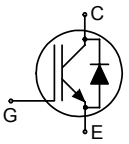
IHW30N100T

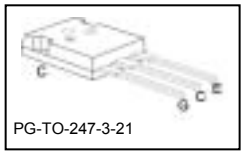
Soft Switching Series

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

Features:

- 1.1V Forward voltage of antiparallel rectifier diode
- Specified for T_{Jmax} = 175°C
- TrenchStop® and Fieldstop technology for 1000 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

Type	V_{CE}	I_C	$V_{CE(sat),Tj=25°C}$	$T_{j,max}$	Marking	Package
IHW30N100T	1000V	30A	1.55V	175°C	H30T100	PG-TO-247-3-21

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	1000	V
DC collector current	I_C		A
T_C = 25°C		60	
T_C = 100°C		30	
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	I_F		
T_C = 25°C		22	
T_C = 100°C		12	
Diode pulsed current, t_p limited by T_{jmax}	I_{Fpuls}	36	
Gate-emitter voltage	V_{GE}	±20	V
Transient Gate-emitter voltage (t_p < 5 ms)		±25	
Power dissipation, T_C = 25°C	P_{tot}	412	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}		0.36	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	1000	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C=30A				
		T_j=25°C	1.3	1.55	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=700µA, V_{CE}=V_{GE}	5.1	5.8	6.4	
Zero gate voltage collector current	I_{CES}	V_{CE}=1000V, V_{GE}=0V				µA
		T_j=25°C	-	-	5	
		T_j=175°C	-	-	2500	
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	600	nA
Transconductance	g_{fs}	V_{CE}=20V, I_C=30A	-	28	-	S
Dynamic Characteristic						
Input capacitance	C_{iss}	V_{CE}=25V,	-	3573	-	pF
Output capacitance	C_{oss}	V_{GE}=0V,	-	98	-	
Reverse transfer capacitance	C_{rss}	f=1MHz	-	76	-	
Gate charge	Q_{Gate}	V_{CC}=800V, I_C=30A	-	217	-	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,	-	50	-	ns
Rise time	t_r	V_{CC}=600V, I_C=30A,	-	25	-	
Turn-off delay time	$t_{d(off)}$	V_{GE}=0/15V,	-	550	-	
Fall time	t_f	R_G=26.9Ω,	-	48	70	
Turn-on energy	E_{on}	Energy losses include	-	-	-	mJ
Turn-off energy	E_{off}	“tail” and diode	-	2.1	2.6	
Total switching energy	E_{ts}	reverse recovery.	-	-	-	

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	-	50	-	ns
Rise time	t_r	V_{CC}=600V,	-	40	-	
Turn-off delay time	$t_{d(off)}$	I_C=30A,	-	650	-	
Fall time	t_f	V_{GE}=0/15V,	-	52	130	
Turn-on energy	E_{on}	R_G= 26.9Ω	-	-	-	mJ
Turn-off energy	E_{off}	Energy losses include	-	2.7	4	
Total switching energy	E_{ts}	“tail” and diode reverse recovery.	-	-	-	

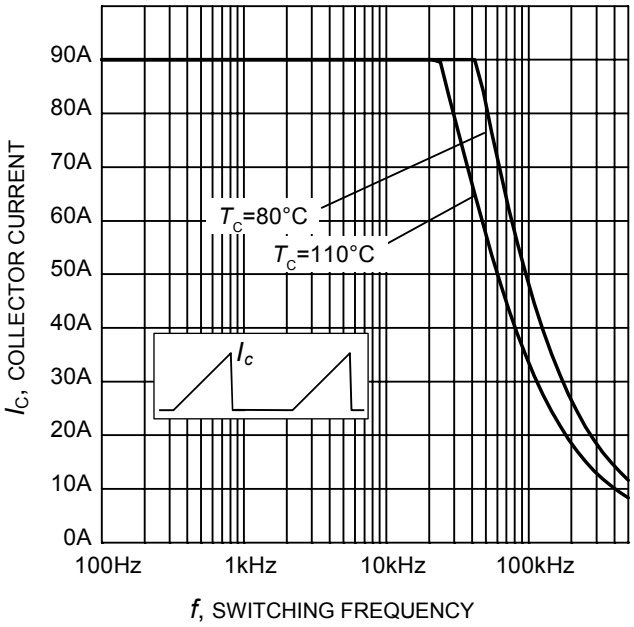


Figure 1. Collector current as a function of switching frequency for triangular current (E_{on} = 0, hard turn-off)
($T_j \le 175°C$, D = 0.5, V_{CE} = 400V, V_{GE} = 0/+15V, R_G = 26.9Ω)

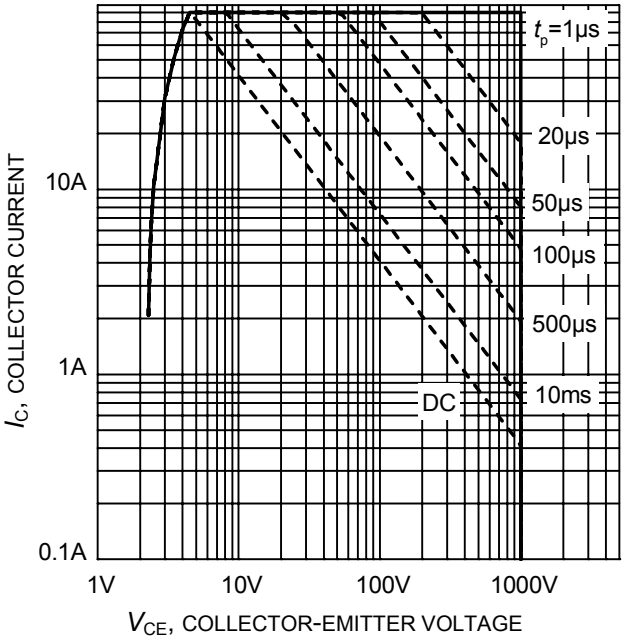


Figure 2. Safe operating area
(D = 0, T_C = 25°C, $T_j \le 175°C$; V_{GE}=15V)

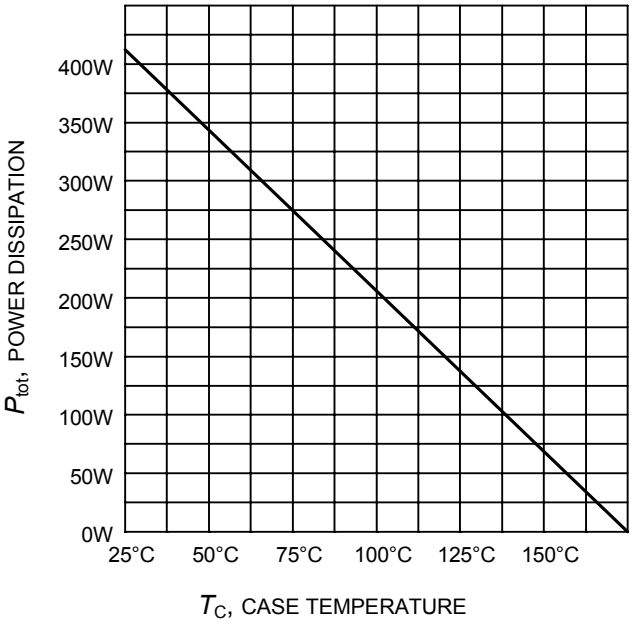


Figure 3. Power dissipation as a function of case temperature
($T_j \le 175°C$)

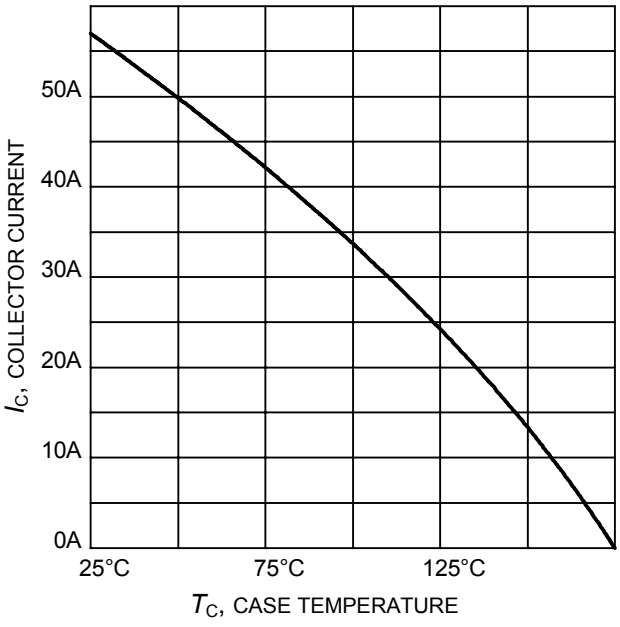


Figure 4. Collector current as a function of case temperature
($V_{GE} \ge 15V$, $T_j \le 175°C$)

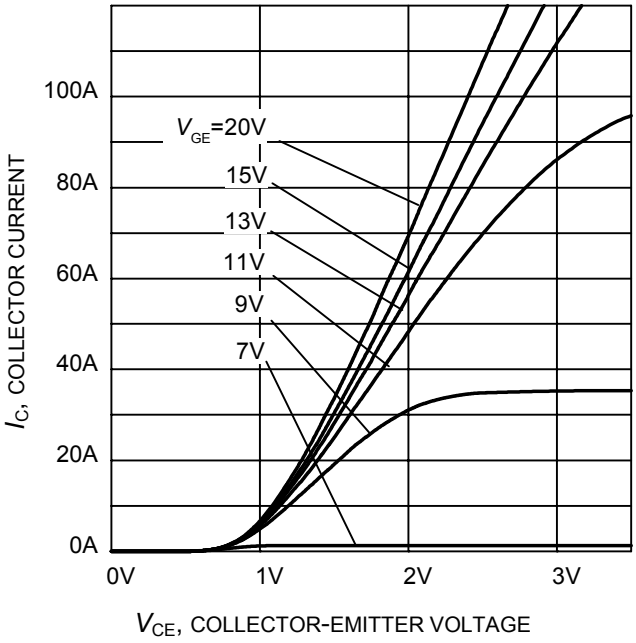


Figure 5. Typical output characteristic
(T_j = 25°C)

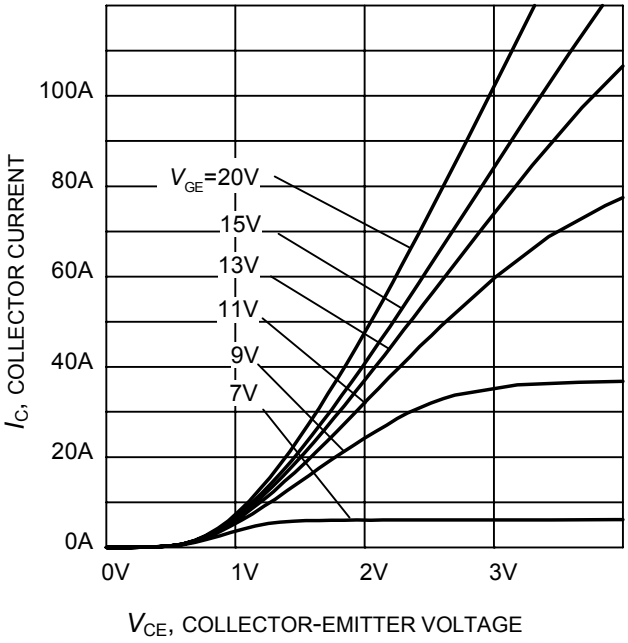


Figure 6. Typical output characteristic
(T_j = 175°C)

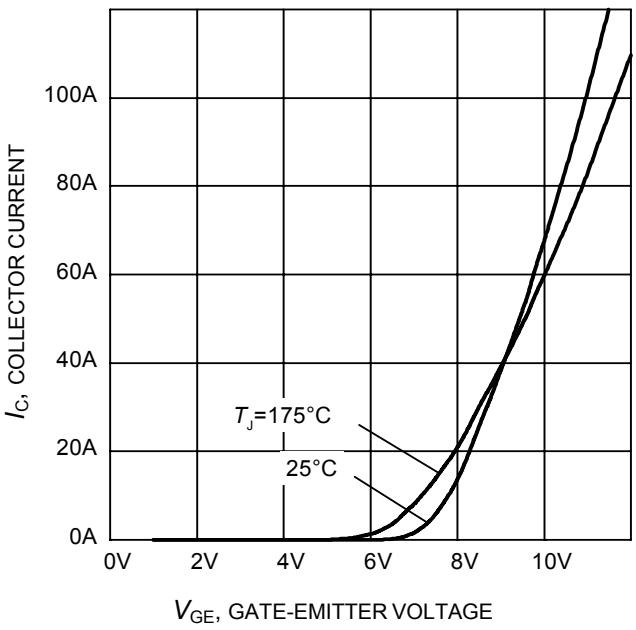


Figure 7. Typical transfer characteristic
(V_{CE}=20V)

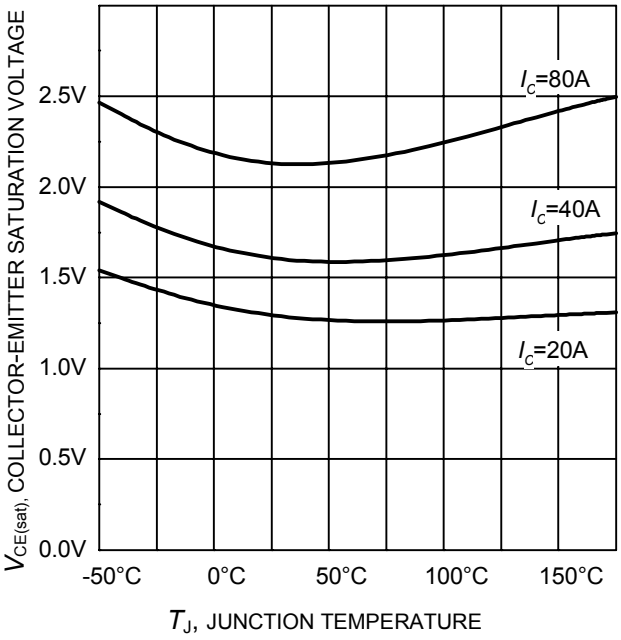


Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE} = 15V)

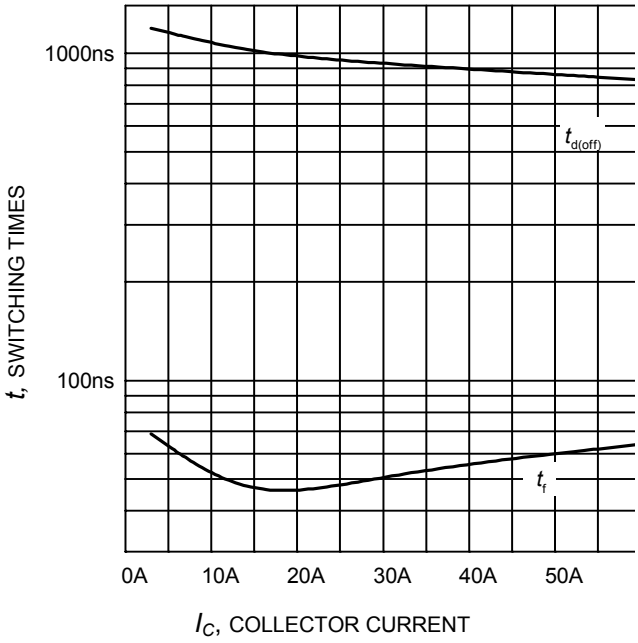


Figure 9. Typical switching times as a function of collector current
(inductive load, T_J=175°C,
V_{CE} = 600V, V_{GE} = 0/15V, R_G=26.9Ω,
Dynamic test circuit in Figure E)

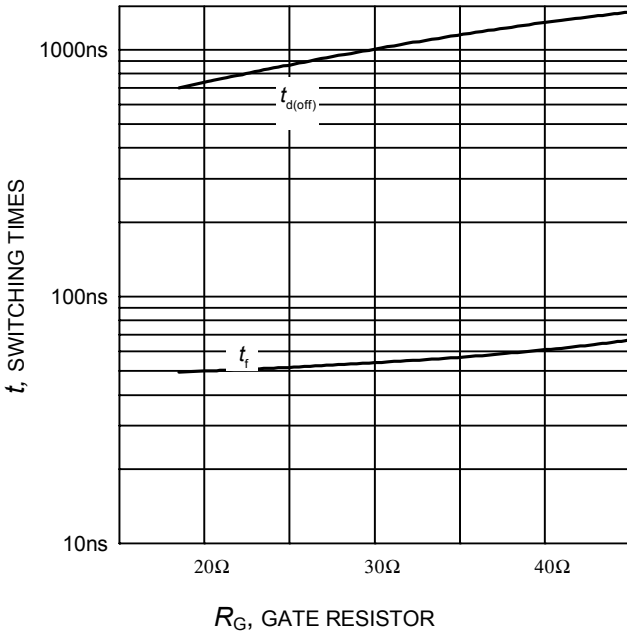


Figure 10. Typical switching times as a function of gate resistor
(inductive load, T_J = 175°C,
V_{CE}= 600V, V_{GE} = 0/15V, I_C = 30A,
Dynamic test circuit in Figure E)

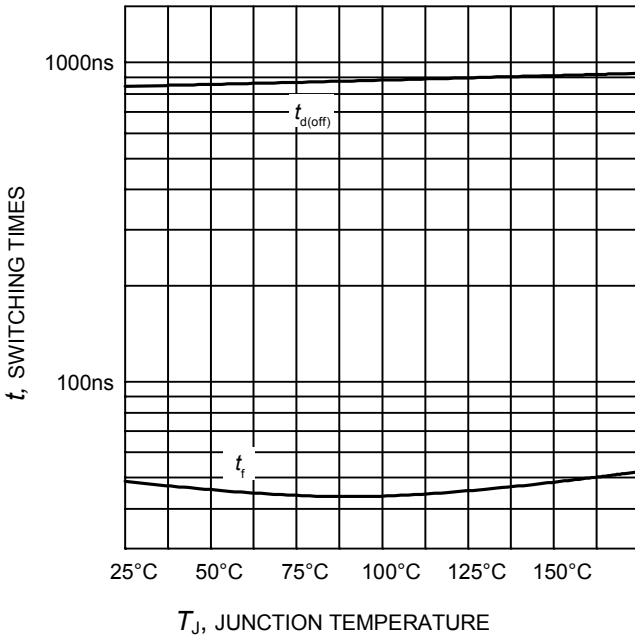


Figure 11. Typical switching times as a function of junction temperature
(inductive load, V_{CE} = 600V,
V_{GE} = 0/15V, I_C = 30A, R_G=26.9Ω,
Dynamic test circuit in Figure E)

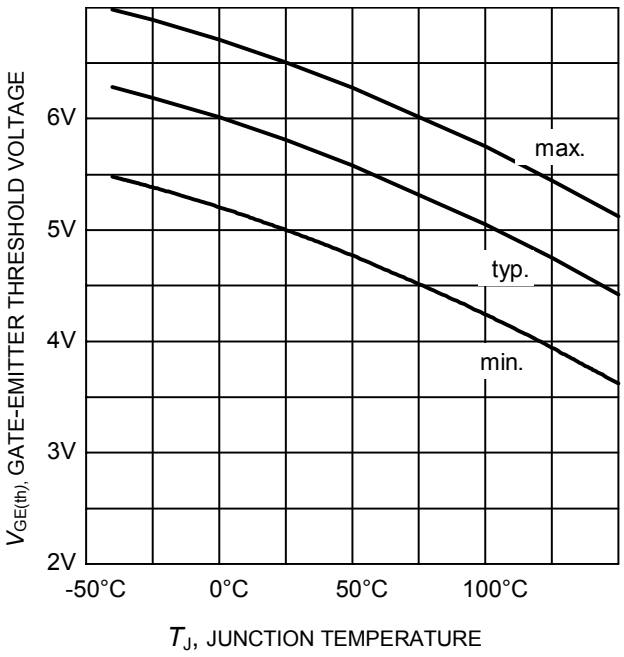


Figure 12. Gate-emitter threshold voltage as a function of junction temperature
(I_C = 0.7mA)

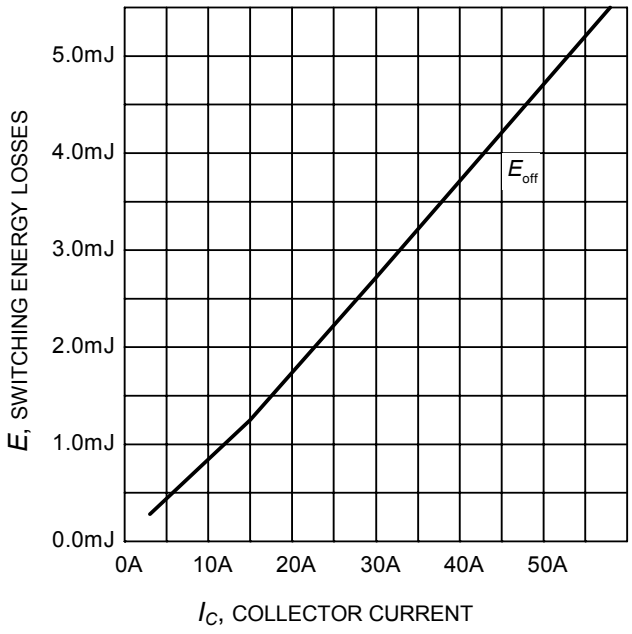


Figure 13. Typical switching energy losses as a function of collector current
(inductive load, T_J = 175°C,
V_{CE} = 600V, V_{GE} = 0/15V, R_G=26.9Ω,
Dynamic test circuit in Figure E)

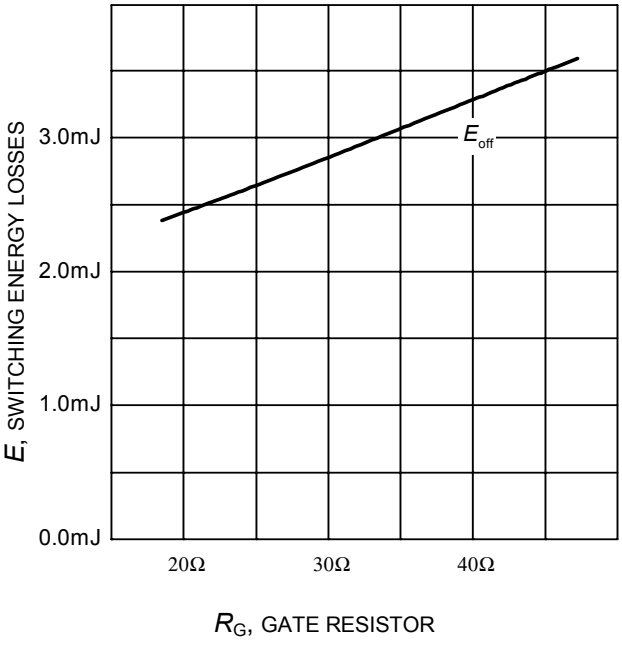


Figure 14. Typical switching energy losses as a function of gate resistor
(inductive load, T_J = 175°C,
V_{CE} = 600V, V_{GE} = 0/15V, I_C = 30A,
Dynamic test circuit in Figure E)

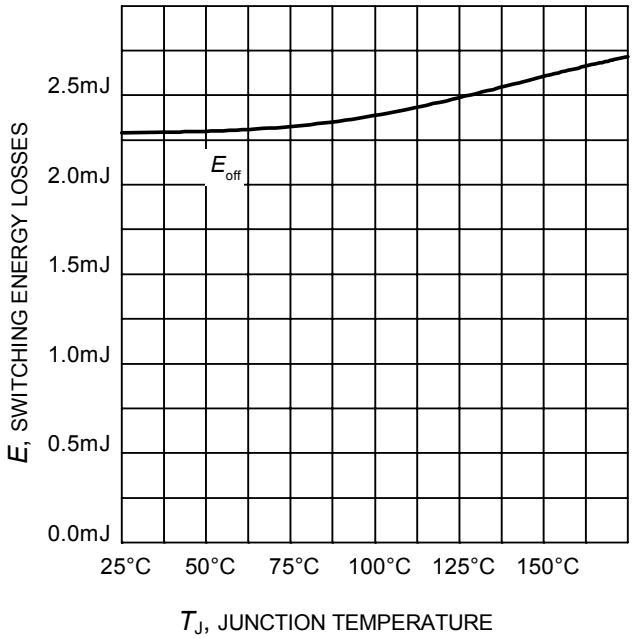


Figure 15. Typical switching energy losses as a function of junction temperature
(inductive load, V_{CE} = 600V,
V_{GE} = 0/15V, I_C = 30A, R_G = 26.9Ω,
Dynamic test circuit in Figure E)

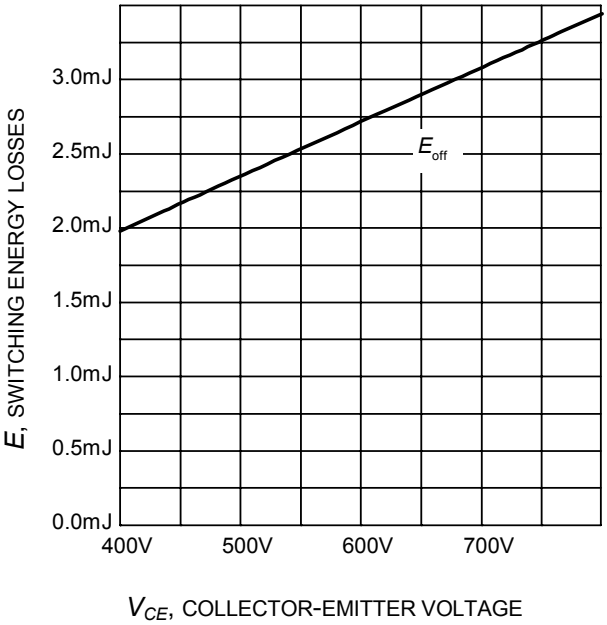


Figure 16. Typical switching energy losses as a function of collector emitter voltage
(inductive load, T_J = 175°C,
V_{GE} = 0/15V, I_C = 30A, R_G = 26.9Ω,
Dynamic test circuit in Figure E)

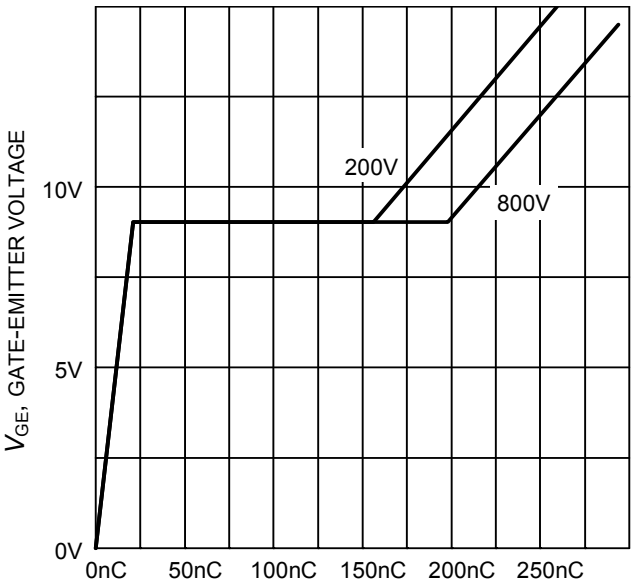


Figure 17. Typical gate charge
(I_C=30 A)

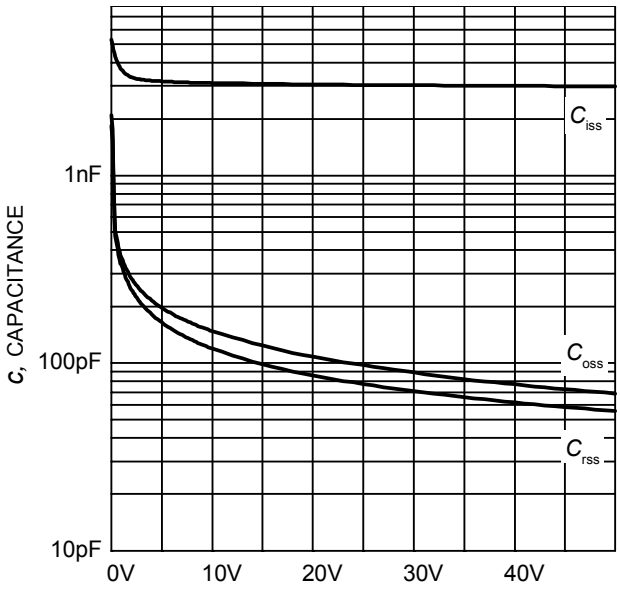


Figure 18. Typical capacitance as a function of collector-emitter voltage
(V_{GE}=0V, f = 1 MHz)

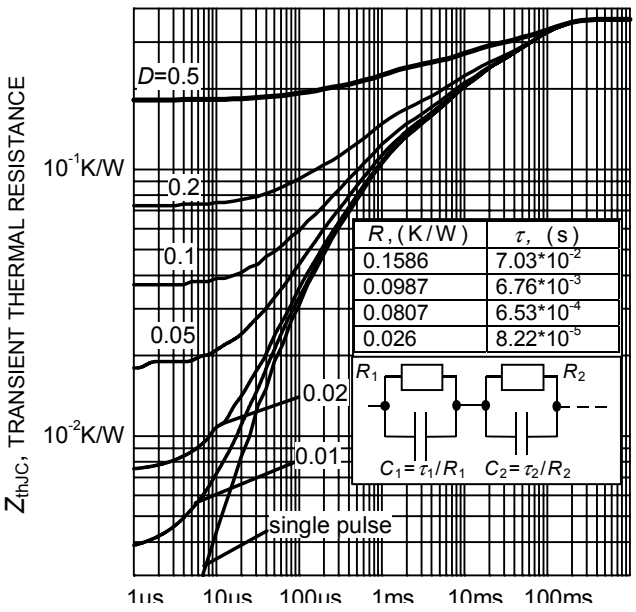


Figure 19. IGBT transient thermal resistance
($D = t_p / T$)

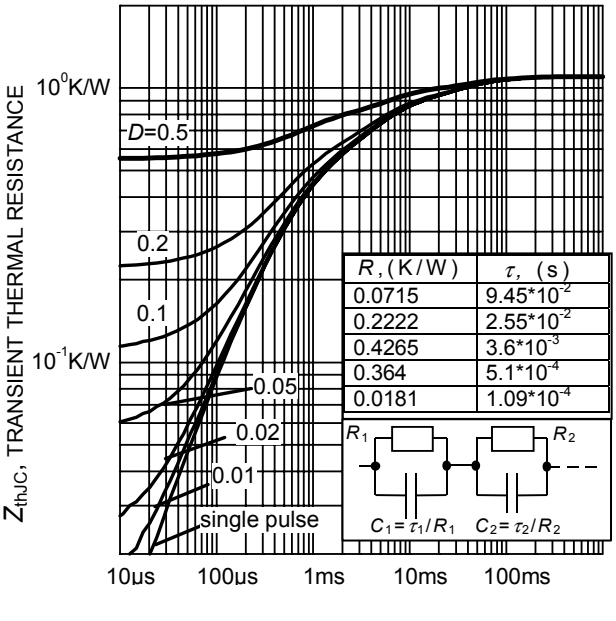


Figure 20. Diode transient thermal impedance as a function of pulse width
($D=t_P/T$)

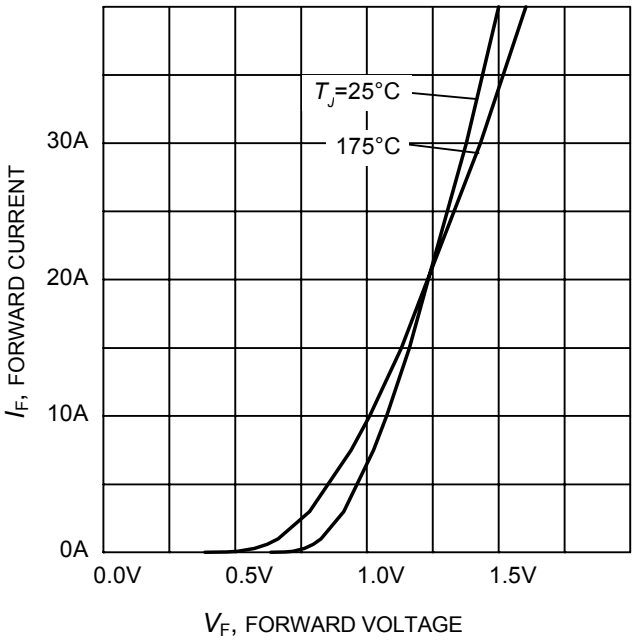


Figure 21. Typical diode forward current as a function of forward voltage

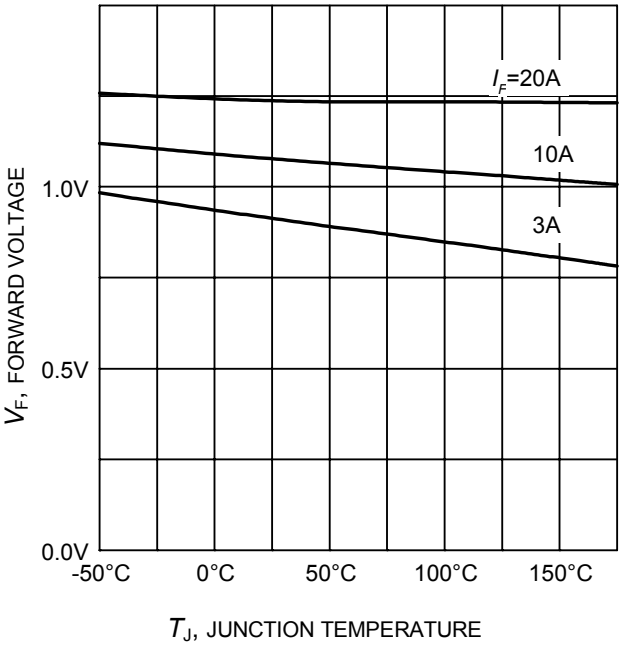
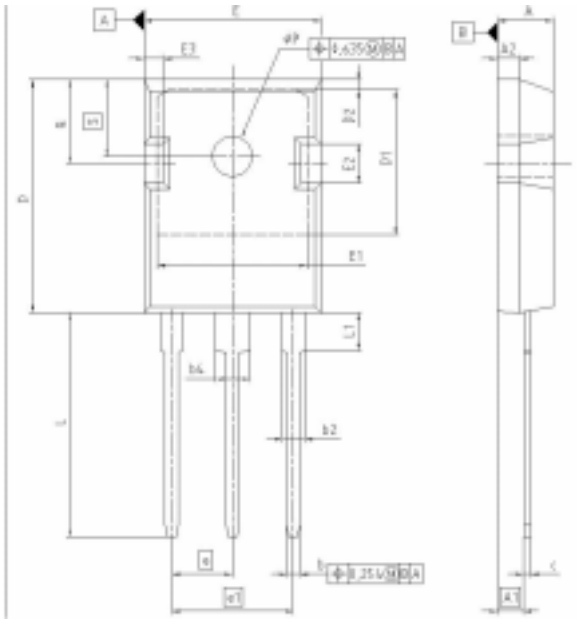


Figure 22. Typical diode forward voltage as a function of junction temperature

PG-TO247-3-21



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	2.286	0.075	0.090
b4	2.870	3.454	0.113	0.136
c	0.549	0.752	0.024	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	0.042	0.052
E	15.773	16.027	0.621	0.631
E1	13.893	14.147	0.547	0.557
E2	3.683	3.937	0.145	0.155
E3	1.863	1.997	0.069	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	4.166	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

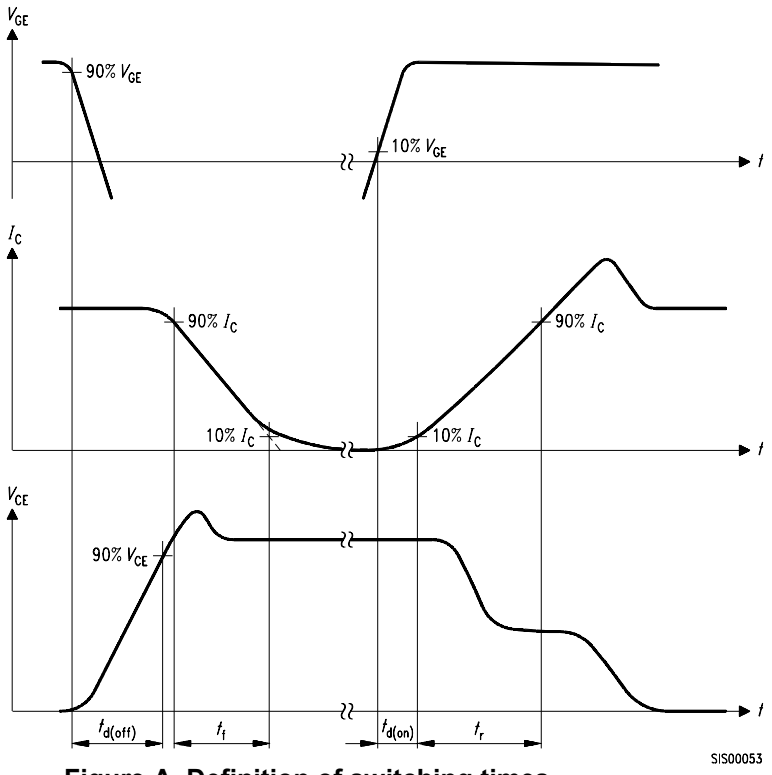


Figure A. Definition of switching times

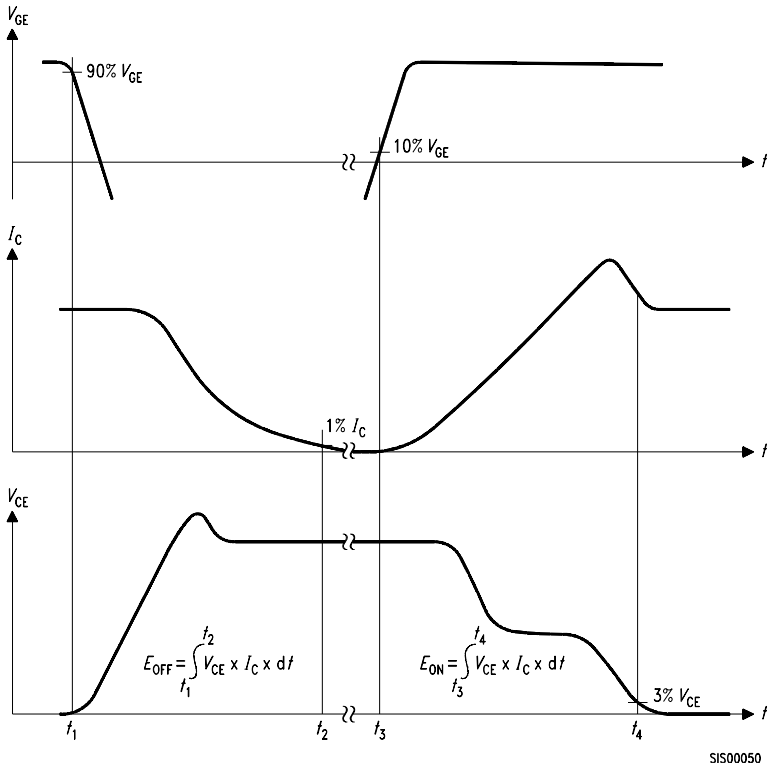


Figure B. Definition of switching losses

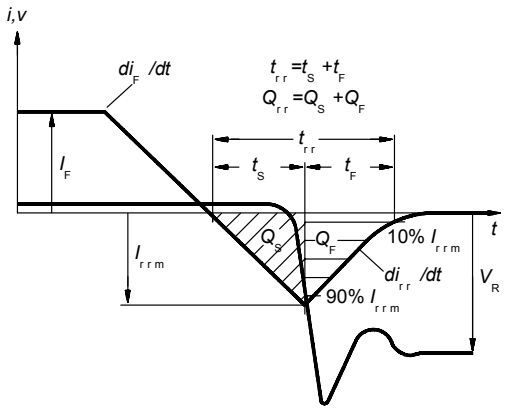


Figure C. Definition of diodes switching characteristics

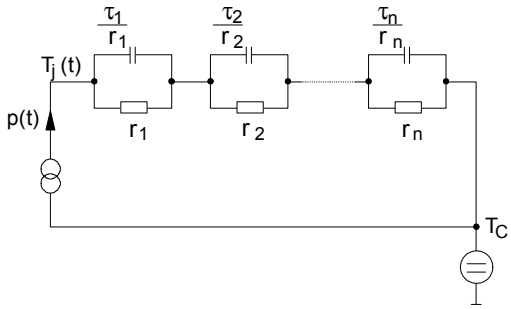


Figure D. Thermal equivalent circuit

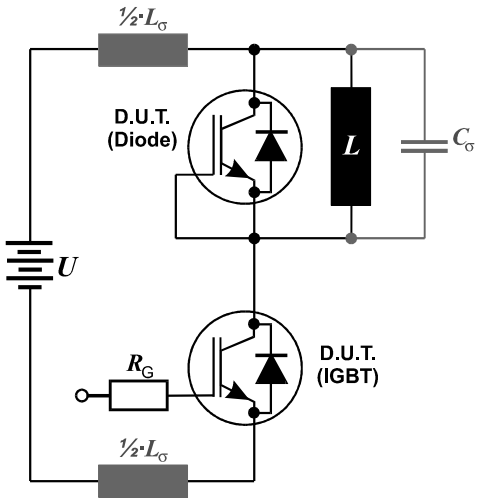


Figure E. Dynamic test circuit

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