

## Reverse-Conducting IGBT with monolithic body diode

### Features

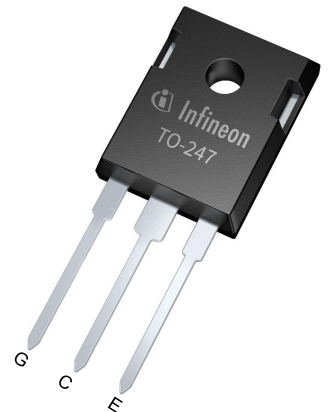
- $V_{CE} = 1100\text{ V}$
- $I_C = 30\text{ A}$
- Powerful monolithic body diode with low forward voltage designed for soft commutation only
- Very tight parameter distribution
- High ruggedness, temperature stable behavior
- Very low  $V_{CEsat}$
- Easy parallel switching capability due to positive temperature coefficient in  $V_{CEsat}$
- Low EMI
- Pb-free lead plating; RoHS compliant
- Complete product spectrum and PSpice Models: <http://www.infineon.com/igbt/>

### Potential applications

- Induction cooking
- Microwave ovens
- Rice Cookers

### Product validation

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



Lead-Free



Green

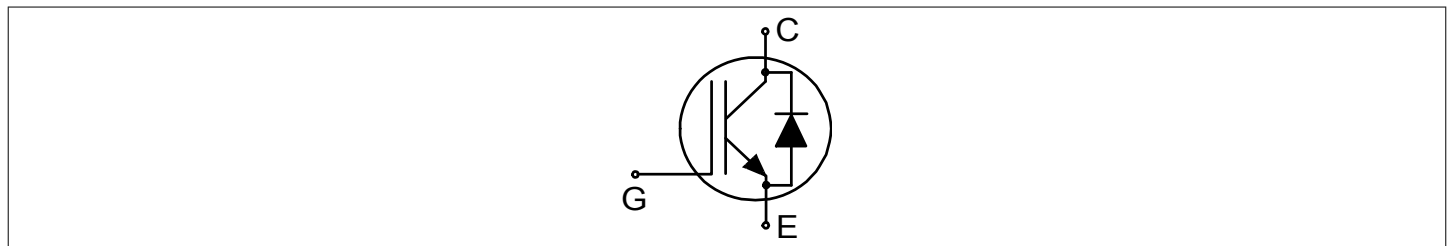


Halogen-Free



RoHS

### Description



Type	Package	Marking
IHW30N110R5	PG-TO247-3-STD-NN2.5	H30KR5

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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	$L_E$			13.0		nH
Storage temperature	$T_{stg}$		-55		150	°C
Soldering temperature		wave soldering 1.6 mm (0.063 in.) from case for 10 s			260	°C
Mounting torque	$M$	M3 screw Maximum of mounting process: 3			0.6	Nm
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	K/W

## 2 IGBT

**Table 2** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Collector-emitter voltage	$V_{CE}$	$T_{vj} \geq 25\text{ °C}$	1100	V	
DC collector current, limited by $T_{vjmax}$	$I_C$		$T_c = 25\text{ °C}$	60	A
			$T_c = 100\text{ °C}$	30	
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		$V_{CE} \leq 1100\text{ V}, t_p \leq 1\text{ }\mu\text{s}, T_{vj} \leq 175\text{ °C}$	90	A	
Gate-emitter voltage	$V_{GE}$		-20/25	V	
Transient gate-emitter voltage	$V_{GE}$	$t_p \leq 10\text{ }\mu\text{s}, D < 0.01$	30	V	
Power dissipation	$P_{tot}$		$T_c = 25\text{ °C}$	330	W
			$T_c = 100\text{ °C}$	165	

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

**Table 3** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter breakdown voltage	$V_{BRCES}$	$I_C = 0.5\text{ mA}, V_{GE} = 0\text{ V}$	1100			V

(table continues...)

**Table 3 (continued) Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CEsat}$	$I_C = 30\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$	1.55	1.85	V
			$T_{vj} = 125\text{ °C}$	1.8		
			$T_{vj} = 175\text{ °C}$	1.9		
Gate-emitter threshold voltage	$V_{GETh}$	$I_C = 0.75\text{ mA}, V_{CE} = V_{GE}$	5.1	5.8	6.4	V
Zero gate-voltage collector current	$I_{CES}$	$V_{CE} = 1100\text{ V}, V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$		100	$\mu\text{A}$
			$T_{vj} = 175\text{ °C}$		630	
Gate-emitter leakage current	$I_{GES}$	$V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}$			100	nA
Transconductance	$g_{fs}$	$I_C = 30\text{ A}, V_{CE} = 20\text{ V}$		23		S
Input capacitance	$C_{ies}$	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$		1800		pF
Output capacitance	$C_{oes}$	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$		55		pF
Reverse transfer capacitance	$C_{res}$	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$		45		pF
Gate charge	$Q_G$	$I_C = 30\text{ A}, V_{GE} = 15\text{ V}, V_{CC} = 880\text{ V}$		240		nC
Turn-off delay time	$t_{d(off)}$	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{Gon} = 10\ \Omega, R_{Goff} = 10\ \Omega, L_\sigma = 175\text{ nH}, C_\sigma = 40\text{ pF}$	$T_{vj} = 25\text{ °C}, I_C = 30\text{ A}$	350		ns
			$T_{vj} = 175\text{ °C}, I_C = 30\text{ A}$	420		
Fall time (inductive load)	$t_f$	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{Gon} = 10\ \Omega, R_{Goff} = 10\ \Omega, L_\sigma = 175\text{ nH}, C_\sigma = 40\text{ pF}$	$T_{vj} = 25\text{ °C}, I_C = 30\text{ A}$	30		ns
			$T_{vj} = 175\text{ °C}, I_C = 30\text{ A}$	90		
Turn-off energy	$E_{off}$	$V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_{Gon} = 10\ \Omega, R_{Goff} = 10\ \Omega, L_\sigma = 175\text{ nH}, C_\sigma = 40\text{ pF}$	$T_{vj} = 25\text{ °C}, I_C = 30\text{ A}$	1.2		mJ
			$T_{vj} = 175\text{ °C}, I_C = 30\text{ A}$	2.4		
Soft turn-off energy	$E_{off}$	$V_{CC} = 600\text{ V}, R_{Gon} = 10\ \Omega, R_{Goff} = 10\ \Omega, L_\sigma = 175\text{ nH}, C_\sigma = 40\text{ pF}$	$T_{vj} = 25\text{ °C}, I_C = 30\text{ A}$	0.14		mJ
			$T_{vj} = 175\text{ °C}, I_C = 30\text{ A}$	0.376		
IGBT thermal resistance, junction to case	$R_{th(j-c)}$				0.45	K/W
Operating junction temperature	$T_{vj}$		-40		175	$^{\circ}\text{C}$

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

### 3 Diode

**Table 4** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Repetitive peak reverse voltage	$V_{RRM}$	$T_{vj} \geq 25\text{ °C}$	1100	V	
Diode forward current, limited by $T_{vjmax}$	$I_F$		$T_c = 25\text{ °C}$	60	A
			$T_c = 100\text{ °C}$	30	
Diode pulsed current, $t_p$ limited by $T_{vjmax}$	$I_{Fpulse}$		90	A	

**Table 5** Characteristic values

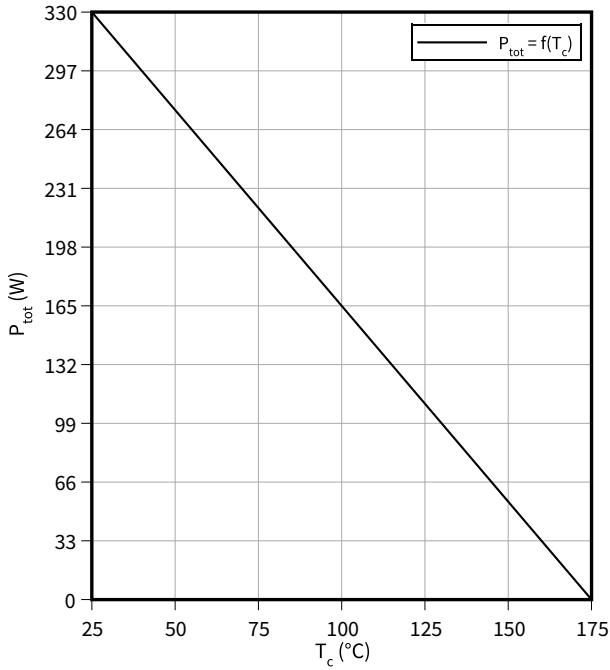
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Diode forward voltage	$V_F$	$I_F = 30\text{ A}$	$T_{vj} = 25\text{ °C}$	1.8	2	V
			$T_{vj} = 125\text{ °C}$	2		
			$T_{vj} = 175\text{ °C}$	2.1		
Reverse leakage current	$I_R$	$V_R = 1100\text{ V}$	$T_{vj} = 25\text{ °C}$		100	$\mu\text{A}$
			$T_{vj} = 175\text{ °C}$		630	
Diode thermal resistance, junction to case	$R_{th(j-c)}$				0.45	K/W
Operating junction temperature	$T_{vj}$		-40		175	$^{\circ}\text{C}$

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

## 4 Characteristics diagrams

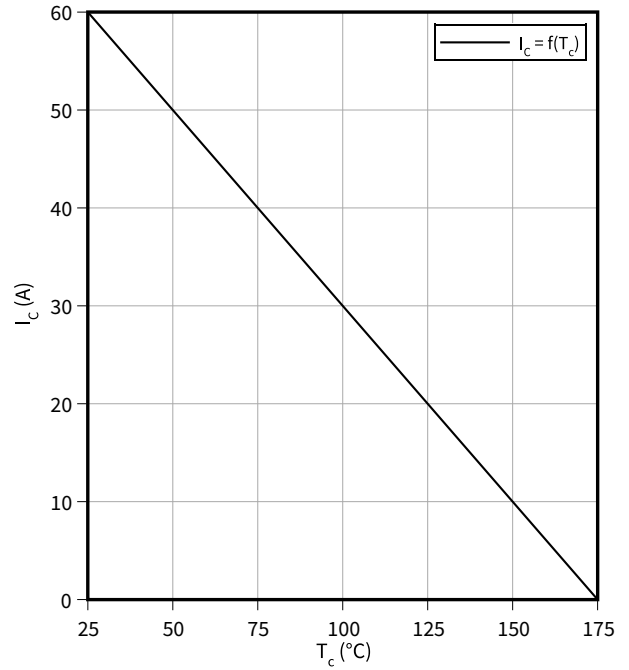
### Power dissipation as a function of case temperature

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



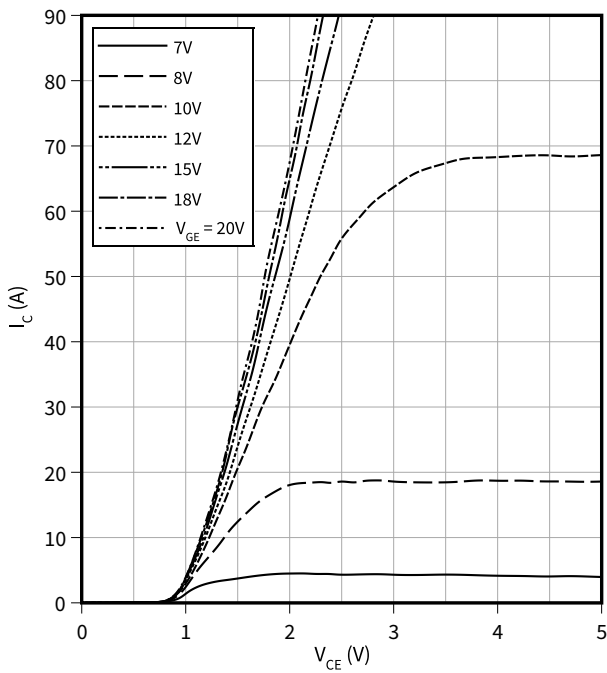
### Collector current as a function of case temperature

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



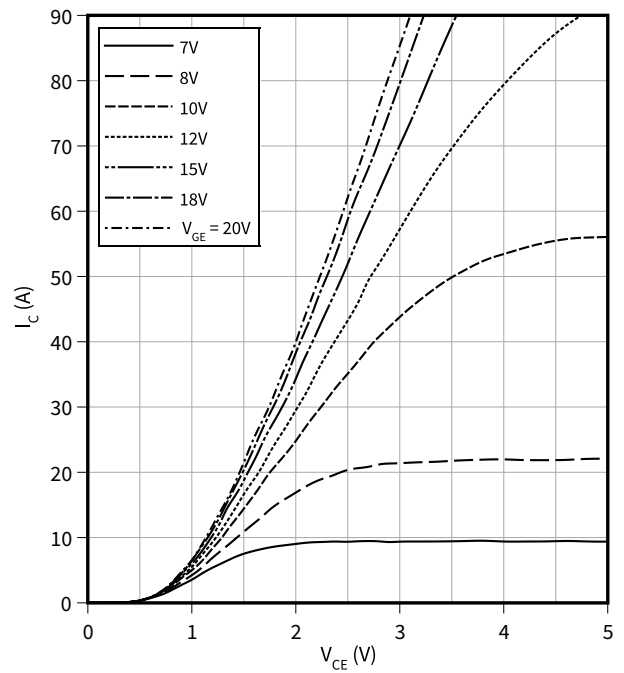
### Typical output characteristic

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



### Typical output characteristic

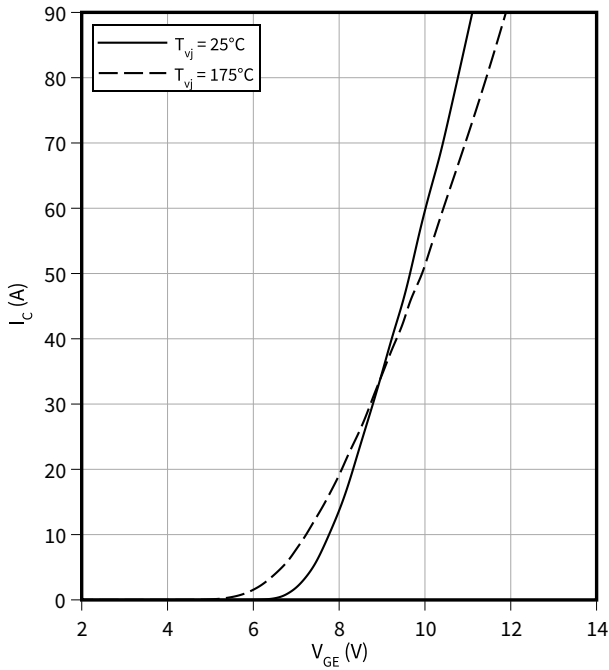
$I_C = f(V_{CE})$   
 $T_{vj} = 175\text{ °C}$



4 Characteristics diagrams

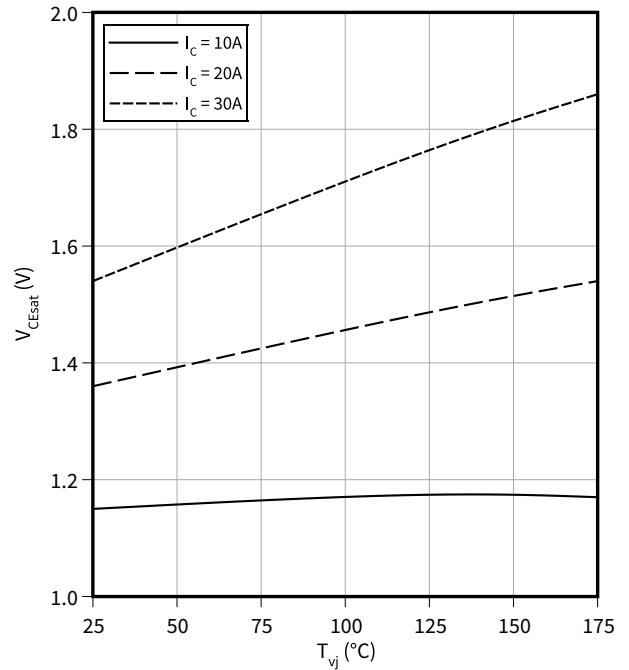
**Typical transfer characteristic**

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



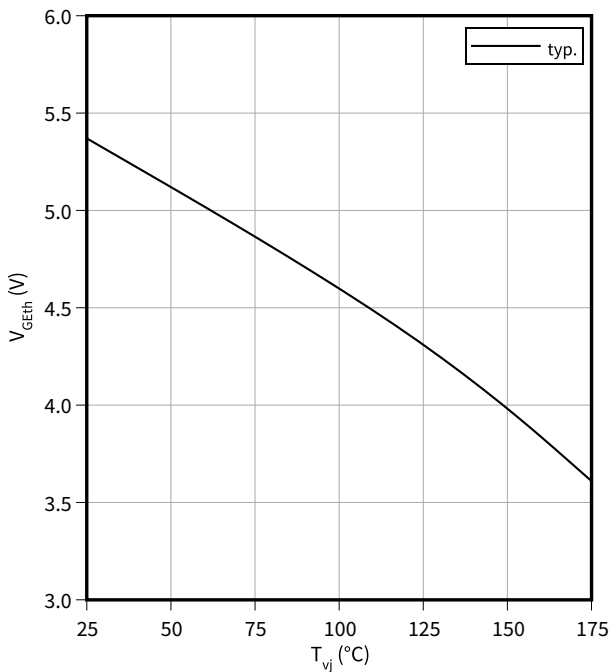
**Typical collector-emitter saturation voltage as a function of junction temperature**

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



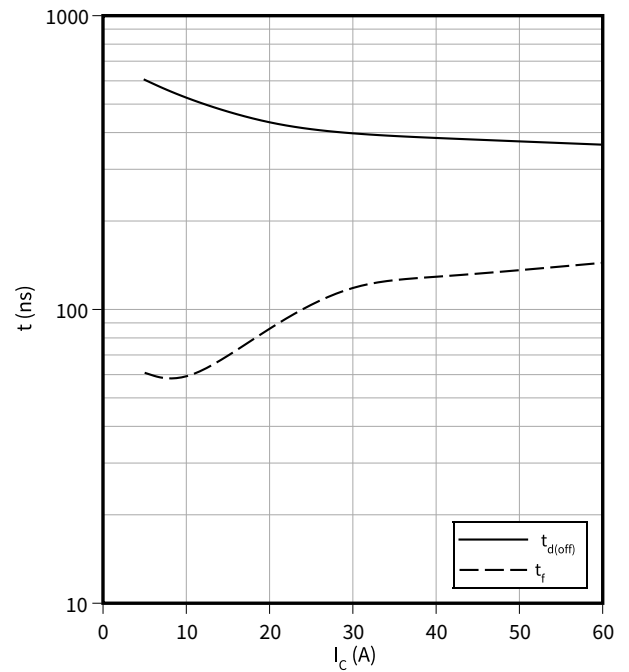
**Gate-emitter threshold voltage as a function of junction temperature**

$V_{GEth} = f(T_{vj})$   
 $I_C = 0.75\text{ mA}$



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

$t = f(I_C)$   
 $V_{CC} = 600\text{ V}, T_{vj} = 175^\circ\text{C}, V_{GE} = 0/15\text{ V}, R_G = 10\ \Omega$

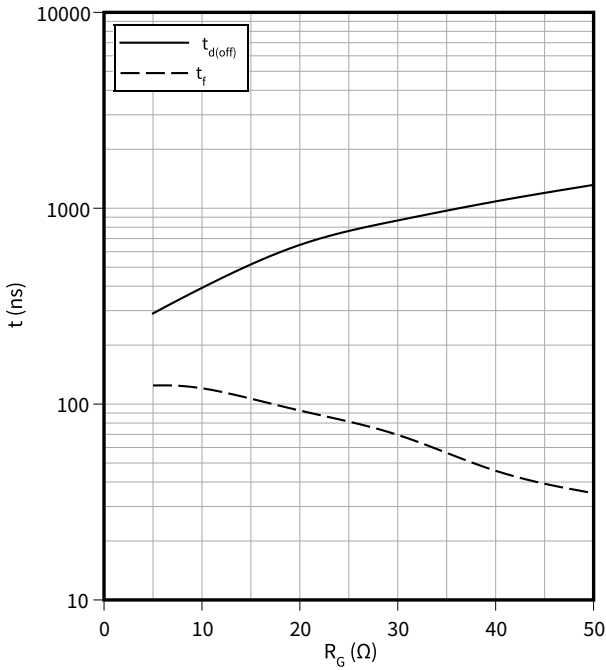


4 Characteristics diagrams

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

$t = f(R_G)$

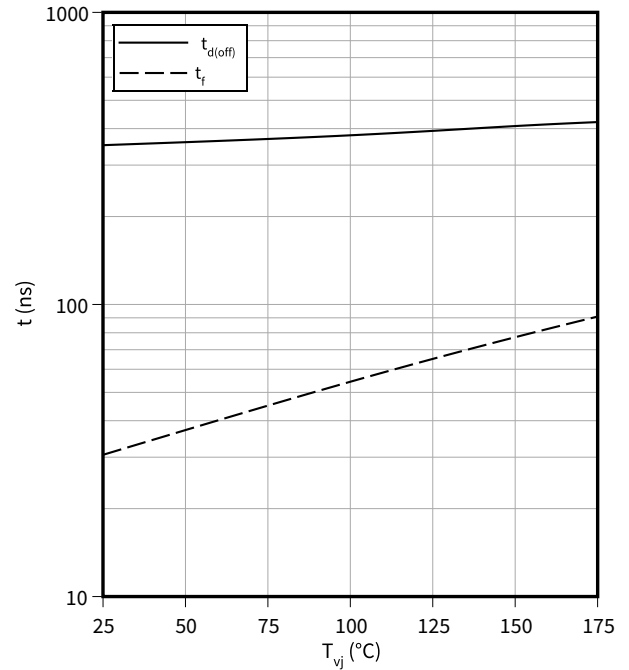
$I_C = 30\text{ A}, V_{CC} = 600\text{ V}, T_{vj} = 175\text{ }^\circ\text{C}, V_{GE} = 0/15\text{ V}$



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

$t = f(T_{vj})$

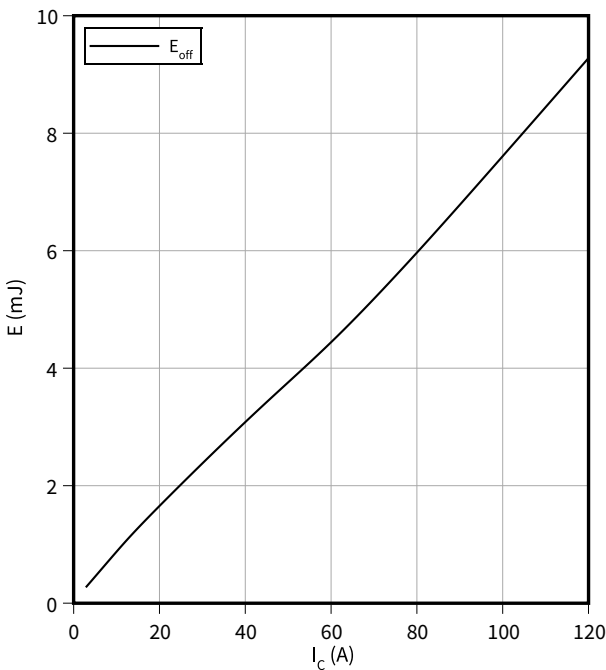
$I_C = 30\text{ A}, V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_G = 10\text{ }^\circ\Omega$



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

$E = f(I_C)$

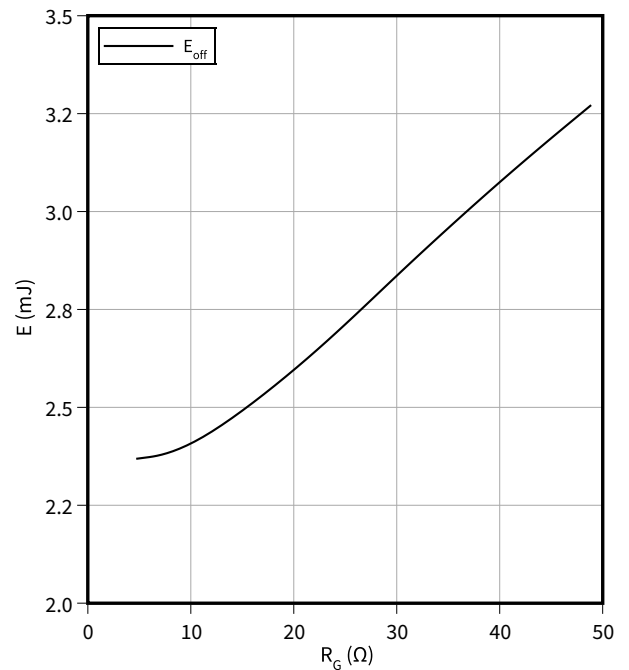
$V_{CC} = 600\text{ V}, T_{vj} = 175\text{ }^\circ\text{C}, V_{GE} = 0/15\text{ V}, R_G = 10\text{ }^\circ\Omega$



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

$E = f(R_G)$

$I_C = 30\text{ A}, V_{CC} = 600\text{ V}, T_{vj} = 175\text{ }^\circ\text{C}, V_{GE} = 0/15\text{ V}$



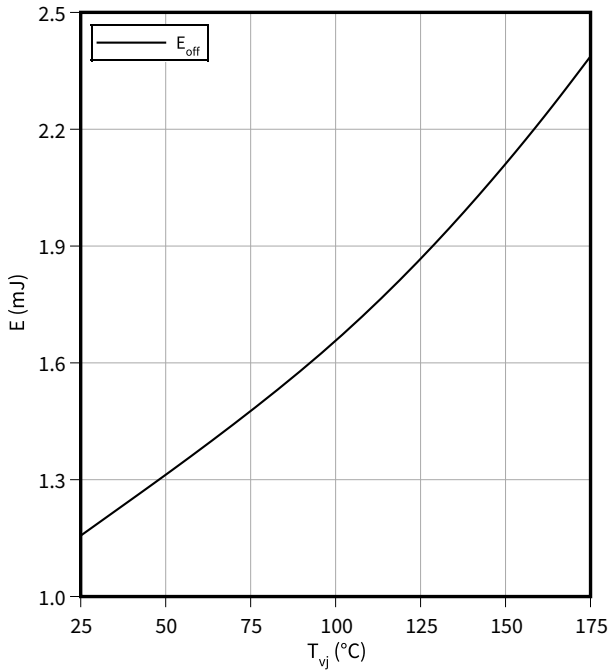


4 Characteristics diagrams

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

$E = f(T_{vj})$

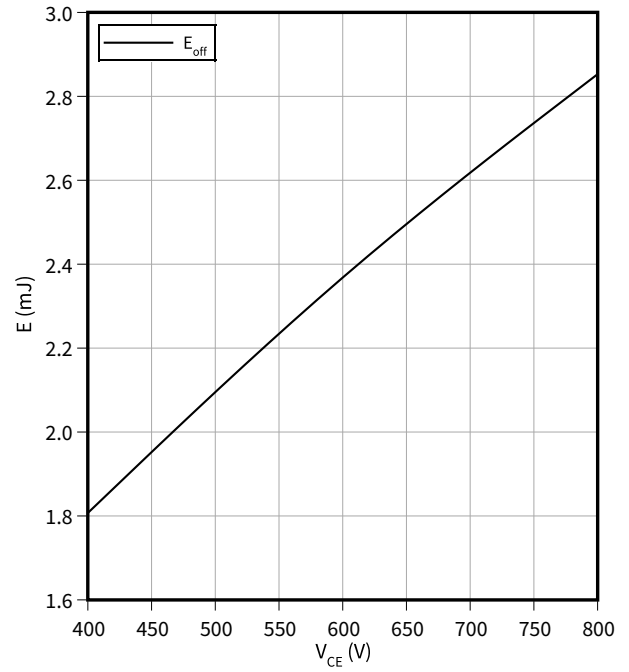
$I_C = 30\text{ A}$ ,  $V_{CC} = 600\text{ V}$ ,  $V_{GE} = 0/15\text{ V}$ ,  $R_G = 10\ \Omega$



**Typical switching energy losses as a function of collector emitter voltage**

$E = f(V_{CE})$

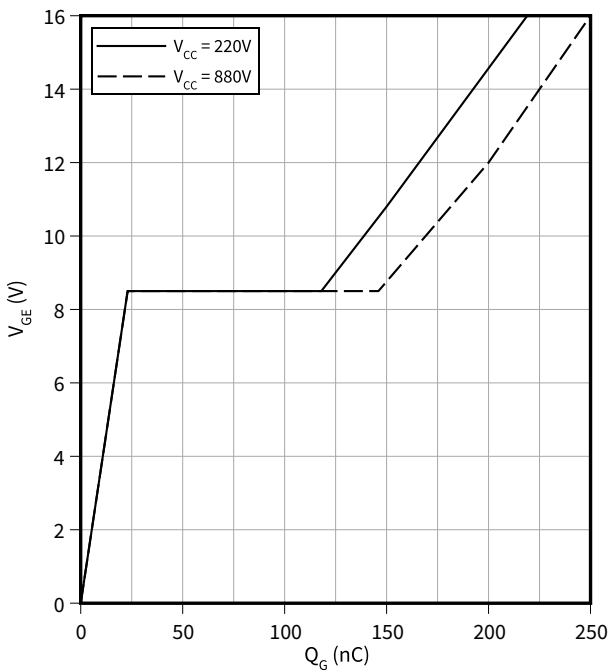
$I_C = 30\text{ A}$ ,  $T_{vj} = 175\text{ °C}$ ,  $V_{GE} = 0/15\text{ V}$ ,  $R_G = 10\ \Omega$



**Typical gate charge**

$V_{GE} = f(Q_G)$

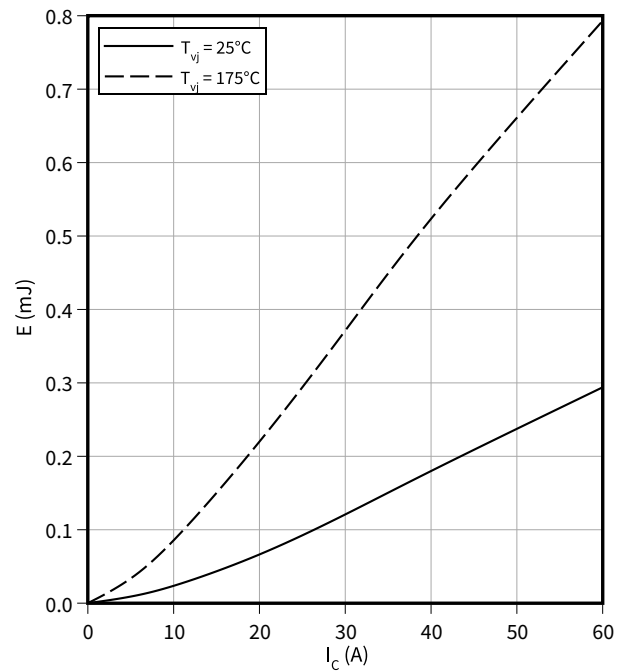
$I_C = 30\text{ A}$



**Typical turn off switching energy loss for soft switching**

$E = f(I_C)$

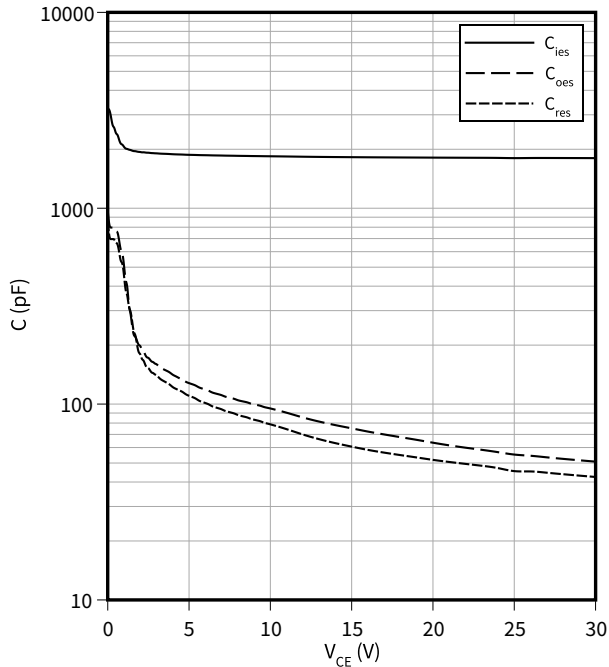
$V_{CC} = 600\text{ V}$ ,  $V_{GE} = 0/15\text{ V}$ ,  $R_G = 10\ \Omega$



4 Characteristics diagrams

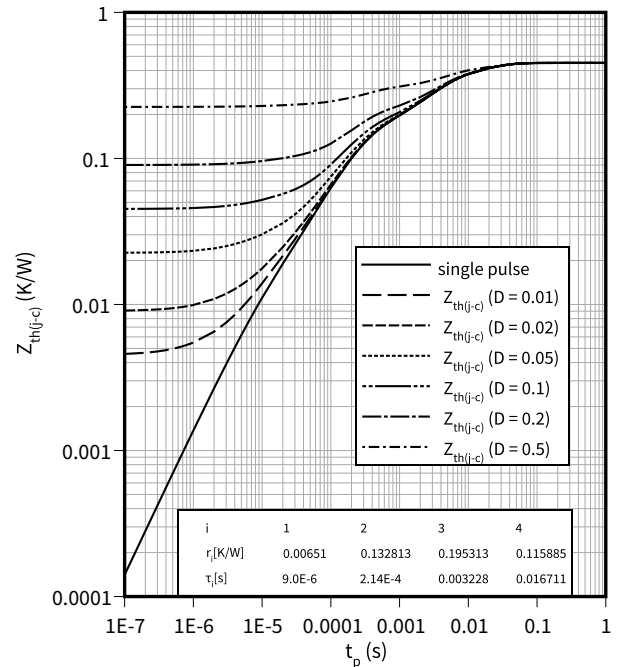
**Typical capacitance as a function of collector-emitter voltage**

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



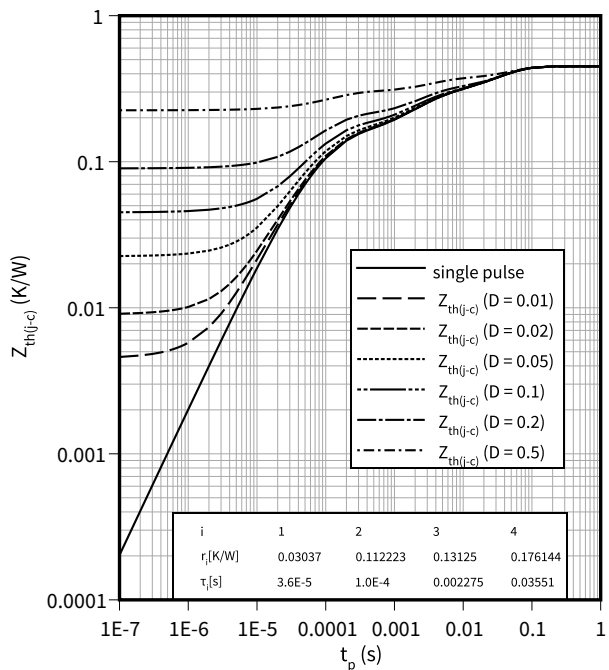
**IGBT transient thermal impedance as a function of pulse width**

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



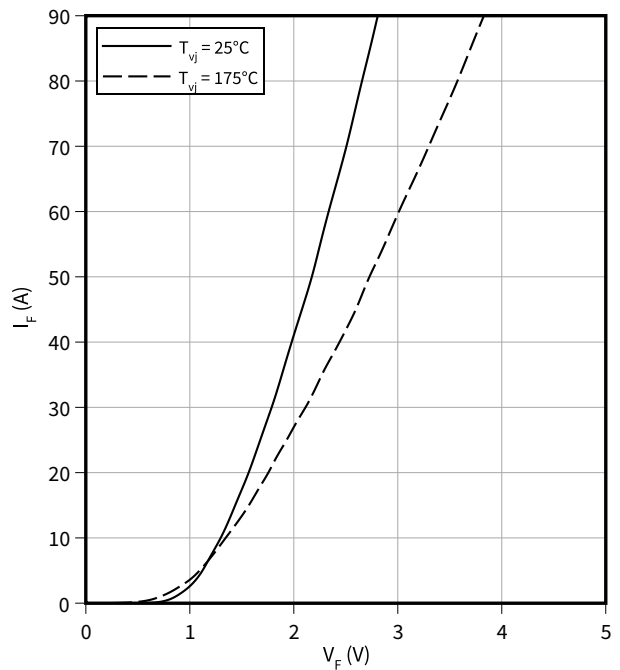
**Diode transient thermal impedance as a function of pulse width**

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



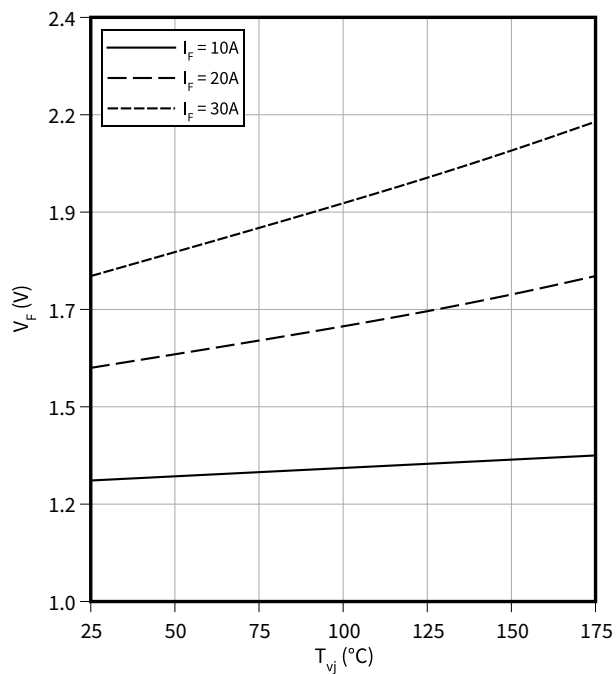
**Typical diode forward current as a function of forward voltage**

$I_F = f(V_F)$



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

$V_F = f(T_{vj})$



5 Package outlines

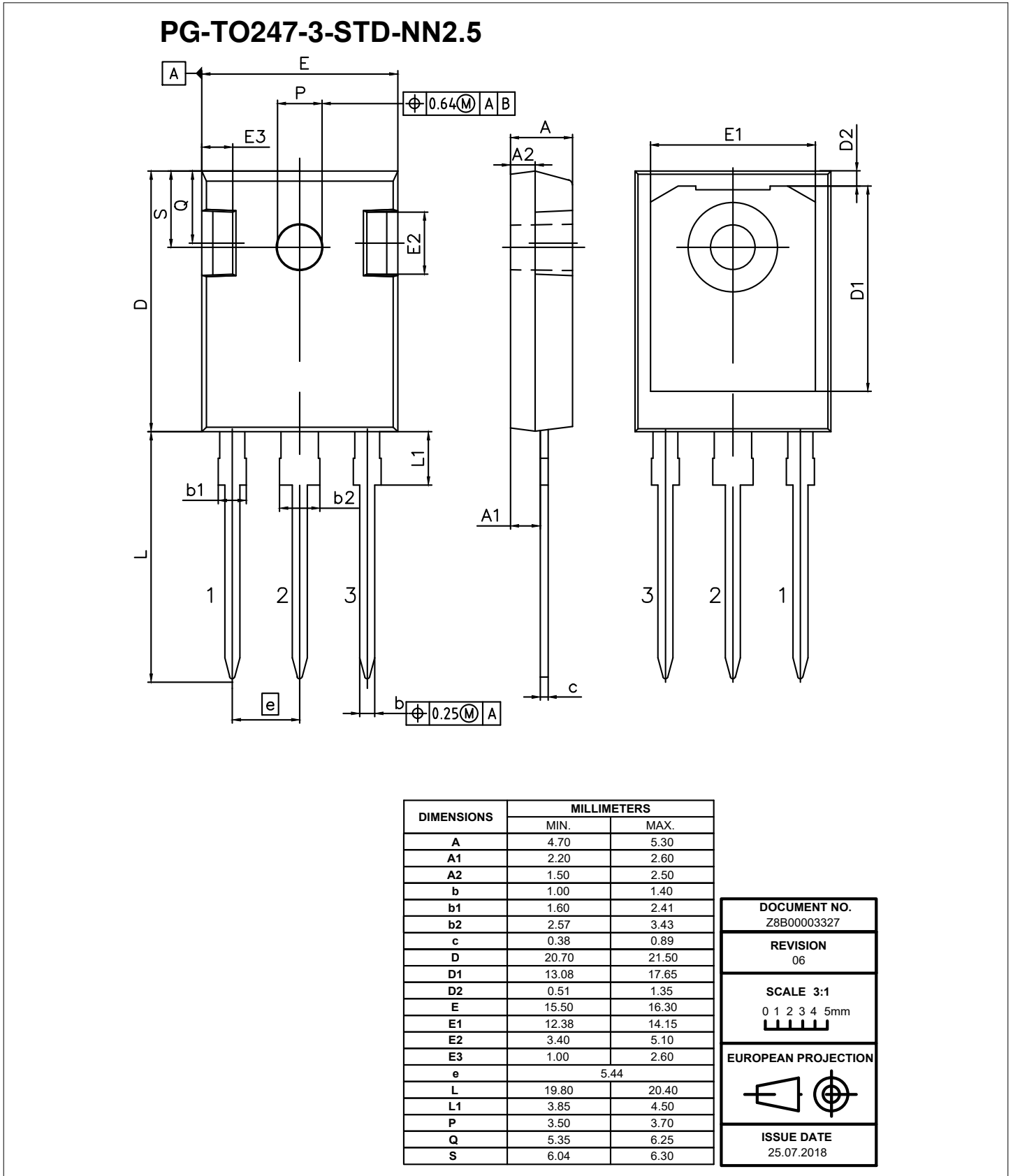


Figure 1

## 6 Testing conditions

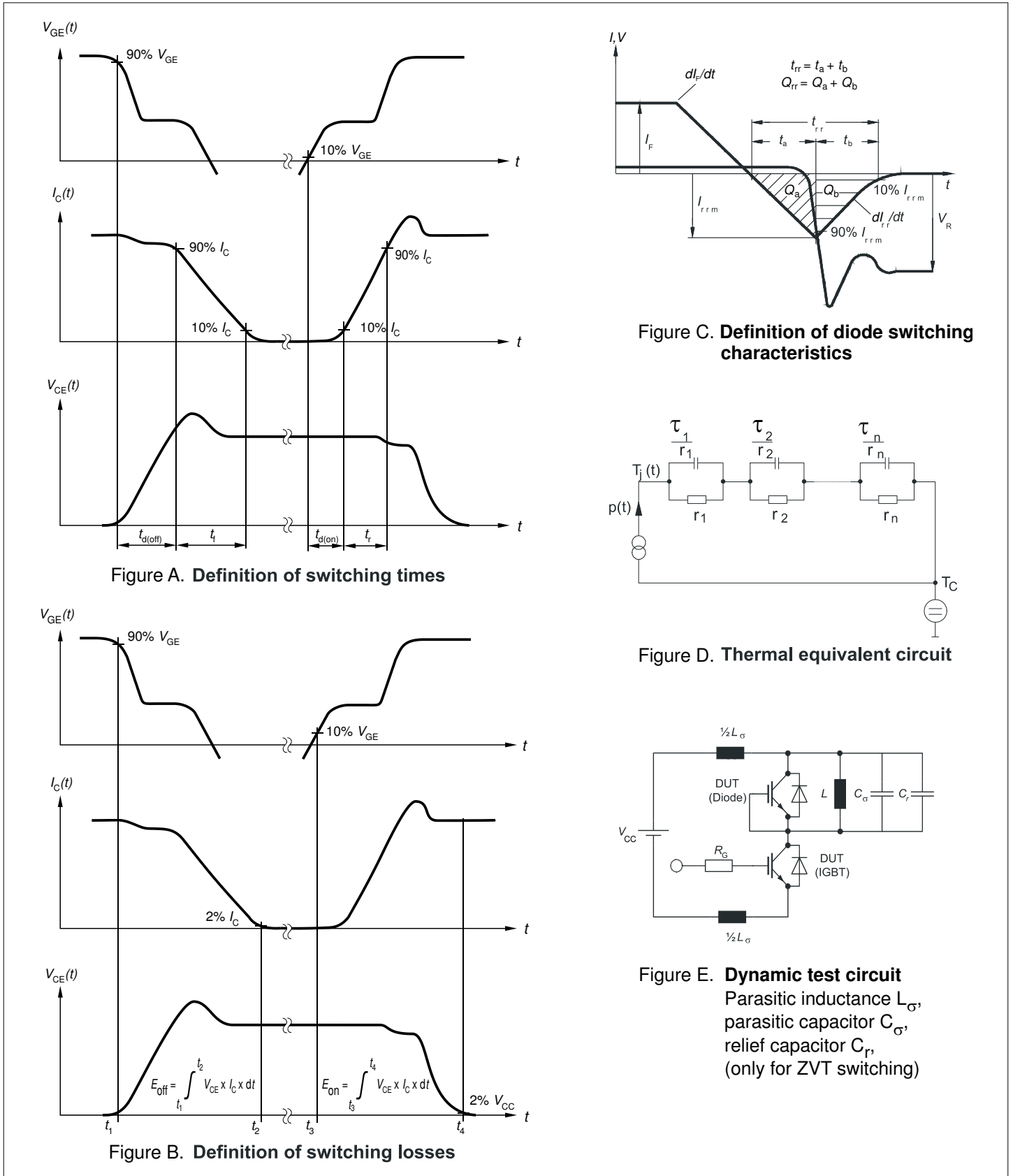


Figure 2

## Revision history

Document revision	Date of release	Description of changes
1.00	2022-05-18	Final datasheet

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**Edition 2022-05-18**

**Published by**

**Infineon Technologies AG**

**81726 Munich, Germany**

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**IFX-ABC780-001**

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