

# TMPIM 25 A CIB Module

## NXH25C120L2C2SG

The NXH25C120L2C2SG is a transfer-molded power module containing a converter-inverter-brake circuit consisting of six 25 A, 1600 V rectifiers, six 25 A, 1200 V IGBTs with inverse diodes, one 25 A, 1200 V brake IGBT with brake diode and an NTC thermistor.

### Features

- Low Thermal Resistance
- 6 mm Clearance Distance between Pin to Heatsink
- Compact 73 mm × 40 mm × 8 mm Package
- Solderable Pins
- Thermistor
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Typical Applications

- Industrial Motor Drives
- Servo Drives

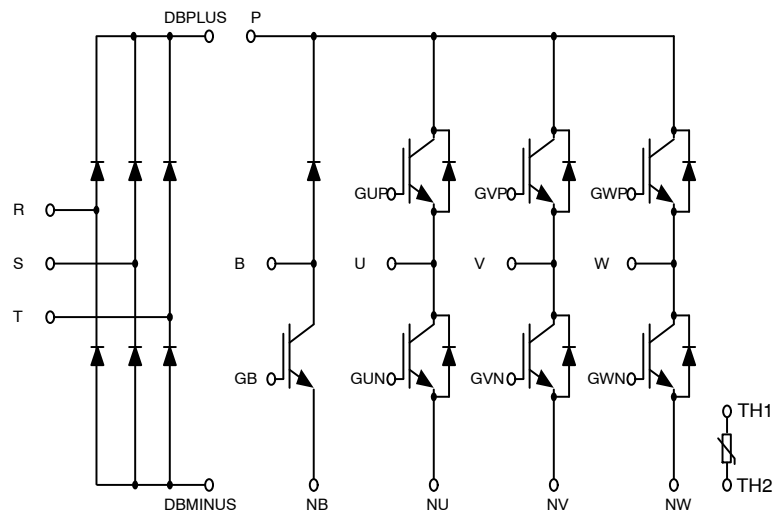
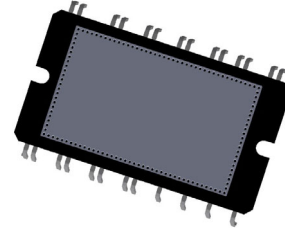


Figure 1. NXH25C120L2C2SG Schematic Diagram



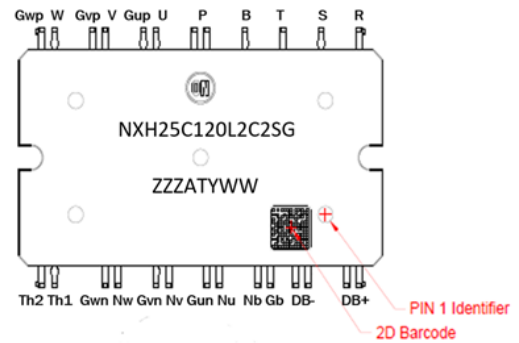
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DIP26 67.8x40  
CASE 181AD

### MARKING DIAGRAM



NXH25C120L2C2SG = Specific Device Code  
ZZZ = Assembly Lot Code  
AT = Assembly & Test Location  
Y = Year  
WW = Work Week

### ORDERING INFORMATION

Device	Package	Shipping†
NXH25C120L2C2SG	DIP26 (Pb-Free)	6 Units / Tube

# NXH25C120L2C2SG

## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
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### IGBT

Collector–Emitter Voltage	$V_{CES}$	1200	V
Gate–Emitter Voltage	$V_{GE}$	±20	V
Continuous Collector Current @ $T_C = 80^\circ\text{C}$ ( $T_{V_{Jmax}} = 175^\circ\text{C}$ )	$I_C$	25	A
Pulsed Collector Current	$I_{Cpulse}$	75	A

### DIODE

Peak Repetitive Reverse Voltage	$V_{RRM}$	1200	V
Continuous Forward Current @ $T_C = 80^\circ\text{C}$ ( $T_{V_{Jmax}} = 175^\circ\text{C}$ )	$I_F$	25	A
Repetitive Peak Forward Current	$I_{FRM}$	75	A

### RECTIFIER DIODE

Peak Repetitive Reverse Voltage	$V_{RRM}$	1600	V
Continuous Forward Current @ $T_C = 80^\circ\text{C}$ ( $T_{V_{Jmax}} = 150^\circ\text{C}$ )	$I_F$	25	A
Repetitive Peak Forward Current	$I_{FRM}$	75	A
$I^2t$ value (10 ms single half–sine wave) @ $25^\circ\text{C}$ (10 ms single half–sine wave) @ $150^\circ\text{C}$	$I^2t$	680 360	$\text{A}^2\text{t}$
Surge current (10 ms sin180°) @ $25^\circ\text{C}$	IFSM	370	A

### THERMAL PROPERTIES

Storage Temperature range	$T_{stg}$	–40 to 125	°C
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### INSULATION PROPERTIES

Isolation test voltage, t = 1 sec, 50 Hz	$V_{is}$	3000	$V_{RMS}$
Internal isolation		$\text{Al}_2\text{O}_3$	
Creepage distance		6.0	mm
Clearance distance		6.0	mm
Comperative Tracking Index	CTI	> 400	

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.

# NXH25C120L2C2SG

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit	
<b>IGBT CHARACTERISTICS</b>							
Collector–Emitter Cutoff Current	V <sub>GE</sub> = 0 V, V <sub>CE</sub> = 1200 V	I <sub>CES</sub>	–	–	250	μA	
Collector–Emitter Saturation Voltage	V <sub>GE</sub> = 15 V, I <sub>C</sub> = 25 A, T <sub>J</sub> = 25°C	V <sub>CE(sat)</sub>	–	1.7	2.4	V	
	V <sub>GE</sub> = 15 V, I <sub>C</sub> = 25 A, T <sub>J</sub> = 150°C		–	1.9	–		
Gate–Emitter Threshold Voltage	V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 3.04 mA	V <sub>GE(TH)</sub>	4.8	5.9	6.8	V	
Gate Leakage Current	V <sub>GE</sub> = 20 V, V <sub>CE</sub> = 0 V	I <sub>GES</sub>	–	–	400	nA	
Turn-on Delay Time	T <sub>J</sub> = 25 °C V <sub>CE</sub> = 600 V, I <sub>C</sub> = 25 A V <sub>GE</sub> = ±15 V, R <sub>G</sub> = 20 Ω	t <sub>d(on)</sub>	–	68	–	ns	
Rise Time		t <sub>r</sub>	–	63	–		
Turn-off Delay Time		t <sub>d(off)</sub>	–	235	–		
Fall Time		t <sub>f</sub>	–	48	–		
Turn-on Switching Loss per Pulse		E <sub>on</sub>	–	2200	–		μJ
Turn off Switching Loss per Pulse		E <sub>off</sub>	–	720	–		
Turn-on Delay Time	T <sub>J</sub> = 125°C V <sub>CE</sub> = 600 V, I <sub>C</sub> = 25 A V <sub>GE</sub> = ±15 V, R <sub>G</sub> = 20 Ω	t <sub>d(on)</sub>	–	72	–	ns	
Rise Time		t <sub>r</sub>	–	56	–		
Turn-off Delay Time		t <sub>d(off)</sub>	–	266	–		
Fall Time		t <sub>f</sub>	–	54	–		
Turn-on Switching Loss per Pulse		E <sub>on</sub>	–	3050	–		μJ
Turn off Switching Loss per Pulse		E <sub>off</sub>	–	1200	–		
Input Capacitance	V <sub>CE</sub> = 20 V, V <sub>GE</sub> = 0 V f = 100 kHz	C <sub>ies</sub>	–	6200	–	pF	
Output Capacitance		C <sub>oes</sub>	–	212	–		
Reverse Transfer Capacitance		C <sub>res</sub>	–	117	–		
Total Gate Charge	V <sub>CE</sub> = 600 V, I <sub>C</sub> = 25 A, V <sub>GE</sub> = 0 V ~ +15 V	Q <sub>g</sub>	–	269	–	nC	
Temperature under switching conditions		T <sub>vj op</sub>	–40		150	°C	
Thermal Resistance – chip-to-case		R <sub>thJC</sub>	–	0.54	–	°C/W	

## DIODE CHARACTERISTICS

Brake Diode Reverse Leakage Current	V <sub>R</sub> = 1200 V	I <sub>R</sub>	–	–	200	μA
Diode Forward Voltage	I <sub>F</sub> = 25 A, T <sub>J</sub> = 25°C	V <sub>F</sub>	–	1.9	2.6	V
	I <sub>F</sub> = 25 A, T <sub>J</sub> = 150°C		–	1.7	–	
Reverse Recovery Charge	T <sub>J</sub> = 25°C V <sub>CE</sub> = 600 V, I <sub>C</sub> = 25 A V <sub>GE</sub> = ±15 V, R <sub>G</sub> = 20 Ω	Q <sub>rr</sub>	–	1.35	–	μC
Peak Reverse Recovery Current		I <sub>RPM</sub>	–	16	–	A
Reverse Recovery Energy		E <sub>rr</sub>	–	350	–	μJ
Reverse Recovery Charge	T <sub>J</sub> = 150 °C V <sub>CE</sub> = 600 V, I <sub>C</sub> = 25 A V <sub>GE</sub> = ±15 V, R <sub>G</sub> = 20 Ω	Q <sub>rr</sub>	–	3.6	–	μC
Peak Reverse Recovery Current		I <sub>RPM</sub>	–	26	–	A
Reverse Recovery Energy		E <sub>rr</sub>	–	1050	–	μJ
Temperature under switching conditions		T <sub>vj op</sub>	–40		150	°C
Thermal Resistance – chip-to-case		R <sub>thJC</sub>	–	1.10	–	°C/W

# NXH25C120L2C2SG

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise specified) (continued)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
<b>RECTIFIER DIODE CHARACTERISTICS</b>						
Rectifier Reverse Leakage Current	$V_R = 1600\text{ V}$	$I_R$	–	–	200	$\mu\text{A}$
Rectifier Forward Voltage	$I_F = 25\text{ A}, T_J = 25^\circ\text{C}$	$V_F$	–	1	1.5	V
	$I_F = 35\text{ A}, T_J = 150^\circ\text{C}$		–	1.1	–	
Temperature under switching conditions		$T_{vj\text{ op}}$	–40		150	$^\circ\text{C}$
Thermal Resistance – chip-to-case		$R_{thJC}$	–	0.86	–	$^\circ\text{C/W}$

## THERMISTOR CHARACTERISTICS

Nominal resistance	$T = 25^\circ\text{C}$	$R_{25}$	–	5	–	$\text{k}\Omega$
Nominal resistance	$T = 100^\circ\text{C}$	$R_{100}$	–	493.3	–	$\Omega$
Deviation of R25		$\Delta R/R$	–5	–	5	%
Power dissipation		$P_D$	–	20	–	mW
Power dissipation constant			–	1.4	–	mW/K
B-value	B(25/50), tolerance $\pm 2\%$		–	3375	–	K
B-value	B(25/100), tolerance $\pm 2\%$		–	3433	–	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 – INVERTER/BRAKE IGBT & DIODE

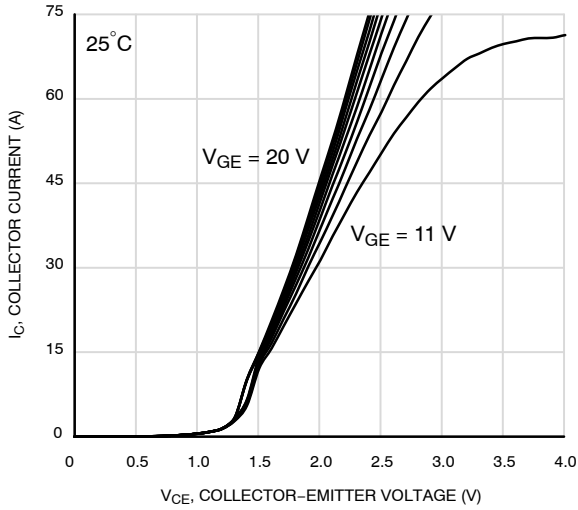


Figure 2. Inverter IGBT Typical Output Characteristic (25°C)

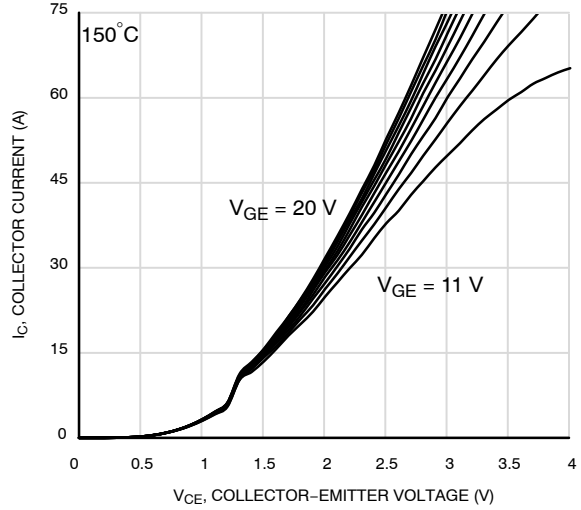


Figure 3. Inverter IGBT Typical Output Characteristic (150°C)

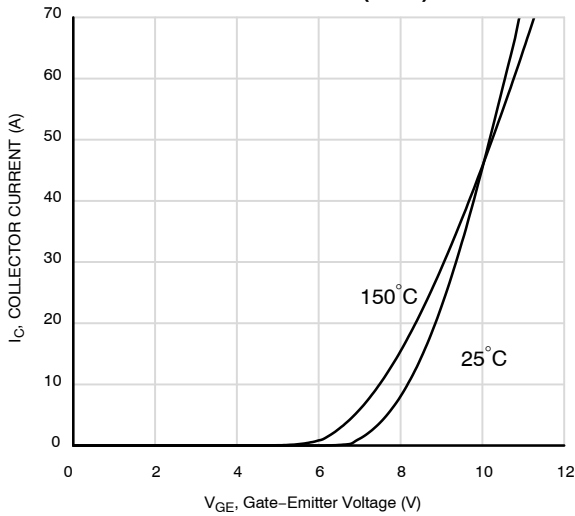


Figure 4. Inverter IGBT Typical Transfer Characteristic

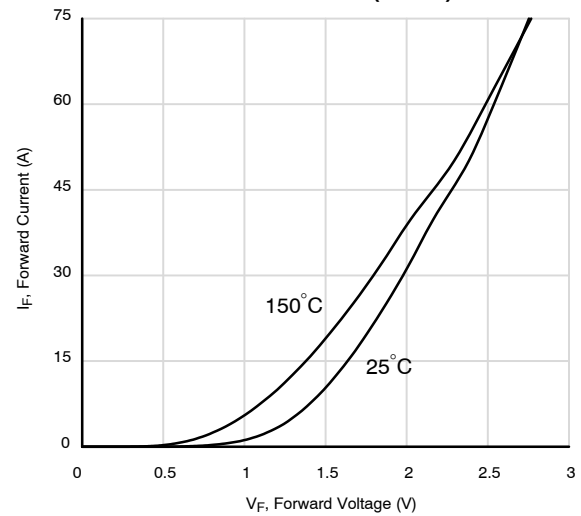


Figure 5. Inverter Diode Typical Forward Characteristic

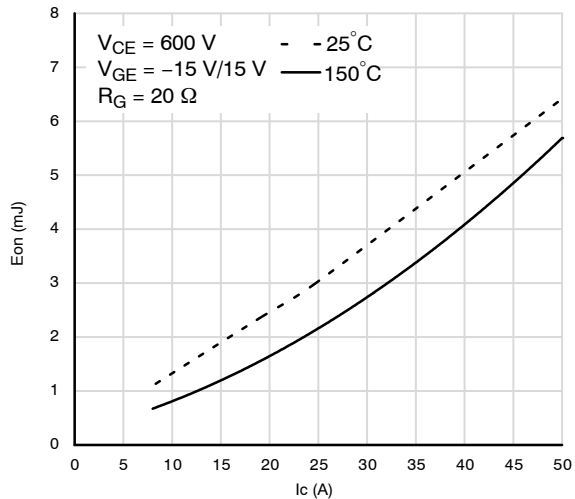


Figure 6. Inverter IGBT Typical Turn On Loss vs Ic

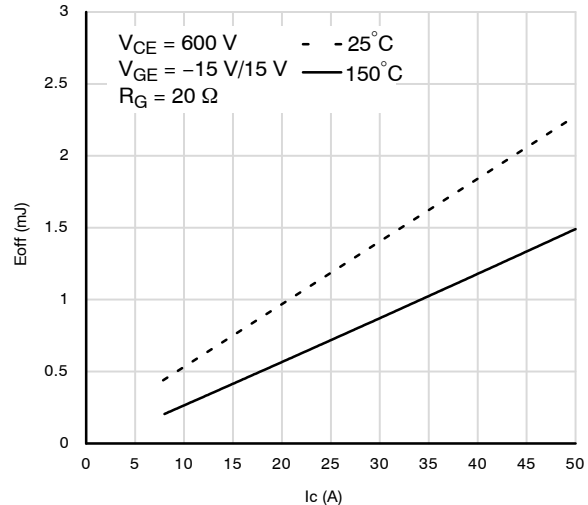
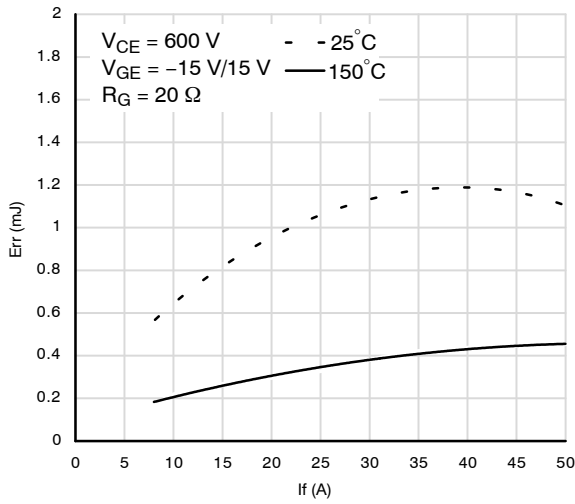


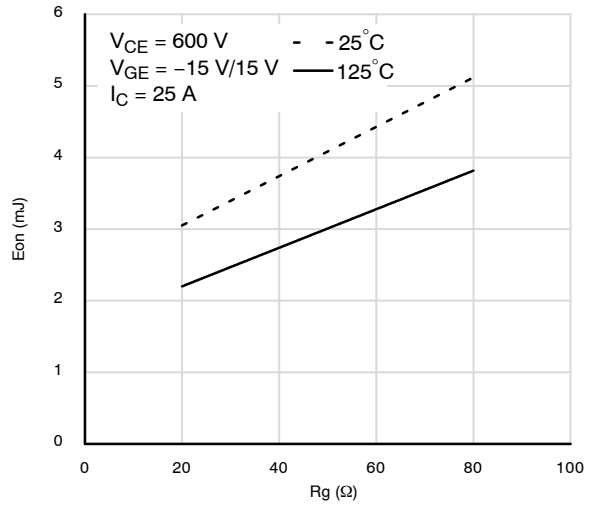
Figure 7. Inverter IGBT Typical Turn Off Loss vs Ic

# NXH25C120L2C2SG

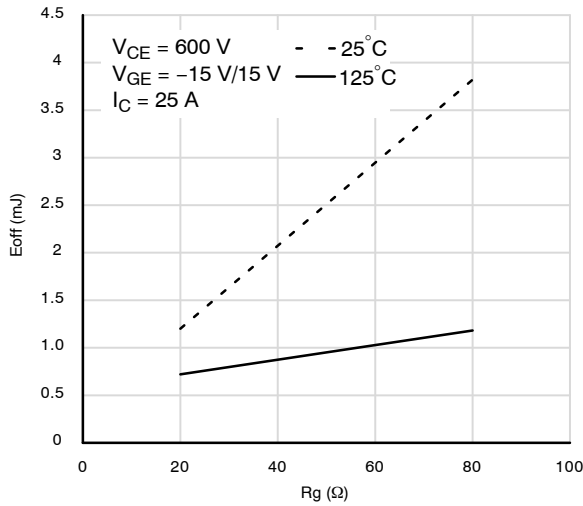
## TYPICAL CHARACTERISTICS – INVERTER/BRAKE IGBT & DIODE



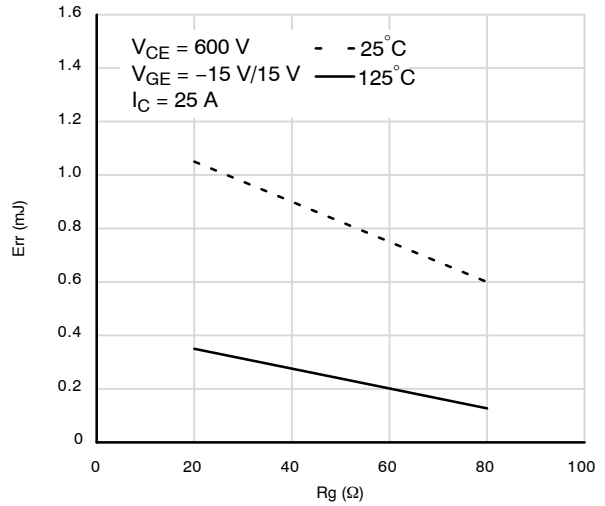
**Figure 8. Inverter Diode Typical Reverse Recovery Energy vs IC**



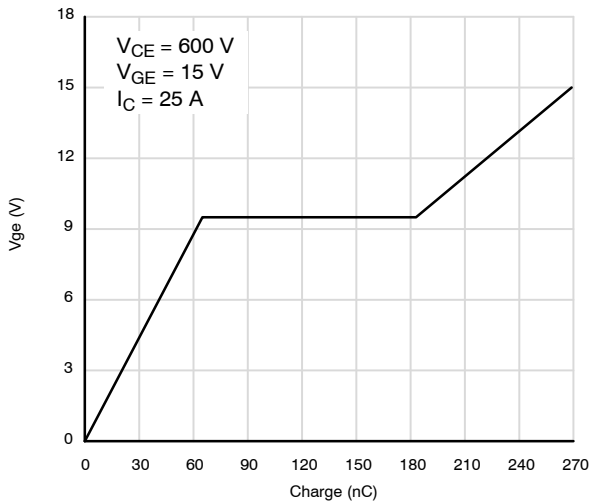
**Figure 9. Inverter IGBT Typical Turn On Loss vs RG**



**Figure 10. Inverter IGBT Typical Turn Off Loss vs RG**



**Figure 11. Inverter Diode Typical Reverse Recovery Energy vs RG**



**Figure 12. Inverter IGBT Gate Voltage vs Gate Charge**

# NXH25C120L2C2SG

## TYPICAL CHARACTERISTICS – INVERTER/BRAKE IGBT & DIODE

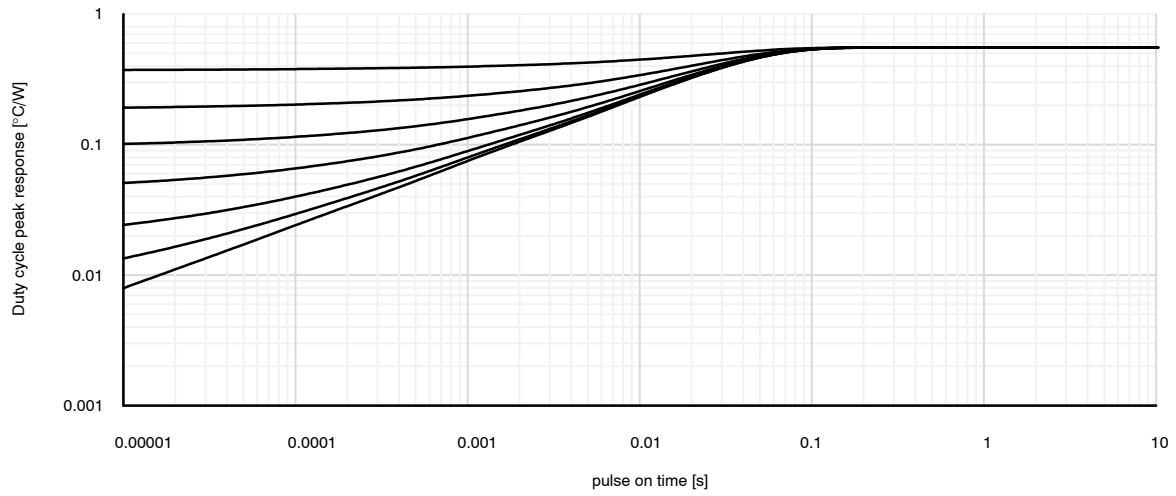


Figure 13. IGBT Junction-to-Case Transient Thermal Impedance

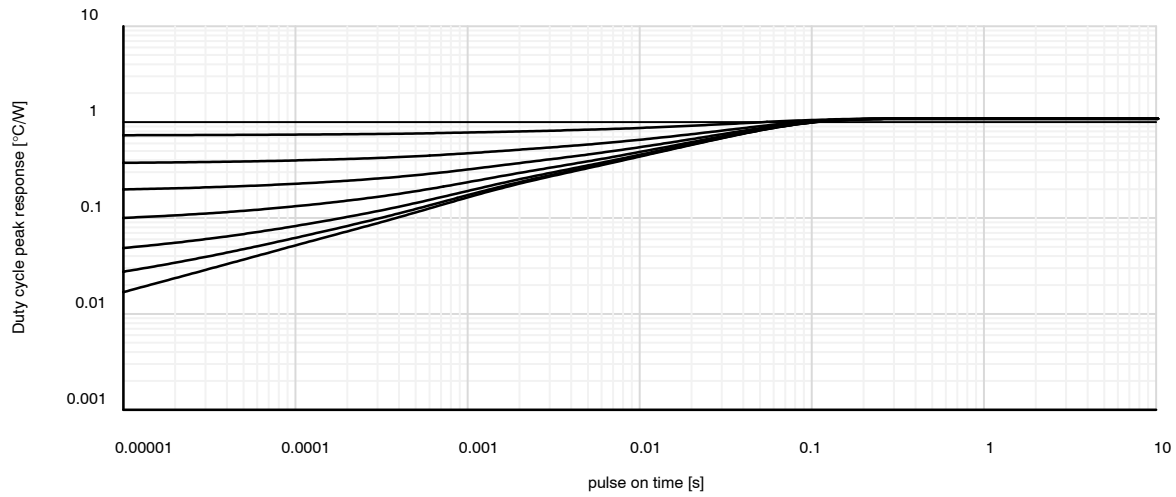


Figure 14. Diode Junction-to-Case Transient Thermal Impedance

# NXH25C120L2C2SG

## TYPICAL CHARACTERISTICS – RECTIFIER

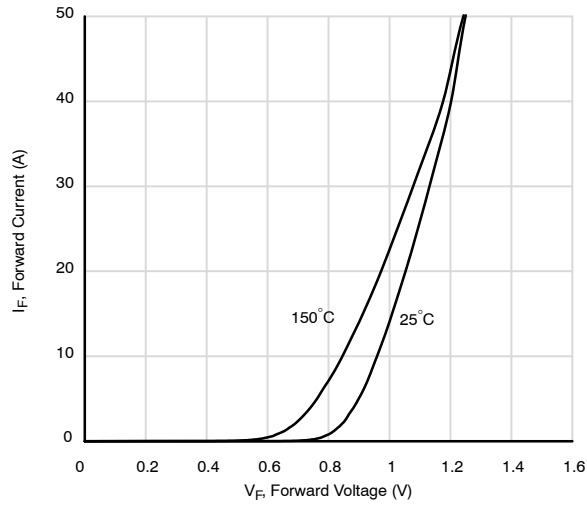


Figure 15. Rectifier Typical Forward Characteristic

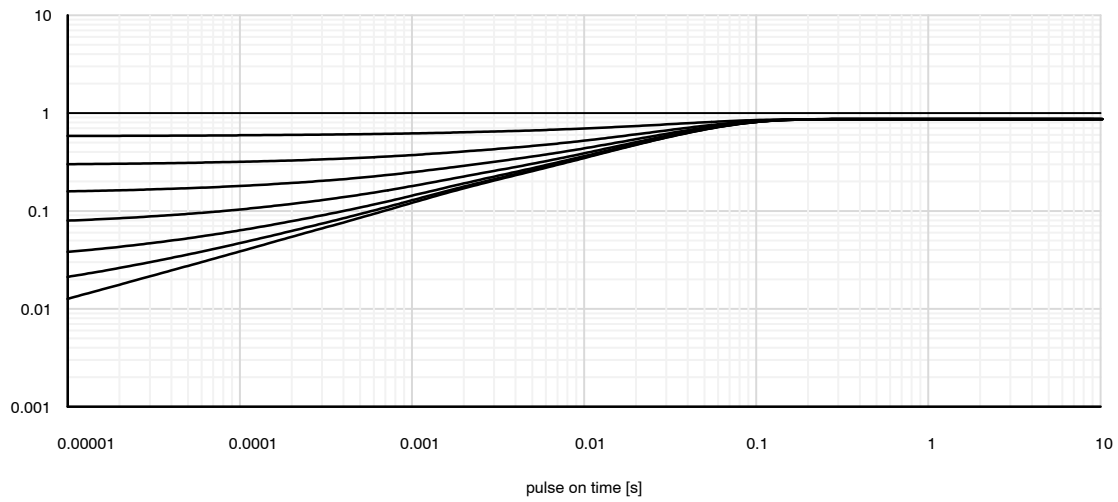


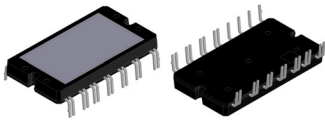
Figure 16. Rectifier Junction-to-Case Transient Thermal Impedance



# MECHANICAL CASE OUTLINE

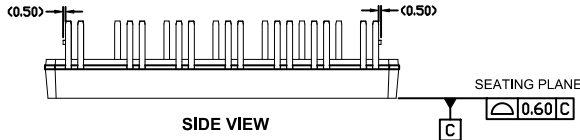
## PACKAGE DIMENSIONS

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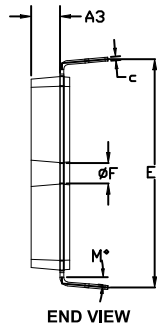
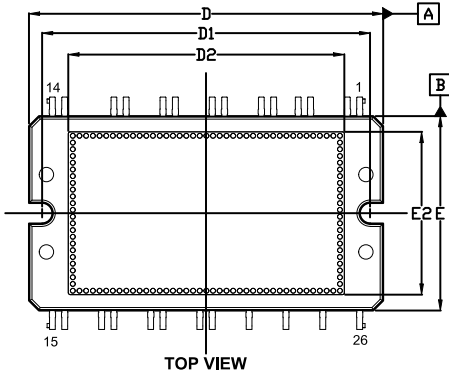
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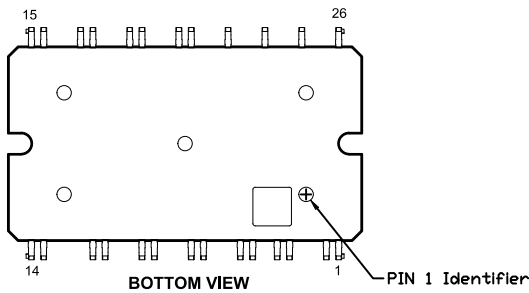
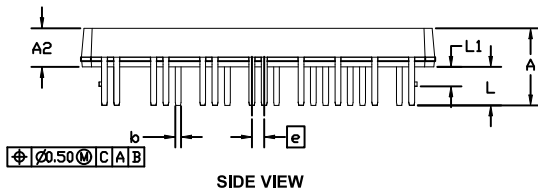


**NOTES:**

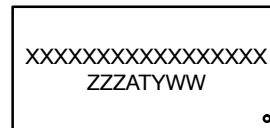
1. Dimensioning and tolerancing as per ASME Y14.5M, 2009
2. Controlling Dimension: Millimeters
3. Dimensions are exclusive of Burrs, Mold Flash, and Tiebar extrusions
4. Dimensions "b" and "c" apply to plated leads
5. Position of the leads is determine at the root of the lead where it exits the package body



DIM	MILLIMETERS		
	MIN	NOM	MAX
A	15.50	16.00	16.50
A2	7.80	8.00	8.20
A3	6.00 REF		
b	1.10	1.20	1.30
c	0.70	0.80	0.90
D	72.70	73.20	73.70
D1	67.30	67.80	68.30
D2	57.30 REF		
E	39.70	40.20	40.70
E1	46.70	47.20	47.70
E2	33.87 REF		
e	2.54 BSC		
F	4.00	4.20	4.40
L	8.00 REF		
L1	3.50	4.00	4.50
M	4°	5°	6°



**GENERIC MARKING DIAGRAM\***



XXX = Specific Device Code  
ZZZ = Assembly Lot Code  
AT = Assembly & Test Location  
Y = Year  
WW = Work Week

\*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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