Reverse-Conducting IGBT with monolithic body diode

Features

- V_{CE} = 1100 V
- I_C = 30 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

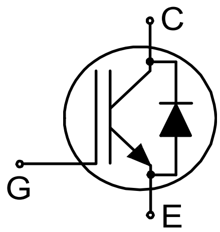
- Induction cooking
- Microwave ovens
- Rice Cookers

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

Table of contents

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

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

Table 3 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter breakdown voltage	V_{BRCES}	$I_C = 0.5$ mA, $V_{GE} = 0$ 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}	$I_C = 30$ A, $V_{GE} = 15$ V	$T_{vj} = 25$ °C		1.55	1.85	V
			$T_{vj} = 125$ °C		1.8		
			$T_{vj} = 175$ °C		1.9		
Gate-emitter threshold voltage	V_{GEth}	$I_C = 0.75$ mA, $V_{CE} = V_{GE}$		5.1	5.8	6.4	V
Zero gate-voltage collector current	I_{CES}	$V_{CE} = 1100$ V, $V_{GE} = 0$ V	$T_{vj} = 25$ °C			100	µA
			$T_{vj} = 175$ °C		630		
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0$ V, $V_{GE} = 20$ V				100	nA
Transconductance	g_{fs}	$I_C = 30$ A, $V_{CE} = 20$ V			23		S
Input capacitance	C_{ies}	$V_{CE} = 25$ V, $V_{GE} = 0$ V, $f = 100$ kHz			1800		pF
Output capacitance	C_{oes}	$V_{CE} = 25$ V, $V_{GE} = 0$ V, $f = 100$ kHz			55		pF
Reverse transfer capacitance	C_{res}	$V_{CE} = 25$ V, $V_{GE} = 0$ V, $f = 100$ kHz			45		pF
Gate charge	Q_G	$I_C = 30$ A, $V_{GE} = 15$ V, $V_{CC} = 880$ V			240		nC
Turn-off delay time	$t_{d(off)}$	$V_{CC} = 600$ V, $V_{GE} = 0/15$ V, $R_{Gon} = 10$ Ω, $R_{Goff} = 10$ Ω, $L_\sigma = 175$ nH, $C_\sigma = 40$ pF	$T_{vj} = 25$ °C, $I_C = 30$ A		350		ns
			$T_{vj} = 175$ °C, $I_C = 30$ A		420		
Fall time (inductive load)	t_f	$V_{CC} = 600$ V, $V_{GE} = 0/15$ V, $R_{Gon} = 10$ Ω, $R_{Goff} = 10$ Ω, $L_\sigma = 175$ nH, $C_\sigma = 40$ pF	$T_{vj} = 25$ °C, $I_C = 30$ A		30		ns
			$T_{vj} = 175$ °C, $I_C = 30$ A		90		
Turn-off energy	E_{off}	$V_{CC} = 600$ V, $V_{GE} = 0/15$ V, $R_{Gon} = 10$ Ω, $R_{Goff} = 10$ Ω, $L_\sigma = 175$ nH, $C_\sigma = 40$ pF	$T_{vj} = 25$ °C, $I_C = 30$ A		1.2		mJ
			$T_{vj} = 175$ °C, $I_C = 30$ A		2.4		
Soft turn-off energy	E_{off}	$V_{CC} = 600$ V, $R_{Gon} = 10$ Ω, $R_{Goff} = 10$ Ω, $L_\sigma = 175$ nH, $C_\sigma = 40$ pF	$T_{vj} = 25$ °C, $I_C = 30$ A		0.14		mJ
			$T_{vj} = 175$ °C, $I_C = 30$ A		0.376		
IGBT thermal resistance, junction to case	$R_{th(j-c)}$					0.45	K/W
Operating junction temperature	T_{vj}			-40		175	°C

Note: Electrical Characteristic, at $T_{vj} = 25$°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}	$T_{vj} \geq 25$ °C		1100	V
Diode forward current, limited by T_{vjmax}	I_F		$T_c = 25$ °C	60	A
			$T_c = 100$ °C	30	
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpulse}			90	A

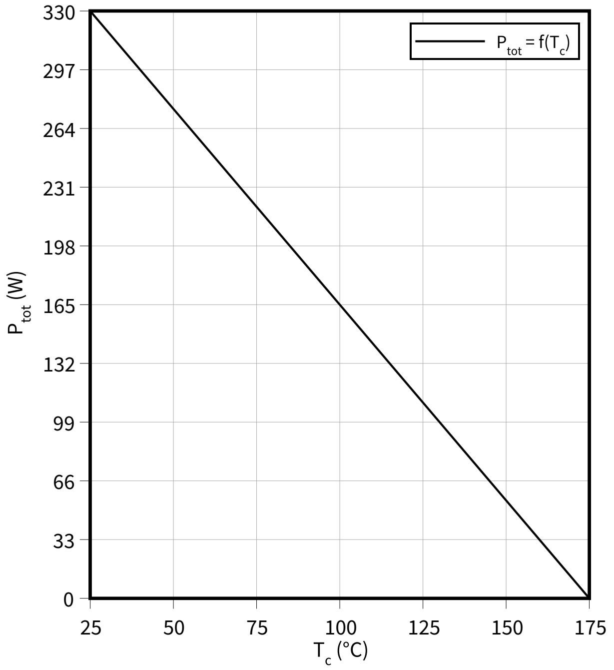
Table 5 Characteristic values

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

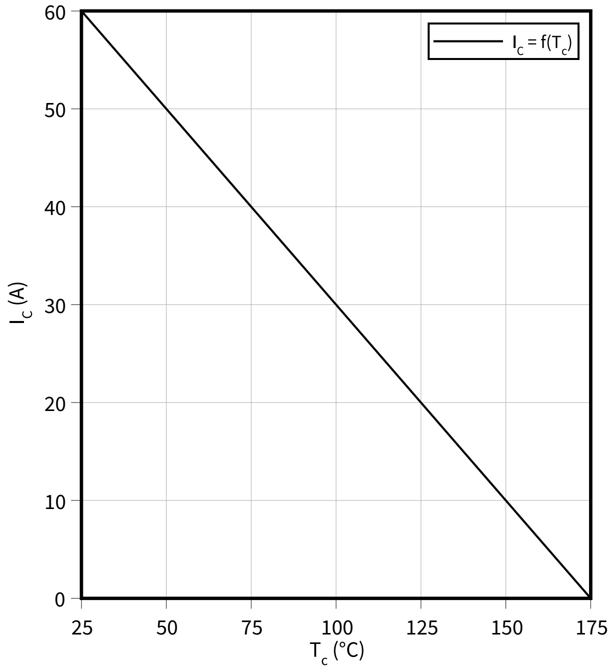
Note: For optimum lifetime and reliability, Infineon recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet.

4 Characteristics diagrams

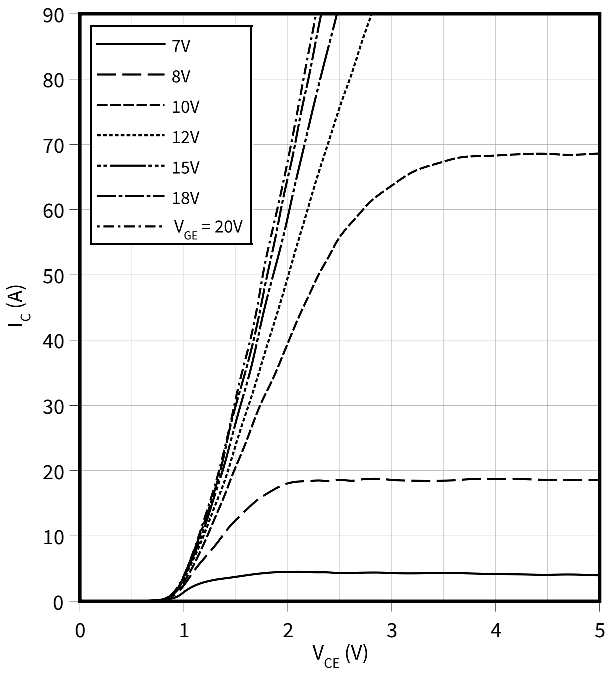
Power dissipation as a function of case temperature
$P_{tot} = f(T_c)$
$T_{vj} \leq 175$ °C



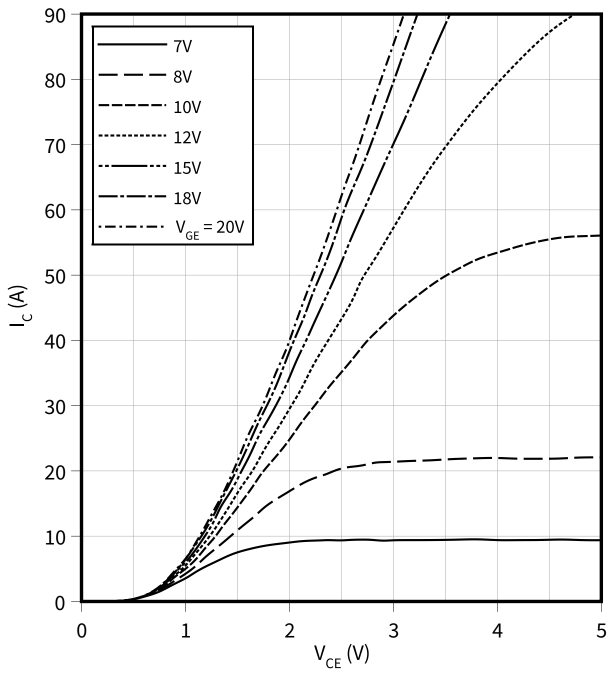
Collector current as a function of case temperature
$I_C = f(T_c)$
$T_{vj} \leq 175$ °C, $V_{GE} \geq 15$ V



Typical output characteristic
$I_C = f(V_{CE})$
$T_{vj} = 25$ °C



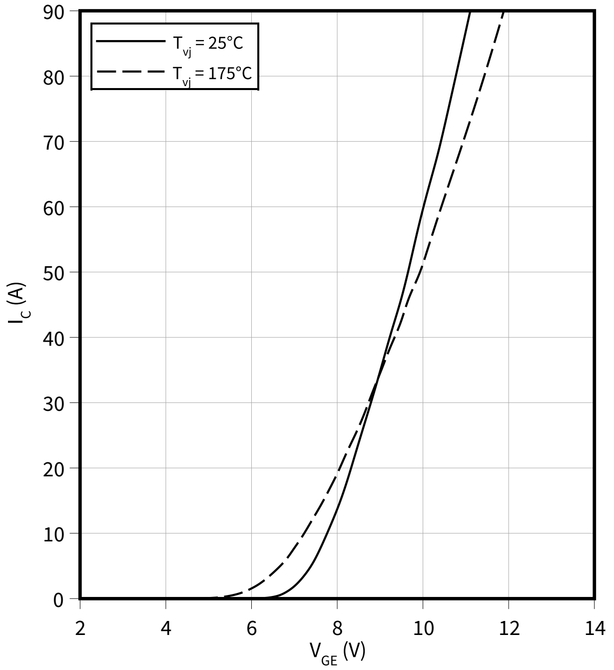
Typical output characteristic
$I_C = f(V_{CE})$
$T_{vj} = 175$ °C



Typical transfer characteristic

$I_C = f(V_{GE})$

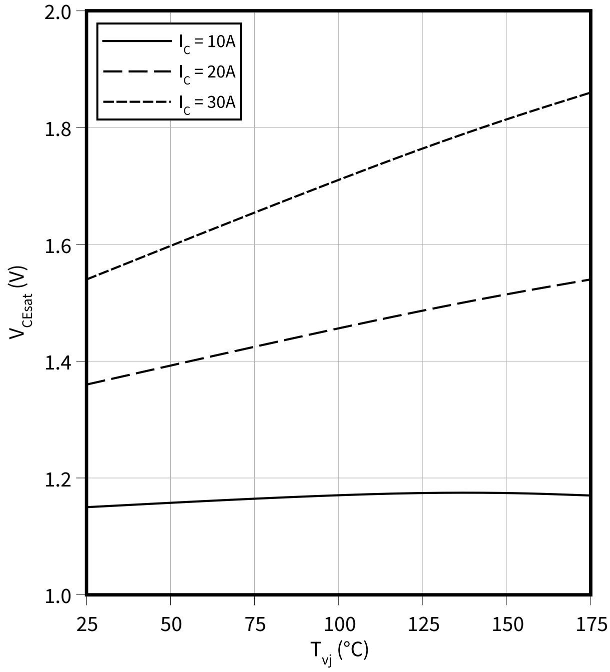
$V_{CE} = 20$ V



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

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

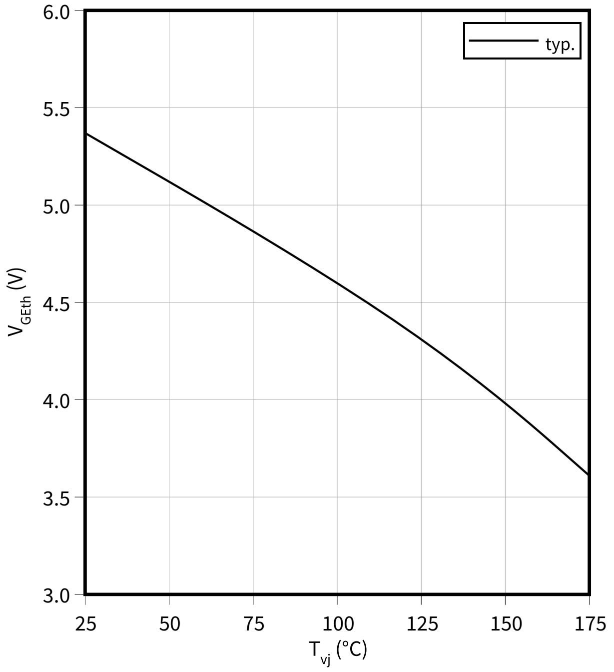
$V_{GE} = 15$ V



Gate-emitter threshold voltage as a function of junction temperature

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

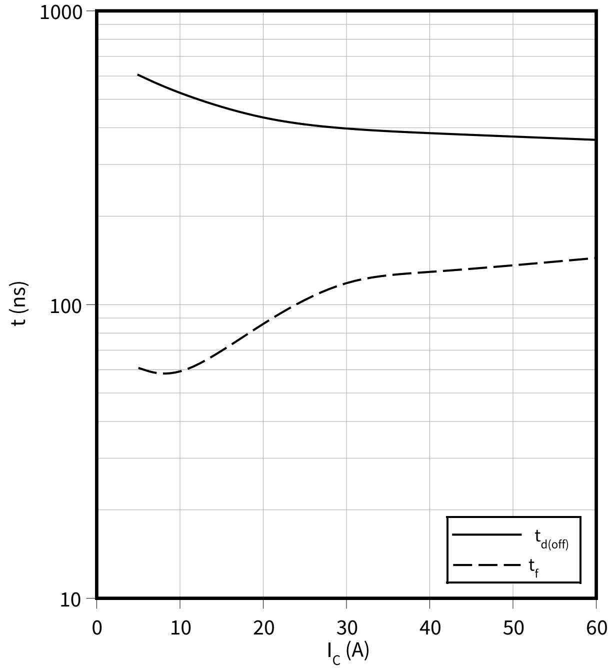
$I_C = 0.75$ mA



Typical switching times as a function of collector current

$t = f(I_C)$

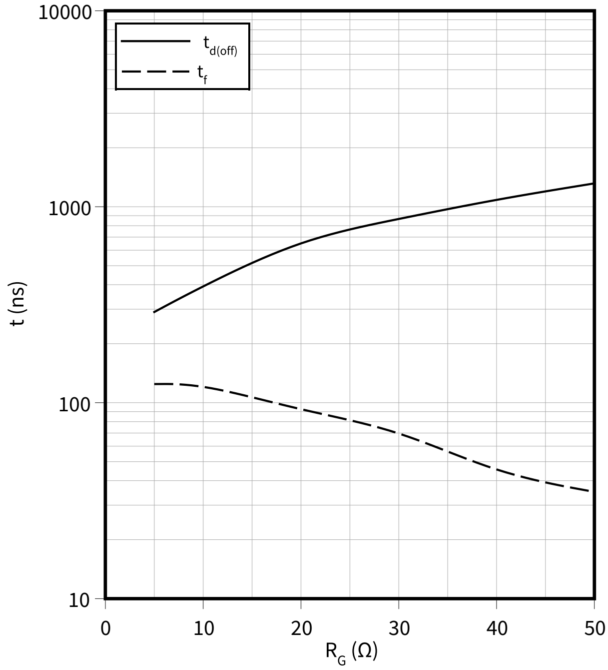
$V_{CC} = 600$ V, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V, $R_G = 10\ \Omega$



Typical switching times as a function of gate resistor

$t = f(R_G)$

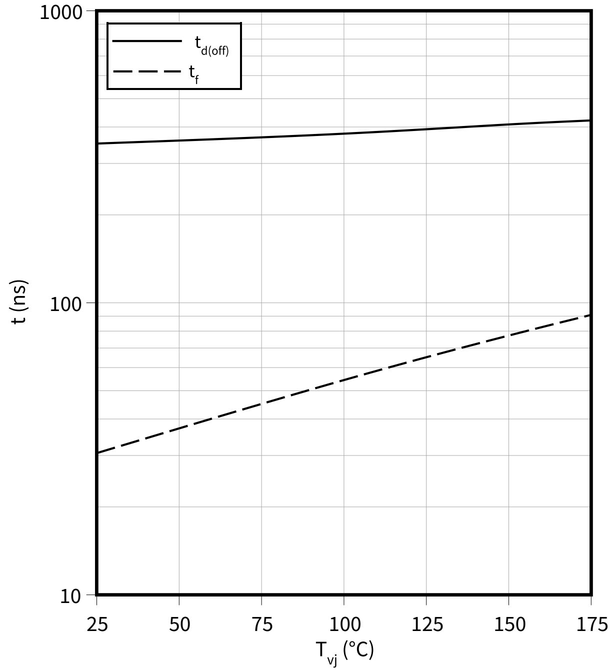
I_C = 30 A, V_{CC} = 600 V, T_{vj} = 175 °C, V_{GE} = 0/15 V



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

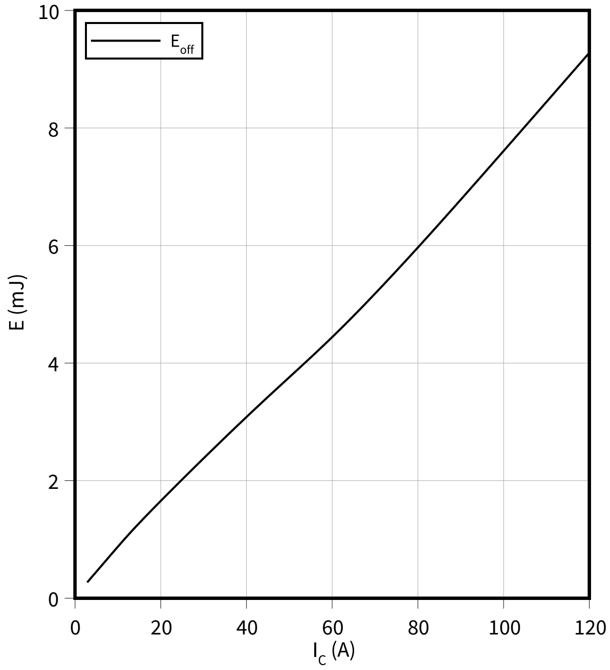
I_C = 30 A, V_{CC} = 600 V, V_{GE} = 0/15 V, R_G = 10 Ω



Typical switching energy losses as a function of collector current

$E = f(I_C)$

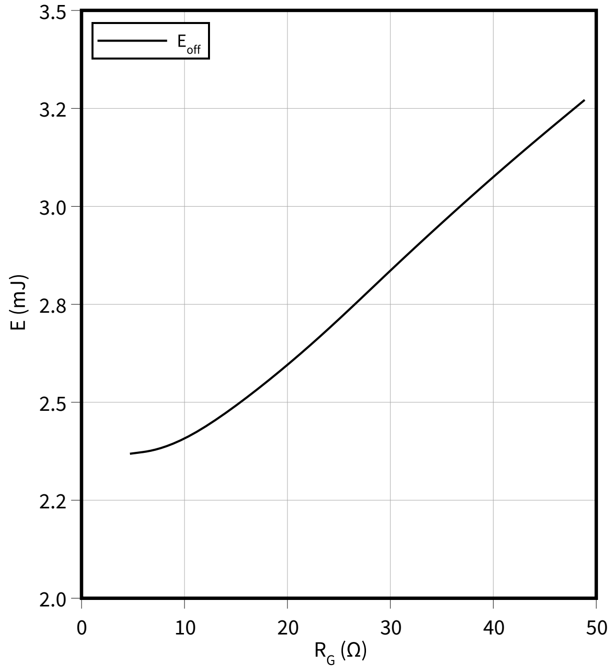
V_{CC} = 600 V, T_{vj} = 175 °C, V_{GE} = 0/15 V, R_G = 10 Ω



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

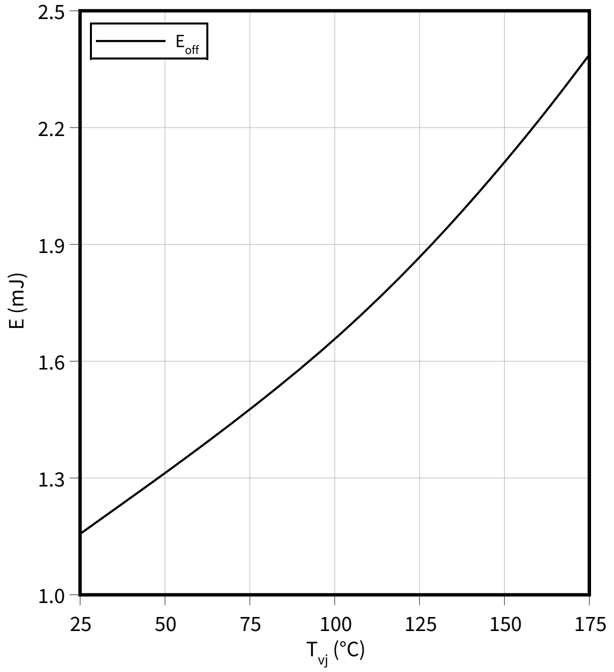
I_C = 30 A, V_{CC} = 600 V, T_{vj} = 175 °C, V_{GE} = 0/15 V



Typical switching energy losses as a function of junction temperature

$E = f(T_{vj})$

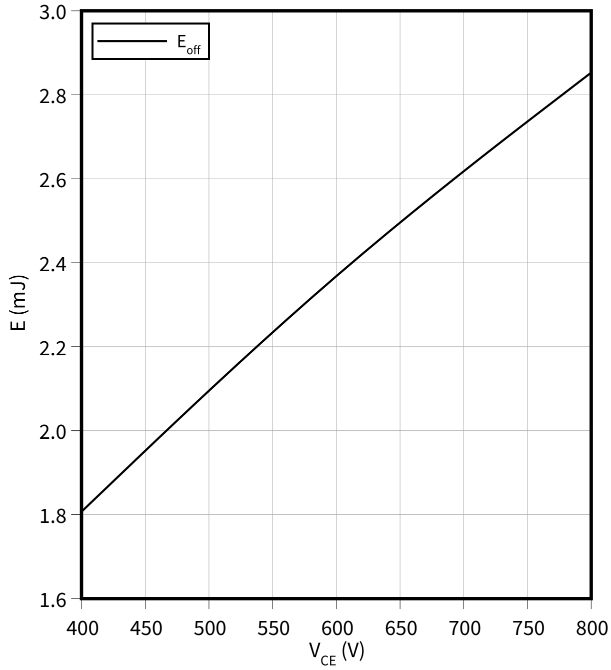
I_C = 30 A, V_{CC} = 600 V, V_{GE} = 0/15 V, R_G = 10 Ω



Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

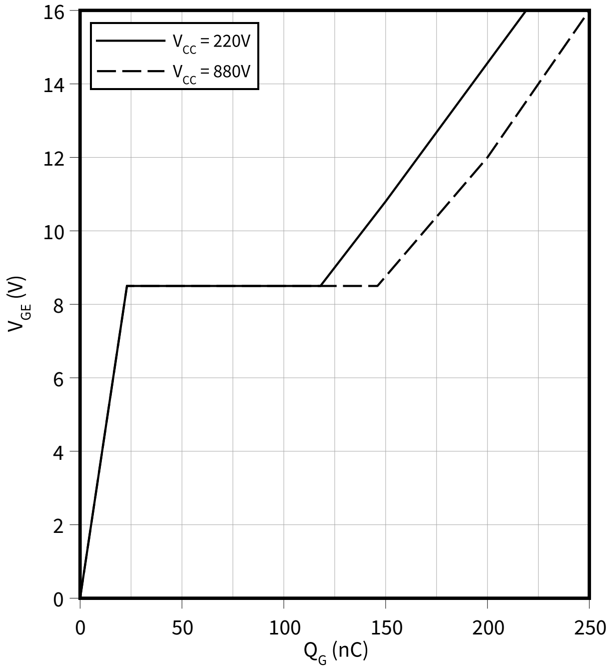
I_C = 30 A, T_{vj} = 175 °C, V_{GE} = 0/15 V, R_G = 10 Ω



Typical gate charge

$V_{GE} = f(Q_G)$

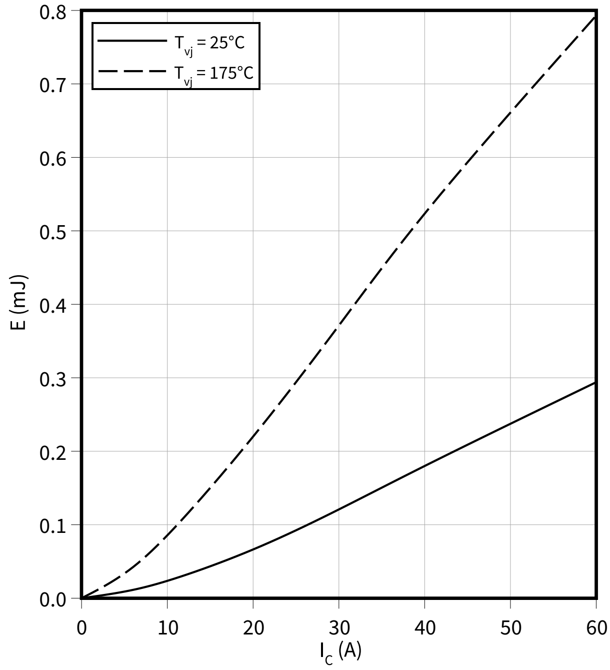
I_C = 30 A



Typical turn off switching energy loss for soft switching

$E = f(I_C)$

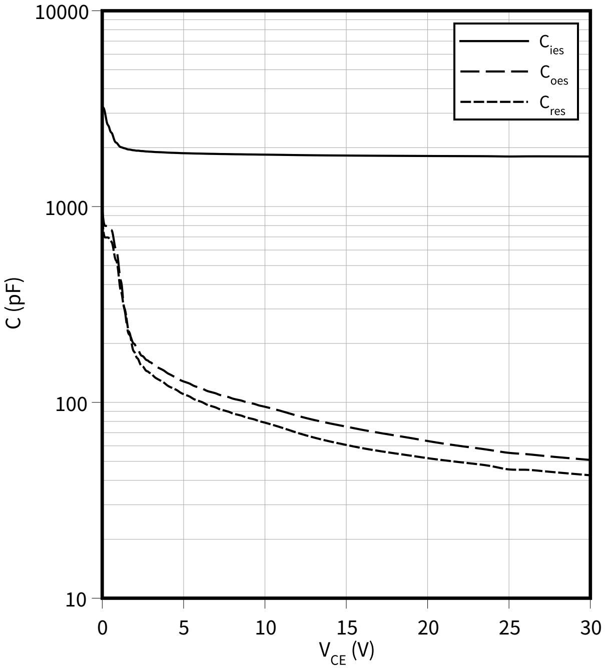
V_{CC} = 600 V, V_{GE} = 0/15 V, R_G = 10 Ω



Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

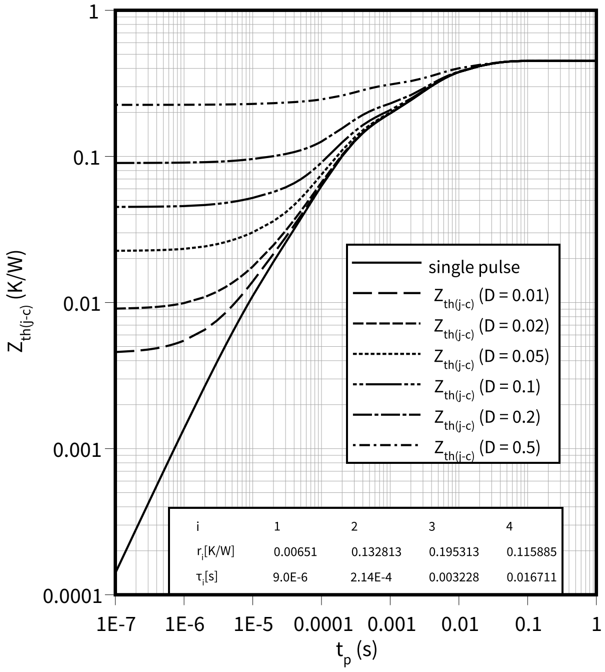
$f = 100\ \text{kHz}, V_{GE} = 0\ \text{V}$



IGBT transient thermal impedance as a function of pulse width

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

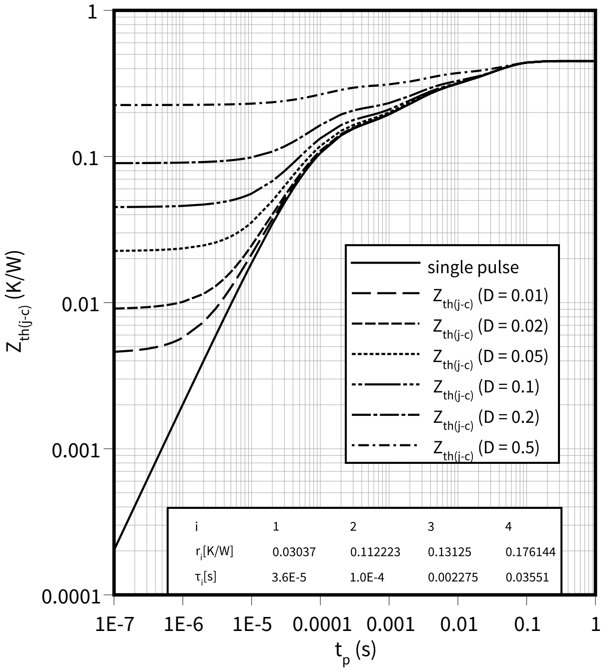
$D = t_p/T$



Diode transient thermal impedance as a function of pulse width

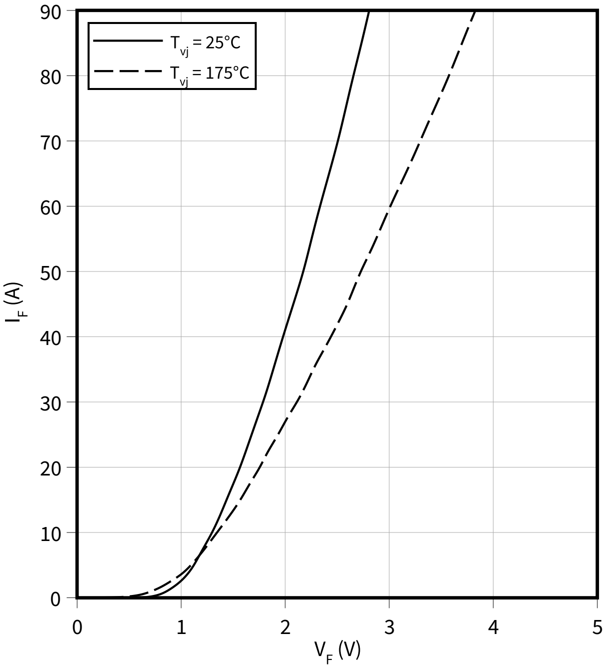
$Z_{th(j-c)} = f(t_p)$

$D = t_p/T$



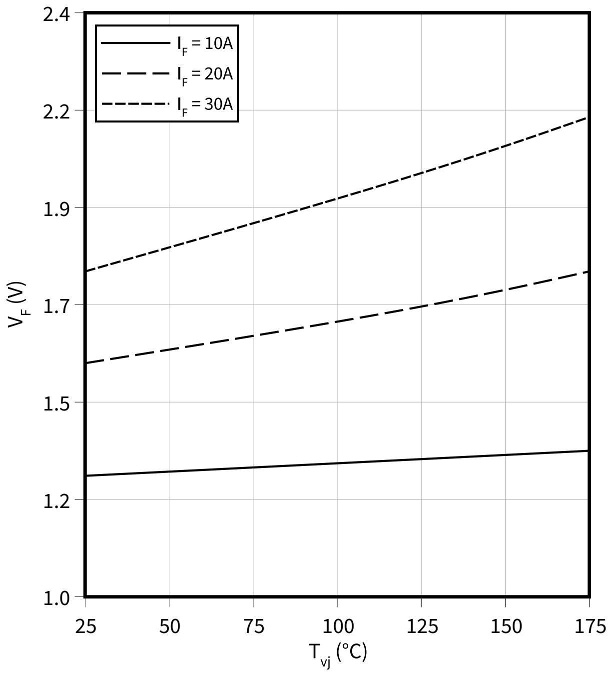
Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



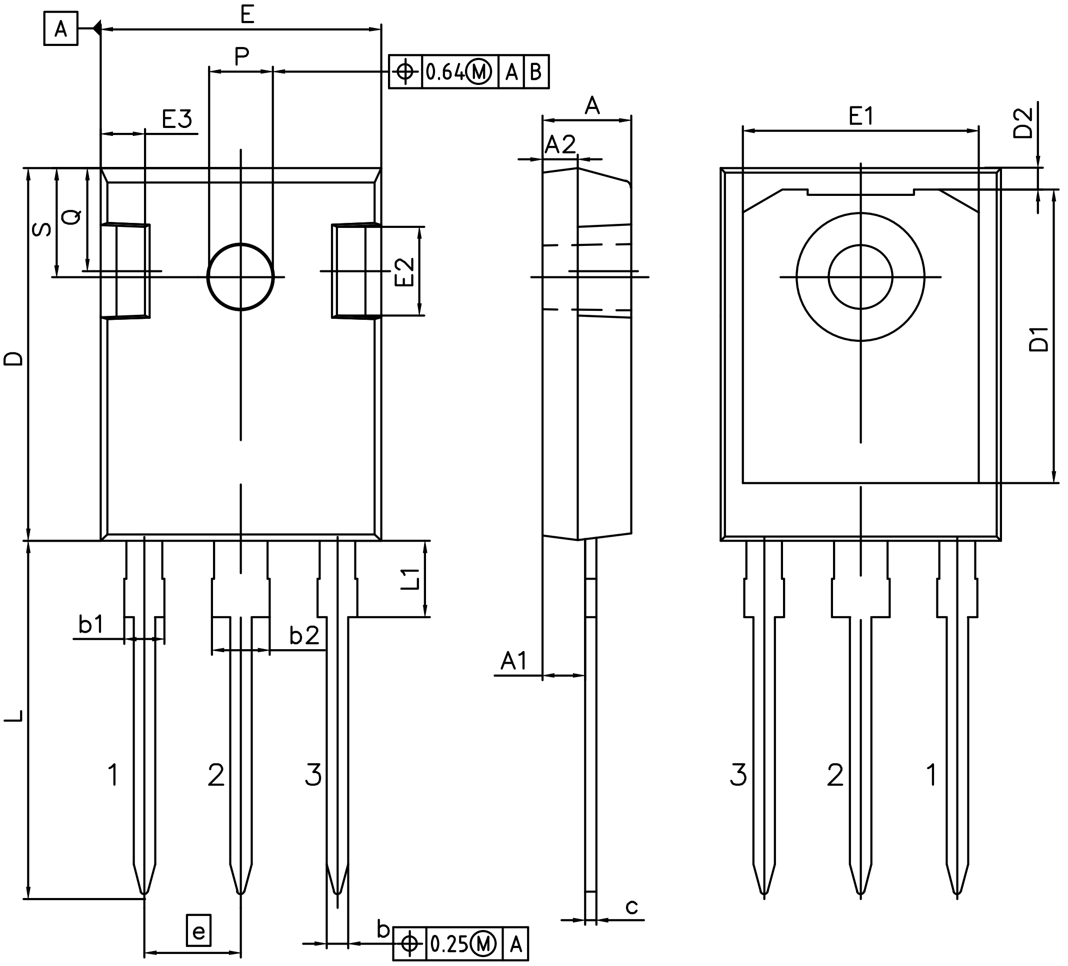
Typical diode forward voltage as a function of junction temperature

$V_F = f(T_{vj})$



5 Package outlines

PG-TO247-3-STD-NN2.5



DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	4.70	5.30
A1	2.20	2.60
A2	1.50	2.50
b	1.00	1.40
b1	1.60	2.41
b2	2.57	3.43
c	0.38	0.89
D	20.70	21.50
D1	13.08	17.65
D2	0.51	1.35
E	15.50	16.30
E1	12.38	14.15
E2	3.40	5.10
E3	1.00	2.60
e	5.44	
L	19.80	20.40
L1	3.85	4.50
P	3.50	3.70
Q	5.35	6.25
S	6.04	6.30

DOCUMENT NO.
Z8B00003327

REVISION
06

SCALE 3:1
0 1 2 3 4 5mm

EUROPEAN PROJECTION

ISSUE DATE
25.07.2018

Figure 1

6 Testing conditions

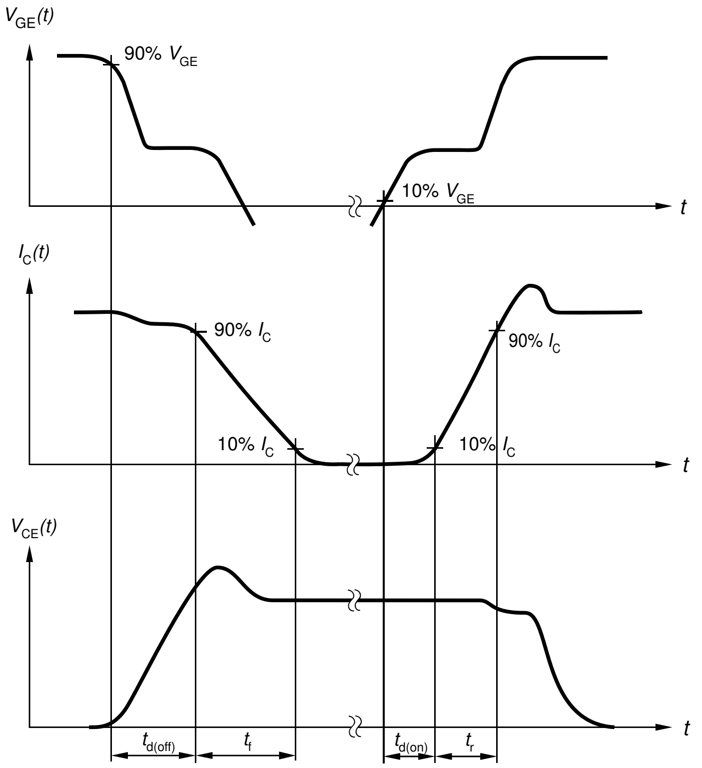


Figure A. **Definition of switching times**

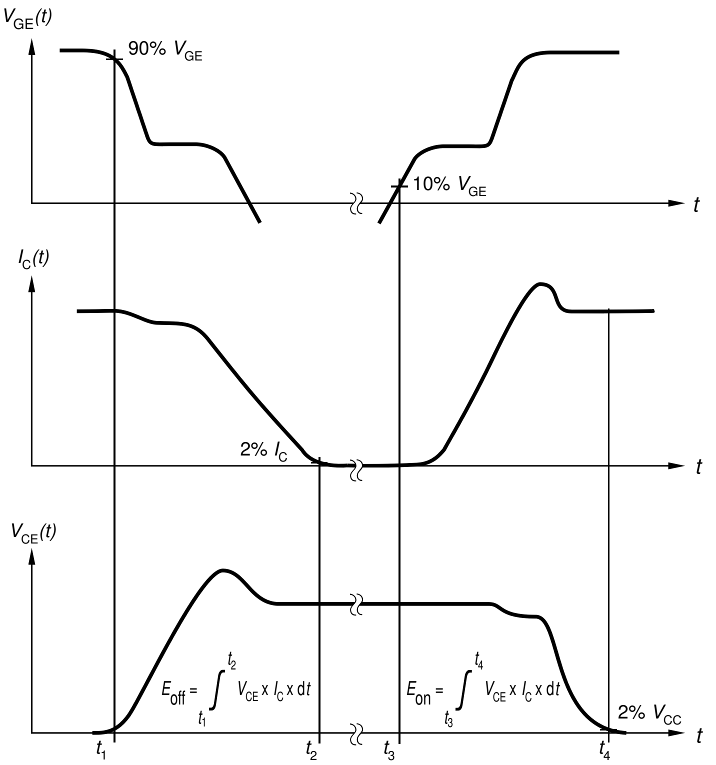


Figure B. **Definition of switching losses**

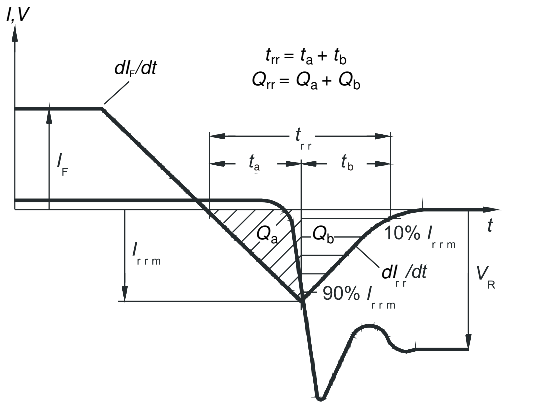


Figure C. **Definition of diode switching characteristics**

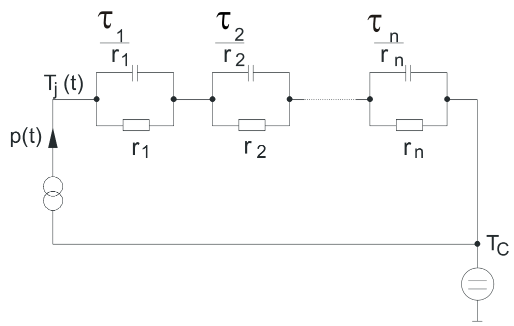


Figure D. **Thermal equivalent circuit**

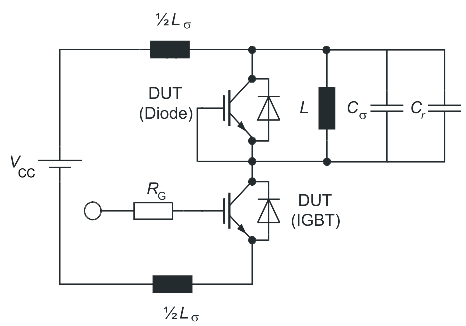


Figure E. **Dynamic test circuit**
Parasitic inductance L_{σ},
parasitic capacitor C_{σ},
relief capacitor C_r,
(only for ZVT switching)

Figure 2

Revision history

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