

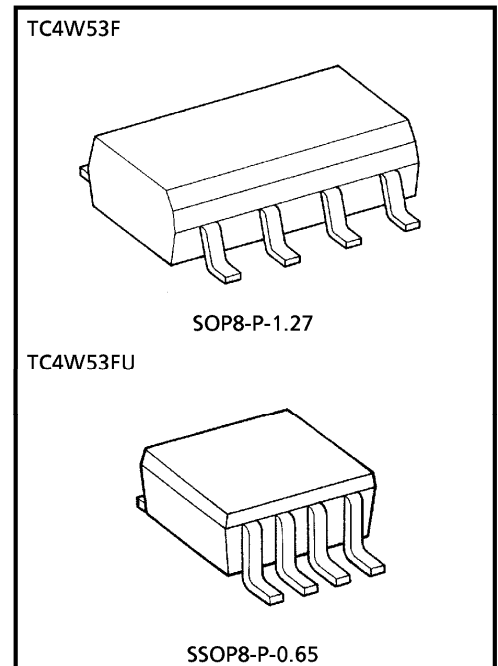
# TC4W53F, TC4W53FU

## 2-CHANNEL MULTIPLEXER / DEMULTIPLEXER

The TC4W53 is multiplexer with capabilities of selection and mixture of analog signal and digital signal. TC4W53F has 2 channel configuration. The digital signal to the control terminal turns "ON" the corresponding switch of each channel, with large amplitude ( $V_{DD}-V_{EE}$ ) can be switched by the control signal with small logical amplitude ( $V_{DD}-V_{SS}$ ). For example, in the case of  $V_{DD}=5V$ ,  $V_{SS}=0V$  and  $V_{EE}=-5V$ , signals between  $-5V$  and  $+5V$  can be switched from the logical circuit with signal power supply of 5 volts. As the ON-resistance of each switch is low, these can be connected to the circuits with low input impedance.

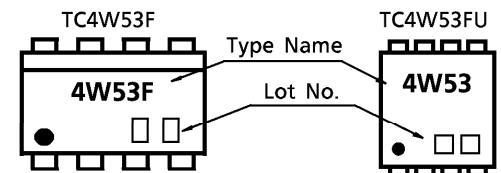
### MAXIMUM RATINGS

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

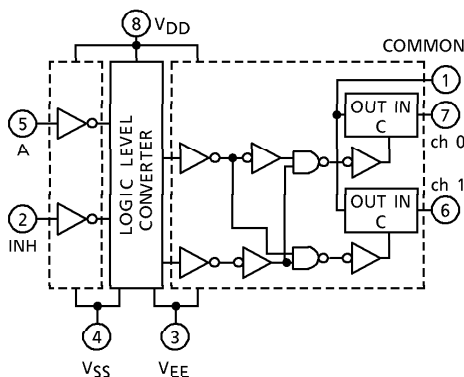


Weight SOP8-P-1.27 : 0.05g (Typ.)  
SSOP8-P-0.65 : 0.02g (Typ.)

### MARKING



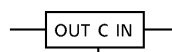
### LOGIC DIAGRAM



### TRUTH TABLE

CONTROL INPUT		ON CHANNEL
INH	A	
L	L	ch 0
L	H	ch 1
H	x	NONE

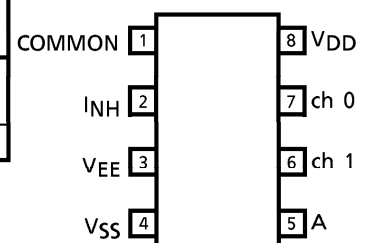
x : Don't Care



### TRUTH TABLE

CONTROL C	IMPE-DANCE BETWEEN IN-OUT
H	$0.5\sim 5 \times 10^2 \Omega$
L	$> 10^9 \Omega$

### PIN ASSIGNMENT (TOP VIEW)



## RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL		MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	$V_{DD}-V_{SS}$	—	3	—	18	V
	$V_{DD}-V_{EE}$	—	3	—	18	V
Control Input Voltage	$V_{IN}$	—	$V_{SS}$	—	$V_{DD}$	V
Input/Output Voltage	$V_{IN}-V_{OUT}$	—	$V_{EE}$	—	$V_{DD}$	V

## DC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYM-BOL	TEST CONDITION			-40°C		25°C			85°C		UNIT
		$V_{SS}$ (V)	$V_{EE}$ (V)	$V_{DD}$ (V)	MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.	
Control Input High Voltage	$V_{IH}$	$V_{IS} = V_{DD}$ thru $1k\Omega$	$V_{EE} = V_{SS}$ $R_L = 1k\Omega$ to $V_{SS}$ $I_{LS} < 2\mu A$ on all OFF Channels	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	$V_{IL}$			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	$R_{ON}$	$0 \leq V_{IS} \leq V_{DD}$ $R_L = 10k\Omega$		5	—	850	—	240	950	—	1200	$\Omega$
				10	—	210	—	110	250	—	300	
				15	—	140	—	80	160	—	200	
$\Delta$ ON-State Resistance Between 2 Switches	$\Delta R_{ON}$	—		5	—	—	—	10	—	—	—	$\Omega$
				10	—	—	—	6	—	—	—	
				15	—	—	—	4	—	—	—	
Input/Output Leakage Current	$I_{OFF}$	$V_{IN} = 18V, V_{OUT} = 0V$ $V_{IN} = 0V, V_{OUT} = 18V$		18	—	$\pm 100$	—	$\pm 0.01$	$\pm 100$	—	$\pm 1000$	nA
				18	—	$\pm 100$	—	$\pm 0.01$	$\pm 100$	—	$\pm 1000$	
Quiescent Device Current	$I_{DD}$	$V_{IN} = V_{SS}, V_{DD} *$		5	—	5.0	—	0.005	5.0	—	150	$\mu A$
				10	—	10	—	0.010	10	—	300	
				15	—	20	—	0.015	20	—	600	
Input Current	$I_{IN}$	$V_{IH} = 18V, V_{IL} = 0V$		18	—	0.1	—	$10^{-5}$	0.1	—	1.0	$\mu A$
				18	—	-0.1	—	$-10^{-5}$	-0.1	—	-1.0	
Input Capacitance	$C_{IN}$	—	—	—	—	—	—	5	7.5	—	—	pF
Switch Input Capacitance	$C_{IN}$	—	—	—	—	—	—	10	—	—	—	pF
Switch Output Capacitance	$C_{OUT}$	—	—	—	—	—	—	17	—	—	—	
Feedthrough Capacitance	$C_{IN-OUT}$	—	—	—	—	—	—	0.2	—	—	—	

\* All valid input combinations.

## AC ELECTRICAL CHARACTERISTICS (Ta = 25°C, CL = 50pF)

CHARACTERISTIC	SYMBOL	TEST CONDITION	TEST CONDITION			MIN.	TYP.	MAX.	UNIT
			VSS (V)	VEE (V)	VDD (V)				
Phase difference between input to output	$\phi_{I-O}$	—	0	0	5	—	15	45	ns
			0	0	10	—	8	20	
			0	0	15	—	6	15	
Propagation Delay Time (A-OUT)	$t_{pZL}$ $t_{pZH}$ $t_{pLZ}$ $t_{pHZ}$	$R_L = 1k\Omega$	0	0	5	—	170	550	ns
			0	0	10	—	90	240	
			0	0	15	—	70	160	
			0	-5	5	—	100	240	
			0	-7.5	7.5	—	80	160	
Propagation Delay Time (INH-OUT)	$t_{pZL}$ $t_{pZH}$	$R_L = 1k\Omega$	0	0	5	—	120	380	ns
			0	0	10	—	60	200	
			0	0	15	—	50	160	
			0	-5	5	—	80	200	
			0	-7.5	7.5	—	60	160	
Propagation Delay Time (INH-OUT)	$t_{pLZ}$ $t_{pHZ}$	$R_L = 1k\Omega$	0	0	5	—	170	450	ns
			0	0	10	—	90	210	
			0	0	15	—	70	160	
			0	-5	5	—	100	210	
			0	-7.5	7.5	—	80	160	
-3dB Cutoff Frequency	$f_{MAX(I-O)}$	$R_L = 1k\Omega$ (*1)	-5	-5	5	—	40	—	MHz
Total Harmonic Distortion	—	$R_L = 10k\Omega$ $f = 1kHz$ (*2)	-2.5	-2.5	2.5	—	0.15	—	%
			-5	-5	5	—	0.03	—	
			-7.5	-7.5	7.5	—	0.02	—	
-50dB Feedthrough (Switch OFF)	—	$R_L = 1k\Omega$ (*3)	-5	-5	5	—	500	—	kHz
Crosstalk (CONTROL-OUT)	—	$R_{IN} = 1k\Omega$ $R_{OUT} = 10k\Omega$ $C_L = 15pF$	0	0	5	—	200	—	mV
			0	0	10	—	400	—	
			0	0	15	—	600	—	

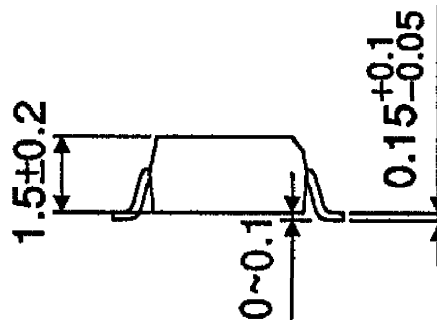
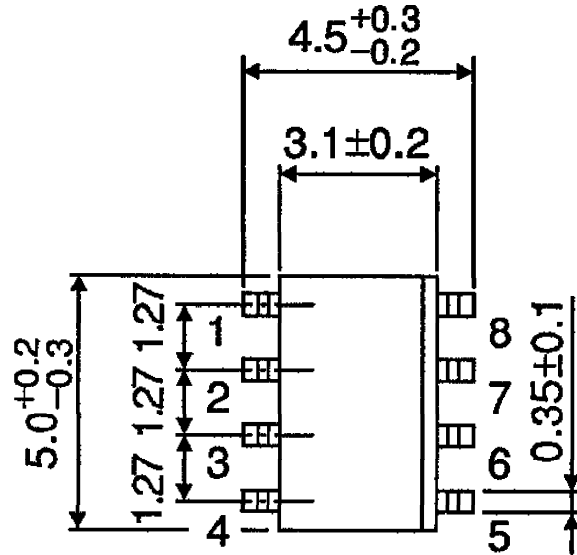
\*1 Sine wave of  $\pm 2.5V_{p-p}$  shall be used for  $V_{IS}$  and the frequency of  $20\log_{10} \frac{V_{OS}}{V_{IS}}$  = -3dB shall be  $f_{MAX}$ .

\*2  $V_{IS}$  shall be sine wave of  $\pm \left( \frac{V_{DD} - V_{EE}}{4} \right) p-p$ .

\*3 Sine wave of  $\pm 2.5V_{p-p}$  shall be used for  $V_{IS}$  and the frequency of  $20\log_{10} \frac{V_{OS}}{V_{IS}}$  = -50dB shall be feed-through.

PACKAGE DIMENSIONS  
SOP8-P-1.27

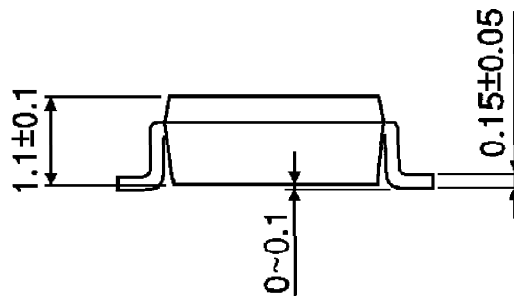
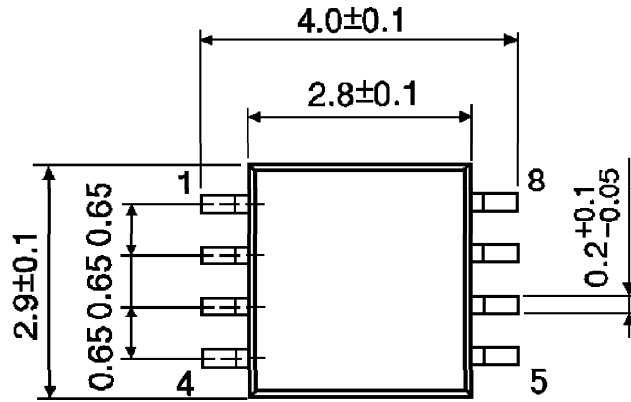
Unit : mm



Weight : 0.05g (Typ.)

PACKAGE DIMENSIONS  
SSOP8-P-0.65

Unit : mm



Weight : 0.02g (Typ.)

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000707EBA

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