

Reverse-Conducting IGBT with monolithic body diode

Features

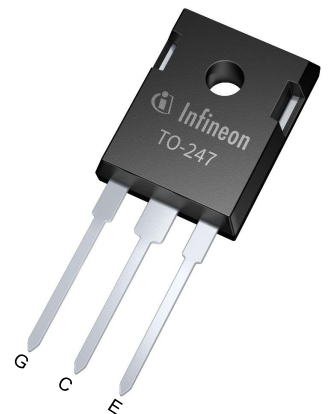
- $V_{CE} = 1100\text{ V}$
- $I_C = 30\text{ A}$
- Powerful monolithic body diode with low forward voltage designed for soft commutation only
- Very tight parameter distribution
- High ruggedness, temperature stable behavior
- Very low V_{CEsat}
- Easy parallel switching capability due to positive temperature 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

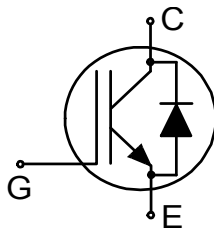
- Induction cooker
- Microwave ovens
- Rice Cookers

Product validation

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



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		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
Diode thermal resistance, junction-case	$R_{th(j-c)}$				0.45	K/W
MOSFET/body diode thermal resistance, junction-case	$R_{th(j-c)}$				0.45	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 ¹⁾	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
Collector-emitter saturation voltage	V_{CEsat}	$I_C = 30 \text{ A}, V_{GE} = 15 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	1.55	1.85	V
			$T_{vj} = 125 \text{ }^\circ\text{C}$	1.8		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	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}	$V_{CE} = 1100 \text{ V}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$		100	μA
			$T_{vj} = 175 \text{ }^\circ\text{C}$		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	$V_{CC} = 880 \text{ V}, I_C = 30 \text{ A}, V_{GE} = 15 \text{ V}$		240		nC
Turn-off delay time	$t_{d(off)}$	$V_{CC} = 600 \text{ V}, V_{GE} = 0/15 \text{ V}, R_{G(on)} = 10 \text{ } \Omega, R_{G(off)} = 10 \text{ } \Omega, L_\sigma = 175 \text{ nH}, C_\sigma = 40 \text{ pF}$	$T_{vj} = 25 \text{ }^\circ\text{C}, I_C = 30 \text{ A}$	350		ns
			$T_{vj} = 175 \text{ }^\circ\text{C}, I_C = 30 \text{ A}$	400		
Fall time (inductive load)	t_f	$V_{CC} = 600 \text{ V}, V_{GE} = 0/15 \text{ V}, R_{G(on)} = 10 \text{ } \Omega, R_{G(off)} = 10 \text{ } \Omega, L_\sigma = 175 \text{ nH}, C_\sigma = 40 \text{ pF}$	$T_{vj} = 25 \text{ }^\circ\text{C}, I_C = 30 \text{ A}$	30		ns
			$T_{vj} = 175 \text{ }^\circ\text{C}, I_C = 30 \text{ A}$	120		
Turn-off energy	E_{off}	$V_{CC} = 600 \text{ V}, V_{GE} = 0/15 \text{ V}, R_{G(on)} = 10 \text{ } \Omega, R_{G(off)} = 10 \text{ } \Omega, L_\sigma = 175 \text{ nH}, C_\sigma = 40 \text{ pF}$	$T_{vj} = 25 \text{ }^\circ\text{C}, I_C = 30 \text{ A}$	1.2		mJ
			$T_{vj} = 175 \text{ }^\circ\text{C}, I_C = 30 \text{ A}$	2.4		
Soft turn-off energy	E_{off}	$V_{GE} = 0/15 \text{ V}, R_{G(on)} = 10 \text{ } \Omega, R_{G(off)} = 10 \text{ } \Omega, L_\sigma = 175 \text{ nH}, C_\sigma = 40 \text{ pF}, C_r = 270 \text{ nF}$	$T_{vj} = 25 \text{ }^\circ\text{C}, I_C = 30 \text{ A}$	0.205		mJ
			$T_{vj} = 175 \text{ }^\circ\text{C}, I_C = 30 \text{ A}$	0.49		
Operating junction temperature	T_{vj}		-40		175	$^\circ\text{C}$

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

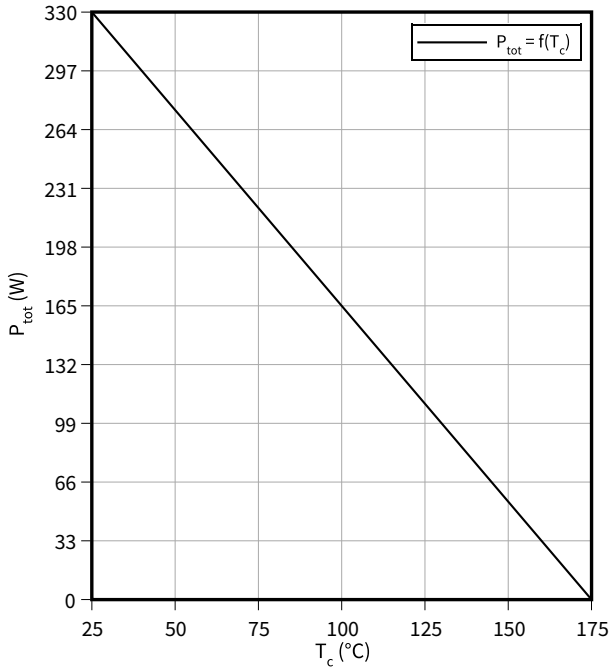
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Diode forward voltage	V_F	$I_F = 30\text{ A}$	$T_{vj} = 25\text{ °C}$	1.8	2	V
			$T_{vj} = 125\text{ °C}$	2		
			$T_{vj} = 175\text{ °C}$	2.1		
Reverse leakage current	I_R	$V_R = 1100\text{ V}$	$T_{vj} = 25\text{ °C}$		100	μA
			$T_{vj} = 175\text{ °C}$		630	
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

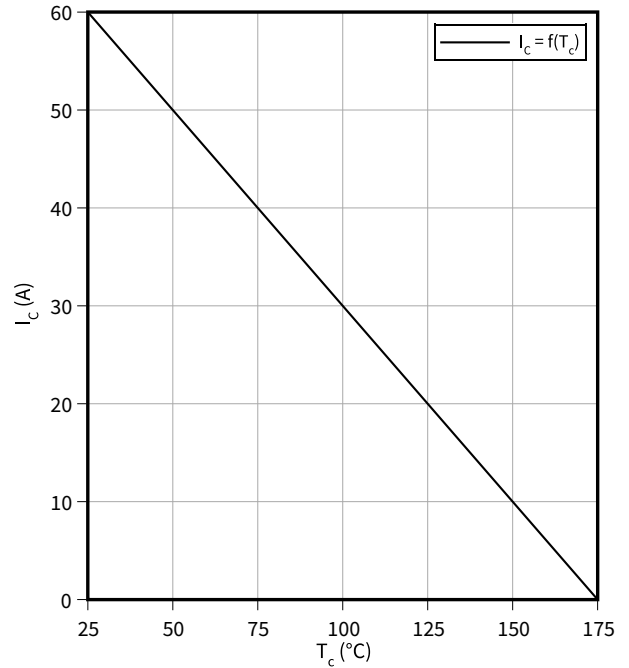
Power dissipation as a function of case temperature

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



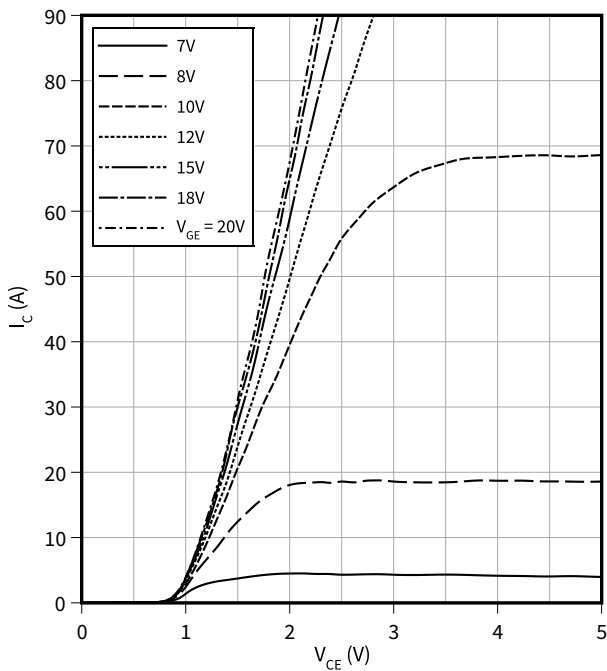
Collector current as a function of case temperature

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



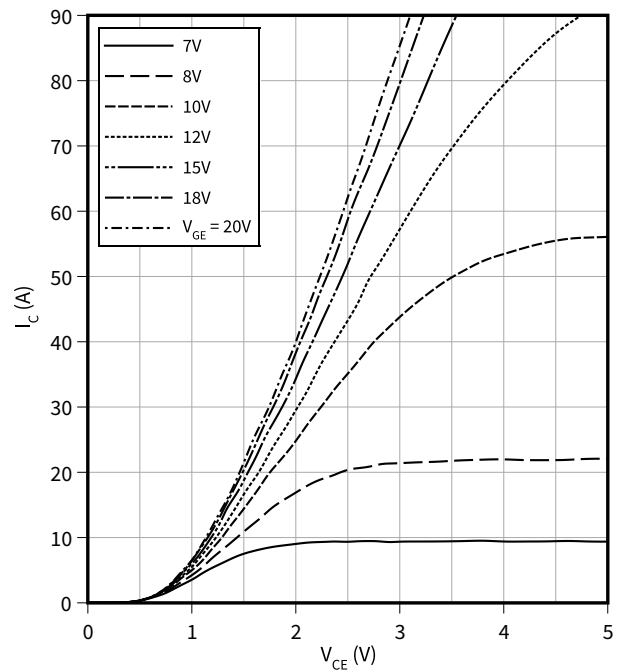
Typical output characteristic

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



Typical output characteristic

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

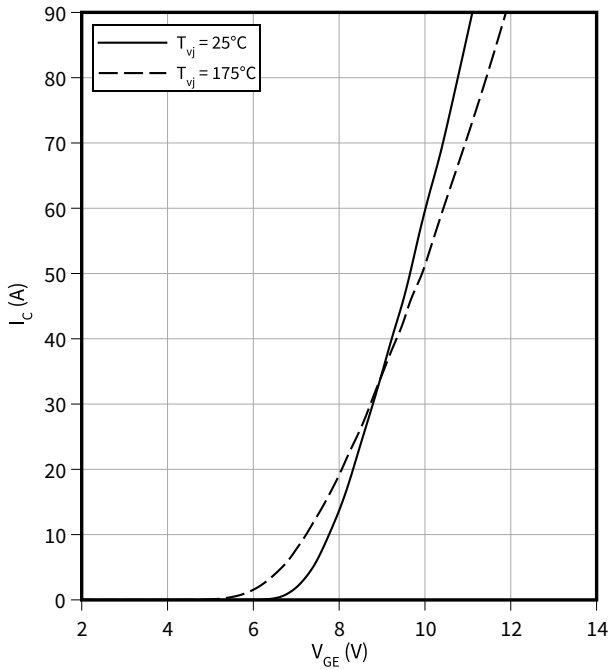


4 Characteristics diagrams

Typical transfer characteristic

$I_C = f(V_{GE})$

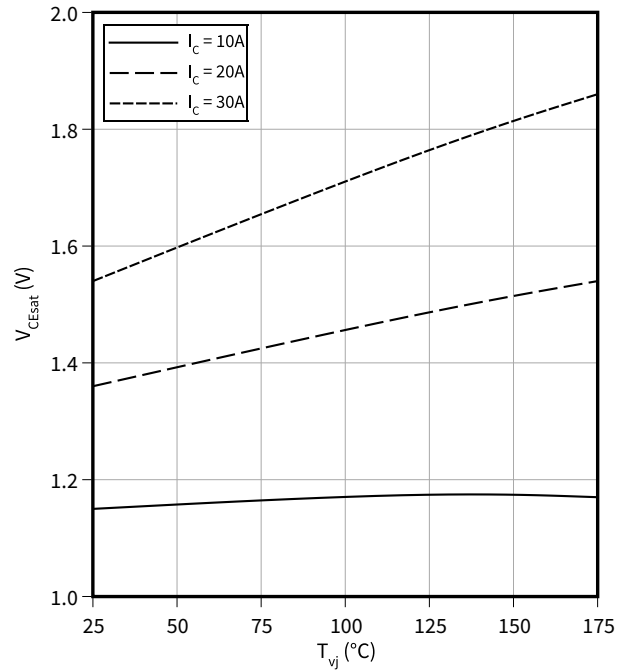
$V_{CE} = 20\text{ V}$



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

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

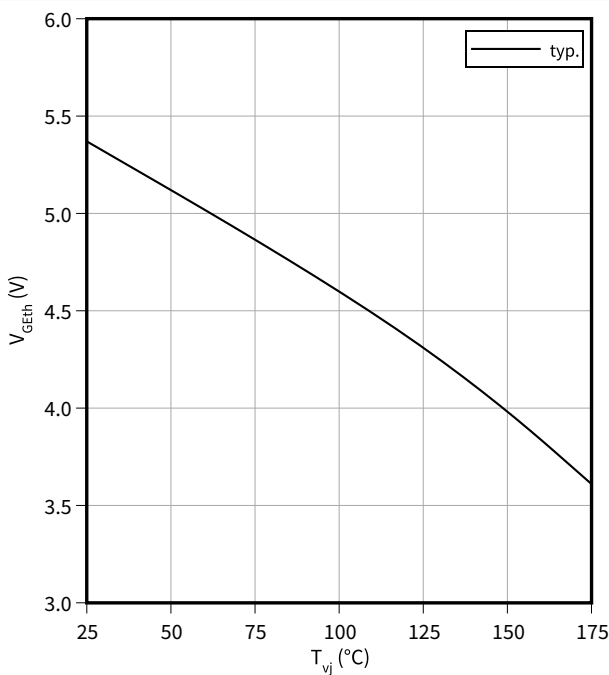
$V_{GE} = 15\text{ V}$



Gate-emitter threshold voltage as a function of junction temperature

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

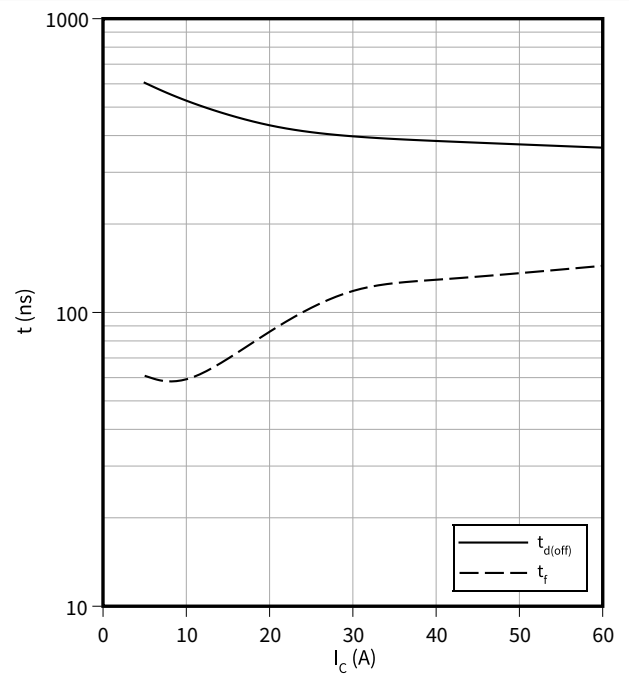
$I_C = 0.75\text{ mA}$



Typical switching times as a function of collector current

$t = f(I_C)$

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

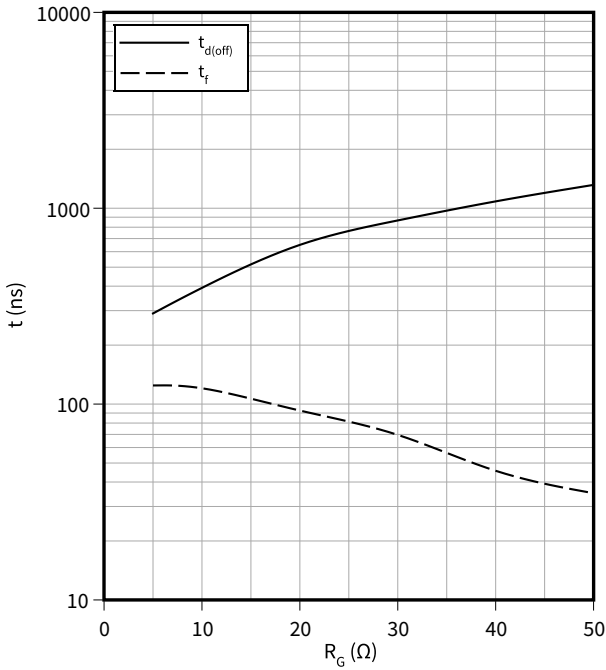


4 Characteristics diagrams

Typical switching times as a function of gate resistor

$t = f(R_G)$

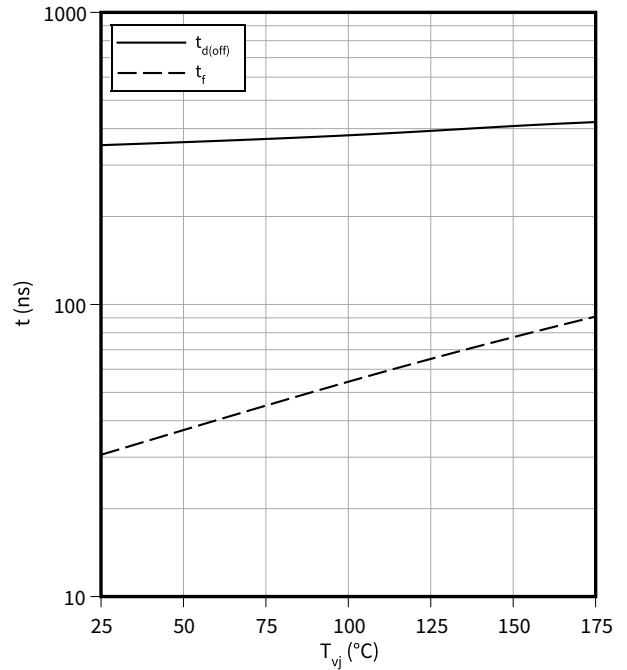
$I_C = 30\text{ A}, V_{CC} = 600\text{ V}, T_{vj} = 175\text{ °C}, V_{GE} = 0/15\text{ V}$



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

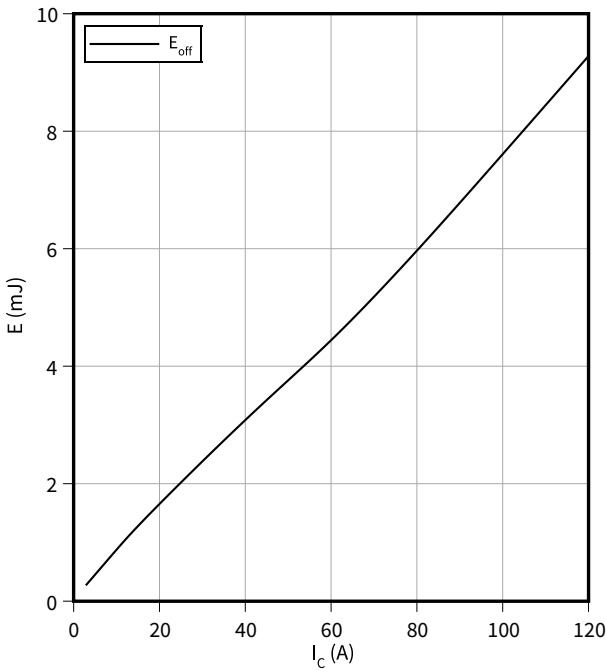
$I_C = 30\text{ A}, V_{CC} = 600\text{ V}, V_{GE} = 0/15\text{ V}, R_G = 10\text{ Ω}$



Typical switching energy losses as a function of collector current

$E = f(I_C)$

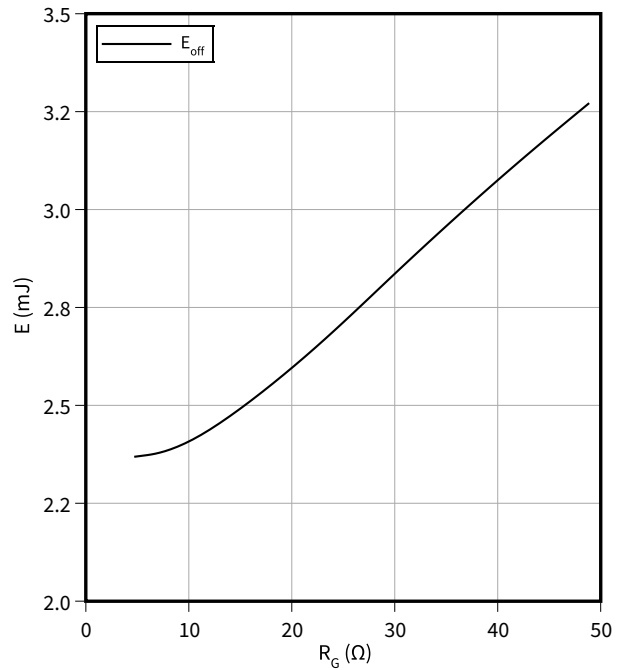
$V_{CC} = 600\text{ V}, T_{vj} = 175\text{ °C}, V_{GE} = 0/15\text{ V}, R_G = 10\text{ Ω}$



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

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

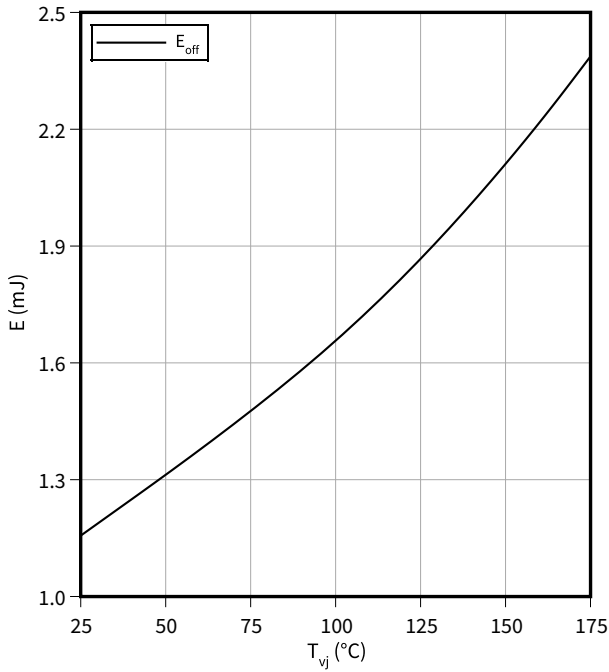


4 Characteristics diagrams

Typical switching energy losses as a function of junction temperature

$E = f(T_{vj})$

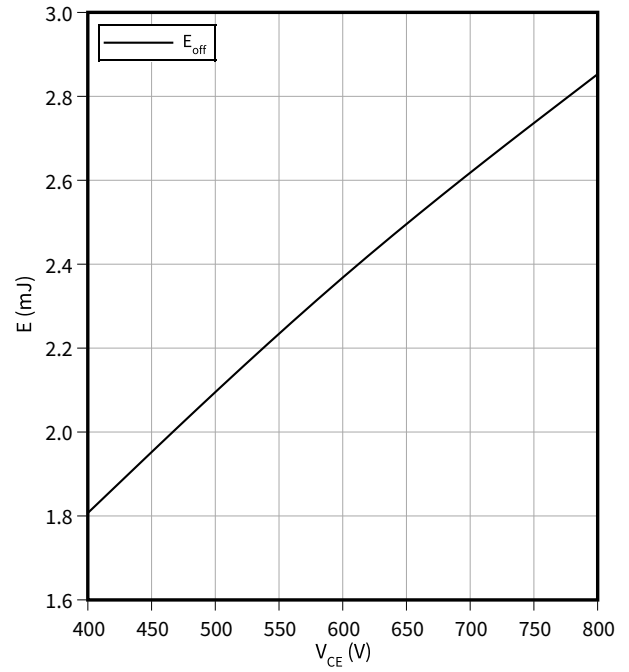
$I_C = 30\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_G = 10\ \Omega$



Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

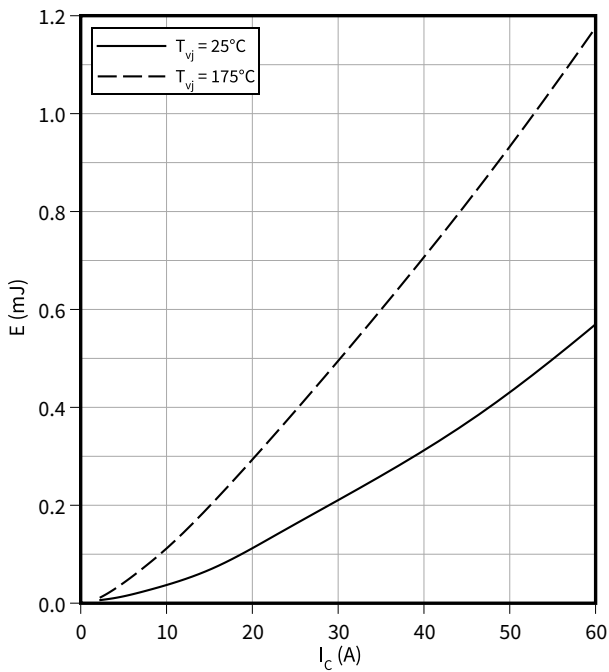
$I_C = 30\text{ A}$, $T_{vj} = 175\text{ °C}$, $V_{GE} = 0/15\text{ V}$, $R_G = 10\ \Omega$



Typical turn off switching energy loss for soft switching

$E = f(I_C)$

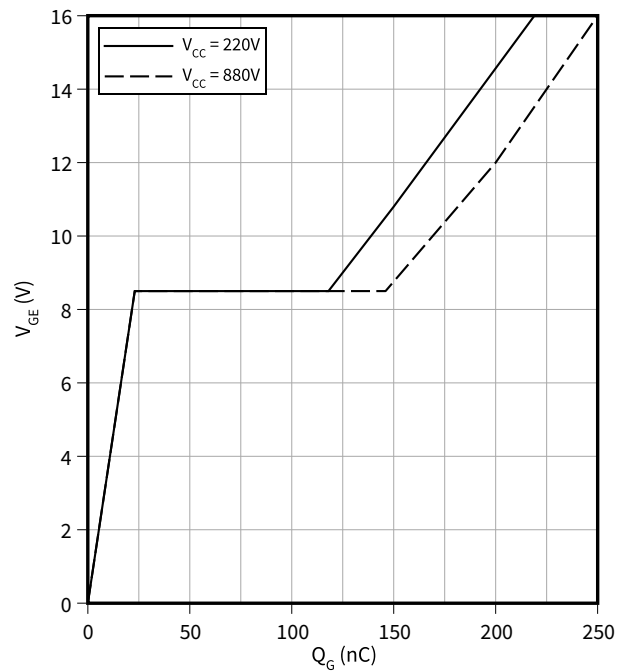
$V_{GE} = 0/15\text{ V}$, $C_r = 270\text{ nF}$, $R_G = 10\ \Omega$



Typical gate charge

$V_{GE} = f(Q_G)$

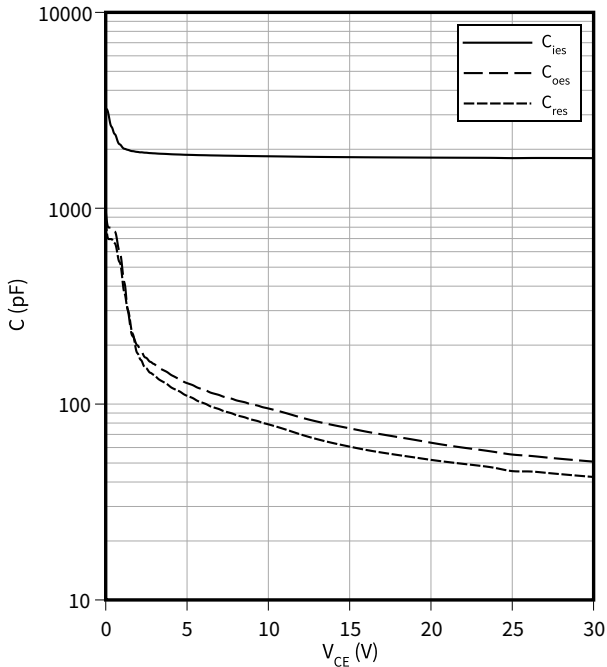
$I_C = 30\text{ A}$



4 Characteristics diagrams

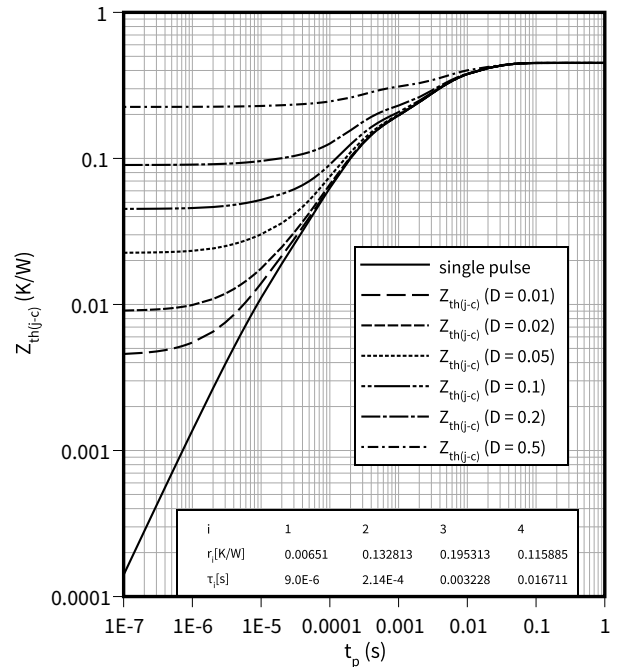
Typical capacitance as a function of collector-emitter voltage

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



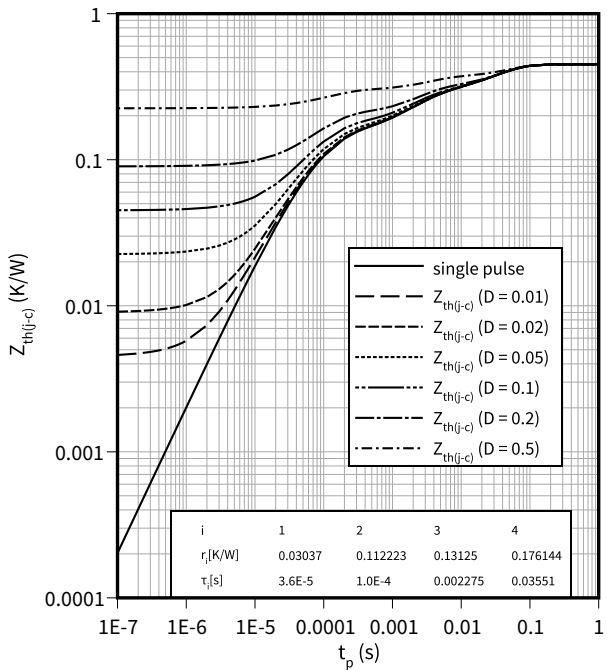
IGBT transient thermal impedance as a function of pulse width

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



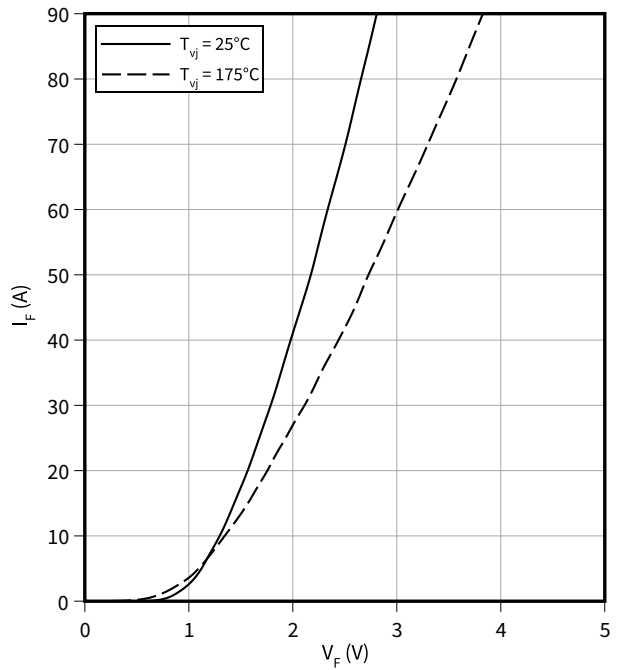
Diode transient thermal impedance as a function of pulse width

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



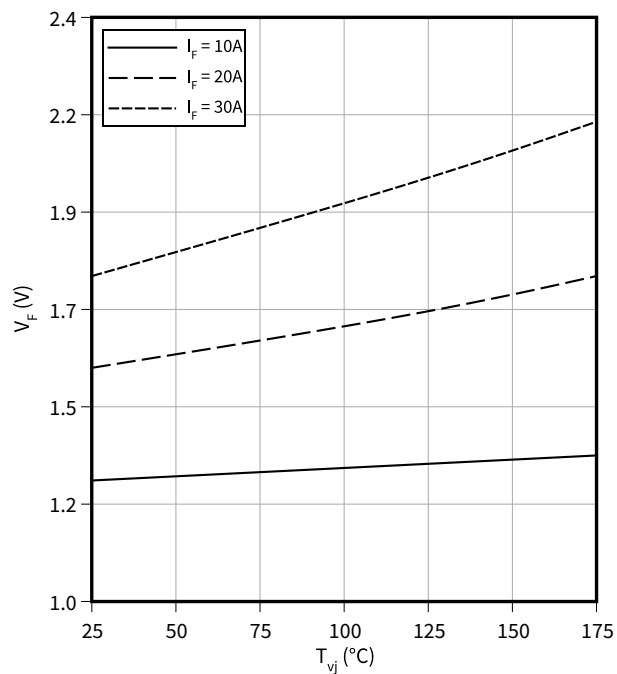
Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



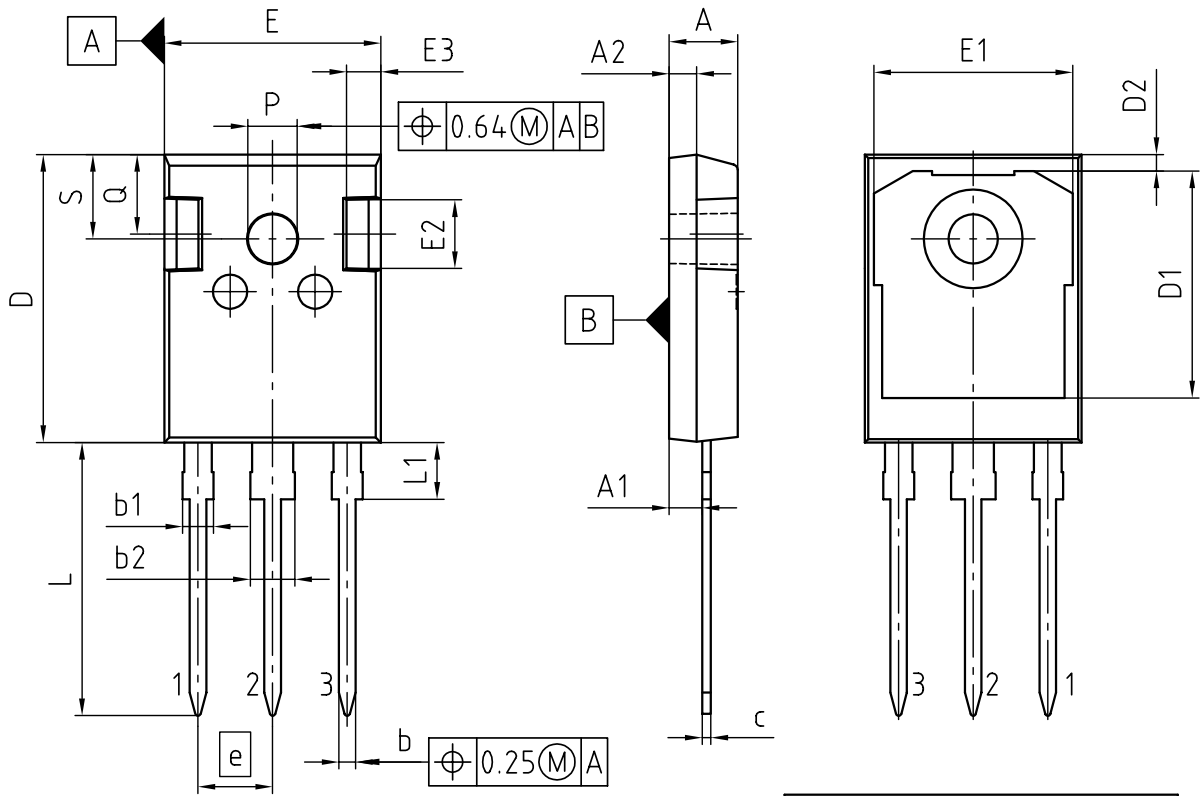
Typical diode forward voltage as a function of junction temperature

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



5 Package outlines

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
ϕP	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

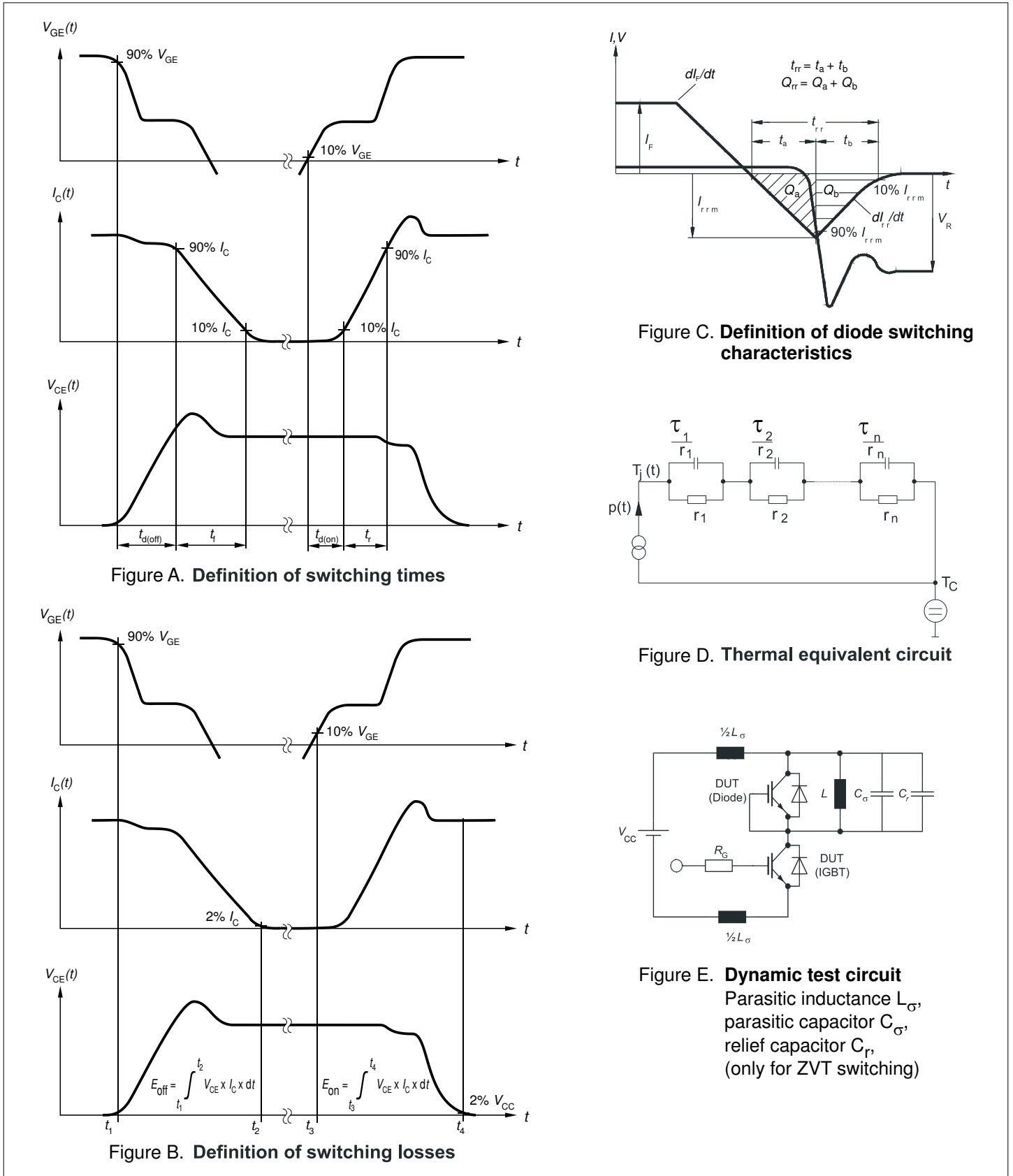


Figure 2

Revision history

Document revision	Date of release	Description of changes
1.00	2022-05-18	Final datasheet
1.10	2023-06-06	Table 3 on page 4 updated Figures on page 9 updated Editorial changes

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