

# TC4W53FU

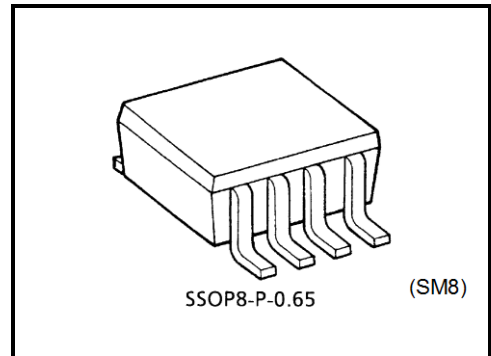
## 2-Channel Multiplexer, Demultiplexer

The TC4W53FU is multiplexer with capabilities of selection and mixture of analog signal and digital signal.

TC4W53FU has 2 channel configuration.

The digital signal to the control terminal turns “ON” the corresponding switch of each channel a 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  $V_{DD} = 5\text{ V}$ ,  $V_{SS} = 0\text{ V}$  and  $V_{EE} = -5\text{ V}$ , signals between  $-5\text{ V}$  and  $+5\text{ V}$  can be switched from the logical circuit with a signal power supply of  $5\text{ V}$ . As the ON-resistance of each switch is low, these can be connected to circuit with low input impedance.

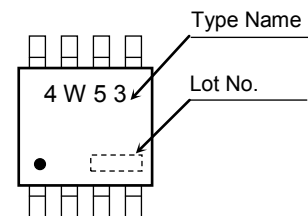


Weight  
SSOP8-P-0.65: 0.02 g (typ.)

### Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
Supply voltage range	$V_{DD}-V_{SS}$	-0.5 to 20	V
	$V_{DD}-V_{EE}$	-0.5 to 20	
Control input voltage	$V_{CIN}$	$V_{SS} - 0.5$ to $V_{DD} + 0.5$	V
Switch I/O voltage	$V_{I/O}$	$V_{EE} - 0.5$ to $V_{DD} + 0.5$	V
Control input current	$I_{CIN}$	$\pm 10$	mA
Potential difference across I/O during ON	$V_{I-O}$	-0.5 to 0.5	V
Power dissipation	$P_D$	300	mW
Operating temperature range	$T_{opr}$	-40 to 85	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-65 to 150	$^\circ\text{C}$
Lead temperature (10 s)	$T_L$	260	$^\circ\text{C}$

### Marking



Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

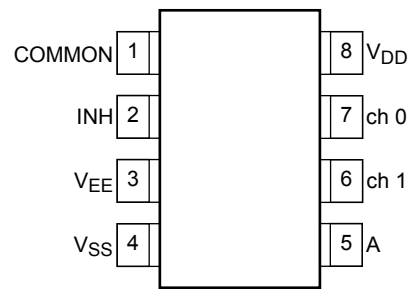
Start of commercial production  
1990-05

## Truth Table

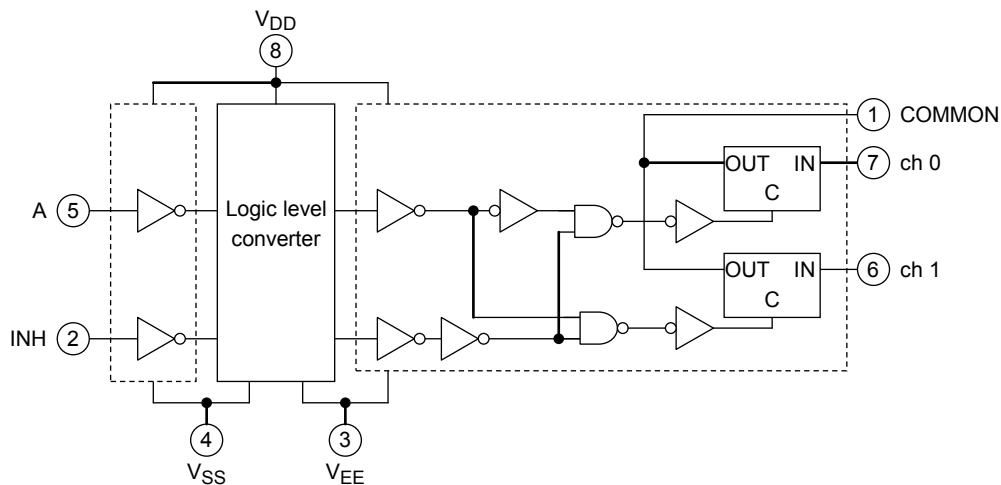
Control Input		On Channel
INH	A	
L	L	ch 0
L	H	ch 1
H	X	none

X: Don't care

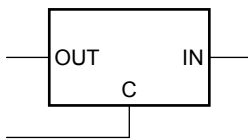
## Pin Assignment (top view)



## Logic Diagram



## Truth Table



Control C	Impedance between IN/OUT
H	$0.5 \text{ to } 5 \times 10^2 \Omega$
L	$> 10^9 \Omega$

## Operating Ranges

Characteristics	Symbol	Min.	Typ.	Max.	Unit
DC supply voltage	$V_{DD}-V_{SS}$	3	—	18	V
	$V_{DD}-V_{EE}$	3	—	18	
Control input voltage	$V_{IN}$	$V_{SS}$	—	$V_{DD}$	V
Switch input/output voltage	$V_{I/O}$	$V_{EE}$	—	$V_{DD}$	V

## Static Electrical Characteristics

Characteristics	Symbol	Test Condition	Test Condition			Ta = -40°C		Ta = 25°C			Ta = 85°C		Unit
			V <sub>SS</sub> (V)	V <sub>EE</sub> (V)	V <sub>DD</sub> (V)	Min	Max	Min	Typ.	Max	Min	Max	
Control input high voltage	V <sub>IH</sub>	V <sub>IS</sub> = V <sub>DD</sub>	V <sub>EE</sub> = V <sub>SS</sub> R <sub>L</sub> = 1 kΩ I <sub>LS</sub> < 2 μA 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 <sub>IL</sub>	thru 1 kΩ		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 <sub>ON</sub>	0 ≤ V <sub>IS</sub> ≤ V <sub>DD</sub> R <sub>L</sub> = 10 kΩ	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 any 2 switches)	ΔR <sub>ON</sub>	—	0	0	5	—	—	—	10	—	—	—	Ω
			0	0	10	—	—	—	6	—	—	—	
			0	0	15	—	—	—	4	—	—	—	
Input/output leakage current	I <sub>OFF</sub>	V <sub>IN</sub> = 18 V, V <sub>OUT</sub> = 0 V V <sub>IN</sub> = 0 V, V <sub>OUT</sub> = 18 V	18	—	±100	—	±0.01	±100	—	±1000	—	±1000	nA
			18	—	±100	—	±0.01	±100	—	±1000	—	±1000	
Quiescent device current	I <sub>DD</sub>	V <sub>IN</sub> = V <sub>SS</sub> , V <sub>DD</sub> (Note)	5	—	5.0	—	0.005	5.0	—	150	—	150	μA
			10	—	10	—	0.010	10	—	300	—	300	
			15	—	20	—	0.015	20	—	600	—	600	
Input current	I <sub>IN</sub>	V <sub>IH</sub> = 18 V, V <sub>IL</sub> = 0 V	18	—	0.1	—	10 <sup>-5</sup>	0.1	—	1.0	—	1.0	μA
			18	—	-0.1	—	-10 <sup>-5</sup>	-0.1	—	-1.0	—	-1.0	
Input capacitance	C <sub>IN</sub>	—	—	—	—	—	—	5	7.5	—	—	pF	
Switch Input Capacitance	C <sub>IN</sub>	—	—	—	—	—	—	10	—	—	—	pF	
Switch Output Capacitance	C <sub>OUT</sub>	—	—	—	—	—	—	17	—	—	—		
Feed through capacitance	C <sub>IN-COUT</sub>	—	—	—	—	—	—	0.2	—	—	—	pF	

Note : All valid input combinations.

## Dynamic Electrical Characteristics (Ta = 25°C, CL = 50 pF)

Characteristics	Symbol	Test Condition	Test Condition			Min	Typ.	Max	Unit
			VSS (V)	VEE (V)	VDD (V)				
Phase difference between input to output (switch IN-OUT)	φI-O	—	0	0	5	—	15	45	ns
			0	0	10	—	8	20	
			0	0	15	—	6	15	
Propagation delay time (A-OUT)	tpZL tpZH tpLZ tpHZ	RL = 1 kΩ	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)	tpZL tpZH	RL = 1 kΩ	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	
	tpLZ tpHZ	RL = 1 kΩ	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	
Frequency response	fMAX (I-O)	RL = 1 kΩ (Note 1)	-5	-5	5	—	40	—	MHz
Total harmonic distortion	—	RL = 10 kΩ f = 1 kHz (Note 2)	-2.5	-2.5	2.5	—	0.15	—	%
			-5	-5	5	—	0.03	—	
			-7.5	-7.5	7.5	—	0.02	—	
Feedthrough frequency (switch off)	—	RL = 1 kΩ (Note 3)	-5	-5	5	—	500	—	kHz
Crosstalk frequency	—	RL = 1 kΩ (Note 4)	-5	-5	5	—	1.5	—	MHz
Crosstalk (CONTROL-OUT)	—	RIN = 1 kΩ ROUT = 10 kΩ CL = 15 pF	0	0	5	—	200	—	mV
			0	0	10	—	400	—	
			0	0	15	—	600	—	

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

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

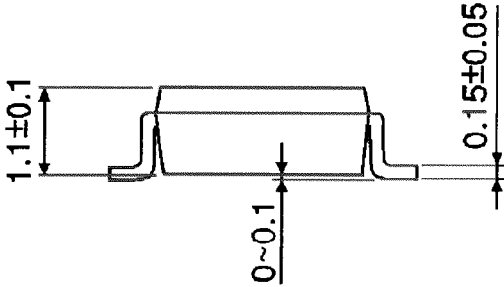
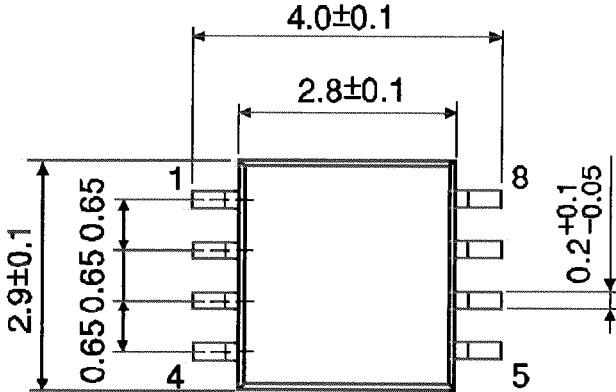
Note 3: Sine wave of  $\pm 2.5 V_{p-p}$  shall be used for  $V_{IS}$  and the frequency of  $20 \log_{10} \frac{V_{OS}}{V_{IS}} = -50dB$  shall be feed-through.

Note 4: Sine wave of  $\pm 2.5 V_{p-p}$  shall be used for  $V_{IS}$  and the frequency of  $20 \log_{10} \frac{V_{OS}}{V_{IS}} = -50dB$  shall be crosstalk.

**Package Dimensions**

SSOP8-P-0.65

Unit : mm



Weight: 0.02 g (typ.)

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