英飞凌谐振开关系列

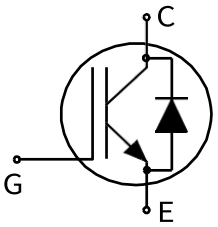
带单片体二极管的反向导通IGBT

IHW20N120R5

数据手册

英飞凌谐振开关系列

带单片体二极管的反向导通IGBT



特性：

• 强大的单片体二极管，具有低正向电压，专为软换向而设计
• TRENCHSTOP™技术产品
- 参数分布紧密
- 高稳健性、温度稳定性
- 低 V_{CEsat}
- 由于 V_{CEsat} 具有正温度系数，因此易于并联
• 低电磁干扰
• 无铅镀层；符合RoHS标准
• 符合 IEC 61249-2-21 标准的无卤素
• 完整的产品品类和 PSpice 模型：
http://www.infineon.com/igbt/



应用：

• 感应烹饪
• 变频微波炉
• 谐振转换器
• 软开关应用

产品验证

符合JEDEC47/20/22相关测试的工业应用要求

封装引脚定义：

• 引脚 1 - 栅极
• 引脚 2 & 背面 - 集电极
• 引脚 3 - 发射极

关键性能和封装参数

Type	V_{CE}	I_C	V_{CEsat}, T_{vj}=25°C	T_{vjmax}	Marking	Package
IHW20N120R5	1200V	20A	1.55V	175°C	H20MR5	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）。

目录

描述.....2

目录.....3

最大额定值.....4

热阻抗.....4

电气特性.....5

电气特性图.....7

封装图编号.....13

测试条件.....14

修订记录.....15

免责声明.....16

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, $T_{vj} \geq 25°C$	V_{CE}	1200	V
DC collector current, limited by T_{vjmax} T_c = 25°C T_c = 100°C	I_C	40.0 20.0	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	60.0	A
Non repetitive peak collector current[1)]	I_{CSM}	200	A
Turn off safe operating area $V_{CE} \leq 1200V$, $T_{vj} \leq 175°C$, $t_p = 1\mu s$	-	60.0	A
Diode forward current, limited by T_{vjmax} T_c = 25°C T_c = 100°C	I_F	40.0 20.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	60.0	A
Gate-emitter voltage Transient Gate-emitter voltage ($t_p \leq 10\mu s$, $D < 0.010$)	V_{GE}	±20 ±25	V
Power dissipation T_c = 25°C Power dissipation T_c = 100°C	P_{tot}	288.0 144.0	W
Operating junction temperature	T_{vj}	-40...+175	°C
Storage temperature	T_{stg}	-55...+150	°C
Soldering temperature, wave soldering 1.6mm (0.063in.) 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	Value			Unit
			min.	typ.	max.	
R_{th} 特性						
IGBT thermal resistance, junction - case	$R_{th(j-c)}$		-	-	0.52	K/W
Diode thermal resistance, junction - case	$R_{th(j-c)}$		-	-	0.52	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		-	-	40	K/W

[1)]电容器充电饱和电流受 T_{vjmax}< 175°C 和 t_p< 3µs限制

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 = 0.50mA	1200	-	-	V
Collector-emitter saturation voltage	V_{CEsat}	V_{GE} = 15.0V, I_C = 20.0A T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	- - -	1.55 1.75 1.80	1.75 - -	V
Diode forward voltage	V_F	V_{GE} = 0V, I_F = 20.0A T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	- - -	1.60 1.75 1.85	1.85 - -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C = 0.50mA, V_{CE} = V_{GE}	5.1	5.8	6.4	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V T_{vj} = 25°C T_{vj} = 175°C	- -	- 300	100 -	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = 20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE} = 20V, I_C = 20.0A	-	15.2	-	S
Integrated gate resistor	r_G			none		Ω

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	-	1340	-	pF
Output capacitance	C_{oes}		-	43	-	
Reverse transfer capacitance	C_{res}		-	34	-	
Gate charge	Q_G	V_{CC} = 1080V, I_C = 20.0A, V_{GE} = 15V	-	170.0	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13.0	-	nH

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-off delay time	$t_{d(off)}$	T_{vj} = 25°C, V_{CC} = 600V, I_C = 20.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 10.0Ω, $R_{G(off)}$ = 10.0Ω, Lσ = 175nH, Cσ = 40pF Lσ, Cσ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	260	-	ns
Fall time	t_f		-	50	-	ns
Turn-off energy	E_{off}		-	0.75	-	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°C的条件						
Turn-off delay time	$t_{d(off)}$	T_{vj} = 175°C, V_{CC} = 600V, I_C = 20.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 10.0Ω, $R_{G(off)}$ = 10.0Ω, $L\sigma$ = 175nH, $C\sigma$ = 40pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	350	-	ns
Fall time	t_f		-	90	-	ns
Turn-off energy	E_{off}		-	1.55	-	mJ

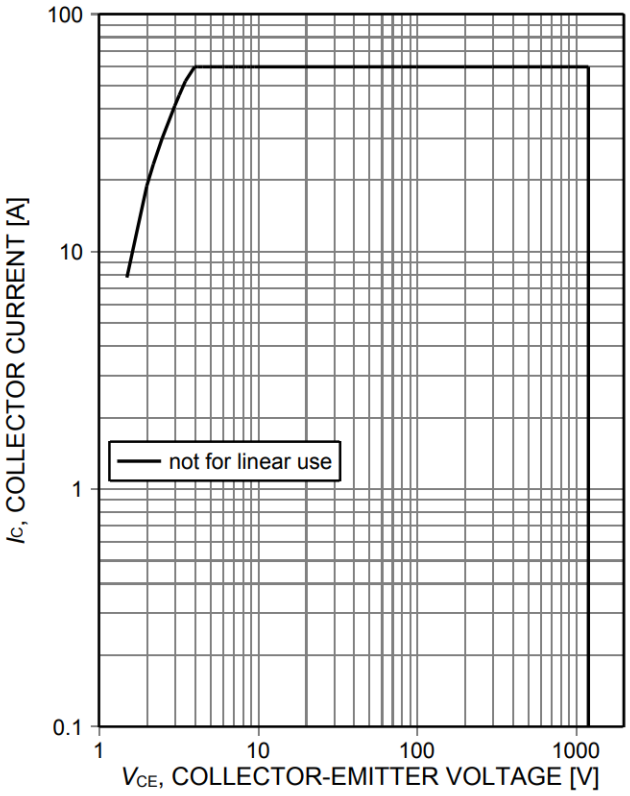


Figure 1. **Forward bias safe operating area**
(D=0, T_C=25°C, T_{vj}≤175°C; V_{GE}=15V, t_p=1µs)

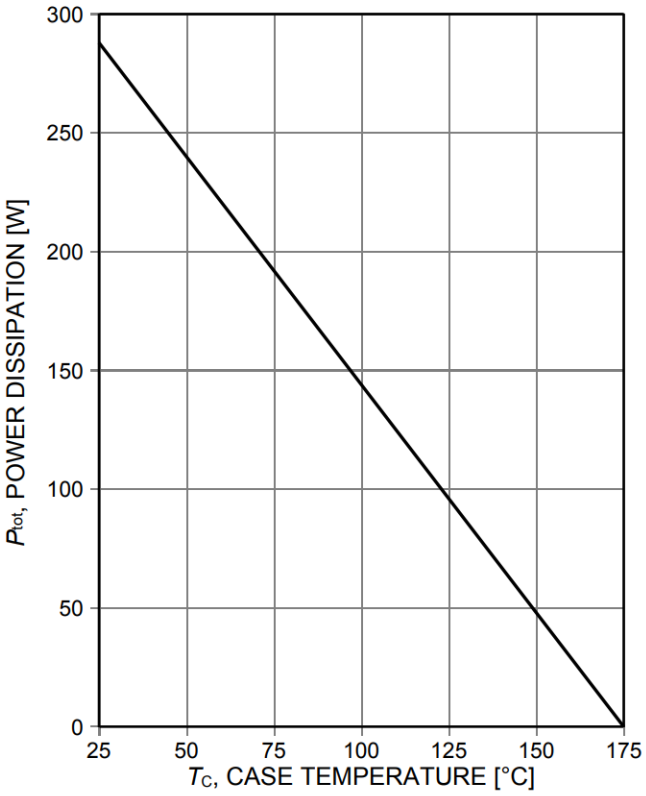


Figure 2. **Power dissipation as a function of case temperature**
(T_{vj}≤175°C)

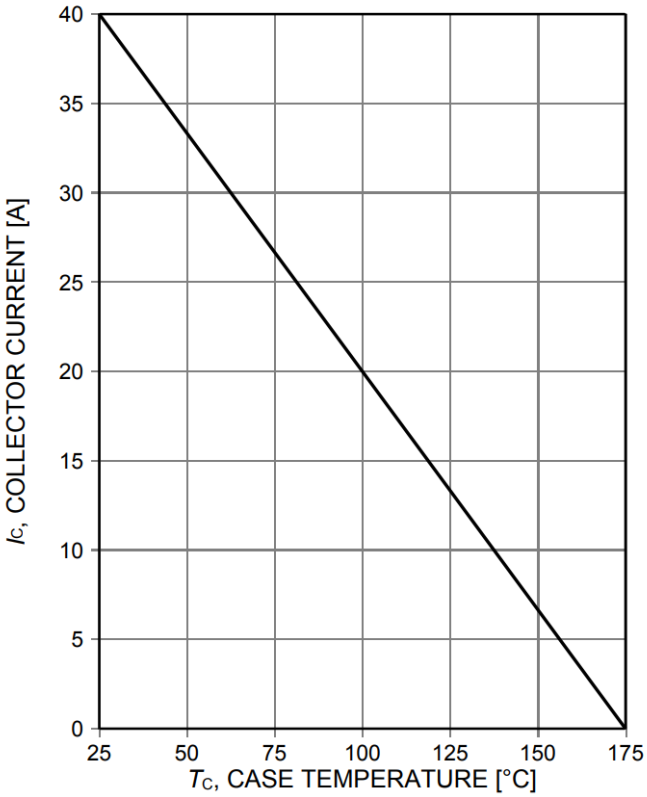


Figure 3. **Collector current as a function of case temperature**
(V_{GE}≥15V, T_{vj}≤175°C)

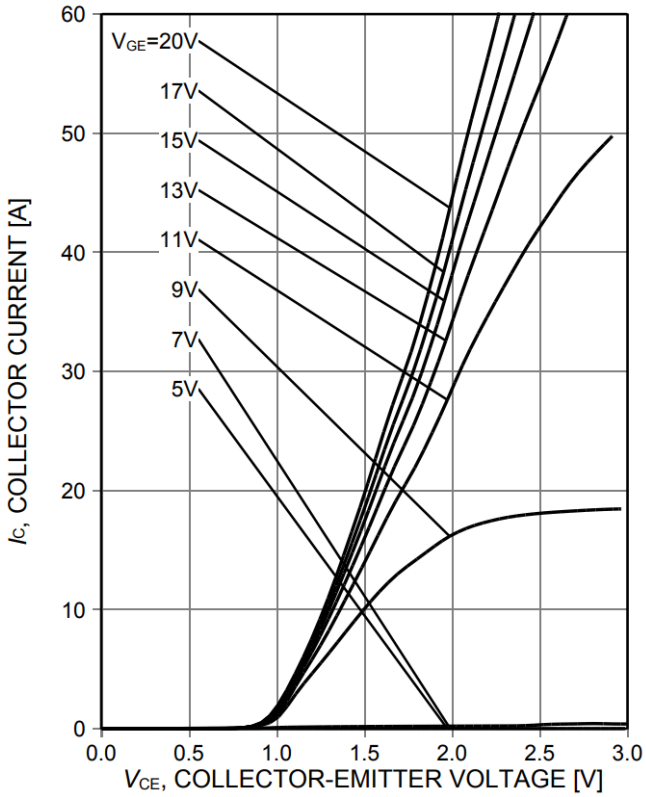


Figure 4. **Typical output characteristic**
(T_{vj}=25°C)

谐振开关系列

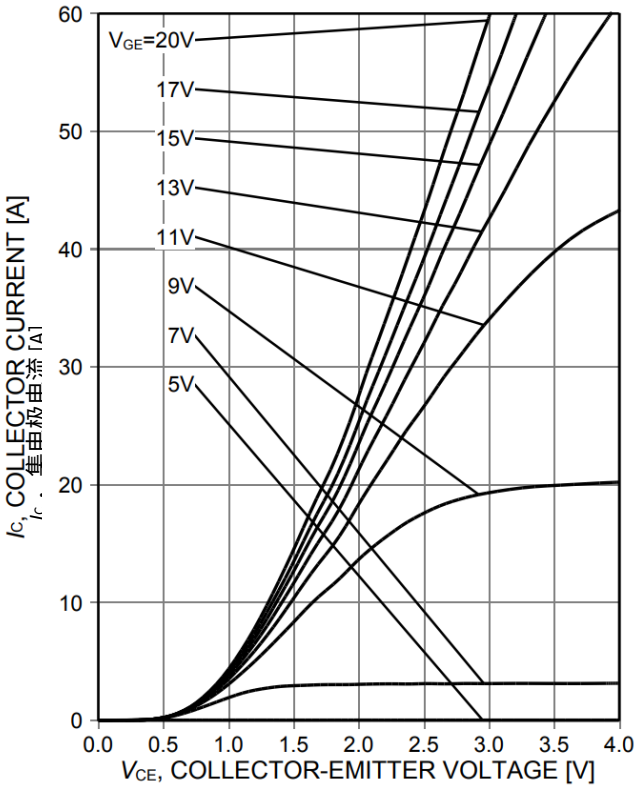


Figure 5. **Typical output characteristic** (T_{vj}=175°C)

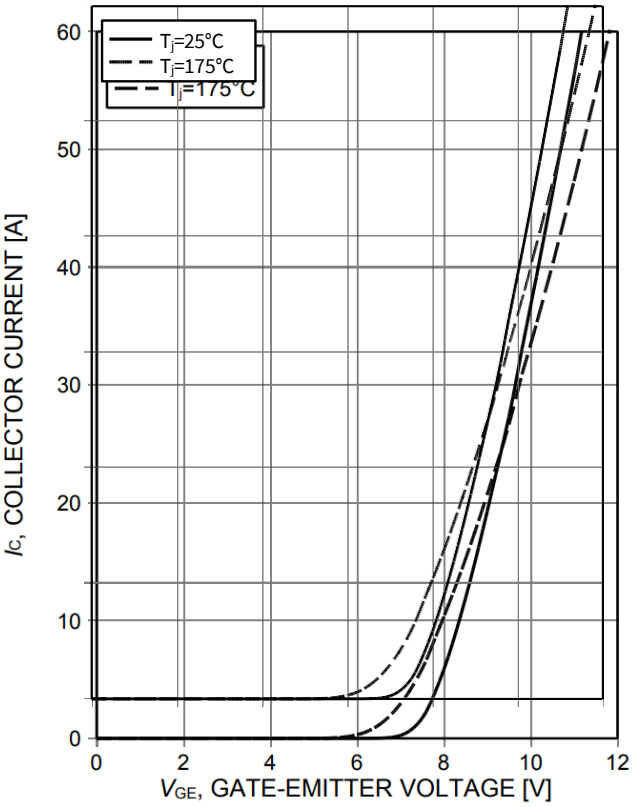


Figure 6. **Typical transfer characteristic** (V_{CE}=20V)

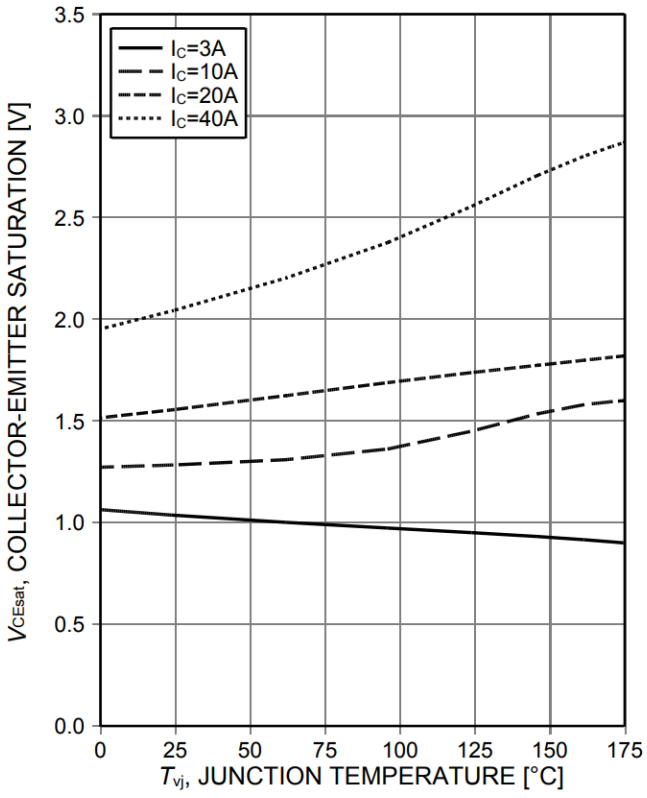


Figure 7. **Typical collector-emitter saturation voltage as a function of junction temperature** (V_{GE}=15V)

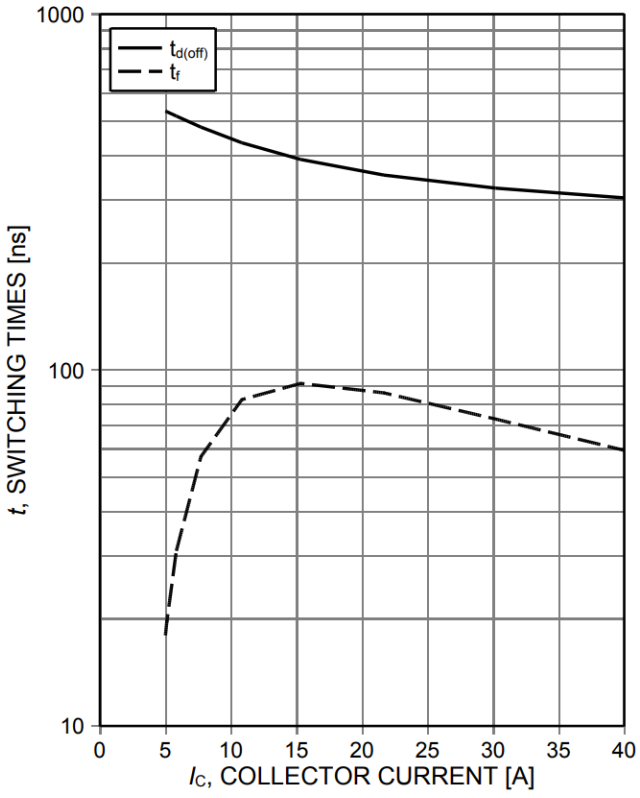


Figure 8. **Typical switching times as a function of collector current** (inductive load, T_{vj}=175°C, V_{CE}=600V, V_{GE}=0/15V, $R_{G(on)}$=10Ω, $R_{G(off)}$=10Ω, dynamic test circuit in Figure E)

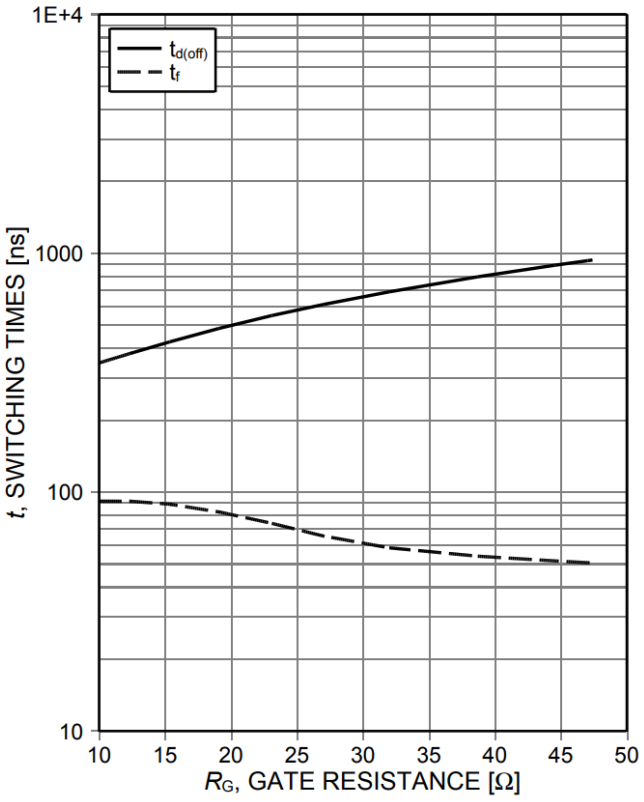


Figure 9. **Typical switching times as a function of gate resistance**
(inductive load, T_{vj}=175°C, V_{CE}=600V, V_{GE}=0/15V, I_C=20A, dynamic test circuit in Figure E)

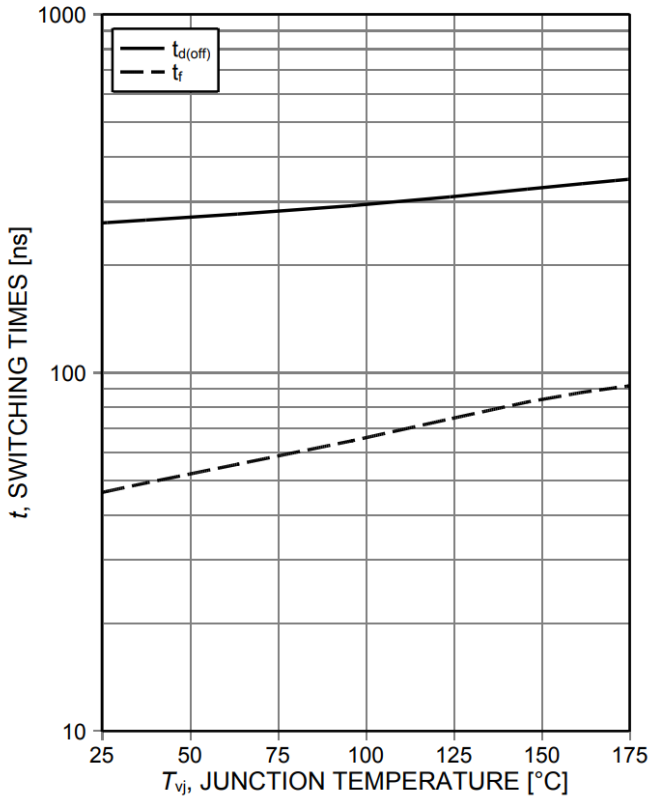


Figure 10. **Typical switching times as a function of junction temperature**
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=20A, $R_{G(on)}$=10Ω, $R_{G(off)}$=10Ω, dynamic test circuit in Figure E)

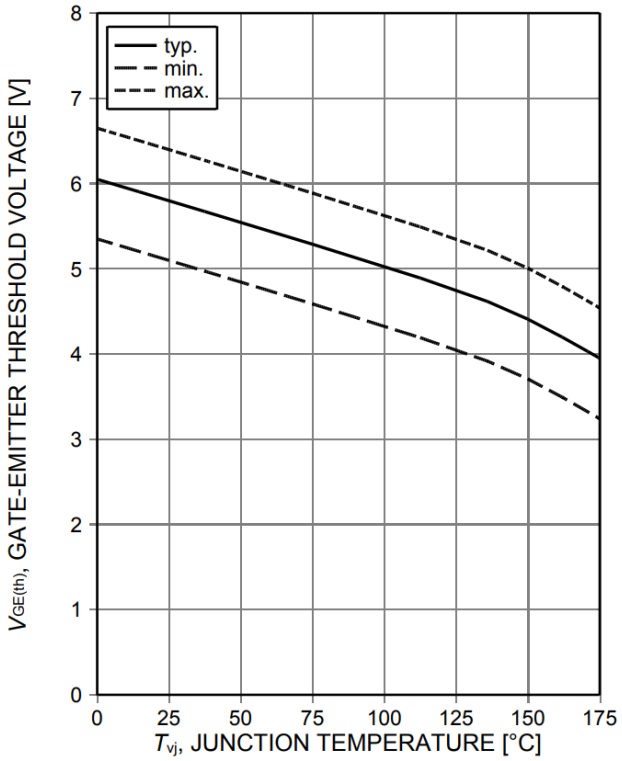


Figure 11. **Gate-emitter threshold voltage as a function of junction temperature**
(I_C=0.5mA, min / max values verified by chip design)

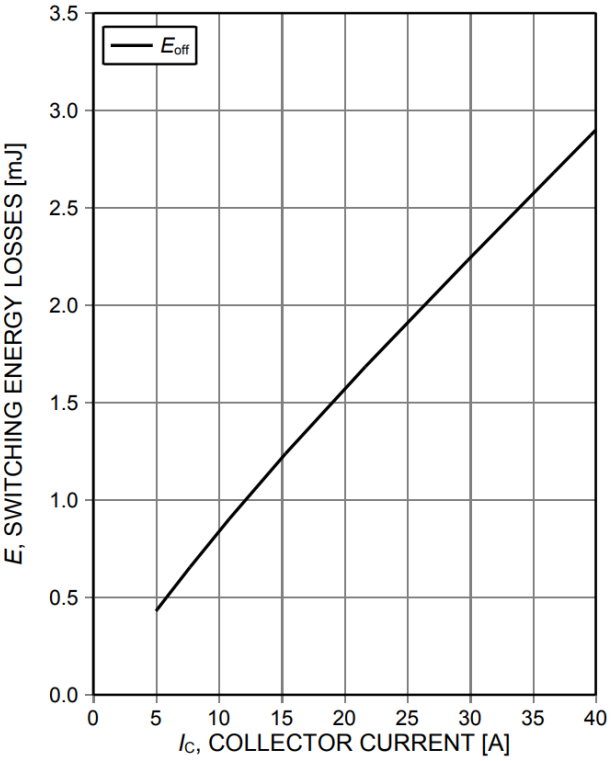


Figure 12. **Typical switching energy losses as a function of collector current**
(inductive load, T_{vj}=175°C, V_{CE}=600V, V_{GE}=0/15V, $R_{G(on)}$=10Ω, $R_{G(off)}$=10Ω, dynamic test circuit in Figure E)

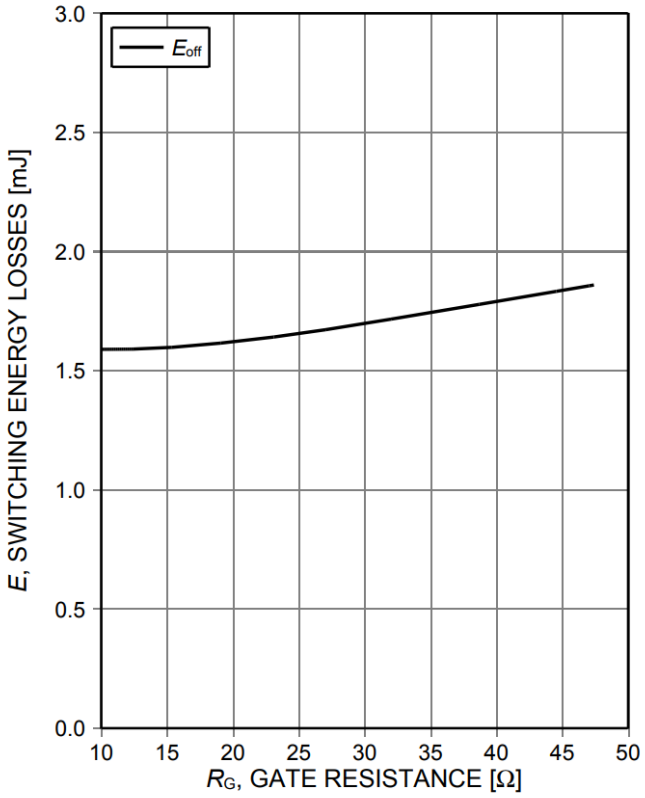


Figure 13. **Typical switching energy losses as a function of gate resistance**
(inductive load, T_{vj}=175°C, V_{CE}=600V, V_{GE}=0/15V, I_C=20A, dynamic test circuit in Figure E)

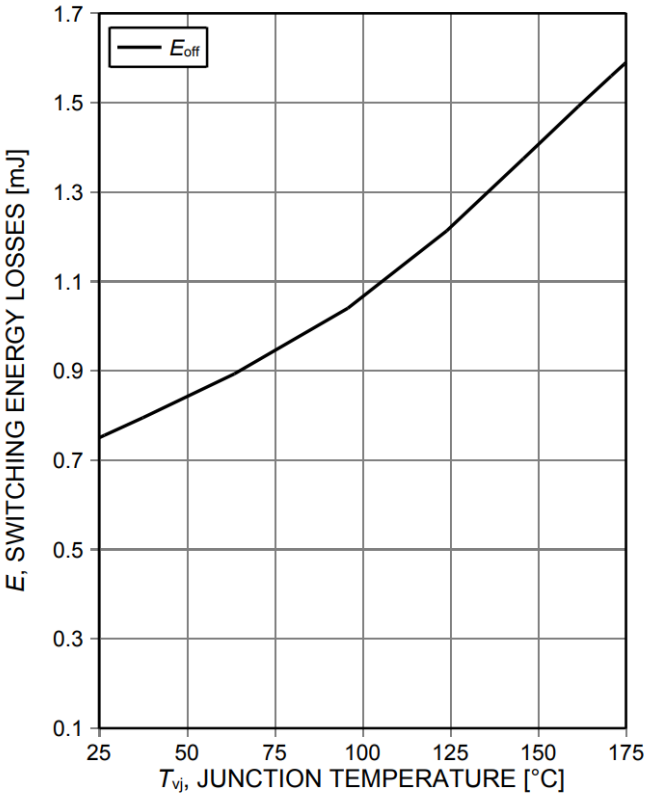


Figure 14. **Typical switching energy losses as a function of junction temperature**
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=20A, $R_{G(on)}$=10Ω, $R_{G(off)}$=10Ω, dynamic test circuit in Figure E)

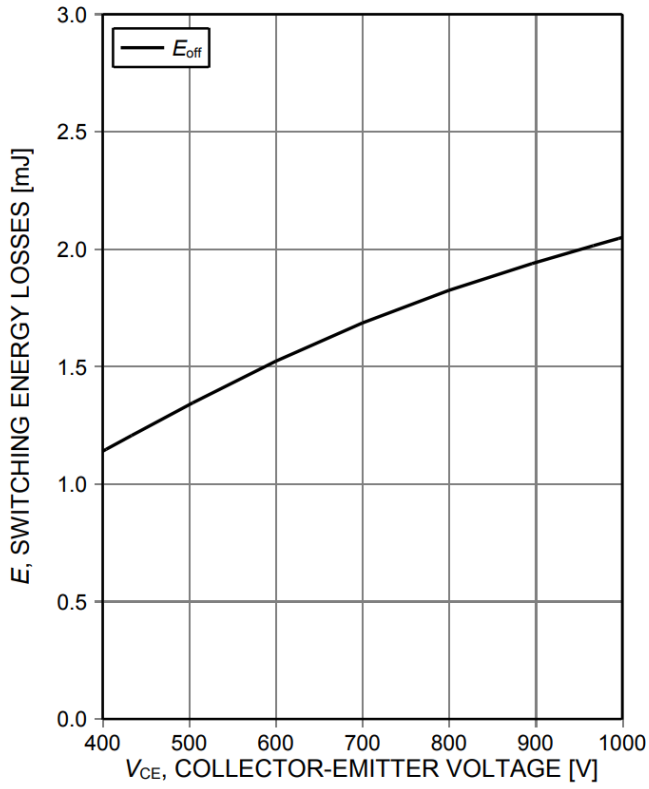


Figure 15. **Typical switching energy losses as a function of collector emitter voltage**
(inductive load, T_{vj}=175°C, V_{GE}=0/15V, I_C=20A, $R_{G(on)}$=10Ω, $R_{G(off)}$=10Ω, dynamic test circuit in Figure E)

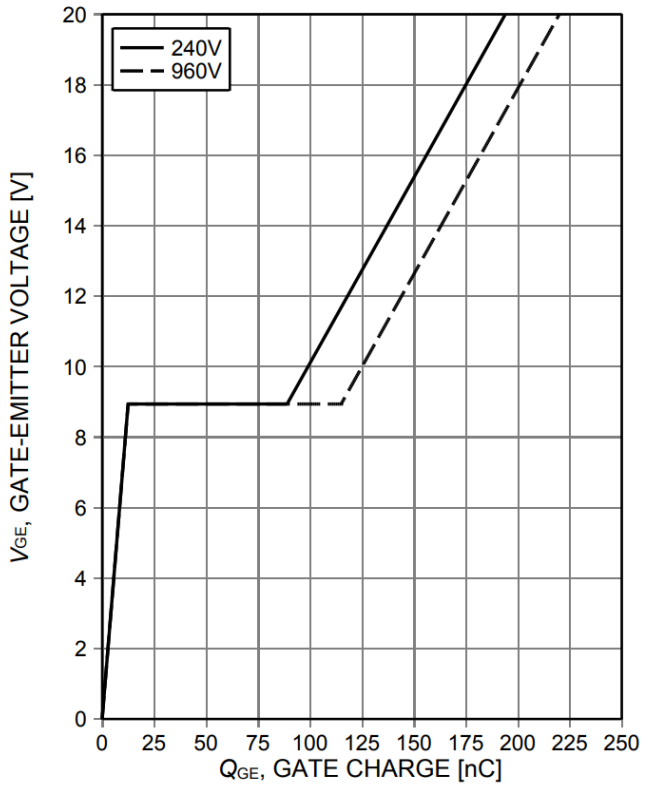


Figure 16. **Typical gate charge**
(I_C=20A)

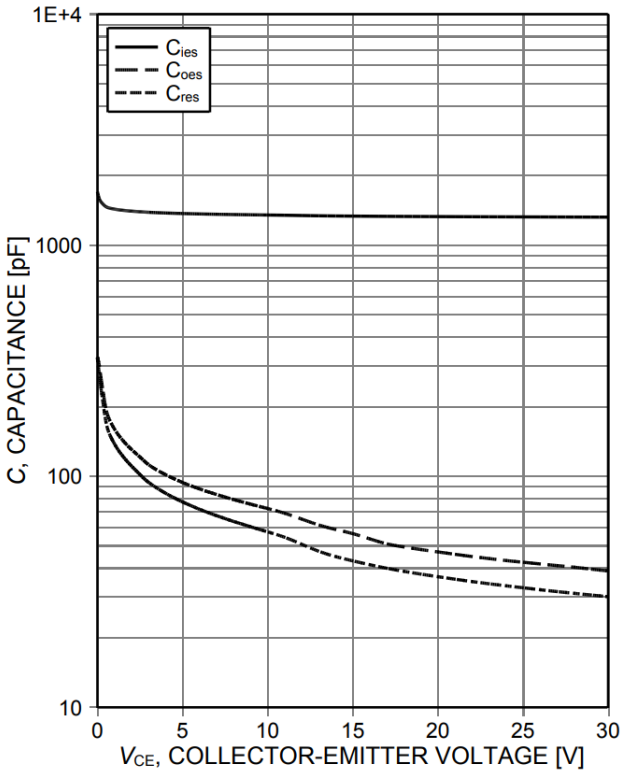


Figure 17. **Typical capacitance as a function of collector-emitter voltage**
(V_{GE}=0V, f=1MHz)

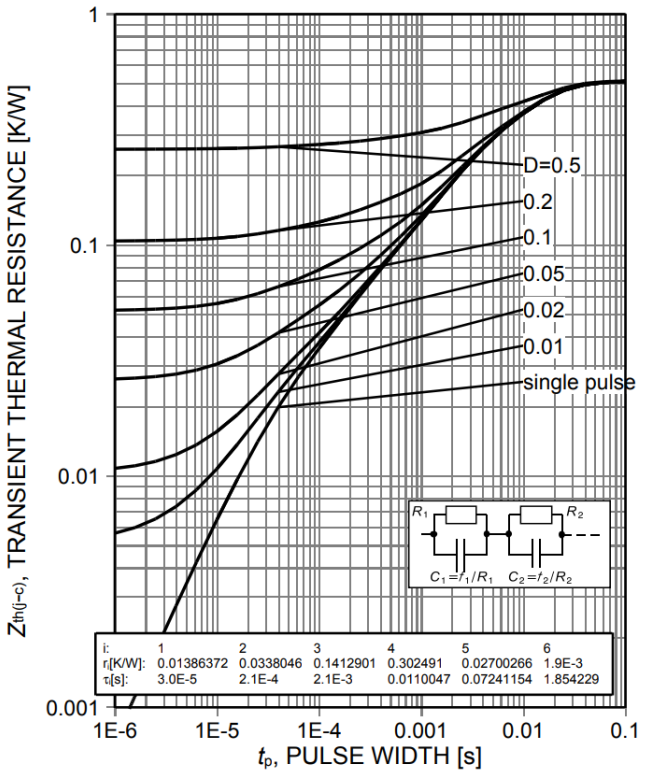


Figure 18. **IGBT transient thermal resistance**
($D=t_p/T$)

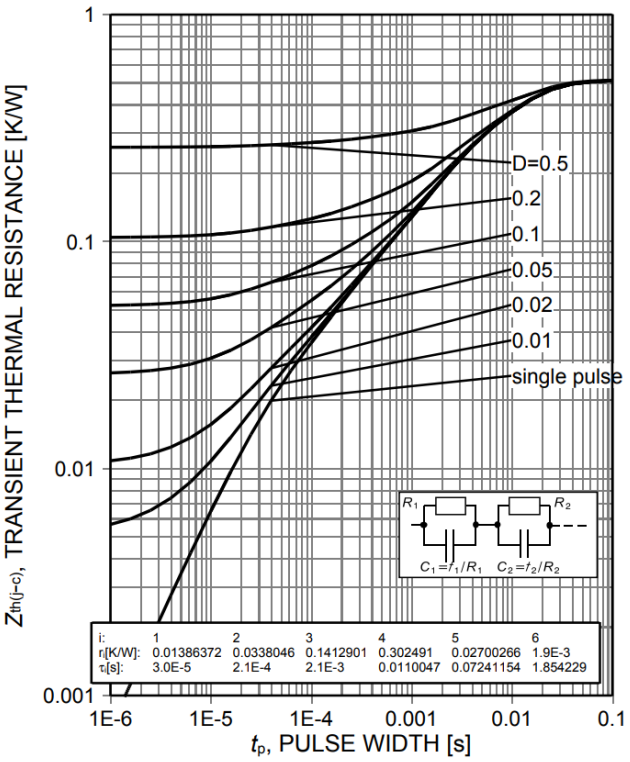


Figure 19. **Diode transient thermal impedance as a function of pulse width**
($D=t_p/T$)

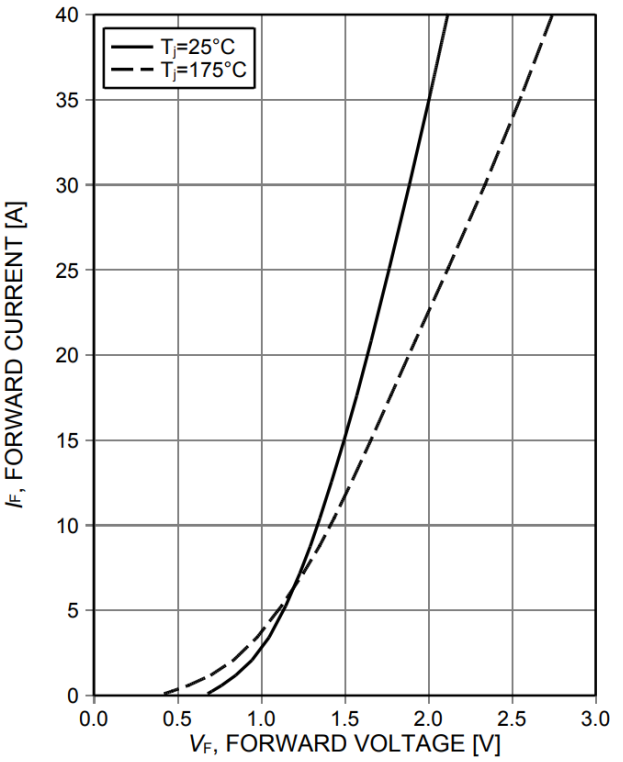


Figure 20. **Typical diode forward current as a function of forward voltage**

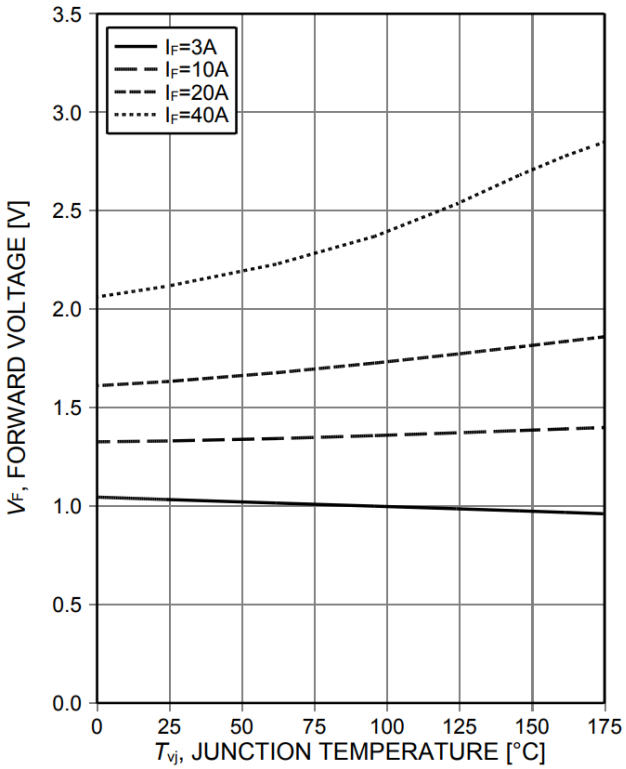
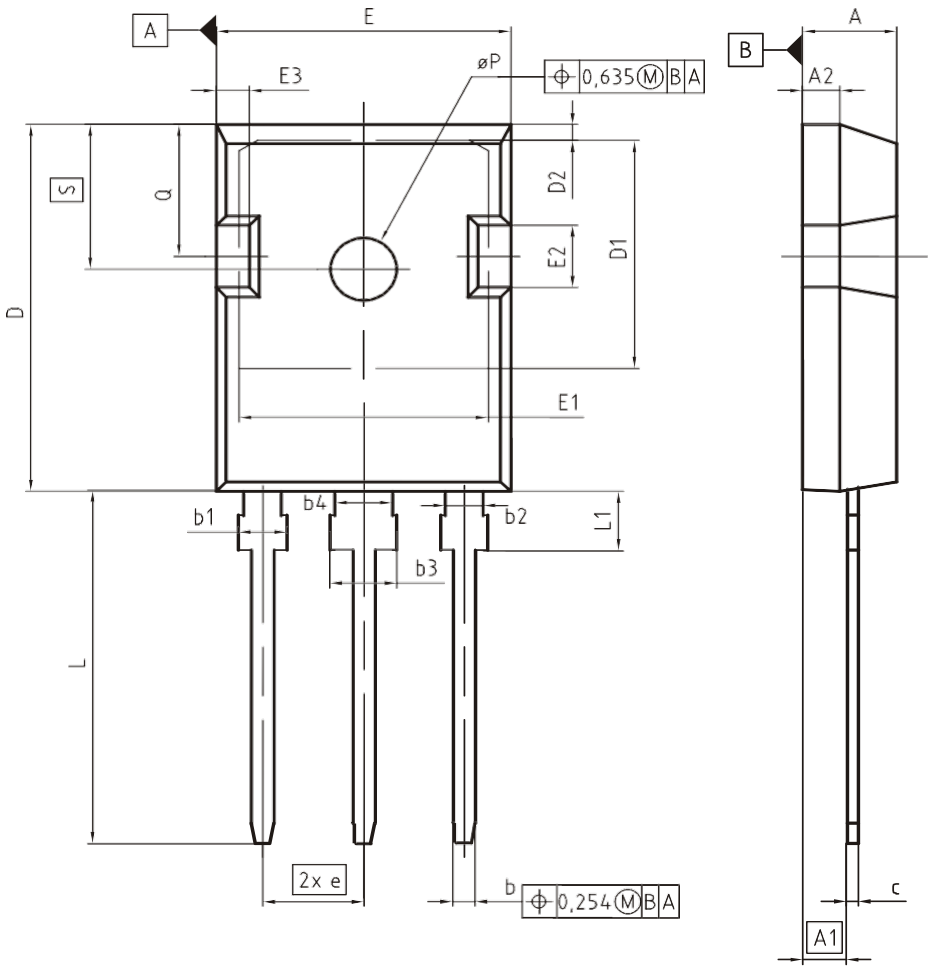


Figure 21. **Typical diode forward voltage as a function of junction temperature**

封装图 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

SCALE
0 5 5 7.5mm

EUROPEAN PROJECTION

ISSUE DATE
09-07-2010

REVISION
05

谐振开关系列

测试条件

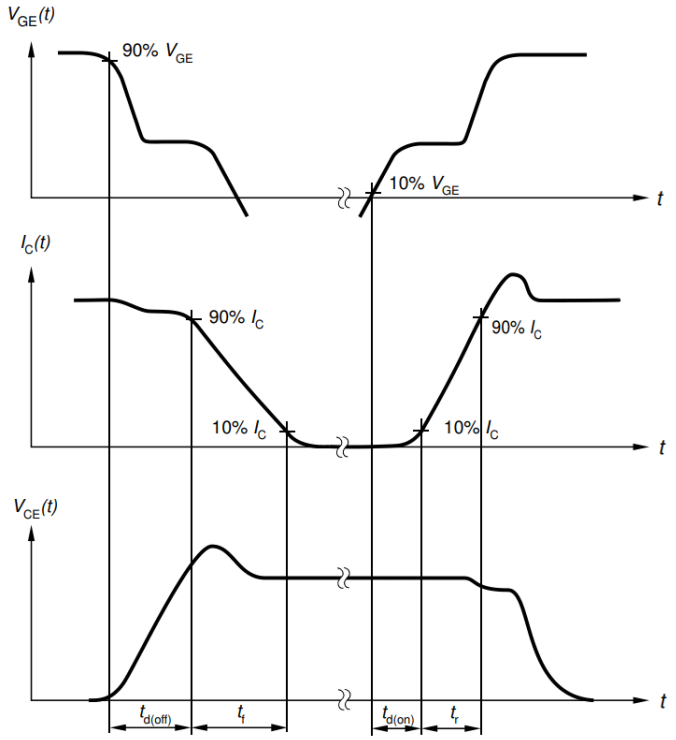


Figure A. **Definition of switching times**

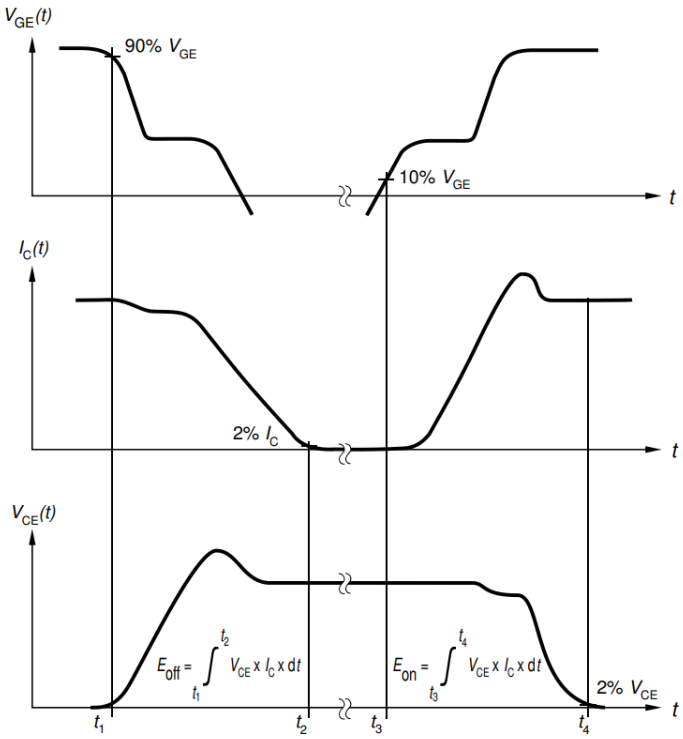


Figure B. **Definition of switching losses**

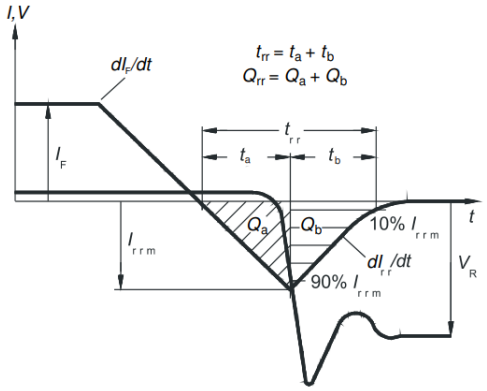


Figure C. **Definition of diode switching characteristics**

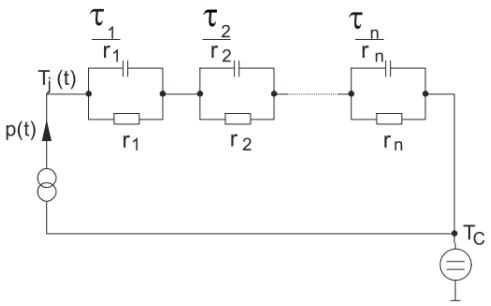


Figure D. **Thermal equivalent circuit**

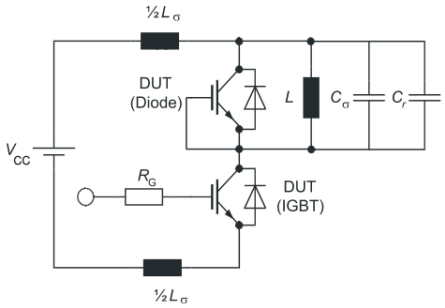


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

修订记录

IHW20N120R5

Revision: 2019-09-19, Rev. 2.2

历史修订版本

Revision	Date	Subjects (major changes since last revision)
1.1	2014-04-17	Preliminary data sheet
2.1	2015-01-26	Final data sheet
2.2	2019-09-19	additional parameter in maximum ratings table: non repetitive peak collector current

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