

TC4W53F, TC4W53FU

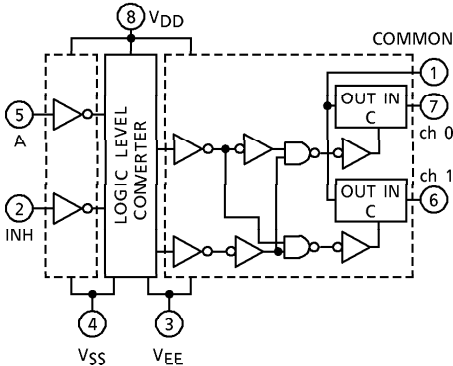
2-CHANNEL MULTIPLEXER / DEMULTIPLEXER

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	$^{\circ}C$

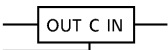
LOGIC DIAGRAM



TRUTH TABLE

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

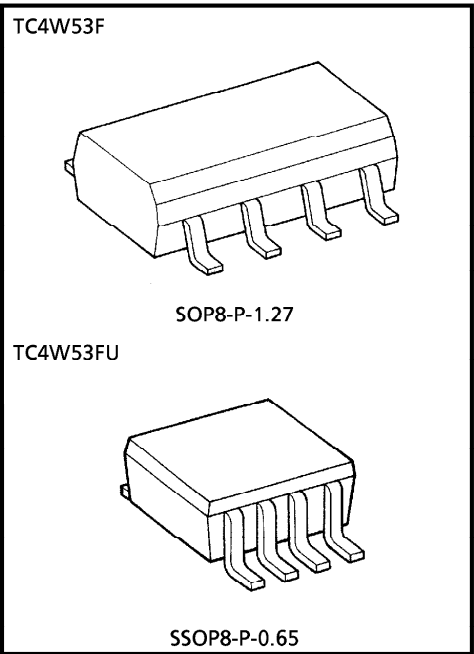
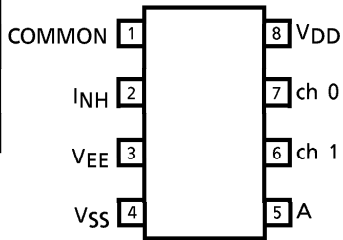
x : Don't Care



TRUTH TABLE

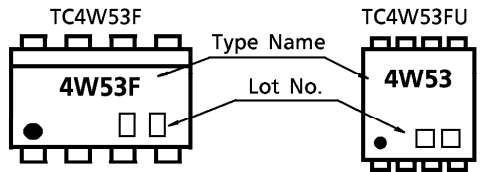
CON-TROL C	IMPE-DANCE BETWEEN IN-OUT
H	$0.5\sim 5 \times 10^2 \Omega$
L	$> 10^9 \Omega$

PIN ASSIGNMENT (TOP VIEW)



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

MARKING



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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 1kΩ	V _{EE} = V _{SS} R _L = 1kΩ to V _{SS} I _{LS} < 2μA 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		
				10	—	3.0	—	4.5	3.0	—	3.0		
				15	—	4.0	—	6.75	4.0	—	4.0		
On-State Resistance	R _{ON}	0 ≤ V _{IS} ≤ V _{DD} R _L = 10kΩ	0	0	5	—	850	—	240	950	—	1200	Ω
			0	0	10	—	210	—	110	250	—	300	
			0	0	15	—	140	—	80	160	—	200	
ΔON-State Resistance Between 2 Switches	ΔR _{ON}	—	0	0	5	—	—	—	10	—	—	—	Ω
			0	0	10	—	—	—	6	—	—	—	
			0	0	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 - OUT}	—			10	—	—	—	0.2	—	—	—	

* All valid input combinations.

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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	ϕ_{I-O}	—	0 0 0	0 0 0	5 10 15	— — —	15 8 6	45 20 15	ns
Propagation Delay Time (A-OUT)	t_{pZL} t_{pZH} t_{pLZ} t_{pHZ}	$R_L = 1k\Omega$	0 0 0 0 0	0 0 0 -5 -7.5	5 10 15 5 7.5	— — — — —	170 90 70 100 80	550 240 160 240 160	ns
Propagation Delay Time (INH-OUT)	t_{pZL} t_{pZH}	$R_L = 1k\Omega$	0 0 0 0 0	0 0 0 -5 -7.5	5 10 15 5 7.5	— — — — —	120 60 50 80 60	380 200 160 200 160	ns
Propagation Delay Time (INH-OUT)	t_{pLZ} t_{pHZ}	$R_L = 1k\Omega$	0 0 0 0 0	0 0 0 -5 -7.5	5 10 15 5 7.5	— — — — —	170 90 70 100 80	450 210 160 210 160	ns
- 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 -5 -7.5	-2.5 -5 -7.5	2.5 5 7.5	— — —	0.15 0.03 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 0	0 0 0	5 10 15	— — —	200 400 600	— — —	mV

*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.