

54AC/74AC32 • 74ACT32 Quad 2-Input OR Gate

General Description

The 'AC/'ACT32 contains four, 2-input OR gates.

Features

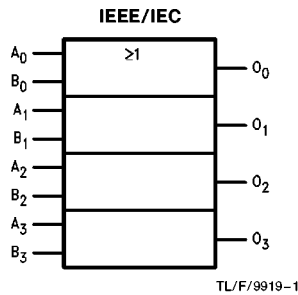
- I_{CC} reduced by 50% on 54AC/74AC only
- Outputs source/sink 24 mA
- 'ACT32 has TTL-compatible inputs
- Standard Military Drawing (SMD)
 - 'AC32: 5962-87614
- For Military 54ACT32, see the 54ACTQ32

| Commercial | Military | Package Number | Package Description |
|---------------------|--------------------|----------------|---------------------------------------------------------|
| 74ACT32PC | | N14A | 14-Lead Molded Dual-In-Line (0.300" Wide) |
| 74ACT32SC (Note 1) | | M14A | 14-Lead Molded Small Outline (0.150" Wide), JEDEC |
| 74ACT32MTC (Note 1) | | MTC14 | 14-Lead Molded Thin Shrink Small Outline Package, JEDEC |
| | 54ACT32DM (Note 2) | J14A | 14-Lead Ceramic Dual-In-Line |
| | 54ACT32FM (Note 2) | W14B | 14-Lead Cerpak |
| | 54ACT32LM (Note 2) | E20A | 20-Lead Ceramic Leadless Chip Carrier, Type C |

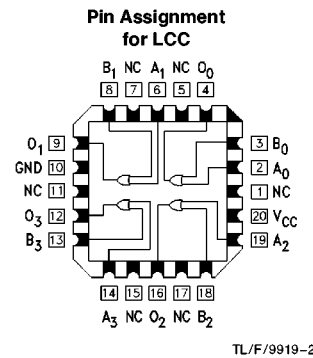
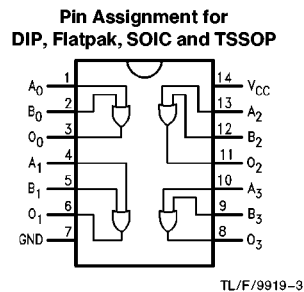
Note 1: Devices also available in 13" Tape and Reel. Use suffix SCX, SJX, and MTCX.

Note 2: Military grade device with environmental and burn-in processing, use suffix DMOB, FMOB and LMOB.

Logic Symbol



Connection Diagrams



| Pin Names | Description |
|---------------------------------|-------------|
| A _n , B _n | Inputs |
| O _n | Outputs |

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Absolute Maximum Rating (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

| | |
|------------------------------------------------------------------------|--------------------------|
| Supply Voltage (V_{CC}) | -0.5V to +7.0V |
| DC Input Diode Current (I_{IK}) | |
| $V_I = -0.5V$ | -20 mA |
| $V_I = V_{CC} + 0.5V$ | +20 mA |
| DC Input Voltage (V_I) | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Diode Current (I_{OK}) | |
| $V_O = -0.5V$ | -20 mA |
| $V_O = V_{CC} + 0.5V$ | +20 mA |
| DC Output Voltage (V_O) | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Source or Sink Current (I_O) | ±50 mA |
| DC V_{CC} or Ground Current per Output Pin (I_{CC} or I_{GND}) | ±50 mA |
| Storage Temperature (T_{STG}) | -65°C to +150°C |
| Junction Temperature (T_J) | |
| CDIP | 175°C |
| PDIP | 140°C |

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT™ circuits outside databook specifications.

Recommended Operating Conditions

| | | |
|-------------------------------------------------|-----------------|--|
| Supply Voltage (V_{CC}) | | |
| 'AC | 2.0V to 6.0V | |
| 'ACT | 4.5V to 5.5V | |
| Input Voltage (V_I) | 0V to V_{CC} | |
| Output Voltage (V_O) | 0V to V_{CC} | |
| Operating Temperature (T_A) | | |
| 74AC/ACT | -40°C to +85°C | |
| 54AC | -55°C to +125°C | |
| Minimum Input Edge Rate ($\Delta V/\Delta t$) | | |
| 'AC Devices | | |
| V_{IN} from 30% to 70% of V_{CC} | | |
| V_{CC} @ 3.3V, 4.5V, 5.5V | 125 mV/ns | |
| Minimum Input Edge Rate ($\Delta V/\Delta t$) | | |
| 'ACT Devices | | |
| V_{IN} from 0.8V to 2.0V | | |
| V_{CC} @ 4.5V, 5.5V | 125 mV/ns | |

DC Characteristics for 'AC Family Devices

| Symbol | Parameter | V_{CC} (V) | 74AC | | 54AC | 74AC | Units | Conditions | |
|----------|-----------------------------------|-----------------|---------------------------|-------------------|----------------------------|---------------------------|-------|----------------------------------------|------------------------------------------------------------------------|
| | | | $T_A = +25^\circ\text{C}$ | | $T_A =$ -55°C to +125°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 | 2.1 | V | $V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$ | |
| | | 4.5 | 2.25 | 3.15 | 3.15 | 3.15 | | | |
| | | 5.5 | 2.75 | 3.85 | 3.85 | 3.85 | | | |
| V_{IL} | Maximum Low Level Input Voltage | 3.0 | 1.5 | 0.9 | 0.9 | 0.9 | V | $V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$ | |
| | | 4.5 | 2.25 | 1.35 | 1.35 | 1.35 | | | |
| | | 5.5 | 2.75 | 1.65 | 1.65 | 1.65 | | | |
| V_{OH} | Minimum High Level Output Voltage | 3.0 | 2.99 | 2.9 | 2.9 | 2.9 | V | $I_{OUT} = -50 \mu\text{A}$ | |
| | | 4.5 | 4.49 | 4.4 | 4.4 | 4.4 | | | |
| | | 5.5 | 5.49 | 5.4 | 5.4 | 5.4 | | | |
| | | | 3.0 | | 2.56 | 2.4 | 2.46 | V | * $V_{IN} = V_{IL}$ or V_{IH} -12 mA I_{OH} -24 mA -24 mA |
| | | | 4.5 | | 3.86 | 3.7 | 3.76 | | |
| | | | 5.5 | | 4.86 | 4.7 | 4.76 | | |
| V_{OL} | Maximum Low Level Output Voltage | 3.0 | 0.002 | 0.1 | 0.1 | 0.1 | V | $I_{OUT} = 50 \mu\text{A}$ | |
| | | 4.5 | 0.001 | 0.1 | 0.1 | 0.1 | | | |
| | | 5.5 | 0.001 | 0.1 | 0.1 | 0.1 | | | |
| | | | 3.0 | | 0.36 | 0.5 | 0.44 | V | * $V_{IN} = V_{IL}$ or V_{IH} 12 mA I_{OL} 24 mA 24 mA |
| | | | 4.5 | | 0.36 | 0.5 | 0.44 | | |
| | | | 5.5 | | 0.36 | 0.5 | 0.44 | | |
| I_{IN} | Maximum Input Leakage Current | 5.5 | | ±0.1 | ±1.0 | ±1.0 | μA | $V_I = V_{CC}, \text{GND}$ | |

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

DC Characteristics for 'AC Family Devices (Continued)

| Symbol | Parameter | V _{CC} (V) | 74AC | 54AC | 74AC | Units | Conditions | |
|------------------|----------------------------------|------------------------|------------------------|-------------------|-------------------------------------|-------|---------------------------------------------|------------------------------------|
| | | | T _A = +25°C | | T _A = -55°C to +125°C | | | T _A = -40°C to +85°C |
| | | | Typ | Guaranteed Limits | | | | |
| I _{OLD} | †Minimum Dynamic Output Current | 5.5 | | 50 | 75 | mA | V _{OLD} = 1.65V Max | |
| I _{OHD} | | 5.5 | | -50 | -75 | mA | V _{OHD} = 3.85V Min | |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | 2.0 | 40.0 | 20.0 | μA | V _{IN} = V _{CC} or GND | |

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

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

I_{CC} for 54AC @ 25°C is identical to 74AC @ 25°C.

DC Characteristics for 'ACT Family Devices

| Symbol | Parameter | V _{CC} (V) | 74ACT | | 74ACT | Units | Conditions |
|-------------------|-----------------------------------|------------------------|------------------------|-------------------|------------------------------------|-------|---------------------------------------------------------------------------------------------|
| | | | T _A = +25°C | | T _A = -40°C to +85°C | | |
| | | | Typ | Guaranteed Limits | | | |
| V _{IH} | Minimum High Level Input Voltage | 4.5 | 1.5 | 2.0 | 2.0 | V | V _{OUT} = 0.1V or V _{CC} - 0.1V |
| | | 5.5 | 1.5 | 2.0 | 2.0 | | |
| V _{IL} | Maximum Low Level Input Voltage | 4.5 | 1.5 | 0.8 | 0.8 | V | V _{OUT} = 0.1V or V _{CC} - 0.1V |
| | | 5.5 | 1.5 | 0.8 | 0.8 | | |
| V _{OH} | Minimum High Level Output Voltage | 4.5 | 4.49 | 4.4 | 4.4 | V | I _{OUT} = -50 μA |
| | | 5.5 | 5.49 | 5.4 | 5.4 | | |
| | | 4.5 | | 3.86 | 3.76 | V | *V _{IN} = V _{IL} or V _{IH} -24 mA I _{OH} = -24 mA |
| | | 5.5 | | 4.86 | 4.76 | | |
| V _{OL} | Maximum Low Level Output Voltage | 4.5 | 0.001 | 0.1 | 0.1 | V | I _{OUT} = 50 μA |
| | | 5.5 | 0.001 | 0.1 | 0.1 | | |
| | | 4.5 | | 0.36 | 0.44 | V | *V _{IN} = V _{IL} or V _{IH} 24 mA I _{OL} = 24 mA |
| | | 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 _{CC} T | Maximum I _{CC} /Input | 5.5 | 0.6 | | 1.5 | mA | V _I = V _{CC} - 2.1V |
| I _{OLD} | †Minimum Dynamic Output Current | 5.5 | | | 75 | mA | V _{OLD} = 1.65V Max |
| I _{OHD} | | 5.5 | | | -75 | mA | V _{OHD} = 3.85V Min |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | | 4.0 | 40.0 | 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 Electrical Characteristics

| Symbol | Parameter | V _{CC} * (V) | 74AC | | | 54AC | | 74AC | | Units |
|------------------|-------------------|--------------------------|--------------------------------------------------|------------|------------|---------------------------------------------------------------|-------------|--------------------------------------------------------------|-------------|-------|
| | | | T _A = +25°C C _L = 50 pF | | | T _A = -55°C to +125°C C _L = 50 pF | | T _A = -40°C to +85°C C _L = 50 pF | | |
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| t _{PLH} | Propagation Delay | 3.3 5.0 | 1.5 1.5 | 7.0 5.5 | 9.0 7.5 | 1.0 1.5 | 12.0 9.0 | 1.5 1.0 | 10.0 8.5 | ns |
| t _{PHL} | Propagation Delay | 3.3 5.0 | 1.5 1.5 | 7.0 5.0 | 8.5 7.0 | 1.0 1.5 | 11.5 8.5 | 1.0 1.0 | 9.0 7.5 | ns |

*Voltage Range 3.3 is 3.3V ±0.3V
Voltage Range 5.0 is 5.0V ±0.5V

AC Electrical Characteristics

| Symbol | Parameter | V _{CC} * (V) | 74ACT | | | 74ACT | | Units |
|------------------|-------------------|--------------------------|--------------------------------------------------|-----|-----|--------------------------------------------------------------|------|-------|
| | | | 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 _{PLH} | Propagation Delay | 5.0 | 1.0 | 6.5 | 9.0 | 1.0 | 10.0 | ns |
| t _{PHL} | Propagation Delay | 5.0 | 1.0 | 6.5 | 9.0 | 1.0 | 10.0 | ns |

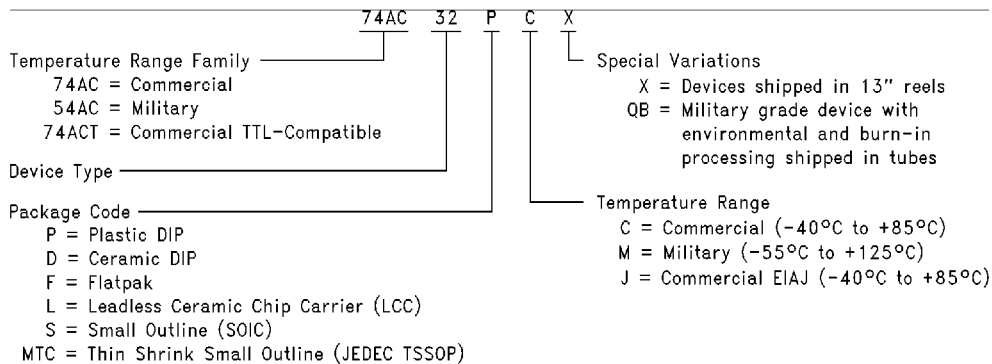
*Voltage Range 5.0 is 5.0V ±0.3V

Capacitance

| Symbol | Parameter | Typ | Units | Conditions |
|-----------------|-------------------------------|------|-------|------------------------|
| C _{IN} | Input Capacitance | 4.5 | pF | V _{CC} = OPEN |
| C _{PD} | Power Dissipation Capacitance | 20.0 | pF | V _{CC} = 5.0V |

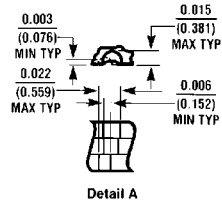
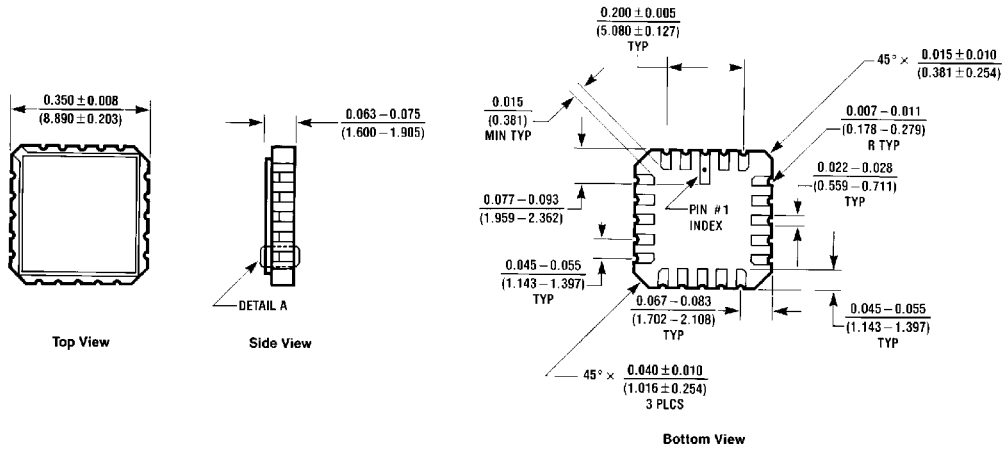
Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



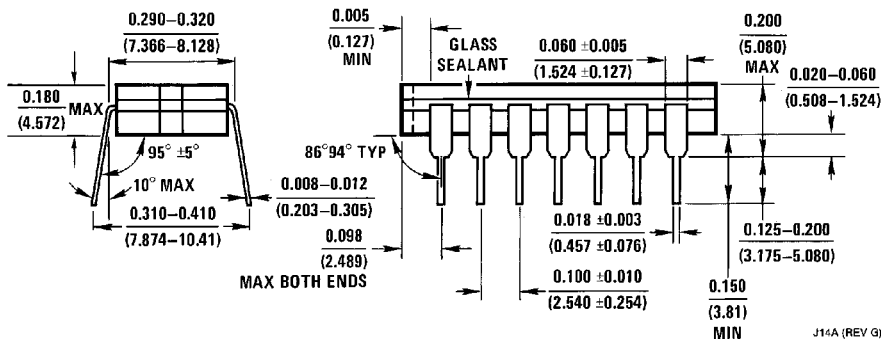
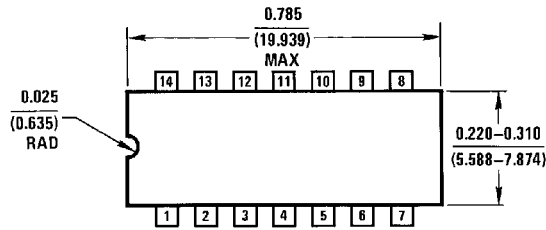
TL/F/9919-5

Physical Dimensions inches (millimeters) unless otherwise noted



20 Terminal Ceramic Leadless Chip Carrier (L)
 NS Package Number E20A

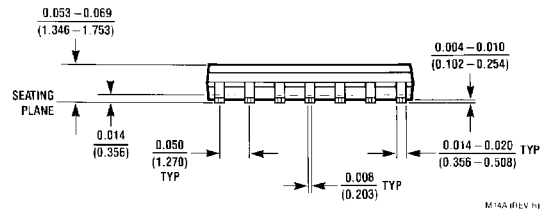
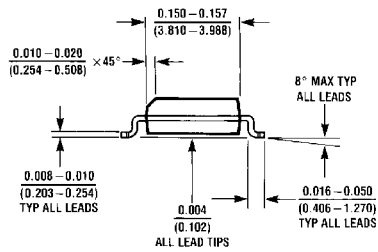
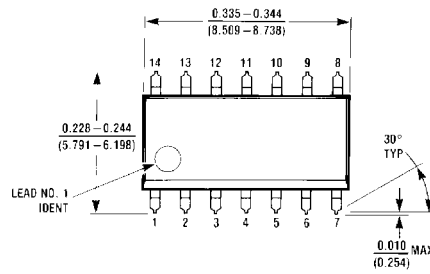
E20A (REV D)



14-Lead Ceramic Dual-In-Line Package (D)
 NS Package Number J14A

J14A (REV G)

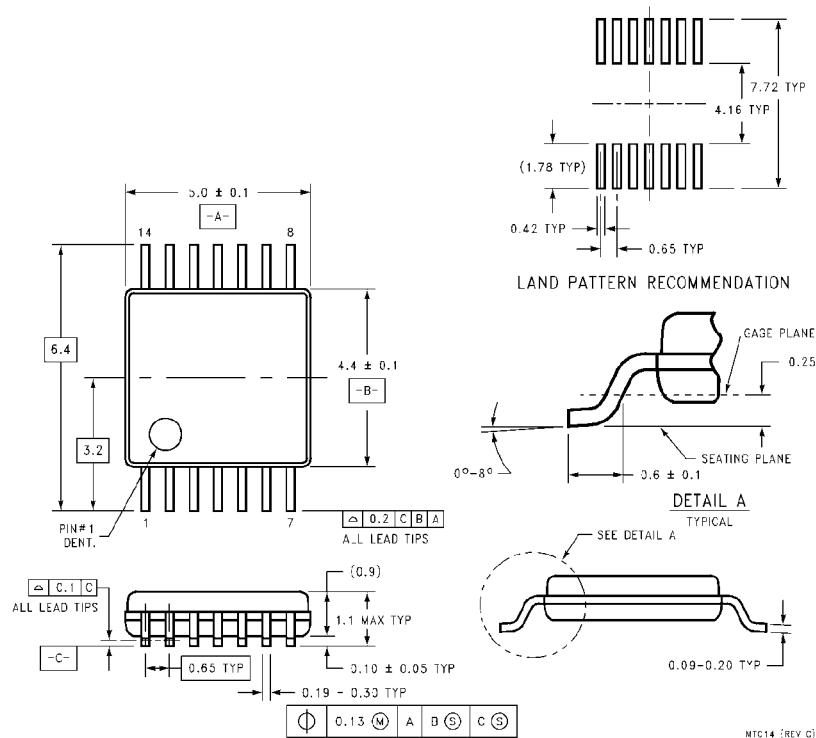
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



14-Lead Small Outline Integrated Circuit (S)
NS Package Number M14A

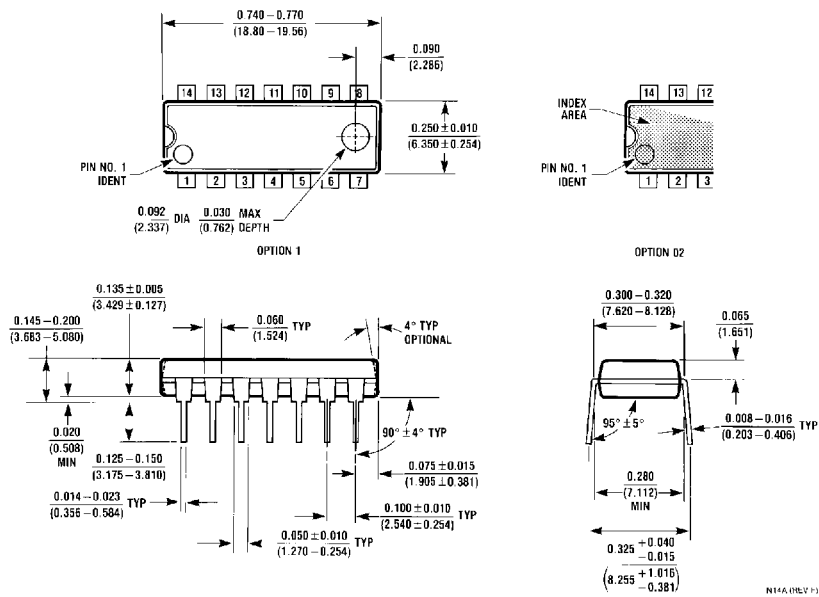
M14A dREV 14

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



14-Lead Molded Thin Shrink Small Outline Package, JEDEC NS Package Number MTC14

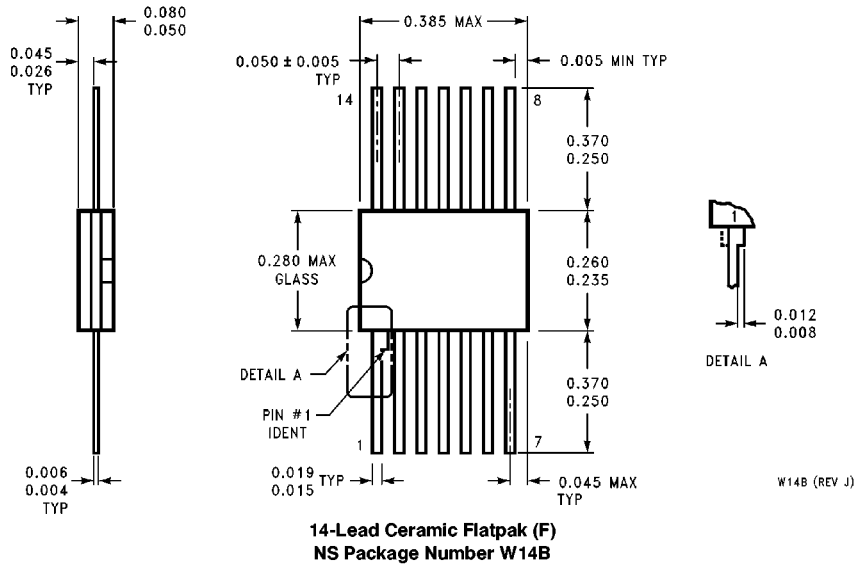
MTC14 (REV C)



14-Lead Plastic Dual-In-Line Package (P) NS Package Number N14A

N14A (REV F)

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



W14B (REV J)

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