

# 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	$^\circ\text{C}$	

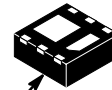
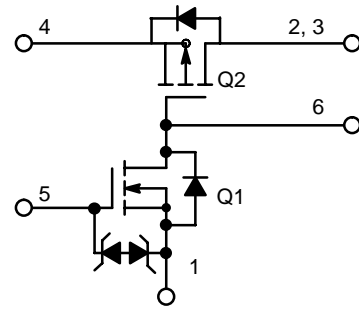
1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces)
2. Surface-mounted on FR4 board using the minimum recommended pad size.



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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

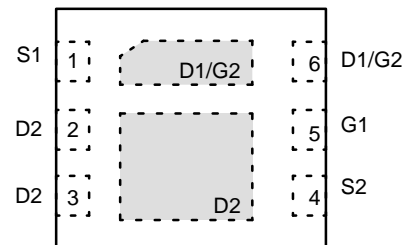
WDFN6  
CASE 506AZ

#### MARKING DIAGRAM



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

#### 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)

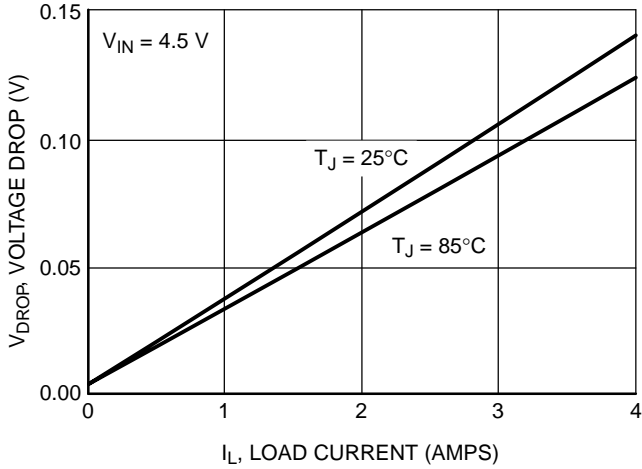


Figure 1. Voltage Drop versus Load Current @  $V_{IN} = 4.5\text{ V}$

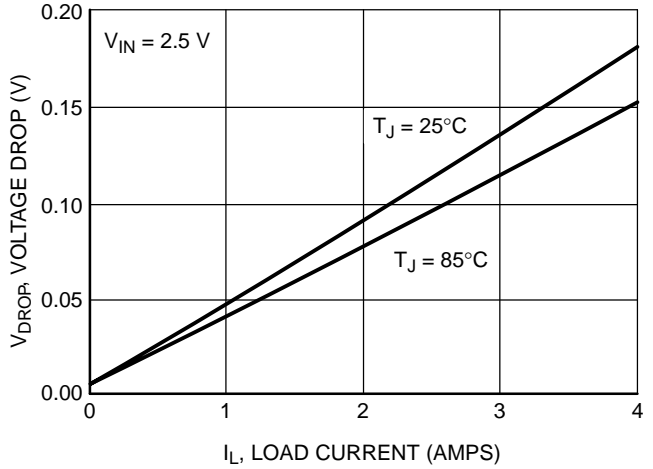


Figure 2. Voltage Drop versus Load Current @  $V_{IN} = 2.5\text{ V}$

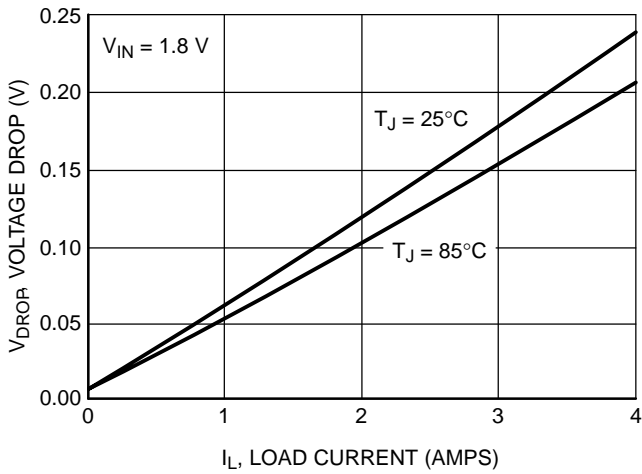


Figure 3. Voltage Drop versus Load Current @  $V_{IN} = 1.8\text{ V}$

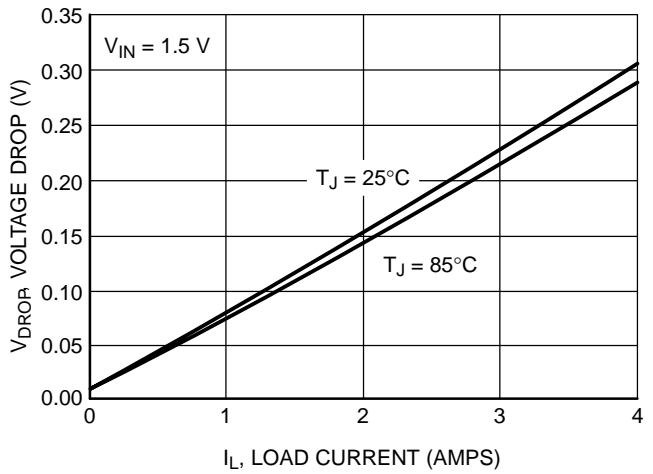
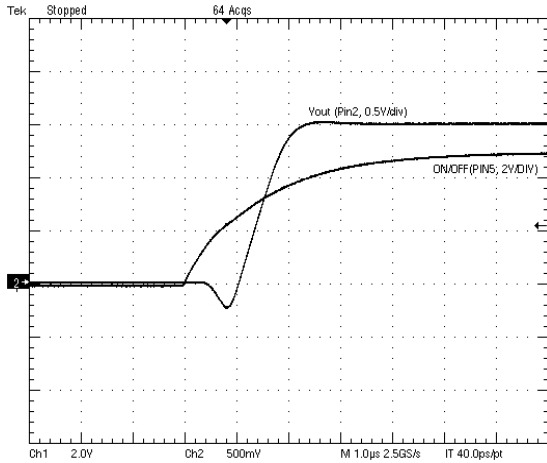


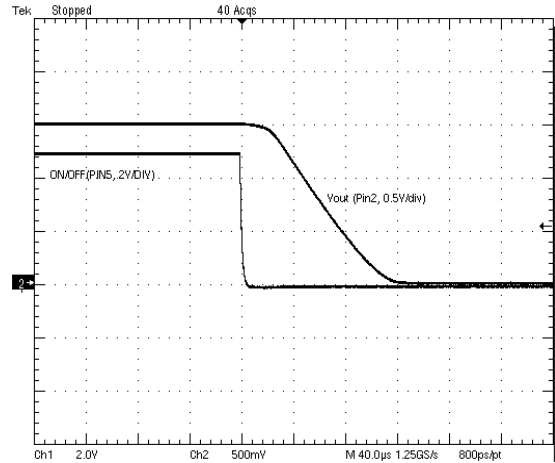
Figure 4. Voltage Drop versus Load Current @  $V_{IN} = 1.5\text{ V}$

# NTLJD2105L

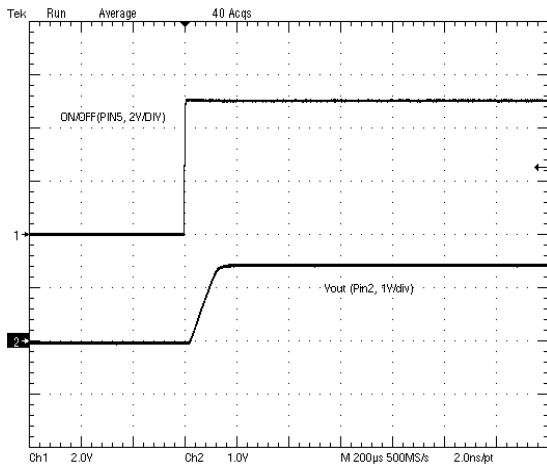
## TYPICAL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)



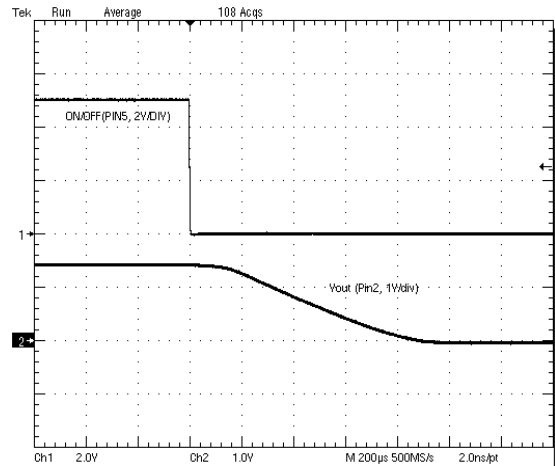
**Figure 5. Turn-on**  
 $(V_{in} = 1.5\text{ V}, R_L = 3\ \Omega, R_1 = 1\ \text{k}\Omega, R_2 = 0, C_1 = 47\ \text{nF})$



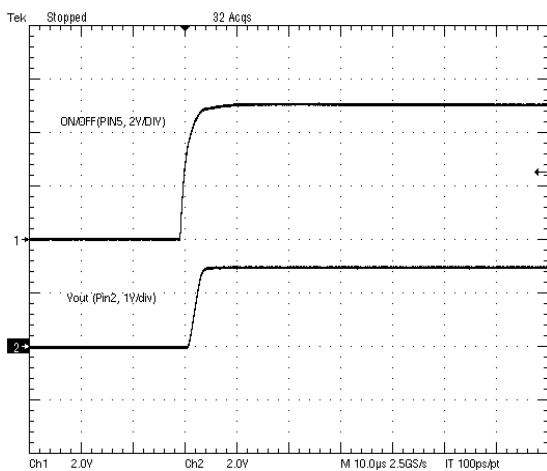
**Figure 6. Turn-off**  
 $(V_{in} = 1.5\text{ V}, R_L = 3\ \Omega, R_1 = 1\ \text{k}\Omega, R_2 = 0, C_1 = 47\ \text{nF})$



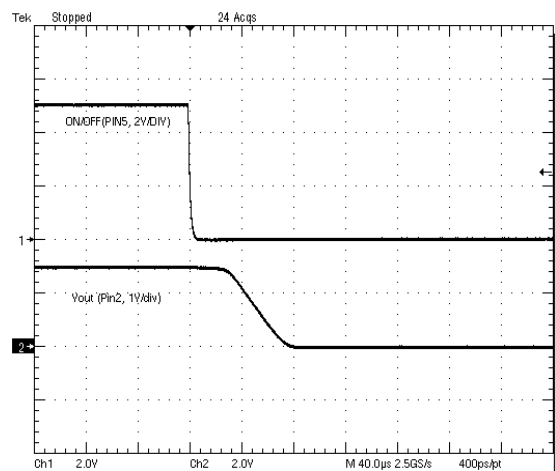
**Figure 7. Turn-on**  
 $(V_{in} = 1.5\text{ V}, R_L = 3\ \Omega, R_1 = 10\ \text{k}\Omega, R_2 = 1\ \text{k}\Omega, C_1 = 47\ \text{nF})$



**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)

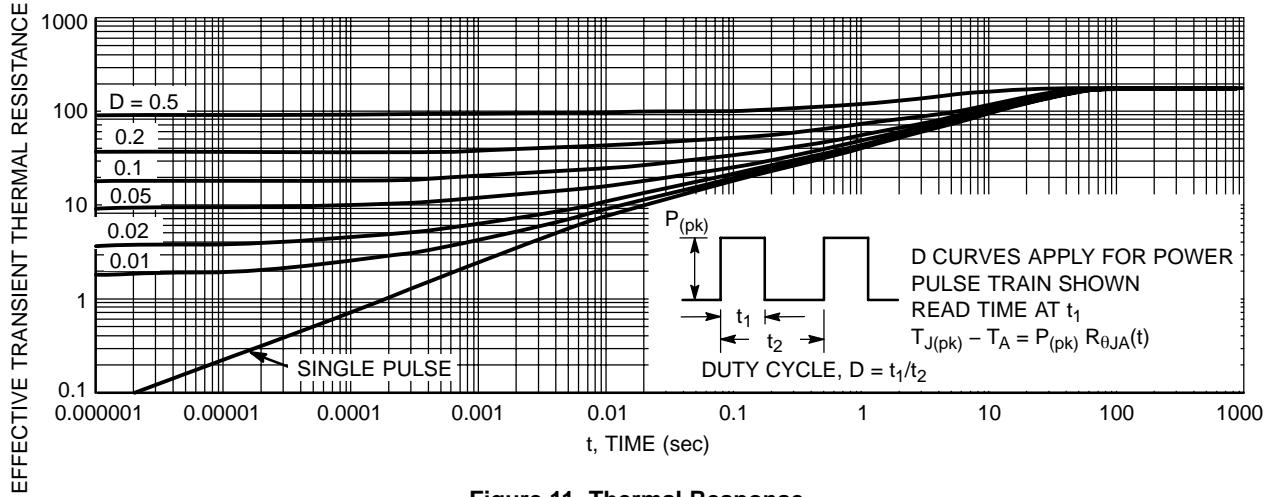


Figure 11. Thermal Response

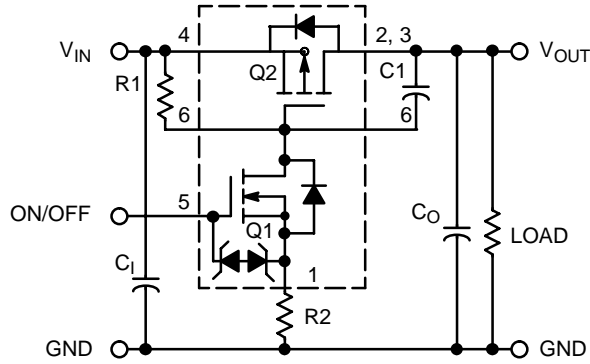


Figure 12. Load Switch Application

Components	Description	Value
R1	Pull-up Resistor	Typical 10 k $\Omega$ to 1.0 $\Omega$ *
R2	Optional Slew-Rate Control	Typical 0 k $\Omega$ to 100 k $\Omega$ *
$C_0, C_1$	Output Capacitance	Usually < 1.0 $\mu\text{F}$
C1	Optional In-Rush Current Control	Typical $\leq$ 1000 pF

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

### ORDERING INFORMATION

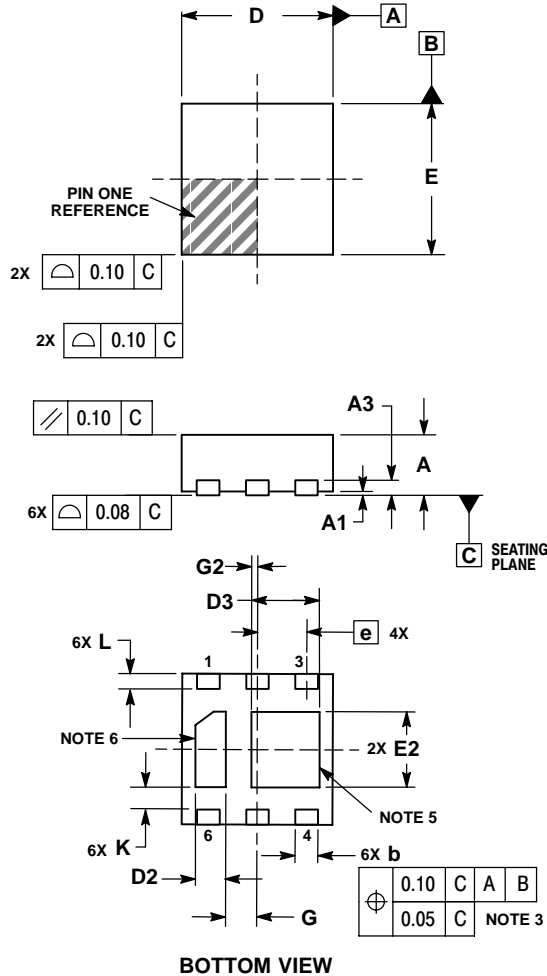
Device	Package	Shipping <sup>†</sup>
NTLJD2105LTBG	WDFN6 (Pb-Free)	3000 / Tape & Reel

<sup>†</sup>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

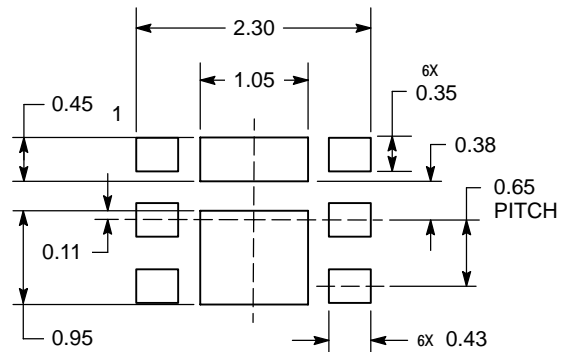


**NOTES:**

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.

DIM	MILLIMETERS	
	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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