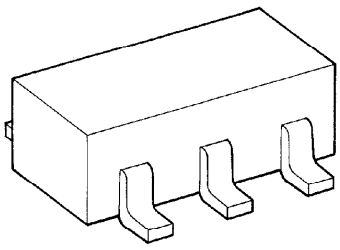
TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC4S66F, TC4S66FU

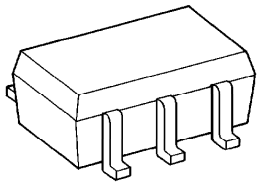
BILATERAL SWITCH

TC4S66F/FU contains one circuit of bidirectional switches. When control input, CONT is set to "H" level, the impedance between input and output of the switch becomes low and when it is set to "L" level, the switch becomes high. This can be applied for switching of analog signals and digital signals.

TC4S66F



TC4S66FU



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

FEATURES

- ON-resistance (R_{ON})

  300 Ω (Typ.) .... $V_{DD} - V_{SS} = 5$ V
  110 Ω (Typ.) .... $V_{DD} - V_{SS} = 10$ V
  70 Ω (Typ.) ..... $V_{DD} - V_{SS} = 15$ V

- OFF-resistance (R_{OFF})

  R_{OFF} (Typ.) $> 10^9$ Ω

MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{DD}	V_{SS} − 0.5~V_{SS} + 20	V
Control Input Voltage	$V_{C\ IN}$	V_{SS} − 0.5~V_{DD} + 0.5	V
Switch I/O Voltage	$V_{I/O}$	V_{SS} − 0.5~V_{DD} + 0.5	V
Power Dissipation	P_D	200	mW
Potential difference across I/O during ON	V_I-V_O	±0.5	V
Control Input Current	$I_{C\ IN}$	±10	mA
Operating Temperature Range	T_{opr}	−40~85	°C
Storage Temperature	T_{stg}	−65~150	°C
Lead Temperature (10 s)	T_L	260	°C

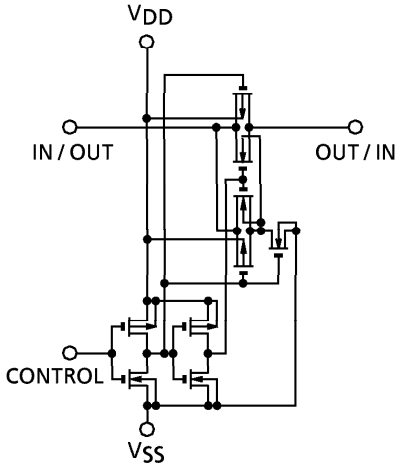
TRUTH TABLE

CONTROL	IMPEDANCE BETWEEN IN/OUT-OUT/IN *
H	0.5~5 × 10^2 Ω
L	$> 10^9$ Ω

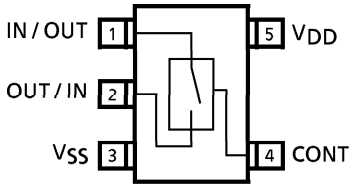
* : See static electrical characteristics.

980910EBA2

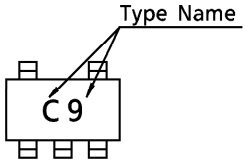
CIRCUIT DIAGRAM



PIN ASSIGNMENT (TOP VIEW)



MARKING



RECOMMENDED OPERATING CONDITIONS (V_{SS} = 0 V)

CHARACTERISTIC	SYMBOL		MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	V_{DD}	—	3	—	18	V
Input / Output Voltage	V_{IN} / V_{OUT}	—	0	—	V_{DD}	V

STATIC ELECTRICAL CHARACTERISTICS (In case not specifically appointed, V_{SS} = 0 V)

CHARACTERISTIC		SYMBOL	TEST CONDITION	V_{DD} (V)	−40°C		25°C			85°C		UNIT
					MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.	
Control Input High Voltage		V_{IH}	$\|I_{IS}\|$ = 10 μA	5	3.5	—	3.5	2.75	—	3.5	—	V
				10	7.0	—	7.0	5.50	—	7.0	—	
				15	11.0	—	11.0	8.25	—	11.0	—	
Control Input Low Voltage		V_{IL}	$\|I_{IS}\|$ = 10 μA	5	—	1.5	—	2.25	1.5	—	1.5	
				10	—	3.0	—	4.5	3.0	—	3.0	
				15	—	4.0	—	6.75	4.0	—	4.0	
On-State Resistance		R_{ON}	$0 \leqq V_{IS} \leqq V_{DD}$ R_L = 10 kΩ	5	—	800	—	290	950	—	1200	Ω
				10	—	210	—	120	250	—	300	
				15	—	140	—	85	160	—	200	
Input / Output Leakage Current		I_{OFF}	V_{IN} = 18 V V_{OUT} = 0 V	18	—	±100	—	±0.1	±100	—	±1000	nA
			V_{IN} = 0 V V_{OUT} = 18 V	18	—	±100	—	±0.1	±100	—	±1000	
Quiescent Device Current		I_{DD}	V_{IN} = V_{DD}, V_{SS}	5	—	0.25	—	0.001	0.25	—	7.5	μA
				10	—	0.5	—	0.001	0.5	—	15	
				15	—	1.0	—	0.002	1.0	—	30	
Input Current	H Level	I_{IH}	V_{IH} = 18 V	18	—	0.1	—	10^{-5}	0.1	—	1.0	μA
	L Level	I_{OL}	V_{IL} = 0 V	18	—	−0.1	—	-10^{-5}	−0.1	—	−1.0	

DYNAMIC ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{SS} (V)	V_{DD} (V)	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time (IN-OUT)	t_{pLH} t_{pHL}	C_L = 50 pF	0	5	—	15	40	ns
			0	10	—	8	20	
			0	15	—	5	15	
Propagation Delay Time (CONTROL-OUT)	t_{pZL} t_{pZH}	R_L = 1 kΩ C_L = 50 pF	0	5	—	55	120	
			0	10	—	25	40	
			0	15	—	20	30	
Propagation Delay Time (CONTROL-OUT)	t_{pLZ} t_{pHZ}	R_L = 1 kΩ C_L = 50 pF	0	5	—	45	80	
			0	10	—	30	70	
			0	15	—	25	60	
Max. Control Input Repetition Rate	f_{MAX} (C)	R_L = 1 kΩ C_L = 50 pF	0	5	—	10	—	MHz
			0	10	—	12	—	
			0	15	—	12	—	
−3dB Cut Off Frequency	f_{MAX} (I-O)	R_L = 1 kΩ C_L = 50 pF (*1)	−5	5	—	30	—	
Total Harmonic Distortion	—	R_L = 10 kΩ f = 1 kHz (*2)	−5	5	—	0.03	—	%
−50dB Feedthrough Frequency	—	R_L = 1 kΩ (*3)	−5	5	—	600	—	kHz
Crosstalk (CONTROL-OUT)	—	R_{IN} = 1 kΩ R_{OUT} = 10 kΩ C_L = 15 pF	0	5	—	200	—	mV
			0	10	—	400	—	
			0	15	—	600	—	
Input Capacitance	C_{IN}	Control Input			—	5	7.5	pF
		Switch I/O			—	10	—	
Feedthrough Capacitance	C_{IN-OUT}	—			—	0.5	—	

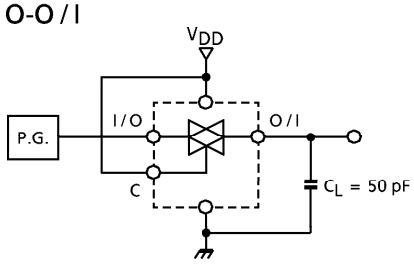
*1 : The frequency at $20\ell og_{10} \frac{V_{OS}}{V_{IS}} = -3$ dB shall be $f_{MAX\,(I/O)}$ using sine wave of ±2.5 V_{p-p} for V_{IS}.

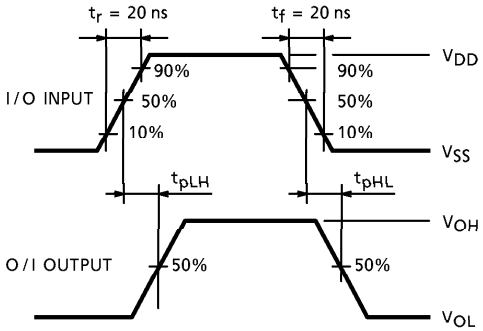
*2 : V_{IS} shall be sine wave of ±2.5 V.

*3 : The frequency at $20\ell og_{10} \frac{V_{OS}}{V_{IS}}$ = 50 dB shall be the feed through using of ±2.5 V_{p-p}.

1. t_{pLH}, t_{pHL}

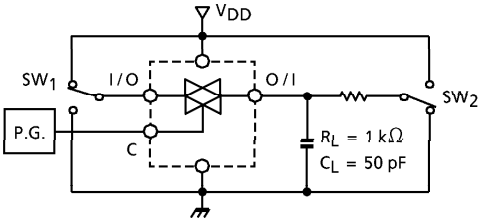
I/O-O/I

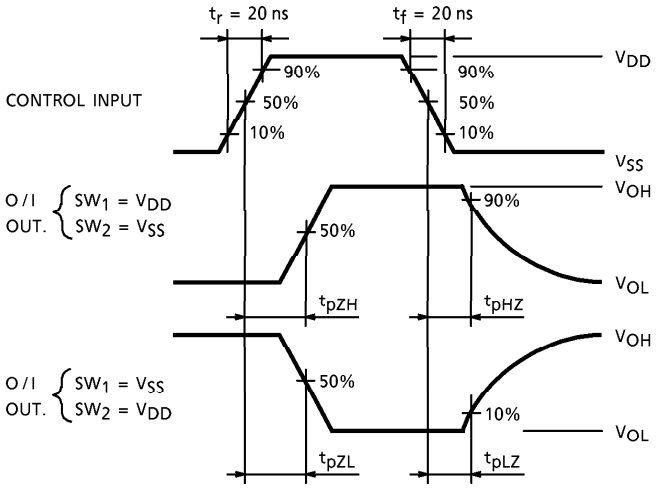




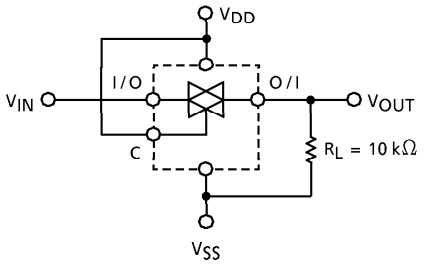
2. t_{pZL}, t_{pZH}, t_{pLZ}, t_{pHZ}

CONTROL-O/I



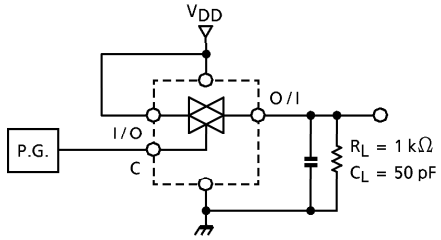


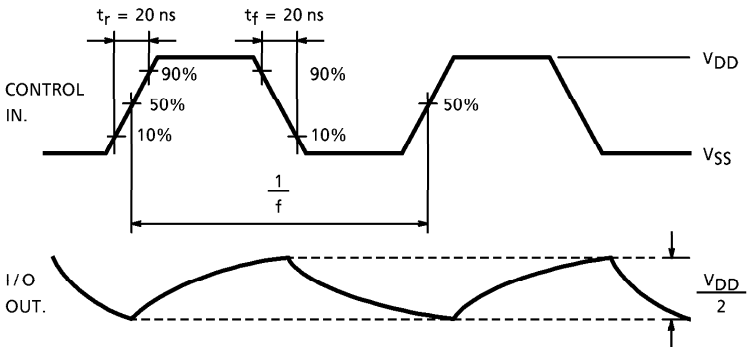
3. R_{ON}



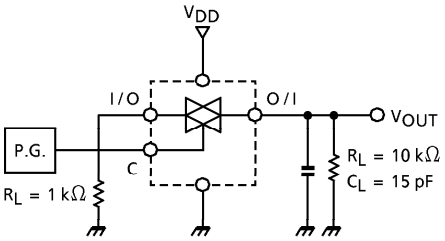
$$R_{ON} = 10 \times \frac{(V_{IN} - V_{OUT})}{V_{OUT}} (k\Omega)$$

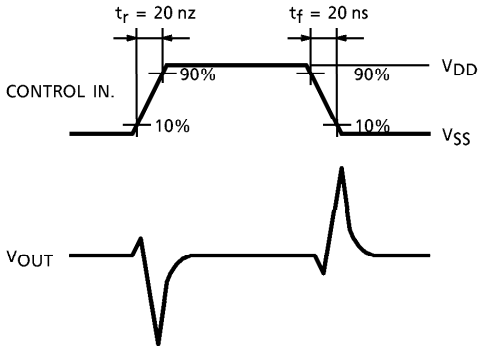
4. f_{MAX} (C)



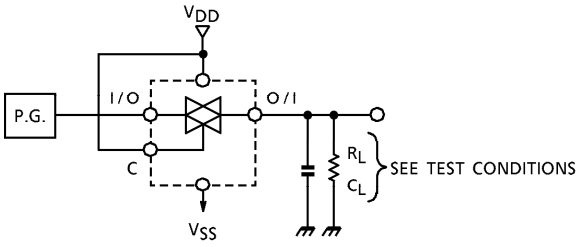


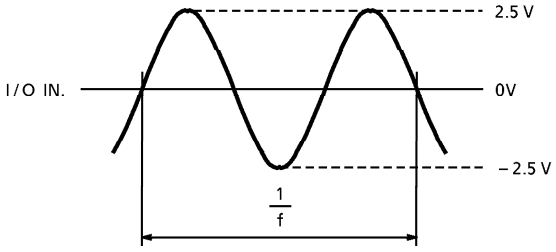
5. CROSSTALK (CONTROL INPUT)





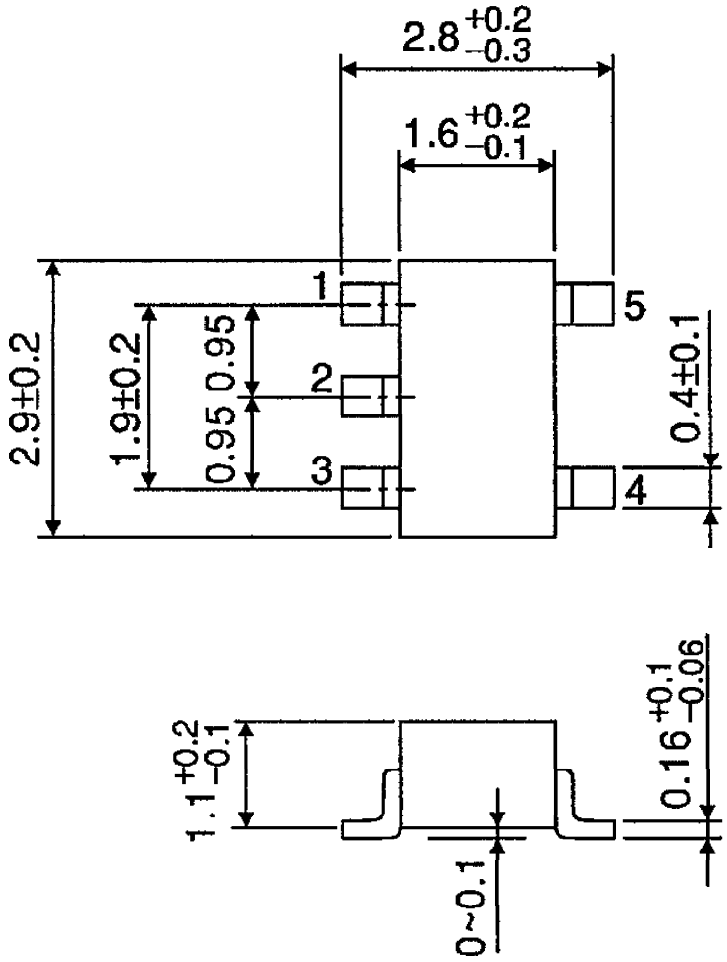
6. TOTAL HARMONIC DISTORTION, f_{MAX} (I/O-O/I), FEEDTHROUGH (SWITCH OFF)





PACKAGE DIMENSIONS

SSOP5-P-0.95 Unit : mm

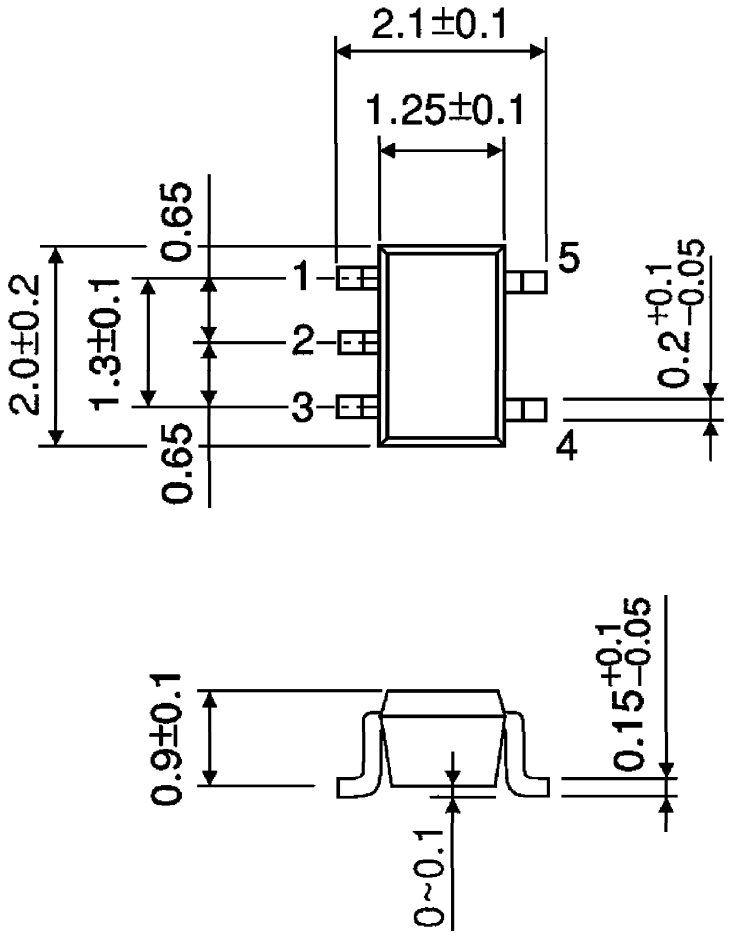


Weight : 0.016 g (Typ.)

PACKAGE DIMENSIONS

SSOP5-P-0.65A

Unit : mm



Weight : 0.006 g (Typ.)