

MC74AC374, MC74ACT374

Octal D-Type Flip-Flop with 3-State Outputs

The MC74AC374/74ACT374 is a high-speed, low-power octal D-type flip-flop featuring separate D-type inputs for each flip-flop and 3-state outputs for bus-oriented applications. A buffered Clock (CP) and Output Enable ($\overline{OE}$) are common to all flip-flops.

Features

- Buffered Positive Edge-Triggered Clock
- 3-State Outputs for Bus-Oriented Applications
- Outputs Source/Sink 24 mA
- See MC74AC273 for Reset Version
- See MC74AC377 for Clock Enable Version
- See MC74AC373 for Transparent Latch Version
- See MC74AC574 for Broadside Pinout Version
- See MC74AC564 for Broadside Pinout Version with Inverted Outputs
- 'ACT374 Has TTL Compatible Inputs
- Pb-Free Packages are Available

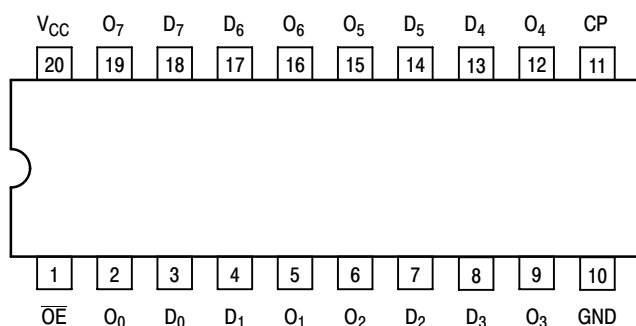


Figure 1. Pinout: 20 Lead Packages Conductors
(Top View)

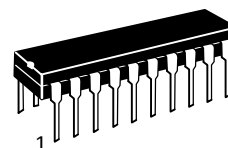
PIN ASSIGNMENT

PIN	FUNCTION
D ₀ -D ₇	Data Inputs
CP	Clock Pulse Input
$\overline{OE}$	3-State Output Enable Input
O ₀ -O ₇	3-State Outputs

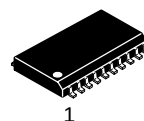


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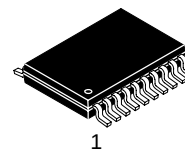
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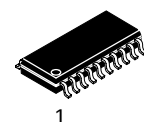
PDIP-20
N SUFFIX
CASE 738



SOIC-20W
DW SUFFIX
CASE 751D



TSSOP-20
DT SUFFIX
CASE 948E



SOEIAJ-20
M SUFFIX
CASE 967

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 6 of this data sheet.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

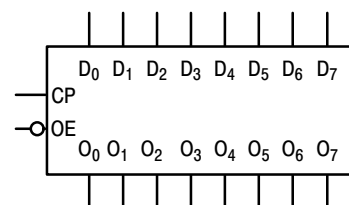


Figure 2. Logic Symbol

MC74AC374, MC74ACT374

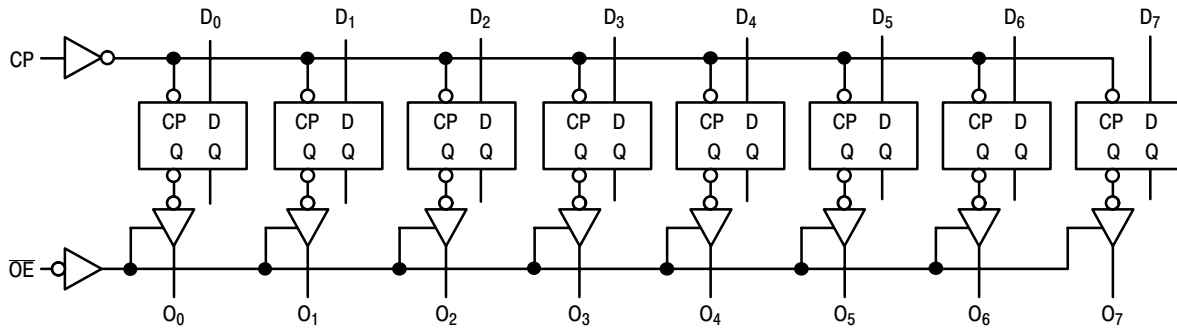
TRUTH TABLE

Inputs			Outputs
D _n	CP	$\overline{OE}$	O _n
H	$\downarrow$	L	H
L	$\downarrow$	L	L
X	X	H	Z

H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Immaterial
 Z = High Impedance
 $\downarrow$ = LOW-to-HIGH Transition

FUNCTIONAL DESCRIPTION

The MC74AC374/74ACT374 consists of eight edge-triggered flip-flops with individual D-type inputs and 3-state true outputs. The buffered clock and buffered Output Enable are common to all flip-flops. The eight flip-flops will store the state of their individual D inputs that meet the setup and hold time requirements on the LOW-to-HIGH Clock (CP) transition. With the Output Enable ($\overline{OE}$) LOW, the contents of the eight flip-flops are available at the outputs. When the $\overline{OE}$ is HIGH, the outputs go to the high impedance state. Operation of the $\overline{OE}$ input does not affect the state of the flip-flops.



NOTE: That this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Figure 3. Logic Diagram

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

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

MC74AC374, MC74ACT374

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.

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}.

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AC CHARACTERISTICS (For Figures and Waveforms – See AND8277/D at www.onsemi.com)

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		
f _{max}	Maximum Clock Frequency	3.3 5.0	60 100	110 155	– –	60 100	– –	MHz	3–3
t _{PLH}	Propagation Delay CP to O _n	3.3 5.0	3.0 2.5	11 8.0	13.5 9.5	1.5 1.5	15.5 10.5	ns	3–6
t _{PHL}	Propagation Delay CP to O _n	3.3 5.0	2.5 2.0	10 7.0	12.5 9.0	2.0 1.5	14 10	ns	3–6
t _{PZH}	Output Enable Time	3.3 5.0	3.0 2.0	9.5 7.0	11.5 8.5	1.5 1.0	13 9.5	ns	3–7
t _{PZL}	Output Enable Time	3.3 5.0	2.5 2.0	9.0 6.5	11.5 8.5	1.5 1.0	13 9.5	ns	3–8
t _{PHZ}	Output Disable Time	3.3 5.0	3.0 2.0	10.5 8.0	12.5 11	2.0 2.0	14.5 12.5	ns	3–7
t _{PLZ}	Output Disable Time	3.3 5.0	2.0 1.5	8.0 6.5	11.5 8.5	1.0 1.0	12.5 10	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.

AC OPERATING REQUIREMENTS

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		
			Typ	Guaranteed Minimum			
t _s	Setup Time, HIGH or LOW D _n to CP	3.3 5.0	2.0 1.0	5.5 4.0	6.0 4.5	ns	3-9
t _h	Hold Time, HIGH or LOW D _n to CP	3.3 5.0	-1.0 0	1.0 1.5	1.0 1.5	ns	3-9
t _w	CP Pulse Width HIGH or LOW	3.3 5.0	4.0 2.5	5.5 4.0	6.0 4.5	ns	3-6

*Voltage Range 3.3 V is 3.3 V ±0.3 V.

Voltage Range 5.0 V is 5.0 V ±0.5 V.

MC74AC374, MC74ACT374

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 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} 24 mA I _{OL} 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 _{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.

AC CHARACTERISTICS (For Figures and Waveforms – See AND8277/D at www.onsemi.com)

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		
f _{max}	Maximum Clock Frequency	5.0	100	160	–	90	–	MHz	3–3
t _{PLH}	Propagation Delay CP to O _n	5.0	2.0	8.5	10	2.0	11.5	ns	3–6
t _{PHL}	Propagation Delay CP to O _n	5.0	2.0	8.0	9.5	1.5	11	ns	3–6
t _{PZH}	Output Enable Time	5.0	2.0	8.0	9.5	1.5	10.5	ns	3–7
t _{PZL}	Output Enable Time	5.0	1.5	8.0	9.0	1.5	10.5	ns	3–8
t _{PHZ}	Output Disable Time	5.0	1.5	8.5	11.5	1.0	12.5	ns	3–7
t _{PLZ}	Output Disable Time	5.0	1.5	7.0	8.5	1.0	10	ns	3–8

*Voltage Range 5.0 V is 5.0 V ±0.5 V.

MC74AC374, MC74ACT374

AC OPERATING REQUIREMENTS (For Figures and Waveforms – See AND8277/D at www.onsemi.com)

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		
			Typ	Guaranteed Minimum			
t _s	Setup Time, HIGH or LOW D _n to CP	5.0	1.0	5.0	5.5	ns	3–9
t _h	Hold Time, HIGH or LOW D _n to CP	5.0	0	1.5	1.5	ns	3–9
t _w	CP Pulse Width HIGH or LOW	5.0	2.5	5.0	5.0	ns	3–6

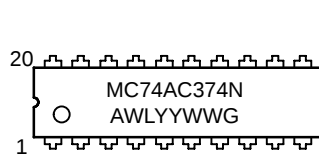
*Voltage Range 5.0 V is 5.0 V ±0.5 V.

CAPACITANCE

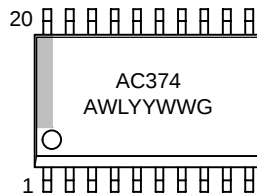
Symbol	Parameter	Value Typ	Unit	Test Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = 5.0 V
C _{PD}	Power Dissipation Capacitance	80	pF	V _{CC} = 5.0 V

MARKING DIAGRAMS

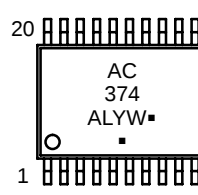
PDIP–20



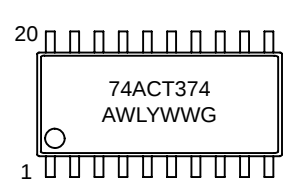
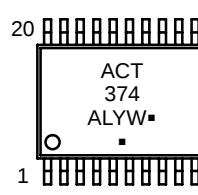
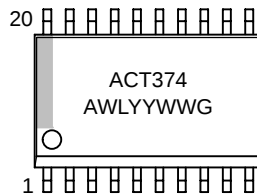
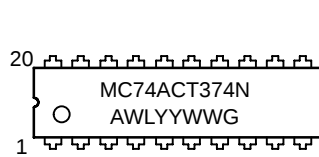
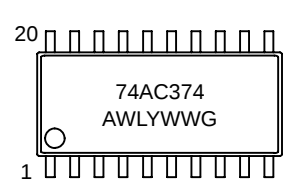
SOIC–20W



TSSOP–20



SOEIAJ–20



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)

MC74AC374, MC74ACT374

ORDERING INFORMATION

Device	Package	Shipping [†]
MC74AC374N	PDIP-20	18 Units / Rail
MC74AC374NG	PDIP-20 (Pb-Free)	
MC74ACT374N	PDIP-20	
MC74ACT374NG	PDIP-20 (Pb-Free)	
MC74AC374DW	SOIC-20	38 Units / Rail
MC74AC374DWG	SOIC-20 (Pb-Free)	
MC74AC374DWR2	SOIC-20	1000 / Tape & Reel
MC74AC374DWR2G	SOIC-20 (Pb-Free)	
MC74ACT374DW	SOIC-20	38 Units / Rail
MC74ACT374DWG	SOIC-20 (Pb-Free)	
MC74ACT374DWR2	SOIC-20	1000 / Tape & Reel
MC74ACT374DWR2G	SOIC-20 (Pb-Free)	
MC74AC374DTR2	TSSOP-20*	2500 / Tape & Reel
MC74AC374DTR2G	TSSOP-20*	
MC74ACT374DTR2	TSSOP-20*	2500 / Tape & Reel
MC74ACT374DTR2G	TSSOP-20*	
MC74AC374MEL	SOEIAJ-20	2000 / Tape & Reel
MC74AC374MELG	SOEIAJ-20 (Pb-Free)	
MC74ACT374MEL	SOEIAJ-20	2000 / Tape & Reel
MC74ACT374MELG	SOEIAJ-20 (Pb-Free)	

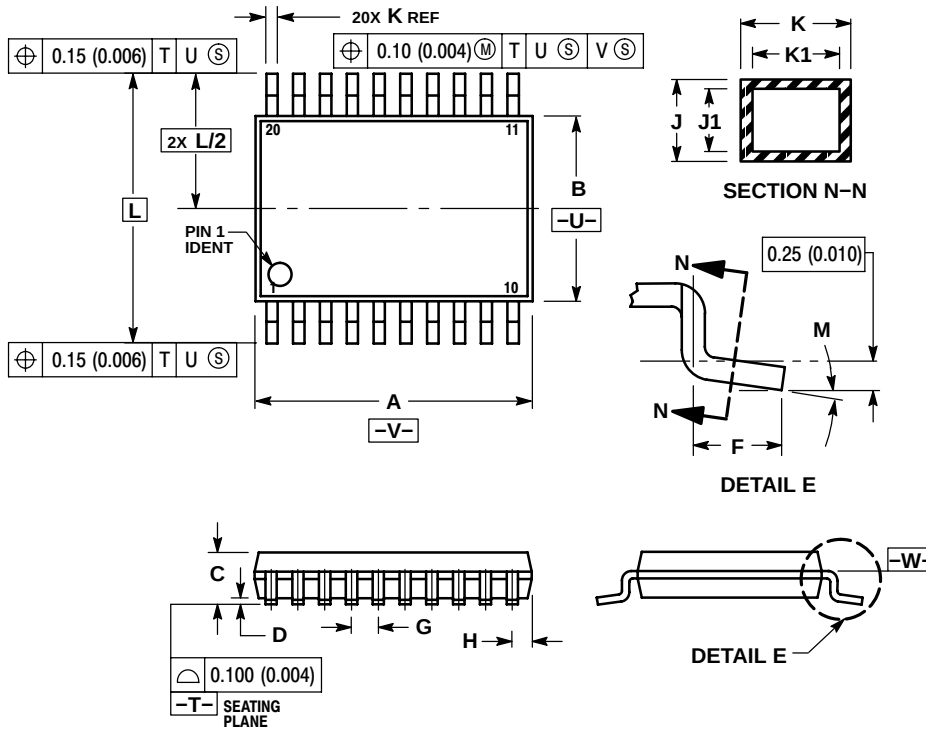
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*These packages are inherently Pb-Free.

MC74AC374, MC74ACT374

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*

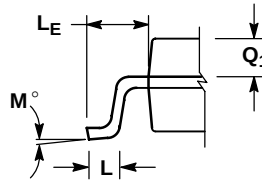
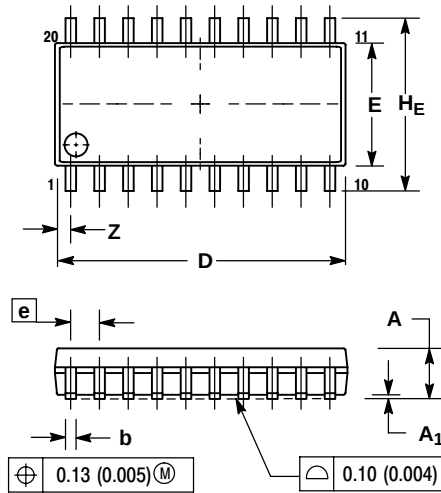


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

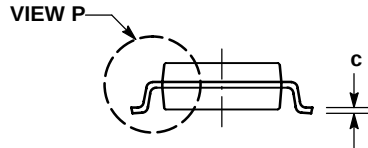
MC74AC374, MC74ACT374

PACKAGE DIMENSIONS

SOEIAJ-20
M SUFFIX
CASE 967-01
ISSUE A



DETAIL P



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	---	2.05	---	0.081
A ₁	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
c	0.15	0.25	0.006	0.010
D	12.35	12.80	0.486	0.504
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
H _E	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
L _E	1.10	1.50	0.043	0.059
M	0°	10°	0°	10°
Q ₁	0.70	0.90	0.028	0.035
Z	---	0.81	---	0.032

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