

Am25LS374A • Am54LS/74LS374A

Am25LS534 • Am54LS/74LS534

8-Bit Registers with Three-State Outputs

DISTINCTIVE CHARACTERISTICS

- 8-bit, high-speed parallel registers
- Positive, edge-triggered, D-type flip-flops
- Buffered common clock and buffered common three-state control
- Am25LS/54LS have $I_{OL} = 24\text{mA}$ over full military temperature range
- Am25LS devices offer the following improvements over Am54/74LS
 - Twice the fan-out over military range
- 100% product assurance screening to MIL-STD-883 requirements

FUNCTIONAL DESCRIPTION

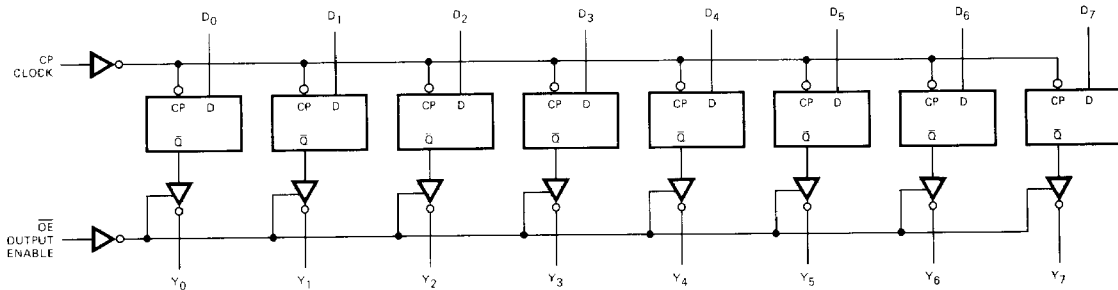
The Am25LS374A and Am54LS/74LS374A are 8-bit registers built using advanced Low-Power Schottky technology. These registers consist of eight D-type flip-flops with a buffered common clock and a buffered three-state output control. When the output enable (OE) input is LOW, the eight outputs are enabled. When the OE input is HIGH, the outputs are in the three-state condition. The Am25LS/54LS/74LS534 provide the inverting version of the same function.

Input data meeting the set-up and hold time requirements of the D inputs is transferred to the Y outputs on the LOW-to-HIGH transition of the clock input.

The device is packaged in a space-saving (0.3-inch row spacing) 20-pin package.

LOGIC DIAGRAM

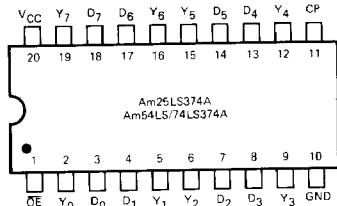
Am25LS/54LS/74LS374A



Outputs Y_0 through Y_7 are inverted on the Am25LS/54LS/74LS534

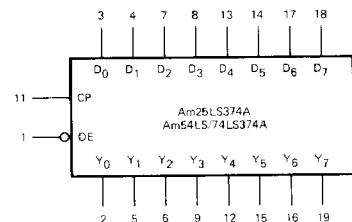
CONNECTION DIAGRAM

Top View



Note: Pin 1 is marked for orientation.
Outputs Y_0 through Y_7 are inverted on the Am25LS/54LS/74LS534

LOGIC SYMBOL



V_{CC} = Pin 20
GND = Pin 10
Outputs Y_0 through Y_7 are inverted on the Am25LS/54LS/74LS534

Am25LS374A/534

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. = 4.75 V	MAX. = 5.25 V
MIL	$T_A = -55^\circ\text{C to } +125^\circ\text{C}$	$V_{CC} = 5.0\text{V} \pm 10\%$	MIN. = 4.50 V	MAX. = 5.50 V

DC CHARACTERISTICS OVER OPERATING RANGE

Parameters	Description	Test Conditions (Note 1)		Min.	Typ. (Note 2)	Max.	Units
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{MIN.}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -1.0\text{mA, MIL}$	2.4	3.4		Volts
			$I_{OH} = -2.6\text{mA, COM'L}$	2.4	3.4		
V_{OL}	Output LOW Voltage	$V_{CC} = \text{MIN.}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 12\text{mA}$			0.4	Volts
			$I_{OL} = 24\text{mA}$			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	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	$V_{CC} = \text{MAX.}, V_{IN} = 0.4\text{V}$				-4	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_{OZ}	Off-State (High-Impedance) Output Current	$V_{CC} = \text{MAX.}$	$V_O = 0.4\text{V}$			-20	μA
			$V_O = 2.7\text{V}$			20	
I_{SC}	Output Short Circuit Current (Note 3)	$V_{CC} = \text{MAX.}$		-30		-85	mA
I_{CC}	Power Supply Current (Note 4)	$V_{CC} = \text{MAX.}$			27	40	mA

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.

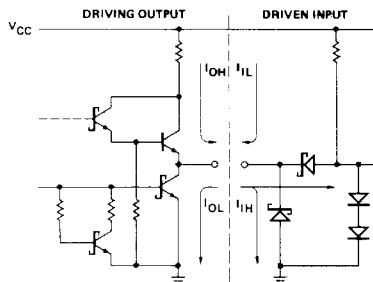
4. All outputs open; all D_i inputs and $\overline{OE} = 4.5\text{V}$. Apply momentary ground, then 4.5V to clock input.

Am25LS • Am54LS/74LS

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	$-30\text{mA to } +5.0\text{mA}$

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



Note: Actual current flow direction shown.

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	$V_{CC} = \text{MIN.}$ $V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -1.0\text{mA}$	MIL	2.4	3.4		Volts
			$I_{OH} = -2.6\text{mA}$	COM'L	2.4	3.4		
V_{OL}	Output LOW Voltage	$V_{CC} = \text{MIN.}$ $V_{IN} = V_{IH}$ or V_{IL}	All, $I_{OL} = 12\text{mA}$				0.4	Volts
			74LS only, $I_{OL} = 24\text{mA}$				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		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	$V_{CC} = \text{MAX.}$, $V_{IN} = 0.4\text{V}$					-0.4	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_{OZ}	Off-State (High-Impedance) Output Current	$V_{CC} = \text{MAX.}$		$V_O = 0.5\text{V}$		-20	μA	
				$V_O = 2.4\text{V}$		20		
I_{SC}	Output Short Circuit Current (Note 3)	$V_{CC} = \text{MAX.}$			-30		-130	mA
I_{CC}	Power Supply Current (Note 4)	$V_{CC} = \text{MAX.}$				27	40	mA

- 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; all D_i inputs and $\overline{OE} = 4.5\text{V}$. Apply momentary ground, then 4.5V to clock input.

DEFINITION OF FUNCTIONAL TERMS

- D_i The D flip-flop data inputs.
 CP Clock Pulse for the register. Enters data on the LOW-to-HIGH transition.
 Y_i The register three-state outputs.
 \overline{OE} Output Control. An active-LOW three-state control used to enable the outputs. A HIGH level input forces the outputs to the high impedance (off) state.

FUNCTION TABLE

FUNCTION	INPUTS			INTERNAL	OUTPUTS
	\overline{OE}	Clock	D_i	Q_i	Y_i
Hi-Z	H	L	X	NC	Z
	H	H	X	NC	Z
LOAD REGISTER	L	\uparrow	L	L	L
	L	\uparrow	H	H	H
	H	\uparrow	L	L	Z
	H	\uparrow	H	H	Z

H = HIGH
 L = LOW
 X = Don't Care

NC = No Change
 Z = High Impedance
 \uparrow = LOW-to-HIGH transition

SWITCHING CHARACTERISTICS(T_A = +25°C, V_{CC} = 5.0V)

Parameters	Description	Am25LS			Am54LS/74LS			Units	Test Conditions
		Min	Typ	Max	Min	Typ	Max		
t _{PLH}	Clock to Y _i			28			28	ns	C _L = 45pF R _L = 667Ω
t _{PHL}				28			28		
t _{PW}	Clock Pulse Width	LOW	15		15				
		HIGH	15		15				
t _s	Data	20			20				
t _h	Data				0				
t _{ZH}	\overline{OE} to Y _i			20			20		
t _{ZL}				20			20		
t _{HZ}	\overline{OE} to Y _i (Note 2)			20			20		
t _{LZ}				25			25		
f _{max}	Maximum Clock Frequency (Note 1)	35	50		35	50		MHz	

Notes: 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.

2. Because of interlead capacitance the rising edge of \overline{OE} is coupled Y_o, thereby, increasing the apparent t_{HZ} for Y_o by 5ns for plastic package device and 10ns for Cerdip. The die geometry for Y_o is the same as other outputs and no spec difference is required for users of dice.

Am25LS ONLY
SWITCHING CHARACTERISTICS
OVER OPERATING RANGE

Parameters	Description	Am25LS COM'L		Am25LS MIL		Units	Test Conditions
		Min	Max	Min	Max		
t _{PLH}	Clock to Y _i		30		38	ns	C _L = 45pF R _L = 667Ω
			30		38		
t _{PW}	Clock Pulse Width	LOW	10	10		ns	
		HIGH	19	28			
t _s	Data	20		20		ns	
t _h	Data	0		0		ns	
t _{ZH}	\overline{OE} to Y _i		25		30	ns	
t _{ZL}			25		30		
t _{HZ}	\overline{OE} to Y _i (Note 2)		25		30	ns	
t _{LZ}			25		28		
f _{max}	Maximum Clock Frequency (Note 1)	35		30		MHz	

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

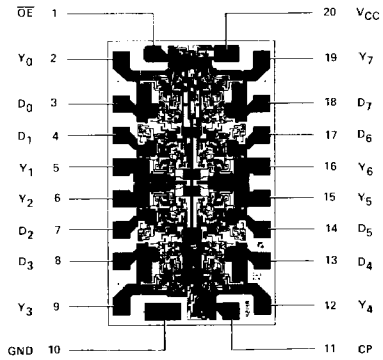
Note 2. Because of interlead capacitance the rising edge of \overline{OE} is coupled into Y_o, thereby, increasing the apparent t_{HZ} for Y_o by 5ns for plastic package device and 10ns for cerdip. The die geometry for Y_o is the same as other outputs and no spec difference is required for users of dice.

ORDERING INFORMATION

Package Type	Temperature Range	Am25LS374A Order Number	Am54LS/ 74LS374A Order Number	Am25LS534 Order Number	Am54LS/ 74LS534 Order Number
Molded DIP	0 to +70°C	AM25LS374APC	SN74LS374AN	AM25LS534PC	SN74LS534N
Hermetic DIP	0 to +70°C	AM25LS374ADC	SN74LS374AJ	AM25LS534DC	SN74LS534J
Dice	0 to +70°C	AM25LS374AXC	SN74LS374AX	AM25LS534XC	SN74LS534X
Hermetic DIP	-55°C to +125°C	AM25LS374ADM	SN54LS374AJ	AM25LS534DM	SN54LS534J
Hermetic Flat Pak	-55°C to +125°C	AM25LS374AFM	SN54LS374AW	AM25LS534FM	SN54LS534W
Dice	-55°C to +125°C	AM25LS374AXM	SN54LS374AX	AM25LS534XM	SN54LS534X

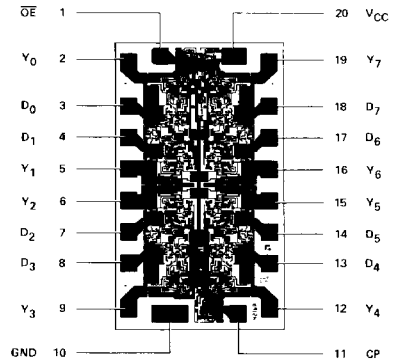
METALLIZATION AND PAD LAYOUTS

Am25LS/54LS/74LS374A



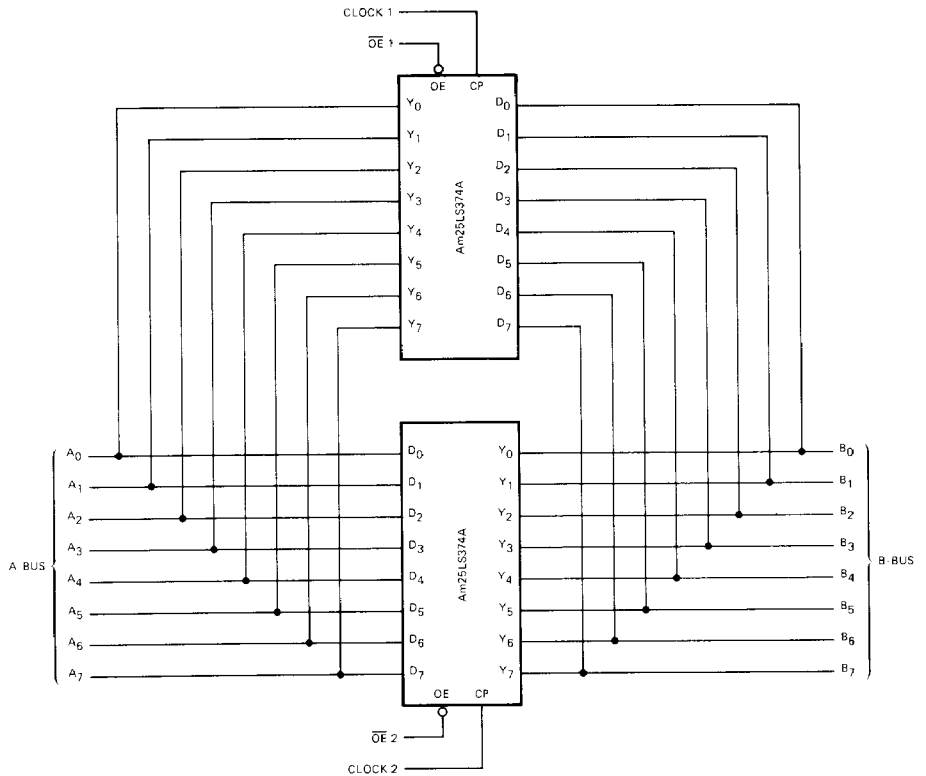
DIE SIZE 0.077" X 0.047"

Am25LS/54LS/74LS534



DIE SIZE 0.077" X 0.047"

APPLICATIONS



Two Am25LS374s can be used as a bidirectional bus driver/register. The above connection shows separate clocks and three-state controls.