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FAIRCHILD SEMICONDUCTOR™

April 1988
Revised October 2000

74F673A
16-Bit Serial-In, Serial/Parallel-Out Shift Register

General Description

The 74F673A contains a 16-bit serial-in, serial-out shift register and a 16-bit Parallel-Out storage register. A single pin serves either as an input for serial entry or as a 3-STATE serial output. In the Serial-Out mode, the data recirculates in the shift register. By means of a separate clock, the contents of the shift register are transferred to the storage register for parallel outputting. The contents of the storage register can also be parallel loaded back into the shift register. A HIGH signal on the Chip Select input prevents both shifting and parallel transfer. The storage register may be cleared via $\overline{STMR}$.

Features

- Serial-to-parallel converter
- 16-bit serial I/O shift register
- 16-bit parallel-out storage register
- Recirculating serial shifting
- Recirculating parallel transfer
- Common serial data I/O pin
- Slim 24 lead package

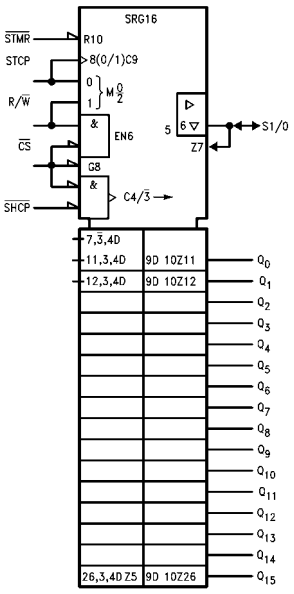
Ordering Code:

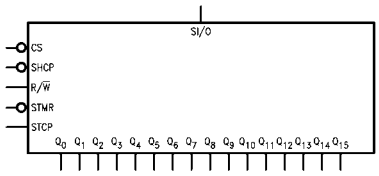
Order Number	Package Number	Package Description
74F673ASC	M24B	24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
74F673APC	N24A	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-011, 0.600 Wide
74F673ASPC	N24C	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

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

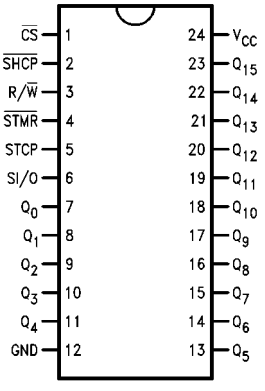
Logic Symbols

IEEE/IEC





Connection Diagram



Unit Loading/Fan Out

Pin Names	Description	U.L. HIGH/LOW	Input I_{IH}/I_{IL} Output I_{OH}/I_{OL}
$\overline{CS}$	Chip Select Input (Active LOW)	1.0/1.0	20 μA/−0.6 mA
$\overline{SHCP}$	Shift Clock Pulse Input (Active Falling Edge)	1.0/1.0	20 μA/−0.6 mA
$\overline{STMR}$	Store Master Reset Input (Active LOW)	1.0/1.0	20 μA/−0.6 mA
STCP	Store Clock Pulse Input	1.0/1.0	20 μA/−0.6 mA
R/$\overline{W}$	Read/Write Input	1.0/1.0	20 μA/−0.6 mA
SI/O	Serial Data Input or	3.5/1.0	70 μA/−0.6 mA
	3-STATE Serial Output	150/40	−3 mA/24 mA
Q_0–Q_{15}	Parallel Data Outputs	50/33.3	−1 mA/20 mA

Functional Description

The 16-bit shift register operates in one of four modes, as indicated in the Shift Register Operations Table. A HIGH signal on the Chip Select ($\overline{CS}$) input prevents clocking and forces the Serial Input/Output (SI/O) 3-STATE buffer into the high impedance state. During serial shift-out operations, the SI/O buffer is active (i.e., enabled) and the output data is also recirculated back into the shift register. When parallel loading the shift register from the storage register, serial shifting is inhibited.

The storage register has an asynchronous master reset ($\overline{STMR}$) input that overrides all other inputs and forces the Q_0–Q_{15} outputs LOW. The storage register is in the Hold mode when either $\overline{CS}$ or the Read/Write (R/$\overline{W}$) input is HIGH. With $\overline{CS}$ and R/$\overline{W}$ both LOW, the storage register is parallel loaded from the shift register.

Shift Register Operations Table

Control Inputs				SI/O	Operating Mode
$\overline{CS}$	R/$\overline{W}$	$\overline{SHCP}$	STCP	Status	
H	X	X	X	High Z	Hold
L	L		X	Data In	Serial Load
L	H	↘	L	Data Out	Serial Output with Recirculation
L	H	↘	H	Active	Parallel Load; No Shifting

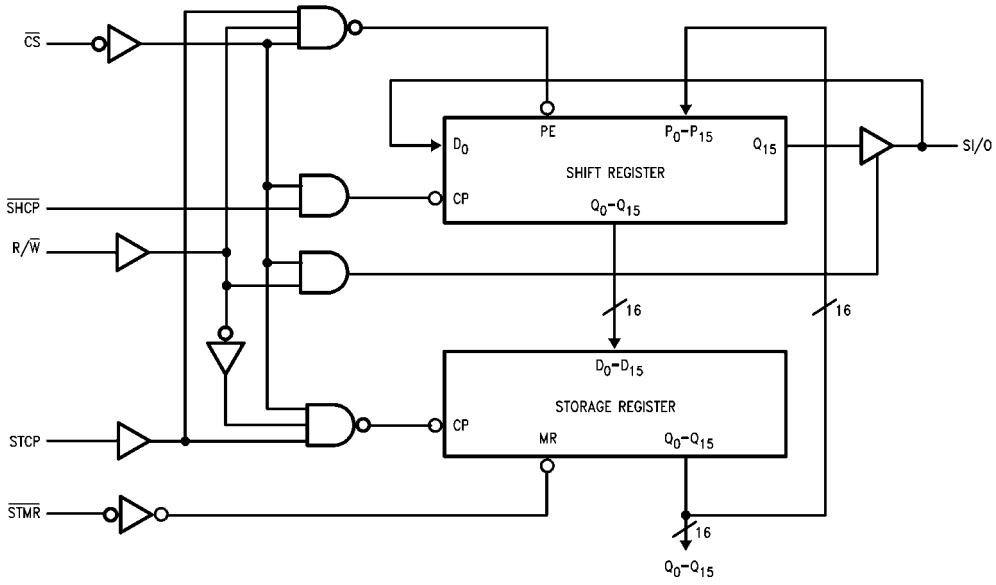
H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
↘ = HIGH-to-LOW Transition

Storage Register Operations Table

Control Inputs				Operating
$\overline{STMR}$	$\overline{CS}$	R/$\overline{W}$	STCP	Mode
L	X	X	X	Reset; Outputs LOW
H	H	X	X	Hold
H	X	H	X	Hold
H	L	L	↗	Parallel Load

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
↗ = LOW-to-HIGH 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 (Non I/O pins)
V_{OH}	Output HIGH Voltage	10% V_{CC}	2.5			V	Min	I_{OH} = −1 mA (Q_n, SI/O)
		10% V_{CC}	2.4					I_{OH} = −3 mA (SI/O)
		5% V_{CC}	2.7					I_{OH} = −1 mA (Q_n, SI/O)
		5% V_{CC}	2.7					I_{OH} = −3 mA (SI/O)
V_{OL}	Output LOW Voltage	10% V_{CC}			0.5	V	Min	I_{OL} = 20 mA (Q_n)
		10% V_{CC}			0.5			I_{OL} = 24 mA (SI/O)
I_{IH}	Input HIGH Current				20	µA	Max	V_{IN} = 2.7V (Non I/O pins)
I_{BVI}	Input HIGH Current Breakdown Test				100	µA	Max	V_{IN} = 7.0V (Non I/O pins)
I_{BVIT}	Input HIGH Current Breakdown Test (I/O)				1.0	mA	Max	V_{IN} = 5.5V (SI/O)
I_{IL}	Input LOW Current				−0.6	mA	Max	V_{IN} = 0.5V
I_{IH} + I_{OZH}	Output Leakage Current				70	µA	Max	V_{OUT} = 2.7V (SI/O)
I_{IL} + I_{OZL}	Output Leakage Current				−650	µA	Max	V_{OUT} = 0.5V (SI/O)
I_{OS}	Output Short-Circuit Current		−60		−150	mA	Max	V_{OUT} = 0V
I_{CEX}	Output HIGH Leakage Current				250	µA	Max	V_{OUT} = V_{CC}
I_{ZZ}	Bus Drainage Test				500	µA	0.0V	V_{OUT} = 5.25V
I_{CCH}	Power Supply Current			114	172	mA	Max	V_O = HIGH
I_{CCL}	Power Supply Current			114	172	mA	Max	V_O = LOW

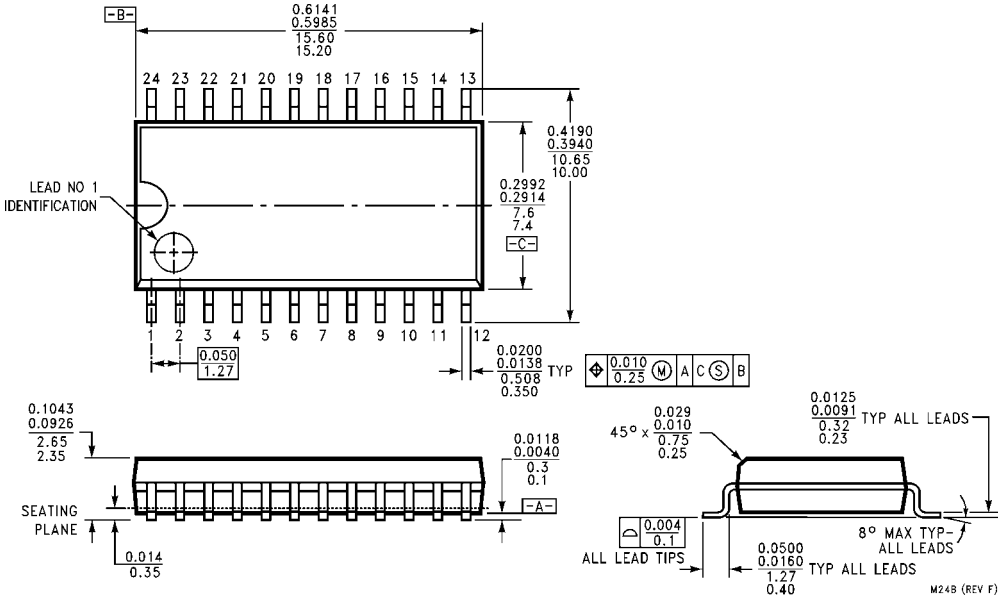
AC Electrical Characteristics

Symbol	Parameter	$T_A = +25°C$, $V_{CC} = +5.0V$, $C_L = 50$ pF			$T_A = 0°C$ to $+70°C$, $V_{CC} = +5.0V$, $C_L = 50$ pF		Units
		Min	Typ	Max	Min	Max	
f_{MAX}	Maximum Clock Frequency	100	130		85		MHz
t_{PLH}	Propagation Delay	3.0	8.0	10.5	2.5	12.0	ns
t_{PHL}	STCP to Q_n	3.0	10.5	13.5	2.5	15.0	
t_{PHL}	Propagation Delay $\overline{STMR}$ to Q_n	6.0	16.5	20.5	5.5	22.5	ns
t_{PLH}	Propagation Delay	4.0	6.5	8.5	3.5	9.5	ns
t_{PHL}	$\overline{SHCP}$ to SI/O	4.5	8.0	10.5	4.0	12.0	
t_{PZH}	Output Enable Time	5.0	8.5	11.0	4.0	12.5	ns
t_{PZL}	$\overline{CS}$ to SI/O	5.5	9.0	11.5	4.5	13.0	
t_{PHZ}	Output Disable Time	3.5	5.5	7.5	3.0	8.5	
t_{PLZ}	$\overline{CS}$ to SI/O	3.0	4.5	6.5	2.5	7.5	
t_{PZH}	Output Enable Time	4.5	7.5	9.5	4.0	10.5	ns
t_{PZL}	R/$\overline{W}$ to SI/O	4.5	8.0	10.0	4.0	11.5	
t_{PHZ}	Output Disable Time	3.0	5.5	7.0	2.5	8.0	
t_{PLZ}	R/$\overline{W}$ to SI/O	2.5	4.0	5.5	2.0	6.5	

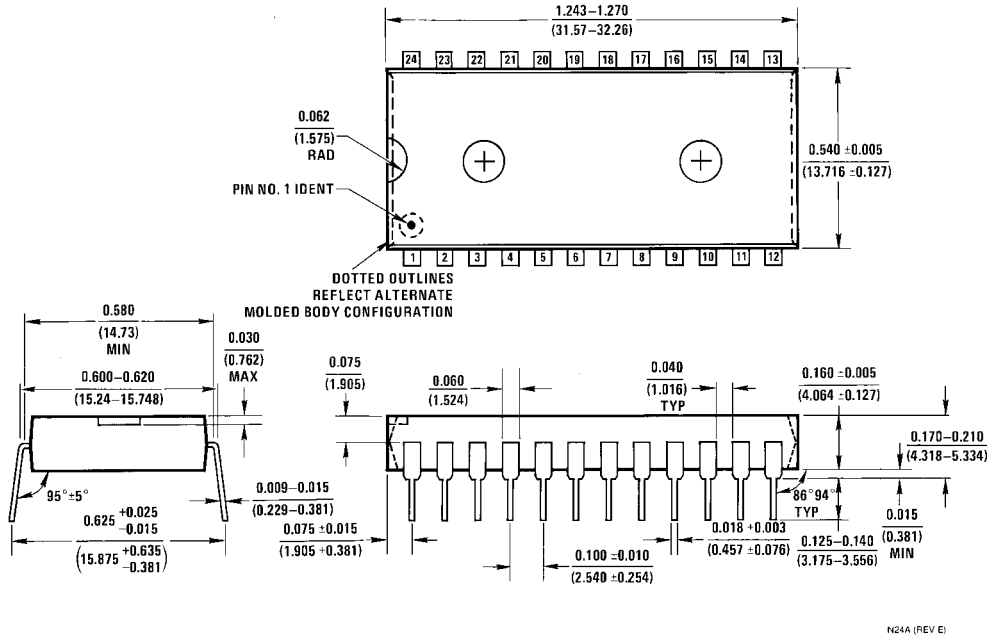
AC Operating Requirements

Symbol	Parameter	$T_A = +25°C$, $V_{CC} = +5.0V$		$T_A = 0°C$ to $+70°C$, $V_{CC} = +5.0V$		Units
		Min	Max	Min	Max	
$t_S(H)$	Setup Time, HIGH or LOW	3.5		4.0		ns
$t_S(L)$	$\overline{CS}$ or R/$\overline{W}$ to STCP	6.0		7.0		
$t_H(H)$	Hold Time, HIGH or LOW	0		0		
$t_H(L)$	$\overline{CS}$ or R/$\overline{W}$ to STCP	0		0		
$t_S(H)$	Setup Time, HIGH or LOW	3.0		3.5		ns
$t_S(L)$	SI/O to $\overline{SHCP}$	3.0		3.5		
$t_H(H)$	Hold Time, HIGH or LOW	3.0		3.5		
$t_H(L)$	SI/O to $\overline{SHCP}$	3.0		3.5		

Physical Dimensions inches (millimeters) unless otherwise noted

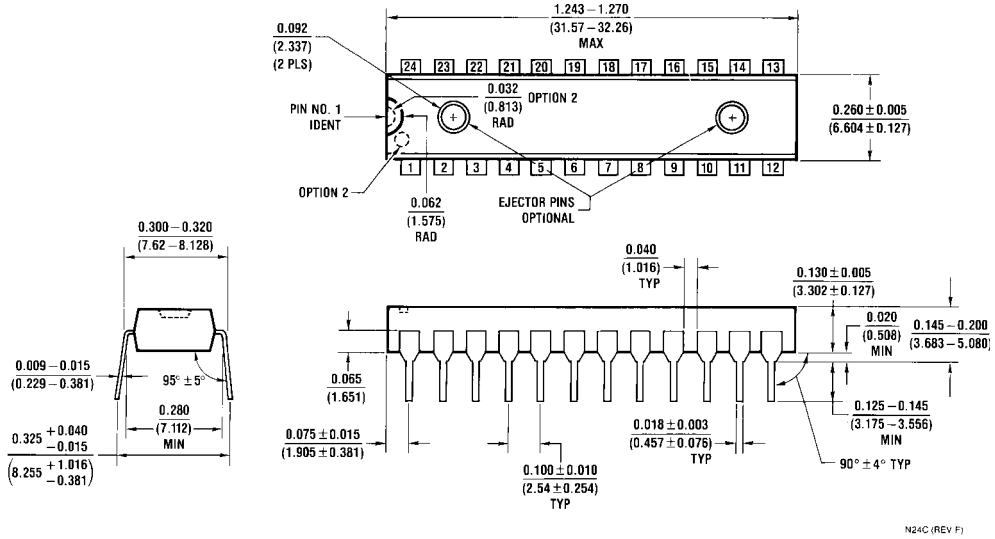


24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
Package Number M24B



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)



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

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