



November 1988
Revised November 1999

74AC151 • 74ACT151

8-Input Multiplexer

General Description

The AC/ACT151 is a high-speed 8-input digital multiplexer. It provides, in one package, the ability to select one line of data from up to eight sources. The AC/ACT151 can be used as a universal function generator to generate any logic function of four variables. Both true and complementary outputs are provided.

Features

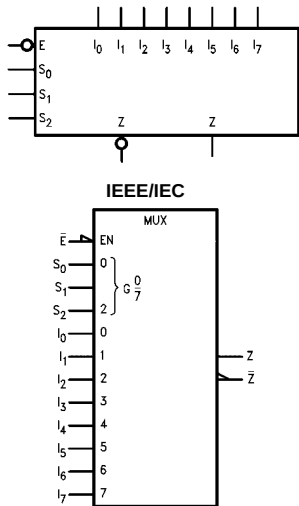
- I_{CC} reduced by 50%
- Outputs source/sink 24 mA
- ACT151 has TTL-compatible inputs

Ordering Code:

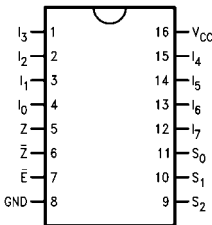
Order Number	Package Number	Package Description
74AC151SC	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body
74AC151SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74AC151MTC	MTC16	16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74AC151PC	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
74ACT151SC	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body
74ACT151SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74ACT151PC	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.

Logic Symbols



Connection Diagram



Pin Descriptions

Pin Names	Description
I_0-I_7	Data Inputs
S_0-S_2	Select Inputs
$\bar{E}$	Enable Input
Z	Data Output
$\bar{Z}$	Inverted Data Output

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Truth Table

Inputs				Outputs	
$\bar{E}$	S_2	S_1	S_0	$\bar{Z}$	Z
H	X	X	X	H	L
L	L	L	L	$\bar{I}_0$	I_0
L	L	L	H	$\bar{I}_1$	I_1
L	L	H	L	$\bar{I}_2$	I_2
L	L	H	H	$\bar{I}_3$	I_3
L	H	L	L	$\bar{I}_4$	I_4
L	H	L	H	$\bar{I}_5$	I_5
L	H	H	L	$\bar{I}_6$	I_6
L	H	H	H	$\bar{I}_7$	I_7

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

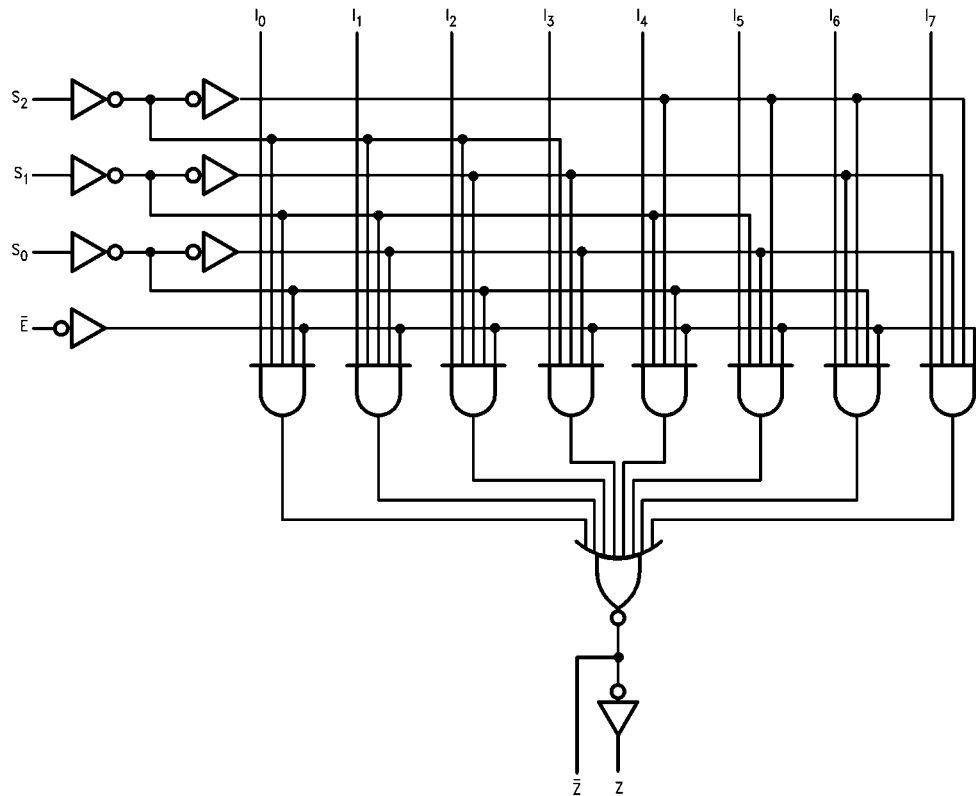
Functional Description

The AC/ACT151 is a logic implementation of a single pole, 8-position switch with the switch position controlled by the state of three Select inputs, S_0 , S_1 , S_2 . Both true and complementary outputs are provided. The Enable input ($\bar{E}$) is active LOW. When it is not activated, the complementary output is HIGH and the true output is LOW regardless of all other inputs. The logic function provided at the output is:

$$Z = \bar{E} \cdot (I_0 \cdot \bar{S}_0 \cdot \bar{S}_1 \cdot \bar{S}_2 + I_1 \cdot \bar{S}_0 \cdot \bar{S}_1 \cdot S_2 + I_2 \cdot \bar{S}_0 \cdot S_1 \cdot \bar{S}_2 + I_3 \cdot \bar{S}_0 \cdot S_1 \cdot S_2 + I_4 \cdot S_0 \cdot \bar{S}_1 \cdot \bar{S}_2 + I_5 \cdot S_0 \cdot \bar{S}_1 \cdot S_2 + I_6 \cdot S_0 \cdot S_1 \cdot \bar{S}_2 + I_7 \cdot S_0 \cdot S_1 \cdot S_2)$$

The AC/ACT151 provides the ability, in one package, to select from eight sources of data or control information. By proper manipulation of the inputs, the AC/ACT151 can provide any logic function of four variables and its complement.

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)			Recommended Operating Conditions						
Supply Voltage (V _{CC})		–0.5V to +7.0V	Supply Voltage (V _{CC})						
DC Input Diode Current (I _{IK})			AC		2.0V to 6.0V				
V _I = –0.5V		–20 mA	ACT		4.5V to 5.5V				
V _I = V _{CC} + 0.5V		+20 mA	Input Voltage (V _I)		0V to V _{CC}				
DC Input Voltage (V _I)		–0.5V to V _{CC} + 0.5V	Output Voltage (V _O)		0V to V _{CC}				
DC Output Diode Current (I _{OK})			Operating Temperature (T _A)		–40°C to +85°C				
V _O = –0.5V		–20 mA	Minimum Input Edge Rate (ΔV/Δt)						
V _O = V _{CC} + 0.5V		+20 mA	AC Devices						
DC Output Voltage (V _O)		–0.5V to V _{CC} + 0.5V	V _{IN} from 30% to 70% of V _{CC}						
DC Output Source			V _{CC} @ 3.3V, 4.5V, 5.5V		125 mV/ns				
or Sink Current (I _O)		±50 mA	Minimum Input Edge Rate (ΔV/Δt)						
DC V _{CC} or Ground Current			ACT Devices						
per Output Pin (I _{CC} or I _{GND})		±50 mA	V _{IN} from 0.8V to 2.0V						
Storage Temperature (T _{STG})		–65°C to +150°C	V _{CC} @ 4.5V, 5.5V		125 mV/ns				
Junction Temperature (T _J)			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. Fairchild does not recommend operation of FACT™ circuits outside databook specifications.						
PDIP		140°C							
DC Electrical Characteristics for AC									
Symbol	Parameter	V _{CC} (V)	T _A = +25°C		T _A = –40°C to +85°C	Units	Conditions		
			Typ	Guaranteed Limits					
V _{IH}	Minimum HIGH Level Input Voltage	3.0	1.5	2.1	2.1	V	V _{OUT} = 0.1V or V _{CC} – 0.1V		
		4.5	2.25	3.15	3.15				
		5.5	2.75	3.85	3.85				
V _{IL}	Maximum LOW Level Input Voltage	3.0	1.5	0.9	0.9	V	V _{OUT} = 0.1V or V _{CC} – 0.1V		
		4.5	2.25	1.35	1.35				
		5.5	2.75	1.65	1.65				
V _{OH}	Minimum HIGH Level Output Voltage	3.0	2.99	2.9	2.9	V	I _{OUT} = –50 μA		
		4.5	4.49	4.4	4.4				
		5.5	5.49	5.4	5.4				
		3.0		2.56	2.46	V	V _{IN} = V _{IL} or V _{IH} I _{OH} = –12 mA I _{OH} = –24 mA I _{OH} = –24 mA (Note 2)		
		4.5		3.86	3.76				
		5.5		4.86	4.76				
		3.0		0.36	0.44			V	V _{IN} = V _{IL} or V _{IH} I _{OL} = 12 mA I _{OL} = 24 mA I _{OL} = 24 mA (Note 2)
		4.5		0.36	0.44				
		5.5		0.36	0.44				
I _{IN} (Note 4)	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V _I = V _{CC} , GND		
I _{OLD}	Minimum Dynamic	5.5			75	mA	V _{OLD} = 1.65V Max		
I _{OHD}	Output Current (Note 3)	5.5			–75	mA	V _{OHD} = 3.85V Min		
I _{CC} (Note 4)	Maximum Quiescent Supply Current	5.5		4.0	40.0	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} .									

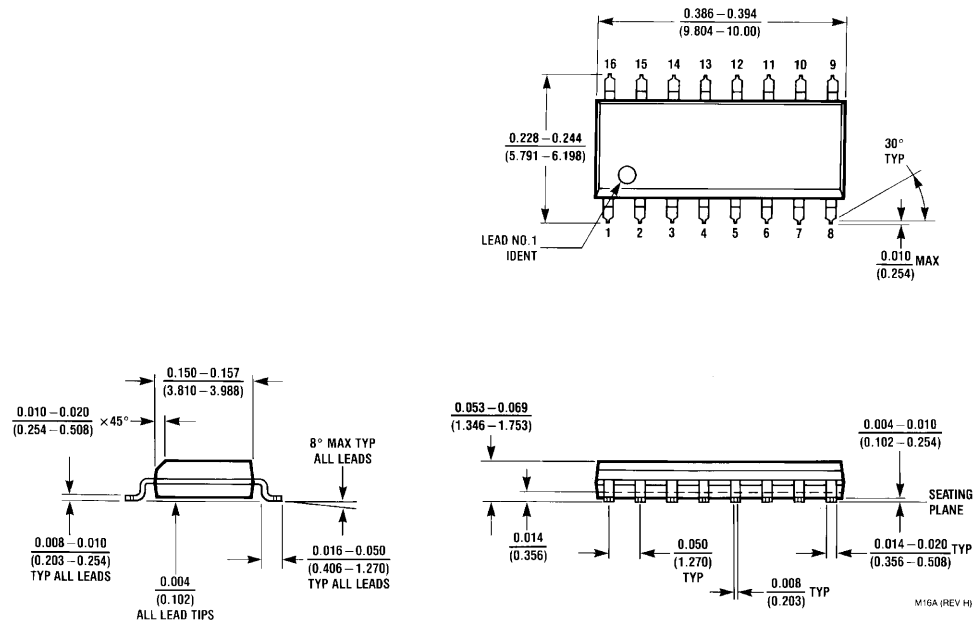
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DC Electrical Characteristics for ACT								
Symbol	Parameter	V _{CC} (V)	T _A = +25°C		T _A = -40°C to +85°C	Units	Conditions	
			Typ	Guaranteed Limits				
V _{IH}	Minimum HIGH Level Input Voltage	4.5	1.5	2.0	2.0	V	V _{OUT} = 0.1V or V _{CC} - 0.1V	
		5.5	1.5	2.0	2.0			
V _{IL}	Maximum LOW Level Input Voltage	4.5	1.5	0.8	0.8	V	V _{OUT} = 0.1V or V _{CC} - 0.1V	
		5.5	1.5	0.8	0.8			
V _{OH}	Minimum HIGH Level Output Voltage	4.5	4.49	4.4	4.4	V	I _{OUT} = -50 μA	
		5.5	5.49	5.4	5.4			
		4.5		3.86	3.76	V	V _{IN} = V _{IL} or V _{IH} I _{OH} = -24 mA I _{OH} = -24 mA (Note 5)	
		5.5		4.86	4.76			
V _{OL}	Maximum LOW Level Output Voltage	4.5	0.001	0.1	0.1	V	I _{OUT} = 50 μA	
		5.5	0.001	0.1	0.1			
		4.5		0.36	0.44	V	V _{IN} = V _{IL} or V _{IH} I _{OL} = 24 mA I _{OL} = 24 mA (Note 5)	
		5.5		0.36	0.44			
I _{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V _I = V _{CC} , GND	
I _{CCT}	Maximum I _{CC} /Input	5.5	0.6		1.5	mA	V _I = V _{CC} - 2.1V	
I _{OLD}	Minimum Dynamic	5.5			75	mA	V _{OLD} = 1.65V Max	
I _{OHD}	Output Current (Note 6)	5.5			-75	mA	V _{OHD} = 3.85V Min	
I _{CC}	Maximum Quiescent Supply Current	5.5		4.0	40.0	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.								
AC Electrical Characteristics for AC								
Symbol	Parameter	V _{CC} (V) (Note 7)	T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF		Units
			Min	Typ	Max	Min	Max	
t _{PLH}	Propagation Delay S _n to Z or $\bar{Z}$	3.3	3.0	11.5	18.0	3.0	20.0	ns
		5.0	2.5	8.5	13.0	2.0	15.0	
t _{PHL}	Propagation Delay S _n to Z or $\bar{Z}$	3.3	2.5	12.0	18.0	2.5	20.0	ns
		5.0	2.0	8.5	13.0	1.5	15.0	
t _{PLH}	Propagation Delay $\bar{E}$ to Z or $\bar{Z}$	3.3	2.5	8.0	13.0	2.0	14.0	ns
		5.0	2.0	6.0	10.0	1.5	11.0	
t _{PHL}	Propagation Delay $\bar{E}$ to Z or $\bar{Z}$	3.3	1.5	8.5	13.0	1.5	14.0	ns
		5.0	1.5	6.5	10.0	1.5	11.0	
t _{PLH}	Propagation Delay I _n to Z or $\bar{Z}$	3.3	2.5	9.5	14.0	2.0	15.5	ns
		5.0	1.5	7.0	10.5	1.5	11.0	
t _{PHL}	Propagation Delay I _n to Z or $\bar{Z}$	3.3	2.5	9.5	15.0	2.0	16.0	ns
		5.0	1.5	7.0	11.0	1.5	12.0	
Note 7: Voltage Range 3.3 is 3.3V ± 0.3V Voltage Range 5.0 is 5.0V ± 0.5V								

AC Electrical Characteristics for ACT								
Symbol	Parameter	V _{CC} (V) (Note 8)	T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF		Units
			Min	Typ	Max	Min	Max	
t _{PLH}	Propagation Delay S _n to Z	5.0	3.5	12.5	15.5	3.0	17.0	ns
t _{PHL}	Propagation Delay S _n to Z	5.0	3.5	12.5	15.5	3.0	16.5	ns
t _{PLH}	Propagation Delay S _n to $\bar{Z}$	5.0	3.5	12.5	15.0	3.0	16.5	ns
t _{PHL}	Propagation Delay S _n to $\bar{Z}$	5.0	4.0	12.5	16.5	3.5	18.5	ns
t _{PLH}	Propagation Delay $\bar{E}$ to Z	5.0	2.5	6.0	9.5	2.5	10.0	ns
t _{PHL}	Propagation Delay $\bar{E}$ to Z	5.0	2.5	6.0	9.0	2.5	10.0	ns
t _{PLH}	Propagation Delay $\bar{E}$ to $\bar{Z}$	5.0	2.5	6.0	8.5	2.5	9.5	ns
t _{PHL}	Propagation Delay $\bar{E}$ to $\bar{Z}$	5.0	3.0	6.5	10.0	2.5	10.5	ns
t _{PLH}	Propagation Delay I _n to Z	5.0	3.5	7.5	11.5	3.0	12.5	ns
t _{PHL}	Propagation Delay I _n to Z	5.0	3.5	8.0	12.0	3.0	13.5	ns
t _{PLH}	Propagation Delay I _n to $\bar{Z}$	5.0	3.5	8.0	12.0	3.0	13.0	ns
t _{PHL}	Propagation Delay I _n to $\bar{Z}$	5.0	4.0	8.0	12.5	3.0	14.0	ns
Note 8: 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	70.0	pF	V _{CC} = 5.0V				

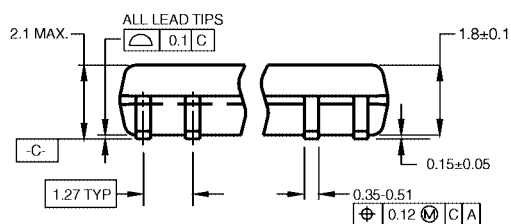
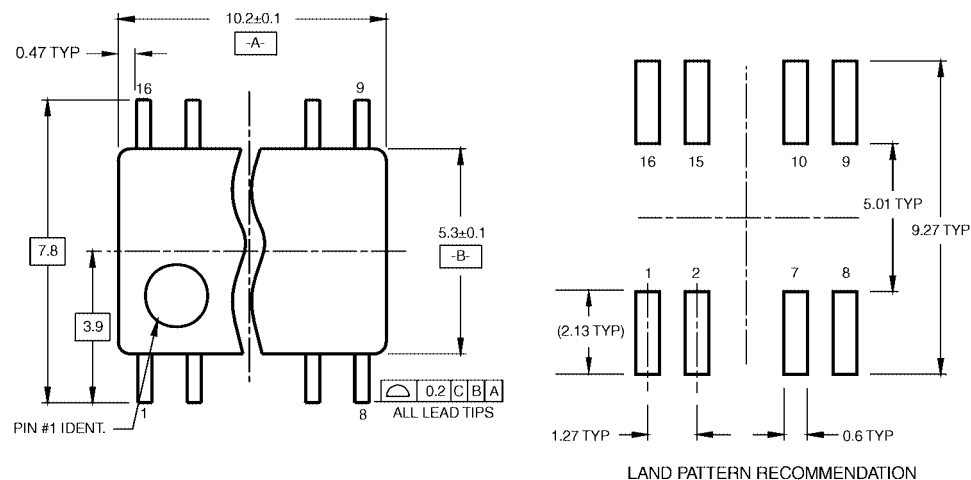
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Physical Dimensions inches (millimeters) unless otherwise noted



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

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

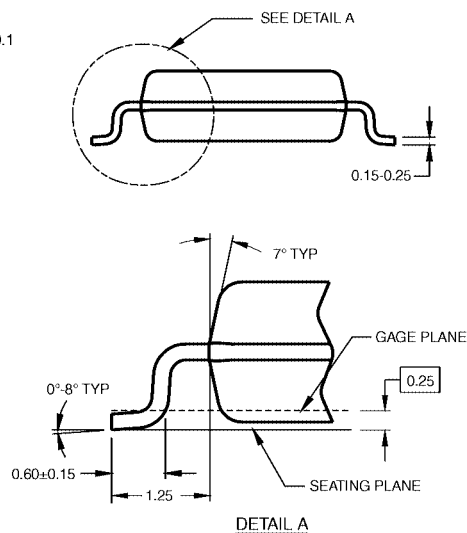


DIMENSIONS ARE IN MILLIMETERS

NOTES:

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

M16DRevB1



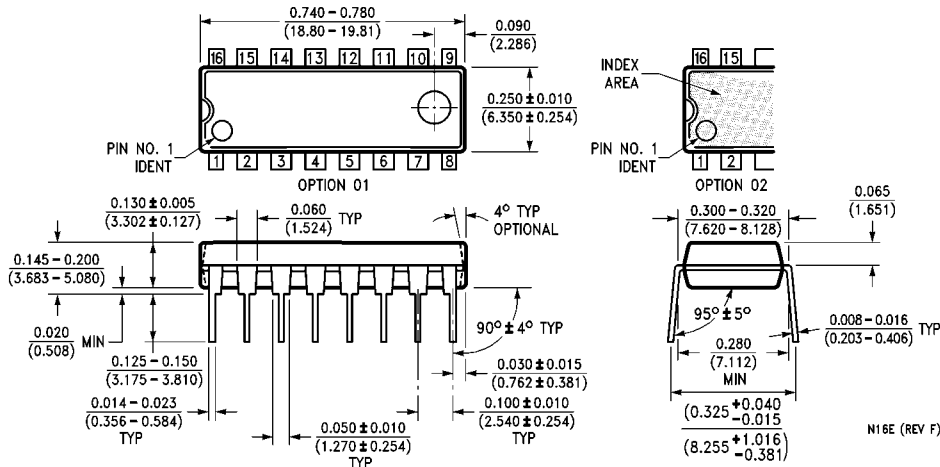
16-Lead Small Outline Package (SOIC), EIAJ TYPE II, 5.3mm Wide
Package Number M16D

DIMENSIONS METRIC ONLY



MTC16 (REV C)

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



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