

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TC4W66F, TC4W66FU

## DUAL BILATERAL SWITCH

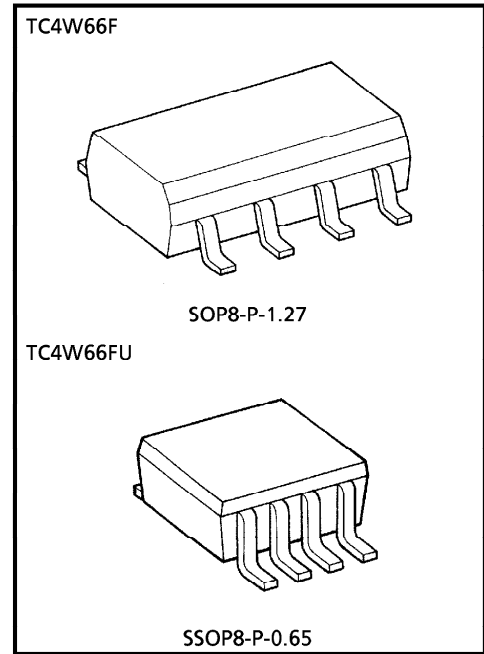
The TC4W66 contains two independence circuits of bidirectional switches. When control input CONT is set to "H" level, the impedance between input and output of the switch becomes low and when it is set to "L" level, the switch becomes high. This can be applied for switching of analog signals and digital signals.

### FEATURES

- ON-resistance,  $R_{ON}$   
 250Ω (Typ.) . . . .  $V_{DD}-V_{SS} = 5V$   
 110Ω (Typ.) . . . .  $V_{DD}-V_{SS} = 10V$   
 70Ω (Typ.) . . . . .  $V_{DD}-V_{SS} = 15V$
- OFF-resistance,  $R_{OFF}$   
 $R_{OFF}$  (Typ.) >  $10^9\Omega$

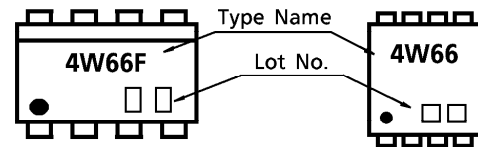
### MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	$V_{DD}$	$V_{SS} - 0.5 \sim V_{SS} + 20$	V
Control Input Voltage	$V_{C IN}$	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
Switch I/O Voltage	$V_{I/O}$	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
Power Dissipation	$P_D$	300	mW
Potential difference across I/O during ON	$V_I - V_O$	$\pm 0.5$	V
Control Input Current	$I_{C IN}$	$\pm 10$	mA
Operating Temperature Range	$T_{opr}$	-40~85	°C
Storage Temperature	$T_{stg}$	-65~150	°C
Lead Temp. / Time	$T_L$	260°C / 10s	

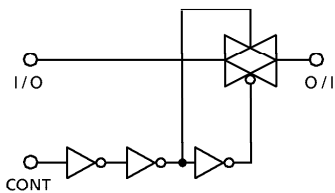


Weight SOP8-P-1.27 : 0.05g (Typ.)  
 SSOP8-P-0.65 : 0.02g (Typ.)

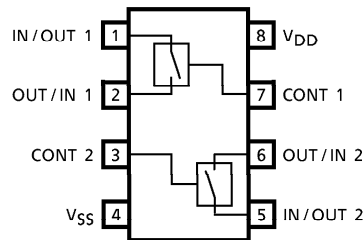
### MARKING



### LOGIC DIAGRAM (1/2 TC4W66F)



### PIN ASSIGNMENT (TOP VIEW)



### TRUTH TABLE

CONTROL	IMPEDANCE BETWEEN IN / OUT-OUT / IN *
H	$0.5 \sim 5 \times 10^2 \Omega$
L	$> 10^9 \Omega$

\* See static electrical characteristics.

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**RECOMMENDED OPERATING CONDITIONS (V<sub>SS</sub> = 0V)**

CHARACTERISTICS	SYMBOL		MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	V <sub>DD</sub>	—	3	—	18	V
Input/Output Voltage	V <sub>DD</sub> /V <sub>OUT</sub>	—	0	—	V <sub>DD</sub>	

**STATIC ELECTRICAL CHARACTERISTICS (In case not specifically appointed, V<sub>SS</sub> = 0V)**

CHARACTERISTICS	SYM-BOL	TEST CONDITION	V <sub>DD</sub> (V)	Ta = -40°C		Ta = 25°C			Ta = 85°C		UNIT	
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.		
Control Input High Voltage	V <sub>IH</sub>	I <sub>IS</sub>   = 10μA	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 <sub>IL</sub>	I <sub>IS</sub>   = 10μA	5	—	1.5	—	2.25	1.5	—	1.5	V	
			10	—	3.0	—	4.5	3.0	—	3.0		
			15	—	4.0	—	6.75	4.0	—	4.0		
On-State Resistance	R <sub>ON</sub>	0 ≤ V <sub>IS</sub> ≤ V <sub>DD</sub> R <sub>L</sub> = 10kΩ	5	—	800	—	290	950	—	1200	Ω	
			10	—	210	—	120	250	—	300		
			15	—	140	—	85	160	—	200		
Δ On-State Resistance (Between Any2 Switches)	R <sub>ON Δ</sub>	—	5	—	—	—	10	—	—	—	Ω	
			10	—	—	—	6	—	—	—		
			15	—	—	—	4	—	—	—		
Input / Output Leakage Current	I <sub>OFF</sub>	V <sub>IN</sub> = 18V, V <sub>OUT</sub> = 0V V <sub>IN</sub> = 0V, V <sub>OUT</sub> = 18V	18	—	± 100	—	± 0.1	± 100	—	± 1000	nA	
			18	—	± 100	—	± 0.1	± 100	—	± 1000		
Quiescent Device Current	I <sub>DD</sub>	V <sub>IN</sub> = V <sub>DD</sub> , V <sub>SS</sub> *	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 <sub>IH</sub>	V <sub>IH</sub> = 18V	18	—	0.1	—	10 <sup>-5</sup>	0.1	—	1.0	μA
	L Level	I <sub>IL</sub>	V <sub>IL</sub> = 0V	18	—	-0.1	—	-10 <sup>-5</sup>	-0.1	—	-1.0	

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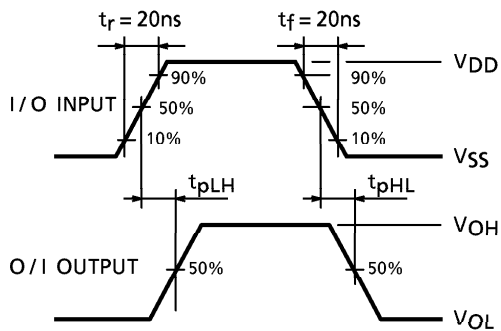
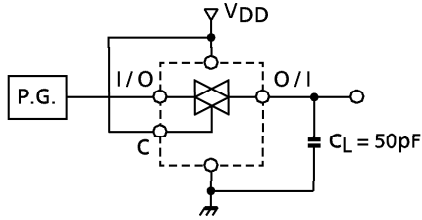
**DYNAMIC ELECTRICAL CHARACTERISTICS** (Ta = 25°C, VSS = 0V, CL = 50pF)

CHARACTERISTICS	SYMBOL	TEST CONDITION	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
			VSS (V)	VDD (V)				
Phase Difference between Input to Output	$\phi$ I-O	CL = 50pF	0	5	—	15	40	ns
			0	10	—	8	20	
			0	15	—	5	15	
Propagation Delay Time (CONTROL-OUT)	t <sub>pZL</sub> t <sub>pZH</sub>	RL = 1kΩ CL = 50pF	0	5	—	55	120	
			0	10	—	25	40	
			0	15	—	20	30	
Propagation Delay Time (CONTROL-OUT)	t <sub>pLZ</sub> t <sub>pHZ</sub>	RL = 1kΩ CL = 50pF	0	5	—	45	80	
			0	10	—	30	70	
			0	15	—	25	60	
MAX. Control Input Repetition Rate	f <sub>MAX</sub> (C)	RL = 1kΩ CL = 50pF	0	5	—	10	—	MHz
			0	10	—	12	—	
			0	15	—	12	—	
- 3dB Cutoff Frequency	f <sub>MAX</sub> (I-O)	RL = 1kΩ CL = 50pF (*1)	- 5	5	—	30	—	
Total Harmonic Distortion	—	RL = 10kΩ f = 1kHz (*2)	- 5	5	—	0.03	—	%
- 50dB Feed through Frequency	—	RL = 1kΩ (*3)	- 5	5	—	600	—	kHz
- 50dB Crosstalk Frequency	—	RL = 1kΩ (*4)	- 5	5	—	1	—	MHz
Crosstalk (CONTROL-OUT)	—	RIN = 1kΩ ROUT = 10kΩ CL = 15pF	0	5	—	200	—	mV
			0	10	—	400	—	
			0	15	—	600	—	
Input Capacitance	C <sub>IN</sub>	Control Input	—	—	—	5	7.5	pF
		Switch I/O	—	—	—	10	—	
Feed through Capacitance	C <sub>IN-OUT</sub>	—	—	—	—	0.5	—	

- \*1 Since wave of  $\pm 2.5V_{p-p}$  shall be used for V<sub>IS</sub> and the frequency of  $20\log_{10} \frac{V_{OS}}{V_{IS}}$  = - 3dB shall be f<sub>MAX</sub>.
- \*2 V<sub>IS</sub> shall be sine wave of  $\pm 2.5V_{p-p}$ .
- \*3 Sine wave of  $\pm 2.5V_{p-p}$  shall be used for V<sub>IS</sub> and the frequency of  $20\log_{10} \frac{V_{OUT}}{V_{IS}}$  = - 50dB shall be feed-through.
- \*4 Sine wave of  $\pm 2.5V_{p-p}$  shall be used for V<sub>IS</sub> and the frequency of  $20\log_{10} \frac{V_{OUT}}{V_{IS}}$  = - 50dB shall be crosstalk.

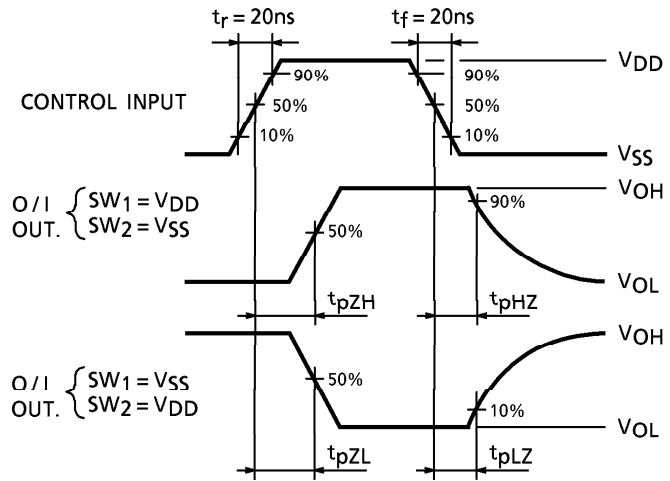
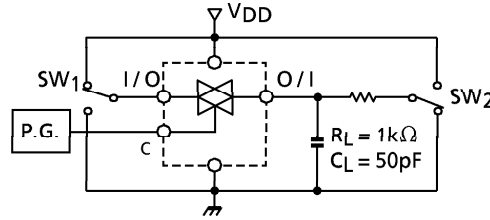
1.  $t_{pLH}$ ,  $t_{pHL}$

I/O-O/I

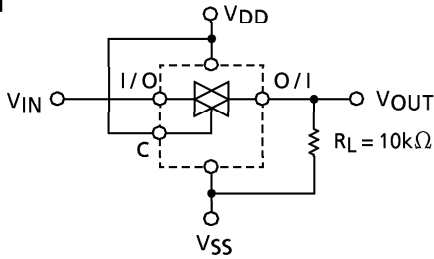


2.  $t_{pZL}$ ,  $t_{pZH}$ ,  $t_{pLZ}$ ,  $t_{pHZ}$

CONTROL-O/I

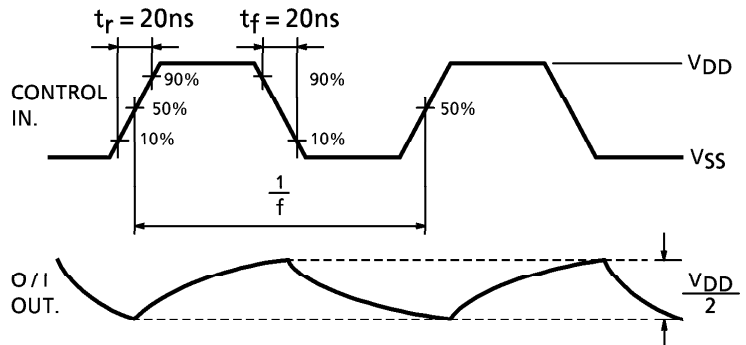
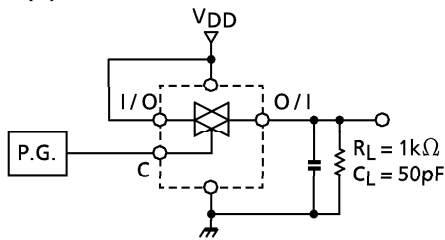


3.  $R_{ON}$

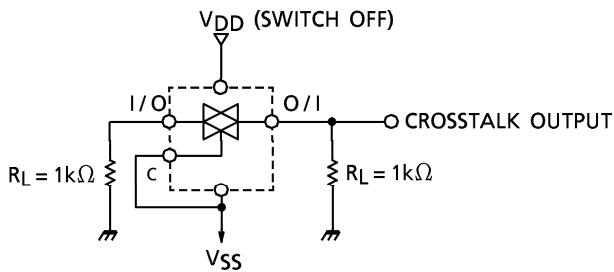
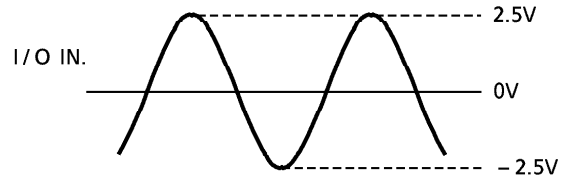
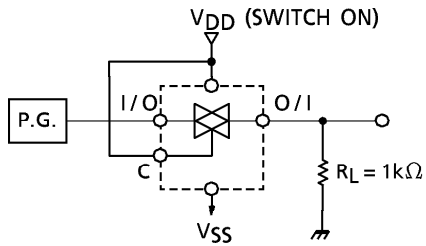


$$R_{ON} = 10 \times \frac{(V_{IN} - V_{OUT})}{V_{OUT}} \text{ (k}\Omega\text{)}$$

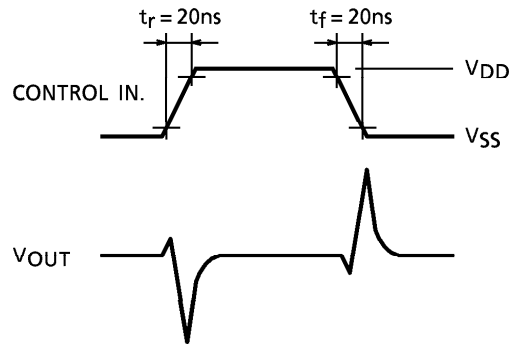
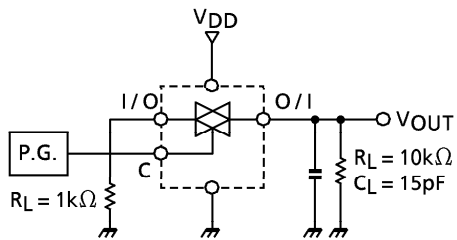
4.  $f_{MAX}(C)$



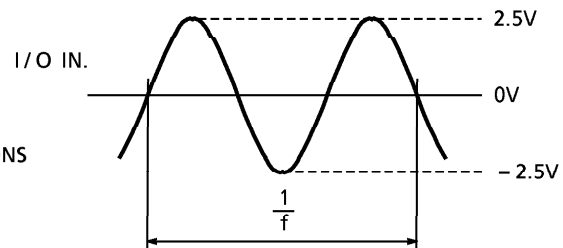
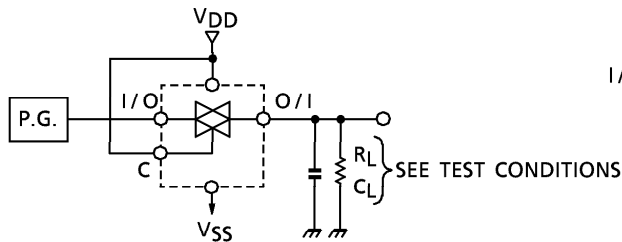
5. CROSSTALK (SWITCH I/O)



6. CROSSTALK (CONTROL INPUT)

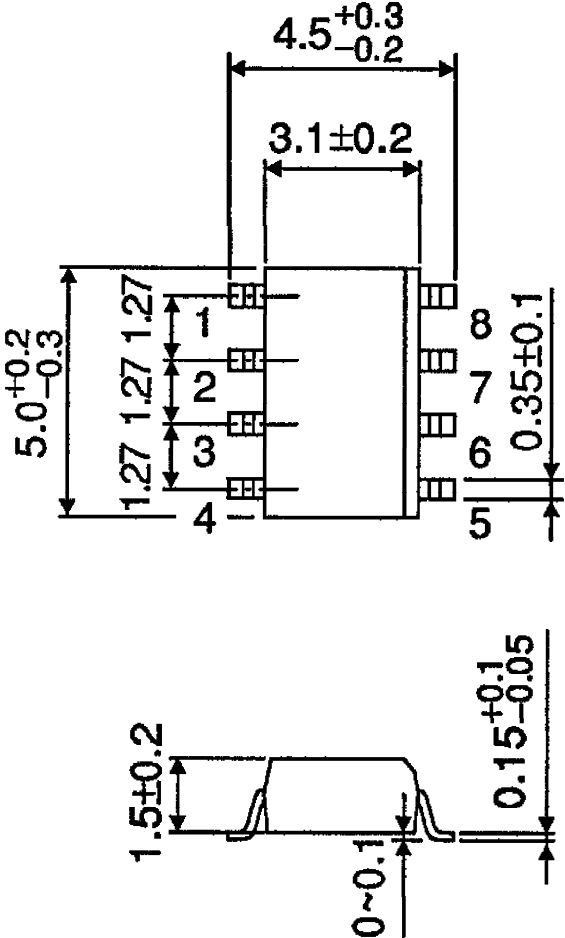


7. TOTAL HARMONIC DISTORTION,  $f_{MAX}$  (I/O-O/I), FEEDTHROUGH (SWITCH OFF)



OUTLINE DRAWING  
SOP8-P-1.27

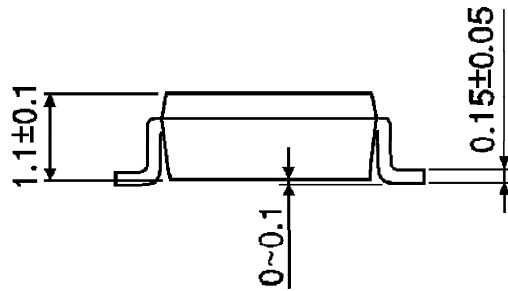
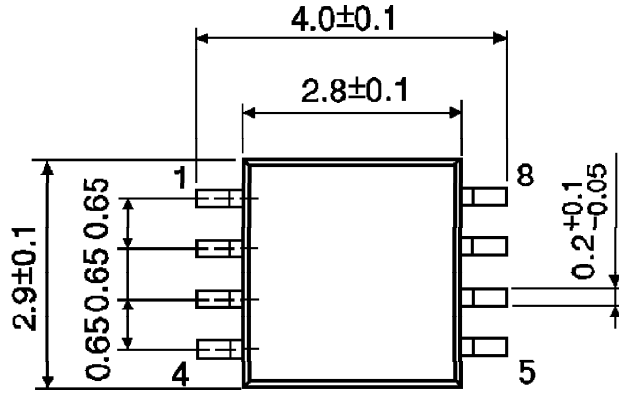
Unit : mm



Weight : 0.05g (Typ.)

OUTLINE DRAWING  
SSOP8-P-0.65

Unit : mm



Weight : 0.02g (Typ.)