

**MNCD4028BM-X REV 1A0**

 Original Creation Date: 10/10/95  
 Last Update Date: 05/14/98  
 Last Major Revision Date: 11/08/96

**BCD-TO-DECIMAL DECODER**
**General Description**

The CD4028BM is a BCD-to-decimal or binary-to-octal decoder consisting of 4 inputs, decoding logic gates, and 10 output buffers. A BCD code applied to the 4 inputs, A, B, C, and D, results in a high level at the selected 1-of-10 decimal decoded outputs. Similarly, a 3-bit binary code applied to inputs A, B, and C is decoded in octal at outputs 0-7. A high level signal at the D input inhibits octal decoding and causes outputs 0-7 to go low.

All inputs are protected against static discharge damage by diode clamps to Vdd and Vss.

**Industry Part Number**

CD4028BM

**NS Part Numbers**

 CD4028BMJ/883  
 CD4028BMW/883

**Prime Die**

CD4028BM

**Processing**

MIL-STD-883, Method 5004

**Quality Conformance Inspection**

MIL-STD-883, Method 5005

Subgrp	Description	Temp ( °C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

**Features**

- Wide supply voltage range 3.0V to 15V
- High noise immunity 0.45V<sub>DD</sub> (typ.)
- Low power TTL Fan out of 2 driving 74L  
compatibility or 1 driving 74LS
- Low power
- Glitch free outputs
- "Positive logic" on inputs and outputs

**Applications**

- Code Conversion
- Address decoding
- Indicator-tube decoder

**(Absolute Maximum Ratings)**

(Note 1, 2)

Supply Voltage (Vdd)	-0.5 to +18V
Input Voltage (Vin)	-0.5 to Vdd +0.5V
Storage Temperature Range (Ts)	-65 C to +150 C
Power Dissipation (Pd)	
Dual-In-Line	700mW
Small Outline	500mW
Lead Temperature (Tl)	
(Soldering, 10 seconds)	260 C

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed; they are not meant to imply that the devices should be operated at these limits. The table of "Recommended Operating Conditions" and "Electrical Characteristics" provides conditions for actual device operation.

Note 2: Vss = 0V unless otherwise specified.

**Recommended Operating Conditions**

(Note 1)

Supply Voltage (Vdd)	3 to 15V
Input Voltage (Vin)	0 to Vdd V
Operating Temperature Range (TA)	
CD4028BM	-55 C to +125 C

Note 1: Vss = 0V unless otherwise specified.

## Electrical Characteristics

### DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)  
DC:  $V_{SS} = 0V$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Icc	Power Supply Current	Vdd = 5V, Vih = 5V, Vil = 0V			5		uA	1, 3
					150		uA	2
		Vdd = 10V, Vih = 10V, Vil = 0V			10		uA	1, 3
					300		uA	2
		Vdd = 15V, Vih = 15V, Vil = 0V			20		uA	1, 3
					600		uA	2
Voh	Logical "1" Output Voltage	Vdd = 5V, Vih = 5V, Vil = 0V, Iout = 0mA			4.95		V	1, 2, 3
					9.95		V	1, 2, 3
					14.95		V	1, 2, 3
Vol	Logical "0" Output Voltage	Vdd = 5V, Vih = 5V, Vil = 0V, Iout = 0uA			0.05		V	1, 2, 3
					0.05		V	1, 2, 3
					0.05		V	1, 2, 3
Iih	Logical "1" Input Current	Vdd = 15V, Vin = 15V (all inputs tied)			100		nA	1, 3
					1000		nA	2
Iil	Logical "0" Input Current	Vdd = 15V, Vin = 0V (all inputs tied)			-100		nA	1, 3
					-1000		nA	2
Isource	Output Source Current	Vdd = 5V, Vih = 5V, Vil = 0V, Vout = 0V			-1		mA	1
					-0.7		mA	2
					-1.1		mA	3
Isink	Output Sink Current	Vdd = 5V, Vih = 5V, Vil = 0V, Vout = 5V			1		mA	1
					0.7		mA	2
					1.1		mA	3
Vih	Logical "1" Input Voltage	Vdd = 5V, Vout = 4.5V (min)	1		3.5		V	1, 2, 3
		Vdd = 10V, Vout = 9V (min)	1		7		V	1, 2, 3
		Vdd = 15V, Vout = 13.5V (min)	1		11		V	1, 2, 3

## Electrical Characteristics

### DC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)  
DC:  $V_{SS} = 0V$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vil	Logical "0" Input Voltage	Vdd = 5V, Vout = 0.5V (max)	1			1.5	V	1, 2, 3
		Vdd = 10V, Vout = 1V (max)	1			3	V	1, 2, 3
		Vdd = 15V, Vout = 1.5V (max)	1			4	V	1, 2, 3
Ioh	Logical "1" Output Current	Vdd = 5V, Vih = 5V, Vil = 0V, Vout = 4.6V			-200		uA	1
					-140		uA	2
					-250		uA	3
		Vdd = 10V, Vih = 10V, Vil = 0V, Vout = 9.5V			-500		uA	1
					-350		uA	2
					-620		uA	3
		Vdd = 15V, Vih = 15V, Vil = 0V, Vout = 13.5V			-1.5		mA	1
					-1.1		mA	2
					-1.8		mA	3
Iol	Logical "0" Output Current	Vdd = 5V, Vih = 5V, Vil = 0V, Vout = 0.4V			510		uA	1
					360		uA	2
					640		uA	3
		Vdd = 10V, Vih = 10V, Vil = 0V, Vout = 0.5V			1.3		mA	1
					0.9		mA	2
					1.6		mA	3
		Vdd = 15V, Vih = 15V, Vil = 0V, Vout = 1.5V			3.5		mA	1
					2.4		mA	2
					4.2		mA	3

## Electrical Characteristics

### AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)  
 AC: CL = 50pF, RL = 200K, Input tr = tf = 20nS

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tPHL	Propagation Delay Time:	Vcc = 5V	3			480	nS	9
			3			670	nS	10
			3			385	nS	11
		Vcc = 10V	2			200	nS	9
			2			280	nS	10
			2			160	nS	11
		Vcc = 15V	2			140	nS	9
			2			195	nS	10
			2			110	nS	11
tPLH	Propagation Delay Time:	Vcc = 5V	3			480	nS	9
			3			670	nS	10
			3			385	nS	11
		Vcc = 10V	2			200	nS	9
			2			280	nS	10
			2			160	nS	11
		Vcc = 15V	2			140	nS	9
			2			195	nS	10
			2			110	nS	11
tTHL	Transition Time	Vcc = 5V				350	nS	9
		Vcc = 10V	2			150	nS	9
		Vcc = 15V	2			110	nS	9
tTLH	Transition Time	Vcc = 5V				350	nS	9
		Vcc = 10V	2			150	nS	9
		Vcc = 15V	2			110	nS	9
Cin	Input Capacitance	Bench Tested 8123HR (Dip)	4			7.5	pF	9

- Note 1: Vout is measured with inputs at Vih, Vil.
- Note 2: Guaranteed parameter not tested.
- Note 3: Tested at 25 C; guaranteed but not tested at +125 C and -55 C.
- Note 4: Tested for initial qual, or requal only.

**Revision History**

Rev	ECN #	Rel Date	Originator	Changes
1A0	M0000532	05/14/98	Linda Collins	Converted from RETS4028BX rev. 7B to MDS MN4028BM-X rev. 1A0. Deleted the DC Rad Hard stress tests and the Drift values.