CD4052

CMOS Single 8-Channel Analog Multiplexer or Demultiplexer With Logic-Level Conversion

1. General Description

1.1 Description

The CD4052 series analog multiplexers and demultiplexers are digitally-controlled analog switches having low ON impedance and very low OFF leakage current. These multiplexer circuits dissipate extremely low quiescent power over the full V_{DD}–V_{SS} and V_{DD}-V_{EE} supply voltage ranges, independent of the logic state of the control signals.

1.2 Features

- Wide range of digital and analog signal levels:
  Digital: 3V to 18V
  Analog: ≤ 18V_{P-P}
- Low ON resistance,80Ω (Typ) over 15V_{P-P} signal input range for V_{DD}-V_{EE} = 18V
- High OFF resistance,channel leakage of ±100pA (Typ) at V_{DD}-V_{EE} = 18V
- Binary address decoding on chip
- 100% tested for quiescent current at 18V
- 5V,10V, and 15V parametric ratings
- Break-before-make switching eliminates channel overlap

1.3 Device Information

PART NUMBER	PACKAGE
CD4052	DIP
	SOP
	TSSOP

2. Pin Description and Functional Diagram

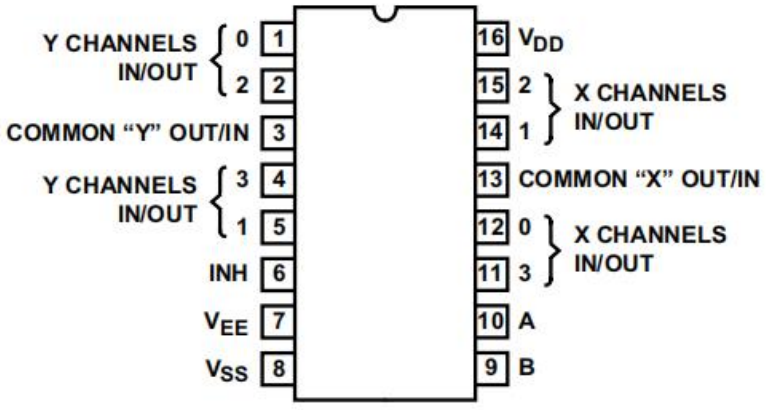


Figure 2.1: Top View

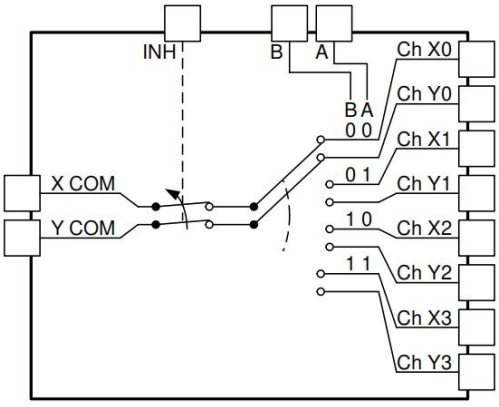


Figure 2.2: Functional Diagram

PIN No.	NAME	I/O	FUNCTION
1	Y CH 0 IN/OUT	I/O	Channel Y0 In/Out
2	Y CH 2 IN/OUT	I/O	Channel Y2 In/Out
3	Y COM OUT/IN	I/O	Y Common Out/In
4	Y CH 3 IN/OUT	I/O	Channel Y3 In/Out
5	Y CH 1 IN/OUT	I/O	Channel Y1 In/Out
6	INH	I	Disables All Channels
7	VEE		Negative Power Input
8	VSS		Ground
9	B	I	Channel Select B
10	A	I	Channel Select A
11	X CH 3 IN/OUT	I/O	Channel X3 In/Out
12	X CH 0 IN/OUT	I/O	Channel X0 In/Out
13	X COM OUT/IN	I/O	X Common Out/In
14	X CH 1 IN/OUT	I/O	Channel X1 In/Out
15	X CH 2 IN/OUT	I/O	Channel X2 In/Out
16	VDD		Positive Power Input

3. System Diagram

3.1 Logic Diagram

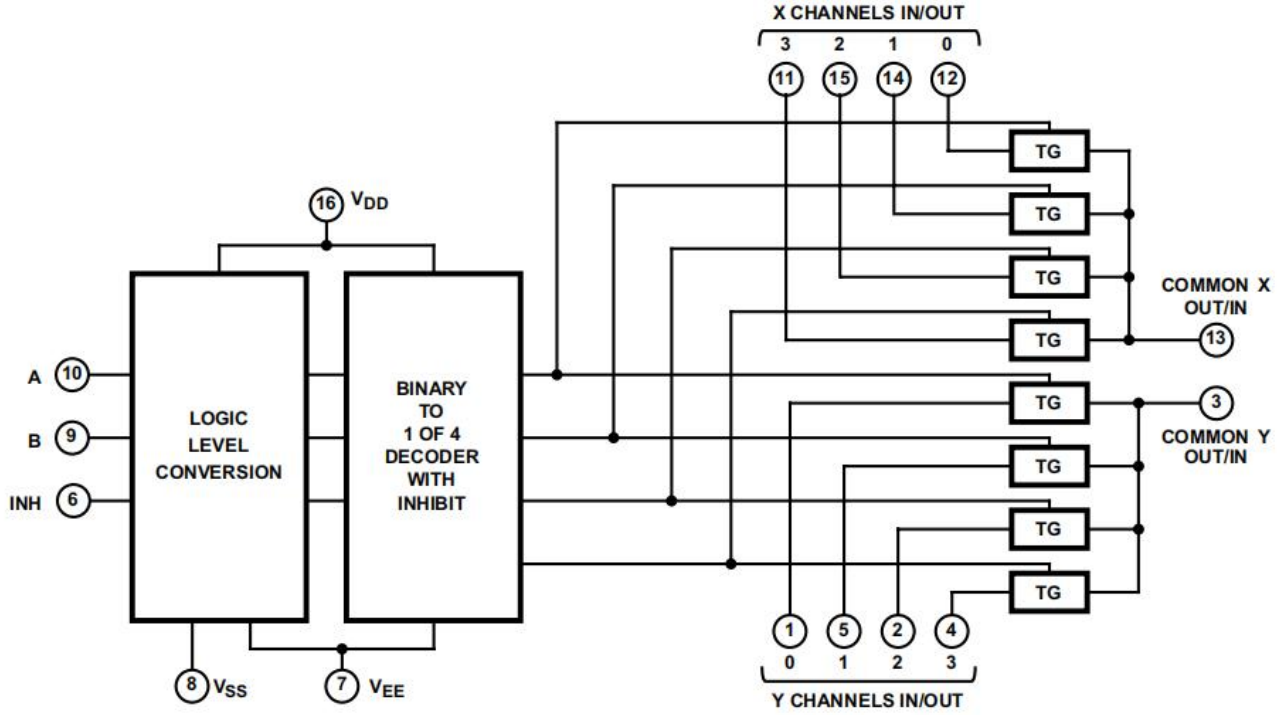


Figure 3.1：CD4052 Logic Diagram

3.2 Truth Table

Input State			On Channel(s)
INHIBIT	B	A	
0	0	0	0x,0y
0	0	1	1x,1y
0	1	0	2x,2y
0	1	1	3x,3y
1	X	X	None

X = don't care, 1≡High State, 0≡Low State

4. Specifications

4.1 Absolute Maximum Ratings

Symbol	Parameter	MIN	MAX	Unit
V_{DD}	DC Supply Voltage Range (Voltage Referenced to VSS Terminals)	-0.5	20	V
V_I	Input Voltage Range, All Inputs	0.5	VDD+0.5	V
T_J	Junction Temperature		125	℃
T_{OP}	Operating Temperature	-40	85	℃

Absolute maximum ratings are those values beyond which the device could be permanently damaged,These are stress ratings only,which do not imply functional operation of the device at these or any other conditions beyond those indicated under normal operating conditions.

4.2 Electrical Characteristics

(T_a=25℃, V_{SUPPLY}=±5 V, and R_L=100 Ω,unless otherwise specified)

Symbol	Parameter	Test Condition				MIN	TYP	MAX	Unit
		VIS	VEE	VSS	VDD				
I_{DD}	Supply Current	--	0	0	5	--	0	1	uA
		--	0	0	10	--	0	1	uA
		--	0	0	18	--	0	2	uA
r_{ON}	Drain to Source ON Resistance ($0≤V_{IS}≤V_{DD}$)	--	0	0	5	--	200	500	Ω
		--	0	0	10	--	100	300	Ω
		--	0	0	15	--	80	240	Ω
Δr_{ON}	Change in ON Resistance(Between Any Two Channels)	--	0	0	5	--	10	--	Ω
		--	0	0	10	--	10	--	Ω
		--	0	0	15	--	10	--	Ω
I_{OFF}	OFF Channel Leakage Current (Any Channel OFF or ALL Channels OFF)	--	0	0	18	--	0	±2	uA

Symbol	Parameter	Test Condition				MIN	TYP	MAX	Unit
		VIS	VEE	VSS	VDD				
I_{ON}	ON Channel Leakage Current (Any Channel ON or ALL Channels ON)	5 or 0	-5	0	10.5	--	--	±2	uA
		5	0	0	18	--	--	±2	uA
V_{IL}	Low Level Input Voltage	--	--	--	5	--	--	0.8	V
		--	--	--	10	--	--	0.8	V
		--	--	--	15	--	--	0.8	V
V_{IH}	High Level Input Voltage	--	--	--	5	3.5	--	--	V
		--	--	--	10	7	--	--	V
		--	--	--	15	11	--	--	V
I_{IN}	Input Leakage Current	V_{IN}=0,18			18	--	0	±2	uA

5. Parameter Measurement Information

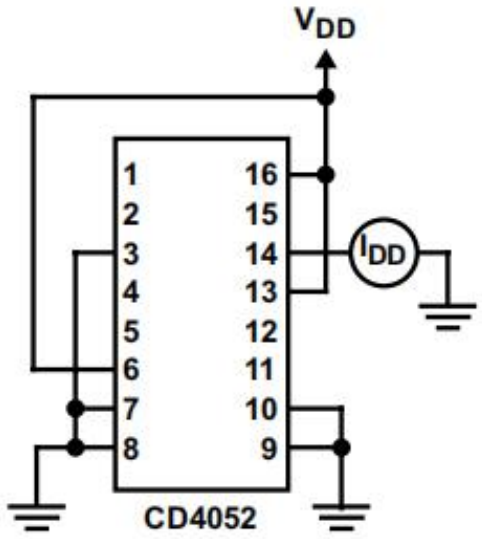


Figure 5.1: OFF Channel Leakage Current – Any Channel OFF

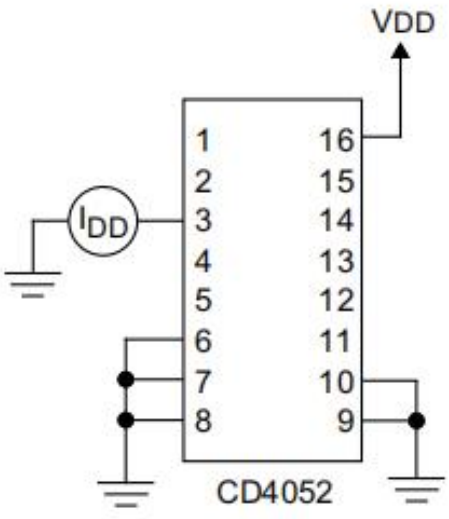


Figure 5.2: ON Channel Leakage Current – Any Channel ON

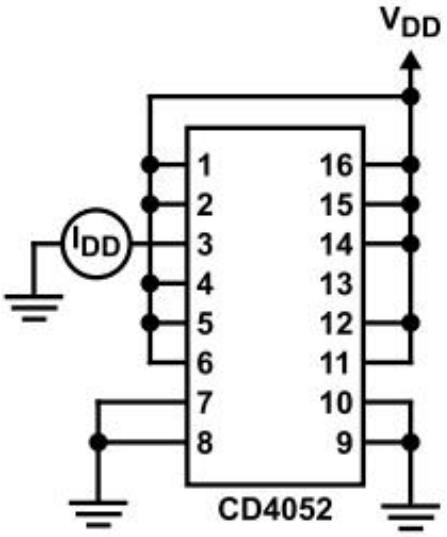


Figure 5.3: OFF Channel Leakage Current – All Channels OFF

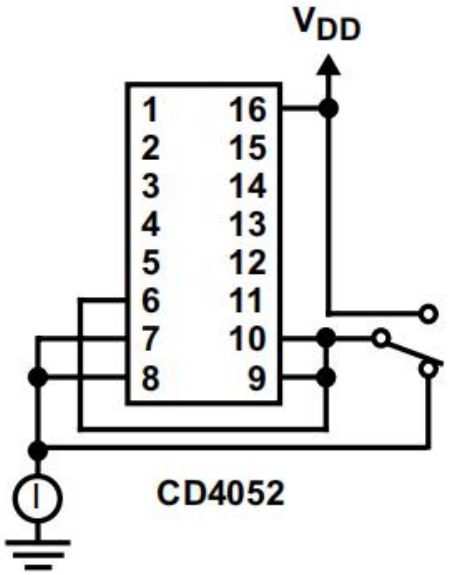


Figure 5.4: Quiescent Device Current

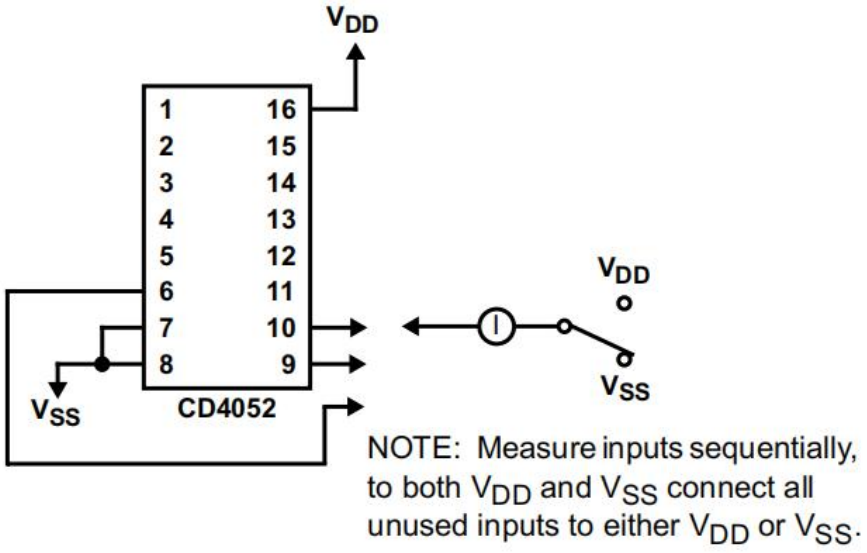


Figure 5.5: Input Current

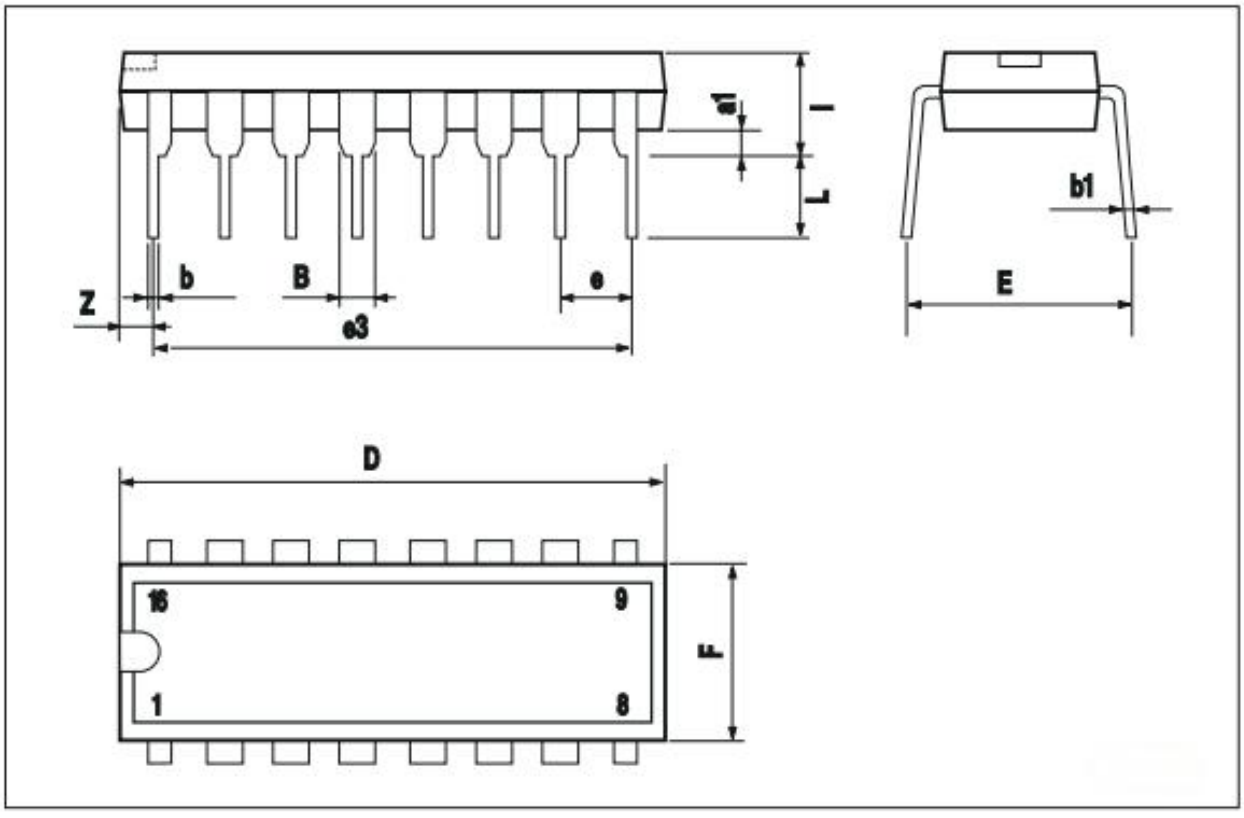
6. Ordering Information

Orderable Device	Package Type	Pins	Packing	Package Qty
CD4052ND16ATBE	DIP	16	Tube	25
CD4052NS16ARDQ	SOP	16	Tape & Reel	4000
CD4052TS16ARDQ	TSSOP	16	Tape & Reel	4000

7. Package Information

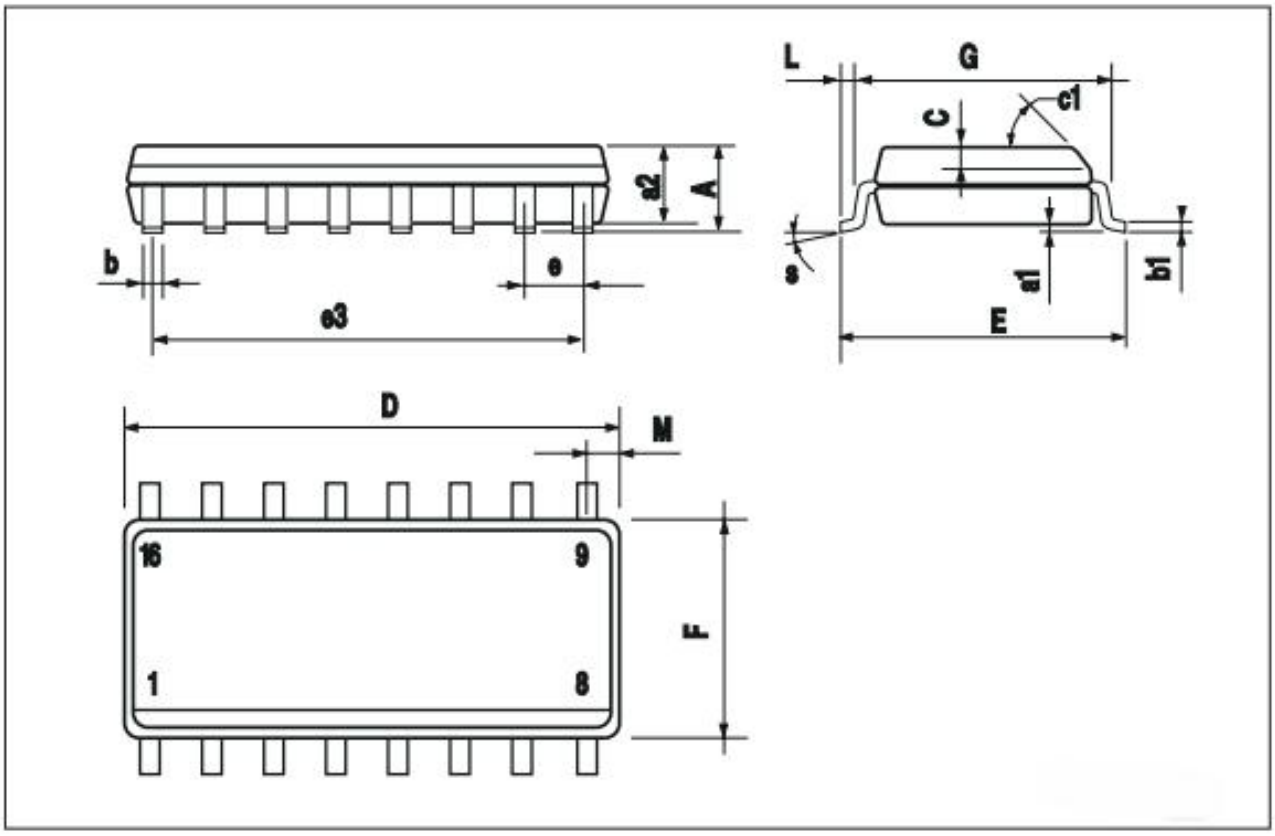
7.1 DIP16

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



7.2 SOP16

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.068
a1	0.1		0.25	0.004		0.010
a2			1.64			0.063
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					



7.3 TSSOP16

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0079
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030