

74155, LS155 Decoders/Demultiplexers

Dual 2-Line To 4-Line Decoder/Demultiplexer
Product Specification

Logic Products

FEATURES

- Common Address Inputs
- True or complement data demultiplexing
- Dual 1-of-4 or 1-of-8 decoding
- Function generator applications

DESCRIPTION

The '155 is a Dual 1-of-4 Decoder/Demultiplexer with common Address inputs and separate gated Enable inputs. Each decoder section, when enabled, will accept the binary weighted Address input (A_0, A_1) and provide four mutually exclusive active-LOW outputs ($\bar{0} - \bar{3}$). When the enable requirements of each decoder are not met, all outputs of that decoder are HIGH.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74155	18ns	25mA
74LS155	17ns	6.1mA

ORDERING CODE

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 5\%$; $T_A = 0^\circ C$ to $+70^\circ C$
Plastic DIP	N74155N, N74LS155N
Plastic SO	N74LS155D

NOTE:

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

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

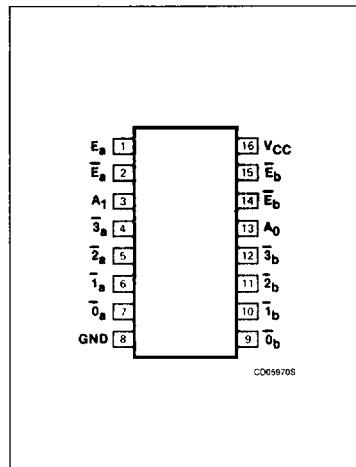
PINS	DESCRIPTION	74	74LS
All	Inputs	1ul	1LSul
All	Outputs	10ul	10LSul

NOTE:

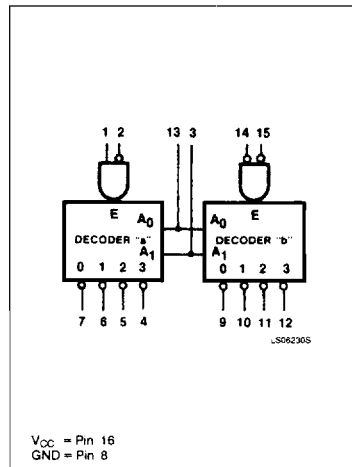
Where a 74 unit load (ul) is understood to be $40\mu A I_{IH}$ and $-1.6mA I_{IL}$, and a 74LS unit load (LSul) is $20\mu A I_{IH}$ and $-0.4mA I_{IL}$.

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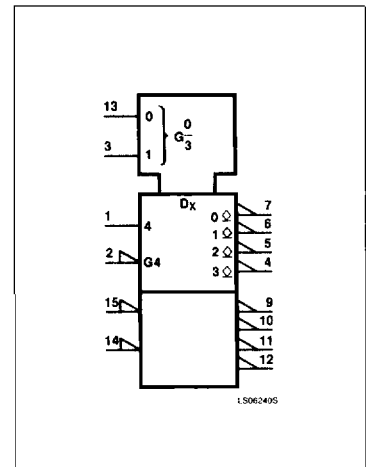
PIN CONFIGURATION



LOGIC SYMBOL



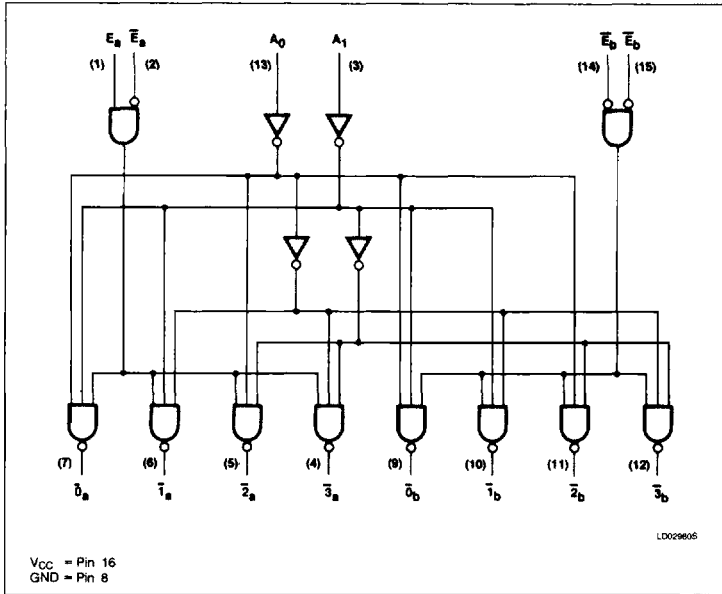
LOGIC SYMBOL (IEEE/IEC)



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LOGIC DIAGRAM



Both decoder sections have a 2-input enable gate. For decoder "a" the enable gate requires one active-HIGH input and one active-LOW input ($E_a \cdot \bar{E}_a$). Decoder "a" can accept either true or complemented data in demultiplexing applications, by using the \bar{E}_a or E_a inputs respectively. The decoder "b" enable gate requires two active-LOW inputs ($\bar{E}_b \cdot \bar{E}_b$). The device can be used as a 1-of-8 decoder/demultiplexer by tying E_a to \bar{E}_b and relabeling the common connection address as (A_2); forming the common enable by connecting the remaining \bar{E}_b and E_a .

FUNCTION TABLE

ADDRESS		ENABLE "a"		OUTPUT "a"				ENABLE "b"		OUTPUT "b"			
A_0	A_1	E_a	\bar{E}_a	$\bar{0}$	$\bar{1}$	$\bar{2}$	$\bar{3}$	\bar{E}_b	E_b	$\bar{0}$	$\bar{1}$	$\bar{2}$	$\bar{3}$
X	X	L	X	H	H	H	H	H	X	H	H	H	H
X	X	X	H	H	H	H	H	X	H	H	H	H	H
L	L	H	L	L	H	H	H	L	L	L	H	H	H
H	L	H	L	H	L	H	H	L	L	H	L	H	H
L	H	H	L	H	H	L	H	L	L	H	H	L	H
H	H	H	L	H	H	H	L	L	L	H	H	H	L

H = HIGH voltage level
 L = LOW voltage level
 X = Don't care

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

PARAMETER	74	74LS	UNIT
V_{CC} Supply voltage	7.0	7.0	V
V_{IN} Input voltage	-0.5 to +5.5	-0.5 to +7.0	V
I_{IN} Input current	-30 to +5	-30 to +1	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		°C

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RECOMMENDED OPERATING CONDITIONS

PARAMETER		74			74LS			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			-12			-18	mA
I _{OH}	HIGH-level output current			-800			-400	μA
I _{OL}	LOW-level output current			16			8	mA
T _A	Operating free-air temperature	0		70	0		70	°C

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

PARAMETER	TEST CONDITIONS ¹	74155			74LS155			UNIT
		Min	Typ ²	Max	Min	Typ ²	Max	
V _{OH}	HIGH-level output voltage V _{CC} = MIN, V _{IH} = MIN, V _{IL} = MAX, I _{OH} = MAX	2.4	3.4		2.7	3.4		V
V _{OL}	LOW-level output voltage V _{CC} = MIN, V _{IH} = MIN, V _{IL} = MAX	I _{OL} = MAX		0.2	0.4			V
		I _{OL} = 4mA (74LS)				0.25	0.4	V
V _{IK}	Input clamp voltage V _{CC} = MIN, I _I = I _{IK}				-1.5		-1.5	V
I _I	Input current at maximum input voltage V _{CC} = MAX	V _I = 5.5V			1.0			mA
		V _I = 7.0V					0.1	mA
I _{IH}	HIGH-level input current V _{CC} = MAX	V _I = 2.4V			40			μA
		V _I = 2.7V					20	μA
I _{IL}	LOW-level input current V _{CC} = MAX, V _I = 0.4V				-1.6		-0.4	mA
I _{OS}	Short-circuit output current ³ V _{CC} = MAX	-18		-57	-15		-100	mA
I _{CC}	Supply current ⁴ (total) V _{CC} = MAX		25	40		6.1	10	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°C.
- I_{OS} is tested with V_{OUT} = +0.5V and V_{CC} = V_{CC} 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.
- Measure I_{CC} with A₁, A₀ and E_a inputs at 4.5V, and E_b, E_a inputs grounded, and outputs open.

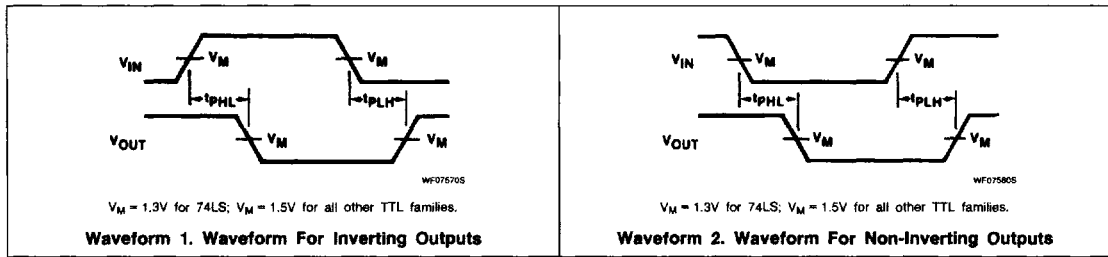
AC ELECTRICAL CHARACTERISTICS T_A = 25°C, V_{CC} = 5.0V

PARAMETER	TEST CONDITIONS	74		74LS		UNIT
		C _L = 15pF, R _L = 400Ω		C _L = 15pF, R _L = 2kΩ		
		Min	Max	Min	Max	
t _{PLH} t _{PHL}	Propagation delay Address to output Waveform 1		32 32		26 30	ns
t _{PLH} t _{PHL}	Propagation delay E _a or E _b to output Waveform 2		20 27		15 30	ns
t _{PLH} t _{PHL}	Propagation delay E _a to output Waveform 1		24 30		27 27	ns

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AC WAVEFORMS



TEST CIRCUITS AND WAVEFORMS

