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FST3125 — 4-Bit Bus Switch

Features

- 4Ω Switch Connection between Two Ports
- Minimal Propagation Delay through the Switch
- Low I_{CC}
- Zero Bounce in Flow-through Mode
- Control Inputs Compatible with TTL Level


Description

Fairchild switch FST3125 provides four high-speed CMOS TTL-compatible bus switches. The low on resistance of the switch allows inputs to be connected to outputs without adding propagation delay or generating additional ground bounce noise.

The device is organized as four one-bit switches with separate /OE inputs. When /OE is LOW, the switch is ON and port A is connected to port B. When /OE is HIGH, the switch is OPEN and a high-impedance state exists between the two ports.

Ordering Information

| Part Number | Operating Temperature Range | Package | Packing Method |
|-------------|-----------------------------|---------------------------------------------------------------------|----------------|
| FST3125M | -40 to 85°C | 14-Lead, Small Outline Integrated Circuit (SOIC) 0.150 inch Narrow | Tube |
| FST3125MX | -40 to 85°C | 14-Lead, Small Outline Integrated Circuit (SOIC) 0.150 inch Narrow | Tape and Reel |
| FST3125QSC | -40 to 85°C | 16-Lead, Quarter Size Outline Package (QSOP) MO-137 0.150 inch Wide | Tube |
| FST3125QSCX | -40 to 85°C | 16-Lead, Quarter Size Outline Package (QSOP) MO-137 0.150 inch Wide | Tape and Reel |
| FST3125MTC | -40 to 85°C | 14-Lead, Thin Shrink Small Outline Package (TSSOP) MO-153, 4mm Wide | Tube |
| FST3125MTCX | -40 to 85°C | 14-Lead, Thin Shrink Small Outline Package (TSSOP) MO-153, 4mm Wide | Tape and Reel |

 All packages are lead free per JEDEC: J-STD-020B standard.

The Fairchild switch family derives from and embodies Fairchild's proven switch technology used for several years in its 74LVX3L384 (FST3384) bus switch product.

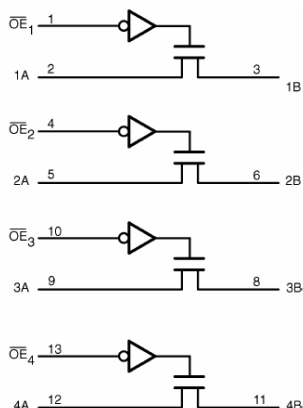


Figure 1. Logic Diagram

Pin Configurations

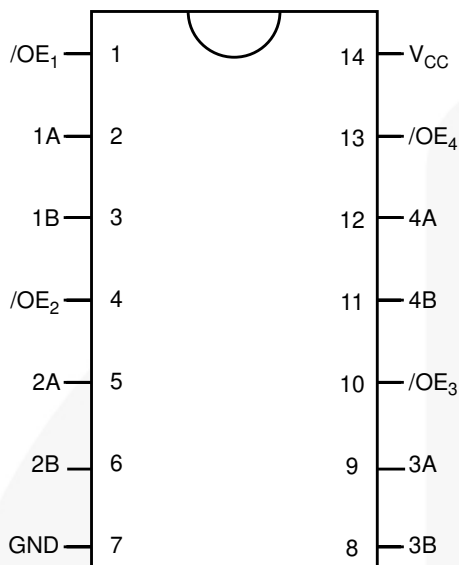


Figure 2. SOIC and TSSOP Pin Assignments

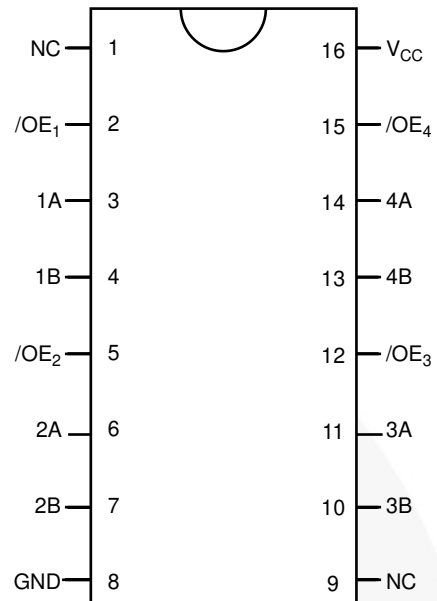


Figure 3. QSOP Pin Assignments

Pin Descriptions

| Pin Names | Description |
|---------------------------------------------------------------------------|--------------------|
| /OE ₁ , /OE ₂ , /OE ₃ , /OE ₄ | Bus Switch Enables |
| 1A, 2A, 3A, 4A | Bus A |
| 1B, 2B, 3B, 4B | Bus B |
| NC | Not Connected |
| V _{CC} | Supply Voltage |
| GND | Ground |

Truth Table

| Inputs | Inputs/Outputs |
|--------|----------------|
| /OE | A, B |
| LOW | A = B |
| HIGH | High Impedance |

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol | Parameter | Min. | Max. | Unit |
|------------------------------------|----------------------------------|------|------|------|
| V _{CC} | Supply Voltage | -0.5 | 7.0 | V |
| V _S | DC Switch Voltage | -0.5 | 7.0 | V |
| V _{IN} | DC Input Voltage ⁽¹⁾ | -0.5 | 7.0 | V |
| I _{IK} | DC Input Current | | -50 | mA |
| I _{OUT} | DC Output Sink Current | | 128 | mA |
| I _{CC} / I _{GND} | DC V _{CC} / GND Current | | ±100 | mA |
| T _{STG} | Storage Temperature Range | -65 | +150 | °C |

Note:

- The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

| Symbol | Parameter | | Min. | Max. | Unit |
|---------------------------------|---------------------------------|-------------------------------------|------|------|------|
| V _{CC} | Power Supply Operating | | 4.0 | 5.5 | V |
| V _{IN} | Input Voltage | | 0 | 5.5 | V |
| V _{OUT} | Output Voltage | | 0 | 5.5 | V |
| t _r , t _f | Input Rise and Fall Time | Switch Control Input ⁽²⁾ | 0 | 5 | ns/V |
| | | Switch I/O | 0 | DC | |
| T _A | Operating Temperature, Free Air | | -40 | +85 | °C |

Note:

- Unused control inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Typical values are at $V_{CC} = 5.0V$ and $T_A = 25^\circ C$.

| Symbol | Parameter | Conditions | V_{CC} (V) | $T_A = -40$ to $+85^\circ C$ | | | Units |
|-----------------|-------------------------------------|----------------------------------------------------|--------------|------------------------------|------|-----------|----------|
| | | | | Min. | Typ. | Max. | |
| V_{IK} | Clamp Diode Voltage | $I_{IN} = -18mA$ | 4.5 | | | -1.2 | V |
| V_{IH} | High-Level Input Voltage | | 4.0 to 5.5 | 2.0 | | | V |
| V_{IL} | Low-Level Input Voltage | | 4.0 to 5.5 | | | 0.8 | V |
| I_{IN} | Input Leakage Current | $0 \leq V_{IN} \leq 5.5$ | 5.5 | | | ± 1.0 | μA |
| I_{OZ} | Off-state Leakage Current | $0 \leq A, B \leq V_{CC}$ | 5.5 | | | ± 1.0 | μA |
| R_{ON} | Switch On Resistance ⁽³⁾ | $V_{IN} = 0V, I_{IN} = 64mA$ | 4.5 | | 4 | 7 | Ω |
| | | $V_{IN} = 0V, I_{IN} = 30mA$ | 4.5 | | 4 | 7 | |
| | | $V_{IN} = 2.4V, I_{IN} = 15mA$ | 4.5 | | 8 | 15 | |
| | | $V_{IN} = 2.4V, I_{IN} = 15mA$ | 4.0 | | 11 | 20 | |
| I_{CC} | Quiescent Supply Current | $V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$ | 5.5 | | | 3 | μA |
| ΔI_{CC} | Increase in I_{CC} per Input | One Input at 3.4V, Other Inputs at V_{CC} or GND | 5.5 | | | 2.5 | mA |

Note:

3. 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 A or B pins.

AC Electrical Characteristics

$T_A = -40$ to $+85^\circ C$, $C_L = 50pF$, and $R_U = R_D = 500\Omega$.

| Symbol | Parameter | Conditions | $V_{CC} = 4.5 - 5.5V$ | | $V_{CC} = 4.0V$ | | Units | Figure |
|--------------------|---------------------------------------------|---------------------------------------------------------------------|-----------------------|------|-----------------|------|-------|----------------------|
| | | | Min. | Max. | Min. | Max. | | |
| t_{PHL}, t_{PLH} | Propagation Delay Bus-to-Bus ⁽⁴⁾ | $V_{IN} = \text{Open}$ | | 0.25 | | 0.25 | ns | Figure 4 Figure 5 |
| t_{PZH}, t_{PZL} | Output Enable Time | $V_{IN} = 7V$ for t_{PZL} $V_{IN} = \text{Open}$ for t_{PZH} | 1.0 | 5.0 | | 5.5 | ns | Figure 4 Figure 5 |
| t_{PHZ}, t_{PLZ} | Output Disable Time | $V_{IN} = 7V$ for t_{PLZ} $V_{IN} = \text{Open}$ for t_{PHZ} | 1.5 | 5.3 | | 5.6 | ns | Figure 4 Figure 5 |

Note:

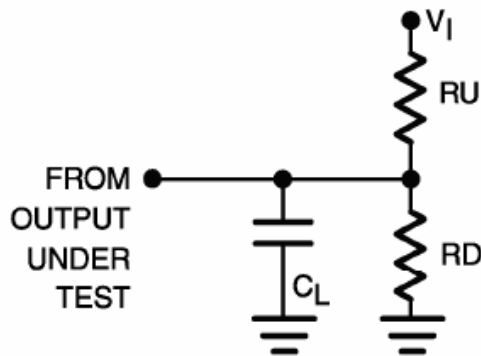
4. This parameter is guaranteed by design, but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical on resistance of the switch and the 50pF load capacitance when driven by an ideal voltage source (zero output impedance).

Capacitance

$T_A = +25^\circ C$, $f = 1MHz$. Capacitance is characterized, but not tested.

| Symbol | Parameter | Conditions | Typ. | Units |
|-----------|-------------------------------|----------------------|------|-------|
| C_{IN} | Control Pin Input Capacitance | $V_{CC} = 5.0V$ | 3 | pF |
| $C_{I/O}$ | Input/Output Capacitance | $V_{CC}, /OE = 5.0V$ | 2 | pF |

AC Loadings and Waveforms



Notes: Input driven by 50Ω source terminated in 50Ω .
 C_L includes load and stray capacitance.
 Input PRR = 1.0MHz, $t_w = 500\text{ns}$.

Figure 4. AC Test Circuit

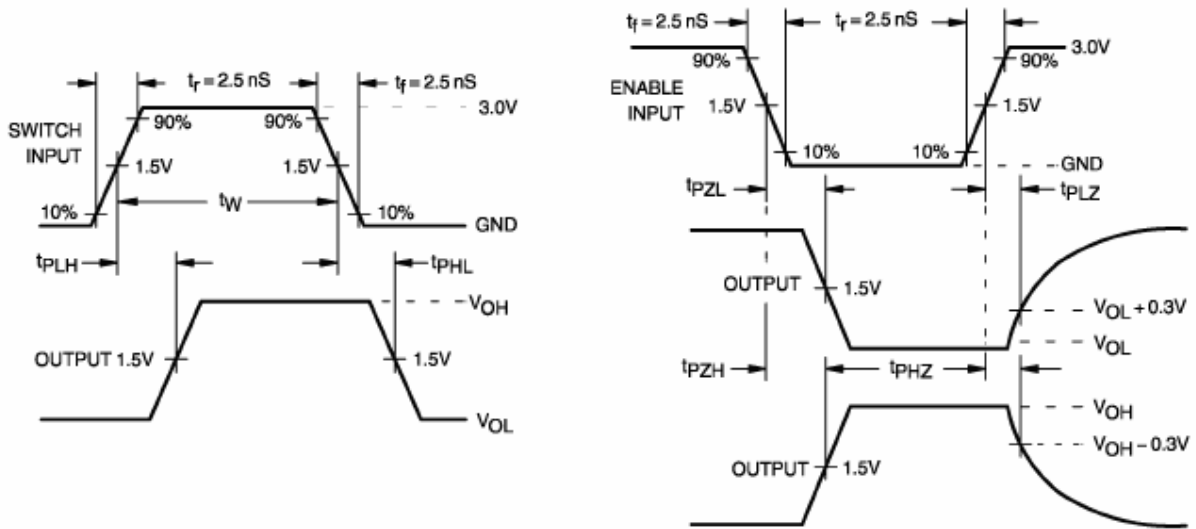


Figure 5. AC Waveforms

Physical Dimensions

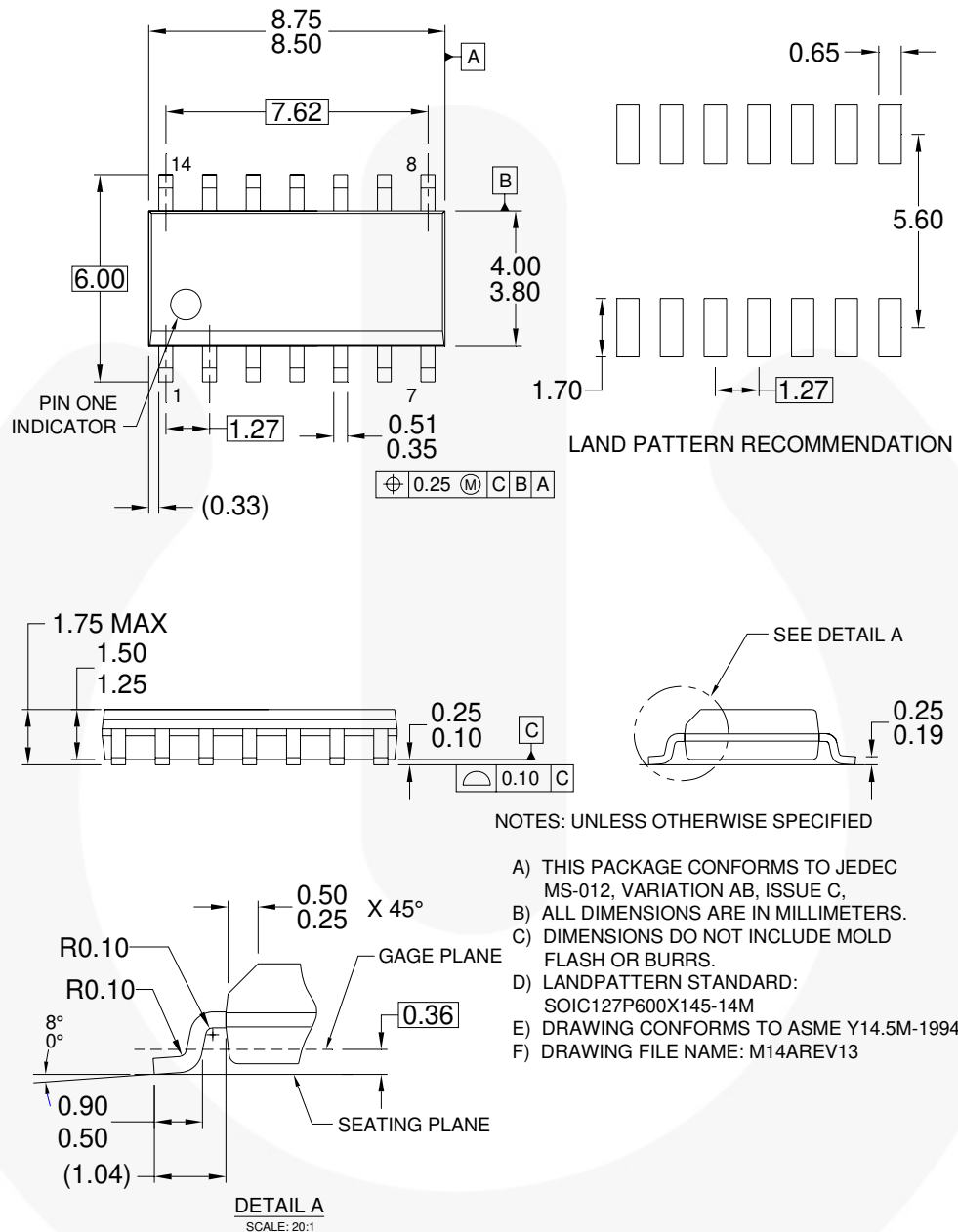
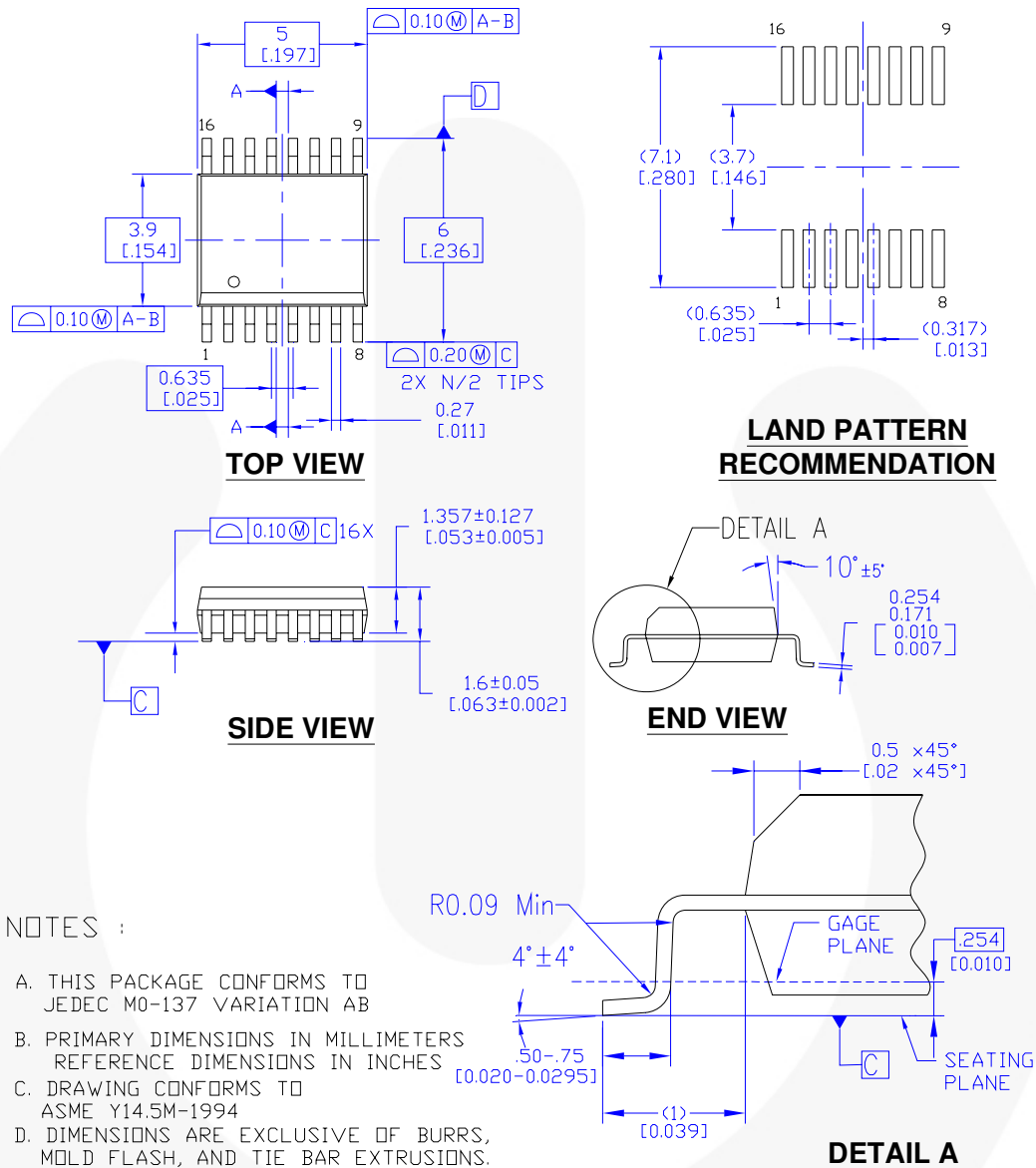


Figure 6. 14-Lead, Small-Outline Integrated Circuit (SOIC) 0.150-inch Narrow

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Physical Dimensions



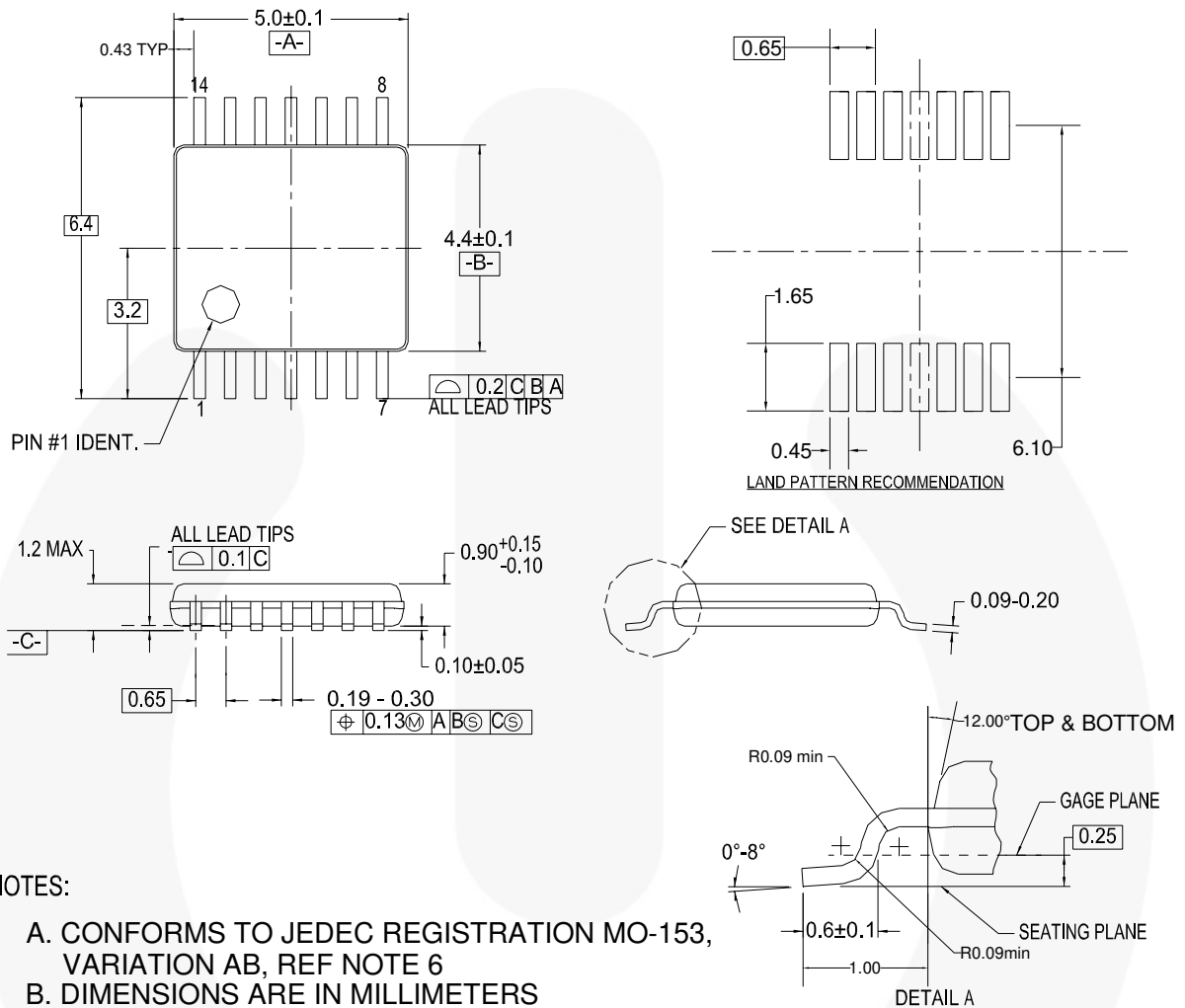
MQA16AREVB

Figure 7. 16-Lead, Quarter-Size Outline Package (QSOP), MO-1370.150-inch Wide

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Physical Dimensions



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- B. DIMENSIONS ARE IN MILLIMETERS
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
- D. DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 1982
- E. LANDPATTERN STANDARD: SOP65P640X110-14M
- F. DRAWING FILE NAME: MTC14REV6

Figure 8. 14-Lead, Thin Shrink Small Outline Package (TSSOP) MO-153, 4mm Wide

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