Am25LS240 • Am54LS/74LS240

Octal Three-State Inverting Drivers

DISTINCTIVE CHARACTERISTICS

- Three-state outputs drive bus lines directly
- Hysteresis at inputs improve noise margin
- PNP inputs reduce D.C. loading on bus lines
- Data-to-output propagation delay times – 18ns MAX.
- Enable-to-output – 30ns MAX.
- Am25LS240 specified at 48mA output current
- 20 pin hermetic and molded DIP packages
- 100% product assurance testing to MIL-STD-883 requirements

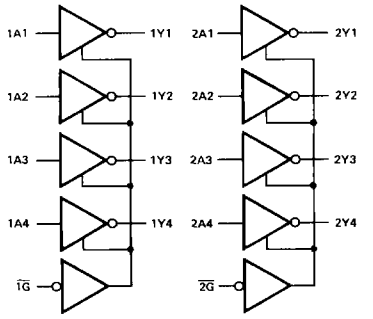
FUNCTIONAL DESCRIPTION

The 'LS240 is an octal inverting line driver fabricated using advanced low-power Schottky technology. The 20-pin package provides improved printed circuit board density for use in memory address and clock driver applications.

Three-state outputs are provided to drive bus lines directly. The Am25LS240 is specified at 48mA and 24mA output sink current, while the Am54/74LS240 is guaranteed at 12mA over the military range and 24mA over the commercial range. Four buffers are enabled from one common line and the other four from a second enable line.

Improved noise rejection and high fan-out are provided by input hysteresis and low current PNP inputs.

LOGIC DIAGRAM



INPUTS		OUTPUT
$\overline{G}$	A	Y
H	X	Z
L	H	L
L	L	H

Note: All devices have input hysteresis.

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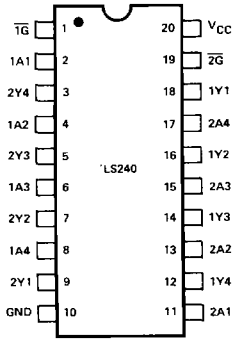
CONNECTION DIAGRAM
Top View



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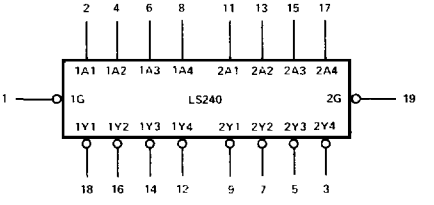
Note: Pin 1 is marked for orientation.

LOGIC SYMBOL



V_{CC} = Pin 20
GND = Pin 10

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Am25LS240
ELECTRICAL CHARACTERISTICS

The Following Conditions Apply Unless Otherwise Specified:

COM'L T_A = 0°C to +70°C V_{CC} = 5.0V ± 5% (MIN. = 4.75V MAX. = 5.25V)

MIL T_A = −55°C to +125°C V_{CC} = 5.0V ± 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}	High-Level Output Voltage		V_{CC} = MIN., V_{IH} = 2.0V I_{OH} = −3.0mA, V_{IL} = V_{IL}MAX.		2.4	3.4		Volts
			V_{CC} = MIN.,	MIL, I_{OH} = −12mA	2.0			
			V_{IL} = 0.5V	COM'L, I_{OH} = −15mA	2.0			
V_{OL}	Low-Level Output Voltage		V_{CC} = MIN.	All I_{OL} = 12mA		0.25	0.4	Volts
				All I_{OL} = 24mA		0.35	0.5	
				COM'L I_{OL} = 48mA			0.55	
V_{IH}	High-Level Input Voltage		Guaranteed input logical HIGH voltage for all inputs		2.0			Volts
V_{IL}	Low-Level Input Voltage	COM'L					0.8	Volts
		MIL					0.7	
V_{IK}	Input Clamp Voltage		V_{CC} = MIN., I_I = −18mA				−1.5	Volts
	Hysteresis (V_{T+} − V_{T-})		V_{CC} = MIN.		0.2	0.4		Volts
I_{OZH}	Off-State Output Current, High Level Voltage Applied		V_{CC} = MAX. V_{IH} = 2.0V	V_O = 2.7V			20	µA
I_{OZL}	Off-State Output Current, Low-Level Voltage Applied		V_{IL} = V_{IL}MAX.	V_O = 0.4V			−20	
I_I	Input Current at Maximum Input Voltage		V_{CC} = MAX., V_I = 7.0V				0.1	mA
I_{IH}	High-Level Input Current, Any Input		V_{CC} MAX., V_{IH} = 2.7V				20	µA
I_{IL}	Low-Level Input Current		V_{CC} = MAX., V_{IL} = 0.4V				−200	µA
I_{SC}	Short Circuit Output Current (Note 3)		V_{CC} = MAX.		−40		−225	mA
I_{CC}	Supply Current	V_{CC} = MAX. Outputs open	All Outputs HIGH			13	23	mA
			All Outputs LOW			26	44	
			Outputs at Hi-Z			29	50	

Notes: 1. For conditions shown as MIN. or MAX., use the appropriate value specified under recommended operating conditions.
2. All typical values are V_{CC} = 5.0V, T_A = 25°C.
3. Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

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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	−0.5V to +7.0V
DC Voltage Applied to Outputs for HIGH Output State	−0.5V to +V_{CC} max.
DC Input Voltage	−0.5V to +7.0V
DC Output Current	150mA
DC Input Current	−30mA to +5.0mA

Am54LS/74LS240
ELECTRICAL CHARACTERISTICS

The Following Conditions Apply Unless Otherwise Specified:

COM'L T_A = 0°C to +70°C V_{CC} = 5.0V ± 5% (MIN. = 4.75V MAX. = 5.25V)

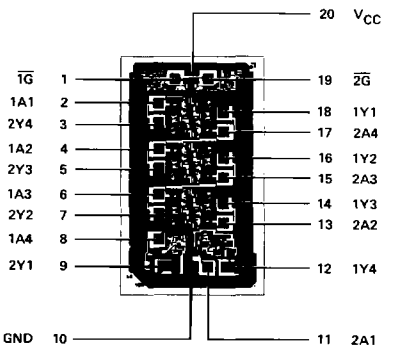
MIL T_A = −55°C to +125°C V_{CC} = 5.0V ± 10% (MIN. = 4.50V MAX. = 5.50V)

DC CHARACTERISTICS OVER OPERATING RANGE

Parameters	Description		Test Conditions (Note 1)		Min.	Typ. (Note 2)	Max.	Units
V_{OH}	High-Level Output Voltage		V_{CC} = MIN., V_{IH} = 2.0V I_{OH} = −3.0mA, V_{IL} = V_{IL}MAX.		2.4	3.4		Volts
			V_{CC} = MIN.,	MIL, I_{OH} = −12mA	2.0			
			V_{IL} = 0.5V	COM'L, I_{OH} = −15mA	2.0			
V_{OL}	Low-Level Output Voltage		V_{CC} = MIN.	All, I_{OL} = 12mA		0.25	0.4	Volts
				COM'L, I_{OL} = 24mA		0.35	0.5	
V_{IH}	High-Level Input Voltage		Guaranteed input logical HIGH voltage for all inputs		2.0			Volts
V_{IL}	Low-Level Input Voltage	COM'L					0.8	Volts
		MIL					0.7	
V_{IK}	Input Clamp Voltage		V_{CC} = MIN., I_I = −18mA				−1.5	Volts
	Hysteresis (V_{T+} − V_{T-})		V_{CC} = MIN.		0.2	0.4		Volts
I_{OZH}	Off-State Output Current, High Level Voltage Applied		V_{CC} = MAX. V_{IH} = 2.0V V_{IL} = V_{IL}MAX.	V_O = 2.7V			20	µA
I_{OZL}	Off-State Output Current, Low-Level Voltage Applied			V_O = 0.4V			−20	
I_I	Input Current at Maximum Input Voltage		V_{CC} = MAX., V_I = 7.0V				0.1	mA
I_{IH}	High-Level Input Current, Any Input		V_{CC} MAX., V_{IH} = 2.7V				20	µA
I_{IL}	Low-Level Input Current		V_{CC} = MAX., V_{IL} = 0.4V				−200	µA
I_{SC}	Short Circuit Output Current (Note 3)		V_{CC} = MAX.		−40		−225	mA
I_{CC}	Supply Current	V_{CC} = MAX. Outputs open	All Outputs HIGH			13	23	mA
			All Outputs LOW			26	44	
			Outputs at Hi-Z			29	50	

Notes: 1. For conditions shown as MIN. or MAX., use the appropriate value specified under recommended operating conditions.
2. All typical values are V_{CC} = 5.0V, T_A = 25°C.
3. Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

Metallization and Pad Layout



DIE SIZE 0.060" X 0.103"

SWITCHING CHARACTERISTICS

(T_A = +25°C, V_{CC} = 5.0V)

Parameters	Description	Am25LS240 Min.	Am25LS240 Typ.	Am25LS240 Max.	Am54LS/74LS240 Min.	Am54LS/74LS240 Typ.	Am54LS/74LS240 Max.	Units	Test Conditions (Notes 1–5)
t_{PLH}	Propagation Delay Time, Low-to-High-Level Output		8.0	12		9.0	14	ns	C_L = 45pF, R_L = 667Ω
t_{PHL}	Propagation Delay Time, High-to-Low-Level Output		12	16		12	18	ns	
t_{PZL}	Output Enable Time to Low Level		19	27		20	30	ns	
t_{PZH}	Output Enable Time to High Level		14	20		15	23	ns	
t_{PLZ}	Output Disable Time from Low Level		14	23		15	25	ns	C_L = 5.0pF, R_L = 667Ω
t_{PHZ}	Output Disable Time from High Level		10	18		10	18	ns	

Am25LS ONLY SWITCHING CHARACTERISTICS OVER OPERATING RANGE*

Parameters	Description	Am25LS COM'L T_A = 0°C to +70°C, V_{CC} = 5.0V ±5% Min.	Am25LS COM'L Max.	Am25LS MIL T_A = −55°C to +125°C, V_{CC} = 5.0V ±10% Min.	Am25LS MIL Max.	Units	Test Conditions
t_{PLH}	Propagation Delay Time, Low-to-High-Level Output		16		19	ns	C_L = 45pF, R_L = 667Ω
t_{PHL}	Propagation Delay Time, High-to-Low-Level Output		22		25	ns	
t_{PZL}	Output Enable Time to Low Level		37		42	ns	
t_{PZH}	Output Enable Time to High Level		27		31	ns	
t_{PLZ}	Output Disable Time from Low Level		31		36	ns	C_L = 5.0pF, R_L = 667Ω
t_{PHZ}	Output Disable Time from High Level		25		28	ns	

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

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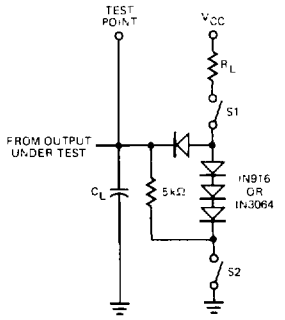
LOAD CIRCUIT FOR THREE-STATE OUTPUTS



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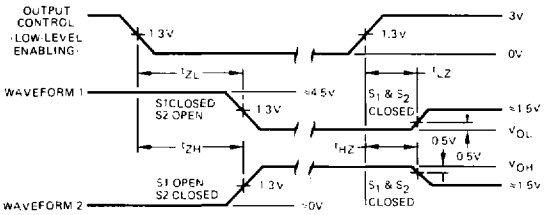
VOLTAGE WAVEFORMS ENABLE AND DISABLE TIMES, THREE-STATE OUTPUTS



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Notes:
1. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
2. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
3. In the examples above, the phase relationships between inputs and outputs have been chosen arbitrarily. PRR ≤ 1.0MHz, $Z_{OUT} \approx 50\Omega$ and $t_r \leq 2.5$ns, $t_f \leq 2.5$ns.