

# Silicon Carbide (SiC) MOSFET – 70 mohm, 1200 V, M3S, D<sup>2</sup>PAK-7L Product Preview NTBG070N120M3S

## Features

- Typ.  $R_{DS(on)} = 70\text{ m}\Omega @ V_{GS} = 18\text{ V}$
- Low Switching Losses
- 100% Avalanche Tested
- This Device is Halide Free and RoHS Compliant with exemption 7a, Pb-Free 2LI (on second level interconnection)

## Typical Applications

- Solar Inverters
- Electric Vehicle Charging Stations
- UPS (Uninterruptible Power Supplies)
- Energy Storage Systems
- SMPS (Switch Mode Power Supplies)

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

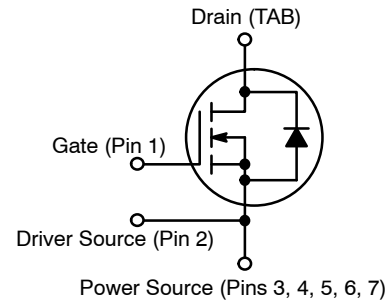
Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		$V_{DSS}$	1200	V	
Gate-to-Source Voltage		$V_{GS}$	-10/+22	V	
Recommended Operation Values of Gate-to-Source Voltage		$T_C < 175^\circ\text{C}$ $V_{GSop}$	-3/+18	V	
Continuous Drain Current (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	$I_D$	37	A
			$P_D$	252	W
Continuous Drain Current (Note 1)	Steady State	$T_C = 100^\circ\text{C}$	$I_D$	27	A
			$P_D$	126	W
Pulsed Drain Current (Note 2)		$T_C = 25^\circ\text{C}$	$I_{DM}$	172	A
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to +175	$^\circ\text{C}$	
Source Current (Body Diode) $T_C = 25^\circ\text{C}, V_{GS} = -3\text{ V}$		$I_S$	TBD	A	
Single Pulse Drain-to-Source Avalanche Energy		$E_{AS}$	TBD	mJ	
Maximum Lead Temperature for Soldering (1/8" from case for 5 s)		$T_L$	245	$^\circ\text{C}$	

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.

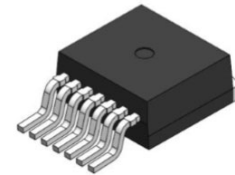
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Repetitive rating, limited by max junction temperature.

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

$V_{(BR)DSS}$	$R_{DS(ON)}\text{ MAX}$	$I_D\text{ MAX}$
1200 V	91 m $\Omega$ @ 18 V	37 A

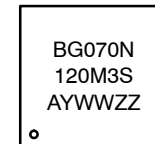


**N-CHANNEL MOSFET**



**D2PAK-7L  
CASE 418BJ**

## MARKING DIAGRAM



BG070N120M3S = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
ZZ = Lot Traceability

## ORDERING INFORMATION

Device	Package	Shipping
NTBG070N120M3S	D2PAK-7L	800 / Tape & Reel

# NTBG070N120M3S

**Table 1. THERMAL CHARACTERISTICS**

Parameter	Symbol	Typ	Max	Unit
Junction-to-Case – Steady State (Note 1)	$R_{\theta JC}$	0.59	TBD	°C/W
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$		40	

**Table 2. ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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**OFF-STATE 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 $25^\circ\text{C}$	-	0.3	-	V/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 1200\text{ V}$ <span style="margin-left: 20px;"><math>T_J = 25^\circ\text{C}</math></span>	-	-	100	$\mu\text{A}$
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{GS} = +22/-10\text{ V}, V_{DS} = 0\text{ V}$	-	-	$\pm 1$	$\mu\text{A}$

**ON-STATE CHARACTERISTICS** (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 7\text{ mA}$	2.04	2.72	4.4	V
Recommended Gate Voltage	$V_{GOP}$		-3	-	+18	V
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 18\text{ V}, I_D = 22\text{ A}, T_J = 25^\circ\text{C}$	-	70	91	m $\Omega$
		$V_{GS} = 18\text{ V}, I_D = 22\text{ A}, T_J = 175^\circ\text{C}$	-	150	-	
Forward Transconductance	$g_{FS}$	$V_{DS} = 10\text{ V}, I_D = 22\text{ A}$	-	9	-	S

**CHARGES, CAPACITANCES & GATE RESISTANCE**

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 800\text{ V}$	-	1213	-	pF
Output Capacitance	$C_{OSS}$		-	57	-	
Reverse Transfer Capacitance	$C_{RSS}$		-	6	-	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -3/18\text{ V}, V_{DS} = 800\text{ V}, I_D = 22\text{ A}$	-	49	-	nC
Threshold Gate Charge	$Q_{G(TH)}$		-	7	-	
Gate-to-Source Charge	$Q_{GS}$		-	14	-	
Gate-to-Drain Charge	$Q_{GD}$		-	16	-	
Gate-Resistance	$R_G$	$f = 1\text{ MHz}$	-	1.31	-	$\Omega$

**SWITCHING CHARACTERISTICS**

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -3/18\text{ V}, V_{DS} = 800\text{ V}, I_D = 22\text{ A}, R_G = 4.5\text{ }\Omega$ Inductive load (Note 3)	-	10	-	ns
Rise Time	$t_r$		-	27	-	
Turn-Off Delay Time	$t_{d(OFF)}$		-	20	-	
Fall Time	$t_f$		-	12	-	
Turn-On Switching Loss	$E_{ON}$		-	357	-	$\mu\text{J}$
Turn-Off Switching Loss	$E_{OFF}$		-	89	-	
Total Switching Loss	$E_{tot}$		-	445	-	

**SOURCE-DRAIN DIODE CHARACTERISTICS**

Continuous Source-Drain Diode Forward Current	$I_{SD}$	$V_{GS} = -3\text{ V}, T_C = 25^\circ\text{C}$	-	-	39	A
Pulsed Source-Drain Diode Forward Current (Note 2)	$I_{SDM}$		-	-	133	
Forward Diode Voltage	$V_{SD}$	$V_{GS} = -3\text{ V}, I_{SD} = 22\text{ A}, T_J = 25^\circ\text{C}$	-	4.5	-	V

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**Table 2. ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise specified) (continued)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>SOURCE-DRAIN DIODE CHARACTERISTICS</b>						
Reverse Recovery Time	$t_{RR}$	$V_{GS} = -3/18\text{ V}$ , $I_{SD} = 22\text{ A}$ , $di_S/dt = 1000\text{ A}/\mu\text{s}$ , $V_{DS} = 800\text{ V}$	-	22	-	ns
Reverse Recovery Charge	$Q_{RR}$		-	102	-	nC
Reverse Recovery Energy	$E_{REC}$		-	3	-	$\mu\text{J}$
Peak Reverse Recovery Current	$I_{RRM}$		-	8	-	A
Charge Time	$T_A$		-	13	-	ns
Discharge Time	$T_B$		-	9	-	ns

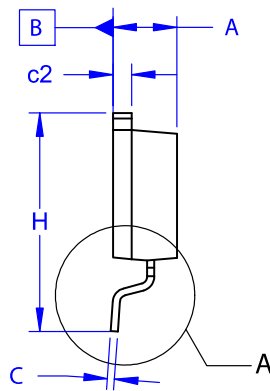
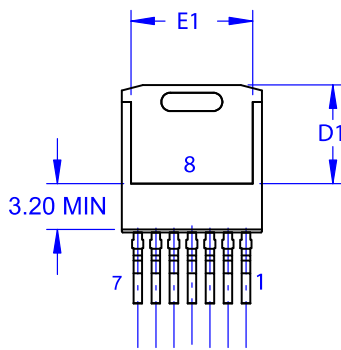
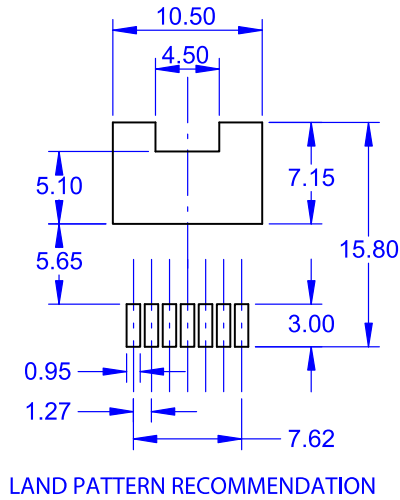
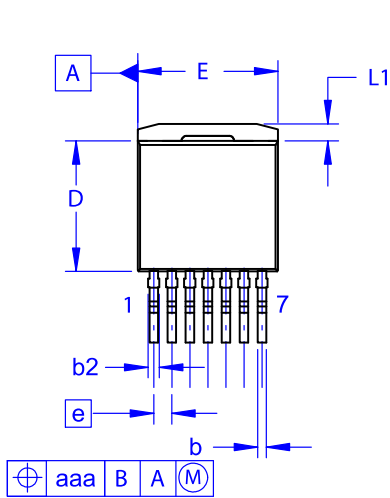
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3.  $E_{ON}/E_{OFF}$  result is with body diode

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## PACKAGE DIMENSIONS

### D<sup>2</sup>PAK7 (TO-263-7L HV) CASE 418BJ ISSUE B



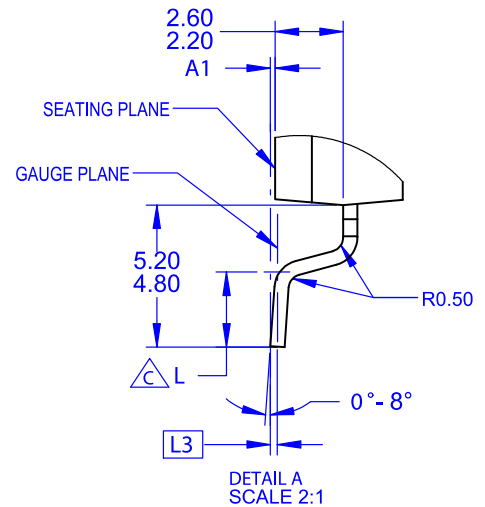
#### NOTES:

- A. PACKAGE CONFORMS TO JEDEC TO-263 VARIATION CB EXCEPT WHERE NOTED.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.

△ OUT OF JEDEC STANDARD VALUE.  
D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.

- E. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	0.00	0.10	0.20
b2	0.60	0.70	0.80
b	0.51	0.60	0.70
c	0.40	0.50	0.60
c2	1.20	1.30	1.40
D	9.00	9.20	9.40
D1	6.15	6.80	7.15
E	9.70	9.90	10.20
E1	7.15	7.65	8.15
e	~	1.27	~
H	15.10	15.40	15.70
L	2.44	2.64	2.84
L1	1.00	1.20	1.40
L3	~	0.25	~
aaa	~	~	0.25



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