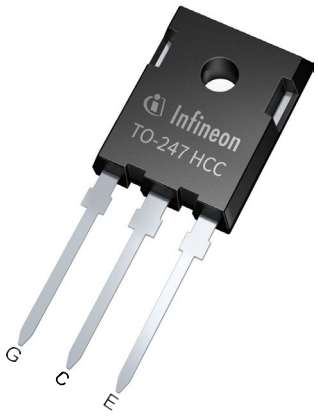
Final datasheet

英飞凌 TRENCHSTOP™ IGBT 7 PR7 反向导通型 IGBT 适用于 Boost PFC 级，具有更好的 EMI 特性，提供业内高功率和高开关频率应用的最佳性能

特性



- V_{CE} = 670 V
- I_C = 60 A
- 引脚间爬电距离 > 4.8 mm
- 引脚间电气间隙 > 3.4 mm
- 为PFC应用优化的单片二极管
- 通过极低的dv/dt改进EMI性能
- 25°C 时，极低的 V_{CEsat} = 1.4 V（典型值）
- 稳定的温度特性
- V_{CEsat} 和 E_{sw} 的低温度依赖性
- 符合 2 kV ESD HBM 标准
- 基于 V_{CEsat} 正温度系提升易于并联的能力
- 完整的产品范围和 PSpice 模型： http://www.infineon.com/igbt/

Lead-free

Green

Halogen-free

RoHS

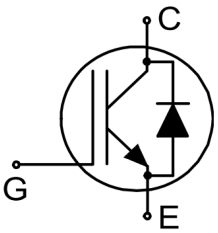
潜在应用

- 家用空调/商用空调
- 住宅暖通空调 / 商业暖通空调

产品验证

- 符合 JEDEC47/20/22 相关测试的工业应用要求

描述



Type	Package	Marking
IKWH60N67PR7	PG-TO247-3-U04	H60EPR7

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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1 封装

表 1 特征值

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Internal emitter inductance measured 5 mm (0.197 in.) from case	L_E			13		nH
Storage temperature	T_{stg}		-55		150	°C
Soldering temperature	T_{sold}	wave soldering 1.6 mm (0.063 in.) from case for 10 s			260	°C
Mounting torque	M	M3 screw, Maximum of mounting processes: 3			0.6	Nm
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	K/W
IGBT thermal resistance, junction-case	$R_{th(j-c)}$			0.53	0.69	K/W

2 IGBT

表 2 最大额定值

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CE}	$T_{vj} \geq 25$ °C		670	V
DC collector current, limited by T_{vjmax}	I_C		$T_c = 25$ °C	122	A
			$T_c = 100$ °C	75	
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}			180	A
Turn-off safe operating area		$V_{CE} \leq 670$ V, $T_{vj} \leq 175$ °C		180	A
Gate-emitter voltage	V_{GE}			±20	V
Transient gate-emitter voltage	V_{GE}	$t_p \leq 0.5$ µs, $D < 0.001$		±30	V
Power dissipation	P_{tot}		$T_c = 25$ °C	283	W
			$T_c = 100$ °C	142	

表 3 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	$I_C = 60$ A	$T_{vj} = 25$ °C		1.4	1.75	V
			$T_{vj} = 175$ °C		1.7		

（表格续下页……）

表 3　　（续）特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Gate-emitter threshold voltage	V_{GEth}	I_C = 0.342 mA, V_{CE} = V_{GE}		3.2	3.95	4.8	V
Zero gate-voltage collector current	I_{CES}	V_{CE} = 670 V, V_{GE} = 0 V	T_{vj} = 25 °C			40	mA
			T_{vj} = 175 °C		5		mA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V				100	nA
Transconductance	g_{fs}	I_C = 60 A, V_{CE} = 20 V			91.9		S
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			3311		pF
Output capacitance	C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			44		pF
Reverse transfer capacitance	C_{res}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			17.2		pF
Gate charge	Q_G	V_{CC} = 520 V, I_C = 60 A, V_{GE} = 15 V			148		nC
Turn-on delay time	$t_{d(on)}$	V_{CC} = 400 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 9.8 Ω, $R_{G(off)}$ = 9.8 Ω	T_{vj} = 25 °C, I_C = 60 A		20		ns
			T_{vj} = 175 °C, I_C = 60 A		18		
Rise time (inductive load)	t_r	V_{CC} = 400 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 9.8 Ω, $R_{G(off)}$ = 9.8 Ω	T_{vj} = 25 °C, I_C = 60 A		24		ns
			T_{vj} = 175 °C, I_C = 60 A		22		
Turn-off delay time	$t_{d(off)}$	V_{CC} = 400 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 9.8 Ω, $R_{G(off)}$ = 9.8 Ω	T_{vj} = 25 °C, I_C = 60 A		208		ns
			T_{vj} = 175 °C, I_C = 60 A		234		
Fall time (inductive load)	t_f	V_{CC} = 400 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 9.8 Ω, $R_{G(off)}$ = 9.8 Ω	T_{vj} = 25 °C, I_C = 60 A		36		ns
			T_{vj} = 175 °C, I_C = 60 A		39		
Turn-on energy	E_{on}	V_{CC} = 400 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 9.8 Ω, $R_{G(off)}$ = 9.8 Ω	T_{vj} = 25 °C, I_C = 60 A		1.28		mJ
			T_{vj} = 175 °C, I_C = 60 A		1.83		
Turn-off energy	E_{off}	V_{CC} = 400 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 9.8 Ω, $R_{G(off)}$ = 9.8 Ω	T_{vj} = 25 °C, I_C = 60 A		0.78		mJ
			T_{vj} = 175 °C, I_C = 60 A		0.95		

（表格续下页……）

表 3 （续） 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Total switching energy	E_{ts}	V_{CC} = 400 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 9.8 Ω, $R_{G(off)}$ = 9.8 Ω	T_{vj} = 25 °C, I_C = 60 A		2.06		mJ
			T_{vj} = 175 °C, I_C = 60 A		2.79		
Operating junction temperature	T_{vj}			-40		175	°C

3 二极管

表4 最大额定值

Parameter	Symbol	Note or test condition	Values	Unit
Repetitive peak reverse voltage	V_{RRM}	T_{vj} ≥ 25 °C	670	V
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpulse}		5	A

表5 特征值

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Operating junction temperature	T_{vj}		-40		175	°C

注： *为了获得最佳的使用寿命和可靠性，英飞凌建议工作条件不超过本数据手册中所述最大额定值的80%。*

电气特性，均在T_{vj} = 25°C 的条件下测得，除非另有说明。

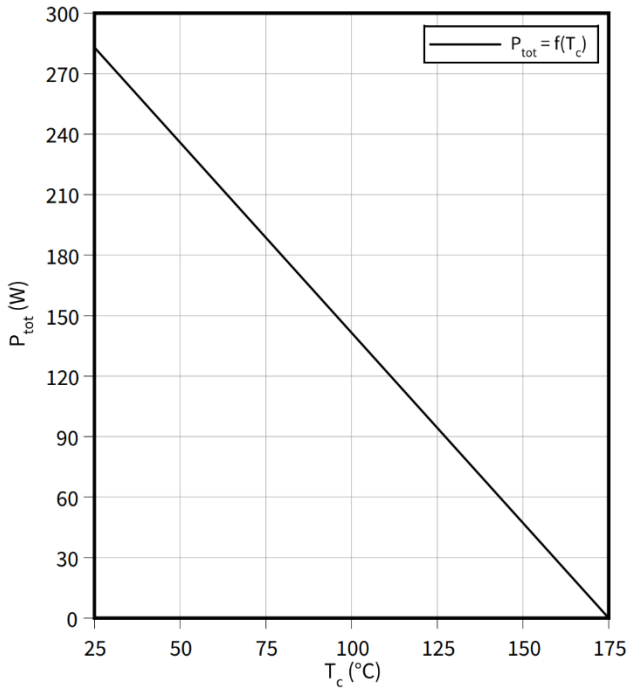
动态测试电路，寄生电感L_σ= 30 nH，寄生电容C_σ= 23 pF，如图C 所示。对管为EC7 二极管= IDWD60E65E7

4 特性图

Power dissipation as a function of case temperature

$P_{tot} = f(T_c)$

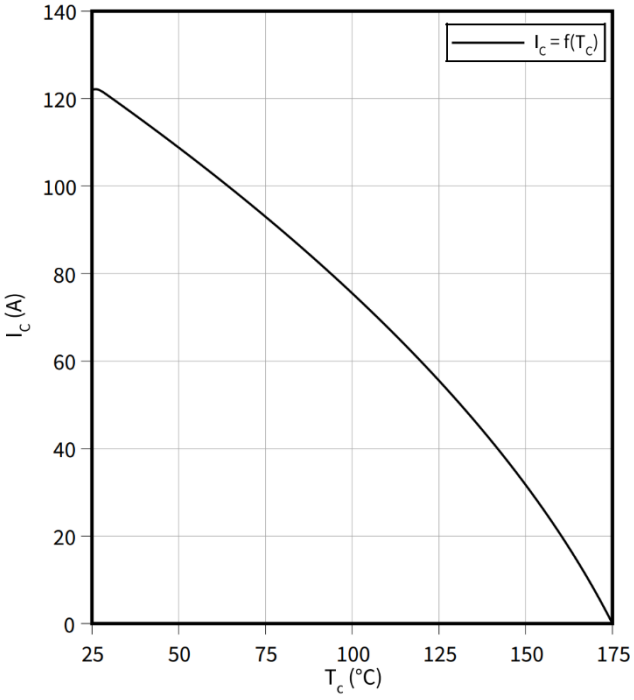
$T_{vj} \leq 175$ °C



Collector current as a function of case temperature

$I_C = f(T_c)$

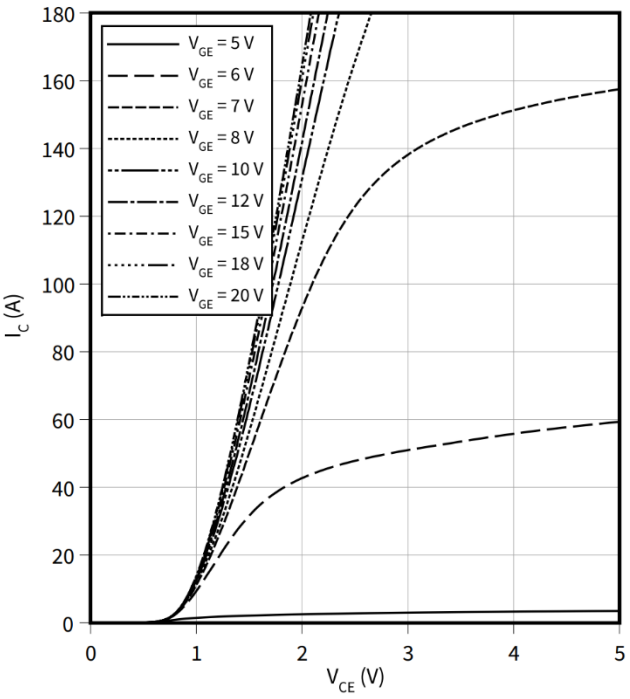
$T_{vj} \leq 175$ °C, $V_{GE} \geq 15$ V



Typical output characteristic

$I_C = f(V_{CE})$

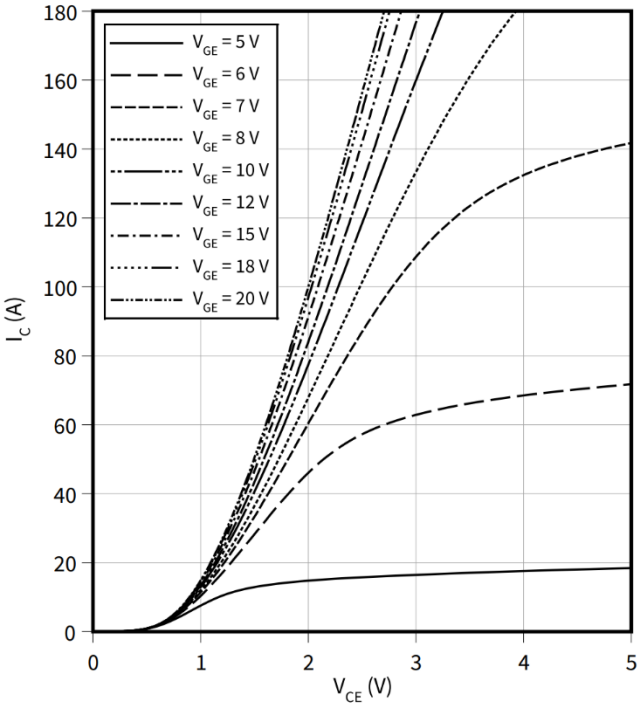
$T_{vj} = 25$ °C



Typical output characteristic

$I_C = f(V_{CE})$

$T_{vj} = 175$ °C

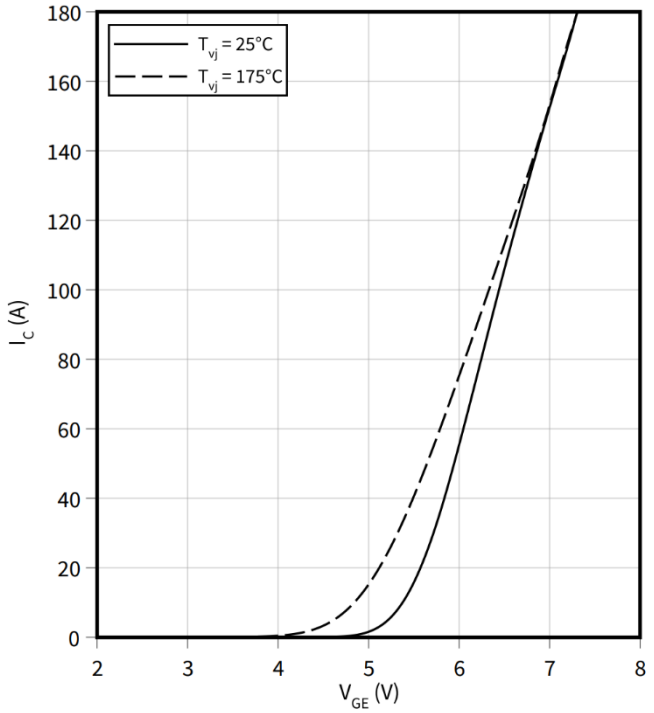


4 特性图

Typical transfer characteristic

$I_C = f(V_{GE})$

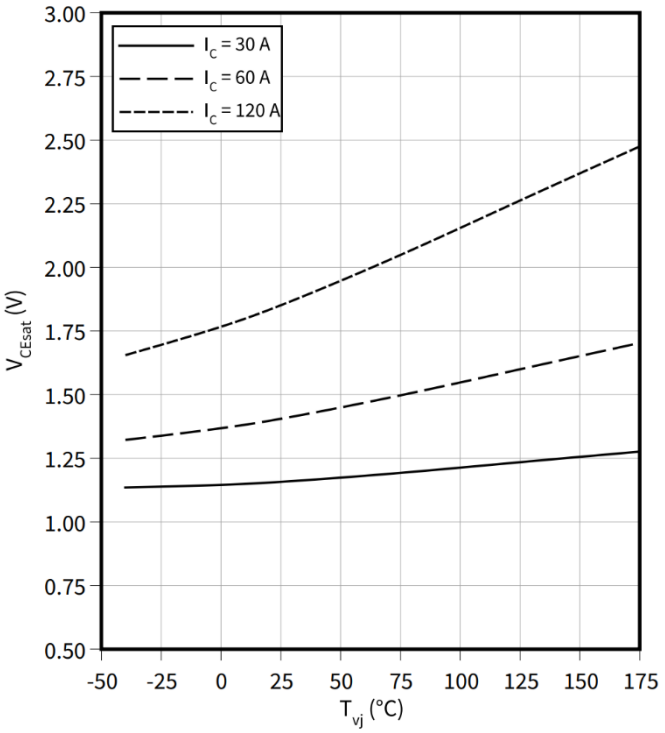
$V_{CE} = 20$ V



Typical collector-emitter saturation voltage as a function of junction temperature

$V_{CEsat} = f(T_{vj})$

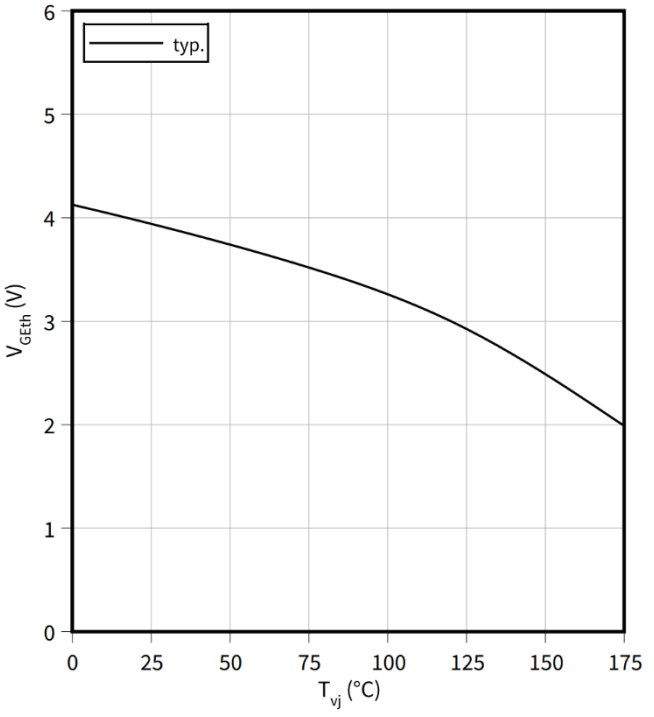
$V_{GE} = 15$ V



Gate-emitter threshold voltage as a function of junction temperature

$V_{GEth} = f(T_{vj})$

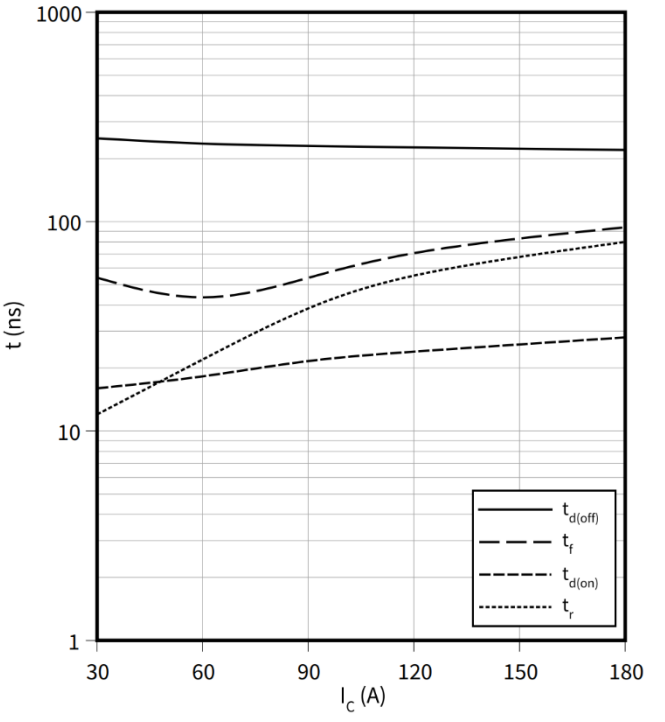
$I_C = 0.342$ mA



Typical switching times as a function of collector current

$t = f(I_C)$

$V_{CC} = 400$ V, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V, $R_G = 9.8\ \Omega$

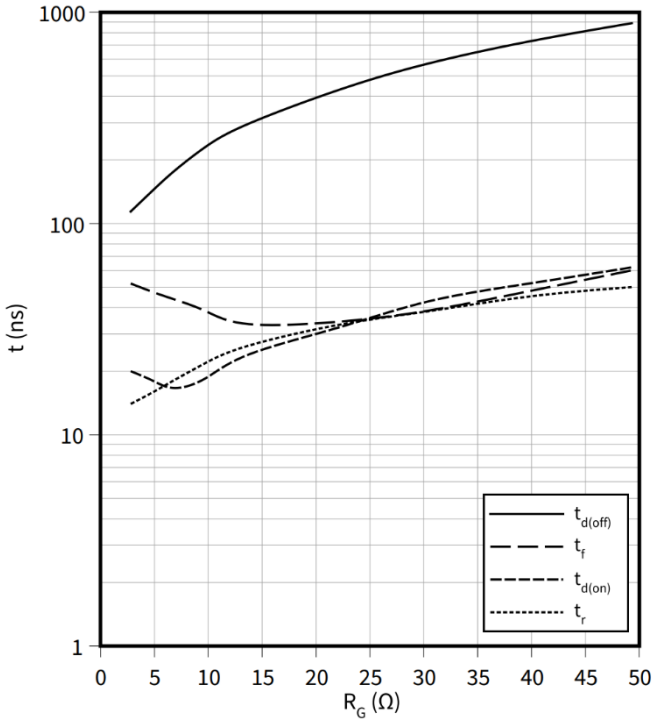


4 特性图

Typical switching times as a function of gate resistor

$t = f(R_G)$

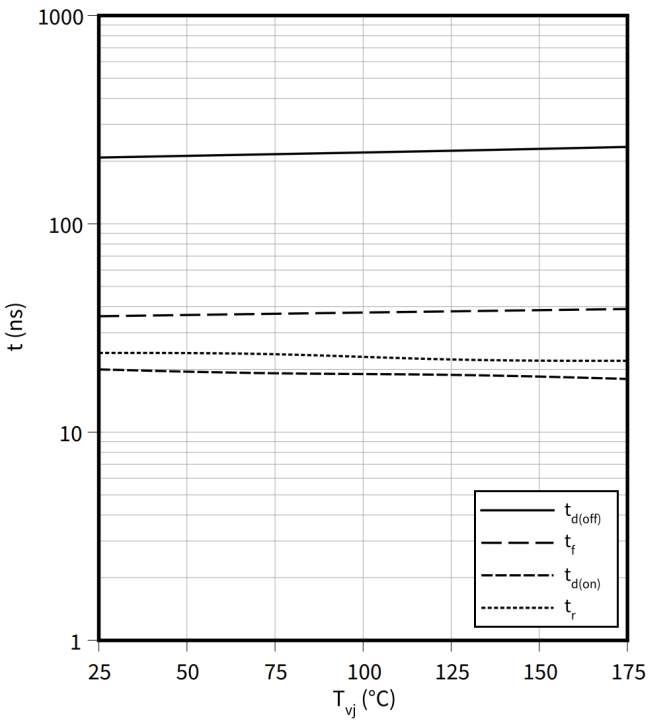
$I_C = 60\ A$, $V_{CC} = 400\ V$, $T_{vj} = 175\ °C$, $V_{GE} = 0/15\ V$



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

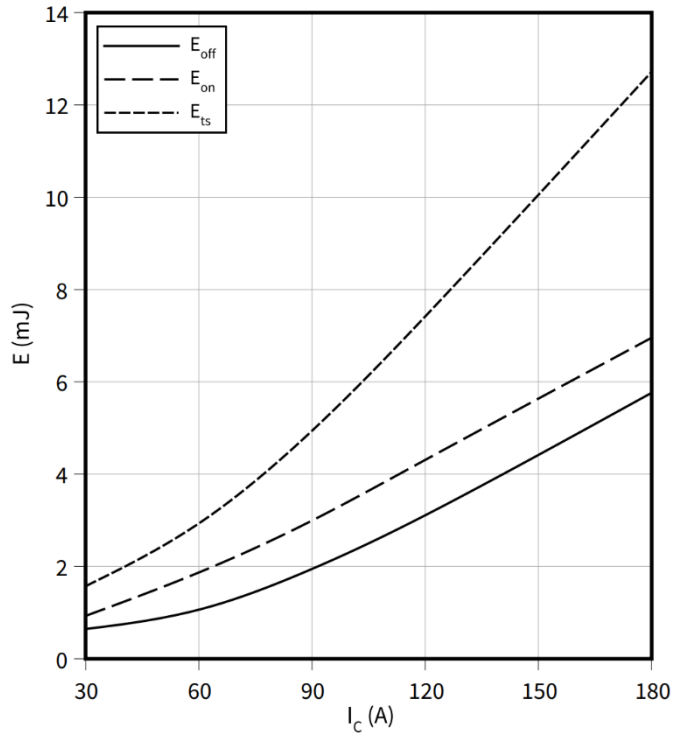
$I_C = 60\ A$, $V_{CC} = 400\ V$, $V_{GE} = 0/15\ V$, $R_G = 9.8\ Ω$



Typical switching energy losses as a function of collector current

$E = f(I_C)$

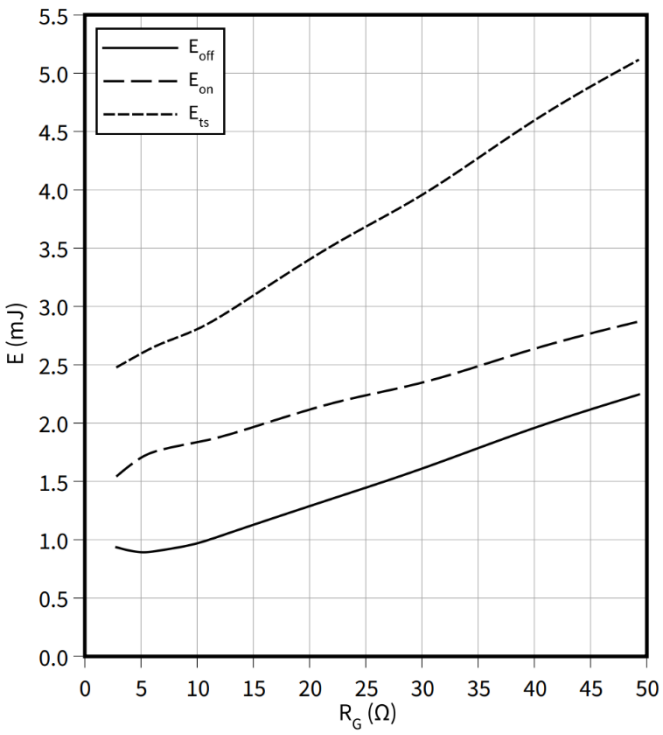
$V_{CC} = 400\ V$, $T_{vj} = 175\ °C$, $V_{GE} = 0/15\ V$, $R_G = 9.8\ Ω$



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

$I_C = 60\ A$, $V_{CC} = 400\ V$, $T_{vj} = 175\ °C$, $V_{GE} = 0/15\ V$

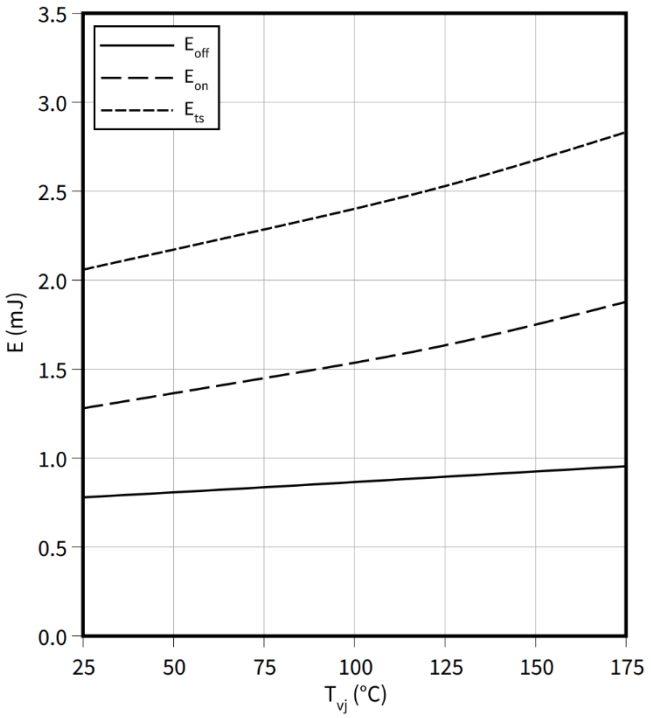


4 特性图

Typical switching energy losses as a function of junction temperature

$E = f(T_{vj})$

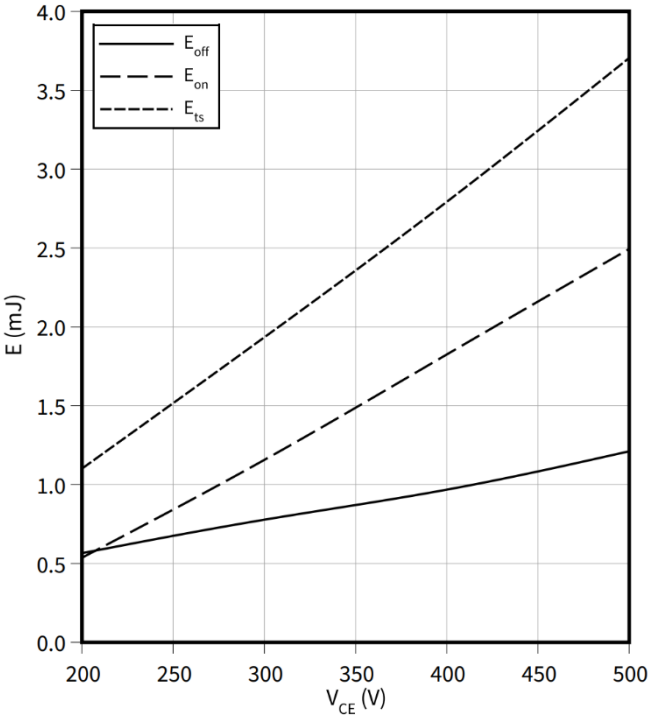
$I_C = 60\ A$, $V_{CC} = 400\ V$, $V_{GE} = 0/15\ V$, $R_G = 9.8\ \Omega$



Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

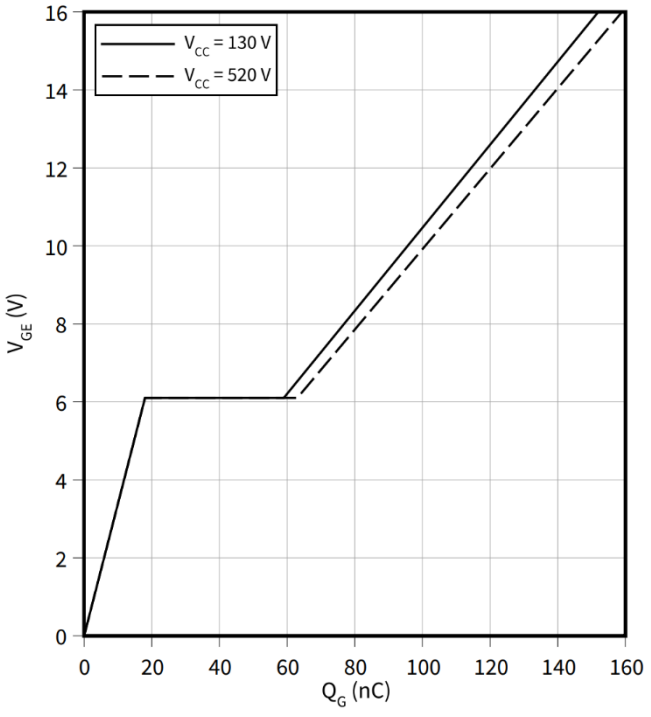
$I_C = 60\ A$, $T_{vj} = 175\ °C$, $V_{GE} = 0/15\ V$, $R_G = 9.8\ \Omega$



Typical gate charge

$V_{GE} = f(Q_G)$

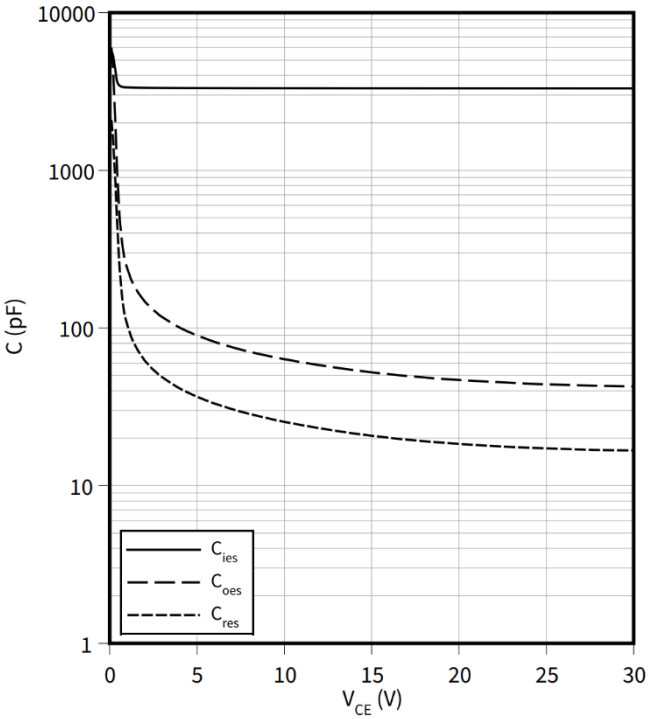
$I_C = 60\ A$



Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

$f = 100\ kHz$, $V_{GE} = 0\ V$

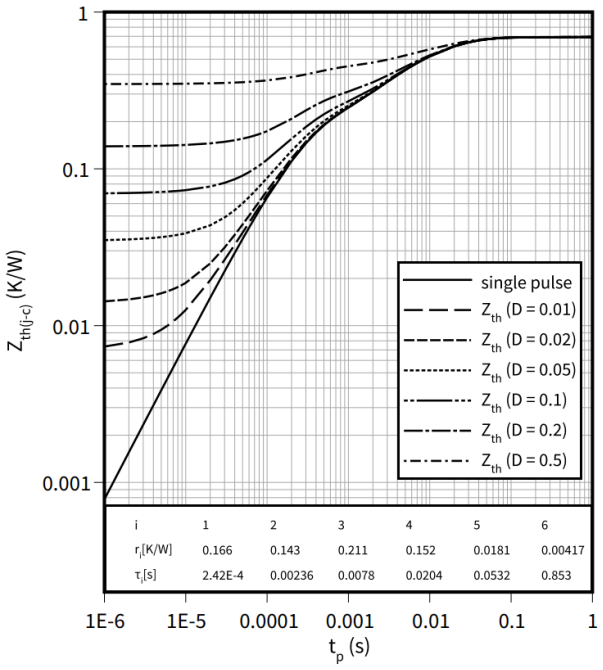


4 特性图

IGBT transient thermal impedance as a function of pulse width

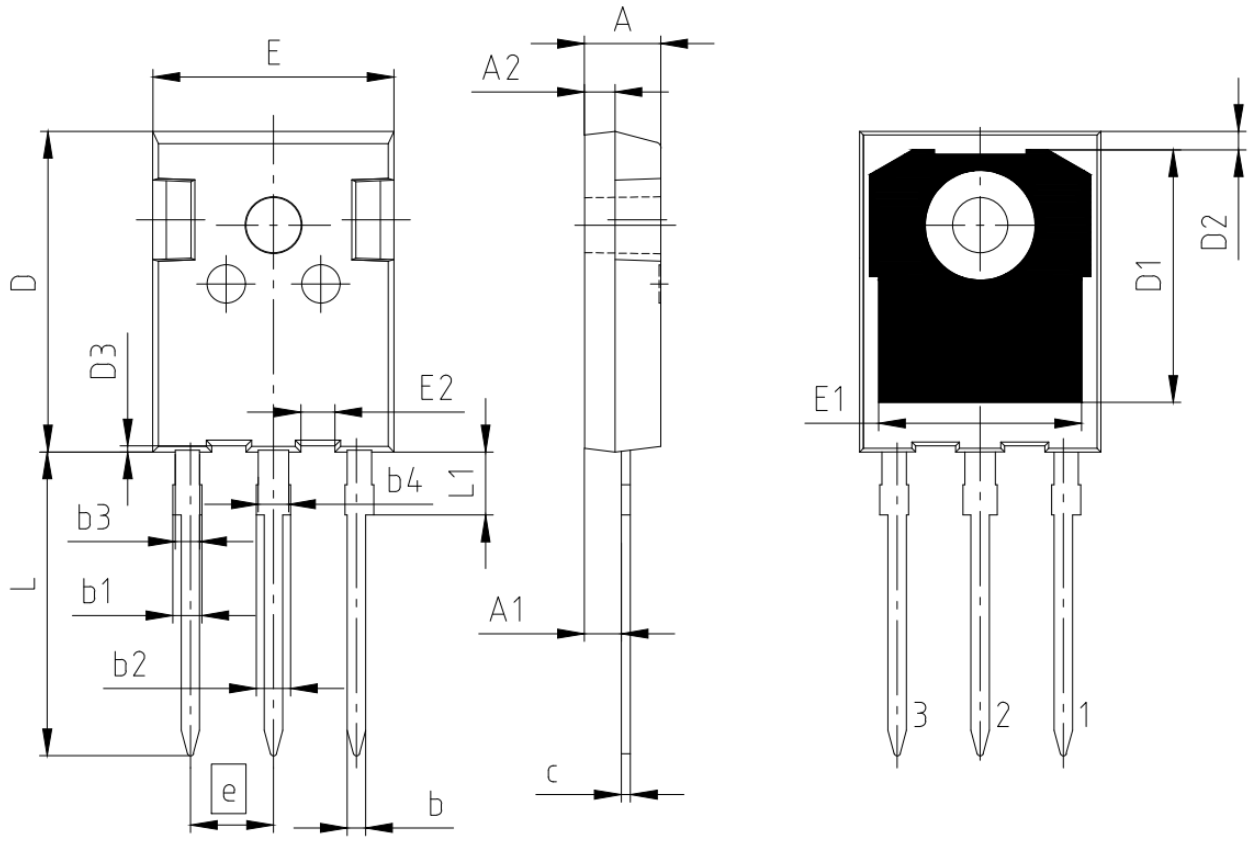
$Z_{th(j-c)} = f(t_p)$

$D = t_p/T$



i	1	2	3	4	5	6
r_i[K/W]	0.166	0.143	0.211	0.152	0.0181	0.00417
τ_i[s]	2.42E-4	0.00236	0.0078	0.0204	0.0532	0.853

5 封装外形



PACKAGE - GROUP NUMBER:	PG-TO247-3-U04	
DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	4.90	5.10
A1	2.31	2.51
A2	1.90	2.10
b	1.16	1.26
b1		1.90
b2		2.30
b3	1.55	1.65
b4	1.96	2.06
c	0.59	0.66
D	20.90	21.10
D1	16.25	16.85
D2	1.05	1.35
D3	0.55	0.65
E	15.70	15.90
E1	13.10	13.50
E2	2.14	2.34
e	5.44	
N	3	
L	19.80	20.10
L1	3.95	4.30

图 1

6 测试条件

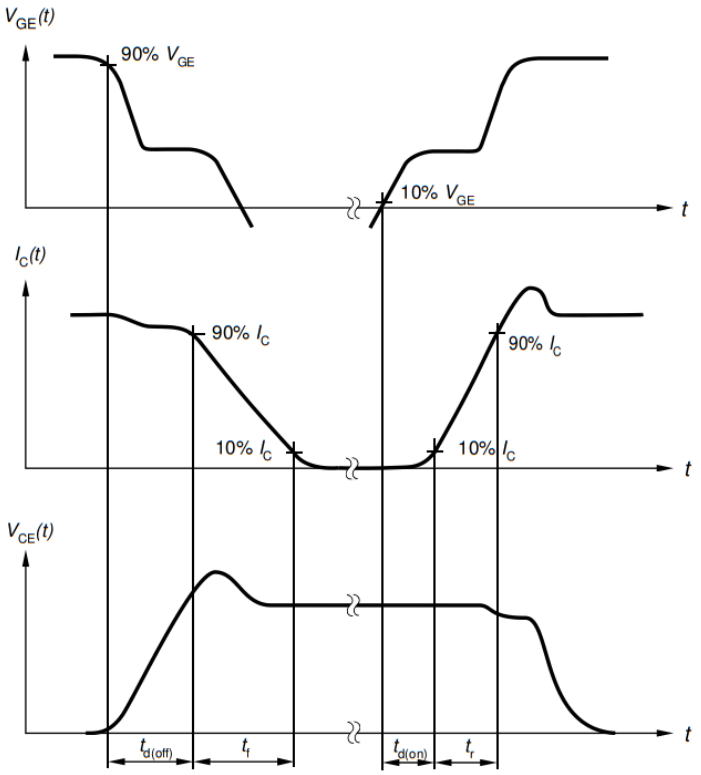


Figure A. **Definition of switching times**

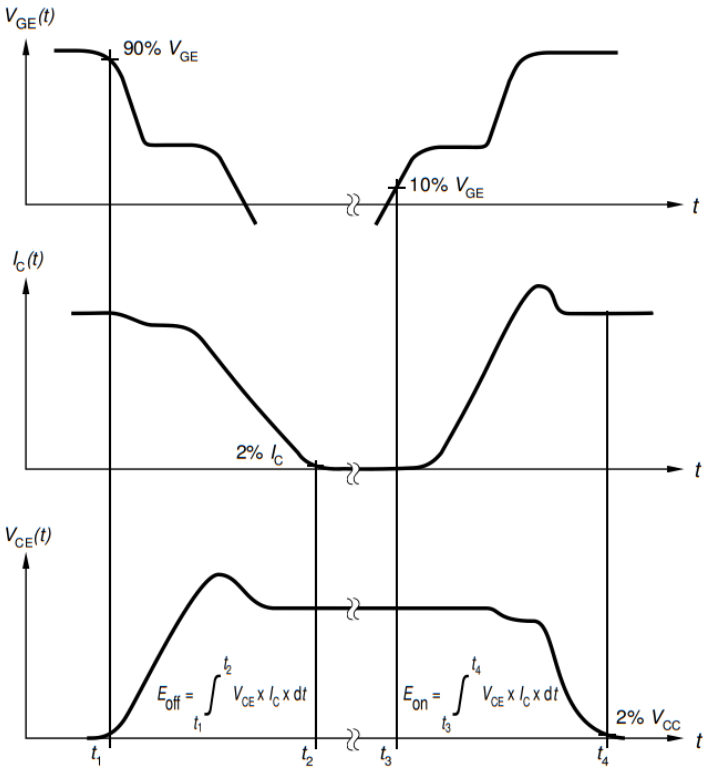


Figure B. **Definition of switching losses**

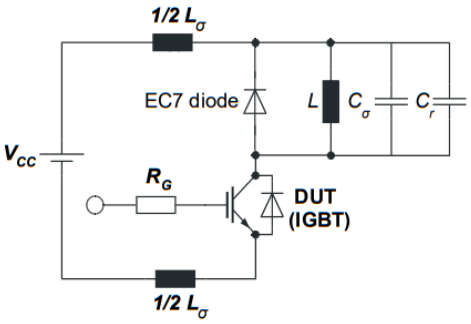


Figure C. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

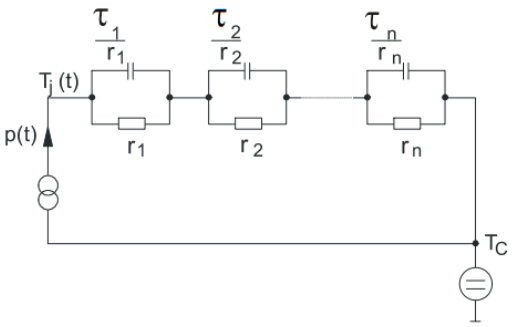


Figure D. **Termal equivalent circuit**

图 2

修订记录

Document revision	Date of release	Description of changes
0.10	2024-08-13	Preliminary datasheet
1.00	2024-09-23	Final datasheet

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Edition 2024-09-23

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