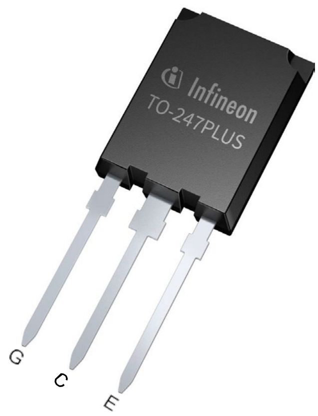
英飞凌高速 1200 V TRENCHSTOP™ IGBT 7 技术，集成全额定电流、软换向、超快速恢复和低 Qrr 发射极控制 7 快速二极管



特性

- V_{CE} = 1200 V
- I_C = 100 A
- 最高结温 T_{vjmax} = 175°C
- 一流的高速 IGBT，集成全额定电流、低 Q_{rr}和软换向高速二极管
- 低饱和电压 V_{CEsat} = 1.7 V，测于 T_{vj} = 25°C时
- 针对高速硬开关拓扑（2-L 逆变器、3-L NPC T 型等）进行了优化，提高了效率
- 由于 V_{CEsat}具有正温度系数，因此易于并联
- 无铅镀层；符合RoHS标准
- 完整的产品品类和 PSpice 模型： http://www.infineon.com/igbt/

Lead-free
Green
Halogen-free
RoHS

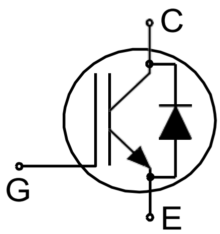
潜在应用

- 工业级不间断电源（UPS）
- 电动汽车充电桩
- 组串式逆变器
- 焊接

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
IKQ100N120CH7	PG-TO247-3-PLUS-NN3.7	K100MCH7

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

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
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	K/W
IGBT thermal resistance, junction-case	$R_{th(j-c)}$			0.16	0.21	K/W
Diode thermal resistance, junction-case	$R_{th(j-c)}$			0.3	0.39	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	limited by bondwire	$T_c = 25$ °C	166	A
			$T_c = 100$ °C	139	
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}			400	A
Turn-off safe operating area		$V_{CC} \leq 800$ V, $V_{CE,peak} < 1200$ V, $V_{GE} = 0/15$ V, $R_{Goff} \geq 4\ \Omega$, $T_{vj} \leq 175$ °C		400	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
Power dissipation	P_{tot}		$T_c = 25$ °C	721	W
			$T_c = 100$ °C	361	

表3 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	$I_C = 100$ A, $V_{GE} = 15$ V	$T_{vj} = 25$ °C		1.7	2.15	V
			$T_{vj} = 175$ °C		2		

（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 = 1.6 mA, V_{CE} = V_{GE}		4.7	5.5	6.2	V
Zero gate-voltage collector current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			40	µA
			T_{vj} = 175 °C		8500		
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V				100	nA
Transconductance	g_{fs}	I_C = 100 A, V_{CE} = 20 V			180		S
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			13		nF
Output capacitance	C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			240		pF
Reverse transfer capacitance	C_{res}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			72		pF
Gate charge	Q_G	V_{CC} = 960 V, I_C = 100 A, V_{GE} = 15 V			696		nC
Turn-on delay time	$t_{d(on)}$	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 7 Ω, $R_{G(off)}$ = 7 Ω	T_{vj} = 25 °C, I_C = 100 A		66		ns
			T_{vj} = 175 °C, I_C = 100 A		63		
Rise time (inductive load)	t_r	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 7 Ω, $R_{G(off)}$ = 7 Ω	T_{vj} = 25 °C, I_C = 100 A		59		ns
			T_{vj} = 175 °C, I_C = 100 A		70		
Turn-off delay time	$t_{d(off)}$	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 7 Ω, $R_{G(off)}$ = 7 Ω	T_{vj} = 25 °C, I_C = 100 A		547		ns
			T_{vj} = 175 °C, I_C = 100 A		607		
Fall time (inductive load)	t_f	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 7 Ω, $R_{G(off)}$ = 7 Ω	T_{vj} = 25 °C, I_C = 100 A		30		ns
			T_{vj} = 175 °C, I_C = 100 A		90		
Turn-on energy	E_{on}	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 7 Ω, $R_{G(off)}$ = 7 Ω	T_{vj} = 25 °C, I_C = 100 A		6.7		mJ
			T_{vj} = 175 °C, I_C = 100 A		10.6		
Turn-off energy	E_{off}	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 7 Ω, $R_{G(off)}$ = 7 Ω	T_{vj} = 25 °C, I_C = 100 A		2.52		mJ
			T_{vj} = 175 °C, I_C = 100 A		4.52		

（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} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 7 Ω, $R_{G(off)}$ = 7 Ω	T_{vj} = 25 °C, I_C = 100 A		9.22		mJ
			T_{vj} = 175 °C, I_C = 100 A		15.1		
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
Diode forward current, limited by T_{vjmax}	I_F	limited by bondwire	T_c = 25 °C	142	A
			T_c = 88 °C	100	
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpulse}			400	A
Power dissipation	P_{tot}		T_c = 25 °C	385	W
			T_c = 100 °C	192	

表5 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Diode forward voltage	V_F	I_F = 100 A	T_{vj} = 25 °C		2.5	3	V
			T_{vj} = 175 °C		2.3		
Diode reverse recovery time	t_{rr}	V_R = 600 V, $R_{G(on)}$ = 7 Ω	T_{vj} = 25 °C, I_F = 100 A		148		ns
			T_{vj} = 175 °C, I_F = 100 A		255		
Diode reverse recovery charge	Q_{rr}	V_R = 600 V, $R_{G(on)}$ = 7 Ω	T_{vj} = 25 °C, I_F = 100 A		3.08		µC
			T_{vj} = 175 °C, I_F = 100 A		9.1		
Diode peak reverse recovery current	I_{rrm}	V_R = 600 V, $R_{G(on)}$ = 7 Ω	T_{vj} = 25 °C, I_F = 100 A		39		A
			T_{vj} = 175 °C, I_F = 100 A		68		

（表格续下页……）

表 5 （续） 特征值

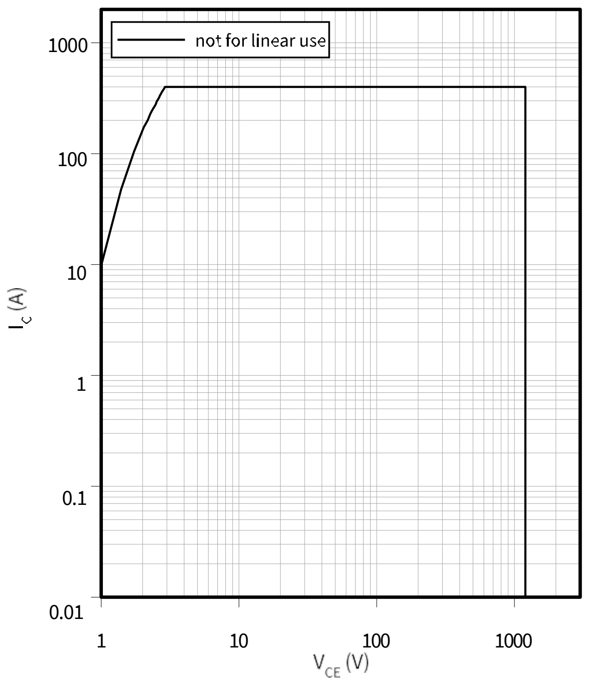
Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Diode peak rate of fall of reverse recovery current	di_{rr}/dt	$V_R = 600$ V, $R_{G(on)} = 7\ \Omega$	$T_{vj} = 25$ °C, $I_F = 100$ A		-359		A/µs
			$T_{vj} = 175$ °C, $I_F = 100$ A		-431		
Reverse recovery energy	E_{rec}	$V_R = 600$ V, $R_{G(on)} = 7\ \Omega$	$T_{vj} = 25$ °C, $I_F = 100$ A		0.93		mJ
			$T_{vj} = 175$ °C, $I_F = 100$ A		3.09		
Operating junction temperature	T_{vj}			-40		175	°C

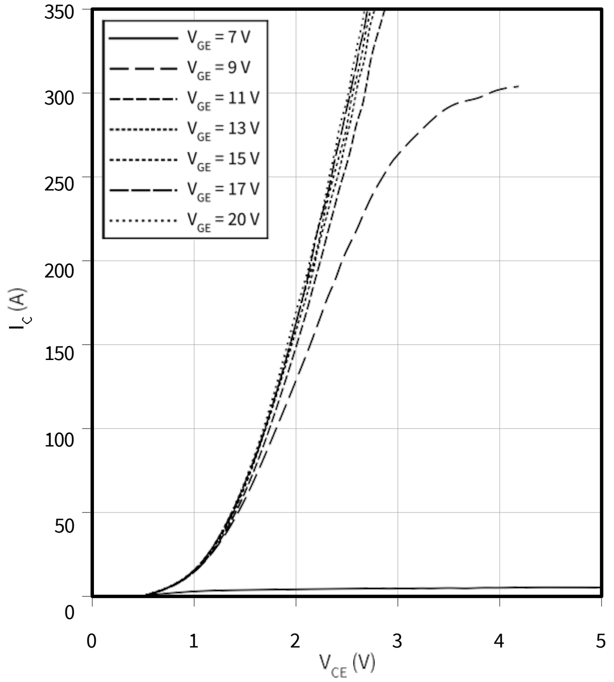
注意：为了获得最佳的使用寿命和可靠性，英飞凌建议运行条件不超过本数据手册中所述最大额定值的80%。

动态测试电路，寄生电感$L_\sigma = 30$ nH, $C_\sigma = 18$ pF

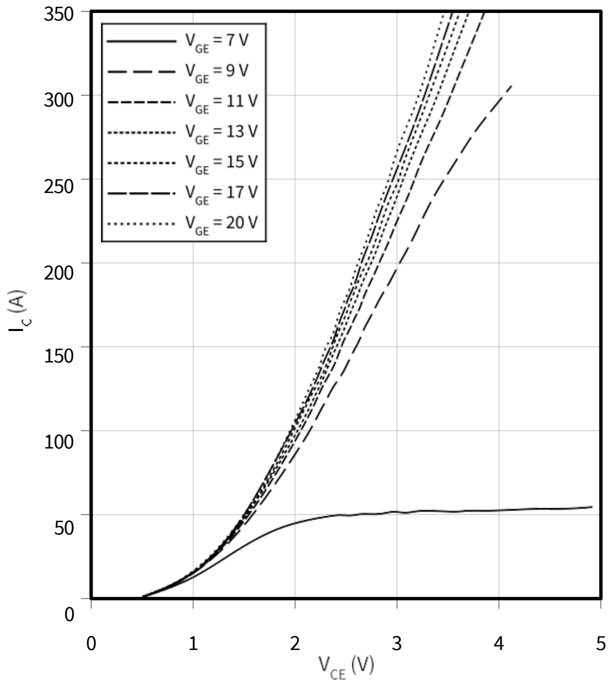
4 特性图

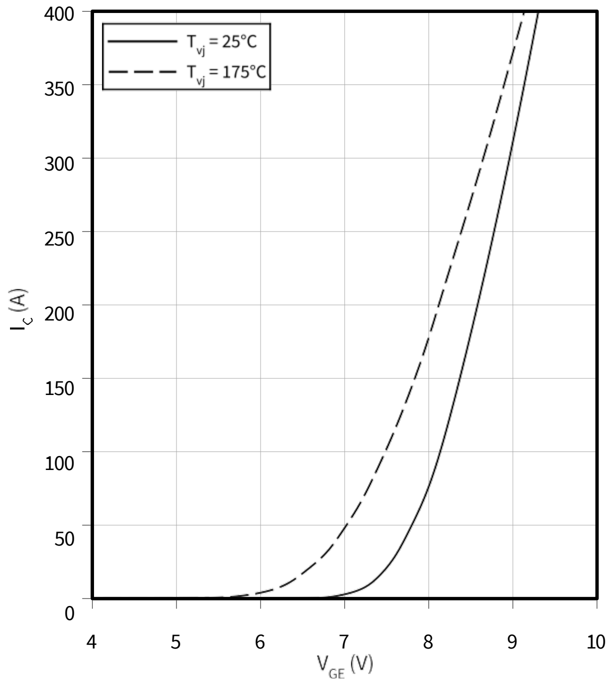
Reverse bias safe operating area	Typical output characteristic
$I_C = f(V_{CE})$, $I_C = f(V_{CE})$	$I_C = f(V_{CE})$
$T_{vj} \leq 175$ °C, $V_{GE} = 0/15$ V	$T_{vj} = 25$ °C





Typical output characteristic	Typical transfer characteristic
$I_C = f(V_{CE})$	$I_C = f(V_{GE})$
$T_{vj} = 175$ °C	$V_{CE} = 20$ V

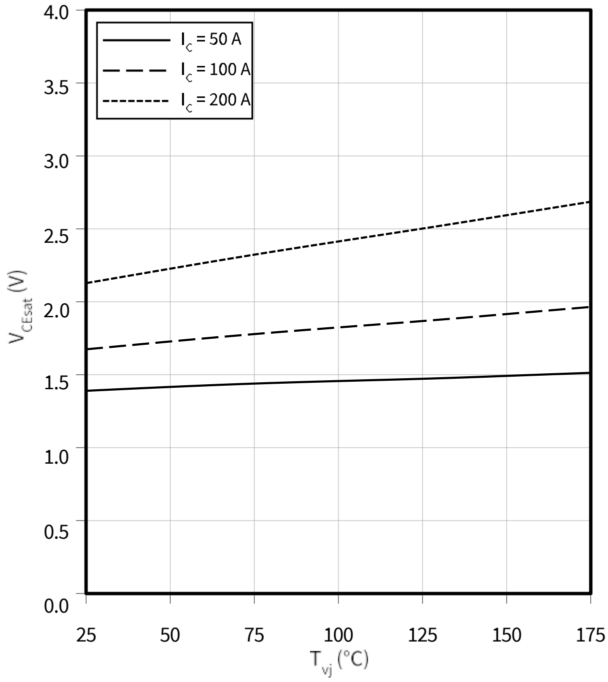




Typical collector-emitter saturation voltage as a function of junction temperature

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

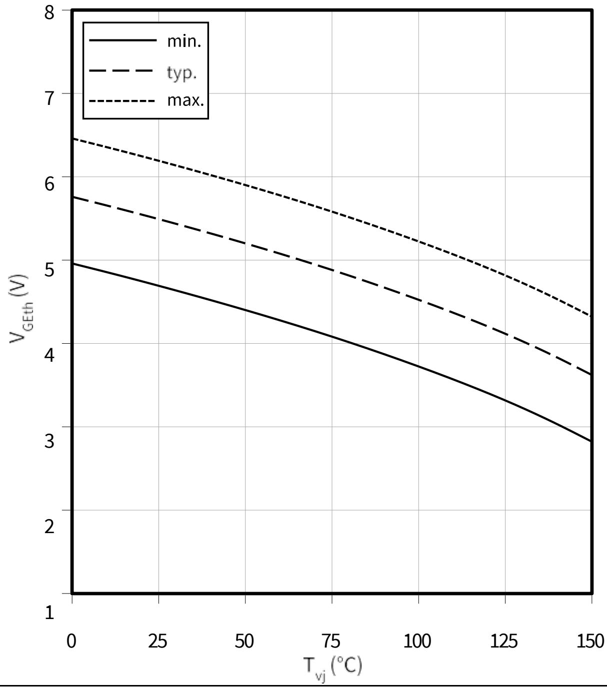
$V_{GE} = 15$ V



Gate-emitter threshold voltage as a function of junction temperature

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

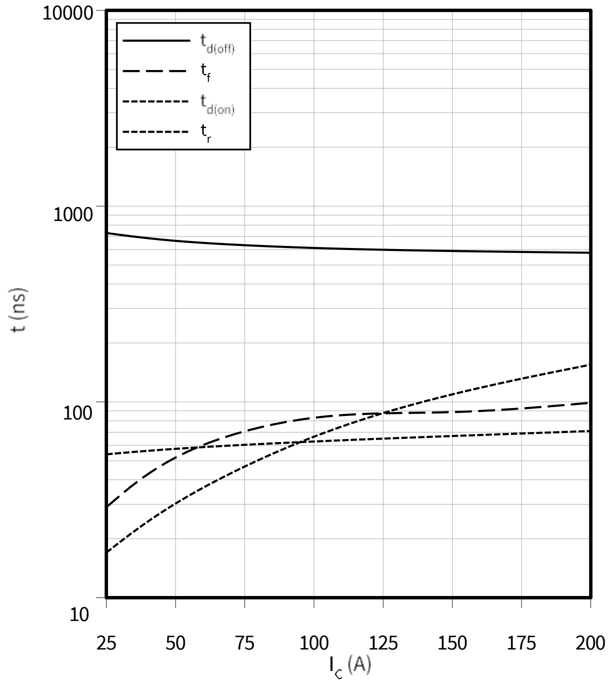
$I_C = 1.6$ mA



Typical switching times as a function of collector current

$t = f(I_C)$

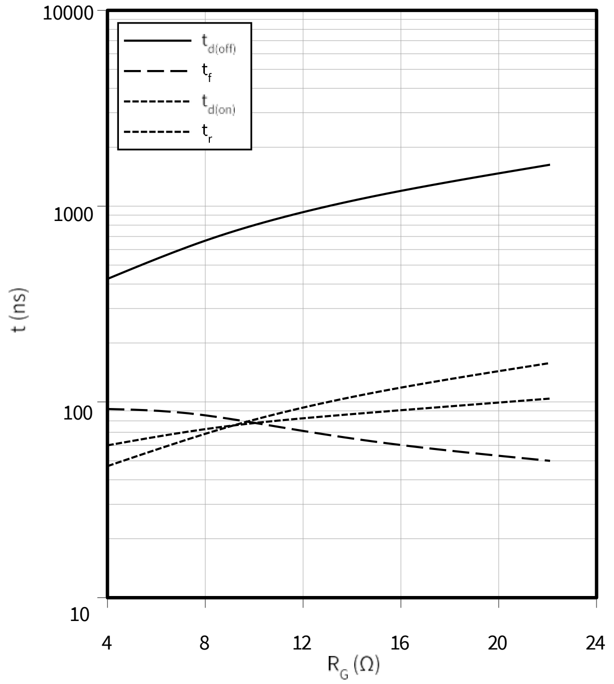
$V_{CC} = 600$ V, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V, $R_G = 7\ \Omega$



Typical switching times as a function of gate resistor

$t = f(R_G)$

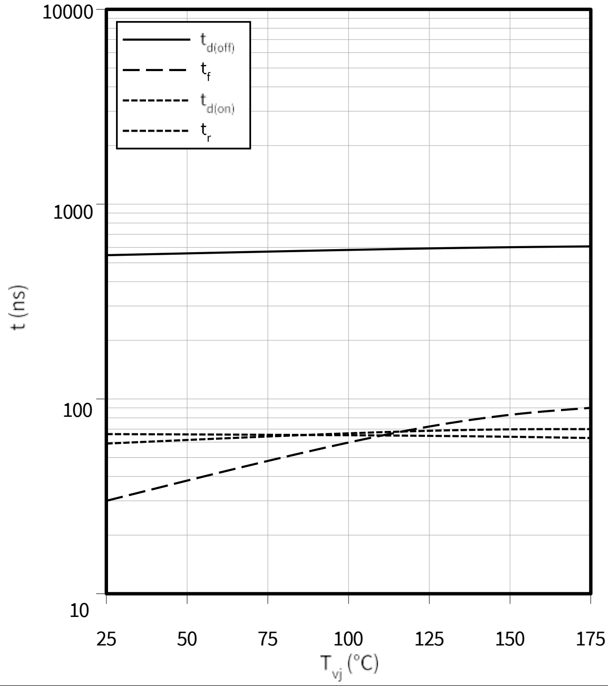
$I_C = 100$ A, $V_{CC} = 600$ V, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

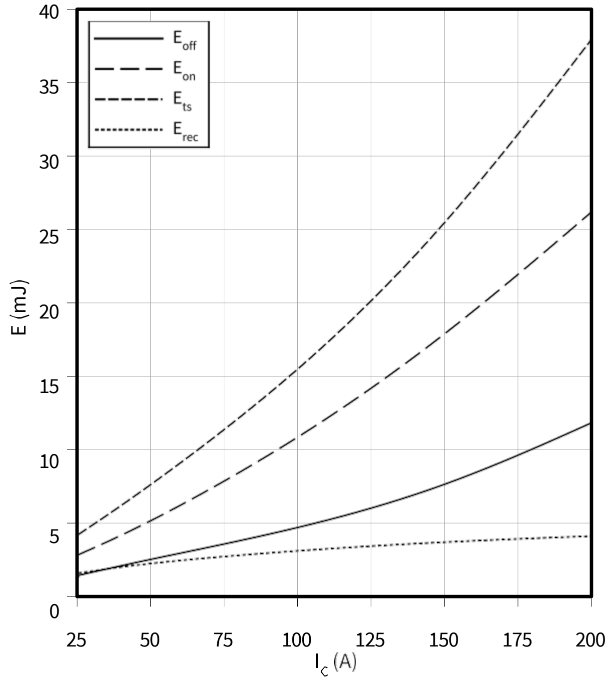
$I_C = 100$ A, $V_{CC} = 600$ V, $V_{GE} = 0/15$ V, $R_G = 7$ Ω



Typical switching energy losses as a function of collector current

$E = f(I_C)$

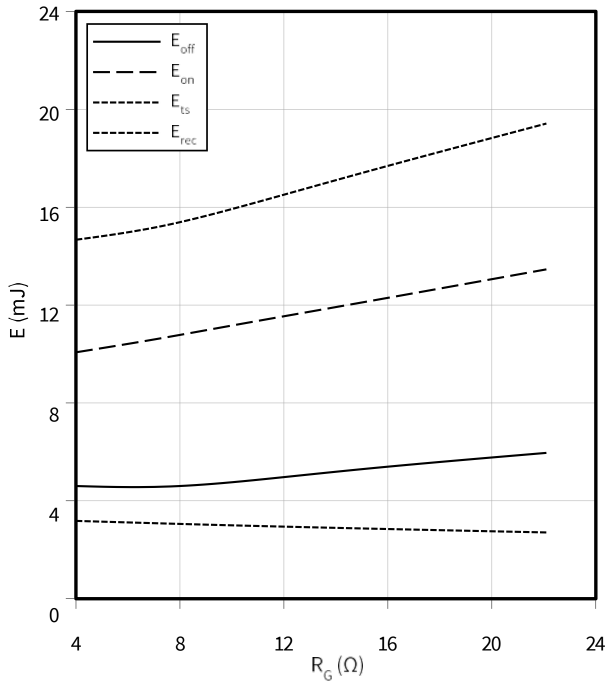
$V_{CC} = 600$ V, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V, $R_G = 7$ Ω



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

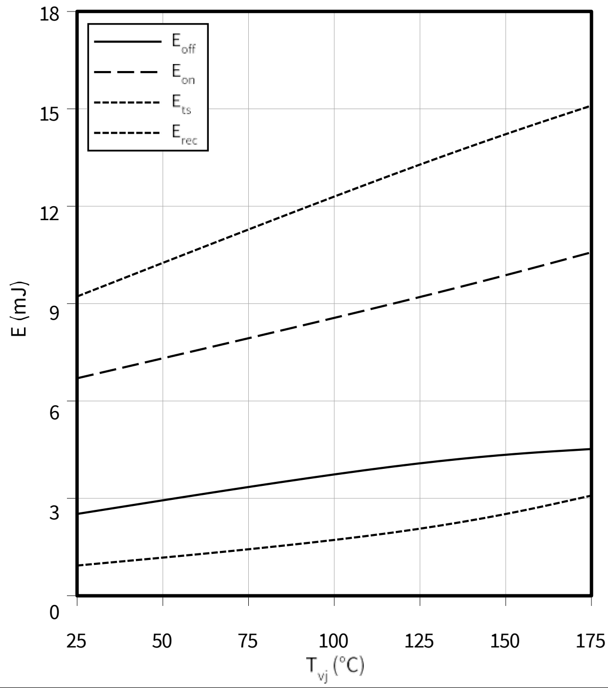
$I_C = 100$ A, $V_{CC} = 600$ V, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V



Typical switching energy losses as a function of junction temperature

$E = f(T_{vj})$

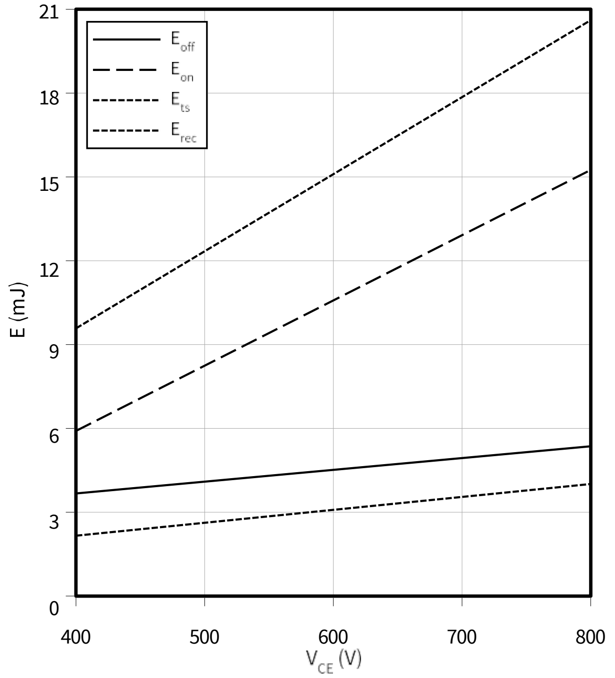
$I_C = 100$ A, $V_{CC} = 600$ V, $V_{GE} = 0/15$ V, $R_G = 7$ Ω



Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

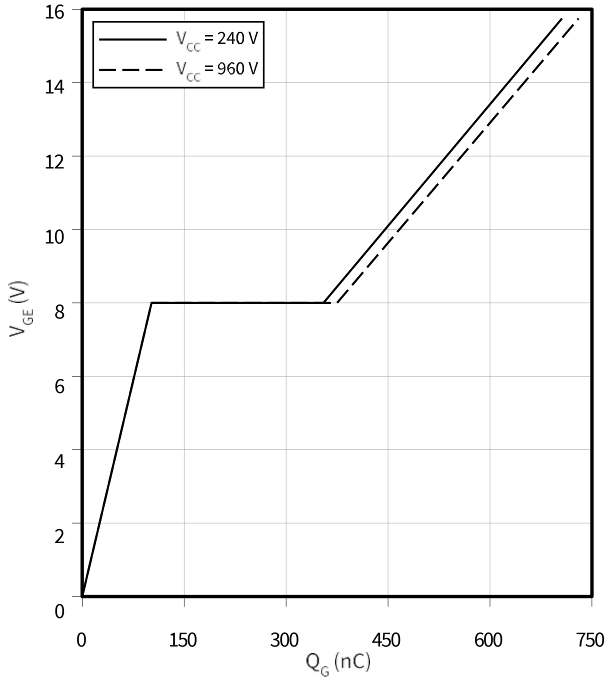
$I_C = 100$ A, $V_{GE} = 0/15$ V, $T_{vj} = 175$ °C, $R_G = 7\ \Omega$



Typical gate charge

$V_{GE} = f(Q_G)$

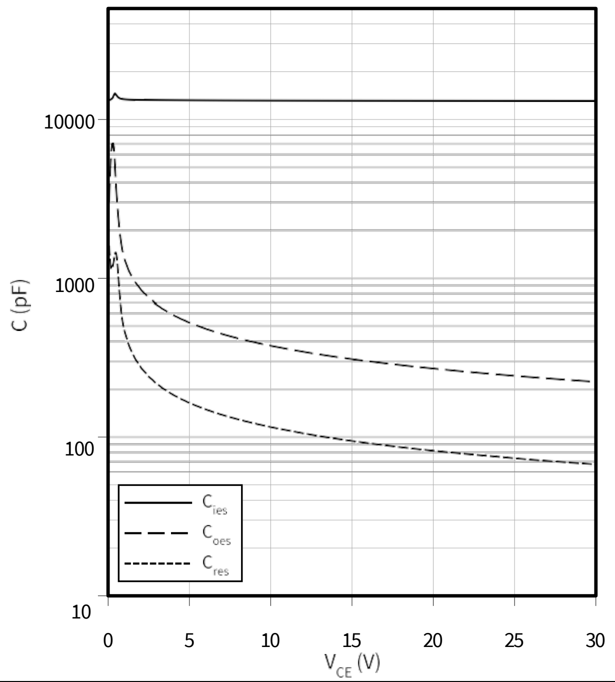
$I_C = 100$ A



Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

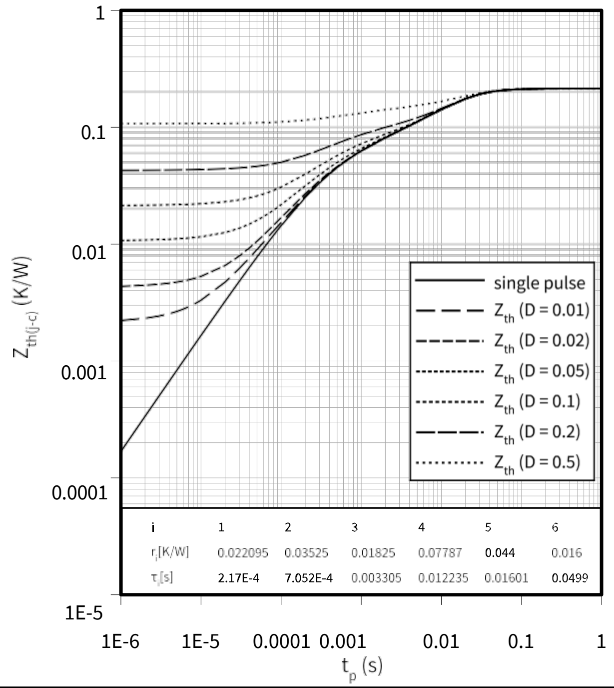
$f = 100$ kHz, $V_{GE} = 0$ V



IGBT transient thermal impedance as a function of pulse width

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

$D = t_p/T$

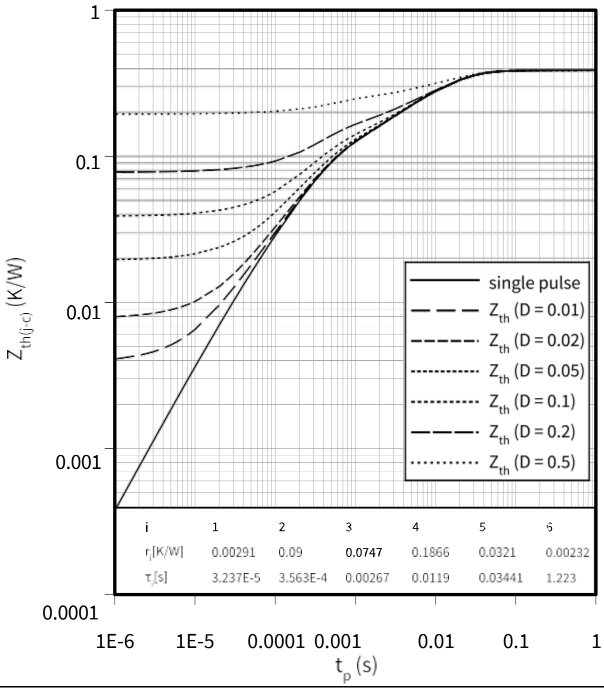


i	1	2	3	4	5	6
r_i[K/W]	0.022095	0.03525	0.01825	0.07787	0.044	0.016
τ_i[s]	2.17E-4	7.052E-4	0.003305	0.012235	0.01601	0.0499

Diode transient thermal impedance as a function of pulse width

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

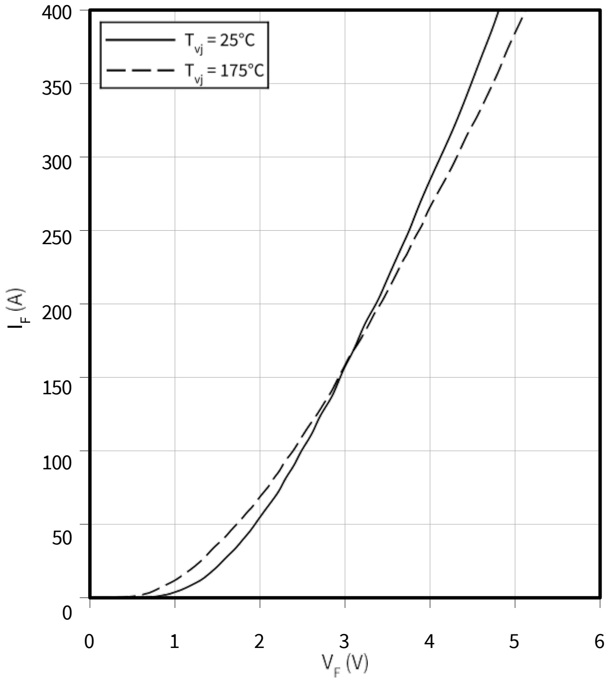
$D = t_p/T$



i	1	2	3	4	5	6
r_i[K/W]	0.00291	0.09	0.0747	0.1866	0.0321	0.00232
τ_i[s]	3.237E-5	3.563E-4	0.00267	0.0119	0.03441	1.223

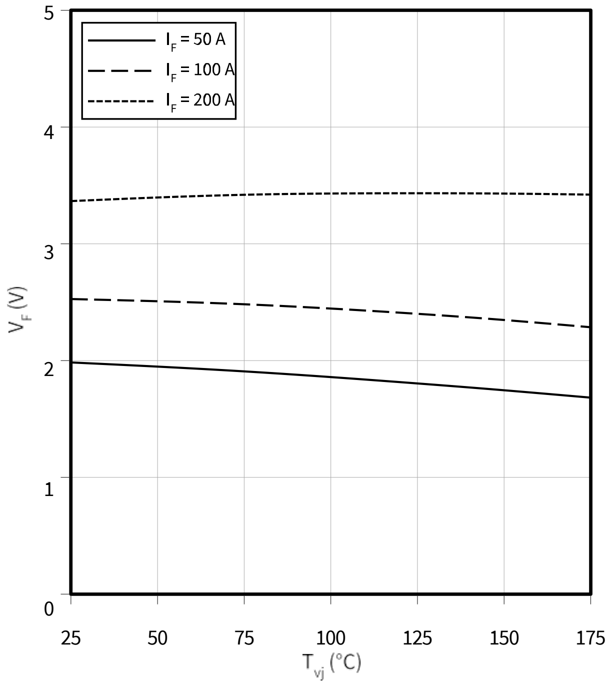
Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



Typical diode forward voltage as a function of junction temperature

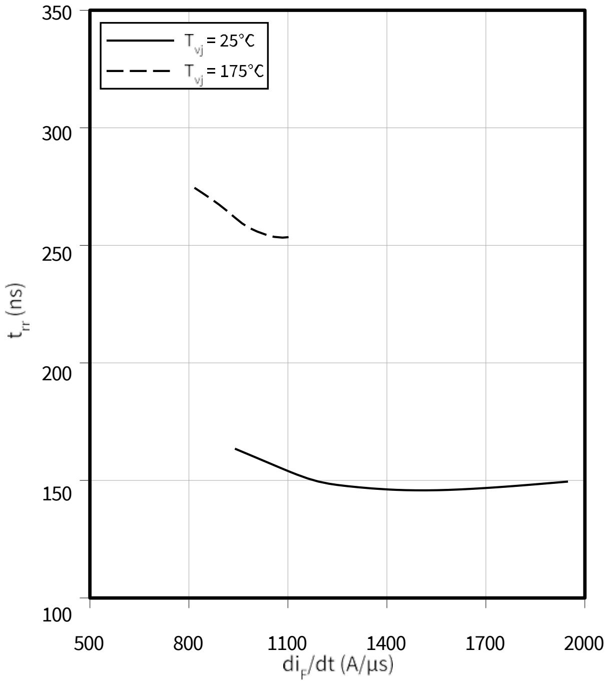
$V_F = f(T_{vj})$



Typical reverse recovery time as a function of diode current slope

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

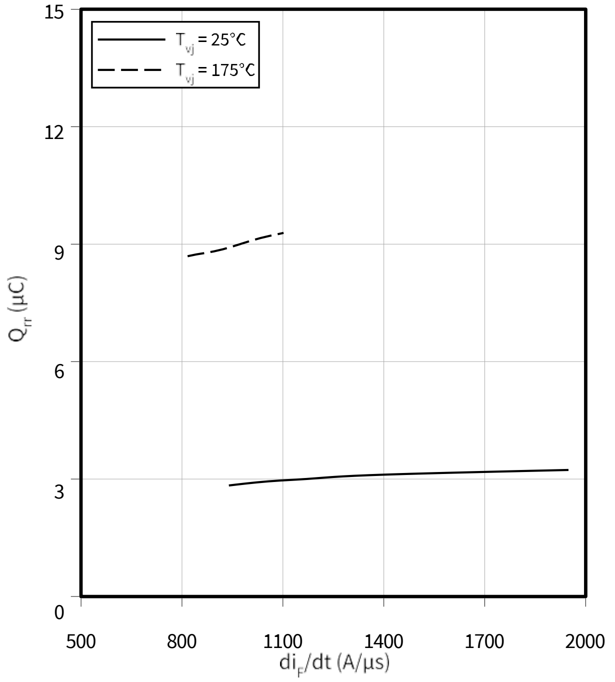
$V_R = 600$ V, $I_F = 100$ A



Typical reverse recovery charge as a function of diode current slope

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

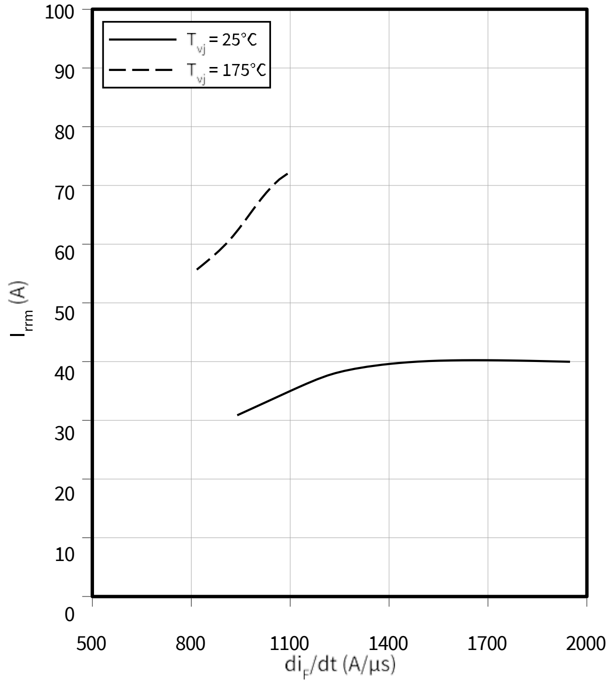
$V_R = 600$ V, $I_F = 100$ A



Typical reverse recovery current as a function of diode current slope

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

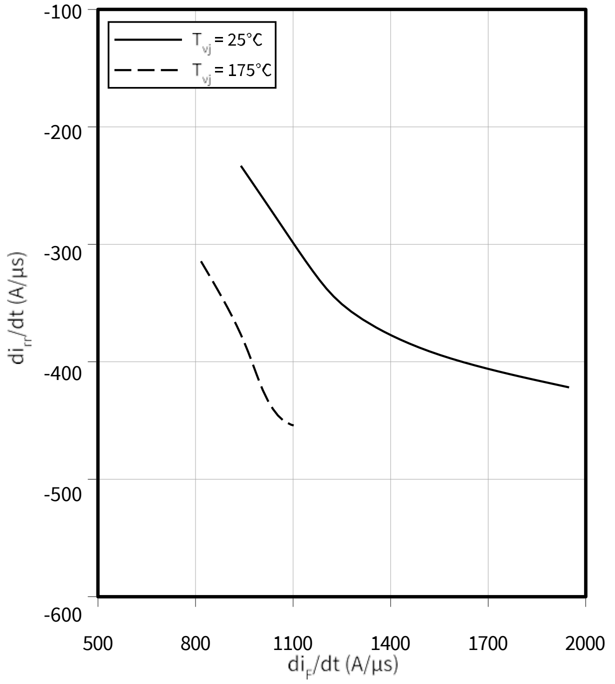
$V_R = 600$ V, $I_F = 100$ A



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

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

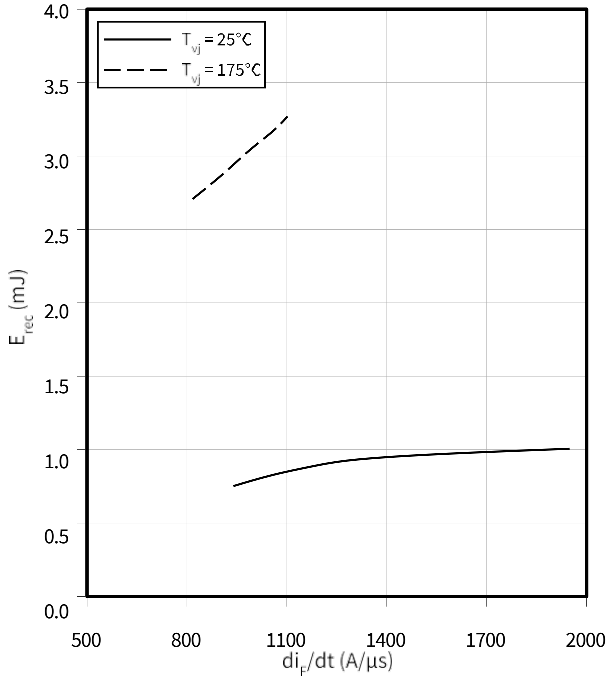
$V_R = 600$ V, $I_F = 100$ A



Typical reverse energy losses as a function of diode current slope

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

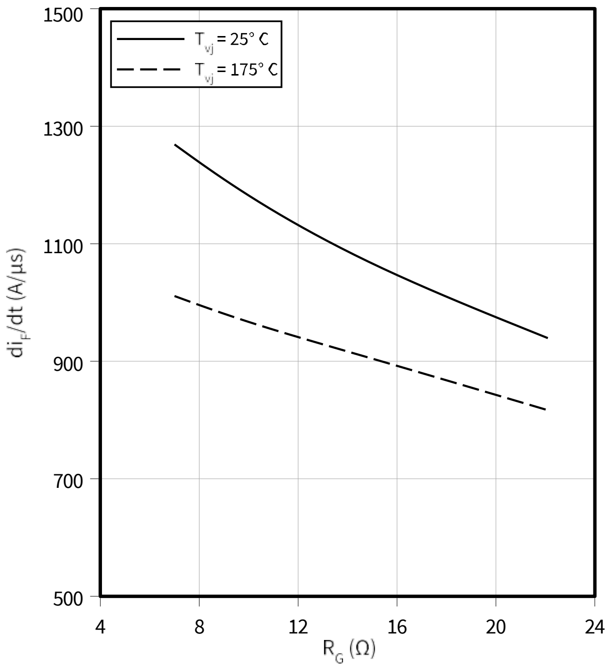
$V_R = 600$ V, $I_F = 100$ A



Typical diode current slope as a function of gate resistor

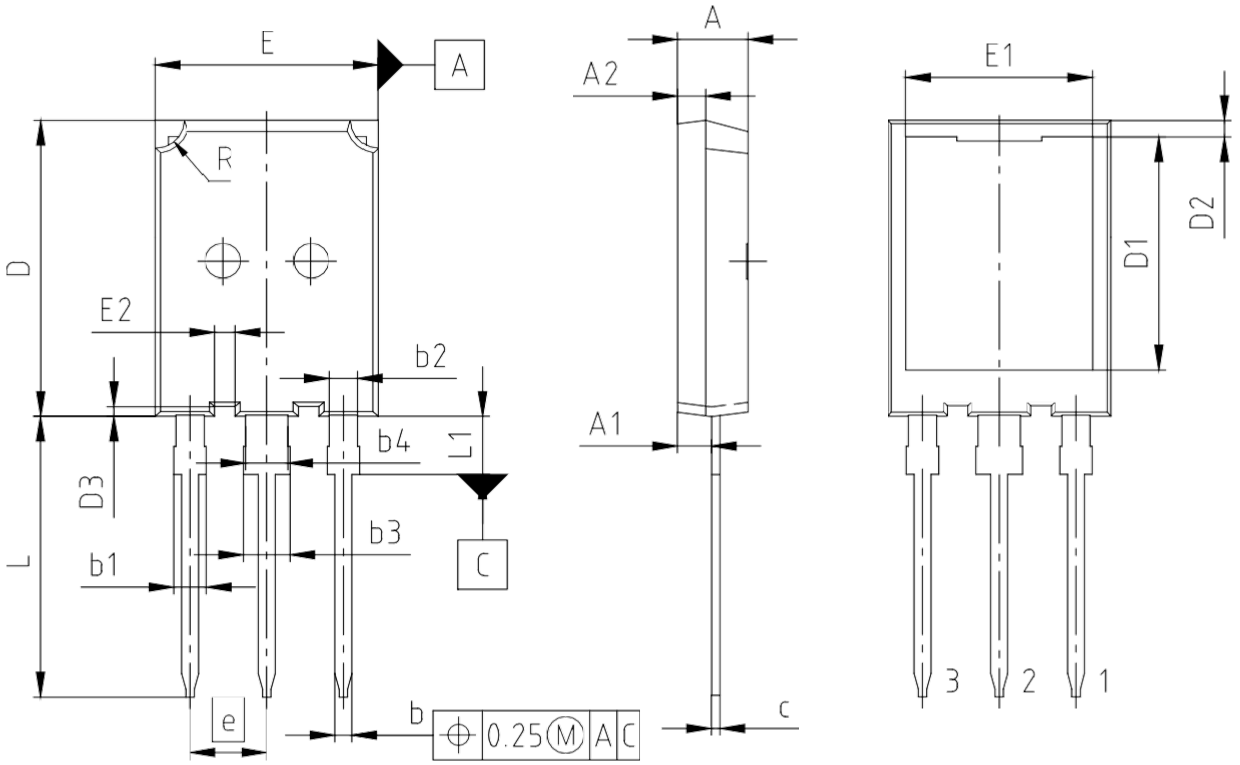
$di_F/dt = f(R_G)$

$V_R = 600$ V, $I_F = 100$ A



5 封装外形

PG-TO247-3-PLUS-NN3.7



PACKAGE - GROUP NUMBER:	PG-TO247-3-U01	
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	---	2.25
b2	1.96	2.06
b3	---	3.25
b4	2.96	3.06
c	0.59	0.66
D	20.90	21.10
D1	16.25	16.85
D2	1.05	1.35
D3	0.58	0.78
E	15.70	15.90
E1	13.10	13.50
E2	1.35	1.55
e	5.44 (BSC)	
N	3	
L	19.80	20.10
L1	3.90	4.30
R	1.90	2.10

NOTE:
DIMENSIONS DO NOT INCLUDE MOLDFLASH, PROTRUSION OR GATE BURRS

图 1

6 测试条件

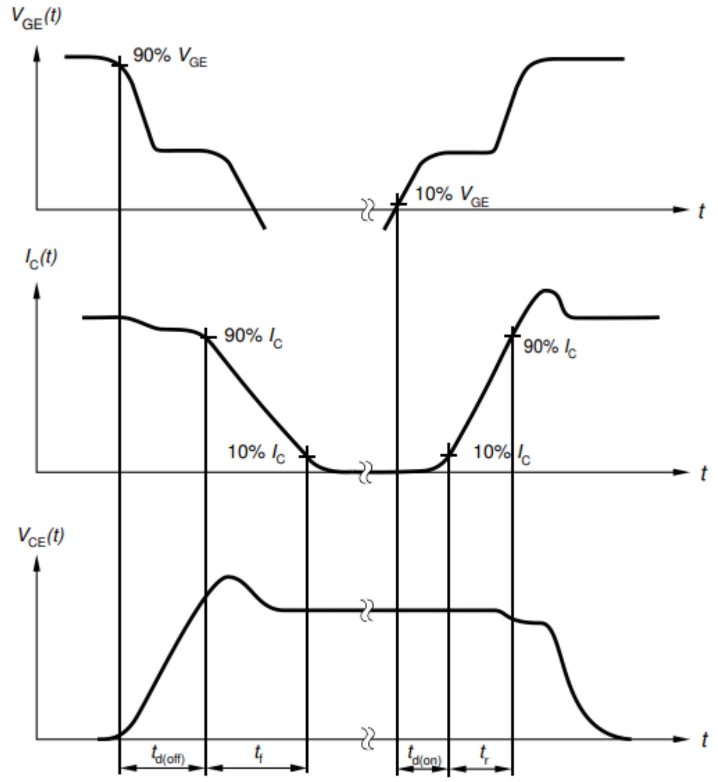


Figure A. **Definition of switching times**

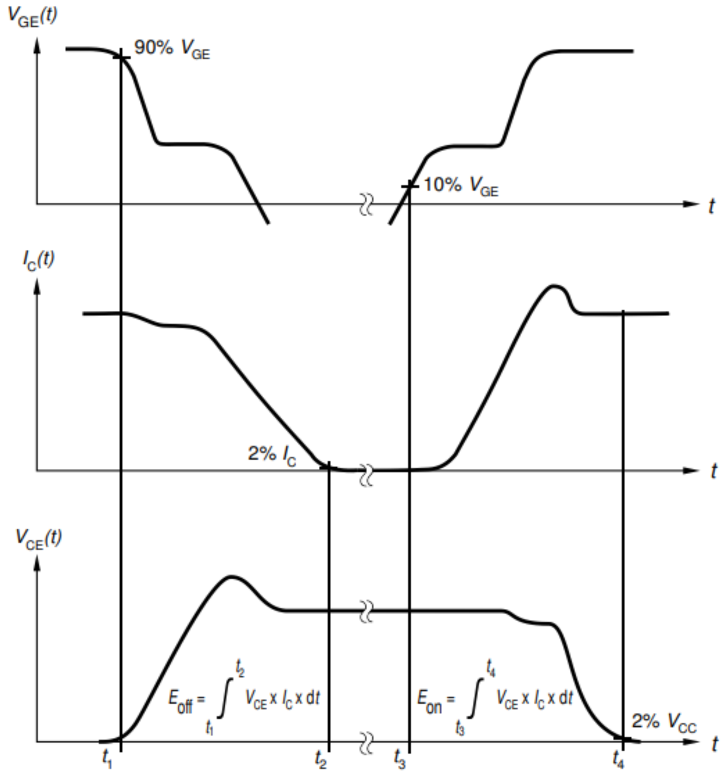


Figure B. **Definition of switching losses**

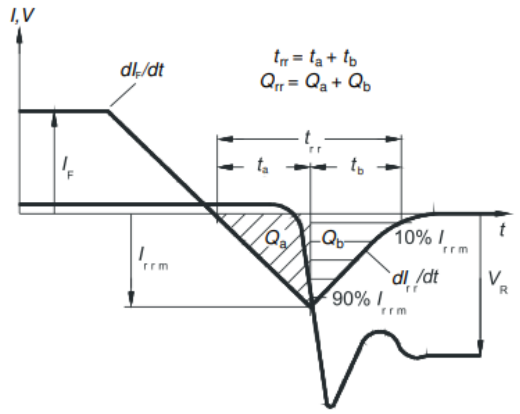


Figure C. **Definition of diode switching characteristics**

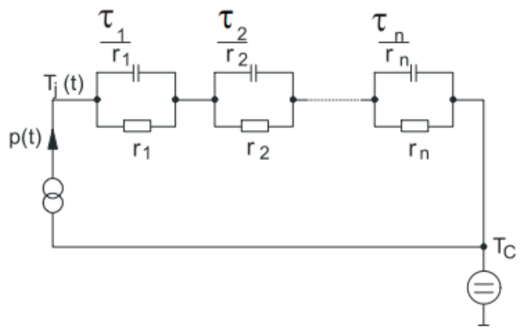


Figure D. **Thermal equivalent circuit**

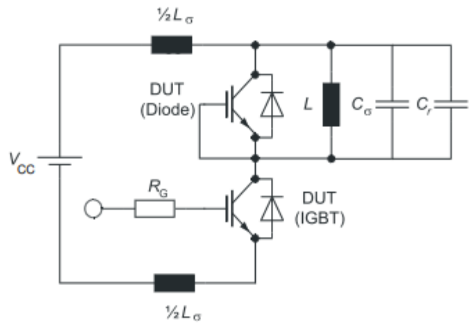


Figure E. **Dynamic test circuit**
Parasitic inductance L_{σ},
parasitic capacitor C_{σ},
relief capacitor C_{r},
(only for ZVT switching)

图 2

修订记录

Document revision	Date of release	Description of changes
0.10	2022-05-02	Target datasheet
0.20	2022-06-01	Editorial changes
1.00	2022-11-23	Final datasheet
1.10	2023-01-20	Change of product outline drawing on page 14
1.20	2023-07-03	Figures on page 7 and 11 updated Editorial changes

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