



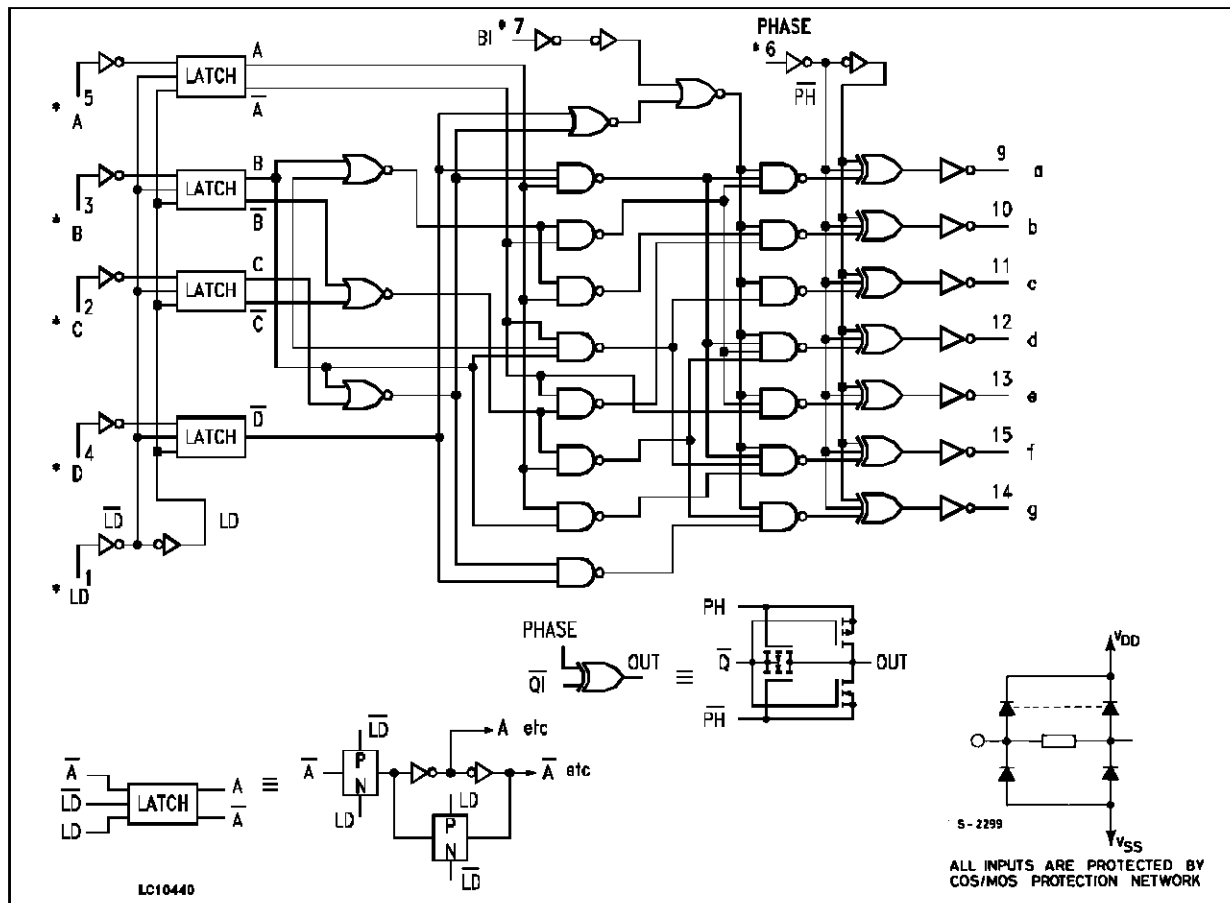
# HCC/HCF4543B

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{DD}^*$	Supply voltage : <b>HCC Types</b> <b>HCF Types</b>	- 0.5 to + 20 - 0.5 to 18	V 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) Dissipation per Output Transistor for $T_{op}$ = Full Package-temperature Range	200 100	mW mW
$T_{op}$	Operating Temperature : <b>HCC Types</b> <b>HCF Types</b>	- 55 to + 125 - 40 to + 85	$^{\circ}C$ $^{\circ}C$
$T_{stg}$	Storage Temperature	- 65 to + 150	$^{\circ}C$

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

## LOGIC DIAGRAM (1/2 of device shown)



## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply Voltage : <b>HCC Types</b> <b>HCF Types</b>	3 to + 18 3 to + 15	V V
$V_i$	Input Voltage	0 to $V_{DD}$	V
$T_{op}$	Operating Temperature : <b>HCC Types</b> <b>HCF Types</b>	- 55 to + 125 - 40 to + 85	$^{\circ}C$ $^{\circ}C$

## TRUTH TABLE

INPUT CODE							OUTPUT STATE							DISPLAY CHARACTER
LD	BI	Ph*	D	C	B	A	a	b	c	d	e	f	g	
X	1	0	X	X	X	X	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	1	1	1	1	1	1	0	0
1	0	0	0	0	0	1	0	1	1	0	0	0	0	1
1	0	0	0	0	1	0	1	1	0	1	1	0	1	0
1	0	0	0	0	1	1	1	1	1	1	0	0	0	1
1	0	0	0	1	0	0	0	1	1	0	0	1	1	4
1	0	0	0	1	0	1	1	0	1	1	0	1	1	5
1	0	0	0	1	1	0	1	0	1	1	1	1	1	6
1	0	0	0	1	1	1	1	1	1	0	0	0	0	7
1	0	0	1	0	0	0	1	1	1	1	1	1	1	8
1	0	0	1	0	0	1	1	1	1	1	0	1	1	9
1	0	0	1	0	1	0	0	0	0	0	0	0	0	Blank
1	0	0	1	0	1	1	0	0	0	0	0	0	0	Blank
1	0	0	1	1	0	0	0	0	0	0	0	0	0	Blank
1	0	0	1	1	1	1	0	0	0	0	0	0	0	Blank
0	0	0	X	X	X	X	**							**
•	•	•	•				Inverse of Output Combinations Above							Display as above

X = Don't care.

• = Above combinations

\* = For liquid-crystal readouts, apply a square wave to Ph.

For common cathode LED readouts, select Ph = 0.

For common anode LED readouts, select Ph = 1.

\*\* = Depends upon the BCD code previously applied when LD = 1.

STATIC ELECTRICAL CHARACTERISTICS

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	HCC Types	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	
		HCF Types	0/5			5		5		0.04	5		150	
			0/10			10		10		0.04	10		300	
			0/15			15		20		0.04	20		600	
V <sub>OH</sub>	Output High Voltage	0/5		< 1	5	4.95		4.95			4.95		V	
		0/10		< 1	10	9.95		9.95			9.95			
		0/15		< 1	15	14.95		14.95			14.95			
V <sub>OL</sub>	Output Low Voltage	5/0		< 1	5		0.05			0.05		0.05	V	
		10/0		< 1	10		0.05			0.05		0.05		
		15/0		< 1	15		0.05			0.05		0.05		
V <sub>IH</sub>	Input High Voltage	0.5/4.5	< 1	5	3.5		3.5				3.5		V	
		1/9	< 1	10	7		7				7			
		1.5/13.5	< 1	15	11		11				11			
V <sub>IL</sub>	Input Low Voltage	4.5/0.5	< 1	5		1.5				1.5		1.5	V	
		9/1	< 1	10		3				3		3		
		13.5/1.5	< 1	15		4				4		4		
I <sub>OH</sub>	Output Drive Current	HCC Types	0/5	2.5		5	-1.6		-1.3	-2.6		-0.9	mA	
			0/5	4.6		5	-0.46		-0.37	-0.75		-0.26		
			0/10	9.5		10	-0.98		-0.8	-1.6		-0.55		
			0/15	13.5		15	-3.33		-2.7	-5.4		-1.9		
		HCF Types	0/5	2.5		5	1.3		-1.1	-2.6		-0.9		
			0/5	4.6		5	0.36		-0.31	-0.75		-0.25		
			0/10	9.5		10	0.81		-0.68	-1.6		-0.54		
0/15	13.5		15	2.7		-2.3	-5.4		-1.84					
I <sub>OL</sub>	Output Sink Current	HCC Types	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		
		HCF Types	0/5	0.4		5	0.52		0.44	1		0.36		
			0/10	0.5		10	1.3		1.1	2.6		0.9		
			0/15	1.5		15	3.6		3.0	6.8		2.4		
I <sub>IH</sub> , I <sub>IL</sub>	Input Leakage Current	HCC types	0/18	Any Input	18		$\pm 0.1$		$\pm 10^{-5}$	$\pm 0.1$		$\pm 1$	$\mu$ A	
		HCF types	0/15		15		$\pm 0.3$		$\pm 10^{-5}$	$\pm 0.3$		$\pm 1$		

\* T<sub>Low</sub> = -55°C for HCC device : -40°C for HCF device.

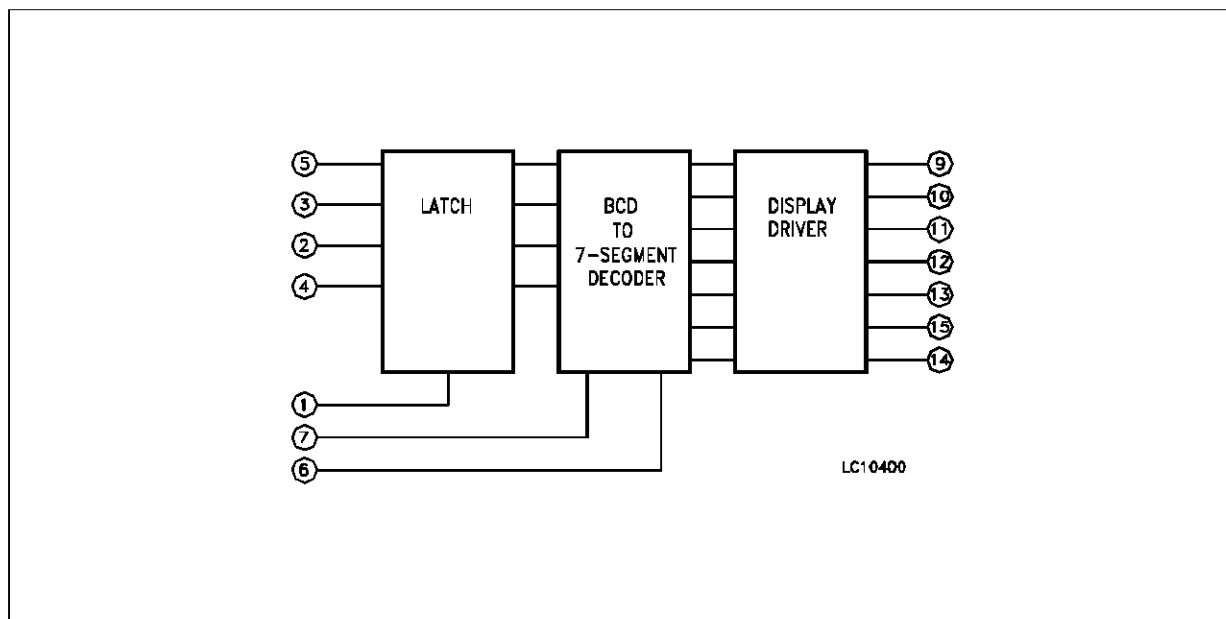
\* T<sub>High</sub> = +125°C for HCC device : +85°C for HCF device.

The Noise Margin for both "1" and "0" level is : 1V min. with V<sub>DD</sub> = 5V, 2V min. with V<sub>DD</sub> = 10V, 2.5V min. with V<sub>DD</sub> = 15V.

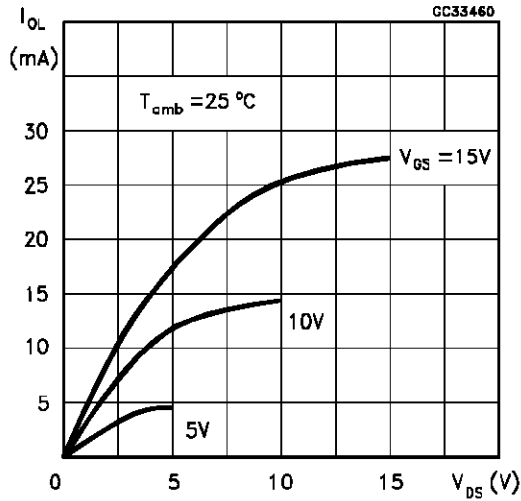
**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25^{\circ}C$ ,  $C_L = 50pF$ ,  $R_L = 200k\Omega$ , typical temperature coefficient for all  $V_{DD}$  values is  $0.3\%/^{\circ}C$ , all input rise and fall time = 20ns)

Symbol	Parameter	Test Conditions $V_{DD}$ (V)	Limits All packages			Unit
			Min.	Typ.	Max.	
$t_{PHL}$	Propagation Delay Time	5		600	1200	ns
		10		200	400	
		15		150	300	
$t_{PLH}$		5		500	1000	
		10		200	400	
		15		150	300	
$t_{rHL}$	Transition Time	5		180	360	
		10		90	180	
		15		65	130	
$t_{rLH}$		5		180	360	
		10		90	180	
		15		65	130	
$t_{WH}$	Latch Disable Pulse Width	5	250	125		
		10	100	50		
		15	80	40		
$t_{SU}$	Address Setup Time	5	60	15		
		10	20	- 5		
		15	10	- 5		
$t_H$	Address Hold Time	5	25	-5		
		10	20	10		
		15	20	0		
$C_{IN}$	Input Capacitance	Any Input		5	7.5	pF

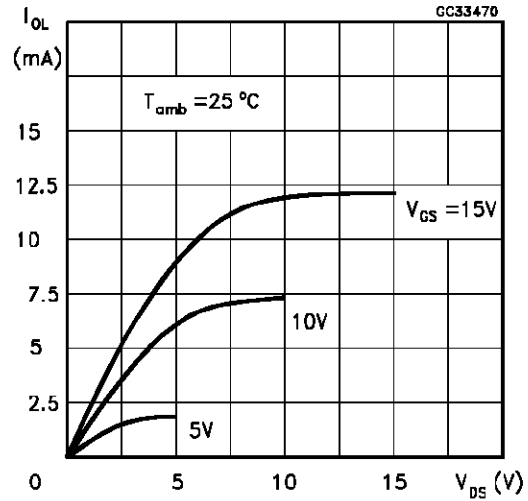
BCD-to-seven-segment latch/decoder/driver functional diagram



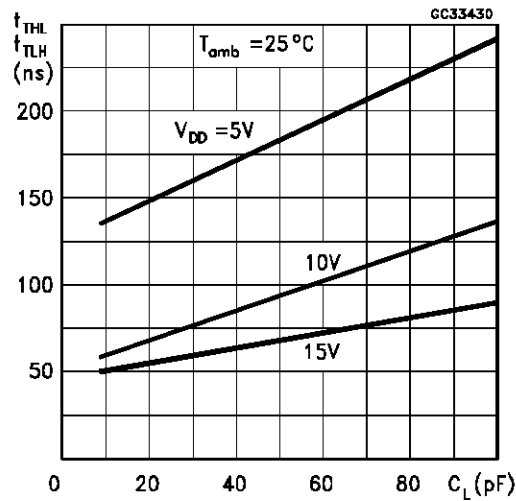
Typical Output Low (sink) Current Characteristics.



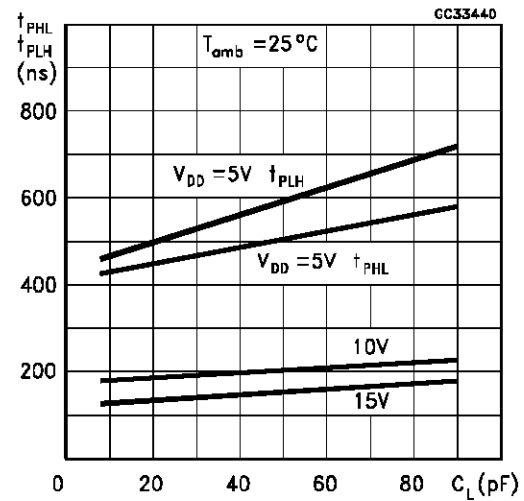
Minimum Output Low (sink) Current Characteristics.



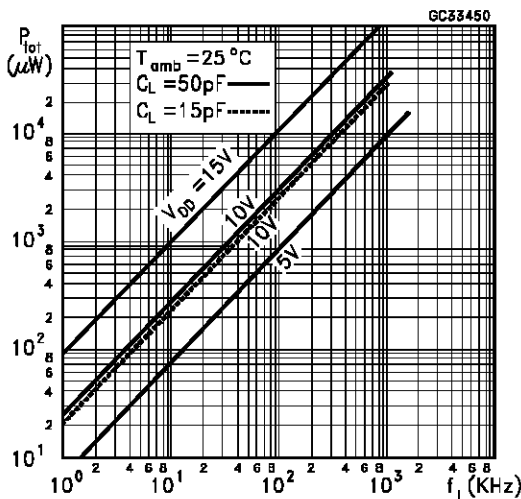
Typical Transition Time as a Function of Load Capacitance



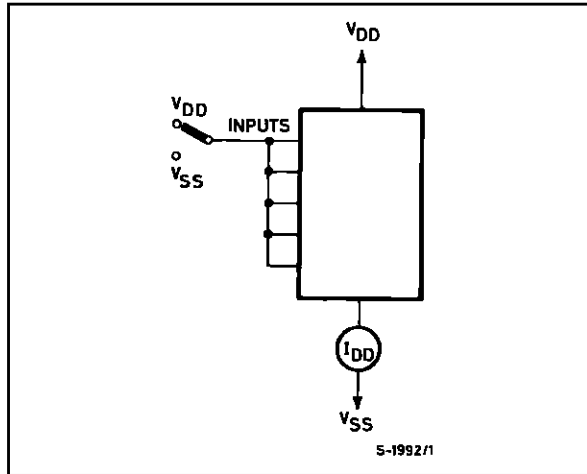
Typical Propagation Delay Time as a Function of Load Capacitance



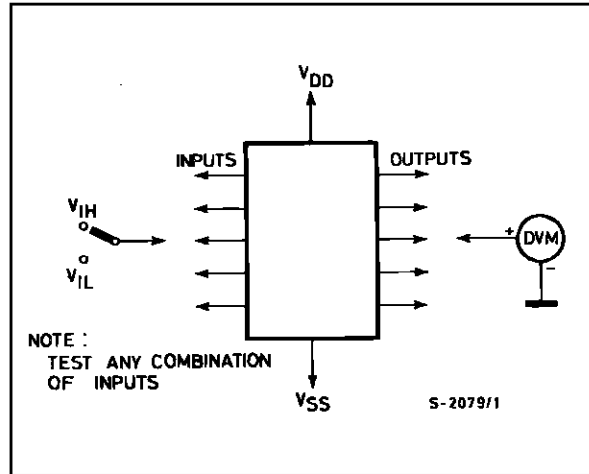
Typical Dynamic Power Dissipation as a Function of Frequency



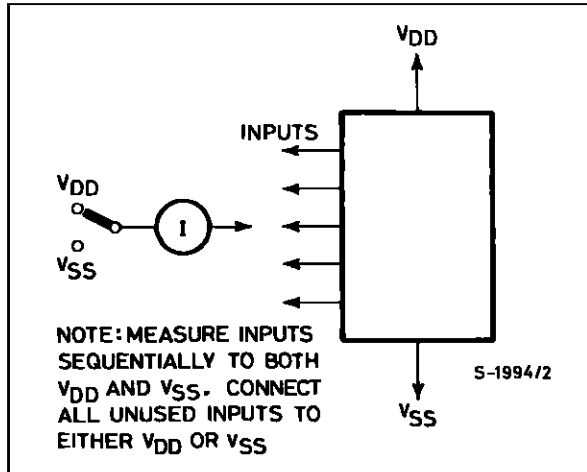
Input Voltage Test Circuit.



Quiescent Device Current Test Circuit.



Input-leakage -current Test Circuit.



**Plastic DIP16 (0.25) MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C



**Ceramic DIP16/1 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		17.78			0.700	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	0.51		1.27	0.020		0.050
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q			5.08			0.200



**SO16 (Narrow) MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.004		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					



P013H

**PLCC20 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	9.78		10.03	0.385		0.395
B	8.89		9.04	0.350		0.356
D	4.2		4.57	0.165		0.180
d1		2.54			0.100	
d2		0.56			0.022	
E	7.37		8.38	0.290		0.330
e		1.27			0.050	
e3		5.08			0.200	
F		0.38			0.015	
G			0.101			0.004
M		1.27			0.050	
M1		1.14			0.045	



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