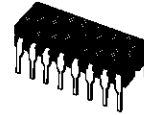




## BCD-TO-SEVEN SEGMENT LATCH/DECODER/DRIVER

- HIGH-OUTPUT-SOURCING CAPABILITY (up to 25 mA)
- INPUT LATCHES FOR BCD CODE STORAGE
- LAMP TEST AND BLANKING CAPABILITY
- 7-SEGMENT OUTPUTS BLANKED FOR BCD INPUT CODES > 1001
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- 5V, 10V, AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100mA AT 18V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N° 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"



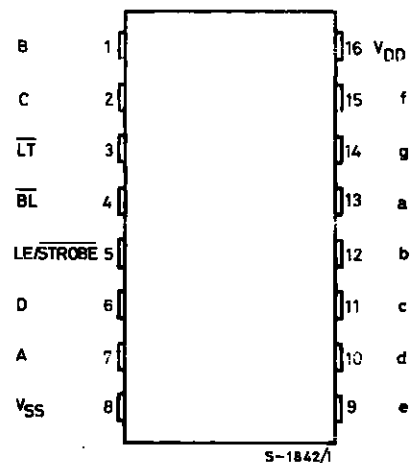
## DESCRIPTION

The **HCC 4511B** (extended temperature range) and the **HCF 4511B** (intermediate temperature range) are monolithic integrated circuits available in 16-lead dual in-line plastic or ceramic package and plastic micro package.

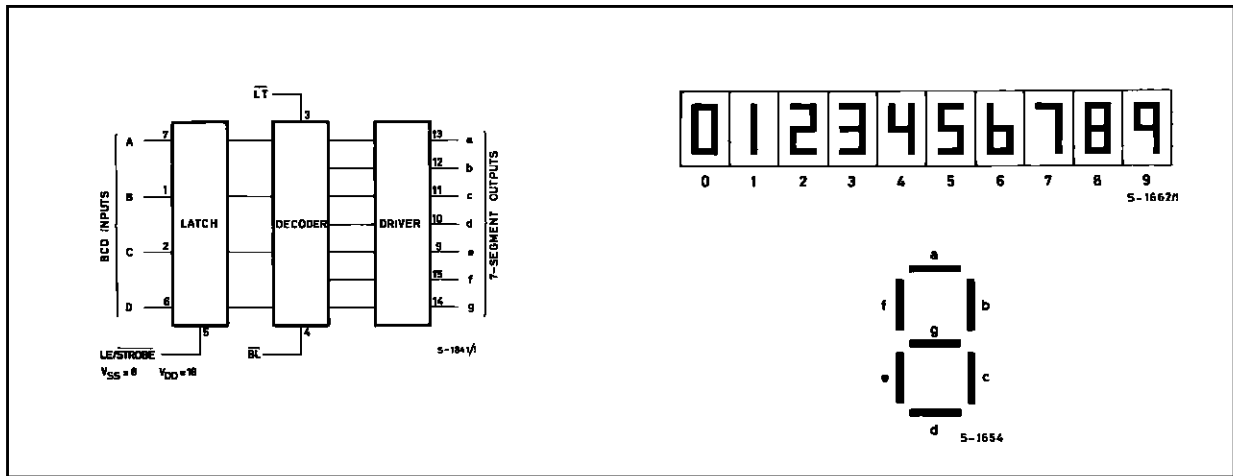
The **HCC/HCF 4511B** types are BCD-to-7-segment latch decoder drivers constructed with COS/MOS logic and n-p-n bipolar transistor output devices on a single monolithic structure. These devices combine the low quiescent power dissipation and high noise immunity features of COS/MOS with n-p-n bipolar output transistors capable of sourcing up to 25 mA. This capability allows the **HCC/HCF 4511B** types to drive LED's and other displays directly.

Lamp Test ( $\overline{LT}$ ), Blanking ( $\overline{BL}$ ), and Latch Enable or Strobe inputs are provided to test the display, shut off or intensity-modulate it, and store or strobe a BCD code, respectively. Several different signal may be multiplexed and displayed when external multiplexing circuitry is used.

## PIN CONNECTIONS



FUNCTIONAL DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{DD}^*$	Supply Voltage :	- 0.5 to + 20	V
$V_i$	Input Voltage	- 0.5 to $V_{DD} + 0.5$	V
$I_I$	DC Input Current (any one input)	$\pm 10$	mA
$P_{tot}$	Total Power Dissipation (per package)	200	mW
	Dissipation per Output Transistor for $T_{op} =$ Full Package-temperature Range	100	mW
$T_{op}$	Operating Temperature :	- 55 to + 125	$^{\circ}C$
$T_{stg}$	Storage Temperature	- 65 to + 150	$^{\circ}C$

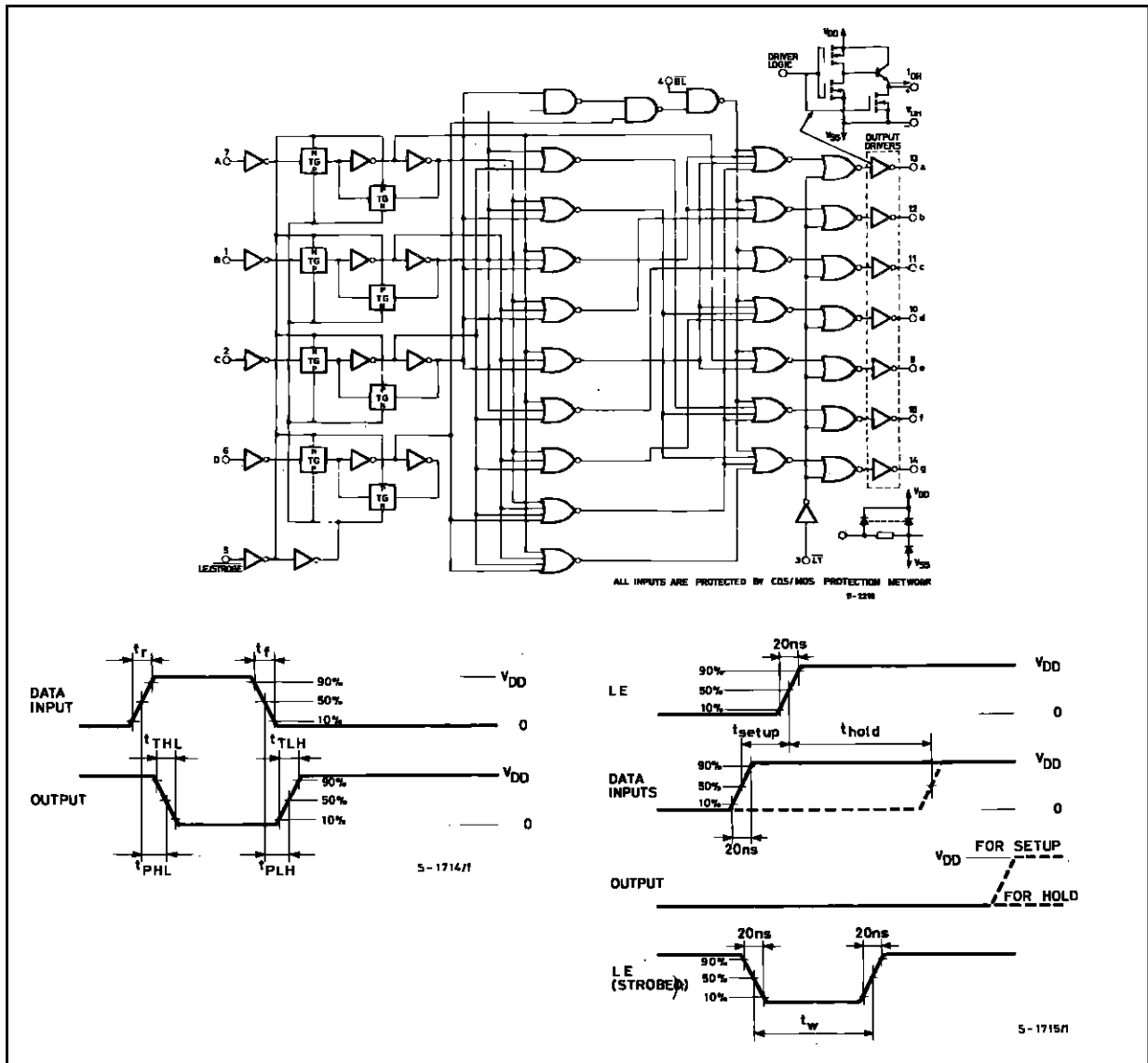
Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for external periods may affect device reliability.

\* All voltage values are referred to  $V_{SS}$  pin voltage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply Voltage :	3 to 18	V
$V_I$	Input Voltage	0 to $V_{DD}$	V
$T_{op}$	Operating Temperature :	- 55 to + 125	$^{\circ}C$

LOGIC DIAGRAMS



**TRUTH TABLE**

LE	$\overline{BI}$	$\overline{LT}$	D	C	B	A	a	b	c	d	e	f	g	Display
X	X	0	X	X	X	X	1	1	1	1	1	1	1	8
X	0	1	X	X	X	X	0	0	0	0	0	0	0	Blank
0	1	1	0	0	0	0	1	1	1	1	1	1	0	0
0	1	1	0	0	0	1	0	1	1	0	0	0	0	1
0	1	1	0	0	1	0	1	1	0	1	1	0	1	2
0	1	1	0	0	1	1	1	1	1	1	0	0	1	3
0	1	1	0	1	0	0	0	1	1	0	0	1	1	4
0	1	1	0	1	0	1	1	0	1	1	0	1	1	5
0	1	1	0	1	1	0	0	0	1	1	1	1	1	6
0	1	1	0	1	1	1	1	1	1	0	0	0	0	7
0	1	1	1	0	0	0	1	1	1	1	1	1	1	8
0	1	1	1	0	0	1	1	1	1	0	0	1	1	9
0	1	1	1	0	1	0	0	0	0	0	0	0	0	Blank
0	1	1	1	0	1	1	0	0	0	0	0	0	0	Blank
0	1	1	1	1	0	0	0	0	0	0	0	0	0	Blank
0	1	1	1	1	0	1	0	0	0	0	0	0	0	Blank
0	1	1	1	1	1	0	0	0	0	0	0	0	0	Blank
0	1	1	1	1	1	1	0	0	0	0	0	0	0	Blank
1	1	1	X	X	X	X				*				*

**STATIC ELECTRICAL CHARACTERISTICS** (over recommended operating conditions)

Symbol	Parameter	Test Conditions				Value						Unit		
		V <sub>I</sub> (V)	V <sub>O</sub> (V)	I <sub>O</sub>   ( $\mu$ A)	V <sub>DD</sub> (V)	T <sub>Low</sub> *		25°C			T <sub>High</sub> *			
						Min.	Max.	Min.	Typ.	Max.	Min.		Max.	
I <sub>L</sub>	Quiescent Current	0/ 5			5		5		0.04	5		150	$\mu$ A	
		0/10			10		10		0.04	10		300		
		0/15			15		20		0.04	20		600		
		0/20			20		100		0.08	100		3000		
V <sub>OH</sub>	Output High Voltage	0/ 5			5	4		4.1	4.55		4.2		V	
		0/10			10	9		9.1	9.55		9.2			
		0/15			15	14		14.1	14.55		14.2			
V <sub>OL</sub>	Output Low Voltage	5/0			5		0.05			0.05		0.05	V	
		10/0			10		0.05			0.05		0.05		
		15/0			15		0.05			0.05		0.05		
V <sub>IH</sub>	Input High Voltage		0.5/3.8		5	3.5		3.5			3.5		V	
			1/8.8		10	7		7			7			
			1.5/13.8		15	11		11			11			
V <sub>IL</sub>	Input Low Voltage		3.8/0.5		5		1.5			1.5		1.5	V	
			8.8/1		10		3			3		3		
			13.8/1.5		15		4			4		4		
V <sub>OH</sub>					5	0	4.1		4.10	4.55		4.20	V	
						5				4.25				
						10	3.80		3.90	4.10		3.90		
						15				3.95				
						20	3.55		3.40	3.75				
						25	3.40		3.10	3.55				
					10	0	9		9.10	9.55		9.20		
						5				9.25				
						10	8.85		9	9.15				
						15				9.05				
						20	8.70		8.60	8.90		8.40		
					15	0	14		14.10	14.55		14.20		
						5				14.30				
						10	13.90		14	14.20		14		
						15				14.10				
20	13.75		13.70	13.95			13.50							
25	13.65		13.50	13.80		13.10								

STATIC ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Conditions				Value						Unit		
		V <sub>I</sub> (V)	V <sub>O</sub> (V)	I <sub>O</sub>   (μA)	V <sub>DD</sub> (V)	T <sub>Low</sub> *		25°C			T <sub>High</sub> *			
						Min.	Max.	Min.	Typ.	Max.	Min.		Max.	
														V
														V
														V
I <sub>OL</sub>	Output Sink Current	0/ 5	0.4		5	0.64		0.51	1		0.36			mA
		0/10	0.5		10	1.6		1.3	2.6		0.9			
		0/15	1.5		15	4.2		3.4	6.8		2.4			
I <sub>IH</sub> , I <sub>IL</sub>	Input Leakage Current	0/18	Any Input		18		± 0.1		±10 <sup>-5</sup>	± 0.1			±1	μA
C <sub>I</sub>	Input Capacitance		Any Input						5	7.5				pF

**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ ,  $C_L = 50\text{ pF}$ ,  $R_L = 200\text{ K}\Omega$ , typical temperature coefficient for all  $V_{DD}$  values is  $03\text{ }^{\circ}\text{C}$ , all input rise and fall times =  $20\text{ ns}$ )

Symbol	Parameter	Test Conditions		Value			Unit
			$V_{DD}$ (V)	Min.	Typ.	Max.	
$t_{PHL}$	Propagation Delay Time (data)		5		520	1040	ns
			10		210	420	
			15		150	300	
$t_{PLH}$	Propagation Delay Time (data)		5		660	1320	ns
			10		260	520	
			15		180	360	
$t_{PHL}$	Propagation Delay Time ( $\overline{BL}$ )		5		350	700	ns
			10		175	350	
			15		125	250	
$t_{PLH}$	Propagation Delay Time ( $\overline{BL}$ )		5		400	800	ns
			10		175	350	
			15		150	300	
$t_{PHL}$	Propagation Delay Time ( $\overline{LT}$ )		5		250	500	ns
			10		125	250	
			15		85	170	
$t_{PLH}$	Propagation Delay Time ( $\overline{LT}$ )		5		150	300	ns
			10		75	150	
			15		50	100	
$t_{TLH}$	Transition Time		5		40	80	ns
			10		30	60	
			15		20	40	
$t_{THL}$	Transition Time		5		125	310	ns
			10		75	185	
			15		65	160	
$t_{setup}$	Setup Time		5	150	75		ns
			10	70	35		
			15	40	20		
$t_{hold}$	Hold Time		5	0	-75		ns
			10	0	-35		
			15	0	-20		
$t_w$	Strobe Pulse Width		5	400	200		ms
			10	160	80		
			15	100	50		