

74F646 • 74F646B • 74F648

Octal Transceiver/Register with 3-STATE Outputs

General Description

These devices consist of bus transceiver circuits with 3-STATE, D-type flip-flops, and control circuitry arranged for multiplexed transmission of data directly from the input bus or from the internal registers. Data on the A or B bus will be clocked into the registers as the appropriate clock pin goes to a high logic level. Control \bar{G} and direction pins are provided to control the transceiver function. In the transceiver mode, data present at the high impedance port may be stored in either the A or the B register or in both. The select controls can multiplex stored and real-time (transparent mode) data. The direction control determines which bus will receive data when the enable control \bar{G} is Active LOW. In the isolation mode (control \bar{G} HIGH), A data may be stored in the B register and/or B data may be stored in the A register.

Features

- Independent registers for A and B buses
- Multiplexed real-time and stored data
- 74F648 has inverting data paths
- 74F646/74F646B have non-inverting data paths
- 74F646B is a faster version of the 74F646
- 3-STATE outputs
- 300 mil slim DIP

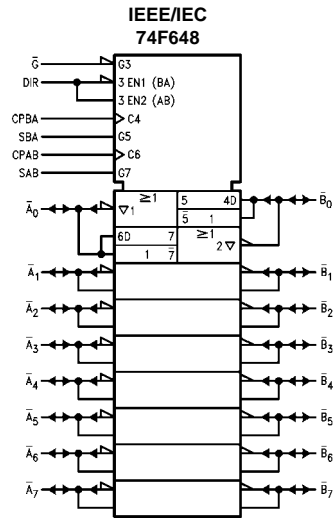
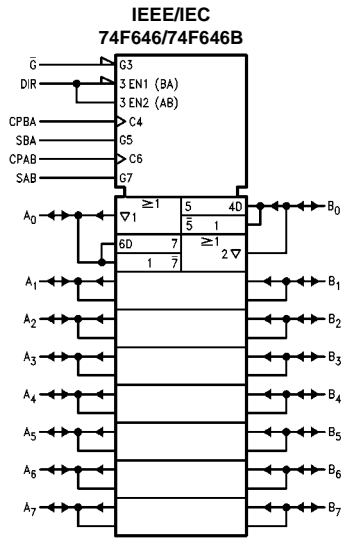
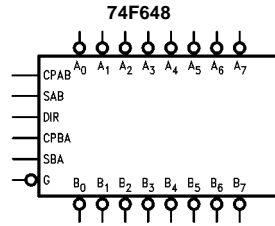
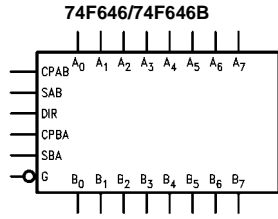
Ordering Code:

| Order Number | Package Number | Package Description |
|--------------|----------------|---|
| 74F646SC | M24B | 24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide |
| 74F646MSA | MSA24 | 24-Lead Shrink Small Outline Package (SSOP), EIAJ TYPE II, 5.3mm Wide |
| 74F646SPC | N24C | 24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-100, 0.300 Wide |
| 74F646BSC | M24B | 24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide |
| 74F646BSPC | N24C | 24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-100, 0.300 Wide |
| 74F648SC | M24B | 24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide |
| 74F648SPC | N24C | 24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-100, 0.300 Wide |

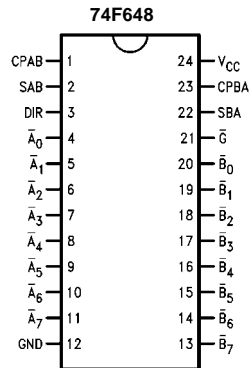
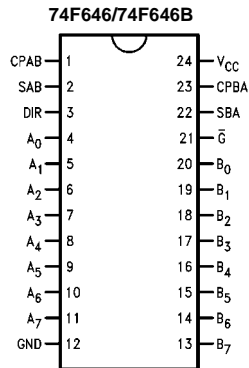
Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

74F646 • 74F646B • 74F648 Octal Transceiver/Register with 3-STATE Outputs

Logic Symbols



Connection Diagrams



Unit Loading/Fan Out

| Pin Names | Description | U.L. | |
|----------------|--|-----------------------------|---|
| | | HIGH/LOW | Input I_{IH}/I_{IL} Output I_{OH}/I_{OL} |
| A_0 – A_7 | Data Register A Inputs/ 3-STATE Outputs | 3.5/1.083 600/106.6 (80) | 70 μ A/–650 μ A –12 mA/64 mA (48 mA) |
| B_0 – B_7 | Data Register B Inputs/ 3-STATE Outputs | 3.5/1.083 600/106.6 (80) | 70 μ A/–650 μ A –12 mA/64 mA (48 mA) |
| CPAB, CPBA | Clock Pulse Inputs | 1.0/1.0 | 20 μ A/–0.6 mA |
| SAB, SBA | Select Inputs | 1.0/1.0 | 20 μ A/–0.6 mA |
| \overline{G} | Output Enable Input | 1.0/1.0 | 20 μ A/–0.6 mA |
| DIR | Direction Control Input | 1.0/1.0 | 20 μ A/–0.6 mA |

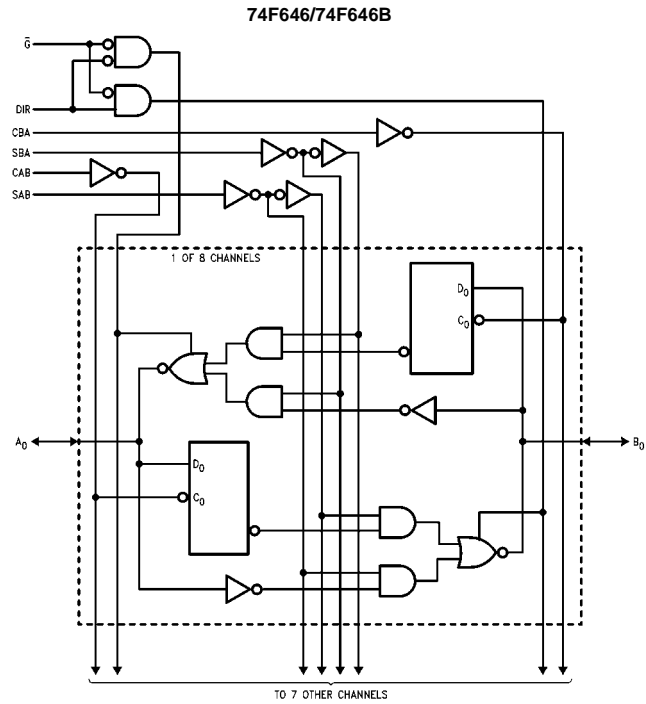
Function Table

| Inputs | | | | | | Data I/O (Note 1) | | Function |
|----------------|-----|------------|------------|-----|-----|-------------------|---------------|--|
| \overline{G} | DIR | CPAB | CPBA | SAB | SBA | A_0 – A_7 | B_0 – B_7 | |
| H | X | H or L | H or L | X | X | | | Isolation |
| H | X | \nearrow | X | X | X | Input | Input | Clock A_n Data into A Register |
| H | X | X | \nearrow | X | X | | | Clock B_n Data into B Register |
| L | H | X | X | L | X | | | A_n to B_n —Real Time (Transparent Mode) |
| L | H | \nearrow | X | L | X | Input | Output | Clock A_n Data into A Register |
| L | H | H or L | X | H | X | | | A Register to B_n (Stored Mode) |
| L | H | \nearrow | X | H | X | | | Clock A_n Data into A Register and Output to B_n |
| L | L | X | X | X | L | | | B_n to A_n —Real Time (Transparent Mode) |
| L | L | X | \nearrow | X | L | Output | Input | Clock B_n Data into B Register |
| L | L | X | H or L | X | H | | | B Register to A_n (Stored Mode) |
| L | L | X | \nearrow | X | H | | | Clock B_n Data into B Register and Output to A_n |

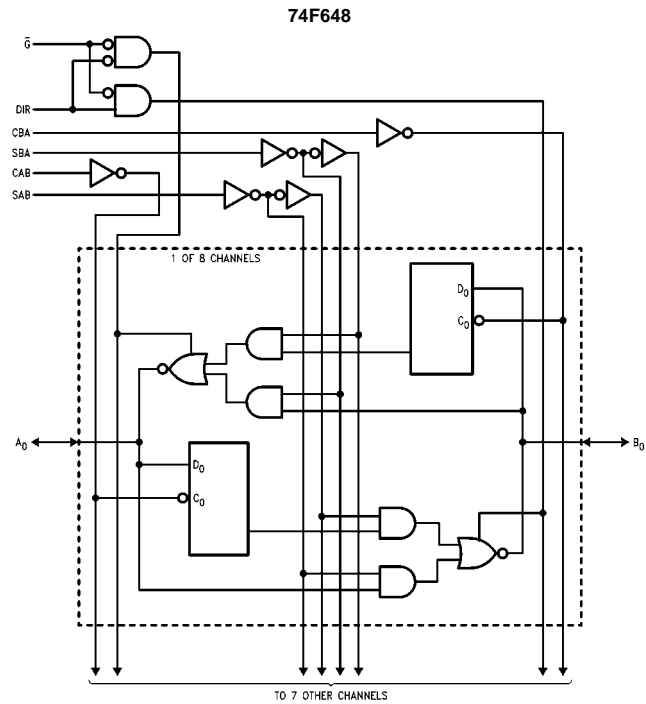
H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Irrelevant
 \nearrow = LOW-to-HIGH Transition

Note 1: The data output functions may be enabled or disabled by various signals at the \overline{G} and DIR Inputs. Data input functions are always enabled; i.e., data at the bus pins will be stored on every LOW-to-HIGH transition of the clock inputs.

Logic Diagrams



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



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(Note 2)

| | |
|--|--------------------------------------|
| Storage Temperature | -65°C to +150°C |
| Ambient Temperature under Bias | -55°C to +125°C |
| Junction Temperature under Bias | -55°C to +150°C |
| V _{CC} Pin Potential to Ground Pin | -0.5V to +7.0V |
| Input Voltage (Note 3) | -0.5V to +7.0V |
| Input Current (Note 3) | -30 mA to +5.0 mA |
| Voltage Applied to Output in HIGH State (with V _{CC} = 0V) | |
| Standard Output | -0.5V to V _{CC} |
| 3-STATE Output | -0.5V to +5.5V |
| Current Applied to Output in LOW State (Max) | twice the rated I _{OL} (mA) |
| ESD Last Passing Voltage (Min) | 4000V |

Recommended Operating Conditions

| | |
|------------------------------|----------------|
| Free Air Ambient Temperature | 0°C to +70°C |
| Supply Voltage | +4.5V to +5.5V |

Note 2: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 3: Either voltage limit or current limit is sufficient to protect inputs.

DC Electrical Characteristics

| Symbol | Parameter | Min | Typ | Max | Units | V _{CC} | Conditions |
|------------------------------------|--|------|-----|------|-------|-----------------|---|
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | | Recognized as a HIGH Signal |
| V _{IL} | Input LOW Voltage | | | 0.8 | V | | Recognized as a LOW Signal |
| V _{CD} | Input Clamp Diode Voltage | | | -1.2 | V | Min | I _{IN} = -18 mA (Non I/O Pins) |
| V _{OH} | Output HIGH Voltage 10% V _{CC} | 2.0 | | | V | Min | I _{OH} = -15 mA (A _n , B _n) |
| V _{OL} | Output LOW Voltage 10% V _{CC} | | | 0.55 | V | Min | I _{OL} = 64 mA (A _n , B _n) |
| I _{IH} | Input HIGH Current | | | 5.0 | μA | Max | V _{IN} = 2.7V (Non I/O Pins) |
| I _{BVI} | Input HIGH Current Breakdown Test | | | 7.0 | μA | Max | V _{IN} = 7.0V (Non I/O Pins) |
| I _{BVIT} | Input HIGH Current Breakdown (I/O) | | | 0.5 | mA | Max | V _{IN} = 5.5V (A _n , B _n) |
| I _{CEx} | Output HIGH Leakage Current | | | 50 | μA | Max | V _{OUT} = V _{CC} |
| V _{ID} | Input Leakage Test | 4.75 | | | V | 0.0 | I _{ID} = 1.9 μA All Other Pins Grounded |
| I _{OD} | Output Leakage Circuit Current | | | 3.75 | μA | 0.0 | V _{ID} = 150 mV All Other Pins Grounded |
| I _{IL} | Input LOW Current | | | -0.6 | mA | Max | V _{IN} = 0.5V (Non I/O Pins) |
| I _{IH} + I _{OZH} | Output Leakage Current | | | 70 | μA | Max | V _{OUT} = 2.7V (A _n , B _n) |
| I _{IL} + I _{OZL} | Output Leakage Current | | | -650 | μA | Max | V _{OUT} = 0.5V (A _n , B _n) |
| I _{OS} | Output Short-Circuit Current | -100 | | -225 | mA | Max | V _{OUT} = 0V |
| I _{ZZ} | Bus Drainage Test | | | 500 | μA | 0.0V | V _{OUT} = 5.25V |
| I _{CCH} | Power Supply Current | | | 135 | mA | Max | V _O = HIGH |
| I _{CCL} | Power Supply Current | | | 150 | mA | Max | V _O = LOW |
| I _{CCZ} | Power Supply Current | | | 150 | mA | Max | V _O = HIGH Z |

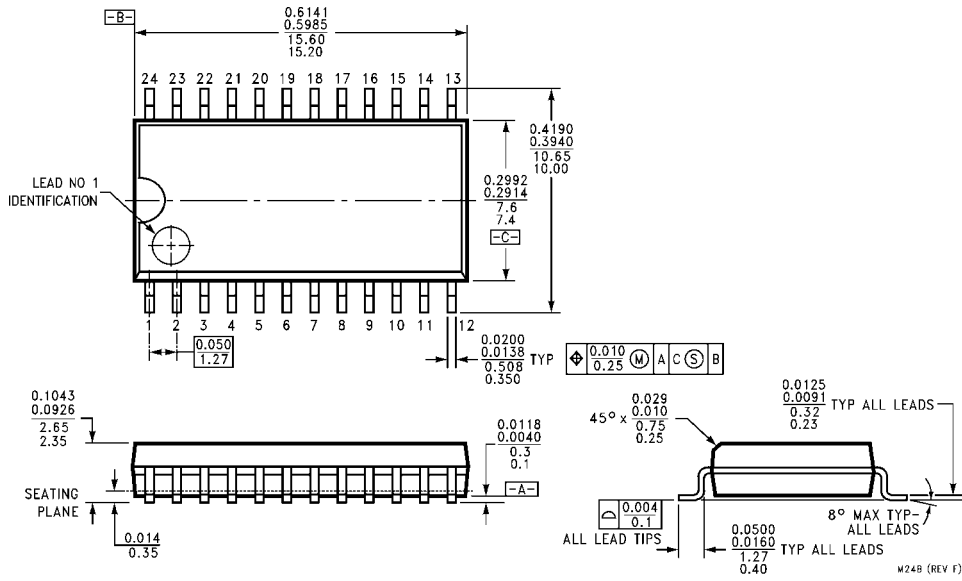
| AC Electrical Characteristics 74F646/74F648 | | | | | | | | |
|---|---------------------------|--|------|---|------|--|------|-------|
| Symbol | Parameter | $T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$ | | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$ | | $T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$ | | Units |
| | | Min | Max | Min | Max | Min | Max | |
| f_{MAX} | Maximum Clock Frequency | 90 | | 75 | | 90 | | MHz |
| t_{PLH} | Propagation Delay | 2.0 | 7.0 | 2.0 | 8.5 | 2.0 | 8.0 | ns |
| t_{PHL} | Clock to Bus | 2.0 | 8.0 | 2.0 | 9.5 | 2.0 | 9.0 | |
| t_{PLH} | Propagation Delay | 1.0 | 7.0 | 1.0 | 8.0 | 1.0 | 7.5 | ns |
| t_{PHL} | Bus to Bus (74F646) | 1.0 | 6.5 | 1.0 | 8.0 | 1.0 | 7.0 | |
| t_{PLH} | Propagation Delay | 2.0 | 8.5 | 1.0 | 10.0 | 2.0 | 9.0 | ns |
| t_{PHL} | Bus to Bus (74F648) | 1.0 | 7.5 | 1.0 | 9.0 | 1.0 | 8.0 | |
| t_{PLH} | Propagation Delay | 2.0 | 8.5 | 2.0 | 11.0 | 2.0 | 9.5 | ns |
| t_{PHL} | SBA or SAB to A or B | 2.0 | 8.0 | 2.0 | 10.0 | 2.0 | 9.0 | |
| t_{PZH} | Enable Time | 2.0 | 8.5 | 2.0 | 10.0 | 2.0 | 9.0 | ns |
| t_{PZL} | \overline{OE} to A or B | 2.0 | 12.0 | 2.0 | 13.5 | 2.0 | 12.5 | |
| t_{PHZ} | Disable Time | 1.0 | 7.5 | 1.0 | 9.0 | 1.0 | 8.5 | ns |
| t_{PLZ} | \overline{OE} to A or B | 2.0 | 9.0 | 2.0 | 11.0 | 2.0 | 9.5 | |
| t_{PZH} | Enable Time | 2.0 | 14.0 | 2.0 | 16.0 | 2.0 | 15.0 | ns |
| t_{PZL} | DIR to A or B | 2.0 | 13.0 | 2.0 | 15.0 | 2.0 | 14.0 | |
| t_{PHZ} | Disable Time | 1.0 | 9.0 | 1.0 | 10.0 | 1.0 | 9.5 | ns |
| t_{PLZ} | DIR to A or B | 2.0 | 11.0 | 2.0 | 12.0 | 2.0 | 11.5 | |

| AC Operating Requirements 74F646/74F648 | | | | | | | | |
|---|-------------------------|--|-----|---|-----|--|-----|-------|
| Symbol | Parameter | $T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ | | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ | | $T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ | | Units |
| | | Min | Max | Min | Max | Min | Max | |
| $t_S(H)$ | Setup Time, HIGH or LOW | 5.0 | | 5.0 | | 5.0 | | ns |
| $t_S(L)$ | Bus to Clock | 5.0 | | 5.0 | | 5.0 | | |
| $t_H(H)$ | Hold Time, HIGH or LOW | 2.0 | | 2.5 | | 2.0 | | ns |
| $t_H(L)$ | Bus to Clock | 2.0 | | 2.5 | | 2.0 | | |
| $t_W(H)$ | Clock Pulse Width | 5.0 | | 5.0 | | 5.0 | | ns |
| $t_W(L)$ | HIGH or LOW | 5.0 | | 5.0 | | 5.0 | | |

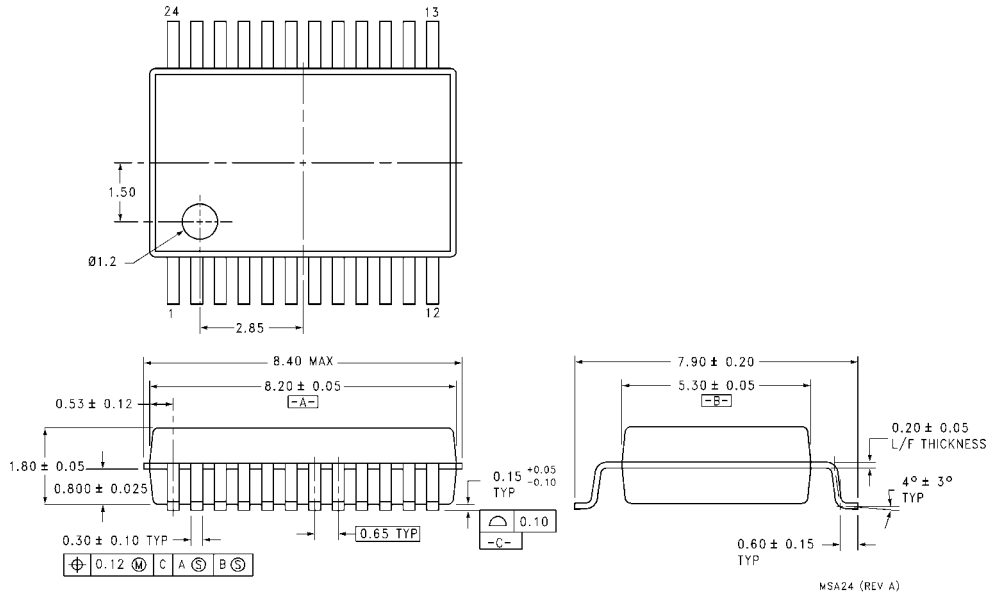
| AC Electrical Characteristics 74F646B | | | | | | | | |
|---------------------------------------|---------------------------|--|-----|---|-----|--|------|-------|
| Symbol | Parameter | $T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$ | | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$ | | $T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$ | | Units |
| | | Min | Max | Min | Max | Min | Max | |
| f_{MAX} | Maximum Clock Frequency | 165 | | | | 150 | | MHz |
| t_{PLH} | Propagation Delay | 2.5 | 7.0 | | | 2.5 | 8.0 | ns |
| t_{PHL} | Clock to Bus | 3.0 | 7.5 | | | 3.0 | 8.0 | |
| t_{PLH} | Propagation Delay | 2.0 | 6.0 | | | 2.0 | 7.0 | ns |
| t_{PHL} | Bus to Bus | 2.0 | 6.0 | | | 2.0 | 7.0 | |
| t_{PLH} | Propagation Delay | 2.5 | 7.5 | | | 2.5 | 8.5 | ns |
| t_{PHL} | SBA or SAB to A or B | 2.5 | 7.5 | | | 2.5 | 8.5 | |
| t_{PZH} | Enable Time | 2.5 | 6.5 | | | 2.5 | 8.0 | ns |
| t_{PZL} | \overline{OE} to A or B | 2.5 | 9.0 | | | 2.5 | 10.0 | |
| t_{PHZ} | Disable Time | 1.5 | 6.5 | | | 1.5 | 7.5 | ns |
| t_{PLZ} | \overline{OE} to A or B | 2.0 | 7.0 | | | 2.0 | 8.5 | |
| t_{PZH} | Enable Time | 2.0 | 7.0 | | | 2.0 | 8.5 | ns |
| t_{PZL} | DIR to A or B | 3.0 | 9.5 | | | 3.0 | 10.0 | |
| t_{PHZ} | Disable Time | 1.5 | 7.5 | | | 1.5 | 8.5 | ns |
| t_{PLZ} | DIR to A or B | 2.5 | 8.5 | | | 2.5 | 9.5 | |

| AC Operating Requirements 74F646B | | | | | | | | |
|-----------------------------------|-------------------------|--|-----|---|-----|--|-----|-------|
| Symbol | Parameter | $T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ | | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ | | $T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ | | Units |
| | | Min | Max | Min | Max | Min | Max | |
| $t_S(H)$ | Setup Time, HIGH or LOW | 5.0 | | | | 4.0 | | ns |
| $t_S(L)$ | Bus to Clock | 5.0 | | | | 4.0 | | |
| $t_H(H)$ | Hold Time, HIGH or LOW | 1.5 | | | | 1.5 | | ns |
| $t_H(L)$ | Bus to Clock | 1.5 | | | | 1.5 | | |
| $t_W(H)$ | Clock Pulse Width | 5.0 | | | | 5.0 | | ns |
| $t_W(L)$ | HIGH or LOW | 5.0 | | | | 5.0 | | |

Physical Dimensions inches (millimeters) unless otherwise noted

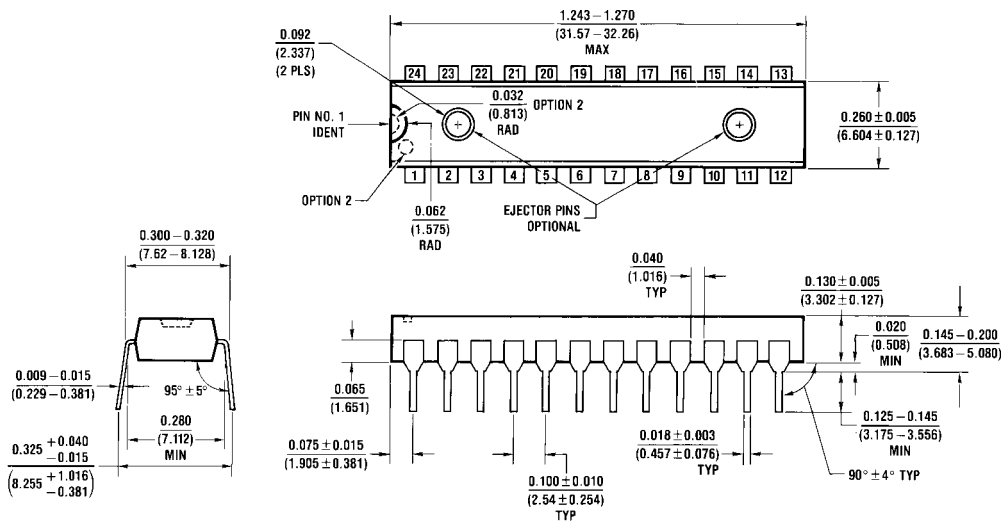


24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide Package Number M24B



24-Lead Shrink Small Outline Package (SSOP), EIAJ TYPE II, 5.3mm Wide Package Number MSA24

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



24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-100, 0.300 Wide Package Number N24C

N24C (REV F)

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