IGB03N120S7

Short circuit rugged 1200 V TRENCHSTOP™ IGBT 7 technology

Final datasheet

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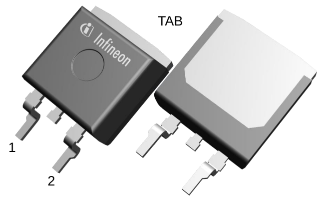


Halogen-free

Lead-free

Green

RoHS

Features

- V_{CE} = 1200 V
- I_C = 3 A
- Low saturation voltage V_{CEsat} = 2 V at T_{vj} = 150°C
- Short circuit ruggedness 8 µs
- Wide range of dv/dt controllability
- Complete product spectrum and PSpice Models: http://www.infineon.com/igbt/

Potential applications

- Industrial drives

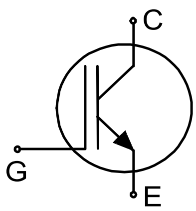
Product validation

- Qualified for industrial applications according to the relevant tests of JEDEC47/20/22
- Encapsulation for the application required

Description

Package pin definition:

- Pin 1 (G) - gate
- Pin 2 (E) - emitter
- TAB (C) - collector



Type	Package	Marking
IGB03N120S7	PG-TO263-3-STD-C1.6	G03MS7

Table of contents

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			7		nH
Storage temperature	T_{stg}		-55		150	°C
Soldering temperature	T_{sold}	reflow soldering (MSL1 according to JEDEC J-STA-020)			260	°C
Thermal resistance, 6 cm^2 Cu on PCB junction to ambient	$R_{th(j\text{-}a)}$				40	K/W
IGBT thermal resistance, junction-case	$R_{th(j\text{-}c)}$			2.51	3.39	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	9	A
			$T_c = 100$ °C	5	
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}			9	A
Turn-off safe operating area		$V_{CE} \leq 1200$ V, $T_{vj} \leq 150$ °C		9	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
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, $T_{vj} = 150$ °C		8	µs
Power dissipation	P_{tot}		$T_c = 25$ °C	37	W
			$T_c = 100$ °C	15	

Table 3 **Characteristic values**

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	I_C = 3 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.65	2	V
			T_{vj} = 150 °C		2		
Gate-emitter threshold voltage	V_{GEth}	I_C = 0.06 mA, V_{CE} = V_{GE}		5.15	5.7	6.45	V
Zero gate-voltage collector current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			20	µA
			T_{vj} = 150 °C		80		
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V				100	nA
Transconductance	g_{fs}	I_C = 3 A, V_{CE} = 20 V, T_{vj} = 150 °C			1.8		S
Short-circuit collector current	I_{SC}	V_{CC} ≤ 600 V, V_{GE} = 15 V, t_{SC} ≤ 8 µs, Allowed number of short circuits < 1000, Time between short circuits ≥ 1.0 s, T_{vj} = 150 °C			15		A
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			0.5		nF
Output capacitance	C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			18		pF
Reverse transfer capacitance	C_{res}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			2		pF
Gate charge	Q_G	V_{CC} = 960 V, I_C = 3 A, V_{GE} = 15 V			24		nC
Turn-on delay time	$t_{d(on)}$	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 60 Ω, $R_{G(off)}$ = 60 Ω	T_{vj} = 25 °C, I_C = 3 A		19		ns
			T_{vj} = 150 °C, I_C = 3 A		18		
Rise time (inductive load)	t_r	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 60 Ω, $R_{G(off)}$ = 60 Ω	T_{vj} = 25 °C, I_C = 3 A		15		ns
			T_{vj} = 150 °C, I_C = 3 A		18		
Turn-off delay time	$t_{d(off)}$	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 60 Ω, $R_{G(off)}$ = 60 Ω	T_{vj} = 25 °C, I_C = 3 A		89		ns
			T_{vj} = 150 °C, I_C = 3 A		142		
Fall time (inductive load)	t_f	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 60 Ω, $R_{G(off)}$ = 60 Ω	T_{vj} = 25 °C, I_C = 3 A		203		ns
			T_{vj} = 150 °C, I_C = 3 A		272		
Turn-on energy	E_{on}	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 60 Ω, $R_{G(off)}$ = 60 Ω	T_{vj} = 25 °C, I_C = 3 A		0.21		mJ
			T_{vj} = 150 °C, I_C = 3 A		0.29		
Turn-off energy	E_{off}	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 60 Ω, $R_{G(off)}$ = 60 Ω	T_{vj} = 25 °C, I_C = 3 A		0.16		mJ
			T_{vj} = 150 °C, I_C = 3 A		0.27		

(table continues...)

Table 3 (continued) Characteristic values

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, $R_{G(on)}$ = 60 Ω, $R_{G(off)}$ = 60 Ω	T_{vj} = 25 °C, I_C = 3 A		0.37		mJ
			T_{vj} = 150 °C, I_C = 3 A		0.56		
Operating junction temperature	T_{vj}			-40		150	°C

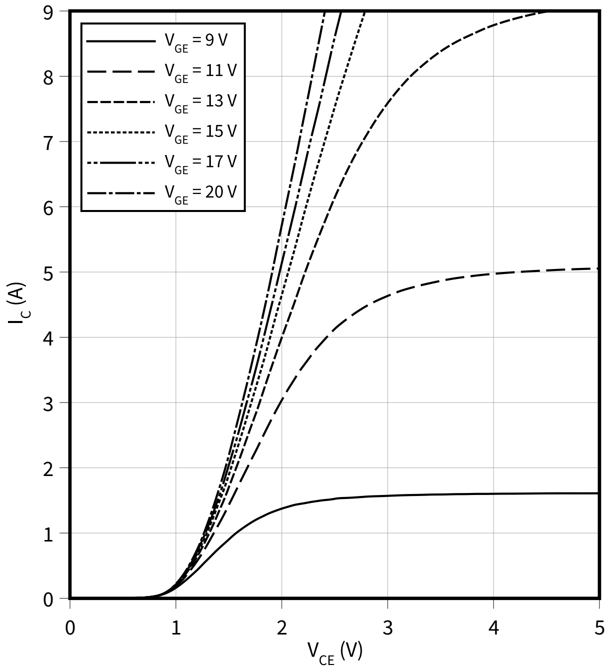
Note: *For optimum lifetime and reliability, Infineon recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet.*

Electrical Characteristic at T_{vj} = 25°C, unless otherwise specified.

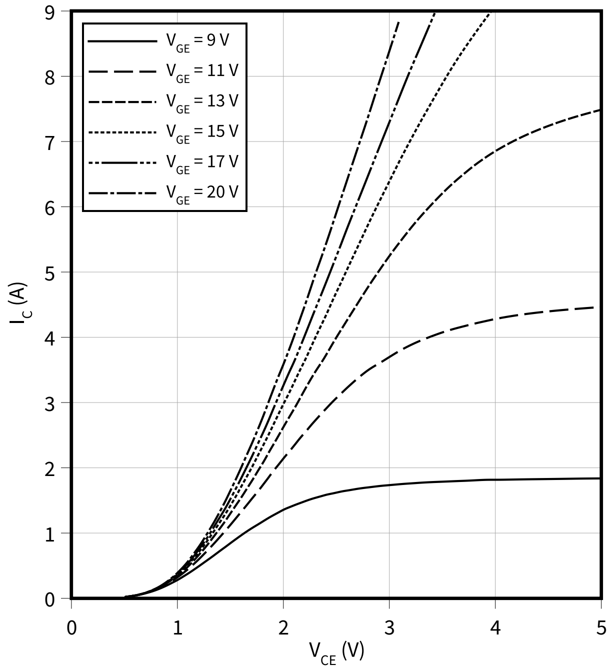
Dynamic test circuit, parasitic inductance L_σ = 45 nH, parasitic capacitor C_σ = 25 pF from Fig. E. Energy losses include “tail” and diode reverse recovery.

3 Characteristics diagrams

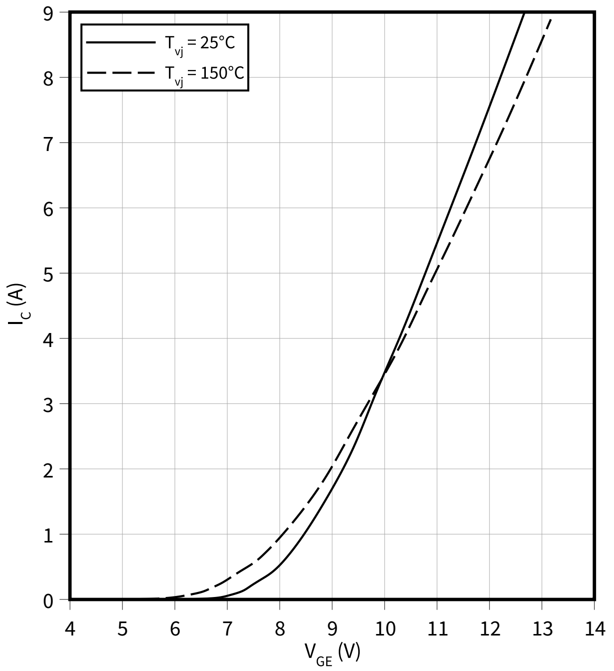
Typical output characteristic
$I_C = f(V_{CE})$
$T_{vj} = 25\ °C$



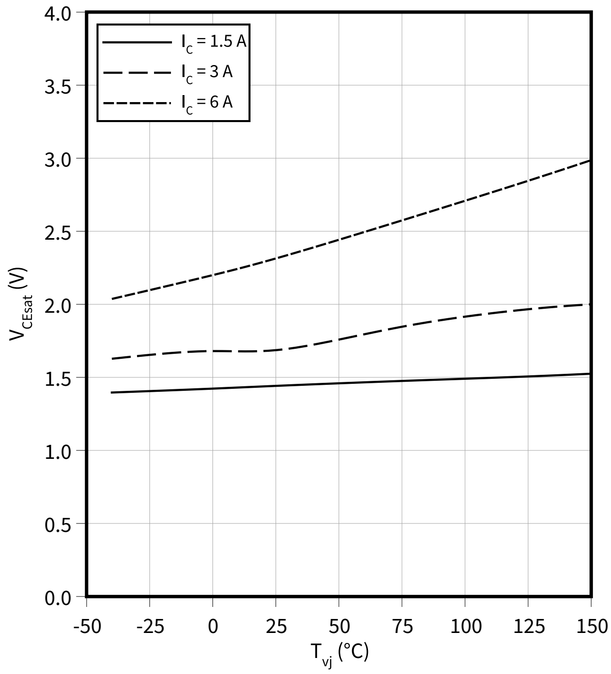
Typical output characteristic
$I_C = f(V_{CE})$
$T_{vj} = 150\ °C$



Typical transfer characteristic
$I_C = f(V_{GE})$
$V_{CE} = 20\ V$



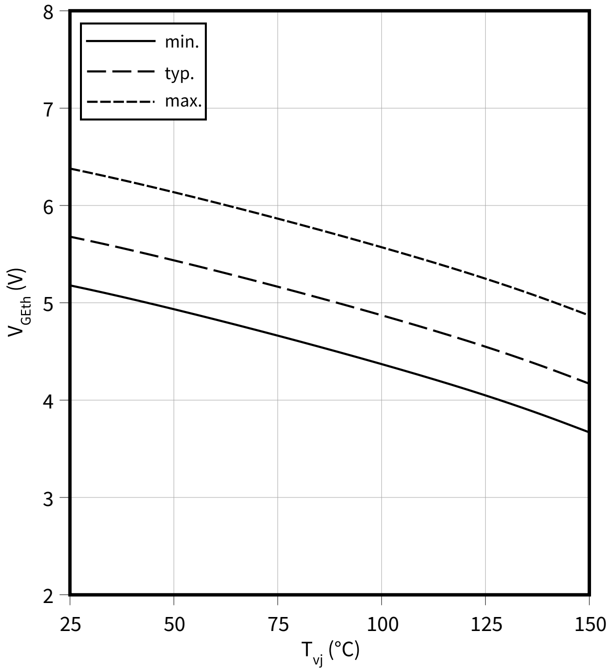
Typical collector-emitter saturation voltage as a function of junction temperature
$V_{CEsat} = f(T_{vj})$
$V_{GE} = 15\ V$



Gate-emitter threshold voltage as a function of junction temperature

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

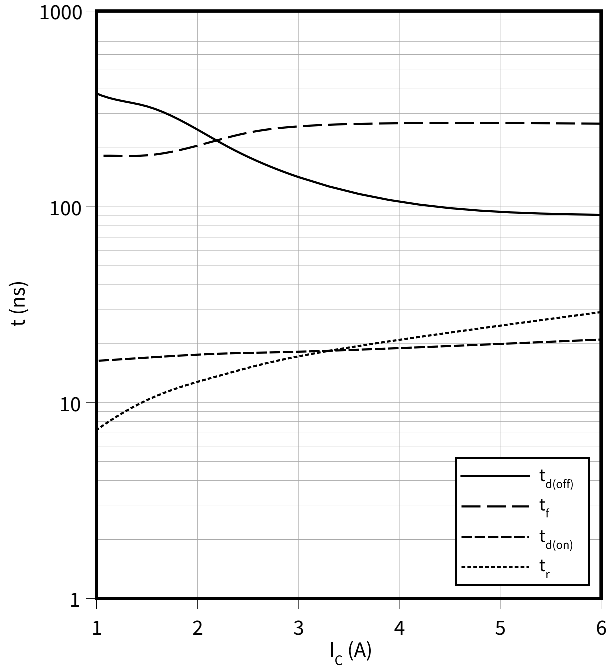
$I_C = 0.06$ mA



Typical switching times as a function of collector current

$t = f(I_C)$

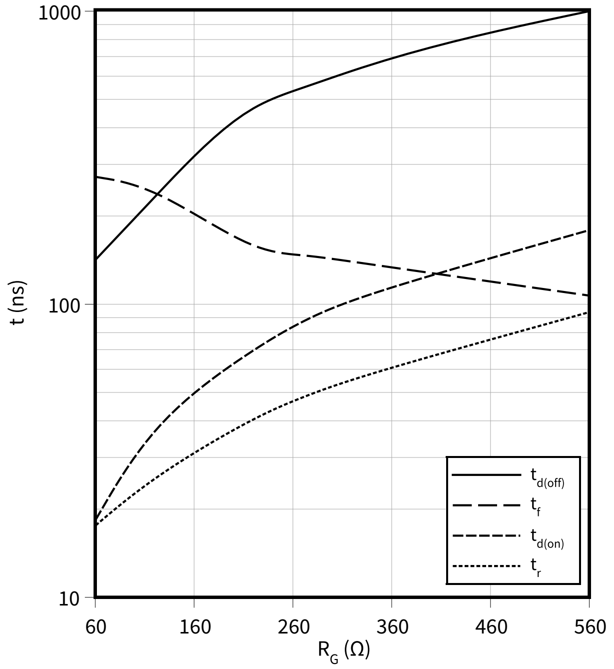
$V_{CC} = 600$ V, $T_{vj} = 150$ °C, $V_{GE} = 0/15$ V, $R_G = 60$ Ω



Typical switching times as a function of gate resistor

$t = f(R_G)$

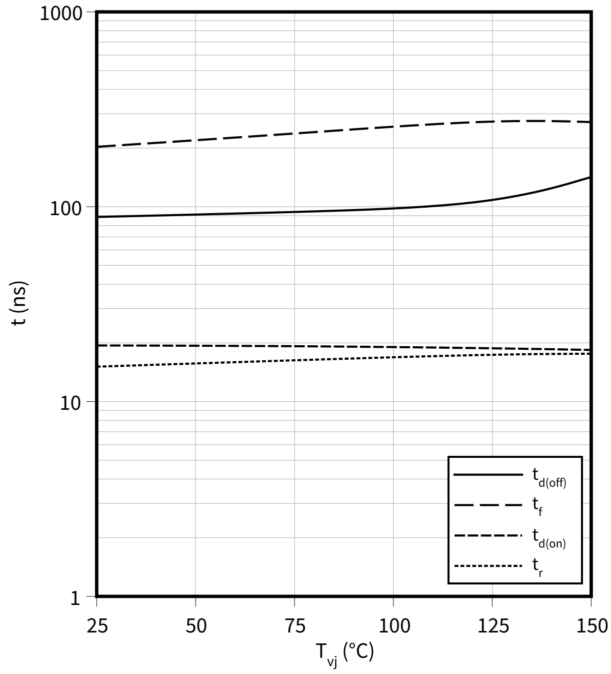
$I_C = 3$ A, $V_{CC} = 600$ V, $T_{vj} = 150$ °C, $V_{GE} = 0/15$ V



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

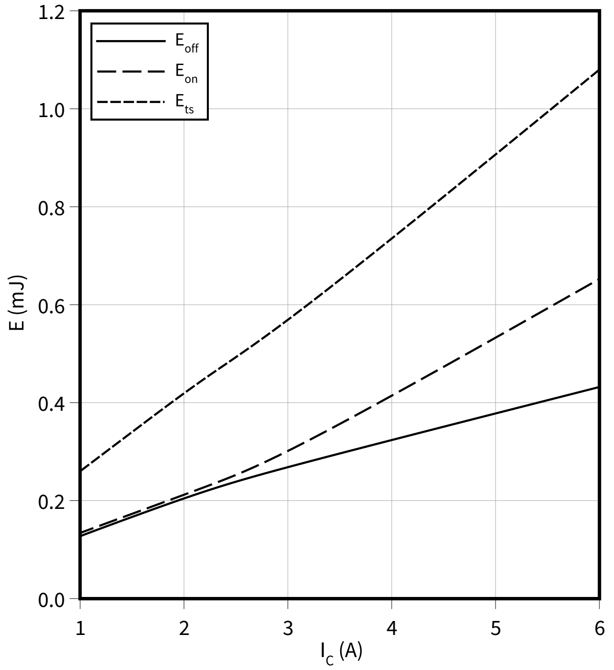
$I_C = 3$ A, $V_{CC} = 600$ V, $V_{GE} = 0/15$ V, $R_G = 60$ Ω



Typical switching energy losses as a function of collector current

$E = f(I_C)$

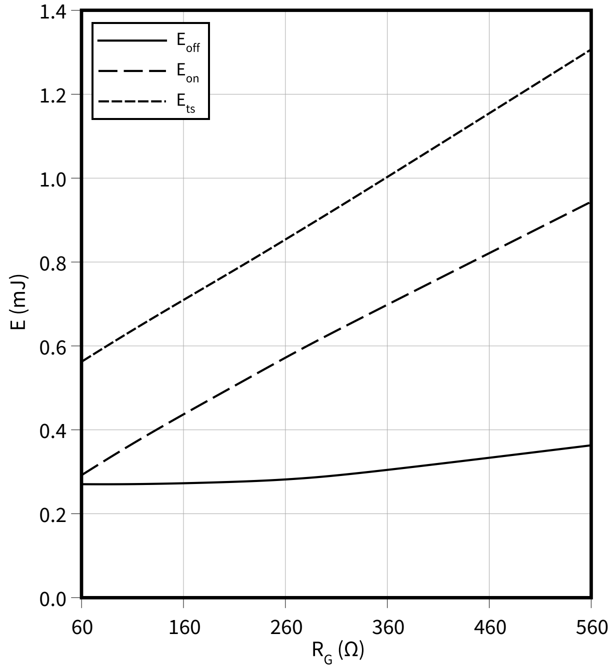
$V_{CC} = 600$ V, $T_{vj} = 150$ °C, $V_{GE} = 0/15$ V, $R_G = 60\ \Omega$



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

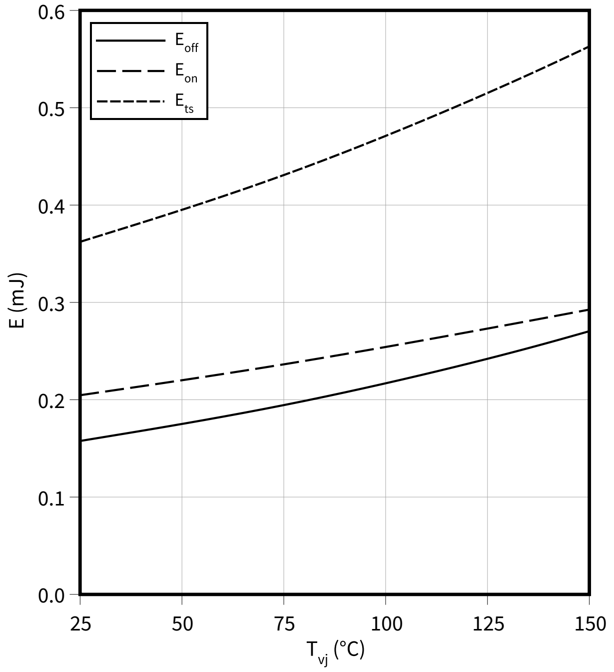
$I_C = 3$ A, $V_{CC} = 600$ V, $T_{vj} = 150$ °C, $V_{GE} = 0/15$ V



Typical switching energy losses as a function of junction temperature

$E = f(T_{vj})$

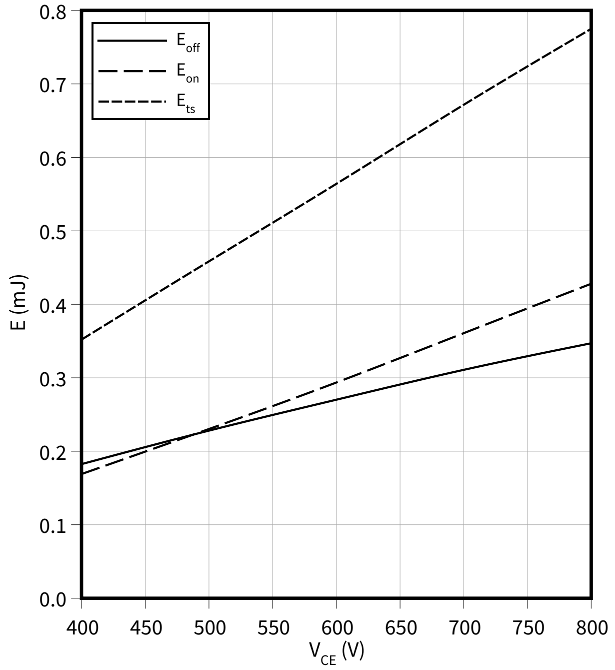
$I_C = 3$ A, $V_{CC} = 600$ V, $V_{GE} = 0/15$ V, $R_G = 60\ \Omega$



Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

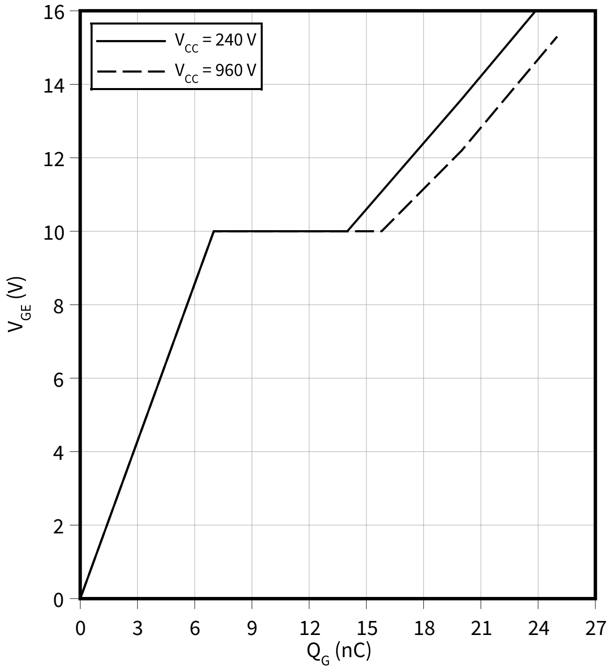
$I_C = 3$ A, $T_{vj} = 150$ °C, $V_{GE} = 0/15$ V, $R_G = 60\ \Omega$



Typical gate charge

$V_{GE} = f(Q_G)$

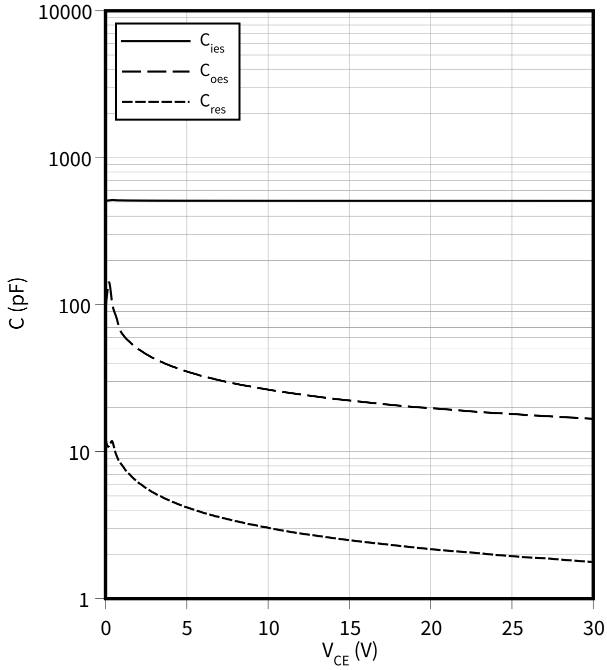
$I_C = 3$ A



Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

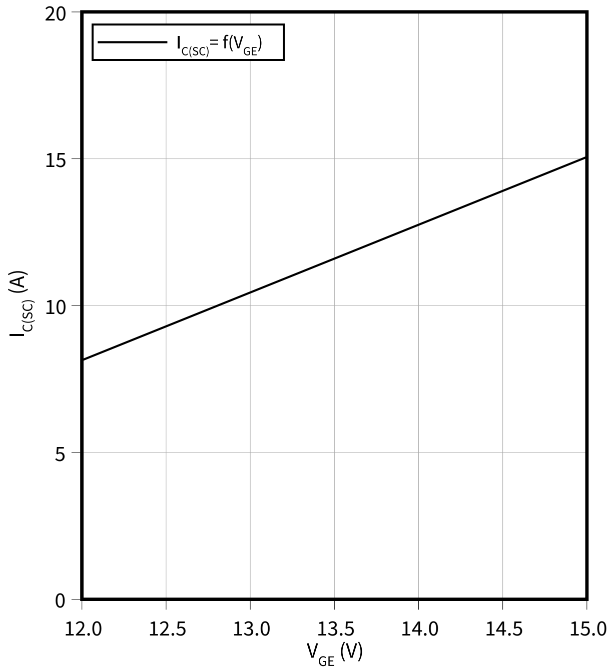
f = 100 kHz, $V_{GE} = 0$ V



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

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

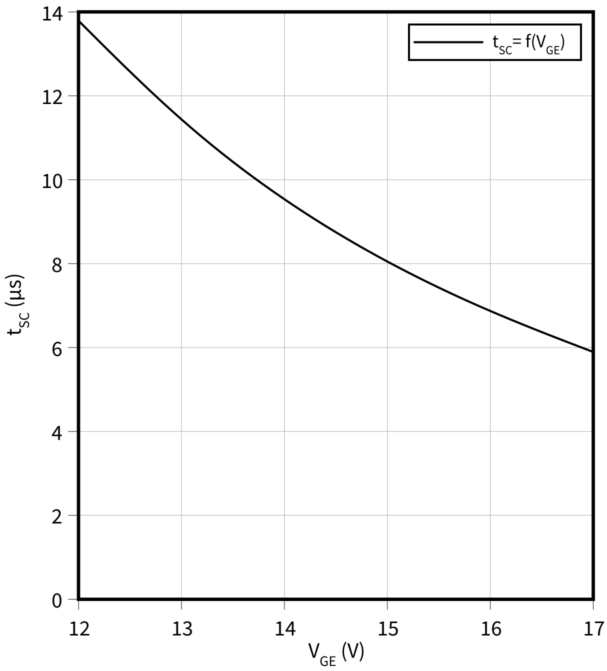
$T_{vj} = 150$ °C, $V_{CC} = 600$ V



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

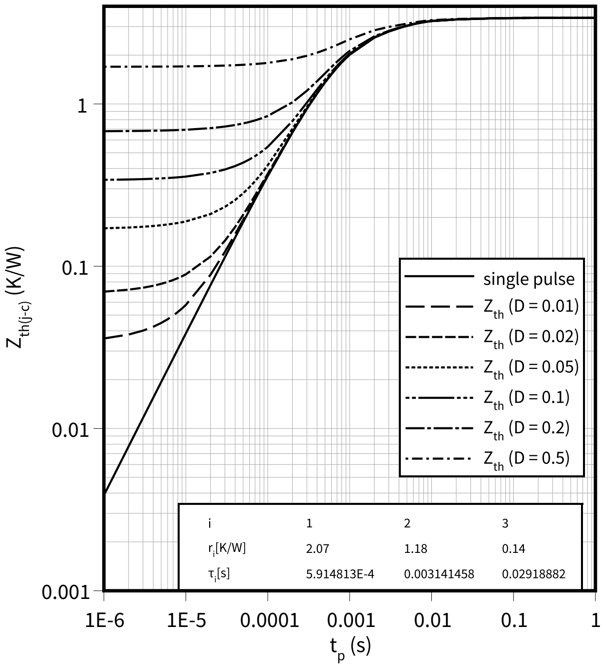
$t_{SC} = f(V_{GE})$

$T_{vj} = 150$ °C, $V_{CC} = 600$ V



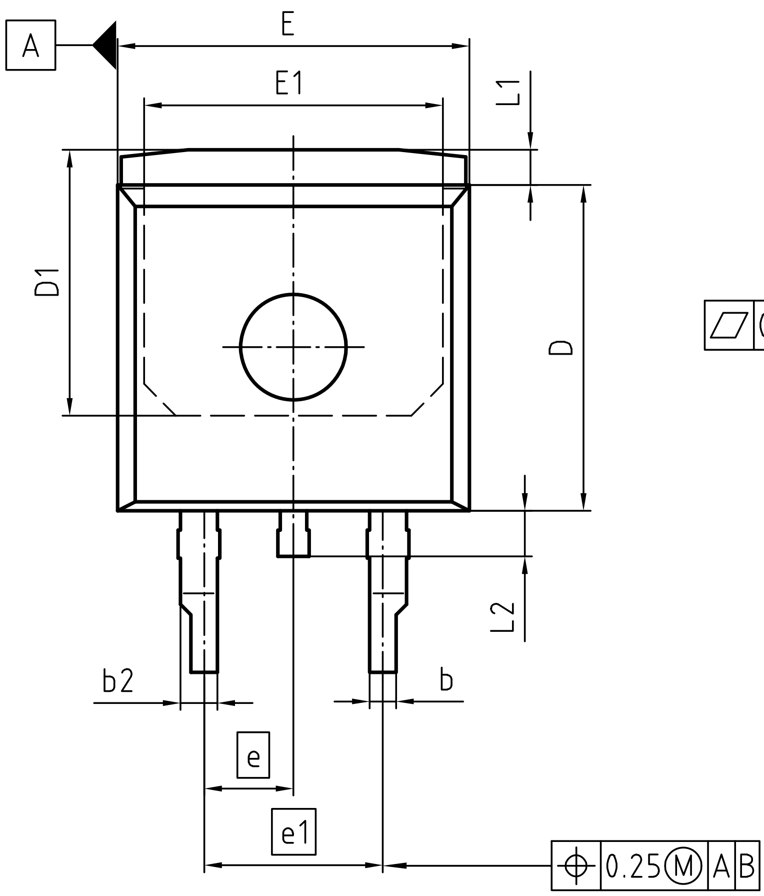
IGBT transient thermal impedance as a function of pulse width

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



4 Package outlines

PG-TO263-3-STD-C1.6



PACKAGE - GROUP NUMBER:	PG-TO263-3-U01	
DIMENSIONS	**MILLIMETERS**	
	MIN.	MAX.
A	4.30	4.50
A1	0.00	0.10
b	0.65	0.85
b2	0.95	1.15
c	0.40	0.60
c2	1.17	1.37
D	9.05	9.45
D1	7.45	7.65
E	9.80	10.20
E1	8.40	8.60
e	2.54	
e1	5.08	
N	2	
H	14.60	15.90
L	2.40	3.00
L1	0.70	1.30
L2	1.00	1.60

Figure 1

5 Testing conditions

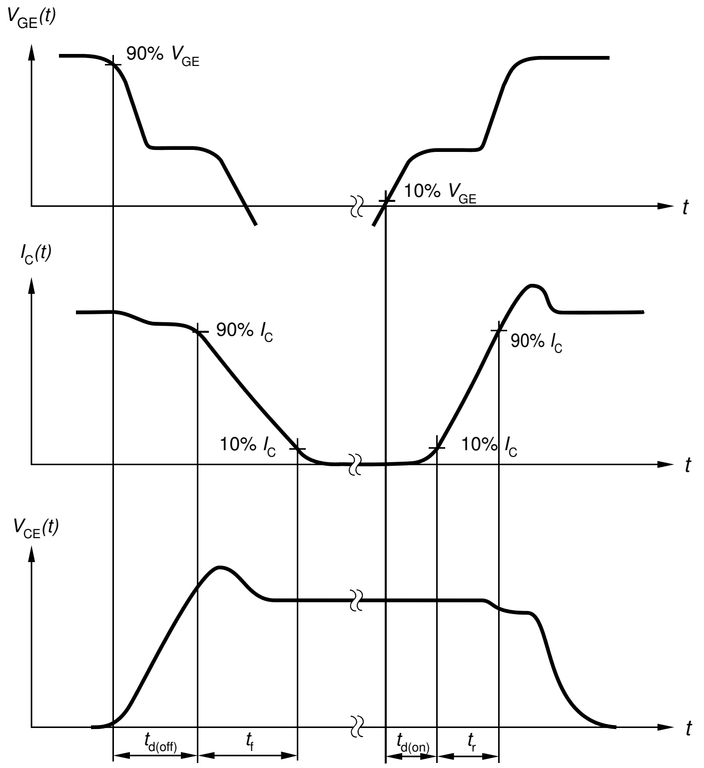


Figure A. **Definition of switching times**

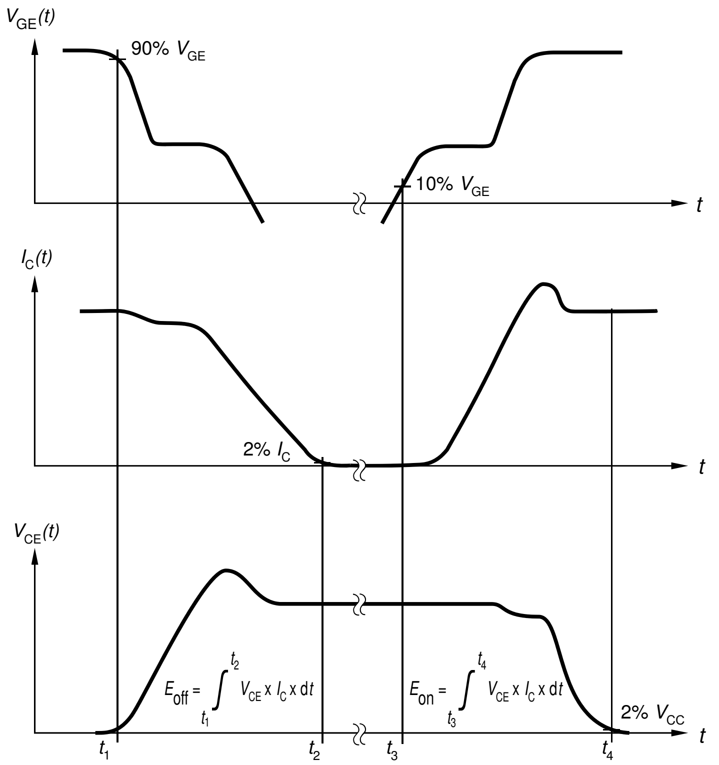


Figure B. **Definition of switching losses**

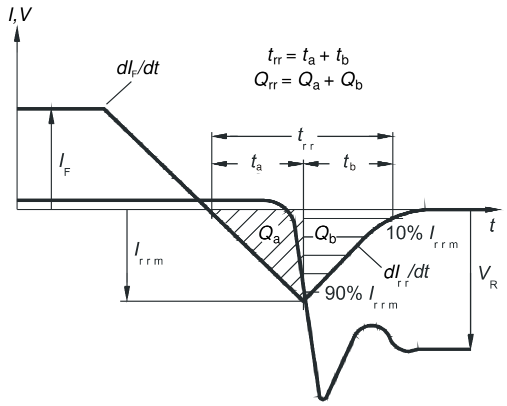


Figure C. **Definition of diode switching characteristics**

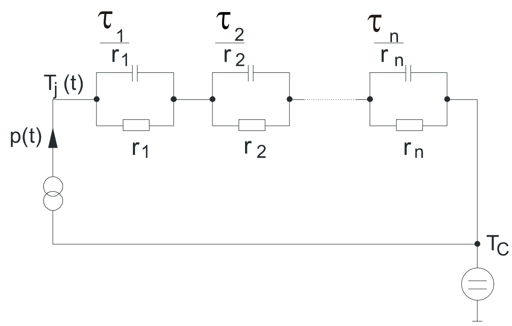


Figure D. **Thermal equivalent circuit**

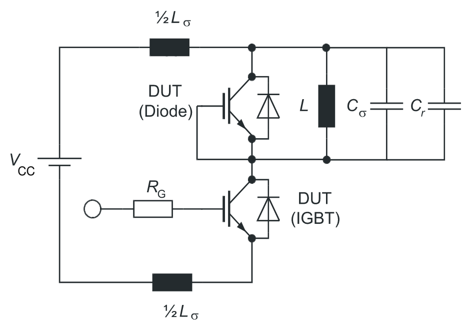


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

Figure 2

Revision history

Document revision	Date of release	Description of changes
1.00	2024-03-11	Final datasheet

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