

# Octal 3-State Non-Inverting Transparent Latch

High-Performance Silicon-Gate CMOS

## MC74HC373A, MC74HCT373A

The MC74HC373A/MC74HCT373A is identical in pinout to the LS373. The MC74HC373A inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs. The MC74HCT373A may be used as a level converter for interfacing TTL or NMOS outputs to High-Speed CMOS inputs.

The eight latches of this device are transparent D-type latches. While Latch Enable is high, the Q outputs follow the Data Inputs. When Latch Enable goes low, data meeting the setup and hold time becomes latched.

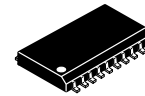
The Output Enable input does not affect the state of the latches, but when Output Enable is high, all outputs are forced to the high-impedance state. Thus, data may be latched even when the outputs are not enabled.

The HC373A/HCT373A is identical in function to the HC573A/HCT573A which has the data inputs on the opposite side of the package from the outputs to facilitate PC board layout.

The HC373A/HCT373A is the non-inverting version of the HC533A/HCT533A.

### Features

- Output Drive Capability: 15 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS and TTL
- Operating Voltage Range: 2.0 to 6.0 V (HC), 4.5 to 5.5 V (HCT)
- Low Input Current: 1.0  $\mu$ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance with the JEDEC Standard No. 7.0 A Requirements
- Chip Complexity: 196 FETs or 49 Equivalent Gates
- These Devices are Pb-Free and are RoHS Compliant

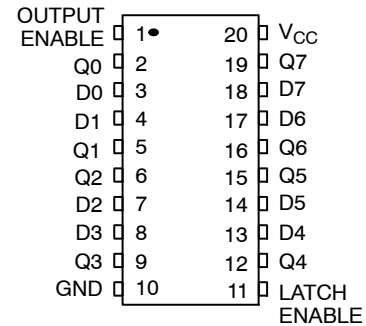


SOIC-20  
DW SUFFIX  
CASE 751D

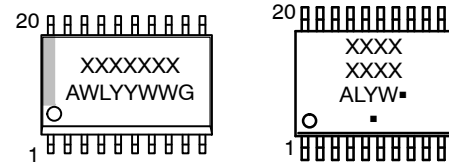


TSSOP-20  
DT SUFFIX  
CASE 948E

### PIN ASSIGNMENT



### MARKING DIAGRAMS



SOIC-20

TSSOP-20

XXXXXXXX = 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)

### FUNCTION TABLE

Inputs		Output	
Output Enable	Latch Enable	D	Q
L	H	H	H
L	H	L	L
L	L	X	No Change
H	X	X	Z

X = Don't Care

Z = High Impedance

### ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

# MC74HC373A, MC74HCT373A

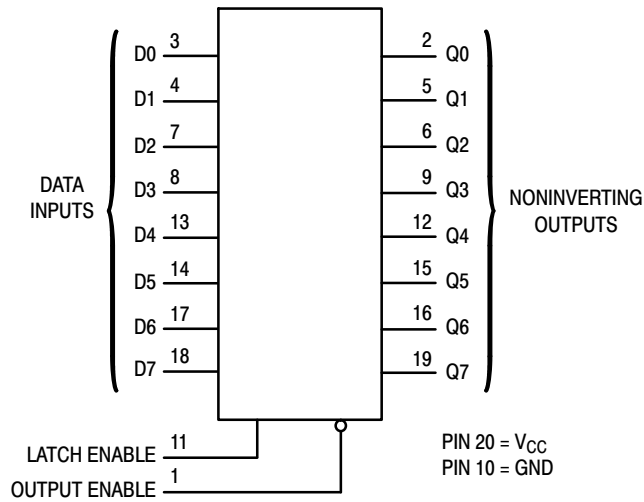


Figure 1. Logic Diagram

## MAXIMUM RATINGS

Symbol	Parameter	Value	Unit	
$V_{CC}$	DC Supply Voltage	-0.5 to +6.5	V	
$V_{IN}$	DC Input Voltage	-0.5 to $V_{CC}+0.5$	V	
$V_{OUT}$	DC Output Voltage	-0.5 to $V_{CC}+0.5$	V	
$I_{IN}$	DC Input Diode Current, per Pin	$\pm 20$	mA	
$I_{OUT}$	DC Input Diode Current, Per Pin	$\pm 35$	mA	
$I_{CC}$	DC Supply Current, $V_{CC}$ and GND Pins	$\pm 75$	mA	
$I_{IK}$	Input Clamp Current ( $V_{IN} < 0$ or $V_{IN} > V_{CC}$ )	$\pm 20$	mA	
$I_{OK}$	Output Clamp Current ( $V_{OUT} < 0$ or $V_{OUT} > V_{CC}$ )	$\pm 20$	mA	
$T_{STG}$	Storage Temperature Range	-65 to +150	$^{\circ}C$	
$T_L$	Lead Temperature, 1 mm from Case for 10 secs	260	$^{\circ}C$	
$T_J$	Junction Temperature Under Bias	+150	$^{\circ}C$	
$\theta_{JA}$	Thermal Resistance (Note 1)	SOIC-20W WQFN20 QFN20 TSSOP-20	96 99 111 150	$^{\circ}C/W$
$P_D$	Power Dissipation in Still Air at 25 $^{\circ}C$	SOIC-20W WQFN20 QFN20 TSSOP-20	1302 1256 1127 833	mW
MSL	Moisture Sensitivity	Level 1	-	
$F_R$	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	-
$V_{ESD}$	ESD Withstand Voltage (Note 2)	Human Body Model Charged Device Model	> 2000 > 1000	V

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. Measured with minimum pad spacing on an FR4 board, using 76 mm-by-114 mm, 2-ounce copper trace no air flow per JESD51-7.
2. HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.

# MC74HC373A, MC74HCT373A

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
<b>MC74HC</b>				
$V_{CC}$	DC Supply Voltage	2.0	6.0	V
$V_{IN}, V_{OUT}$	DC Input Voltage, Output Voltage (Note 3)	0	$V_{CC}$	V
$T_A$	Operating Free-Air Temperature	-55	+125	°C
$t_r, t_f$	Input Rise or Fall Time	$V_{CC} = 2.0\text{ V}$ 0 $V_{CC} = 4.5\text{ V}$ 0 $V_{CC} = 6.0\text{ V}$ 0	1000 500 400	ns
<b>MC74HCT</b>				
$V_{CC}$	DC Supply Voltage	4.5	5.5	V
$V_{IN}, V_{OUT}$	DC Input Voltage, Output Voltage (Note 3)	0	$V_{CC}$	V
$T_A$	Operating Free-Air Temperature	-55	+125	°C
$t_r, t_f$	Input Rise or Fall Time	0	500	ns

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.

3. 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.

## DC ELECTRICAL CHARACTERISTICS (MC74HC373A)

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	$V_{out} = V_{CC} - 0.1\text{ V}$ $ I_{out}  \leq 20\ \mu\text{A}$	2.0	1.5	1.5	1.5	V
			3.0	2.1	2.1	2.1	
			4.5	3.15	3.15	3.15	
			6.0	4.2	4.2	4.2	
$V_{IL}$	Maximum Low-Level Input Voltage	$V_{out} = 0.1\text{ V}$ $ I_{out}  \leq 20\ \mu\text{A}$	2.0	0.5	0.5	0.5	V
			3.0	0.9	0.9	0.9	
			4.5	1.35	1.35	1.35	
			6.0	1.8	1.8	1.8	
$V_{OH}$	Minimum High-Level Output Voltage	$V_{in} = V_{IH}$ $ I_{out}  \leq 20\ \mu\text{A}$	2.0	1.9	1.9	1.9	V
			4.5	4.4	4.4	4.4	
			6.0	5.9	5.9	5.9	
		$V_{in} = V_{IH}$ $ I_{out}  \leq 2.4\text{ mA}$ $ I_{out}  \leq 6.0\text{ mA}$ $ I_{out}  \leq 7.8\text{ mA}$	3.0	2.48	2.34	2.2	
			4.5	3.98	3.84	3.7	
			6.0	5.48	5.34	5.2	
$V_{OL}$	Maximum Low-Level Output Voltage	$V_{in} = V_{IL}$ $ I_{out}  \leq 20\ \mu\text{A}$	2.0	0.1	0.1	0.1	V
			4.5	0.1	0.1	0.1	
			6.0	0.1	0.1	0.1	
		$V_{in} = V_{IL}$ $ I_{out}  \leq 2.4\text{ mA}$ $ I_{out}  \leq 6.0\text{ mA}$ $ I_{out}  \leq 7.8\text{ mA}$	3.0	0.26	0.33	0.4	
			4.5	0.26	0.33	0.4	
			6.0	0.26	0.33	0.4	
$I_{in}$	Maximum Input Leakage Current	$V_{in} = V_{CC}$ or GND	6.0	±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	6.0	±0.5	±5.0	±10	μA
$I_{CC}$	Maximum Quiescent Supply Current (per Package)	$V_{in} = V_{CC}$ or GND $I_{out} = 0\ \mu\text{A}$	6.0	4.0	40	160	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

# MC74HC373A, MC74HCT373A

## AC ELECTRICAL CHARACTERISTICS (MC74HC373A) (See Figures 2 and 3)

Symbol	Parameter	V <sub>CC</sub> V	Guaranteed Limit			Unit
			-55 to 25°C	≤ 85°C	≤ 125°C	
t <sub>PLH</sub> t <sub>PHL</sub>	Maximum Propagation Delay, Input D to Q	2.0	125	155	190	ns
		3.0	80	110	130	
		4.5	25	31	38	
		6.0	21	26	32	
t <sub>PLH</sub> t <sub>PHL</sub>	Maximum Propagation Delay, Latch Enable to Q	2.0	140	175	210	ns
		3.0	90	120	140	
		4.5	28	35	42	
		6.0	24	30	36	
t <sub>PLZ</sub> t <sub>PHZ</sub>	Maximum Propagation Delay, Output Enable to Q	2.0	150	190	225	ns
		3.0	100	125	150	
		4.5	30	38	45	
		6.0	26	33	38	
t <sub>PZL</sub> t <sub>PZH</sub>	Maximum Propagation Delay, Output Enable to Q	2.0	150	190	225	ns
		3.0	100	125	150	
		4.5	30	38	45	
		6.0	26	33	38	
t <sub>TLH</sub> t <sub>THL</sub>	Maximum Output Transition Time, Any Output	2.0	60	75	90	ns
		3.0	23	27	32	
		4.5	12	15	18	
		6.0	10	13	15	
C <sub>in</sub>	Maximum Input Capacitance		10	10	10	pF
C <sub>out</sub>	Maximum Three-State Output Capacitance (Output in High-Impedance State)		15	15	15	pF

C <sub>PD</sub>	Power Dissipation Capacitance (Per Enabled Output)*	Typical @ 25°C, V <sub>CC</sub> = 5.0 V			pF
		36			

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

## TIMING REQUIREMENTS (MC74HC373A) (See Figures 2 and 3)

Symbol	Parameter	V <sub>CC</sub> Volts	Guaranteed Limit						Unit
			-55 to 25°C		≤ 85°C		≤ 125°C		
			Min	Max	Min	Max	Min	Max	
t <sub>su</sub>	Minimum Setup Time, Input D to Latch Enable	2.0	25		30		40		ns
		3.0	20		25		30		
		4.5	5.0		6.0		8.0		
		6.0	5.0		6.0		7.0		
t <sub>h</sub>	Minimum Hold Time, Latch Enable to Input D	2.0	5.0		5.0		5.0		ns
		3.0	5.0		5.0		5.0		
		4.5	5.0		5.0		5.0		
		6.0	5.0		5.0		5.0		
t <sub>w</sub>	Minimum Pulse Width, Latch Enable	2.0	60		75		90		ns
		3.0	23		27		32		
		4.5	12		15		18		
		6.0	10		13		15		
t <sub>r</sub> , t <sub>f</sub>	Maximum Input Rise and Fall Times	2.0		1000		1000		1000	ns
		3.0		800		800		800	
		4.5		500		500		500	
		6.0		400		400		400	

# MC74HC373A, MC74HCT373A

## DC ELECTRICAL CHARACTERISTICS (MC74HCT373A)

Symbol	Parameter	Test Conditions	V <sub>CC</sub> V	Guaranteed Limit			Unit
				-55 to 25°C	≤ 85°C	≤ 125°C	
V <sub>IH</sub>	Minimum High-Level Input Voltage	V <sub>out</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V  I <sub>out</sub>   ≤ 20 μA	4.5 5.5	2.0 2.0	2.0 2.0	2.0 2.0	V
V <sub>IL</sub>	Maximum Low-Level Input Voltage	V <sub>out</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V  I <sub>out</sub>   ≤ 20 μA	4.5 5.5	0.8 0.8	0.8 0.8	0.8 0.8	V
V <sub>OH</sub>	Minimum High-Level Output Voltage	V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>out</sub>   ≤ 20 μA	4.5 5.5	4.4 5.4	4.4 5.4	4.4 5.4	V
		V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>out</sub>   ≤ 6.0 mA	4.5	3.98	3.84	3.7	
V <sub>OL</sub>	Maximum Low-Level Output Voltage	V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>out</sub>   ≤ 20 μA	4.5 5.5	0.1 0.1	0.1 0.1	0.1 0.1	V
		V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>out</sub>   ≤ 6.0 mA	4.5	0.26	0.33	0.4	
I <sub>in</sub>	Maximum Input Leakage Current	V <sub>in</sub> = V <sub>CC</sub> or GND	5.5	±0.1	±1.0	±1.0	μA
I <sub>OZ</sub>	Maximum Three-State Leakage Current	Output in High-Impedance State V <sub>in</sub> = V <sub>IL</sub> or V <sub>IH</sub> V <sub>out</sub> = V <sub>CC</sub> or GND	5.5	±0.5	±5.0	±10	μA
I <sub>CC</sub>	Maximum Quiescent Supply Current (per Package)	V <sub>in</sub> = V <sub>CC</sub> or GND I <sub>out</sub> = 0 μA	5.5	4.0	40	160	μA

ΔI <sub>CC</sub>	Additional Quiescent Supply Current	V <sub>in</sub> = 2.4 V, Any One Input V <sub>in</sub> = V <sub>CC</sub> or GND, Other Inputs I <sub>out</sub> = 0 μA	5.5	≥ -55°C	25°C to 125°C	mA
				2.9	2.4	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Total Supply Current = I<sub>CC</sub> + ΣΔI<sub>CC</sub>.

# MC74HC373A, MC74HCT373A

## AC ELECTRICAL CHARACTERISTICS (MC74HCT373A)

Symbol	Parameter	Guaranteed Limit			Unit
		-55 to 25°C	≤ 85°C	≤ 125°C	
t <sub>PLH</sub> , t <sub>PHL</sub>	Maximum Propagation Delay, Input D to Q	28	35	42	ns
t <sub>PLH</sub> , t <sub>PHL</sub>	Maximum Propagation Delay, Latch Enable to Q	32	40	48	ns
t <sub>PLZ</sub> , t <sub>PHZ</sub>	Maximum Propagation Delay, Output Enable to Q	30	38	45	ns
t <sub>PZL</sub> , t <sub>PZH</sub>	Maximum Propagation Delay, Output Enable to Q	35	44	53	ns
t <sub>TLH</sub> , t <sub>THL</sub>	Maximum Output Transition Time, Any Output	12	15	18	ns
C <sub>in</sub>	Maximum Input Capacitance	10	10	10	pF
C <sub>out</sub>	Maximum Three-State Output Capacitance	15	15	15	pF

C <sub>PD</sub>	Power Dissipation Capacitance (Per Latch)*	Typical @ 25°C, V <sub>CC</sub> = 5.0 V			pF
		65			

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

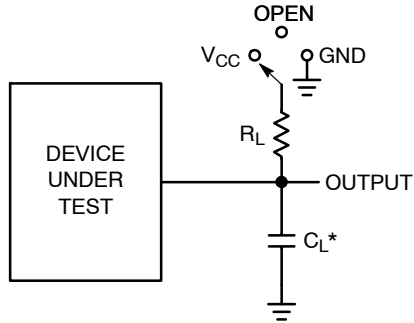
\*Used to determine the no-load dynamic power consumption:  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ .

## TIMING REQUIREMENTS (MC74HCT373A)

Symbol	Parameter	Guaranteed Limit			Unit
		-55 to 25°C	≤ 85°C	≤ 125°C	
t <sub>su</sub>	Minimum Setup Time, Input D to Latch Enable	10	13	15	ns
t <sub>h</sub>	Minimum Hold Time, Latch Enable to Input D	10	13	15	ns
t <sub>w</sub>	Minimum Pulse Width, Latch Er	12	15	18	ns
t <sub>r</sub> , t <sub>f</sub>	Maximum Input Rise and Fall Times	500	500	500	ns

# MC74HC373A, MC74HCT373A

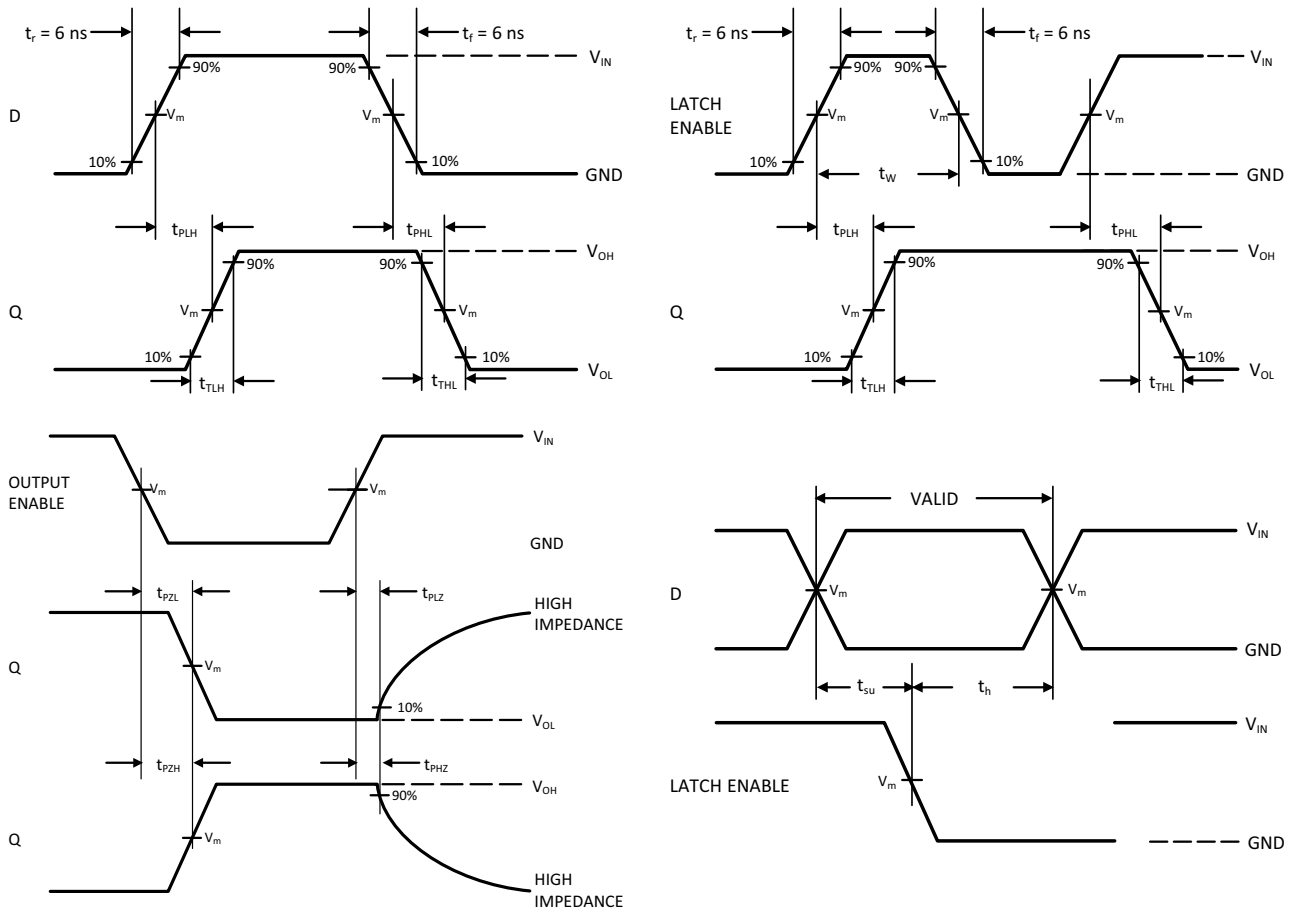
## SWITCHING WAVEFORMS



\* $C_L$  Includes probe and jig capacitance

Test	Switch Position	$C_L$	$R_L$
$t_{PLH} / t_{PHL}$	Open	50 pF	1 k $\Omega$
$t_{PLZ} / t_{PZL}$	$V_{CC}$		
$t_{PHZ} / t_{PZH}$	GND		

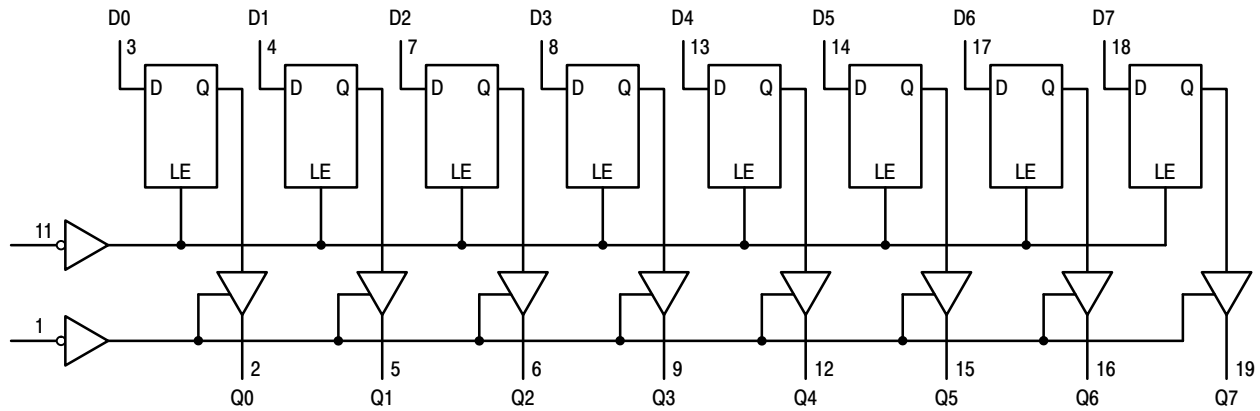
Figure 2. Test Circuit



Device	$V_{IN}, V$	$V_m, V$
MC74HC373A	$V_{CC}$	$50\% \times V_{CC}$
MC74HCT373A	3 V	1.3 V

Figure 3. Switching Waveforms

## MC74HC373A, MC74HCT373A



**Figure 4. Expanded Logic Diagram**

### ORDERING INFORMATION

Device	Marking	Package	Shipping†
MC74HC373ADWG	HC373A	SOIC-20 Wide	38 Units / Rail
MC74HC373ADWR2G	HC373A	SOIC-20 Wide	1000 / Tape & Reel
MC74HC373ADWR2G-Q*	HC373A	SOIC-20 Wide	1000 / Tape & Reel
MC74HC373ADTG	HC 373A	TSSOP-20	75 Units / Rail
MC74HC373ADTR2G	HC 373A	TSSOP-20	2500 / Tape & Reel
MC74HCT373ADWG	HCT373A	SOIC-20 Wide	38 Units / Rail
MC74HCT373ADWR2G	HCT373A	SOIC-20 Wide	1000 / Tape & Reel
MC74HCT373ADWR2G-Q*	HCT373A	SOIC-20 Wide	1000 / Tape & Reel
MC74HCT373ADTR2G	HCT 373A	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.

\*-Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.



# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 1:1

SOIC-20 WB  
CASE 751D-05  
ISSUE H

DATE 22 APR 2015



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°

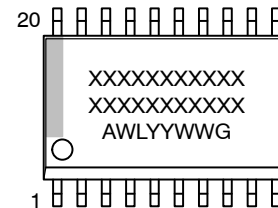
RECOMMENDED  
SOLDERING FOOTPRINT\*



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\*



- XXXXXX = 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.

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DESCRIPTION:	SOIC-20 WB	PAGE 1 OF 1

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# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



TSSOP-20 WB  
CASE 948E  
ISSUE D

DATE 17 FEB 2016

SCALE 2:1



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



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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