

# 74AC125, 74ACT125

## Quad Buffer with 3-STATE Outputs

### Features

- $I_{CC}$  reduced by 50%
- Outputs source/sink 24mA
- ACT125 has TTL-compatible outputs

### General Description

The AC/ACT125 contains four independent non-inverting buffers with 3-STATE outputs.

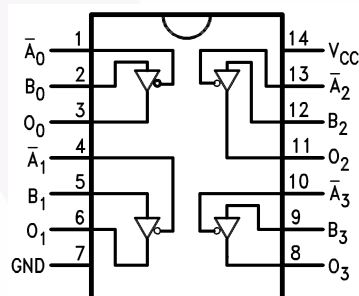
### Ordering Information

| Order Number | Package Number | Package Description                                                          |
|--------------|----------------|------------------------------------------------------------------------------|
| 74AC125SC    | M14A           | 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow |
| 74AC125SJ    | M14D           | 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide                |
| 74AC125MTC   | MTC14          | 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide  |
| 74AC125PC    | N14A           | 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide       |
| 74ACT125SC   | M14A           | 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow |
| 74ACT125SJ   | M14D           | 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide                |
| 74ACT125MTC  | MTC14          | 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide  |
| 74ACT125PC   | N14A           | 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide       |

Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.

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

### Connection Diagram



### Logic Symbol



### Pin Description

| Pin Names        | Description |
|------------------|-------------|
| $\bar{A}_n, B_n$ | Inputs      |
| $O_n$            | Outputs     |

### Function Table

| Inputs |       | Output |
|--------|-------|--------|
| $A_n$  | $B_n$ | $O_n$  |
| L      | L     | L      |
| L      | H     | H      |
| H      | X     | Z      |

H = HIGH Voltage Level, L = LOW Voltage Level  
Z = HIGH Impedance, X = Immaterial

## 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           |
| $I_{IK}$              | DC Input Diode Current<br>$V_I = -0.5V$      | −20mA                    |
|                       | $V_I = V_{CC} + 0.5$                         | +20mA                    |
| $V_I$                 | DC Input Voltage                             | −0.5V to $V_{CC} + 0.5V$ |
| $I_{OK}$              | DC Output Diode Current<br>$V_O = -0.5V$     | −20mA                    |
|                       | $V_O = V_{CC} + 0.5V$                        | +20mA                    |
| $V_O$                 | DC Output Voltage                            | −0.5V to $V_{CC} + 0.5V$ |
| $I_O$                 | DC Output Source or Sink Current             | ±50mA                    |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or Ground Current per Output Pin | ±50mA                    |
| $T_{STG}$             | Storage Temperature                          | −65°C to +150°C          |
| $T_J$                 | Junction Temperature                         | 140°C                    |

## 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                                                                                                  | Rating         |
|-----------------------|------------------------------------------------------------------------------------------------------------|----------------|
| $V_{CC}$              | Supply Voltage<br>AC                                                                                       | 2.0V to 6.0V   |
|                       | ACT                                                                                                        | 4.5V to 5.5V   |
| $V_I$                 | Input Voltage                                                                                              | 0V to $V_{CC}$ |
| $V_O$                 | Output Voltage                                                                                             | 0V to $V_{CC}$ |
| $T_A$                 | Operating Temperature                                                                                      | −40°C to +85°C |
| $\Delta V / \Delta t$ | Minimum Input Edge Rate, AC Devices:<br>$V_{IN}$ from 30% to 70% of $V_{CC}$ , $V_{CC}$ @ 3.3V, 4.5V, 5.5V | 125mV/ns       |
| $\Delta V / \Delta t$ | Minimum Input Edge Rate, ACT Devices:<br>$V_{IN}$ from 0.8V to 2.0V, $V_{CC}$ @ 4.5V, 5.5V                 | 125mV/ns       |

## DC Electrical Characteristics for AC

| Symbol                         | Parameter                                     | V <sub>CC</sub><br>(V) | Conditions                                                                                                                                             | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> = −40°C to +85°C |  | Units |
|--------------------------------|-----------------------------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------|---------------------------------|--|-------|
|                                |                                               |                        |                                                                                                                                                        | Typ.                   | Guaranteed Limits |                                 |  |       |
| V <sub>IH</sub>                | Minimum HIGH Level Input Voltage              | 3.0                    | V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> − 0.1V                                                                                                      | 1.5                    | 2.1               | 2.1                             |  | V     |
|                                |                                               | 4.5                    |                                                                                                                                                        | 2.25                   | 3.15              | 3.15                            |  |       |
|                                |                                               | 5.5                    |                                                                                                                                                        | 2.75                   | 3.85              | 3.85                            |  |       |
| V <sub>IL</sub>                | Maximum LOW Level Input Voltage               | 3.0                    | V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> − 0.1V                                                                                                      | 1.5                    | 0.9               | 0.9                             |  | V     |
|                                |                                               | 4.5                    |                                                                                                                                                        | 2.25                   | 1.35              | 1.35                            |  |       |
|                                |                                               | 5.5                    |                                                                                                                                                        | 2.75                   | 1.65              | 1.65                            |  |       |
| V <sub>OH</sub>                | Minimum HIGH Level Output Voltage             | 3.0                    | I <sub>OUT</sub> = −50μA                                                                                                                               | 2.99                   | 2.9               | 2.9                             |  | V     |
|                                |                                               | 4.5                    |                                                                                                                                                        | 4.49                   | 4.4               | 4.4                             |  |       |
|                                |                                               | 5.5                    |                                                                                                                                                        | 5.49                   | 5.4               | 5.4                             |  |       |
|                                |                                               | 3.0                    | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = −12mA                                                                         |                        | 2.56              | 2.46                            |  |       |
|                                |                                               | 4.5                    | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = −24mA                                                                         |                        | 3.86              | 3.76                            |  |       |
|                                |                                               | 5.5                    | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = −24mA <sup>(1)</sup>                                                          |                        | 4.86              | 4.76                            |  |       |
| V <sub>OL</sub>                | Maximum LOW Level Output Voltage              | 3.0                    | I <sub>OUT</sub> = 50μA                                                                                                                                | 0.002                  | 0.1               | 0.1                             |  | V     |
|                                |                                               | 4.5                    |                                                                                                                                                        | 0.001                  | 0.1               | 0.1                             |  |       |
|                                |                                               | 5.5                    |                                                                                                                                                        | 0.001                  | 0.1               | 0.1                             |  |       |
|                                |                                               | 3.0                    | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 12mA                                                                          |                        | 0.36              | 0.44                            |  |       |
|                                |                                               | 4.5                    | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24mA                                                                          |                        | 0.36              | 0.44                            |  |       |
|                                |                                               | 5.5                    | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24mA <sup>(1)</sup>                                                           |                        | 0.36              | 0.44                            |  |       |
| I <sub>IN</sub> <sup>(3)</sup> | Maximum Input Leakage Current                 | 5.5                    | V <sub>I</sub> = V <sub>CC</sub> , GND                                                                                                                 |                        | ±0.1              | ±1.0                            |  | μA    |
| I <sub>OZ</sub>                | Maximum 3-STATE Current                       | 5.5                    | V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub> , V <sub>I</sub> = V <sub>CC</sub> , V <sub>GND</sub> , V <sub>O</sub> = V <sub>CC</sub> , GND |                        | ±0.25             | ±2.5                            |  | μA    |
| I <sub>OLD</sub>               | Minimum Dynamic Output Current <sup>(2)</sup> | 5.5                    | V <sub>OLD</sub> = 1.65V Max.                                                                                                                          |                        |                   | 75                              |  | mA    |
| I <sub>OHD</sub>               |                                               | 5.5                    | V <sub>OHD</sub> = 3.85V Min.                                                                                                                          |                        |                   | −75                             |  | mA    |
| I <sub>CC</sub> <sup>(3)</sup> | Maximum Quiescent Supply Current              | 5.5                    | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                                                               |                        | 4.0               | 40.0                            |  | μA    |

## Notes:

1. All outputs loaded; thresholds on input associated with output under test.
2. Maximum test duration 2.0ms, one output loaded at a time.
3. I<sub>IN</sub> and I<sub>CC</sub> @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V<sub>CC</sub>.

## DC Electrical Characteristics for ACT

| Symbol           | Parameter                                     | V <sub>CC</sub><br>(V) | Conditions                                                                                    | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> = −40°C to +85°C |  | Units |
|------------------|-----------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------|------------------------|-------------------|---------------------------------|--|-------|
|                  |                                               |                        |                                                                                               | Typ.                   | Guaranteed Limits |                                 |  |       |
| V <sub>IH</sub>  | Minimum HIGH Level Input Voltage              | 4.5                    | V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> − 0.1V                                             | 1.5                    | 2.0               | 2.0                             |  | V     |
|                  |                                               | 5.5                    |                                                                                               | 1.5                    | 2.0               | 2.0                             |  |       |
| V <sub>IL</sub>  | Maximum LOW Level Input Voltage               | 4.5                    | V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> − 0.1V                                             | 1.5                    | 0.8               | 0.8                             |  | V     |
|                  |                                               | 5.5                    |                                                                                               | 1.5                    | 0.8               | 0.8                             |  |       |
| V <sub>OH</sub>  | Minimum HIGH Level Output Voltage             | 4.5                    | I <sub>OUT</sub> = −50μA                                                                      | 4.49                   | 4.4               | 4.4                             |  | V     |
|                  |                                               | 5.5                    |                                                                                               | 5.49                   | 5.4               | 5.4                             |  |       |
|                  |                                               | 4.5                    | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = −24mA                |                        | 3.86              | 3.76                            |  |       |
|                  |                                               | 5.5                    | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = −24mA <sup>(4)</sup> |                        | 4.86              | 4.76                            |  |       |
| V <sub>OL</sub>  | Maximum LOW Level Output Voltage              | 4.5                    | I <sub>OUT</sub> = 50μA                                                                       | 0.001                  | 0.1               | 0.1                             |  | V     |
|                  |                                               | 5.5                    |                                                                                               | 0.001                  | 0.1               | 0.1                             |  |       |
|                  |                                               | 4.5                    | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24mA                 |                        | 0.36              | 0.44                            |  |       |
|                  |                                               | 5.5                    | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24mA <sup>(4)</sup>  |                        | 0.36              | 0.44                            |  |       |
| I <sub>IN</sub>  | Maximum Input Leakage Current                 | 5.5                    | V <sub>I</sub> = V <sub>CC</sub> , GND                                                        |                        | ±0.1              | ±1.0                            |  | μA    |
| I <sub>OZ</sub>  | Maximum 3-STATE Current                       | 5.5                    | V <sub>I</sub> = V <sub>IL</sub> , V <sub>IH</sub> ; V <sub>O</sub> = V <sub>CC</sub> , GND   |                        | ±0.5              | ±5.0                            |  | μA    |
| I <sub>CCT</sub> | Maximum I <sub>CC</sub> /Input                | 5.5                    | V <sub>I</sub> = V <sub>CC</sub> − 2.1V <sup>(6)</sup>                                        | 0.6                    |                   | 1.5                             |  | mA    |
| I <sub>OLD</sub> | Minimum Dynamic Output Current <sup>(5)</sup> | 5.5                    | V <sub>OLD</sub> = 1.65V Max.                                                                 |                        |                   | 75                              |  | mA    |
| I <sub>OHD</sub> |                                               | 5.5                    | V <sub>OHD</sub> = 3.85V Min.                                                                 |                        |                   | −75                             |  | mA    |
| I <sub>CC</sub>  | Maximum Quiescent Supply Current              | 5.5                    | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                      |                        | 4.0               | 40.0                            |  | μA    |

**Notes:**

4. All outputs loaded; thresholds on input associated with output under test.
5. Maximum test duration 2.0ms, one output loaded at a time.
6. May be measured per the JEDEC Alternate Method.

**AC Electrical Characteristics for AC**

| Symbol    | Parameter                            | $V_{CC}$ (V) <sup>(7)</sup> | $T_A = +25^\circ\text{C}$ ,<br>$C_L = 50\text{pF}$ |      |      | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ ,<br>$C_L = 50\text{pF}$ |      | Units |
|-----------|--------------------------------------|-----------------------------|----------------------------------------------------|------|------|--------------------------------------------------------------------------|------|-------|
|           |                                      |                             | Min.                                               | Typ. | Max. | Min.                                                                     | Max. |       |
| $t_{PLH}$ | Propagation Delay,<br>Data to Output | 3.3                         | 1.0                                                | 6.5  | 9.0  | 1.0                                                                      | 10.0 | ns    |
|           |                                      | 5.0                         | 1.0                                                | 5.5  | 7.0  | 1.0                                                                      | 7.5  |       |
| $t_{PHL}$ | Propagation Delay,<br>Data to Output | 3.3                         | 1.0                                                | 6.5  | 9.0  | 1.0                                                                      | 10.0 | ns    |
|           |                                      | 5.0                         | 1.0                                                | 5.0  | 7.0  | 1.0                                                                      | 7.5  |       |
| $t_{PZH}$ | Output Enable Time                   | 3.3                         | 1.0                                                | 6.0  | 10.5 | 1.0                                                                      | 11.0 | ns    |
|           |                                      | 5.0                         | 1.0                                                | 5.0  | 7.0  | 1.0                                                                      | 8.0  |       |
| $t_{PZL}$ | Output Enable Time                   | 3.3                         | 1.0                                                | 7.5  | 10.0 | 1.0                                                                      | 11.0 | ns    |
|           |                                      | 5.0                         | 1.0                                                | 5.5  | 8.0  | 1.0                                                                      | 8.5  |       |
| $t_{PHZ}$ | Output Disable Time                  | 3.3                         | 1.0                                                | 7.5  | 10.0 | 1.0                                                                      | 10.5 | ns    |
|           |                                      | 5.0                         | 1.0                                                | 6.5  | 9.0  | 1.0                                                                      | 9.5  |       |
| $t_{PLZ}$ | Output Disable Time                  | 3.3                         | 1.0                                                | 7.5  | 10.5 | 1.0                                                                      | 11.5 | ns    |
|           |                                      | 5.0                         | 1.0                                                | 6.5  | 9.0  | 1.0                                                                      | 9.5  |       |

**Note:**

7. Voltage range 3.3 is  $3.3\text{V} \pm 0.3\text{V}$ . Voltage range 5.0 is  $5.0\text{V} \pm 0.5\text{V}$ .

**AC Electrical Characteristics for ACT**

| Symbol    | Parameter                            | $V_{CC}$ (V) <sup>(8)</sup> | $T_A = +25^\circ\text{C}$ ,<br>$C_L = 50\text{pF}$ |      |      | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ ,<br>$C_L = 50\text{pF}$ |      | Units |
|-----------|--------------------------------------|-----------------------------|----------------------------------------------------|------|------|--------------------------------------------------------------------------|------|-------|
|           |                                      |                             | Min.                                               | Typ. | Max. | Min.                                                                     | Max. |       |
| $t_{PLH}$ | Propagation Delay,<br>Data to Output | 5.0                         | 1.0                                                | 6.5  | 9.0  | 1.0                                                                      | 10.0 | ns    |
| $t_{PHL}$ | Propagation Delay,<br>Data to Output | 5.0                         | 1.0                                                | 7.0  | 9.0  | 1.0                                                                      | 10.0 | ns    |
| $t_{PZH}$ | Output Enable Time                   | 5.0                         | 1.0                                                | 6.0  | 8.5  | 1.0                                                                      | 9.5  | ns    |
| $t_{PZL}$ | Output Enable Time                   | 5.0                         | 1.0                                                | 7.0  | 9.5  | 1.0                                                                      | 10.5 | ns    |
| $t_{PHZ}$ | Output Disable Time                  | 5.0                         | 1.0                                                | 7.0  | 9.5  | 1.0                                                                      | 10.5 | ns    |
| $t_{PLZ}$ | Output Disable Time                  | 5.0                         | 1.0                                                | 7.5  | 10.0 | 1.0                                                                      | 10.5 | ns    |

**Note:**

8. Voltage Range 5.0 is  $5.0\text{V} \pm 0.5\text{V}$ .

**Capacitance**

| Symbol   | Parameter                     | Conditions             | Typ. | Units |
|----------|-------------------------------|------------------------|------|-------|
| $C_{IN}$ | Input Capacitance             | $V_{CC} = \text{OPEN}$ | 4.5  | pF    |
| $C_{PD}$ | Power Dissipation Capacitance | $V_{CC} = 5.0\text{V}$ | 45.0 | pF    |

## Physical Dimensions

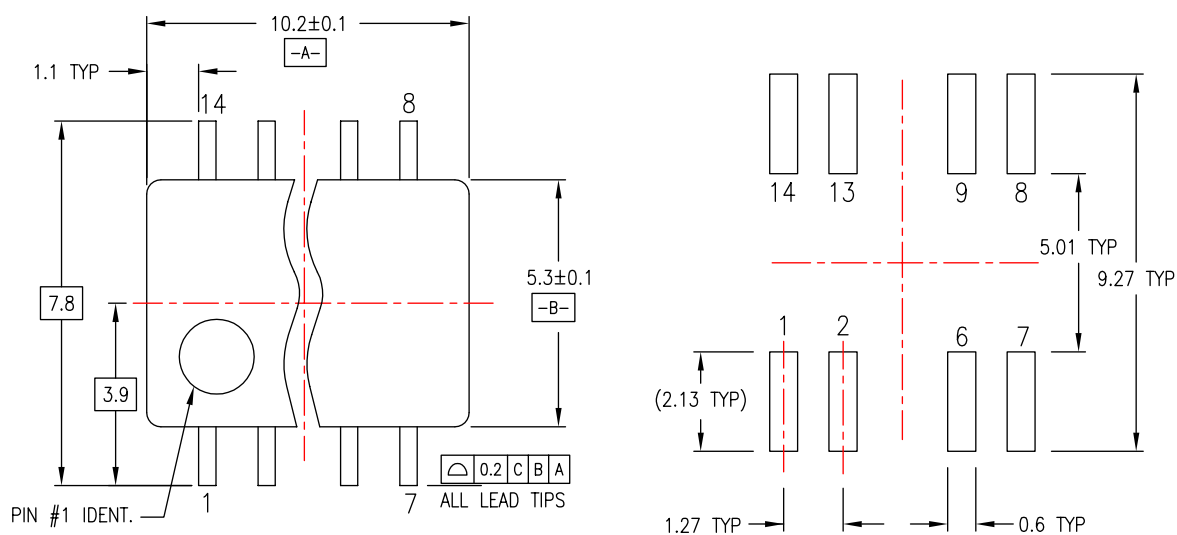


Figure 1. 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow

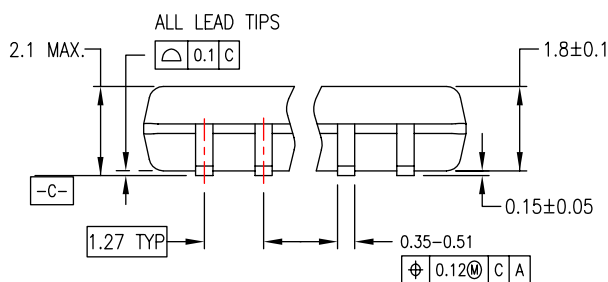
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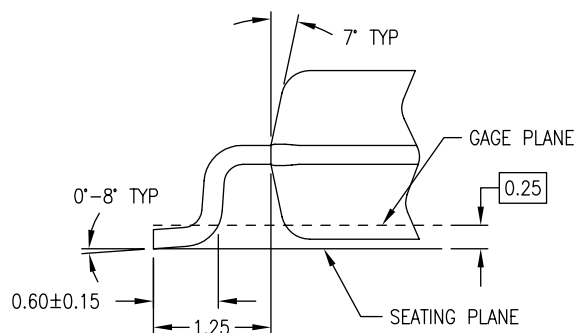
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## LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



DETAIL A

NOTES:

- 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.

M14DREVC

**Figure 2. 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide**

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**Physical Dimensions** (Continued)**NOTES: UNLESS OTHERWISE SPECIFIED**

THIS PACKAGE CONFORMS TO

A) JEDEC MS-001 VARIATION BA

B) ALL DIMENSIONS ARE IN MILLIMETERS.

DIMENSIONS ARE EXCLUSIVE OF BURRS,  
C) MOLD FLASH, AND TIE BAR EXTRUSIONS.D) DIMENSIONS AND TOLERANCES PER  
ASME Y14.5-1994

E) DRAWING FILE NAME: MKT-N14AREV7

**Figure 4. 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide**

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| Build it Now <sup>™</sup>                                                         | FRFET <sup>®</sup>                           | Power220 <sup>®</sup>                  | SYSTEM <sup>®</sup>              |
| CorePLUS <sup>™</sup>                                                             | Global Power Resource <sup>SM</sup>          | Power247 <sup>®</sup>                  | GENERAL                          |
| CROSSVOLT <sup>™</sup>                                                            | Green FPS <sup>™</sup>                       | POWEREDGE <sup>®</sup>                 | The Power Franchise <sup>®</sup> |
| CTL <sup>™</sup>                                                                  | Green FPS <sup>™</sup> e-Series <sup>™</sup> | Power-SPM <sup>™</sup>                 | the                              |
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|  | ISOPLANAR <sup>™</sup>                       | QS <sup>™</sup>                        | TinyBuck <sup>™</sup>            |
|  | MegaBuck <sup>™</sup>                        | QT Optoelectronics <sup>™</sup>        | TinyLogic <sup>®</sup>           |
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| FACT Quiet Series <sup>™</sup>                                                    | MicroPak <sup>™</sup>                        | SMART START <sup>™</sup>               | TinyPWM <sup>™</sup>             |
| FACT <sup>®</sup>                                                                 | MillerDrive <sup>™</sup>                     | SPM <sup>®</sup>                       | TinyWire <sup>™</sup>            |
| FAST <sup>®</sup>                                                                 | Motion-SPM <sup>™</sup>                      | STEALTH <sup>™</sup>                   | μSerDes <sup>™</sup>             |
| FastvCore <sup>™</sup>                                                            | OPTOLOGIC <sup>®</sup>                       | SuperFET <sup>™</sup>                  | UHC <sup>®</sup>                 |
| FlashWriter <sup>®</sup> *                                                        | OPTOPLANAR <sup>®</sup>                      | SuperSOT <sup>™</sup> -3               | Ultra FRFET <sup>™</sup>         |
|                                                                                   |                                              | SuperSOT <sup>™</sup> -6               | UniFET <sup>™</sup>              |
|                                                                                   |                                              | SuperSOT <sup>™</sup> -8               | VCX <sup>™</sup>                 |

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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.
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## 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.                                                                       |
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