

BCD-TO-SEVEN SEGMENT LATCH/DECODER/DRIVER

FEATURES

- ◆ Phase Input Signal Reproduced on Outputs for Liquid Crystal Display
- ◆ Latched Storage of Input Code
- ◆ Blanking Input for Display Intensity Modulation
- ◆ Readout Blanking for Illegal Input Combinations
- ◆ Pin Compatible with CD4056A (with Pin 7 Tied to V_{SS})

DESCRIPTION

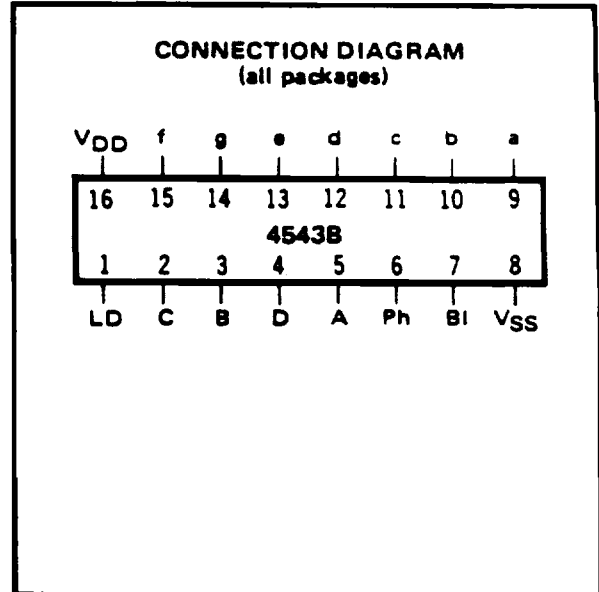
The 4543B BCD-to-7 Segment Latch/Decoder/Driver is designed for use with liquid crystal readouts and is constructed with complementary MOS (CMOS) enhancement-mode devices. The circuit provides the functions of a 4-bit storage latch and a 8421 BCD-to-seven segment decoder and driver. The device has the capability to invert the logic levels of the output combinations. The Phase (Ph), Blanking (BI), and Latch Disable (LD) inputs are used to reverse the truth-table phase, blank the display, and store a BCD code, respectively. For liquid crystal readouts, a square wave is applied to the Ph input of the circuit and the electrically common backplane of the display. The outputs of the circuit are connected directly to the segments of the readout. For other types of readouts, such as light-emitting diode (LED), incandescent, gas discharge, and fluorescent readouts, connection diagrams are given on this data sheet.

Applications include instrument (e.g., counter,

TRUTH TABLE

INPUTS				OUTPUTS							
LD	BI	Ph	DCBA	a	b	c	d	e	f	g	Display
X	1	0	X X X X	0	0	0	0	0	0	0	Blank
1	0	0	0 0 0 0	1	1	1	1	1	1	1	0
1	0	0	0 0 0 1	0	1	1	0	0	0	0	1
1	0	0	0 0 1 0	1	1	0	1	0	0	1	2
1	0	0	0 0 1 1	1	1	1	0	0	1	1	3
1	0	0	0 1 0 0	0	1	0	0	1	1	1	4
1	0	0	0 1 0 1	1	0	1	1	0	1	1	5
1	0	0	0 1 1 0	1	0	1	1	1	1	1	6
1	0	0	0 1 1 1	1	1	1	0	0	0	0	7
1	0	0	1 0 0 0	1	1	1	1	1	1	1	8
1	0	0	1 0 0 1	1	1	1	0	1	1	1	9
1	0	0	1 0 1 0	0	0	0	0	0	0	0	Blank
1	0	0	1 0 1 1	0	0	0	0	0	0	0	Blank
1	0	0	1 1 0 0	0	0	0	0	0	0	0	Blank
1	0	0	1 1 0 1	0	0	0	0	0	0	0	Blank
1	0	0	1 1 1 0	0	0	0	0	0	0	0	Blank
1	0	0	1 1 1 1	0	0	0	0	0	0	0	Blank
0	0	0	X X X X	**	**	**	**	**	**	**	**
1	1	1	1	Inverse of Output Combinations Above						Display as above	

- X - Don't care
- 1 - Above Combinations
- ** - For liquid crystal readouts, apply a square wave to Ph. For common cathode LED readouts, select Ph = 0. For common anode LED readouts, select Ph = 1
- ** - Depends upon the BCD code previously applied when LD = 1



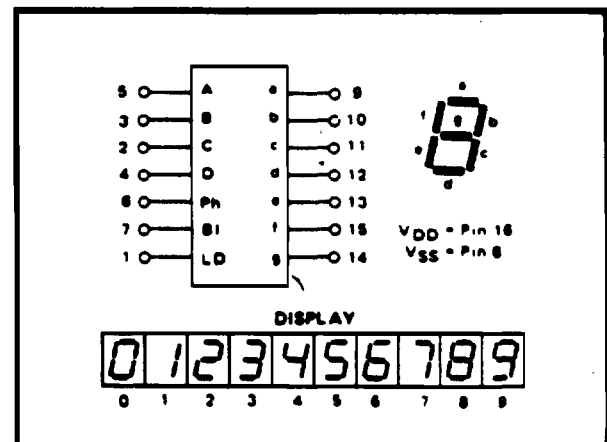
RECOMMENDED OPERATING CONDITIONS

For maximum reliability:

DC Supply Voltage	V _{DD} - V _{SS}	3 to 15	Vdc
Operating Temperature	T _A	-55 to +125	°C
		-40 to +85	°C

DVM, etc.) display driver, computer/calculator display driver, cockpit display driver, and various clock, watch, and timer uses.

BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS

STATIC CHARACTERISTICS¹

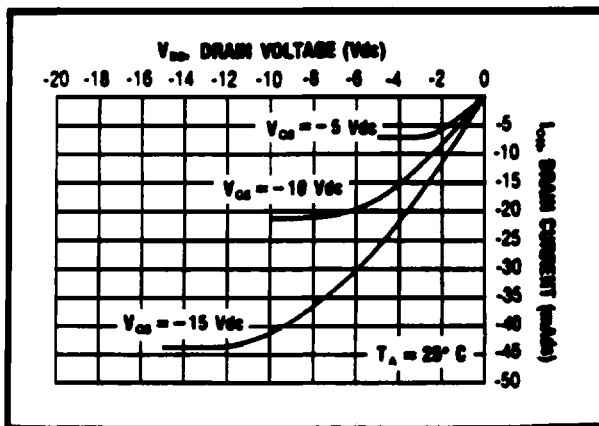
PARAMETER	V _{DD} (Vdc)	CONDITIONS	T _{LOW} ²		+25°C			T _{HIGH} ³		Units
			Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
QUIESCENT DEVICE CURRENT	I _{DD}	V _{IN} = V _{SS} or V _{DD} All valid input combinations	-	5	-	0.05	5	-	150	μAdc
			-	10	-	0.1	10	-	300	
			-	20	-	0.2	20	-	600	

NOTES: ¹ Remaining Static Electrical Characteristics are listed under "4000B Series Family Specifications".

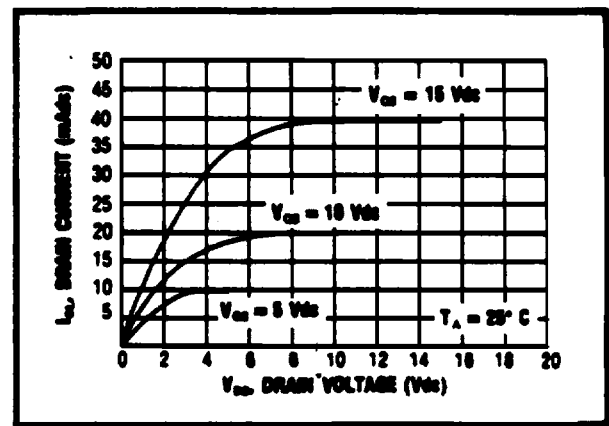
² T_{LOW} = -55°C for C
= -40°C for E
T_{HIGH} = +125°C for C
= +85°C for E

DYNAMIC CHARACTERISTICS (C_L = 50pF, T_A = 25°C)

PARAMETER	V _{DD} (Vdc)	Min.	Typ.	Max.	Units
PROPAGATION DELAY TIME	t _{PLH} , t _{PHL}	-	550	1100	ns
		5	210	420	
		10	160	320	
OUTPUT TRANSITION TIME	t _{TLH} , t _{THL}	-	100	200	ns
		5	50	100	
		10	40	80	
MINIMUM DATA INPUT SETUP TIME	t _{setup}	-	-40	0	ns
		5	-15	0	
		10	-10	0	
MINIMUM DATA INPUT HOLD TIME	t _{hold}	-	40	80	ns
		5	15	30	
		10	10	20	
MINIMUM LD PULSE WIDTH	PW _{LD}	-	125	250	ns
		5	50	100	
		10	40	80	

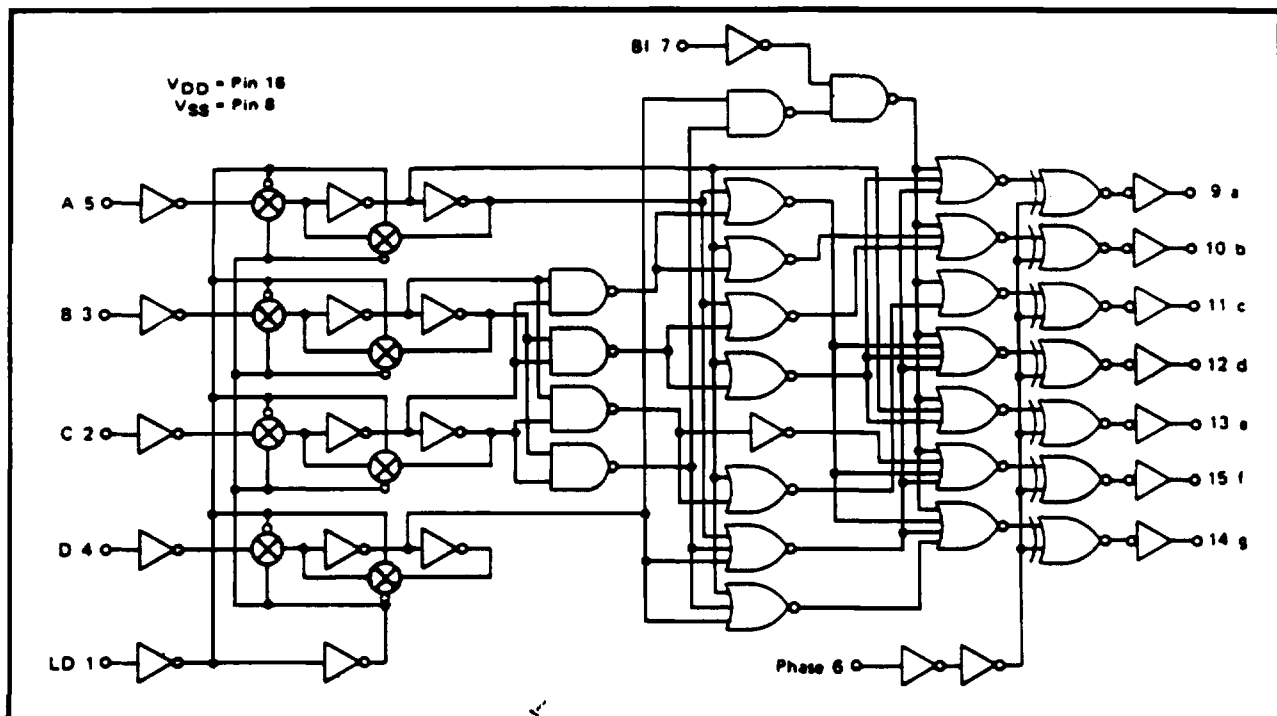


Typical P-Channel
Source Current Characteristics



Typical N-Channel
Sink Current Characteristics

LOGIC DIAGRAM



APPLICATIONS INFORMATION

CONNECTIONS TO VARIOUS DISPLAY READOUTS

<p>LIQUID CRYSTAL (LC) READOUT</p> <p>One of Seven Segments</p> <p>Common Backplane</p> <p>Square Wave (VSS to VDD)</p>	<p>INCANDESCENT READOUT</p> <p>Appropriate Voltage</p>
<p>LIGHT EMITTING DIODE (LED) READOUT</p> <p>Common Cathode LED</p> <p>Common Anode LED</p> <p>VDD</p> <p>VSS</p>	<p>GAS DISCHARGE READOUT</p> <p>Appropriate Voltage</p>
<p>FLUORESCENT READOUT</p> <p>Filament Supply</p> <p>VSS or appropriate voltage below VSS.</p>	

Note. Bipolar transistors may be added for gain (for $V_{DD} \leq 10V$ or $I_{out} > 10\text{ mA}$).