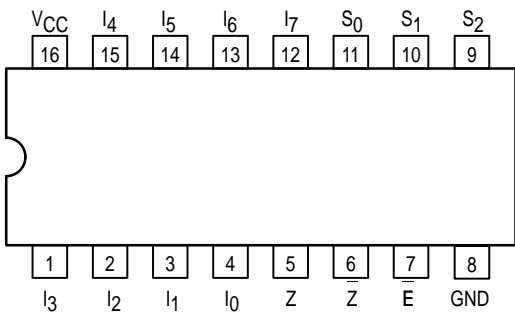**MOTOROLA**

1-of-8 Decoder/Demultiplexer

The MC74AC151/74ACT151 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 MC74AC151/74ACT151 can be used as a universal function generator to generate any logic function of four variables. Both true and complementary outputs are provided.

- Outputs Source/Sink 24 mA
- ′ACT151 Has TTL Compatible Inputs

MC74AC151
MC74ACT151

1-OF-8
DECODER/DEMULTIPLEXER
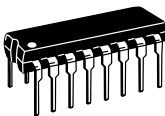
N SUFFIX
CASE 648-08
PLASTIC
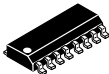
D SUFFIX
CASE 751B-05
PLASTIC

V_{CC}	I_4	I_5	I_6	I_7	S_0	S_1	S_2
16	15	14	13	12	11	10	9

1	2	3	4	5	6	7	8
I_3	I_2	I_1	I_0	Z	$\overline{Z}$	$\overline{E}$	GND

PIN NAMES

I_0–I_7	Data Inputs
S_0–S_2	Select Inputs
$\overline{E}$	Enable Input
Z	Data Output
$\overline{Z}$	Inverted Data Output

LOGIC SYMBOL

TRUTH TABLE

Inputs				Outputs	
$\overline{E}$	S_2	S_1	S_0	$\overline{Z}$	Z
H	X	X	X	H	L
L	L	L	L	$\overline{I_0}$	I_0
L	L	L	H	$\overline{I_1}$	I_1
L	L	H	L	$\overline{I_2}$	I_2
L	L	H	H	$\overline{I_3}$	I_3
L	H	L	L	$\overline{I_4}$	I_4
L	H	L	H	$\overline{I_5}$	I_5
L	H	H	L	$\overline{I_6}$	I_6
L	H	H	H	$\overline{I_7}$	I_7

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
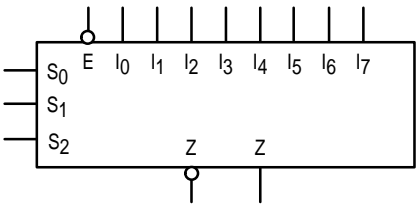
MC74AC151 MC74ACT151

FUNCTIONAL DESCRIPTION

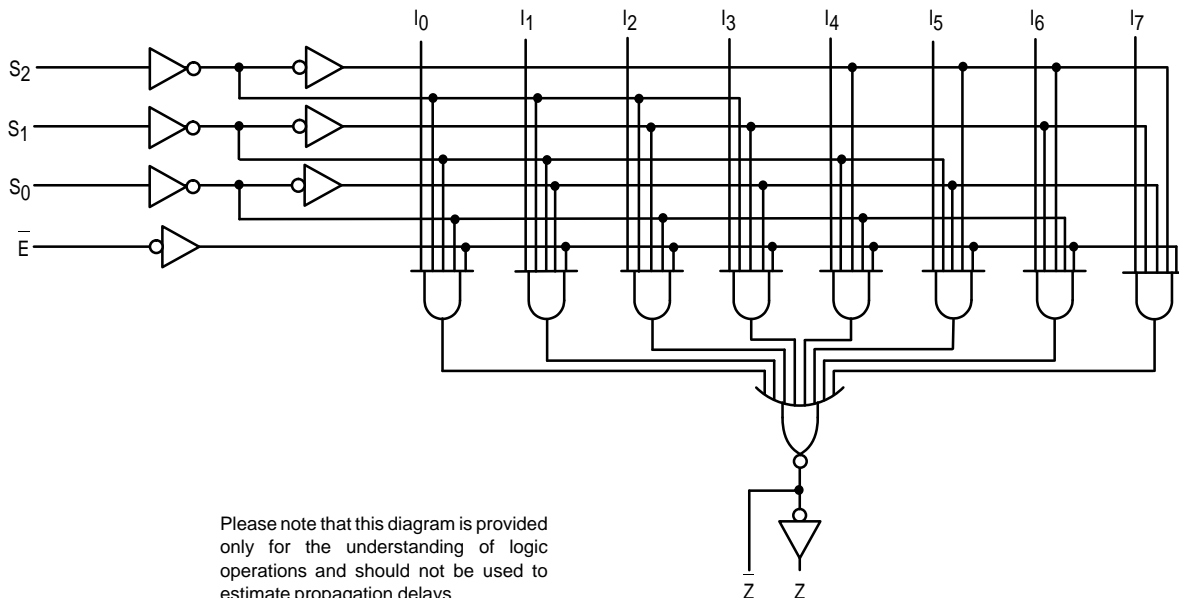The MC74AC151/74ACT151 is a logic implementation of a single pole, 8-position switch with the switch position controlled by the state of three Select inputs, S_0, S_1, S_2. Both true and complementary outputs are provided. The Enable input (E) is active LOW. When it is not activated, the complementary output is HIGH and the true output is LOW regardless of all other inputs. The logic function provided at the output is:

$$Z = \overline{E} \bullet (I_0 \bullet \overline{S_0} \bullet \overline{S_1} \bullet \overline{S_2} + I_1 \bullet S_0 \bullet \overline{S_1} \bullet \overline{S_2} +$$
$$I_2 \bullet \overline{S_0} \bullet S_1 \bullet \overline{S_2} + I_3 \bullet S_0 \bullet \overline{S_1} \bullet S_2 +$$
$$I_4 \bullet \overline{S_0} \bullet S_1 \bullet S_2 + I_5 \bullet S_0 \bullet S_1 \bullet S_2 +$$
$$I_6 \bullet S_0 \bullet S_1 \bullet S_2 + I_7 \bullet S_0 \bullet S_1 \bullet S_2)$$

The MC74AC151/74ACT151 provides the ability, in one package, to select from eight sources of data or control information. By proper manipulation of the inputs, the MC74AC151/74ACT151 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.

MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	−0.5 to +7.0	V
V_{in}	DC Input Voltage (Referenced to GND)	−0.5 to V_{CC} +0.5	V
V_{out}	DC Output Voltage (Referenced to GND)	−0.5 to V_{CC} +0.5	V
I_{in}	DC Input Current, per Pin	±20	mA
I_{out}	DC Output Sink/Source Current, per Pin	±50	mA
I_{CC}	DC V_{CC} or GND Current per Output Pin	±50	mA
T_{stg}	Storage Temperature	−65 to +150	°C

* Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

MC74AC151 MC74ACT151

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	'AC	2.0	5.0	6.0	V
		'ACT	4.5	5.0	5.5	
V_{in}, V_{out}	DC Input Voltage, Output Voltage (Ref. to GND)		0		V_{CC}	V
t_r, t_f	Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs	V_{CC} @ 3.0 V		150		ns/V
		V_{CC} @ 4.5 V		40		
		V_{CC} @ 5.5 V		25		
t_r, t_f	Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs	V_{CC} @ 4.5 V		10		ns/V
		V_{CC} @ 5.5 V		8.0		
T_J	Junction Temperature (PDIP)				140	°C
T_A	Operating Ambient Temperature Range		−40	25	85	°C
I_{OH}	Output Current — High				−24	mA
I_{OL}	Output Current — Low				24	mA

1. V_{in} from 30% to 70% V_{CC}; see individual Data Sheets for devices that differ from the typical input rise and fall times.
2. V_{in} from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

DC CHARACTERISTICS

Symbol	Parameter	V_{CC} (V)	74AC $T_A = +25$°C	74AC $T_A = -40$°C to +85°C	Unit	Conditions
			Typ	Guaranteed Limits		
V_{IH}	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1	V	$V_{OUT} = 0.1$ V or $V_{CC} - 0.1$ V
		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	$V_{OUT} = 0.1$ V or $V_{CC} - 0.1$ V
		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} −12 mA
		4.5		3.86	3.76		I_{OH} −24 mA
		5.5		4.86	4.76		−24 mA
V_{OL}	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1	V	$I_{OUT} = 50$ μA
		4.5	0.001	0.1	0.1		
		5.5	0.001	0.1	0.1		
		3.0		0.36	0.44	V	*$V_{IN} = V_{IL}$ or V_{IH} 12 mA
		4.5		0.36	0.44		I_{OL} 24 mA
		5.5		0.36	0.44		24 mA
I_{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	$V_I = V_{CC}$, GND
I_{OLD}	†Minimum Dynamic Output Current	5.5			75	mA	$V_{OLD} = 1.65$ V Max
I_{OHD}		5.5			−75	mA	$V_{OHD} = 3.85$ V Min
I_{CC}	Maximum Quiescent Supply Current	5.5		8.0	80	μA	$V_{IN} = V_{CC}$ or GND

* All outputs loaded; thresholds on input associated with output under test.
† Maximum test duration 2.0 ms, one output loaded at a time.
Note: I_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V_{CC}.

FACT DATA

AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V_{CC}* (V)	74AC T_A = +25°C C_L = 50 pF			74AC T_A = −40°C to +85°C C_L = 50 pF		Unit	Fig. No.
			Min	Typ	Max	Min	Max		
t_{PLH}	Propagation Delay S_n to Z or Z̄	3.3 5.0	3.0 2.5	11.5 8.5	18.0 13.0	3.0 2.0	20.0 15.0	ns	3-6
t_{PHL}	Propagation Delay S_n to Z or Z̄	3.3 5.0	2.5 2.0	12 8.5	18.0 13.0	2.5 1.5	20.0 15.0	ns	3-6
t_{PLH}	Propagation Delay E to Z or Z̄	3.3 5.0	2.5 2.0	8.0 6.0	13.0 10.0	2.0 1.5	14.0 11.0	ns	3-6
t_{PHL}	Propagation Delay E to Z or Z̄	3.3 5.0	1.5 1.5	8.5 6.5	13.0 10.0	1.5 1.5	14.0 11.0	ns	3-6
t_{PLH}	Propagation Delay I_n to Z or Z̄	3.3 5.0	2.5 1.5	9.5 7.0	14.0 10.5	2.0 1.5	15.5 11.0	ns	3-5
t_{PHL}	Propagation Delay I_n to Z or Z̄	3.3 5.0	2.5 1.5	9.5 7.0	15.0 11.0	2.0 1.5	16.0 12.0	ns	3-5

* Voltage Range 3.3 V is 3.3 V ± 0.3 V
  Voltage Range 5.0 V is 5.0 V ± 0.5 V

DC CHARACTERISTICS

Symbol	Parameter	V_{CC} (V)	74ACT T_A = +25°C	74ACT T_A = −40°C to +85°C	Unit	Conditions
			Typ	Guaranteed Limits		
V_{IH}	Minimum High Level Input Voltage	4.5 5.5	1.5 1.5	2.0 2.0	2.0 2.0	V	V_{OUT} = 0.1 V or V_{CC} − 0.1 V
V_{IL}	Maximum Low Level Input Voltage	4.5 5.5	1.5 1.5	0.8 0.8	0.8 0.8	V	V_{OUT} = 0.1 V or V_{CC} − 0.1 V
V_{OH}	Minimum High Level Output Voltage	4.5 5.5	4.49 5.49	4.4 5.4	4.4 5.4	V	I_{OUT} = −50 µA
		4.5 5.5		3.86 4.86	3.76 4.76	V	*V_{IN} = V_{IL} or V_{IH} I_{OH} −24 mA −24 mA
V_{OL}	Maximum Low Level Output Voltage	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1	V	I_{OUT} = 50 µA
		4.5 5.5		0.36 0.36	0.44 0.44	V	*V_{IN} = V_{IL} or V_{IH} I_{OL} 24 mA 24 mA
I_{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	µA	V_I = V_{CC}, GND
ΔI_{CCT}	Additional Max. I_{CC}/Input	5.5	0.6		1.5	mA	V_I = V_{CC} − 2.1 V
I_{OLD}	†Minimum Dynamic Output Current	5.5			75	mA	V_{OLD} = 1.65 V Max
I_{OHD}		5.5			−75	mA	V_{OHD} = 3.85 V Min
I_{CC}	Maximum Quiescent Supply Current	5.5		8.0	80	µA	V_{IN} = V_{CC} or GND

* All outputs loaded; thresholds on input associated with output under test.
† Maximum test duration 2.0 ms, one output loaded at a time.

MC74AC151 MC74ACT151

AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V_{CC}* (V)	74ACT $T_A = +25°C$ $C_L = 50$ pF			74ACT $T_A = -40°C$ to +85°C $C_L = 50$ pF		Unit	Fig. No.
			Min	Typ	Max	Min	Max		
t_{PLH}	Propagation Delay S_n to Z	5.0	3.5		15.5	3.0	17.0	ns	3-6
t_{PHL}	Propagation Delay S_n to Z	5.0	3.5		15.5	3.0	16.5	ns	3-6
t_{PLH}	Propagation Delay S_n to Z	5.0	3.5		15	3.0	16.5	ns	3-6
t_{PHL}	Propagation Delay S_n to Z	5.0	4.0		16.5	3.5	18.5	ns	3-6
t_{PLH}	Propagation Delay E to Z	5.0	2.5		9.5	2.5	10.0	ns	3-6
t_{PHL}	Propagation Delay E to Z	5.0	2.5		9.0	2.5	10.0	ns	3-6
t_{PLH}	Propagation Delay E to Z	5.0	2.5		8.5	2.5	9.5	ns	3-6
t_{PHL}	Propagation Delay E to Z	5.0	3.0		10.0	2.5	10.5	ns	3-6
t_{PLH}	Propagation Delay I_n to Z	5.0	3.5		11.5	3.0	12.5	ns	3-6
t_{PHL}	Propagation Delay I_n to Z	5.0	3.5		12.0	3.0	13.5	ns	3-6
t_{PLH}	Propagation Delay I_n to Z	5.0	3.5		12.0	3.0	13.0	ns	3-6
t_{PHL}	Propagation Delay I_n to Z	5.0	4.0		12.5	3.0	14.0	ns	3-6

* Voltage Range 5.0 V is 5.0 V $\pm$ 0.5 V

CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
C_{IN}	Input Capacitance	4.5	pF	$V_{CC} = 5.0$ V
C_{PD}	Power Dissipation Capacitance	70	pF	$V_{CC} = 5.0$ V

MC74AC151 MC74ACT151

OUTLINE DIMENSIONS

N SUFFIX
PLASTIC DIP PACKAGE
CASE 648–08
ISSUE R
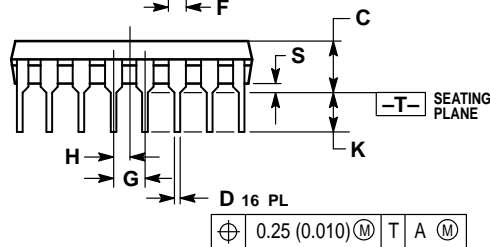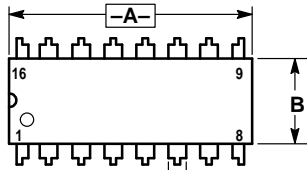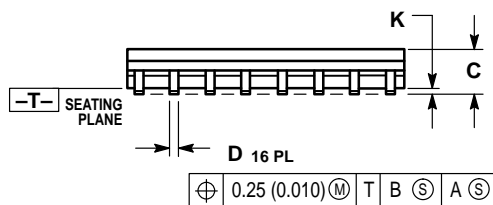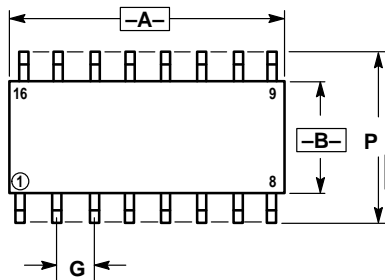
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0 °	10 °	0 °	10 °
S	0.020	0.040	0.51	1.01

D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751B–05
ISSUE J

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0 °	7 °	0 °	7 °
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

Ⓜ **MOTOROLA**

◇