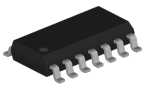
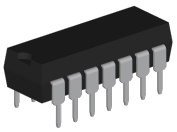
CMOS Quad Bilateral Switch CD4066B

FEATURES

- Wide Operating Voltage Range of 3.0V to 18.0V
- Maximum Input Current of 1μA at 18V over Full Package-Temperature range, 100nA at 18V and 25°C
- Standardized Symmetrical Output Characteristics
- Noise Margin
  - 1.0V min @ 5.0V supply
  - 2.0V min @ 10.0V supply
  - 2.5V min @ 15.0V supply



SOP-14



DIP-14

ORDERING INFORMATION

Device	Package
CD4066BD	SOP-14
CD4066BN	DIP-14

DESCRIPTION

The CD4066B device is a quad bilateral switch intended for the transmission or multiplexing of analog or digital signals. In addition, the on-state resistance is relatively constant over the full signal input range.

The CD4066B device consists of four bilateral switches, each with independent controls. Both the p and the n devices in a given switch are biased on or off switch is tied to either the input (when the switch is on) or to V_{SS} (when the switch is off). This configuration eliminates the variation of the switch-transistor threshold voltage with input signal and, thus, keeps the on-state resistance low over the full operating-signal range.

The advantages over single-channel switches include peak input-signal voltage swings equal to the full supply voltage and more constant on-state impedance over the input-signal range.

ABSOLUTE MAXIMUM RATINGS (Note 1)

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
DC Supply Voltage (Referenced to V_{SS})	V_{DD}	−0.5	20	V
Digital Input Voltage (Referenced to V_{SS})	V_{IN}	−0.5	V_{DD} + 0.5	V
Analog Input Voltage (Referenced to V_{SS})	V_{IS}	−0.5	V_{DD} + 0.5	V
Analog Output Voltage (Referenced to V_{SS})	V_{OS}	−0.5	V_{DD} + 0.5	V
DC Input Current	I_{IN}	-	±10	mA
Storage Temperature	T_{STG}	−65	150	°C

Note1. Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS (Note 2)

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage (Referenced to V_{SS})	V_{DD}	3	18	V
Digital Input Voltage (Referenced to V_{SS})	V_{IN}	0	V_{DD}	V
Analog Input Voltage (Referenced to V_{SS})	V_{IS}	0	V_{DD}	V
Operating Free-Air Temperature Range	T_A	−55	125	°C

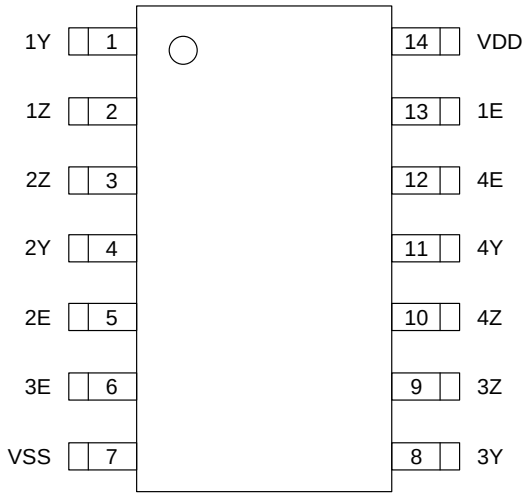
Note 2. The device is not guaranteed to function outside its operating ratings.

ORDERING INFORMATION

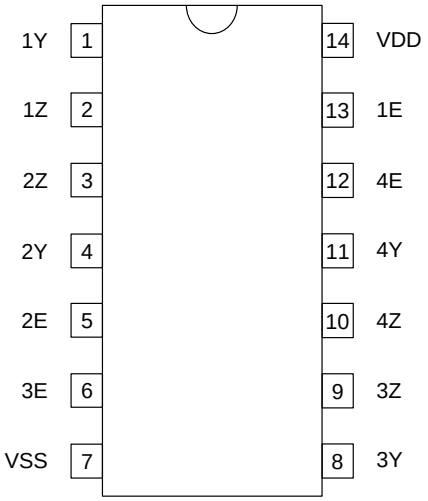
Package	Order No.	Description	Supplied As	Status
SOP-14	CD4066BD	Quad Bilateral Switch	Tape & Reel	Active
DIP-14	CD4066BN	Quad Bilateral Switch	Tube	Active

PIN CONFIGURATION

SOP-14



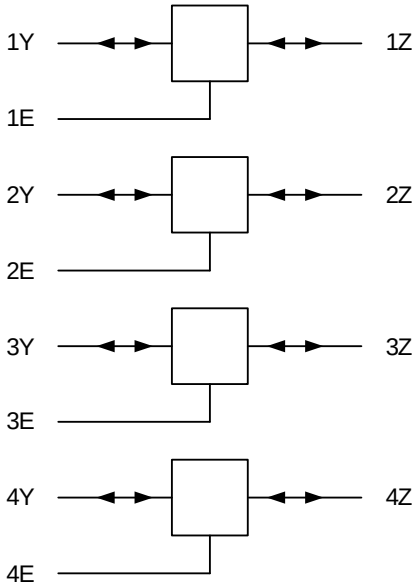
DIP-14



PIN DESCRIPTION

Pin No.		Pin Name	Pin Function
SOP-14	DIP-14		
1	1	1Y	Analog Input/Output for Switch 1
2	2	1Z	Analog Output/Input for Switch 1
3	3	2Z	Analog Output/Input for Switch 2
4	4	2Y	Analog Input/Output for Switch 2
5	5	2E	ON/OFF (Enable) Control for Switch 2
6	6	3E	ON/OFF (Enable) Control for Switch 3
7	7	VSS	Low Power Supply
8	8	3Y	Analog Input/Output for Switch 3
9	9	3Z	Analog Output/Input for Switch 3
10	10	4Z	Analog Output/Input for Switch 4
11	11	4Y	Analog Input/Output for Switch 4
12	12	4E	ON/OFF (Enable) Control for Switch 4
13	13	1E	ON/OFF (Enable) Control for Switch 1
14	14	VDD	Power Supply

BLOCK DIAGRAM



DC ELECTRICAL CHARACTERISTICS

Voltages referenced to V_{SS}.

SYMBOL	PARAMETER	TEST CONDITION	V_{DD}	Limit			UNIT
				−55°C	25°C	125°C	
V_{IH}	Minimum High-Level Input Voltage, ON/OFF Control Inputs	R_{ON} = Per Spec	5 V	3.5	3.5	3.5	V
			10 V	7	7	7	
			15 V	11	11	11	
V_{IL}	Maximum Low-Level Input Voltage, ON/OFF Control Inputs	R_{ON} = Per Spec	5 V	1	1	1	V
			10 V	2	2	2	
			15 V	2	2	2	
I_{IN}	Maximum Input Leakage Current, On/Off Control Inputs	V_{IN} = V_{DD} or V_{SS}	18 V	±0.1	±0.1	±1.0	μA
I_{DD}	Maximum Quiescent Supply Current (Per Package)	V_{IN} = V_{DD} or V_{SS}	5 V	0.25	0.25	7.5	μA
			10 V	0.5	0.5	15	
			15 V	1.0	1.0	30	
			20 V	5.0	5.0	150	
R_{ON}	Maximum On-State Resistance	V_{IN} = V_{DD}, R_L = 10kΩ returned to (V_{DD}−V_{SS})/2, V_{IS} = V_{SS} to V_{DD}	5 V	800	1050	1300	Ω
			10 V	310	400	550	
			15 V	200	240	320	
ΔR_{ON}	Maximum Difference in On-State Resistance between Any Two Channels	V_{IN} = V_{DD}, R_L = 10 kΩ	5 V	-	15	-	Ω
			10 V	-	10	-	
			15 V	-	5	-	
I_{OFF}	Maximum Off-Channel Leakage Current	V_{IN} = V_{SS}, $\lvert V_{IS} - V_{OS} \rvert$ = V_{DD} − V_{SS}	18 V	±0.1	±0.1	±1.0	μA
I_{ON}	Maximum On-Channel Leakage Current	V_{IN} = V_{DD}, V_{IS} = V_{DD} or V_{SS}	18 V	±0.1	±0.1	±1.0	μA
V_{OS}	Switch Output Voltage	V_{IS} = V_{SS}	5 V	-	-	0.4	V
			10 V	-	-	0.5	
			15 V	-	-	1.5	
		V_{IS} = V_{DD}	5 V	4.6	-	-	V
			10 V	9.5	-	-	
			15 V	13.5	-	-	
I_{IS}	Switch Input Current	V_{IS} = V_{SS}	5 V	0.64	0.51	0.36	mA
			10 V	1.6	1.3	0.9	
			15 V	4.2	3.4	2.4	
		V_{IS} = V_{DD}	5 V	−0.64	−0.51	−0.36	mA
			10 V	−1.6	−1.3	−0.9	
			15 V	−4.2	−3.4	−2.4	

AC ELECTRICAL CHARACTERISTICS

Voltages referenced to V_{SS}, C_L = 50 pF, R_L = 200kΩ, Input $t_r = t_f$ = 20 ns

SYMBOL	PARAMETER		V_{DD}	Limit			UNIT
				−55°C	25°C	125°C	
t_{PLH}, t_{PHL}	Maximum Propagation Delay, Analog Input to Analog Output (Figure 1)		5 V	40	40	80	ns
			10 V	20	20	40	
			15 V	15	15	30	
t_{PLZ}, t_{PHZ}, t_{PZL}, t_{PZH}	Maximum Propagation Delay, ON/OFF Control to Analog Output (Figure 2)		5 V	70	70	140	ns
			10 V	40	40	80	
			15 V	30	30	60	
C_{IO}	Capacitance	ON/OFF Control Input	-	-	15	-	pF
		Analog I/O (Control Input = V_{SS})	-	-	7.5	-	
		Feedthrough (Control Input = V_{SS})	-	-	0.6	-	

ADDITIONAL DYNAMIC CHARACTERISTICS

Voltages referenced to GND and T_A=25°C unless otherwise noted. Guaranteed by design.

SYMBOL	PARAMETER	TEST CONDITION	V_{DD}	TYP	UNIT
THD	Total Harmonic Distortion	$V_{IN} = V_{DD}$, V_{SS} = −5V, R_L = 10kΩ, f_{IS} = 1kHz sine wave	5 V	0.4	%
-	−3dB Cutoff Frequency (Switch On)	$V_{IN} = V_{DD}$, V_{SS} = −5V, R_L = 1kΩ	5 V	40	MHz
-	−50dB Feedthrough Frequency (Switch Off)	V_{IN} = GND, V_{IS} = 5V, R_L = 1kΩ	10 V	1	MHz
-	−50dB Crosstalk Frequency	V_{IN}(A) = V_{DD} = 5V, V_{IN}(B) = V_{SS} = −5V, V_{IS}(A) = $5V_{p-p}$, 50Ω source, R_L = 1kΩ	5 V	8	MHz
-	Crosstalk (Control Input to Signal Output)	V_{IN} = 10V (square wave), R_L = 10kΩ, t_r, t_f = 20ns	10 V	50	mV
-	Maximum Control Input Repetition Rate	$V_{IS} = V_{DD}$, V_{SS} = GND, R_L = 1kΩ, C_L = 50pF, V_{IN} = 10V (square wave centered on 5V), t_r, t_f = 20ns, V_{OS} = 1/2 V_{OS} at 1kHz	5 V	6	MHz
			10 V	9	
			15 V	9.5	

FUNCTION TABLE

ON/OFF Control	Switch
L	OFF (Hi-Z)
H	ON

SWITCHING CHARACTERISTICS

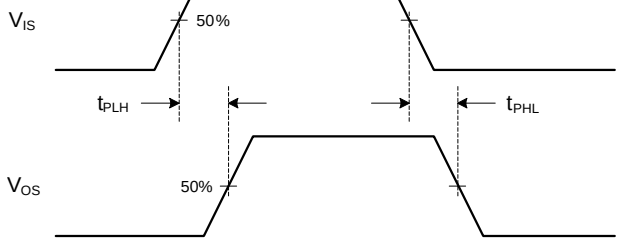


Fig. 1. Analog In to Analog Out

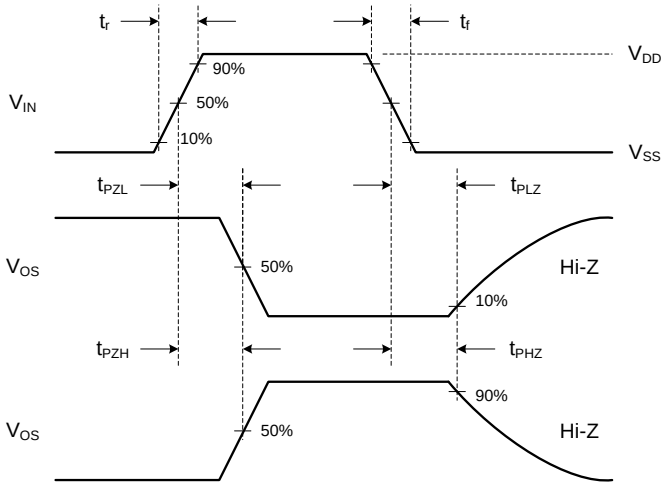


Fig. 2. ON/OFF Control to Analog Out

TYPICAL OPERATING CHARACTERISTICS

T.B.D.

REVISION NOTICE

The description in this datasheet is subject to change without any notice to describe its electrical characteristics properly.