

# 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.

### Features

- 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
- These are Pb-Free Devices

### TRUTH TABLE

Inputs			Outputs	
$\overline{OE}_1$	$\overline{OE}_2$	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

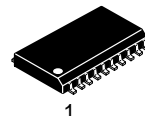
X = Immaterial

Z = High Impedance

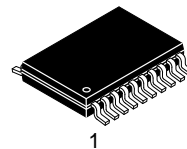


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SOIC-20W  
DW SUFFIX  
CASE 751D



TSSOP-20  
DT SUFFIX  
CASE 948E

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

### DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 8 of this data sheet.

# MC74AC540, MC74ACT540, MC74AC541, MC74ACT541

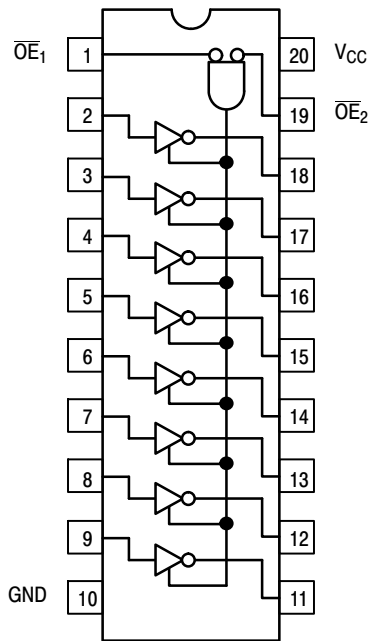


Figure 1. MC74AC540/74ACT540

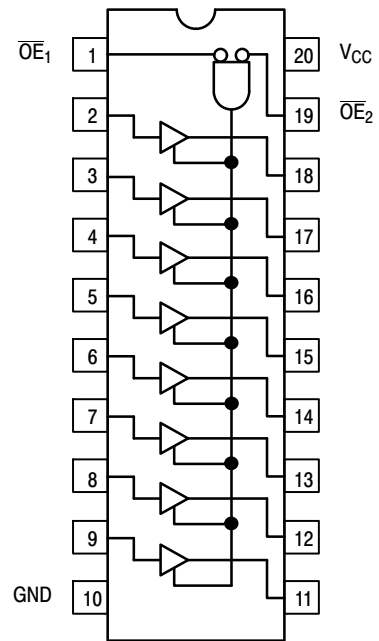


Figure 2. MC74AC541/74ACT541

# MC74AC540, MC74ACT540, MC74AC541, MC74ACT541

## MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	DC Supply Voltage (Referenced to GND)	-0.5 to +7.0	V
V <sub>IN</sub>	DC Input Voltage (Referenced to GND)	-0.5 to V <sub>CC</sub> +0.5	V
V <sub>OUT</sub>	DC Output Voltage (Referenced to GND) (Note 1)	-0.5 to V <sub>CC</sub> +0.5	V
I <sub>IK</sub>	DC Input Diode Current	±20	mA
I <sub>OK</sub>	DC Output Diode Current	±50	mA
I <sub>OUT</sub>	DC Output Sink/Source Current	±50	mA
I <sub>CC</sub>	DC Supply Current, per Output Pin	±50	mA
I <sub>GND</sub>	DC Ground Current, per Output Pin	±100	mA
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C
T <sub>L</sub>	Lead temperature, 1 mm from Case for 10 Seconds	260	°C
T <sub>J</sub>	Junction Temperature Under Bias	140	°C
θ <sub>JA</sub>	Thermal Resistance (Note 2)	SOIC TSSOP 65.8 110.7	°C/W
MSL	Moisture Sensitivity	Level 1	
F <sub>R</sub>	Flammability Rating	Oxygen Index: 30% – 35% UL 94 V-0 @ 0.125 in	
V <sub>ESD</sub>	ESD Withstand Voltage	Human Body Model (Note 3) Machine Model (Note 4) Charged Device Model (Note 5) > 2000 > 200 > 1000	V
I <sub>Latchup</sub>	Latchup Performance	Above V <sub>CC</sub> and Below GND at 85°C (Note 6)	±100 mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. I<sub>OUT</sub> absolute maximum rating must be observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.
3. Tested to EIA/JESD22-A114-A.
4. Tested to EIA/JESD22-A115-A.
5. Tested to JESD22-C101-A.
6. Tested to EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit	
V <sub>CC</sub>	Supply Voltage	'AC	2.0	5.0	6.0	V
		'ACT	4.5	5.0	5.5	
V <sub>IN</sub> , V <sub>OUT</sub>	DC Input Voltage, Output Voltage (Ref. to GND)	0	-	V <sub>CC</sub>	V	
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs	V <sub>CC</sub> @ 3.0 V	-	150	-	ns/V
		V <sub>CC</sub> @ 4.5 V	-	40	-	
		V <sub>CC</sub> @ 5.5 V	-	25	-	
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs	V <sub>CC</sub> @ 4.5 V	-	10	-	ns/V
		V <sub>CC</sub> @ 5.5 V	-	8.0	-	
T <sub>A</sub>	Operating Ambient Temperature Range	-40	25	85	°C	
I <sub>OH</sub>	Output Current – High	-	-	-24	mA	
I <sub>OL</sub>	Output Current – Low	-	-	24	mA	

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

1. V<sub>IN</sub> from 30% to 70% V<sub>CC</sub>; see individual Data Sheets for devices that differ from the typical input rise and fall times.
2. V<sub>IN</sub> from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

# MC74AC540, MC74ACT540, MC74AC541, MC74ACT541

## DC CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	74AC		74AC		Unit	Conditions
			T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C			
			Typ	Guaranteed Limits				
V <sub>IH</sub>	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1		V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V
		4.5	2.25	3.15	3.15			
		5.5	2.75	3.85	3.85			
V <sub>IL</sub>	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9		V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V
		4.5	2.25	1.35	1.35			
		5.5	2.75	1.65	1.65			
V <sub>OH</sub>	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9		V	I <sub>OUT</sub> = -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 <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> -12 mA I <sub>OH</sub> -24 mA -24 mA
		4.5	-	3.86	3.76			
		5.5	-	4.86	4.76			
V <sub>OL</sub>	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1		V	I <sub>OUT</sub> = 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 <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> 12 mA I <sub>OL</sub> 24 mA 24 mA
		4.5	-	0.36	0.44			
		5.5	-	0.36	0.44			
I <sub>IN</sub>	Maximum Input Leakage Current	5.5	-	±0.1	±1.0		μA	V <sub>I</sub> = V <sub>CC</sub> , GND
I <sub>OZ</sub>	Maximum 3-State Current	5.5	-	±0.5	±5.0		μA	V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub> V <sub>I</sub> = V <sub>CC</sub> , GND V <sub>O</sub> = V <sub>CC</sub> , GND
I <sub>OLD</sub>	†Minimum Dynamic Output Current	5.5	-	-	75		mA	V <sub>OLD</sub> = 1.65 V Max
I <sub>OHD</sub>		5.5	-	-	-75		mA	V <sub>OHD</sub> = 3.85 V Min
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5	-	8.0	80		μA	V <sub>IN</sub> = V <sub>CC</sub> 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<sub>IN</sub> and I<sub>CC</sub> @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V<sub>CC</sub>.

# MC74AC540, MC74ACT540, MC74AC541, MC74ACT541

**AC CHARACTERISTICS** (For Figures and Waveforms – See AND8277/D at [www.onsemi.com](http://www.onsemi.com))

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

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

# MC74AC540, MC74ACT540, MC74AC541, MC74ACT541

## DC CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	74ACT		74ACT		Unit	Conditions
			T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C			
			Typ	Guaranteed Limits				
V <sub>IH</sub>	Minimum High Level Input Voltage	4.5	1.5	2.0	2.0	V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V	
		5.5	1.5	2.0	2.0			
V <sub>IL</sub>	Maximum Low Level Input Voltage	4.5	1.5	0.8	0.8	V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V	
		5.5	1.5	0.8	0.8			
V <sub>OH</sub>	Minimum High Level Output Voltage	4.5	4.49	4.4	4.4	V	I <sub>OUT</sub> = -50 μA	
		5.5	5.49	5.4	5.4			
		4.5	-	3.86	3.76	V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> I <sub>OH</sub> -24 mA -24 mA	
		5.5	-	4.86	4.76			
V <sub>OL</sub>	Maximum Low Level Output Voltage	4.5	0.001	0.1	0.1	V	I <sub>OUT</sub> = 50 μA	
		5.5	0.001	0.1	0.1			
		4.5	-	0.36	0.44	V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> 24 mA I <sub>OL</sub> 24 mA	
		5.5	-	0.36	0.44			
I <sub>IN</sub>	Maximum Input Leakage Current	5.5	-	±0.1	±1.0	μA	V <sub>I</sub> = V <sub>CC</sub> , GND	
ΔI <sub>CCT</sub>	Additional Max. I <sub>CC</sub> /Input	5.5	0.6	-	1.5	mA	V <sub>I</sub> = V <sub>CC</sub> - 2.1 V	
I <sub>OZ</sub>	Maximum 3-State Current	5.5	-	±0.5	±5.0	μA	V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub> V <sub>I</sub> = V <sub>CC</sub> , GND V <sub>O</sub> = V <sub>CC</sub> , GND	
I <sub>OLD</sub>	†Minimum Dynamic Output Current	5.5	-	-	75	mA	V <sub>OLD</sub> = 1.65 V Max	
I <sub>OHD</sub>		5.5	-	-	-75	mA	V <sub>OHD</sub> = 3.85 V Min	
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5	-	8.0	80	μA	V <sub>IN</sub> = V <sub>CC</sub> 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 AND8277/D at www.onsemi.com)

Symbol	Parameter	V <sub>CC</sub> * (V)	74ACT			74ACT		Unit	Fig. No.
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF			T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF			
			Min	Typ	Max	Min	Max		
t <sub>PLH</sub>	Propagation Delay Data to Output ('ACT540)	5.0	1.0	–	7.0	1.0	7.5	ns	3–5
t <sub>PHL</sub>	Propagation Delay Data to Output ('ACT540)	5.0	1.0	–	8.0	1.0	8.5	ns	3–5
t <sub>PZH</sub>	Output Enable Time (‘ACT540)	5.0	1.0	–	10.5	1.0	11.5	ns	3–7
t <sub>PZL</sub>	Output Enable Time (‘ACT540)	5.0	1.0	–	9.5	1.0	10.5	ns	3–8
t <sub>PHZ</sub>	Output Disable Time (‘ACT540)	5.0	1.0	–	12.0	1.0	12.5	ns	3–7
t <sub>PLZ</sub>	Output Disable Time (‘ACT540)	5.0	1.5	–	9.0	1.0	10	ns	3–8
t <sub>PLH</sub>	Propagation Delay Data to Output ('ACT541)	5.0	1.5	–	7.5	1.0	8.0	ns	3–5
t <sub>PHL</sub>	Propagation Delay Data to Output ('ACT541)	5.0	1.5	–	7.5	1.0	8.0	ns	3–5
t <sub>PZH</sub>	Output Enable Time (‘ACT541)	5.0	2.0	–	10.0	1.0	11.0	ns	3–7
t <sub>PZL</sub>	Output Enable Time (‘ACT541)	5.0	1.5	–	9.5	1.0	10.5	ns	3–8
t <sub>PHZ</sub>	Output Disable Time (‘ACT541)	5.0	2.0	–	11.0	1.0	12.0	ns	3–7
t <sub>PLZ</sub>	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 <sub>IN</sub>	Input Capacitance	4.5	pF	V <sub>CC</sub> = 5.0 V
C <sub>PD</sub>	Power Dissipation Capacitance	30	pF	V <sub>CC</sub> = 5.0 V

# MC74AC540, MC74ACT540, MC74AC541, MC74ACT541

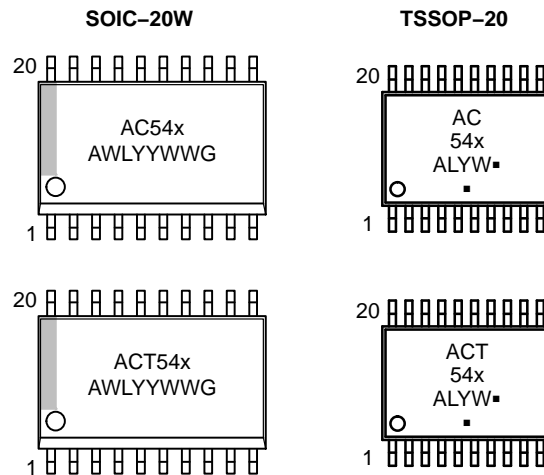
## ORDERING INFORMATION

Device	Package	Shipping†
MC74AC540DWG	SOIC–20 (Pb–Free)	38 Units / Rail
MC74AC540DWR2G	SOIC–20 (Pb–Free)	1000 / Tape & Reel
MC74ACT540DWG	SOIC–20 (Pb–Free)	38 Units / Rail
MC74ACT540DWR2G	SOIC–20 (Pb–Free)	1000 / Tape & Reel
MC74ACT540DTR2G	TSSOP–20 (Pb–Free)	2500 / Tape & Reel
MC74AC541DWG	SOIC–20 (Pb–Free)	38 Units / Rail
MC74AC541DWR2G	SOIC–20 (Pb–Free)	1000 / Tape & Reel
MC74ACT541DWG	SOIC–20 (Pb–Free)	38 Units / Rail
MC74ACT541DWR2G	SOIC–20 (Pb–Free)	1000 / Tape & Reel
MC74AC541DTR2G	TSSOP–20 (Pb–Free)	2500 / Tape & Reel
MC74ACT541DTG	TSSOP–20 (Pb–Free)	75 Units / Rail
MC74ACT541DTR2G	TSSOP–20 (Pb–Free)	2500 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*These packages are inherently Pb–Free.

## MARKING DIAGRAMS



x = 0 or 1  
A = Assembly Location  
WL, L = Wafer Lot  
YY, Y = Year  
WW, W = Work Week  
G or ▪ = Pb–Free Package

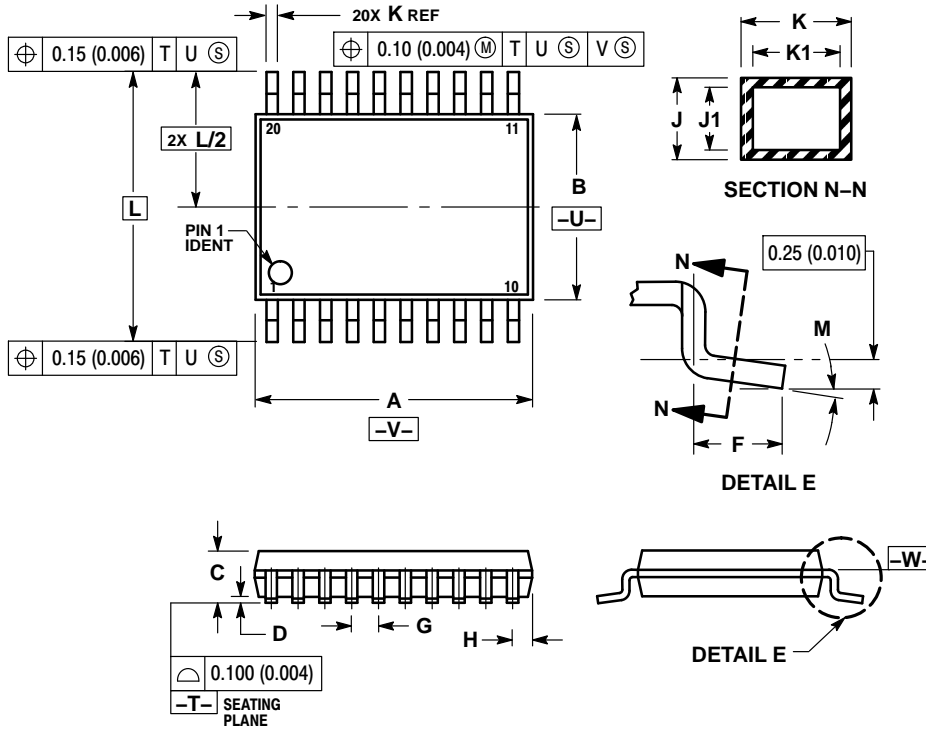
(Note: Microdot may be in either location)



# MC74AC540, MC74ACT540, MC74AC541, MC74ACT541

## PACKAGE DIMENSIONS

TSSOP-20  
DT SUFFIX  
CASE 948E-02  
ISSUE C

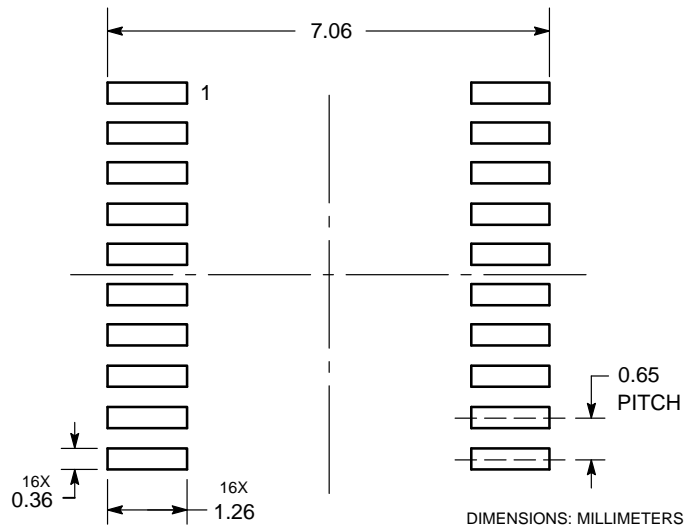


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.40	6.60	0.252	0.260
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.27	0.37	0.011	0.015
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

### SOLDERING FOOTPRINT\*

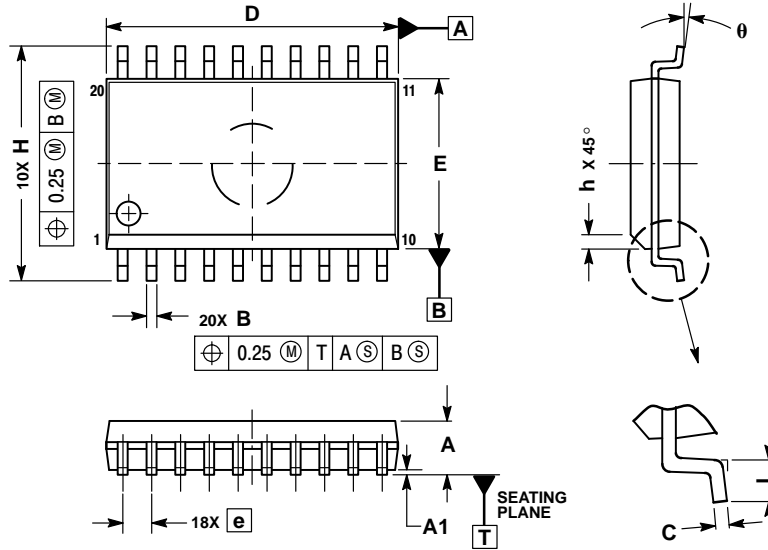


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# MC74AC540, MC74ACT540, MC74AC541, MC74ACT541

## PACKAGE DIMENSIONS

SOIC-20W  
DW SUFFIX  
CASE 751D-05  
ISSUE G



NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
B	0.35	0.49
C	0.23	0.32
D	12.65	12.95
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.50	0.90
θ	0°	7°

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