

MOSFET - SiC Power, Single N-Channel

1200 V, 80 mΩ, 31 A

NTHL080N120SC1

Features

- Typ. $R_{DS(on)} = 80 \text{ m}\Omega$
- Ultra Low Gate Charge (typ. $Q_{G(tot)} = 56 \text{ nC}$)
- Low Effective Output Capacitance (typ. $C_{oss} = 80 \text{ pF}$)
- 100% UIL Tested
- These Devices are RoHS Compliant

Typical Applications

- UPS
- DC/DC Converter
- Boost Inverter

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V _{DSS}	1200	V
Gate-to-Source Voltage			V _{GS}	-15/+25	V
Recommended Operation Values of Gate-to-Source Voltage	T _C < 175°C		V _{GSop}	-5/+20	V
Continuous Drain Current R _{θJC}	Steady State	T _C = 25°C	I _D	31	A
Power Dissipation R _{θJC}			P _D	178	W
Continuous Drain Current R _{θJC}	Steady State	T _C = 100°C	I _D	22	A
Power Dissipation R _{θJC}			P _D	89	W
Pulsed Drain Current (Note 2)	T _A = 25°C		I _{DM}	132	A
Single Pulse Surge Drain Current Capability	T _A = 25°C, t _p = 10 μs, R _G = 4.7 Ω		I _{DSC}	132	A
Operating Junction and Storage Temperature Range			T _J , T _{stg}	-55 to +175	°C
Source Current (Body Diode)			I _S	18	A
Single Pulse Drain-to-Source Avalanche Energy (I _{L(pk)} = 18.5 A, L = 1 mH) (Note 3)			E _{AS}	171	mJ

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 RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Note 1)	$R_{\theta JC}$	0.84	°C/W
Junction-to-Ambient (Note 1)	$R_{\theta JA}$	40	°C/W

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Repetitive rating, limited by max junction temperature.
3. E_{AS} of 171 mJ is based on starting $T_J = 25^\circ\text{C}$; $L = 1 \text{ mH}$, $I_{AS} = 18.5 \text{ A}$, $V_{DD} = 120 \text{ V}$, $V_{GS} = 18 \text{ V}$.

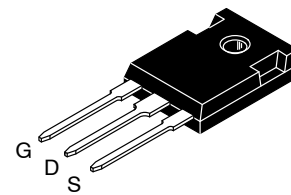
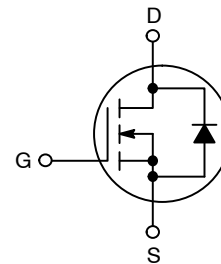


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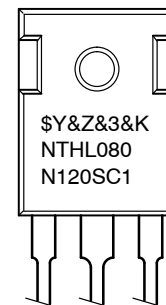
$V_{(BR)DSS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
1200 V	110 mΩ @ 20 V	31 A

N-CHANNEL MOSFET



TO-247-3LD
CASE 340CX

MARKING DIAGRAM



$\$Y$ = ON Semiconductor Logo
 $\&Z$ = Assembly Plant Code
 $\&3$ = Data Code (Year & Week)
 $\&K$ = Lot
 NTHL080N120SC1 = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

NTHL080N120SC1

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	1200	–	–	V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = 1\text{ mA}$, referenced to 25°C	–	700	–	mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 1200\text{ V}, T_J = 25^\circ\text{C}$	–	–	100	μA
		$V_{GS} = 0\text{ V}, V_{DS} = 1200\text{ V}, T_J = 175^\circ\text{C}$	–	–	1	mA
Gate-to-Source Leakage Current	I_{GSS}	$V_{GS} = +25/-15\text{ V}, V_{DS} = 0\text{ V}$	–	–	± 1	μA

ON CHARACTERISTICS

Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = 5\text{ mA}$	1.8	2.7	4.3	V
Recommended Gate Voltage	V_{GOP}		–5	–	+20	V
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 20\text{ V}, I_D = 20\text{ A}, T_J = 25^\circ\text{C}$	–	80	110	m Ω
		$V_{GS} = 20\text{ V}, I_D = 20\text{ A}, T_J = 150^\circ\text{C}$	–	114	–	
Forward Transconductance	g_{FS}	$V_{DS} = 20\text{ V}, I_D = 20\text{ A}$	–	13	–	S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 800\text{ V}$	–	1112	–	pF
Output Capacitance	C_{OSS}		–	80	–	
Reverse Transfer Capacitance	C_{RSS}		–	6.5	–	
Total Gate Charge	$Q_{G(tot)}$	$V_{GS} = -5/20\text{ V}, V_{DS} = 600\text{ V}, I_D = 20\text{ A}$	–	56	–	nC
Gate-to-Source Charge	Q_{GS}		–	11	–	
Gate-to-Drain Charge	Q_{GD}		–	12	–	
Gate Resistance	R_G	$f = 1\text{ MHz}$	–	1.7	–	Ω

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = -5/20\text{ V}, V_{DS} = 800\text{ V}, I_D = 20\text{ A}, R_G = 4.7\text{ }\Omega$, Inductive Load	–	13	–	ns
Rise Time	t_r		–	20	–	
Turn-Off Delay Time	$t_{d(off)}$		–	22	–	
Fall Time	t_f		–	10	–	
Turn-On Switching Loss	E_{ON}		–	258	–	μJ
Turn-Off Switching Loss	E_{OFF}		–	52	–	
Total Switching Loss	E_{TOT}		–	311	–	

DRAIN-SOURCE DIODE CHARACTERISTICS

Continuous Drain-to-Source Diode Forward Current	I_{SD}	$V_{GS} = -5\text{ V}, T_J = 25^\circ\text{C}$	–	–	18	A
Pulsed Drain-to-Source Diode Forward Current (Note 2)	I_{SDM}	$V_{GS} = -5\text{ V}, T_J = 25^\circ\text{C}$	–	–	132	A
Forward Diode Voltage	V_{SD}	$V_{GS} = -5\text{ V}, I_{SD} = 10\text{ A}, T_J = 25^\circ\text{C}$	–	4	–	V
Reverse Recovery Time	t_{RR}	$V_{GS} = -5/20\text{ V}, I_{SD} = 20\text{ A}, dI_S/dt = 1000\text{ A}/\mu\text{s}$	–	16	–	ns
Reverse Recovery Charge	Q_{RR}		–	62	–	nC
Reverse Recovery Energy	E_{REC}		–	5	–	μJ
Peak Reverse Recovery Current	I_{RRM}		–	8	–	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.

TYPICAL CHARACTERISTICS $T_J = 25^\circ\text{C}$ unless otherwise noted

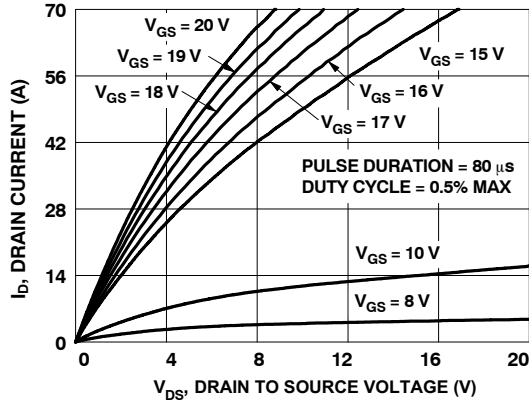


Figure 1. On Region Characteristics

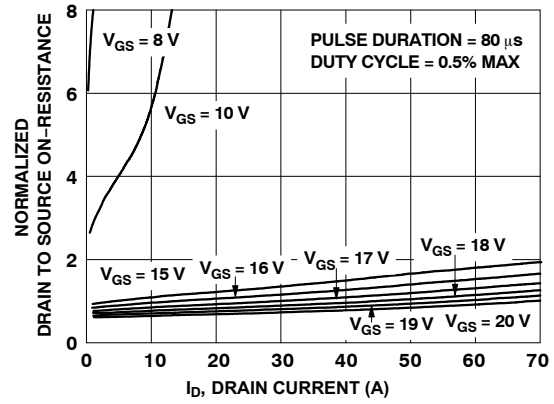


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

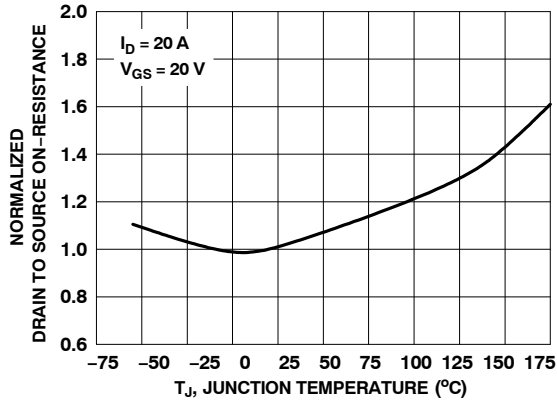


Figure 3. Normalized On Resistance vs. Junction Temperature

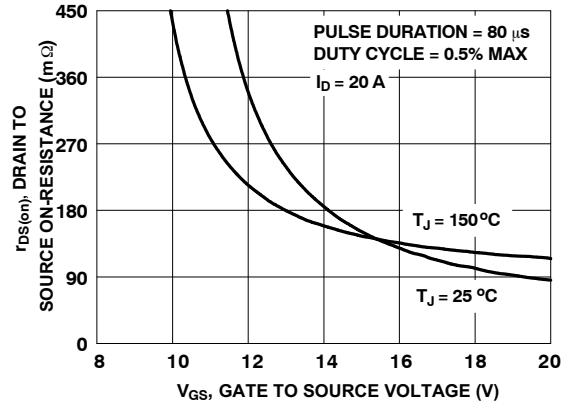


Figure 4. On-Resistance vs. Gate-to-Source Voltage

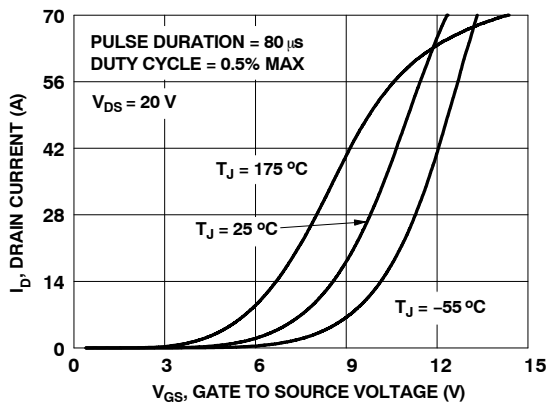


Figure 5. Transfer Characteristics

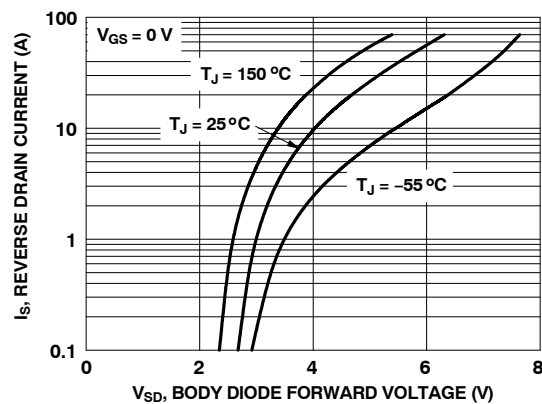


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS $T_J = 25^\circ\text{C}$ unless otherwise noted

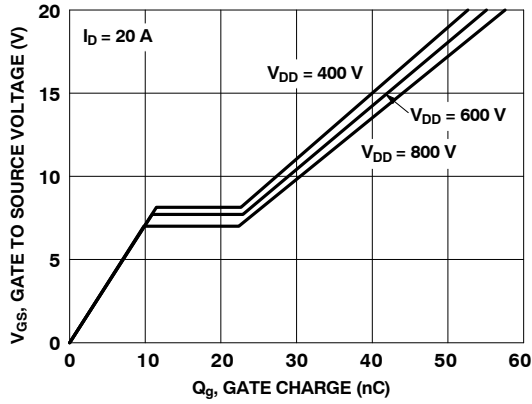


Figure 7. Gate Charge Characteristics

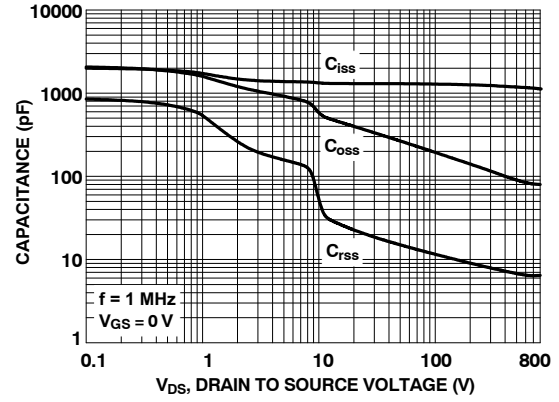


Figure 8. Capacitance vs. Drain-to-Source Voltage

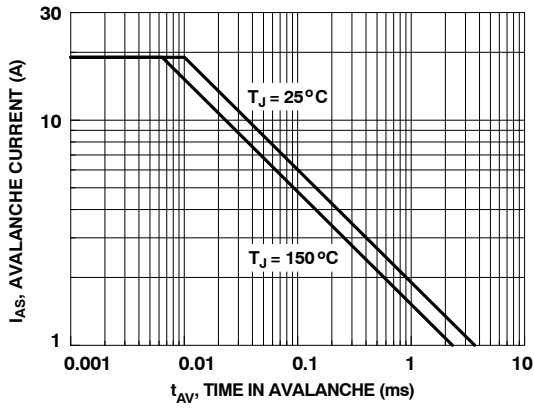


Figure 9. Unclamped Inductive Switching Capability

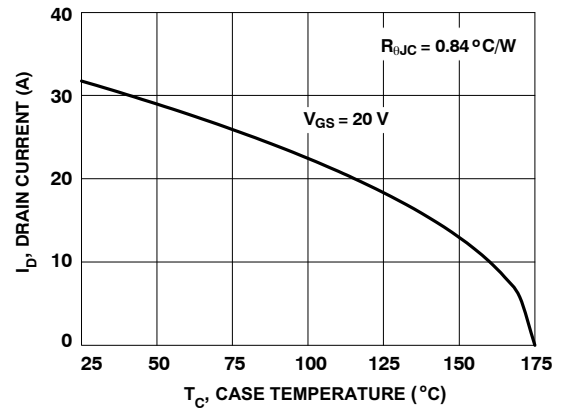


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

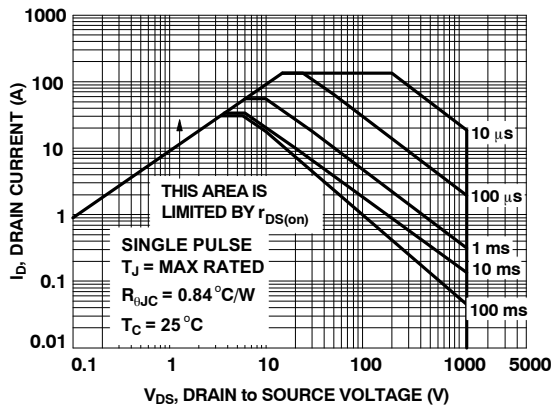


Figure 11. Forward Bias Safe Operating Area

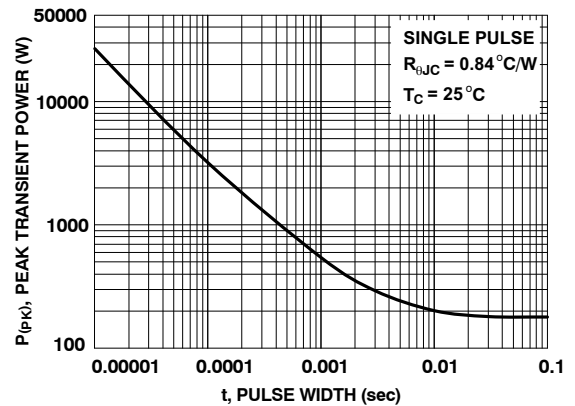


Figure 12. Single Pulse Maximum Power Dissipation

NTHL080N120SC1

TYPICAL CHARACTERISTICS $T_J = 25^\circ\text{C}$ unless otherwise noted

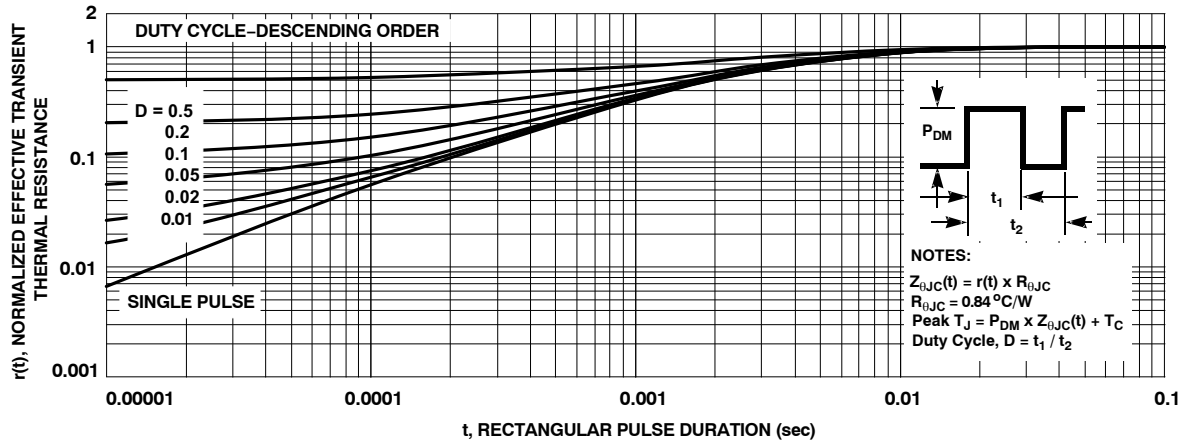


Figure 13. Junction-to-Case Transient Thermal Response Curve

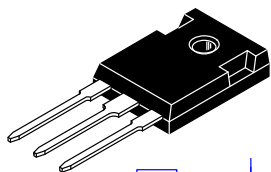
PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Marking	Package	Packing Method	Reel Size	Tape Width	Quantity
NTHL080N120SC1	NTHL080N120SC1	TO-247 Long Lead	Tube	N/A	N/A	30 Units

MECHANICAL CASE OUTLINE

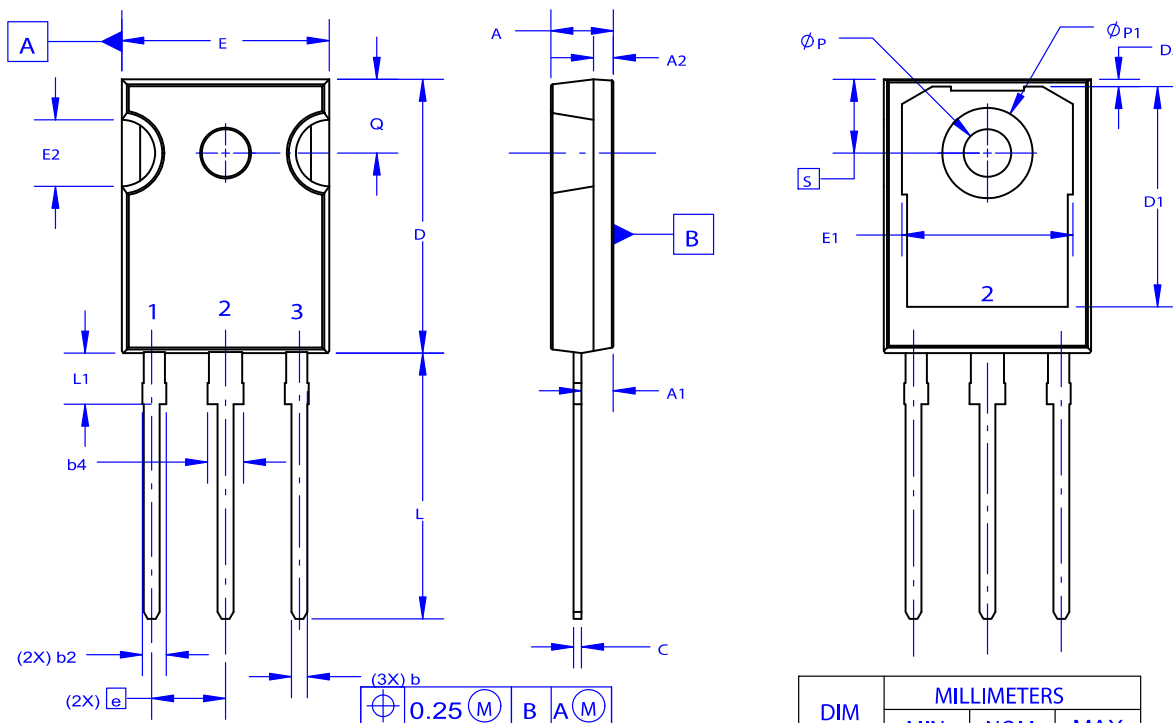
PACKAGE DIMENSIONS

ON Semiconductor®



TO-247-3LD
CASE 340CX
ISSUE O

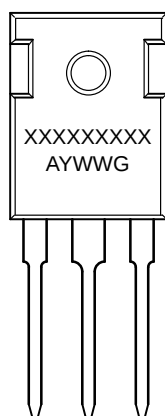
DATE 27 JUN 2018



NOTES: UNLESS OTHERWISE SPECIFIED.

- A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DRAWING CONFORMS TO ASME Y14.5 - 2009.
- D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
- E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

GENERIC MARKING DIAGRAM*



XXXXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

*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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