



MOTOROLA

MC74AC540
MC74ACT540
MC74AC541
MC74ACT541

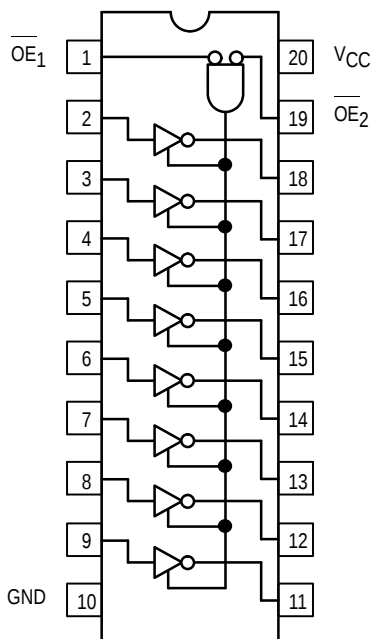
Octal Buffer/Line Driver with 3-State Outputs

The MC74AC540/74ACT540 and MC74AC541/74ACT541 are octal buffer/line drivers designed to be employed as memory and address drivers, clock drivers and bus oriented transmitter/receivers. The MC74AC541/74ACT541 is a noninverting option of the MC74AC540/74ACT540.

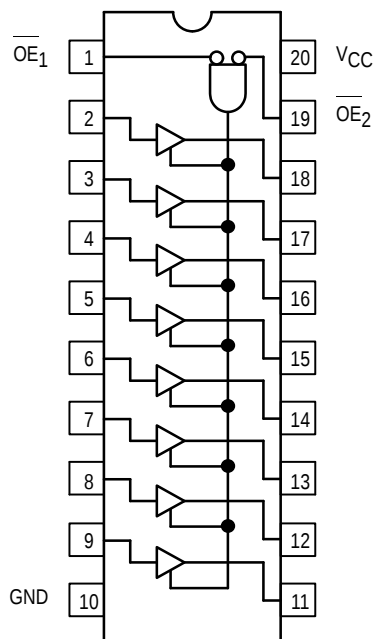
These devices are similar in function to the MC74AC240/74ACT240 and MC74AC244/74ACT244 while providing flow-through architecture (inputs on opposite side from outputs). This pinout arrangement makes these devices especially useful as output ports for microprocessors, allowing ease of layout and greater PC board density.

- 3-State Outputs
- Inputs and Outputs Opposite Side of Package, Allowing Easier Interface to Microprocessors
- Outputs Source/Sink 24 mA
- MC74AC540/74ACT540 Provides Inverted Outputs
- MC74AC541/74ACT541 Provides Noninverted Outputs
- 'ACT540 and 'ACT541 Have TTL Compatible Inputs

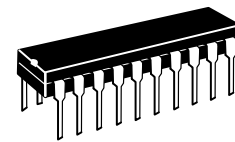
MC74AC540/74ACT540



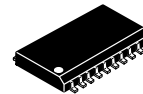
MC74AC541/74ACT541



OCTAL
BUFFER/LINE DRIVER
WITH 3-STATE
OUTPUTS



N SUFFIX
CASE 738-03
PLASTIC



DW SUFFIX
CASE 751D-04
PLASTIC

TRUTH TABLE

Inputs			Outputs	
OE ₁	OE ₂	D	'540	'541
L	L	H	L	H
H	X	X	Z	Z
X	H	X	Z	Z
L	L	L	H	L

H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Immaterial
 Z = High Impedance

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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.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit
V _{CC}	Supply Voltage	'AC	2.0	5.0	V
		'ACT	4.5	5.0	
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.

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DC CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	74AC		74AC	Unit	Conditions
			T _A = +25°C		T _A = –40°C to +85°C		
			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 I _{OH} –24 mA –24 mA
		4.5		3.86	3.76		
		5.5		4.86	4.76		
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 I _{OL} 24 mA 24 mA
		4.5		0.36	0.44		
		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 _{OZ}	Maximum 3-State Current	5.5		±0.5	±5.0	μA	V _I (OE) = V _{IL} , V _{IH} V _I = V _{CC} , GND V _O = 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}.

MC74AC540 MC74ACT540 MC74AC541 MC74ACT541

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

Symbol	Parameter	V _{CC} * (V)	74AC			74AC		Unit	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max		
t _{PLH}	Propagation Delay Data to Output ('AC540)	3.3 5.0	1.5 1.5	5.5 4.0	7.5 6.0	1.0 1.0	8.0 6.5	ns	3-5
t _{PHL}	Propagation Delay Data to Output ('AC540)	3.3 5.0	1.5 1.5	5.0 4.0	7.0 5.5	1.0 1.0	7.5 6.0	ns	3-5
t _{PZH}	Output Enable Time ('AC540)	3.3 5.0	3.0 2.0	8.5 6.5	11 8.5	2.5 2.0	12 9.5	ns	3-7
t _{PZL}	Output Enable Time ('AC540)	3.3 5.0	2.5 2.0	7.5 6.0	10 7.5	2.0 1.5	11 8.5	ns	3-8
t _{PHZ}	Output Disable Time ('AC540)	3.3 5.0	2.5 1.5	8.5 7.5	13 10.5	1.5 1.0	14 11	ns	3-7
t _{PLZ}	Output Disable Time ('AC540)	3.3 5.0	2.0 1.5	7.0 6.0	10 8.0	2.0 1.5	11 9.0	ns	3-8
t _{PLH}	Propagation Delay Data to Output ('AC541)	3.3 5.0	2.0 1.5	5.5 4.0	8.0 6.0	1.5 1.0	9.0 6.5	ns	3-5
t _{PHL}	Propagation Delay Data to Output ('AC541)	3.3 5.0	2.0 1.5	5.5 4.0	8.0 6.0	1.5 1.0	8.5 6.5	ns	3-5
t _{PZH}	Output Enable Time ('AC541)	3.3 5.0	3.0 2.0	8.0 6.0	11.5 8.5	3.0 1.5	12.5 9.5	ns	3-7
t _{PZL}	Output Enable Time ('AC541)	3.3 5.0	2.5 1.5	7.0 5.5	10 7.5	2.5 1.0	11.5 8.5	ns	3-8
t _{PHZ}	Output Disable Time ('AC541)	3.3 5.0	3.5 2.0	9.0 7.0	12.5 9.5	2.5 1.0	14 10.5	ns	3-7
t _{PLZ}	Output Disable Time ('AC541)	3.3 5.0	2.5 2.0	6.5 5.5	9.5 7.5	2.0 1.0	10.5 8.5	ns	3-8

* Voltage Range 3.3 V is 3.3 V ±0.3 V.

Voltage Range 5.0 V is 5.0 V ±0.5 V.

MC74AC540 MC74ACT540 MC74AC541 MC74ACT541

DC CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	74ACT		74ACT	Unit	Conditions
			T _A = +25°C		T _A = –40°C to +85°C		
			Typ	Guaranteed Limits			
V _{IH}	Minimum High Level Input Voltage	4.5	1.5	2.0	2.0	V	V _{OUT} = 0.1 V or V _{CC} – 0.1 V
		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} = 0.1 V or V _{CC} – 0.1 V
		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 5.5	 3.86 4.86	 3.76 4.76	V
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 5.5	 0.36 0.36	 0.44 0.44	V
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 _{OZ}	Maximum 3-State Current	5.5		±0.5	±5.0	μA	V _I (OE) = V _{IL} , V _{IH} V _I = V _{CC} , GND V _O = 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.

MC74AC540 MC74ACT540 MC74AC541 MC74ACT541

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

Symbol	Parameter	V _{CC} * (V)	74ACT			74ACT		Unit	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max		
t _{PLH}	Propagation Delay Data to Output ('ACT540)	5.0	1.0		7.0	1.0	7.5	ns	3-5
t _{PHL}	Propagation Delay Data to Output ('ACT540)	5.0	1.0		8.0	1.0	8.5	ns	3-5
t _{PZH}	Output Enable Time (ACT540)	5.0	1.0		10.5	1.0	11.5	ns	3-7
t _{PZL}	Output Enable Time (ACT540)	5.0	1.0		9.5	1.0	10.5	ns	3-8
t _{PHZ}	Output Disable Time (ACT540)	5.0	1.0		12.0	1.0	12.5	ns	3-7
t _{PLZ}	Output Disable Time (ACT540)	5.0	1.5		9.0	1.0	10	ns	3-8
t _{PLH}	Propagation Delay Data to Output ('ACT541)	5.0	1.5		7.5	1.0	8.0	ns	3-5
t _{PHL}	Propagation Delay Data to Output ('ACT541)	5.0	1.5		7.5	1.0	8.0	ns	3-5
t _{PZH}	Output Enable Time (ACT541)	5.0	2.0		10.0	1.0	11.0	ns	3-7
t _{PZL}	Output Enable Time (ACT541)	5.0	1.5		9.5	1.0	10.5	ns	3-8
t _{PHZ}	Output Disable Time (ACT541)	5.0	2.0		11.0	1.0	12.0	ns	3-7
t _{PLZ}	Output Disable Time (ACT541)	5.0	2.0		9.0	1.0	10	ns	3-8

* Voltage Range 5.0 V is 5.0 V ±0.5 V.

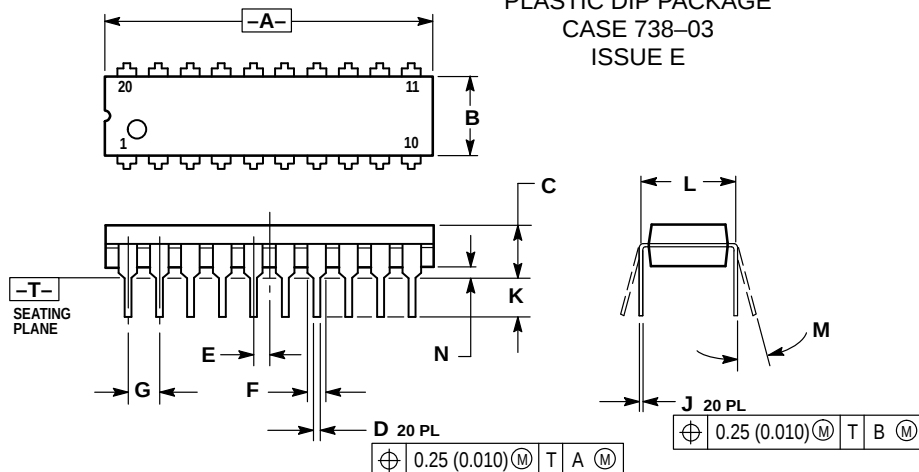
CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = 5.0 V
C _{PD}	Power Dissipation Capacitance	30	pF	V _{CC} = 5.0 V

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OUTLINE DIMENSIONS

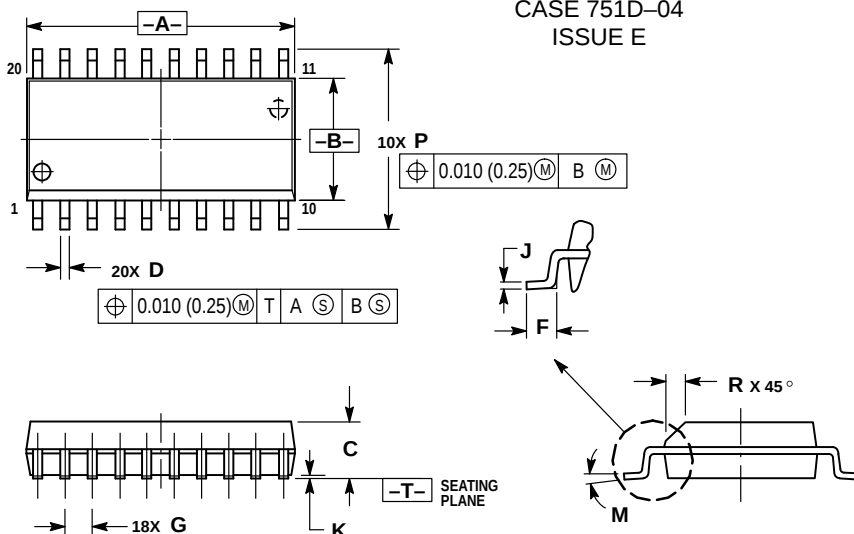
N SUFFIX PLASTIC DIP PACKAGE CASE 738-03 ISSUE E



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
 4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.010	1.070	25.66	27.17
B	0.240	0.260	6.10	6.60
C	0.150	0.180	3.81	4.57
D	0.015	0.022	0.39	0.55
E	0.050 BSC		1.27 BSC	
F	0.050	0.070	1.27	1.77
G	0.100 BSC		2.54 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.140	2.80	3.55
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.01

DW SUFFIX PLASTIC SOIC PACKAGE CASE 751D-04 ISSUE E



- 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 0.150 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	12.65	12.95	0.499	0.510
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.50	0.90	0.020	0.035
G	1.27 BSC		0.050 BSC	
J	0.25	0.32	0.010	0.012
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029

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MC74AC540/D

