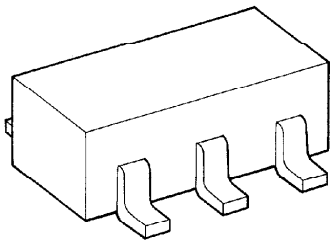
TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7S66F, TC7S66FU

BILATERAL SWITCH

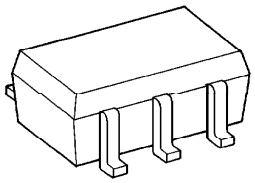
The TC7S66 is a high Speed C^2MOS BILATERAL SWITCH fabricated with silicon gate C^2MOS technology.
It consists of a high speed switch capable of controlling either digital or analog signals while maintaining the C^2MOS low power dissipation.
Control input (C) is provided to control the switch
The switch turns ON while the C linput is high, and the switch turns OFF while low.
Input is equipped with protection circuits against static discharge or transient excess voltage.

TC7S66F



SSOP5-P-0.95

TC7S66FU



SSOP5-P-0.65A

Weight SSOP5-P-0.95 : 0.016g (Typ.)
SSOP5-P-0.65A : 0.006g (Typ.)

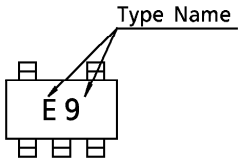
FEATURES

- 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} = 100Ω (Typ.) at V_{CC} = 9V
- Low T.H.D ..... THD = 0.05% (Typ.) at V_{CC} = 5V
- Pin and Function Compatible with TC4S66F

MAXIMUM RATINGS

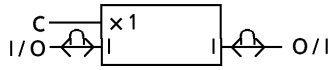
CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{CC}	−0.5~13	V
Control Input Voltage	V_{IN}	−0.5~V_{CC}+0.5	V
Swith I/O Voltage	$V_{I/O}$	−0.5~V_{CC}+0.5	V
Control Diode Current	I_{CK}	±20	mA
Output Diode Current	I_{IOK}	±20	mA
Through I/O Current	I_T	±12.5	mA
DC V_{CC}/Ground Current	I_{CC}	±25	mA
Power Dissipation	P_D	200	mW
Storage Temperature	T_{stg}	−65~150	°C
Lead Temperature (10s)	T_L	260	°C

MARKING

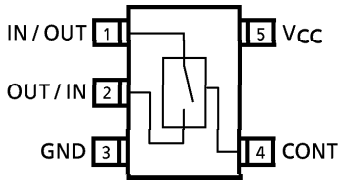


961001EBA2

LOGIC DIAGRAM



PIN ASSIGNMENT (TOP VIEW)



TRUTH TABLE

CONTROL	SWITCH FUNCTION
H	ON
L	OFF

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) 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		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	
			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 $V_{I/O}$ ≦ 1mA	4.5	—	192	340	—	400	Ω
			9.0	—	110	170	—	200	
			12.0	—	90	160	—	180	
		V_{IN} = V_{IHC} $V_{I/O}$ = V_{CC} or GND $V_{I/O}$ ≦ 1mA	2.0	—	320	—	—	—	
			4.5	—	140	200	—	260	
			9.0	—	100	150	—	190	
			12.0	—	90	140	—	180	
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

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = −40~85°C		UNIT
			V_{CC}	MIN.	TYP.	MAX.	MIN.	MAX.	
Switch Input Leakage Current (SW 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	
Quiscent Device 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 $t_r = t_f = 6ns$)

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = −40~85°C		UNIT
			V_{CC}	MIN.	TYP.	MAX.	MIN.	MAX.	
Phase difference between input and output	ϕ_{I-O}	—	2.0	—	20	75	—	100	ns
			4.5	—	7	15	—	20	
			9.0	—	4	12	—	15	
			12.0	—	4	11	—	14	
Output Enable Time	t_{PZL} t_{PZH}	$R_L = 1k\Omega$	2.0	—	20	150	—	190	
			4.5	—	13	30	—	38	
			9.0	—	9	18	—	33	
			12.0	—	8	18	—	27	
Output Disable Time	t_{PLZ} t_{PHZ}	$R_L = 1k\Omega$	2.0	—	40	170	—	220	
			4.5	—	11	35	—	44	
			9.0	—	10	30	—	38	
			12.0	—	9	27	—	33	
Maximum Control Input Frequency	—	$R_L = 1k\Omega$ $C_L = 15pF$ $V_{OUT} = 1/2\ V_{CC}$	2.0	—	30	—	—	—	MHz
			4.5	—	30	—	—	—	
			9.0	—	30	—	—	—	
			12.0	—	30	—	—	—	
Control Input Capacitance	C_{IN}	—	—	—	5	10	—	10	—
Switch Terminal Capacitance	$C_{I/O}$	—	—	—	6	—	—	—	pF
Feedthrough Capacitance	C_{IOS}	—	—	—	0.5	—	—	—	—
Power Dissipation Capacitance	C_{PD}	(Note 1)	—	—	15	—	—	—	—

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

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

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

PARAMETER	SYMBOL	TEST CONDITION	V_{CC}	TYP.	UNIT
Total Harmonic Distortion (T.H.D)	—	f_{IN} = 1kHz V_{IN} = 4V_{PP} (V_{CC} = 4.5V) R_L = 10kΩ V_{IN} = 8V_{PP} (V_{CC} = 9.0V) C_L = 50pF	4.5 9.0	0.05 0.04	%
Maximum Propagation Frequency (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 (SWITCH ON)	—	V_{in} is ceintered 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 SWITCH)	—	R_L = 600Ω, C_L = 50pF IN = 1MHz, PULSE ($t_r = t_f$ = 6ns)	4.5 9.0	60 100	mV

Note : These characteristics are determined by design of devices.