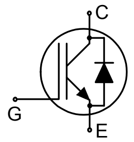
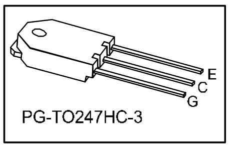
TrenchStop® Reverse Conducting (RC-)IGBT with monolithic body diode



Features:

- Powerful monolithic body diode with very low forward voltage
- Body diode clamps negative voltages
- Trench and fieldstop technology 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
- New TO-247HC package offers increased air & creepage distances compared to TO247 package
- Qualified according to JEDEC[1] 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/



RoHS

Halogen-Free

Applications:

- Inductive cooking
- Soft switching applications

Type	V_{CE}	I_C	$V_{CE(sat),Tj=25°C}$	$T_{j,max}$	Marking	Package
IHY30N160R2	1600V	30A	1.8V	175°C	H30R1602	PG-TO247HC-3

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	1600	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 ($V_{CE} \le$ 1600V, $T_j \le$ 175°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	
Diode surge non repetitive current, t_p limited by T_{jmax} T_C = 25°C, t_p = 10ms, sine halfwave T_C = 25°C, $t_p \le$ 2.5µs, sine halfwave T_C = 100°C, $t_p \le$ 2.5µs, sine halfwave	I_{FSM}	 50 130 120	
Gate-emitter voltage Transient Gate-emitter voltage (t_p < 10 µs, D < 0.01)	V_{GE}	±20 ±25	V
Power dissipation T_C = 25°C	P_{tot}	312	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

Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
IGBT thermal resistance, junction – case	R_{thJC}		0.48	K/W
Diode thermal resistance, junction – case	R_{thJCD}		0.48	
Thermal resistance, junction – ambient	R_{thJA}		55	

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	1600	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C=30A T_j=25°C T_j=150°C T_j=175°C	 - - -	 1.8 2.25 2.35	 2.1 - -	
Diode forward voltage	V_F	V_{GE}=0V, I_F=30A T_j=25°C T_j=150°C T_j=175°C	 - - -	 1.65 2.0 2.0	 2.0 - -	
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=0.75mA, V_{CE}=V_{GE}	5.1	5.8	6.4	
Zero gate voltage collector current	I_{CES}	V_{CE}=1600V, V_{GE}=0V T_j=25°C T_j=175°C	 - -	 - -	 5 2500	µA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V,V_{GE}=20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE}=20V, I_C=30A	-	22.5	-	S
Integrated gate resistor	R_{Gint}			none		Ω

Dynamic Characteristic

Input capacitance	C_{iss}	V_{CE}=25V, V_{GE}=0V, f=1MHz	-	2740	-	pF
Output capacitance	C_{oss}		-	68.1	-	
Reverse transfer capacitance	C_{rss}		-	58.7	-	
Gate charge	Q_{Gate}	V_{CC}=1280V, I_C=30A; V_{GE}=15V	-	94	-	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, V_{CC}=600V, I_C=30A V_{GE}=0 /15V, R_G=10Ω	-	525	-	ns
Fall time	t_f		-	38.3	-	
Turn-on energy	E_{on}		-	-	-	
Turn-off energy	E_{off}		-	2.53	-	
Total switching energy	E_{ts}		-	2.53	-	mJ

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 V_{CC}=600V, I_C=30A, V_{GE}= 0 /15V, R_G= 10Ω	-	564	-	ns
Fall time	t_f		-	111	-	
Turn-on energy	E_{on}		-	-	-	
Turn-off energy	E_{off}		-	4.37	-	
Total switching energy	E_{ts}		-	4.37	-	mJ

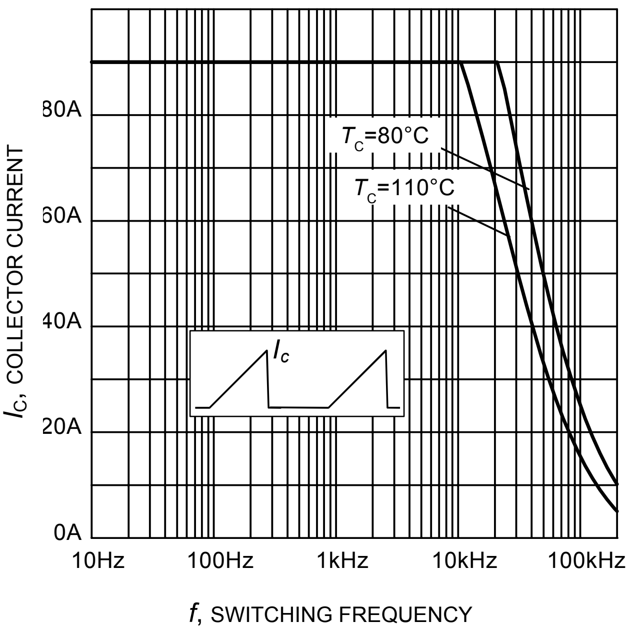


Figure 1. Collector current as a function of switching frequency for hard switching (turn-off)
($T_j \leq 175°C$, D = 0.5, V_{CE} = 600V, V_{GE} = 0/+15V, R_G = 10Ω)

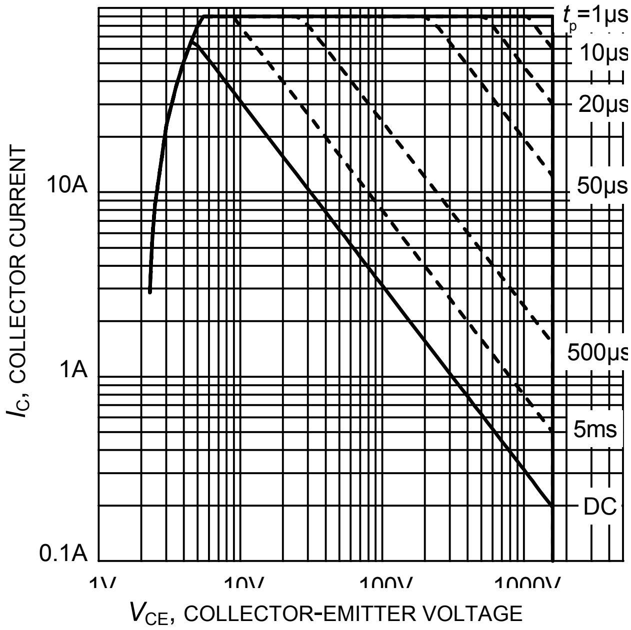


Figure 2. IGBT Safe operating area
(D = 0, T_C = 25°C, $T_j \leq 175°C$; V_{GE}=15V)

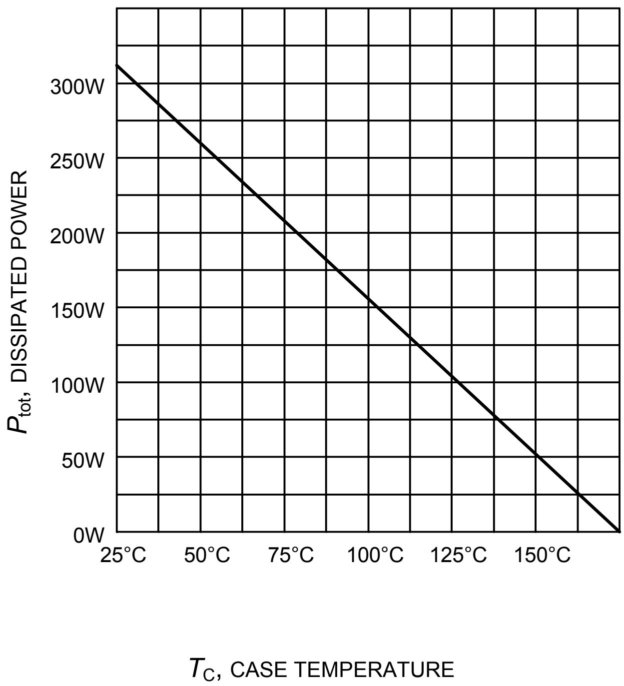


Figure 3. Power dissipation as a function of case temperature
($T_j \leq 175°C$)

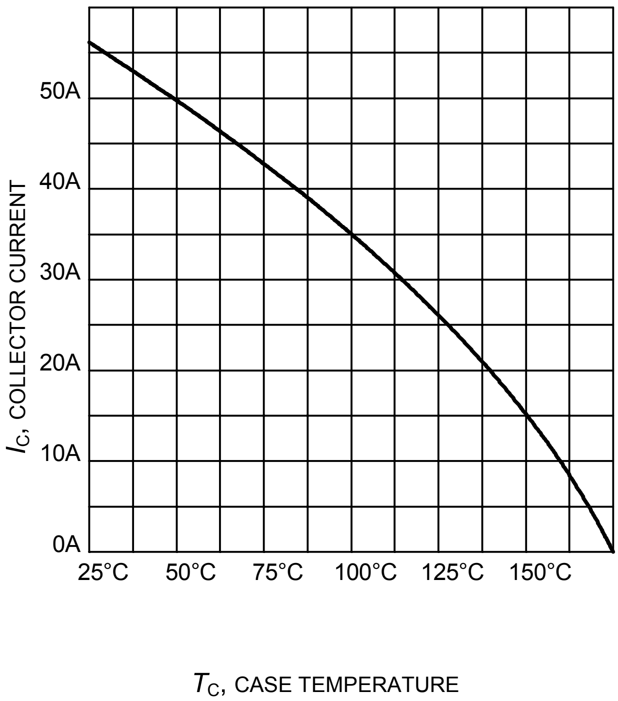


Figure 4. DC Collector current as a function of case temperature
($V_{GE} \geq 15V$, $T_j \leq 175°C$)

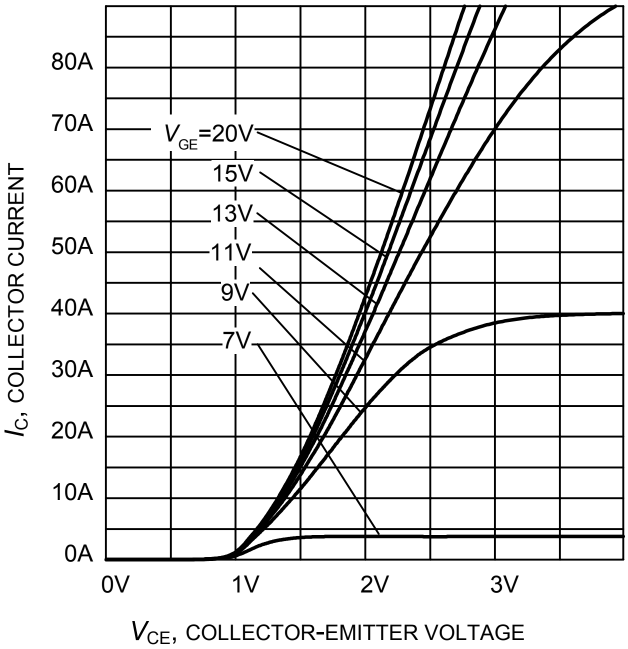


Figure 5. Typical output characteristic
(T_j = 25°C)

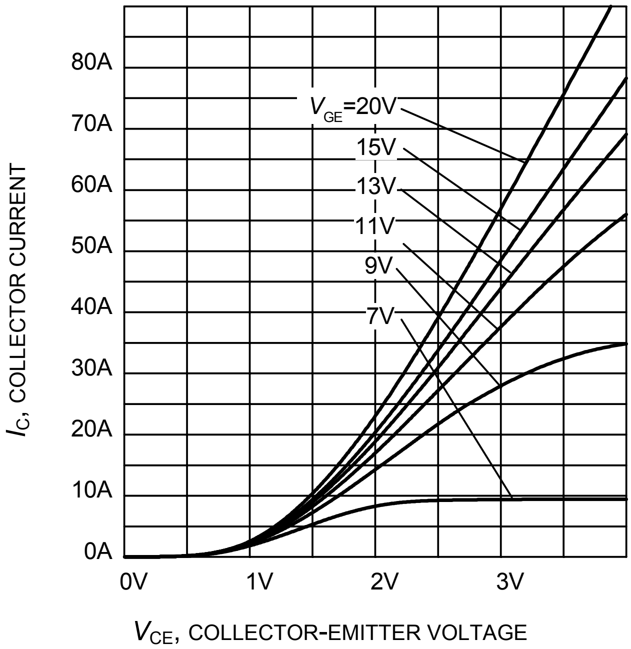


Figure 6. Typical output characteristic
(T_j = 175°C)

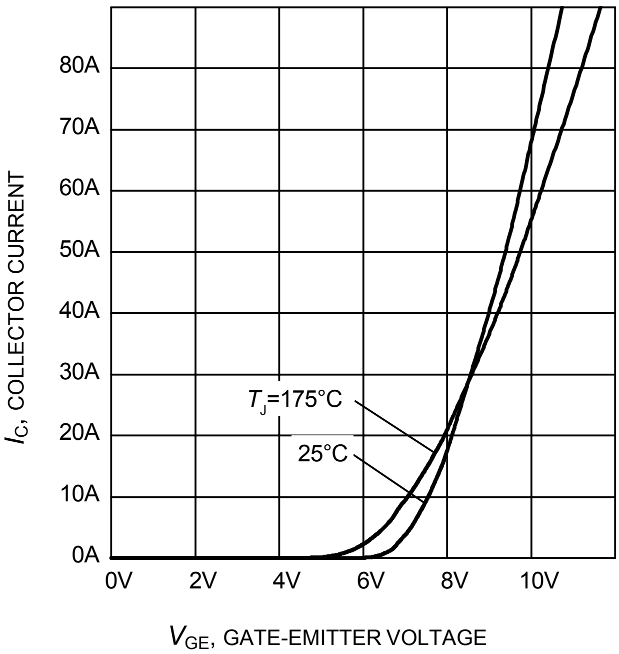


Figure 7. Typical transfer characteristic
(V_{CE}=20V)

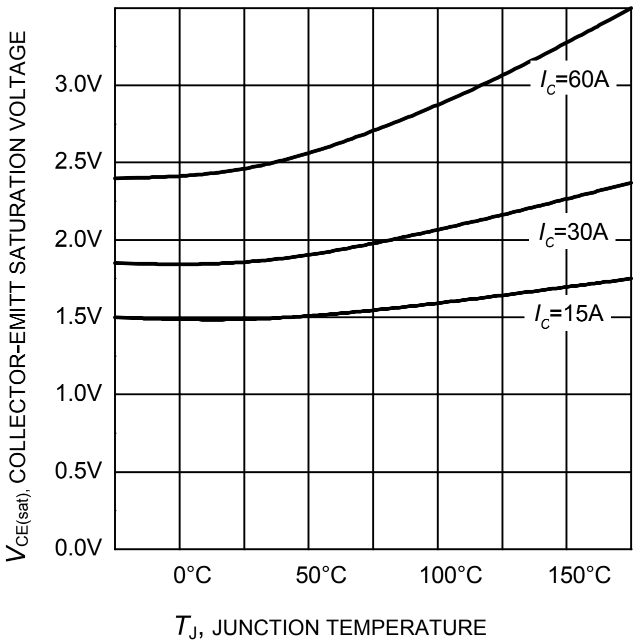


Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE} =15V)

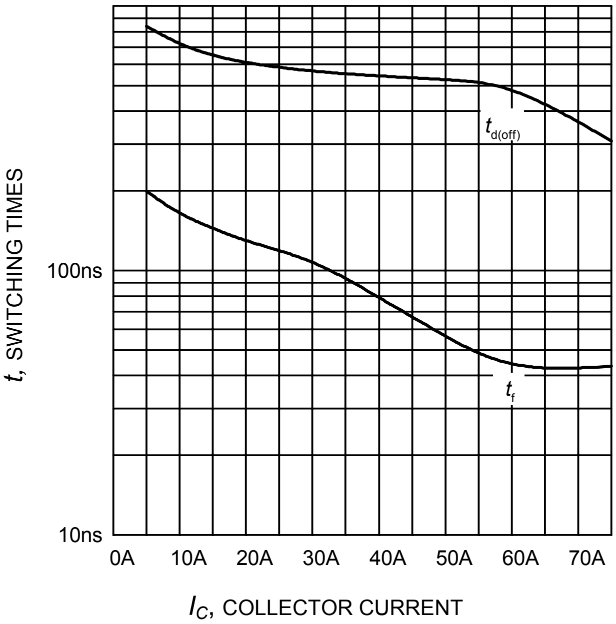


Figure 9. Typical switching times as a function of collector current
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω, Dynamic test circuit in Figure E)

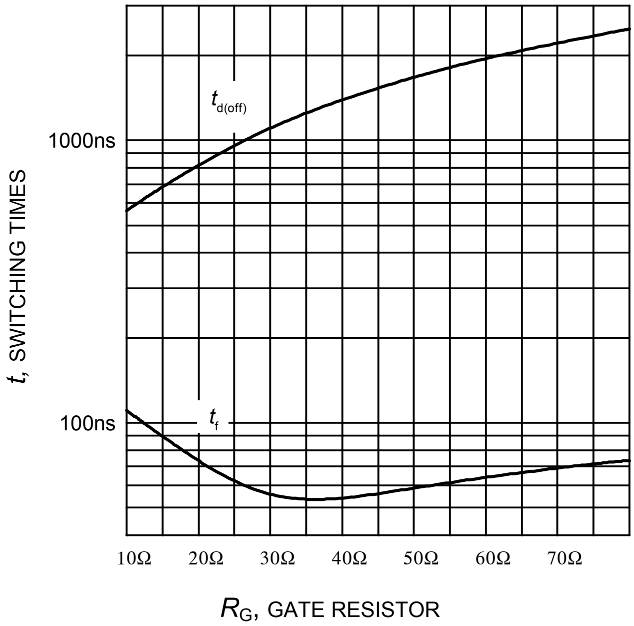


Figure 10. Typical switching times as a function of gate resistor
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, Dynamic test circuit in Figure E)

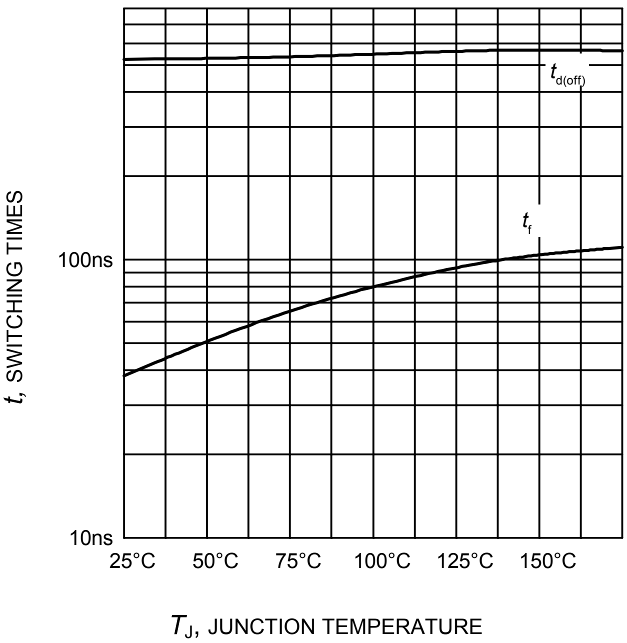


Figure 11. Typical switching times as a function of junction temperature
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, R_G=10Ω, Dynamic test circuit in Figure E)

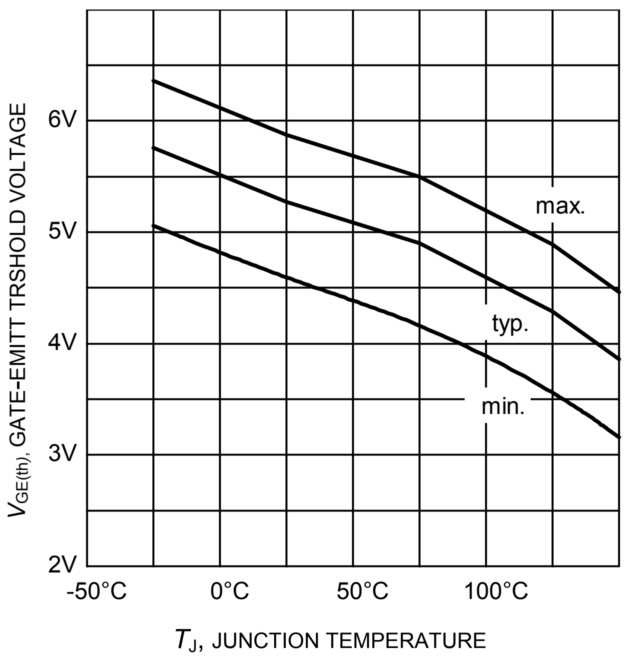


Figure 12. Gate-emitter threshold voltage as a function of junction temperature
(I_C = 0.15mA)

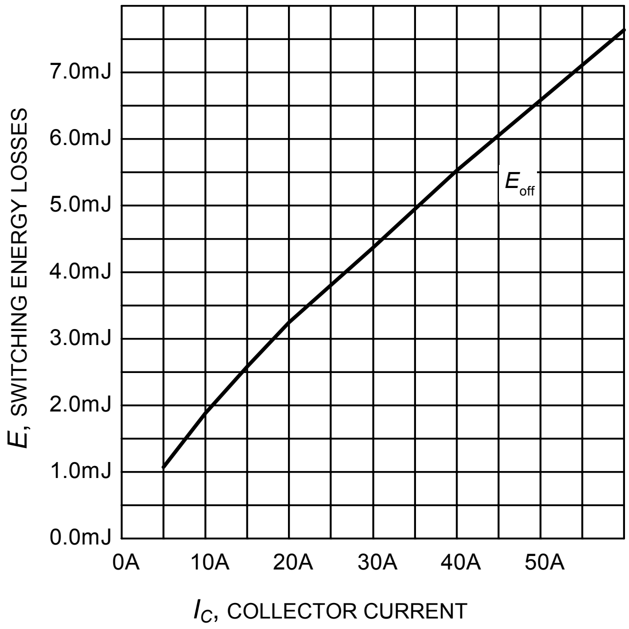


Figure 13. Typical turn-off energy as a function of collector current
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω, Dynamic test circuit in Figure E)

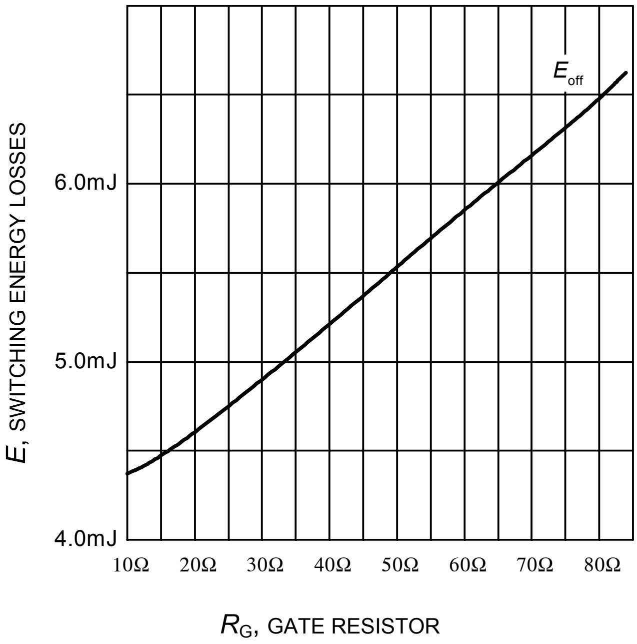


Figure 14. Typical turn-off energy as a function of gate resistor
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, Dynamic test circuit in Figure E)

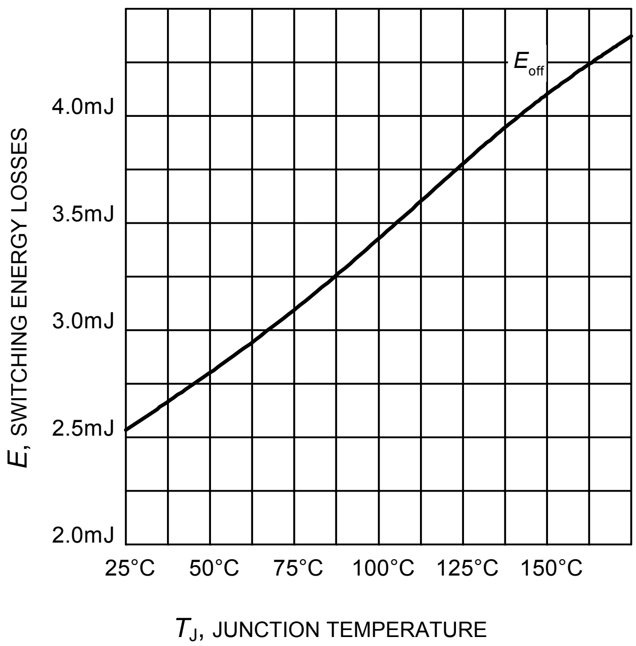


Figure 15. Typical turn-off energy as a function of junction temperature
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, R_G=10Ω, Dynamic test circuit in Figure E)

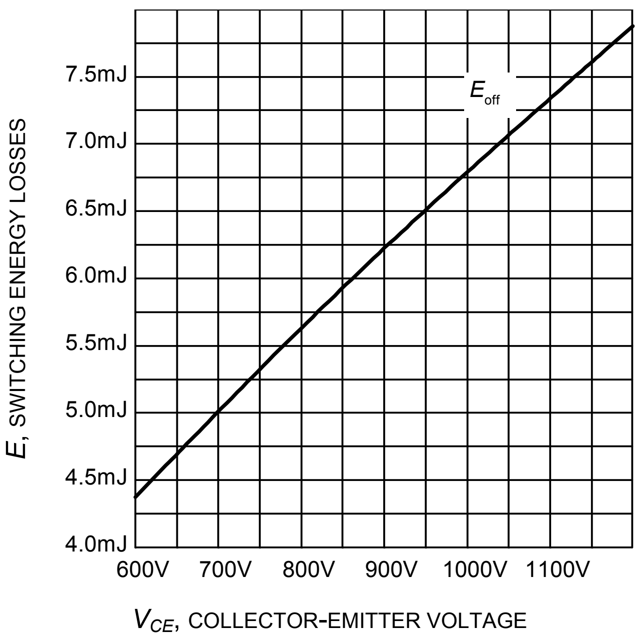


Figure 16. Typical turn-off energy as a function of collector emitter voltage
(inductive load, T_J=175°C, V_{GE}=0/15V, I_C=30A, R_G=10Ω, Dynamic test circuit in Figure E)

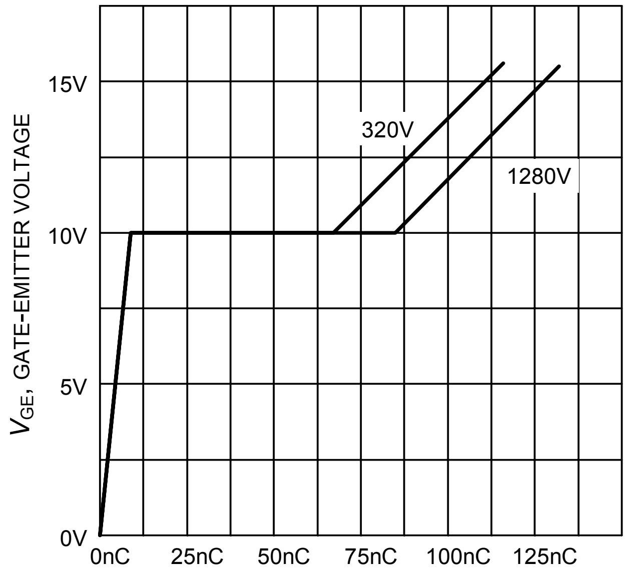


Figure 17. Typical gate charge
(I_C=30 A)

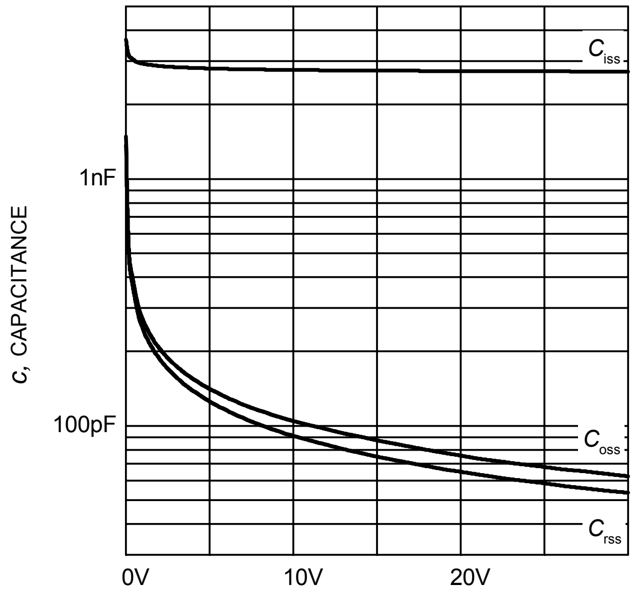


Figure 18. Typical capacitance as a function of collector-emitter voltage
(V_{GE}=0V, f = 1 MHz)

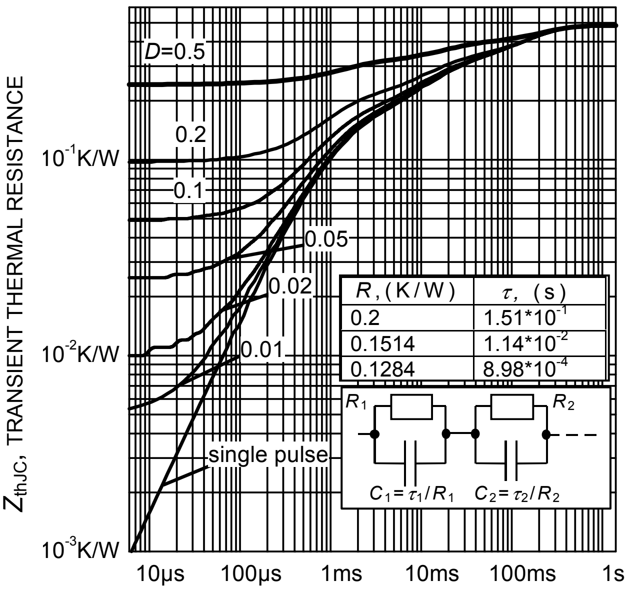


Figure 19. IGBT transient thermal resistance
($D = t_p / T$)

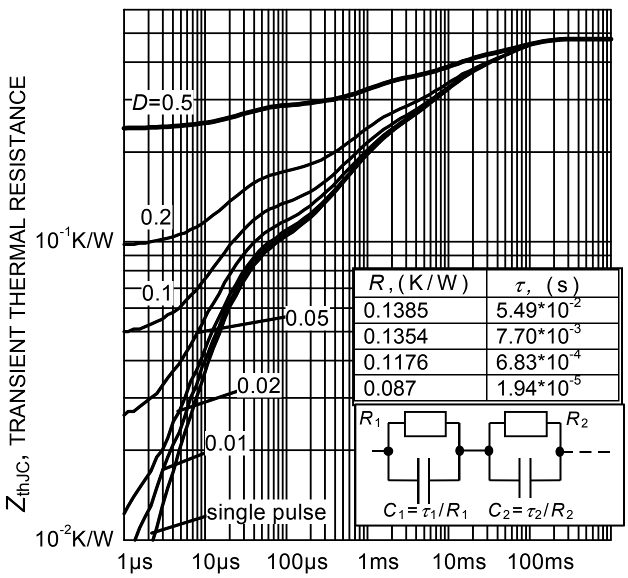


Figure 20. Diode transient thermal impedance as a function of pulse width
($D=t_P/T$)

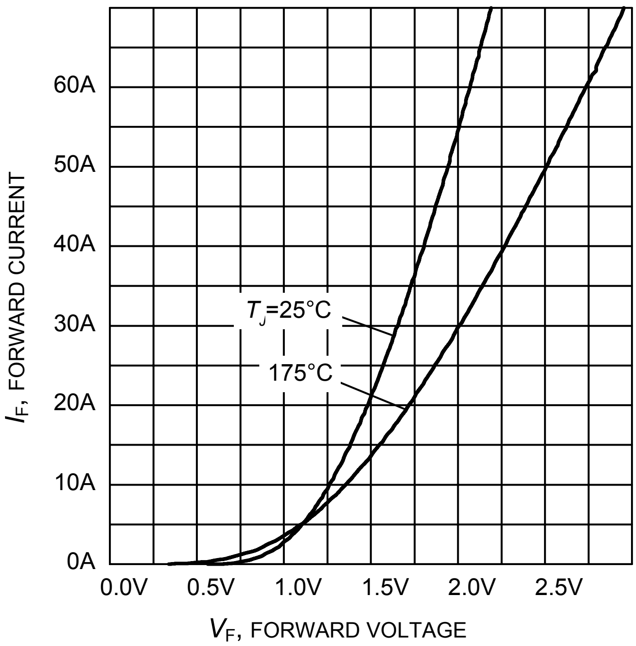


Figure 21. Typical diode forward current as a function of forward voltage

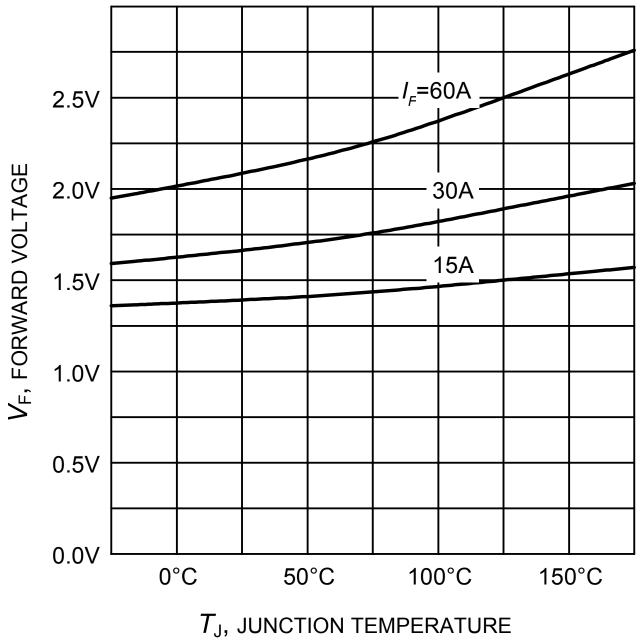
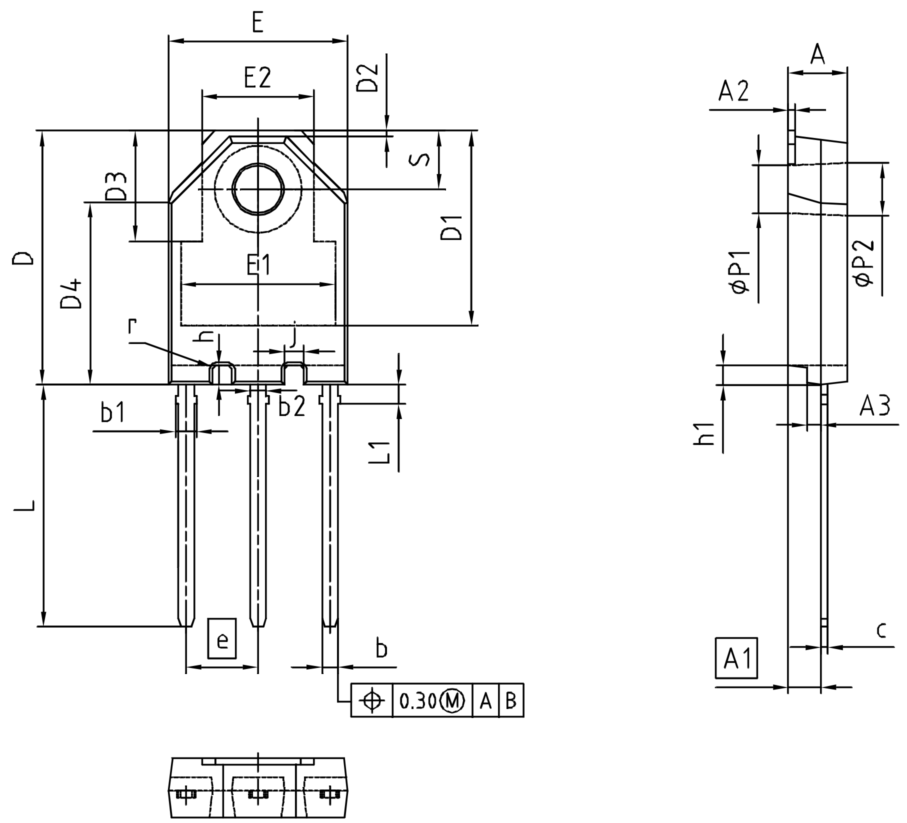


Figure 22. Typical diode forward voltage as a function of junction temperature

PG-TO247HC-3 (PG-TOHC-3)



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.40	4.60	0.173	0.181
A1	2.40	2.60	0.094	0.102
A2	0.40	0.60	0.016	0.024
A3	0.95	1.15	0.037	0.045
b	1.10	1.30	0.043	0.051
b1	1.50	1.70	0.059	0.067
b2	1.10	1.30	0.043	0.051
c	0.40	0.60	0.016	0.024
D	19.05	19.45	0.750	0.766
D1	14.69	14.89	0.578	0.586
D2	0.35	0.55	0.014	0.022
D3	8.30	8.50	0.327	0.335
D4	13.51	14.11	0.532	0.556
E	13.40	13.80	0.528	0.543
E1	11.60	11.80	0.457	0.465
E2	8.30	8.70	0.327	0.343
e	5.45		0.215	
N	3		3	
L	18.05	18.65	0.711	0.734
L1	1.35	1.55	0.053	0.061
øP1	3.51	3.71	0.138	0.146
øP2	4.00	4.10	0.157	0.161
S	4.35	4.55	0.171	0.179
j	1.35	1.55	0.053	0.061
h	1.35	1.55	0.053	0.061
r	max 0.2		max 0.008	
h1	1.35	1.55	0.053	0.061

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SCALE
0 2.5 5mm

EUROPEAN PROJECTION

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01

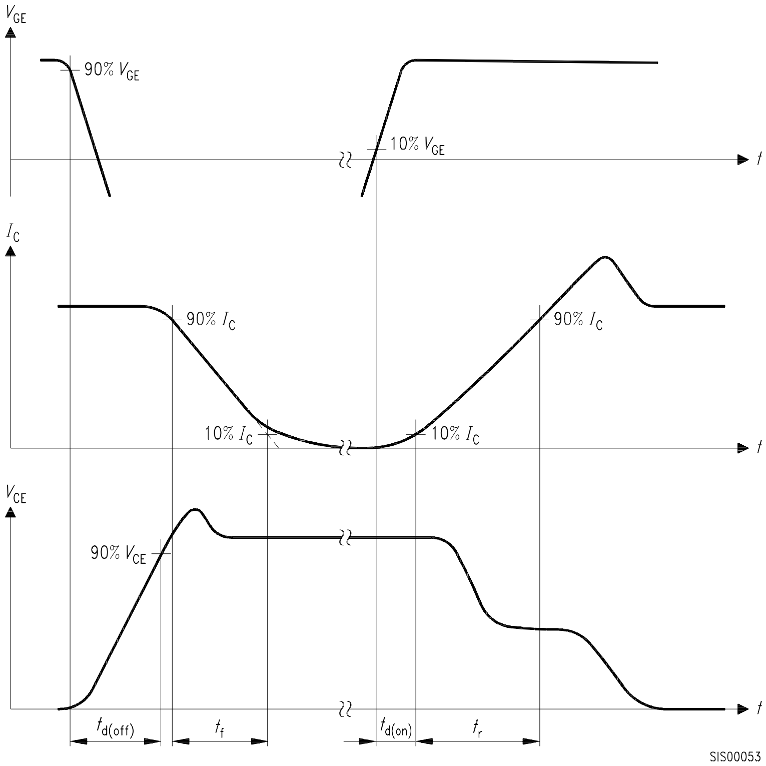

Figure A. Definition of switching times

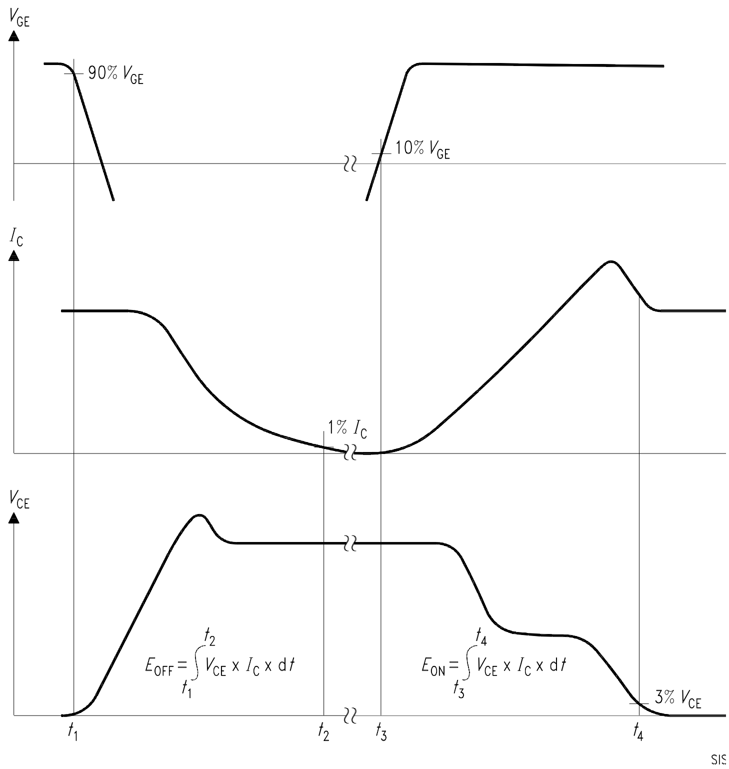

Figure B. Definition of switching losses

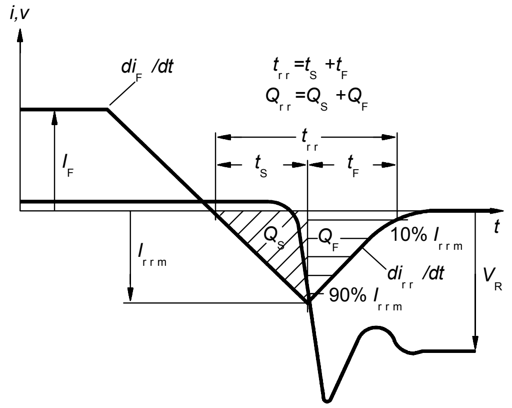

Figure C. Definition of diodes switching characteristics

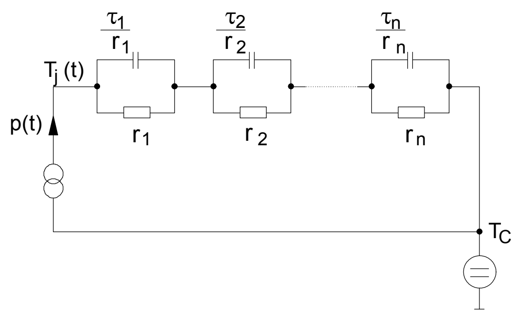

Figure D. Thermal equivalent circuit

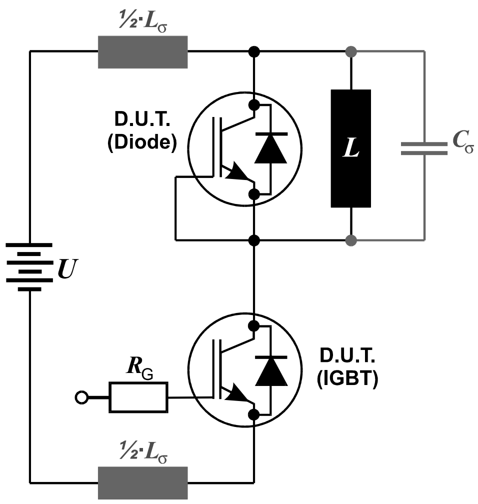

Figure E. Dynamic test circuit

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