

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

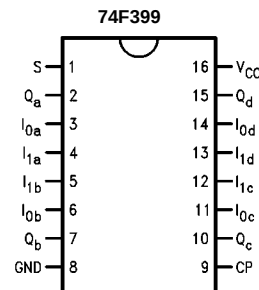
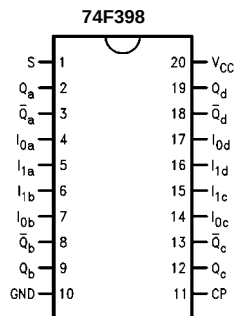
- Select inputs from two data sources
- Fully positive edge-triggered operation
- Both true and complement outputs—74F398

Ordering Code:

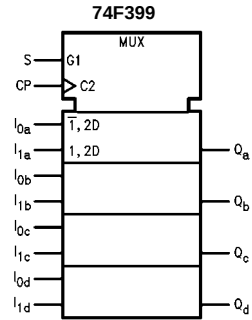
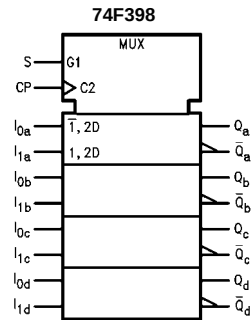
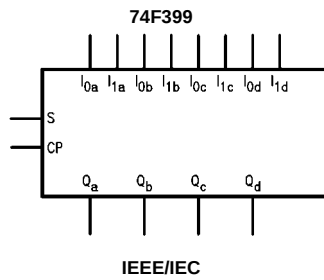
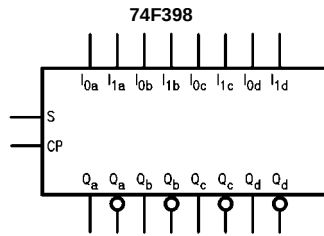
Order Number	Package Number	Package Description
74F398SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
74F398PC	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
74F399SC	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
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



Unit Loading/Fan Out

Pin Names	Description	U.L. HIGH/LOW	Input I_{IH}/I_{IL} Output I_{OH}/I_{OL}
S	Common Select Input	1.0/1.0	20 μ A/–0.6 mA
CP	Clock Pulse Input (Active Rising Edge)	1.0/1.0	20 μ A/–0.6 mA
I _{0a} –I _{0d}	Data Inputs from Source 0	1.0/1.0	20 μ A/–0.6 mA
I _{1a} –I _{1d}	Data Inputs from Source 1	1.0/1.0	20 μ 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

Inputs			Outputs	
S	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

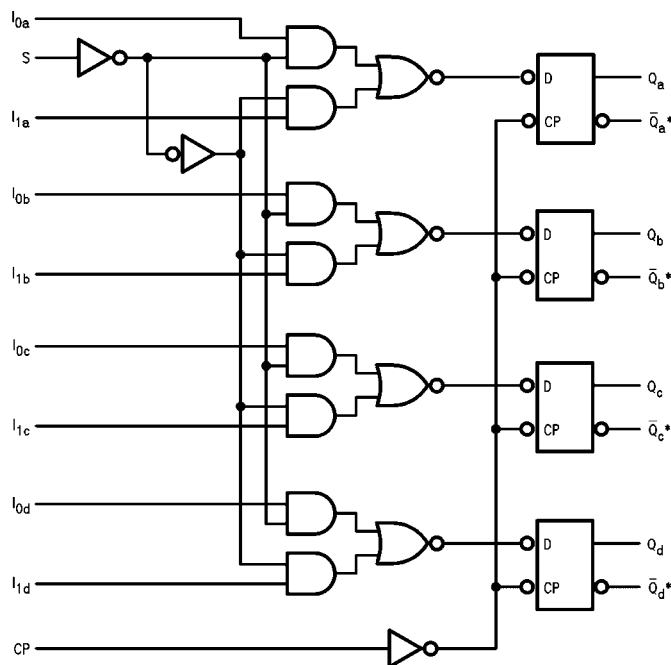
h = HIGH Voltage Level one setup time prior to the LOW-to-HIGH clock transition

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 _{CC} 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 _{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)
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 _{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 _{CCH}	Power Supply Current (74F398)		25	38	mA	Max	V _O = HIGH
I _{CCL}	Power Supply Current (74F398)		25	38	mA	Max	V _O = LOW
I _{CCH}	Power Supply Current (74F399)		22	34	mA	Max	V _O = HIGH
I _{CCL}	Power Supply Current (74F399)		22	34	mA	Max	V _O = LOW

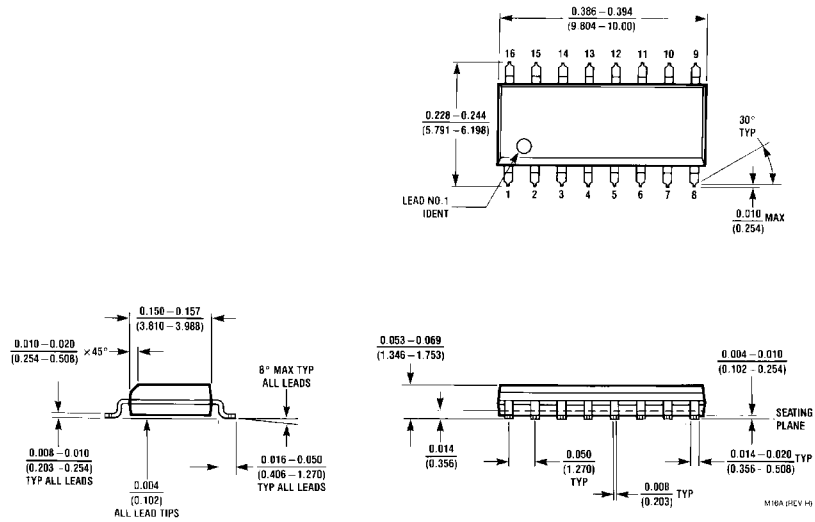
AC Electrical Characteristics

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}	Input Clock Frequency	100	140		100		MHz
t _{PLH}	Propagation Delay	3.0 (Note 4)	5.7	7.5	3.0	8.5	ns
t _{PHL}	CP to Q or $\overline{Q}$	3.0	6.8	9.0	3.0	10.0	

Note 4: 74F398 3.3 ns**AC Operating Requirements**

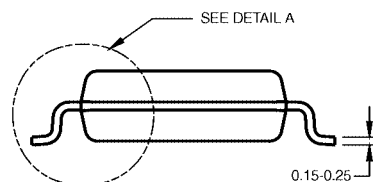
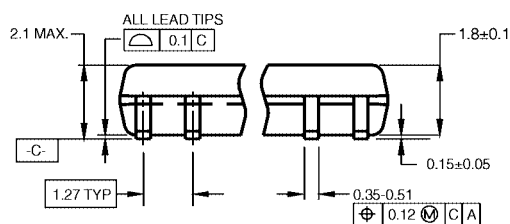
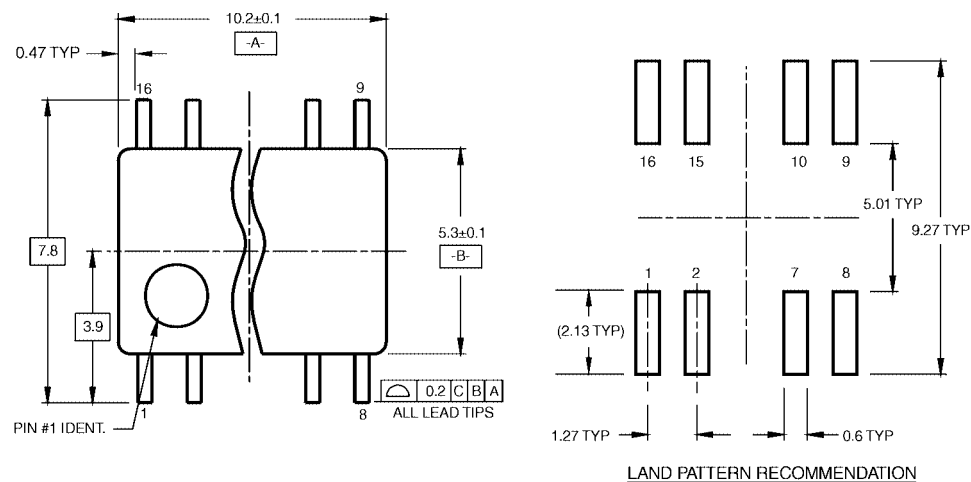
Symbol	Parameter	T _A = +25°C V _{CC} = +5.0V		T _A = 0°C to +70°C V _{CC} = +5.0V		Units
		Min	Max	Min	Max	
t _S (H)	Setup Time, HIGH or LOW	3.0		3.0		ns
t _S (L)	I _n to CP	3.0		3.0		
t _H (H)	Hold Time, HIGH or LOW	1.0		1.0		
t _H (L)	I _n to CP	1.0		1.0		
t _S (H)	Setup Time, HIGH or LOW	7.5		8.5		ns
t _S (L)	S to CP (F398)	7.5		8.5		
t _S (H)	Setup Time, HIGH or LOW	7.5		8.5		
t _S (L)	S to CP (F399)	7.5		8.5		
t _H (H)	Hold Time, HIGH or LOW	0		0		
t _H (L)	S to CP	0		0		
t _W (H)	CP Pulse Width	4.0		4.0		ns
t _W (L)	HIGH or LOW	5.0		5.0		

Physical Dimensions inches (millimeters) unless otherwise noted



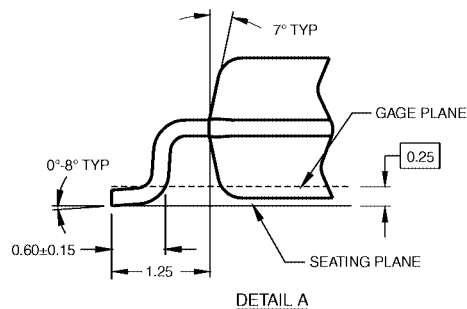
16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
Package Number M16A

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



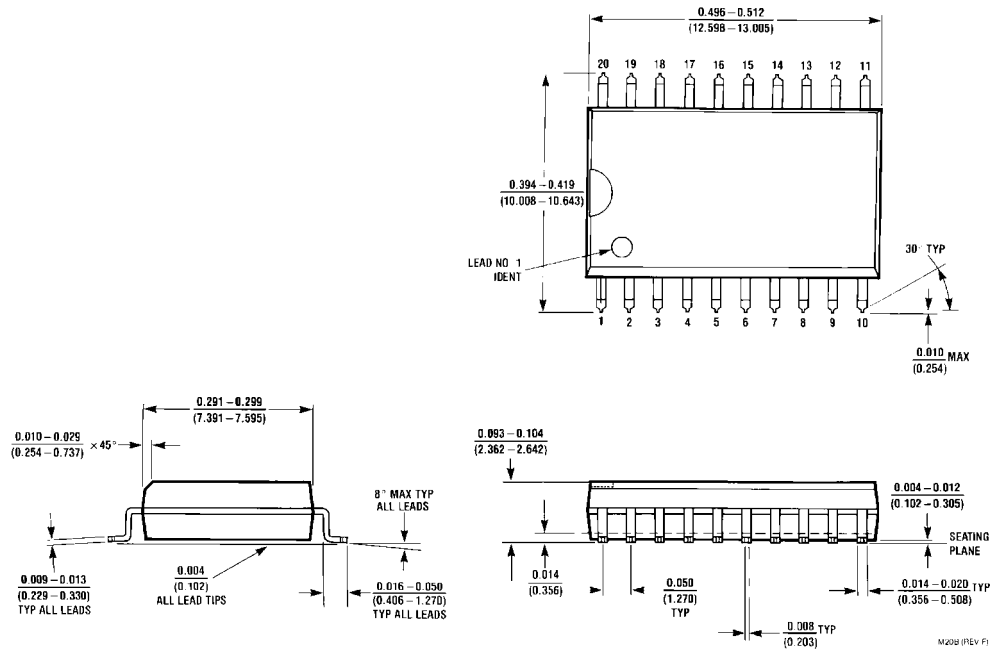
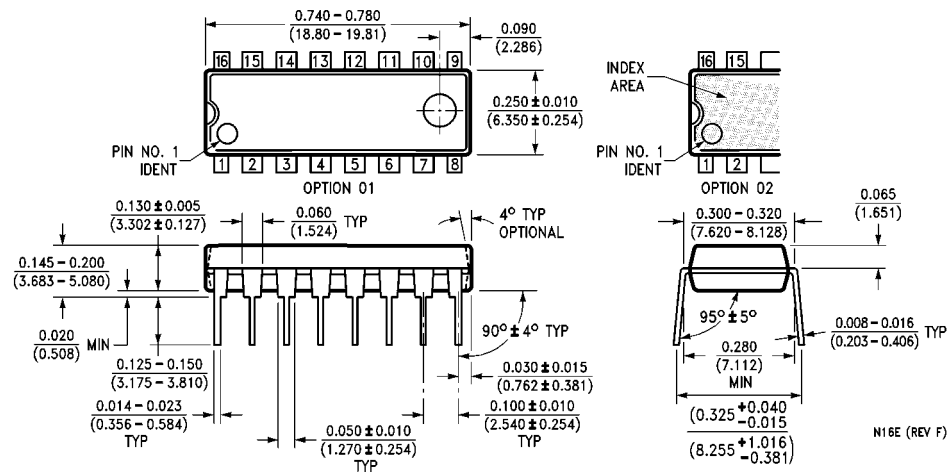
- NOTES:
- A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
 - B. DIMENSIONS ARE IN MILLIMETERS.
 - C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

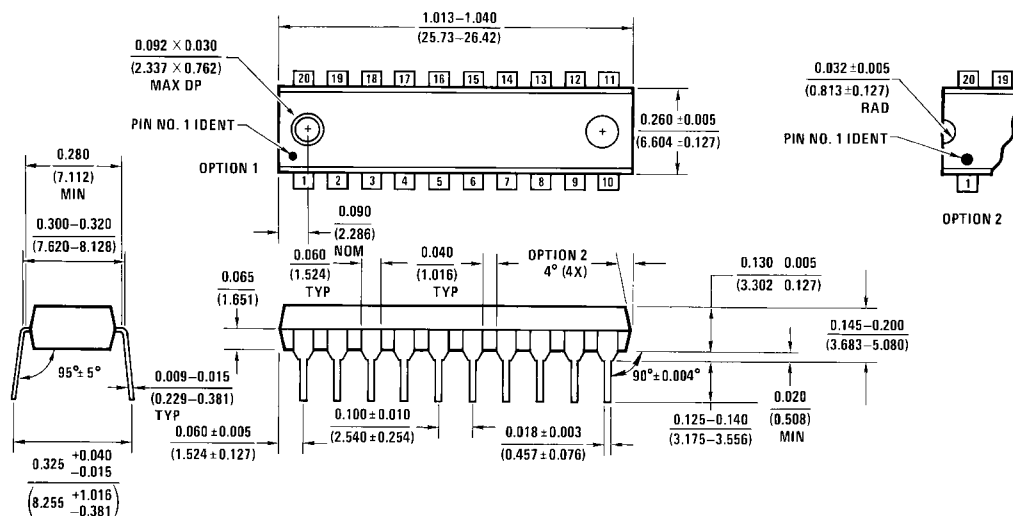
M16DRevB1



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

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



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

**20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
Package Number N20A**

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