

74LS242, LS243, S242, S243 Transceivers

'242 Quad Inverting Transceiver (3-State)

'243 Quad Transceiver (3-State)

Product Specification

FUNCTION TABLE, '242

INPUTS		INPUT/OUTPUT	
OE _A	OE _B	A _n	B _n
L	L	INPUT	B = \bar{A}
H	L	(Z)	(Z)
L	H	(a)	(a)
H	H	A = \bar{B}	INPUT

FUNCTION TABLE, '243

INPUTS		INPUT/OUTPUT	
OE _A	OE _B	A _n	B _n
L	L	INPUT	B = A
H	L	(Z)	(Z)
L	H	(a)	(a)
H	H	A = B	INPUT

H = HIGH voltage level
 L = LOW voltage level
 (Z) = HIGH impedance (off) state
 (a) = This condition is not allowed due to excessive currents.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74LS242	10ns	27mA
74LS243	12ns	28mA
74S242	6.0ns	95mA
74S243	7.0ns	120mA

ORDERING CODE

PACKAGES	COMMERCIAL RANGE V _{CC} = 5V ±5%; T _A = 0°C to +70°C
Plastic DIP	N74LS242N, N74LS243N, N74524N, N745243N

NOTE:

For information regarding devices processed to Military Specifications, see the Signetics Military Products Data Manual.

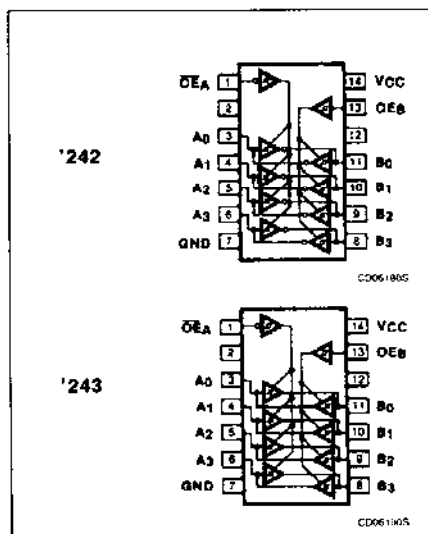
INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74LS	74S
All	Inputs	1LSul	1Sul
A, B	Outputs	30LSul	10Sul

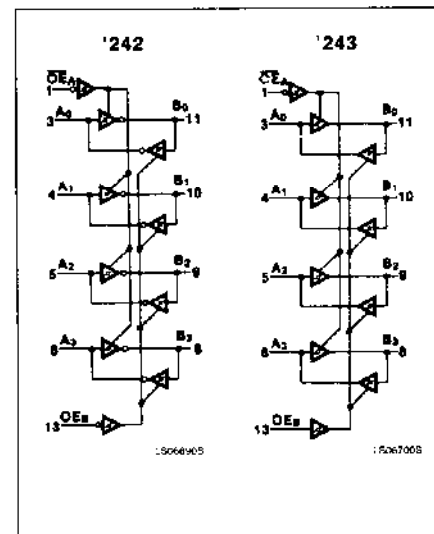
NOTE:

Where a 74LS unit load (LSul) is 20μA I_{IH} and -0.4mA I_{IL} and 74S unit load (Sul) is 50μA I_{IH} and -2.0mA I_{IL}.

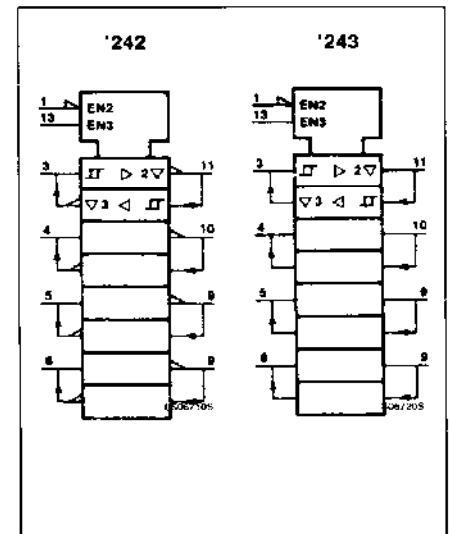
PIN CONFIGURATION



LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



Transceivers

74LS242, LS243, S242, S243

ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

PARAMETER		74LS	74S	UNIT
V _{CC}	Supply voltage	7.0	7.0	V
V _{IN}	Input voltage	-0.5 to +7.0	-0.5 to +5.5	V
I _{IN}	Input current	-30 to +1	-30 to +5	mA
V _{OUT}	Voltage applied to output in HIGH output state	-0.5 to +V _{CC}	-0.5 to +V _{CC}	V
T _A	Operating free-air temperature range	0 to 70	0 to 70	°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	74LS			74S			UNIT	
	Min	Nom	Max	Min	Nom	Max		
V _{CC}	Supply voltage	4.75	5.0	5.25	4.75	5.0	5.25	V
V _{IH}	HIGH-level input voltage	2.0			2.0			V
V _{IL}	LOW-level input voltage			+0.8			-0.8	V
I _{IK}	Input clamp current			-18			-18	mA
I _{OH}	HIGH-level output current			-15			-15	mA
I _{OL}	LOW-level output current			24			64	mA
T _A	Operating free-air temperature	0		70	0		70	°C

Transceivers

74LS242, LS243, S242, S243

DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

PARAMETER	TEST CONDITIONS ¹		74LS242 74LS243			74S242 74S243			UNIT
			Min	Typ ²	Max	Min	Typ ²	Max	
ΔV_T Hysteresis ($V_{T+} - V_{T-}$)	$V_{CC} = \text{MIN}$		0.2	0.4		0.2	0.4		V
V_{OH} HIGH-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = \text{MIN}, V_{IL} = 0.5V, I_{OH} = \text{MAX}$		2.0			2.0			V
	$V_{CC} = \text{MIN}, V_{IH} = \text{MIN}, V_{IL} = \text{MAX}, I_{OH} = -3\text{mA}$		2.4	3.1		2.4	3.4		V
V_{OL} LOW-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = \text{MIN}, V_{IL} = \text{MAX}$	$I_{OL} = \text{MAX}$		0.35	0.5			0.55	
		$I_{OL} = 12\text{mA}$ (74LS)		0.25	0.4				V
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = I_{IK}$				-1.5			-1.2	V
I_{OZH} Off-state output current, HIGH-level voltage applied	$V_{CC} = \text{MAX}, V_{IH} = \text{MIN}, V_{IL} = \text{MAX}, V_O = 2.7V$				40			50	μA
I_{OZL} Off-state output current, LOW-level voltage applied	$V_{CC} = \text{MAX}, V_{IH} = \text{MIN}, V_{IL} = \text{MAX}, V_O = 0.4V$				-200			-400	μA
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}$	$V_I = 5.5V$	A, B inputs					1.0	mA
		$V_I = 7.0V$	$\overline{OE}_A, \overline{OE}_B$ inputs					0.1	mA
I_{IH} HIGH-level input current	$V_{CC} = \text{MAX}, V_I = 2.7V$				20			50	μA
I_{IL} LOW-level input current	$V_{CC} = \text{MAX}, V_I = 0.4V$	A inputs $\overline{OE}_A, \overline{OE}_B = V_{IL} = \text{MAX}$				-0.2		-0.4	mA
		B inputs $\overline{OE}_A, \overline{OE}_B = V_{IH} = \text{MIN}$				-0.2		-0.4	mA
		$\overline{OE}_A, \overline{OE}_B$ inputs				-0.2		-2	mA
I_{OS} Short-circuit output current ³	$V_{CC} = \text{MAX}$		-40		-130	-80		-180	mA
I_{CC} Supply current ⁴ (total)	$V_{CC} = \text{MAX}$	I_{CCH} Outputs HIGH	'242	22	38		80	135	mA
		I_{CCL} Outputs LOW		29	50		100	150	mA
		I_{CCZ} Outputs OFF		29	50		100	150	mA
		I_{CCH} Outputs HIGH	'243	22	38		95	160	mA
		I_{CCL} Outputs LOW		29	50		120	180	mA
		I_{CCZ} Outputs OFF		32	54		120	180	mA

NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at $V_{CC} = 5V, T_A = 25^\circ\text{C}$.
- I_{OS} is tested with $V_{OUT} = +0.5V$ and $V_{CC} = V_{CC\text{ MAX}} + 0.5V$. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.
- I_{CC} is measured with outputs open and transceivers enabled in one direction only, or with all transceivers disabled.

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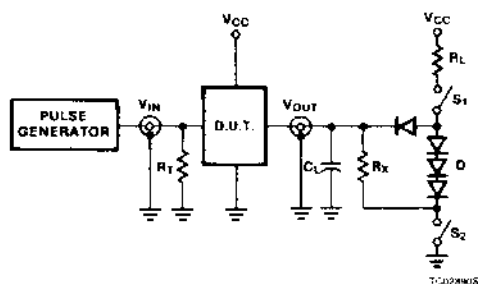
Transceivers

74LS242, LS243, S242, S243

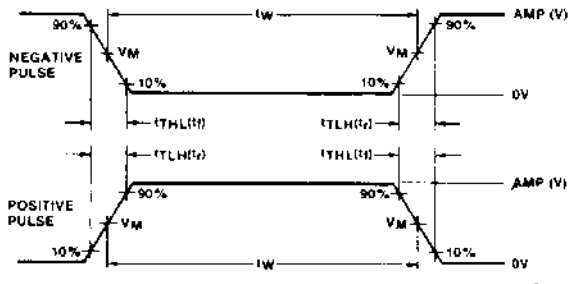
AC ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$

PARAMETER	TEST CONDITIONS	74LS242		74LS243		74S242		74S243		UNIT
		$C_L = 45\text{pF}$, $R_L = 667\Omega$		$C_L = 45\text{pF}$, $R_L = 667\Omega$		$C_L = 50\text{pF}$, $R_L = 90\Omega$		$C_L = 50\text{pF}$, $R_L = 90\Omega$		
		Min	Max	Min	Max	Min	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay		14 18				7 7			ns
t_{PLH} t_{PHL}	Propagation delay				18 18				9 9	ns
t_{PZH}	Enable to HIGH		23		23		12		12	ns
t_{PZL}	Enable to LOW		30		30		15		15	ns
t_{PHZ}	Disable from HIGH		18		18		9		9	ns
t_{PLZ}	Disable from LOW		25		25		15		15	ns

TEST CIRCUITS AND WAVEFORMS



Test Circuit For 3-State Outputs



$V_M = 1.3\text{V}$ for 74LS; $V_M = 1.5\text{V}$ for all other TTL families.

Input Pulse Definition

SWITCH POSITION

TEST	SWITCH 1	SWITCH 2
t_{PZH}	Open	Closed
t_{PZL}	Closed	Open
t_{PHZ}	Closed	Closed
t_{PLZ}	Closed	Closed

DEFINITIONS

R_L = Load resistor to V_{CC} ; see AC CHARACTERISTICS for value.

C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

R_T = Termination resistance should be equal to Z_{OUT} of Pulse Generators.

D = Diodes are 1N916, 1N3064, or equivalent.

$R_X = 1\text{k}\Omega$ for 74, 74S. $R_X = 5\text{k}\Omega$ for 74LS.

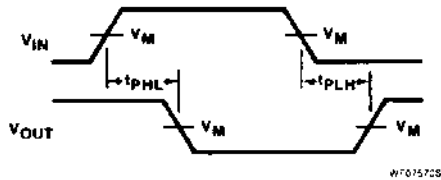
t_{TLH} , t_{THL} Values should be less than or equal to the table entries.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	Pulse Width	t_{TLH}	t_{THL}
74	3.0V	1MHz	500ns	7ns	7ns
74LS	3.0V	1MHz	500ns	15ns	6ns
74S	3.0V	1MHz	500ns	2.5ns	2.5ns

Transceivers

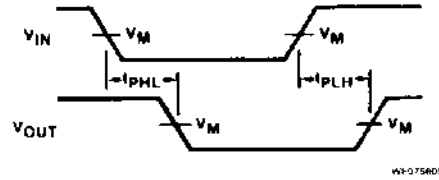
74LS242, LS243, S242, S243

AC WAVEFORMS



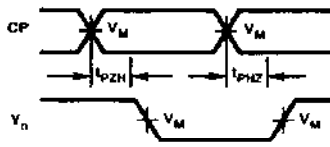
$V_M = 1.3V$ for 74LS; $V_M = 1.5V$ for all other TTL families.

Waveform 1. Waveform For Inverting Outputs



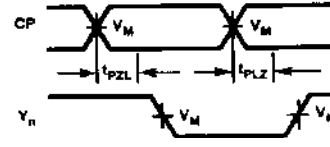
$V_M = 1.3V$ for 74LS; $V_M = 1.5V$ for all other TTL families.

Waveform 2. Waveform For Non-Inverting Outputs



$V_M = 1.3V$ for 74LS; $V_M = 1.5V$ for all other TTL families.

Waveform 3. 3-State Enable Time To High Level and Disable Time From High Level



$V_M = 1.3V$ for 74LS; $V_M = 1.5V$ for all other TTL families.

Waveform 4. 3-State Enable Time To Low Level And Disable Time From Low Level