National Semiconductor

54LS49 BCD to 7-Segment Decoder

General Description

The 54LS49 translates four lines of BCD (8421) input data into the 7-segment numeral code as shown in the Function Table. It has open-collector outputs and is logically the 14-pin verson of the '48, without the lamp test and ripple blanking features. Also see the 'LS249 data sheet.
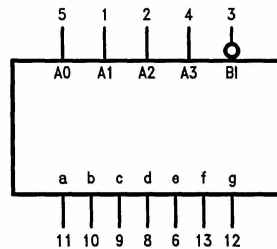
Connection Diagram

Dual-In-Line Package
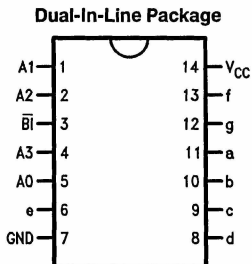
TL/F/10204–1

Order Number 54LS49DMQB or 54LS49FMQB
See NS Package Number J14A or W14B

Logic Symbol

TL/F/10204–2

V_{CC} = Pin 14
GND = Pin 7

Pin Names	Description
A0–A3	BCD Inputs
$\overline{BI}$	Blanking Input (Active LOW)
a–g	Segment Outputs (Active HIGH)

Numerical Designations—Resultant Displays
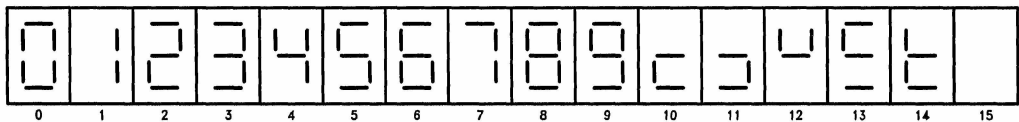
TL/F/10204–3

Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	5.5V
Operating Free Air Temperature Range	
54LS	$-55°C$ to $+125°C$
Storage Temperature Range	$-65°C$ to $+150°C$

Note: *The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.*

Recommended Operating Conditions

Symbol	Parameter	54LS49			Units
		Min	Nom	Max	
V_{CC}	Supply Voltage	4.5	5	5.5	V
V_{IH}	High Level Input Voltage	2			V
V_{IL}	Low Level Input Voltage			0.7	V
I_{OH}	High Level Output Current			250	μA
I_{OL}	Low Level Output Current			4	mA
T_A	Free Air Operating Temperature	-55		125	°C

Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = -18 mA			-1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = Min, I_{OH} = Max, V_{IL} = Max, V_{IH} = Min	2.5			V
V_{OL}	Low Level Output Voltage	V_{CC} = Min, I_{OL} = Max, V_{IH} = Min, V_{IL} = Max			0.4	V
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 10.0V			0.1	mA
I_{IH}	High Level Input Current	V_{CC} = Max, V_I = 2.7V			20	μA
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.4V			-0.4	mA
I_{CC}	Supply Current	V_{CC} = Max			15	mA

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Switching Characteristics V_{CC} = +5.0V, T_A = +25°C (See Section 1 for waveforms and output load)

Symbol	Parameter	54LS		Units
		C_L = 15 pF		
		Min	Max	
t_{PLH} t_{PHL}	Propagation Delay; R_L = 2 kΩ A_n to a–g		100 100	ns
t_{PLH} t_{PHL}	Propagation Delay; R_L = 6 kΩ $\overline{BI}$ to a–g		100 100	ns

Function Table

Decimal or Function	Inputs					Outputs							Note
	A3	A2	A1	A0	$\overline{BI}$	a	b	c	d	e	f	g	
0	L	L	L	L	H	H	H	H	H	H	H	L	1
1	L	L	L	H	H	L	H	H	L	L	L	L	
2	L	L	H	L	H	H	H	L	H	H	L	H	
3	L	L	H	H	H	H	H	H	H	L	L	H	
4	L	H	L	L	H	L	H	H	L	L	H	H	
5	L	H	L	H	H	H	L	H	H	L	H	H	
6	L	H	H	L	H	L	L	H	H	H	H	H	
7	L	H	H	H	H	H	H	H	L	L	L	L	
8	H	L	L	L	H	H	H	H	H	H	H	H	
9	H	L	L	H	H	H	H	H	L	L	H	H	
10	H	L	H	L	H	L	L	L	H	H	L	H	
11	H	L	H	H	H	L	L	H	H	L	L	H	
12	H	H	L	L	H	L	H	L	L	L	H	H	
13	H	H	L	H	H	H	L	L	H	L	H	H	
14	H	H	H	L	H	L	L	L	H	H	H	H	
15	H	H	H	H	H	L	L	L	L	L	L	L	
BI	X	X	X	X	L	L	L	L	L	L	L	L	2

Note 1: The blanking input must be open or held at a HIGH level when output functions 0 through 15 are desired.
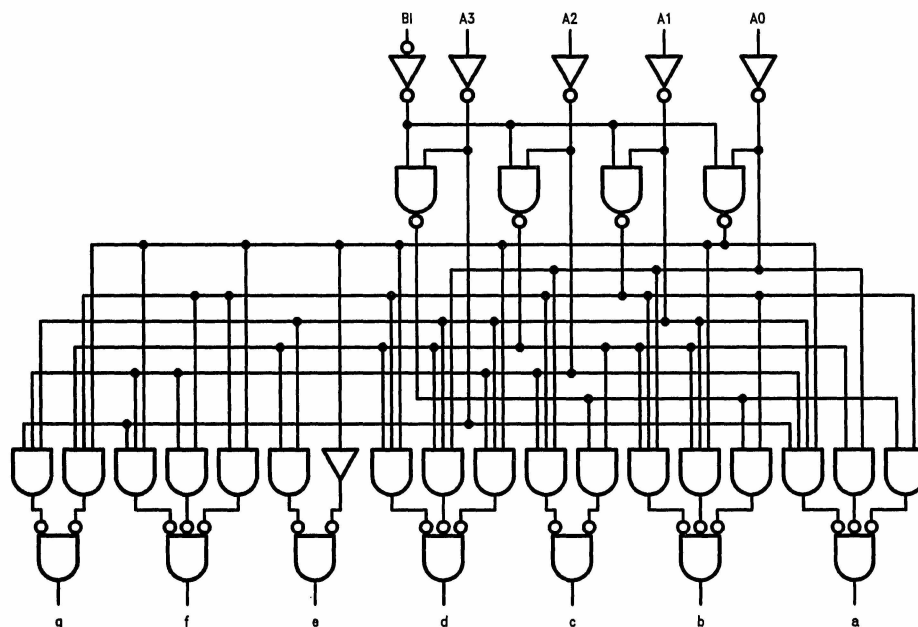
Note 2: When a LOW level is applied to the blanking input all segment outputs go to a LOW level regardless of the state of any other input condition. X = Input may be HIGH or LOW.

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

Logic Diagram

TL/F/10204-4