

# 4-Bit Dual-Supply Level Translator

## NL3V4T244, NL3V4T240, NL3V4T3144

The NL3V4T244 / NL3V4T240 / NL3V4T3144 are 4-bit configurable dual-supply level translators with 3-state outputs. The A- and B- ports are designed to track two different power supply rails,  $V_{CCA}$  and  $V_{CCB}$  respectively. Both supply rails are configurable from 0.9 V to 3.6 V allowing universal voltage level translation between the A- to B- ports.

The NL3V4T244 is a 4-bit level translator that allows non-inverting translations from A to B ports. The NL3V4T240 is a 4-bit level translator that allows inverting translations from A to B ports. The NL3V4T3144 is a 4-bit level translator that allows 3-bits of non-inverting translations from A to B ports and 1 bit of non-inverting translation from B to A.

The output enable pin ( $\overline{OE}$ ), when High, disables all the output ports by putting them in 3-state. The  $\overline{OE}$  pin is designed to track  $V_{CCA}$ .

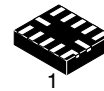
### Features

- Wide  $V_{CCA}$  and  $V_{CCB}$  Operating Range: 0.9 V to 3.6 V
- Balanced Output Drive:  $\pm 24$  mA @ 3.0 V
- High-Speed w/ Balanced Propagation Delay: 2.8 ns max at 3.0 to 3.6 V
- Input/Output Pins OVT to 3.6 V
- Non-preferential  $V_{CC}$  Sequencing
- Outputs at 3-State until Active  $V_{CC}$  is Reached
- Partial Power-Off Protection
- Outputs Switch to 3-State with either  $V_{CC}$  at GND
- Typical Max Data Rates:
  - 380 Mbps ( $\geq 1.8$ -V to 3.3-V Translation)
  - 200 Mbps ( $\geq 1.1$ -V to [1.8-V, 2.5-V, 3.3-V] Translation)
  - 150 Mbps ( $\geq 1.1$ -V to 1.5-V Translation)
  - 100 Mbps ( $\geq 1.1$ -V to 1.2-V Translation)
- Small Pb-Free Packaging: TSSOP-14, SOIC-14, UQFN12
- -Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable\*
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

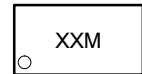
### Typical Applications

- Mobile Phones, PDAs, Other Portable Devices
- Automotive
- Industrial

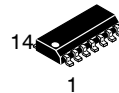
### MARKING DIAGRAMS



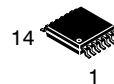
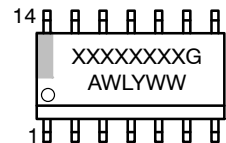
UQFN12  
MU SUFFIX  
CASE 523AE



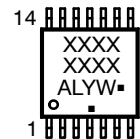
XX = Specific Device Code  
M = Date Code



SOIC-14  
D SUFFIX  
CASE 751A



TSSOP-14  
DT SUFFIX  
CASE 948G



A = Assembly Location  
WL, L = Wafer Lot  
Y = Year  
WW, W = Work Week  
G or ■ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 9 of this data sheet.

# NL3V4T244, NL3V4T240, NL3V4T3144

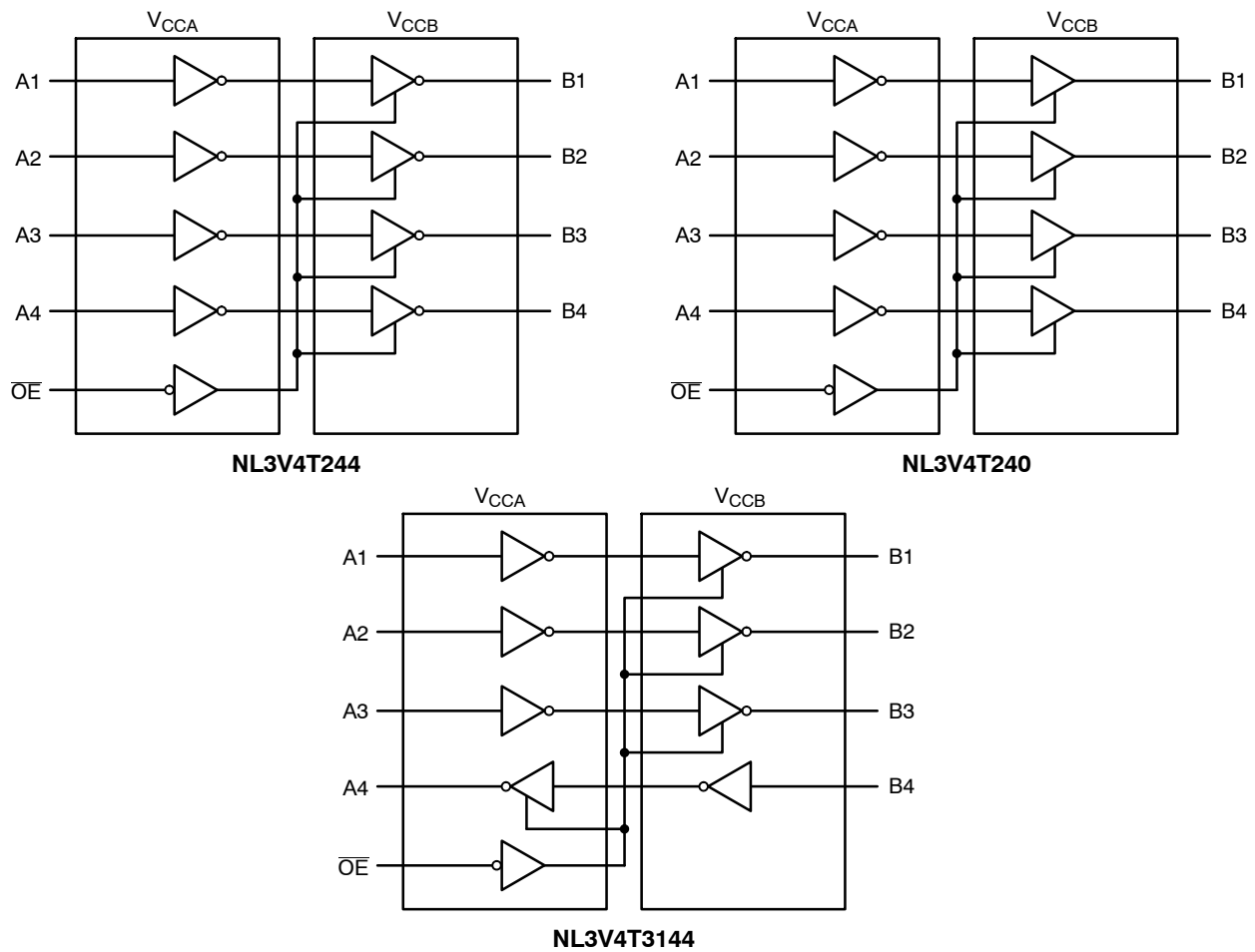


Figure 1. Logic Diagrams

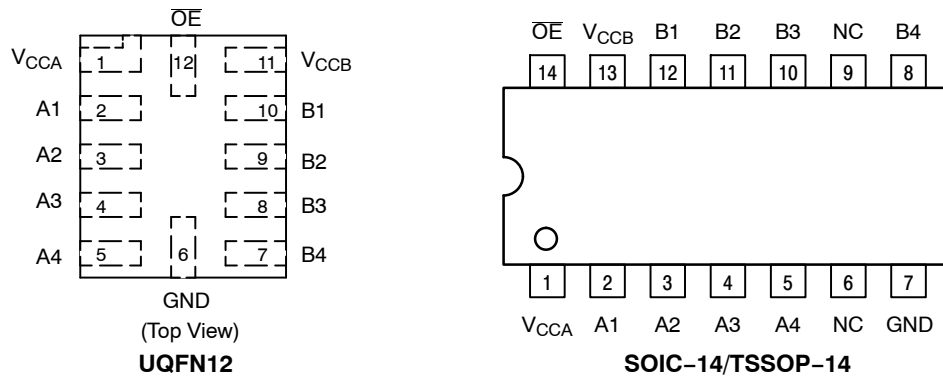


Figure 2. Pin Assignments (Top View)

## NL3V4T244, NL3V4T240, NL3V4T3144

FUNCTION TABLE – NL3V4T244

| Inputs          |       | Output  |
|-----------------|-------|---------|
| $\overline{OE}$ | $A_n$ | $B_n$   |
| L               | L     | L       |
| L               | H     | H       |
| H               | X     | 3-State |

FUNCTION TABLE – NL3V4T240

| Inputs          |       | Output  |
|-----------------|-------|---------|
| $\overline{OE}$ | $A_n$ | $B_n$   |
| L               | L     | H       |
| L               | H     | L       |
| H               | X     | 3-State |

FUNCTION TABLE – NL3V4T3144

| Inputs          |             | Output      |
|-----------------|-------------|-------------|
| $\overline{OE}$ | A1,A2,A3,B4 | B1,B2,B3,A4 |
| L               | L           | L           |
| L               | H           | H           |
| H               | X           | 3-State     |

PIN ASSIGNMENT – NL3V4T244, NL3V4T240

| PIN             | FUNCTION               |
|-----------------|------------------------|
| $V_{CCA}$       | A-Port DC Power Supply |
| $V_{CCB}$       | B-Port DC Power Supply |
| GND             | Ground                 |
| $\overline{OE}$ | Output Enable          |
| A1, A2, A3, A4  | Input Ports            |
| B1, B2, B3, B4  | Output Ports           |

PIN ASSIGNMENT – NL3V4T3144

| PIN             | FUNCTION               |
|-----------------|------------------------|
| $V_{CCA}$       | A-Port DC Power Supply |
| $V_{CCB}$       | B-Port DC Power Supply |
| GND             | Ground                 |
| $\overline{OE}$ | Output Enable          |
| A1, A2, A3, B4  | Input Ports            |
| B1, B2, B3, A4  | Output Ports           |

### Application Recommendations

During power-up and power-down, it is recommended that the  $\overline{OE}$  pin be connected to  $V_{CC}$  through pull-up resistors to ensure high impedance at the I/O ports.

# NL3V4T244, NL3V4T240, NL3V4T3144

## MAXIMUM RATINGS

| Symbol             | Rating                                                                     | Value                 | Condition               | Unit |
|--------------------|----------------------------------------------------------------------------|-----------------------|-------------------------|------|
| $V_{CCA}, V_{CCB}$ | DC Supply Voltage                                                          | -0.5 to +4.3          |                         | V    |
| $V_I$              | DC Input Voltage OE, A, B                                                  | -0.5 to +4.3          |                         | V    |
| $V_O$              | DC Output Voltage (Power Down Mode) A, B                                   | -0.5 to +4.3          | $V_{CCA} = V_{CCB} = 0$ | V    |
|                    | (3-State Mode) A, B                                                        | -0.5 to +4.3          |                         |      |
|                    | (Active Mode) A                                                            | -0.5 to $V_{CCA}+0.5$ |                         |      |
|                    | (Active Mode) B                                                            | -0.5 to $V_{CCB}+0.5$ |                         |      |
| $I_{IK}$           | DC Input Diode Current                                                     | -50                   | $V_I < \text{GND}$      | mA   |
| $I_{OK}$           | DC Output Diode Current                                                    | -50                   | $V_O < \text{GND}$      | mA   |
| $I_O$              | DC Output Source/Sink Current                                              | $\pm 50$              |                         | mA   |
| $I_{CC}$           | DC Supply Current Per Supply Pin                                           | $\pm 100$             |                         | mA   |
| $I_{GND}$          | DC Ground Current per Ground Pin                                           | $\pm 100$             |                         | mA   |
| $T_{STG}$          | Storage Temperature Range                                                  | -65 to +150           |                         | °C   |
| $\theta_{JA}$      | Thermal Resistance (Note 1)<br>SOIC-14<br>TSSOP-14<br>UQFN12               |                       | 116<br>150<br>143       | °C/W |
| $P_D$              | Power Dissipation in Still Air<br>SOIC-14<br>TSSOP-14<br>UQFN12            |                       | 1077<br>833<br>875      | mW   |
| MSL                | Moisture Sensitivity Level                                                 |                       | Level 1                 | -    |
| $F_R$              | Flammability Rating Oxygen Index: 28 to 34                                 |                       | UL 94 V-0 @ 0.125 in    | -    |
| $V_{ESD}$          | ESD Withstand Voltage (Note 2)<br>Human Body Model<br>Charged Device Model |                       | 2<br>1                  | kV   |
| $I_{LATCHUP}$      | Latchup Performance (Note 3)                                               |                       | $\pm 100$               | mA   |

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. Measured with minimum pad spacing on an FR4 board, using 76mm-by-114mm, 2-ounce copper trace no air flow per JESD51-7.
2. HBM tested to ANSI/ESDA/JEDEC JS-001-2017. CDM tested to EIA/JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued per JEDEC/JEP172A.
3. Tested to EIA/JESD78 Class II.

## RECOMMENDED OPERATING CONDITIONS

| Symbol                | Parameter                             | Min | Max       | Unit |
|-----------------------|---------------------------------------|-----|-----------|------|
| $V_{CCA}, V_{CCB}$    | Positive DC Supply Voltage            | 0.9 | 3.6       | V    |
| $V_I$                 | Input Voltage                         | GND | 3.6       | V    |
| $V_{IO}$              | Output Voltage (Power Down Mode) A, B | GND | 3.6       | V    |
|                       | (3-State Mode) A, B                   | GND | 3.6       |      |
|                       | (Active Mode) A                       | GND | $V_{CCA}$ |      |
|                       | (Active Mode) B                       | GND | $V_{CCB}$ |      |
| $T_A$                 | Operating Temperature Range           | -40 | +125      | °C   |
| $\Delta t / \Delta V$ | Input Transition Rise or Rate         | 0   | 5         | nS/V |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

# NL3V4T244, NL3V4T240, NL3V4T3144

## DC ELECTRICAL CHARACTERISTICS – INPUT VOLTAGES

| Symbol          | Parameter          | Test Conditions | Port  | V <sub>CCA</sub> (V) | V <sub>CCB</sub> (V) | –40°C to +85°C        |                      |                       | –40°C to +125°C       |                       | Unit |
|-----------------|--------------------|-----------------|-------|----------------------|----------------------|-----------------------|----------------------|-----------------------|-----------------------|-----------------------|------|
|                 |                    |                 |       |                      |                      | Min                   | Typ (Note 4)         | Max                   | Min                   | Max                   |      |
| V <sub>IH</sub> | Input HIGH Voltage |                 | OE, A | 2.7 – 3.6            | 0.9 – 3.6            | 2.0                   | –                    | –                     | 2.0                   | –                     | V    |
|                 |                    |                 |       | 2.3 – 2.7            |                      | 1.6                   | –                    | –                     | 1.6                   | –                     |      |
|                 |                    |                 |       | 1.65–1.95            |                      | 0.65 V <sub>CCA</sub> | –                    | –                     | 0.65 V <sub>CCA</sub> | –                     |      |
|                 |                    |                 |       | 1.1 – 1.6            |                      | 0.7 V <sub>CCA</sub>  | –                    | –                     | 0.7 V <sub>CCA</sub>  | –                     |      |
|                 |                    |                 |       | 0.9                  |                      | –                     | 0.9 V <sub>CCA</sub> | –                     | –                     | –                     |      |
|                 |                    |                 | B     | 0.9 – 3.6            | 2.7 – 3.6            | 2.0                   | –                    | –                     | 2.0                   | –                     | V    |
|                 |                    |                 |       | 2.3 – 2.7            |                      | 1.6                   | –                    | –                     | 1.6                   | –                     |      |
|                 |                    |                 |       | 1.65–1.95            |                      | 0.65 V <sub>CCB</sub> | –                    | –                     | 0.65 V <sub>CCB</sub> | –                     |      |
|                 |                    |                 |       | 1.1 – 1.6            |                      | 0.7 V <sub>CCB</sub>  | –                    | –                     | 0.7 V <sub>CCB</sub>  | –                     |      |
|                 |                    |                 |       | 0.9                  |                      | –                     | 0.9 V <sub>CCB</sub> | –                     | –                     | –                     |      |
| V <sub>IL</sub> | Input LOW Voltage  |                 | OE, A | 2.7 – 3.6            | 0.9 – 3.6            | –                     | –                    | 0.8                   | –                     | 0.8                   | V    |
|                 |                    |                 |       | 2.3 – 2.7            |                      | –                     | –                    | 0.7                   | –                     | 0.7                   |      |
|                 |                    |                 |       | 1.65–1.95            |                      | –                     | –                    | 0.35 V <sub>CCA</sub> | –                     | 0.35 V <sub>CCA</sub> |      |
|                 |                    |                 |       | 1.1 – 1.6            |                      | –                     | –                    | 0.3 V <sub>CCA</sub>  | –                     | 0.3 V <sub>CCA</sub>  |      |
|                 |                    |                 |       | 0.9                  |                      | –                     | 0.1 V <sub>CCA</sub> | –                     | –                     | –                     |      |
|                 |                    |                 | B     | 0.9 – 3.6            | 2.7 – 3.6            | –                     | –                    | 0.8                   | –                     | 0.8                   | V    |
|                 |                    |                 |       | 2.3 – 2.7            |                      | –                     | –                    | 0.7                   | –                     | 0.7                   |      |
|                 |                    |                 |       | 1.65–1.95            |                      | –                     | –                    | 0.35 V <sub>CCB</sub> | –                     | 0.35 V <sub>CCB</sub> |      |
|                 |                    |                 |       | 1.1 – 1.6            |                      | –                     | –                    | 0.3 V <sub>CCB</sub>  | –                     | 0.3 V <sub>CCB</sub>  |      |
|                 |                    |                 |       | 0.9                  |                      | –                     | 0.1 V <sub>CCB</sub> | –                     | –                     | –                     |      |

4. All typical values are at T<sub>A</sub> = 25°C.

# NL3V4T244, NL3V4T240, NL3V4T3144

## DC ELECTRICAL CHARACTERISTICS – OUTPUT VOLTAGES

| Symbol          | Parameter           | Test Conditions                                       | V <sub>CCA</sub><br>(V) | V <sub>CCB</sub><br>(V) | –40°C to +85°C |                        |                        | –40°C to +125°C |                        | Unit |
|-----------------|---------------------|-------------------------------------------------------|-------------------------|-------------------------|----------------|------------------------|------------------------|-----------------|------------------------|------|
|                 |                     |                                                       |                         |                         | Min            | Typ<br>(Note 4)        | Max                    | Min             | Max                    |      |
| V <sub>OH</sub> | Output HIGH Voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> : |                         |                         |                |                        |                        |                 |                        | V    |
|                 |                     | I <sub>OH</sub> = –100 µA                             | A                       | 0.9                     | 0.9            | –                      | V <sub>CCA</sub> – 0.1 | –               | –                      |      |
|                 |                     |                                                       | B                       | 0.9                     | 0.9            | –                      | V <sub>CCB</sub> – 0.1 | –               | –                      |      |
|                 |                     |                                                       | A                       | 1.1 – 3.6               | 1.1 – 3.6      | V <sub>CCA</sub> – 0.1 | –                      | –               | V <sub>CCA</sub> – 0.1 |      |
|                 |                     |                                                       | B                       |                         |                | V <sub>CCB</sub> – 0.1 | –                      | –               | V <sub>CCB</sub> – 0.1 |      |
|                 |                     | I <sub>OH</sub> = –3 mA                               |                         | 1.1                     | 1.1            | 0.85                   | –                      | –               | 0.85                   |      |
|                 |                     | I <sub>OH</sub> = –6 mA                               |                         | 1.4                     | 1.4            | 1.05                   | –                      | –               | 1.05                   |      |
|                 |                     | I <sub>OH</sub> = –8 mA                               |                         | 1.65                    | 1.65           | 1.2                    | –                      | –               | 1.2                    |      |
|                 |                     | I <sub>OH</sub> = –12 mA                              |                         | 2.3                     | 2.3            | 1.8                    | –                      | –               | 1.8                    |      |
|                 |                     |                                                       |                         | 2.7                     | 2.7            | 2.2                    | –                      | –               | 2.2                    |      |
|                 |                     | I <sub>OH</sub> = –18 mA                              |                         | 2.3                     | 2.3            | 1.7                    | –                      | –               | 1.7                    |      |
|                 |                     |                                                       |                         | 3.0                     | 3.0            | 2.4                    | –                      | –               | 2.4                    |      |
|                 |                     | I <sub>OH</sub> = –24 mA                              |                         | 3.0                     | 3.0            | 2.2                    | –                      | –               | 2.2                    |      |
| V <sub>OL</sub> | Output LOW Voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> : |                         |                         |                |                        |                        |                 |                        | V    |
|                 |                     | I <sub>OL</sub> = 100 µA                              |                         | 0.9                     | 0.9            | –                      | 0.1                    | –               | –                      |      |
|                 |                     |                                                       |                         | 1.1 – 3.6               | 1.1 – 3.6      | –                      | –                      | 0.1             | –                      |      |
|                 |                     | I <sub>OL</sub> = 3 mA                                |                         | 1.1                     | 1.1            | –                      | –                      | 0.25            | –                      |      |
|                 |                     | I <sub>OL</sub> = 6 mA                                |                         | 1.4                     | 1.4            | –                      | –                      | 0.35            | –                      |      |
|                 |                     | I <sub>OL</sub> = 8 mA                                |                         | 1.65                    | 1.65           | –                      | –                      | 0.3             | –                      |      |
|                 |                     | I <sub>OL</sub> = 12 mA                               |                         | 2.3                     | 2.3            | –                      | –                      | 0.4             | –                      |      |
|                 |                     |                                                       |                         | 2.7                     | 2.7            | –                      | –                      | 0.4             | –                      |      |
|                 |                     | I <sub>OL</sub> = 18 mA                               |                         | 2.3                     | 2.3            | –                      | –                      | 0.4             | –                      |      |
|                 |                     |                                                       |                         | 3.0                     | 3.0            | –                      | –                      | 0.4             | –                      |      |
|                 |                     | I <sub>OL</sub> = 24 mA                               |                         | 3.0                     | 3.0            | –                      | –                      | 0.55            | –                      |      |

## DC ELECTRICAL CHARACTERISTICS – LEAKAGE AND SUPPLY CURRENTS

| Symbol           | Parameter                 | Test Conditions                                                      | V <sub>CCA</sub><br>(V) | V <sub>CCB</sub><br>(V) | –40°C to +85°C |      | –40°C to +125°C |      | Unit |
|------------------|---------------------------|----------------------------------------------------------------------|-------------------------|-------------------------|----------------|------|-----------------|------|------|
|                  |                           |                                                                      |                         |                         | Min            | Max  | Min             | Max  |      |
| I <sub>I</sub>   | Input Leakage Current     | V <sub>I</sub> = 3.6 V or GND                                        | 0.9 – 3.6               | 0.9 – 3.6               | –              | ±1.0 | –               | ±5.0 | µA   |
| I <sub>OZ</sub>  | 3-State Output Leakage    | $\overline{OE}$ = V <sub>IH</sub> ;<br>V <sub>O</sub> = GND to 3.6 V | 3.6                     | 3.6                     | –              | ±1.0 | –               | ±5.0 | µA   |
| I <sub>OFF</sub> | Power-Off Leakage Current | V <sub>I</sub> or V <sub>O</sub> = 0 to 3.6 V                        | A                       | 0                       | 0.9 – 3.6      | –    | ±1.0            | –    | ±5.0 |
|                  |                           |                                                                      | B                       | 0.9 – 3.6               | 0              | –    | ±1.0            | –    | ±5.0 |
| I <sub>CCA</sub> | Quiescent Supply Current  | V <sub>I</sub> = V <sub>CCA</sub> or GND;<br>I <sub>O</sub> = 0      | 0.9 – 3.6               | 0.9 – 3.6               | –              | 5.0  | –               | 10   | µA   |
|                  |                           |                                                                      | 0                       | 0.9 – 3.6               | –              | –1.0 | –               | –5.0 |      |
|                  |                           |                                                                      | 0.9 – 3.6               | 0                       | –              | 5.0  | –               | 10   |      |
| I <sub>CCB</sub> | Quiescent Supply Current  | V <sub>I</sub> = V <sub>CCB</sub> or GND;<br>I <sub>O</sub> = 0      | 0.9 – 3.6               | 0.9 – 3.6               | –              | 5.0  | –               | 10   | µA   |
|                  |                           |                                                                      | 0                       | 0.9 – 3.6               | –              | 5.0  | –               | 10   |      |
|                  |                           |                                                                      | 0.9 – 3.6               | 0                       | –              | –1.0 | –               | –5.0 |      |

NOTE: Connect ground before applying supply voltage V<sub>CCA</sub> or V<sub>CCB</sub>. This device is designed with the feature that the power-up sequence of V<sub>CCA</sub> and V<sub>CCB</sub> will not damage the IC.

# NL3V4T244, NL3V4T240, NL3V4T3144

## AC ELECTRICAL CHARACTERISTICS (Notes 5 and 6)

| Symbol                                 | Parameter                  | V <sub>CCA</sub> (V) | T <sub>A</sub> = −40°C to +85°C |      |      |      |      | T <sub>A</sub> = −40°C to +125°C |      |      |      |      | Unit |
|----------------------------------------|----------------------------|----------------------|---------------------------------|------|------|------|------|----------------------------------|------|------|------|------|------|
|                                        |                            |                      | V <sub>CCB</sub> (V)            |      |      |      |      | V <sub>CCB</sub> (V)             |      |      |      |      |      |
|                                        |                            |                      | 3.3                             | 2.5  | 1.8  | 1.5  | 1.2  | 3.3                              | 2.5  | 1.8  | 1.5  | 1.2  |      |
|                                        |                            |                      | Max                             | Max  | Max  | Max  | Max  | Max                              | Max  | Max  | Max  | Max  |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Propagation Delay, A to B  | 3.3                  | 2.9                             | 3.3  | 4.5  | 5.6  | 9.3  | 3.3                              | 3.8  | 5.0  | 6.2  | 9.5  | nS   |
|                                        |                            | 2.5                  | 3.6                             | 3.7  | 4.6  | 5.7  | 9.4  | 4.0                              | 4.0  | 5.1  | 6.3  | 9.6  |      |
|                                        |                            | 1.8                  | 3.9                             | 4.0  | 4.9  | 6.0  | 9.6  | 4.3                              | 4.3  | 5.4  | 6.6  | 9.8  |      |
|                                        |                            | 1.5                  | 4.2                             | 4.3  | 5.2  | 6.3  | 9.8  | 4.7                              | 4.7  | 5.8  | 7.0  | 10.0 |      |
|                                        |                            | 1.2                  | 5.1                             | 5.2  | 6.2  | 7.1  | 11.0 | 5.7                              | 5.8  | 6.9  | 7.9  | 11.2 |      |
|                                        | Propagation Delay, B to A  | 3.3                  | 2.8                             | 3.0  | 3.4  | 4.2  | 5.1  | 3.3                              | 3.4  | 3.9  | 4.7  | 5.7  |      |
|                                        |                            | 2.5                  | 3.3                             | 3.4  | 3.9  | 4.2  | 5.2  | 3.8                              | 3.9  | 4.3  | 4.7  | 5.8  |      |
|                                        |                            | 1.8                  | 4.5                             | 4.6  | 4.9  | 5.3  | 6.2  | 5.0                              | 5.1  | 5.4  | 5.9  | 6.9  |      |
|                                        |                            | 1.5                  | 5.6                             | 5.7  | 6.0  | 6.3  | 7.1  | 6.2                              | 6.3  | 6.6  | 7.9  | 7.9  |      |
|                                        |                            | 1.2                  | 9.3                             | 9.4  | 9.6  | 9.8  | 11.0 | 9.5                              | 9.6  | 9.8  | 10.0 | 11.2 |      |
| t <sub>PZH</sub> ,<br>t <sub>PZL</sub> | Output Enable,<br>OE to A  | 3.3                  | 3.8                             | 3.8  | 3.8  | 4.3  | 5.7  | 4.2                              | 4.2  | 4.2  | 4.5  | 5.8  | nS   |
|                                        |                            | 2.5                  | 4.8                             | 4.8  | 4.8  | 4.9  | 6.2  | 5.3                              | 5.3  | 5.3  | 5.3  | 6.3  |      |
|                                        |                            | 1.8                  | 7.2                             | 7.2  | 7.2  | 7.2  | 7.5  | 8.0                              | 8.0  | 8.0  | 8.0  | 8.0  |      |
|                                        |                            | 1.5                  | 9.4                             | 9.4  | 9.4  | 9.4  | 9.4  | 10.4                             | 10.4 | 10.4 | 10.4 | 10.4 |      |
|                                        |                            | 1.2                  | 12.8                            | 12.8 | 12.8 | 12.8 | 13.4 | 14.1                             | 14.1 | 14.1 | 14.1 | 14.1 |      |
|                                        | Output Enable,<br>OE to B  | 3.3                  | 3.8                             | 4.7  | 6.8  | 8.7  | 11.6 | 4.2                              | 5.2  | 7.5  | 9.6  | 12.4 |      |
|                                        |                            | 2.5                  | 4.0                             | 4.8  | 7.0  | 8.8  | 11.6 | 4.4                              | 5.3  | 7.7  | 9.7  | 12.4 |      |
|                                        |                            | 1.8                  | 4.6                             | 5.3  | 7.4  | 9.2  | 11.9 | 5.1                              | 5.9  | 8.2  | 10.2 | 12.9 |      |
|                                        |                            | 1.5                  | 5.6                             | 5.8  | 7.7  | 9.6  | 12.5 | 6.2                              | 6.4  | 8.5  | 10.6 | 13.3 |      |
|                                        |                            | 1.2                  | 7.7                             | 7.9  | 8.9  | 10.0 | 13.9 | 8.5                              | 8.7  | 9.8  | 11.0 | 14.7 |      |
| t <sub>PHZ</sub> ,<br>t <sub>PLZ</sub> | Output Disable,<br>OE to A | 3.3                  | 5.6                             | 5.6  | 5.6  | 5.6  | 5.6  | 6.2                              | 6.2  | 6.2  | 6.2  | 6.2  | nS   |
|                                        |                            | 2.5                  | 6.2                             | 6.2  | 6.2  | 6.2  | 6.2  | 6.9                              | 6.9  | 6.9  | 6.9  | 6.9  |      |
|                                        |                            | 1.8                  | 8.6                             | 8.6  | 8.6  | 8.6  | 8.6  | 9.5                              | 9.5  | 9.5  | 9.5  | 9.5  |      |
|                                        |                            | 1.5                  | 10.2                            | 10.2 | 10.2 | 10.2 | 10.2 | 11.3                             | 11.3 | 11.3 | 11.3 | 11.3 |      |
|                                        |                            | 1.2                  | 10.9                            | 10.9 | 10.9 | 10.9 | 10.9 | 12.0                             | 12.0 | 12.0 | 12.0 | 12.0 |      |
|                                        | Output Disable,<br>OE to B | 3.3                  | 6.2                             | 6.4  | 8.1  | 9.3  | 10.2 | 6.9                              | 7.1  | 9.0  | 10.3 | 11.3 |      |
|                                        |                            | 2.5                  | 5.2                             | 6.2  | 8.2  | 8.8  | 10.4 | 5.8                              | 6.9  | 9.1  | 10.4 | 11.5 |      |
|                                        |                            | 1.8                  | 6.9                             | 6.9  | 8.7  | 9.9  | 10.9 | 7.6                              | 7.6  | 9.6  | 10.9 | 12.0 |      |
|                                        |                            | 1.5                  | 7.6                             | 7.4  | 9.1  | 10.3 | 11.3 | 8.2                              | 8.4  | 10.1 | 11.4 | 12.5 |      |
|                                        |                            | 1.2                  | 8.1                             | 8.1  | 9.5  | 9.6  | 12.4 | 9.0                              | 10.1 | 10.5 | 10.6 | 13.7 |      |

5. Propagation delays defined per Figure 3.

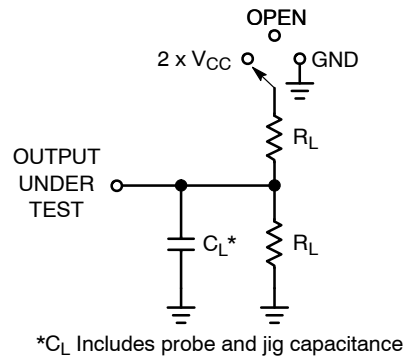
6. These parameters are guaranteed by characterization and are not production tested.

## CAPACITANCE

| Symbol                      | Parameter                     | Test Conditions                                                                                    | Typ (Note 4) | Unit |
|-----------------------------|-------------------------------|----------------------------------------------------------------------------------------------------|--------------|------|
| C <sub>IN</sub>             | Control Pin Input Capacitance | V <sub>CCA</sub> = V <sub>CCB</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CCA</sub>              | 2.5          | pF   |
| C <sub>I/O</sub>            | I/O Pin Input Capacitance     | V <sub>CCA</sub> = V <sub>CCB</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CCA</sub>              | 5.0          | pF   |
| C <sub>PD</sub><br>(Note 7) | Power Dissipation Capacitance | V <sub>CCA</sub> = V <sub>CCB</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CCA</sub> , f = 10 MHz | 12           | pF   |

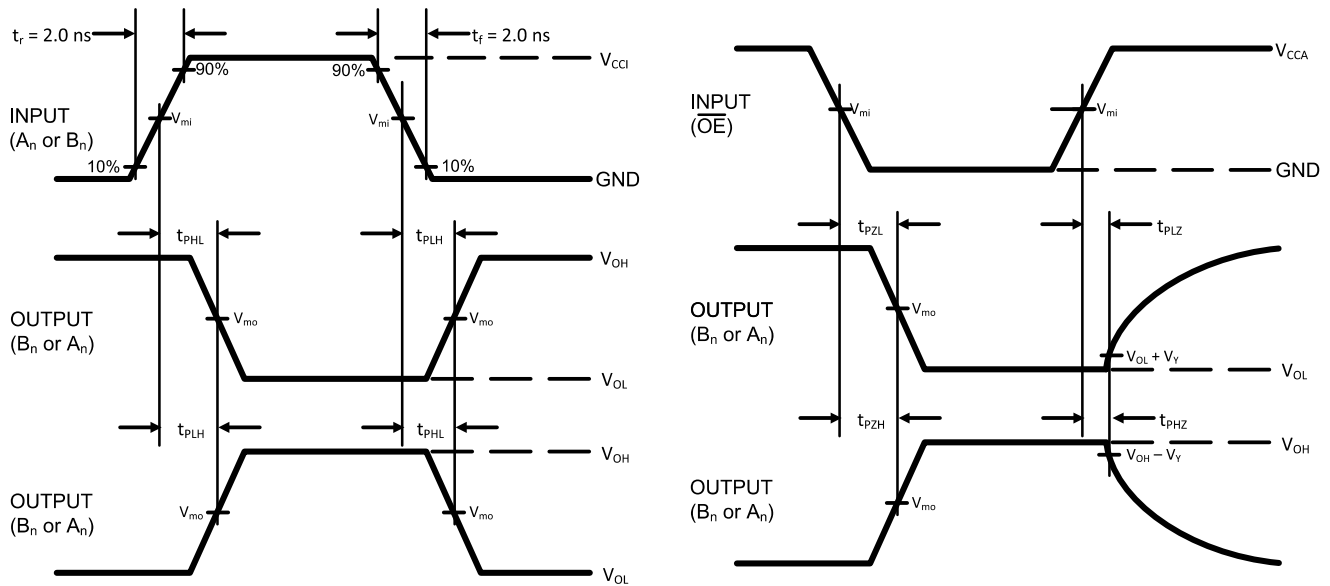
7. C<sub>PD</sub> is defined as the value of the IC's equivalent capacitance from which the operating current can be calculated from:  
 $I_{CC(operating)} \approx C_{PD} \times V_{CC} \times f_{IN} \times N_{SW}$  where  $I_{CC} = I_{CCA} + I_{CCB}$  and  $N_{SW}$  = total number of outputs switching.

# NL3V4T244, NL3V4T240, NL3V4T3144



**Figure 3. AC Test Circuit**

| Test                                                                                                                                     | Switch              | C <sub>L</sub> | R <sub>L</sub> |
|------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------|----------------|
| t <sub>PLH</sub> , t <sub>PHL</sub>                                                                                                      | OPEN                | 15 pF          | 2 kΩ           |
| t <sub>PLZ</sub> , t <sub>PZL</sub>                                                                                                      | 2 x V <sub>CC</sub> |                |                |
| t <sub>PHZ</sub> , t <sub>PZH</sub>                                                                                                      | GND                 |                |                |
| C <sub>L</sub> includes probe and jig capacitance<br>Pulse generator Z <sub>O</sub> = 50 Ω<br>Input f = 1.0 MHz; t <sub>W</sub> = 500 ns |                     |                |                |



**Figure 4. AC Waveforms**

| Symbol          | V <sub>CC</sub>     |                     |                     |                     |                     |
|-----------------|---------------------|---------------------|---------------------|---------------------|---------------------|
|                 | 3.0 V – 3.6 V       | 2.3 V – 2.7 V       | 1.65 V – 1.95 V     | 1.4 V – 1.6 V       | 1.1 V – 1.3 V       |
| V <sub>mi</sub> | V <sub>CCI</sub> /2 | V <sub>CCI</sub> /2 | V <sub>CCI</sub> /2 | V <sub>CCI</sub> /2 | V <sub>CCI</sub> /2 |
| V <sub>mo</sub> | V <sub>CCO</sub> /2 | V <sub>CCO</sub> /2 | V <sub>CCO</sub> /2 | V <sub>CCO</sub> /2 | V <sub>CCO</sub> /2 |
| V <sub>Y</sub>  | 0.3 V               | 0.15 V              | 0.15 V              | 0.1 V               | 0.1 V               |

8. V<sub>CCI</sub> is the V<sub>CC</sub> associated with the input port.

9. V<sub>CCO</sub> is the V<sub>CC</sub> associated with the output port.



# NL3V4T244, NL3V4T240, NL3V4T3144

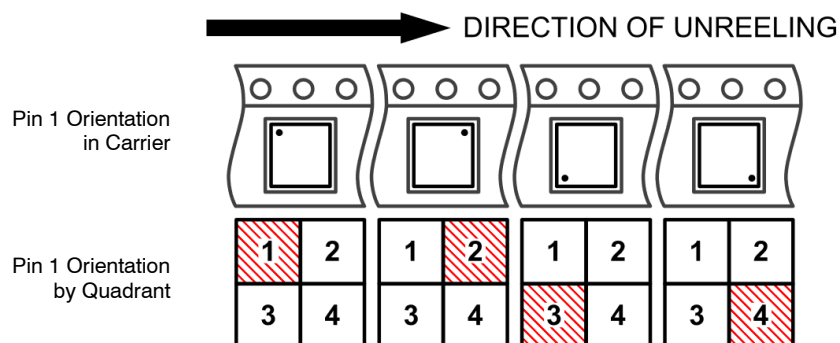
## ORDERING INFORMATION

| Device                                          | Marking | Package  | Pin 1 Quadrant | Shipping <sup>†</sup>    |
|-------------------------------------------------|---------|----------|----------------|--------------------------|
| NL3V4T244MU2TAG                                 | AG      | UQFN12   | 1              | 3000 Units / Tape & Reel |
| NL3V4T244MU2TAG-Q*                              | AG      | UQFN12   | 1              | 3000 Units / Tape & Reel |
| NL3V4T244DR2G<br>(Contact <b>onsemi</b> sales)  | TBD     | SOIC-14  | TBD            | 2500 Units / Tape & Reel |
| NL3V4T244DTR2G<br>(Contact <b>onsemi</b> sales) | TBD     | TSSOP-14 | TBD            | 2500 Units / Tape & Reel |
| NL3V4T240MU2TAG                                 | AJ      | UQFN12   | 1              | 3000 Units / Tape & Reel |
| NL3V4T240DR2G<br>(Contact <b>onsemi</b> sales)  | TBD     | SOIC-14  | TBD            | 2500 Units / Tape & Reel |
| NL3V4T240DTR2G<br>(Contact <b>onsemi</b> sales) | TBD     | TSSOP-14 | TBD            | 2500 Units / Tape & Reel |
| NL3V4T3144MU2TAG                                | AE      | UQFN12   | 1              | 3000 Units / 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.

\*-Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

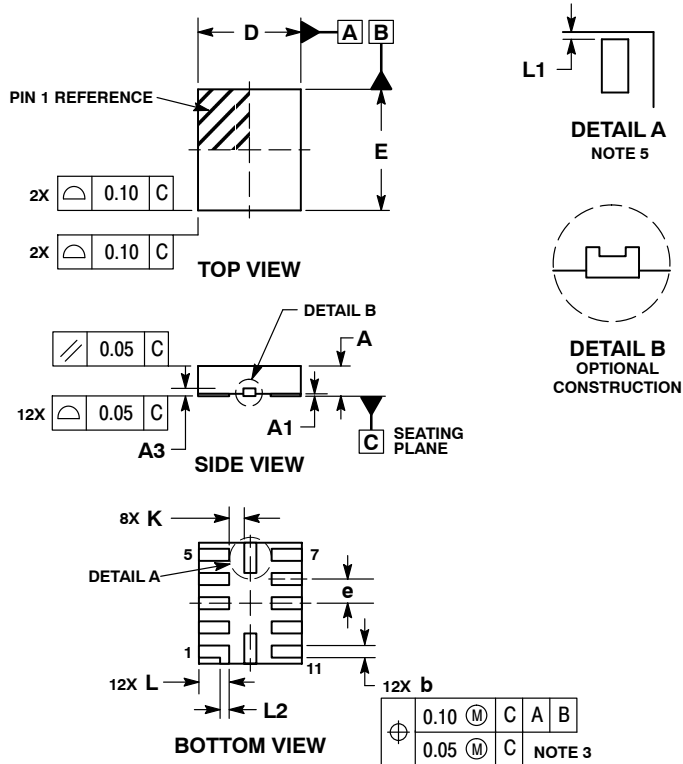
## Pin 1 Orientation in Tape and Reel



# NL3V4T244, NL3V4T240, NL3V4T3144

## PACKAGE DIMENSIONS

UQFN12 1.7x2.0, 0.4P  
CASE 523AE  
ISSUE A

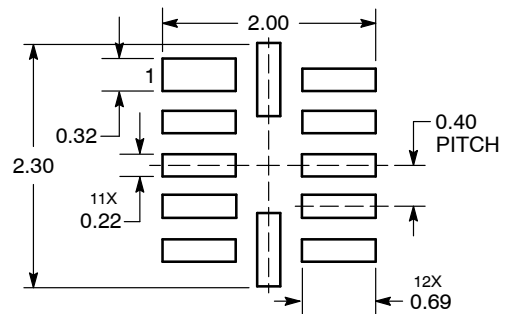


### NOTES:

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 0.30 MM FROM TERMINAL TIP.
4. MOLD FLASH ALLOWED ON TERMINALS ALONG EDGE OF PACKAGE. FLASH 0.03 MAX ON BOTTOM SURFACE OF TERMINALS.
5. DETAIL A SHOWS OPTIONAL CONSTRUCTION FOR TERMINALS.

| MILLIMETERS |           |      |
|-------------|-----------|------|
| DIM         | MIN       | MAX  |
| A           | 0.45      | 0.55 |
| A1          | 0.00      | 0.05 |
| A3          | 0.127 REF |      |
| b           | 0.15      | 0.25 |
| D           | 1.70 BSC  |      |
| E           | 2.00 BSC  |      |
| e           | 0.40 BSC  |      |
| K           | 0.20      | ---- |
| L           | 0.45      | 0.55 |
| L1          | 0.00      | 0.03 |
| L2          | 0.15 REF  |      |

### MOUNTING FOOTPRINT SOLDEMASK DEFINED



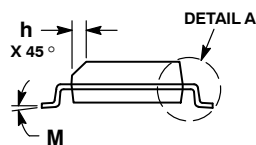
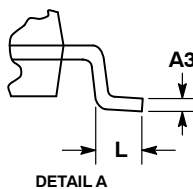
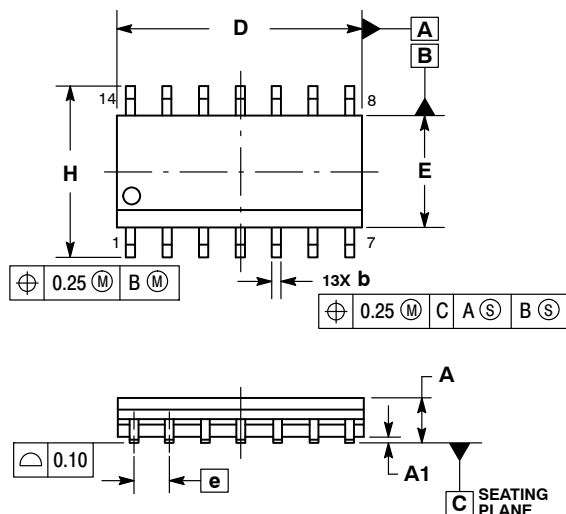
DIMENSIONS: MILLIMETERS

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

# NL3V4T244, NL3V4T240, NL3V4T3144

## PACKAGE DIMENSIONS

SOIC-14  
D SUFFIX  
CASE 751A-03  
ISSUE L

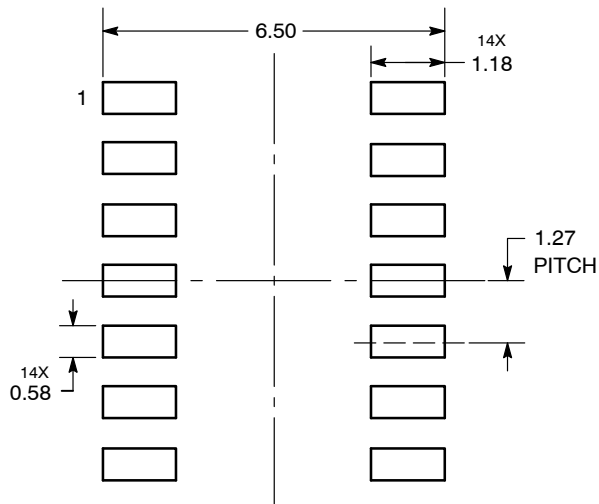


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 1.35        | 1.75 | 0.054     | 0.068 |
| A1  | 0.10        | 0.25 | 0.004     | 0.010 |
| A3  | 0.19        | 0.25 | 0.008     | 0.010 |
| b   | 0.35        | 0.49 | 0.014     | 0.019 |
| D   | 8.55        | 8.75 | 0.337     | 0.344 |
| E   | 3.80        | 4.00 | 0.150     | 0.157 |
| e   | 1.27 BSC    |      | 0.050 BSC |       |
| H   | 5.80        | 6.20 | 0.228     | 0.244 |
| h   | 0.25        | 0.50 | 0.010     | 0.019 |
| L   | 0.40        | 1.25 | 0.016     | 0.049 |
| M   | 0°          | 7°   | 0°        | 7°    |

### SOLDERING FOOTPRINT\*



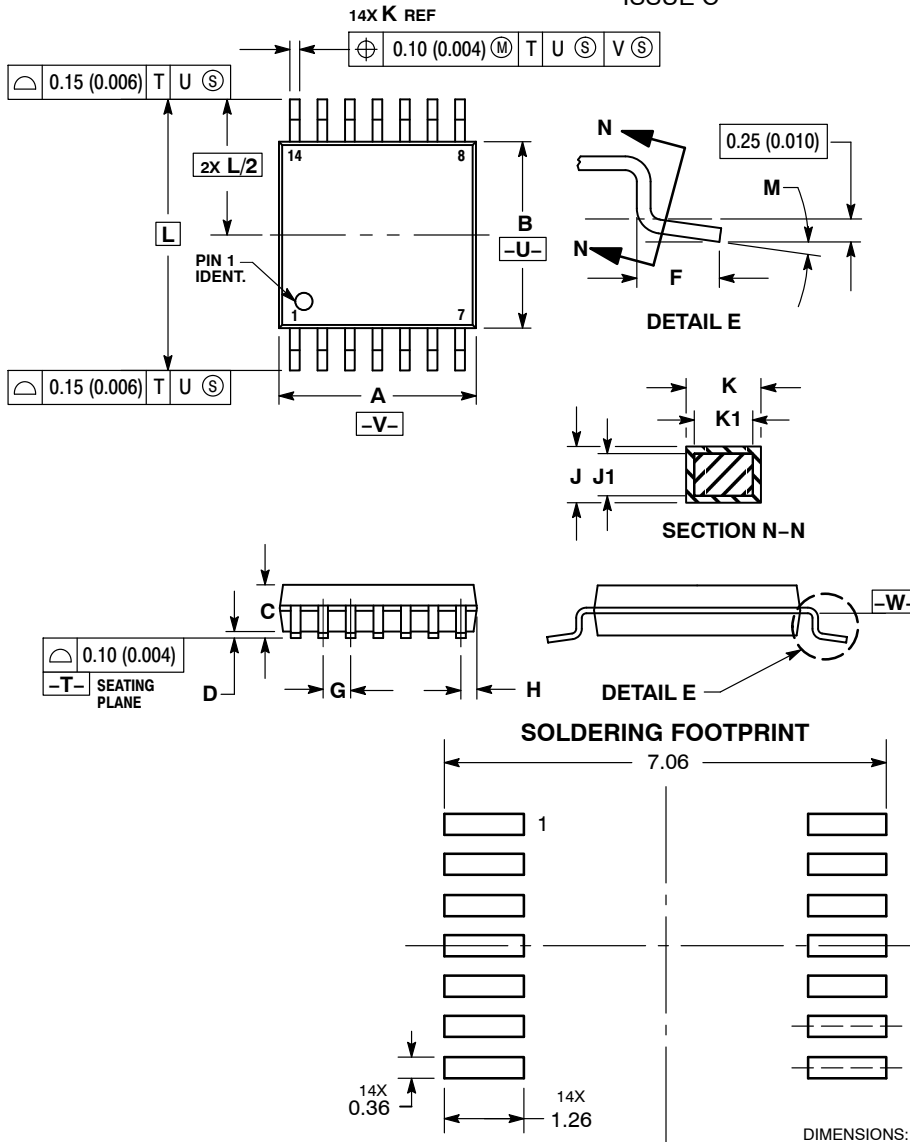
DIMENSIONS: MILLIMETERS

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

# NL3V4T244, NL3V4T240, NL3V4T3144

## PACKAGE DIMENSIONS

TSSOP-14  
DT SUFFIX  
CASE 948G  
ISSUE C



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

|     | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
| DIM | MIN         | MAX  | MIN       | MAX   |
| A   | 4.90        | 5.10 | 0.193     | 0.200 |
| B   | 4.30        | 4.50 | 0.169     | 0.177 |
| C   | ---         | 1.20 | ---       | 0.047 |
| D   | 0.05        | 0.15 | 0.002     | 0.006 |
| F   | 0.50        | 0.75 | 0.020     | 0.030 |
| G   | 0.65 BSC    | ---  | 0.026 BSC | ---   |
| H   | 0.50        | 0.60 | 0.020     | 0.024 |
| J   | 0.09        | 0.20 | 0.004     | 0.008 |
| J1  | 0.09        | 0.16 | 0.004     | 0.006 |
| K   | 0.19        | 0.30 | 0.007     | 0.012 |
| K1  | 0.19        | 0.25 | 0.007     | 0.010 |
| L   | 6.40 BSC    | ---  | 0.252 BSC | ---   |
| M   | 0°          | 8°   | 0°        | 8°    |

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