

# 74FST3257

## Quad 2:1 Multiplexer/ Demultiplexer Bus Switch

The ON Semiconductor 74FST3257 is a quad 2:1, high performance multiplexer/demultiplexer bus switch. The device is CMOS TTL compatible when operating between 4 and 5.5 Volts. The device exhibits extremely low  $R_{ON}$  and adds nearly zero propagation delay. The device adds no noise or ground bounce to the system.

### Features

- $R_{ON} < 4 \Omega$  Typical
- Less Than 0.25 ns–Max Delay Through Switch
- Nearly Zero Standby Current
- No Circuit Bounce
- Control Inputs are TTL/CMOS Compatible
- Pin-For-Pin Compatible With QS3257, FST3257, CBT3257
- All Popular Packages: SOIC-16, TSSOP-16, QFN16
- NLV Prefix 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

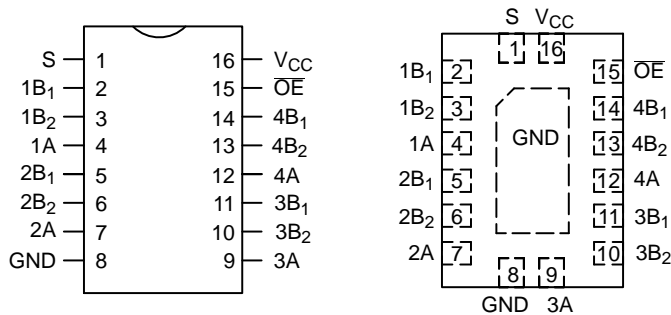


Figure 1. 16-Lead Pinout Diagrams

| S | $\overline{OE}$ | Function           |
|---|-----------------|--------------------|
| X | H               | Disconnect         |
| L | L               | A = B <sub>1</sub> |
| H | L               | A = B <sub>2</sub> |

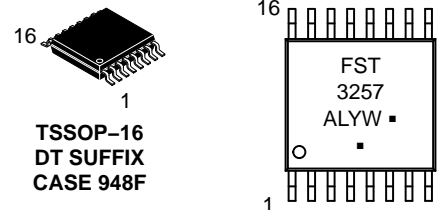
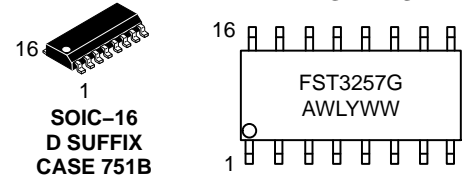
Figure 2. Truth Table



ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)

### MARKING DIAGRAMS



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)

### PIN NAMES

| Pin   | Description        |
|---|--------------------|
| $\overline{OE}_1, \overline{OE}_2$                                | Bus Switch Enables |
| S <sub>0</sub> , S <sub>1</sub>                                   | Select Inputs      |
| A   | Bus A              |
| B <sub>1</sub> , B <sub>2</sub> , B <sub>3</sub> , B <sub>4</sub> | Bus B              |

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# 74FST3257

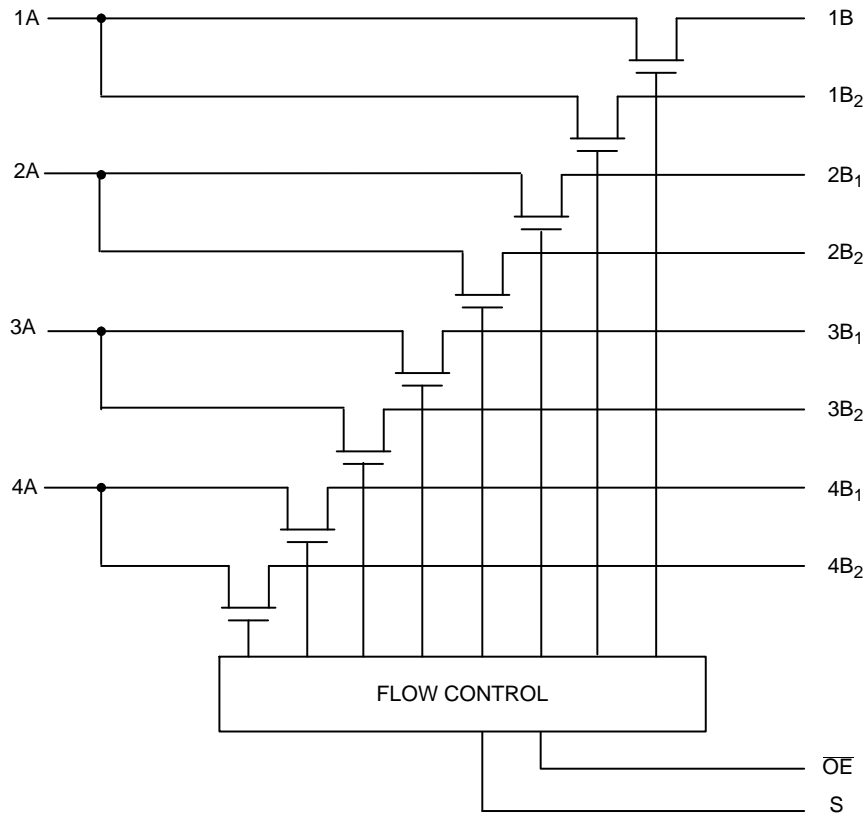


Figure 3. Logic Diagram

## ORDERING INFORMATION

| Device Order Number | Package               | Shipping†                |
|---------------------|-----------------------|--------------------------|
| 74FST3257DR2G       | SOIC-16<br>(Pb-Free)  | 2500 Units / Tape & Reel |
| NLV74FST3257DR2G*   |                       |                          |
| 74FST3257DTR2G      | TSSOP-16<br>(Pb-Free) | 2500 Units / Tape & Reel |
| 74FST3257MNTWG      | QFN16<br>(Pb-Free)    | 3000 Units / 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.

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

**MAXIMUM RATINGS**

| Symbol        | Parameter   | Value                  | Units         |
|---------------|---|------------------------|---------------|
| $V_{CC}$      | DC Supply Voltage   | -0.5 to +7.0           | V             |
| $V_I$         | DC Input Voltage  | -0.5 to +7.0           | V             |
| $V_O$         | DC Output Voltage   | -0.5 to +7.0           | V             |
| $I_{IK}$      | DC Input Diode Current<br>$V_I < GND$   | -50                    | mA            |
| $I_{OK}$      | DC Output Diode Current<br>$V_O < GND$  | -50                    | mA            |
| $I_O$         | DC Output Sink Current  | 128                    | 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            | $^{\circ}C$   |
| $T_L$         | Lead Temperature, 1 mm from Case for 10 Seconds   | 260                    | $^{\circ}C$   |
| $T_J$         | Junction Temperature Under Bias   | +150                   | $^{\circ}C$   |
| $\theta_{JA}$ | Thermal Resistance<br>SOIC<br>TSSOP<br>QFN  | 125<br>170<br>N/A      | $^{\circ}C/W$ |
| MSL           | Moisture Sensitivity  | Level 1                |               |
| $F_R$         | Flammability Rating<br>Oxygen Index: 28 to 34   | UL 94 V-0 @ 0.125 in   |               |
| $V_{ESD}$     | ESD Withstand Voltage<br>Human Body Model (Note 1)<br>Machine Model (Note 2)<br>Charged Device Model (Note 3) | > 2000<br>> 200<br>N/A | V             |
| $I_{Latchup}$ | Latchup Performance<br>Above $V_{CC}$ and Below GND at 85 $^{\circ}C$ (Note 4)                                | $\pm 500$              | 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. Tested to EIA/JESD22-A114-A.
2. Tested to EIA/JESD22-A115-A.
3. Tested to JESD22-C101-A.
4. Tested to EIA/JESD78.

**RECOMMENDED OPERATING CONDITIONS**

| Symbol              | Parameter  | Min | Max     | Units       |
|---------------------|--|-----|---------|-------------|
| $V_{CC}$            | Supply Voltage<br>Operating, Data Retention Only   | 4.0 | 5.5     | V           |
| $V_I$               | Input Voltage (Note 5)                             | 0   | 5.5     | V           |
| $V_O$               | Output Voltage (HIGH or LOW State)                 | 0   | 5.5     | V           |
| $T_A$               | Operating Free-Air Temperature                     | -40 | +85     | $^{\circ}C$ |
| $\Delta t/\Delta V$ | Input Transition Rise or Fall Rate<br>Switch I/O   |     | DC<br>5 | ns/V        |
|                     | Switch Control Input<br>$V_{CC} = 5.0 V \pm 0.5 V$ | 0   |         |             |

5. Unused control inputs may not be left open. All control inputs must be tied to a high or low logic input voltage level.

# 74FST3257

## DC ELECTRICAL CHARACTERISTICS

| Symbol           | Parameter                             | Conditions   | V <sub>CC</sub><br>(V) | T <sub>A</sub> = -40°C to +85°C |      |      | Units |
|------------------|---------------------------------------|--|------------------------|---------------------------------|------|------|-------|
|                  |                                       |  |                        | Min                             | Typ* | Max  |       |
| V <sub>IK</sub>  | Clamp Diode Voltage                   | I <sub>IN</sub> = -18 mA                                       | 4.5                    |                                 |      | -1.2 | V     |
| V <sub>IH</sub>  | High-Level Input Voltage              |  | 4.0 to 5.5             | 2.0                             |      |      | V     |
| V <sub>IL</sub>  | Low-Level Input Voltage               |  | 4.0 to 5.5             |                                 |      | 0.8  | V     |
| I <sub>I</sub>   | Input Leakage Current                 | 0 ≤ V <sub>IN</sub> ≤ 5.5 V                                    | 5.5                    |                                 |      | ±1.0 | μA    |
| I <sub>OZ</sub>  | Off-State Leakage Current             | 0 ≤ A, B ≤ V <sub>CC</sub>                                     | 5.5                    |                                 |      | ±1.0 | μA    |
| R <sub>ON</sub>  | Switch On Resistance (Note 6)         | V <sub>IN</sub> = 0 V, I <sub>IN</sub> = 64 mA                 | 4.5                    |                                 | 4    | 7    | Ω     |
|                  |                                       | V <sub>IN</sub> = 0 V, I <sub>IN</sub> = 30 mA                 | 4.5                    |                                 | 4    | 7    |       |
|                  |                                       | V <sub>IN</sub> = 2.4 V, I <sub>IN</sub> = 15 mA               | 4.5                    |                                 | 8    | 15   |       |
|                  |                                       | V <sub>IN</sub> = 2.4 V, I <sub>IN</sub> = 15 mA               | 4.0                    |                                 | 11   | 20   |       |
| I <sub>CC</sub>  | Quiescent Supply Current              | V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>OUT</sub> = 0 | 5.5                    |                                 |      | 3    | μA    |
| ΔI <sub>CC</sub> | Increase In I <sub>CC</sub> per Input | One input at 3.4 V,<br>Other inputs at V <sub>CC</sub> or GND  | 5.5                    |                                 |      | 2.5  | mA    |

\*Typical values are at V<sub>CC</sub> = 5.0 V and T<sub>A</sub> = 25°C.

6. Measured by the voltage drop between A and B pins at the indicated current through the switch. On resistance is determined by the lower of the voltages on the two (A or B) pins.

## AC ELECTRICAL CHARACTERISTICS

| Symbol                                 | Parameter  | Conditions                                 | T <sub>A</sub> = -40°C to +85°C<br>C <sub>L</sub> = 50 pF, R <sub>U</sub> = R <sub>D</sub> = 500 Ω |      |                         |      | Units |
|--|--|--|--|------|-------------------------|------|-------|
|  |  |  | V <sub>CC</sub> = 4.5-5.5 V  |      | V <sub>CC</sub> = 4.0 V |      |       |
|  |  |  | Min  | Max  | Min                     | Max  |       |
| t <sub>PHL</sub> ,<br>t <sub>PLH</sub> | Prop Delay Bus to Bus (Note 7)                   | V <sub>I</sub> = OPEN                      |  | 0.25 |                         | 0.25 | ns    |
|  | Prop Delay, Select to Bus A                      |  | 1.0  | 4.7  |                         | 5.2  |       |
| t <sub>PZH</sub> ,<br>t <sub>PZL</sub> | Output Enable Time, Select to Bus B              | V <sub>I</sub> = 7 V for t <sub>PZL</sub>  | 1.0  | 5.2  |                         | 5.7  | ns    |
|  | Output Enable Time, I <sub>OE</sub> to Bus A, B  | V <sub>I</sub> = OPEN for t <sub>PZH</sub> | 1.0  | 5.1  |                         | 5.6  |       |
| t <sub>PHZ</sub> ,<br>t <sub>PLZ</sub> | Output Disable Time, Select to Bus B             | V <sub>I</sub> = 7 V for t <sub>PLZ</sub>  | 1.0  | 5.2  |                         | 5.5  | ns    |
|  | Output Disable Time, I <sub>OE</sub> to Bus A, B | V <sub>I</sub> = OPEN for t <sub>PHZ</sub> | 1.0  | 5.5  |                         | 5.5  |       |

7. This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical On resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage source (zero output impedance).

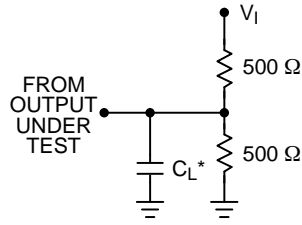
## CAPACITANCE (Note 8)

| Symbol           | Parameter                       | Conditions                                | Typ | Max | Units |
|------------------|---------------------------------|---|-----|-----|-------|
| C <sub>IN</sub>  | Control Pin Input Capacitance   | V <sub>CC</sub> = 5.0 V                   | 3   |     | pF    |
| C <sub>I/O</sub> | A Port Input/Output Capacitance | V <sub>CC</sub> , $\overline{OE}$ = 5.0 V | 7   |     | pF    |
| C <sub>I/O</sub> | B Port Input/Output Capacitance | V <sub>CC</sub> , $\overline{OE}$ = 5.0 V | 5   |     | pF    |

8. T<sub>A</sub> = +25°C, f = 1 MHz, Capacitance is characterized but not tested.

# 74FST3257

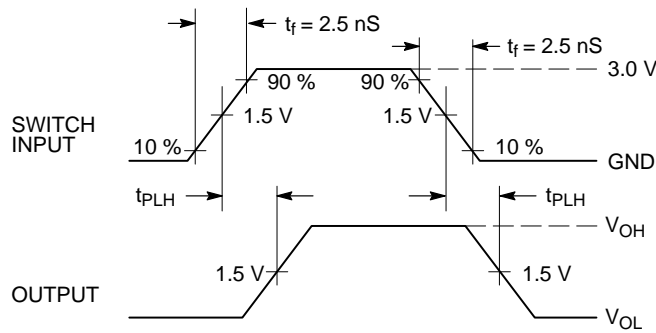
## AC Loading and Waveforms



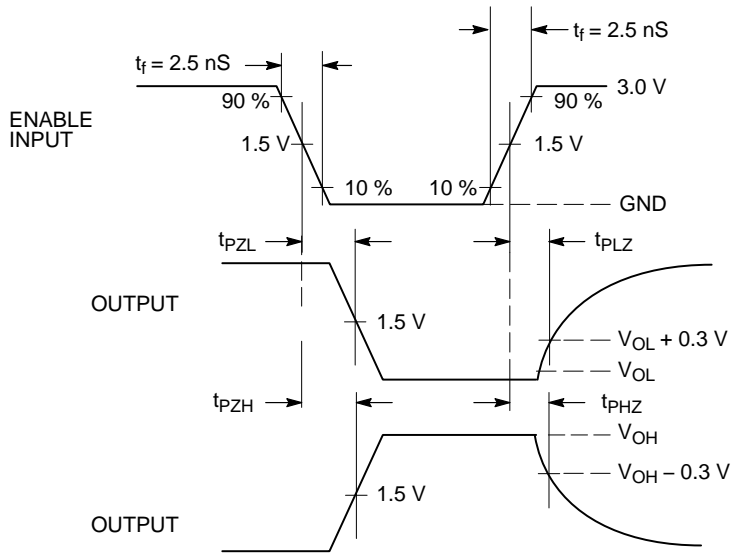
**NOTES:**

1. Input driven by 50 Ω source terminated in 50 Ω.
  2. C<sub>L</sub> includes load and stray capacitance.
- \*C<sub>L</sub> = 50 pF

**Figure 4. AC Test Circuit**



**Figure 5. Propagation Delays**



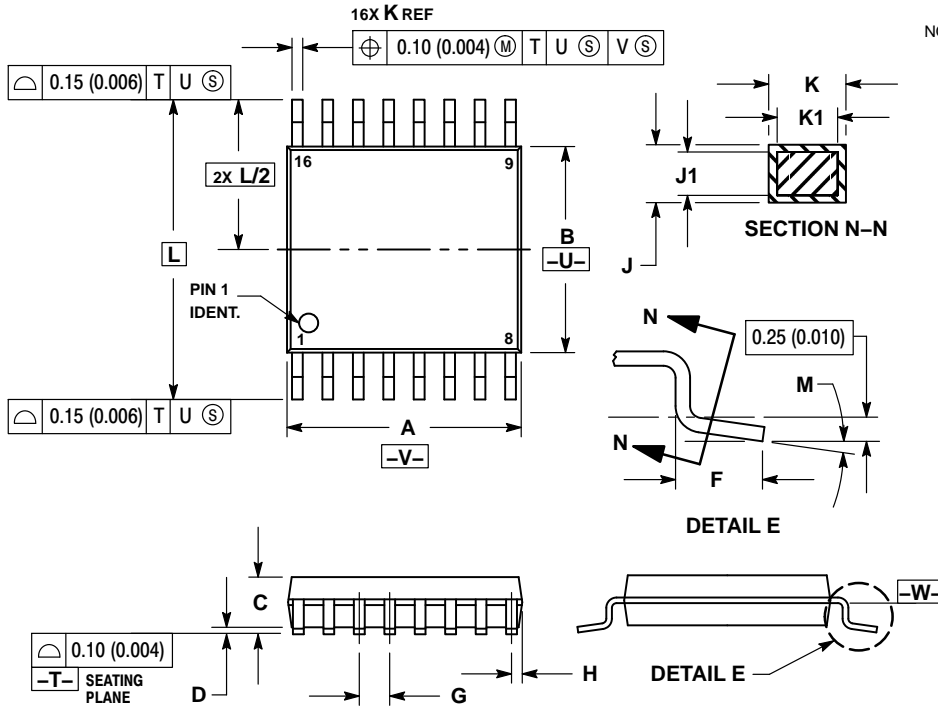
**Figure 6. Enable/Disable Delays**



# 74FST3257

## PACKAGE DIMENSIONS

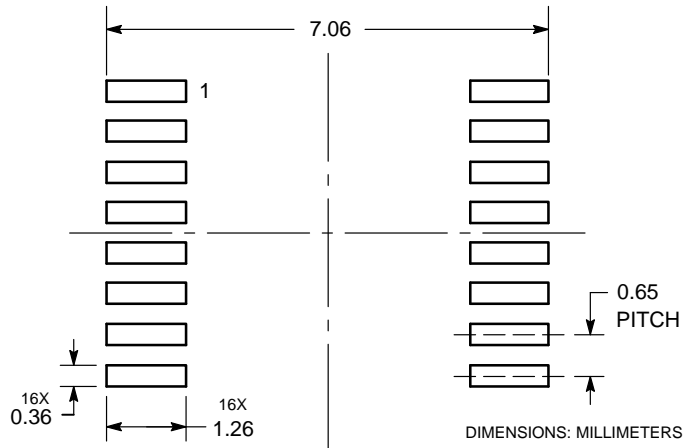
TSSOP-16  
DT SUFFIX  
CASE 948F  
ISSUE B



- NOTES:
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  - CONTROLLING DIMENSION: MILLIMETER.
  - 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.
  - DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
  - 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.
  - TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
  - DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | 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   | 0.18        | 0.28 | 0.007     | 0.011 |
| 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°    |

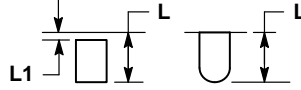
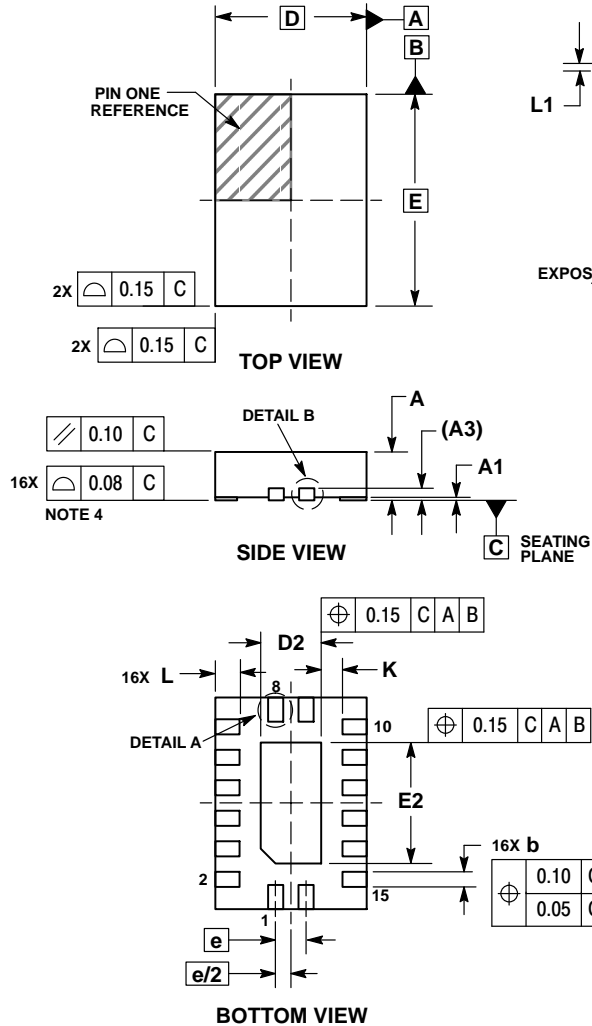
### SOLDERING FOOTPRINT



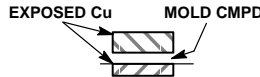
# 74FST3257

## PACKAGE DIMENSIONS

**QFN16**  
**MN SUFFIX**  
**CASE 485AW**  
**ISSUE 0**



**DETAIL A**  
**ALTERNATE TERMINAL CONSTRUCTIONS**



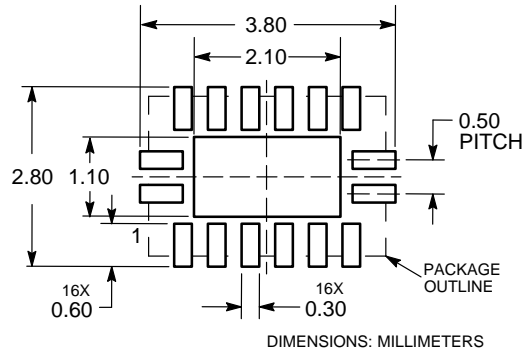
**DETAIL B**  
**ALTERNATE CONSTRUCTIONS**

**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 0.80        | 1.00 |
| A1  | 0.00        | 0.05 |
| A3  | 0.20 REF    |      |
| b   | 0.20        | 0.30 |
| D   | 2.50 BSC    |      |
| D2  | 0.85        | 1.15 |
| E   | 3.50 BSC    |      |
| E2  | 1.85        | 2.15 |
| e   | 0.50 BSC    |      |
| K   | 0.20        | ---  |
| L   | 0.35        | 0.45 |
| L1  | ---         | 0.15 |

**SOLDERING FOOTPRINT\***



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

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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 ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor 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 ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor 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 ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor 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:**  
 Literature Distribution Center for ON Semiconductor  
 19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
 USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
 Phone: 421 33 790 2910

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative