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.

LOGIC DIAGRAMS

Am54LS/74LS242


Am54LS/74LS243
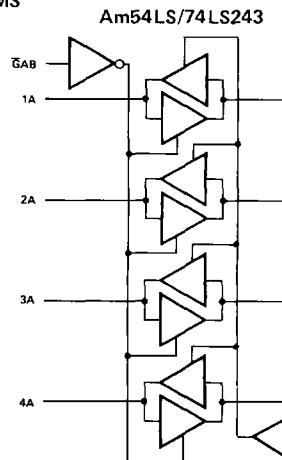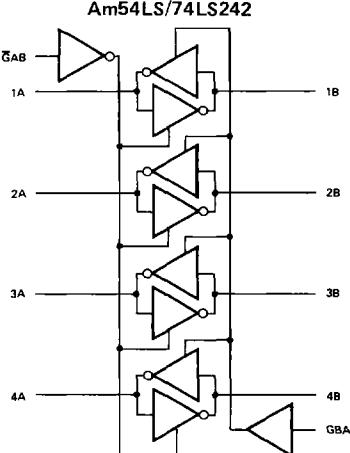
Note: All devices have input hysteresis.

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## CONNECTION DIAGRAMS
Top Views
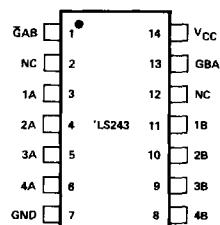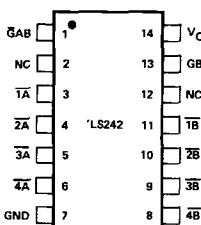
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Note: Pin 1 is marked for orientation

LOGIC SYMBOLS
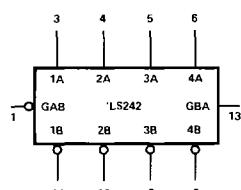
LIC-348
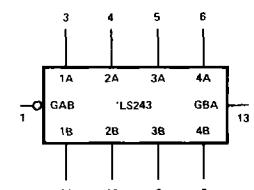
V_{CC} = Pin 14
GND = Pin 7

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Am25LS242 • Am25LS243
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. = 4.75V   MAX. = 5.25V)

MIL $T_A = -55°C$ to $+125°C$ $V_{CC} = 5.0V \pm 10\%$ (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} = MIN., V_{IH} = 2.0V $I_{OH} = -3.0mA$, $V_{IL} = V_{IL}$MAX.		2.4	3.4		Volts
			V_{CC} = MIN., V_{IL} = 0.5V	MIL, $I_{OH} = -12mA$	2.0			
				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			40	μA
I_{OZL}	Off-State Output Current, Low-Level Voltage Applied		$V_{IL} = V_{IL}$MAX.	V_O = 0.4V			-200	
I_I	Input Current at Maximum Input Voltage		V_{CC} = MAX.	V_I = 7.0V, $\overline{GAB}$ or GBA			0.1	mA
				V_I = 5.5V, A or B			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 (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} = 5.0V, 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.

      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 $+7.0V$
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/74LS242 • Am54LS/74LS243
ELECTRICAL CHARACTERISTICS

The Following Conditions Apply unless Otherwise Specified:

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

MIL $\quad T_A = -55°C$ to $+125°C \ V_{CC} = 5.0V \pm 10\% \quad$ (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., V_{IL} = 0.5V	MIL, $I_{OH} = -12mA$	2.0			
				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			40	μA
I_{OZL}	Off-State Output Current, Low-Level Voltage Applied			V_O = 0.4V			-200	
I_I	Input Current at Maximum Input Voltage		V_{CC} = MAX.	V_I = 7.0V, $\overline{GAB}$ or GBA			0.1	mA
				V_I = 5.5V, A or B			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 (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} = 5.0V, 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.

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
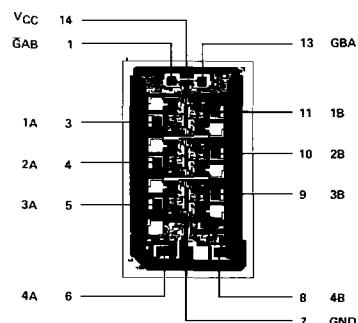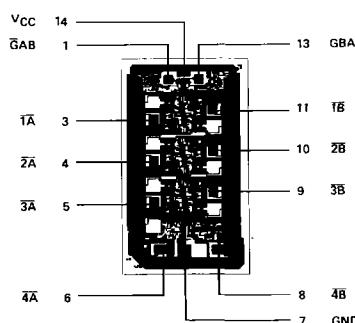
DIE SIZE 0.060" x 0.103"

DIE SIZE 0.060" x 0.103"

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	$C_L = 45pF$ $R_L = 667\Omega$
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	$C_L = 5.0pF$ $R_L = 667\Omega$
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 $T_A = 0°C$ to $+70°C$ $V_{CC} = 5.0V \pm 5\%$		Am25LS MIL $T_A = -55°C$ to $+125°C$ $V_{CC} = 5.0V \pm 10\%$		Units	Test Conditions
		Min.	Max.	Min.	Max.		
t_{PLH}	Propagation Delay Time, Low-to-High-Level Output		16		19	ns	$C_L = 45pF$ $R_L = 667\Omega$
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	$C_L = 5.0pF$ $R_L = 667\Omega$
t_{PHZ}	Output Disable Time from High Level		25		28	ns	

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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	$C_L = 45pF$ $R_L = 667\Omega$
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	$C_L = 5.0pF$ $R_L = 667\Omega$
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 $T_A = 0°C$ to $+70°C$ $V_{CC} = 5.0V \pm 5\%$		Am25LS MIL $T_A = -55°C$ to $+125°C$ $V_{CC} = 5.0V \pm 10\%$		Units	Test Conditions
		Min.	Max.	Min.	Max.		
t_{PLH}	Propagation Delay Time, Low-to-High-Level Output		21		24	ns	$C_L = 45pF$ $R_L = 667\Omega$
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		33		49	ns	
t_{PLZ}	Output Disable Time from Low Level		36		38	ns	$C_L = 5.0pF$ $R_L = 667\Omega$
t_{PHZ}	Output Disable Time from High Level		25		28	ns	

SWITCHING CHARACTERISTICS TEST CONDITIONS

LOAD CIRCUIT FOR
THREE-STATE OUTPUTS
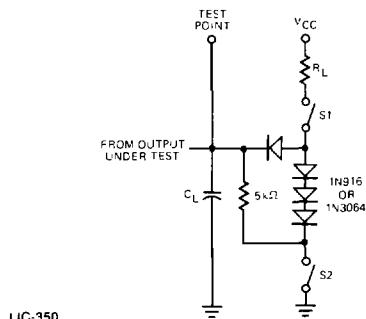
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VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, THREE-STATE OUTPUTS
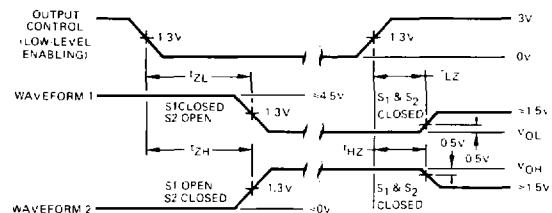
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Notes: 1. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
2. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
3. In the examples above, the phase relationships between inputs and outputs have been chosen arbitrarily.
4. Pulse generator characteristics: PRR ≤ 1MHz, $Z_{OUT} \approx 50\Omega$, $t_r \leqslant 15ns$, $t_f \leqslant 6ns$.
5. When measuring t_{PLH} and t_{PHL}, switches S_1 and S_2 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   H = HIGH
O = Output   L = LOW
$\overline{O}$ = Inverting Output

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.