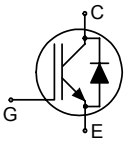
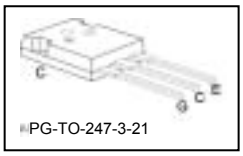
IHW30N90T

Soft Switching Series

Low Loss DuoPack : IGBT in TrenchStop® and Fieldstop technology with anti-parallel diode





Features:

- 1.1V Forward voltage of antiparallel diode
- TrenchStop® 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
IHW30N90T	900V	30A	1.5V	175°C	H30T90	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}	900	
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	 23 13	
Diode pulsed current, t_p limited by T_{jmax}	I_{Fpuls}	36	
Gate-emitter voltage Transient Gate-emitter voltage (t_p < 5 ms)	V_{GE}	±20 ±25	V
Power dissipation, T_C = 25°C	P_{tot}	428	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}		0.35	K/W
Diode thermal resistance, junction – case	R_{thJCD}		1.1	
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=500µA	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	-	1.7	-	
		T_j=175°C	-	1.8	-	
Diode forward voltage	V_F	V_{GE}=0V, I_F=10A				
		T_j=25°C	-	1.1	1.3	
		T_j=150°C	-	1.0	-	
		T_j=175°C	-	1.0	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=150µA, V_{CE}=V_{GE}	4.6	5.3	6	
Zero gate voltage collector current	I_{CES}	V_{CE}=900V, V_{GE}=0V				µA
		T_j=25°C	-	-	250	
		T_j=150°C	-	-	2500	
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	600	nA
Transconductance	g_{fs}	V_{CE}=20V, I_C=20A	-	26	-	S
Dynamic Characteristic						
Input capacitance	C_{iss}	V_{CE}=25V,	-	2617	-	pF
Output capacitance	C_{oss}	V_{GE}=0V,	-	96	-	
Reverse transfer capacitance	C_{rss}	f=1MHz	-	38	-	
Gate charge	Q_{Gate}	V_{CC}=720V, I_C=30A	-	280	-	nC
		V_{GE}=15V				
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-on delay time	$t_{d(on)}$	T_j=25°C,	-	45	-	ns
Rise time	t_r	V_{CC}=600V, I_C=30A,	-	26	-	
Turn-off delay time	$t_{d(off)}$	V_{GE}=0/15V,	-	556	-	
Fall time	t_f	R_G=15Ω,	-	29	-	
Turn-on energy	E_{on}		-	-	-	mJ
Turn-off energy	E_{off}		-	1.8	-	
Total switching energy	E_{ts}		-	1.8	-	

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

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	T_j=175°C	-	44	-	ns
Rise time	t_r	V_{CC}=600V,	-	38	-	
Turn-off delay time	$t_{d(off)}$	I_C=30A,	-	650	-	
Fall time	t_f	V_{GE}=0/15V,	-	41	-	
Turn-on energy	E_{on}	R_G= 15Ω	-	-	-	mJ
Turn-off energy	E_{off}		-	2.4	-	
Total switching energy	E_{ts}		-	2.4	-	

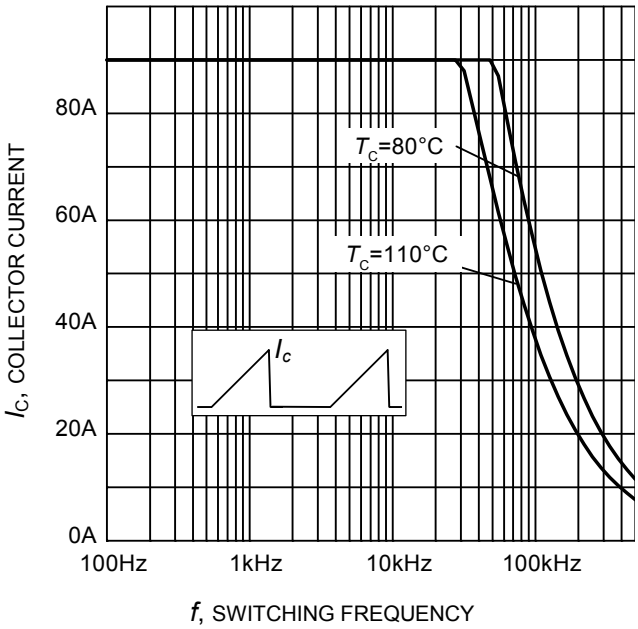


Figure 1. Collector current as a function of switching frequency for triangular current (E_{on} = 0, hard turn-off)
($T_j \le 175°C$, D = 0.5, V_{CE} = 600V, V_{GE} = 0/+15V, R_G = 15Ω)

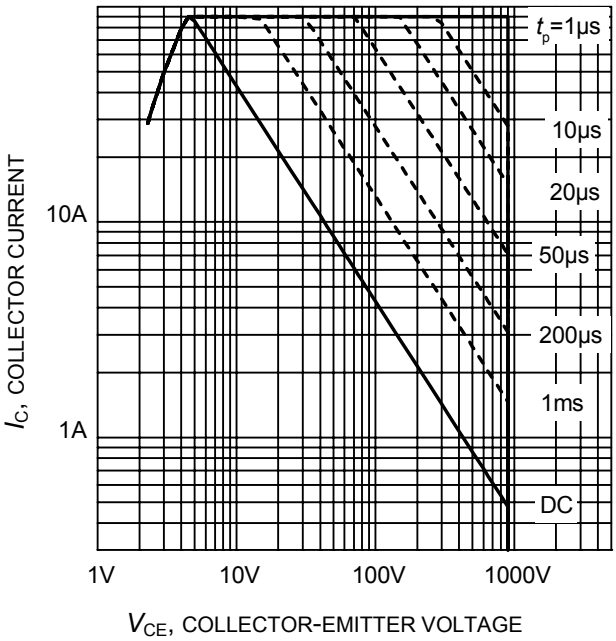


Figure 2. IGBT Safe operating area
(D = 0, T_C = 25°C, $T_j \le 175°C$; V_{GE}=15V)

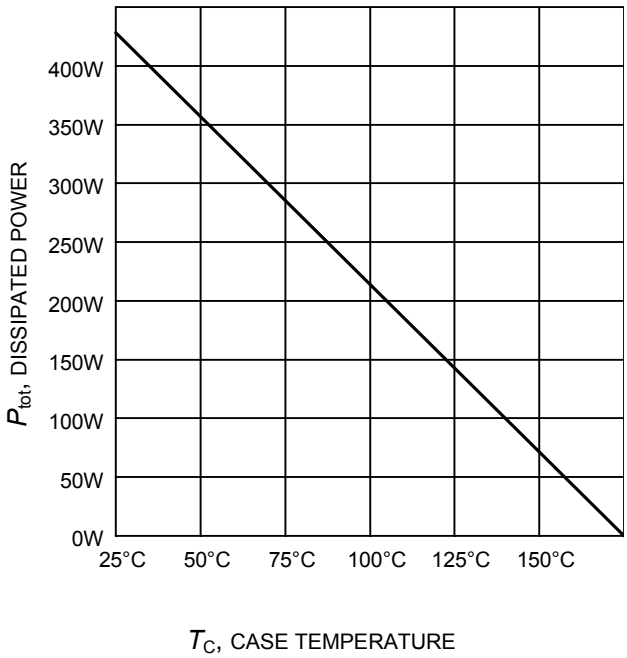


Figure 3. Power dissipation as a function of case temperature
($T_j \le 175°C$)

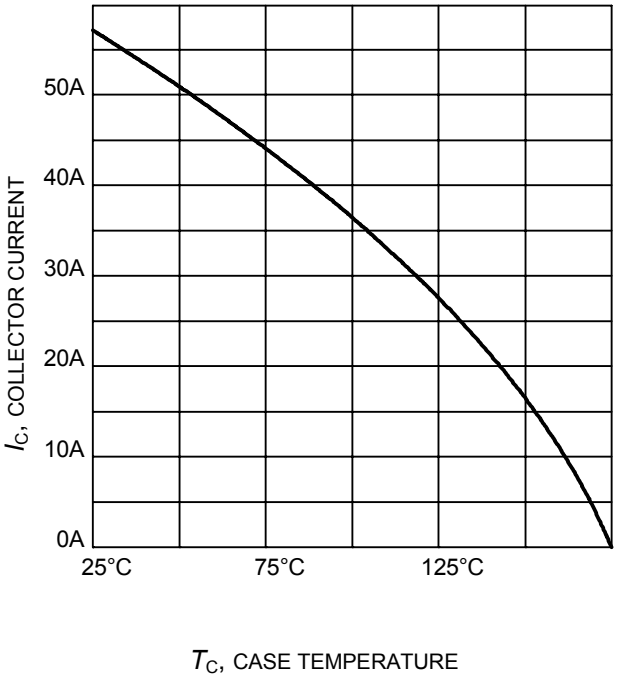


Figure 4. Collector current as a function of case temperature
($V_{GE} \ge 15V$, $T_j \le 175°C$)

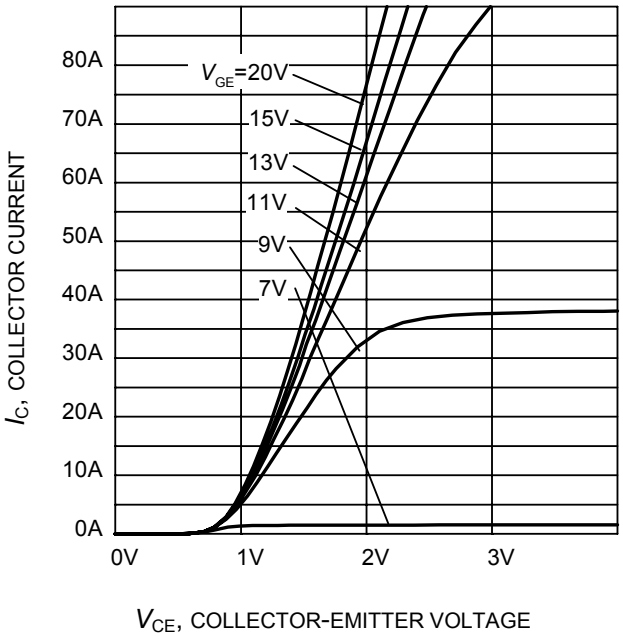


Figure 5. Typical output characteristic
(T_j = 25°C)

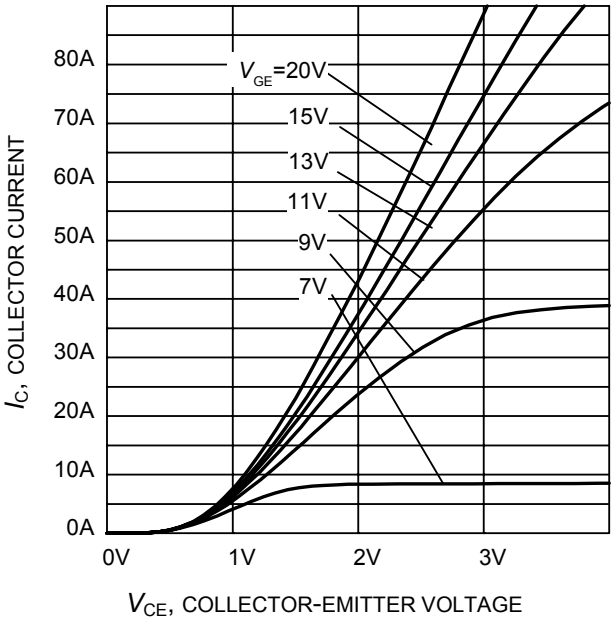


Figure 6. Typical output characteristic
(T_j = 175°C)

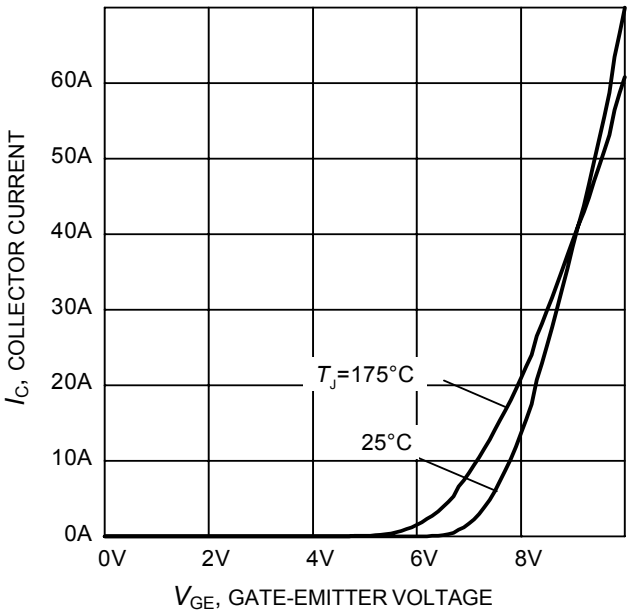


Figure 7. Typical transfer characteristic
(V_{CE}=20V)

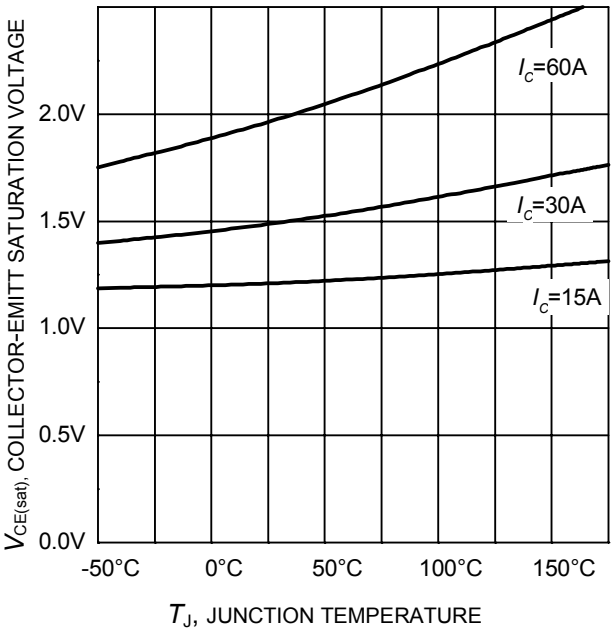


Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE} = 15V)

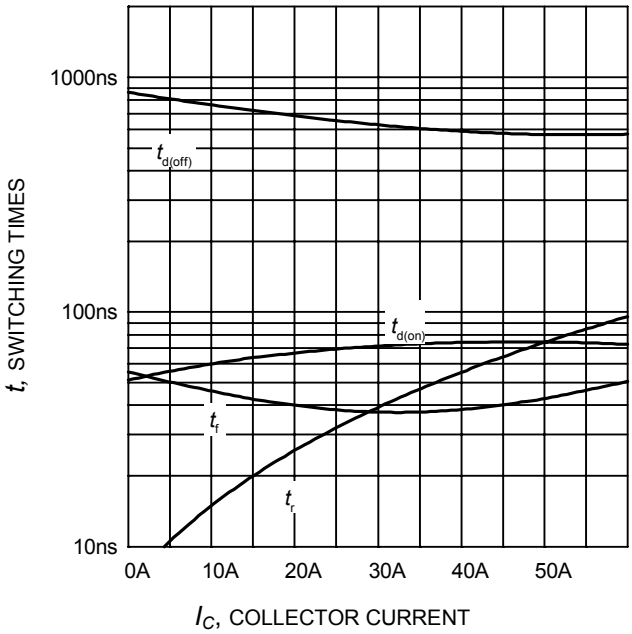


Figure 9. Typical switching times as a function of collector current
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, R_G=15Ω, Dynamic test circuit in Figure E)

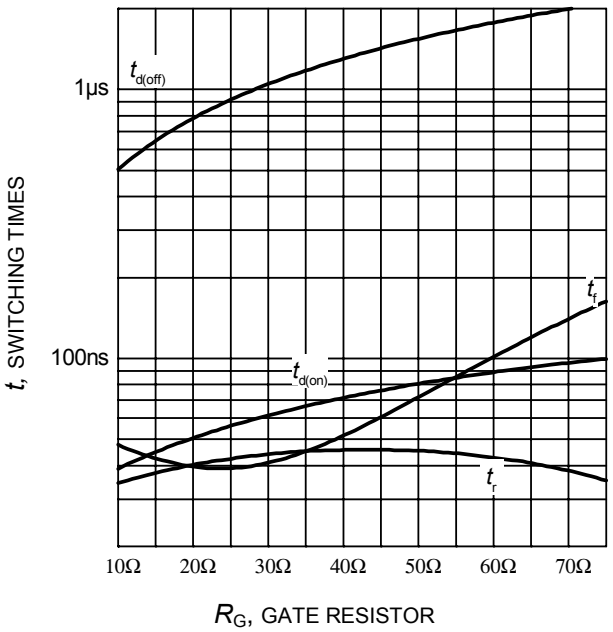


Figure 10. Typical switching times as a function of gate resistor
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, Dynamic test circuit in Figure E)

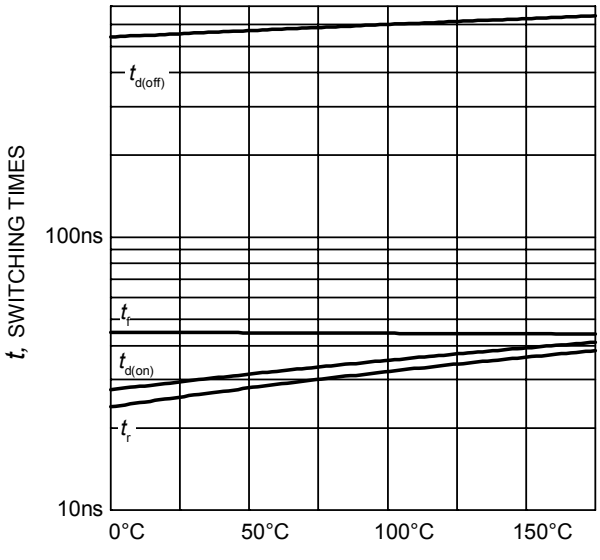


Figure 11. Typical switching times as a function of junction temperature
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, R_G=15Ω, Dynamic test circuit in Figure E)

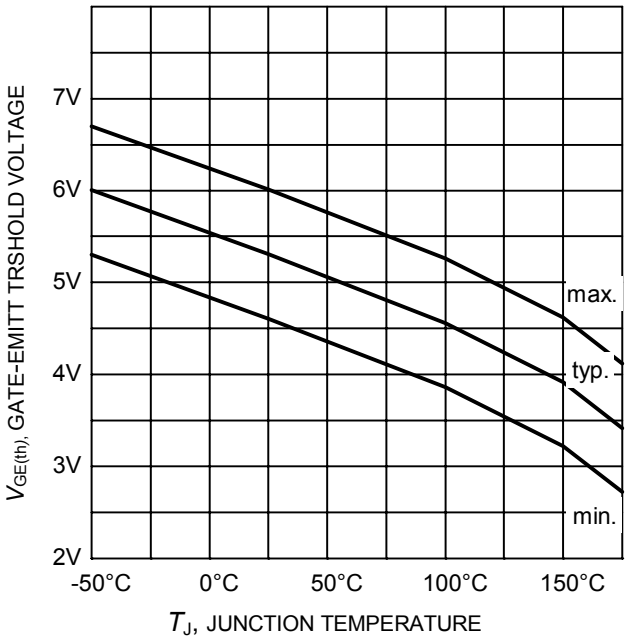


Figure 12. Gate-emitter threshold voltage as a function of junction temperature
(I_C = 0.3mA)

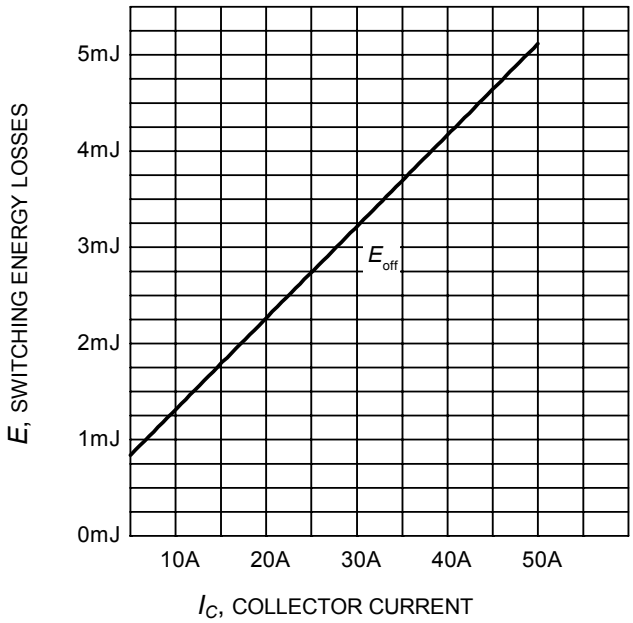


Figure 13. Typical switching energy losses as a function of collector current
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, R_G=15Ω, Dynamic test circuit in Figure E)

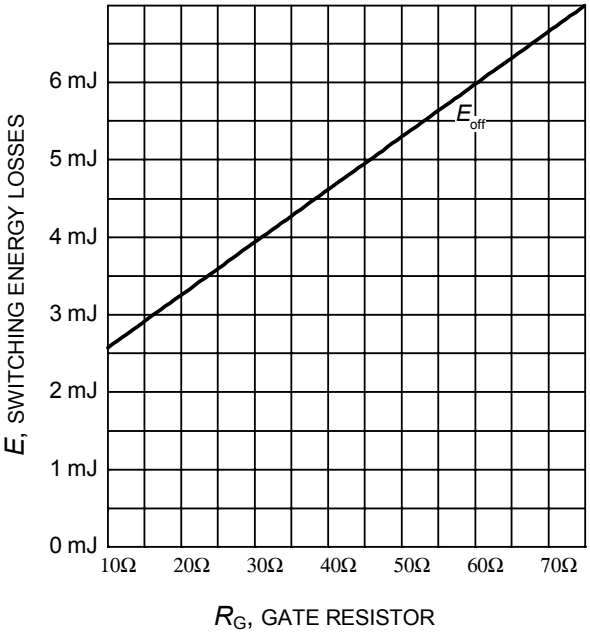


Figure 14. Typical switching energy losses as a function of gate resistor
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, Dynamic test circuit in Figure E)

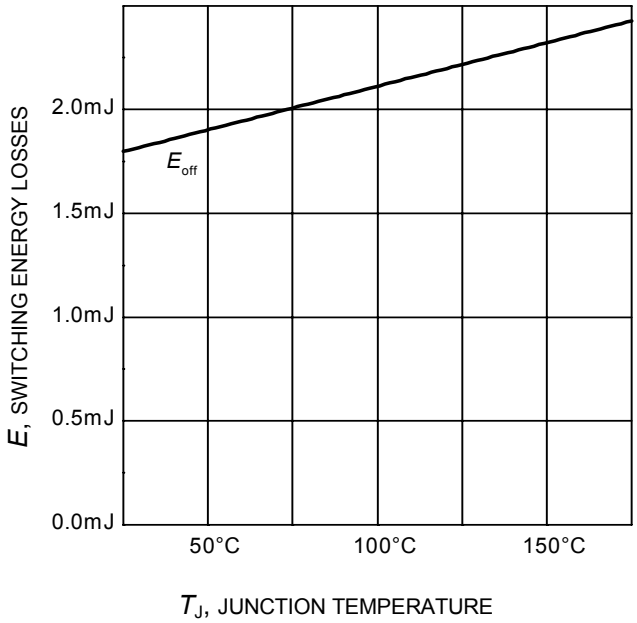


Figure 15. Typical switching energy losses as a function of junction temperature
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, R_G=15Ω, Dynamic test circuit in Figure E)

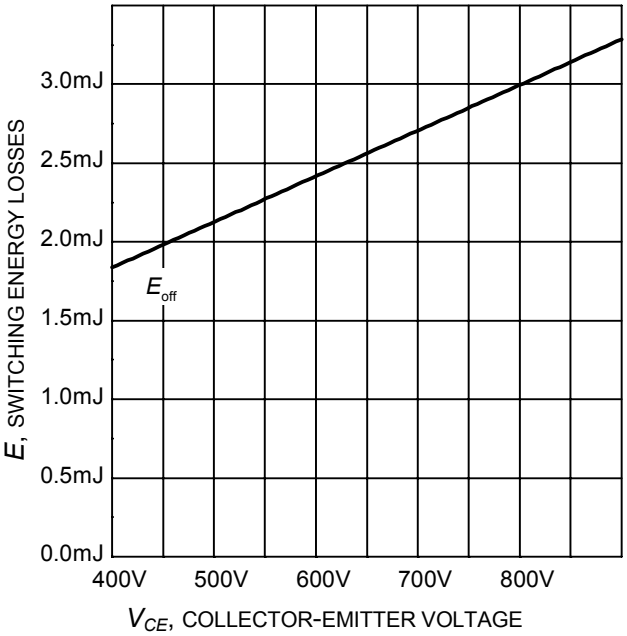


Figure 16. Typical switching energy losses as a function of collector emitter voltage
(inductive load, T_J=175°C, V_{GE}=0/15V, I_C=30A, R_G=15Ω, Dynamic test circuit in Figure E)

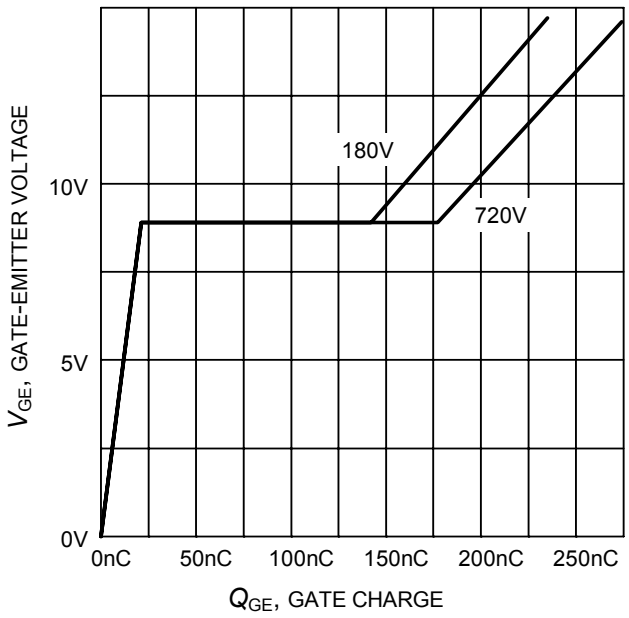


Figure 17. Typical gate charge
(I_C=30 A)

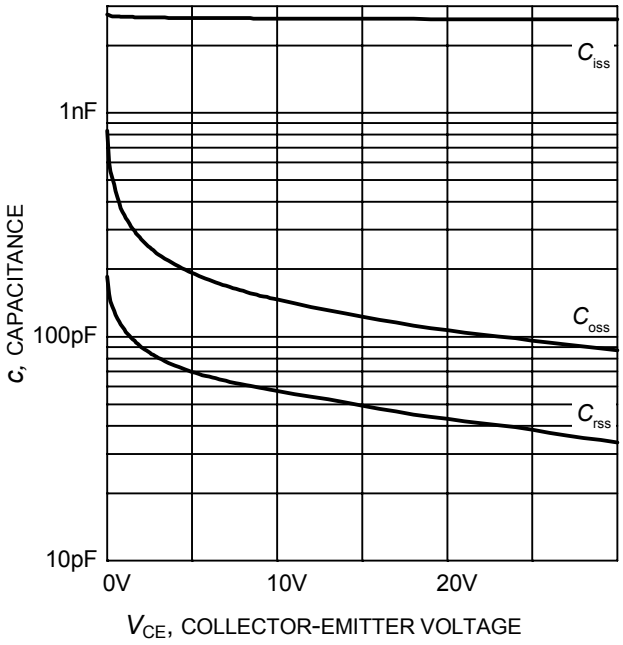


Figure 18. Typical capacitance as a function of collector-emitter voltage
(V_{GE}=0V, f = 1 MHz)

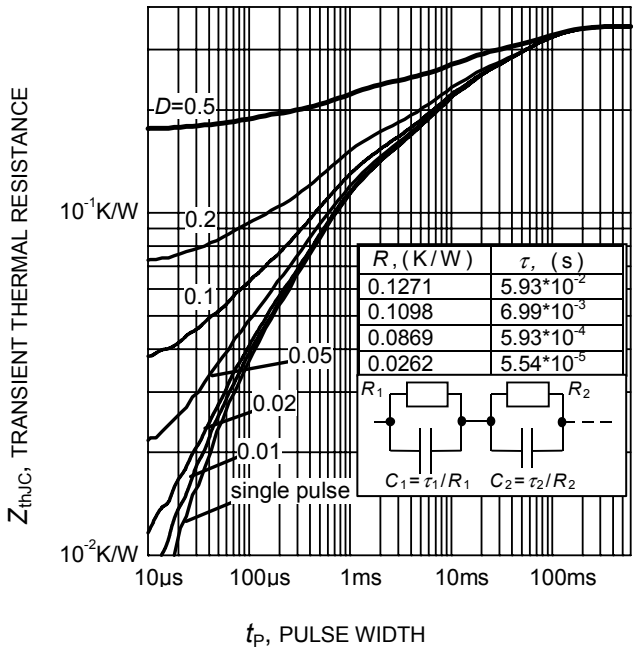


Figure 19. IGBT transient thermal resistance
($D = t_p / T$)

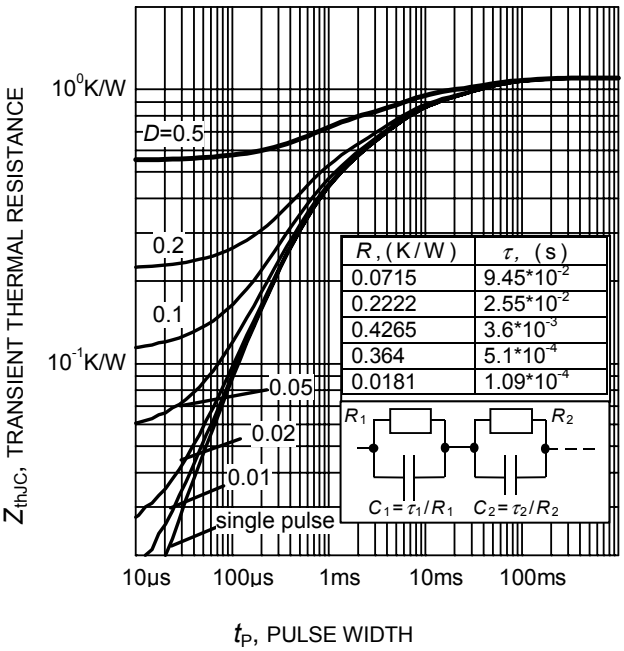


Figure 20. Typical Diode transient thermal impedance as a function of pulse width
(D=t_P/T)

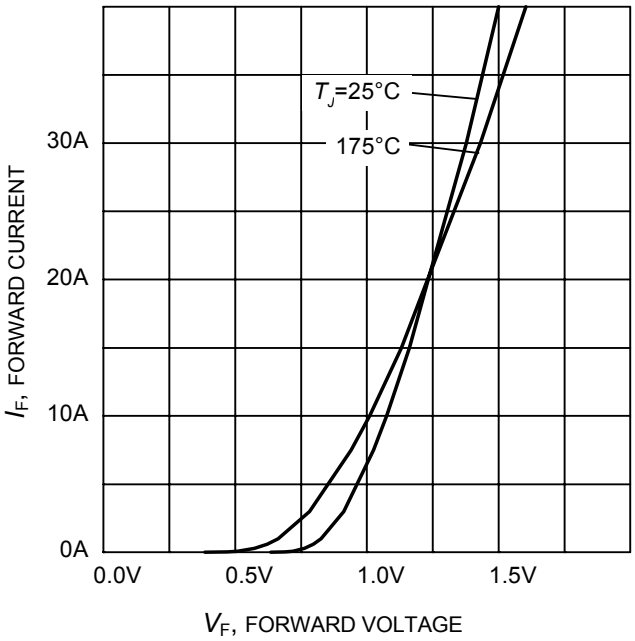


Figure 21. Typical diode forward current as a function of forward voltage

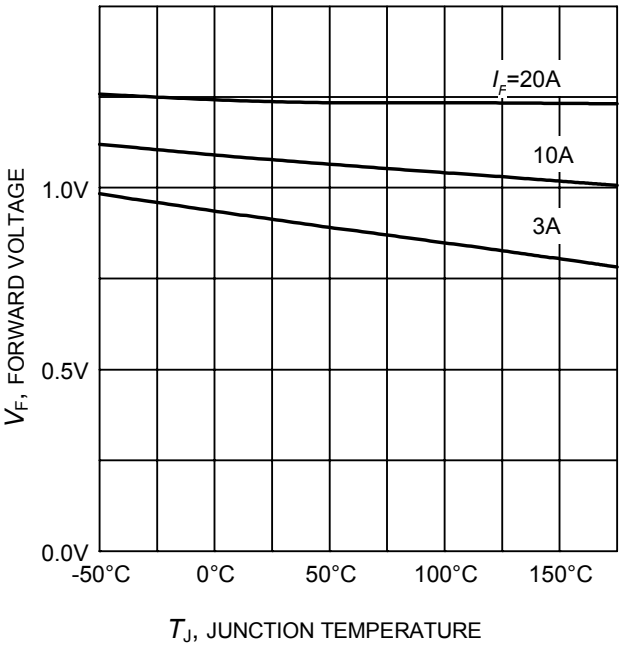


Figure 22. Typical diode forward voltage as a function of junction temperature

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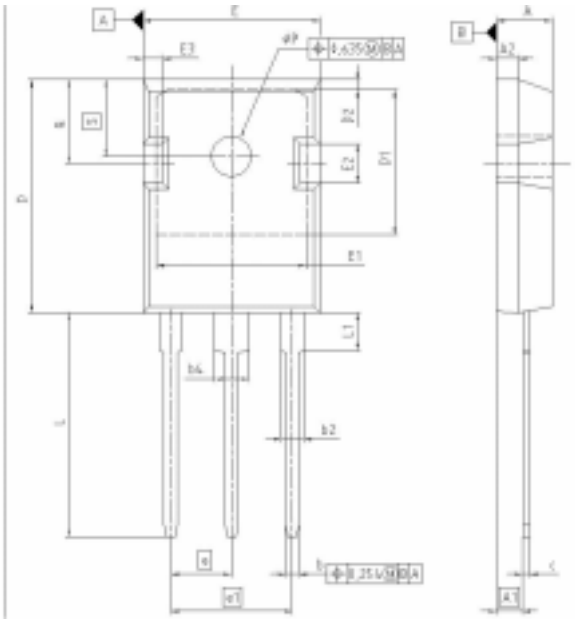

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.965	5.157	0.195	0.203
A1	2.275	2.527	0.090	0.099
A2	1.853	2.107	0.073	0.083
b	1.073	1.327	0.042	0.052
b2	1.903	2.386	0.075	0.094
b4	2.979	3.454	0.117	0.136
c	0.549	0.752	0.022	0.030
D	20.823	21.077	0.820	0.830
D1	17.323	17.831	0.682	0.702
D2	1.083	1.317	0.043	0.052
E	15.773	16.027	0.621	0.631
E1	13.898	14.147	0.547	0.557
E2	3.683	3.937	0.145	0.155
E3	1.883	1.937	0.089	0.079
e	5.450		0.215	
e1	10.900		0.430	
N	3		3	
L	20.053	20.307	0.789	0.799
L1	4.168	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

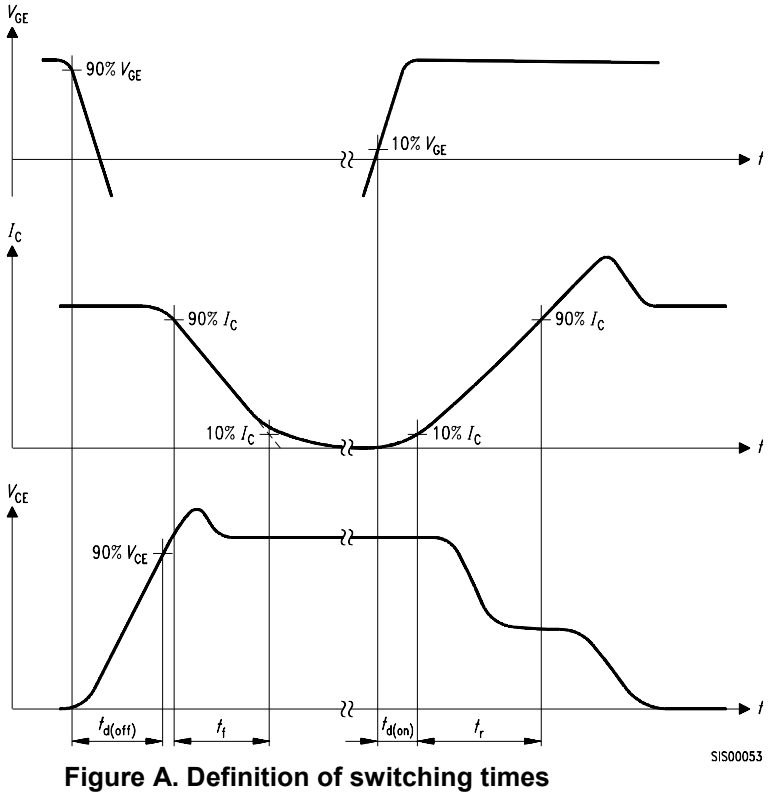

Figure A. Definition of switching times

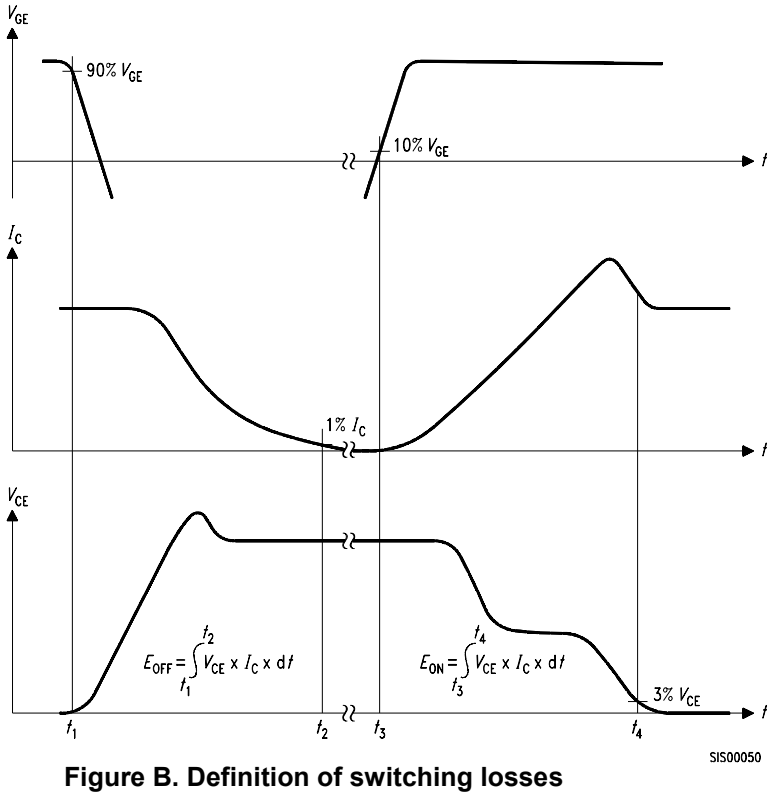

Figure B. Definition of switching losses

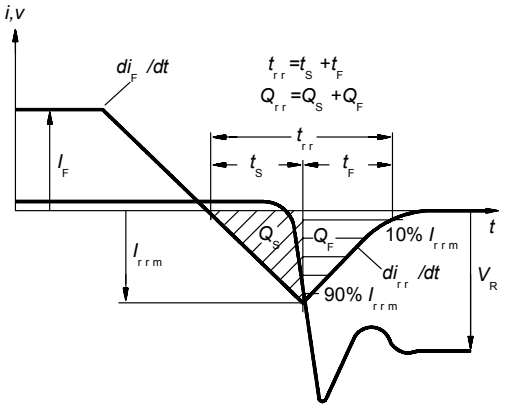

Figure C. Definition of diodes switching characteristics

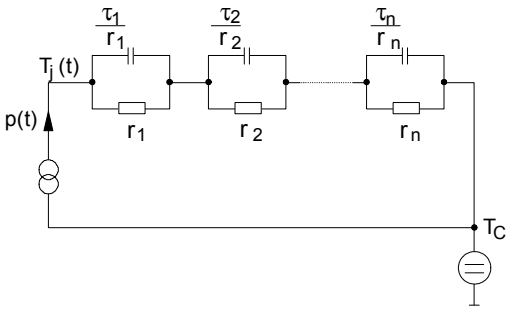

Figure D. Thermal equivalent circuit

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