IGBT

英飞凌高速 DuoPack：采用 Trench 和 Fieldstop 技术的 IGBT，搭配软、快速恢复反并联二极管

IKW30N60H3

英飞凌600V 第三代高速开关 IGBT 系列

数据手册

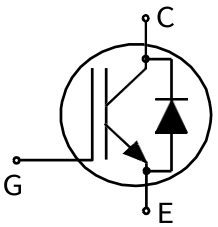
工业功率控制

英飞凌高速 DuoPack：采用 Trench 和 Fieldstop 技术的 IGBT，搭配软、快速恢复反并联二极管

特性：

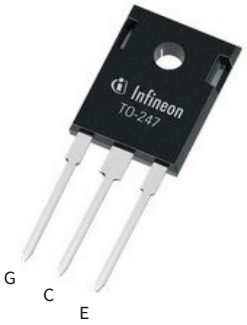
TRENCHSTOP™技术产品
- 极低 V_{CEsat}
- 低电磁干扰
- 非常柔软、快速恢复的反并联二极管
- 最高结温 175°C
- 符合 JEDEC 目标应用要求
- 无铅镀层；符合RoHS标准
- 完整的产品品类和 PSpice 模型：

http://www.infineon.com/igbt/



应用：

- UPS（不间断电源）
- 焊机
- 高开关频率转换器



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

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）。

IKW30N60H3	600V	30A	1.95V	175°C	K30H603	PG-TO247-3

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最大额定值

Parameter	Symbol	Value	Unit
Collector-emitter voltage, $T_{vj} \geq 25°C$	V_{CE}	600	V
DC collector current, limited by T_{vjmax} T_C = 25°C T_C = 100°C	I_C	60.0 30.0	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	120.0	A
Turn off safe operating area $V_{CE} \leq 600V$, $T_{vj} \leq 175°C$, $t_p = 1\mu s$	-	120.0	A
Diode forward current, limited by T_{vjmax} T_C = 25°C T_C = 100°C	I_F	30.0 15.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	120.0	A
Gate-emitter voltage	V_{GE}	±20	V
Short circuit withstand time V_{GE} = 15.0V, $V_{CC} \leq 400V$ Allowed number of short circuits < 1000 Time between short circuits: ≥ 1.0s T_{vj} = 150°C	t_{SC}	5	µs
Power dissipation T_C = 25°C Power dissipation T_C = 100°C	P_{tot}	187.0 94.0	W
Operating junction temperature	T_{vj}	-40...+175	°C
Storage temperature	T_{stg}	-55...+150	°C
Soldering temperature, wave soldering 1.6 mm (0.063 in.) from case for 10s		260	°C
Mounting torque, M3 screw Maximum of mounting processes: 3	M	0.6	Nm

热阻抗

Parameter	Symbol	Conditions	Max. Value	Unit
特性				
IGBT thermal resistance, junction - case	$R_{th(j-c)}$		0.80	K/W
Diode thermal resistance, junction - case	$R_{th(j-c)}$		1.90	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.	
静态特性						
Collector-emitter breakdown voltage	$V_{(BR)CES}$	V_{GE} = 0V, I_C = 2.00mA	600	-	-	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	 - - -	 1.95 2.30 2.50	 2.40 - -	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	 - - -	 1.65 1.67 1.65	 2.05 - -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C = 0.43mA, V_{CE} = V_{GE}	4.1	5.1	5.7	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 600V, V_{GE} = 0V T_{vj} = 25°C T_{vj} = 175°C	 - -	 - -	 40.0 2000.0	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	-	16.0	-	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.	
动态特性						
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	1630	-	pF
Output capacitance	C_{oes}		-	107	-	
Reverse transfer capacitance	C_{res}		-	50	-	
Gate charge	Q_G	V_{CC} = 480V, I_C = 30.0A, V_{GE} = 15V	-	165.0	-	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: ≥ 1.0s	$I_{C(SC)}$	V_{GE} = 15.0V, V_{CC} ≤ 400V, t_{SC} ≤ 5µs T_{vj} = 150°C	-	 160	-	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°C的条件下						
Turn-on delay time	$t_{d(on)}$	T_{vj} = 25°C, V_{CC} = 400V, I_C = 30.0A, V_{GE} = 0.0/15.0V, r_G = 10.5Ω, $L\sigma$ = 95nH, $C\sigma$ = 67pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	21	-	ns
Rise time	t_r		-	33	-	ns
Turn-off delay time	$t_{d(off)}$		-	207	-	ns
Fall time	t_f		-	22	-	ns
Turn-on energy	E_{on}		-	0.94	-	mJ
Turn-off energy	E_{off}		-	0.44	-	mJ
Total switching energy	E_{ts}		-	1.38	-	mJ
Diode reverse recovery time	t_{rr}	T_{vj} = 25°C, V_R = 400V, I_F = 15.0A, di_F/dt = 1000A/µs	-	38	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.32	-	µC
Diode peak reverse recovery current	I_{rrm}		-	12.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-765	-	A/µs

开关特性、感性负载

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT 特性，测于 T_{vj} = 175°C的条件						
Turn-on delay time	$t_{d(on)}$	T_{vj} = 175°C, V_{CC} = 400V, I_C = 30.0A, V_{GE} = 0.0/15.0V, r_G = 10.5Ω, $L\sigma$ = 95nH, $C\sigma$ = 67pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	20	-	ns
Rise time	t_r		-	30	-	ns
Turn-off delay time	$t_{d(off)}$		-	239	-	ns
Fall time	t_f		-	23	-	ns
Turn-on energy	E_{on}		-	1.12	-	mJ
Turn-off energy	E_{off}		-	0.60	-	mJ
Total switching energy	E_{ts}		-	1.72	-	mJ
Diode reverse recovery time	t_{rr}	T_{vj} = 175°C, V_R = 400V, I_F = 15.0A, di_F/dt = 1000A/µs	-	117	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.08	-	µC
Diode peak reverse recovery current	I_{rrm}		-	16.6	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-530	-	A/µs

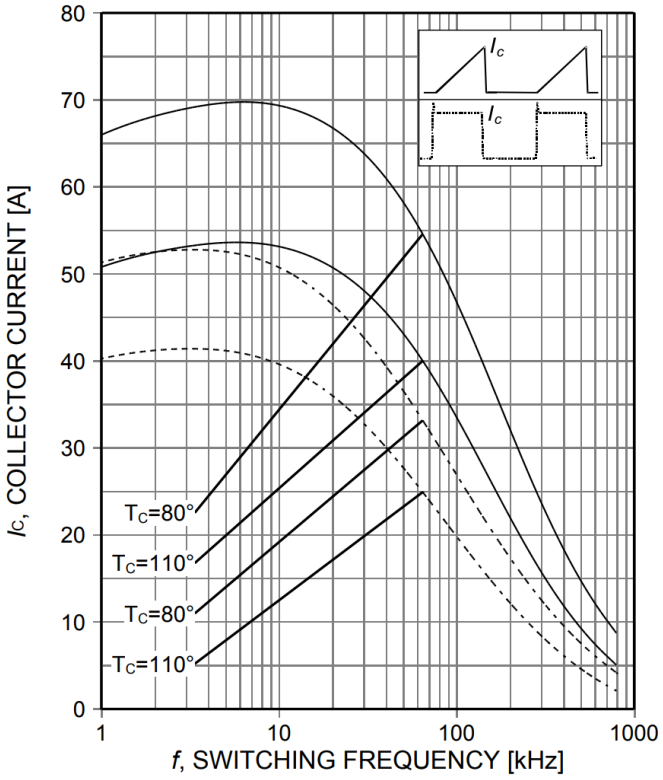


Figure 1. **Collector current as a function of switching frequency**
(T_j≤175°C, D=0.5, V_{CE}=400V, V_{GE}=15/0V, r_G=10,5Ω)

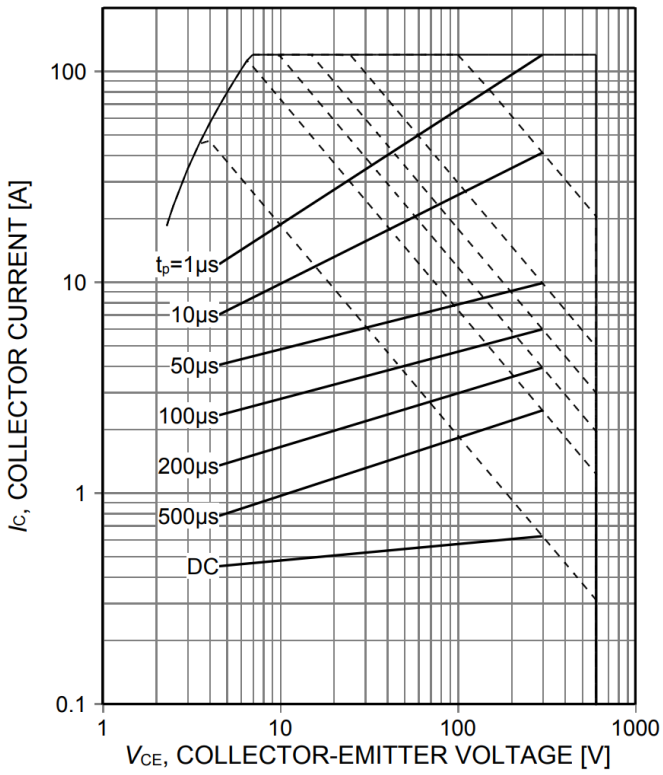


Figure 2. **Forward bias safe operating area**
(D=0, T_C=25°C, T_j≤175°C; V_{GE}=15V)

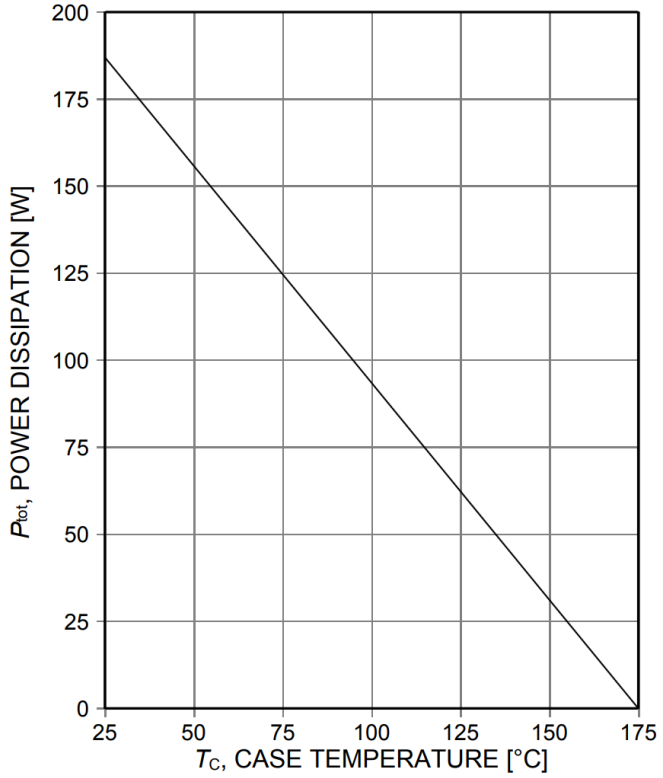


Figure 3. **Power dissipation as a function of case temperature**
(T_j≤175°C)

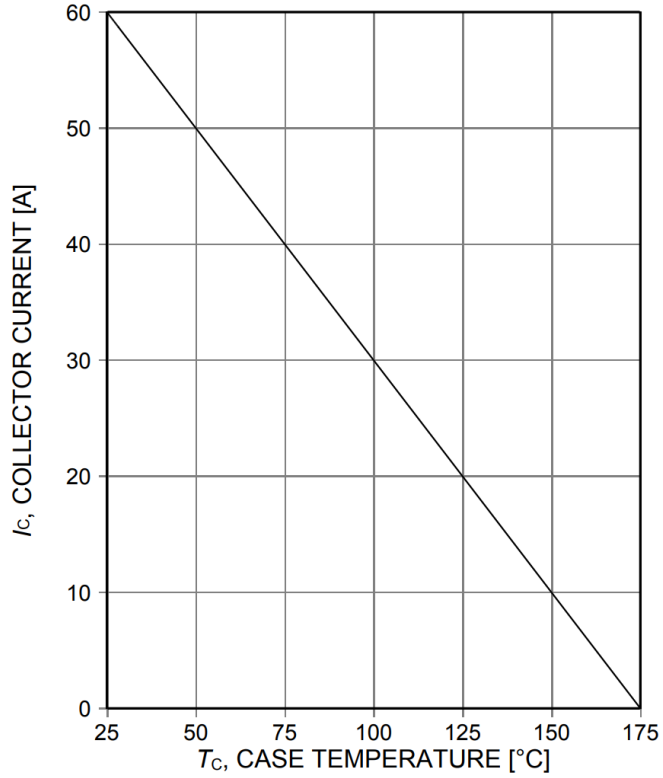


Figure 4. **Collector current as a function of case temperature**
(V_{GE}≥15V, T_j≤175°C)

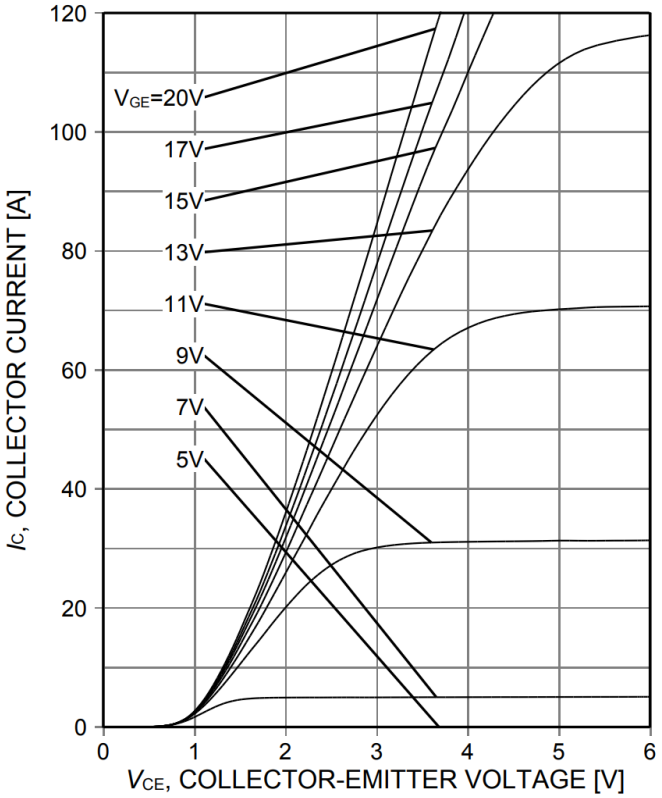


Figure 5. **Typical output characteristic**
(T_j=25°C)

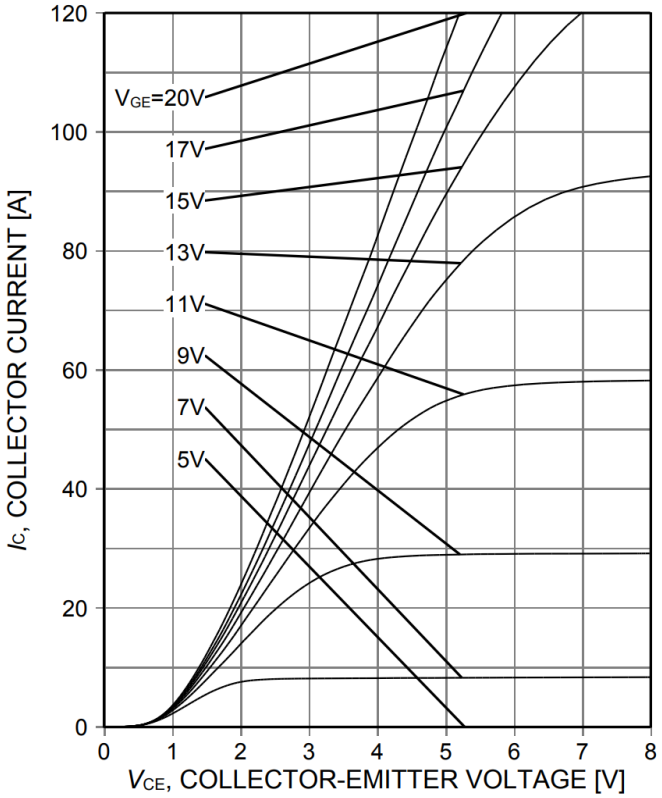


Figure 6. **Typical output characteristic**
(T_j=175°C)

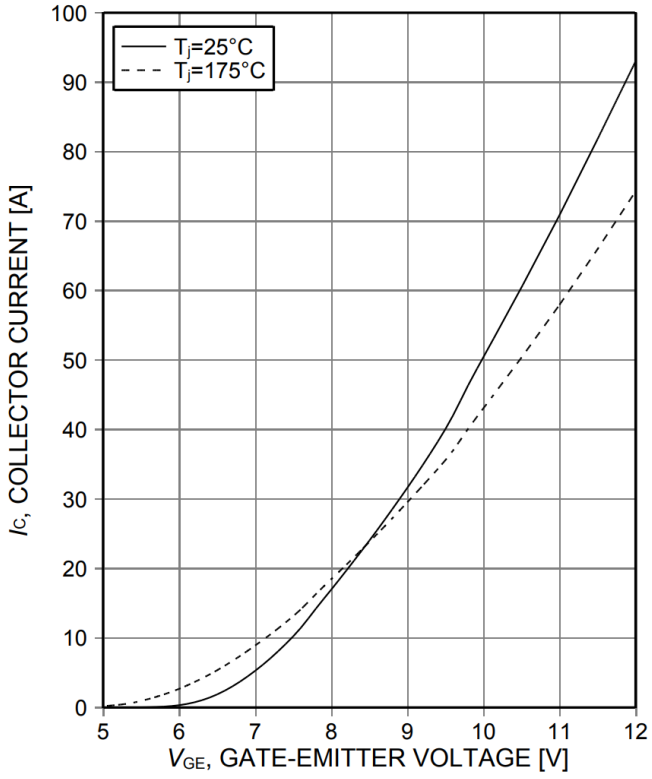


Figure 7. **Typical transfer characteristic**
(V_{CE}=20V)

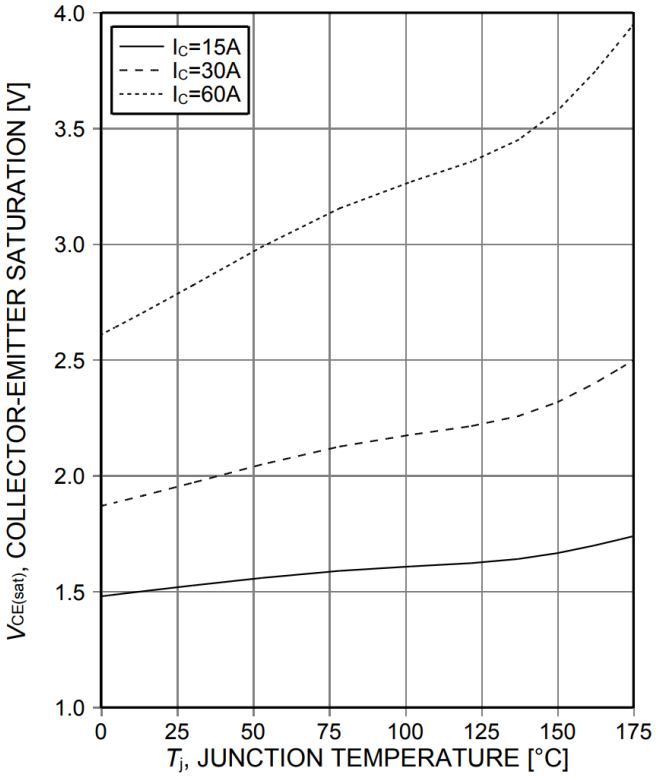


Figure 8. **Typical collector-emitter saturation voltage as a function of junction temperature**
(V_{GE}=15V)

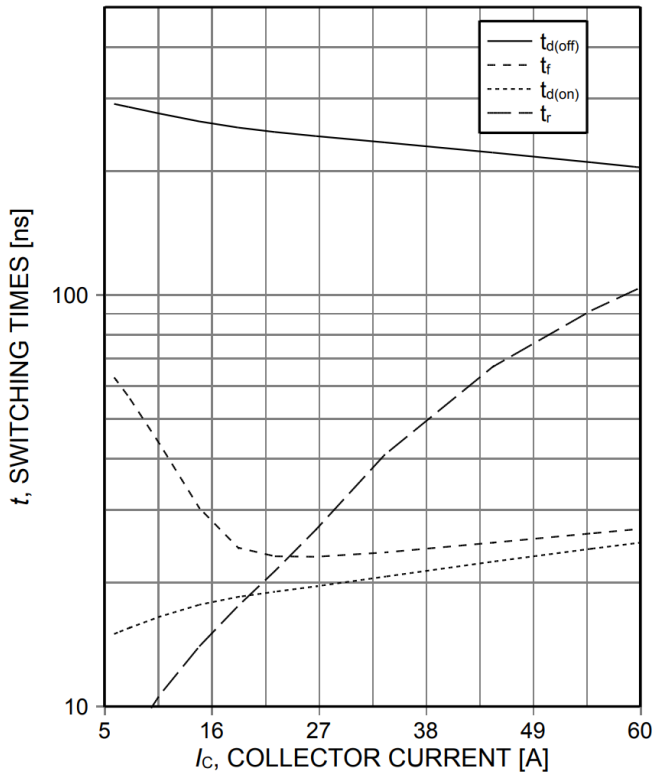


Figure 9. **Typical switching times as a function of collector current**
(ind. load, T_j=175°C, V_{CE}=400V, V_{GE}=15/0V, r_G=10,5Ω, test circuit in Fig. E)

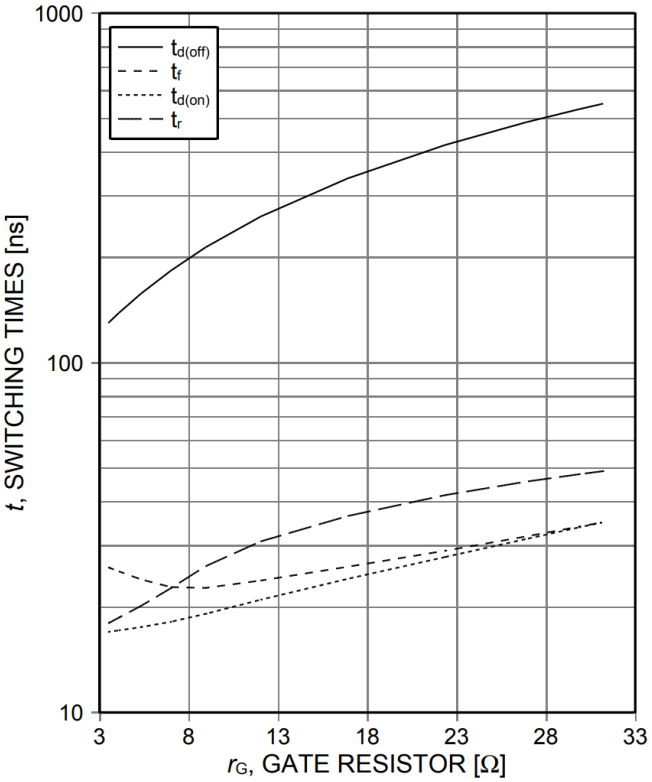


Figure 10. **Typical switching times as a function of gate resistor**
(ind. load, T_j=175°C, V_{CE}=400V, V_{GE}=15/0V, I_C=30A, test circuit in Fig. E)

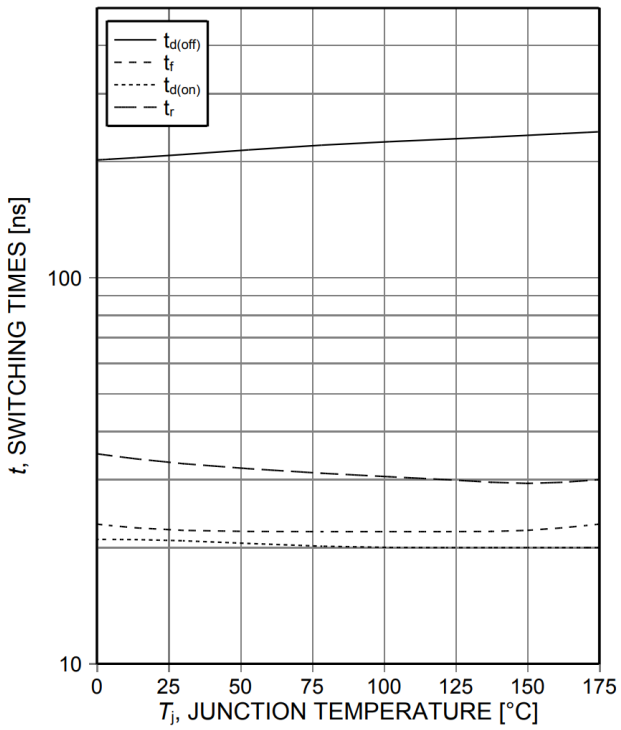


Figure 11. **Typical switching times as a function of junction temperature**
(ind. load, V_{CE}=400V, V_{GE}=15/0V, I_C=30A, r_G=10,5Ω, test circuit in Fig. E)

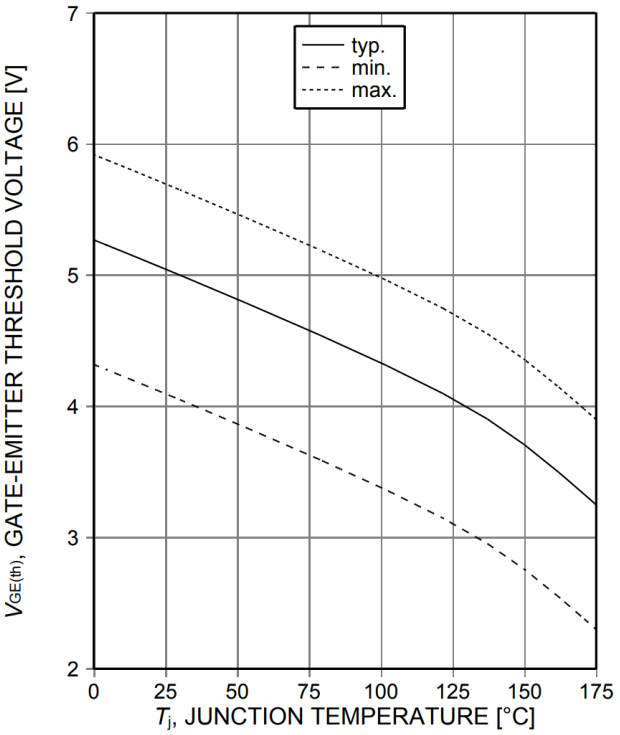


Figure 12. **Gate-emitter threshold voltage as a function of junction temperature**
(I_C=0.43mA)

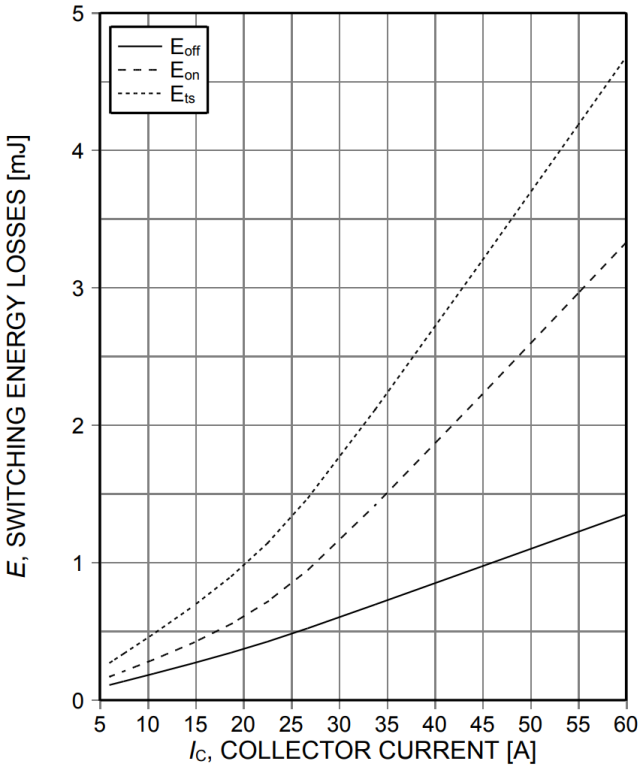


Figure 13. **Typical switching energy losses as a function of collector current**
(ind. load, T_j=175°C, V_{CE}=400V, V_{GE}=15/0V, r_G=10,5Ω, test circuit in Fig. E)

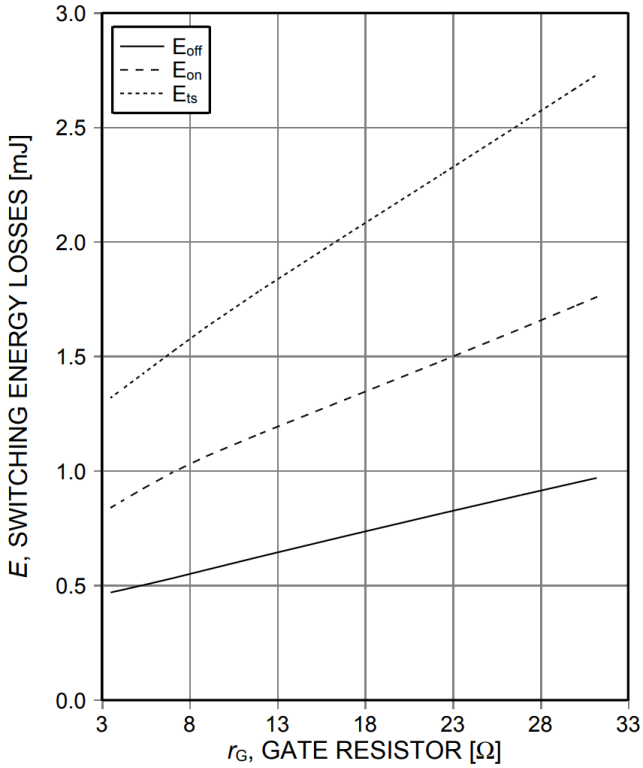


Figure 14. **Typical switching energy losses as a function of gate resistor**
(ind. load, T_j=175°C, V_{CE}=400V, V_{GE}=15/0V, I_C=30A, test circuit in Fig. E)

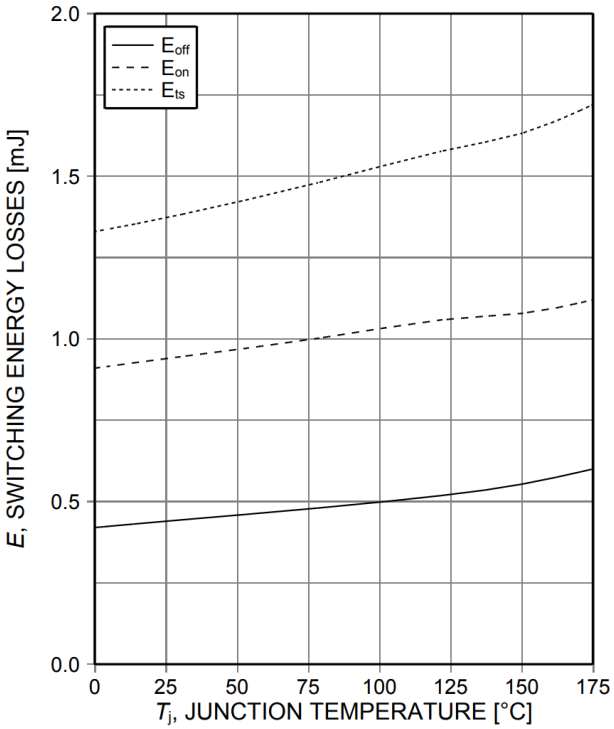


Figure 15. **Typical switching energy losses as a function of junction temperature**
(ind load, V_{CE}=400V, V_{GE}=15/0V, I_C=30A, r_G=10,5Ω, test circuit in Fig. E)

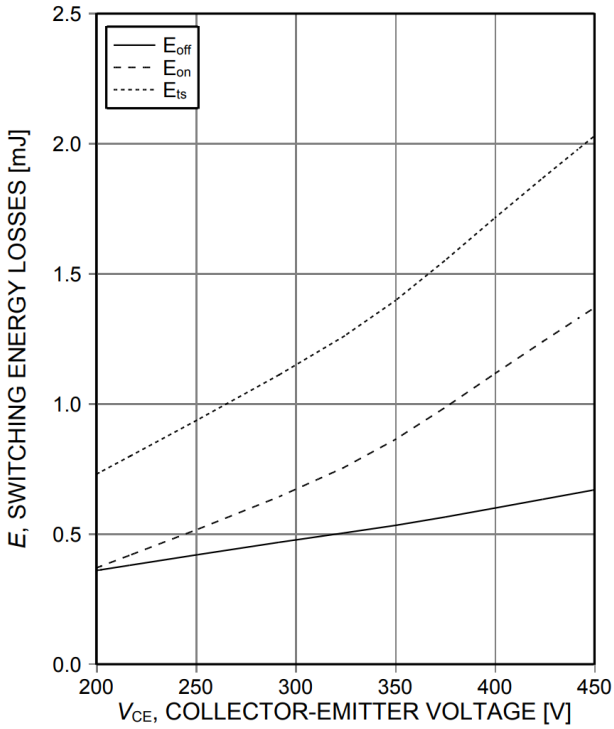


Figure 16. **Typical switching energy losses as a function of collector emitter voltage**
(ind. load, T_j=175°C, V_{GE}=15/0V, I_C=30A, r_G=10,5Ω, test circuit in Fig. E)

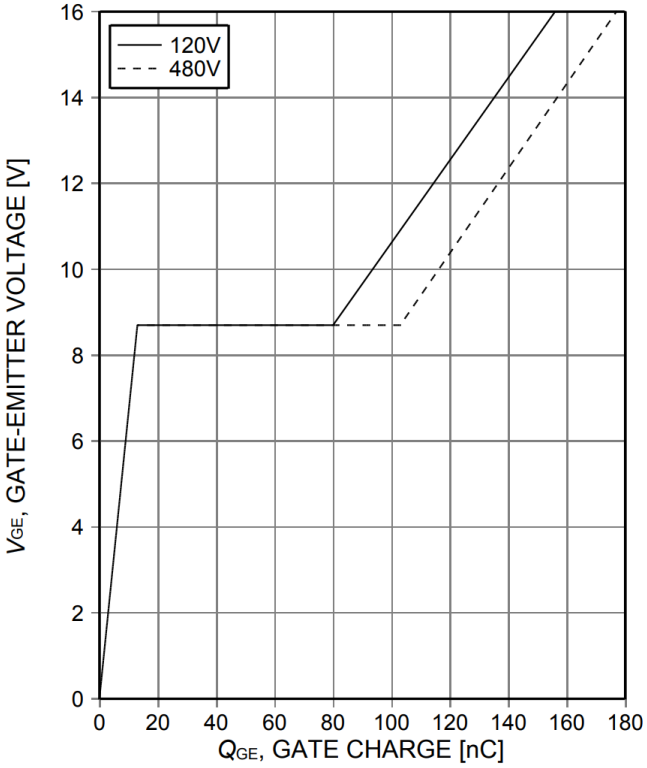


Figure 17. **Typical gate charge**
(I_C=30A)

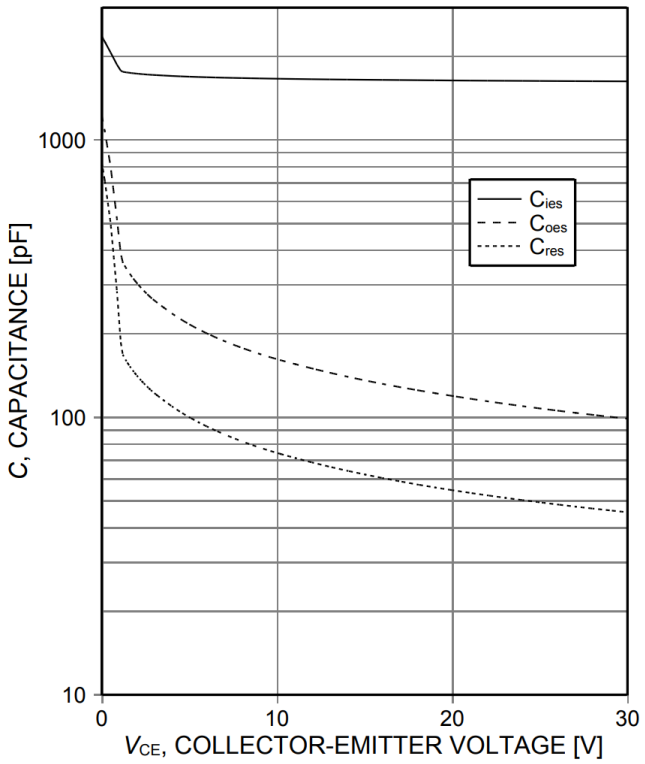


Figure 18. **Typical capacitance as a function of collector-emitter voltage**
(V_{GE}=0V, f=1MHz)

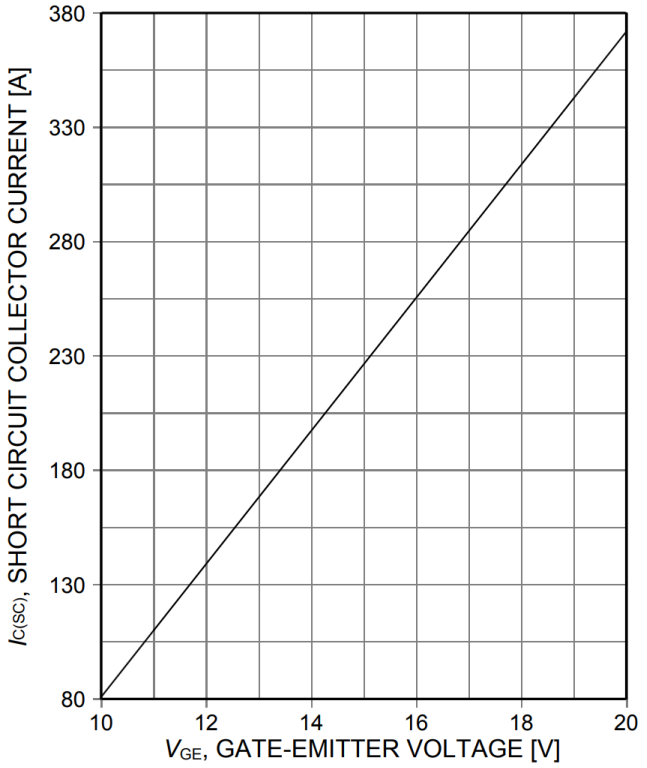


Figure 19. **Typical short circuit collector current as a function of gate-emitter voltage**
(V_{CE}≤400V, start atT_j=25°C)

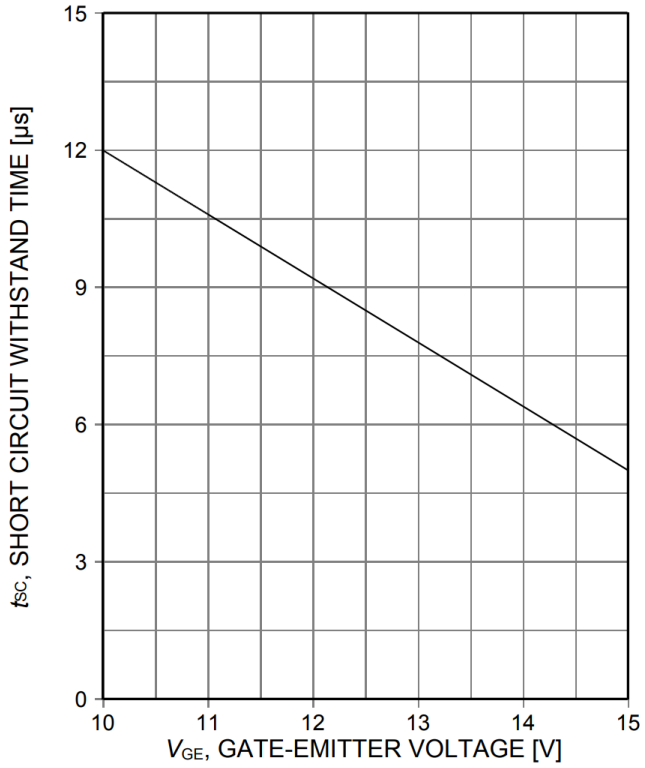


Figure 20. **Short circuit withstand time as a function of gate-emitter voltage**
(V_{CE}≤400V, start at T_j≤150°C)

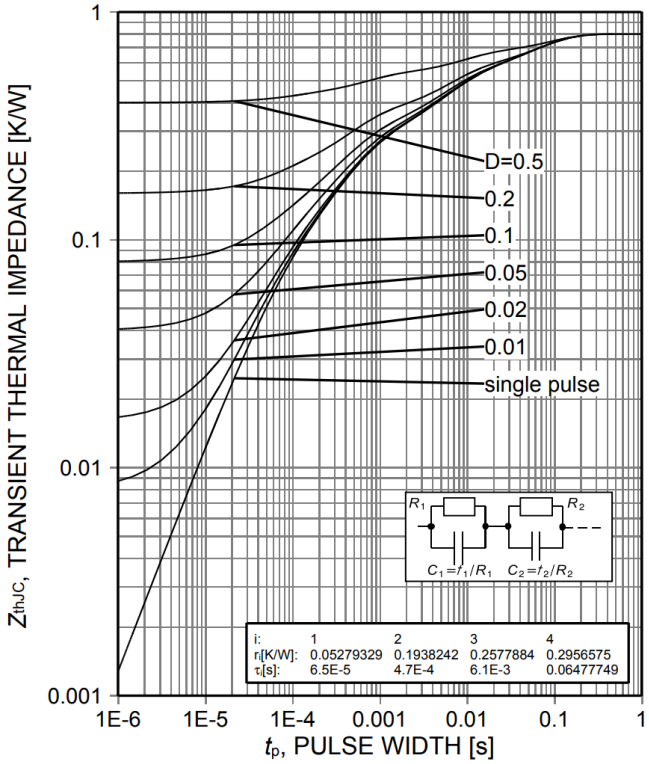


Figure 21. **IGBT transient thermal impedance** ($D=t_p/T$)

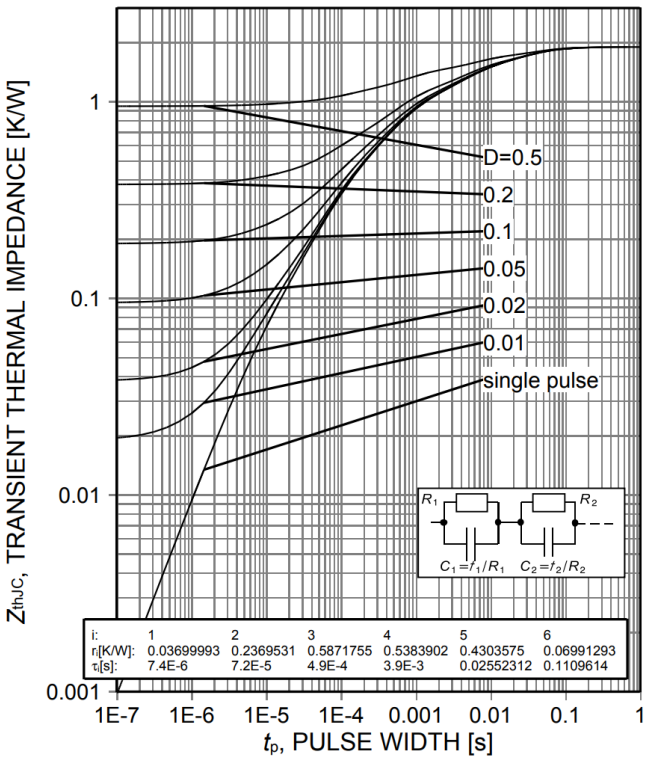


Figure 22. **Diode transient thermal impedance as a function of pulse width** ($D=t_p/T$)

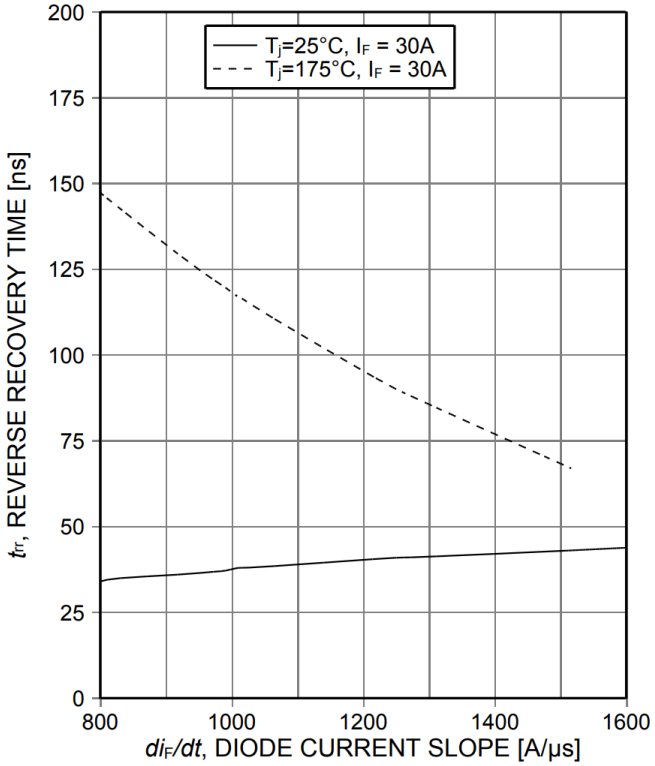


Figure 23. **Typical reverse recovery time as a function of diode current slope** (V_R=400V)

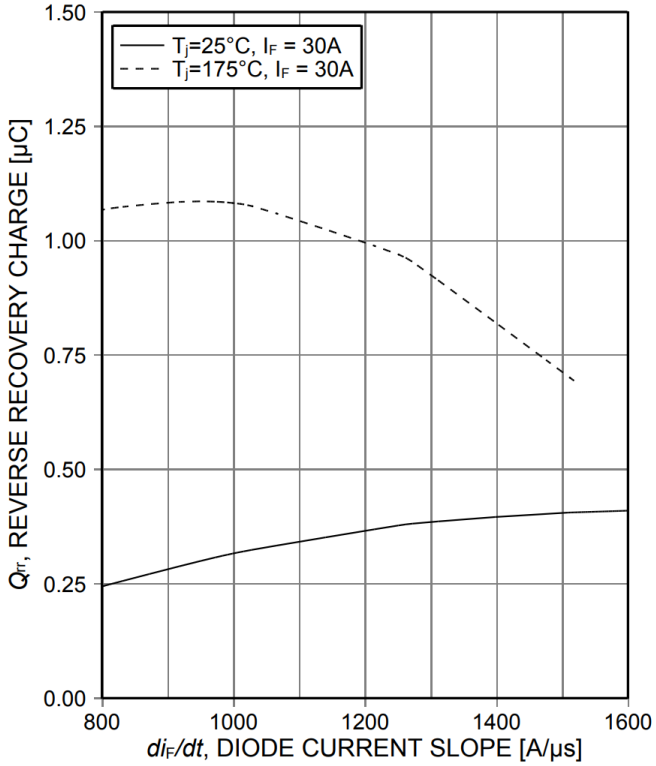


Figure 24. **Typical reverse recovery charge as a function of diode current slope** (V_R=400V)

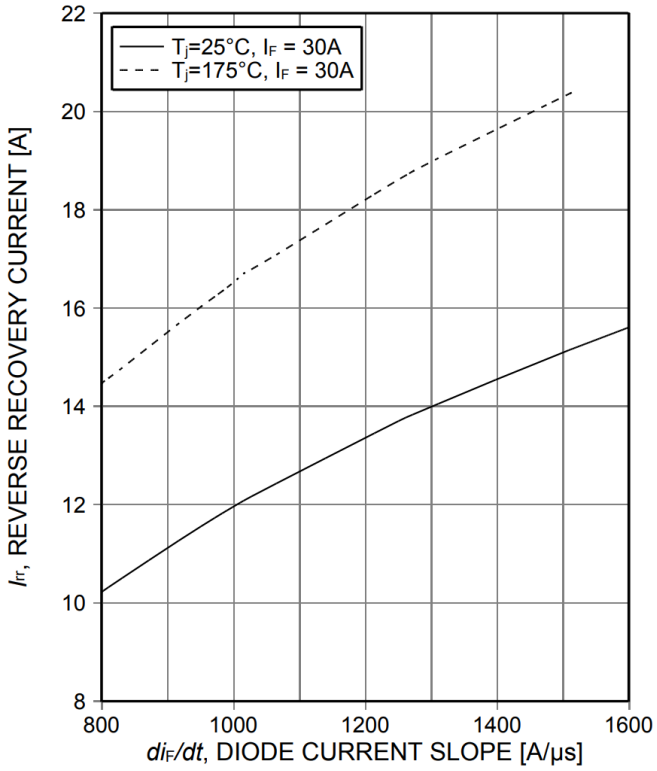


Figure 25. **Typical reverse recovery current as a function of diode current slope**
(V_R=400V)

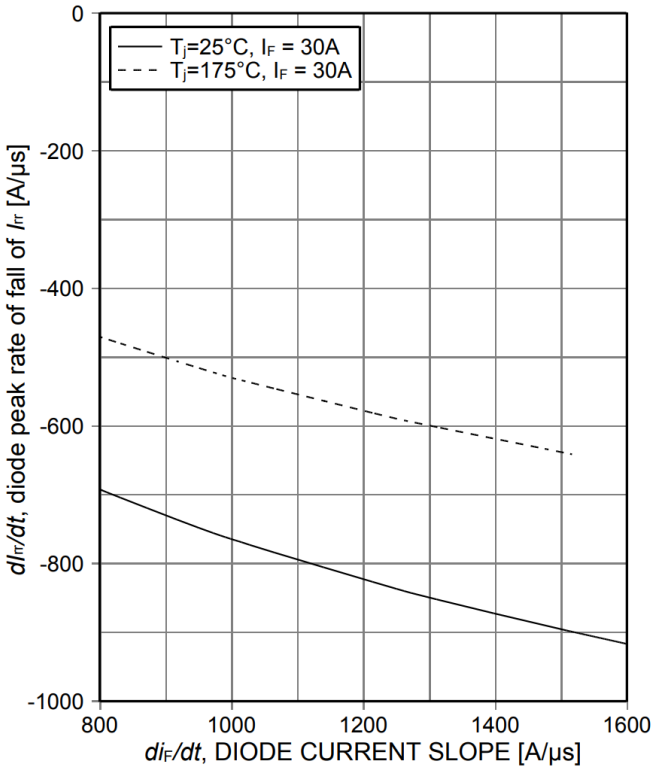


Figure 26. **Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**
(V_R=400V)

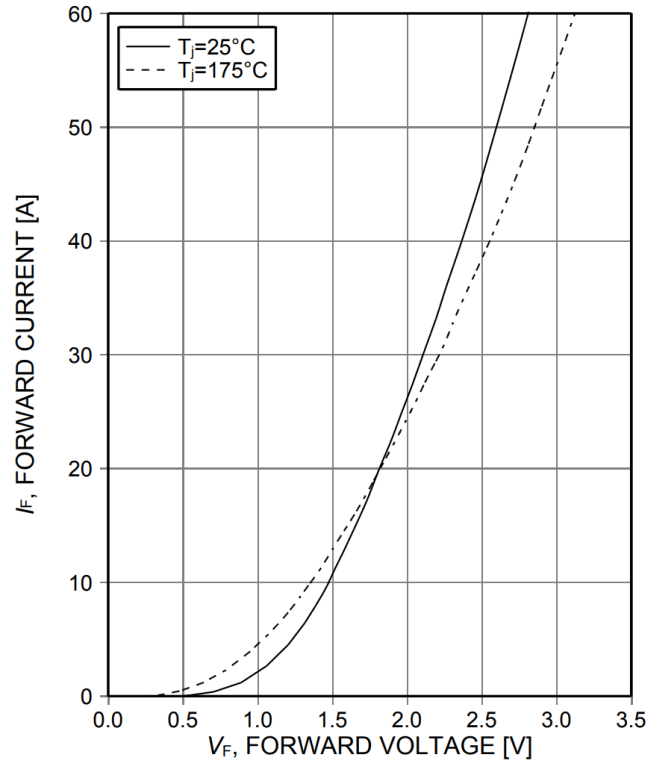


Figure 27. **Typical diode forward current as a function of forward voltage**

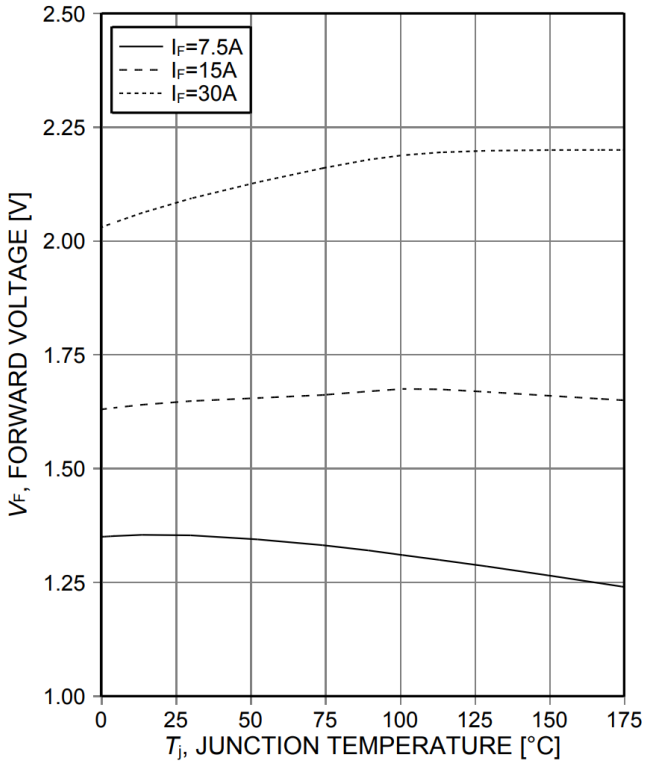
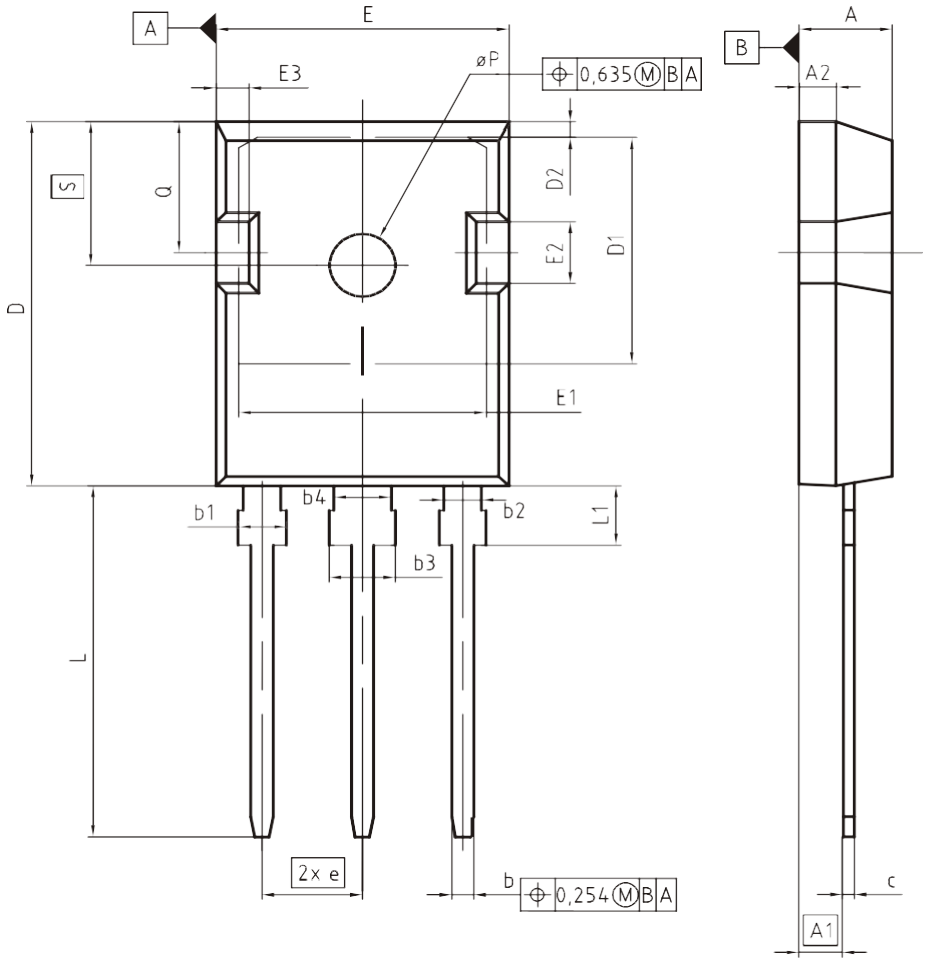


Figure 28. **Typical diode forward voltage as a function of junction temperature**

PG-TO247-3



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
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EUROPEAN PROJECTION	
ISSUE DATE	09-07-2010
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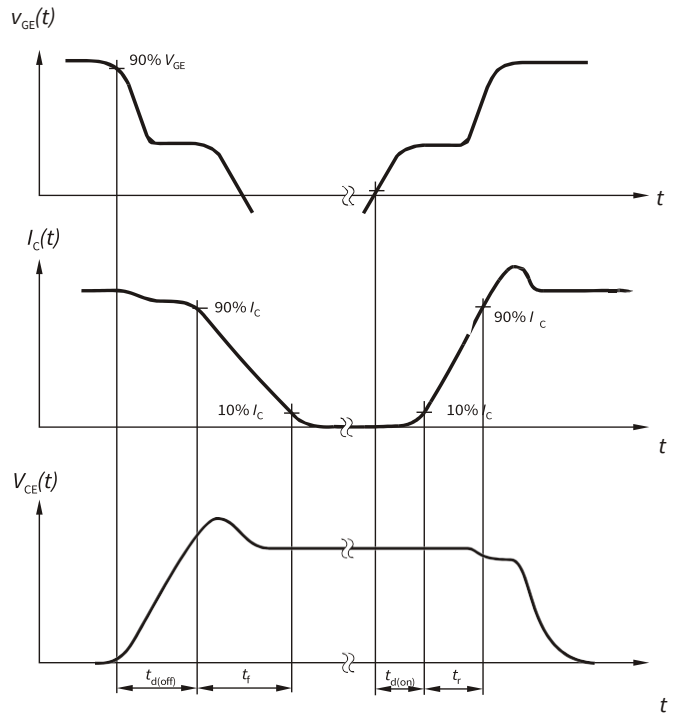


Figure A. Definition of switching times

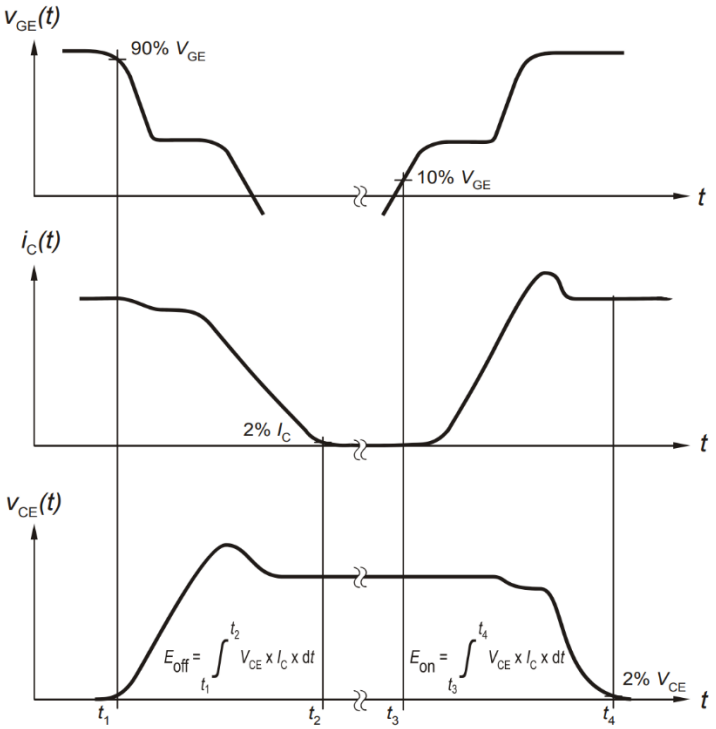


Figure B. Definition of switching losses

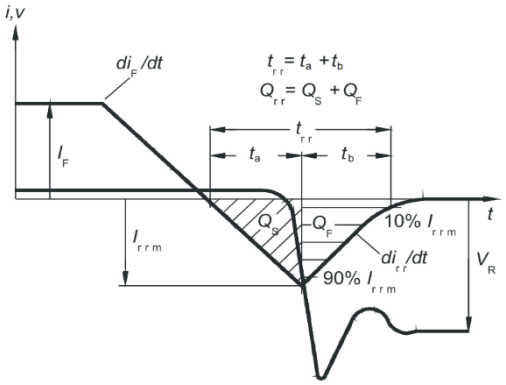


Figure C. Definition of diodes switching characteristics

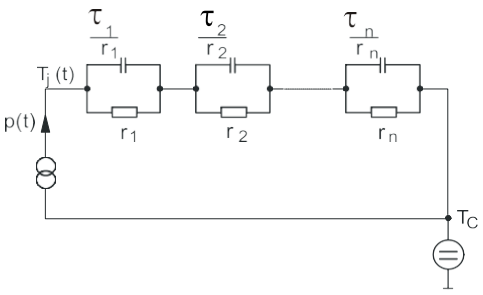


Figure D. Thermal equivalent circuit

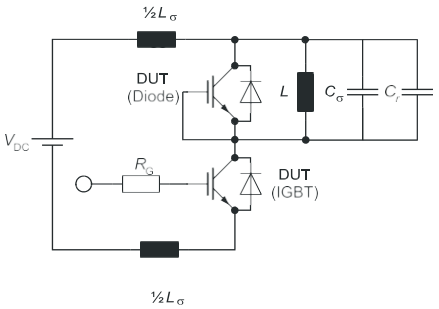


Figure E. Dynamic test circuit
Parasitic inductance L_σ,
Parasitic capacitor C_σ,
Relief capacitor C_r
(only for ZVT switching)

修订记录

IKW30N60H3

Revision: 2014-03-12, Rev. 2.2

历史修订版本

Revision	Date	Subjects (major changes since last revision)
1.1	2010-02-01	-
1.2	2010-07-26	Preliminary datasheet
2.1	2013-12-09	New value IRmax limit at 175°C
2.2	2014-03-12	Max ratings Vce, Tvj ≥ 25°C

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