

Am25LS174 • Am54LS/74LS174

Am25LS175 • Am54LS/74LS175

Hex/Quadruple D-Type Flip Flops With Clear

DISTINCTIVE CHARACTERISTICS

- 4-bit and 6-bit parallel registers
- Common clock and common clear
- Positive edge-triggered D flip-flops
- Am25LS devices offer the following improvements over Am54/74LS
 - Higher speed
 - 50mV lower V_{OL}
 - Twice the fan-out over military range
 - 440 μ A source current
- 100% product assurance screening to MIL-STD-883 requirements

FUNCTIONAL DESCRIPTION

The Am25LS174 is a six-bit register and the Am25LS175 is a four-bit register built using advanced Low Power Schottky technology. The registers consist of D-type flip-flops with a buffered common clock and an asynchronous active LOW buffered clear.

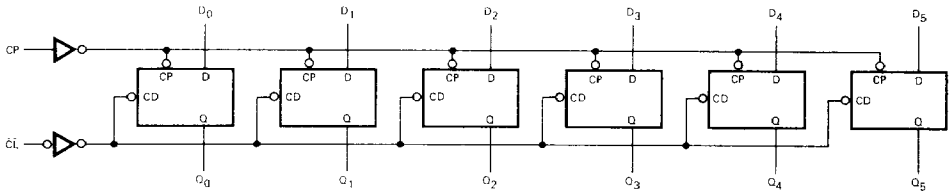
When the clear is LOW, the Q outputs are LOW independent of the other inputs. Information meeting the set-up requirements of the D inputs is transferred to the Q outputs on the positive-going edge of the clock pulse.

For versions of these devices having a common enable rather than clear see Am25LS07 and Am25LS08.

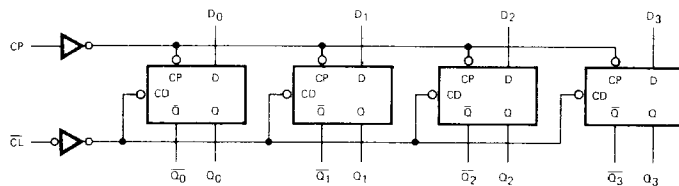
The Am54LS/74LS174 and 175 are standard performance versions of the Am25LS174 and 175. See appropriate electrical characteristic tables for detailed Am25LS improvements.

LOGIC DIAGRAMS

'LS174

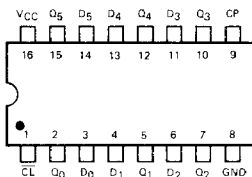


'LS175

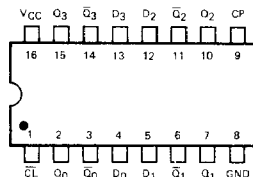


CONNECTION DIAGRAMS Top Views

'LS174



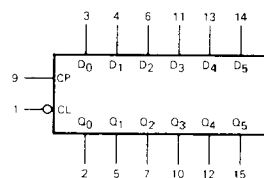
'LS175



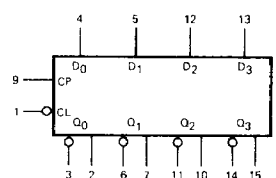
Note: Pin 1 is marked for orientation.

LOGIC SYMBOLS

'LS174



'LS175



V_{CC} = Pin 16
GND = Pin 8

ELECTRICAL CHARACTERISTICS The following conditions apply unless otherwise specified:

COM'L	$T_A = 0^\circ\text{C to } +70^\circ\text{C}$	$V_{CC} = 5.0\text{V} \pm 5\%$ (MIN. = 4.75V MAX. = 5.25V)
MIL	$T_A = -55^\circ\text{C to } +125^\circ\text{C}$	$V_{CC} = 5.0\text{V} \pm 10\%$ (MIN. = 4.50V MAX. = 5.50V)

DC CHARACTERISTICS OVER OPERATING RANGE

Parameters	Description	Test Conditions (Note 1)	Min.	Typ. (Note 2)	Max.	Units
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{MIN.}, I_{OH} = -440\mu\text{A}$ $V_{IN} = V_{IH}$ or V_{IL}	MIL	2.5	3.4	Volts
			COM'L	2.7	3.4	
V_{OL}	Output LOW Voltage	$V_{CC} = \text{MIN.}$ $V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 4\text{mA}$		0.4	Volts
			$I_{OL} = 8\text{mA}$		0.45	
V_{IH}	Input HIGH Level	Guaranteed input logical HIGH voltage for all inputs	2.0			Volts
V_{IL}	Input LOW Level	Guaranteed input logical LOW voltage for all inputs	MIL		0.7	Volts
			COM'L		0.8	
V_I	Input Clamp Voltage	$V_{CC} = \text{MIN.}, I_{IN} = -18\text{mA}$			-1.5	Volts
I_{IL}	Input LOW Current	$V_{CC} = \text{MAX.}, V_{IN} = 0.4\text{V}$	Clock, \overline{CL}		-0.36	mA
			Others		-0.24	
I_{IH}	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 2.7\text{V}$			20	μA
I_I	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 7.0\text{V}$			0.1	mA
I_{SC}	Output Short Circuit Current (Note 3)	$V_{CC} = \text{MAX.}$	-15		-85	mA
I_{CC}	Power Supply Current (Note 4)	$V_{CC} = \text{MAX.}$	LS174	16	26	mA
			LS175	11	18	

Am54LS/74LS174/175**ELECTRICAL CHARACTERISTICS** The Following Conditions Apply Unless Otherwise Specified:

COM'L	$T_A = 0^\circ\text{C to } +70^\circ\text{C}$	$V_{CC} = 5.0\text{V} \pm 5\%$ (MIN. = 4.75V MAX. = 5.25V)
MIL	$T_A = -55^\circ\text{C to } +125^\circ\text{C}$	$V_{CC} = 5.0\text{V} \pm 10\%$ (MIN. = 4.50V MAX. = 5.50V)

DC CHARACTERISTICS OVER OPERATING RANGE

Parameters	Description	Test Conditions (Note 1)	Min.	Typ. (Note 2)	Max.	Units
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{MIN.}, I_{OH} = -400\mu\text{A}$ $V_{IN} = V_{IH}$ or V_{IL}	Am74LS	2.7	3.4	Volts
			Am54LS	2.5	3.4	
V_{OL}	Output LOW Voltage	$V_{CC} = \text{MIN.}$ $V_{IN} = V_{IH}$ or V_{IL}	All, $I_{OL} = 4\text{mA}$		0.4	Volts
			74LS only, $I_{OL} = 8\text{mA}$		0.5	
V_{IH}	Input HIGH Level	Guaranteed input logical HIGH voltage for all inputs	2.0			Volts
V_{IL}	Input LOW Level	Guaranteed input logical LOW voltage for all inputs	Am54LS		0.7	Volts
			Am74LS		0.8	
V_I	Input Clamp Voltage	$V_{CC} = \text{MIN.}, I_{IN} = -18\text{mA}$			-1.5	Volts
I_{IL}	Input LOW Current	$V_{CC} = \text{MAX.}, V_{IN} = 0.4\text{V}$			-0.40	mA
I_{IH}	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 2.7\text{V}$			20	μA
I_I	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 7.0\text{V}$			0.1	mA
I_{SC}	Output Short Circuit Current (Note 3)	$V_{CC} = \text{MAX.}$	-15		-100	mA
I_{CC}	Power Supply Current (Note 4)	$V_{CC} = \text{MAX.}$	LS174	16	26	mA
			LS175	11	18	

Notes: 1. For conditions shown as MIN. or MAX., use the appropriate value specified under Electrical Characteristics for the applicable device type.

2. Typical limits are at $V_{CC} = 5.0\text{V}$, 25°C ambient and maximum loading.

3. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.

4. All outputs open and 4.5V applied to the data and clear inputs. Measured after a momentary ground, then 4.5V applied to the clock input.

MAXIMUM RATINGS (Above which the useful life may be impaired)

Storage Temperature	$-65^\circ\text{C to } +150^\circ\text{C}$
Temperature (Ambient) Under Bias	$-55^\circ\text{C to } +125^\circ\text{C}$
Supply Voltage to Ground Potential Continuous	$-0.5\text{V to } +7.0\text{V}$
DC Voltage Applied to Outputs for High Output State	$-0.5\text{V to } +V_{CC} \text{ max.}$
DC Input Voltage	$-0.5\text{V to } +7.0\text{V}$
DC Output Current, Into Outputs	30 mA
DC Input Current	$-30\text{mA to } +5.0\text{mA}$

SWITCHING CHARACTERISTICS

($T_A = +25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$)

Parameters	Description	Am25LS			Am54LS/74LS			Units	Test Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
t_{PLH}	Clock to Output		15	23		20	30	ns	C _L = 15pF R _L = 2.0k Ω
t_{PHL}			13	20		23	35		
t_{PLH}	Clear to Q Output, LS175 only		16	25		16	25		
t_{PHL}		Clear to Output		23	35		23		
t_{pw}	Pulse Width		Clock	17		20			
		Clear	20		20				
t_s	Data Set-up Time	20			20		ns		
t_s	Set-up Time Clear Recovery (in-active) to Clock	20			25		ns		
t_h	Data Hold Time	5			5		ns		
f_{max}	Maximum Clock Frequency (Note 1)	40	65		30	40	MHz		

Note 1. Per industry convention, f_{max} is the worst case value of the maximum device operating frequency with no constraints on t_r , t_f , pulse width or duty cycle.

Am25LS ONLY
SWITCHING CHARACTERISTICS
OVER OPERATING RANGE*

Parameters	Description	Am25LS COM'L		Am25LS MIL		Units	Test Conditions
		Min.	Max.	Min.	Max.		
		$T_A = 0^\circ\text{C to } +70^\circ\text{C}$		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$			
		$V_{CC} = 5.0\text{V } \pm 5\%$		$V_{CC} = 5.0\text{V } \pm 10\%$			
t_{PLH}	Clock to Output		34		39	ns	C _L = 50pF R _L = 2.0k Ω
t_{PHL}			30		35		
t_{PLH}	Clear to Q Output, LS175 only		37		42	ns	
t_{PHL}		Clear to Output		50		57	
t_{pw}	Pulse Width		Clock	26		30	
		Clear	30		35		
t_s	Data Set-up Time	30		35	ns		
t_s	Set-up Time Clear Recovery (In-active) to Clock	30		35	ns		
t_h	Data Hold Time	11		12	ns		
f_{max}	Maximum Clock Frequency (Note 1)	30		26	MHz		

*AC performance over the operating temperature range is guaranteed by testing defined in Group A, Subgroup 9.

DEFINITION OF FUNCTIONAL TERMS

D_i The D flip-flop data inputs.

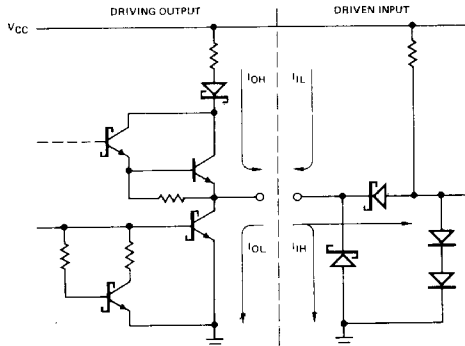
CL Clear. When the clear is LOW, the Q_i outputs are LOW, regardless of the other inputs. When the clear is HIGH, data can be entered in the register.

CP Clock pulse for the register. Enters data on the positive transition.

Q_i The TRUE register outputs.

Q_i The complement register outputs.

Am25LS • Am54LS/74LS
LOW-POWER SCHOTTKY INPUT/OUTPUT
CURRENT INTERFACE CONDITIONS



Note: Actual current flow direction shown.

FUNCTION TABLE

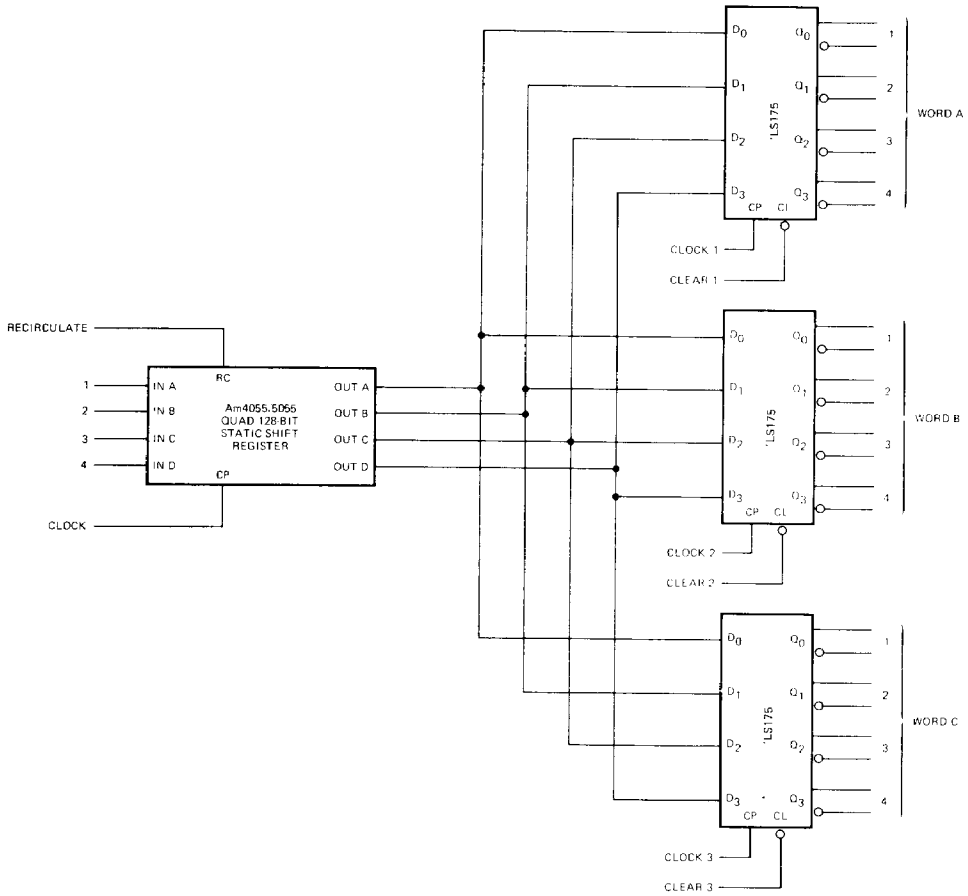
INPUTS			OUTPUTS	
Clear	Clock	D _i	Q _i	Q _i
L	X	X	L	H
H	L	X	NC	NC
H	H	X	NC	NC
H	↑	L	L	H
H	↑	H	H	L

H = HIGH
L = LOW
↑ = LOW-to-HIGH Transition

X = Don't Care
NC = No Change

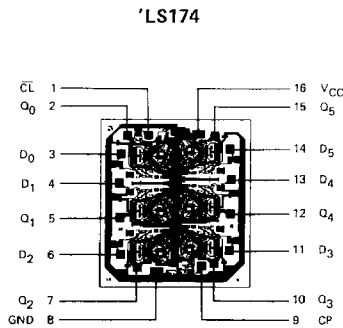
Note: Q_i on Am25LS175 only.
Q_i on Am54LS/74LS175 only.

APPLICATION

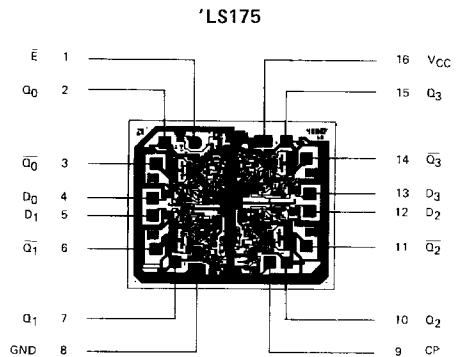


Low-Power Schottky registers interface directly with many MOS shift registers.

Metallization and Pad Layouts



DIE SIZE 0.075" X 0.084"



DIE SIZE 0.075" X 0.061"

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