Resonant Switching Series

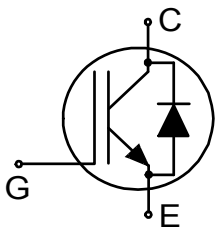
Reverse conducting IGBT with monolithic body diode

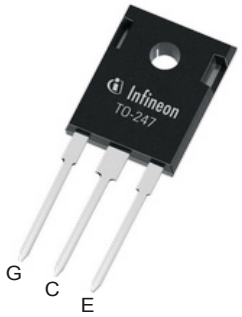
IHW30N110R3

Data sheet

Industrial Power Control

Reverse conducting IGBT with monolithic body diode





Features:

- Powerful monolithic body diode with low forward voltage designed for soft commutation only
- Very tight parameter distribution
- High ruggedness, temperature stable behavior
- Low V_{CEsat}
- Easy parallel switching capability due to positive temperature coefficient in V_{CEsat}
- Low EMI
- Qualified according to JEDEC for target applications
- Pb-free lead plating; RoHS compliant
- Complete product spectrum and PSpice Models: http://www.infineon.com/igbt/

Applications:

- Inductive cooking
- Inverterized microwave ovens
- Resonant converters
- Soft switching applications

Pb Green

HAL Halogen-Free

RoHS

Key Performance and Package Parameters

Type	V_{CE}	I_C	V_{CEsat}, T_{vj}=25°C	T_{vjmax}	Marking	Package
IHW30N110R3	1100V	30A	1.55V	175°C	H30R1103	PG-TO247-3

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Maximum Ratings

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

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	1100	V
DC collector current, limited by T_{vjmax} T_C = 25°C T_C = 100°C	I_C	 60.0 30.0	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	90.0	A
Turn off safe operating area $V_{CE} \leq 1100V$, $T_{vj} \leq 175°C$	-	90.0	A
Diode forward current, limited by T_{vjmax} T_C = 25°C T_C = 100°C	I_F	 60.0 30.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	90.0	A
Gate-emitter voltage Transient Gate-emitter voltage ($t_p \leq 10\mu s$, D < 0.010)	V_{GE}	±20 ±25	V
Power dissipation T_C = 25°C Power dissipation T_C = 100°C	P_{tot}	333.0 166.0	W
Operating junction temperature	T_{vj}	-40...+175	°C
Storage temperature	T_{stg}	-55...+175	°C
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s		260	°C
Mounting torque, M3 screw Maximum of mounting processes: 3	M	0.6	Nm

Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
IGBT thermal resistance, junction - case	$R_{th(j-c)}$		0.45	K/W
Diode thermal resistance, junction - case	$R_{th(j-c)}$		0.45	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		40	K/W

Electrical Characteristic, at T_{vj} = 25°C, unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Static Characteristic						
Collector-emitter breakdown voltage	$V_{(BR)CES}$	V_{GE} = 0V, I_C = 0.50mA	1100	-	-	V
Collector-emitter saturation voltage	V_{CEsat}	V_{GE} = 15.0V, I_C = 30.0A T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	 - - -	 1.55 1.85 2.00	 1.75 - -	V
Diode forward voltage	V_F	V_{GE} = 0V, I_F = 30.0A T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	 - - -	 1.35 1.38 1.41	 1.55 - -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C = 0.70mA, V_{CE} = V_{GE}	5.1	5.8	6.4	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 1100V, V_{GE} = 0V T_{vj} = 25°C T_{vj} = 175°C	 - -	 - -	 5.0 2500.0	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = 20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE} = 20V, I_C = 30.0A	-	15.0	-	S
Integrated gate resistor	r_G			none		Ω

Electrical Characteristic, at T_{vj} = 25°C, unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Dynamic Characteristic						
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	1460	-	pF
Output capacitance	C_{oes}		-	55	-	
Reverse transfer capacitance	C_{res}		-	45	-	
Gate charge	Q_G	V_{CC} = 880V, I_C = 30.0A, V_{GE} = 15V	-	180.0	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13.0	-	nH

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic, at T_{vj} = 25°C						
Turn-off delay time	$t_{d(off)}$	T_{vj} = 25°C, V_{CC} = 600V, I_C = 30.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 15.0Ω, $R_{G(off)}$ = 15.0Ω, Lσ = 80nH, Cσ = 39pF Lσ, Cσ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	350	-	ns
Fall time	t_f		-	16	-	ns
Turn-off energy	E_{off}		-	1.15	-	mJ

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic, at T_{vj} = 175°C						
Turn-off delay time	$t_{d(off)}$	T_{vj} = 175°C, V_{CC} = 600V, I_C = 30.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 15.0Ω, $R_{G(off)}$ = 15.0Ω, $L\sigma$ = 80nH, $C\sigma$ = 39pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery.	-	410	-	ns
Fall time	t_f		-	60	-	ns
Turn-off energy	E_{off}		-	1.80	-	mJ

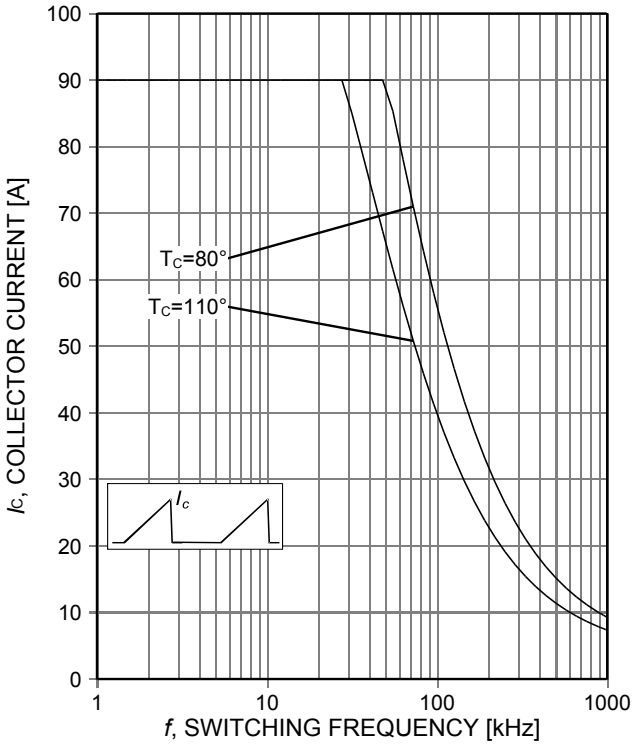


Figure 1. **Collector current as a function of switching frequency**
(T_j≤175°C, D=0.5, V_{CE}=600V, V_{GE}=0/15V, R_G=15Ω)

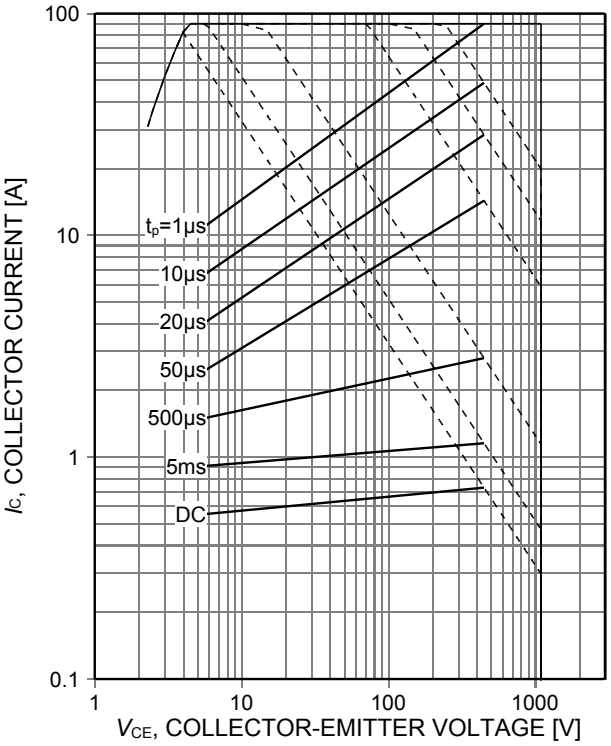


Figure 2. **Forward bias safe operating area**
(D=0, T_C=25°C, T_j≤175°C; V_{GE}=15V)

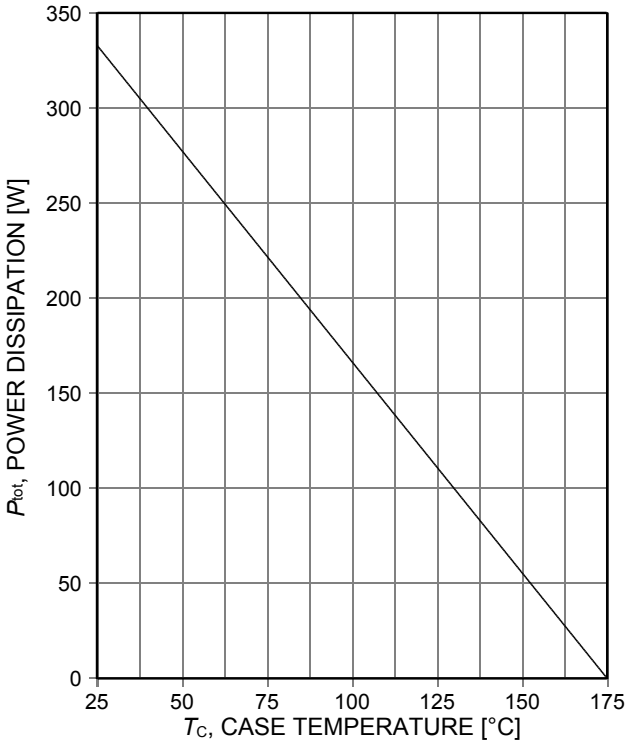


Figure 3. **Power dissipation as a function of case temperature**
(T_j≤175°C)

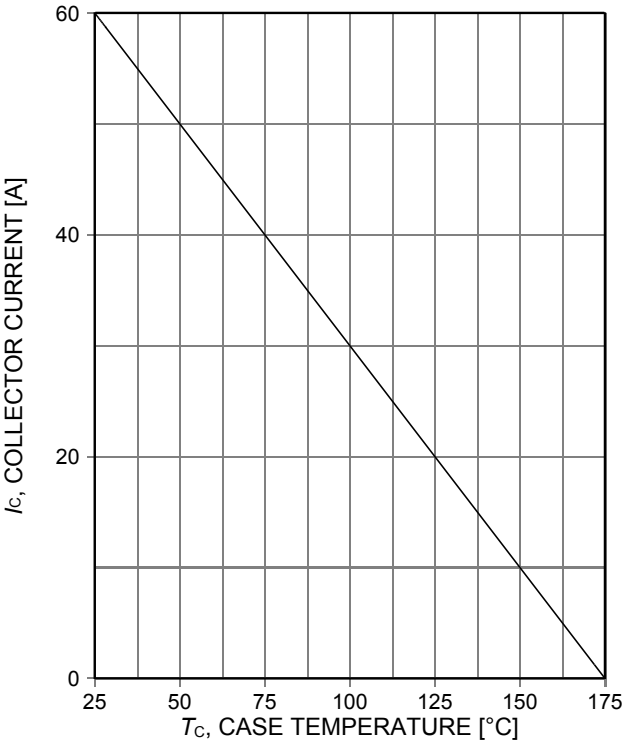


Figure 4. **Collector current as a function of case temperature**
(V_{GE}≥15V, T_j≤175°C)

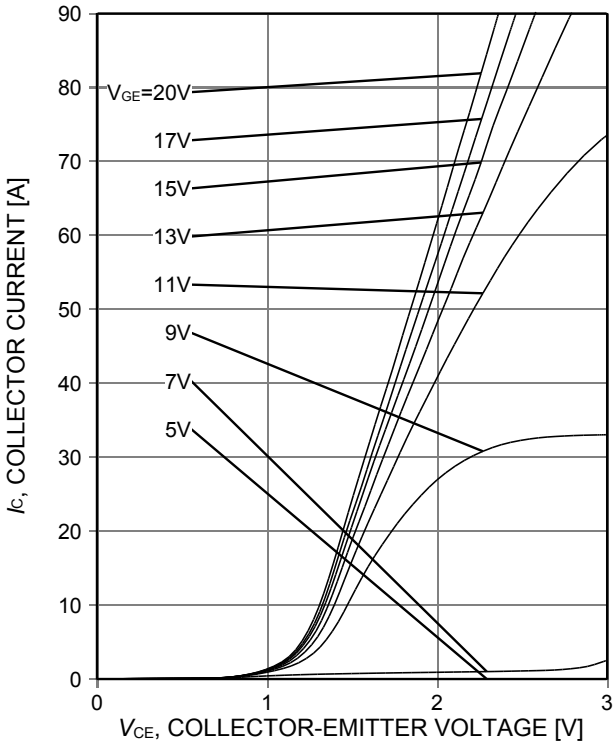


Figure 5. **Typical output characteristic** (T_j=25°C)

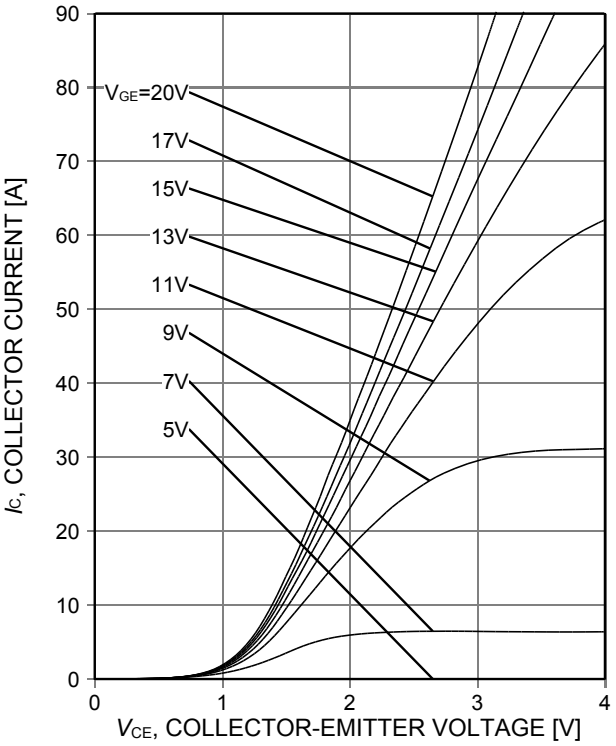


Figure 6. **Typical output characteristic** (T_j=175°C)

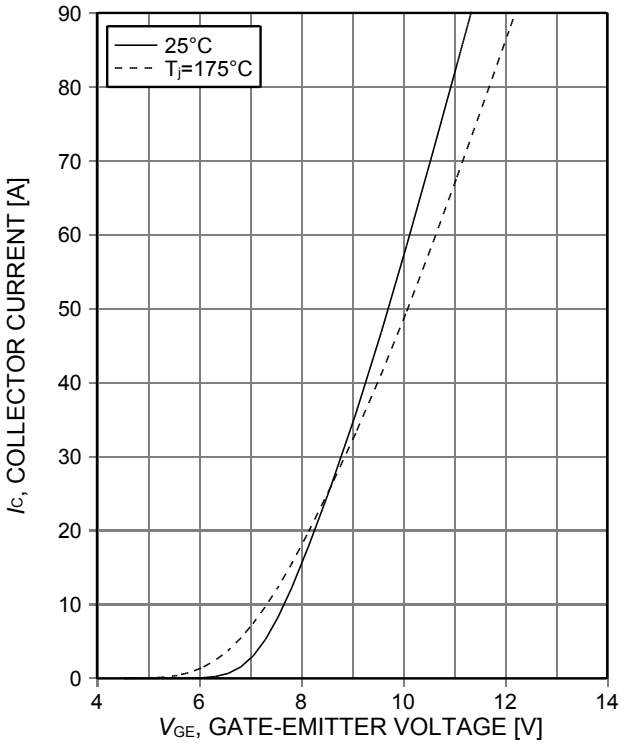


Figure 7. **Typical transfer characteristic** (V_{CE}=20V)

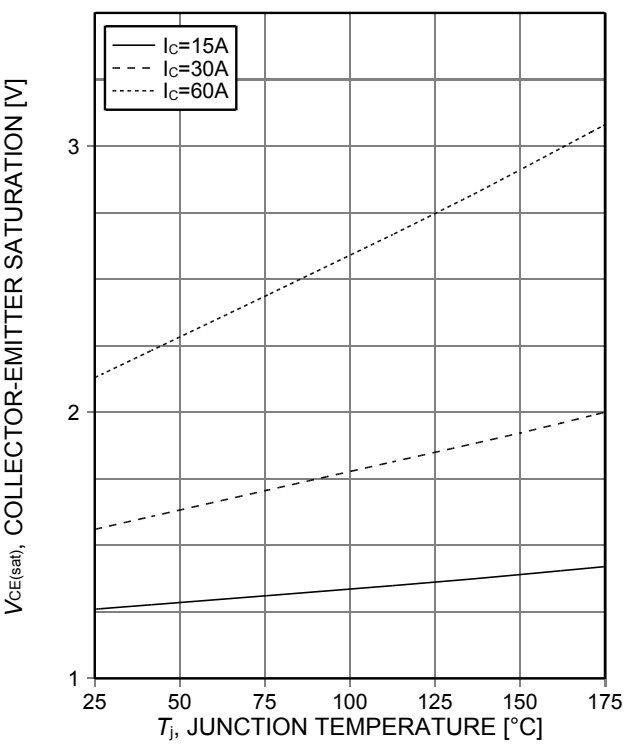


Figure 8. **Typical collector-emitter saturation voltage as a function of junction temperature** (V_{GE}=15V)

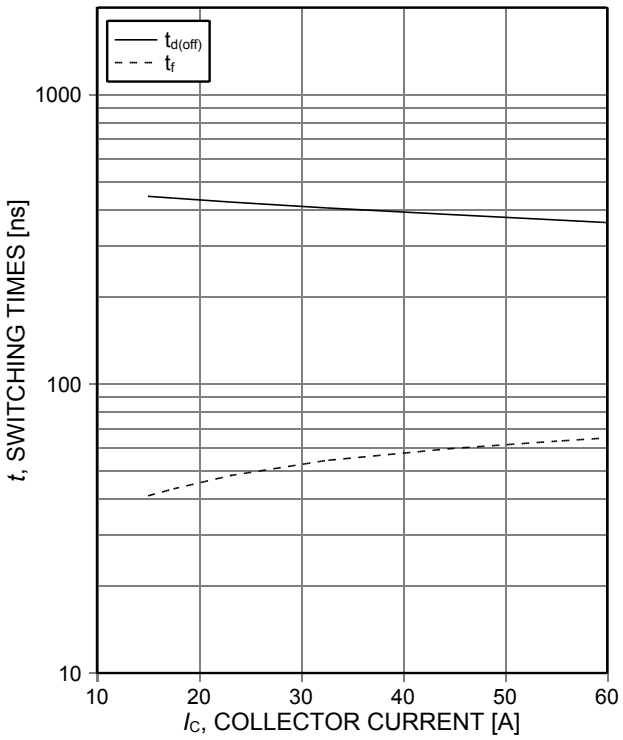


Figure 9. **Typical switching times as a function of collector current**
(ind. load, T_j=175°C, V_{CE}=600V, V_{GE}=0/15V, $R_{G(on)}$=15Ω, $R_{G(off)}$=15Ω, test circuit in Fig. E)

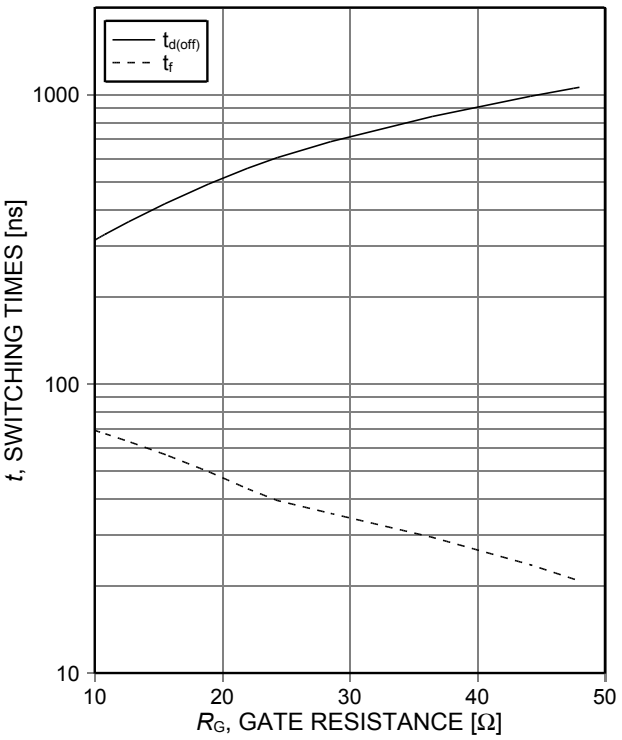


Figure 10. **Typical switching times as a function of gate resistance**
(ind. load, T_j=175°C, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, test circuit in Fig. E)

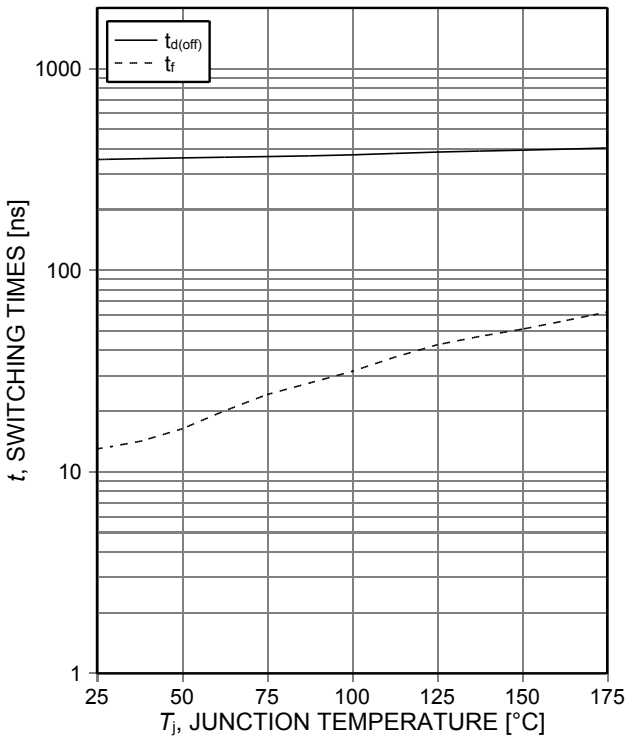


Figure 11. **Typical switching times as a function of junction temperature**
(ind. load, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, $R_{G(on)}$=15Ω, $R_{G(off)}$=15Ω, test circuit in Fig. E)

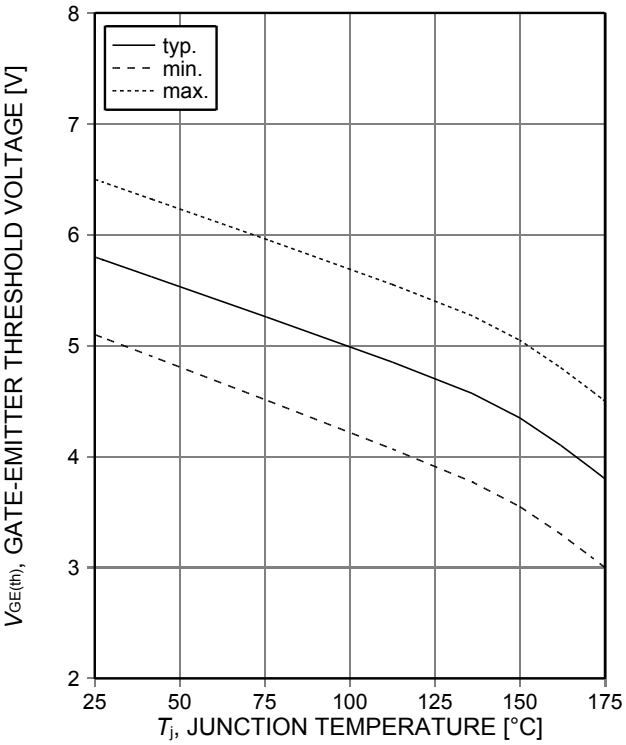


Figure 12. **Gate-emitter threshold voltage as a function of junction temperature**
(I_C=0.7mA)

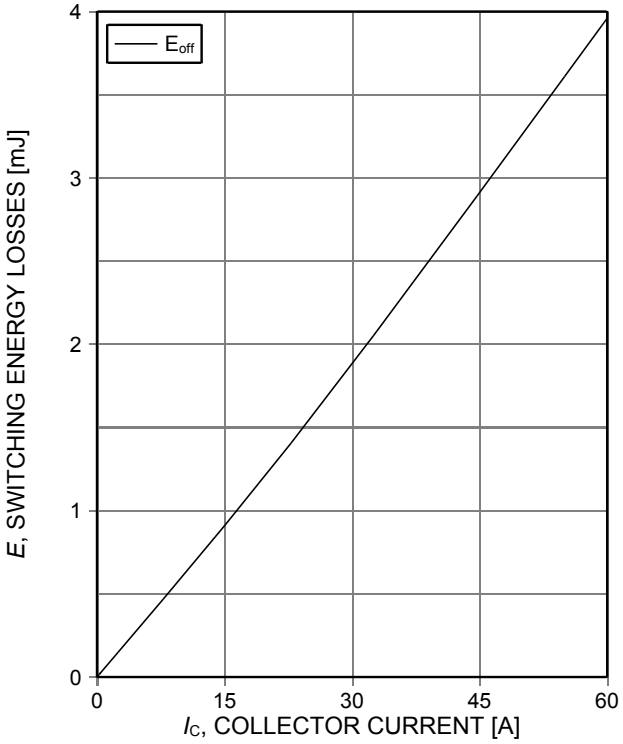


Figure 13. **Typical switching energy losses as a function of collector current**
(ind. load, T_j=175°C, V_{CE}=600V, V_{GE}=0/15V, $R_{G(on)}$=15Ω, $R_{G(off)}$=15Ω, test circuit in Fig. E)

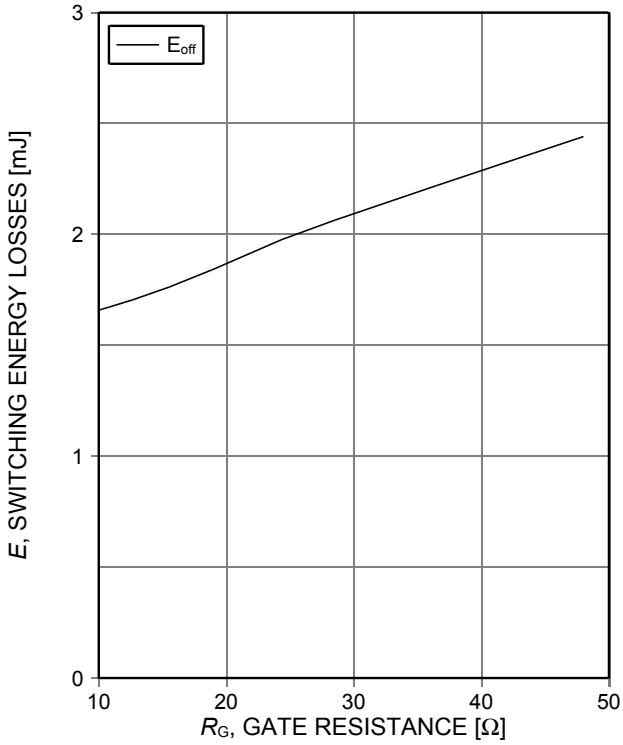


Figure 14. **Typical switching energy losses as a function of gate resistance**
(ind. load, T_j=175°C, V_{CE}=600V, V_{GE}=0/15V, test circuit in Fig. E)

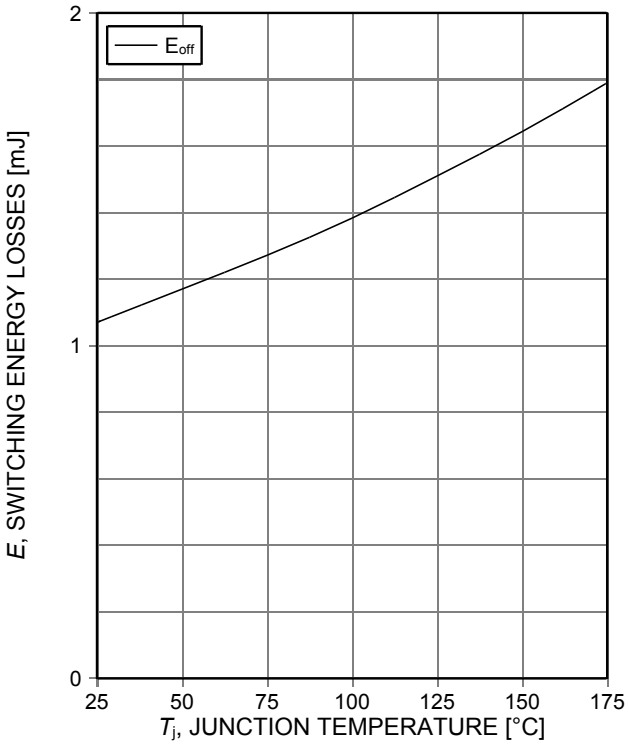


Figure 15. **Typical switching energy losses as a function of junction temperature**
(ind load, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, $R_{G(on)}$=15Ω, $R_{G(off)}$=15Ω, test circuit in Fig. E)

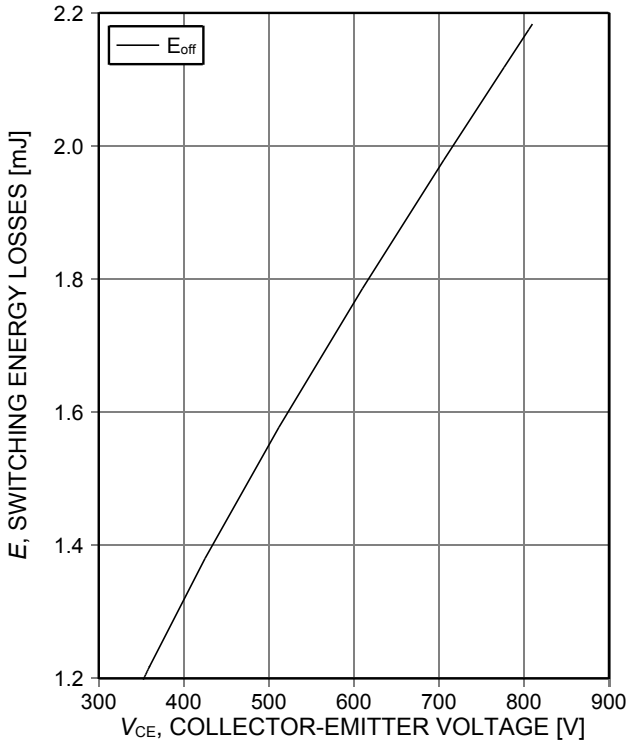


Figure 16. **Typical switching energy losses as a function of collector emitter voltage**
(ind. load, T_j=175°C, V_{GE}=0/15V, I_C=30A, $R_{G(on)}$=15Ω, $R_{G(off)}$=15Ω, test circuit in Fig. E)

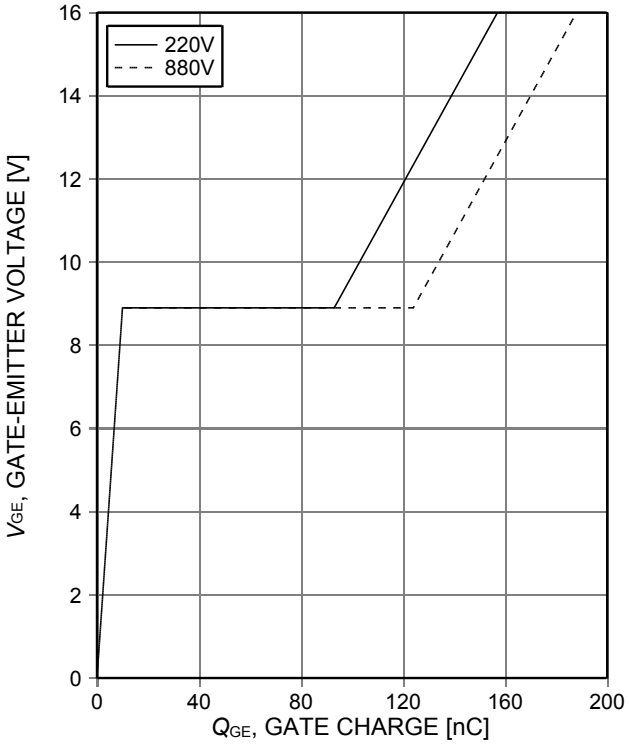


Figure 17. **Typical gate charge**
(I_C=30A)

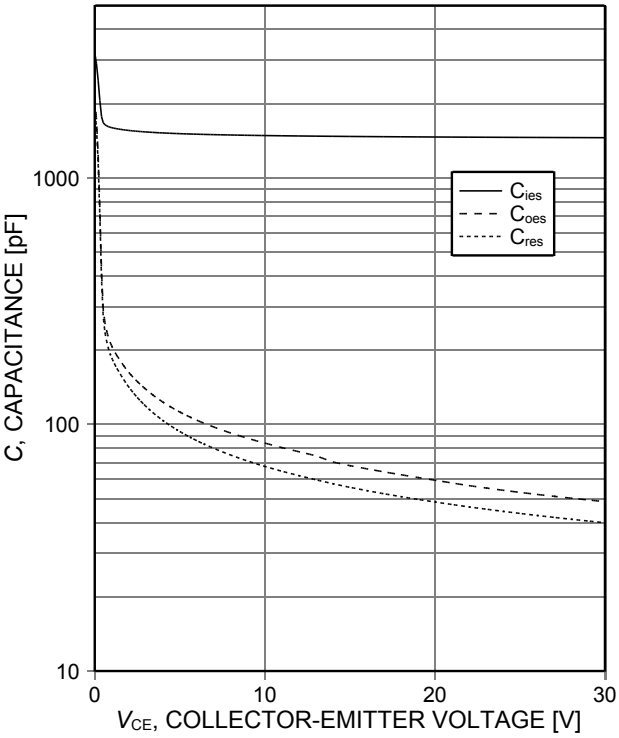


Figure 18. **Typical capacitance as a function of collector-emitter voltage**
(V_{GE}=0V, f=1MHz)

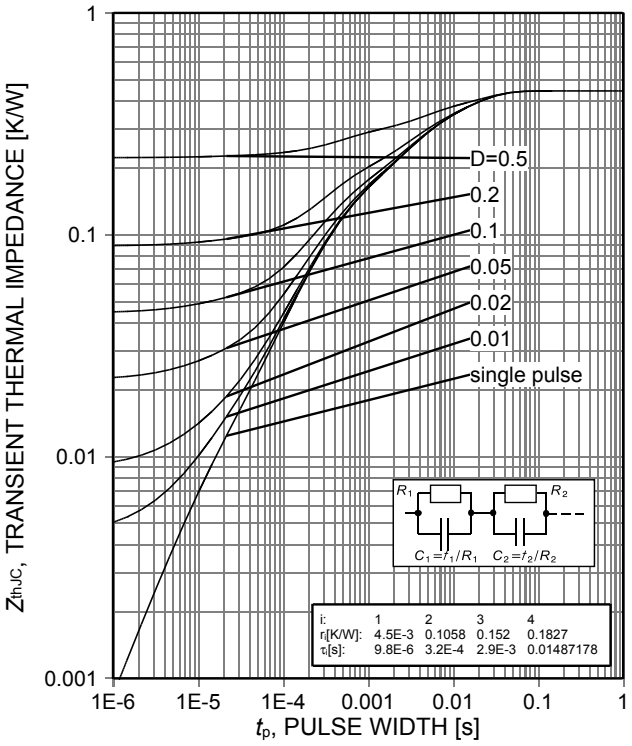


Figure 19. **IGBT transient thermal impedance**
($D=t_p/T$)

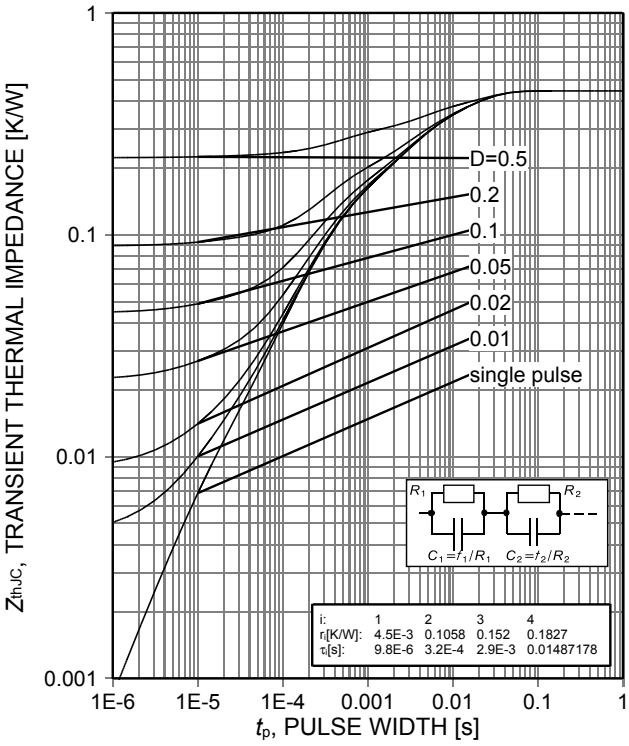


Figure 20. **Diode transient thermal impedance as a function of pulse width**
($D=t_p/T$)

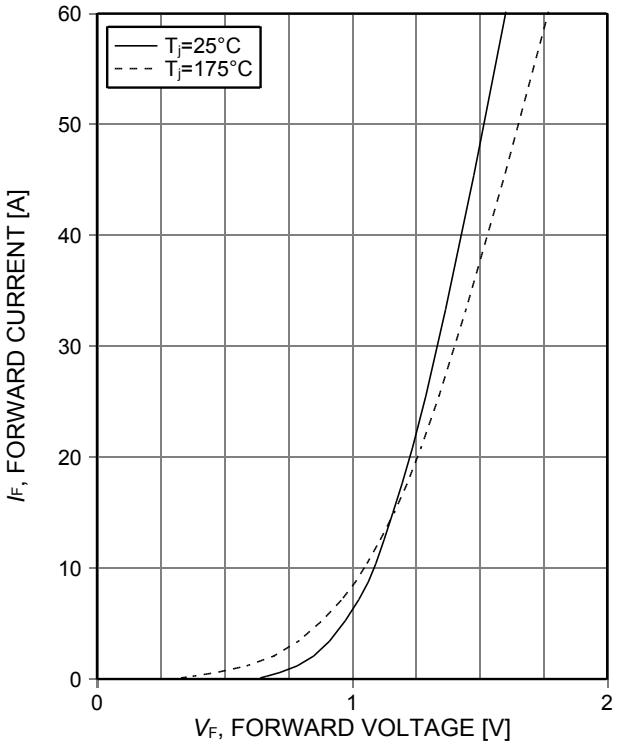


Figure 21. **Typical diode forward current as a function of forward voltage**

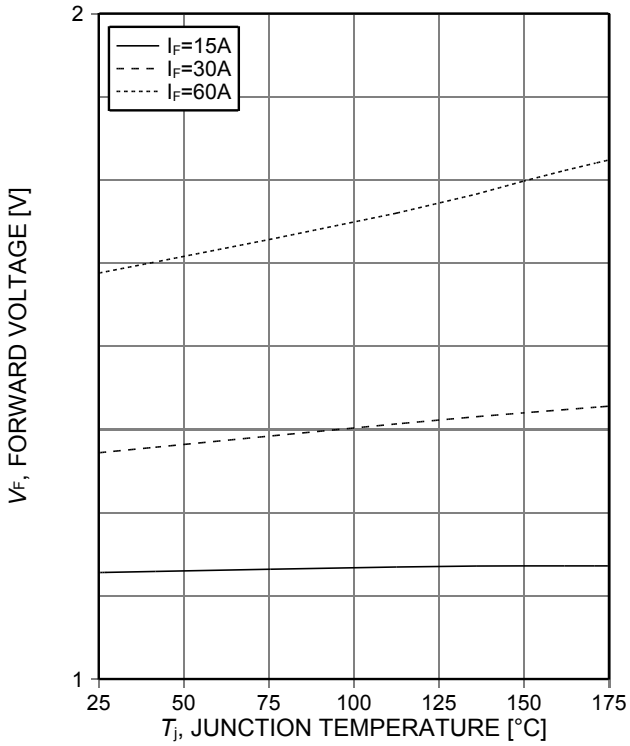
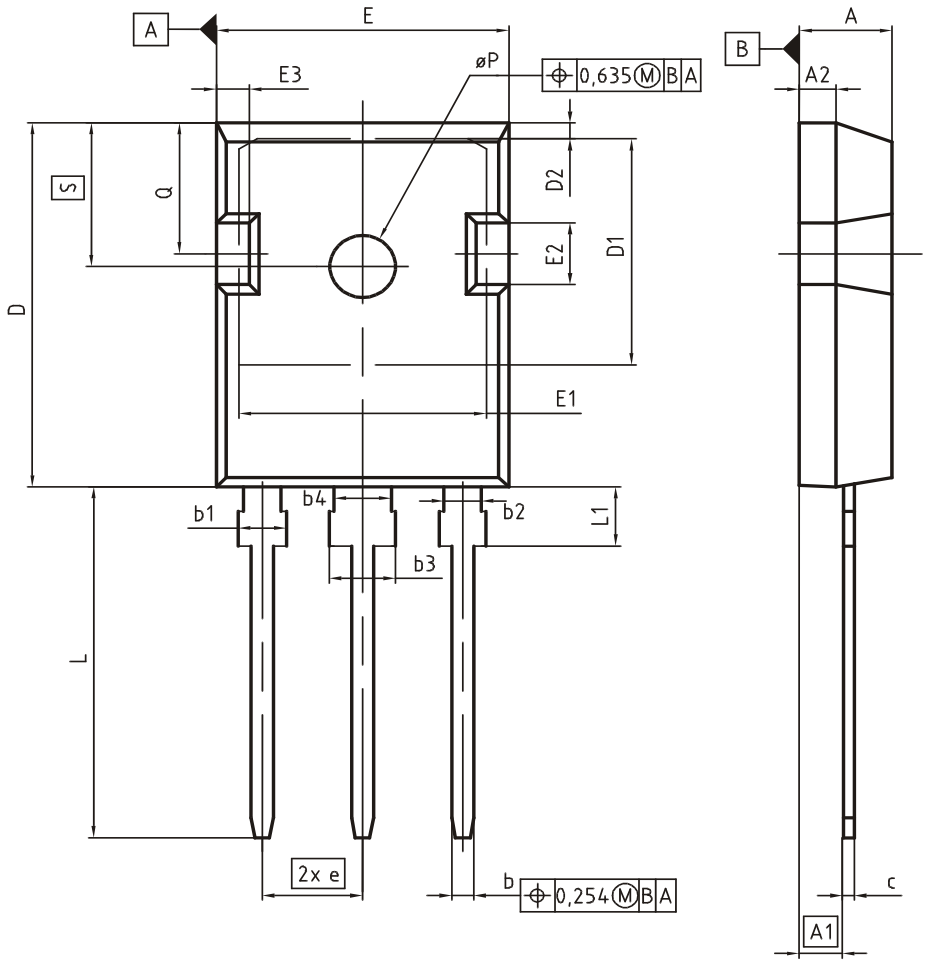


Figure 22. **Typical diode forward voltage as a function of junction temperature**

PG-TO247-3



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44 (BSC)		0.214 (BSC)	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
øP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248

DOCUMENT NO.	Z8B00003327
SCALE	0 5 5 7.5mm
EUROPEAN PROJECTION	
ISSUE DATE	09-07-2010
REVISION	05

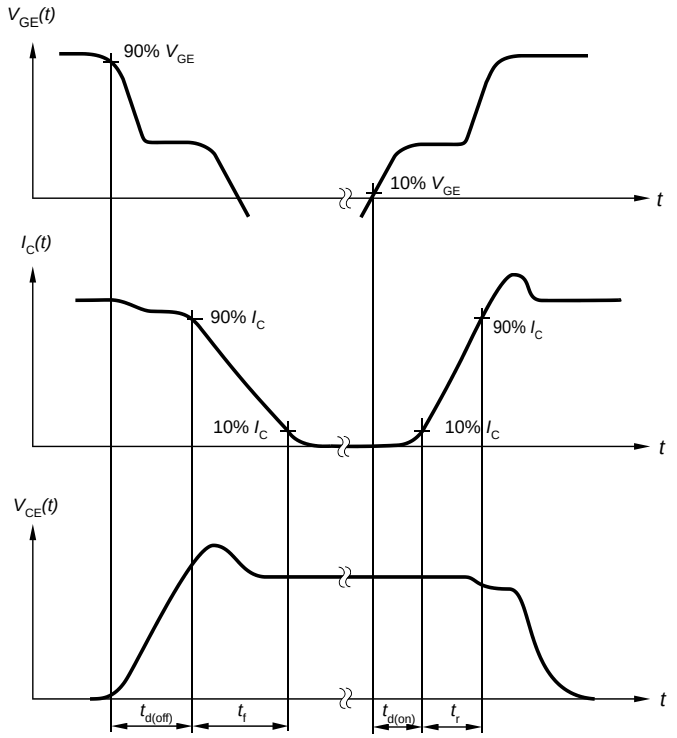


Figure A. **Definition of switching times**

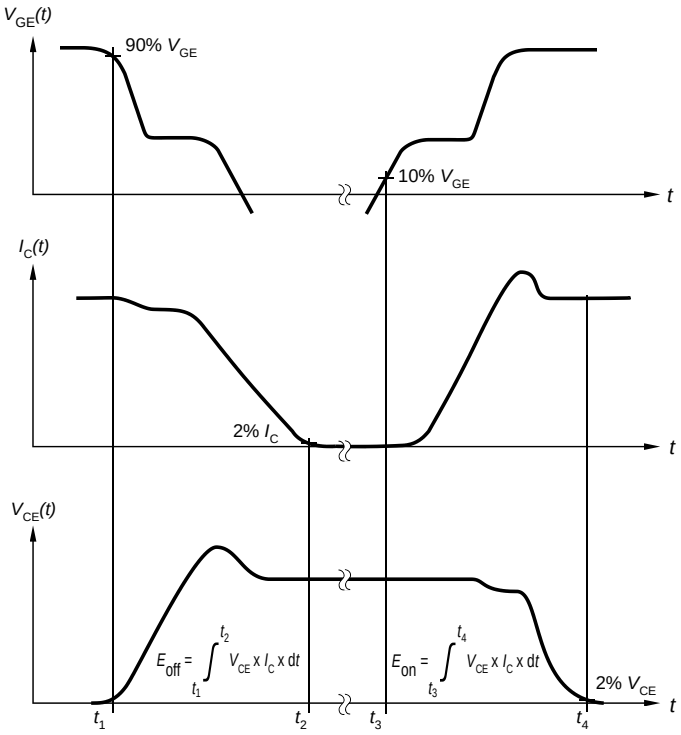


Figure B. **Definition of switching losses**

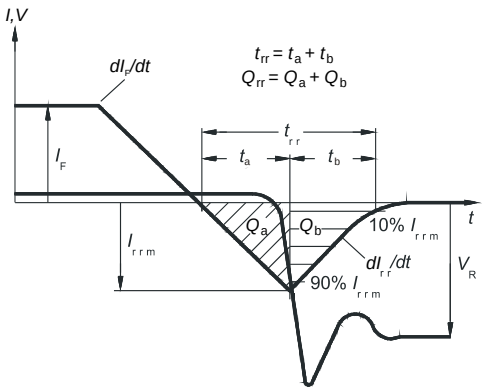


Figure C. **Definition of diode switching characteristics**

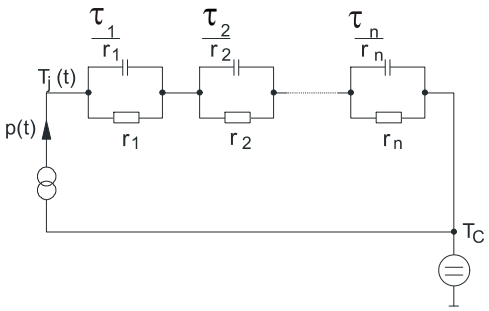


Figure D. **Thermal equivalent circuit**

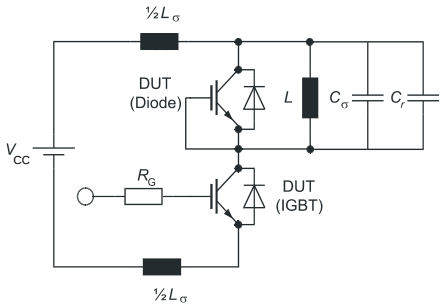


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

Revision History

IHW30N110R3

Revision: 2015-01-26, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
1.1	2009-12-01	-
1.2	2011-01-21	Package drawing Rev. 05
1.3	2013-02-12	Layout change
2.1	2015-01-26	Final data sheet

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Warnings
Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.
The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.