

Features

- Wide supply voltage range from 2.3V to 3.6V
- Inputs accept voltages up to 3.6V
- I_{OFF} supports partial-power-down mode
- Low static power consumption; $I_{CC}=1.5\mu A$ (Max.)
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

General Description

The provides a single inverting function. This device ensures a very low static and dynamic power consumption across the entire V_{CC} range from 2.3 V to 3.6 V.

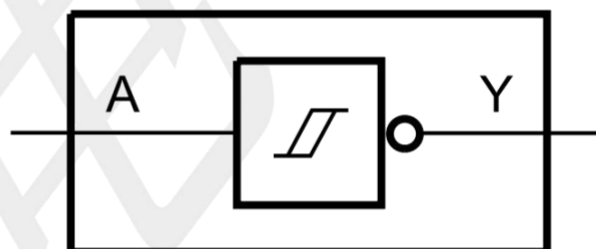
The is designed for logic-level translation applications with input switching levels that accept 1.8 V low-voltage CMOS signals, while operating from either a single 2.5 V or 3.3 V supply voltage.

The wide supply voltage range ensures normal operation as battery voltage drops from 3.6 V to 2.3 V.

Applications

- AV Receiver
- Audio Dock:Portable
- Blu-ray Player and Home Theater
- Embedded PC
- Personal Digital Assistant(PDA)
- Power:Telecom/Server AC/DC Supply:Single Controller:Analog and Digital
- Solid State Drive(SSD):Client and Enterprise
- Wireless Headset,Keyboard,and Mouse

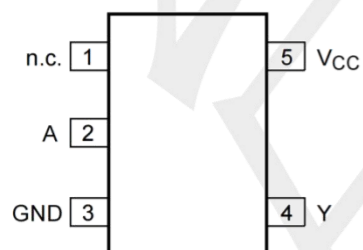
Logic Diagram



Ordering Information

ORDER NUMBER	PACKAGE DESCRIPTION	PACKAGE OPTION
TP74AUP1T14S5	SOT23-5	Tape and Reel,3000
TP74AUP1T14C5	SOT353	Tape and Reel,3000

Pin Configuratio (TOP VIEW)



SOT23-5 / SOT353

Function Table

INPUT(A)	OUTPUT(Y)
L	H
H	L

Note:H: HIGH voltage level;L: LOW voltage level.

Absolute Maximum Ratings

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Supply Voltage	V _{CC}		-0.5 ~ +4.6	V
Input Voltage	V _{IN}		-0.5 ~ +4.6	V
Output Voltage	V _{OUT}	Output in the high or low state	-0.5 ~ +V _{CC} +0.5V	V
		Output in the power-off state	-0.5 ~ +4.6	V
VCC or GND Current	I _{CC}		±50	mA
Continuous Output Current	I _{OUT}	V _{OUT} =0~V _{CC}	±20	mA
Input Clamp Current	I _{IK}	V _{IN} <0	-50	mA
Output Clamp Current	I _{OK}	V _{OUT} <0	-50	mA
Storage Temperature Range	T _{STG}		-65 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

Recommended Operating Conditions

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V _{CC}	Operating	2.3	--	3.6	V
Input Voltage	V _{IN}		0	--	3.6	V
Output Voltage	V _{OUT}	High or low state	0	--	3.6	V
Operating Temperature	T _A		-40	--	+125	°C

TP74AUP1T14 Series

Low-power inverter with voltage-level translator

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Static characteristics (At recommended operating conditions; voltages are referenced to GND)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = 25 °C						
V _{T+}	positive-going threshold voltage	V _{CC} = 2.3 V to 2.7 V	0.60	--	1.10	V
		V _{CC} = 3.0 V to 3.6 V	0.75	--	1.16	V
V _{T-}	negative-going threshold voltage	V _{CC} = 2.3 V to 2.7 V	0.35	--	0.60	V
		V _{CC} = 3.0 V to 3.6 V	0.50	--	0.85	V
V _H	hysteresis voltage	(V _H = V _{T+} - V _{T-})				
		V _{CC} = 2.3 V to 2.7 V	0.23	--	0.60	V
		V _{CC} = 3.0 V to 3.6 V	0.25	--	0.56	V
V _{OH}	HIGH-level output voltage	V _I = V _{T+} or V _{T-}				
		I _O = -20 μA; V _{CC} = 2.3 V to 3.6 V	V _{CC} - 0.1	--	--	V
		I _O = -2.3 mA; V _{CC} = 2.3 V	2.05	--	--	V
		I _O = -3.1 mA; V _{CC} = 2.3 V	1.9	--	--	V
		I _O = -2.7 mA; V _{CC} = 3.0 V	2.72	--	--	V
		I _O = -4.0 mA; V _{CC} = 3.0 V	2.6	--	--	V
V _{OL}	LOW-level output voltage	V _I = V _{T+} or V _{T-}				
		I _O = 20 μA; V _{CC} = 2.3 V to 3.6 V	--	--	0.10	V
		I _O = 2.3 mA; V _{CC} = 2.3 V	--	--	0.31	V
		I _O = 3.1 mA; V _{CC} = 2.3 V	--	--	0.44	V
		I _O = 2.7 mA; V _{CC} = 3.0 V	--	--	0.31	V
		I _O = 4.0 mA; V _{CC} = 3.0 V	--	--	0.44	V
I _I	input leakage current	V _I = GND to 3.6 V; V _{CC} = 0 V to 3.6 V	--	--	±0.1	μA
I _{OFF}	power-off leakage current	V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V	--	--	±0.1	μA
ΔI _{OFF}	additional power-off leakage current	V _I or V _O = 0 V to 3.6V; V _{CC} = 0 V to 0.2 V	--	--	±0.1	μA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 2.3 V to 3.6 V	--	--	1.2	μA
C _I	input capacitance	V _{CC} = 0 V to 3.6 V; V _I = GND or V _{CC}	--	0.8	--	pF
C _O	output capacitance	V _O = GND; V _{CC} = 0 V	--	1.7	--	pF

Static characteristics (At recommended operating conditions; voltages are referenced to GND)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = -40\text{ }^{\circ}\text{C to }+85\text{ }^{\circ}\text{C}$						
V_{T+}	positive-going threshold voltage	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	0.60	--	1.10	V
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	0.75	--	1.19	V
V_{T-}	negative-going threshold voltage	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	0.35	--	0.60	V
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	0.50	--	0.85	V
V_H	hysteresis voltage	$(V_H = V_{T+} - V_{T-})$				
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	0.10	--	0.60	V
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	0.15	--	0.56	V
V_{OH}	HIGH-level output voltage	$V_I = V_{T+} \text{ or } V_{T-}$				
		$I_O = -20\text{ }\mu\text{A}; V_{CC} = 2.3\text{ V to }3.6\text{ V}$	$V_{CC} - 0.1$	--	--	V
		$I_O = -2.3\text{ mA}; V_{CC} = 2.3\text{ V}$	1.97	--	--	V
		$I_O = -3.1\text{ mA}; V_{CC} = 2.3\text{ V}$	1.85	--	--	V
		$I_O = -2.7\text{ mA}; V_{CC} = 3.0\text{ V}$	2.67	--	--	V
		$I_O = -4.0\text{ mA}; V_{CC} = 3.0\text{ V}$	2.55	--	--	V
V_{OL}	LOW-level output voltage	$V_I = V_{T+} \text{ or } V_{T-}$				
		$I_O = 20\text{ }\mu\text{A}; V_{CC} = 2.3\text{ V to }3.6\text{ V}$	--	--	0.1	V
		$I_O = 2.3\text{ mA}; V_{CC} = 2.3\text{ V}$	--	--	0.33	V
		$I_O = 3.1\text{ mA}; V_{CC} = 2.3\text{ V}$	--	--	0.45	V
		$I_O = 2.7\text{ mA}; V_{CC} = 3.0\text{ V}$	--	--	0.33	V
		$I_O = 4.0\text{ mA}; V_{CC} = 3.0\text{ V}$	--	--	0.45	V
I_I	input leakage current	$V_I = \text{GND to }3.6\text{ V}; V_{CC} = 0\text{ V to }3.6\text{ V}$	--	--	± 0.5	μA
I_{OFF}	power-off leakage current	$V_I \text{ or } V_O = 0\text{ V to }3.6\text{ V}; V_{CC} = 0\text{ V}$	--	--	± 0.5	μA
ΔI_{OFF}	additional power-off leakage current	$V_I \text{ or } V_O = 0\text{ V to }3.6\text{ V}; V_{CC} = 0\text{ V to }0.2\text{ V}$	--	--	± 0.5	μA
I_{CC}	supply current	$V_I = \text{GND or }V_{CC}; I_O = 0\text{ A}; V_{CC} = 2.3\text{ V to }3.6\text{ V}$	--	--	1.5	μA
ΔI_{CC}	additional supply current	$V_{CC} = 2.3\text{ V to }2.7\text{ V}; I_O = 0\text{ A(1)}$	--	--	0.6	μA
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}; I_O = 0\text{ A(2)}$	--	--	10	μA

Notes: 1. One input at 0.3 V or 1.1 V, other input at V_{CC} or GND.

2. One input at 0.45 V or 1.2 V, other input at V_{CC} or GND.

Dynamic characteristics (Voltages are referenced to GND)

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		Unit
			Min	Typ	Max	Min	Max	
V _{CC} = 2.3 V to 2.7 V; V _I = 1.65 V to 1.95 V								
t _{pd}	propagation delay	A to Y; see						
		C _L = 5 pF	1.8	3.3	5.1	0.5	6.8	ns
		C _L = 10 pF	2.2	3.8	5.9	1.0	7.9	ns
		C _L = 15 pF	2.6	4.3	6.4	1.0	8.7	ns
		C _L = 30 pF	3.6	5.4	7.8	1.5	10.8	ns
V _{CC} = 2.3 V to 2.7 V; V _I = 2.3 V to 2.7 V								
t _{pd}	propagation delay	A to Y; see						
		C _L = 5 pF	1.4	3.1	5.3	0.5	6.0	ns
		C _L = 10 pF	1.8	3.7	6.0	1.0	7.1	ns
		C _L = 15 pF	2.1	4.1	6.5	1.0	7.9	ns
		C _L = 30 pF	3.1	5.3	8.0	1.5	10.0	ns
V _{CC} = 2.3 V to 2.7 V; V _I = 3.0 V to 3.6 V								
t _{pd}	propagation delay	A to Y; see						
		C _L = 5 pF	1.1	2.8	4.8	0.5	5.5	ns
		C _L = 10 pF	1.5	3.4	5.5	1.0	6.5	ns
		C _L = 15 pF	1.8	3.9	6.1	1.0	7.4	ns
		C _L = 30 pF	2.8	5.0	7.5	1.5	9.5	ns
V _{CC} = 3.0 V to 3.6 V; V _I = 1.65 V to 1.95 V								
t _{pd}	propagation delay	A to Y; see						
		C _L = 5 pF	1.8	2.7	3.8	0.5	8.0	ns
		C _L = 10 pF	2.2	3.2	4.5	1.0	8.5	ns
		C _L = 15 pF	2.5	3.7	5.1	1.0	9.1	ns
		C _L = 30 pF	3.3	4.9	6.5	1.5	9.8	ns
V _{CC} = 3.0 V to 3.6 V; V _I = 2.3 V to 2.7 V								
t _{pd}	propagation delay	A to Y; see						
		C _L = 5 pF	1.3	2.6	4.2	0.5	5.3	ns
		C _L = 10 pF	1.9	3.1	4.5	1.0	6.1	ns
		C _L = 15 pF	2.2	3.6	5.1	1.0	6.8	ns
		C _L = 30 pF	3.0	4.8	6.6	1.5	8.5	ns

Dynamic characteristics (Voltages are referenced to GND)

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		Unit
			Min	Typ	Max	Min	Max	
V _{CC} = 3.0 V to 3.6 V; V _I = 3.0 V to 3.6 V								
t _{pd}	propagation delay	A to Y; see						
		C _L = 5 pF	1.1	2.5	4.0	0.5	4.7	ns
		C _L = 10 pF	1.6	3.1	4.5	1.0	5.7	ns
		C _L = 15 pF	1.9	3.6	5.1	1.0	6.2	ns
		C _L = 30 pF	2.7	4.7	6.6	1.5	7.8	ns
T _{amb} = 25 °C								
C _{PD}	power dissipation capacitance	f _i = 1 MHz; V _I = GND to V _{CC}						
		V _{CC} = 2.3 V to 2.7 V	--	4	--	--	--	pF
		V _{CC} = 3.0 V to 3.6 V	--	5	--	--	--	pF

Measurement points

Supply voltage	Output	Input		
V_{CC}	V_M	V_M	V_I	$t_r = t_f$
2.3 V to 3.6 V	$0.5 \times V_{CC}$	$0.5 \times V_I$	1.65 V to 3.6 V	$\leq 3.0 \text{ ns}$

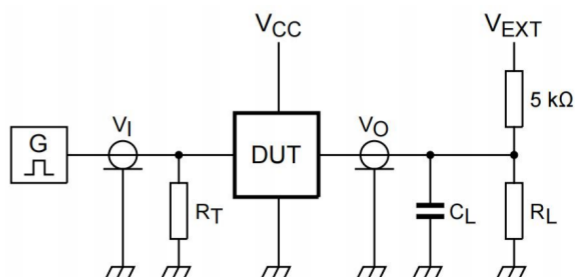
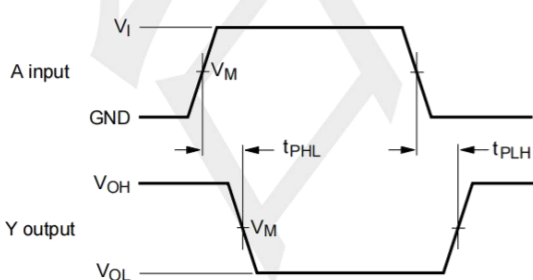
Test data

Supply voltage	Load		V_{EXT}		
V_{CC}	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
2.3 V to 3.6 V	5 pF, 10 pF, 15 pF and 30 pF	5 kΩ or 1 MΩ	open	GND	$2 \times V_{CC}$

For measuring enable and disable times $R_L = 5 \text{ k}\Omega$.

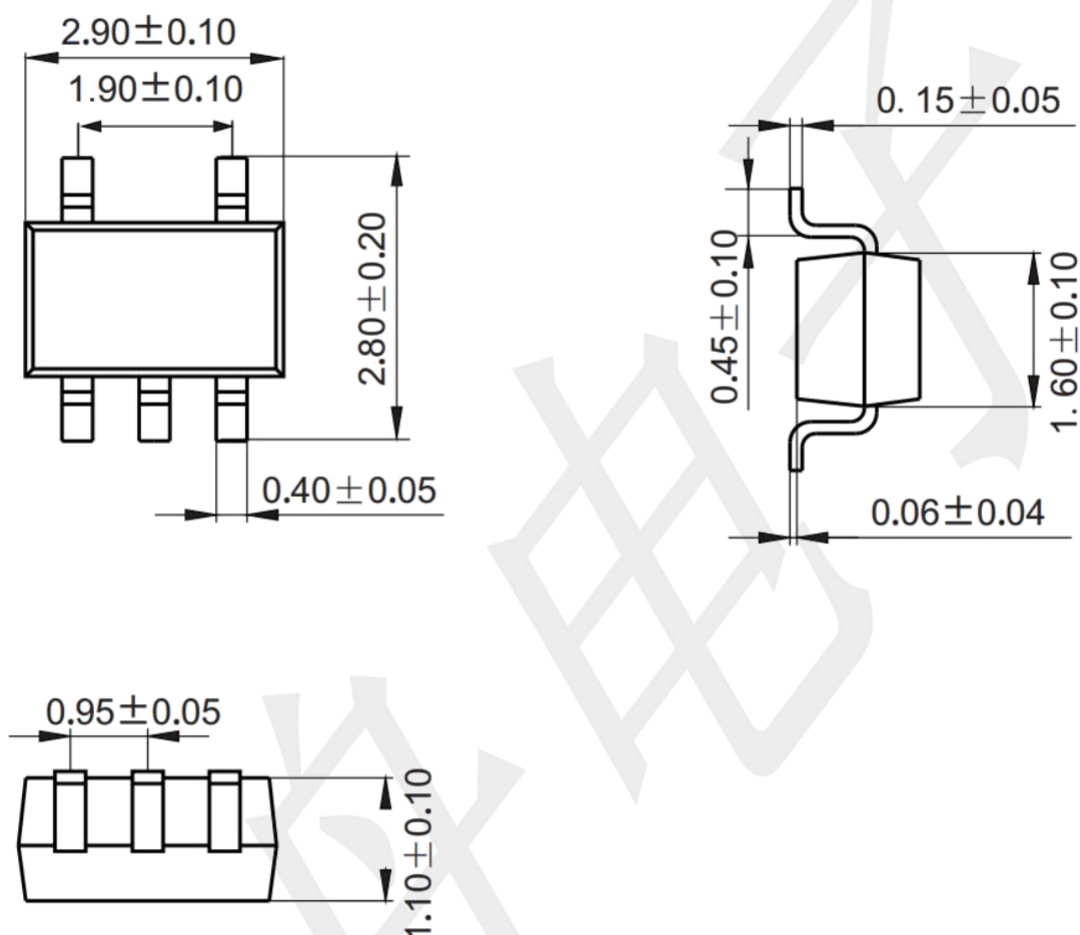
For measuring propagation delays, setup and hold times and pulse width $R_L = 1 \text{ M}\Omega$.

Waveforms and test circuit

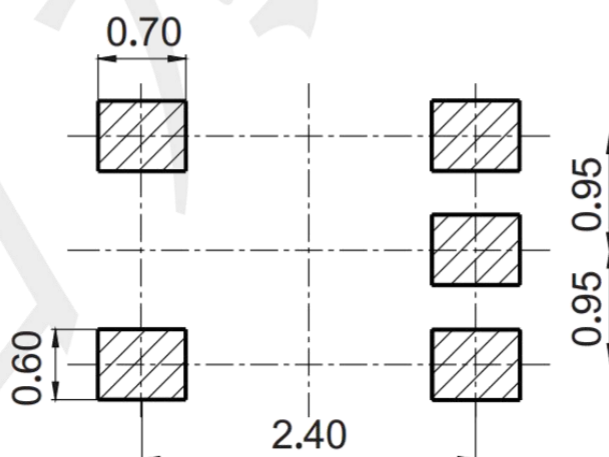


Package information (Unit: mm)

SOT23-5

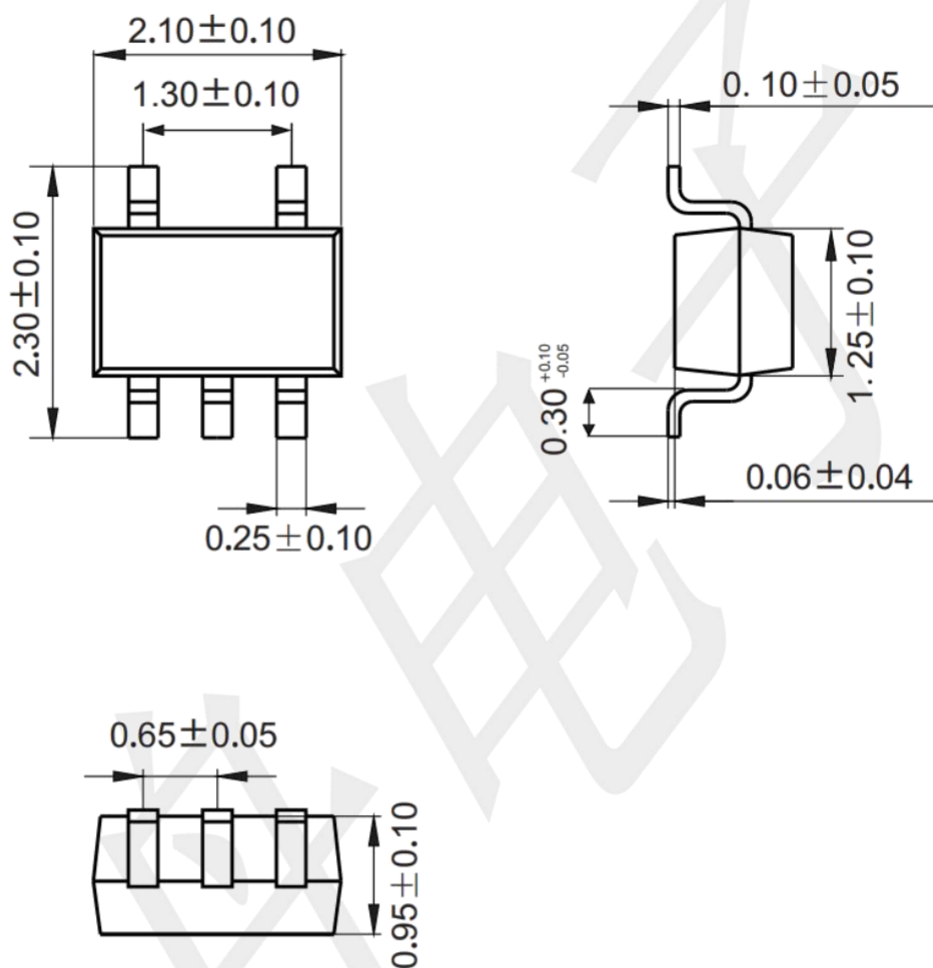


Mounting Pad Layout (unit: mm)



Package information (Unit: mm)

SOT353



Mounting Pad Layout (unit: mm)

