SGS-THOMSON MICROELECTRONICS
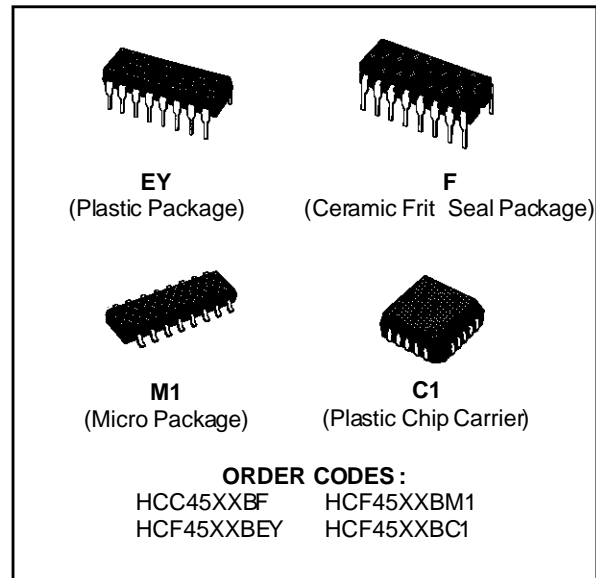
HCC/HCF4555B
HCC/HCF4556B

DUAL BINARY TO 1 OF 4 DECODER/DEMULTIPLEXERS

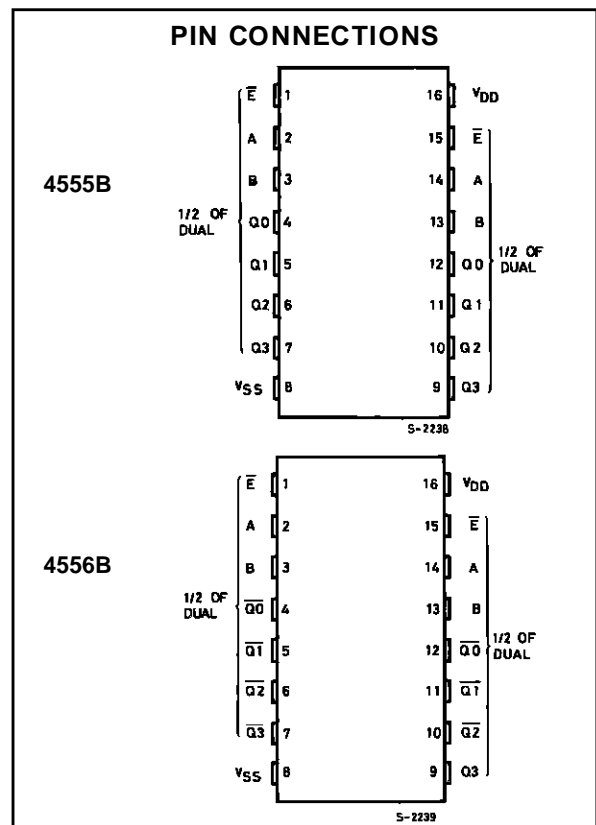**4555B OUTPUTS HIGH ON SELECT**
4556B OUTPUTS LOW ON SELECT

- EXPANDABLE WITH MULTIPLE PACKAGES
- STANDARD, SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- 5V, 10V, AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100nA 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"

EY
(Plastic Package)

F
(Ceramic Frit Seal Package)

M1
(Micro Package)

C1
(Plastic Chip Carrier)

ORDER CODES:
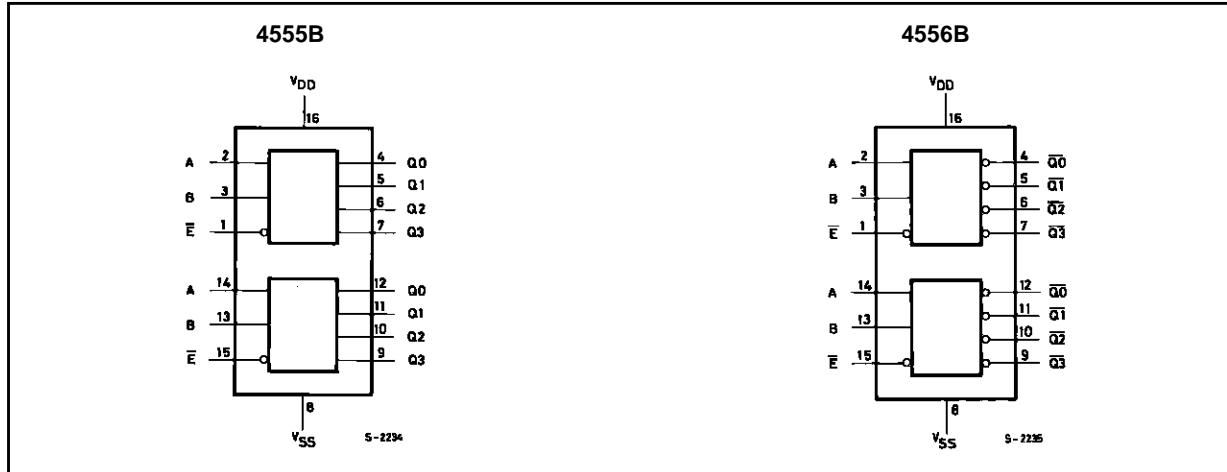HCC45XXBF HCF45XXBM1
HCF45XXBEY HCF45XXBC1

DESCRIPTION

The **HCC4555B, HCC4556B** (extended temperature range) and the **HCF4555B, HCF4556B** (intermediate temperature range) are monolithic integrated circuits available in 16-lead dual in-line plastic or ceramic package and plastic micropackage.

The **HCC/HCF4555B** and **HCC/HCF4556B** are dual one-of-four decoders/demultiplexers. Each decoder has two select inputs (A and B), an Enable input (E̅), and four mutually exclusive outputs. On the **HCC/HCF4555B** the outputs are high on select; on the **HCC/HCF4556B** the outputs are low on select. When the Enable input is high, the outputs of the **HCC/HCF4555B** remain low and the outputs of the **HCC/HCF4556B** remain high regardless of the state of the select inputs A and B.

PIN CONNECTIONS

4555B

E̅	1		16	V_DD
A	2		15	E̅
B	3		14	A
Q0	4		13	B
Q1	5		12	Q0
Q2	6		11	Q1
Q3	7		10	Q2
V_SS	8		9	Q3

1/2 OF DUAL

S-2238

4556B

E̅	1		16	V_DD
A	2		15	E̅
B	3		14	A
Q̅0	4		13	B
Q̅1	5		12	Q̅0
Q̅2	6		11	Q̅1
Q̅3	7		10	Q̅2
V_SS	8		9	Q̅3

1/2 OF DUAL

S-2239

FUNCTIONAL DIAGRAMS

4555B

4556B

ABSOLUTE MAXIMUM RATINGS

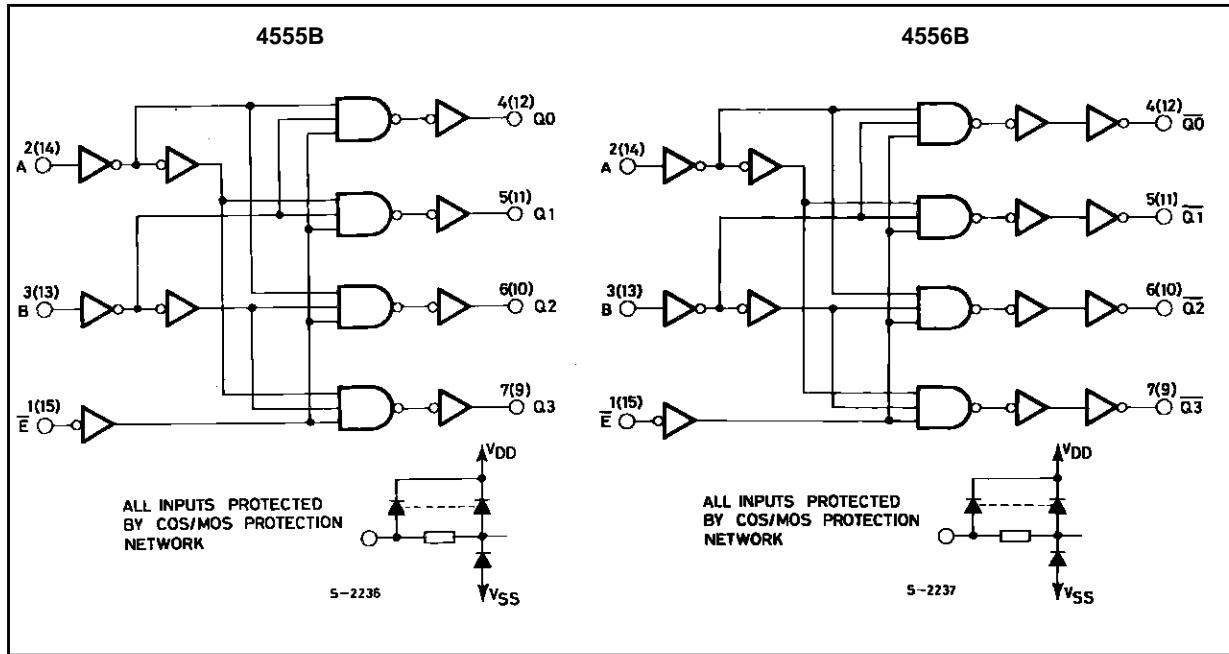| Symbol	Parameter	Value	Unit
V_{DD}*	Supply Voltage : **HCC** Types **HCF** Types	− 0.5 to + 20 − 0.5 to + 18	V V
V_i	Input Voltage	− 0.5 to V_{DD} + 0.5	V
I_I	DC Input Current (any one input)	± 10	mA
P_{tot}	Total Power Dissipation (per package) Dissipation per Output Transistor for T_{op} = Full Package-temperature Range	200 100	mW 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

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 voltages values are referred to V_{SS} pin voltage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage : **HCC** Types **HCF** Types	3 to 18 3 to 15	V V
V_I	Input Voltage	0 to V_{DD}	V
T_{op}	Operating Temperature : **HCC** Types **HCF** Types	− 55 to + 125 − 40 to + 85	°C °C

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LOGIC DIAGRAMS

4555B   4556B

ALL INPUTS PROTECTED
BY COS/MOS PROTECTION
NETWORK

ALL INPUTS PROTECTED
BY COS/MOS PROTECTION
NETWORK

S-2236   S-2237

TRUTH TABLE

Inputs Enable Select			Outputs 4555B				Outputs 4556B			
$\overline{E}$	B	A	Q 3	Q 2	Q 1	Q 0	$\overline{Q3}$	$\overline{Q2}$	$\overline{Q1}$	$\overline{Q0}$
0	0	0	0	0	0	1	1	1	1	0
0	0	1	0	0	1	0	1	1	0	1
0	1	0	0	1	0	0	1	0	1	1
0	1	1	1	0	0	0	0	1	1	1
1	X	X	0	0	0	0	1	1	1	1

X = DON'T CARE, LOGIC 1 = HIGH, LOGIC 0 = LOW.

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Symbol	Parameter		V_I (V)	V_O (V)	$|I_O|$ (μA)	V_{DD} (V)	T_{Low}* Min.	T_{Low}* Max.	25°C Min.	25°C Typ.	25°C Max.	T_{High}* Min.	T_{High}* Max.	Unit
I_L	Quiescent Current		0/ 5			5		5		0.04	5		150	μA
		HCC Types	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		20		0.04	20		150	
			0/10			10		40		0.04	40		300	
			0/15			15		80		0.04	80		600	
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		0/ 5	2.5		5	− 2		− 1.6	− 3.2		− 1.15		mA
		HCC Types	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		
			0/15	13.5		15	− 3.6		− 3.0	− 6.8		− 2.4		
I_{OL}	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_{IH}, I_{IL}	Input Leakage Current	HCC Types	0/18	Any Input		18		± 0.1		$\pm10^{-5}$	± 0.1		± 1	μA
		HCF Types	0/15	Any Input		15		± 0.3		$\pm10^{-5}$	± 0.3		± 1	
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.

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

Symbol	Parameter	Test Conditions		Value			Unit
			V_{DD} (V)	Min.	Typ.	Max.	
t_{PLH}, t_{PHL}	Propagation Delay Time (A or B input to any output)		5		220	440	ns
			10		95	190	
			15		70	140	
	Propagation Delay Time ($\overline{E}$ input to any output)		5		200	400	ns
			10		85	170	
			15		65	130	
t_{TLH}, t_{THL}	Transition Time		5		100	200	ns
			10		50	100	
			15		40	80	

Typical Output Low (sink) Current Characteristics.
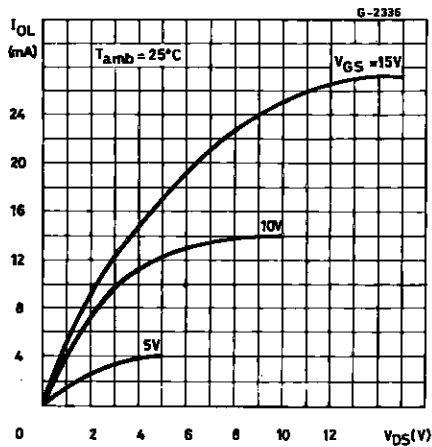
Minimum Output Low (sink) Current Characteristics.
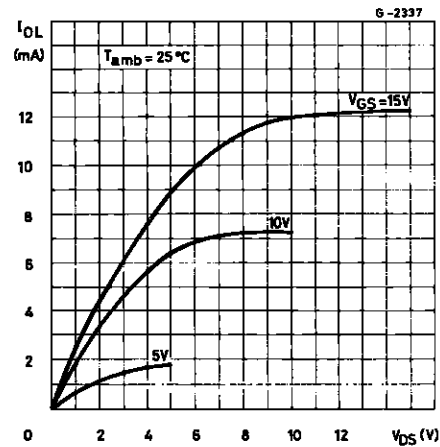
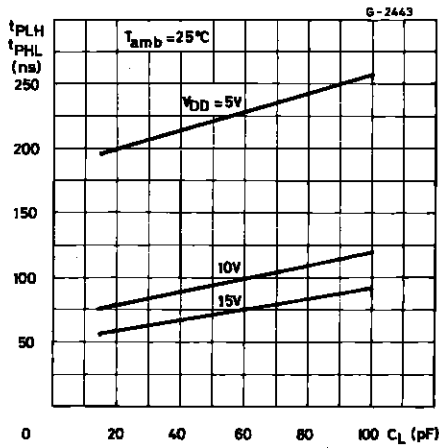

Typical Output High (source) Current Characteristics.
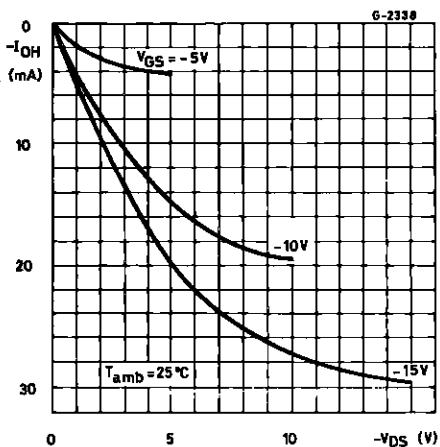
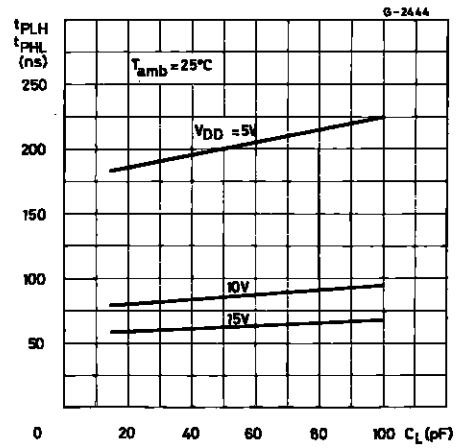Minimum Output High (source) Current Characteristics.
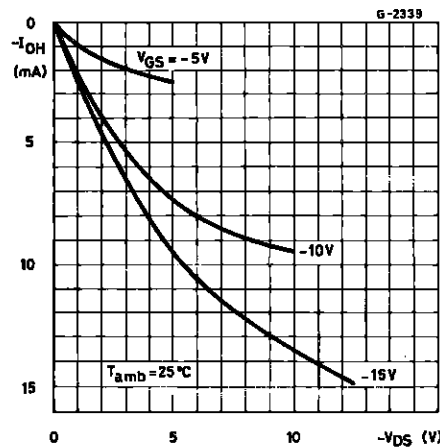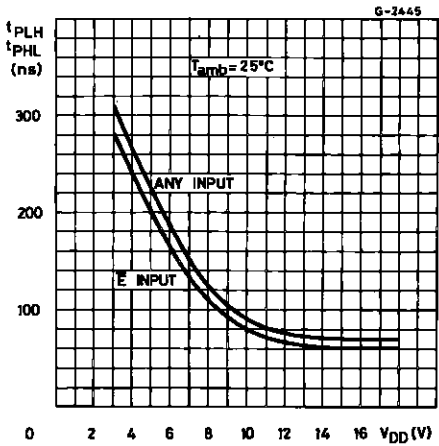
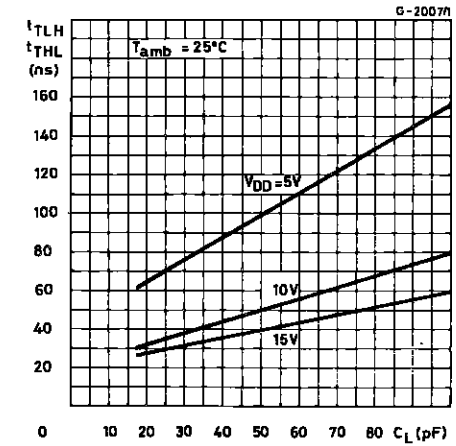Typical Propagation Delay Time vs. Load Capacitance (A or B input to any output).

Typical Propagation Delay Time vs. Load Capacitance (E̅ input to any input).
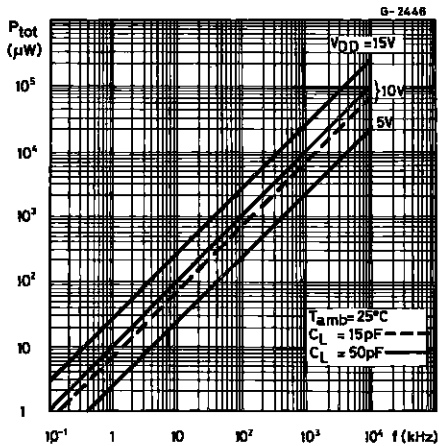

Typical Propagation Delay Time vs. Supply Voltage.

Typical Transition Time vs. Load Capacitance.
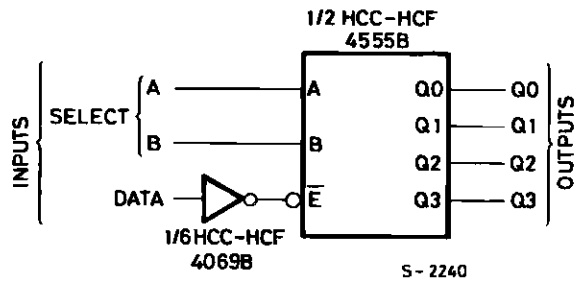

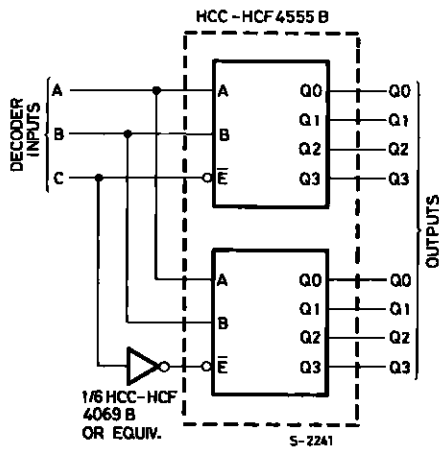Typical Dynamic Power Dissipation/per Device vs. Frequency.

APPLICATIONS

1 of 4 Line Data Demultiplexer using
HCC/HCF4555B

1/2 HCC-HCF 4555B
1/6 HCC-HCF 4069B
S-2240

TRUTH TABLE

Select Inputs		Outputs			
B	A	Q 0	Q 1	Q 2	Q 3
0	0	DATA	0	0	0
0	1	0	DATA	0	0
1	0	0	0	DATA	0
1	1	0	0	0	DATA

1 of 8 Decoder using HCC/HCF 4555B

HCC-HCF 4555 B
1/6 HCC-HCF 4069 B OR EQUIV.
S-2241

TRUTH TABLE

Inputs			Q Outputs							
C	B	A	0	1	2	3	4	5	6	7
0	0	0	1	0	0	0	0	0	0	0
0	0	1	0	1	0	0	0	0	0	0
0	1	0	0	0	1	0	0	0	0	0
0	1	1	0	0	0	1	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0
1	0	1	0	0	0	0	0	1	0	0
1	1	0	0	0	0	0	0	0	1	0
1	1	1	0	0	0	0	0	0	0	1

APPLICATIONS (continued)

1 of 16 Decoder using HCC/HCF4555B and HCC/HCF4556B

S-2242
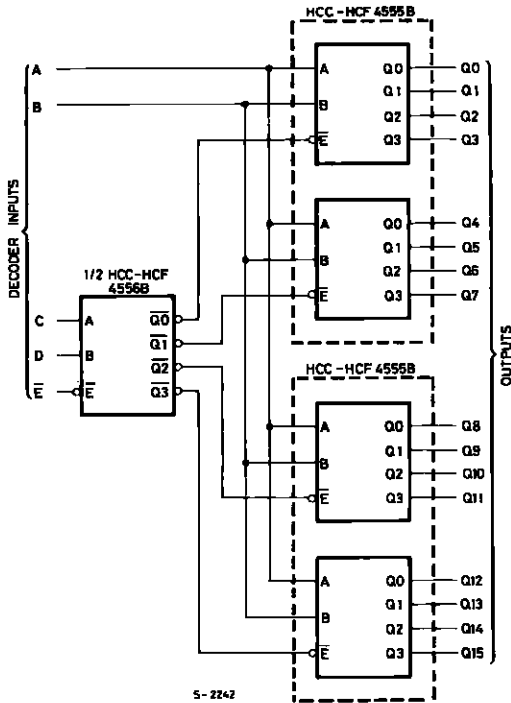
TRUTH TABLE

Inputs					Q Outputs															
E	D	C	B	A	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1	X	X	X	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

X = Don't care.

HCC/HCF4555B Input to Q3 Output Dynamic Signal Waveforms

S-2243

f_I = 1MHz, 50% DUTY CYCLE
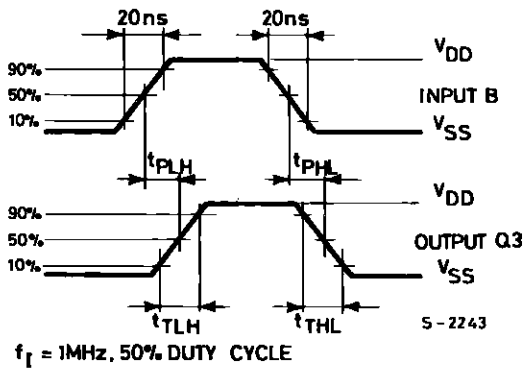
HCC/HCF4556B Input to $\overline{Q3}$ Output Dynamic Signal Waveforms

S-2244

f_I = 1MHz, 50% DUTY CYCLE

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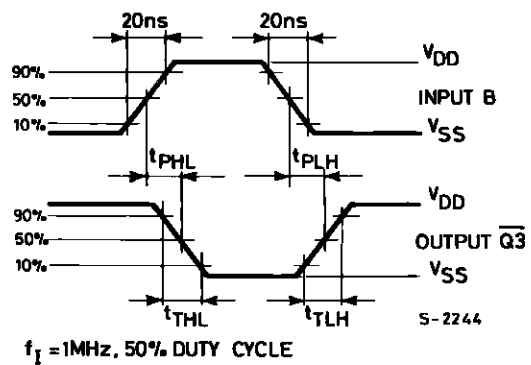
APPLICATIONS (continued)

HCC/HCF4555B $\overline{E}$ Input to Q3 Output Dynamic Signal Waveforms

$f_I = 1MHz$, 50% DUTY CYCLE
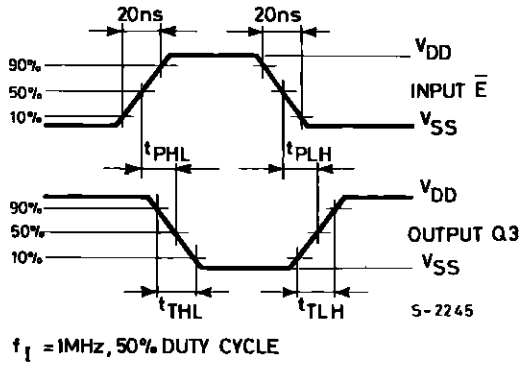
HCC/HCF4556B $\overline{E}$ Input to $\overline{Q3}$ Output Dynamic Signal Waveforms

$f_I = 1MHz$, 50% DUTY CYCLE
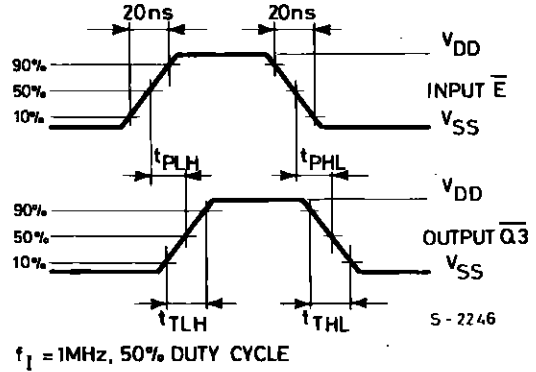
TEST CIRCUITS

Quiescien tDevice Current.

Noise Immunity.

NOTE :
TEST ANY COMBINATION OF INPUTS

Input Leakage Current.

NOTE: MEASURE INPUTS SEQUENTIALLY TO BOTH V_{DD} AND V_{SS}. CONNECT ALL UNUSED INPUTS TO EITHER V_{DD} OR V_{SS}

SGS-THOMSON
MICROELECTRONICS
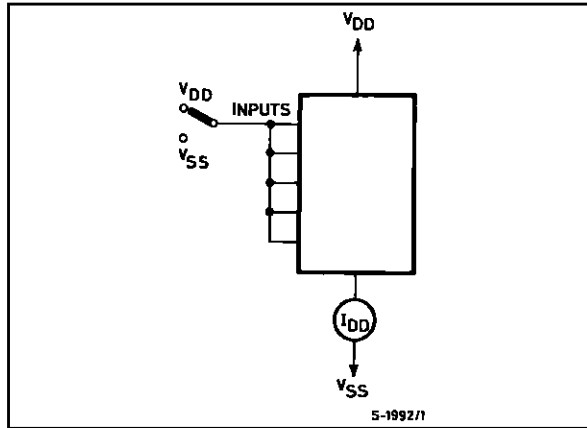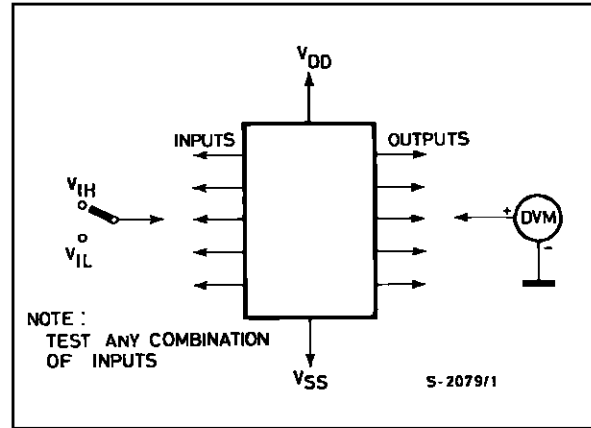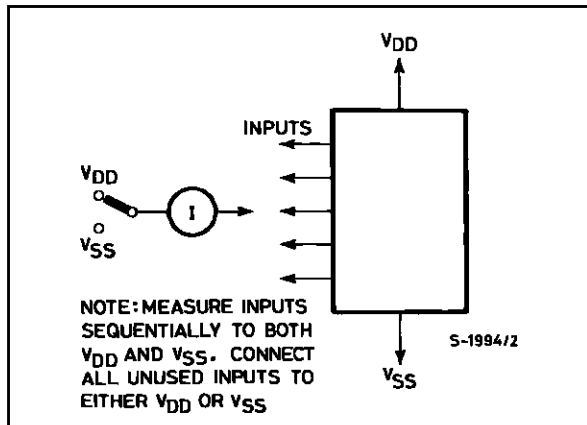
Plastic DIP16 (0.25) MECHANICAL DATA

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

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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

P053D

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MICROELECTRONICS

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

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MICROELECTRONICS
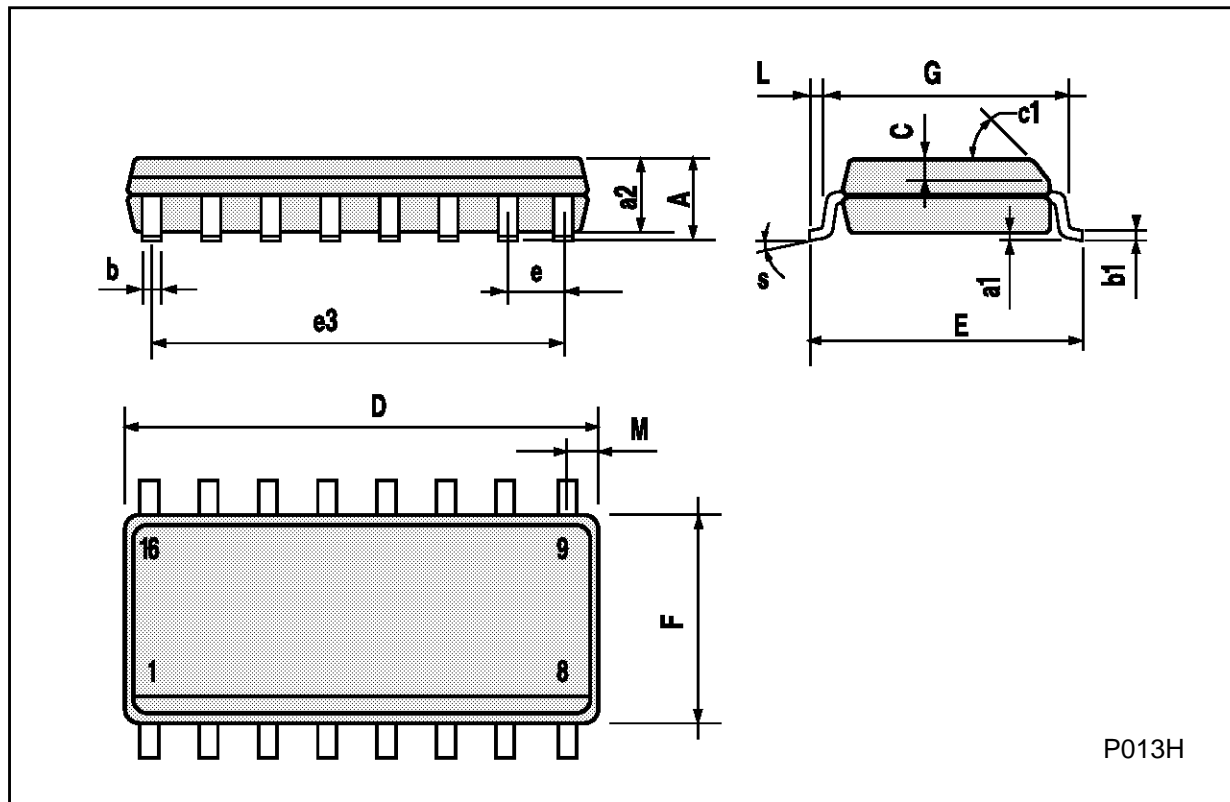
PLCC20 MECHANICAL DATA

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	

G (Seating Plane Coplanarity)

P027A

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SGS-THOMSON
MICROELECTRONICS