CMOS BCD-TO-DECIMAL DECODER

FEATURES

- BCD-to-Decimal or Binary-to-Octal Decoding
- Buffered Outputs go High on Selection
- Low Outputs for all Illegal Input Combinations

DESCRIPTION

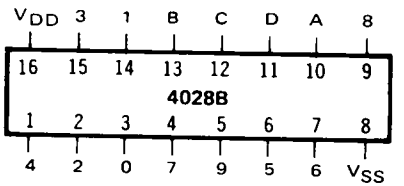
The 4028B types are BCD-to-Decimal or Binary-to-Octal Decoders consisting of pulse shaping circuits on all 4 inputs, decoding/logic gates, and 10 output buffers. A BCD code applied to the four inputs, A to D, results in a high level at the selected one of 10 decimal decoded outputs. Similarly, a 3-bit binary code applied to inputs A through C is decoded in octal code at output 0 to 7. A high-level signal at the D input inhibits octal decoding and causes outputs 0 through 7 to go low. If unused, the D input must be connected to V_{SS}.

Expanded decoding such as binary-to-hexadecimal (1-of-16), etc., can be achieved by using other 4028B devices. This part is useful for code conversion, address decoding, memory selection control, demultiplexing, and readout decoding.

TRUTH TABLE

Input				Output									
D	C	B	A	9	8	7	6	5	4	3	2	1	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	1	0
0	0	1	0	0	0	0	0	0	0	0	1	0	0
0	0	1	1	0	0	0	0	0	0	1	0	0	0
0	1	0	0	0	0	0	0	0	1	0	0	0	0
0	1	0	1	0	0	0	0	1	0	0	0	0	0
0	1	1	0	0	0	0	1	0	0	0	0	0	0
0	1	1	1	0	0	1	0	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	0	0	0	0
1	0	0	1	1	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	0	0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	1	0	0	0	0	0	0	0	0	0	0
1	1	1	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0

CONNECTION DIAGRAM
(all packages)



Add suffix for package:

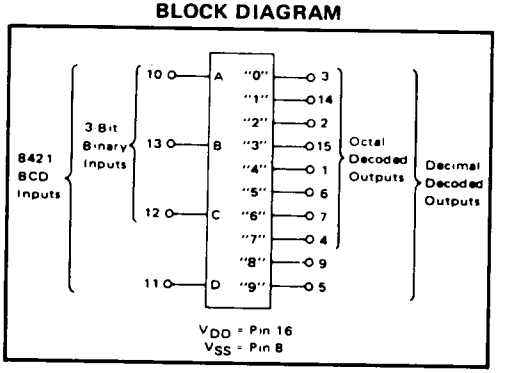
C	16-pin Cerdip
D	16-pin Ceramic
E	16-pin Epoxy
F	16-pin Flat
H	Chip

RECOMMENDED OPERATING CONDITIONS

For maximum reliability:

DC Supply Voltage	$V_{DD} - V_{SS}$	3 to 15	Vdc
Operating Temperature	T_A		
C, D, F, H Device		-55 to +125	°C
E Device		-40 to +85	°C

BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS

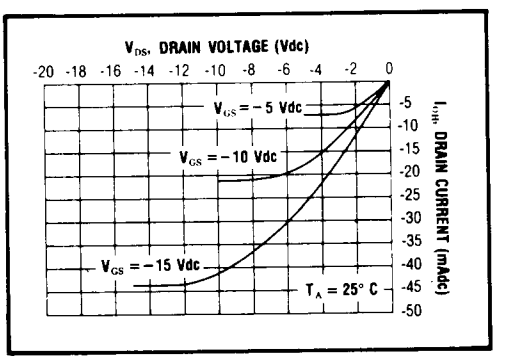
STATIC CHARACTERISTICS [1]

PARAMETER		V_{DD} (Vdc)	CONDITIONS	T_{LOW} [2]		+25°C			T_{HIGH} [2]		Units
				Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
QUIESCENT DEVICE CURRENT	I_{DD}	5	$V_{IN}=V_{SS}$ or V_{DD}	–	5	—	0.05	5	–	150	μAdc
		10	All valid input	–	10	—	0.1	10	–	300	
		15	combinations	–	20	—	0.2	20	–	600	

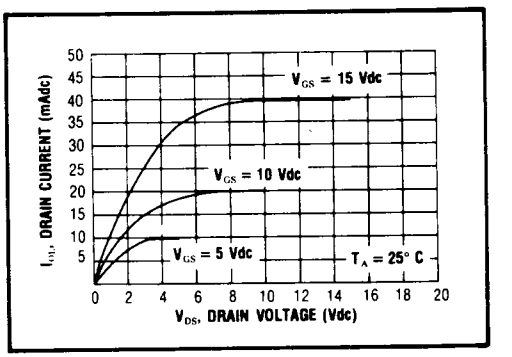
NOTES: [1] Remaining Static Electrical Characteristics are listed under "4000B Series Family Specifications".
[2] T_{LOW} = -55°C for C, D, F, H device.
= -40°C for E device.
T_{HIGH} = +125°C for C, D, F, H device.
= + 85°C for E device.

DYNAMIC CHARACTERISTICS (C_L = 50pF, T_A = 25°C)

PARAMETER		V_{DD} (Vdc)	Min.	Typ.	Max.	Units
PROPAGATION DELAY TIME	t_{PLH}, t_{PHL}	5	–	150	300	ns
		10	–	60	120	
		15	–	50	100	
OUTPUT TRANSITION TIME	t_{TLH}, t_{THL}	5	–	90	180	ns
		10	–	50	100	
		15	–	40	80	

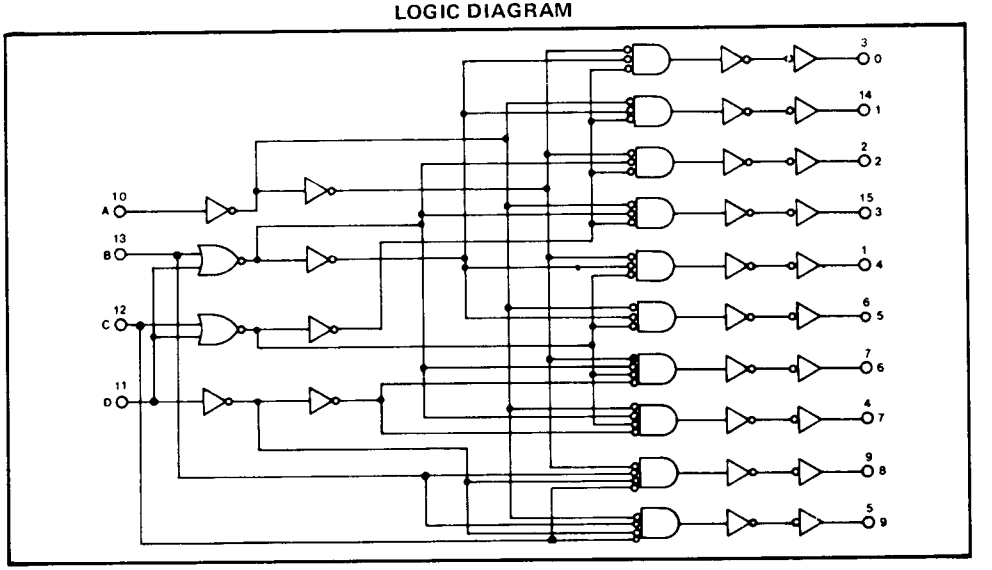


Typical P-Channel
Source Current Characteristics



Typical N-Channel
Sink Current Characteristics

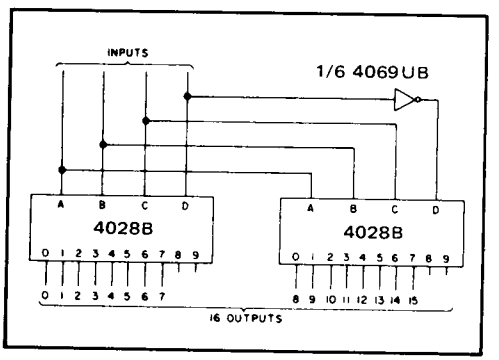
LOGIC DIAGRAM



APPLICATIONS INFORMATION

CODE CONVERSION CIRCUIT

The circuit shown here converts any 4-bit code to a decimal or hexadecimal code. The table shows a number of codes and the decimal or hexadecimal number in these codes which must be applied to the input terminals of the 4028B to select a particular output. For example: in order to get a "high" on output No. 8 the input must be either an 8 expressed in 4-Bit Binary code, a 15 expressed in 4-Bit Gray code, or a 5 expressed in Excess-3 code.



INPUTS				INPUT CODES							OUTPUT NUMBER																
				Hexa Decimal		Decimal																					
D	C	B	A	4 BIT BINARY	4 BIT GRAY	EXCESS 3	EXCESS 3 GRAY	AIKEN	4 2 2 1		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0			0	0		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	1			1	1		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	2	3		0	2	2		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	3	2	0	3	3			0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	4	7	1	4	4			0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
0	1	0	1	5	6	2				3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
0	1	1	0	6	4	3	1			4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	1	1	1	7	5	4	2				0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
1	0	0	0	8	15	5					0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1	0	0	1	9	14	6				5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
1	0	1	0	10	12	7	9			6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
1	0	1	1	11	13	8		5			0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
1	1	0	0	12	8	9	5	6			0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
1	1	0	1	13	9		6	7	7		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
1	1	1	0	14	11		8	8	8		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
1	1	1	1	15	10		7	9	9		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Code Conversion Chart

6-BIT BINARY TO 1-OF-64 ADDRESS DECODER