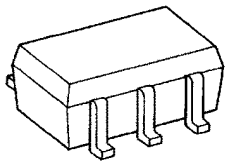
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7PA53FU

2-Channel Multiplexer/Demultiplexer

Features

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



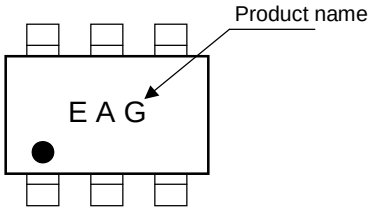
SSOP6-P-0.65A

Weight: 0.0068 g (typ.)

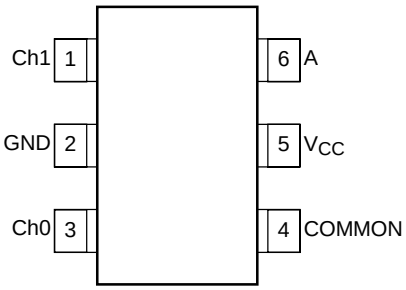
Maximum Ratings (Ta = 25°C)

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		±50	
Switch through current		I_T	100	mA
Power dissipation		P_D	200	mW
DC V_{CC}/ground current		I_{CC}	±100	mA
Storage temperature		T_{stg}	−65 to 150	°C

Marking



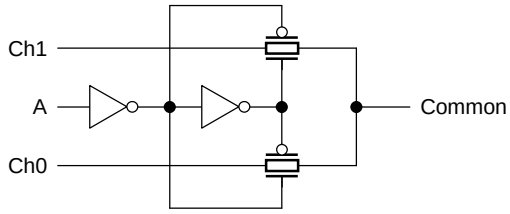
Pin Assignment (top view)



Truth Table

Input 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_{CC} (V)	Min	Max	Unit
Input voltage	High level	V_{IH}	—	1.8	0.75 × V_{CC}	—	V
				2.3 to 3.6	0.7 × V_{CC}	—	
	Low level	V_{IL}	—	1.8	—	0.25 × V_{CC}	
				2.3 to 3.6	—	0.3 × V_{CC}	
On resistance $V_{I/O}$ = V_{CC} or GND		R_{ON}	V_{IN} = 0 V, I_O = 24 mA	3.6	—	19	Ω
			V_{IN} = 1.9 V, I_O = –24 mA	3.6	—	18	
			V_{IN} = 3.6 V, I_O = –24 mA	3.6	—	16	
			V_{IN} = 0 V, I_O = 24 mA	3.0	—	21	
			V_{IN} = 3 V, I_O = –24 mA	3.0	—	17	
			V_{IN} = 0 V, I_O = 18 mA	2.3	—	25	
			V_{IN} = 2.3 V, I_O = –18 mA	2.3	—	20	
			V_{IN} = 0 V, I_O = 6 mA	1.8	—	32	
			V_{IN} = 1.8 V, I_O = –6 mA	1.8	—	26	
On resistance $V_{I/O}$ = V_{CC} to GND		R_{ON}	0 < V_{IN} < 3.6 V, I_O = 24 mA	3.6	—	21	Ω
			0 < V_{IN} < 3 V, I_O = 24 mA	3.0	—	23	
			0 < V_{IN} < 2.3 V, I_O = 18 mA	2.3	—	42	
			0 < V_{IN} < 1.8 V, I_O = 6 mA	1.8	—	140	
Control input leakage current		I_{IN}	V_{IN} = 0 to 3.6 V	3.6	—	±5.0	μA
Switch I/O leakage current		I_{SZ}	V_{IN} = 0 to 3.6 V	3.6	—	10.0	μA
Quiescent supply current		I_{CC}	V_{IN} = V_{CC} or GND	3.6	—	20.0	μA
Increase in I_{CC} per Input		ΔI_{CC}	V_{IH} = 3 V	3.6	—	750	

AC Characteristics (Ta = –40°C to 85°C, input $t_r = t_f = 2.0$ ns, $C_L = 30$ pF, $R_L = 500\ \Omega$)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Min	Max	Unit
Propagation delay time (Note 12)	t_{pLH} t_{pHL}	—	1.8	—	0.7	ns
			2.5 ± 0.2	—	0.55	
			3.3 ± 0.3	—	0.4	
Output enable time	t_{pZL} t_{pZH}	—	1.8	—	9	ns
			2.5 ± 0.2	—	7	
			3.3 ± 0.3	—	5	
Output disable time	t_{pLZ} t_{pHZ}	—	1.8	—	9	ns
			2.5 ± 0.2	—	7	
			3.3 ± 0.3	—	5	

When $C_L = 50$ pF, add approximately 300 ps to the maximum values above.

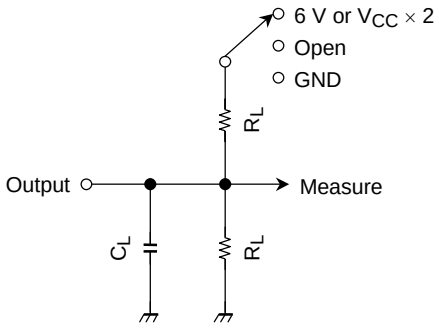
Note 12: The propagation delay time is the calculated RC time constant of the typical on-state resistance of the switch and a load capacitance.

Capacitive Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Typ.	Unit
Input capacitance	C_{IN}	—	1.8, 2.5, 3.3	3.0	pF
Power dissipation capacitance	C_{PD}	f_{IN} = 10 MHz (Note 13)	1.8, 2.5, 3.3	5.5	pF

Note 13: C_{PD} 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:
$I_{CC\ (opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

Figure 1 AC Test Circuit



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

AC Waveforms

Figure 2 t_{pLH}, t_{pHL}

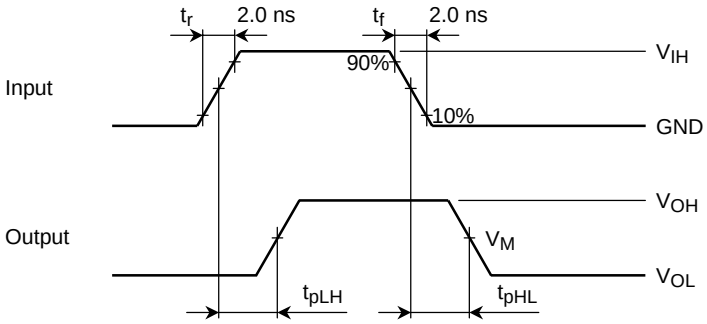
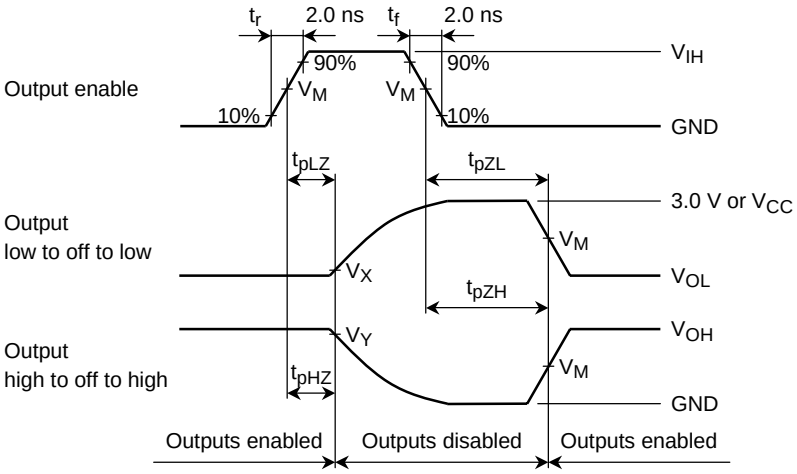


Figure 3 t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}

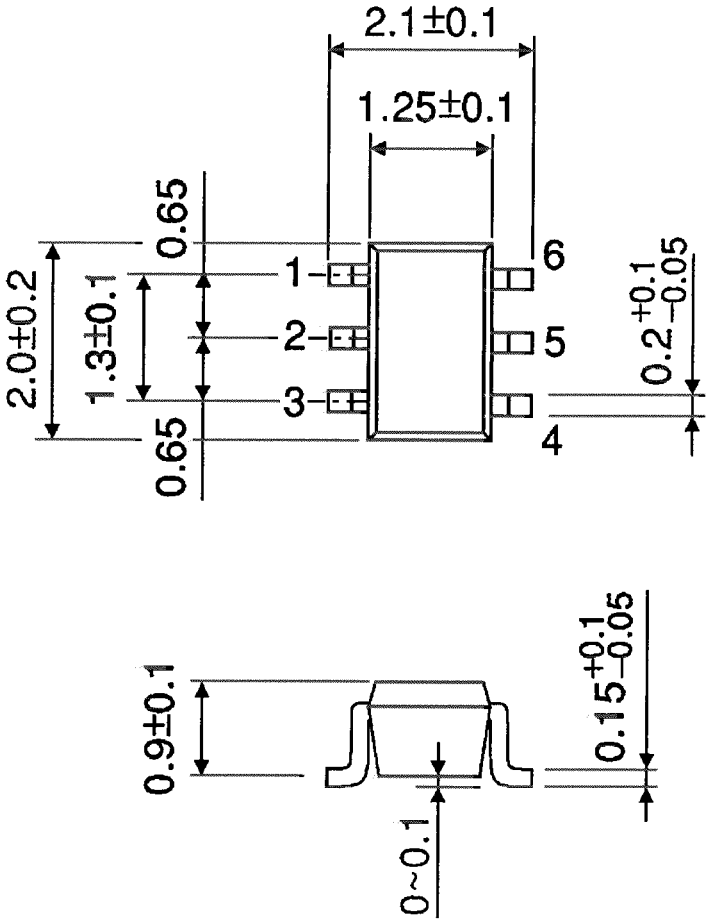


Symbol	V_{CC}		
	3.3 ± 0.3 V	2.5 ± 0.2 V	1.8 V
V_{IH}	2.7 V	V_{CC}	V_{CC}
V_M	1.5 V	$V_{CC/2}$	$V_{CC/2}$
V_X	V_{OL} + 0.3 V	V_{OL} + 0.15 V	V_{OL} + 0.15 V
V_Y	V_{OH} − 0.3 V	V_{OH} − 0.15 V	V_{OH} − 0.15 V

Package Dimensions

SSOP6-P-0.65A

Unit: mm



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