National Semiconductor

August 1998

54ACT399
Quad 2-Port Register

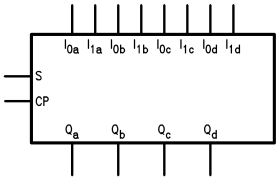
General Description

The 'AC/ACT399 is the logical equivalent 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-flop on the rising edge of the clock.

Features

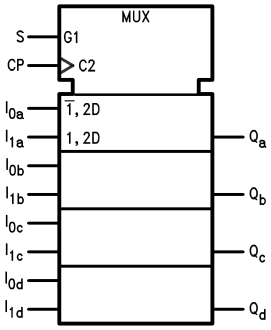
- I_{CC} reduced by 50%
- Select inputs from two data sources
- Fully positive edge-triggered operation
- Outputs source/sink 24 mA
- ACT399 has TTL-compatible inputs

Logic Symbols



DS100356-1

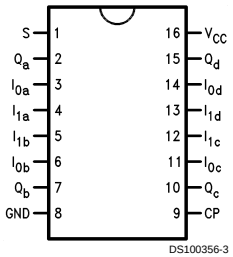
IEEE/IEC



DS100356-5

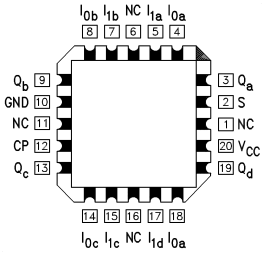
Connection Diagrams

Pin Assignment for DIP and Flatpak



DS100356-3

Pin Assignment for LCC



DS100356-2

Pin Names	Description
S	Common Select Input
CP	Clock Pulse Input
I_{0a}–I_{0d}	Data Inputs from Source 0
I_{1a}–I_{1d}	Data Inputs from Source 1
Q_a–Q_d	Register True Outputs

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Functional Description

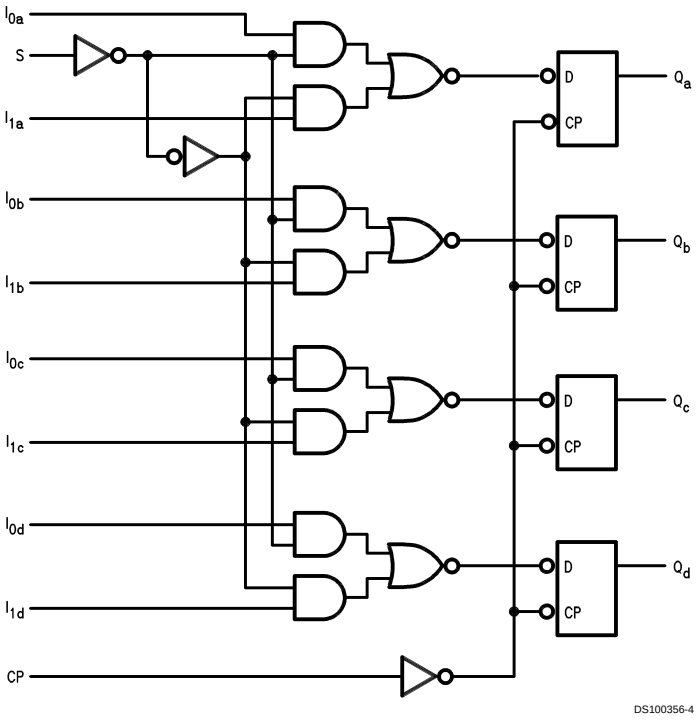
The 'AC/ACT399 is a high-speed quad 2-port register. It selects four bits of data from either of two sources (Ports) under control of a common Select input (S). The selected data is transferred to a 4-bit output register synchronous with the LOW-to-HIGH transition of the Clock input (CP). The 4-bit D-type 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.

Function Table

Inputs				Outputs	
S	**I_0**	**I_1**	**CP**	**Q**	**$\overline{Q}$**
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
X = Immaterial
⌐ = LOW-to-HIGH Clock Transition

Logic Diagram



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 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Supply Voltage (V_{CC})	−0.5V to +7.0V
DC Input Diode Current (I_{IK})	
V_I = −0.5V	−20 mA
V_I = V_{CC} + 0.5V	+20 mA
DC Input Voltage (V_I)	−0.5V to V_{CC} + 0.5V
DC Output Diode Current (I_{OK})	
V_O = −0.5V	−20 mA
V_O = V_{CC} + 0.5V	+20 mA
DC Output Voltage (V_O)	−0.5V to V_{CC} + 0.5V
DC Output Source or Sink Current (I_O)	±50 mA
DC V_{CC} or Ground Current per Output Pin (I_{CC} or I_{GND})	±50 mA
Storage Temperature (T_{STG})	−65˚C to +150˚C
Junction Temperature (T_J)	
CDIP	+175˚C

Recommended Operating Conditions

Supply Voltage (V_{CC})	
'ACT	4.5V to 5.5V
Input Voltage (V_I)	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	
54ACT	−55˚C to +125˚C
Minimum Input Edge Rate ($\Delta V/\Delta t$)	
'ACT Devices	
V_{IN} from 0.8V to 2.0V	
V_{CC} @ 4.5V, 5.5V	125 mV/ns

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT® circuits outside databook specifications.

DC Electrical Characteristics for 'ACT Family Devices

Symbol	Parameter	V_{CC} (V)	54ACT T_A = −55˚C to +125˚C Guaranteed Limits	Units	Conditions
V_{IH}	Minimum High Level Input Voltage	4.5	2.0	V	V_{OUT} = 0.1V
		5.5	2.0		or V_{CC} −0.1V
V_{IL}	Maximum Low Level Input Voltage	4.5	0.8	V	V_{OUT} = 0.1V
		5.5	0.8		or V_{CC} − 0.1V
V_{OH}	Minimum High Level	4.5	4.4	V	I_{OUT} = −50 µA
		5.5	5.4		
					(Note 2) V_{IN} = V_{IL} or V_{IH}
		4.5	3.70	V	I_{OH} = −24 mA
		5.5	4.70		I_{OH} = −24 mA
V_{OL}	Maximum Low Level Output Voltage	4.5	0.1	V	I_{OUT} = 50 µA
		5.5	0.1		
					(Note 2) V_{IN} = V_{IL} or V_{IH}
		4.5	0.50	V	I_{OL} = 24 mA
		5.5	0.50		I_{OL} = 24 mA
I_{IN}	Maximum Input Leakage Current	5.5	±1.0	µA	V_I = V_{CC}, GND
I_{CCT}	Maximum I_{CC}/Input	5.5	1.6	mA	V_I = V_{CC} −2.1V
I_{OLD}	Minimum Dynamic (Note 3)	5.5	50	mA	V_{OLD} = 1.65V Max
I_{OHD}	Output Current	5.5	−50	mA	V_{OHD} = 3.85V Min
I_{CC}	Maximum Quiescent Supply Current	5.5	80.0	µA	V_{IN} = V_{CC} or Ground

Note 2: All outputs loaded; thresholds on input associated with output under test.

Note 3: Maximum test duration 2.0 ms, one output loaded at a time.

AC Electrical Characteristics

Symbol	Parameter	V_{CC} (V) (Note 4)	54ACT T_A, V_{CC} = Mil C_L = 50 pF		Units	Fig. No.
			Min	Max		
f_{max}	Input Clock Frequency	5.0	90		MHz	
t_{PLH}	Propagation Delay CP to Q	5.0	1.5	10.0	ns	
t_{PHL}	Propagation Delay CP to Q	5.0	1.5	10.0	ns	

Note 4: Voltage Range 5.0 is 5.0V ±0.5V

AC Operating Requirements

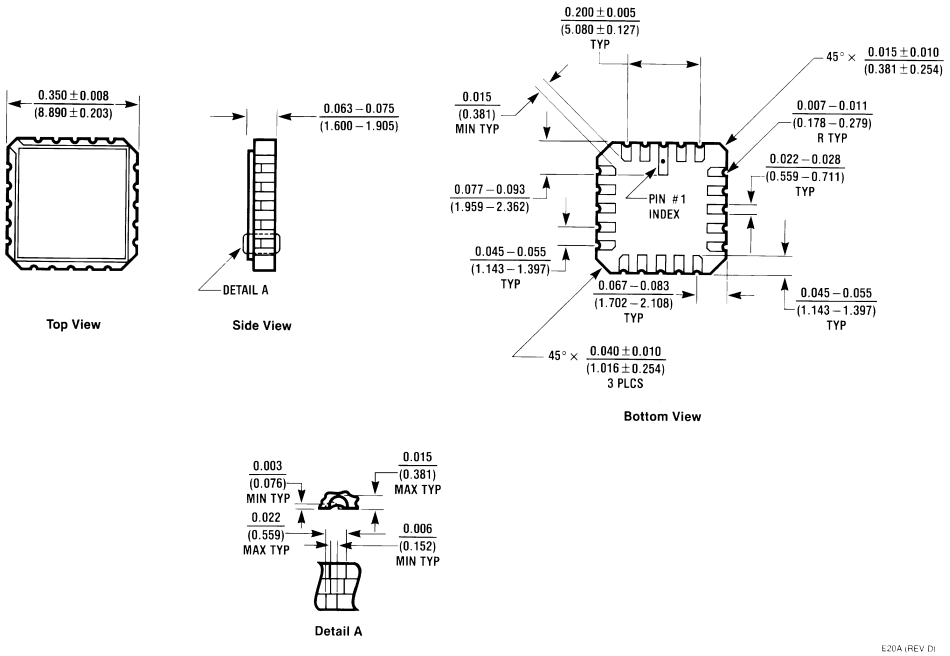
Symbol	Parameter	V_{CC} (V) (Note 5)	54ACT T_A = −55°C to +125°C C_L = 50 pF Guaranteed Minimum	Units	Fig. No.
t_s	Setup Time, HIGH or LOW I_n to CP	5.0	3.5	ns	
t_h	Hold Time, HIGH or LOW I_n to CP	5.0	3.0	ns	
t_s	Setup Time, HIGH or LOW S to CP	5.0	6.0	ns	
t_h	Hold Time, HIGH or LOW S to CP	5.0	2.5	ns	
t_w	CP Pulse Width, HIGH or LOW	5.0	5.0	ns	

Note 5: Voltage Range 5.0 is 5.0V ±0.5V

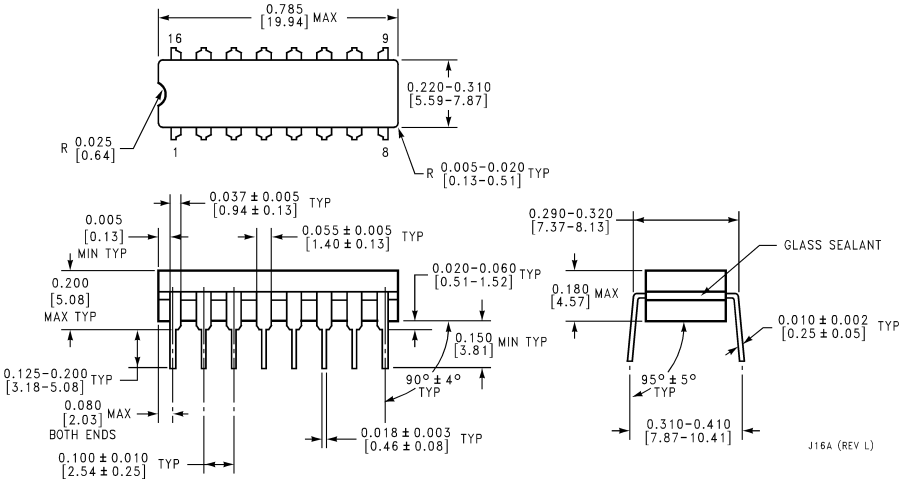
Capacitance

Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	4.5	pF	V_{CC} = OPEN
C_{PD}	Power Dissipation Capacitance	30	pF	V_{CC} = 5.0V

Physical Dimensions inches (millimeters) unless otherwise noted

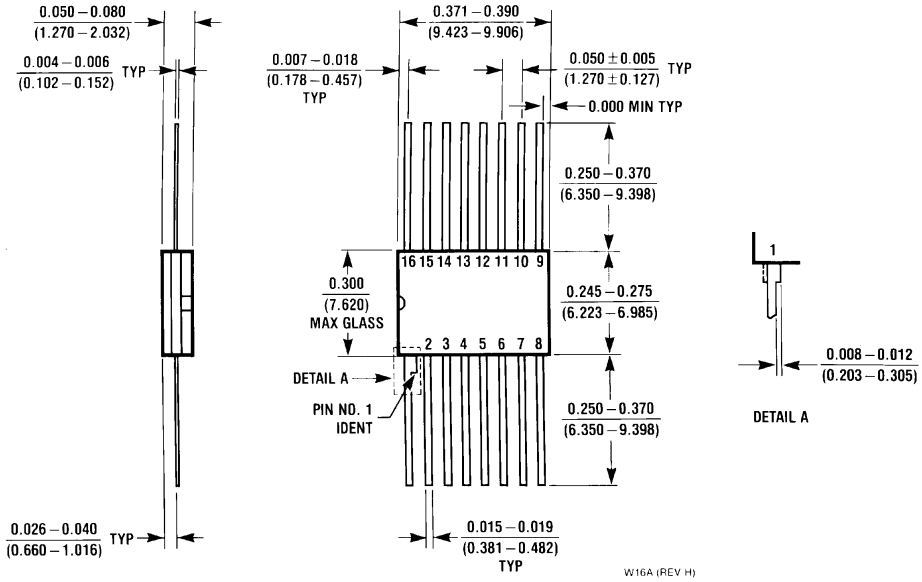


20 Terminal Ceramic Leadless Chip Carrier (L)
NS Package Number E20A



16-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J16A

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



16-Lead Ceramic Flatpak (IF)
NS Package Number W16A

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Datasheet

Title	Size (in Kbytes)	Date	View Online	Download	Receive via Email
54ACT399 Quad 2-Port Register	137 Kbytes	24-Aug-98	View Online	Download	Receive via Email
54ACT399 Mil-Aero Datasheet MN54ACT399-X	13 Kbytes		View Online	Download	Receive via Email

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Package Availability, Models, Samples & Pricing

Part Number	Package		Status	Models		Samples & Electronic Orders	Budgetary Pricing		Std Pack Size	Package Marking
	Type	# pins		SPICE	IBIS		Quantity	$US each		
54ACT399ERQMLV	LCC	20	Full production	N/A	N/A	.			tube of N/A	[logo]¢Z¢S¢4¢A 54ACT399E RQMLV $E 5962R 9093401V2A
54ACT399LMQB	LCC	20	Full production	N/A	N/A	.	50+	$9.0000	tube of 50	[logo]¢Z¢S¢4¢A 54ACT399 LMQB 9093401 Q2A /Q¢M$E
5962R9093401Q2A	LCC	20	Full production	N/A	N/A	.	50+	$82.0000	tube of 50	[logo]¢Z¢S¢4¢A 54ACT399 LMQB-RH R9093401 Q2A /Q¢M$E
54ACT399JRQMLV	Cerdip	16	Full production	N/A	N/A	.			tube of N/A	[logo]¢Z¢S¢4¢A$E 54ACT399JRQMLV 5962R9093401VEA
54ACT399DMQB	Cerdip	16	Full production	N/A	N/A	.	50+	$7.0000	tube of 25	[logo]¢Z¢S¢4¢A$E 54ACT399DMQB /Q¢M 5962-9093401QEA

5962R9093401QEA	Cerdip	16	Full production	N/A	N/A	.	50+	$82.0000	tube of 25	[logo]¢Z¢S¢4¢A$E 54ACT399DMQB-RH Q¢M 5962R9093401QEA
54ACT399WRQMLV	Cerpack	16	Full production	N/A	N/A	.			tube of N/A	[logo]¢Z¢S¢4¢A$E 54ACT399W RQMLV 5962 R9093401VFA
54ACT399FMQB	Cerpack	16	Full production	N/A	N/A	.	50+	$8.0000	tube of 19	[logo]¢Z¢S¢4¢A$E 54ACT399FMQB /Q¢M 5962 9093401QFA
5962R9093401QFA	Cerpack	16	Full production	N/A	N/A	.	50+	$82.0000	tube of 19	[logo]¢Z¢S¢4¢A$E 54ACT399FMQB -RH /Q¢M 5962 R9093401QFA
54ACT399FM-MPR	Cerpack	16	Full production	N/A	N/A	.			tube of N/A	[logo]¢Z¢S¢4¢A$E 54ACT399FM- MPR PROTO
54ACT399FM-MLS	Cerpack	16	Full production	N/A	N/A	.	50+	$152.0000	tube of 19	[logo]¢Z¢S¢4¢A$E 54ACT399FM -MLS
54ACT399 MW8	wafer		Full production	N/A	N/A	.			N/A	-

[Information as of 2-Sep-2000]