

## 74ACT16374 16-Bit D-Type Flip-Flop with 3-STATE Outputs

### General Description

The ACT16374 contains sixteen non-inverting D-type flip-flops with 3-STATE outputs and is intended for bus oriented applications. The device is byte controlled. A buffered clock (CP) and Output Enable (OE) are common to each byte and can be shorted together for full 16-bit operation.

### Features

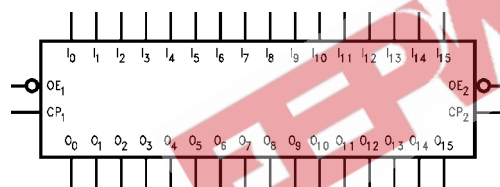
- Buffered Positive edge-triggered clock
- Separate control logic for each byte
- 16-bit version of the ACT374
- Outputs source/sink 24 mA
- TTL-compatible inputs

### Ordering Code:

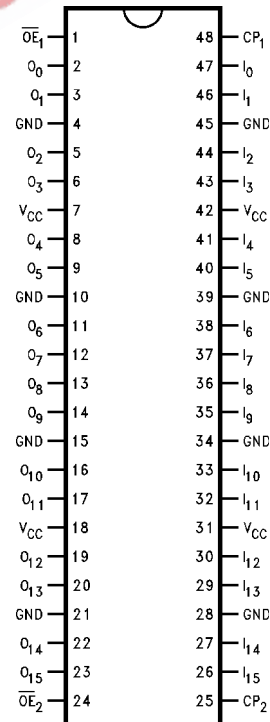
Order Number	Package Number	Package Description
74ACT16374SSC	MS48A	48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide
74ACT16374MTD	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.

### Logic Symbol



### Connection Diagram



### Pin Descriptions

Pin Names	Description
$\overline{OE}_n$	Output Enable Input (Active LOW)
$CP_n$	Clock Pulse Input
$I_0-I_{15}$	Inputs
$O_0-O_{15}$	Outputs

FACT™ is a trademark of Fairchild Semiconductor Corporation.

### Functional Description

The ACT16374 consists of sixteen edge-triggered flip-flops with individual D-type inputs and 3-STATE true outputs. The device is byte controlled with each byte functioning identically, but independent of the other. The control pins can be shorted together to obtain full 16-bit operation. Each byte has a buffered clock and buffered Output Enable common to all flip-flops within that byte. The description which follows applies to each byte. Each flip-flop will store the state of their individual D inputs that meet the setup and hold time requirements on the LOW-to-HIGH Clock ( $CP_n$ ) transition. With the Output Enable ( $\overline{OE}_n$ ) LOW, the contents of the flip-flops are available at the outputs. When  $\overline{OE}_n$  is HIGH, the outputs go to the high impedance state. Operation of the  $OE_n$  input does not affect the state of the flip-flops.

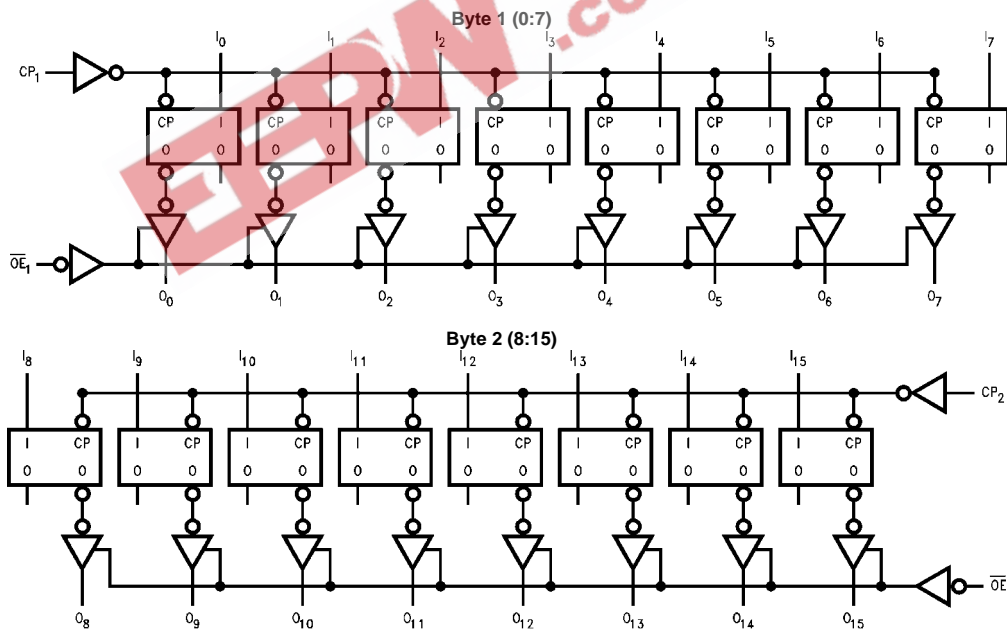
### Truth Tables

Inputs			Outputs
$CP_1$	$\overline{OE}_1$	$I_0-I_7$	$O_0-O_7$
↗	L	H	H
↗	L	L	L
L	L	X	(Previous)
X	H	X	Z

Inputs			Outputs
$CP_2$	$\overline{OE}_2$	$I_8-I_{15}$	$O_8-O_{15}$
↗	L	H	H
↗	L	L	L
L	L	X	(Previous)
X	H	X	Z

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Immaterial  
 Z = HIGH Impedance  
 ↗ = LOW-to-HIGH Transition

### Logic Diagrams



**Absolute Maximum Ratings** (Note 1)

Supply Voltage ( $V_{CC}$ )	-0.5V to +7.0V
DC Input Diode Current ( $I_{IK}$ )	
$V_I = -0.5V$	-20 mA
$V_I = V_{CC} + 0.5V$	+20 mA
DC Output Diode Current ( $I_{OK}$ )	
$V_O = -0.5V$	-20 mA
$V_O = V_{CC} + 0.5V$	+20 mA
DC Output Voltage ( $V_O$ )	-0.5V to $V_{CC} + 0.5V$
DC Output Source/Sink Current ( $I_O$ )	$\pm 50$ mA
DC $V_{CC}$ or Ground Current per Output Pin	$\pm 50$ mA
Storage Temperature	-65°C to +150°C

**Recommended Operating Conditions**

Supply Voltage ( $V_{CC}$ )	4.5V to 5.5V
Input Voltage ( $V_I$ )	0V to $V_{CC}$
Output Voltage ( $V_O$ )	0V to $V_{CC}$
Operating Temperature ( $T_A$ )	-40°C to +85°C
Minimum Input Edge Rate ( $\Delta V/\Delta t$ )	125 mV/ns
$V_{IN}$ from 0.8V to 2.0V	
$V_{CC}$ @ 4.5V, 5.5V	

**Note 1:** Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation of FACT™ circuits outside databook specifications.

**DC Electrical Characteristics**

Symbol	Parameter	$V_{CC}$ (V)	$T_A = +25^\circ\text{C}$		$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		Units	Conditions
			Typ	Guaranteed Limits				
$V_{IH}$	Minimum HIGH Input Voltage	4.5	1.5	2.0	2.0	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$	
		5.5	1.5	2.0	2.0			
$V_{IL}$	Maximum LOW Input Voltage	4.5	1.5	0.8	0.8	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$	
		5.5	1.5	0.8	0.8			
$V_{OH}$	Minimum HIGH Output Voltage	4.5	4.49	4.4	4.4	V	$I_{OUT} = -50 \mu\text{A}$	
		5.5	5.49	5.4	5.4			
		4.5		3.86	3.76	V	$V_{IN} = V_{IL}$ or $V_{IH}$ $I_{OH} = -24 \text{ mA}$ $I_{OH} = -24 \text{ mA}$ (Note 2)	
		5.5		4.86	4.76			
$V_{OL}$	Maximum LOW Output Voltage	4.5	0.001	0.1	0.1	V	$I_{OUT} = 50 \mu\text{A}$	
		5.5	0.001	0.1	0.1			
		4.5		0.36	0.44	V	$V_{IN} = V_{IL}$ or $V_{IH}$ $I_{OL} = 24 \text{ mA}$ $I_{OL} = 24 \text{ mA}$ (Note 2)	
		5.5		0.36	0.44			
$I_{OZ}$	Maximum 3-STATE Leakage Current	5.5		$\pm 0.5$	$\pm 5.0$	$\mu\text{A}$	$V_I = V_{IL}, V_{IH}$ $V_O = V_{CC}, \text{GND}$	
$I_{IN}$	Maximum Input Leakage Current	5.5		$\pm 0.1$	$\pm 1.0$	$\mu\text{A}$	$V_I = V_{CC}, \text{GND}$	
$I_{CCT}$	Maximum $I_{CC}/\text{Input}$	5.5	0.6		1.5	mA	$V_I = V_{CC} - 2.1V$	
$I_{CC}$	Maximum Quiescent Supply Current	5.5		8.0	80.0	$\mu\text{A}$	$V_{IN} = V_{CC}$ or GND	
$I_{OLD}$	Minimum Dynamic Output Current (Note 3)	5.5			75	mA	$V_{OLD} = 1.65V \text{ Max}$	
$I_{OHD}$	Output Current (Note 3)				-75	mA	$V_{OHD} = 3.85V \text{ Min}$	

**Note 2:** All outputs loaded; thresholds associated with output under test.

**Note 3:** Maximum test duration 2.0 ms; one output loaded at a time.

## AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub> (V) (Note 4)	T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF			T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF		Units
			Min	Typ	Max	Min	Max	
f <sub>MAX</sub>	Maximum Clock Frequency	5.0	71			67		MHz
t <sub>PLH</sub>	Propagation Delay CP to O <sub>n</sub>	5.0	3.1	5.3	7.9	3.1	8.4	ns
t <sub>PHL</sub>	CP to O <sub>n</sub>	5.0	3.0	5.1	7.3	3.0	7.8	ns
t <sub>PZH</sub>	Output Enable Time	5.0	2.5	4.7	7.4	2.5	7.9	ns
t <sub>PZL</sub>	Output Enable Time	5.0	3.0	5.4	8.0	2.0	8.5	ns
t <sub>PHZ</sub>	Output Disable Time	5.0	2.1	5.1	7.9	2.1	8.2	ns
t <sub>PLZ</sub>	Output Disable Time	5.0	2.0	4.8	7.4	2.0	7.9	ns

Note 4: Voltage Range 5.0 is 5.0V ± 0.5V.

## AC Operating Requirements

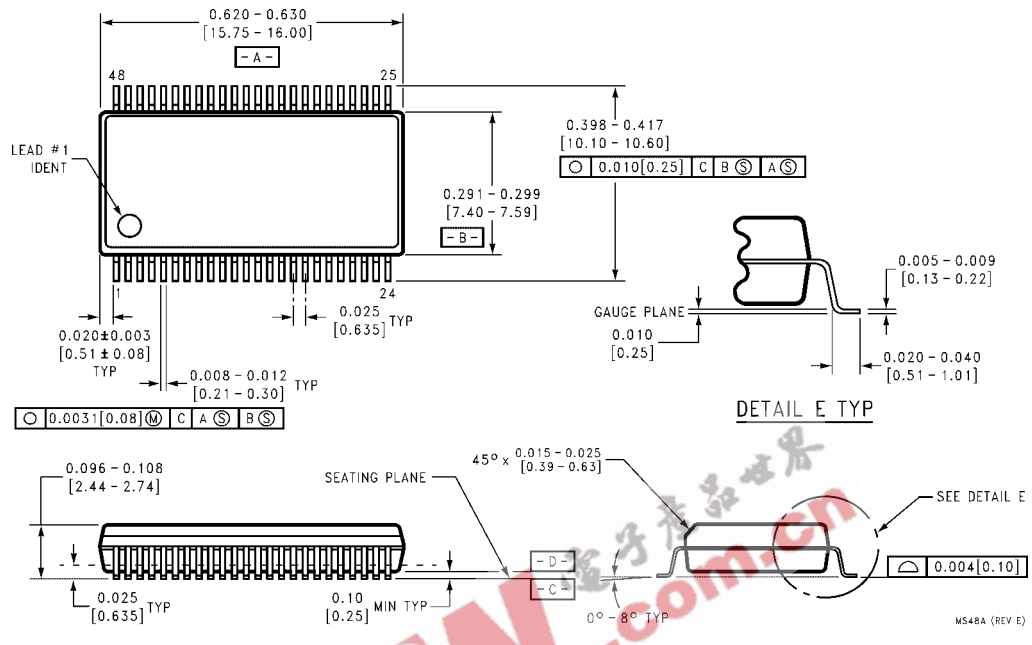
Symbol	Parameter	V <sub>CC</sub> (V) (Note 5)	T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF		Units
			Typ	Guaranteed Limits			
t <sub>S</sub>	Setup Time, HIGH or LOW, Input to Clock	5.0	0.7	3.0	3.0		ns
t <sub>H</sub>	Hold Time, HIGH or LOW, Input to Clock	5.0	0.8	1.0	1.0		ns
t <sub>W</sub>	CP Pulse Width, HIGH or LOW	5.0	1.5	5.0	5.0		ns

Note 5: Voltage Range 5.0 is 5.0V ± 0.5V.

## Capacitance

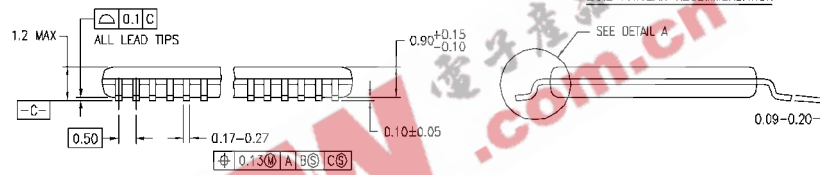
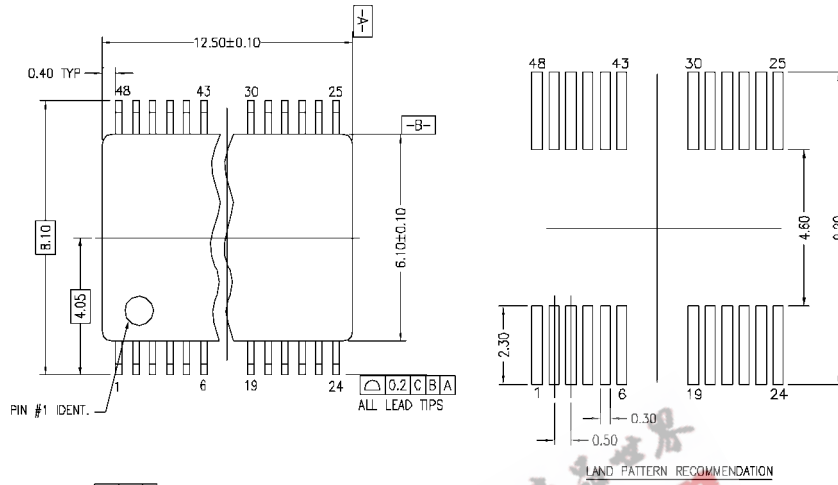
Symbol	Parameter	Typ	Units	Conditions
C <sub>IN</sub>	Input Capacitance	4.5	pF	V <sub>CC</sub> = 5.0V
C <sub>PD</sub>	Power Dissipation Capacitance	30	pF	V <sub>CC</sub> = 5.0V

**Physical Dimensions** inches (millimeters) unless otherwise noted



**48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide  
Package Number MS48A**

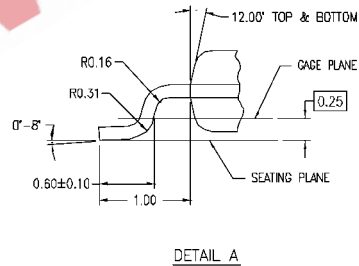
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



DIMENSIONS ARE IN MILLIMETERS

**NOTES:**

- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION ED, DATE 4/97.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.



MTD48REV C

**48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide Package Number MTD48**

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

**LIFE SUPPORT POLICY**

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

[www.fairchildsemi.com](http://www.fairchildsemi.com)