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} = 24mA 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

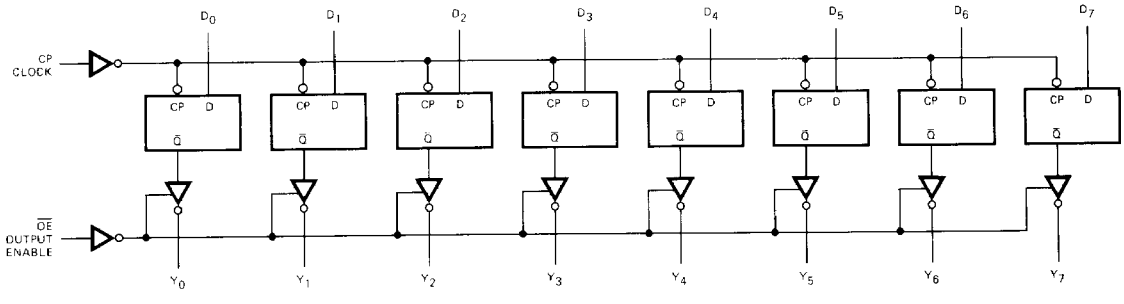
The Am25LS374A and Am54LS/74LS374A are 8-bit registers built using advanced Low-Power Schottky technology. These registers consist of eight D-type flip-flops with a buffered common clock and a buffered three-state output control. When the output enable (OE) input is LOW, the eight outputs are enabled.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

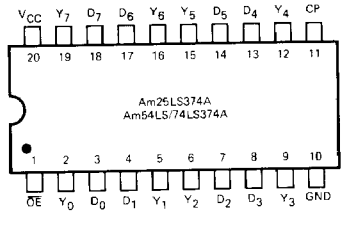
LOGIC DIAGRAM

Am25LS/54LS/74LS374A



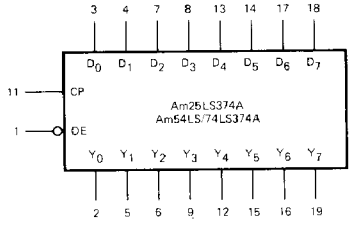
Ouputs Y_0 through Y_7 are inverted on the Am25LS/54LS/74LS534

CONNECTION DIAGRAM
Top View



Note: Pin 1 is marked for orientation.
Ouputs 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 $T_A = 0°C$ to $+70°C$ $V_{CC} = 5.0V \pm 5\%$ MIN. = 4.75 V MAX. = 5.25 V
MIL $T_A = -55°C$ to $+125°C$ $V_{CC} = 5.0V \pm 10\%$ 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} = MIN., $V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -1.0mA$, MIL	2.4	3.4		Volts
			$I_{OH} = -2.6mA$, COM'L	2.4	3.4		
V_{OL}	Output LOW Voltage	V_{CC} = MIN., $V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 12mA$			0.4	Volts
			$I_{OL} = 24mA$			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} = MIN., $I_{IN} = -18mA$				−1.5	Volts
I_{IL}	Input LOW Current	V_{CC} = MAX., $V_{IN} = 0.4V$				−.4	mA
I_{IH}	Input HIGH Current	V_{CC} = MAX., $V_{IN} = 2.7V$				20	μA
I_I	Input HIGH Current	V_{CC} = MAX., $V_{IN} = 7.0V$				0.1	mA
I_{OZ}	Off-State (High-Impedance) Output Current	V_{CC} = MAX.	$V_O = 0.4V$			−20	μA
			$V_O = 2.7V$			20	
I_{SC}	Output Short Circuit Current (Note 3)	V_{CC} = MAX.		−30		−85	mA
I_{CC}	Power Supply Current (Note 4)	V_{CC} = MAX.			27	40	mA

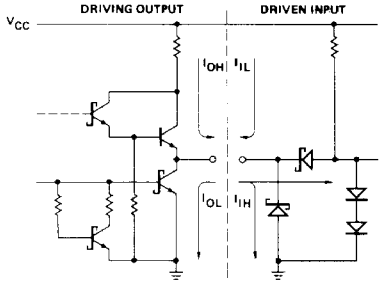
Notes: 1. For conditions shown as MIN. or MAX., use the appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical limits are at $V_{CC} = 5.0V$, 25°C ambient and maximum loading.
3. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.
4. All outputs open; all D_i inputs and $\overline{OE} = 4.5V$. 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°C to +150°C
Temperature (Ambient) Under Bias	−55°C to +125°C
Supply Voltage to Ground Potential Continuous	−0.5 V to +7.0 V
DC Voltage Applied to Outputs for High Output State	−0.5 V to +V_{CC} max.
DC Input Voltage	−0.5 V to +7.0 V
DC Output Current, Into Outputs	30 mA
DC Input Current	−30 mA to +5.0 mA

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



Note: Actual current flow direction shown.

Am54LS/74LS374A/LS534

ELECTRICAL CHARACTERISTICS

The Following Conditions Apply Unless Otherwise Specified:

COM'L $T_A = 0°C$ to $+70°C$ $V_{CC} = 5.0V \pm 5\%$ MIN. = 4.75 V MAX. = 5.25 V
MIL $T_A = -55°C$ to $+125°C$ $V_{CC} = 5.0V \pm 10\%$ 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} = MIN., $V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -1.0mA$	MIL	2.4	3.4		Volts
			$I_{OH} = -2.6mA$	COM'L	2.4	3.4		
V_{OL}	Output LOW Voltage	V_{CC} = MIN., $V_{IN} = V_{IH}$ or V_{IL}	All, $I_{OL} = 12mA$				0.4	Volts
			74LS only, $I_{OL} = 24mA$				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} = MIN., $I_{IN} = -18mA$					−1.5	Volts
I_{IL}	Input LOW Current	V_{CC} = MAX., $V_{IN} = 0.4V$					−0.4	mA
I_{IH}	Input HIGH Current	V_{CC} = MAX., $V_{IN} = 2.7V$					20	µA
I_I	Input HIGH Current	V_{CC} = MAX., $V_{IN} = 7.0V$					0.1	mA
I_{OZ}	Off-State (High-Impedance) Output Current	V_{CC} = MAX.	$V_O = 0.5V$				−20	µA
			$V_O = 2.4V$				20	
I_{SC}	Output Short Circuit Current (Note 3)	V_{CC} = MAX.			−30		−130	mA
I_{CC}	Power Supply Current (Note 4)	V_{CC} = 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 $V_{CC} = 5.0V$, 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 $\overline{OE} = 4.5V$. 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	↑	L	L	L
	L	↑	H	H	H
	H	↑	L	L	Z
	H	↑	H	H	Z

H = HIGH
L = LOW
X = Don't Care
NC = No Change
Z = High Impedance
↑ = LOW-to-HIGH transition

SWITCHING CHARACTERISTICS

(T_A = +25°C, V_{CC} = 5.0V)

Parameters	Description		Am25LS Min	Am25LS Typ	Am25LS Max	Am54LS/74LS Min	Am54LS/74LS Typ	Am54LS/74LS Max	Units	Test Conditions
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			ns	
		HIGH	15			15				
t_s	Data		20			20			ns	
t_h	Data		0			0			ns	
t_{ZH}	$\overline{OE}$ to Y_i				20			20	ns	
t_{ZL}					20			20		
t_{HZ}	$\overline{OE}$ to Y_i (Note 2)				20			20	ns	C_L = 5.0pF, R_L = 667Ω
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 T_A = 0 to +70°C, V_{CC} = 5.0V ±5% Min	Am25LS COM'L Max	Am25LS MIL T_C = −55 to +125°C, V_{CC} = 5.0V ±10% Min	Am25LS MIL Max	Units	Test Conditions
t_{PLH}	Clock to Y_i			30		38	ns	C_L = 45pF, R_L = 667Ω
t_{PHL}				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	C_L = 5.0pF, R_L = 667Ω
t_{LZ}				25		28		
f_{max}	Maximum Clock Frequency (Note 1)		35		30		MHz	

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

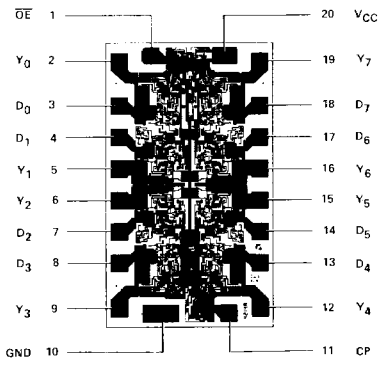
Note 2. Because of interlead capacitance the rising edge of $\overline{OE}$ is coupled into Y_o, thereby, increasing the apparent t_{HZ} for Y_o by 5ns for plastic package device and 10ns for cerdip. The die geometry for Y_o is the same as other outputs and no spec difference is required for users of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

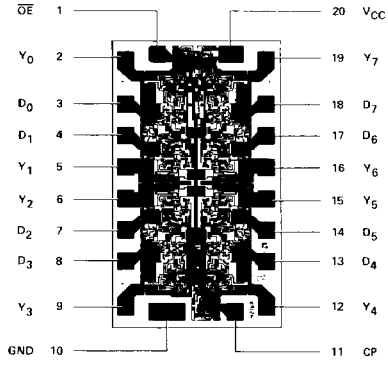
METALLIZATION AND PAD LAYOUTS

Am25LS/54LS/74LS374A



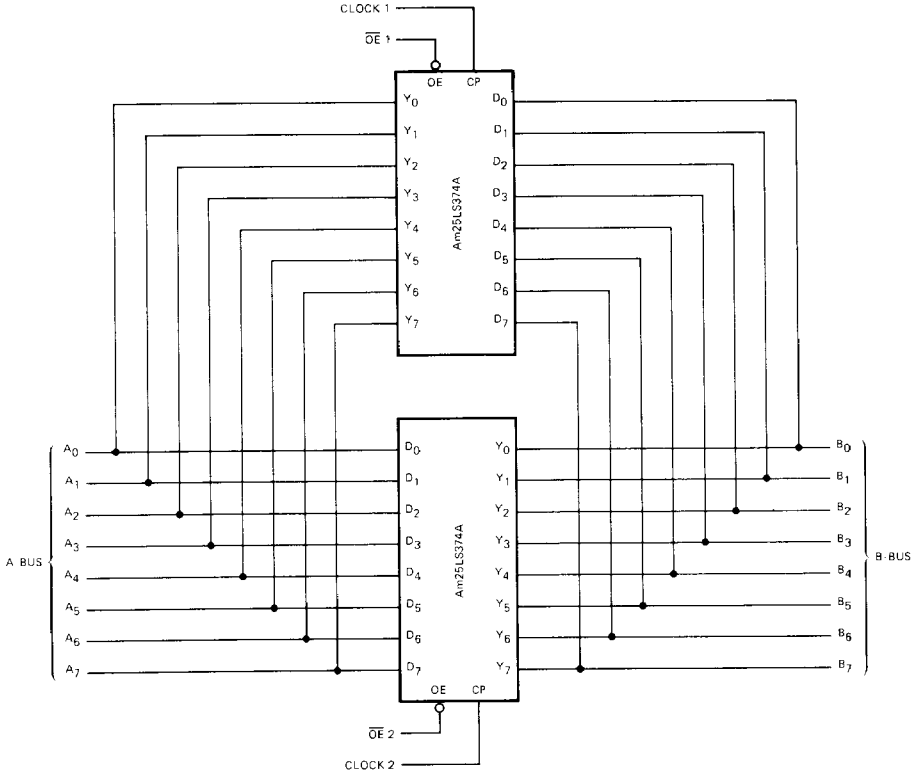
DIE SIZE 0.077" X 0.047"

Am25LS/54LS/74LS534



DIE SIZE 0.077" X 0.047"

APPLICATIONS



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