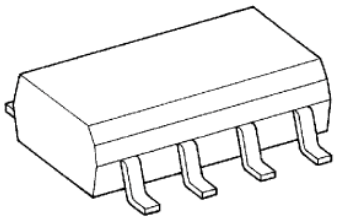
TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC4W53F, TC4W53FU

2-CHANNEL MULTIPLEXER / DEMALTIPLEXER

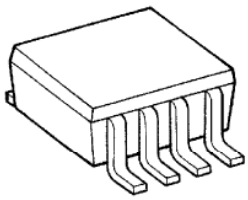
The TC4W53 is multiplexer with capabilities of selection and mixture of analog signal and digital signal.
TC4W53F has 2 channel configuration.
The digital signal to the control terminal turns "ON" the corresponding switch of each channel, with large amplitude (V_{DD}-V_{EE}) can be switched by the control 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.

TC4W53F



SOP8-P-1.27

TC4W53FU



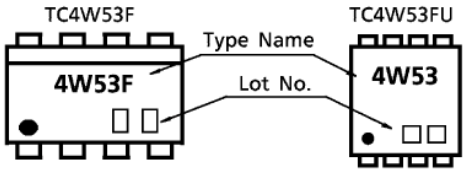
SSOP8-P-0.65

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

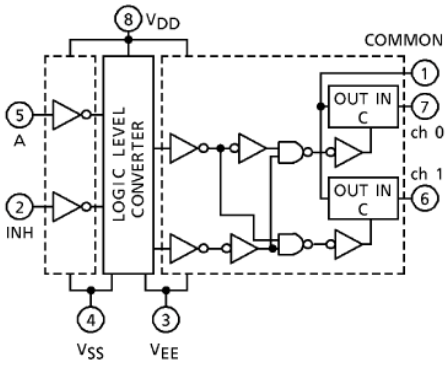
MAXIMUM RATINGS

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

MARKING



LOGIC DIAGRAM



TRUTH TABLE

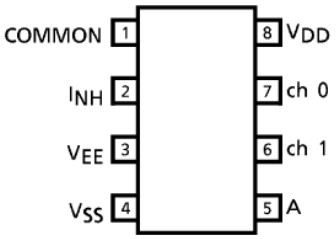
CONTROL INPUT		ON CHANNEL
INH	A	
L	L	ch 0
L	H	ch 1
H	×	NONE

× : Don't Care

TRUTH TABLE

CONTROL C	IMPEDANCE BETWEEN IN-OUT
H	0.5~ $5\times10^2\Omega$
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	V_{SS} (V)	V_{EE} (V)	V_{DD} (V)	−40°C MIN.	−40°C MAX.	25°C MIN.	25°C TYP.	25°C MAX.	85°C MIN.	85°C MAX.	UNIT
Control Input High Voltage	V_{IH}	$V_{IS}=V_{DD}$ thru 1kΩ	$V_{EE}=V_{SS}$		5	3.5	—	3.5	2.75	—	3.5	—	V
			R_L = 1kΩ		10	7.0	—	7.0	5.50	—	7.0	—	
			to V_{SS}		15	11.0	—	11.0	8.25	—	11.0	—	
Control Input Low Voltage	V_{IL}		$I_{LS}<2\mu A$		5	—	1.5	—	2.25	1.5	—	1.5	
			on all OFF		10	—	3.0	—	4.5	3.0	—	3.0	
			Channels		15	—	4.0	—	6.75	4.0	—	4.0	
On-State Resistance	R_{ON}	$0 \leqq V_{IS} \leqq V_{DD}$, 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	
⊿ON-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			18	—	±100	—	±0.01	±100	—	±1000	nA
		V_{IN} = 0V, V_{OUT} = 18V			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.

AC ELECTRICAL CHARACTERISITICS (Ta = 25°C, C_L = 50pF)

CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{SS} (V)	V_{EE} (V)	V_{DD} (V)	MIN.	TYP.	MAX.	UNIT
Phase difference between input to output	ϕ_{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 = 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	
Propagetion 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	
Propagetion 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 $\pm 2.5V_{p-p}$ shall be used for V_{IS} and the frequency of $20\ell og_{10}\frac{V_{OS}}{V_{IS}} = -3dB$ shall be f_{MAX}.

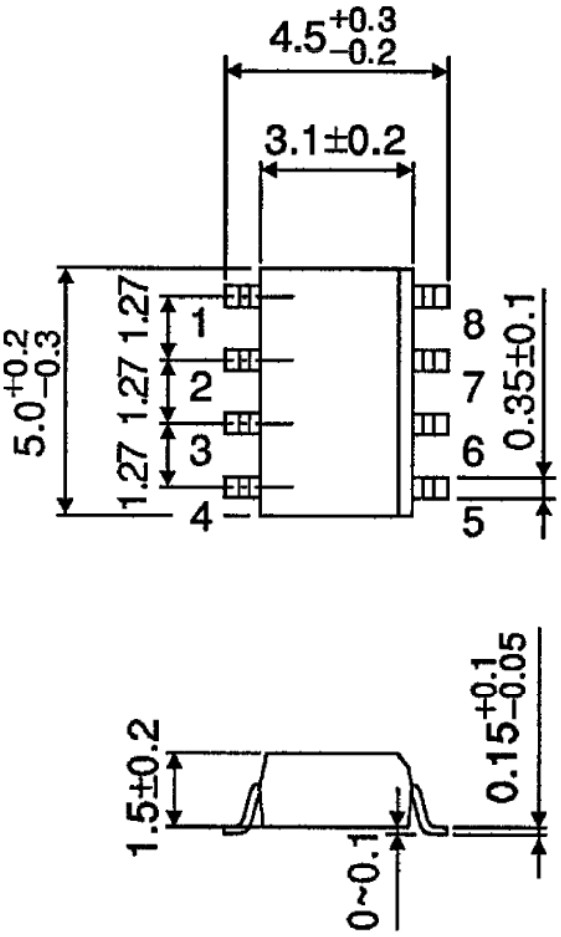
*2 V_{IS} shall be sine wave of $\pm\left(\frac{V_{DD}-V_{EE}}{4}\right)$ p-p.

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

PACKAGE DIMENSIONS

SOP8-P-1.27

Unit : mm



Weight : 0.05g (Typ.)

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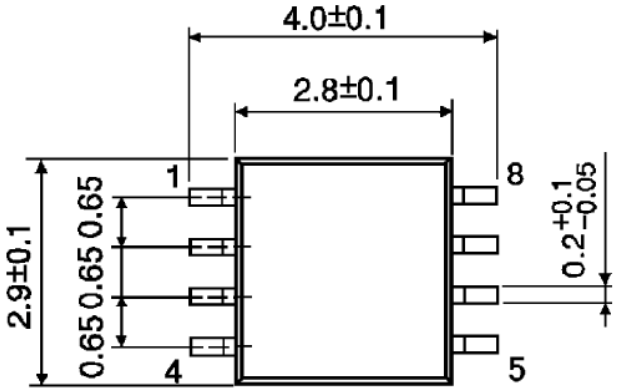
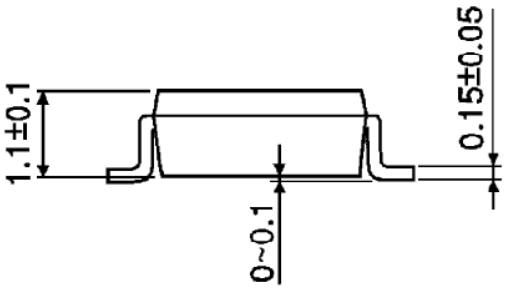
SSOP8-P-0.65

Unit : mm





Weight : 0.02g (Typ.)

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