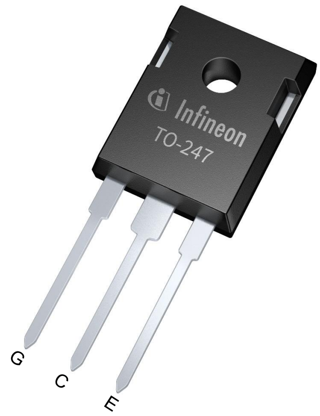
Final datasheet
High speed IGBT in Trench and Fieldstop technology

Features

- V_{CE} = 1200 V
- I_C = 15 A
- TRENCHSTOP™ technology offering
- Very low turn-off energy
- Low V_{CEsat}
- Low EMI
- Maximum junction temperature T_{vjmax} = 175°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/



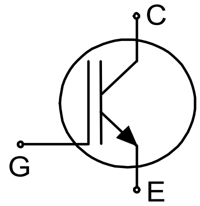
Halogen-free
Lead-free
Green
RoHS

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

Table of contents

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

Table 3 Characteristic values

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

(table continues...)

Table 3 (continued) Characteristic values

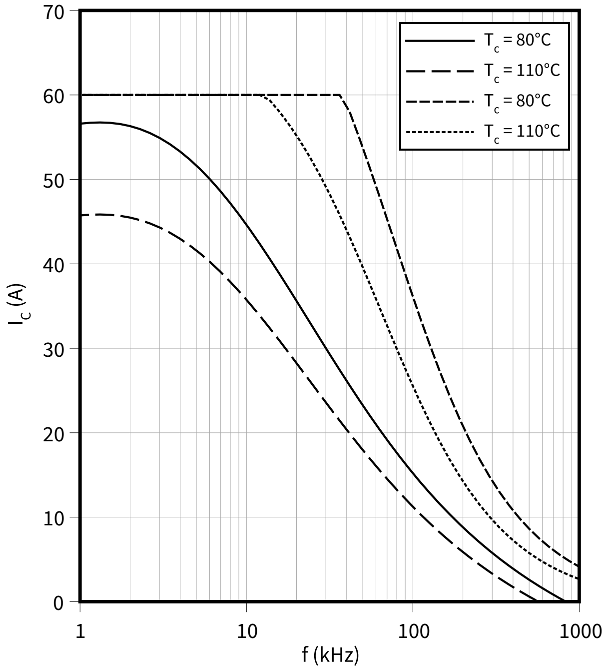
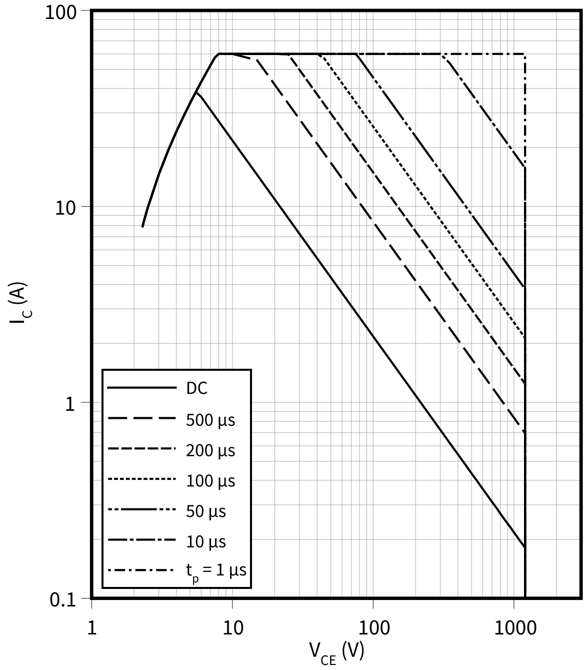
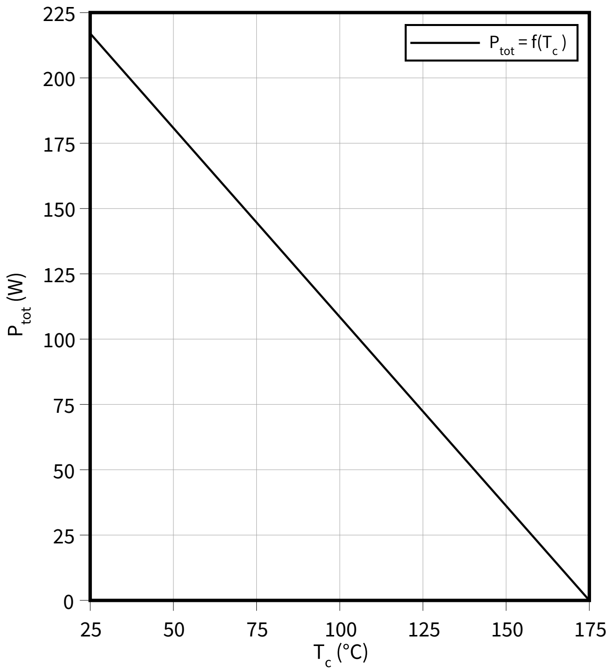
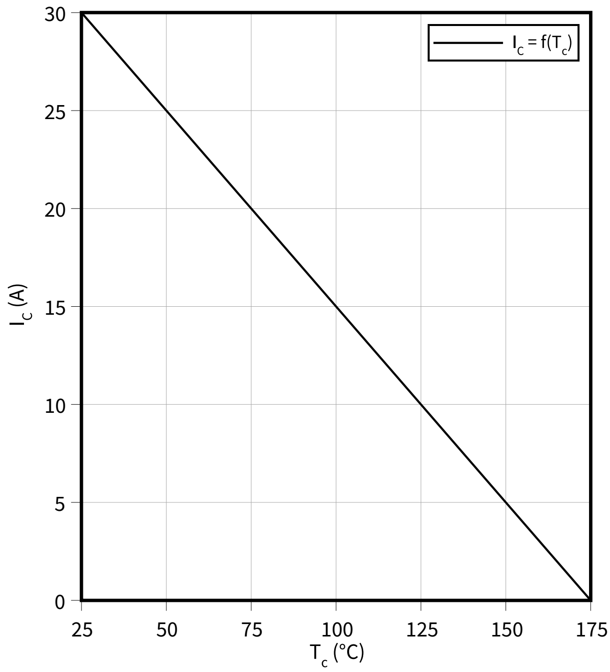
Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-on energy	E_{on}	V_{CC} = 600 V, V_{GE} = 0/15 V, R_G = 35 Ω	T_{vj} = 25 °C, I_C = 15 A		1.1		mJ
			T_{vj} = 175 °C, I_C = 15 A		1.6		
Turn-off energy	E_{off}	V_{CC} = 600 V, V_{GE} = 0/15 V, R_G = 35 Ω	T_{vj} = 25 °C, I_C = 15 A		0.45		mJ
			T_{vj} = 175 °C, I_C = 15 A		0.9		
Total switching energy	E_{ts}	V_{CC} = 600 V, V_{GE} = 0/15 V, R_G = 35 Ω	T_{vj} = 25 °C, I_C = 15 A		1.55		mJ
			T_{vj} = 175 °C, I_C = 15 A		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°C, unless otherwise specified.

Dynamic test circuit: L_σ = 95 nH, C_σ = 67 pF from Figure E. Energy losses include “tail” and diode (IKW15N120H3) reverse recovery.

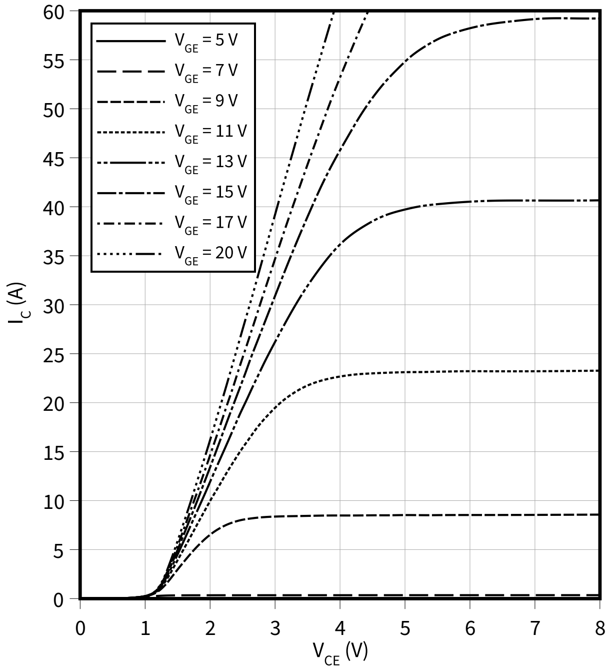
3 Characteristics diagrams

Collector current as a function of switching frequency $I_C = f(f)$ $D = 0.5$, $V_{CE} = 600$ V, $T_{vj} \leq 175$ °C, $V_{GE} = 0/15$ V, $R_G = 35\ \Omega$	**Forward bias safe operating area** $I_C = f(V_{CE})$ $D = 0$, $T_{vj} = 175$ °C, $V_{GE} = 15$ V, $T_c = 25$ °C
	
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

$I_C = f(V_{CE})$

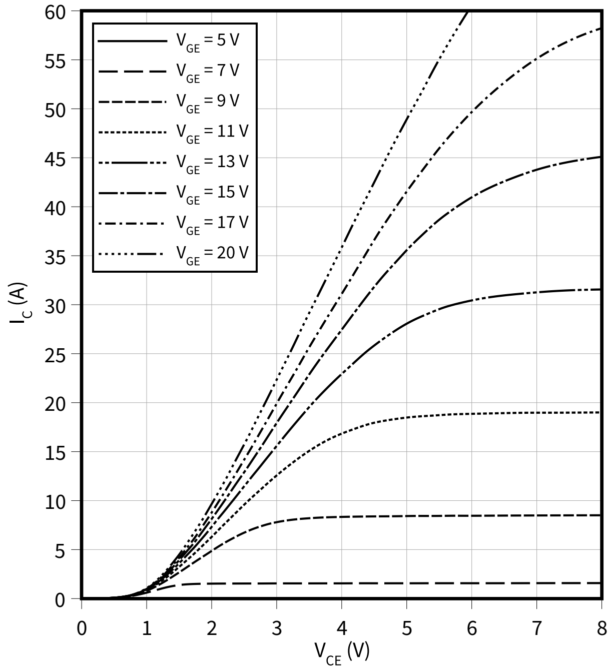
$T_{vj} = 25\ °C$



Typical output characteristic

$I_C = f(V_{CE})$

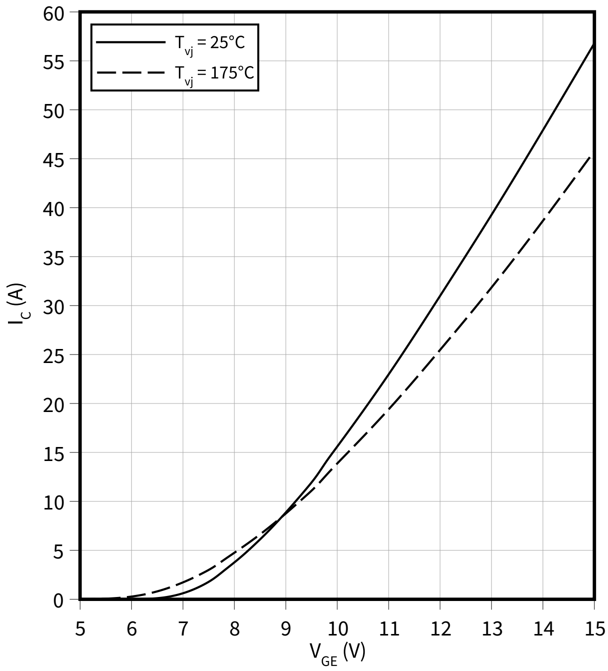
$T_{vj} = 175\ °C$



Typical transfer characteristic

$I_C = f(V_{GE})$

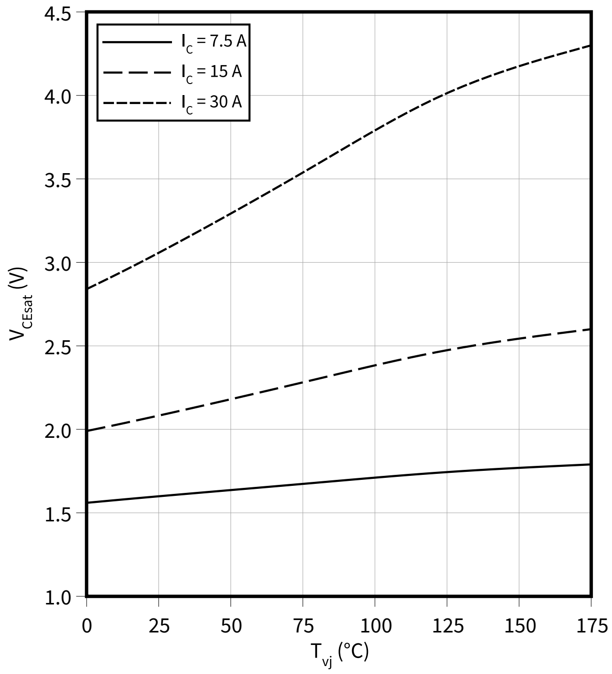
$V_{CE} = 20\ V$



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

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

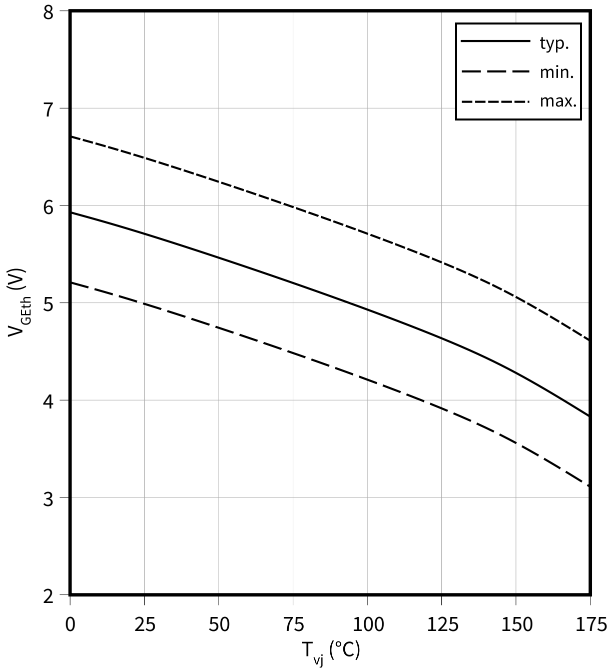
$V_{GE} = 15\ V$



Gate-emitter threshold voltage as a function of junction temperature

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

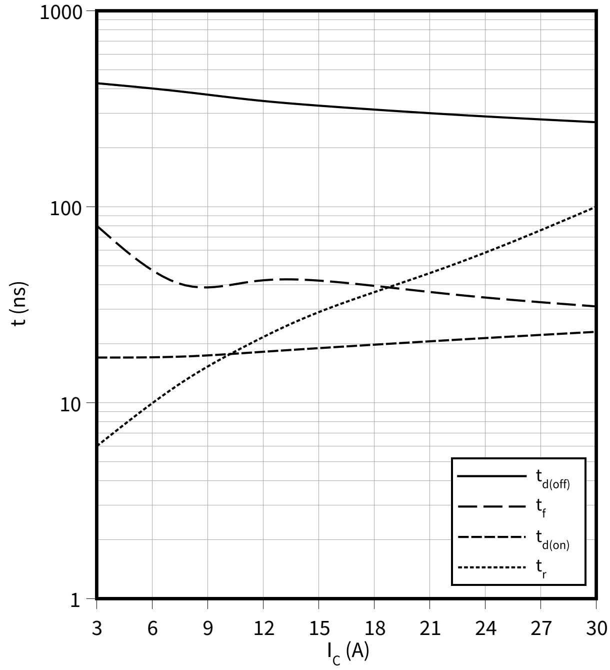
$I_C = 0.5$ mA



Typical switching times as a function of collector current

$t = f(I_C)$

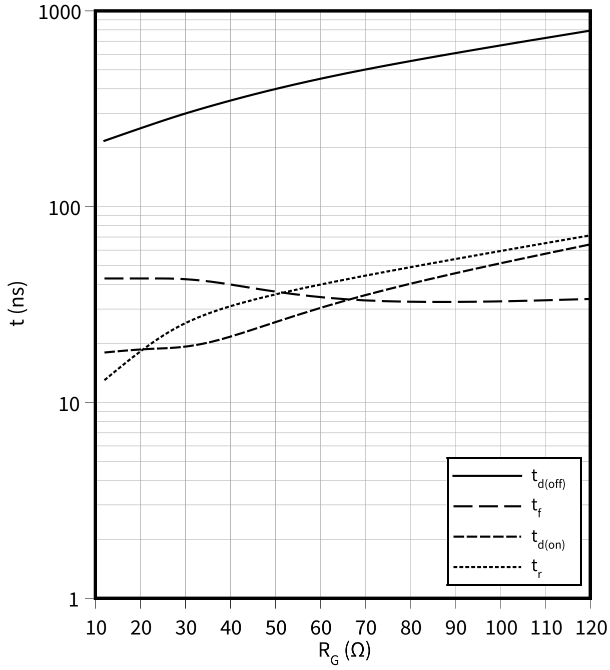
$V_{CC} = 600$ V, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V, $R_G = 35$ Ω



Typical switching times as a function of gate resistor

$t = f(R_G)$

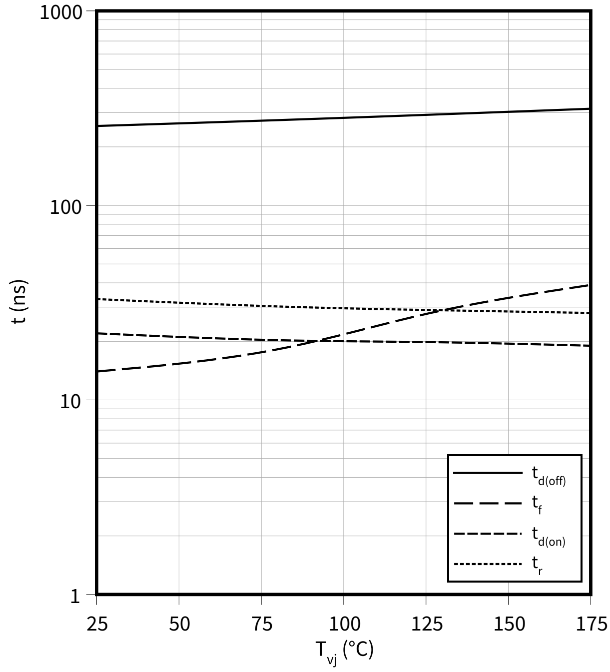
$I_C = 15$ A, $V_{CC} = 600$ V, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

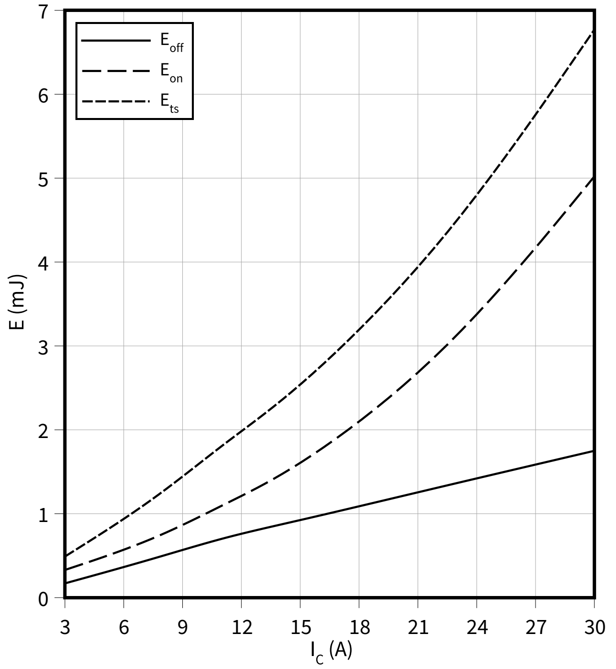
$I_C = 15$ A, $V_{CC} = 600$ V, $V_{GE} = 0/15$ V, $R_G = 35$ Ω



Typical switching energy losses as a function of collector current

$E = f(I_C)$

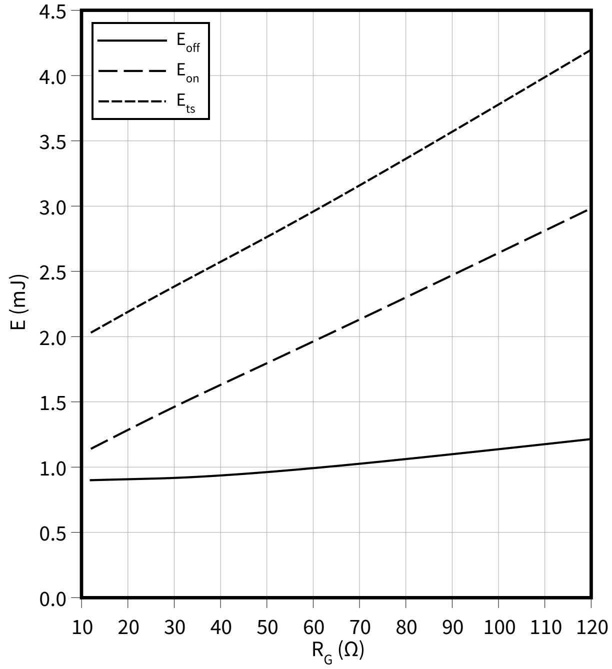
$V_{CC} = 600$ V, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V, $R_G = 35\ \Omega$



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

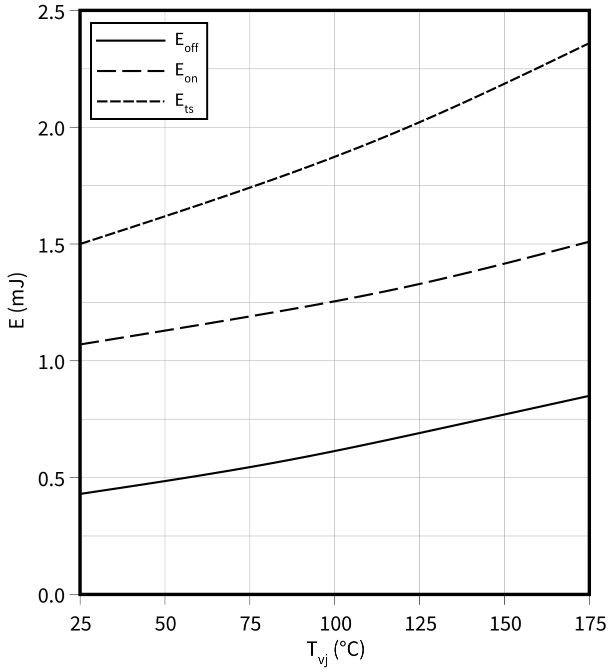
$I_C = 15$ A, $V_{CC} = 600$ V, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V



Typical switching energy losses as a function of junction temperature

$E = f(T_{vj})$

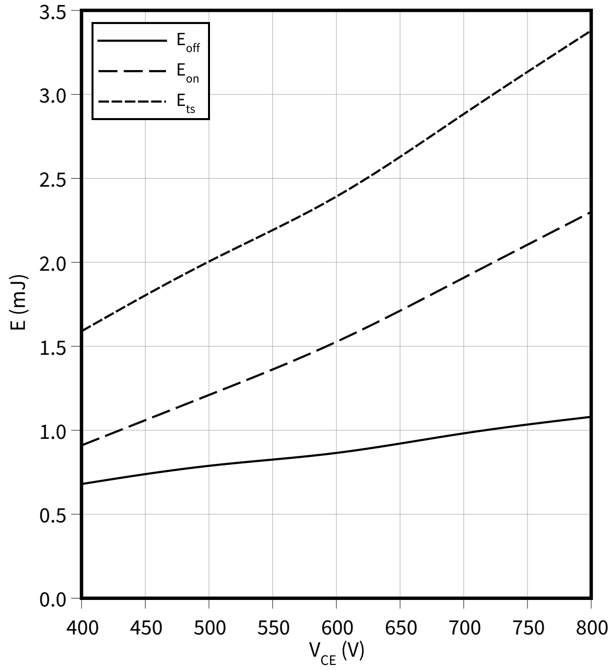
$I_C = 15$ A, $V_{CC} = 600$ V, $V_{GE} = 0/15$ V, $R_G = 35\ \Omega$



Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

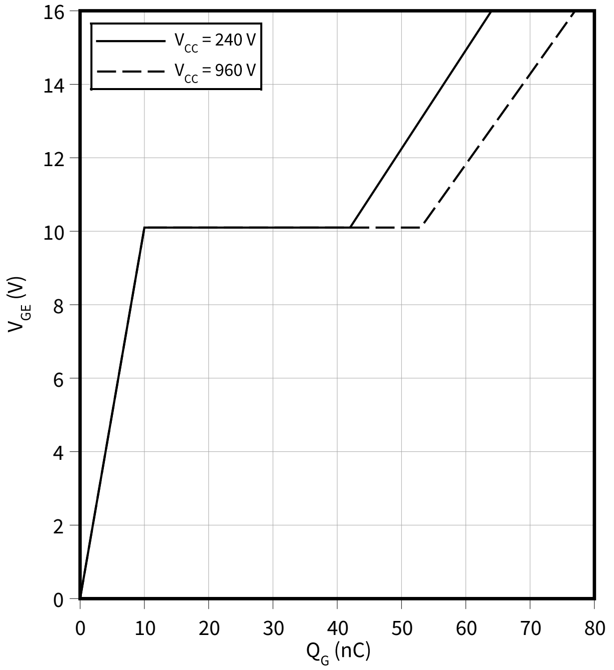
$I_C = 15$ A, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V, $R_G = 35\ \Omega$



Typical gate charge

$V_{GE} = f(Q_G)$

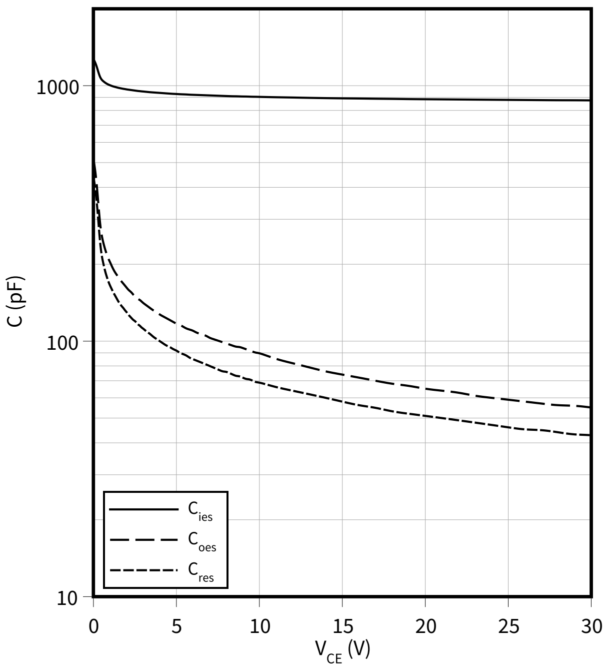
$I_C = 15$ A



Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

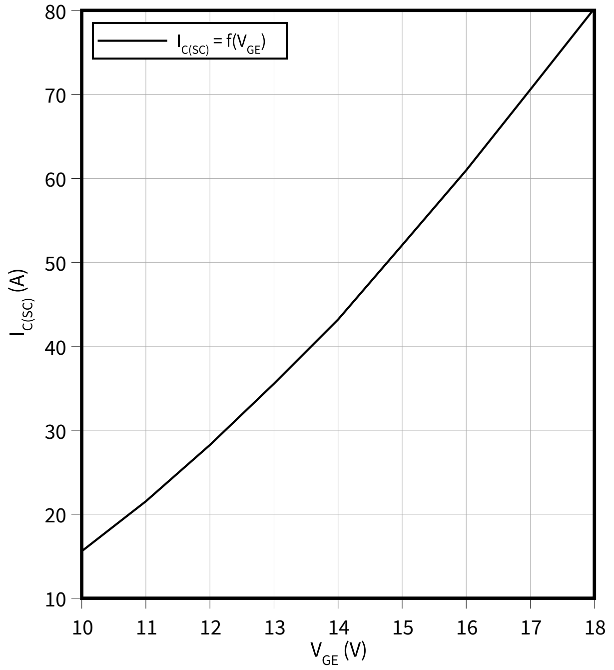
f = 1000 kHz, $V_{GE} = 0$ V



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

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

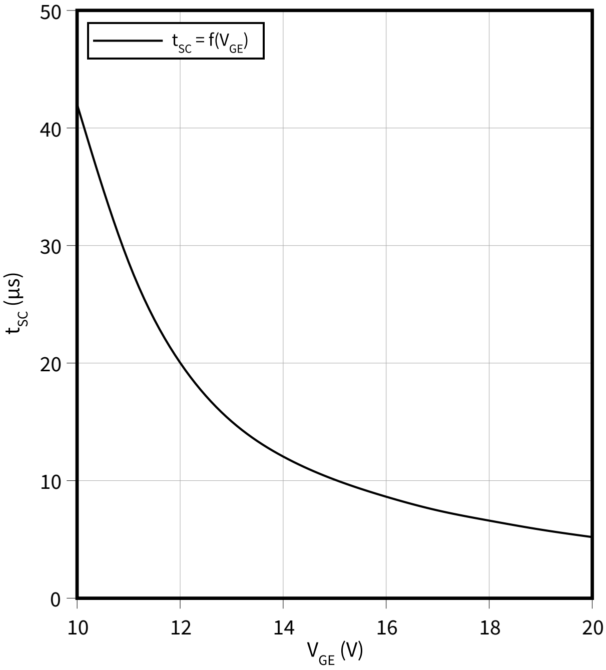
$T_{vj,\,start} = 25$ °C, $V_{CC} \leq 600$ V



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

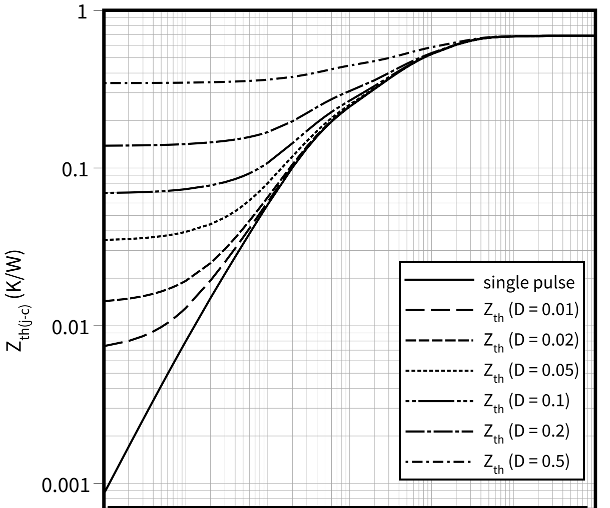
$t_{SC} = f(V_{GE})$

$T_{vj,\,start} \leq 150$ °C, $V_{CC} \leq 600$ V



IGBT transient thermal impedance as a function of pulse width

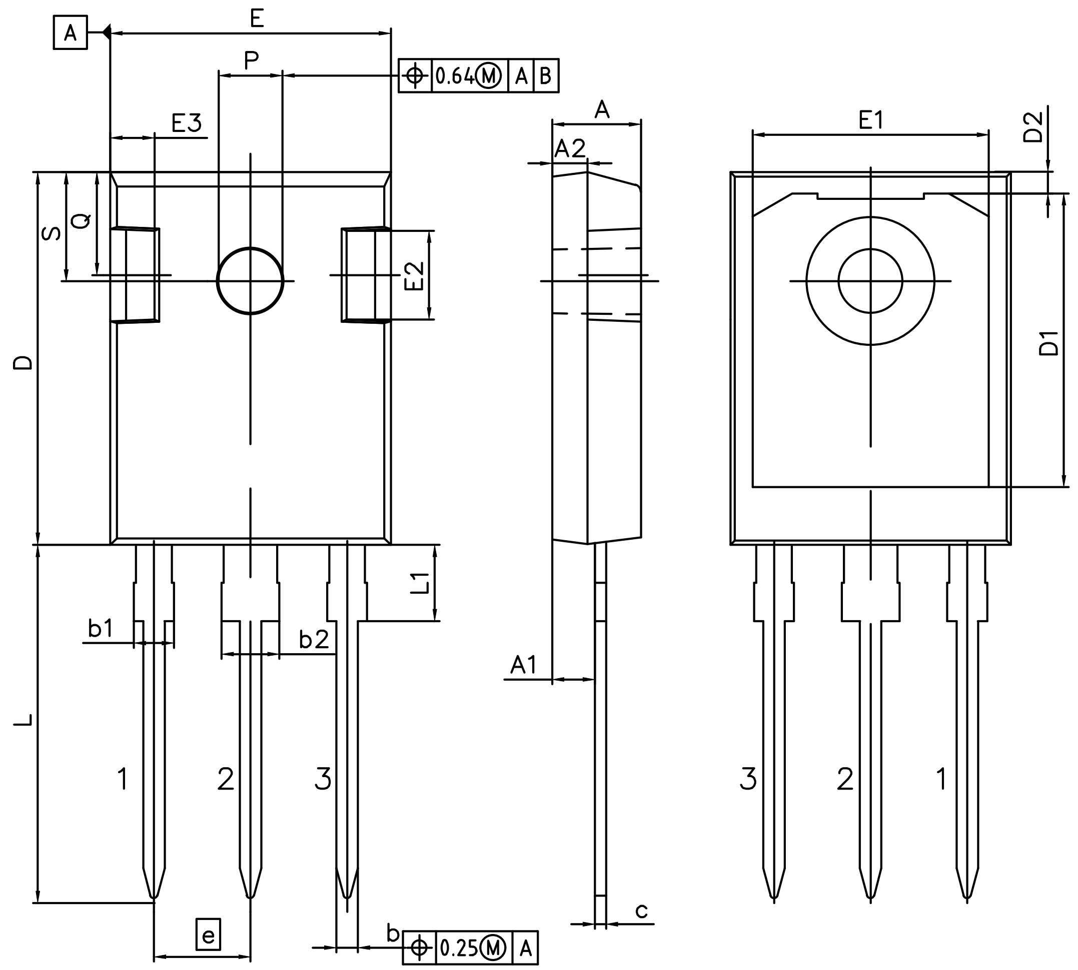
$Z_{th(j-c)} = f(t_p)$
$D = t_p/T$



i	1	2	3	4	5
r_i[K/W]	0.003875	0.15885	0.23655	0.2763	0.015225
τ_i[s]	1.6E-5	3.02E-4	0.002854	0.014902	0.158278

4 Package outlines

Package Drawing PG-TO247-3



DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	4.70	5.30
A1	2.20	2.60
A2	1.50	2.50
b	1.00	1.40
b1	1.60	2.41
b2	2.57	3.43
c	0.38	0.89
D	20.70	21.50
D1	13.08	17.65
D2	0.51	1.35
E	15.50	16.30
E1	12.38	14.15
E2	3.40	5.10
E3	1.00	2.60
e	5.44	
L	19.80	20.40
L1	3.85	4.50
P	3.50	3.70
Q	5.35	6.25
S	6.04	6.30

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ISSUE DATE	25.07.2018

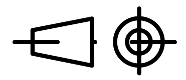

Figure 1

5 Testing conditions

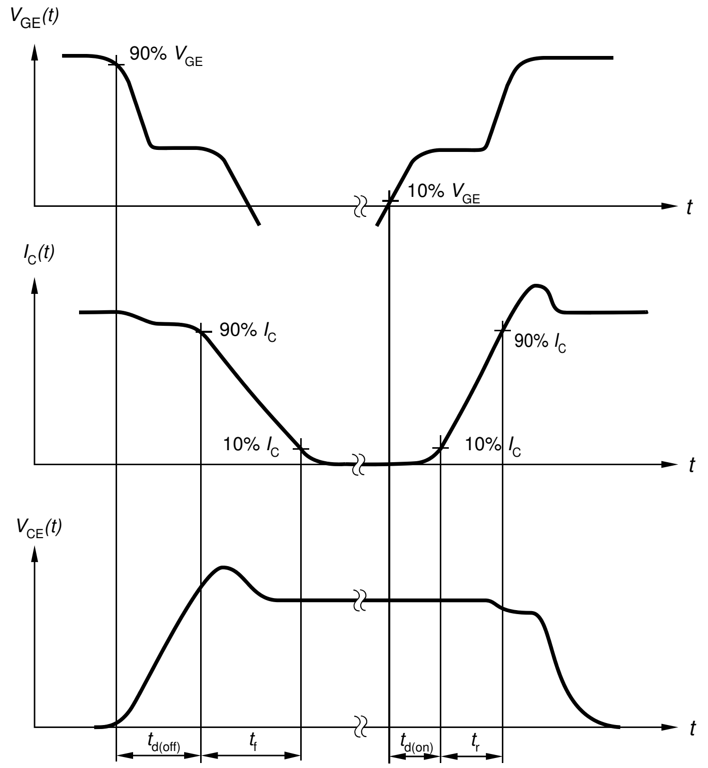

Figure A. **Definition of switching times**

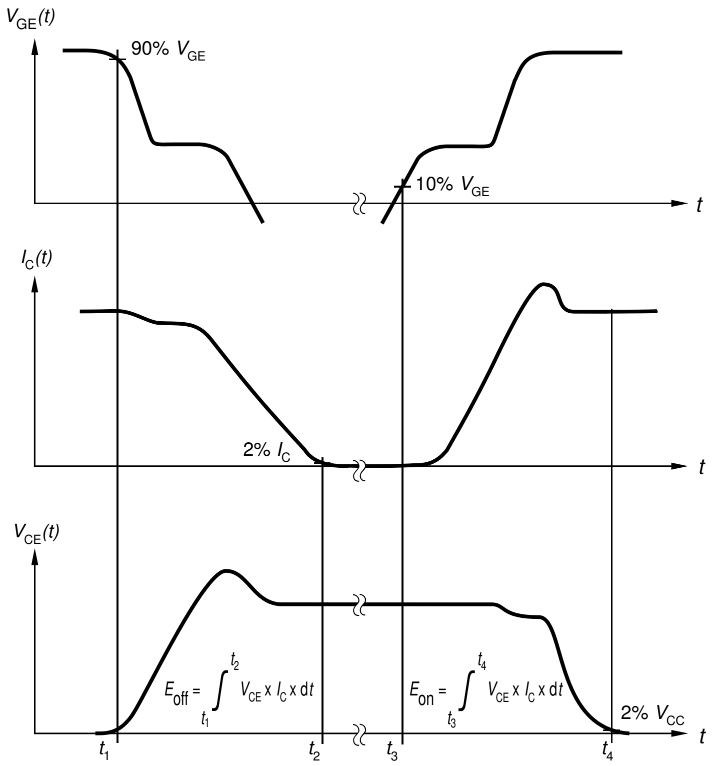

Figure B. **Definition of switching losses**

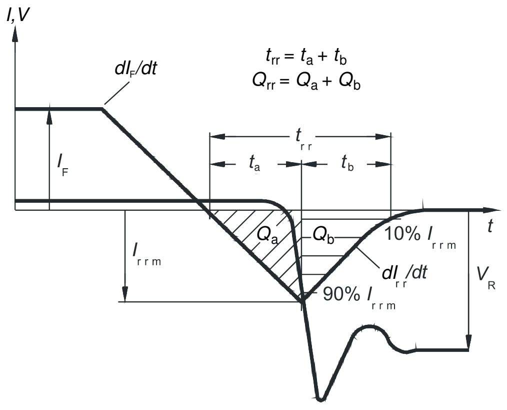

Figure C. **Definition of diode switching characteristics**

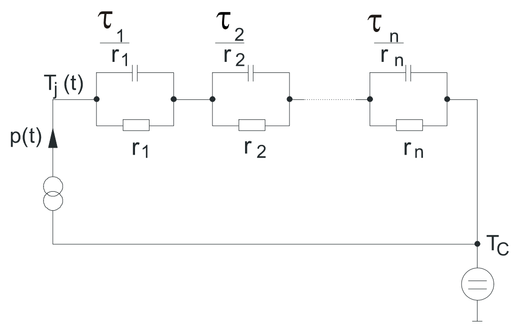

Figure D. **Thermal equivalent circuit**

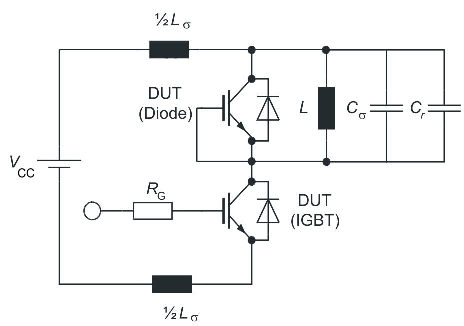

Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

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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