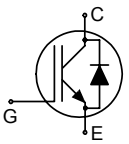
IHW30N90R

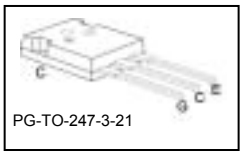
Soft Switching Series

Reverse Conducting IGBT with monolithic body diode

Features:

- 1.5V typical saturation voltage of IGBT
- Trench and Fieldstop technology for 900 V applications offers :
  - very tight parameter distribution
  - high ruggedness, temperature stable behavior
  - easy parallel switching capability due to positive temperature coefficient in $V_{CE(sat)}$
- Low EMI
- Qualified according to JEDEC[1] for target applications
- Application specific optimisation of inverse diode
- Pb-free lead plating; RoHS compliant





Applications:

- Microwave Oven
- Soft Switching Applications for ZCS

Type	V_{CE}	I_C	$V_{CE(sat),Tj=25°C}$	$T_{j,max}$	Marking	Package
IHW30N90R	900V	30A	1.5V	175°C	H30R90	PG-TO-247-3-21

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	900	V
DC collector current T_C = 25°C T_C = 100°C	I_C	 60 30	A
Pulsed collector current, t_p limited by T_{jmax}	I_{Cpuls}	90	
Turn off safe operating area $V_{CE} \le 1200V$, $T_j \le 150°C$	-	90	
Diode forward current T_C = 25°C T_C = 100°C	I_F	 60 30	
Diode pulsed current, t_p limited by T_{jmax}	I_{Fpuls}	90	
Gate-emitter voltage Transient Gate-emitter voltage (t_p < 5 ms)	V_{GE}	±20 ±25	V
Power dissipation, T_C = 25°C	P_{tot}	454	W
Operating junction temperature	T_j	-40...+175	°C
Storage temperature	T_{stg}	-55...+175	°C
Soldering temperature, 1.6mm (0.063 in.) from case for 10s	-	260	

[1] J-STD-020 and JESD-022

Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
IGBT thermal resistance, junction – case	R_{thJC}		0.33	K/W
Diode thermal resistance, junction – case	R_{thJCD}		0.33	
Thermal resistance, junction – ambient	R_{thJA}		40	

Electrical Characteristic, at T_j = 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=0.5mA	900	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C=30A				
		T_j=25°C	-	1.5	1.7	
		T_j=150°C	-	1.6	-	
		T_j=175°C	-	1.7	-	
Diode forward voltage	V_F	V_{GE}=0V, I_F=30A				
		T_j=25°C	-	1.4	1.6	
		T_j=150°C	-	1.4	-	
		T_j=175°C	-	1.45	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=700µA, V_{CE}=V_{GE}	5.1	5.8	6.4	
Zero gate voltage collector current	I_{CES}	V_{CE}=900V, V_{GE}=0V				µA
		T_j=25°C	-	-	5	
		T_j=150°C	-	-	2500	
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	600	nA

Dynamic Characteristic

Input capacitance	C_{iss}	V_{CE}=25V,	-	2889	-	pF
Output capacitance	C_{oss}	V_{GE}=0V,	-	83	-	
Reverse transfer capacitance	C_{rss}	f=1MHz	-	79	-	
Gate charge	Q_{Gate}	V_{CC}=720V, I_C=30A V_{GE}=15V	-	200	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13	-	nH

Switching Characteristic, Inductive Load, at T_j=25 °C

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	Max.	
IGBT Characteristic						
Turn-off delay time	$t_{d(off)}$	T_j=25°C	-	511	-	
Fall time	t_f	V_{CC}=600V,	-	24	-	
Turn-on energy	E_{on}	I_C=30A,	-	-	-	mJ
Turn-off energy	E_{off}	V_{GE}=0/15V,	-	1.46	-	
Total switching energy	E_{ts}	R_G= 15Ω	-	1.46	-	

Switching Characteristic, Inductive Load, at T_j=175 °C

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
IGBT Characteristic						
Turn-off delay time	$t_{d(off)}$	T_j=175°C	-	594	-	
Fall time	t_f	V_{CC}=600V,	-	46	-	
Turn-on energy	E_{on}	I_C=30A,	-	-	-	mJ
Turn-off energy	E_{off}	V_{GE}=0/15V,	-	2.1	-	
Total switching energy	E_{ts}	R_G= 15Ω	-	2.1	-	

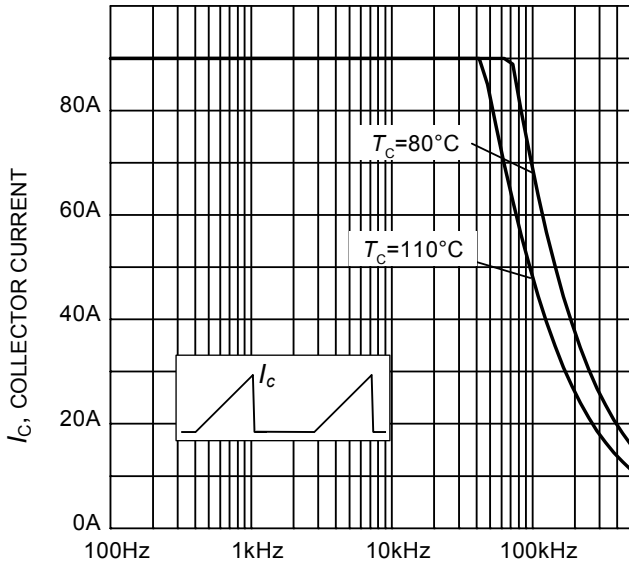


Figure 1. Collector current as a function of switching frequency for triangular current (E_{on} = 0, hard turn-off)
($T_j \le 175°C$, D = 0.5, V_{CE} = 600V, V_{GE} = 0/+15V, R_G = 15Ω)

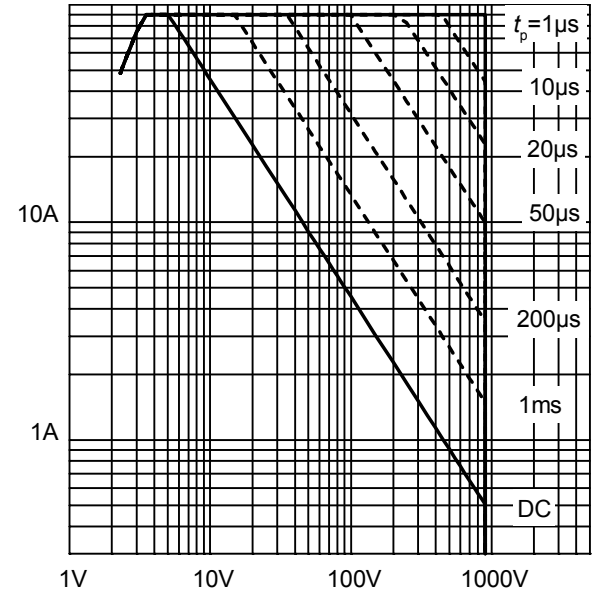


Figure 2. IGBT Safe operating area
(D = 0, T_C = 25°C, $T_j \le 175°C$; V_{GE}=15V)

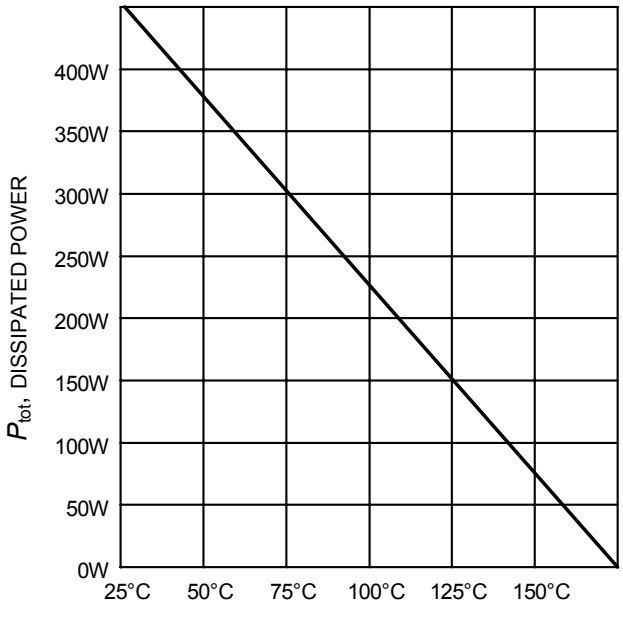


Figure 3. Power dissipation as a function of case temperature
($T_j \le 175°C$)

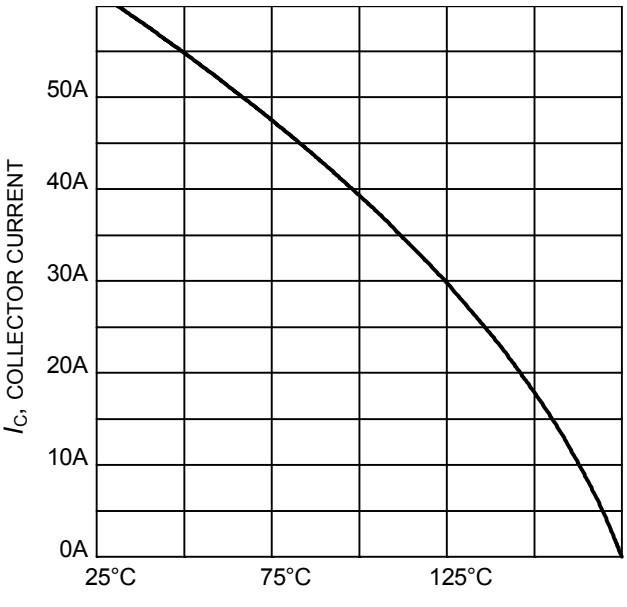


Figure 4. Collector current as a function of case temperature
($V_{GE} \ge 15V$, $T_j \le 175°C$)

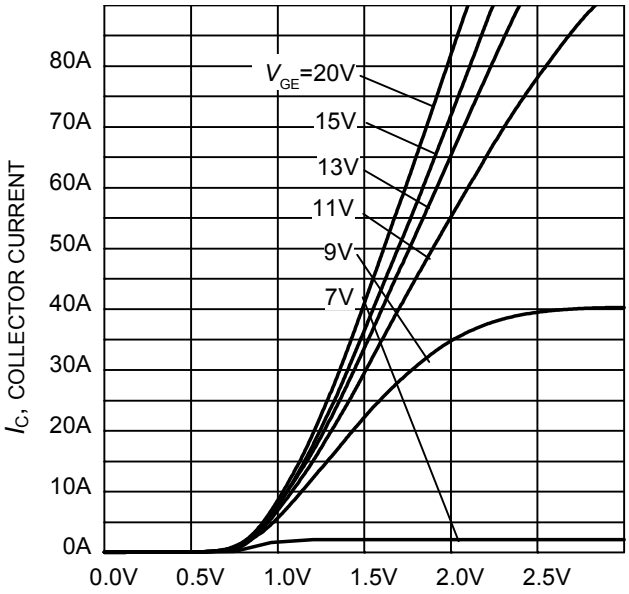


Figure 5. Typical output characteristic
(T_j = 25°C)

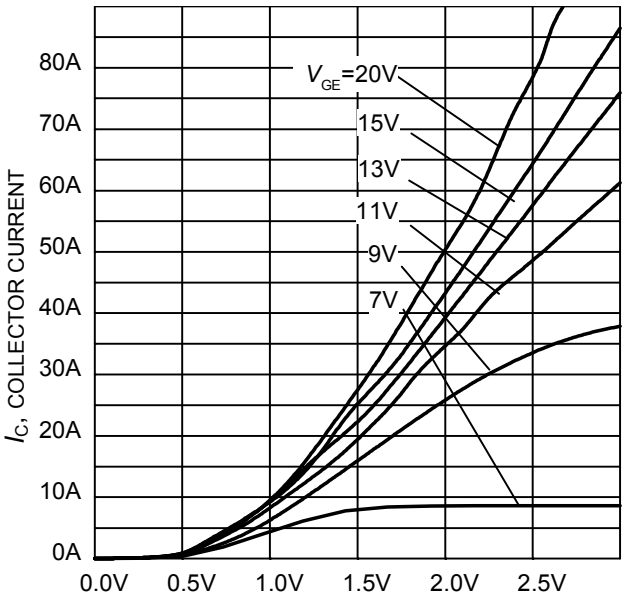


Figure 6. Typical output characteristic
(T_j = 175°C)

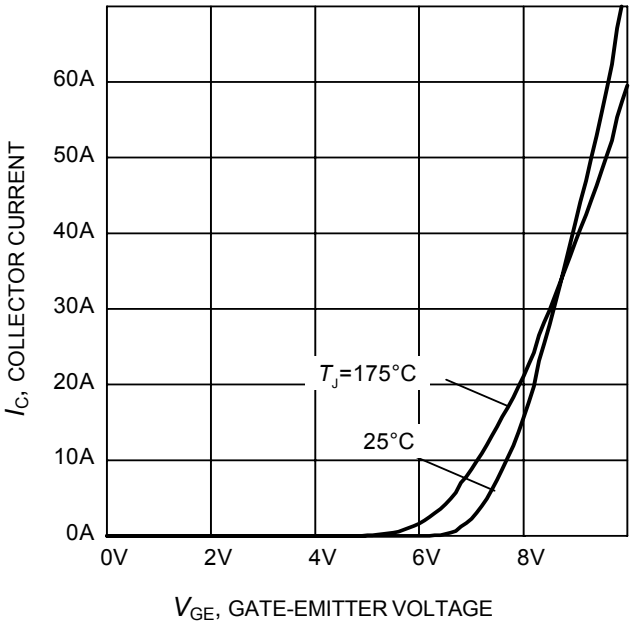


Figure 7. Typical transfer characteristic
(V_{CE}=20V)

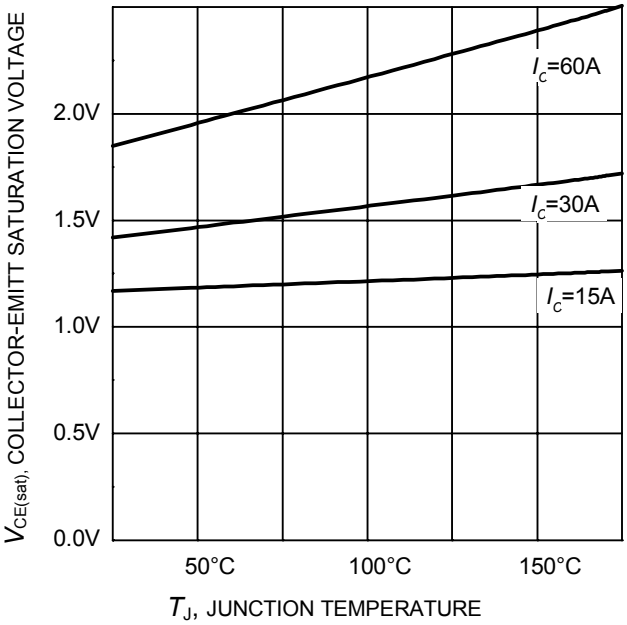


Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE} = 15V)

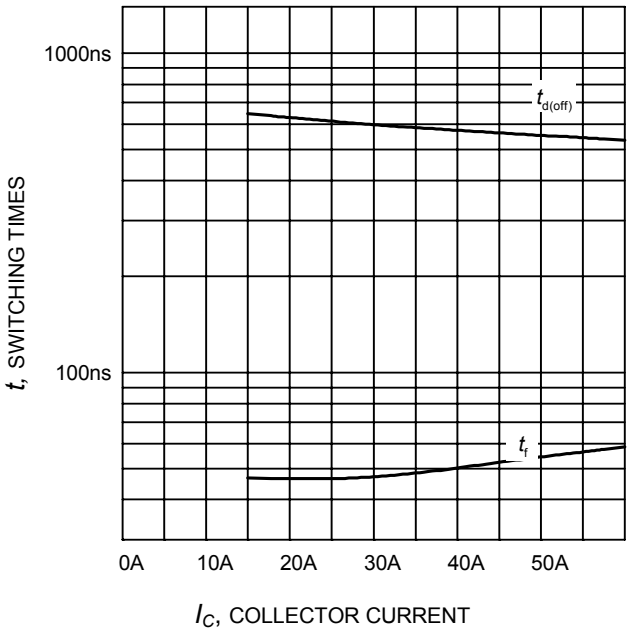


Figure 9. Typical switching times as a function of collector current
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, R_G=15Ω, Dynamic test circuit in Figure E)

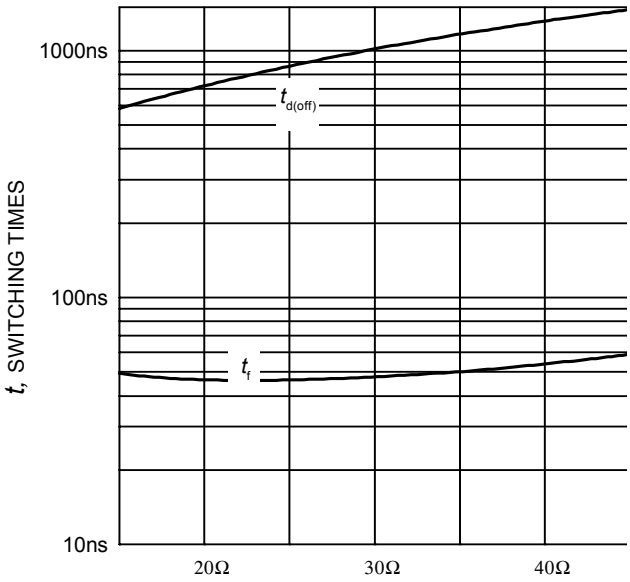


Figure 10. Typical switching times as a function of gate resistor
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, Dynamic test circuit in Figure E)

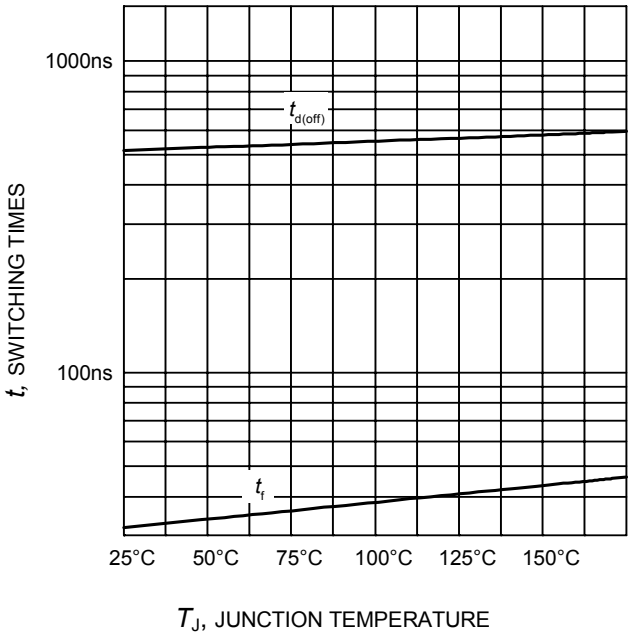


Figure 11. Typical switching times as a function of junction temperature
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, R_G=15Ω, Dynamic test circuit in Figure E)

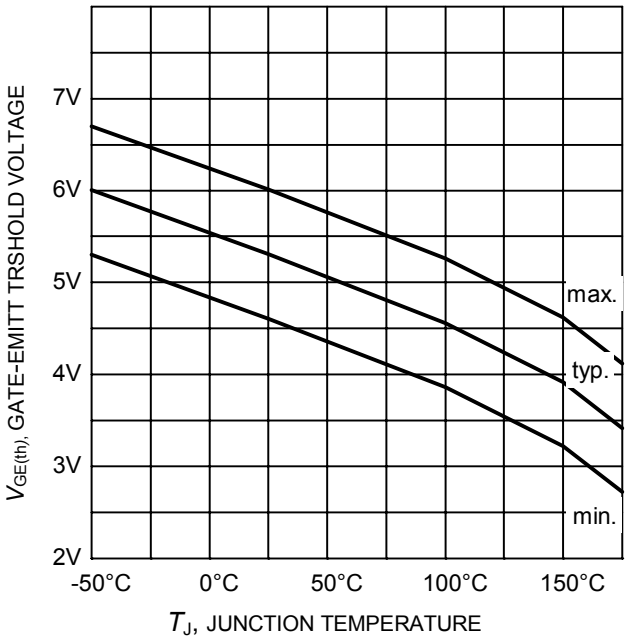


Figure 12. Gate-emitter threshold voltage as a function of junction temperature
(I_C = 0.7mA)

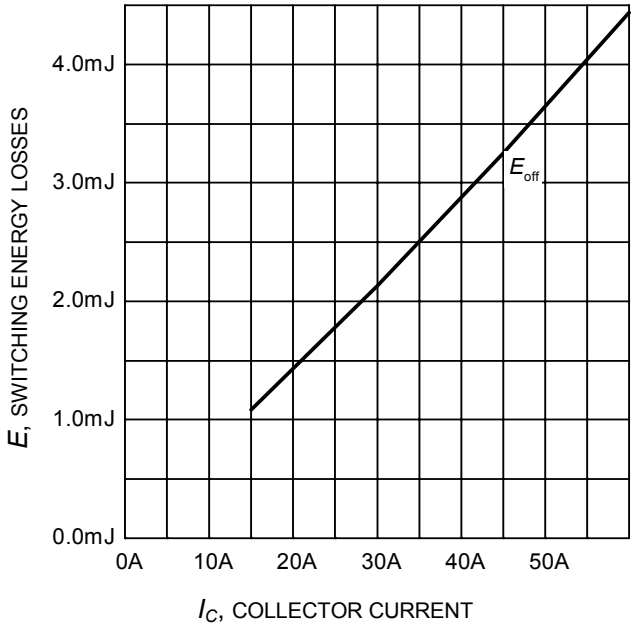


Figure 13. Typical switching energy losses as a function of collector current
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, R_G=15Ω, Dynamic test circuit in Figure E)

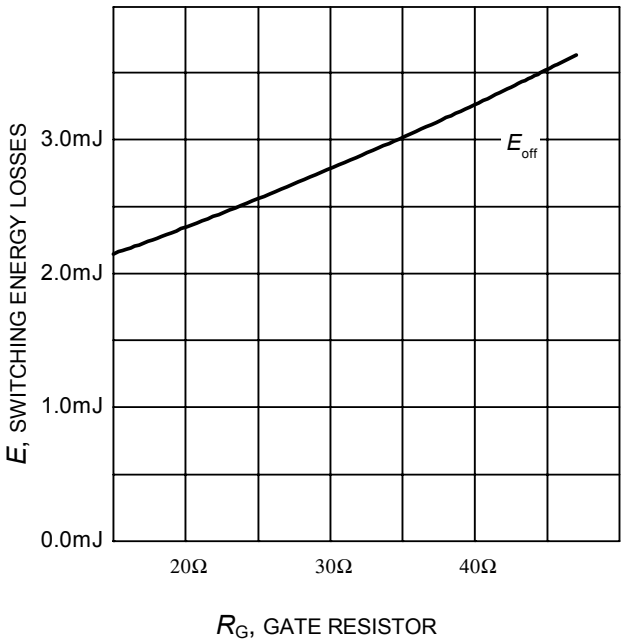


Figure 14. Typical switching energy losses as a function of gate resistor
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, Dynamic test circuit in Figure E)

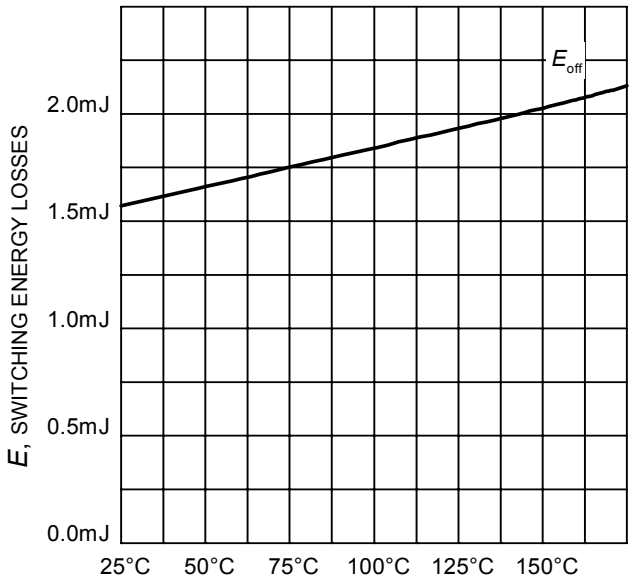


Figure 15. Typical switching energy losses as a function of junction temperature
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, R_G=15Ω, Dynamic test circuit in Figure E)

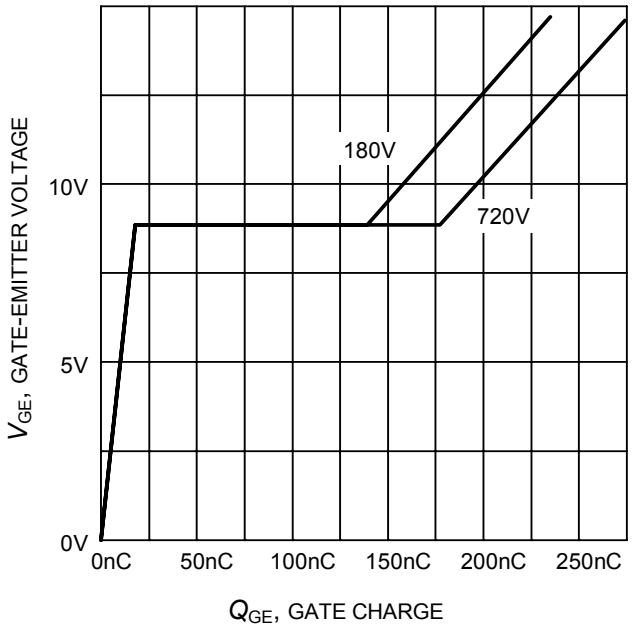


Figure 16. Typical gate charge
(I_C=30 A)

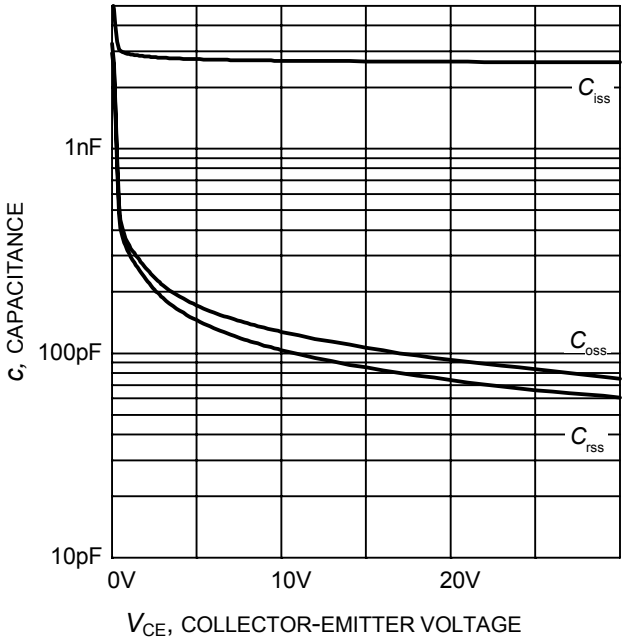


Figure 17. Typical capacitance as a function of collector-emitter voltage
(V_{GE}=0V, f = 1 MHz)

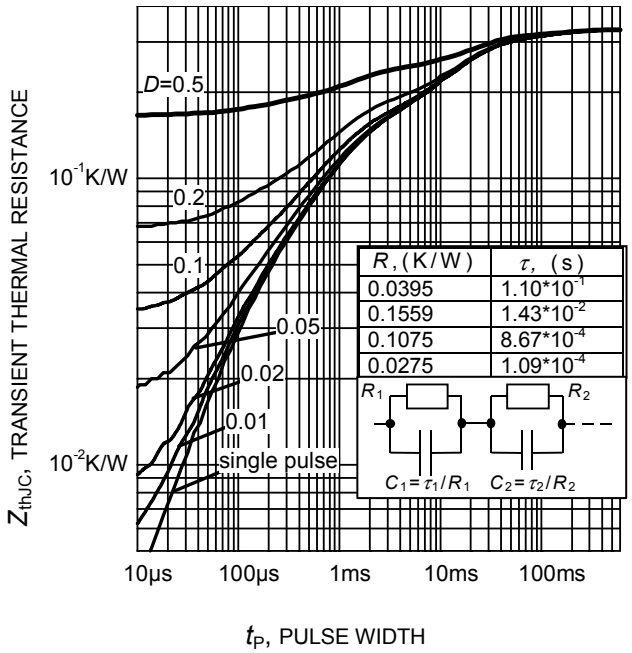


Figure 18. IGBT transient thermal resistance
($D = t_p / T$)

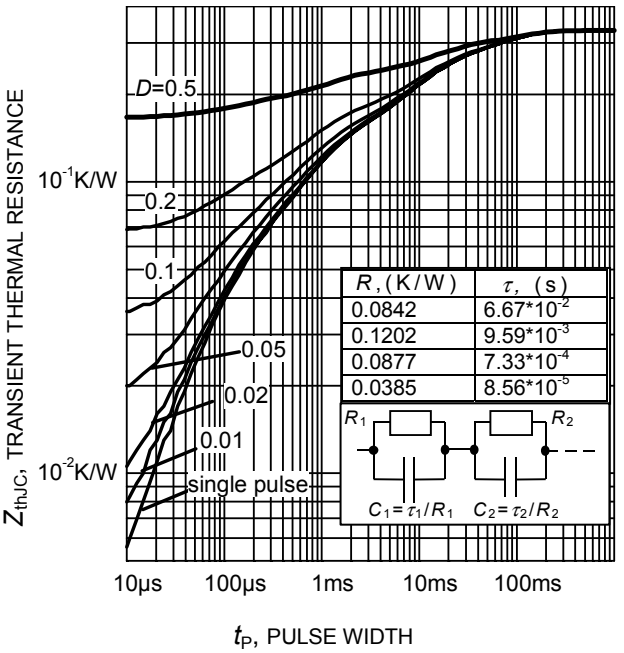


Figure 19. Typical Diode transient thermal impedance as a function of pulse width
(D=t_P/T)

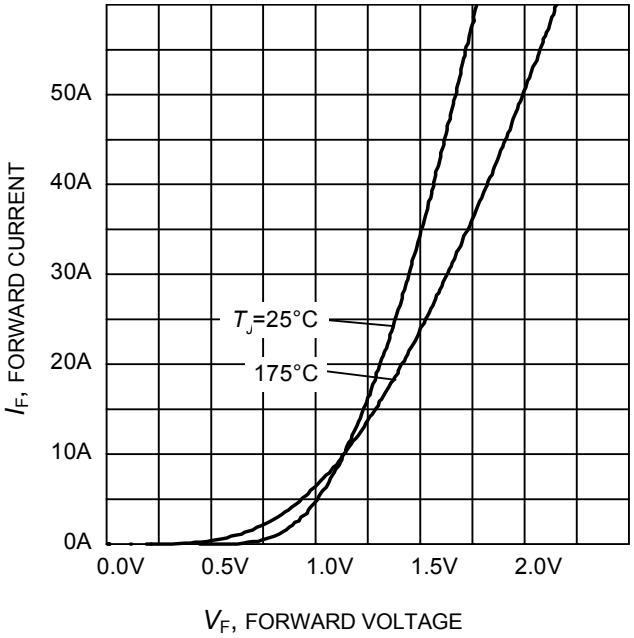


Figure 20. Typical diode forward current as a function of forward voltage

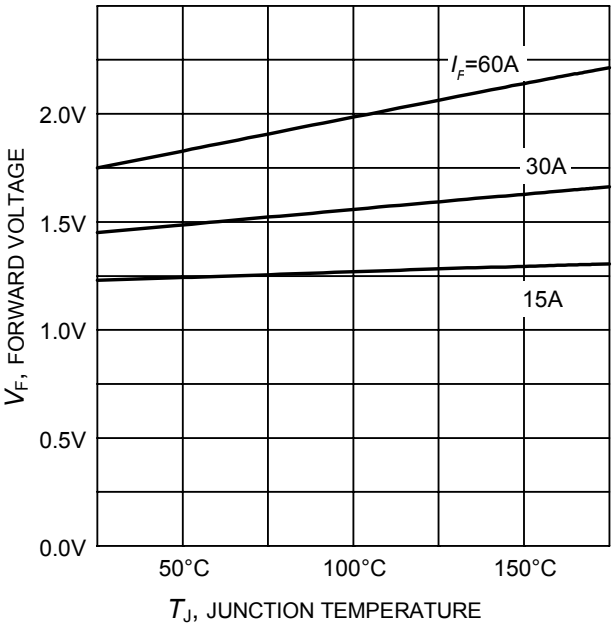


Figure 21. Typical diode forward voltage as a function of junction temperature

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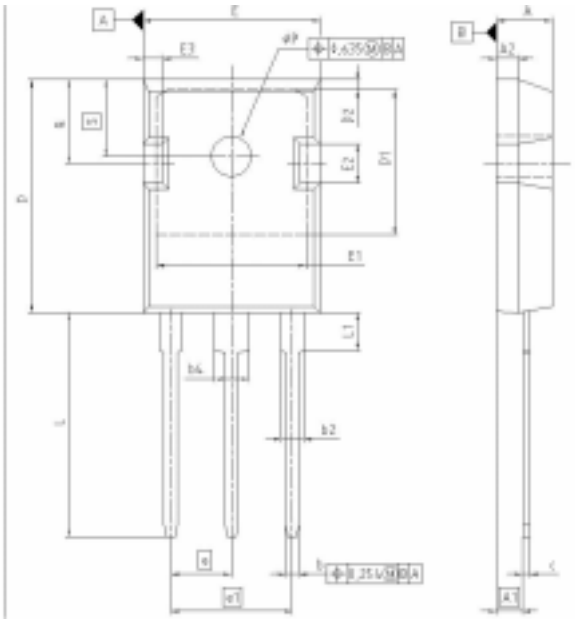

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.965	5.157	0.195	0.203
A1	2.275	2.527	0.090	0.099
A2	1.853	2.107	0.073	0.083
b	1.073	1.327	0.042	0.052
b2	1.903	2.386	0.075	0.094
b4	2.979	3.454	0.117	0.136
c	0.549	0.752	0.022	0.030
D	20.823	21.077	0.820	0.830
D1	17.323	17.831	0.682	0.702
D2	1.083	1.317	0.043	0.052
E	15.773	16.027	0.621	0.631
E1	13.998	14.147	0.547	0.557
E2	3.683	3.937	0.145	0.155
E3	1.883	1.937	0.089	0.076
e	5.450		0.215	
e1	10.900		0.430	
N	3		3	
L	20.053	20.307	0.789	0.799
L1	4.166	4.472	0.164	0.176
øP	3.559	3.661	0.140	0.144
Q	5.490	5.747	0.216	0.226
S	6.043	6.297	0.238	0.248

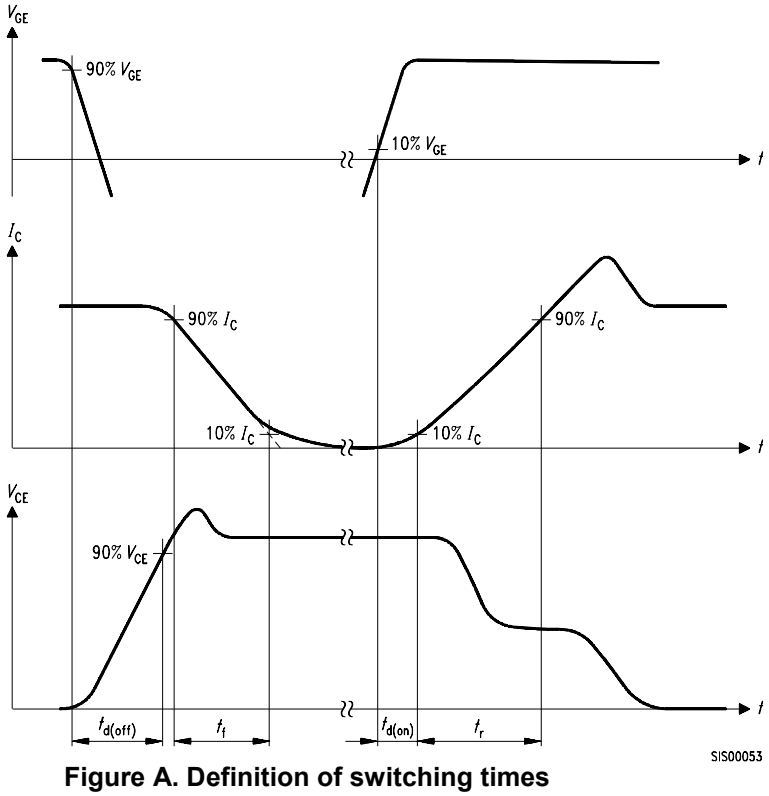

Figure A. Definition of switching times

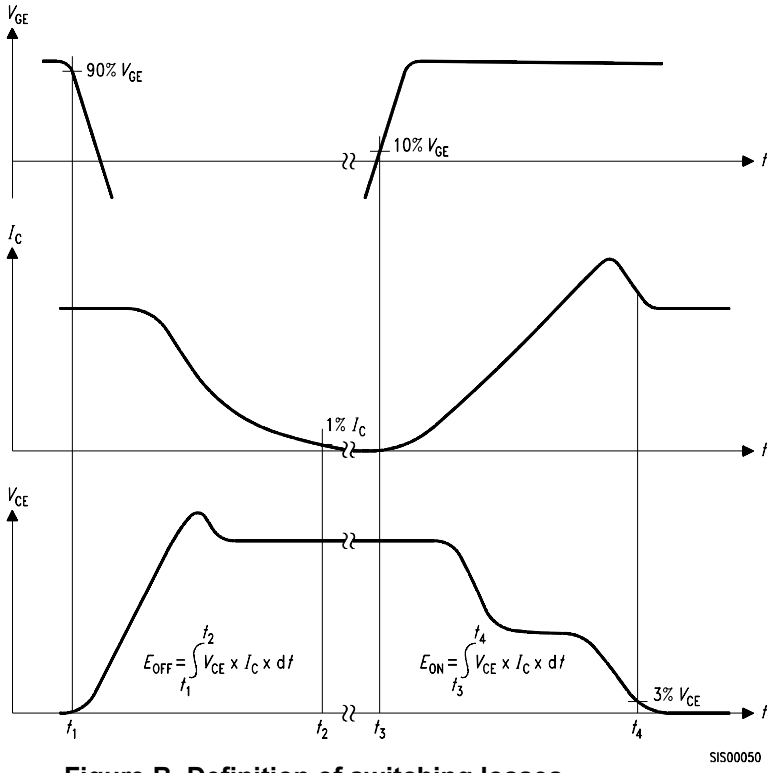

Figure B. Definition of switching losses

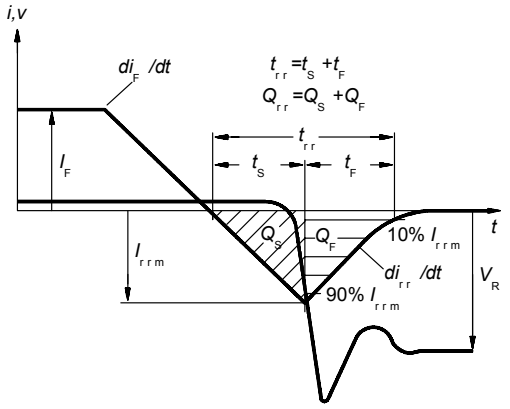

Figure C. Definition of diodes switching characteristics

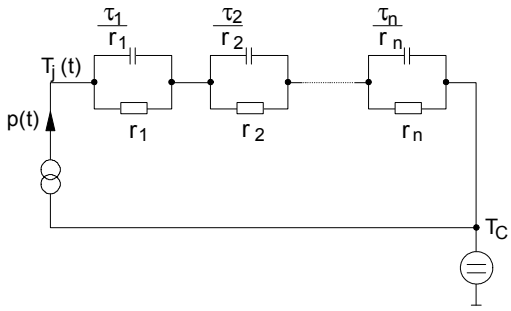

Figure D. Thermal equivalent circuit

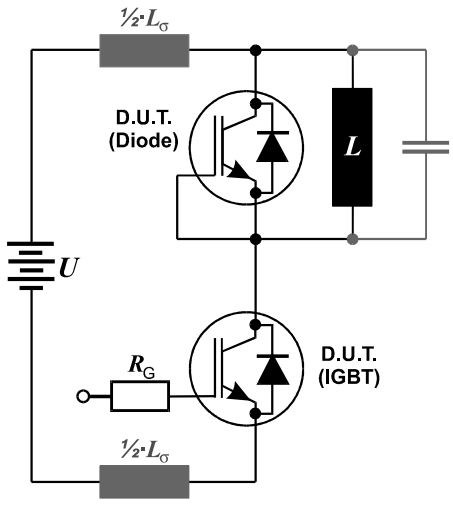

Figure E. Dynamic test circuit

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