

54AC158 • 54ACT158 Quad 2-Input Multiplexer

General Description

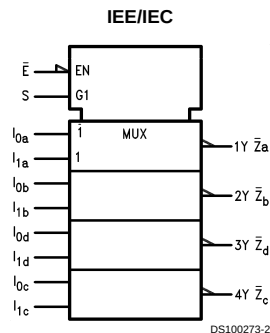
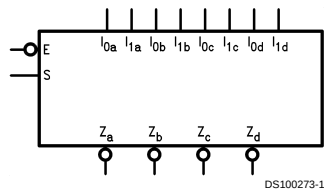
The 'AC/'ACT158 is a high-speed quad 2-input multiplexer. It selects four bits of data from two sources using the common Select and Enable inputs. The four buffered outputs present the selected data in the inverted form. The 'AC/'ACT158 can also be used as a function generator.

- Outputs source/sink 24 mA
- 'ACT158 has TTL-compatible inputs
- Standard Microcircuit Drawing (SMD)
 - 'AC158: 5962-89729
 - 'ACT158: 5962-88755

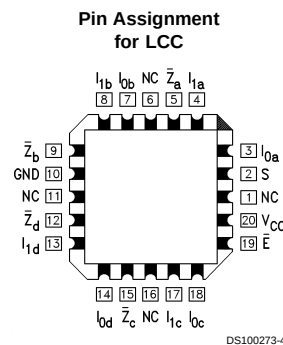
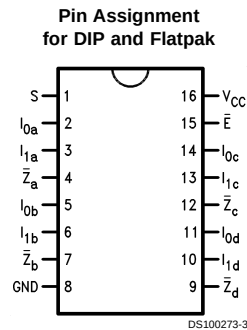
Features

- I_{CC} reduced by 50%

Logic Symbols



Connection Diagrams



Pin Names	Description
I_{0a} – I_{0d}	Source 0 Data Inputs
I_{1a} – I_{1d}	Source 1 Data Inputs
$\bar{E}$	Enable Input
S	Select Input
$\bar{Z}_a$ – $\bar{Z}_d$	Inverted Outputs

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Functional Description

The 'AC/ACT158 quad 2-input multiplexer selects four bits of data from two sources under the control of a common Select input (S) and presents the data in inverted form at the four outputs. The Enable input ($\bar{E}$) is active-LOW. When $\bar{E}$ is HIGH, all of the outputs ($\bar{Z}$) are forced HIGH regardless of all other inputs. The 'AC/ACT158 is the logic implementation of a 4-pole, 2-position switch where the position of the switch is determined by the logic levels supplied to the Select input.

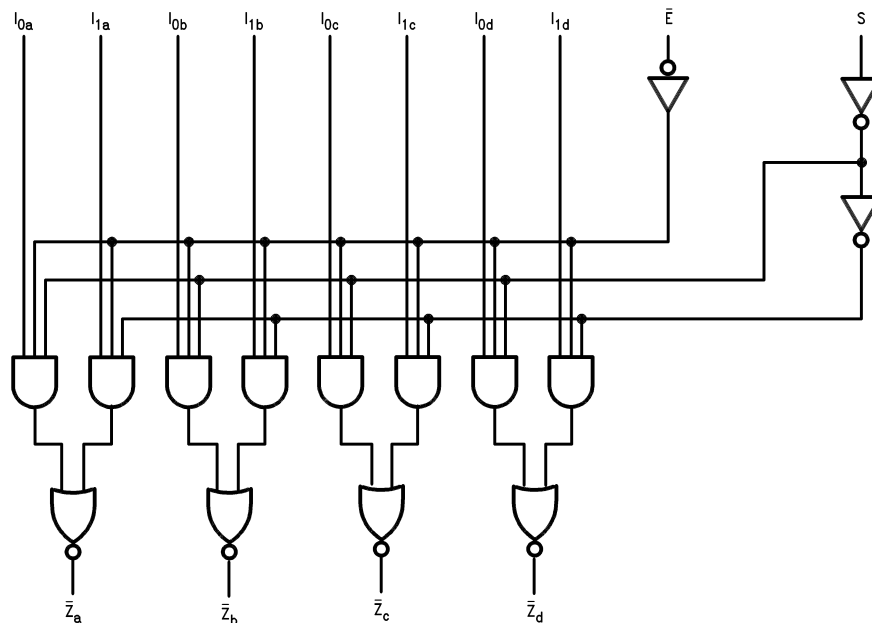
A common use of the 'AC/ACT158 is the moving of data from two groups of registers to four common output busses. The particular register from which the data comes is determined by the state of the Select input. A less obvious use is as a function generator. The 'AC/ACT158 can generate four functions of two variables with one variable common. This is useful for implementing gating functions.

Truth Table

Inputs				Outputs
$\bar{E}$	S	I_0	I_1	$\bar{Z}$
H	X	X	X	H
L	L	L	X	H
L	L	H	X	L
L	H	X	L	H
L	H	X	H	L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

Logic Diagram



DS100273-5

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})	
'AC	2.0V to 6.0V
'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)	
54AC/ACT	-55°C to +125°C
Minimum Input Edge Rate ($\Delta V/\Delta t$)	
'AC Devices	
V_{IN} from 30% to 70% of V_{CC}	
V_{CC} @ 3.3V, 4.5V, 5.5V	125 mV/ns
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 Characteristics for 'AC Family Devices

Symbol	Parameter	V _{CC} (V)	54AC	Units	Conditions
			T _A = -55°C to +125°C		
			Guaranteed Limits		
V _{IH}	Minimum High Level Input Voltage	3.0	2.1	V	V _{OUT} = 0.1V or V _{CC} - 0.1V
		4.5	3.15		
		5.5	3.85		
V _{IL}	Maximum Low Level Input Voltage	3.0	0.9	V	V _{OUT} = 0.1V or V _{CC} - 0.1V
		4.5	1.35		
		5.5	1.65		
V _{OH}	Minimum High Level Output Voltage	3.0	2.9	V	I _{OUT} = -50 μA
		4.5	4.4		
		5.5	5.4		
	(Note 2) V _{IN} = V _{IL} or V _{IH} I _{OH} = -12 mA I _{OH} = -24 mA I _{OH} = -24 mA	3.0	2.4	V	
		4.5	3.7		
		5.5	4.7		
V _{OL}	Maximum Low Level Output Voltage	3.0	0.1	V	I _{OUT} = 50 μA
		4.5	0.1		
		5.5	0.1		
	(Note 2) V _{IN} = V _{IL} or V _{IH} I _{OL} = 12 mA I _{OL} = 24 mA I _{OL} = 24 mA	3.0	0.50	V	
		4.5	0.50		
		5.5	0.50		
I _{IN}	Maximum Input Leakage Current	5.5	±1.0	μA	V _I = V _{CC} , GND

DC Characteristics for 'AC Family Devices (Continued)

Symbol	Parameter	V _{CC} (V)	54AC	Units	Conditions
			T _A = –55°C to +125°C		
			Guaranteed Limits		
I _{OLD}	Minimum Dynamic Output Current (Note 3)	5.5	50	mA	V _{OLD} = 1.65V Max
I _{OHD}		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 GND

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.

Note 4: I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC}.

I_{CC} for 54AC @ 25°C is identical to 74AC @ 25°C.

DC Characteristics for 'ACT Family Devices

Symbol	Parameter	V _{CC} (V)	54ACT	Units	Conditions
			T _A = –55°C to +125°C		
			Guaranteed Limits		
V _{IH}	Minimum High Level Input Voltage	4.5	2.0	V	V _{OUT} = 0.1V or V _{CC} – 0.1V
		5.5	2.0		
V _{IL}	Maximum Low Level Input Voltage	4.5	0.8	V	V _{OUT} = 0.1V or V _{CC} – 0.1V
		5.5	0.8		
V _{OH}	Minimum High Level Output Voltage	4.5	4.4	V	I _{OUT} = –50 μA
		5.5	5.4		
		4.5	3.70	V	(Note 5) V _{IN} = V _{IL} or V _{IH} I _{OH} = –24 mA I _{OH} = –24 mA
		5.5	4.70		
V _{OL}	Maximum Low Level Output Voltage	4.5	0.1	V	I _{OUT} = 50 μA
		5.5	0.1		
		4.5	0.50	V	(Note 5) V _{IN} = V _{IL} or V _{IH} I _{OL} = 24 mA I _{OL} = 24 mA
		5.5	0.50		
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 Output Current (Note 6)	5.5	50	mA	V _{OLD} = 1.65V Max
I _{OHD}		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 GND

Note 5: All outputs loaded; thresholds on input associated with output under test.

Note 6: Maximum test duration 2.0 ms, one output loaded at a time.

Note 7: I_{CC} for 54ACT @ 25°C is identical to 74ACT @ 25°C.

AC Electrical Characteristics

Symbol	Parameter	V _{CC} (V) (Note 8)	54AC		Units	Fig. No.
			T _A = -55°C to +125°C C _L = 50 pF			
			Min	Max		
t _{PLH}	Propagation Delay S to $\bar{Z}_n$	3.3	1.0	14.0	ns	
		5.0	1.0	11.0		
t _{PHL}	Propagation Delay S to $\bar{Z}_n$	3.3	1.0	14.0	ns	
		5.0	1.0	11.0		
t _{PLH}	Propagation Delay $\bar{E}$ to $\bar{Z}_n$	3.3	1.0	15.0	ns	
		5.0	1.0	12.0		
t _{PHL}	Propagation Delay $\bar{E}$ to $\bar{Z}_n$	3.3	1.0	14.0	ns	
		5.0	1.0	10.0		
t _{PLH}	Propagation Delay I _n to $\bar{Z}_n$	3.3	1.0	11.0	ns	
		5.0	1.0	8.5		
t _{PHL}	Propagation Delay I _n to $\bar{Z}_n$	3.3	1.0	10.0	ns	
		5.0	1.0	7.5		

Note 8: Voltage Range 3.3 is 3.3V ±0.3V
Voltage Range 5.0 is 5.0V ±0.5V

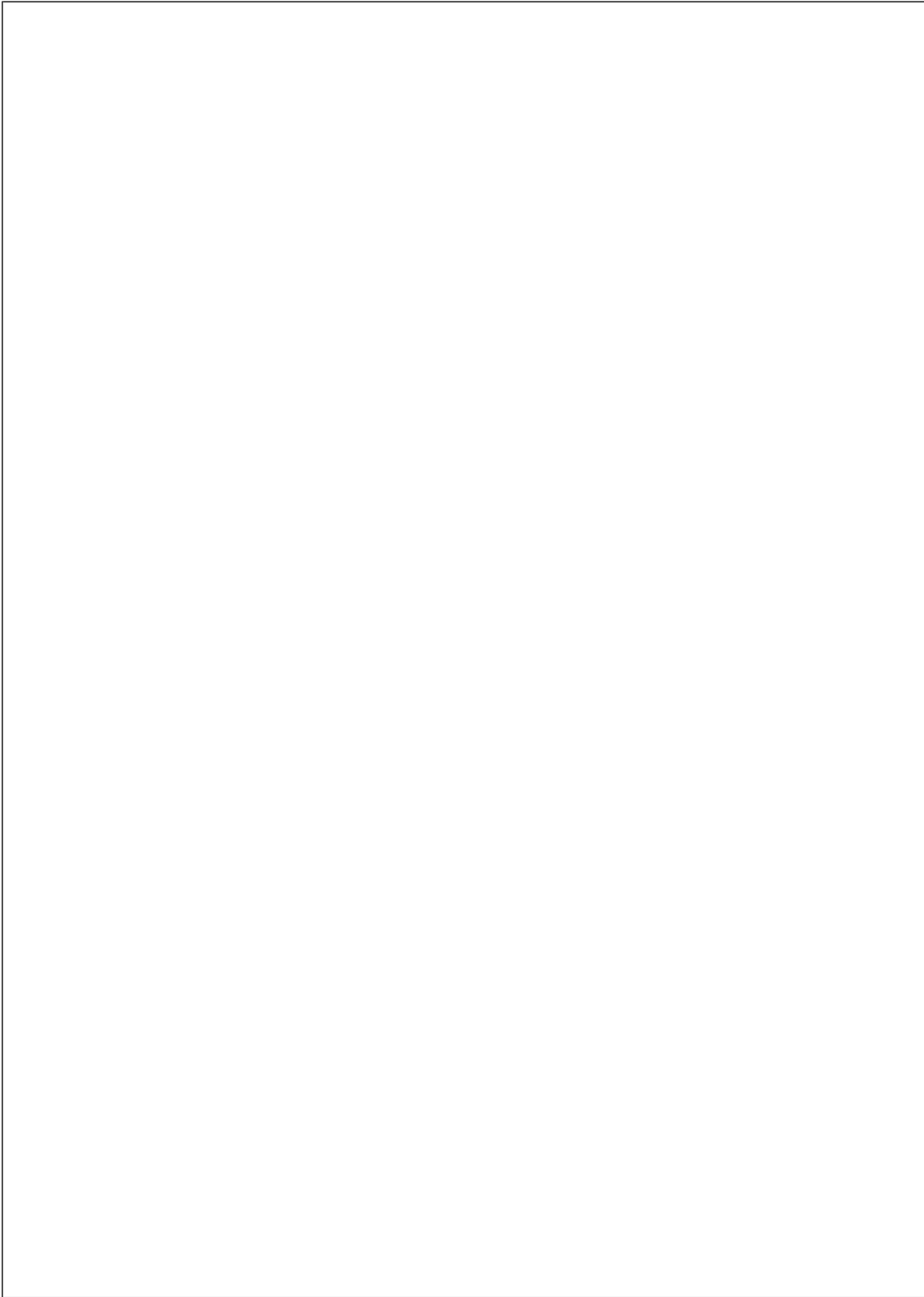
AC Electrical Characteristics

Symbol	Parameter	V _{CC} (V) (Note 9)	54ACT		Units	Fig. No.
			T _A = -55°C to +125°C C _L = 50 pF			
			Min	Max		
t _{PLH}	Propagation Delay S to $\bar{Z}_n$	5.0	1.0	12.0	ns	
t _{PHL}	Propagation Delay S to $\bar{Z}_n$	5.0	1.0	11.5	ns	
t _{PLH}	Propagation Delay $\bar{E}$ to $\bar{Z}_n$	5.0	1.0	11.0	ns	
t _{PHL}	Propagation Delay $\bar{E}$ to $\bar{Z}_n$	5.0	1.0	11.0	ns	
t _{PLH}	Propagation Delay I _n to $\bar{Z}_n$	5.0	1.0	9.5	ns	
t _{PHL}	Propagation Delay I _n to $\bar{Z}_n$	5.0	1.0	8.0	ns	

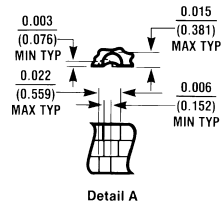
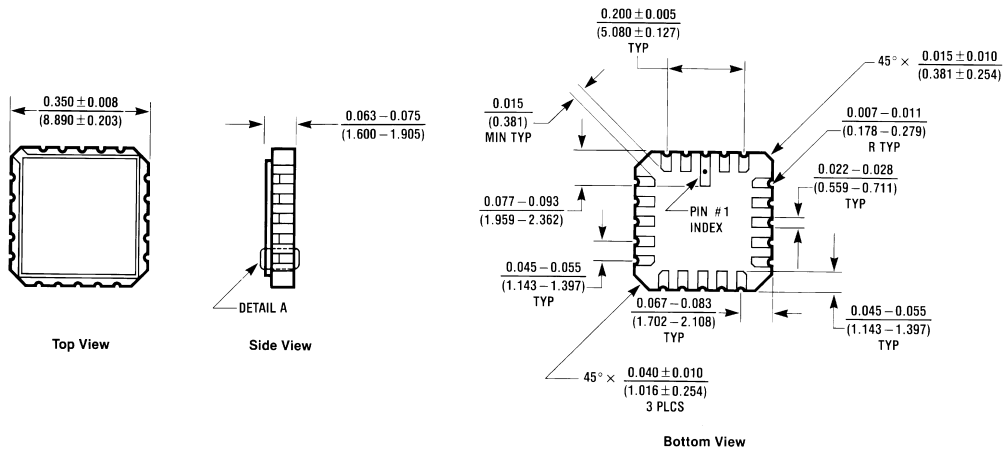
Note 9: Voltage Range 5.0 is 5.0V ±0.5V

Capacitance

Symbol	Parameter	Typ	Units	Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = OPEN
C _{PD}	Power Dissipation Capacitance	45.0	pF	V _{CC} = 5.0V

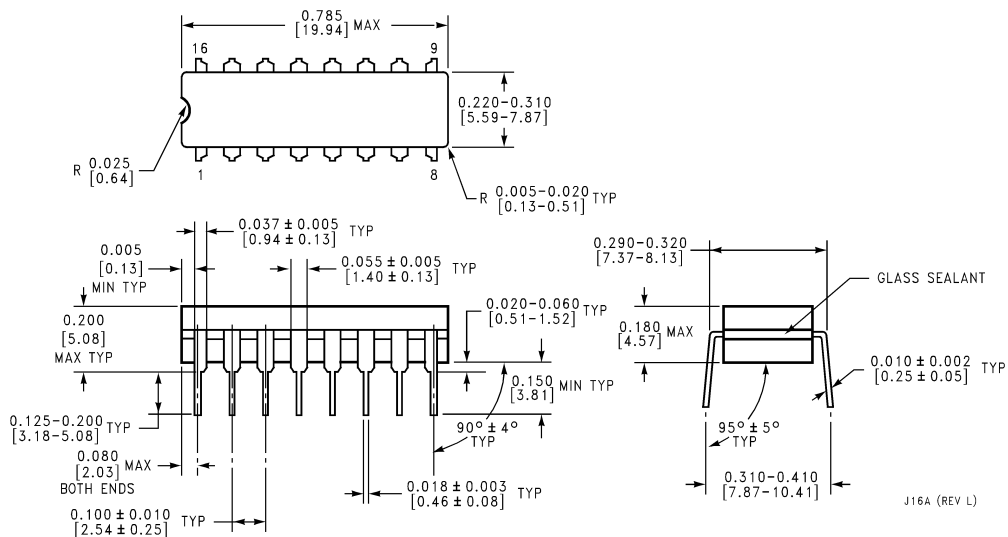


Physical Dimensions inches (millimeters) unless otherwise noted



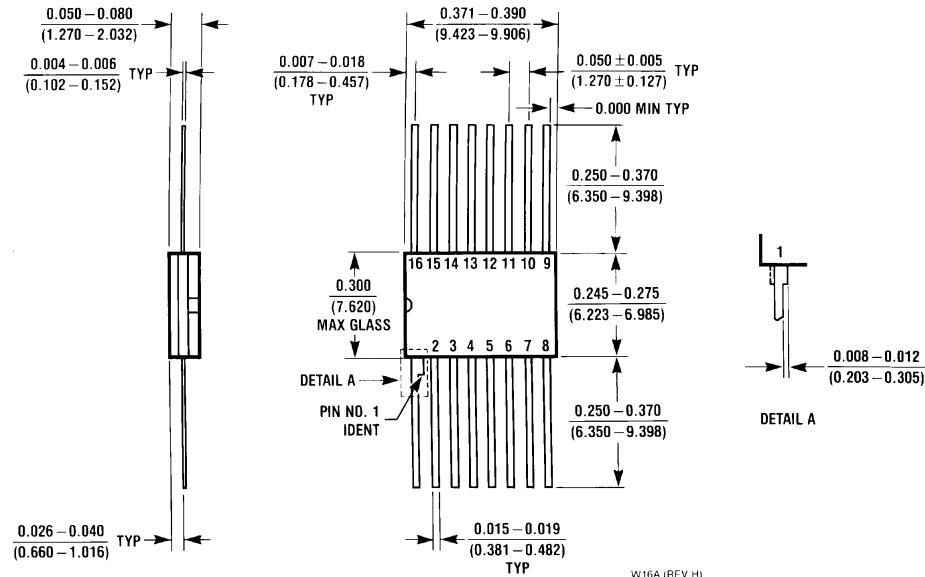
E20A (REV D)

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



J16A (REV L)

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

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

16 Lead Ceramic Flatpak (F)
NS Package Number W16A

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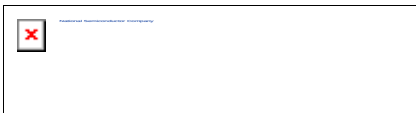
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54AC158 Quad 2-Input Multiplexer

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General Description

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 - Standard Microcircuit Drawing (SMD)
 - 'AC158: 5962-89729
 - 'ACT158: 5962-88755
-

Datasheet

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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		
5962-89729012A	LCC	20	Full production	N/A	N/A	.	50+	\$8.0000	tube of 50	[logo]¢Z¢S¢4¢A 54AC158 LMQB /Q¢M\$E 5962- 89729012A
5962-8972901EA	Cerdip	16	Full production	N/A	N/A		50+	\$7.5000	tube of 25	[logo]¢Z¢S¢4¢A\$E 54AC158DMQB /Q¢M 5962-8972901EA
5962R8972901V2A	LCC	20	Full production	N/A	N/A	.	50+	\$138.0000	tube of 50	[logo]¢Z¢S¢4¢A 54AC158E RQMLV \$E 5962R 8972901V2A
5962-8972901VEA	Cerdip	16	Full production	N/A	N/A	.	50+	\$138.0000	tube of 25	[logo]¢Z¢S¢4¢A\$E 54AC158J-QMLV 5962-8972901VEA
5962R897201VEA	Cerdip	16	Full production	N/A	N/A	.	50+	\$138.0000	tube of 25	[logo]¢Z¢S¢4¢A\$E 54AC158JRQMLV 5962R8972901VEA

RM54AC158VFA	Cerpack	16	Preliminary	N/A	N/A	.			tube of N/A	[logo]¢Z¢S¢4¢A\$E RM54AC158VFA ¢R WAFER #
5962-8972901VFA	Cerpack	16	Full production	N/A	N/A	.	50+	\$138.0000	tube of 19	[logo]¢Z¢S¢4¢A\$E 54AC158W -QMLV 5962 -8972901VFA
5962R8972901VFA	Cerpack	16	Full production	N/A	N/A	.	50+	\$138.0000	tube of 19	[logo]¢Z¢S¢4¢A\$E 54AC158W RQMLV 5962 R8972901VFA

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