TMPIM 35 A Enhances CIB Module

NXH35C120L2C2ESG

The NXH35C120L2C2ESG is a transfer−molded power module with low thermal resistance substrate containing a converter−inverter−brake circuit consisting of six 35 A, 1600 V rectifiers, six 35 A, 1200 V IGBTs with inverse diodes, one 35 A, 1200 V brake IGBT with brake diode and an NTC thermistor.

Features

- Low Thermal Resistance Substrate for 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

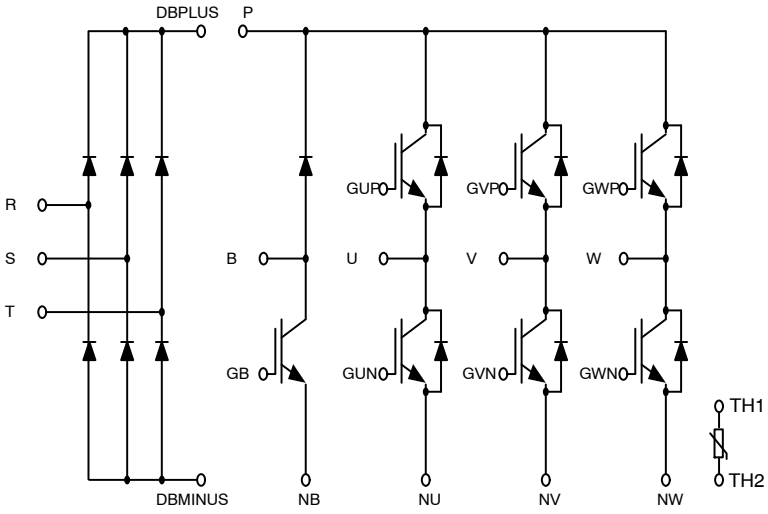

Figure 1. NXH35C120L2C2ESG Schematic Diagram

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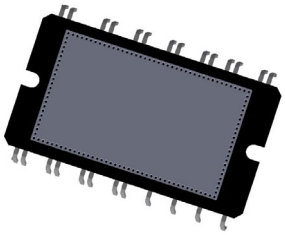

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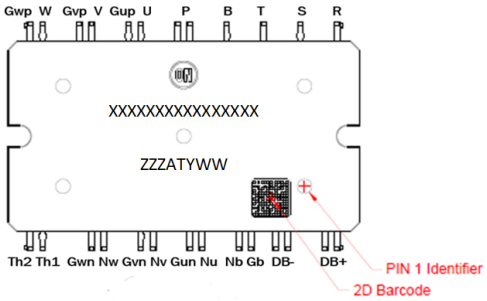
MARKING DIAGRAM



XXXXX = Specific Device Code
ZZZ = Assembly Lot Code
AT = Assembly & Test Site Code
YYWW = Year and Work Week Code

ORDERING INFORMATION

Device	Package	Shipping†
NXH35C120L2C2ESG	DIP26 (Pb−Free)	6 Units / Tube

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
IGBT			
Collector−Emitter Voltage	V_{CES}	1200	V
Gate−Emitter Voltage	V_{GE}	±20	V
Continuous Collector Current @ T_C = 80°C (Tv_{Jmax} = 175°C)	I_C	35	A
Pulsed Collector Current	I_{Cpulse}	105	A
DIODE			
Peak Repetitive Reverse Voltage	V_{RRM}	1200	V
Continuous Forward Current @ T_C = 80°C (Tv_{Jmax} = 175°C)	I_F	35	A
Repetitive Peak Forward Current	I_{FRM}	105	A
RECTIFIER DIODE			
Peak Repetitive Reverse Voltage	V_{RRM}	1600	V
Continuous Forward Current @ T_C = 80°C (Tv_{Jmax} = 150°C)	I_F	35	A
Repetitive Peak Forward Current	I_{FRM}	105	A
I^2t value (10 ms single half−sine wave) @ 25°C (10 ms single half−sine wave) @ 150°C	I^2t	1126 510	A^2t
Surge current (10 ms sin180°) @ 25°C	IFSM	520	A
THERMAL PROPERTIES			
Storage Temperature range	T_{stg}	−40 to 125	°C
INSULATION PROPERTIES			
Isolation test voltage, t = 1 sec, 50Hz	V_{is}	3000	V_{RMS}
Internal isolation		HPS	
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.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
IGBT CHARACTERISTICS						
Collector−Emitter Cutoff Current	V_{GE} = 0 V, V_{CE} = 1200 V	I_{CES}	–	–	250	μA
Collector−Emitter Saturation Voltage	V_{GE} = 15 V, I_C = 35 A, T_J = 25°C	$V_{CE(sat)}$	–	1.8	2.4	V
	V_{GE} = 15 V, I_C = 35 A, T_J = 150°C		–	1.9	–	
Gate−Emitter Threshold Voltage	V_{GE} = V_{CE}, I_C = 4.25 mA	$V_{GE(TH)}$	4.8	6	6.8	V
Gate Leakage Current	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	400	nA
Turn−on Delay Time	T_J = 25 °C V_{CE} = 600 V, I_C = 35 A V_{GE} = ±15 V, R_G = 15 Ω	$t_{d(on)}$	–	104	–	ns
Rise Time		t_r	–	64	–	
Turn−off Delay Time		$t_{d(off)}$	–	277	–	
Fall Time		t_f	–	53	–	
Turn−on Switching Loss per Pulse		E_{on}	–	2900	–	μJ
Turn off Switching Loss per Pulse		E_{off}	–	1200	–	
Turn−on Delay Time	T_J = 150°C V_{CE} = 600 V, I_C = 35 A V_{GE} = ±15 V, R_G = 15 Ω	$t_{d(on)}$	–	168	–	ns
Rise Time		t_r	–	72	–	
Turn−off Delay Time		$t_{d(off)}$	–	320	–	
Fall Time		t_f	–	165	–	
Turn−on Switching Loss per Pulse		E_{on}	–	4030	–	μJ
Turn off Switching Loss per Pulse		E_{off}	–	2200	–	
Input Capacitance	V_{CE} = 20 V. V_{GE} = 0 V f = 100 kHz	C_{ies}	–	8333	–	pF
Output Capacitance		C_{oes}	–	298	–	
Reverse Transfer Capacitance		C_{res}	–	175	–	
Total Gate Charge	V_{CE} = 600 V, I_C = 35 A, V_{GE} = 0 V ~ +15 V	Q_g	–	360	–	nC
Temperature under switching conditions		Tvj op	−40		150	°C
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness − 3 mil, λ = 2.8 W/mK	RthJH	–	0.83	–	°C/W
DIODE CHARACTERISTICS						
Brake Diode Reverse Leakage Current	V_R = 1200 V	I_R	–	–	200	μA
Diode Forward Voltage	I_F = 35 A, T_J = 25°C	V_F	–	2.2	2.7	V
	I_F = 35 A, T_J = 150°C		–	2	–	
Reverse Recovery Time	T_J = 25°C V_{CE} = 600 V, I_C = 35 A V_{GE} = ±15 V, R_G = 15 Ω	t_{rr}		224		ns
Reverse Recovery Charge		Q_{rr}	–	1.51	–	μC
Peak Reverse Recovery Current		I_{RRM}	–	18	–	A
Reverse Recovery Energy		E_{rr}	–	410	–	μJ
Reverse Recovery Time	T_J = 150 °C V_{CE} = 600 V, I_C = 35 A V_{GE} = ±15 V, R_G = 15 Ω	t_{rr}		532		ns
Reverse Recovery Charge		Q_{rr}	–	5.36	–	μC
Peak Reverse Recovery Current		I_{RRM}	–	30	–	A
Reverse Recovery Energy		E_{rr}	–	1983	–	μJ
Temperature under switching conditions		Tvj op	−40		150	°C
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness − 3mil, λ = 2.8 W/mK	RthJH	–	1.4	–	°C/W

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified) (continued)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
RECTIFIER DIODE CHARACTERISTICS						
Rectifier Reverse Leakage Current	V_R = 1600 V	I_R	–	–	200	μA
Rectifier Forward Voltage	I_F = 35 A, T_J = 25°C	V_F	–	1.1	1.5	V
	I_F = 35 A, T_J = 150°C		–	1	–	
Temperature under switching conditions		Tvj op	–40		150	°C
Thermal Resistance – chip–to–heatsink	Thermal grease, Thickness – 3 mil, λ = 2.8 W/mK	R_{thJH}	–	1.25	–	°C/W
THERMISTOR CHARACTERISTICS						
Nominal resistance	T = 25°C	R_{25}	–	5	–	kΩ
Nominal resistance	T = 100°C	R_{100}	–	493.3	–	Ω
Deviation of R25		ΔR/R	–5	–	5	%
Power dissipation		P_D	–	20	–	mW
Power dissipation constant			–	1.4	–	mW/K
B–value	B(25/50), tolerance ±2%		–	3375	–	K
B–value	B(25/100), tolerance ±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

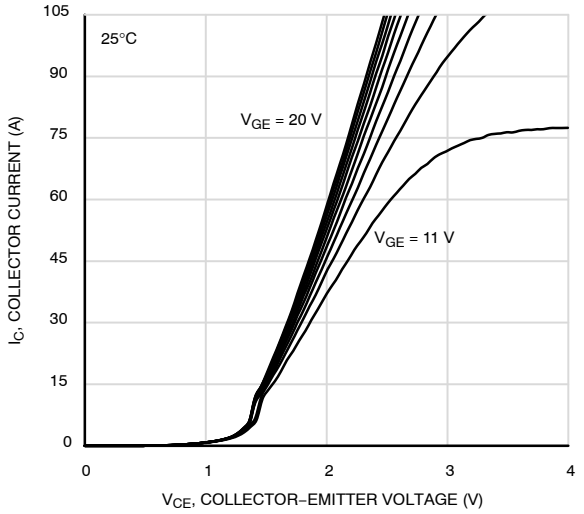


Figure 2. IGBT Typical Output Characteristic

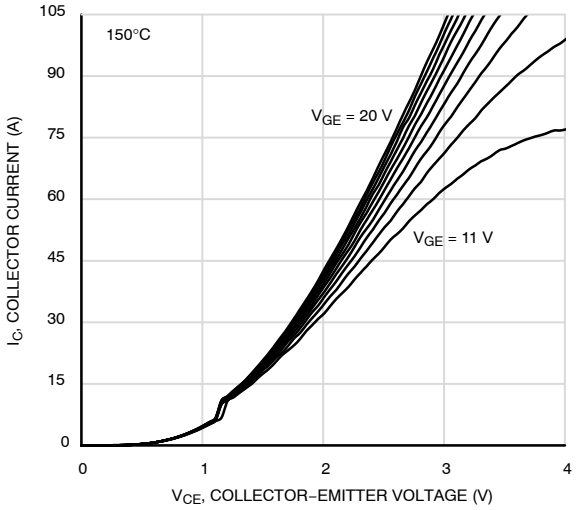


Figure 3. IGBT Typical Output Characteristic

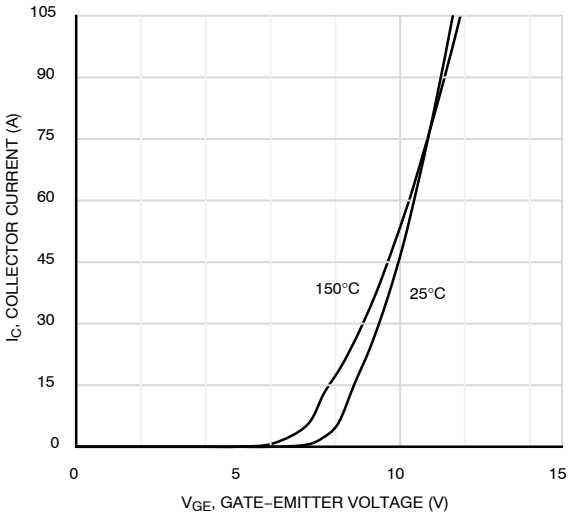


Figure 4. IGBT Typical Output Characteristic

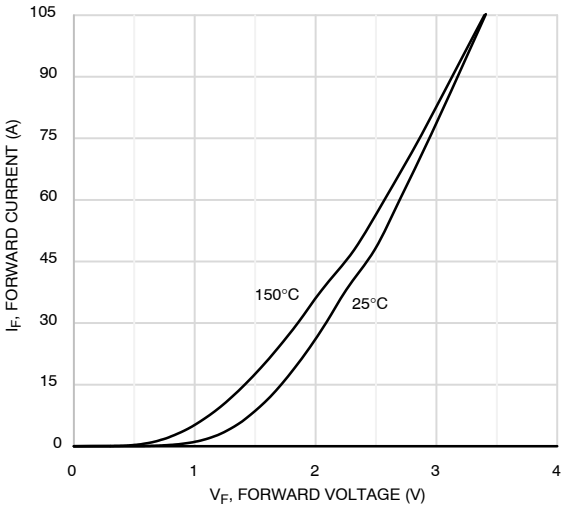


Figure 5. Diode Typical Forward Characteristic

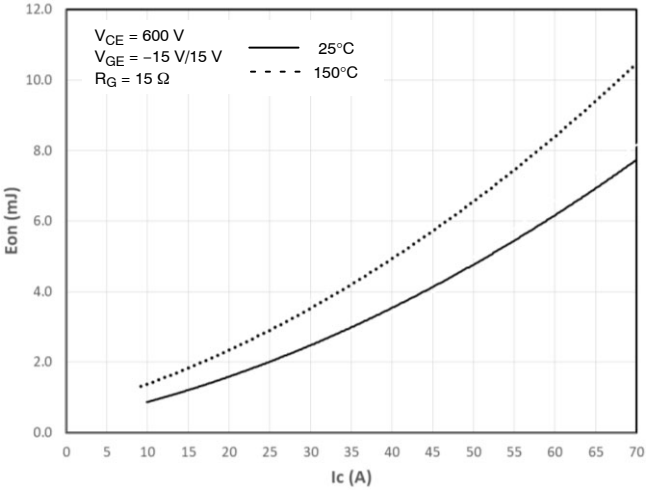


Figure 6. Typical Turn On Loss vs Ic

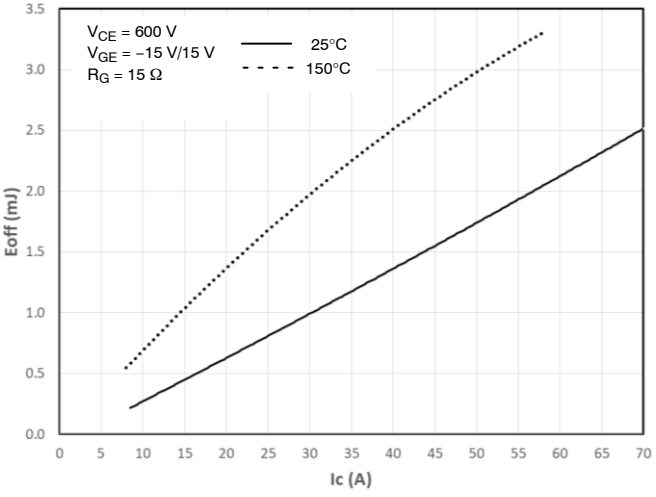


Figure 7. Typical Turn Off Loss vs Ic

TYPICAL CHARACTERISTICS – INVERTER/BRAKE IGBT & DIODE

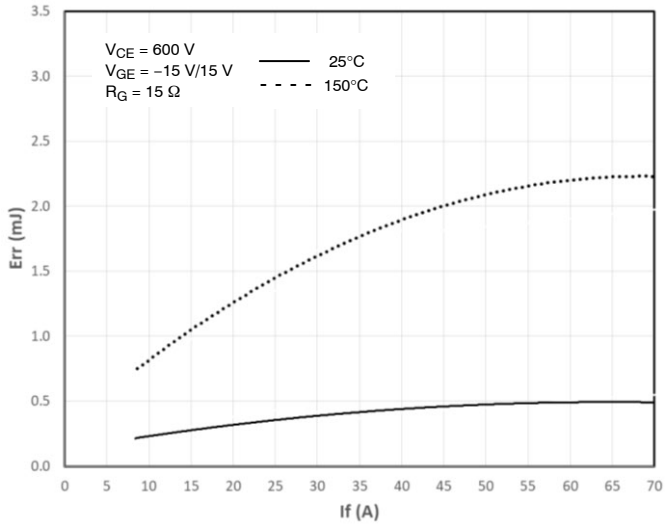


Figure 8. Typical Reverse Recovery Energy vs Ic

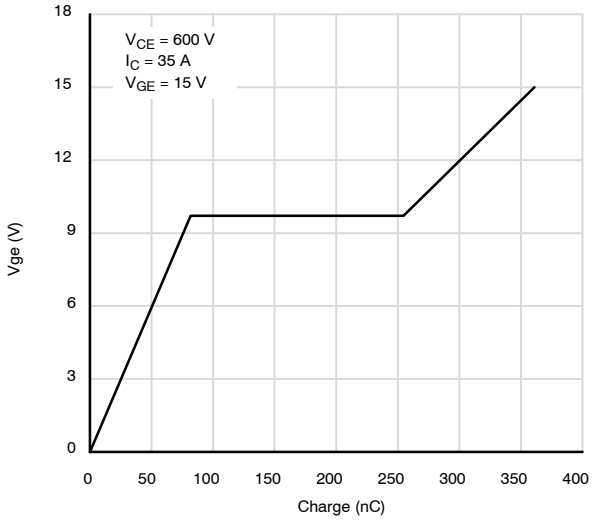


Figure 9. Gate Voltage vs. Gate Charge

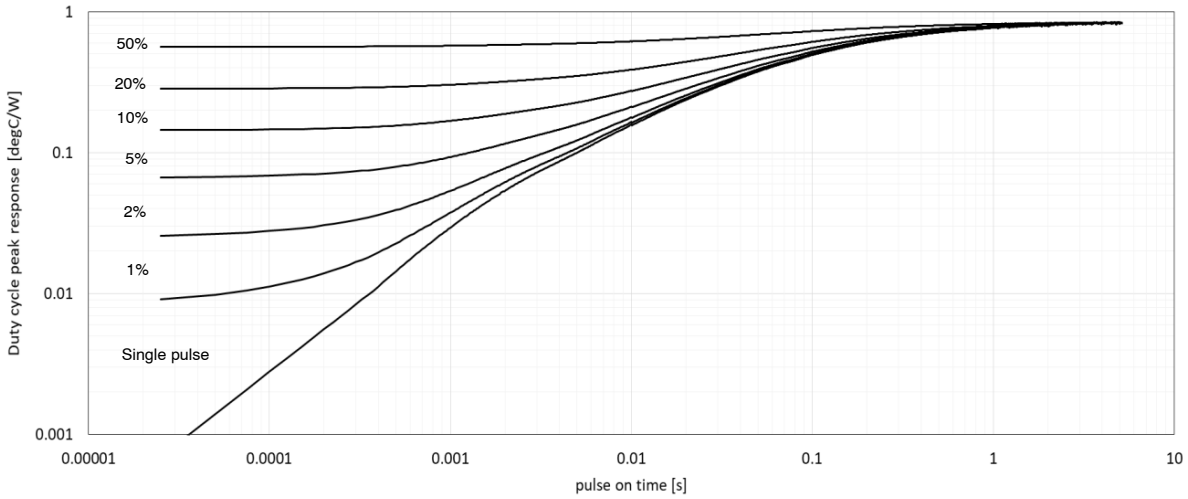


Figure 10. IGBT Junction−to−Heatsink Transient Thermal Impedance

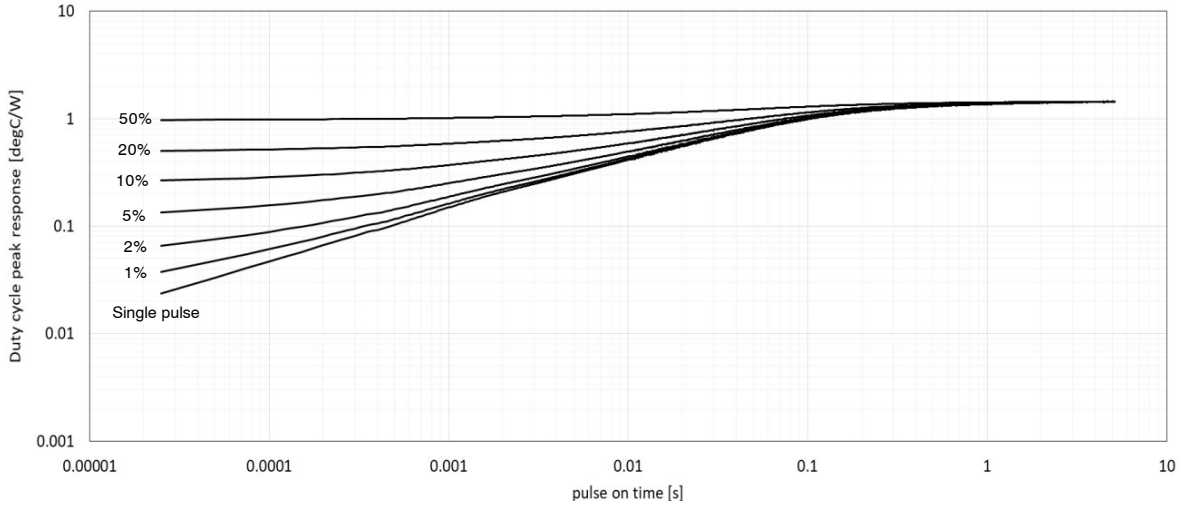


Figure 11. Diode Junction−to−Heatsink Transient Thermal Impedance

TYPICAL CHARACTERISTICS − RECTIFIER

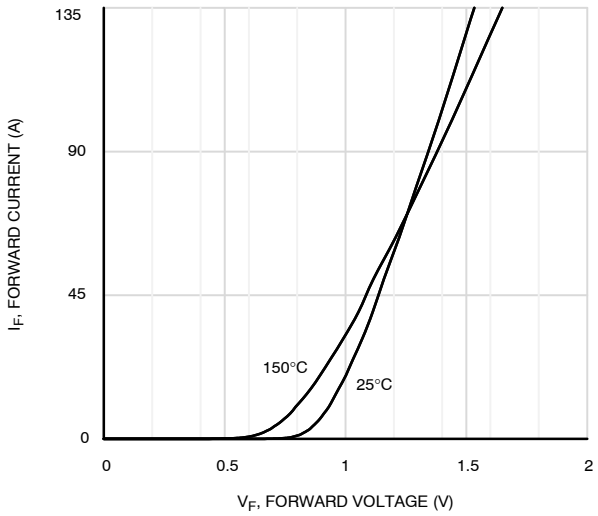


Figure 12. Rectifier Typical Forward Characteristic

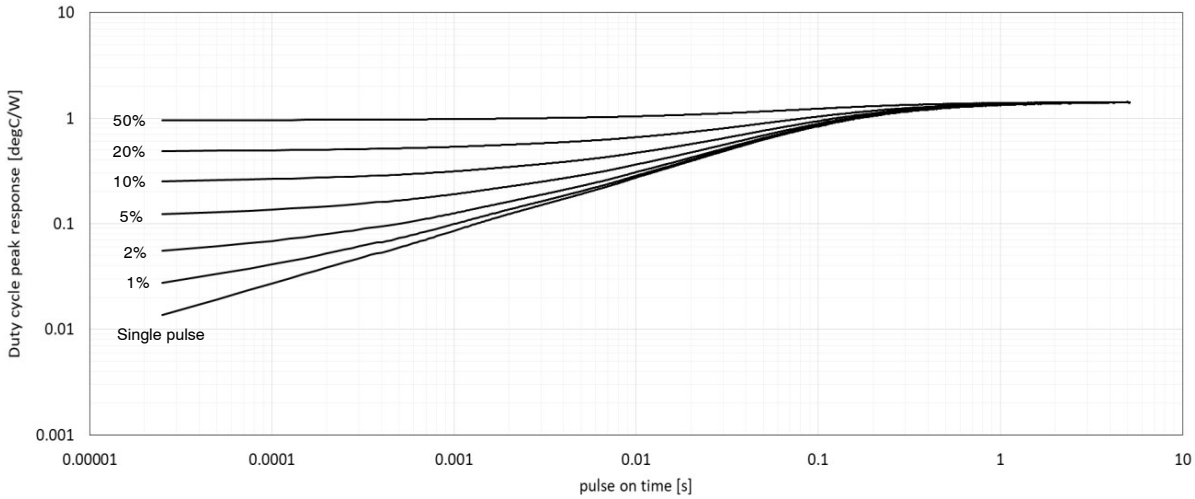


Figure 13. Rectifier Junction−to−Heatsink Transient Thermal Impedance

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

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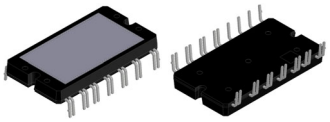

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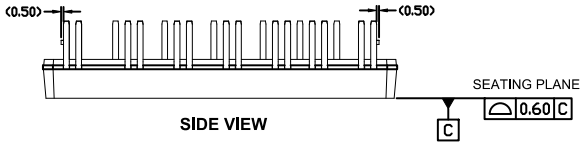
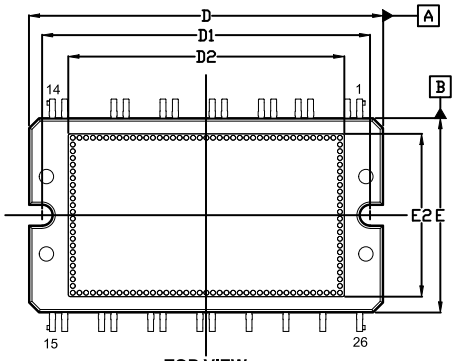
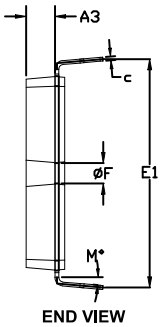


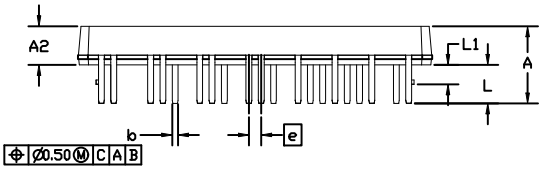
SIDE VIEW



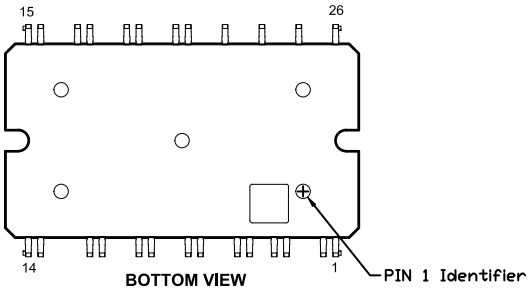
TOP VIEW



END VIEW



SIDE VIEW



BOTTOM VIEW

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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