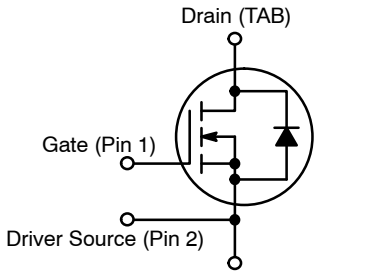
Silicon Carbide (SiC) MOSFET – 40 mohm, 1200 V, M3S, D²PAK-7L

Product Preview

NTBG040N120M3S

$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
1200 V	52 mΩ @ 18 V	51 A



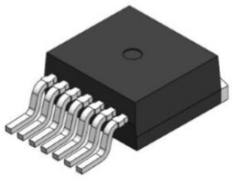
N−CHANNEL MOSFET

Features

- Typ. $R_{DS(on)}$ = 40 mΩ @ V_{GS} = 18 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)



D2PAK−7L
CASE 418BJ

MARKING DIAGRAM

BG040N120M3S = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Lot Traceability

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}	−10/+22	V
Recommended Operation Values of Gate−to−Source Voltage		T_C < 175°C	V_{GSop}	−3/+18	V
Continuous Drain Current (Note 1)	Steady State	T_C = 25°C	I_D	51	A
Power Dissipation (Note 1)	Steady State	T_C = 25°C	P_D	329	W
Continuous Drain Current (Note 1)	Steady State	T_C = 100°C	I_D	37	A
Power Dissipation (Note 1)	Steady State	T_C = 100°C	P_D	165	W
Pulsed Drain Current (Note 2)	T_C = 25°C		I_{DM}	244	A
Operating Junction and Storage Temperature Range			T_J, T_{stg}	−55 to +175	°C
Source Current (Body Diode) T_C = 25°C, V_{GS} = −3 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	°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.

ORDERING INFORMATION

Device	Package	Shipping
NTBG040N120M3S	D2PAK−7L	800 / Tape & Reel

Table 1. THERMAL CHARACTERISTICS

Parameter	Symbol	Typ	Max	Unit
Junction−to−Case − Steady State (Note 1)	$R_{\theta JC}$	0.46	TBD	°C/W
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$		40	

Table 2. ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF−STATE CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 1 mA		1200	−	−	V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	I_D = 1 mA, referenced to 25°C		−	0.3	−	V/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 1200 V	T_J = 25°C	−	−	100	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = +22/−10 V, V_{DS} = 0 V		−	−	±1	μA
ON−STATE CHARACTERISTICS (Note 2)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 10 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 V, I_D = 30 A, T_J = 25°C		−	40	52	mΩ
		V_{GS} = 18 V, I_D = 30 A, T_J = 175°C		−	85	−	
Forward Transconductance	g_{FS}	V_{DS} = 10 V, I_D = 30 A		−	13	−	S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 800 V		−	1699	−	pF
Output Capacitance	C_{OSS}			−	76	−	
Reverse Transfer Capacitance	C_{RSS}			−	8	−	
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −3/18 V, V_{DS} = 800 V, I_D = 30 A		−	70	−	nC
Threshold Gate Charge	$Q_{G(TH)}$			−	9	−	
Gate−to−Source Charge	Q_{GS}			−	20	−	
Gate−to−Drain Charge	Q_{GD}			−	23	−	
Gate−Resistance	R_G	f = 1 MHz		−	1.12	−	Ω
SWITCHING CHARACTERISTICS							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = −3/18 V, V_{DS} = 800 V, I_D = 30 A, R_G = 4.5 Ω Inductive load (Note 3)		−	11	−	ns
Rise Time	t_r			−	16	−	
Turn−Off Delay Time	$t_{d(OFF)}$			−	24	−	
Fall Time	t_f			−	10	−	
Turn−On Switching Loss	E_{ON}			−	179	−	μJ
Turn−Off Switching Loss	E_{OFF}			−	96	−	
Total Switching Loss	E_{tot}			−	275	−	
SOURCE−DRAIN DIODE CHARACTERISTICS							
Continuous Source−Drain Diode Forward Current	I_{SD}	V_{GS} = −3 V, T_C = 25°C		−	−	54	A
Pulsed Source−Drain Diode Forward Current (Note 2)	I_{SDM}			−	−	185	
Forward Diode Voltage	V_{SD}	V_{GS} = −3 V, I_{SD} = 30 A, T_J = 25°C		−	4.5	−	V

Table 2. ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified) (continued)

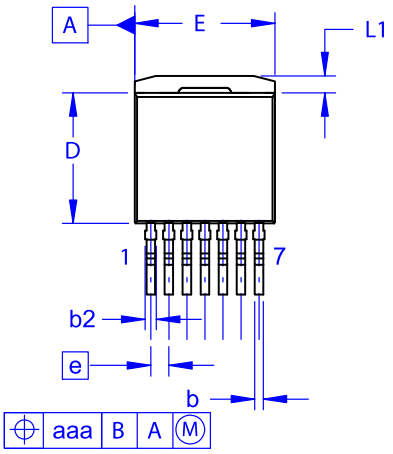
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
SOURCE−DRAIN DIODE CHARACTERISTICS						
Reverse Recovery Time	t_{RR}	V_{GS} = −3/18 V, I_{SD} = 30 A, dI_S/dt = 1000 A/μs, V_{DS} = 800 V	–	22	–	ns
Reverse Recovery Charge	Q_{RR}		–	123	–	nC
Reverse Recovery Energy	E_{REC}		–	4	–	μJ
Peak Reverse Recovery Current	I_{RRM}		–	10	–	A
Charge Time	T_A		–	13	–	ns
Discharge Time	T_B		–	9	–	ns

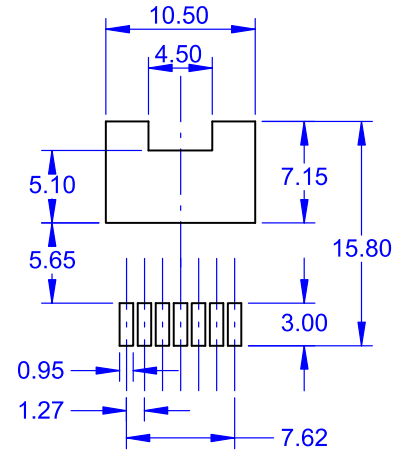
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

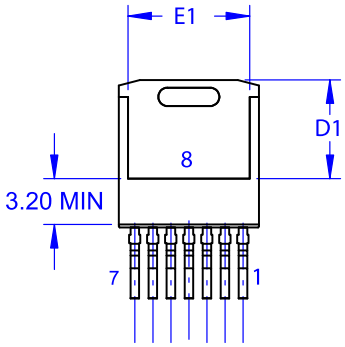
PACKAGE DIMENSIONS

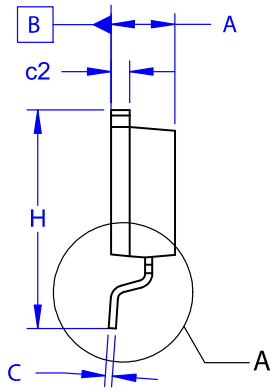
D²PAK7 (TO−263−7L HV)
CASE 418BJ
ISSUE B





LAND PATTERN RECOMMENDATION

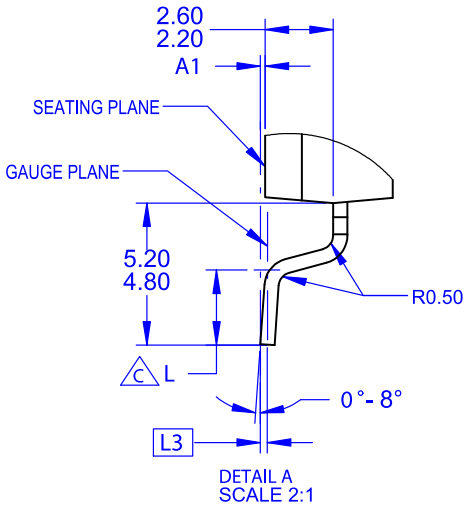




NOTES:

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



PUBLICATION ORDERING INFORMATION

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