

MC74HCT241A

Octal 3-State Noninverting Buffer/Line Driver/ Line Receiver with LSTTL-Compatible Inputs

High-Performance Silicon-Gate CMOS

The MC74HCT241A is identical in pinout to the LS241. This device may be used as a level converter for interfacing TTL or NMOS outputs to High-Speed CMOS inputs. The HCT241A is an octal noninverting buffer/line driver/line receiver designed to be used with 3-state memory address drivers, clock drivers, and other bus-oriented systems. The device has non-inverted outputs and two output enables. Enable A is active-low and Enable B is active-high.

The HCT241A is similar in function to the HCT244. See also HCT240.

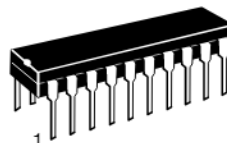
Features

- Output Drive Capability: 15 LSTTL Loads
- TTL/NMOS Compatible Input Levels
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 4.5 to 5.5 V
- Low Input Current: 1.0 μ A
- In Compliance with the Requirements Defined by JEDEC Standard No. 7A
- Chip Complexity: 118 FETs or 29.5 Equivalent Gates
- Pb-Free Packages are Available*

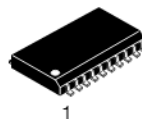


ON Semiconductor®

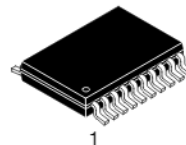
<http://onsemi.com>



PDIP-20
N SUFFIX
CASE 738



SOIC-20W
DW SUFFIX
CASE 751D



TSSOP-20
DT SUFFIX
CASE 948E

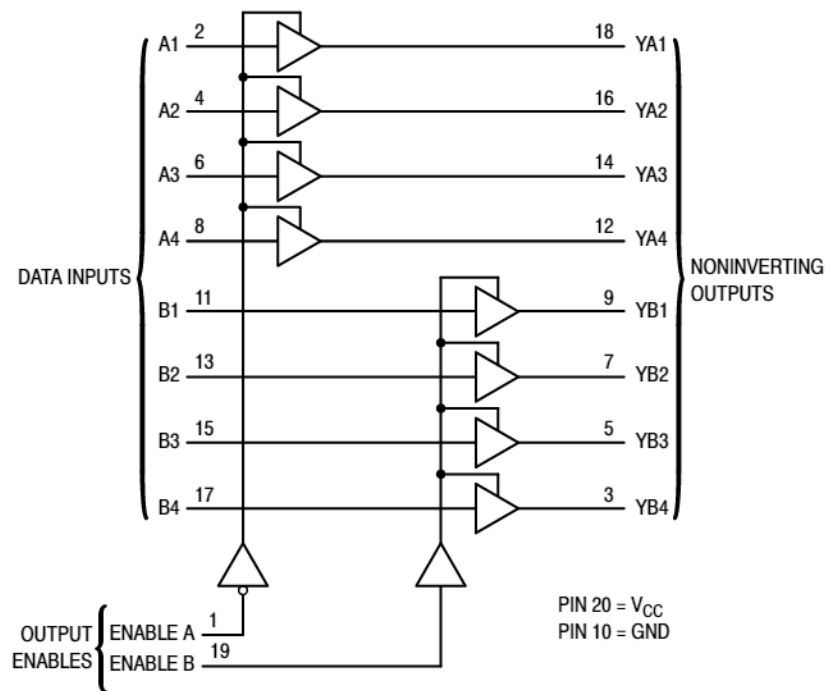
ORDERING INFORMATION

See detailed ordering, shipping information, and marking information in the package dimensions section on page 6 of this data sheet.

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

MC74HCT241A

LOGIC DIAGRAM



PIN ASSIGNMENT

ENABLE A	1	20	V_{CC}
A1	2	19	ENABLE B
YB4	3	18	YA1
A2	4	17	B4
YB3	5	16	YA2
A3	6	15	B3
YB2	7	14	YA3
A4	8	13	B2
YB1	9	12	YA4
GND	10	11	B1

FUNCTION TABLE

Inputs		Output
Enable A	A	YA
L	L	L
L	H	H
H	X	Z

Inputs		Output
Enable B	B	YB
H	L	L
H	H	H
L	X	Z

Z = high impedance

X = don't care

MC74HCT241A

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 Current, per Pin	± 35	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	± 75	mA
P_D	Power Dissipation in Still Air, Plastic or Ceramic DIP† SOIC Package†	750 500	mW
T_{stg}	Storage Temperature	- 65 to + 150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP or SOIC Package) (Ceramic DIP)	260 300	°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range $GND \leq (V_{in} \text{ or } V_{out}) \leq V_{CC}$. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

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.

†Derating — Plastic DIP: - 10 mW/°C from 65° to 125°C
Ceramic DIP: - 10 mW/°C from 100° to 125°C
SOIC Package: - 7 mW/°C from 65° to 125°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	4.5	5.5	V
V_{in}, V_{out}	DC Input Voltage, Output Voltage (Referenced to GND)	0	V_{CC}	V
T_A	Operating Temperature, All Package Types	- 55	+ 125	°C
t_r, t_f	Input Rise and Fall Time (Figure 1)	0	500	ns

DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V _{CC} V	Guaranteed Limit			Unit
				− 55 to 25°C	≤ 85°C	≤ 125°C	
V _{IH}	Minimum High-Level Input Voltage	V _{out} = 0.1 V or V _{CC} − 0.1 V I _{out} ≤ 20 μA	4.5 5.5	2 2	2 2	2 2	V
V _{IL}	Maximum Low-Level Input Voltage	V _{out} = 0.1 V or V _{CC} − 0.1 V I _{out} ≤ 20 μA	4.5 5.5	0.8 0.8	0.8 0.8	0.8 0.8	V
V _{OH}	Minimum High-Level Output Voltage	V _{in} = V _{IH} or V _{IL} I _{out} ≤ 20 μA	4.5 5.5	4.4 5.4	4.4 5.4	4.4 5.4	V
		V _{in} = V _{IH} or V _{IL} I _{out} ≤ 6 mA	4.5	3.98	3.84	3.7	
V _{OL}	Maximum Low-Level Output Voltage	V _{in} = V _{IH} or V _{IL} I _{out} ≤ 20 μA	4.5 5.5	0.1 0.1	0.1 0.1	0.1 0.1	V
		V _{in} = V _{IH} or V _{IL} I _{out} ≤ 6 mA	4.5	0.26	0.33	0.4	
I _{in}	Maximum Input Leakage Current	V _{in} = V _{CC} or GND	5.5	± 0.1	± 1.0	± 1.0	μA
I _{OZ}	Maximum Three-State Leakage Current	Output in High-Impedance State V _{in} = V _{IL} or V _{IH} V _{out} = V _{CC} or GND	5.5	± 0.5	± 5.0	± 10	μA
I _{CC}	Maximum Quiescent Supply Current (per Package)	V _{in} = V _{CC} or GND I _{out} = 0 μA	5.5	4	40	160	μA
ΔI _{CC}	Additional Quiescent Supply Current	V _{in} = 2.4 V, Any One Input V _{in} = V _{CC} or GND, Other Inputs I _{out} = 0 μA	5.5	≥ −55°C	25°C to 125°C		mA
				2.9	2.4		

1. Total Supply Current = $I_{CC} + \Sigma \Delta I_{CC}$.

MC74HCT241A

AC ELECTRICAL CHARACTERISTICS ($V_{CC} = 5.0 \text{ V} \pm 10\%$, $C_L = 50 \text{ pF}$, Input $t_r = t_f = 6 \text{ ns}$)

Symbol	Parameter	Guaranteed Limit			Unit
		– 55 to 25°C	≤ 85°C	≤ 125°C	
t _{PLH} , t _{PHL}	Maximum Propagation Delay, A to YA or B to YB (Figures 1 and 3)	23	29	35	ns
t _{PLZ} , t _{PHZ}	Maximum Propagation Delay, Output Enable to YA or YB (Figures 2 and 4)	30	38	45	ns
t _{PZL} , t _{PZH}	Maximum Propagation Delay, Output Enable to YA or YB (Figures 2 and 4)	26	33	39	ns
t _{TLH} , t _{THL}	Maximum Output Transition Time, Any Output (Figures 1 and 3)	12	15	18	ns
C _{in}	Maximum Input Capacitance	10	10	10	pF
C _{out}	Maximum Three-State Output Capacitance (Output in High-Impedance State)	15	15	15	pF
C _{PD}	Power Dissipation Capacitance (Per Enabled Output)*	Typical @ 25°C, V _{CC} = 5.0 V			pF
		55			

* Used to determine the no-load dynamic power consumption: $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$.

SWITCHING WAVEFORMS

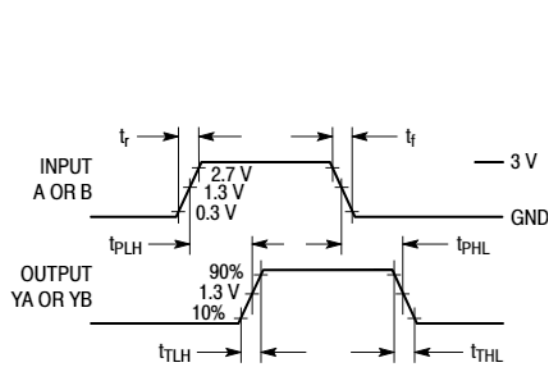


Figure 1.

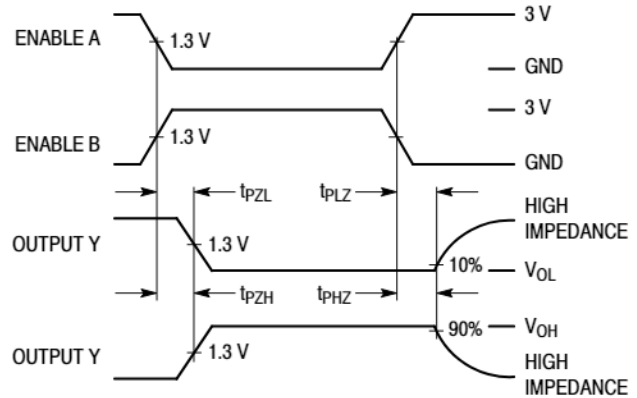
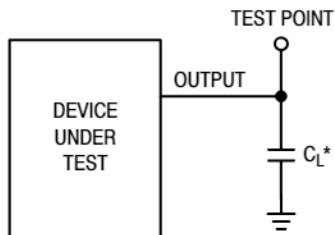
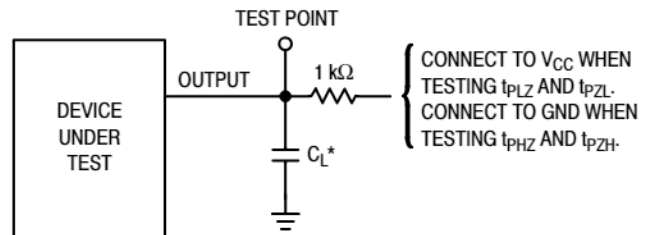


Figure 2.



*Includes all probe and jig capacitance

Figure 3. Test Circuit

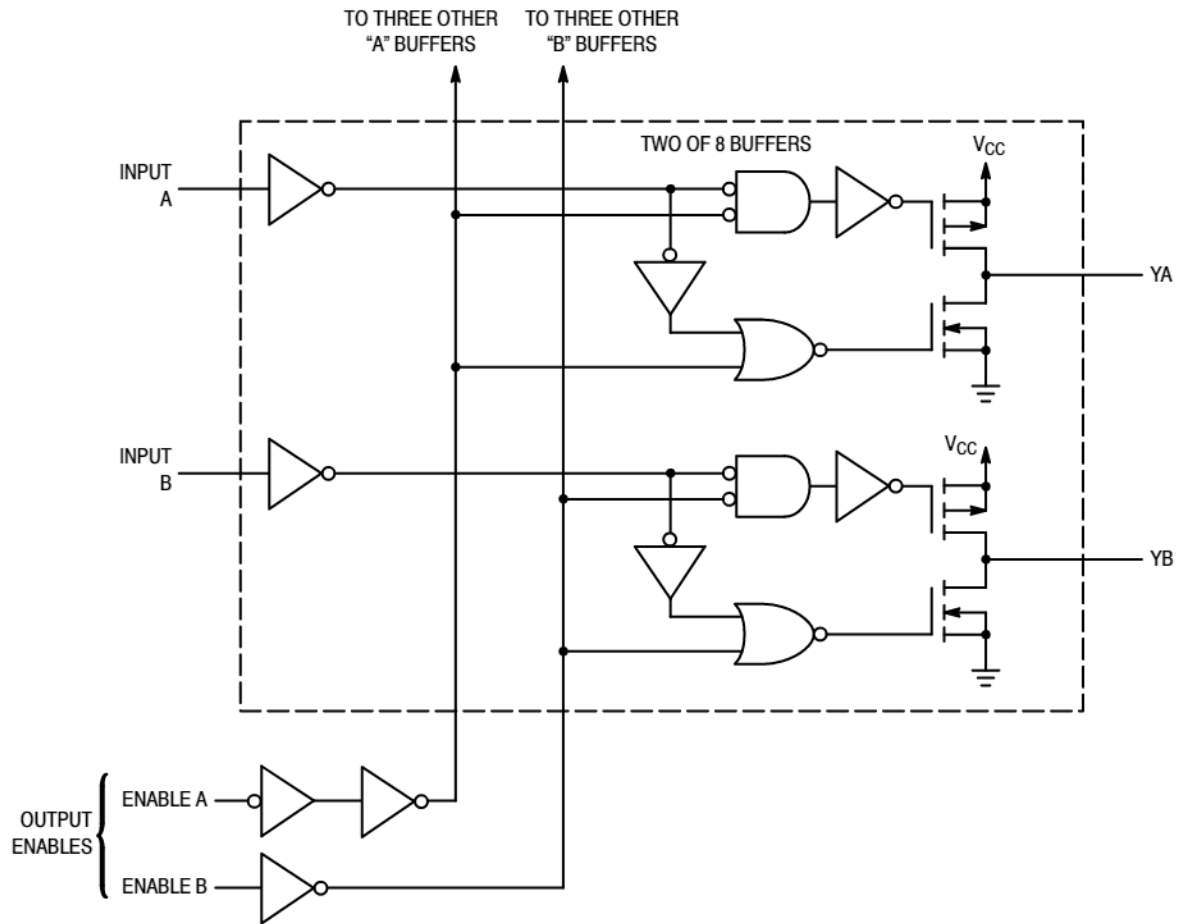


*Includes all probe and jig capacitance

Figure 4. Test Circuit

MC74HCT241A

LOGIC DETAIL



MC74HCT241A

ORDERING INFORMATION

Device	Package	Shipping†
MC74HCT241ANG	PDIP-20 (Pb-Free)	18 Units / Rail
MC74HCT241ADWG	SOIC-20 (Pb-Free)	38 Units / Rail
MC74HCT241ADWR2G	SOIC-20 (Pb-Free)	1000 / Tape & Reel
MC74HCT241ADTG	TSSOP-20*	75 Units / Rail
MC74HCT241ADTR2G	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.

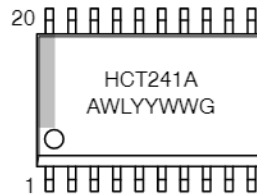
*These packages are inherently Pb-Free.

MARKING DIAGRAMS

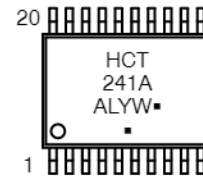
PDIP-20



SOIC-20W



TSSOP-20

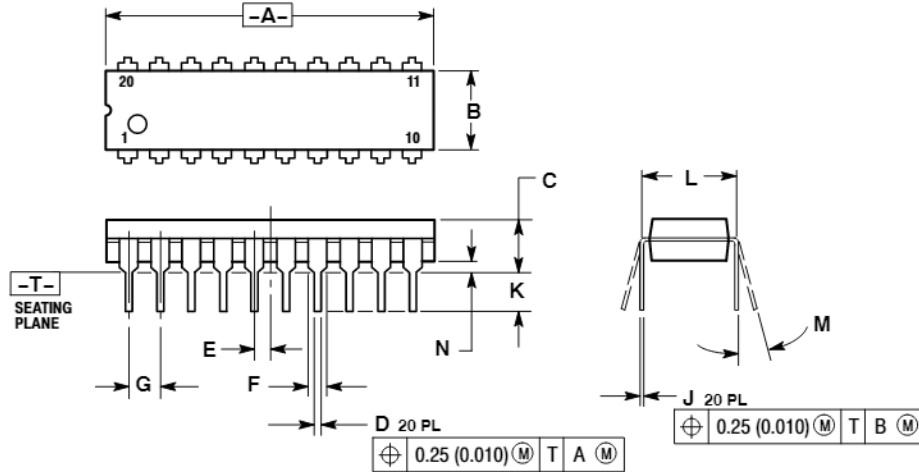


A = Assembly Location
 WL, L = Wafer Lot
 YY, Y = Year
 WW, W = Work Week
 G or ■ = Pb-Free Package
 (Note: Microdot may be in either location)

MC74HCT241A

PACKAGE DIMENSIONS

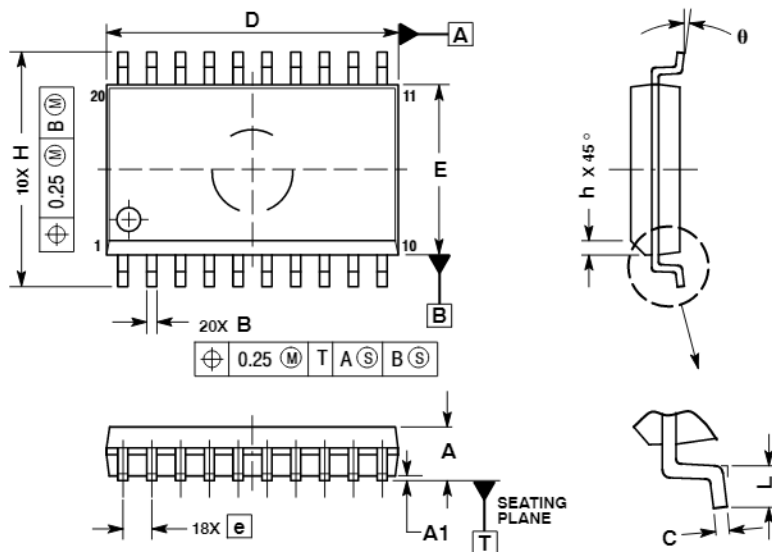
PDIP-20
N SUFFIX
PLASTIC DIP PACKAGE
CASE 738-03
ISSUE E



- 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

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°

PACKAGE DIMENSIONS

Figure 1: Mechanical drawing of the 20-pin connector. The drawing includes a top view, a side view, and two detail views.

Top View: Shows the connector with 20 pins. Dimensions include $20X K_{REF}$, $0.15 (0.006)$, $2X L/2$, L , $0.10 (0.004)$, $0.15 (0.006)$, A , B , and $-U-$. Tolerances are indicated by circles with crosses. A "PIN 1 IDENT" circle is shown.

Side View: Shows the profile of the connector. Dimensions include C , D , G , and H . A tolerance of $0.100 (0.004)$ is indicated. A "SEATING PLANE" is marked with $-T-$.

Detail E: Shows the internal structure of the connector. Dimensions include $0.25 (0.010)$, F , and M .

Detail F: Shows the internal structure of the connector. Dimensions include K , $K1$, J , and $J1$. A "SECTION N-N" is indicated.

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°

Figure 1: Dimensions of the test specimen. The diagram shows a rectangular specimen with a central vertical slot. The total width is 7.06 mm. The width of the left and right sections is 1.26 mm each. The height of the specimen is 16X 0.36 mm. The pitch of the central slot is 0.65 mm. The dimensions are in millimeters.

MC74HCT241A

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada

Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

Japan Customer Focus Center
Phone: 81-3-5773-3850

ON Semiconductor Website: www.onsemi.com

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local
Sales Representative