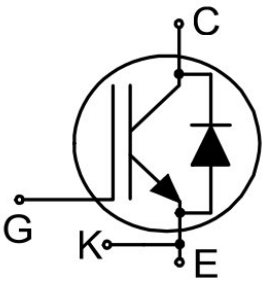
第六代，高速软开关系列

英飞凌高速软开关 TRENCHSTOP™ IGBT 6，采用 Trench 和 Fieldstop技术，与软快速恢复反并联二极管共同封装



特性：

英飞凌 1200V TRENCHSTOP™IGBT6 技术提供：
- 高效率硬开关和谐振拓扑
- 由于 V_{CEsat} 具有正温度系数，因此易于并联
- 低电磁干扰
- 低栅极电荷 Q_g
- 非常软、快速恢复的全电流反并联二极管
- 最高结温 175°C
- 无铅引脚镀层；符合 RoHS 标准
- 完整的产品系列和 PSpice 模型：
http://www.infineon.com/igbt/



应用：

- 工业级不间断电源（UPS）
- 充电器
- 储能
- 三电平组串太阳能逆变器
- 焊接

产品验证

符合 JEDEC47/20/22 相关测试的工业应用要求

关键性能和封装参数

Type	V_{CE}	I_C	V_{CEsat}, T_{vj}=25°C	T_{vjmax}	Marking	Package
IKY40N120CS6	1200V	40A	1.85V	175°C	K40MCS6	PG-TO247-4-2

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）。

第六代，高速软开关系列

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第六代，高速软开关系列

最大额定值

注意：为了获得最佳的使用寿命和可靠性，英飞凌建议运行条件不超过本数据手册中所述最大额定值的 80%。

Parameter	Symbol	Value	Unit
Collector-emitter voltage, $T_{vj} \geq 25°C$	V_{CE}	1200	V
DC collector current, limited by T_{vjmax} $T_c = 25°C$ $T_c = 100°C$	I_C	 80.0 40.0	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	160.0	A
Turn off safe operating area $V_{CE} \leq 1200V$, $T_{vj} \leq 175°C$	-	160.0	A
Diode forward current, limited by T_{vjmax} $T_c = 25°C$ $T_c = 100°C$	I_F	 80.0 40.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	160.0	A
Gate-emitter voltage Transient Gate-emitter voltage ($t_p \leq 0.5\mu s$, $D < 0.001$)	V_{GE}	±20 25	V
Power dissipation $T_c = 25°C$ Power dissipation $T_c = 100°C$	P_{tot}	500.0 250.0	W
Operating junction temperature	T_{vj}	-40...+175	°C
Storage temperature	T_{stg}	-55...+150	°C
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s		 260	°C

热阻

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
R_{th} Characteristics						
IGBT thermal resistance, junction - case	$R_{th(j-c)}$		-	-	0.30	K/W
Diode thermal resistance, junction - case	$R_{th(j-c)}$		-	-	0.78	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		-	-	40	K/W

电气特性，测于 T_{vj}= 25°C 的条件下，除非另有规定

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Static Characteristic						
Collector-emitter saturation voltage	V_{CEsat}	V_{GE} = 15.0V, I_C = 40.0A T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	 - - -	 1.85 2.15 2.25	 2.15 - -	V
Diode forward voltage	V_F	V_{GE} = 0V, I_F = 40.0A T_{vj} = 25°C T_{vj} = 175°C	 - -	 2.20 2.25	 2.55 -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C = 1.90mA, V_{CE} = V_{GE}	5.1	5.7	6.3	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V T_{vj} = 25°C T_{vj} = 175°C	 - -	 - 1600	 850 -	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = 20V	-	-	600	nA
Transconductance	g_{fs}	V_{CE} = 20V, I_C = 40.0A	-	32.0	-	S

电气特性，测于 T_{vj} = 25°C的条件下，除非另有规定

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Dynamic Characteristic						
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	2700	-	pF
Output capacitance	C_{oes}		-	185	-	
Reverse transfer capacitance	C_{res}		-	120	-	
Gate charge	Q_G	V_{CC} = 960V, I_C = 40.0A, V_{GE} = 15V	-	285.0	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13.0	-	nH

开关特性、感性负载

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic, at T_{vj} = 25°C						
Turn-on delay time	$t_{d(on)}$	T_{vj} = 25°C, V_{CC} = 600V, I_C = 40.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 9.0Ω, $R_{G(off)}$ = 9.0Ω, Lσ = 70nH, Cσ = 67pF Lσ, Cσ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	27	-	ns
Rise time	t_r		-	27	-	ns
Turn-off delay time	$t_{d(off)}$		-	315	-	ns
Fall time	t_f		-	27	-	ns
Turn-on energy	E_{on}		-	1.45	-	mJ
Turn-off energy	E_{off}		-	1.55	-	mJ
Total switching energy	E_{ts}		-	3.00	-	mJ

第六代，高速软开关系列

二极管特性， T_{vj} = 25°C

Diode reverse recovery time	t_{rr}	T_{vj} = 25°C, V_R = 600V, I_F = 40.0A, di_F/dt = 1650A/µs, Lσ = 70nH, Cσ = 67pF	-	255	-	ns
Diode reverse recovery charge	Q_{rr}		-	2.60	-	µC
Diode peak reverse recovery current	I_{rrm}		-	39.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-450	-	A/µs

开关特性、感性负载

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic, at T_{vj} = 175°C						
Turn-on delay time	$t_{d(on)}$	T_{vj} = 175°C, V_{CC} = 600V, I_C = 40.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 9.0Ω, $R_{G(off)}$ = 9.0Ω, Lσ = 70nH, Cσ = 67pF Lσ, Cσ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	27	-	ns
Rise time	t_r		-	29	-	ns
Turn-off delay time	$t_{d(off)}$		-	390	-	ns
Fall time	t_f		-	55	-	ns
Turn-on energy	E_{on}		-	2.05	-	mJ
Turn-off energy	E_{off}		-	2.95	-	mJ
Total switching energy	E_{ts}		-	5.00	-	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 = 600V, I_F = 40.0A, di_F/dt = 1650A/µs, Lσ = 70nH, Cσ = 67pF	-	360	-	ns
Diode reverse recovery charge	Q_{rr}		-	5.30	-	µC
Diode peak reverse recovery current	I_{rrm}		-	53.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-580	-	A/µs

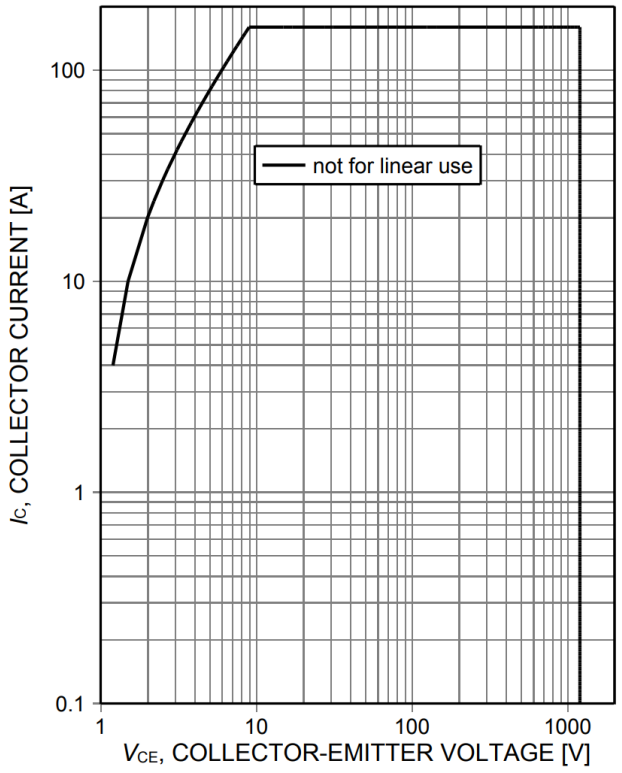


Figure 1. **Forward bias safe operating area** (*D*=0, T_{vj}≤175°C; V_{GE}=15V, pulse width limited by T_{vjmax})

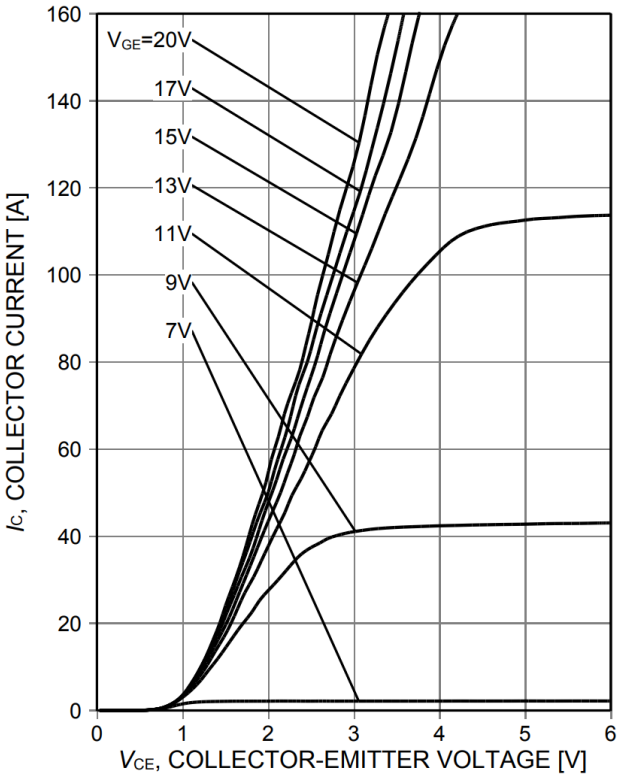


Figure 2. **Typical output characteristic** (T_{vj}=25°C)

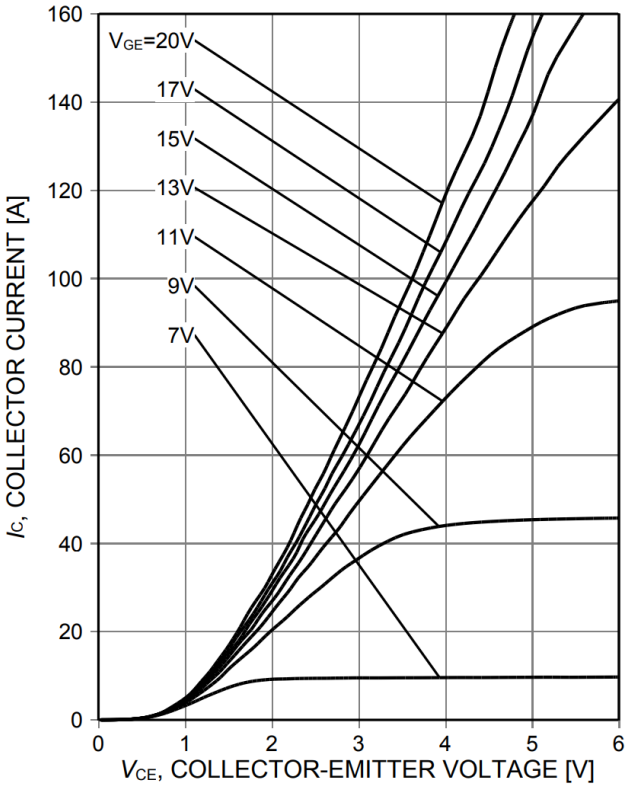


Figure 3. **Typical output characteristic** (T_{vj}=175°C)

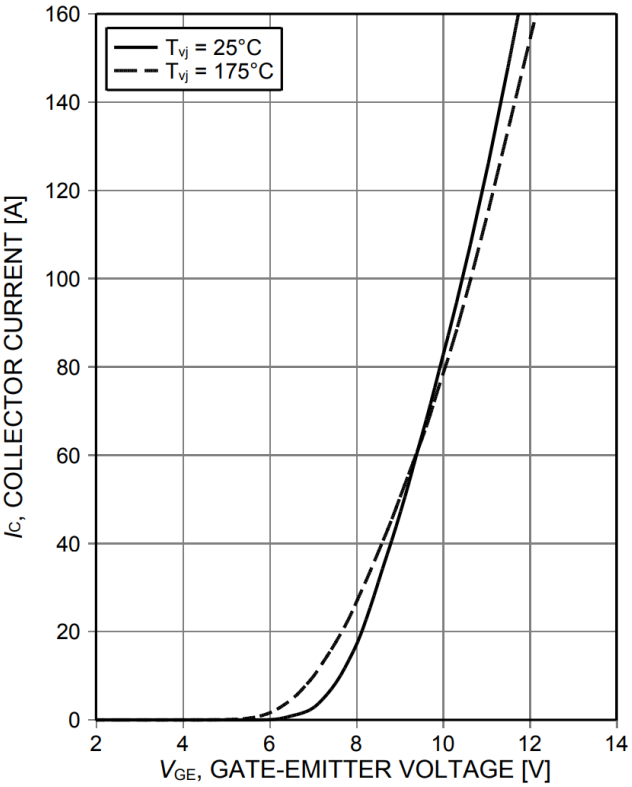


Figure 4. **Typical transfer characteristic** (V_{CE}=20V)

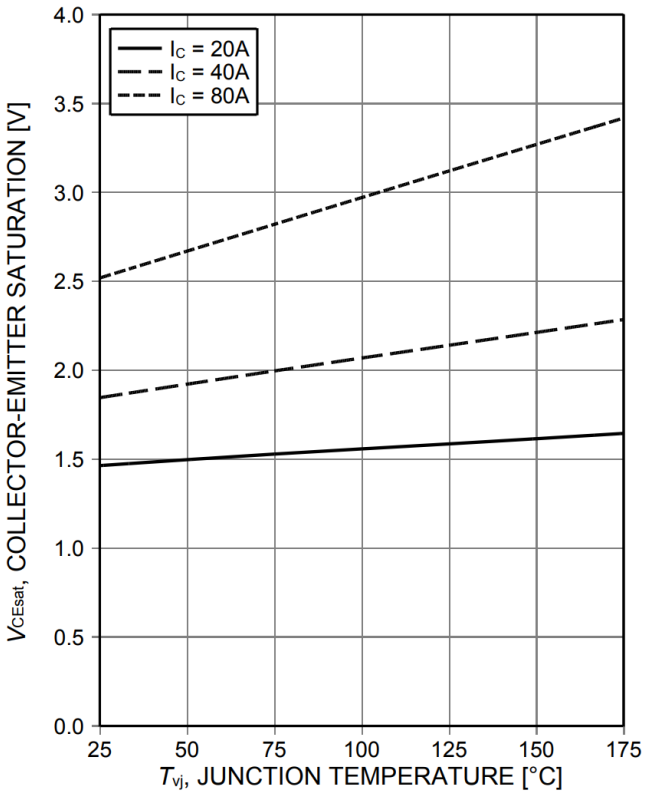


Figure 5. **Typical collector-emitter saturation voltage as a function of junction temperature**
(V_{GE}=15V)

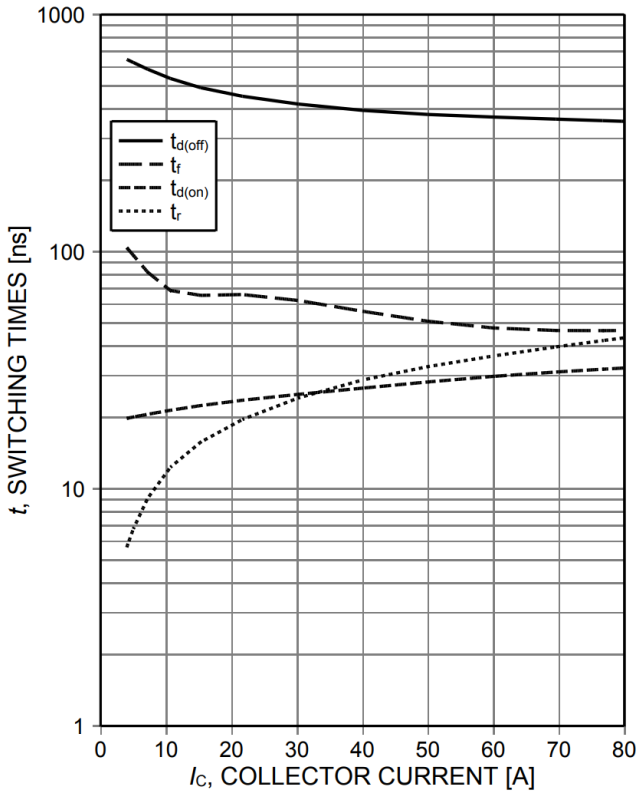


Figure 6. **Typical switching times as a function of collector current**
(inductive load, T_{vj}=175°C, V_{CE}=600V, V_{GE}=0/15V, R_G=9Ω, Dynamic test circuit in Figure E)

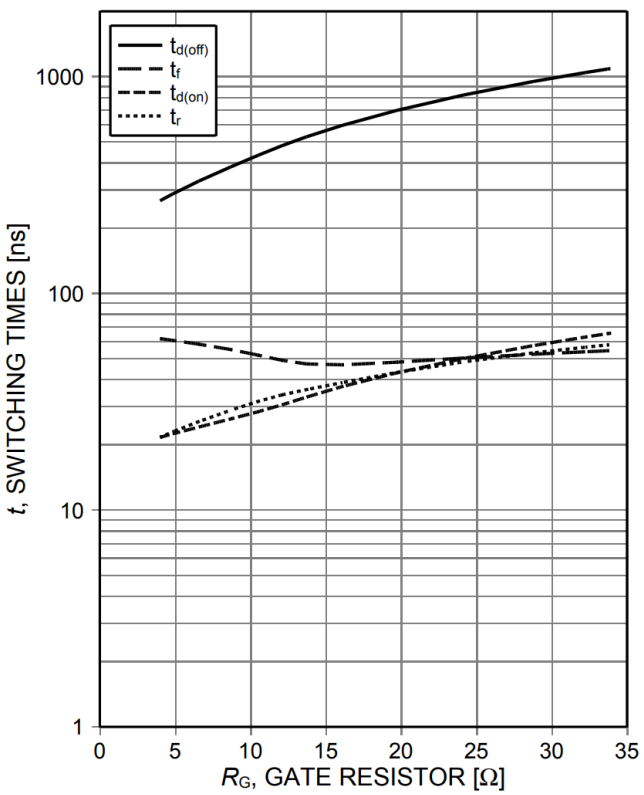


Figure 7. **Typical switching times as a function of gate resistor**
(inductive load, T_{vj}=175°C, V_{CE}=600V, V_{GE}=0/15V, I_C=40A, Dynamic test circuit in Figure E)

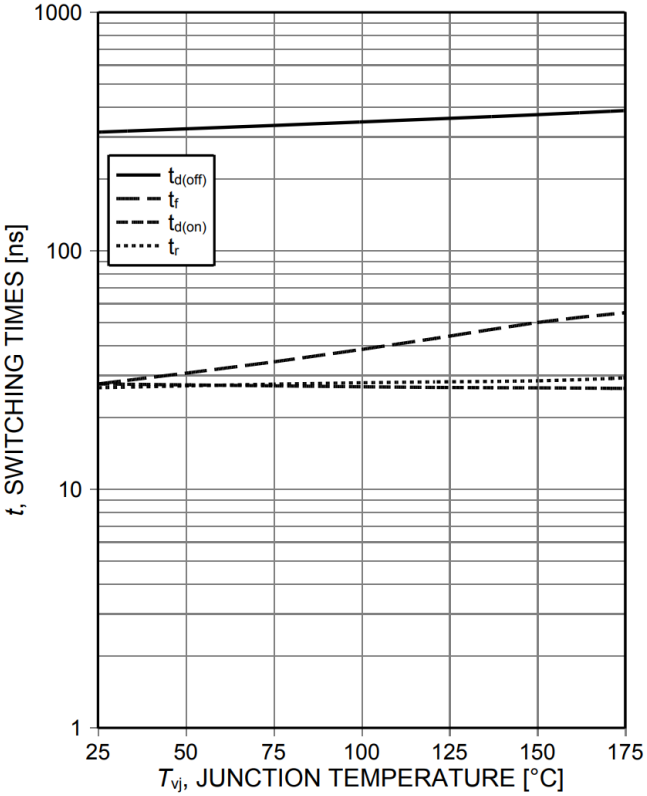


Figure 8. **Typical switching times as a function of junction temperature**
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=40A, R_G=9Ω, Dynamic test circuit in Figure E)

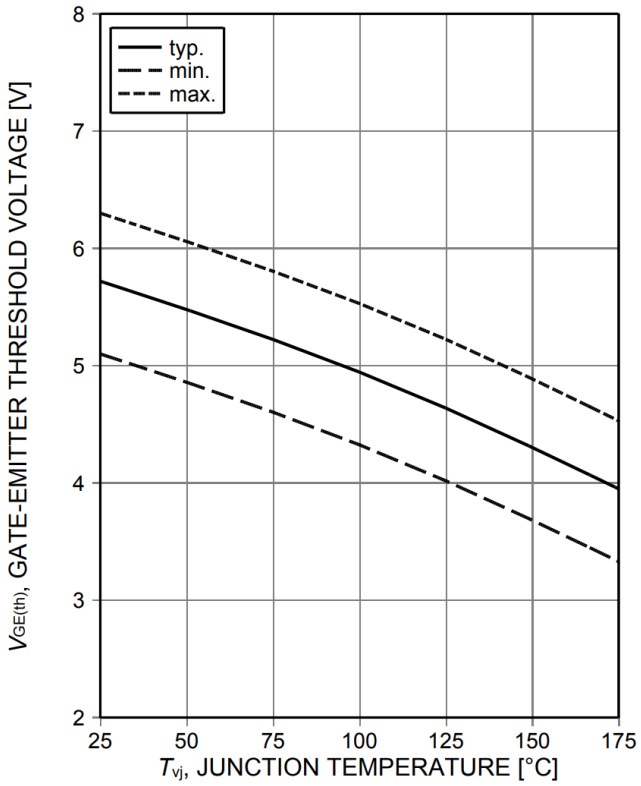


Figure 9. **Gate-emitter threshold voltage as a function of junction temperature** (I_C=1.9mA)

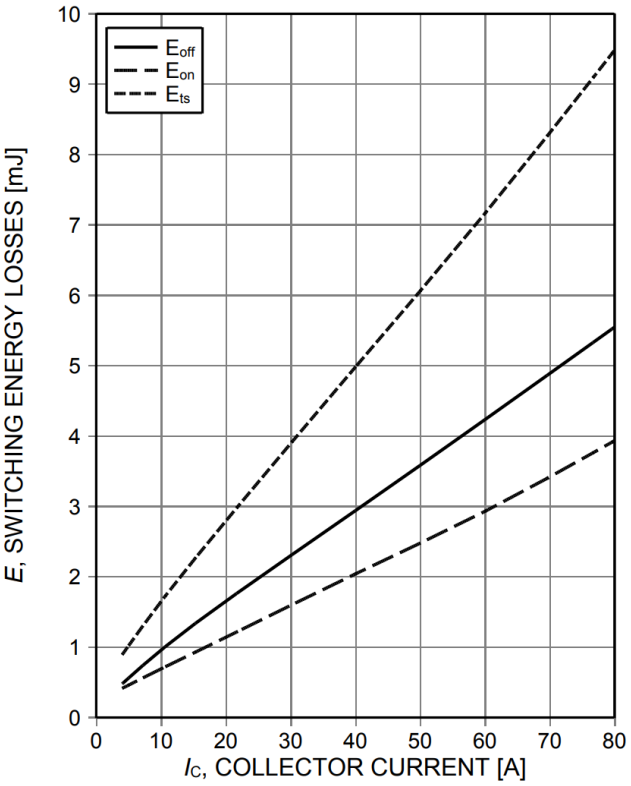


Figure 10. **Typical switching energy losses as a function of collector current** (inductive load, T_{vj}=175°C, V_{CE}=600V,V_{GE}=0/15V, R_G=9Ω, Dynamic test circuit in Figure E)

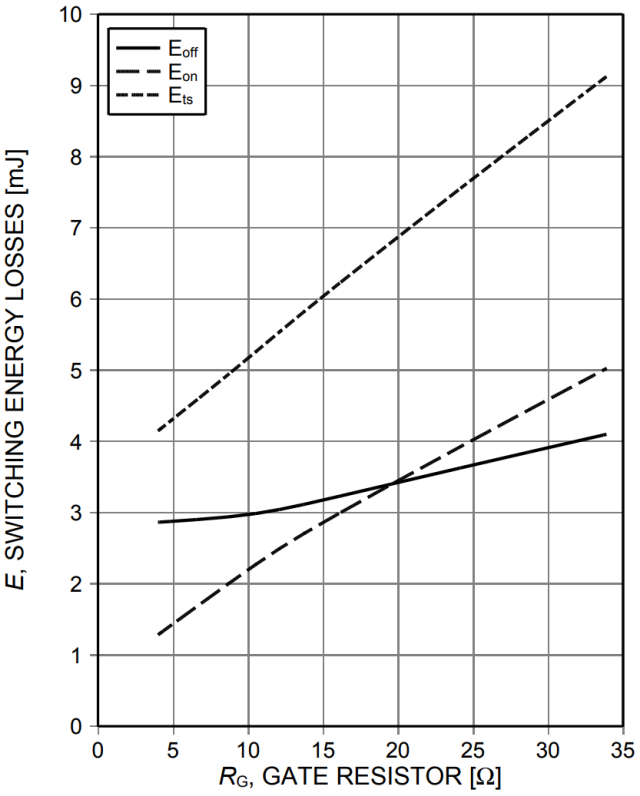


Figure 11. **Typical switching energy losses as a function of gate resistor** (inductive load, T_{vj}=175°C, V_{CE}=600V, V_{GE}=0/15V, I_C=40A, Dynamic test circuit in Figure E)

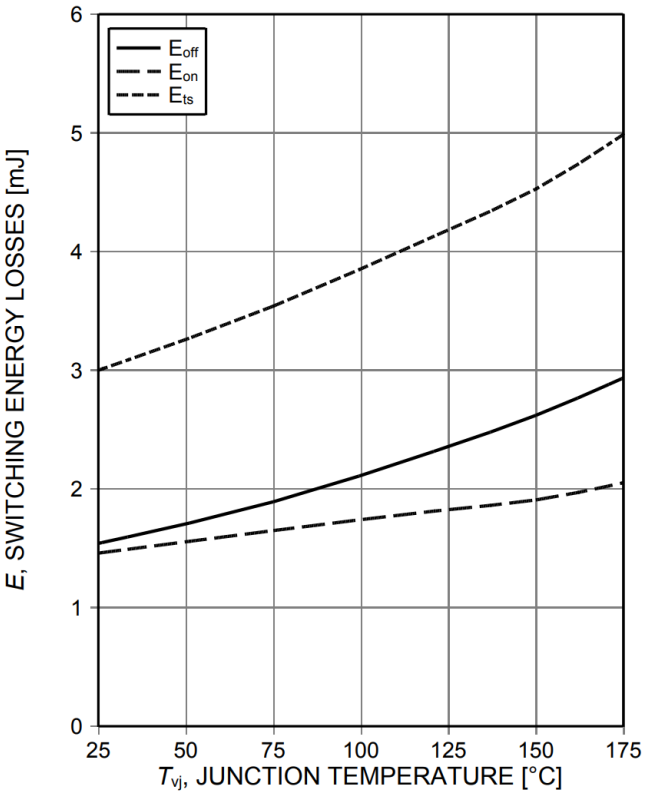


Figure 12. **Typical switching energy losses as a function of junction temperature** (inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=40A, R_G=9Ω, Dynamic test circuit in Figure E)

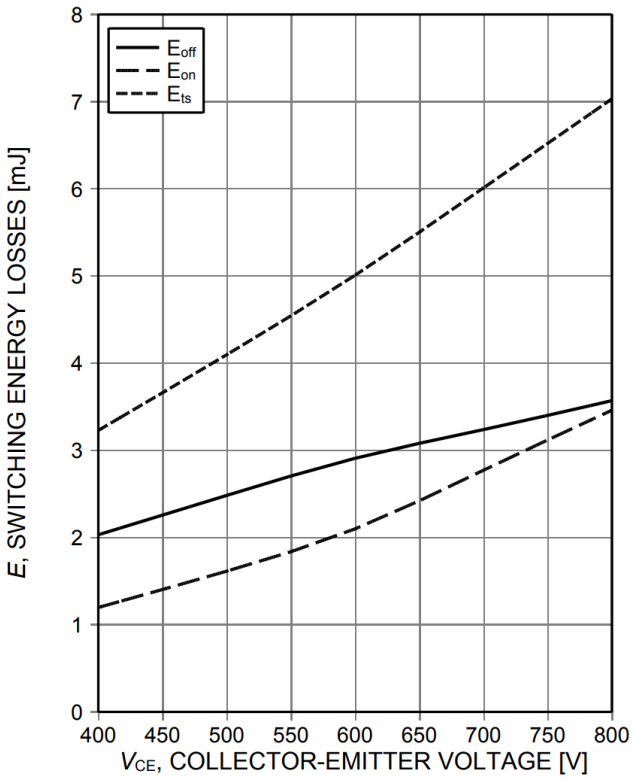


Figure 13. **Typical switching energy losses as a function of collector emitter voltage**
(inductive load, T_{vj}=175°C, V_{GE}=0/15V, I_C=40A, R_G=9Ω, Dynamic test circuit in Figure E)

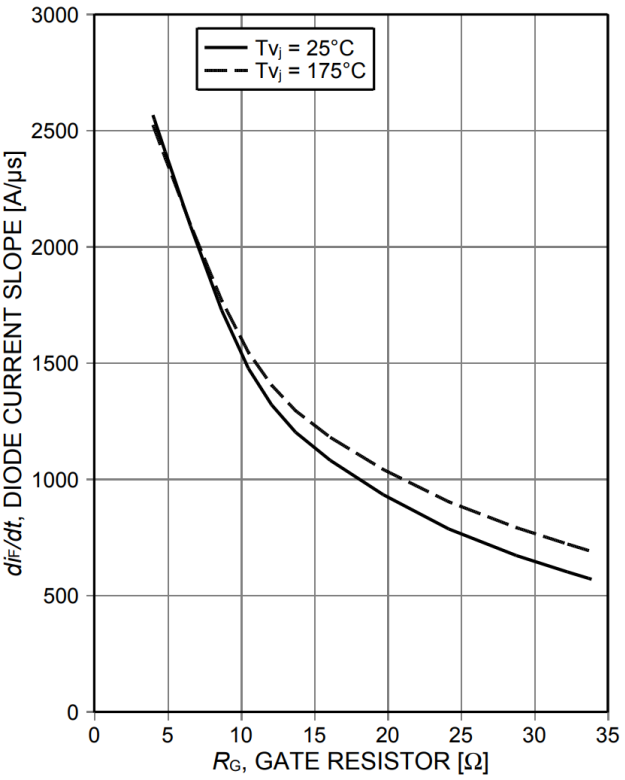


Figure 14. **Typical diode current slope as a function of gate resistor**
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=40A, Dynamic test circuit in Figure E)

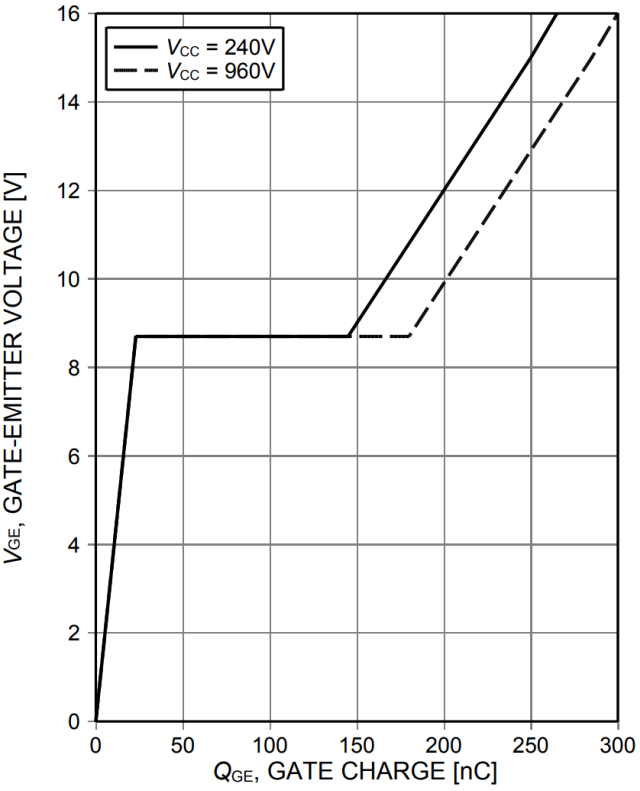


Figure 15. **Typical gate charge**
(I_C=40A)

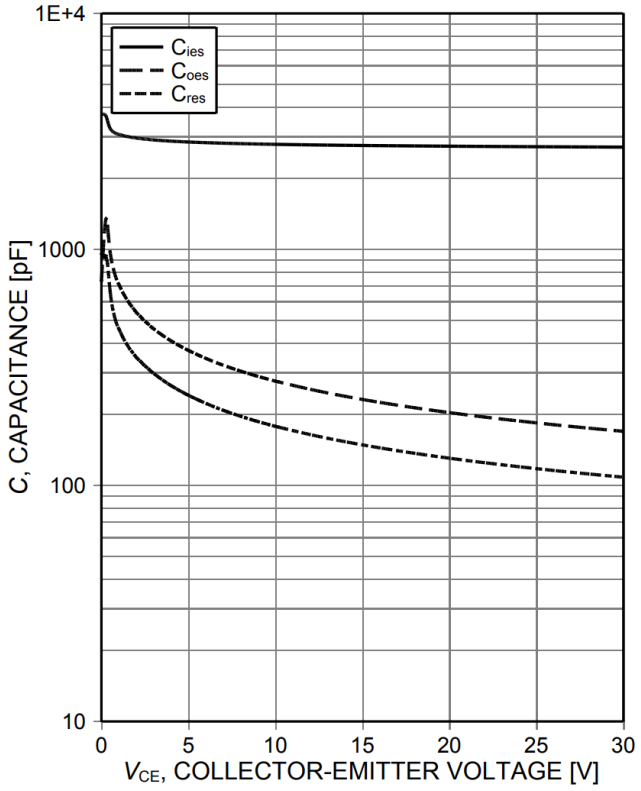


Figure 16. **Typical capacitance as a function of collector-emitter voltage**
(V_{GE}=0V, f=1MHz)

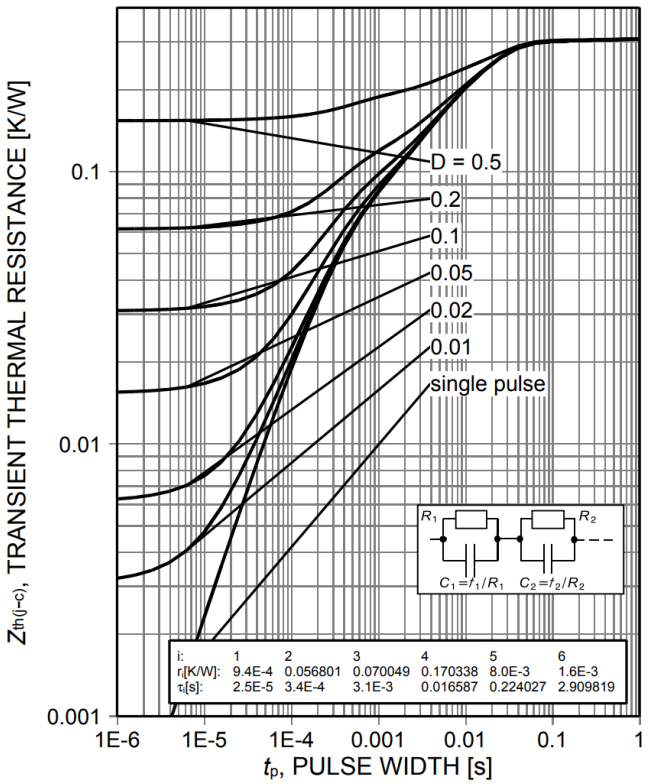


Figure 17. **IGBT transient thermal resistance** ($D=t_p/T$)

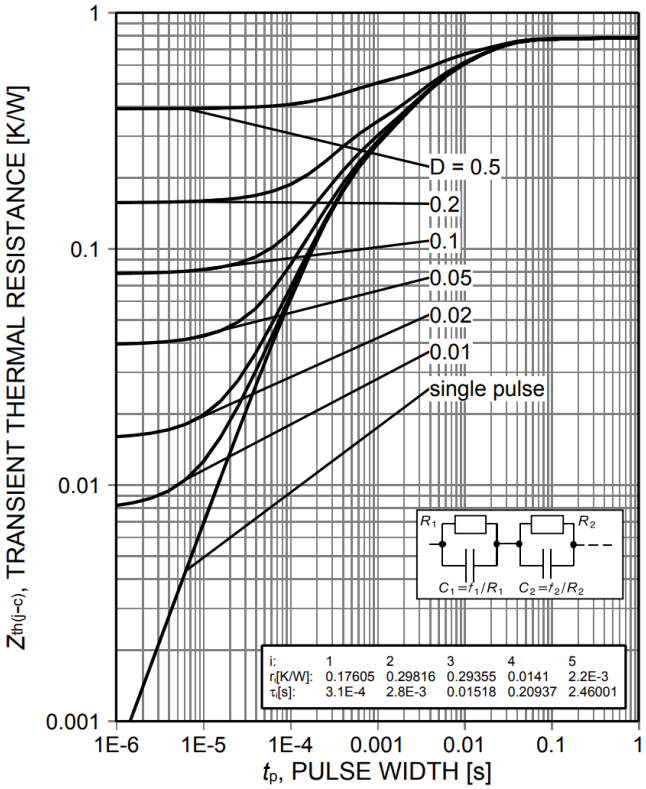


Figure 18. **Diode transient thermal impedance as a function of pulse width** ($D=t_p/T$)

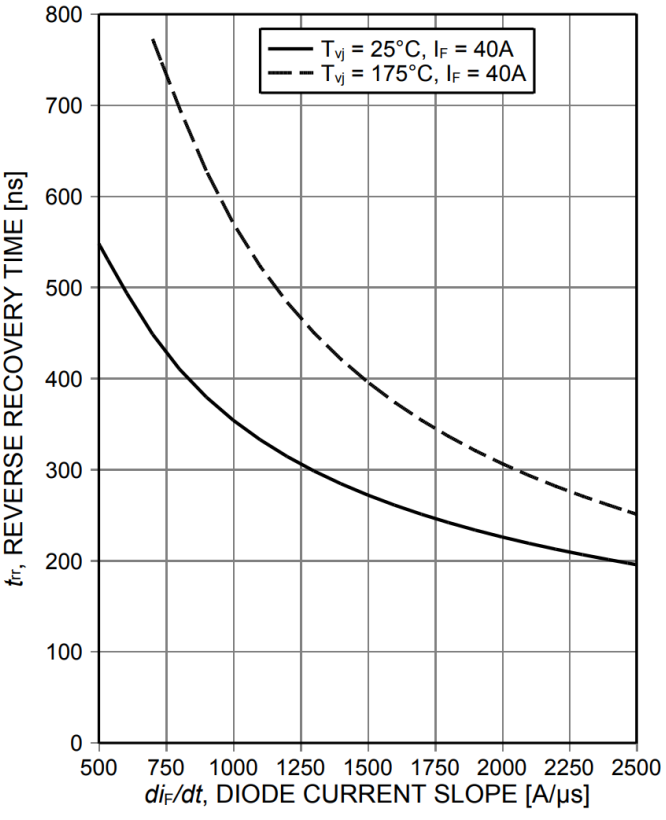


Figure 19. **Typical reverse recovery time as a function of diode current slope** (V_R=600V)

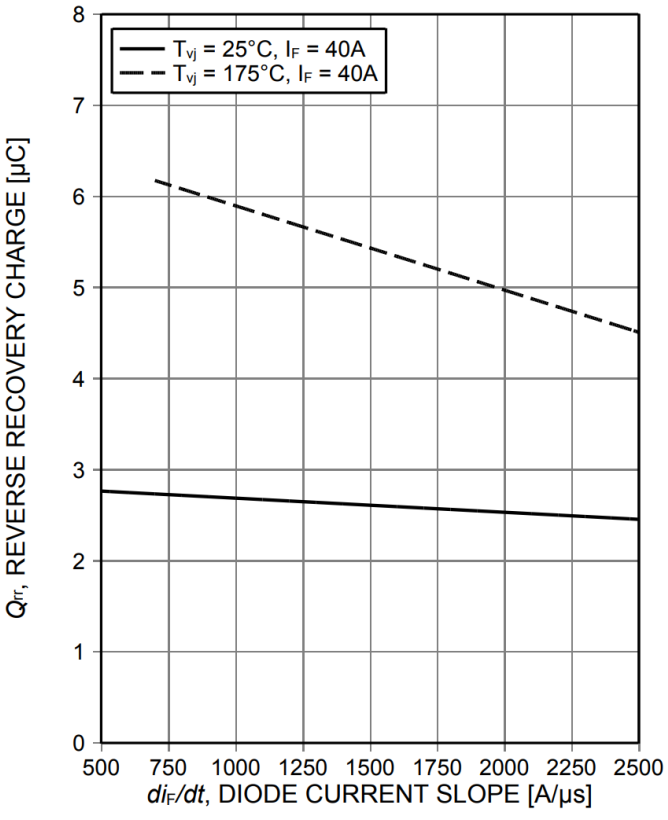


Figure 20. **Typical reverse recovery charge as a function of diode current slope** (V_R=600V)

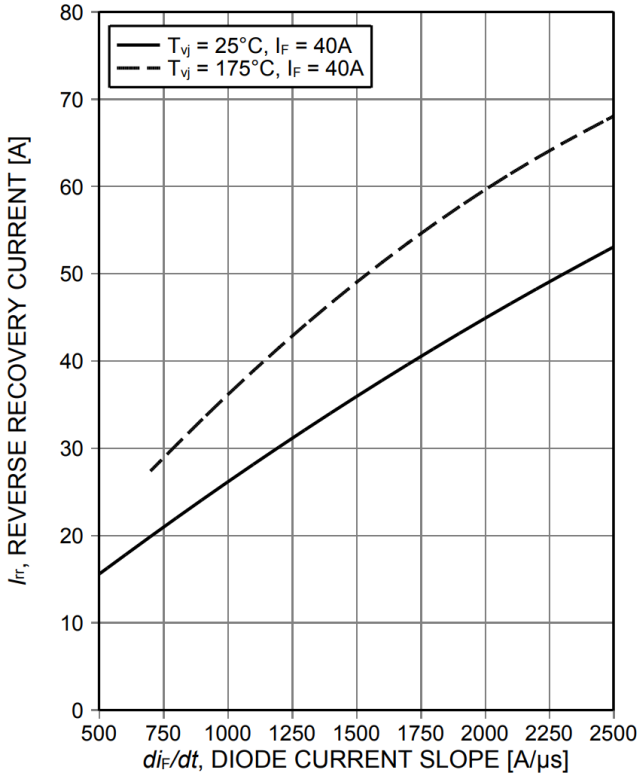


Figure 21. **Typical reverse recovery charge as a function of diode current slope**
(V_R=600V)

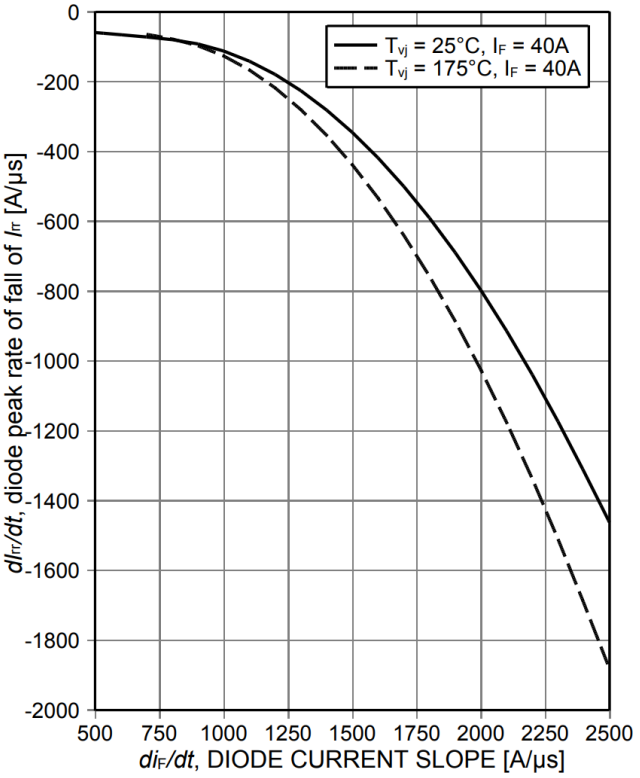


Figure 22. **Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**
(V_R=600V)

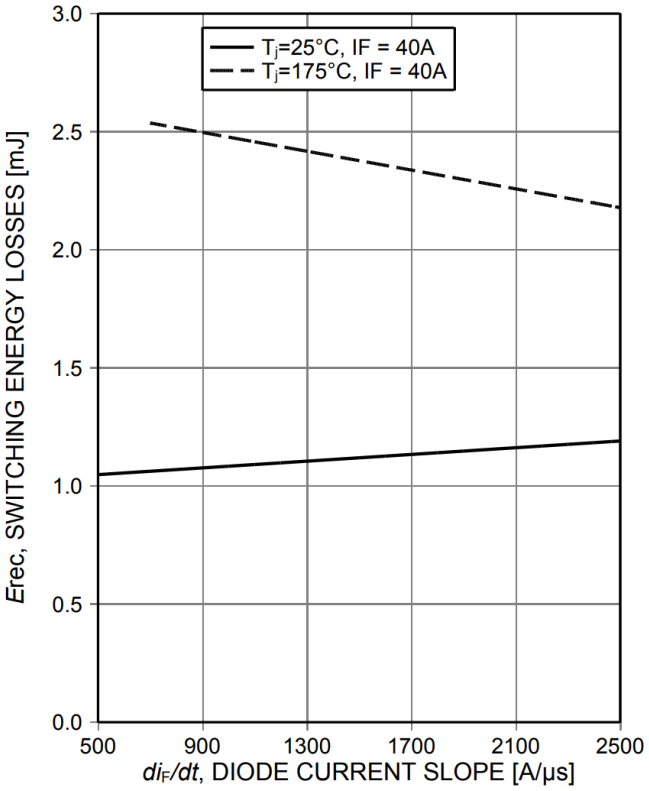


Figure 23. **Typical reverse energy losses as a function of diode current slope**
(V_R=600V)

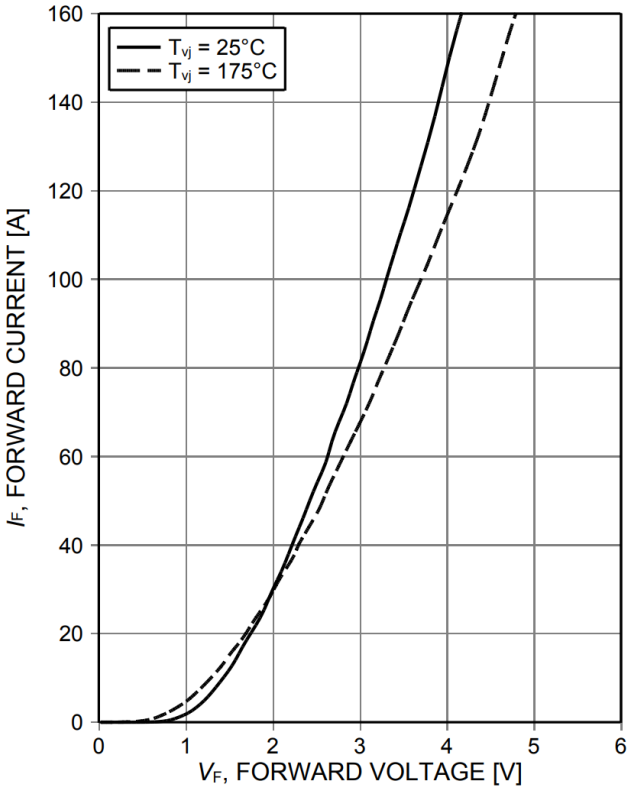


Figure 24. **Typical diode forward current as a function of forward voltage**

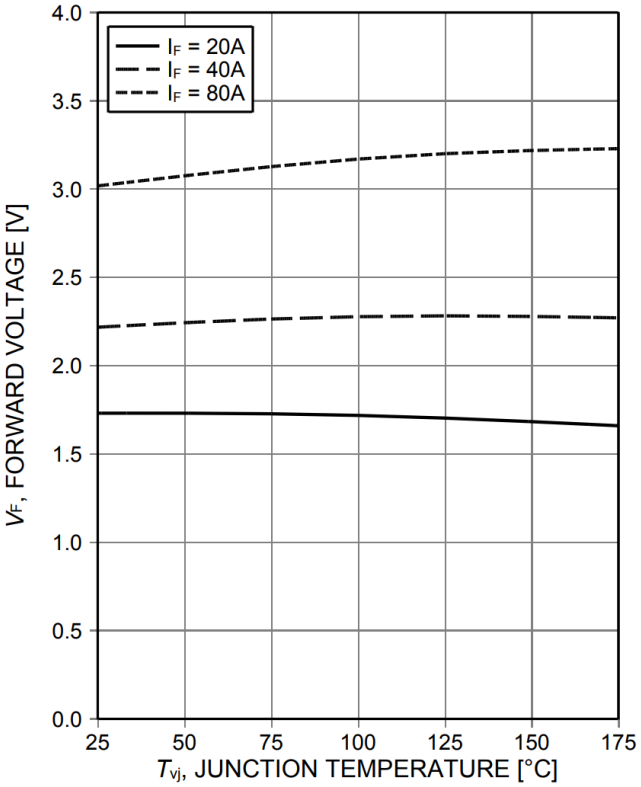
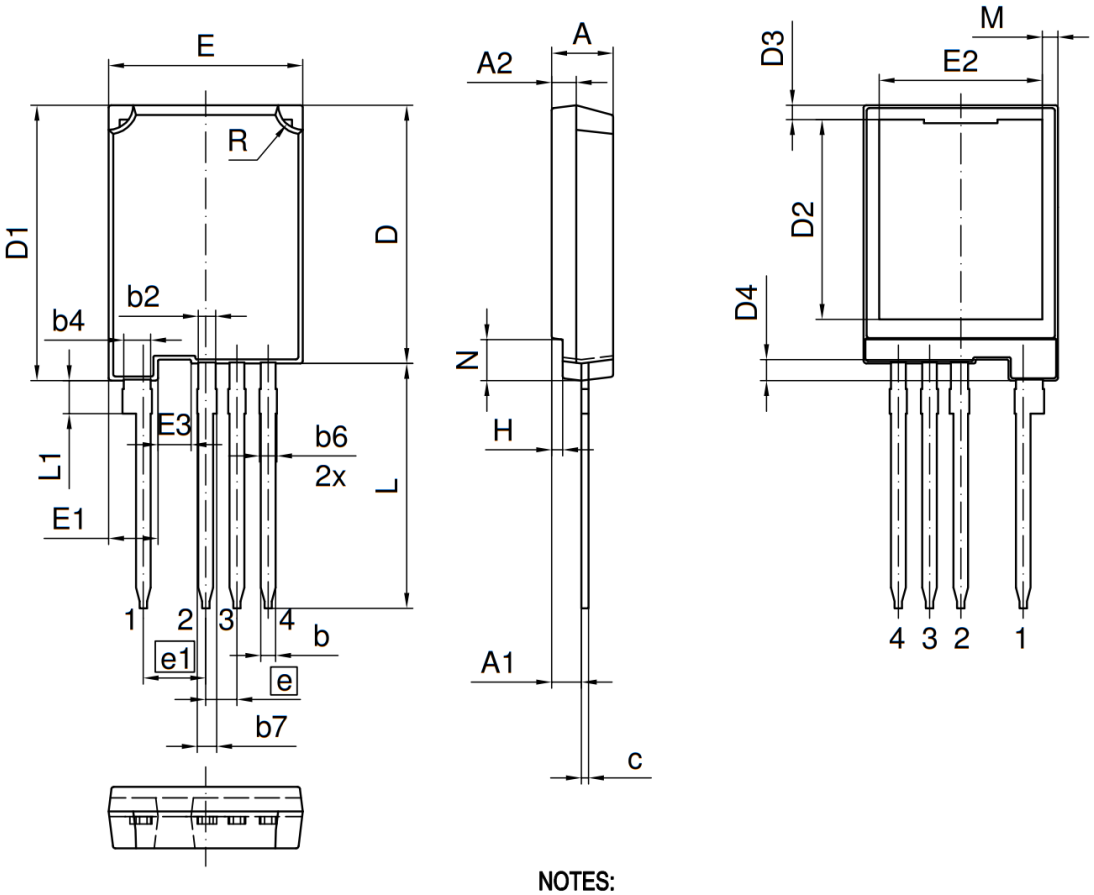


Figure 25. **Typical diode forward voltage as a function of junction temperature**

PG-TO247-4-2



NOTES:

PACKAGE SURFACE ROUTE BETWEEN PIN 1 & PIN 2 WILL BE 5.1mm MIN.

ALL b... AND c DIMENSIONS INCLUDING PLATING EXCEPT AREA OF CUTTING

DIMENSION	MILLIMETERS	
	MIN.	MAX.
A	4.9	5.1
A1	2.31	2.51
A2	1.9	2.1
b	1.16	1.29
b2	1.36	1.49
b4	2.16	2.29
b6	1.16	1.45
b7	1.16	1.65
c	0.59	0.66
D	20.9	21.1
D1	22.3	22.5
D2	15.95	16.55
D3	1	1.35
D4	1.6	1.8
E	15.7	15.9
E1	3.9	4.1
E2	13.1	13.5
E3	2.58	2.78
e	2.54	
e1	5.08	
H	0.8	1
L	19.8	20.1
L1	2.55	2.85
M	0.97	1.57
N	3.24	3.44
R	1.9	2.1

DOCUMENT NO.	Z8B00182798
REVISION	01
SCALE 2:1	0 5 10mm
EUROPEAN PROJECTION	
ISSUE DATE	23.09.2016

测试条件

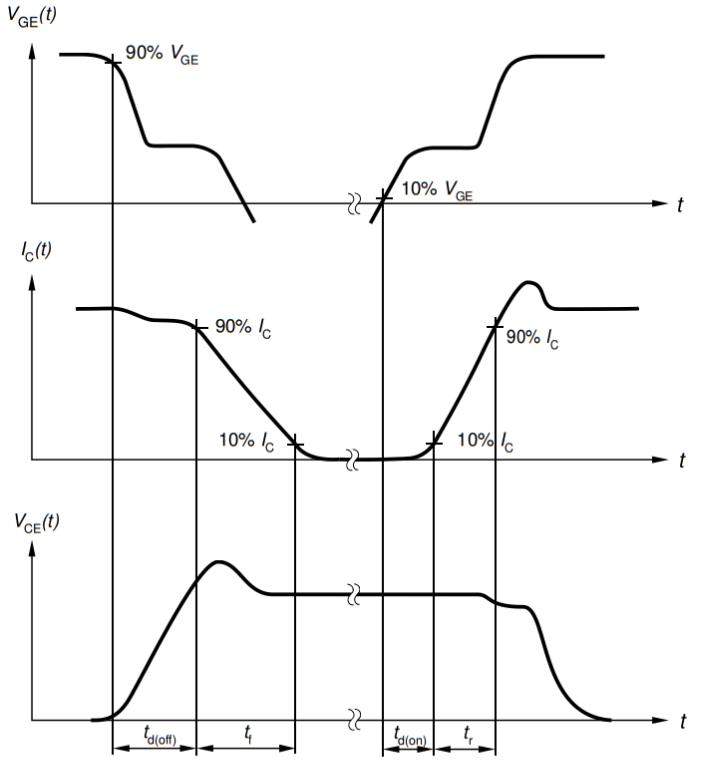


Figure A. **Definition of switching times**

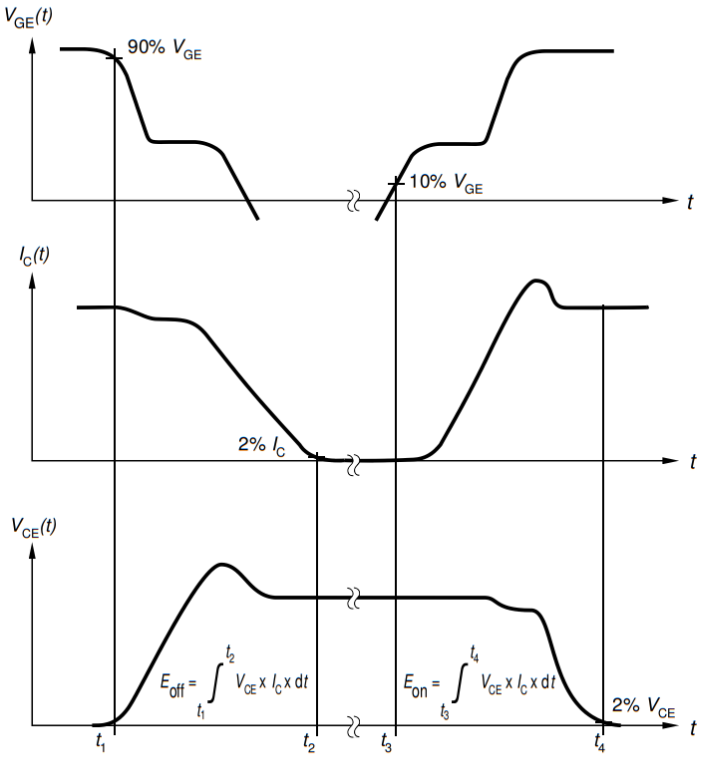


Figure B. **Definition of switching losses**

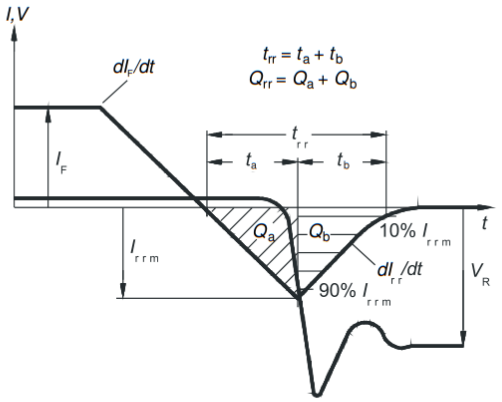


Figure C. **Definition of diode switching characteristics**

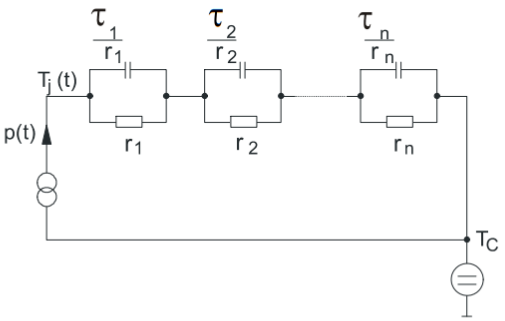


Figure D. **Thermal equivalent circuit**

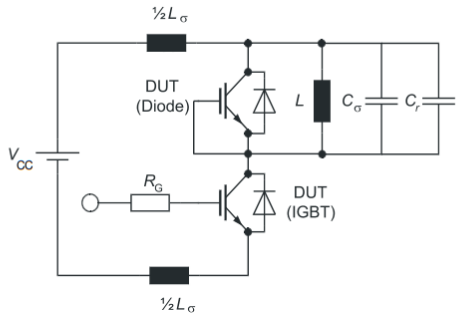


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

第六代，高速软开关系列

修订记录

IKY40N120CS6

Revision: 2018-05-07, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.1	2018-05-07	Final data sheet

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