

## Induction Heating Series

Reverse conducting IGBT with monolithic body diode

### IHW30N135R3

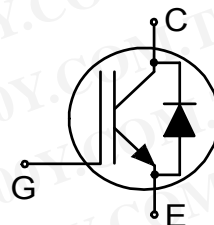
Datasheet

勝特力材料 886-3-5753170  
勝特力电子(上海) 86-21-34970699  
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### Reverse conducting IGBT with monolithic body diode

#### Features:

- Offers new higher breakdown voltage to 1350V for improved reliability
- Powerful monolithic body diode with low forward voltage designed for soft commutation only
- TRENCHSTOP™ technology offering:
  - 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 JESD-022 for target applications
- Pb-free lead plating; RoHS compliant
- Halogen free (according to IEC 61249-2-21)
- Complete product spectrum and PSpice Models:  
<http://www.infineon.com/igbt/>



#### Applications:

- Inductive cooking

#### Package pin definition:

- Pin 1 - gate
- Pin 2 & backside - collector
- Pin 3 - emitter



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#### Key Performance and Package Parameters

Type	$V_{CE}$	$I_C$	$V_{CEsat}, T_{vj}=25^{\circ}C$	$T_{vjmax}$	Marking	Package
IHW30N135R3	1350V	30A	1.65V	175°C	H30R1353	PG-TO247-3

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**Maximum ratings**

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{CE}$	1350	V
DC collector current, limited by $T_{vjmax}$ $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	$I_C$	60.0 30.0	A
Pulsed collector current, $t_p$ limited by $T_{vjmax}$	$I_{Cpuls}$	90.0	A
Turn off safe operating area $V_{CE} \leq 1350\text{V}$ , $T_{vj} \leq 175^\circ\text{C}$	-	90.0	A
Diode forward current, limited by $T_{vjmax}$ $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	$I_F$	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 ( $t_p \leq 10\mu\text{s}$ , $D < 0.010$ )	$V_{GE}$	$\pm 20$ $\pm 25$	V
Power dissipation $T_C = 25^\circ\text{C}$ Power dissipation $T_C = 100^\circ\text{C}$	$P_{tot}$	349.0 175.0	W
Operating junction temperature	$T_{vj}$	-40...+175	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55...+175	$^\circ\text{C}$
Soldering temperature, wave soldering 1.6 mm (0.063 in.) from case for 10s		260	$^\circ\text{C}$
Mounting torque, M3 screw Maximum of mounting processes: 3	$M$	0.6	Nm

**Thermal Resistance**

Parameter	Symbol	Conditions	Max. Value	Unit
<b>Characteristic</b>				
IGBT thermal resistance, junction - case	$R_{th(j-c)}$		0.43	K/W
Diode thermal resistance, junction - case	$R_{th(j-c)}$		0.43	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		40	K/W

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## Induction Heating Series

Electrical Characteristic, at  $T_{vj} = 25^{\circ}\text{C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
<b>Static Characteristic</b>						
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE} = 0\text{V}, I_C = 0.50\text{mA}$	1350	-	-	V
Collector-emitter saturation voltage	$V_{CEsat}$	$V_{GE} = 15.0\text{V}, I_C = 30.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	-	1.65 1.90 2.00	1.85 - -	V
Diode forward voltage	$V_F$	$V_{GE} = 0\text{V}, I_F = 30.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	-	1.65 1.80 1.90	1.85 - -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C = 0.75\text{mA}, V_{CE} = V_{GE}$	5.1	5.8	6.4	V
Zero gate voltage collector current	$I_{CES}$	$V_{CE} = 1350\text{V}, V_{GE} = 0\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	-	-	100.0 2500.0	$\mu\text{A}$
Gate-emitter leakage current	$I_{GES}$	$V_{CE} = 0\text{V}, V_{GE} = 20\text{V}$	-	-	100	nA
Transconductance	$g_{fs}$	$V_{CE} = 20\text{V}, I_C = 30.0\text{A}$	-	25.6	-	S
Integrated gate resistor	$r_G$			none		$\Omega$

Electrical Characteristic, at  $T_{vj} = 25^{\circ}\text{C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
<b>Dynamic Characteristic</b>						
Input capacitance	$C_{ies}$	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$	-	2066	-	pF
Output capacitance	$C_{oes}$		-	67	-	
Reverse transfer capacitance	$C_{res}$		-	58	-	
Gate charge	$Q_G$	$V_{CC} = 1080\text{V}, I_C = 30.0\text{A},$ $V_{GE} = 15\text{V}$	-	263.0	-	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  $T_{vj} = 25^{\circ}\text{C}$

Turn-off delay time	$t_{d(off)}$	$T_{vj} = 25^{\circ}\text{C},$	-	337	-	ns
Fall time	$t_f$	$V_{CC} = 600\text{V}, I_C = 30.0\text{A},$ $V_{GE} = 0.0/15.0\text{V},$	-	47	-	ns
Turn-off energy	$E_{off}$	$r_G = 10.0\Omega, L\sigma = 220\text{nH},$ $C\sigma = 40\text{pF}$ $L\sigma, C\sigma$ from Fig. E Energy losses include "tail" and diode reverse recovery.	-	1.93	-	mJ
Turn-off energy, soft switching	$E_{off}$	$dv/dt = 150.0\text{V}/\mu\text{s}$	-	0.41	-	mJ

### Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
<b>IGBT Characteristic, at <math>T_{vj} = 175^{\circ}\text{C}</math></b>						
Turn-off delay time	$t_{d(off)}$	$T_{vj} = 175^{\circ}\text{C}$ ,	-	410	-	ns
Fall time	$t_f$	$V_{CC} = 600\text{V}$ , $I_C = 30.0\text{A}$ , $V_{GE} = 0.0/15.0\text{V}$ ,	-	100	-	ns
Turn-off energy	$E_{off}$	$r_G = 10.0\Omega$ , $L\sigma = 220\text{nH}$ , $C\sigma = 40\text{pF}$ $L\sigma$ , $C\sigma$ from Fig. E Energy losses include "tail" and diode reverse recovery.	-	3.50	-	mJ
Turn-off energy, soft switching	$E_{off}$	$dv/dt = 150.0\text{V}/\mu\text{s}$	-	0.82	-	mJ

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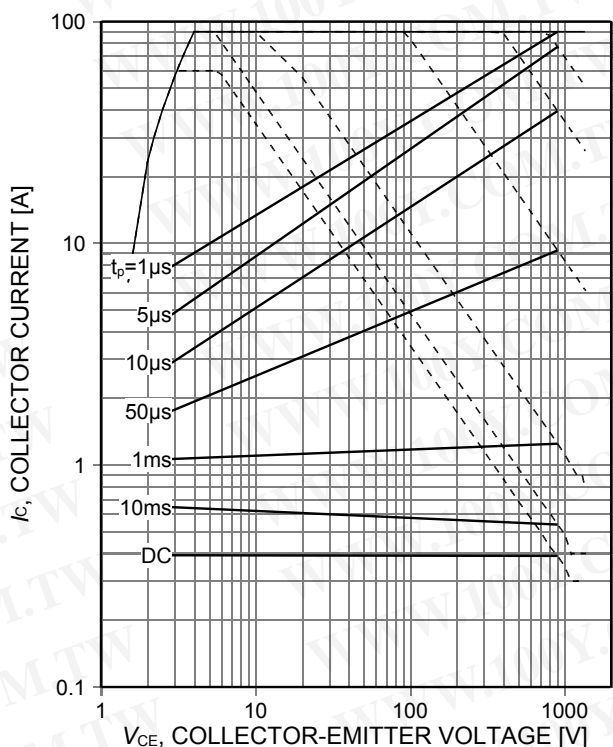


Figure 1. **Forward bias safe operating area**  
 ( $D=0$ ,  $T_C=25^\circ\text{C}$ ,  $T_{vj}\leq 175^\circ\text{C}$ ;  $V_{GE}=15\text{V}$ )

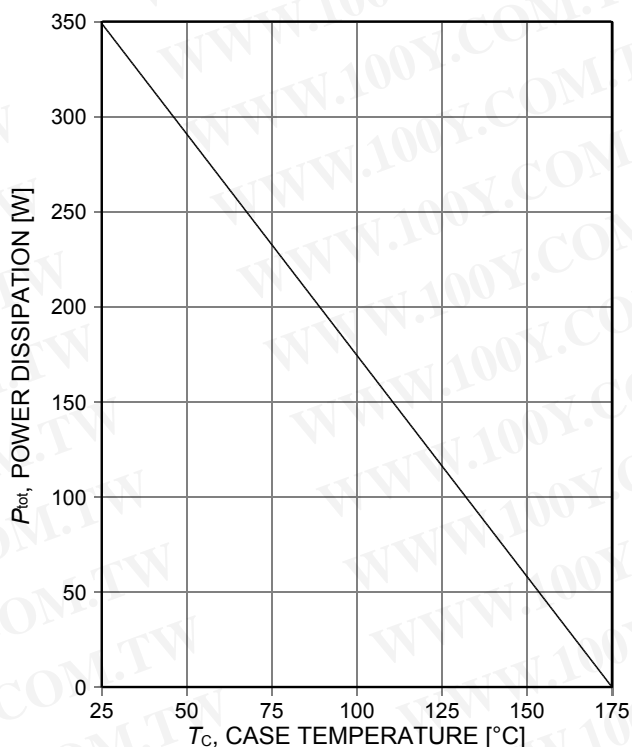


Figure 2. **Power dissipation as a function of case temperature**  
 ( $T_{vj}\leq 175^\circ\text{C}$ )

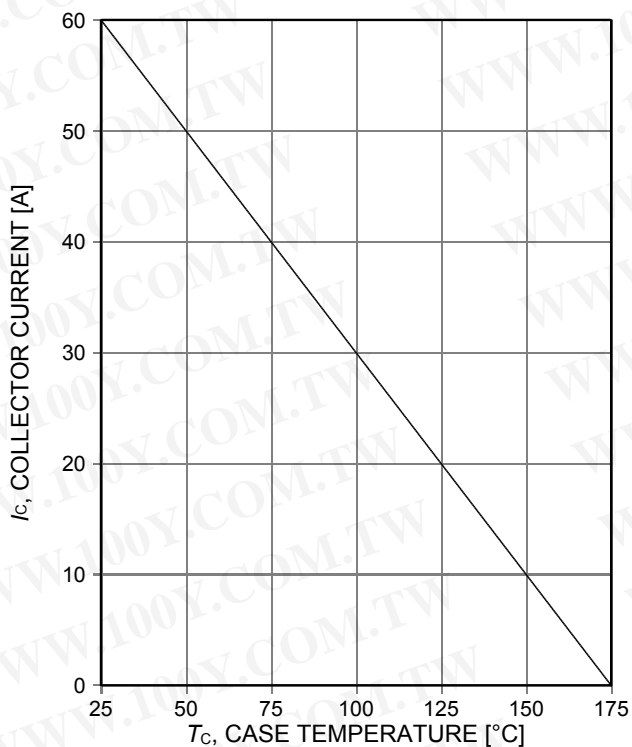


Figure 3. **Collector current as a function of case temperature**  
 ( $V_{GE}\geq 15\text{V}$ ,  $T_{vj}\leq 175^\circ\text{C}$ )

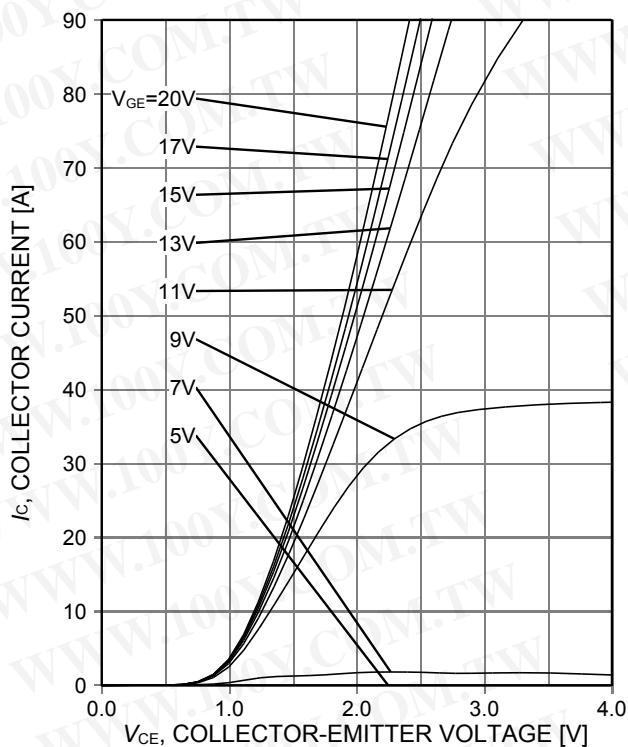


Figure 4. **Typical output characteristic**  
 ( $T_{vj}=25^\circ\text{C}$ )



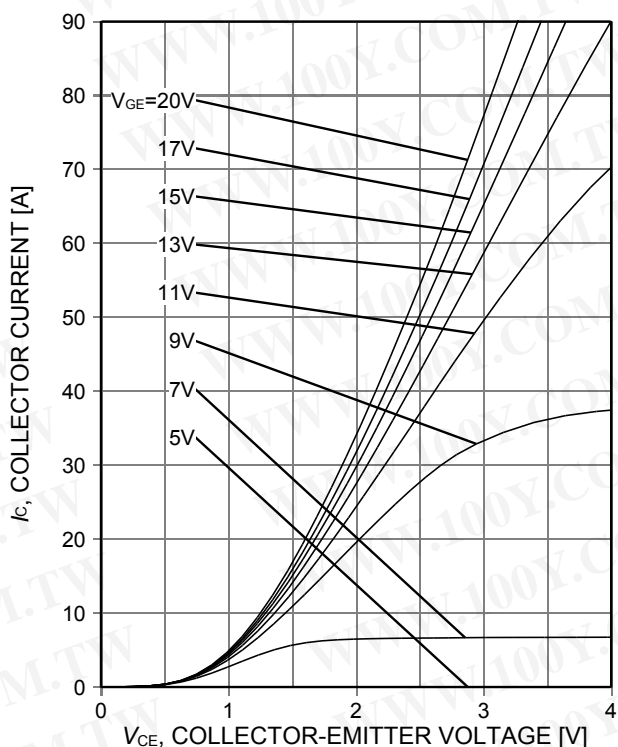


Figure 5. Typical output characteristic ( $T_{vj}=175^{\circ}\text{C}$ )

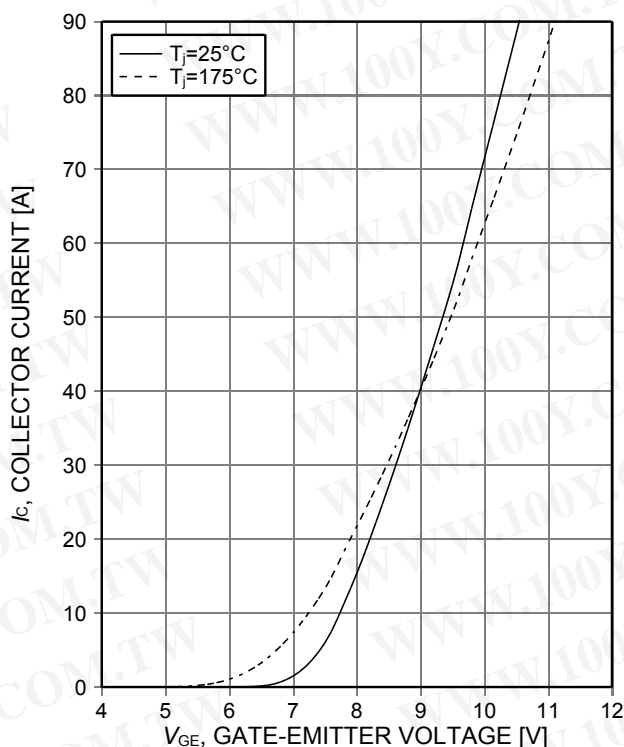


Figure 6. Typical transfer characteristic ( $V_{CE}=20\text{V}$ )

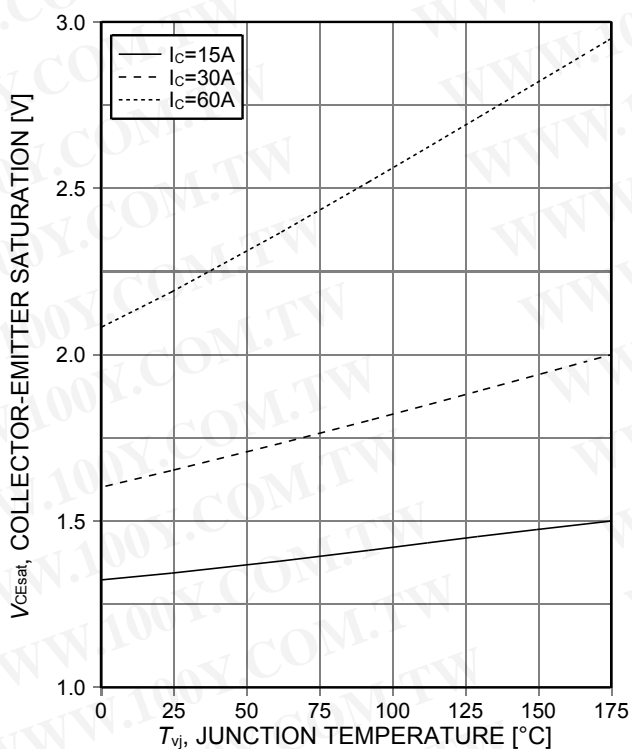


Figure 7. Typical collector-emitter saturation voltage as a function of junction temperature ( $V_{GE}=15\text{V}$ )

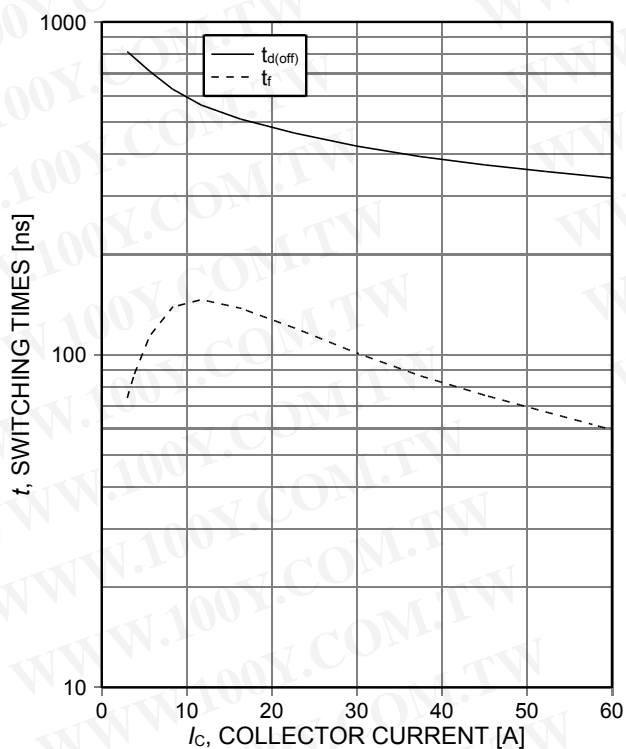


Figure 8. Typical switching times as a function of collector current (inductive load,  $T_{vj}=175^{\circ}\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{GE}=15/0\text{V}$ ,  $r_G=10\Omega$ , Dynamic test circuit in Figure E)



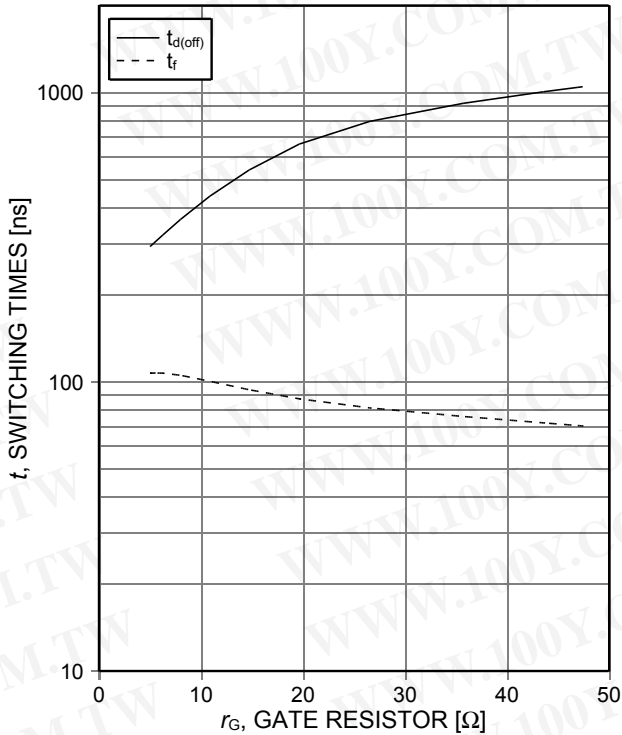


Figure 9. **Typical switching times as a function of gate resistor**  
 (inductive load,  $T_{vj}=175^\circ\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{GE}=15/0\text{V}$ ,  $I_C=30\text{A}$ , Dynamic test circuit in Figure E)

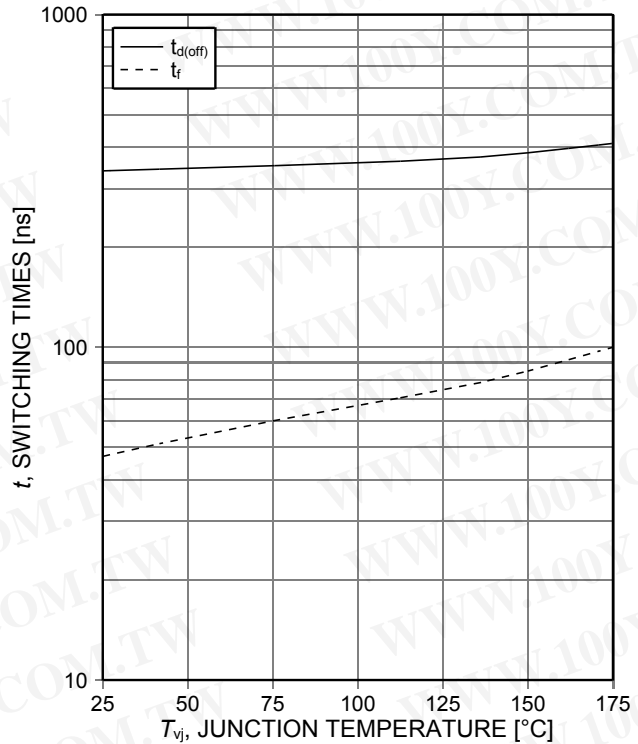


Figure 10. **Typical switching times as a function of junction temperature**  
 (inductive load,  $V_{CE}=600\text{V}$ ,  $V_{GE}=15/0\text{V}$ ,  $I_C=30\text{A}$ ,  $r_G=10\Omega$ , Dynamic test circuit in Figure E)

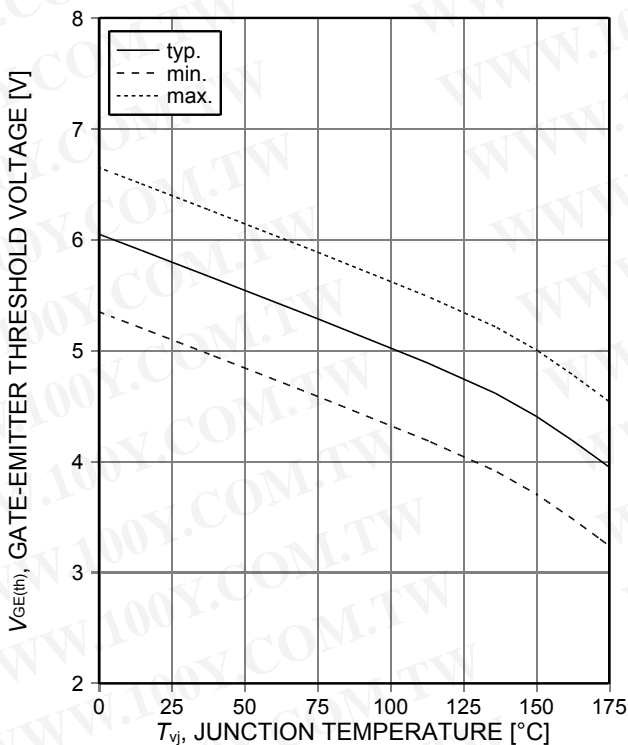


Figure 11. **Gate-emitter threshold voltage as a function of junction temperature**  
 ( $I_C=0.75\text{mA}$ )

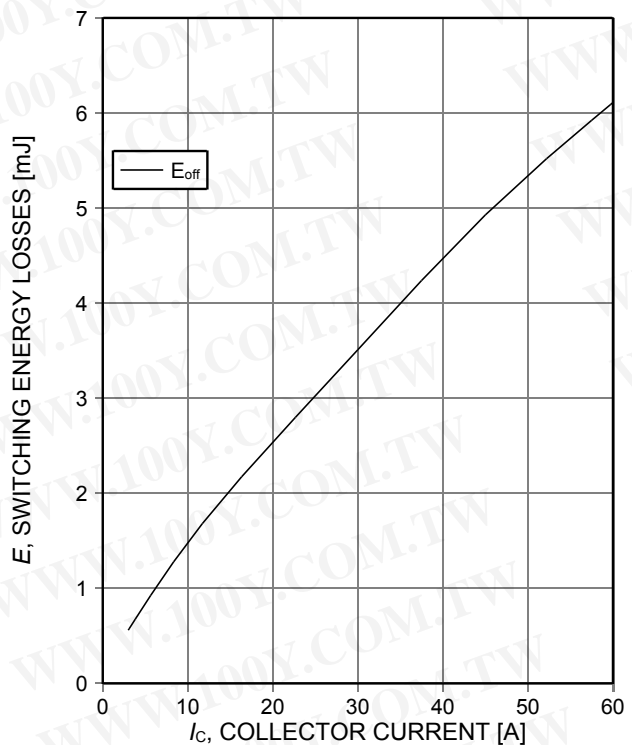


Figure 12. **Typical switching energy losses as a function of collector current**  
 (inductive load,  $T_{vj}=175^\circ\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{GE}=15/0\text{V}$ ,  $r_G=10\Omega$ , Dynamic test circuit in Figure E)

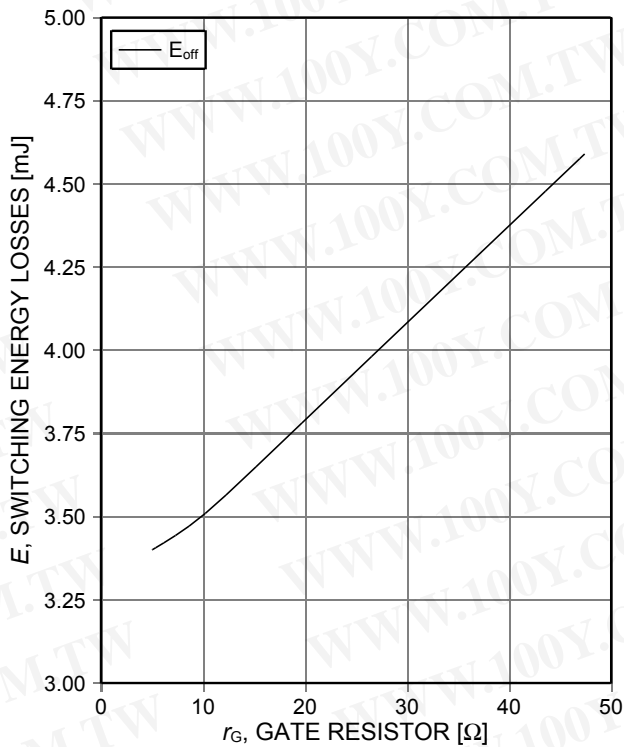


Figure 13. **Typical switching energy losses as a function of gate resistor**  
 (inductive load,  $T_{vj}=175^\circ\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{GE}=15/0\text{V}$ ,  $I_C=30\text{A}$ , Dynamic test circuit in Figure E)

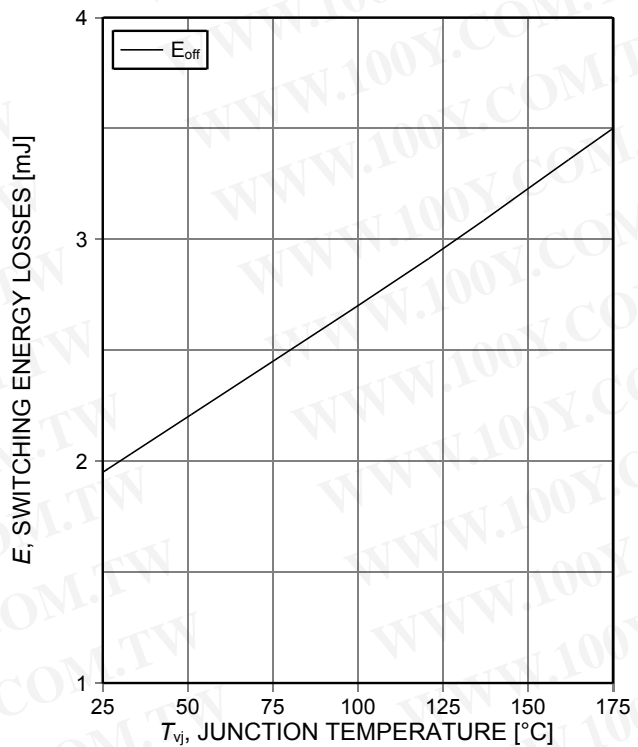


Figure 14. **Typical switching energy losses as a function of junction temperature**  
 (inductive load,  $V_{CE}=600\text{V}$ ,  $V_{GE}=15/0\text{V}$ ,  $I_C=30\text{A}$ ,  $r_G=10\Omega$ , Dynamic test circuit in Figure E)

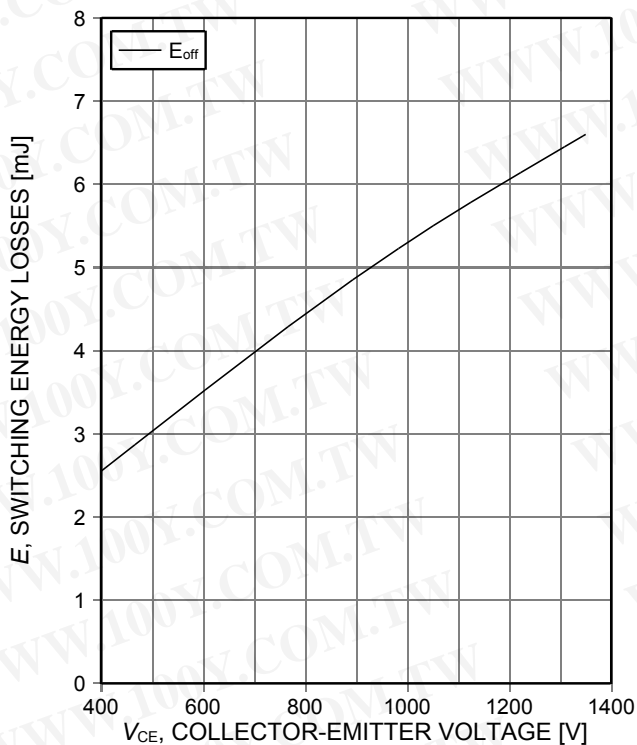


Figure 15. **Typical switching energy losses as a function of collector emitter voltage**  
 (inductive load,  $T_{vj}=175^\circ\text{C}$ ,  $V_{GE}=15/0\text{V}$ ,  $I_C=30\text{A}$ ,  $r_G=10\Omega$ , Dynamic test circuit in Figure E)

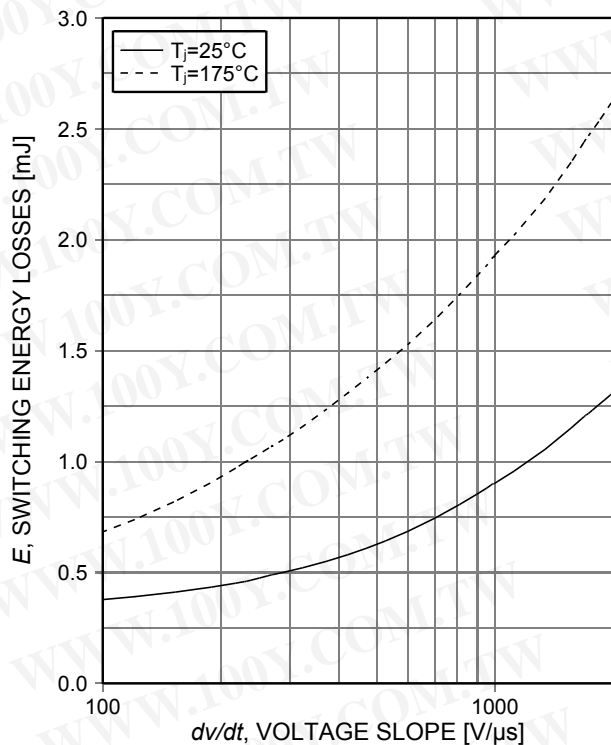


Figure 16. **Typical turn off switching energy loss for soft switching**  
 (inductive load,  $T_{vj}=175^\circ\text{C}$ ,  $V_{GE}=15/0\text{V}$ ,  $I_C=30\text{A}$ ,  $r_G=10\Omega$ , Dynamic test circuit in Figure E)

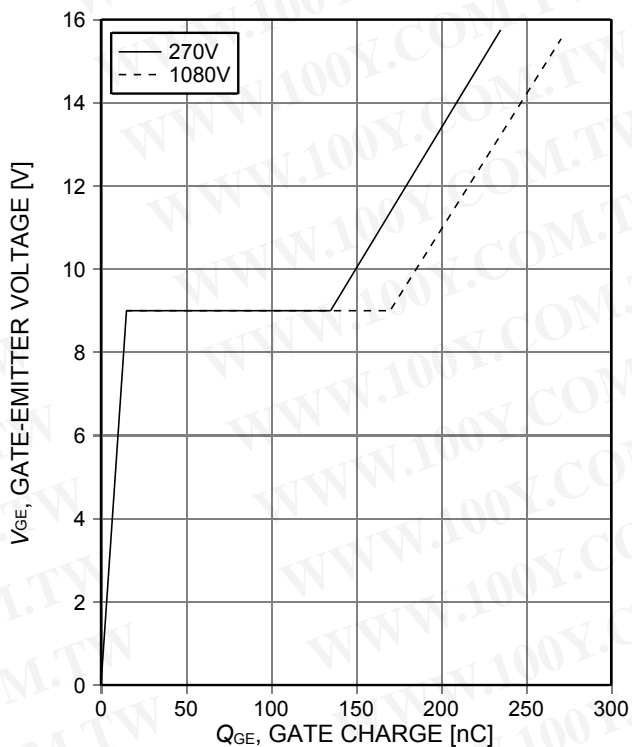


Figure 17. Typical gate charge ( $I_C=30A$ )

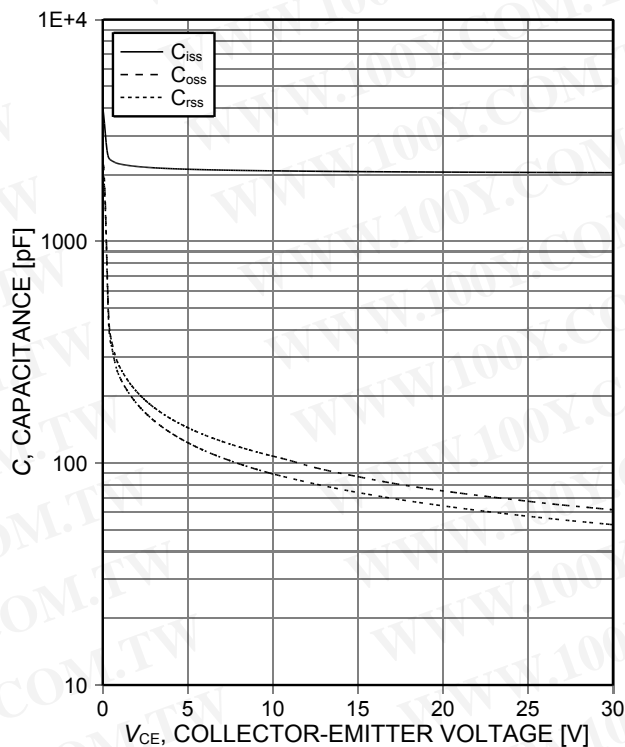


Figure 18. Typical capacitance as a function of collector-emitter voltage ( $V_{GE}=0V$ ,  $f=1MHz$ )

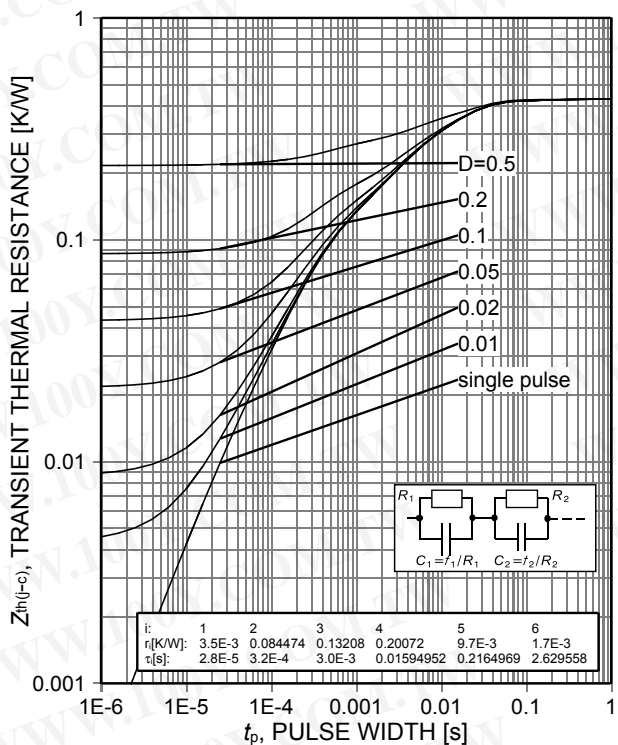


Figure 19. IGBT transient thermal resistance ( $D=t_p/T$ )

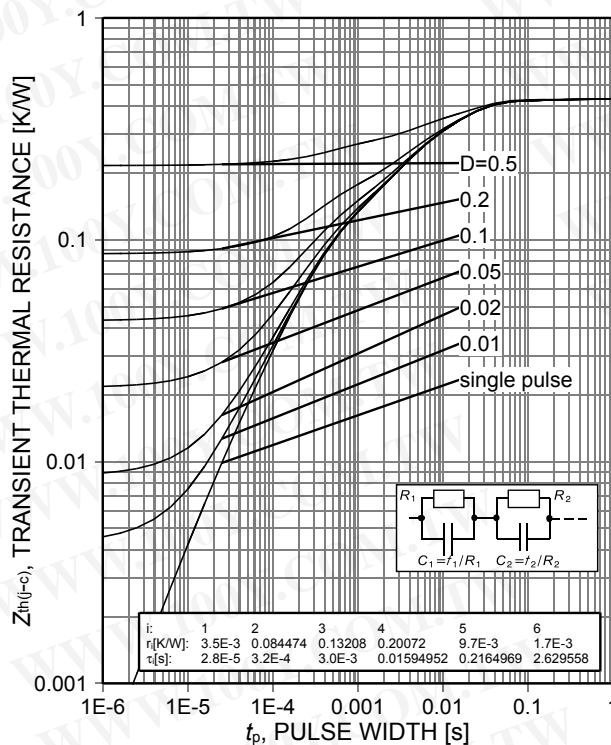


Figure 20. Diode transient thermal impedance as a function of pulse width ( $D=t_p/T$ )



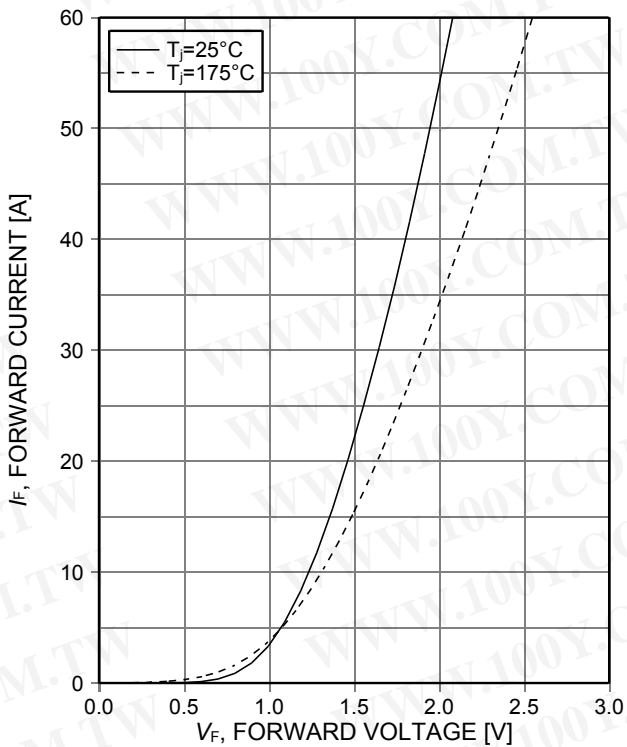


Figure 21. Typical diode forward current as a function of forward voltage

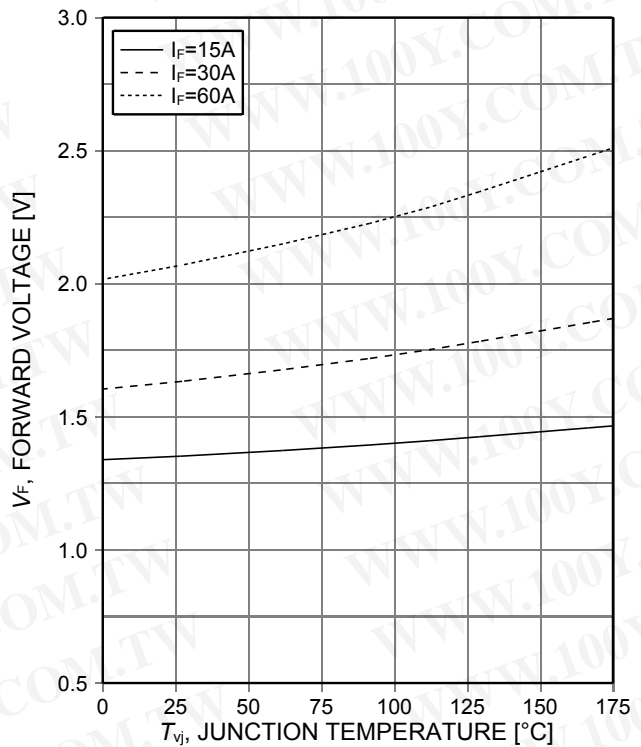
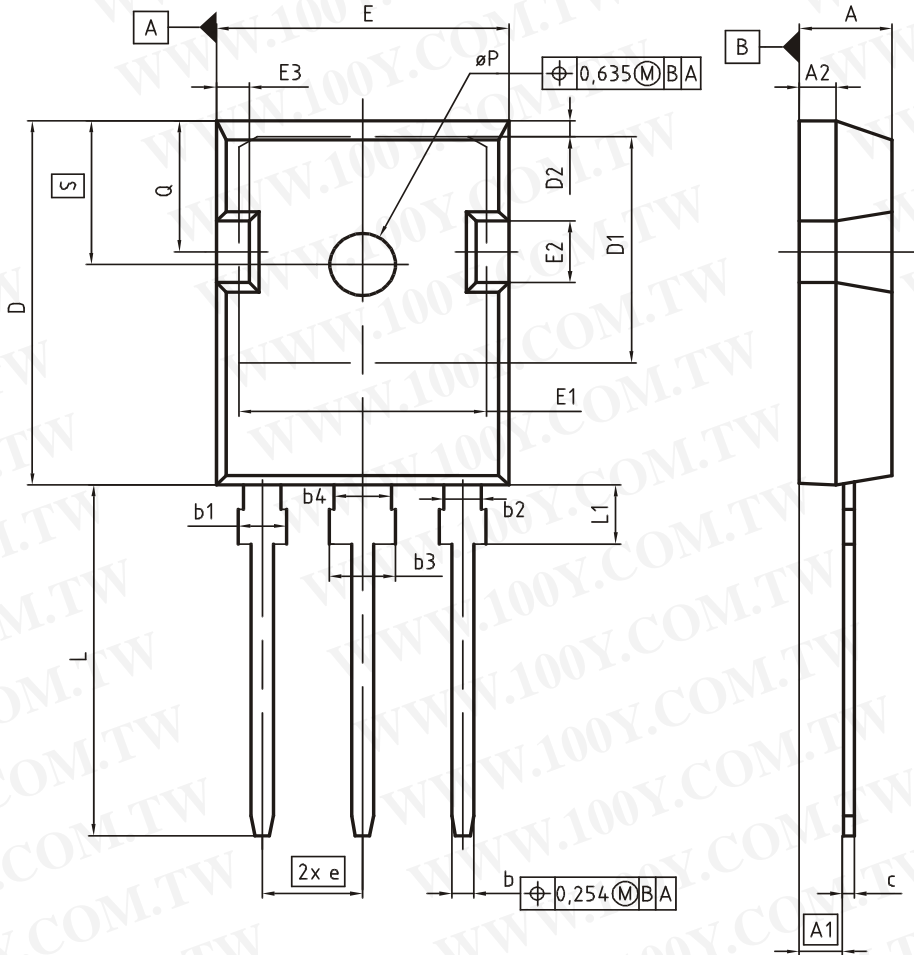


Figure 22. Typical diode forward voltage as a function of junction temperature

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### PG-TO247-3

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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
$\phi P$	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

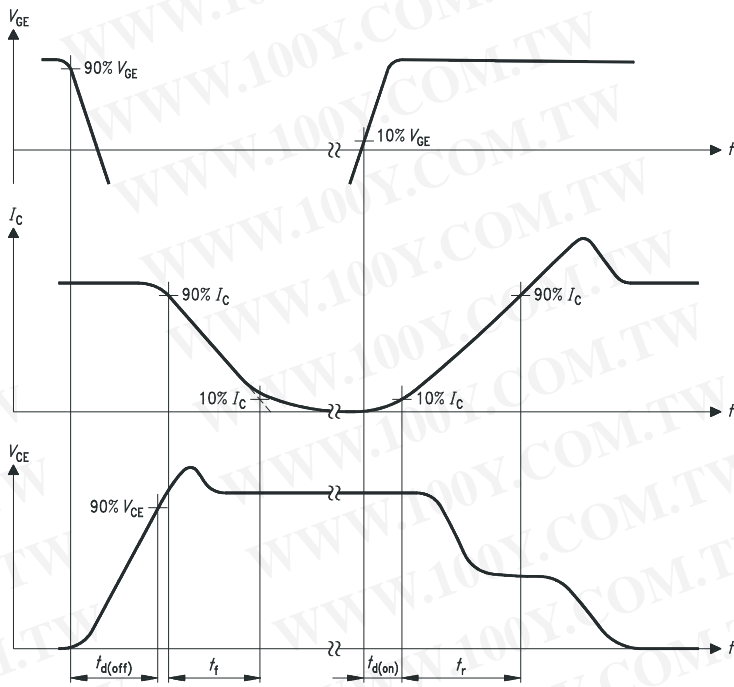


Figure A. Definition of switching times

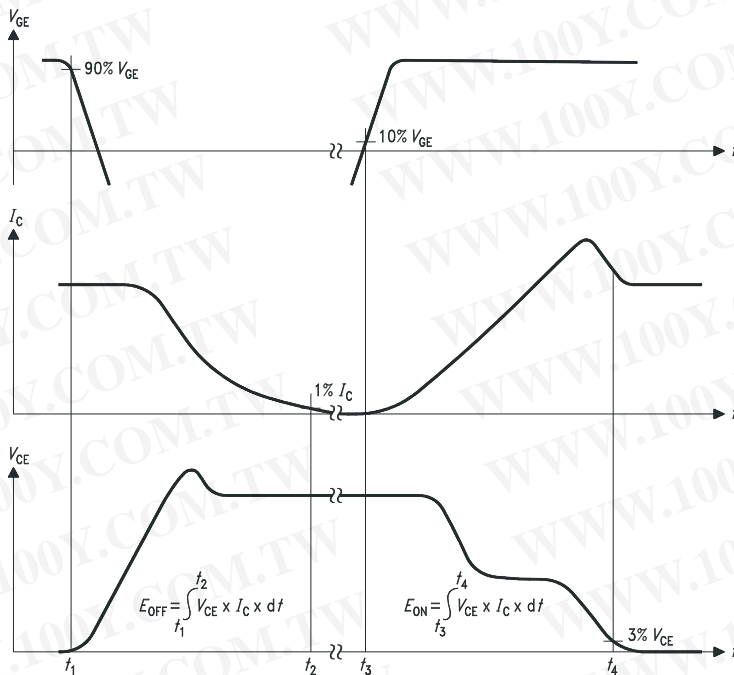


Figure B. Definition of switching losses

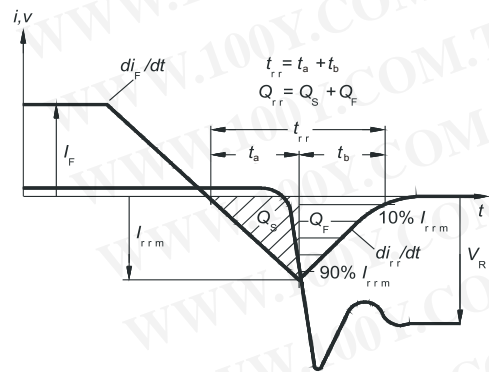


Figure C. Definition of diodes switching characteristics

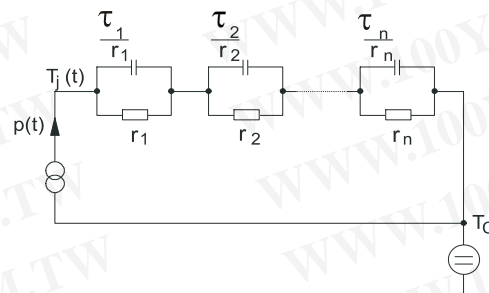


Figure D. Thermal equivalent circuit

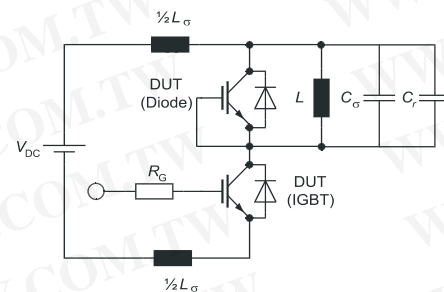


Figure E. Dynamic test circuit  
Parasitic inductance  $L_{\sigma}$ ,  
Parasitic capacitor  $C_{\sigma}$ ,  
Relief capacitor  $C_r$   
(only for ZVT switching)

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**Revision History**

IHW30N135R3

**Revision: 2012-10-12, Rev. 2.1**

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.1	2012-10-12	Final data sheet

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Any information within this document that you feel is wrong, unclear or missing at all ?

Your feedback will help us to continuously improve the quality of this document.

Please send your proposal (including a reference to this document) to: [erratum@infineon.com](mailto:erratum@infineon.com)

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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.

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