

MNCD4053BM-X REV 1A0

Original Creation Date: 05/23/96
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TRIPLE 2-CHANNEL ANALOG MULTIPLEXER/DEMULTIPLEXER
General Description

These analog multiplexers/demultiplexers are digitally controlled analog switches having low "ON" impedance and very low "OFF" leakage currents. Control of analog signals up to 15Vp-p can be achieved by digital signal amplitudes of 3-15V. For example, if Vdd = 5V, Vss = 0V and Vee = -5V, analog signals from -5V to +5V can be controlled by digital inputs of 0-5V. The multiplexer circuits dissipate extremely low quiescent power over the full Vdd-Vss and Vdd-Vee supply voltage ranges, independent of the logic state of the control signals. When a logical "1" is present at the inhibit input terminal all channels are "OFF".

CD4053BM is a triple 2-channel multiplexer having three separate digital control inputs, A, B, and C, and an inhibit input. Each control input selects one of a pair of channels which are connected in a single-pole double-throw configuration.

Industry Part Number

CD4053BM

NS Part Numbers

CD4053BMJ/883
CD4053BMW/883

Prime Die

MM4653

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 range of digital and analog signal levels: digital 3-15V, analog to 15Vp-p
- Low "ON" resistance: 80 Ohms (typ.) over entire 15Vp-p signal-input range for Vdd-Vee = 15V
- High "OFF" resistance: channel leakage of ± 10 pA (typ.) at Vdd-Vee = 10V
- Logic level conversion for digital addressing signals of 3-15V (Vdd-Vss = 3-15V) to switch analog signals to 15Vp-p (Vdd-Vee = 15V)
- Matched switch characteristics: $\Delta R_{ON} = 5$ Ohms (typ.) for Vdd-Vee = 15V
- Very low quiescent power dissipation under all digital-control input and supply conditions: 1 μ W (typ.) at Vdd-Vss = Vdd-Vee = 10V
- Binary address decoding on chip

(Absolute Maximum Ratings)

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

Recommended Operating Conditions

DC Supply Voltage (VDD)	+5Vdc to +15Vdc
Input Voltage (Vin)	0V to Vdd Vdc
Operating Temperature Range (TA)	
CD4053BM	-55 C to +125 C

Electrical Characteristics

DC PARAMETERS

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Iih	Logical "1" Input Current	Vdd = 15V, Vin = 15V, Vee = 0V				100	nA	1, 3
						1000	nA	2
Iil	Logical "0" Input Current	Vdd = 15V, Vin = 0V, Vee = 0V				-100	nA	1, 3
						-1000	nA	2
Ioff1	Off Channel Leakage Current	Vdd = +7.5V, Vee = -7.5V, Vin (Inhibit) = 7.5V, Vin (I/O) = 7.5V, Meas. Vout (O/I) = 0V				-200	nA	1, 3
						-2000	nA	2
		Vdd = 7.5V, Vee = -7.5V, Vin (Inhibit) = 7.5V, Vin (I/O) = -7.5V, Meas. Vout (O/I) = 0V				+200	nA	1, 3
						+2000	nA	2
Ioff2	Off Channel Leakage Current	Vdd = 7.5V, Vee = -7.5V, Vin (Inhibit) = 7.5V, Vout (O/I) = 7.5V, Meas. Vin (I/O) = 0V				-50	nA	1, 3
						-500	nA	2
		Vdd = 7.5V, Vee = -7.5V, Vin (Inhibit) = 7.5V, Vout (O/I) = -7.5V, Meas. Vin (I/O) = 0V				+50	nA	1, 3
						+500	nA	2
Ron	ON Resistance	Vdd = 5V, Vee = 0V, Vin (I/O) = 2.5V, Iout = IoutA (min), Vout = (O/I) = 3.10V				2500	Ohms	1
						2000	Ohms	3
		Vdd = 5V, Vee = 0V, Vin (I/O) = 2.5V, Iout = IoutA (min), Vout = (O/I) = 2.9V				3500	Ohms	2
		Vdd = 10V, Vee = 0V, Vin (I/O) = 5V, Iout = IoutB (min), Vout (O/I) = 5.6V				400	Ohms	1
						310	Ohms	3
		Vdd = 10V, Vee = 0V, Vin (I/O) = 5V, Iout = IoutB (min), Vout (O/I) = 5.40V				580	Ohms	2
IoutA	ON Resistance	Vdd = 15V, Vee = 0V, Vin = (I/O) = 7.5V, Iout = IoutC (min), Vout (O/I) = 8.10V				280	Ohms	1
						220	Ohms	3
		Vdd = 15V, Vee = 0V, Vin (I/O) = 7.5V, Iout = IoutC (min), Vout (O/I) = 7.9V				400	Ohms	2
						0.24	mA	1
						0.12	mA	2
IoutB	ON Resistance					0.30	mA	3
						1.5	mA	1
						0.69	mA	2
						1.94	mA	3

Electrical Characteristics

DC PARAMETERS (Continued)

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IoutC	ON Resistance				2.14		mA	1
					1.00		mA	2
					2.72		mA	3
Idd	Quiescent Device Current	Vdd = 5V				5	uA	1, 3
						150	uA	2
		Vdd = 10V				10	uA	1, 3
						300	uA	2
		Vdd = 15V				20	uA	1, 3
						600	uA	2
Vih	Logical "1" Input Voltage	Vdd = 5V	1		3.5		V	1, 2, 3
		Vdd = 10V	1		7		V	1, 2, 3
		Vdd = 15V	1		11		V	1, 2, 3
Vil	Logical "0" Input Voltage	Vdd = 5V	1			1.5	V	1, 2, 3
		Vdd = 10V	1			3	V	1, 2, 3
		Vdd = 15V	1			4	V	1, 2, 3

Electrical Characteristics

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)

AC: $C_l = 50\text{pF}$, $R_l = 1\text{K Ohms}$, $V_{ee} = V_{ss} = 0\text{V}$, or equivalent impedance provided by diode load.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tPHL	Propagation Delay Time:	Vdd = 5V, Signal Input to Signal Output	3			55	nS	9
			3			80	nS	10
			3			45	nS	11
		Vdd = 10V, Signal Input to Signal Output	2			35	nS	9
			2			50	nS	10
			2			30	nS	11
		Vdd = 15V, Signal Input to Signal Output	2			25	nS	9
			2			35	nS	10
			2			20	nS	11
		Vdd = 5V, Address Input to Signal Output	3			1000	nS	9
			3			1400	nS	10
			3			800	nS	11
		Vdd = 10V, Address Input to Signal Output	2			360	nS	9
			2			505	nS	10
			2			290	nS	11
		Vdd = 15V, Address Input to Signal Output	2			240	nS	9
			2			335	nS	10
			2			190	nS	11

Electrical Characteristics

AC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: $C_1 = 50\text{pF}$, $R_1 = 1\text{K Ohms}$, $V_{ee} = V_{ss} = 0\text{V}$, or equivalent impedance provided by diode load.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tPLH	Propagation Delay Time:	Vdd = 5V, Signal Input to Signal Output	3			55	nS	9
			3			80	nS	10
			3			45	nS	11
		Vdd = 10V, Signal Input to Signal Output	2			35	nS	9
			2			50	nS	10
			2			30	nS	11
		Vdd = 15V, Signal Input to Signal Output	2			25	nS	9
			2			35	nS	10
			2			20	nS	11
		Vdd = 5V, Address Input to Signal Output	3			1000	nS	9
			3			1400	nS	10
			3			800	nS	11
		Vdd = 10V, Address Input to Signal Output	2			360	nS	9
			2			505	nS	10
			2			290	nS	11
		Vdd = 15V, Address Input to Signal Output	2			240	nS	9
			2			335	nS	10
			2			190	nS	11
tPZH	Turn-On Time	Vdd = 5V	3			1200	nS	9
			3			1800	nS	10, 11
		Vdd = 10V	2			450	nS	9
			2			675	nS	10, 11
		Vdd = 15V	2			320	nS	9
tPZL	Turn-On Time	Vdd = 5V	2			480	nS	10, 11
			3			1200	nS	9
		Vdd = 10V	3			1800	nS	10, 11
			2			450	nS	9
		Vdd = 15V	2			675	nS	10, 11
		Vdd = 5V	2			320	nS	9
			3			480	nS	10, 11
		Vdd = 10V	2			320	nS	9
			3			480	nS	10, 11
		Vdd = 15V	2			320	nS	9

Electrical Characteristics

AC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)

AC: $C_1 = 50\text{pF}$, $R_1 = 1\text{K Ohms}$, $V_{ee} = V_{ss} = 0\text{V}$, or equivalent impedance provided by diode load.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tPHZ	Turn-Off Time	Vdd = 5V	3			420	nS	9
			3			630	nS	10, 11
		Vdd = 10V	2			200	nS	9
			2			300	nS	10, 11
		Vdd = 15V	2			150	nS	9
			2			225	nS	10, 11
tPLZ	Turn-Off Time	Vdd = 5V	3			420	nS	9
			3			630	nS	10, 11
		Vdd = 10V	2			200	nS	9
			2			300	nS	10, 11
		Vdd = 15V	2			150	nS	9
			2			225	nS	10, 11
Cin	Average Input Capacitance	Control Input	2			7.5	pF	9
		Signal (In/Out) input	2			15	pF	9
		Continuity Tests	4					9, 10, 11

Note 1: Parameter tested go-no-go only.

Note 2: Guaranteed parameter not tested.

Note 3: Tested at 25 C; guaranteed but not tested at +125 C and -55 C.

Note 4: Engineering setup tests, no limits.