

NTH4L020N120SC1

Product Preview

MOSFET - N-Channel Silicon Carbide

1200 V, 21.6 mΩ, 162 A



ON Semiconductor®

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MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V _{DSS}	1200	V
Gate-to-Source Voltage	V _{GS}	+25/-15	V
Continuous Drain Current R _{θJC}	I _{DC}	162	A
Power Dissipation R _{θJC}			
Continuous Drain Current R _{θJC}	I _{DC}	114	A
Power Dissipation R _{θJC}			
Continuous Drain Current R _{θJA}	I _{DA}	TBD	A
Power Dissipation R _{θJA}			
Continuous Drain Current R _{θJA}	I _{DA}	TBD	A
Power Dissipation R _{θJA}			
Pulsed Drain Current R _{θJC}	I _{DM}	1038	A
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-55 to +175	°C
Source Current (Body Diode)	I _S	221	A
Single Pulse Avalanche Energy (T _J = 25°C, V _{GS} = 20 V, I _{LPK} = 1 A, L = 0.1 mH, R _G = 25 Ω)	E _{AS}	TBD	mJ
Lead Temperature for Soldering Purposes	T _L	TBD	°C

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.

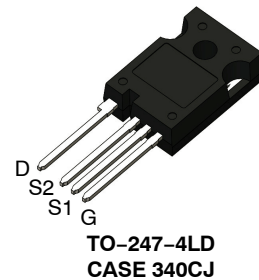
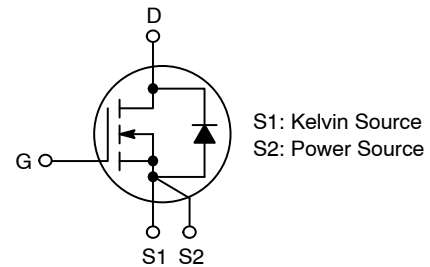
THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	R _{θJC}	0.18	°C/W
Thermal Resistance, Junction-to-Ambient	R _{θJA}	TBD	

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

V _{(BR)DSS}	R _{DS(on)}	I _D MAX
1200 V	21.6 mΩ @ 20 V	162 A

N-CHANNEL MOSFET



MARKING DIAGRAM



&Z = Assembly Plant Code
&3 = Data Code (Year & Week)
&K = Lot
NTH4L020N120SC1 = Specific Device Code

ORDERING INFORMATION

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

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ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 2.50\text{e} - 04\text{A}, T_C = 25^\circ\text{C}$	1200	-	-	V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}T_J$	$V_{GS} = 0\text{ V}, I_D = 2.50\text{e} - 04\text{A}, T_{Jmax} = 175^\circ\text{C}$	-	0.25	-	V/°C
Zero Gate Voltage Drain Current	I_{DSS}	$T_C = 25^\circ\text{C}$	-	-	10.0	μA
		$T_C = 175^\circ\text{C}$	-	-	250	
Gate-to-Source Leakage Current	I_{GSS}	$V_G = 20\text{ V}, V_D = 0\text{ V}$	-	-	250	nA

ON CHARACTERISTICS

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_G = 20\text{ V}, I_D = 77.4\text{ A}$	-	21.6	-	m Ω
Gate Threshold Voltage	$V_{GS(th)}$	$V_G = V_D, I_D = 0.02\text{ A}$	-	2.83	-	V
Gate Threshold Voltage Temperature Coefficient	$V_{GS(th)}/T_J$		-	-5.37	-	mV/°C
Forward Transconductance	g_{FS}	$V_D = 10.0\text{ V}, I_D = 77.4\text{ A}$	-	31.2	-	S

CHARGES, CAPACITANCES & GATE RESISTANCE

Gate Resistance	R_G	$V_G = 0\text{ V}, V_D = 1000\text{ V}$	-	1.86	-	Ω
Input Capacitance	C_{ISS}		-	4513	-	pF
Reverse Transfer Capacitance	C_{RSS}		-	14.9	-	
Output Capacitance	C_{OSS}		-	266	-	
Effective Output Capacitance	C_{OSSef}	$V_{DS} = 0\text{ to }1000\text{ V}, V_G = 0\text{ V}$	-	427	-	
Energy Related Output Capacitance	C_{OSSer}		-	316	-	
Coss Stored Energy	E_{OSS}		-	158	-	μJ
Total Gate Charge	$Q_{G(tot)}$	$V_D = 800\text{ V}, I_D = 38.7\text{ A}, V_G = 20\text{ V}$	-	170	-	nC
Gate-to-Source Charge	Q_{GS}		-	38.5	-	
Gate-to-Drain Charge	Q_{GD}		-	44.3	-	

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(on)}$	$V_G = -5/20\text{ V}, I_D = 60\text{ A}, V_D = 800\text{ V}, R_G = 2\ \Omega$	-	20.8	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	31.0	-	
Rise Time	t_r		-	6.71	-	
Fall Time	t_f		-	8.39	-	
Turn-On Switching Loss	E_{ON}		-	0.51	-	mJ
Turn-Off Switching Loss	E_{OFF}		-	0.14	-	
Total Switching Loss	E_{TOT}		-	0.65	-	

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$I_D = 30\text{ A}$	-	3.01	-	V
Reverse Recovery Time	t_{RR}	$I_D = 60\text{ A}, di/dt = 1000\text{ A}/\mu\text{s}, V_{DS} = 800\text{ V}, V_{GS} = -5/20\text{ V}$	-	100	-	ns
Reverse Recovery Charge	Q_{RR}		-	378	-	nC
Reverse Recovery Energy	E_{REC}		-	93.0	-	μJ
Peak Reverse Recovery Current	I_{RRM}		-	10.7	-	A

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.

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TYPICAL PERFORMANCE CHARACTERISTICS

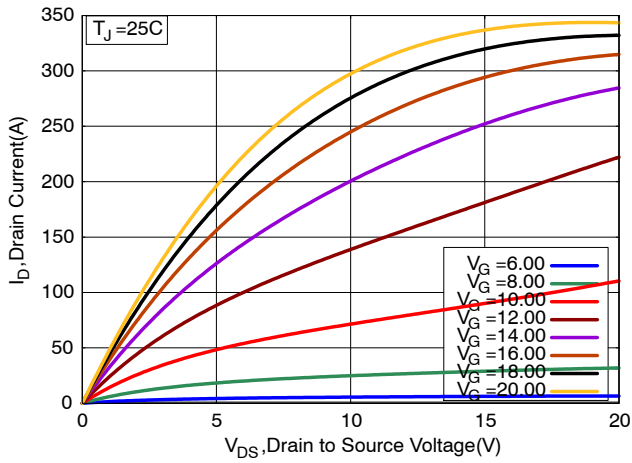


Figure 1. On-Region Characteristics

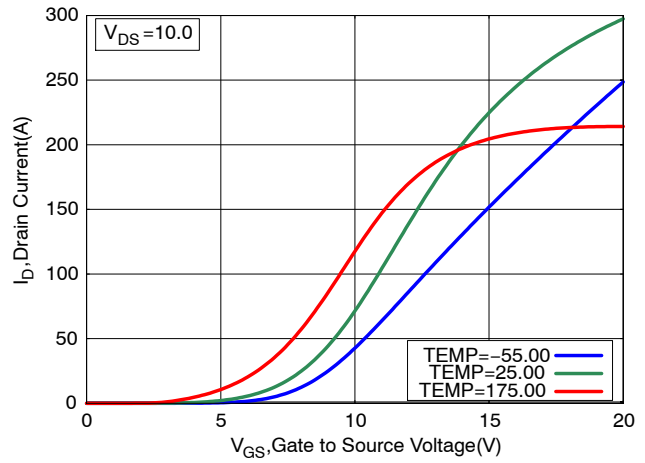


Figure 2. Transfer Characteristics

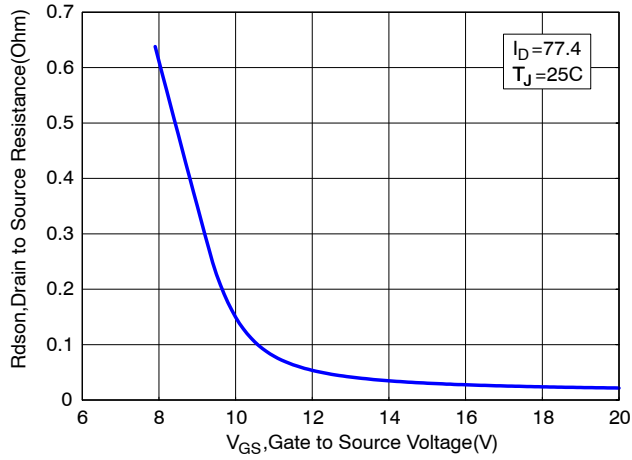


Figure 3. On-Resistance vs. V_{GS}

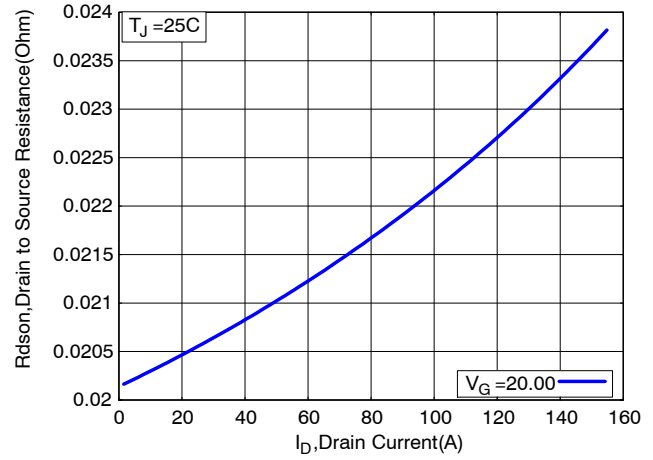


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

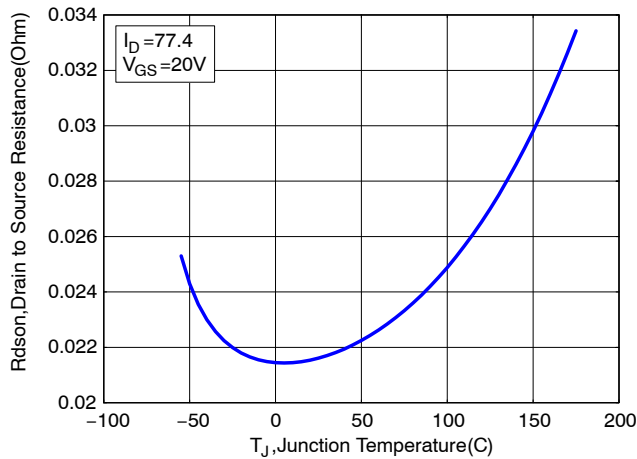


Figure 5. On-Resistance Variation with Temperature

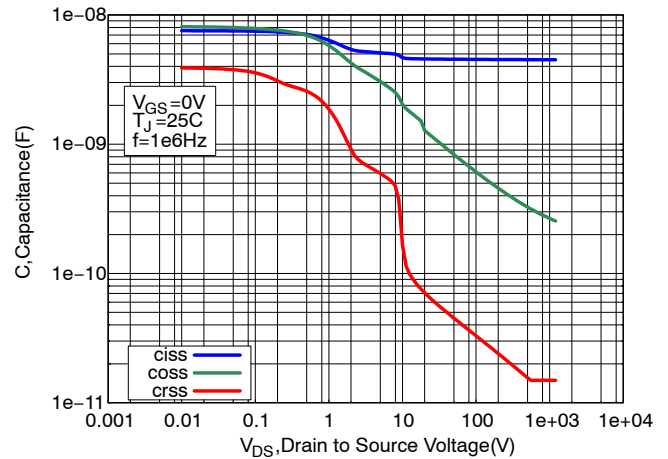


Figure 6. Capacitance Variation

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TYPICAL PERFORMANCE CHARACTERISTICS

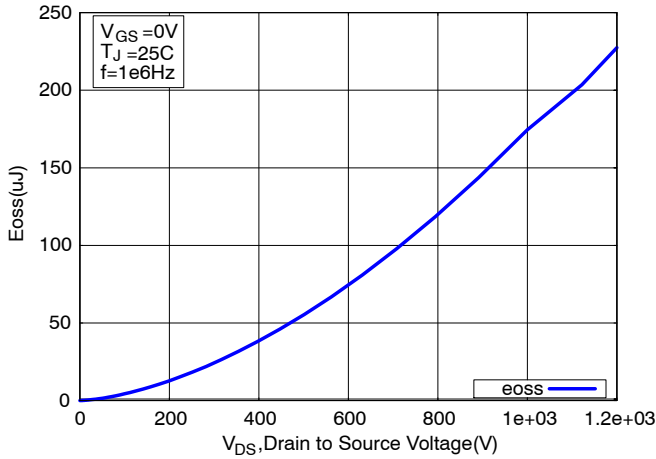


Figure 7. Eoss vs. Drain-to-Source Voltage

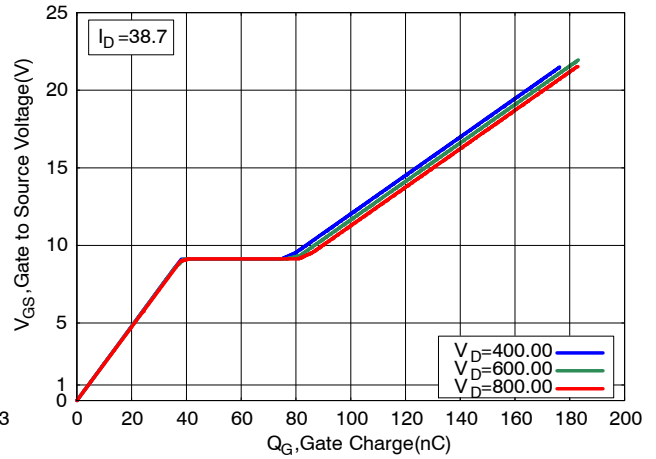


Figure 8. Gate-to-Source Voltage vs. Total Charge

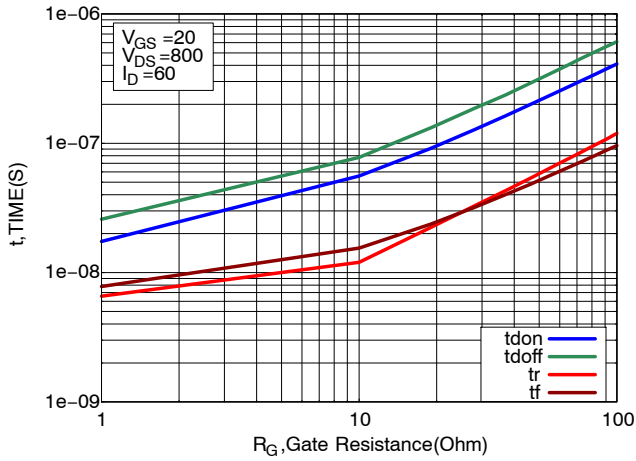


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

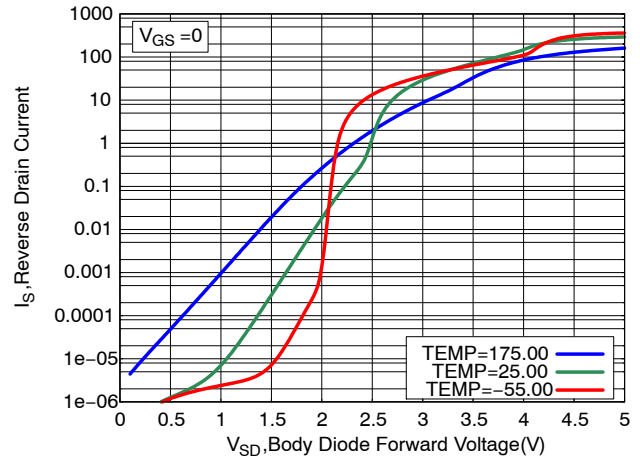


Figure 10. Diode Forward Voltage vs. Current

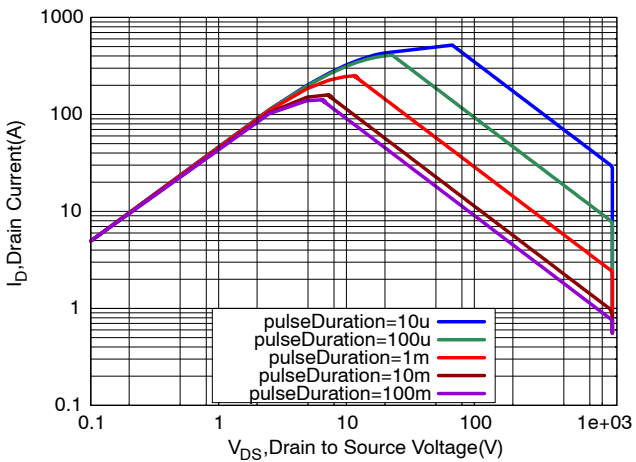


Figure 11. Maximum Rated Forward Biased Safe Operating Area

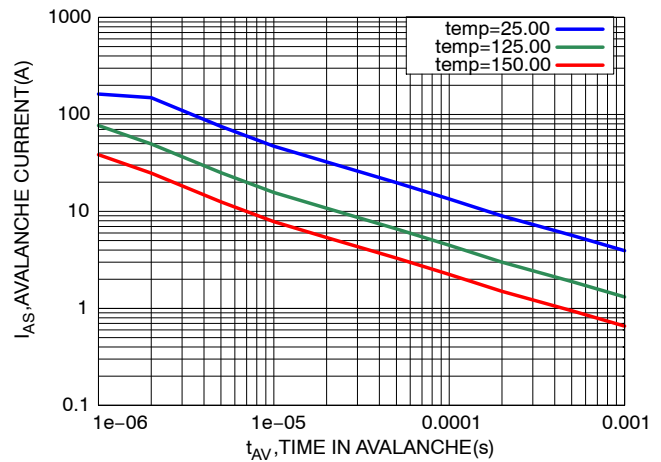


Figure 12. Ipeak vs. Time in Avalanche

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TYPICAL PERFORMANCE CHARACTERISTICS

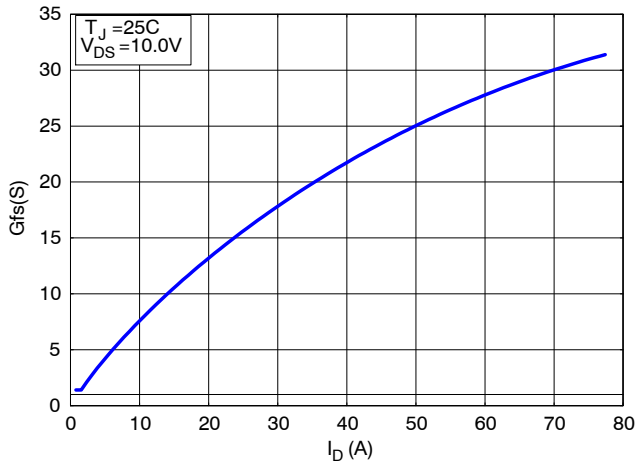


Figure 13. GFS vs. ID

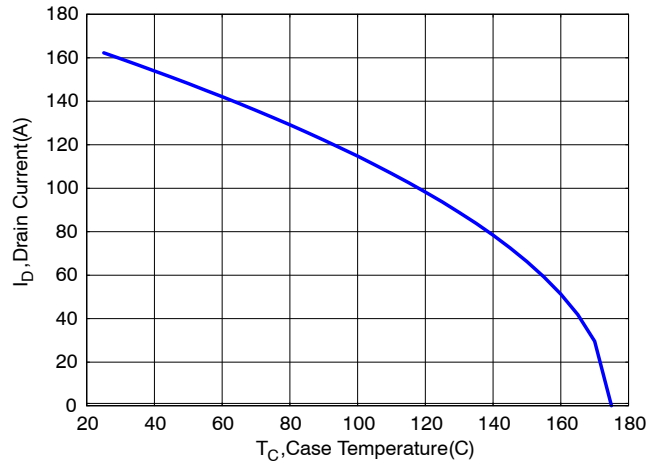


Figure 14. Maximum Current vs. Case Temperature

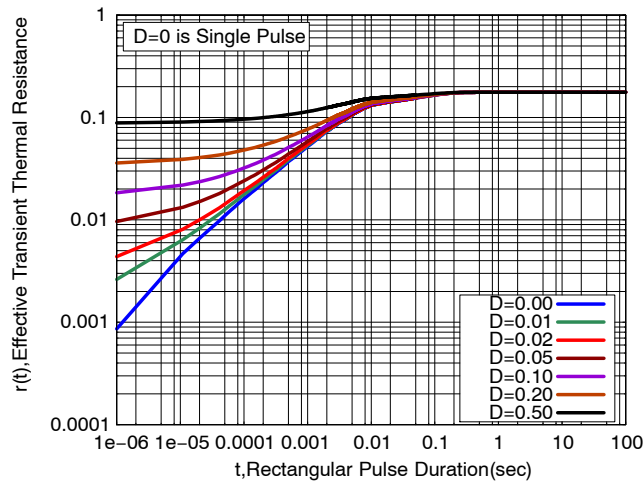


Figure 15. Thermal Response

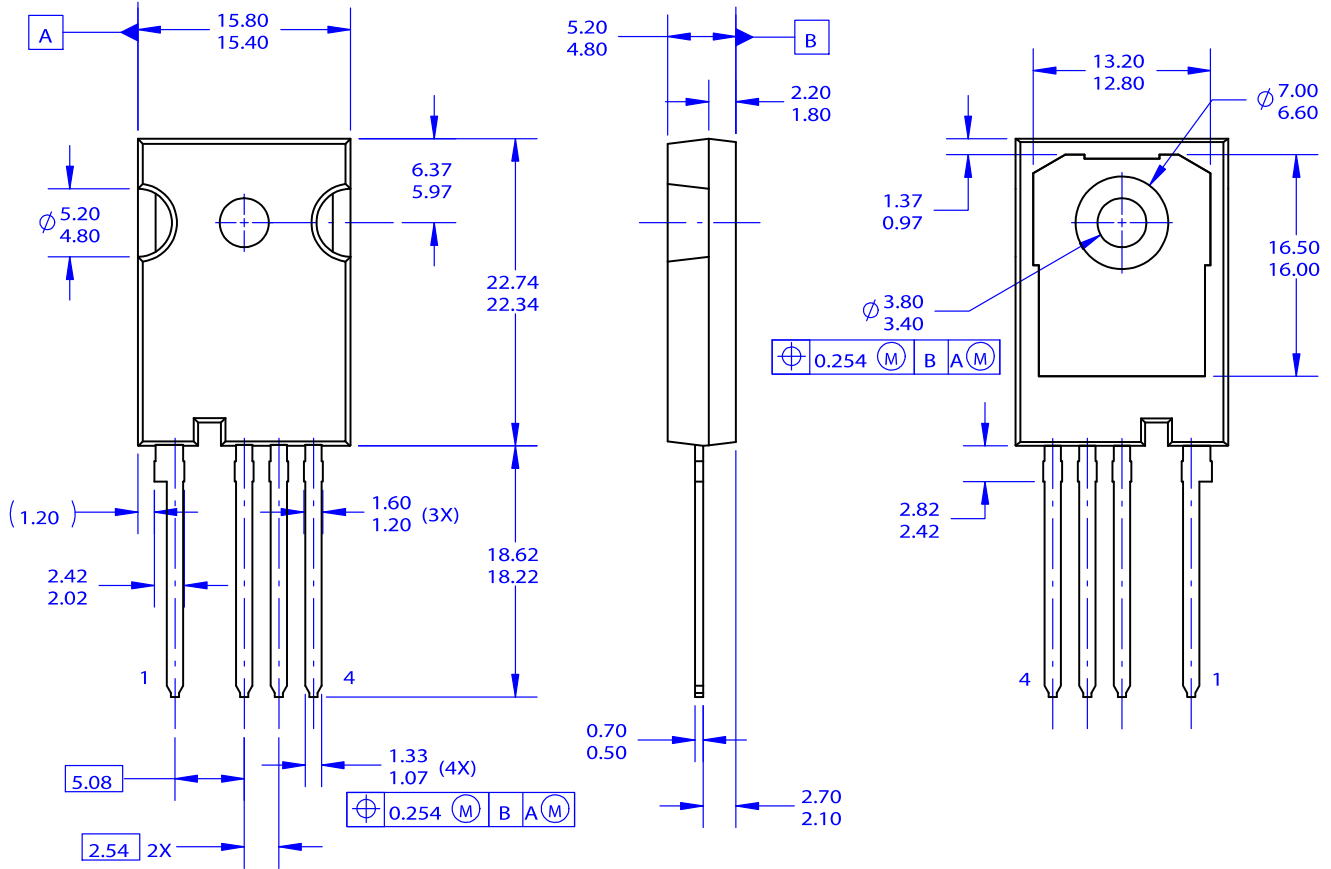
PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Marking	Package	Packing Method	Reel Size	Tape Width	Quantity
NTH4L020N120SC1	NTH4L020N120SC1	TO-247	Tube	N/A	N/A	30 Units

NTH4L020N120SC1

PACKAGE DIMENSIONS

TO-247-4LD
CASE 340CJ
ISSUE O



NOTES:

- A. NO INDUSTRY STANDARD APPLIES TO THIS PACKAGE.
- B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DRAWING CONFORMS TO ASME Y14.5-2009.

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