

# 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

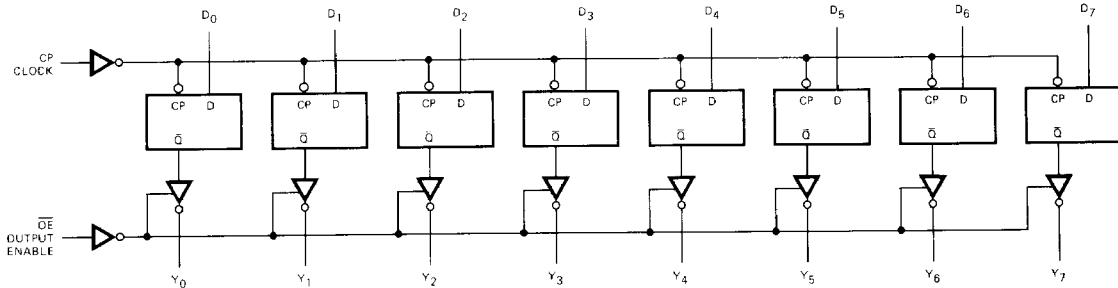
The Am25LS374A and Am54LS/74LS374A are 8-bit registers built using advanced Low-Power Schottky technology. These registers consist of eight D-type flip-flops with a buffered common clock and a buffered three-state output control. When the output enable (OE) input is LOW, the eight outputs are enabled.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

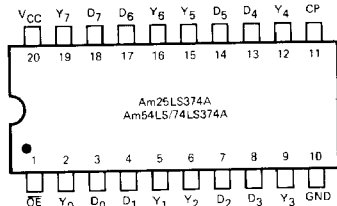
##### Am25LS/54LS/74LS374A



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

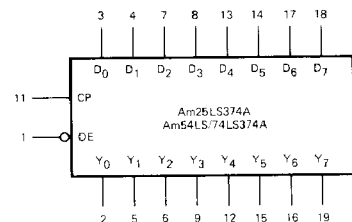
#### CONNECTION DIAGRAM

##### 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	$V_{CC} = \text{MIN.}$ $V_{IN} = V_{IH}$ 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 $V_{IL}$	$I_{OL} = 12\text{mA}$			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				
$V_I$	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	$\mu\text{A}$
$I_I$	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	$\mu\text{A}$
			$V_O = 2.7\text{V}$			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  $V_{CC} = 5.0\text{V}$ ,  $25^\circ\text{C}$  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.

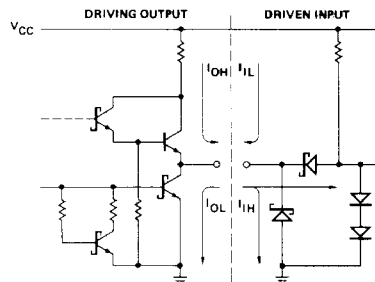
4. All outputs open; all  $D_i$  inputs and  $\overline{OE} = 4.5\text{V}$ . Apply momentary ground, then 4.5V to clock input.

## 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	$\mu\text{A}$
$I_I$	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	$\mu\text{A}$	
				$V_O = 2.4\text{V}$		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  $V_{CC} = 5.0\text{V}$ ,  $25^\circ\text{C}$  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  $4.5\text{V}$  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<sub>A</sub> = +25°C, V<sub>CC</sub> = 5.0V)

Parameters	Description	Am25LS			Am54LS/74LS			Units	Test Conditions
		Min	Typ	Max	Min	Typ	Max		
t <sub>PLH</sub>	Clock to Y <sub>i</sub>			28			28	ns	C <sub>L</sub> = 45pF R <sub>L</sub> = 667Ω
t <sub>PHL</sub>				28			28		
t <sub>PW</sub>	Clock Pulse Width	LOW	15		15			ns	
		HIGH	15		15				
t <sub>s</sub>	Data	20			20		ns		
t <sub>h</sub>	Data				0		ns		
t <sub>ZH</sub>	OE to Y <sub>i</sub>			20			20	ns	
t <sub>ZL</sub>				20			20		
t <sub>HZ</sub>	OE to Y <sub>i</sub> (Note 2)			20			20	ns	
t <sub>LZ</sub>				25			25		
f <sub>max</sub>	Maximum Clock Frequency (Note 1)	35	50		35	50		MHz	

Notes: 1. Per industry convention, f<sub>max</sub> is the worst case value of the maximum device operating frequency with no constraints on t<sub>r</sub>, t<sub>f</sub>, pulse width or duty cycle.

2. Because of interlead capacitance the rising edge of OE is coupled Y<sub>o</sub>, thereby, increasing the apparent t<sub>HZ</sub> for Y<sub>o</sub> by 5ns for plastic package device and 10ns for Cerdip. The die geometry for Y<sub>o</sub> 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 <sub>PLH</sub>	Clock to Y <sub>i</sub>		30		38	ns	C <sub>L</sub> = 45pF R <sub>L</sub> = 667Ω
			30		38		
t <sub>PW</sub>	Clock Pulse Width	LOW	10	10		ns	
		HIGH	19	28			
t <sub>s</sub>	Data	20		20		ns	
t <sub>h</sub>	Data	0		0		ns	
t <sub>ZH</sub>	OE to Y <sub>i</sub>		25		30	ns	
t <sub>ZL</sub>			25		30		
t <sub>HZ</sub>	OE to Y <sub>i</sub> (Note 2)		25		30	ns	
t <sub>LZ</sub>			25		28		
f <sub>max</sub>	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.

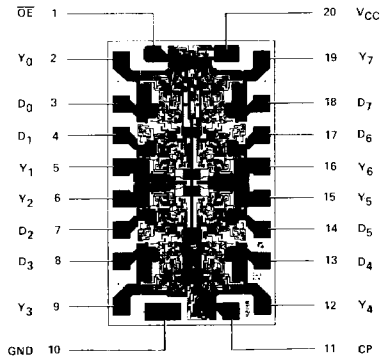
Note 2. Because of interlead capacitance the rising edge of OE is coupled into Y<sub>o</sub>, thereby, increasing the apparent t<sub>HZ</sub> for Y<sub>o</sub> by 5ns for plastic package device and 10ns for cerdip. The die geometry for Y<sub>o</sub> is the same as other outputs and no spec difference 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

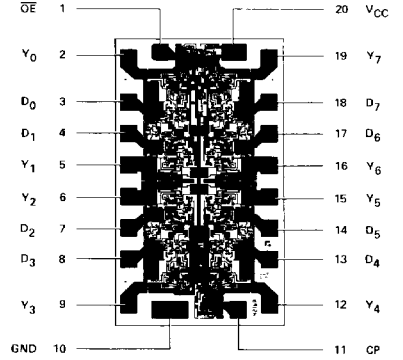
METALLIZATION AND PAD LAYOUTS

Am25LS/54LS/74LS374A



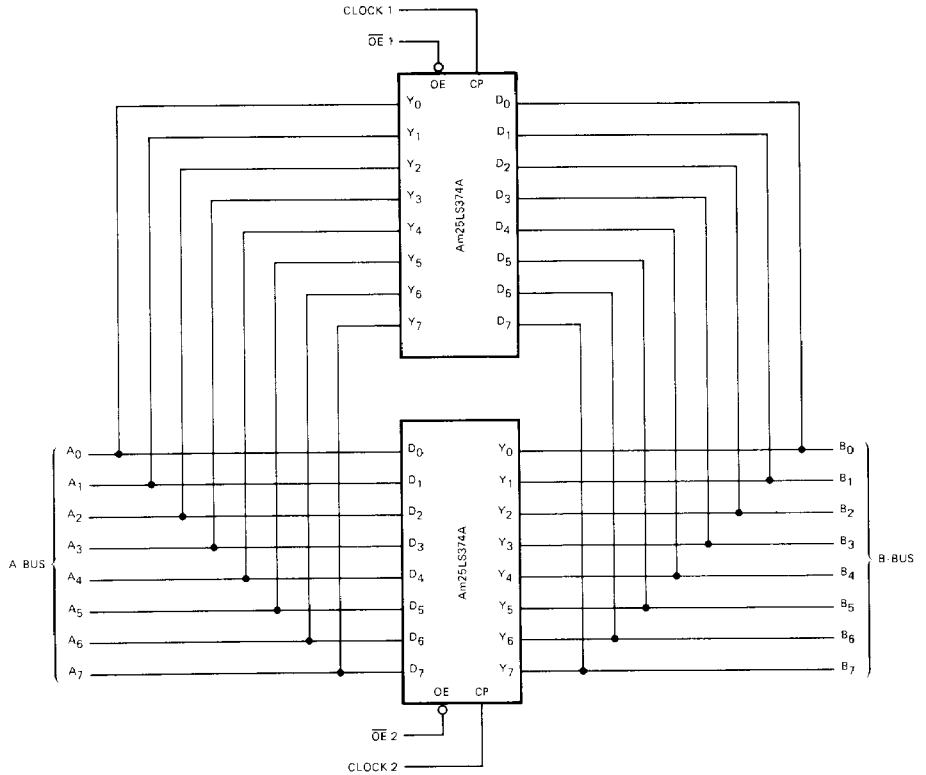
DIE SIZE 0.077" X 0.047"

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.