

Final datasheet

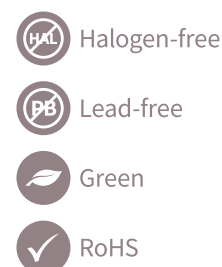
High speed IGBT in Trench and Fieldstop technology

Features

- $V_{CE} = 1200\text{ V}$
- $I_C = 15\text{ A}$
- TRENCHSTOP™ technology offering
- Very low turn-off energy
- Low V_{CEsat}
- Low EMI
- Maximum junction temperature $T_{vjmax} = 175^\circ\text{C}$
- Qualified according to JEDEC for target applications
- Pb-free lead plating, halogen-free mould compound, RoHS compliant
- Complete product spectrum and PSpice Models: <http://www.infineon.com/igbt/>

Potential applications

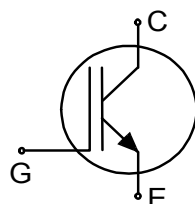
- Uninterruptible power supplies
- Welding converters
- Converters with high switching frequency



Description

Package pin definition:

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



Type	Package	Marking
IGW15N120H3	PG-TO247-3	G15H1203



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1 Package

Table 1 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
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
Mounting torque	M	M3 screw, Maximum of mounting processes: 3			0.6	Nm
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	K/W
IGBT thermal resistance, junction-case	$R_{th(j-c)}$				0.7	K/W

2 IGBT

Table 2 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CE}	$T_{vj} \geq 25\text{ °C}$		1200	V
DC collector current, limited by T_{vjmax}	I_C		$T_c = 25\text{ °C}$	30	A
			$T_c = 100\text{ °C}$	15	
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}			60	A
Turn-off safe operating area		$V_{CE} \leq 1200\text{ V}$, $T_{vj} \leq 175\text{ °C}$		60	A
Gate-emitter voltage	V_{GE}			± 20	V
Transient gate-emitter voltage	V_{GE}	$t_p \leq 10\text{ }\mu\text{s}$, $D < 0.01$		± 30	V
Short-circuit withstand time	t_{SC}	$V_{CC} \leq 600\text{ V}$, $V_{GE} = 15\text{ V}$, Allowed number of short circuits < 1000, Time between short circuits $\geq 1.0\text{ s}$, $T_{vj} = 175\text{ °C}$		10	μs
Power dissipation	P_{tot}		$T_c = 25\text{ °C}$	217	W
			$T_c = 100\text{ °C}$	105	

Table 3 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter breakdown voltage	V_{BRCES}	$I_C = 0.5\text{ mA}$, $V_{GE} = 0\text{ V}$	1200			V

(table continues...)

Table 3 (continued) **Characteristic values**

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	$I_C = 15\text{ A}$, $V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$		2.05	2.4	V
			$T_{vj} = 125\text{ °C}$		2.5		
			$T_{vj} = 175\text{ °C}$		2.7		
Gate-emitter threshold voltage	V_{GETh}	$I_C = 0.5\text{ mA}$, $V_{CE} = V_{GE}$		5	5.8	6.5	V
Zero gate-voltage collector current	I_{CES}	$V_{CE} = 1200\text{ V}$, $V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$			250	μA
			$T_{vj} = 175\text{ °C}$			2500	
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\text{ V}$, $V_{GE} = 20\text{ V}$				600	nA
Transconductance	g_{fs}	$I_C = 15\text{ A}$, $V_{CE} = 20\text{ V}$			7.5		S
Short-circuit collector current	I_{SC}	$V_{CC} \leq 600\text{ V}$, $V_{GE} = 15\text{ V}$, $t_{SC} \leq 10\text{ }\mu\text{s}$, Allowed number of short circuits < 1000 , Time between short circuits $\geq 1.0\text{ s}$, $T_{vj} = 175\text{ °C}$			52		A
Input capacitance	C_{ies}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 1000\text{ kHz}$			875		pF
Output capacitance	C_{oes}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 1000\text{ kHz}$			60		pF
Reverse transfer capacitance	C_{res}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 1000\text{ kHz}$			45		pF
Gate charge	Q_G	$V_{CC} = 960\text{ V}$, $I_C = 15\text{ A}$, $V_{GE} = 15\text{ V}$			75		nC
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 600\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_G = 35\text{ }\Omega$	$T_{vj} = 25\text{ °C}$, $I_C = 15\text{ A}$		21		ns
			$T_{vj} = 175\text{ °C}$, $I_C = 15\text{ A}$		19		
Rise time (inductive load)	t_r	$V_{CC} = 600\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_G = 35\text{ }\Omega$	$T_{vj} = 25\text{ °C}$, $I_C = 15\text{ A}$		34		ns
			$T_{vj} = 175\text{ °C}$, $I_C = 15\text{ A}$		30		
Turn-off delay time	$t_{d(off)}$	$V_{CC} = 600\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_G = 35\text{ }\Omega$	$T_{vj} = 25\text{ °C}$, $I_C = 15\text{ A}$		260		ns
			$T_{vj} = 175\text{ °C}$, $I_C = 15\text{ A}$		327		
Fall time (inductive load)	t_f	$V_{CC} = 600\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_G = 35\text{ }\Omega$	$T_{vj} = 25\text{ °C}$, $I_C = 15\text{ A}$		14		ns
			$T_{vj} = 175\text{ °C}$, $I_C = 15\text{ A}$		40		

(table continues...)

Table 3 (continued) **Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-on energy	E_{on}	$V_{CC} = 600\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_G = 35\ \Omega$		1.1		mJ
				1.6		
Turn-off energy	E_{off}	$V_{CC} = 600\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_G = 35\ \Omega$		0.45		mJ
				0.9		
Total switching energy	E_{ts}	$V_{CC} = 600\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_G = 35\ \Omega$		1.55		mJ
				2.5		
Operating junction temperature	T_{vj}		-40		175	°C

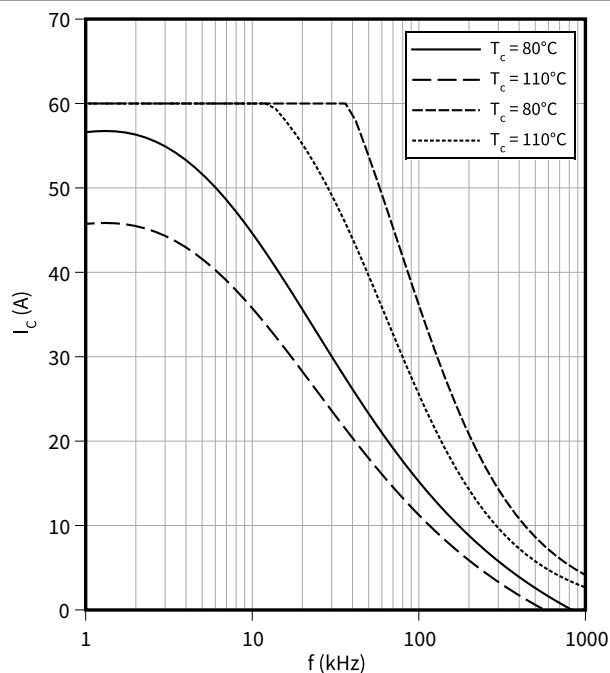
Note: Maximum rated values: For optimum lifetime and reliability, Infineon recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet.
Characteristic values at $T_{vj} = 25^\circ\text{C}$, unless otherwise specified.
Dynamic test circuit: $L_\sigma = 95\text{ nH}$, $C_\sigma = 67\text{ pF}$ from Figure E. Energy losses include “tail” and diode (IKW15N120H3) reverse recovery.

3 Characteristics diagrams

Collector current as a function of switching frequency

$$I_C = f(f)$$

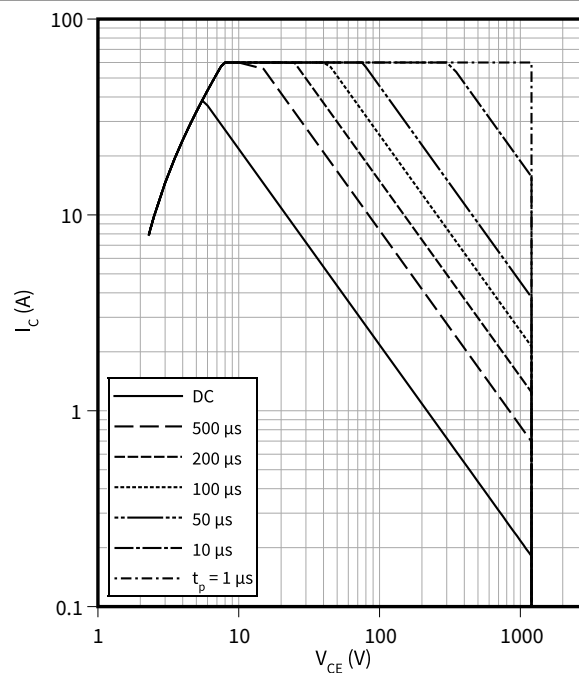
$D = 0.5$, $V_{CE} = 600 \text{ V}$, $T_{vj} \leq 175 \text{ }^\circ\text{C}$, $V_{GE} = 0/15 \text{ V}$, $R_G = 35 \text{ } \Omega$



Forward bias safe operating area

$$I_C = f(V_{CE})$$

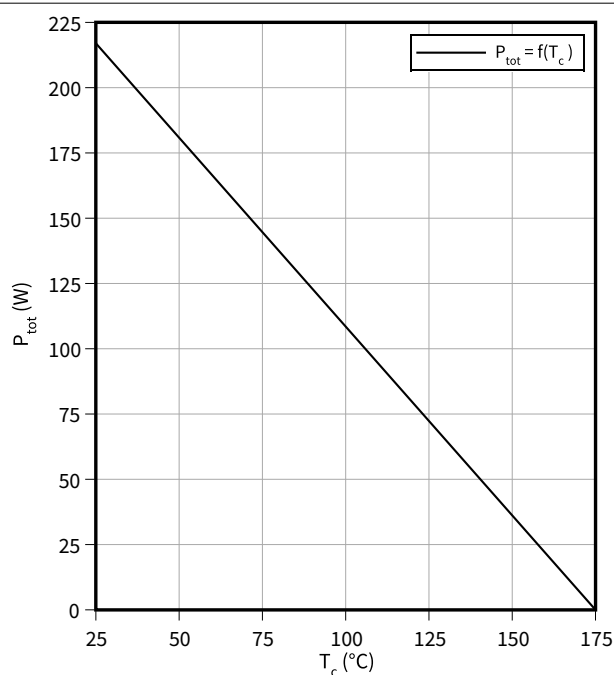
$D = 0$, $T_{vj} = 175 \text{ }^\circ\text{C}$, $V_{GE} = 15 \text{ V}$, $T_c = 25 \text{ }^\circ\text{C}$



Power dissipation as a function of case temperature

$$P_{tot} = f(T_c)$$

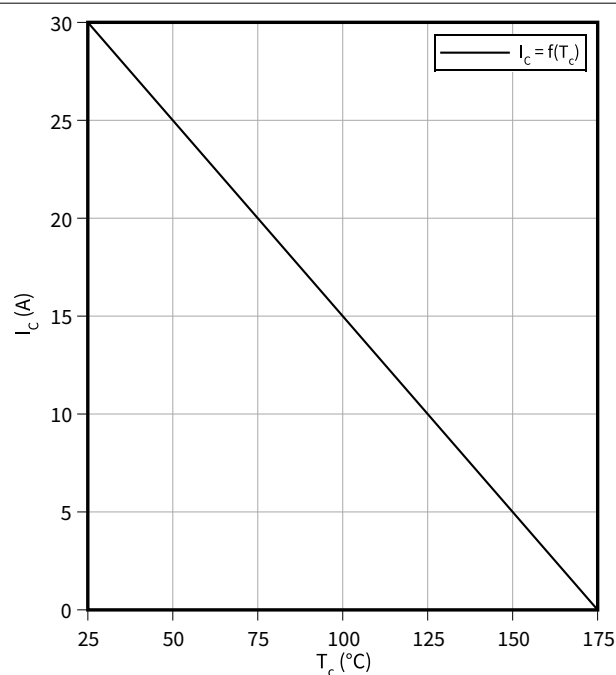
$T_{vj} \leq 175 \text{ }^\circ\text{C}$



Collector current as a function of case temperature

$$I_C = f(T_c)$$

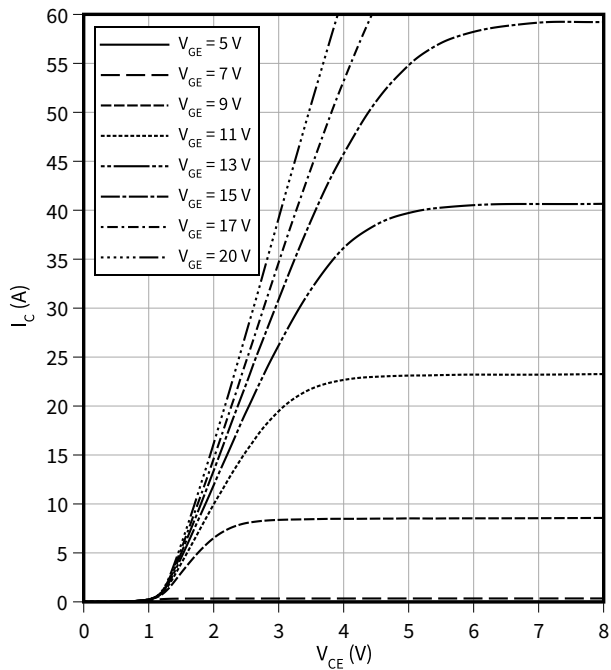
$T_{vj} \leq 175 \text{ }^\circ\text{C}$, $V_{GE} \geq 15 \text{ V}$



3 Characteristics diagrams

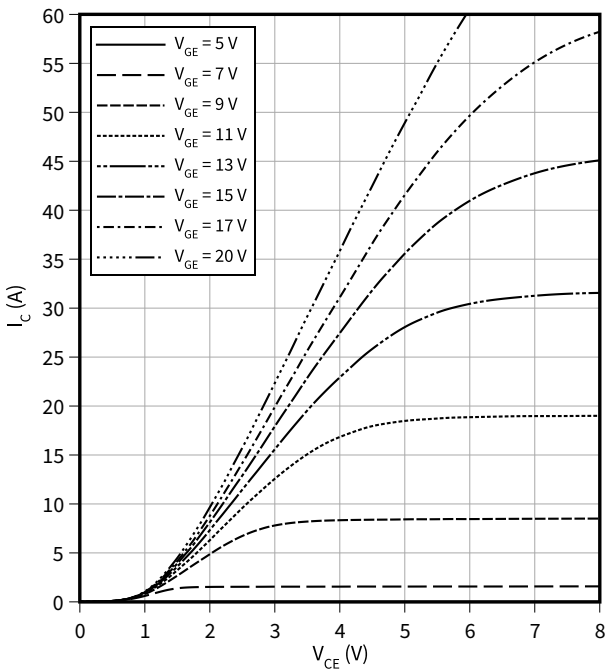
Typical output characteristic

$I_C = f(V_{CE})$
 $T_{vj} = 25\text{ }^{\circ}\text{C}$



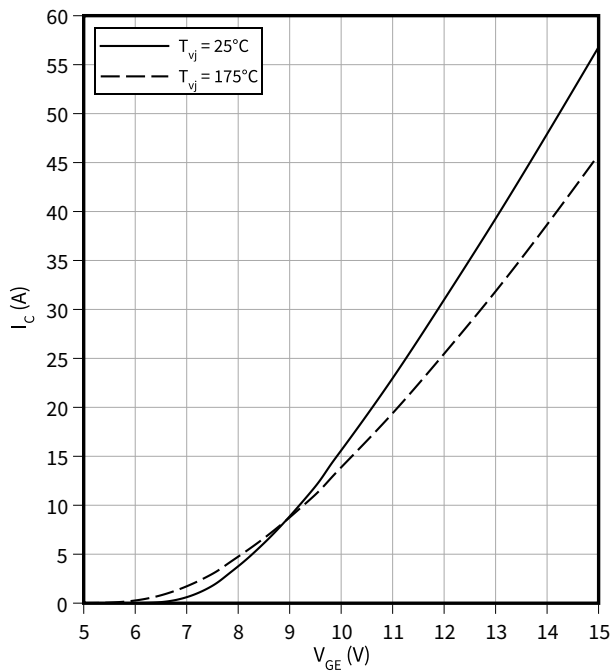
Typical output characteristic

$I_C = f(V_{CE})$
 $T_{vj} = 175\text{ }^{\circ}\text{C}$



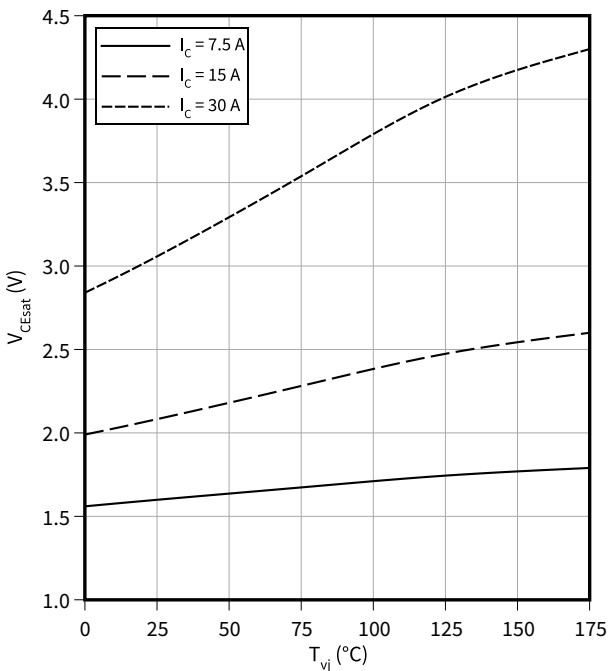
Typical transfer characteristic

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



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

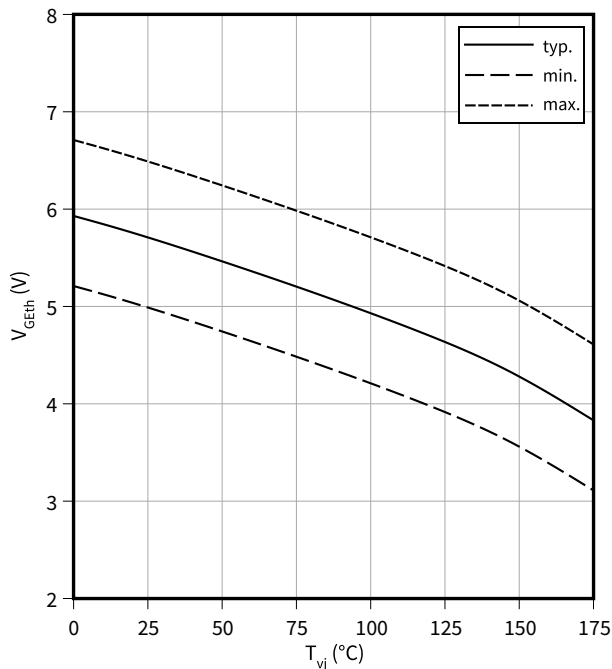
$V_{CEsat} = f(T_{vj})$
 $V_{GE} = 15\text{ V}$



3 Characteristics diagrams

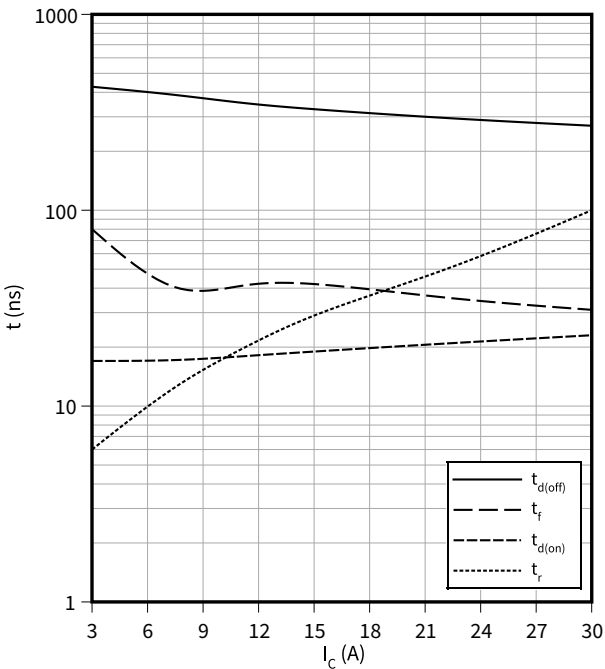
Gate-emitter threshold voltage as a function of junction temperature

$V_{GEth} = f(T_{vj})$
 $I_C = 0.5\text{ mA}$



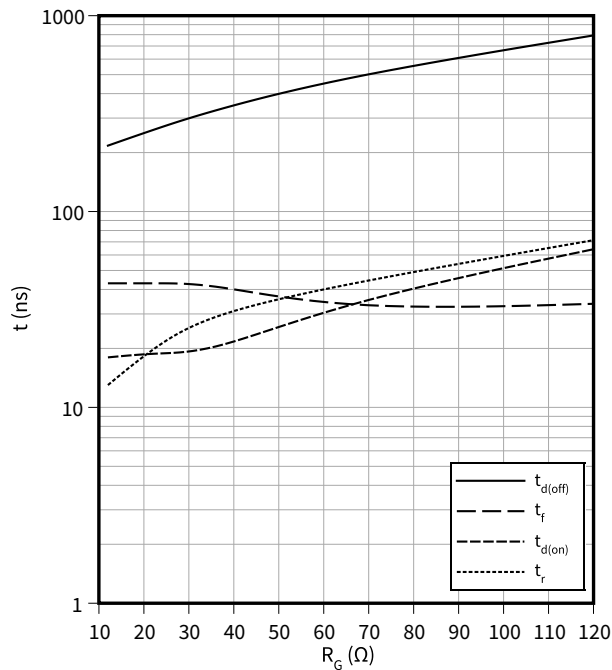
Typical switching times as a function of collector current

$t = f(I_C)$
 $V_{CC} = 600\text{ V}, T_{vj} = 175\text{ °C}, V_{GE} = 0/15\text{ V}, R_G = 35\text{ }\Omega$



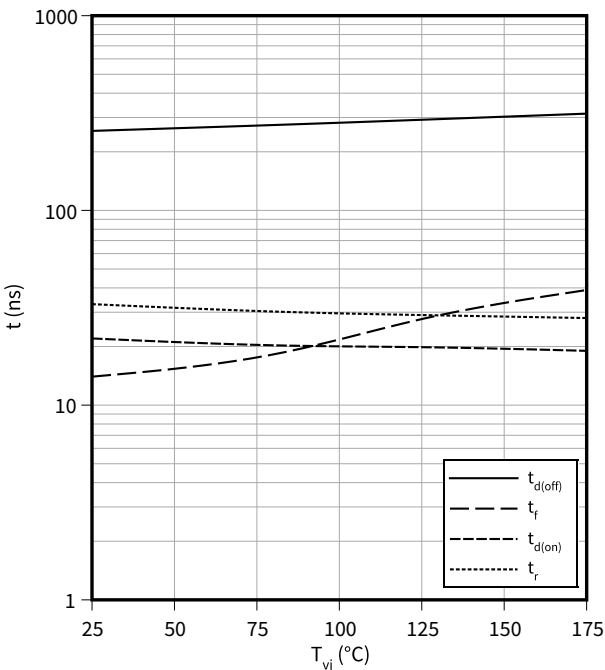
Typical switching times as a function of gate resistor

$t = f(R_G)$
 $I_C = 15\text{ A}, V_{CC} = 600\text{ V}, T_{vj} = 175\text{ °C}, V_{GE} = 0/15\text{ V}$



Typical switching times as a function of junction temperature

$t = f(T_{vj})$
 $I_C = 15\text{ A}, V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_G = 35\text{ }\Omega$

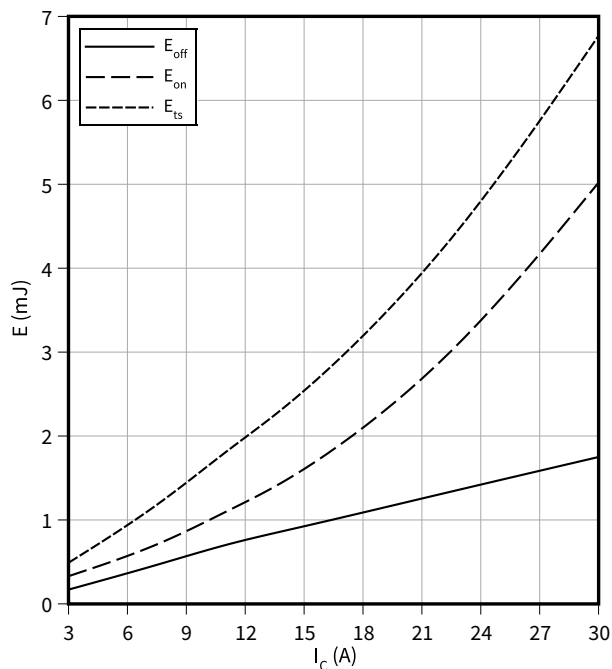


3 Characteristics diagrams

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$

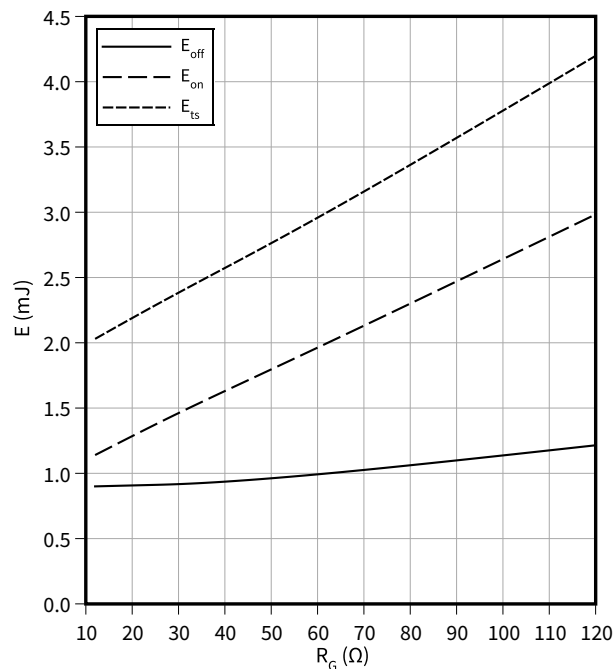
$V_{CC} = 600 \text{ V}$, $T_{vj} = 175 \text{ }^\circ\text{C}$, $V_{GE} = 0/15 \text{ V}$, $R_G = 35 \text{ } \Omega$



Typical switching energy losses as a function of gate resistor

$$E = f(R_G)$$

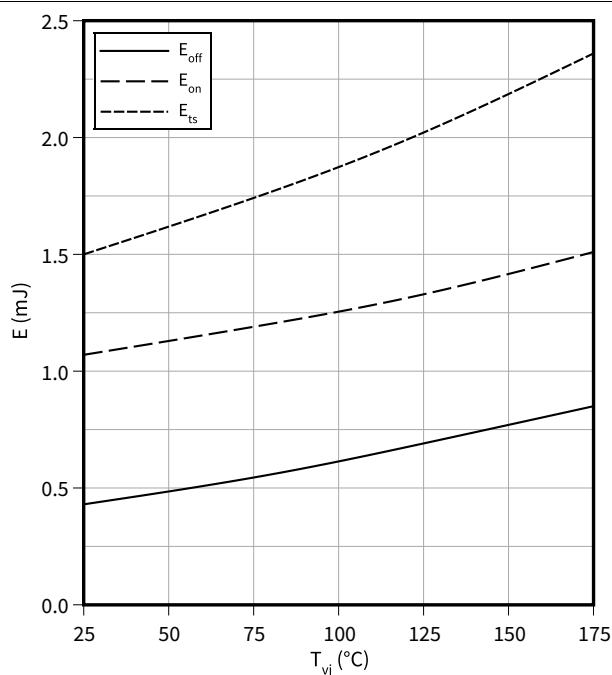
$I_C = 15 \text{ A}$, $V_{CC} = 600 \text{ V}$, $T_{vj} = 175 \text{ }^\circ\text{C}$, $V_{GE} = 0/15 \text{ V}$



Typical switching energy losses as a function of junction temperature

$$E = f(T_{vj})$$

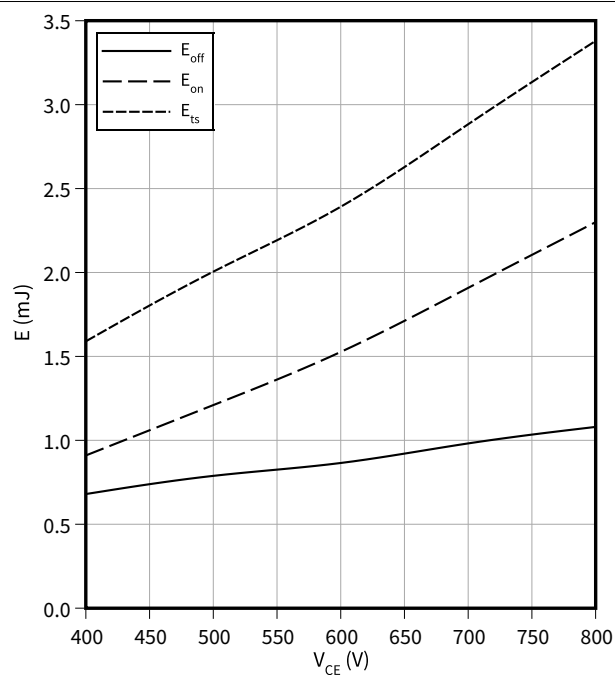
$I_C = 15 \text{ A}$, $V_{CC} = 600 \text{ V}$, $V_{GE} = 0/15 \text{ V}$, $R_G = 35 \text{ } \Omega$



Typical switching energy losses as a function of collector emitter voltage

$$E = f(V_{CE})$$

$I_C = 15 \text{ A}$, $T_{vj} = 175 \text{ }^\circ\text{C}$, $V_{GE} = 0/15 \text{ V}$, $R_G = 35 \text{ } \Omega$

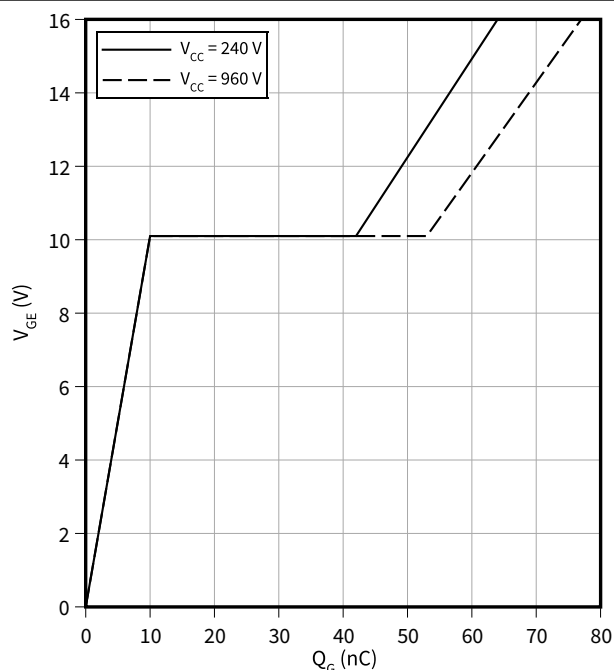


3 Characteristics diagrams

Typical gate charge

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

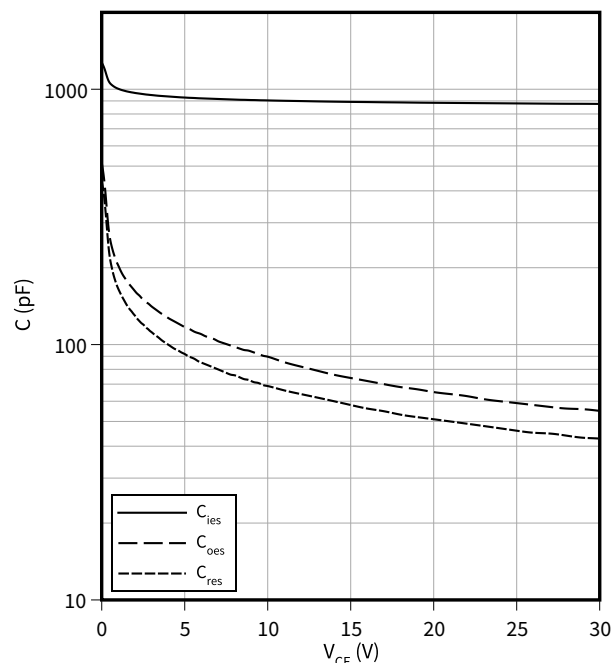
$$I_C = 15 \text{ A}$$



Typical capacitance as a function of collector-emitter voltage

$$C = f(V_{CE})$$

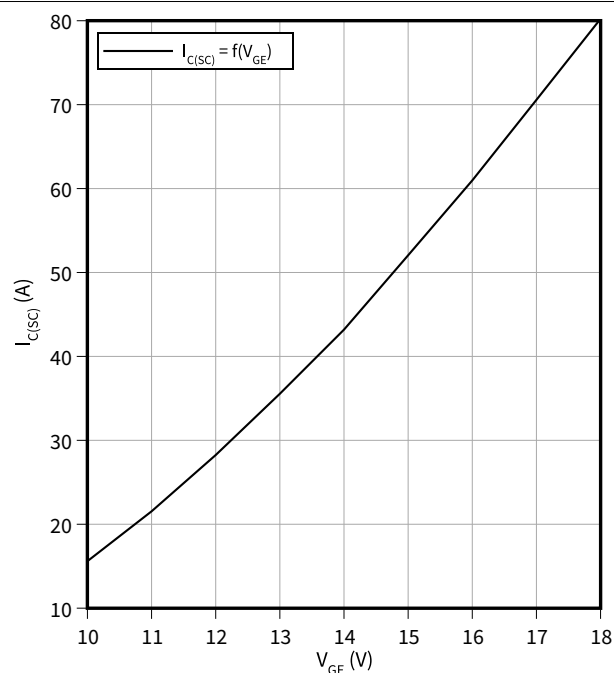
$$f = 1000 \text{ kHz}, V_{GE} = 0 \text{ V}$$



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

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

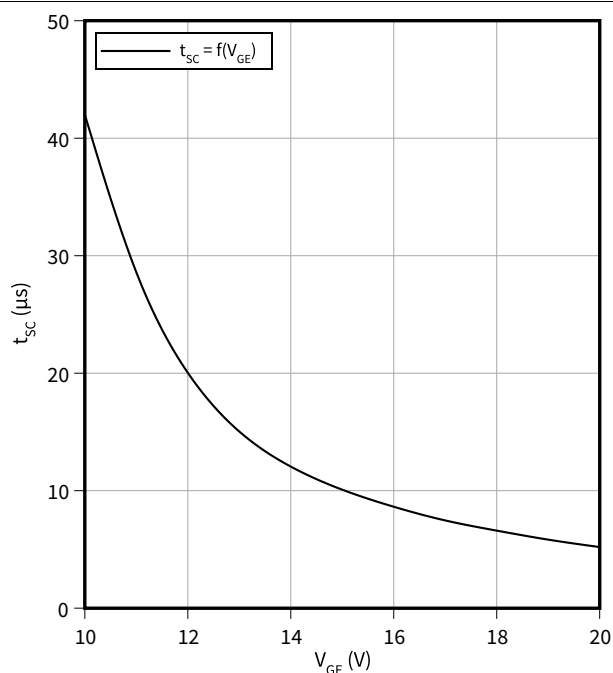
$$T_{vj, \text{start}} = 25 \text{ }^{\circ}\text{C}, V_{CC} \leq 600 \text{ V}$$



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

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

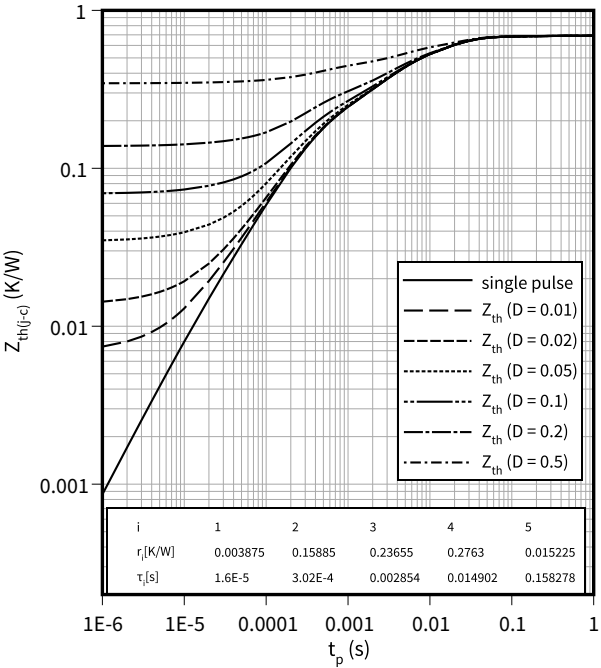
$$T_{vj, \text{start}} \leq 150 \text{ }^{\circ}\text{C}, V_{CC} \leq 600 \text{ V}$$



3 Characteristics diagrams

IGBT transient thermal impedance as a function of pulse width

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



4 Package outlines

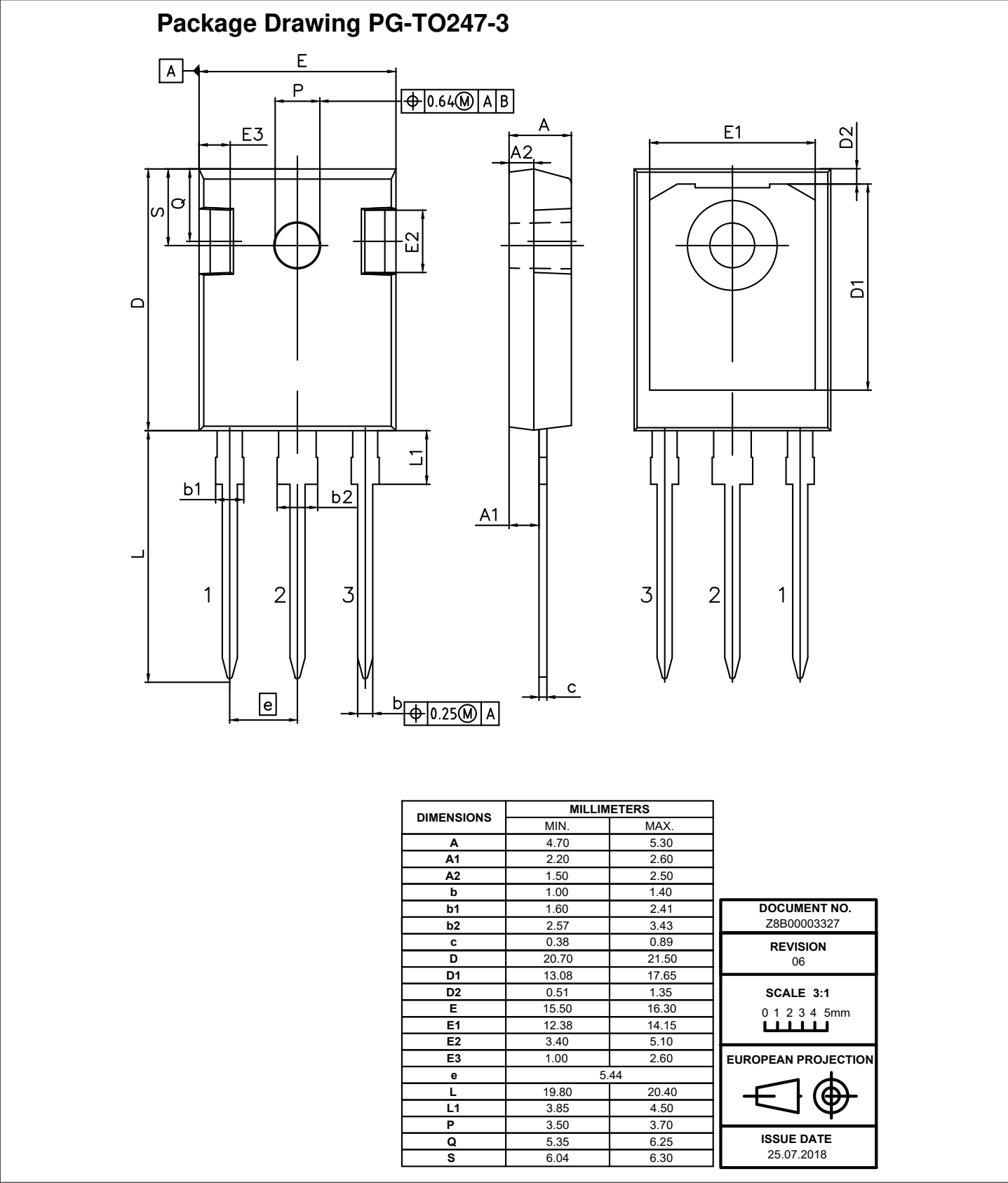


Figure 1

5 Testing conditions

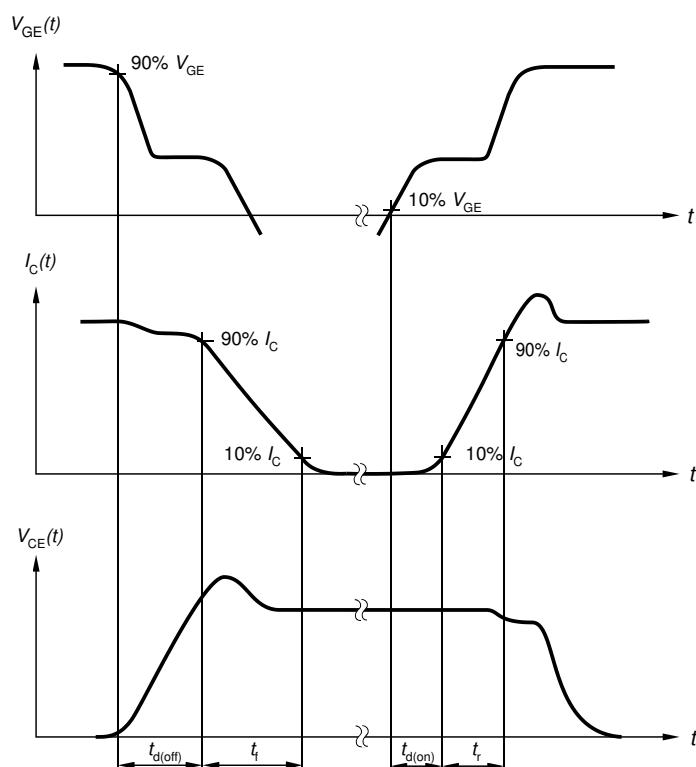


Figure A. Definition of switching times

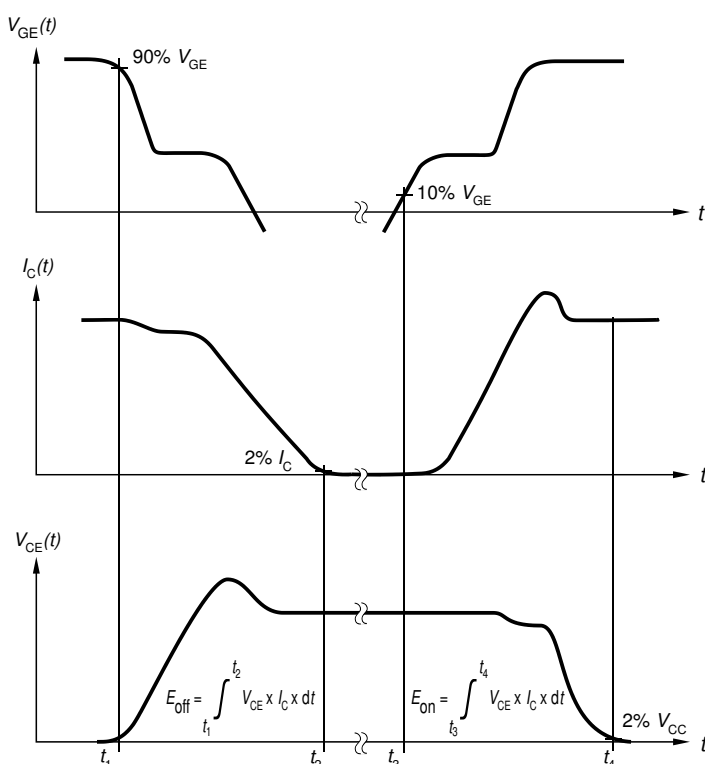


Figure B. Definition of switching losses

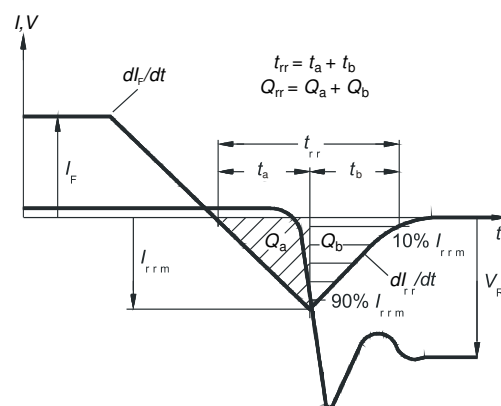


Figure C. Definition of diode switching characteristics

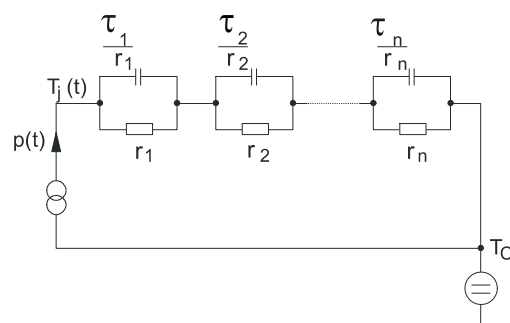


Figure D. Thermal equivalent circuit

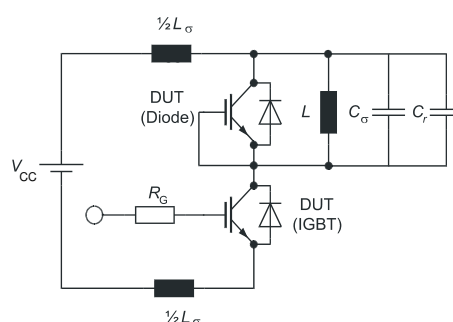


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ ,
parasitic capacitor C_σ ,
relief capacitor C_r ,
(only for ZVT switching)

Figure 2

Revision history

Document revision	Date of release	Description of changes
V1.1	2009-11-27	
V2.1	2014-12-01	Final data sheet
V2.2	2020-10-16	Minor change Switching Characteristic
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
1.10	2025-06-12	Added transient Gate-emitter voltage Editorial changes

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Edition 2025-06-12

Published by

Infineon Technologies AG
81726 Munich, Germany

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Document reference
IFX-AAK483-004

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