

# NTLJD2105L

## Power MOSFET

### 8 V, 4.3 A, $\mu$ Cool™ High Side Load Switch with Level Shift, 2x2 mm WDFN Package

#### Features

- WDFN 2x2 mm Package with Exposed Drain Pads Offers Excellent Thermal Performance
- Low  $R_{DS(on)}$  P-Channel Load Switch with N-channel MOSFET for Level Shift
- N Channel Operated at 1.5 V Gate Drive Voltage Level
- P Channel Operated at 1.5 V Supply Voltage
- Same Footprint as SC88
- Low Profile (<0.8 mm) Allows it to Fit Easily into Extremely Thin Environments
- ESD Protection
- These are Pb-Free Devices

#### Applications

- High Side Load Switch with Level Shift
- Optimized for Power Management in Ultra Portable Equipment

#### MOSFET(Q2) MAXIMUM RATINGS

( $T_J = 25^\circ\text{C}$  unless otherwise stated)

Parameter		Symbol	Value	Unit	
Q2 Input Voltage ( $V_{DS}$ , P-Channel)		$V_{IN}$	8	V	
Q1 On/Off Voltage ( $V_{GS}$ , N-Channel)		$V_{ON/OFF}$	6	V	
Continuous Load Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$I_L$	4.3	A
		$T_A = 85^\circ\text{C}$		3.1	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	1.56	W
Continuous Load Current (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	$I_L$	2.5	A
		$T_A = 85^\circ\text{C}$		1.8	
Power Dissipation (Note 2)		$T_A = 25^\circ\text{C}$	$P_D$	0.52	W
Pulsed Load Current	$t_p = 10 \mu\text{s}$	$I_{LM}$	20	A	
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$	
Source Current (Body Diode) (Note 2)		$I_S$	-2.7	A	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	260	$^\circ\text{C}$	

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

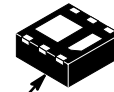
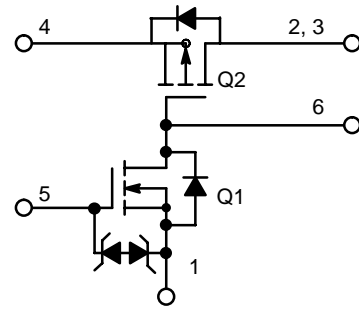
1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces)
2. Surface-mounted on FR4 board using the minimum recommended pad size.



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$V_{INMAX}$	$R_{DS(on)} MAX$	$I_L MAX$
20 V	50 m $\Omega$ @ 4.5 V	4.3 A
	60 m $\Omega$ @ 2.5 V	
	80 m $\Omega$ @ 1.8 V	
	115 m $\Omega$ @ 1.5 V	



Pin 1

WDFN6  
CASE 506AZ

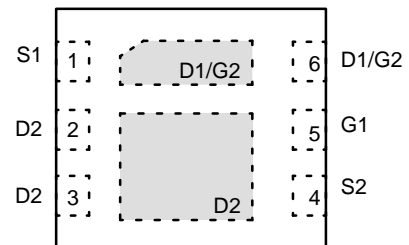
#### MARKING DIAGRAM



JN = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### PIN CONNECTIONS



(Top View)

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# NTLJD2105L

## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	80	$^{\circ}\text{C}/\text{W}$
Junction-to-Ambient – $t \leq 5$ s (Note 3)	$R_{\theta JA}$	38	$^{\circ}\text{C}/\text{W}$
Junction-to-Ambient – Steady State Min Pad (Note 4)	$R_{\theta JA}$	180	$^{\circ}\text{C}/\text{W}$

3. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).  
 4. Surface-mounted on FR4 board using the minimum recommended pad size.

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Q2 Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0$ V, $I_D = 250$ $\mu\text{A}$	-8.0			V
Q2 Forward Leakage Current	$I_{FL}$	$V_{ON/OFF} = 0$ V, $V_{IN} = 8.0$ V	$T_J = 25^{\circ}\text{C}$		0.1	$\mu\text{A}$
			$T_J = 85^{\circ}\text{C}$		1	
Q1 Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0$ V, $V_{GS1} = \pm 6$ V			$\pm 100$	nA
Q1 Diode Forward On-Voltage	$V_{SD}$	$I_S = -1.0$ A, $V_{GS1} = 0$ V		-0.8	-1.1	V

### ON CHARACTERISTICS

Q1 ON/OFF Voltage	$V_{ON/OFF}$		1.5		8.0	
Q1 Gate Threshold Voltage	$V_{GS1(TH)}$	$V_{GS1} = V_{DS1}$ , $I_D = 250$ $\mu\text{A}$	0.40		1.0	V
Q2 Input Voltage	$V_{IN}$		1.8		8.0	V
Q2 Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{IN} = 4.5$ V, $I_L = 4.0$ A		33	50	m $\Omega$
		$V_{IN} = 2.5$ V, $I_L = 3.0$ A		40	60	
		$V_{IN} = 1.8$ V, $I_L = 1.7$ A		60	80	
		$V_{IN} = 1.5$ V, $I_L = 1.2$ A		75	115	
Q2 Load Current	$I_L$	$V_{DROP} \leq 0.2$ V, $V_{IN} = 2.5$ V, $V_{ON/OFF} = 1.5$ V	1.0			A
		$V_{DROP} \leq 0.3$ V, $V_{IN} = 1.8$ V, $V_{ON/OFF} = 1.5$ V	1.0			

# NTLJD2105L

## TYPICAL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

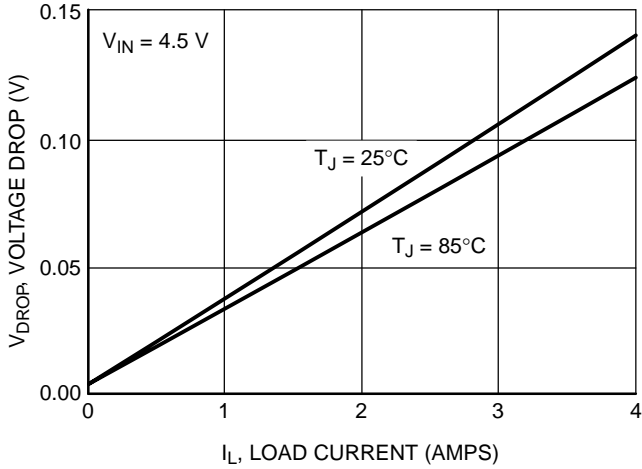


Figure 1. Voltage Drop versus Load Current @  $V_{IN} = 4.5\text{ V}$

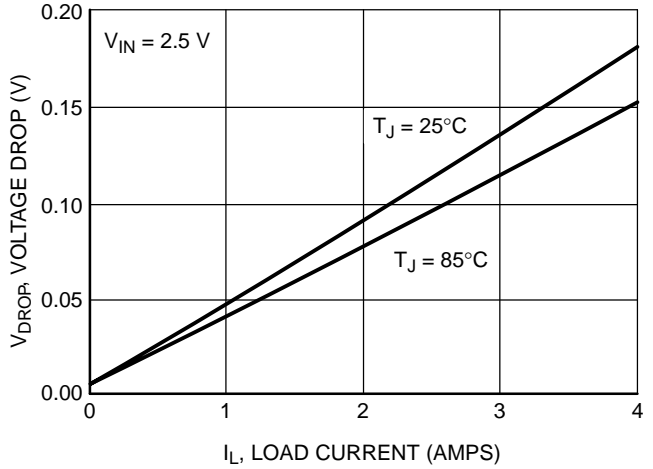


Figure 2. Voltage Drop versus Load Current @  $V_{IN} = 2.5\text{ V}$

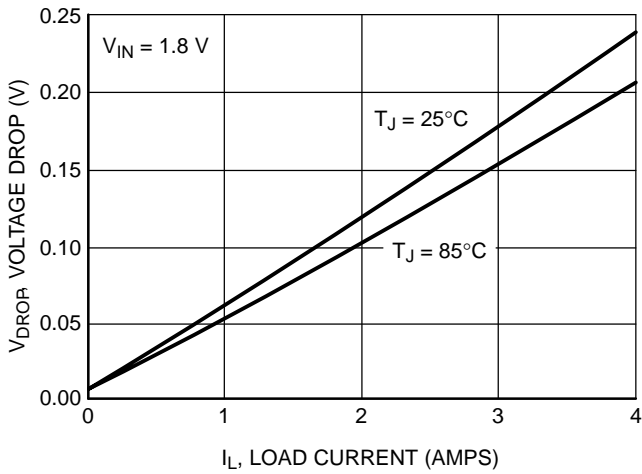


Figure 3. Voltage Drop versus Load Current @  $V_{IN} = 1.8\text{ V}$

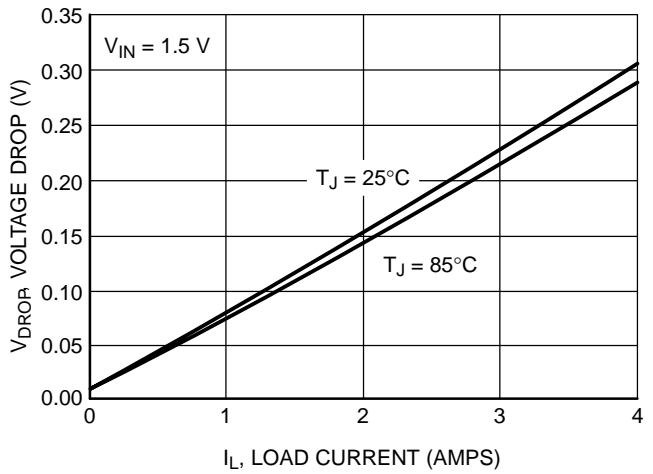
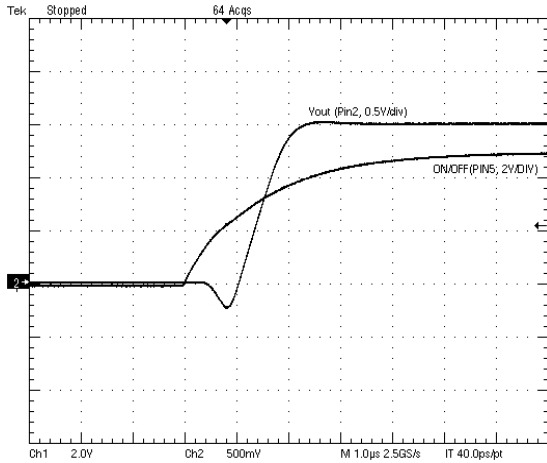


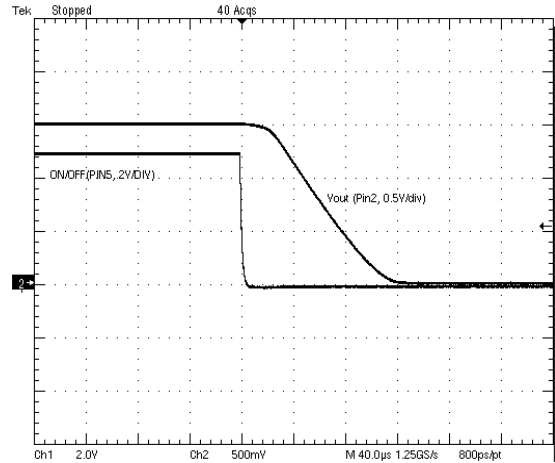
Figure 4. Voltage Drop versus Load Current @  $V_{IN} = 1.5\text{ V}$

# NTLJD2105L

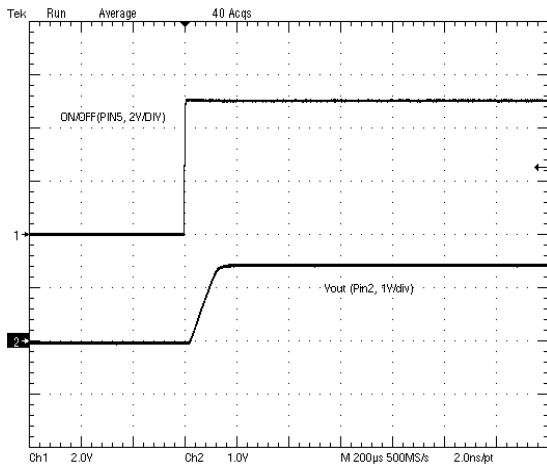
## TYPICAL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)



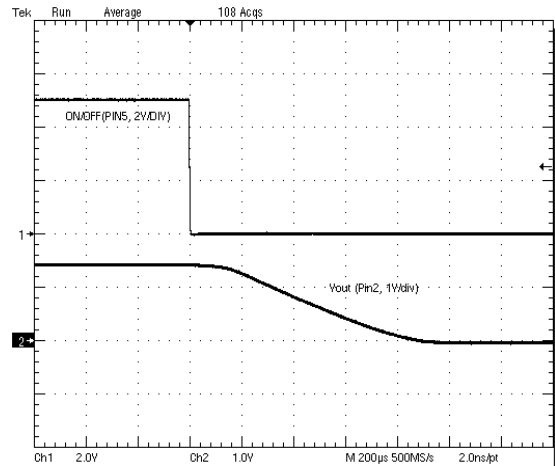
**Figure 5. Turn-on**  
 $(V_{in} = 1.5\text{ V}, R_L = 3\ \Omega, R_1 = 1\ \text{k}\Omega, R_2 = 0, C_1 = 47\ \text{nF})$



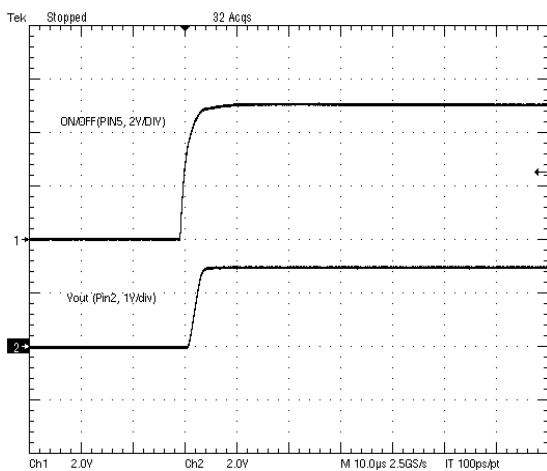
**Figure 6. Turn-off**  
 $(V_{in} = 1.5\text{ V}, R_L = 3\ \Omega, R_1 = 1\ \text{k}\Omega, R_2 = 0, C_1 = 47\ \text{nF})$



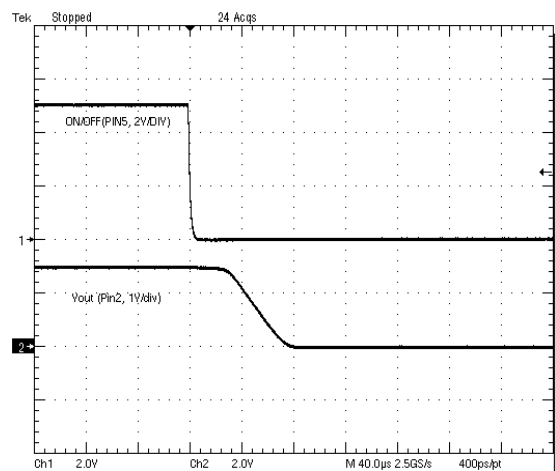
**Figure 7. Turn-on**  
 $(V_{in} = 1.5\text{ V}, R_L = 3\ \Omega, R_1 = 10\ \text{k}\Omega, R_2 = 1\ \text{k}\Omega, C_1 = 47\ \text{nF})$



**Figure 8. Turn-off**  
 $(V_{in} = 1.5\text{ V}, R_L = 3\ \Omega, R_1 = 10\ \text{k}\Omega, R_2 = 1\ \text{k}\Omega, C_1 = 47\ \text{nF})$



**Figure 9. Turn-on**  
 $(V_{in} = 3\text{ V}, R_L = 3\ \Omega, R_1 = 10\ \text{k}\Omega, R_2 = 1\ \text{k}\Omega, C_1 = 47\ \text{nF})$



**Figure 10. Turn-off**  
 $(V_{in} = 3\text{ V}, R_L = 3\ \Omega, R_1 = 10\ \text{k}\Omega, R_2 = 1\ \text{k}\Omega, C_1 = 47\ \text{nF})$

# NTLJD2105L

## TYPICAL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

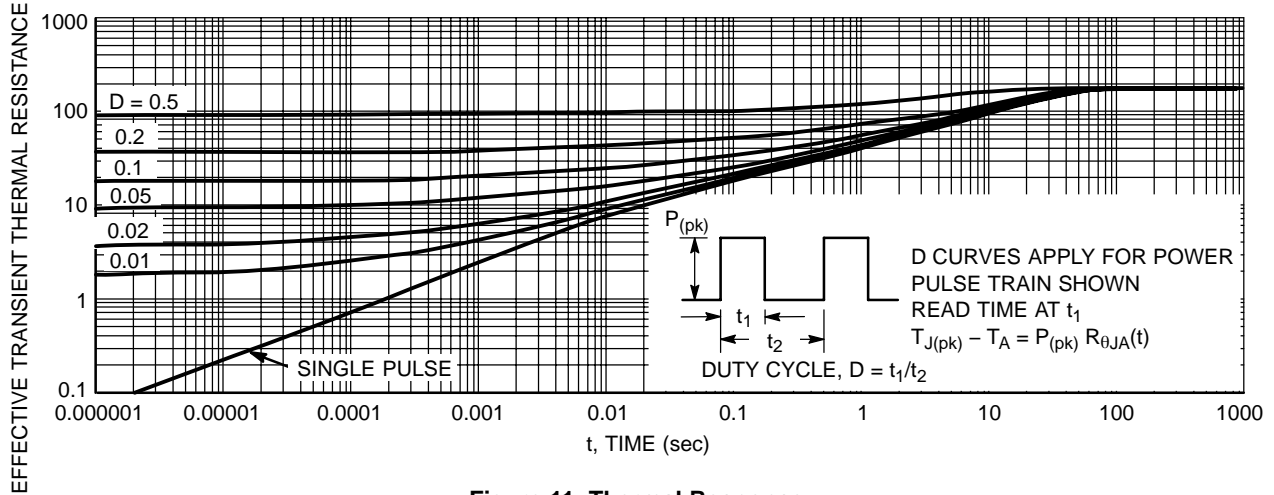


Figure 11. Thermal Response

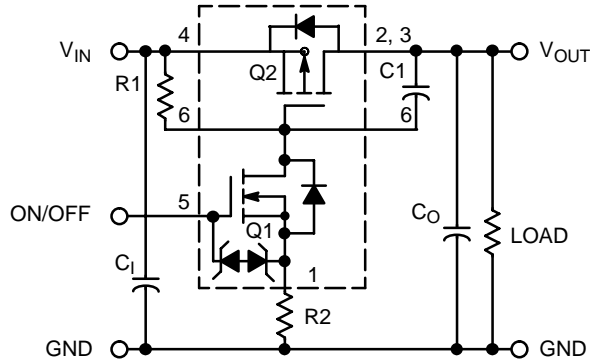


Figure 12. Load Switch Application

Components	Description	Value
R1	Pull-up Resistor	Typical 10 kΩ to 1.0 MΩ*
R2	Optional Slew-Rate Control	Typical 0 kΩ to 100 kΩ*
C <sub>0</sub> , C <sub>1</sub>	Output Capacitance	Usually < 1.0 μF
C1	Optional In-Rush Current Control	Typical ≤ 1000 pF

\*Minimum R1 value should be at least 10 x R2 to ensure Q1 turn-on.

### ORDERING INFORMATION

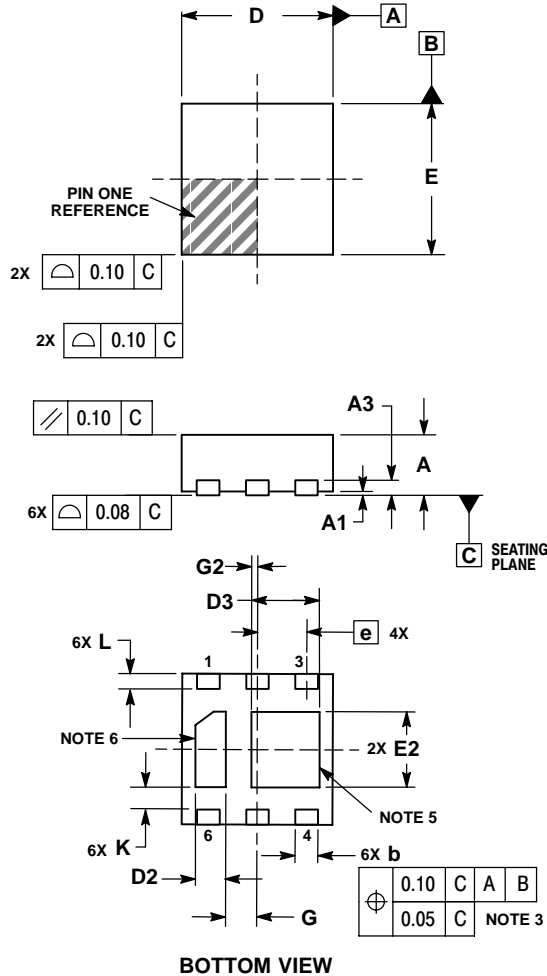
Device	Package	Shipping†
NTLJD2105LTBG	WDFN6 (Pb-Free)	3000 / Tape & Reel

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

# NTLJD2105L

## PACKAGE DIMENSIONS

WDFN6, 2x2  
CASE 506AZ-01  
ISSUE A

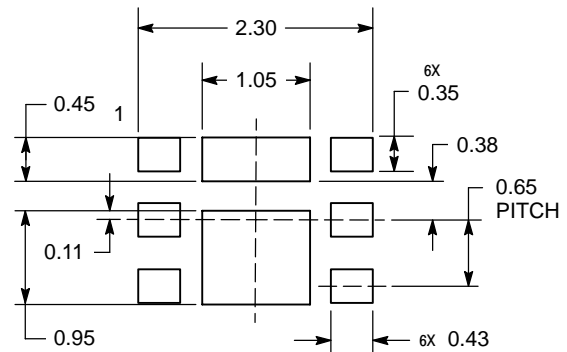


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
5. PINS 2 & 3 CONNECTED TO LARGE FLAG.
6. PIN 6 CONNECTED TO SMALL FLAG.

MILLIMETERS		
DIM	MIN	MAX
A	0.70	0.80
A1	0.00	0.05
A3	0.20 REF	
b	0.25	0.35
D	2.00 BSC	
D2	0.30	0.50
D3	0.80	1.00
E	2.00 BSC	
E2	0.90	1.10
e	0.65 BSC	
G	0.41 REF	
G2	0.085 REF	
K	0.25 REF	
L	0.20	0.30

**SOLDERING FOOTPRINT\***



DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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