TC74HC4066AP/AF/AFN

QUAD BILATERAL SWITCH

The TC74HC4066A is a high speed CMOS QUAD BILATERAL SWITCH fabricated with silicon gate C^2MOS technology.

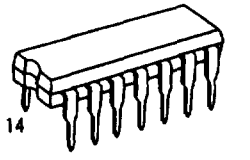
It consists of four independent high speed switches capable of controlling either digital or analog signals while maintaining the CMOS low power dissipation.

Control input (C) is provided to control the switch. The switch turns ON while the C input is high, and the switch turns OFF while low.

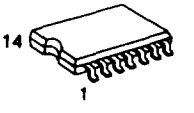
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

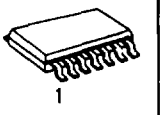
FEATURES:

- High Speed ····· t_{pd}=7ns(typ.)at V_{CC}=5V
- Low Power Dissipation ····· I_{CC}=1μA(Max.)at Ta=25℃
- High Noise Immunity ····· $V_{NIH}=V_{NIL}$ 28% V_{CC}(Min.)
- Low ON Resistance ····· R_{ON}=50Ω(typ.)at V_{CC}=9V
- High Degree of Linearity ····· THD=0.05%(typ.)at V_{CC}=5V
- Pin and Function Compatible with 4066B



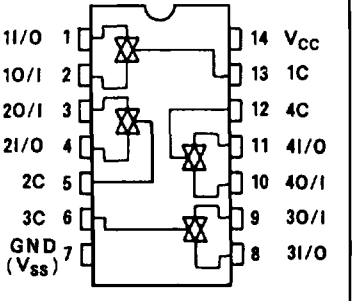
P(DIP14-P-300)





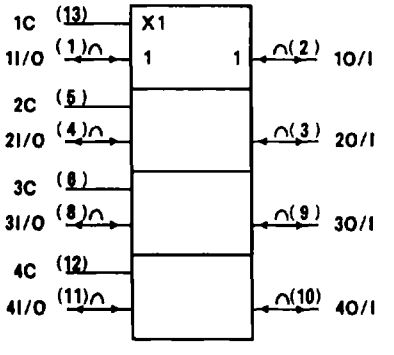
F(SOP14-P-300) FN(SOL14-P-150)

PIN ASSIGNMENT



(Top View)

IEC LOGIC SYMBOL



TRUTH TABLE

CONTROL	SWITCH FUNCTION
H	ON
L	OFF

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	−0.5 ~13	V
Control Input Voltage	V_{IN}	−0.5 ~V_{CC}+0.5	V
Switch I/O Voltage	$V_{I/O}$	−0.5 ~V_{CC}+0.5	V
Control Input Diode Current	I_{CK}	±20	mA
I/O Diode Current	I_{IOK}	±20	mA
Switch through Current	I_T	±25	mA
DC V_{CC}/GND Current	I_{CC}	±50	mA
Power Dissipation	P_D	500(DIP)*/180(SOIC)	mW
Storage Temperature	T_{stg}	−65 ~150	℃
Lead Temperature 10sec	T_L	300	℃

*500mW in the range of Ta= −40℃~ 65℃. From Ta=65℃ to 85℃ a derating factor of −10mW/℃ shall be applied until 300mW.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	2 ~ 12	V
Control Input Voltage	V_{IN}	0 ~ V_{CC}	V
Switch I/O Voltage	$V_{I/O}$	0 ~ V_{CC}	V
Operating Temperature	T_{opr}	−40 ~ 85	℃
Input Rise and Fall Time	t_r, t_f	0 ~ 1000(V_{CC} = 2.0V) 0 ~ 500(V_{CC} = 4.5V) 0 ~ 400(V_{CC} = 6.0V) 0 ~ 250(V_{CC} =10.0V)	ns

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	V_{CC}	Ta=25℃ MIN.	Ta=25℃ TYP.	Ta=25℃ MAX.	Ta=−40~85℃ MIN.	Ta=−40~85℃ MAX.	UNIT
High−Level Control Input Voltage	V_{IHC}		2.0	1.5	−	−	1.5	−	V
			4.5	3.15	−	−	3.15	−	
			9.0	6.3	−	−	6.3	−	
			12.0	8.4	−	−	8.4	−	
Low−Level Control Input Voltage	V_{ILC}		2.0	−	−	0.5	−	0.5	
			4.5	−	−	1.35	−	1.35	
			9.0	−	−	2.7	−	2.7	
			12.0	−	−	3.6	−	3.6	
ON Resistance	R_{ON}	V_{IN} = V_{IHC} $V_{I/O}$ = V_{CC} toGND $I_{I/O}$≦1mA	4.5	−	96	170	−	200	Ω
			9.0	−	55	85	−	100	
			12.0	−	45	80	−	90	
		V_{IN} = V_{IHC} $V_{I/O}$ = V_{CC} orGND $I_{I/O}$≦1mA	2.0	−	160	−	−	−	
			4.5	−	70	100	−	130	
			9.0	−	50	75	−	95	
			12.0	−	45	70	−	90	
Difference of ON Resistance Between Switches	$\triangle R_{ON}$	V_{IN} = V_{IHC} $V_{I/O}$ = V_{CC} toGND $I_{I/O}$≦1mA	4.5	−	10	−	−	−	
			9.0	−	5	−	−	−	
			12.0	−	5	−	−	−	
Input/Output Leakage Current (SWITCH OFF)	I_{OFF}	V_{OS} = V_{CC} orGND V_{IS} = GNDorV_{CC} V_{IN} = V_{ILC}	12.0	−	−	±100	−	±1000	nA
Switch Input Leakage Current (SWITCH ON,OUTPUT OPEN)	I_{IZ}	V_{OS} = V_{CC} orGND V_{INH} = V_{IHC}	12.0	−	−	±100	−	±1000	
Control Input Current	I_{IN}	V_{IN} = V_{CC} orGND	6.0	−	−	±100	−	±1000	
Quiescent Supply Current	I_{CC}	V_{IN} = V_{CC} orGND	6.0	−	−	1.0	−	10.0	μA
			9.0	−	−	4.0	−	40.0	
			12.0	−	−	8.0	−	80.0	

AC ELECTRICAL CHARACTERISTICS(C_L=50pF, Input t_r=t_f=6ns)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC}	Ta=25℃ MIN.	Ta=25℃ TYP.	Ta=25℃ MAX.	Ta=−40 ~85℃ MIN.	Ta=−40 ~85℃ MAX.	UNIT
Phase difference between Input and Output	$\phi_{I/O}$		2.0	−	10	50	−	65	ns
			4.5	−	4	10	−	13	
			9.0	−	3	8	−	10	
			12.0	−	3	7	−	9	
Output Enable Time	t_{pZL}, t_{pZH}	R_L =1KΩ	2.0	−	18	100	−	125	
			4.5	−	8	20	−	25	
			9.0	−	6	12	−	22	
			12.0	−	6	12	−	18	
Output Disable Time	t_{pLZ}, t_{pHZ}	R_L =1KΩ	2.0	−	20	115	−	145	
			4.5	−	10	23	−	29	
			9.0	−	8	20	−	25	
			12.0	−	8	18	−	22	
Maximum Control Input Frequency		R_L =1KΩ, C_L =15pF, V_{OUT} =1/2V_{CC}	2.0	−	30	−	−	−	MHz
			4.5	−	30	−	−	−	
			9.0	−	30	−	−	−	
			12.0	−	30	−	−	−	
Control Input Capacitance	C_{IN}			−	5	10	−	10	pF
Switch Terminal Capacitance	$C_{I/O}$			−	6	−	−	−	
Feed through Capacitance	C_{IOS}			−	0.5	−	−	−	
Power Dissipation Capacitance	C_{PD}	(1)		−	15	−	−	−	

Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.
Average operating current can be obtained by the equation:

$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4 \text{ (per channel)}$$

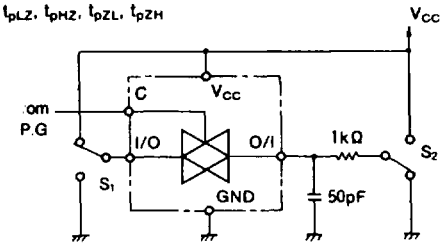
ANALOG SWITCH CHARACTERISTICS (GND=0V, Ta=25℃)

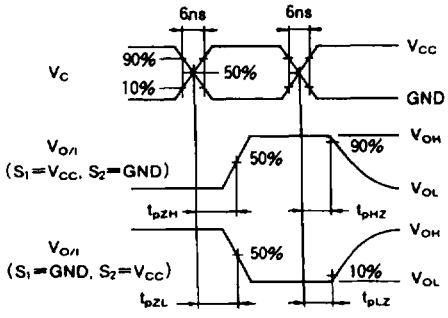
PARAMETER	SYMBOL	TEST CONDITION	V_{CC}	TYP.	UNIT
Sine Wave Distortion (T.H.D)		f_{IN} = 1kHz, R_L = 10kΩ, C_L = 50pF, V_{IN} = 4.0V_{P-P} @V_{CC} = 4.5V	4.5	0.05	%
		V_{IN} = 8.0V_{P-P} @V_{CC} = 9.0V	9.0	0.04	
Frequency Response (Swith ON)	f_{MAX}	Adjust f_{IN} voltage to obtain 0dBm at V_{OS}. Increase f_{IN} Frequency until dB Meter reads −3dB. R_L = 50Ω, C_L = 10pF, f_{IN} = 1MHz, Sine Wave	4.5	200	MHz
			9.0	200	
Feedthrough Attenuation (Switch OFF)		Vin is centered at V_{CC}/2. Adjust input for 0dBm. R_L = 600Ω, C_L = 50pF, f_{IN} = 1MHz, Sine Wave	4.5	−60	dB
			9.0	−60	
Crosstalk (Control Input to Signal Output)		R_L = 600Ω, C_L = 50pF, f_{IN} = 1MNz, Square Wave (t_r = t_f = 6ns)	4.5	60	mV
			9.0	100	
Crosstalk (Between any switches)		Adjust V_{IN} to obtain 0dBm at Input. R_L = 600Ω, C_L = 50pF, f_{IN} = 1MHz, Sine Wave	4.5	−60	dB
			9.0	−60	

NOTE: These characteristics are determined by design of devices.

SWITCHING CHARACTERISTICS TEST CIRCUITS

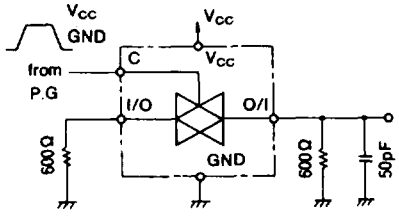
1. t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}



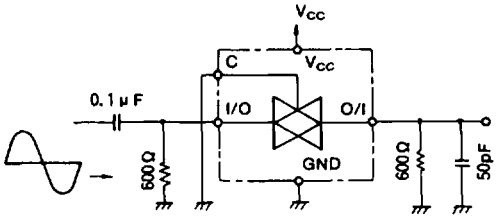


2. CROSSTALK (CONTROL INPUT–SWITCH OUTPUT)

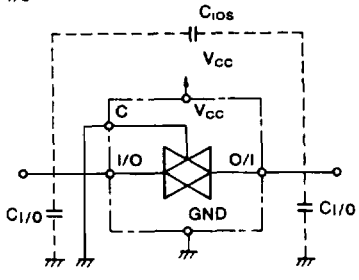
fin=1MHz duty=50% tr=tf=6ns



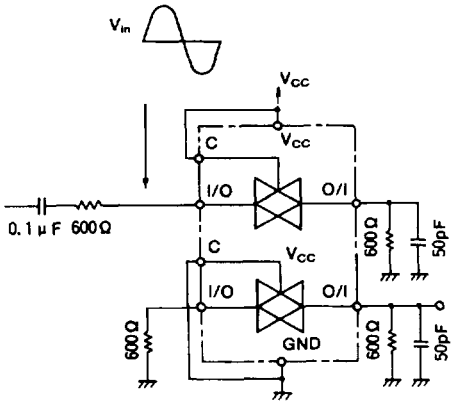
3. FEEDTHROUGH ATTENUATION



4. Clos, C I/O



5. CROSSTALK (BETWEEN ANY TWO SWITCHES)



6. FREQUENCY RESPONSE (SWITCH ON)