

Final datasheet

Short circuit rugged 1200 V TRENCHSTOP™ IGBT 7 technology

Features

- $V_{CE} = 1200\text{ V}$
- $I_C = 3\text{ A}$
- 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

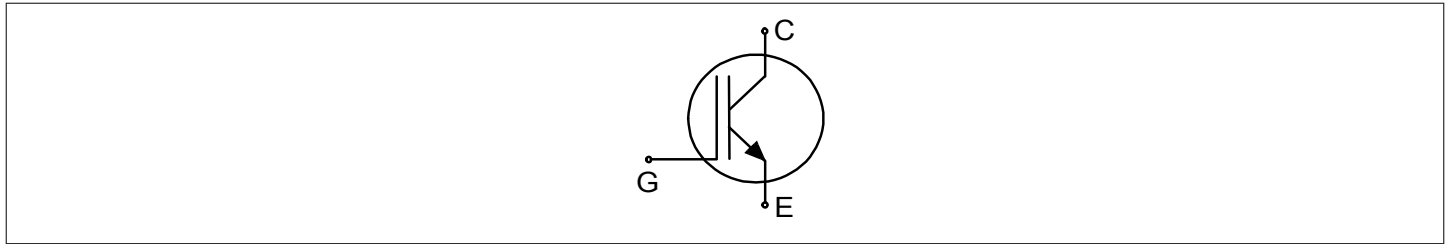
Product validation

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



- Halogen-free
- Lead-free
- Green
- RoHS

Description



Type	Package	Marking
IGD03N120S7	PG-TO252-3	G03MS7

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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			3		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	$R_{th(j-a)}$				50	K/W
IGBT thermal resistance, junction-case	$R_{th(j-c)}$			2.07	2.79	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	$T_c = 25 \text{ °C}$	10	A
		$T_c = 100 \text{ °C}$	6	
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}		9	A
Turn-off safe operating area		$V_{CE} \leq 1200 \text{ V}, T_{vj} \leq 150 \text{ °C}$	9	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}	$T_c = 25 \text{ °C}$	45	W
		$T_c = 100 \text{ °C}$	18	

Table 3 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	$I_C = 3\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$		1.65	2	V
			$T_{vj} = 150\text{ °C}$		2		
Gate-emitter threshold voltage	V_{GETh}	$I_C = 0.06\text{ mA}, V_{CE} = V_{GE}$		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	μA
			$T_{vj} = 150\text{ °C}$		80		
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}$				100	nA
Transconductance	g_{fs}	$I_C = 3\text{ A}, V_{CE} = 20\text{ V}, T_{vj} = 150\text{ °C}$			1.8		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 $\geq 1.0\text{ s}$, $T_{vj} = 150\text{ °C}$			15		A
Input capacitance	C_{ies}	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$			0.5		nF
Output capacitance	C_{oes}	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$			18		pF
Reverse transfer capacitance	C_{res}	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$			2		pF
Gate charge	Q_G	$V_{CC} = 960\text{ V}, I_C = 3\text{ A}, V_{GE} = 15\text{ V}$			24		nC
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{G(on)} = 60\text{ }\Omega, R_{G(off)} = 60\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 3\text{ A}$		19		ns
			$T_{vj} = 150\text{ °C}, I_C = 3\text{ A}$		18		
Rise time (inductive load)	t_r	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{G(on)} = 60\text{ }\Omega, R_{G(off)} = 60\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 3\text{ A}$		15		ns
			$T_{vj} = 150\text{ °C}, I_C = 3\text{ A}$		18		
Turn-off delay time	$t_{d(off)}$	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{G(on)} = 60\text{ }\Omega, R_{G(off)} = 60\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 3\text{ A}$		89		ns
			$T_{vj} = 150\text{ °C}, I_C = 3\text{ A}$		142		
Fall time (inductive load)	t_f	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{G(on)} = 60\text{ }\Omega, R_{G(off)} = 60\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 3\text{ A}$		203		ns
			$T_{vj} = 150\text{ °C}, I_C = 3\text{ A}$		272		
Turn-on energy	E_{on}	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{G(on)} = 60\text{ }\Omega, R_{G(off)} = 60\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 3\text{ A}$		0.21		mJ
			$T_{vj} = 150\text{ °C}, I_C = 3\text{ A}$		0.29		
Turn-off energy	E_{off}	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{G(on)} = 60\text{ }\Omega, R_{G(off)} = 60\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 3\text{ A}$		0.16		mJ
			$T_{vj} = 150\text{ °C}, I_C = 3\text{ A}$		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}	$V_{CC} = 600 \text{ V}, V_{GE} = 0/15 \text{ V},$ $R_{G(on)} = 60 \Omega,$ $R_{G(off)} = 60 \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C}, I_C = 3 \text{ A}$		0.37	mJ
			$T_{vj} = 150 \text{ }^\circ\text{C},$ $I_C = 3 \text{ A}$		0.56	
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 $T_{vj} = 25^\circ\text{C}$, unless otherwise specified.

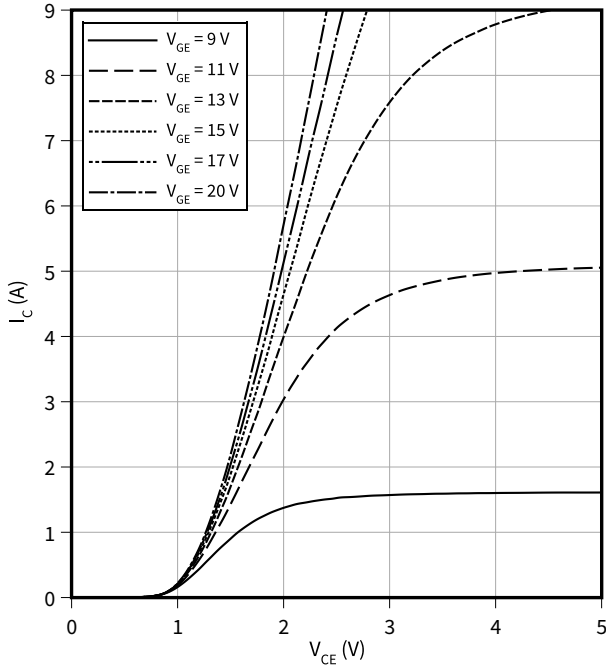
Dynamic test circuit, parasitic inductance $L_\sigma = 45 \text{ nH}$, parasitic capacitor $C_\sigma = 25 \text{ pF}$ from Fig. E. Energy losses include “tail” and diode reverse recovery.

3 Characteristics diagrams

Typical output characteristic

$I_C = f(V_{CE})$

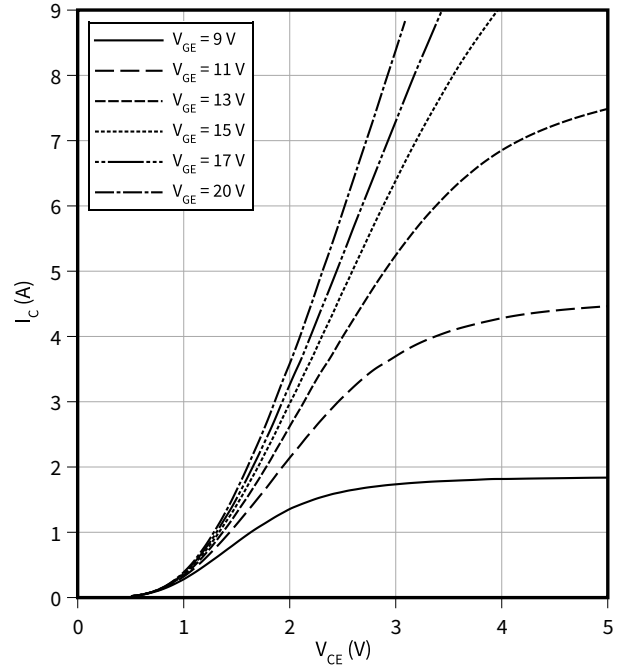
$T_{vj} = 25\text{ °C}$



Typical output characteristic

$I_C = f(V_{CE})$

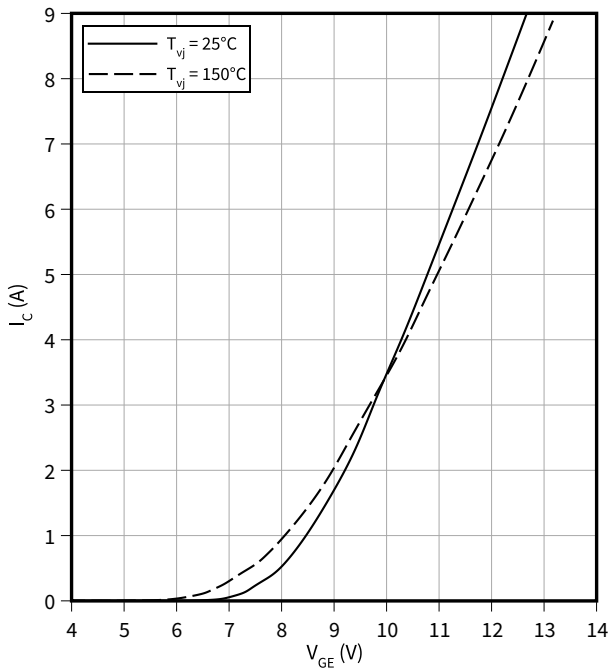
$T_{vj} = 150\text{ °C}$



Typical transfer characteristic

$I_C = f(V_{GE})$

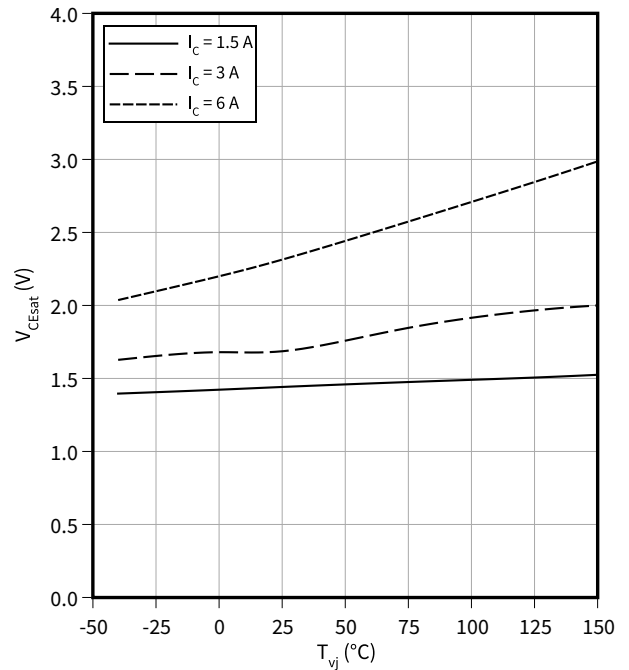
$V_{CE} = 20\text{ V}$



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

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

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

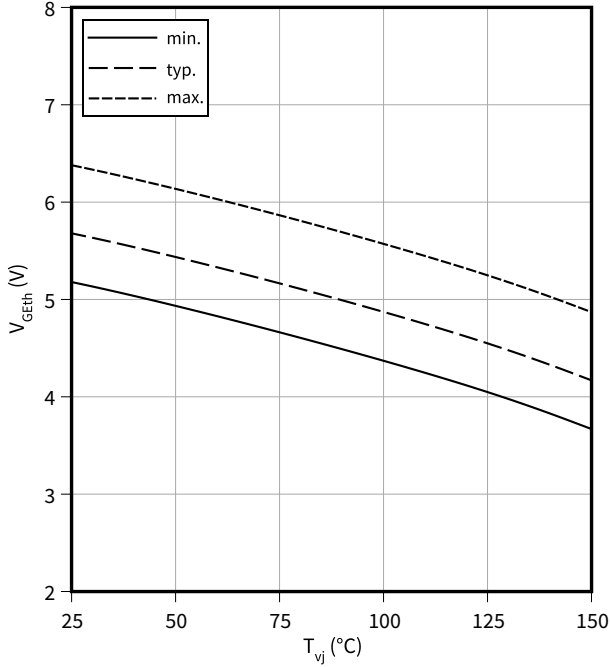


3 Characteristics diagrams

Gate-emitter threshold voltage as a function of junction temperature

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

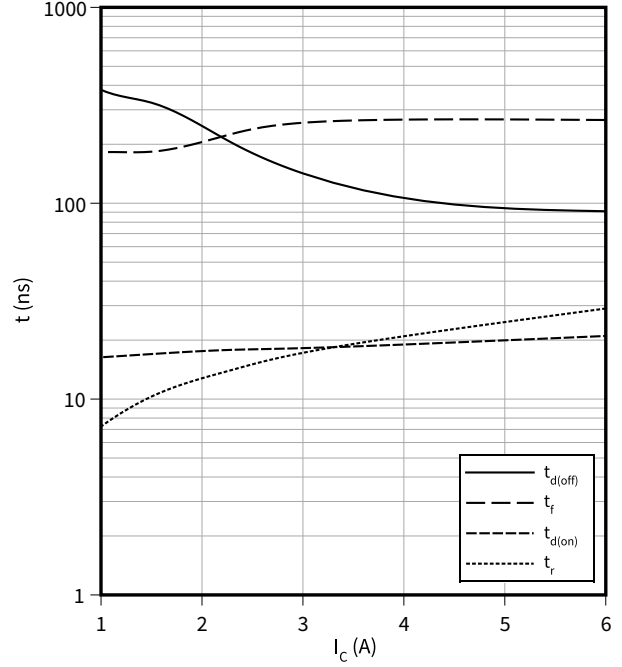
$I_C = 0.06 \text{ mA}$



Typical switching times as a function of collector current

$t = f(I_C)$

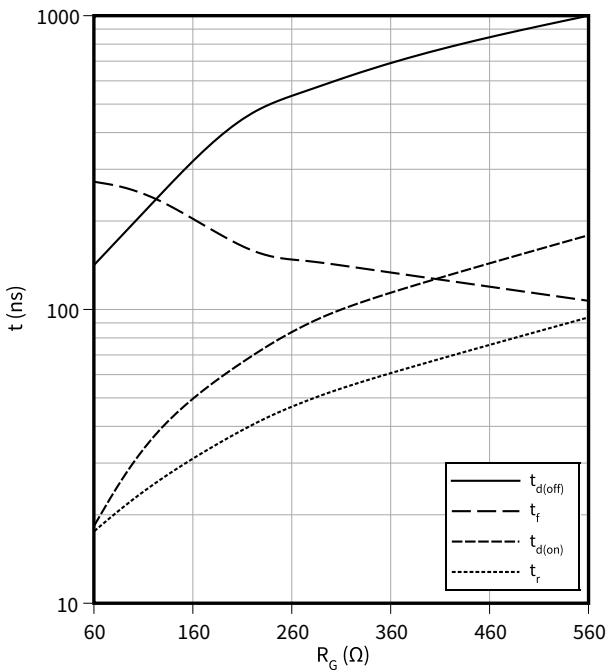
$V_{CC} = 600 \text{ V}, T_{vj} = 150 \text{ °C}, V_{GE} = 0/15 \text{ V}, R_G = 60 \text{ } \Omega$



Typical switching times as a function of gate resistor

$t = f(R_G)$

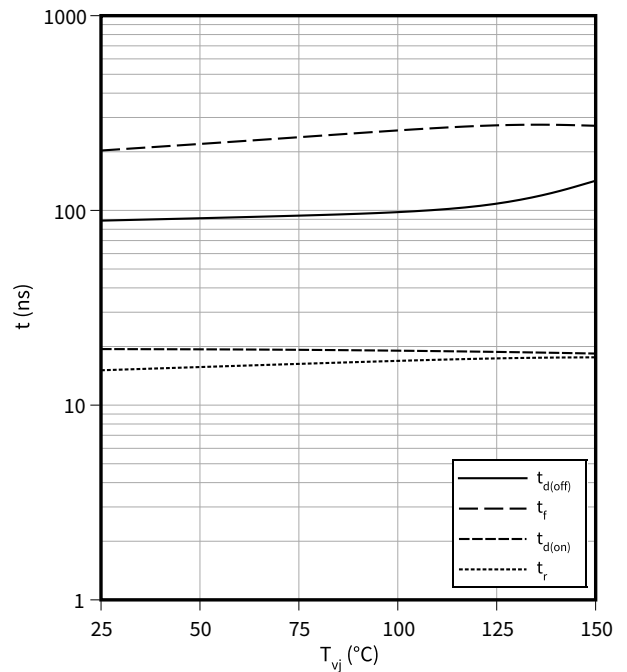
$I_C = 3 \text{ A}, V_{CC} = 600 \text{ V}, T_{vj} = 150 \text{ °C}, V_{GE} = 0/15 \text{ V}$



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

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

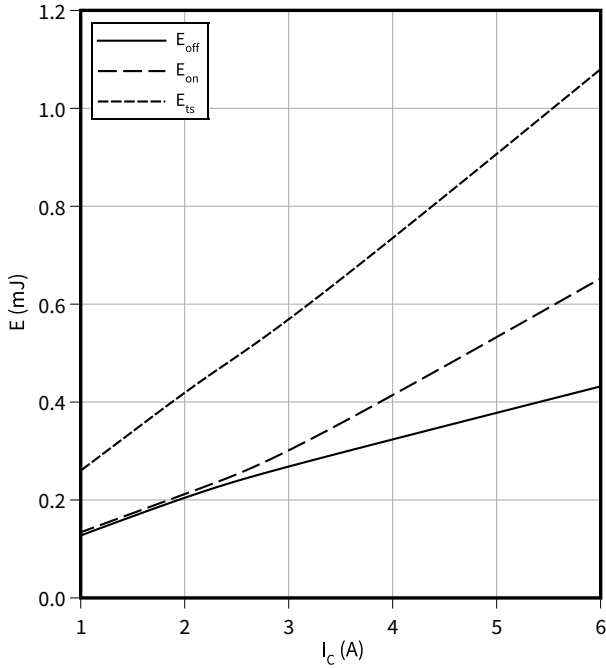


3 Characteristics diagrams

Typical switching energy losses as a function of collector current

$E = f(I_C)$

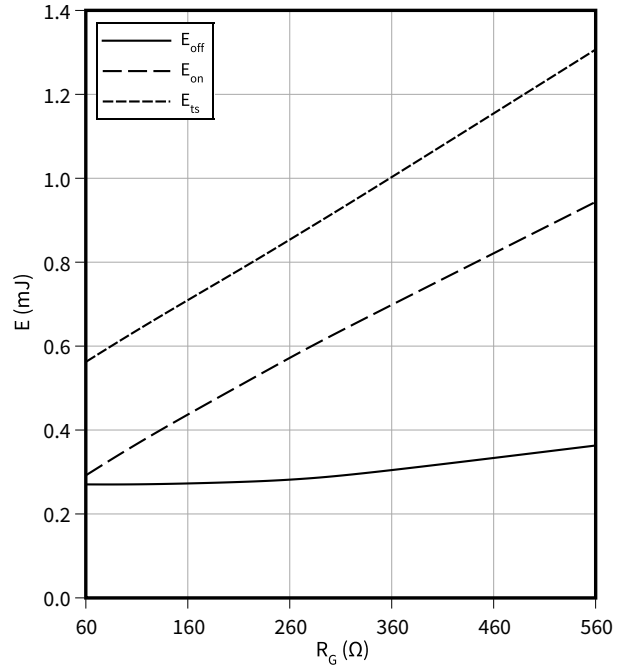
$V_{CC} = 600\text{ V}, T_{vj} = 150\text{ }^\circ\text{C}, V_{GE} = 0/15\text{ V}, R_G = 60\text{ }\Omega$



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

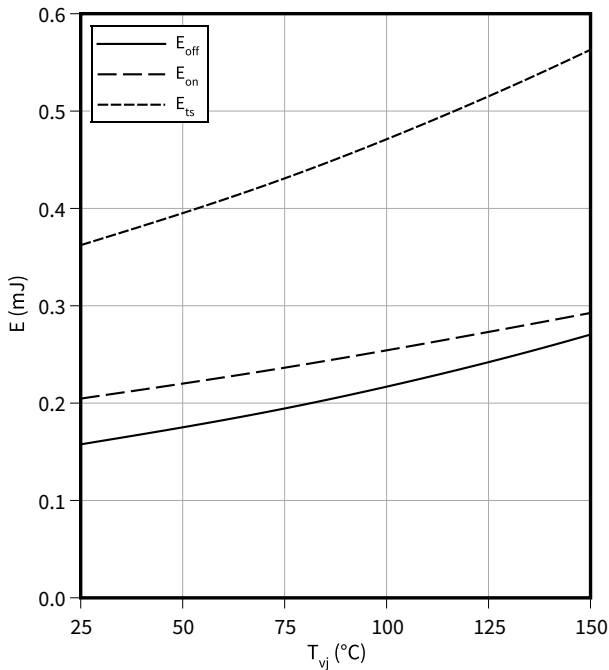
$I_C = 3\text{ A}, V_{CC} = 600\text{ V}, T_{vj} = 150\text{ }^\circ\text{C}, V_{GE} = 0/15\text{ V}$



Typical switching energy losses as a function of junction temperature

$E = f(T_{vj})$

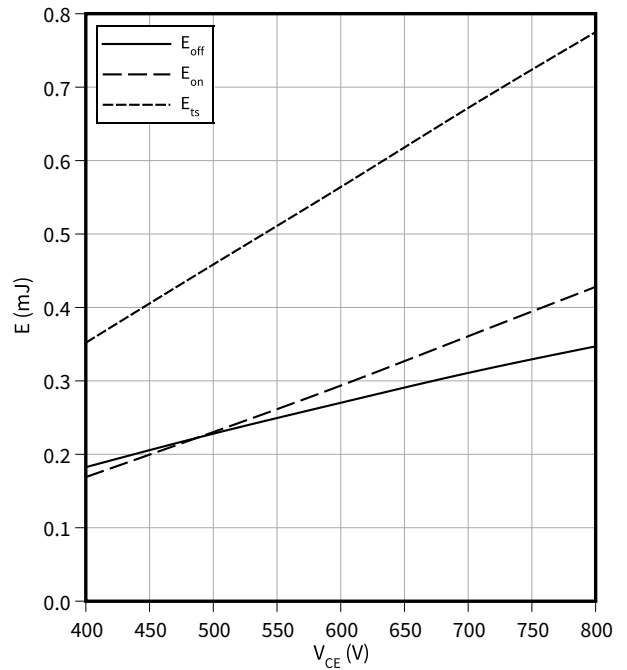
$I_C = 3\text{ A}, V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_G = 60\text{ }\Omega$



Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

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

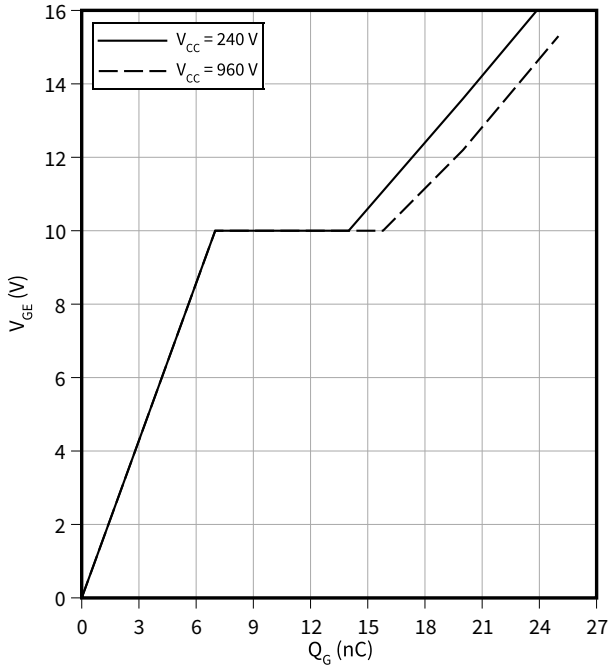


3 Characteristics diagrams

Typical gate charge

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

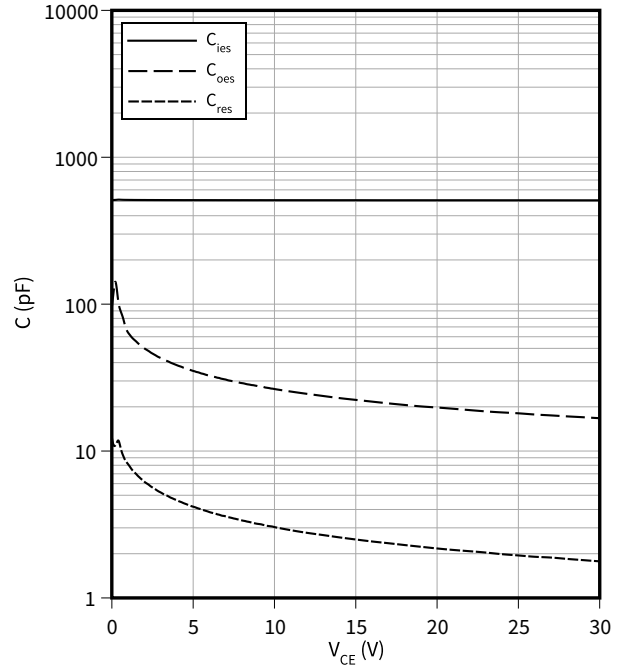
$$I_C = 3 \text{ A}$$



Typical capacitance as a function of collector-emitter voltage

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

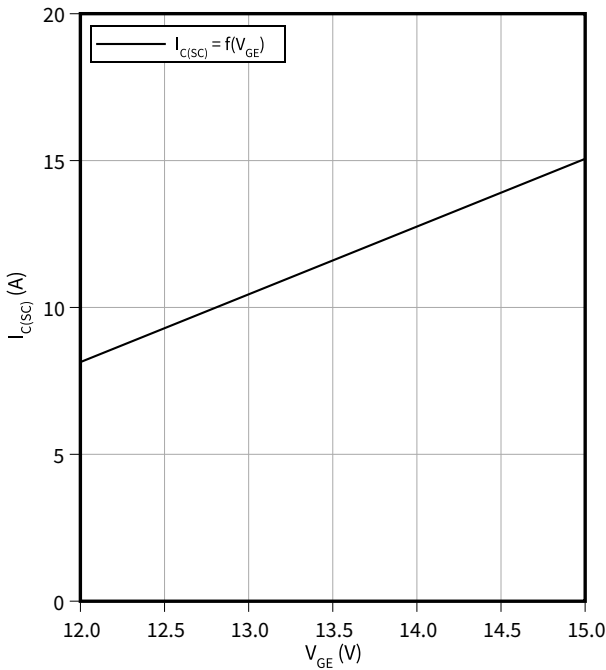
$$f = 100 \text{ kHz}, V_{GE} = 0 \text{ V}$$



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

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

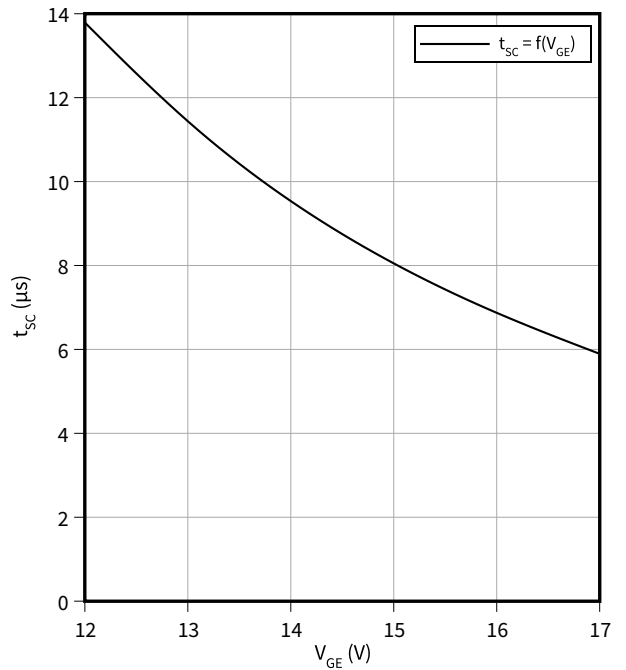
$$T_{vj} = 150 \text{ }^\circ\text{C}, V_{CC} = 600 \text{ V}$$



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

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

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

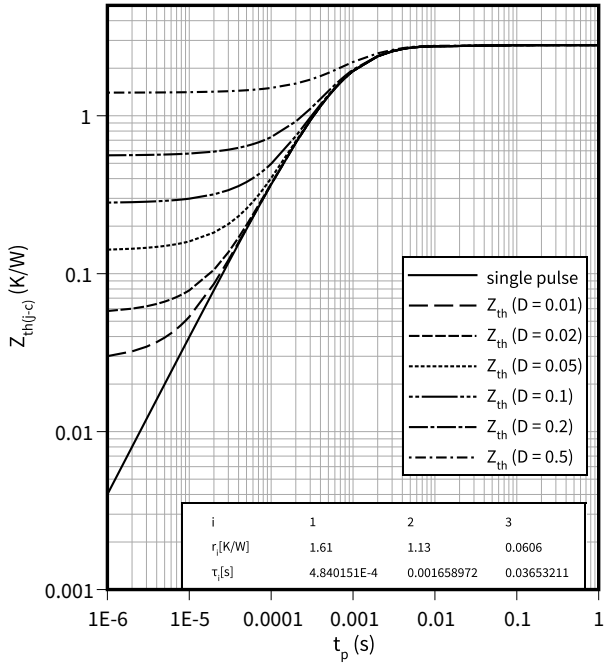


3 Characteristics diagrams

IGBT transient thermal impedance as a function of pulse width

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

$$D = t_p/T$$



4 Package outlines

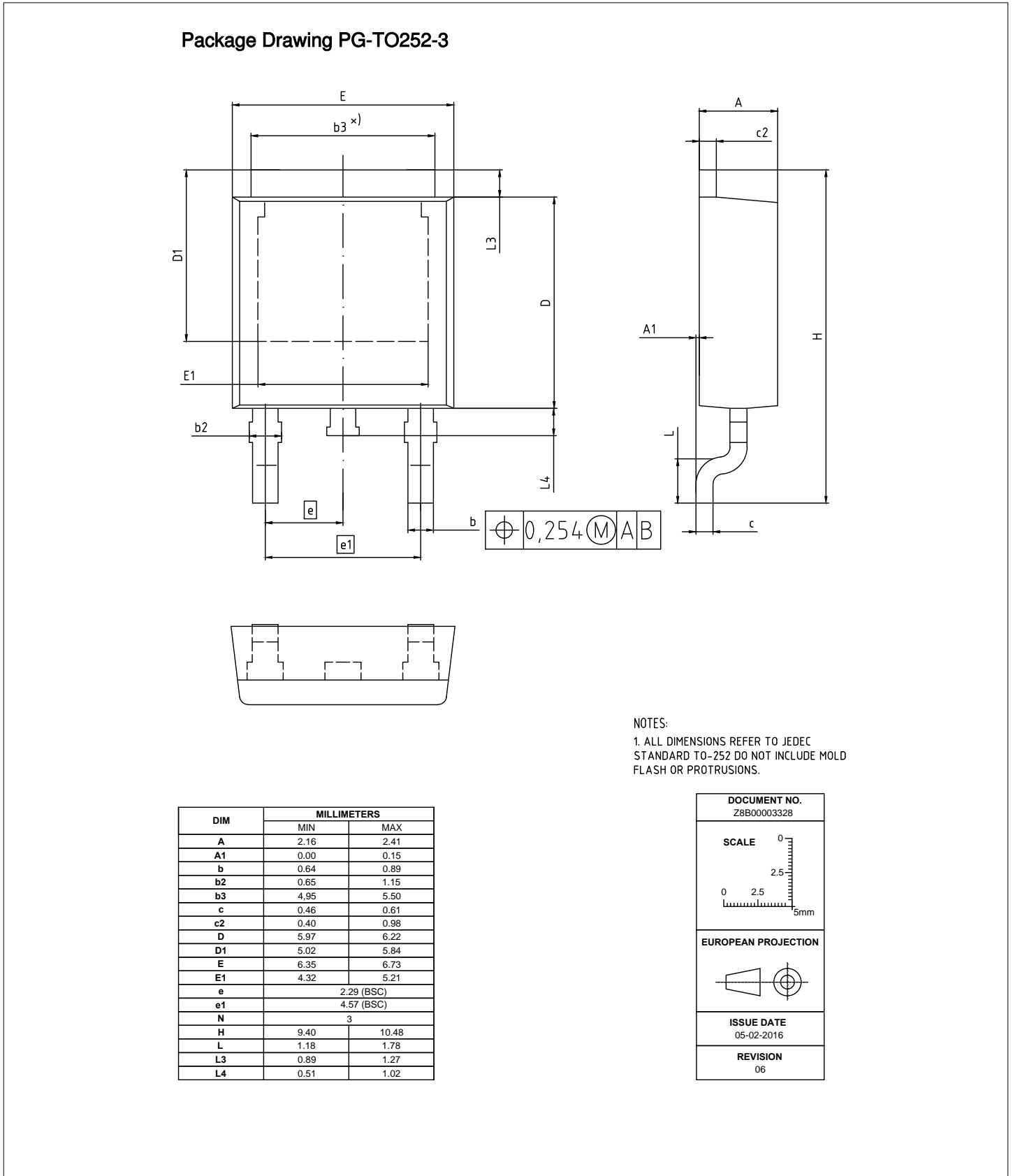


Figure 1

5 Testing conditions

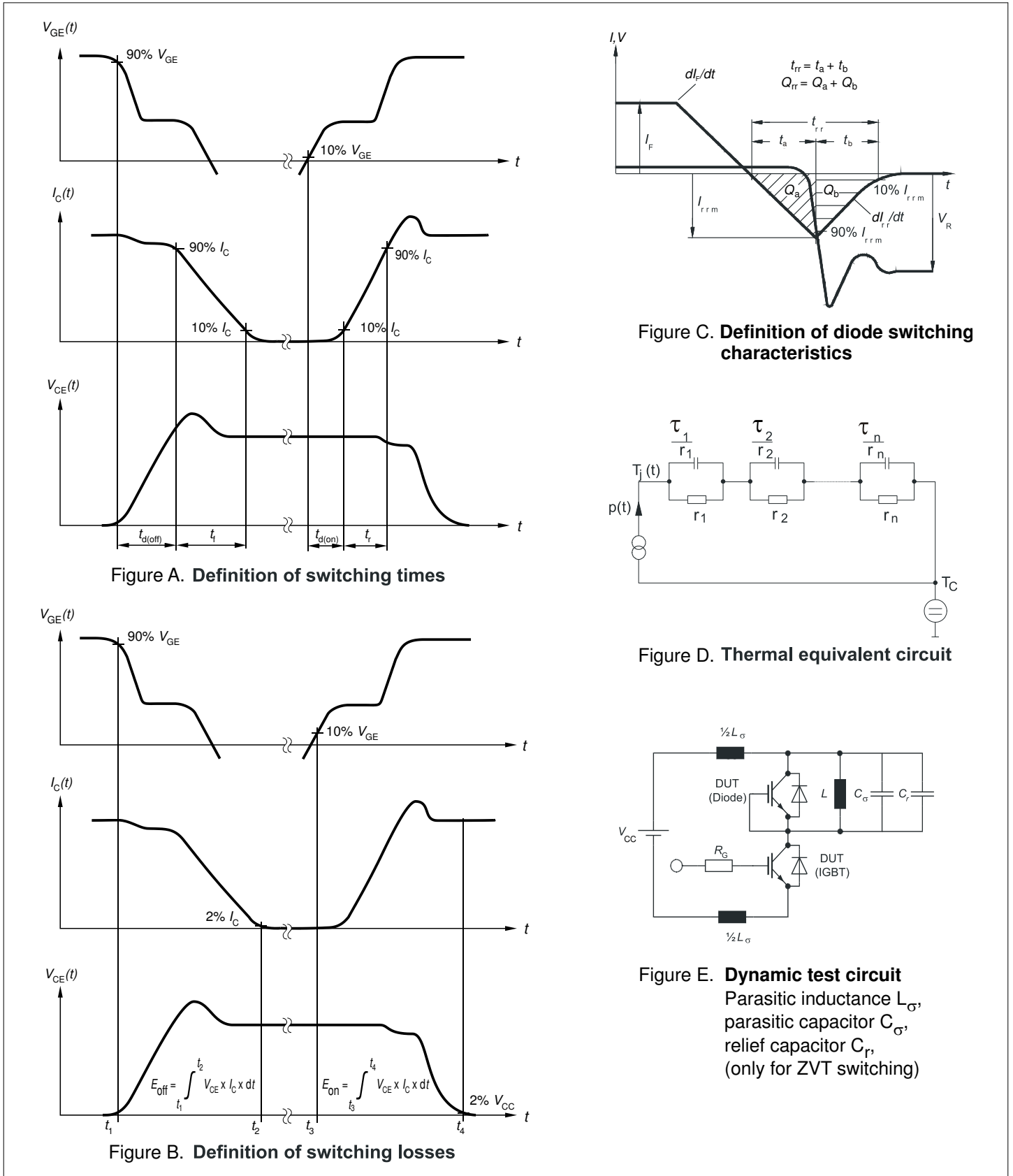


Figure 2

Revision history

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

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