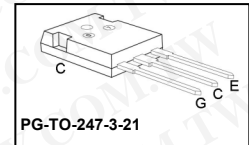
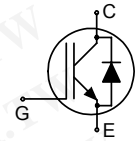


Reverse Conducting IGBT with monolithic body diode

Features:

- Powerful monolithic Body Diode with very low forward voltage
- Body diode clamps negative voltages
- Trench and Fieldstop technology for 1200 V applications offers :
 - very tight parameter distribution
 - high ruggedness, temperature stable behavior
- NPT technology offers easy parallel switching capability due to positive temperature coefficient in $V_{CE(sat)}$
- Low EMI
- Qualified according to JEDEC¹ for target applications
- Pb-free lead plating; RoHS compliant
- Complete product spectrum and PSpice Models : <http://www.infineon.com/igbt/>



Applications:

- Inductive Cooking
- Soft Switching Applications

Type	V_{CE}	I_C	$V_{CE(sat), T_J=25^\circ C}$	$T_{j,max}$	Marking	Package
IHW25N120R2	1200V	25A	1.6V	175°C	H25R1202	PG-TO-247-3-21

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	1200	V
DC collector current $T_C = 25^\circ C$ $T_C = 100^\circ C$	I_C	50 25	A
Pulsed collector current, t_p limited by $T_{j,max}$	$I_{C,puls}$	75	
Turn off safe operating area ($V_{CE} \leq 1200V, T_j \leq 175^\circ C$)	-	75	
Diode forward current $T_C = 25^\circ C$ $T_C = 100^\circ C$	I_F	50 25	
Diode pulsed current, t_p limited by $T_{j,max}$	$I_{F,puls}$	75	
Diode surge non repetitive current, t_p limited by $T_{j,max}$ $T_C = 25^\circ C, t_p = 10ms$, sine halfwave $T_C = 25^\circ C, t_p \leq 2.5\mu s$, sine halfwave $T_C = 100^\circ C, t_p \leq 2.5\mu s$, sine halfwave	I_{FSM}	50 130 120	
Gate-emitter voltage	V_{GE}	± 20	V
Transient Gate-emitter voltage ($t_p < 10 \mu s, D < 0.01$)		± 25	
Power dissipation $T_C = 25^\circ C$	P_{tot}	365	W
Operating junction temperature	T_j	-40...+175	°C
Storage temperature	T_{stg}	-55...+175	
Soldering temperature, 1.6mm (0.063 in.) from case for 10s	-	260	

¹ J-STD-020 and JESD-022

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Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
IGBT thermal resistance, junction – case	R_{thJC}		0.41	K/W
Diode thermal resistance, junction – case	R_{thJCD}		0.41	
Thermal resistance, junction – ambient	R_{thJA}		40	

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

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
Static Characteristic						
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=500\mu A$	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE} = 15V, I_C=25A$ $T_j=25^\circ\text{C}$ $T_j=150^\circ\text{C}$ $T_j=175^\circ\text{C}$	-	1.6 1.95 2.0	1.8 - -	
Diode forward voltage	V_F	$V_{GE}=0V, I_F=25A$ $T_j=25^\circ\text{C}$ $T_j=150^\circ\text{C}$ $T_j=175^\circ\text{C}$	-	1.5 1.75 1.8	1.75 - -	
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C=0.58mA, V_{CE}=V_{GE}$	5.1	5.8	6.4	
Zero gate voltage collector current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V$ $T_j=25^\circ\text{C}$ $T_j=175^\circ\text{C}$	-	-	4 2500	μA
Gate-emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V$	-	-	100	nA
Transconductance	g_{fs}	$V_{CE}=20V, I_C=25A$	-	16.3	-	S
Integrated gate resistor	R_{Gint}			none		Ω

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Dynamic Characteristic

Input capacitance	C_{iss}	$V_{CE}=25V,$	-	2342	-	pF
Output capacitance	C_{oss}	$V_{GE}=0V,$	-	68.7	-	
Reverse transfer capacitance	C_{riss}	$f=1MHz$	-	55.5	-	
Gate charge	Q_{Gate}	$V_{CC}=960V, I_C=25A$ $V_{GE}=15V$	-	60.7	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13	-	nH

Switching Characteristic, Inductive Load, at $T_j=25^\circ C$

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic						
Turn-off delay time	$t_{d(off)}$	$T_j=25^\circ C,$	-	324	-	ns
Fall time	t_f	$V_{CC}=600V, I_C=25A$	-	55.8	-	
Turn-on energy	E_{on}	$V_{GE}=0 / 15V,$	-	-	-	mJ
Turn-off energy	E_{off}	$R_G=10\Omega,$	-	1.59	-	
Total switching energy	E_{ts}		-	1.59	-	

Switching Characteristic, Inductive Load, at $T_j=175^\circ C$

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
IGBT Characteristic						
Turn-off delay time	$t_{d(off)}$	$T_j=175^\circ C$	-	373	-	ns
Fall time	t_f	$V_{CC}=600V, I_C=25A,$	-	90.6	-	
Turn-on energy	E_{on}	$V_{GE}=0 / 15V,$	-	-	-	mJ
Turn-off energy	E_{off}	$R_G=10\Omega,$	-	2.54	-	
Total switching energy	E_{ts}		-	2.54	-	

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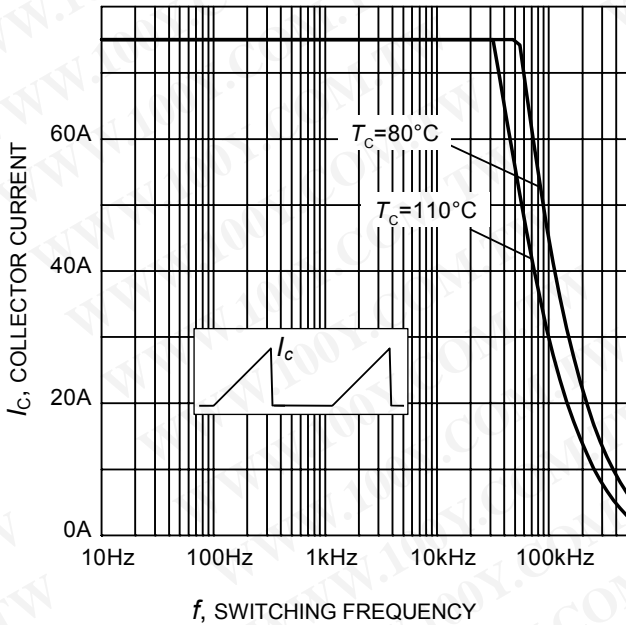


Figure 1. Collector current as a function of switching frequency for hard switching (turn-off)
 $(T_j \leq 175^\circ\text{C}, D = 0.5, V_{CE} = 600\text{V}, V_{GE} = 0/+15\text{V}, R_G = 10\Omega)$

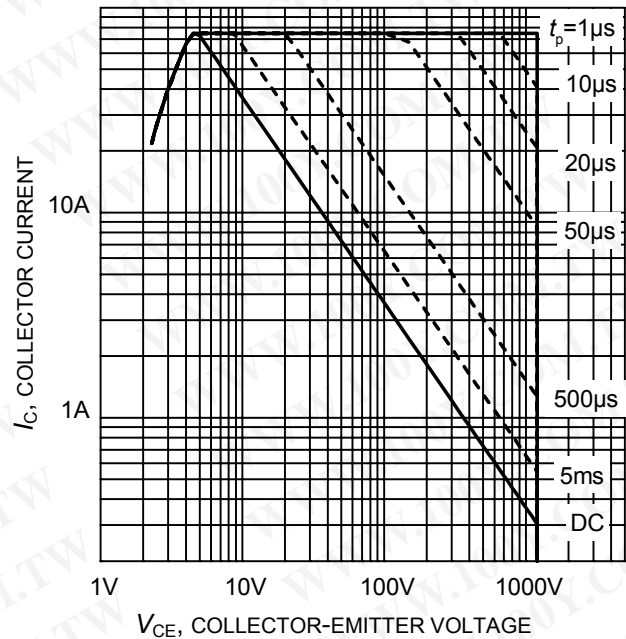


Figure 2. IGBT Safe operating area
 $(D = 0, T_C = 25^\circ\text{C}, T_j \leq 175^\circ\text{C}; V_{GE} = 15\text{V})$

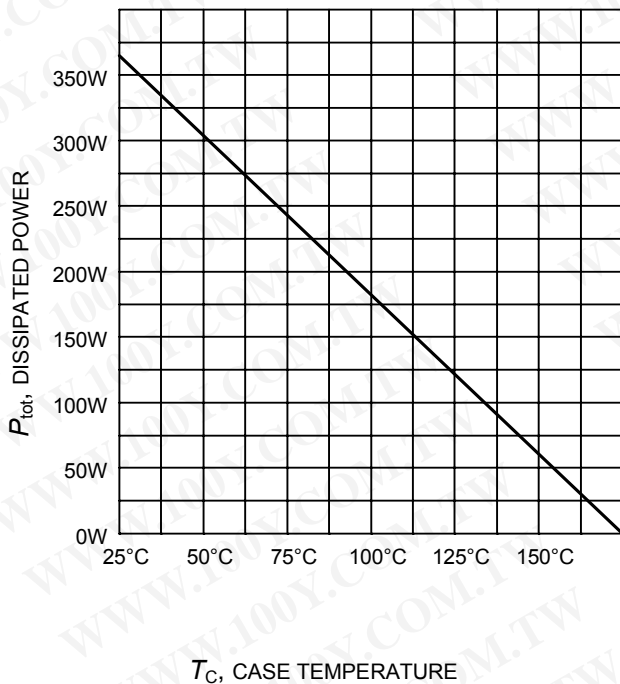


Figure 3. Power dissipation as a function of case temperature
 $(T_j \leq 175^\circ\text{C})$

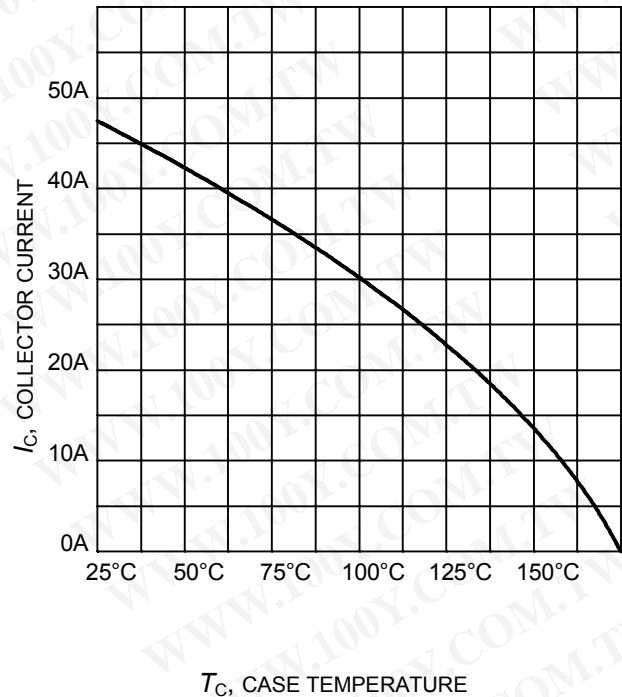


Figure 4. DC Collector current as a function of case temperature
 $(V_{GE} \geq 15\text{V}, T_j \leq 175^\circ\text{C})$

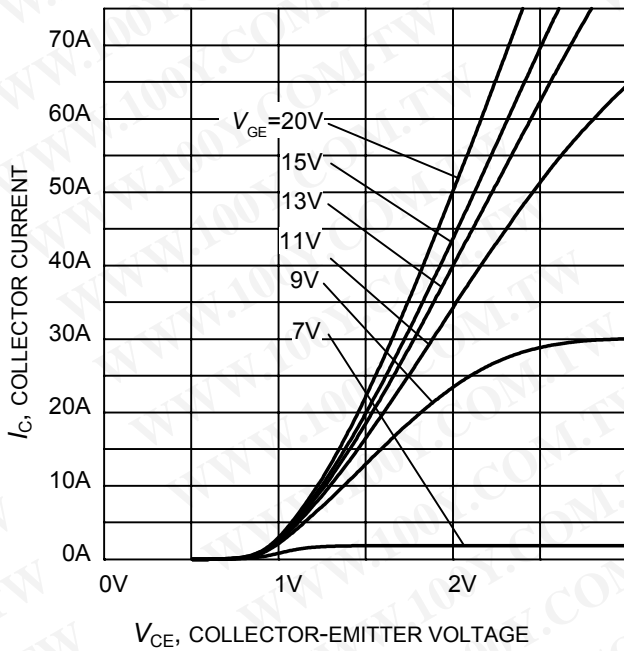


Figure 5. Typical output characteristic
($T_j = 25^\circ\text{C}$)

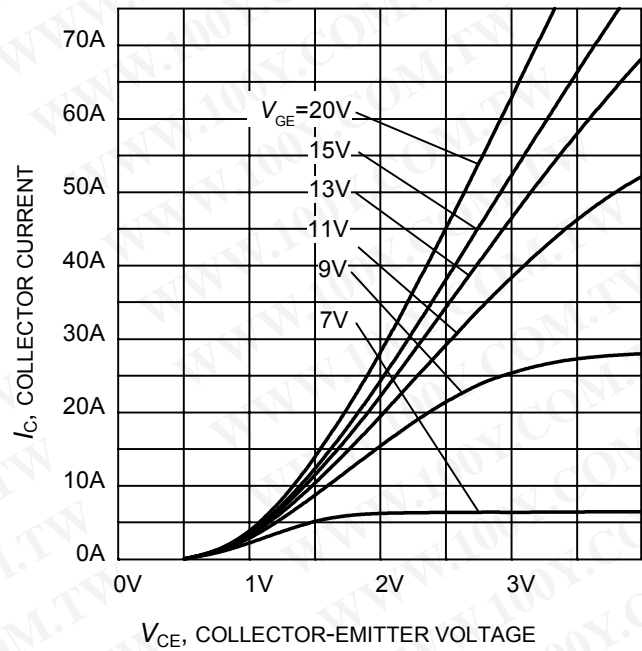


Figure 6. Typical output characteristic
($T_j = 175^\circ\text{C}$)

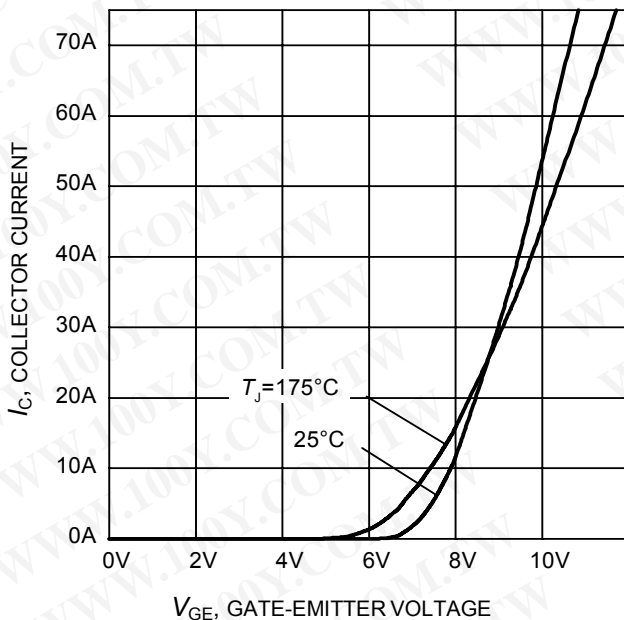


Figure 7. Typical transfer characteristic
($V_{CE} = 20\text{V}$)

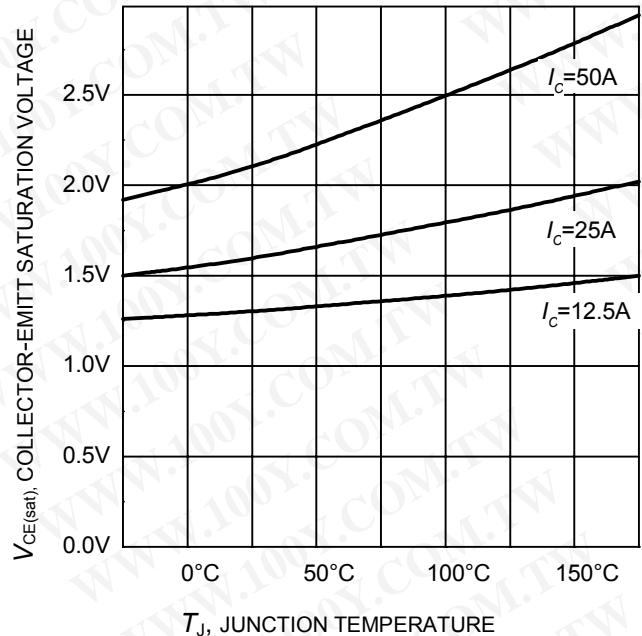


Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
($V_{GE} = 15\text{V}$)

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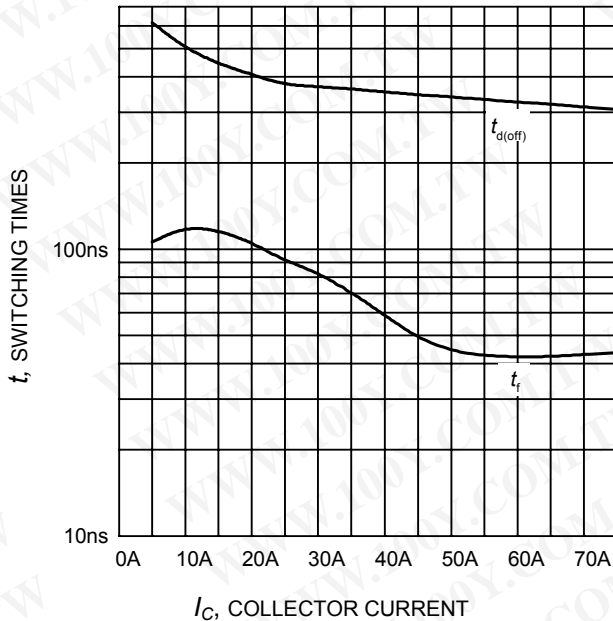


Figure 9. Typical switching times as a function of collector current
(inductive load, $T_J=175^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, Dynamic test circuit in Figure E)

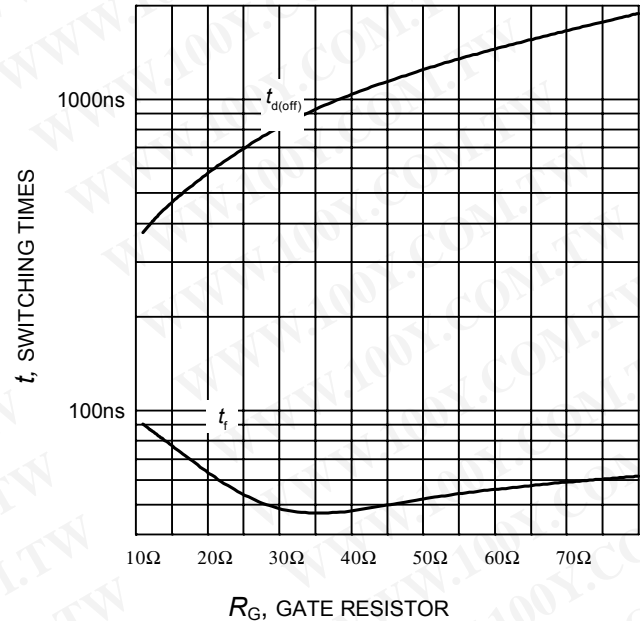


Figure 10. Typical switching times as a function of gate resistor
(inductive load, $T_J=175^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $I_C=25\text{A}$, Dynamic test circuit in Figure E)

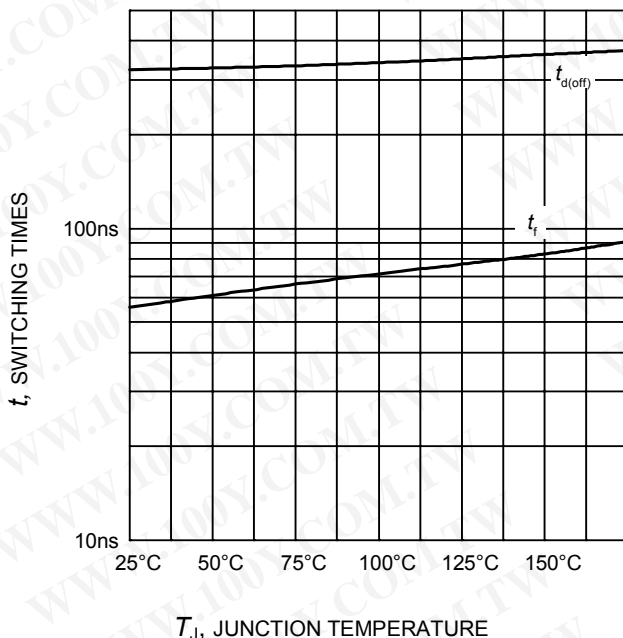


Figure 11. Typical switching times as a function of junction temperature
(inductive load, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $I_C=25\text{A}$, $R_G=10\Omega$, Dynamic test circuit in Figure E)

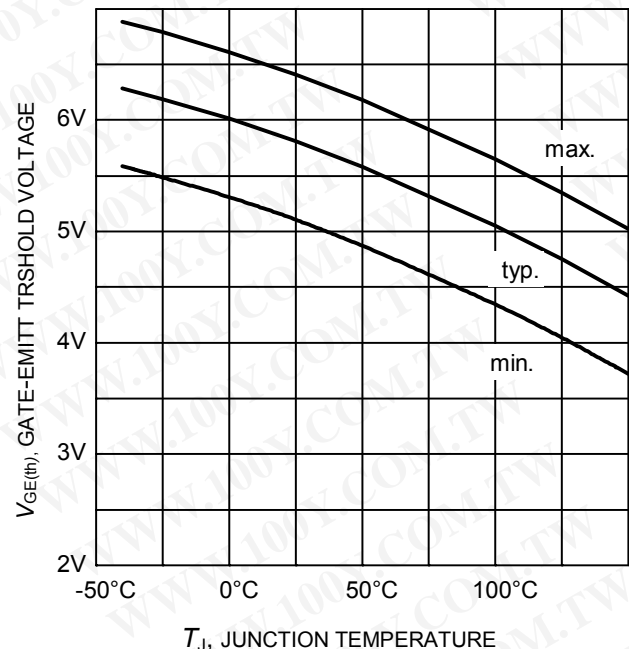


Figure 12. Gate-emitter threshold voltage as a function of junction temperature
($I_C = 0.6\text{mA}$)

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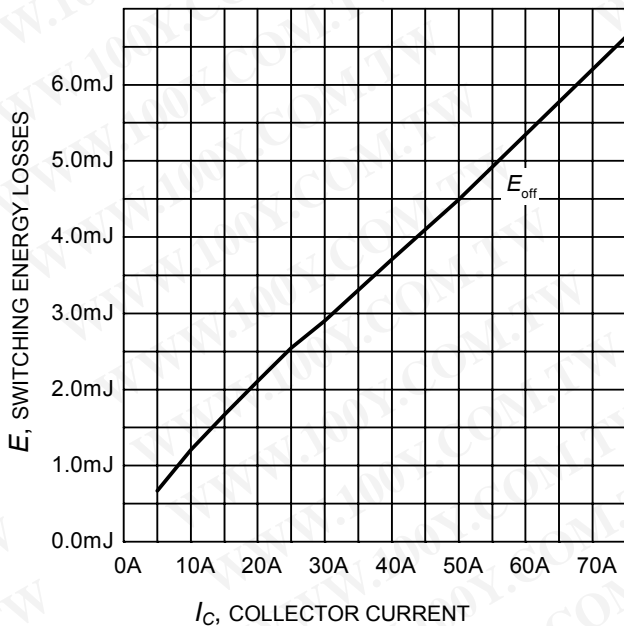


Figure 13. Typical turn-off energy as a function of collector current
 (inductive load, $T_J=175^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, Dynamic test circuit in Figure E)

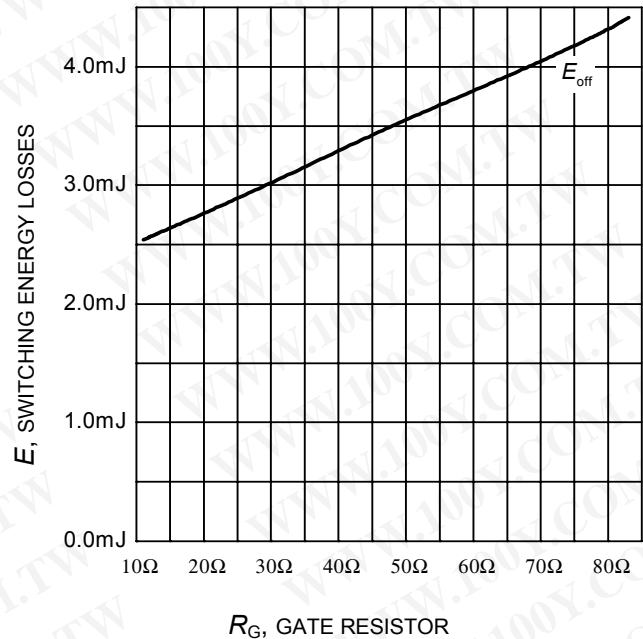


Figure 14. Typical turn-off energy as a function of gate resistor
 (inductive load, $T_J=175^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $I_C=25\text{A}$, Dynamic test circuit in Figure E)

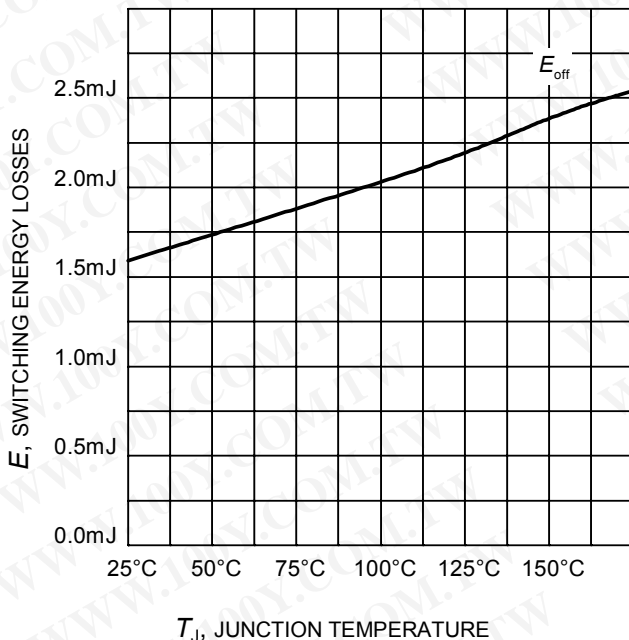


Figure 15. Typical turn-off energy as a function of junction temperature
 (inductive load, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $I_C=25\text{A}$, $R_G=10\Omega$, Dynamic test circuit in Figure E)

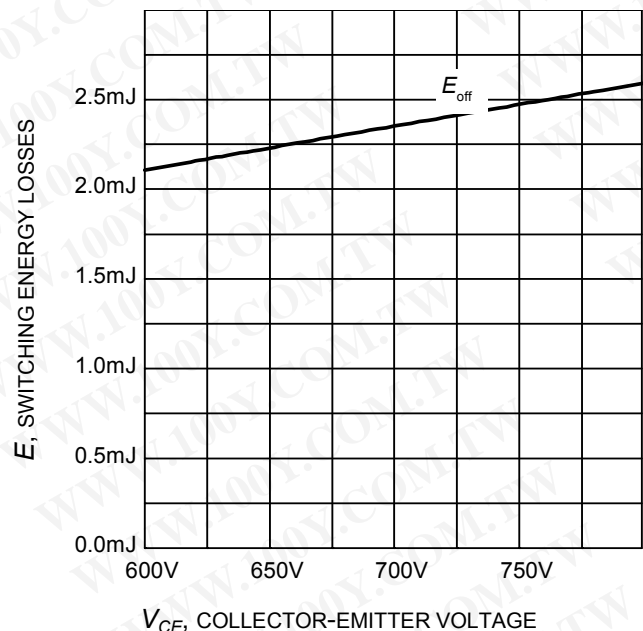


Figure 16. Typical turn-off energy as a function of collector emitter voltage
 (inductive load, $T_J=175^\circ\text{C}$, $V_{GE}=0/15\text{V}$, $I_C=20\text{A}$, $R_G=10\Omega$, Dynamic test circuit in Figure E)

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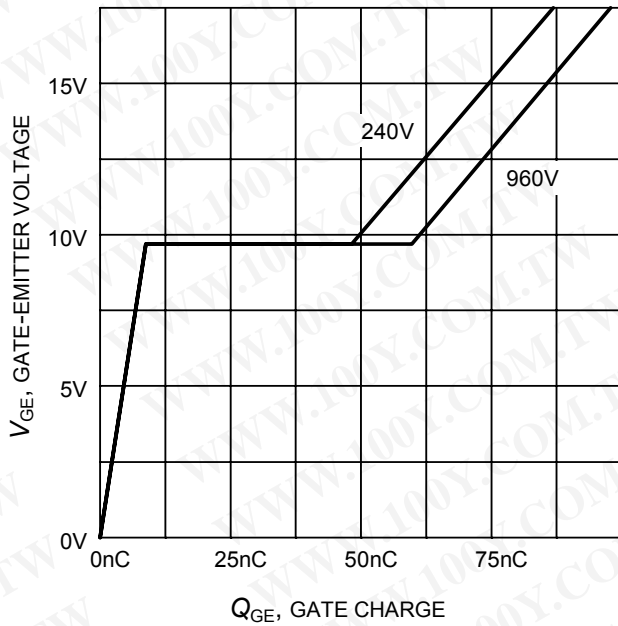


Figure 17. Typical gate charge
($I_C=25\text{ A}$)

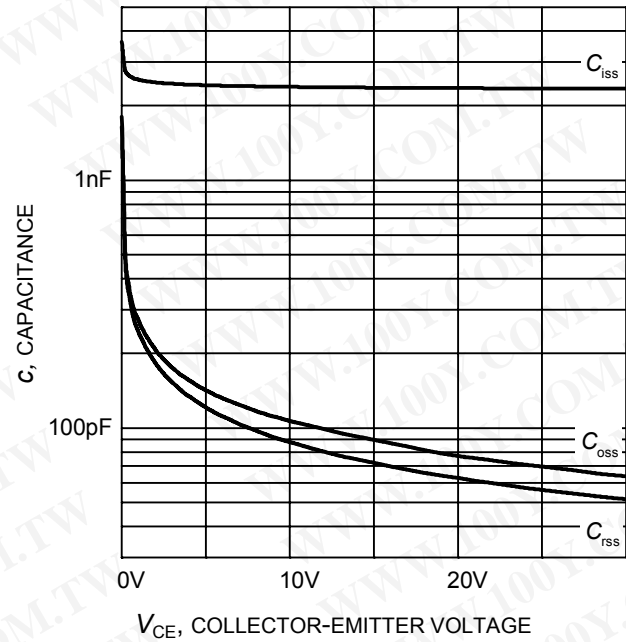


Figure 18. Typical capacitance as a function of collector-emitter voltage
($V_{GE}=0\text{V}$, $f = 1\text{ MHz}$)

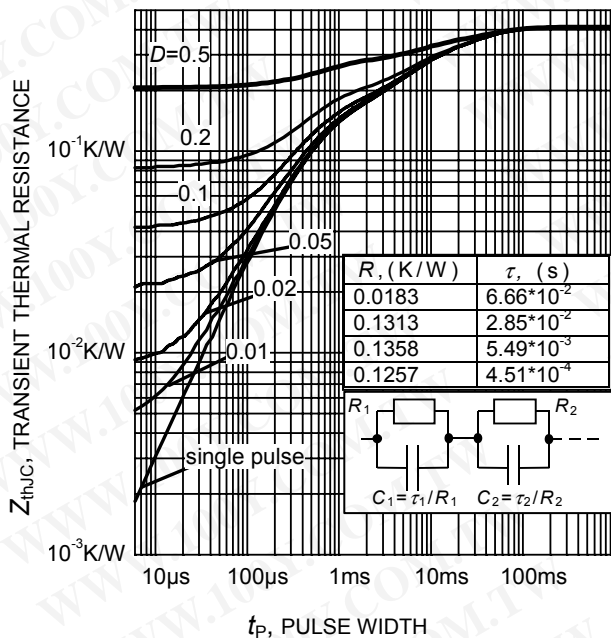


Figure 19. IGBT transient thermal resistance
($D = t_p / T$)

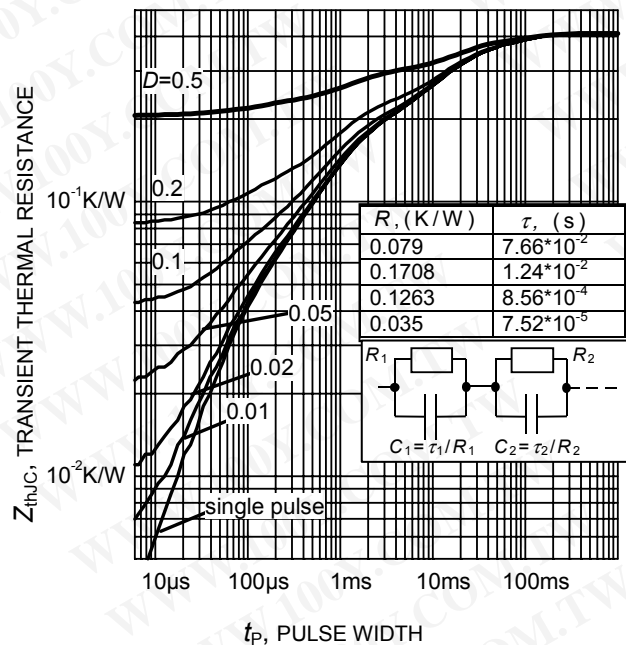


Figure 20. Diode transient thermal impedance as a function of pulse width
($D=t_p/T$)

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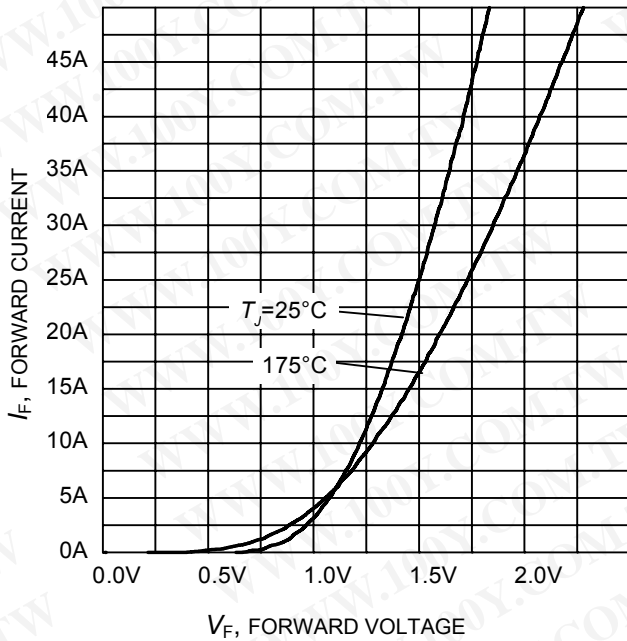


Figure 21. Typical diode forward current as a function of forward voltage

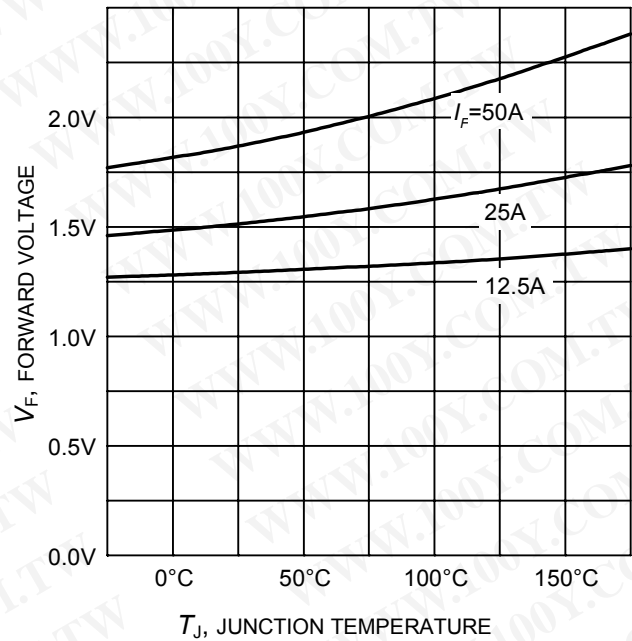
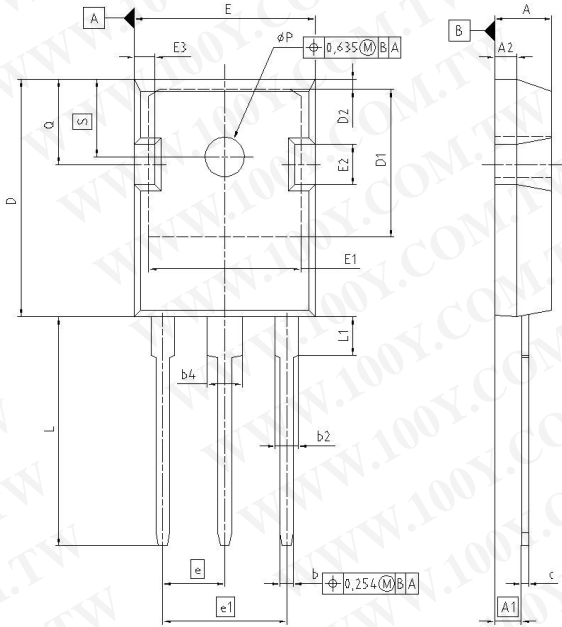


Figure 22. Typical diode forward voltage as a function of junction temperature

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PG-T0247-3-21



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.903	5.157	0.193	0.203
A1	2.273	2.527	0.092	0.096
A2	1.853	2.107	0.075	0.081
b	1.073	1.327	0.047	0.052
b2	1.903	2.386	0.075	0.094
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	1.063	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	1.683	1.937	0.066	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	4.168	4.472	0.164	0.176
eP	3.559	3.661	0.140	0.144
Q	5.493	5.747	0.216	0.226
S	6.043	6.297	0.238	0.248

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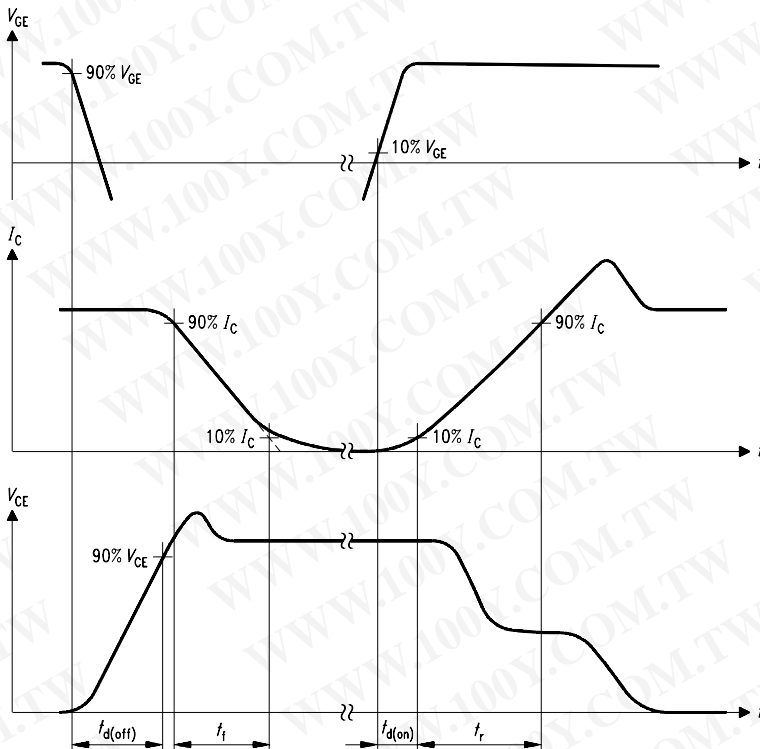


Figure A. Definition of switching times

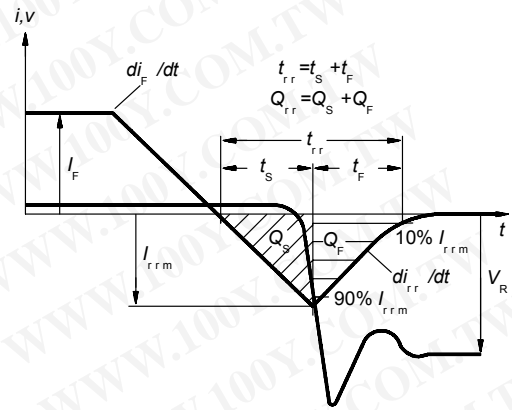


Figure C. Definition of diodes switching characteristics

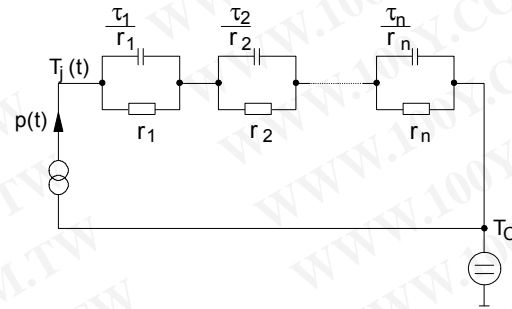


Figure D. Thermal equivalent circuit

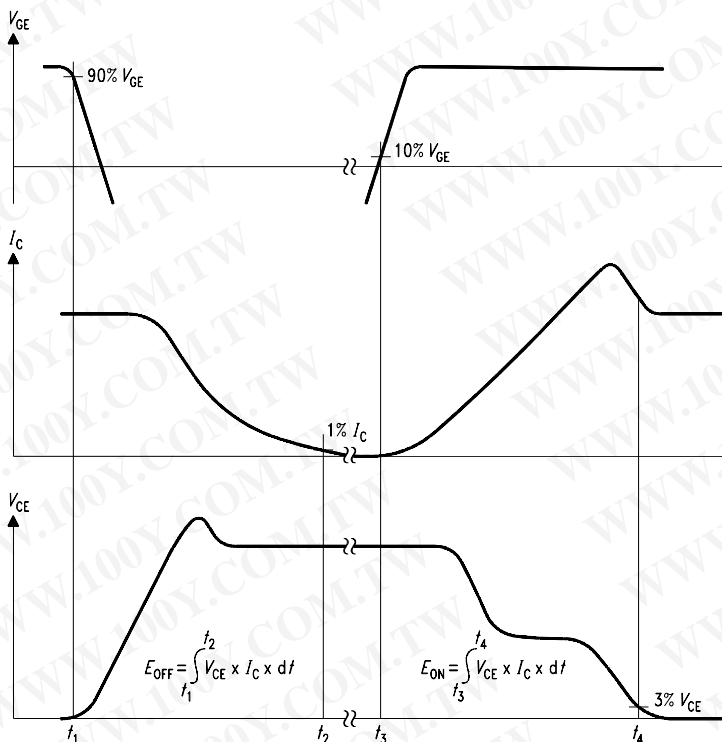


Figure B. Definition of switching losses

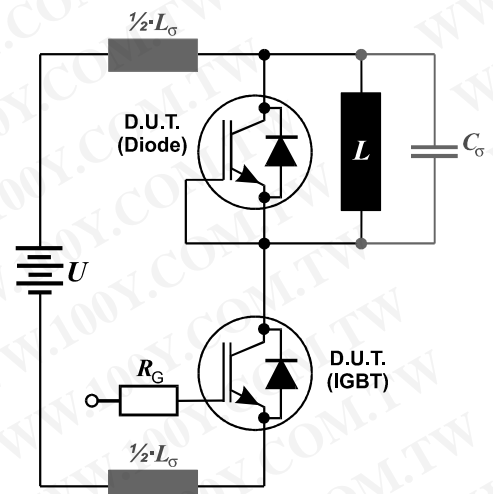


Figure E. Dynamic test circuit

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