最终数据手册

英飞凌耐短路的 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

Halogen-free

RoHS

AEC Qualified

特性

- V_{CE} = 750 V
- I_C = 200 A
- 行业领先的 750 V TO247 PLUS封装 - 最高的单器件功率输出能力
- 适用于 470 V V_{DC}系统，并增加了 400 V V_{DC} 系统的过压裕量
- 极低V_{CEsat}(C-KE) = 1.25 V（典型值），I_{Cnom}= 200 A，25°C
- 短路耐受时间 t_{sc} = 3 µs（V_{CE} = 470 V、V_{GE} = 15 V）
- 由于回流焊能力，系统 R_{th}可降低至 40%，增加功率输出
- 由于开尔文发射极，与 3 引脚器件相比，开通损耗减少 30%
- 短路条件下的自限电流
- 正温度系数和非常紧密的参数分布，易于并联
- 由于 I_{nom}= 200 A，减少了需要并联的器件数量
- 优异的并联均流能力
- 低栅极电荷 Q_G
- 平滑的开关特性
- 简单的栅极驱动器设计
- 配备快速软恢复发射极控制二极管 (Emcon3)
- 低EMI特征
- TO247PLUS 封装，高爬电距离 6.6 mm，400 ≤ CTI< 600
- 高可靠性和使用寿命，经过验证的秒级功率循环。鲁棒性
- 适用于高电流母线的宽电源引脚 (2 mm)
- 用于直接母线连接的阻性焊接引脚
- 无铅镀层的引脚和背板

潜在应用

- 电动汽车牵引逆变器
- 直流母线放电开关
- 汽车辅助驱动

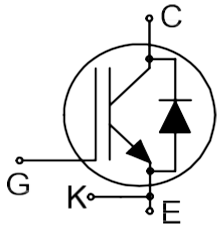
产品验证

- 汽车应用认证。符合AEC-Q101 产品认证
- 符合JEDEC J-STD-020 MSL2 标准的回流焊 260°C

描述

封装引脚定义：

- 引脚 C (1) & 背面 - 集电极
- 引脚 E (2) - 发射极
- 引脚 K (3) - 开尔文发射极
- 引脚 G (4) - 栅极



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）。

Type	Package	Marking
AIKYX200N75CP2	PG-TO247-4-U06	AKYX20FCP

目录

1 封装

表 1 特征值

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Internal emitter inductance	L_E	simulated starting from L2 at 1 MHz		3.6		nH
Collector-emitter loop inductance	L_{CE}	simulated starting from L2 at 1 MHz		6.2		nH
Main emitter pin resistance	R_E	Simulated starting from L2 at 10 kHz		0.32		mΩ
Storage temperature	T_{stg}		-55		150	°C
Soldering temperature	T_{sold}	reflow soldering (MSL2 according to JEDEC J-STD-020)			260	°C
Thermal resistance, junction-ambient	$R_{th(j-a)}$			40		K/W
IGBT thermal resistance, junction-case	$R_{th(j-c)}$			0.12	0.16[1)]	K/W
Diode thermal resistance, junction-case	$R_{th(j-c)}$			0.23	0.3[1)]	K/W

1) 通过仿真定义，不进行生产测试

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		750	V
DC collector current, limited by T_{vjmax}	I_C		$T_c = 25$ °C	250	A
			$T_c = 100$ °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}	$V_{CC} \leq 470$ V, $V_{GE} = -8/15$ V, Allowed number of short circuits < 1000, Time between short circuits ≥ 1.0 s, $T_{vj} = 25$ °C		3	µs
Power dissipation	P_{tot}	$T_{vj} = 175$ °C	$T_c = 25$ °C	938	W
			$T_c = 100$ °C	469	

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	1.2	1.37	1.55	V
			T_{vj} = 175 °C		1.65		
Collector-Kelvin emitter saturation voltage	V_{CEsat} *(C-KE)*	I_C = 200 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.25		V
Gate-emitter threshold voltage	V_{GEth}	I_C = 2.6 mA, V_{CE} = V_{GE}		5.2	5.8	6.4	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		10		mA
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			146		S
Short-circuit collector current	I_{SC}	V_{CC} ≤ 470 V, V_{GE} = -8/15 V, t_{SC} ≤ 3 µs, Allowed number of short circuits < 1000, Time between short circuits ≥ 1.0 s, T_{vj} = 25 °C	T_{vj} = 25 °C		1860		A
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			21800		pF
Output capacitance	C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			560		pF
Reverse transfer capacitance	C_{res}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			100		pF
Gate charge	Q_G	V_{CC} = 600 V, I_C = 200 A, V_{GE} = -8/15 V			1270		nC
Turn-on delay time	$t_{d(on)}$	V_{CC} = 470 V, V_{GE} = -8/15 V, $R_{G(on)}$ = 5 Ω, L_σ = 20 nH, C_σ = 15 pF	T_{vj} = 25 °C, I_C = 200 A		79		ns
			T_{vj} = 175 °C, I_C = 200 A		80		
Rise time (inductive load)	t_r	V_{CC} = 470 V, V_{GE} = -8/15 V, $R_{G(on)}$ = 5 Ω, L_σ = 20 nH, C_σ = 15 pF	T_{vj} = 25 °C, I_C = 200 A		44		ns
			T_{vj} = 175 °C, I_C = 200 A		52		
Turn-off delay time	$t_{d(off)}$	V_{CC} = 470 V, V_{GE} = -8/15 V, $R_{G(on)}$ = 5 Ω, L_σ = 20 nH, C_σ = 15 pF	T_{vj} = 25 °C, I_C = 200 A		268		ns
			T_{vj} = 175 °C, I_C = 200 A		346		
Fall time (inductive load)	t_f	V_{CC} = 470 V, V_{GE} = -8/15 V, $R_{G(on)}$ = 5 Ω, L_σ = 20 nH, C_σ = 15 pF	T_{vj} = 25 °C, I_C = 200 A		58		ns
			T_{vj} = 175 °C, I_C = 200 A		130		

（表格续下页……）

表 3 （续） 特征值

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-on energy[1)]	E_{on}	V_{CC} = 470 V, V_{GE} = -8/15 V, $R_{G(on)}$ = 5 Ω, $L_σ$ = 20 nH, $C_σ$ = 15 pF	T_{vj} = 25 °C, I_C = 200 A		7.6		mJ
			T_{vj} = 175 °C, I_C = 200 A		10.3		
Turn-off energy	E_{off}	V_{CC} = 470 V, V_{GE} = -8/15 V, $R_{G(on)}$ = 5 Ω, $L_σ$ = 20 nH, $C_σ$ = 15 pF	T_{vj} = 25 °C, I_C = 200 A		6.4		mJ
			T_{vj} = 175 °C, I_C = 200 A		11.4		
Total switching energy	E_{ts}	V_{CC} = 470 V, V_{GE} = -8/15 V, $R_{G(on)}$ = 5 Ω, $L_σ$ = 20 nH, $C_σ$ = 15 pF	T_{vj} = 25 °C, I_C = 200 A		14		mJ
			T_{vj} = 175 °C, I_C = 200 A		21.7		
Operating junction temperature	T_{vj}			-40		175	°C

1) 包括反向恢复电流引起的 IGBT 损耗

注： 特征参数，在T_{vj} = 25°C 下测定，除非另有说明。

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		T_c = 25 °C	250	A
			T_c = 100 °C	200	
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpulse}			600	A
Power dissipation	P_{tot}	T_{vj} = 175 °C	T_c = 25 °C	500	W
			T_c = 100 °C	250	

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	1.6	1.8	2	V
			T_{vj} = 175 °C		1.9		

（表格续下页……）

表 5　（续） 特征值

Parameter	Symbol	Note or test condition		Values Min.	Typ.	Max.	Unit
Diode reverse recovery charge	Q_{rr}	V_R = 470 V	T_{vj} = 25 °C, I_F = 200 A, $-di_F/dt$ = 3673 A/µs		6.1		µC
			T_{vj} = 175 °C, I_F = 200 A, $-di_F/dt$ = 3241 A/µs		17		
Diode peak reverse recovery current	I_{rrm}	V_R = 470 V	T_{vj} = 25 °C, I_F = 200 A, $-di_F/dt$ = 3673 A/µs		68.4		A
			T_{vj} = 175 °C, I_F = 200 A, $-di_F/dt$ = 3241 A/µs		116.5		
Reverse recovery energy	E_{rec}	V_R = 470 V, L_σ = 20 nH, C_σ = 15 pF	T_{vj} = 25 °C, I_F = 200 A, $-di_F/dt$ = 3673 A/µs		2.2		mJ
			T_{vj} = 175 °C, I_F = 200 A, $-di_F/dt$ = 3241 A/µs		5.7		
Operating junction temperature	T_{vj}			-40		175	°C

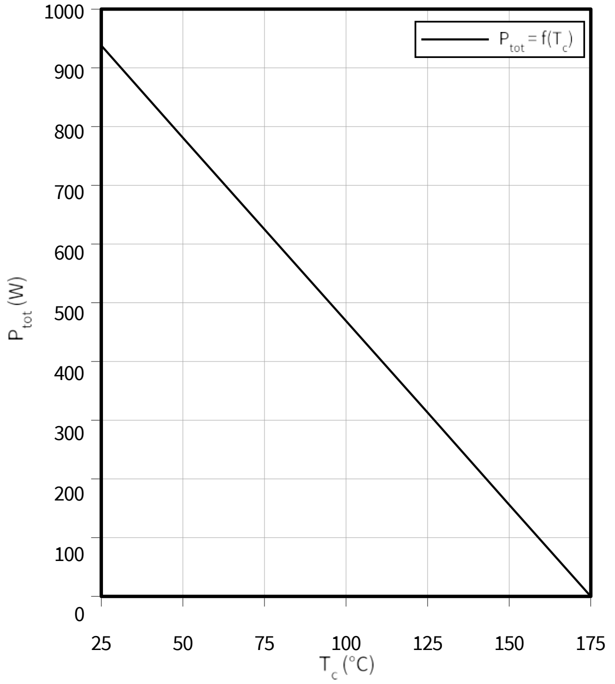
注意： *为了获得最佳的使用寿命和可靠性，英飞凌建议工作条件不超过本数据手册中所述最大额定值的80%。*

4 特性图

Power dissipation as a function of case temperature

$P_{tot} = f(T_c)$

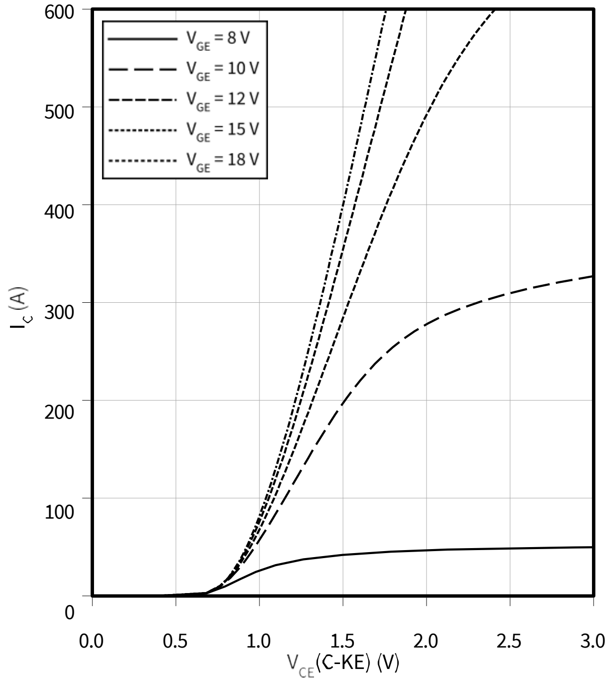
$T_{vj} \leq 175\ °C$



Typical output characteristic

$I_C = f(V_{CE}(C\text{-}KE))$

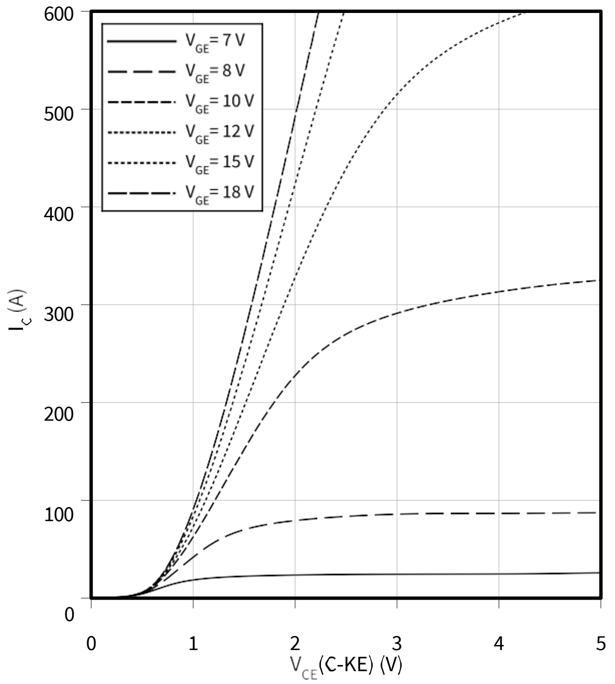
$T_{vj} = 25\ °C$



Typical output characteristic

$I_C = f(V_{CE}(C\text{-}KE))$

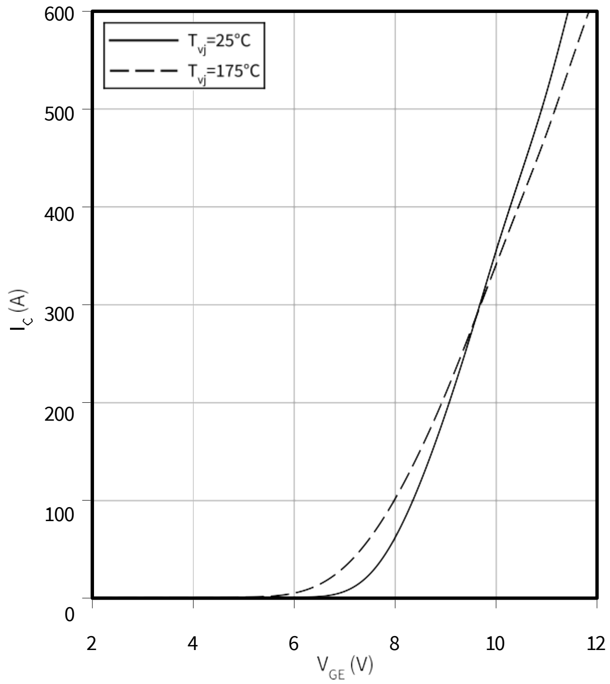
$T_{vj} = 175\ °C$



Typical transfer characteristic

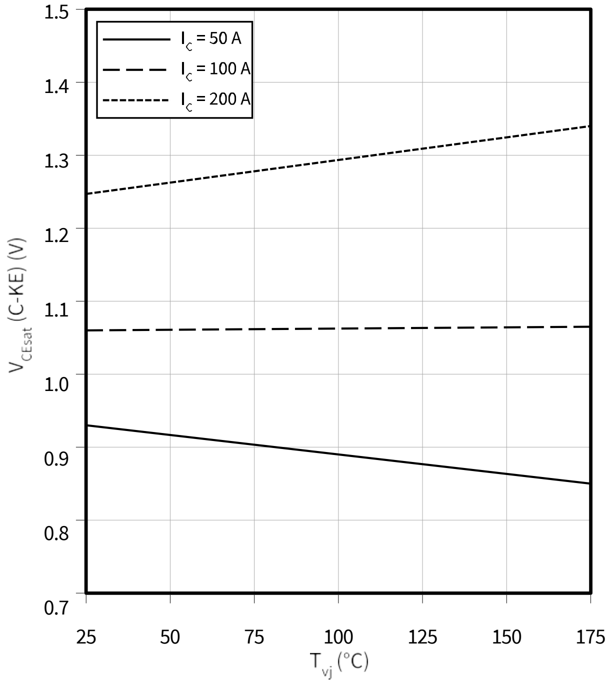
$I_C = f(V_{GE})$

$V_{CE} = 20\ V$



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

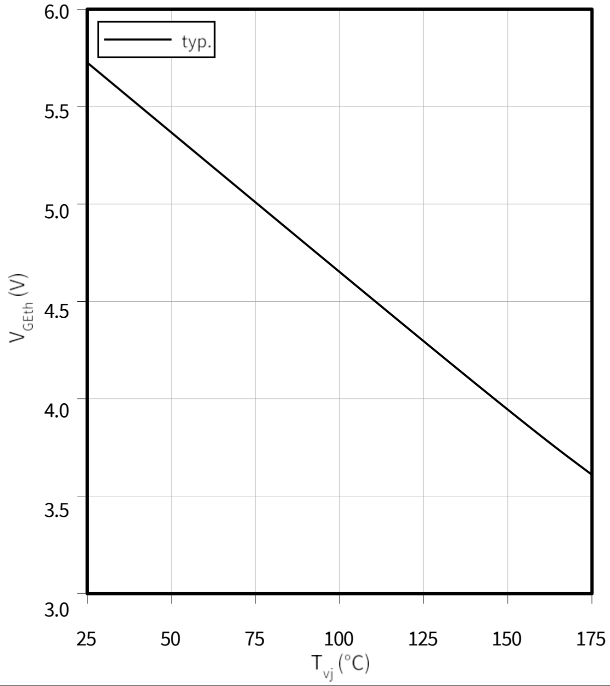
V_{CEsat} (C-KE) = f(T_{vj})



Gate-emitter threshold voltage as a function of junction temperature

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

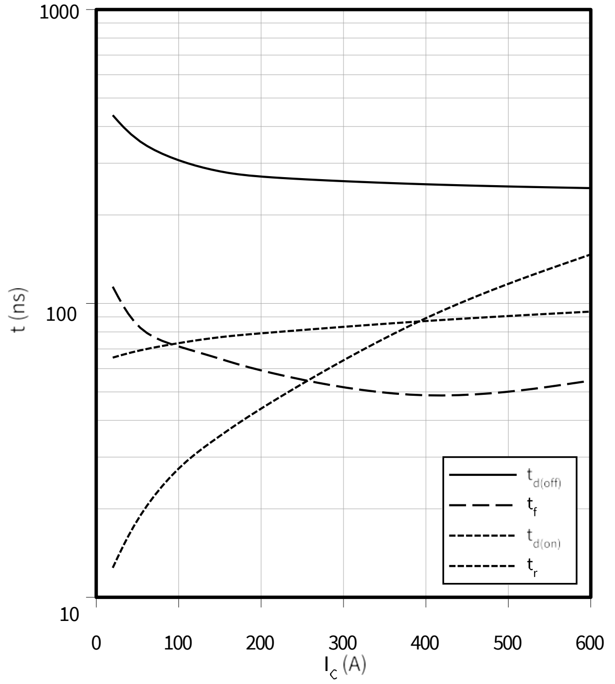
I_C = 2.6 mA



Typical switching times as a function of collector current

t = f(I_C)

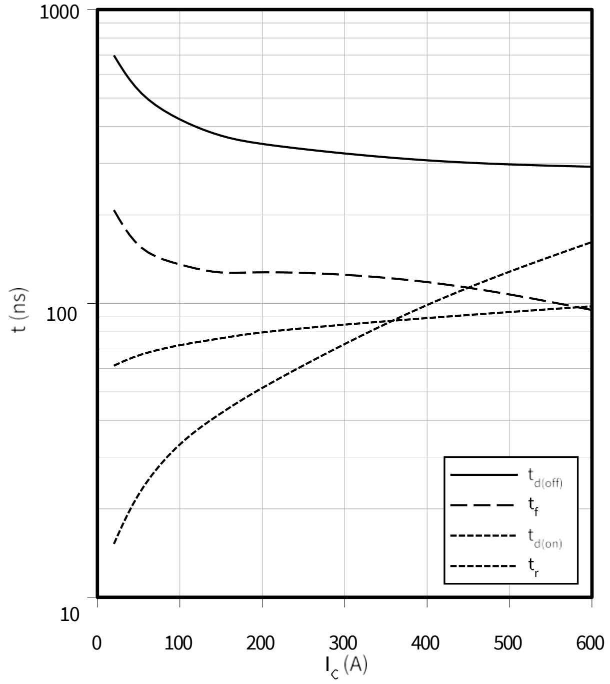
V_{CC} = 470 V, T_{vj} = 25 °C, R_G = 5 Ω



Typical switching times as a function of collector current

t = f(I_C)

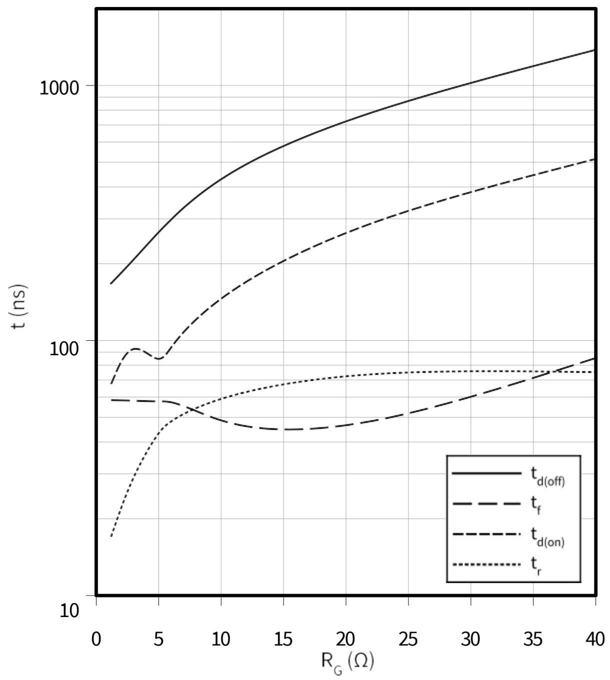
V_{CC} = 470 V, T_{vj} = 175 °C, R_G = 5 Ω



Typical switching times as a function of gate resistor

$t = f(R_G)$

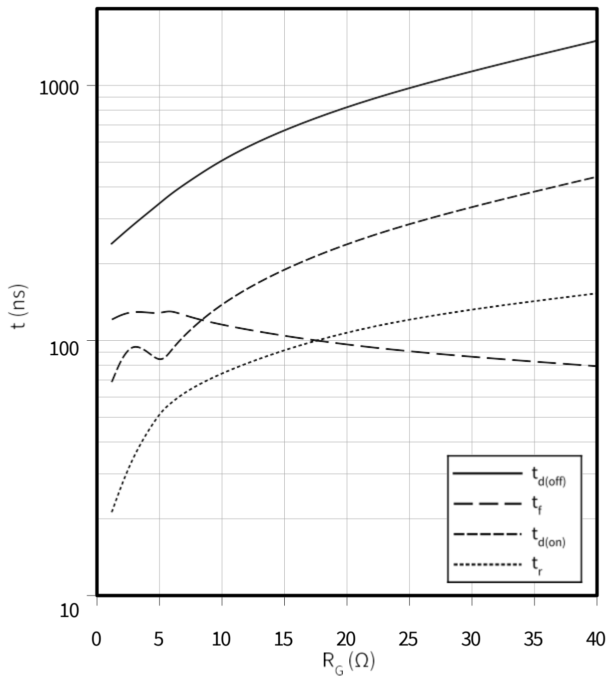
$I_C = 200$ A, $V_{CC} = 470$ V, $T_{vj} = 25$ °C



Typical switching times as a function of gate resistor

$t = f(R_G)$

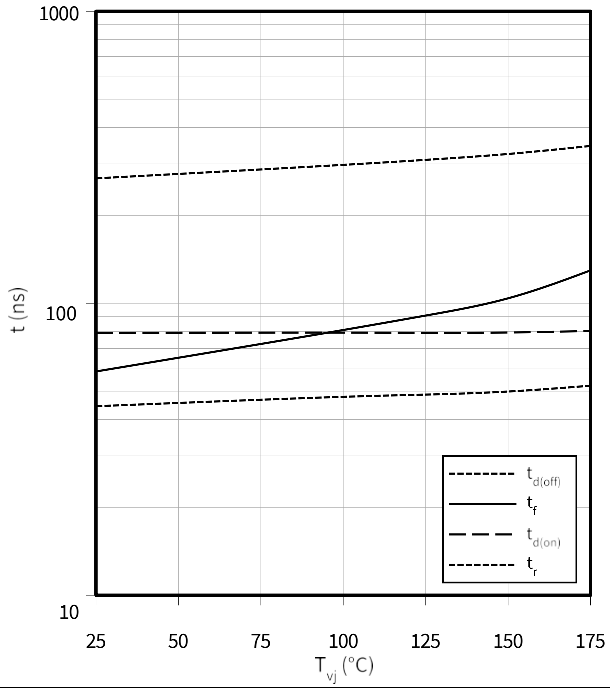
$I_C = 200$ A, $V_{CC} = 470$ V, $T_{vj} = 175$ °C



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

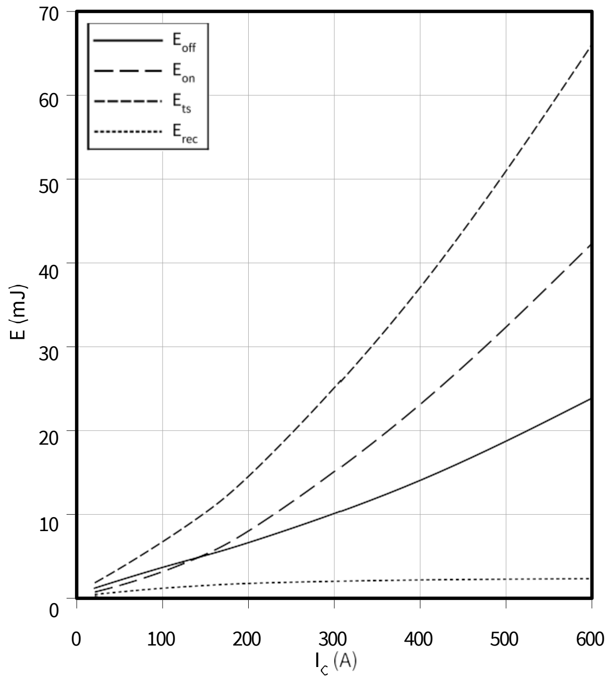
$I_C = 200$ A, $V_{CC} = 470$ V, $R_G = 5$ Ω

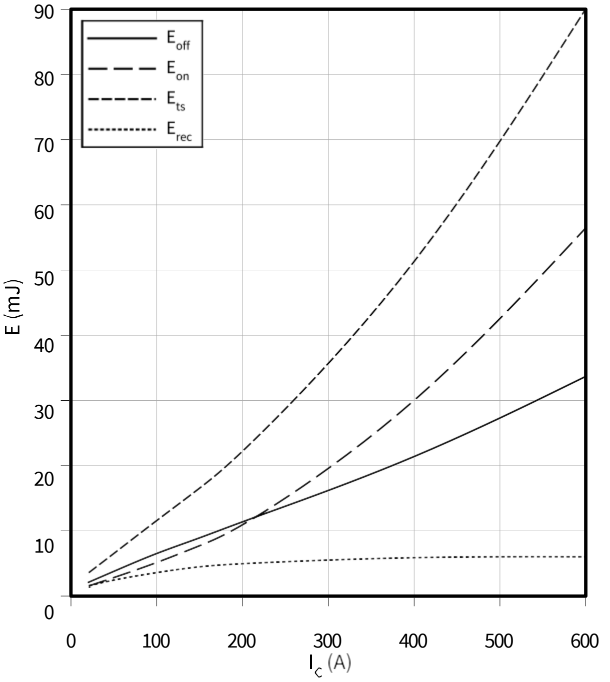
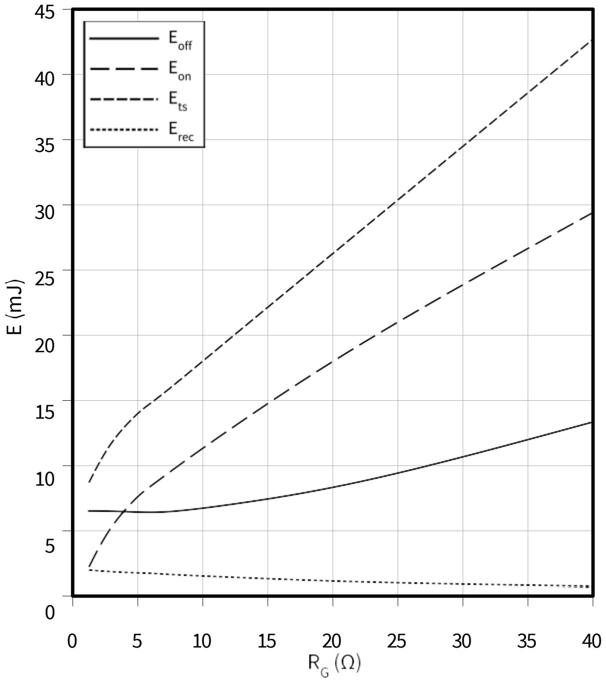
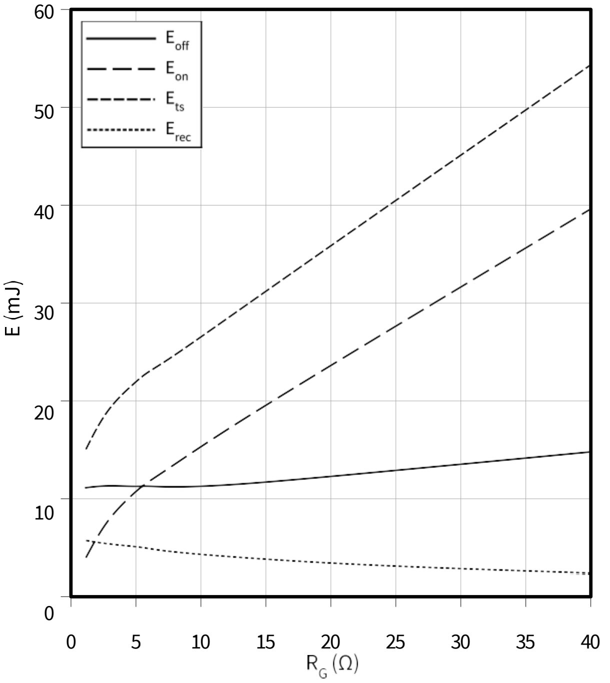
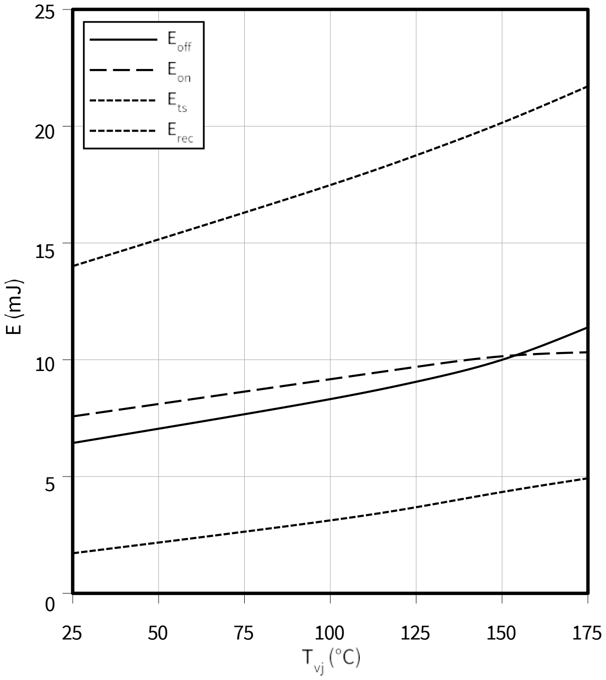


Typical switching energy losses as a function of collector current

$E = f(I_C)$

$V_{CC} = 470$ V, $T_{vj} = 25$ °C, $R_G = 5$ Ω

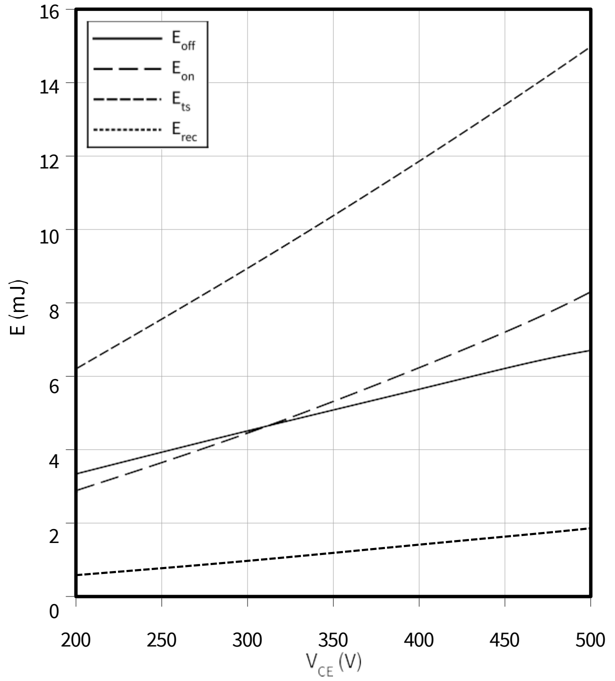


Typical switching energy losses as a function of collector current $E = f(I_C)$ $V_{CC} = 470$ V, $T_{vj} = 175$ °C, $R_G = 5$ Ω	**Typical switching energy losses as a function of gate resistor** $E = f(R_G)$ $I_C = 200$ A, $V_{CC} = 470$ V, $T_{vj} = 25$ °C
	
Typical switching energy losses as a function of gate resistor $E = f(R_G)$ $I_C = 200$ A, $V_{CC} = 470$ V, $T_{vj} = 175$ °C	**Typical switching energy losses as a function of junction temperature** $E = f(T_{vj})$ $I_C = 200$ A, $V_{CC} = 470$ V, $R_G = 5$ Ω
	

Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

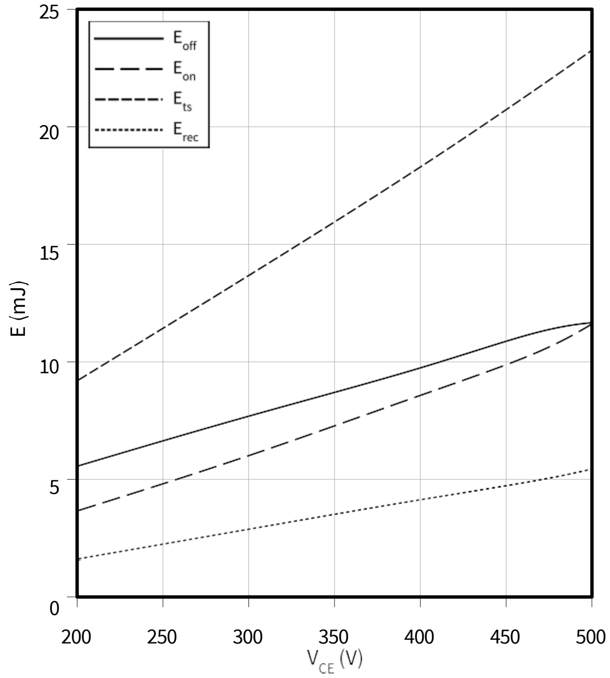
$I_C = 200$ A, $T_{vj} = 25$ °C, $R_G = 5$ Ω



Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

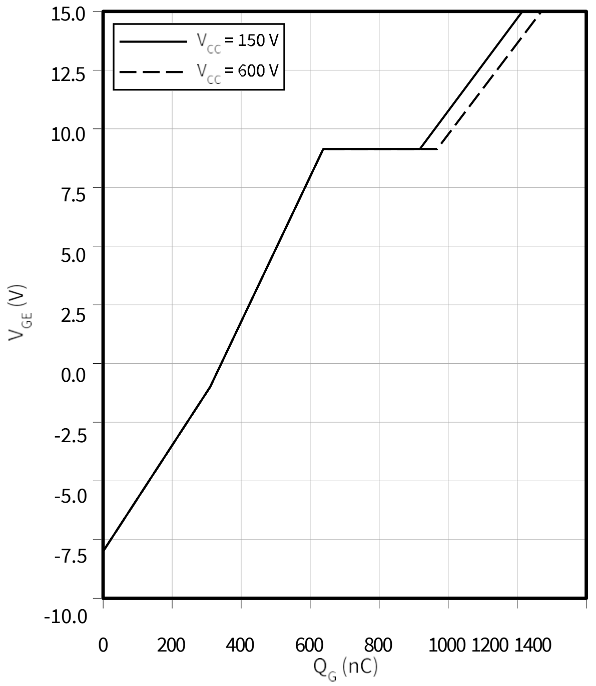
$I_C = 200$ A, $T_{vj} = 175$ °C, $R_G = 5$ Ω



Typical gate charge

$V_{GE} = f(Q_G)$

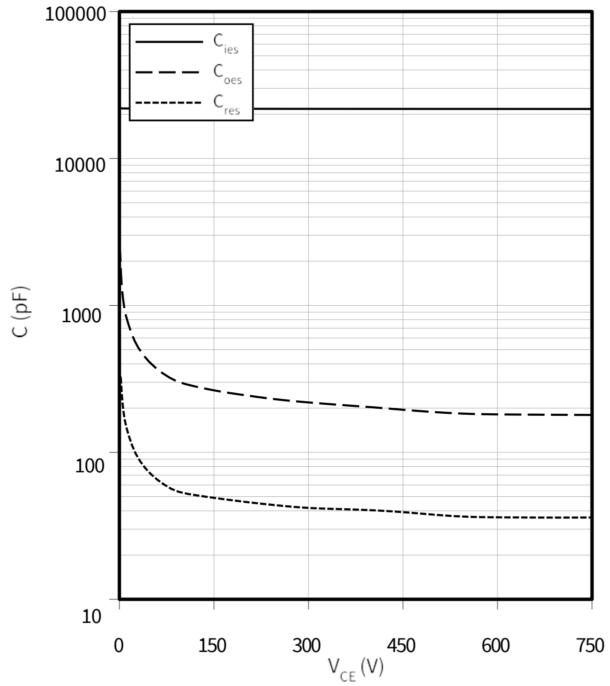
$I_C = 200$ A



Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

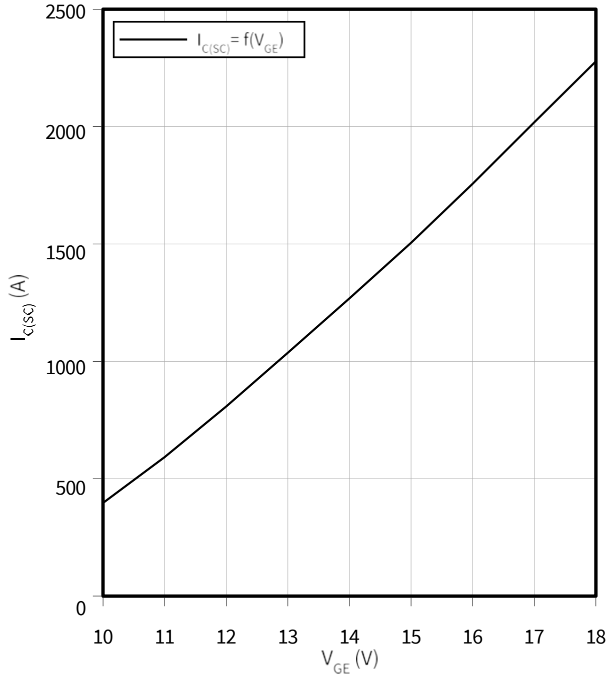
f = 100 kHz



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

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

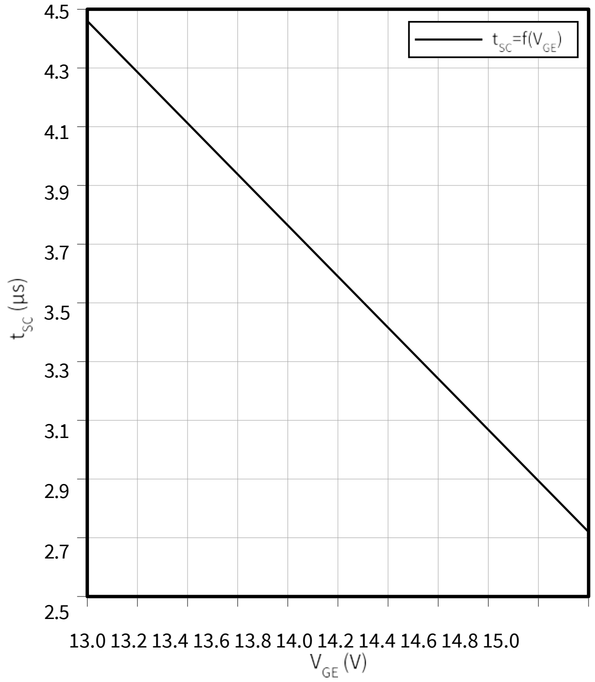
$T_{vj} = 175$ °C, $V_{CC} = 470$ V



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

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

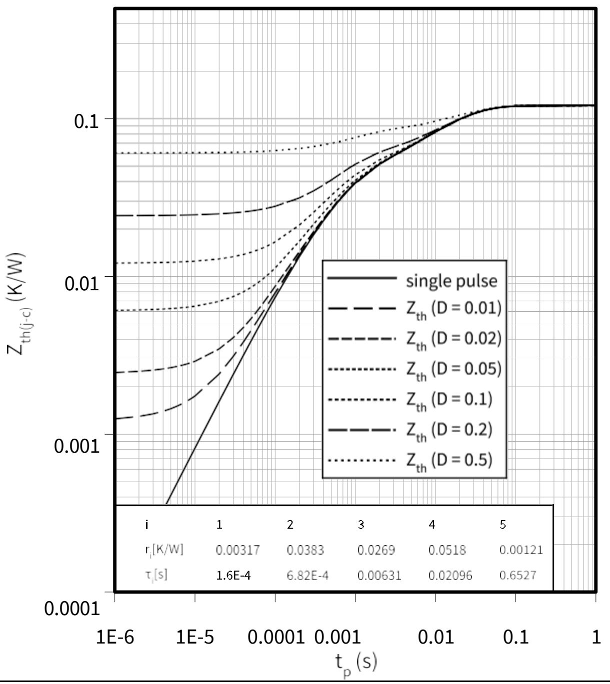
$T_{vj} = 175$ °C, $V_{CC} = 470$ V



IGBT typical transient thermal impedance as a function of pulse width

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

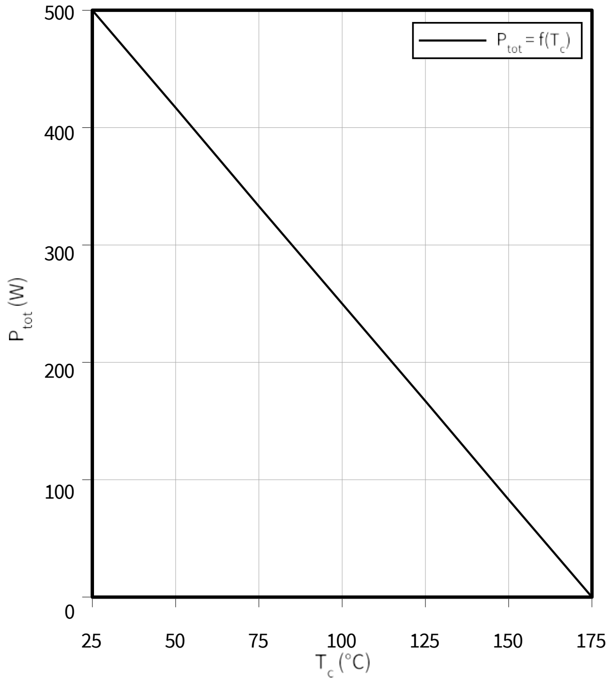
$D = t_p/T$



Power dissipation as a function of case temperature

$P_{tot} = f(T_c)$

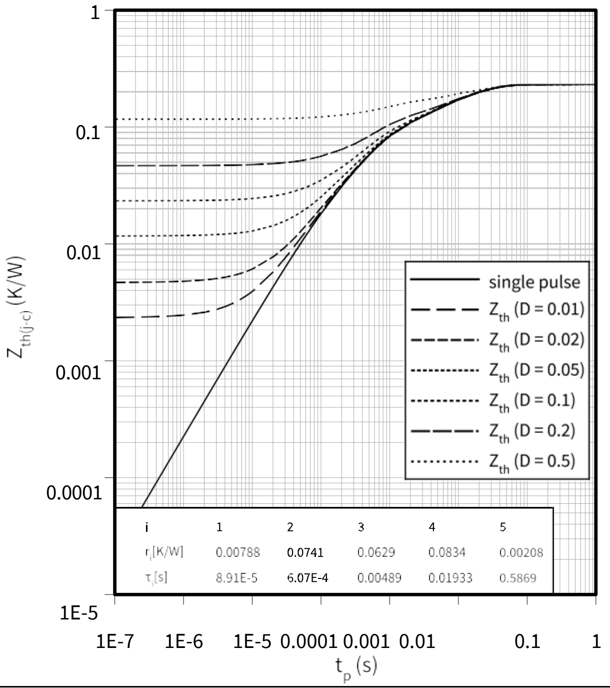
$T_{vj} \leq 175$ °C



Diode typical transient thermal impedance as a function of pulse width

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

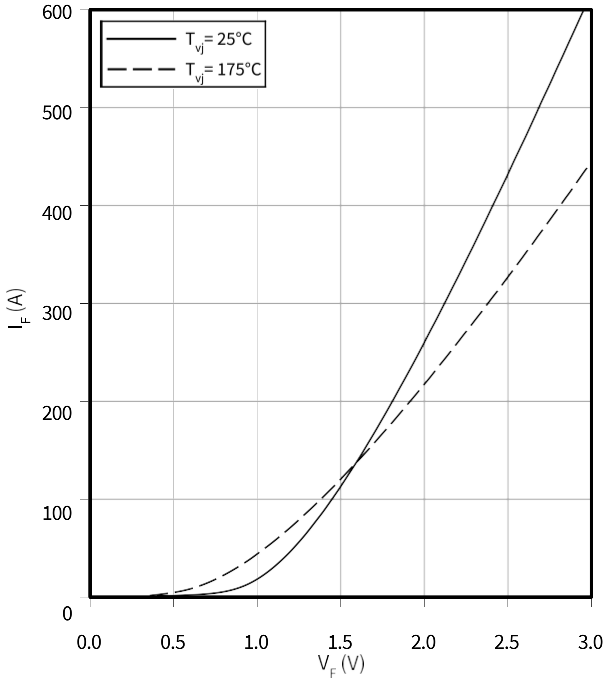
$D = t_p/T$



i	1	2	3	4	5
r_i[K/W]	0.00788	0.0741	0.0629	0.0834	0.00208
τ_i[s]	8.91E-5	6.07E-4	0.00489	0.01933	0.5869

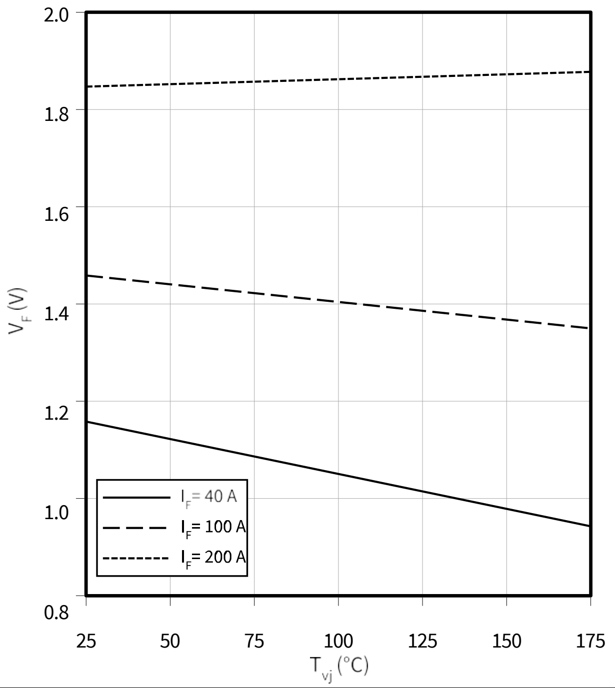
Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



Typical diode forward voltage as a function of junction temperature

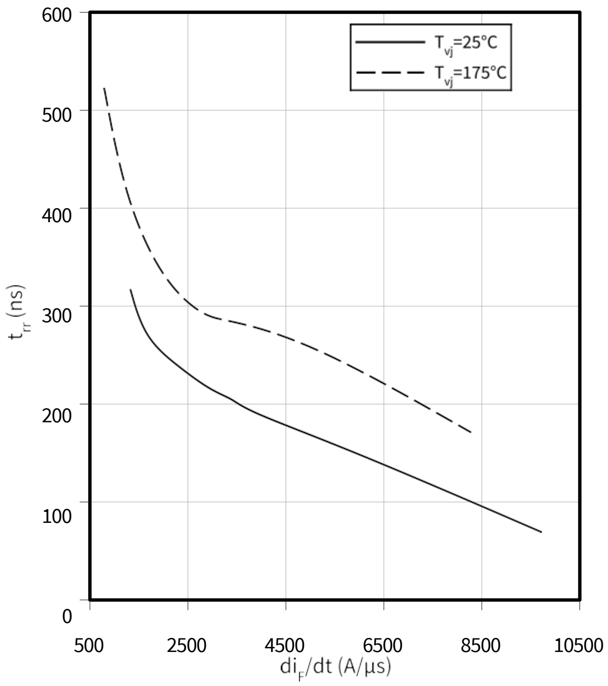
$V_F = f(T_{vj})$

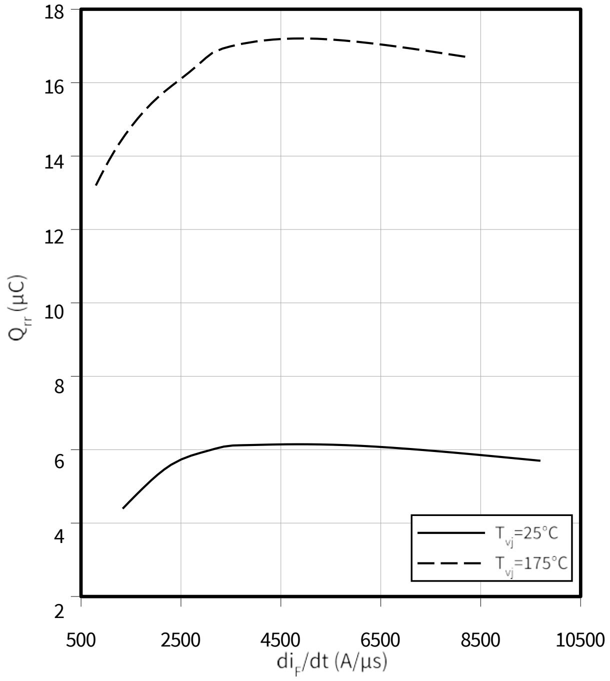
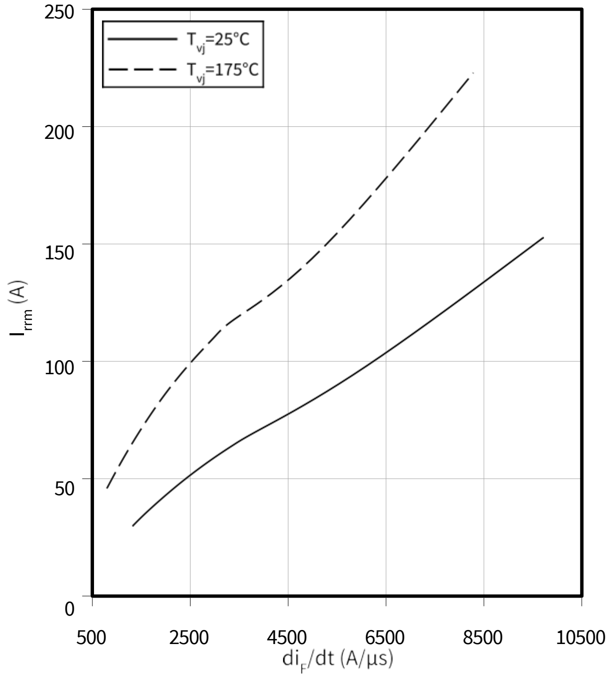
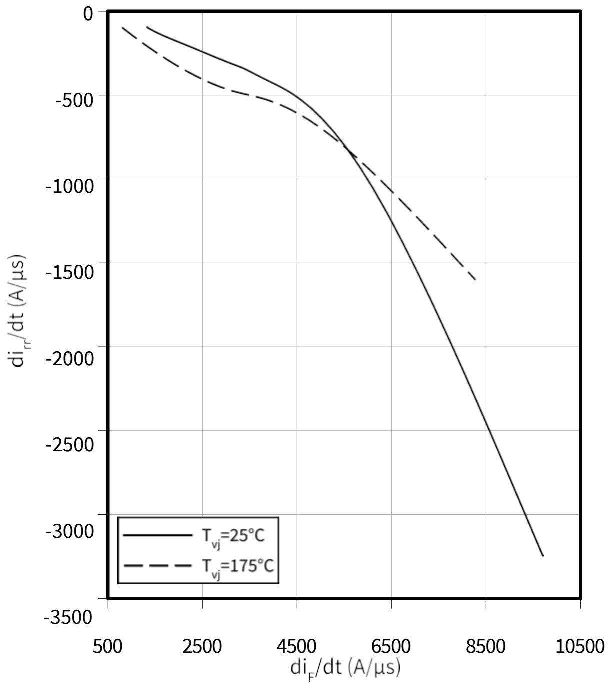
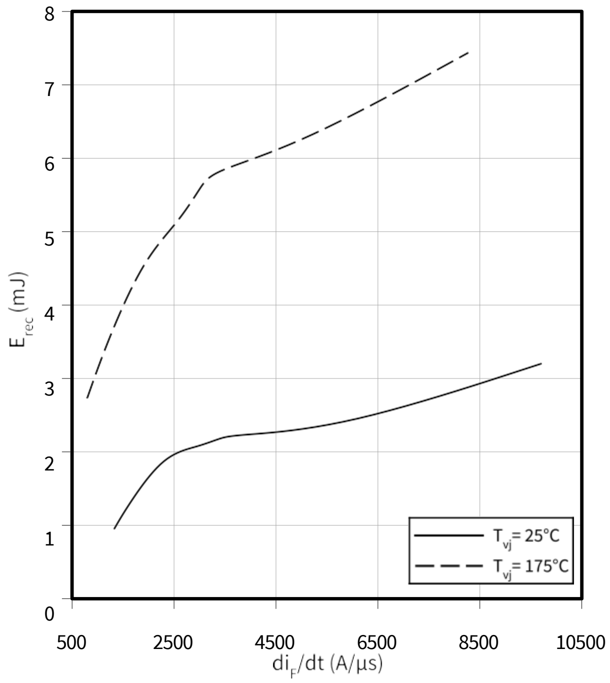


Typical reverse recovery time as a function of diode current slope

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

$V_R = 470$ V, $I_F = 200$ A

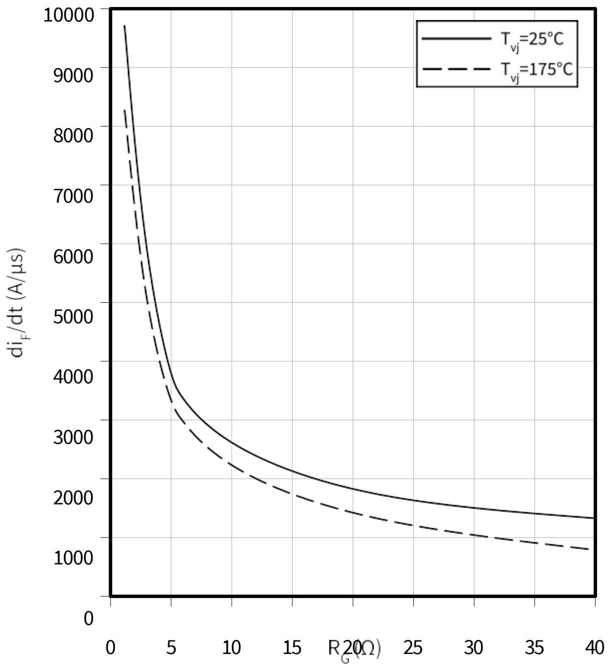


Typical reverse recovery charge as a function of diode current slope $Q_{rr} = f(di_F/dt)$ $V_R = 470$ V, $I_F = 200$ A	**Typical reverse recovery current as a function of diode current slope** $I_{rrm} = f(di_F/dt)$ $V_R = 470$ V, $I_F = 200$ A
	
Typical diode peak rate of fall of reverse recovery current as a function of diode current slope $di_{rr}/dt = f(di_F/dt)$ $I_F = 200$ A, $V_R = 470$ V	**Typical reverse energy losses as a function of diode current slope** $E_{rec} = f(di_F/dt)$ $V_R = 470$ V, $I_F = 200$ A
	

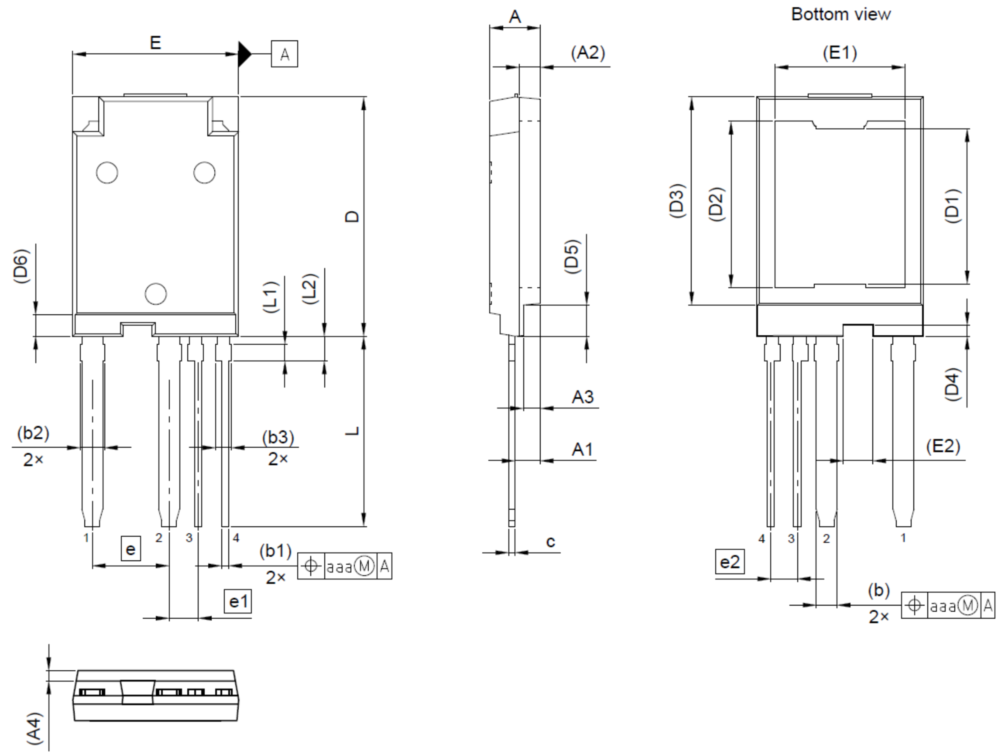
Typical diode current slope as a function of gate resistor

$di_F/dt = f(R_G)$

$V_R = 470$ V, $I_F = 200$ A



5 封装外形



PACKAGE - GROUP NUMBER: **PG-TO247-4-U06**

DIMENSIONS	MILLIMETERS MIN.	MILLIMETERS MAX.
A	4.7	4.9
A1	2.16	2.66
A2	2	
A3	1.51	1.71
A4	0.99	
b	2	
b1	0.7	
b2	2.3	
b3	1.5	
c	0.5	0.7
D	22.7	22.9
D1	14.79	
D2	15.86	
D3	19.82	

DIMENSIONS	MILLIMETERS MIN.	MILLIMETERS MAX.
D4	1.03	
D5	2.98	
D6	2.05	
E	15.7	15.9
E1	12.38	
E2	2.8	
e	7.32	
e1	2.79	
e2	2.54	
L	18.01	18.21
L1	1.6	
L2	2.36	
aaa	0.25	

1) All metal surfaces tin plated except area of cut
2) Mold gate protrusion after degating.
All dimensions are in units mm
The drawing is in compliance with ISO 128-30, Projection Method 3 [⌖◁]
Drawing according to ISO 8015, general tolerances

图 1

6 测试条件

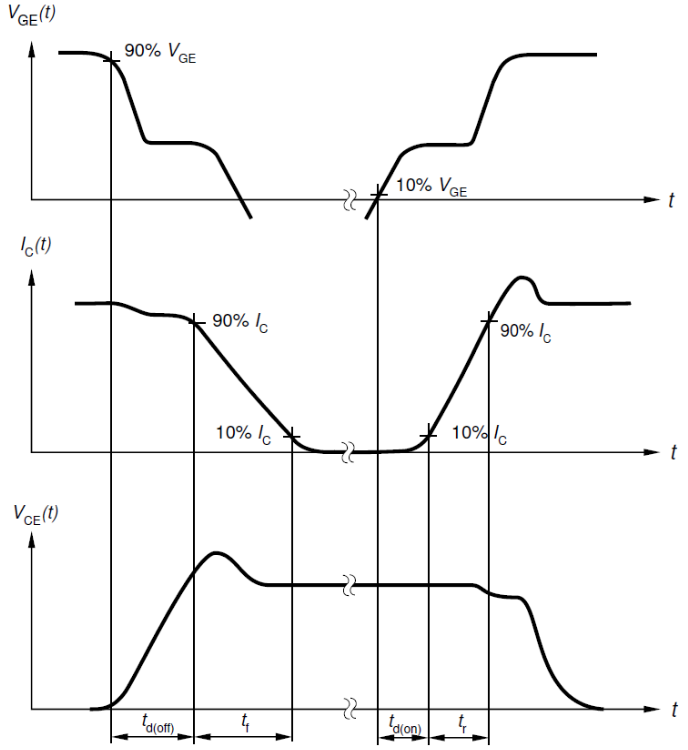


Figure A. **Definition of switching times**

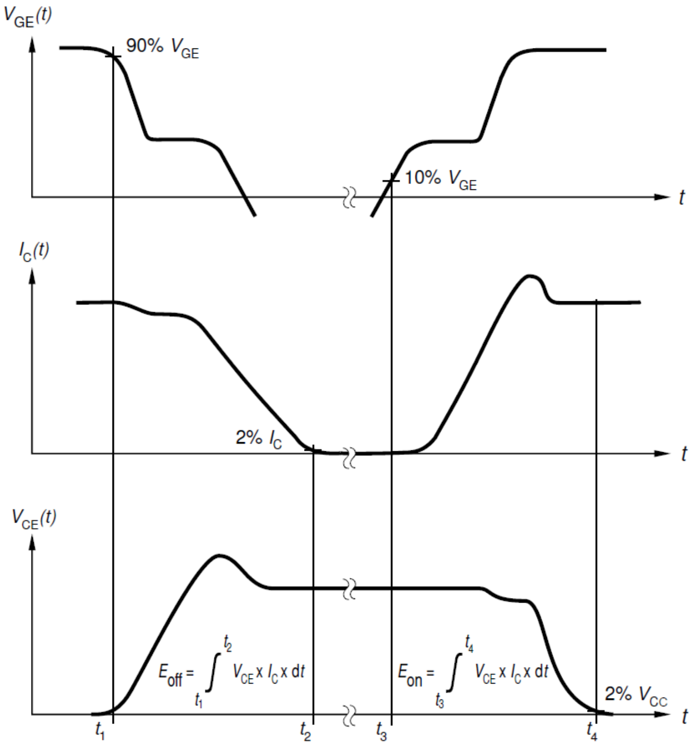


Figure B. **Definition of switching losses**

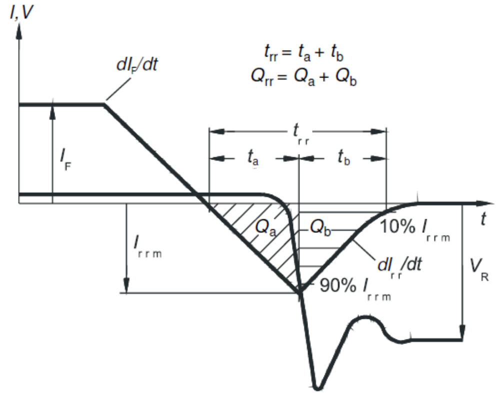


Figure C. **Definition of diode switching characteristics**

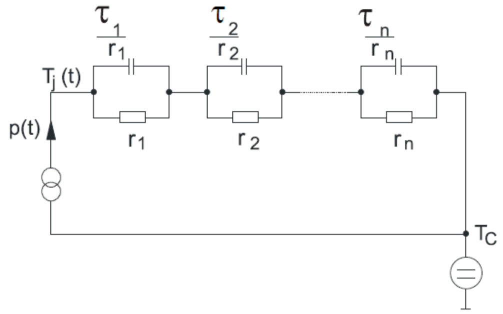


Figure D. **Thermal equivalent circuit**

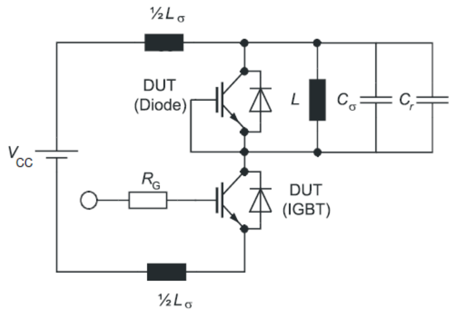


Figure E. **Dynamic test circuit**
Parasitic inductance L_{σ},
parasitic capacitor C_{σ},
relief capacitor C_r,
(only for ZVT switching)

图 2

修订记录

Document revision	Date of release	Description of changes
0.10	2024-03-26	Preliminary datasheet
1.00	2024-07-24	Final datasheet
1.10	2024-07-30	Adjust legend in Vce(Tvj) graph
1.20	2025-06-10	Transient thermal impedance plots, package naming convention, and qualification labels updated according to the latest guidelines

免责声明

请注意，本文件的原文使用英文撰写，为方便客户浏览英飞凌提供了中文译文。该中文译文仅供参考，并不可作为任何论点之依据。
由于翻译过程中可能使用了自动化程序，以及语言翻译和转换过程中的差异，最后的中文译文与最新的英文版本原文含义可能存在不尽相同之处。
因此，我们同时提供该中文译文版本的最新英文原文供您阅读，请参见 http://www.infineon.com
英文原文和中文译文版本之间若存有任何歧异，以最新的英文版本为准，并且仅认可英文版本为正式文件。

您如果使用本文件，即表示您同意并理解上述说明。英飞凌不对因翻译过程中可能存在的任何不完整或不准确信息而产生的任何直接或间接损失或损害负责。英飞凌不承担中文译文版本的完整性和准确性责任。如果您不同意上述说明，请不要使用本文件。

Trademarks
All referenced product or service names and trademarks are the property of their respective owners.

版本 **2025-12-24**

Infineon Technologies AG 出版，
德国 **Neubiberg 85579**

Do you have a question about this document?

Email:

erratum@infineon.com