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NTE7446 Integrated Circuit TTL – BCD-to-Seven-Segment Decoder/Driver with Open Collector Outputs

Description:

The NTE7446 is a BCD-to-Seven-Segment Decoder/Driver in a 16-Lead plastic DIP type package that features active-low outputs designed for driving common-anode VLEDs or incandescent indicators directly. This device has full ripple-blanking input/output controls and a lamp test input. Display patterns for BCD input count above 9 are unique symbols to authenticate input conditions.

The NTE7446 incorporates automatic leading and/or trailing-edge zero-blanking control (\overline{RBI} and \overline{RBO}). Lamp test (\overline{LT}) may be performed at any time when the $\overline{BI/RBO}$ node is set at a high level. This device also contains an overriding blanking input (\overline{BI}) which can be used to control the lamp intensity by pulsing or to inhibit the outputs. Inputs and outputs are entirely compatible for use with TTL logic outputs.

Features:

- Open-Collector Outputs Drive Indicators Directly
- Lamp Test Provision
- Leading/Trailing Zero Suppression

Absolute Maximum Ratings: (Note 1)

Supply Voltage, V_{CC}	7V
Input Voltage	5.5V
Current Forced Into Any Output in the Off-State	1mA
Operating Temperature Range, T_A	0°C to +70°C
Storage Temperature Range, T_{stg}	-65°C to +150°C

Note 1. Unless otherwise specified, all voltages are referenced to GND.

Recommended Operating Conditions:

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	4.75	5.0	5.25	V
Off-State Output Voltage (a through g)	$V_{O(off)}$	-	-	30	V
On-State Output Current (a through g)	$I_{O(on)}$	-	-	40	mA
High-Level Output Current ($\overline{BI/RBO}$)	I_{OH}	-	-	-200	μA
Low-Level Output Current ($\overline{BI/RBO}$)	I_{OL}	-	-	8	mA
Operating Temperature Range	T_A	0	-	+70	°C

Electrical Characteristics: (Note 2, Note 3)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
High-Level Input Voltage	V_{IH}		2	-	-	V	
Low-Level Input Voltage	V_{IL}		-	-	0.8	V	
Input Clamp Voltage	V_{IK}	$V_{CC} = \text{MIN}, I_I = -18\text{mA}$	-	-	-1.5	V	
High Level Output Voltage BI/RBO	V_{OH}	$V_{CC} = \text{MIN}, V_{IH} = 2\text{V}, V_{IL} = \text{MAX}, I_{OH} = -50\mu\text{A}$	2.4	4.2	-	V	
Low Level Output Voltage BI/RBO	V_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2\text{V}, V_{IL} = \text{MAX}$	$I_{OL} = 1.6\text{mA}$	-	0.25	0.4	V
			$I_{OL} = 3.2\text{mA}$	-	0.35	0.5	V
Off-State Output Current a through g	$I_{O(\text{off})}$	$V_{CC} = \text{MAX}, V_{IH} = 2\text{V}, V_{IL} = \text{MAX}, V_{O(\text{off})} = 15\text{V}$	-		250	μA	
On-State Output Voltage a through g	$V_{O(\text{on})}$	$V_{CC} = \text{MIN}, V_{IH} = 2\text{V}, V_{IL} = \text{MAX}$	$I_{O(\text{on})} = 12\text{mA}$	-	0.25	0.4	V
			$I_{O(\text{on})} = 24\text{mA}$	-	0.35	0.5	V
Input Current	I_I	$V_{CC} = \text{MAX}, V_I = 7\text{V}$	-	-	0.1	mA	
High Level Input Current	I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.7\text{V}$	-	-	20	μA	
Low Level Input Current Any Input except BI/RBO	I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.4\text{V}$		-	-	-0.4	mA
			$\overline{\text{BI/RBO}}$	-	-	-1.2	mA
Short-Circuit Output Current BI/RBO	I_{OS}	$V_{CC} = \text{MAX}$	-0.3	-	-2	mA	
Supply Current	I_{CC}	$V_{CC} = \text{MAX}, \text{Note 4}$	-	7	13	mA	

Note 2. For conditions shown as MIN or MAX, use the appropriate value specified under "Recommended Operation Conditions".

Note 3. All typical values are at $V_{CC} = 5\text{V}, T_A = +25^\circ\text{C}$.

Note 4. I_{CC} is measured with all outputs open and all inputs at 4.5V.

Switching Characteristics: ($V_{CC} = 5\text{V}, T_A = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Turn-Off Time from A Input	t_{off}	$R_L = 665\Omega, C_L = 15\text{pF}$	-	-	100	ns
Turn-On Time from A Input	t_{on}		-	-	100	ns
Turn-Off Time from $\overline{\text{RB}}\overline{\text{I}}$ Input	t_{off}		-	-	100	ns
Turn-On Time from $\overline{\text{RB}}\overline{\text{I}}$ Input	t_{on}		-	-	100	ns

Function Table:

Decimal or Function	Inputs						BI/RBO (NOTE)	Outputs							Notes
	LT	RBI	D	C	B	A		a	b	c	d	e	f	g	
0	H	H	L	L	L	L	H	ON	ON	ON	ON	ON	ON	OFF	1
1	H	X	L	L	L	H	H	OFF	ON	ON	OFF	OFF	OFF	OFF	
2	H	X	L	L	H	L	H	ON	ON	OFF	ON	ON	OFF	ON	
3	H	X	L	L	H	H	H	ON	ON	ON	ON	OFF	OFF	ON	
4	H	X	L	H	L	L	H	OFF	ON	ON	OFF	OFF	ON	ON	
5	H	X	L	H	L	H	H	ON	OFF	ON	ON	OFF	ON	ON	
6	H	X	L	H	H	L	H	OFF	OFF	ON	ON	ON	ON	ON	
7	H	X	L	H	H	H	H	ON	ON	ON	OFF	OFF	OFF	OFF	
8	H	X	H	L	L	L	H	ON	ON	ON	ON	ON	ON	ON	
9	H	X	H	L	L	H	H	ON	ON	ON	OFF	OFF	ON	ON	
10	H	X	H	L	H	L	H	OFF	OFF	OFF	ON	ON	OFF	ON	
11	H	X	H	L	H	H	H	OFF	OFF	ON	ON	OFF	OFF	ON	
12	H	X	H	H	L	L	H	OFF	ON	OFF	OFF	OFF	ON	ON	
13	H	X	H	H	L	H	H	ON	OFF	OFF	ON	OFF	ON	ON	
14	H	X	H	H	H	L	H	OFF	OFF	OFF	ON	ON	ON	ON	
15	H	X	H	H	H	H	H	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
BI	X	X	X	X	X	X	L	OFF	OFF	OFF	OFF	OFF	OFF	OFF	2
RBI	H	L	L	L	L	L	L	OFF	OFF	OFF	OFF	OFF	OFF	OFF	3
LT	L	X	X	X	X	X	H	ON	ON	ON	ON	ON	ON	ON	4

H = HIGH Level
L = LOW Level
X = Irrelevant

NOTE: $\overline{\text{BI}}/\overline{\text{RBO}}$ is wire-AND logic serving as blanking input ($\overline{\text{BI}}$) and/or ripple-blanking output ($\overline{\text{RBO}}$).

- Note 1. The blanking input ($\overline{\text{BI}}$) must be open or held at a high logic level when output functions 0 through 15 are desired. The ripple-blanking input ($\overline{\text{RBI}}$) must be open or high if blanking of a decimal zero is not desired.
- Note 2. When a low logic level is applied directly to the blanking input ($\overline{\text{BI}}$), all segment outputs are off regardless of the level of any other input.
- Note 3. When ripple-blanking input ($\overline{\text{RBI}}$) and inputs A, B, C, and D are at a low level with the lamp test input high, all segment outputs go off and the ripple-blanking output ($\overline{\text{RBO}}$) goes to a low level (response condition).
- Note 4. When the blanking input/ripple blanking output ($\overline{\text{BI}}/\overline{\text{RBO}}$) is open or held high and a low is applied to the lamp-test input, all segment outputs are on.

Pin Connection Diagram

