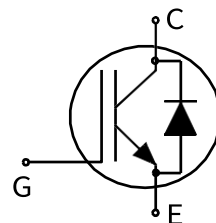


英飞凌TRENCHSTOP™ 系列

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 μ s
- 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



关键性能和封装参数

Type	V_{CE}	I_C	$V_{CE(sat)}, T_{vj}=25^{\circ}C$	T_{vjmax}	Marking	Package
AIKW50N60CT	600V	50A	1.5V	175°C	AK50DCT	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）。



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最大额定值

Parameter	Symbol	Value	Unit
Collector-emitter voltage, $T_{vj} \geq 25^{\circ}\text{C}$	V_{CE}	600	V
DC collector current, limited by T_{vjmax} $T_c = 25^{\circ}\text{C}$ value limited by bondwire $T_c = 100^{\circ}\text{C}$	I_C	80.0 50.0	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	150.0	A
Turn off safe operating area $V_{CE} \leq 600\text{V}$, $T_{vj} \leq 175^{\circ}\text{C}$, $t_p = 1\mu\text{s}$	-	150.0	A
Diode forward current, limited by T_{vjmax} $T_c = 25^{\circ}\text{C}$ value limited by bondwire $T_c = 100^{\circ}\text{C}$	I_F	80.0 50.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	150.0	A
Gate-emitter voltage	V_{GE}	± 20	V
Short circuit withstand time $V_{GE} = 15.0\text{V}$, $V_{CC} \leq 400\text{V}$ Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0\text{s}$ $T_{vj} = 150^{\circ}\text{C}$	t_{SC}	5	μs
Power dissipation $T_c = 25^{\circ}\text{C}$	P_{tot}	333.0	W
Operating junction temperature	T_{vj}	$-40 \dots +175$	$^{\circ}\text{C}$
Storage temperature	T_{stg}	$-55 \dots +150$	$^{\circ}\text{C}$
Soldering temperature, ¹⁾ wave soldering 1.6mm (0.063in.) from case for 10s		260	$^{\circ}\text{C}$
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	$R_{th(j-c)}$		-	-	0.45	K/W
Diode thermal resistance, ²⁾ junction - case	$R_{th(j-c)}$		-	-	0.80	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。

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除非另有规定，特性均为 $T_{vj} = 25^{\circ}\text{C}$ 。

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}	$V_{GE} = 15.0V, I_C = 50.0A$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 175^{\circ}C$	- -	1.50 1.90	2.00 -	V
Diode forward voltage	V_F	$V_{GE} = 0V, I_F = 50.0A$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 175^{\circ}C$	- -	1.65 1.60	2.05 -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C = 0.80mA, V_{CE} = V_{GE}$	4.1	4.9	5.7	V
Zero gate voltage collector current	I_{CES}	$V_{CE} = 600V, V_{GE} = 0V$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 175^{\circ}C$	- -	- 1250	40 -	μA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0V, V_{GE} = 20V$	-	-	100	nA
Transconductance	g_{fs}	$V_{CE} = 20V, I_C = 50.0A$	-	31.0	-	S

电气特性，测于 $T_{vj} = 25^{\circ}\text{C}$ 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}	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$	-	3140	-	pF
Output capacitance	C_{oes}		-	200	-	
Reverse transfer capacitance	C_{res}		-	93	-	
Gate charge	Q_G	$V_{CC} = 480V, I_C = 20.0A,$ $V_{GE} = 15V$	-	310.0	-	nC
Short circuit collector current Max. 1000 short circuits Time between short circuits: $\geq 1.0s$	$I_{C(SC)}$	$V_{GE} = 15.0V, V_{CC} \leq 400V,$ $t_{SC} \leq 5\mu s$ $T_{vj} = 150^{\circ}C$	-	458	-	A

开关特性、感性负载

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT 特性，测于 $T_{vj} = 25^{\circ}\text{C}$ 的条件下						
Turn-on delay time	$t_{d(\text{on})}$	$T_{vj} = 25^{\circ}\text{C},$ $V_{CC} = 400\text{V}, I_C = 50.0\text{A},$ $V_{GE} = 0.0/15.0\text{V},$ $R_{G(\text{on})} = 7.0\Omega, R_{G(\text{off})} = 7.0\Omega,$ $L\sigma = 103\text{nH}, C\sigma = 39\text{pF}$ $L\sigma, C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	26	-	ns
Rise time	t_r		-	29	-	ns
Turn-off delay time	$t_{d(\text{off})}$		-	299	-	ns
Fall time	t_f		-	29	-	ns
Turn-on energy	E_{on}		-	1.20	-	mJ
Turn-off energy	E_{off}		-	1.40	-	mJ
Total switching energy	E_{ts}		-	2.60	-	mJ

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二极管特性，测于 $T_{vj} = 25^{\circ}\text{C}$ 的条件下

Diode reverse recovery time	t_{rr}	$T_{vj} = 25^{\circ}\text{C},$ $V_R = 400\text{V}, I_F$ $= 50.0\text{A},$ $di_F/dt = 1280\text{A}/\mu\text{s}$	-	143	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.80	-	μC
Diode peak reverse recovery current	I_{rrm}		-	27.7	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-671	-	$\text{A}/\mu\text{s}$

开关特性、感性负载

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	

IGBT 特性，测于 $T_{vj} = 175^{\circ}\text{C}$ 的条件

Turn-on delay time	$t_{d(on)}$	$T_{vj} = 175^{\circ}\text{C},$ $V_{CC} = 400\text{V}, I_C = 50.0\text{A},$ $V_{GE} = 0.0/15.0\text{V},$ $R_{G(on)} = 7.0\Omega, R_{G(off)} = 7.0\Omega,$ $L\sigma = 103\text{nH}, C\sigma = 39\text{pF}$ $L\sigma, C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	27	-	ns
Rise time	t_r		-	33	-	ns
Turn-off delay time	$t_{d(off)}$		-	341	-	ns
Fall time	t_f		-	55	-	ns
Turn-on energy	E_{on}		-	1.80	-	mJ
Turn-off energy	E_{off}		-	1.85	-	mJ
Total switching energy	E_{ts}		-	3.65	-	mJ

二极管特性，测于 $T_{vj} = 175^{\circ}\text{C}$ 的条件下

Diode reverse recovery time	t_{rr}	$T_{vj} = 175^{\circ}\text{C}, V_R$ $= 400\text{V}, I_F =$ $50.0\text{A},$ $di_F/dt = 1280\text{A}/\mu\text{s}$	-	205	-	ns
Diode reverse recovery charge	Q_{rr}		-	4.30	-	μC
Diode peak reverse recovery current	I_{rrm}		-	40.7	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-449	-	$\text{A}/\mu\text{s}$

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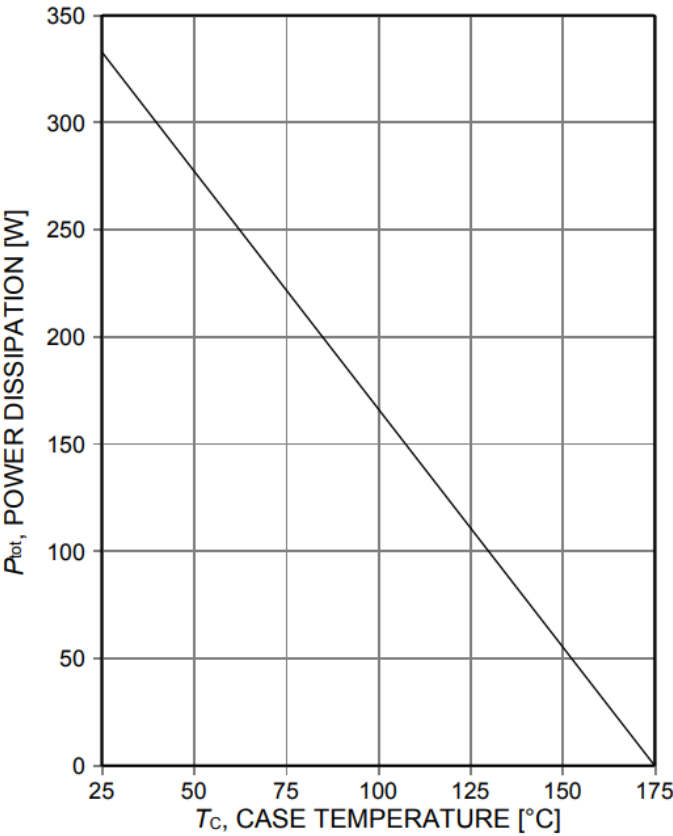


Figure 1. Power dissipation as a function of case temperature ($T_J \leq 175^\circ\text{C}$)

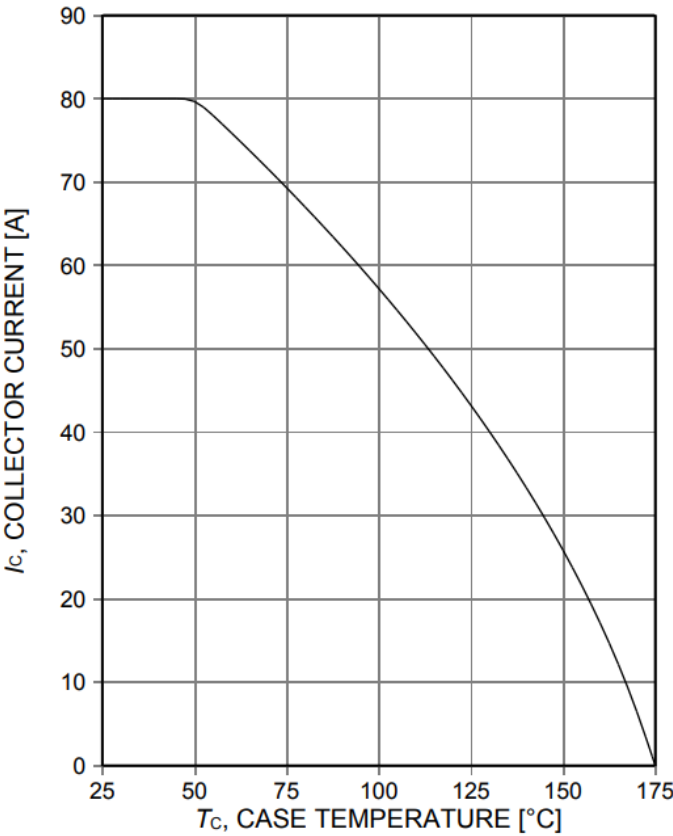


Figure 2. Collector current as a function of case temperature ($V_{GE} \geq 15\text{V}$, $T_J \leq 175^\circ\text{C}$)

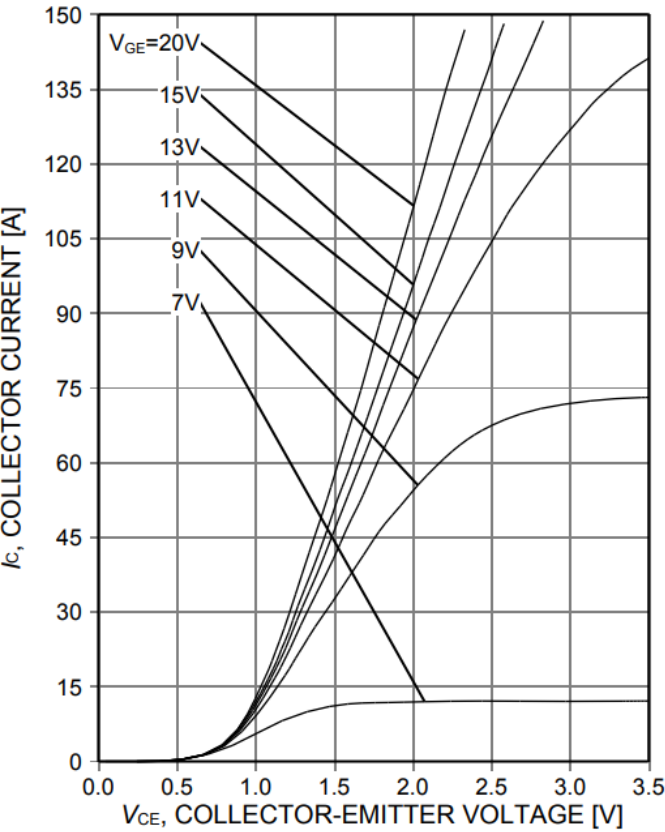


Figure 3. Typical output characteristic ($T_J = 25^\circ\text{C}$)

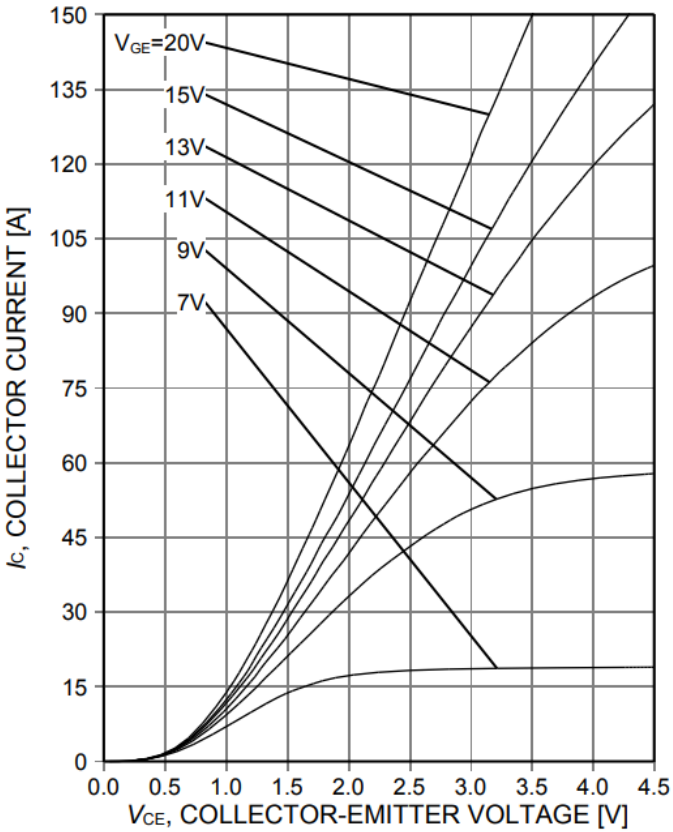


Figure 4. Typical output characteristic ($T_J = 175^\circ\text{C}$)

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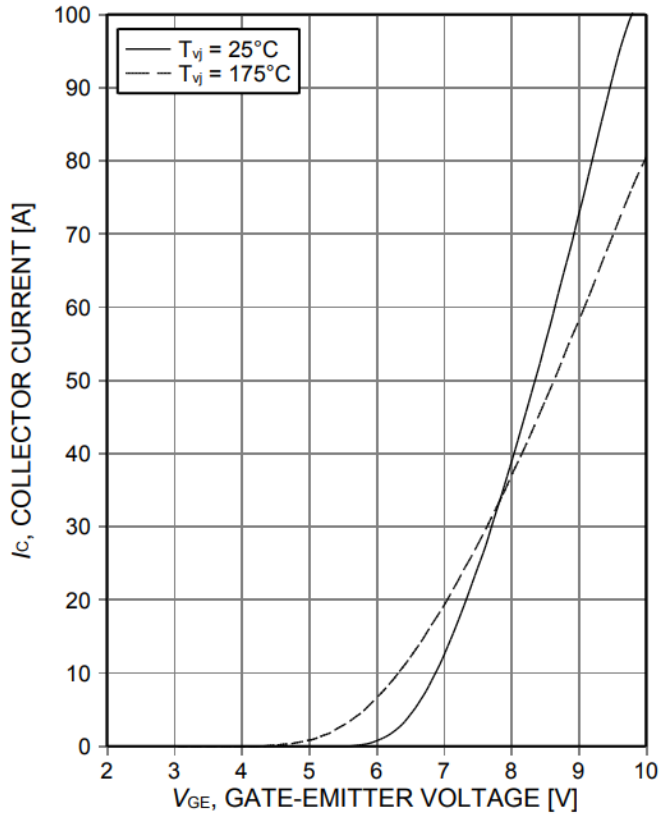


Figure 5. **Typical transfer characteristic**
($V_{CE}=20V$)

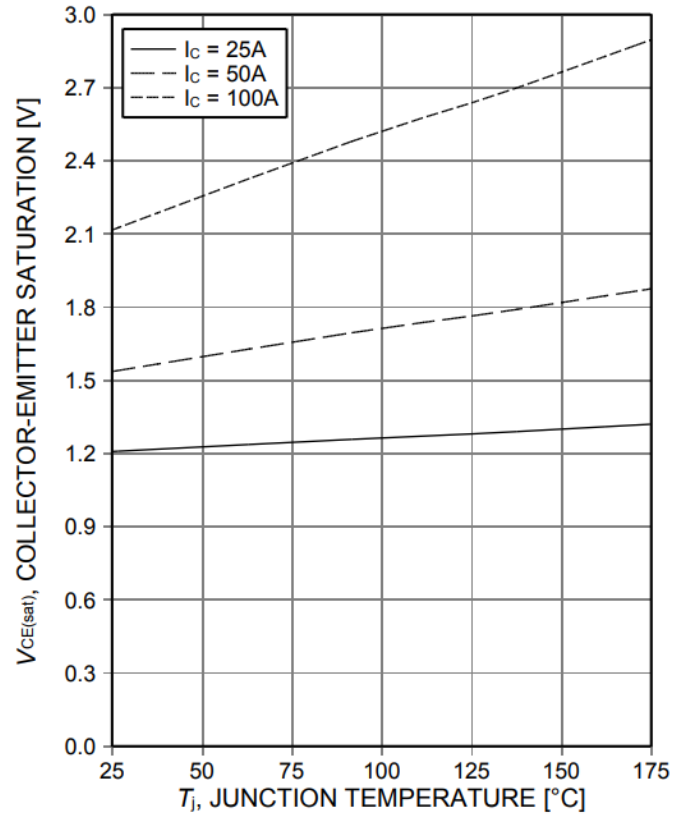


Figure 6. **Typical collector-emitter saturation voltage as a function of junction temperature**
($V_{GE}=15V$)

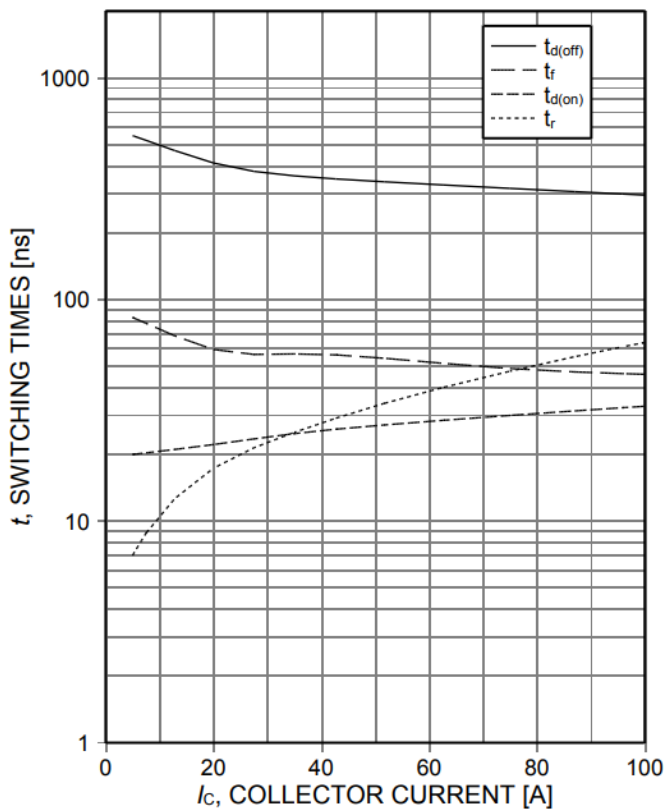


Figure 7. **Typical switching times as a function of collector current**
(inductive load, $T_J=175^\circ C$, $V_{CE}=400V$, $V_{GE}=0/15V$, $R_G=7\Omega$, Dynamic test circuit in Figure E)

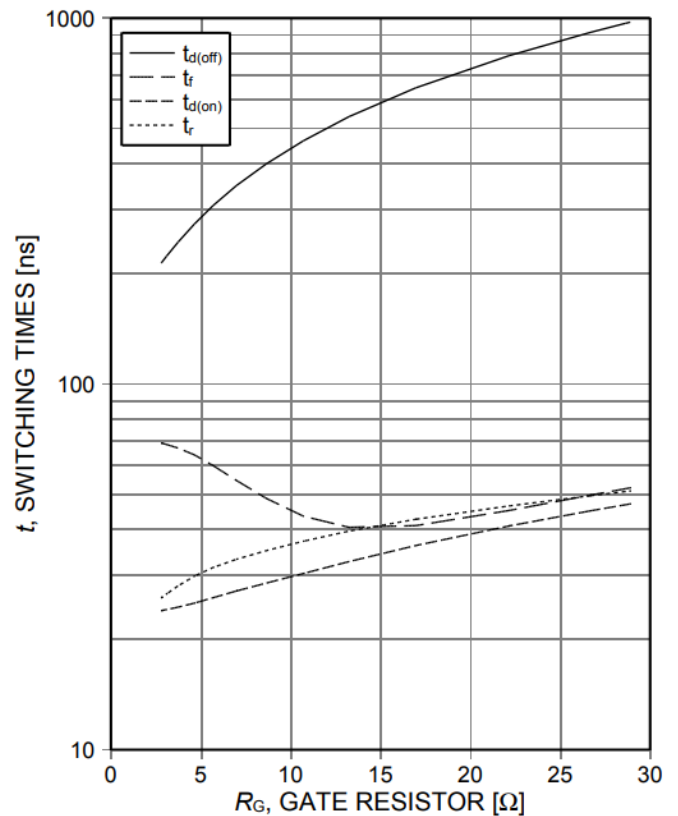


Figure 8. **Typical switching times as a function of gate resistor**
(inductive load, $T_J=175^\circ C$, $V_{CE}=400V$, $V_{GE}=0/15V$, $I_C=50A$, Dynamic test circuit in Figure E)

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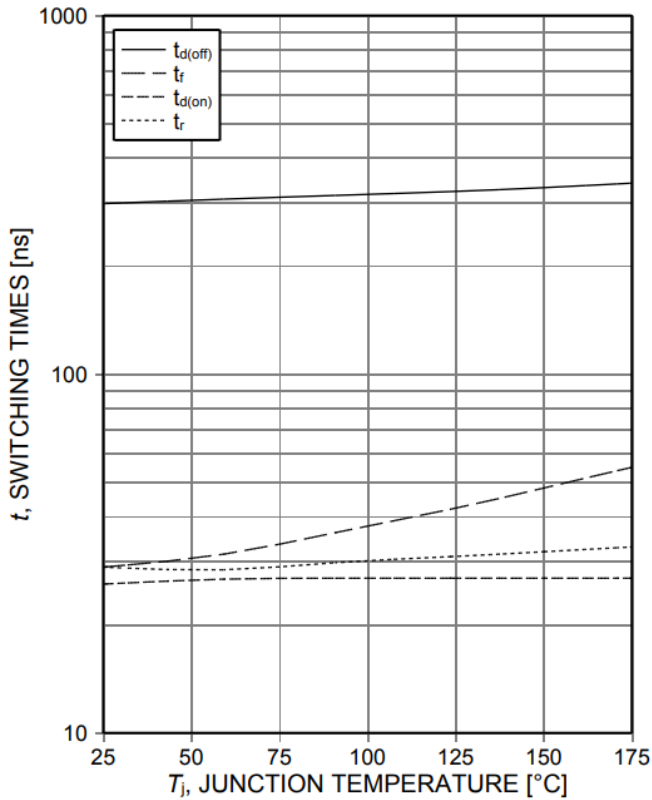


Figure 9. **Typical switching times as a function of junction temperature**
(inductive load, $V_{CE}=400V$, $V_{GE}=0/15V$, $I_C=50A$, $R_G=7\Omega$, Dynamic test circuit in Figure E)

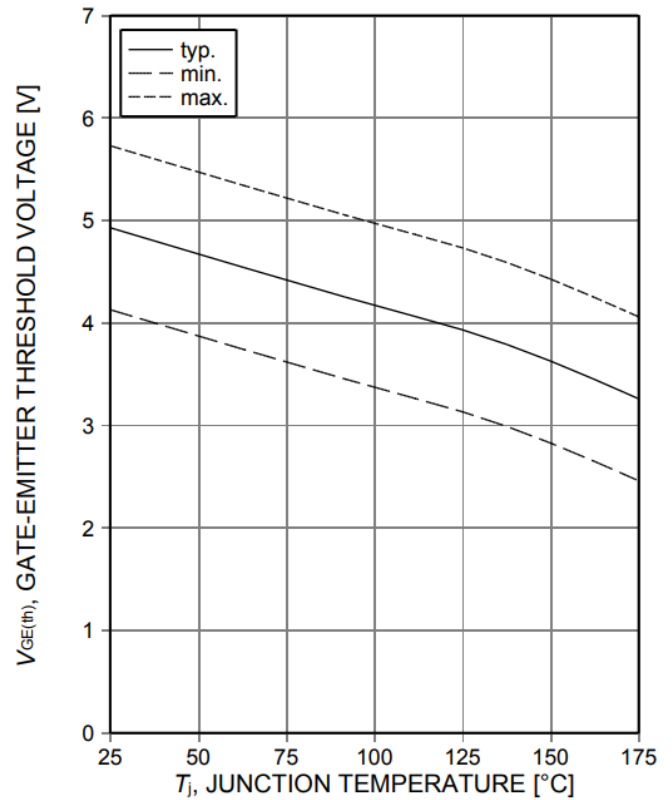


Figure 10. **Gate-emitter threshold voltage as a function of junction temperature**
($I_C=0,8mA$)

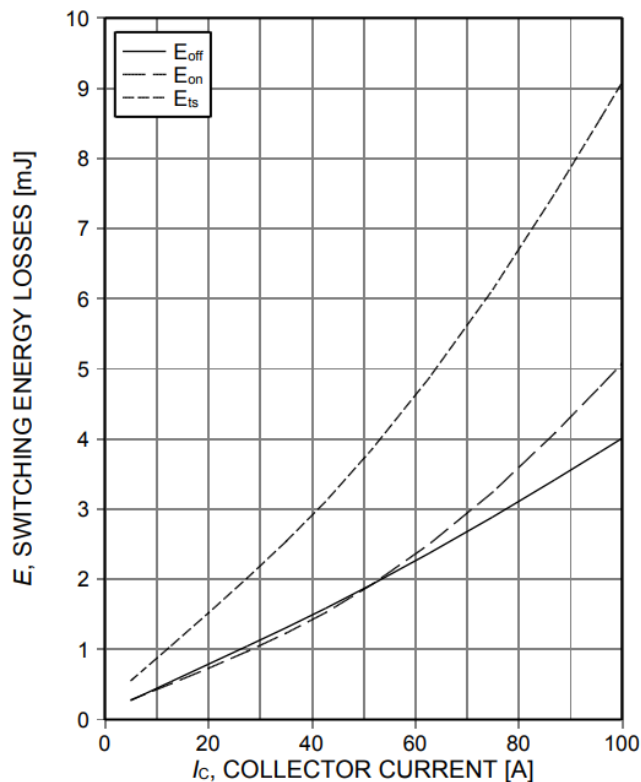


Figure 11. **Typical switching energy losses as a function of collector current**
(inductive load, $T_j=175^\circ C$, $V_{CE}=400V$, $V_{GE}=0/15V$, $R_G=7\Omega$, Dynamic test circuit in Figure E)

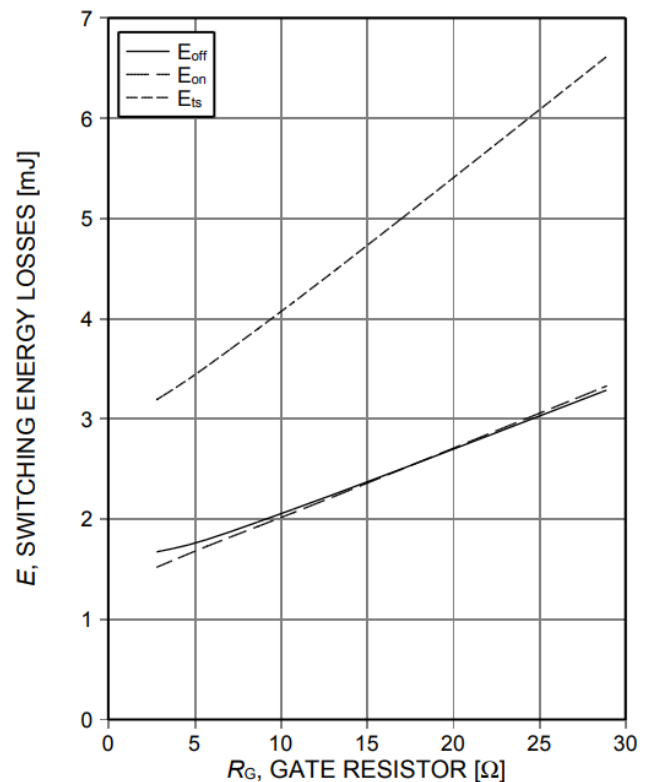


Figure 12. **Typical switching energy losses as a function of gate resistor**
(inductive load, $T_j=175^\circ C$, $V_{CE}=400V$, $V_{GE}=0/15V$, $I_C=50A$, Dynamic test circuit in Figure E)

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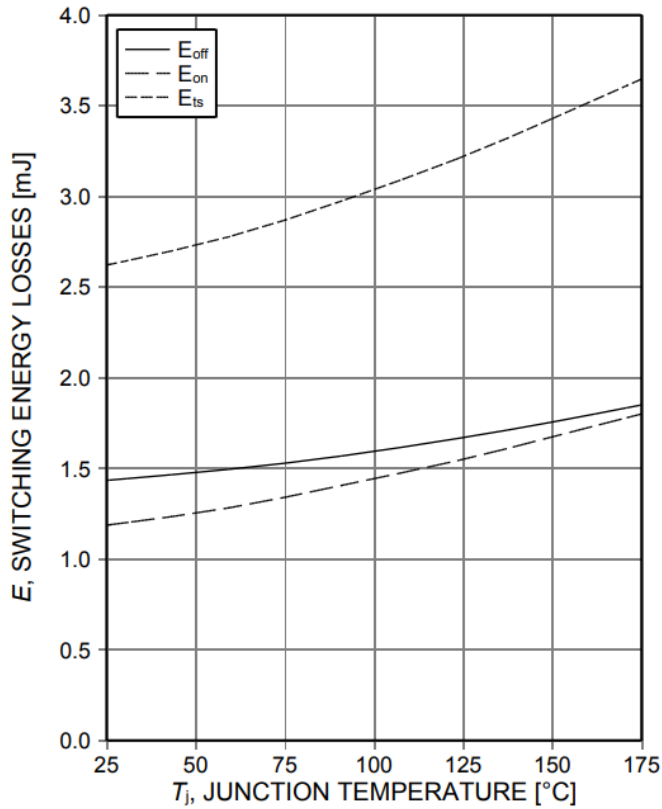


Figure 13. **Typical switching energy losses as a function of junction temperature**
(inductive load, $V_{CE}=400V$, $V_{GE}=0/15V$, $I_C=50A$, $R_G=7\Omega$, Dynamic test circuit in Figure E)

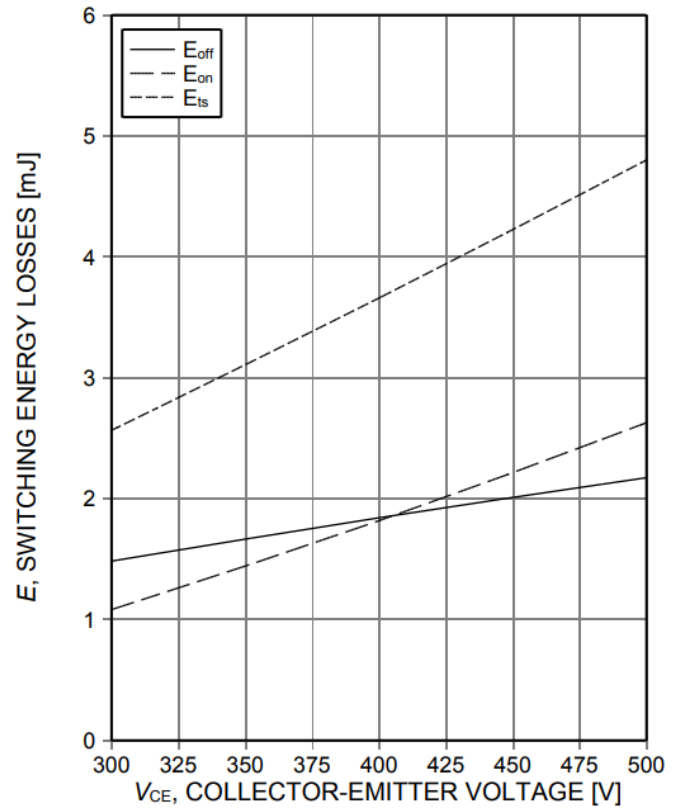


Figure 14. **Typical switching energy losses as a function of collector emitter voltage**
(inductive load, $T_j=175^\circ C$, $V_{GE}=0/15V$, $I_C=50A$, $R_G=7\Omega$, Dynamic test circuit in Figure E)

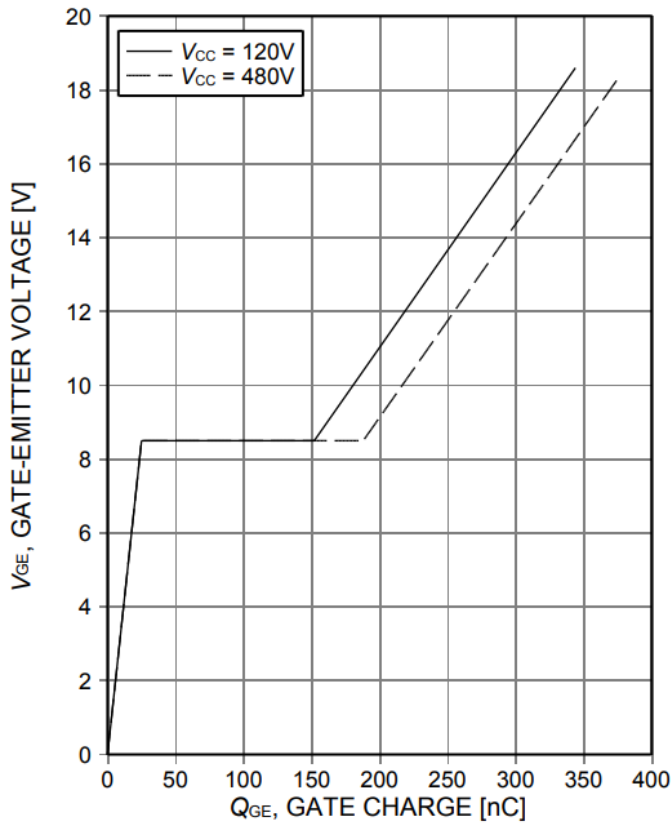


Figure 15. **Typical gate charge**
($I_C=50A$)

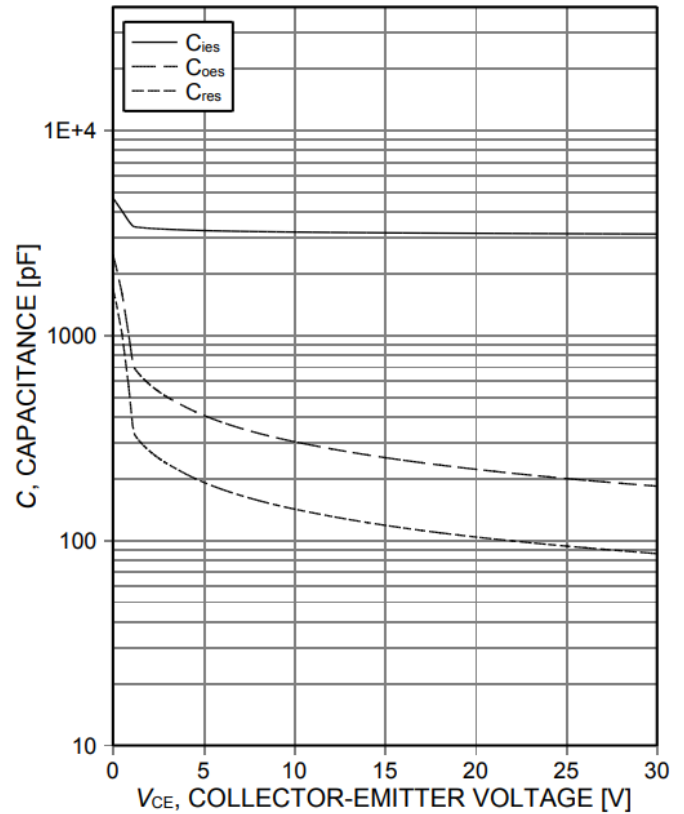


Figure 16. **Typical capacitance as a function of collector-emitter voltage**
($V_{GE}=0V$, $f=1MHz$)

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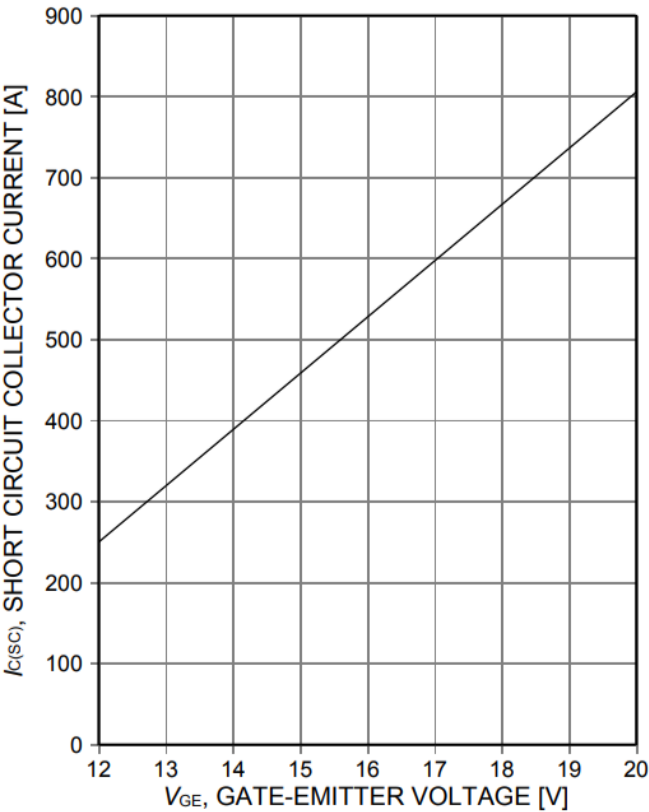


Figure 17. Typical short circuit collector current as a function of gate-emitter voltage ($V_{CE} \leq 400V$, start at $T_J \leq 150^{\circ}C$)

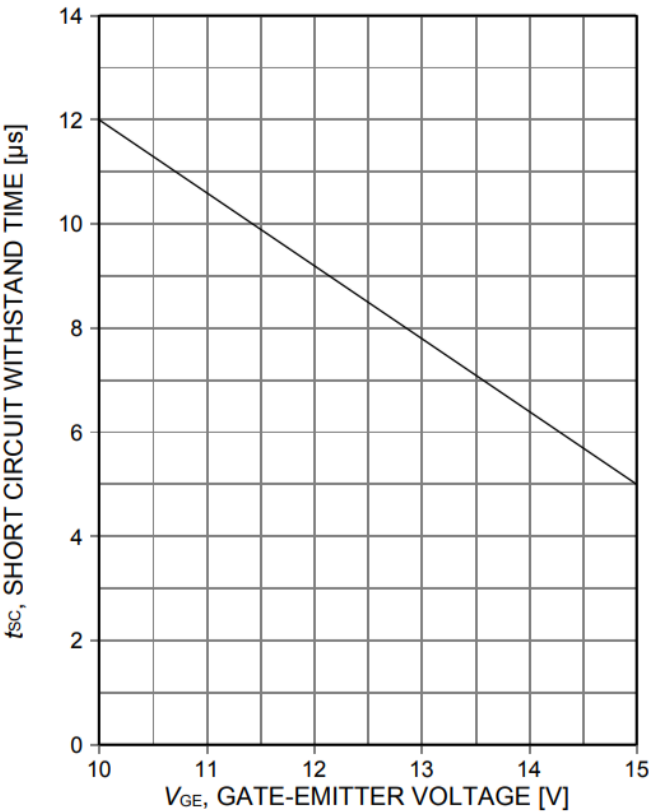


Figure 18. Short circuit withstand time as a function of gate-emitter voltage ($V_{CE} = 400V$, start at $T_J = 25^{\circ}C$, $T_{Jmax} \leq 150^{\circ}C$)

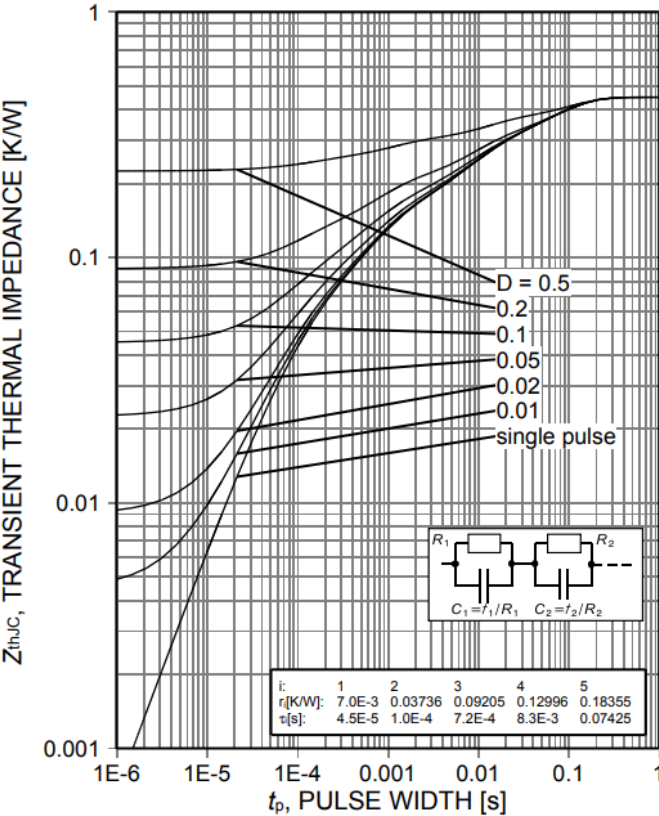


Figure 19. IGBT transient thermal impedance as a function of pulse width for different duty cycles D ($D = t_p/T$)

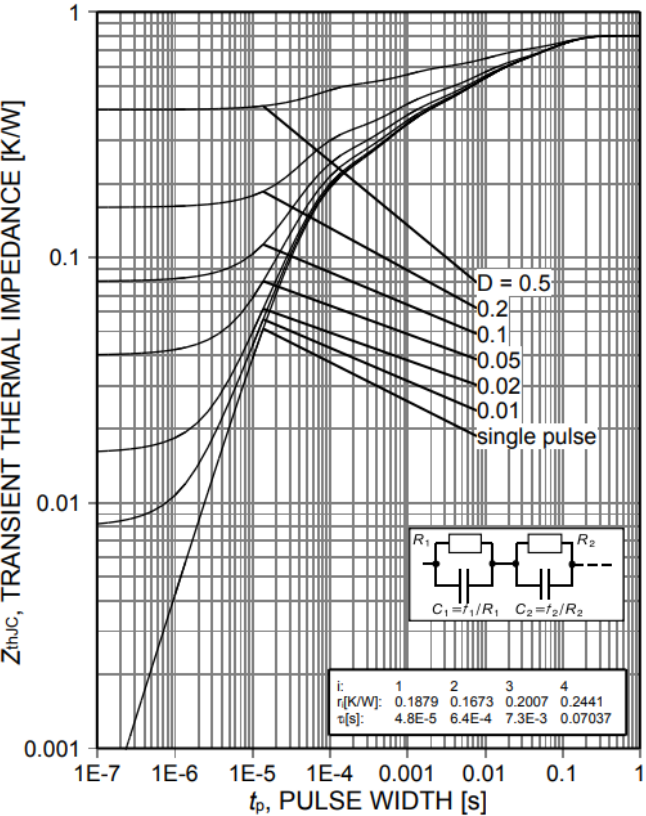


Figure 20. Diode transient thermal impedance as a function of pulse width for different duty cycles D ($D = t_p/T$)

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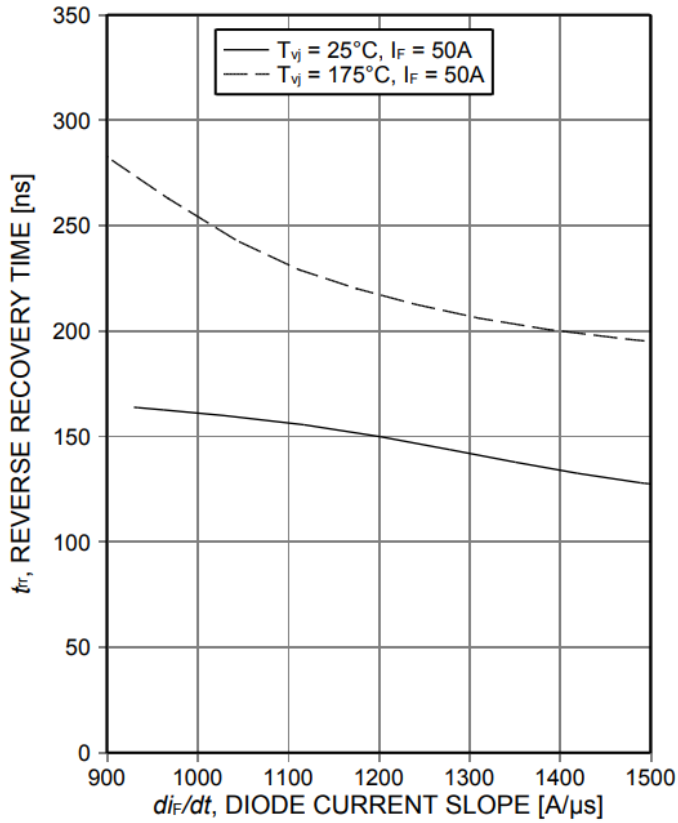


Figure 21. Typical reverse recovery time as a function of diode current slope
($V_R=400V$, Dynamic test circuit in Figure E)

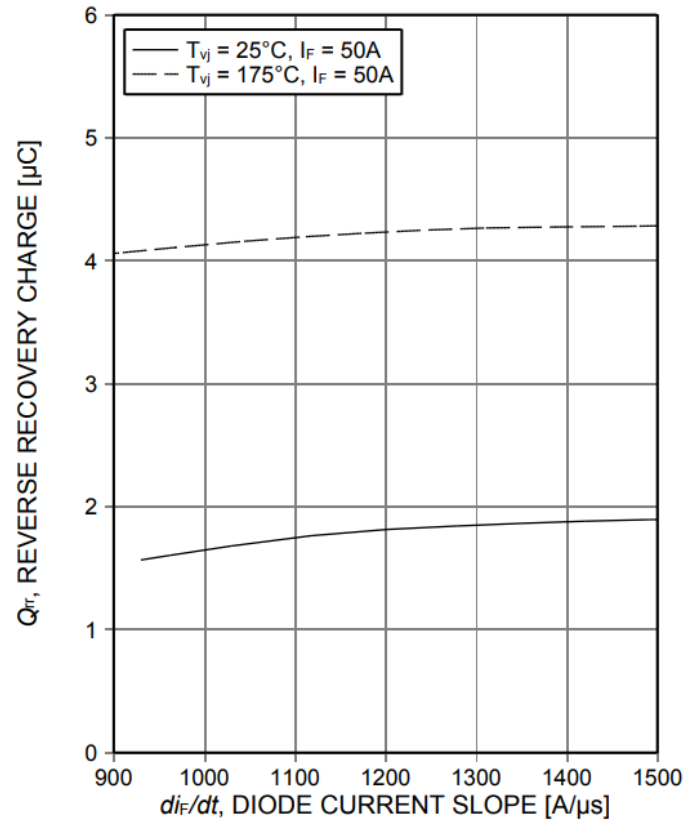


Figure 22. Typical reverse recovery charge as a function of diode current slope
($V_R=400V$, Dynamic test circuit in Figure E)

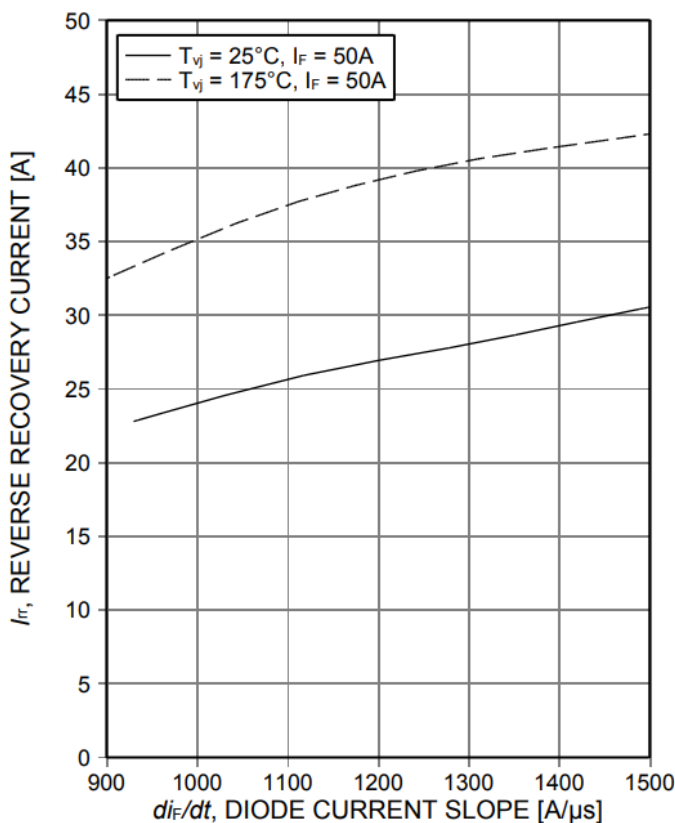


Figure 23. Typical reverse recovery current as a function of diode current slope
($V_R=400V$, Dynamic test circuit in Figure E)

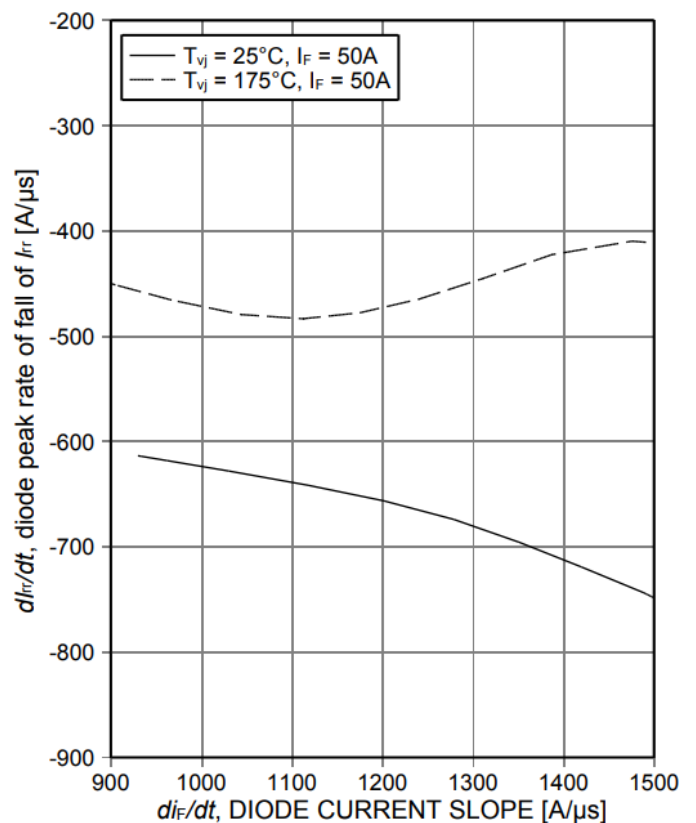


Figure 24. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope
($V_R=400V$, Dynamic test circuit in Figure E)

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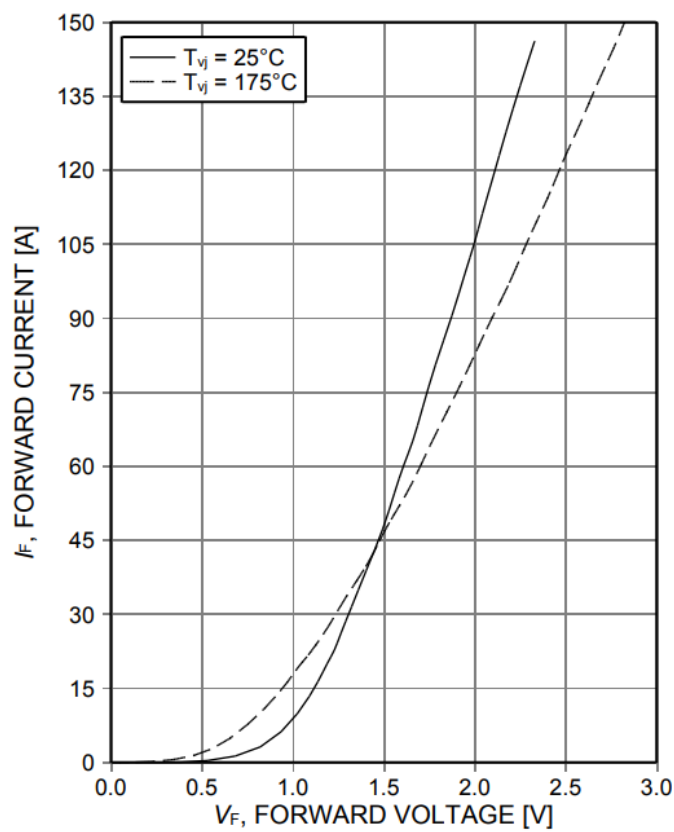


Figure 25. Typical diode forward current as a function of forward voltage

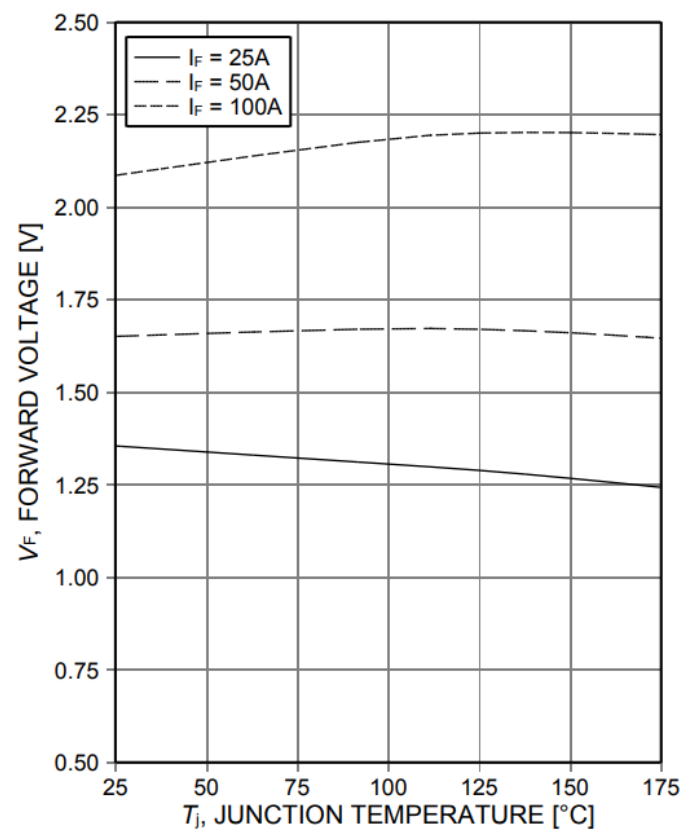
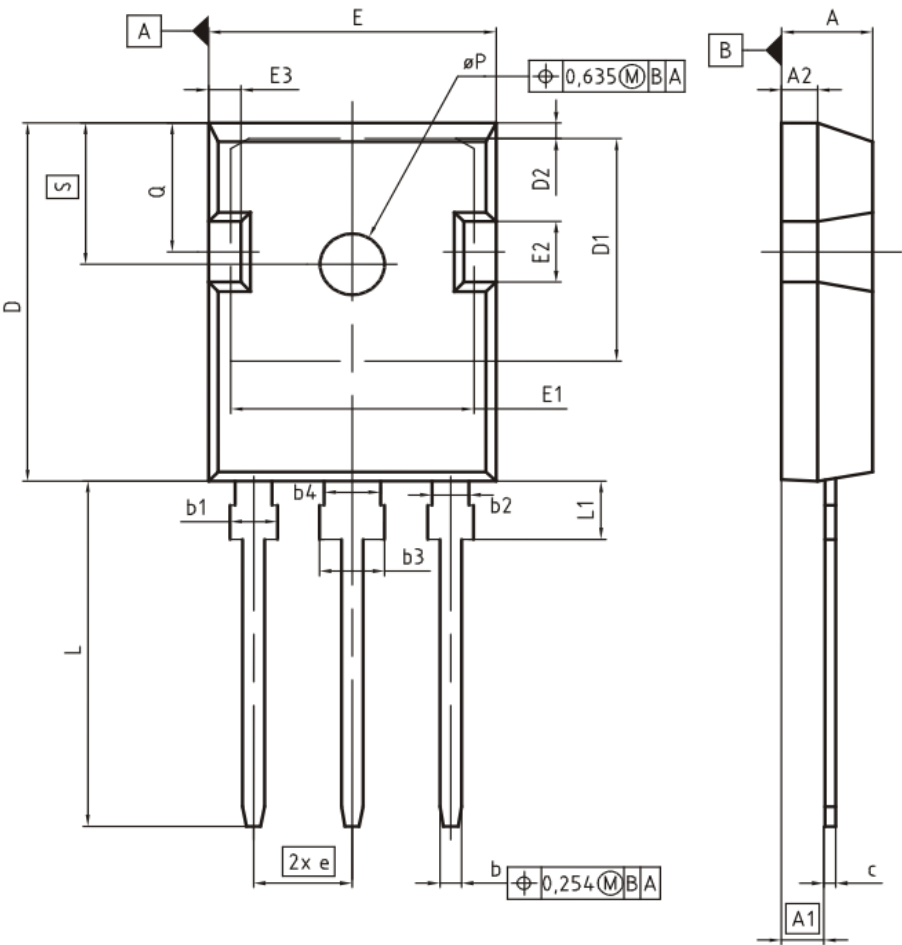


Figure 26. Typical diode forward voltage as a function of junction temperature

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封装图 PG-T0247-3



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

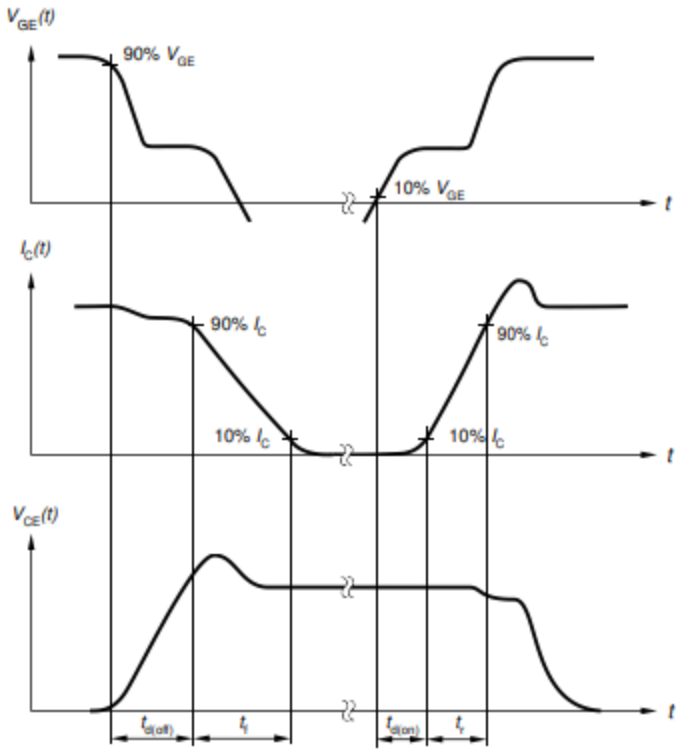


Figure A. Definition of switching times

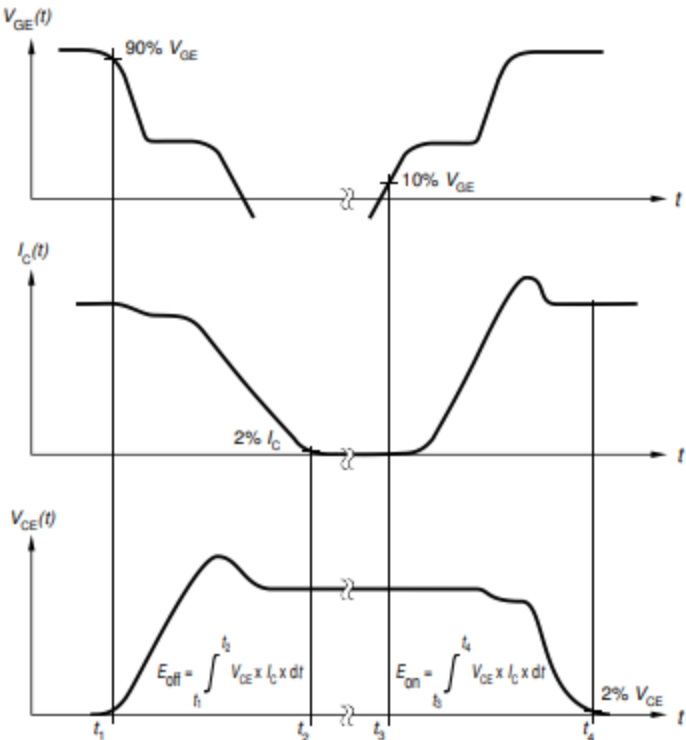


Figure B. Definition of switching losses

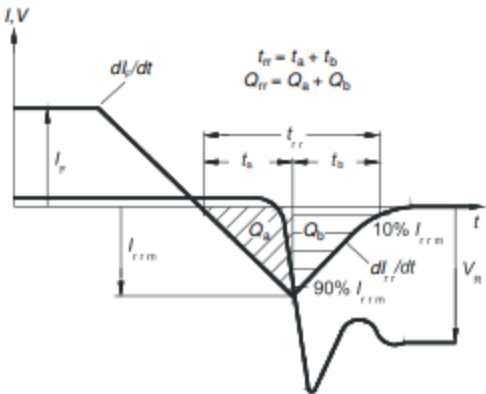


Figure C. Definition of diode switching characteristics

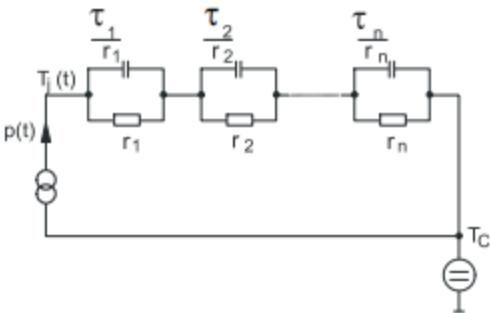


Figure D. Thermal equivalent circuit

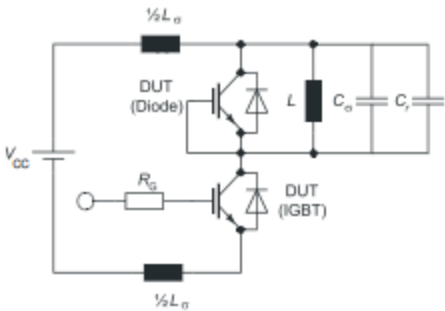


Figure E. **Dynamic test circuit**
Parasitic inductance L_{σ} ,
parasitic capacitor C_{σ} ,
relief capacitor C_r
(only for ZVT switching)



TRENCHSTOP™ 系列

修订记录

AIKW50N60CT

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

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