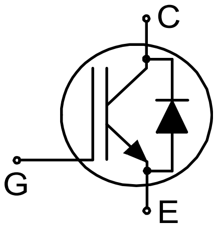
Reverse conducting IGBT with monolithic body diode

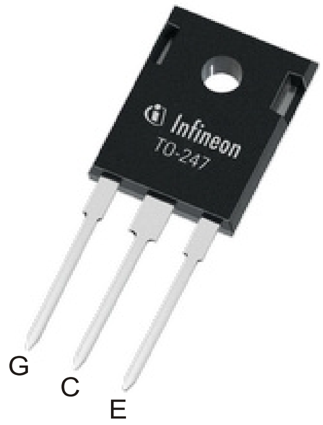


Features:

- Powerful monolithic body diode with low forward voltage
- TRENCHSTOP^{TM} technology applications offers:

- 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
- Pb-free lead plating; RoHS compliant; halogen free (according IEC 61249-2-21)
- Complete product spectrum and PSpice Models: http://www.infineon.com/igbt/



Potential Applications:

- Induction Cooking
- Microwave Ovens

Product Validation:

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

Key Performance and Package Parameters

Type	V_{CE}	I_C	V_{CEsat}, T_{vj}=25°C	T_{vjmax}	Marking	Package
IHW30N160R5	1600V	30A	1.85V	175°C	H30SR5	PG-TO247-3

Table of Contents

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, $T_{vj} \geq 25°C$	V_{CE}	1600	V
DC collector current, limited by T_{vjmax} $T_c = 25°C$ $T_c = 100°C$	I_C	 60.0 39.0	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	90.0	A
Turn off safe operating area $V_{CE} \leq 1600V$, $T_{vj} \leq 150°C$, $t_p = 1µs$[1]	-	90.0	A
Diode forward current, limited by T_{vjmax} $T_c = 25°C$ $T_c = 100°C$	I_F	 55.0 36.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	90.0	A
Gate-emitter voltage Transient Gate-emitter voltage ($t_p \leq 10µs$, $D < 0.010$)	V_{GE}	±20 ±25	V
Power dissipation $T_c = 25°C$ Power dissipation $T_c = 100°C$	P_{tot}	263.0 131.5	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**	**Value**			**Unit**
			min.	**typ.**	**max.**	
R_{th} Characteristics						
IGBT thermal resistance, junction - case	$R_{th(j-c)}$		-	-	0.57	K/W
Diode thermal resistance, junction - case	$R_{th(j-c)}$		-	-	0.57	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		-	-	40	K/W

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[1] dV/dt < 1kV/µs

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	1600	-	-	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	- - -	1.85 2.20 2.40	2.15 - -	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	- - -	2.00 2.40 2.60	2.30 - -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C = 0.75mA, V_{CE} = V_{GE}	4.5	5.1	5.8	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 1600V, V_{GE} = 0V T_{vj} = 25°C T_{vj} = 175°C	- -	- 800	100 -	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	-	20.5	-	S

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	-	1500	-	pF
Output capacitance	C_{oes}		-	42	-	
Reverse transfer capacitance	C_{res}		-	38	-	
Gate charge	Q_G	V_{CC} = 1280V, I_C = 30.0A, V_{GE} = 15V	-	205.0	-	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, $R_{G(on)}$ = 10.0Ω, $R_{G(off)}$ = 10.0Ω, $L\sigma$ = 175nH, $C\sigma$ = 40pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include "tail" according Figure B. (Test circuit Figure E).	-	290	-	ns
Fall time	t_f		-	47	-	ns
Turn-off energy	E_{off}		-	2.00	-	mJ
Turn-off energy, soft switching	E_{off}	dv/dt = 300.0V/µs	-	0.35	-	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, $R_{G(on)}$ = 10.0Ω, $R_{G(off)}$ = 10.0Ω, $L\sigma$ = 175nH, $C\sigma$ = 40pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” according Figure B. (Test circuit Figure E).	-	330	-	ns
Fall time	t_f		-	81	-	ns
Turn-off energy	E_{off}		-	3.00	-	mJ
Turn-off energy, soft switching	E_{off}	dv/dt = 300.0V/µs	-	1.27	-	mJ

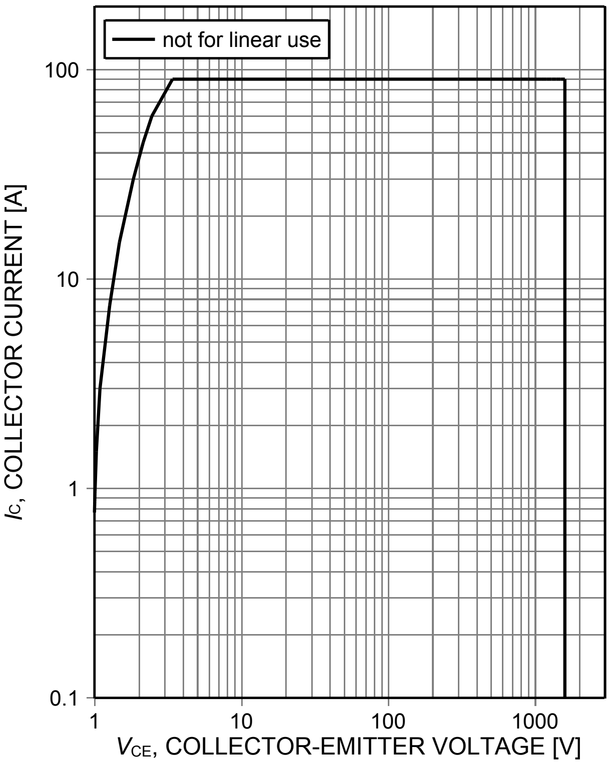


Figure 1. **Forward bias safe operating area**
(D=0, T_C=25°C, T_{vj}≤175°C; V_{GE}=15V)

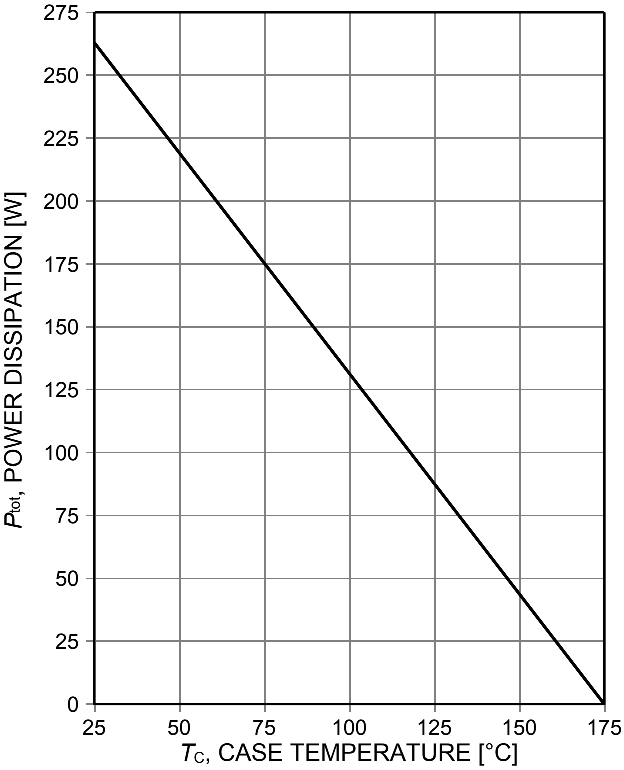


Figure 2. **Power dissipation as a function of case temperature**
(T_{vj}≤175°C)

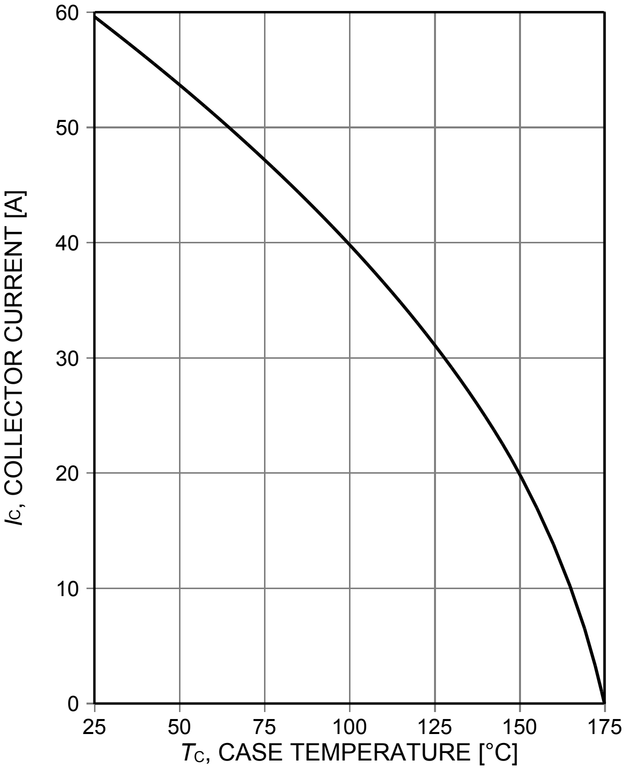


Figure 3. **Collector current as a function of case temperature**
(V_{GE}≥15V, T_{vj}≤175°C)

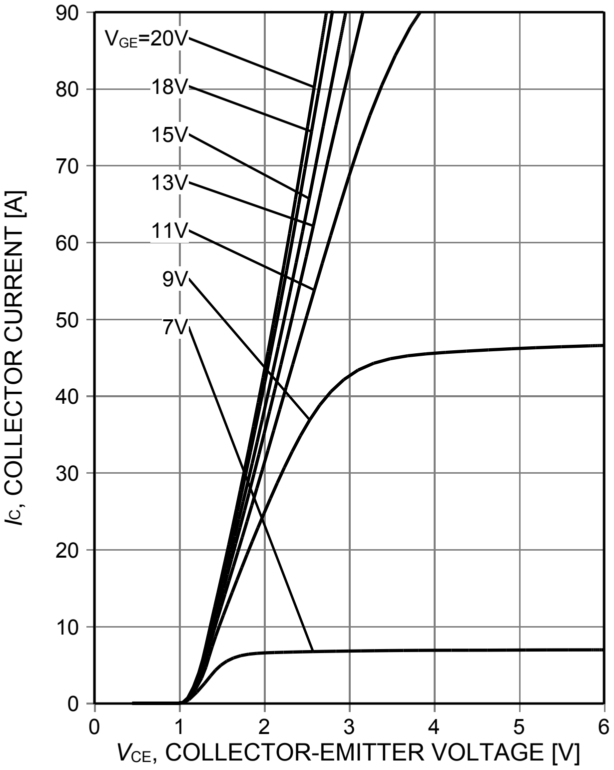


Figure 4. **Typical output characteristic**
(T_{vj}=25°C)

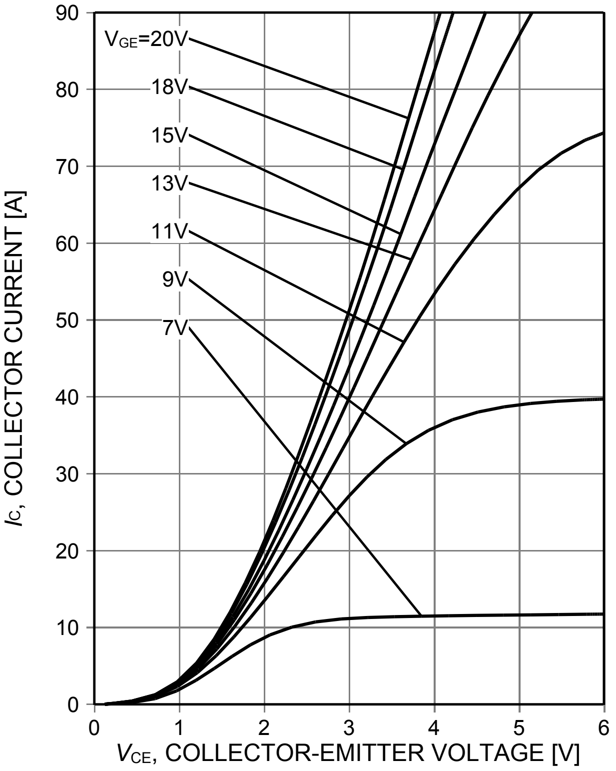


Figure 5. **Typical output characteristic**
(T_{vj}=175°C)

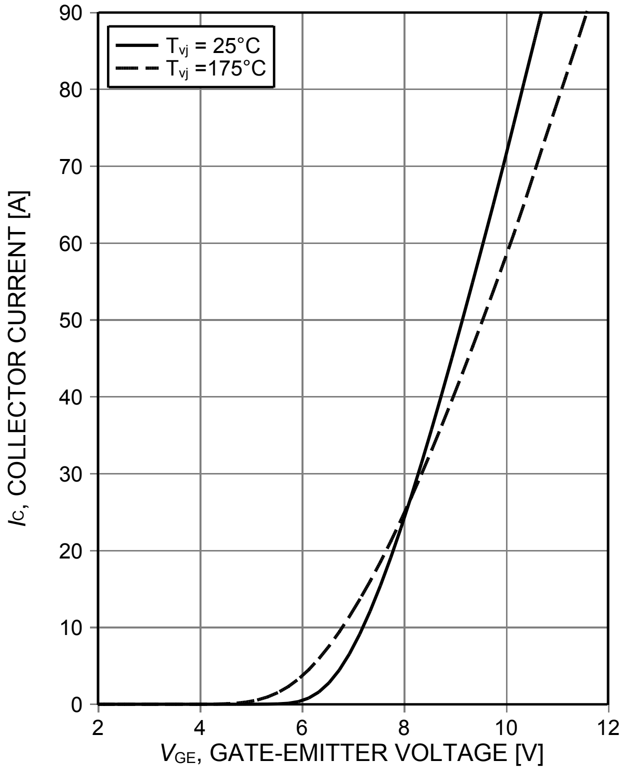


Figure 6. **Typical transfer characteristic**
(V_{CE}=20V)

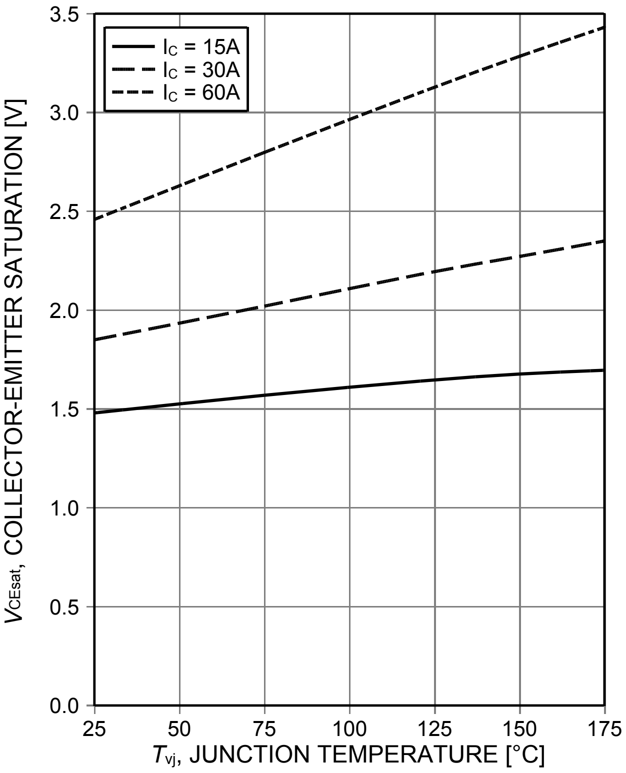


Figure 7. **Typical collector-emitter saturation voltage as a function of junction temperature**
(V_{GE}=15V)

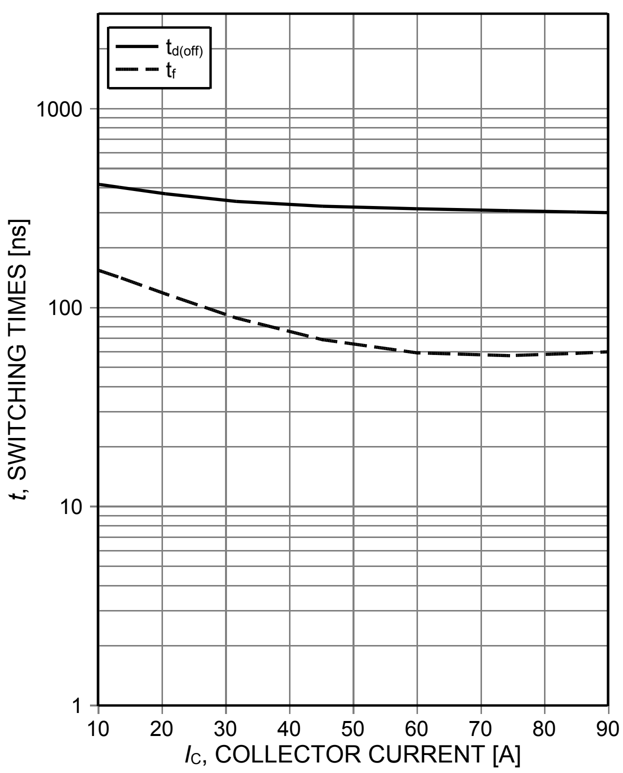


Figure 8. **Typical switching times as a function of collector current**
(inductive load, T_{vj}=175°C, V_{CE}=600V, V_{GE}=15/0V, r_G=10Ω, Dynamic test circuit in Figure E)

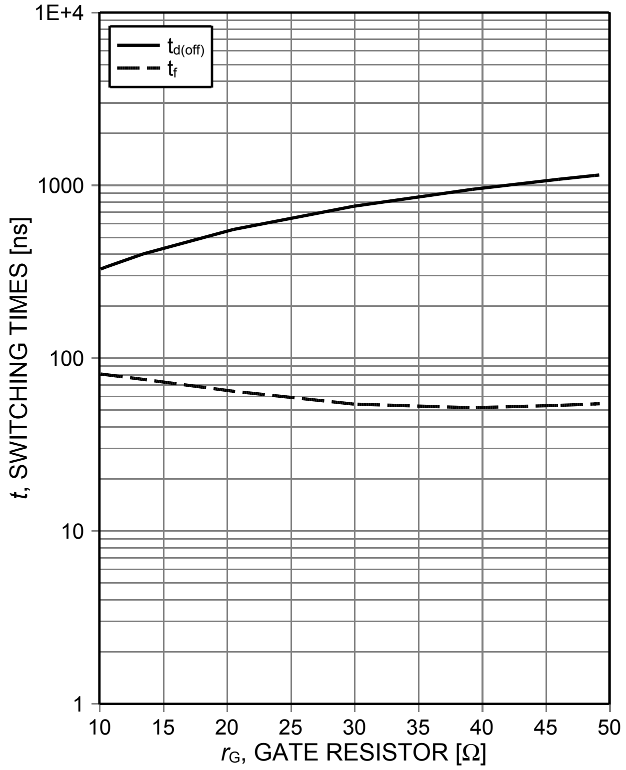


Figure 9. **Typical switching times as a function of gate resistor**
(inductive load, T_{vj}=175°C, V_{CE}=600V, V_{GE}=15/0V, I_C=30A,Dynamic test circuit in Figure E)

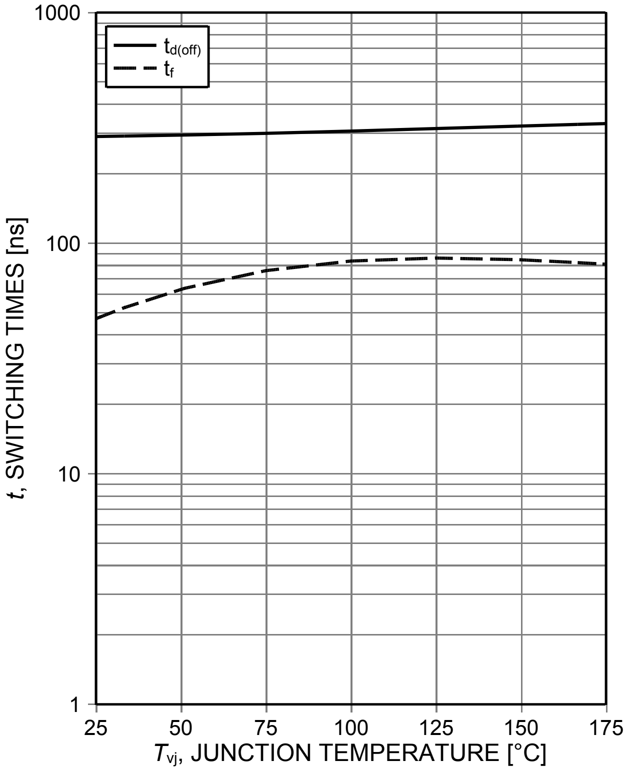


Figure 10. **Typical switching times as a function of junction temperature**
(inductive load, V_{CE}=600V, V_{GE}=15/0V, I_C=30A, r_G=10Ω,Dynamic test circuit in Figure E)

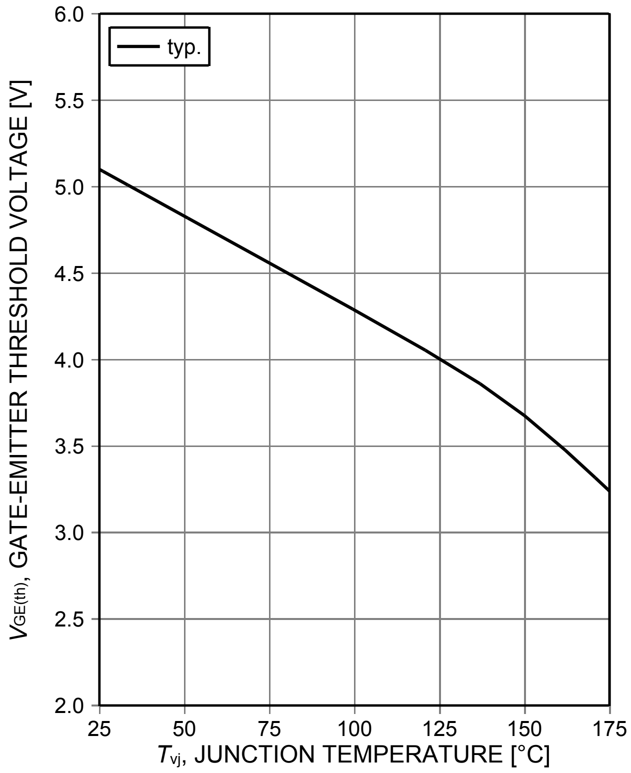


Figure 11. **Gate-emitter threshold voltage as a function of junction temperature**
(I_C=0.75mA)

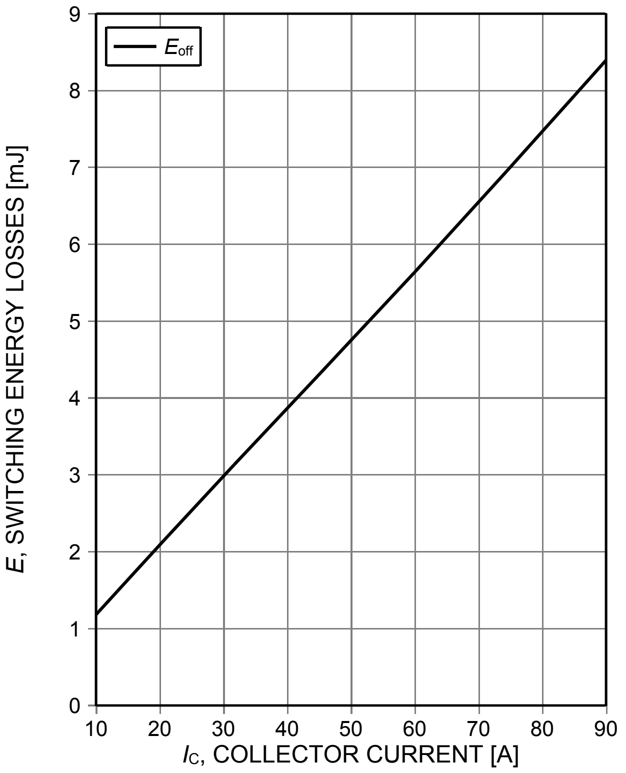


Figure 12. **Typical switching energy losses as a function of collector current**
(inductive load, T_{vj}=175°C, V_{CE}=600V, V_{GE}=15/0V, r_G=10Ω,Dynamic test circuit in Figure E)

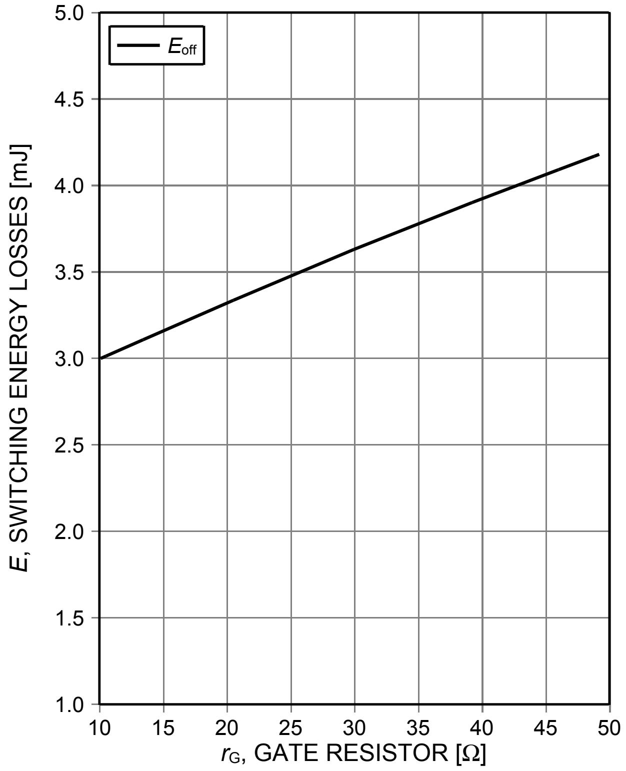


Figure 13. **Typical switching energy losses as a function of gate resistor**
(inductive load, T_{vj}=175°C, V_{CE}=600V, V_{GE}=15/0V, I_C=30A, Dynamic test circuit in Figure E)

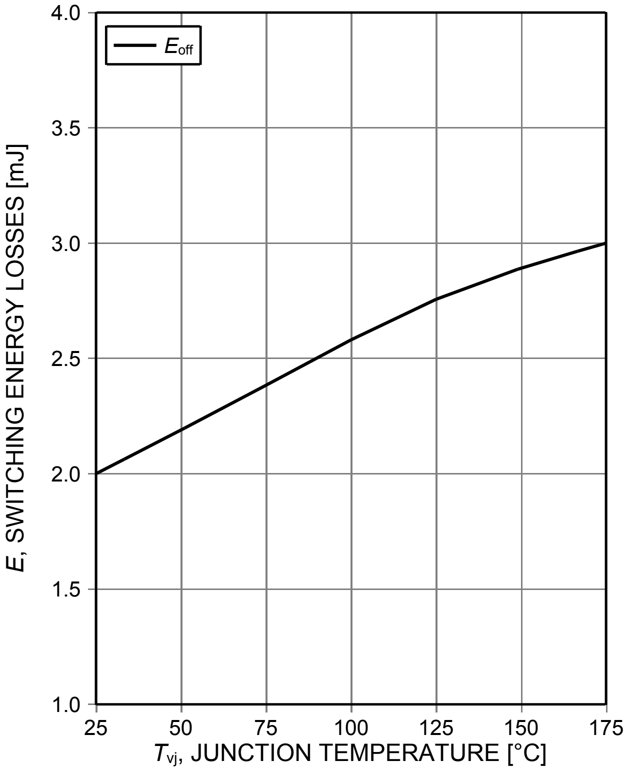


Figure 14. **Typical switching energy losses as a function of junction temperature**
(inductive load, V_{CE}=600V, V_{GE}=15/0V, I_C=30A, r_G=10Ω,Dynamic test circuit in Figure E)

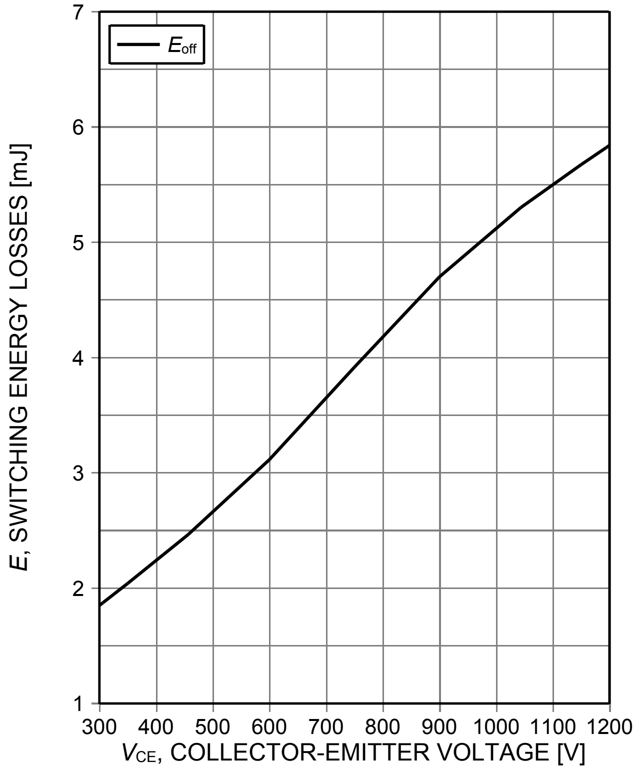


Figure 15. **Typical switching energy losses as a function of collector emitter voltage**
(inductive load, T_{vj}=175°C, V_{GE}=15/0V, I_C=30A, r_G=10Ω,Dynamic test circuit in Figure E)

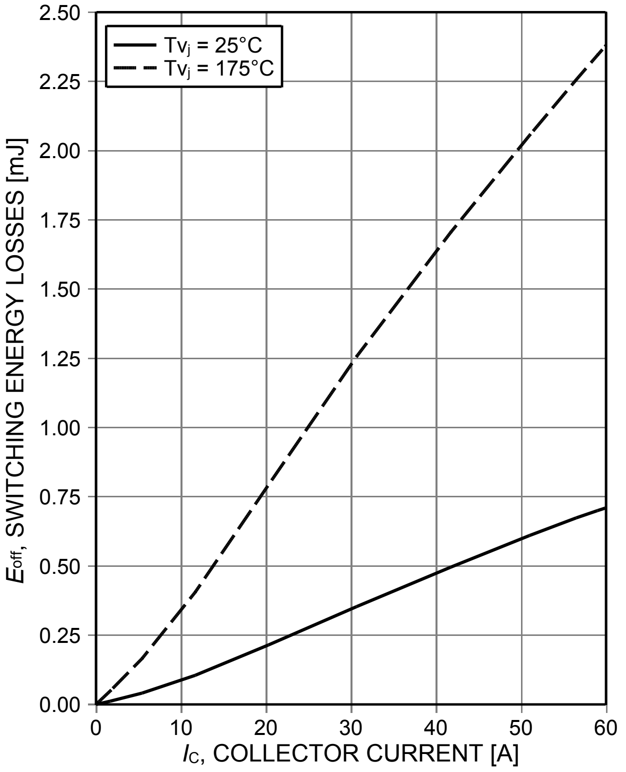


Figure 16. **Typical resonant switching energy losses as a function of collector current**
(inductive load, V_{CE}=600V, V_{GE}=15/0V, r_G=10Ω,Dynamic test circuit in Figure E)

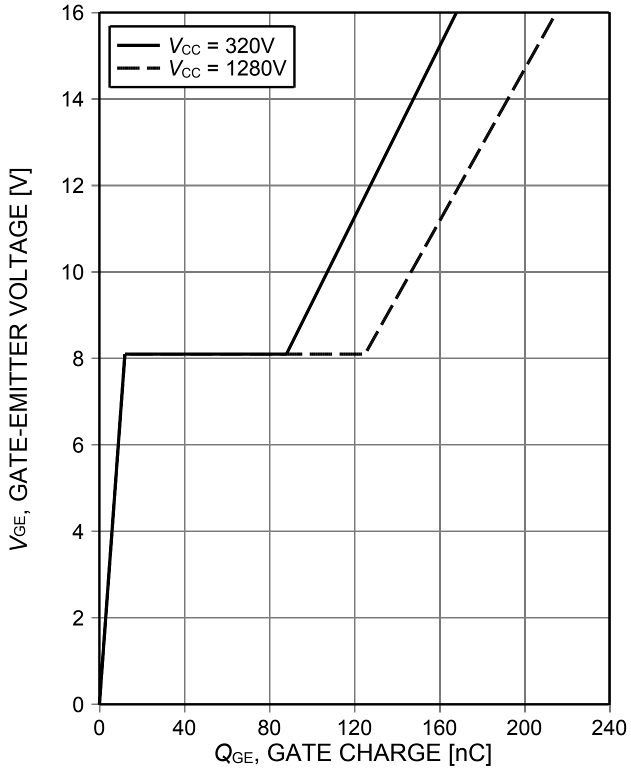


Figure 17. **Typical gate charge**
(I_C=30A)

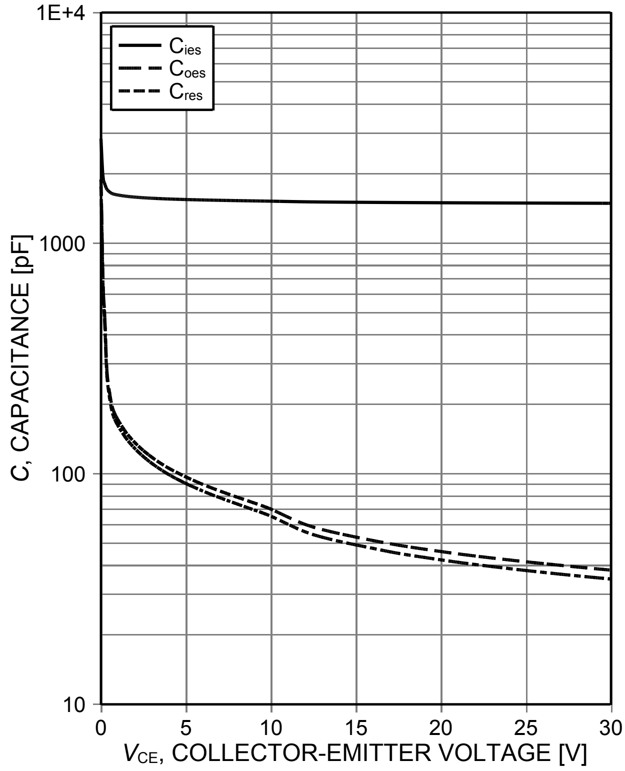
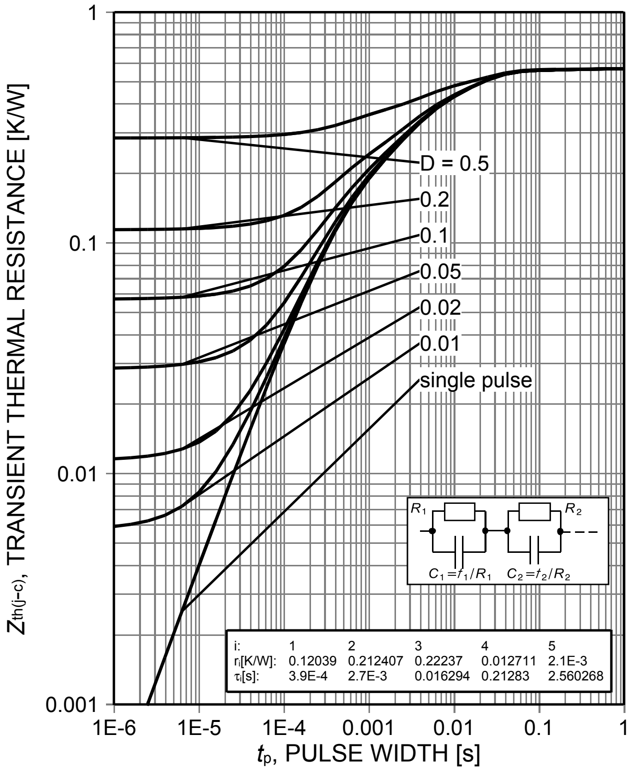
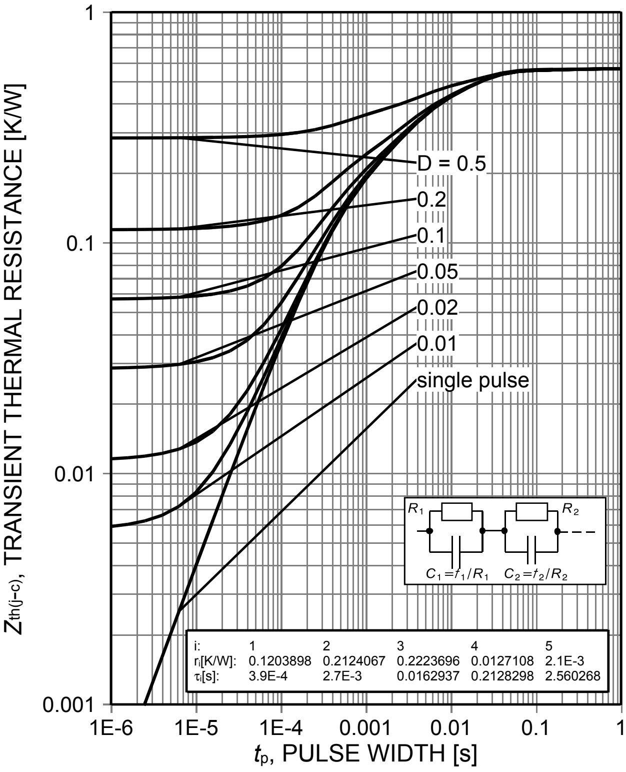


Figure 18. **Typical capacitance as a function of collector-emitter voltage**
(V_{GE}=0V, f=1MHz)



i:	1	2	3	4	5
r_i[K/W]:	0.12039	0.212407	0.22237	0.012711	2.1E-3
τ_i[s]:	3.9E-4	2.7E-3	0.016294	0.21283	2.560268

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



i:	1	2	3	4	5
r_i[K/W]:	0.1203898	0.2124067	0.2223696	0.0127108	2.1E-3
τ_i[s]:	3.9E-4	2.7E-3	0.0162937	0.2128298	2.560268

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

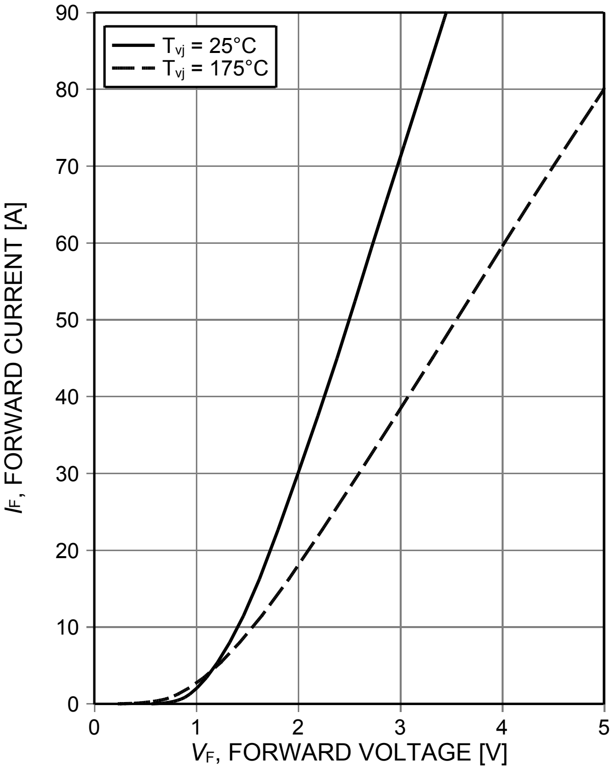


Figure 21. **Typical diode forward current as a function of forward voltage**

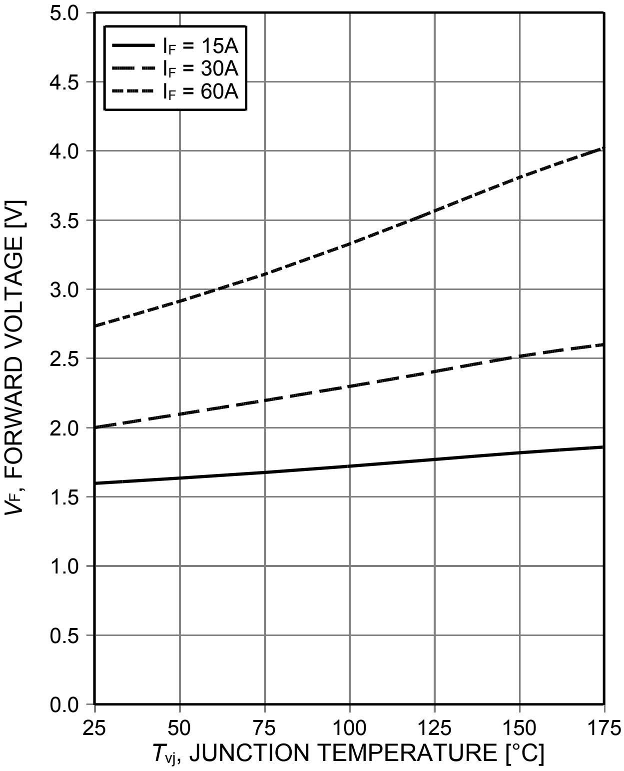
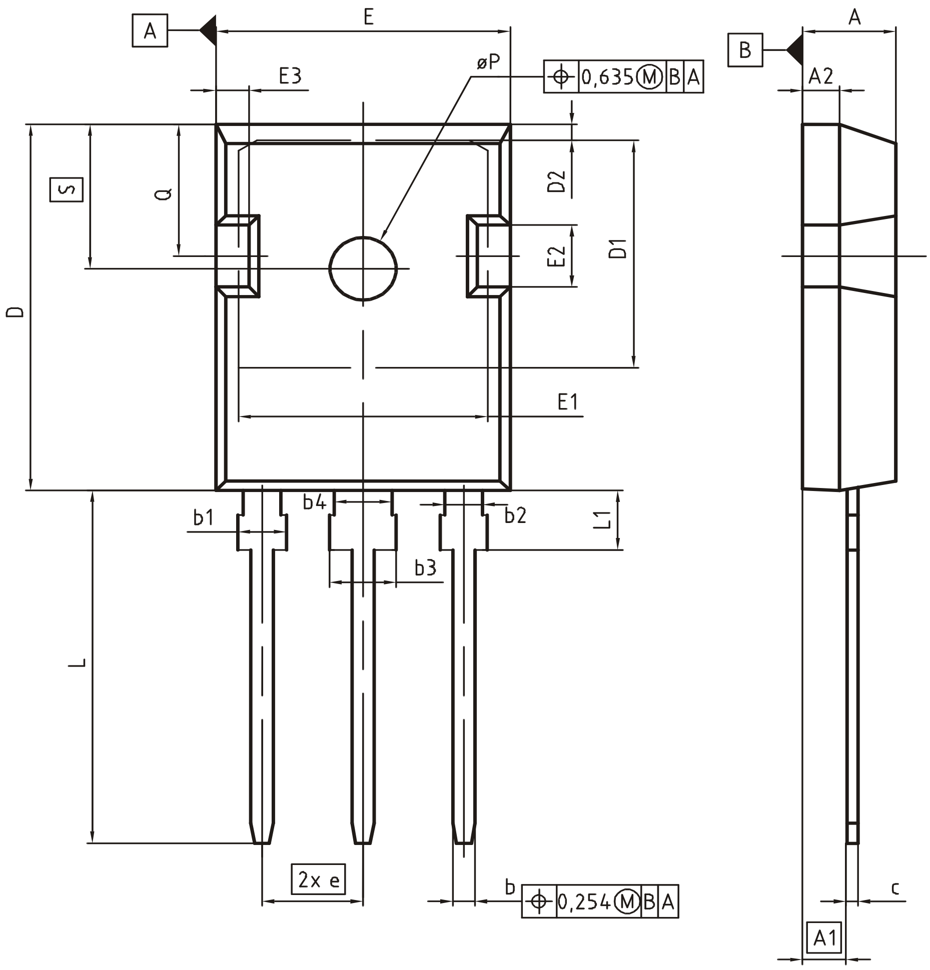


Figure 22. **Typical diode forward voltage as a function of junction temperature**

Package Drawing 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

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EUROPEAN PROJECTION

ISSUE DATE
09-07-2010

REVISION
05

Testing Conditions

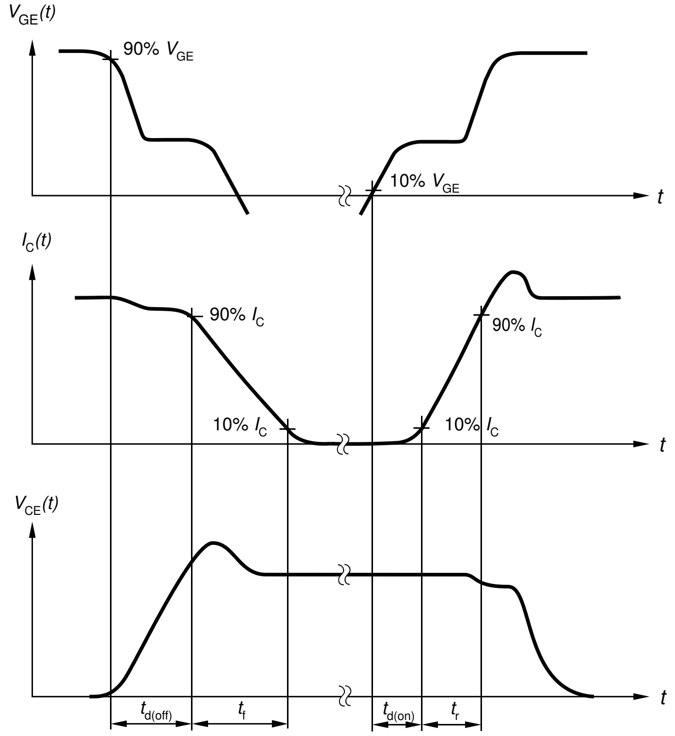

Figure A. **Definition of switching times**

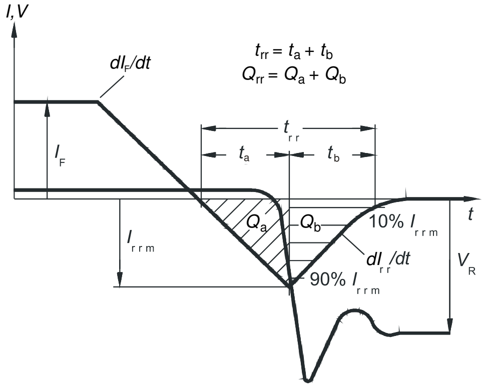

Figure C. **Definition of diode switching characteristics**

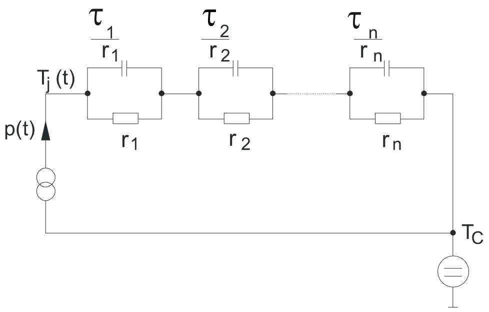

Figure D. **Thermal equivalent circuit**

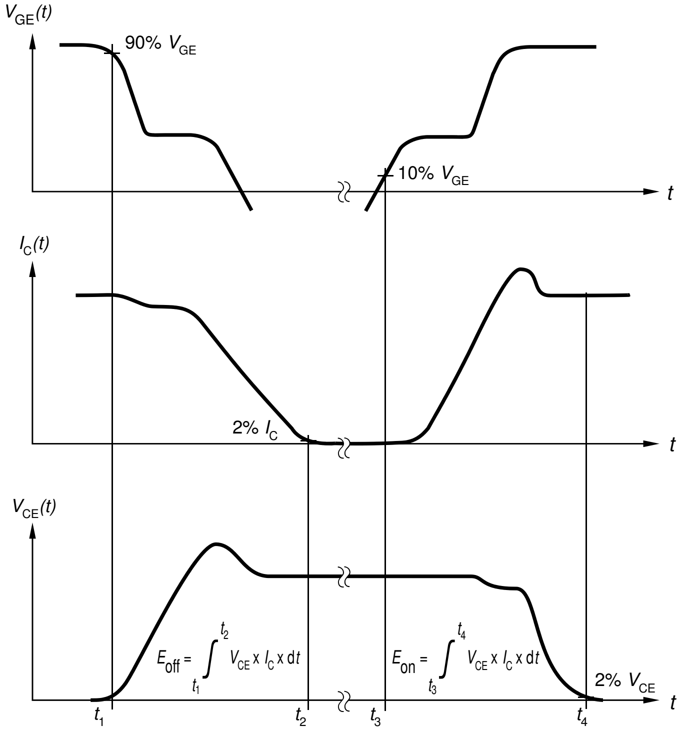

Figure B. **Definition of switching losses**

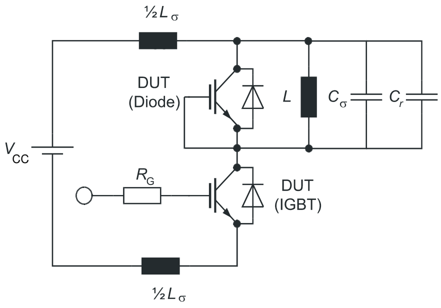

Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

Revision History

IHW30N160R5

Revision: 2018-08-28, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.1	2018-08-28	Final Data Sheet

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- *Входной контроль качества.*
- *Наличие сертификата ISO.*

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- *Регистрацию проекта у производителя компонентов.*
- *Техническую поддержку проекта.*
- *Защиту от снятия компонента с производства.*
- *Оценку стоимости проекта по компонентам.*
- *Изготовление тестовой платы монтаж и пусконаладочные работы.*

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