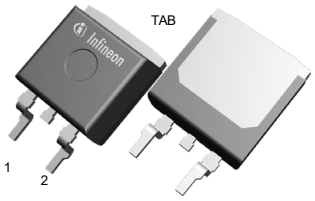
英飞凌耐短路 1200 V TRENCHSTOP™ IGBT 7 技术



Halogen-free

Lead-free

Green

RoHS

特性

- V_{CE} = 1200 V
- I_C = 15 A
- 低饱和电压 V_{CEsat} = 2 V at T_{vj} = 150°C
- 短路耐受性 8 µs
- 广泛的 dv/dt 可控性
- 完整的产品品类和 PSpice 模型： http://www.infineon.com/igbt/

潜在应用

- 工业驱动

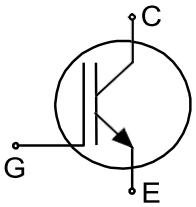
产品验证

- 符合JEDEC47/20/22相关测试的工业应用要求
- 所需应用的封装

描述

封装引脚定义：

- 引脚 1 - 栅极
- 引脚 2 (E) - 发射器
- TAB（C）-收集器



Type	Package	Marking
IGB15N120S7	PG-TO263-3-STD-C1.6	G15MS7

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			7		nH
Storage temperature	T_{stg}		-55		150	°C
Soldering temperature	T_{sold}	reflow soldering (MSL1 according to JEDEC J-STA-020)			260	°C
Thermal resistance, 6 cm^2 Cu on PCB junction to ambient	$R_{th(j-a)}$				40	K/W
IGBT thermal resistance, junction-case	$R_{th(j-c)}$			0.66	0.89	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		1200	V
DC collector current, limited by T_{vjmax}	I_C		$T_c = 25$ °C	34[1)]	A
			$T_c = 100$ °C	22	
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}			45	A
Turn-off safe operating area		$V_{CE} \leq 1200$ V, $T_{vj} \leq 150$ °C		45	A
Gate-emitter voltage	V_{GE}			±20	V
Transient gate-emitter voltage	V_{GE}	$t_p \leq 0.5$ µs, $D < 0.001$		±25	V
Short-circuit withstand time	t_{SC}	$V_{CC} \leq 600$ V, $V_{GE} = 15$ V, Allowed number of short circuits < 1000, Time between short circuits ≥ 1.0 s, $T_{vj} = 150$ °C		8	µs
Power dissipation	P_{tot}		$T_c = 25$ °C	141	W
			$T_c = 100$ °C	56	

1) 受封装限制

表3 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	I_C = 15 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.65	2	V
			T_{vj} = 150 °C		2		
Gate-emitter threshold voltage	V_{GEth}	I_C = 0.3 mA, V_{CE} = V_{GE}		5.15	5.7	6.45	V
Zero gate-voltage collector current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			20	µA
			T_{vj} = 150 °C		260		
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V				100	nA
Transconductance	g_{fs}	I_C = 15 A, V_{CE} = 20 V, T_{vj} = 150 °C			6.7		S
Short-circuit collector current	I_{SC}	V_{CC} ≤ 600 V, V_{GE} = 15 V, t_{SC} ≤ 8 µs, Allowed number of short circuits < 1000, Time between short circuits ≥ 1.0 s, T_{vj} = 150 °C			72		A
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			2.5		nF
Output capacitance	C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			41		pF
Reverse transfer capacitance	C_{res}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			27		pF
Gate charge	Q_G	V_{CC} = 960 V, I_C = 15 A, V_{GE} = 15 V			97		nC
Turn-on delay time	$t_{d(on)}$	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 10 Ω, $R_{G(off)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 15 A		16		ns
			T_{vj} = 150 °C, I_C = 15 A		16		
Rise time (inductive load)	t_r	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 10 Ω, $R_{G(off)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 15 A		17		ns
			T_{vj} = 150 °C, I_C = 15 A		19		
Turn-off delay time	$t_{d(off)}$	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 10 Ω, $R_{G(off)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 15 A		156		ns
			T_{vj} = 150 °C, I_C = 15 A		223		
Fall time (inductive load)	t_f	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 10 Ω, $R_{G(off)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 15 A		111		ns
			T_{vj} = 150 °C, I_C = 15 A		216		
Turn-on energy	E_{on}	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 10 Ω, $R_{G(off)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 15 A		0.9		mJ
			T_{vj} = 150 °C, I_C = 15 A		1.3		

（表格续下页……）

表 3 （续） 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-off energy	E_{off}	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 10 Ω, $R_{G(off)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 15 A		0.68		mJ
			T_{vj} = 150 °C, I_C = 15 A		1.3		
Total switching energy	E_{ts}	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 10 Ω, $R_{G(off)}$ = 10 Ω	T_{vj} = 25 °C, I_C = 15 A		1.58		mJ
			T_{vj} = 150 °C, I_C = 15 A		2.63		
Operating junction temperature	T_{vj}			-40		150	°C

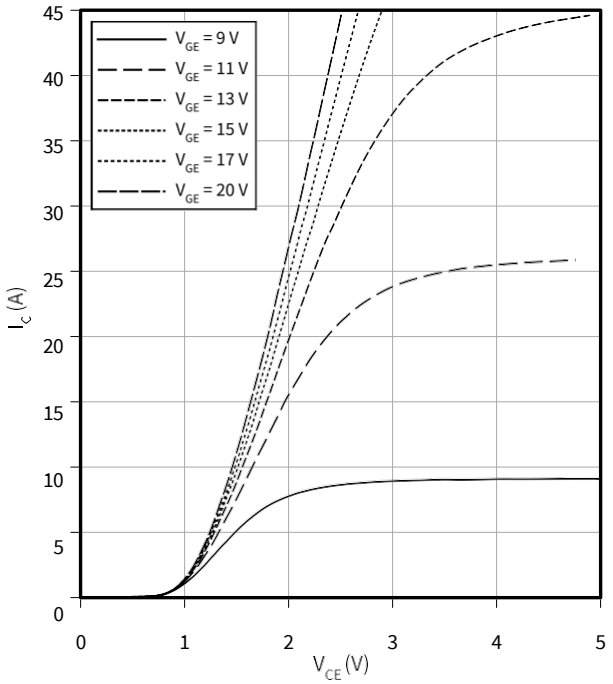
注意： *为了获得最佳的使用寿命和可靠性，英飞凌建议工作条件不超过本数据手册中所述最大额定值的80%。*

除非另有规定，*电气特性均为 T_{vj} = 25°C。*

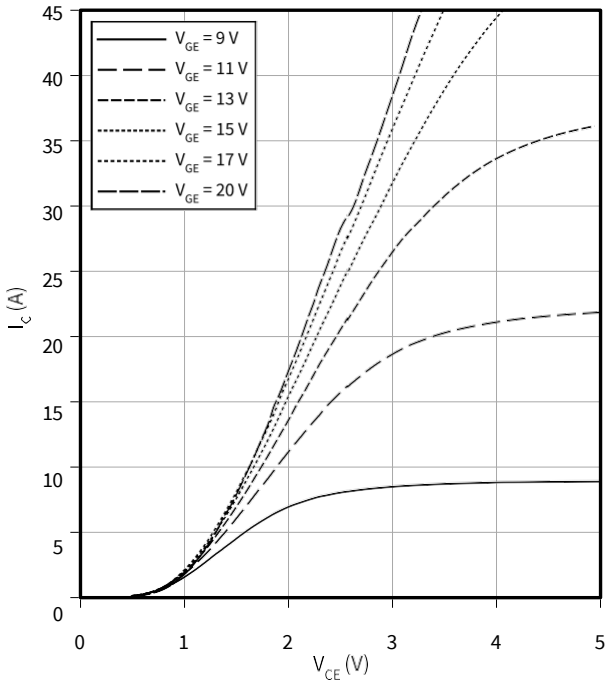
动态测试电路，寄生电感 $L_σ$= 45 nH，寄生电容 $C_σ$= 25 pF，来自图E。能量损失包括"拖尾"和二极管(IKW15N120CS7) 反向恢复。

3 特性图

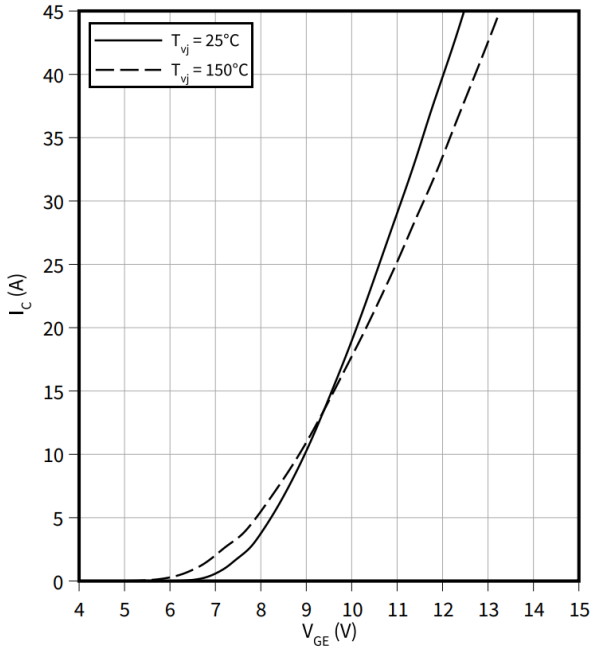
Typical output characteristic
$I_C = f(V_{CE})$
$T_{vj} = 25\ °C$



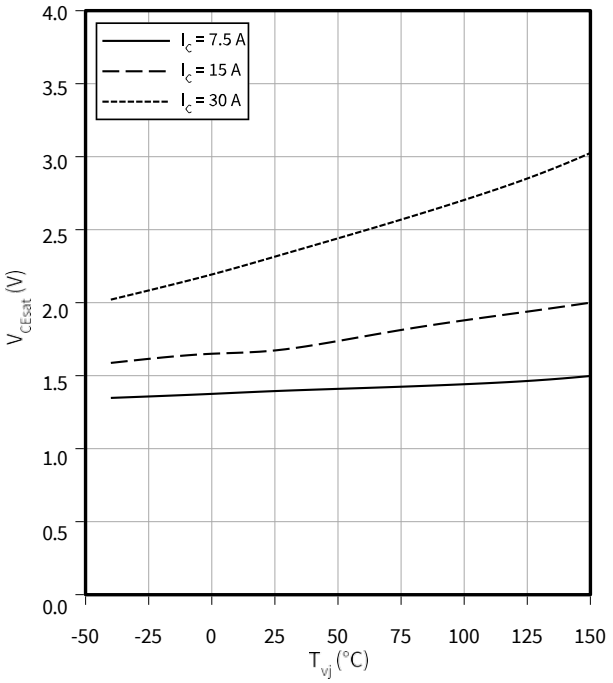
Typical output characteristic
$I_C = f(V_{CE})$
$T_{vj} = 150\ °C$



Typical transfer characteristic
$I_C = f(V_{GE})$
$V_{CE} = 20\ V$



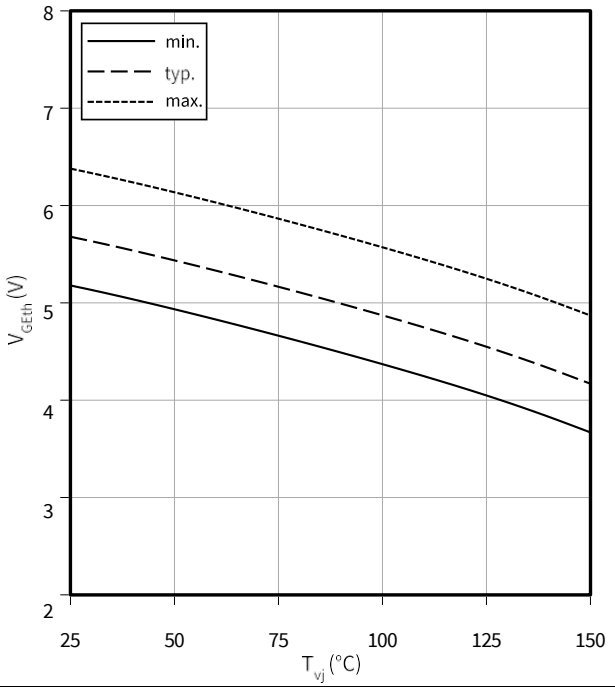
Typical collector-emitter saturation voltage as a function of junction temperature
$V_{CEsat} = f(T_{vj})$
$V_{GE} = 15\ V$



Gate-emitter threshold voltage as a function of junction temperature

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

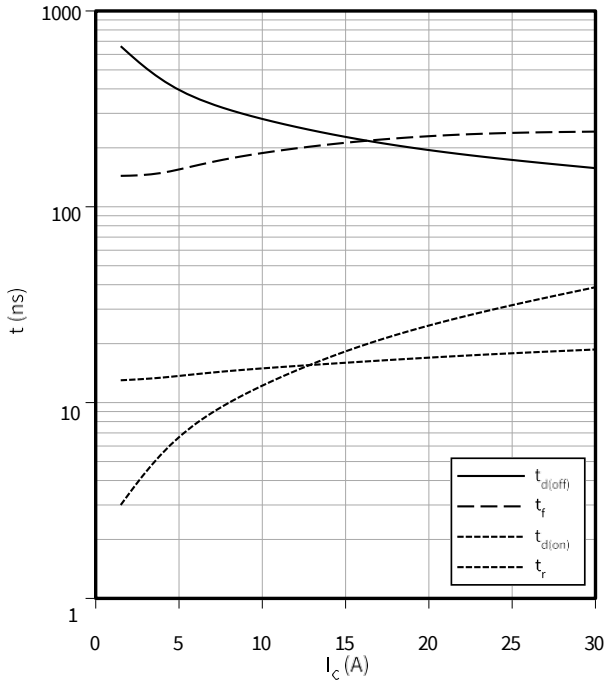
$I_C = 0.3$ mA



Typical switching times as a function of collector current

$t = f(I_C)$

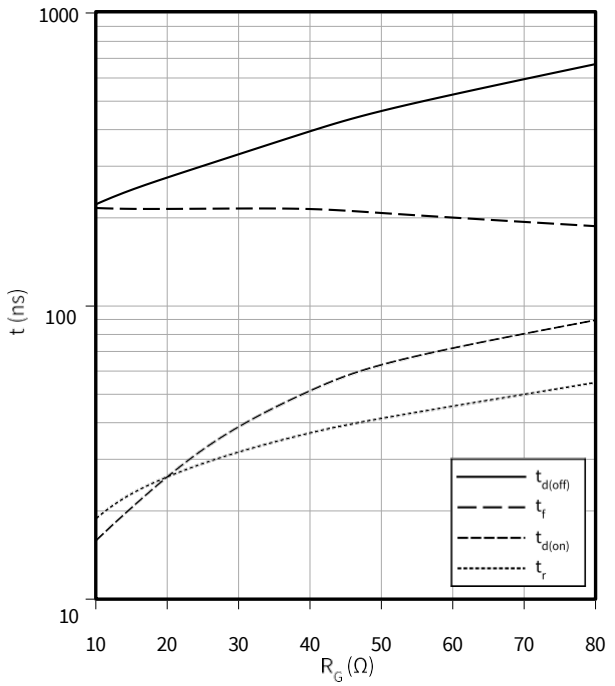
$V_{CC} = 600$ V, $T_{vj} = 150$ °C, $V_{GE} = 0/15$ V, $R_G = 10\ \Omega$



Typical switching times as a function of gate resistor

$t = f(R_G)$

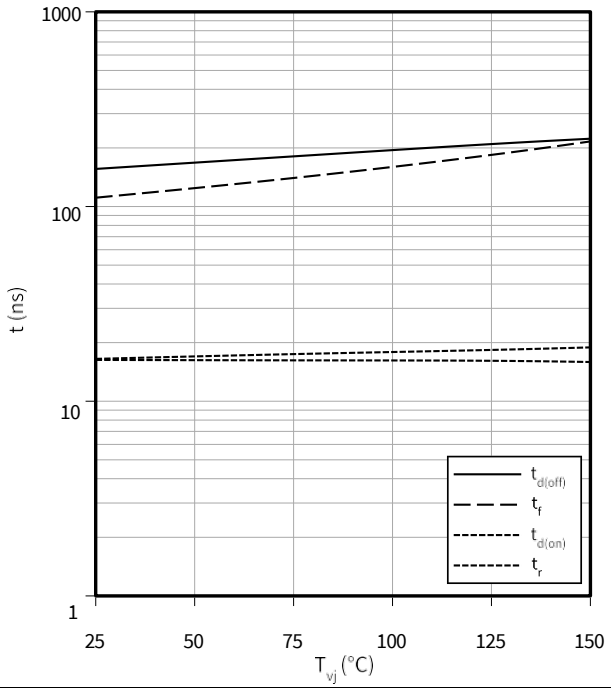
$I_C = 15$ A, $V_{CC} = 600$ V, $T_{vj} = 150$ °C, $V_{GE} = 0/15$ V



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

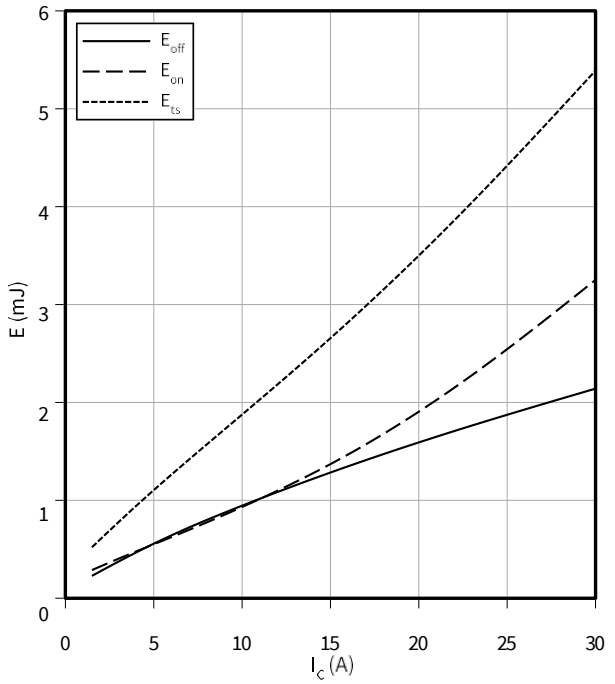
$I_C = 15$ A, $V_{CC} = 600$ V, $V_{GE} = 0/15$ V, $R_G = 10\ \Omega$



Typical switching energy losses as a function of collector current

$E = f(I_C)$

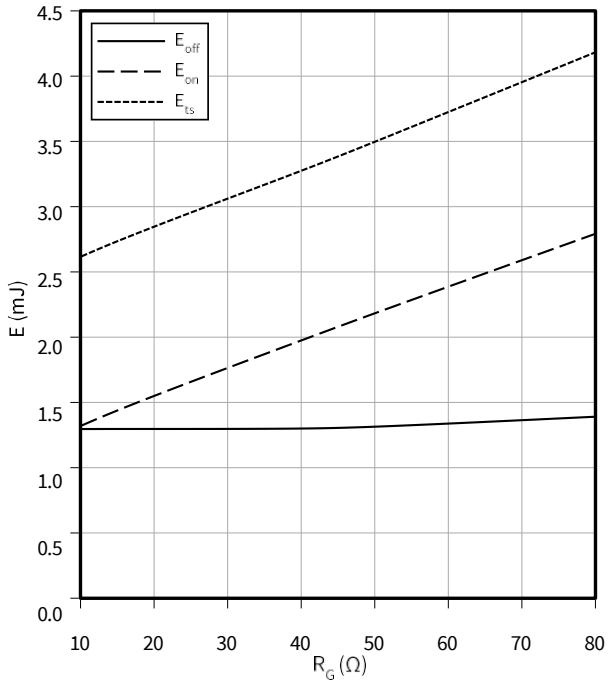
$V_{CC} = 600$ V, $T_{vj} = 150$ °C, $V_{GE} = 0/15$ V, $R_G = 10$ Ω



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

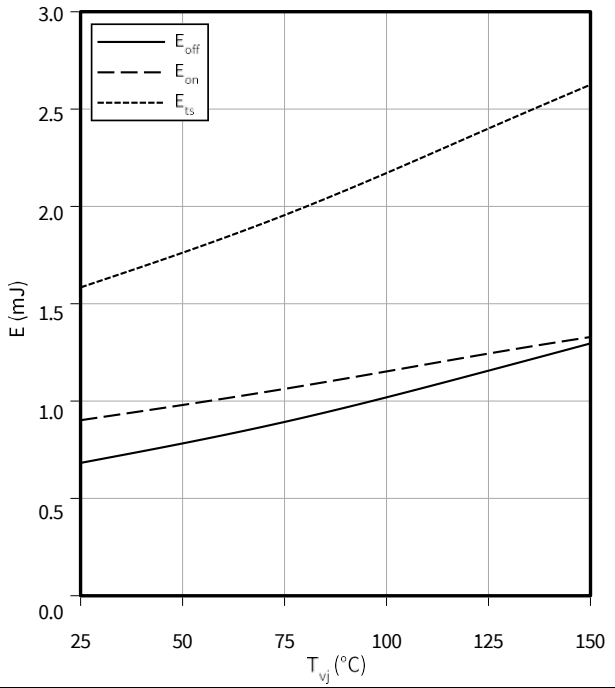
$I_C = 15$ A, $V_{CC} = 600$ V, $T_{vj} = 150$ °C, $V_{GE} = 0/15$ V



Typical switching energy losses as a function of junction temperature

$E = f(T_{vj})$

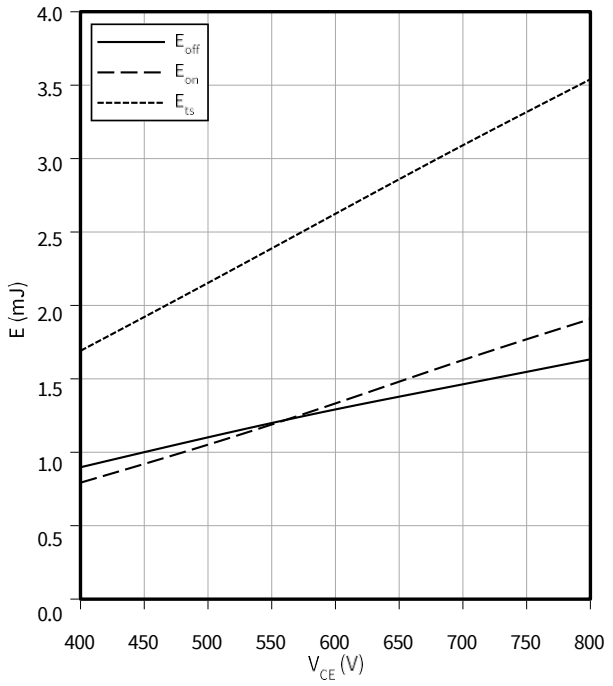
$I_C = 15$ A, $V_{CC} = 600$ V, $V_{GE} = 0/15$ V, $R_G = 10$ Ω



Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

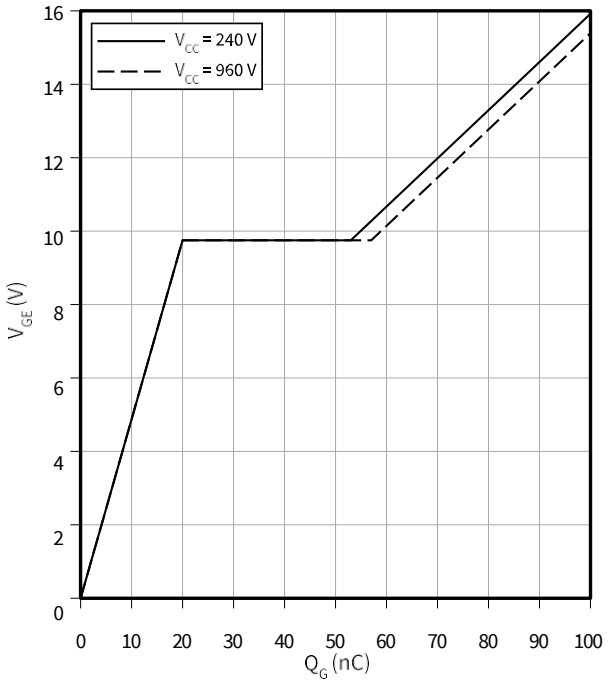
$I_C = 15$ A, $T_{vj} = 150$ °C, $V_{GE} = 0/15$ V, $R_G = 10$ Ω



Typical gate charge

$V_{GE} = f(Q_G)$

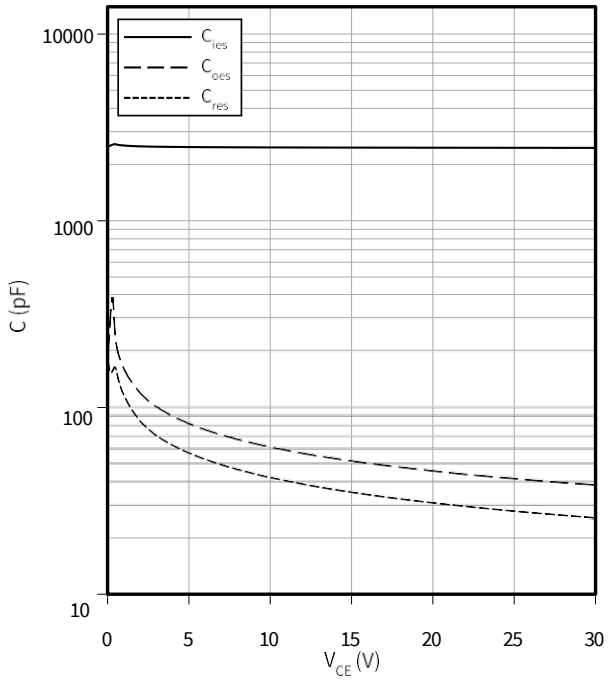
$I_C = 15$ A



Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

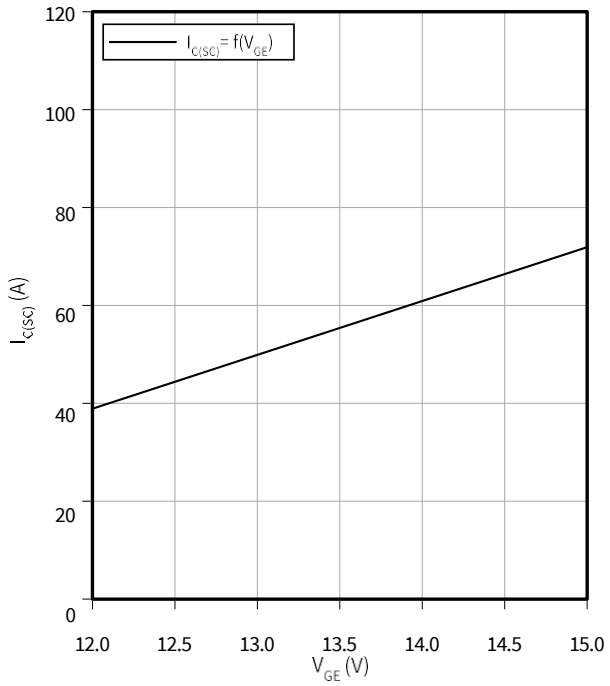
$f = 100$ kHz, $V_{GE} = 0$ V



Typical short circuit collector current as a function of gate-emitter voltage

$I_{C(SC)} = f(V_{GE})$

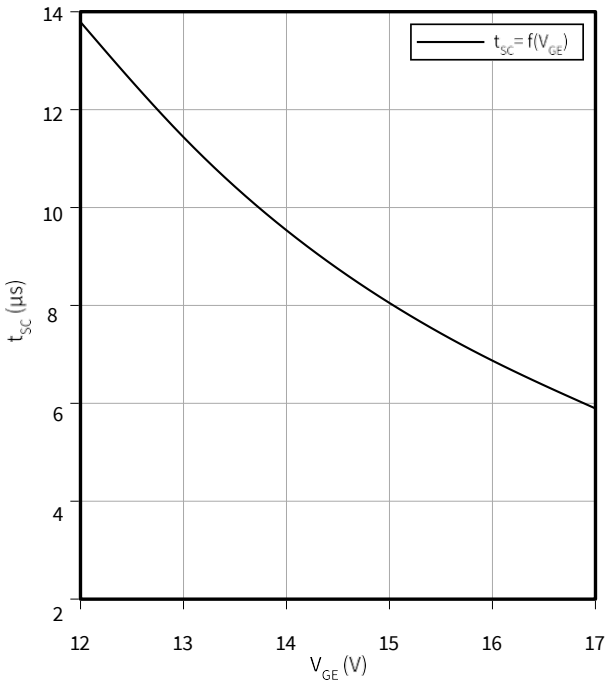
$T_{vj} = 150$ °C, $V_{CC} = 600$ V



Short circuit withstand time as a function of gate-emitter voltage

$t_{SC} = f(V_{GE})$

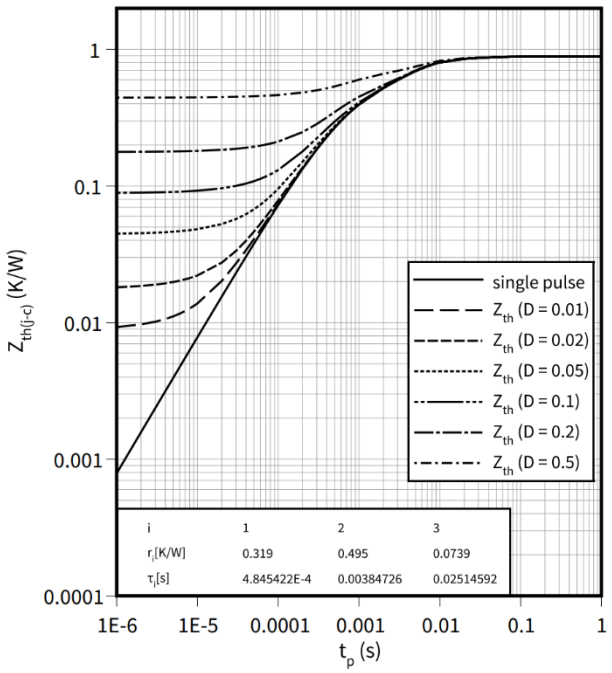
$T_{vj} = 150$ °C, $V_{CC} = 600$ V



IGBT transient thermal impedance as a function of pulse width

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

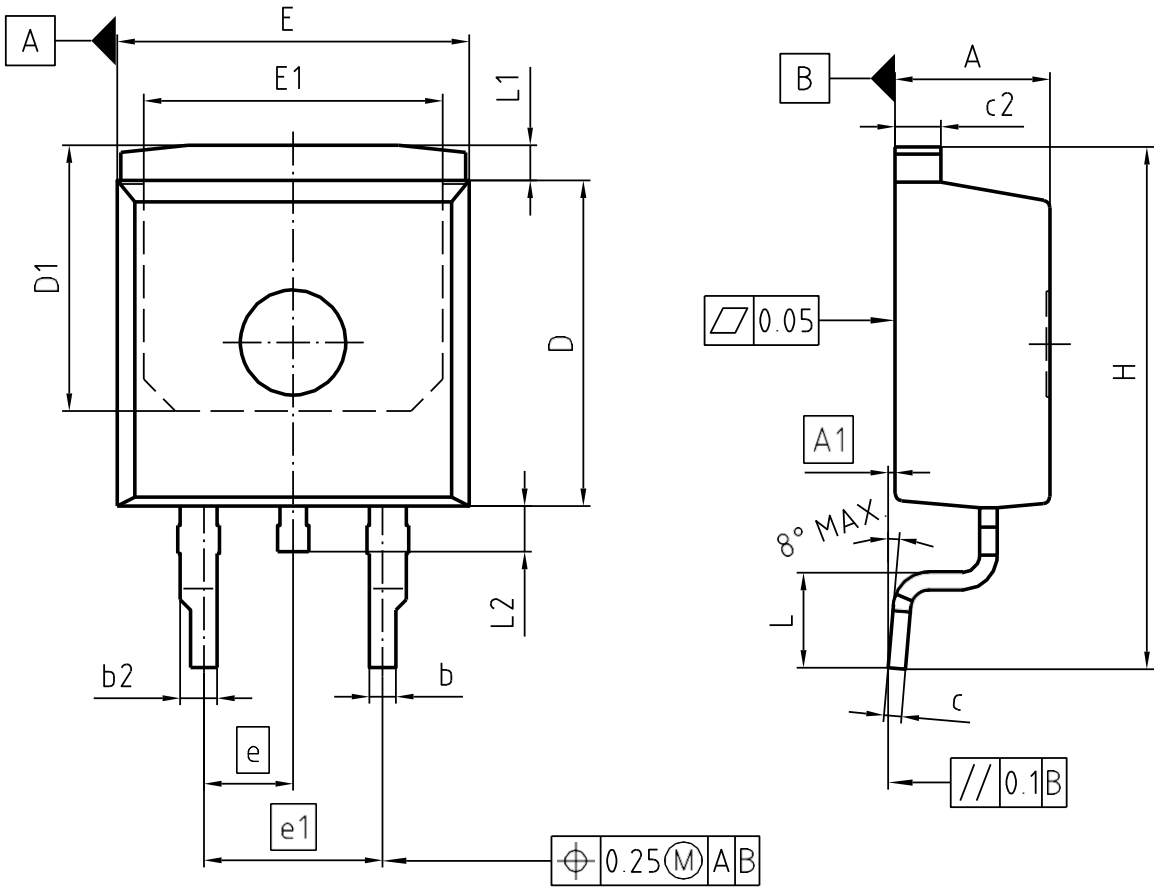
$D = t_p/T$



i	1	2	3
r_i[K/W]	0.319	0.495	0.0739
τ_i[s]	4.845422E-4	0.00384726	0.02514592

4 封装外形

PG-TO263-3-STD-C1.6



PACKAGE - GROUP NUMBER:	PG-TO263-3-U01	
DIMENSIONS	**MILLIMETERS**	
	MIN.	MAX.
A	4.30	4.50
A1	0.00	0.10
b	0.65	0.85
b2	0.95	1.15
c	0.40	0.60
c2	1.17	1.37
D	9.05	9.45
D1	7.45	7.65
E	9.80	10.20
E1	8.40	8.60
e	2.54	
e1	5.08	
N	2	
H	14.60	15.90
L	2.40	3.00
L1	0.70	1.30
L2	1.00	1.60

图 1

5 测试条件

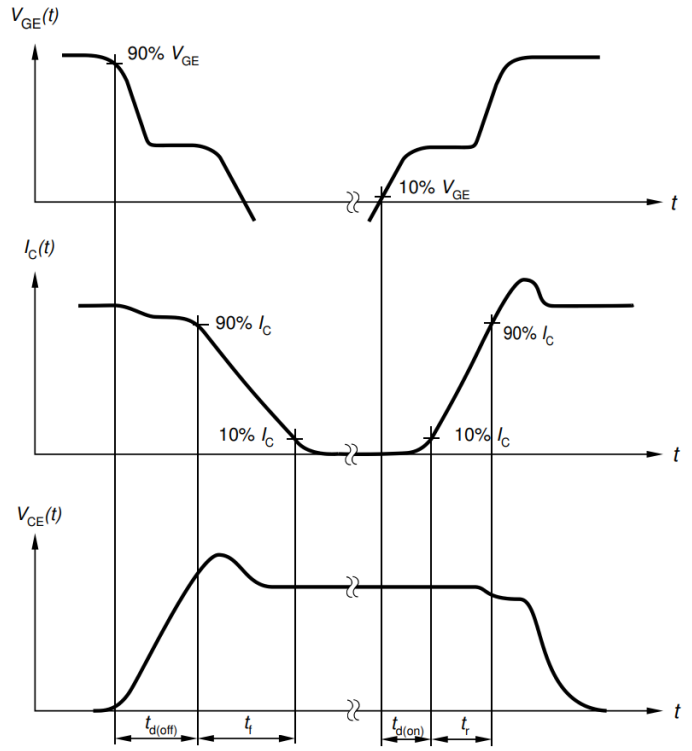


Figure A. **Definition of switching times**

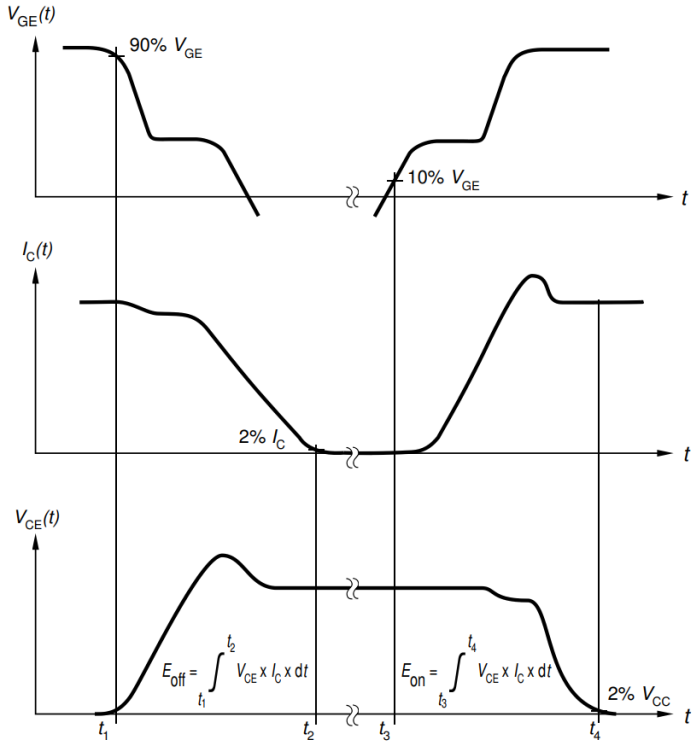


Figure B. **Definition of switching losses**

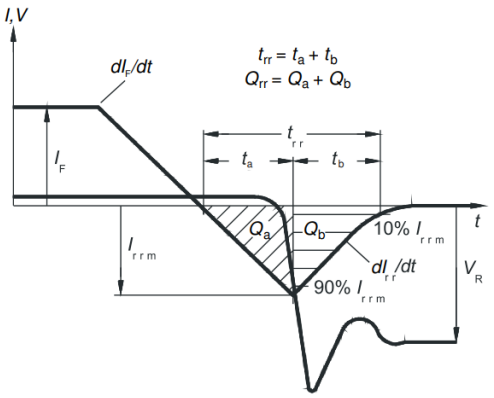


Figure C. **Definition of diode switching characteristics**

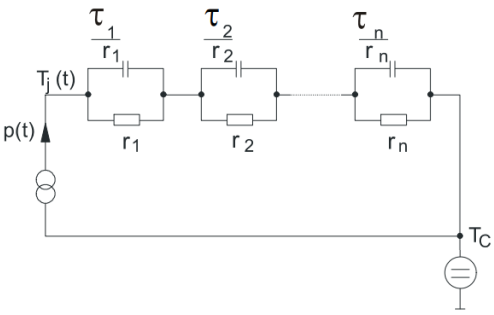


Figure D. **Thermal equivalent circuit**

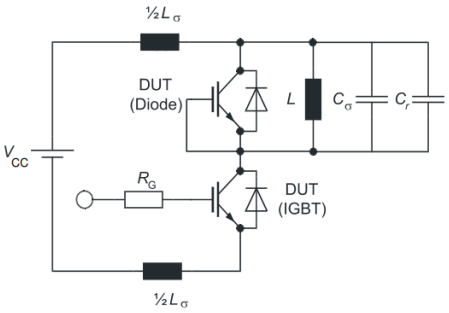


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

图 2

修订记录

Document revision	Date of release	Description of changes
1.00	2024-03-11	Final datasheet

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