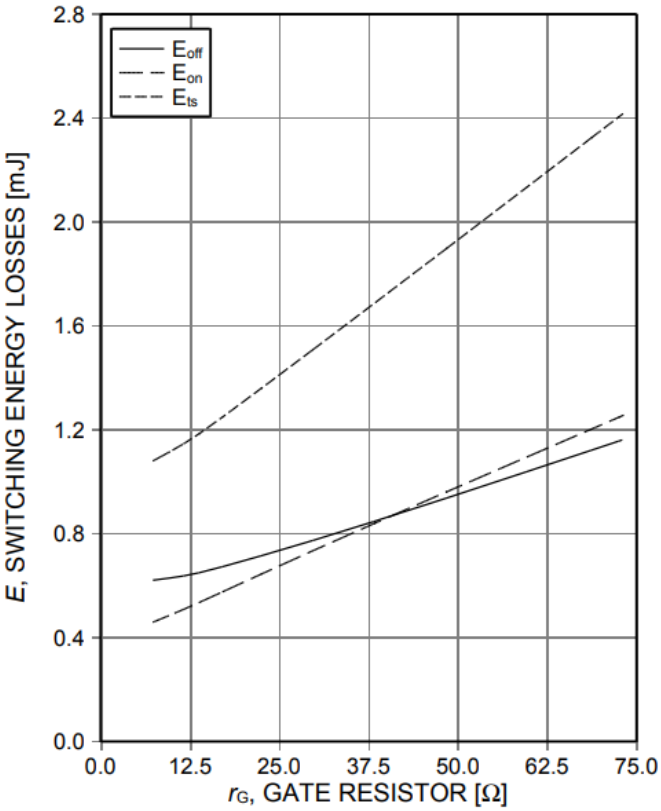


Figure 12. **Typical switching energy losses as a function of gate resistor**
(inductive load, T_j=175°C, V_{CE}=400V, V_{GE}=0/15V, I_C=20A, Dynamic test circuit in Figure E)

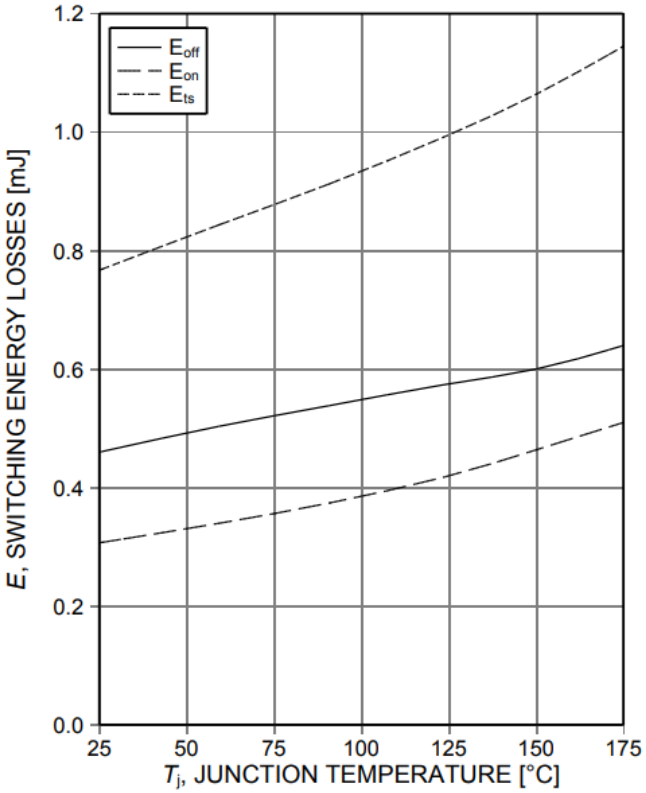


Figure 13. **Typical switching energy losses as a function of junction temperature** (inductive load, V_{CE}=400V, V_{GE}=0/15V, I_C=20A, r_G=12Ω, Dynamic test circuit in Figure E)

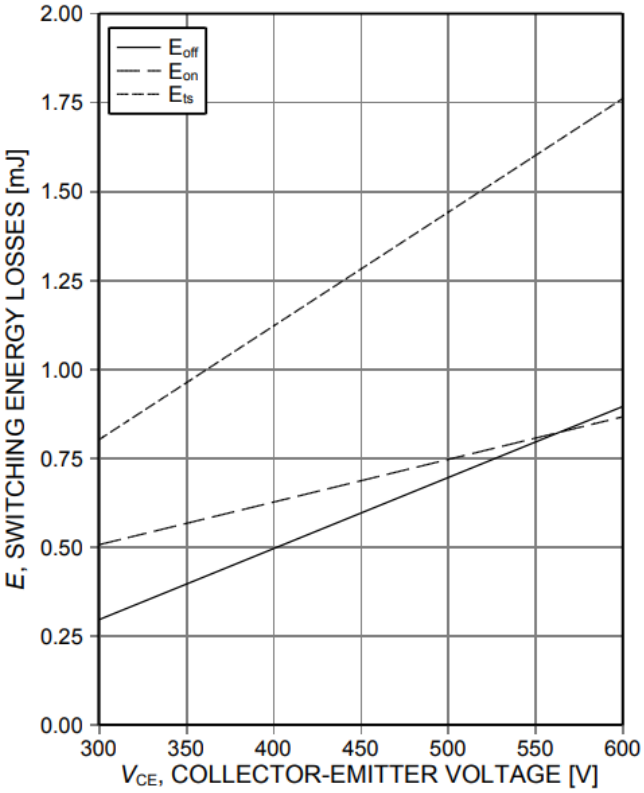


Figure 14. **Typical switching energy losses as a function of collector emitter voltage** (inductive load, T_j=175°C, V_{GE}=0/15V, I_C=20A, R_G=12Ω, Dynamic test circuit in Figure E)

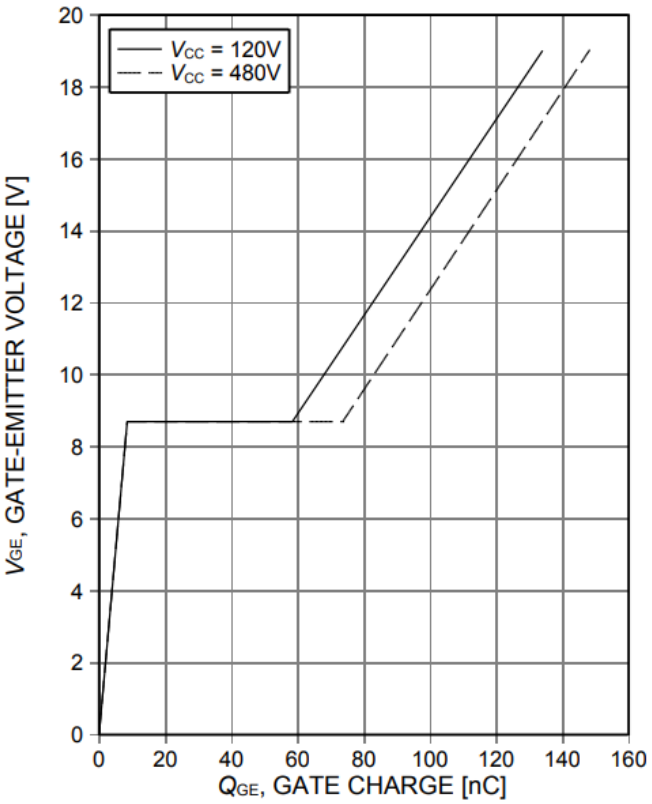


Figure 15. **Typical gate charge** (I_C=20A)

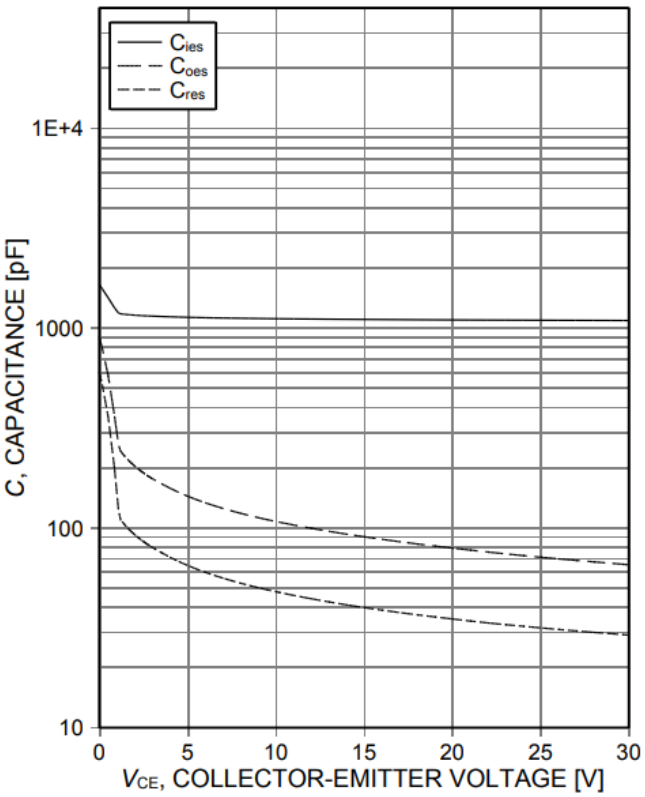


Figure 16. **Typical capacitance as a function of collector-emitter voltage** (V_{GE}=0V, f=1MHz)

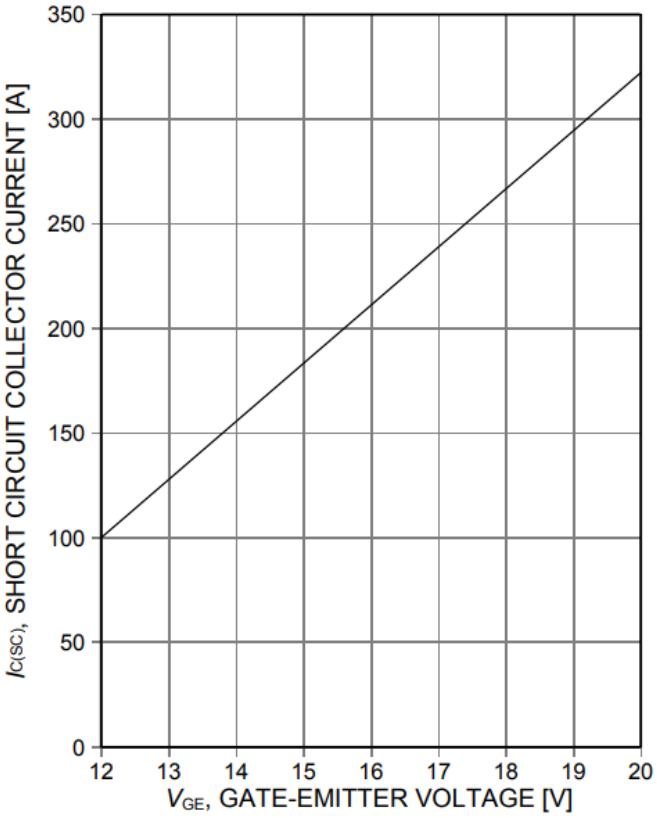


Figure 17. **Typical short circuit collector current as a function of gate-emitter voltage**
(V_{CE}≤400V, start at T_j≤150°C)

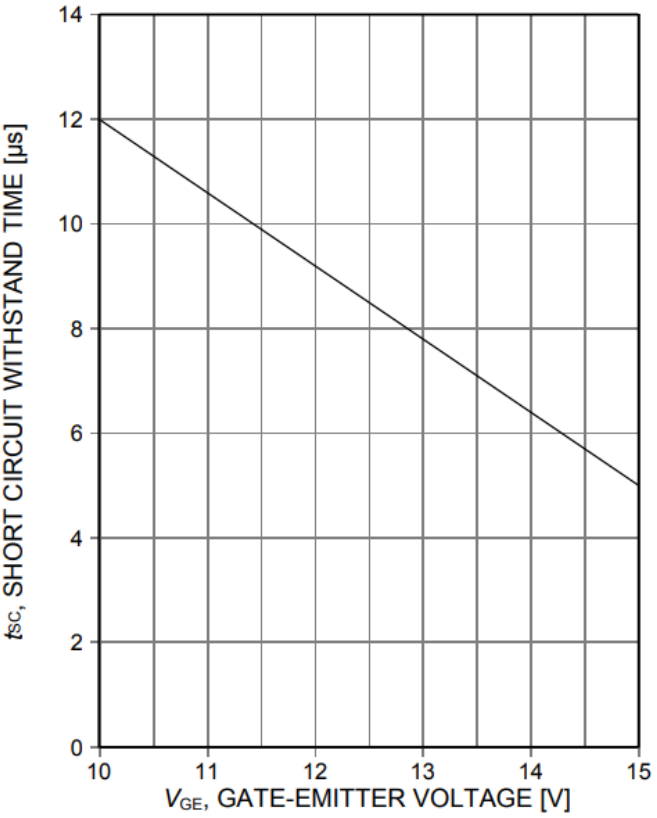


Figure 18. **Short circuit withstand time as a function of gate-emitter voltage**
(V_{CE}=400V, start at T_j=25°C, $T_j$max≤150°C)

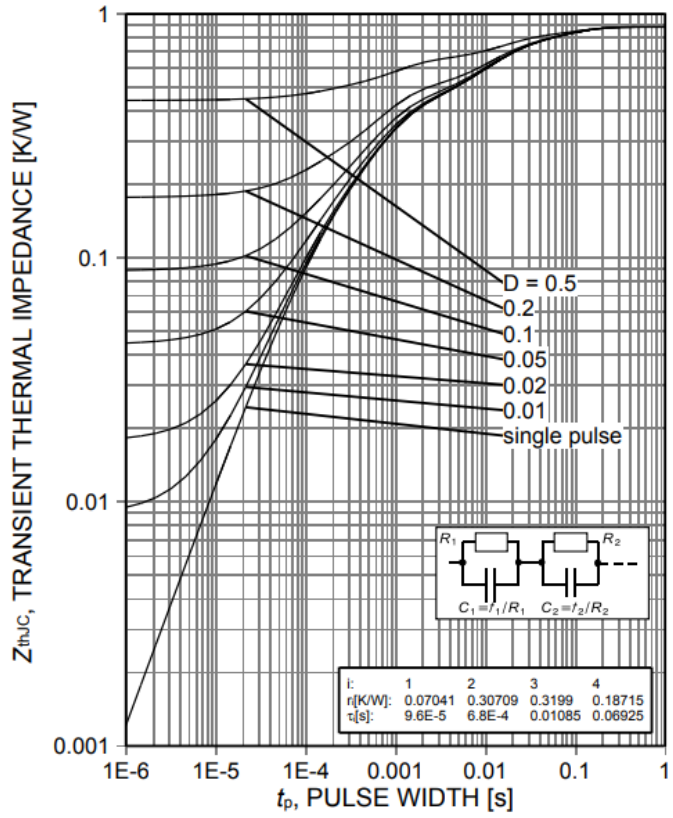


Figure 19. **IGBT transient thermal impedance as a function of pulse width for different duty cycles *D***
(*D*=t_p/T)

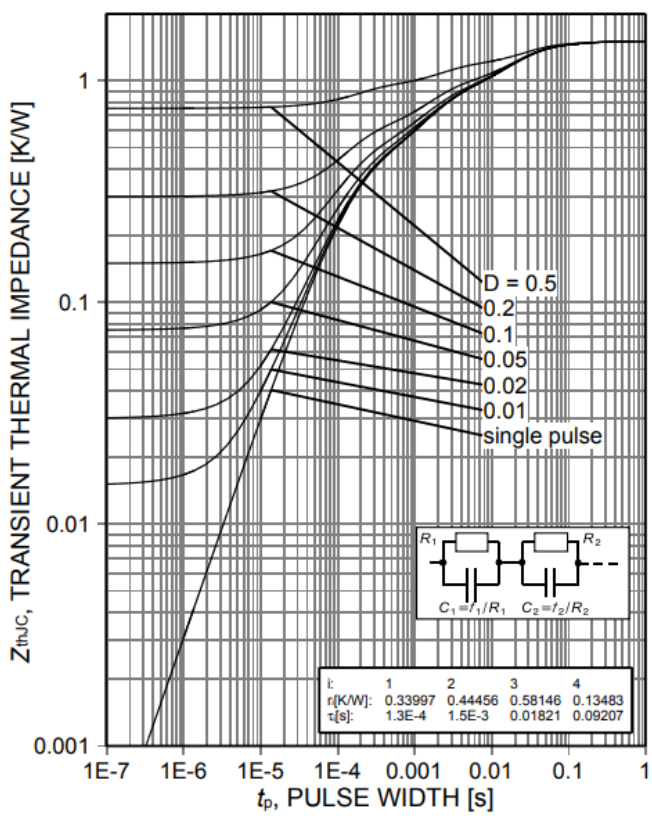


Figure 20. **Diode transient thermal impedance as a function of pulse width for different duty cycles *D***
(*D*=t_p/T)

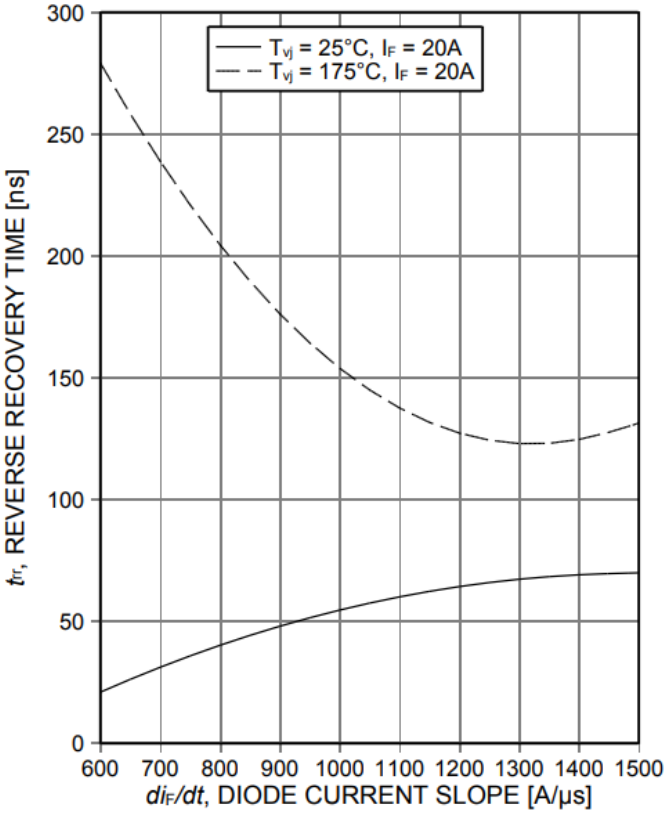


Figure 21. **Typical reverse recovery time as a function of diode current slope**
(V_R=400V,Dynamic test circuit in Figure E)

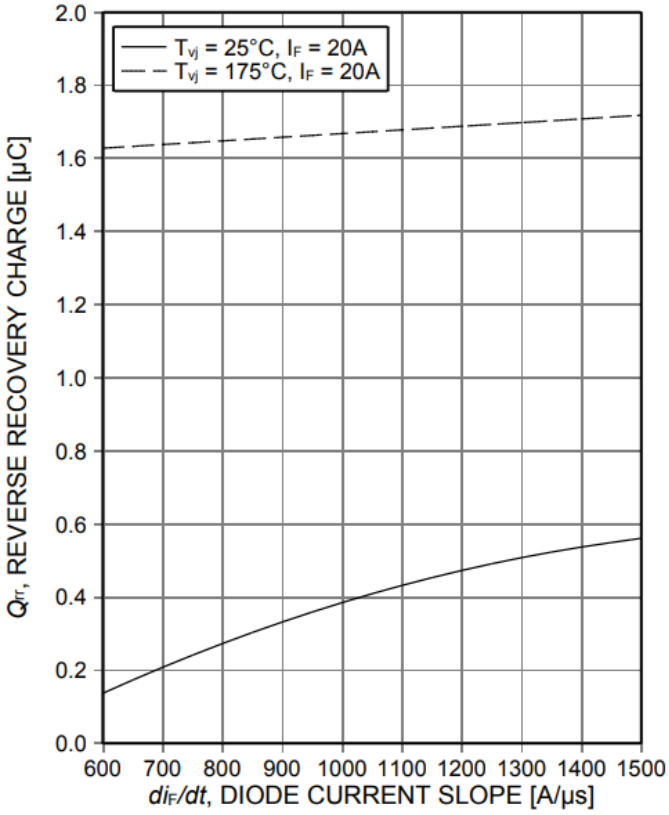


Figure 22. **Typical reverse recovery charge as a function of diode current slope**
(V_R=400V, Dynamic test circuit in Figure E)

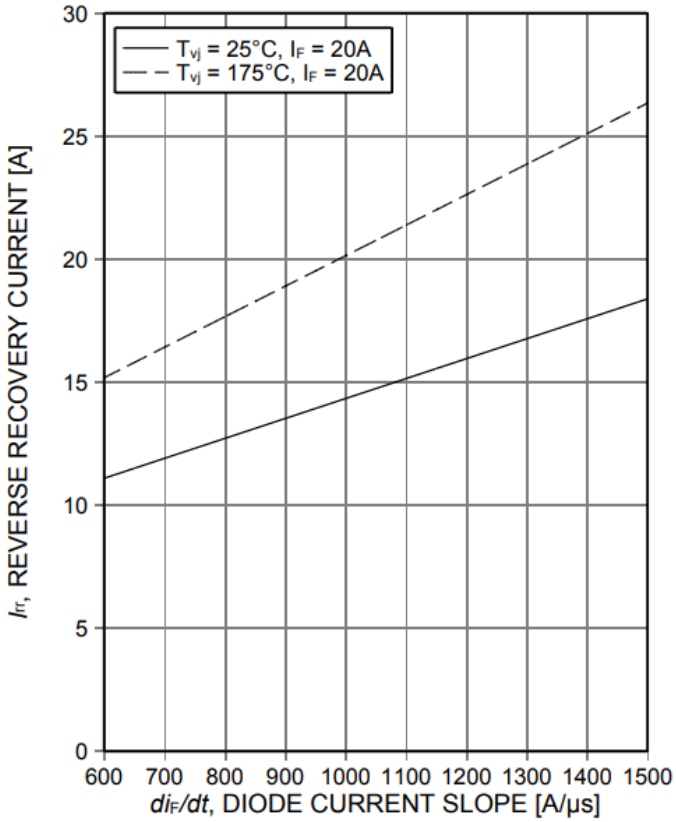


Figure 23. **Typical reverse recovery current as a function of diode current slope**
(V_R=400V, Dynamic test circuit in Figure E)

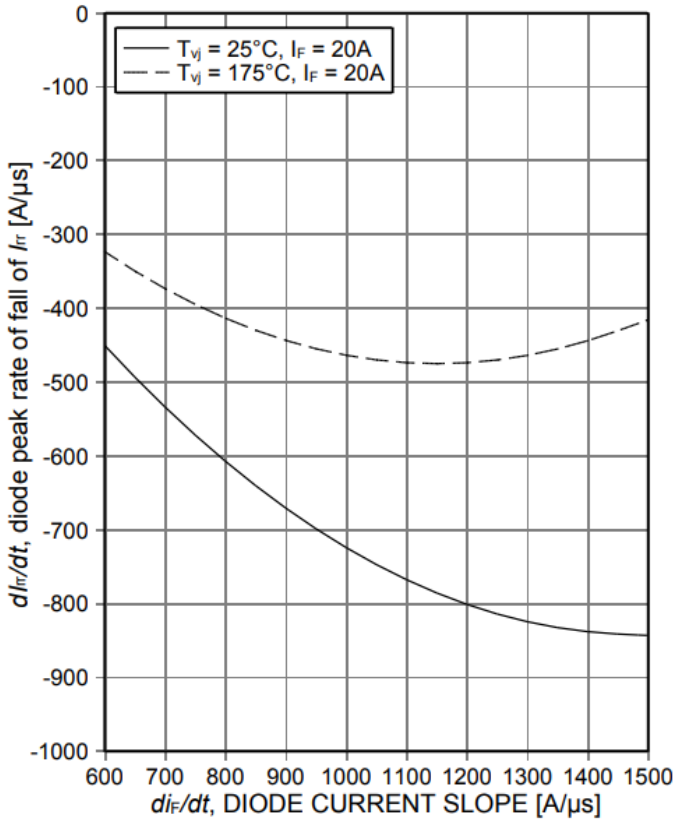


Figure 24. **Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**
(V_R=400V, Dynamic test circuit in Figure E)

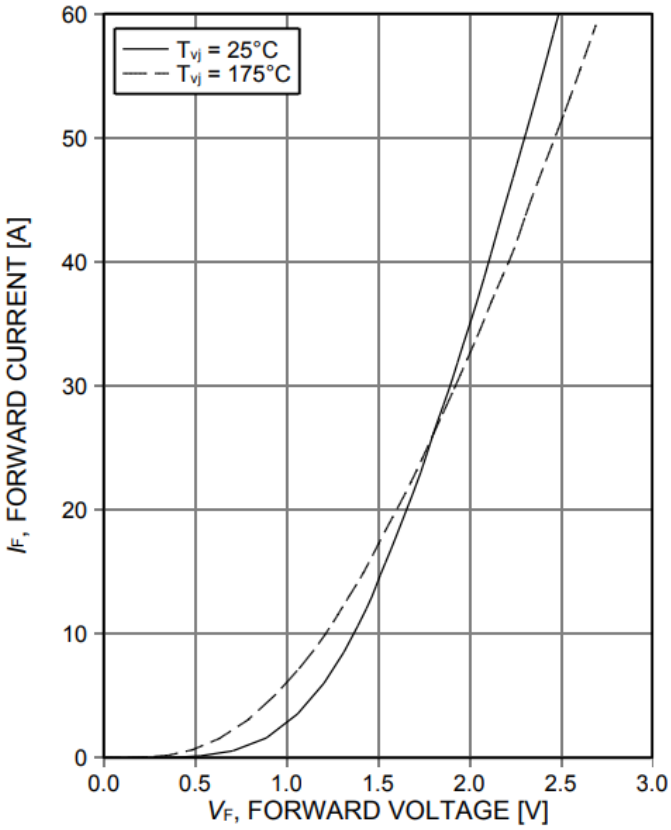


Figure 25. **Typical diode forward current as a function of forward voltage**

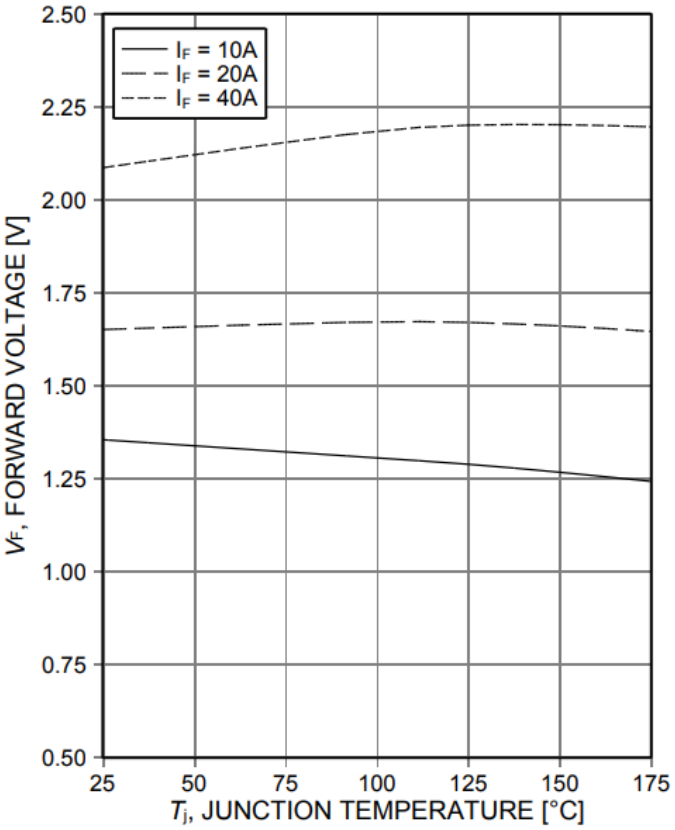
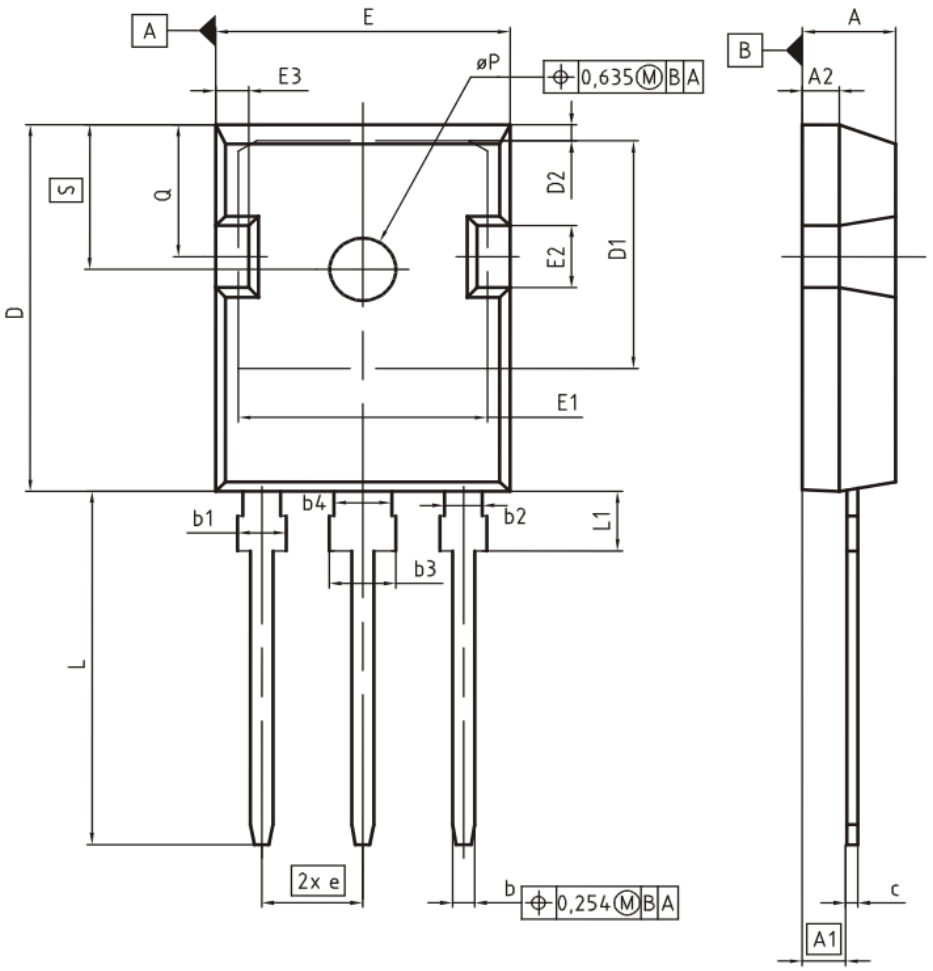


Figure 26. **Typical diode forward voltage as a function of junction temperature**

封装图 PG-TO247-3



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44 (BSC)		0.214 (BSC)	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
øP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248

DOCUMENT NO.	Z8B00003327
SCALE	0 5 5 7.5mm
EUROPEAN PROJECTION	
ISSUE DATE	09-07-2010
REVISION	05

测试条件

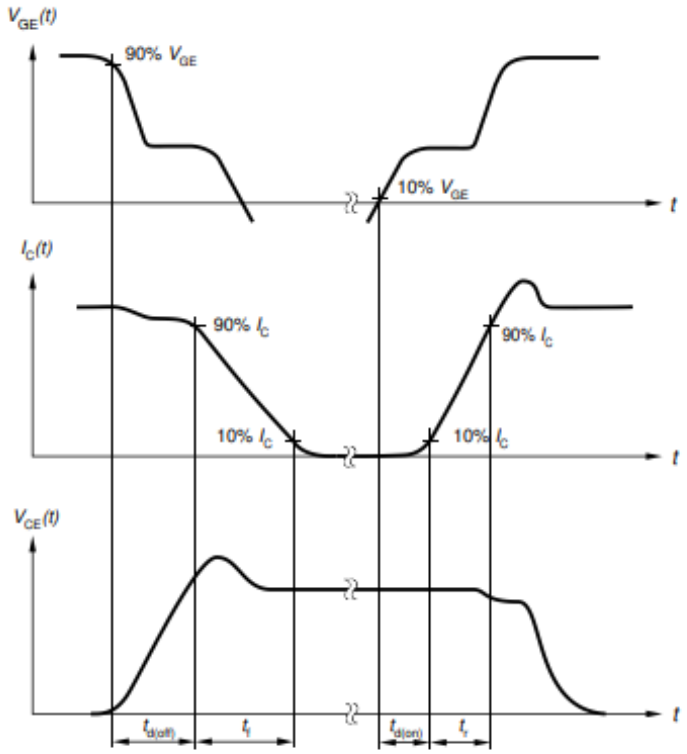


Figure A. **Definition of switching times**

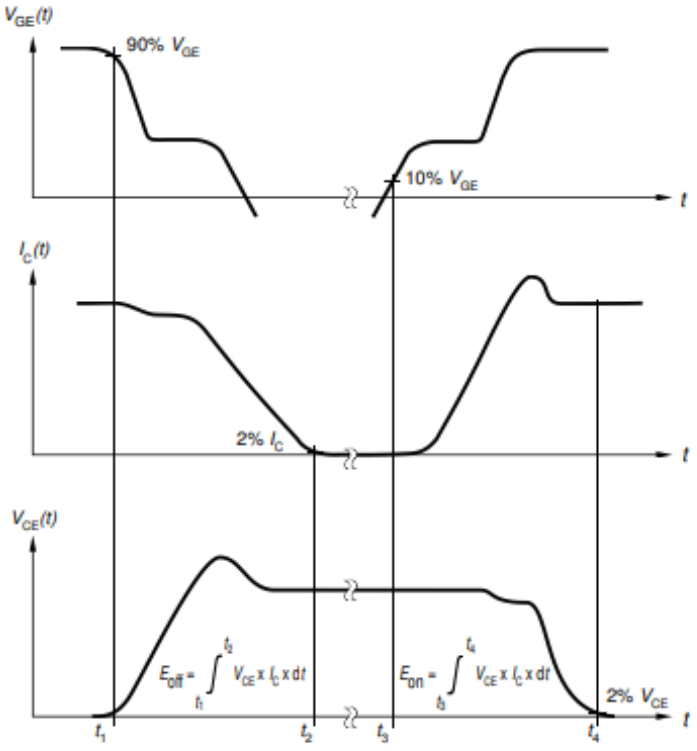


Figure B. **Definition of switching losses**

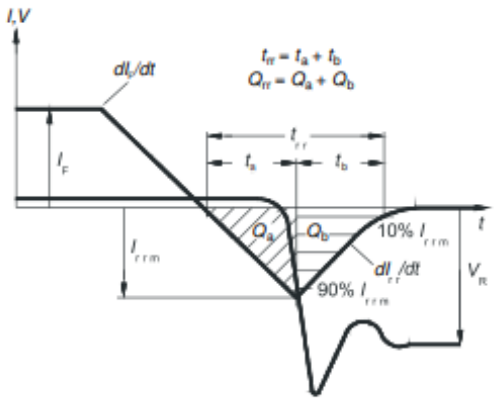


Figure C. **Definition of diode switching characteristics**

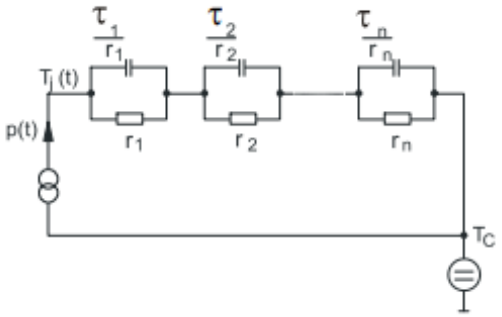


Figure D. **Thermal equivalent circuit**

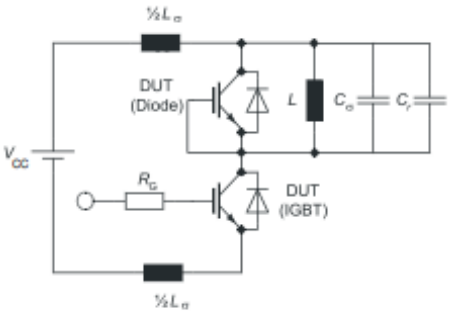


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

修订记录

AIKW20N60CT

Revision: 2017-02-09, Rev. 2.1

历史修订版本

Revision	Date	Subjects (major changes since last revision)
2.1	2017-02-09	Data sheet created

Trademarks of Infineon Technologies AG
µHVIC™, µIPM™, µPFC™, AU-ConvertIR™, AURIX™, C166™, CanPAK™, CIPOS™, CIPURSE™, CoolDP™, CoolGaN™, COOLiR™, CoolMOS™, CoolSET™, CoolSiC™, DAVE™, DI-POL™, DirectFET™, DrBlade™, EasyPIM™, EconoBRIDGE™, EconoDUAL™, EconoPACK™, EconoPIM™, EiceDRIVER™, eupec™, FCOS™, GaNpowIR™, HEXFET™, HITFET™, HybridPACK™, iMOTION™, IRAM™, ISOFACE™, IsoPACK™, LEDrivIR™, LITIX™, MIPAQ™,
ModSTACK™, my-d™, NovalithIC™, OPTIGA™, OptiMOS™, ORIGA™, PowIRaudio™, PowIRStage™, PrimePACK™, PrimeSTACK™, PROFET™, PRO-SIL™, RASIC™, REAL3™, SmartLEWIS™, SOLID FLASH™, SPOC™,
StrongIRFET™, SupIRBuck™, TEMPFET™, TRENCHSTOP™, TriCore™, UHVIC™, XHP™, XMC™

Trademarks updated November 2015

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

Published by
Infineon Technologies AG 81726
München, Germany
© Infineon Technologies AG 2017.
All Rights Reserved.

Important notice
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.

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

Warnings
Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.

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 2025-07-28
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

本文档所提供的任何信息绝不应当被视为针对任何条件或者品质而做出的保证（质量保证）。英飞凌对于本文档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，本文档所提供的任何信息均取决于客户履行本文档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。

本文档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档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。