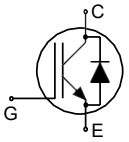
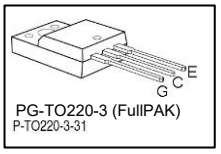
IKA15N60T

TRENCHSTOP™ 系列

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





特性：

- 极低 $V_{CE(sat)}$ 1.5V（典型值）
- 最高结温 175°C
- 短路耐受时间 5 µs
- 适用于 600V 应用的 TRENCHSTOP™ 和场截止技术提供：
  - 参数分布紧密
  - 高稳健性、温度稳定性
  - 切换速度快
- $V_{CE(sat)}$ 正温度系数
- 低电磁干扰
- 符合 JEDEC[1]目标应用要求
- 无铅引脚镀层；符合 RoHS 标准
- 完整的产品品类和 PSpice 模型： http://www.infineon.cn/igbt/

应用：

- 空调
- 逆变器

Type	V_{CE}	I_C	$V_{CE(sat),Tj=25°C}$	$T_{j,max}$	Marking Code	Package
IKA15N60T	600V	15A	1.5V	175°C	K15T60	PG-TO220-3 (FullPAK)

最大额定值

Parameter	Symbol	Value	Unit
Collector-emitter voltage, $T_j \geq 25°C$	V_{CE}	600	V
DC collector current, limited by T_{jmax} $T_C = 25°C$ $T_C = 100°C$	I_C	 18.3 10.6	A
Pulsed collector current, t_p limited by T_{jmax}	I_{Cpuls}	45	
Turn off safe operating area, $V_{CE} = 600V$, $T_j = 175°C$, $t_p = 1µs$	-	45	
Diode forward current, limited by T_{jmax} $T_C = 25°C$ $T_C = 100°C$	I_F	 17.2 10.8	
Diode pulsed current, t_p limited by T_{jmax}	I_{Fpuls}	45	
Gate-emitter voltage	V_{GE}	±20	V
Short circuit withstand time[2] $V_{GE} = 15V$, $V_{CC} \leq 400V$, $T_j \leq 150°C$	t_{SC}	5	µs
Power dissipation $T_C = 25°C$	P_{tot}	35.7	W
Operating junction temperature	T_j	-40...+175	°C
Storage temperature	T_{stg}	-55...+150	
Solder temperature wavesoldering, 1.6 mm (0.063 in.) from case for 10s		260	
Isolation Voltage	V_{isol}	2500	V_{rms}

[1] J-STD-020 and JESD-022
[2] 允许短路次数低于1000次；允许短路间隔时间大于1s

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）。

热阻

Parameter	Symbol	Conditions	Max. Value	Unit
特性				
IGBT thermal resistance, junction – case	R_{thJC}		4.2	K/W
Diode thermal resistance, junction – case	R_{thJCD}		4.8	
Thermal resistance, junction – ambient	R_{thJA}		80	

电气特性，测于T_j=25 °C°的条件下，除非另有规定

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
静态特性						
Collector-emitter breakdown voltage	$V_{(BR)CES}$	V_{GE}= 0 V, I_C= 0 . 2 mA	600	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE}= 15 V, I_C= 15 A				
		T_j= 25 °C	-	1.5	2.05	
		T_j=175 °C	-	1.9	-	
Diode forward voltage	V_F	V_{GE}= 0 V, I_F= 15 A				
		T_j= 25 °C	-	1.65	2.05	
		T_j=175 °C	-	1.6	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C= 210 µ A, V_{CE}= V_{GE}	4.1	4.9	5.7	
Zero gate voltage collector current	I_{CES}	V_{CE}= 600V, V_{GE}= 0 V				µA
		T_j= 25 °C	-	-	40	
		T_j=175 °C	-	-	1000	
Gate-emitter leakage current	I_{GES}	V_{CE}= 0 V, V_{GE}= 20 V	-	-	100	nA
Transconductance	g_{fs}	V_{CE}= 20 V, I_C= 15 A	-	8.7	-	S
Integrated gate resistor	R_{Gint}			-		Ω
动态特性						
Input capacitance	C_{iss}	V_{CE}= 25 V,	-	860	-	pF
Output capacitance	C_{oss}	V_{GE}= 0 V,	-	55	-	
Reverse transfer capacitance	C_{rss}	f= 1 MHz	-	24	-	
Gate charge	Q_{Gate}	V_{CC}= 480 V, I_C= 15 A	-	87	-	nC
		V_{GE}= 15 V				
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	7	-	nH
Short circuit collector current[1)]	$I_{C(SC)}$	V_{GE}= 15 V, t_{SC}≤ 5 µs V_{CC}= 400 V, T_j≤ 150° C	-	137.5	-	A

[1)] 允许短路次数低于1000次；允许短路间隔时间大于1s

开关特性，感性负载，测于T_j = 25 °C的条件下

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
IGBT特性						
Turn-on delay time	$t_{d(on)}$	T_j = 25 °C, V_{CC} = 400 V, I_C = 15 A, V_{GE} = 0 / 15 V, r_G = 15 Ω , L_σ = 154 n H, C_σ = 39 pF L_σ, C_σ f rom Fig. E Energy losses include “tail” and diode reverse recovery.	-	17	-	ns
Rise time	t_r		-	11	-	
Turn-off delay time	$t_{d(off)}$		-	188	-	
Fall time	t_f		-	50	-	
Turn-on energy	E_{on}		-	0.22	-	mJ
Turn-off energy	E_{off}		-	0.35	-	
Total switching energy	E_{ts}		-	0.57	-	
反并联二极管特性						
Diode reverse recovery time	t_{rr}	T_j = 25 °C, V_R = 400 V, I_F = 15 A, di_F/dt = 825 A/ µs	-	34	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.24	-	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		-	718	-	A/µs

开关特性，感性负载， T_j = 175 °C

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
IGBT特性						
Turn-on delay time	$t_{d(on)}$	T_j = 175 °C, V_{CC} = 400 V, I_C = 15 A, V_{GE} = 0 / 15 V, r_G = 15 Ω , L_σ = 154 n H, C_σ = 39 pF L_σ, C_σ f rom Fig. E Energy losses include “tail” and diode reverse recovery.	-	17	-	ns
Rise time	t_r		-	15	-	
Turn-off delay time	$t_{d(off)}$		-	212	-	
Fall time	t_f		-	79	-	
Turn-on energy	E_{on}		-	0.34	-	mJ
Turn-off energy	E_{off}		-	0.47	-	
Total switching energy	E_{ts}		-	0.81	-	
反并联二极管特性						
Diode reverse recovery time	t_{rr}	T_j=175 °C V_R = 400 V, I_F = 15 A, di_F/dt =825 A/ µs	-	140	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.0	-	µC
Diode peak reverse recovery current	I_{rrm}		-	14.7	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	495	-	A/µs

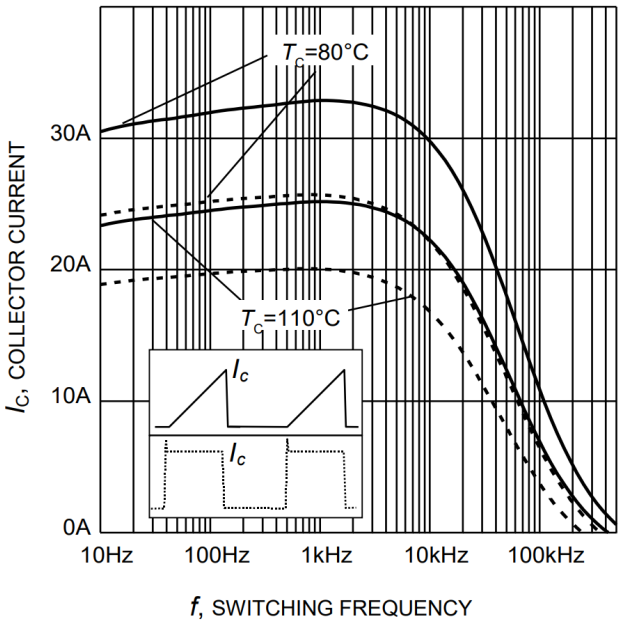


Figure 1. Collector current as a function of switching frequency
($T_j \leq 175°C$, $D = 0.5$, $V_{CE} = 400V$, $V_{GE} = 0/15V$, $r_G = 15\Omega$)

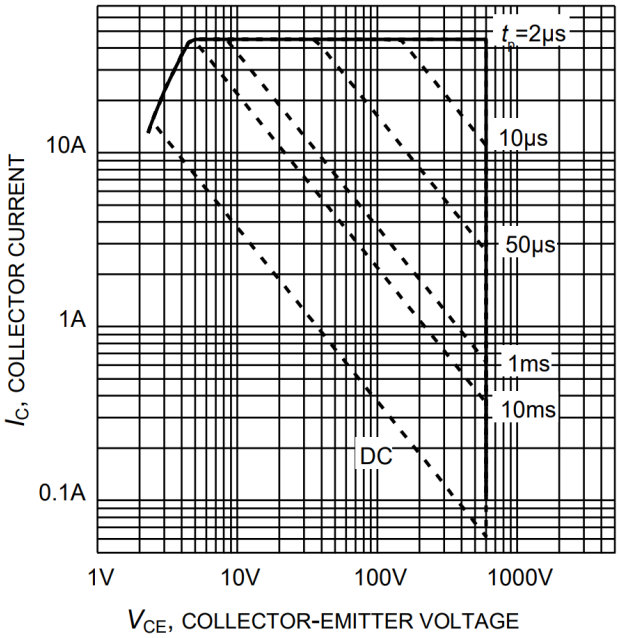


Figure 2. Safe operating area
($D = 0$, $T_C = 25°C$, $T_j \leq 175°C$; V_{GE}=0/15V)

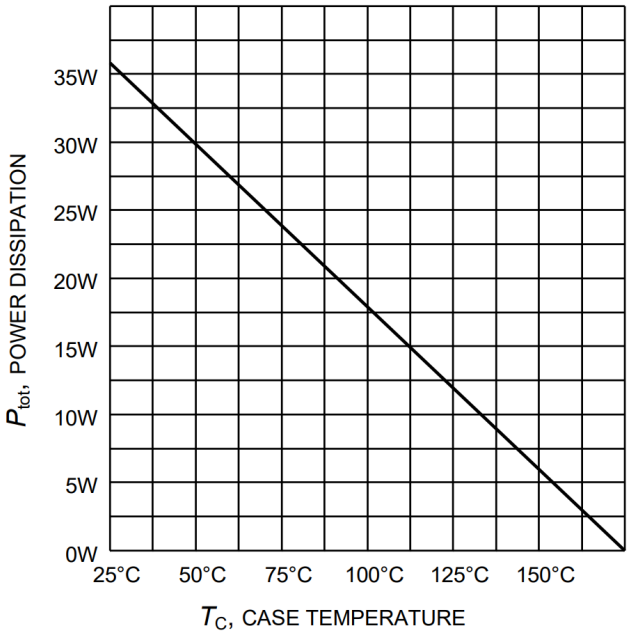


Figure 3. Power dissipation as a function of case temperature
($T_j \leq 175°C$)

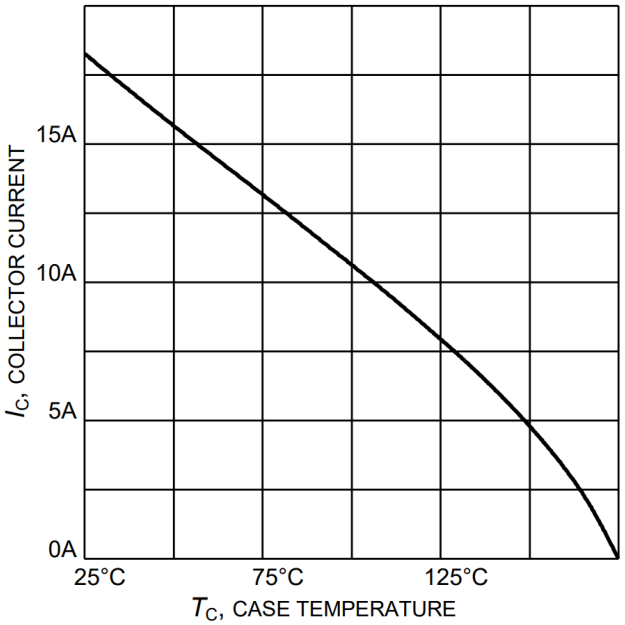


Figure 4. Collector current as a function of case temperature
($V_{GE} \geq 15V$, $T_j \leq 175°C$)

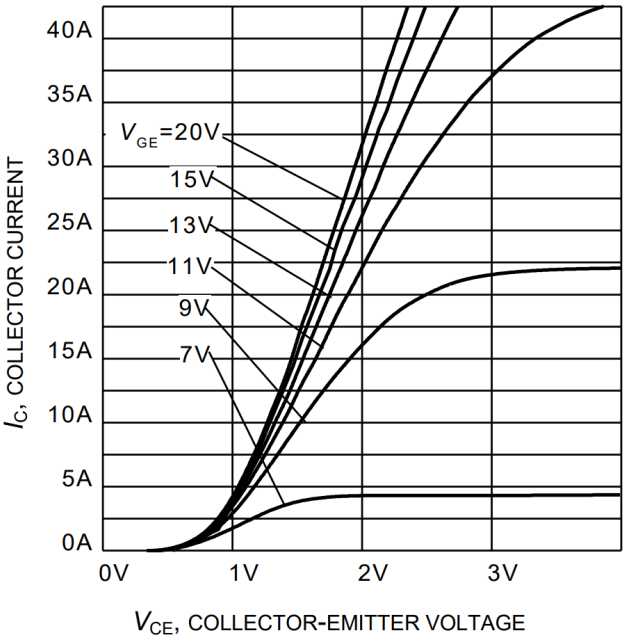


Figure 5. Typical output characteristic
(T_j = 25°C)

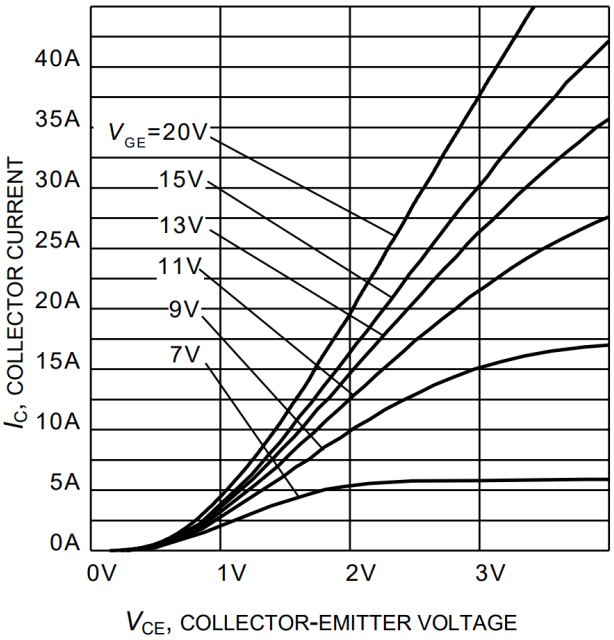


Figure 6. Typical output characteristic
(T_j = 175°C)

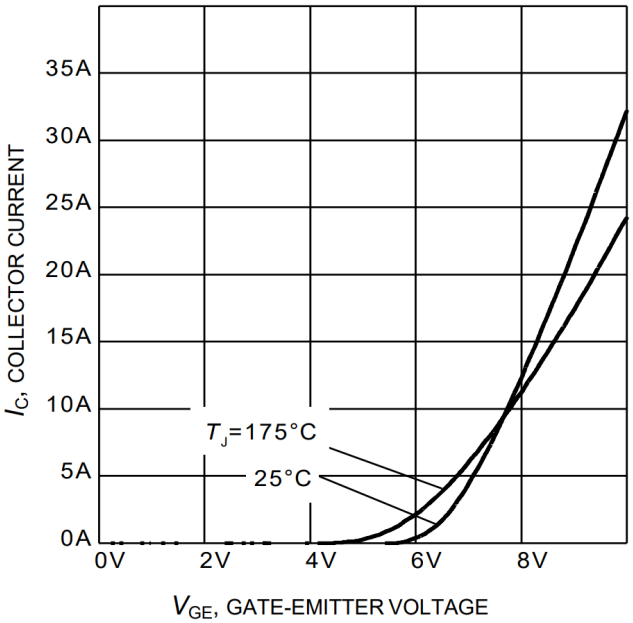


Figure 7. Typical transfer characteristic
(V_{CE}=20V)

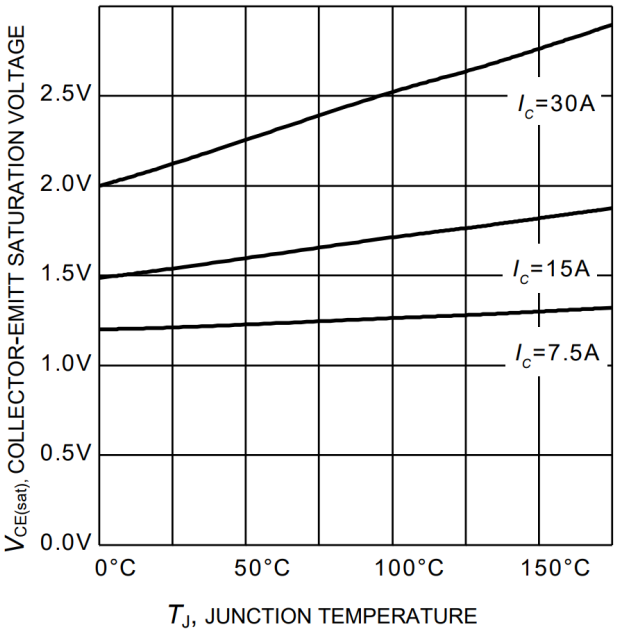


Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE} = 15V)

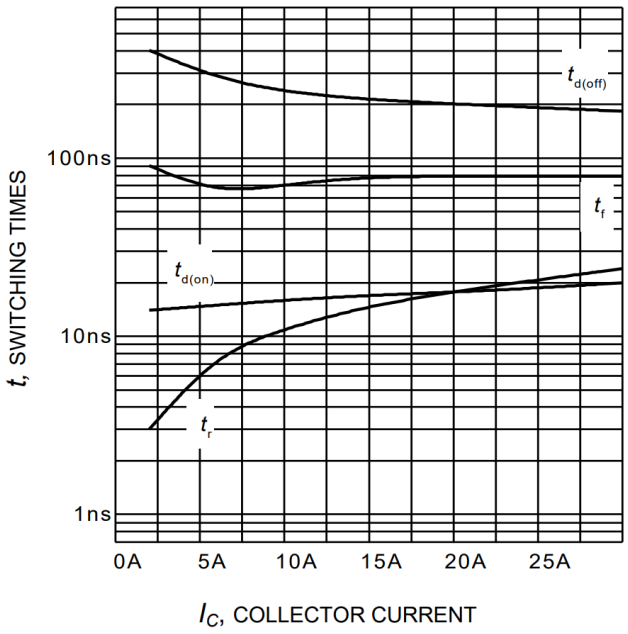


Figure 9. Typical switching times as a function of collector current
(inductive load, T_J=175°C,
V_{CE} = 400V, V_{GE} = 0/15V, r_G = 15Ω,
Dynamic test circuit in Figure E)

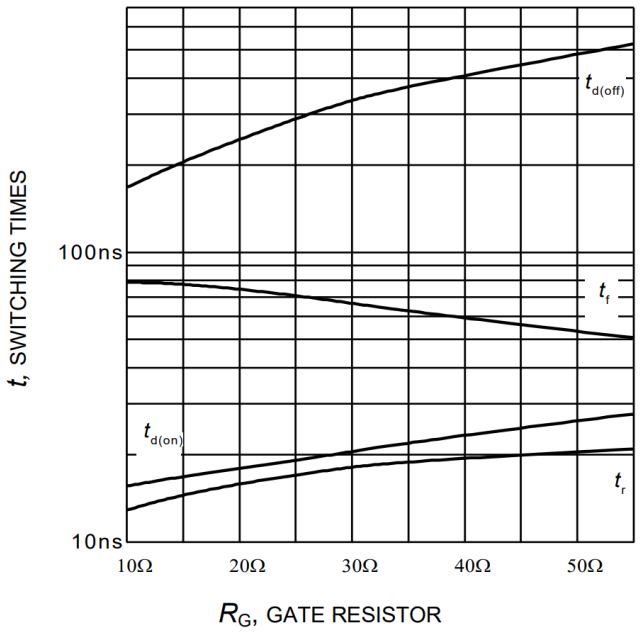


Figure 10. Typical switching times as a function of gate resistor
(inductive load, T_J = 175°C,
V_{CE}= 400V, V_{GE} = 0/15V, I_C = 15A,
Dynamic test circuit in Figure E)

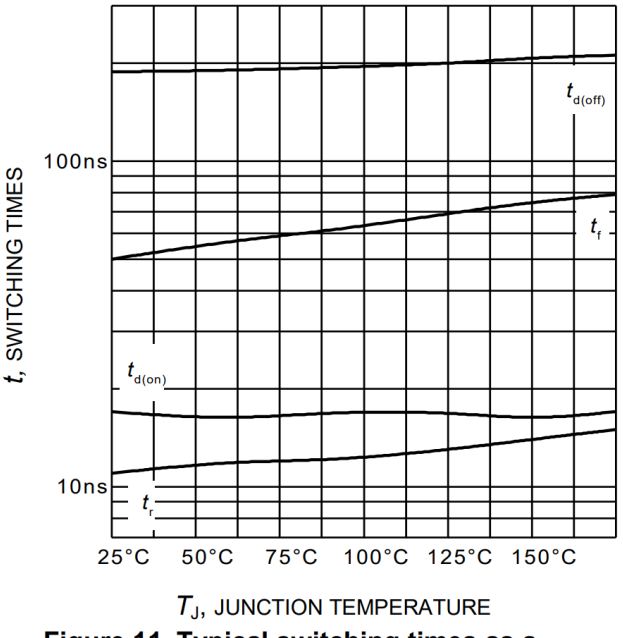


Figure 11. Typical switching times as a function of junction temperature
(inductive load, V_{CE} = 400V,
V_{GE} = 0/15V, I_C = 15A, r_G=15Ω,
Dynamic test circuit in Figure E)

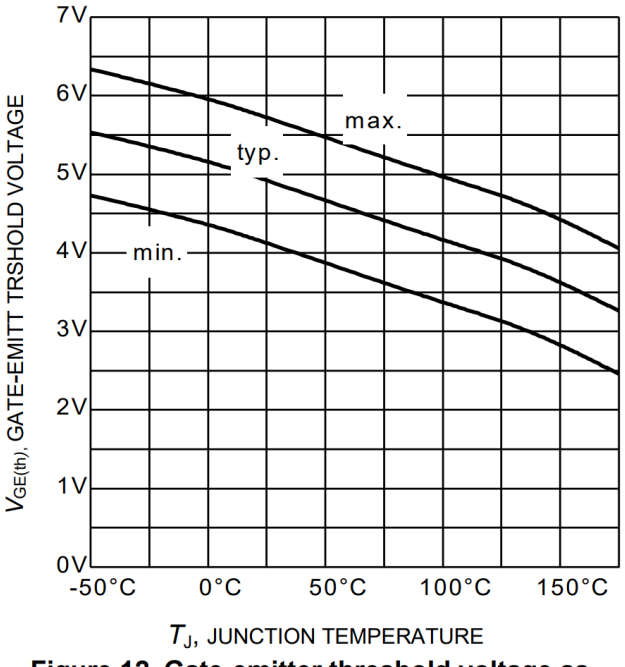


Figure 12. Gate-emitter threshold voltage as a function of junction temperature
(I_C = 0.21mA)

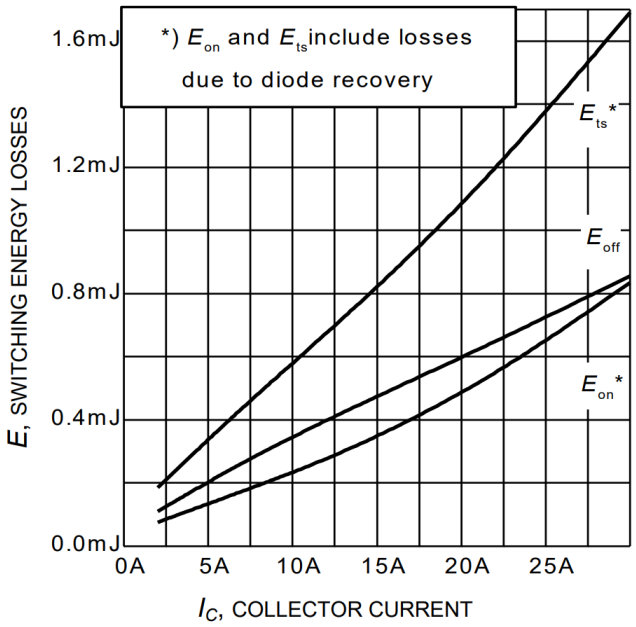


Figure 13. Typical switching energy losses as a function of collector current
(inductive load, T_J = 175°C, V_{CE} = 400V, V_{GE} = 0/15V, r_G = 15Ω, Dynamic test circuit in Figure E)

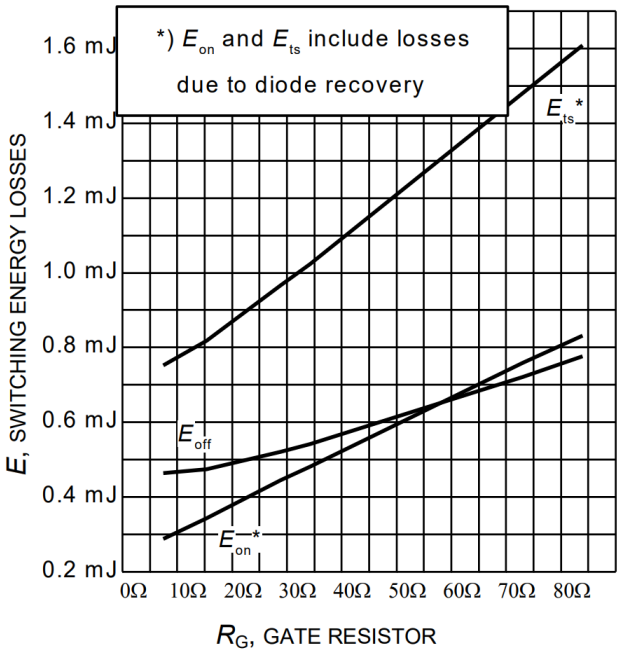


Figure 14. Typical switching energy losses as a function of gate resistor
(inductive load, T_J = 175°C, V_{CE} = 400V, V_{GE} = 0/15V, I_C = 15A, Dynamic test circuit in Figure E)

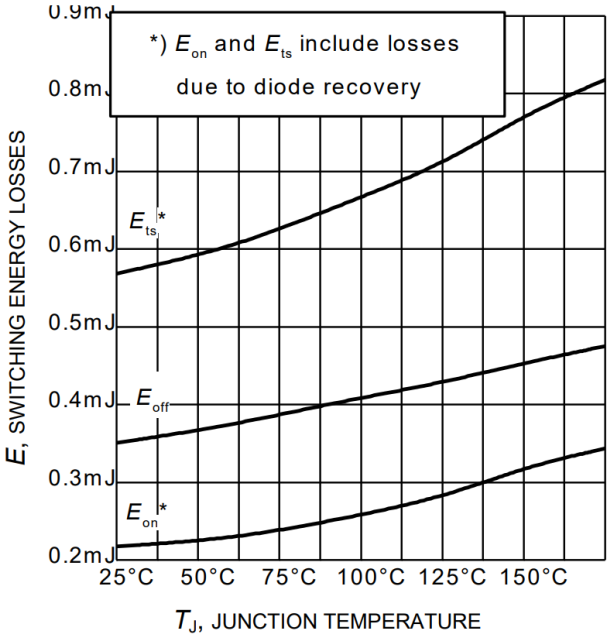


Figure 15. Typical switching energy losses as a function of junction temperature
(inductive load, V_{CE} = 400V, V_{GE} = 0/15V, I_C = 15A, r_G = 15Ω, Dynamic test circuit in Figure E)

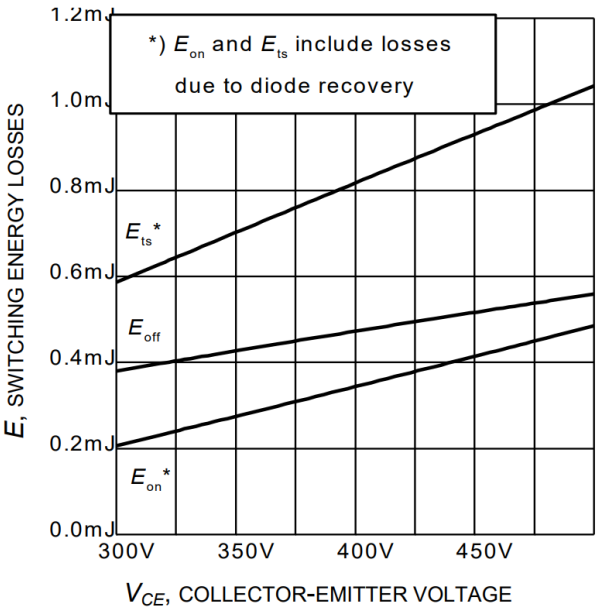


Figure 16. Typical switching energy losses as a function of collector emitter voltage
(inductive load, T_J = 175°C, V_{GE} = 0/15V, I_C = 15A, r_G = 15Ω, Dynamic test circuit in Figure E)

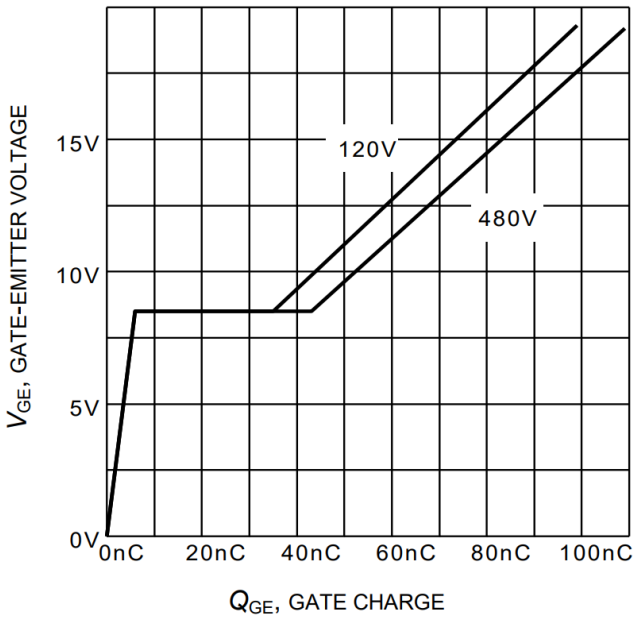


Figure 17. Typical gate charge
(I_C=15 A)

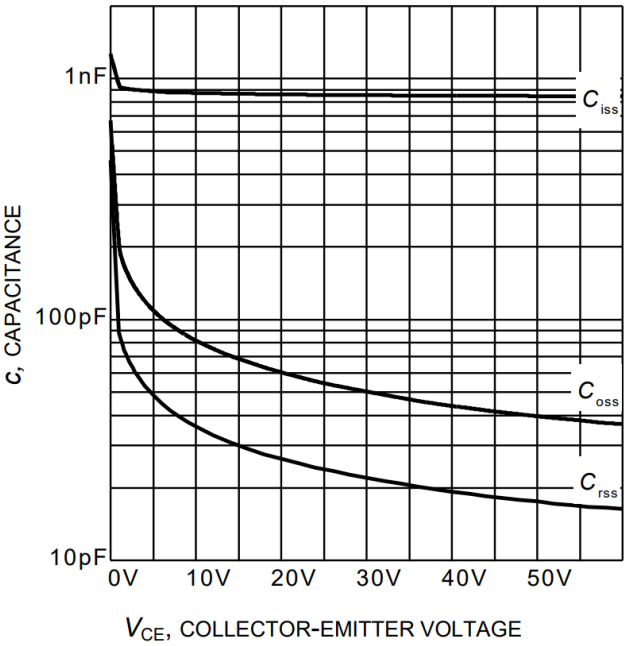


Figure 18. Typical capacitance as a function of collector-emitter voltage
(V_{GE}=0V, f = 1 MHz)

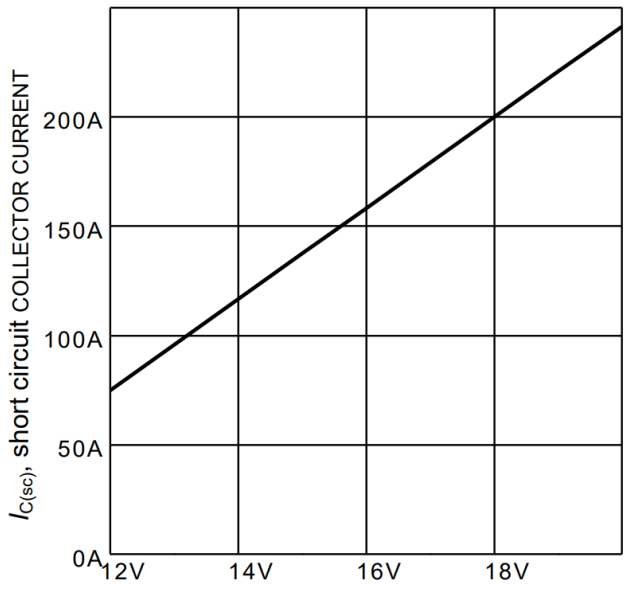


Figure 19. Typical short circuit collector current as a function of gate-emitter voltage
($V_{CE} \le$ 400V, $T_j \le$ 150°C)

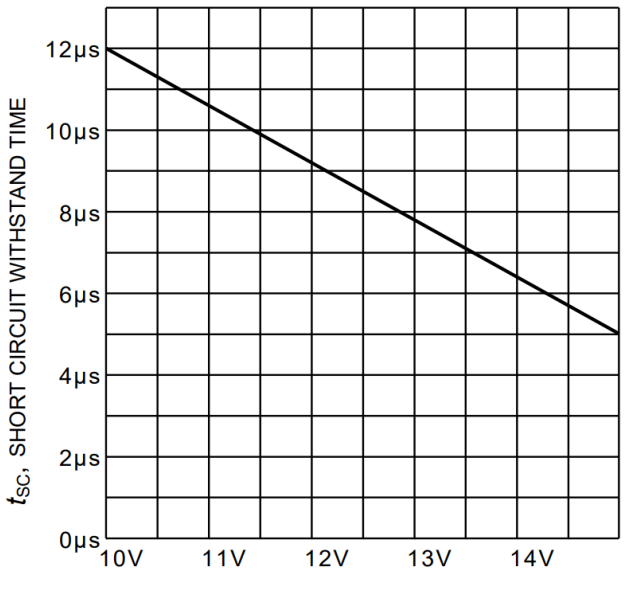


Figure 20. Short circuit withstand time as a function of gate-emitter voltage
(V_{CE}=400V, start at T_J=25°C, T_{Jmax}<150°C)

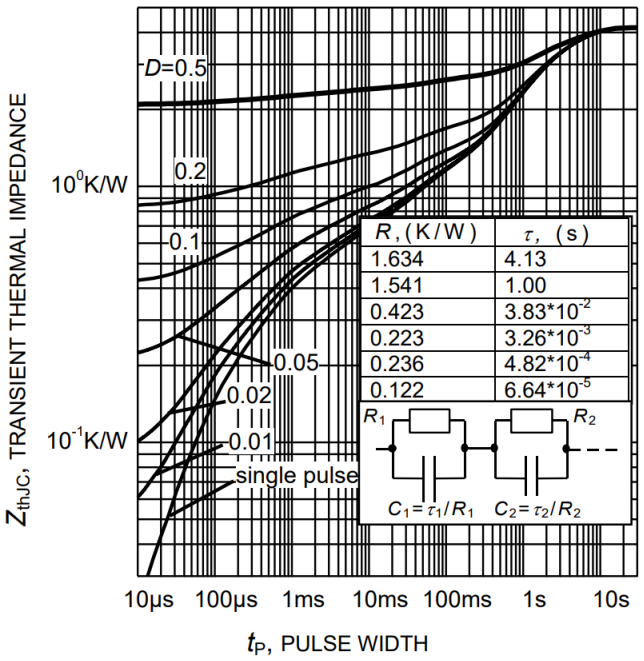


Figure 21. IGBT transient thermal impedance
($D = t_p / T$)

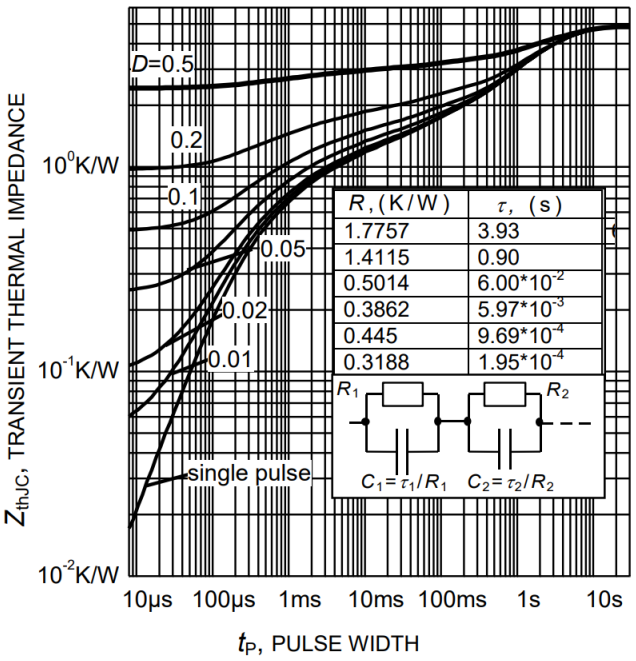


Figure 22. Diode transient thermal impedance as a function of pulse width
($D=t_P/T$)

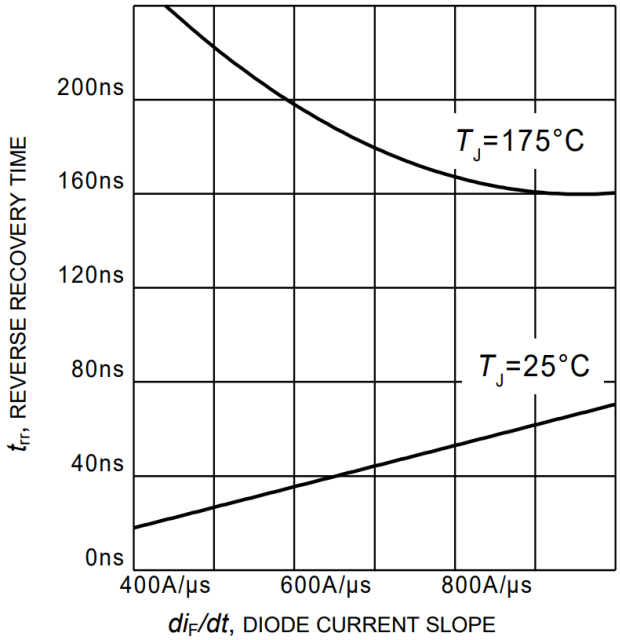


Figure 23. Typical reverse recovery time as a function of diode current slope
(V_R=400V, I_F=15A,
Dynamic test circuit in Figure E)

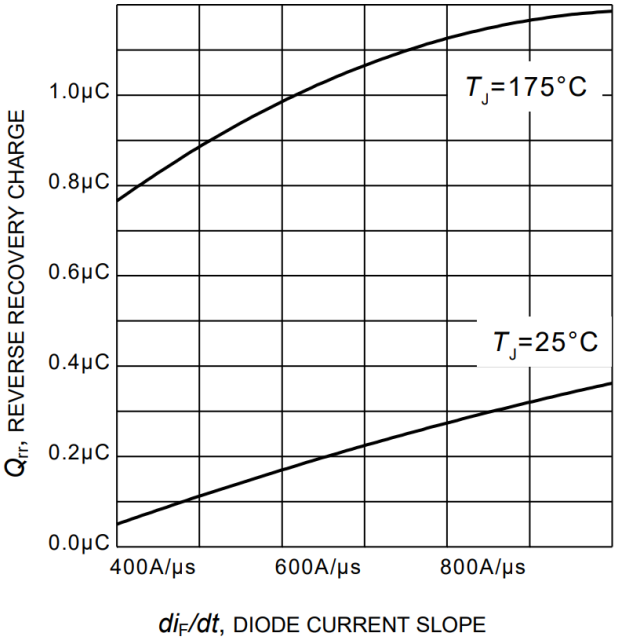


Figure 24. Typical reverse recovery charge as a function of diode current slope
(V_R = 400V, I_F = 15A,
Dynamic test circuit in Figure E)

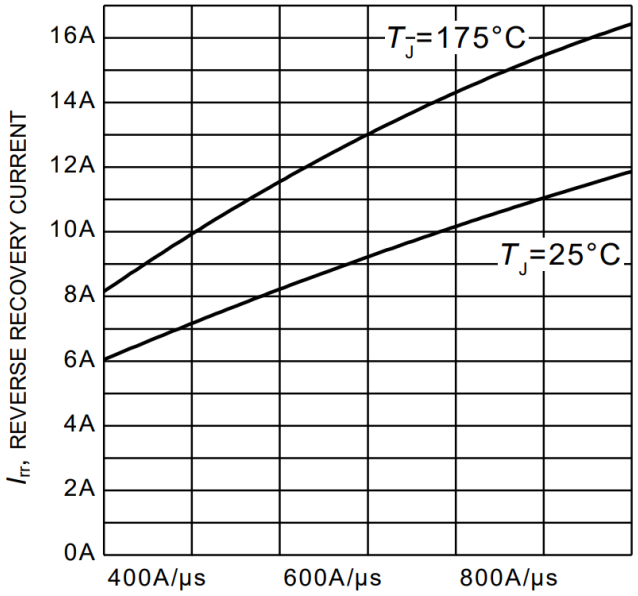


Figure 25. Typical reverse recovery current as a function of diode current slope
(V_R = 400V, I_F = 15A,
Dynamic test circuit in Figure E)

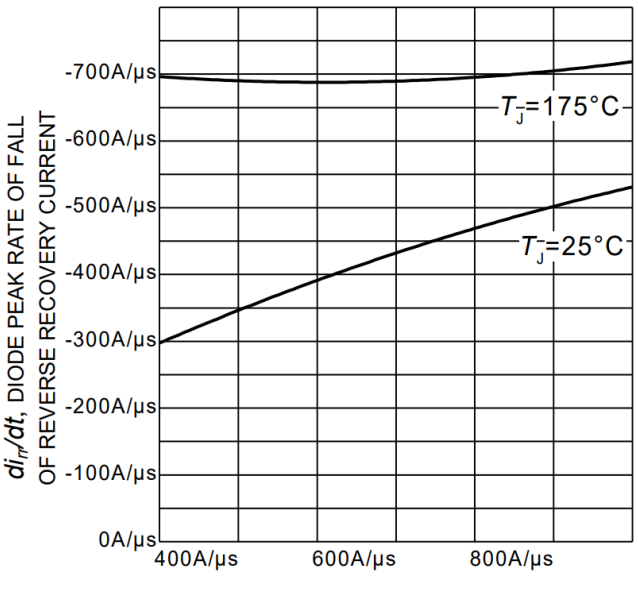


Figure 26. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope
(V_R=400V, I_F=15A,
Dynamic test circuit in Figure E)

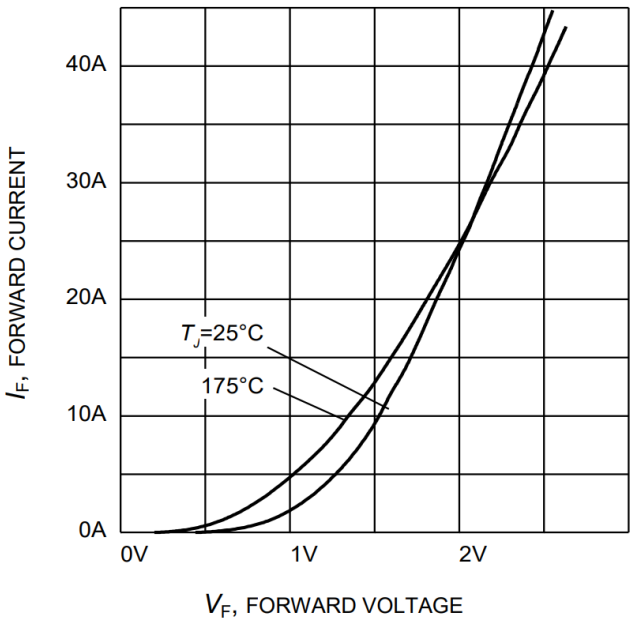


Figure 27. Typical diode forward current as a function of forward voltage

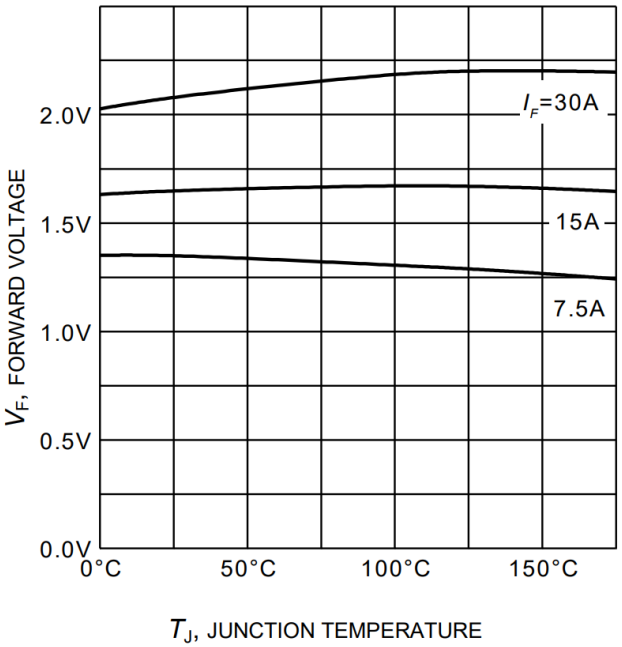
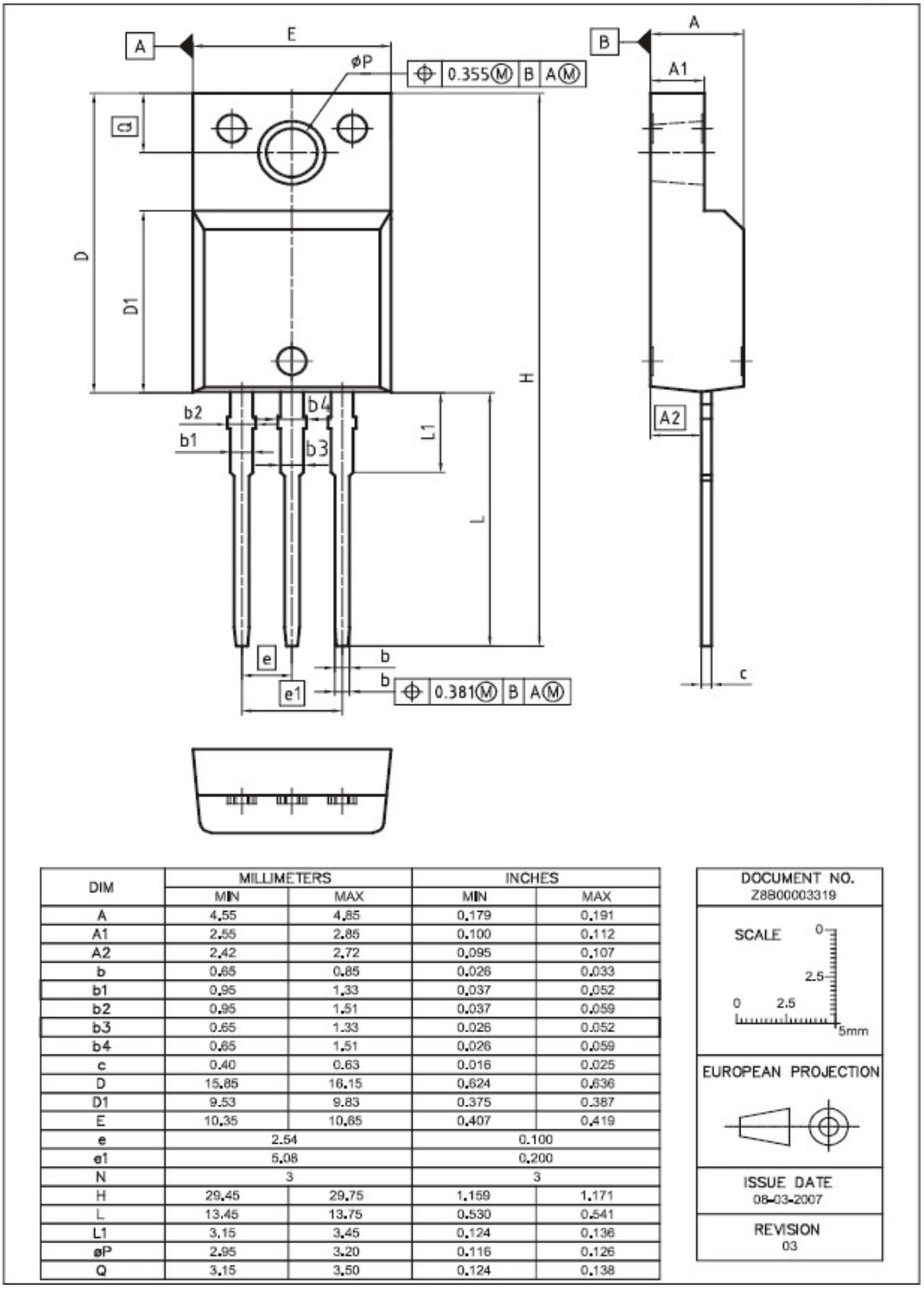


Figure 28. Typical diode forward voltage as a function of junction temperature

PG-TO220-3 (FullPAK)



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.55	4.85	0.179	0.191
A1	2.55	2.85	0.100	0.112
A2	2.42	2.72	0.095	0.107
b	0.65	0.85	0.026	0.033
b1	0.95	1.33	0.037	0.052
b2	0.95	1.51	0.037	0.059
b3	0.65	1.33	0.026	0.052
b4	0.65	1.51	0.026	0.059
c	0.40	0.63	0.016	0.025
D	15.85	16.15	0.624	0.636
D1	9.53	9.83	0.375	0.387
E	10.35	10.65	0.407	0.419
e	2.54		0.100	
e1	5.08		0.200	
N	3		3	
H	29.45	29.75	1.159	1.171
L	13.45	13.75	0.530	0.541
L1	3.15	3.45	0.124	0.136
øP	2.95	3.20	0.116	0.126
Q	3.15	3.50	0.124	0.138

DOCUMENT NO.
Z8B00003319

SCALE 0 2.5 0 2.5 5mm

EUROPEAN PROJECTION

ISSUE DATE
08-03-2007

REVISION
03

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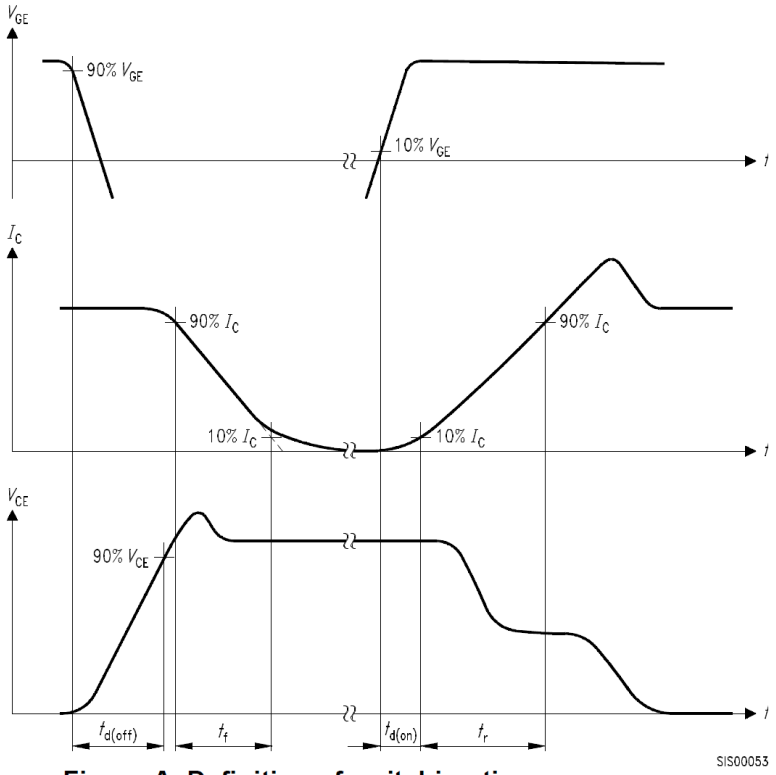


Figure A. Definition of switching times

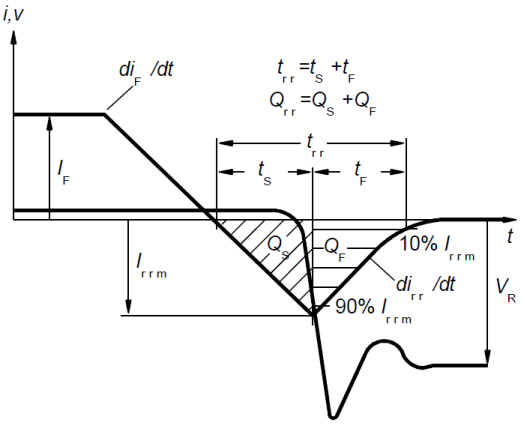


Figure C. Definition of diodes switching characteristics

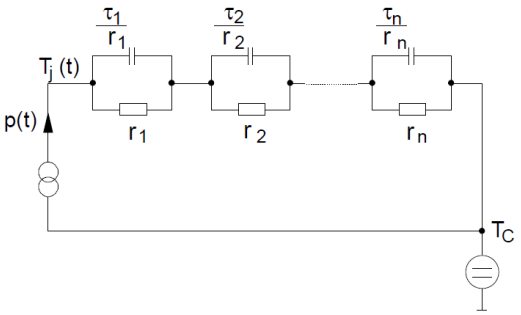


Figure D. Thermal equivalent circuit

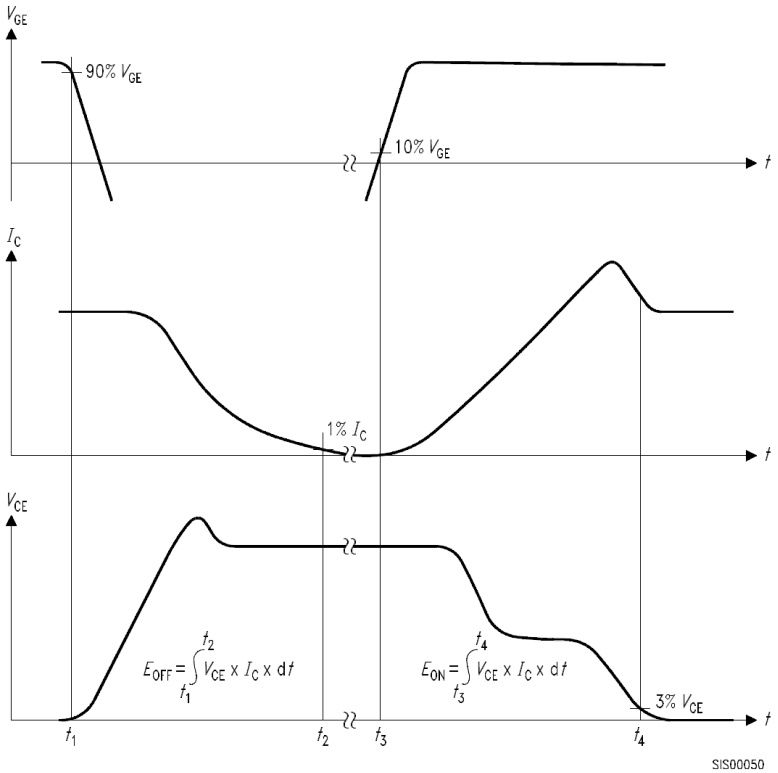


Figure B. Definition of switching losses

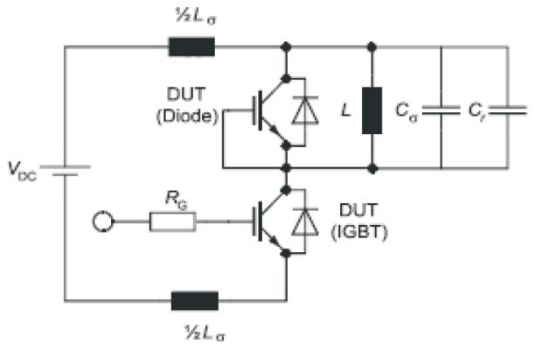


Figure E. Dynamic test circuit
Parasitic inductance L_σ,
Parasitic capacitor C_σ,
Relief capacitor C_r
(only for ZVT switching)

Published by
Infineon Technologies AG
81726 Munich, Germany
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版本 **2026-09-29**

Infineon Technologies AG 出版，
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