

DN74LS85

4-bit Magnitude Comparators

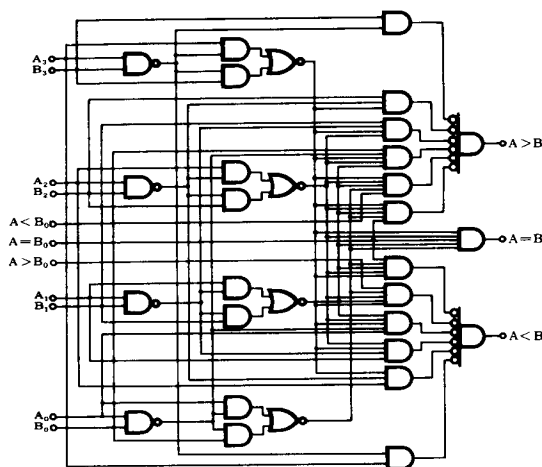
Description

DN74LS85 is a 4-bit digital comparator.

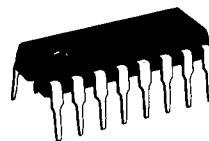
Features

- Number of bits easily increased
- Low output impedance
- Wide operating temperature range ($T_a = -20$ to $+75^{\circ}\text{C}$)

Logic diagram



P-2



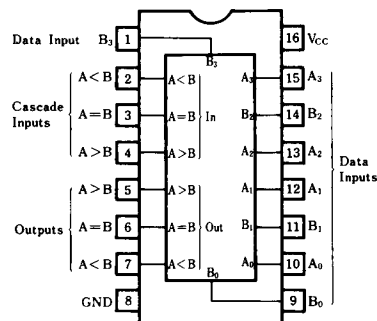
16-pin plastic DIL package

P-5



16-pin Pinflat package (SO-16D)

Pin configuration (top view)



Recommended operating conditions

Parameter	Sym	Min	Typ	Max	Unit
Supply voltage	V_{CC}	4.75	5.00	5.25	V
Output current	I_{OH}			-400	μA
	I_{OL}			8	mA
Operating temperature range	T_{opr}	-20	25	75	$^{\circ}\text{C}$

■ DC characteristics ($T_a = -20 \sim +75^\circ\text{C}$)

Parameter		Sym	Test conditions	Min	Typ*	Max	Unit	
Input voltage		V _{IH}		2.0			V	
		V _{IL}				0.8	V	
Output voltage		V _{OH}	V _{CC} = 4.75 V, I _{OH} = −400 μA V _{IH} = 2 V, V _{IL} = 0.8 V		2.7	3.4		V
		V _{OL1}	V _{CC} = 4.75 V V _{IH} = 2 V	I _{OL} = 4 mA		0.25	0.4	V
		V _{OL2}	V _{IL} = 0.8 V	I _{OL} = 8 mA		0.35	0.5	V
Input current	Inputs where A < (B, A) B	I _{IH}	V _{CC} = 5.25 V V _I = 2.7 V			20	μA	
	Other inputs					60	μA	
	Inputs where A < (B, A) B	I _{IL}	V _{CC} = 5.25 V V _I = 0.4 V			−0.4	mA	
	Other inputs					−1.2	mA	
	Inputs where A < (B, A) B	I _I	V _{CC} = 5.25 V V _I = 7 V			0.1	mA	
	Other inputs					0.3	mA	
Output short circuit current**		I _{OS}	V _{CC} = 5.25 V V _O = 0 V	−15		−100	mA	
Input clamp voltage		V _{IK}	V _{CC} = 4.75 V I _I = −18 mA			−1.5	V	
Supply current***		I _{CC}	V _{CC} = 5.25 V		10.4	20	mA	

* When constant at $V_{CC} = 5\text{V}$, $T_a = 25^\circ\text{C}$.

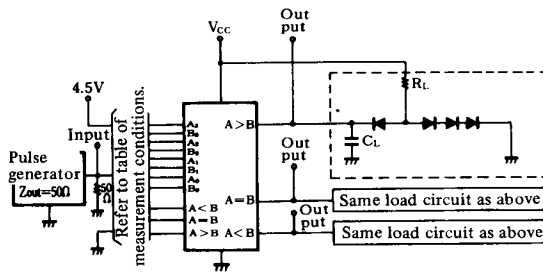
** Only one output at a time short circuited to GND. Also, short circuit time to GND within 1 second.

*** I_{CC} is measured with all outputs open, A = B input terminal grounded, and 4.5V applied to other input terminals.■ Switching characteristics ($V_{CC} = 5\text{V}$, $T_a = 25^\circ\text{C}$)

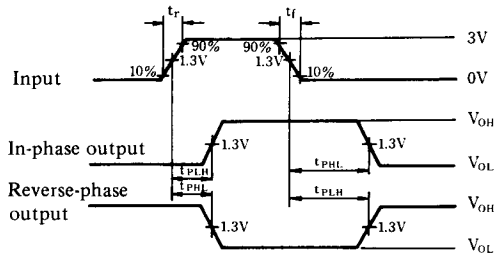
Parameter	Sym	Inputs	Outputs	Gate level	Test conditions	Min	Typ	Max	Unit
Propagation delay time	t_{PLH}	Any A or B data Input	A < B	1	$C_L = 15\text{pF}$ $R_L = 2\text{k}\Omega$		14		ns
			A > B	2			19		ns
			A = B	3			24	36	ns
				4			27	45	ns
	t_{PHL}	Any A or B data Input	A < B	1			11		ns
			A > B	2			15		ns
			A = B	3			20	30	ns
				4			23	45	ns
	t_{PLH}	A < B or A = B	A > B	1			14	22	ns
	t_{PHL}	A < B or A = B	A > B	1			11	17	ns
	t_{PLH}	A = B	A = B	2			13	20	ns
	t_{PHL}	A = B	A = B	2			13	26	ns
	t_{PLH}	A > B or A = B	A < B	1			14	22	ns
	t_{PHL}	A > B or A = B	A < B	1			11	17	ns

✱ Switching parameter measurement information

1. Measurement circuit



2. Waveforms



Notes

1. C_L includes probe and tool floating capacitance.
2. Diodes are all MA161 or equivalent.

1. Input waveform: $t_r \leq 15\text{ns}$, $t_f \leq 6\text{ns}$, $\text{PRR} = 1\text{MHz}$,
duty cycle = 50%.

3. Table of measurement conditions

Parameter	DC inputs											Output waveforms		
	A ₃	B ₃	A ₂	B ₂	A ₁	B ₁	A ₀	B ₀	A > B	A = B	A < B	A > B	A = B	A < B
t _{PLH}	IN	4.5V	4.5V	GND	GND	GND	GND	GND	GND	GND	GND	A		B
	4.5V	IN	GND	4.5V	GND	GND	GND	GND	GND	GND	GND	B		A
	GND	GND	IN	4.5V	4.5V	GND	GND	GND	GND	GND	GND	A		B
	GND	GND	4.5V	IN	GND	4.5V	GND	GND	GND	GND	GND	B		A
	GND	GND	GND	GND	IN	4.5V	4.5V	GND	GND	GND	GND	A		B
t _{PHL}	GND	GND	GND	GND	4.5V	IN	GND	4.5V	GND	GND	GND	B		A
	GND	GND	GND	GND	GND	GND	IN	4.5V	4.5V	GND	GND	A		B
	GND	GND	GND	GND	GND	GND	4.5V	IN	GND	GND	4.5V	B		A
	GND	GND	GND	GND	GND	GND	IN	4.5V	GND	4.5V	GND		A	B
	GND	GND	GND	GND	GND	GND	GND	4.5V	IN	GND	4.5V	B	A	
	GND	GND	GND	GND	GND	GND	GND	GND	IN	GND	GND			B
	GND	GND	GND	GND	GND	GND	GND	GND	GND	IN	GND	B	A	B
	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	IN	B		

■ Truth tables

Inputs				Previous stage direct coupled inputs			Outputs		
A_3, B_3	A_2, B_2	A_1, B_1	A_0, B_0	$A > B$	$A < B$	$A = B$	$A > B$	$A < B$	$A = B$
$A_3 > B_3$	X	X	X	X	X	X	H	L	L
$A_3 < B_3$	X	X	X	X	X	X	L	H	L
$A_3 = B_3$	$A_2 > B_2$	X	X	X	X	X	H	L	L
$A_3 = B_3$	$A_2 < B_2$	X	X	X	X	X	L	H	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 > B_1$	X	X	X	X	H	L	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 < B_1$	X	X	X	X	L	H	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 > B_0$	X	X	X	H	L	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 < B_0$	X	X	X	L	H	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 = B_0$	H	L	L	H	L	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 = B_0$	L	H	L	L	H	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 = B_0$	L	L	H	L	H	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 = B_0$	X	X	H	L	L	H
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 = B_0$	H	H	L	L	L	L
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 = B_0$	L	L	L	H	H	L

Notes

1. H: HIGH voltage level.
2. L: LOW voltage level.
3. X: Either HIGH or LOW; doesn't matter.