

Am25LS241 • Am54LS/74LS241

Am25LS244 • Am54LS/74LS244

Octal Three-State Buffers

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.
- Am25LS241 and 244 specified at 48mA output current
- 20 pin hermetic and molded DIP packages
- 100% product assurance testing to MIL-STD-883 requirements

FUNCTIONAL DESCRIPTION

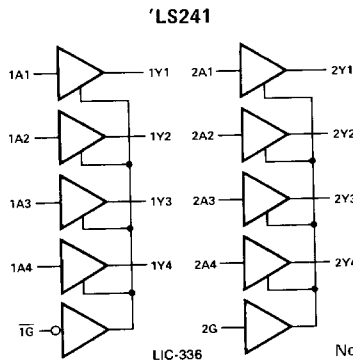
The 'LS241 and 'LS244 are octal buffers fabricated using advanced low-power Schottky technology. The 20-pin package provides improved printed circuit board density for use in memory address and clock driver applications.

Three-state outputs are provided to drive bus lines directly. The Am25LS241 and Am25LS244 are specified at 48mA and 24mA output sink current, while the Am54LS/74LS241 and Am54LS/74LS244 are 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.

The 'LS241 has enable inputs of opposite polarity to allow use as a transceiver without overlap. The 'LS244 enables are of similar polarity for use as a unidirectional buffer in which both halves are enabled simultaneously.

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

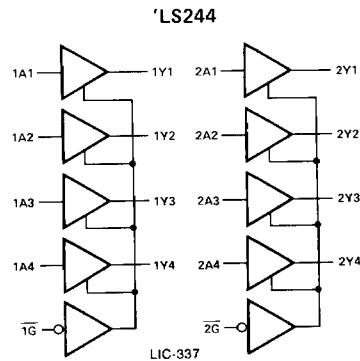
LOGIC DIAGRAMS



'LS241

INPUTS			OUTPUTS
$\overline{1G}$	2G	A	Y
H	L	X	Z
L	H	H	H
L	L	L	L

Note: All devices have input hysteresis.

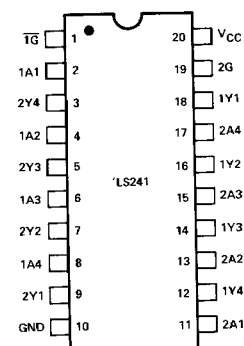


'LS244

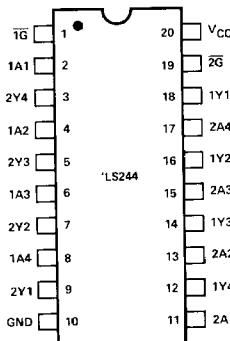
INPUTS		OUTPUT
\overline{G}	A	
H	X	Z
L	H	H
L	L	L

CONNECTION DIAGRAMS

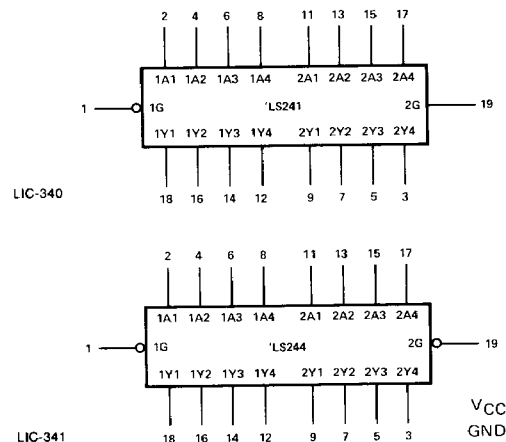
Top Views



Note: Pin 1 is marked for orientation.



LOGIC SYMBOLS



VCC = Pin 20
GND = Pin 11

Am25LS241 - Am25LS244

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}	High-Level Output Voltage	$V_{CC} = \text{MIN.}, V_{IH} = 2.0\text{V}$ $I_{OH} = -3.0\text{mA}, V_{IL} = V_{IL\text{MAX.}}$	2.4	3.4		Volts	
		$V_{CC} = \text{MIN.},$ $V_{IL} = 0.5\text{V}$	2.0				
		MIL, $I_{OH} = -12\text{mA}$ COM'L, $I_{OH} = -15\text{mA}$	2.0				
V_{OL}	Low-Level Output Voltage	$V_{CC} = \text{MIN.}$	All $I_{OL} = 12\text{mA}$	0.25	0.4	Volts	
			All $I_{OL} = 24\text{mA}$	0.35	0.5		
			COM'L, $I_{OL} = 48\text{mA}$		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	$V_{CC} = \text{MIN.}, I_I = -18\text{mA}$			-1.5	Volts	
	Hysteresis ($V_{T+} - V_{T-}$)	$V_{CC} = \text{MIN.}$	0.2	0.4		Volts	
I_{OZH}	Off-State Output Current, High Level Voltage Applied	$V_{CC} = \text{MAX.}$ $V_{IH} = 2.0\text{V}$ $V_{IL} = V_{IL\text{MAX.}}$	$V_O = 2.7\text{V}$		20	μA	
I_{OZL}	Off-State Output Current, Low-Level Voltage Applied			$V_O = 0.4\text{V}$			-20
I_I	Input Current at Maximum Input Voltage	$V_{CC} = \text{MAX.}, V_I = 7.0\text{V}$			0.1	mA	
I_{IH}	High-Level Input Current, Any Input	$V_{CC} = \text{MAX.}, V_{IH} = 2.7\text{V}$			20	μA	
I_{IL}	Low-Level Input Current	$V_{CC} = \text{MAX.}, V_{IL} = 0.4\text{V}$			-200	μA	
I_{SC}	Short Circuit Output Current (Note 3)	$V_{CC} = \text{MAX.}$	-40		-225	mA	
I_{CC}	Supply Current	$V_{CC} = \text{MAX.}$ Outputs open	All Outputs HIGH	13	23	mA	
			All Outputs LOW		27		46
			Outputs at Hi-Z	32	54		

Notes: 1. For conditions shown as MIN. or MAX., use the appropriate value specified under recommended operating conditions.

2. All typical values are $V_{CC} = 5.0\text{V}, T_A = 25^\circ\text{C}$.

3. Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

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

Am54LS/74LS241 • Am54LS/74LS244
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)

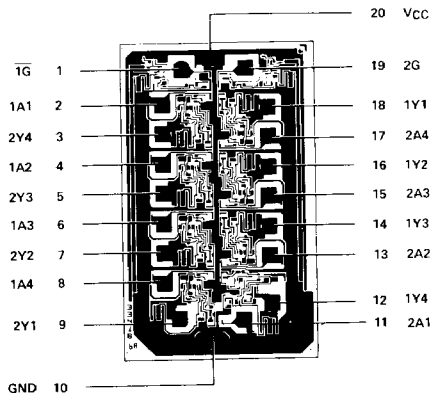
DC CHARACTERISTICS OVER OPERATING RANGE

Parameters	Description	Test Conditions (Note 1)	Min.	Typ. (Note 2)	Max.	Units	
V_{OH}	High-Level Output Voltage	$V_{CC} = \text{MIN.}, V_{IH} = 2.0\text{V}$ $I_{OH} = -3.0\text{mA}, V_{IL} = V_{IL}\text{MAX.}$	2.4	3.4		Volts	
		$V_{CC} = \text{MIN.},$ $V_{IL} = 0.5\text{V}$	MIL, $I_{OH} = -12\text{mA}$ COM'L, $I_{OH} = -15\text{mA}$	2.0			
				2.0			
V_{OL}	Low-Level Output Voltage	$V_{CC} = \text{MIN.}$	All, $I_{OL} = 12\text{mA}$	0.25	0.4	Volts	
			COM'L, $I_{OL} = 24\text{mA}$	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	$V_{CC} = \text{MIN.}, I_I = -18\text{mA}$			-1.5	Volts	
	Hysteresis ($V_{T+} - V_{T-}$)	$V_{CC} = \text{MIN.}$	0.2	0.4		Volts	
I_{OZH}	Off-State Output Current, High Level Voltage Applied	$V_{CC} = \text{MAX.}$ $V_{IH} = 2.0\text{V}$			20	μA	
I_{OZL}	Off-State Output Current, Low-Level Voltage Applied	$V_{IL} = V_{IL}\text{MAX.}$			-20		
I_I	Input Current at Maximum Input Voltage	$V_{CC} = \text{MAX.}, V_I = 7.0\text{V}$			0.1	mA	
I_{IH}	High-Level Input Current, Any Input	$V_{CC} = \text{MAX.}, V_{IH} = 2.7\text{V}$			20	μA	
I_{IL}	Low-Level Input Current	$V_{CC} = \text{MAX.}, V_{IL} = 0.4\text{V}$			-200	μA	
I_{SC}	Short Circuit Output Current (Note 3)	$V_{CC} = \text{MAX.}$	-40		-225	mA	
I_{CC}	Supply Current	$V_{CC} = \text{MAX.}$ Outputs open	All Outputs HIGH	13	23	mA	
			All Outputs LOW		27		46
			Outputs at Hi-Z		32		54

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

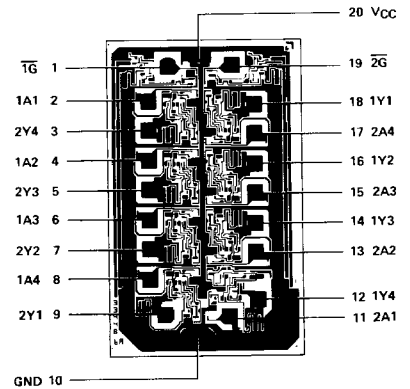
Metallization and Pad Layouts

'LS241



DIE SIZE .056" X .089"

'LS244



DIE SIZE .056" X .089"

SWITCHING CHARACTERISTICS

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

Parameters	Description	Am25LS241 Am25LS244			Am54LS74LS241 Am54LS74LS244			Units	Test Conditions (Notes 1-5)
		Min.	Typ.	Max.	Min.	Typ.	Max.		
t_{PLH}	Propagation Delay Time, Low-to-High-Level Output		10	15		12	18	ns	$C_L = 45\text{pF}$ $R_L = 667\Omega$
t_{PHL}	Propagation Delay Time, High-to-Low-Level Output		12	18		12	18	ns	
t_{PZL}	Output Enable Time to Low Level		20	30		20	30	ns	
t_{PZH}	Output Enable Time to High Level		15	23		15	23	ns	
t_{PLZ}	Output Disable Time from Low Level		15	25		15	25	ns	$C_L = 5.0\text{pF}$ $R_L = 667\Omega$
t_{PHZ}	Output Disable Time from High Level		10	18		10	18	ns	

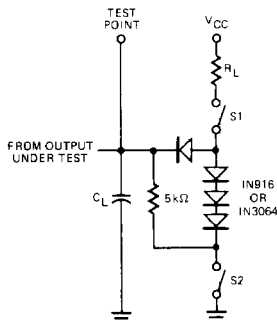


**Am25LS ONLY
SWITCHING CHARACTERISTICS
OVER OPERATING RANGE***

Parameters	Description	Am25LS COM'L		Am25LS MIL		Units	Test Conditions
		Min.	Max.	Min.	Max.		
		$T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 5\%$		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 10\%$			
t_{PLH}	Propagation Delay Time, Low-to-High-Level Output		21		24	ns	$C_L = 45\text{pF}$ $R_L = 667\Omega$
t_{PHL}	Propagation Delay Time, High-to-Low-Level Output		25		28	ns	
t_{PZL}	Output Enable Time to Low Level		41		47	ns	
t_{PZH}	Output Enable Time to High Level		31		47	ns	
t_{PLZ}	Output Disable Time from Low Level		34		36	ns	$C_L = 5.0\text{pF}$ $R_L = 667\Omega$
t_{PHZ}	Output Disable Time from High Level		25		28	ns	

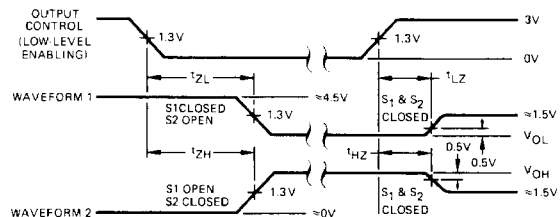
*AC performance over the operating temperature range is guaranteed by testing defined in Group A, Subgroup 9.

**LOAD CIRCUIT FOR
THREE-STATE OUTPUTS**



LIC-342

**VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, THREE-STATE OUTPUTS**



LIC-343

- 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.
- 4. Pulse generator characteristics: $PRR \leq 1.0\text{MHz}$, $Z_{OUT} \approx 50\Omega$, $t_r \leq 15\text{ns}$, $t_f \leq 6\text{ns}$.
- 5. When measuring t_{PLH} and t_{PHL} , switches S_1 and S_2 are closed.