

英飞凌TRENCHSTOP™ 系列

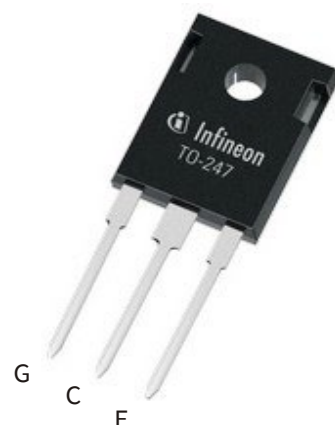
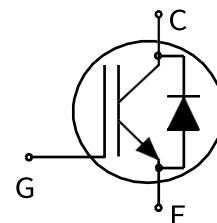
英飞凌低损耗 DuoPack：采用 TRENCHSTOP™ 和 Fieldstop 技术的 IGBT，搭配软、快速恢复反并联发射极控制二极管

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
AIKW30N60CT	600V	30A	1.5V	175°C	AK30DCT	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} $T_C = 25^{\circ}\text{C}$ $T_C = 100^{\circ}\text{C}$	I_C	60.0 30.0	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	90.0	A
Turn off safe operating area $V_{CE} \leq 600\text{V}$, $T_{vj} \leq 175^{\circ}\text{C}$, $t_p = 1\mu\text{s}$	-	90.0	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	60.0 30.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	90.0	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}	187.0	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	$R_{th(j-c)}$		-	-	0.80	K/W
Diode thermal resistance, ²⁾ junction - case	$R_{th(j-c)}$		-	-	1.05	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，电气特性均测于 $T_{vj} = 25^{\circ}\text{C}$ 的条件下。

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}	$V_{GE} = 15.0V, I_C = 30.0A$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 175^{\circ}C$	- -	1.50 1.90	2.05 -	V
Diode forward voltage	V_F	$V_{GE} = 0V, I_F = 30.0A$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 175^{\circ}C$	- -	1.65 1.60	2.05 -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C = 0.43mA, V_{CE} = V_{GE}$	4.1	4.9	5.7	V
Zero gate voltage collector current	I_{CES}	$V_{CE} = 600V, V_{GE} = 0V$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 175^{\circ}C$	- -	- 750	40 -	μA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0V, V_{GE} = 20V$	-	-	100	nA
Transconductance	g_{fs}	$V_{CE} = 20V, I_C = 30.0A$	-	16.7	-	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}	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$	-	1630	-	pF
Output capacitance	C_{oes}		-	108	-	
Reverse transfer capacitance	C_{res}		-	50	-	
Gate charge	Q_G	$V_{CC} = 480V, I_C = 20.0A,$ $V_{GE} = 15V$	-	167.0	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13.0	-	nH
Short circuit collector current Max. 1000 short circuits Time between short circuits: $\geq 1.0s$	$I_{C(SC)}$	$V_{GE} = 15.0V, V_{CC} \leq 400V,$ $t_{SC} \leq 5\mu s$ $T_{vj} = 150^{\circ}C$	-	275	-	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	$t_{d(on)}$	$T_{vj} = 25^{\circ}\text{C},$ $V_{CC} = 400\text{V}, I_C = 30.0\text{A},$ $V_{GE} = 0.0/15.0\text{V},$ $R_{G(on)} = 10.6\Omega, R_{G(off)} = 10.6\Omega,$ $L\sigma = 136\text{nH}, C\sigma = 39\text{pF}$ $L\sigma, C\sigma$ from Fig. E Energy losses include "tail" and diode reverse recovery.	-	23	-	ns
Rise time	t_r		-	21	-	ns
Turn-off delay time	$t_{d(off)}$		-	254	-	ns
Fall time	t_f		-	46	-	ns
Turn-on energy	E_{on}		-	0.69	-	mJ
Turn-off energy	E_{off}		-	0.77	-	mJ
Total switching energy	E_{ts}		-	1.46	-	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}	$T_{vj} = 25^{\circ}\text{C},$ $V_R = 400\text{V}, I_F$ $= 30.0\text{A},$ $di_F/dt = 910\text{A}/\mu\text{s}$	-	85	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.80	-	μC
Diode peak reverse recovery current	I_{rrm}		-	16.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-630	-	$\text{A}/\mu\text{s}$

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	$t_{d(on)}$	$T_{vj} = 175^{\circ}\text{C},$ $V_{CC} = 400\text{V}, I_C = 30.0\text{A},$ $V_{GE} = 0.0/15.0\text{V},$ $R_{G(on)} = 10.6\Omega, R_{G(off)} = 10.6\Omega,$ $L\sigma = 136\text{nH}, C\sigma = 39\text{pF}$ $L\sigma, C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	24	-	ns
Rise time	t_r		-	26	-	ns
Turn-off delay time	$t_{d(off)}$		-	292	-	ns
Fall time	t_f		-	90	-	ns
Turn-on energy	E_{on}		-	1.00	-	mJ
Turn-off energy	E_{off}		-	1.10	-	mJ
Total switching energy	E_{ts}		-	2.10	-	mJ

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

Diode reverse recovery time	t_{rr}	$T_{vj} = 175^{\circ}\text{C}, V_R$ $= 400\text{V}, I_F =$ $30.0\text{A},$ $di_F/dt = 910\text{A}/\mu\text{s}$	-	240	-	ns
Diode reverse recovery charge	Q_{rr}		-	2.39	-	μC
Diode peak reverse recovery current	I_{rrm}		-	22.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-320	-	$\text{A}/\mu\text{s}$

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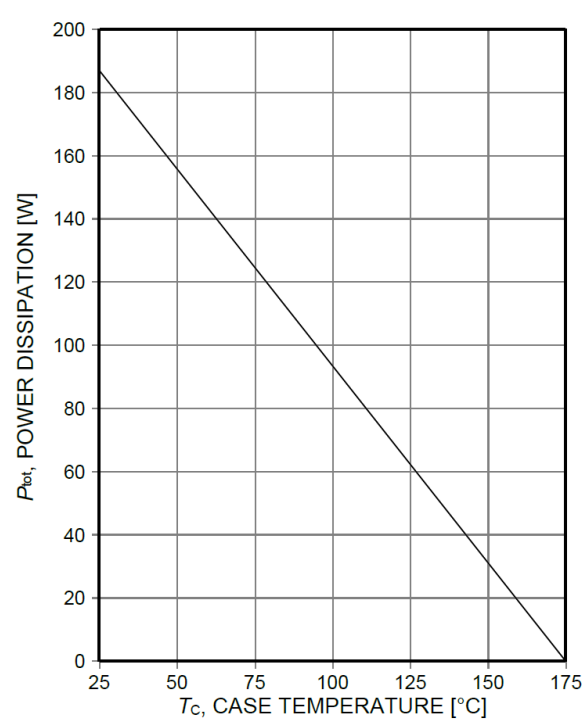


Figure 1. **Power dissipation as a function of case temperature**
($T_j \leq 175^\circ\text{C}$)

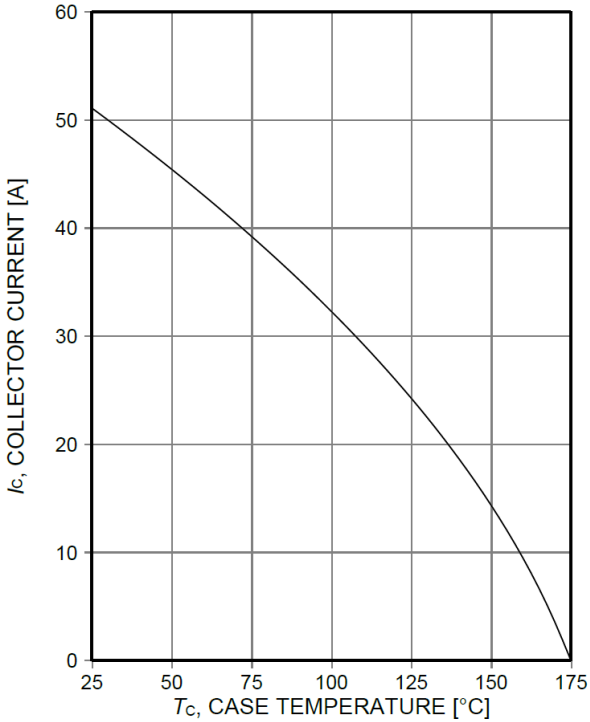


Figure 2. **Collector current as a function of case temperature**
($V_{GE} \geq 15\text{V}$, $T_j \leq 175^\circ\text{C}$)

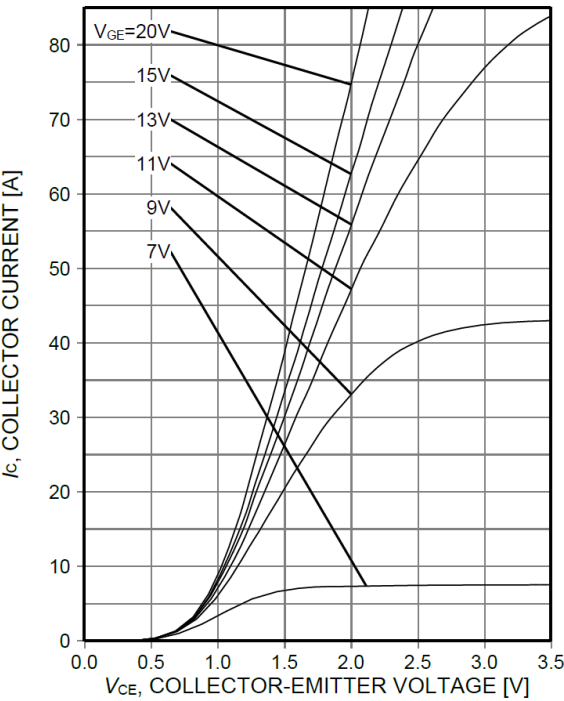


Figure 3. **Typical output characteristic**
($T_j = 25^\circ\text{C}$)

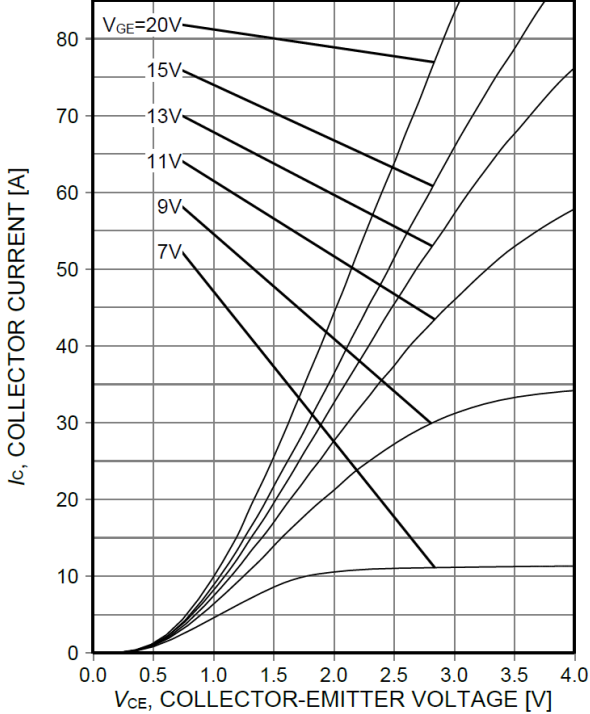


Figure 4. **Typical output characteristic**
($T_j = 175^\circ\text{C}$)

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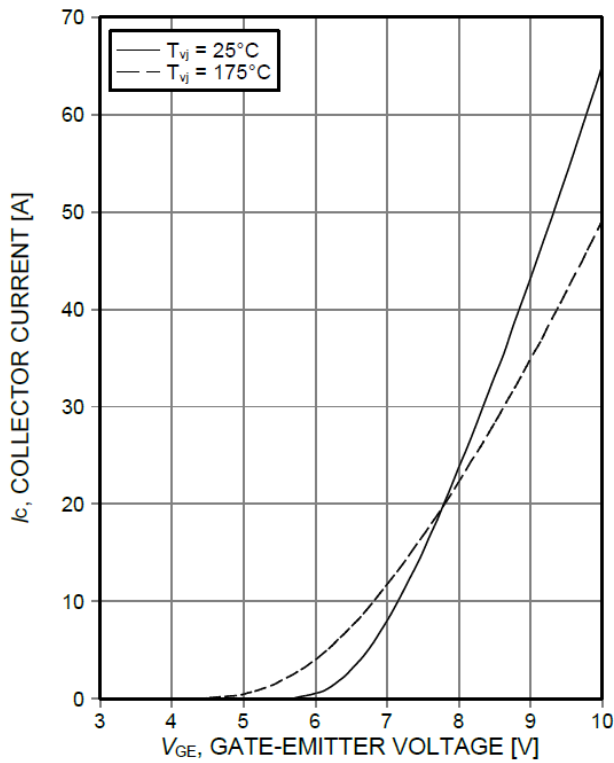


Figure 5. Typical transfer characteristic
($V_{CE}=20V$)

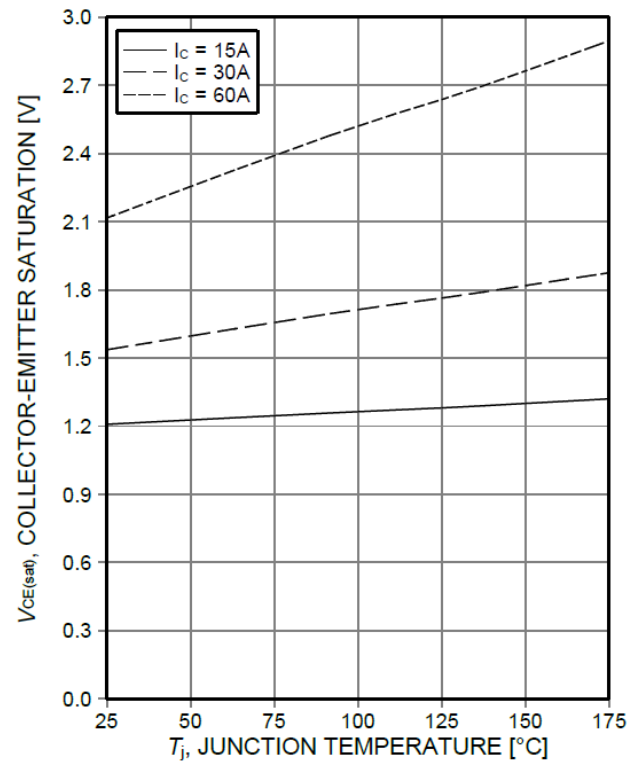


Figure 6. Typical collector-emitter saturation voltage as
a function of junction temperature
($V_{GE}=15V$)

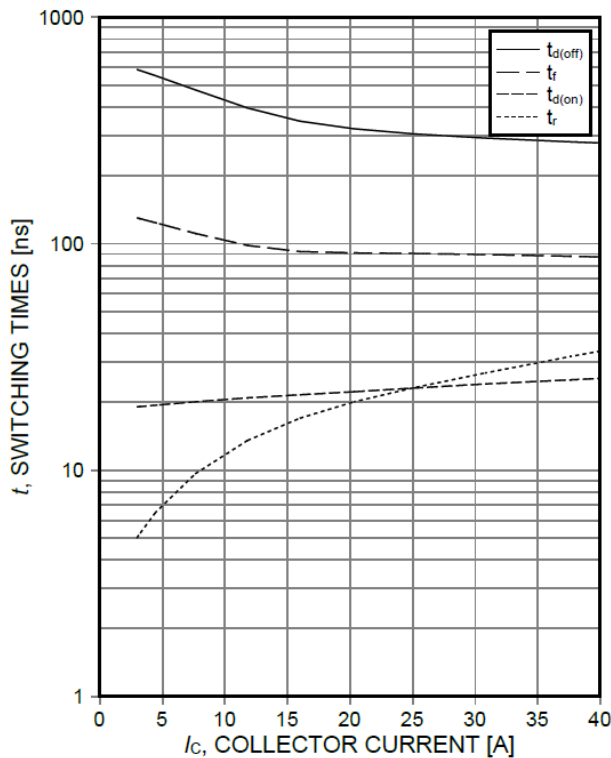


Figure 7. Typical switching times as a function of
collector current
(inductive load, $T_j=175^\circ C$, $V_{CE}=400V$,
 $V_{GE}=0/15V$, $R_G=10\Omega$, Dynamic test circuit in
Figure E)

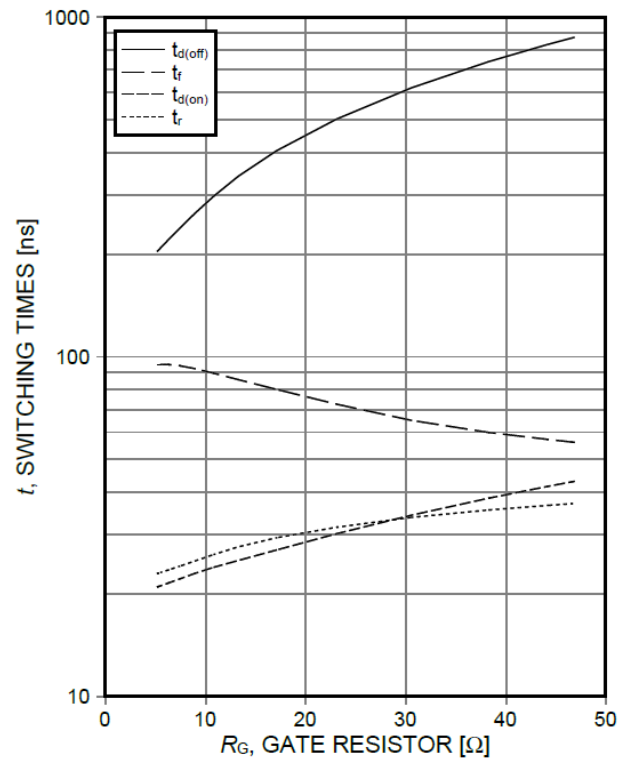


Figure 8. Typical switching times as a function of gate
resistor
(inductive load, $T_j=175^\circ C$, $V_{CE}=400V$,
 $V_{GE}=0/15V$, $I_C=30A$, Dynamic test circuit in
Figure E)

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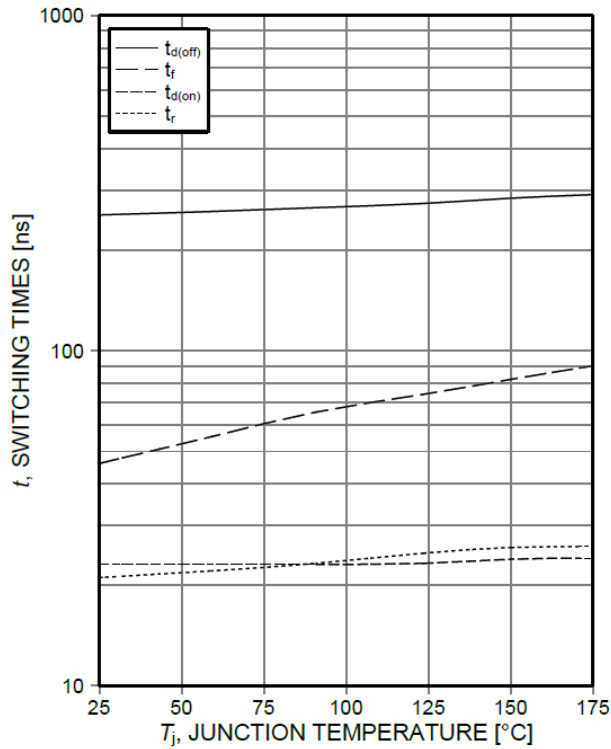


Figure 9. Typical switching times as a function of junction temperature
(inductive load, $V_{CE}=400V$, $V_{GE}=0/15V$, $I_C=30A$, $R_G=10\Omega$, Dynamic test circuit in Figure E)

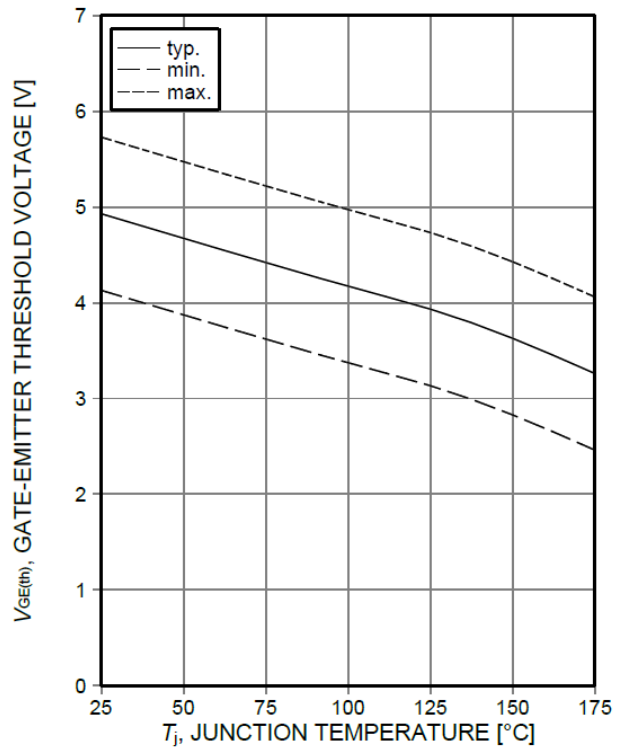


Figure 10. Gate-emitter threshold voltage as a function of junction temperature
($I_C=0,43mA$)

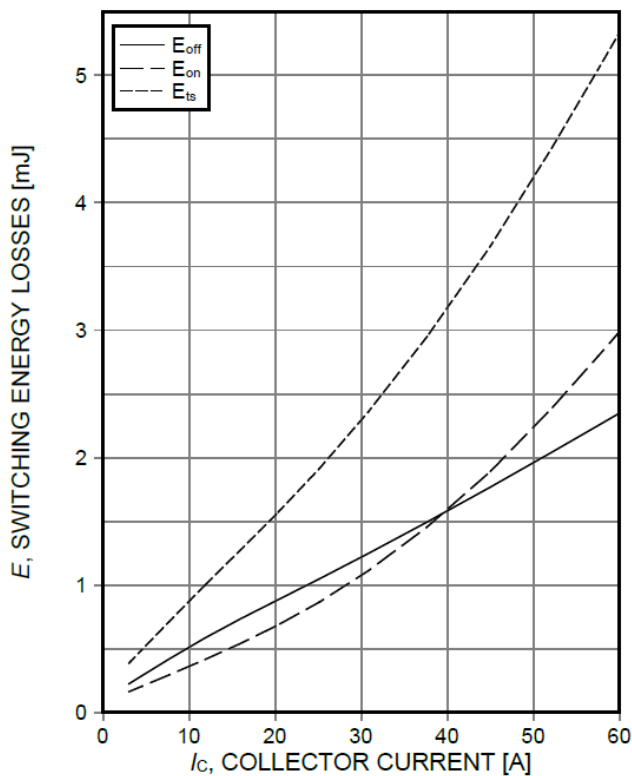


Figure 11. Typical switching energy losses as a function of collector current
(inductive load, $T_J=175^\circ C$, $V_{CE}=400V$, $V_{GE}=0/15V$, $R_G=10\Omega$, Dynamic test circuit in Figure E)

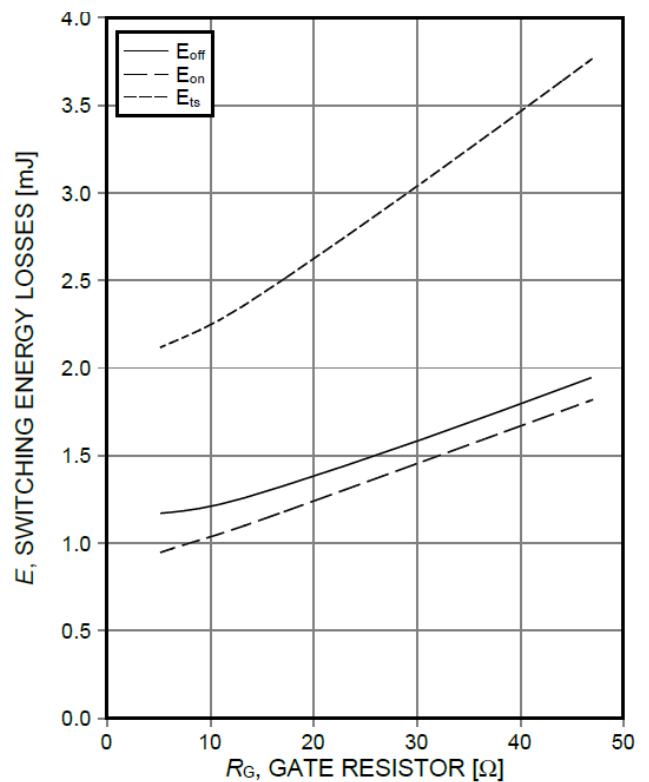


Figure 12. Typical switching energy losses as a function of gate resistor
(inductive load, $T_J=175^\circ C$, $V_{CE}=400V$, $V_{GE}=0/15V$, $I_C=30A$, Dynamic test circuit in Figure E)

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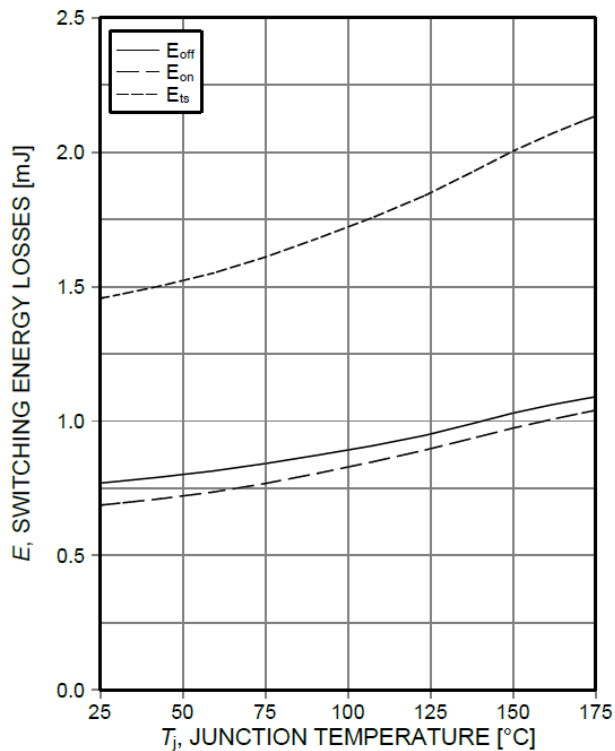


Figure 13. **Typical switching energy losses as a function of junction temperature**
(inductive load, $V_{CE}=400V$, $V_{GE}=0/15V$, $I_C=30A$, $R_G=10\Omega$, Dynamic test circuit in Figure E)

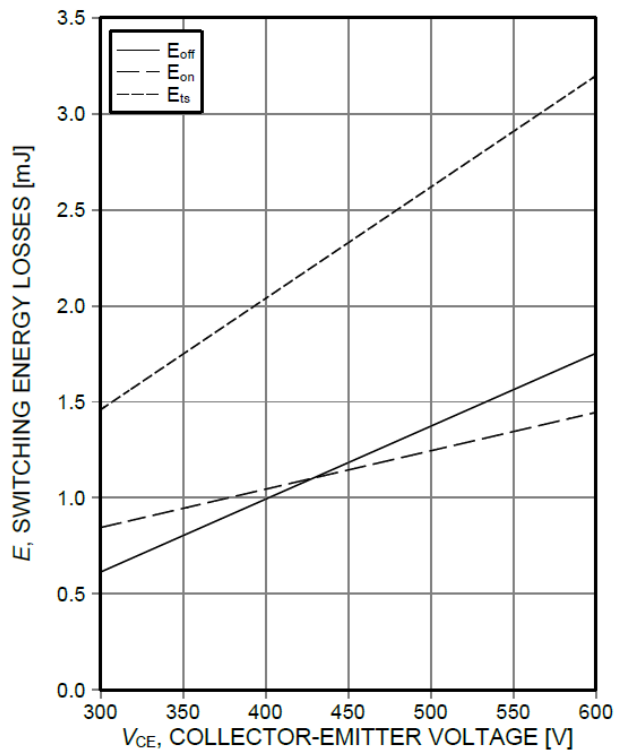


Figure 14. **Typical switching energy losses as a function of collector emitter voltage**
(inductive load, $T_j=175^\circ C$, $V_{GE}=0/15V$, $I_C=30A$, $R_G=10\Omega$, Dynamic test circuit in Figure E)

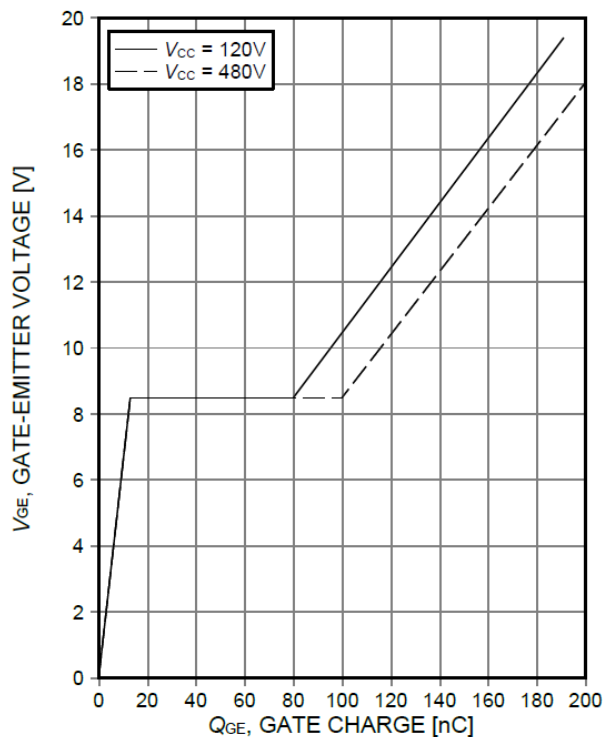


Figure 15. **Typical gate charge**
($I_C=30A$)

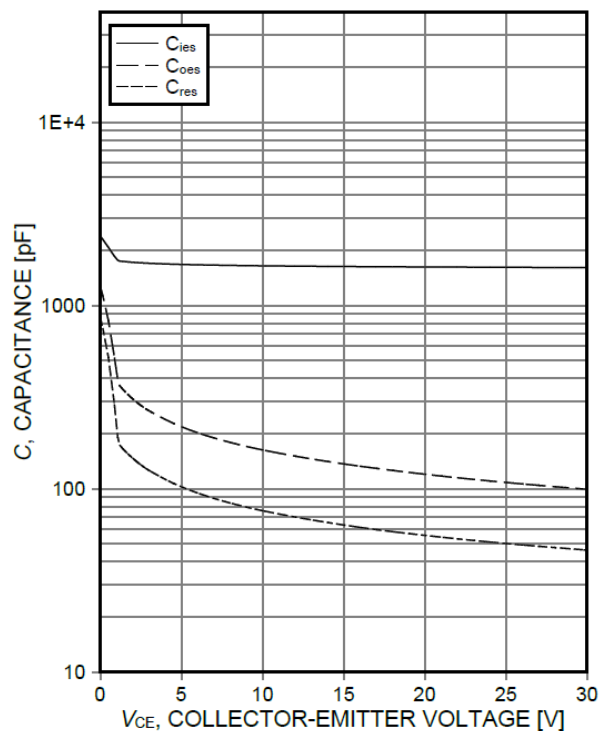


Figure 16. **Typical capacitance as a function of collector-emitter voltage**
($V_{GE}=0V$, $f=1MHz$)

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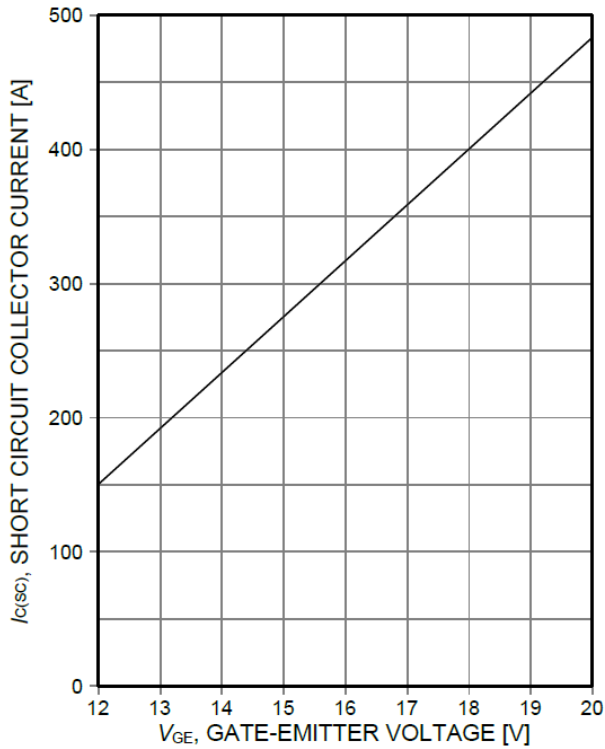


Figure 17. Typical short circuit collector current as a function of gate-emitter voltage
($V_{CE} \leq 400V$, start at $T_j \leq 150^{\circ}C$)

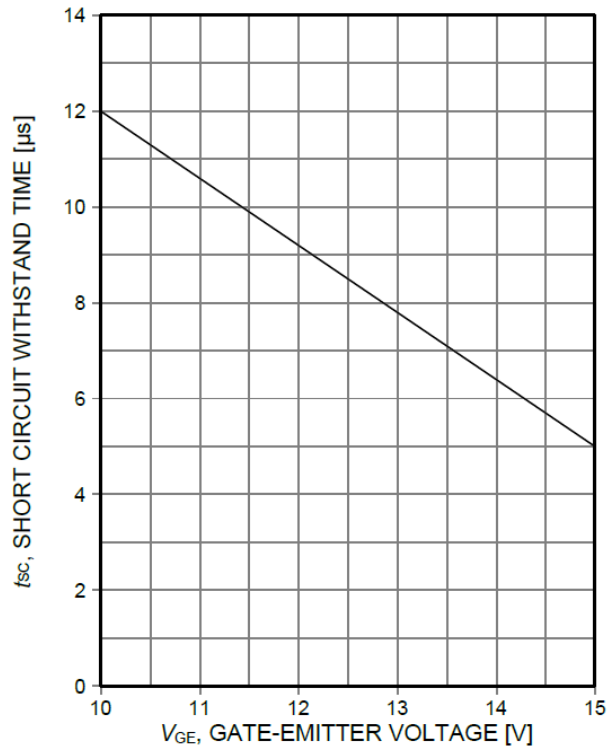


Figure 18. Short circuit withstand time as a function of gate-emitter voltage
($V_{CE} = 400V$, start at $T_j = 25^{\circ}C$, $T_{jmax} \leq 150^{\circ}C$)

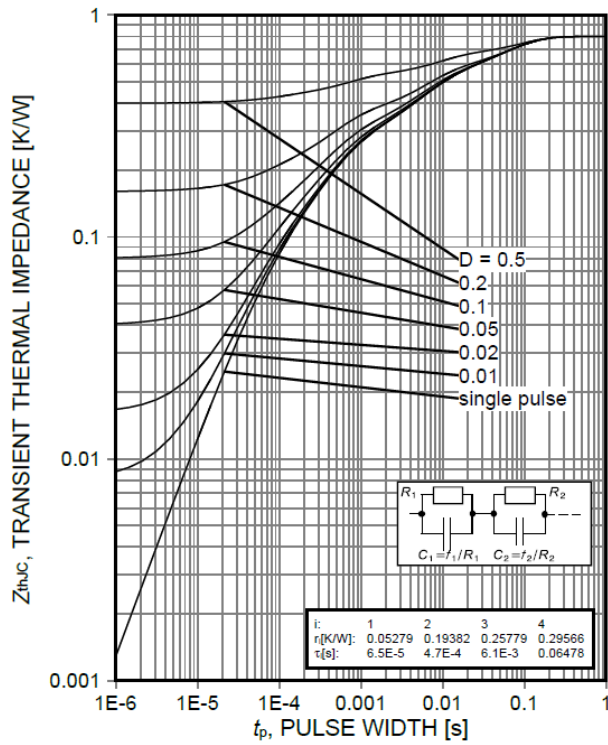


Figure 19. IGBT transient thermal impedance as a function of pulse width for different duty cycles D
($D = t_p/T$)

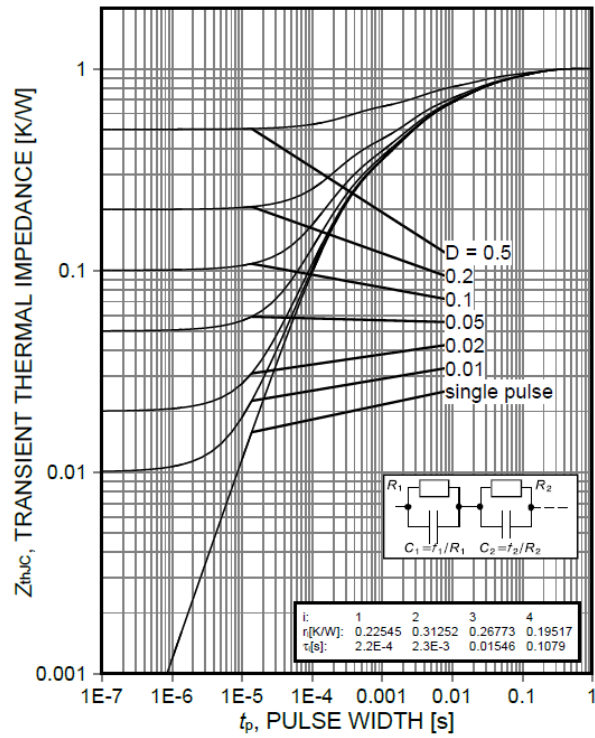


Figure 20. Diode transient thermal impedance as a function of pulse width for different duty cycles D
($D = t_p/T$)

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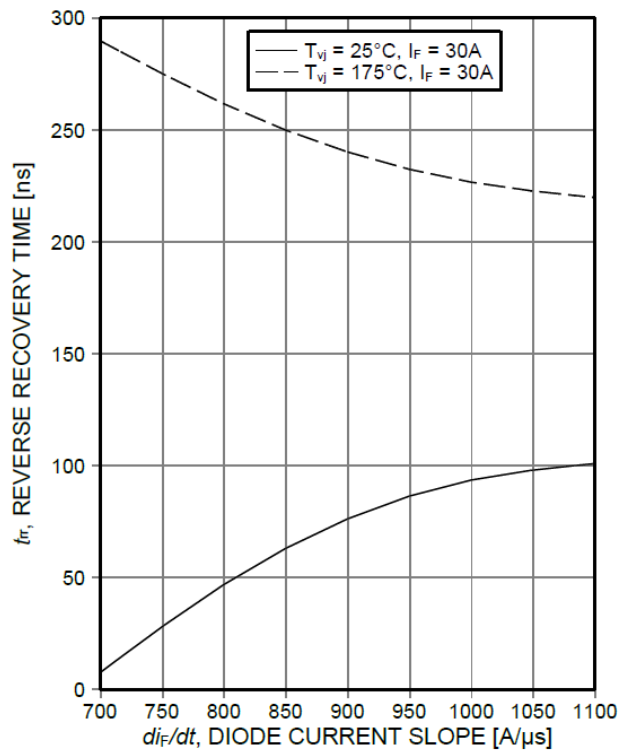


Figure 21. Typical reverse recovery time as a function of diode current slope
($V_R=400V$, Dynamic test circuit in Figure E)

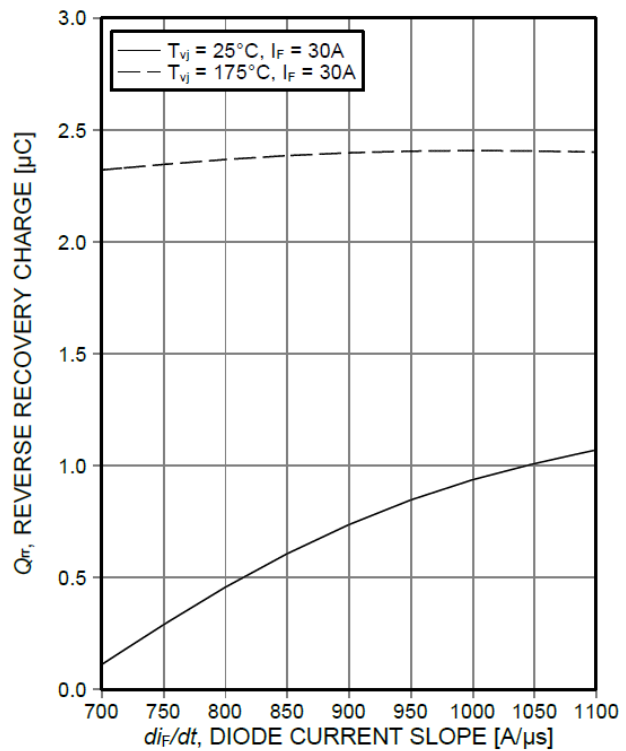


Figure 22. Typical reverse recovery charge as a function of diode current slope
($V_R=400V$, Dynamic test circuit in Figure E)

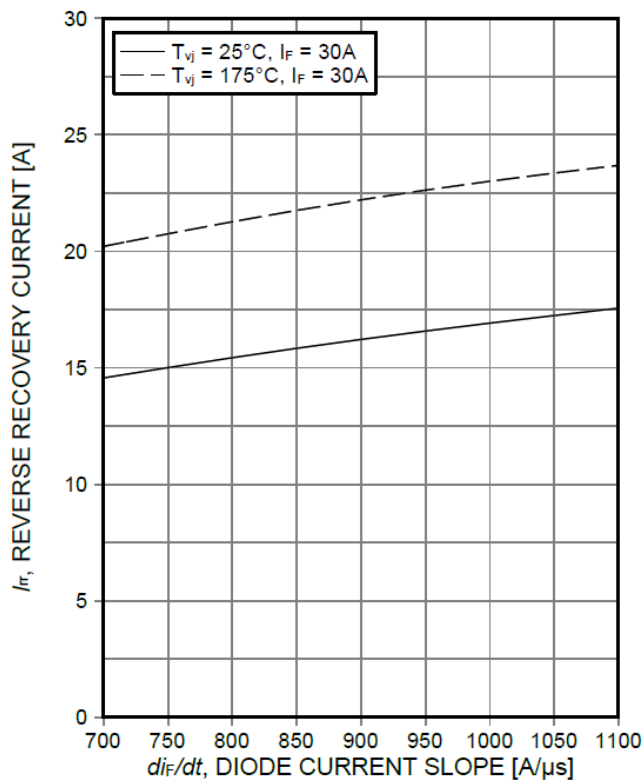


Figure 23. Typical reverse recovery current as a function of diode current slope
($V_R=400V$, Dynamic test circuit in Figure E)

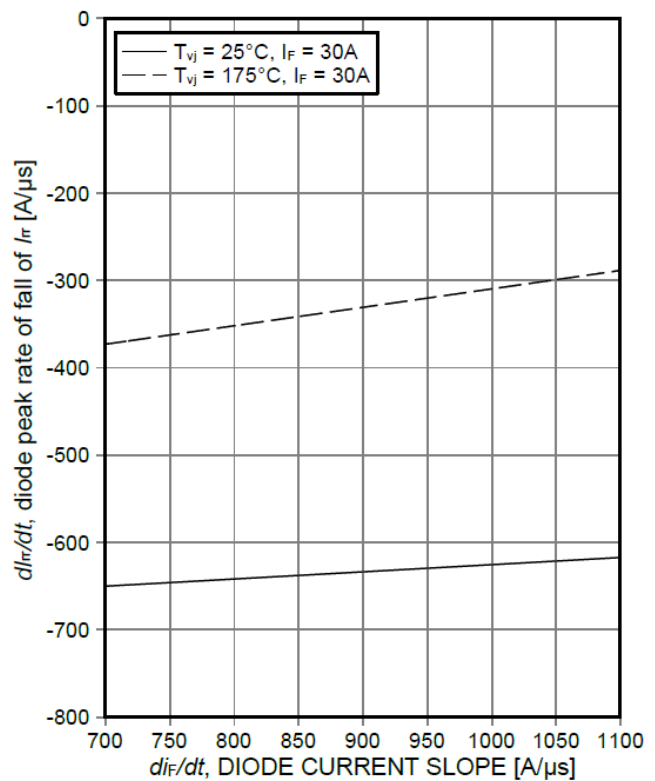


Figure 24. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope
($V_R=400V$, Dynamic test circuit in Figure E)

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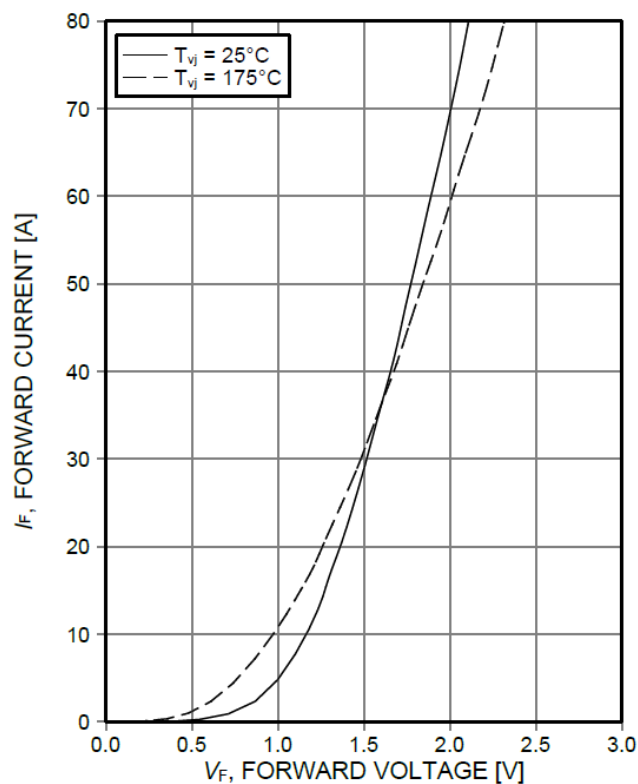


Figure 25. Typical diode forward current as a function of forward voltage

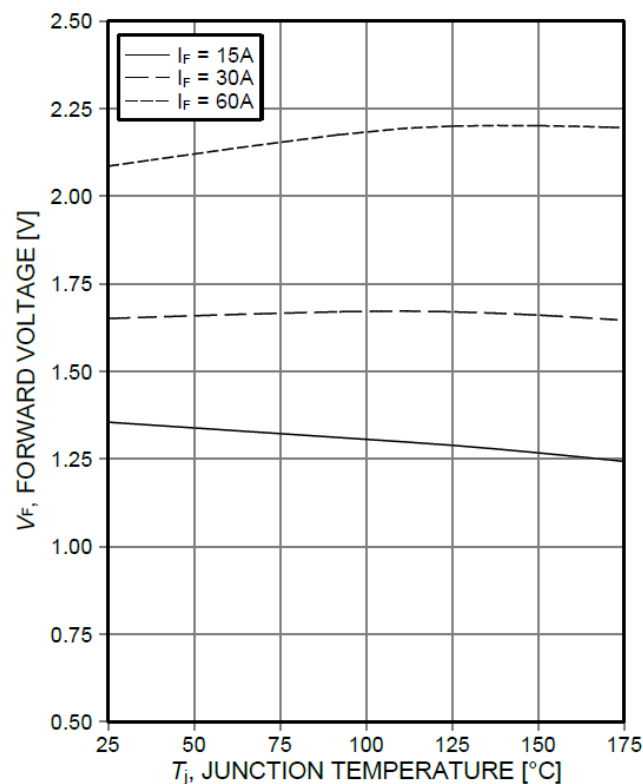
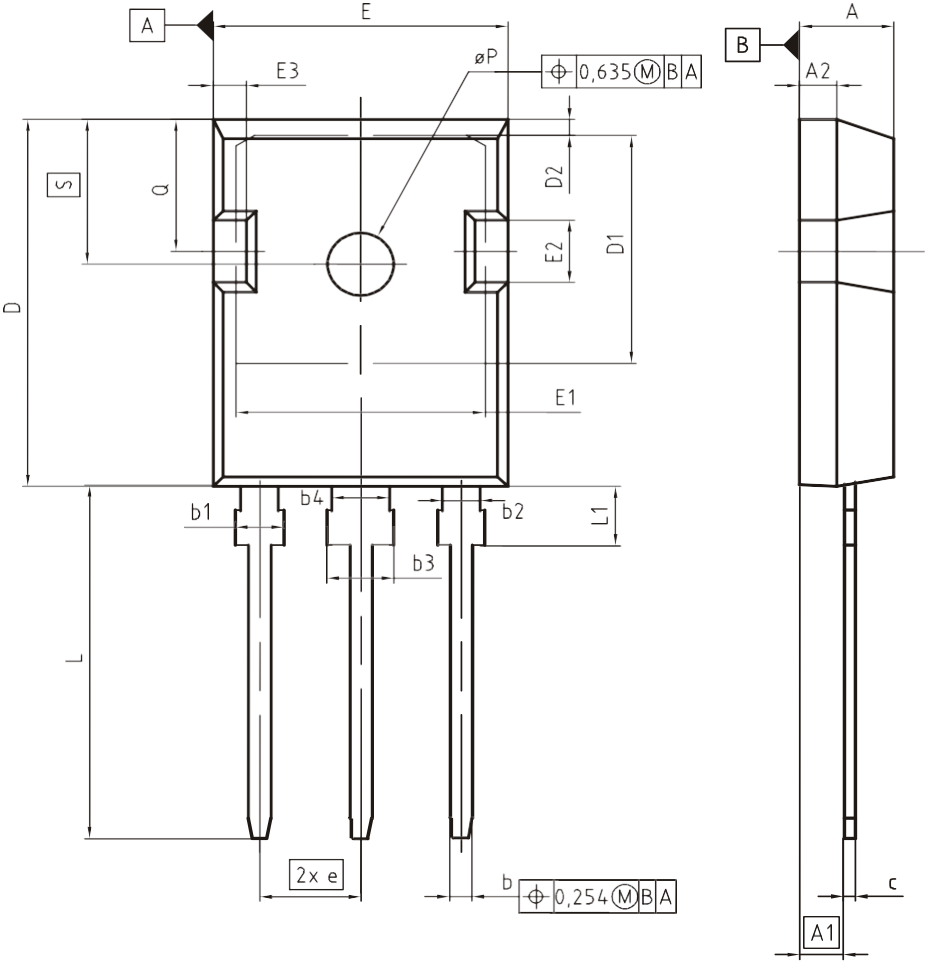


Figure 26. Typical diode forward voltage as a function of junction temperature

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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

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测试条件

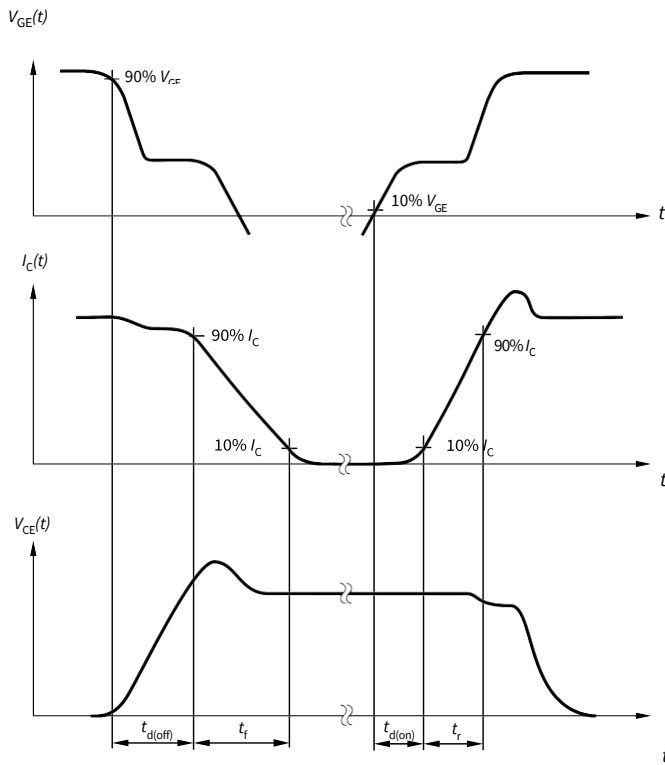


Figure A. Definition of switching times

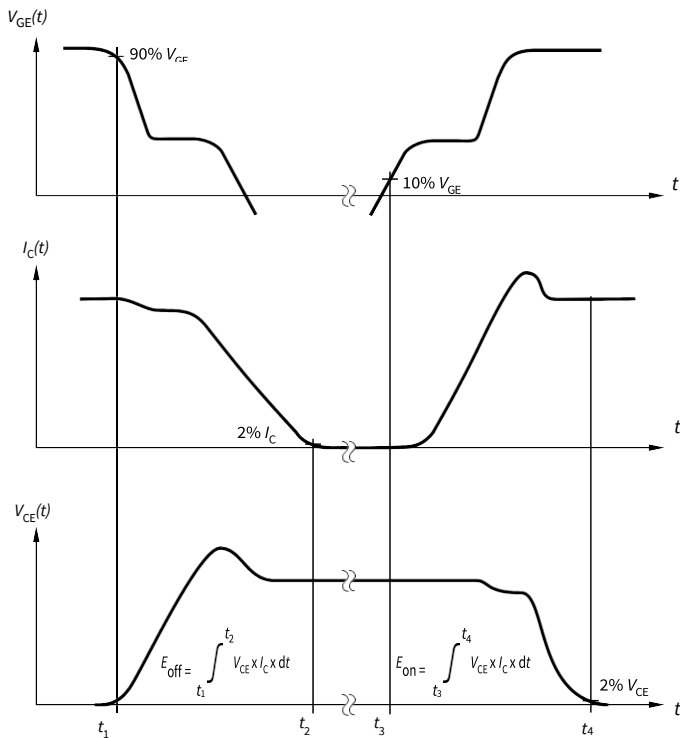


Figure B. Definition of switching losses

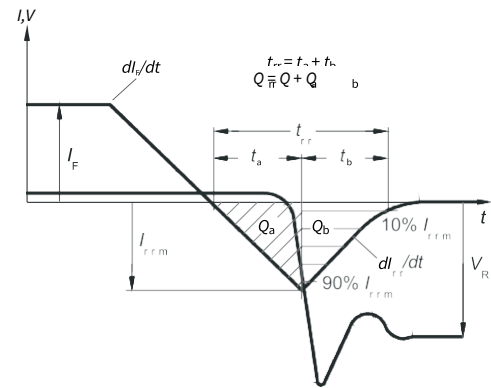


Figure C. Definition of diode switching characteristics

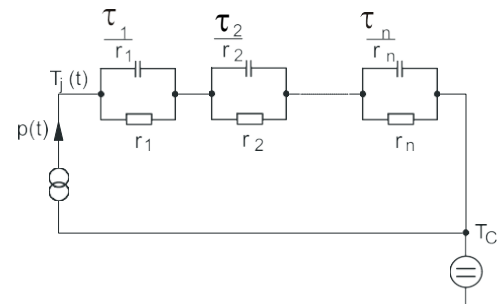


Figure D. Thermal equivalent circuit

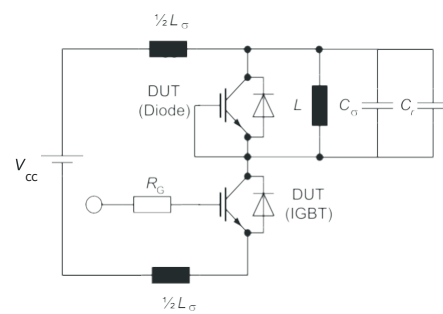


Figure E. **Dynamic test circuit**
 Parasitic inductance L_{σ} ,
 parasitic capacitor C_{σ} ,
 relief capacitor C_r ,
 (only for ZVT switching)



TRENCHSTOP™ 系列

修订记录

AIKW30N60CT

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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