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Dual Boost Power Module

NXH100B120H3Q0, NXH100B120H3Q0PG-R

The NXH100B120H3Q0 is a power module containing a dual boost stage. The integrated field stop trench IGBTs and SiC Diodes provide lower conduction losses and switching losses, enabling designers to achieve high efficiency and superior reliability.

Features

- 1200 V Ultra Field Stop IGBTs
- Low Reverse Recovery and Fast Switching SiC Diodes
- 1600 V Bypass and Anti-parallel Diodes
- Low Inductive Layout
- Solderable Pins or Press-Fit Pins
- Thermistor
- Options with Pre-Applied Thermal Interface Material (TIM) and Without Pre-Applied TIM

Typical Applications

- Solar Inverter
- Uninterruptible Power Supplies
- Energy Storage Systems

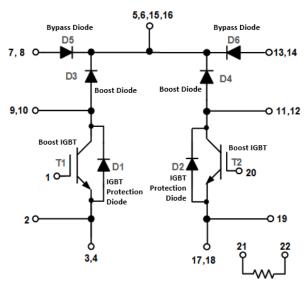
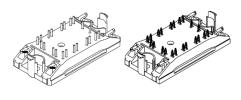
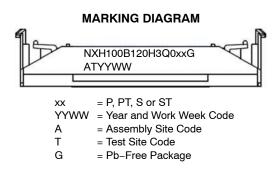


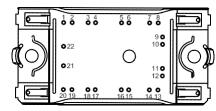
Figure 1. NXH100B120H3Q0xG/PG-R Schematic Diagram



Q0BOOST CASE 180AJ SOLDER PINS Q0BOOST CASE 180BF PRESS-FIT PINS



PIN CONNECTIONS



ORDERING INFORMATION

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

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 @ $T_{C <} 80^{\circ}C$ ($T_{J} = 175^{\circ}C$)	I _{C1}	61	А
Continuous Collector Current @ $T_{C <} 102^{\circ}C (T_{J} = 175^{\circ}C)$	I _{C2}	50	А
Pulsed Collector Current ($T_J = 175^{\circ}C$)	I _{Cpulse}	150	А
Maximum Power Dissipation @ $T_C = 80^{\circ}C (T_J = 175^{\circ}C)$	P _{tot}	186	W
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 @ $T_{C <} 80^{\circ}C$ ($T_{J} = 175^{\circ}C$)	I _{F1}	34	А
Continuous Forward Current @ $T_{C <}$ 132°C (T_{J} = 175°C)	I _{F2}	20	А
Maximum Power Dissipation @ $T_C = 80^{\circ}C (T_J = 175^{\circ}C)$	P _{tot}	114	W
Surge Forward Current (60 Hz single half-sine wave)	I _{FSM}	185	А
I ² t - value (60 Hz single half-sine wave)	l ² t	142	A ² s
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 _{C <} 80°C (T _J = 175°C)	I _{F1}	58	А
Continuous Forward Current @ $T_{C <}$ 141°C (T_{J} = 175°C)	I _{F2}	25	А
Repetitive Peak Forward Current (T _J = 175°C, t_p limited by T _{Jmax})	I _{FRM}	75	А
Maximum Power Dissipation @ $T_C = 80^{\circ}C (T_J = 175^{\circ}C)$	P _{tot}	91	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	VRMS
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.

RECOMMENDED OPERATING RANGES

Rating	Symbol	Min	Мах	Unit
Module Operating Junction Temperature	TJ	-40	150	°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.

ELECTRICAL CHARACTERISTICS $T_J = 25^{\circ}C$ Unless Otherwise Noted

Parameter	Test Conditions	Symbol	Min	Тур	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 = 50 A, T _J = 25°C	V _{CE(sat)}	_	1.77	2.3	V
	V_{GE} = 15 V, I _C = 50 A, T _J = 150°C		_	1.93	-	
Gate-Emitter Threshold Voltage	$V_{GE} = V_{CE}, I_C = 1 \text{ mA}$	V _{GE(TH)}	4.6	5.27	6.5	V
Gate Leakage Current	V _{GE} = 20 V, V _{CE} = 0 V	I _{GES}	-	-	800	nA
Turn-on Delay Time	$T_{\rm J} = 25^{\circ}{\rm C}$	t _{d(on)}	-	44	-	ns
Rise Time	V_{CE} = 700 V, I_C = 50 A V_{GE} = ±15 V, R _G = 4 Ω	tr	-	16	-	
Turn-off Delay Time		t _{d(off)}	-	203	-	
Fall Time		t _f	_	23	-	
Turn-on Switching Loss per Pulse		Eon	_	700	-	
Turn-off Switching Loss per Pulse		E _{off}	-	1500	-	
Turn-on Delay Time	$T_J = 125^{\circ}C$	t _{d(on)}	-	43	-	ns
Rise Time	$V_{CE} = 700 \text{ V}, \text{ I}_{C} = 50 \text{ A V}_{GE} = \pm 15 \text{ V},$ R _G = 4 Ω	t _r	_	18	-	
Turn-off Delay Time		t _{d(off)}	_	233	-	
Fall Time		t _f	_	58	-	
Turn-on Switching Loss per Pulse		Eon	_	800	-	
Turn-off Switching Loss per Pulse		E _{off}	_	2600	-	
Input Capacitance	V_{CE} = 20 V, V_{GE} = 0 V, f = 10 kHz	C _{ies}	_	9075	-	pF
Output Capacitance	1	C _{oes}	_	173	-	1
Reverse Transfer Capacitance		C _{res}	-	147	-	
Total Gate Charge	V_{CE} = 600 V, I_{C} = 40 A, V_{GE} = 15 V	Qg	-	409	-	nC
Thermal Resistance - chip-to-case		R _{thJC}	-	0.51	-	°C/W
Thermal Resistance – chip–to–heatsink	Thermal grease, Thickness \approx 100 $\mu m,$ λ = 2.87 W/mK	R _{thJH}	_	0.82	-	°C/W

BOOST DIODE CHARACTERISTICS

Diode Reverse Leakage Current	V _R = 1200 V	I _R	-	-	300	μA
Diode Forward Voltage	I _F = 20 A, T _J = 25°C	V _F	_	1.44	1.8	V
	I _F = 20 A, T _J = 150°C		_	1.93	_	
Reverse Recovery Time	$T_J = 25^{\circ}C$	t _{rr}	_	15	_	ns
Reverse Recovery Charge	V_{CE} = 700 V, I _C = 50 A V _{GE} = ±15 V, R _G = 4 Ω	Q _{rr}	_	108	_	nC
Peak Reverse Recovery Current		I _{RRM}	_	11	_	А
Peak Rate of Fall of Recovery Current		di/dt	_	1500	_	A/μs
Reverse Recovery Energy]	E _{rr}	_	20	_	μJ
Reverse Recovery Time	$T_{\rm J} = 125^{\circ}{\rm C}$	t _{rr}	_	16	_	ns
Reverse Recovery Charge	V_{CE} = 700 V, I _C = 50 A V _{GE} = ±15 V, R _G = 4 Ω	Q _{rr}	_	115		nC
Peak Reverse Recovery Current		I _{RRM}	_	12		А
Peak Rate of Fall of Recovery Current		di/dt	_	1400		A/μs
Reverse Recovery Energy		E _{rr}	_	22		μJ
Thermal Resistance - chip-to-case	1	R _{thJC}	_	0.83		°C/W
Thermal Resistance - chip-to- heatsink	Thermal grease, Thickness \approx 100 $\mu m,$ λ = 2.87 W/mK	R _{thJH}	-	1.15	-	°C/W

Parameter	Test Conditions	Symbol	Min	Тур	Max	Unit
BYPASS DIODE/IGBT PROTECTION	DIODE CHARACTERISTICS	•			•	
Diode Reverse Leakage Current	$V_{R} = 1600 \text{ V}, \text{ T}_{J} = 25^{\circ}\text{C}$	I _R	-	-	100	μΑ
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-case		R _{thJC}	_	1.04	-	°C/W
$\begin{array}{ll} \mbox{Thermal Resistance-chip-to-} & \mbox{Thermal grease, Thickness} \approx \\ \mbox{heatsink} & \lambda = 2.87 \mbox{ W/mK} \end{array}$		R _{thJH}	—	1.41	-	°C/W
THERMISTOR CHARACTERISTICS	•	•		•		
Nominal resistance		R ₂₅	-	22	-	kΩ
Nominal resistance	T = 100°C	R ₁₀₀	-	1486	-	Ω
Deviation of R25		$\Delta R/R$	-5	-	5	%
Power dissipation		PD	-	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	-	К

ELECTRICAL CHARACTERISTICS T_J = 25°C Unless Otherwise Noted

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
NXH100B120H3Q0PG, NXH100B120H3Q0PG-R	NXH100B120H3Q0PG, NXH100B120H3Q0PG-R		
NXH100B120H3Q0SG	NXH100B120H3Q0SG	Q0BOOST – Case 180AJ (Pb-Free and Halide-Free) Solder Pins	24 Units / Blister Tray
NXH100B120H3Q0PTG	NXH100B120H3Q0PTG	Q0BOOST – Case 180BF (Pb-Free and Halide-Free) Press-Fit Pins, Thermal Interface Material (TIM)	24 Units / Blister Tray
NXH100B120H3Q0STG	NXH100B120H3Q0STG	Q0BOOST – Case 180AJ (Pb–Free and Halide–Free) Solder Pins, Thermal Interface Material (TIM)	24 Units / Blister Tray

TYPICAL CHARACTERISTICS Boost IGBT & IGBT Protection Diode / Bypass Diode

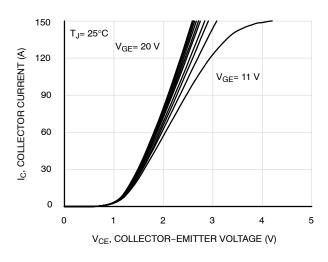


Figure 2. IGBT Typical Output Characteristics

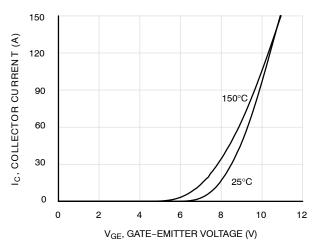


Figure 4. IGBT Typical Transfer Characteristics

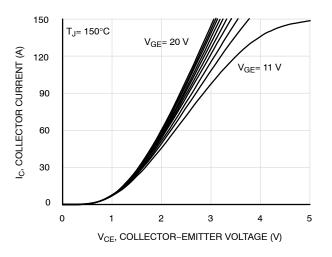


Figure 3. IGBT Typical Output Characteristics

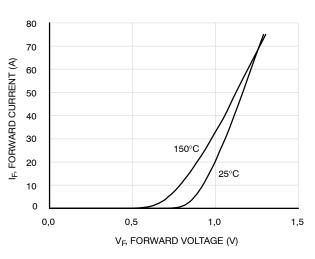
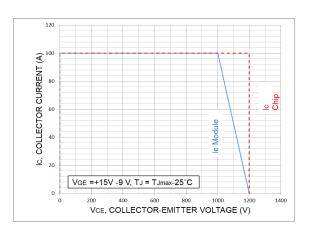


Figure 5. Diode Forward Characteristics



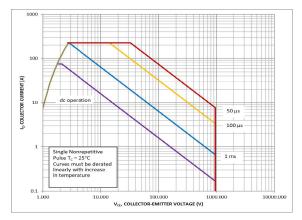


Figure 6. FBSOA



TYPICAL CHARACTERISTICS Boost IGBT & IGBT Protection Diode / Bypass Diode

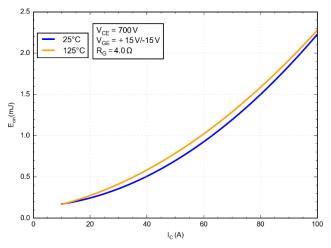


Figure 8. Typical Switching Loss Eon vs. IC

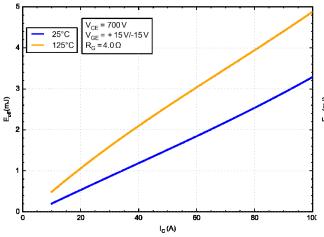
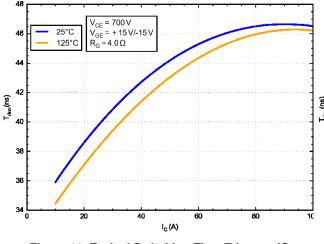


Figure 10. Typical Switching Loss Eoff vs. IC





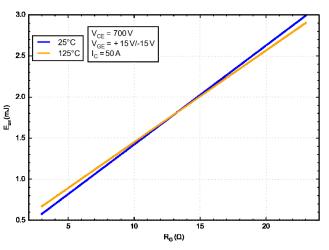


Figure 9. Typical Switching Loss Eon vs. R_G

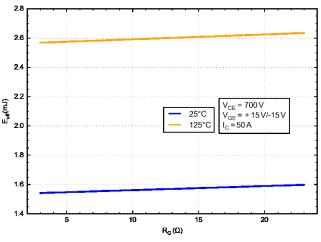
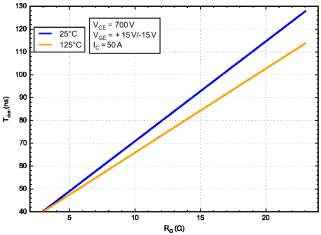
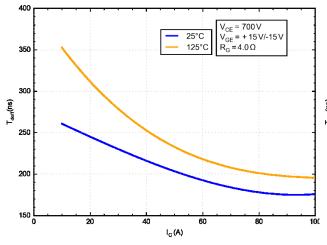


Figure 11. Typical Switching Loss Eoff vs. R_G





TYPICAL PERFORMANCE CHARACTERISTICS



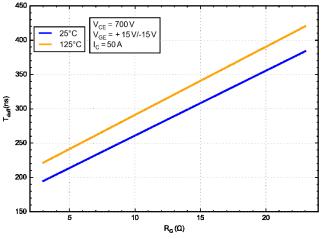


Figure 14. Typical Switching Time Tdoff vs. IC

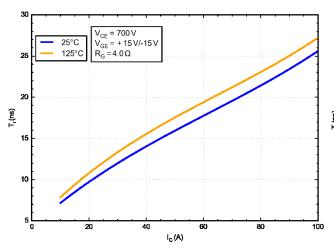
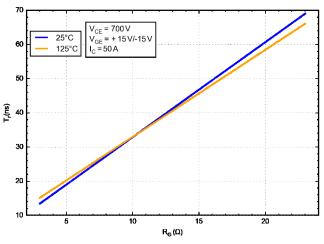
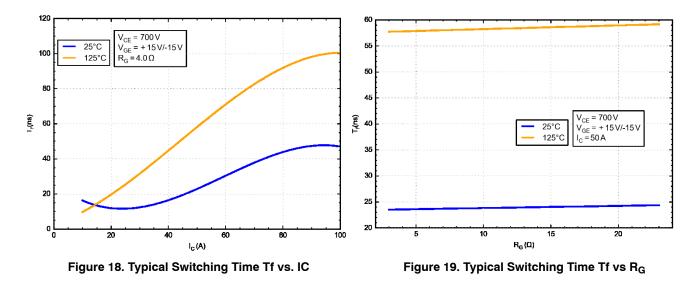


Figure 16. Typical Switching Time Tron vs. IC



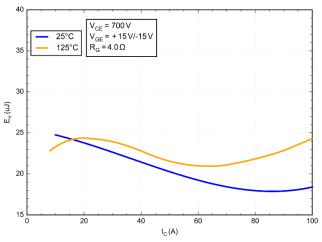






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TYPICAL PERFORMANCE CHARACTERISTICS



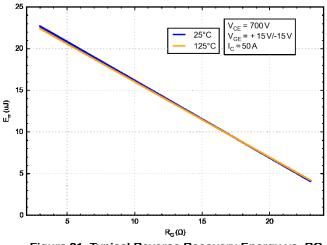


Figure 20. Typical Reverse Recovery Energy vs. IC Figure 21. Typical Reverse Recovery Energy vs. RG

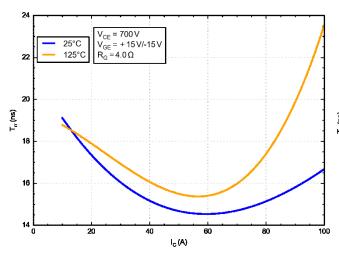


Figure 22. Typical Reverse Recovery Time vs. IC

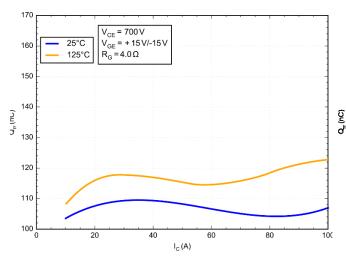
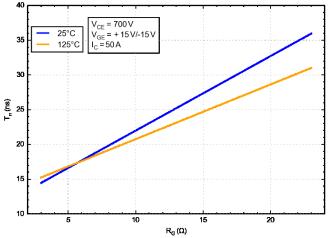


Figure 24. Typical Reverse Recovery Charge vs. IC





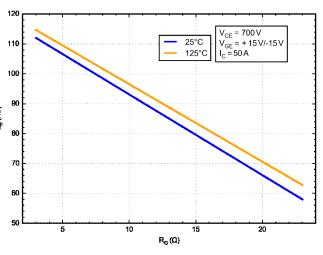


Figure 25. Typical Reverse Recovery Charge vs. RG

TYPICAL PERFORMANCE CHARACTERISTICS

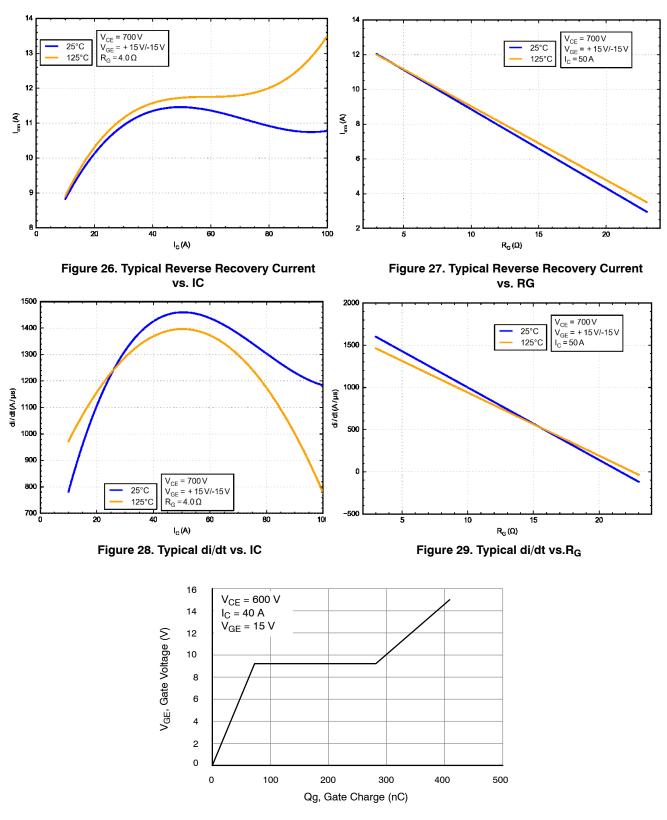


Figure 30. Gate Voltage vs. Gate Charge

TYPICAL PERFORMANCE CHARACTERISTICS

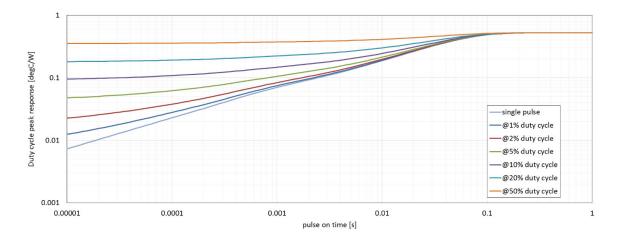


Figure 31. IGBT Junction-to-Case Transient Thermal Impedance

TYPICAL PERFORMANCE CHARACTERISTICS – Boost Diode

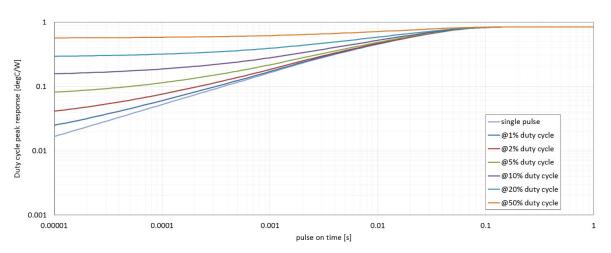
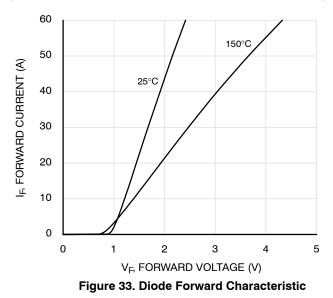
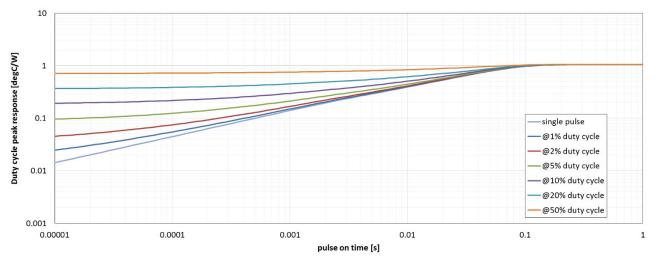


Figure 32. Diode Junction-to-Case Transient Thermal Impedance



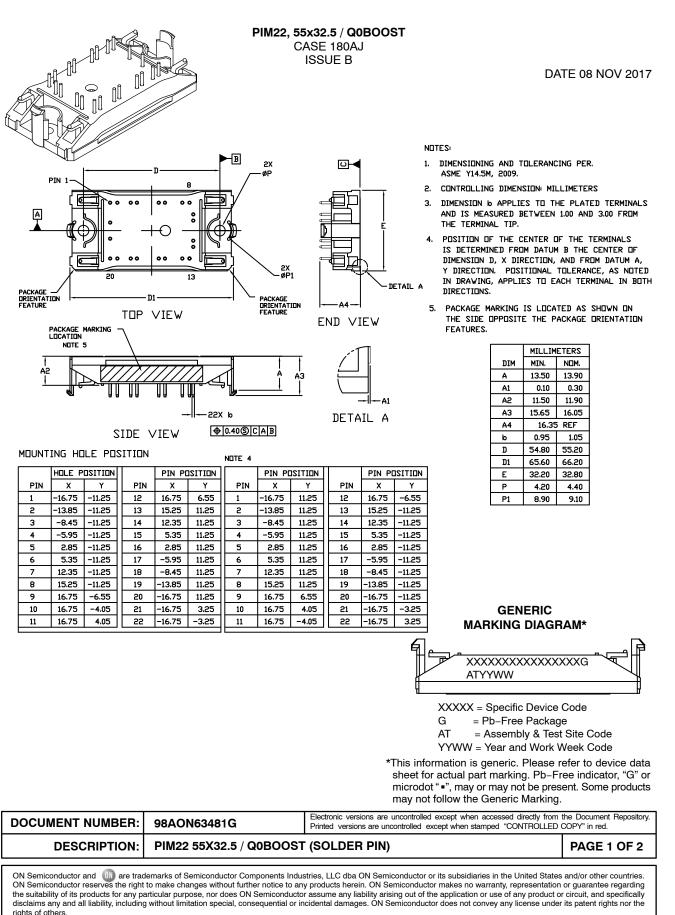






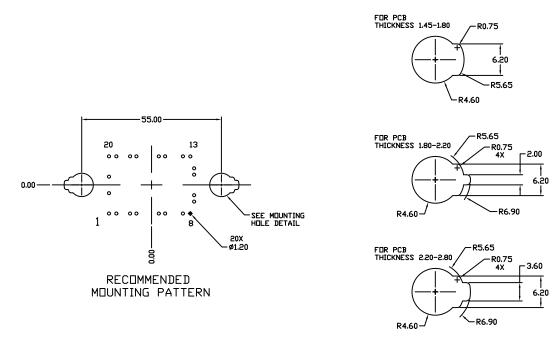
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS





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

DATE 08 NOV 2017

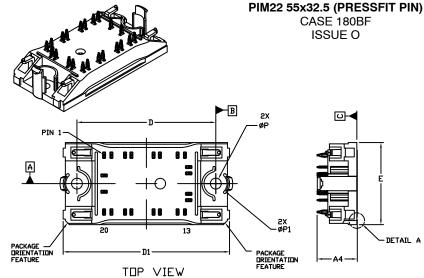


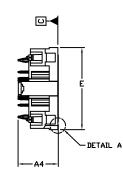
MOUNTING HOLE DETAIL

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DESCRIPTION:	PIM22 55X32.5 / Q0BOOST	PAGE 2 OF 2			
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DATE 21 MAY 2019







ISSUE O

NOTES

- 1. DIMENSIONING AND TOLERANCING PER. ASME Y14.5M, 2009.
- 2. CONTROLLING DIMENSION: MILLIMETERS
- 3. DIMENSION & 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.	NDM.	MAX.		
Α	13.50	13.70	13.90		
A1	0.10	0.20	0.30		
A2	11.50	11.70	11.90		
A3	15.65	15.85	16.05		
A4	1	5.95 RE	F		
Ð	1.61	1.66	1.71		
D	54.80	55.00	55.20		
D1	65.60	65.90	66.20		
E	32.20	32.50	32.80		
Ρ	4.20	4.30	4.40		
P1	8.90	9.00	9.10		

PACKAGE MARKING LOCATION NOTE 5	
SIDE VIEW	

NOTE 4

	PIN POSITION			PIN PE	ISITION
PIN	х	Y	PIN	х	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
1					

DOCUMENT NUMBER:	98AON07824H	Electronic versions are uncontrolled except when accessed directly from the Document Repositor Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.				
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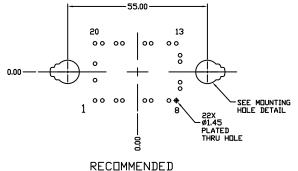
END VIEW

PIM22 55x32.5 (PRESSFIT PIN) CASE 180BF ISSUE O

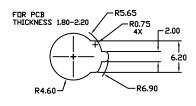
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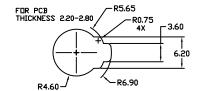
MOUNTING HOLE POSITION

			_			
	HOLE P	OSITION			PIN PE	ISITION
PIN	X	Y		PIN	х	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



MOUNTING PATTERN





MOUNTING HOLE DETAIL

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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