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Octal D-Type Latch with 3-State Output

The MC74VHC573 is an advanced high speed CMOS octal latch with 3-state output fabricated with silicon gate CMOS technology. It achieves high speed operation similar to equivalent Bipolar Schottky TTL while maintaining CMOS low power dissipation.

This 8-bit D-type latch is controlled by a latch enable input and an output enable input. When the output enable input is high, the eight outputs are in a high impedance state.

The internal circuit is composed of three stages, including a buffer output which provides high noise immunity and stable output. The inputs tolerate voltages up to 7 V, allowing the interface of 5 V systems to 3 V systems.

- High Speed: $t_{PD} = 4.5 \text{ ns}$ (Typ) at $V_{CC} = 5 \text{ V}$
- Low Power Dissipation: $I_{CC} = 4 \mu A$ (Max) at $T_A = 25^{\circ}C$
- High Noise Immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Designed for 2 V to 5.5 V Operating Range
- Low Noise: V_{OLP} = 1.2 V (Max)
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300 mA
- ESD Performance: HBM > 2000 V; Machine Model > 200 V
- Chip Complexity: 218 FETs or 54.5 Equivalent Gates
- These Devices are Pb-Free and are RoHS Compliant

PIN ASSIGNMENT

OE [1●	20] v _{cc}
D0 [2	19] Q0
D1 [3	18] Q1
D2 [4	17] Q2
D3 [5	16	_ Q3
D4 [6	15] Q4
D5 [7	14] Q5
D6 [8	13] Q6
D7 [9	12] Q7
GND [10	11	LE
			•



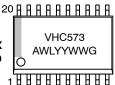
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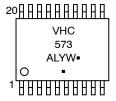
MARKING DIAGRAMS



SOIC-20 DW SUFFIX CASE 751D









SOEIAJ-20 M SUFFIX CASE 967

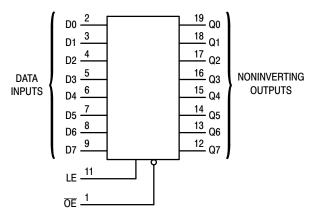
VHC573 = Specific Device Code A = Assembly Location WL, L = Wafer Lot

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

ORDERING INFORMATION

Device	Package	Shipping
MC74VHC573DWR2G	SOIC-20	1000 / Reel
MC74VHC573DTR2G	TSSOP-20	2500 / Reel
MC74VHC573MELG	SOEIAJ-20	2000 / Reel

LOGIC DIAGRAM



FUNCTION TABLE

	INPUTS	OUTPUT	
ŌĒ	LE	D	Q
L	Н	Н	Н
L	Н	L	L
L	L	Х	No Change
Н	Х	Х	Z

MAXIMUM RATINGS*

Symbol	Parameter	1	Value	Unit
V _{CC}	DC Supply Voltage		- 0.5 to + 7.0	V
V _{in}	DC Input Voltage		- 0.5 to + 7.0	V
V _{out}	DC Output Voltage	$-$ 0.5 to V_{CC} + 0.5	V	
I _{IK}	Input Diode Current	- 20	mA	
lok	Output Diode Current	± 20	mA	
I _{out}	DC Output Current, per Pin		± 25	mA
Icc	DC Supply Current, V _{CC} and GI	ND Pins	± 75	mA
P _D	Power Dissipation in Still Air,	SOIC Packages† TSSOP Package†	500 450	mW
T _{stg}	Storage Temperature	- 65 to + 150	°C	

^{*} Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum-rated conditions is not implied.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V _{CC}	DC Supply Voltage			5.5	V
V _{in}	DC Input Voltage	0	5.5	V	
V _{out}	DC Output Voltage	0	V _{CC}	V	
T _A	Operating Temperature			+ 85	°C
t _r , t _f	Input Rise and Fall Time $V_{CC} = V_{CC} = V_{CC}$	3.3V 5.0V	0 0	100 20	ns/V

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} 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.

DC ELECTRICAL CHARACTERISTICS

			v _{cc}		T _A = 25°C		T _A = - 40	0 to 85°C	
Symbol	Parameter	Parameter Test Conditions	v	Min	Тур	Max	Min	Max	Unit
V _{IH}	Minimum High-Level Input Voltage		2.0 3.0 to 5.5	1.50 V _{CC} x 0.7			1.50 V _{CC} x 0.7		V
V _{IL}	Maximum Low-Level Input Voltage		2.0 3.0 to 5.5			0.50 V _{CC} x 0.3		0.50 V _{CC} x 0.3	V
V _{OH}	Minimum High-Level Output Voltage	$V_{in} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -50 \mu A$	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5		1.9 2.9 4.4		V
		$V_{in} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -4mA$ $I_{OH} = -8mA$	3.0 4.5	2.58 3.94			2.48 3.80		<u></u>
V _{OL}	Maximum Low-Level Output Voltage	$V_{in} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 50 \mu A$	2.0 3.0 4.5		0.0 0.0 0.0	0.1 0.1 0.1		0.1 0.1 0.1	V
		$V_{in} = V_{IH}$ or V_{IL} $I_{OL} = 4mA$ $I_{OL} = 8mA$	3.0 4.5			0.36 0.36		0.44 0.44	ļ
I _{in}	Maximum Input Leakage Current	V _{in} = 5.5 V or GND	0 to 5.5			± 0.1		± 1.0	μА

[†]Derating — SOIC Packages: - 7 mW/°C from 65° to 125°C TSSOP Package: - 6.1 mW/°C from 65° to 125°C

DC ELECTRICAL CHARACTERISTICS

			v _{cc}		T _A = 25°C		T _A = - 40) to 85°C	
Symbol	Parameter	Test Conditions	v	Min	Тур	Max	Min	Max	Unit
l _{OZ}	Maximum Three-State Leakage Current	$V_{in} = V_{IL}$ or V_{IH} $V_{out} = V_{CC}$ or GND	5.5			± 0.25		± 2.5	μА
I _{CC}	Maximum Quiescent Supply Current	V _{in} = V _{CC} or GND	5.5			4.0		40.0	μА

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0 \text{ns}$)

					T _A = 25°C		T _A = - 40	0 to 85°C	
Symbol	Parameter	Test Condi	tions	Min	Тур	Max	Min	Max	Unit
t _{PLH} , t _{PHL}	Maximum Propagation Delay, LE to Q	$V_{CC} = 3.3 \pm 0.3 V$	C _L = 15pF C _L = 50pF		7.6 10.1	11.9 15.4	1.0 1.0	14.0 17.5	ns
		$V_{CC} = 5.0 \pm 0.5 V$	$C_L = 15pF$ $C_L = 50pF$		5.0 6.5	7.7 9.7	1.0 1.0	9.0 11.0	
t _{PLH} , t _{PHL}	Maximum Propagation Delay, D to Q	$V_{CC} = 3.3 \pm 0.3 V$	$C_L = 15pF$ $C_L = 50pF$		7.0 9.5	11.0 14.5	1.0 1.0	13.0 16.5	ns
		$V_{CC} = 5.0 \pm 0.5 V$	C _L = 15pF C _L = 50pF		4.5 6.0	6.8 8.8	1.0 1.0	8.0 10.0	
t _{PZL} , t _{PZH}	Output Enable Time, OE to Q	$\begin{aligned} V_{CC} &= 3.3 \pm 0.3 V \\ R_L &= 1 k \Omega \end{aligned}$	C _L = 15pF C _L = 50pF		7.3 9.8	11.5 15.0	1.0 1.0	13.5 17.0	ns
		$V_{CC} = 5.0 \pm 0.5V$ $R_L = 1k\Omega$	C _L = 15pF C _L = 50pF		5.2 6.7	7.7 9.7	1.0 1.0	9.0 11.0	
t _{PLZ} , t _{PHZ}	Output Disable Time, OE to Q	$\begin{aligned} V_{CC} &= 3.3 \pm 0.3 V \\ R_L &= 1 k \Omega \end{aligned}$	C _L = 50pF		10.7	14.5	1.0	16.5	ns
		$\begin{aligned} V_{CC} &= 5.0 \pm 0.5 V \\ R_L &= 1 k \Omega \end{aligned}$	C _L = 50pF		6.7	9.7	1.0	11.0	
t _{OSLH} , t _{OSHL}	Output to Output Skew	V _{CC} = 3.3 ± 0.3V (Note 1)	C _L = 50pF			1.5		1.5	ns
		V _{CC} = 5.5 ± 0.5V (Note 1)	C _L = 50pF			1.0		1.0	ns
C _{in}	Maximum Input Capacitance				4	10		10	pF
C _{out}	Maximum Three-State Output Capacitance (Output in High-Impedance State)				6				pF

		Typical @ 25°C, V _{CC} = 5.0V	
C_{PD}	Power Dissipation Capacitance (Note 2)	29	pF

NOISE CHARACTERISTICS (Input t_{f} = t_{f} = 3.0ns, C_{L} = 50 pF, V_{CC} = 5.0V)

		T _A = 25°C		
Symbol	Parameter	Тур	Max	Unit
V _{OLP}	Quiet Output Maximum Dynamic V _{OL}		1.2	V
V _{OLV}	Quiet Output Minimum Dynamic V _{OL}		- 1.2	V
V _{IHD}	Minimum High Level Dynamic Input Voltage		3.5	V
V _{ILD}	Maximum Low Level Dynamic Input Voltage		1.5	V

Parameter guaranteed by design. t_{OSLH} = |t_{PLHm} - t_{PLHn}|, t_{OSHL} = |t_{PHLm} - t_{PHLn}|.
 C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I_{CC(OPR)} = C_{PD} • V_{CC} • f_{in} + I_{CC}/8 (per latch). C_{PD} is used to determine the no-load dynamic power consumption; P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.

TIMING REQUIREMENTS (Input $t_r = t_f = 3.0 \text{ns}$)

			T _A =	25°C	T _A = - 40 to 85°C	
Symbol	Parameter	Test Conditions	Тур	Limit	Limit	Unit
t _{w(h)}	Minimum Pulse Width, LE	$V_{CC} = 3.3 \pm 0.3V$ $V_{CC} = 5.0 \pm 0.5V$		5.0 5.0	5.0 5.0	ns
t _{su}	Minimum Setup Time, D to LE	$V_{CC} = 3.3 \pm 0.3V$ $V_{CC} = 5.0 \pm 0.5V$		3.5 3.5	3.5 3.5	ns
t _h	Minimum Hold Time, D to LE	$V_{CC} = 3.3 \pm 0.3V$ $V_{CC} = 5.0 \pm 0.5V$		1.5 1.5	1.5 1.5	ns

SWITCHING WAVEFORMS

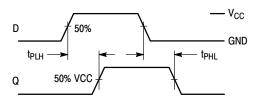


Figure 1.

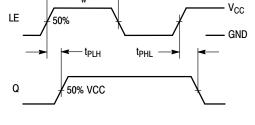


Figure 2.

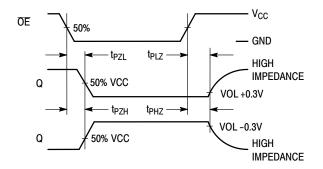


Figure 3.

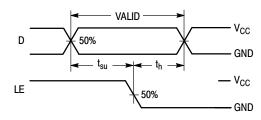
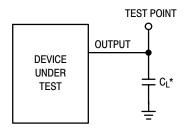
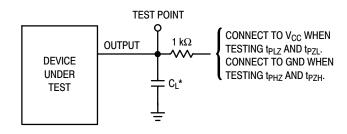


Figure 4.

TEST CIRCUITS



*Includes all probe and jig capacitance

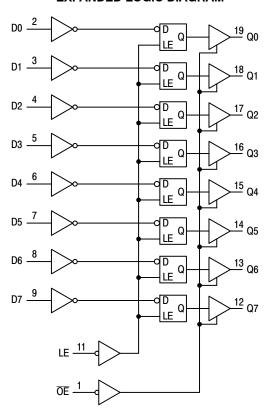


*Includes all probe and jig capacitance

Figure 5.

Figure 6.

EXPANDED LOGIC DIAGRAM



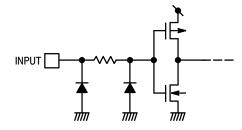
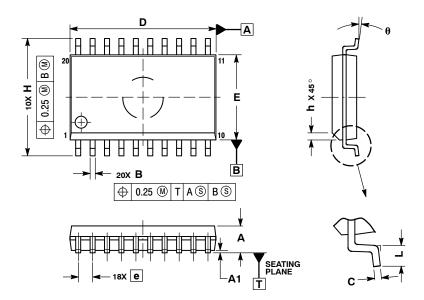


Figure 7. Input Equivalent Circuit

PACKAGE DIMENSIONS

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



NOTES:

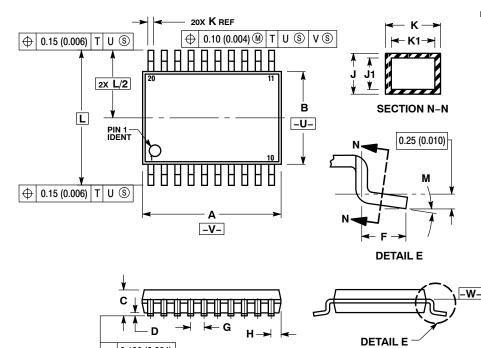
- 1. DIMENSIONS ARE IN MILLIMETERS.
 2. INTERPRET DIMENSIONS AND TOLERANCES
 PER ASME Y14.5M, 1994.
 3. DIMENSIONS D AND E DO NOT INCLUDE MOLD

DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
 MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
 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				
Α	2.35	2.65				
A1	0.10	0.25				
В	0.35	0.49				
С	0.23	0.32				
D	12.65	12.95				
Е	7.40	7.60				
е	1.27	BSC				
Н	10.05	10.55				
h	0.25	0.75				
L	0.50	0.90				
A	0 °	7 °				

PACKAGE DIMENSIONS

TSSOP-20 CASE 948E-02 ISSUE C



<u>0.100 (0.004)</u>

NOTES:

- OTES:

 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

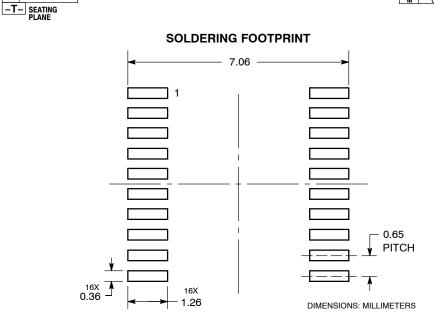
 2. CONTROLLING DIMENSION: MILLIMETER.

 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.

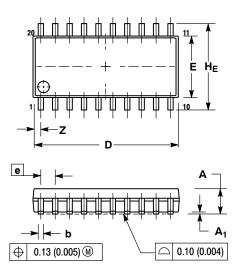
 5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE
- DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL
- DIMENSION AT MAXIMUM WATERING.
 CONDITION.
 6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

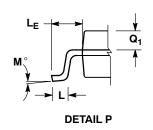
		IETERS	INCHES	
DIM	MIN	MAX	MIN	MAX
Α	6.40	6.60	0.252	0.260
В	4.30	4.50	0.169	0.177
С		1.20		0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
Н	0.27	0.37	0.011	0.015
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC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

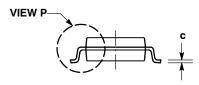


PACKAGE DIMENSIONS

SOEIAJ-20 CASE 967-01 **ISSUE A**







- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982. 2. CONTROLLING DIMENSION: MILLIMETER.
- B. 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.

 I. TERMINAL NUMBERS ARE SHOWN FOR
- REFERENCE ONLY.

 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).

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
Α		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
е	1.27 BSC		0.050 BSC	
HE	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
LE	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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