TENTATIVE TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

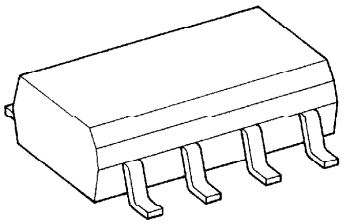
TC7W66F, TC7W66FU

(UNDER DEVELOPMENT)

DUAL BILATERAL SWITCH

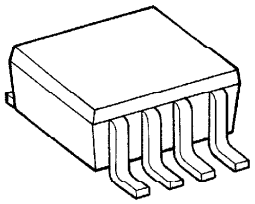
The TC7W66 is a high speed CMOS DUAL BILATERAL SWITCH fabricated with silicon gate CMOS technology. It consists of four independent high speed switches capable of controlling either digital or analog signals while maintaining the CMOS low power dissipation. Control input (C) is provided to control the 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.

TC7W66F



SOP8-P-1.27

TC7W66FU



SSOP8-P-0.65

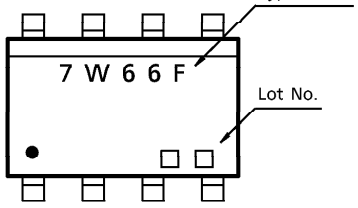
Weight SOP8-P-1.27 : 0.05g (Typ.)
SSOP8-P-0.65 : 0.02g (Typ.)

FEATURES

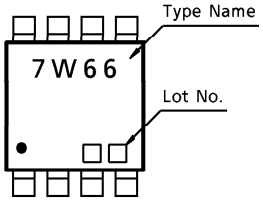
- High Speed ····· t_{pd} = 7ns (Typ.) at V_{CC} = 5V
- Low Power Dissipation ····· I_{CC} = 1μA (Max.) at Ta = 25°C
- High Noise Immunity ····· $V_{NIH} = V_{NIL}$ = 28% V_{CC} (Min.)
- Low ON Resistance ····· R_{ON} = 50Ω (Typ.) at V_{CC} = 9V
- High Degree of Linearity ····· THD = 0.05 (Typ.) at V_{CC} = 5V
- Pin and Function Compatible with TC4W66

MARKING

TC7W66F



TC7W66FU

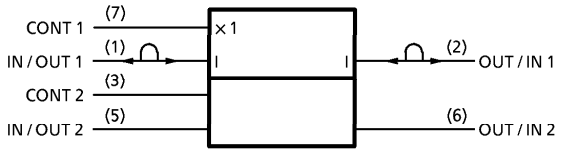


MAXIMUM RATINGS (Ta = 25°C)

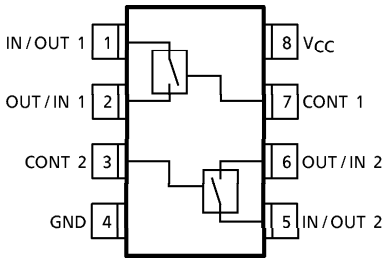
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage Range	V_{CC}	−0.5~13	V
Control Input Voltage	V_{IN}	−0.5~V_{CC} + 0.5	V
Switch I/O Voltage	$V_{I/O}$	−0.5~V_{CC} + 0.5	V
Control Input Diode Current	I_{CK}	±20	mA
I/O Diode Current	I_{IOK}	±20	mA
Switch Through Current	I_T	±25	mA
DC V_{CC}/GND Current	I_{CC}	±50	mA
Power Dissipation	P_D	300	mW
Storage Temperature	T_{stg}	−65~150	°C
Lead Temperature (10 s)	T_L	260	°C

961001EBA2

LOGIC SYMBOL



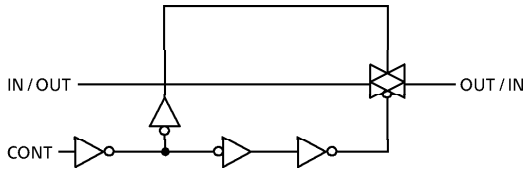
PIN ASSIGNMENT (TOP VIEW)



TRUTH TABLE

CONTROL	SWITCH FUNCTION
H	ON
L	OFF

LOGIC DIAGRAM (1 / 2 TC7W66)



RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	RATING	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)	ns
		0~500 (V_{CC} = 4.5V)	
		0~400 (V_{CC} = 6.0V)	
		0~250 (V_{CC} = 10.0V)	

DC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = −40~85°C		UNIT
			V_{CC}	MIN.	TYP.	MAX.	MIN.	MAX.	
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	V
			4.5	—	—	1.35	—	1.35	
			9.0	—	—	2.7	—	2.7	
			12.0	—	—	3.6	—	3.6	
ON Resistance	R_{ON}	$V_{IN} = V_{IHC}$ $V_{I/O} = V_{CC}$ to GND $I_{I/O} \leqq 1mA$	4.5	—	96	170	—	200	Ω
			9.0	—	55	85	—	100	
			12.0	—	45	80	—	90	
		$V_{IN} = V_{IHC}$ $V_{I/O} = V_{CC}$ or GND $I_{I/O} \leqq 1mA$	2.0	—	160	—	—	—	
			4.5	—	70	100	—	130	
			9.0	—	50	75	—	95	
			12.0	—	45	70	—	90	
Difference of ON Resistance Between Switches	ΔR_{ON}	$V_{IN} = V_{IHC}$ $V_{I/O} = V_{CC}$ to GND $I_{I/O} \leqq 1mA$	4.5	—	10	—	—	—	Ω
			9.0	—	5	—	—	—	
			12.0	—	5	—	—	—	
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 $V_{INH} = V_{IHC}$	12.0	—	—	± 100	—	± 1000	nA
Control Input Current	I_{IN}	$V_{IN} = V_{CC}$ or GND	6.0	—	—	± 100	—	± 1000	nA
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC}$ or GND	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)

CHARACTERISTIC	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = −40~85°C		UNIT
			V_{CC}	MIN.	TYP.	MAX.	MIN.	MAX.	
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	ns
			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	ns
			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	—	—	—	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 :

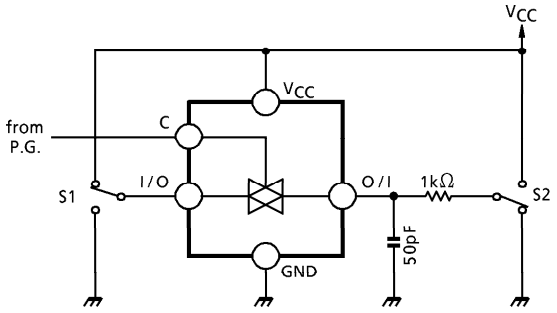
$$I_{CC\,(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2$$

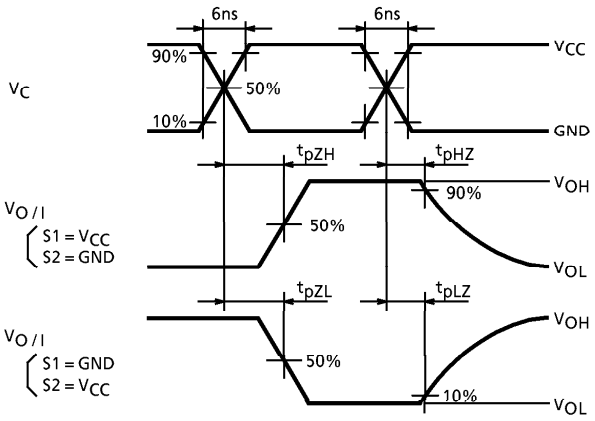
ANALOG SWITCH CHARACTERISTICS (GND = 0V, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{CC}	TYP.	UNIT
Sine Wave Distortion (T.H.D)		f_{IN} = 1kHz, V_{IN} = 4.0Vp-p @V_{CC} = 4.5V R_L = 10kΩ, V_{IN} = 8.0Vp-p @V_{CC} = 9.0V C_L = 50pF	4.5	0.05	%
			9.0	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	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} = 1MHz, 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	

SWITCHING CHARACTERISTICS TEST CIRCUITS

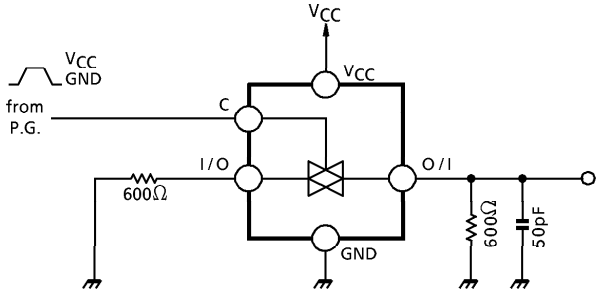
1. t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}



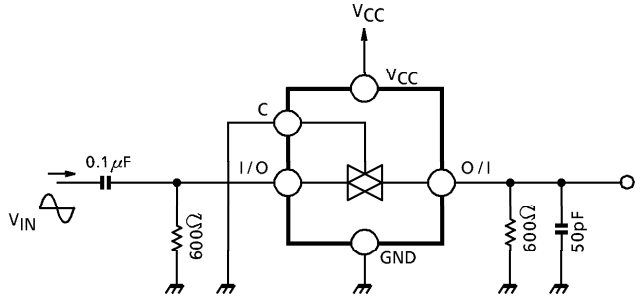


2. CROSS TALK (CONTROL INPUT-SWITCH OUTPUT)

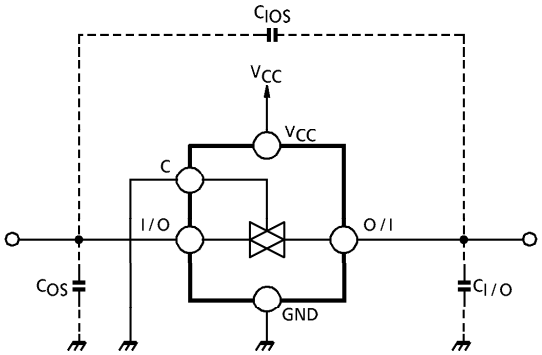
fin = 1MHz, duty = 50%, $t_r = t_f$ = 6ns



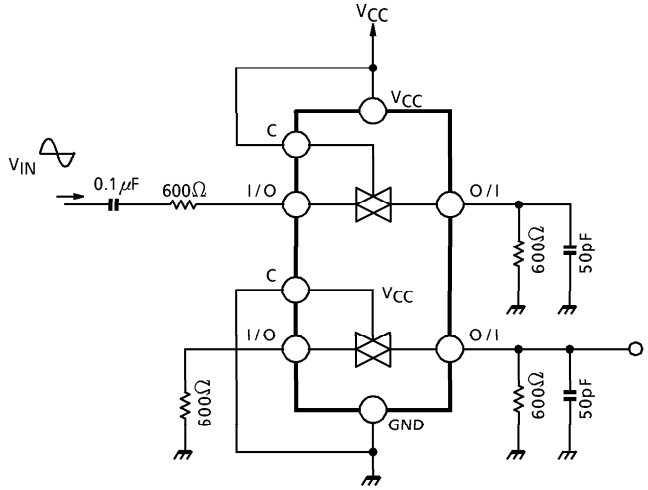
3. FEEDTHROUGH ATTENUATION



4. Clos, $C_{I/O}$



5. CROSS TALK (BETWEEN ANY TWO SWITCHES)



6. FREQUENCY RESPONSE (SWITCH ON)