

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

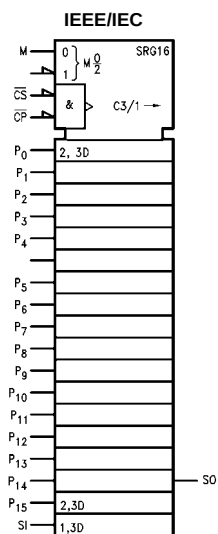
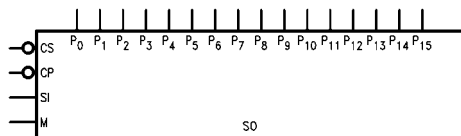
- 16-bit parallel-to-serial conversion
- 16-bit serial-in, serial-out
- Chip select control
- Slim 24 lead 300 mil package

Ordering Code:

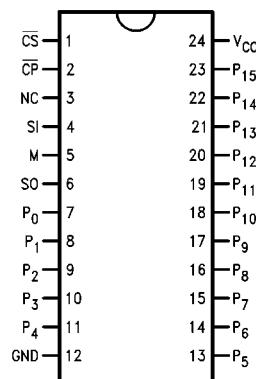
Order Number	Package Number	Package Description
74F676SC	M24B	24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74F676PC	N24A	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-011, 0.600" Wide
74F676SPC	N24C	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300"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

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

Logic Symbols



Connection Diagram



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 μA /–0.6 mA
$\overline{CS}$	Chip Select Input (Active LOW)	1.0/1.0	20 μA /–0.6 mA
$\overline{CP}$	Clock Pulse Input (Active LOW)	1.0/1.0	20 μA /–0.6 mA
M	Mode Select Input	1.0/1.0	20 μA /–0.6 mA
SI	Serial Data Input	1.0/1.0	20 μA /–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.

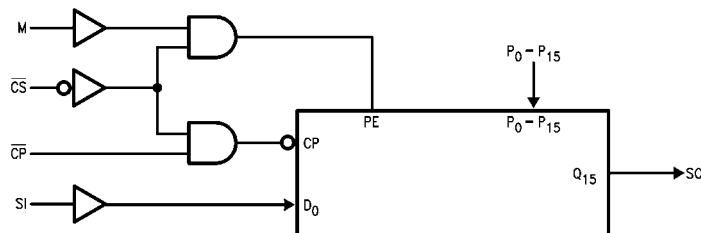
To prevent false clocking, $\overline{CP}$ must be LOW during a LOW-to-HIGH transition of $\overline{CS}$.

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 _{CC} 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_{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)**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

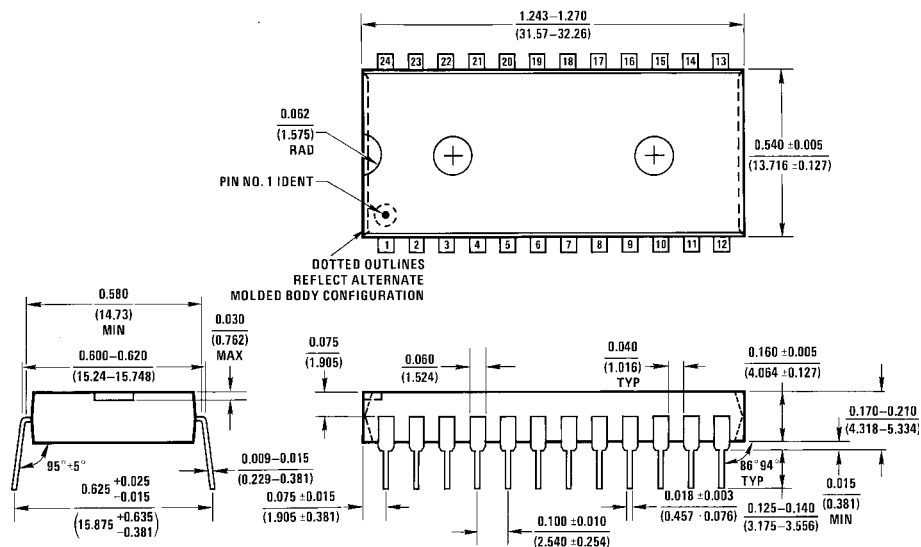
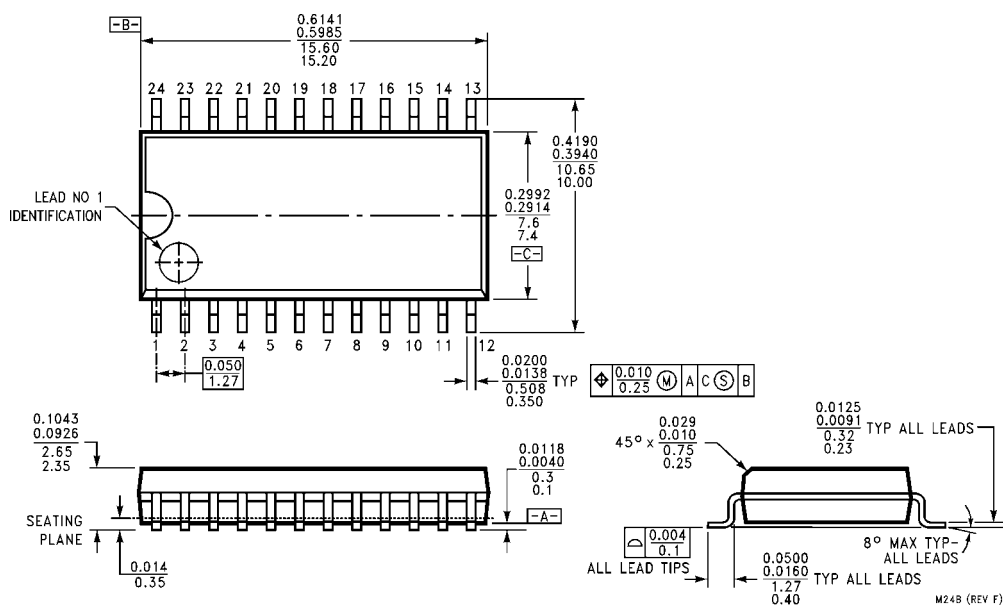
Symbol	Parameter	Min	Typ	Max	Units	V _{CC}	Conditions
V _{IH}	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V _{IL}	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V _{CD}	Input Clamp Diode Voltage			–1.2	V	Min	I _{IN} = –18 mA
V _{OH}	Output HIGH Voltage	10% V _{CC} 5% V _{CC}	2.5 2.7		V	Min	I _{OH} = –1 mA I _{OH} = –1 mA
V _{OL}	Output LOW Voltage	10% V _{CC}		0.5	V	Min	I _{OL} = 20 mA
I _{IH}	Input HIGH Current			5.0	μA	Max	V _{IN} = 2.7V
I _{BVI}	Input HIGH Current Breakdown Test			7.0	μA	Max	V _{IN} = 7.0V
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 _{IOD} = 150 mV, All Other Pins Grounded
I _{IL}	Input LOW Current			–0.6	mA	Max	V _{IN} = 0.5V
I _{OS}	Output Short-Circuit Current	–60		–150	mA	Max	V _{OUT} = 0V
I _{CC}	Power Supply Current			72	mA	Max	

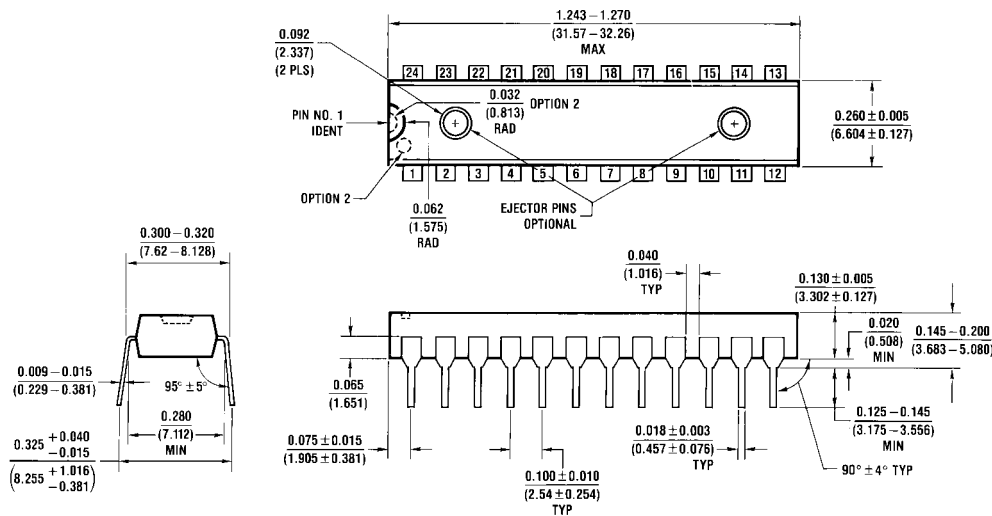
AC Electrical Characteristics

Symbol	Parameter	T _A = +25°C V _{CC} = +5.0V C _L = 50 pF			T _A = -55°C to 125°C V _{CC} = +5.0V C _L = 50 pF		T _A = 0°C to +70°C V _{CC} = +5.0V C _L = 50 pF		Units
		Min	Typ	Max	Min	Max	Min	Max	
f _{MAX}	Maximum Clock Frequency	100	110		45		90		MHz
t _{PLH}	Propagation Delay	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	

AC Operating Requirements

Symbol	Parameter	T _A = +25°C V _{CC} = +5.0V		T _A = -55°C to 125°C V _{CC} = +5.0V		T _A , V _{CC} = — V _{CC} = +5.0V		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 $\overline{\text{CP}}$	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 $\overline{\text{CP}}$	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 $\overline{\text{CP}}$	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 $\overline{\text{CP}}$	4.0		4.0		4.0		
t _S (H)	Setup Time, HIGH or LOW	8.0		8.0		8.0		ns
t _S (L)	M to $\overline{\text{CP}}$	8.0		8.0		8.0		
t _H (H)	Hold Time, HIGH or LOW	2.0		2.0		2.0		
t _H (L)	M to $\overline{\text{CP}}$	2.0		2.0		2.0		ns
t _S (L)	Setup Time, LOW $\overline{\text{CS}}$ to $\overline{\text{CP}}$	10.0		12.0		10.0		
t _H (H)	Hold Time, HIGH $\overline{\text{CS}}$ to $\overline{\text{CP}}$	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		



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

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

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