

## 74F398 • 74F399 Quad 2-Port Register

### General Description

The 74F398 and 74F399 are the logical equivalents of a quad 2-input multiplexer feeding into four edge-triggered flip-flops. A common Select input determines which of the two 4-bit words is accepted. The selected data enters the flip-flops on the rising edge of the clock. The 74F399 is the 16-pin version of the 74F398, with only the Q outputs of the flip-flops available.

### Features

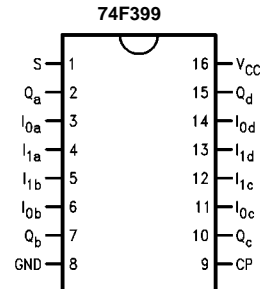
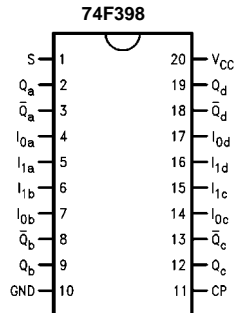
- Select inputs from two data sources
- Fully positive edge-triggered operation
- Both true and complement outputs—74F398

### Ordering Code:

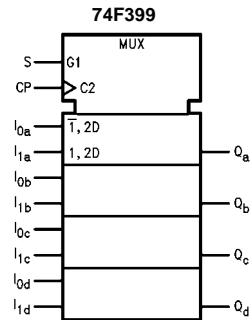
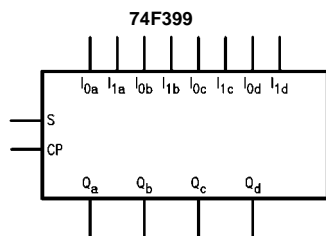
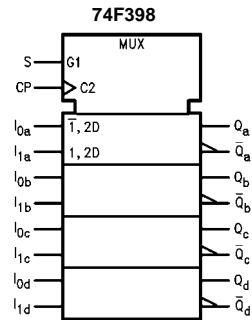
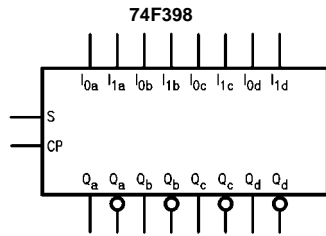
Order Number	Package Number	Package Description
74F398SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Body
74F398PC	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
74F399SC	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body
74F399SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74F399PC	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

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

### Connection Diagrams



### Logic Symbols



IEEE/IEC

### Unit Loading/Fan Out

Pin Names	Description	U.L.	
		HIGH/LOW	Input $I_H/I_L$ Output $I_{OH}/I_{OL}$
S	Common Select Input	1.0/1.0	20 $\mu$ A/-0.6 mA
CP	Clock Pulse Input (Active Rising Edge)	1.0/1.0	20 $\mu$ A/-0.6 mA
$I_{0a}$ - $I_{0d}$	Data Inputs from Source 0	1.0/1.0	20 $\mu$ A/-0.6 mA
$I_{1a}$ - $I_{1d}$	Data Inputs from Source 1	1.0/1.0	20 $\mu$ A/-0.6 mA
$Q_a$ - $Q_d$	Register True Outputs	50/33.3	-1 mA/20 mA
$\bar{Q}_a$ - $\bar{Q}_d$	Register Complementary Outputs (74F398)	50/33.3	-1 mA/20 mA

### Functional Description

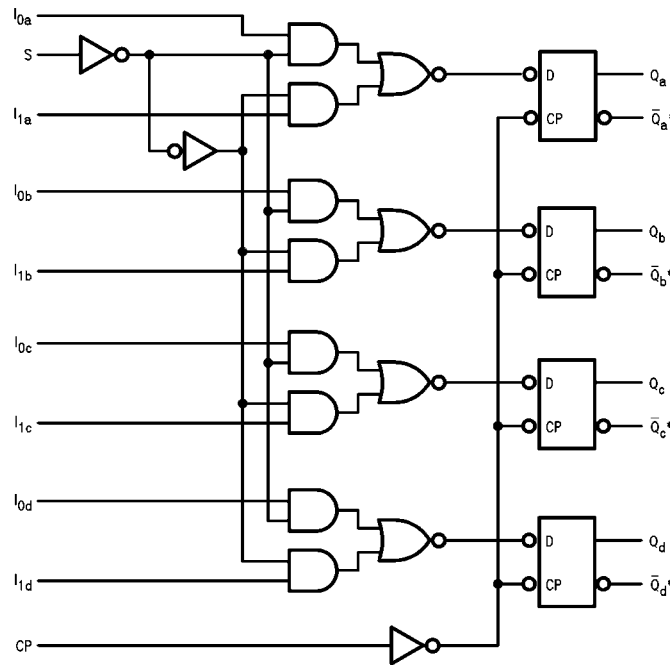
The 74F398 and 74F399 are high-speed quad 2-port registers. They select four bits of data from either of two sources (Ports) under control of a common Select input (S). The selected data is transferred to a 4-bit output register synchronous with the LOW-to-HIGH transition of the Clock input (CP). The 4-bit D-type output register is fully edge-triggered. The Data inputs ( $I_{0x}$ ,  $I_{1x}$ ) and Select input (S) must be stable only a setup time prior to and hold time after the LOW-to-HIGH transition of the Clock input for predictable operation. The 74F398 has both Q and  $\bar{Q}$  outputs.

### Function Table

S	Inputs		Outputs	
	$I_0$	$I_1$	Q	$\bar{Q}$ (Note 1)
l	l	X	L	H
l	h	X	H	L
h	X	l	L	H
h	X	h	H	L

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 h = HIGH Voltage Level one setup time prior to the LOW-to-HIGH clock transition  
 l = LOW Voltage Level one setup time prior to the LOW-to-HIGH clock transition  
 X = Immaterial  
**Note 1:** 74F398 only

### Logic Diagram



\*F398 Only  
 Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

**Absolute Maximum Ratings** (Note 2)

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 3)	-0.5V to +7.0V
Input Current (Note 3)	-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)
ESD Last Passing Voltage (Min)—74F399	4000V

**Recommended Operating Conditions**

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

**Note 2:** 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.

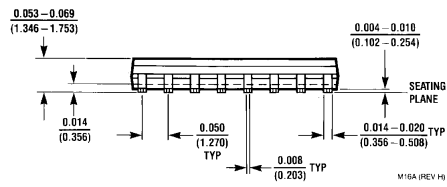
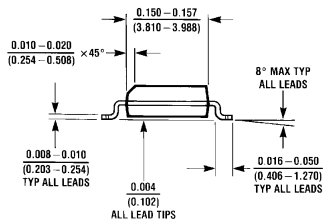
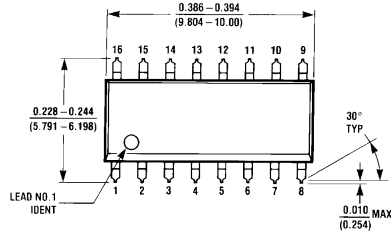
**Note 3:** Either voltage limit or current limit is sufficient to protect inputs.

**DC Electrical Characteristics**

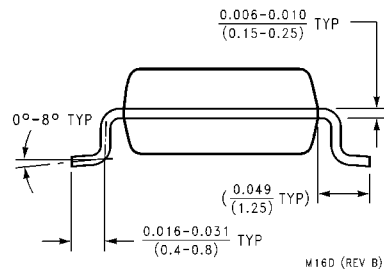
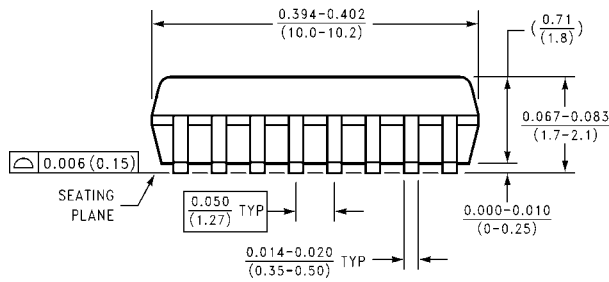
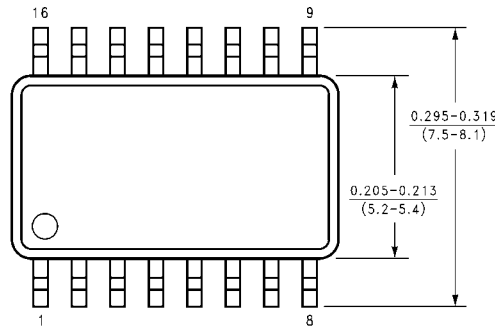
Symbol	Parameter	Min	Typ	Max	Units	V <sub>CC</sub>	Conditions
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V <sub>IL</sub>	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage			-1.2	V	Min	I <sub>IN</sub> = -18 mA
V <sub>OH</sub>	Output HIGH Voltage	10% V <sub>CC</sub> 5% V <sub>CC</sub>	2.5 2.7		V	Min	I <sub>OH</sub> = -1 mA 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>IOD</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>CCH</sub>	Power Supply Current (74F398)		25	38	mA	Max	V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current (74F398)		25	38	mA	Max	V <sub>O</sub> = LOW
I <sub>CCH</sub>	Power Supply Current (74F399)		22	34	mA	Max	V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current (74F399)		22	34	mA	Max	V <sub>O</sub> = LOW

AC Electrical Characteristics							
Symbol	Parameter	T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> = 0°C to +70°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF		Units
		Min	Typ	Max	Min	Max	
f <sub>MAX</sub>	Input Clock Frequency	100	140		100		MHz
t <sub>PLH</sub>	Propagation Delay	3.0 (Note 4)	5.7	7.5	3.0	8.5	ns
t <sub>PHL</sub>	CP to Q or $\bar{Q}$	3.0	6.8	9.0	3.0	10.0	
<b>Note 4:</b> 74F398 3.3 ns							
AC Operating Requirements							
Symbol	Parameter	T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V		T <sub>A</sub> = 0°C to +70°C V <sub>CC</sub> = +5.0V		Units	
		Min	Max	Min	Max		
t <sub>S</sub> (H)	Setup Time, HIGH or LOW	3.0		3.0		ns	
t <sub>S</sub> (L)	I <sub>n</sub> to CP	3.0		3.0			
t <sub>H</sub> (H)	Hold Time, HIGH or LOW	1.0		1.0		ns	
t <sub>H</sub> (L)	I <sub>n</sub> to CP	1.0		1.0			
t <sub>S</sub> (H)	Setup Time, HIGH or LOW	7.5		8.5		ns	
t <sub>S</sub> (L)	S to CP (F398)	7.5		8.5			
t <sub>S</sub> (H)	Setup Time, HIGH or LOW	7.5		8.5			
t <sub>S</sub> (L)	S to CP (F399)	7.5		8.5			
t <sub>H</sub> (H)	Hold Time, HIGH or LOW	0		0			
t <sub>H</sub> (L)	S to CP	0		0			
t <sub>W</sub> (H)	CP Pulse Width	4.0		4.0		ns	
t <sub>W</sub> (L)	HIGH or LOW	5.0		5.0			

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

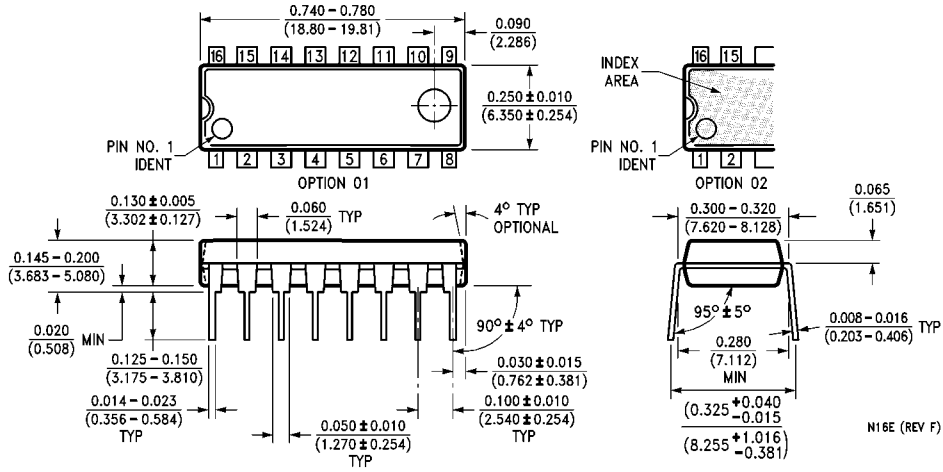


**16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body  
Package Number M16A**

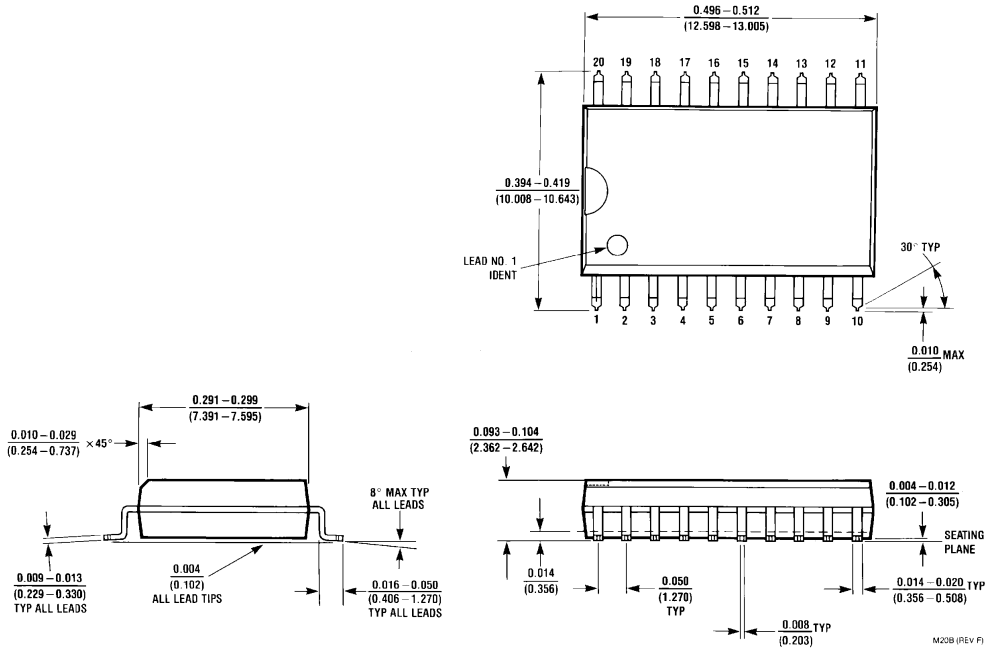


**16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide  
Package Number M16D**

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



**16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide Package Number N16E**



**20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Body Package Number M20B**

