

## 74F676

### 16-Bit Serial/Parallel-In, Serial-Out Shift Register

#### General Description

The 74F676 contains 16 flip-flops with provision for synchronous parallel or serial entry and serial output. When the Mode (M) input is HIGH, information present on the parallel data ( $P_0$ – $P_{15}$ ) inputs is entered on the falling edge of the Clock Pulse ( $\overline{CP}$ ) input signal. When M is LOW, data is shifted out of the most significant bit position while information present on the Serial (SI) input shifts into the least significant bit position. A HIGH signal on the Chip Select ( $\overline{CS}$ ) input prevents both parallel and serial operations.

#### Features

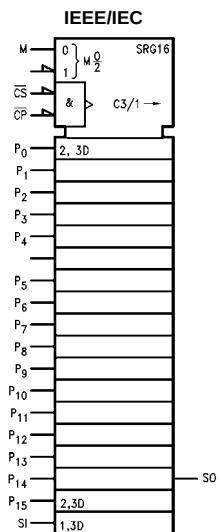
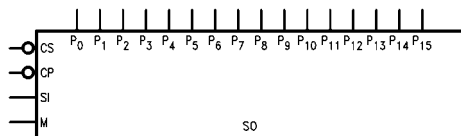
- 16-bit parallel-to-serial conversion
- 16-bit serial-in, serial-out
- Chip select control
- Slim 24 lead 300 mil package

#### Ordering Code:

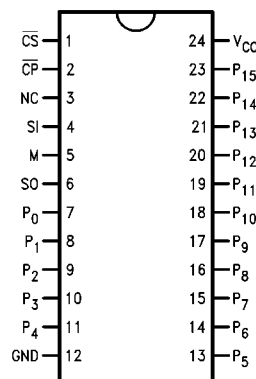
| Order Number | Package Number | Package Description                                                        |
|--------------|----------------|----------------------------------------------------------------------------|
| 74F676SC     | M24B           | 24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide |
| 74F676PC     | N24A           | 24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-011, 0.600" Wide     |
| 74F676SPC    | N24C           | 24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide     |

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

#### Logic Symbols



#### Connection Diagram



74F676 16-Bit Serial/Parallel-In, Serial-Out Shift Register

## Unit Loading/Fan Out

| Pin Names       | Description                    | U.L.<br>HIGH/LOW | Input $I_{IH}/I_{IL}$<br>Output $I_{OH}/I_{OL}$ |
|-----------------|--------------------------------|------------------|-------------------------------------------------|
| $P_0-P_{15}$    | Parallel Data Inputs           | 1.0/1.0          | 20 $\mu A$ /–0.6 mA                             |
| $\overline{CS}$ | Chip Select Input (Active LOW) | 1.0/1.0          | 20 $\mu A$ /–0.6 mA                             |
| $\overline{CP}$ | Clock Pulse Input (Active LOW) | 1.0/1.0          | 20 $\mu A$ /–0.6 mA                             |
| M               | Mode Select Input              | 1.0/1.0          | 20 $\mu A$ /–0.6 mA                             |
| SI              | Serial Data Input              | 1.0/1.0          | 20 $\mu A$ /–0.6 mA                             |
| SO              | Serial Output                  | 50/33.3          | –1 mA/20 mA                                     |

## Functional Description

The 16-bit shift register operates in one of three modes, as indicated in the Shift Register Operations Table.

**HOLD**— a HIGH signal on the Chip Select ( $\overline{CS}$ ) input prevents clocking, and data is stored in the sixteen registers.

**Shift/Serial Load**— data present on the SI pin shifts into the register on the falling edge of  $\overline{CP}$ . Data enters the  $Q_0$  position and shifts toward  $Q_{15}$  on successive clocks, finally appearing on the SO pin.

**Parallel Load**— data present on  $P_0-P_{15}$  are entered into the register on the falling edge of  $\overline{CP}$ . The SO output represents the  $Q_{15}$  register output.

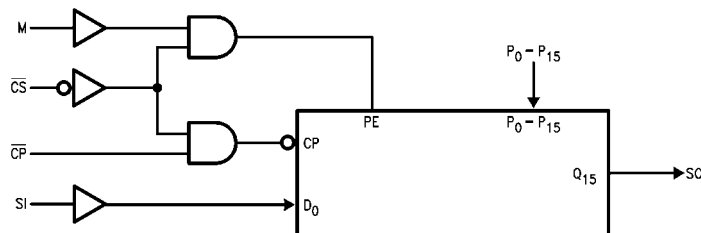
To prevent false clocking,  $\overline{CP}$  must be LOW during a LOW-to-HIGH transition of  $\overline{CS}$ .

## Shift Register Operations Table

| Control Input   |   |                 | Operating Mode    |
|-----------------|---|-----------------|-------------------|
| $\overline{CS}$ | M | $\overline{CP}$ |                   |
| H               | X | X               | Hold              |
| L               | L | $\sim$          | Shift/Serial Load |
| L               | H | $\sim$          | Parallel Load     |

H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Immaterial  
 $\sim$  = HIGH-to-LOW Transition

## Block Diagram



**Absolute Maximum Ratings**(Note 1)

|                                             |                   |
|---------------------------------------------|-------------------|
| 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 <sub>CC</sub> Pin Potential to Ground Pin | -0.5V to +7.0V    |
| Input Voltage (Note 2)                      | -0.5V to +7.0V    |
| Input Current (Note 2)                      | -30 mA to +5.0 mA |

Voltage Applied to Output

in HIGH State (with V<sub>CC</sub> = 0V)Standard Output -0.5V to V<sub>CC</sub>

3-STATE Output -0.5V to +5.5V

Current Applied to Output

in LOW State (Max) twice the rated I<sub>OL</sub> (mA)**Recommended Operating Conditions**

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

**Note 1:** 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 2:** Either voltage limit or current limit is sufficient to protect inputs.

**DC Electrical Characteristics**

| Symbol           | Parameter                         | Min                                       | Typ        | Max  | Units | V <sub>CC</sub> | Conditions                                            |
|------------------|-----------------------------------|-------------------------------------------|------------|------|-------|-----------------|-------------------------------------------------------|
| V <sub>IH</sub>  | Input HIGH Voltage                | 2.0                                       |            |      | V     |                 | Recognized as a HIGH Signal                           |
| V <sub>IL</sub>  | Input LOW Voltage                 |                                           |            | 0.8  | V     |                 | Recognized as a LOW Signal                            |
| V <sub>CD</sub>  | Input Clamp Diode Voltage         |                                           |            | -1.2 | V     | Min             | I <sub>IN</sub> = -18 mA                              |
| V <sub>OH</sub>  | Output HIGH Voltage               | 10% V <sub>CC</sub><br>5% V <sub>CC</sub> | 2.5<br>2.7 |      | V     | Min             | I <sub>OH</sub> = -1 mA<br>I <sub>OH</sub> = -1 mA    |
| V <sub>OL</sub>  | Output LOW Voltage                | 10% V <sub>CC</sub>                       |            | 0.5  | V     | Min             | I <sub>OL</sub> = 20 mA                               |
| I <sub>IH</sub>  | Input HIGH Current                |                                           |            | 5.0  | μA    | Max             | V <sub>IN</sub> = 2.7V                                |
| I <sub>BVI</sub> | Input HIGH Current Breakdown Test |                                           |            | 7.0  | μA    | Max             | V <sub>IN</sub> = 7.0V                                |
| I <sub>CEX</sub> | Output HIGH Leakage Current       |                                           |            | 50   | μA    | Max             | V <sub>OUT</sub> = V <sub>CC</sub>                    |
| V <sub>ID</sub>  | Input Leakage Test                | 4.75                                      |            |      | V     | 0.0             | I <sub>ID</sub> = 1.9 μA,<br>All Other Pins Grounded  |
| I <sub>OD</sub>  | Output Leakage Circuit Current    |                                           |            | 3.75 | μA    | 0.0             | V <sub>IOD</sub> = 150 mV,<br>All Other Pins Grounded |
| I <sub>IL</sub>  | Input LOW Current                 |                                           |            | -0.6 | mA    | Max             | V <sub>IN</sub> = 0.5V                                |
| I <sub>OS</sub>  | Output Short-Circuit Current      | -60                                       |            | -150 | mA    | Max             | V <sub>OUT</sub> = 0V                                 |
| I <sub>CC</sub>  | Power Supply Current              |                                           |            | 72   | mA    | Max             |                                                       |

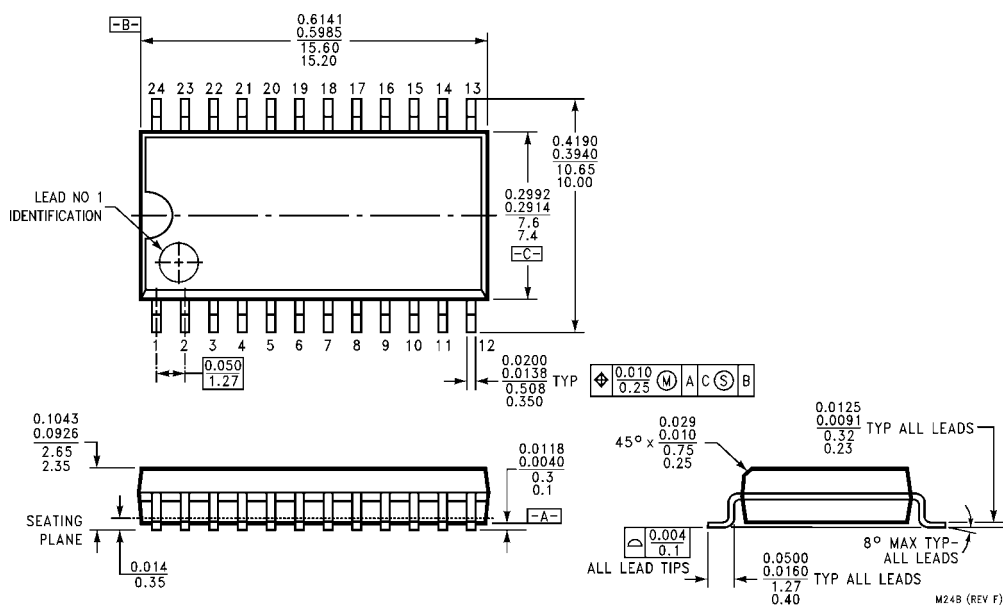
## AC Electrical Characteristics

| Symbol           | Parameter               | T <sub>A</sub> = +25°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |     |      | T <sub>A</sub> = -55°C to 125°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |      | T <sub>A</sub> = 0°C to +70°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |      | Units |
|------------------|-------------------------|-----------------------------------------------------------------------------|-----|------|--------------------------------------------------------------------------------------|------|------------------------------------------------------------------------------------|------|-------|
|                  |                         | Min                                                                         | Typ | Max  | Min                                                                                  | Max  | Min                                                                                | Max  |       |
| t <sub>MAX</sub> | Maximum Clock Frequency | 100                                                                         | 110 |      | 45                                                                                   |      | 90                                                                                 |      | MHz   |
| t <sub>PLH</sub> | Propagation Delay       | 4.5                                                                         | 9.0 | 11.0 | 4.5                                                                                  | 17.0 | 4.5                                                                                | 12.0 | ns    |
| t <sub>PHL</sub> | CP to SO                | 5.0                                                                         | 9.0 | 12.5 | 5.0                                                                                  | 14.5 | 5.0                                                                                | 13.5 |       |

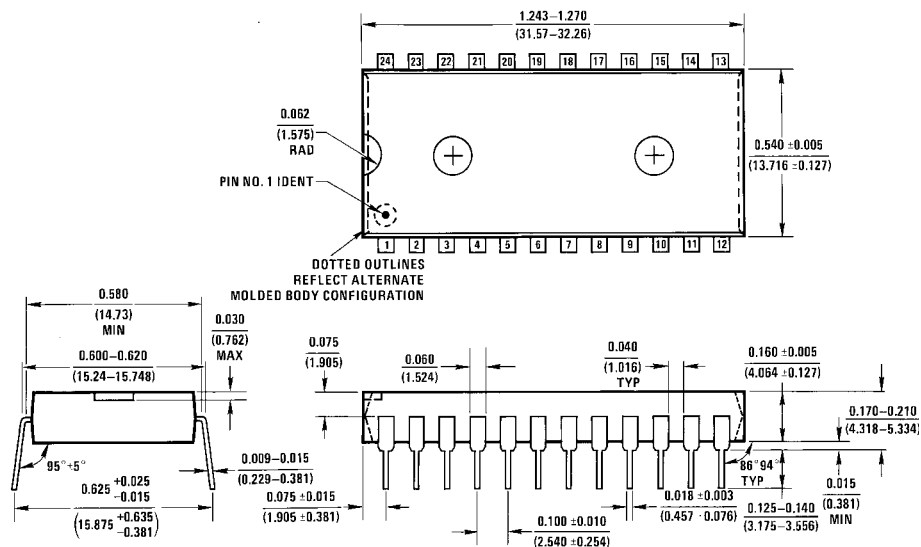
## AC Operating Requirements

| Symbol             | Parameter                                                           | T <sub>A</sub> = +25°C<br>V <sub>CC</sub> = +5.0V |     | T <sub>A</sub> = -55°C to 125°C<br>V <sub>CC</sub> = +5.0V |     | T <sub>A</sub> , V <sub>CC</sub> = —<br>V <sub>CC</sub> = +5.0V |     | Units |
|--------------------|---------------------------------------------------------------------|---------------------------------------------------|-----|------------------------------------------------------------|-----|-----------------------------------------------------------------|-----|-------|
|                    |                                                                     | Min                                               | Max | Min                                                        | Max | Min                                                             | Max |       |
| t <sub>S</sub> (H) | Setup Time, HIGH or LOW                                             | 4.0                                               |     | 4.0                                                        |     | 4.0                                                             |     | ns    |
| t <sub>S</sub> (L) | SI to $\overline{\text{CP}}$                                        | 4.0                                               |     | 4.0                                                        |     | 4.0                                                             |     |       |
| t <sub>H</sub> (H) | Hold Time, HIGH or LOW                                              | 4.0                                               |     | 4.0                                                        |     | 4.0                                                             |     | ns    |
| t <sub>H</sub> (L) | SI to $\overline{\text{CP}}$                                        | 4.0                                               |     | 4.0                                                        |     | 4.0                                                             |     |       |
| t <sub>S</sub> (H) | Setup Time, HIGH or LOW                                             | 3.0                                               |     | 3.0                                                        |     | 3.0                                                             |     | ns    |
| t <sub>S</sub> (L) | P <sub>n</sub> to $\overline{\text{CP}}$                            | 3.0                                               |     | 3.0                                                        |     | 3.0                                                             |     |       |
| t <sub>H</sub> (H) | Hold Time, HIGH or LOW                                              | 4.0                                               |     | 4.0                                                        |     | 4.0                                                             |     | ns    |
| t <sub>H</sub> (L) | P <sub>n</sub> to $\overline{\text{CP}}$                            | 4.0                                               |     | 4.0                                                        |     | 4.0                                                             |     |       |
| t <sub>S</sub> (H) | Setup Time, HIGH or LOW                                             | 8.0                                               |     | 8.0                                                        |     | 8.0                                                             |     | ns    |
| t <sub>S</sub> (L) | M to $\overline{\text{CP}}$                                         | 8.0                                               |     | 8.0                                                        |     | 8.0                                                             |     |       |
| t <sub>H</sub> (H) | Hold Time, HIGH or LOW                                              | 2.0                                               |     | 2.0                                                        |     | 2.0                                                             |     | ns    |
| t <sub>H</sub> (L) | M to $\overline{\text{CP}}$                                         | 2.0                                               |     | 2.0                                                        |     | 2.0                                                             |     |       |
| t <sub>S</sub> (L) | Setup Time, LOW<br>$\overline{\text{CS}}$ to $\overline{\text{CP}}$ | 10.0                                              |     | 12.0                                                       |     | 10.0                                                            |     | ns    |
| t <sub>H</sub> (H) | Hold Time, HIGH<br>$\overline{\text{CS}}$ to $\overline{\text{CP}}$ | 10.0                                              |     | 10.0                                                       |     | 10.0                                                            |     |       |
| t <sub>W</sub> (H) | CP Pulse Width                                                      | 4.0                                               |     | 5.0                                                        |     | 4.0                                                             |     | ns    |
| t <sub>W</sub> (L) | HIGH or LOW                                                         | 6.0                                               |     | 9.0                                                        |     | 6.0                                                             |     |       |

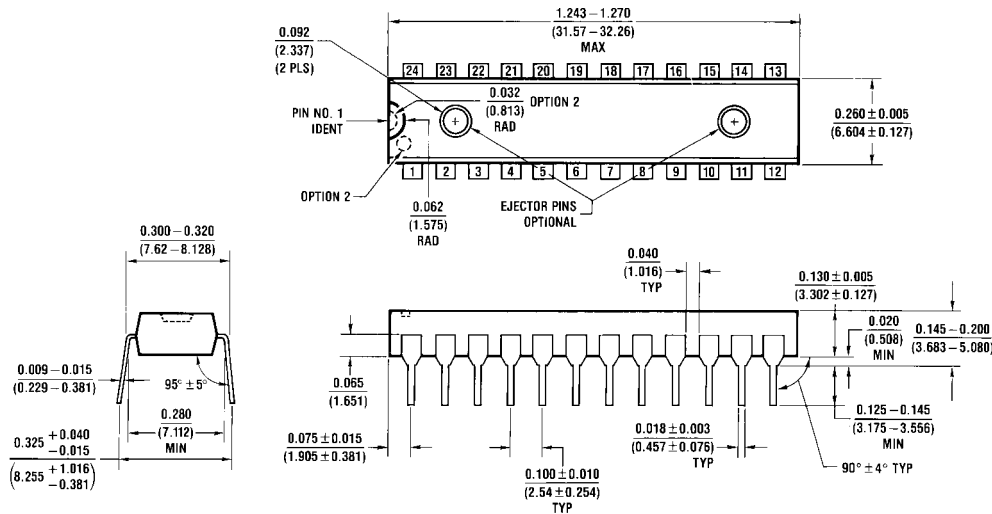
# Physical Dimensions inches (millimeters) unless otherwise noted



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



24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-011, 0.600" Wide  
Package Number N24A

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

N24C (REV F)

**24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide  
Package Number N24C**

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

**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 THE PRESIDENT 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 to 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.

[www.fairchildsemi.com](http://www.fairchildsemi.com)