

英飞凌IGBT

TRENCHSTOP™ 性能技术

IGW30N60TP

600V IGBT TRENCHSTOP™ 性能系列

数据手册

工业功率控制

采用 Trench 和 Fieldstop 技术的高速 IGBT

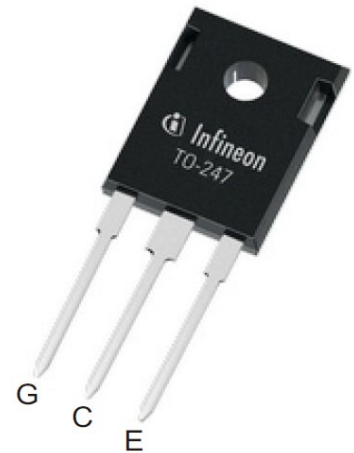
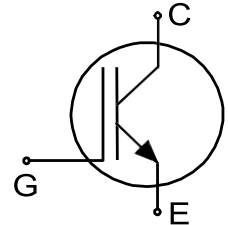
特性：

TRENCHSTOP™技术产品

- 极低 V_{CEsat}
- 低关断损耗
- 短拖尾电流
- 低电磁干扰
- 最高结温 175°C
- 符合 JEDEC 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.com/igbt/>

应用：

- 驱动器
- 太阳能逆变器
- 不间断电源
- 中等开关频率转换器



关键性能和封装参数

Type	V_{CE}	I_C	$V_{CEsat}, T_{vj}=25^{\circ}C$	T_{vjmax}	Marking	Package
IGW30N60TP	600V	30A	1.6V	175°C	G30DTP	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](http://www.infineon.com) 参考最新的英文版本（控制文档）。

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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, $T_{vj} \geq 25^{\circ}\text{C}$	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	53.0 38.0	A
Pulsed collector current, t_p limited by T_{vjmax} ¹⁾	I_{Cpuls}	90.0	A
Turn off safe operating area $V_{CE} \leq 600\text{V}$, $T_{vj} \leq 175^{\circ}\text{C}$, $t_p = 1\mu\text{s}$ ¹⁾	-	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 $T_c = 25^{\circ}\text{C}$ Power dissipation $T_c = 100^{\circ}\text{C}$	P_{tot}	200.0 100.0	W
Operating junction temperature	T_{vj}	$-40 \dots +175$	$^{\circ}\text{C}$
Storage temperature	T_{stg}	$-55 \dots +150$	$^{\circ}\text{C}$
Soldering temperature, 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

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	

R_{th} 特性

IGBT thermal resistance, junction - case	$R_{th(j-c)}$		-	0.50	0.75	K/W
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¹⁾由设计指定，未经过生产测试。

电气特性，测于 $T_{vj} = 25^{\circ}\text{C}$ 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}	$V_{GE} = 15.0V, I_C = 30.0A$	-	1.60	1.80	V
		$T_{vj} = 25^{\circ}C$ $T_{vj} = 175^{\circ}C$	-	1.94	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C = 0.48mA, V_{CE} = V_{GE}$	4.1	5.1	5.7	V
Zero gate voltage collector current	I_{CES}	$V_{CE} = 600V, V_{GE} = 0V$	-	-	40	μA
		$T_{vj} = 25^{\circ}C$ $T_{vj} = 175^{\circ}C$	-	-	-	
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0V, V_{GE} = 20V$	-	-	100	nA
Transconductance	g_{fs}	$V_{CE} = 20V, I_C = 30.0A$	-	26.0	-	S

电气特性，测于 $T_{vj} = 25^{\circ}\text{C}$ 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	-	1050	-	pF
Output capacitance	C _{oes}		-	45	-	
Reverse transfer capacitance	C _{res}		-	36	-	
Gate charge	Q _G	V _{CC} = 480V, I _C = 30.0A, V _{GE} = 15V	-	130.0	-	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	-	137	-	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	$t_{d(on)}$	$T_{vj} = 25^{\circ}\text{C}, V_{CC} = 400\text{V}, I_C = 30.0\text{A}, V_{GE} = 0.0/15.0\text{V}, R_{G(on)} = 10.5\Omega, R_{G(off)} = 10.5\Omega, L_{\sigma} = 32\text{nH}, C_{\sigma} = 60\text{pF}$ Energy losses include "tail" and diode (IKW30N60DTP) reverse recovery.	-	15	-	ns
Rise time	t_r		-	21	-	ns
Turn-off delay time	$t_{d(off)}$		-	179	-	ns
Fall time	t_f		-	12	-	ns
Turn-on energy	E_{on}		-	0.71	-	mJ
Turn-off energy	E_{off}		-	0.42	-	mJ
Total switching energy	E_{ts}		-	1.13	-	mJ

开关特性、感性负载

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	

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

Turn-on delay time	$t_{d(on)}$	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 400\text{V}$, $I_C = 30.0\text{A}$, $V_{GE} = 0.0/15.0\text{V}$, $R_{G(on)} = 10.5\Omega$, $R_{G(off)} = 10.5\Omega$, $L\sigma = 32\text{nH}$, $C\sigma = 60\text{pF}$ $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode (IKW30N60DTP) reverse recovery.	-	15	-	ns
Rise time	t_r		-	23	-	ns
Turn-off delay time	$t_{d(off)}$		-	220	-	ns
Fall time	t_f		-	59	-	ns
Turn-on energy	E_{on}		-	0.99	-	mJ
Turn-off energy	E_{off}		-	0.74	-	mJ
Total switching energy	E_{ts}		-	1.73	-	mJ

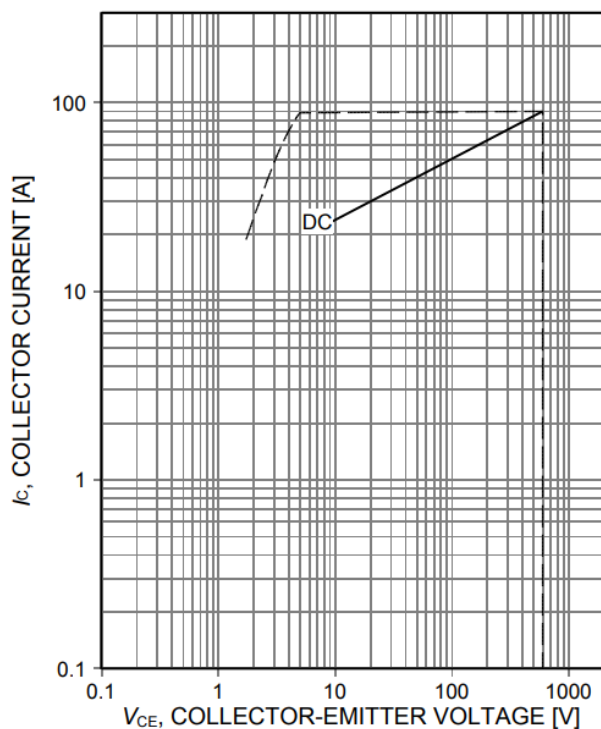


Figure 1. **Forward bias safe operating area**
($D=0$, $T_C=25^\circ\text{C}$, $T_J\leq 175^\circ\text{C}$; $V_{GE}=15\text{V}$)

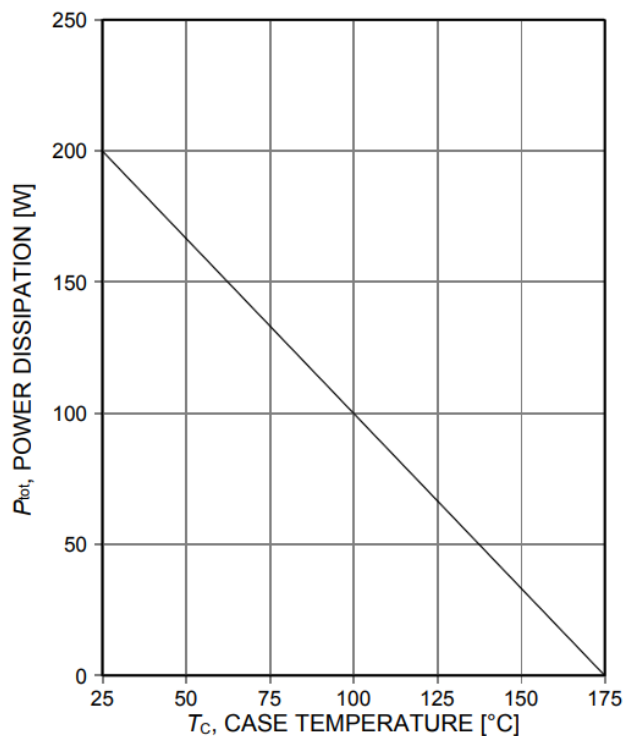


Figure 2. **Power dissipation as a function of case temperature**
($T_J\leq 175^\circ\text{C}$)

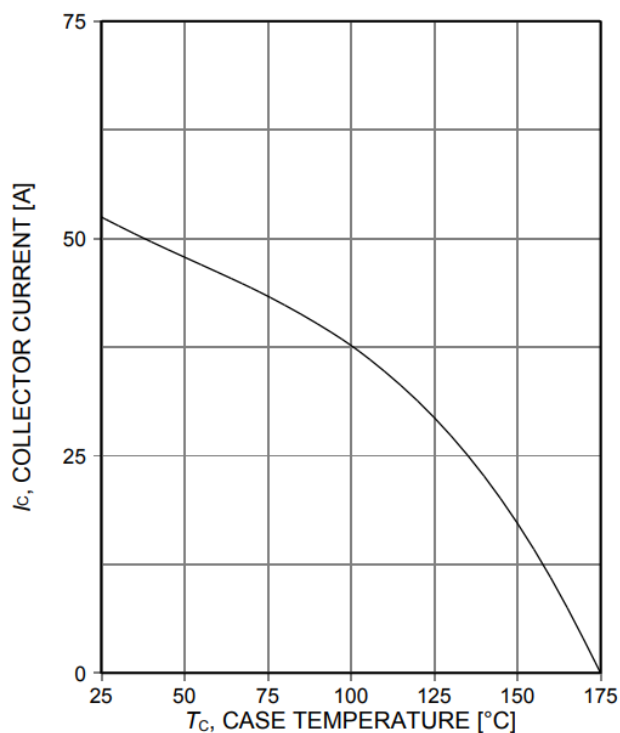


Figure 3. **Collector current as a function of case temperature**
($V_{GE}\geq 15\text{V}$, $T_J\leq 175^\circ\text{C}$)

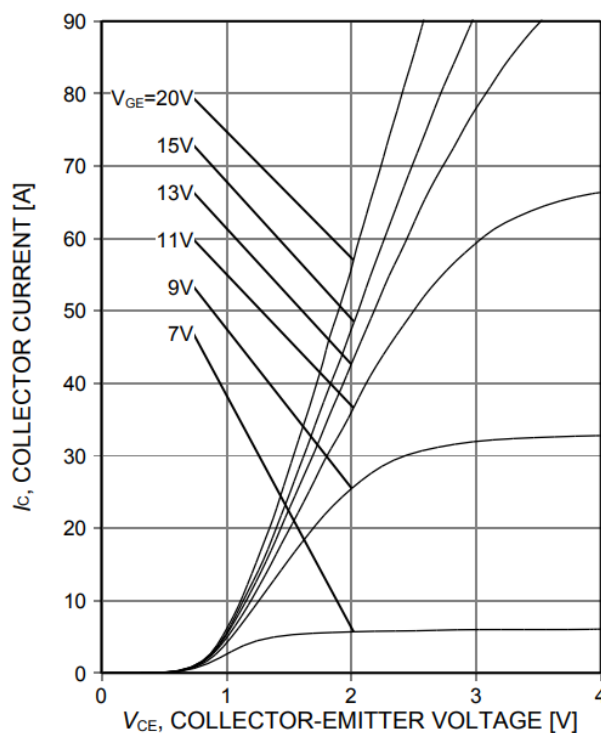


Figure 4. **Typical output characteristic**
($T_J=25^\circ\text{C}$)

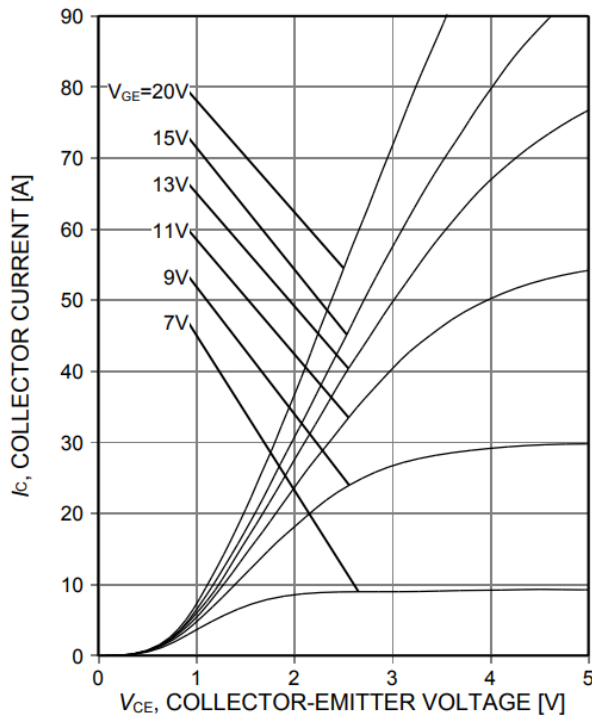


Figure 5. **Typical output characteristic**
($T_j=175^\circ\text{C}$)

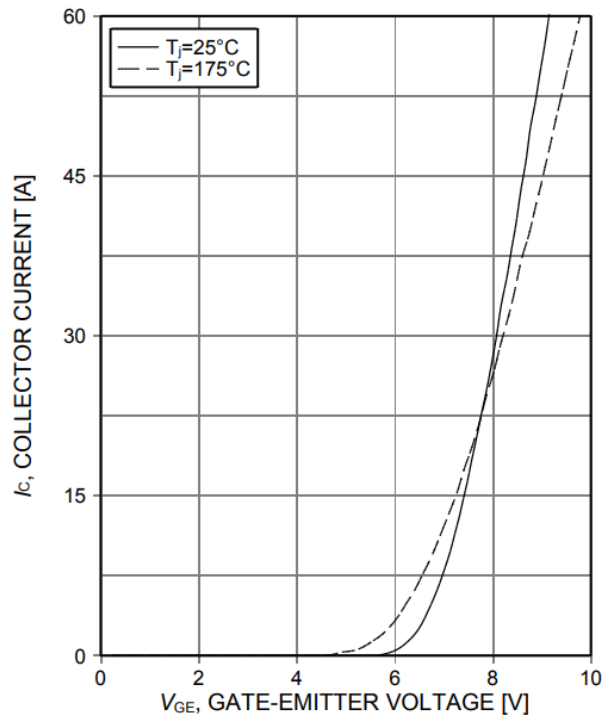


Figure 6. **Typical transfer characteristic**
($V_{CE}=20\text{V}$)

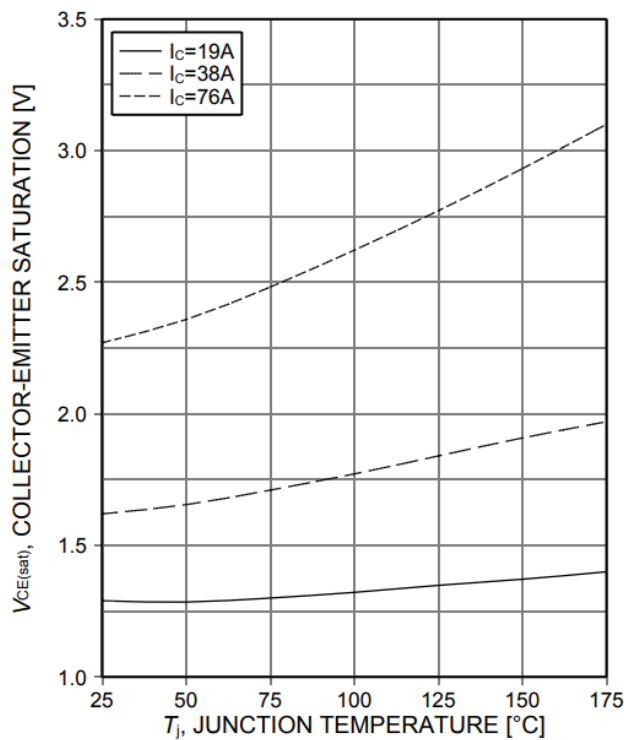


Figure 7. **Typical collector-emitter saturation voltage as a function of junction temperature**
($V_{GE}=15\text{V}$)

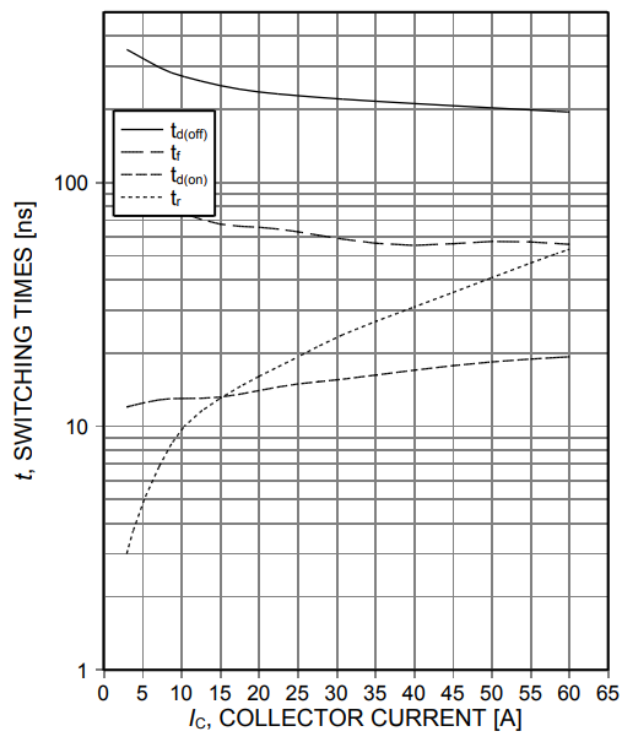


Figure 8. **Typical switching times as a function of collector current**
(ind. load, $T_j=175^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $r_G=10.5\Omega$, test circuit in Fig. E)

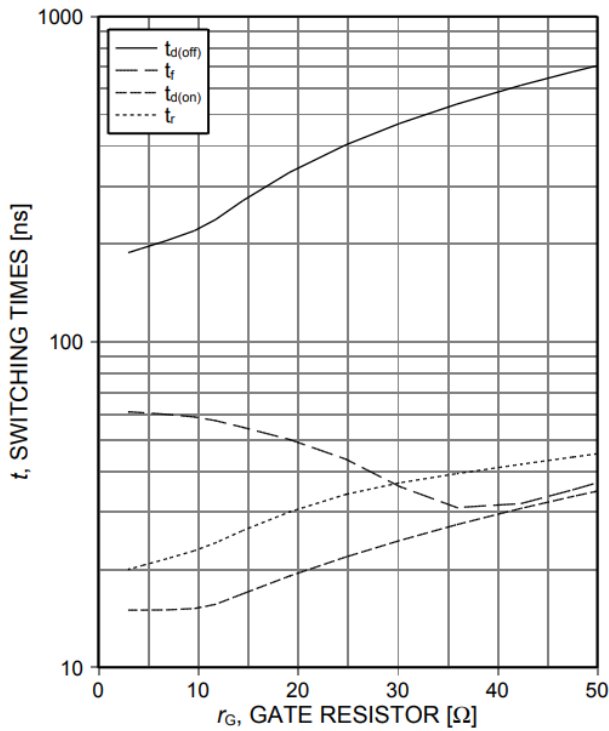


Figure 9. **Typical switching times as a function of gate resistor**
(ind. load, $T_J=175^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=30\text{A}$, test circuit in Fig. E)

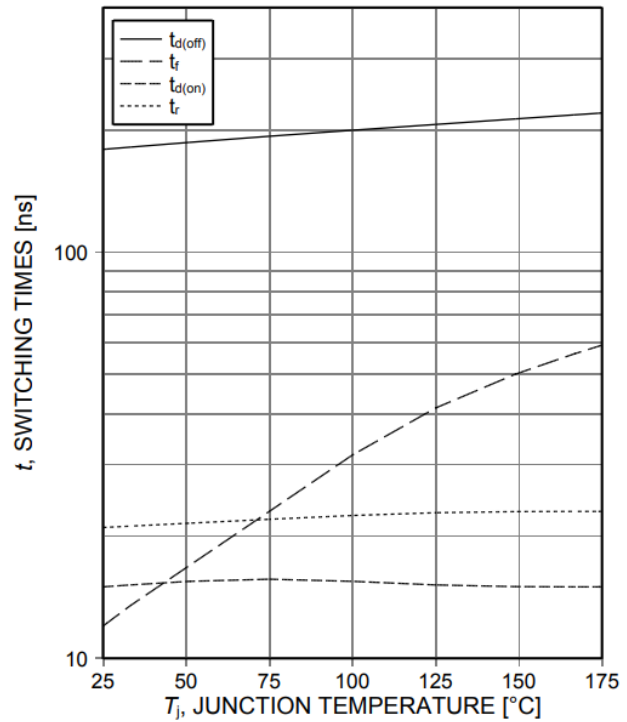


Figure 10. **Typical switching times as a function of junction temperature**
(ind. load, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=30\text{A}$, $r_G=10.5\Omega$, test circuit in Fig. E)

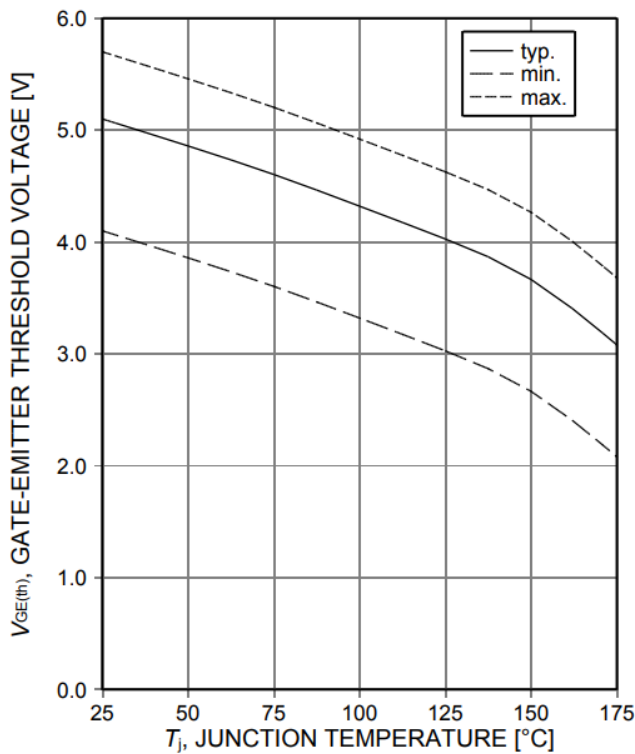


Figure 11. **Gate-emitter threshold voltage as a function of junction temperature**
($I_C=0.48\text{mA}$)

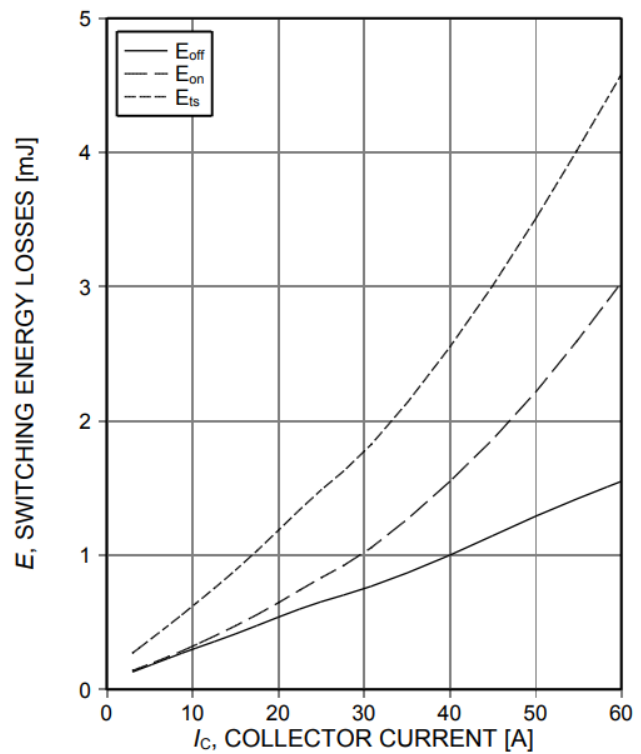


Figure 12. **Typical switching energy losses as a function of collector current**
(ind. load, $T_J=175^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $r_G=10.5\Omega$, test circuit in Fig. E)

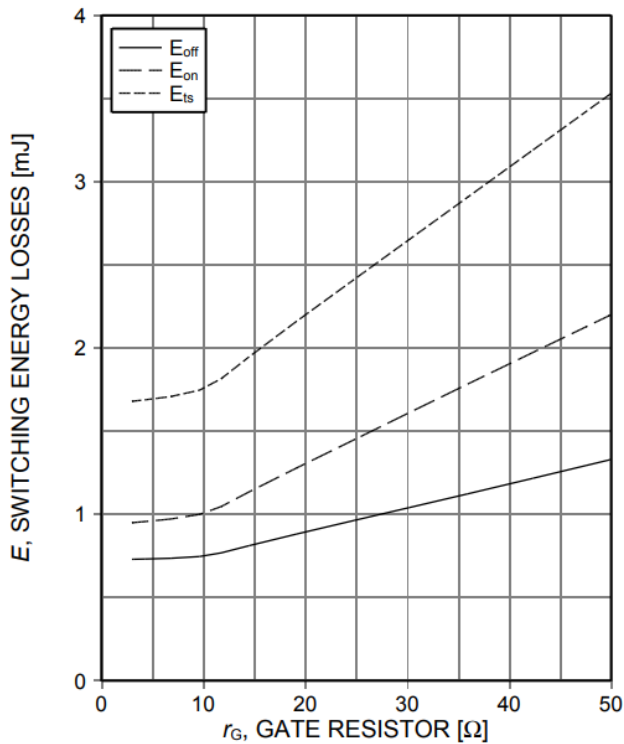


Figure 13. **Typical switching energy losses as a function of gate resistor**
(ind. load, $T_J=175^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=30\text{A}$, test circuit in Fig. E)

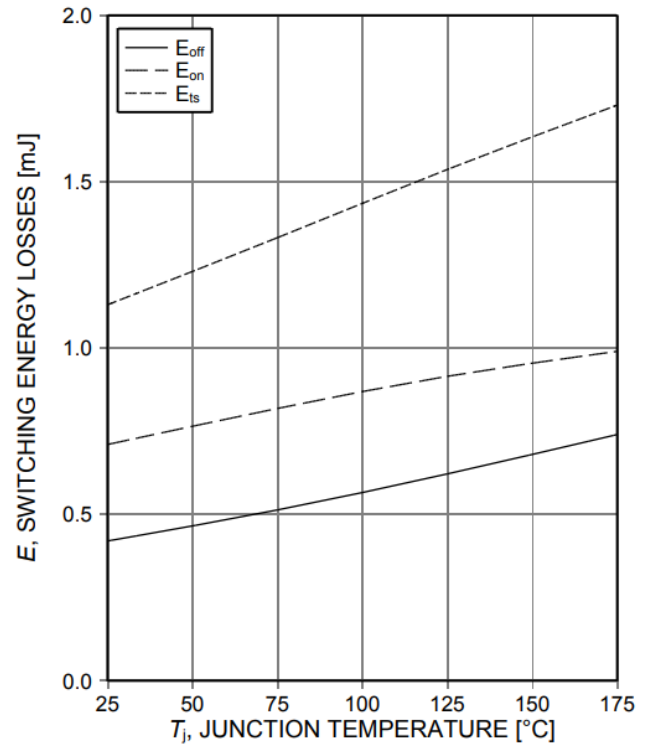


Figure 14. **Typical switching energy losses as a function of junction temperature**
(ind load, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=30\text{A}$, $r_G=10.5\Omega$, test circuit in Fig. E)

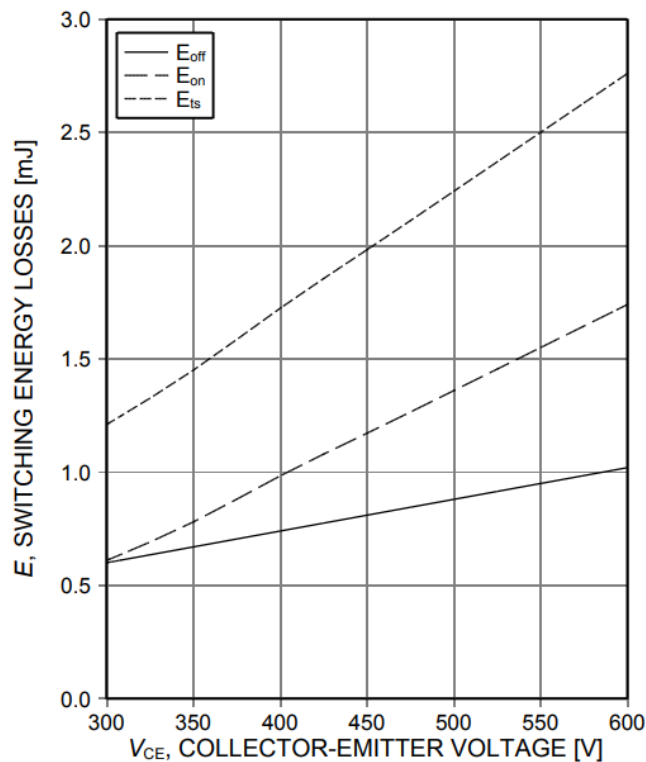


Figure 15. **Typical switching energy losses as a function of collector emitter voltage**
(ind. load, $T_J=175^\circ\text{C}$, $V_{GE}=15/0\text{V}$, $I_C=30\text{A}$, $r_G=10.5\Omega$, test circuit in Fig. E)

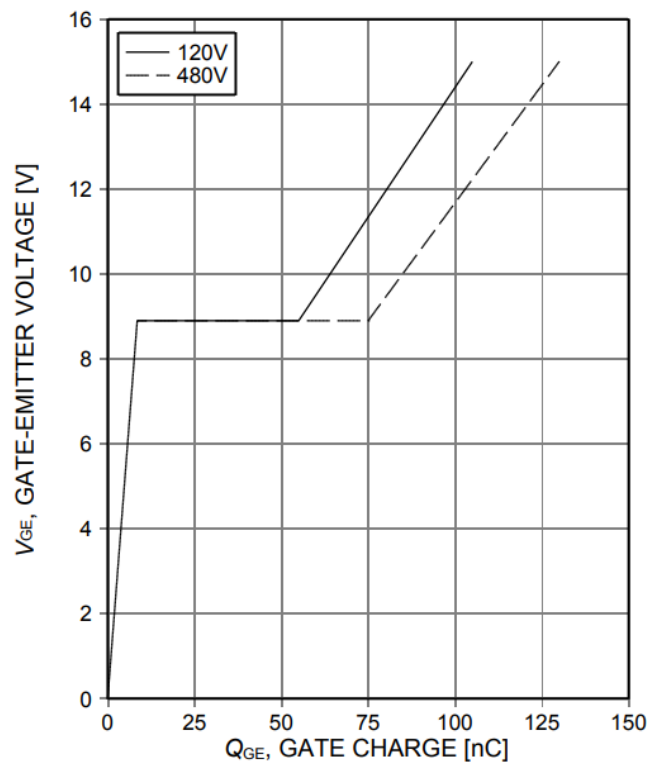


Figure 16. **Typical gate charge**
($I_C=30\text{A}$)

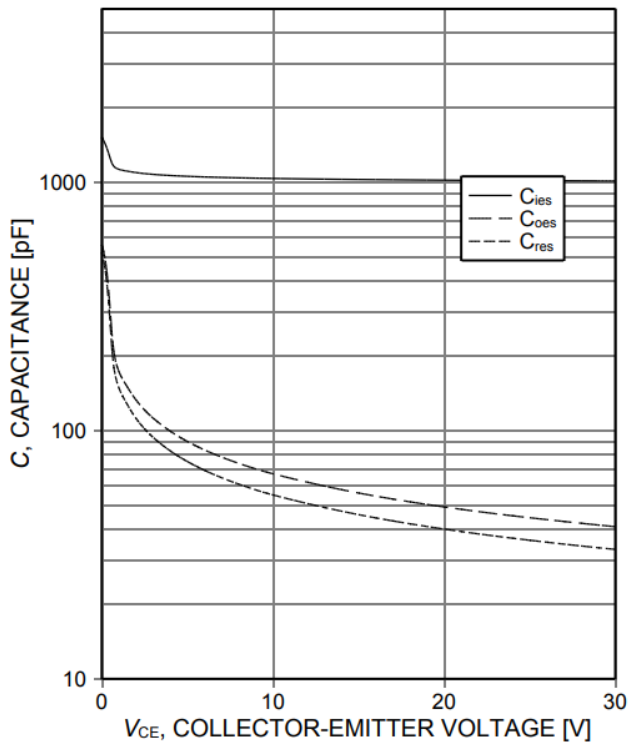


Figure 17. Typical capacitance as a function of collector-emitter voltage ($V_{GE}=0V$, $f=1MHz$)

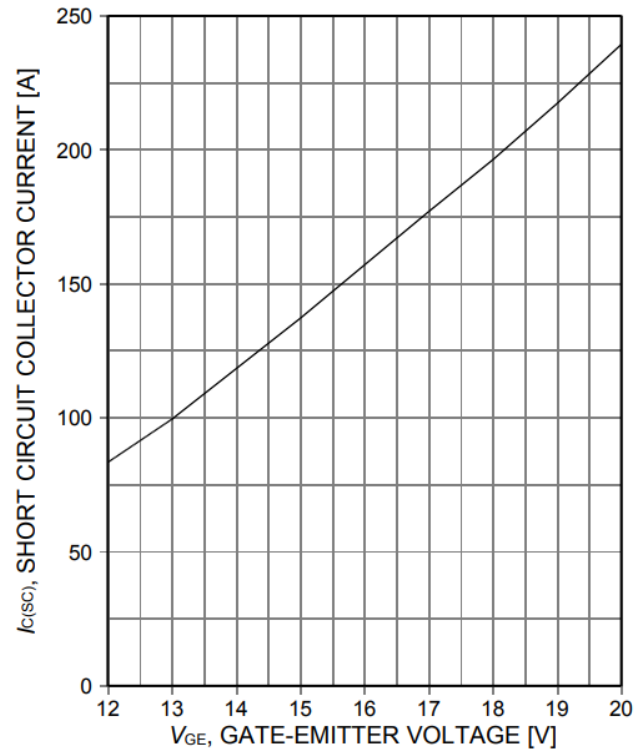


Figure 18. Typical short circuit collector current as a function of gate-emitter voltage ($V_{CE}\leq 400V$, start at $T_J=25^\circ C$)

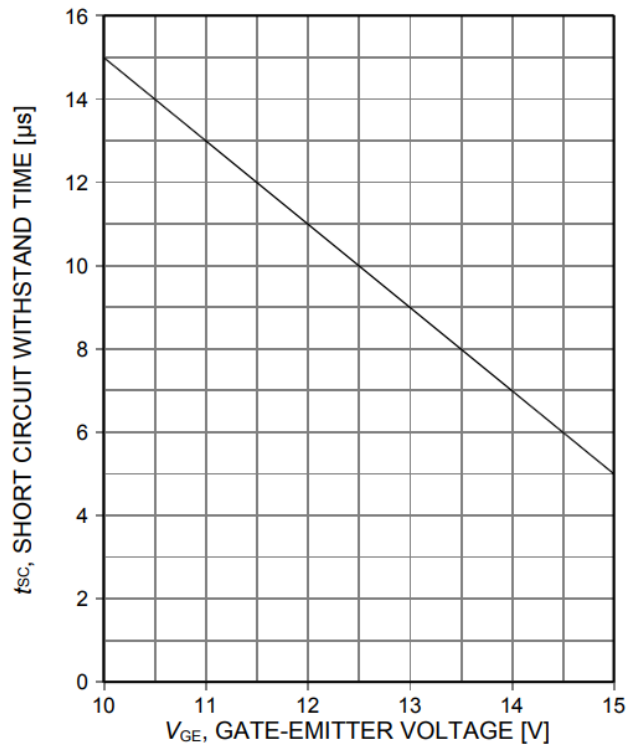


Figure 19. Short circuit withstand time as a function of gate-emitter voltage ($V_{CE}\leq 400V$, start at $T_J\leq 150^\circ C$)

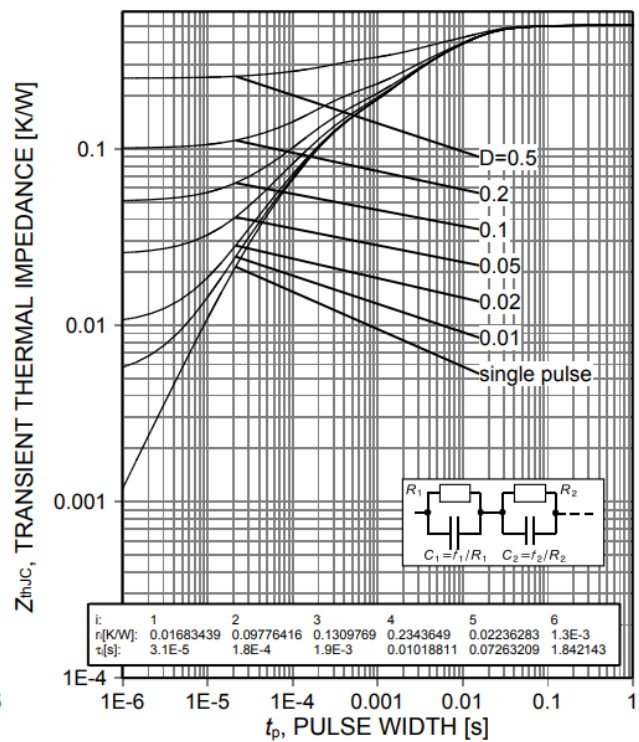
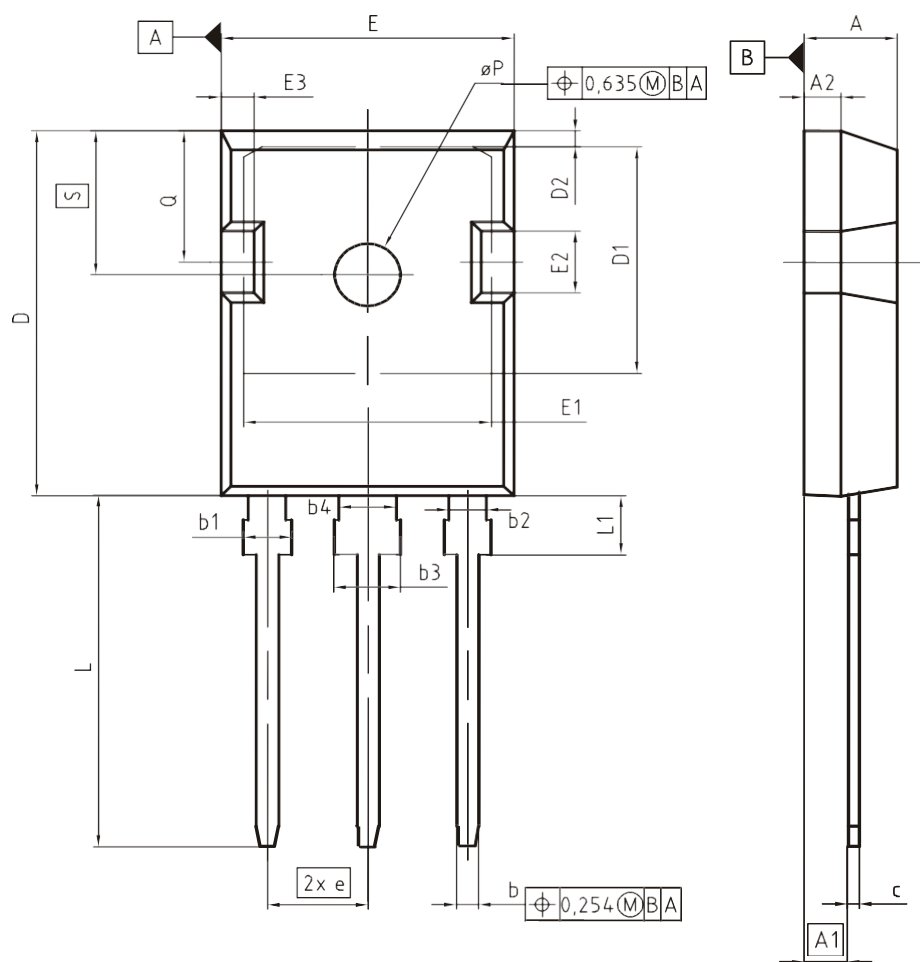
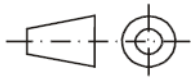


Figure 20. Typical IGBT transient thermal impedance ($D=t_p/T$)

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

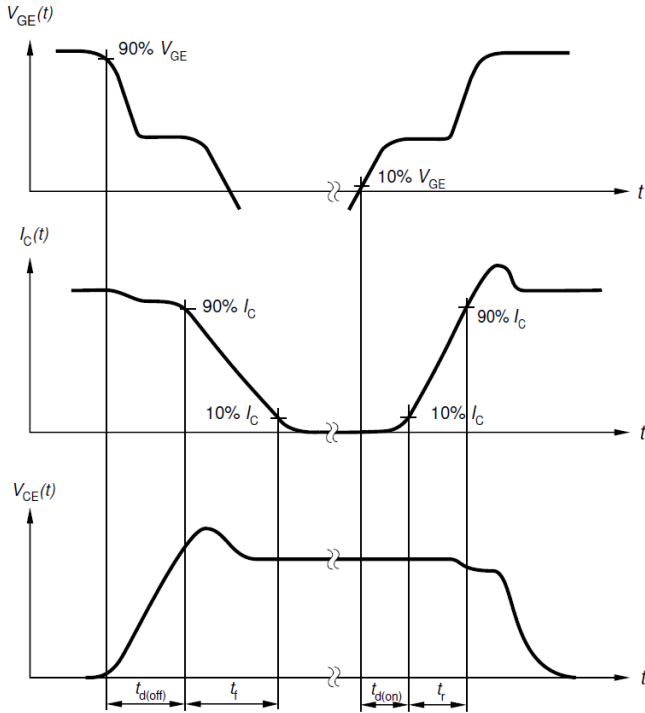


Figure A. Definition of switching times

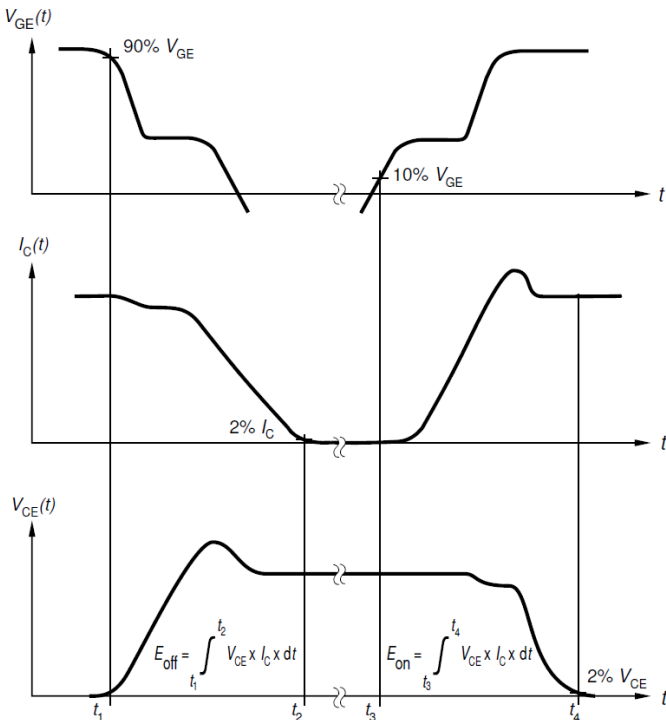


Figure B. Definition of switching losses

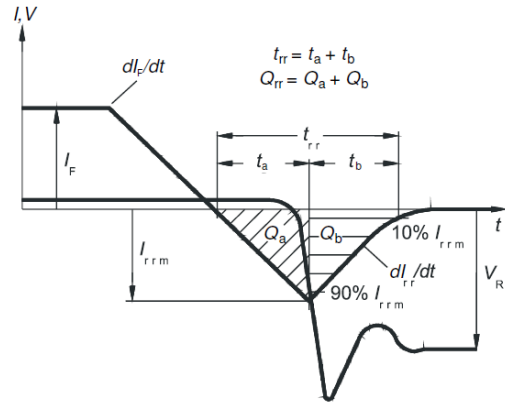


Figure C. Definition of diode switching characteristics

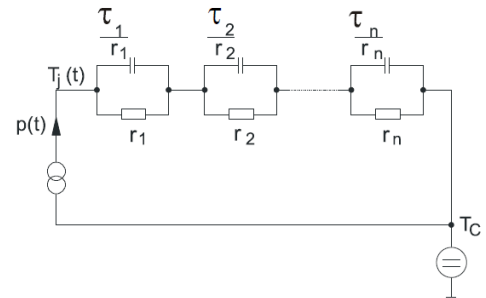


Figure D. Thermal equivalent circuit

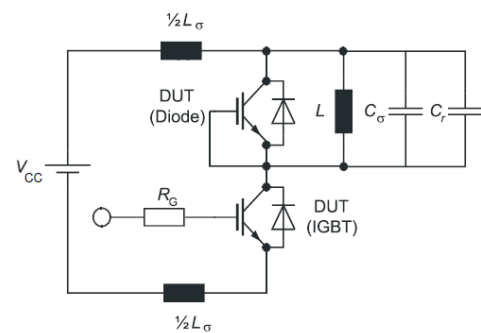


Figure E. Dynamic test circuit
Parasitic inductance L_{σ} ,
parasitic capacitor C_{σ} ,
relief capacitor C_r ,
(only for ZVT switching)

修订记录

IGW30N60TP

Revision: 2016-02-05, Rev. 2.1

历史记录

Revision	Date	Subjects (major changes since last revision)
2.1	-	Release of final datasheet

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