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74VHC374

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

Features

- High Speed: $t_{PD} = 5.4ns$ (typ) at $V_{CC} = 5V$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (Min.)
- Power down protection is provided on all inputs
- Low power dissipation: $I_{CC} = 4\mu A$ (Max) @ $T_A = 25^\circ C$
- Pin and function compatible with 74HC374

General Description

The VHC374 is an advanced high speed CMOS octal flip-flop with 3-STATE output fabricated with silicon gate CMOS technology. It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation. This 8-bit D-type flip-flop is controlled by a clock input (CP) and an output enable input (\overline{OE}). When the \overline{OE} input is HIGH, the eight outputs are in a HIGH impedance state.

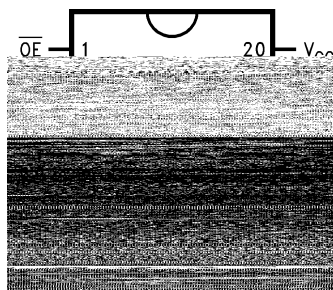
An input protection circuit ensures that 0V to 7V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5V to 3V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

Ordering Information

Order Number	Package Number	Package Description
74VHC374M	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74VHC374SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74VHC374MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

Surface mount packages are also available on Tape and Reel. Specify by appending the suffix letter "X" to the ordering number. Pb-Free package per JEDEC J-STD-020B.

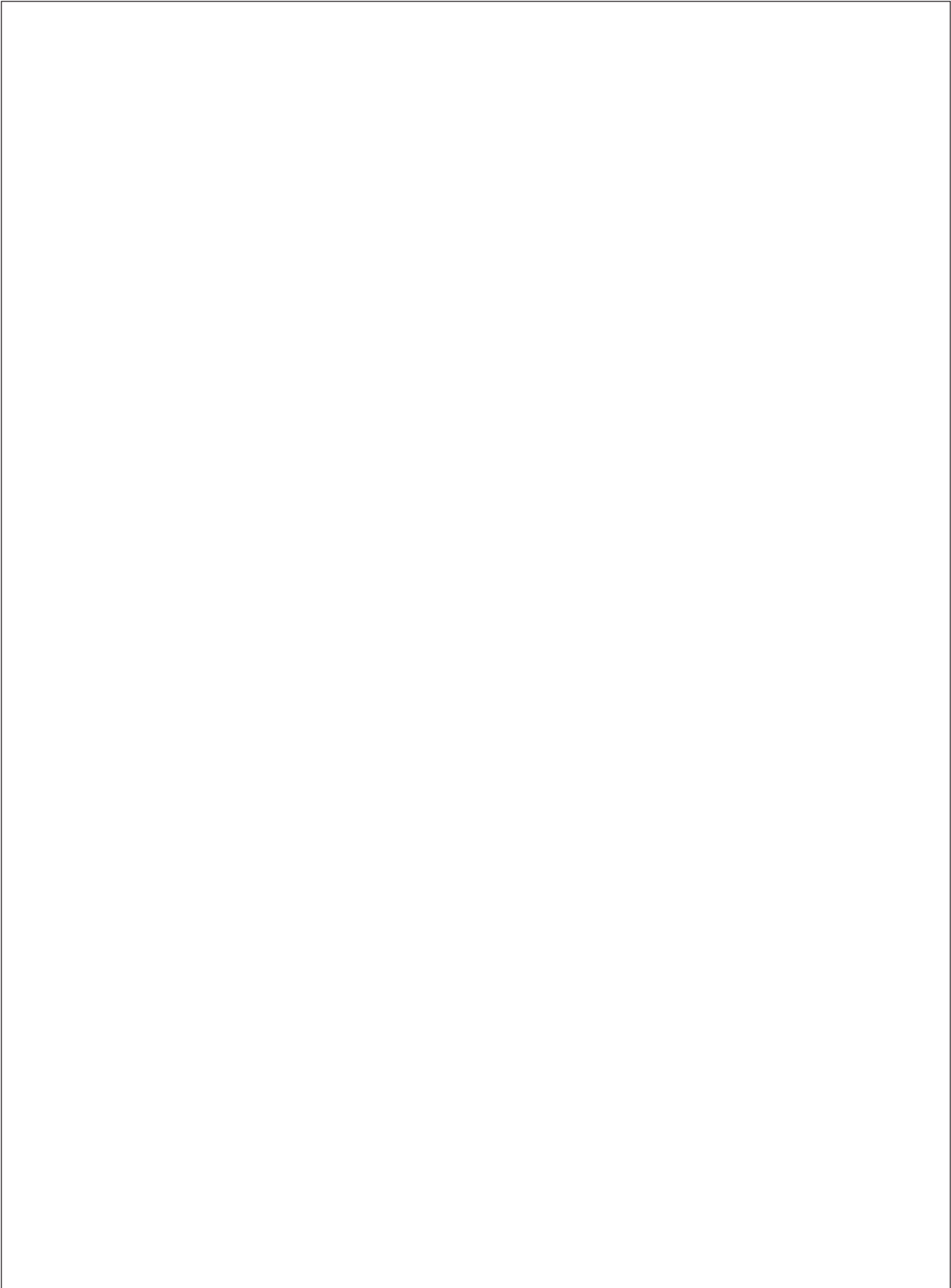
Connection Diagram



Pin Descriptions

Pin Names	Description
D_0-D_7	Data Inputs
CP	Clock Pulse Input
\overline{OE}	3-STATE Output Enable Input
O_0-O_7	3-STATE Outputs

74VHC374 Octal D-Type Flip-Flop with 3-STATE Outputs



Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	-0.5V to +7.0V
V_{IN}	DC Input Voltage	-0.5V to +7.0V
V_{OUT}	DC Output Voltage	-0.5V to $V_{CC} + 0.5V$
I_{IK}	Input Diode Current	-20mA
I_{OK}	Output Diode Current	$\pm 20mA$
I_{OUT}	DC Output Current	$\pm 25mA$
I_{CC}	DC V_{CC}/GND Current	$\pm 75mA$
T_{STG}	Storage Temperature	-65°C to +150°C
T_L	Lead Temperature (Soldering, 10 seconds)	260°C

Recommended Operating Conditions⁽¹⁾

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	2.0V to +5.5V
V_{IN}	Input Voltage	0V to +5.5V
V_{OUT}	Output Voltage	0V to V_{CC}
T_{OPR}	Operating Temperature	-40°C to +85°C
t_r, t_f	Input Rise and Fall Time, $V_{CC} = 3.3V \pm 0.3V$ $V_{CC} = 5.0V \pm 0.5V$	0ns/V ~ 100ns/V 0ns/V ~ 20ns/V

Note:

1. Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	V _{CC} (V)	Conditions	Min.	T _A =		Units	
					25°C	–40°C to +85°C		
				Typ.	Max.	Min.	Max.	
V _{IH}	HIGH Level Input Voltage	2.0		1.50		1.50		V
		3.0–5.5		0.7 x V _{CC}		0.7 x V _{CC}		
V _{IL}	LOW Level Input Voltage	2.0			0.50		0.50	V
		3.0–5.5			0.3 x V _{CC}		0.3 x V _{CC}	
V _{OH}	HIGH Level Output Voltage	2.0	V _{IN} = V _{IH}	1.9	2.0	1.9		V
		3.0	or V _{IL}	2.9	3.0	2.9		
		4.5		4.4	4.5	4.4		
		3.0	I _{OH} = –50μA	2.58		2.48		
		4.5	I _{OH} = –8mA	3.94		3.80		
V _{OL}	LOW Level Output Voltage	2.0	V _{IN} = V _{IH}		0.0	0.1	0.1	V
		3.0	or V _{IL}		0.0	0.1	0.1	
		4.5			0.0	0.1	0.1	
		3.0	I _{OL} = 4mA			0.36	0.44	
		4.5	I _{OL} = 8mA			0.36	0.44	
I _{OZ}	3-STATE Output Off-State Current	5.5	V _{IN} = V _{IH} or V _{IL} ; V _{OUT} = V _{CC} or GNDI; Ve1 7.3416 TC73dμT[44.4IL					

Noise Characteristics

Note:

2. Parameter guaranteed by design.

AC Electrical Characteristics

Symbol	Parameter	V _{CC} (V)	Conditions	T _A = 25°C			T _A = -40°C to +85°C		Units	
				Min.	Typ.	Max.	Min.	Max.		
t _{PLH} , t _{PHL}	Propagation Delay Time (CP to O _n)	3.3 ± 0.3	C _L = 15pF		8.1	12.7	1.0	15.0	ns	
					10.6	16.2	1.0	18.5		
		5.0 ± 0.5		C _L = 50pF		5.4	8.1	1.0	9.5	ns
						6.9	10.1	1.0	11.5	
t _{PZL} , t _{PZH}	3-STATE Output Enable Time	3.3 ± 0.3	R _L = 1kΩ		C _L = 15pF	7.1	11.0	1.0	13.0	ns
					C _L = 50pF	9.6	14.5	1.0	16.5	
		5.0 ± 0.5		C _L = 15pF	5.1	7.6	1.0	9.0	ns	
				C _L = 50pF	6.6	9.6	1.0	11.0		
t _{PLZ} , t _{PHZ}	3-STATE Output Disable Time	3.3 ± 0.3	R _L = 1kΩ	C _L = 50pF	10.2	14.0	1.0	16.0	ns	
		5.0 ± 0.5		C _L = 50pF	6.1	8.8	1.0	10.0		
t _{OSLH} , t _{OSHL}	Output to Output Skew	3.3 ± 0.3	(3)	C _L = 50pF			1.5	1.5	ns	
		5.0 ± 0.5		C _L = 50pF			1.0	1.0		
f _{MAX}	Maximum Clock Frequency	3.3 ± 0.3		C _L = 15pF	80	130	70		MHz	
				C _L = 50pF	55	85	50			
		5.0 ± 0.5		C _L = 15pF	130	185	110			
				C _L = 50pF	85	120	75			
C _{IN}	Input Capacitance		V _{CC} = Open		4	10		10	pF	
C _{OUT}	Output Capacitance		V _{CC} = 5.0V		6				pF	
C _{PD}	Power Dissipation Capacitance		(4)		32				pF	

Notes:

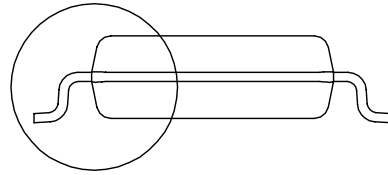
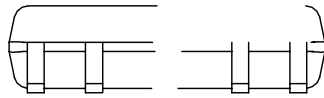
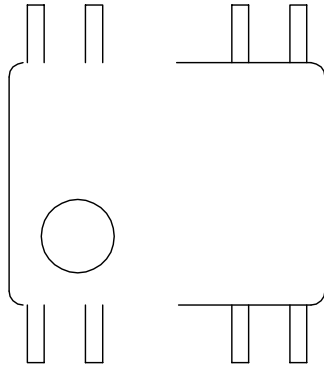
3. Parameter guaranteed by design. $t_{OSLH} = |t_{PLH\ max} - t_{PLH\ min}|$; $t_{OSHL} = |t_{PHL\ max} - t_{PHL\ min}|$
4. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation:
 $I_{CC\ (opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 8$ (per F/F). The total C_{PD} when n pcs. of the Octal D Flip-Flop operates can be calculated by the equation: $C_{PD\ (total)} = 20 + 12n$.

AC Operating Requirements

Symbol	Parameter	V _{CC} (V)	T _A = 25°C			T _A = -40°C to +85°C		Units
			Min.	Typ.	Max.	Min.	Max.	
t _{W(H)} , t _{W(L)}	Minimum Pulse Width (CP)	3.3 ± 0.3	5.0			5.5		ns
		5.0 ± 0.5	5.0			5.0		
t _S	Minimum Set-Up Time	3.3 ± 0.3	4.5			4.5		ns
		5.0 ± 0.5	3.0			3.0		
t _H	Minimum Hold Time	3.3 ± 0.3	2.0			2.0		ns
		5.0 ± 0.5	2.0			2.0		

Physical Dimensions (Continued)

Dimensions are in millimeters unless otherwise noted.



DIMENSIONS ARE IN MILLIMETERS

NOTES:

DETAIL A

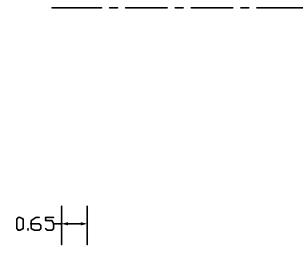
M20DREVC

**Figure 3. 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M20D**

Physical Dimensions (Continued)

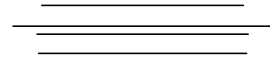
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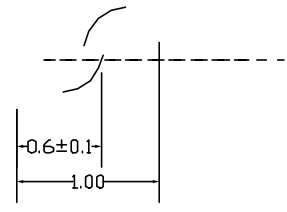


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SEE DETAIL



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MTC20REV D1

Figure 4. 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide Package Number MTC20

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