

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

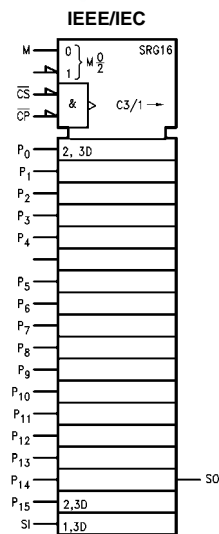
- 16-bit parallel-to-serial conversion
- 16-bit serial-in, serial-out
- Chip select control
- Slim 24 lead 300 mil package

Ordering Code:

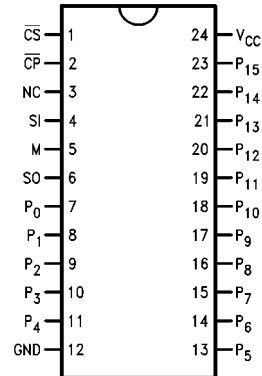
Order Number	Package Number	Package Description
74F676SC	M24B	24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74F676PC	N24A	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-011, 0.600" Wide
74F676SPC	N24C	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" 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 μ A/-0.6 mA
\overline{CS}	Chip Select Input (Active LOW)	1.0/1.0	20 μ A/-0.6 mA
\overline{CP}	Clock Pulse Input (Active LOW)	1.0/1.0	20 μ A/-0.6 mA
M	Mode Select Input	1.0/1.0	20 μ A/-0.6 mA
SI	Serial Data Input	1.0/1.0	20 μ 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.

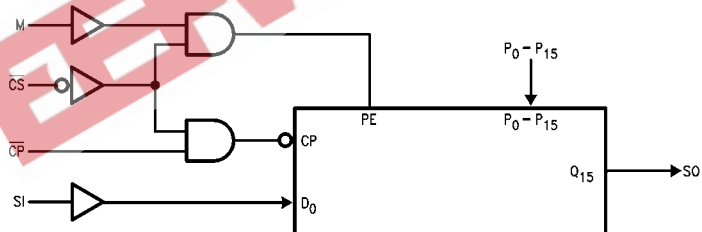
To prevent false clocking, \overline{CP} must be LOW during a LOW-to-HIGH transition of \overline{CS} .

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 _{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.

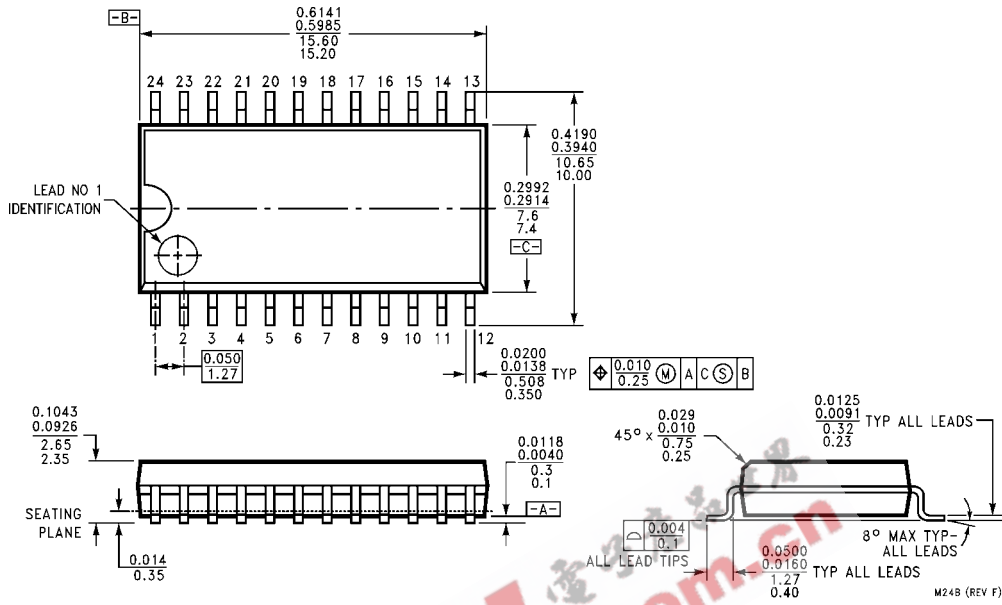
Note 2: Either voltage limit or current limit is sufficient to protect inputs.

DC Electrical Characteristics

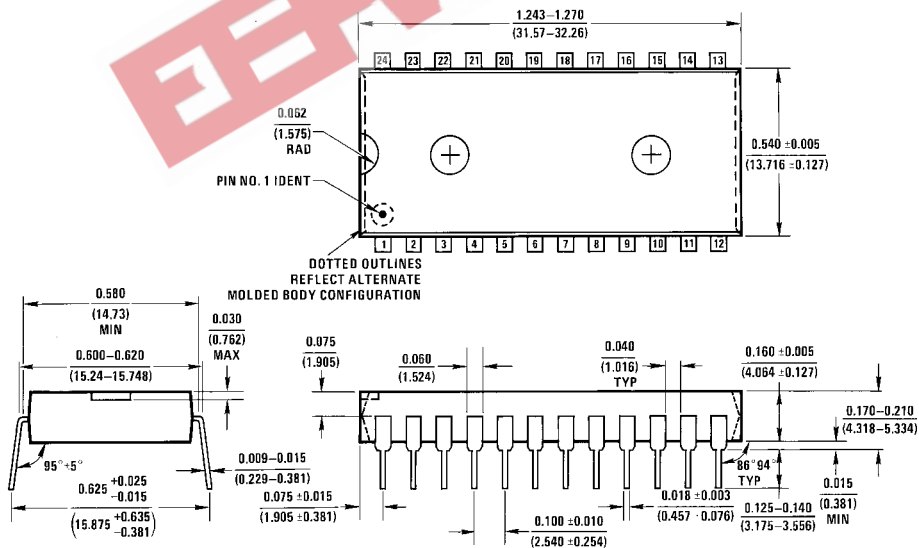
Symbol	Parameter	Min	Typ	Max	Units	V _{CC}	Conditions
V _{IH}	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V _{IL}	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V _{CD}	Input Clamp Diode Voltage			-1.2	V	Min	I _{IN} = -18 mA
V _{OH}	Output HIGH Voltage	10% V _{CC}	2.5		V	Min	I _{OH} = -1 mA
		5% V _{CC}	2.7		V	Min	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	$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$			$T_A = -55^\circ\text{C to } 125^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$		$T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$		Units
		Min	Typ	Max	Min	Max	Min	Max	
f_{MAX}	Maximum Clock Frequency	100	110		45		90		MHz
t_{PLH}	Propagation Delay	4.5	9.0	11.0	4.5	17.0	4.5	12.0	ns
t_{PHL}	\overline{CP} to SO	5.0	9.0	12.5	5.0	14.5	5.0	13.5	
AC Operating Requirements									
Symbol	Parameter	$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$		$T_A = -55^\circ\text{C to } 125^\circ\text{C}$ $V_{CC} = +5.0\text{V}$		$T_A, V_{CC} = \text{---}$ $V_{CC} = +5.0\text{V}$		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		ns	
$t_H(L)$	SI to \overline{CP}	4.0		4.0		4.0			
$t_S(H)$	Setup Time, HIGH or LOW	3.0		3.0		3.0		ns	
$t_S(L)$	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		ns	
$t_S(L)$	M to \overline{CP}	8.0		8.0		8.0			
$t_H(H)$	Hold Time, HIGH or LOW	2.0		2.0		2.0		ns	
$t_H(L)$	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			
$t_W(H)$	\overline{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



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

