

**COS/MOS
INTEGRATED
CIRCUIT****HCC/HCF 4502B**

7929225 S G S SEMICONDUCTOR CORP 41C 08959 D T-43-21

STROBED HEX INVERTER/BUFFER

- 2 TTL-LOAD OUTPUT DRIVE CAPABILITY
- 3-STATE OUTPUTS
- COMMON OUTPUT-DISABLE CONTROL
- INHIBIT CONTROL
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- 5V, 10V, AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100 nA AT 18V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD No. 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"

The **HCC 4502B** (extended temperature range) and **HCF 4502B** (intermediate temperature range) are monolithic integrated circuit, available in 16-lead dual in-line plastic or ceramic package, ceramic flat package and plastic micropackage. The **HCC/HCF 4502B** consists of six inverter-buffers with 3-state outputs. A logic "1" on the OUTPUT DISABLE input produces a high-impedance state in all six outputs. This feature permits common busing of the outputs, thus simplifying system design. A logic "1" on the INHIBIT input switches all six outputs to logic "0" if the OUTPUT DISABLE input is a logic "0". This device is capable of driving two standard TTL loads, which is equivalent to six times the JEDEC "B" series I_{OL} standard.

ABSOLUTE MAXIMUM RATINGS

V_{DD}^*	Supply voltage: HCC types HCF types	-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)	± 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: HCC types HCF types	-55 to 125 -40 to 85	°C °C
T_{stg}	Storage temperature	-65 to 150	°C

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

ORDERING NUMBERS:

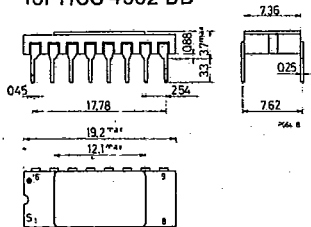
HCC 4502 BD for dual in-line ceramic package
HCC 4502 BF for dual in-line ceramic package, frit seal
HCC 4502 BK for ceramic flat package
HCF 4502 BE for dual in-line plastic package
HCF 4502 BF for dual in-line ceramic package, frit seal
HCF 4502 BM for plastic micropackage

HCC/HCF 4502 B

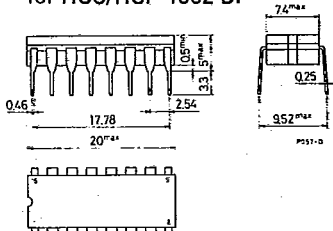
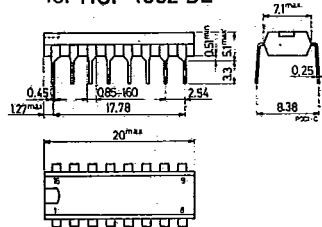
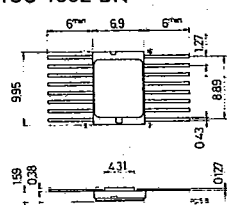
7929225 S G S SEMICONDUCTOR CORP 41C 08960 DT-43-21

MECHANICAL DATA (dimensions in mm)

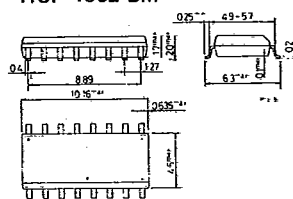
Dual in-line ceramic package
for HCC 4502 BD



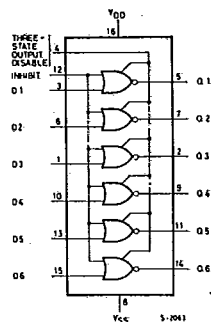
Dual in-line ceramic package
for HCC/HCF 4502 BF

Dual in-line plastic package
for HCF 4502 BECeramic flat package for
HCC 4502 BK

Plastic micropackage for HCF 4502 BM



CONNECTION DIAGRAM



TRUTH TABLE

DISABLE	INHIBIT	Dn	Qn
0	0	0	1
0	0	1	0
0	1	X	0
1	X	X	Z

X = Don't Care
Z = High Impedance
Logic 1 = High
Logic 0 = Low

RECOMMENDED OPERATING CONDITIONS

V_{DD}	Supply voltage: HCC types	3 to 18	V
	HCF types	3 to 15	V
V_I	Input voltage	0 to V_{DD}	V
T_{op}	Operating temperature: HCC types	-55 to 125	°C
	HCF types	-40 to 85	°C



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STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Parameter			Test conditions				Values						Unit	
			V _I (V)	V _O (V)	I _O (μA)	V _{DD} (V)	T _{Low} *		25° C			T _{High} *		
							Min.	Max.	Min.	Typ.	Max.	Min.		Max.
I _L	Quiescent current	HCC types	0/ 5			5		1		0.02	1		30	μA
			0/10			10		2		0.02	2		60	
			0/15			15		4		0.02	4		120	
			0/20			20		20		0.04	20		600	
	HCF types	0/ 5			5		4		0.02	4		30		
		0/10			10		8		0.02	8		60		
		0/15			15		16		0.02	16		120		
V _{OH}	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 _{OL}	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 _{IH}	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 _{IL}	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 _{OH}	Output drive current	HCC types	0/ 5	2.5		5	-2		-1.6	-3.2		-1.15		mA
			0/ 5	4.6		5	-0.64		-0.51	-1		-0.36		
			0/10	9.5		10	-1.6		-1.3	-2.6		-0.9		
			0/15	13.5		15	-4.2		-3.4	-6.8		-2.4		
	HCF types	0/ 5	2.5		5	-1.53		-1.36	-3.2		-1.1			
		0/ 5	4.6		5	-0.52		-0.44	-1		-0.36			
		0/10	9.5		10	-1.3		-1.1	-2.6		-0.9			
I _{OL}	Output sink current	HCC types	0/ 5	0.4		5	3.84		3.06	6		2.10		mA
			0/10	0.5		10	9.6		7.8	15.6		5.4		
			0/15	1.5		15	25.2		20.4	40.8		14.4		
		HCF types	0/ 5	0.4		5	3.11		2.6	6		2.10		
			0/10	0.5		10	7.05		6.63	15.6		5.61		
			0/15	1.5		15	20.4		17.3	40.8		14.2		
I _{IH} , I _{IL}	Input leakage current	HCC types	0/18	Any input		18		±0.1		±10 ⁻⁵	±0.1		± 1	μA
		HCF types	0/15			15		±0.3		±10 ⁻⁵	±0.3		± 1	
I _{OH} I _{OL}	3-state output	HCC types	0/18			18		±0.4		±10 ⁻⁴	±0.4		± 12	μA
		HCF types	0/15			15		±1.0		±10 ⁻⁴	±1.0		±7.5	
C _I	Input capacitance				Any input					5	7.5			pF

* T_{Low} = -55°C for HCC device; -40°C for HCF device.* T_{High} = +125°C for HCC device; +85°C for HCF device.
 The Noise Margin for both "1" and "0" level is: 1V min. with V_{DD} = 5V
 2V min. with V_{DD} = 10V
 2.5V min. with V_{DD} = 15V

HCC/HCF 4502B

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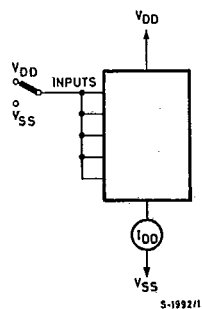
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DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, $C_L = 50\text{ pF}$, $R_L = 200\text{ k}\Omega$, typical temperature coefficient for all V_{DD} values is $0.3\%/^{\circ}\text{C}$, all input rise and fall times = 20 ns)

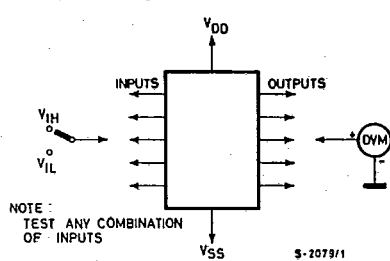
Parameter	Test conditions	Values			Unit
		V_{DD} (V)	Min.	Typ.	Max.
t_{PHL} Data or inhibit delay time		5		135	270
		10		60	120
		15		40	80
t_{PLH} Data or inhibit delay time		5		190	380
		10		90	180
		15		65	30
t_{PHZ} Disable delay time (output high to high impedance)		5		60	120
		10		40	80
		15		30	60
t_{PZH} Disable delay time (high impedance to output high)		5		110	220
		10		50	100
		15		40	80
t_{PLZ} Disable delay time (output low to high impedance)		5		125	250
		10		65	130
		15		55	110
t_{PZL} Disable delay time (high impedance to output low)		5		125	250
		10		55	110
		15		40	80
t_{TLH} Transition time		5		100	200
		10		50	100
		15		40	80
t_{THL} Transition time		5		60	120
		10		30	60
		15		20	40

TEST CIRCUIT

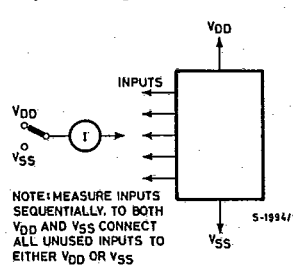
Quiescent device current



Input voltage



Input leakage current





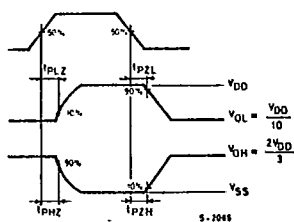
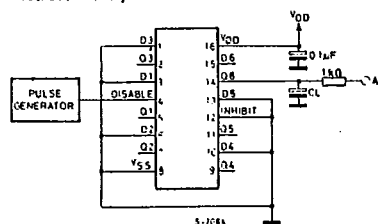
HCC/HCF 4502B

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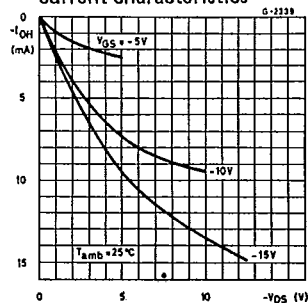
Test circuit and waveforms

disable delay time

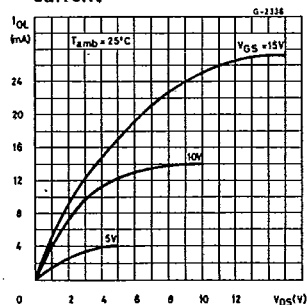


TEST CONDITION		
Test	Pin 15	Point A
t_{PHZ}	V_{SS}	V_{SS}
t_{PLZ}	V_{DD}	V_{DD}
t_{PZL}	V_{DD}	V_{DD}
t_{PZH}	V_{SS}	V_{SS}

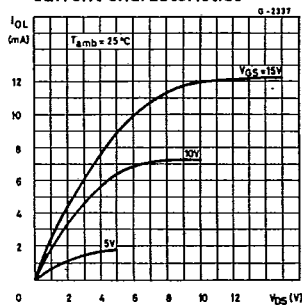
Minimum output high(source) current characteristics



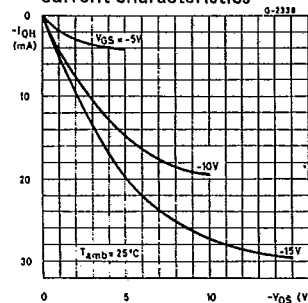
Typical output low (sink) current



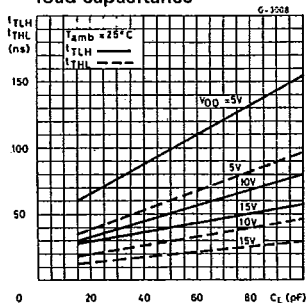
Minimum output low (sink) current characteristics



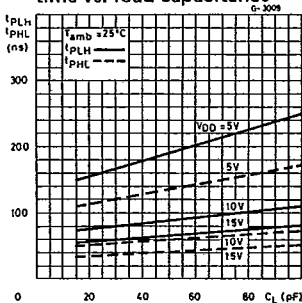
Typical output high (source) current characteristics

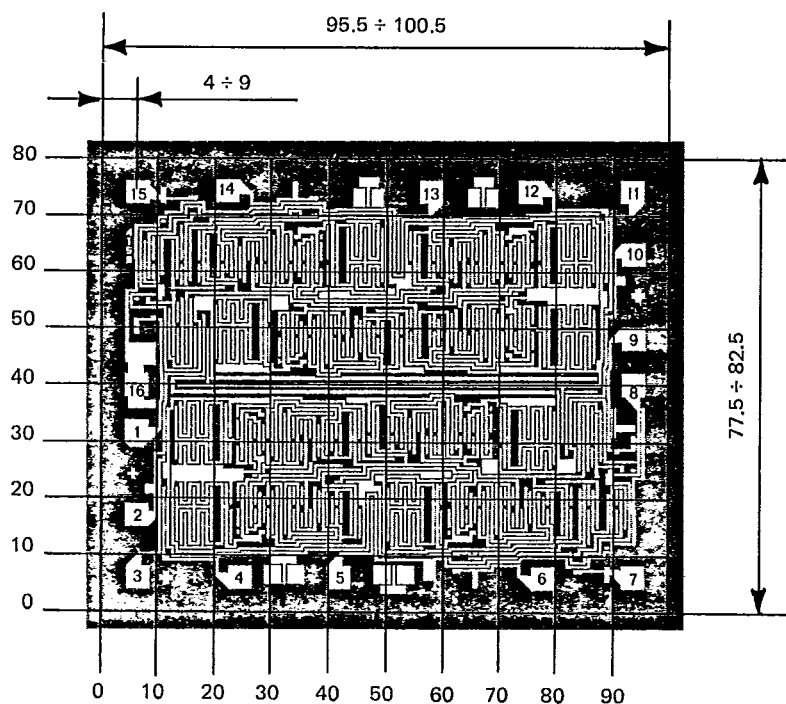


Typical transition time vs. load capacitance

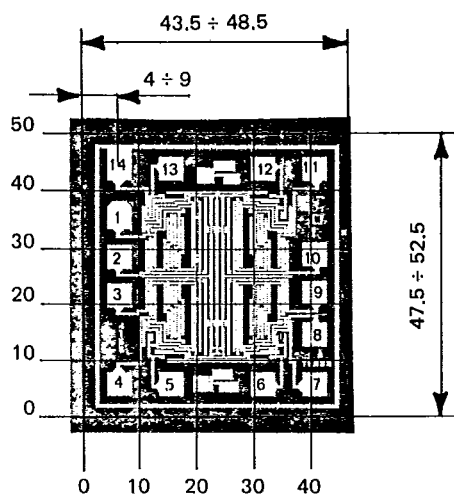


Typical propagation delay time vs. load capacitance





4015B



4016B