



April 1988  
 Revised January 2002

## 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<sub>0</sub>-P<sub>15</sub>) inputs is entered on the falling edge of the Clock Pulse (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 (CS) input prevents both parallel and serial operations.

#### Features

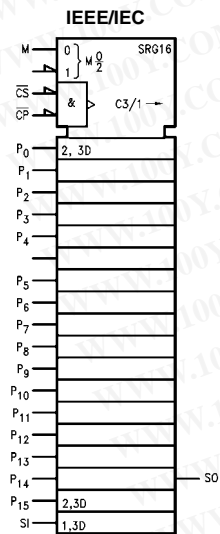
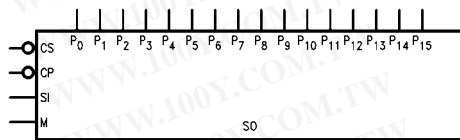
- 16-bit parallel-to-serial conversion
- 16-bit serial-in, serial-out
- Chip select control
- Slim 24 lead 300 mil package

#### Ordering Code:

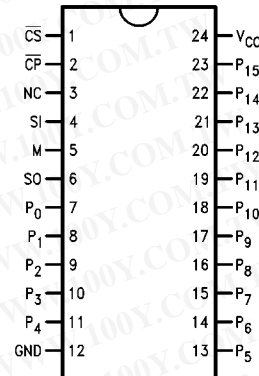
Order Number	Package Number	Package Description
74F676SC	M24B	24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74F676PC	N24A	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-011, 0.600" Wide
74F676SPC	N24C	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300"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

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### Unit Loading/Fan Out

Pin Names	Description	U.L.	
		HIGH/LOW	Input $I_{IH}/I_{IL}$ 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.

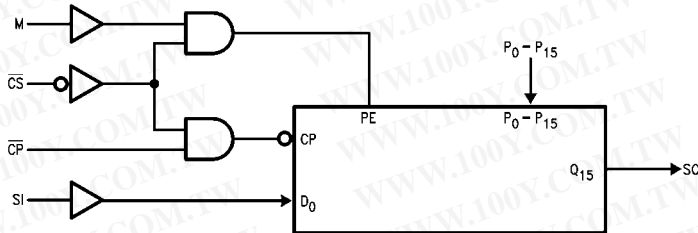
To prevent false clocking,  $\overline{CP}$  must be LOW during a LOW-to-HIGH transition of  $\overline{CS}$ .

### 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



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### 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

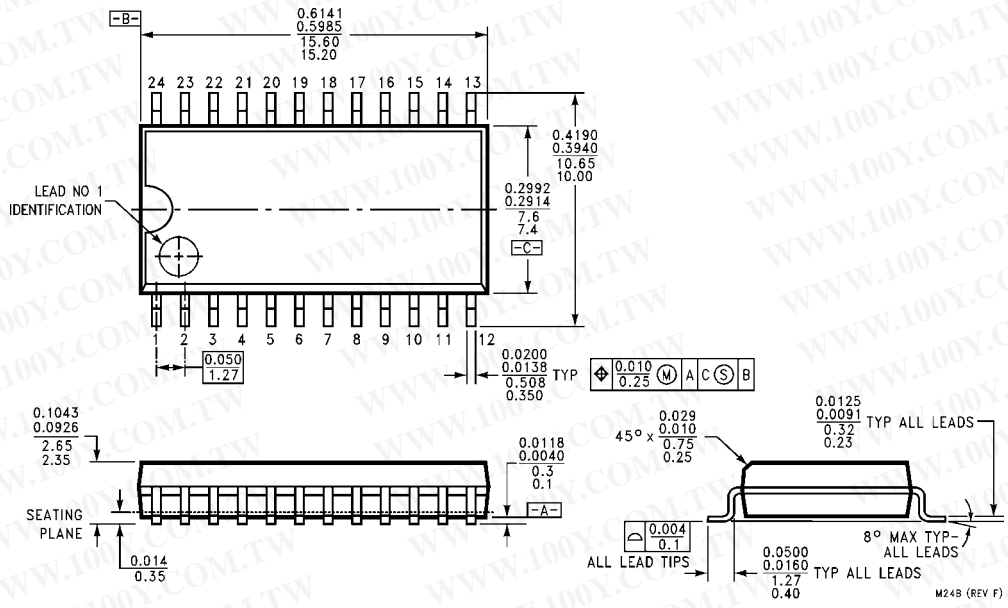
Symbol	Parameter	Min	Typ	Max	Units	V <sub>CC</sub>	Conditions
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V <sub>IL</sub>	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage			-1.2	V	Min	I <sub>IN</sub> = -18 mA
V <sub>OH</sub>	Output HIGH Voltage	10% V <sub>CC</sub>	2.5		V	Min	I <sub>OH</sub> = -1 mA
		5% V <sub>CC</sub>	2.7				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, All Other Pins Grounded
I <sub>OD</sub>	Output Leakage Circuit Current			3.75	μA	0.0	V <sub>ID</sub> = 150 mV, 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	

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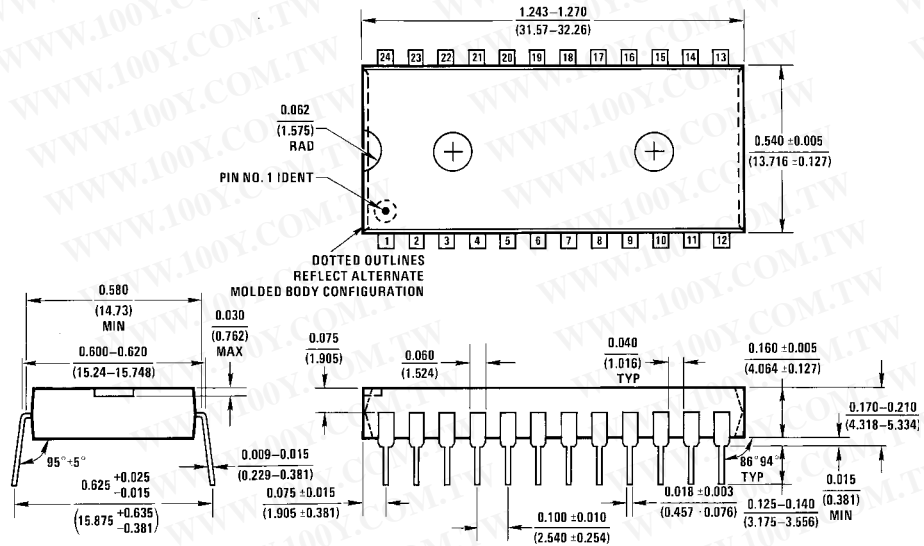
<b>AC Electrical Characteristics</b>									
Symbol	Parameter	$T_A = +25^{\circ}\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$			$T_A = -55^{\circ}\text{C to } 125^{\circ}\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$		$T_A = 0^{\circ}\text{C to } +70^{\circ}\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$		Units
		Min	Typ	Max	Min	Max	Min	Max	
$f_{MAX}$	Maximum Clock Frequency	100	110		45		90		MHz
$t_{PLH}$	Propagation Delay CP to SO	4.5	9.0	11.0	4.5	17.0	4.5	12.0	ns
$t_{PHL}$	CP to SO	5.0	9.0	12.5	5.0	14.5	5.0	13.5	
<b>AC Operating Requirements</b>									
Symbol	Parameter	$T_A = +25^{\circ}\text{C}$ $V_{CC} = +5.0\text{V}$		$T_A = -55^{\circ}\text{C to } 125^{\circ}\text{C}$ $V_{CC} = +5.0\text{V}$		$T_A, V_{CC} = \text{---}$ $V_{CC} = +5.0\text{V}$		Units	
		Min	Max	Min	Max	Min	Max		
$t_S(H)$	Setup Time, HIGH or LOW	4.0		4.0		4.0		ns	
$t_S(L)$	SI to $\overline{CP}$	4.0		4.0		4.0			
$t_H(H)$	Hold Time, HIGH or LOW	4.0		4.0		4.0			
$t_H(L)$	SI to $\overline{CP}$	4.0		4.0		4.0		ns	
$t_S(H)$	Setup Time, HIGH or LOW	3.0		3.0		3.0			
$t_S(L)$	$P_n$ to $\overline{CP}$	3.0		3.0		3.0			
$t_H(H)$	Hold Time, HIGH or LOW	4.0		4.0		4.0		ns	
$t_H(L)$	$P_n$ to $\overline{CP}$	4.0		4.0		4.0			
$t_S(H)$	Setup Time, HIGH or LOW	8.0		8.0		8.0			
$t_S(L)$	M to $\overline{CP}$	8.0		8.0		8.0		ns	
$t_H(H)$	Hold Time, HIGH or LOW	2.0		2.0		2.0			
$t_H(L)$	M to $\overline{CP}$	2.0		2.0		2.0			
$t_S(L)$	Setup Time, LOW $\overline{CS}$ to $\overline{CP}$	10.0		12.0		10.0		ns	
$t_H(H)$	Hold Time, HIGH $\overline{CS}$ to $\overline{CP}$	10.0		10.0		10.0			
$t_W(H)$	CP Pulse Width	4.0		5.0		4.0		ns	
$t_W(L)$	HIGH or LOW	6.0		9.0		6.0			

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



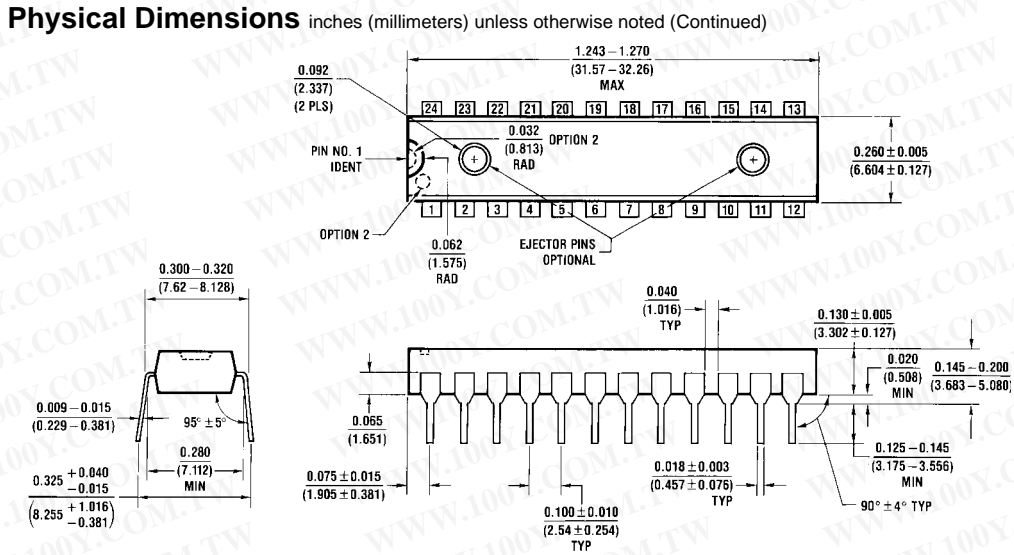
**24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Package Number M24B**



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

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



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

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