

## 74ACT18823 18-Bit D-Type Flip-Flop with 3-STATE Outputs

### General Description

The ACT18823 contains eighteen 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), Clear (CLR), Clock Enable (EN) and Output Enable (OE) are common to each byte and can be shorted together for full 18-bit operation.

### Features

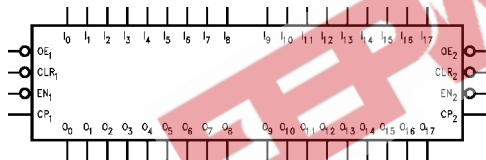
- Broadside pinout allows for easy board layout
- Separate control logic for each byte
- Extra data width for wider address/data paths or buses carrying parity
- Outputs source/sink 24 mA
- TTL-compatible inputs

### Ordering Code:

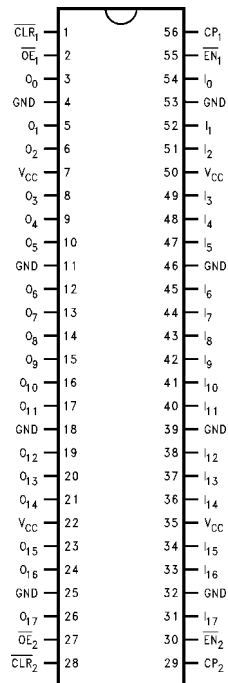
Order Number	Package Number	Package Description
74ACT18823SSC	MS56A	56-Lead Shrink Small Outline Package (SSOP), JEDEC MO-118, 0.300" Wide
74ACT18823MTD	MTD56	56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

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
OE <sub>n</sub>	Output Enable Input (Active LOW)
CLR <sub>n</sub>	Clear (Active LOW)
EN <sub>n</sub>	Clock Enable (Active LOW)
CP <sub>n</sub>	Clock Pulse Input
I <sub>0</sub> -I <sub>17</sub>	Inputs
O <sub>0</sub> -O <sub>17</sub>	Outputs

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### Functional Description

The ACT18823 consists of eighteen D-type edge-triggered flip-flops. These have 3-STATE outputs for bus systems organized with inputs and outputs on opposite sides. 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. The following description applies to each byte. The buffered clock ( $CP_n$ ) and buffered Output Enable ( $\overline{OE}_n$ ) are common to all flip-flops within that byte. The flip-flops will store the state of their individual D inputs that meet set-up and hold time requirements on the LOW-to-HIGH  $CP_n$  transition. With  $\overline{OE}_n$  LOW, the contents of the flip-flops are available at the outputs. When  $\overline{OE}_n$  is HIGH, the outputs go to the impedance state. Operation of the  $\overline{OE}_n$  input does not affect the state of the flip-flops. In addition to the Clock and Output Enable pins, there are Clear ( $\overline{CLR}_n$ ) and Clock Enable ( $\overline{EN}_n$ ) pins. These devices are ideal for parity bus interfacing in high performance systems.

When  $\overline{CLR}_n$  is LOW and  $\overline{OE}_n$  is LOW, the outputs are LOW. When  $\overline{CLR}_n$  is HIGH, data can be entered into the flip-flops. When  $\overline{EN}_n$  is LOW, data on the inputs is transferred to the outputs on the LOW-to-HIGH clock transition. When the  $\overline{EN}_n$  is HIGH, the outputs do not change state, regardless of the data or clock input transitions.

### Function Table

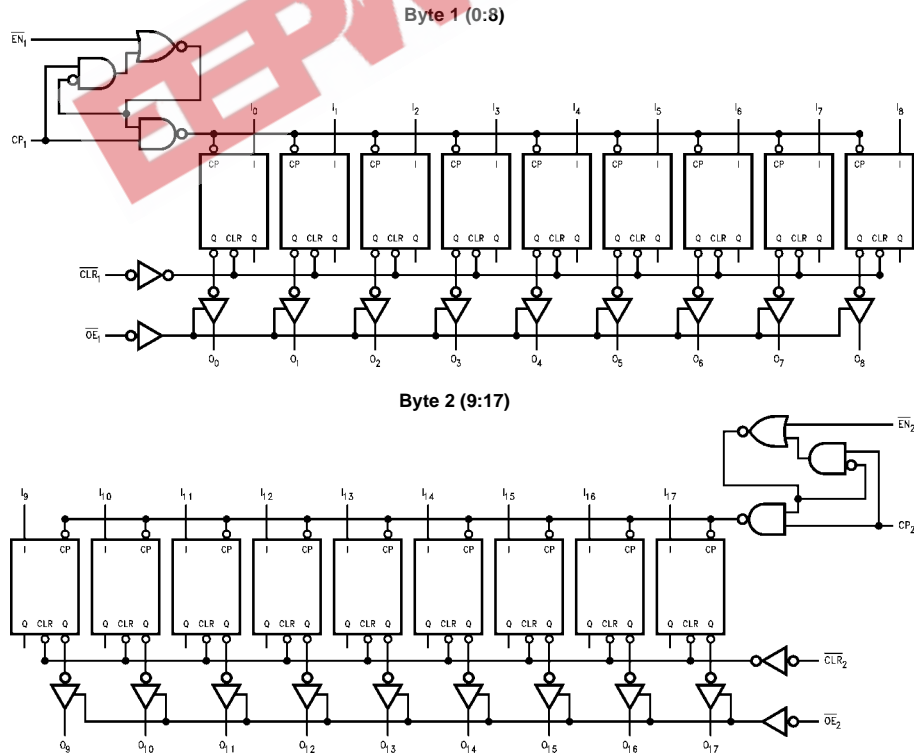
(Note 1)

Inputs					Internal	Output	Function
$\overline{OE}$	$\overline{CLR}$	$\overline{EN}$	CP	$I_n$	Q	$O_n$	
H	X	L	↗	L	L	Z	High Z
H	X	L	↗	H	H	Z	High Z
H	L	X	X	X	L	Z	Clear
L	L	X	X	X	L	L	Clear
H	H	H	X	X	NC	Z	Hold
L	H	H	X	X	NC	NC	Hold
H	H	L	↗	L	L	Z	Load
H	H	L	↗	H	H	Z	Load
L	H	L	↗	L	L	L	Load
L	H	L	↗	H	H	H	Load

H= HIGH Voltage Level  
 L= LOW Voltage Level  
 X= Immaterial  
 Z= High Impedance  
 ↗= LOW-to-HIGH Transition  
 NC= No Change

Note 1: The table represents the logic for one byte. The two bytes are independent of each other and function identically.

### Logic Diagrams



**Absolute Maximum Ratings** (Note 2)

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
Junction Temperature	
PDIP/SOIC	+140°C
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 2:** 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 3)	
$V_{OL}$	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 3)	
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 $I_{CC}$ /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	mA	$V_{IN} = V_{CC}$ or GND	
$I_{OLD}$	Minimum Dynamic	5.5			75	mA	$V_{OLD} = 1.65V \text{ Max}$	
$I_{OHD}$	Output Current (Note 4)				-75	mA	$V_{OHD} = 3.85V \text{ Min}$	

**Note 3:** All outputs loaded; thresholds associated with output under test.

**Note 4:** Maximum test duration 2.0 ms, one output loaded at a time.

AC Electrical Characteristics							
Symbol	Parameter	V <sub>CC</sub> (V) (Note 5)	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C		Units
			C <sub>L</sub> = 50 pF		C <sub>L</sub> = 50 pF		
			Min	Max	Min	Max	
f <sub>MAX</sub>	Maximum Clock Frequency	5.0	100		90		MHz
t <sub>PHL</sub>	Propagation Delay	5.0	2.0	9.0	2.0	9.5	ns
t <sub>PLH</sub>	CP <sub>n</sub> to O <sub>n</sub>		2.0	9.0	2.0	9.5	
t <sub>PHL</sub>	Propagation Delay	5.0	2.0	9.0	2.0	9.5	ns
t <sub>PHL</sub>	CLR <sub>n</sub> to O <sub>n</sub>		2.0	9.0	2.0	9.5	
t <sub>PZL</sub>	Output Enable Time	5.0	2.0	9.0	2.0	10.0	ns
t <sub>PZH</sub>			2.0	9.0	2.0	10.0	
t <sub>PLZ</sub>	Output Disable Time	5.0	1.5	7.0	1.5	7.5	ns
t <sub>PHZ</sub>			1.5	8.0	1.5	8.5	

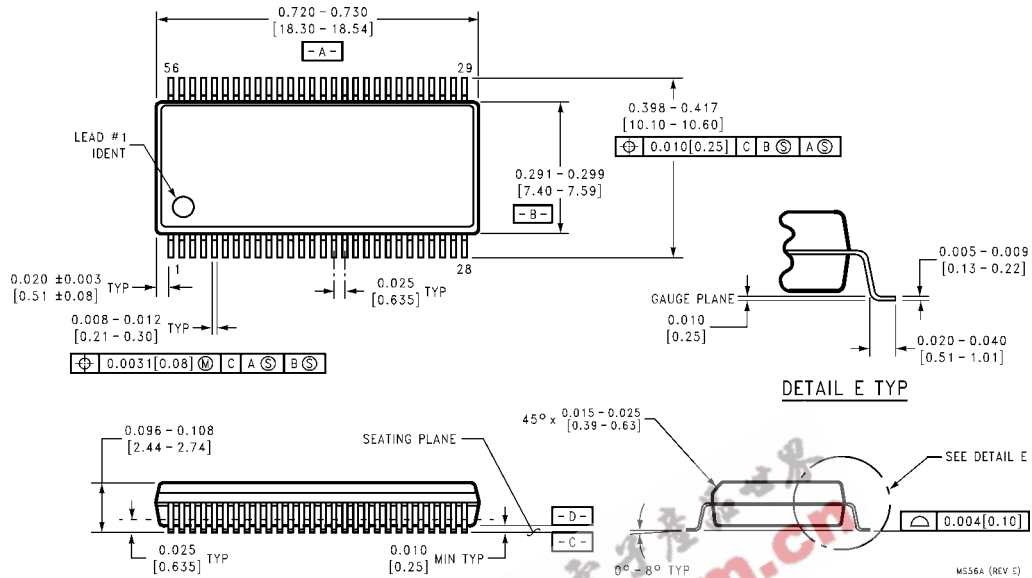
Note 5: Voltage Range 5.0 is 5.0V ± 0.5V.

AC Operating Requirements						
Symbol	Parameter	V <sub>CC</sub> (V) (Note 6)	T <sub>A</sub> = +25°C	T <sub>A</sub> = -40°C to +85°C	Units	
			C <sub>L</sub> = 50 pF	C <sub>L</sub> = 50 pF		
			Guaranteed Minimum			
t <sub>S</sub>	Setup Time, HIGH or LOW, Input to Clock	5.0	3.0	3.0	ns	
t <sub>H</sub>	Hold Time, HIGH or LOW, Input to Clock	5.0	1.5	1.5	ns	
t <sub>S</sub>	Setup Time, HIGH or LOW, Enable to Clock	5.0	3.0	3.0	ns	
t <sub>H</sub>	Hold Time, HIGH or LOW, Enable to Clock	5.0	1.5	1.5	ns	
t <sub>W</sub>	CP <sub>n</sub> Pulse Width, HIGH or LOW	5.0	4.0	4.0	ns	
t <sub>W</sub>	CLR <sub>n</sub> Pulse Width, HIGH or LOW	5.0	4.0	4.0	ns	
t <sub>rec</sub>	Recovery Time, CLR <sub>n</sub> to CP <sub>n</sub>	5.0	6.0	6.0	ns	

Note 6: Voltage Range 5.0 is 5.0V ± 0.5V.

Capacitance					
Symbol	Parameter	Typ	Units	Conditions	
C <sub>IN</sub>	Input Pin Capacitance	4.5	pF	V <sub>CC</sub> = 5.0V	
C <sub>PD</sub>	Power Dissipation Capacitance	95	pF	V <sub>CC</sub> = 5.0V	

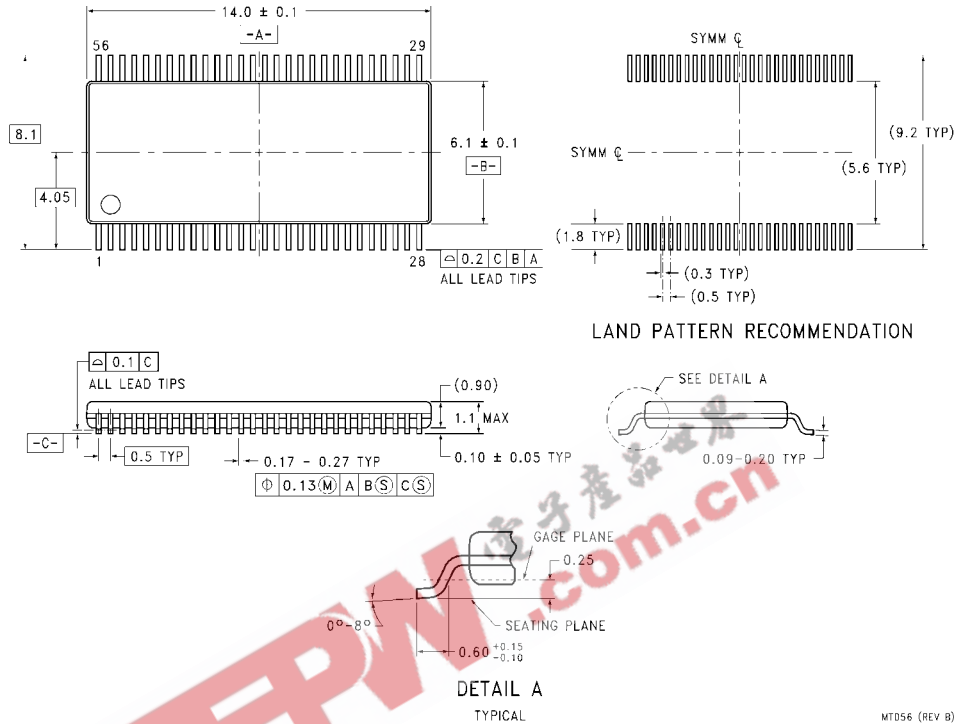
**Physical Dimensions** inches (millimeters) unless otherwise noted



**56-Lead Shrink Small Outline Package (SSOP), JEDEC MO-118, 0.300" Wide**  
**Package Number MS56A**



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



**56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide  
Package Number MTD56**

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