

GD4734B

BCD-TO-7 SEGMENT LATCH/DECODER/DRIVER WITH RIPPLE BLANKING

DESCRIPTION: The 4734B is a BCD-to-7 Segment Latch/Decoder/Driver with Ripple Blanking. It has four Address Inputs (A_0 - A_3), an active LOW Latch Enable Input (\overline{EL}), an active LOW Blanking Input (\overline{IB}), an active LOW Lamp Test Input (\overline{ILT}), a Ripple Blanking Input (I_{RB}), a Ripple Blanking Output (O_{RB}) and seven active HIGH NPN bipolar Segment Outputs (a-g).

When the Lamp Test Input (\overline{ILT}) is LOW, all the Segment Outputs (a-g) are HIGH; independent of all other input conditions. The Lamp Test Input (\overline{ILT}) does not affect the Ripple Blanking Output (O_{RB}). With the Lamp Test Input (\overline{ILT}) HIGH, a LOW on the Blanking Input (\overline{IB}) forces the Segment Outputs (a-g) LOW; independent of all other input conditions. The Blanking Input (\overline{IB}) does not affect the Ripple Blanking Output (O_{RB}). The Ripple Blanking Output (O_{RB}) is HIGH when the Ripple Blanking Input (I_{RB}) is HIGH and the latch contains binary zero. With the Lamp Test Input (\overline{ILT}) HIGH, the display is blank when the Ripple Blank Output (O_{RB}) is HIGH.

When the Latch Enable Input (\overline{EL}) is LOW, the state of the latch is determined by the data on the Address Inputs (A_0 - A_3). When the Latch Enable Input (\overline{EL}) goes HIGH, the last data present at the Address Inputs (A_0 - A_3) is stored in the latch. The Lamp Test (\overline{ILT}), Blanking (\overline{IB}) and Ripple Blanking (I_{RB}) inputs do not affect the latch circuit.

- HIGH CURRENT SOURCING OUTPUTS (UP TO 25 mA)
- BLANKING INPUT (ACTIVE LOW)
- LAMP TEST INPUT (ACTIVE LOW)
- LAMP INTENSITY MODULATION CAPABILITY
- MULTIPLEXING CAPABILITY
- RIPPLE BLANKING INPUT/OUTPUT

PIN NAMES

A_0 - A_3	Address (Data) Inputs	\overline{ILT}	Lamp Test Input (Active LOW)
\overline{EL}	Latch Enable Input (Active LOW)	I_{RB}	Ripple Blanking Input
\overline{IB}	Blanking Input (Active LOW)	O_{RB}	Ripple Blanking Output
		a-g	Segment Outputs

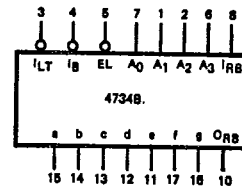
TRUTH TABLE

INPUTS				OUTPUTS							DISPLAY
A_3	A_2	A_1	A_0	a	b	c	d	e	f	g	
X	X	X	X	H	H	H	H	H	H	H	8
X	X	X	X	L	L	L	L	L	L	L	BLANK
L	L	L	L	H	H	H	H	H	H	H	0
L	L	L	H	L	H	H	L	L	L	L	1
L	L	H	L	H	H	L	H	H	L	H	2
L	L	H	H	H	H	H	H	L	L	H	3
L	H	L	L	L	H	H	L	L	H	H	4
L	H	L	H	H	L	H	H	L	H	H	5
L	H	H	L	H	L	H	H	H	H	H	6
L	H	H	H	H	H	H	L	L	L	L	7
H	L	L	L	H	H	H	H	H	H	H	8
H	L	L	H	H	H	H	H	L	H	H	9
H	L	H	L	L	L	L	L	L	L	L	BLANK
H	L	H	H	L	L	L	L	L	L	L	BLANK
H	H	L	L	L	L	L	L	L	L	L	BLANK
H	H	L	H	L	L	L	L	L	L	L	BLANK
H	H	H	L	L	L	L	L	L	L	L	BLANK
H	H	H	H	L	L	L	L	L	L	L	BLANK

CONDITIONS:
 \overline{EL} = LOW, \overline{IB} = HIGH
 \overline{ILT} = HIGH, and I_{RB} = LOW

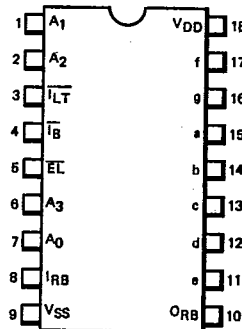
L = LOW Level
 H = HIGH Level
 X = Don't Care

LOGIC SYMBOL

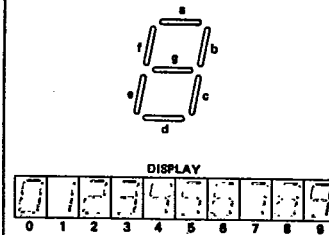


V_{DD} = Pin 18
 V_{SS} = Pin 9

**CONNECTION DIAGRAM
DIP (TOP VIEW)**



NUMERICAL DESIGNATIONS



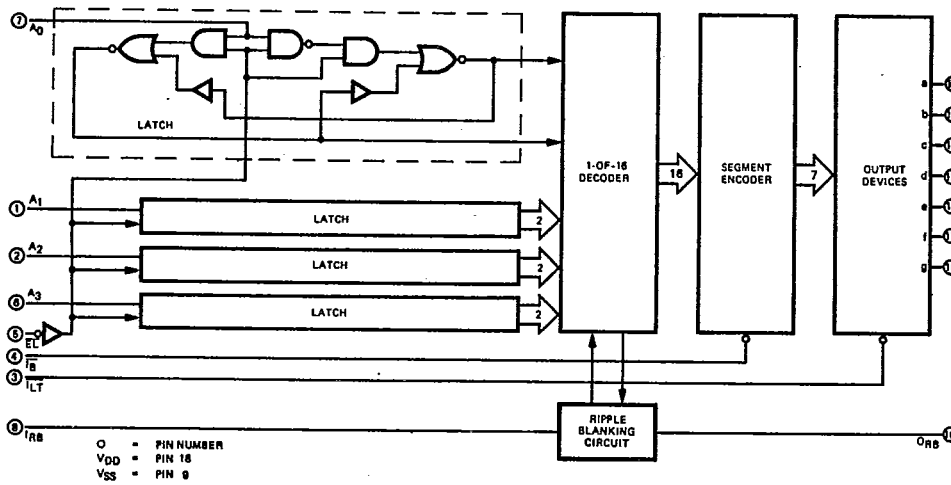
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BLOCK DIAGRAM



DC CHARACTERISTICS: V_{DD} = 5 V, V_{SS} = 0 V (Note 1)

SYMBOL	PARAMETER	LIMITS			UNITS	TEMP	TEST CONDITIONS	
		MIN	TYP	MAX				
V _{IH}	Input HIGH Voltage	3.5			V	All	Guaranteed Input HIGH Voltage	
V _{IL}	Input LOW Voltage			1.5	V	All	Guaranteed Input LOW Voltage	
V _{OH}	Output HIGH Voltage	XC or XM	4.1	4.57		V	25°C	I _{OH} < 1 μA
			XC	3.60	4.24		V	25°C
		4.22			I _{OH} = 10 mA			
		4.16			I _{OH} = 15 mA			
		2.80		4.12		I _{OH} = 20 mA		
		XM	4.05			V	25°C	I _{OH} = 25 mA
			4.24					I _{OH} = 5 mA
			3.90	4.22				I _{OH} = 10 mA
			4.16					I _{OH} = 15 mA
			3.40	4.12				I _{OH} = 20 mA
			4.05					I _{OH} = 25 mA
		V _{OL}	Output LOW Voltage			0.05	V	MIN, 25°C
				0.05	V	MAX	I _{OL} < 1 μA Inputs at 1.5 or 3.5 V	
I _{OL}	Output LOW Current	1			mA	MIN, 25°C	V _{OUT} = 0.4 V	
		0.8						MAX
I _{DD}	Quiescent Power Supply Current	XC		20	μA	MIN, 25°C	All Inputs at 0 V or V _{DD} and All Outputs Open	
				150		MAX		
		XM		5		MIN, 25°C		
				150		MAX		

Notes on following pages.

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DC CHARACTERISTICS: $V_{DD} = 10\text{ V}$, $V_{SS} = 0\text{ V}$ (Note 1)

SYMBOL	PARAMETER		LIMITS			UNITS	TEMP	TEST CONDITIONS							
			MIN	TYP	MAX										
V_{IH}	Input HIGH Voltage		7			V	All	Guaranteed Input HIGH Voltage							
V_{IL}	Input LOW Voltage				3	V	All	Guaranteed Input LOW Voltage							
V_{OH}	Output HIGH Voltage	XC or XM	9.1	9.58		V	25°C	$I_{OH} < 1\ \mu\text{A}$	Inputs at 0 V or V_{DD} per the Truth Table						
										XC	9.26		V	25°C	$I_{OH} = 5\ \text{mA}$
		8.75	9.21		$I_{OH} = 10\ \text{mA}$										
			9.17			$I_{OH} = 15\ \text{mA}$									
		8.10	9.14				$I_{OH} = 20\ \text{mA}$								
			9.10					$I_{OH} = 25\ \text{mA}$							
			9.26												
		XM	9.00	9.21						V	25°C	$I_{OH} = 10\ \text{mA}$			
													9.17		$I_{OH} = 15\ \text{mA}$
					8.60	9.14								$I_{OH} = 20\ \text{mA}$	
						9.10							$I_{OH} = 25\ \text{mA}$		
								$I_{OH} = 5\ \text{mA}$							
						$I_{OH} = 10\ \text{mA}$									
V_{OL}	Output LOW Voltage			0.05	V		MIN, 25°C		$I_{OL} < 1\ \mu\text{A}$	Inputs at 0 V or V_{DD} per the Truth Table					
											0.05				
				1	V		All		$I_{OL} < 1\ \mu\text{A}$	Inputs at 3 or 7 V					
I_{OL}	Output LOW Current		2.6	2			mA		MIN, 25°C	$V_{OUT} = 0.5\ \text{V}$	Inputs at 0 V or V_{DD} per the Truth Table				
								1.2						MAX	
I_{DD}	Quiescent Power Supply Current	XC			40	μA	MIN, 25°C	All Inputs at 0 V or V_{DD} and all Outputs Open							
							300		MAX						
		XM			10		MIN, 25°C								
							300		MAX						

Notes on following pages.

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DC CHARACTERISTICS: $V_{DD} = 15\text{ V}$, $V_{SS} = 0\text{ V}$ (Note 1)

SYMBOL	PARAMETER		LIMITS			UNITS	TEMP	TEST CONDITIONS	
			MIN	TYP	MAX				
V_{IH}	Input HIGH Voltage		11			V	All	Guaranteed Input HIGH Voltage	
V_{IL}	Input LOW Voltage				4	V	All	Guaranteed Input LOW Voltage	
V_{OH}	Output HIGH Voltage	XC or XM	14.10	14.59		V	25°C	$I_{OH} < 1\ \mu\text{A}$	Inputs at 0 V or V_{DD} per the Truth Table
					14.27				
		XC	13.75	14.23		V	25°C	$I_{OH} = 10\text{ mA}$	
				14.20				$I_{OH} = 15\text{ mA}$	
			13.10	14.17				$I_{OH} = 20\text{ mA}$	
				14.13				$I_{OH} = 25\text{ mA}$	
		XM		14.27		V	25°C	$I_{OH} = 5\text{ mA}$	
			14	14.23				$I_{OH} = 10\text{ mA}$	
				14.20				$I_{OH} = 15\text{ mA}$	
			13.60	14.17				$I_{OH} = 20\text{ mA}$	
				14.13				$I_{OH} = 25\text{ mA}$	
		V_{OL}	Output LOW Voltage			0.05	V	MIN, 25°C	
				0.05	MAX				
					2	V	All	$I_{OL} < 1\ \mu\text{A}$ Inputs at 4 or 11 V	
I_{IN}	Input Current	XC			1	μA	All	Lead under test at 0 V or V_{DD} All other Inputs simultaneously at 0 V or V_{DD}	
		XM			1				
I_{OL}	Output LOW Current		7.5		mA	MIN, 25°C	$V_{OUT} = 1.5\text{ V}$	Inputs at 0 V or V_{DD} per the Truth Table	
			4.5			MAX			
I_{DD}	Quiescent Power Supply Current	XC			80	μA	MIN, 25°C	All Inputs at 0 V or V_{DD} and all Outputs Open	
					600		MAX		
		XM			20		MIN, 25°C		
					600		MAX		

Notes on following page.

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AC CHARACTERISTICS AND SET-UP REQUIREMENTS: V_{DD} as shown, $V_{SS} = 0 V$, $T_A = 25^\circ C$ (See Note 2)

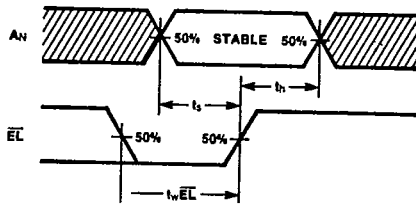
SYMBOL	PARAMETER	LIMITS									UNITS	TEST CONDITIONS
		$V_{DD} = 5 V$			$V_{DD} = 10 V$			$V_{DD} = 15 V$				
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX		
t _{PLH}	Propagation Delay, A_n to a - g		212			90			68		ns	C _L = 50 pF, R _L = 200 kΩ Input Transition Times < 20 ns
t _{PHL}			238			88			60			
t _{PLH}	Propagation Delay, $\overline{I_{LT}}$ to a - g		82			38			30		ns	
t _{PHL}			85			34			24			
t _{PLH}	Propagation Delay, $\overline{I_B}$ to a - g		147			60			42		ns	
t _{PHL}			164			65			46			
t _{PLH}	Propagation Delay, \overline{EL} to a - g		230			90			63		ns	
t _{PHL}			275			98			66			
t _{PLH}	Propagation Delay, A_n to O _{RB}		212			90			68		ns	
t _{PHL}			238			88			60			
t _{PLH}	Propagation Delay, I_{RB} to O _{RB}		147			60			42		ns	
t _{PHL}			164			65			46			
t _{TLH}	Output Transition Time		25			18			16		ns	
t _{THL}			75			26			17			
t _{wEL}	EL Minimum Pulse Width		34			14			10		ns	
t _s	Set-Up Time, A_n to EL		20			7			4		ns	
t _h	Hold Time, A_n to \overline{EL}		19			6			4		ns	

NOTES:

1. Additional DC Characteristics are listed in this section under 4000B Series CMOS Family Characteristics.
2. Propagation Delays and Output Transition Times are graphically described in this section under 4000B Series CMOS Family Characteristics.

SWITCHING WAVEFORMS

SET-UP AND HOLD TIMES, A_n TO EL AND MINIMUM EL PULSE WIDTH

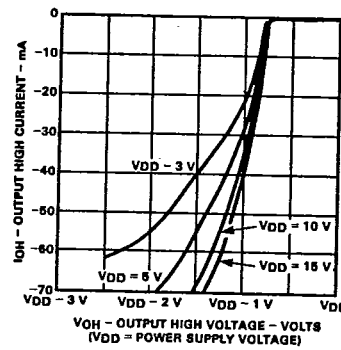


NOTE:

Set-up and Hold Times are shown as positive values but may be specified as negative values.

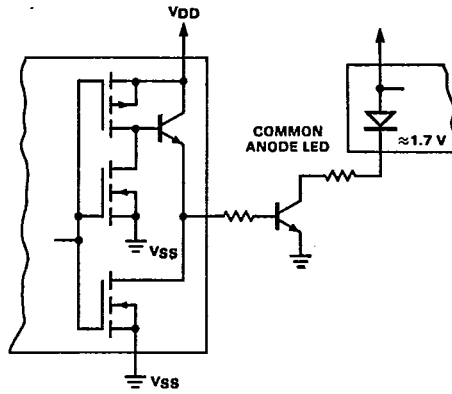
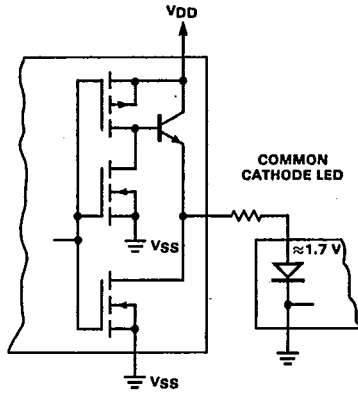
TYPICAL ELECTRICAL CHARACTERISTICS

TYPICAL OUTPUT DRIVE CHARACTERISTICS

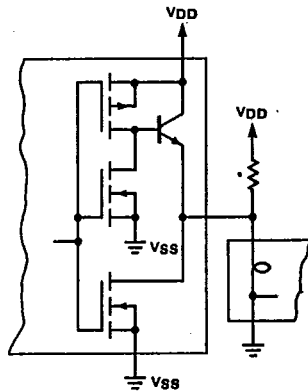


TYPICAL APPLICATIONS

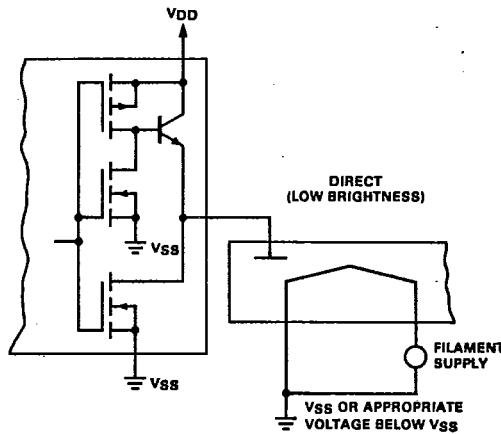
LIGHT EMITTING DIODE (LED) READOUT



INCANDESCENT READOUT

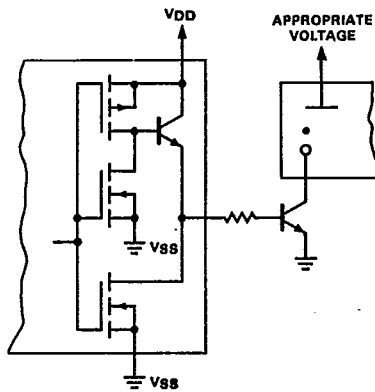


FLUORESCENT READOUT

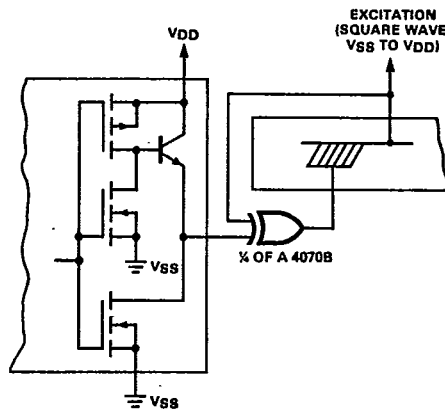


*A filament pre-warm resistor is recommended to reduce filament thermal shock and increase the effective cold resistance of the filament.

GAS DISCHARGE READOUT



LIQUID CRYSTAL (LCD) READOUT**



**Direct dc drive of LCD's not recommended for life of LCD readouts.