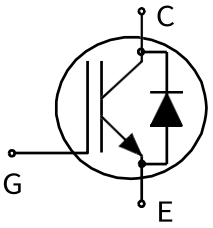
第五代高速开关系列

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

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
AIKB30N65DH5	650V	30A	1.65V	175°C	AK30EDH5	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	55.0 35.0	A
Pulsed collector current, t_p limited by T_{vjmax} [1)]	I_{Cpuls}	90.0	A
Turn off safe operating area $V_{CE} \leq 650V$, $T_{vj} \leq 175°C$, $t_p = 1\mu s$[1)]	-	90.0	A
Diode forward current, limited by T_{vjmax} [1)] T_c = 25°C T_c = 100°C	I_F	37.0 22.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	90.0	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}	188.0 93.0	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	$R_{th(j-c)}$		-	-	0.80	K/W
Diode thermal resistance, junction - case	$R_{th(j-c)}$		-	-	1.80	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 = 30.0A 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 = 15.0A 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 = 0.30mA, 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 = 30.0A	-	30.0	-	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	-	1800	-	pF
Output capacitance	C_{oes}		-	50	-	
Reverse transfer capacitance	C_{res}		-	10	-	
Gate charge	Q_G	V_{CC} = 520V, I_C = 30.0A, V_{GE} = 15V	-	70.0	-	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 = 15.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 23.0Ω, $R_{G(off)}$ = 23.0Ω, Lσ = 30nH, Cσ = 30pF Lσ, Cσ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	24	-	ns
Rise time	t_r		-	15	-	ns
Turn-off delay time	$t_{d(off)}$		-	184	-	ns
Fall time	t_f		-	24	-	ns
Turn-on energy	E_{on}		-	0.32	-	mJ
Turn-off energy	E_{off}		-	0.09	-	mJ
Total switching energy	E_{ts}		-	0.41	-	mJ

Turn-on delay time	$t_{d(on)}$	T_{vj} = 25°C, V_{CC} = 400V, I_C = 5.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 23.0Ω, $R_{G(off)}$ = 23.0Ω, $L\sigma$ = 30nH, $C\sigma$ = 30pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	22	-	ns
Rise time	t_r		-	8	-	ns
Turn-off delay time	$t_{d(off)}$		-	188	-	ns
Fall time	t_f		-	27	-	ns
Turn-on energy	E_{on}		-	0.11	-	mJ
Turn-off energy	E_{off}		-	0.03	-	mJ
Total switching energy	E_{ts}		-	0.14	-	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 = 15.0A, di_F/dt = 1046A/µs	-	65	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.48	-	µC
Diode peak reverse recovery current	I_{rrm}		-	12.3	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-262	-	A/µs

Diode reverse recovery time	t_{rr}	T_{vj} = 25°C, V_R = 400V, I_F = 5.0A, di_F/dt = 774A/µs	-	40	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.26	-	µC
Diode peak reverse recovery current	I_{rrm}		-	10.4	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-560	-	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 = 15.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 23.0Ω, $R_{G(off)}$ = 23.0Ω, $L\sigma$ = 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		-	15	-	ns
Turn-off delay time	$t_{d(off)}$		-	203	-	ns
Fall time	t_f		-	19	-	ns
Turn-on energy	E_{on}		-	0.44	-	mJ
Turn-off energy	E_{off}		-	0.11	-	mJ
Total switching energy	E_{ts}		-	0.55	-	mJ

Turn-on delay time	$t_{d(on)}$	T_{vj} = 150°C, V_{CC} = 400V, I_C = 5.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 23.0Ω, $R_{G(off)}$ = 23.0Ω, $L\sigma$ = 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		-	9	-	ns
Turn-off delay time	$t_{d(off)}$		-	215	-	ns
Fall time	t_f		-	30	-	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

二极管特性， T_{vj} = 150°C

Diode reverse recovery time	t_{rr}	T_{vj} = 150°C, V_R = 400V, I_F = 15.0A, di_F/dt = 967A/µs	-	97	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.87	-	µC
Diode peak reverse recovery current	I_{rrm}		-	15.6	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-218	-	A/µs

Diode reverse recovery time	t_{rr}	T_{vj} = 150°C, V_R = 400V, I_F = 5.0A, di_F/dt = 870A/µs	-	61	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.50	-	µC
Diode peak reverse recovery current	I_{rrm}		-	14.8	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-394	-	A/µs

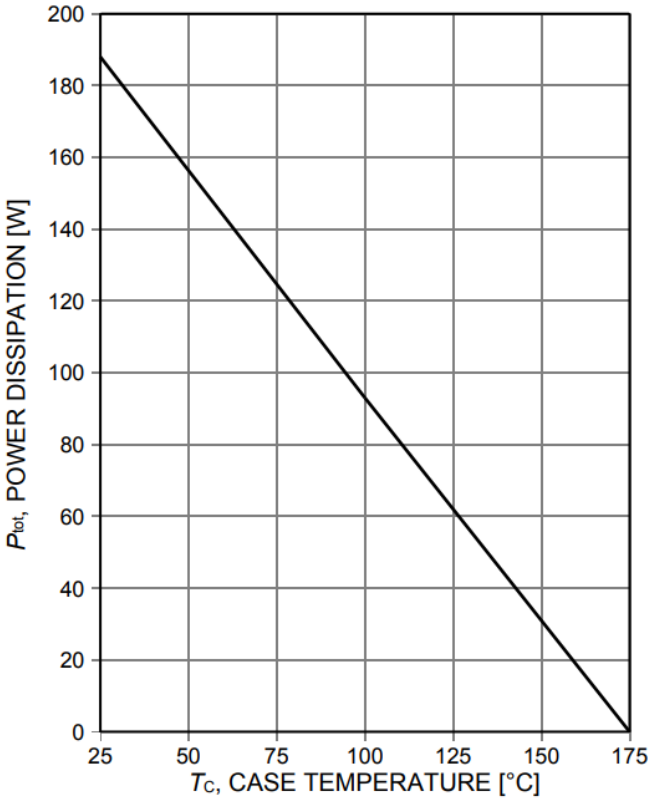


Figure 1. **Power dissipation as a function of case temperature**
(T_{vj}≤175°C)

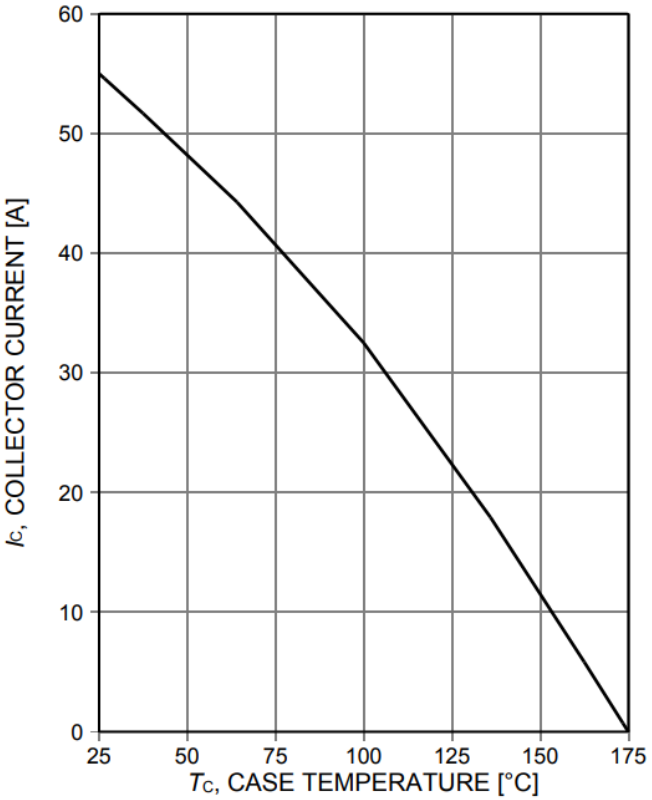


Figure 2. **Collector current as a function of case temperature**
(V_{GE}≥15V, T_{vj}≤175°C)

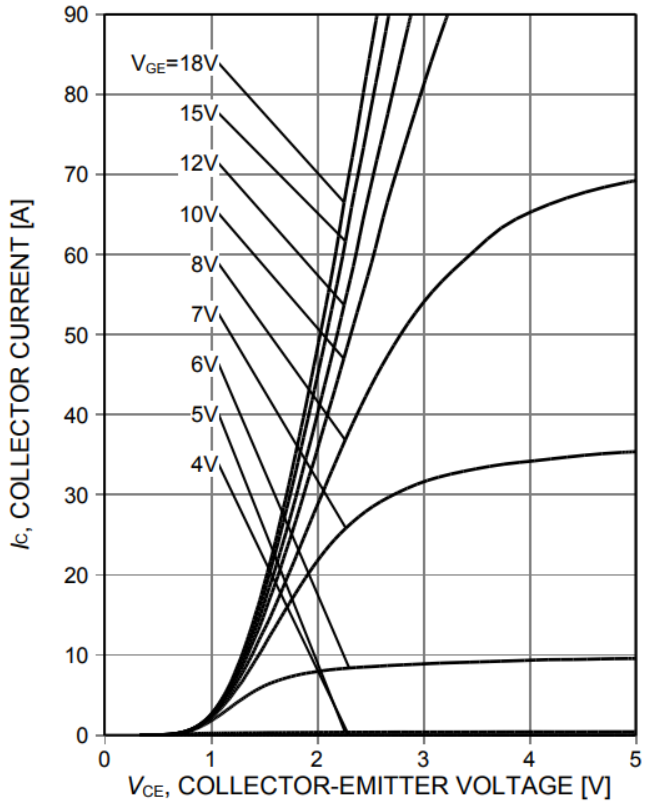


Figure 3. **Typical output characteristic**
(T_{vj}=25°C)

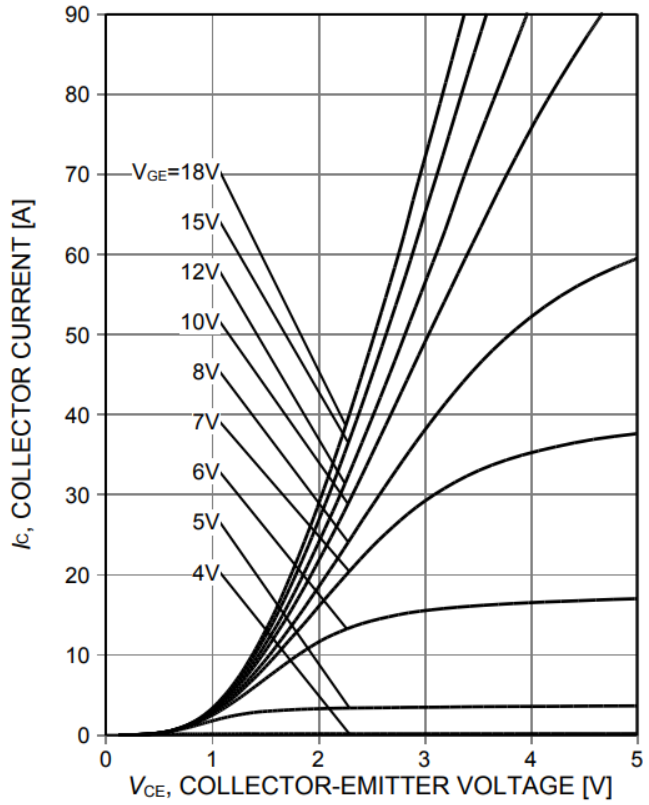


Figure 4. **Typical output characteristic**
(T_{vj}=150°C)

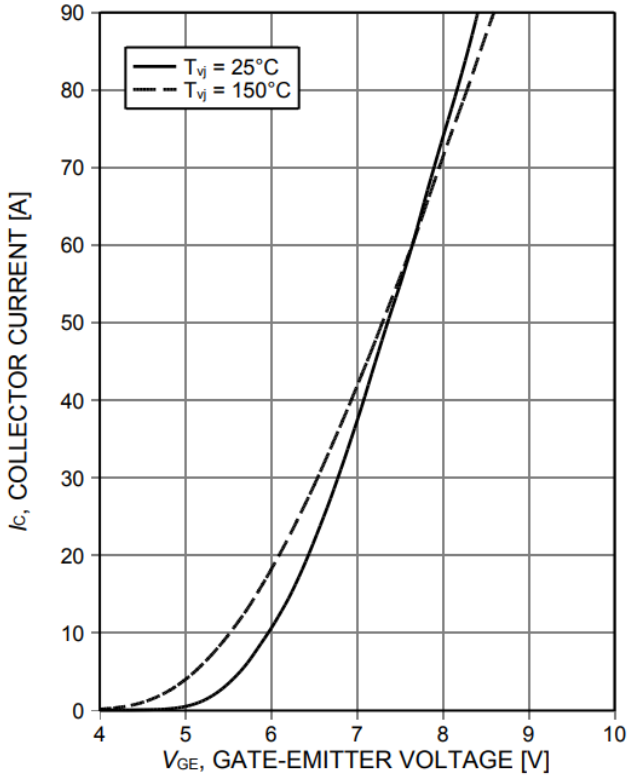


Figure 5. **Typical transfer characteristic** (V_{CE}=20V)

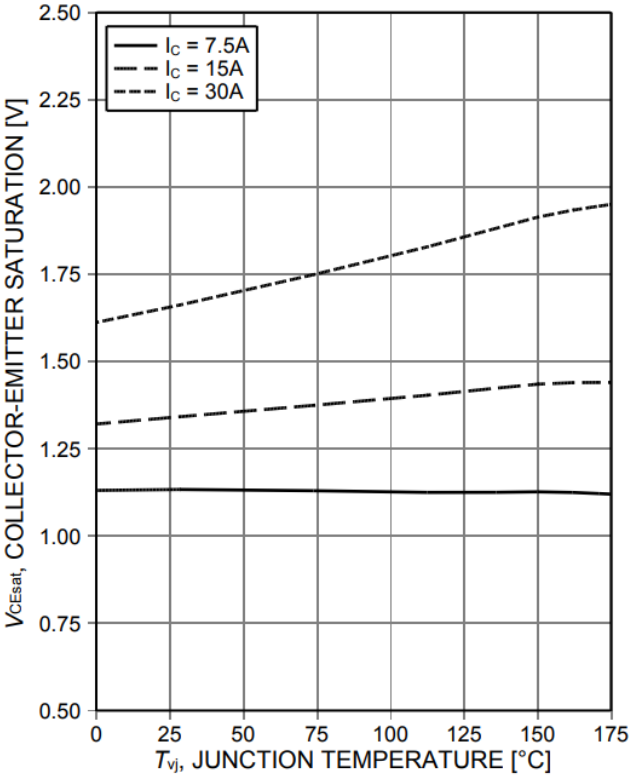


Figure 6. **Typical collector-emitter saturation voltage as a function of junction temperature** (V_{GE}=15V)

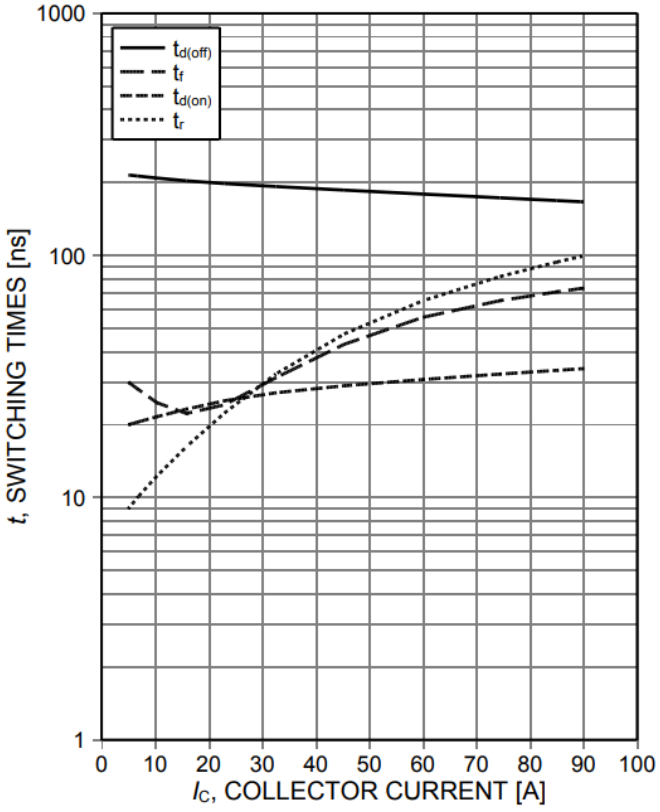


Figure 7. **Typical switching times as a function of collector current** (inductive load, T_{vj}=150°C, V_{CE}=400V, V_{GE}=15/0V, r_G=23Ω, Dynamic test circuit in Figure E)

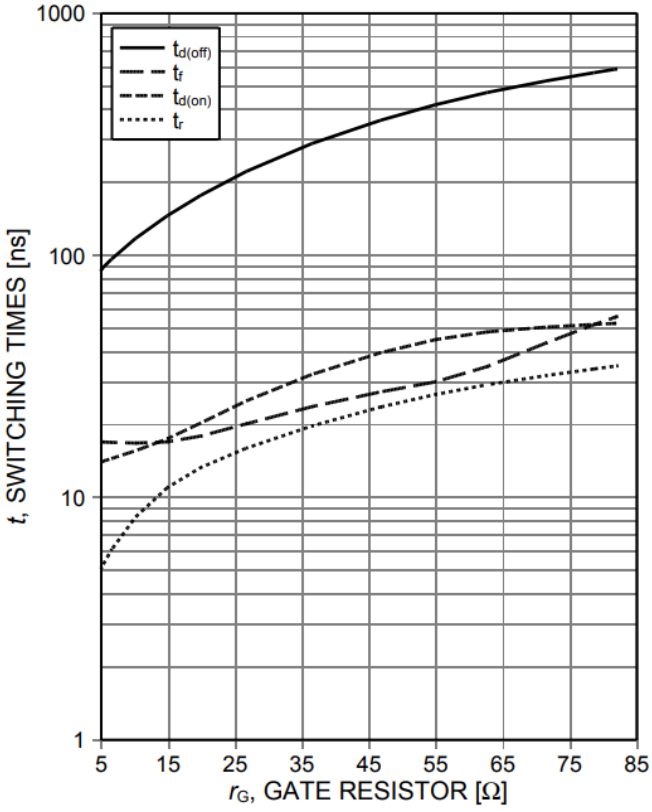


Figure 8. **Typical switching times as a function of gate resistor** (inductive load, T_{vj}=150°C, V_{CE}=400V, V_{GE}=15/0V, I_C=15A,Dynamic test circuit in Figure E)

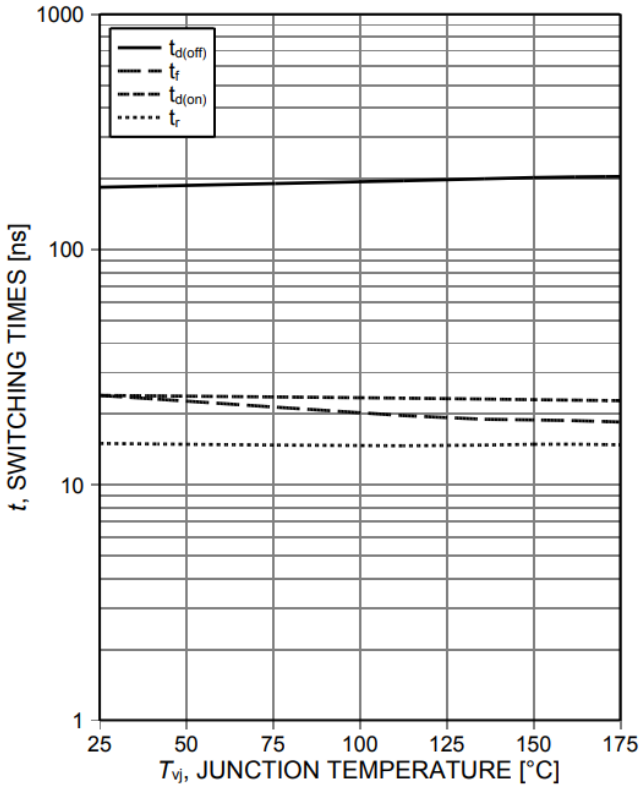


Figure 9. **Typical switching times as a function of junction temperature**
(inductive load, V_{CE}=400V, V_{GE}=15/0V, I_C=15A, r_G=23Ω,Dynamic test circuit in Figure E)

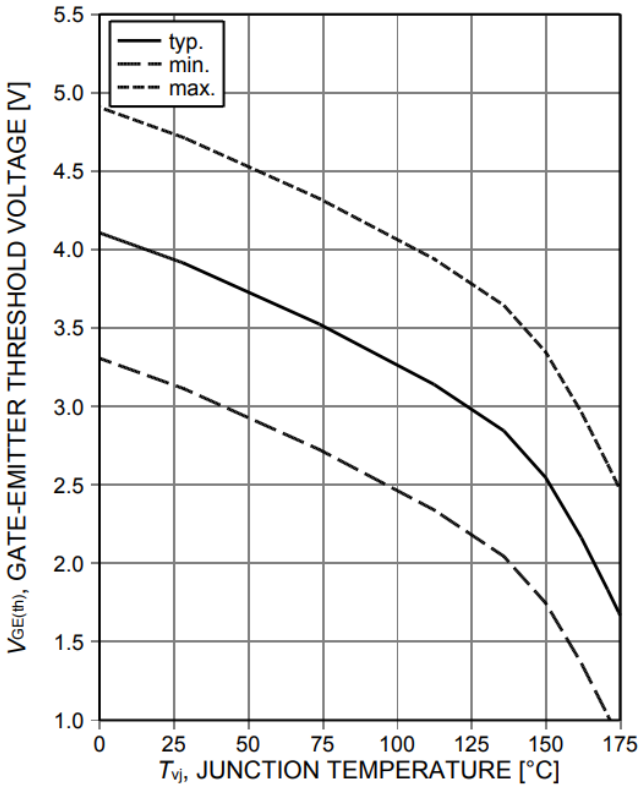


Figure 10. **Gate-emitter threshold voltage as a function of junction temperature**
(I_C=0.3mA)

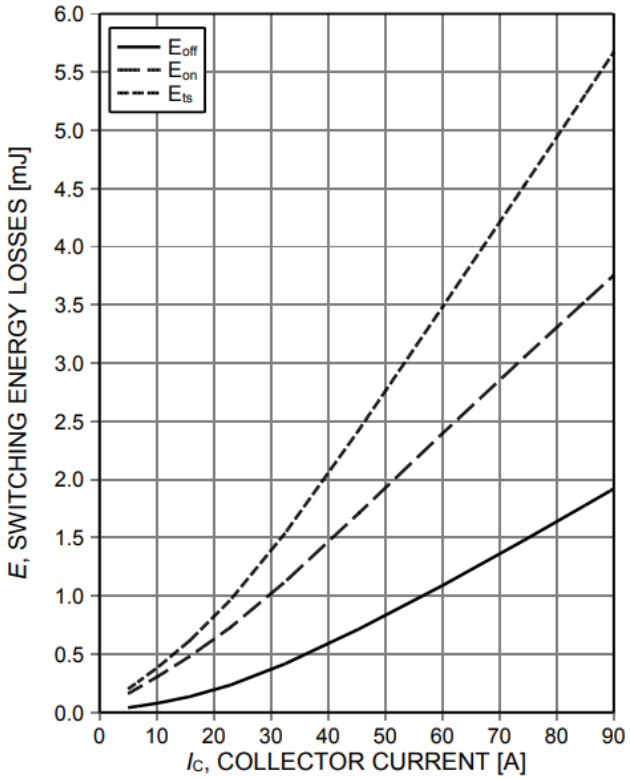


Figure 11. **Typical switching energy losses as a function of collector current**
(inductive load, T_{vj}=150°C, V_{CE}=400V, V_{GE}=15/0V, r_G=23Ω,Dynamic test circuit in Figure E)

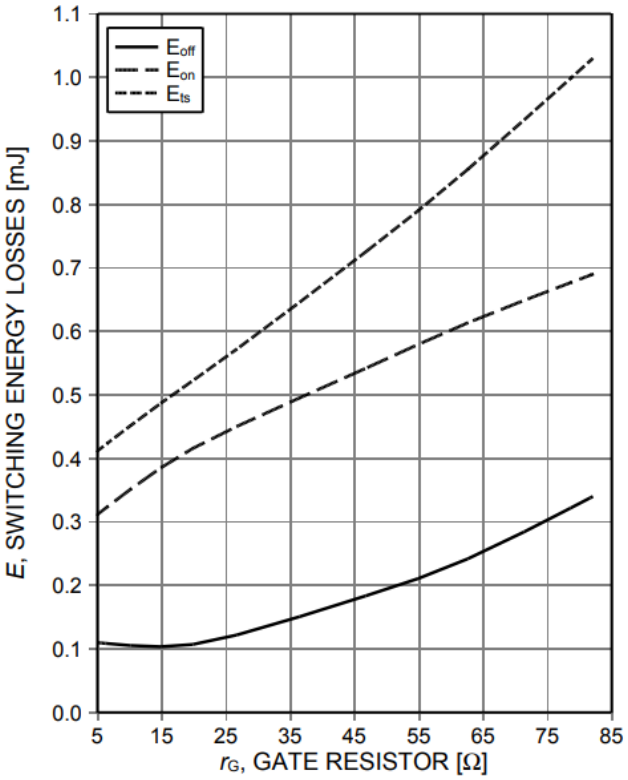


Figure 12. **Typical switching energy losses as a function of gate resistor**
(inductive load, T_{vj}=150°C, V_{CE}=400V, V_{GE}=15/0V, I_C=15A, Dynamic test circuit in Figure E)

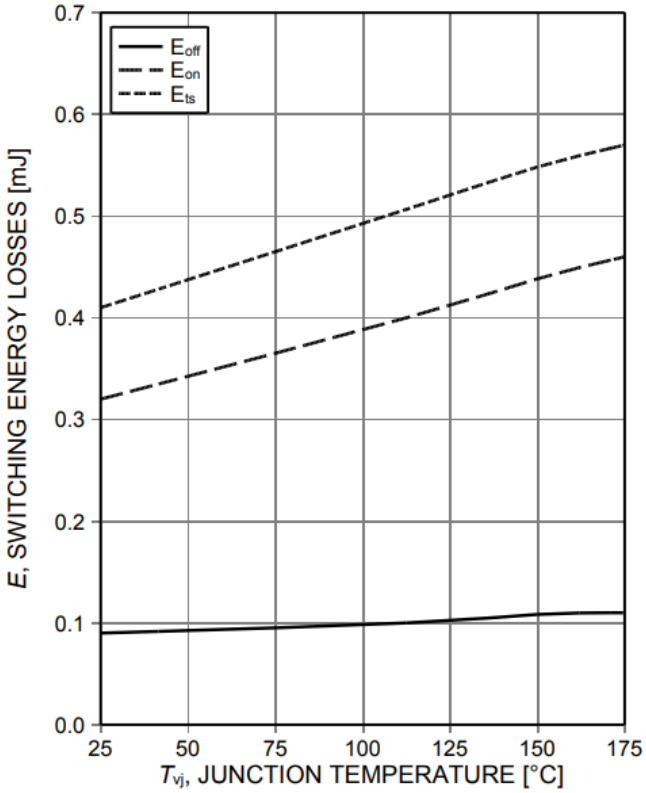


Figure 13. **Typical switching energy losses as a function of junction temperature** (inductive load, V_{CE}=400V, V_{GE}=15/0V, I_C=15A, r_G=23Ω,Dynamic test circuit in Figure E)

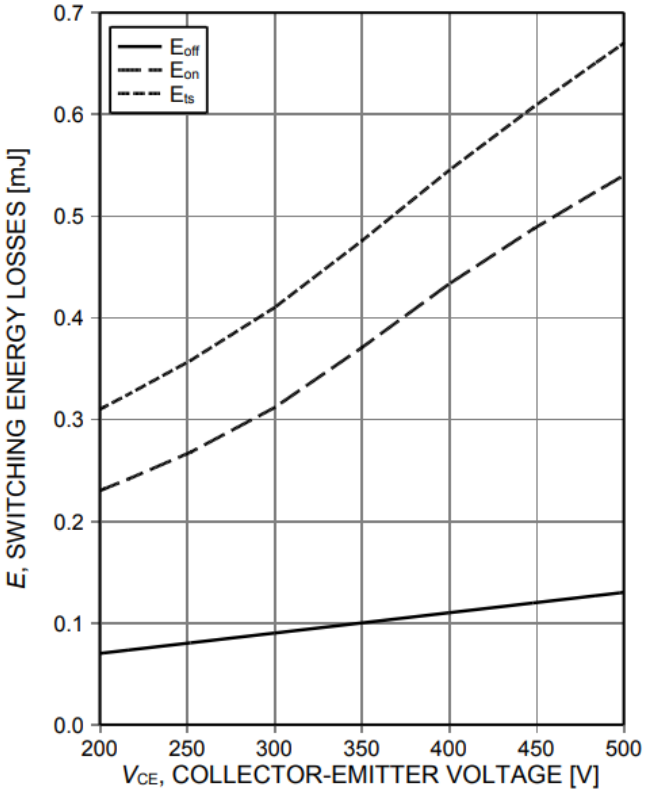


Figure 14. **Typical switching energy losses as a function of collector emitter voltage** (inductive load, T_{vj}= 150°C, V_{GE}=15/0V, I_C=15A, r_G=23Ω,Dynamic test circuit in Figure E)

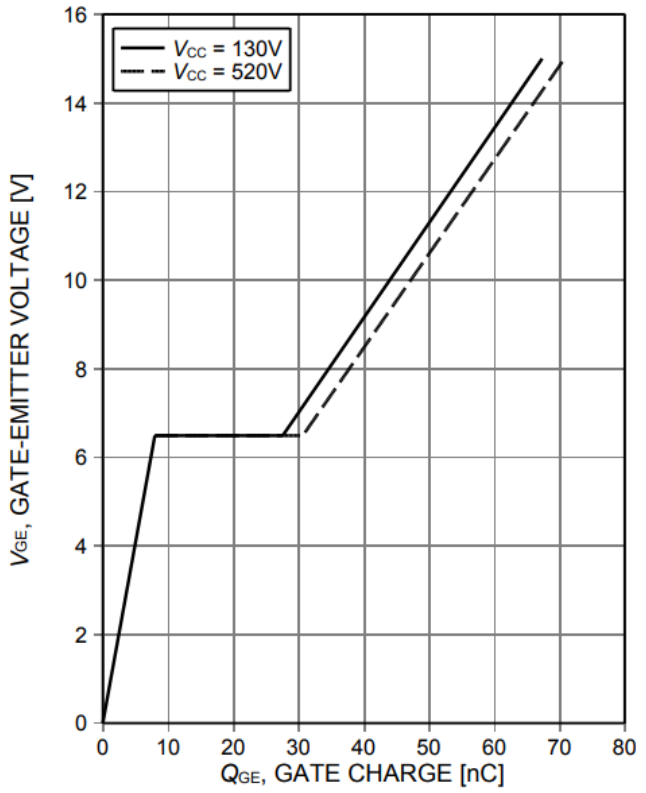


Figure 15. **Typical gate charge** (I_C=30A)

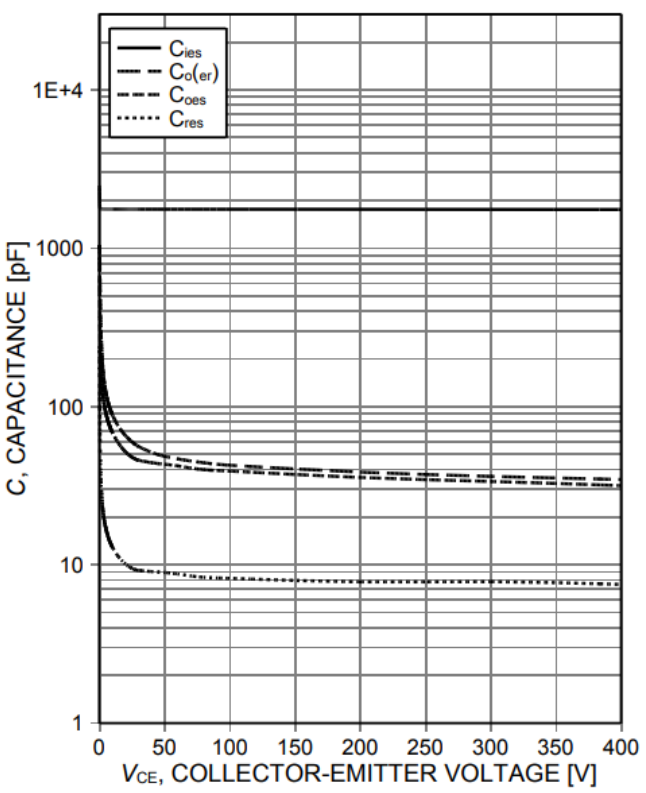


Figure 16. **Typical capacitance as a function of collector-emitter voltage** (V_{GE}=0V, f=1MHz)

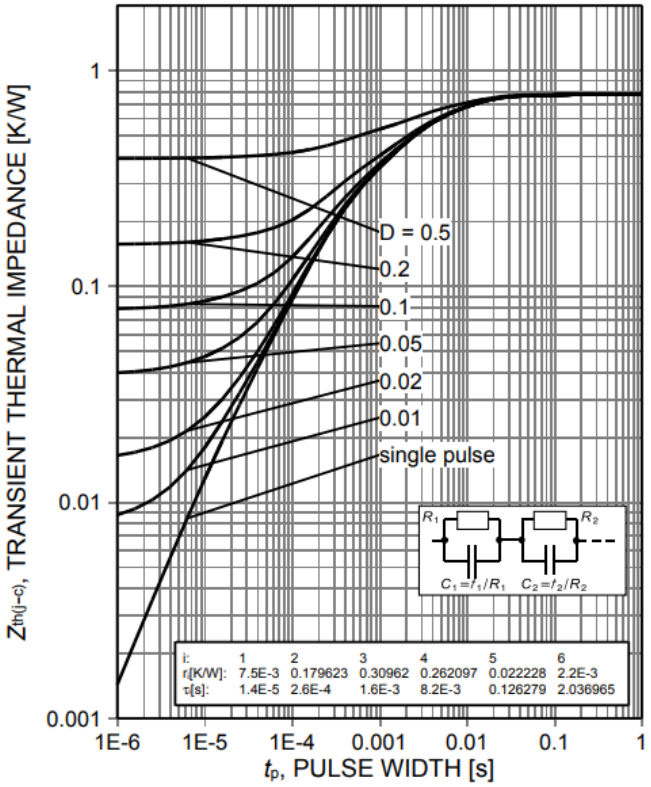


Figure 17. **IGBT transient thermal impedance** ($D=t_p/T$)

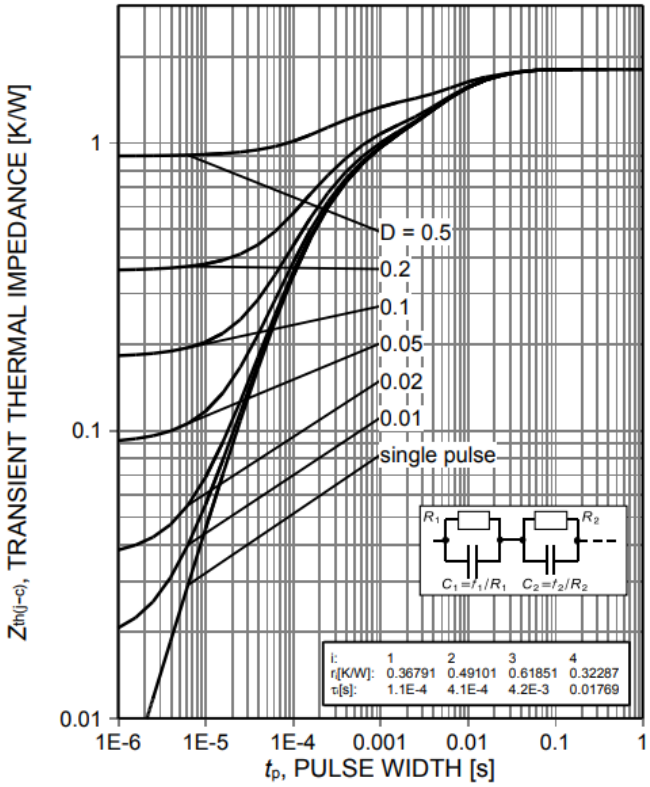


Figure 18. **Diode transient thermal impedance as a function of pulse width** ($D=t_p/T$)

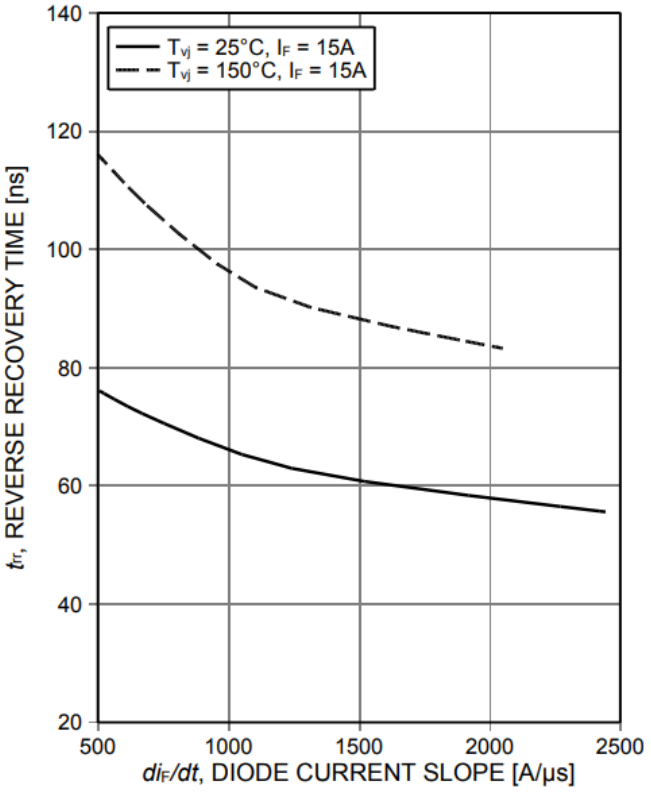


Figure 19. **Typical reverse recovery time as a function of diode current slope** (V_R=400V)

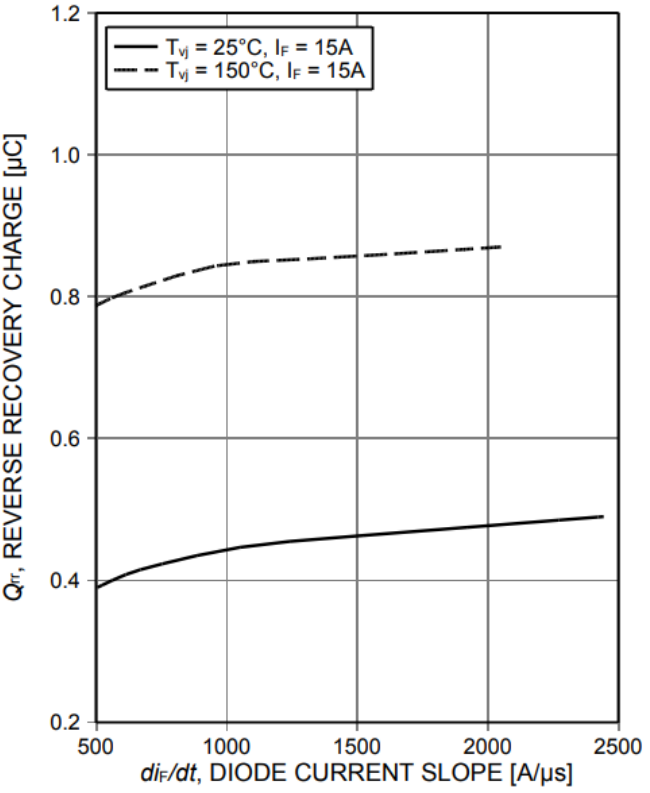


Figure 20. **Typical reverse recovery charge as a function of diode current slope** (V_R=400V)

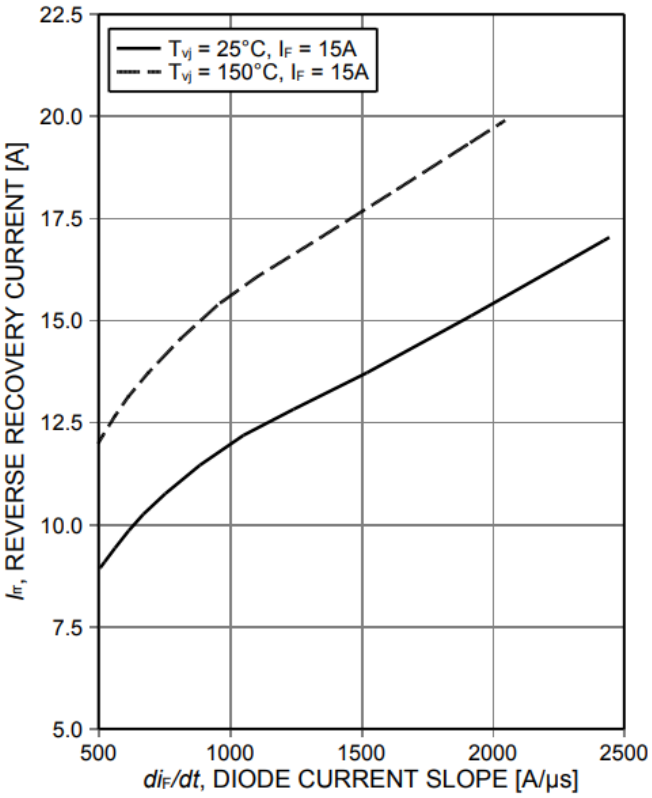


Figure 21. **Typical reverse recovery current as a function of diode current slope**
(V_R=400V)

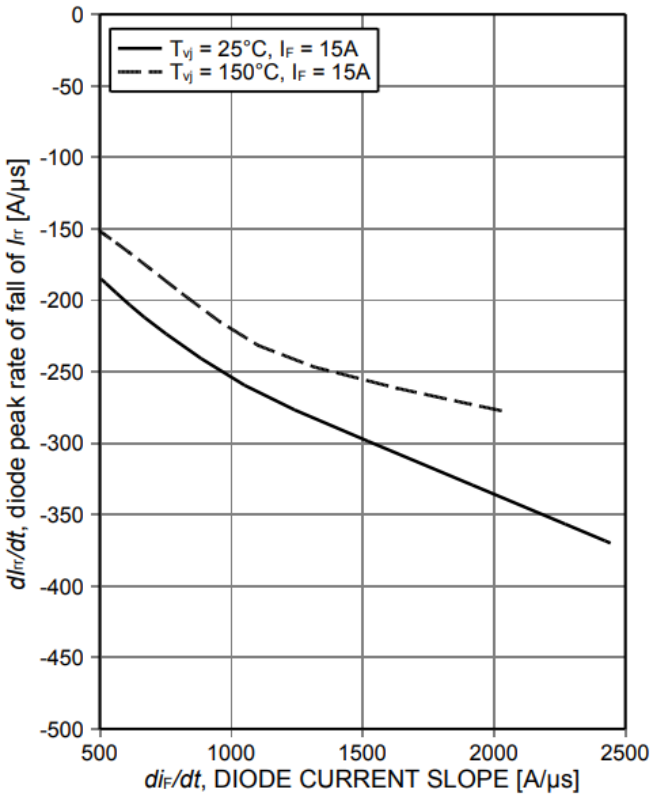


Figure 22. **Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**
(V_R=400V)

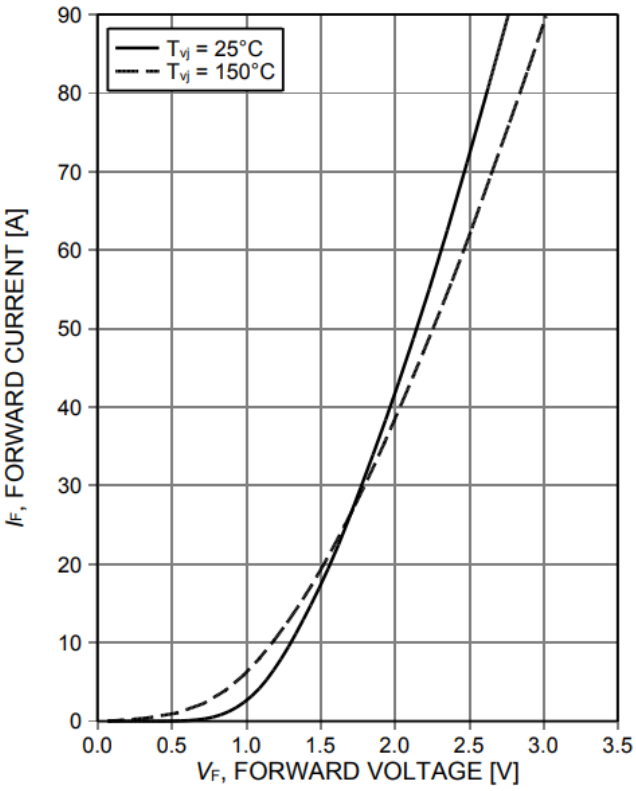


Figure 23. **Typical diode forward current as a function of forward voltage**

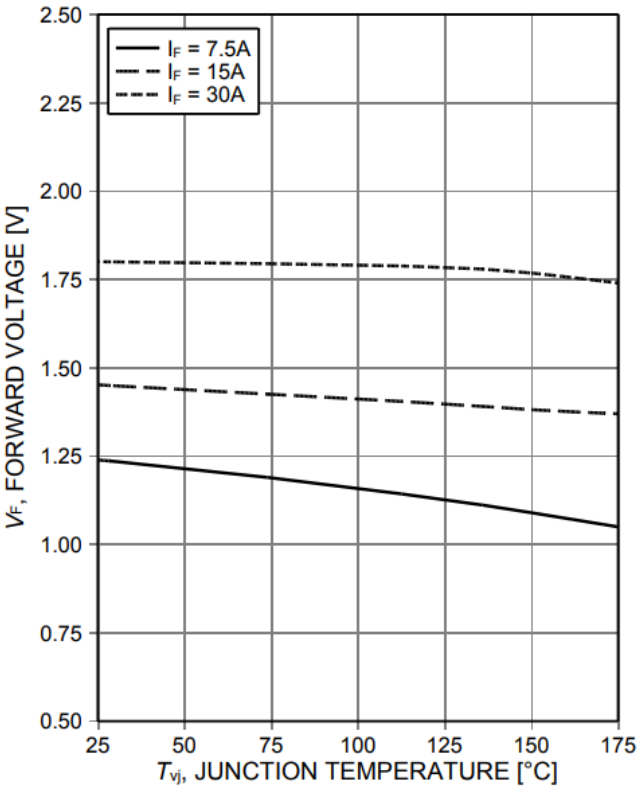
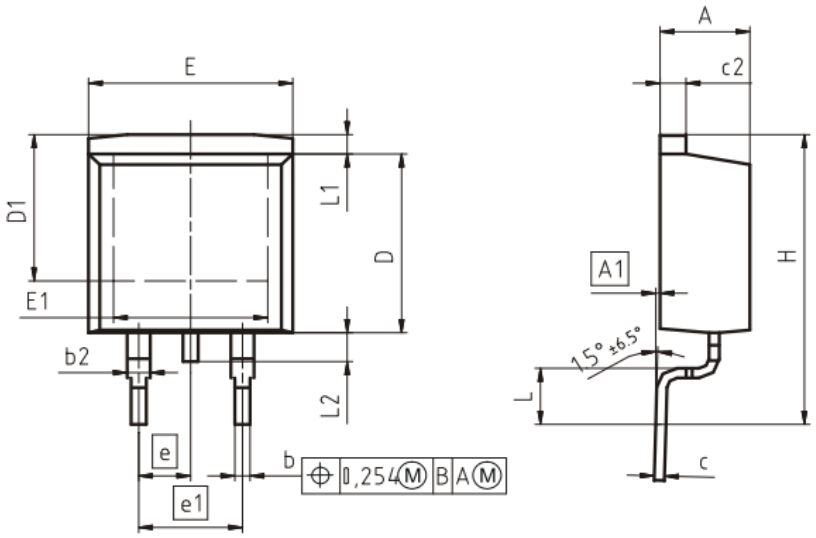
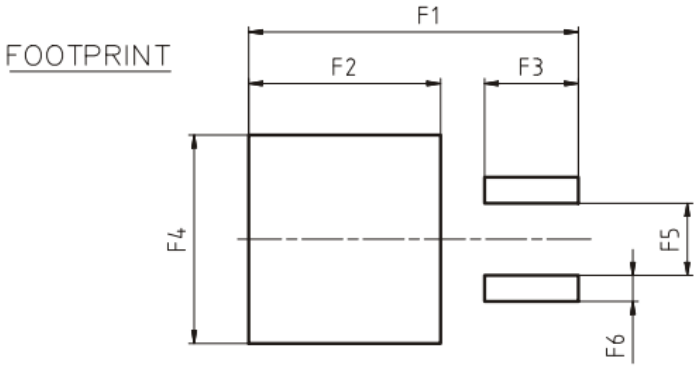


Figure 24. **Typical diode forward voltage as a function of junction temperature**

封装图 PG-TO263-3



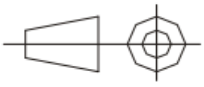


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.57	0.169	0.180
A1	0.00	0.25	0.000	0.010
b	0.65	0.85	0.026	0.033
b2	0.95	1.15	0.037	0.045
c	0.33	0.65	0.013	0.026
c2	1.17	1.40	0.046	0.055
D	8.51	9.45	0.335	0.372
D1	7.10	7.90	0.280	0.311
E	9.80	10.31	0.386	0.406
E1	6.50	8.60	0.256	0.339
e	2.54		0.100	
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 0 5 0 5
7.5mm

EUROPEAN PROJECTION



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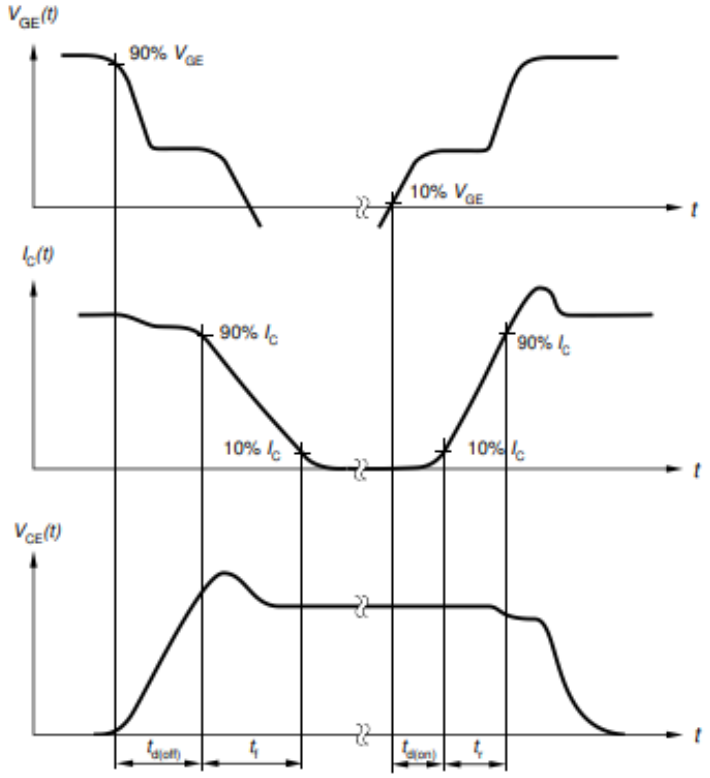

Figure A. **Definition of switching times**

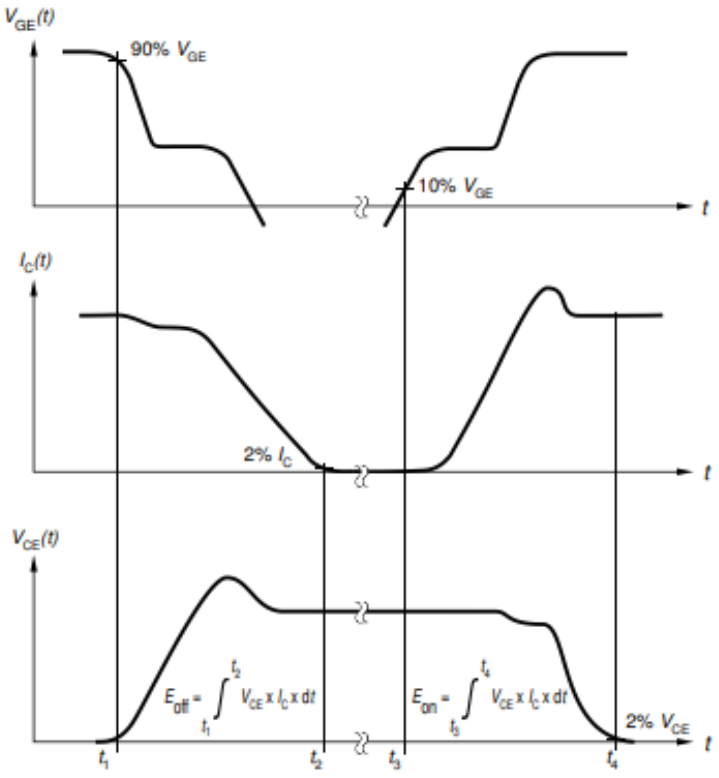

Figure B. **Definition of switching losses**

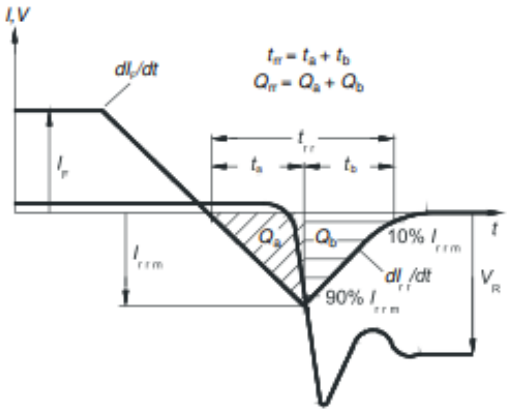

Figure C. **Definition of diode switching characteristics**

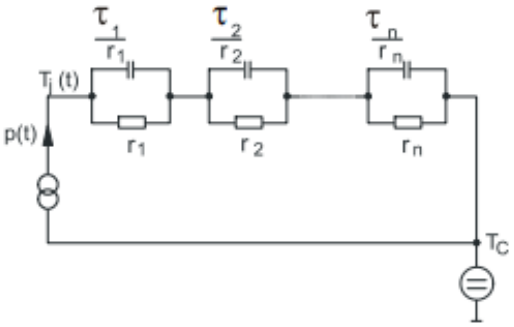

Figure D. **Thermal equivalent circuit**

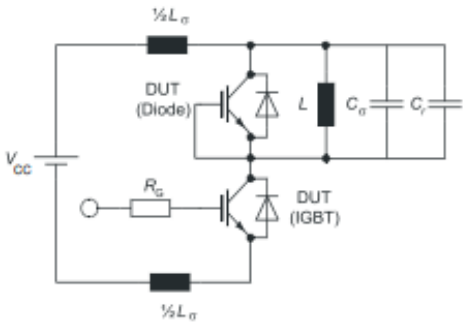

Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

第五代高速开关系列

修订记录

AIKB30N65DH5

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

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