

DATA SHEET

For a complete data sheet, please also download:

- The IC04 LOCMOS HE4000B Logic Family Specifications HEF, HEC
- The IC04 LOCMOS HE4000B Logic Package Outlines/Information HEF, HEC

HEF4511B **MSI** BCD to 7-segment latch/decoder/driver

Product specification
File under Integrated Circuits, IC04

January 1995

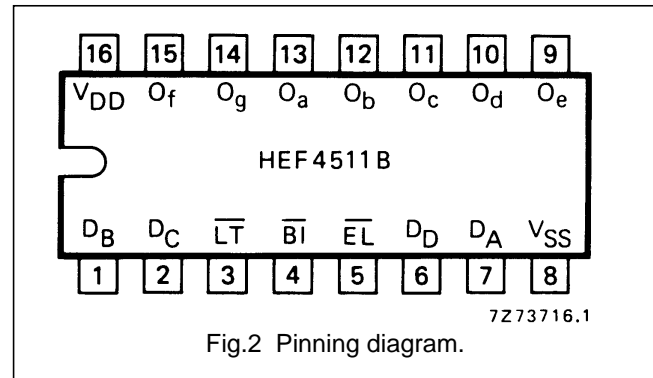
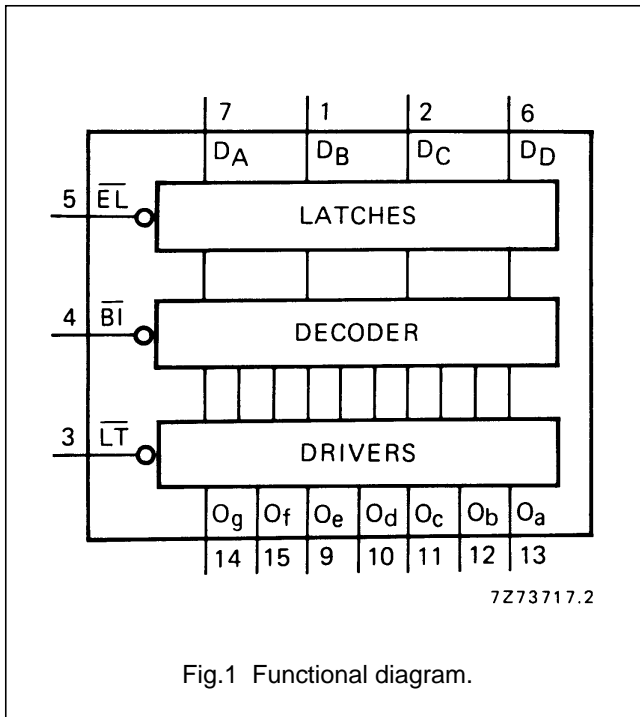
BCD to 7-segment latch/decoder/driver

**HEF4511B
MSI**

DESCRIPTION

The HEF4511B is a BCD to 7-segment latch/decoder/driver with four address inputs (D_A to D_D), an active LOW latch enable input (\overline{EL}), an active LOW ripple blanking input (\overline{BI}), an active LOW lamp test input (\overline{LT}), and seven active HIGH n-p-n bipolar transistor segment outputs (O_a to O_g).

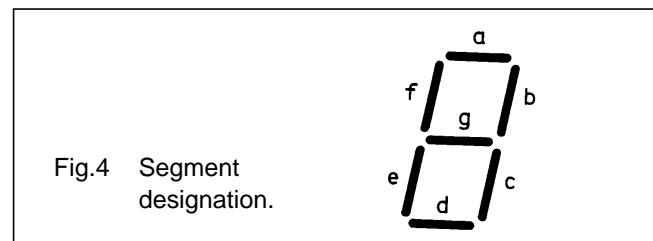
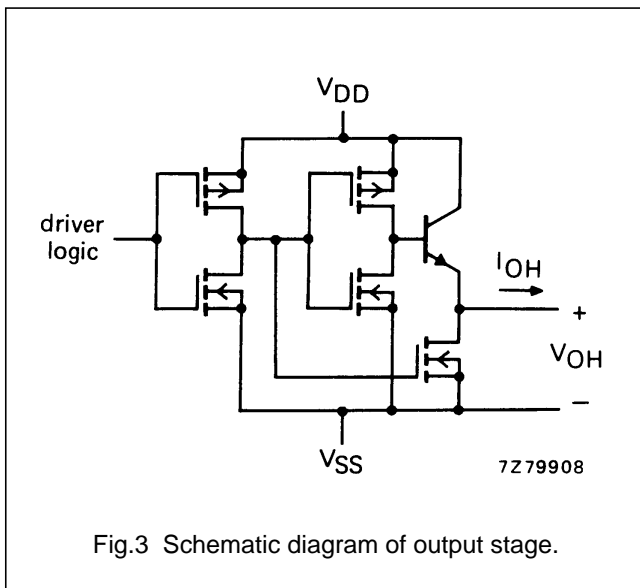
When \overline{EL} is LOW, the state of the segment outputs (O_a to O_g) is determined by the data on D_A to D_D . When \overline{EL} goes HIGH, the last data present on D_A to D_D are stored in the latches and the segment outputs remain stable. When \overline{LT} is LOW, all the segment outputs are HIGH independent of all other input conditions. With \overline{LT} HIGH, a LOW on \overline{BI} forces all segment outputs LOW. The inputs \overline{LT} and \overline{BI} do not affect the latch circuit.



- HEF4511BP(N): 16-lead DIL; plastic (SOT38-1)
- HEF4511BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)
- HEF4511BT(D): 16-lead SO; plastic (SOT109-1)
- (): Package Designator North America

PINNING

- D_A to D_D address (data) inputs
- \overline{EL} latch enable input (active LOW)
- \overline{BI} ripple blanking input (active LOW)
- \overline{LT} lamp test input (active LOW)
- O_a to O_g segment outputs



FAMILY DATA, I_{DD} LIMITS category MSI

See Family Specifications

BCD to 7-segment latch/decoder/driver

HEF4511B
MSI

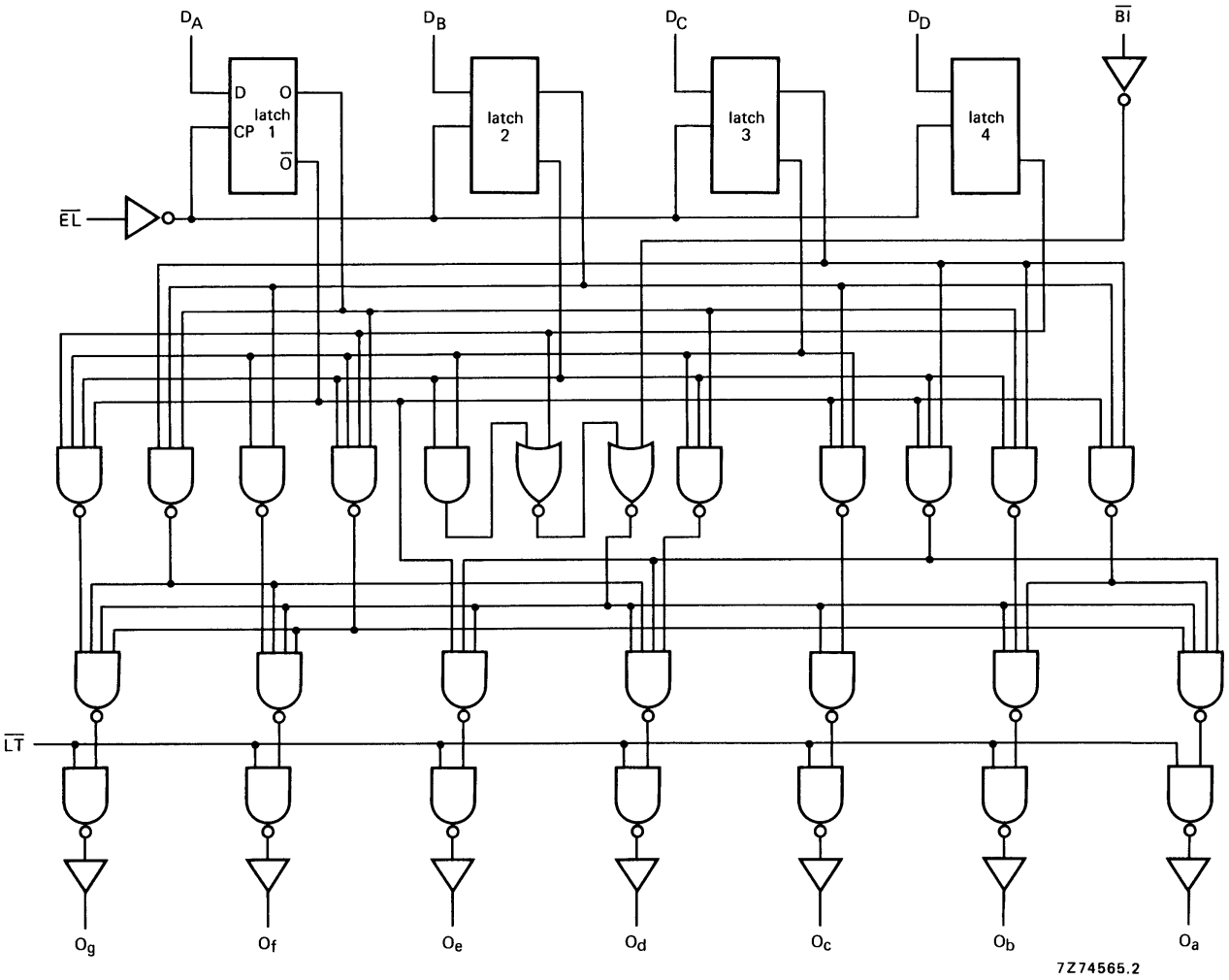


Fig.5 Logic diagram; for one latch see Fig.6.

BCD to 7-segment latch/decoder/driver

HEF4511B
MSI

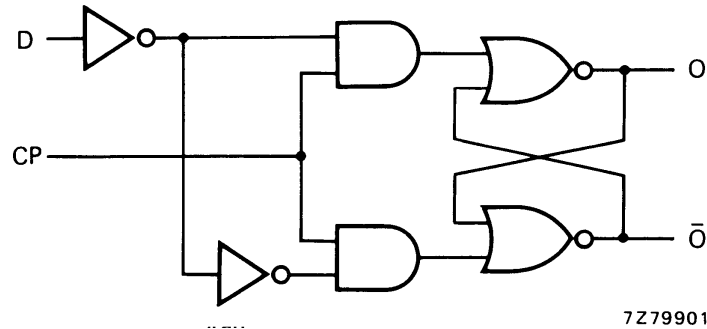


Fig.6 Logic diagram (one latch); see also Fig.5.

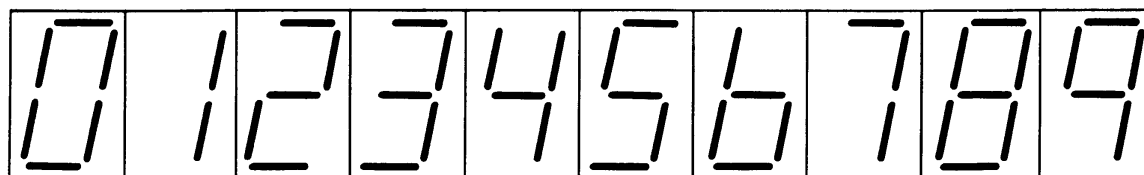
FUNCTION TABLE

INPUTS							OUTPUTS							
\overline{EL}	\overline{BI}	\overline{LT}	D_D	D_C	D_B	D_A	O_a	O_b	O_c	O_d	O_e	O_f	O_g	DISPLAY
X	X	L	X	X	X	X	H	H	H	H	H	H	H	8
X	L	H	X	X	X	X	L	L	L	L	L	L	L	blank
L	H	H	L	L	L	L	H	H	H	H	H	H	L	0
L	H	H	L	L	L	H	L	H	H	L	L	L	L	1
L	H	H	L	L	H	L	H	H	L	H	H	L	H	2
L	H	H	L	L	H	H	H	H	H	H	L	L	H	3
L	H	H	L	H	L	L	L	H	H	L	L	H	H	4
L	H	H	L	H	L	H	H	L	H	H	L	H	H	5
L	H	H	L	H	H	L	L	L	H	H	H	H	H	6
L	H	H	L	H	H	H	H	H	H	L	L	L	L	7
L	H	H	H	L	L	L	H	H	H	H	H	H	H	8
L	H	H	H	L	L	H	H	H	H	L	L	H	H	9
L	H	H	H	L	H	L	L	L	L	L	L	L	L	blank
L	H	H	H	L	H	H	L	L	L	L	L	L	L	blank
L	H	H	H	H	L	L	L	L	L	L	L	L	L	blank
L	H	H	H	H	H	L	L	L	L	L	L	L	L	blank
L	H	H	H	H	H	H	L	L	L	L	L	L	L	blank
H	H	H	X	X	X	X				*				*

Note

- H = HIGH state (the more positive voltage)
L = LOW state (the less positive voltage)
X = state is immaterial
* Depends upon the BCD code applied during the LOW to HIGH transition of \overline{EL} .

BCD to 7-segment latch/decoder/driver

HEF4511B
MSI

7272856

Fig.7 Display.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134).

Output (source) current HIGH $-I_{OH}$ max. 25 mA

For other RATINGS see Family Specifications.

Note

1. A destructive high current mode may occur if V_I and V_O are not constrained to the range $V_{SS} \leq V_I$ or $V_O \leq V_{DD}$.

BCD to 7-segment latch/decoder/driver

HEF4511B
MSI

DC CHARACTERISTICS

 $V_{SS} = 0\text{ V}$

HEF	V_{DD} V	I_{OH} mA	SYMBOL	T_{amb} (°C)					
				-40		+ 25		+ 85	
				MIN.	MAX.	MIN.	TYP.	MIN.	MAX.
Output voltage HIGH	5	0	V_{OH}	4,10		4,10	4,40	4,10	V
	10	0		9,10		9,10	9,40	9,10	V
	15	0		14,10		14,10	14,40	14,10	V
Output voltage HIGH	5	5	V_{OH}				4,20		V
	10	5					9,20		V
	15	5					14,20		V
Output voltage HIGH	5	10	V_{OH}	3,60		3,60	4,05	3,30	V
	10	10		8,75		8,75	9,10	8,45	V
	15	10		13,75		13,75	14,10	13,45	V
Output voltage HIGH	5	15	V_{OH}				4,00		V
	10	15					9,00		V
	15	15					14,00		V
Output voltage HIGH	5	20	V_{OH}	2,80		2,80	3,80	2,50	V
	10	20		8,10		8,10	9,00	7,80	V
	15	20		13,10		13,10	14,00	12,80	V
Output voltage HIGH	5	25	V_{OH}				3,70		V
	10	25					8,90		V
	15	25					14,00		V

BCD to 7-segment latch/decoder/driver

HEF4511B
MSI

HEC	V _{DD} V	I _{OH} mA	SYMBOL	T _{amb} (°C)					
				-55		+ 25		+ 125	
				MIN.	MAX.	MIN.	TYP.	MIN.	MAX.
Output voltage HIGH	5	0	V _{OH}	4,10		4,10	4,40	4,10	V
	10	0		9,10		9,10	9,90	9,10	V
	15	0		14,10		14,10	14,40	14,40	V
Output voltage HIGH	5	5	V _{OH}				4,30		V
	10	5					9,30		V
	15	5					14,30		V
Output voltage HIGH	5	10	V _{OH}	3,60		3,60	4,25	3,20	V
	10	10		8,75		8,75	9,25	8,35	V
	15	10		13,75		13,75	14,25	13,35	V
Output voltage HIGH	5	15	V _{OH}				4,20		V
	10	15					9,20		V
	15	15					14,20		V
Output voltage HIGH	5	20	V _{OH}	2,80		2,80	4,20	2,30	V
	10	20		8,10		8,10	9,20	7,60	V
	15	20		13,10		13,10	14,20	12,60	V
Output voltage HIGH	5	25	V _{OH}				4,15		V
	10	25					9,20		V
	15	25					14,20		V

AC CHARACTERISTICS

V_{SS} = 0 V; T_{amb} = 25 °C; input transition times ≤ 20 ns

	V _{DD} V	TYPICAL FORMULA FOR P (μW)	
Dynamic power dissipation per package (P)	5 10 15	1 000 f _i + ∑ (f _o C _L) × V _{DD} ² 4 000 f _i + ∑ (f _o C _L) × V _{DD} ² 10 000 f _i + ∑ (f _o C _L) × V _{DD} ²	where f _i = input freq. (MHz) f _o = output freq. (MHz) C _L = load capacitance (pF) ∑ (f _o C _L) = sum of outputs V _{DD} = supply voltage (V)

BCD to 7-segment latch/decoder/driver

HEF4511B
MSI

AC CHARACTERISTICS

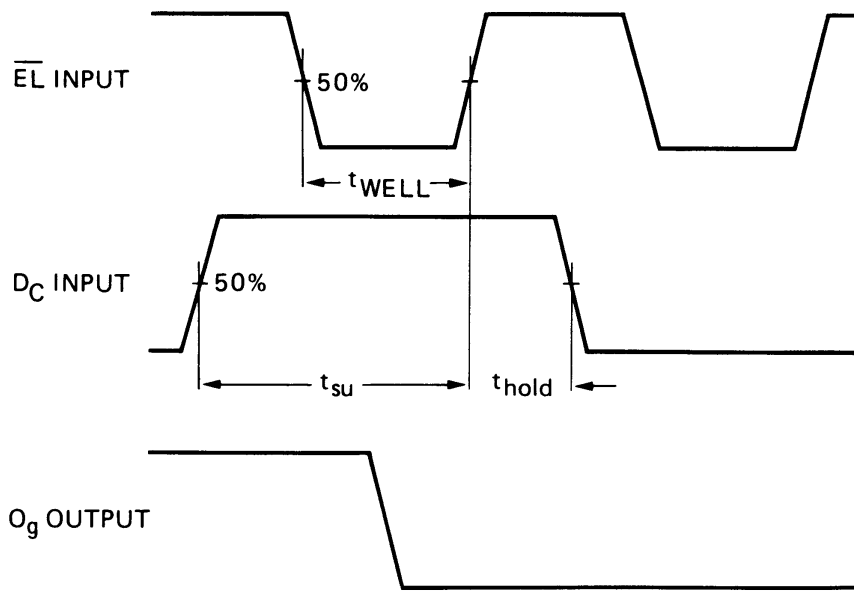
 $V_{SS} = 0\text{ V}$; $T_{amb} = 25\text{ °C}$; $C_L = 50\text{ pF}$; input transition times $\leq 20\text{ ns}$

	V_{DD} V	SYMBOL	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA												
Propagation delays	5	t_{PHL}		155	310	ns	128 ns + (0,55 ns/pF) C_L											
								HIGH to LOW	10	60	120	ns	49 ns + (0,23 ns/pF) C_L					
														15	40	80	ns	32 ns + (0,16 ns/pF) C_L
	5			t_{PLH}		135	270											
								LOW to HIGH	10	55	110	ns	44 ns + (0,23 ns/pF) C_L					
														15	40	80	ns	32 ns + (0,16 ns/pF) C_L
	5			t_{PHL}		160	320											
								$\overline{EL} \rightarrow O_n$	HIGH to LOW	10	60	120	ns					
														15	45	90	ns	37 ns + (0,16 ns/pF) C_L
	5	t_{PLH}				160	320											
								LOW to HIGH	10	70	140	ns	59 ns + (0,23 ns/pF) C_L					
														15	50	100	ns	42 ns + (0,16 ns/pF) C_L
	5	t_{PHL}				120	240											
								$\overline{BI} \rightarrow O_n$	HIGH to LOW	10	50	100	ns					
														15	35	70	ns	27 ns + (0,16 ns/pF) C_L
	5			t_{PLH}		105	210											
								$\overline{BI} \rightarrow O_n$	LOW to HIGH	10	40	80	ns					
														15	30	60	ns	22 ns + (0,16 ns/pF) C_L
	5					t_{PHL}												
								$\overline{LT} \rightarrow O_n$	HIGH to LOW	10	30	60	ns					
														15	20	40	ns	12 ns + (0,16 ns/pF) C_L
	5	t_{PLH}																
								LOW to HIGH	10	30	60	ns	19 ns + (0,23 ns/pF) C_L					
														15	25	50	ns	17 ns + (0,16 ns/pF) C_L
5	t_{THL}				60													
								Output transition times	HIGH to LOW	10	30	60	ns					
														15	20	40	ns	6 ns + (0,28 ns/pF) C_L
5					t_{TLH}		25											
								LOW to HIGH	10	16	32	ns	13 ns + (0,06 ns/pF) C_L					
														15	13	26	ns	10 ns + (0,06 ns/pF) C_L

BCD to 7-segment latch/decoder/driver

HEF4511B
MSI

	V _{DD} V	SYMBOL	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA
Minimum \overline{EL} pulse width; LOW	5	t_{WELL}	80	40	ns	see also waveforms Fig.8
	10		40	20	ns	
	15		35	17	ns	
Set-up time $D_n \rightarrow \overline{EL}$	5	t_{su}	50	25	ns	
	10		25	12	ns	
	15		20	9	ns	
Hold-time $D_n \rightarrow \overline{EL}$	5	t_{hold}	60	30	ns	
	10		30	15	ns	
	15		25	12	ns	



Conditions:
 $D_D = \text{LOW}$
 $D_A = D_B = \overline{B}_1 = \overline{LT} = \text{HIGH}$

Fig.8 Waveforms showing minimum \overline{EL} pulse width, set-up and hold time for D_C to \overline{EL} .

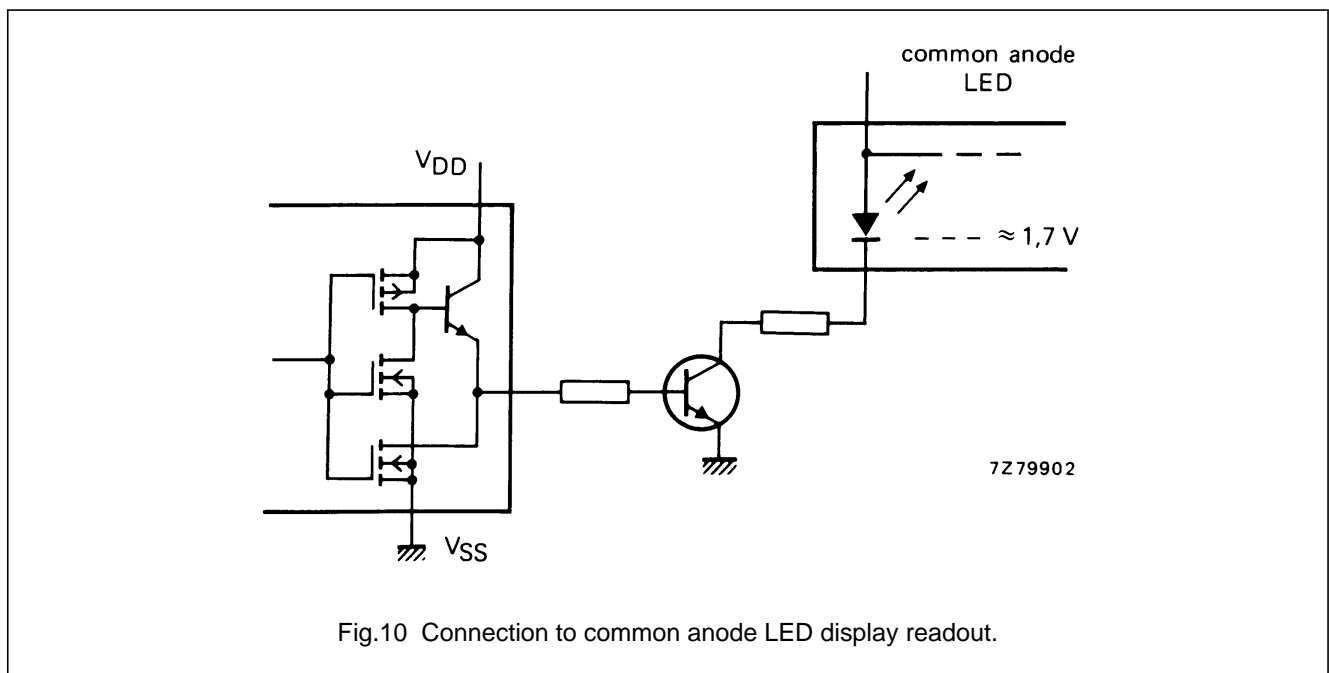
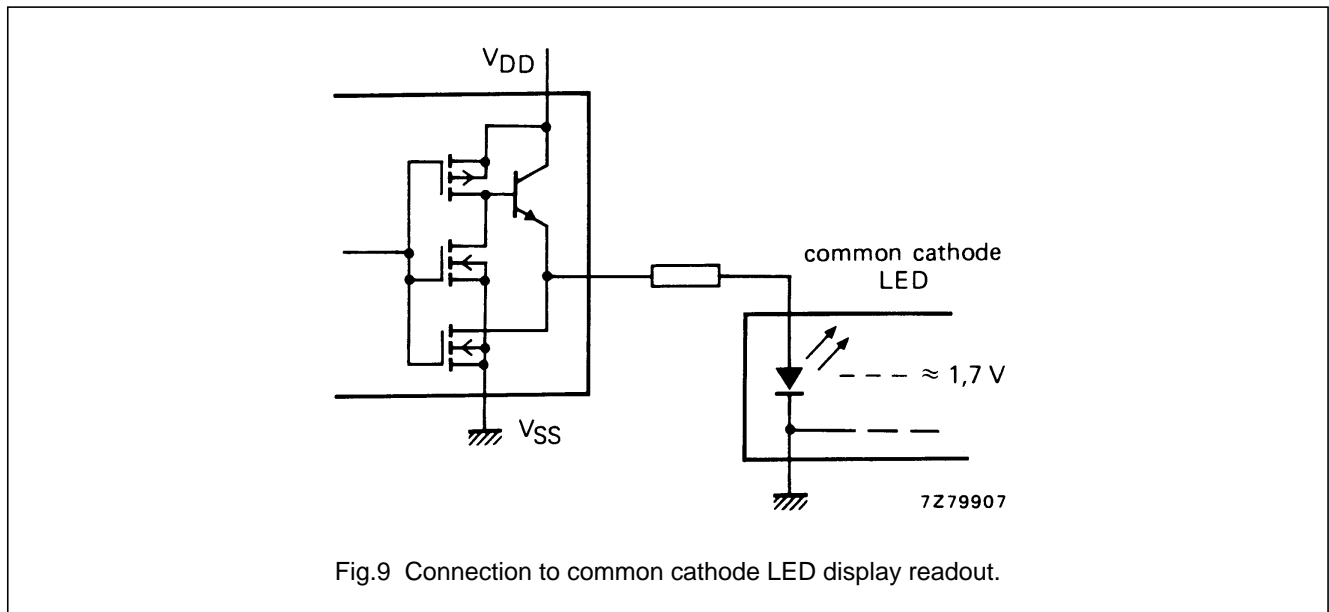
BCD to 7-segment latch/decoder/driver

HEF4511B
MSI

APPLICATION INFORMATION

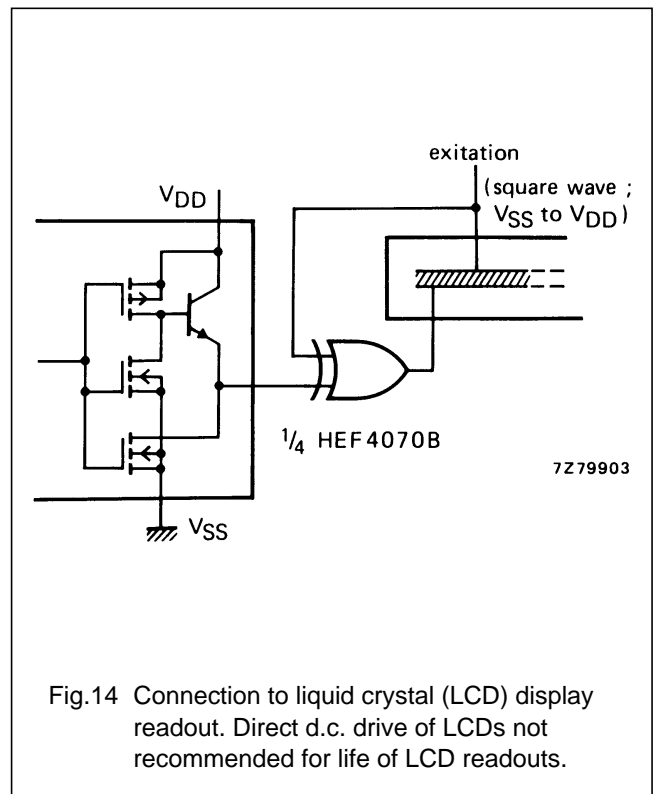
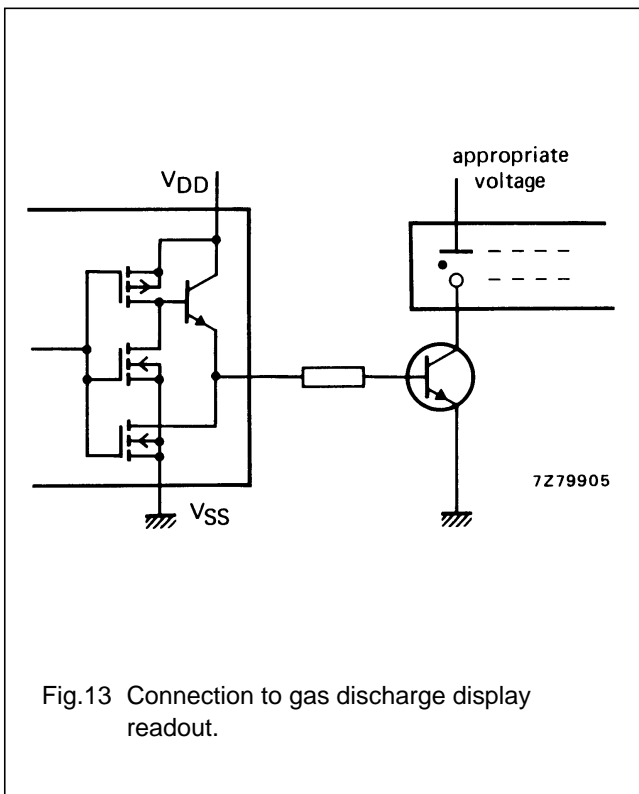
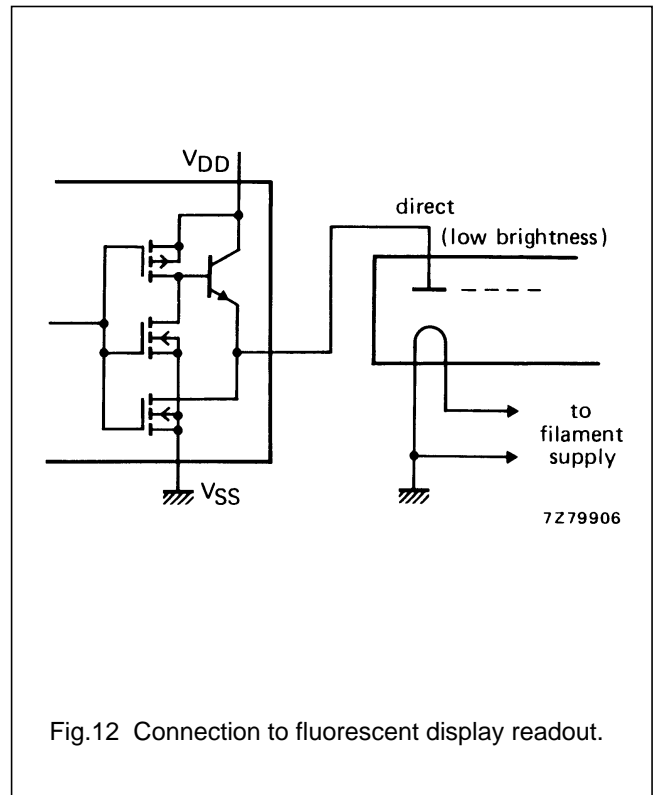
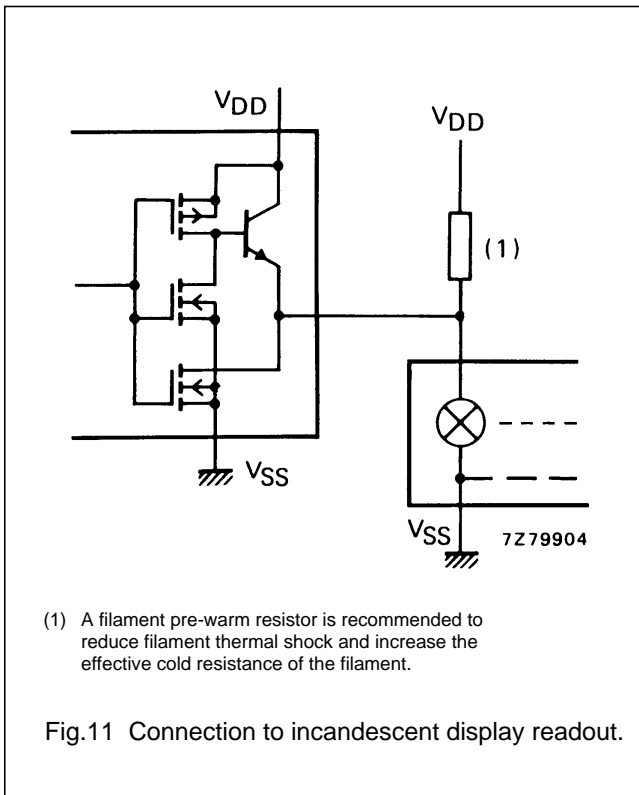
Some examples of applications for the HEF4511B are:

- Driving LED displays.
- Driving incandescent displays.
- Driving fluorescent displays.
- Driving LCD displays.
- Driving gas discharge displays.



BCD to 7-segment latch/decoder/driver

HEF4511B
MSI





LittleDiode supplies new, hard to find or obsolete electronic components and semiconductors all over the world.

With over two million different components listed you are sure to find the part you need.

Feel free to visit us today at our online store:

LittleDiode.com

Looking forward to providing you with the best possible service.