

# F2 Boost Power Module

## NXH200B100H4F2SG, NXH200B100H4F2SG-R

The NXH200B100H4F2SG is a power module containing high-performance IGBTs with rugged anti-parallel diodes. The module also contains an on-board thermistor.

### Features

- Extremely Efficient Trench with Field Stop Technology
- Low Switching Loss Reduces System Power Dissipation
- F2 Package with Solder Pins

### Typical Applications

- Solar Inverter
- Uninterruptible Power Supplies

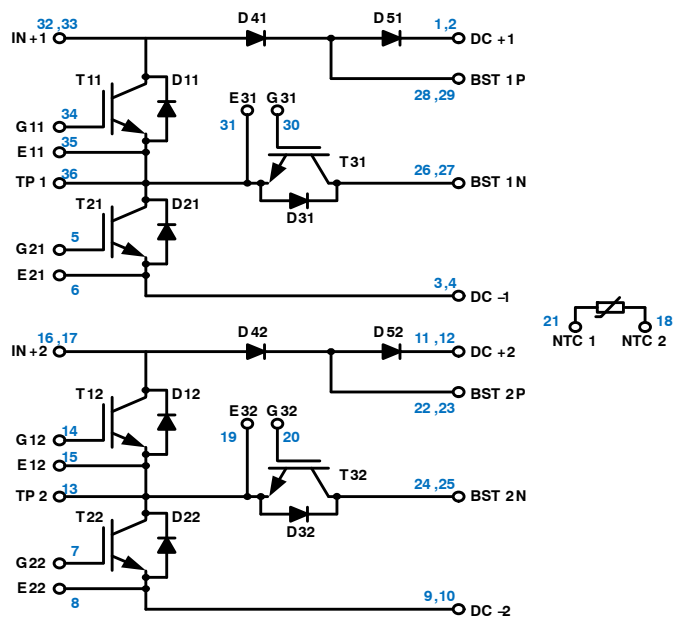
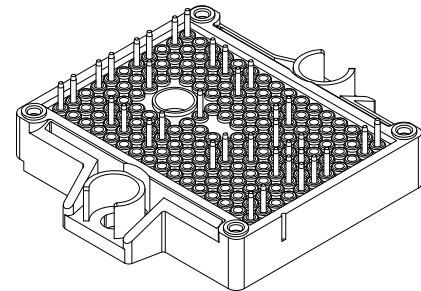


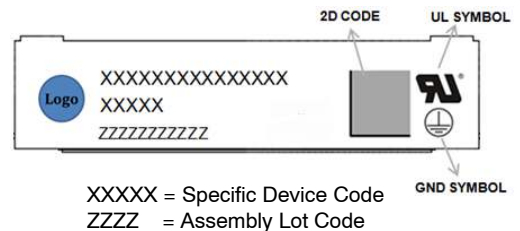
Figure 1.

NXH200B100H4F2SG/NXH200B100H4F2SG-R  
Schematic Diagram

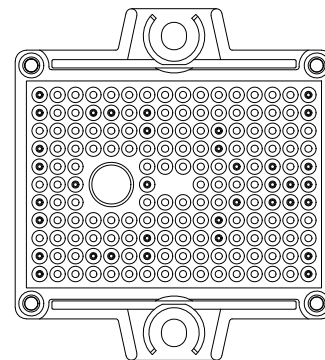


F2 PACKAGE  
CASE 180CJ  
SOLDER PINS

### MARKING DIAGRAM



### PIN CONNECTIONS



### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

# NXH200B100H4F2SG, NXH200B100H4F2SG-R

**Table 1. ABSOLUTE MAXIMUM RATINGS** (Note 1)  $T_J = 25^\circ\text{C}$  unless otherwise noted

Rating	Symbol	Value	Unit
<b>BOOST IGBT (T11, T21, T12, T22)</b>			
Collector-Emitter Voltage	$V_{CES}$	1000	V
Gate-Emitter Voltage	$V_{GE}$	$\pm 20$	V
Continuous Collector Current @ $T_h = 80^\circ\text{C}$	$I_C$	100	A
Pulsed Collector Current	$I_{Cpulse}$	300	A
Maximum Power Dissipation @ $T_h = 80^\circ\text{C}$	$P_{tot}$	93	W
Minimum Operating Junction Temperature	$T_{JMIN}$	-40	$^\circ\text{C}$
Maximum Operating Junction Temperature	$T_{JMAX}$	150	$^\circ\text{C}$
<b>BOOST IGBT INVERSE DIODE (D11, D21, D12, D22)</b>			
Peak Repetitive Reverse Voltage	$V_{RRM}$	1600	V
Continuous Forward Current @ $T_h = 80^\circ\text{C}$	$I_F$	30	A
Repetitive Peak Forward Current, $T_{pulse} = 1\text{ ms}$	$I_{FRM}$	90	A
Power Dissipation Per Diode @ $T_h = 80^\circ\text{C}$	$P_{tot}$	37	W
Minimum Operating Junction Temperature	$T_{JMIN}$	-40	$^\circ\text{C}$
Maximum Operating Junction Temperature	$T_{JMAX}$	150	$^\circ\text{C}$
<b>PATH IGBT (T31, T32)</b>			
Collector-Emitter Voltage	$V_{CES}$	1000	V
Gate-Emitter Voltage	$V_{GE}$	$\pm 20$	V
Continuous Collector Current @ $T_h = 80^\circ\text{C}$	$I_C$	100	A
Pulsed Collector Current	$I_{Cpulse}$	300	A
Maximum Power Dissipation @ $T_h = 80^\circ\text{C}$	$P_{tot}$	109	W
Minimum Operating Junction Temperature	$T_{JMIN}$	-40	$^\circ\text{C}$
Maximum Operating Junction Temperature	$T_{JMAX}$	150	$^\circ\text{C}$
<b>PATH IGBT INVERSE DIODE (D31, D32)</b>			
Peak Repetitive Reverse Voltage	$V_{RRM}$	1200	V
Continuous Forward Current @ $T_h = 80^\circ\text{C}$	$I_F$	40	A
Repetitive Peak Forward Current	$I_{FRM}$	120	A
Power Dissipation Per Diode @ $T_h = 80^\circ\text{C}$	$P_{tot}$	78	W
Minimum Operating Junction Temperature	$T_{JMIN}$	-40	$^\circ\text{C}$
Maximum Operating Junction Temperature	$T_{JMAX}$	150	$^\circ\text{C}$
<b>BOOST DIODE (D41, D51, D42, D52)</b>			
Peak Repetitive Reverse Voltage	$V_{RRM}$	1200	V
Continuous Forward Current @ $T_h = 80^\circ\text{C}$	$I_F$	40	A
Repetitive Peak Forward Current, $T_{pulse} = 1\text{ ms}$	$I_{FRM}$	120	A
Maximum Power Dissipation @ $T_h = 80^\circ\text{C}$	$P_{tot}$	72	W
Minimum Operating Junction Temperature	$T_{JMIN}$	-40	$^\circ\text{C}$
Maximum Operating Junction Temperature	$T_{JMAX}$	150	$^\circ\text{C}$
<b>THERMAL PROPERTIES</b>			
Storage Temperature range	$T_{stg}$	-40 to 125	$^\circ\text{C}$
<b>INSULATION PROPERTIES</b>			
Isolation test voltage, $t = 1\text{ sec}$ , 50 Hz	$V_{is}$	3000	$V_{RMS}$
Creepage distance (pin to heatsink)		>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.

# NXH200B100H4F2SG, NXH200B100H4F2SG-R

**Table 2. RECOMMENDED OPERATING RANGES**

Rating	Symbol	Min	Max	Unit
Module Operating Junction Temperature	$T_J$	-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.

**Table 3. ELECTRICAL CHARACTERISTICS**  $T_J = 25^\circ\text{C}$  unless otherwise noted

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
<b>BOOST IGBT CHARACTERISTICS (T11, T21, T12, T22)</b>						
Collector-Emitter Cutoff Current	$V_{GE} = 0\text{ V}, V_{CE} = 1000\text{ V}$	$I_{CES}$	-	-	200	$\mu\text{A}$
Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{ V}, I_C = 100\text{ A}, T_J = 25^\circ\text{C}$	$V_{CE(sat)}$	-	1.8	2.4	V
	$V_{GE} = 15\text{ V}, I_C = 100\text{ A}, T_J = 150^\circ\text{C}$		-	2.1	-	
Gate-Emitter Threshold Voltage	$V_{GE} = V_{CE}, I_C = 100\text{ mA}$	$V_{GE(TH)}$	3.9	5	6.3	V
Gate Leakage Current	$V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$	$I_{GES}$	-	-	800	nA
Turn-on Switching Loss per Pulse	$T_J = 25^\circ\text{C}$ $V_{CE} = 600\text{ V}, I_C = 30\text{ A}$ $V_{GE} = -5\text{ V} \sim 15\text{ V}, R_G = 10\ \Omega$	$E_{on}$	-	0.57	-	mJ
Turn-off Switching Loss per Pulse		$E_{off}$	-	0.96	-	
Turn-on Switching Loss per Pulse	$T_J = 125^\circ\text{C}$ $V_{CE} = 600\text{ V}, I_C = 30\text{ A}$ $V_{GE} = -5\text{ V} \sim 15\text{ V}, R_G = 10\ \Omega$	$E_{on}$	-	0.70	-	mJ
Turn-off Switching Loss per Pulse		$E_{off}$	-	1.60	-	
Input Capacitance	$V_{CE} = 20\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{ies}$	-	6523	-	pF
Output Capacitance		$C_{oes}$	-	253	-	
Reverse Transfer Capacitance		$C_{res}$	-	26	-	
Total Gate Charge	$V_{CE} = 600\text{ V}, I_C = 100\text{ A}, V_{GE} = \pm 15\text{ V}$	$Q_g$	-	326	-	nC
Thermal Resistance - chip-to-case		$R_{thJC}$	-	0.42	-	°C/W
Thermal Resistance - chip-to-heatsink	Thermal grease, Thickness $\approx 57\ \mu\text{m}$ , $\lambda = 2.87\text{ W/mK}$	$R_{thJH}$	-	0.75	-	°C/W

**BOOST IGBT INVERSE DIODE CHARACTERISTICS (D11, D21, D12, D22)**

Diode Forward Voltage	$I_F = 30\text{ A}, T_J = 25^\circ\text{C}$	$V_F$	-	1	1.6	V
	$I_F = 30\text{ A}, T_J = 150^\circ\text{C}$		-	0.94	-	
Thermal Resistance - chip-to-case		$R_{thJC}$	-	0.77	-	°C/W
Thermal Resistance - chip-to-heatsink	Thermal grease, Thickness $\approx 57\ \mu\text{m}$ , $\lambda = 2.87\text{ W/mK}$	$R_{thJH}$	-	1.19	-	°C/W

**PATH IGBT CHARACTERISTICS (T31, T32)**

Collector-Emitter Cutoff Current	$V_{GE} = 0\text{ V}, V_{CE} = 1000\text{ V}$	$I_{CES}$	-	-	200	$\mu\text{A}$
Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{ V}, I_C = 100\text{ A}, T_J = 25^\circ\text{C}$	$V_{CE(sat)}$	-	1.26	2.1	V
	$V_{GE} = 15\text{ V}, I_C = 100\text{ A}, T_J = 150^\circ\text{C}$		-	1.34	-	
Gate-Emitter Threshold Voltage	$V_{GE} = V_{CE}, I_C = 100\text{ mA}$	$V_{GE(TH)}$	3.2	4.6	5.5	V
Gate Leakage Current	$V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$	$I_{GES}$	-	-	800	nA
Input Capacitance	$V_{CE} = 20\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{ies}$	-	20937	-	pF
Output Capacitance		$C_{oes}$	-	341	-	
Reverse Transfer Capacitance		$C_{res}$	-	158	-	
Total Gate Charge	$V_{CE} = 600\text{ V}, I_C = 100\text{ A}, V_{GE} = 15\text{ V}$	$Q_g$	-	1746	-	nC
Thermal Resistance - chip-to-case		$R_{thJC}$	-	0.33	-	°C/W
Thermal Resistance - chip-to-heatsink	Thermal grease, Thickness $\approx 57\ \mu\text{m}$ , $\lambda = 2.87\text{ W/mK}$	$R_{thJH}$	-	0.64	-	°C/W

## NXH200B100H4F2SG, NXH200B100H4F2SG-R

**Table 3. ELECTRICAL CHARACTERISTICS**  $T_J = 25^\circ\text{C}$  unless otherwise noted

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
<b>PATH IGBT INVERSE DIODE CHARACTERISTICS (D31, D32)</b>						
Diode Forward Voltage	$I_F = 40\text{ A}, T_J = 25^\circ\text{C}$	$V_F$	-	2.3	3	V
	$I_F = 40\text{ A}, T_J = 150^\circ\text{C}$		-	1.6	-	
Thermal Resistance – chip-to-case		$R_{thJC}$	-	0.6	-	$^\circ\text{C/W}$
Thermal Resistance – chip-to-heatsink	Thermal grease, Thickness $\approx 57\ \mu\text{m}$ , $\lambda = 2.87\ \text{W/mK}$	$R_{thJH}$	-	0.9	-	$^\circ\text{C/W}$
<b>BOOST DIODE CHARACTERISTICS (D41, D51, D42, D52)</b>						
Diode Reverse Leakage Current	$V_R = 1200\text{ V}, T_J = 25^\circ\text{C}$	$I_R$	-	-	400	$\mu\text{A}$
Diode Forward Voltage	$I_F = 40\text{ A}, T_J = 25^\circ\text{C}$	$V_F$	-	1.5	2	V
	$I_F = 40\text{ A}, T_J = 150^\circ\text{C}$		-	2.0	-	
Peak Reverse Recovery Current	$T_J = 25^\circ\text{C}$ $V_{CE} = 600\text{ V}, I_C = 30\text{ A}$ $V_{GE} = -5\text{ V} \sim 15\text{ V}, R_G = 10\ \Omega$	$I_{RRM}$	-	10	-	A
Reverse Recovery Energy		$E_{rr}$	-	66	-	$\mu\text{J}$
Peak Reverse Recovery Current	$T_J = 125^\circ\text{C}$ $V_{CE} = 600\text{ V}, I_C = 30\text{ A}$ $V_{GE} = -5\text{ V} \sim 15\text{ V}, R_G = 10\ \Omega$	$I_{RRM}$	-	9.9	-	A
Reverse Recovery Energy		$E_{rr}$	-	64	-	$\mu\text{J}$
Thermal Resistance – chip-to-case		$R_{thJC}$	-	0.59	-	$^\circ\text{C/W}$
Thermal Resistance – chip-to-heatsink	Thermal grease, Thickness $\approx 57\ \mu\text{m}$ , $\lambda = 2.87\ \text{W/mK}$	$R_{thJH}$	-	0.97	-	$^\circ\text{C/W}$

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.

**Table 4. THERMISTOR CHARACTERISTICS**

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Nominal resistance		$R_{25}$	-	22	-	$\text{k}\Omega$
Nominal resistance	$T = 100^\circ\text{C}$	$R_{100}$	-	1486	-	$\Omega$
Deviation of $R_{25}$		$-R/R$	-5	-	5	%
Power dissipation		$P_D$	-	200	-	mW
Power dissipation constant			-	2	-	mW/K
B-value	$B(25/50)$ , tolerance $\pm 3\%$		-	3950	-	K
B-value	$B(25/100)$ , tolerance $\pm 3\%$		-	3998	-	K

**Table 5. ORDERING INFORMATION**

Orderable Part Number	Marking	Package	Shipping
NXH200B100H4F2SG, NXH200B100H4F2SG-R	NXH200B100H4F2SG, NXH200B100H4F2SG-R	F2 – Case 180CJ (Pb-Free and Halide-Free, Solder Pins)	20 Units / Blister Tray

# NXH200B100H4F2SG, NXH200B100H4F2SG-R

## TYPICAL CHARACTERISTICS – BOOST IGBT & INVERSE DIODE

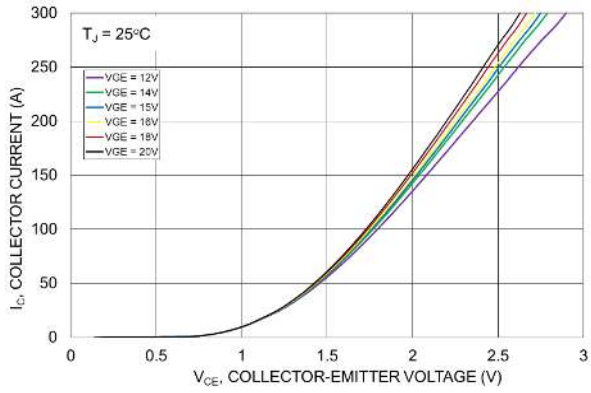


Figure 2. Typical Output Characteristics

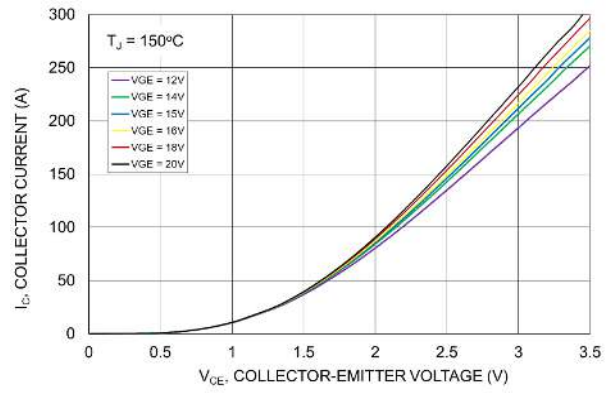


Figure 3. Typical Output Characteristics

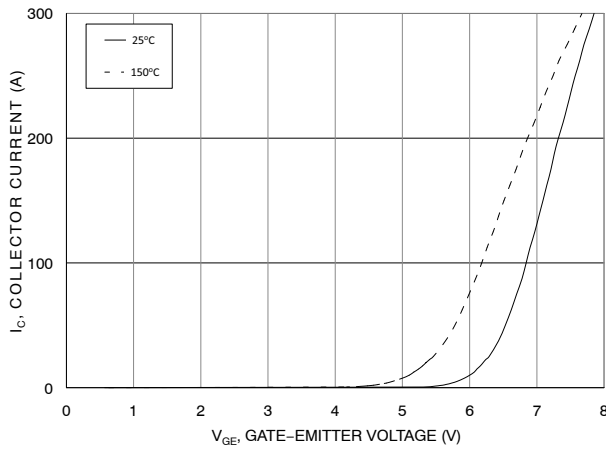


Figure 4. Typical Transfer Characteristics

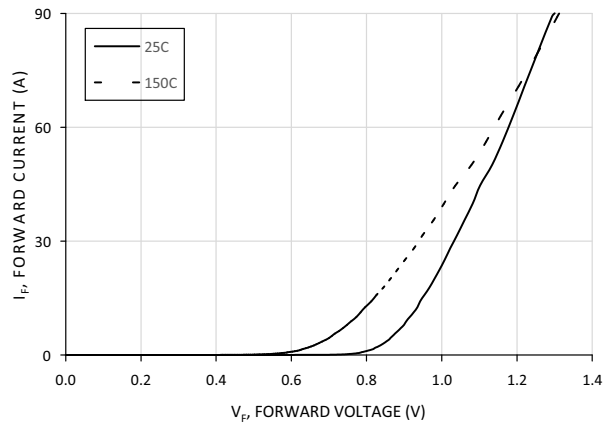


Figure 5. Inverse Diode Forward Characteristics

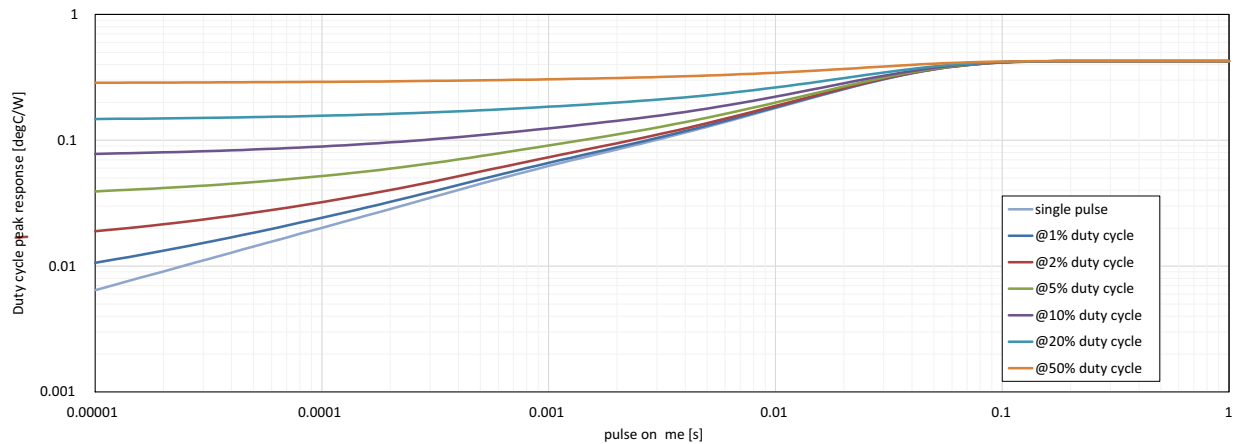


Figure 6. Boost IGBT Transient Thermal Impedance

# NXH200B100H4F2SG, NXH200B100H4F2SG-R

## TYPICAL CHARACTERISTICS – BOOST IGBT & INVERSE DIODE

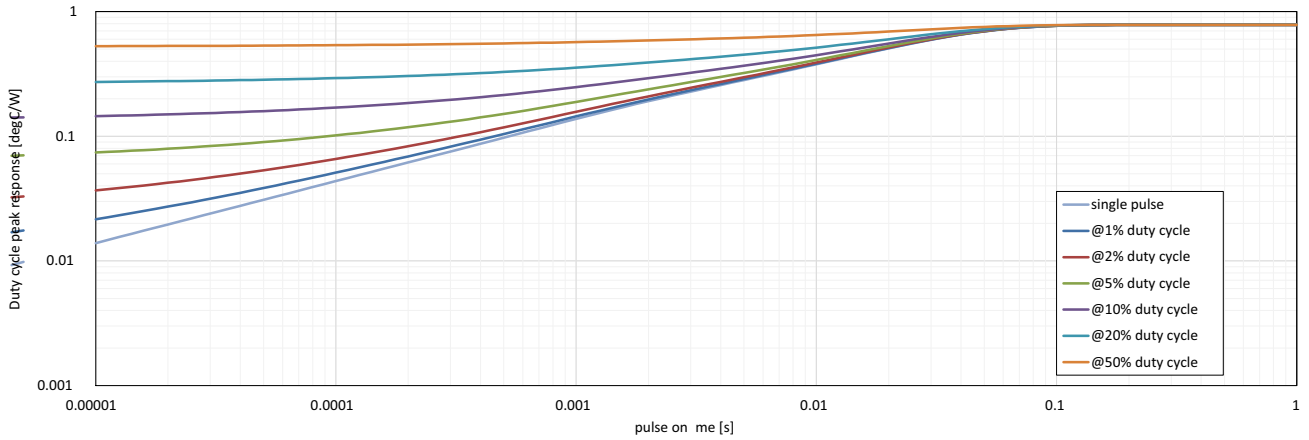


Figure 7. Inverse Diode Transient Thermal Impedance

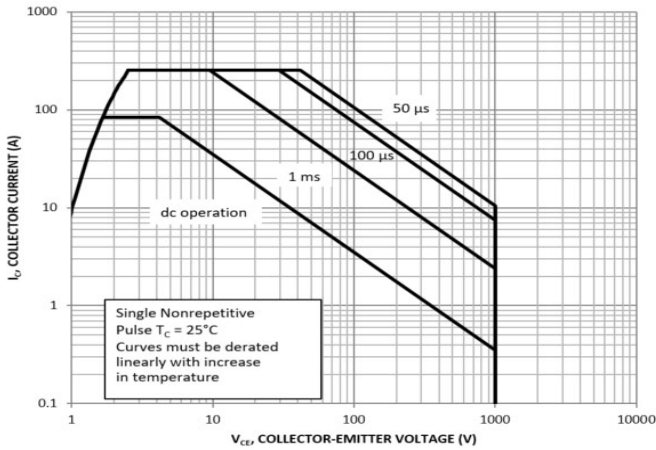


Figure 8. Boost IGBT FBSOA

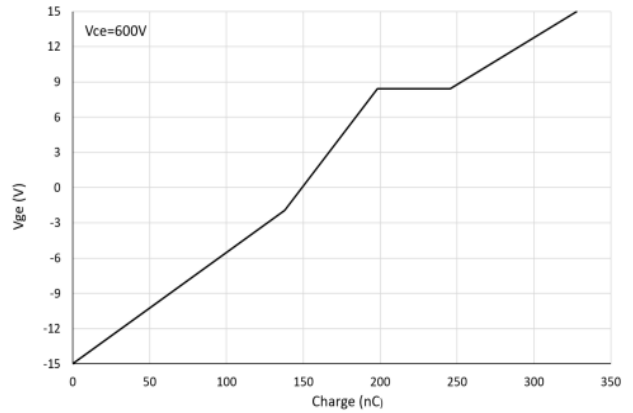


Figure 9. Boost IGBT Gate Voltage vs. Gate Charge

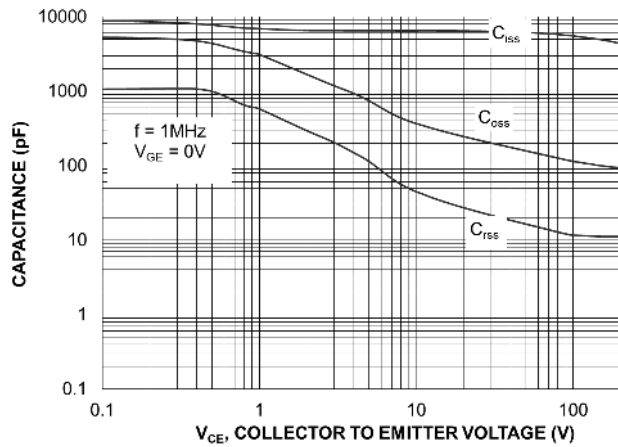


Figure 10. Boost IGBT Capacitance

# NXH200B100H4F2SG, NXH200B100H4F2SG-R

## TYPICAL CHARACTERISTICS – PATH IGBT & INVERSE DIODE

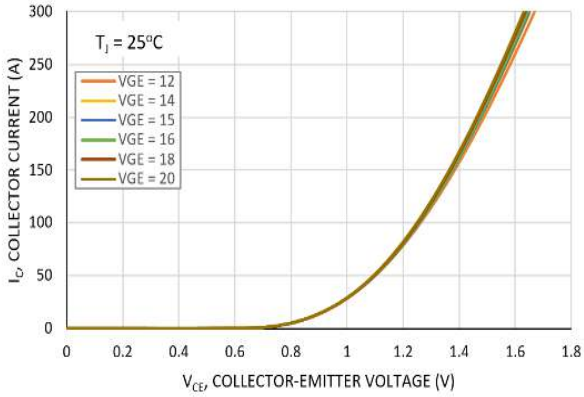


Figure 11. Typical Output Characteristics

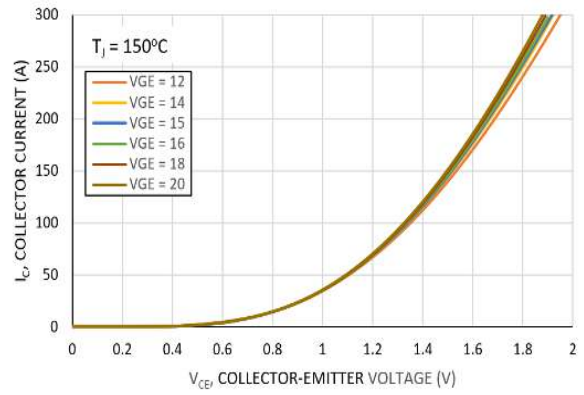


Figure 12. Typical Output Characteristics

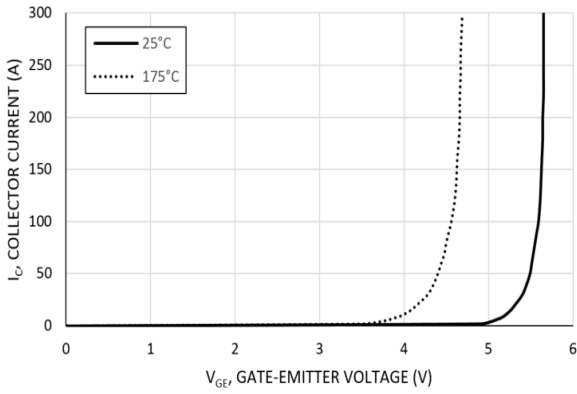


Figure 13. Typical Transfer Characteristics

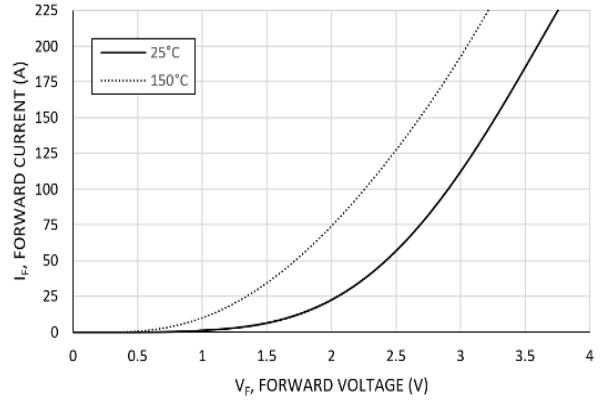


Figure 14. Inverse Diode Forward Characteristics

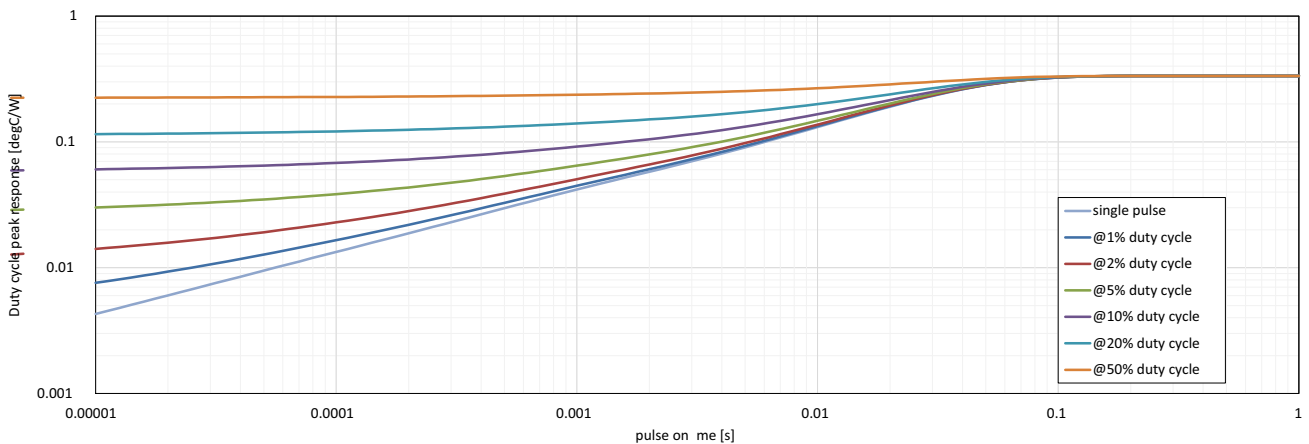
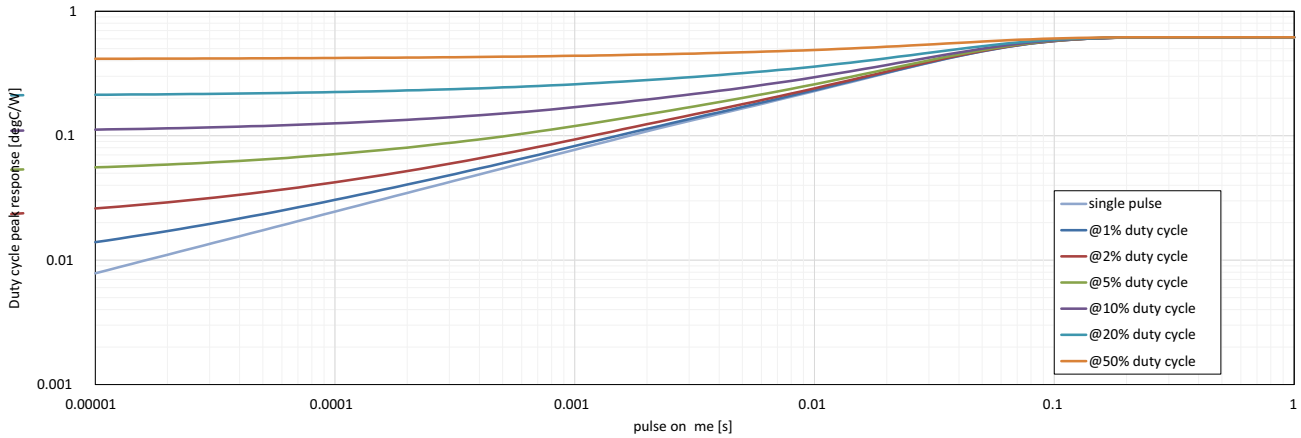


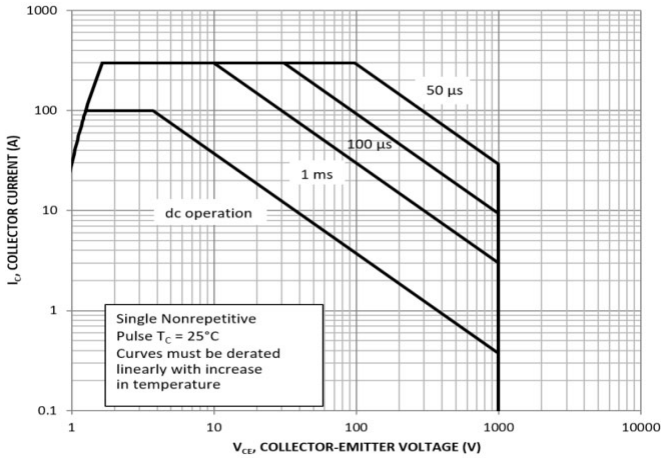
Figure 15. Path IGBT Transient Thermal Impedance

# NXH200B100H4F2SG, NXH200B100H4F2SG-R

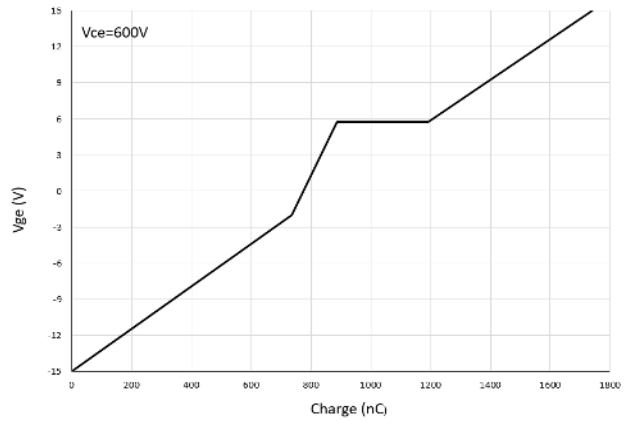
## TYPICAL CHARACTERISTICS – PATH IGBT & INVERSE DIODE



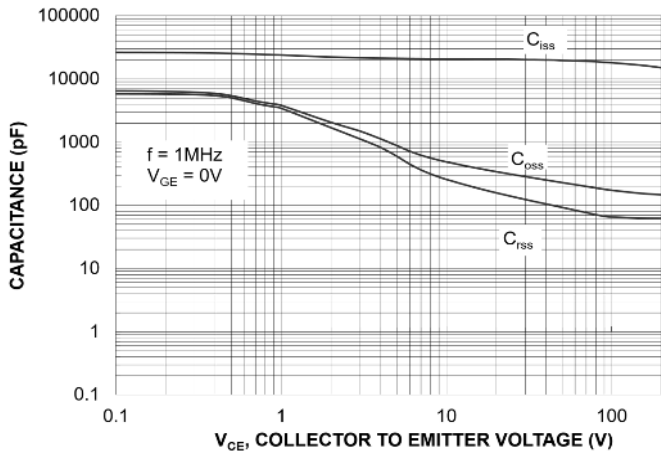
**Figure 16. Inverse Diode Transient Thermal Impedance**



**Figure 17. Path IGBT FBSOA**



**Figure 18. Path IGBT Gate Voltage vs. Gate Charge**



**Figure 19. Path IGBT Capacitance**



TYPICAL CHARACTERISTICS – BOOST DIODE

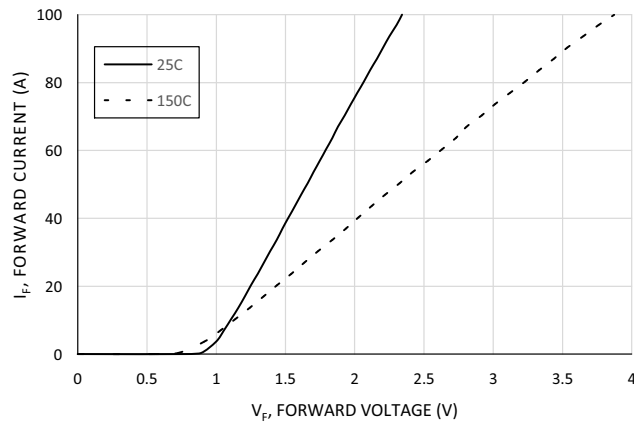


Figure 20. Typical Forward Characteristics

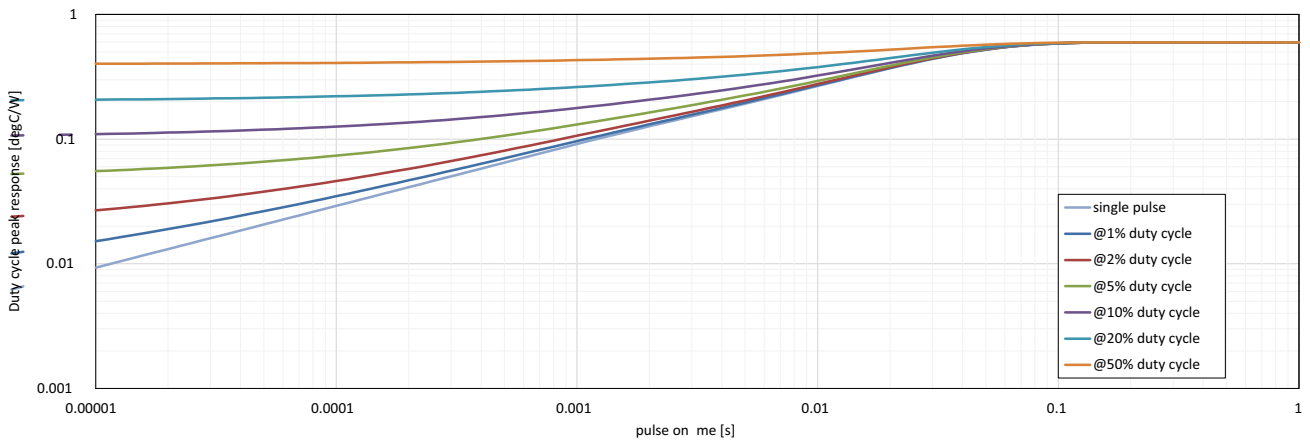


Figure 21. Junction-to-Case Transient Thermal Impedance

# NXH200B100H4F2SG, NXH200B100H4F2SG-R

## TYPICAL CHARACTERISTICS – BOOST IGBT COMMUTATE BOOST DIODE

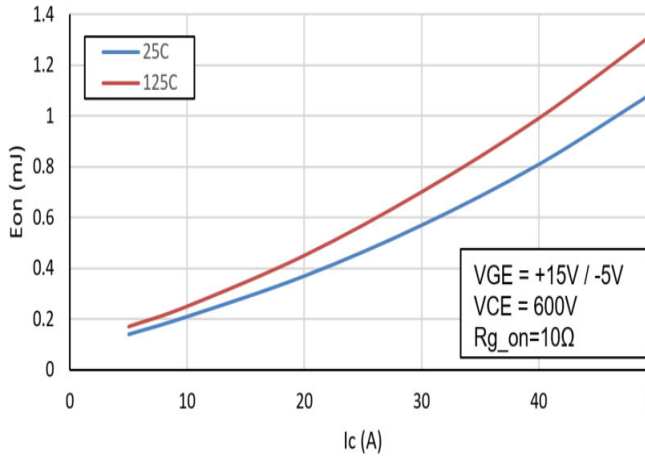


Figure 22. Typical Turn On Loss vs.  $I_c$

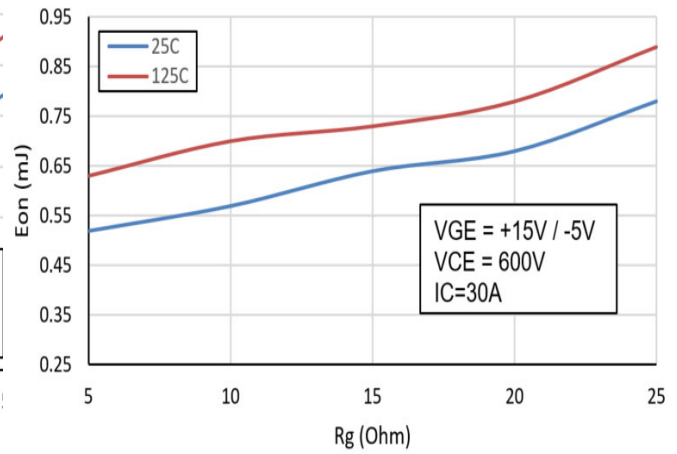


Figure 23. Typical Turn On Loss vs.  $R_g$

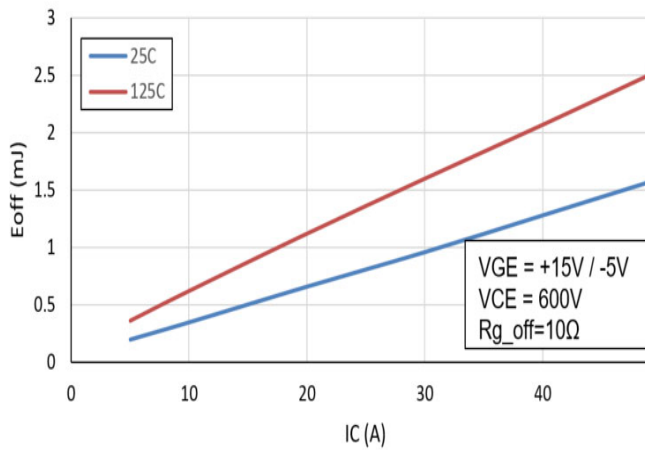


Figure 24. Typical Turn Off Loss vs.  $I_c$

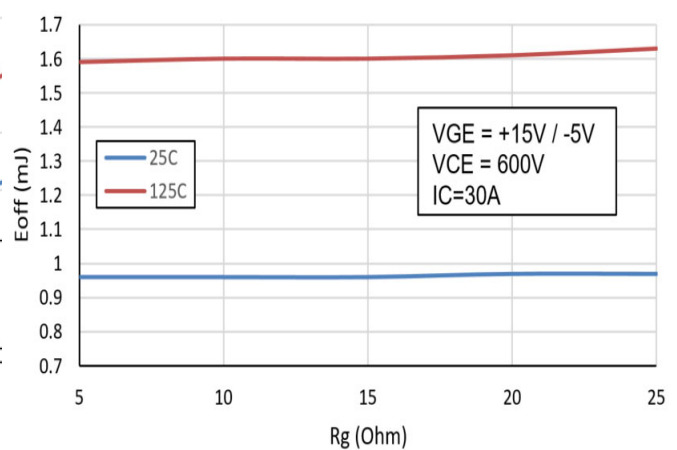


Figure 25. Typical Turn Off Loss vs.  $R_g$

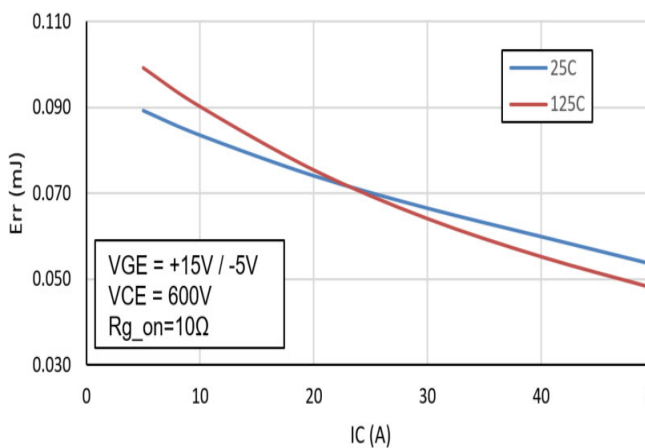


Figure 26. Typical Reverse Recovery Loss vs.  $I_c$

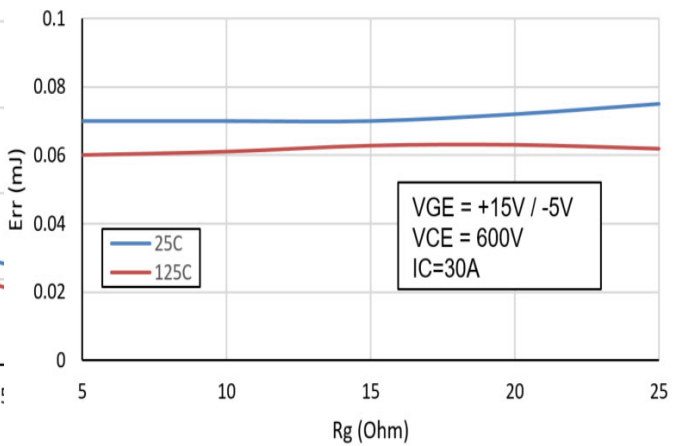
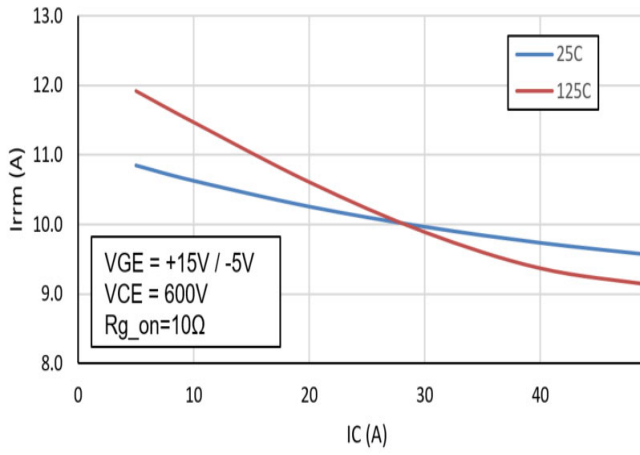
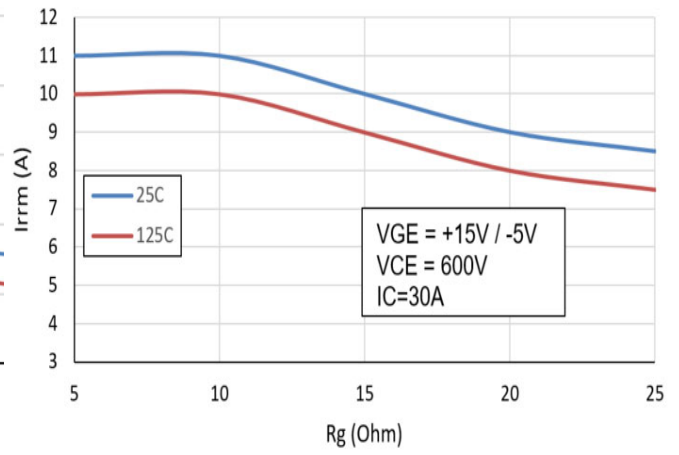


Figure 27. Typical Reverse Recovery Loss vs.  $R_g$

## NXH200B100H4F2SG, NXH200B100H4F2SG-R

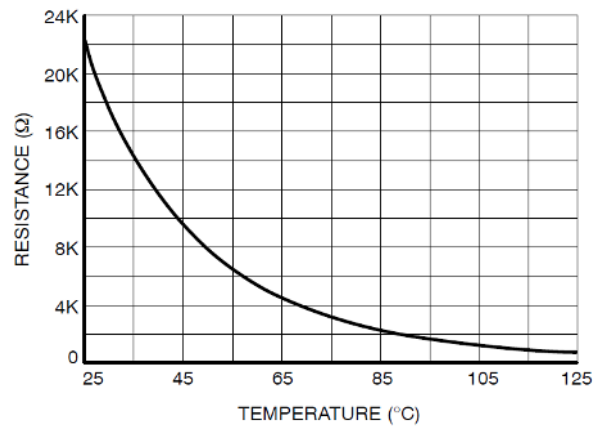


**Figure 28. Typical Reverse Recovery Current vs.  $I_C$**



**Figure 29. Typical Reverse Recovery Current vs.  $R_G$**

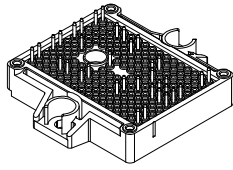
### TYPICAL CHARACTERISTICS – THERMISTOR



**Figure 30. Thermistor Characteristics**

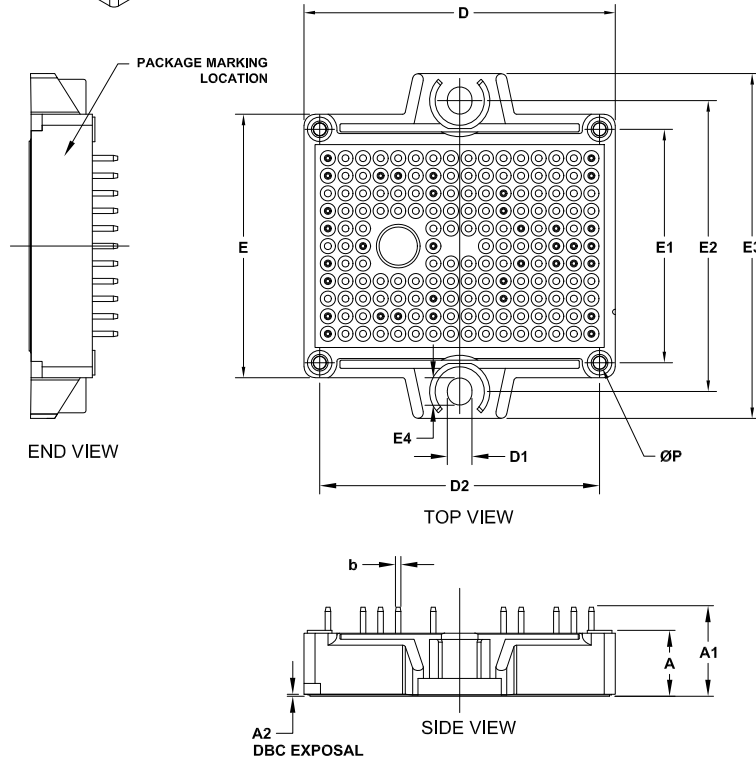
# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS



**PIM36 56.7x42.5 (SOLDER PIN)**  
**CASE 180CJ**  
**ISSUE C**

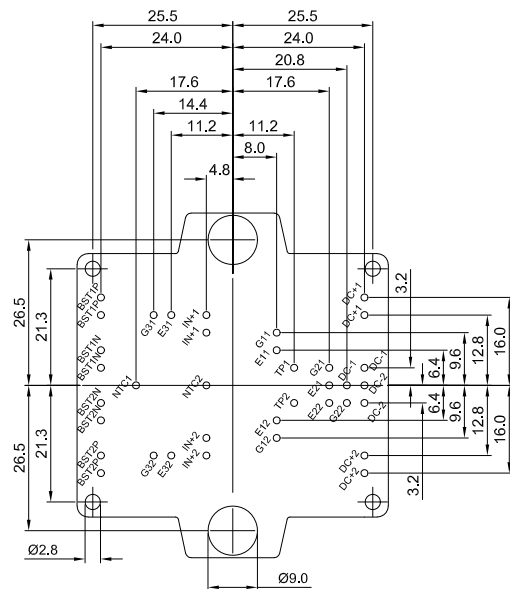
DATE 18 MAY 2023



**NOTES:**

1. CONTROLLING DIMENSION: MILLIMETERS
2. PIN POSITION TOLERANCE IS  $\pm 0.4\text{mm}$

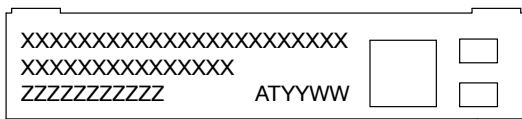
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	11.65	12.00	12.35
A1	15.65	16.15	16.65
A2	0.00	0.35	0.60
b	0.95	1.00	1.05
D	56.40	56.70	57.00
D1	4.40	4.50	4.60
D2	50.85	51.00	51.15
E	47.70	48.00	48.30
E1	42.35	42.50	42.65
E2	52.90	53.00	53.10
E3	62.30	62.80	63.30
E4	4.90	5.00	5.10
P	2.20	2.30	2.40



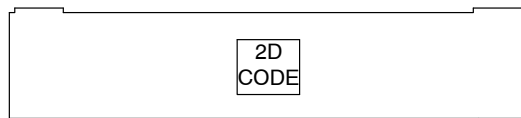
**RECOMMENDED MOUNTING PATTERN**

\* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDER RM/D.

**GENERIC MARKING DIAGRAM\***



FRONTSIDE MARKING



BACKSIDE MARKING

XXXXX = Specific Device Code  
 ZZZZ = Assembly Lot Code  
 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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<b>DESCRIPTION:</b>	<b>PIM36 56.7x42.5 (SOLDER PIN)</b>	<b>PAGE 1 OF 1</b>

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