



Is Now Part of



ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

ON Semiconductor and the ON Semiconductor logo 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. 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.

74VHC157

Quad 2-Input Multiplexer

Features

- High Speed: $t_{PD} = 4.1ns$ (Typ.) at $V_{CC} = 5V$
- Low power dissipation: $I_{CC} = 4\mu A$ (Max.) at $T_A = 25^\circ C$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (Min.)
- Power down protection is provided on all inputs
- Low noise: $V_{OLP} = 0.8V$ (Max.)
- Pin and function compatible with 74HC157

General Description

The VHC157 is an advanced high speed CMOS Quad 2-Channel Multiplexer fabricated with silicon gate CMOS technology. It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

It consists of four 2-input digital multiplexers with common select and enable inputs. When the \overline{ENABLE} input is held "H" level, selection of data is inhibited and all the outputs become "L" level. The SELECT decoding determines whether the I_{0x} or I_{1x} inputs get routed to their corresponding outputs.

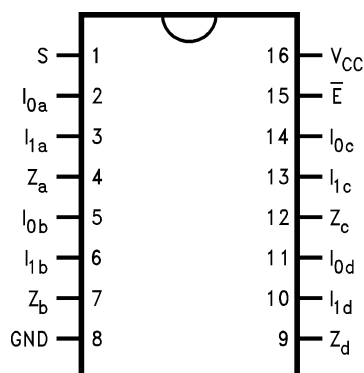
An Input protection circuit ensures that 0V to 7V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5V to 3V systems and on two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

Ordering Information

| Order Number | Package Number | Package Description |
|--------------|----------------|--|
| 74VHC157M | M16A | 16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow |
| 74VHC157SJ | M16D | 16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| 74VHC157MTC | MTC16 | 16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |

Surface mount packages are also available on Tape and Reel. Specify by appending the suffix letter "X" to the ordering number.

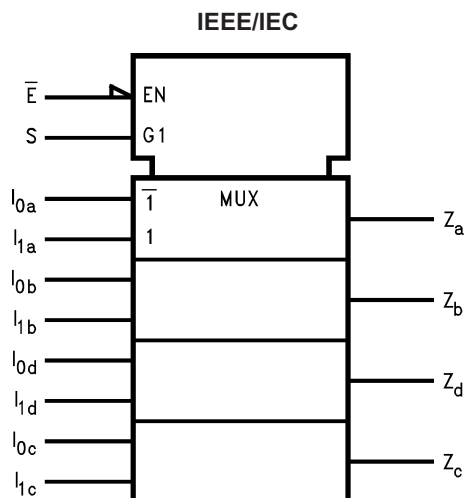
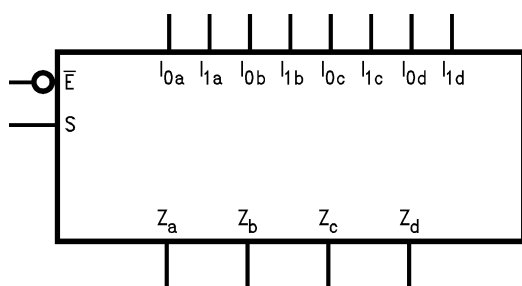
Connection Diagram



Pin Description

| Pin Names | Description |
|-----------------|----------------------|
| $I_{0a}-I_{0d}$ | Source 0 Data Inputs |
| $I_{1a}-I_{1d}$ | Source 1 Data Inputs |
| \overline{E} | Enable Input |
| S | Select Input |
| Z_a-Z_d | Outputs |

Logic Symbols



Functional Description

The VHC157 is a quad 2-input multiplexer. It selects four bits of data from two sources under the control of a common Select input (S). The Enable input (\bar{E}) is active-LOW. When \bar{E} is HIGH, all of the outputs (Z) are forced LOW regardless of all other inputs. The VHC157 is the logic implementation of a 4-pole, 2-position switch where the position of the switch is determined by the logic levels supplied to the Select input. The logic equations for the outputs are shown below:

$$Z_a = \bar{E} \cdot (I_{1a} \cdot S + I_{0a} \cdot \bar{S})$$

$$Z_b = \bar{E} \cdot (I_{1b} \cdot S + I_{0b} \cdot \bar{S})$$

$$Z_c = \bar{E} \cdot (I_{1c} \cdot S + I_{0c} \cdot \bar{S})$$

$$Z_d = \bar{E} \cdot (I_{1d} \cdot S + I_{0d} \cdot \bar{S})$$

A common use of the VHC157 is the moving of data from two groups of registers to four common output busses. The particular register from which the data comes is determined by the state of the Select input. A less obvious use is as a function generator. The VHC157 can generate any four of the sixteen different functions of two variables with one variable common. This is useful for implementing gating functions.

Truth Table

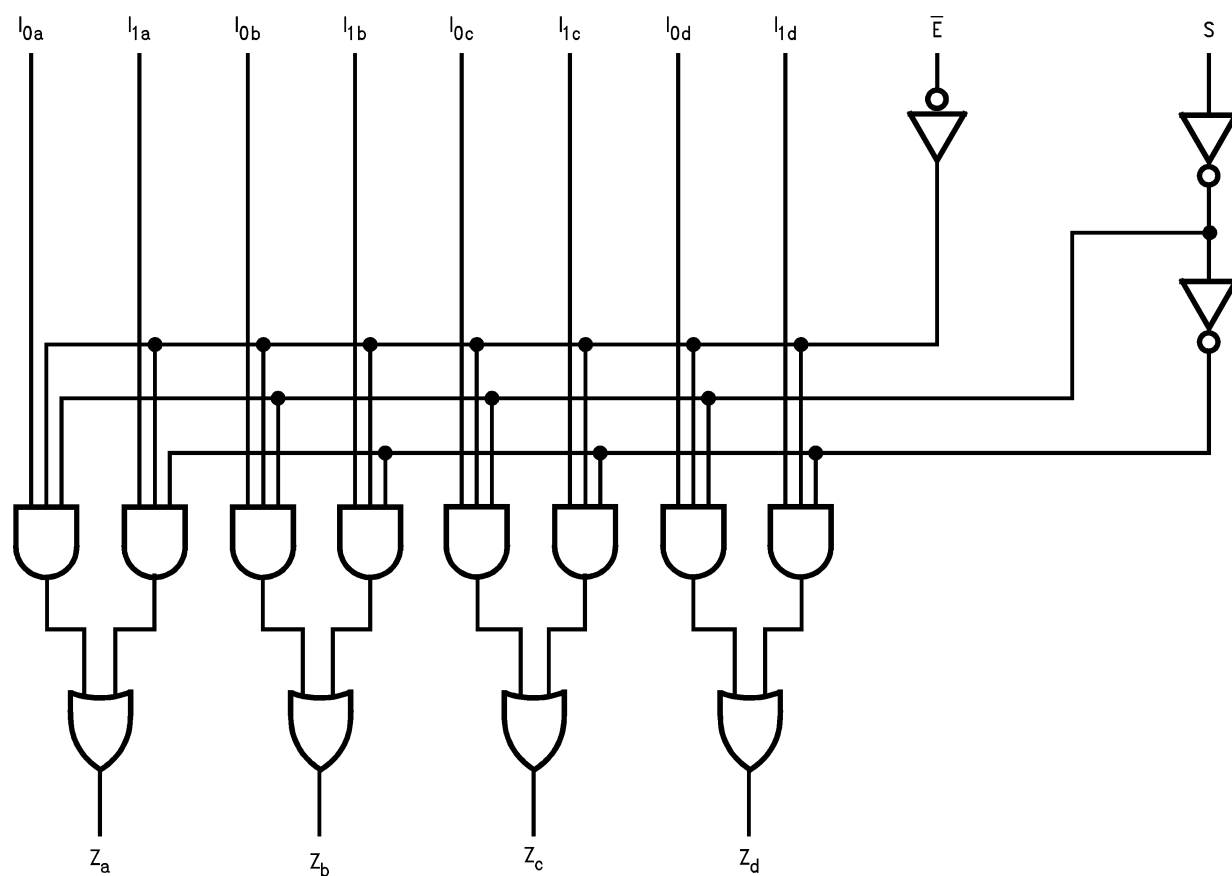
| Inputs | | | | Outputs |
|-----------|---|-------|-------|---------|
| \bar{E} | S | I_0 | I_1 | Z |
| H | X | X | X | L |
| L | H | X | L | L |
| L | H | X | H | H |
| L | L | L | X | L |
| L | L | H | X | H |

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

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 | Rating |
|-----------|--|--------------------------|
| V_{CC} | Supply Voltage | -0.5V to +7.0V |
| V_{IN} | DC Input Voltage | -0.5V to +7.0V |
| V_{OUT} | DC Output Voltage | -0.5V to $V_{CC} + 0.5V$ |
| I_{IK} | Input Diode Current | -20mA |
| I_{OK} | Output Diode Current | $\pm 20mA$ |
| I_{OUT} | DC Output Current | $\pm 25mA$ |
| I_{CC} | DC V_{CC} / GND Current | $\pm 50mA$ |
| T_{STG} | Storage Temperature | -65°C to +150°C |
| T_L | Lead Temperature (Soldering, 10 seconds) | 260°C |

Recommended Operating Conditions⁽¹⁾

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 | Rating |
|------------|---|-----------------------------------|
| V_{CC} | Supply Voltage | 2.0V to +5.5V |
| V_{IN} | Input Voltage | 0V to +5.5V |
| V_{OUT} | Output Voltage | 0V to V_{CC} |
| T_{OPR} | Operating Temperature | -40°C to +85°C |
| t_r, t_f | Input Rise and Fall Time, $V_{CC} = 3.3V \pm 0.3V$ $V_{CC} = 5.0V \pm 0.5V$ | 0ns/V ~ 100ns/V 0ns/V ~ 20ns/V |

Note:

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

DC Electrical Characteristics

| Symbol | Parameter | V_{CC} (V) | Conditions | $T_A = 25^\circ\text{C}$ | | | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ | | Units |
|----------|---------------------------|--------------|----------------------------------|---------------------------|------|---------------------|---|---------------------|---------------|
| | | | | Min. | Typ. | Max. | Min. | Max. | |
| V_{IH} | HIGH Level Input Voltage | 2.0 | | 1.50 | | | 1.50 | | V |
| | | 3.0–5.5 | | $0.7 \times V_{CC}$ | | | $0.7 \times V_{CC}$ | | |
| V_{IL} | LOW Level Input Voltage | 2.0 | | | | 0.50 | | 0.50 | V |
| | | 3.0–5.5 | | | | $0.3 \times V_{CC}$ | | $0.3 \times V_{CC}$ | |
| V_{OH} | HIGH Level Output Voltage | 2.0 | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OH} = -50\mu\text{A}$ | 1.9 | 2.0 | | 1.9 | V |
| | | 3.0 | | | 2.9 | 3.0 | | 2.9 | |
| | | 4.5 | | | 4.4 | 4.5 | | 4.4 | |
| | | 3.0 | | $I_{OH} = -4\text{mA}$ | 2.58 | | | 2.48 | |
| | | 4.5 | | $I_{OH} = -8\text{mA}$ | 3.94 | | | 3.80 | |
| V_{OL} | LOW Level Output Voltage | 2.0 | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OL} = 50\mu\text{A}$ | | 0.0 | 0.1 | | V |
| | | 3.0 | | | | 0.0 | 0.1 | | |
| | | 4.5 | | | | 0.0 | 0.1 | | |
| | | 3.0 | | $I_{OL} = 4\text{mA}$ | | | 0.36 | 0.44 | |
| | | 4.5 | | $I_{OL} = 8\text{mA}$ | | | 0.36 | 0.44 | |
| I_{IN} | Input Leakage Current | 0–5.5 | $V_{IN} = 5.5\text{V or GND}$ | | | ± 0.1 | | ± 1.0 | μA |
| I_{CC} | Quiescent Supply Current | 5.5 | $V_{IN} = V_{CC}$ or GND | | | 4.0 | | 40.0 | μA |

Noise Characteristics

| Symbol | Parameter | V_{CC} (V) | Conditions | $T_A = 25^\circ\text{C}$ | | Units |
|-----------------|--|--------------|---------------------|--------------------------|--------|-------|
| | | | | Typ. | Limits | |
| $V_{OLP}^{(3)}$ | Quiet Output Maximum Dynamic V_{OL} | 5.0 | $C_L = 50\text{pF}$ | 0.3 | 0.8 | V |
| $V_{OLV}^{(3)}$ | Quiet Output Minimum Dynamic V_{OL} | 5.0 | $C_L = 50\text{pF}$ | –0.3 | –0.8 | V |
| $V_{IHD}^{(3)}$ | Minimum HIGH Level Dynamic Input Voltage | 5.0 | $C_L = 50\text{pF}$ | | 3.5 | V |
| $V_{ILD}^{(3)}$ | Maximum LOW Level Dynamic Input Voltage | 5.0 | $C_L = 50\text{pF}$ | | 1.5 | V |

Note:

2. Parameter guaranteed by design.

AC Electrical Characteristics

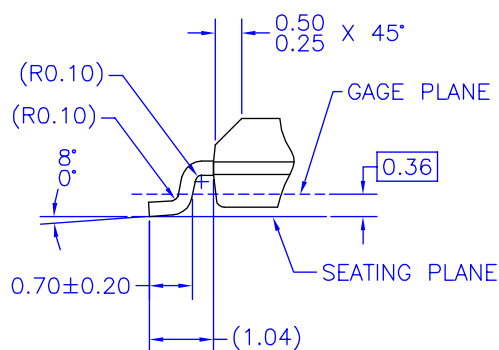
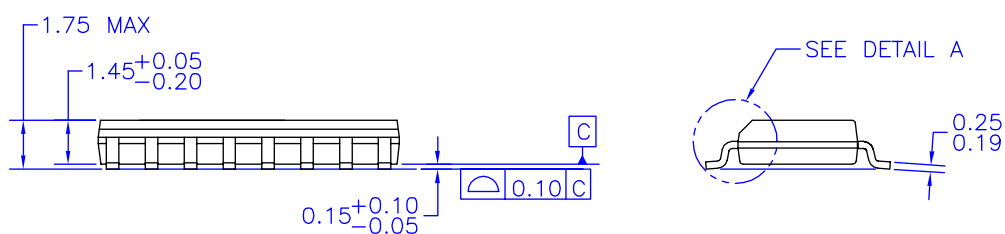
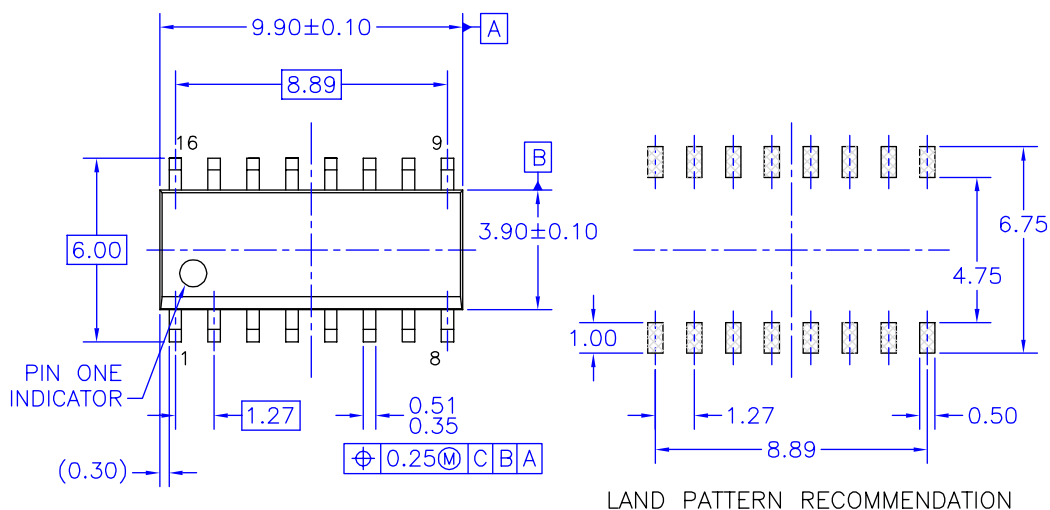
| Symbol | Parameter | V _{CC} (V) | Conditions | T _A = 25°C | | | T _A = -40°C to +85°C | | Units |
|-------------------------------------|--|------------------------|------------------------|-----------------------|------|------|------------------------------------|------|-------|
| | | | | Min. | Typ. | Max. | Min. | Max. | |
| t _{PLH} , t _{PHL} | Propagation Delay, I _n to Z _n | 3.3 ± 0.3 | C _L = 15pF | | 6.2 | 9.7 | 1.0 | 11.5 | ns |
| | | | C _L = 50pF | | 8.7 | 13.2 | 1.0 | 15.0 | |
| | | 5.0 ± 0.5 | C _L = 15pF | | 4.1 | 6.4 | 1.0 | 7.5 | ns |
| | | | C _L = 50pF | | 5.6 | 8.4 | 1.0 | 9.5 | |
| t _{PLH} , t _{PHL} | Propagation Delay, S to Z _n | 3.3 ± 0.3 | C _L = 15pF | | 8.4 | 13.2 | 1.0 | 15.5 | ns |
| | | | C _L = 50pF | | 10.9 | 16.7 | 1.0 | 19.0 | |
| | | 5.0 ± 0.5 | C _L = 15pF | | 5.3 | 8.1 | 1.0 | 9.5 | ns |
| | | | C _L = 50pF | | 6.8 | 10.1 | 1.0 | 11.5 | |
| t _{PLH} , t _{PHL} | Propagation Delay, Ē to Z _n | 3.3 ± 0.3 | C _L = 15pF | | 8.7 | 13.6 | 1.0 | 16.0 | ns |
| | | | C _L = 50pF | | 11.2 | 17.1 | 1.0 | 19.5 | |
| | | 5.0 ± 0.5 | C _L = 15pF | | 5.6 | 8.6 | 1.0 | 10.0 | ns |
| | | | C _L = 50pF | | 7.1 | 10.6 | 1.0 | 12.0 | |
| C _{IN} | Input Capacitance | | V _{CC} = Open | | 4 | 10 | | 10 | pF |
| C _{PD} | Power Dissipation Capacitance | | ⁽³⁾ | | 20 | | | | pF |

Note:

3. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation:

$$I_{CC}(\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Dimensions are in millimeters unless otherwise noted.



DETAIL A
SCALE: 2:1

- NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO JEDEC MS-012, VARIATION AC, ISSUE C, DATED MAY 1990.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
- D) STANDARD LEAD FINISH:
200 MICROINCHES / 5.08 MICRONS MIN.
LEAD/TIN (SOLDER) ON COPPER.

- B) ALL DIMENSIONS ARE IN MILLIMETERS.

- C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.

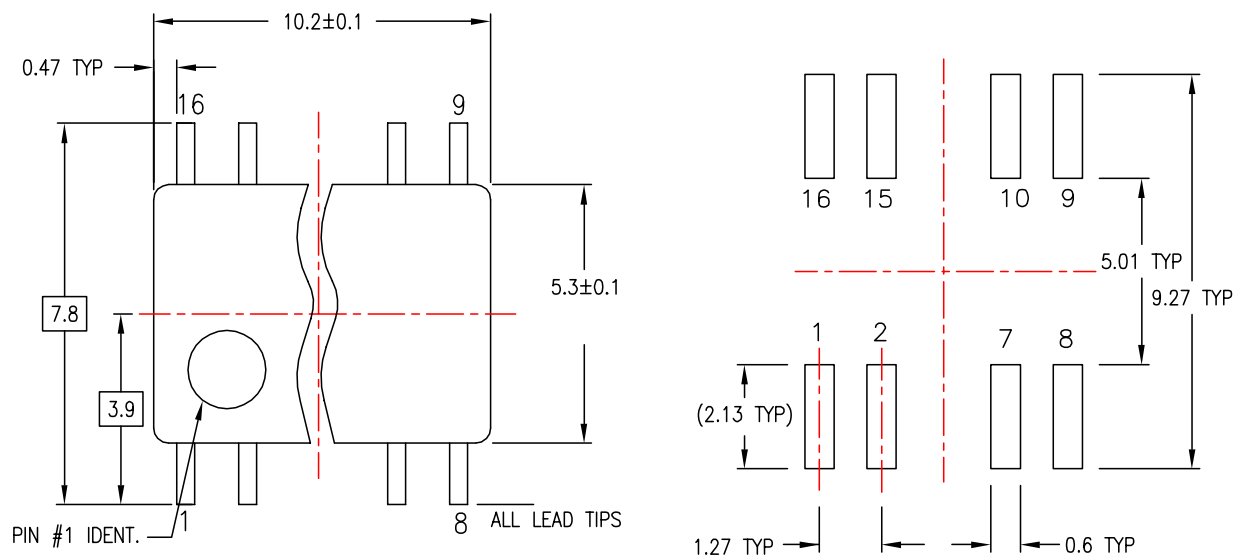
- D) STANDARD LEAD FINISH:
200 MICROINCHES / 5.08 MICRONS MIN.
LEAD/TIN (SOLDER) ON COPPER.

M16AREVK

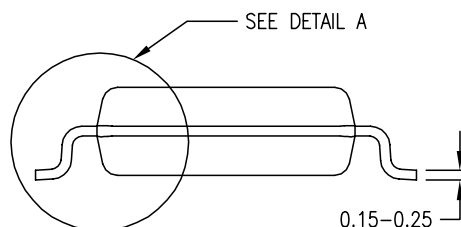
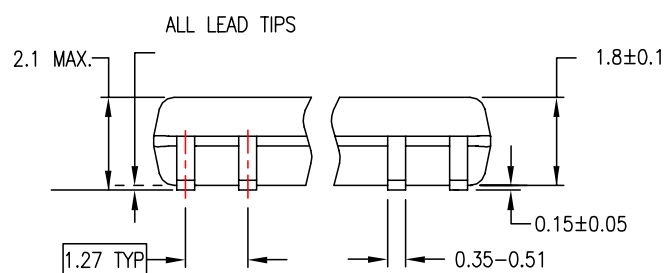
Figure 1. 16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Package Number M16A

Physical Dimensions (Continued)

Dimensions are in millimeters unless otherwise noted.



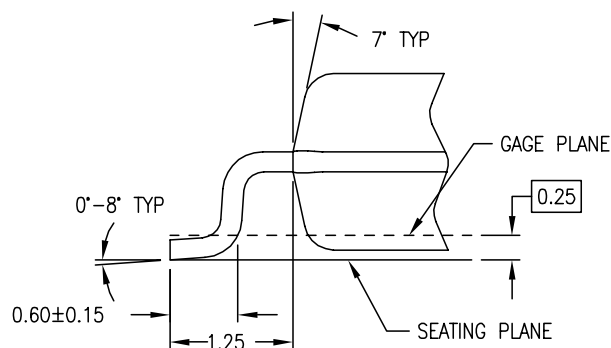
LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS

NOTES:

- A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.



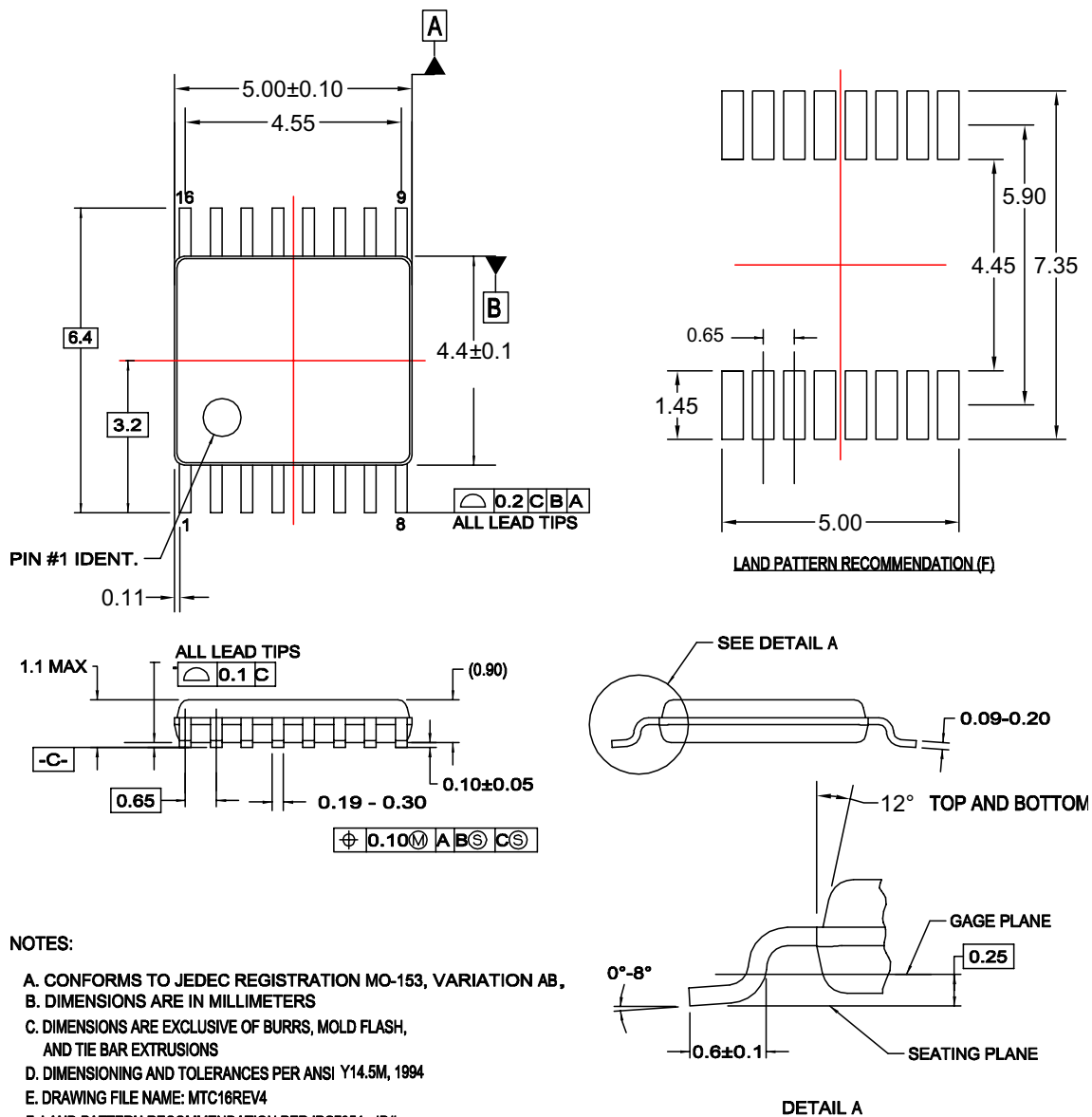
DETAIL A

M16DREVC

**Figure 2. 16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M16D**

Physical Dimensions (Continued)

Dimensions are in millimeters unless otherwise noted.




MTC16rev4

Figure 3. 16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide Package Number MTC16

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

| | | | |
|--|--------------------------------|---|-----------------------------|
| ACE [®] | <i>i-Lo</i> [™] | Power-SPM [™] | TinyBoost [™] |
| Across the board. Around the world. [™] | ImpliedDisconnect [™] | PowerTrench [®] | TinyBuck [™] |
| ActiveArray [™] | IntelliMAX [™] | Programmable Active Droop [™] | TinyLogic [®] |
| Bottomless [™] | ISOPANAR [™] | QFET [®] | TINYOPTO [™] |
| Build it Now [™] | MICROCOUPLER [™] | QS [™] | TinyPower [™] |
| CoolFET [™] | MicroPak [™] | QT Optoelectronics [™] | TinyWire [™] |
| CROSSVOLT [™] | MICROWIRE [™] | Quiet Series [™] | TruTranslation [™] |
| CTL [™] | Motion-SPM [™] | RapidConfigure [™] | μSerDes [™] |
| Current Transfer Logic [™] | MSX [™] | RapidConnect [™] | UHC [®] |
| DOVE [™] | MSXPro [™] | ScalarPump [™] | UniFET [™] |
| E ² CMOS [™] | OCX [™] | SMART START [™] | VCX [™] |
| EcoSPARK [®] | OCXPro [™] | SPM [®] | Wire [™] |
| EnSigna [™] | OPTOLOGIC [®] | STEALTH [™] | |
| FACT Quiet Series [™] | OPTOPLANAR [®] | SuperFET [™] | |
| FACT [®] | PACMAN [™] | SuperSOT [™] -3 | |
| FAST [®] | PDP-SPM [™] | SuperSOT [™] -6 | |
| FASTr [™] | POP [™] | SuperSOT [™] -8 | |
| FPS [™] | Power220 [®] | SyncFET [™] | |
| FRFET [®] | Power247 [®] | TCM [™] | |
| GlobalOptoisolator [™] | PowerEdge [™] | The Power Franchise [®] | |
| GTO [™] | PowerSaver [™] |  | |
| HiSeC [™] | | | |

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

| Datasheet Identification | Product Status | Definition |
|--------------------------|------------------------|--|
| Advance Information | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | First Production | This datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| No Identification Needed | Full Production | This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| Obsolete | Not In Production | This datasheet contains specifications on a product that has been discontinued by Fairchild Semiconductor. The datasheet is printed for reference information only. |

Rev. I26

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Fairchild Semiconductor:

[74VHC157M](#) [74VHC157MTCX](#) [74VHC157SJX](#) [74VHC157MX](#) [74VHC157MTC](#)