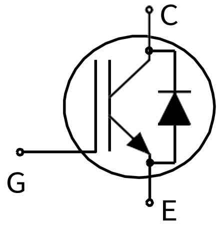
第五代高速开关系列

采用 TRENCHSTOP™ 5 技术的高速快开关IGBT，与 RAPID 1 快速软恢复反并联二极管共封装



特征和优点：

高速 F5 技术提供：
- 硬开关和谐振拓扑中的行业领先效率
- 即插即用，替代上一代 IGBT
- 650 V 击穿电压
- 低栅极电荷 Q_G
- IGBT 与 RAPID 1 快速软恢复反并联二极管共封装
- 最高结温 175°C
- 经过动态压力测试
- 符合 AEC-Q101 标准
- 绿色封装（符合 RoHS 要求）
- 完整的产品范围和 PSpice 模型：
  http://www.infineon.com/igbt/

应用：

- 车载充电器
- 车载充电器
- 直流/直流转换器
- 功率因数校正

封装引脚定义：

- 引脚 1 - 栅极
- 引脚 2 & 背面 - 集电极
- 引脚 3 - 发射极

关键性能和封装参数

Type	V_{CE}	I_C	V_{CEsat}, T_{vj}=25°C	T_{vjmax}	Marking	Package
AIKB15N65DH5	650V	15A	1.65V	175°C	AK15EDH5	PG-TO263-3

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}	650	V
DC collector current, limited by T_{vjmax} $T_c = 25°C$ $T_c = 100°C$	I_C	30.0 18.0	A
Pulsed collector current, t_p limited by T_{vjmax} [1)	I_{Cpuls}	45.0	A
Turn off safe operating area $V_{CE} \leq 650V$, $T_{vj} \leq 175°C$, $t_p = 1\mu s$[1)	-	45.0	A
Diode forward current, limited by T_{vjmax} $T_c = 25°C$ $T_c = 100°C$	I_F	32.0 17.0	A
Diode pulsed current, t_p limited by T_{vjmax} [1)	I_{Fpuls}	45.0	A
Gate-emitter voltage Transient Gate-emitter voltage ($t_p \leq 10\mu s$, $D < 0.010$)	V_{GE}	±20 ±30	V
Power dissipation $T_c = 25°C$ Power dissipation $T_c = 100°C$	P_{tot}	105.0 52.5	W
Operating junction temperature	T_{vj}	-40...+175	°C
Storage temperature	T_{stg}	-55...+150	°C
Soldering temperature, reflow soldering (MSL1 according to JEDEC J-STA-020)		260	°C

热阻抗

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
R_{th} 特性						
IGBT thermal resistance, junction - case	$R_{th(j-c)}$		-	-	1.40	K/W
Diode thermal resistance, junction - case	$R_{th(j-c)}$		-	-	2.40	K/W
Thermal resistance, min. footprint junction - ambient	$R_{th(j-a)}$		-	-	65	K/W
Thermal resistance, 6cm² Cu on PCB junction - ambient	$R_{th(j-a)}$		-	-	40	K/W

[1)] 由设计标定，不受制于生产测试。

第五代高速开关系列

除非另有规定，电气特性均为 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	650	-	-	V
Collector-emitter saturation voltage	V_{CEsat}	V_{GE} = 15.0V, I_C = 15.0A T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	- - -	1.65 1.85 1.95	2.10 - -	V
Diode forward voltage	V_F	V_{GE} = 0V, I_F = 9.0A T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	- - -	1.45 1.40 1.40	1.80 - -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C = 0.15mA, V_{CE} = V_{GE}	3.2	4.0	4.8	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 650V, V_{GE} = 0V T_{vj} = 25°C T_{vj} = 175°C	- -	- 1000	40 -	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = 20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE} = 20V, I_C = 15.0A	-	15.0	-	S

电气特性，T_{vj} = 25°C，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	-	930	-	pF
Output capacitance	C_{oes}		-	24	-	
Reverse transfer capacitance	C_{res}		-	4	-	
Gate charge	Q_G	V_{CC} = 520V, I_C = 15.0A, V_{GE} = 15V	-	40.0	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	7.0	-	nH

开关特性、感性负载

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT 特性， T_{vj} = 25°C						
Turn-on delay time	$t_{d(on)}$	T_{vj} = 25°C, V_{CC} = 400V, I_C = 7.5A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 39.0Ω, $R_{G(off)}$ = 39.0Ω, $L\sigma$ = 30nH, $C\sigma$ = 30pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	24	-	ns
Rise time	t_r		-	13	-	ns
Turn-off delay time	$t_{d(off)}$		-	151	-	ns
Fall time	t_f		-	22	-	ns
Turn-on energy	E_{on}		-	0.16	-	mJ
Turn-off energy	E_{off}		-	0.04	-	mJ
Total switching energy	E_{ts}		-	0.20	-	mJ

Turn-on delay time	$t_{d(on)}$	T_{vj} = 25°C, V_{CC} = 400V, I_C = 2.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 39.0Ω, $R_{G(off)}$ = 39.0Ω, $L\sigma$ = 30nH, $C\sigma$ = 30pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	20	-	ns
Rise time	t_r		-	7	-	ns
Turn-off delay time	$t_{d(off)}$		-	156	-	ns
Fall time	t_f		-	45	-	ns
Turn-on energy	E_{on}		-	0.05	-	mJ
Turn-off energy	E_{off}		-	0.01	-	mJ
Total switching energy	E_{ts}		-	0.06	-	mJ

二极管特性， T_{vj} = 25°C

Diode reverse recovery time	t_{rr}	T_{vj} = 25°C, V_R = 400V, I_F = 7.5A, di_F/dt = 629A/µs	-	62	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.25	-	µC
Diode peak reverse recovery current	I_{rrm}		-	7.1	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-161	-	A/µs

Diode reverse recovery time	t_{rr}	T_{vj} = 25°C, V_R = 400V, I_F = 2.0A, di_F/dt = 491A/µs	-	35	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.12	-	µC
Diode peak reverse recovery current	I_{rrm}		-	5.9	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-384	-	A/µs

开关特性、感性负载

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT 特性， T_{vj} = 150°C						
Turn-on delay time	$t_{d(on)}$	T_{vj} = 150°C, V_{CC} = 400V, I_C = 7.5A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 39.0Ω, $R_{G(off)}$ = 39.0Ω, $L\sigma$ = 30nH, $C\sigma$ = 30pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	23	-	ns
Rise time	t_r		-	13	-	ns
Turn-off delay time	$t_{d(off)}$		-	171	-	ns
Fall time	t_f		-	26	-	ns
Turn-on energy	E_{on}		-	0.23	-	mJ
Turn-off energy	E_{off}		-	0.06	-	mJ
Total switching energy	E_{ts}		-	0.29	-	mJ

Turn-on delay time	$t_{d(on)}$	T_{vj} = 150°C, V_{CC} = 400V, I_C = 2.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 39.0Ω, $R_{G(off)}$ = 39.0Ω, $L\sigma$ = 30nH, $C\sigma$ = 30pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	17	-	ns
Rise time	t_r		-	10	-	ns
Turn-off delay time	$t_{d(off)}$		-	190	-	ns
Fall time	t_f		-	49	-	ns
Turn-on energy	E_{on}		-	0.08	-	mJ
Turn-off energy	E_{off}		-	0.02	-	mJ
Total switching energy	E_{ts}		-	0.10	-	mJ

二极管特性， T_{vj} = 150°C

Diode reverse recovery time	t_{rr}	T_{vj} = 150°C, V_R = 400V, I_F = 7.5A, di_F/dt = 604A/µs	-	89	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.46	-	µC
Diode peak reverse recovery current	I_{rrm}		-	9.2	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-143	-	A/µs

Diode reverse recovery time	t_{rr}	T_{vj} = 150°C, V_R = 400V, I_F = 2.0A, di_F/dt = 483A/µs	-	52	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.24	-	µC
Diode peak reverse recovery current	I_{rrm}		-	7.9	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-273	-	A/µs

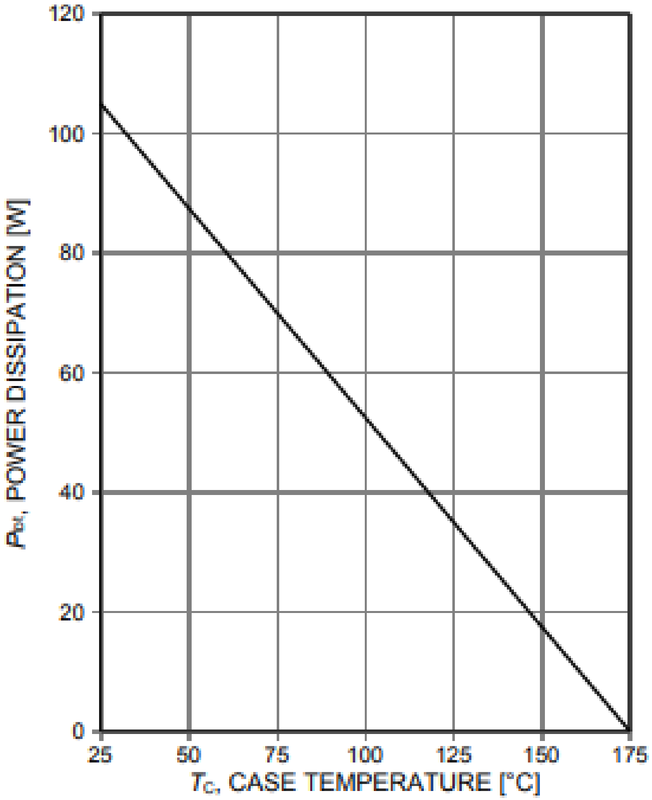


Figure 1. **Power dissipation as a function of case temperature**
(T_{vj}≤175°C)

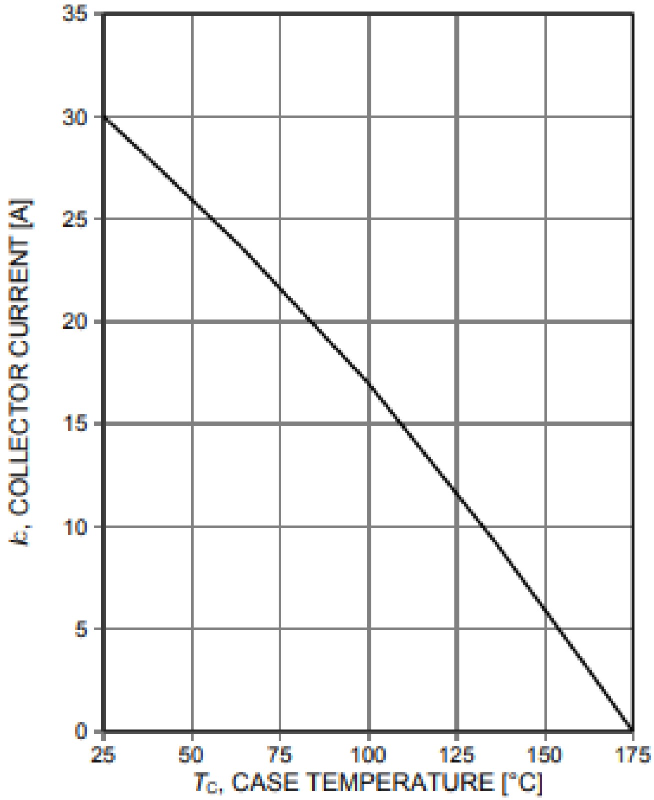


Figure 2. **Collector current as a function of case temperature**
(V_{GE}≥15V, T_{vj}≤175°C)

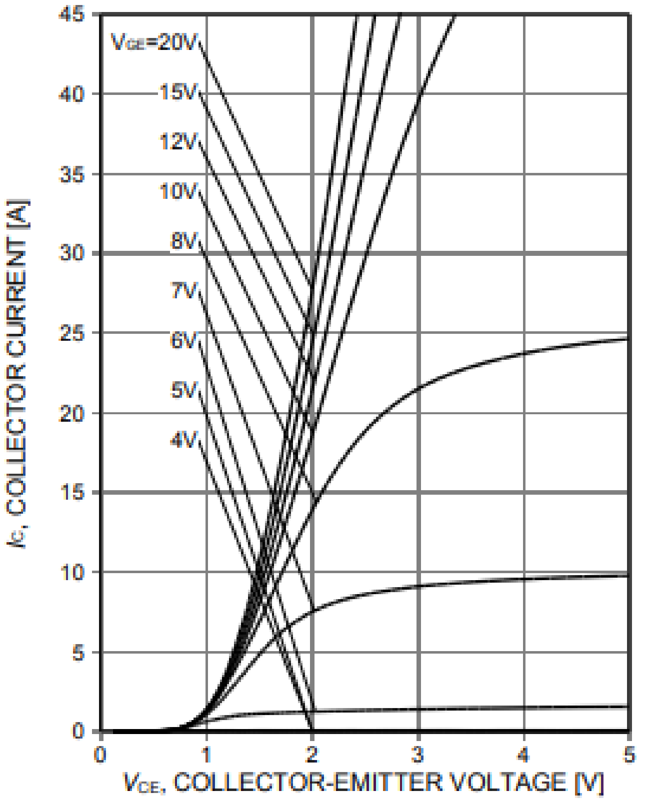


Figure 3. **Typical output characteristic**
(T_{vj}=25°C)

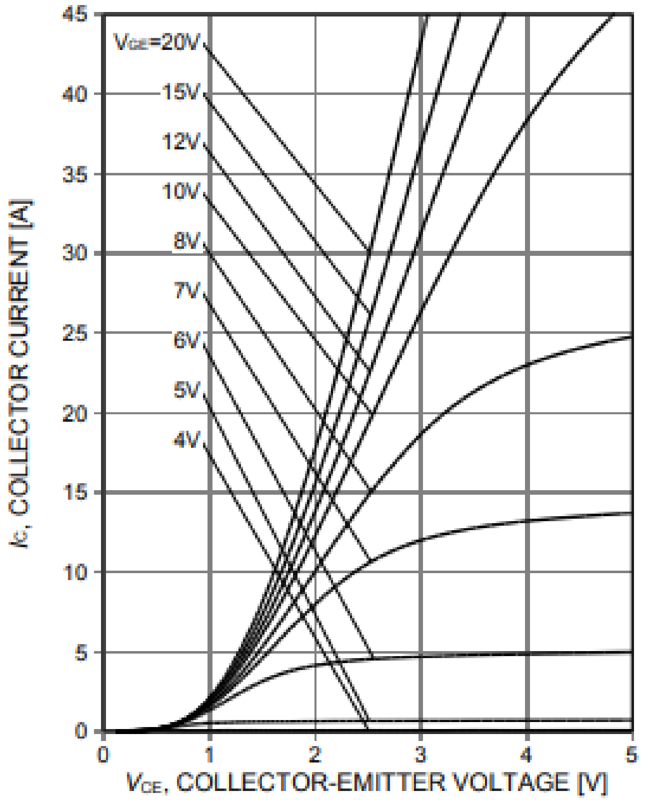


Figure 4. **Typical output characteristic**
(T_{vj}=150°C)

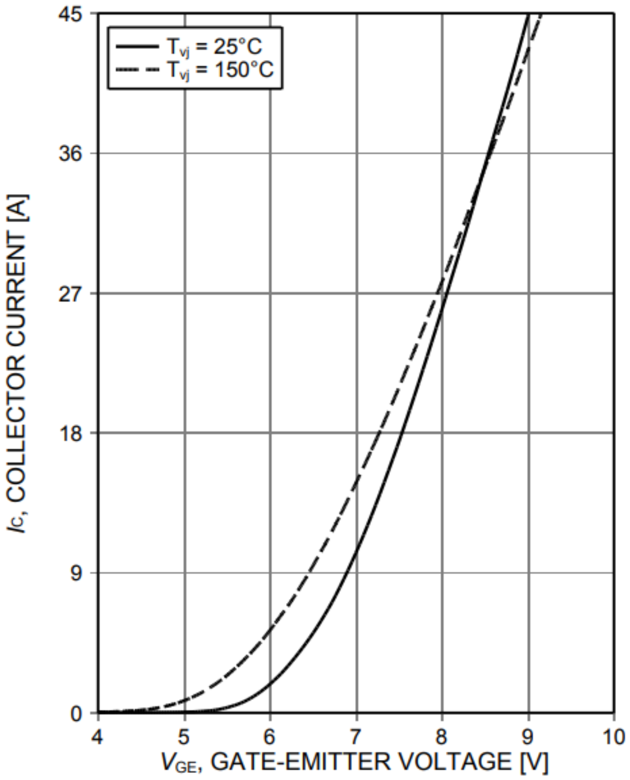


Figure 5. **Typical transfer characteristic**
(V_{CE}=20V)

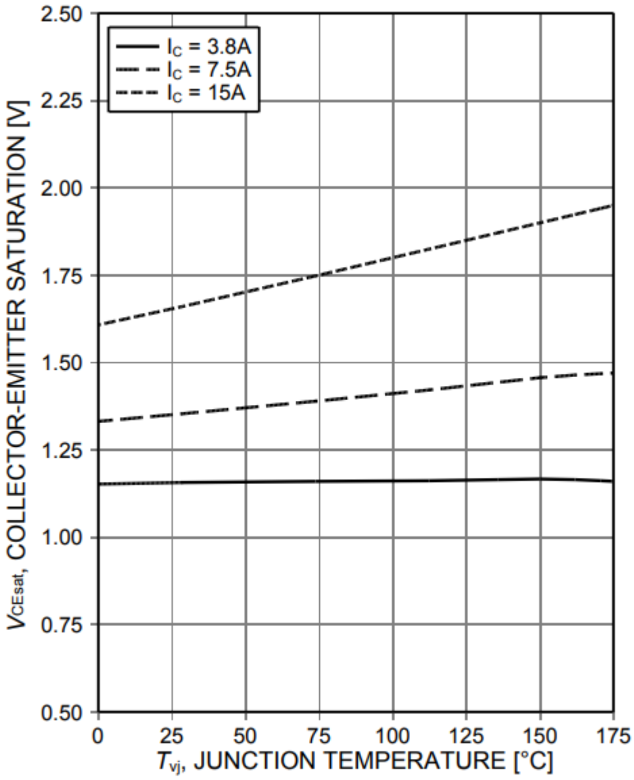


Figure 6. **Typical collector-emitter saturation voltage as a function of junction temperature**
(V_{GE}=15V)

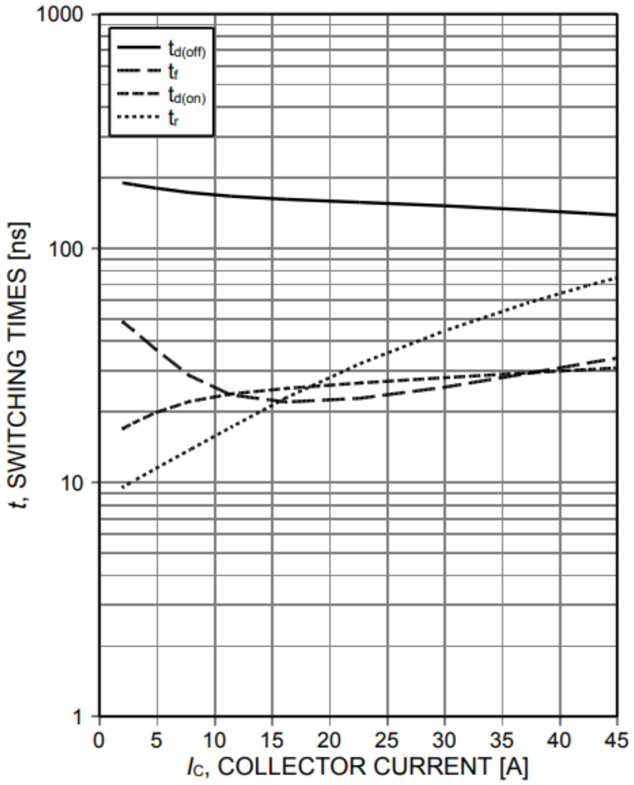


Figure 7. **Typical switching times as a function of collector current**
(inductive load, T_{vj}=150°C, V_{CE}=400V, V_{GE}=15/0V, r_G=39Ω, Dynamic test circuit in Figure E)

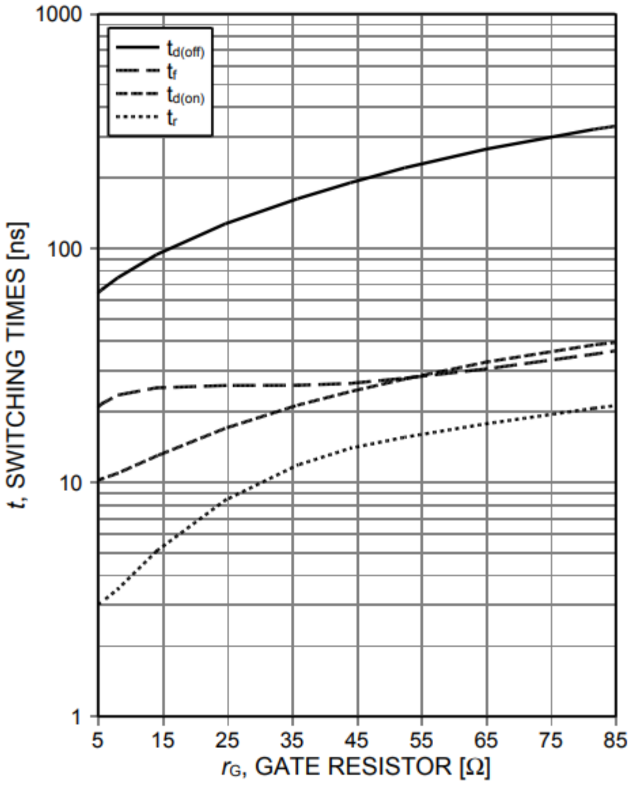


Figure 8. **Typical switching times as a function of gate resistor**
(inductive load, T_{vj}=150°C, V_{CE}=400V, V_{GE}=15/0V, I_C=7.5A,Dynamic test circuit in Figure E)

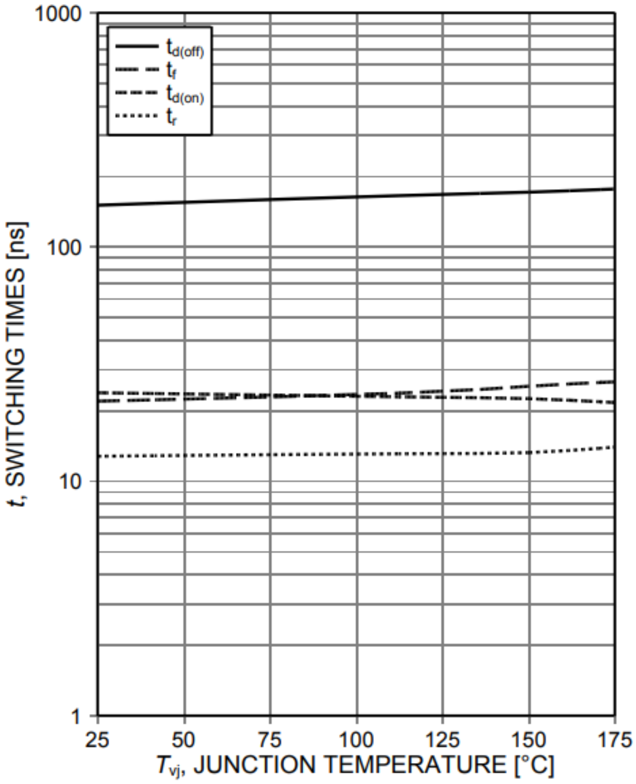


Figure 9. **Typical switching times as a function of junction temperature**
(inductive load, V_{CE}=400V, V_{GE}=15/0V, I_C=7.5A, r_G=39Ω,Dynamic test circuit in Figure E)

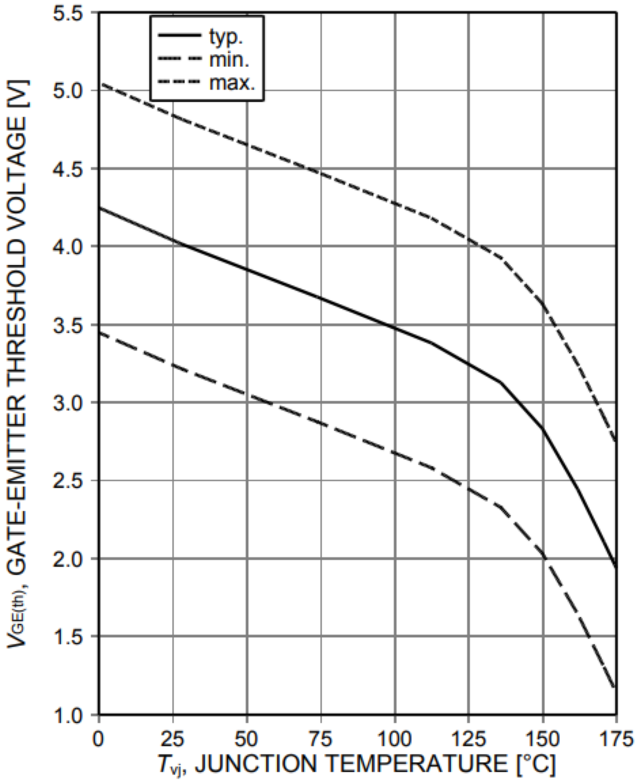


Figure 10. **Gate-emitter threshold voltage as a function of junction temperature**
(I_C=0.15mA)

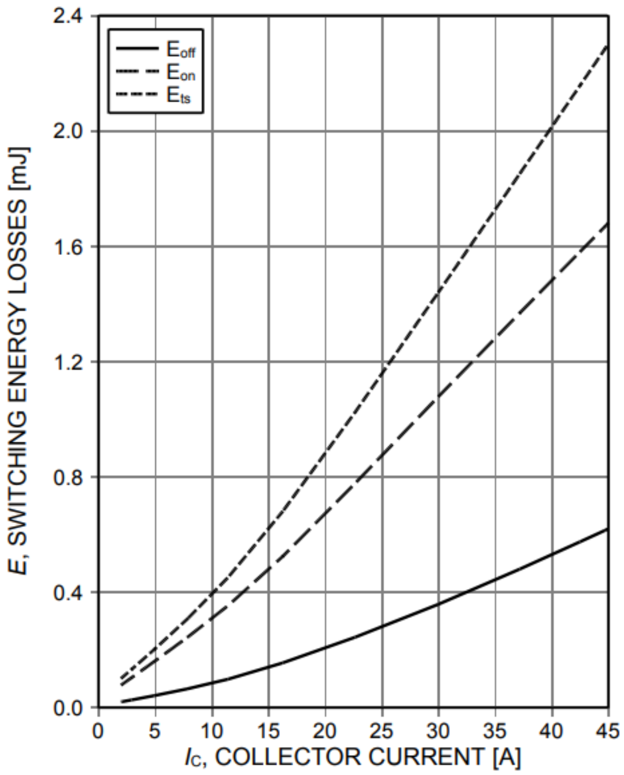


Figure 11. **Typical switching energy losses as a function of collector current**
(inductive load, T_{vj}=150°C, V_{CE}=400V, V_{GE}=15/0V, r_G=39Ω,Dynamic test circuit in Figure E)

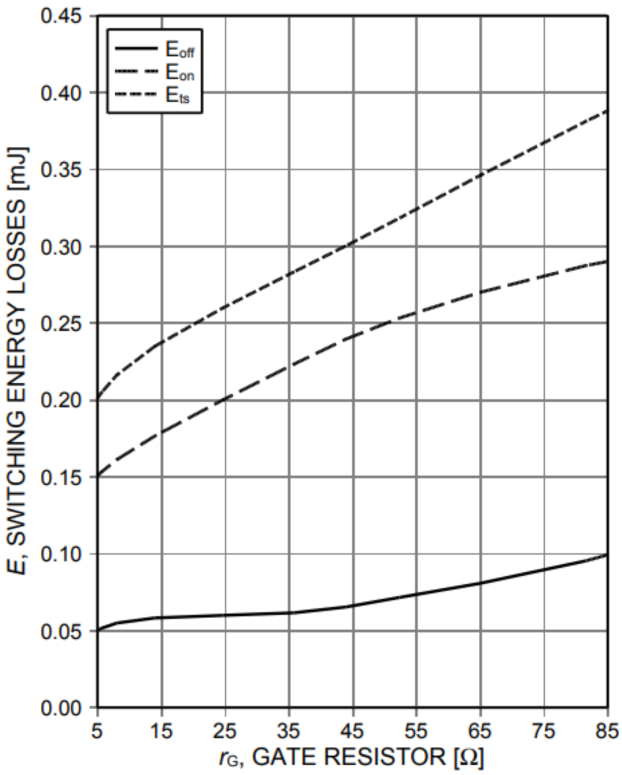


Figure 12. **Typical switching energy losses as a function of gate resistor**
(inductive load, T_{vj}=150°C, V_{CE}=400V, V_{GE}=15/0V, I_C=7.5A, Dynamic test circuit in Figure E)

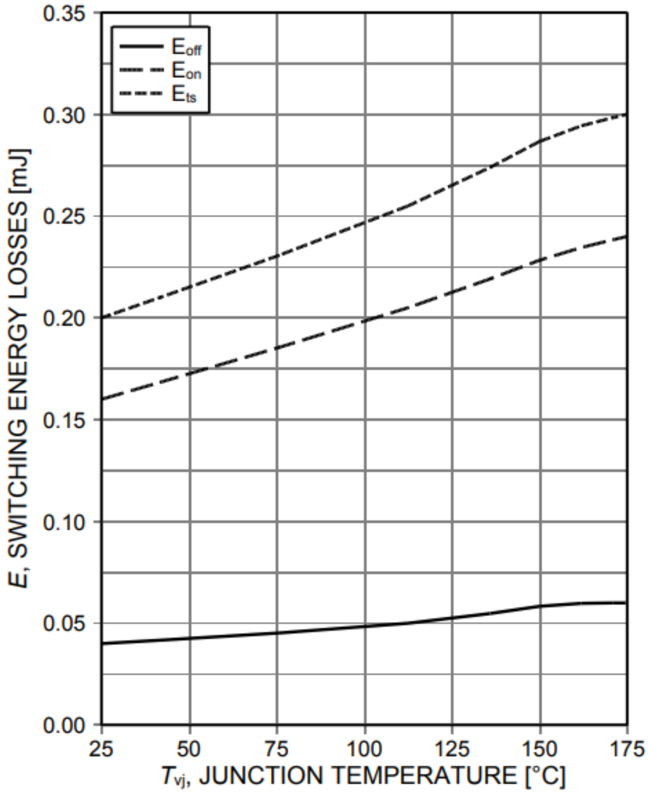


Figure 13. **Typical switching energy losses as a function of junction temperature**
(inductive load, V_{CE}=400V, V_{GE}=15/0V, I_C=7.5A, r_G=39Ω,Dynamic test circuit in Figure E)

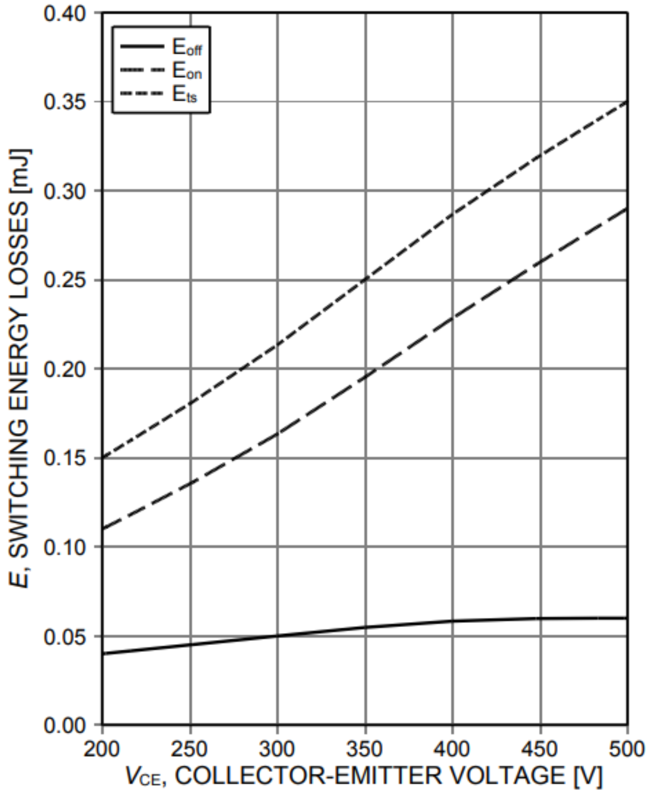


Figure 14. **Typical switching energy losses as a function of collector emitter voltage**
(inductive load, T_{vj}=150°C, V_{GE}=15/0V, I_C=7.5A, r_G=39Ω,Dynamic test circuit in Figure E)

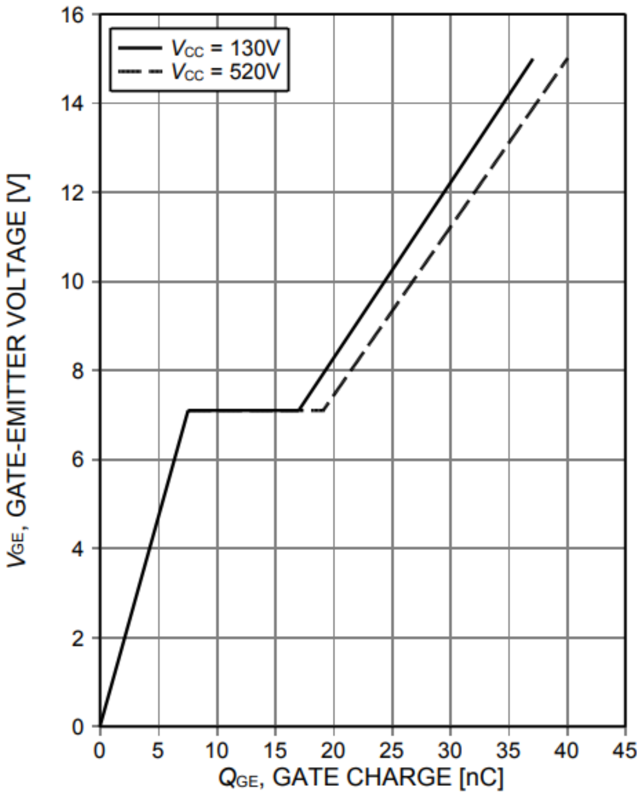


Figure 15. **Typical gate charge**
(I_C=7.5A)

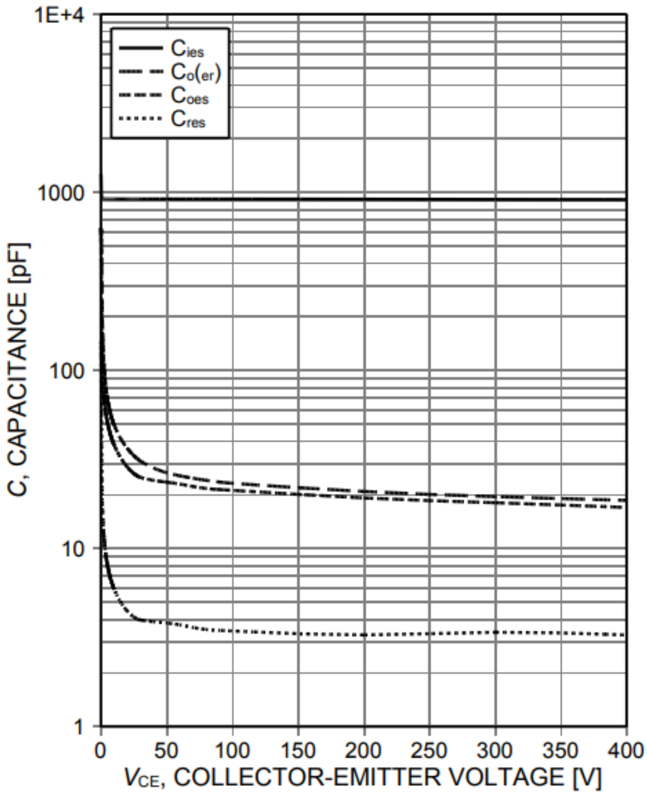


Figure 16. **Typical capacitance as a function of collector-emitter voltage**
(V_{GE}=0V, f=1MHz)

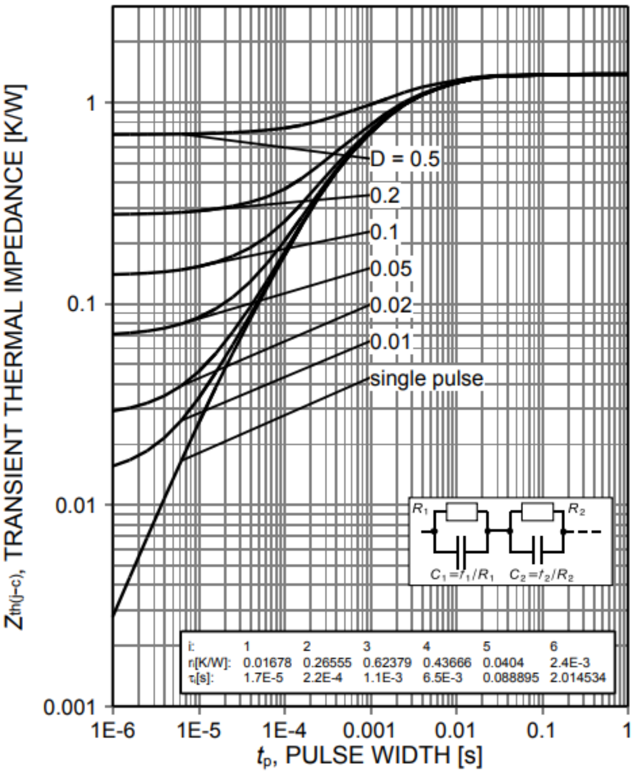


Figure 17. **IGBT transient thermal impedance**
($D=t_p/T$)

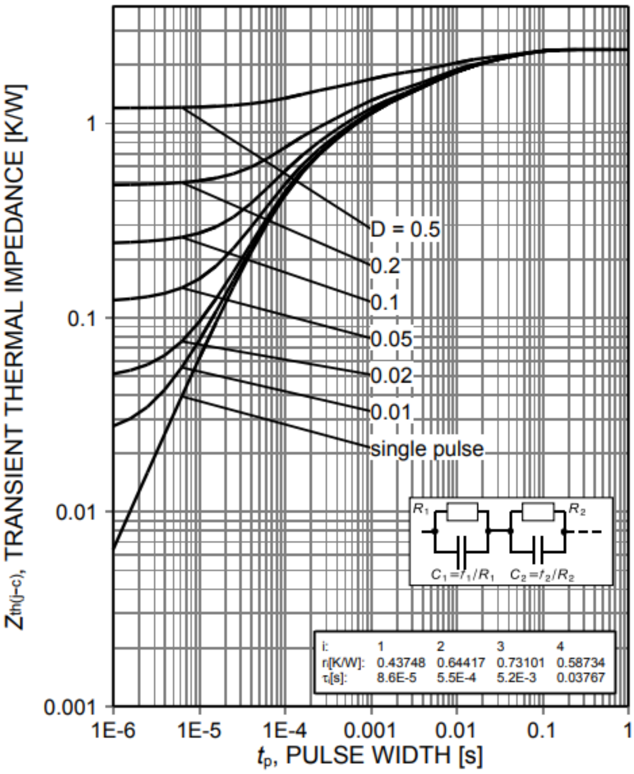


Figure 18. **Diode transient thermal impedance as a function of pulse width**
($D=t_p/T$)

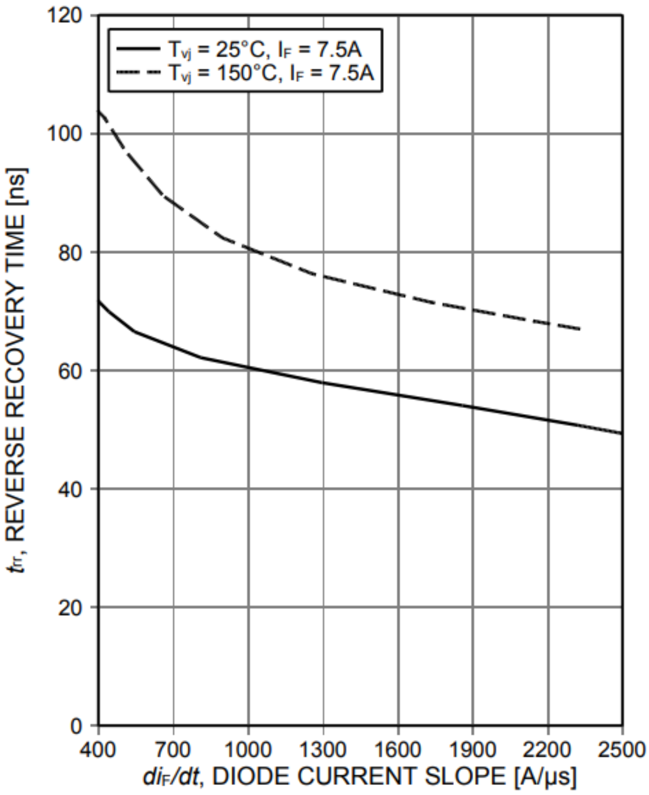


Figure 19. **Typical reverse recovery time as a function of diode current slope**
(V_R=400V)

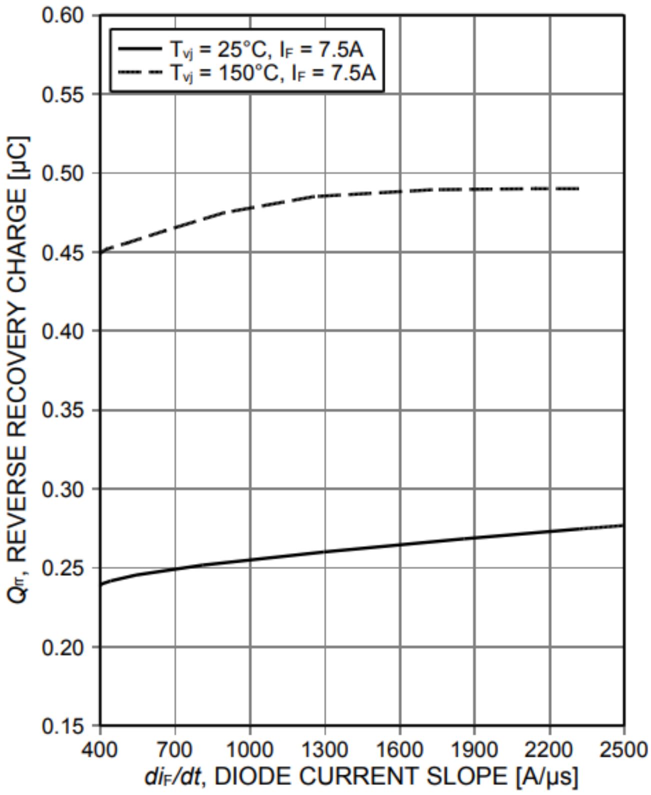


Figure 20. **Typical reverse recovery charge as a function of diode current slope**
(V_R=400V)

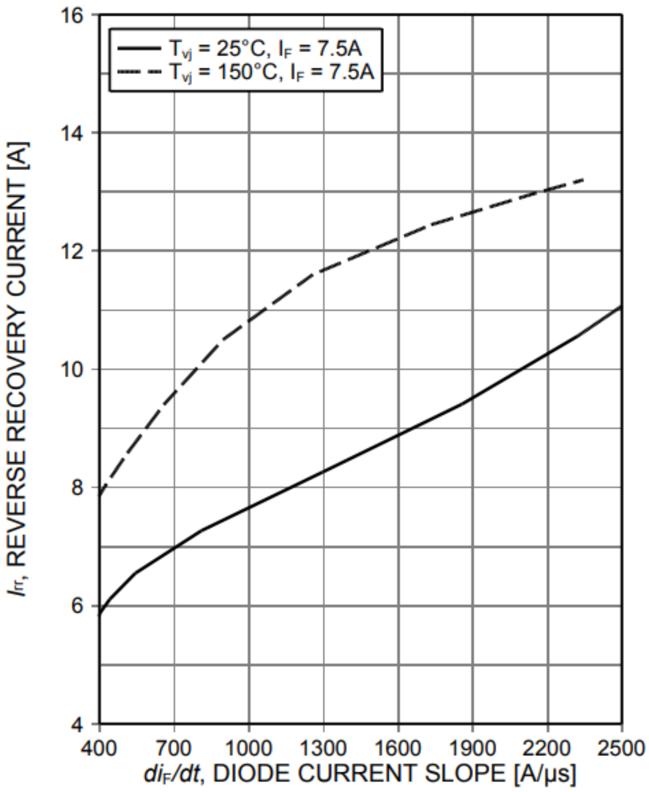


Figure 21. **Typical reverse recovery current as a function of diode current slope**
(V_R=400V)

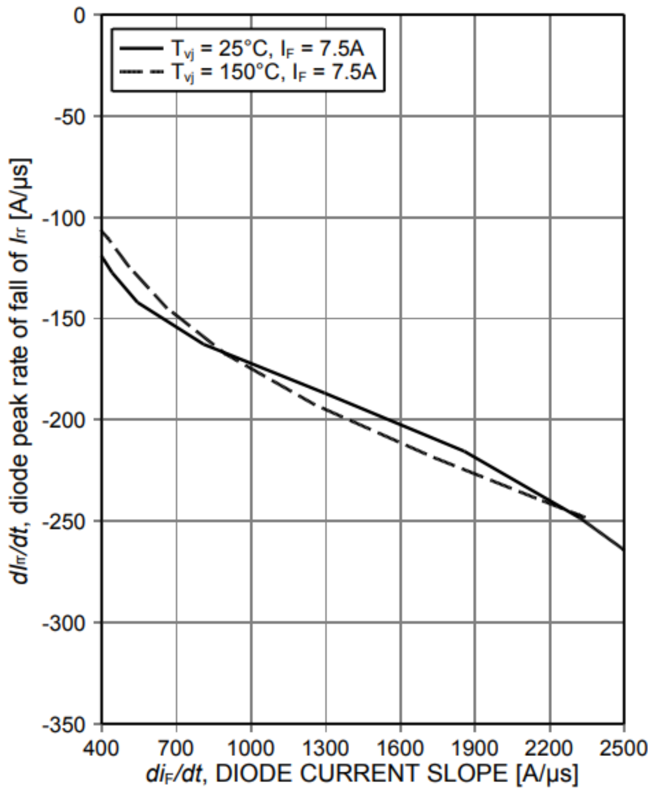


Figure 22. **Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**
(V_R=400V)

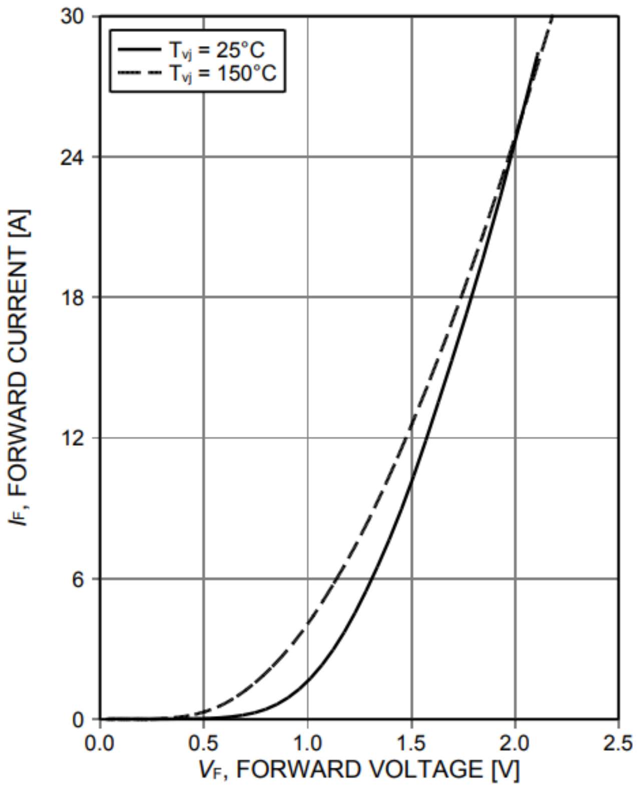


Figure 23. **Typical diode forward current as a function of forward voltage**

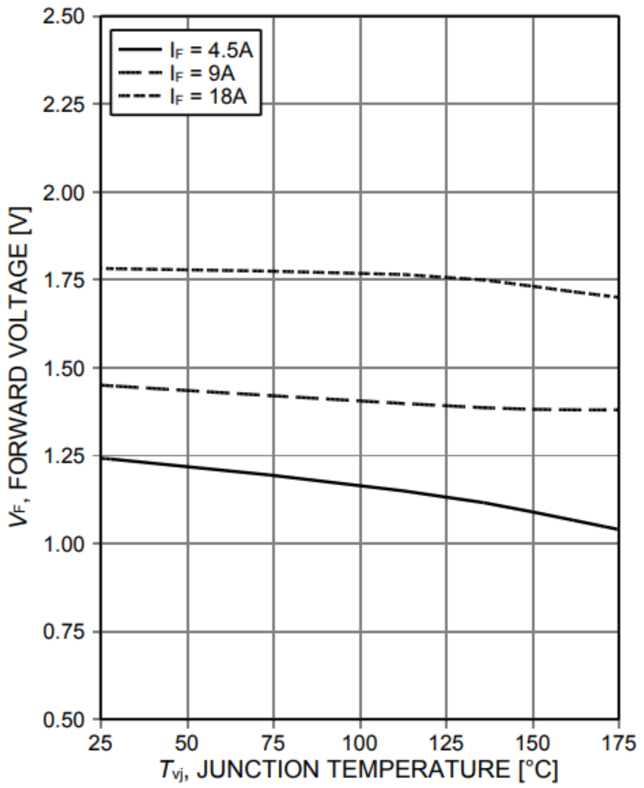
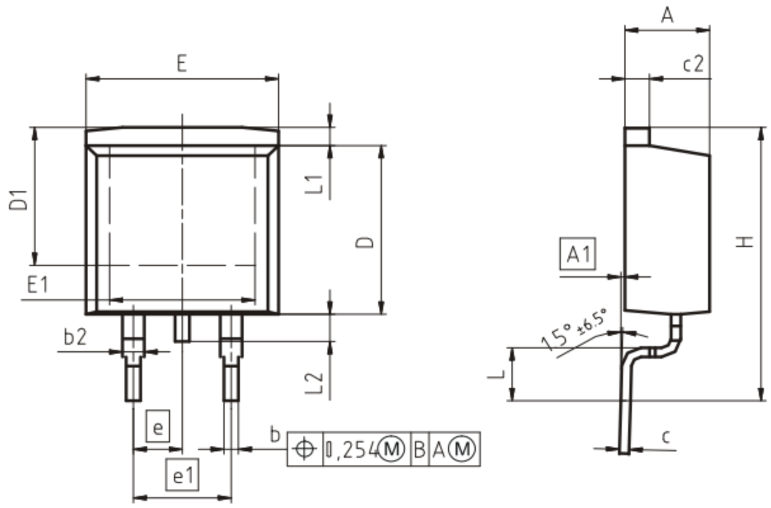
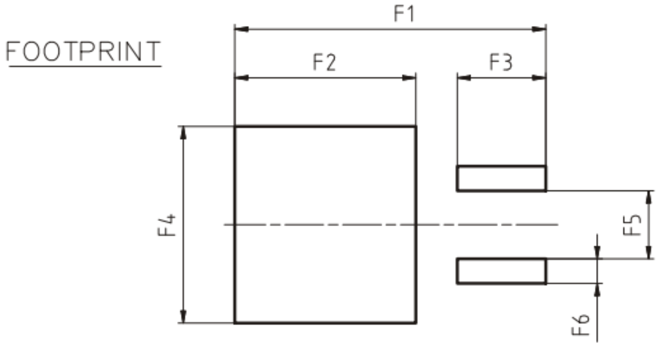


Figure 24. **Typical diode forward voltage as a function of junction temperature**

封装图 PG-TO263-3

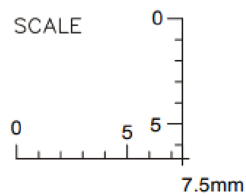




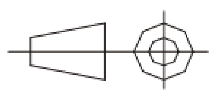
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.57	0.169	0.180
A1	0.00	0.25	0.000	0.010
b	0.65	0.85	0.026	0.033
b2	0.95	1.15	0.037	0.045
c	0.33	0.65	0.013	0.026
c2	1.17	1.40	0.046	0.055
D	8.51	9.45	0.335	0.372
D1	7.10	7.90	0.280	0.311
E	9.80	10.31	0.386	0.406
E1	6.50	8.60	0.256	0.339
e	2.54		0.100	
e1	5.08		0.200	
N	2		2	
H	14.61	15.88	0.575	0.625
L	2.29	3.00	0.090	0.118
L1	0.70	1.60	0.028	0.063
L2	1.00	1.78	0.039	0.070
F1	16.05	16.25	0.632	0.640
F2	9.30	9.50	0.366	0.374
F3	4.50	4.70	0.177	0.185
F4	10.70	10.90	0.421	0.429
F5	3.65	3.85	0.144	0.152
F6	1.25	1.45	0.049	0.057

DOCUMENT NO.
Z8B00003324

SCALE



EUROPEAN PROJECTION



ISSUE DATE
30-08-2007

REVISION
01

测试条件

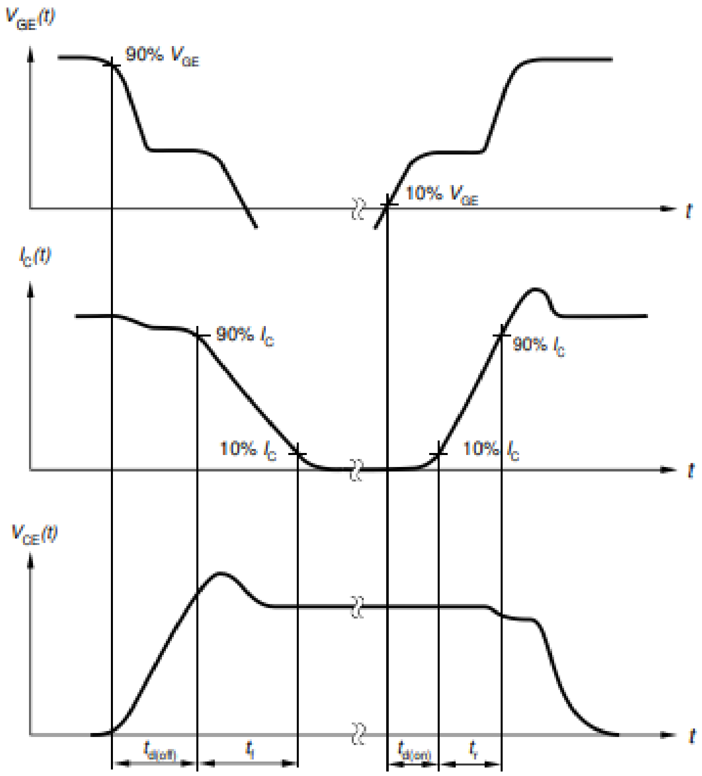


Figure A. **Definition of switching times**

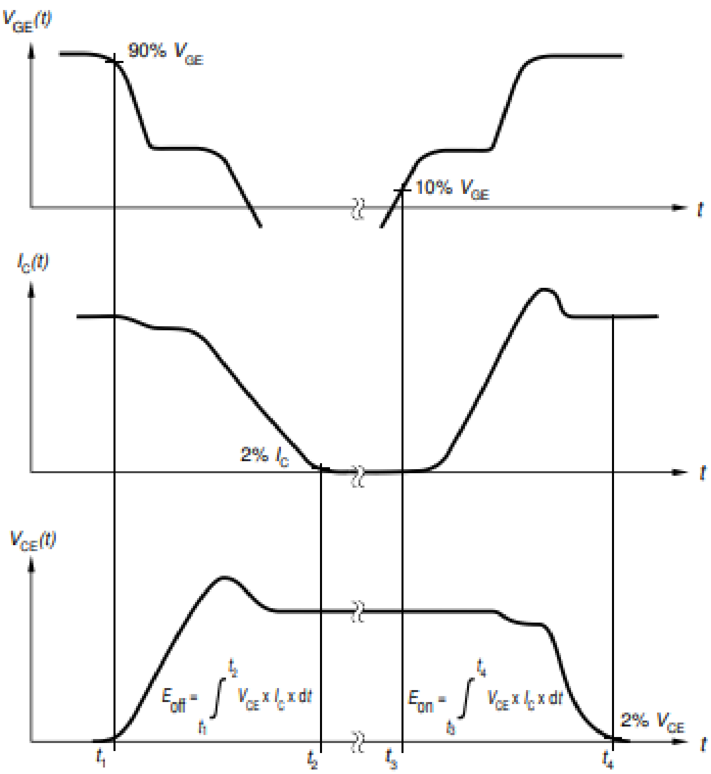


Figure B. **Definition of switching losses**

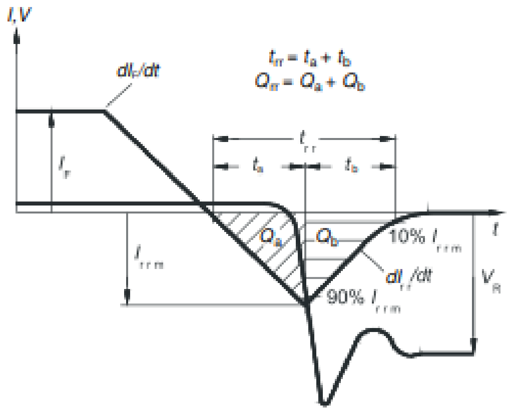


Figure C. **Definition of diode switching characteristics**

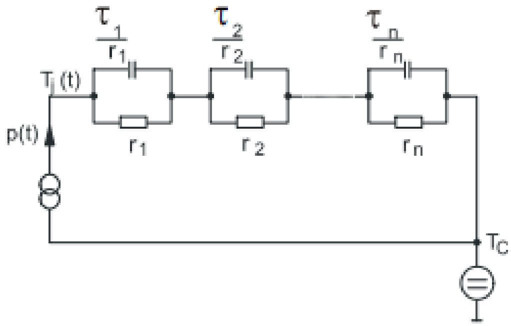


Figure D. **Thermal equivalent circuit**

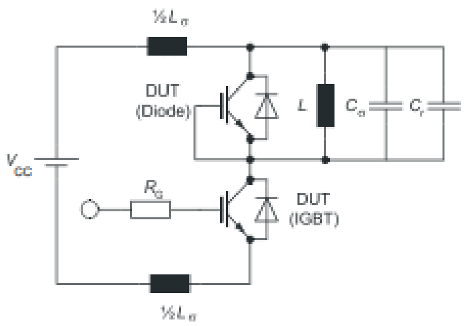


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

修订记录

AIKB15N65DH5

Revision: 2019-10-17, Rev. 2.1

历史修订版本

Revision	Date	Subjects (major changes since last revision)
2.1	2019-10-17	Final Datasheet

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。

Edition 2025-07-28

Published by

Infineon Technologies AG
81726 Munich, Germany

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。