Resonant Soft-Switching Series

Reverse conducting IGBT with monolithic body Diode for soft-switching

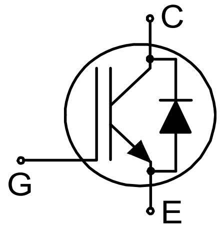
IHW25N120E1

Data sheet

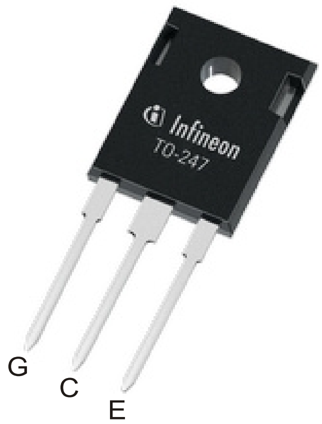
Industrial Power Control

Reverse conducting IGBT with monolithic body diode

Features:



• Powerful monolithic body diode with low forward voltage designed for soft commutation only
• TRENCHSTOP™ 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
• 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

Key Performance and Package Parameters

Type	V_{CE}	I_C	V_{CEsat}, T_{vj}=25°C	T_{vjmax}	Marking	Package
IHW25N120E1	1200V	25A	1.5V	150°C	H25ME1	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}	1200	V
DC collector current, limited by T_{vjmax} T_C = 25°C T_C = 100°C	I_C	50.0 25.0	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	75.0	A
Turn off safe operating area $V_{CE} \leq 1200V$, $T_{vj} \leq 150°C$[1)]	-	75.0	A
Diode forward current, limited by T_{vjmax} T_C = 25°C T_C = 100°C	I_F	50.0 25.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	75.0	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}	231.0 92.4	W
Operating junction temperature	T_{vj}	-40...+150	°C
Storage temperature	T_{stg}	-55...+150	°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	$R_{th(j-c)}$		-	-	0.54	K/W
Diode thermal resistance, junction - case	$R_{th(j-c)}$		-	-	0.54	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		-	-	40	K/W

[1)] dV/dt < 1kV/µs

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

Parameter	Symbol	Conditions	Value min.	Value typ.	Value max.	Unit
Static Characteristic						
Collector-emitter breakdown voltage	$V_{(BR)CES}$	V_{GE} = 0V, I_C = 0.50mA	1200	-	-	V
Collector-emitter saturation voltage	V_{CEsat}	V_{GE} = 15.0V, I_C = 25.0A T_{vj} = 25°C T_{vj} = 100°C T_{vj} = 150°C	- - -	1.50 1.65 1.75	2.00 - -	V
Diode forward voltage	V_F	V_{GE} = 0V, I_F = 25.0A T_{vj} = 25°C T_{vj} = 100°C T_{vj} = 150°C	- - -	1.90 2.15 2.35	2.50 - -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C = 0.80mA, V_{CE} = V_{GE}	4.0	5.8	8.0	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V T_{vj} = 25°C T_{vj} = 150°C	- -	- 500	100 -	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = 20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE} = 20V, I_C = 25.0A	-	23.0	-	S
Integrated gate resistor	r_G			8.5		Ω

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

Parameter	Symbol	Conditions	Value min.	Value typ.	Value max.	Unit
Dynamic Characteristic						
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	1300	-	pF
Output capacitance	C_{oes}		-	37	-	
Reverse transfer capacitance	C_{res}		-	31	-	
Gate charge	Q_G	V_{CC} = 960V, I_C = 25.0A, V_{GE} = 15V	-	147.0	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13.0	-	nH

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value min.	Value typ.	Value max.	Unit
IGBT Characteristic, at T_{vj} = 25°C						
Turn-off delay time	$t_{d(off)}$	T_{vj} = 25°C, V_{CC} = 105V, I_C = 25.0A, V_{GE} = 0.0/18.0V, $R_{G(off)}$ = 10.2Ω Energy losses include “tail” according Figure B. (Test circuit Figure E, C_r = 300nF).	-	229	-	ns
Fall time	t_f		-	1020	-	ns
Turn-off energy, soft switching	E_{off}	dv/dt = 83.0V/µs	-	0.08	-	mJ

Turn-off delay time	$t_{d(off)}$	T_{vj} = 25°C, V_{CC} = 210V, I_C = 50.0A, V_{GE} = 0.0/18.0V, $R_{G(off)}$ = 10.2Ω Energy losses include “tail” according Figure B. (Test circuit Figure E, C_r = 300nF).	-	249	-	ns
Fall time	t_f		-	850	-	ns
Turn-off energy, soft switching	E_{off}	dv/dt = 166.0V/µs	-	0.24	-	mJ

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic, at T_{vj} = 150°C						
Turn-off delay time	$t_{d(off)}$	T_{vj} = 150°C, V_{CC} = 105V, I_C = 25.0A, V_{GE} = 0.0/18.0V, $R_{G(off)}$ = 10.2Ω Energy losses include “tail” according Figure B. (Test circuit Figure E, C_r = 300nF).	-	240	-	ns
Fall time	t_f		-	1764	-	ns
Turn-off energy, soft switching	E_{off}	dv/dt = 83.0V/µs	-	0.19	-	mJ
Turn-off delay time	$t_{d(off)}$	T_{vj} = 150°C, V_{CC} = 210V, I_C = 50.0A, V_{GE} = 0.0/18.0V, $R_{G(off)}$ = 10.2Ω Energy losses include “tail” according Figure B. (Test circuit Figure E, C_r = 300nF).	-	253	-	ns
Fall time	t_f		-	1424	-	ns
Turn-off energy, soft switching	E_{off}	dv/dt = 166.0V/µs	-	0.52	-	mJ

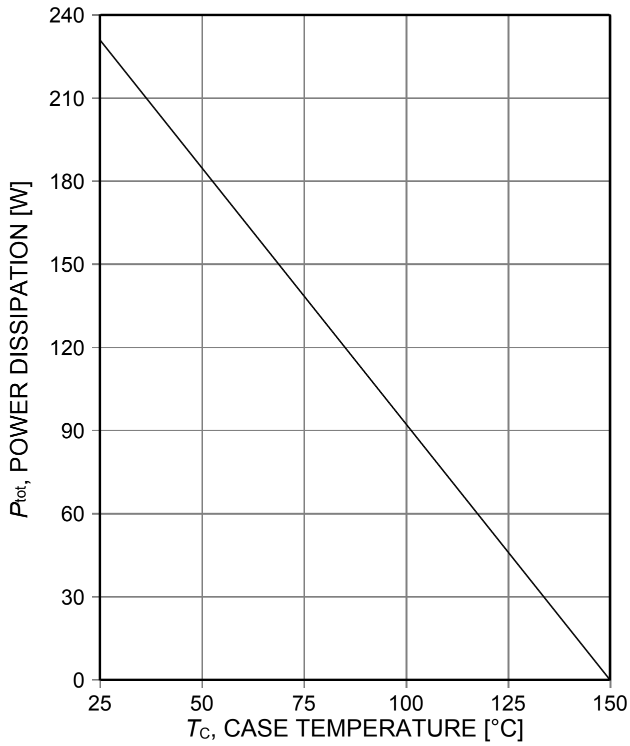


Figure 1. **Power dissipation as a function of case temperature**
(T_{vj}≤150°C)

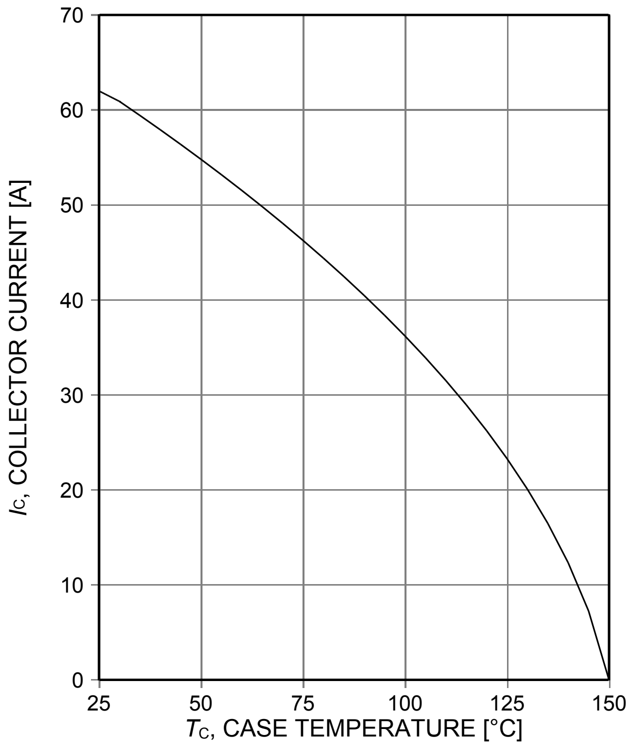


Figure 2. **Collector current as a function of case temperature**
(V_{GE}≥15V, T_{vj}≤150°C)

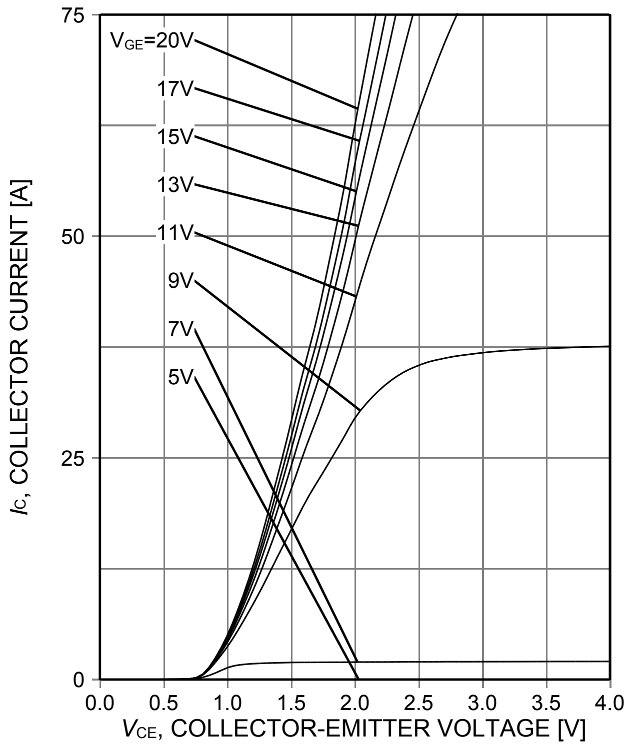


Figure 3. **Typical output characteristic**
(T_{vj}=25°C)

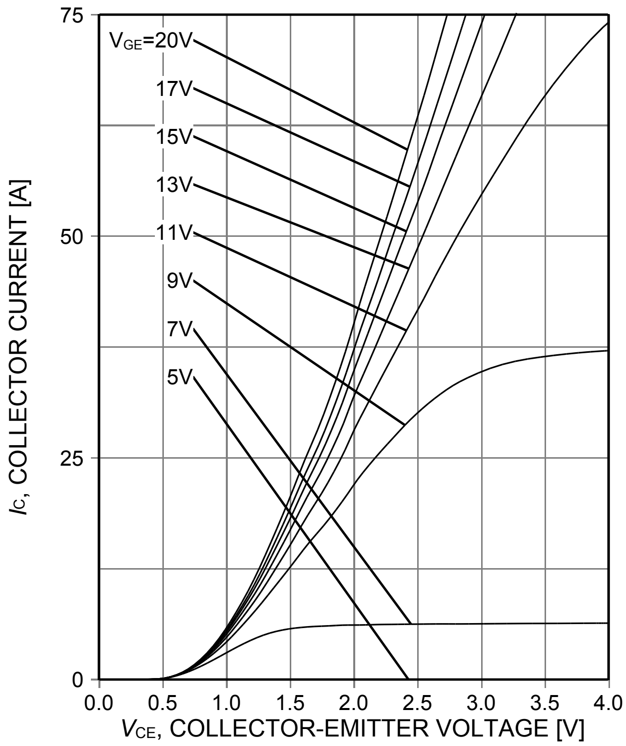


Figure 4. **Typical output characteristic**
(T_{vj}=150°C)

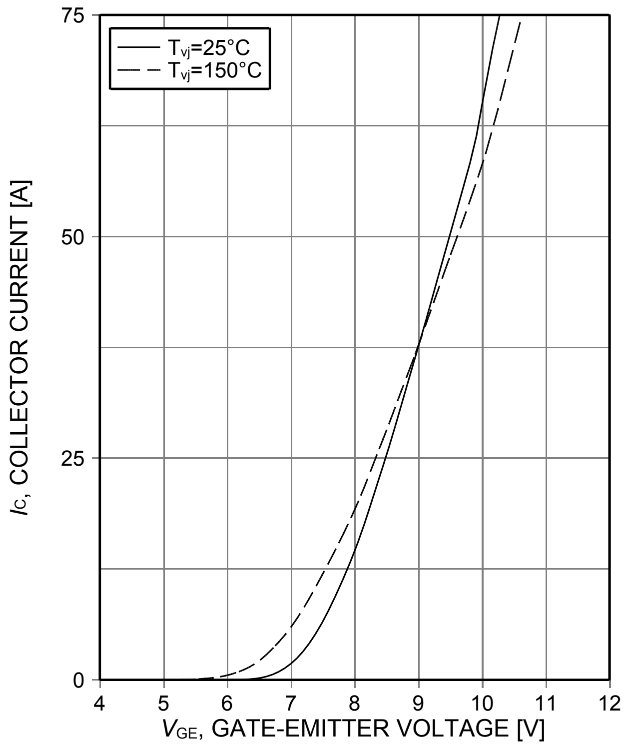


Figure 5. **Typical transfer characteristic**
(V_{CE}=20V)

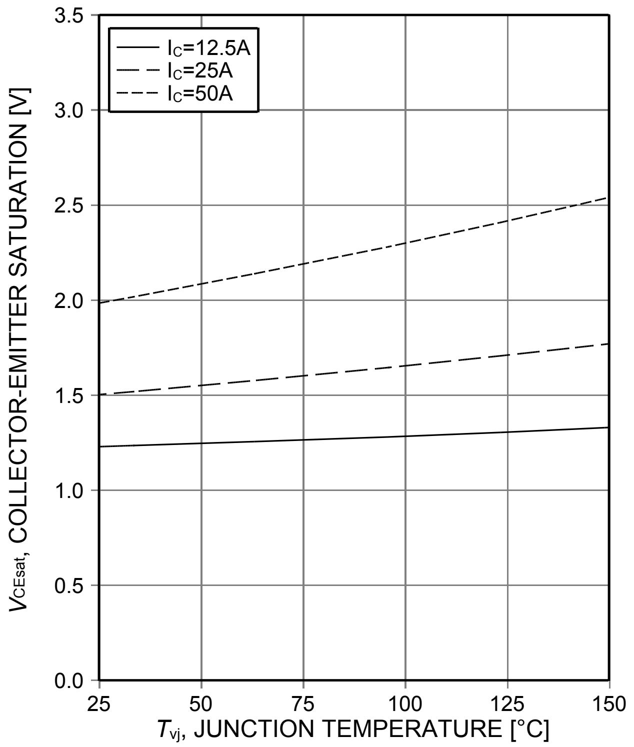


Figure 6. **Typical collector-emitter saturation voltage as a function of junction temperature**
(V_{GE}=15V)

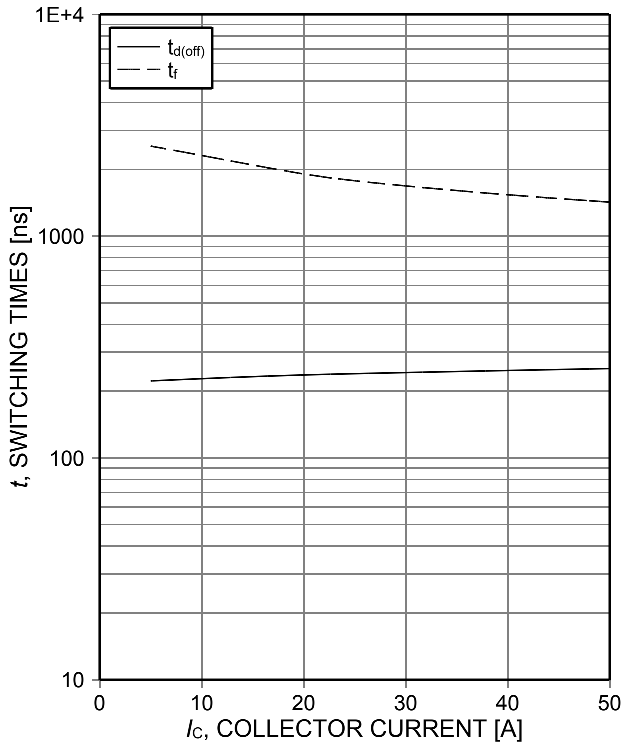


Figure 7. **Typical switching times as a function of collector current**
(inductive load, T_{vj}=150°C, V_{GE}=0/18V, R_G=10.2Ω, Dynamic test circuit in Figure E)

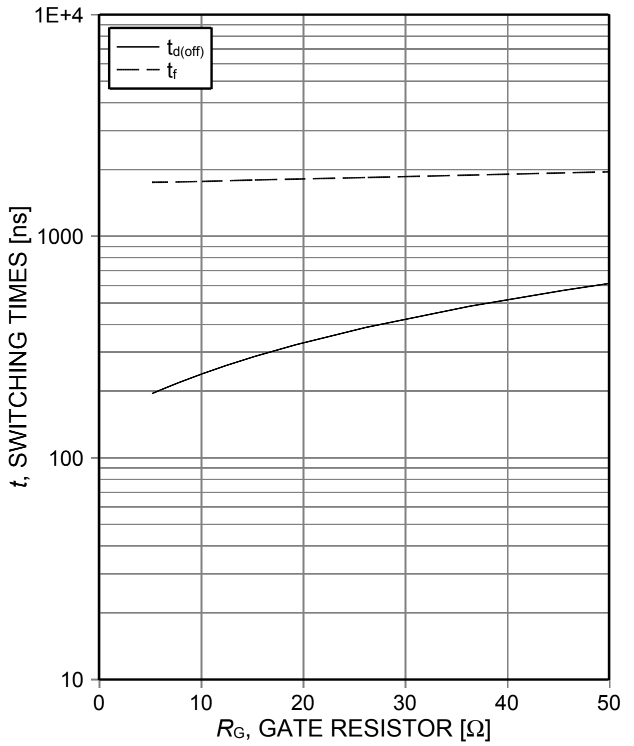


Figure 8. **Typical switching times as a function of gate resistance**
(inductive load, T_{vj}=150°C, V_{GE}=0/18V, I_C=25A, Dynamic test circuit in Figure E)

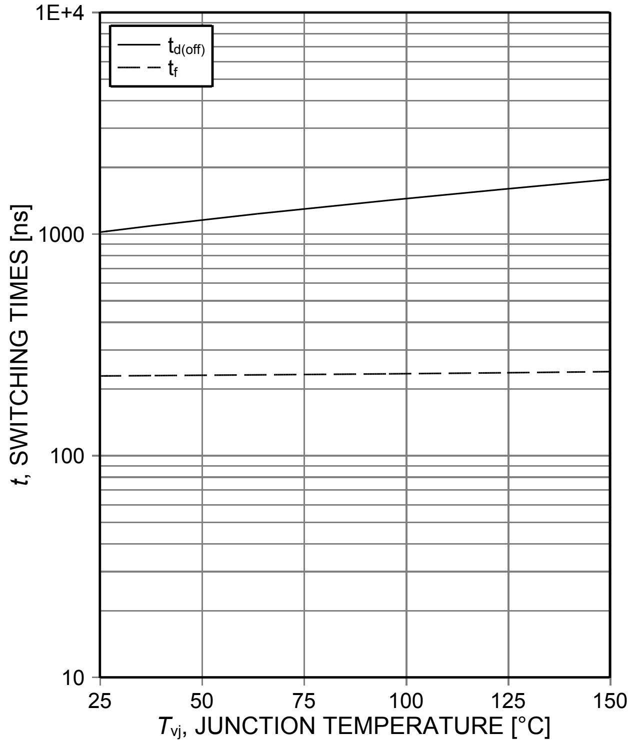


Figure 9. **Typical switching times as a function of junction temperature**
(inductive load, V_{GE}=0/18V, I_C=25A, R_G=10.2Ω, Dynamic test circuit in Figure E)

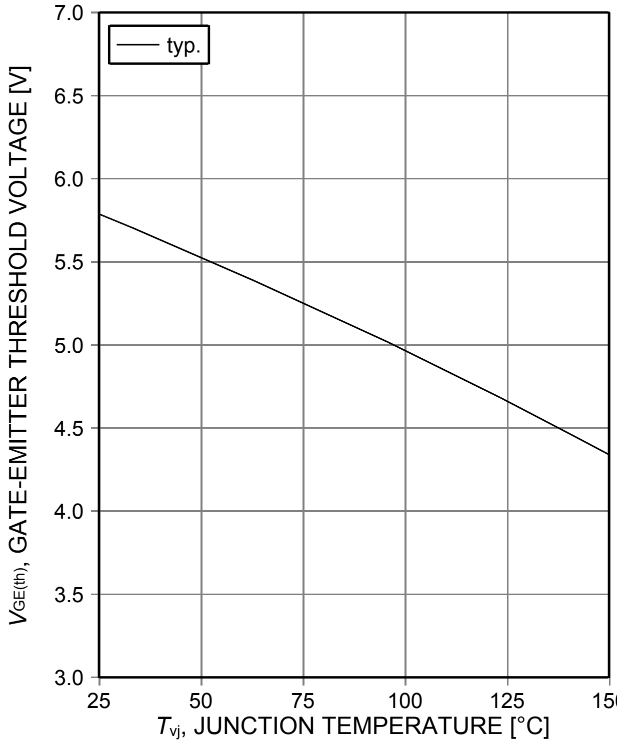


Figure 10. **Gate-emitter threshold voltage as a function of junction temperature**
(I_C=0.8mA)

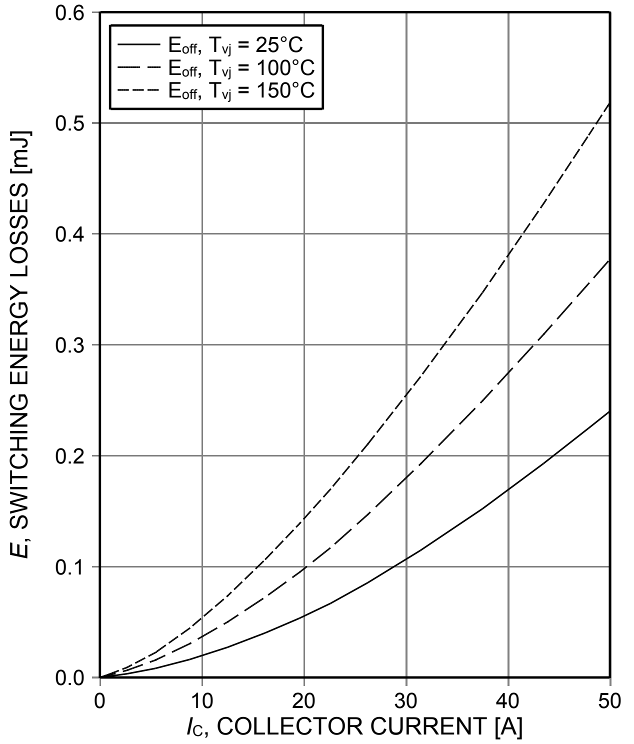


Figure 11. **Typical switching energy losses as a function of collector current**
(inductive load, V_{GE}=0/18V, R_G=10.2Ω, Dynamic test circuit in Figure E)

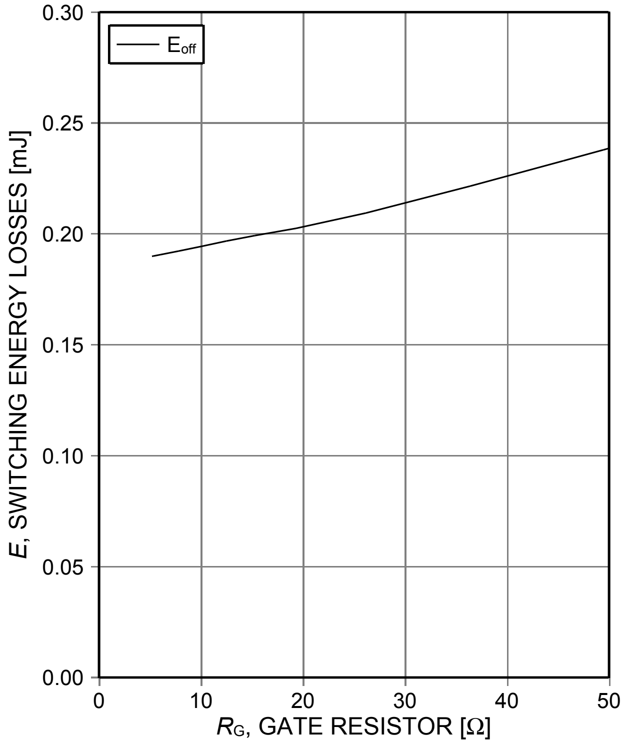


Figure 12. **Typical switching energy losses as a function of gate resistance**
(inductive load, T_{vj}=150°C, V_{GE}=0/18V, I_C=25A, Dynamic test circuit in Figure E)

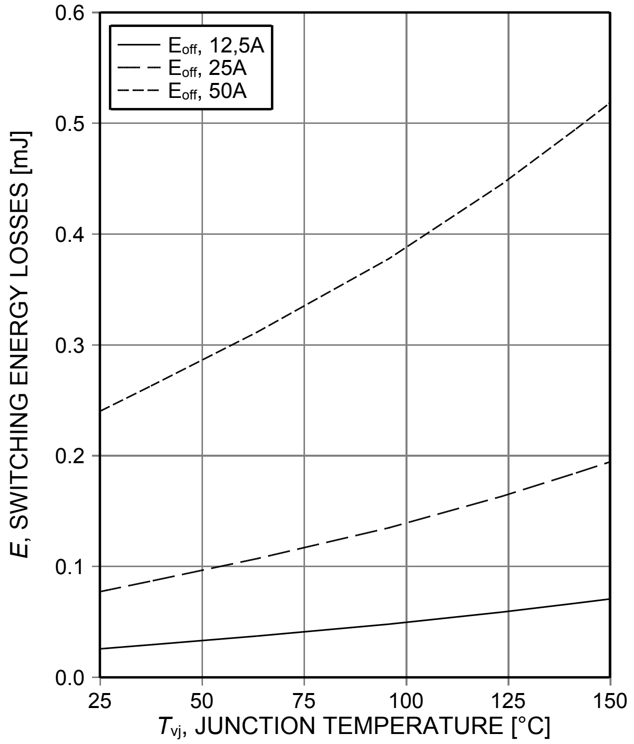


Figure 13. **Typical switching energy losses as a function of junction temperature**
(inductive load, V_{GE}=0/18V, I_C=25A, R_G=10.2Ω, Dynamic test circuit in Figure E)

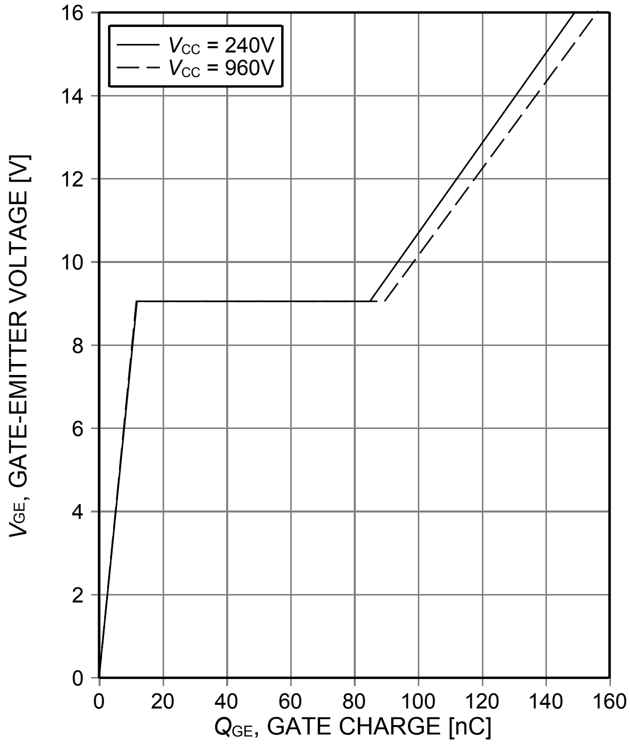


Figure 14. **Typical gate charge**
(I_C=25A)

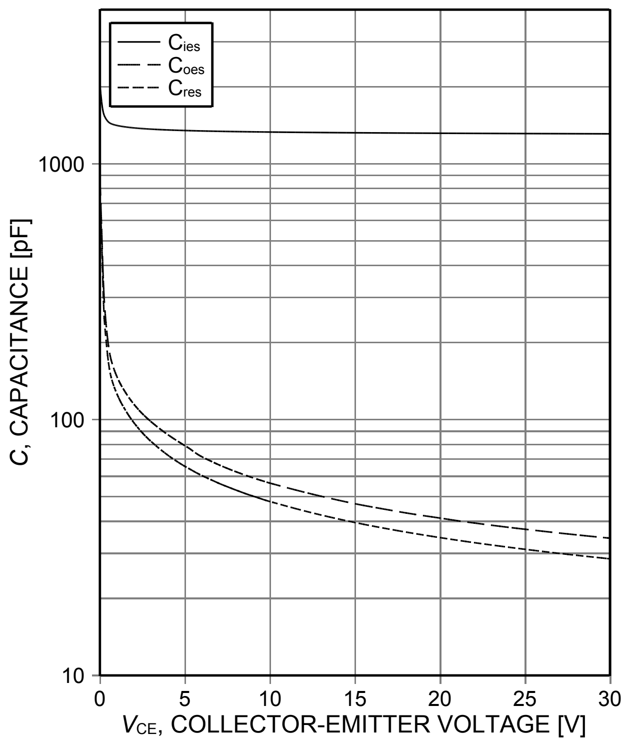


Figure 15. **Typical capacitance as a function of collector-emitter voltage**
(V_{GE}=0V, f=1MHz)

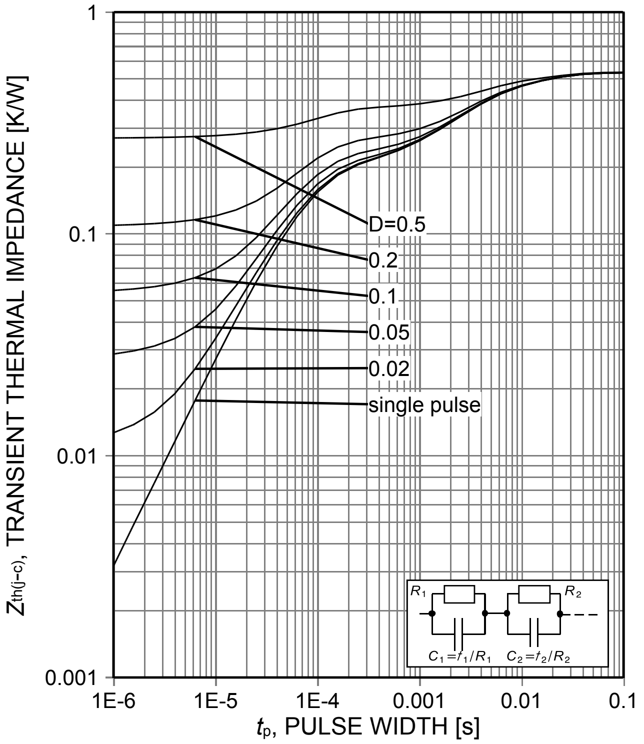


Figure 16. **IGBT / Diode transient thermal impedance**
(D=t_p/T)

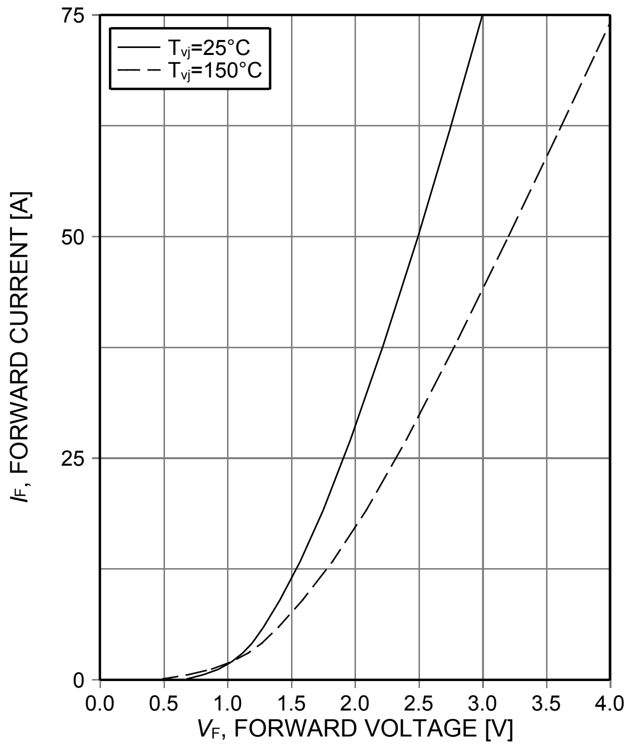


Figure 17. **Typical diode forward current as a function of forward voltage**

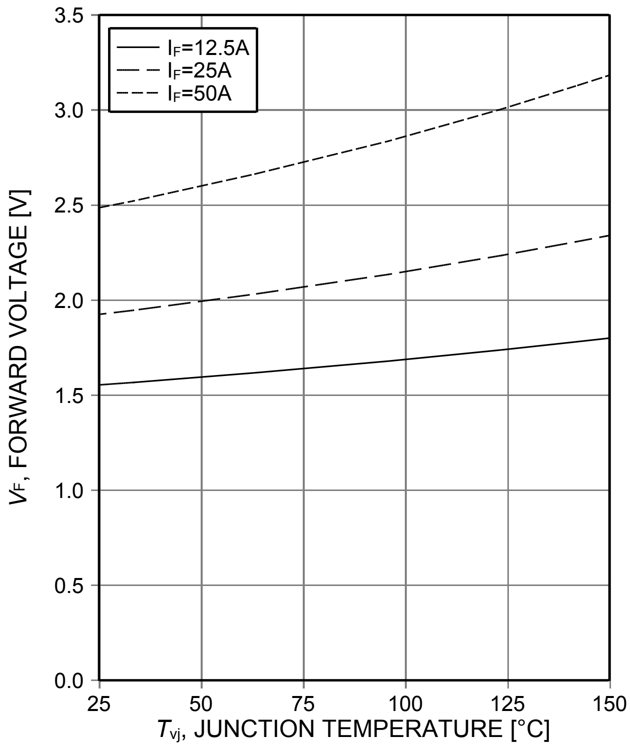
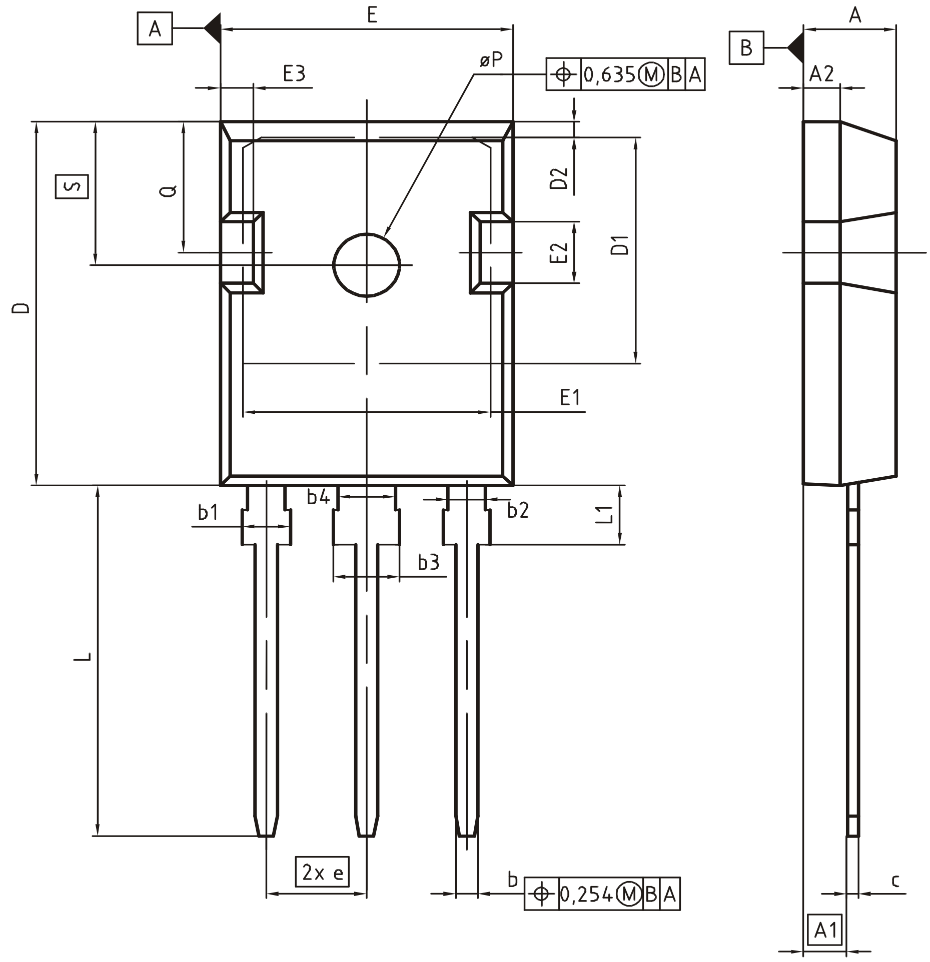


Figure 18. **Typical diode forward voltage as a function of junction temperature**

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

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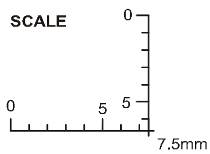
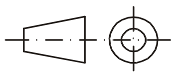
SCALE



EUROPEAN PROJECTION



ISSUE DATE
09-07-2010

REVISION
05

Testing Conditions

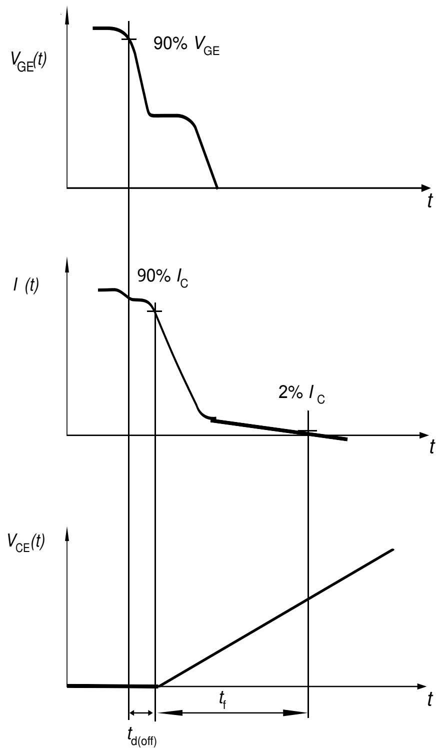


Figure A. **Definition of switching times**

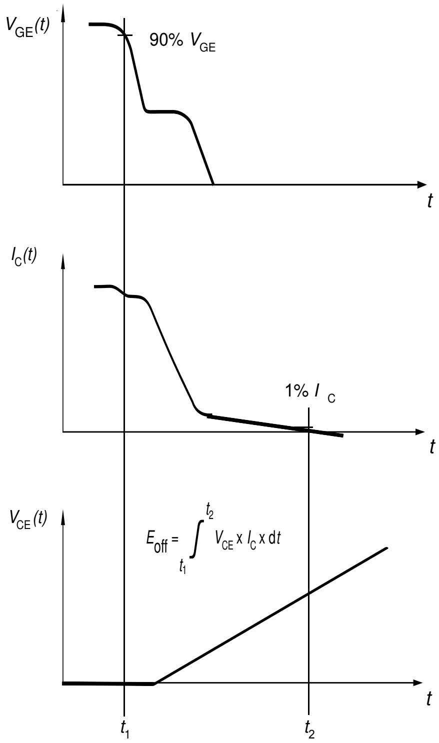


Figure B. **Definition of switching losses**

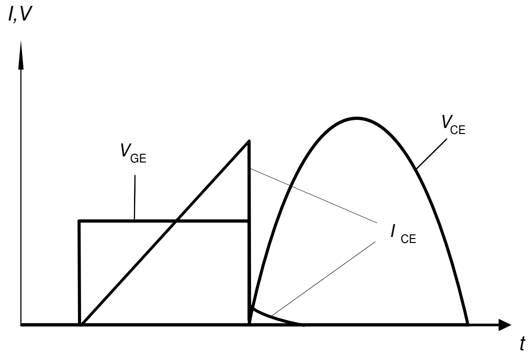


Figure C. **Typical switching behavior in resonant applications**

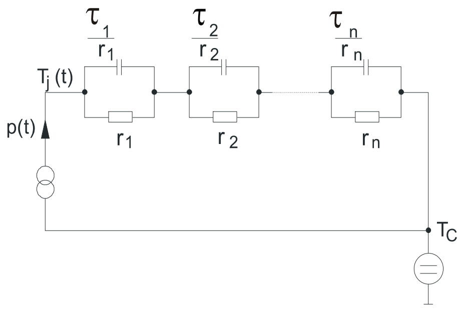


Figure D. **Thermal equivalent circuit**

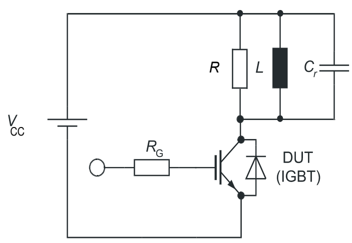


Figure E. **Dynamic test circuit**
Resonant capacitor, C_r
Damping resistor, R

Revision History

IHW25N120E1

Revision: 2016-07-29, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.1	2016-07-29	Final data sheet

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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

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