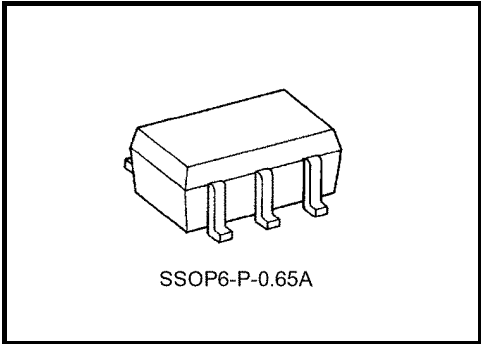


TC7PA14FU

Dual Schmitt Inverter with 3.6 V Tolerant Input and Output

Features

- Operating voltage range: $V_{CC} = 1.8\sim 3.6\text{ V}$
- High-speed operation: $t_{pd} = 4.0\text{ ns (max)}$ at $V_{CC} = 3.0\sim 3.6\text{ V}$
 $t_{pd} = 4.3\text{ ns (max)}$ at $V_{CC} = 2.3\sim 2.7\text{ V}$
 $t_{pd} = 8.6\text{ ns (max)}$ at $V_{CC} = 1.8\text{ V}$
- High-level output current:
 $I_{OH}/I_{OL} = \pm 24\text{ mA (min)}$ at $V_{CC} = 3.0\text{ V}$
 $I_{OH}/I_{OL} = \pm 18\text{ mA (min)}$ at $V_{CC} = 2.3\text{ V}$
 $I_{OH}/I_{OL} = \pm 6\text{ mA (min)}$ at $V_{CC} = 1.8\text{ V}$
- 3.6-V tolerant inputs.
- Power down protection is provided on all outputs.



Weight: 0.0068 g (typ.)

Maximum Ratings (Ta = 25°C)

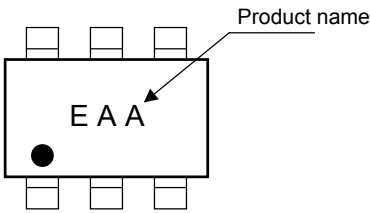
Characteristics	Symbol	Value	Unit
Power supply voltage	V_{CC}	$-0.5\sim 4.6$	V
DC input voltage	V_{IN}	$-0.5\sim 4.6$	V
DC output voltage	V_{OUT}	$-0.5\sim 4.6$ (Note 1)	V
		$-0.5\sim V_{CC} + 0.5$ (Note 2)	
Input diode current	I_{IK}	-50	mA
Output diode current	I_{OK}	± 50 (Note 3)	mA
DC output current	I_{OUT}	± 50	mA
Power dissipation	P_D	200	mW
DC V_{CC} /ground current	I_{CC}	± 100	mA
Storage temperature	T_{stg}	$-65\sim 150$	°C

Note 1: $V_{CC} = 0\text{ V}$

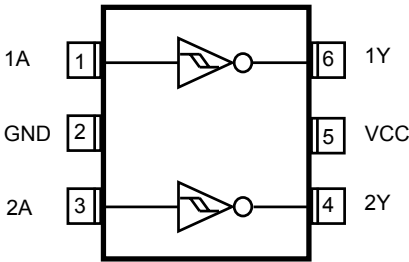
Note 2: High or Low state. I_{OUT} absolute maximum rating must be observed.

Note 3: $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

Marking



Pin Assignment (top view)



Truth Table

A	Y
L	H
H	L

IEC Logic Symbol



Recommended Operating Conditions

Characteristics	Symbol	Value	Unit
Power supply voltage	V _{CC}	1.8~3.6	V
		1.2~3.6 (Note 4)	
Input voltage	V _{IN}	−0.3~3.6	V
Output voltage	V _{OUT}	0~3.6 (Note 5)	V
		0~V _{CC} (Note 6)	
Output Current	I _{OH} /I _{OL}	±24 (Note 7)	mA
		±18 (Note 8)	
		±6 (Note 9)	
Operating temperature	T _{opr}	−40~85	°C

- Note 4: Data retention only
- Note 5: V_{CC} = 0 V
- Note 6: High or Low state
- Note 7: V_{CC} = 3.0~3.6 V
- Note 8: V_{CC} = 2.3~2.7 V
- Note 9: V_{CC} = 1.8 V

DC Electrical Characteristics (Ta = -40~85°C, 2.7 V < V_{CC} ≤ 3.6 V)

Characteristics	Symbol	Test Condition		Min	Max	Unit
Positive Threshold Voltage	V _P	—	V _{CC} (V)			
			3.6	—	2.2	V
			3.0	—	2.0	
Negative Threshold Voltage	V _N	—	3.6	0.8	—	V
			3.0	0.7	—	
Hysteresys Voltage	V _H	—	3.6	0.3	1.2	V
			3.0	0.3	1.2	
High-Level Output Voltage	V _{OH}	V _{IN} = V _{IL}	I _{OH} = -100 μA	2.7~3.6	V _{CC} - 0.2	V
			I _{OH} = -12 mA	2.7	2.2	
			I _{OH} = -18 mA	3.0	2.4	
			I _{OH} = -24 mA	3.0	2.2	
Low-Level Output Voltage	V _{OL}	V _{IN} = V _{IH}	I _{OL} = 100 μA	2.7~3.6	—	
			I _{OL} = 12 mA	2.7	—	
			I _{OL} = 18 mA	3.0	—	
			I _{OL} = 24 mA	3.0	—	
Input Leakage Current	I _{IN}	V _{IN} = 0~3.6 V	2.7~3.6	—	±5.0	μA
Power-off Leakage Current	I _{OFF}	V _{IN} , V _{OUT} = 0~3.6 V	0	—	10.0	μA
Quiescent Supply Current	I _{CC}	V _{IN} = V _{CC} or GND	2.7~3.6	—	20.0	μA
		V _{CC} ≤ (V _{IN} , V _{OUT}) ≤ 3.6 V	2.7~3.6	—	±20.0	
Increase in I _{CC} per Input	ΔI _{CC}	V _{IH} = V _{CC} - 0.6 V	2.7~3.6	—	750	

DC Characteristics (Ta = -40~85°C, 2.3 V ≤ V_{CC} ≤ 2.7 V)

Characteristics	Symbol	Test Condition		Min	Max	Unit
Positive Threshold Voltage	V _P	—	V _{CC} (V)			
			2.3	—	1.8	V
Negative Threshold Voltage	V _N	—	2.3	0.5	—	
Hysteresys Voltage	V _H	—	2.3	0.3	1.0	V
High-Level Output Voltage	V _{OH}	V _{IN} = V _{IL}	I _{OH} = -100 μA	2.3~2.7	V _{CC} - 0.2	V
			I _{OH} = -6 mA	2.3	2.0	
			I _{OH} = -12 mA	2.3	1.8	
			I _{OH} = -18 mA	2.3	1.7	
Low-Level Output Voltage	V _{OL}	V _{IN} = V _{IH}	I _{OL} = 100 μA	2.3~2.7	—	
			I _{OL} = 12 mA	2.3	—	
			I _{OL} = 18 mA	2.3	—	
Input Leakage Current	I _{IN}	V _{IN} = 0~3.6 V	2.3~2.7	—	±5.0	μA
Power-off Leakage Current	I _{OFF}	V _{IN} , V _{OUT} = 0~3.6 V	0	—	10.0	μA
Quiescent Supply Current	I _{CC}	V _{IN} = V _{CC} or GND	2.3~2.7	—	20.0	μA
		V _{CC} ≤ (V _{IN} , V _{OUT}) ≤ 3.6 V	2.3~2.7	—	±20.0	

DC Characteristics (Ta = -40~85°C, 1.8 V ≤ VCC < 2.3 V)

Characteristics	Symbol	Test Condition		Min	Max	Unit
Positive Threshold Voltage	V _P	—	1.8	—	1.4	V
Negative Threshold Voltage	V _N	—	1.8	0.25	—	
Hysteresys Voltage	V _H	—	1.8	0.2	0.95	V
High-Level Output Voltage	V _{OH}	V _{IN} = V _{IL}	I _{OH} = -100 μA	1.8	V _{CC} - 0.2	V
			I _{OH} = -6 mA	1.8	1.4	
Low-Level Output Voltage	V _{OL}	V _{IN} = V _{IH}	I _{OL} = 100 μA	1.8	—	
			I _{OL} = 6 mA	1.8	0.3	
Input Leakage Current	I _{IN}	V _{IN} = 0~3.6 V	1.8	—	±5.0	μA
Power-off Leakage Current	I _{OFF}	V _{IN} , V _{OUT} = 0~3.6 V	0	—	10.0	μA
Quiescent Supply Current	I _{CC}	V _{IN} = V _{CC} or GND	1.8	—	20.0	μA
		V _{CC} ≤ (V _{IN} , V _{OUT}) ≤ 3.6 V	1.8	—	±20.0	

AC Electrical Characteristics (Ta = -40~85°C, input t_r = t_f = 2.0 ns, C_L = 30 pF, R_L = 500 Ω)

Characteristics	Symbol	Test Condition		Min	Max	Unit
Propagation delay time	t _{pLH} t _{pHL}	(Figure 1 and 2)	1.8	1.0	8.6	ns
			2.5 ± 0.2	0.8	4.3	
			3.3 ± 0.3	0.6	4.0	

For C_L = 50 pF, add approximately 300 ps to the AC maximum specification.

Dynamic Switching Characteristics (Ta = 25°C, input tr = tf = 2.0 ns, CL = 30 pF)

Characteristics	Symbol	Test Condition	VCC (V)	TYP.	Unit
Quiet Output Maximum Dynamic VOL	VOLP	VIN = 1.8 V, VIL = 0 V (Note 11)	1.8	0.25	ns
		VIN = 2.5 V, VIL = 0 V (Note 11)	2.5	0.6	
		VIN = 3.3 V, VIL = 0 V (Note 11)	3.3	0.8	
Quiet Output Minimum Dynamic VOL	VOLV	VIN = 1.8 V, VIL = 0 V (Note 11)	1.8	-0.25	ns
		VIN = 2.5 V, VIL = 0 V (Note 11)	2.5	-0.6	
		VIN = 3.3 V, VIL = 0 V (Note 11)	3.3	-0.8	
Quiet Output Minimum Dynamic VOH	VOLP	VIN = 1.8 V, VIL = 0 V (Note 11)	1.8	1.5	ns
		VIN = 2.5 V, VIL = 0 V (Note 11)	2.5	1.9	
		VIN = 3.3 V, VIL = 0 V (Note 11)	3.3	2.2	

Note 11: Characteristics guaranteed by design.

Capacitive Characteristics (Ta = 25°C)

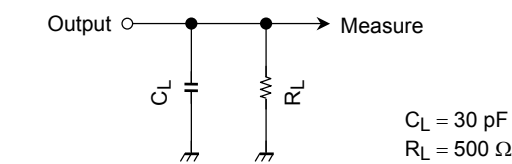
Characteristics	Symbol	Test Condition	VCC (V)	TYP.	Unit
Input Capacitance	CIN	—	1.8, 2.5, 3.3	4	pF
Power Dissipation Capacitance	CPD	fIN = 10 MHz (Note 12)	1.8, 2.5, 3.3	27	pF

Note 12: CPD 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:

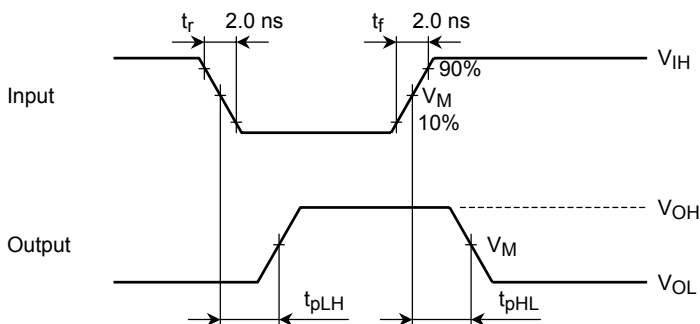
$$I_{CC}(\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2$$

Figure 1 Test Circuit



AC Waveforms

Figure 2 t_{pLH} , t_{pHL}

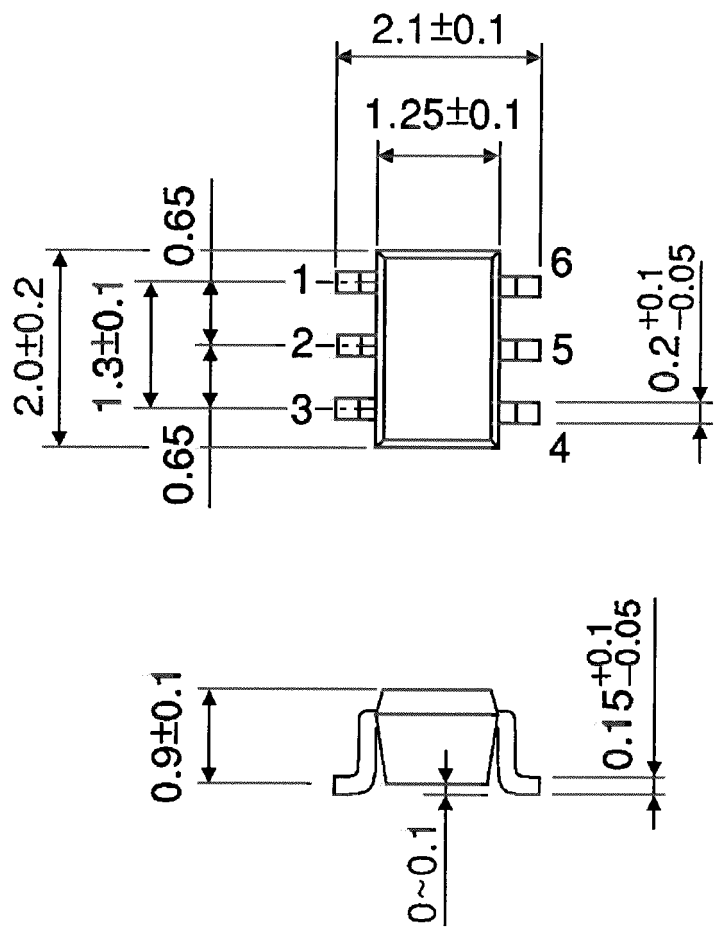


Symbol	V_{CC}		
	$3.3 \pm 0.3 \text{ V}$	$2.5 \pm 0.2 \text{ V}$	1.8 V
V_{IH}	2.7 V	V_{CC}	V_{CC}
V_M	1.5 V	$V_{CC}/2$	$V_{CC}/2$

Package Dimensions

SSOP6-P-0.65A

Unit: mm



Weight: 0.0068 g (typ.)

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