

Final datasheet

Short circuit rugged 1200 V TRENCHSTOP™ IGBT 7 technology

Features

- $V_{CE} = 1200\text{ V}$
- $I_C = 25\text{ A}$
- Very low $V_{CEsat} = 1.65\text{ V}$ (typ.) at $I_{Cnom} = 25\text{ A}$, 25°C
- Short circuit robust $t_{sc} = 4\text{ }\mu\text{s}$ at $V_{CE} = 800\text{ V}$, $V_{GE} = 15\text{ V}$
- Smooth switching characteristics
- Wide range of dv/dt controllability
- TO263-7 package with high creepage distance $> 5.8\text{ mm}$, $400 \leq CTI < 600$
- High reliability and operating lifetime

Potential applications

- xEV auxiliary drives
- Automotive HV heaters

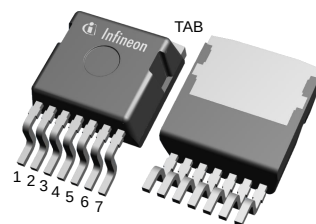
Product validation

- Qualified according to AEC-Q101 for automotive applications
- Qualified Reflow device according to JEDEC J-STD-020 MSL1

Description

Pin definition:

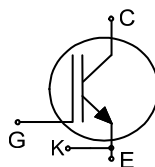
- Pin 1 - Gate
- Pin 2 - Kelvin Emitter
- Pin 3...7 - Emitter
- Tab - Collector



Halogen-free



RoHS



Type	Package	Marking
AIGBG25N120S7	PG-TO263-7-U01	AGBG25S7



Table of contents

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

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}	reflow soldering (MSL1 according to JEDEC J-STD-020)			260	°C
IGBT thermal resistance, junction-case	$R_{th(j-c)}$			0.45	0.6	K/W

2 IGBT

Table 2 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage ¹⁾	V_{CE}	$T_{vj} = -40...175\text{ °C}$		1200	V
DC collector current, limited by T_{vjmax}	I_C		$T_c = 25\text{ °C}$	55	A
			$T_c = 100\text{ °C}$	37	
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}			75	A
Turn-off safe operating area		$V_{CE} \leq 1200\text{ V}$, $t_p \leq 1\text{ }\mu\text{s}$, $T_{vj} \leq 175\text{ °C}$		75	A
Gate-emitter voltage	V_{GE}			± 20	V
Transient gate-emitter voltage	V_{GE}	$t_p \leq 0.5\text{ }\mu\text{s}$, $D < 0.01$		± 25	V
Short-circuit withstand time	t_{SC}	$V_{CC} \leq 800\text{ V}$, $V_{GE} = 15\text{ V}$, Allowed number of short circuits < 1000, Time between short circuits $\geq 1.0\text{ s}$, $T_{vj} = 175\text{ °C}$		4	μs
Power dissipation	P_{tot}		$T_c = 25\text{ °C}$	250	W
			$T_c = 100\text{ °C}$	125	

1) Tested at $T_{vj}=25\text{ °C}$, verified by design/characterization over full temperature range

Table 3 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	$I_C = 25\text{ A}$, $V_{GE} = 15\text{ V}$		$T_{vj} = 25\text{ °C}$	1.65	V
				$T_{vj} = 175\text{ °C}$	2	
Gate-emitter threshold voltage	V_{GEth}	$I_C = 0.49\text{ mA}$, $V_{CE} = V_{GE}$	5.15	5.7	6.45	V

(table continues...)

Table 3 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Zero gate-voltage collector current	I_{CES}	$V_{CE} = 1200 \text{ V}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^{\circ}\text{C}$			40	μA
			$T_{vj} = 175 \text{ }^{\circ}\text{C}$		2000		
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0 \text{ V}, V_{GE} = 20 \text{ V}$				100	nA
Transconductance	g_{fs}	$I_C = 25 \text{ A}, V_{CE} = 20 \text{ V}, T_{vj} = 175 \text{ }^{\circ}\text{C}$			9.3		S
Short-circuit collector current	I_{SC}	$V_{CC} \leq 800 \text{ V}, V_{GE} = 15 \text{ V}, t_{SC} \leq 4 \text{ } \mu\text{s}$, Allowed number of short circuits < 1000, Time between short circuits $\geq 1.0 \text{ s}$	$T_{vj} = 25 \text{ }^{\circ}\text{C}$		158.2		A
			$T_{vj} = 175 \text{ }^{\circ}\text{C}$		126.5		
Input capacitance	C_{ies}	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 100 \text{ kHz}$			3.6		nF
Output capacitance	C_{oes}	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 100 \text{ kHz}$			58		pF
Reverse transfer capacitance	C_{res}	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 100 \text{ kHz}$			17		pF
Gate charge	Q_G	$V_{CC} = 960 \text{ V}, I_C = 25 \text{ A}, V_{GE} = 0/15 \text{ V}$			158		nC
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 800 \text{ V}, V_{GE} = 15 \text{ V}, R_{G(on)} = 4.5 \text{ } \Omega, R_{G(off)} = 4.5 \text{ } \Omega$	$T_{vj} = 25 \text{ }^{\circ}\text{C}, I_C = 25 \text{ A}$		12.9		ns
			$T_{vj} = 175 \text{ }^{\circ}\text{C}, I_C = 25 \text{ A}$		14.5		
Rise time (inductive load)	t_r	$V_{CC} = 800 \text{ V}, V_{GE} = 15 \text{ V}, R_{G(on)} = 4.5 \text{ } \Omega, R_{G(off)} = 4.5 \text{ } \Omega$	$T_{vj} = 25 \text{ }^{\circ}\text{C}, I_C = 25 \text{ A}$		4.5		ns
			$T_{vj} = 175 \text{ }^{\circ}\text{C}, I_C = 25 \text{ A}$		5.8		
Turn-off delay time	$t_{d(off)}$	$V_{CC} = 800 \text{ V}, V_{GE} = 15 \text{ V}, R_{G(on)} = 4.5 \text{ } \Omega, R_{G(off)} = 4.5 \text{ } \Omega$	$T_{vj} = 25 \text{ }^{\circ}\text{C}, I_C = 25 \text{ A}$		120		ns
			$T_{vj} = 175 \text{ }^{\circ}\text{C}, I_C = 25 \text{ A}$		186		
Fall time (inductive load)	t_f	$V_{CC} = 800 \text{ V}, V_{GE} = 15 \text{ V}, R_{G(on)} = 4.5 \text{ } \Omega, R_{G(off)} = 4.5 \text{ } \Omega$	$T_{vj} = 25 \text{ }^{\circ}\text{C}, I_C = 25 \text{ A}$		86		ns
			$T_{vj} = 175 \text{ }^{\circ}\text{C}, I_C = 25 \text{ A}$		165		
Turn-on energy	E_{on}	$V_{CC} = 800 \text{ V}, V_{GE} = 15 \text{ V}, R_{G(on)} = 4.5 \text{ } \Omega, R_{G(off)} = 4.5 \text{ } \Omega$	$T_{vj} = 25 \text{ }^{\circ}\text{C}, I_C = 25 \text{ A}$		0.2		mJ
			$T_{vj} = 175 \text{ }^{\circ}\text{C}, I_C = 25 \text{ A}$		0.3		

(table continues...)

Table 3 (continued) Characteristic values

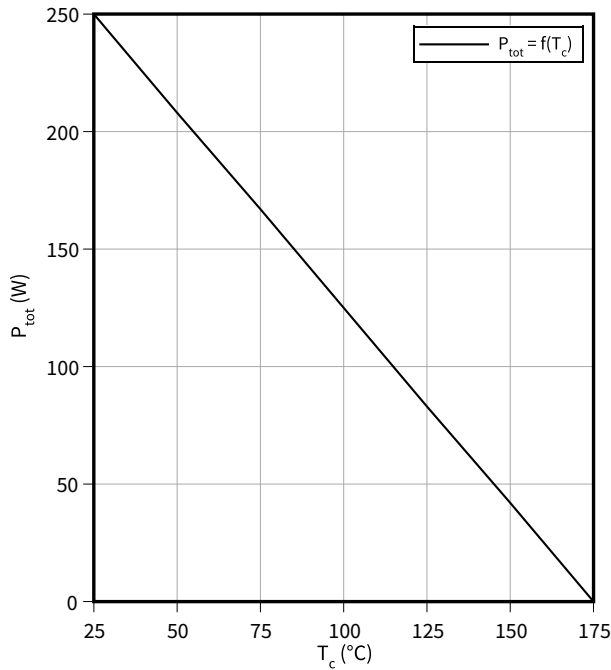
Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-off energy	E_{off}	$V_{CC} = 800 \text{ V}$, $V_{GE} = 15 \text{ V}$, $R_{G(on)} = 4.5 \Omega$, $R_{G(off)} = 4.5 \Omega$	$T_{vj} = 25 \text{ }^{\circ}\text{C}$, $I_C = 25 \text{ A}$		1.47		mJ
			$T_{vj} = 175 \text{ }^{\circ}\text{C}$, $I_C = 25 \text{ A}$		2.61		
Total switching energy	E_{ts}	$V_{CC} = 800 \text{ V}$, $V_{GE} = 15 \text{ V}$, $R_{G(on)} = 4.5 \Omega$, $R_{G(off)} = 4.5 \Omega$	$T_{vj} = 25 \text{ }^{\circ}\text{C}$, $I_C = 25 \text{ A}$		1.67		mJ
			$T_{vj} = 175 \text{ }^{\circ}\text{C}$, $I_C = 25 \text{ A}$		2.91		
Operating junction temperature	T_{vj}			-40		175	$^{\circ}\text{C}$

Note: Electrical Characteristic at $T_{vj} = 25^{\circ}\text{C}$, unless otherwise specified.

3 Characteristics diagrams

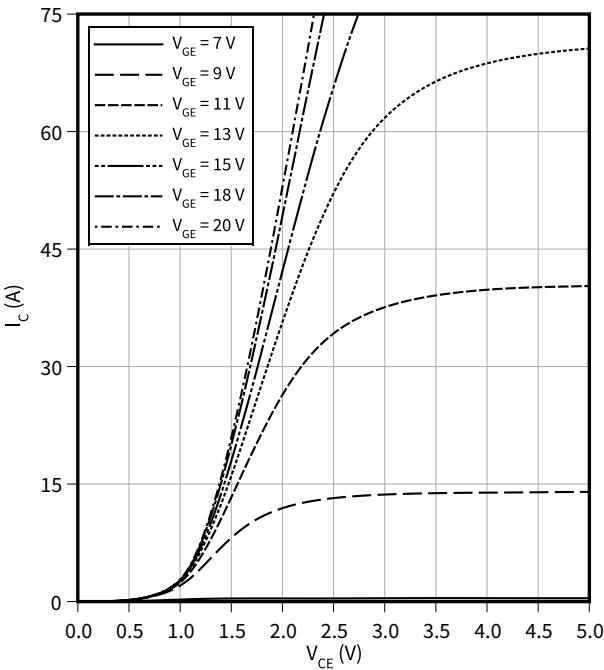
Power dissipation as a function of case temperature

$P_{\text{tot}} = f(T_c)$
 $T_{vj} \leq 175\text{ °C}$



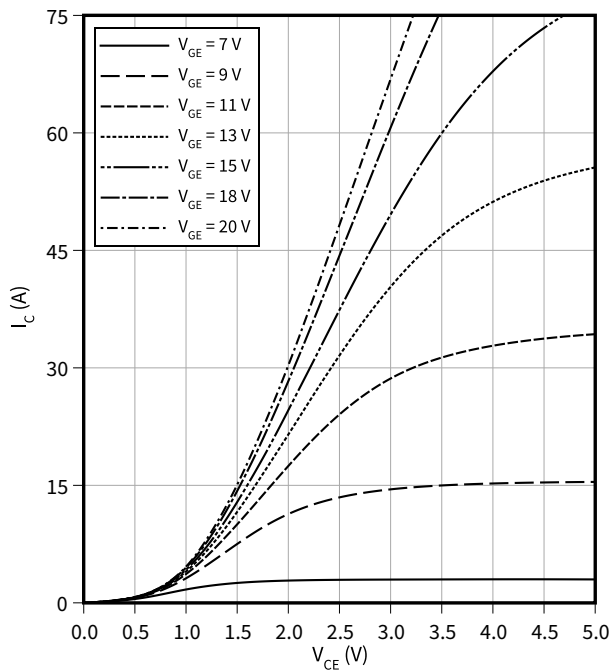
Typical output characteristic

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



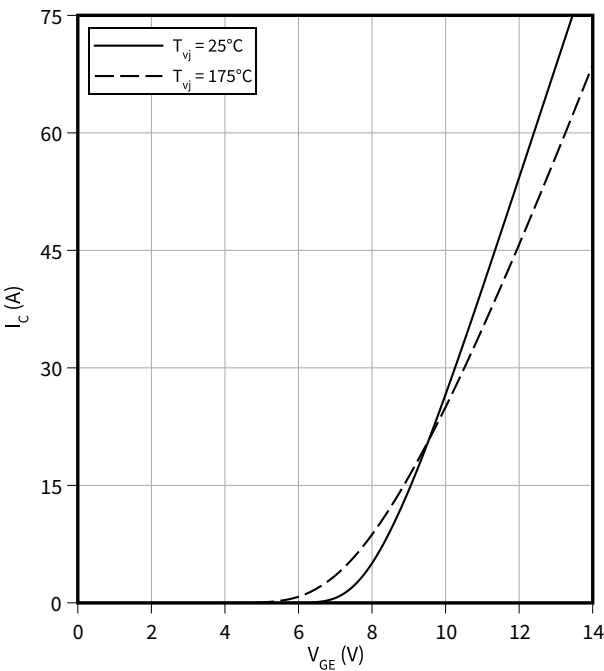
Typical output characteristic

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



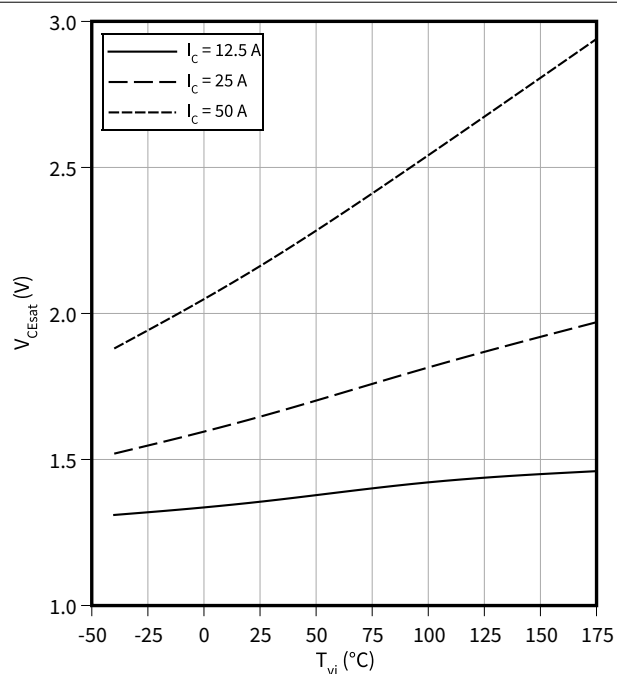
Typical transfer characteristic

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



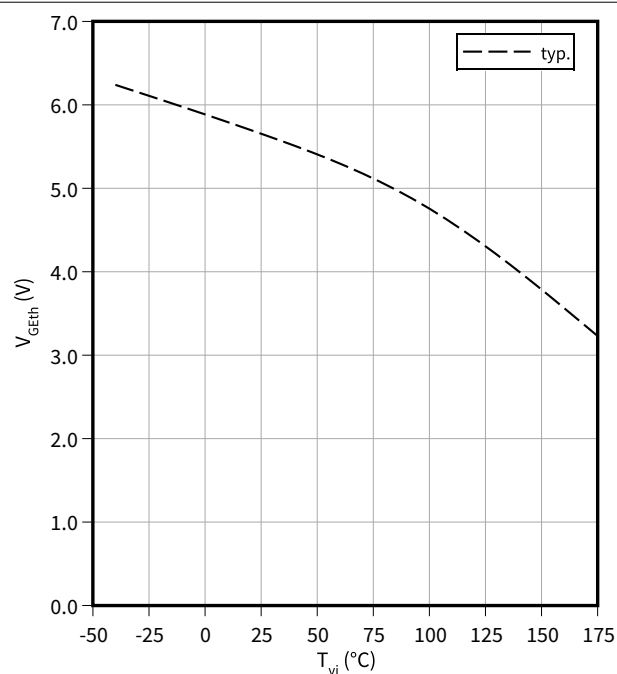
3 Characteristics diagrams
Typical collector-emitter saturation voltage as a function of junction temperature

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


Gate-emitter threshold voltage as a function of junction temperature

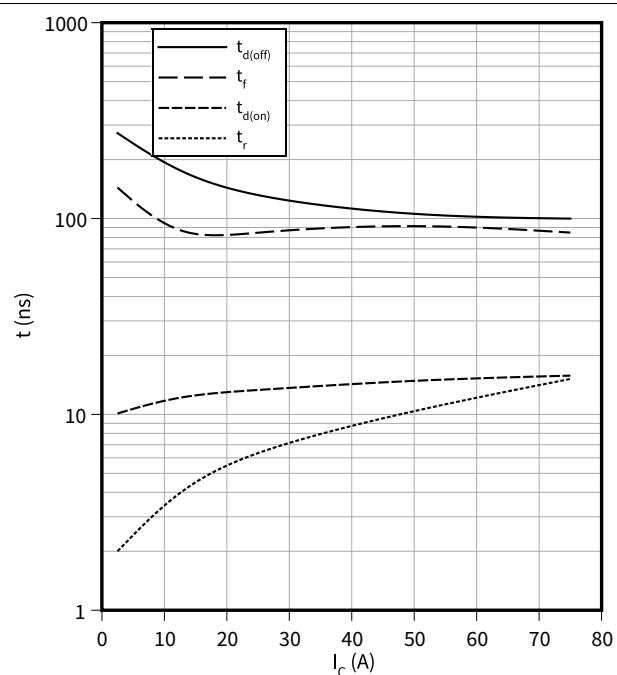
$$V_{GEth} = f(T_{vj})$$

$$I_C = 0.85 \text{ mA}$$


Typical switching times as a function of collector current

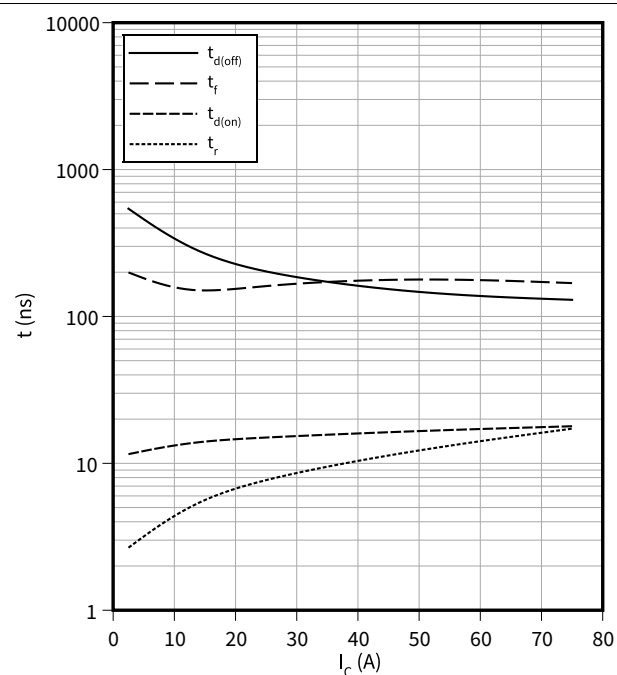
$$t = f(I_C)$$

$$V_{CC} = 800 \text{ V}, T_{vj} = 25 \text{ °C}, R_G = 4.5 \text{ } \Omega$$


Typical switching times as a function of collector current

$$t = f(I_C)$$

$$V_{CC} = 800 \text{ V}, T_{vj} \geq 25 \text{ °C}, R_G = 4.5 \text{ } \Omega$$

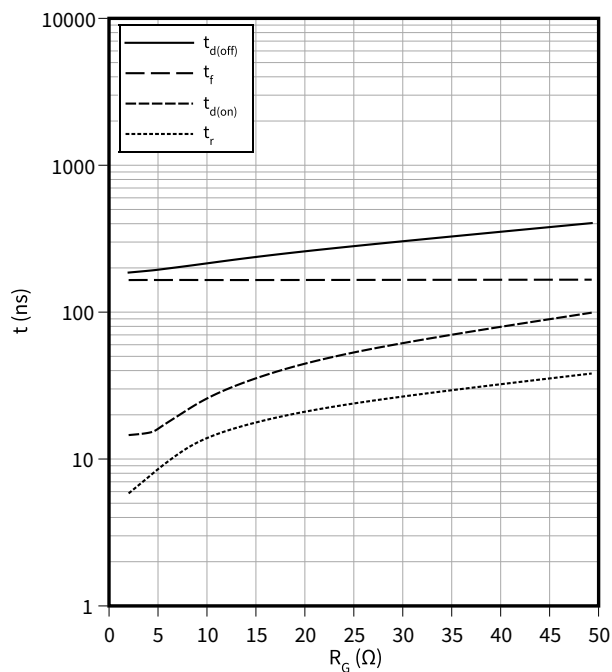


3 Characteristics diagrams

Typical switching times as a function of gate resistor

$t = f(R_G)$

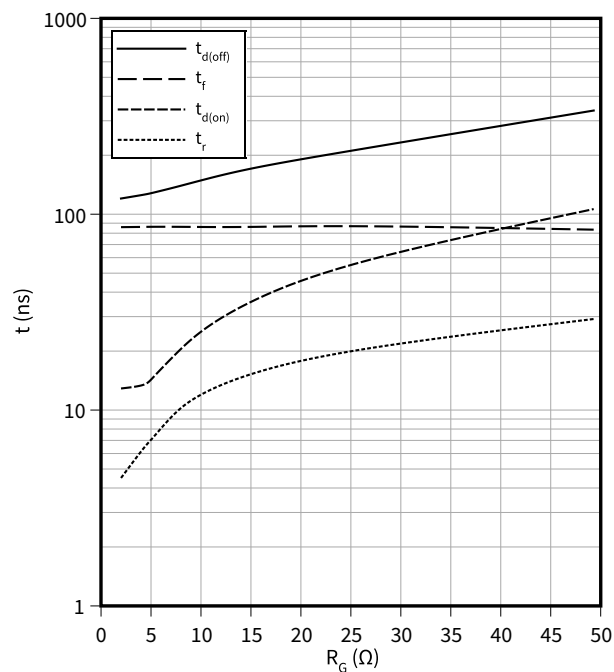
$I_C = 25 \text{ A}$, $V_{CC} = 800 \text{ V}$, $T_{vj} = 175 \text{ °C}$



Typical switching times as a function of gate resistor

$t = f(R_G)$

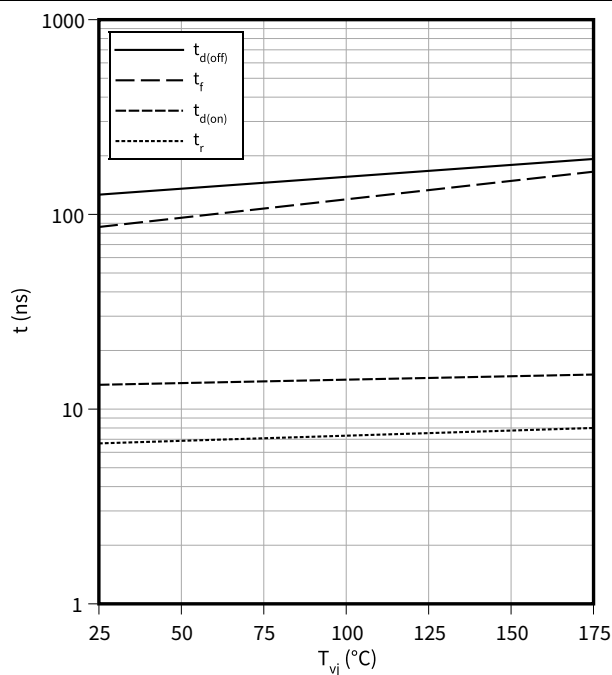
$I_C = 25 \text{ A}$, $V_{CC} = 800 \text{ V}$, $T_{vj} = 25 \text{ °C}$



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

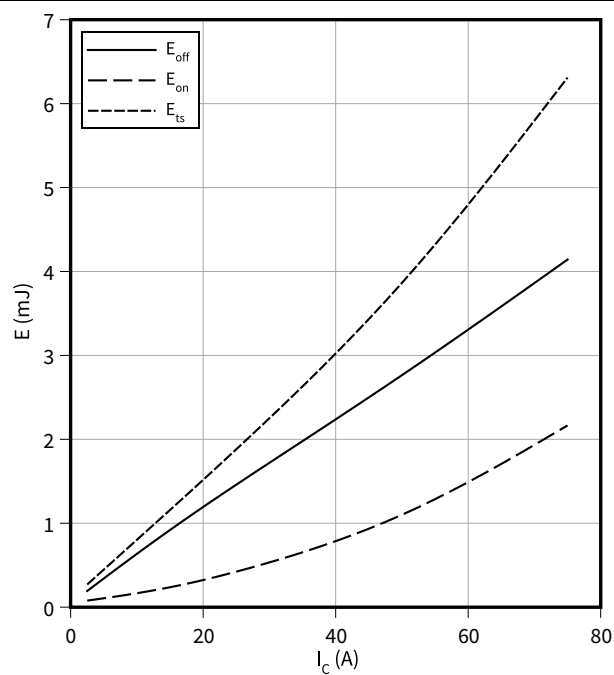
$I_C = 25 \text{ A}$, $V_{CC} = 800 \text{ V}$, $R_G = 4.5 \text{ }\Omega$



Typical switching energy losses as a function of collector current

$E = f(I_C)$

$V_{CC} = 800 \text{ V}$, $T_{vj} = 25 \text{ °C}$, $R_G = 4.5 \text{ }\Omega$

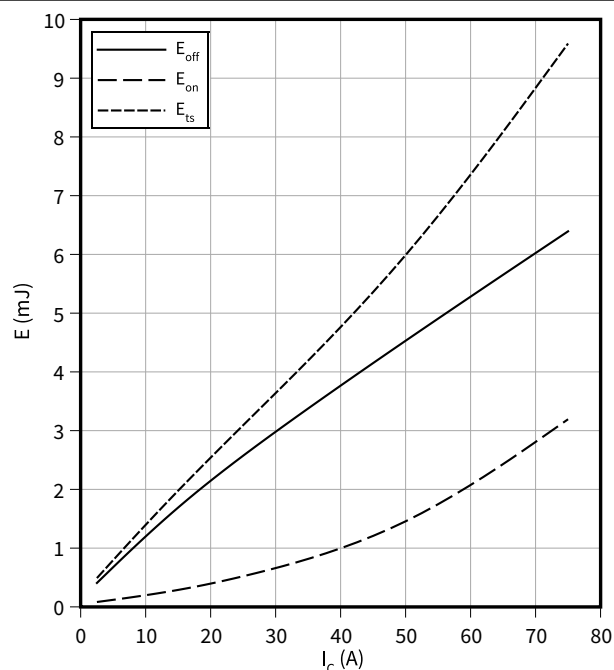


3 Characteristics diagrams

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$

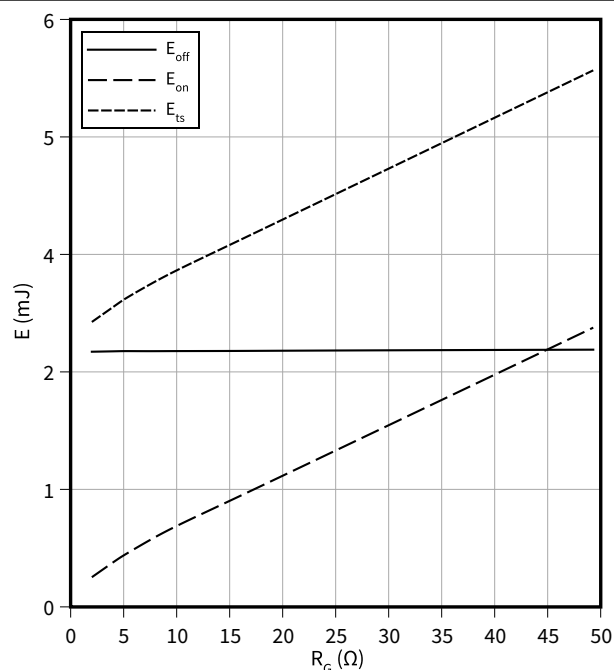
$V_{CC} = 800 \text{ V}$, $T_{vj} \geq 25 \text{ °C}$, $R_G = 4.5 \text{ } \Omega$



Typical switching energy losses as a function of gate resistor

$$E = f(R_G)$$

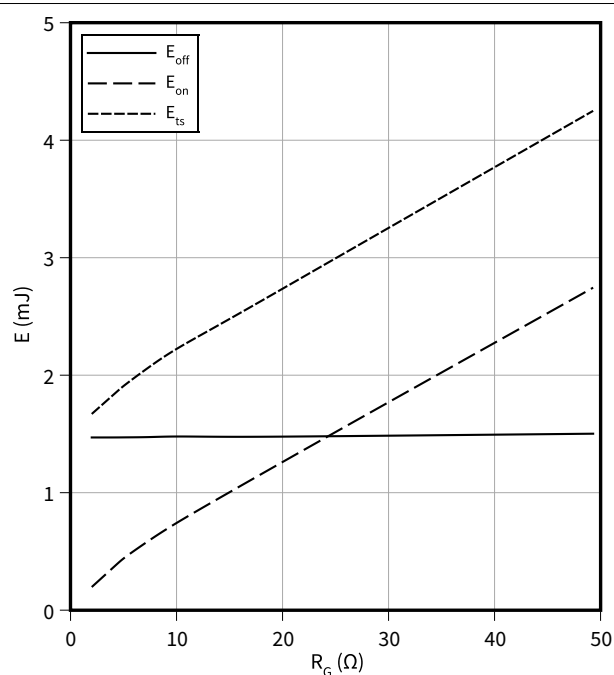
$I_C = 25 \text{ A}$, $V_{CC} = 800 \text{ V}$, $T_{vj} = 175 \text{ °C}$



Typical switching energy losses as a function of gate resistor

$$E = f(R_G)$$

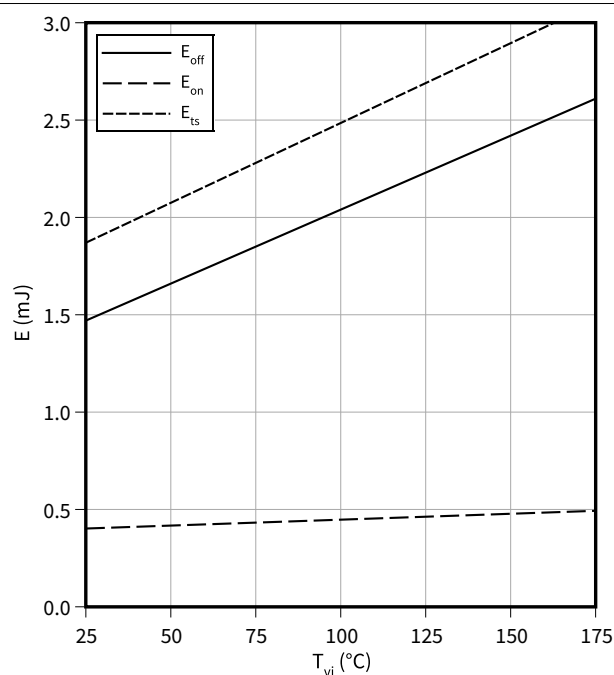
$I_C = 25 \text{ A}$, $V_{CC} = 800 \text{ V}$, $T_{vj} = 25 \text{ °C}$



Typical switching energy losses as a function of junction temperature

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

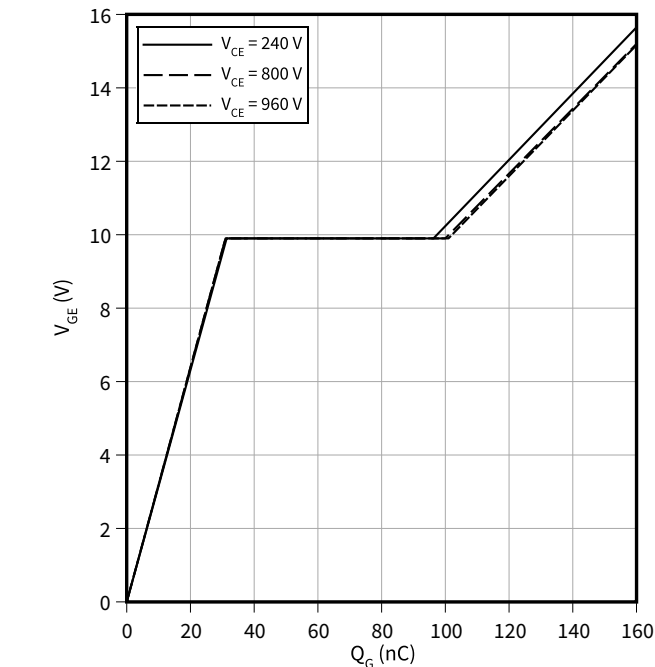
$I_C = 25 \text{ A}$, $V_{CC} = 800 \text{ V}$, $R_G = 4.5 \text{ } \Omega$



3 Characteristics diagrams

Typical gate charge

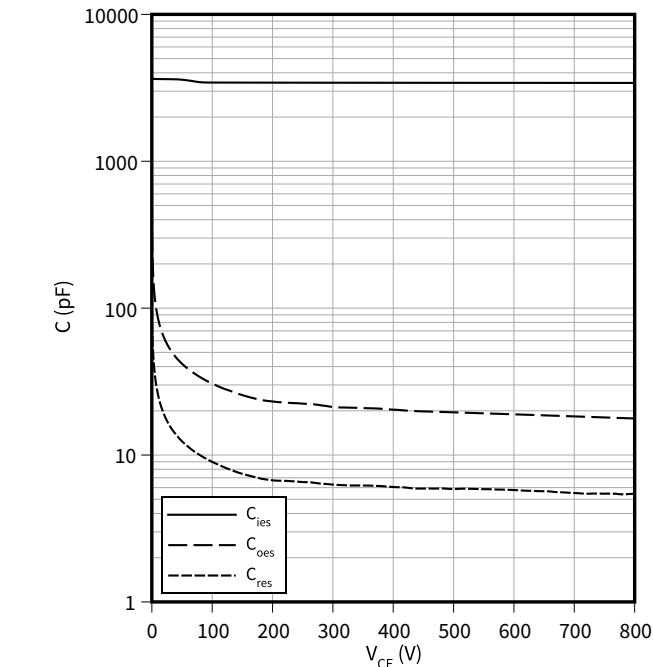
$V_{GE} = f(Q_G)$



Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

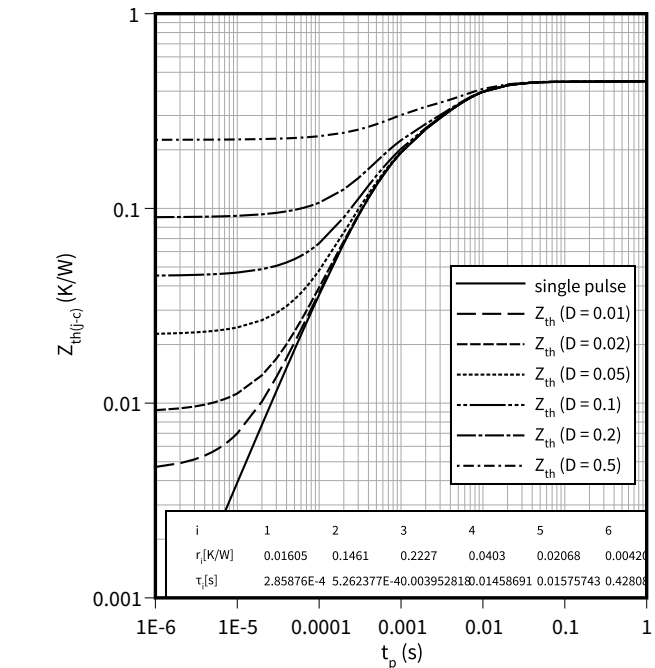
$f = 100$ kHz, $V_{GE} = 0$ V



IGBT typical transient thermal impedance as a function of pulse width

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

$D = t_p/T$



4 Package outlines

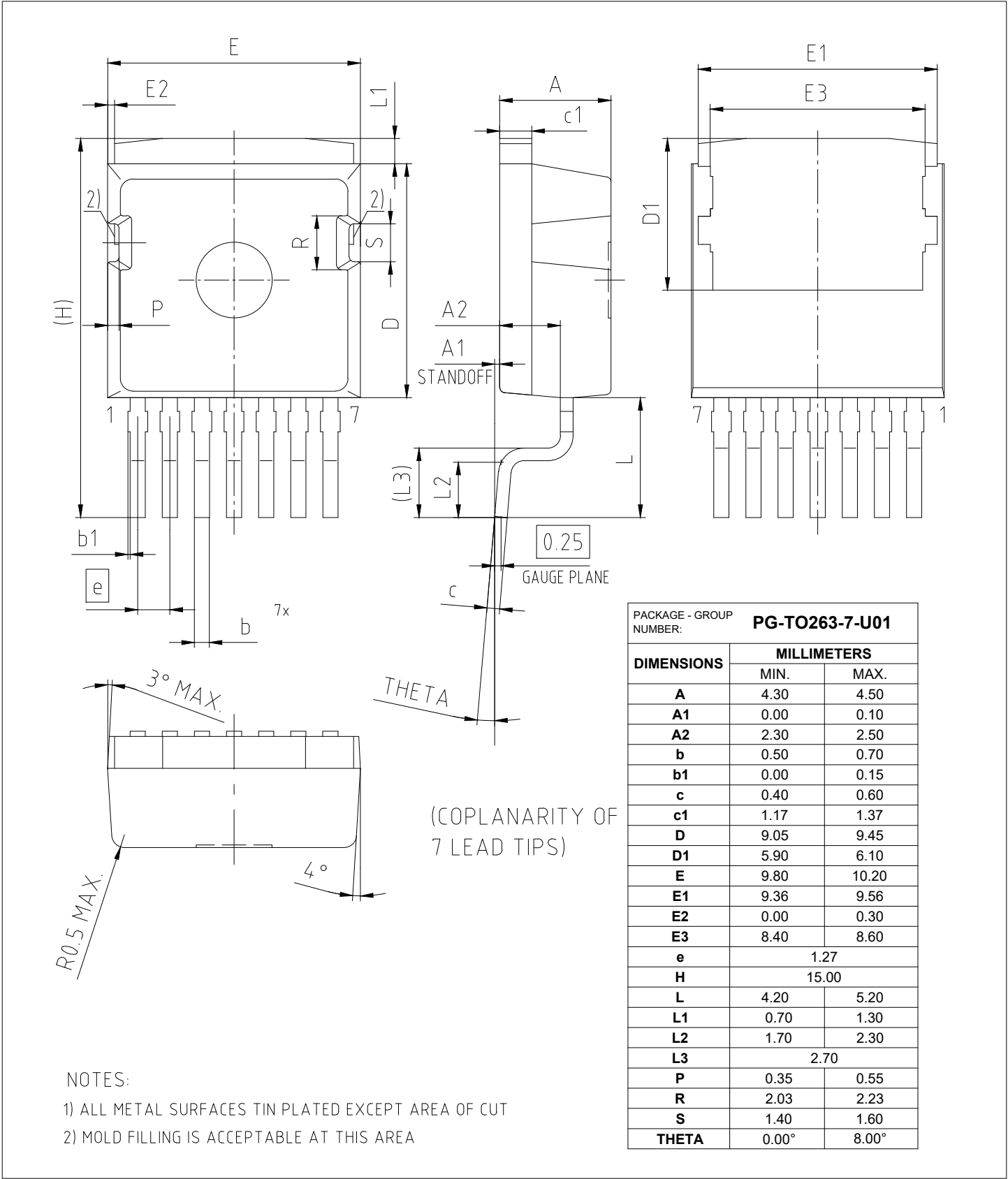


Figure 1

5 Testing conditions

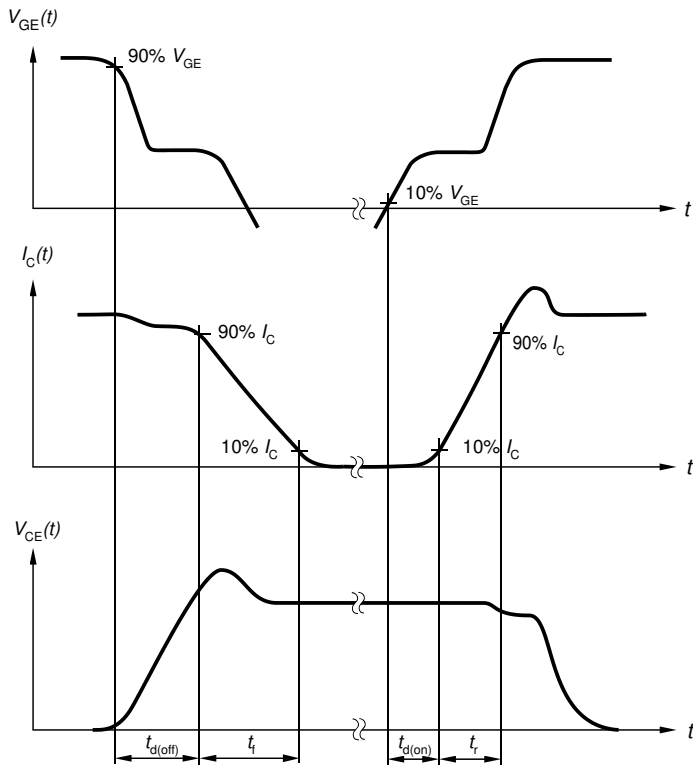


Figure A. Definition of switching times

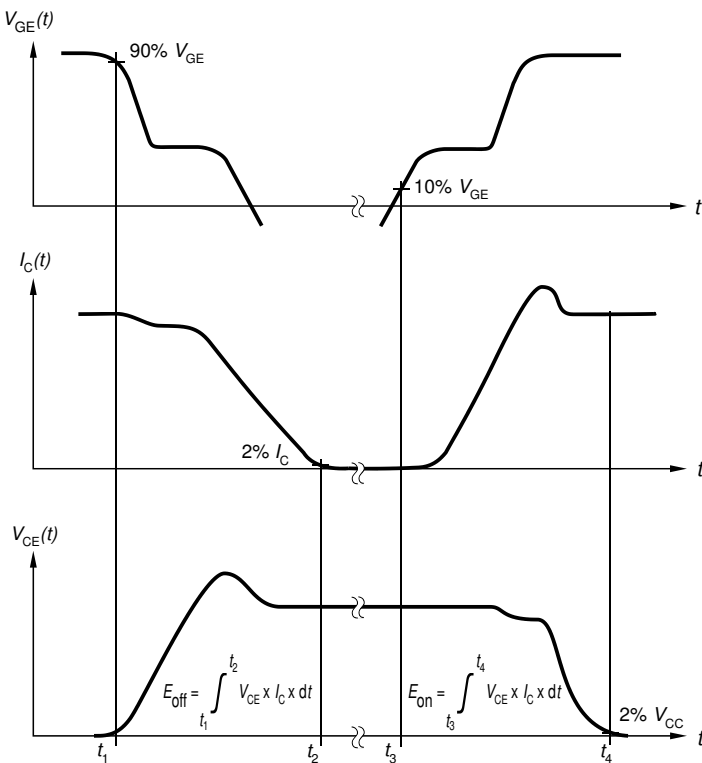


Figure B. Definition of switching losses

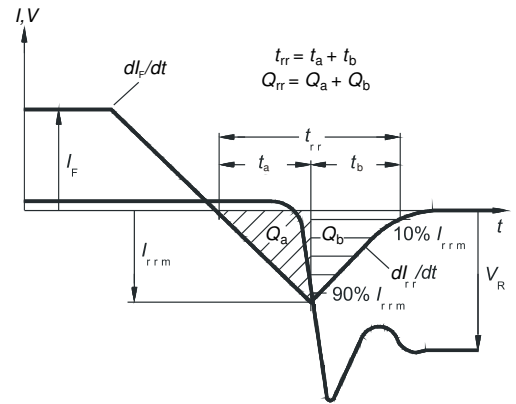


Figure C. Definition of diode switching characteristics

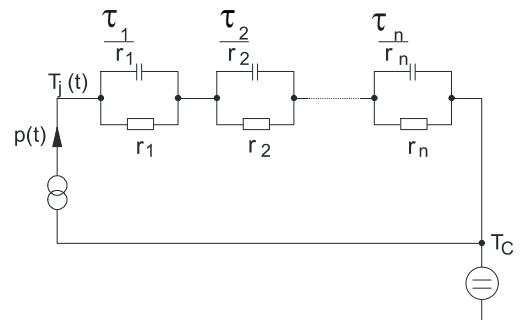


Figure D. Thermal equivalent circuit

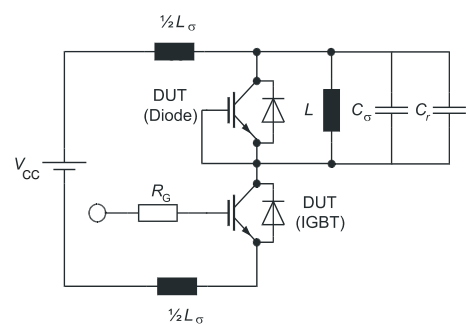


Figure E. **Dynamic test circuit**
 Parasitic inductance L_{σ} ,
 parasitic capacitor C_{σ} ,
 relief capacitor C_r ,
 (only for ZVT switching)



Revision history

Revision history

Document revision	Date of release	Description of changes
0.10	2024-03-14	Target datasheet
0.20	2025-04-29	Preliminary datasheet
1.00	2025-09-18	Final datasheet

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