Si/SiC Hybrid Module – EliteSiC, Dual Boost, 1200 V, 40 A IGBT + 1200 V, 15 A SiC Diode, Q0 Package

NXH80B120H2Q0

The NXH80B120H2Q0 is a high−density, integrated power module combines high−performance IGBTs with rugged anti−parallel diodes including on−board thermistor.

Features

- Dual Boost 40 A / 1200 V IGBT + SiC Rectifier Hybrid Module
- 1200 V FSII IGBT $V_{CE(SAT)} = 2.2$ V
- 1200 V SiC Diode $V_F = 1.4$ V
- Low Inductive Layout
- Solderable Pins
- Thermistor
- Bare Copper and Nickel−Plated DBC Options

Typical Applications

- Solar Inverter
- Uninterruptible Power Supplies
- Energy Storage Systems

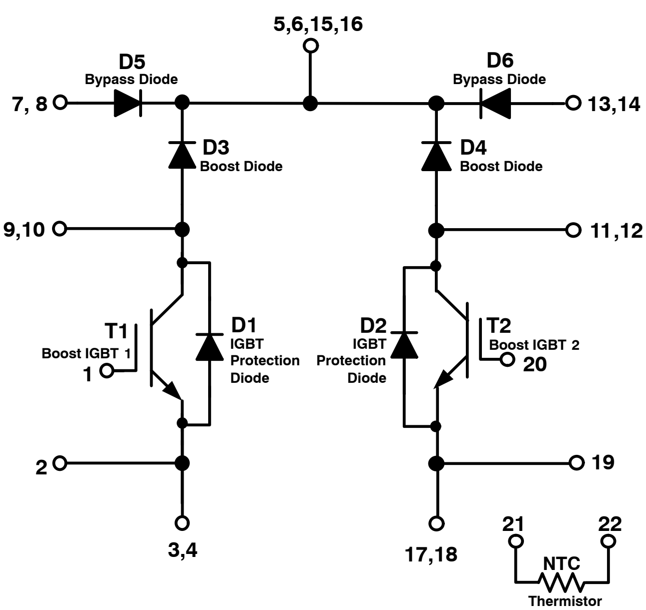
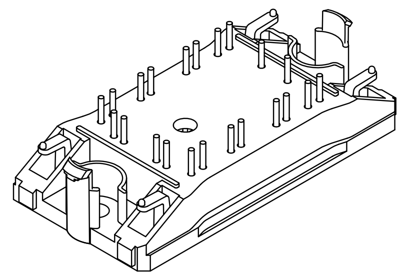
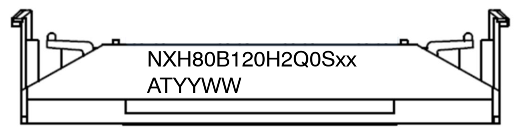


Figure 1. NXH80B120H2Q0SG Schematic Diagram



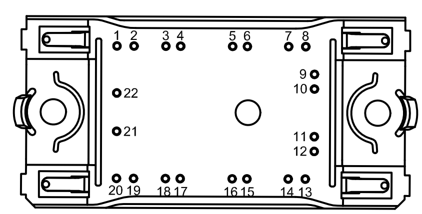
Q0BOOST
CASE 180AJ

MARKING DIAGRAM



NXH80B120H2Q0Sxx = Device Code
AT = Assembly & Test Site Code
YYWW = Year and Work Week Code

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 4 of this data sheet.

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

Rating	Symbol	Value	Unit
BOOST 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	41	A
Pulsed Collector Current (T_J = 175°C)	I_{Cpulse}	123	A
Maximum Power Dissipation @ T_h = 80°C (T_J = 175°C)	P_{tot}	103	W
Short Circuit Withstand Time @ V_{GE} = 15 V, V_{CE} = 600 V, $T_J \leq$ 150°C	T_{sc}	5	μs
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	150	°C
BOOST DIODE			
Peak Repetitive Reverse Voltage	V_{RRM}	1200	V
Continuous Forward Current @ T_h = 80°C (T_J = 175°C)	I_F	28	A
Repetitive Peak Forward Current (limited by T_J, duty cycle = 10%)	I_{FRM}	75	A
Maximum Power Dissipation @ T_h = 80°C (T_J = 175°C)	P_{tot}	79	W
Surge Forward Current (60 Hz single half−sine wave) (T_J = 25°C)	I_{FSM}	69	A
I^2t − value (60 Hz single half−sine wave) (T_J = 150°C)	I^2t	19	A^2s
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	150	°C
BYPASS DIODE / IGBT PROTECTION DIODE			
Peak Repetitive Reverse Voltage	V_{RRM}	1600	V
Continuous Forward Current @ T_h = 80°C (T_J = 175°C)	I_F	46	A
Repetitive Peak Forward Current (T_J = 175°C, t_p limited by T_{Jmax})	I_{FRM}	130	A
Power Dissipation Per Diode @ T_h = 80°C (T_J = 175°C)	P_{tot}	66	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
BOOST IGBT CHARACTERISTICS						
Collector−Emitter Cutoff Current	V_{GE} = 0 V, V_{CE} = 1200 V	I_{CES}	–	–	200	μA
Collector−Emitter Saturation Voltage	V_{GE} = 15 V, I_C = 40 A, T_J = 25°C	$V_{CE(sat)}$	–	2.20	2.5	V
	V_{GE} = 15 V, I_C = 40 A, T_J = 150°C		–	2.16	–	
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}	–	–	200	nA
Turn−on Delay Time	T_J = 25°C V_{CE} = 700 V, I_C = 40 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	27	–	ns
Rise Time		t_r	–	19	–	
Turn−off Delay Time		$t_{d(off)}$	–	94	–	
Fall Time		t_f	–	78	–	
Turn−on Switching Loss per Pulse		E_{on}	–	540	–	μJ
Turn−off Switching Loss per Pulse		E_{off}	–	1640	–	
Turn−on Delay Time	T_J = 125°C V_{CE} = 700 V, I_C = 40 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	27	–	ns
Rise Time		t_r	–	20	–	
Turn−off Delay Time		$t_{d(off)}$	–	110	–	
Fall Time		t_f	–	189	–	
Turn−on Switching Loss per Pulse		E_{on}	–	620	–	μJ
Turn−off Switching Loss per Pulse		E_{off}	–	3590	–	
Input Capacitance	V_{CE} = 25 V, V_{GE} = 0 V, f = 10 kHz	C_{ies}	–	9700	–	pF
Output Capacitance		C_{oes}	–	200	–	
Reverse Transfer Capacitance		C_{res}	–	170	–	
Total Gate Charge	V_{CE} = 600 V, I_C = 40 A, V_{GE} = 15 V	Q_g	–	400	–	nC
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness < 100 μm, λ = 0.84 W/mK	R_{thJH}	–	0.92	–	°C/W
BOOST DIODE CHARACTERISTICS						
Diode Reverse Leakage Current	V_R = 1200 V	I_R	–	–	300	μA
Diode Forward Voltage	I_F = 15 A, T_J = 25°C	V_F	–	1.42	1.7	V
	I_F = 15 A, T_J = 150°C		–	1.95	–	
Reverse Recovery Time	T_J = 25°C V_{CE} = 700 V, I_C = 40 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	27	–	ns
Reverse Recovery Charge		Q_{rr}	–	280	–	nC
Peak Reverse Recovery Current		I_{RRM}	–	16	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	1080	–	A/μs
Reverse Recovery Energy		E_{rr}	–	130	–	μJ
Reverse Recovery Time	T_J = 125°C V_{CE} = 700 V, I_C = 40 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	28	–	ns
Reverse Recovery Charge		Q_{rr}	–	250	–	nC
Peak Reverse Recovery Current		I_{RRM}	–	15	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	940	–	A/μs
Reverse Recovery Energy		E_{rr}	–	110	–	μJ
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness < 100 μm, λ = 0.84 W/mK	R_{thJH}	–	1.21	–	°C/W
BYPASS DIODE/IGBT PROTECTION DIODE CHARACTERISTICS						
Diode Reverse Leakage Current	V_R = 1600 V, T_J = 25°C	I_R	–	–	100	μA

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

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
BYPASS DIODE/IGBT PROTECTION DIODE CHARACTERISTICS						
Diode Forward Voltage	I_F = 25 A, T_J = 25°C	V_F	–	1.0	1.4	V
	I_F = 25 A, T_J = 150°C		–	0.90	–	
Thermal Resistance – chip–to–heatsink	Thermal grease, Thickness < 100 μm, λ = 0.84 W/mK	R_{thJH}	–	1.44	–	°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.

ORDERING INFORMATION

Orderable Part Number	Marking	Package	Shipping
NXH80B120H2Q0SG	NXH80B120H2Q0SG	Q0BOOST – Case 180AJ Bare Copper DBC, Solder Pins (Pb–Free and Halide–Free)	24 Units / Blister Tray
NXH80B120H2Q0SNG	NXH80B120H2Q0SNG	Q0BOOST – Case 180AJ Nickel–Plated DBC, Solder Pins (Pb–Free and Halide–Free)	24 Units / Blister Tray

TYPICAL CHARACTERISTICS – BOOST IGBT & BOOST DIODE

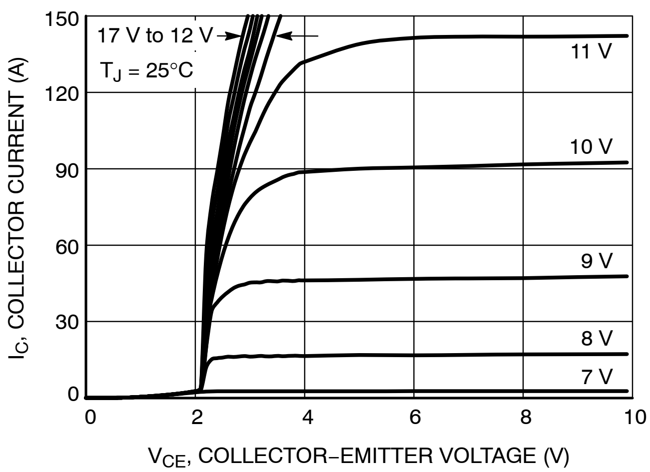


Figure 1. IGBT Typical Output Characteristics

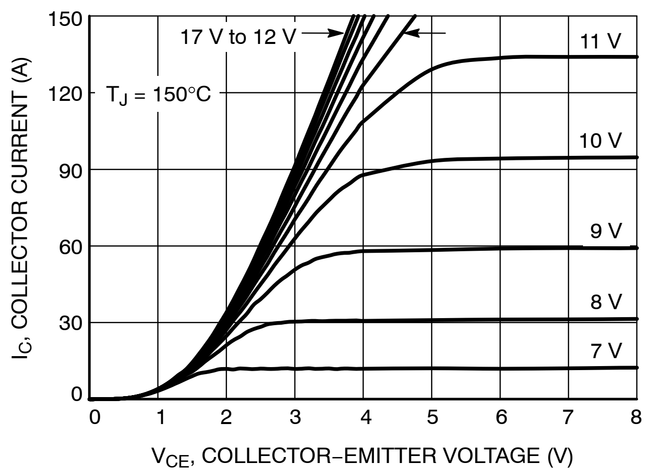


Figure 2. IGBT Typical Output Characteristics

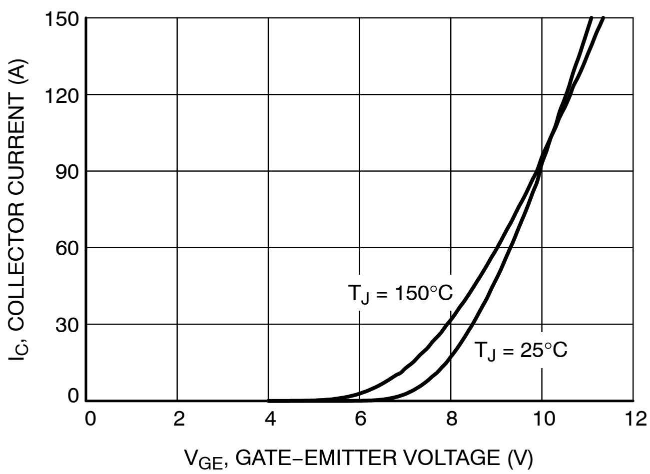


Figure 3. IGBT Typical Transfer Characteristics

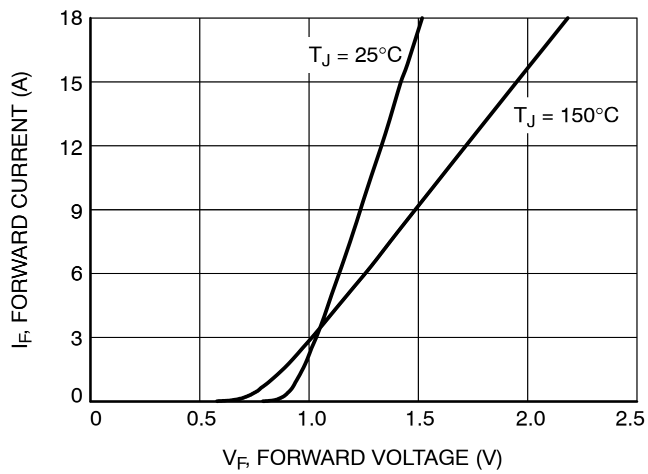


Figure 4. Diode Forward Characteristic

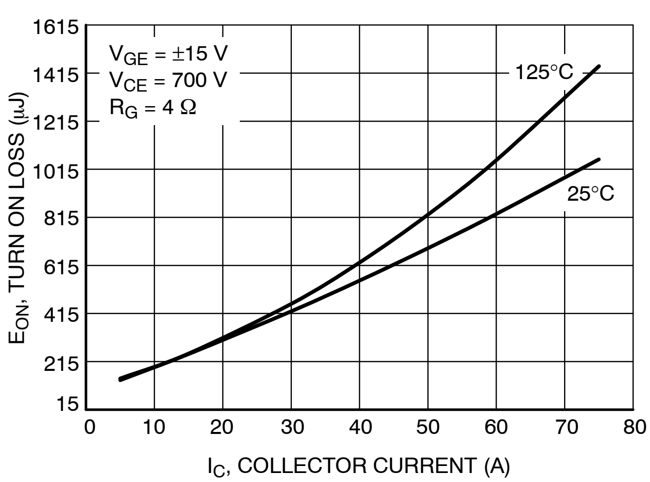


Figure 5. Typical Turn On Loss vs. IC

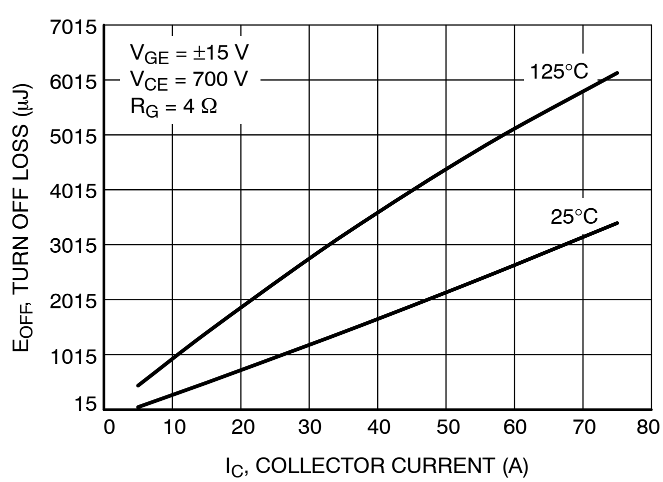


Figure 6. Typical Turn Off Loss vs. IC

TYPICAL CHARACTERISTICS – BOOST IGBT & BOOST DIODE

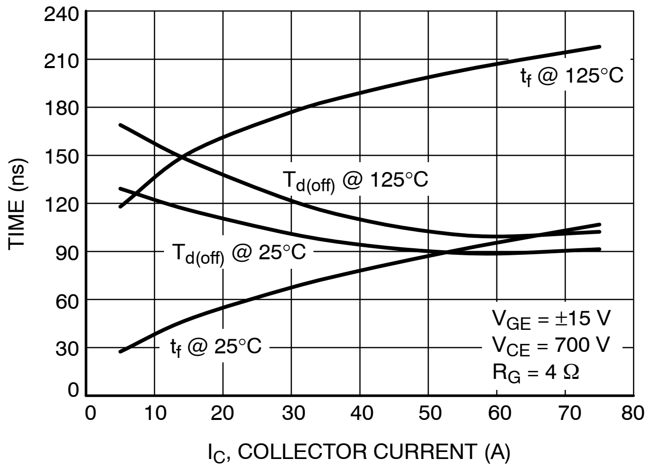


Figure 7. Typical Switching Times vs. IC

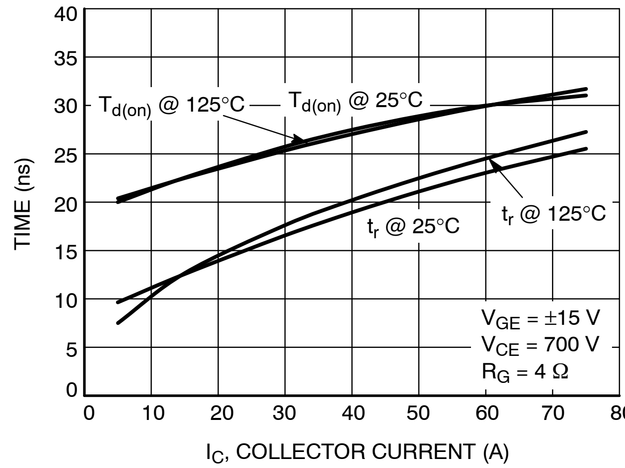


Figure 8. Typical Switching Times vs. IC

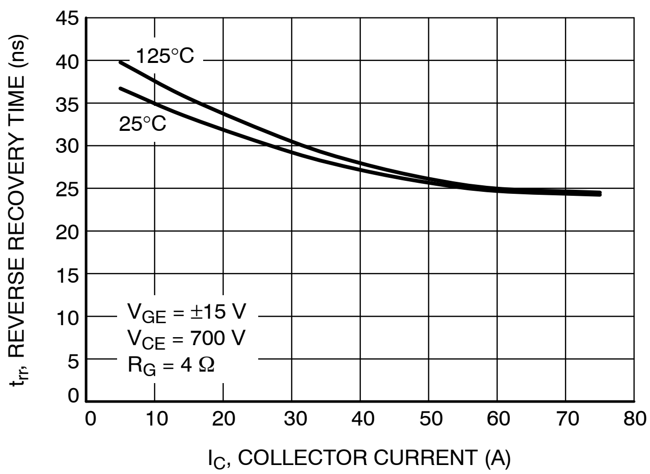


Figure 9. Typical Reverse Recovery Time vs. IC

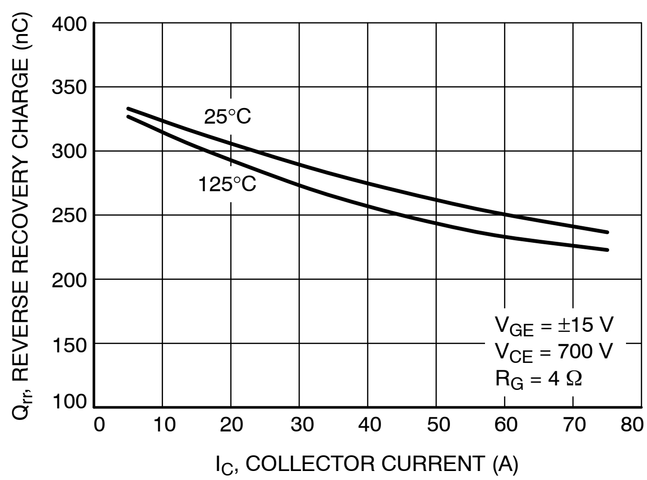


Figure 10. Typical Reverse Recovery Charge vs. IC

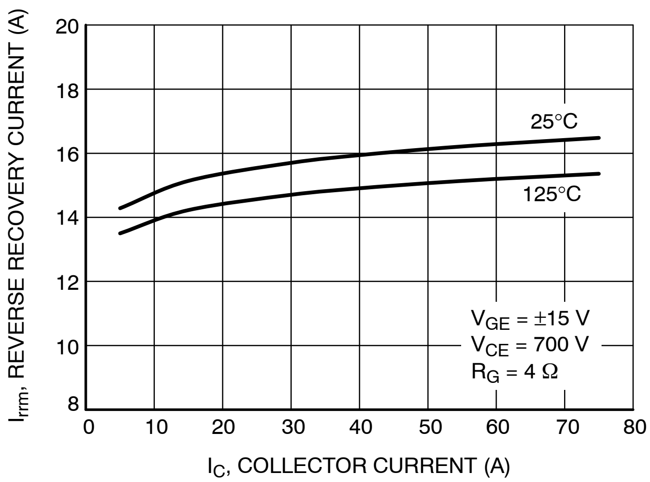


Figure 11. Typical Reverse Recovery Peak Current vs. IC

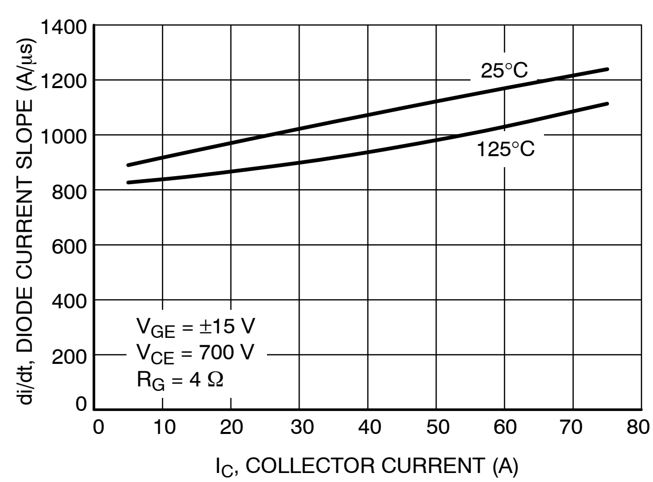


Figure 12. Typical Diode Current Slope vs. IC

TYPICAL CHARACTERISTICS – BOOST IGBT & BOOST DIODE

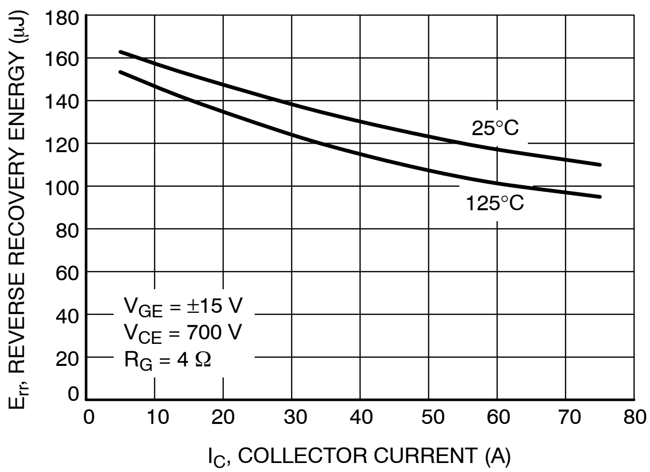


Figure 13. Typical Reverse Recovery Energy vs. IC

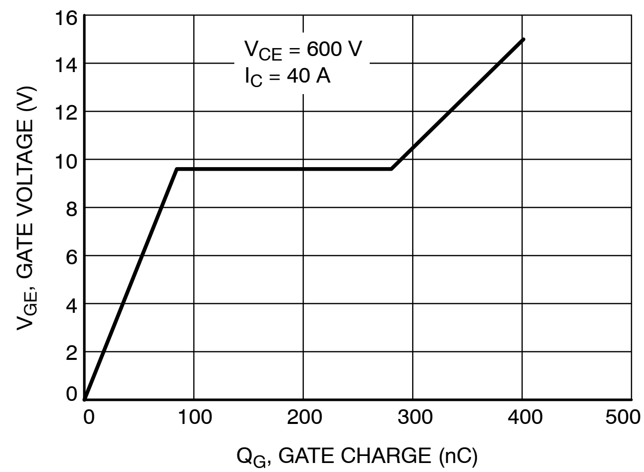


Figure 14. Gate Voltage vs. Gate Charge

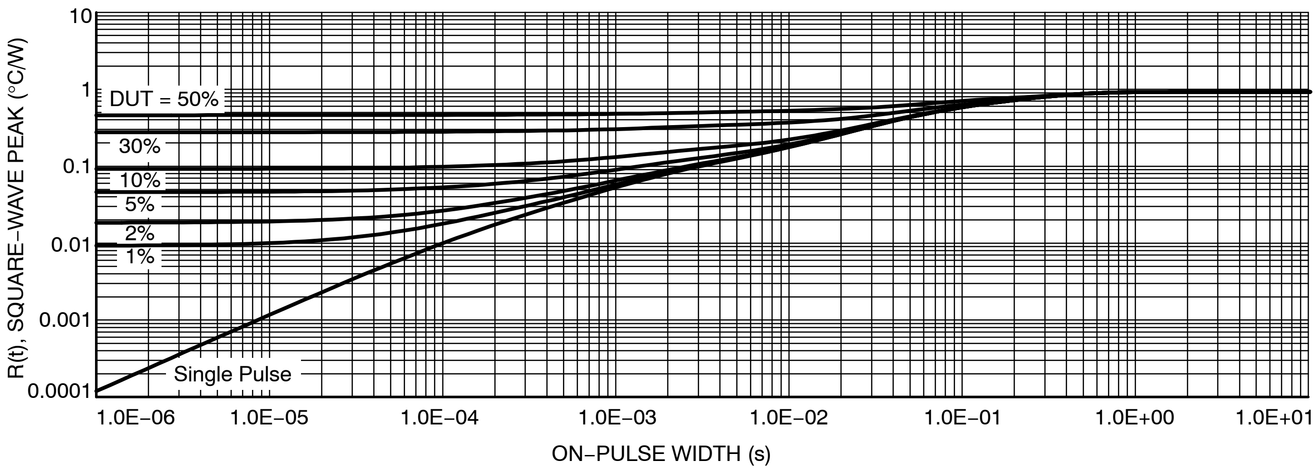


Figure 15. IGBT Transient Thermal Impedance

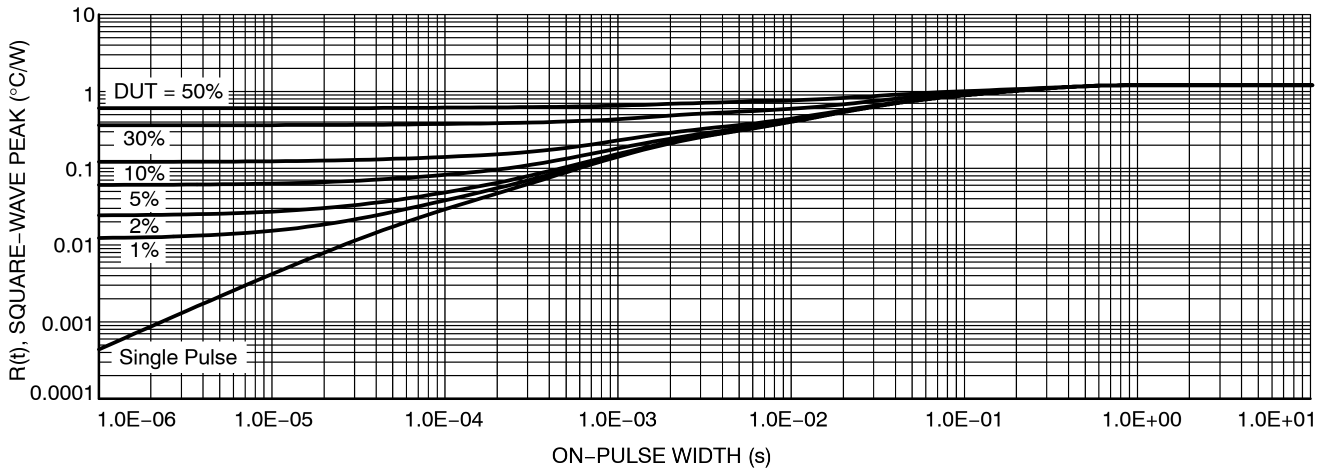


Figure 16. Diode Transient Thermal Impedance Boost Diode

TYPICAL CHARACTERISTICS – BOOST IGBT & BOOST DIODE

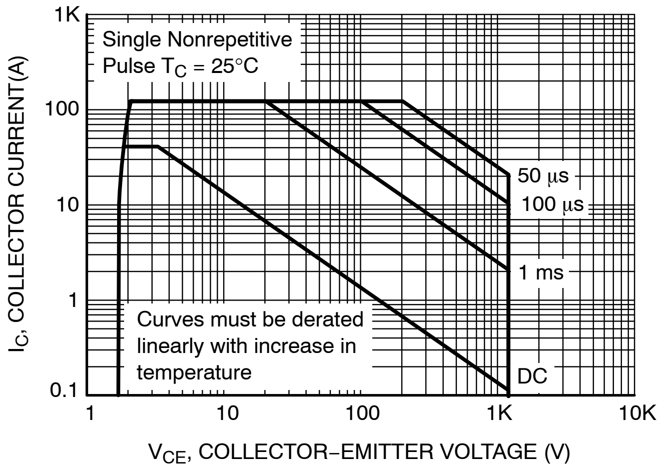


Figure 17. T1 & T2 FBSOA

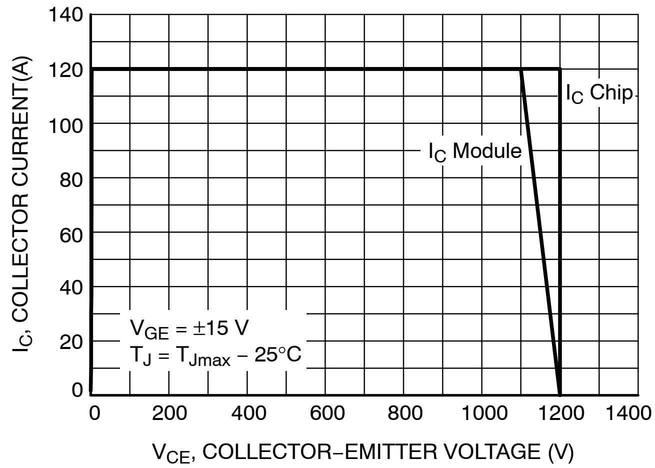


Figure 18. T1 & T2 RBSOA

TYPICAL CHARACTERISTICS – IGBT PROTECTION DIODE AND BYPASS DIODE

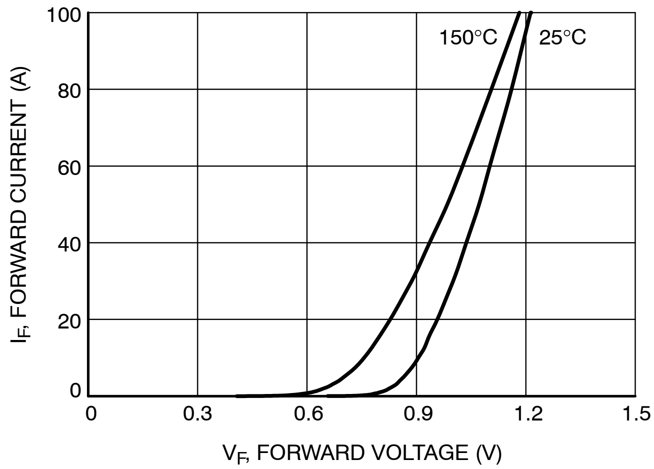


Figure 19. Diode Forward Characteristic

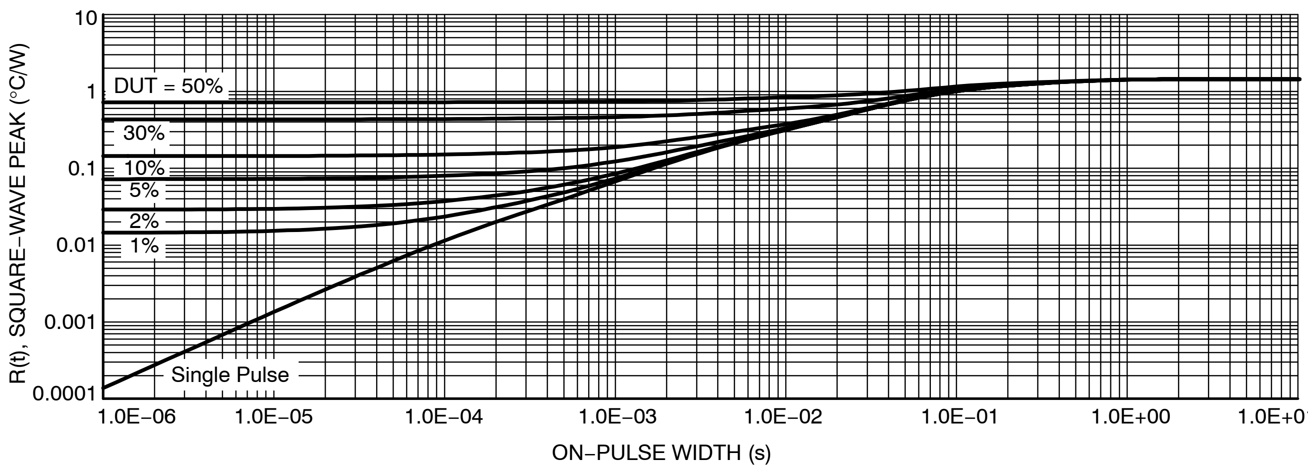


Figure 20. Diode Transient Thermal Impedance Bypass Diode / IGBT Protection Diode

TYPICAL CHARACTERISTICS – THERMISTOR

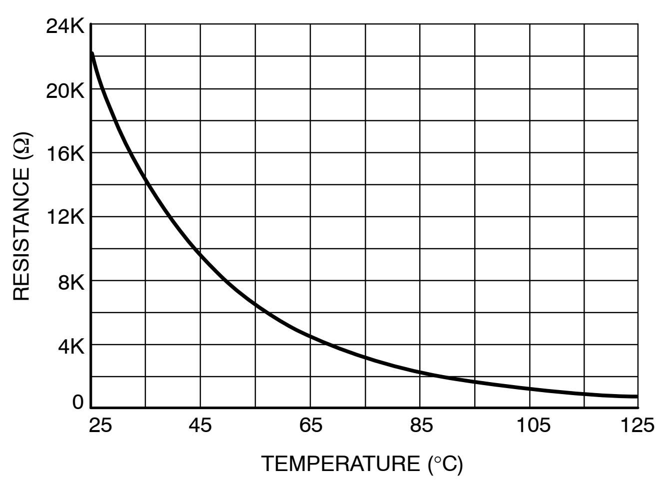


Figure 21. Thermistor Characteristic

PIM22, 55x32.5 / Q0BOOST
CASE 180AJ
ISSUE B

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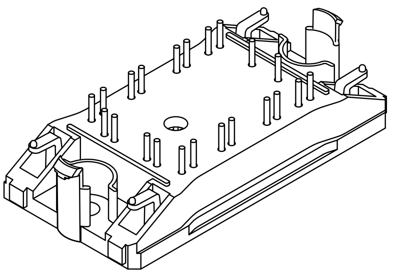
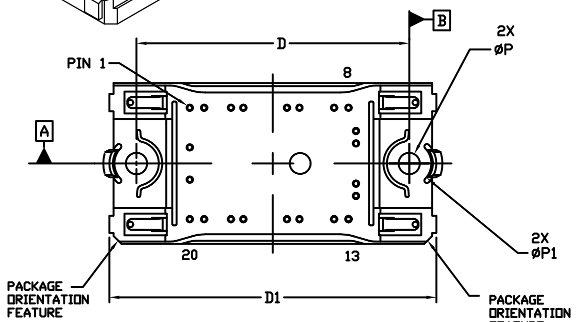
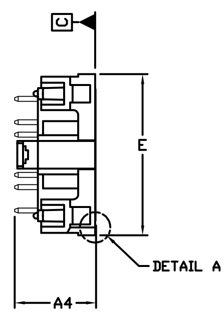




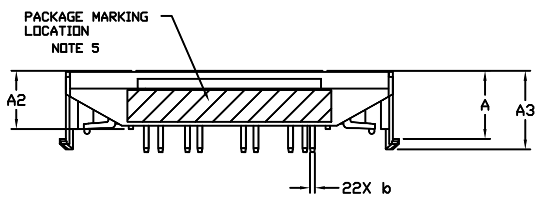
TOP VIEW



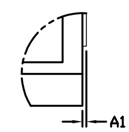
END VIEW

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.



SIDE VIEW



DETAIL A

DIM	MILLIMETERS 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

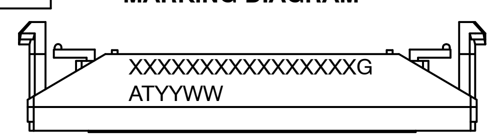
MOUNTING HOLE POSITION

PIN	HOLE POSITION X	Y	PIN	HOLE POSITION X	Y
1	−16.75	−11.25	12	16.75	6.55
2	−13.85	−11.25	13	15.25	11.25
3	−8.45	−11.25	14	12.35	11.25
4	−5.95	−11.25	15	5.35	11.25
5	2.85	−11.25	16	2.85	11.25
6	5.35	−11.25	17	−5.95	11.25
7	12.35	−11.25	18	−8.45	11.25
8	15.25	−11.25	19	−13.85	11.25
9	16.75	−6.55	20	−16.75	11.25
10	16.75	−4.05	21	−16.75	3.25
11	16.75	4.05	22	−16.75	−3.25

NOTE 4

PIN	PIN POSITION X	Y	PIN	PIN POSITION X	Y
1	−16.75	11.25	12	16.75	−6.55
2	−13.85	11.25	13	15.25	−11.25
3	−8.45	11.25	14	12.35	−11.25
4	−5.95	11.25	15	5.35	−11.25
5	2.85	11.25	16	2.85	−11.25
6	5.35	11.25	17	−5.95	−11.25
7	12.35	11.25	18	−8.45	−11.25
8	15.25	11.25	19	−13.85	−11.25
9	16.75	6.55	20	−16.75	−11.25
10	16.75	4.05	21	−16.75	−3.25
11	16.75	−4.05	22	−16.75	3.25

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code
G = Pb−Free Package
AT = Assembly & Test Site Code
YYWW = Year and Work Week Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “ ▪”, may or may not be present. Some products may not follow the Generic Marking.

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DESCRIPTION:	PIM22 55X32.5 / Q0BOOST (SOLDER PIN)	PAGE 1 OF 2

PIM22, 55x32.5 / Q0BOOST
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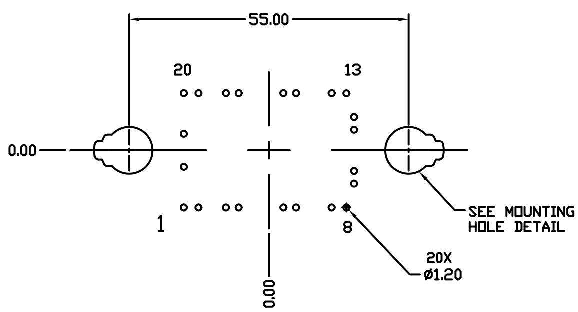
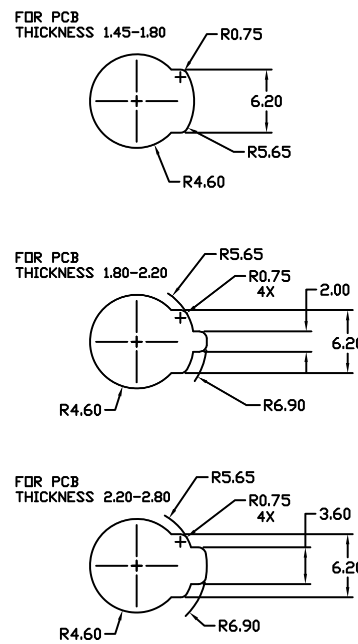
DATE 08 NOV 2017



RECOMMENDED MOUNTING PATTERN



MOUNTING HOLE DETAIL

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DESCRIPTION:	PIM22 55X32.5 / Q0BOOST (SOLDER PIN)	PAGE 2 OF 2

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
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