

Am25LS242 • Am54LS/74LS242

Am25LS243 • Am54LS/74LS243

Quad Bus Transceivers with Three-State Outputs

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.
- Am25LS242 and Am25LS243 are specified at 48mA output current
- 100% product assurance testing to MIL-STD-883 requirements

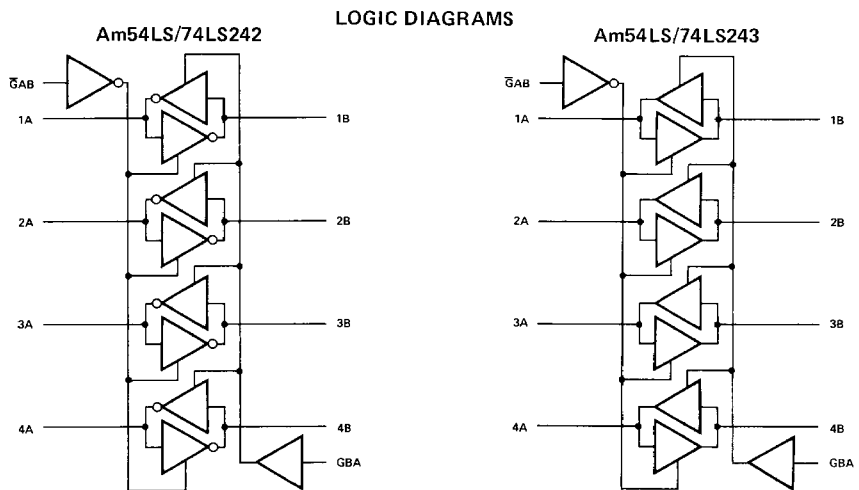
FUNCTIONAL DESCRIPTION

The 'LS242 and 'LS243 are quad bus transceivers designed for asynchronous two-way communications between data buses.

The 'LS242 and 'LS243 have the two 4-line data paths connected input-to-output on both sides to form an asynchronous transceiver/buffer with complementing enable inputs. The 'LS242 is inverting, while the 'LS243 presents non-inverting data at the outputs.

Three-state outputs are provided to drive bus lines directly. The Am25LS242 and Am25LS243 are specified at 48mA and 24mA output sink current, while the Am54/74LS242 and 243 are guaranteed at 12mA over the military range and 24mA over the commercial range.

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



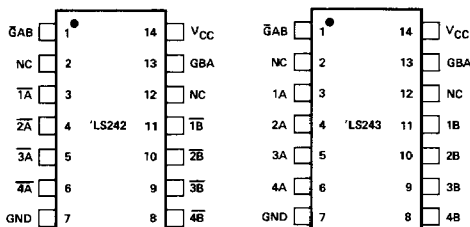
LIC-344

Note: All devices have input hysteresis.

LIC-345

CONNECTION DIAGRAMS

Top Views

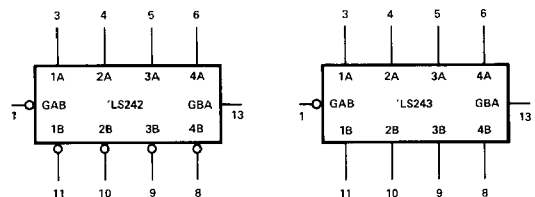


LIC-346

Note: Pin 1 is marked for orientation

LIC-347

LOGIC SYMBOLS



LIC-348

VCC = Pin 14
GND = Pin 7

LIC-349

Am25LS242 • Am25LS243

ELECTRICAL CHARACTERISTICS

The Following Conditions Apply unless Otherwise Specified:

OM'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
			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	$V_{CC} = \text{MAX.}$ $V_{IH} = 2.0\text{V}$ $V_{IL} = V_{IL\text{MAX.}}$	$V_O = 2.7\text{V}$		40	μA	
I_{OZL}	Off-State Output Current, Low-Level Voltage Applied		$V_O = 0.4\text{V}$		-200		
I_I	Input Current at Maximum Input Voltage	$V_{CC} = \text{MAX.}$	$V_I = 7.0\text{V}, \bar{G}AB \text{ or } GBA$		0.1	mA	
			$V_I = 5.5\text{V}, A \text{ or } B$		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 (Note 4)	All Outputs HIGH	'LS242, 'LS243	22	38	mA
			All Outputs LOW	'LS242, 'LS243	29	50	
			Outputs at Hi-Z	'LS242	29	50	
			'LS243	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.
 4. For 'LS242 and 'LS243 I_{CC} is measured with transceivers enabled in one direction only, or with all transceivers disabled.

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

Am54LS/74LS242 • Am54LS/74LS243
ELECTRICAL CHARACTERISTICS

The Following Conditions Apply unless Otherwise Specified:

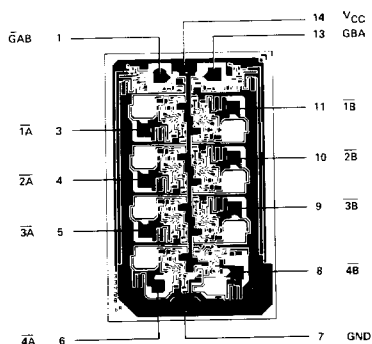
COM'L $T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 5\%$ (MIN. = 4.75V MAX. = 5.25V)
 MIL $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 10\%$ (MIN. = 4.50V MAX. = 5.50V)

DC CHARACTERISTICS OVER OPERATING RANGE

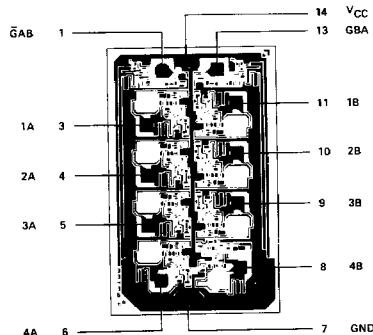
Parameters	Description	Test Conditions (Note 1)	Min.	Typ. (Note 2)	Max.	Units	
V_{OH}	High-Level Output Voltage	$V_{CC} = \text{MIN.}, V_{IH} = 2.0\text{V}$ $I_{OH} = -3.0\text{mA}, V_{IL} = V_{IL\text{MAX.}}$	2.4	3.4		Volts	
		$V_{CC} = \text{MIN.},$ $V_{IL} = 0.5\text{V}$					
		MIL, $I_{OH} = -12\text{mA}$ COM'L, $I_{OH} = -15\text{mA}$	2.0				
V_{OL}	Low-Level Output Voltage	$V_{CC} = \text{MIN.}$ All, $I_{OL} = 12\text{mA}$ COM'L, $I_{OL} = 24\text{mA}$		0.25 0.35	0.4 0.5	Volts	
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	Volts	
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	$V_{CC} = \text{MAX.}$ $V_{IH} = 2.0\text{V}$			40	μA	
I_{OZL}	Off-State Output Current, Low-Level Voltage Applied	$V_{IL} = V_{IL\text{MAX.}}$			-200		
I_I	Input Current at Maximum Input Voltage	$V_{CC} = \text{MAX.}$	$V_I = 7.0\text{V}, \bar{G}AB \text{ or } GBA$		0.1	mA	
			$V_I = 5.5\text{V}, A \text{ or } B$		0.1		
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 (Note 4)	All Outputs HIGH	'LS242, 'LS243	22	38	mA
			All Outputs LOW	'LS242, 'LS243	29	50	
			Outputs at Hi-Z	'LS242 'LS243	29 32	50 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.
 4. For 'LS242 and 'LS243 I_{CC} is measured with transceivers enabled in one direction only, or with all transceivers disabled.

Metallization and Pad Layouts



DIE SIZE .056" X .089"



DIE SIZE .056" X .089"

Am25LS242 • Am54LS/74LS242
SWITCHING CHARACTERISTICS
(T_A = +25°C, V_{CC} = 5.0V)

Parameters	Description	Am25LS242			Am54LS/74LS242			Units	Test Conditions (Notes 1–5)
		Min.	Typ.	Max.	Min.	Typ.	Max.		
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		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 = 5.0pF R _L = 667Ω
t _{PHZ}	Output Disable Time from High Level		10	18		10	18	ns	

Am25LS242 ONLY
SWITCHING CHARACTERISTICS
OVER OPERATION RANGE*

Parameters	Description	Am25LS COM'L		Am25LS MIL		Units	Test Conditions
		Min.	Max.	Min.	Max.		
		T _A = 0°C to +70°C V _{CC} = 5.0V ±5%		T _A = -55°C to +125°C V _{CC} = 5.0V ±10%			
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		29		33	ns	
t _{PLZ}	Output Disable Time from Low Level		33		38	ns	C _L = 5.0pF R _L = 667Ω
t _{PHZ}	Output Disable Time from High Level		25		28	ns	

Am25LS243 • Am54LS/74LS243
SWITCHING CHARACTERISTICS
(T_A = +25°C, V_{CC} = 5.0V)

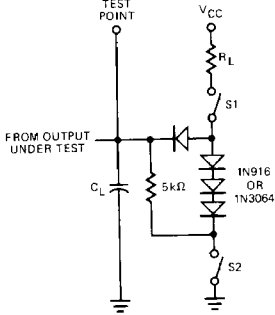
Parameters	Description	Am25LS243			Am54LS/74LS243			Units	Test Conditions (Notes 1–5)
		Min.	Typ.	Max.	Min.	Typ.	Max.		
t _{PLH}	Propagation Delay Time, Low-to-High-Level Output		10	15		12	18	ns	C _L = 45pF R _L = 667Ω
t _{PHL}	Propagation Delay Time, High-to-Low-Level Output		12	18		12	18	ns	
t _{PZL}	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 = 5.0pF R _L = 667Ω
t _{PHZ}	Output Disable Time from High Level		10	18		10	18	ns	

Am25LS243 ONLY
SWITCHING CHARACTERISTICS
OVER OPERATION RANGE*

Parameters	Description	Am25LS COM'L		Am25LS MIL		Units	Test Conditions
		Min.	Max.	Min.	Max.		
		T _A = 0°C to +70°C V _{CC} = 5.0V ±5%		T _A = -55°C to +125°C V _{CC} = 5.0V ±10%			
t _{PLH}	Propagation Delay Time, Low-to-High-Level Output		21		24	ns	C _L = 45pF R _L = 667Ω
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		33		49	ns	
t _{PLZ}	Output Disable Time from Low Level		36		38	ns	C _L = 5.0pF R _L = 667Ω
t _{PHZ}	Output Disable Time from High Level		25		28	ns	

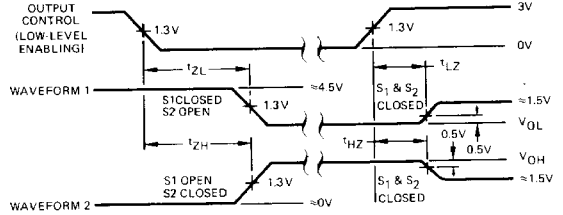
SWITCHING CHARACTERISTICS TEST CONDITIONS

LOAD CIRCUIT FOR THREE-STATE OUTPUTS



LIC-350

VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, THREE-STATE OUTPUTS



LIC-351

- 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 ≤ 1MHz, Z_{OUT} ≈ 50Ω, t_r ≤ 6ns, t_f ≤ 6ns.
- 5. When measuring t_{pLH} and t_{pHL}, switches S₁ and S₂ are closed.

FUNCTION TABLES

Am54LS/74LS242

CONTROL INPUTS		DATA OUTPUTS	
\overline{GAB}	GBA	A	B
H	H	\overline{O}	I
L	H	*	*
H	L	ISOLATED	
L	L	I	\overline{O}

I = Input
O = Output
 \overline{O} = Inverting Output
H = HIGH
L = LOW

Am54LS/74LS243

CONTROL INPUTS		DATA OUTPUTS	
\overline{GAB}	GBA	A	B
H	H	O	I
L	H	*	*
H	L	ISOLATED	
L	L	I	O

*Possible destructive oscillation may occur if the transceivers are enable in both directions at once.