

CMOS Quad Bilateral Switch

Description :

The CD4066 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 CD4066 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.

Features :

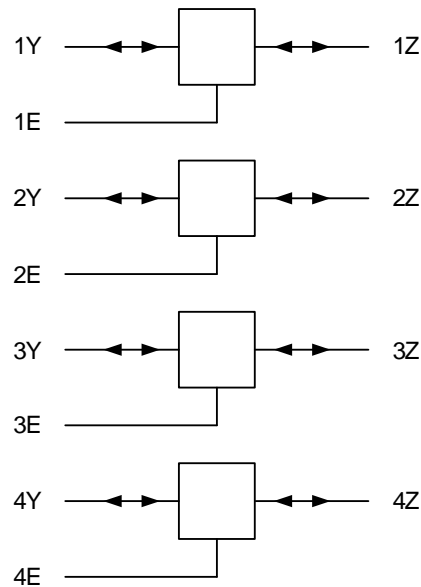
- Wide Operating Voltage Range of 3.0V to 18.0V
- Maximum Input Current of $1\mu\text{A}$ at 18V over Full Package-Temperature range, 100nA at 18V and 25°C
- Standardized Symmetrical Output Characteristics
- Noise Margin
 - 1.0V min @ 5.0V supply
 - 2.0V min @ 10.0V supply
 - 2.5V min @ 15.0V supply

Absolute Maximum Ratings :

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.

Block Diagram



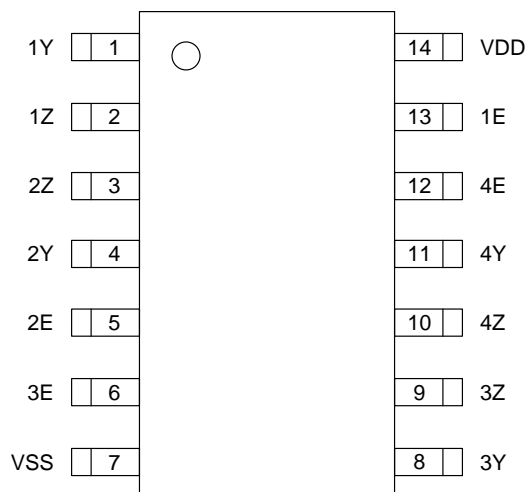
Recommended operating conditions

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	°C

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

Pin Assignment :

DIP/SOP14



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

electrical characteristic

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} = 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} , 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} 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, $R_L = 200$ k Ω , Input $t_r = t_f = 20$ 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	$V_{IN} = V_{DD}$, $V_{SS} = -5V$, $R_L = 10$ k Ω , $f_{IS} = 1$ kHz sine wave	5 V	0.4	%
-	-3dB Cutoff Frequency (Switch On)	$V_{IN} = V_{DD}$, $V_{SS} = -5V$, $R_L = 1$ k Ω	5 V	40	MHz
-	-50dB Feedthrough Frequency (Switch Off)	$V_{IN} = GND$, $V_{IS} = 5V$, $R_L = 1$ k Ω	10 V	1	MHz
-	-50dB Crosstalk Frequency	$V_{IN(A)} = V_{DD} = 5V$, $V_{IN(B)} = V_{SS} = -5V$, $V_{IS(A)} = 5V_{p-p}$, 50 Ω source, $R_L = 1$ k Ω	5 V	8	MHz
-	Crosstalk (Control Input to Signal Output)	$V_{IN} = 10V$ (square wave), $R_L = 10$ k Ω , $t_r, t_f = 20$ ns	10 V	50	mV
-	Maximum Control Input Repetition Rate	$V_{IS} = V_{DD}$, $V_{SS} = GND$, $R_L = 1$ k Ω , $C_L = 50$ pF, $V_{IN} = 10V$ (square wave centered on 5V), $t_r, t_f = 20$ ns, $V_{OS} = 1/2 V_{OS}$ at 1 kHz	5 V	6	MHz
			10 V	9	
			15 V	9.5	

Fucction table

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

Switchng characteristics

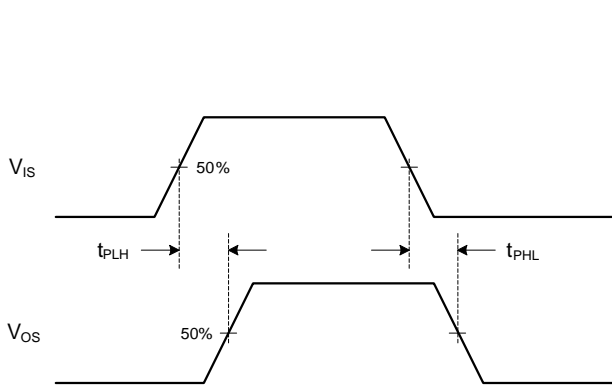


Fig. 1. Analog In to Analog Out

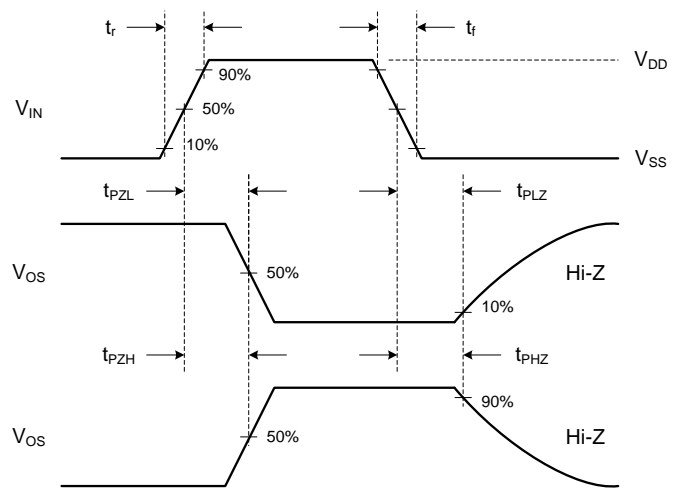
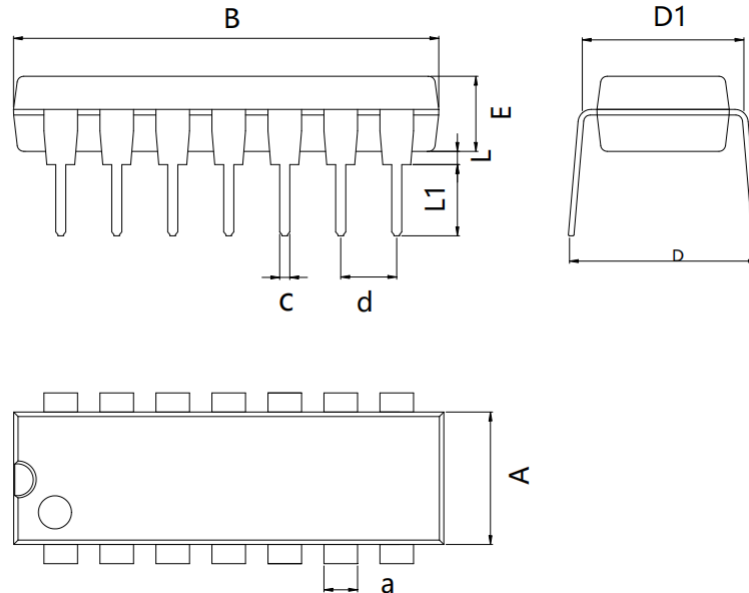


Fig. 2. ON/OFF Control to Analog Out

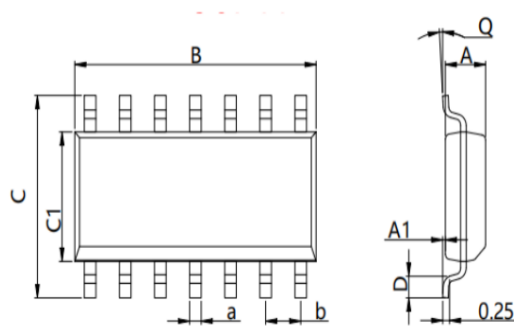
PACKAGE MECHANICAL DATA

DIP14



Dimensions In Millimeters(DIP14)										
Symbol:	A	B	D	D1	E	L	L1	a	C	d
Min:	6.10	18.94	8.40	7.42	3.10	0.50	3.00	1.50	0.40	2.54 BSC
Max:	6.68	19.56	9.00	7.82	3.55	0.70	3.60	1.55	0.50	

SOP14



Dimensions In Millimeters(SOP14)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	8.55	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	8.75	6.20	4.00	0.80	8°	0.45	