Octal D Flip-Flop with 3-State Outputs

MC74AC574, MC74ACT574

The MC74AC574/74ACT574 is a high−speed, low power octal flip−flop with a buffered common Clock (CP) and a buffered common Output Enable ($\overline{OE}$). The information presented to the D inputs is stored in the flip−flops on the LOW−to−HIGH Clock (CP) transition.

The MC74AC574/74ACT574 is functionally identical to the MC74AC374/74ACT374 except for the pinouts.

Features

- Inputs and Outputs on Opposite Sides of Package Allowing Easy Interface with Microprocessors
- Useful as Input or Output Port for Microprocessors
- Functionally Identical to MC74AC374/74ACT374
- 3-State Outputs for Bus-Oriented Applications
- Outputs Source/Sink 24 mA
- ′ACT574 Has TTL Compatible Inputs
- Pb−Free Packages are Available

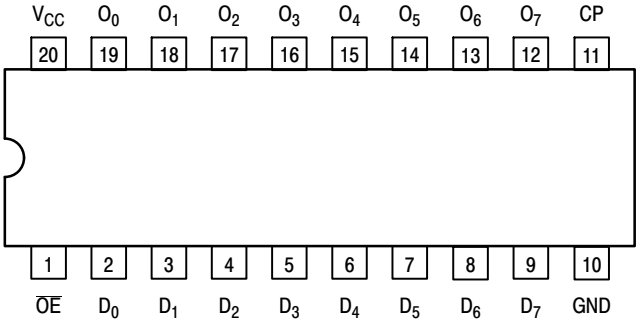


Figure 1. Pinout: 20−Lead Packages Conductors
(Top View)

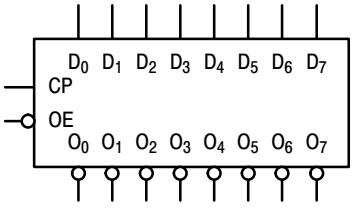
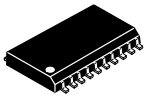


Figure 2. Logic Symbol

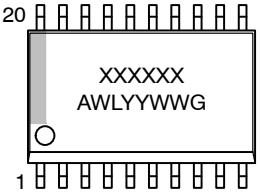
PIN ASSIGNMENT

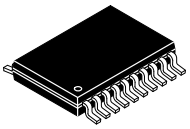
PIN	FUNCTION
D_0−D_7	Data Inputs
CP	Clock Pulse Input
$\overline{OE}$	3−State Output Enable Input
O_0−O_7	3−State Outputs

MARKING DIAGRAMS

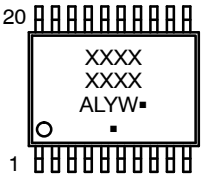


SOIC−20W
DW SUFFIX
CASE 751D





TSSOP−20
DT SUFFIX
CASE 948E



XXXXXX = Specific Device Code
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)

ORDERING INFORMATION

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

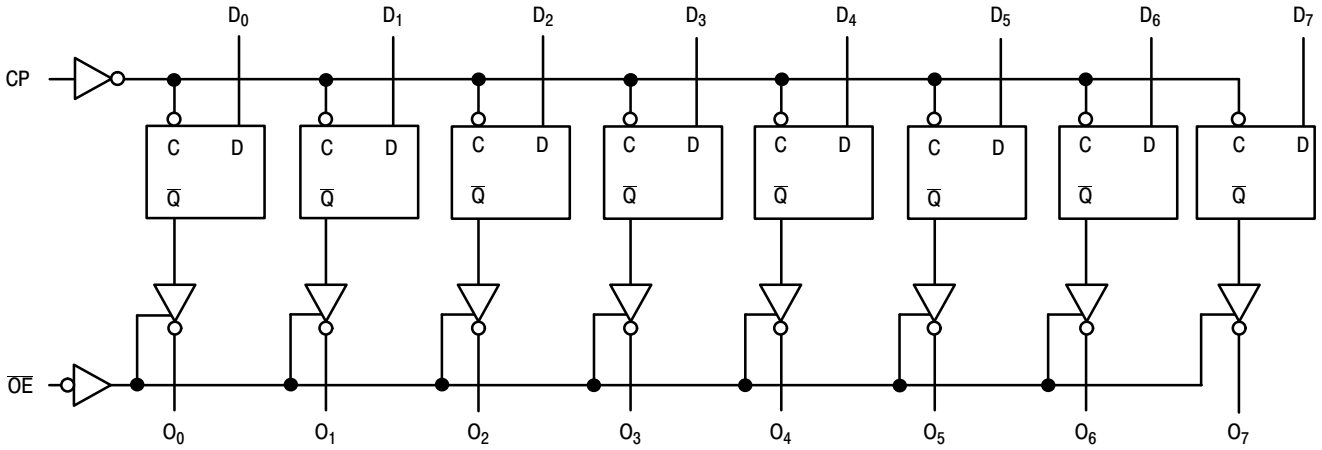
FUNCTIONAL DESCRIPTION

The MC74AC574/74ACT574 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 $\overline{OE}$ 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.

FUNCTION TABLE

Inputs			Internal	Outputs	Function
$\overline{OE}$	CP	D	Q	O_n	
H	H	L	NC	Z	Hold
H	H	H	NC	Z	Hold
H	⌐¬	L	L	Z	Load
H	⌐¬	H	H	Z	Load
L	⌐¬	L	L	L	Data Available
L	⌐¬	H	H	H	Data Available
L	H	L	NC	NC	No Change in Data
L	H	H	NC	NC	No Change in Data

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
Z = High Impedance
⌐¬ = LOW-to-HIGH Clock Transition
NC = No Change



NOTE: 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 +6.5	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 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.

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_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: 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}.

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

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		
f_{max}	Maximum Clock Frequency	3.3 5.0	75 95	– –	– –	60 85	– –	MHz	3–3
t_{PLH}	Propagation Delay CP to O_n	3.3 5.0	3.5 2.0	– –	13.5 9.5	3.5 2.0	15 11	ns	3–6
t_{PHL}	Propagation Delay CP to O_n	3.3 5.0	3.5 2.0	– –	12 8.5	3.5 2.0	13.5 9.5	ns	3–6
t_{PZH}	Output Enable Time	3.3 5.0	2.5 2.0	– –	11 8.5	2.5 2.0	12 9.0	ns	3–7
t_{PZL}	Output Enable Time	3.3 5.0	3.0 1.5	– –	10.5 8.0	3.5 2.0	11.5 9.0	ns	3–8
t_{PHZ}	Output Disable Time	3.3 5.0	4.0 2.0	– –	12 9.5	4.5 2.0	13 10.5	ns	3–7
t_{PLZ}	Output Disable Time	3.3 5.0	2.0 1.5	– –	9.0 7.5	2.5 1.5	10 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.

AC OPERATING REQUIREMENTS

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.
			Typ	Guaranteed Minimum			
t_s	Setup Time, HIGH or LOW D_n to CP	3.3 5.0	– –	2.5 1.5	3.0 2.0	ns	3–9
t_h	Hold Time, HIGH or LOW D_n to CP	3.3 5.0	– –	1.5 1.5	1.5 1.5	ns	3–9
t_w	CP Pulse Width HIGH or LOW	3.3 5.0	– –	6.0 4.0	7.0 5.0	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.

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_{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 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		
f_{max}	Maximum Clock Frequency	5.0	100	–	–	85	–	ns	3–3
t_{PLH}	Propagation Delay CP to O_n	5.0	2.5	–	11	2.0	12	ns	3–6
t_{PHL}	Propagation Delay CP to O_n	5.0	2.0	–	10	1.5	11	ns	3–6
t_{PZH}	Output Enable Time	5.0	2.0	–	9.5	1.5	10	ns	3–7
t_{PZL}	Output Enable Time	5.0	2.0	–	9.0	1.5	10	ns	3–8
t_{PHZ}	Output Disable Time	5.0	2.0	–	10.5	1.5	11.5	ns	3–7
t_{PLZ}	Output Disable Time	5.0	2.0	–	8.5	1.5	9.0	ns	3–8

*Voltage Range 5.0 V is 5.0 V ±0.5 V.

AC OPERATING REQUIREMENTS

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	–	2.5	2.5	ns	3–9
t_h	Hold Time, HIGH or LOW D_n to CP	5.0	–	1.0	1.0	ns	3–9
t_w	CP Pulse Width HIGH or LOW	5.0	–	3.0	4.0	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.

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	40	pF	V_{CC} = 5.0 V

ORDERING INFORMATION

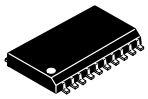
Device	Marking	Package	Shipping†
MC74AC574DWG	AC574	SOIC−20	38 Units / Rail
MC74AC574DWR2G	AC574	SOIC−20	1000 / Tape & Reel
MC74ACT574DWG	ACT574	SOIC−20	38 Units / Rail
MC74ACT574DWR2G	ACT574	SOIC−20	1000 / Tape & Reel
MC74AC574DTR2G	AC 574	TSSOP−20	2500 / Tape & Reel
MC74ACT574DTR2G	ACT 574	TSSOP−20	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.

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

SOIC−20 WB
CASE 751D−05
ISSUE H

DATE 22 APR 2015



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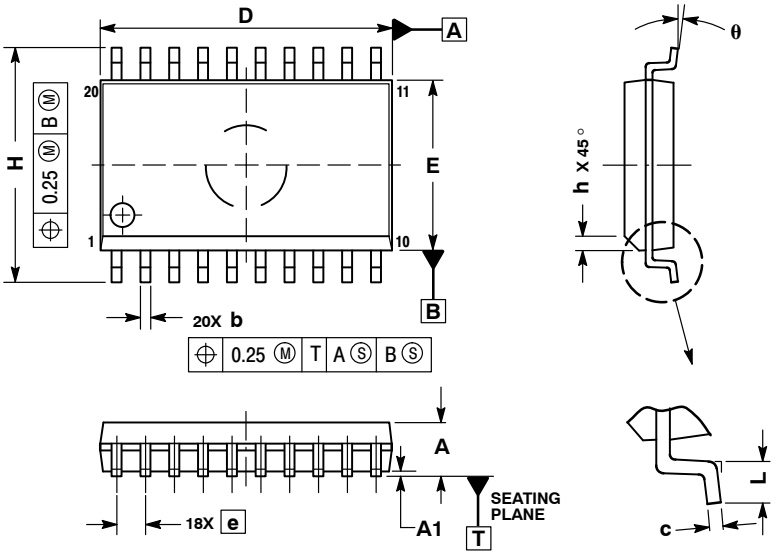
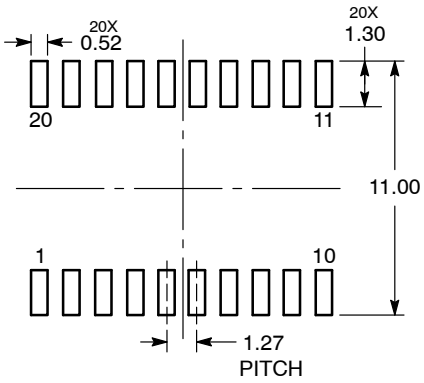


NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS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

	MILLIMETERS	
DIM	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°

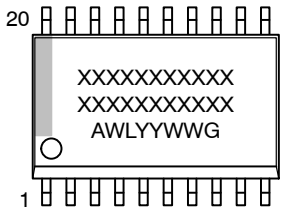
RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week
G = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

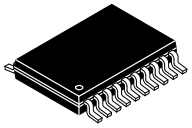
DOCUMENT NUMBER:	**98ASB42343B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**SOIC−20 WB**	**PAGE 1 OF 1**

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

TSSOP−20 WB
CASE 948E
ISSUE D

DATE 17 FEB 2016



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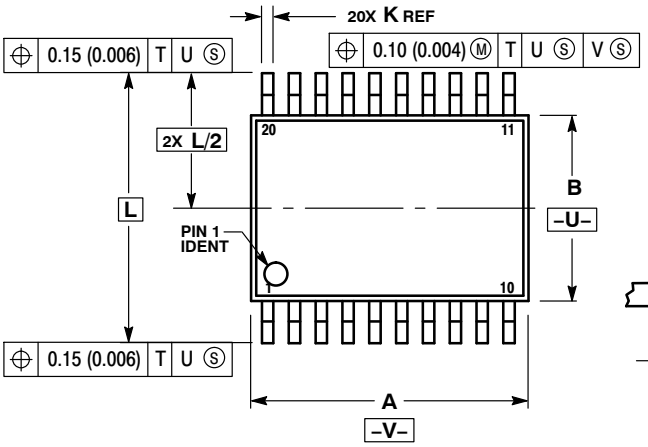
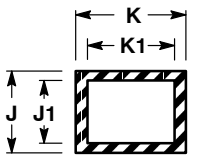
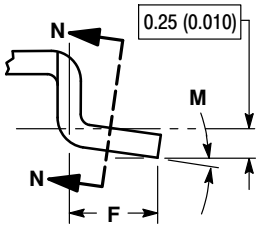
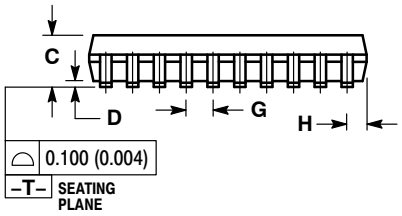


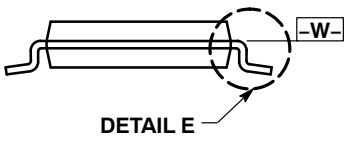


SECTION N−N



DETAIL E

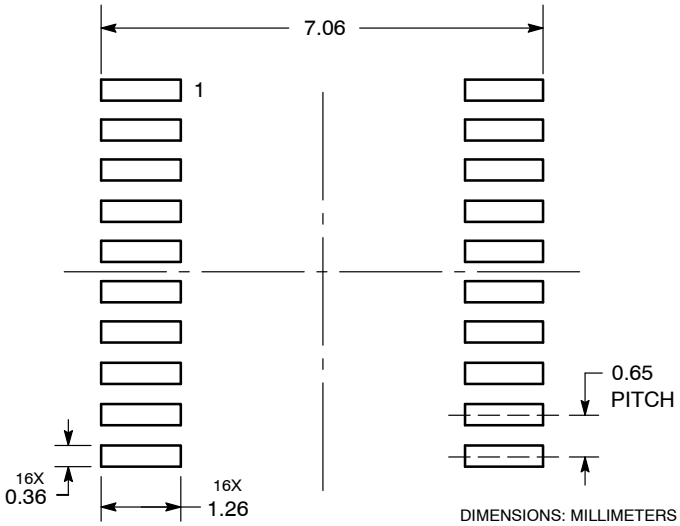




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD 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−.

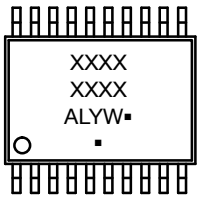
	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	6.40	6.60	0.252	0.260
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.27	0.37	0.011	0.015
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010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

SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

GENERIC MARKING DIAGRAM*



A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “ ▪”, may or may not be present.

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