MOSFET - SiC Power, Single N-Channel, D2PAK-7L
900 V, 60 mΩ, 44 A

NTBG060N090SC1

Features

- Typ. $R_{DS(on)}$ = 60 mΩ
- Ultra Low Gate Charge ($Q_{G(tot)}$ = 88 nC)
- High Speed Switching with Low Capacitance (C_{oss} = 115 pF)
- 100% Avalanche Tested
- T_J = 175°C
- RoHS Compliant

Typical Applications

- UPS
- DC/DC Converter
- Boost Inverter

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

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	900	V
Gate−to−Source Voltage			V_{GS}	−10/+19	V
Recommended Operation Values of Gate−to−Source Voltage		T_C < 175°C	V_{GSop}	−5/+15	V
Continuous Drain Current (Note 2)	Steady State	T_C = 25°C	I_D	44	A
Power Dissipation (Note 2)	Steady State	T_C = 25°C	P_D	211	W
Continuous Drain Current (Notes 1, 2)	Steady State	T_A = 25°C	I_D	5.8	A
Power Dissipation (Notes 1, 2)	Steady State	T_A = 25°C	P_D	3.6	W
Pulsed Drain Current (Note 3)	T_A = 25°C		I_{DM}	176	A
Single Pulse Surge Drain Current Capability	T_A = 25°C, t_p = 10 μs, R_G = 4.7 Ω		I_{DSC}	320	A
Operating Junction and Storage Temperature Range			T_J, T_{stg}	−55 to +175	°C
Source Current (Body Diode)			I_S	21	A
Single Pulse Drain−to−Source Avalanche Energy ($I_{L(pk)}$ = 18 A, L = 1 mH) (Note 4)			E_{AS}	162	mJ
Maximum Lead Temperature for Soldering (1/8″ from case for 5 s)			T_L	245	°C

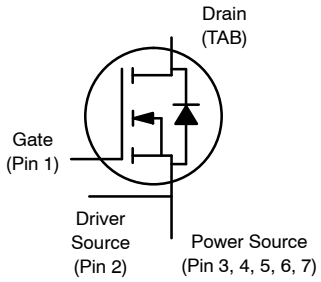
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Surface mounted on a FR−4 board using1 in2 pad of 2 oz copper.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
3. Repetitive rating, limited by max junction temperature.
4. EAS of 162 mJ is based on starting T_J = 25°C; L = 1 mH, I_{AS} = 18 A, V_{DD} = 100 V, V_{GS} = 15 V.

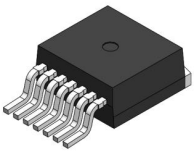
ON Semiconductor®

www.onsemi.com

$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
900 V	84 mΩ @ 15 V	44 A

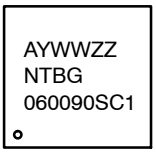


N−CHANNEL MOSFET



D2PAK−7L
CASE 418BJ

MARKING DIAGRAM



A = Assembly Location
Y = Year
WW = Work Week
ZZ = Lot Traceability
NTBG060090SC1 = Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping†
NTBG060N090SC1	D2PAK−7L	800 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

© Semiconductor Components Industries, LLC, 2019

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Max	Unit
Junction−to−Case − Steady State (Note 2)	$R_{\theta JC}$	0.70	°C/W
Junction−to−Ambient − Steady State (Notes 1, 2)	$R_{\theta JA}$	41	

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 1 mA		900			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	I_D = 1 mA, referenced to 25°C			502		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 900 V	T_J = 25°C			100	μA
			T_J = 175°C			250	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = +19/−10 V, V_{DS} = 0 V				±1	μA
ON CHARACTERISTICS (Note 3)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 5 mA		1.8	2.7	4.3	V
Recommended Gate Voltage	V_{GOP}			−5		+15	V
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 15 V, I_D = 20 A, T_J = 25°C			60	84	mΩ
		V_{GS} = 15 V, I_D = 20 A, T_J = 175°C			76	135	
Forward Transconductance	g_{FS}	V_{DS} = 20 V, I_D = 20 A			16		S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 450 V			1800		pF
Output Capacitance	C_{OSS}				115		
Reverse Transfer Capacitance	C_{RSS}				12		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −5/15 V, V_{DS} = 720 V, I_D = 10 A			88		nC
Threshold Gate Charge	$Q_{G(TH)}$				16		
Gate−to−Source Charge	Q_{GS}				27		
Gate−to−Drain Charge	Q_{GD}				28		
Gate−Resistance	R_G	f = 1 MHz			3.0		Ω
SWITCHING CHARACTERISTICS, VGS = 10 V (Note 5)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = −5/15 V, V_{DS} = 720 V, I_D = 20 A, R_G = 2.5 Ω inductive load			24	40	ns
Rise Time	t_r				23	66	
Turn−Off Delay Time	$t_{d(OFF)}$				35	74	
Fall Time	t_f				11	20	
Turn−On Switching Loss	E_{ON}				410		μJ
Turn−Off Switching Loss	E_{OFF}				19		
Total Switching Loss	E_{tot}				429		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Continuous Drain−Source Diode Forward Current	I_{SD}	V_{GS} = −5 V, T_J = 25°C				21	A
Pulsed Drain−Source Diode Forward Current (Note 3)	I_{SDM}					176	
Forward Diode Voltage	V_{SD}	V_{GS} = −5 V, I_{SD} = 10 A, T_J = 25°C			3.9		V

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
DRAIN−SOURCE DIODE CHARACTERISTICS (continued)						
Reverse Recovery Time	t_{RR}	V_{GS} = −5/15 V, I_{SD} = 30 A, dI_S/dt = 1000 A/μs, V_{DS} = 720 V		18		ns
Reverse Recovery Charge	Q_{RR}			80		nC
Reverse Recovery Energy	E_{REC}			1.0		μJ
Peak Reverse Recovery Current	I_{RRM}			9.0		A
Charge Time	t_a			10		ns
Discharge Time	t_b			8.0		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.

5. Switching characteristics are independent of operating junction temperature

TYPICAL CHARACTERISTICS

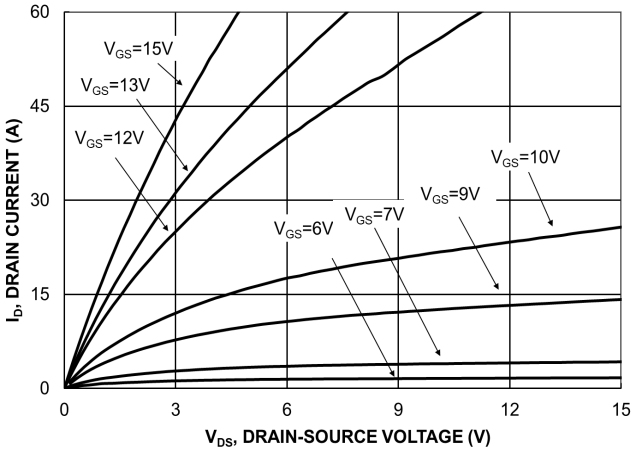


Figure 1. On−Region Characteristics

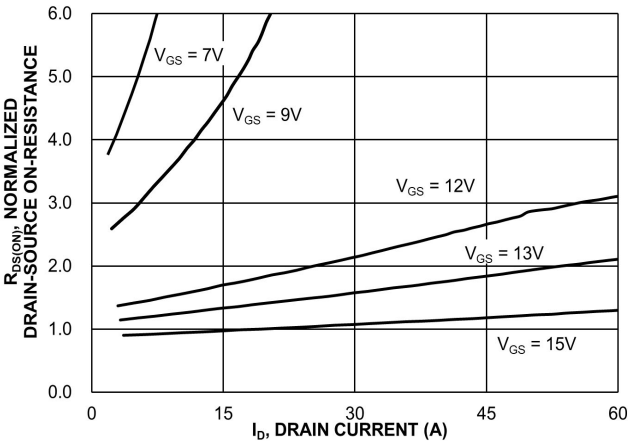


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

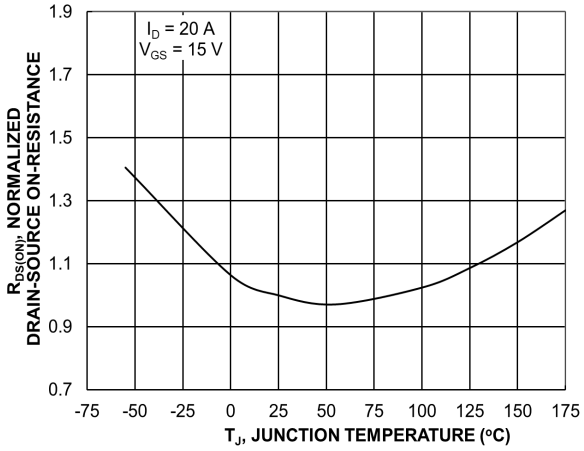


Figure 3. On−Resistance Variation with Temperature

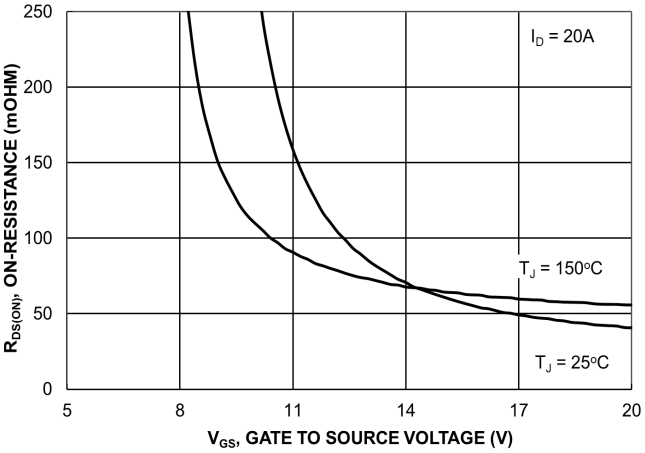


Figure 4. On−Resistance vs. Gate−to−Source Voltage

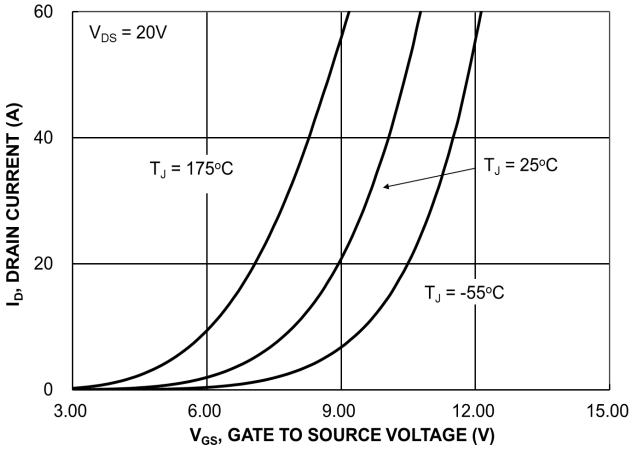


Figure 5. Transfer Characteristics

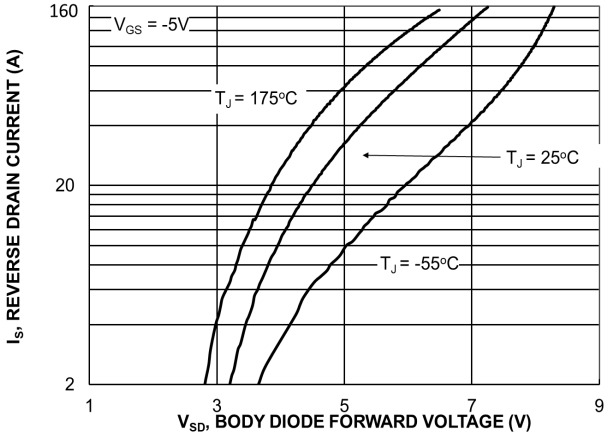


Figure 6. Diode Forward Voltage vs. Current

TYPICAL CHARACTERISTICS

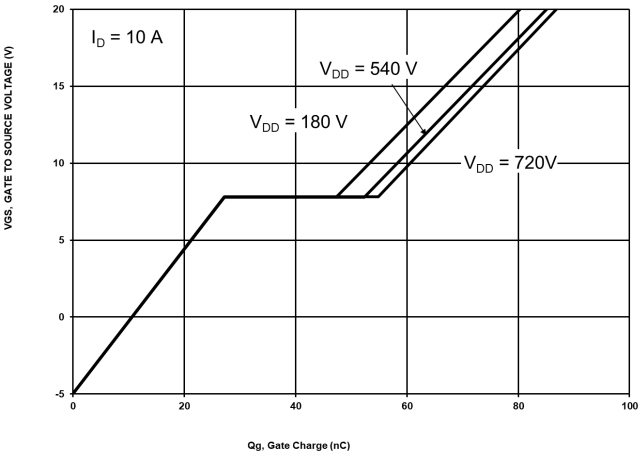


Figure 7. Gate−to−Source Voltage vs. Total Charge

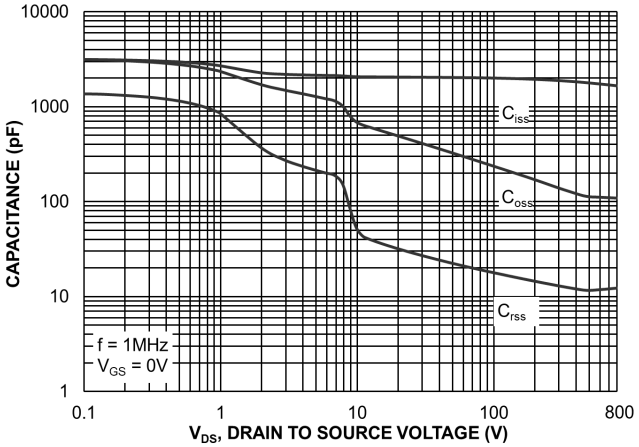


Figure 8. Capacitance vs. Drain−to−Source Voltage

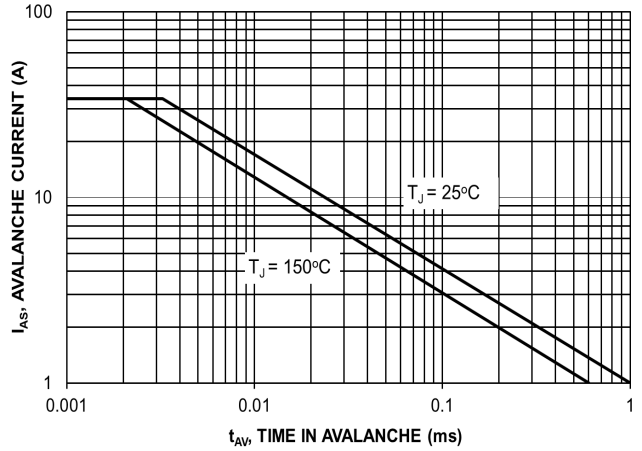


Figure 9. Unclamped Inductive Switching Capability

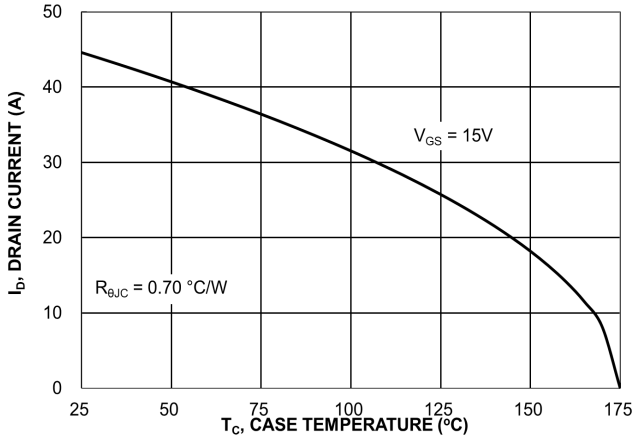


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

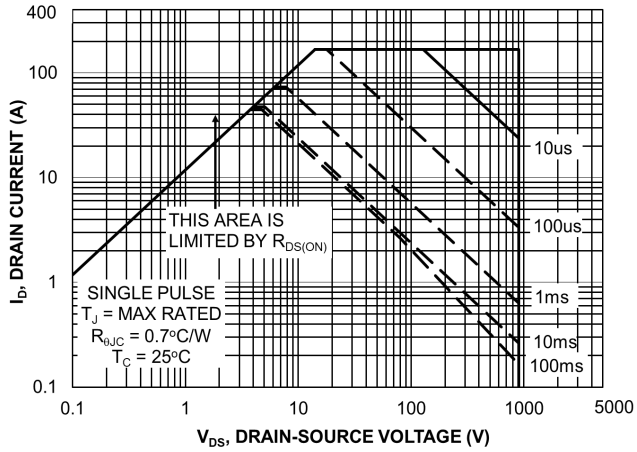


Figure 11. Maximum Rated Forward Biased Safe Operating Area

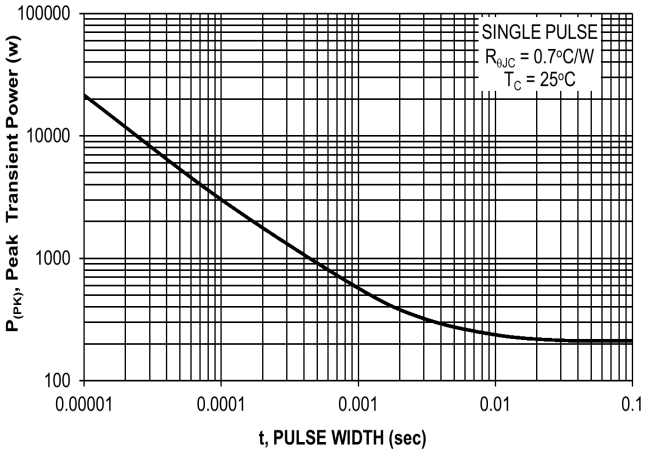


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS

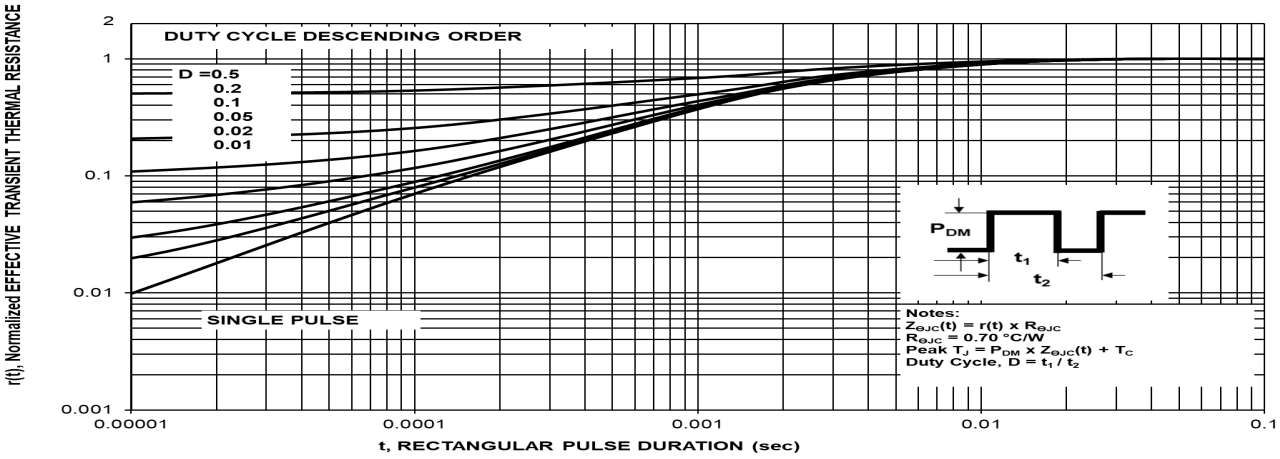
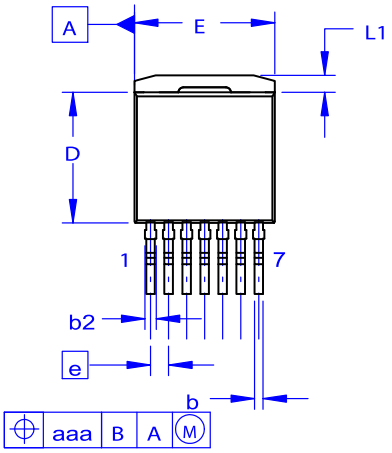
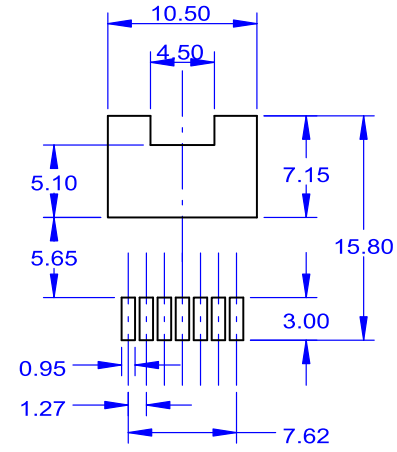


Figure 13. Junction−to−Case Transient Thermal Response Curve

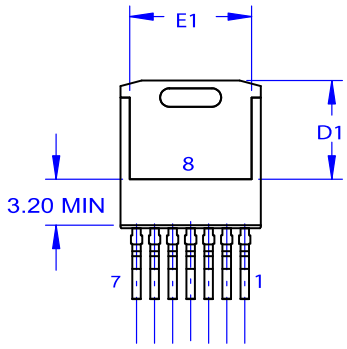
PACKAGE DIMENSIONS

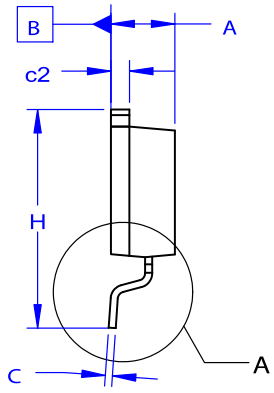
D²PAK7 (TO−263−7L HV)
CASE 418BJ
ISSUE A





LAND PATTERN RECOMMENDATION

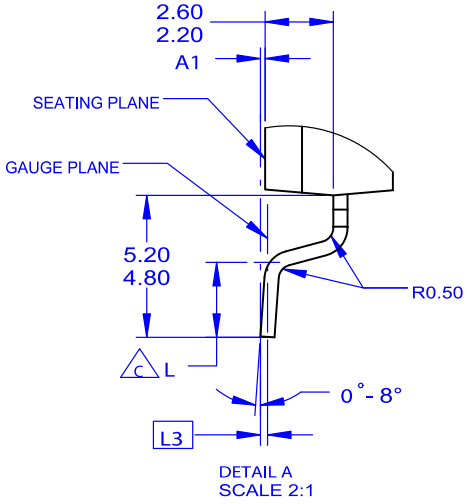




NOTES:

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	6.75	6.95	7.15
E	9.70	9.90	10.20
E1	7.70	7.90	8.10
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



DETAIL A
SCALE 2:1

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent−Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative