

Final datasheet**Short circuit rugged 1200 V TRENCHSTOP™ IGBT 7 technology****Features**

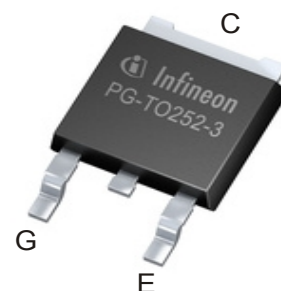
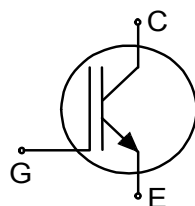
- $V_{CE} = 1200\text{ V}$
- $I_C = 3\text{ A}$
- Low saturation voltage $V_{CEsat} = 2\text{ V}$ at $T_{vj} = 150^\circ\text{C}$
- Short circuit ruggedness $8\text{ }\mu\text{s}$
- Wide range of dv/dt controllability
- Complete product spectrum and PSpice Models: <http://www.infineon.com/igbt/>

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**

Type	Package	Marking
IGD03N120S7	PG-TO252-3	G03MS7



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.	
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}	$V_{CC} = 600\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_{G(on)} = 60\ \Omega$, $R_{G(off)} = 60\ \Omega$	$T_{vj} = 25\text{ °C}$, $I_C = 3\text{ A}$	0.37		mJ
			$T_{vj} = 150\text{ °C}$, $I_C = 3\text{ A}$	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.

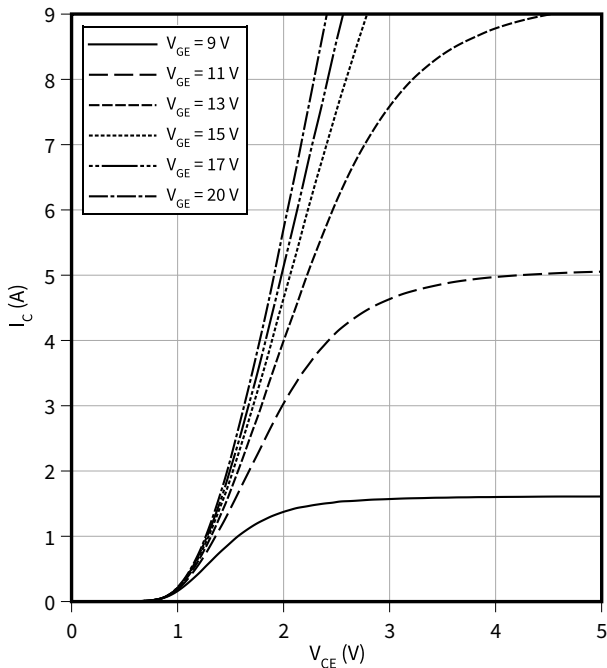
Electrical Characteristic at $T_{vj} = 25\text{ °C}$, unless otherwise specified.

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

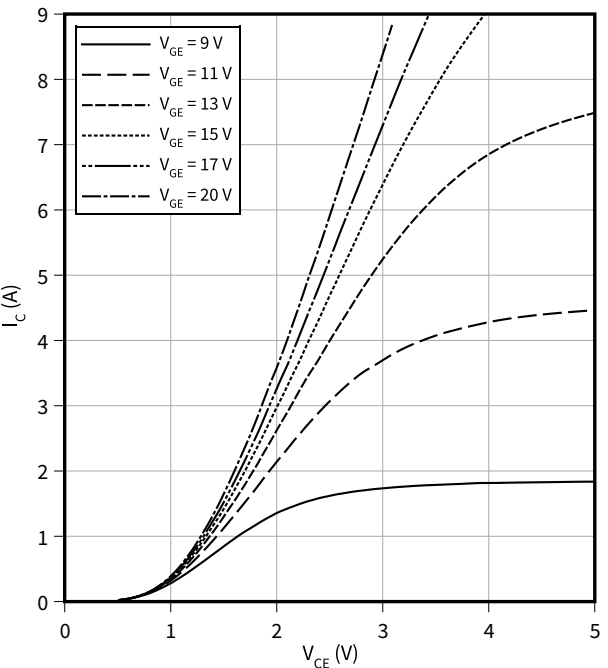
Typical output characteristic

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



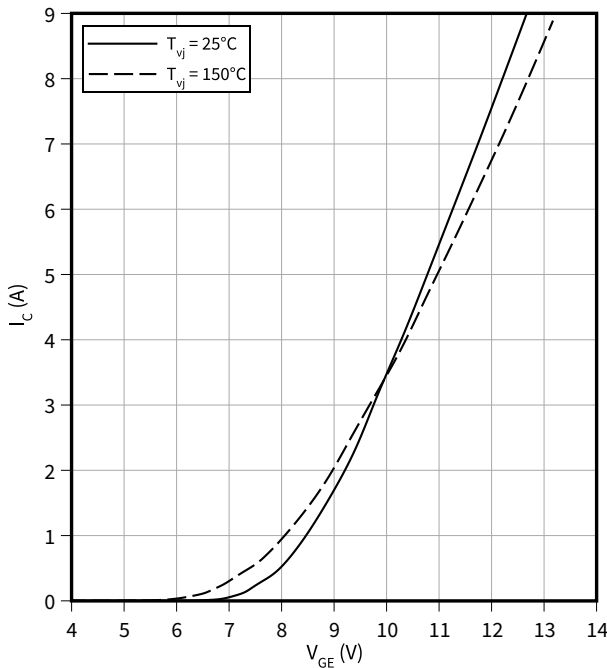
Typical output characteristic

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



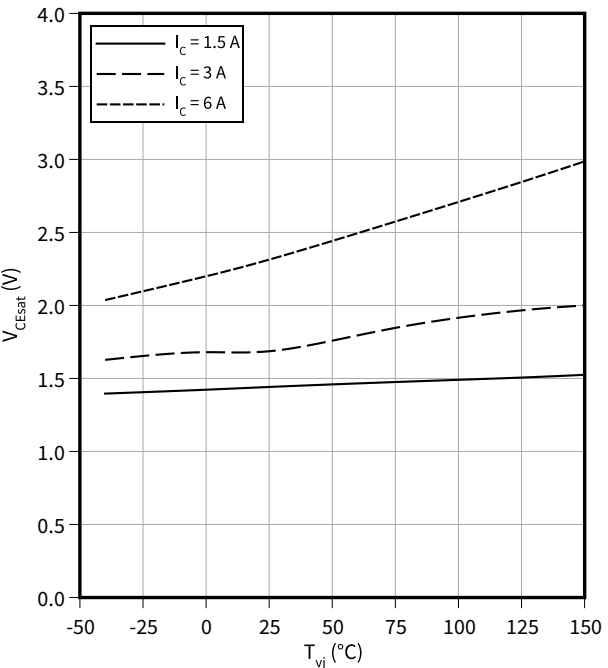
Typical transfer characteristic

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



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

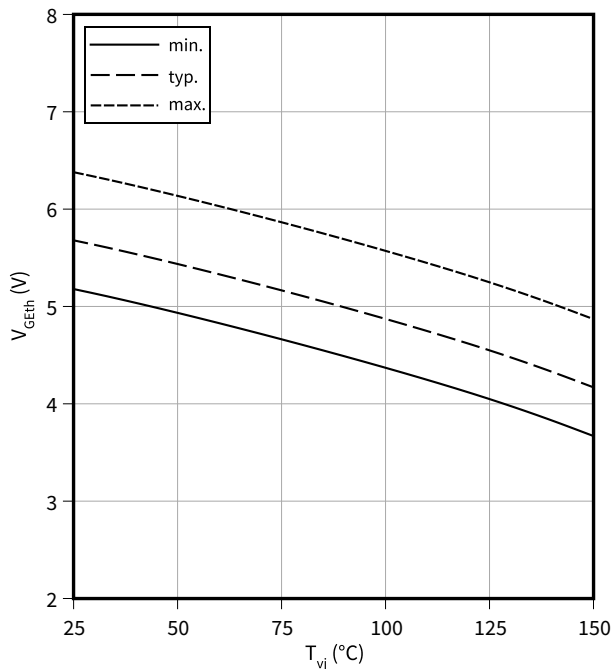
$V_{CEsat} = f(T_{vj})$
 $V_{GE} = 15\text{ V}$



3 Characteristics diagrams

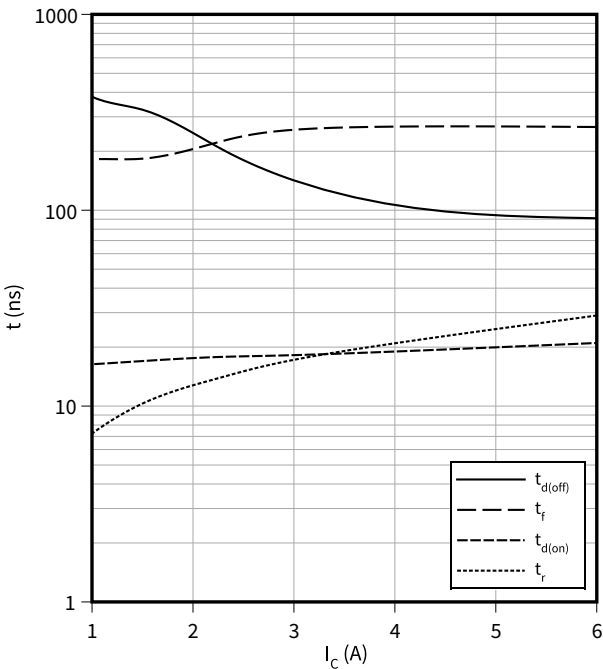
Gate-emitter threshold voltage as a function of junction temperature

$V_{GEth} = f(T_{vj})$
 $I_C = 0.06 \text{ mA}$



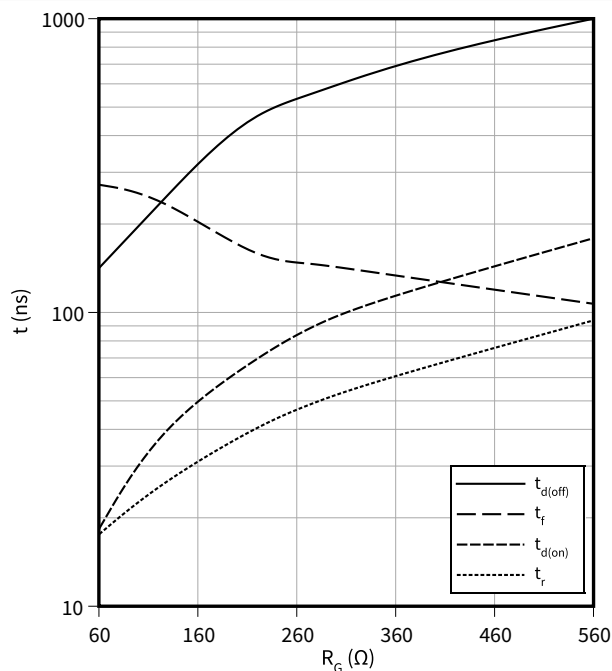
Typical switching times as a function of collector current

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



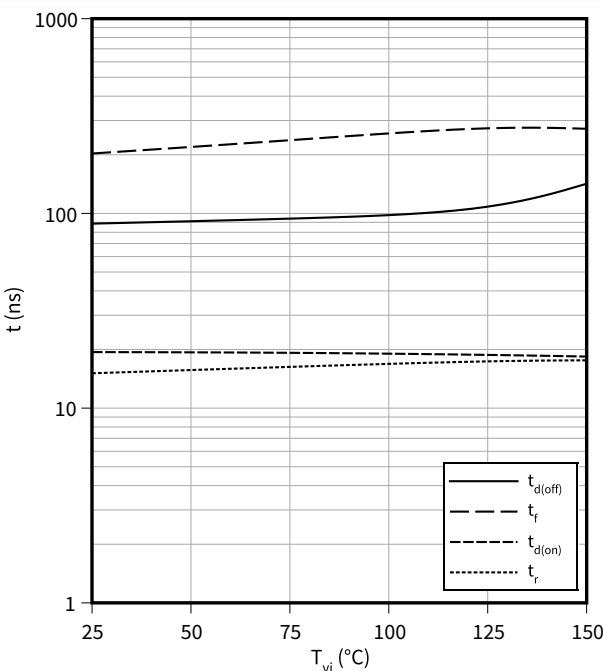
Typical switching times as a function of gate resistor

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



Typical switching times as a function of junction temperature

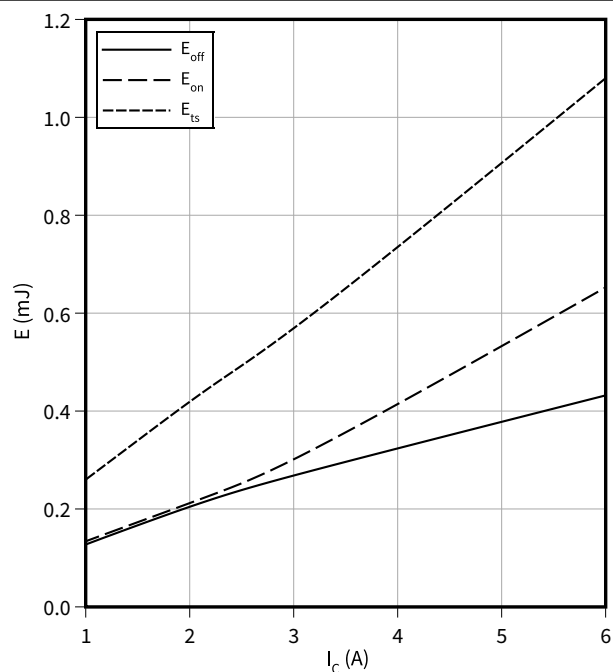
$t = f(T_{vj})$
 $I_C = 3 \text{ A}, V_{CC} = 600 \text{ V}, V_{GE} = 0/15 \text{ V}, R_G = 60 \text{ } \Omega$



3 Characteristics diagrams

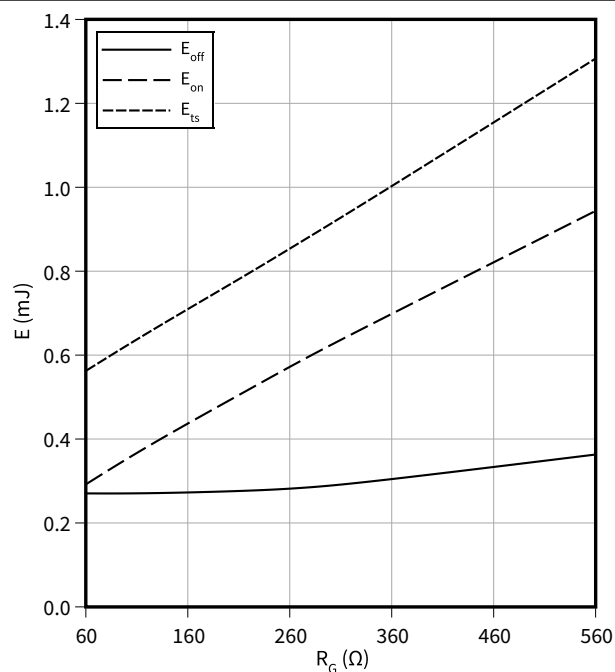
Typical switching energy losses as a function of collector current

$$E = f(I_C)$$

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


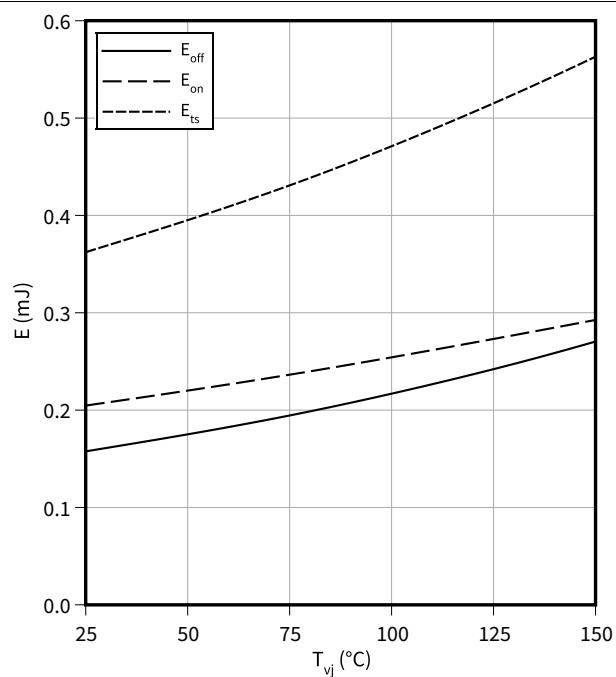
Typical switching energy losses as a function of gate resistor

$$E = f(R_G)$$

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


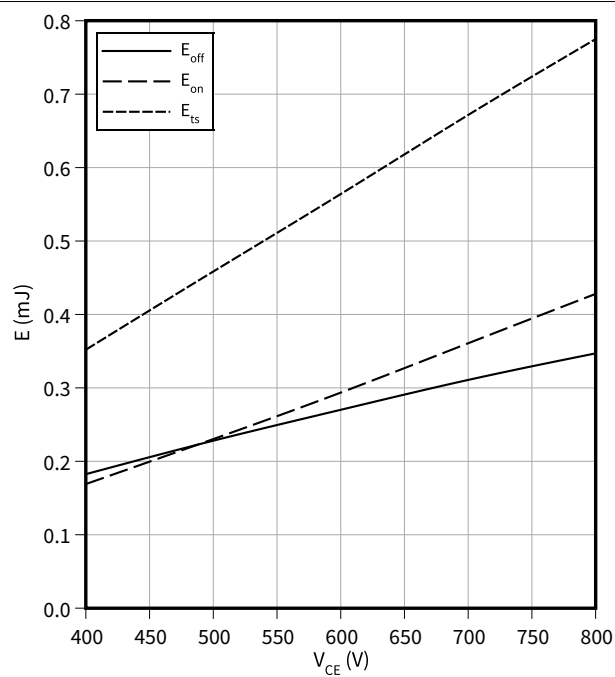
Typical switching energy losses as a function of junction temperature

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

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


Typical switching energy losses as a function of collector emitter voltage

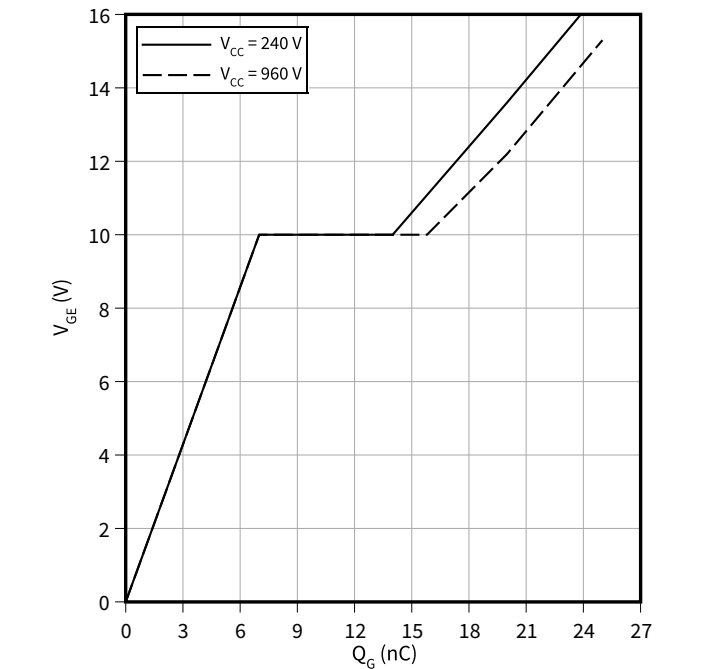
$$E = f(V_{CE})$$

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


3 Characteristics diagrams

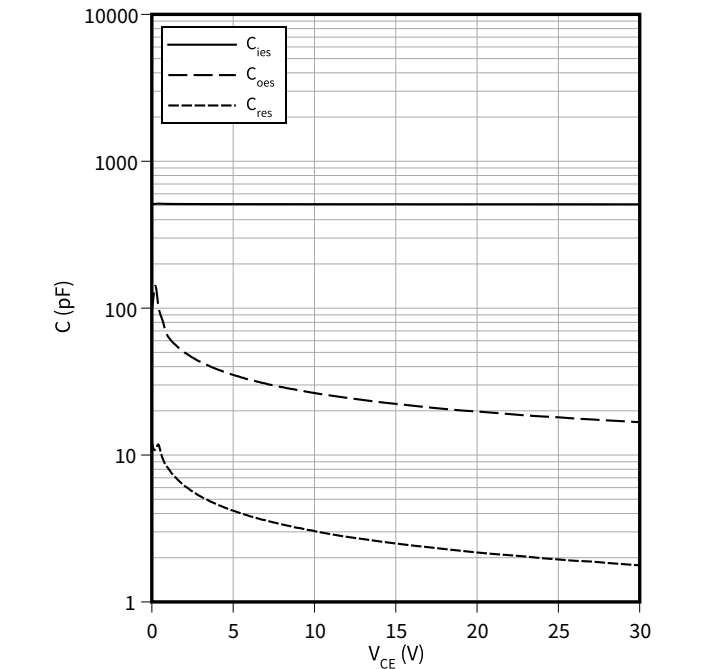
Typical gate charge

$V_{GE} = f(Q_G)$
 $I_C = 3\text{ A}$



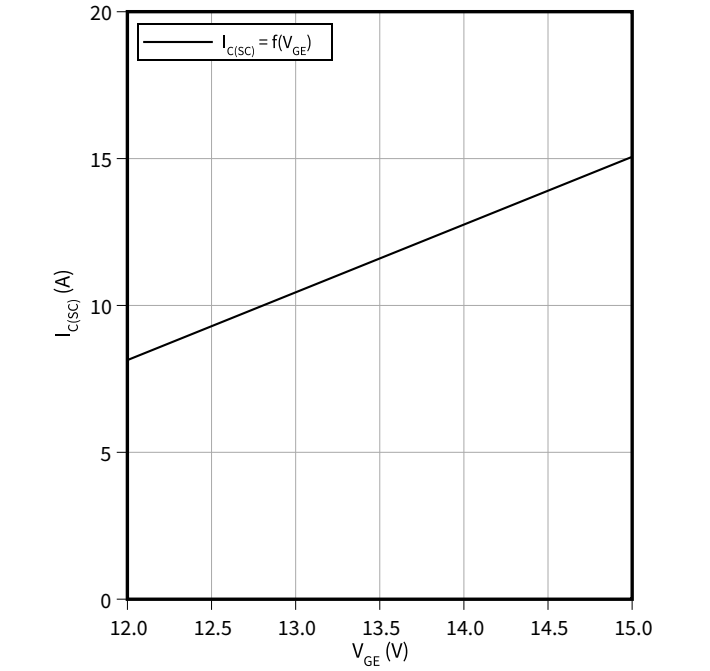
Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$
 $f = 100\text{ kHz}, V_{GE} = 0\text{ V}$



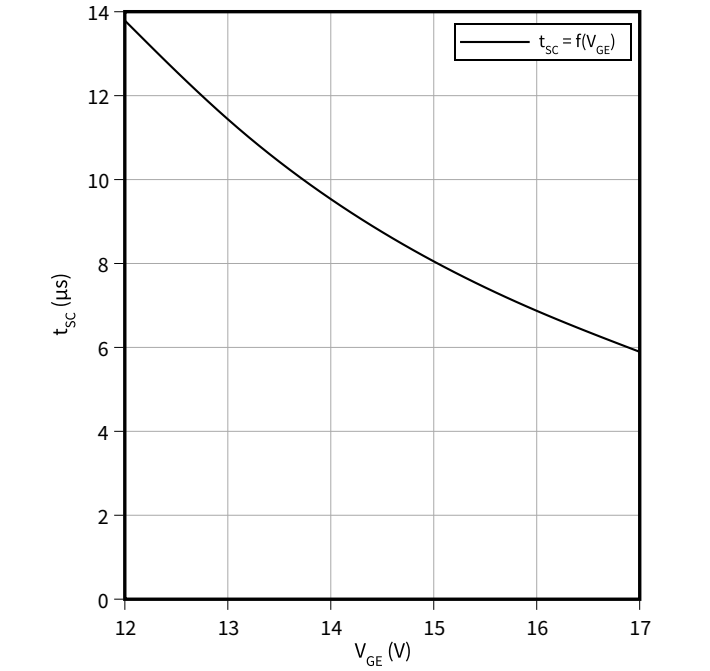
Typical short circuit collector current as a function of gate-emitter voltage

$I_{C(SC)} = f(V_{GE})$
 $T_{vj} = 150\text{ }^{\circ}\text{C}, V_{CC} = 600\text{ V}$



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

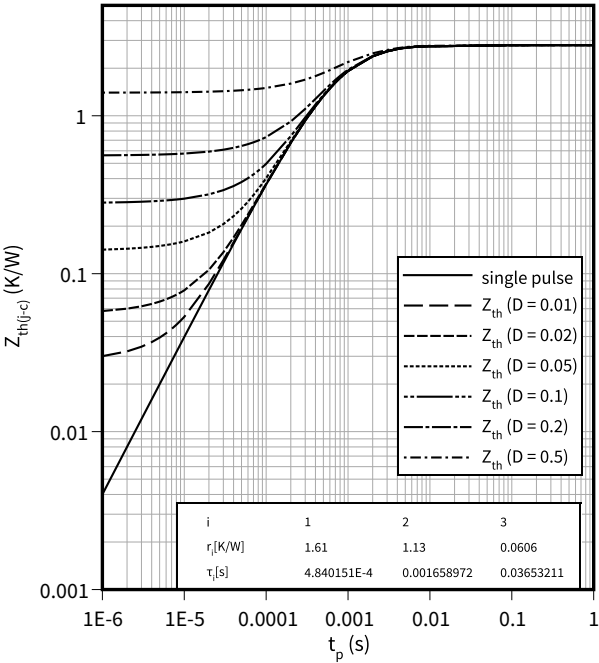
$t_{SC} = f(V_{GE})$
 $T_{vj} = 150\text{ }^{\circ}\text{C}, V_{CC} = 600\text{ V}$



3 Characteristics diagrams

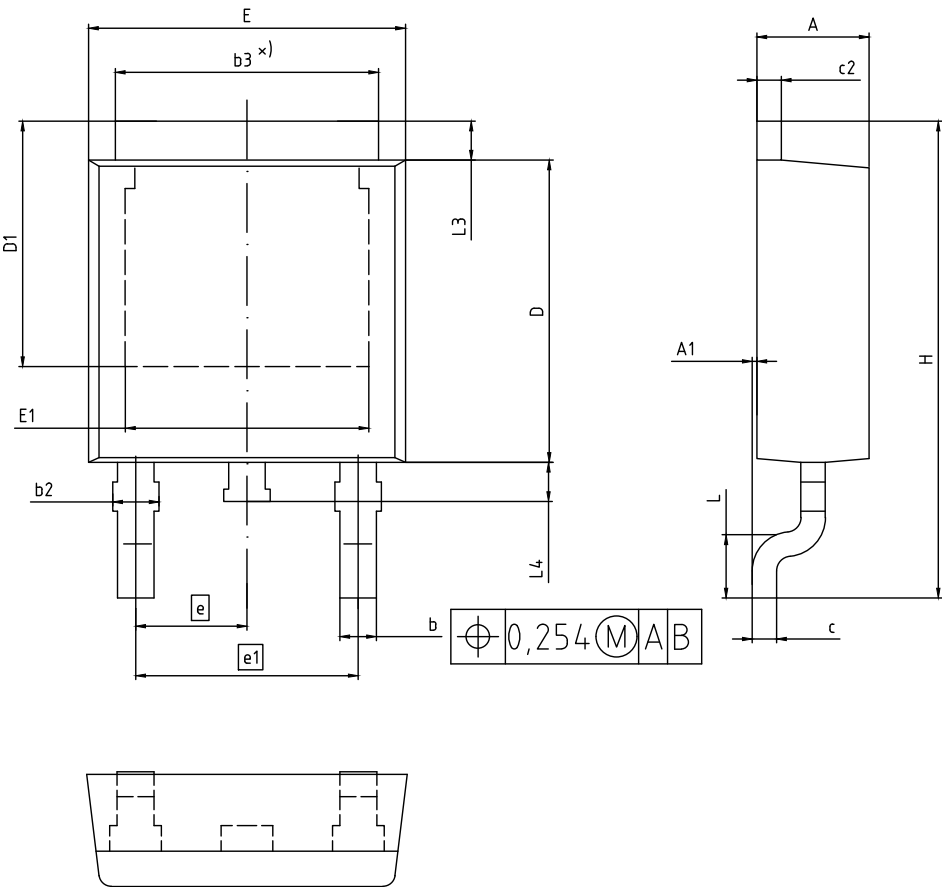
IGBT transient thermal impedance as a function of pulse width

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



4 Package outlines

Package Drawing PG-TO252-3



NOTES:
1. ALL DIMENSIONS REFER TO JEDEC
STANDARD TO-252 DO NOT INCLUDE MOLD
FLASH OR PROTRUSIONS.

DIM	MILLIMETERS	
	MIN	MAX
A	2.16	2.41
A1	0.00	0.15
b	0.64	0.89
b2	0.65	1.15
b3	4.95	5.50
c	0.46	0.61
c2	0.40	0.98
D	5.97	6.22
D1	5.02	5.84
E	6.35	6.73
E1	4.32	5.21
e	2.29 (BSC)	
e1	4.57 (BSC)	
N	3	
H	9.40	10.48
L	1.18	1.78
L3	0.89	1.27
L4	0.51	1.02

DOCUMENT NO.
Z8B00003328

SCALE
0 2.5 5mm

EUROPEAN PROJECTION

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05-02-2016

REVISION
06

Figure 1

5 Testing conditions

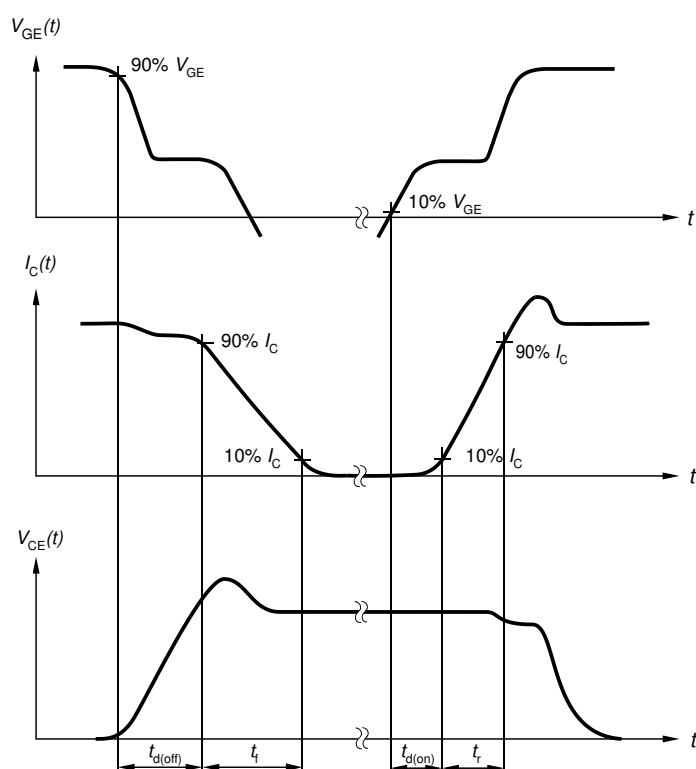


Figure A. Definition of switching times

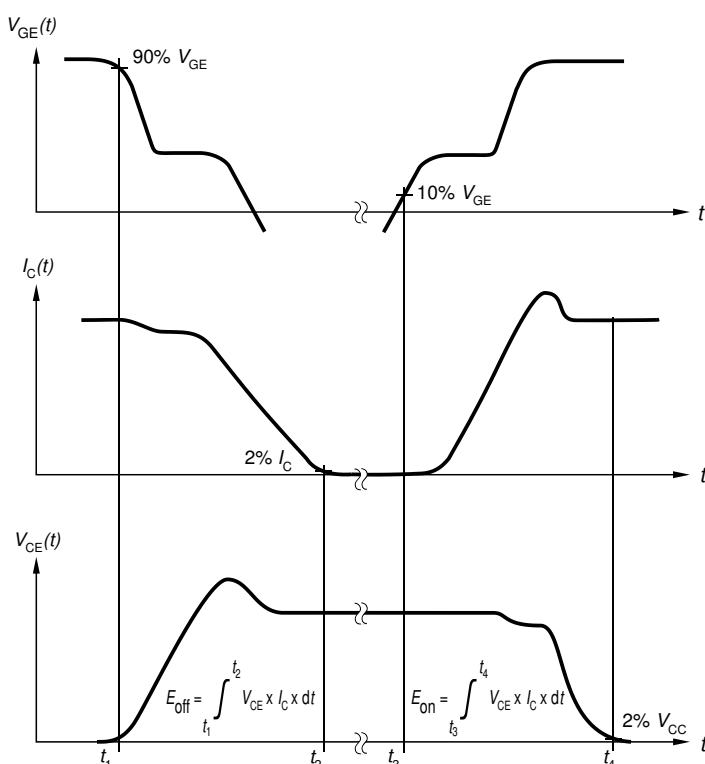


Figure B. Definition of switching losses

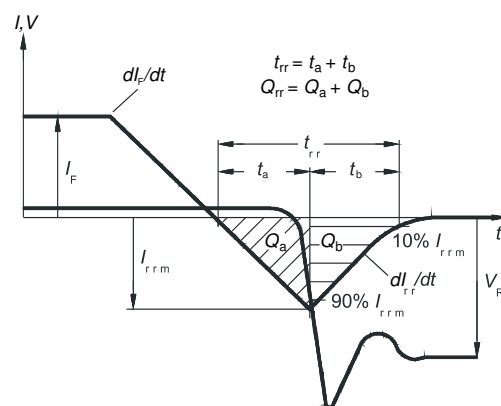


Figure C. Definition of diode switching characteristics

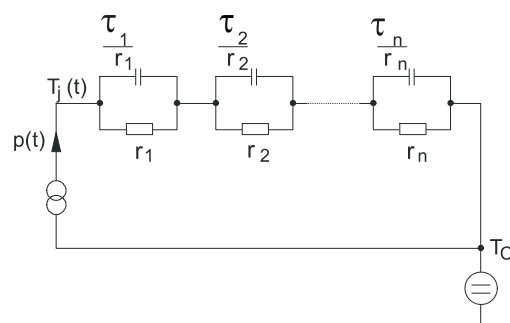


Figure D. Thermal equivalent circuit

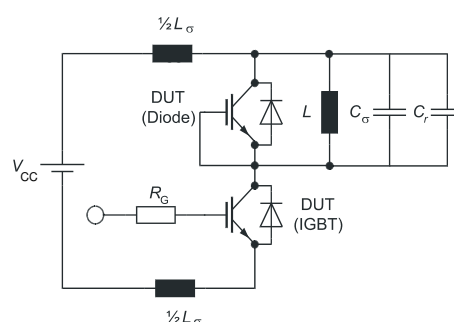


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ ,
parasitic capacitor C_σ ,
relief capacitor C_r ,
(only for ZVT switching)



Revision history

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

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