MOSFET - Power, Single N-Channel, SUPERFET®, FAST, TOLL-4L

600 V, 61 mΩ, 41 A

NTBL061N60S5H

$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
600 V	61 mΩ @ V_{GS}= 10 V	41 A

Description

The SUPERFET V MOSFET FAST series helps maximize system efficiency by the extremely low switching losses in hard switching application. The TOLL package offers improved thermal performance and excellent switching performance by providing a Kelvin Source configuration and lower parasitic source inductance.

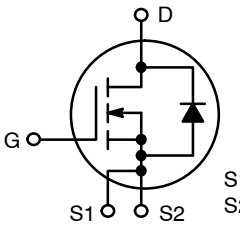
Features

- 650 V @ T_J = 150°C / Typ. $R_{DS(on)}$ = 48.8 mΩ
- 100% Avalanche Tested
- Pb−Free, Halogen Free / BFR Free and RoHS Compliant

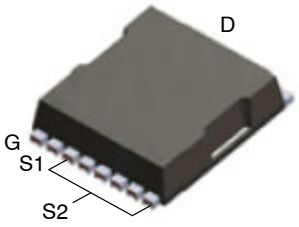
Applications

- Telecom / Server Power Supplies
- EV Charger / UPS / Solar / Industrial Power Supplies

N−CHANNEL MOSFET



S1: Driver Source
S2: Power Source



H−PSOF8L
CASE 100DC

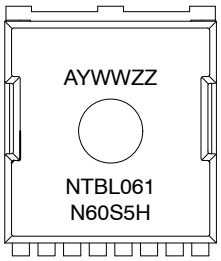
MAXIMUM RATINGS (T_J = 25°C, unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain−to−Source Voltage		V_{DSS}	600	V
Gate−to−Source Voltage	DC	V_{GS}	±30	V
	AC (f > 1 Hz)		±30	
Continuous Drain Current	T_C = 25°C	I_D	41	A
	T_C = 100°C		25	
Power Dissipation	T_C = 25°C	P_D	250	W
Pulsed Drain Current (Note 1)	T_C = 25°C	I_{DM}	144	A
Pulsed Source Current (Body Diode) (Note 1)		I_{SM}	144	
Operating Junction and Storage Temperature Range		T_J, T_{STG}	−55 to +150	°C
Source Current (Body Diode)		I_S	41	A
Single Pulse Avalanche Energy	I_L = 6.7 A, R_G = 25 Ω	E_{AS}	376	mJ
Avalanche Current		I_{AS}	6.7	A
Repetitive Avalanche Energy (Note 1)		E_{AR}	2.5	mJ
MOSFET dv/dt		dv/dt	120	V/ns
Peak Diode Recovery dv/dt (Note 2)			20	
Lead Temperature for Soldering Purposes (1/8″ from case for 10 seconds)		T_L	260	°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. Repetitive rating: pulse−width limited by maximum junction temperature.
2. I_{SD} ≤ 20.5 A, di/dt ≤ 200 A/μs, V_{DD} ≤ 400 V, starting T_J = 25°C.

MARKING DIAGRAM



A	= Assembly Location
Y	= Year
WW	= Work Week
ZZ	= Assembly Lot Code
NTBL061N60S5H	= Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping†
NTBL061N60S5H	H−PSOF8L	2000 / 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, 2022

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.5	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	43	

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 1 mA, T_J = 25°C	600	–	–	V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	I_D = 10 mA, Referenced to 25°C	–	630	–	mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 600 V, T_J = 25°C	–	–	2	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = ±30 V, V_{DS} = 0 V	–	–	±100	nA
ON CHARACTERISTICS						
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 20.5 A, T_J = 25°C	–	48.8	61	mΩ
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS} = V_{DS}, I_D = 4.4 mA, T_J = 25°C	2.7	–	4.3	V
Forward Trans−conductance	g_{FS}	V_{DS} = 20 V, I_D = 20.5 A	–	42.2	–	S
CHARGES, CAPACITANCES & GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{DS} = 400 V, V_{GS} = 0 V, f = 250 kHz	–	4156	–	pF
Output Capacitance	C_{OSS}		–	59.4	–	
Time Related Output Capacitance	$C_{OSS(tr.)}$	I_D = Constant, V_{DS} = 0 V to 400 V, V_{GS} = 0 V	–	933	–	
Energy Related Output Capacitance	$C_{OSS(er.)}$	V_{DS} = 0 V to 400 V, V_{GS} = 0 V	–	99.8	–	
Total Gate Charge	$Q_{G(tot)}$	V_{DD} = 400 V, I_D = 20.5 A, V_{GS} = 10 V	–	73.1	–	nC
Gate−to−Source Charge	Q_{GS}		–	20.1	–	
Gate−to−Drain Charge	Q_{GD}		–	18.5	–	
Gate Resistance	R_G	f = 1 MHz	–	0.68	–	Ω
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{d(ON)}$	V_{GS} = 0/10 V, V_{DD} = 400 V, I_D = 20.5 A, R_G = 4.7 Ω	–	25.3	–	ns
Rise Time	t_r		–	7.59	–	
Turn-Off Delay Time	$t_{d(OFF)}$		–	75.2	–	
Fall Time	t_f		–	2.54	–	
SOURCE-TO−DRAIN DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_{SD} = 20.5 A, T_J = 25°C	–	–	1.2	V
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, I_{SD} = 20.5 A, dI/dt = 100 A/μs, V_{DD} = 400 V	–	416	–	ns
Reverse Recovery Charge	Q_{RR}		–	7386	–	nC

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.

SUPERFET is a registered trademark of Semiconductor Components Industries, LLC dba “**onsemi**” or its affiliates and/or subsidiaries in the United States and/or other countries.

TYPICAL CHARACTERISTICS

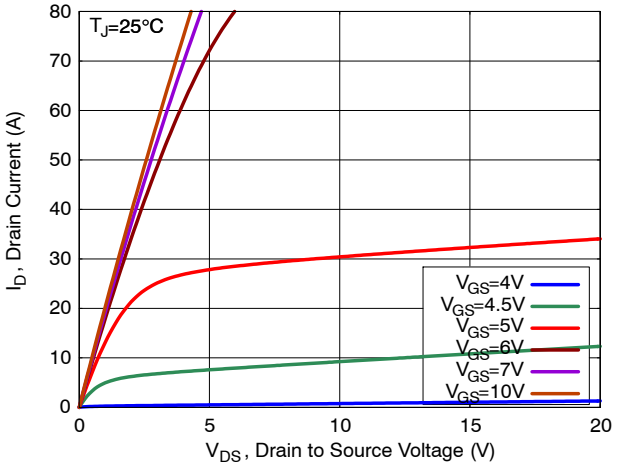


Figure 1. On−Region Characteristics

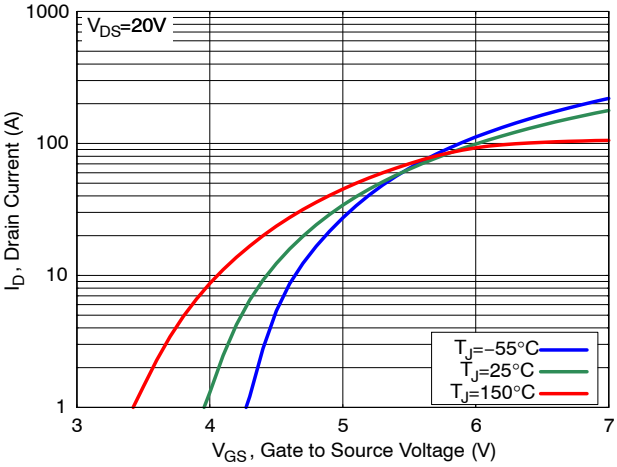


Figure 2. Transfer Characteristics

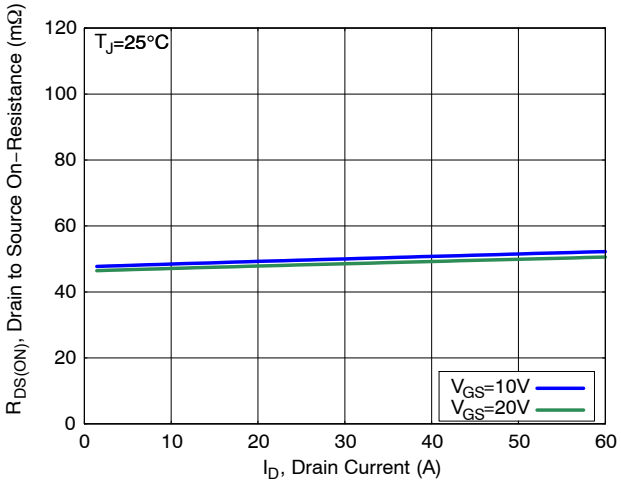


Figure 3. On−Resistance Variation vs. Drain Current and Gate Voltage

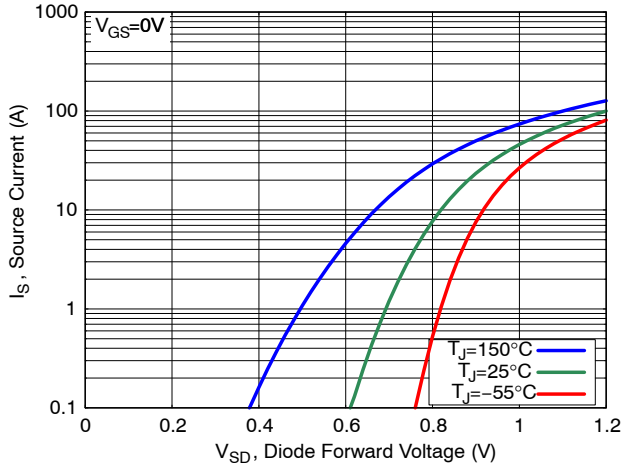


Figure 4. Diode Forward Voltage vs. Source Current

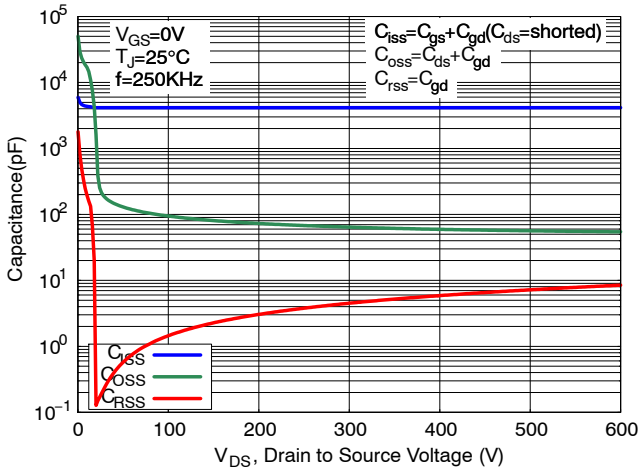


Figure 5. Capacitance Characteristics

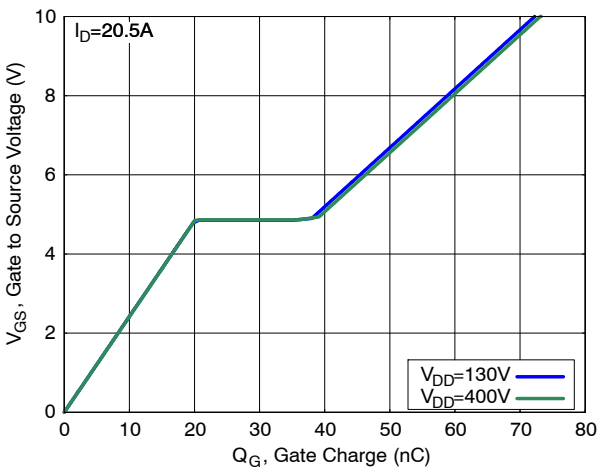


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS

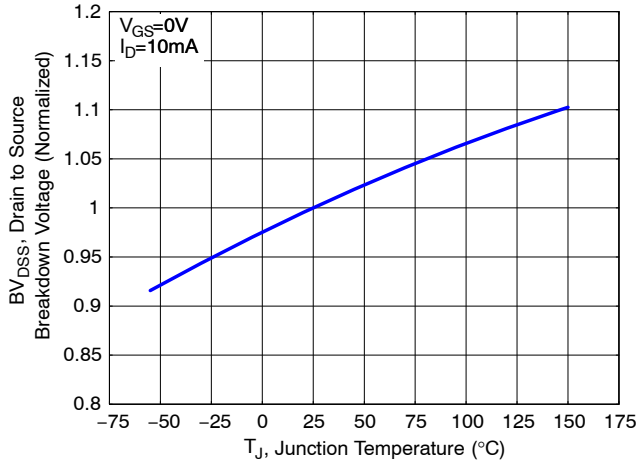


Figure 7. Breakdown Voltage Variation vs. Temperature

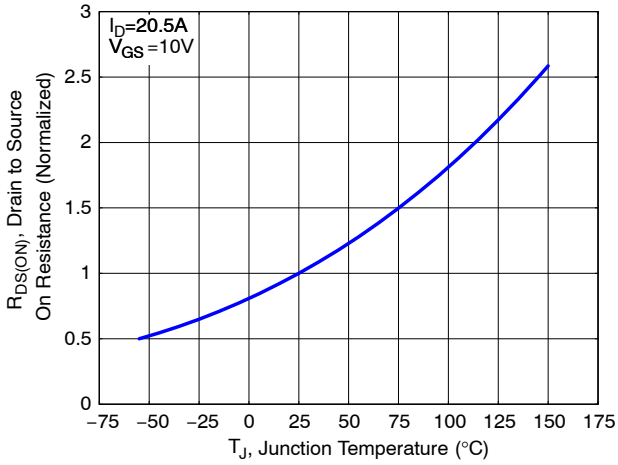


Figure 8. On−Resistance Variation vs. Temperature

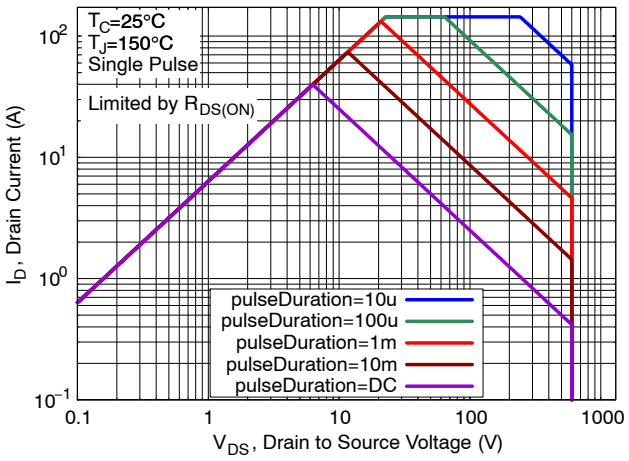


Figure 9. Maximum Safe Operating Area

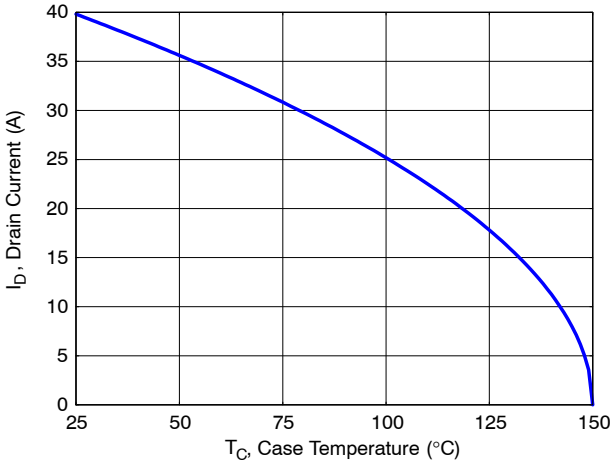


Figure 10. Maximum Drain Current vs. Case Temperature

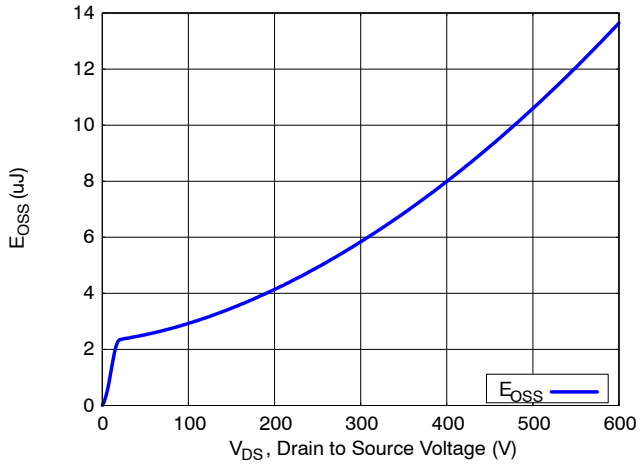


Figure 11. Eoss vs. Drain−to−Source Voltage

TYPICAL CHARACTERISTICS

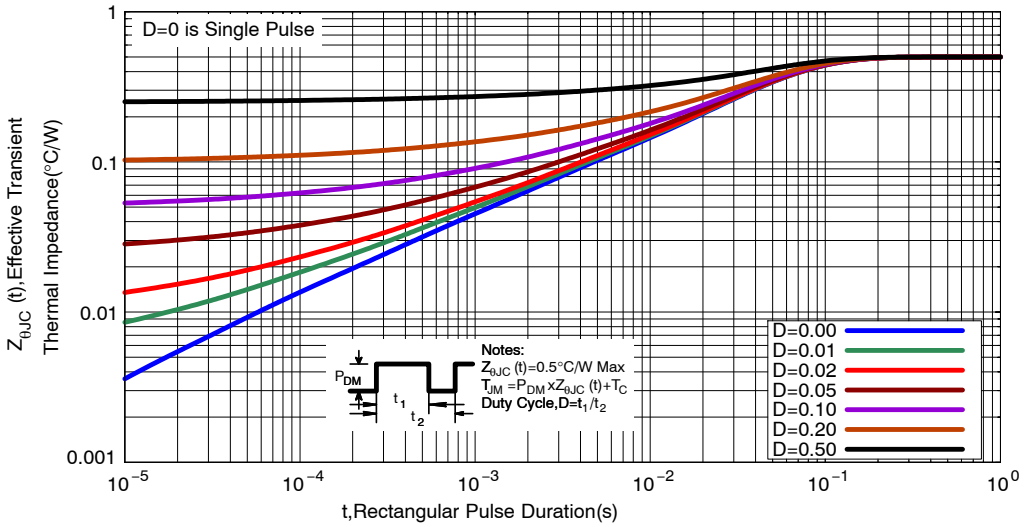
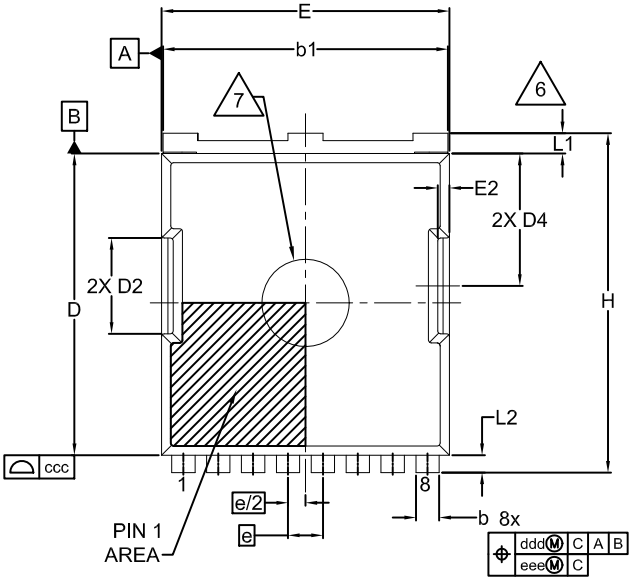


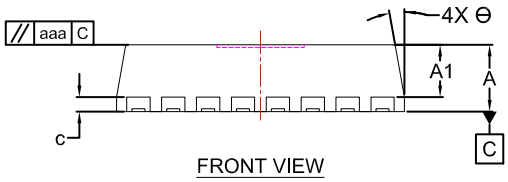
Figure 12. Transient Thermal Impedance

PACKAGE DIMENSIONS

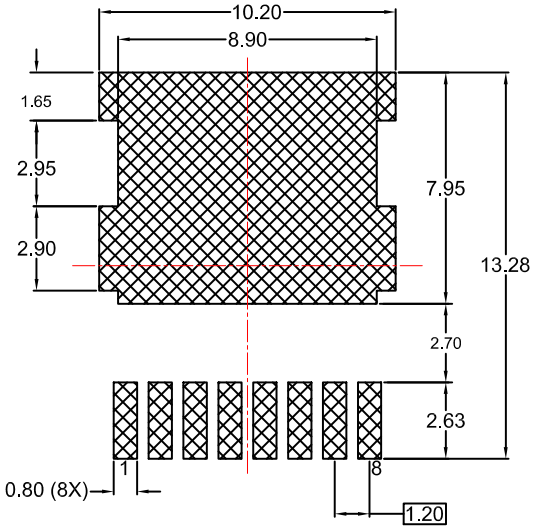
H−PSOF8L 9.90x11.68, 1.20P
CASE 100DC
ISSUE O



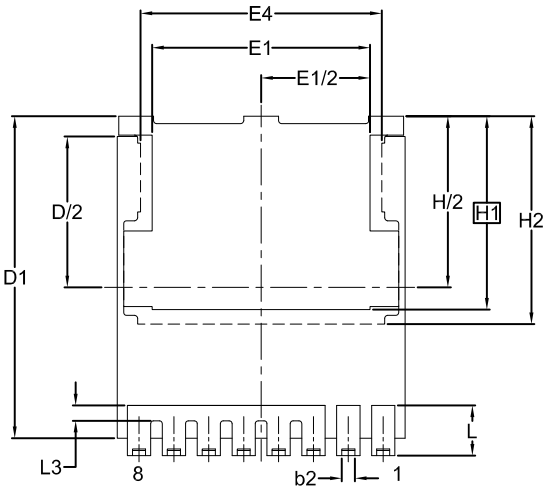
TOP VIEW



FRONT VIEW



RECOMMENDED LAND PATTERN



BOTTOM VIEW

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	2.20	2.30	2.40
A1	1.70	1.80	1.90
b	0.70	0.80	0.90
b1	9.70	9.80	9.90
b2	0.35	0.45	0.55
c	0.40	0.50	0.60
D	10.28	10.38	10.48
D1	10.98	11.08	11.18
D2	3.20	3.30	3.40
D/2	5.09	5.19	5.29
D4	4.45	4.55	4.65
E	9.80	9.90	10.00
E1	7.40	7.50	7.60
E2	0.30	0.40	0.50
E4	8.20	8.30	8.40
e	1.20 BSC		
H	11.58	11.68	11.78
H1	6.66 BSC		
H2	7.05	7.15	7.25
H/2	5.79	5.89	5.99
L	1.63	1.73	1.83
L1	0.60	0.70	0.80
L2	0.50	0.60	0.70
L3	0.43	0.53	0.63
Θ	10° REF.		
aaa	0.20		
ccc	0.20		
ddd	0.25		
eee	0.20		

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLEMETERS.
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

onsemi, ONSEMI , and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent−Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as−is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** 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 **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** 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. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** 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 **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** 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 **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** 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:
Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

◊