

MC74AC05, MC74ACT05

Hex Inverter with Open-Drain Outputs

The MC74AC/ACT05 is identical in pinout to the LS05. The device inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with TTL outputs.

Features

- Outputs Source/Sink 24 mA
- 'ACT05 Has TTL Compatible Inputs
- Pb-Free Packages are Available

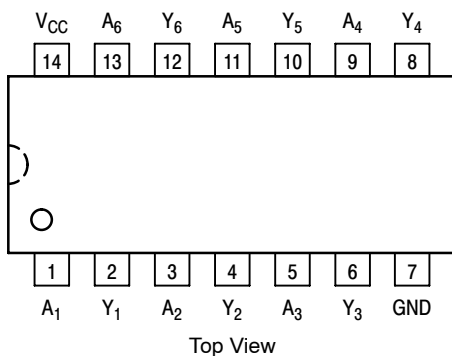
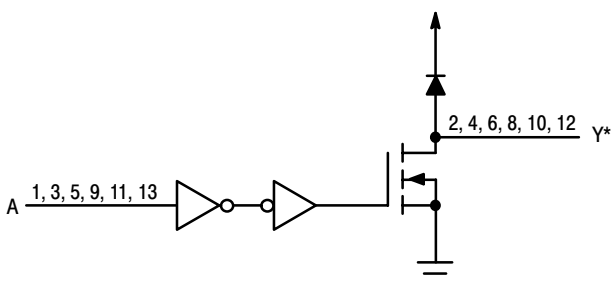


Figure 1. Pinout: 14-Lead Packages



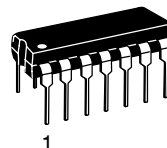
PIN 14 = VCC
 PIN 7 = GND
 * DENOTES OPEN-DRAIN OUTPUTS

Figure 2. Logic Diagram

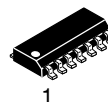


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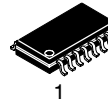
PDIP-14
 N SUFFIX
 CASE 646



SOIC-14
 D SUFFIX
 CASE 751A



TSSOP-14
 DT SUFFIX
 CASE 948G



SOEIAJ-14
 M SUFFIX
 CASE 965

FUNCTION TABLE

| Input A | Output Y |
|---------|----------|
| L | Z |
| H | L |

NOTE: Z = High Impedance

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 6 of this data sheet.

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MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-----------|---|------------------------|------|
| V_{CC} | DC Supply Voltage (Referenced to GND) | -0.5 to +7.0 | V |
| V_{in} | DC Input Voltage (Referenced to GND) | -0.5 to $V_{CC} + 0.5$ | V |
| V_{out} | DC Output Voltage (Referenced to GND) | -0.5 to $V_{CC} + 0.5$ | V |
| I_{in} | DC Input Current, per Pin | ± 20 | mA |
| I_{out} | DC Output Sink/Source Current, per Pin | ± 50 | mA |
| I_{CC} | DC V_{CC} or GND Current per Output Pin | ± 50 | mA |
| T_{stg} | Storage Temperature | -65 to +150 | °C |

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.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Typ | Max | Unit | |
|------------|---|------------------|-----|----------|------|------|
| V_{CC} | Supply Voltage | 'AC | 2.0 | 5.0 | 6.0 | V |
| | | 'ACT | 4.5 | 5.0 | 5.5 | |
| VREG | DC Regulated Power Voltage (Ref. to GND) | 0 | - | V_{CC} | V | |
| t_p, t_f | Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs | $V_{CC} @ 3.0 V$ | - | 150 | - | ns/V |
| | | $V_{CC} @ 4.5 V$ | - | 40 | - | |
| | | $V_{CC} @ 5.5 V$ | - | 25 | - | |
| t_p, t_f | Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs | $V_{CC} @ 4.5 V$ | - | 10 | - | ns/V |
| | | $V_{CC} @ 5.5 V$ | - | 8.0 | - | |
| T_J | Junction Temperature (PDIP) | - | - | 140 | °C | |
| T_A | Operating Ambient Temperature Range | -40 | 25 | 85 | °C | |
| I_{OH} | Output Current – HIGH | - | - | -24 | mA | |
| I_{OL} | Output Current – LOW | - | - | 24 | mA | |

- V_{in} from 30% to 70% V_{CC} ; see individual Data Sheets for devices that differ from the typical input rise and fall times.
- V_{in} from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

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DC CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | 74AC | | 74AC | | Unit | Conditions |
|------------------|----------------------------------|------------------------|------------------------|-------------------|---------------------------------|--|------|--|
| | | | T _A = +25°C | | T _A = -40°C to +85°C | | | |
| | | | Typ | Guaranteed Limits | | | | |
| V _{IH} | Minimum High Level Input Voltage | 3.0 | 1.5 | 2.1 | 2.1 | | V | V _{OUT} = 0.1 V or V _{CC} - 0.1 V |
| | | 4.5 | 2.25 | 3.15 | 3.15 | | | |
| | | 5.5 | 2.75 | 3.85 | 3.85 | | | |
| V _{IL} | Maximum Low Level Input Voltage | 3.0 | 1.5 | 0.9 | 0.9 | | V | V _{OUT} = 0.1 V or V _{CC} - 0.1 V |
| | | 4.5 | 2.25 | 1.35 | 1.35 | | | |
| | | 5.5 | 2.75 | 1.65 | 1.65 | | | |
| V _{OL} | Maximum Low Level Output Voltage | 3.0 | 0.002 | 0.1 | 0.1 | | V | I _{OUT} = 50 μA |
| | | 4.5 | 0.001 | 0.1 | 0.1 | | | |
| | | 5.5 | 0.001 | 0.1 | 0.1 | | | |
| | | 3.0 | - | 0.36 | 0.44 | | V | *V _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA |
| | | 4.5 | - | 0.36 | 0.44 | | | |
| | | 5.5 | - | 0.36 | 0.44 | | | |
| I _{IN} | Maximum Input Leakage Current | 5.5 | - | ±0.1 | ±1.0 | | μA | V _I = V _{CC} , GND |
| I _{OLD} | †Minimum Dynamic Output Current | 5.5 | - | - | 75 | | mA | V _{OLD} = 1.65 V Max |
| I _{OHD} | | 5.5 | - | - | -75 | | mA | V _{OHD} = 3.85 V Min |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | - | 4.0 | 40 | | μA | V _{IN} = V _{CC} or GND |

*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time.

NOTE: I_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V.

AC CHARACTERISTICS

| Symbol | Parameter | V _{CC} * (V) | 74AC | | | 74AC | | Unit |
|------------------|---------------------------------|--------------------------|---|-----|-----|--|-----|------|
| | | | T _A = +25°C C _L = 50 pF | | | T _A = -40°C to +85°C C _L = 50 pF | | |
| | | | Min | Typ | Max | Min | Max | |
| t _{pZL} | Propagation Delay Output Enable | 3.3 | 1.5 | - | 8.0 | 1.0 | 9.0 | ns |
| | | 5.0 | 1.5 | - | 6.0 | 1.0 | 6.5 | |
| t _{pLZ} | Propagation Delay Output Enable | 3.3 | 1.5 | - | 8.0 | 1.0 | 9.0 | ns |
| | | 5.0 | 1.5 | - | 6.0 | 1.0 | 6.5 | |

*Voltage Range 3.3 V is 3.3 V ±0.3 V.

Voltage Range 5.0 V is 5.0 V ±0.5 V.

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DC CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | 74ACT | | 74ACT | | Unit | Conditions |
|--------------------------------------|--|------------------------|------------------------|-------------------|---------------------------------|--|----------|--|
| | | | T _A = +25°C | | T _A = -40°C to +85°C | | | |
| | | | Typ | Guaranteed Limits | | | | |
| V _{IH} | Minimum High Level Input Voltage | 4.5 5.5 | 1.5 1.5 | 2.0 2.0 | 2.0 2.0 | | V | V _{OUT} = 0.1 V or V _{CC} - 0.1 V |
| V _{IL} | Maximum Low Level Input Voltage | 4.5 5.5 | 1.5 1.5 | 0.8 0.8 | 0.8 0.8 | | V | V _{OUT} = 0.1 V or V _{CC} - 0.1 V |
| V _{OL} | Maximum Low Level Output Voltage | 4.5 5.5 | 0.001 0.001 | 0.1 0.1 | 0.1 0.1 | | V | I _{OUT} = 50 μA |
| | | 4.5 5.5 | - - | 0.36 0.36 | 0.44 0.44 | | 0.44 | *V _{IN} = V _{IL} or V _{IH} I _{OH} = 24 mA |
| I _{IN} | Maximum Input Leakage Current | 5.5 | - | ±0.1 | ±1.0 | | μA | V _I = V _{CC} , GND |
| ΔI _{CC} T | Additional Max. I _{CC} /Input | 5.5 | 0.6 | - | 1.5 | | mA | V _I = V _{CC} - 2.1 V |
| I _{OLD} I _{OHD} | †Minimum Dynamic Output Current | 5.5 5.5 | - - | - - | 75 -75 | | mA mA | V _{OLD} = 1.65 V Max V _{OHD} = 3.85 V Min |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | - | 4.0 | 40 | | μA | V _{IN} = V _{CC} or GND |

*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time.

AC CHARACTERISTICS

| Symbol | Parameter | V _{CC} * (V) | 74ACT | | | 74ACT | | Unit |
|------------------|---------------------------------|--------------------------|---|-----|-----|--|-----|------|
| | | | T _A = +25°C C _L = 50 pF | | | T _A = -40°C to +85°C C _L = 50 pF | | |
| | | | Min | Typ | Max | Min | Max | |
| t _{PZL} | Propagation Delay Output Enable | 5.0 | 1.5 | - | 8.0 | 1.0 | 8.5 | ns |
| t _{PLZ} | Propagation Delay Output Enable | 5.0 | 1.5 | - | 8.5 | 1.0 | 9.0 | ns |

*Voltage Range 5.0 V is 5.0 V ±0.5 V.

CAPACITANCE

| Symbol | Parameter | Value Typ | Unit | Test Conditions |
|-----------------|-------------------------------|-----------|------|-------------------------|
| C _{IN} | Input Capacitance | 4.5 | pF | V _{CC} = 5.0 V |
| C _{PD} | Power Dissipation Capacitance | 30 | pF | V _{CC} = 5.0 V |

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ORDERING INFORMATION

| Device | Package | Shipping† |
|----------------|------------------------|--------------------|
| MC74AC05N | PDIP-14 | 25 Units / Rail |
| MC74AC05NG | PDIP-14 (Pb-Free) | |
| MC74AC05D | SOIC-14 | 55 Units / Rail |
| MC74AC05DG | SOIC-14 (Pb-Free) | |
| MC74AC05DR2 | SOIC-14 | 2500 / Tape & Reel |
| MC74AC05DR2G | SOIC-14 (Pb-Free) | |
| MC74AC05MEL | SOEIAJ-14 | 2000 / Tape & Reel |
| MC74AC05MELG | SOEIAJ-14 (Pb-Free) | |
| MC74ACT05N | PDIP-14 | 25 Units / Rail |
| MC74ACT05NG | PDIP-14 (Pb-Free) | |
| MC74ACT05D | SOIC-14 | 55 Units / Rail |
| MC74ACT05DG | SOIC-14 (Pb-Free) | |
| MC74ACT05DR2 | SOIC-14 | 2500 / Tape & Reel |
| MC74ACT05DR2G | SOIC-14 (Pb-Free) | |
| MC74ACT05DTR2 | TSSOP-14* | |
| MC74ACT05DTR2G | TSSOP-14* | |
| MC74ACT05MEL | SOEIAJ-14 | 2000 / Tape & Reel |
| MC74ACT05MELG | SOEIAJ-14 (Pb-Free) | |

†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.

*These packages are inherently Pb-Free.

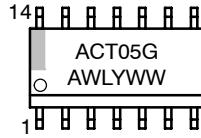
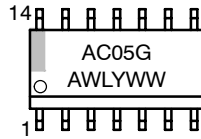
MC74AC05, MC74ACT05

MARKING DIAGRAMS

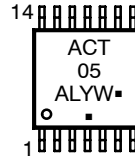
PDIP-14



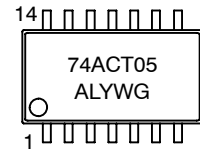
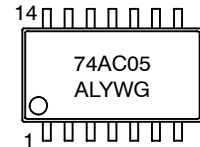
SOIC-14



TSSOP-14



SOEIAJ-14



A = Assembly Location
 WL, L = Wafer Lot
 YY, Y = Year
 WW, W = Work Week
 G or ■ = Pb-Free Package
 (Note: Microdot may be in either location)

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PACKAGE DIMENSIONS

PDIP-14
CASE 646-06
ISSUE P



NOTES:

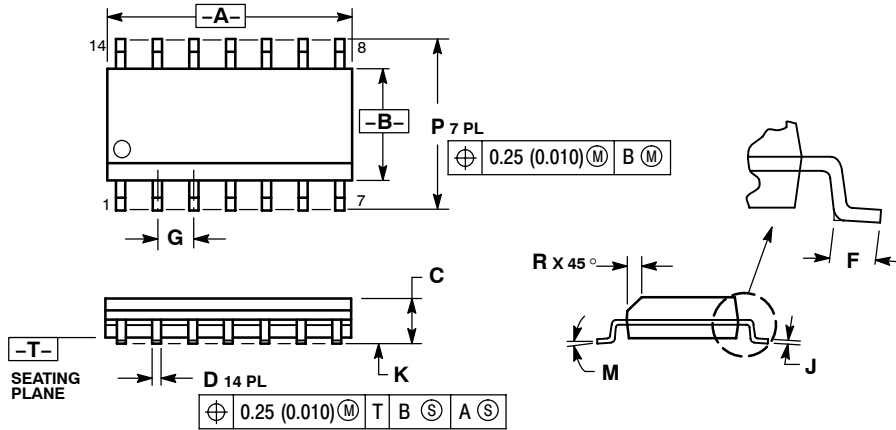
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.715 | 0.770 | 18.16 | 19.56 |
| B | 0.240 | 0.260 | 6.10 | 6.60 |
| C | 0.145 | 0.185 | 3.69 | 4.69 |
| D | 0.015 | 0.021 | 0.38 | 0.53 |
| F | 0.040 | 0.070 | 1.02 | 1.78 |
| G | 0.100 BSC | | 2.54 BSC | |
| H | 0.052 | 0.095 | 1.32 | 2.41 |
| J | 0.008 | 0.015 | 0.20 | 0.38 |
| K | 0.115 | 0.135 | 2.92 | 3.43 |
| L | 0.290 | 0.310 | 7.37 | 7.87 |
| M | --- | 10° | --- | 10° |
| N | 0.015 | 0.039 | 0.38 | 1.01 |

MC74AC05, MC74ACT05

PACKAGE DIMENSIONS

SOIC-14
CASE 751A-03
ISSUE H

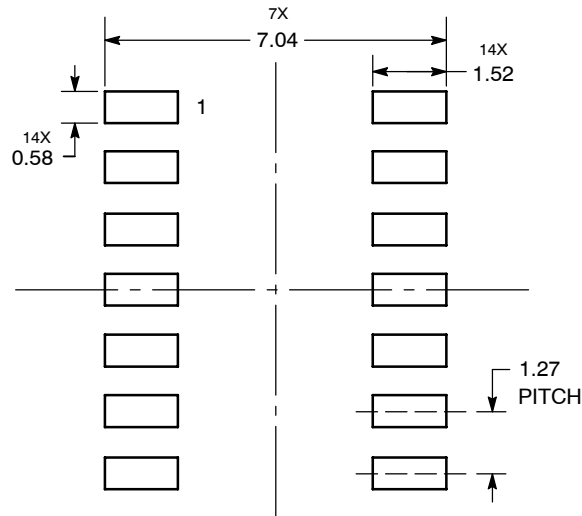


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 8.55 | 8.75 | 0.337 | 0.344 |
| B | 3.80 | 4.00 | 0.150 | 0.157 |
| C | 1.35 | 1.75 | 0.054 | 0.068 |
| D | 0.35 | 0.49 | 0.014 | 0.019 |
| F | 0.40 | 1.25 | 0.016 | 0.049 |
| G | 1.27 BSC | | 0.050 BSC | |
| J | 0.19 | 0.25 | 0.008 | 0.009 |
| K | 0.10 | 0.25 | 0.004 | 0.009 |
| M | 0° | 7° | 0° | 7° |
| P | 5.80 | 6.20 | 0.228 | 0.244 |
| R | 0.25 | 0.50 | 0.010 | 0.019 |

SOLDERING FOOTPRINT*



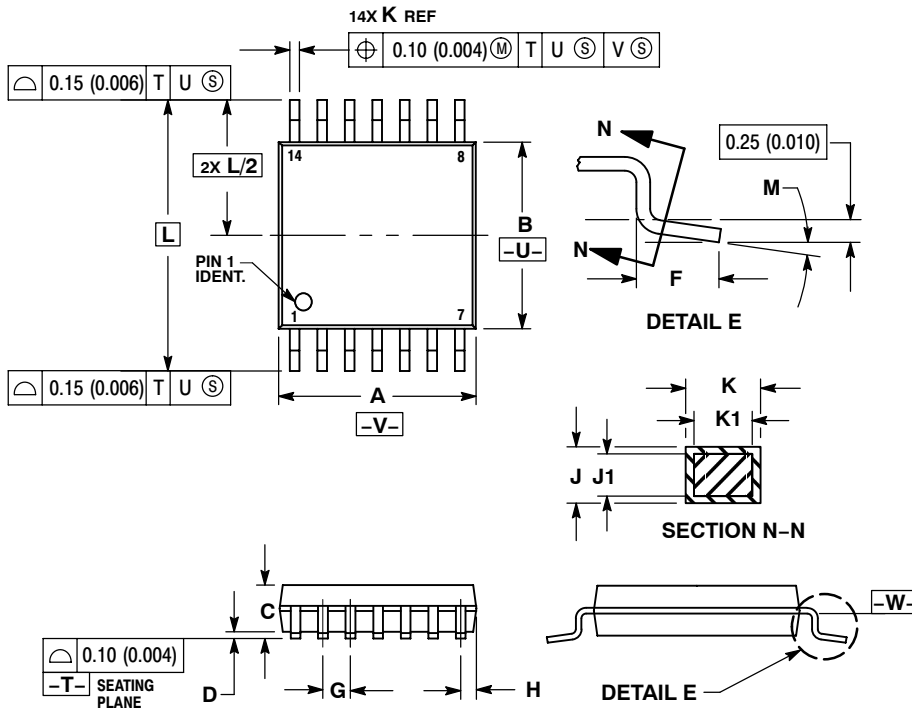
DIMENSIONS: MILLIMETERS

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

MC74AC05, MC74ACT05

PACKAGE DIMENSIONS

TSSOP-14
CASE 948G-01
ISSUE A



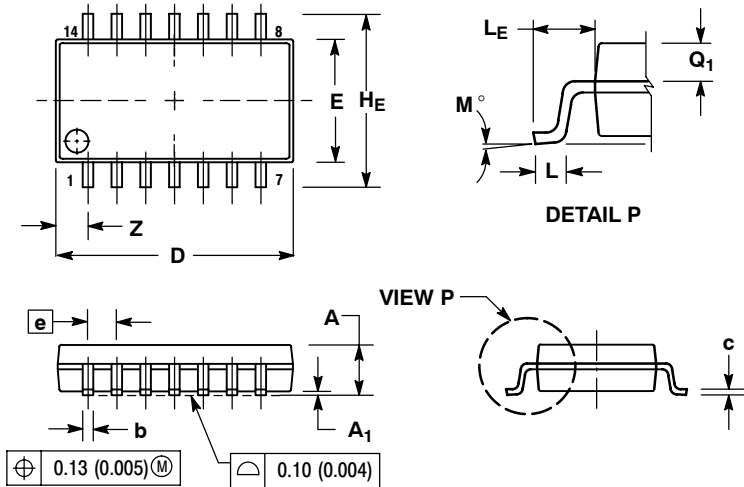
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
 5. 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.
 6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 7. 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 | 0.50 | 0.60 | 0.020 | 0.024 |
| 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° |

MC74AC05, MC74ACT05

PACKAGE DIMENSIONS

SOEIAJ-14
CASE 965-01
ISSUE A



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

| DIM | MILLIMETERS | | INCHES | |
|----------------|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | --- | 2.05 | --- | 0.081 |
| A ₁ | 0.05 | 0.20 | 0.002 | 0.008 |
| b | 0.35 | 0.50 | 0.014 | 0.020 |
| c | 0.10 | 0.20 | 0.004 | 0.008 |
| D | 9.90 | 10.50 | 0.390 | 0.413 |
| E | 5.10 | 5.45 | 0.201 | 0.215 |
| e | 1.27 BSC | | 0.050 BSC | |
| HE | 7.40 | 8.20 | 0.291 | 0.323 |
| 0.50 | 0.50 | 0.85 | 0.020 | 0.033 |
| LE | 1.10 | 1.50 | 0.043 | 0.059 |
| M | 0° | 10° | 0° | 10° |
| Q ₁ | 0.70 | 0.90 | 0.028 | 0.035 |
| Z | --- | 1.42 | --- | 0.056 |

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