TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC74HC4066AP, TC74HC4066AF, TC74HC4066AFN, TC74HC4066AFT

(Note) The JEDEC SOP (FN) is not available in Japan.

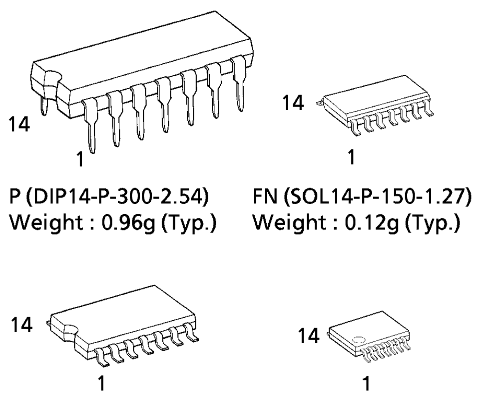
QUAD BILATERAL SWITCH

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.



P (DIP14-P-300-2.54) Weight : 0.96g (Typ.)

FN (SOL14-P-150-1.27) Weight : 0.12g (Typ.)

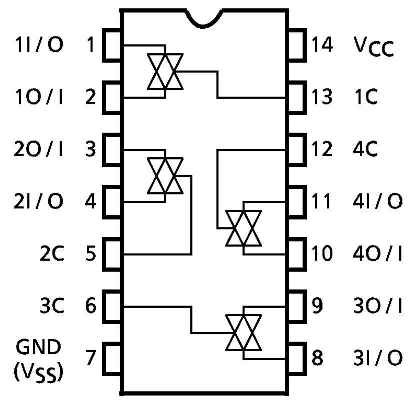
F (SOP14-P-300-1.27) Weight : 0.18g (Typ.)

FT (TSSOP14-P-0044-0.65) Weight : 0.06g (Typ.)

FEATURES :

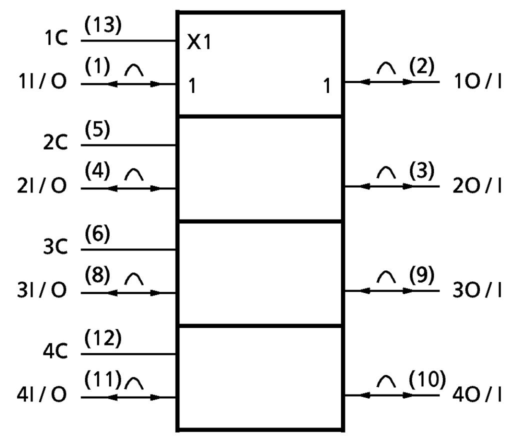
- High Speed .... t_{pd} = 7ns(typ.) at V_{CC} = 5V
- Low Power Dissipation .... I_{CC} = 1μA(Max.) at Ta = 25°C
- High Noise Immunity .... V_{NIH} = V_{NIL} = 28% V_{CC} (Min.)
- Low ON Resistance .... R_{ON} = 50Ω(typ.) at V_{CC} = 9V
- High Degree of Linearity .... THD = 0.05% (typ.) at V_{CC} = 5V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

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_{IK}	±20	mA
I/O Diode Current	I_{OK}	±20	mA
Switch through Current	I_{OUT}	±25	mA
DC V_{CC}/Ground Current	I_{CC}	±50	mA
Power Dissipation	P_D	500 (DIP)* / 180 (SOP / TSSOP)	mW
Storage Temperature	T_{stg}	−65～150	°C

*500mW in the range of Ta = −40°C～65°C. From Ta = 65°C to 85°C a derating factor of −10mW/°C 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	°C
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} (V)	Ta = 25°C MIN.	Ta = 25°C TYP.	Ta = 25°C MAX.	Ta = −40~85°C MIN.	Ta = −40~85°C MAX.	UNIT
High-Level Control Input Voltage	V_{IHC}		2.0 4.5 9.0 12.0	1.50 3.15 6.30 8.40	— — — —	— — — —	1.50 3.15 6.30 8.40	— — — —	V
Low-Level Control Input Voltage	V_{ILC}		2.0 4.5 9.0 12.0	— — — —	— — — —	0.50 1.35 2.70 3.60	— — — —	0.50 1.35 2.70 3.60	V
ON Resistance	R_{ON}	V_{IN} = V_{IHC} $V_{I/O}$ = V_{CC} to GND $I_{I/O}$ ≦ 1mA	4.5 9.0 12.0	— — —	96 55 45	170 85 80	— — —	200 100 90	Ω
		V_{IN} = V_{IHC} $V_{I/O}$ = V_{CC} or GND $I_{I/O}$ ≦ 1mA	2.0 4.5 9.0 12.0	— — — —	160 70 50 45	— 100 75 70	— — — —	— 130 95 90	Ω
Difference of ON Resistance Between Switches	ΔR_{ON}	V_{IN} = V_{IHC} $V_{I/O}$ = V_{CC} to GND $I_{I/O}$ ≦ 1mA	4.5 9.0 12.0	— — —	10 5 5	— — —	— — —	— — —	Ω
Input/Output Leakage Current (SWITCH OFF)	I_{OFF}	V_{OS} = V_{CC} or GND V_{IS} = GND or V_{CC} V_{IN} = V_{ILC}	12.0	—	—	±100	—	±1000	nA
Switch Input Leakage Current (SWITCH ON, OUTPUT OPEN)	I_{IZ}	V_{OS} = V_{CC} or GND V_{IN} = V_{IHC}	12.0	—	—	±100	—	±1000	nA
Control Input Current	I_{IN}	V_{IN} = V_{CC} or GND	12.0	—	—	±100	—	±1000	nA
Quiescent Supply Current	I_{CC}	V_{IN} = V_{CC} or GND	6.0 9.0 12.0	— — —	— — —	1.0 4.0 8.0	— — —	10.0 40.0 80.0	μA

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

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

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:

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

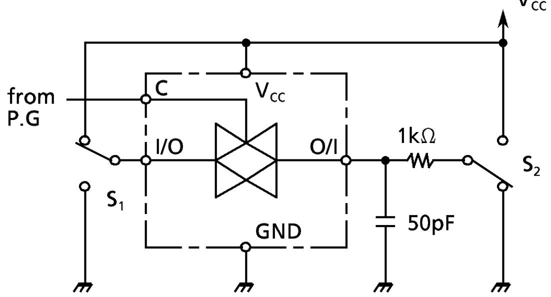
ANALOG SWITCH CHARACTERISTICS (GND = 0V, Ta = 25°C)

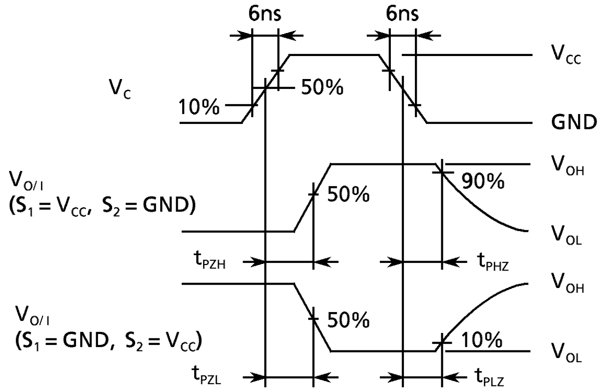
PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	TYP.	UNIT
Sine Wave Distortion (T. H. D)		f_{IN} = 1kHz, R_L = 10kΩ, C_L = 50pF V_{IN} = 4.0V_{P-P} @V_{CC} = 4.5V V_{IN} = 8.0V_{P-P} @V_{CC} = 9.0V	4.5 9.0	0.05 0.04	%
Frequency Response (Switch ON)	f_{MAX}	Adjust f_{IN} voltage to obtain 0dBm at V_{OS} Increase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

Note : These characteristics are determined by design of devices.

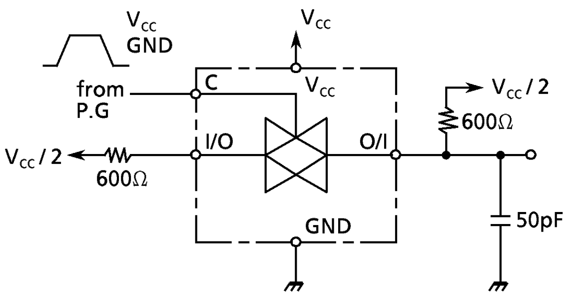
SWITCHING CHARACTERISTICS TEST CIRCUITS

1. t_{PLZ}, t_{PHZ}, t_{PZL}, t_{PZH}

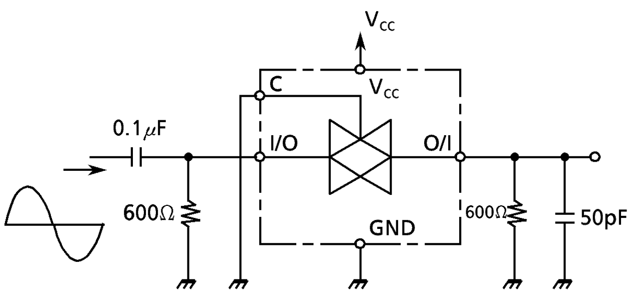




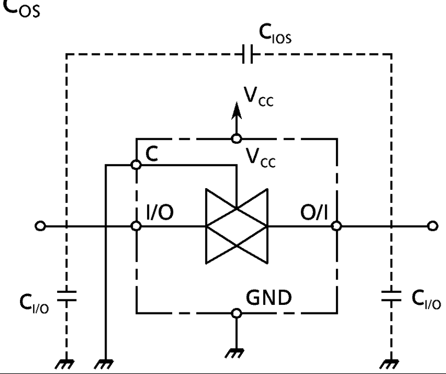
2. CROSS TALK (CONTROL INPUT-SWITCH OUTPUT)
fin = 1MHz duty = 50% tr = tf = 6ns



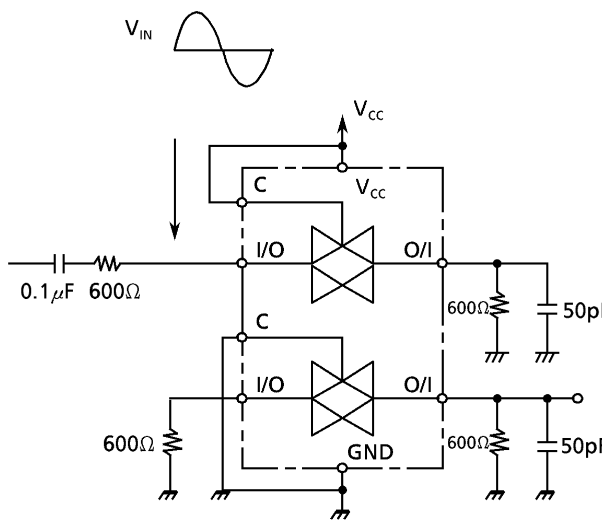
3. FEEDTHROUGH ATTENUATION



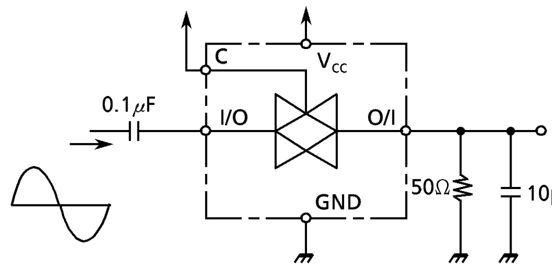
4. C_{IOS}, C_{IS}, C_{OS}



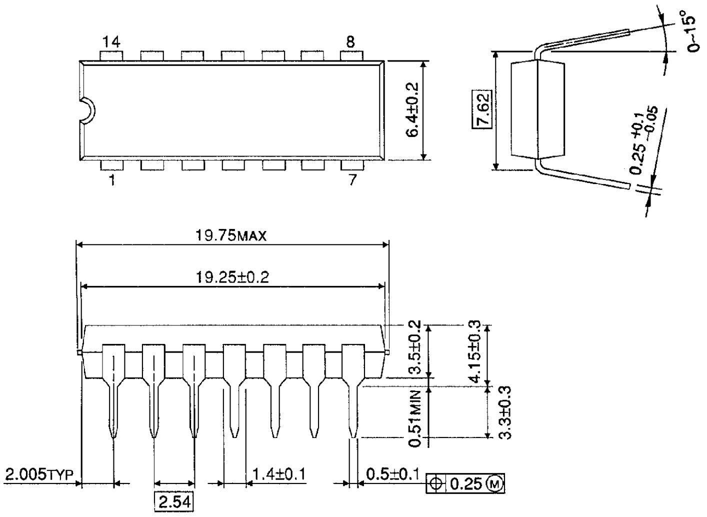
5. CROSSTALK (BETWEEN ANY TWO SWITCHES)



6. FREQUENCY RESPONSE (SWITCH ON)

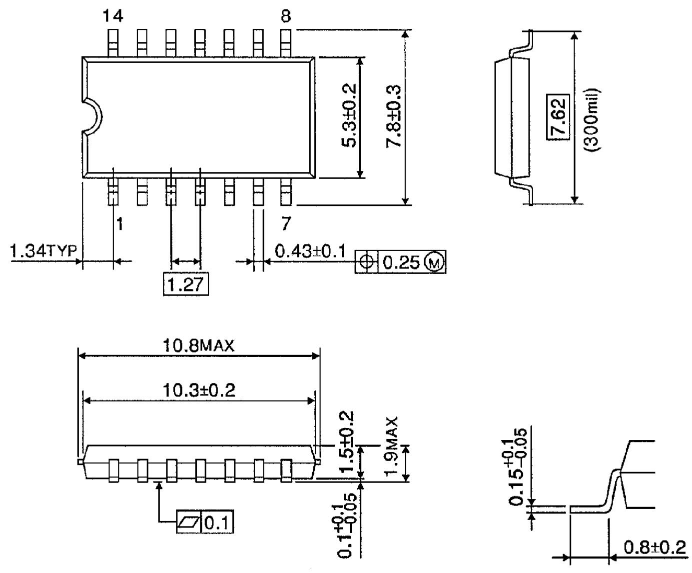


DIP 14PIN PACKAGE DIMENSIONS (DIP14-P-300-2.54) Unit in mm



Weight : 0.96g (Typ.)

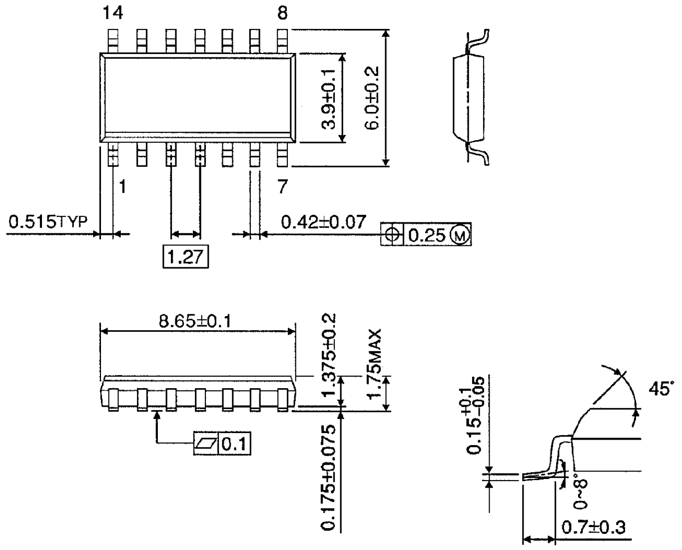
SOP 14PIN (200mil BODY) PACKAGE DIMENSIONS (SOP14-P-300-1.27) Unit in mm



Weight : 0.18g (Typ.)

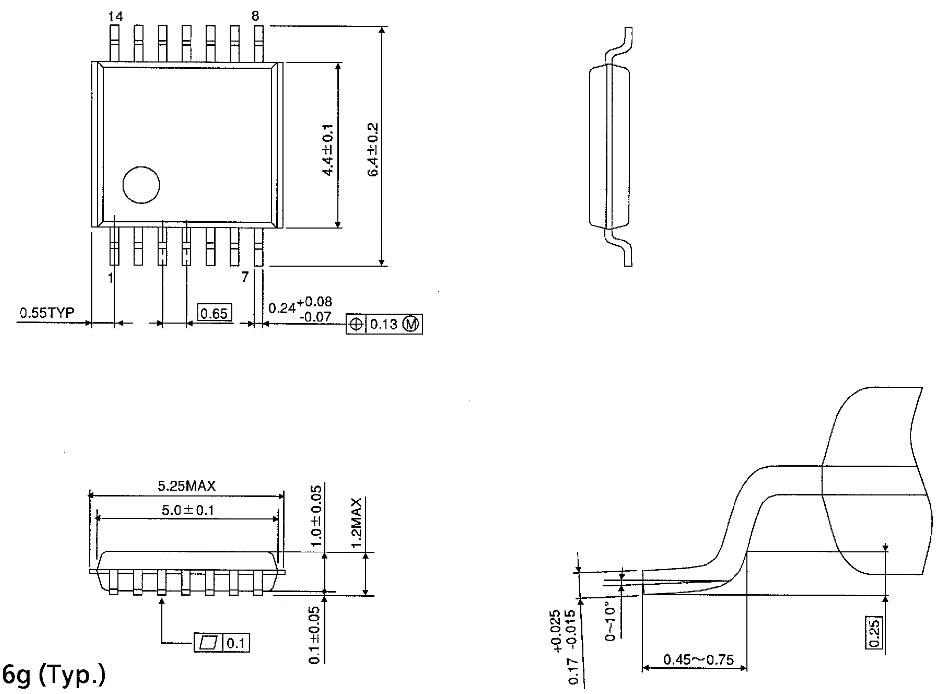
SOP 14PIN (150mil BODY) PACKAGE DIMENSIONS (SOL14-P-150 -1.27) Unit in mm

(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

TSSOP 14PIN (170mil BODY) PACKAGE DIMENSIONS (TSSOP14-P-0044-0.65) Unit in mm



Weight : 0.06g (Typ.)

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