

CMOS Quad Bilateral Switch

FEATURES

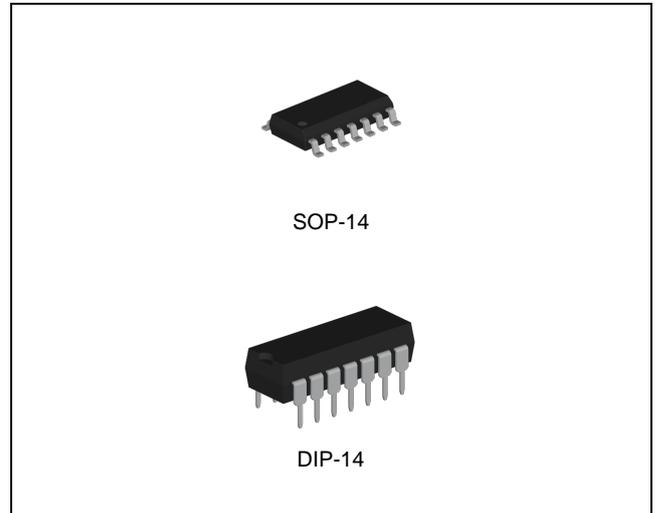
- Wide Operating Voltage Range of 3.0V to 18.0V
- Maximum Input Current of 1 μ A at 18V over Full Package-Temperature range, 100nA at 18V and 25°C
- Standardized Symmetrical Output Characteristics
- Noise Margin
 - 1.0V min @ 5.0V supply
 - 2.0V min @ 10.0V supply
 - 2.5V min @ 15.0V supply

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.

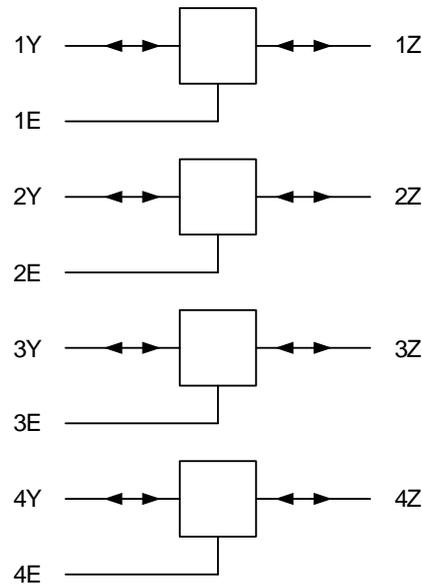
The advantages over single-channel switches include peak input-signal voltage swings equal to the full supply voltage and more constant on-state impedance over the input-signal range.



ORDERING INFORMATION

DEVICE	Package Type	MARKING	Packing	Packing Qty
CD4066BE	DIP14	CD4066B	TUBE	1000/box
CD4066BM/TR	SOP14	CD4066B	REEL	2500/reel

BLOCK DIAGRAM



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	$^{\circ}C$

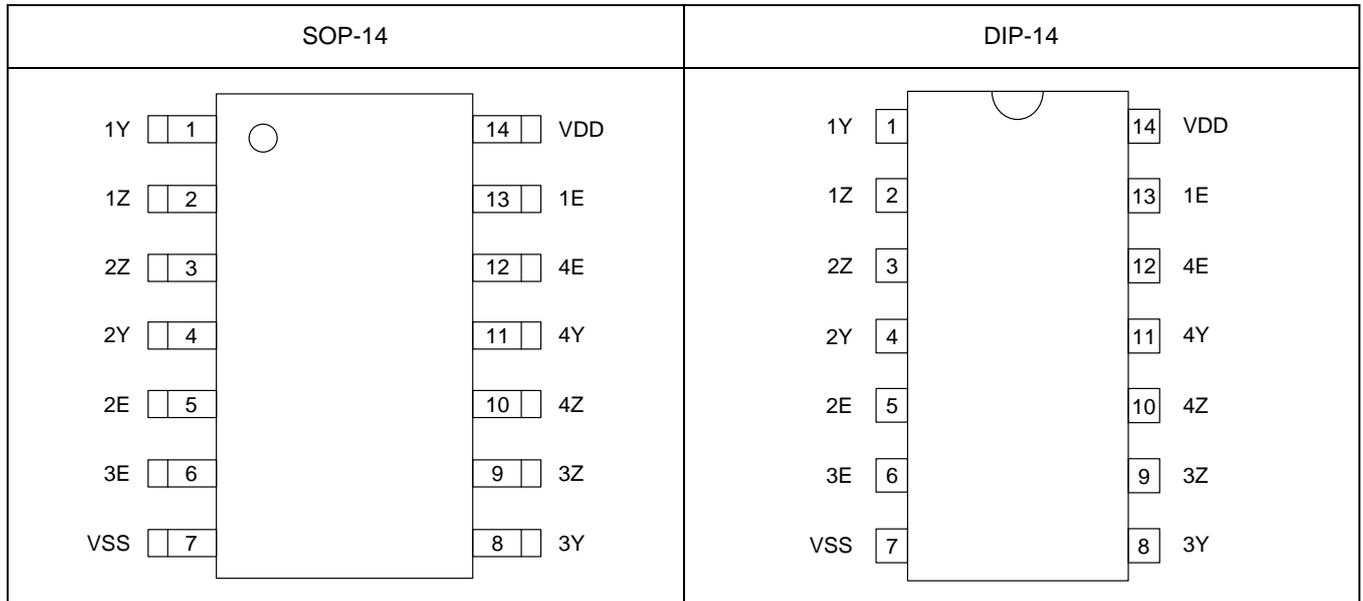
Note1. Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure 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	-40	85	$^{\circ}C$

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

PIN CONFIGURATION



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

DC ELECTRICAL CHARACTERISTICS

 Voltages referenced to V_{SS} .

SYMBOL	PARAMETER	TEST CONDITION	V_{DD}	Limit			UNIT	
				-40°C	25°C	85°C		
V_{IH}	Minimum High-Level Input Voltage, ON/OFF Control Inputs	$R_{ON} = \text{Per Spec}$	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	$R_{ON} = \text{Per Spec}$	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	$V_{IN} = V_{DD} \text{ or } V_{SS}$	18 V	± 0.1	± 0.1	± 1.0	μA	
I_{DD}	Maximum Quiescent Supply Current (Per Package)	$V_{IN} = V_{DD} \text{ or } V_{SS}$	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	$V_{IN} = V_{DD}$, $R_L = 10\text{k}\Omega$ 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	$V_{IN} = V_{DD}$, $R_L = 10\text{k}\Omega$	5 V	-	15	-	Ω	
			10 V	-	10	-		
			15 V	-	5	-		
I_{OFF}	Maximum Off-Channel Leakage Current	$V_{IN} = V_{SS}$, $ V_{IS} - V_{OS} = V_{DD} - V_{SS}$	18 V	± 0.1	± 0.1	± 1.0	μA	
I_{ON}	Maximum On-Channel Leakage Current	$V_{IN} = V_{DD}$, $V_{IS} = V_{DD} \text{ or } V_{SS}$	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} , $C_L = 50 \text{ pF}$, $R_L = 200\text{k}\Omega$, Input $t_r = t_f = 20 \text{ ns}$

SYMBOL	PARAMETER	V_{DD}	Limit			UNIT	
			-40°C	25°C	85°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 $T_A = 25^\circ\text{C}$ unless otherwise noted. Guaranteed by design.

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

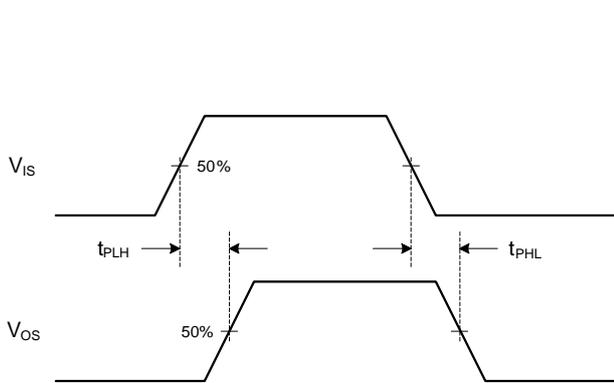


Fig. 1. Analog In to Analog Out

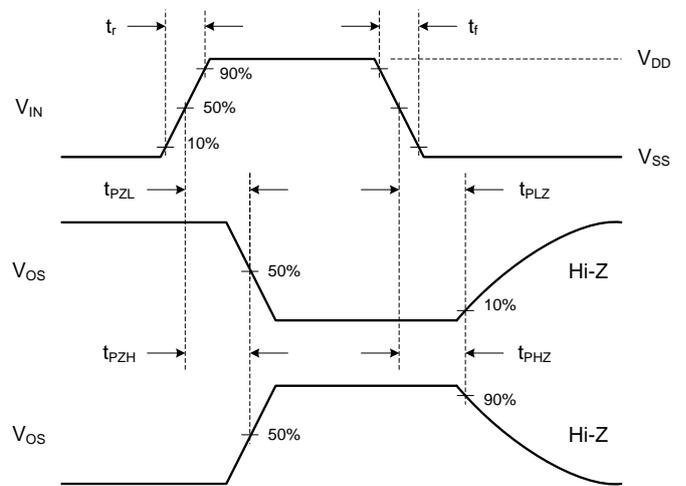


Fig. 2. ON/OFF Control to Analog Out

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