

### Final datasheet

### Short circuit rugged 1200 V TRENCHSTOP™ IGBT 7 technology

#### Features

- $V_{CE} = 1200\text{ V}$
- $I_C = 15\text{ A}$
- Low saturation voltage  $V_{CEsat} = 2\text{ V}$  at  $T_{vj} = 150^\circ\text{C}$
- Short circuit ruggedness  $8\ \mu\text{s}$
- Wide range of  $dv/dt$  controllability
- Complete product spectrum and PSpice Models: <http://www.infineon.com/igbt/>

#### Potential applications

- Industrial drives

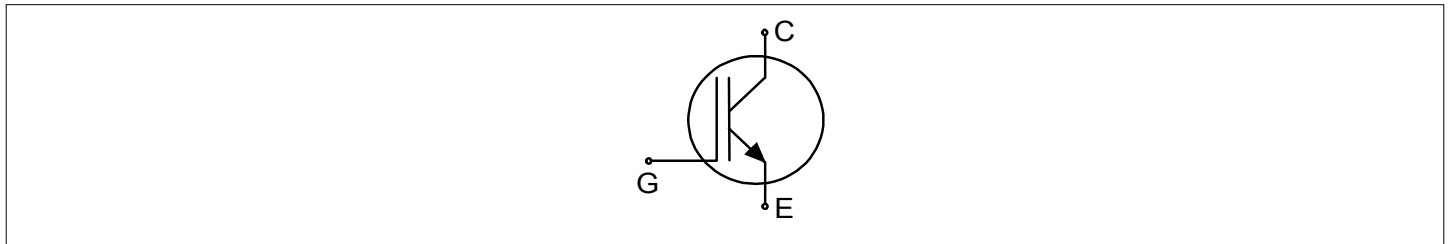
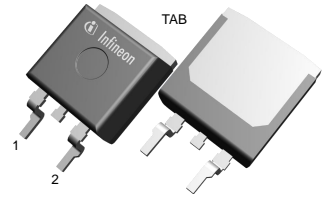
#### Product validation

- 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
IGB15N120S7	PG-TO263-3-STD-C1.6	G15MS7

## Table of contents

	<b>Description</b> .....	1
	<b>Features</b> .....	1
	<b>Potential applications</b> .....	1
	<b>Product validation</b> .....	1
	<b>Table of contents</b> .....	2
<b>1</b>	<b>Package</b> .....	3
<b>2</b>	<b>IGBT</b> .....	3
<b>3</b>	<b>Characteristics diagrams</b> .....	6
<b>4</b>	<b>Package outlines</b> .....	11
<b>5</b>	<b>Testing conditions</b> .....	12
	<b>Revision history</b> .....	13
	<b>Disclaimer</b> .....	14

## 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 <sup>2</sup> Cu on PCB junction to ambient	$R_{th(j-a)}$				40	K/W
IGBT thermal resistance, junction-case	$R_{th(j-c)}$			0.66	0.89	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 $T_{vjmax}$	$I_C$	$T_c = 25 \text{ °C}$	34 <sup>1)</sup>	A
		$T_c = 100 \text{ °C}$	22	
Pulsed collector current, $t_p$ limited by $T_{vjmax}$	$I_{Cpulse}$		45	A
Turn-off safe operating area		$V_{CE} \leq 1200 \text{ V}, T_{vj} \leq 150 \text{ °C}$	45	A
Gate-emitter voltage	$V_{GE}$		±20	V
Transient gate-emitter voltage	$V_{GE}$	$t_p \leq 0.5 \text{ } \mu\text{s}, D < 0.001$	±25	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 $\geq 1.0 \text{ s}, T_{vj} = 150 \text{ °C}$	8	μs
Power dissipation	$P_{tot}$	$T_c = 25 \text{ °C}$	141	W
		$T_c = 100 \text{ °C}$	56	

1) Limited by bondwire

**Table 3 Characteristic values**

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CEsat}$	$I_C = 15\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$		1.65	2	V
			$T_{vj} = 150\text{ °C}$		2		
Gate-emitter threshold voltage	$V_{GETh}$	$I_C = 0.3\text{ mA}, V_{CE} = V_{GE}$		5.15	5.7	6.45	V
Zero gate-voltage collector current	$I_{CES}$	$V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$			20	$\mu\text{A}$
			$T_{vj} = 150\text{ °C}$		260		
Gate-emitter leakage current	$I_{GES}$	$V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}$				100	nA
Transconductance	$g_{fs}$	$I_C = 15\text{ A}, V_{CE} = 20\text{ V}, T_{vj} = 150\text{ °C}$			6.7		S
Short-circuit collector current	$I_{SC}$	$V_{CC} \leq 600\text{ V}, V_{GE} = 15\text{ V}, t_{SC} \leq 8\text{ }\mu\text{s}$ , Allowed number of short circuits < 1000, Time between short circuits $\geq 1.0\text{ s}$ , $T_{vj} = 150\text{ °C}$			72		A
Input capacitance	$C_{ies}$	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$			2.5		nF
Output capacitance	$C_{oes}$	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$			41		pF
Reverse transfer capacitance	$C_{res}$	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$			27		pF
Gate charge	$Q_G$	$V_{CC} = 960\text{ V}, I_C = 15\text{ A}, V_{GE} = 15\text{ V}$			97		nC
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{G(on)} = 10\text{ }\Omega, R_{G(off)} = 10\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 15\text{ A}$		16		ns
			$T_{vj} = 150\text{ °C}, I_C = 15\text{ A}$		16		
Rise time (inductive load)	$t_r$	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{G(on)} = 10\text{ }\Omega, R_{G(off)} = 10\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 15\text{ A}$		17		ns
			$T_{vj} = 150\text{ °C}, I_C = 15\text{ A}$		19		
Turn-off delay time	$t_{d(off)}$	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{G(on)} = 10\text{ }\Omega, R_{G(off)} = 10\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 15\text{ A}$		156		ns
			$T_{vj} = 150\text{ °C}, I_C = 15\text{ A}$		223		
Fall time (inductive load)	$t_f$	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{G(on)} = 10\text{ }\Omega, R_{G(off)} = 10\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 15\text{ A}$		111		ns
			$T_{vj} = 150\text{ °C}, I_C = 15\text{ A}$		216		
Turn-on energy	$E_{on}$	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{G(on)} = 10\text{ }\Omega, R_{G(off)} = 10\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 15\text{ A}$		0.9		mJ
			$T_{vj} = 150\text{ °C}, I_C = 15\text{ A}$		1.3		

**(table continues...)**

**Table 3 (continued) Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-off energy	$E_{off}$	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V},$ $R_{G(on)} = 10\ \Omega,$ $R_{G(off)} = 10\ \Omega$	$T_{vj} = 25\text{ }^\circ\text{C},$ $I_C = 15\text{ A}$		0.68	mJ
			$T_{vj} = 150\text{ }^\circ\text{C},$ $I_C = 15\text{ A}$		1.3	
Total switching energy	$E_{ts}$	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V},$ $R_{G(on)} = 10\ \Omega,$ $R_{G(off)} = 10\ \Omega$	$T_{vj} = 25\text{ }^\circ\text{C},$ $I_C = 15\text{ A}$		1.58	mJ
			$T_{vj} = 150\text{ }^\circ\text{C},$ $I_C = 15\text{ A}$		2.63	
Operating junction temperature	$T_{vj}$		-40		150	$^\circ\text{C}$

**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  $T_{vj} = 25\text{ }^\circ\text{C}$ , unless otherwise specified.

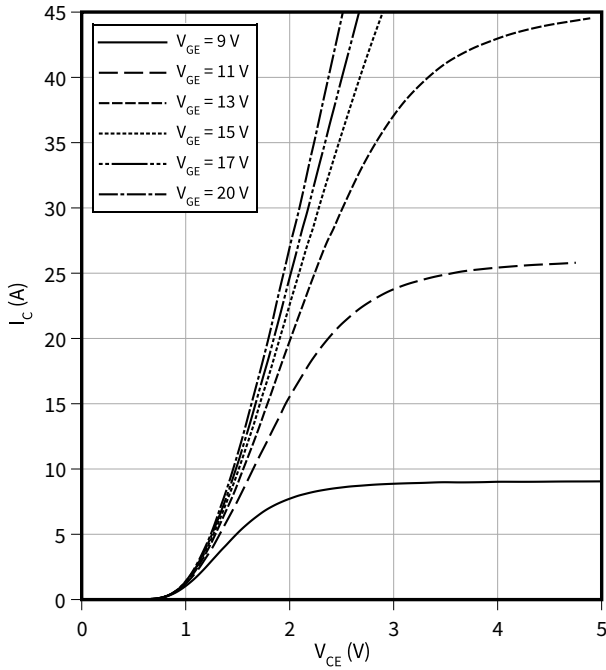
Dynamic test circuit, parasitic inductance  $L_\sigma = 45\text{ nH}$ , parasitic capacitor  $C_\sigma = 25\text{ pF}$  from Fig. E. Energy losses include “tail” and diode (IKW15N120CS7) reverse recovery.

### 3 Characteristics diagrams

**Typical output characteristic**

$I_C = f(V_{CE})$

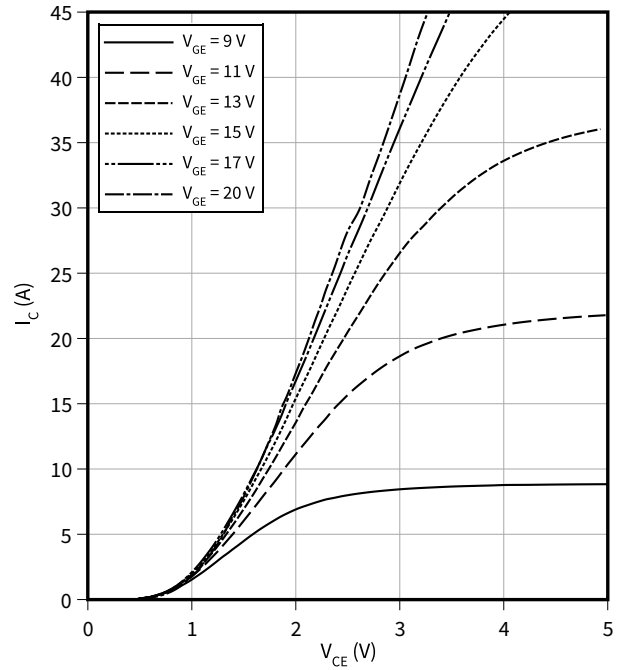
$T_{vj} = 25\text{ °C}$



**Typical output characteristic**

$I_C = f(V_{CE})$

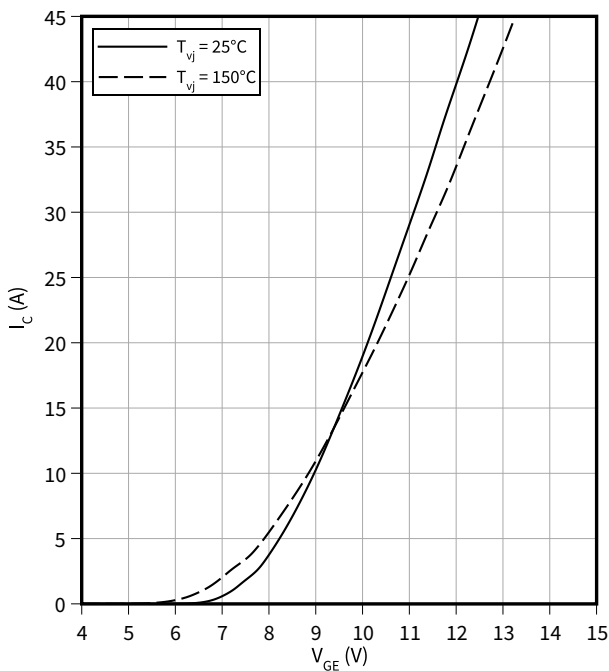
$T_{vj} = 150\text{ °C}$



**Typical transfer characteristic**

$I_C = f(V_{GE})$

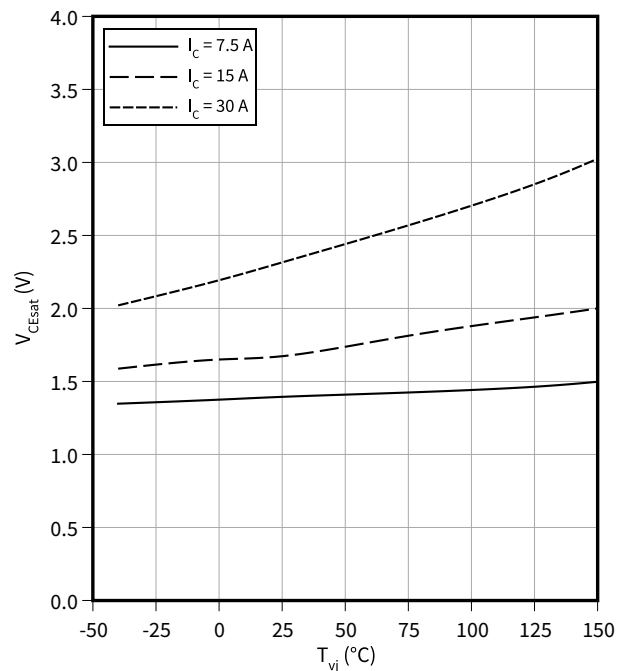
$V_{CE} = 20\text{ V}$



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

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

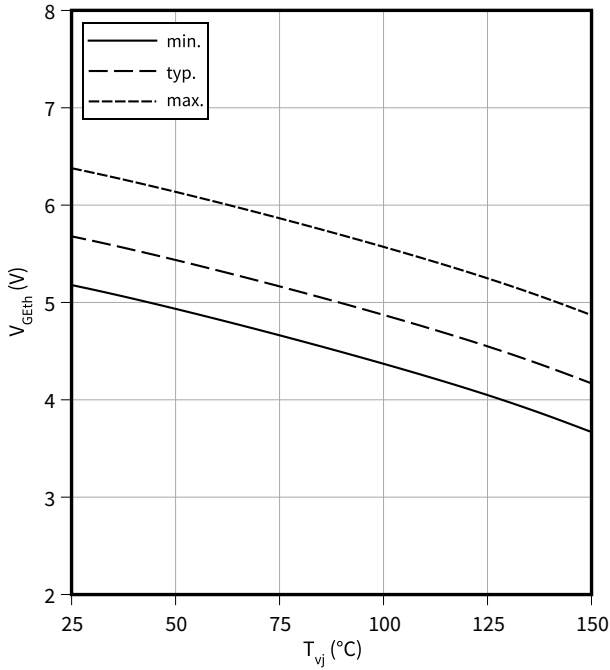
$V_{GE} = 15\text{ V}$



3 Characteristics diagrams

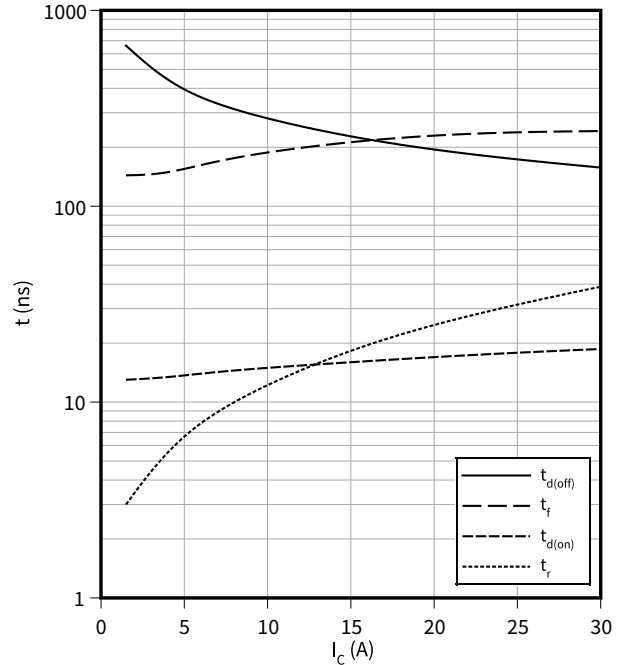
**Gate-emitter threshold voltage as a function of junction temperature**

$V_{GEth} = f(T_{vj})$   
 $I_C = 0.3 \text{ mA}$



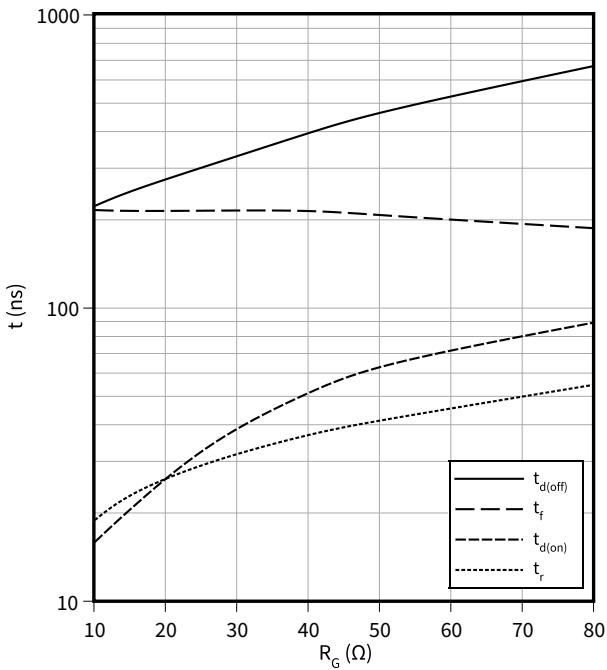
**Typical switching times as a function of collector current**

$t = f(I_C)$   
 $V_{CC} = 600 \text{ V}, T_{vj} = 150 \text{ °C}, V_{GE} = 0/15 \text{ V}, R_G = 10 \text{ } \Omega$



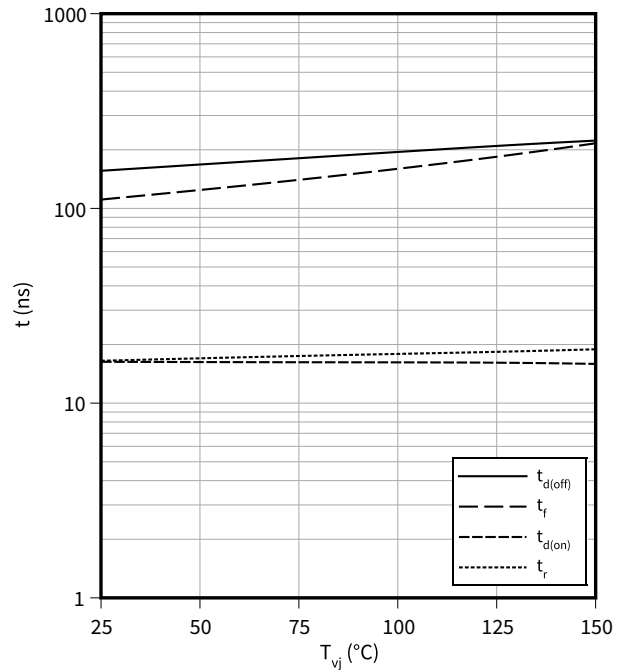
**Typical switching times as a function of gate resistor**

$t = f(R_G)$   
 $I_C = 15 \text{ A}, V_{CC} = 600 \text{ V}, T_{vj} = 150 \text{ °C}, V_{GE} = 0/15 \text{ V}$



**Typical switching times as a function of junction temperature**

$t = f(T_{vj})$   
 $I_C = 15 \text{ A}, V_{CC} = 600 \text{ V}, V_{GE} = 0/15 \text{ V}, R_G = 10 \text{ } \Omega$

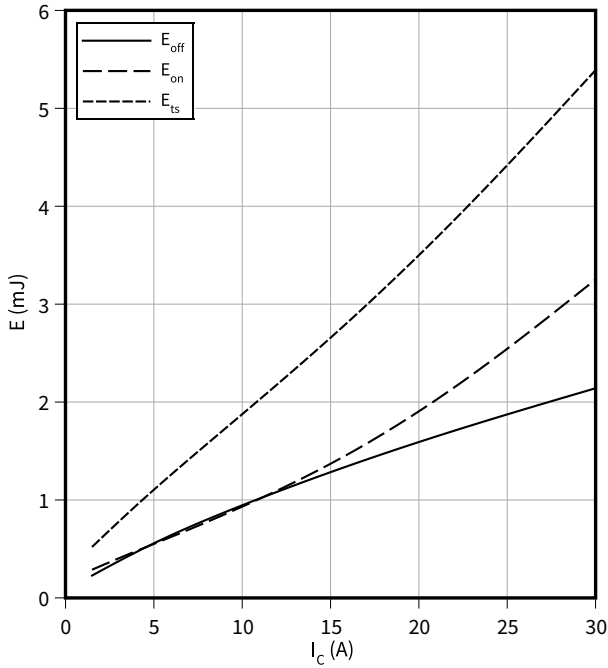


3 Characteristics diagrams

**Typical switching energy losses as a function of collector current**

$E = f(I_C)$

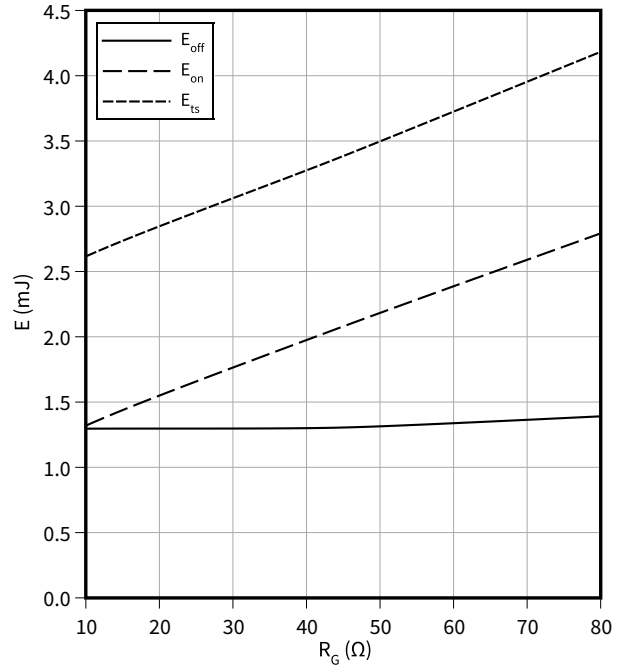
$V_{CC} = 600\text{ V}, T_{vj} = 150\text{ °C}, V_{GE} = 0/15\text{ V}, R_G = 10\text{ }\Omega$



**Typical switching energy losses as a function of gate resistor**

$E = f(R_G)$

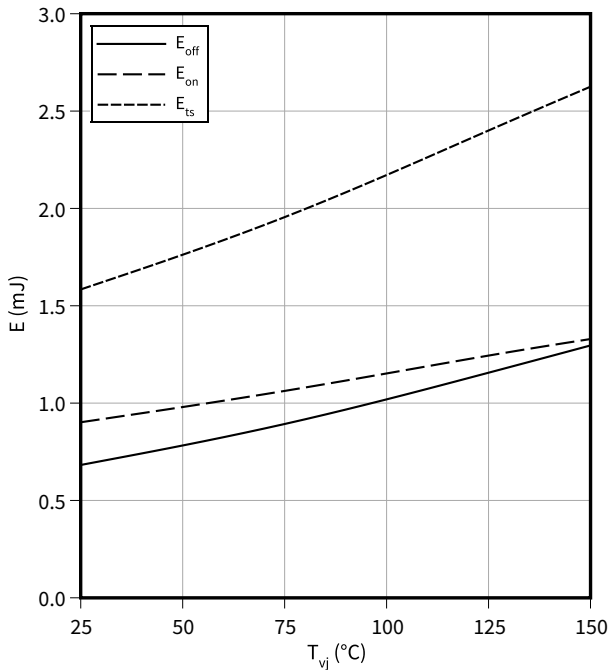
$I_C = 15\text{ A}, V_{CC} = 600\text{ V}, T_{vj} = 150\text{ °C}, V_{GE} = 0/15\text{ V}$



**Typical switching energy losses as a function of junction temperature**

$E = f(T_{vj})$

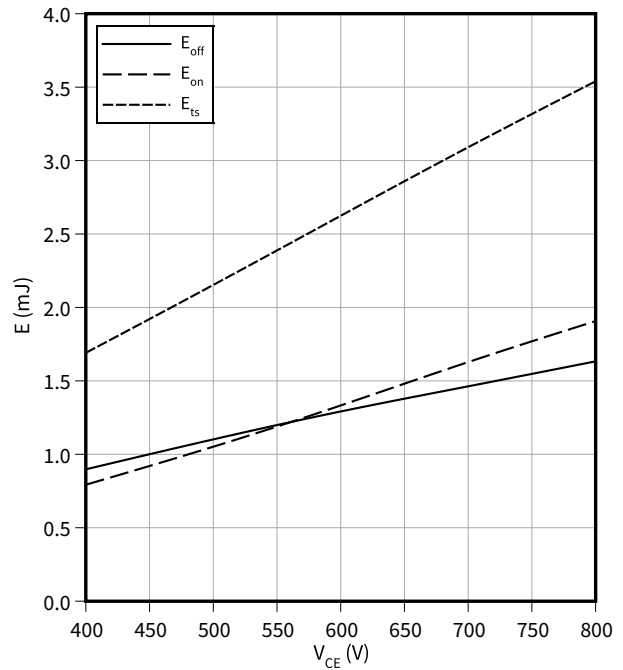
$I_C = 15\text{ A}, V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_G = 10\text{ }\Omega$



**Typical switching energy losses as a function of collector emitter voltage**

$E = f(V_{CE})$

$I_C = 15\text{ A}, T_{vj} = 150\text{ °C}, V_{GE} = 0/15\text{ V}, R_G = 10\text{ }\Omega$

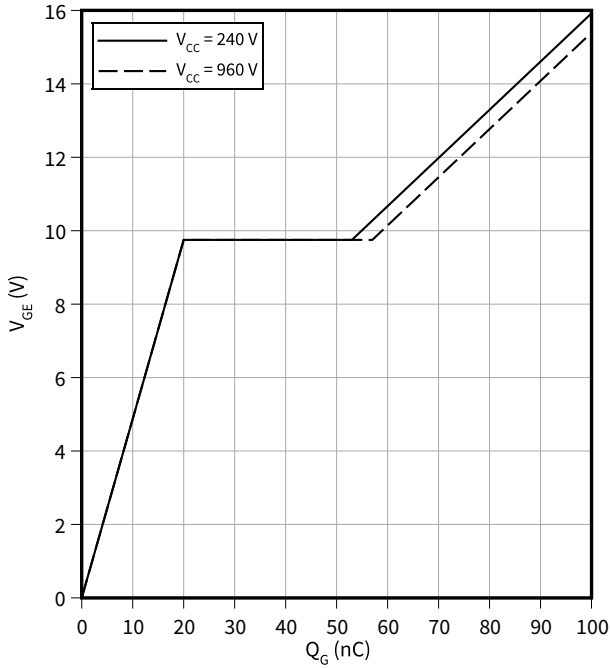


3 Characteristics diagrams

**Typical gate charge**

$V_{GE} = f(Q_G)$

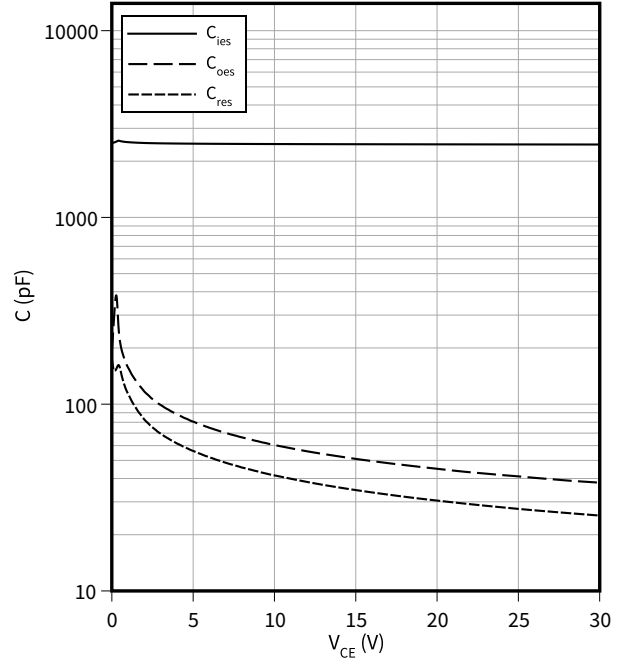
$I_C = 15 \text{ A}$



**Typical capacitance as a function of collector-emitter voltage**

$C = f(V_{CE})$

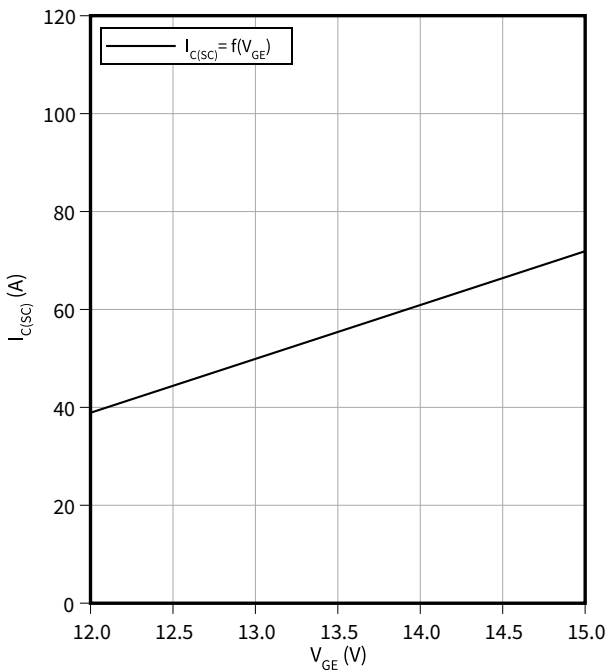
$f = 100 \text{ kHz}, V_{GE} = 0 \text{ V}$



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

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

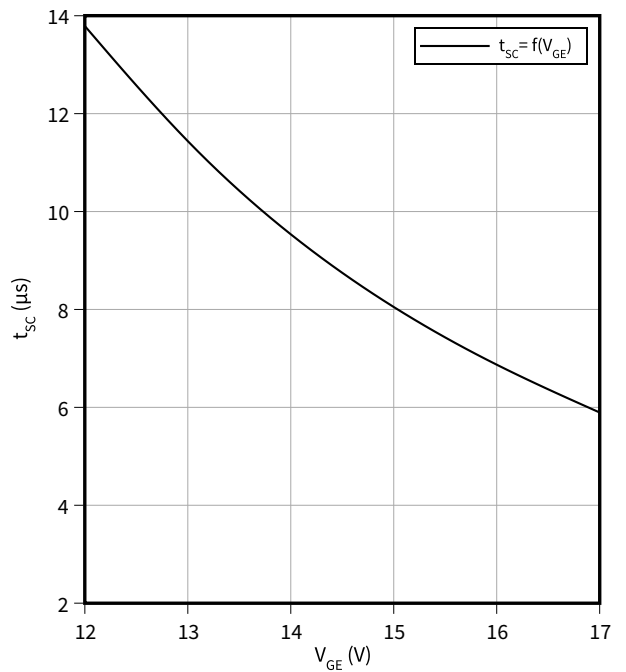
$T_{vj} = 150 \text{ }^\circ\text{C}, V_{CC} = 600 \text{ V}$



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

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

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

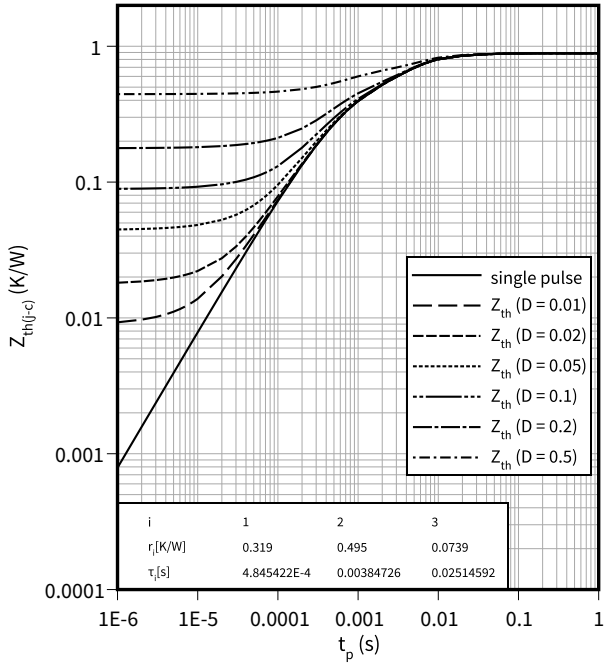


3 Characteristics diagrams

**IGBT transient thermal impedance as a function of pulse width**

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

$$D = t_p/T$$



4 Package outlines

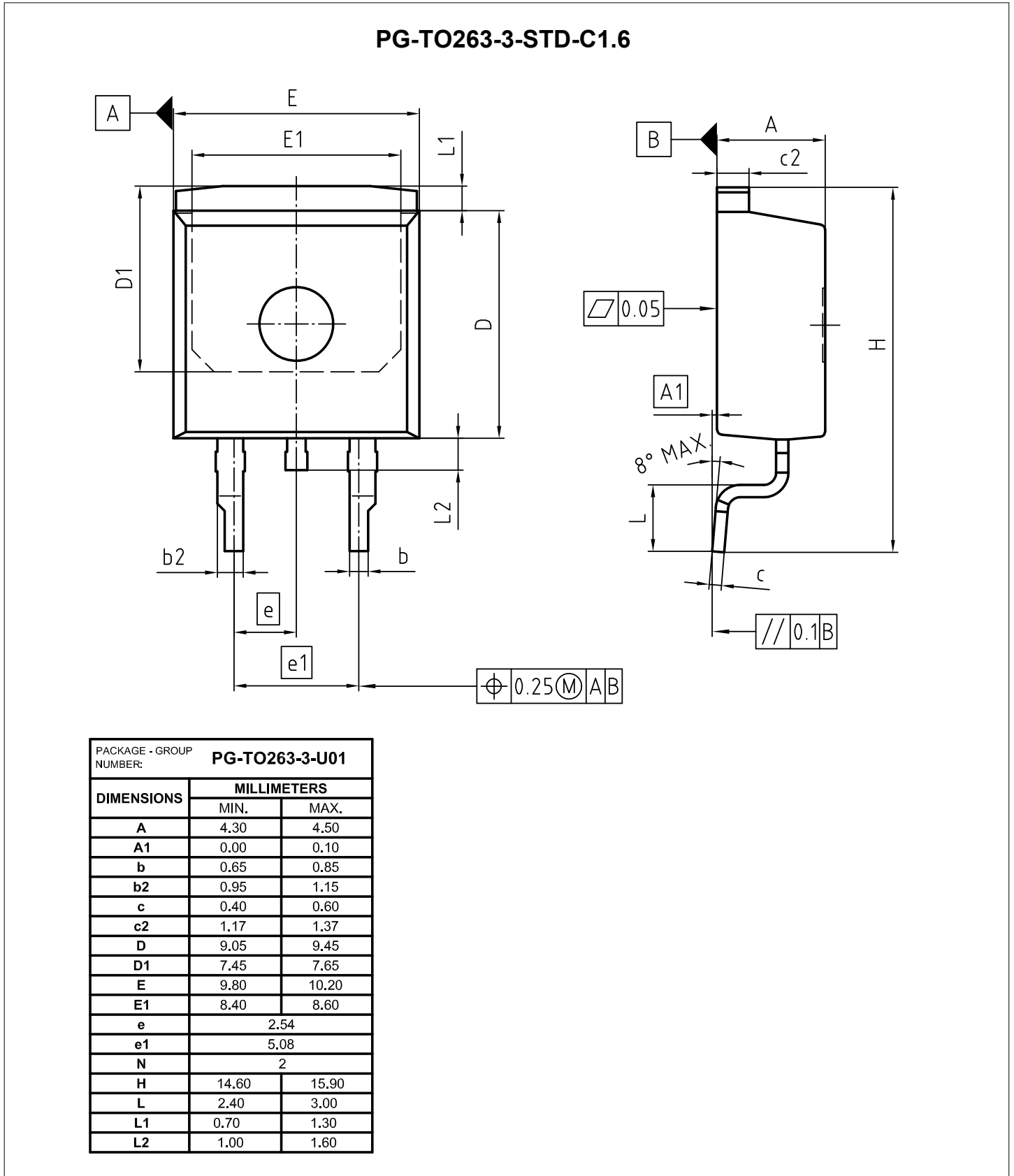
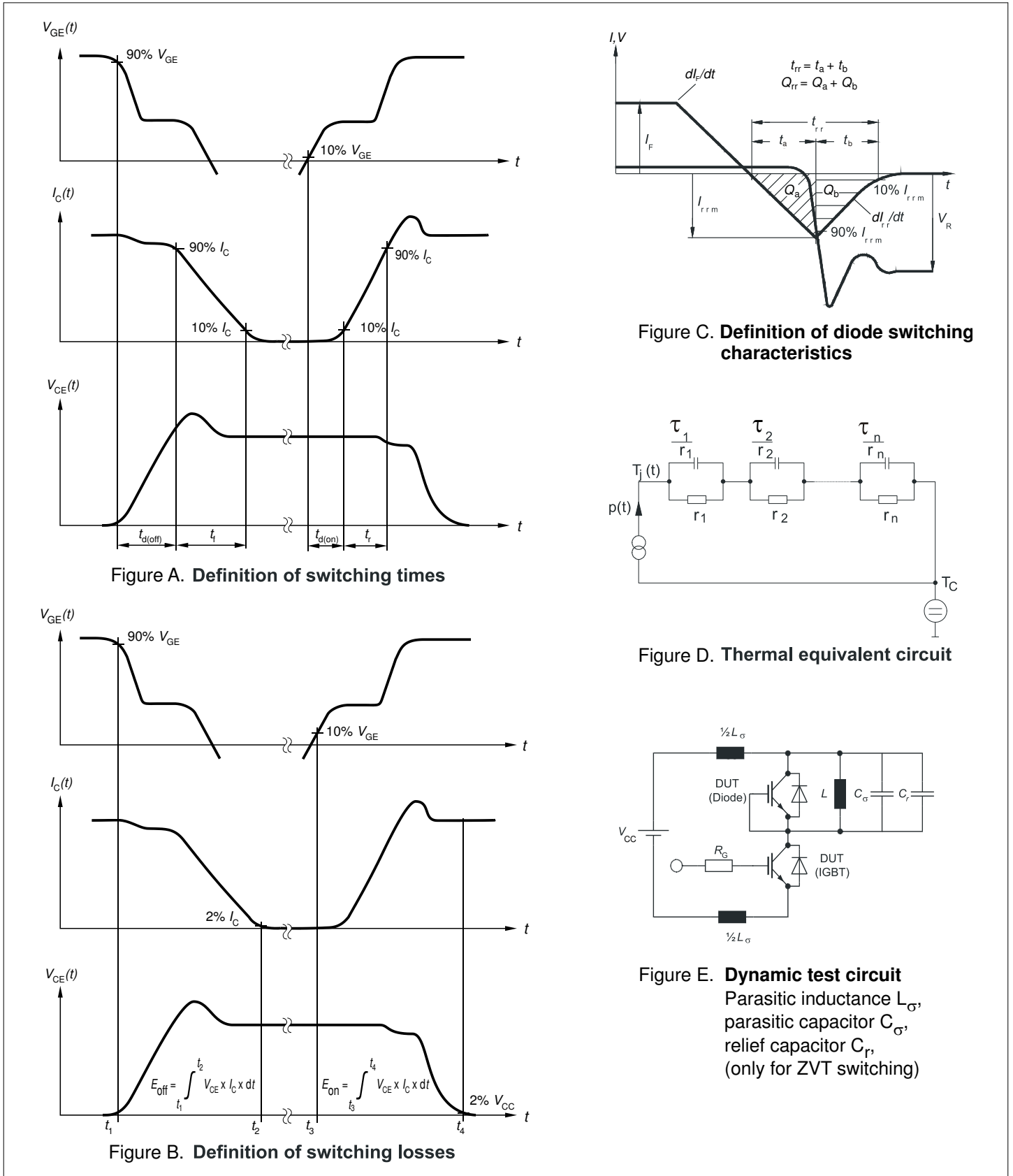


Figure 1

**5 Testing conditions**



**Figure 2**

## Revision history

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

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**Document reference**

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