

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

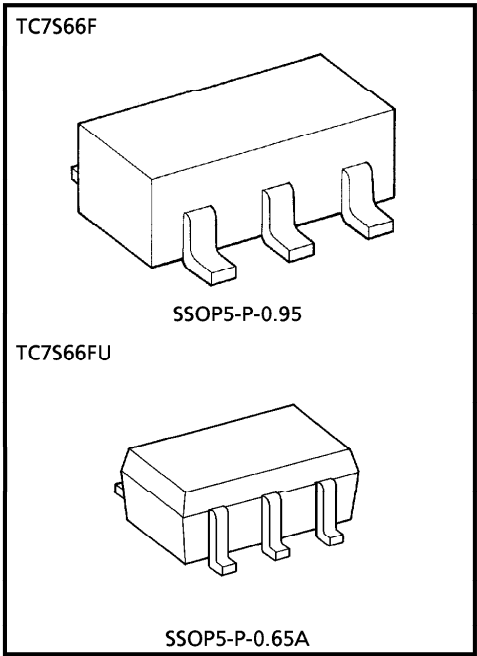
TC7S66F, TC7S66FU

BILATERAL SWITCH

The TC7S66 is a high Speed C²MOS BILATERAL SWITCH fabricated with silicon gate C²MOS technology. It consists of a high speed switch capable of controlling either digital or analog signals while maintaining the C²MOS 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. Input is equipped with protection circuits against static discharge or transient excess voltage.

FEATURES

- High Speed $t_{pd} = 7\text{ns}$ (Typ.) at $V_{CC} = 5\text{V}$
- Low Power Dissipation $I_{CC} = 1\mu\text{A}$ (Max.) at $T_a = 25^\circ\text{C}$
- High Noise Immunity $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (Min.)
- Low ON Resistance $R_{ON} = 100\Omega$ (Typ.) at $V_{CC} = 9\text{V}$
- Low T.H.D $\text{THD} = 0.05\%$ (Typ.) at $V_{CC} = 5\text{V}$
- Pin and Function Compatible with TC4S66F

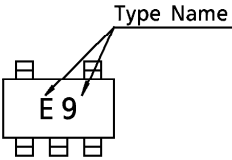


Weight SSOP5-P-0.95 : 0.016g (Typ.)
SSOP5-P-0.65A : 0.006g (Typ.)

MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{CC}	$-0.5 \sim 13$	V
Control Input Voltage	V_{IN}	$-0.5 \sim V_{CC} + 0.5$	V
Swth I/O Voltage	$V_{I/O}$	$-0.5 \sim V_{CC} + 0.5$	V
Control Diode Current	I_{CK}	± 20	mA
Output Diode Current	I_{OK}	± 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}	$-65 \sim 150$	$^\circ\text{C}$
Lead Temperature (10s)	T_L	260	$^\circ\text{C}$

MARKING



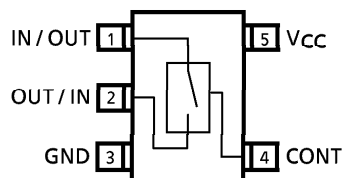
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LOGIC DIAGRAM



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	$T_a = 25^\circ C$				$T_a = -40 \sim 85^\circ C$		UNIT
			V_{CC}	MIN.	TYP.	MAX.	MIN.	MAX.	
High-level Control Input Voltage	V_{IHC}	—	2.0 4.5 9.0 12.0	1.5 3.15 6.3 8.4	— — — —	— — — —	1.5 3.15 6.3 8.4	— — — —	V
Low-Level Control Input Voltage	V_{ILC}	—	2.0 4.5 9.0 12.0	— — — —	— — — —	0.5 1.35 2.7 3.6	— — — —	0.5 1.35 2.7 3.6	
ON Resistance	R_{ON}	$V_{IN} = V_{IHC}$	4.5	—	192	340	—	400	Ω
		$V_{I/O} = V_{CC}$ to GND	9.0	—	110	170	—	200	
		$V_{I/O} \leq 1mA$	12.0	—	90	160	—	180	
		$V_{IN} = V_{IHC}$	2.0	—	320	—	—	—	
		$V_{I/O} = V_{CC}$ or GND	4.5	—	140	200	—	260	
		$V_{I/O} \leq 1mA$	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

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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 = 1kΩ	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 = 1kΩ	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 = 1kΩ 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.