



## MICROCIRCUIT DATA SHEET

**MNCD4060BM-X REV 1A0**

Original Creation Date: 10/10/95  
Last Update Date: 05/19/98  
Last Major Revision Date: 03/05/98

### 14-STAGE RIPPLE CARRY BINARY COUNTERS

#### General Description

The CD4060BM are 14-stage ripple carry binary counters. The counters are advanced one count on the negative transition of each clock pulse. The counters are reset to the zero state by a logical "1" at the reset input independent of clock.

#### Industry Part Number

CD4060BM

#### NS Part Numbers

CD4060BMJ-MIL  
CD4060BMW-MIL

#### Prime Die

CD4060BM

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#### 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 1.0V 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
- Medium speed operation 8MHz typ. at V<sub>dd</sub> = 10V
- Schmitt trigger clock input

**(Absolute Maximum Ratings)**

(Note 1, 2)

Supply Voltage (Vdd)	-0.5V to +18V
Input Voltage (Vin)	-0.5V 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**

Supply Voltage (Vdd)	+3V to +15V
Input Voltage (Vin)	0V to Vdd
Operating Temperature Range (TA)	
CD4060BM	-55 C to +125 C

## 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
Vol	Logical "0" Output Voltage	Vdd = 5V, Vih = 5V, Vil = 0V, Iout = 0uA				0.05	V	1, 2, 3
		Vdd = 10V, Vih = 10V, Vil = 0V, Iout = 0uA				0.05	V	1, 2, 3
		Vdd = 15V, Vih = 15V, Vil = 0V, Iout = 0uA				0.05	V	1, 2, 3
Voh	Logical "1" Output Voltage	Vdd = 5V, Vih = 5V, Vil = 0V, Iout = 0uA			4.95		V	1, 2, 3
		Vdd = 10V, Vih = 10V, Vil = 0V, Iout = 0uA			9.95		V	1, 2, 3
		Vdd = 15V, Vih = 15V, Vil = 0V, Iout = 0uA			14.95		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
Ioh	Logical "1" Output Current	Vdd = 5V, Vih = 5V, Vil = 0V, Vout = 4.6V			-0.51		mA	1
					-0.36		mA	2
					-0.64		mA	3
		Vdd = 10V, Vih = 10V, Vil = 0V, Vout = 9.5V			-1.3		mA	1
					-0.9		mA	2
					-1.6		mA	3
		Vdd = 15V, Vih = 15V, Vil = 0V, Vout = 13.5V			-3.4		mA	1
					-2.4		mA	2
					-4.2		mA	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
I <sub>ol</sub>	Logical "0" Output Current	V <sub>dd</sub> = 5V, V <sub>ih</sub> = 5V, V <sub>il</sub> = 0V, V <sub>out</sub> = 0.4V			0.51		mA	1
					0.36		mA	2
					0.64		mA	3
		V <sub>dd</sub> = 10V, V <sub>ih</sub> = 10V, V <sub>il</sub> = 0V, V <sub>out</sub> = 0.5V			1.3		mA	1
					0.9		mA	2
					1.6		mA	3
		V <sub>dd</sub> = 15V, V <sub>ih</sub> = 15V, V <sub>il</sub> = 0V, V <sub>out</sub> = 1.5V			3.4		mA	1
					2.4		mA	2
					4.2		mA	3
I <sub>cc</sub>	Power Supply Current	V <sub>dd</sub> = 5V, V <sub>ih</sub> = 5V, V <sub>il</sub> = 0V				5	uA	1, 3
						150	uA	2
		V <sub>dd</sub> = 10V, V <sub>ih</sub> = 10V, V <sub>il</sub> = 0V				10	uA	1, 3
						300	uA	2
		V <sub>dd</sub> = 15V, V <sub>ih</sub> = 15V, V <sub>il</sub> = 0V				20	uA	1, 3
						600	uA	2
V <sub>ih</sub>	Logical "1" Input Voltage	V <sub>cc</sub> = 5V, V <sub>out</sub> = 4.5V (min)	1		3.5		V	1, 2, 3
		V <sub>cc</sub> = 10V, V <sub>out</sub> = 9V (min)	1		7		V	1, 2, 3
		V <sub>cc</sub> = 15V, V <sub>out</sub> = 13.5V (min)	1		11		V	1, 2, 3
V <sub>il</sub>	Logical "0" Input Voltage	V <sub>cc</sub> = 5V, V <sub>out</sub> = 0.5V (max)	1			1.5	V	1, 2, 3
		V <sub>cc</sub> = 10V, V <sub>out</sub> = 1V (max)	1			3	V	1, 2, 3
		V <sub>cc</sub> = 15V, V <sub>out</sub> = 1.5V (max)	1			4	V	1, 2, 3

## Electrical Characteristics

### AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)  
 AC:  $C_l = 50\text{pF}$ ,  $R_l = 200\text{K}$ ,  $t_r = t_f = 20\text{nS}$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tPHL	Propagation Delay Time: To Q4	Vdd = 5V	2			1300	nS	9
			2			1820	nS	10
			2			1040	nS	11
		Vdd = 10V	2			525	nS	9
			2			735	nS	10
			2			420	nS	11
		Vdd = 15V	2			400	nS	9
			2			560	nS	10
			2			320	nS	11
tPLH	Propagation Delay Time: To Q4	Vdd = 5V	2			1300	nS	9
			2			1820	nS	10
			2			1040	nS	11
		Vdd = 10V	2			525	nS	9
			2			735	nS	10
			2			420	nS	11
		Vdd = 15V	2			400	nS	9
			2			560	nS	10
			2			320	nS	11
tPHL	Interstage Propagation Delay Time: From Qn to Qn+1	Vdd = 5V	2			330	nS	9
			2			460	nS	10
			2			265	nS	11
		Vdd = 10V	2			125	nS	9
			2			175	nS	10
			2			100	nS	11
		Vdd = 15V	2			90	nS	9
			2			125	nS	10
			2			70	nS	11

## Electrical Characteristics

### AC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)  
 AC:  $C_l = 50\text{pF}$ ,  $R_l = 200\text{K}$ ,  $t_r=t_f=20\text{nS}$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tPLH	Interstage Propagation Delay Time: From Qn to Qn+1	Vdd = 5V	2			330	nS	9
			2			460	nS	10
			2			265	nS	11
		Vdd = 10V	2			125	nS	9
			2			175	nS	10
			2			100	nS	11
		Vdd = 15V	2			90	nS	9
			2			125	nS	10
			2			70	nS	11
tTHL	Transition Time	Vdd = 5V	2			200	nS	9
		Vdd = 10V	2			100	nS	9
		Vdd = 15V	2			80	nS	9
tTLH	Transition Time	Vdd = 5V	2			200	nS	9
		Vdd = 10V	2			100	nS	9
		Vdd = 15V	2			80	nS	9
tWL	Minimum Clock Pulse Width	Vdd = 5V	2			500	nS	9
		Vdd = 10V	2			170	nS	9
		Vdd = 15V	2			125	nS	9
tWH	Minimum Clock Pulse Width	Vdd = 5V	2			500	nS	9
		Vdd = 10V	2			170	nS	9
		Vdd = 15V	2			125	nS	9
fCL	Maximum Clock Frequency	Vdd = 5V	2		1		MHz	9
		Vdd = 10V	2		3		MHz	9
		Vdd = 15V	2		4		MHz	9

## Electrical Characteristics

### AC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)  
 AC:  $C_1 = 50\text{pF}$ ,  $R_1 = 200\text{K}$ ,  $t_r = t_f = 20\text{nS}$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tPHL(R)	Reset Propagation	Vdd = 5V	2			450	nS	9
			2			630	nS	10
			2			360	nS	11
		Vdd = 10V	2			210	nS	9
			2			295	nS	10
			2			170	nS	11
		Vdd = 15V	2			170	nS	9
			2			240	nS	10
			2			135	nS	11
tWH(R)	Minimum Reset Pulse Width	Vdd = 5V	2			450	nS	9
		Vdd = 10V	2			210	nS	9
		Vdd = 15V	2			170	nS	9
Cin	Average Input Capacitance	Any Inputs	2			7.5	pF	9

Note 1: Parameter tested go-no-go only.  
 Note 2: Guaranteed parameter, not tested.



**Revision History**

Rev	ECN #	Rel Date	Originator	Changes
1A0	M0000538	05/19/98	Linda Collins	Converted from RETS4060BX rev. 5C to MDS MNCD4060BM-X rev. 1A0. Deleted the Drift values.