TEXAS INSTRUMENTS
Data sheet acquired from Harris Semiconductor
SCHS087B – Revised March 2002

CD4555B, CD4556B Types

CMOS Dual Binary to 1 of 4 Decoder/Demultiplexers

High-Voltage Types (20-Volt Rating)

CD4555B: Outputs High on Select
CD4556B: Outputs Low on Select

■ CD4555B and CD4556B are dual one-of-four decoders/demultiplexers. Each decoder has two select inputs (A and B), an Enable input ($\overline{E}$), and four mutually exclusive outputs. On the CD4555B the outputs are high on select; on the CD4556B the outputs are low on select.

When the Enable input is high, the outputs of the CD4555B remain low and the outputs of the CD4556B remain high regardless of the state of the select inputs A and B. The CD4555B and CD4556B are similar to types MC14555 and MC14556, respectively.

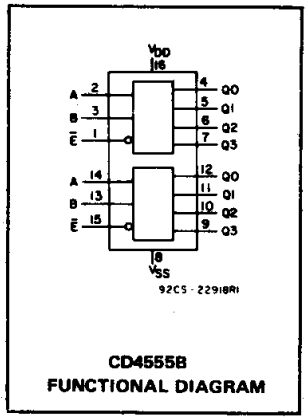
The CD4555B and CD4556B types are supplied in 16-lead hermetic dual-in-line ceramic packages (D and F suffixes), 16-lead dual-in-line plastic packages (E suffix), and in chip form (H suffix). The CD4555B is also supplied in the 16-lead small-outline package (NSR suffix).

Features:

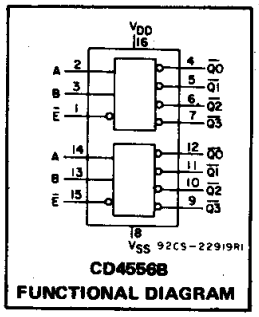
- Expandable with multiple packages
- Standard, symmetrical output characteristics
- 100% tested for quiescent current at 20 V
- Maximum input current of 1 μA at 18 V over full package temperature range; 100 nA at 18 V and 25°C
- Noise margin (full package-temperature range): 1 V at V_{DD} = 5 V, 2 V at V_{DD} = 10 V, 2.5 V at V_{DD} = 15 V
- 5-V, 10-V, and 15-V parametric ratings
- Meets all requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

Applications:

- Decoding
- Code conversion
- Demultiplexing (using Enable input as a data input)
- Memory chip-enable selection
- Function selection



CD4555B
FUNCTIONAL DIAGRAM

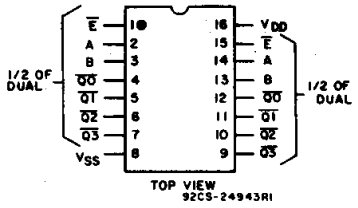


CD4556B
FUNCTIONAL DIAGRAM

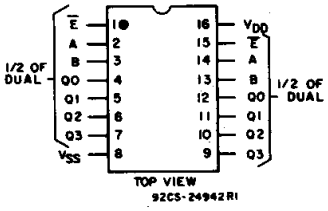
RECOMMENDED OPERATING CONDITIONS
For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges.

CHARACTERISTIC	V_{DD}	MIN.	MAX.	UNITS
Supply Voltage Range (For T_A = Full Package Temp. Range)	–	3	18	V

TERMINAL ASSIGNMENTS



CD4556B



CD4555B

MAXIMUM RATINGS, *Absolute-Maximum Values:*

DC SUPPLY-VOLTAGE RANGE, (V_{DD})
Voltages referenced to V_{SS} Terminal) ..... -0.5V to +20V
INPUT VOLTAGE RANGE, ALL INPUTS ..... -0.5V to V_{DD} +0.5V
DC INPUT CURRENT, ANY ONE INPUT ..... ±10mA
POWER DISSIPATION PER PACKAGE (P_D):
For T_A = -55°C to +100°C 500mW
For T_A = +100°C to +125°C ..... Derate Linearity at 12mW/°C to 200mW
DEVICE DISSIPATION PER OUTPUT TRANSISTOR
FOR T_A = FULL PACKAGE-TEMPERATURE RANGE (All Package Types)..... 100mW
OPERATING-TEMPERATURE RANGE (T_A) .....-55°C to +125°C
STORAGE TEMPERATURE RANGE (T_{stg}) .....-65°C to +150°C
LEAD TEMPERATURE (DURING SOLDERING):
At distance 1/16 ± 1/32 inch (1.59 ± 0.79mm) from case for 10s max ..... +265°C

STATIC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	CONDITIONS			LIMITS AT INDICATED TEMPERATURES (°C)							UNITS
								+25			
	V_O (V)	V_{IN} (V)	V_{DD} (V)	−55	−40	+85	+125	Min.	Typ.	Max.	
Quiescent Device Current, I_{DD} Max.	–	0,5	5	5	5	150	150	–	0.04	5	μA
	–	0,10	10	10	10	300	300	–	0.04	10	
	–	0,15	15	20	20	600	600	–	0.04	20	
	–	0,20	20	100	100	3000	3000	–	0.08	100	
Output Low (Sink) Current I_{OL} Min.	0.4	0,5	5	0.64	0.61	0.42	0.36	0.51	1	–	mA
	0.5	0,10	10	1.6	1.5	1.1	0.9	1.3	2.6	–	
	1.5	0,15	15	4.2	4	2.8	2.4	3.4	6.8	–	
Output High (Source) Current, I_{OH} Min.	4.6	0,5	5	−0.64	−0.61	−0.42	−0.36	−0.51	−1	–	
	2.5	0,5	5	−2	−1.8	−1.3	−1.15	−1.6	−3.2	–	
	9.5	0,10	10	−1.6	−1.5	−1.1	−0.9	−1.3	−2.6	–	
	13.5	0,15	15	−4.2	−4	−2.8	−2.4	−3.4	−6.8	–	
Output Voltage: Low-Level, V_{OL} Max.	–	0,5	5	0.05				–	0	0.05	V
	–	0,10	10	0.05				–	0	0.05	
	–	0,15	15	0.05				–	0	0.05	
Output Voltage: High-Level, V_{OH} Min.	–	0,5	5	4.95				4.95	5	–	
	–	0,10	10	9.95				9.95	10	–	
	–	0,15	15	14.95				14.95	15	–	
Input Low Voltage, V_{IL} Max.	0.5,4.5	–	5	1.5				–	–	1.5	
	1,9	–	10	3				–	–	3	
	1.5,13.5	–	15	4				–	–	4	
Input High Voltage, V_{IH} Min.	0.5,4.5	–	5	3.5				3.5	–	–	
	1,9	–	10	7				7	–	–	
	1.5,13.5	–	15	11				11	–	–	
Input Current I_{IN} Max.		0,18	18	±0.1	±0.1	±1	±1	–	$\pm 10^{-5}$	±0.1	μA

DYNAMIC ELECTRICAL CHARACTERISTICS *at T_A = 25° C; Input t_r, t_f = 20 ns, C_L = 50 pF, R_L = 200 KΩ*

CHARACTERISTIC	TEST CONDITIONS	LIMITS		UNITS
	V_{DD} Volts	TYP.	MAX.	
Propagation Delay Time, t_{PHL}, t_{PLH} A or B Input to Any Output	5	220	440	ns
	10	95	190	
	15	70	140	
$\overline{E}$ Input to Any Output	5	200	400	ns
	10	85	170	
	15	65	130	
Transition Time t_{THL}, t_{TLH}	5	100	200	ns
	10	50	100	
	15	40	80	
Input Capacitance C_{IN}	Any Input	5	7.5	pF

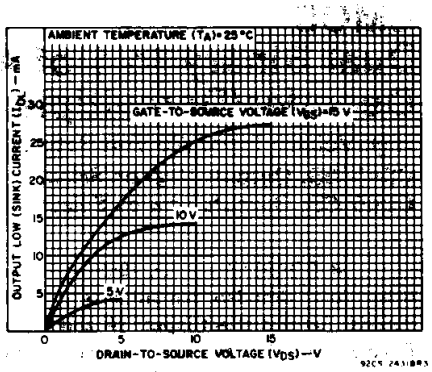


Fig. 1 – Typical output low (sink) current characteristics.

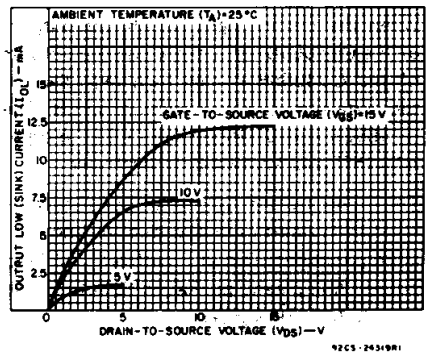


Fig. 2 – Minimum output low (sink) current characteristics.

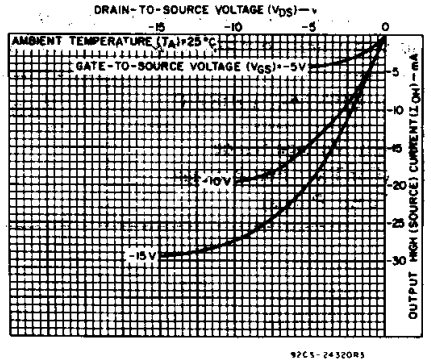


Fig. 3 – Typical output high (source) current characteristics.

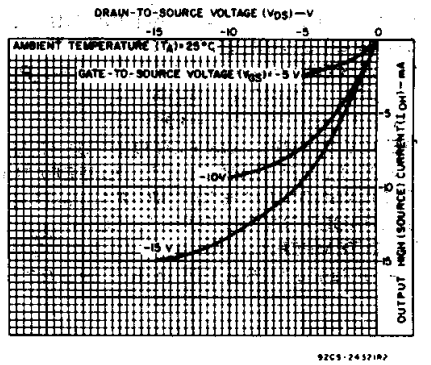


Fig. 4 – Minimum output high (source) current characteristics.

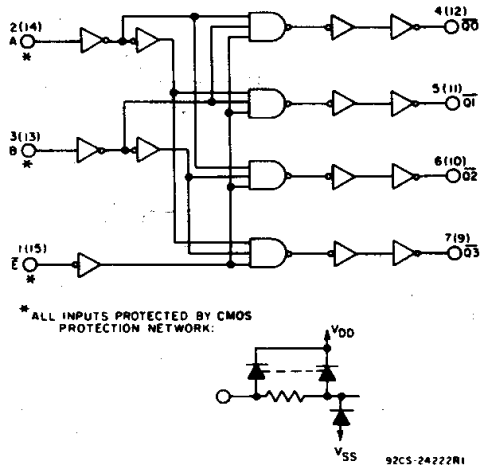


Fig. 5 – CD4556B logic diagram (1 of 2 identical circuits).

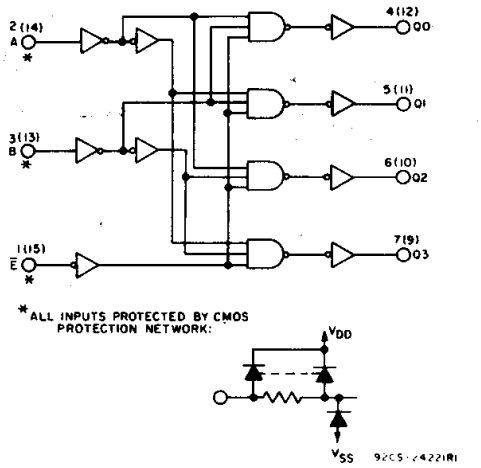


Fig. 6 – CD4555B logic diagram (1 of 2 identical circuits).

TRUTH TABLE

INPUTS ENABLE	SELECT		OUTPUTS CD4555B				OUTPUTS CD4556B			
$\bar{E}$	B	A	Q3	Q2	Q1	Q0	$\bar{Q3}$	$\bar{Q2}$	$\bar{Q1}$	$\bar{Q0}$
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

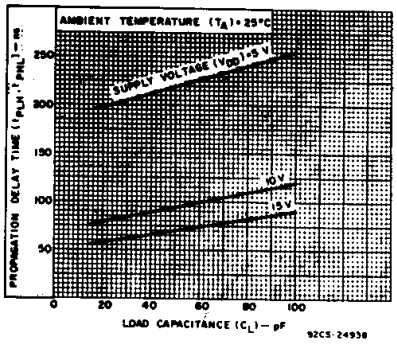


Fig. 7 – Typical propagation delay time vs. load capacitance (A or B input to any output).

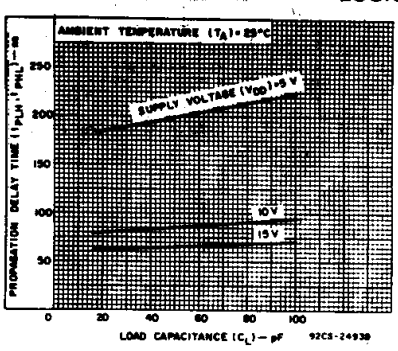


Fig. 8 – Typical propagation delay time vs. load capacitance (E input to any output).

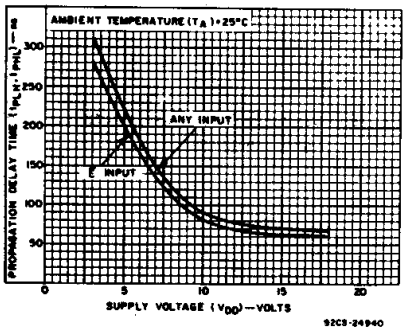


Fig. 9 – Typical propagation delay time vs. supply voltage.

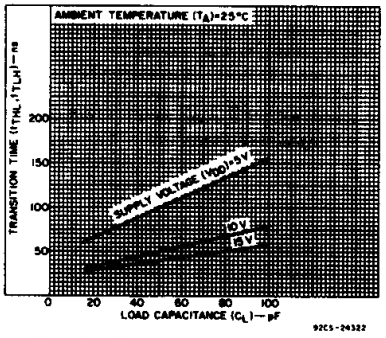


Fig. 10 – Typical transition time vs. load capacitance.

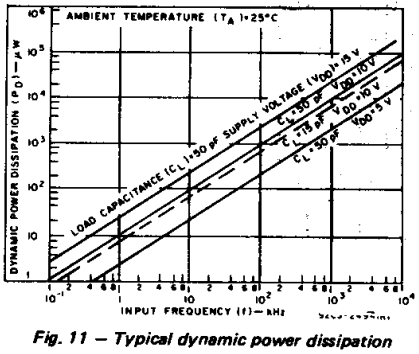


Fig. 11 – Typical dynamic power dissipation vs. frequency.

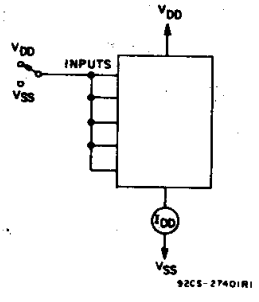


Fig. 12 – Quiescent device current test circuit.

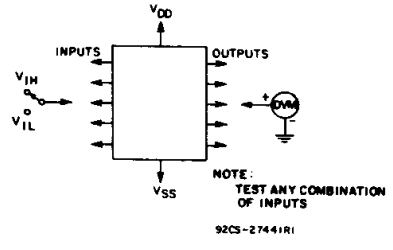


Fig. 13 – Input voltage test circuit.

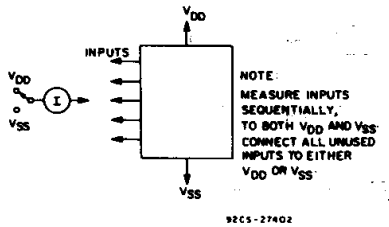


Fig. 14 – Input current test circuit.

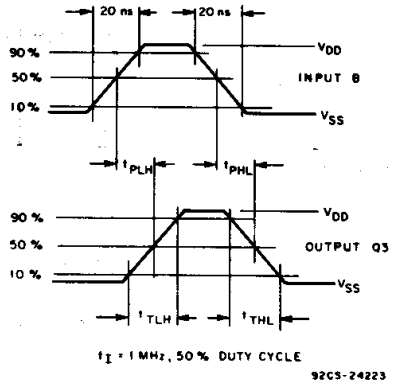


Fig. 15 – CD4555B B input to Q3 output dynamic signal waveforms.

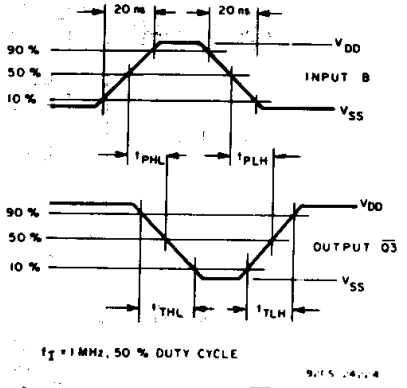


Fig. 16 – CD4556B B input to $\overline{Q3}$ output dynamic signal waveforms.

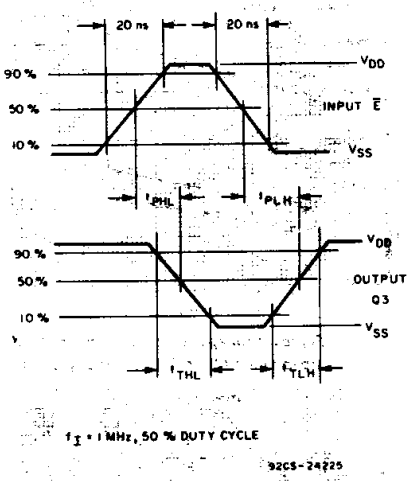


Fig. 17 – CD4555B $\overline{E}$ input to Q3 output dynamic signal waveforms.

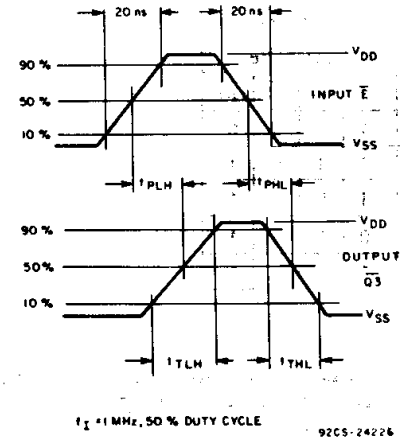
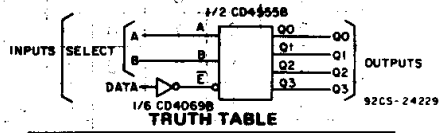


Fig. 18 – CD4556B $\overline{E}$ input to $\overline{Q_3}$ output dynamic signal waveforms.

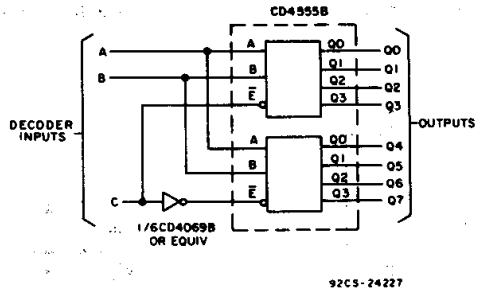
APPLICATIONS



TRUTH TABLE

SELECT INPUTS		OUTPUTS			
B	A	Q0	Q1	Q2	Q3
0	0	DATA	0	0	0
0	1	0	DATA	0	0
1	0	0	0	DATA	0
1	1	0	0	0	DATA

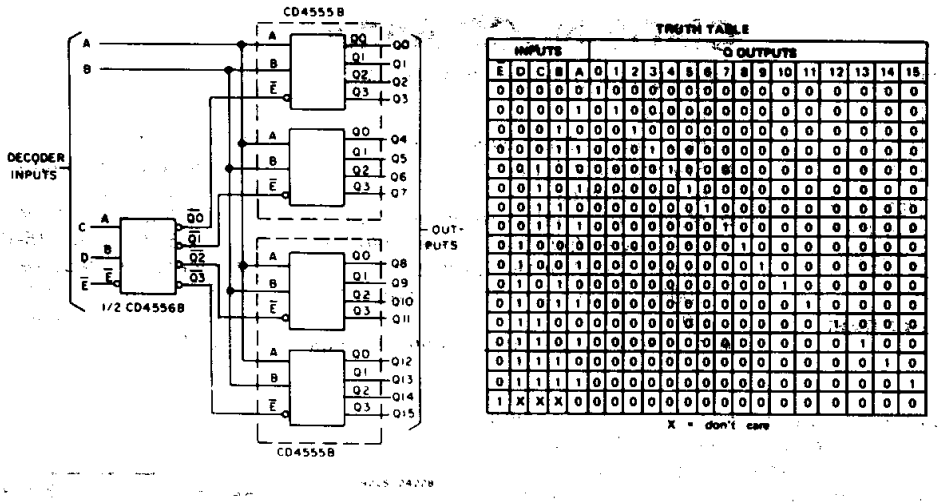
Fig. 19 – 1-of-4 line data demultiplexer using CD4555B.



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

Fig. 20 – 1-of-8 decoder using CD4555B.

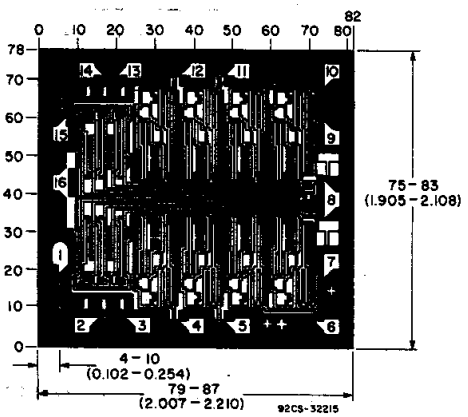


TRUTH TABLE

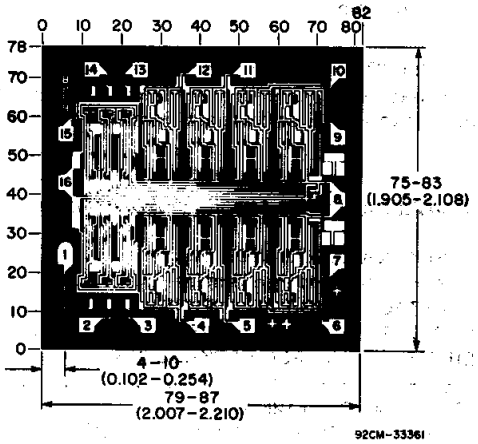
INPUTS				Q OUTPUTS															
E	D	C	B	A	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0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

X = don't care

Fig. 21 — 1-of-16 decoder using CD4555B and CD4556B.



DIMENSIONS AND PAD LAYOUT FOR CD4555BH.



DIMENSIONS AND PAD LAYOUT FOR CD4556BH.

Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils (10^{-3} inch).

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