

BCD-TO-SEVEN SEGMENT DECODER/DRIVER

MC5400/7400 series

MC5448L • MC7448L, P*

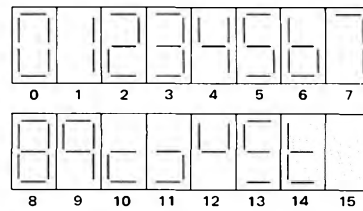
This device decodes 4-bit binary coded decimal input data in a format suitable for use with incandescent, seven-segment, display indicators. It is intended for use with other logic elements or discrete components rather than for the direct driving of display indicators as is the case with the MC5446/7446 and MC5447/7447 which are similar.

Ripple blanking inputs provide capability for suppression of non-significant zeros in a system. The blanking input may be used to control lamp intensity.



SEGMENT IDENTIFICATION

NUMERICAL DESIGNATION – SEGMENTS ILLUMINATED



Input Loading Factor:
BI/RBO = 2.6
Other Inputs = 1

Output Loading Factor:
BI/RBO = 5
a thru g = 4

Total Power Dissipation =
265 mW typ/pkg

V_{CC} = Pin 16
GND = Pin 8

TRUTH TABLE

DIGIT OR FUNCTION	INPUT							OUTPUT						
	LT Pin 3	RBI Pin 5	D Pin 6	C Pin 2	B Pin 1	A Pin 7	BI/RBO Pin 4	a Pin 13	b Pin 12	c Pin 11	d Pin 10	e Pin 9	f Pin 15	g Pin 14
0	1	1	0	0	0	0	1	1	1	1	1	1	1	0
1	1	X	0	0	0	1	1	0	1	1	0	0	0	0
2	1	X	0	0	1	0	1	1	1	0	1	1	0	1
3	1	X	0	0	1	1	1	1	1	1	1	0	0	1
4	1	X	0	1	0	0	1	0	1	1	0	0	1	1
5	1	X	0	1	0	1	1	1	0	1	1	0	1	1
6	1	X	0	1	1	0	1	0	0	1	1	1	1	0
7	1	X	0	1	1	1	1	1	1	1	0	0	0	0
8	1	X	1	0	0	0	1	1	1	1	1	1	1	1
9	1	X	1	0	0	1	1	1	1	1	0	0	1	1
10	1	X	1	0	1	0	1	0	0	0	1	1	0	1
11	1	X	1	0	1	1	1	0	0	1	1	0	0	1
12	1	X	1	1	0	0	1	0	1	0	0	0	1	1
13	1	X	1	1	0	1	1	1	0	0	0	1	1	1
14	1	X	1	1	1	0	1	0	0	0	1	1	1	1
15	1	X	1	1	1	1	1	0	0	0	0	0	0	0
BI	X	X	X	X	X	X	0	0	0	0	0	0	0	0
RBI	1	0	0	0	0	0	0	0	0	0	0	0	0	0
LT	0	X	X	X	X	X	1	1	1	1	1	1	1	1

X = Don't care

*L suffix = 16-pin dual in-line ceramic package (Case 620).

P suffix = 16-pin dual in-line plastic package (Case 612).

MC5448L, MC7448L,P (continued)

ELECTRICAL CHARACTERISTICS

Test procedures are shown for only one data input and the blanking input, and for one driver output and the ripple blanking output. Test other inputs and outputs in the same manner according to the truth table. Test all input-output combinations according to the truth table.

7	A	a	13
1	B	b	12
2	C	c	11
6	D	d	10
3	LT	e	9
5	RBI	f	15
4	BI/RBO	g	14

Characteristic		Symbol	Pin Under Test	MC5448 Test Limits -55 to +125°C			MC7448 Test Limits 0 to +70°C			TEST CURRENT/VOLTAGE VALUES (All Temperatures)														
				Min	Max	Unit	Min	Max	Unit	mA														
										Volts														
				TEST CURRENT/VOLTAGE APPLIED TO PINS LISTED BELOW:																				
Input																								
Forward Current	IF	1	4	-	-1.6	mAdc	-	-	-1.6	mAdc	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leakage Current	IR1	1		-	40	μAdc	-	-	40	μAdc	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	IR2	1		-	1.0	mAdc	-	-	1.0	mAdc	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Output																								
Output Voltage	VOL	9*	4**	-	0.4	Vdc	-	-	0.4	Vdc	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				-	0.4	Vdc	-	-	0.4	Vdc	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	VOH	9*	4**	2.4	-	Vdc	2.4	-	Vdc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				2.4	-	Vdc	2.4	-	Vdc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Load Current	I _{Load}	9*		-1.3	-	mAdc	-1.3	-	mAdc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Short-Circuit Current	ISC	4		-	-4.0	mAdc	-	-	-4.0	mAdc	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Power Requirements (Total Device)																								
Power Supply Drain	IPD	16		-	76	mAdc	-	-	90	mAdc	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Switching Parameters																								
Turn-On Delay	t _{pd-1}	7,9		-	100#	ns	-	-	100#	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turn-Off Delay	t _{pd+1}	7,9		-	100#	ns	-	-	100#	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turn-On Delay	t _{pd-2}	4,5,13		-	100#	ns	-	-	100#	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turn-Off Delay	t _{pd+2}	4,5,13		-	100#	ns	-	-	100#	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-

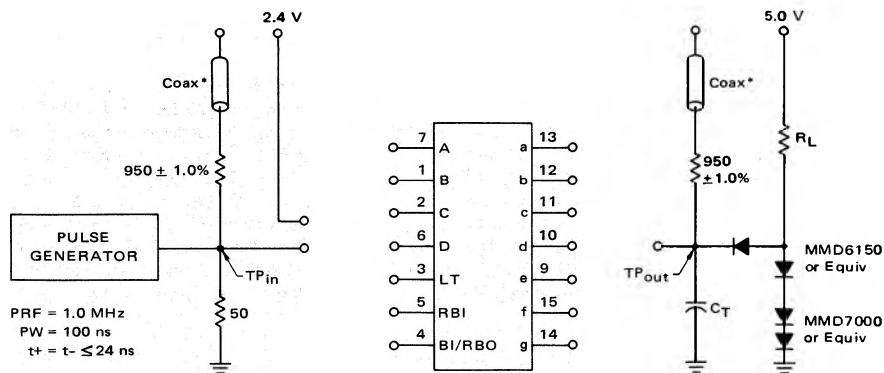
*Test procedure for outputs a thru g.

**Test procedure for BI/RBO only.

#Tested only at 25°C.

MC5448L, MC7448L,P (continued)

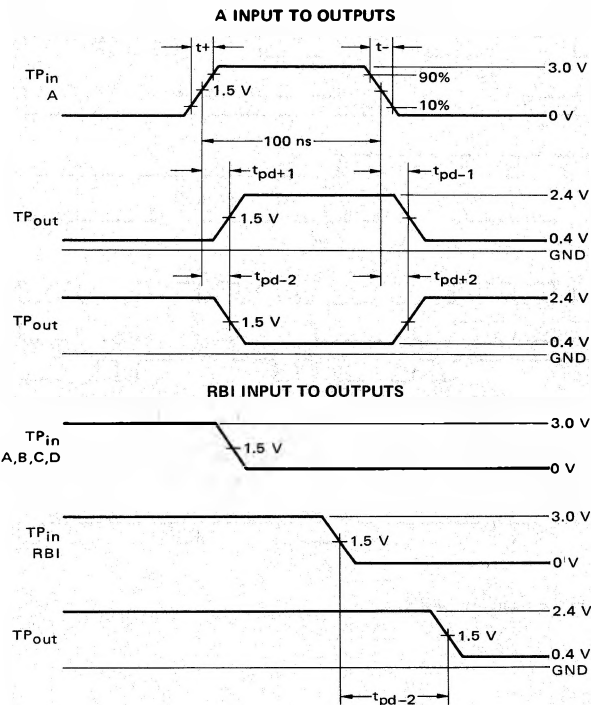
SWITCHING TIME TEST CIRCUIT AND VOLTAGE WAVEFORMS



$R_L = 1.0$ k Ω for MC5448, 667 Ω for MC7448.

$C_T = 15$ pF = total parasitic capacitance, which includes probe and wiring capacitances.

*The coax delays from input to scope and output to scope must be matched. The scope must be terminated in 50-ohm impedance. The 950-ohm resistor and the scope termination impedance constitute a 20:1 attenuator probe. Coax shall be CT-070-50 or equivalent.



OPERATING CHARACTERISTICS

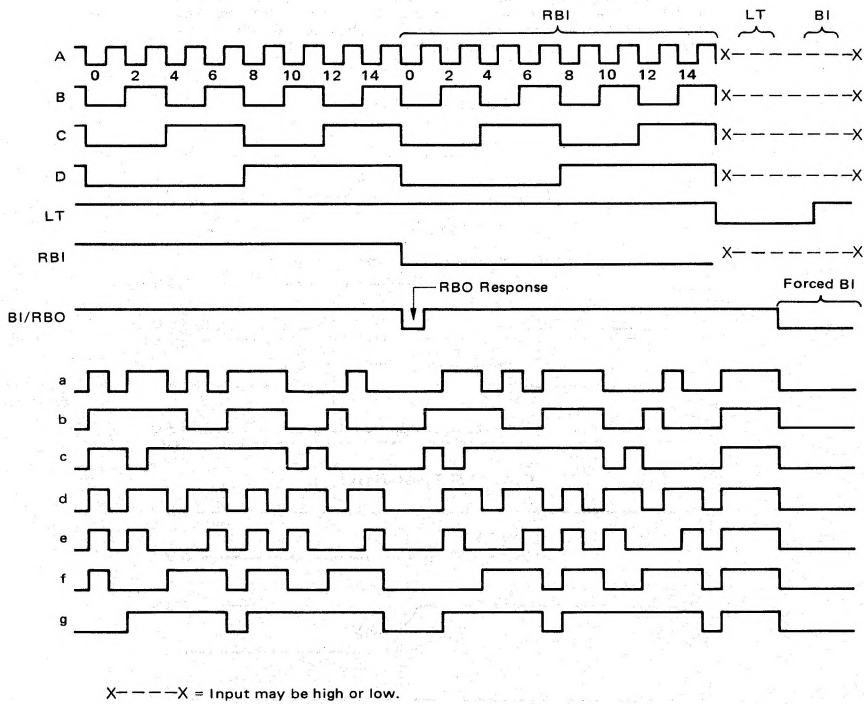
This monolithic integrated circuit provides the logic necessary to decode a BCD input and drive a seven-segment numerical indicator. It is intended for use primarily as a driver for discrete, active components or logic elements. If direct driving of display indicators is desired, the MC5446/7446 (30 volts maximum output voltage) or the MC5447/7447 (15 volts) should be used, since they are designed to handle the relatively high voltages and sink currents (20 mA) of incandescent indicators.

Pin 4 serves as both a blanking input and a ripple blank-

ing output (BI/RBO). For displaying digits 0 thru 15 the blanking input must be held at a logic "1" or open (see the truth table). For a decimal 0 output the ripple blanking input (RBI) must also be at a logic "1" or open.

When a logic "0" is applied to BI, outputs a thru g go to a logic "0" regardless of the state of any other input. With RBI at a logic "0" and A = B = C = D also at a logic "0", outputs a thru g and RBO go to a logic "0". When a logic "0" is applied to lamp-test and BI/RBO is open or held at a logic "1", outputs a thru g go to a logic "1".

INPUT/OUTPUT VOLTAGE WAVEFORMS



APPLICATIONS INFORMATION

The MC5448/7448 is useful in applications requiring higher output currents and/or voltages than is available with the MC5446/7446. The decoder/driver may be used to drive buffer transistors selected for the required output characteristics. A suitable interface circuit is shown in Figure 1, where each decoder/driver output drives two lamp segments.

If the buffer load current is known, then base current is obtained from $I_B \approx I_L/h_{FE}$. From this and the approximate MC5448/7448 output characteristics, suitable values of R_B can be determined. For a given load current,

I_{Load} , ($2I_B$ in this example) the output voltage, V_O , is given by $V_O = 2.5 - 0.139 I_{Load} = 2.22$ volts. (See the load line of Figure 2, with $I_{Load} = 2.0$ mA.) R_B is then found from:

$$R_B = \frac{V_O - V_{BE}}{I_B} = \frac{2.22 - 0.75}{10^{-3}} \approx 1.5 \text{ k}\Omega$$

Operation of the blanking controls is identical to that of the MC5446/7446 and is illustrated in a typical application on the MC5446/7446 data sheet.

FIGURE 1 – TYPICAL INTERFACE CIRCUIT

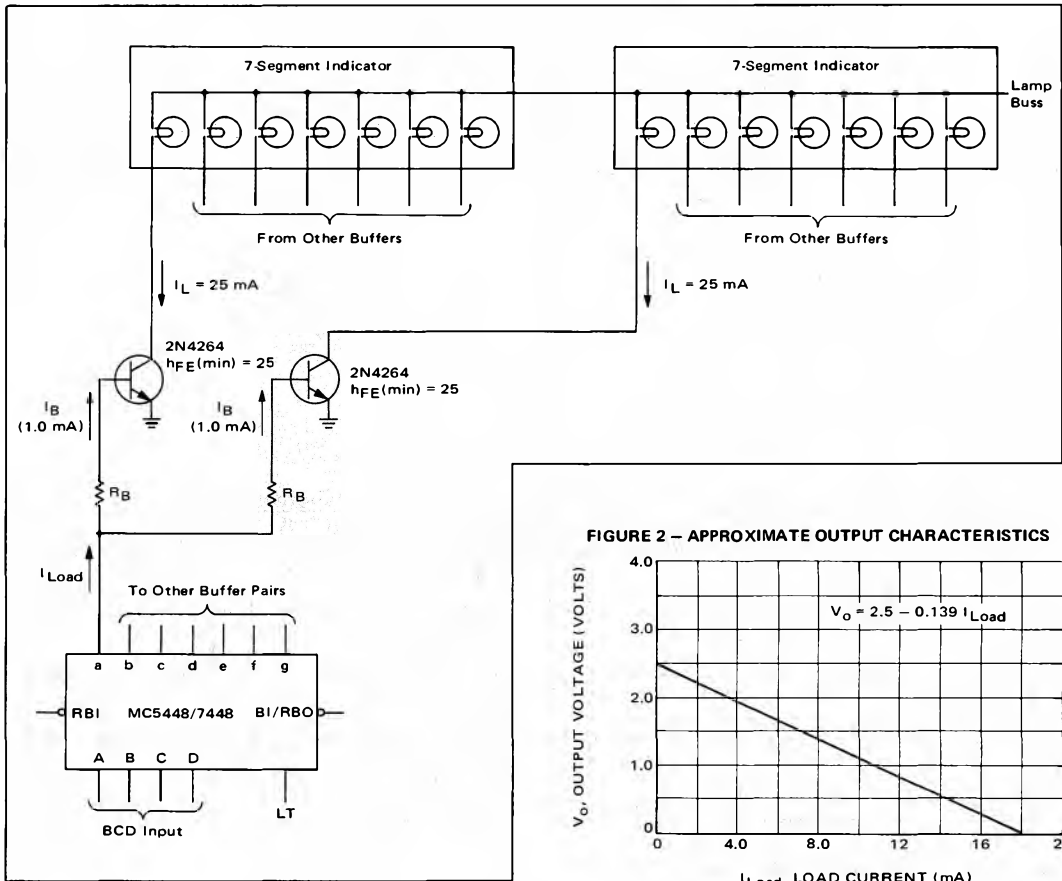


FIGURE 2 – APPROXIMATE OUTPUT CHARACTERISTICS

