

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

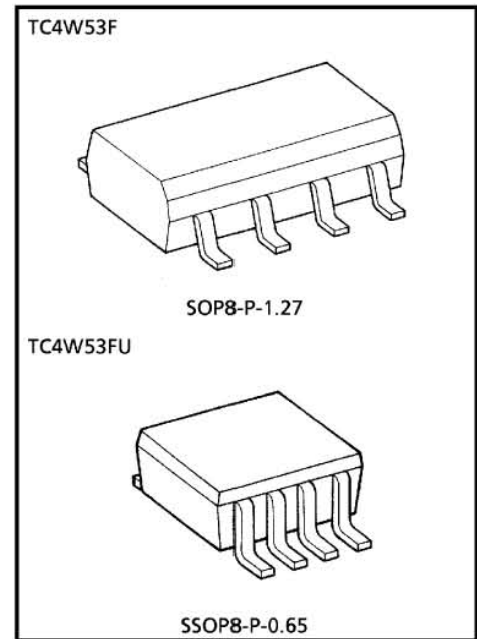
TC4W53F, TC4W53FU

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.

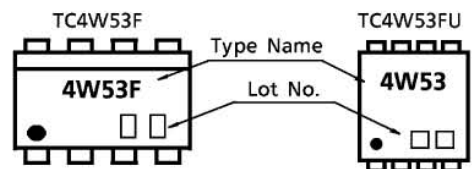
MAXIMUM RATINGS

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}	± 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	$^{\circ}C$

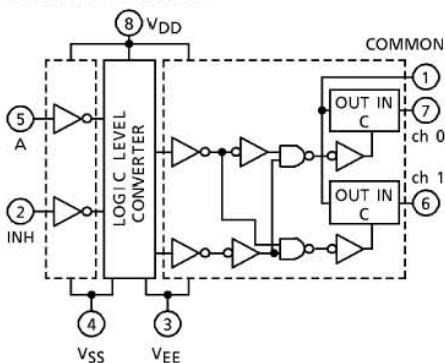


Weight SOP8-P-1.27 : 0.05g (Typ.)
SSOP8-P-0.65 : 0.02g (Typ.)

MARKING



LOGIC DIAGRAM



TRUTH TABLE

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

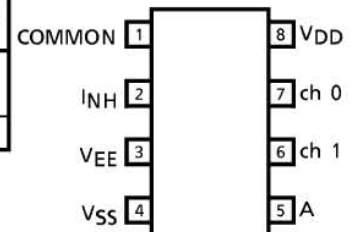
x : Don't Care



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}	$0 \leq V_{IS} \leq V_{DD}$ $R_L = 10k\Omega$	0	0	5	—	850	—	240	950	—	1200	Ω
			0	0	10	—	210	—	110	250	—	300	
			0	0	15	—	140	—	80	160	—	200	
Δ ON-State Resistance Between 2 Switches	ΔR_{ON}	—		5	—	—	—	10	—	—	—	Ω	
				10	—	—	—	6	—	—	—		
				15	—	—	—	4	—	—	—		
Input / Output Leakage Current	I_{OFF}	$V_{IN} = 18V, V_{OUT} = 0V$ $V_{IN} = 0V, V_{OUT} = 18V$	18	—	± 100	—	± 0.01	± 100	—	± 1000	—	nA	
			18	—	± 100	—	± 0.01	± 100	—	± 1000			
Quiescent Device Current	I_{DD}	$V_{IN} = V_{SS}, V_{DD} *$	5	—	5.0	—	0.005	5.0	—	150	μA		
			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	μA		
			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}	—	10	—	—	—	17	—	—	—			
Feedthrough Capacitance	C_{IN}^- C_{OUT}	—	10	—	—	—	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	φI-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 = 1kΩ	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 = 1kΩ	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 = 1kΩ	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 = 1kΩ (*1)	-5	-5	5	—	40	—	MHz
Total Harmonic Distortion	—	R _L = 10kΩ 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 = 1kΩ (*3)	-5	-5	5	—	500	—	kHz
Crosstalk (CONTROL-OUT)	—	R _{IN} = 1kΩ R _{OUT} = 10kΩ C _L = 15pF	0	0	5	—	200	—	mV
			0	0	10	—	400	—	
			0	0	15	—	600	—	

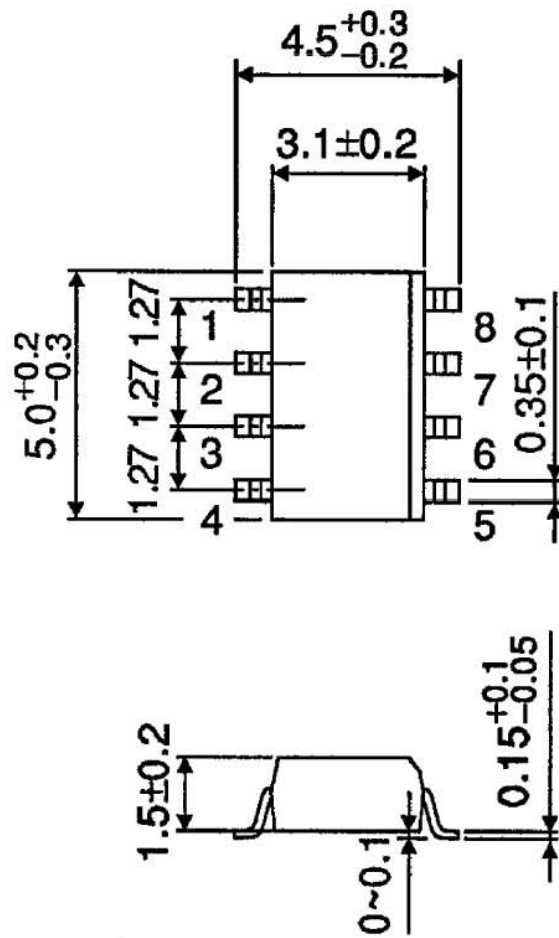
*1 Sine wave of ±2.5V_{p-p} shall be used for V_{IS} and the frequency of $20\log_{10} \frac{V_{OS}}{V_{IS}}$ = -3dB shall be f_{MAX}.

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

*3 Sine wave of ±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

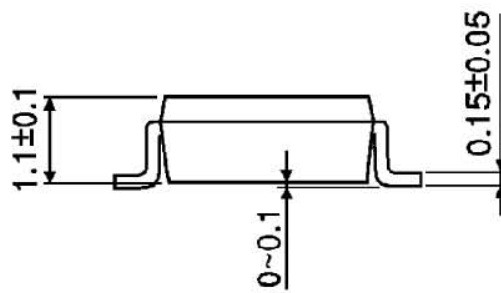
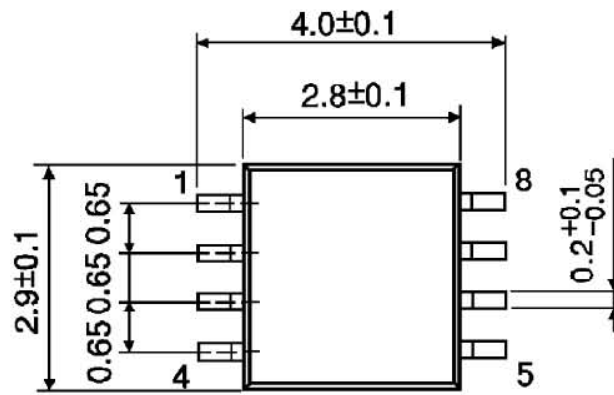
Unit : mm



Weight : 0.05g (Typ.)

PACKAGE DIMENSIONS
SSOP8-P-0.65

Unit : mm



Weight : 0.02g (Typ.)