

Low Loss Duopack: IGBT 7 with Trench and Fieldstop technology

Features

- $V_{CE} = 650\text{ V}$
- $I_C = 30\text{ A}$
- Very Low V_{CEsat}
- Low turn-off losses
- Short tail current
- Reduced EMI
- Humidity robust design
- Very soft, fast recovery antiparallel diode
- Maximum junction temperature $T_{vjmax} = 175^\circ\text{C}$
- Qualified according to JEDEC for target applications
- Pb-free lead plating; RoHS compliant
- Complete product spectrum and PSpice Models: <http://www.infineon.com/igbt7/>

Potential applications

- Servo Drives
- General Purpose Drives (GPD)
- Industrial Power Supplies
- Industrial UPS
- Industrial SMPS
- Energy Generation
- Solar Optimizer
- Solar String Inverter

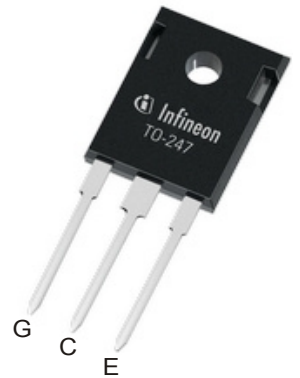
Product validation

- Product Validation: Qualified for industrial applications according to the relevant tests of JEDEC47/20/22

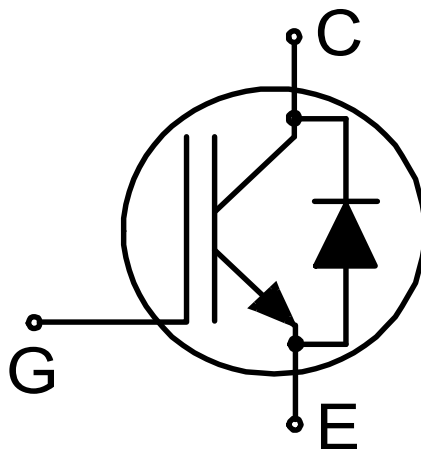
Description

Package pin definition:

- Pin C & backside - Collector
- Pin E - Emitter
- Pin G - Gate



-  Lead-Free
-  Green
-  Halogen-Free
-  RoHS



Type	Package	Marking
IKW30N65ET7	PG-TO247-3	K30EET7

Table of contents

	Description	1
	Features	1
	Potential applications	1
	Product validation	1
	Table of contents	2
1	Package	3
2	IGBT	3
3	Diode	6
4	Characteristics diagrams	9
5	Package outlines	16
6	Testing conditions	17
	Revision history	18
	Disclaimer	19

1 Package

Table 1 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Internal emitter inductance measured 5 mm (0.197 in) from case	L_E			13.0		nH
Storage temperature	T_{stg}		-55		150	°C
Soldering temperature		wave soldering 1.6 mm (0.063 in.) from case for 10 s			260	°C
Mounting torque, M3 screw Maximum of mounting processes: 3	M				0.6	Nm
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	K/W

2 IGBT

Table 2 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Collector-emitter voltage	V_{CE}	$T_{vj} \geq 25 \text{ °C}$	650	V	
DC collector current, limited by T_{vjmax}	I_C		$T_C = 25 \text{ °C}$	60	A
			$T_C = 100 \text{ °C}$	39.1	
Pulsed collector current, t_p limited by T_{vjmax} ¹⁾	I_{Cpuls}		90	A	
Turn-off safe operating area ²⁾		$V_{CE} \leq 650 \text{ V}$, $t_p = 1 \text{ }\mu\text{s}$, $T_{vj} \leq 175 \text{ °C}$	90	A	
Gate-emitter voltage	V_{GE}		± 20	V	
Transient gate-emitter voltage	V_{GE}	$t_p \leq 10 \text{ }\mu\text{s}$, $D < 0.010$	± 30	V	
Short circuit withstand time	t_{SC}	$V_{GE} = 15 \text{ V}$, Allowed number of short circuits < 1000, Time between short circuits $\geq 1.0 \text{ s}$	$V_{CC} \leq 330 \text{ V}$, $T_{vj} = 100 \text{ °C}$	5	μs
			$V_{CC} \leq 400 \text{ V}$, $T_{vj} = 150 \text{ °C}$	3	
Power dissipation	P_{tot}		$T_C = 25 \text{ °C}$	188	W
			$T_C = 100 \text{ °C}$	94	

1) Defined by design. Not subject to production test.

2) Clamped inductive load current test for each device, $I_C=90\text{A}$, $V_{CC}=400\text{V}$, $T_C=25\text{°C}$, $V_{GE}=20\text{V}$, $L=80\mu\text{H}$, $R_G=10\Omega$

Table 3 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE\ sat}$	$I_C = 30.0\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$	1.35	1.65	V
			$T_{vj} = 125\ ^\circ C$	1.50		
			$T_{vj} = 175\ ^\circ C$	1.60		
Gate-emitter threshold voltage	V_{GEth}	$I_C = 0.30\ mA, V_{CE} = V_{GE}$	4.30	5.00	5.70	V
Zero gate voltage collector current	I_{CES}	$V_{CE} = 650\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$		40	μA
			$T_{vj} = 175\ ^\circ C$		800	
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\ V, V_{GE} = 20\ V$			100	nA
Transconductance	g_{fs}	$I_C = 30.0\ A, V_{CE} = 20\ V$		15		S
Short circuit collector current	I_{SC}	$V_{GE} = 15\ V, t_{SC} \leq 3\ \mu s$, Allowed number of short circuits < 1000 , Time between short circuits $\geq 1.0\ s, T_{vj} = 150\ ^\circ C$		160		A
Input capacitance	C_{ies}	$V_{CE} = 25\ V, V_{GE} = 0\ V, f = 1000\ kHz$		1900		pF
Output capacitance	C_{oes}	$V_{CE} = 25\ V, V_{GE} = 0\ V, f = 1000\ kHz$		62		pF
Reverse transfer capacitance	C_{res}	$V_{CE} = 25\ V, V_{GE} = 0\ V, f = 1000\ kHz$		20		pF
Gate charge	Q_G	$I_C = 30.0\ A, V_{GE} = 15\ V, V_{CE} = 520\ V$		180		nC
Turn-on delay time	t_{don}	$V_{CE} = 400\ V, V_{GE} = 15\ V,$ $R_{Gon} = 10.0\ \Omega,$ $R_{Goff} = 10.0\ \Omega,$ $L_\sigma = 32\ nH, C_\sigma = 30\ pF$	$T_{vj} = 25\ ^\circ C,$ $I_C = 30.0\ A$	20		ns
			$T_{vj} = 25\ ^\circ C,$ $I_C = 15.0\ A$	19		
			$T_{vj} = 175\ ^\circ C,$ $I_C = 30.0\ A$	22		
			$T_{vj} = 175\ ^\circ C,$ $I_C = 15.0\ A$	20		
Rise time (inductive load)	t_r	$V_{CE} = 400\ V, V_{GE} = 15\ V,$ $R_{Gon} = 10.0\ \Omega,$ $R_{Goff} = 10.0\ \Omega,$ $L_\sigma = 32\ nH, C_\sigma = 30\ pF$	$T_{vj} = 25\ ^\circ C,$ $I_C = 30.0\ A$	12		ns
			$T_{vj} = 25\ ^\circ C,$ $I_C = 15.0\ A$	7		
			$T_{vj} = 175\ ^\circ C,$ $I_C = 30.0\ A$	15		
			$T_{vj} = 175\ ^\circ C,$ $I_C = 15.0\ A$	9		

Table 3 Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-off delay time	t_{doff}	$V_{\text{CE}} = 400 \text{ V}, V_{\text{GE}} = 15 \text{ V},$ $R_{\text{Gon}} = 10.0 \ \Omega,$ $R_{\text{Goff}} = 10.0 \ \Omega,$ $L_{\sigma} = 32 \text{ nH}, C_{\sigma} = 30 \text{ pF}$	$T_{\text{vj}} = 25 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 30.0 \text{ A}$	245		ns
			$T_{\text{vj}} = 25 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 15.0 \text{ A}$	265		
			$T_{\text{vj}} = 175 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 30.0 \text{ A}$	300		
			$T_{\text{vj}} = 175 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 15.0 \text{ A}$	355		
Fall time (inductive load)	t_{f}	$V_{\text{CE}} = 400 \text{ V}, V_{\text{GE}} = 15 \text{ V},$ $R_{\text{Gon}} = 10.0 \ \Omega,$ $R_{\text{Goff}} = 10.0 \ \Omega,$ $L_{\sigma} = 32 \text{ nH}, C_{\sigma} = 30 \text{ pF}$	$T_{\text{vj}} = 25 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 30.0 \text{ A}$	11		ns
			$T_{\text{vj}} = 25 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 15.0 \text{ A}$	9		
			$T_{\text{vj}} = 175 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 30.0 \text{ A}$	45		
			$T_{\text{vj}} = 175 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 15.0 \text{ A}$	53		
Turn-on energy	E_{on}	$V_{\text{CE}} = 400 \text{ V}, V_{\text{GE}} = 15 \text{ V},$ $R_{\text{Gon}} = 10.0 \ \Omega,$ $R_{\text{Goff}} = 10.0 \ \Omega,$ $L_{\sigma} = 32 \text{ nH}, C_{\sigma} = 30 \text{ pF}$	$T_{\text{vj}} = 25 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 30.0 \text{ A}$	0.59		mJ
			$T_{\text{vj}} = 25 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 15.0 \text{ A}$	0.26		
			$T_{\text{vj}} = 175 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 30.0 \text{ A}$	0.96		
			$T_{\text{vj}} = 175 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 15.0 \text{ A}$	0.49		
Turn-off energy	E_{off}	$V_{\text{CE}} = 400 \text{ V}, V_{\text{GE}} = 15 \text{ V},$ $R_{\text{Gon}} = 10.0 \ \Omega,$ $R_{\text{Goff}} = 10.0 \ \Omega,$ $L_{\sigma} = 32 \text{ nH}, C_{\sigma} = 30 \text{ pF}$	$T_{\text{vj}} = 25 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 30.0 \text{ A}$	0.50		mJ
			$T_{\text{vj}} = 25 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 15.0 \text{ A}$	0.22		
			$T_{\text{vj}} = 175 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 30.0 \text{ A}$	0.90		
			$T_{\text{vj}} = 175 \text{ }^{\circ}\text{C},$ $I_{\text{C}} = 15.0 \text{ A}$	0.47		

Table 3 Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Total switching energy	E_{ts}	$V_{CE} = 400\text{ V}$, $R_{Gon} = 10.0\ \Omega$, $R_{Goff} = 10.0\ \Omega$, $L_{\sigma} = 32\text{ nH}$, $C_{\sigma} = 30\text{ pF}$	$T_{vj} = 25\text{ }^{\circ}\text{C}$, $I_C = 30.0\text{ A}$		1.09		mJ
			$T_{vj} = 25\text{ }^{\circ}\text{C}$, $I_C = 15.0\text{ A}$		0.48		
			$T_{vj} = 175\text{ }^{\circ}\text{C}$, $I_C = 30.0\text{ A}$		1.86		
			$T_{vj} = 175\text{ }^{\circ}\text{C}$, $I_C = 15.0\text{ A}$		0.96		
IGBT thermal resistance, junction-case	R_{thjc}				0.80	K/W	
Operating junction temperature	T_{vj}		-40		175	$^{\circ}\text{C}$	

Note: Electrical Characteristic, at $T_{vj}=25^{\circ}\text{C}$, unless otherwise specified.

3 Diode

Table 4 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} \geq 25\text{ }^{\circ}\text{C}$	650	V	
Diode forward current, limited by T_{vjmax}	I_F	limited by bondwire	$T_C = 25\text{ }^{\circ}\text{C}$	40	A
			$T_C = 100\text{ }^{\circ}\text{C}$	34.8	
Diode pulsed current, limited by T_{vjmax} ¹⁾	I_{Fpuls}		90	A	

1) Defined by design. Not subject to production test.

Table 5 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Diode forward voltage	V_F	$I_F = 30.0\text{ A}$	$T_{vj} = 25\text{ }^{\circ}\text{C}$		1.65	2.00	V
			$T_{vj} = 125\text{ }^{\circ}\text{C}$		1.60		
			$T_{vj} = 175\text{ }^{\circ}\text{C}$		1.55		
Reverse leakage current	I_R		$T_{vj} = 25\text{ }^{\circ}\text{C}$			40	μA
			$T_{vj} = 175\text{ }^{\circ}\text{C}$		800		

Table 5 Characteristic values (continued)

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Diode reverse recovery time	t_{rr}	$V_R = 400\text{ V}$	$T_{vj} = 25\text{ °C},$ $I_F = 30.0\text{ A},$ $-di_F/dt = 1700\text{ A}/\mu\text{s}$		80		ns
					55		
					140		
					105		
Diode reverse recovery charge	Q_{rr}	$V_R = 400\text{ V}$	$T_{vj} = 25\text{ °C},$ $I_F = 30.0\text{ A},$ $-di_F/dt = 1700\text{ A}/\mu\text{s}$		0.68		μC
					0.48		
					1.90		
					1.36		
Diode peak reverse recovery current	I_{rrm}	$V_R = 400\text{ V}$	$T_{vj} = 25\text{ °C},$ $I_F = 30.0\text{ A},$ $-di_F/dt = 1700\text{ A}/\mu\text{s}$		18.4		A
					20.0		
					25.0		
					25.8		

Table 5 Characteristic values (continued)

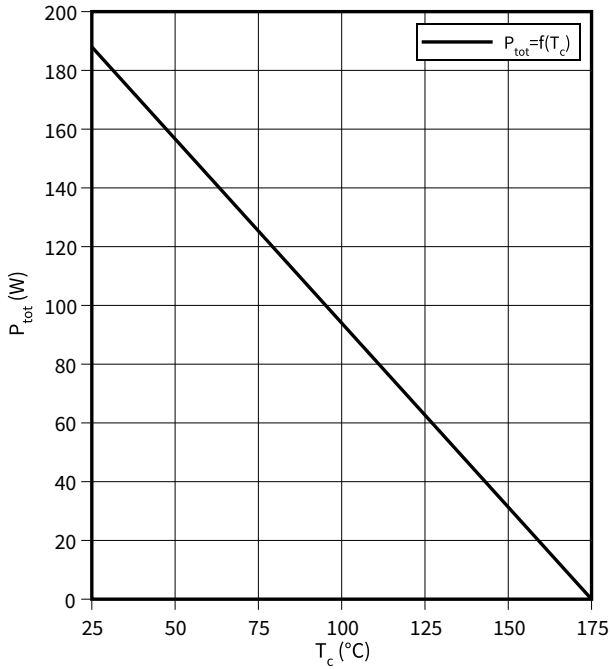
Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Diode peak rate off fall of reverse recovery current	di_{rr}/dt	$V_R = 400\text{ V}$	$T_{vj} = 25\text{ °C},$ $I_F = 30.0\text{ A},$ $-di_F/dt = 1700\text{ A}/\mu\text{s}$		-270		A/ μs
			$T_{vj} = 25\text{ °C},$ $I_F = 15.0\text{ A},$ $-di_F/dt = 1830\text{ A}/\mu\text{s}$		-440		
			$T_{vj} = 175\text{ °C},$ $I_F = 30.0\text{ A},$ $-di_F/dt = 1475\text{ A}/\mu\text{s}$		-205		
			$T_{vj} = 175\text{ °C},$ $I_F = 15.0\text{ A},$ $-di_F/dt = 1580\text{ A}/\mu\text{s}$		-295		
Diode thermal resistance, junction-case	R_{thjc}				1.10	K/W	
Operating junction temperature	T_{vj}		-40		175	°C	

Note: For optimum lifetime and reliability, Infineon recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet.

4 Characteristics diagrams

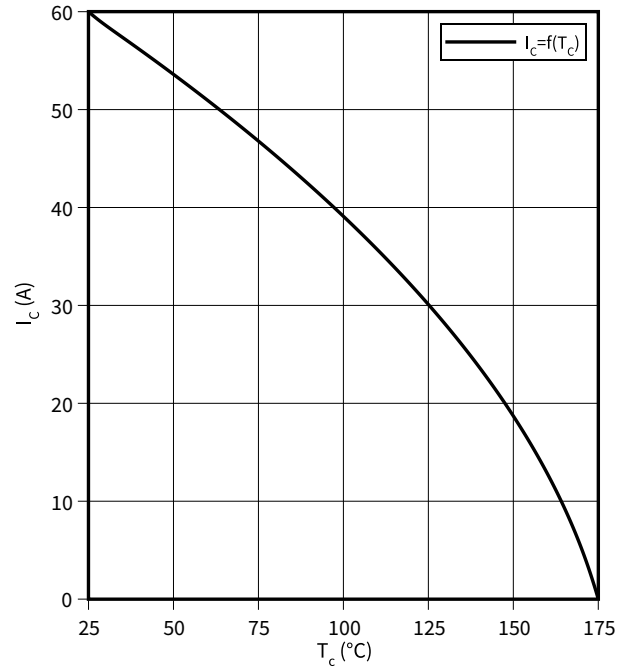
Power dissipation as a function of case temperature, IGBT

$P_{tot} = f(T_c)$
 $T_{vj} \leq 175\text{ °C}$



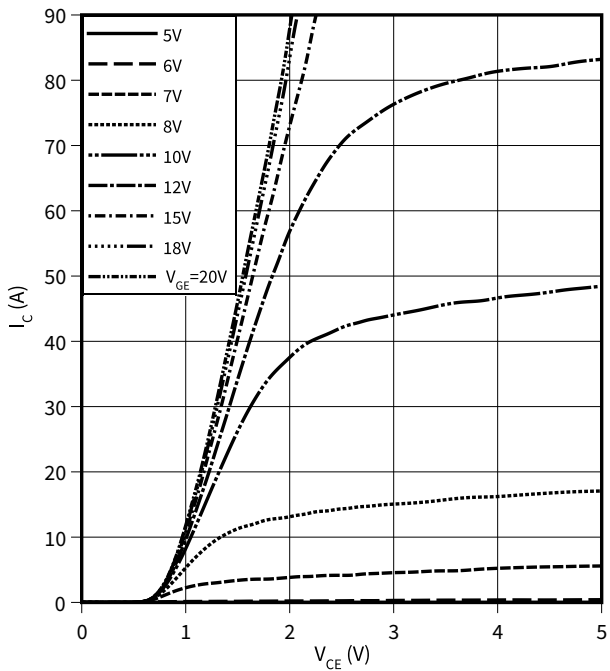
Collector current as a function of case temperature, IGBT

$I_c = f(T_c)$
 $V_{GE} \geq 15\text{ V}, T_{vj} \leq 175\text{ °C}$



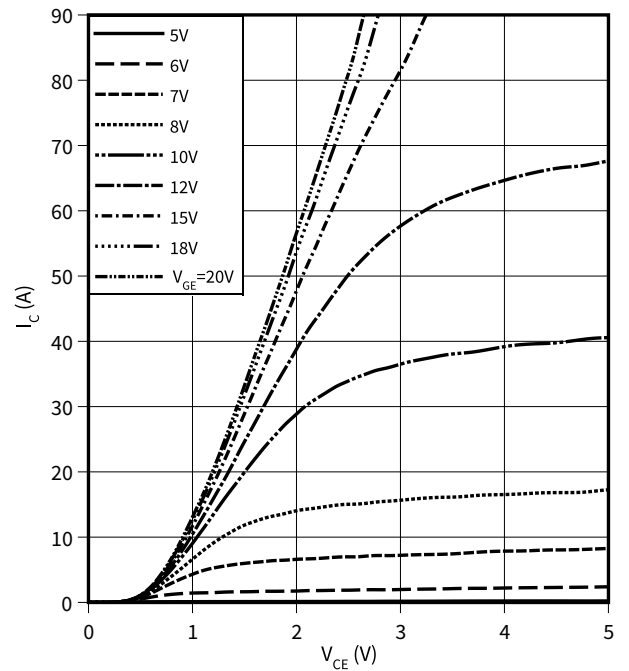
Typical output characteristic, IGBT

$I_c = f(V_{CE})$
 $T_{vj} = 25\text{ °C}$



Typical output characteristic, IGBT

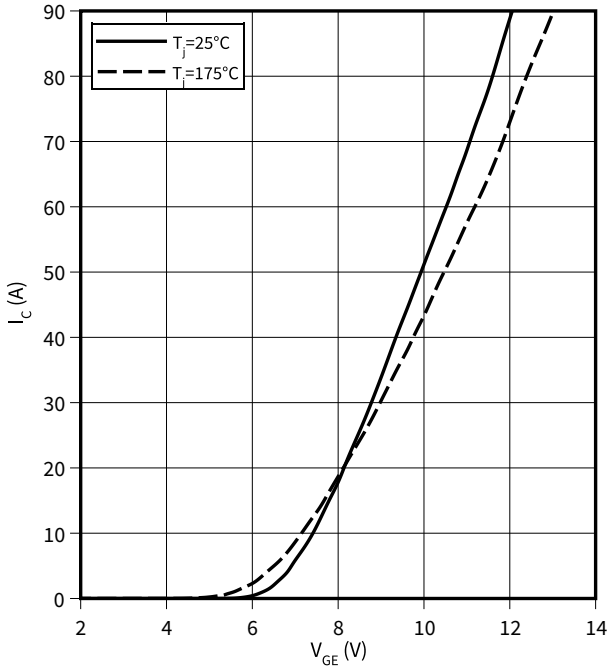
$I_c = f(V_{CE})$
 $T_{vj} = 175\text{ °C}$



4 Characteristics diagrams

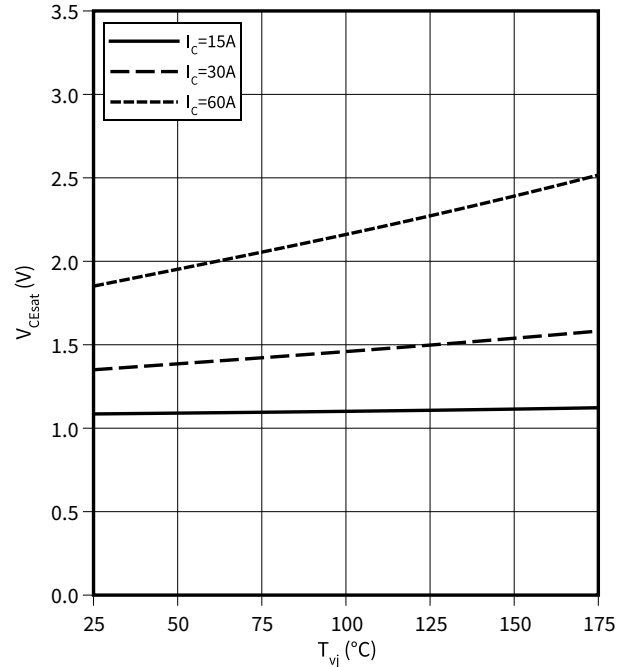
Typical transfer characteristic, IGBT

$I_C = f(V_{GE})$
 $V_{CE} = 20\text{ V}$



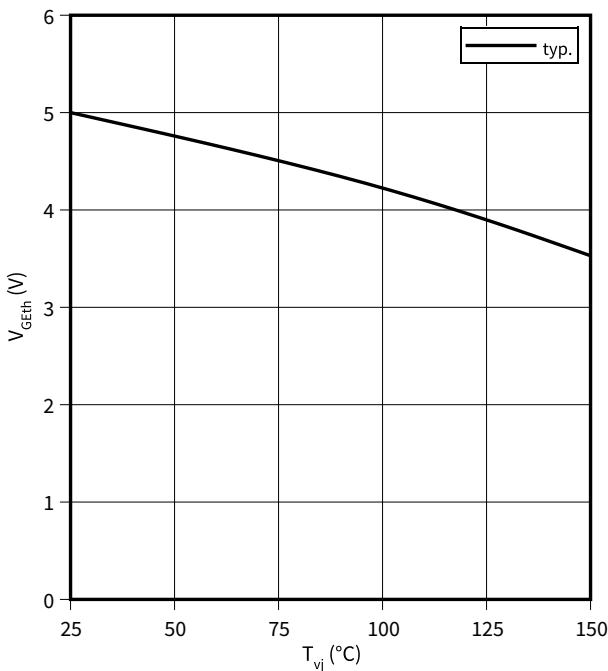
Typical collector-emitter saturation voltage as a function of junction temperature, IGBT

$V_{CEsat} = f(T_{vj})$
 $V_{GE} = 15\text{ V}$



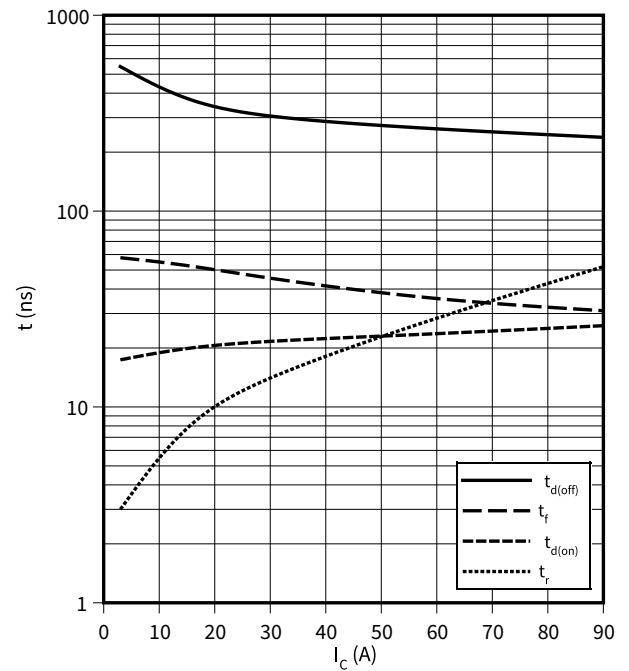
Gate-emitter threshold voltage as a function of junction temperature, IGBT

$V_{GEth} = f(T_{vj})$
 $I_C = 0.30\text{ mA}$



Typical switching times as a function of collector current, IGBT

$t = f(I_C)$
 $V_{CE} = 400\text{ V}, T_{vj} = 175^\circ\text{C}, V_{GE} = 0/15\text{ V}, R_G = 10\ \Omega$

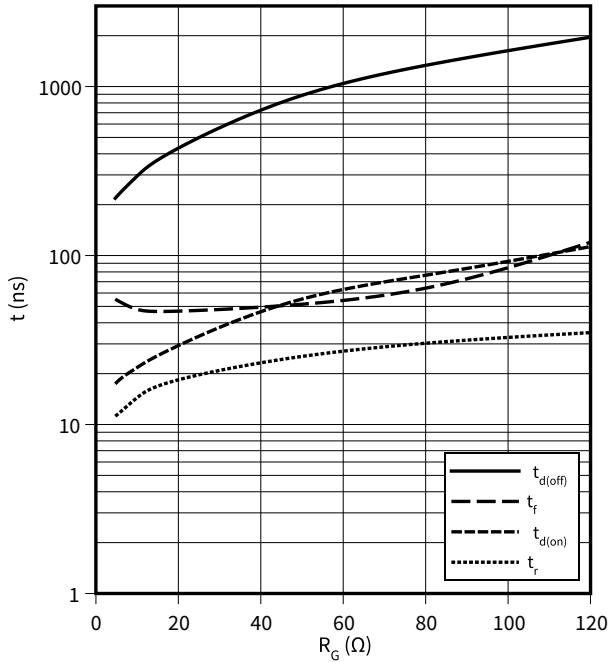


4 Characteristics diagrams

Typical switching times as a function of gate resistor, IGBT

$t = f(R_G)$

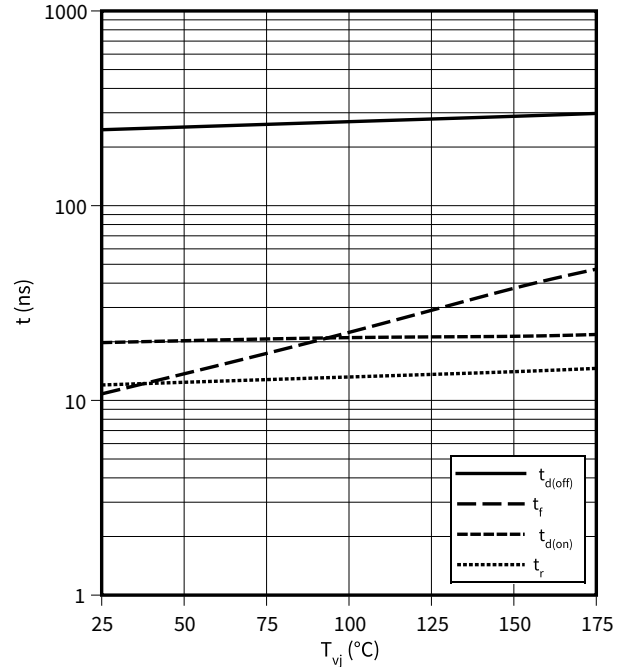
$I_C = 30.0 \text{ A}, V_{CE} = 400 \text{ V}, T_{vj} = 175 \text{ }^\circ\text{C}, V_{GE} = 0/15 \text{ V}$



Typical switching times as a function of junction temperature, IGBT

$t = f(T_{vj})$

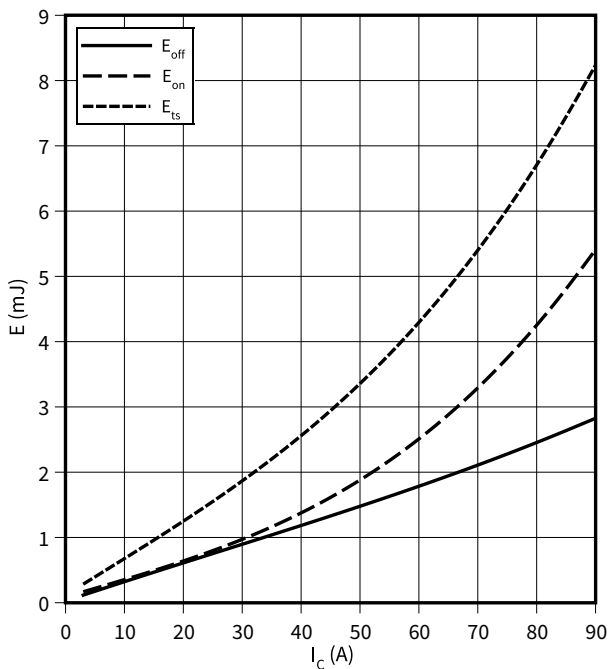
$I_C = 30.0 \text{ A}, V_{CE} = 400 \text{ V}, V_{GE} = 0/15 \text{ V}, R_G = 10 \text{ } \Omega$



Typical switching energy losses as a function of collector current, IGBT

$E = f(I_C)$

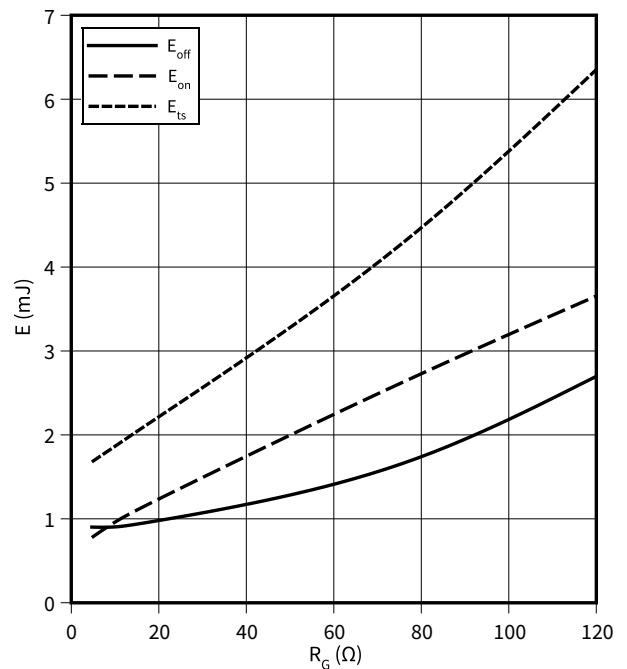
$V_{CE} = 400 \text{ V}, T_{vj} = 175 \text{ }^\circ\text{C}, V_{GE} = 0/15 \text{ V}, R_G = 10 \text{ } \Omega$



Typical switching energy losses as a function of gate resistor, IGBT

$E = f(R_G)$

$I_C = 30.0 \text{ A}, V_{CE} = 400 \text{ V}, T_{vj} = 175 \text{ }^\circ\text{C}, V_{GE} = 0/15 \text{ V}$

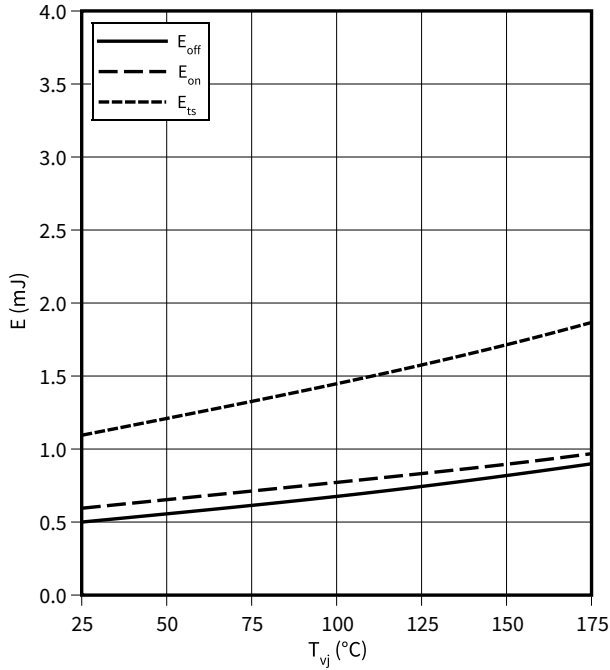


4 Characteristics diagrams

Typical switching energy losses as a function of junction temperature, IGBT

$E = f(T_{vj})$

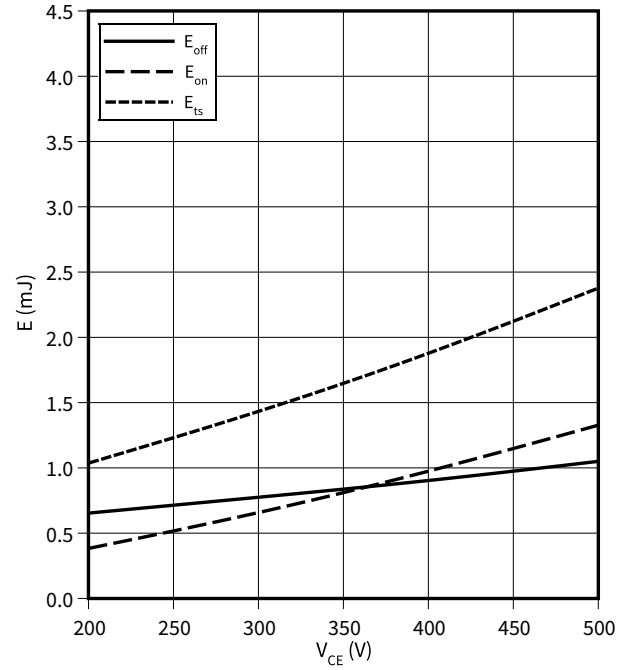
$I_C = 30.0 \text{ A}$, $V_{CE} = 400 \text{ V}$, $V_{GE} = 0/15 \text{ V}$, $R_G = 10 \Omega$



Typical switching energy losses as a function of collector emitter voltage, IGBT

$E = f(V_{CE})$

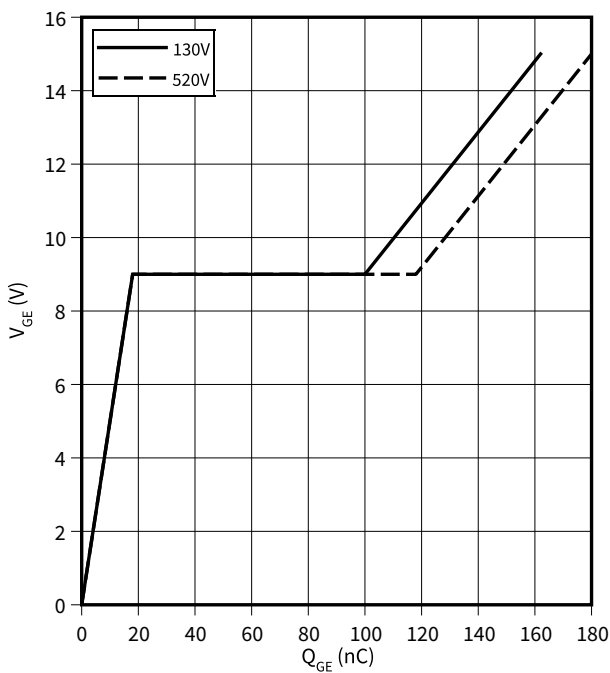
$I_C = 30.0 \text{ A}$, $T_{vj} = 175 \text{ °C}$, $V_{GE} = 0/15 \text{ V}$, $R_G = 10 \Omega$



Typical gate charge, IGBT

$V_{GE} = f(Q_{GE})$

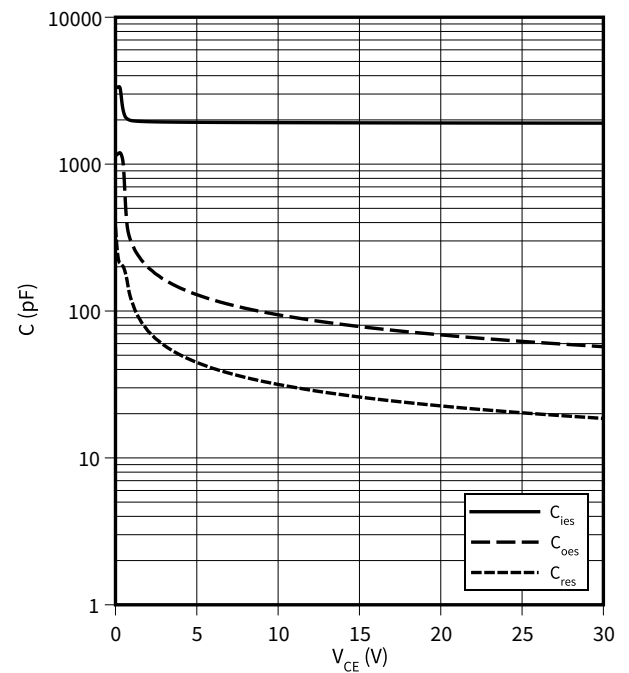
$I_C = 30.0 \text{ A}$



Typical capacitance as a function of collector-emitter voltage, IGBT

$C = f(V_{CE})$

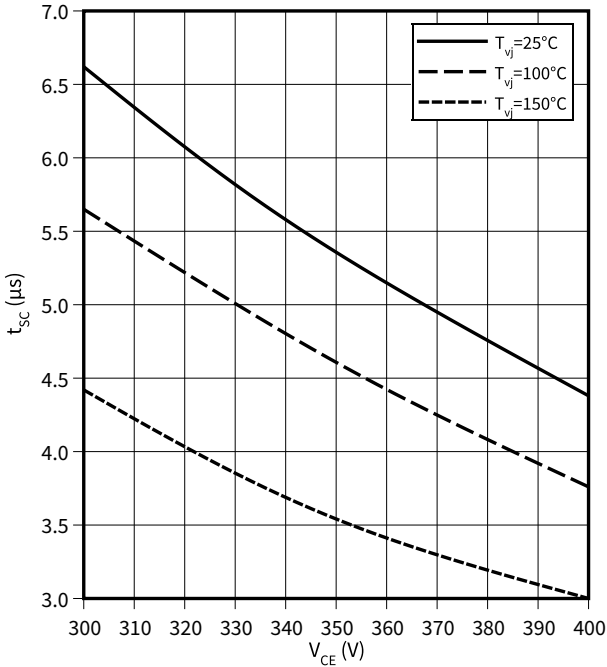
$f = 1000 \text{ kHz}$, $V_{GE} = 0 \text{ V}$



4 Characteristics diagrams

Typical short circuit safe operating range as a function of collector-emitter voltage, IGBT

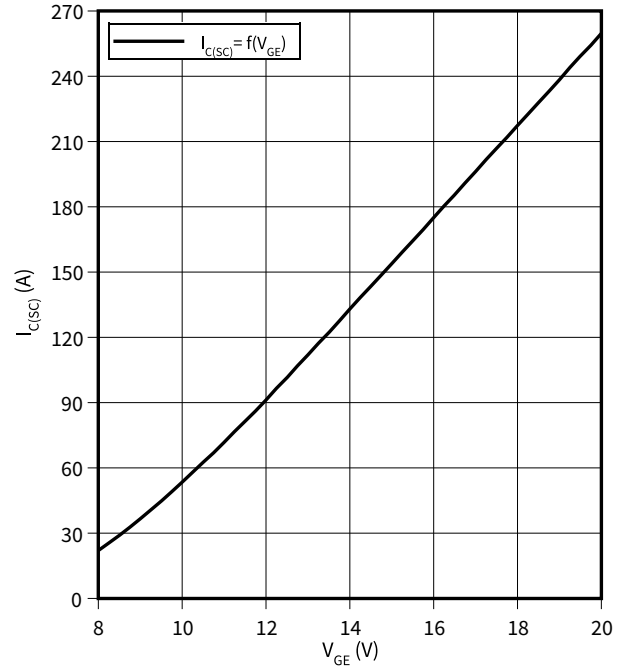
$t_{SC} = f(V_{CE})$



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

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

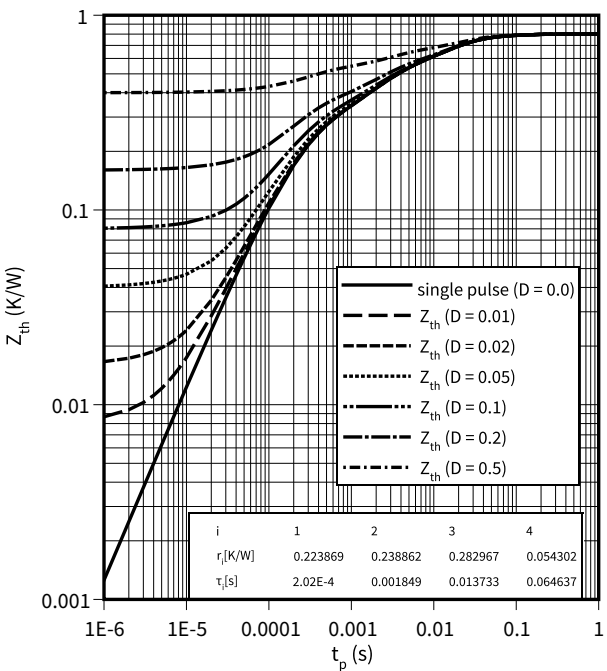
V_{CE} = 400 V, T_{vj} = 150 °C



IGBT transient thermal resistance, IGBT

$Z_{th} = f(t_p)$

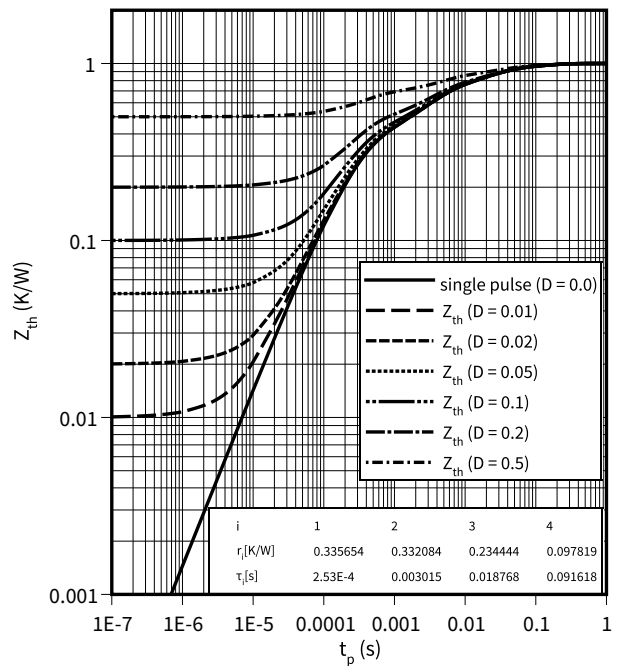
$D = t_p/T$



Diode transient thermal impedance as a function of pulse width, Diode

$Z_{th} = f(t_p)$

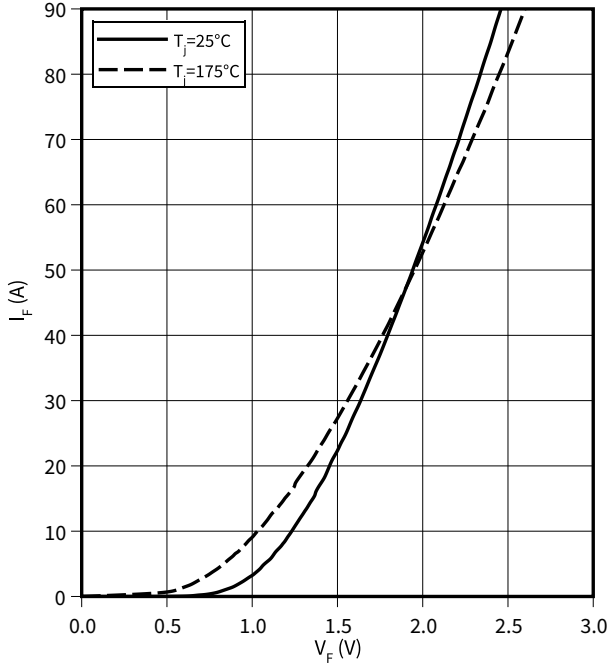
$D = t_p/T$



4 Characteristics diagrams

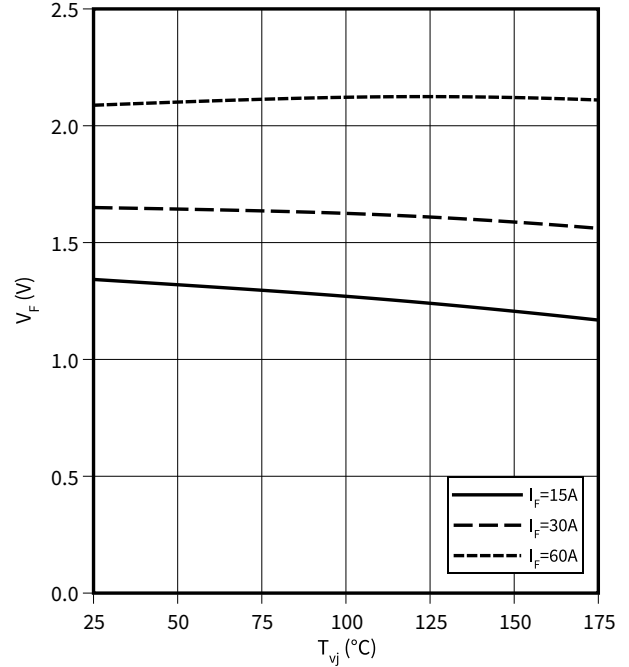
Typical diode forward current as a function of forward voltage, Diode

$I_F = f(V_F)$



Typical diode forward voltage as a function of junction temperature, Diode

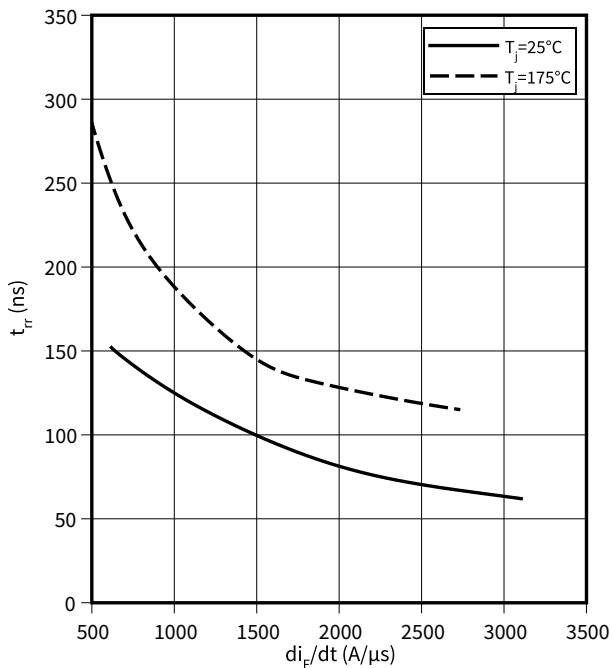
$V_F = f(T_{vj})$



Typical reverse recovery time as a function of diode current slope, Diode

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

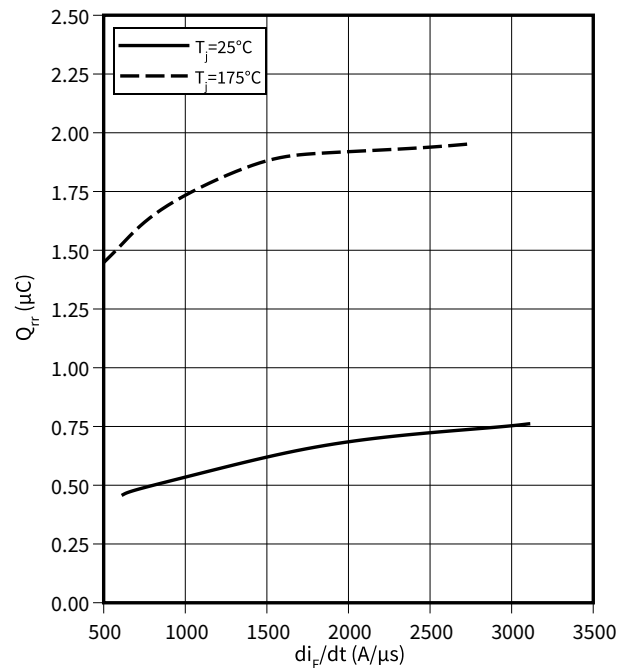
$V_R = 400\text{ V}, I_F = 30.0\text{ A}$



Typical reverse recovery charge as a function of diode current slope, Diode

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

$V_R = 400\text{ V}, I_F = 30.0\text{ A}$

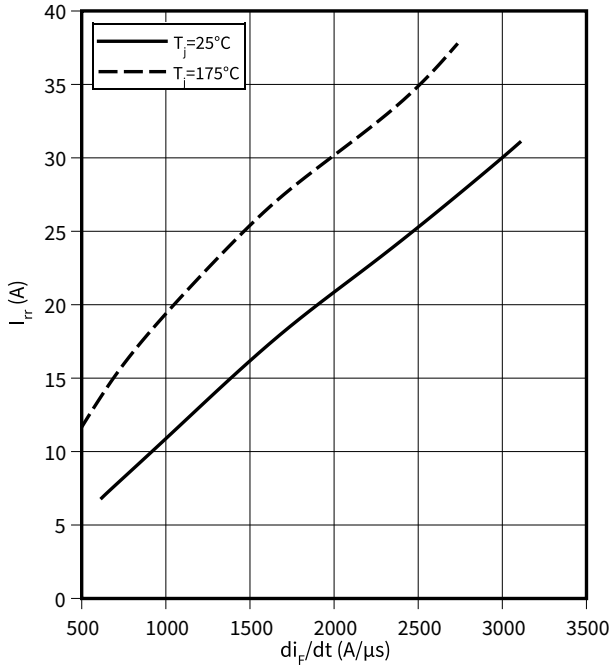


4 Characteristics diagrams

Typical reverse recovery current as a function of diode current slope, Diode

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

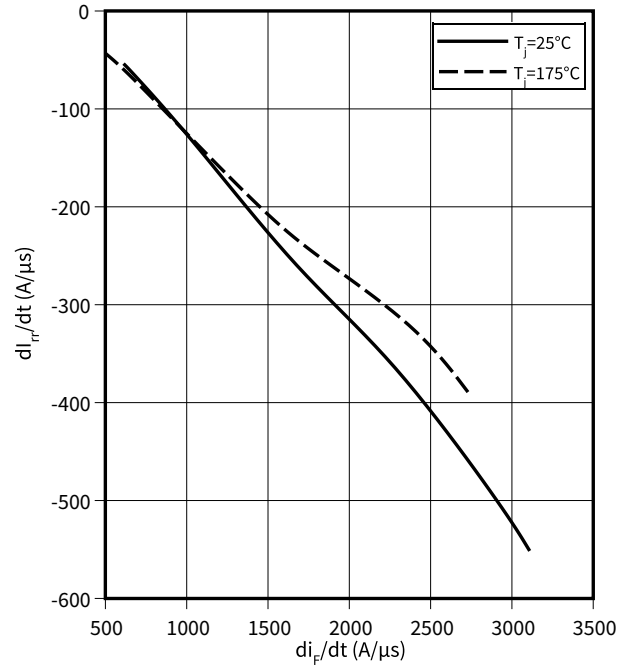
$V_R = 400\text{ V}$, $I_F = 30.0\text{ A}$



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

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

$V_R = 400\text{ V}$, $I_F = 30.0\text{ A}$



5 Package outlines

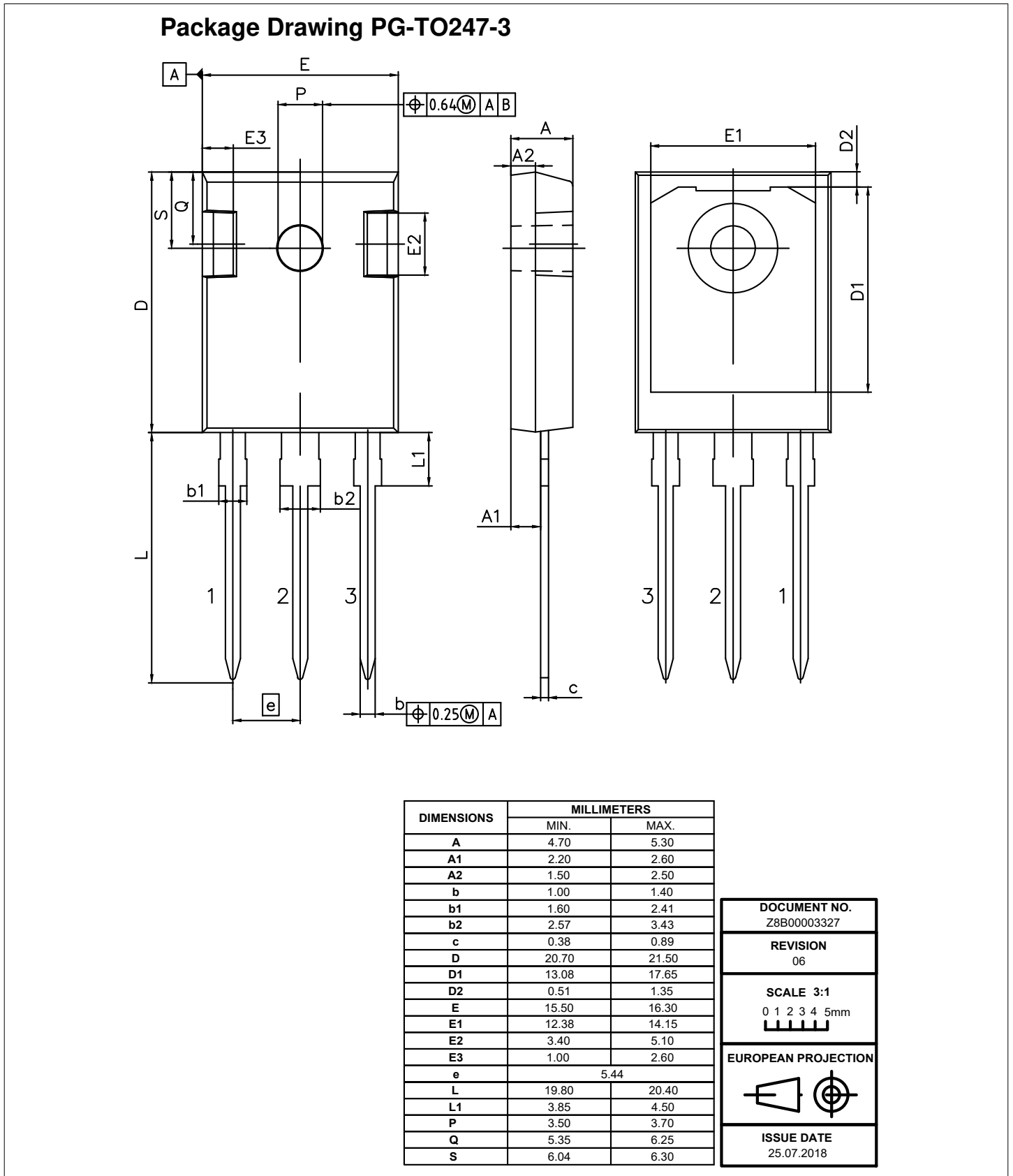


Figure 6

6 Testing conditions

6 Testing conditions

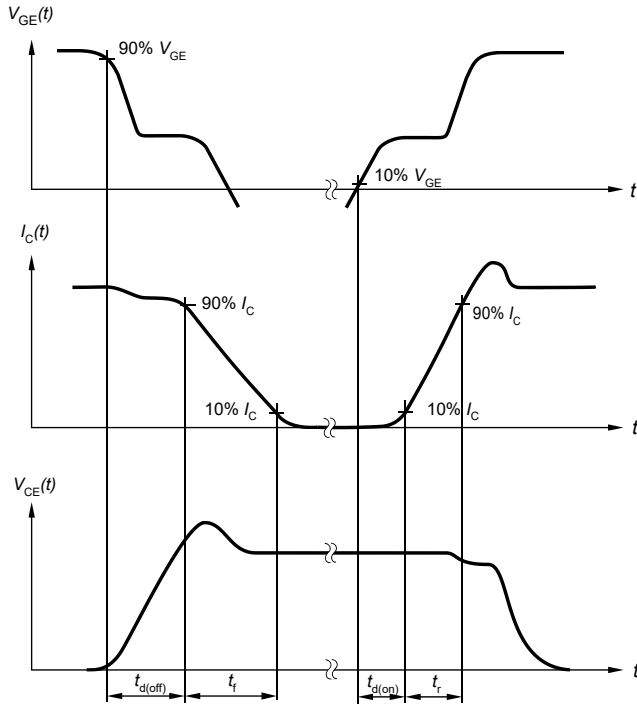


Figure A. Definition of switching times

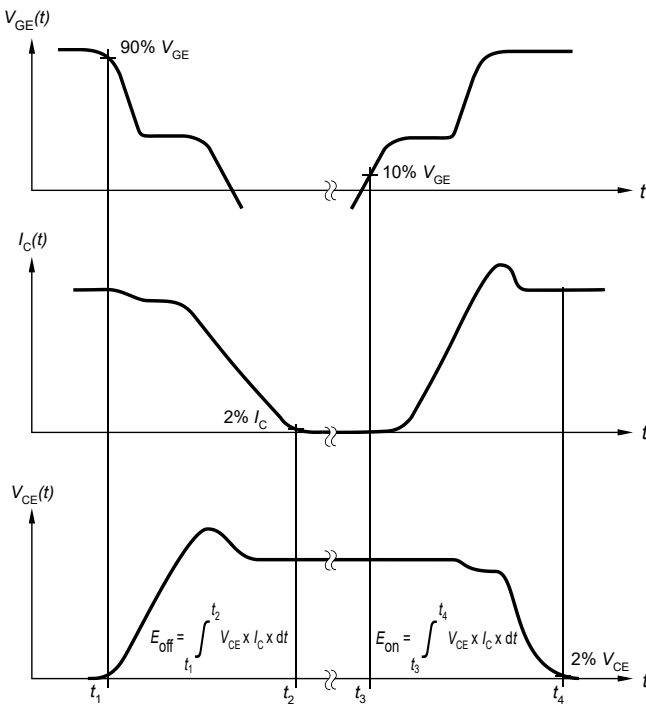


Figure B. Definition of switching losses

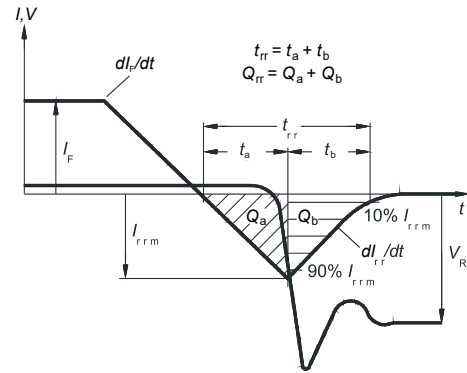


Figure C. Definition of diode switching characteristics

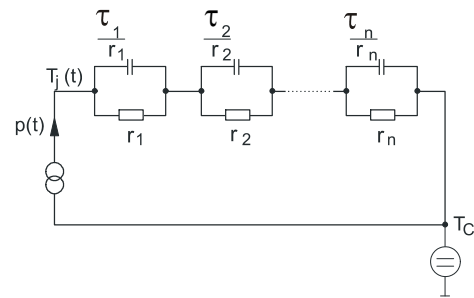


Figure D. Thermal equivalent circuit

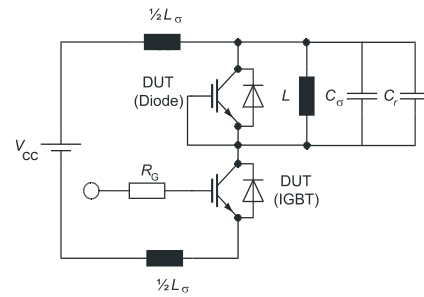


Figure E. Dynamic test circuit
 Parasitic inductance L_σ ,
 parasitic capacitor C_σ ,
 relief capacitor C_r ,
 (only for ZVT switching)

Figure 7

Revision history

Revision history

Document revision	Date of release	Description of changes
V1.1	2020-04-20	Preliminary data sheet
V2.1	2020-05-12	Final data sheet
1.00	2021-06-29	Change of potential applications and new diagram added (t_{SC} as function of V_{CE})

Trademarks

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

Edition 2021-06-29

Published by

Infineon Technologies AG

81726 Munich, Germany

© 2021 Infineon Technologies AG

All Rights Reserved.

Do you have a question about any aspect of this document?

Email: erratum@infineon.com

Document reference

IFX-AAL381-003

IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffheitsgarantie").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

Please note that this product is not qualified according to the AEC Q100 or AEC Q101 documents of the Automotive Electronics Council.

WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.

单击下面可查看定价，库存，交付和生命周期等信息

[>>Infineon\(英飞凌\)](#)