FAIRCHILD SEMICONDUCTOR™

July 1988
Revised September 2000

74ACT823
9-Bit D-Type Flip-Flop

General Description

The ACT823 is a 9-bit buffered register. It features Clock Enable and Clear which are ideal for parity bus interfacing in high performance microprogramming systems. The ACT823 offers noninverting outputs.

Features

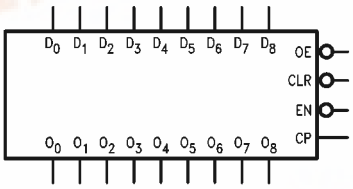
- Outputs source/sink 24 mA
- 3-STATE outputs for bus interfacing
- Inputs and outputs are on opposite sides
- TTL compatible inputs

Ordering Code:

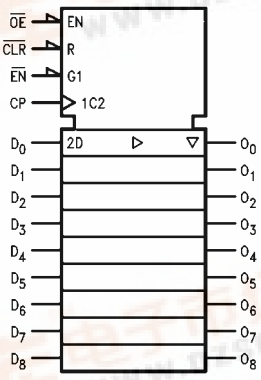
Order Number	Package Number	Package Description
74ACT823SC	M24B	24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
74ACT823MTC	MTC24	24-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74ACT823SPC	N24C	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code. (SPC not available in Tape and Reel.)

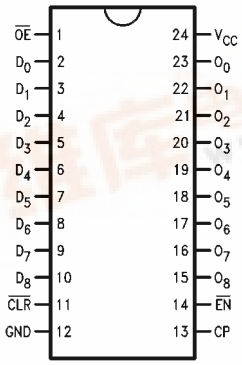
Logic Symbols



IEEE/IEC



Connection Diagram



Pin Descriptions

Pin Names	Description
D_0–D_8	Data Inputs
O_0–O_8	Data Outputs
$\overline{OE}$	Output Enable
$\overline{CLR}$	Clear
CP	Clock Input
$\overline{EN}$	Clock Enable

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Functional Description

The ACT823 consists of nine D-type edge-triggered flip-flops. These have 3-STATE outputs for bus systems organized with inputs and outputs on opposite sides. The buffered clock (CP) and buffered Output Enable ($\overline{OE}$) are common to all flip-flops. The flip-flops will store the state of their individual D-type inputs that meet the setup and hold time requirements on the LOW-to-HIGH CP transition. With $\overline{OE}$ LOW, the contents of the flip-flops are available at the outputs. When $\overline{OE}$ is HIGH, the outputs go to the high impedance state. Operation of the $\overline{OE}$ input does not affect the state of the flip-flops. In addition to the Clock and Output Enable pins, there are Clear ($\overline{CLR}$) and Clock Enable ($\overline{EN}$) pins. These devices are ideal for parity bus interfacing in high performance systems.

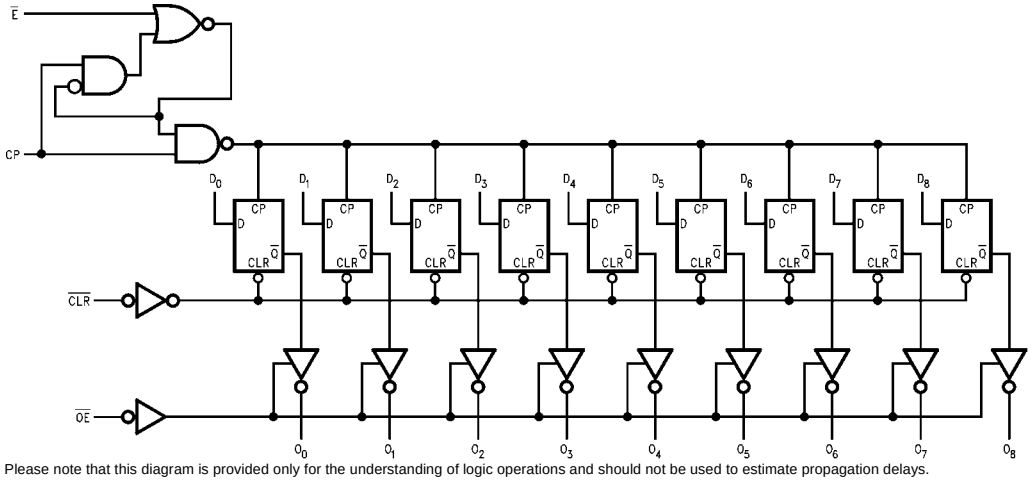
When $\overline{CLR}$ is LOW and $\overline{OE}$ is LOW, the outputs are LOW. When $\overline{CLR}$ is HIGH, data can be entered into the flip-flops. When $\overline{EN}$ is LOW, data on the inputs is transferred to the outputs on the LOW-to-HIGH clock transition. When the $\overline{EN}$ is HIGH, the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

Function Table

Inputs					Internal	Output	Function
$\overline{OE}$	$\overline{CLR}$	$\overline{EN}$	CP	D	Q	O	
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

Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

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 Input Voltage (V_I)	−0.5V to V_{CC} + 0.5V
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 or Sink Current (I_O)	±50 mA
DC V_{CC} or Ground Current per Output Pin (I_{CC} or I_{GND})	±50 mA
Storage Temperature (T_{STG})	−65°C to +150°C
Junction Temperature (T_J)	
PDIP	140°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 (ΔV/Δt)	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°C Typ	T_A = −40°C to +85°C Guaranteed Limits		Units	Conditions
V_{IH}	Minimum HIGH Level 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 Level Input Voltage	4.5	1.5	0.8	0.8	V	V_{OUT} = 0.1V or V_{CC} −0.1V
		4.5	1.5	0.8	0.8		
V_{OH}	Minimum HIGH Level	4.5	4.49	4.4	4.4	V	I_{OUT} = −50 μA
			5.49	5.4	5.4		
		4.5		3.86	3.76	V	V_{IN} = V_{IL} or V_{IH} I_{OH} = −24 mA
				4.86	4.76		I_{OH} = −24 mA (Note 2)
V_{OL}	Maximum LOW Level Output Voltage	4.5	0.001	0.1	0.1	V	I_{OUT} = 50 μA
		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 mA
		5.5		0.36	0.44		I_{OL} = 24 mA (Note 2)
I_{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V_I = V_{CC}, GND
I_{OZ}	Maximum 3-STATE Current	5.5		±0.5	±5.0	μA	V_I = V_{IL}, V_{IH} V_O = V_{CC}, GND
I_{CCT}	Maximum I_{CC}/Input	5.5	0.6		1.5	mA	V_I = V_{CC} −2.1V
I_{OLD}	Minimum Dynamic Output Current (Note 3)	5.5			75	mA	V_{OLD} = 1.65V Max
I_{OHD}		5.5			−75	mA	V_{OHD} = 3.85V Min
I_{CC}	Maximum Quiescent Supply Current	5.5		8.0	80	μA	V_{IN} = V_{CC} or GND

Note 2: All outputs loaded; thresholds on input 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_{CC} (V)	$T_A = +25°C$, $C_L = 50pF$			$T_A = -40°C$ to $+85°C$, $C_L = 50$ pF		Units
		(Note 4)	Min	Typ	Max	Min	Max	
f_{MAX}	Maximum Clock Frequency	5.0	120	158		109		MHz
t_{PLH}	Propagation Delay CP to O_n	5.0	1.5	5.5	9.5	1.5	10.5	ns
t_{PHL}	Propagation Delay CP to O_n	5.0	2.0	5.5	9.5	1.5	10.5	ns
t_{PHL}	Propagation Delay $\overline{CLR}$ to O_n	5.0	2.5	8.0	13.5	2.0	15.5	ns
t_{PZH}	Output Enable Time $\overline{OE}$ to O_n	5.0	1.5	6.0	10.5	1.5	11.5	ns
t_{PZL}	Output Enable Time $\overline{OE}$ to O_n	5.0	2.0	6.5	11.0	1.5	12.0	ns
t_{PHZ}	Output Disable Time $\overline{OE}$ to O_n	5.0	1.5	6.5	11.0	1.5	12.0	ns
t_{PLZ}	Output Disable Time $\overline{OE}$ to O_n	5.0	1.5	6.0	10.5	1.5	11.5	ns

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

AC Operating Requirements

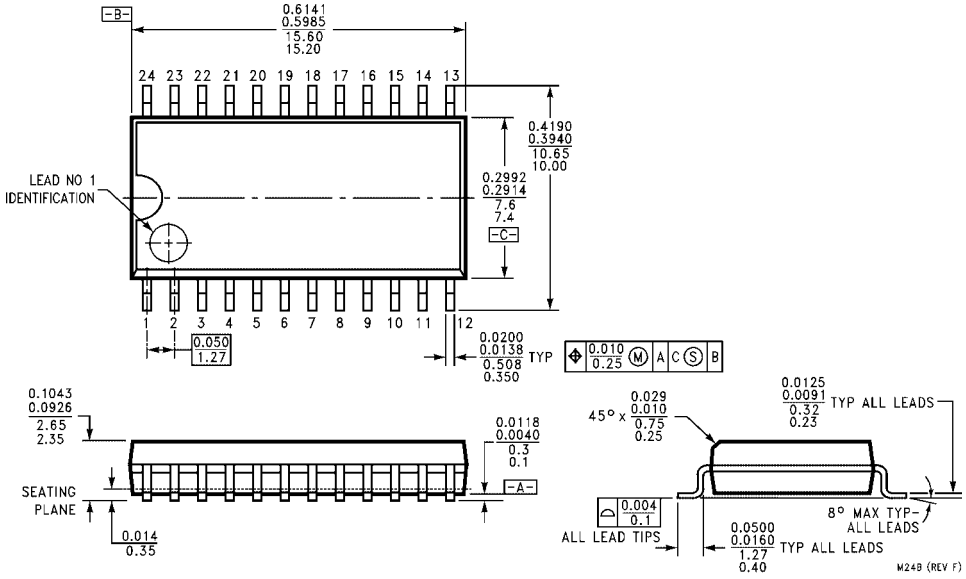
Symbol	Parameter	V_{CC} (V)	$T_A = +25°C$, $C_L = 50$ pF		$T_A = -40°C$ to $+85°C$, $C_L = 50$ pF	Units
		(Note 5)	Typ	Guaranteed Minimum		
t_S	Setup Time, HIGH or LOW D to CP	5.0	0.5	2.5	2.5	ns
t_H	Hold Time, HIGH or LOW D_n to CP	5.0	0	2.5	2.5	ns
t_S	Setup Time, HIGH or LOW $\overline{EN}$ to CP	5.0	0	2.0	2.5	ns
t_H	Hold Time, HIGH or LOW $\overline{EN}$ to CP	5.0	0	1.0	1.0	ns
t_W	CP Pulse Width HIGH or LOW	5.0	2.5	4.5	5.5	ns
t_W	$\overline{CLR}$ Pulse Width, LOW	5.0	3.0	5.5	5.5	ns
t_{REC}	$\overline{CLR}$ to CP Recovery Time	5.0	1.5	3.5	4.0	ns

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

Capacitance

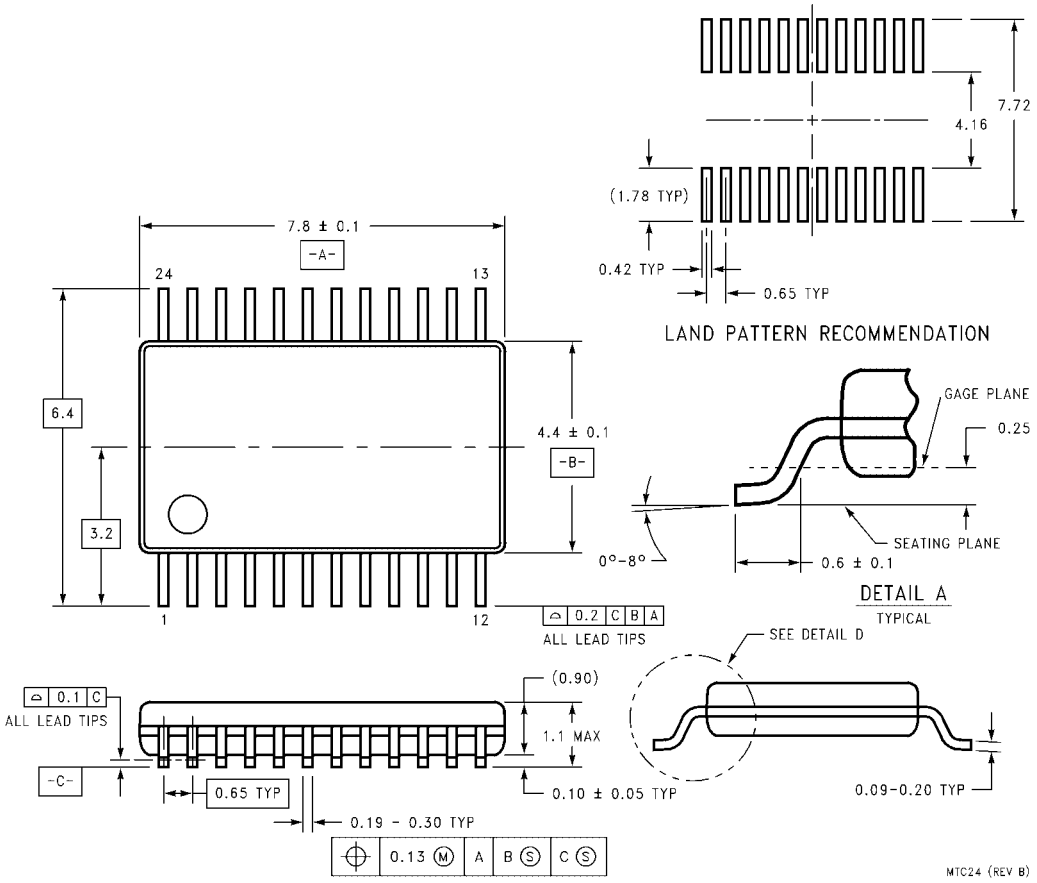
Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	4.5	pF	V_{CC} = OPEN
C_{PD}	Power Dissipation Capacitance	44	pF	V_{CC} = 5.0V

Physical Dimensions inches (millimeters) unless otherwise noted



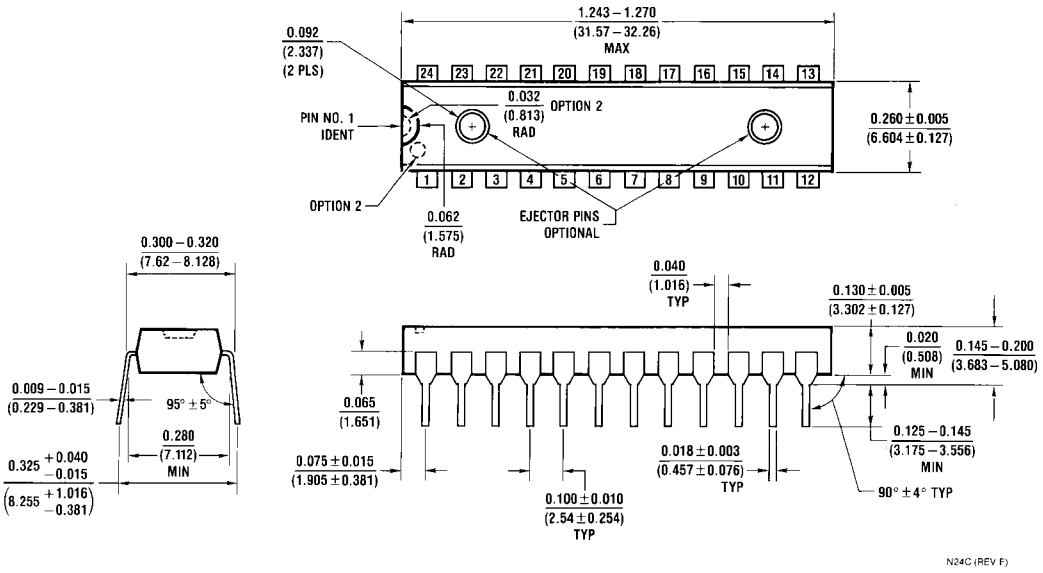
24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
Package Number M24B

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



24-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC24

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



24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
Package Number N24C