英飞凌短路耐受型 750 V EDT2 IGBT，采用可回流焊接的封装，与软、快速恢复二极管共同封装

特性

- V_{CE} = 750 V
- I_C = 200 A
- 低饱和电压 V_{CEsat} = 1.4 V
- 低开关损耗
- 短路耐受性 3 µs
- IGBT与全电流，软的及快恢复二极管合封
- 针对高达 10 kHz 的硬开关拓扑进行了优化
- 封装背面可在 245°C 下回流焊接达3 次
- 引脚镀层可进一步实现电阻焊接
- 完整的产品范围和 PSpice 模型： http://www.infineon.com/igbt/

Green

Halogen-free

RoHS

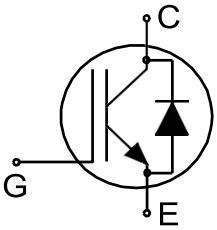
潜在应用

- CAV动力总成控制模块
- 通用驱动器（GPD）

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
IKQB200N75CP2	PG-TO247-3-PLUS-NN8.5	K200GCP2

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}	reflow soldering (MSL1 according to JEDEC J-STA-020)			245	°C
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	K/W
IGBT thermal resistance, junction-case	$R_{th(j-c)}$				0.16	K/W
Diode thermal resistance, junction-case	$R_{th(j-c)}$				0.3	K/W

2 绝缘栅双极晶体管

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		750	V
DC collector current, limited by T_{vjmax}	I_C	limited by bondwire	$T_c = 25$ °C	200	A
			$T_c = 120$ °C	200	
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}			600	A
Turn-off safe operating area		$V_{CE} \leq 750$ V, $T_{vj} \leq 175$ °C		600	A
Gate-emitter voltage	V_{GE}			±20	V
Transient gate-emitter voltage	V_{GE}	$t_p = 10$ µs, $D < 0.01$		±30	V
Short-circuit withstand time	t_{SC}	$V_{CC} \leq 450$ V, $V_{GE} = 15$ V, Allowed number of short circuits < 1000, Time between short circuits ≥ 1.0 s, $T_{vj} = 125$ °C		3	µs
Power dissipation	P_{tot}		$T_c = 25$ °C	937	W
			$T_c = 120$ °C	344	

表 3 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	I_C = 200 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.4	1.65	V
			T_{vj} = 175 °C		1.7		
Gate-emitter threshold voltage	V_{GEth}	I_C = 2.6 mA, V_{CE} = V_{GE}		5	5.8	6.5	V
Zero gate-voltage collector current	I_{CES}	V_{CE} = 750 V, V_{GE} = 0 V	T_{vj} = 25 °C			200	µA
			T_{vj} = 175 °C		6000		
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V				100	nA
Transconductance	g_{fs}	I_C = 200 A, V_{CE} = 20 V			140		S
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			21280		pF
Output capacitance	C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			540		pF
Reverse transfer capacitance	C_{res}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			95		pF
Gate charge	Q_G	V_{CC} = 600 V, I_C = 200 A, V_{GE} = 15 V			797		nC
Turn-on delay time	$t_{d(on)}$	V_{CC} = 450 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 4.8 Ω, $R_{G(off)}$ = 4.8 Ω, L_σ = 30 nH, C_σ = 144 pF	T_{vj} = 25 °C, I_C = 200 A		95		ns
			T_{vj} = 175 °C, I_C = 200 A		87		
Rise time (inductive load)	t_r	V_{CC} = 450 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 4.8 Ω, $R_{G(off)}$ = 4.8 Ω, L_σ = 30 nH, C_σ = 144 pF	T_{vj} = 25 °C, I_C = 200 A		97		ns
			T_{vj} = 175 °C, I_C = 200 A		92		
Turn-off delay time	$t_{d(off)}$	V_{CC} = 450 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 4.8 Ω, $R_{G(off)}$ = 4.8 Ω, L_σ = 30 nH, C_σ = 144 pF	T_{vj} = 25 °C, I_C = 200 A		407		ns
			T_{vj} = 175 °C, I_C = 200 A		468		
Fall time (inductive load)	t_f	V_{CC} = 450 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 4.8 Ω, $R_{G(off)}$ = 4.8 Ω, L_σ = 30 nH, C_σ = 144 pF	T_{vj} = 25 °C, I_C = 200 A		46		ns
			T_{vj} = 175 °C, I_C = 200 A		57		
Turn-on energy	E_{on}	V_{CC} = 450 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 4.8 Ω, $R_{G(off)}$ = 4.8 Ω, L_σ = 30 nH, C_σ = 144 pF	T_{vj} = 25 °C, I_C = 200 A		14.4		mJ
			T_{vj} = 175 °C, I_C = 200 A		17.3		

（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} = 450 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 4.8 Ω, $R_{G(off)}$ = 4.8 Ω, L_σ = 30 nH, C_σ = 144 pF	T_{vj} = 25 °C, I_C = 200 A		6.9		mJ
			T_{vj} = 175 °C, I_C = 200 A		9.9		
Total switching energy	E_{ts}	V_{CC} = 450 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 4.8 Ω, $R_{G(off)}$ = 4.8 Ω, L_σ = 30 nH, C_σ = 144 pF	T_{vj} = 25 °C, I_C = 200 A		21.3		mJ
			T_{vj} = 175 °C, I_C = 200 A		27.2		
Operating junction temperature	T_{vj}			-40		175	°C

注：　　电气特性，在T_{vj} = 25°C条件下测得，除非另有规定。

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		750	V
Diode forward current, limited by T_{vjmax}	I_F	limited by bondwire	T_c = 25 °C	200	A
			T_c = 60 °C	200	
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpulse}			600	A
Power dissipation	P_{tot}		T_c = 25 °C	500	W
			T_c = 120 °C	183	

表 5　　特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Diode forward voltage	V_F	I_F = 200 A	T_{vj} = 25 °C		1.8	2	V
			T_{vj} = 175 °C		1.9		
Diode reverse recovery time	t_{rr}	V_R = 450 V	T_{vj} = 25 °C, I_F = 200 A, $-di_F/dt$ = 1000 A/µs		239		ns
			T_{vj} = 175 °C, I_F = 200 A, $-di_F/dt$ = 1000 A/µs		318		

（表格续下页……）

表 5 （续） 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Diode reverse recovery charge	Q_{rr}	V_R = 450 V	T_{vj} = 25 °C, I_F = 200 A, $-di_F/dt$ = 1000 A/µs		4.8		µC
			T_{vj} = 175 °C, I_F = 200 A, $-di_F/dt$ = 1000 A/µs		10.7		
Diode peak reverse recovery current	I_{rrm}	V_R = 450 V	T_{vj} = 25 °C, I_F = 200 A, $-di_F/dt$ = 1000 A/µs		37.4		A
			T_{vj} = 175 °C, I_F = 200 A, $-di_F/dt$ = 1000 A/µs		57.3		
Diode peak rate of fall of reverse recovery current	di_{rr}/dt	V_R = 450 V	T_{vj} = 25 °C, I_F = 200 A, $-di_F/dt$ = 1000 A/µs		400		A/µs
			T_{vj} = 175 °C, I_F = 200 A, $-di_F/dt$ = 1000 A/µs		454		
Operating junction temperature	T_{vj}			-40		175	°C

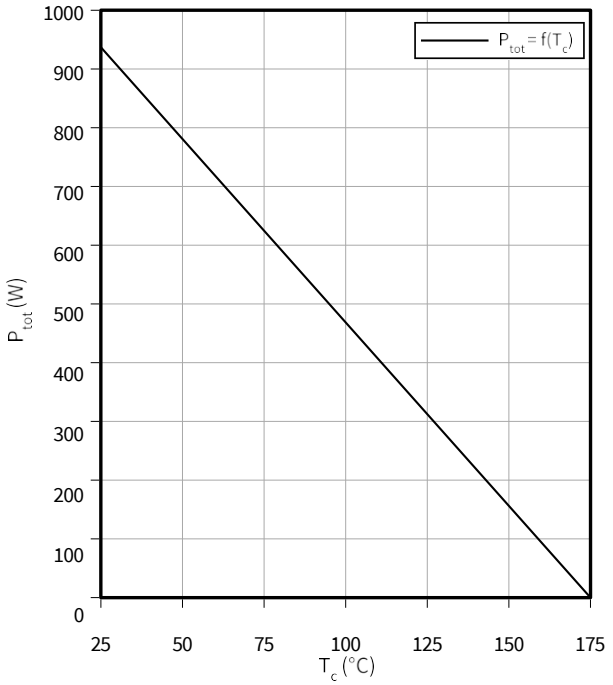
注意：为了获得最佳的使用寿命和可靠性，英飞凌建议运行条件不超过本数据手册中所述最大额定值的80%。

4 特性图

Power dissipation as a function of case temperature

$P_{tot} = f(T_c)$

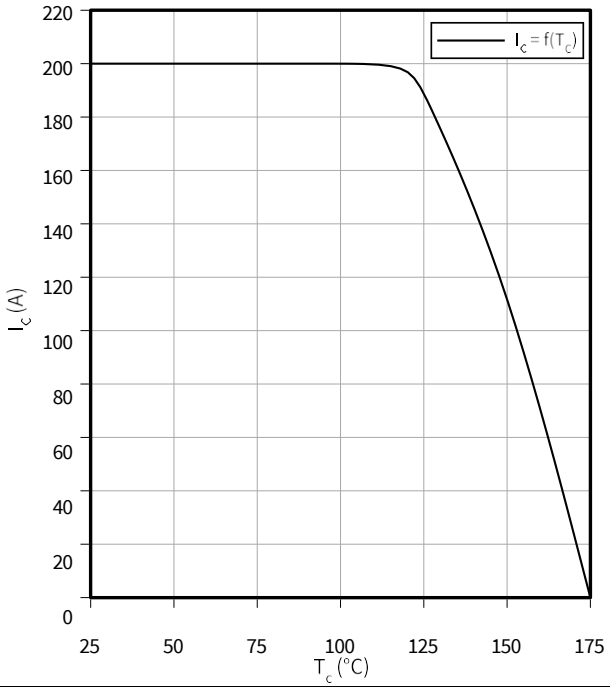
$T_{vj} \leq 175$ °C



Collector current as a function of case temperature

$I_C = f(T_c)$

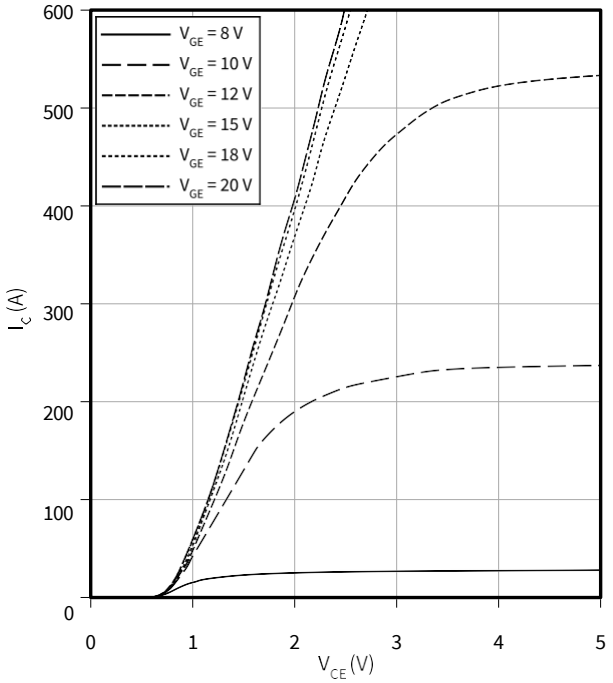
$T_{vj} \leq 175$ °C, $V_{GE} \geq 15$ V



Typical output characteristic

$I_C = f(V_{CE})$

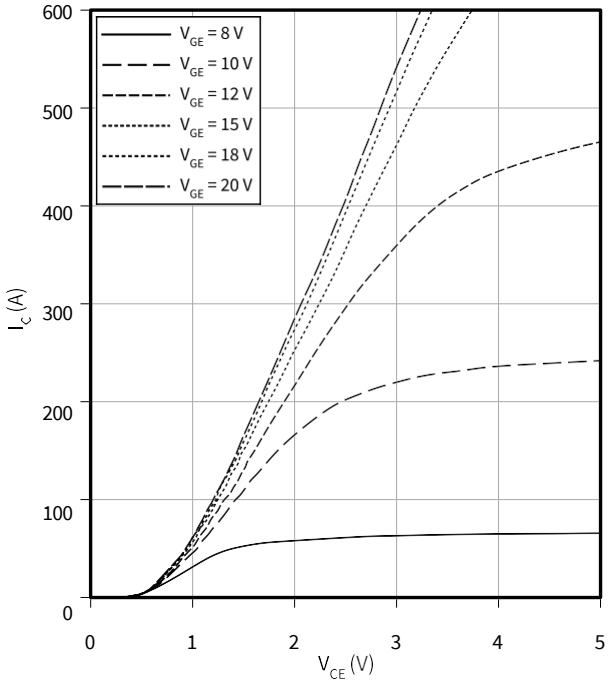
$T_{vj} = 25$ °C



Typical output characteristic

$I_C = f(V_{CE})$

$T_{vj} = 175$ °C

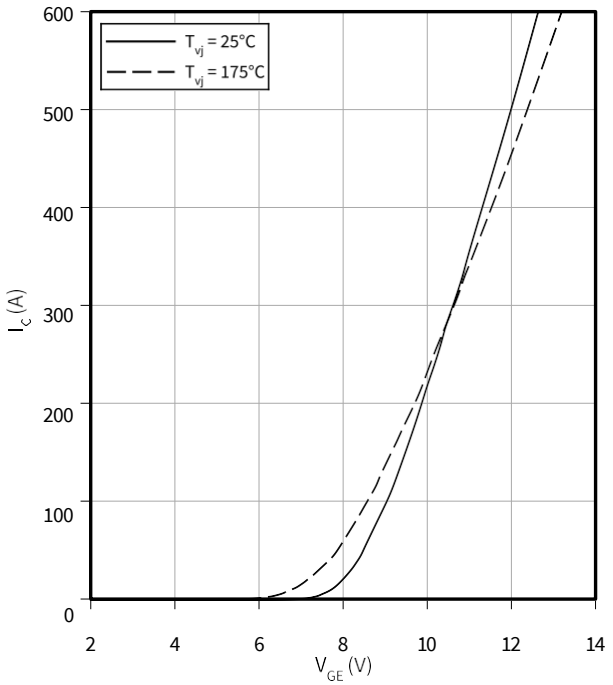


4 特征图

Typical transfer characteristic

$I_C = f(V_{GE})$

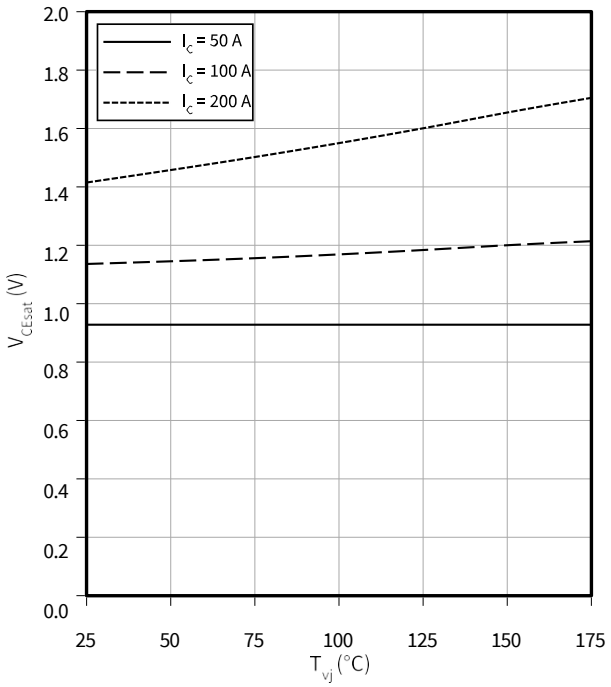
$V_{CE} = 20$ V



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

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

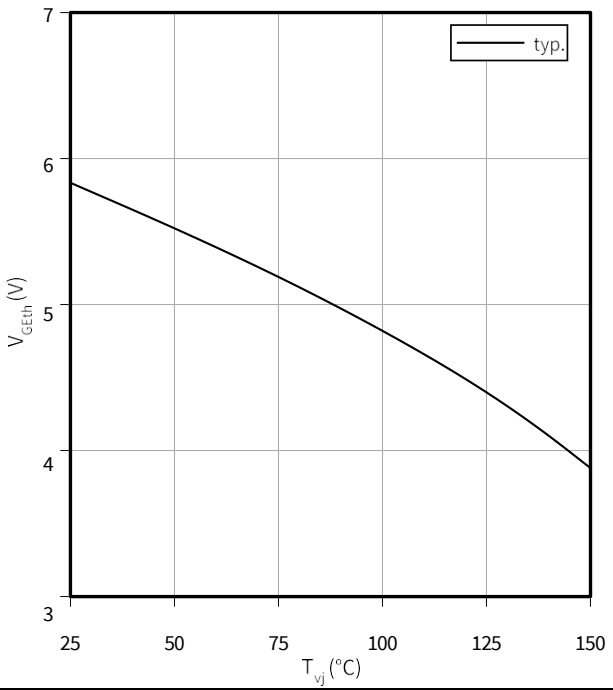
$V_{GE} = 15$ V



Gate-emitter threshold voltage as a function of junction temperature

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

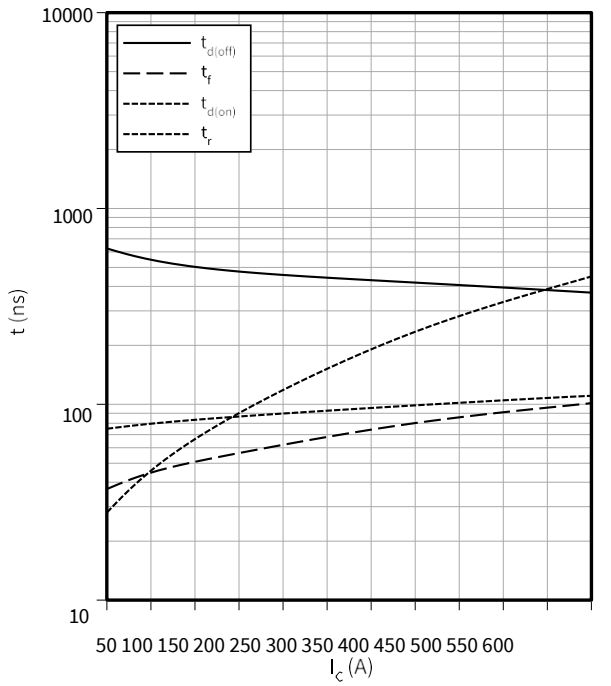
$I_C = 2.6$ mA



Typical switching times as a function of collector current

$t = f(I_C)$

$V_{CC} = 450$ V, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V, $R_G = 4.8\ \Omega$

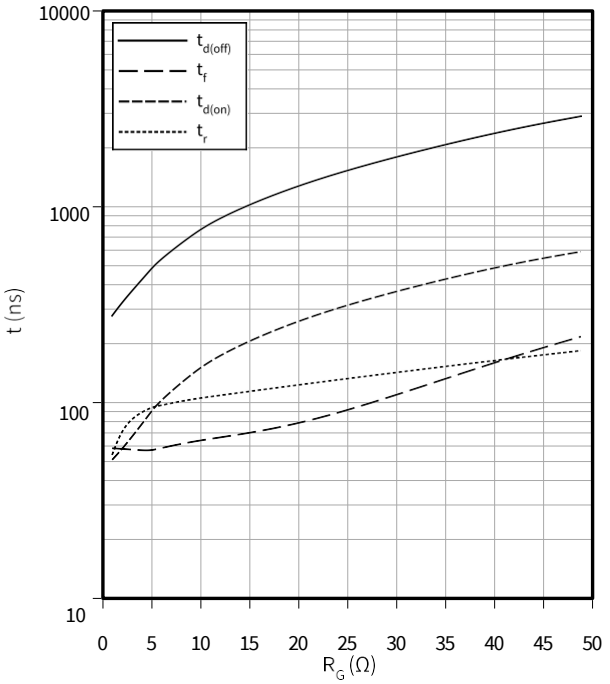


4 特征图

Typical switching times as a function of gate resistor

$t = f(R_G)$

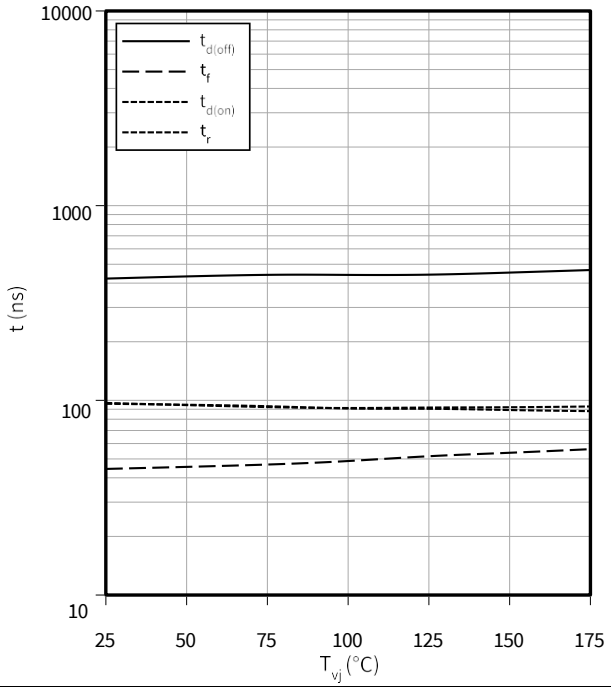
$I_C = 200\ A$, $V_{CC} = 450\ V$, $T_{vj} = 175\ °C$, $V_{GE} = 0/15\ V$



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

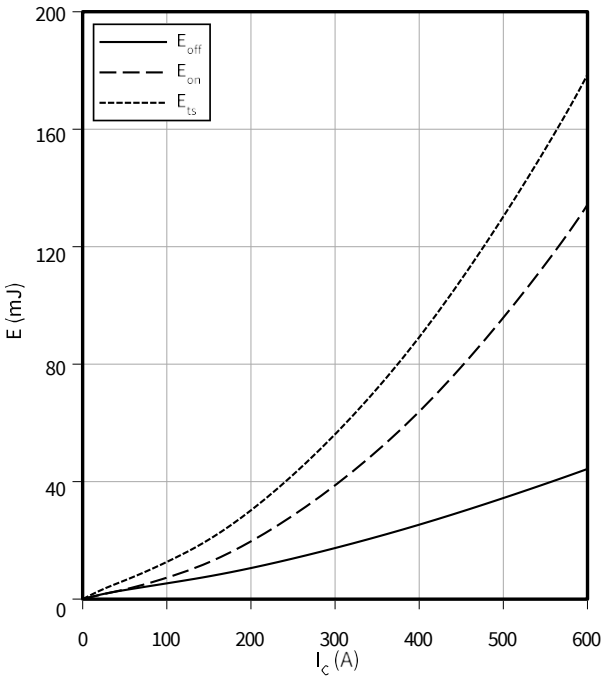
$I_C = 200\ A$, $V_{CC} = 450\ V$, $V_{GE} = 0/15\ V$, $R_G = 4.8\ \Omega$



Typical switching energy losses as a function of collector current

$E = f(I_C)$

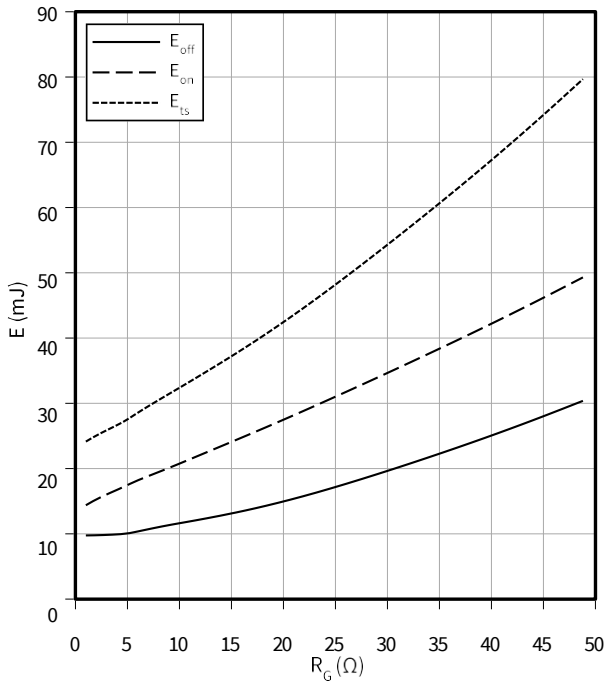
$V_{CC} = 450\ V$, $T_{vj} = 175\ °C$, $V_{GE} = 0/15\ V$, $R_G = 4.8\ \Omega$



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

$I_C = 200\ A$, $V_{CC} = 450\ V$, $T_{vj} = 175\ °C$, $V_{GE} = 0/15\ V$

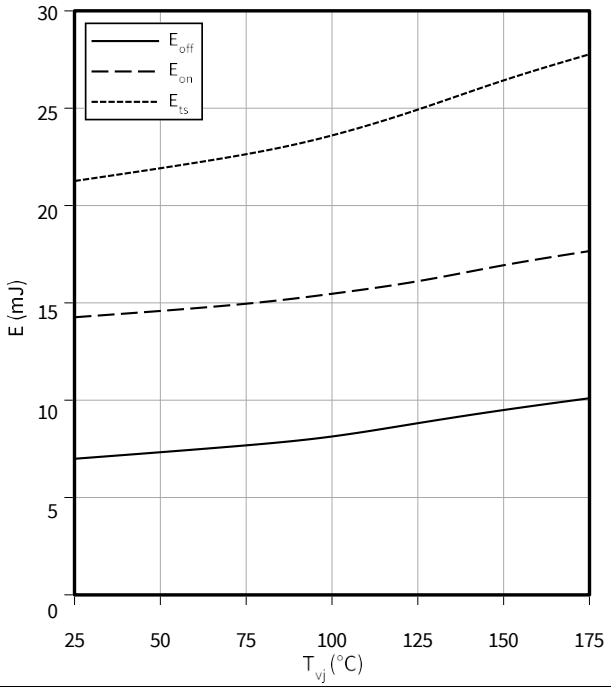


4 特征图

Typical switching energy losses as a function of junction temperature

$E = f(T_{vj})$

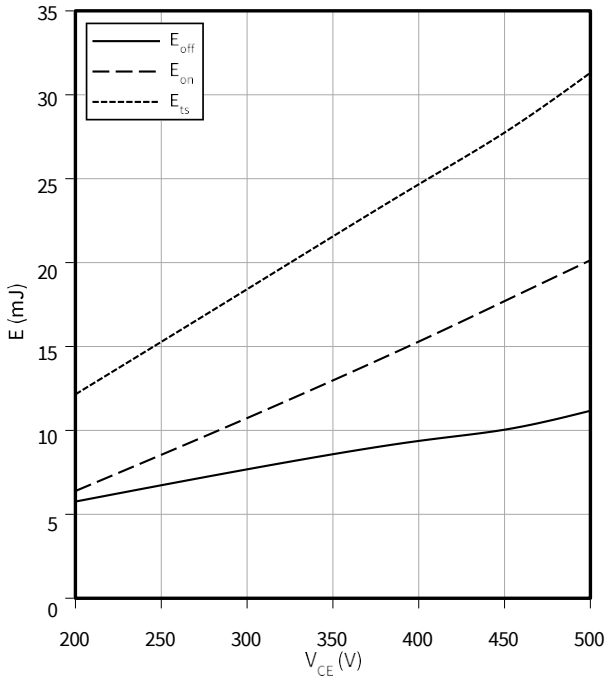
$I_C = 200\ A$, $V_{CE} = 450\ V$, $V_{GE} = 0/15\ V$, $R_G = 4.8\ \Omega$



Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

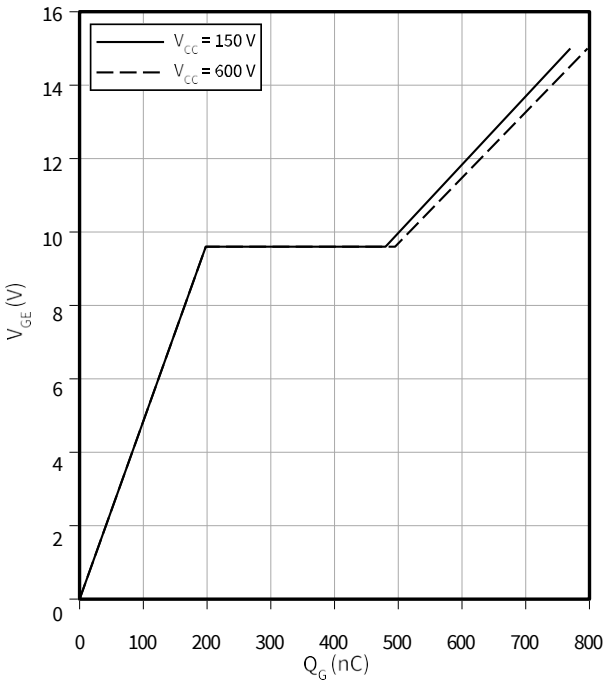
$I_C = 200\ A$, $V_{GE} = 0/15\ V$, $T_{vj} = 175\ °C$, $R_G = 4.8\ \Omega$



Typical gate charge

$V_{GE} = f(Q_G)$

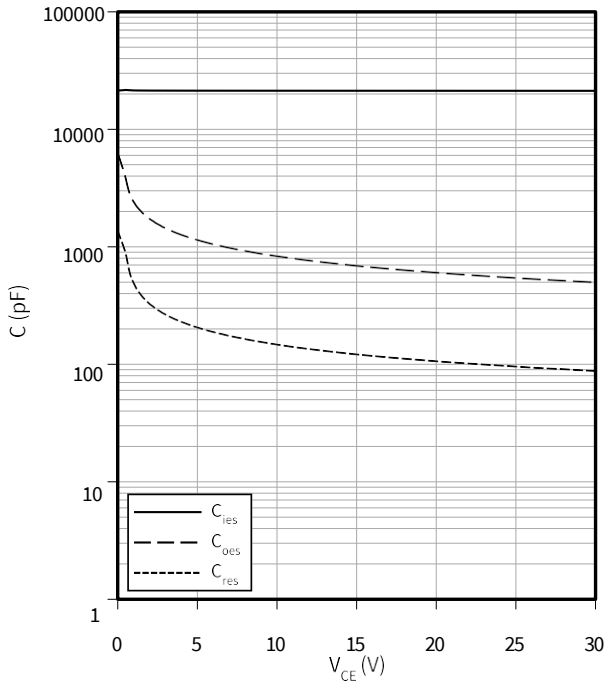
$I_C = 200\ A$



Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

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

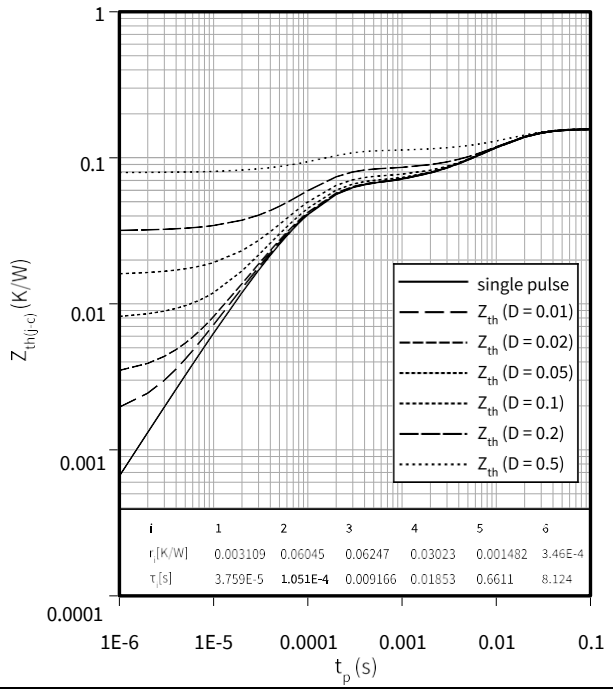


4 特征图

IGBT transient thermal impedance as a function of pulse width

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

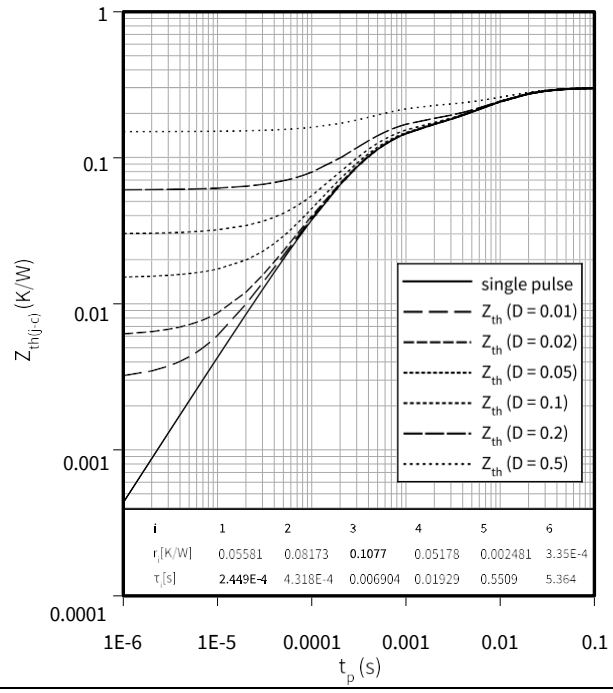
$D = t_p/T$



Diode transient thermal impedance as a function of pulse width

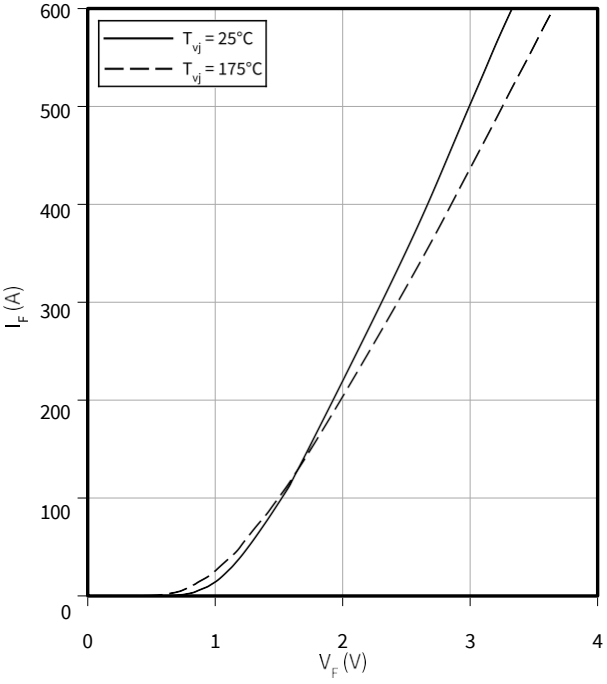
$Z_{th(j-c)} = f(t_p)$

$D = t_p/T$



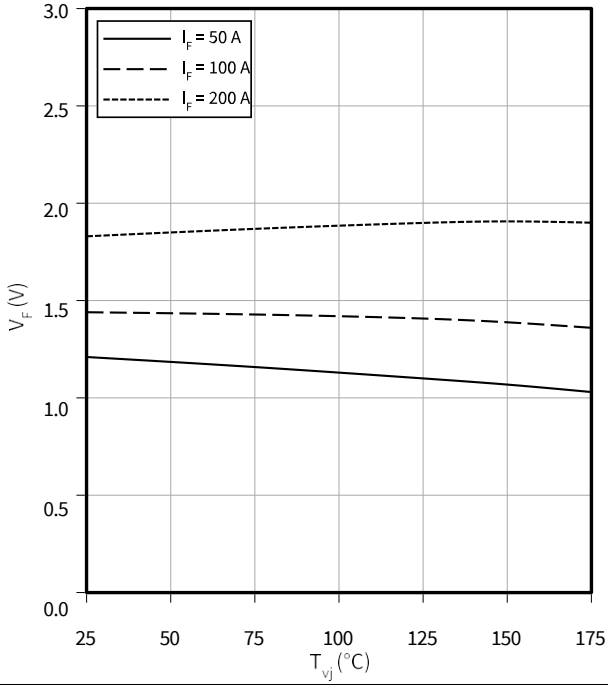
Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



Typical diode forward voltage as a function of junction temperature

$V_F = f(T_{vj})$

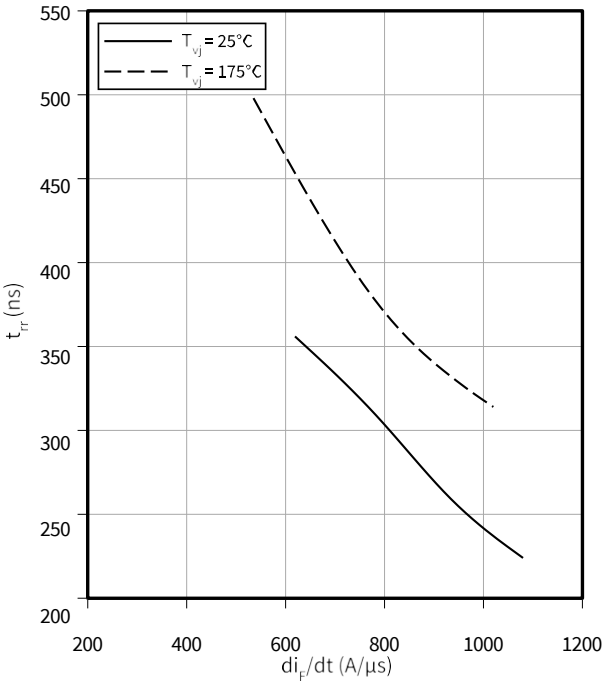


4 特征图

Typical reverse recovery time as a function of diode current slope

$t_{rr} = f(di_F/dt)$

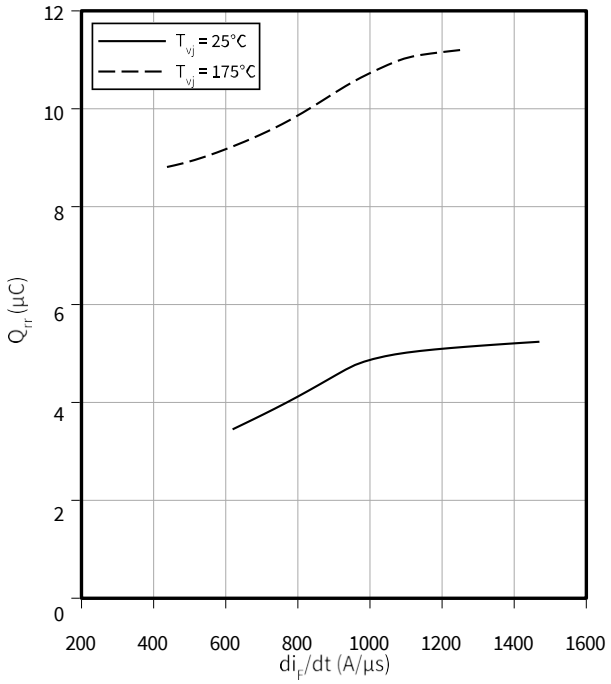
$V_R = 450\ V$, $I_F = 200\ A$



Typical reverse recovery charge as a function of diode current slope

$Q_{rr} = f(di_F/dt)$

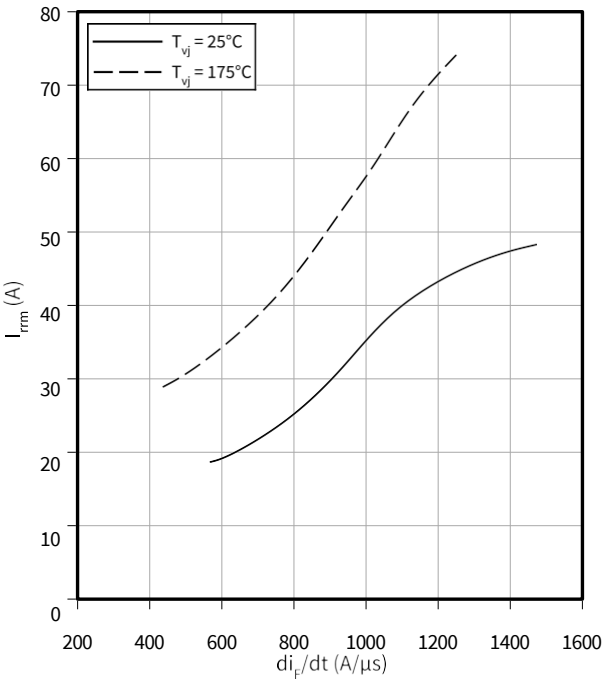
$V_R = 450\ V$, $I_F = 200\ A$



Typical reverse recovery current as a function of diode current slope

$I_{rrm} = f(di_F/dt)$

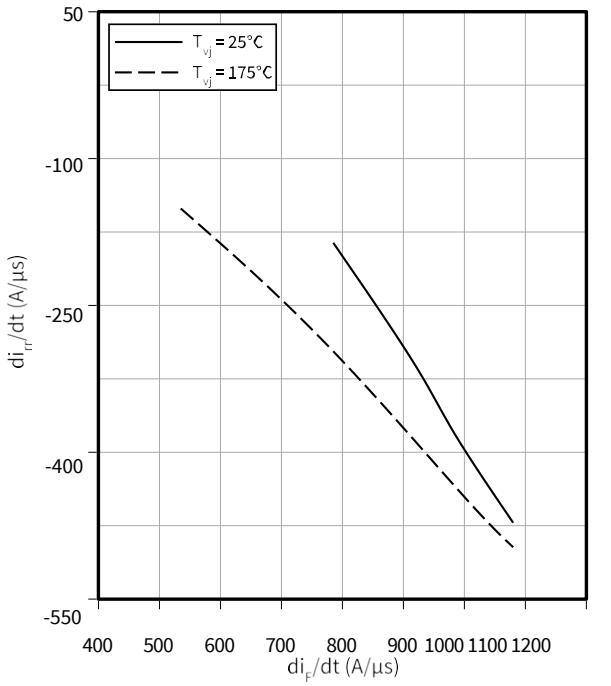
$V_R = 450\ V$, $I_F = 200\ A$



Typical diode peak rate of fall of reverse recovery current as a function of diode current slope

$di_{rr}/dt = f(di_F/dt)$

$V_R = 450\ V$, $I_F = 200\ A$

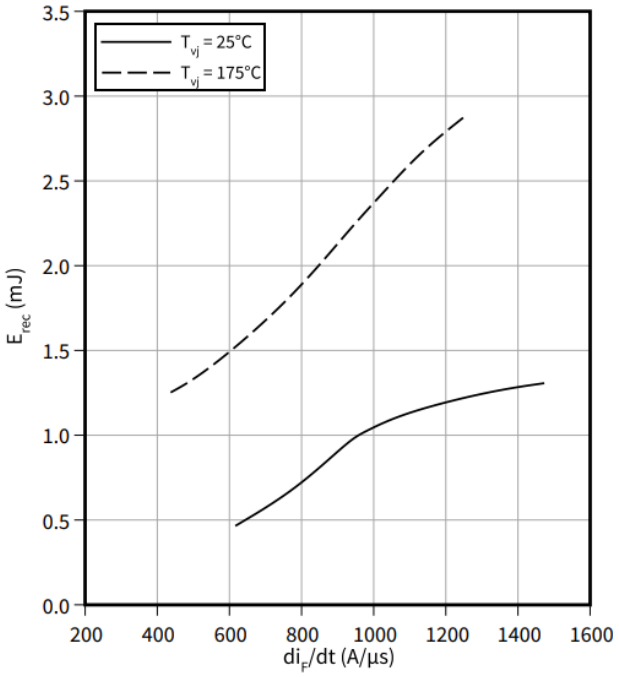


4 特征图

Typical reverse energy losses as a function of diode current slope

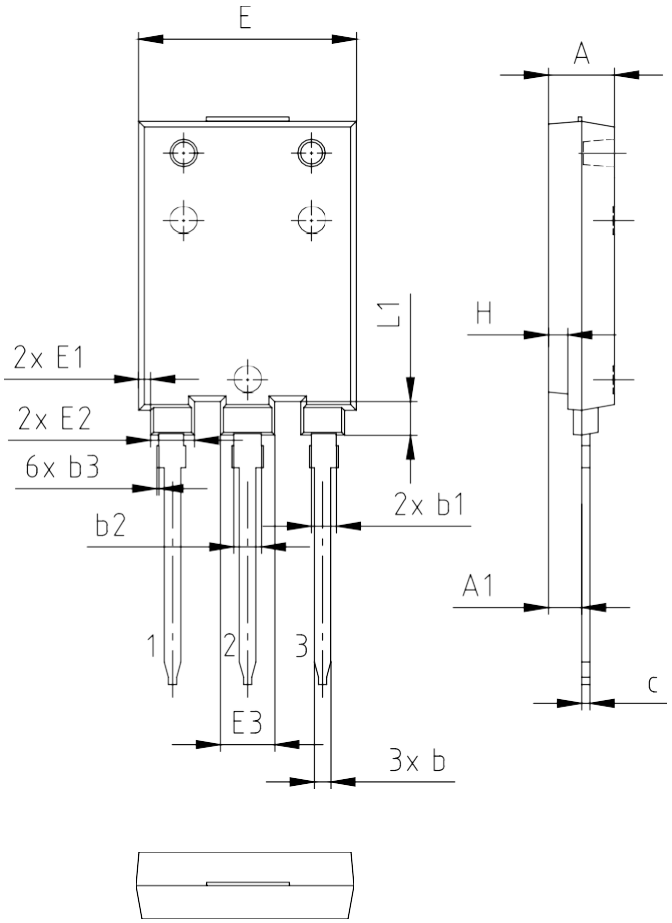
$E_{rec} = f(di_F/dt)$

$V_R = 450\ V,\ I_F = 200\ A$



5 封装外形

PG-TO247-3-PLUS-NN8.5



PACKAGE - GROUP NUMBER:	PG-TO247-3-U02	
DIMENSIONS	**MILLIMETERS**	
	MIN.	MAX.
A	4.70	4.90
A1	2.16	2.66
b	1.10	1.30
b1	1.80	
b2	2.00	
b3	0.00	0.15
c	0.50	0.70
D	22.70	22.90
D1	14.69	14.89
E	15.70	15.90
E1	0.76	0.96
E2	3.08	3.28
E3	3.84	4.04
E4	12.28	12.48
e	5.44	
N	3	
H	1.30	1.50
L	18.01	18.21
L1	2.34	2.54
aaa	0.25	

NOTES:

(1) ALL METAL SURFACES TIN PLATED EXCEPT AREA OF CUT
(2) MOLD GATE PROTRUSION AFTER DEGATING.

图 1

6 测试条件

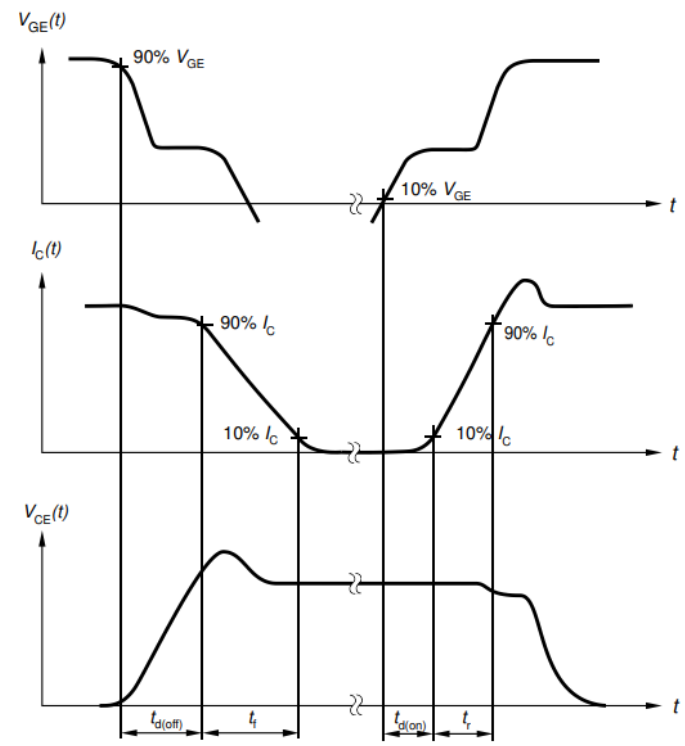


Figure A. **Definition of switching times**

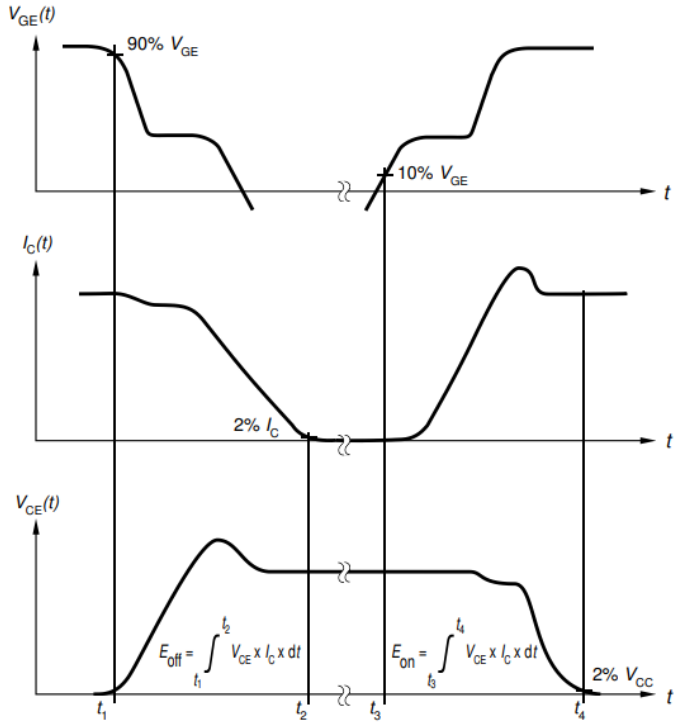


Figure B. **Definition of switching losses**

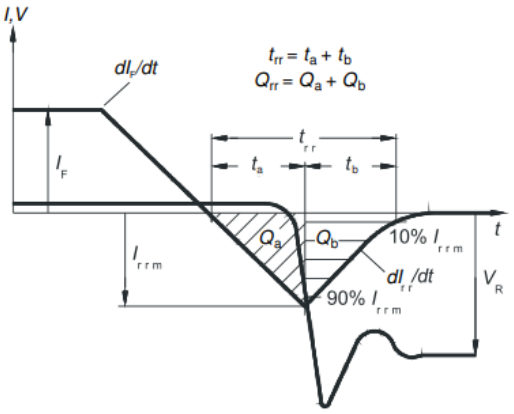


Figure C. **Definition of diode switching characteristics**

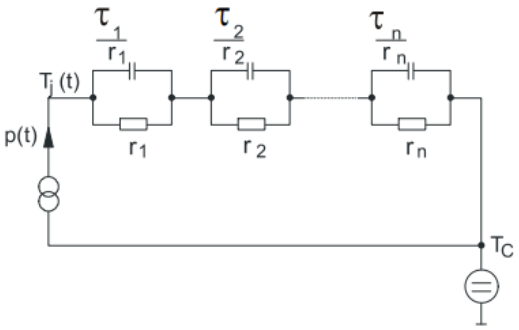


Figure D. **Thermal equivalent circuit**

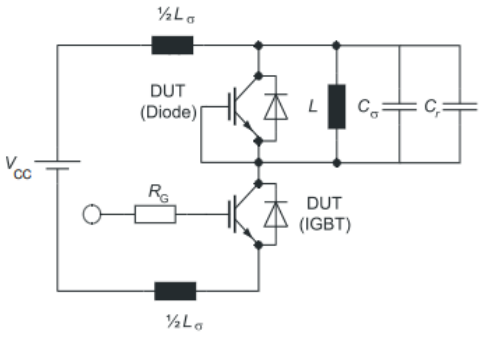


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

图 2

修订记录

Document revision	Date of release	Description of changes
V0.1		Target Data Sheet
n/a	2020-11-30	Datasheet migrated to a new system with a new layout and new revision number schema: target or preliminary datasheet = 0.xy; final datasheet = 1.xy
1.00	2022-11-23	Final datasheet
1.10	2023-06-30	Editorial changes on cover page

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版本 **2025-08-28**

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