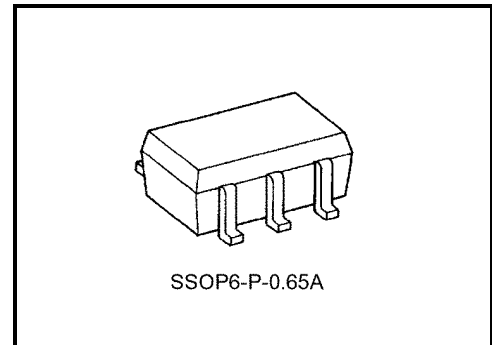


# TC7PA53FU

## 2-Channel Multiplexer/Demultiplexer

### Features

- Ultra-high speed operation:  $t_{pd} = 0.4 \text{ ns (max) @} V_{CC} = 3.6 \text{ V, } C_L = 30 \text{ pF}$
- Ultra-low on resistance:  $R_{ON} = 21 \Omega \text{ (max) @} V_{CC} = 3.6 \text{ V}$
- Operating voltage range:  $V_{CC (opr)} = 1.8 \text{ to } 3.6 \text{ V}$
- High latch-up immunity: Higher than or equal to  $\pm 500 \text{ mA}$
- High ESD: Higher than or equal to  $\pm 200 \text{ V (JEITA)}$   
: Higher than or equal to  $\pm 2000 \text{ V (MIL)}$
- Power-down protection provided on all input pins

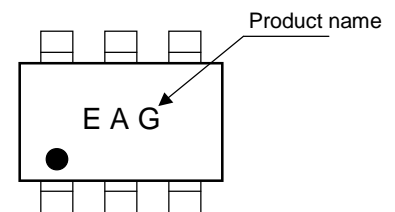


Weight: 0.0068 g (typ.)

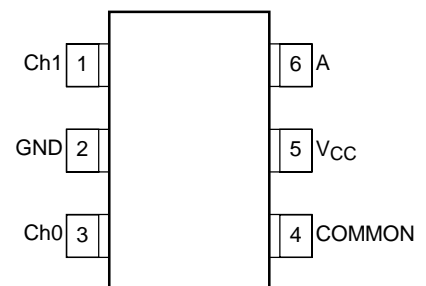
### Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Power supply voltage		$V_{CC}$	-0.5 to 4.6	V
DC input voltage		$V_{IN}$	-0.5 to 4.6	V
Switch I/O voltage		$V_S$	-0.5 to $V_{CC} + 0.5$	V
Clamp diode current	Control input block	$I_{IK}$	-50	mA
	Switch block		$\pm 50$	
Switch through current		$I_T$	100	mA
Power dissipation		$P_D$	200	mW
DC $V_{CC}$ /ground current		$I_{CC}$	$\pm 100$	mA
Storage temperature		$T_{stg}$	-65 to 150	°C

### Marking



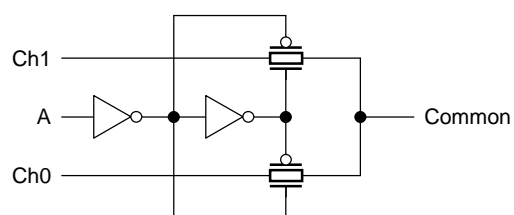
### Pin Assignment (top view)



## Truth Table

Input	On Channel
A	On Channel
L	Ch0
H	Ch1

## System Diagram



## Recommended Operating Conditions

Characteristics	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	1.8 to 3.6	V
Control input voltage	$V_{IN}$	0 to 3.6	V
Switch I/O voltage	$V_S$	0 to $V_{CC}$	V
Operating temperature	$T_{opr}$	-40 to 85	°C
Control input rise and fall time	$d_t/d_v$	0 to 10	ns/V

## DC Electrical Characteristics (Ta = -40 to 85°C)

Characteristics		Symbol	Test Condition	V <sub>CC</sub> (V)	Min	Max	Unit
Input voltage	High level	V <sub>IH</sub>	—	1.8	0.75 × V <sub>CC</sub>	—	V
				2.3 to 3.6	0.7 × V <sub>CC</sub>	—	
	Low level	V <sub>IL</sub>	—	1.8	—	0.25 × V <sub>CC</sub>	
				2.3 to 3.6	—	0.3 × V <sub>CC</sub>	
On resistance V <sub>I/O</sub> = V <sub>CC</sub> or GND		R <sub>ON</sub>	V <sub>IN</sub> = 0 V, I <sub>O</sub> = 24 mA	3.6	—	19	Ω
			V <sub>IN</sub> = 1.9 V, I <sub>O</sub> = -24 mA	3.6	—	18	
			V <sub>IN</sub> = 3.6 V, I <sub>O</sub> = -24 mA	3.6	—	16	
			V <sub>IN</sub> = 0 V, I <sub>O</sub> = 24 mA	3.0	—	21	
			V <sub>IN</sub> = 3 V, I <sub>O</sub> = -24 mA	3.0	—	17	
			V <sub>IN</sub> = 0 V, I <sub>O</sub> = 18 mA	2.3	—	25	
			V <sub>IN</sub> = 2.3 V, I <sub>O</sub> = -18 mA	2.3	—	20	
			V <sub>IN</sub> = 0 V, I <sub>O</sub> = 6 mA	1.8	—	32	
			V <sub>IN</sub> = 1.8 V, I <sub>O</sub> = -6 mA	1.8	—	26	
On resistance V <sub>I/O</sub> = V <sub>CC</sub> to GND		R <sub>ON</sub>	0 < V <sub>IN</sub> < 3.6 V, I <sub>O</sub> = 24 mA	3.6	—	21	Ω
			0 < V <sub>IN</sub> < 3 V, I <sub>O</sub> = 24 mA	3.0	—	23	
			0 < V <sub>IN</sub> < 2.3 V, I <sub>O</sub> = 18 mA	2.3	—	42	
			0 < V <sub>IN</sub> < 1.8 V, I <sub>O</sub> = 6 mA	1.8	—	140	
Control input leakage current		I <sub>IN</sub>	V <sub>IN</sub> = 0 to 3.6 V	3.6	—	±5.0	μA
Switch I/O leakage current		I <sub>SZ</sub>	V <sub>IN</sub> = 0 to 3.6 V	3.6	—	10.0	μA
Quiescent supply current		I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND	3.6	—	20.0	μA
Increase in I <sub>CC</sub> per Input		ΔI <sub>CC</sub>	V <sub>IH</sub> = 3 V	3.6	—	750	

## AC Characteristics (Ta = -40°C to 85°C, input tr = tf = 2.0 ns, CL = 30 pF, RL = 500 Ω)

Characteristics	Symbol	Test Condition	VCC (V)	Min	Max	Unit
Propagation delay time (Note 12)	t <sub>pLH</sub> t <sub>pHL</sub>	—	1.8	—	0.7	ns
			2.5 ± 0.2	—	0.55	
			3.3 ± 0.3	—	0.4	
Output enable time	t <sub>pZL</sub> t <sub>pZH</sub>	—	1.8	—	9	ns
			2.5 ± 0.2	—	7	
			3.3 ± 0.3	—	5	
Output disable time	t <sub>pLZ</sub> t <sub>pHZ</sub>	—	1.8	—	9	ns
			2.5 ± 0.2	—	7	
			3.3 ± 0.3	—	5	

When C<sub>L</sub> = 50 pF, add approximately 300 ps to the maximum values above.

Note 12: The propagation delay time is the calculated RC time constant of the typical on-state resistance of the switch and a load capacitance.

## Capacitive Characteristics (Ta = 25°C)

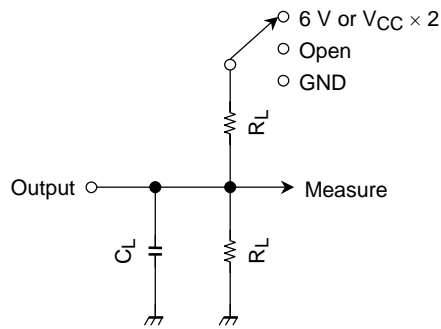
Characteristics	Symbol	Test Condition	VCC (V)	Typ.	Unit
Input capacitance	C <sub>IN</sub>	—	1.8, 2.5, 3.3	3.0	pF
Power dissipation capacitance	C <sub>PD</sub>	f <sub>IN</sub> = 10 MHz (Note 13)	1.8, 2.5, 3.3	5.5	pF

Note 13: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

$$I_{CC} (\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Figure 1 AC Test Circuit



Characteristics	Switch
$t_{pLH}$ , $t_{pHL}$	Open
$t_{pLZ}$ , $t_{pZL}$	6 V @ $V_{CC} = 3.3 \pm 0.3$ V
	$V_{CC} \times 2$ @ $V_{CC} = 2.5 \pm 0.2$ V
	@ $V_{CC} = 1.8$ V
$t_{pHZ}$ , $t_{pZH}$	GND

**AC Waveforms**

Figure 2  $t_{pLH}$ ,  $t_{pHL}$

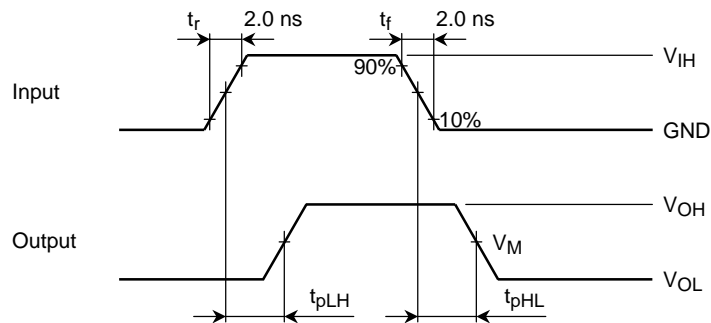
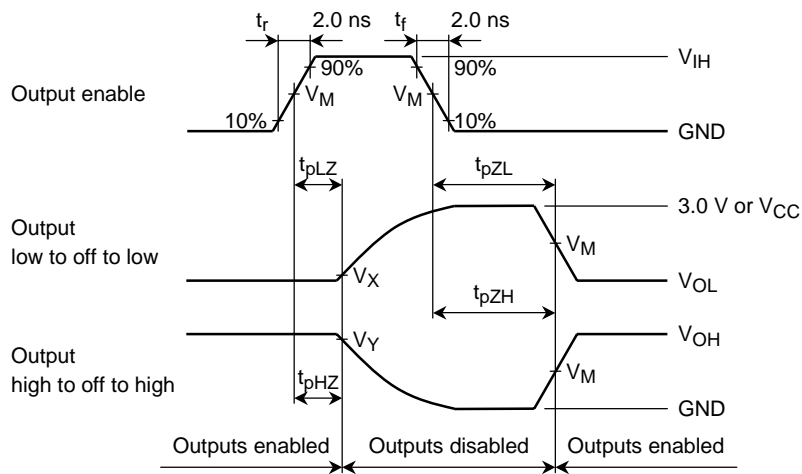


Figure 3  $t_{pLZ}$ ,  $t_{pHZ}$ ,  $t_{pZL}$ ,  $t_{pZH}$

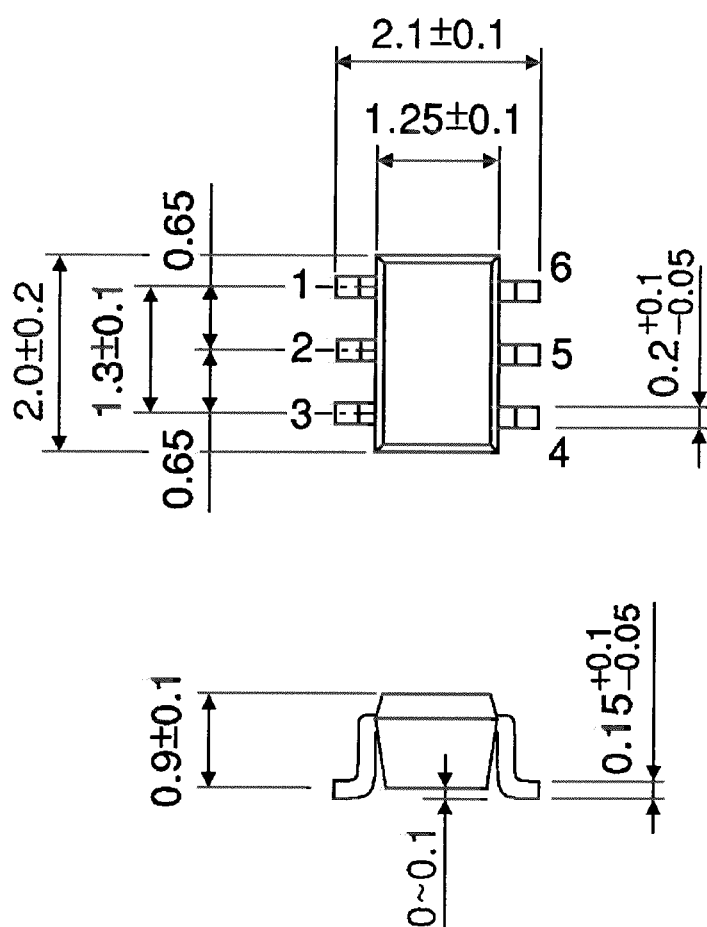


Symbol	$V_{CC}$		
	$3.3 \pm 0.3 \text{ V}$	$2.5 \pm 0.2 \text{ V}$	1.8 V
$V_{IH}$	2.7 V	$V_{CC}$	$V_{CC}$
$V_M$	1.5 V	$V_{CC}/2$	$V_{CC}/2$
$V_X$	$V_{OL} + 0.3 \text{ V}$	$V_{OL} + 0.15 \text{ V}$	$V_{OL} + 0.15 \text{ V}$
$V_Y$	$V_{OH} - 0.3 \text{ V}$	$V_{OH} - 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$

## Package Dimensions

SSOP6-P-0.65A

Unit: mm



Weight: 0.0068 g (typ.)

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000707EBA

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