

## Reverse-Conducting IGBT with monolithic body diode

### Features

- $V_{CE} = 1400\text{ V}$
- $I_C = 30\text{ A}$
- Powerful monolithic body diode with low forward voltage designed for soft commutation only
- Very tight parameter distribution
- High ruggedness, temperature stable behavior
- Very low  $V_{CEsat}$
- Easy paralleling capability due to positive temperature coefficient in  $V_{CEsat}$
- Low EMI
- Qualified according to JESD-022 for target applications
- Pb-free lead plating; RoHS compliant
- Halogen free (according to IEC 61249-2-21)
- Complete product spectrum and PSpice Models: <http://www.infineon.com/igbt/>

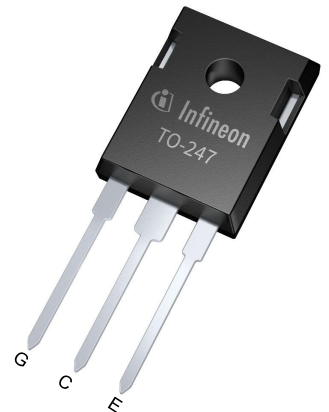
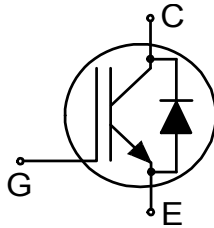
### Potential applications

- Induction cooker
- Microwave ovens

### Product validation

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

### Description



Type	Package	Marking
IHW30N140R5L	PG-TO247-3-STD-NN2.5	H30QR5L

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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	$L_E$			13		nH
Storage temperature	$T_{stg}$		-55		150	°C
Soldering temperature	$T_{sold}$	wave soldering 1.6 mm (0.063 in.) from case for 10 s			260	°C
Mounting torque	$M$	M3 screw, Maximum of mounting processes: 3			0.6	Nm
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	K/W
IGBT thermal resistance, junction-case	$R_{th(j-c)}$				0.49	K/W
Diode thermal resistance, junction-case	$R_{th(j-c)}$				0.49	K/W

## 2 IGBT

**Table 2** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Collector-emitter voltage	$V_{CE}$	$T_{vj} \geq 25\text{ °C}$	1400	V	
DC collector current, limited by $T_{vjmax}$	$I_C$	limited by bondwire	$T_c = 25\text{ °C}$	80	A
			$T_c = 100\text{ °C}$	58	
Pulsed collector current, $t_p$ limited by $T_{vjmax}$	$I_{Cpulse}$		90	A	
Non repetitive peak collector current <sup>1)</sup>	$I_{CSM}$		200	A	
Turn-off safe operating area <sup>2)</sup>		$V_{CE} \leq 1400\text{ V}, T_{vj} \leq 175\text{ °C}$	90	A	
Gate-emitter voltage	$V_{GE}$		±20	V	
Transient gate-emitter voltage	$V_{GE}$	$t_p \leq 10\text{ }\mu\text{s}, D < 0.01$	±25	V	
Power dissipation	$P_{tot}$		$T_c = 25\text{ °C}$	306	W
			$T_c = 100\text{ °C}$	153	

1) capacitor charging saturation current limited by  $T_{vjmax} < 175\text{ °C}$  and  $t_p < 3\text{ }\mu\text{s}$

2)  $dV/dt < 1\text{ kV}/\mu\text{s}$

**Table 3** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter breakdown voltage	$V_{BRCES}$	$I_C = 0.5 \text{ mA}, V_{GE} = 0 \text{ V}$	1400			V
Collector-emitter saturation voltage	$V_{CEsat}$	$I_C = 30 \text{ A}, V_{GE} = 15 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	1.65	1.95	V
			$T_{vj} = 125 \text{ }^\circ\text{C}$	1.85		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	1.9		
Gate-emitter threshold voltage	$V_{GEth}$	$I_C = 0.47 \text{ mA}, V_{CE} = V_{GE}$	4	5.6	6.2	V
Zero gate-voltage collector current	$I_{CES}$	$V_{CE} = 1400 \text{ V}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$		100	$\mu\text{A}$
			$T_{vj} = 175 \text{ }^\circ\text{C}$	700		
Gate-emitter leakage current	$I_{GES}$	$V_{CE} = 0 \text{ V}, V_{GE} = 20 \text{ V}$			100	nA
Transconductance	$g_{fs}$	$I_C = 30 \text{ A}, V_{CE} = 20 \text{ V}$		26.4		S
Input capacitance	$C_{ies}$	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 100 \text{ kHz}$		1520		pF
Output capacitance	$C_{oes}$	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 100 \text{ kHz}$		45		pF
Reverse transfer capacitance	$C_{res}$	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 100 \text{ kHz}$		37		pF
Gate charge	$Q_G$	$V_{CC} = 1120 \text{ V}, I_C = 30 \text{ A}, V_{GE} = 15 \text{ V}$		210		nC
Turn-off delay time	$t_{d(off)}$	$V_{GE} = 0/15 \text{ V},$ $R_{G(off)} = 10 \text{ } \Omega, C_r = 270 \text{ nF},$ $L = 77 \text{ } \mu\text{H}, R = 2.2 \text{ } \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C},$ $I_C = 30 \text{ A}$	175		ns
			$T_{vj} = 175 \text{ }^\circ\text{C},$ $I_C = 30 \text{ A}$	180		
Fall time (inductive load)	$t_f$	$V_{GE} = 0/15 \text{ V},$ $R_{G(off)} = 10 \text{ } \Omega, C_r = 270 \text{ nF},$ $L = 77 \text{ } \mu\text{H}, R = 2.2 \text{ } \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C},$ $I_C = 30 \text{ A}$	1120		ns
			$T_{vj} = 175 \text{ }^\circ\text{C},$ $I_C = 30 \text{ A}$	1980		
Soft turn-off energy	$E_{off}$	$V_{GE} = 0/15 \text{ V},$ $R_{G(off)} = 10 \text{ } \Omega, C_r = 270 \text{ nF},$ $L = 77 \text{ } \mu\text{H}, R = 2.2 \text{ } \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C},$ $I_C = 30 \text{ A}$	0.14		mJ
			$T_{vj} = 175 \text{ }^\circ\text{C},$ $I_C = 30 \text{ A}$	0.37		
Operating junction temperature	$T_{vj}$		-40		175	$^\circ\text{C}$

### 3 Diode

**Table 4** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Diode forward current, limited by $T_{vjmax}$	$I_F$	limited by bondwire	$T_c = 25\text{ °C}$	80	A
			$T_c = 100\text{ °C}$	60	
Diode pulsed current, $t_p$ limited by $T_{vjmax}$	$I_{Fpulse}$		90	A	

**Table 5** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Diode forward voltage	$V_F$	$I_F = 30\text{ A}$	$T_{vj} = 25\text{ °C}$	1.6	1.95	V
			$T_{vj} = 125\text{ °C}$	1.8		
			$T_{vj} = 175\text{ °C}$	1.9		
Operating junction temperature	$T_{vj}$		-40		175	°C

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

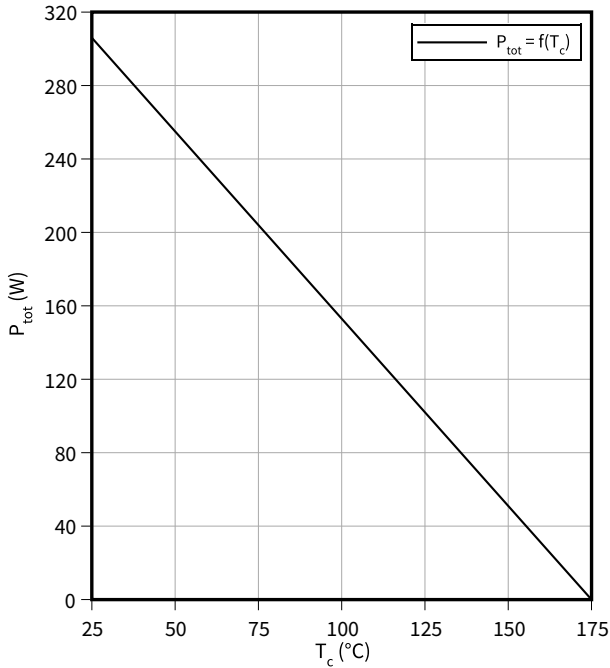
Electrical Characteristic, at  $T_{vj} = 25\text{ °C}$ , unless otherwise specified.

Dynamic test circuit, energy losses include “tail” according to Figure B. (Test circuit Figure E).

## 4 Characteristics diagrams

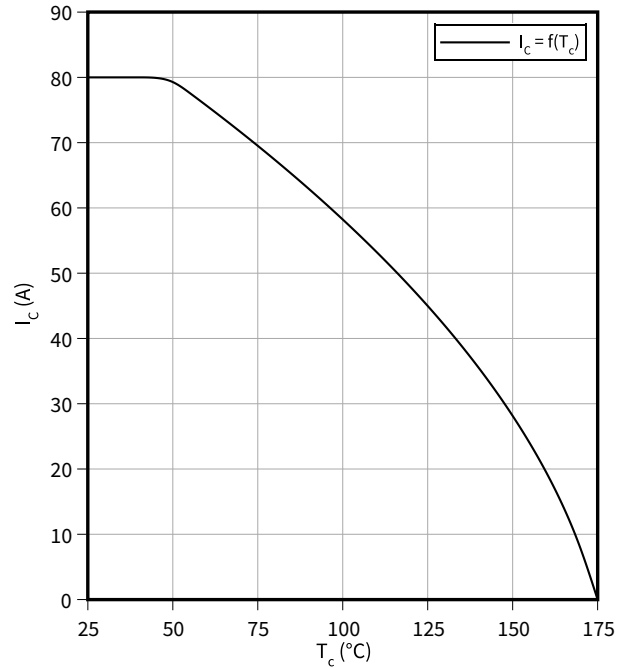
### Power dissipation as a function of case temperature

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



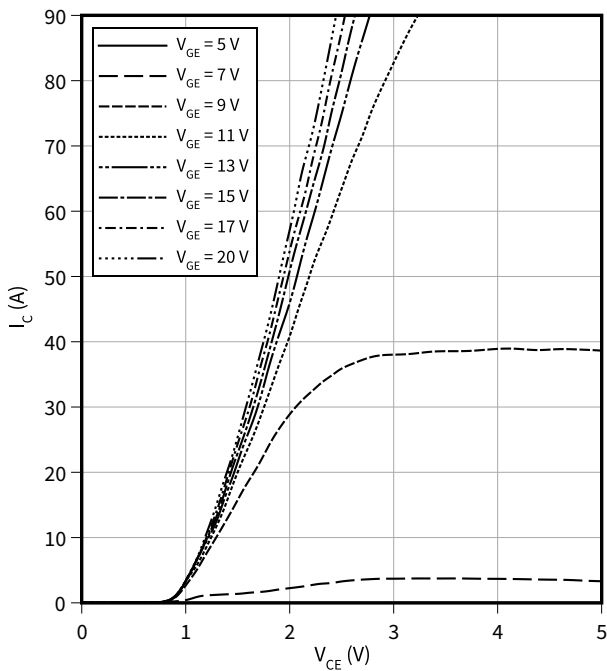
### Collector current as a function of case temperature

$I_C = f(T_c)$   
 $T_{vj} \leq 175\text{ }^\circ\text{C}, V_{GE} \geq 15\text{ V}$



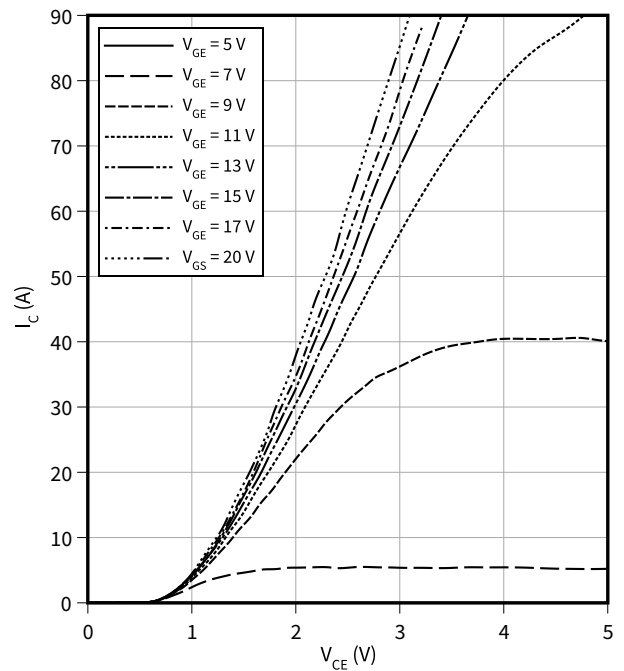
### Typical output characteristic

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



### Typical output characteristic

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

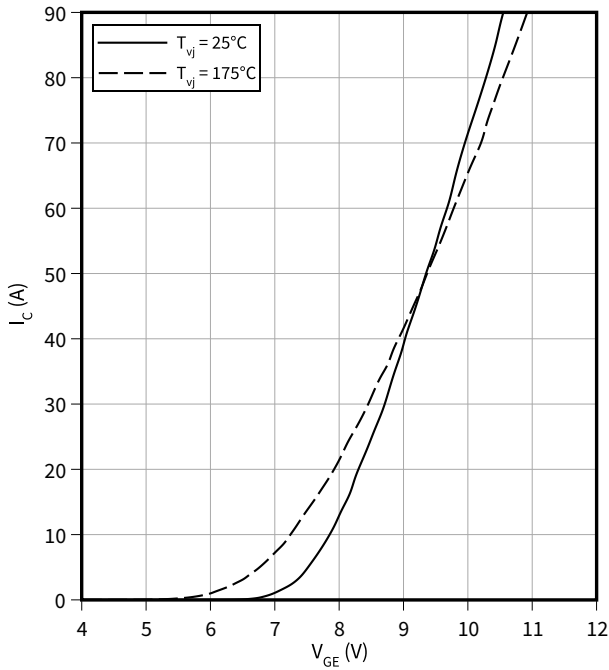


4 Characteristics diagrams

**Typical transfer characteristic**

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

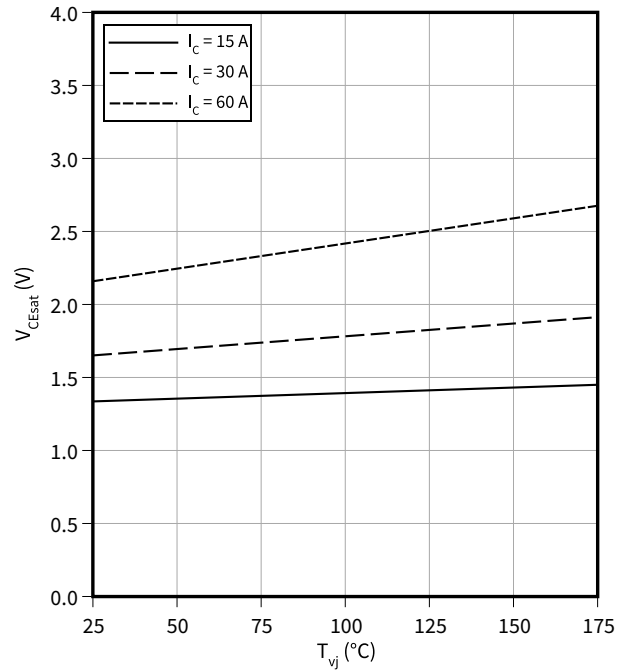
$$V_{CE} = 20 \text{ V}$$



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

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

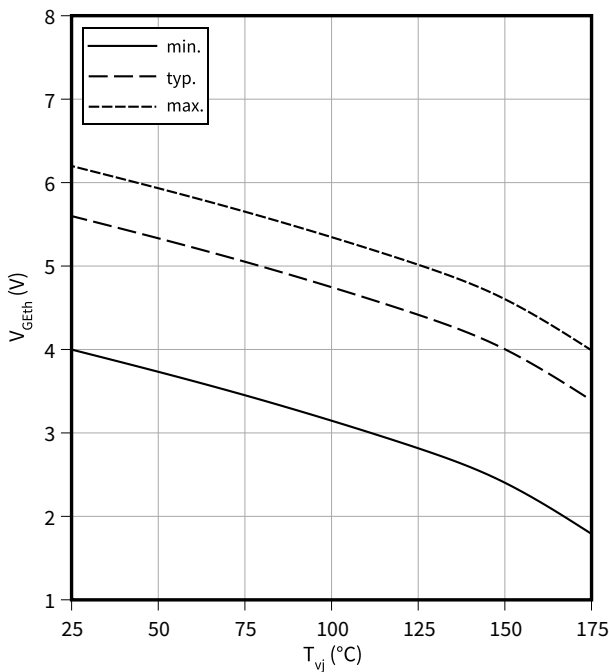
$$V_{GE} = 15 \text{ V}$$



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

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

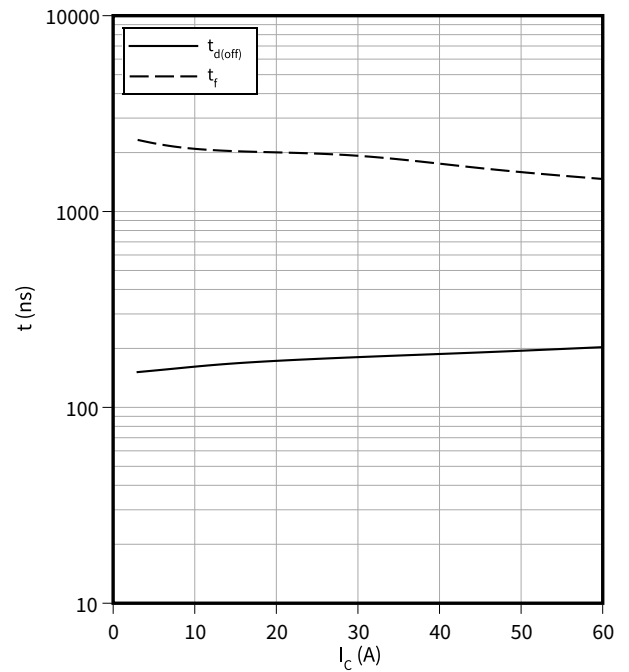
$$I_C = 0.47 \text{ mA}$$



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

$$t = f(I_C)$$

$$T_{vj} = 175^\circ\text{C}, V_{GE} = 0/15 \text{ V}, C_r = 270 \text{ nF}, R_G = 10 \Omega$$

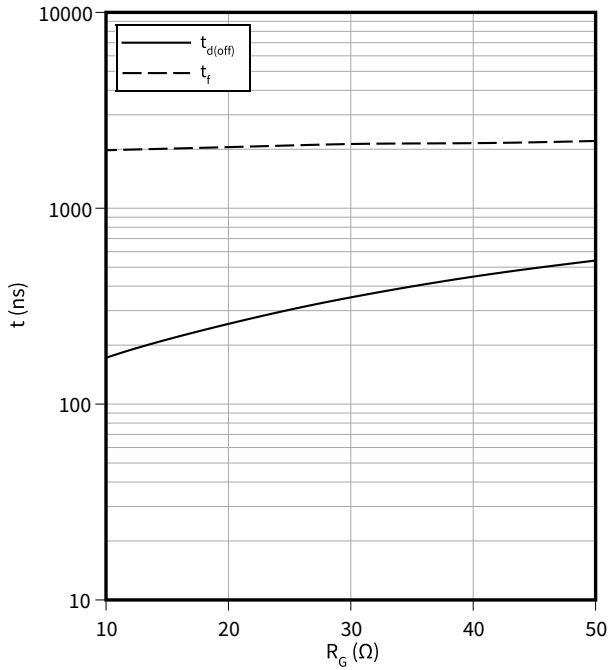


4 Characteristics diagrams

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

$t = f(R_G)$

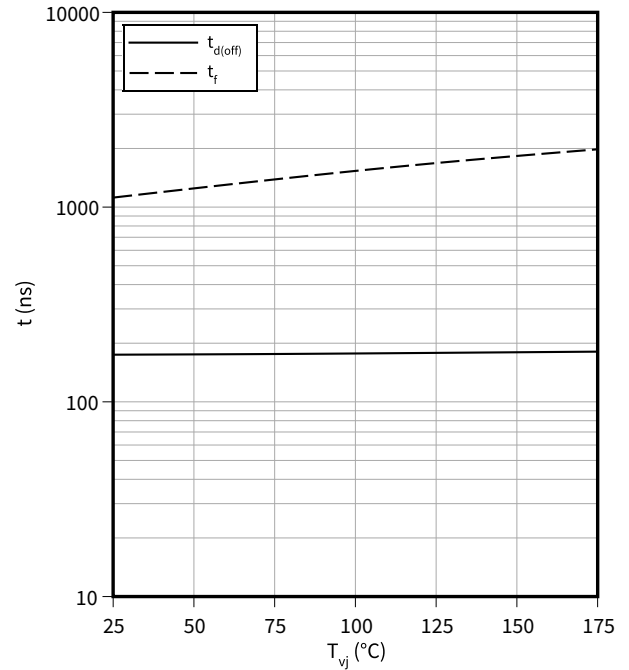
$I_C = 30\text{ A}$ ,  $T_{vj} = 175\text{ °C}$ ,  $V_{GE} = 0/15\text{ V}$ ,  $C_r = 270\text{ nF}$



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

$t = f(T_{vj})$

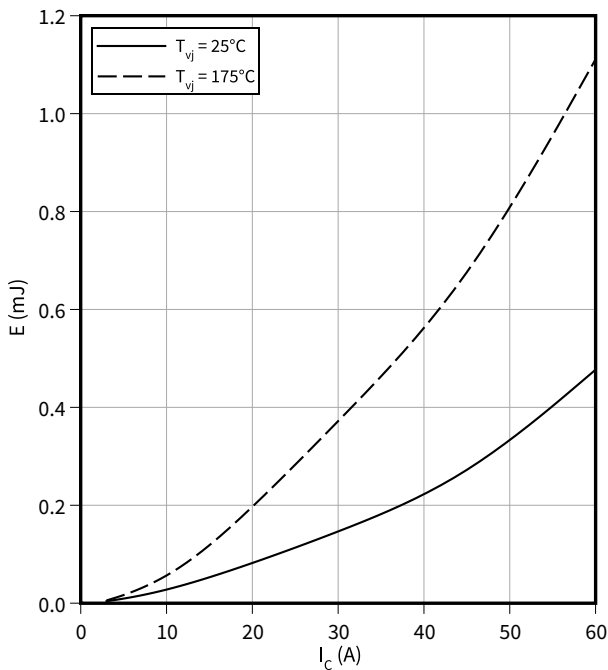
$I_C = 30\text{ A}$ ,  $V_{GE} = 0/15\text{ V}$ ,  $C_r = 270\text{ nF}$ ,  $R_G = 10\text{ Ω}$



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

$E = f(I_C)$

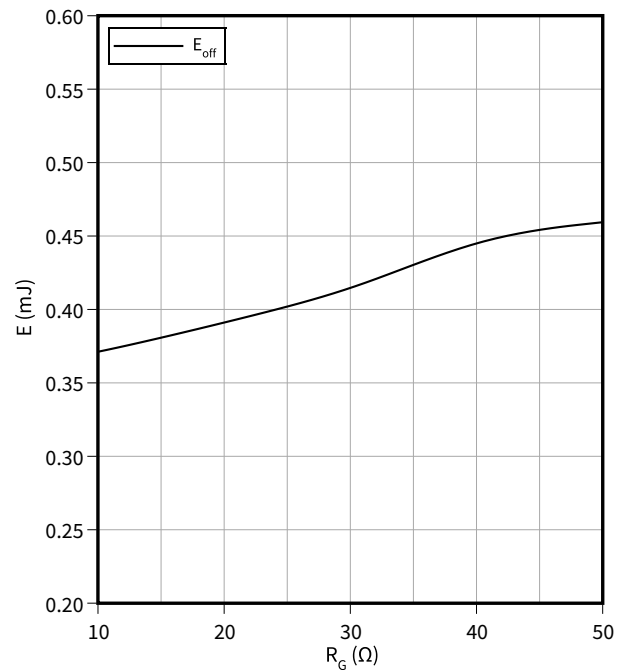
$V_{GE} = 0/15\text{ V}$ ,  $C_r = 270\text{ nF}$ ,  $R_G = 10\text{ Ω}$



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

$E = f(R_G)$

$I_C = 30\text{ A}$ ,  $T_{vj} = 175\text{ °C}$ ,  $V_{GE} = 0/15\text{ V}$ ,  $C_r = 270\text{ nF}$



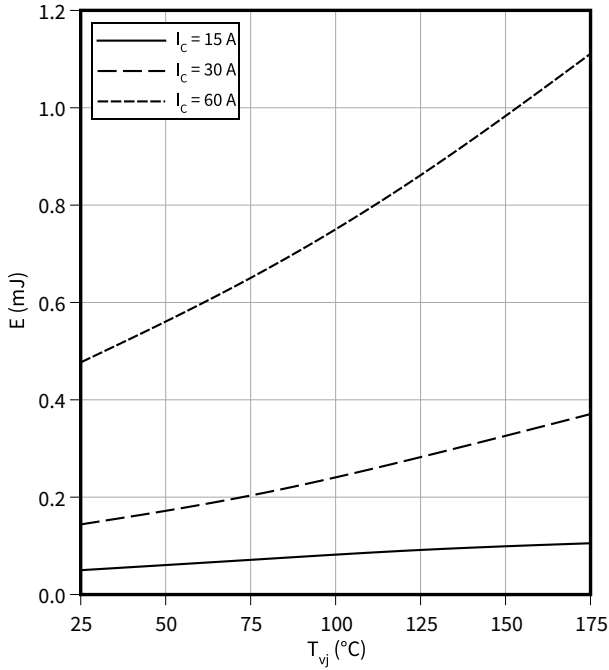


4 Characteristics diagrams

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

$E = f(T_{vj})$

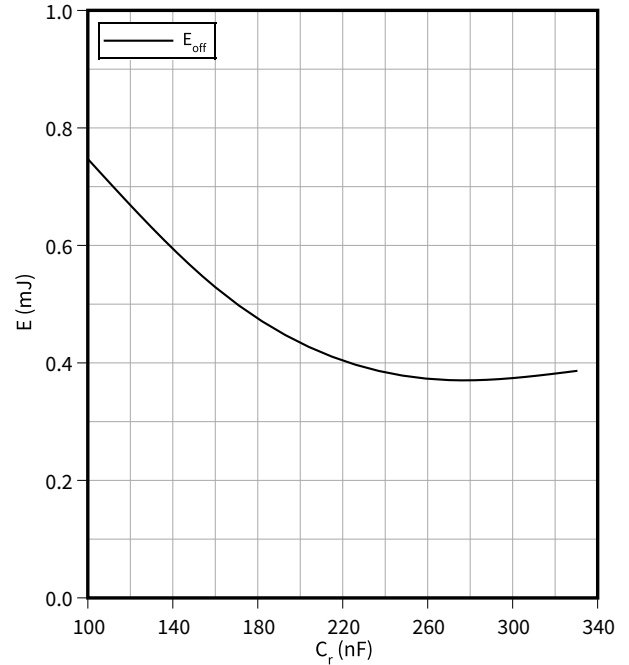
$V_{GE} = 0/15\text{ V}$ ,  $C_r = 270\text{ nF}$ ,  $R_G = 10\ \Omega$



**Typical switching energy losses as a function of resonant capacitance**

$E = f(C_r)$

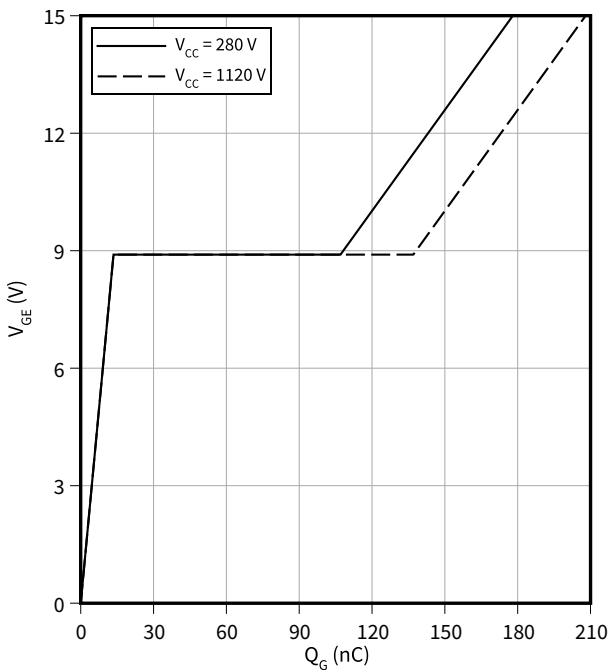
$I_C = 30\text{ A}$ ,  $T_{vj} = 175\text{ °C}$ ,  $V_{GE} = 0/15\text{ V}$ ,  $R_G = 10\ \Omega$



**Typical gate charge**

$V_{GE} = f(Q_G)$

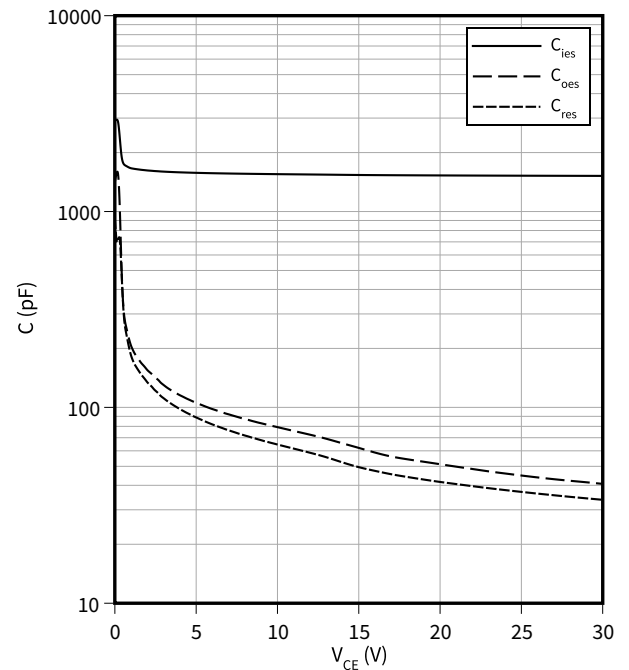
$I_C = 30\text{ A}$



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

$C = f(V_{CE})$

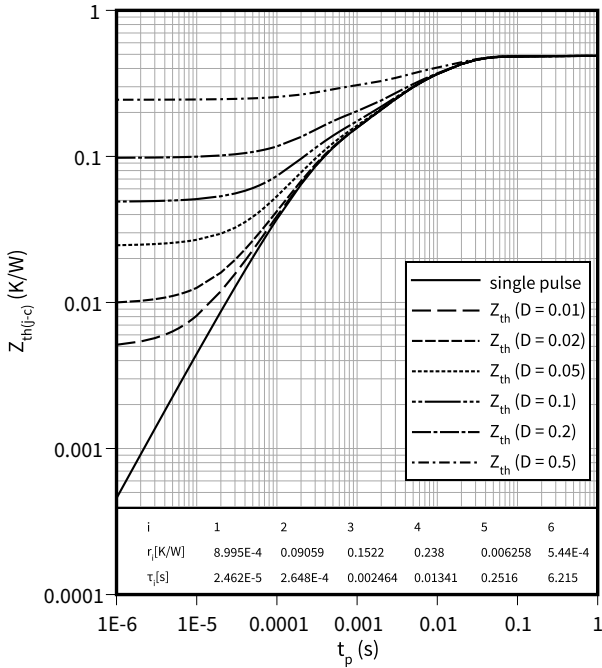
$f = 100\text{ kHz}$ ,  $V_{GE} = 0\text{ V}$



4 Characteristics diagrams

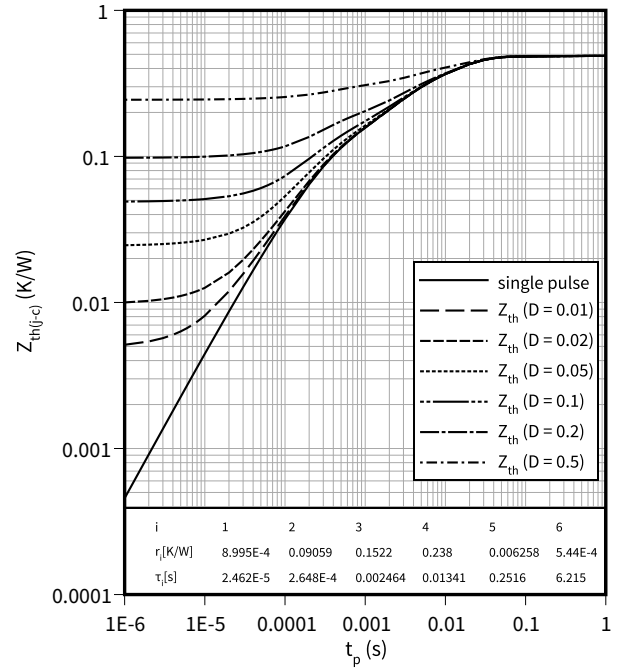
**IGBT transient thermal impedance as a function of pulse width**

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



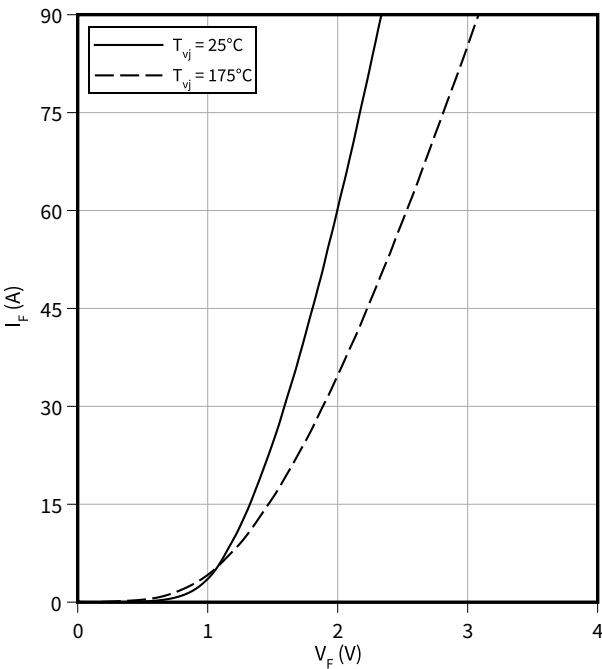
**Diode transient thermal impedance as a function of pulse width**

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



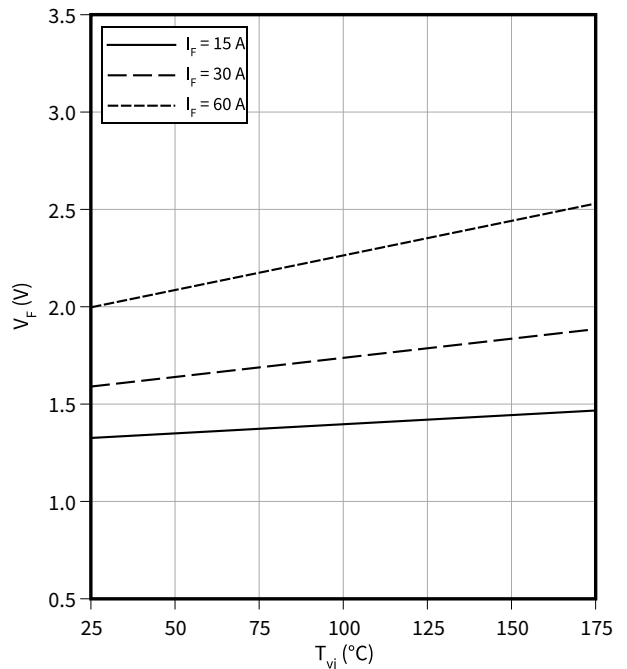
**Typical diode forward current as a function of forward voltage**

$I_F = f(V_F)$



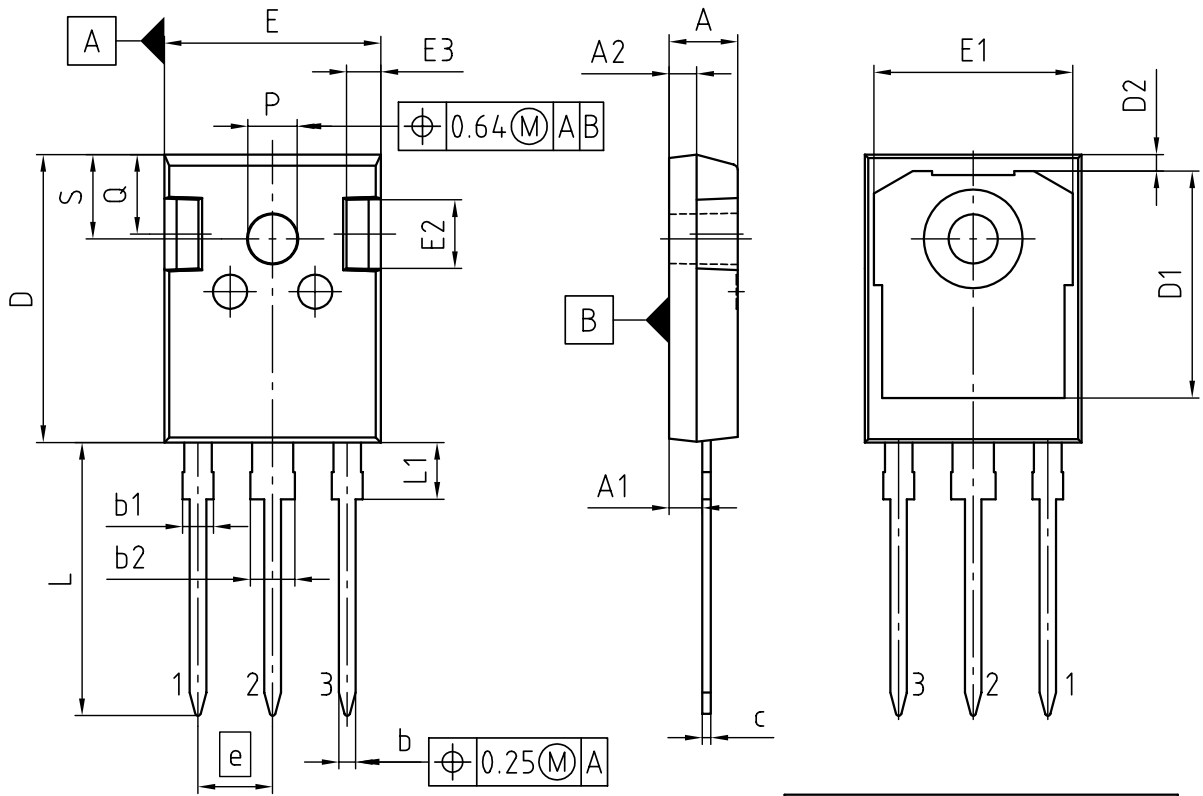
**Typical diode forward voltage as a function of junction temperature**

$V_F = f(T_{vj})$



5 Package outlines

PG-TO247-3-STD-NN2.5



PACKAGE - GROUP NUMBER: PG-TO247-3-U06		
DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	4.83	5.21
A1	2.27	2.54
A2	1.85	2.16
b	1.07	1.33
b1	1.90	2.41
b2	2.87	3.38
c	0.55	0.68
D	20.80	21.10
D1	16.25	17.65
D2	0.95	1.35
E	15.70	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	2.60
e	5.44	
N	3	
L	19.80	20.32
L1	4.10	4.47
$\phi P$	3.50	3.70
Q	5.49	6.00
S	6.04	6.30

NOTE:  
DIMENSIONS DO NOT INCLUDE MOLDFLASH; PROTRUSION OR GATE BURRS

Figure 1

## 6 Testing conditions

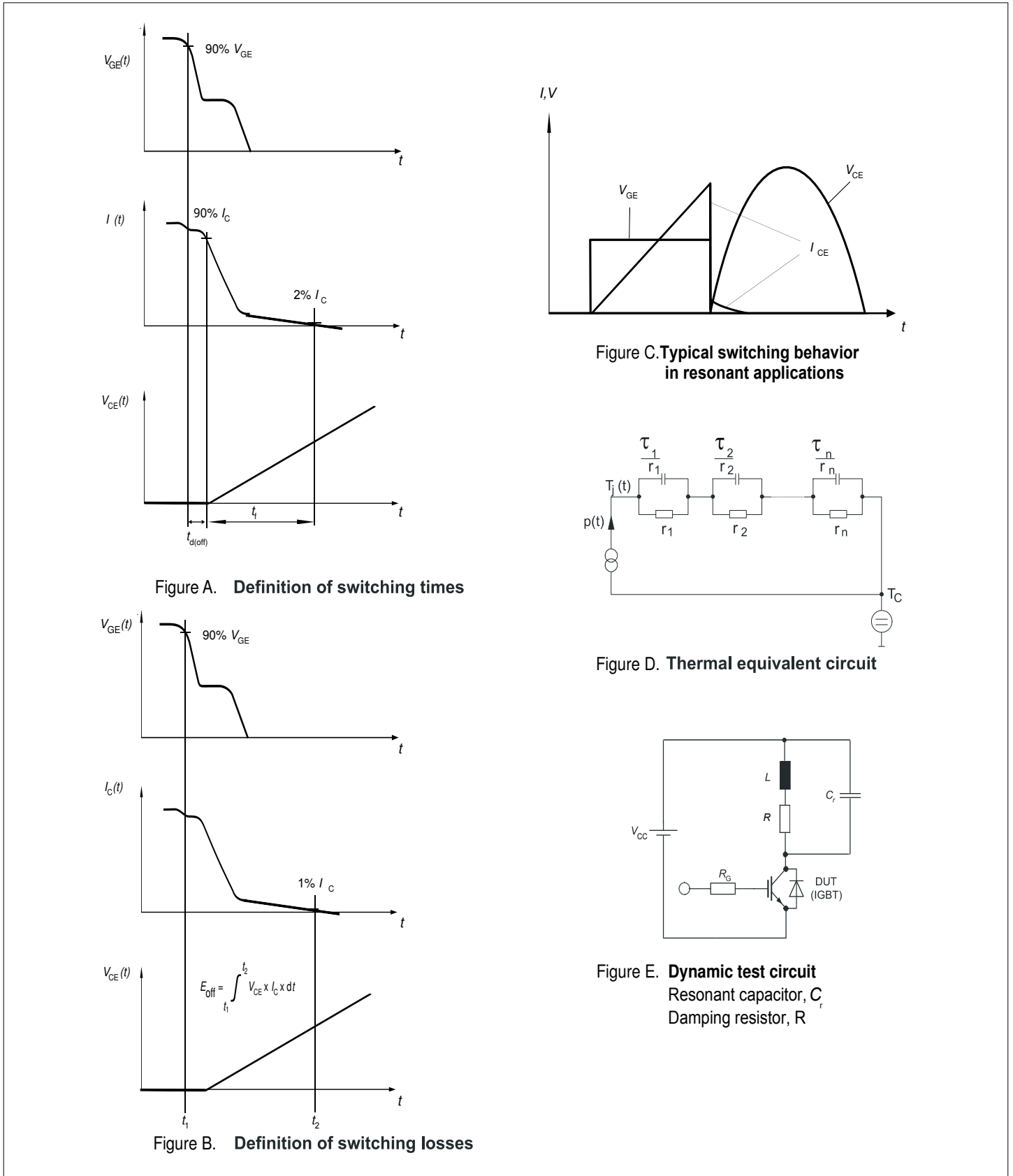


Figure 2

## Revision history

Document revision	Date of release	Description of changes
0.10	2022-11-25	Preliminary datasheet
1.00	2023-05-19	Final datasheet

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**IFX-ABC707-002**

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