## NLSF2500

## Keypad Multiplexer

The NLSF2500 is a keyboard multiplexer fabricated in sub-micron silicon CMOS Technology. The NLSF2500 is designed to operate over wide operating voltage, with minimum power consumption and very low voltage drop from $\mathrm{V}_{\mathrm{CC}}$. The device saves dozens of active and passive components and permits operating voltage far lower than the standard diode scheme.

## Features

- Single Supply Operation
- Optimized for 1.8 V to $3.6 \mathrm{VV}_{\mathrm{CC}}$
- Tiny $3 \times 3 \mathrm{~mm}$ QFN-16 Package
- Conforms to: JEDEC MO-220, Issue H, Variation VEED-6
- Very Low Voltage Drop
- Permits Operation Down to 1.65 V
- Near Zero Static Power
- ESD Protection: Human Body Model (HBM); > 3000 V, Machine Model (MM); >300 V
- Latchup Maximum Rating: 200 mA
- Pin-to-Pin Compatible with CM2500
- This is a $\mathrm{Pb}-$ Free Device


## Typical Applications

- Cell Phones
- PDAs
- MP3 players



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ORDERING INFORMATION
See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.


Figure 1. Device Block Diagram


Figure 2. Circuit Schematic (1 Channel Pair Only)

PIN DESCRIPTION

| Pin | Name | Function Description |
| :---: | :---: | :---: |
| 1 | NC | Not Internally Connected |
| 2 | OUTA | Combined "Functional OR" Output of IN1, IN2, and IN3 |
| 3 | $\mathrm{V}_{\mathrm{CC}}$ | Supply Pin |
| 4 | IN1 | Input 1 from Switch to be Multiplexed |
| 5 | IN2 | Input 2 from Switch to be Multiplexed |
| 6 | IN3 | Input 3 from Switch to be Multiplexed |
| 7 | IN4 | Input 4 from Switch to be Multiplexed |
| 8 | IN5 | Input 5 from Switch to be Multiplexed |
| 9 | NC | Not Internally Connected |
| 10 | GND | Ground |
| 11 | OUTB | Combined "Functional OR" Output of IN4 and IN5 |
| 12 | OUT5 | Output 5 for Keyboard Interface Lines |
| 13 | OUT4 | Output 4 for Keyboard Interface Lines |
| 14 | OUT3 | Output 3 for Keyboard Interface Lines |
| 15 | OUT2 | Output 2 for Keyboard Interface Lines |
| 16 | OUT1 | Output 1 for Keyboard Interface Lines |

MAXIMUM RATINGS

| Symbol | Rating | Value | Unit |
| :---: | :---: | :---: | :---: |
| $\mathrm{V}_{\mathrm{CC}}$ | DC Supply Voltage | -0.5 to +7.0 | V |
| $\mathrm{V}_{1}$ | DC Input Voltage | $0 \leq \mathrm{V}_{\mathrm{CC}} \leq \mathrm{V}_{\mathrm{CC}}+0.5$ | V |
| $\mathrm{V}_{\mathrm{O}}$ | DC Output Voltage | -0.5 to + 7.0 | V |
| $\mathrm{I}_{\mathrm{IK}}$ | DC Input Diode Current $\quad \mathrm{V}_{1}<$ GND | $\pm 50$ | mA |
| lok | DC Output Diode Current $\quad \mathrm{V}_{\mathrm{O}}=$ GND | -50 | mA |
| Io | DC Output Sink Current | $\pm 50$ | mA |
| ICC | DC Supply Current per Supply Pin | $\pm 100$ | mA |
| $\mathrm{I}_{\text {GND }}$ | DC Ground Current per Ground Pin | $\pm 100$ | mA |
| TSTG | Storage Temperature Range | -65 to +150 | ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{T}_{\mathrm{L}}$ | Lead Temperature, 1 mm from Case for 10 Seconds | 260 | ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{T}_{J}$ | Junction Temperature under bias | + 150 | ${ }^{\circ} \mathrm{C}$ |
| $\theta_{\text {JA }}$ | Thermal Resistance | 80 | ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |
| $\mathrm{P}_{\mathrm{D}}$ | Power Dissipation in Still Air at $85^{\circ} \mathrm{C}$ | 800 | mW |
| MSL | Moisture Sensitivity | Level 1 |  |
| $\mathrm{F}_{\mathrm{R}}$ | Flammability Rating Oxygen Index: 28 to 34 | UL94 V-0 @ 0125 in |  |
| $\mathrm{V}_{\text {ESD }}$ | ESD Test Voltage Human Body Model (Note 1) <br> Machine Model (Note 2) | $\begin{array}{r} 3000 \\ >300 \end{array}$ | V |

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. Tested to EIA/JESD22-A114-A.
2. Tested to EIA/JESD22-A115-A.

## RECOMMENDED OPERATING CONDITIONS

| Symbol | Characteristics | Min | Max | Unit |
| :---: | :--- | :---: | :---: | :---: |
| $\mathrm{V}_{\mathrm{CC}}$ | Positive DC Supply Voltage | 1.5 | 5.5 | V |
| $\mathrm{~V}_{\mathrm{IN}}$ | DC Input Voltage | GND | $\mathrm{V}_{\mathrm{CC}}+0.5$ | V |
| $\mathrm{~V}_{\mathrm{OUT}}$ | DC Output Voltage | GND | 5.5 | V |
| $\mathrm{~T}_{\mathrm{A}}$ | Operating Temperature Range | 40 | 85 | ${ }^{\circ} \mathrm{C}$ |

DC CHARACTERISTICS

| Symbol | Parameter | Condition | $\mathrm{V}_{\mathrm{CC}}$ | Min | Max | Unit |
| :---: | :--- | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{V}_{\mathrm{IL}}$ | Input Logic Low Voltage |  | $1.65-3.6$ | $0.3{ }^{*} \mathrm{~V}_{\mathrm{CC}}$ |  | V |
| $\mathrm{V}_{\mathrm{IH}}$ | Input Logic High Voltage |  | $1.65-3.6$ |  | $0.7{ }^{*} \mathrm{~V}_{\mathrm{CC}}$ | V |
| $\mathrm{R}_{\mathrm{OUT}}$ | OUT $_{\mathrm{x}}$ Pullup Resistance |  | $1.65-3.6$ | 50 | 150 | $\mathrm{k} \Omega$ |
| $\mathrm{R}_{\mathrm{IN}} 2.7$ | INx Pullup Resistance | PIN $=\mathrm{GND}$ | 2.7 | 50 | 150 | $\mathrm{k} \Omega$ |
| $\mathrm{R}_{\mathrm{IN}} 1.8$ | INx Pullup Resistance | PIN = GND | 1.8 | 100 | 360 | $\mathrm{k} \Omega$ |
| $\mathrm{V}_{\mathrm{D}}$ | Voltage Drop | $\mathrm{INx}=\mathrm{GND}, \mathrm{I}_{\mathrm{OUT}}=100 \mu \mathrm{~A}$ |  |  | 100 | mV |
| $\mathrm{I}_{\mathrm{CC}}$ | Quiescent Current | All I/O Floating | $1.65-3.6$ |  | 10 | $\mu \mathrm{~A}$ |
| $\mathrm{I}_{\mathrm{L}}$ | Output Leakage Current | $\mathrm{INx}=$ Floating |  |  | 1.0 | $\mu \mathrm{~A}$ |
| $\mathrm{C}_{\mathrm{P}}$ | $\mathrm{I} / \mathrm{O}$ Pin Capacitance | 1.0 MHz | 2.5 |  | 15 | pF |

ORDERING INFORMATION

| Device Order Number | Device Nomenclature |  |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Circuit <br> Indicator | Technology | Device <br> Function | Package <br> Suffix | Tape and Reel <br> Suffix | Package <br> Type | Tape \& Reel <br> Size |
|  | NL | SF | 2500 | MN1 | R2 | QFN-16 <br> (Pb-Free) | 3000 |

$\dagger$ 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.

## PACKAGE DIMENSIONS

QFN-16 3*3*0.85 MM, 0.5 P
CASE 485AE-01
ISSUE O


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## PUBLICATION ORDERING INFORMATION

## LITERATURE FULFILLMENT

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