

## 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/>

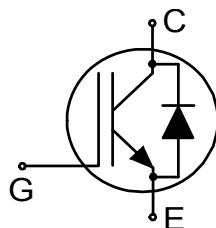
### Potential applications

- 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	$V_{CEsat}$	$I_C = 30 \text{ A}, V_{GE} = 15 \text{ V}$	$T_{vj} = 25 \text{ °C}$		1.65	1.95	V
			$T_{vj} = 125 \text{ °C}$		1.85		
			$T_{vj} = 175 \text{ °C}$		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	$I_{CES}$	$V_{CE} = 1400 \text{ V}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$			100	$\mu\text{A}$
			$T_{vj} = 175 \text{ °C}$		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	$t_{d(off)}$	$V_{GE} = 0/15 \text{ V},$ $R_{G(off)} = 10 \text{ }\Omega, C_r = 270 \text{ nF},$ $L = 77 \text{ }\mu\text{H}, R = 2.2 \text{ }\Omega$	$T_{vj} = 25 \text{ °C},$ $I_C = 30 \text{ A}$		175		ns
			$T_{vj} = 175 \text{ °C},$ $I_C = 30 \text{ A}$		180		
Fall time (inductive load)	$t_f$	$V_{GE} = 0/15 \text{ V},$ $R_{G(off)} = 10 \text{ }\Omega, C_r = 270 \text{ nF},$ $L = 77 \text{ }\mu\text{H}, R = 2.2 \text{ }\Omega$	$T_{vj} = 25 \text{ °C},$ $I_C = 30 \text{ A}$		1120		ns
			$T_{vj} = 175 \text{ °C},$ $I_C = 30 \text{ A}$		1980		
Soft turn-off energy	$E_{off}$	$V_{GE} = 0/15 \text{ V},$ $R_{G(off)} = 10 \text{ }\Omega, C_r = 270 \text{ nF},$ $L = 77 \text{ }\mu\text{H}, R = 2.2 \text{ }\Omega$	$T_{vj} = 25 \text{ °C},$ $I_C = 30 \text{ A}$		0.14		mJ
			$T_{vj} = 175 \text{ °C},$ $I_C = 30 \text{ A}$		0.37		
Operating junction temperature	$T_{vj}$			-40		175	°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

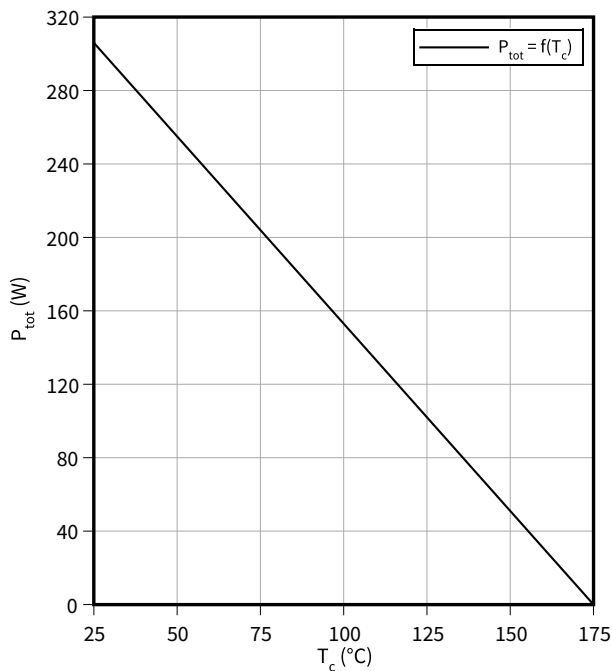
Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Diode forward voltage	$V_F$	$I_F = 30\text{ A}$	$T_{vj} = 25\text{ °C}$		1.6	1.95	V
			$T_{vj} = 125\text{ °C}$		1.8		
			$T_{vj} = 175\text{ °C}$		1.9		
Operating junction temperature	$T_{vj}$			-40		175	°C

**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

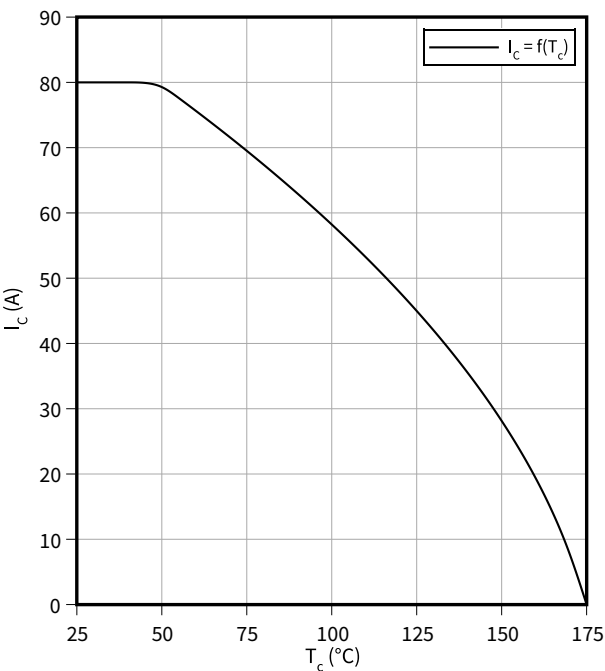
Power dissipation as a function of case temperature

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



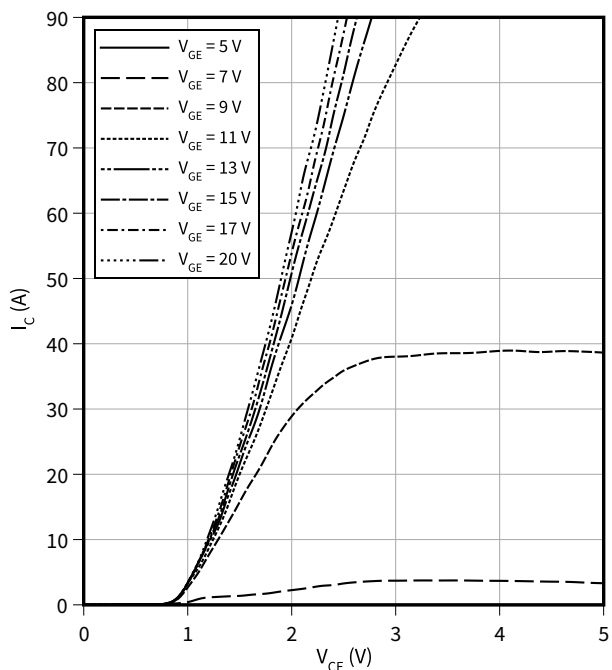
Collector current as a function of case temperature

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



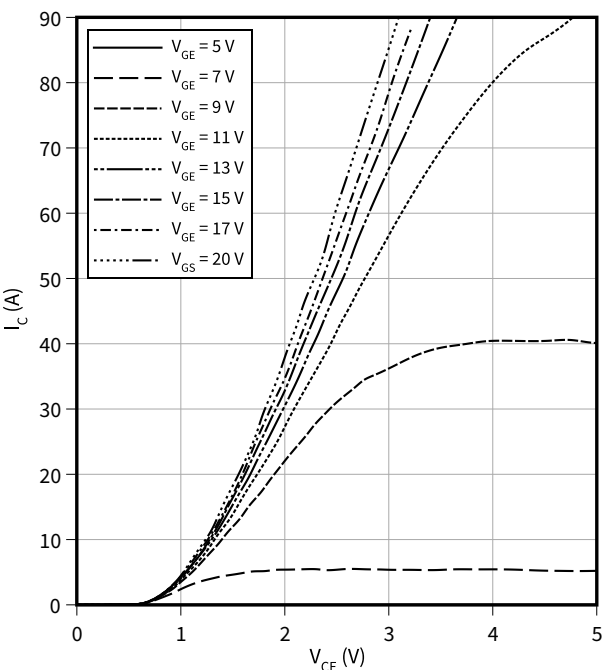
Typical output characteristic

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



Typical output characteristic

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

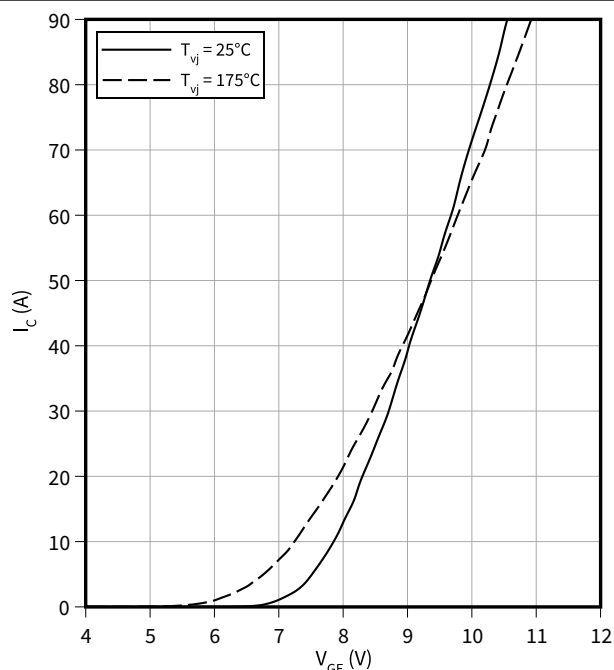


4 Characteristics diagrams

Typical transfer characteristic

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

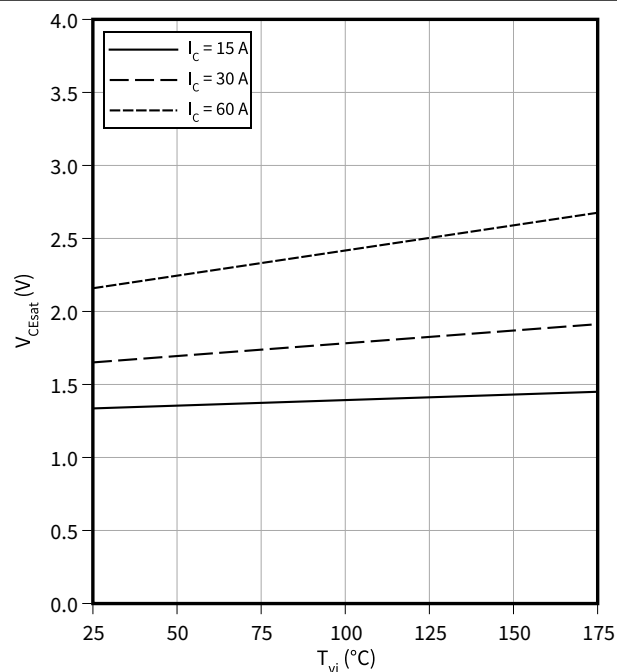
$$V_{CE} = 20 \text{ V}$$



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

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

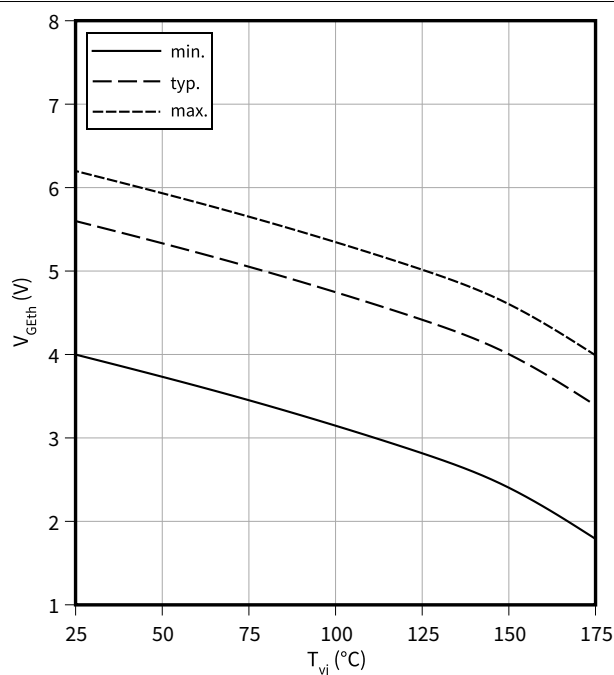
$$V_{GE} = 15 \text{ V}$$



Gate-emitter threshold voltage as a function of junction temperature

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

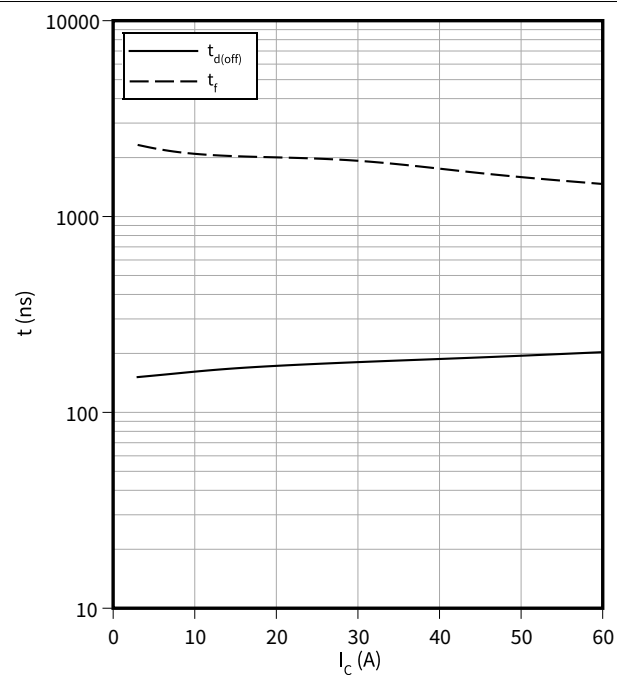
$$I_C = 0.47 \text{ mA}$$



Typical switching times as a function of collector current

$$t = f(I_C)$$

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

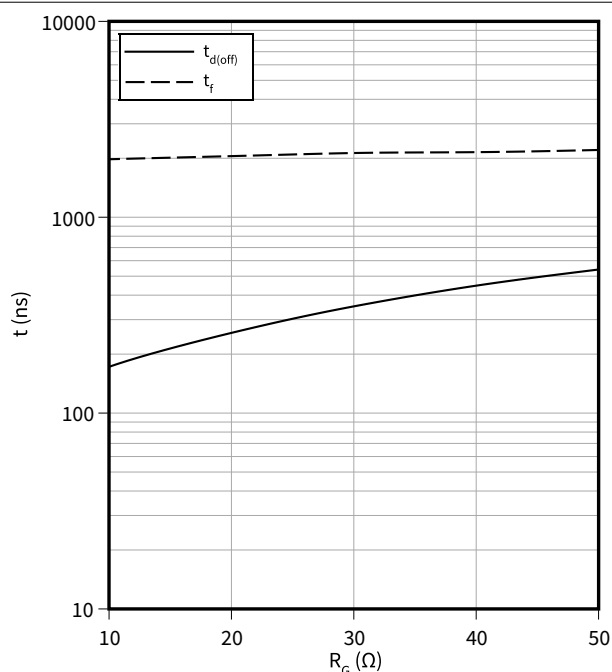


4 Characteristics diagrams

Typical switching times as a function of gate resistor

$$t = f(R_G)$$

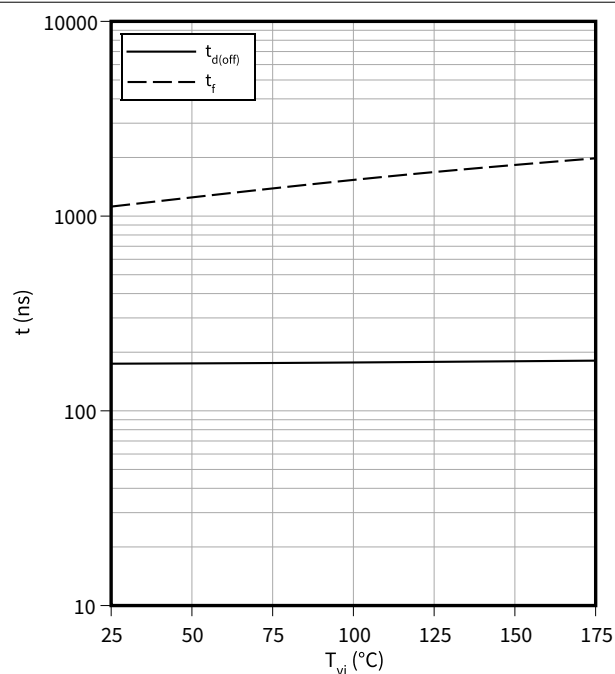
$I_C = 30\text{ A}$ ,  $T_{vj} = 175\text{ °C}$ ,  $V_{GE} = 0/15\text{ V}$ ,  $C_r = 270\text{ nF}$



Typical switching times as a function of junction temperature

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

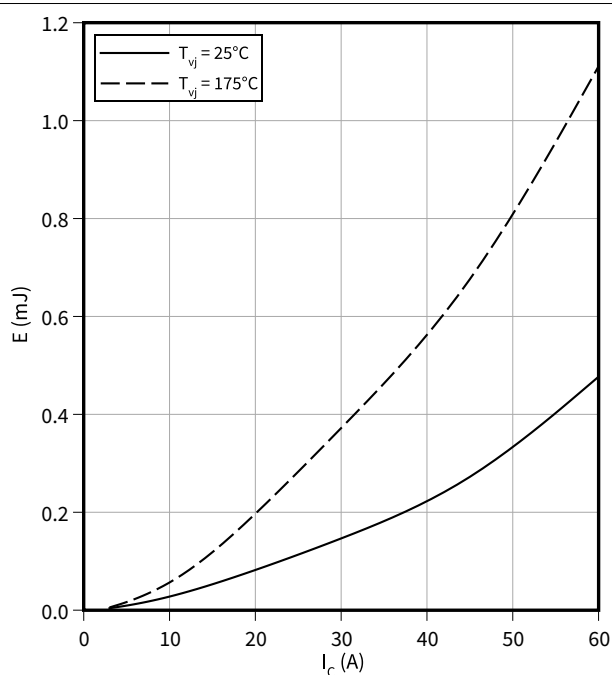
$I_C = 30\text{ A}$ ,  $V_{GE} = 0/15\text{ V}$ ,  $C_r = 270\text{ nF}$ ,  $R_G = 10\text{ Ω}$



Typical switching energy losses as a function of collector current

$$E = f(I_C)$$

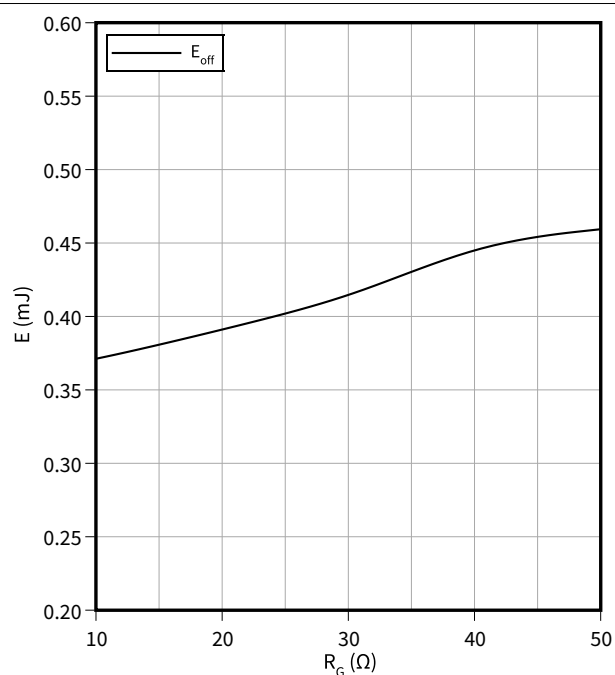
$V_{GE} = 0/15\text{ V}$ ,  $C_r = 270\text{ nF}$ ,  $R_G = 10\text{ Ω}$



Typical switching energy losses as a function of gate resistor

$$E = f(R_G)$$

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



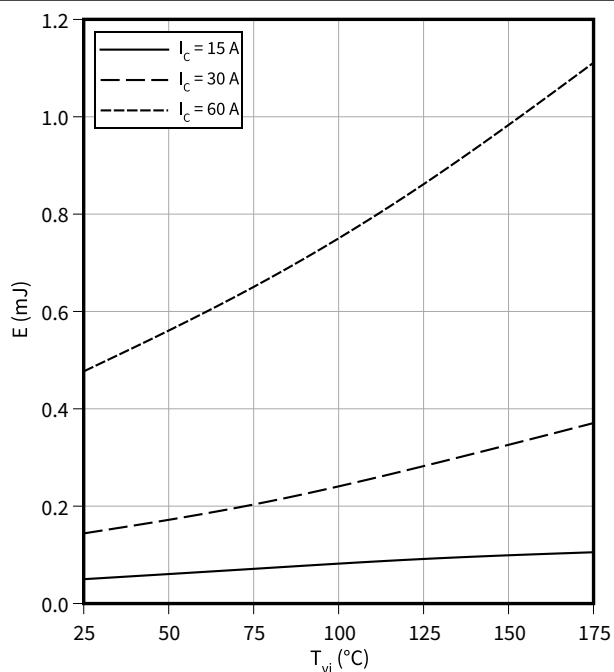


4 Characteristics diagrams

Typical switching energy losses as a function of junction temperature

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

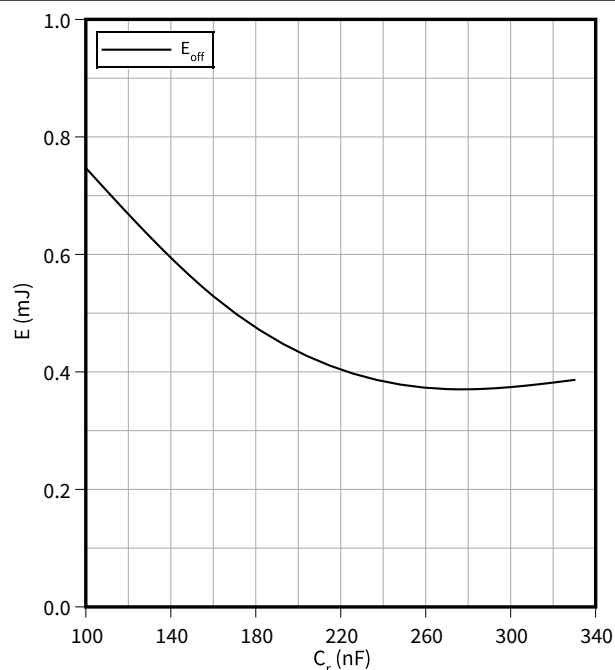
$V_{GE} = 0/15 \text{ V}$ ,  $C_r = 270 \text{ nF}$ ,  $R_G = 10 \text{ } \Omega$



Typical switching energy losses as a function of resonant capacitance

$$E = f(C_r)$$

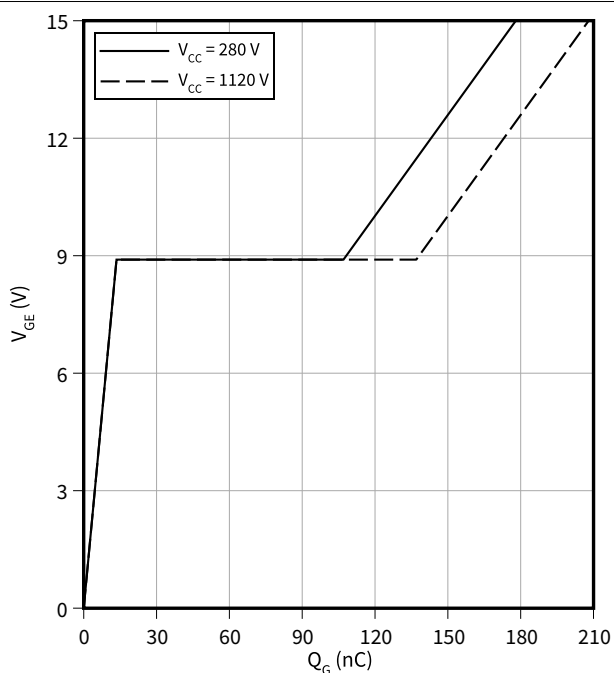
$I_C = 30 \text{ A}$ ,  $T_{vj} = 175 \text{ } ^\circ\text{C}$ ,  $V_{GE} = 0/15 \text{ V}$ ,  $R_G = 10 \text{ } \Omega$



Typical gate charge

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

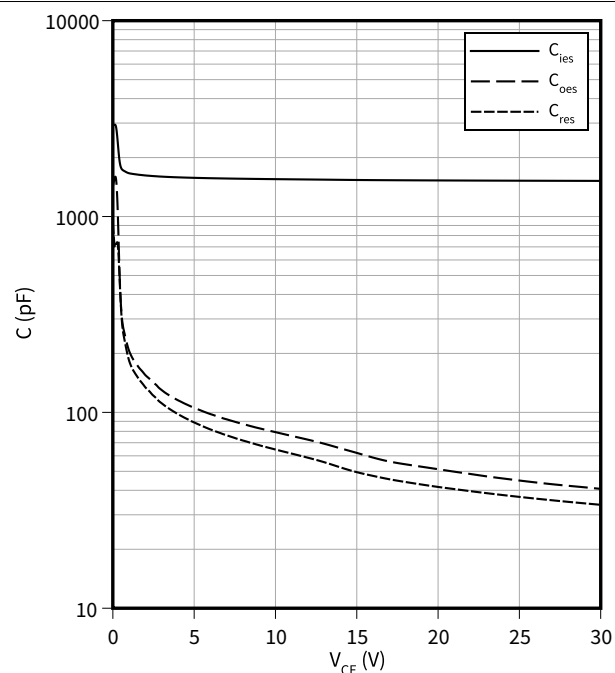
$I_C = 30 \text{ A}$



Typical capacitance as a function of collector-emitter voltage

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

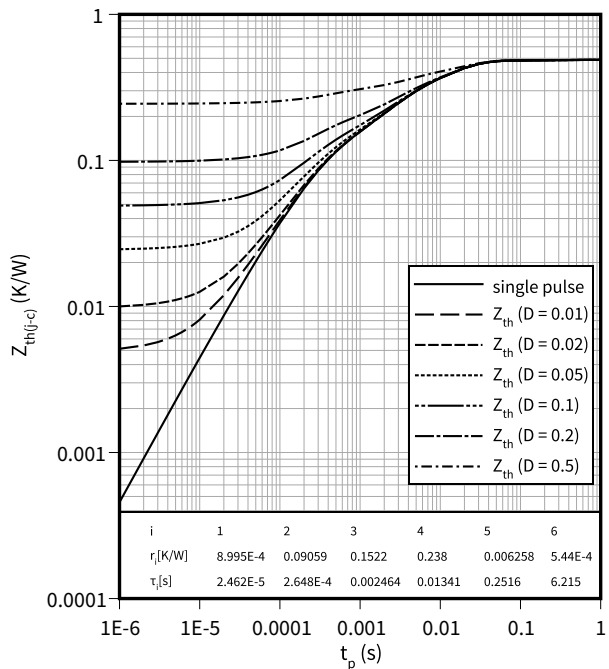
$f = 100 \text{ kHz}$ ,  $V_{GE} = 0 \text{ V}$



4 Characteristics diagrams

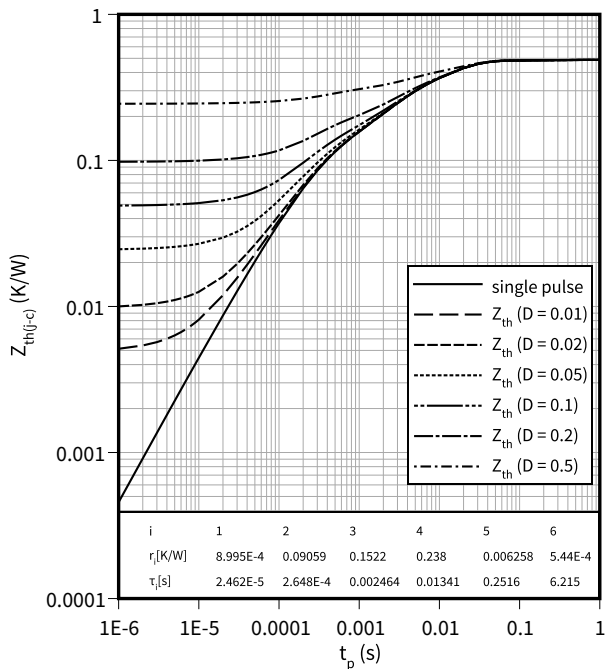
IGBT transient thermal impedance as a function of pulse width

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



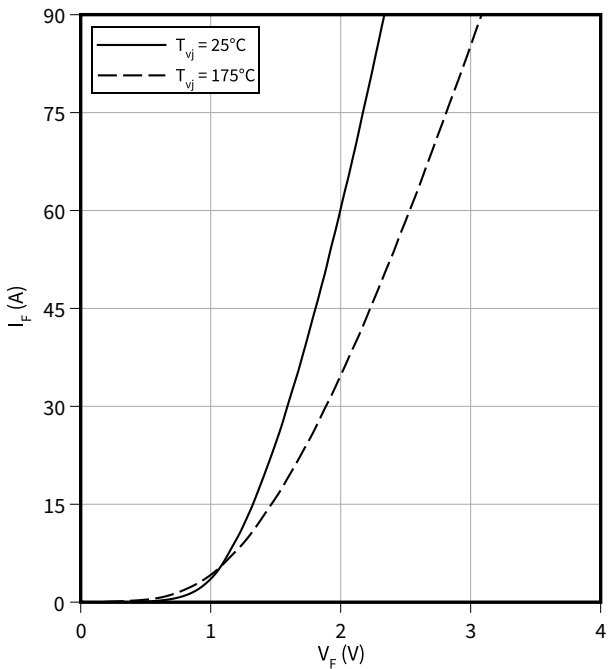
Diode transient thermal impedance as a function of pulse width

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



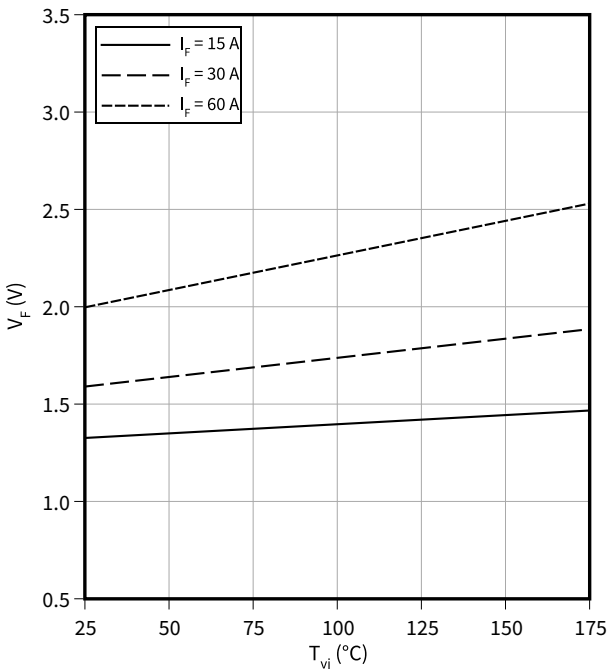
Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



Typical diode forward voltage as a function of junction temperature

$V_F = f(T_{vj})$



5 Package outlines

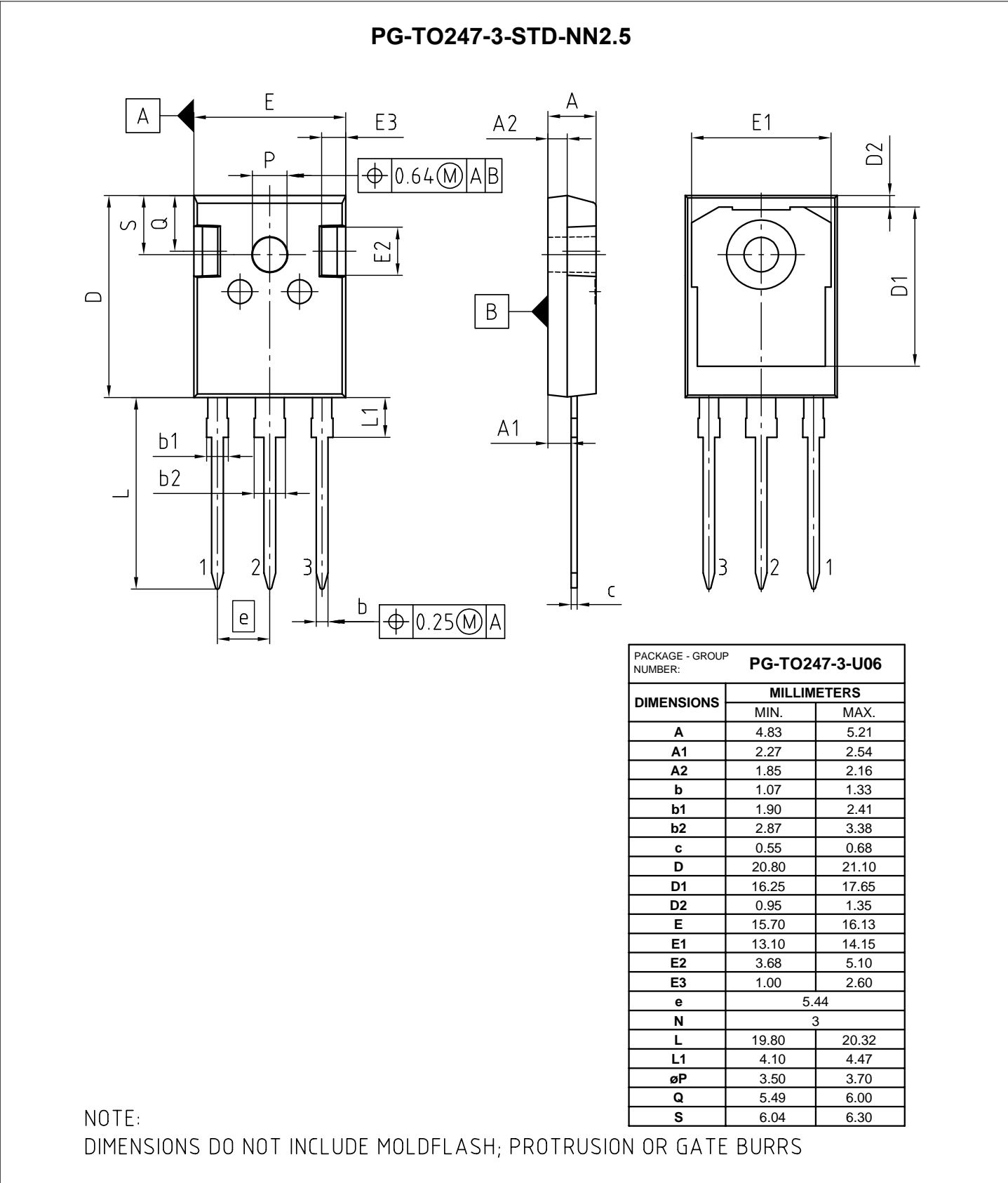


Figure 1

6 Testing conditions

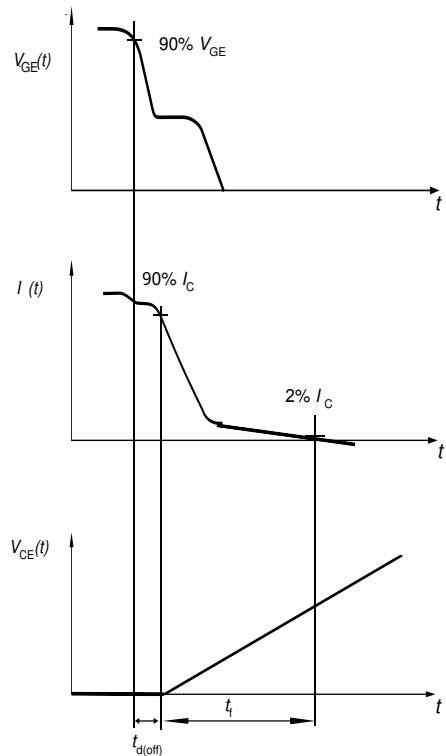


Figure A. Definition of switching times

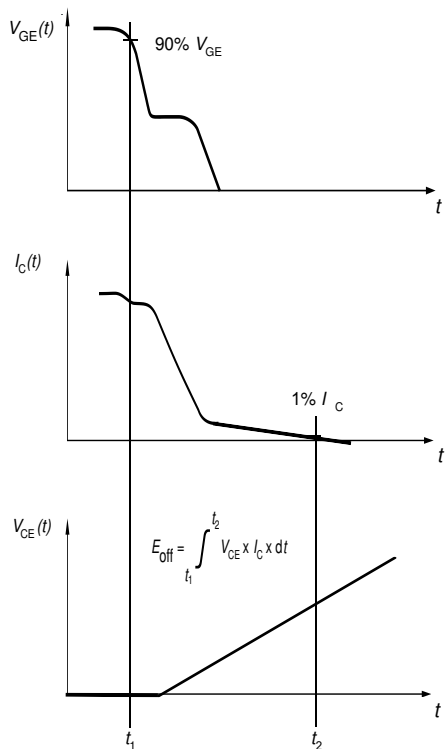


Figure B. Definition of switching losses

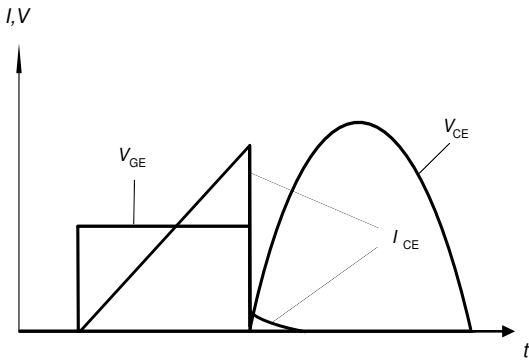


Figure C. Typical switching behavior in resonant applications

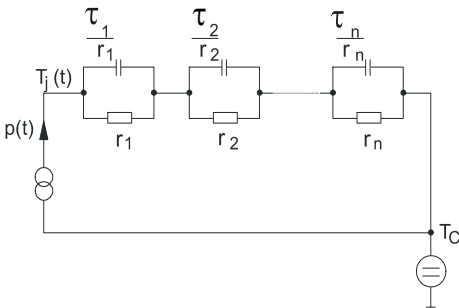


Figure D. Thermal equivalent circuit

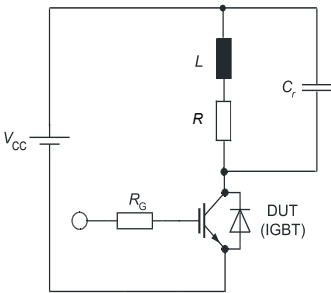


Figure E. Dynamic test circuit  
Resonant capacitor,  $C_r$   
Damping resistor,  $R$

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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**Email:** [erratum@infineon.com](mailto:erratum@infineon.com)

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**IFX-ABC707-002**

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