NXH80T120L2Q0S1G

T-Type NPC Power Module

1200 V, 55 A IGBT, 600 V, 50 A IGBT

The NXH80T120L2Q0S1G is a power module containing a T−type neutral point clamped (NPC) three level inverter consisting of two 55 A/1200 V half−bridge IGBTs with 40 A/1200 V half−bridge diodes and two 50 A/600 V NP IGBTs with two 50 A/600 V NP diodes. The module also contains an on−board thermistor.

Features

- T−type NPC Module with 55 A/1200 V and 50 A/600 V IGBTs
- HB IGBT Specifications: $V_{CE(SAT)}$ = 2.5 V, E_{SW} = 1000 μJ
- NP IGBT Specifications: $V_{CE(SAT)}$ = 1.5 V, E_{SW} = 880 μJ
- Solder Pins
- Thermistor

Typical Applications

- Solar Inverter
- Uninterruptible Power Supplies

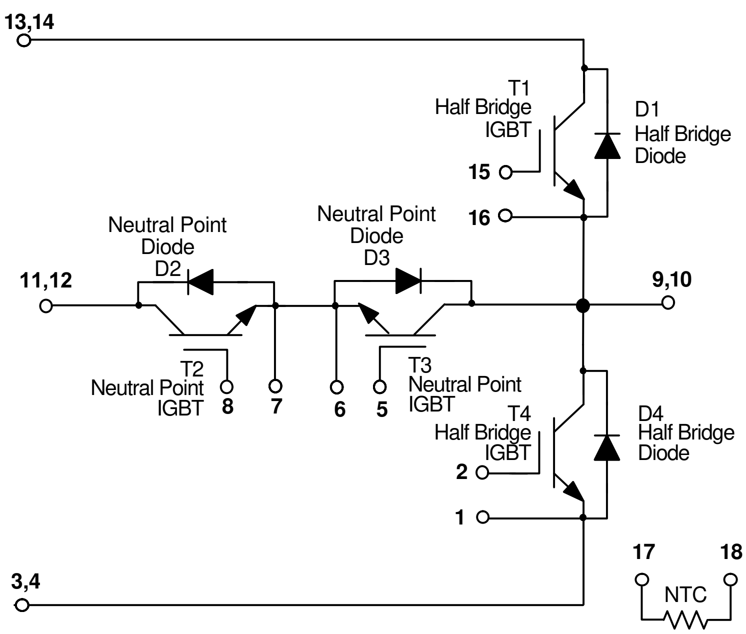

Figure 1. NXH80T120L2Q0S1G Schematic Diagram

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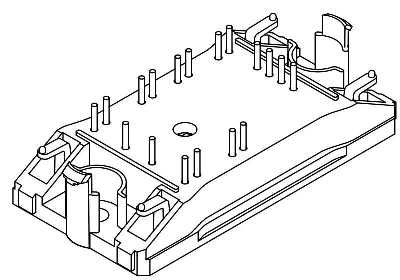
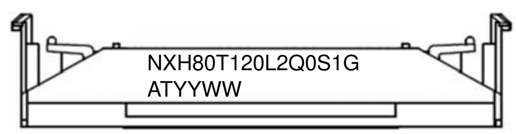


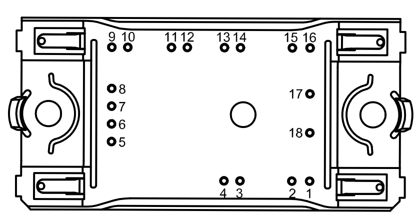
Q0PACK
CASE 180AH

MARKING DIAGRAM



NXH80T120L2Q0S1G = Device Code
YYWW = Year and Work Week Code
A = Assembly Site Code
T = Test Site Code
G = Pb−Free Package

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information in the dimensions section on page 11 of this data sheet.

Table 1. ABSOLUTE MAXIMUM RATINGS (Note 1) T_J = 25°C unless otherwise noted

Rating	Symbol	Value	Unit
HALF BRIDGE IGBT			
Collector−Emitter Voltage	V_{CES}	1200	V
Gate−Emitter Voltage	V_{GE}	±20	V
Continuous Collector Current @ T_h = 80°C (T_J = 175°C)	I_C	57	A
Pulsed Collector Current (T_J = 175°C)	I_{Cpulse}	171	A
Maximum Power Dissipation @ T_h = 80°C (T_J = 175°C)	P_{tot}	125	W
Short Circuit Withstand Time @ V_{GE} = 15 V, V_{CE} = 600 V, T_J ≤ 150°C	T_{sc}	5	μs
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	150	°C
NEUTRAL POINT IGBT			
Collector−Emitter Voltage	V_{CES}	600	V
Gate−Emitter Voltage	V_{GE}	±20	V
Continuous Collector Current @ T_h = 80°C (T_J = 175°C)	I_C	52	A
Pulsed Collector Current (T_J = 175°C)	I_{Cpulse}	156	A
Maximum Power Dissipation @ T_h = 80°C (T_J = 175°C)	P_{tot}	95	W
Short Circuit Withstand Time @ V_{GE} = 15 V, V_{CE} = 400 V, T_J ≤ 150°C	T_{sc}	5	μs
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	150	°C
HALF BRIDGE DIODE			
Peak Repetitive Reverse Voltage	V_{RRM}	1200	V
Continuous Forward Current @ T_h = 80°C (T_J = 175°C)	I_F	25	A
Repetitive Peak Forward Current (T_J = 175°C, t_p limited by T_{Jmax})	I_{FRM}	70	A
Maximum Power Dissipation @ T_h = 80°C (T_J = 175°C)	P_{tot}	54	W
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	150	°C
NEUTRAL POINT DIODE			
Peak Repetitive Reverse Voltage	V_{RRM}	600	V
Continuous Forward Current @ T_h = 80°C.(T_J = 175°C)	I_F	31	A
Repetitive Peak Forward Current (T_J = 175°C, t_p limited by T_{Jmax})	I_{FRM}	85	A
Maximum Power Dissipation @ T_h = 80°C (T_J = 175°C)	P_{tot}	53	W
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	150	°C
THERMAL PROPERTIES			
Storage Temperature range	T_{stg}	−40 to 125	°C
INSULATION PROPERTIES			
Isolation test voltage, t = 1 sec, 60 Hz	V_{is}	3000	V_{RMS}
Creepage distance		12.7	mm

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Refer to ELECTRICAL CHARACTERISTICS, RECOMMENDED OPERATING RANGES and/or APPLICATION INFORMATION for Safe Operating parameters.

Table 2. RECOMMENDED OPERATING RANGES

Rating	Symbol	Min	Max	Unit
Module Operating Junction Temperature	T_J	−40	(T_{Jmax}−25)	°C

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

Table 3. ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
HALF BRIDGE IGBT CHARACTERISTICS						
Collector−Emitter Cutoff Current	V_{GE} = 0 V, V_{CE} = 1200 V	I_{CES}	–	–	300	μA
Collector−Emitter Saturation Voltage	V_{GE} = 15 V, I_C = 80 A, T_J = 25°C	$V_{CE(sat)}$	–	2.50	2.85	V
	V_{GE} = 15 V, I_C = 80 A, T_J = 150°C		–	2.15	–	
Gate−Emitter Threshold Voltage	V_{GE} = V_{CE}, I_C = 1.5 mA	$V_{GE(TH)}$	–	5.45	6.4	V
Gate Leakage Current	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	300	nA
Turn−on Delay Time	T_J = 25°C V_{CE} = 350 V, I_C = 40 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	37	–	ns
Rise Time		t_r	–	23	–	
Turn−off Delay Time		$t_{d(off)}$	–	190	–	
Fall Time		t_f	–	30	–	
Turn−on Switching Loss per Pulse		E_{on}	–	320	–	μJ
Turn−off Switching Loss per Pulse		E_{off}	–	680	–	
Turn−on Delay Time	T_J = 125°C V_{CE} = 350 V, I_C = 40 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	30	–	ns
Rise Time		t_r	–	25	–	
Turn−off Delay Time		$t_{d(off)}$	–	230	–	
Fall Time		t_f	–	90	–	
Turn−on Switching Loss per Pulse		E_{on}	–	500	–	μJ
Turn−off Switching Loss per Pulse		E_{off}	–	1300	–	
Input Capacitance	V_{CE} = 25 V, V_{GE} = 0 V, f = 10 kHz	C_{ies}	–	19400	–	pF
Output Capacitance		C_{oes}	–	400	–	
Reverse Transfer Capacitance		C_{res}	–	340	–	
Total Gate Charge	V_{CE} = 600 V, I_C = 80 A, V_{GE} = 15 V	Q_g	–	800	–	nC
Thermal Resistance – chip−to−heatsink	Thermal grease, Thickness = 100 μm, λ = 0.84 W/mK	R_{thJH}	–	0.76	–	°C/W
NEUTRAL POINT DIODE CHARACTERISTICS						
Diode Forward Voltage	I_F = 50 A, T_J = 25°C	V_F	–	2.60	2.85	V
	I_F = 50 A, T_J = 150°C		–	2.0	–	
Reverse Recovery Time	T_J = 25°C V_{CE} = 350 V, I_C = 40 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	30	–	ns
Reverse Recovery Charge		Q_{rr}	–	305	–	μC
Peak Reverse Recovery Current		I_{RRM}	–	22	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	1870	–	A/μs
Reverse Recovery Energy		E_{rr}	–	77	–	μJ
Reverse Recovery Time	Tj = 125°C V_{CE} = 350 V, I_C = 40 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	34	–	ns
Reverse Recovery Charge		Q_{rr}	–	910	–	nC
Peak Reverse Recovery Current		I_{RRM}	–	50	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	4200	–	A/μs
Reverse Recovery Energy		E_{rr}	–	200	–	μJ
Thermal Resistance – chip−to−heatsink	Thermal grease, Thickness = 100 μm, λ = 0.84 W/mK	R_{thJH}	–	1.80	–	°C/W
NEUTRAL POINT IGBT CHARACTERISTICS						
Collector−Emitter Cutoff Current	V_{GE} = 0 V, V_{CE} = 600 V	I_{CES}	–	–	200	μA
Collector−Emitter Saturation Voltage	V_{GE} = 15 V, I_C = 50 A, T_J = 25°C	$V_{CE(sat)}$	–	1.50	1.75	V
	V_{GE} = 15 V, I_C = 50 A, T_J = 150°C		–	1.60	–	
Gate−Emitter Threshold Voltage	V_{GE} = V_{CE}, I_C = 1.2 mA	$V_{GE(TH)}$	–	5.45	6.4	V
Gate Leakage Current	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	200	nA

Table 3. ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
NEUTRAL POINT IGBT CHARACTERISTICS						
Turn–on Delay Time	T_J = 25°C, V_{CE} = 350 V, I_C = 40 A, V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	23	–	ns
Rise Time		t_r	–	17	–	
Turn–off Delay Time		$t_{d(off)}$	–	108	–	
Fall Time		t_f	–	31	–	
Turn–on Switching Loss per Pulse		E_{on}	–	360	–	μJ
Turn–off Switching Loss per Pulse		E_{off}	–	520	–	
Turn–on Delay Time	T_J = 125°C, V_{CE} = 350 V, I_C = 40 A, V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	27	–	ns
Rise Time		t_r	–	17	–	
Turn–off Delay Time		$t_{d(off)}$	–	130	–	
Fall Time		t_f	–	75	–	
Turn–on Switching Loss per Pulse		E_{on}	–	535	–	μJ
Turn–off Switching Loss per Pulse		E_{off}	–	865	–	
Input Capacitance	V_{CE} = 25 V, V_{GE} = 0 V, f = 10 kHz	C_{ies}	–	9400	–	pF
Output Capacitance		C_{oes}	–	280	–	
Reverse Transfer Capacitance		C_{res}	–	250	–	
Total Gate Charge	V_{CE} = 480 V, I_C = 50 A, V_{GE} = 15 V	Q_g	–	395	–	nC
Thermal Resistance – chip–to–heatsink	Thermal grease, Thickness < 100 μm, λ = 0.84 W/mK	R_{thJH}	–	1.00	–	°C/W
HALF BRIDGE DIODE CHARACTERISTICS						
Diode Forward Voltage	I_F = 40 A, T_J = 25°C	V_F	–	2.65	3.45	V
	I_F = 40 A, T_J = 150°C		–	2.15	–	
Reverse Recovery Time	T_J = 25°C, V_{CE} = 350 V, I_C = 40 A, V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	38	–	ns
Reverse Recovery Charge		Q_{rr}	–	853	–	nC
Peak Reverse Recovery Current		I_{RRM}	–	43	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	2600	–	A/μs
Reverse Recovery Energy		E_{rr}	–	200	–	μJ
Reverse Recovery Time	T_J = 125°C, V_{CE} = 350 V, I_C = 40 A, V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	300	–	ns
Reverse Recovery Charge		Q_{rr}	–	2550	–	nC
Peak Reverse Recovery Current		I_{RRM}	–	57	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	2340	–	A/μs
Reverse Recovery Energy		E_{rr}	–	390	–	μJ
Thermal Resistance – chip–to–heatsink	Thermal grease, Thickness < 100 μm, λ = 0.84 W/mK	R_{thJH}	–	1.76	–	°C/W
THERMISTOR CHARACTERISTICS						
Nominal resistance		R_{25}	–	22	–	kΩ
Nominal resistance	T = 100°C	R_{100}	–	1486	–	Ω
Deviation of R25		ΔR/R	–5		5	%
Power dissipation		P_D	–	200	–	mW
Power dissipation constant			–	2	–	mW/K
B–value	B(25/50), tolerance ±3%		–	3950	–	K
B–value	B(25/100), tolerance ±3%		–	3998	–	K

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL CHARACTERISTICS – Half Bridge IGBT and Neutral Point Diode

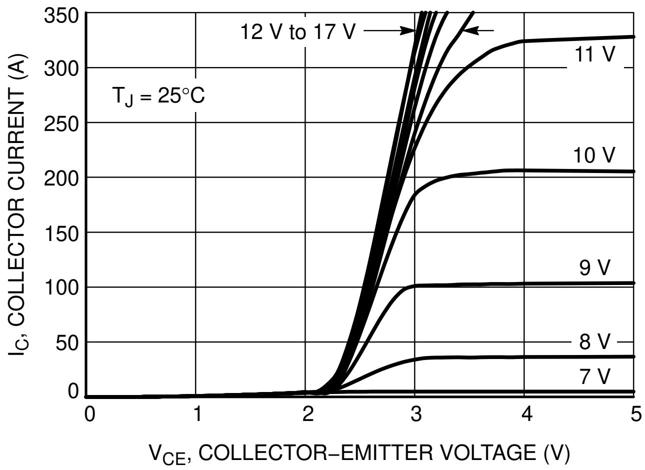


Figure 1. IGBT Typical Output Characteristics

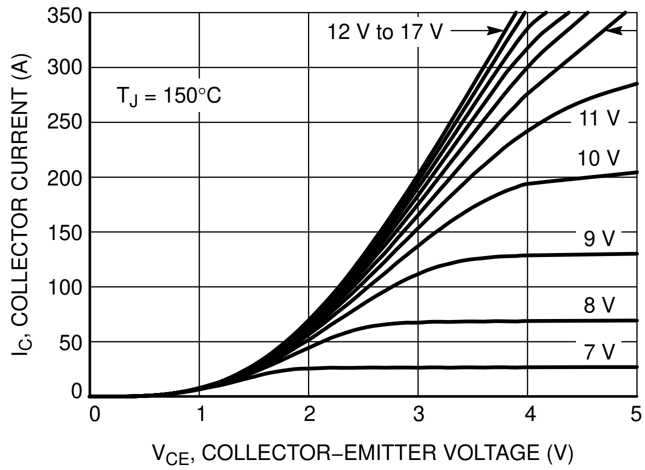


Figure 2. IGBT Typical Output Characteristics

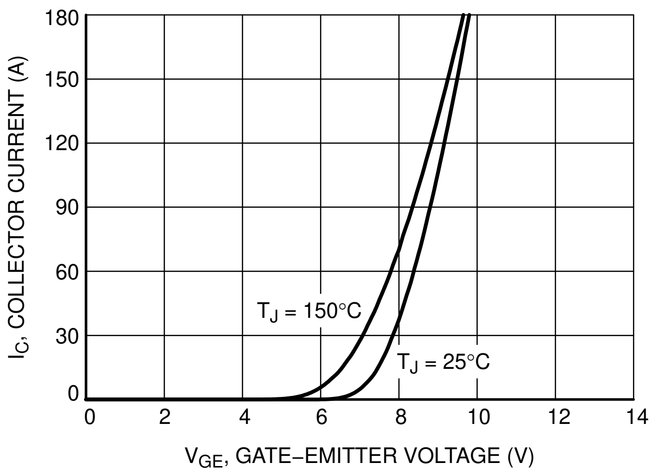


Figure 3. IGBT Typical Transfer Characteristics

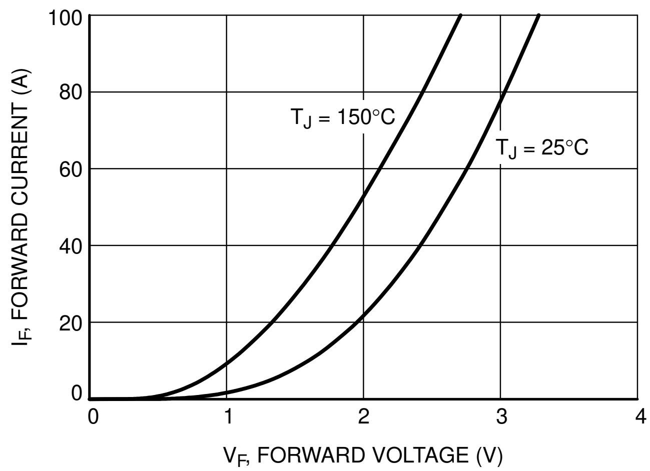


Figure 4. Diode Forward Characteristics

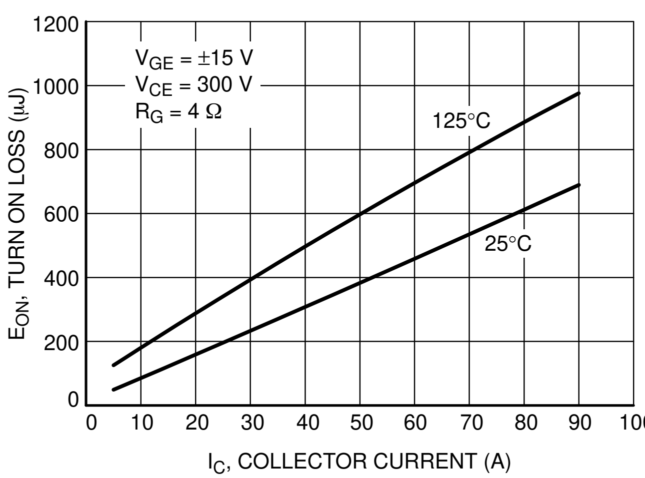


Figure 5. Typical Turn On Loss vs. IC

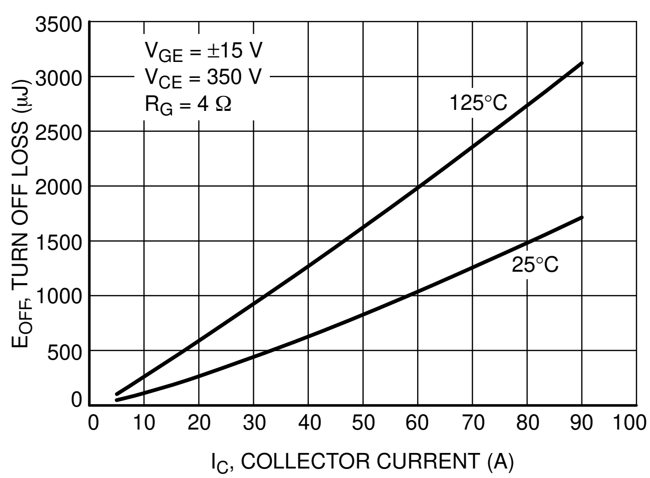


Figure 6. Typical Turn Off Loss vs. IC

TYPICAL CHARACTERISTICS – Half Bridge IGBT and Neutral Point Diode

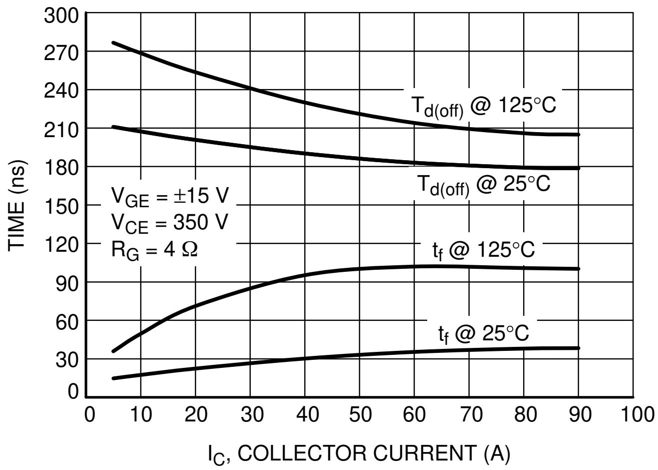


Figure 7. Typical Switching Times vs. IC

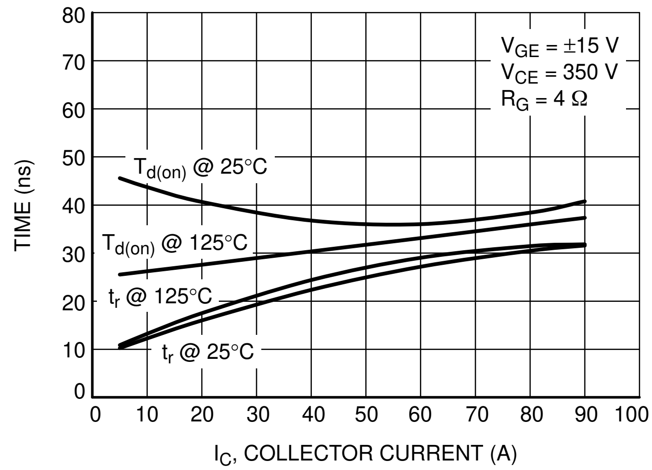


Figure 8. Typical Switching Times vs. IC

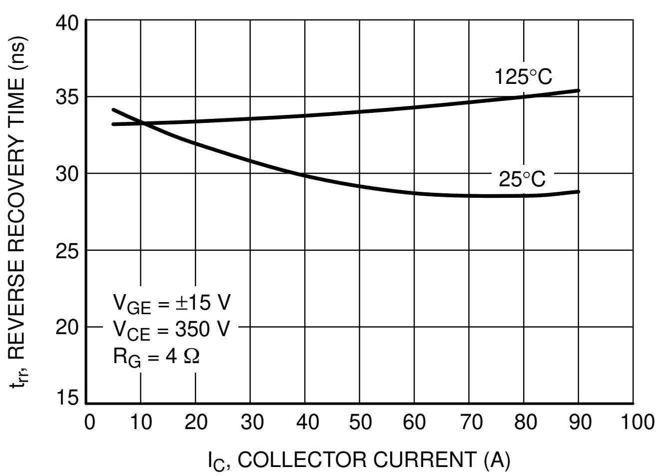


Figure 9. Typical Reverse Recovery Time vs. IC

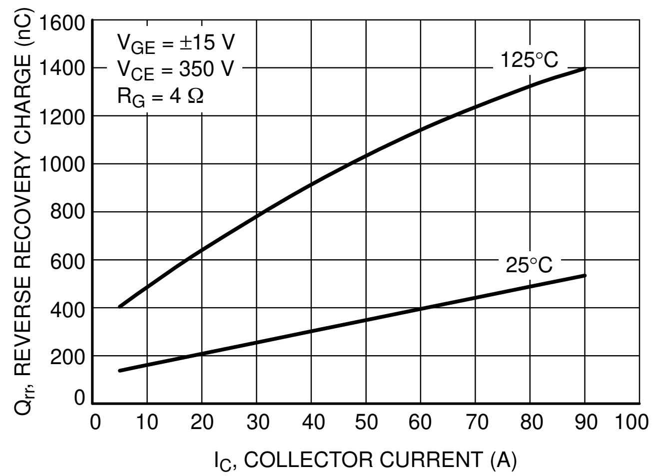


Figure 10. Typical Reverse Recovery Charge vs. IC

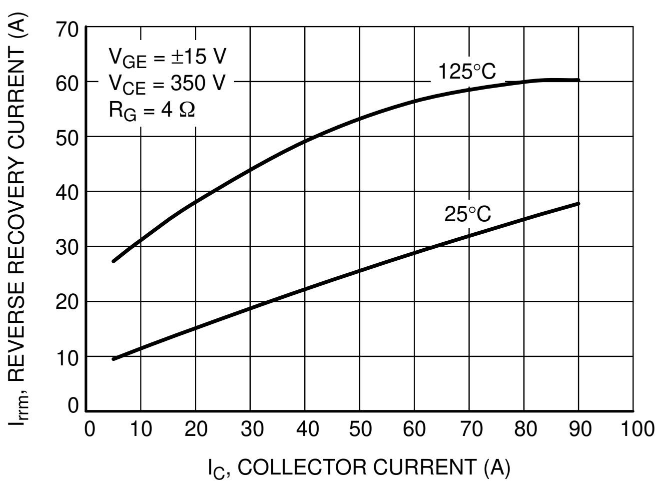


Figure 11. Typical Reverse Recovery Peak Current vs. IC

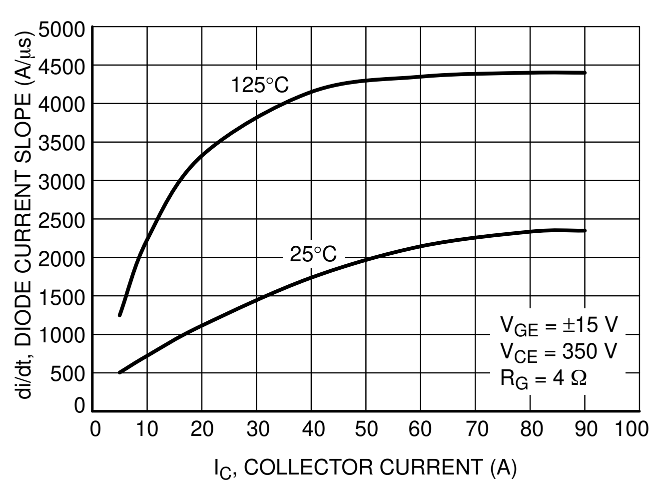


Figure 12. Typical Diode Current Slope vs. IC

TYPICAL CHARACTERISTICS – Half Bridge IGBT and Neutral Point Diode

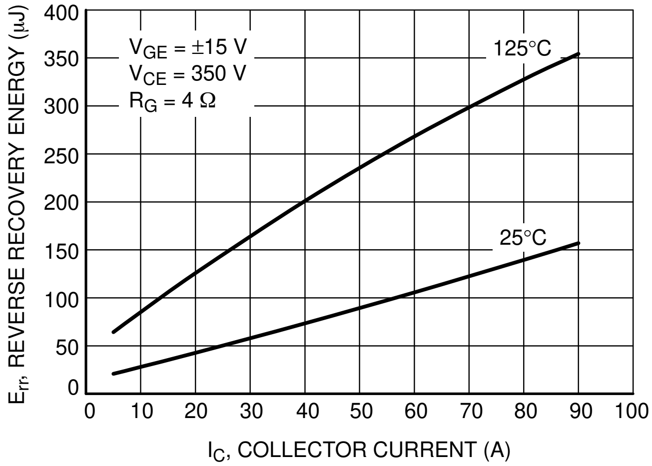


Figure 13. Typical Reverse Recovery Time vs. IC

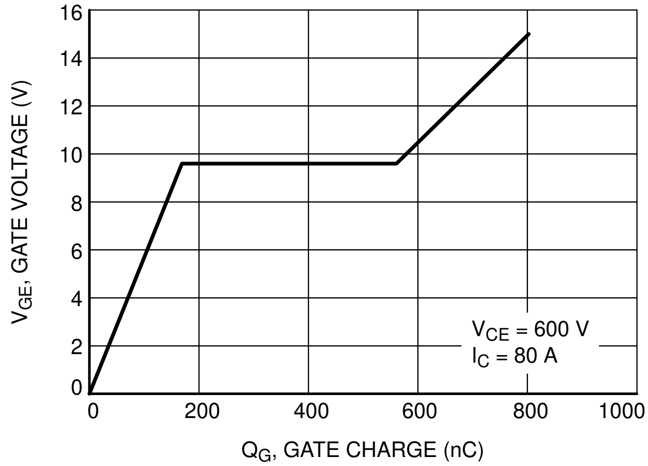


Figure 14. Gate Voltage vs. Gate Charge

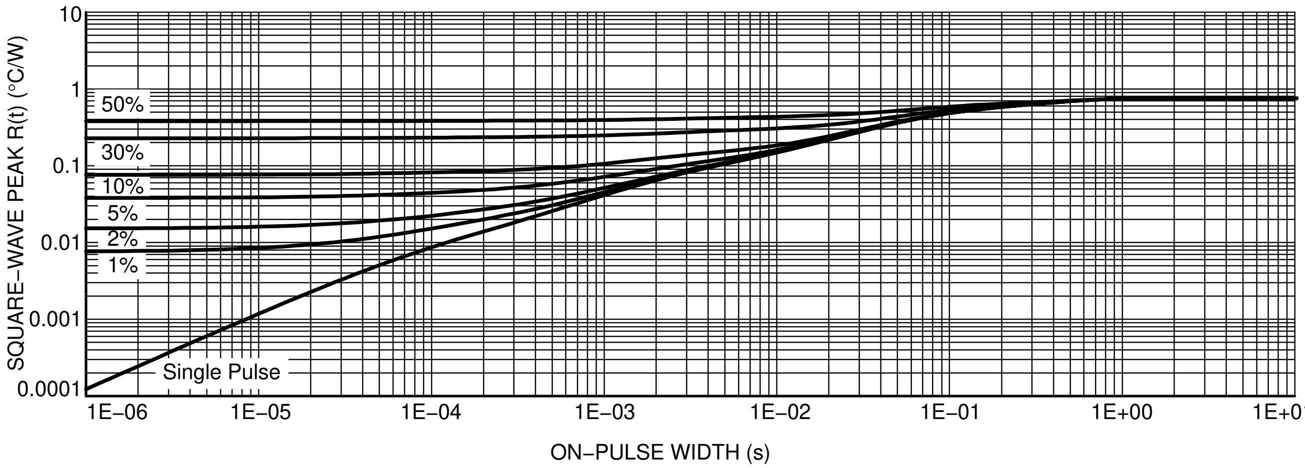


Figure 15. IGBT Transient Thermal Impedance

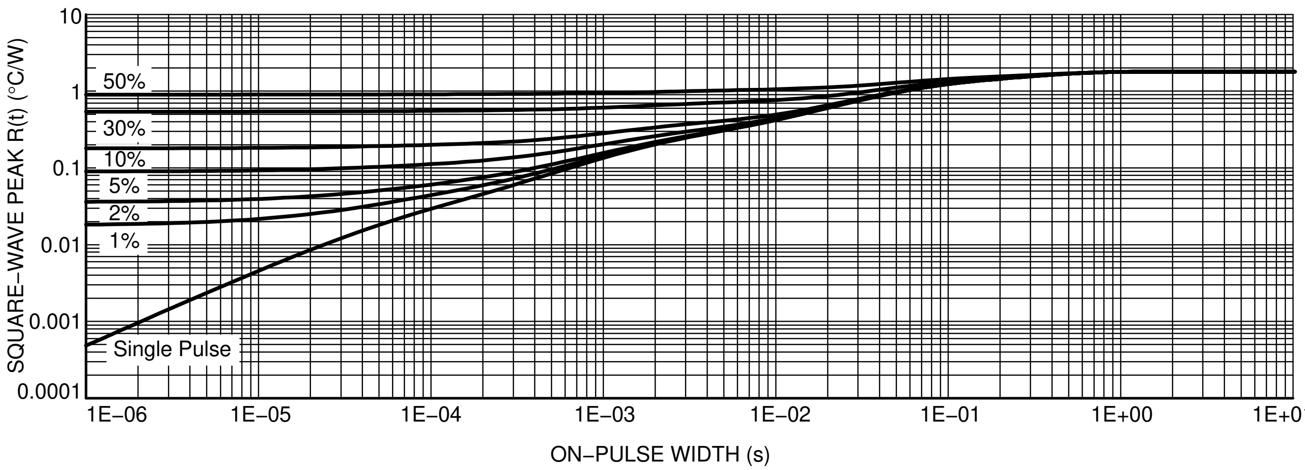


Figure 16. Diode Transient Thermal Impedance

TYPICAL CHARACTERISTICS – Neutral Point IGBT and Half Bridge Diode

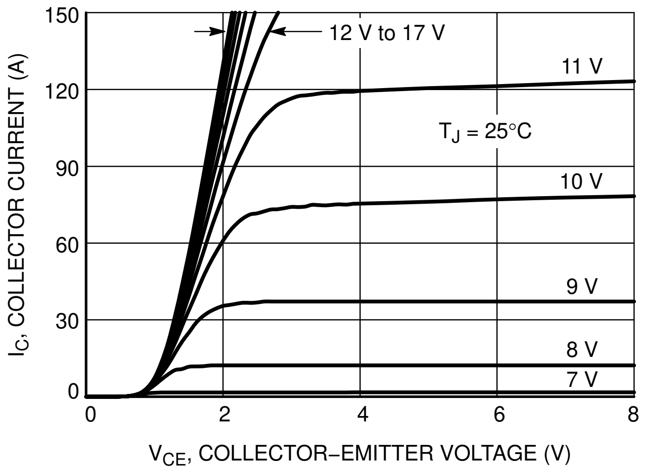


Figure 17. IGBT Typical Output Characteristics

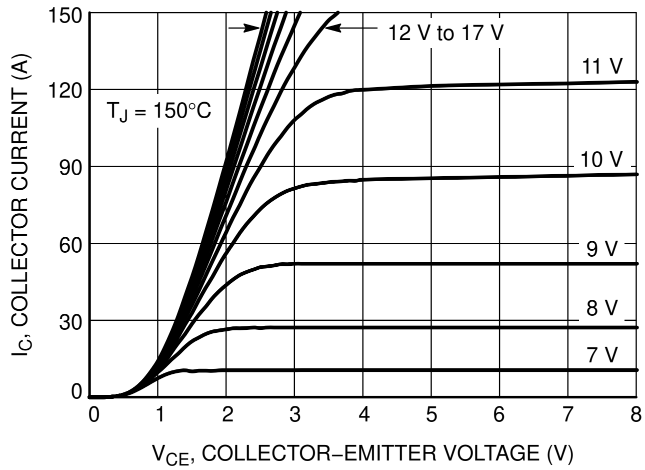


Figure 18. IGBT Typical Output Characteristics

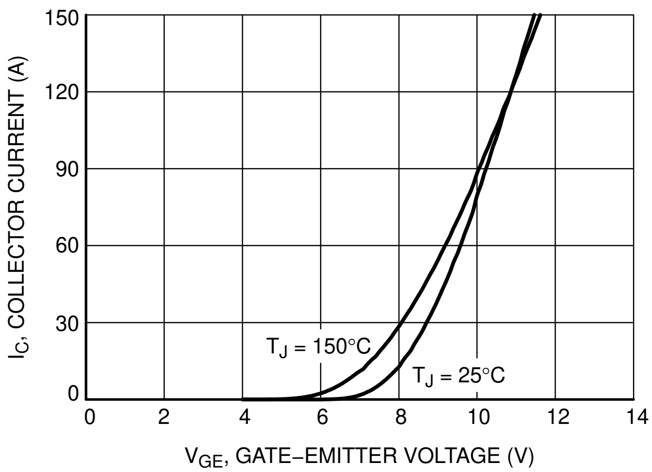


Figure 19. IGBT Typical Transfer Characteristics

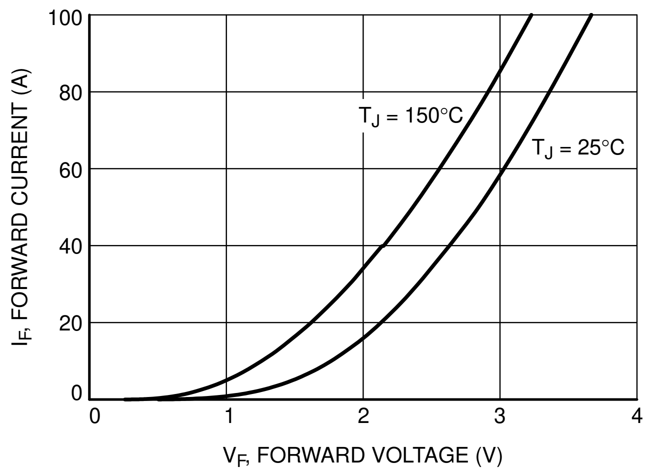


Figure 20. Diode Forward Characteristic

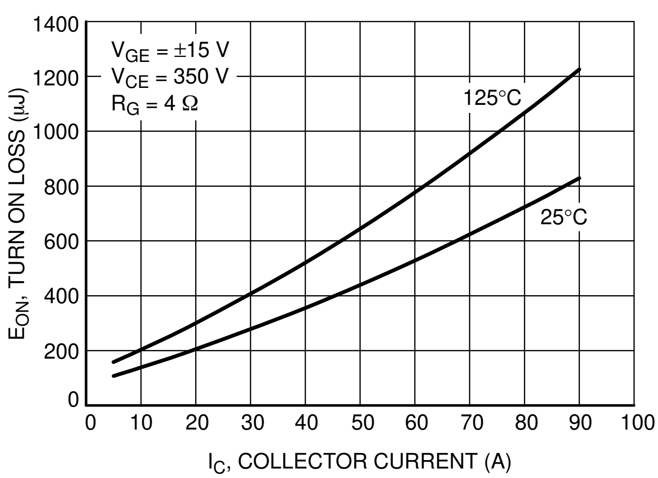


Figure 21. Typical Turn On Loss vs. IC

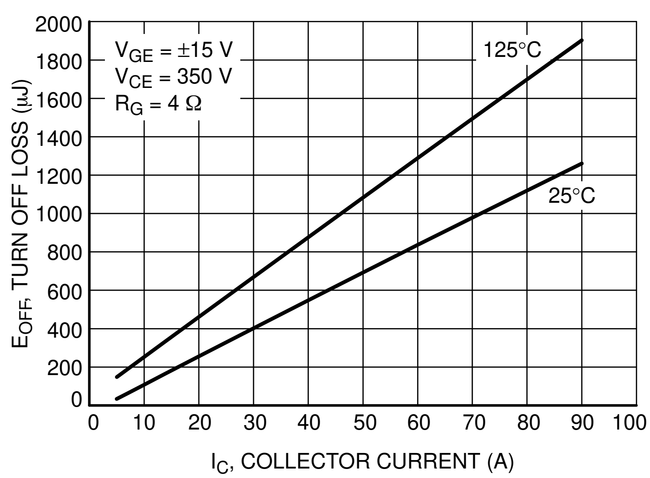


Figure 22. Typical Turn Off Loss vs. IC

TYPICAL CHARACTERISTICS – Neutral Point IGBT and Half Bridge Diode

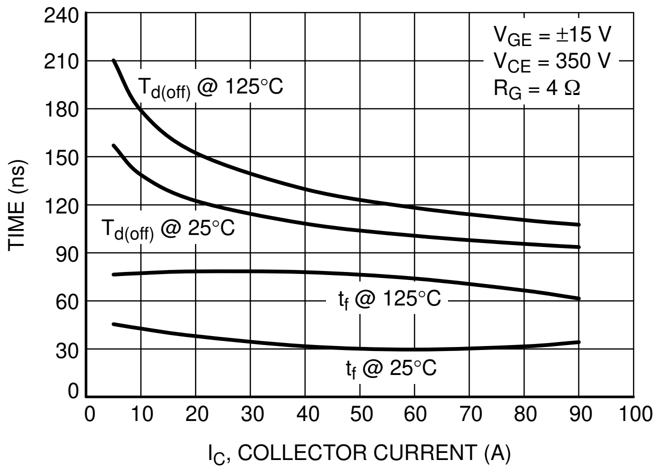


Figure 23. Typical Switching Times vs. IC

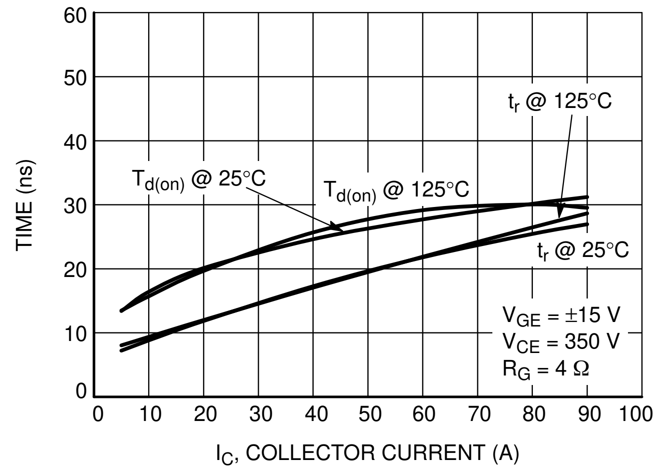


Figure 24. Typical Switching Times vs. IC

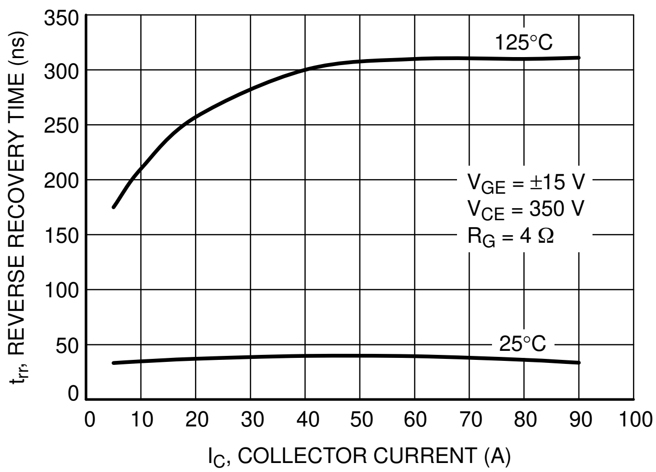


Figure 25. Typical Reverse Recovery Time vs. IC

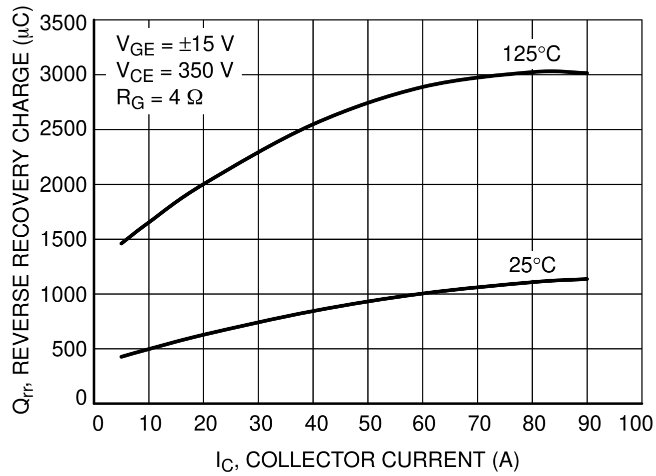


Figure 26. Typical Reverse Recovery Charge vs. IC

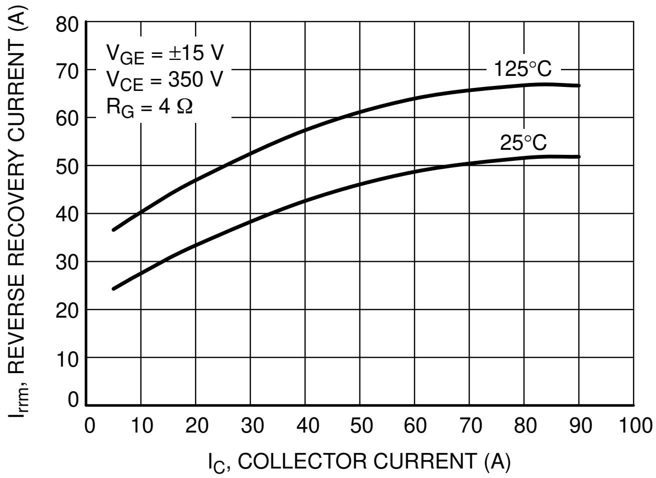


Figure 27. Typical Reverse Recovery Peak Current vs. IC

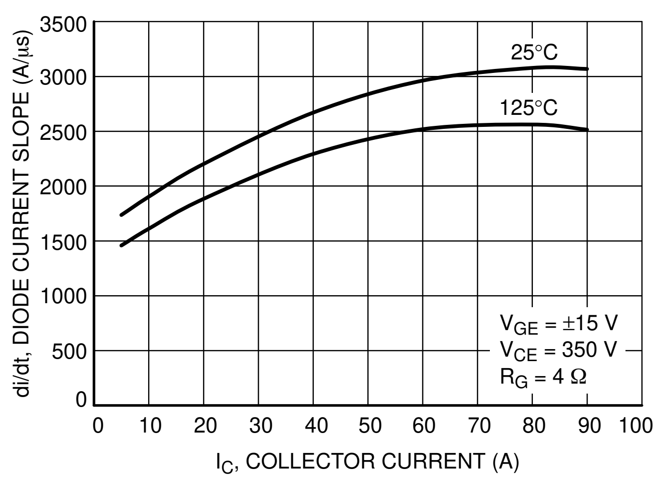


Figure 28. Typical Diode Current Slope vs. IC

TYPICAL CHARACTERISTICS – Neutral Point IGBT and Half Bridge Diode

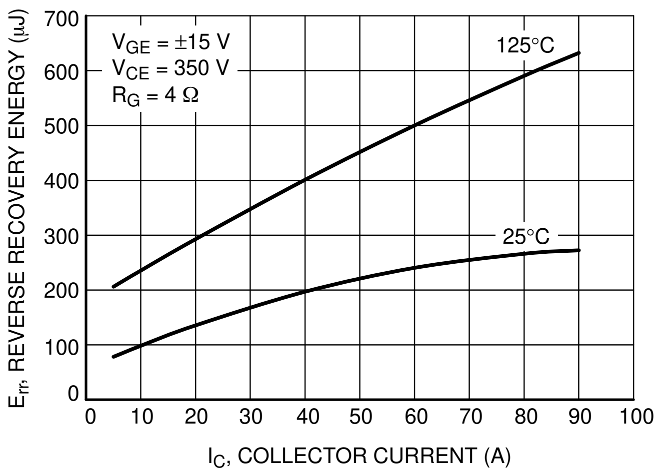


Figure 29. Typical Reverse Recovery Energy vs. IC

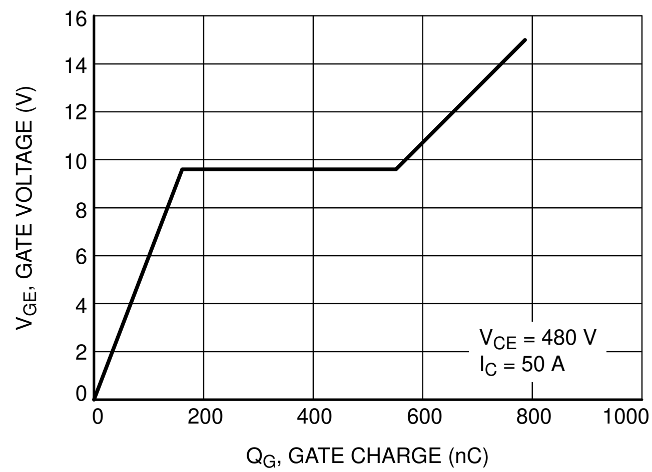


Figure 30. Gate Voltage vs. Gate Charge

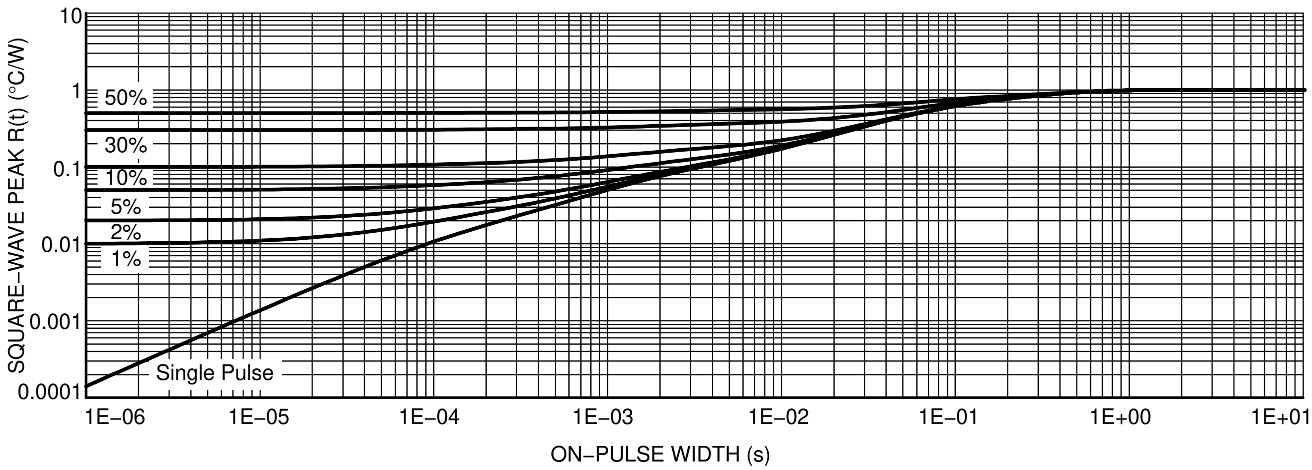


Figure 31. IGBT Transient Thermal Impedance

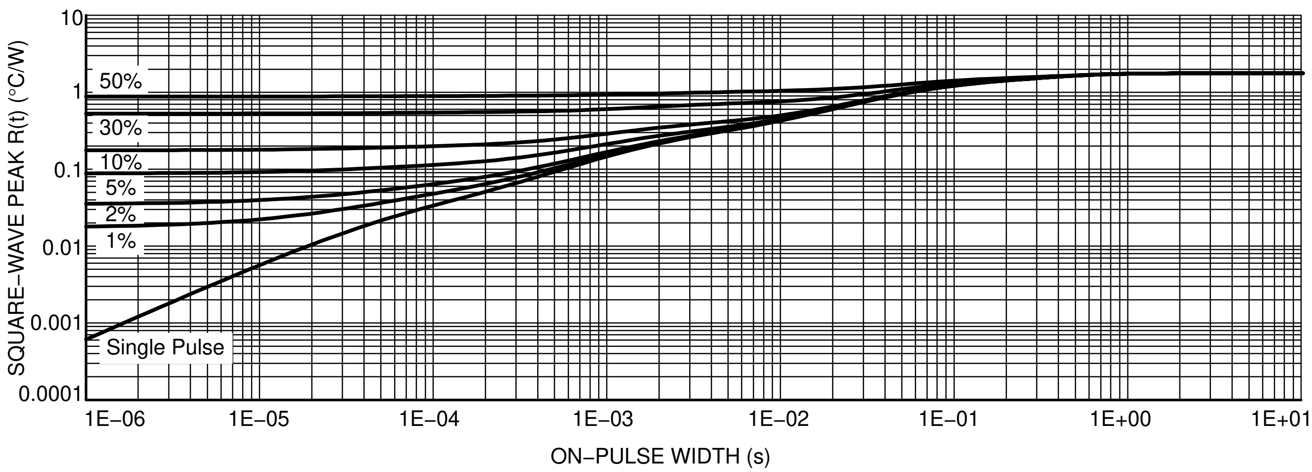


Figure 32. Diode Transient Thermal Impedance

TYPICAL CHARACTERISTICS – Thermistor

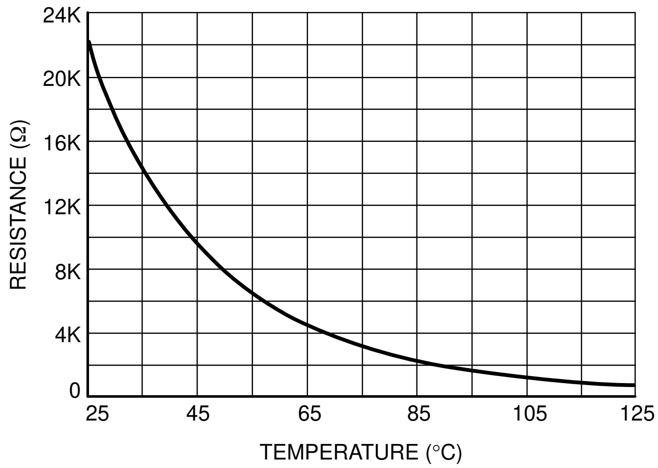


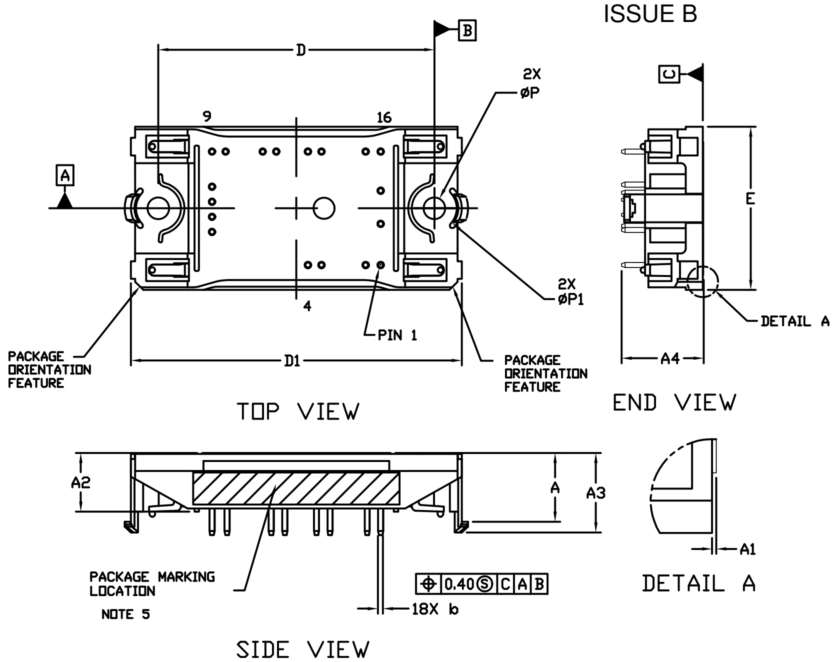
Figure 33. Thermistor Characteristics

ORDERING INFORMATION

Orderable Part Number	Marking	Package	Shipping
NXH80T120L2Q0S1G Q0PACK	NXH80T120L2Q0S1G	Q0PACK – Case 180AH (Pb−Free and Halide−Free)	24 Units / Blister Tray

PACKAGE DIMENSIONS

PIM18, 55x32.5 / Q0PACK
CASE 180AH
ISSUE B



NOTES:

1. DIMENSIONING AND TOLERANCING PER. ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b APPLIES TO THE PLATED TERMINALS AND IS MEASURED BETWEEN 1.00 AND 3.00 FROM THE TERMINAL TIP.
4. POSITION OF THE CENTER OF THE TERMINALS IS DETERMINED FROM DATUM B THE CENTER OF DIMENSION D, X DIRECTION, AND FROM DATUM A, Y DIRECTION. POSITIONAL TOLERANCE, AS NOTED IN DRAWING, APPLIES TO EACH TERMINAL IN BOTH DIRECTIONS.
5. PACKAGE MARKING IS LOCATED AS SHOWN ON THE SIDE OPPOSITE THE PACKAGE ORIENTATION FEATURES.

	MILLIMETERS	
DIM	MIN.	NOM.
A	13.50	13.90
A1	0.10	0.30
A2	11.50	11.90
A3	15.65	16.05
A4	16.35 REF	
b	0.95	1.05
D	54.80	55.20
D1	65.60	66.20
E	32.20	32.80
P	4.20	4.40
P1	8.90	9.10

MOUNTING HOLE POSITION

NOTE 4

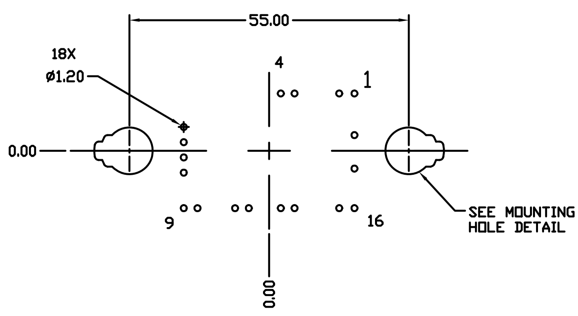
	PIN POSITION			PIN POSITION			PIN POSITION			PIN POSITION	
PIN	X	Y	PIN	X	Y	PIN	X	Y	PIN	X	Y
1	16.80	11.30	10	−14.10	−10.70	1	16.80	−11.30	10	−14.10	10.70
2	13.80	11.30	11	−6.70	−10.70	2	13.80	−11.30	11	−6.70	10.70
3	5.00	11.30	12	−4.00	−10.70	3	5.00	−11.30	12	−4.00	10.70
4	2.30	11.30	13	2.30	−10.70	4	2.30	−11.30	13	2.30	10.70
5	−16.80	4.70	14	5.00	−10.70	5	−16.80	−4.70	14	5.00	10.70
6	−16.80	1.70	15	13.80	−10.70	6	−16.80	−1.70	15	13.80	10.70
7	−16.80	−1.30	16	16.80	−10.70	7	−16.80	1.30	16	16.80	10.70
8	−16.80	−4.30	17	16.80	−3.50	8	−16.80	4.30	17	16.80	3.50
9	−16.80	−10.70	18	16.80	3.10	9	−16.80	10.70	18	16.80	−3.10

PACKAGE DIMENSIONS

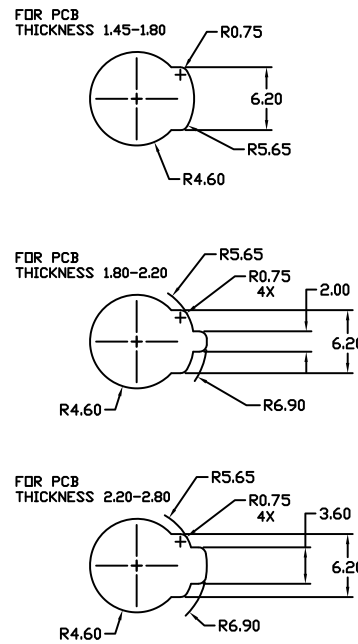
PIM18, 55x32.5 / Q0PACK
CASE 180AH
ISSUE O

MOUNTING HOLE POSITION

	PIN POSITION			PIN POSITION	
PIN	X	Y	PIN	X	Y
1	16.80	11.30	10	−14.10	−10.70
2	13.80	11.30	11	−6.70	−10.70
3	5.00	11.30	12	−4.00	−10.70
4	2.30	11.30	13	2.30	−10.70
5	−16.80	4.70	14	5.00	−10.70
6	−16.80	1.70	15	13.80	−10.70
7	−16.80	−1.30	16	16.80	−10.70
8	−16.80	−4.30	17	16.80	−3.50
9	−16.80	−10.70	18	16.80	3.10



RECOMMENDED
MOUNTING PATTERN



MOUNTING HOLE DETAIL

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