National Semiconductor

February 1999

54ACT825
8-Bit D Flip-Flop

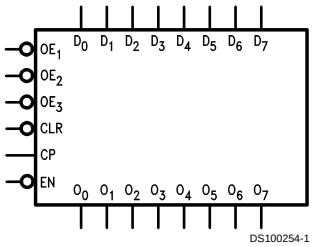
General Description

The 'ACT825 is an 8-bit buffered register. They have Clock Enable and Clear features which are ideal for parity bus interfacing in high performance microprogramming systems. Also included are multiple enables that allow multi-use control of the interface. The 'ACT825 has noninverting outputs and is fully compatible with AMD's Am29825.

Features

- Outputs source/sink 24 mA
- Inputs and outputs are on opposite sides
- 'ACT825 has TTL-compatible inputs
- Standard Microcircuit Drawing (SMD)
  — 'ACT825: 5962-91611

Logic Symbols



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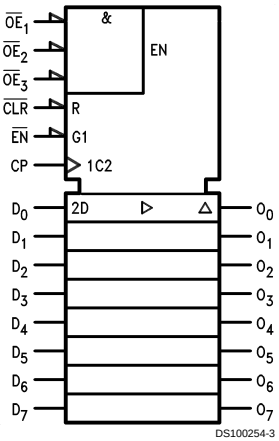
IEEE/IEC



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Pin Names	Description
D_0–D_7	Data Inputs
O_0–O_7	Data Outputs
$\overline{OE}_1$, $\overline{OE}_2$, $\overline{OE}_3$	Output Enables
$\overline{EN}$	Clock Enable
$\overline{CLR}$	Clear
CP	Clock Input

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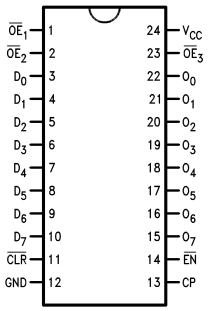
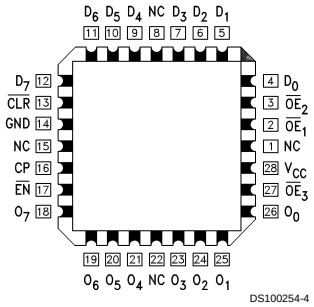
Connection Diagrams

Pin Assignment for DIP and Flatpak



DS100254-2

Pin Assignment for LCC



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Functional Description

The ’ACT825 consists of eight D-type edge-triggered flip-flops. These devices have TRI-STATE® outputs for bus systems, organized in a broadside pinning. In addition to the clock and output enable pins, 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 inputs that meet the setup and hold time requirements on the LOW-to-HIGH CP transition. With $\overline{OE}_1$, $\overline{OE}_2$ and $\overline{OE}_3$ LOW, the contents of the flip-flops are available at the outputs. When one of $\overline{OE}_1$, $\overline{OE}_2$ or $\overline{OE}_3$ 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. The ’ACT825 has Clear ($\overline{CLR}$) and Clock Enable ($\overline{EN}$) pins. These pins are ideal for parity bus interfacing in high performance systems.

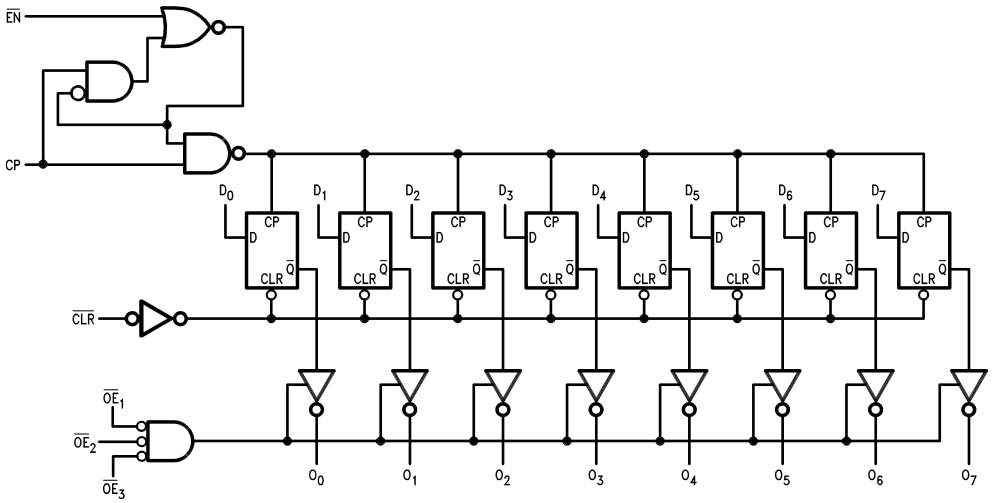
When $\overline{CLR}$ is LOW and $\overline{OE}$ is LOW, the outputs are LOW. When $\overline{CLR}$ is HIGH, data can be entered into the flip-flops. When $\overline{EN}$ is LOW, data on the inputs is transferred to the outputs on the LOW-to-HIGH clock transition. When $\overline{EN}$ is HIGH, the outputs 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_n	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



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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)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

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
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) CDIP	175˚C

Recommended Operating Conditions

Supply Voltage (V_{CC})	
'ACT	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)	
54ACT	−55˚C to +125˚C
Minimum Input Edge Rate (ΔV/Δt)	
'ACT Devices	
V_{IN} from 0.8V to 2.0V	
V_{CC} @ 4.5V, 5.5V	125 mV/ns

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. National does not recommend operation of FACT™ circuits outside databook specifications.

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	54ACT T_A = −55˚C to +125˚C Guaranteed Limits	Units	Conditions
V_{IH}	Minimum High Level Input Voltage	4.5	2.0	V	V_{OUT} = 0.1V or V_{CC} −0.1V
		5.5	2.0		
V_{IL}	Maximum Low Level Input Voltage	4.5	0.8		V_{OUT} = 0.1V or V_{CC} −0.1V
		5.5	0.8		
V_{OH}	Minimum High Level	4.5	4.4	V	I_{OUT} = −50 μA
		5.5	5.4		
					(Note 2) V_{IN} = V_{IL} or V_{IH}
		4.5	3.70	V	I_{OH} = −24 mA
		5.5	4.70		I_{OH} = −24 mA
V_{OL}	Maximum Low Level Output Voltage	4.5	0.1	V	I_{OUT} = 50 μA
		5.5	0.1		
					(Note 2) V_{IN} = V_{IL} or V_{IH}
		4.5	0.50	V	I_{OL} = 24 mA
		5.5	0.50		I_{OL} = 24 mA
I_{IN}	Maximum Input Leakage Current	5.5	±1.0	μA	V_I = V_{CC}, GND
I_{OZ}	Maximum TRI-STATE Current	5.5	±10.0	μA	V_I = V_{IL}, V_{IH} V_O = V_{CC}, GND
I_{CCT}	Maximum I_{CC}/Input	5.5	1.6	mA	V_I = V_{CC} −2.1V
	(Note 3)				
I_{OLD}	Minimum Dynamic	5.5	50	mA	V_{OLD} = 1.65V Max
I_{OHD}	Output Current	5.5	−50	mA	V_{OHD} = 3.85V Min
I_{CC}	Maximum Quiescent Supply Current	5.5	160	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.

DC Electrical Characteristics (Continued)

Note 4: I_{CC} limit for 54ACT @ 25˚C is identical to 74ACT @ 25˚C.

AC Electrical Characteristics

Symbol	Parameter	V_{CC} (V) (Note 5)	54ACT T_A = −55˚C to +125˚C C_L = 50 pF		Units	Fig. No.
			Min	Max		
f_{max}	Maximum Clock Frequency	5.0	95		MHz	
t_{PLH}	Propagation Delay CP to O_n	5.0	1.5	11.5	ns	
t_{PHL}	Propagation Delay CP to O_n	5.0	1.5	11.5	ns	
t_{PHL}	Propagation Delay $\overline{CLR}$ to O_n	5.0	1.5	18.0	ns	
t_{PZH}	Output Enable Time $\overline{OE}$ to O_n	5.0	1.5	11.5	ns	
t_{PZL}	Output Enable Time $\overline{OE}$ to O_n	5.0	1.5	12.5	ns	
t_{PHZ}	Output Disable Time $\overline{OE}$ to O_n	5.0	1.5	13.5	ns	
t_{PLZ}	Output Disable Time $\overline{OE}$ to O_n	5.0	1.5	13.0	ns	

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

AC Operating Requirements

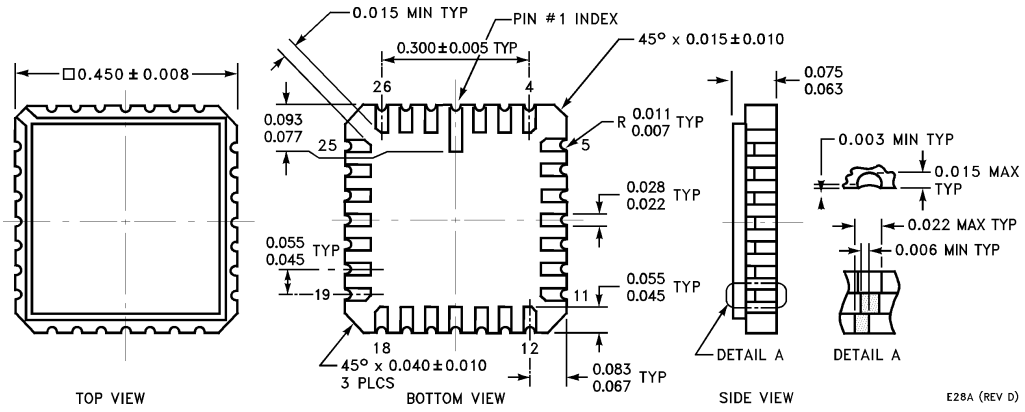
Symbol	Parameter	V_{CC} (V) (Note 6)	54ACT T_A = −55˚C to +125˚C C_L = 50 pF	Units	Fig. No.
			Guaranteed Minimum		
t_s	Setup Time, HIGH or LOW D_n to CP	5.0	4.0	ns	
t_h	Hold Time, HIGH or LOW D_n to CP	5.0	2.5	ns	
t_s	Setup Time, HIGH or LOW $\overline{EN}$ to CP	5.0	4.0	ns	
t_h	Hold Time, HIGH or LOW $\overline{EN}$ to CP	5.0	2.0	ns	
t_w	CP Pulse Width HIGH or LOW	5.0	6.0	ns	
t_w	$\overline{CLR}$ Pulse Width, LOW	5.0	7.0	ns	
t_{rec}	$\overline{CLR}$ to CP Recovery Time	5.0	4.5	ns	

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

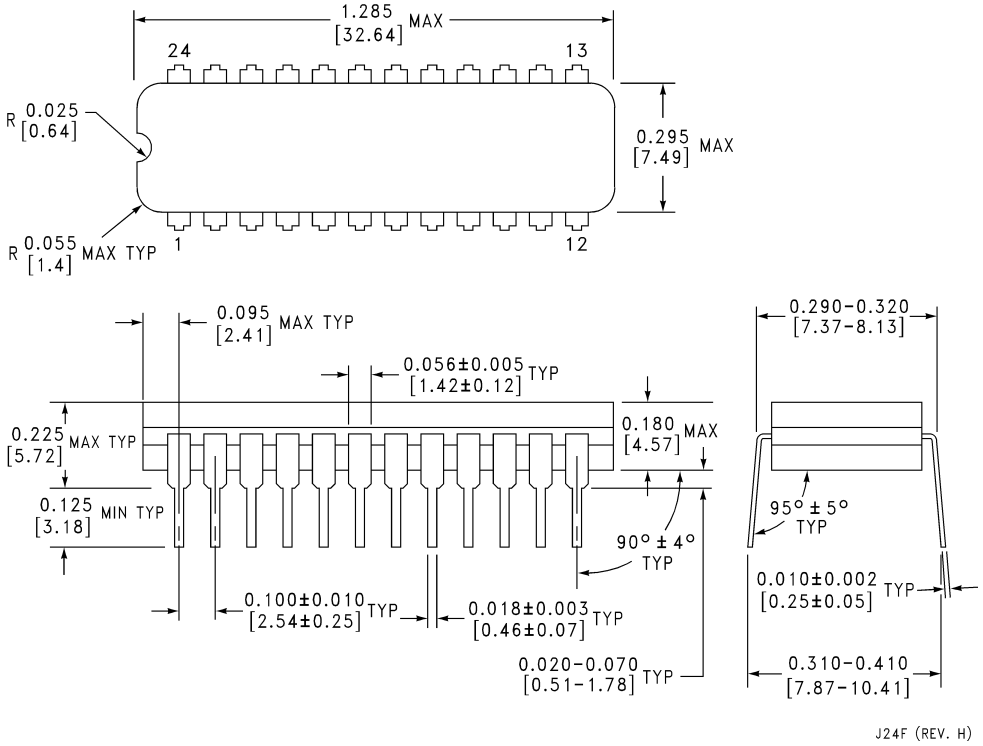
Capacitance

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

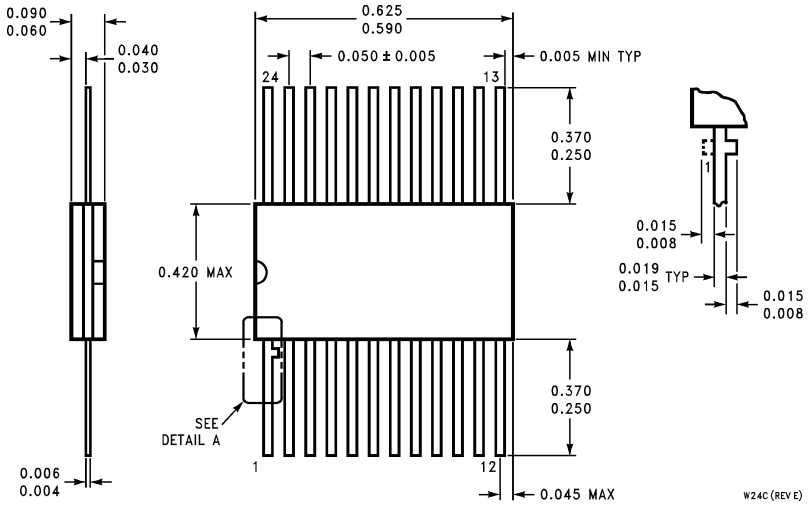


28-Terminal Ceramic Leadless Chip Carrier (L)
NS Package Number E28A



24 Lead Slim (0.300" Wide) Ceramic Dual-In-Line (SD)
NS Package Number J24F

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



24 Lead Ceramic Flatpak (F)
NS Package Number W24C

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