TECH PUBLIC
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SN74AUP1T14 Series

Low-power inverter with voltage-level translator

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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}=1.5μA (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)

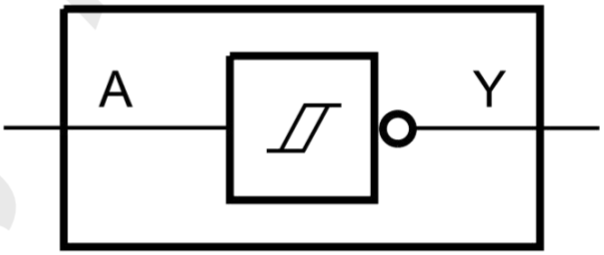
Applications

- 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

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.

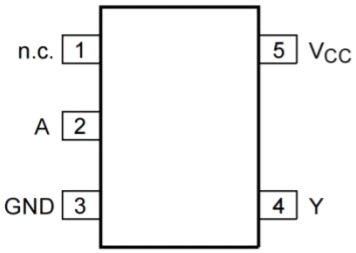
Logic Diagram



Ordering Information

ORDER NUMBER	PACKAGE DESCRIPTION	PACKAGE OPTION
SN74AUP1T14DBVR-TP	SOT23-5	Tape and Reel,3000
SN74AUP1T14DCKR-TP	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}	VOUT=0~VCC	±20	mA
Input Clamp Current	I_{IK}	VIN<0	-50	mA
Output Clamp Current	I_{OK}	VOUT<0	-50	mA
Storage Temperature Range	T_{STG}		-65 ~ +150	℃

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

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	VI or VO = 0 V to 3.6V; VCC = 0 V to 0.2 V	--	--	±0.1	μA
I_{CC}	supply current	VI = GND or VCC; IO = 0 A; VCC = 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 °C to +85 °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	--	1.19	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	0.10	--	0.60	V
		V_{CC} = 3.0 V to 3.6 V	0.15	--	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	1.97	--	--	V
		I_O = -3.1 mA; V_{CC} = 2.3 V	1.85	--	--	V
		I_O = -2.7 mA; V_{CC} = 3.0 V	2.67	--	--	V
		I_O = -4.0 mA; V_{CC} = 3.0 V	2.55	--	--	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	--	--	0.1	V
		I_O = 2.3 mA; V_{CC} = 2.3 V	--	--	0.33	V
		I_O = 3.1 mA; V_{CC} = 2.3 V	--	--	0.45	V
		I_O = 2.7 mA; V_{CC} = 3.0 V	--	--	0.33	V
		I_O = 4.0 mA; V_{CC} = 3.0 V	--	--	0.45	V
I_I	input leakage current	V_I = GND to 3.6 V; V_{CC} = 0 V to 3.6 V	--	--	±0.5	μA
I_{OFF}	power-off leakage current	V_I or V_O = 0 V to 3.6 V; V_{CC} = 0 V	--	--	±0.5	μA
ΔI_{OFF}	additional power-off leakage current	V_I or V_O = 0 V to 3.6 V; V_{CC} = 0 V to 0.2 V	--	--	±0.5	μA
I_{CC}	supply current	V_I = GND or V_{CC}; I_O = 0 A; V_{CC} = 2.3 V to 3.6 V	--	--	1.5	μA
ΔI_{CC}	additional supply current	V_{CC} = 2.3 V to 2.7 V; I_O = 0 A(1)	--	--	0.6	μA
		V_{CC} = 3.0 V to 3.6 V; I_O = 0 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 × V_{CC}	0.5 × V_I	1.65 V to 3.6 V	≤ 3.0 ns

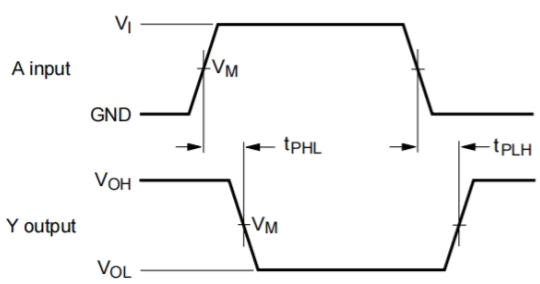
Test data

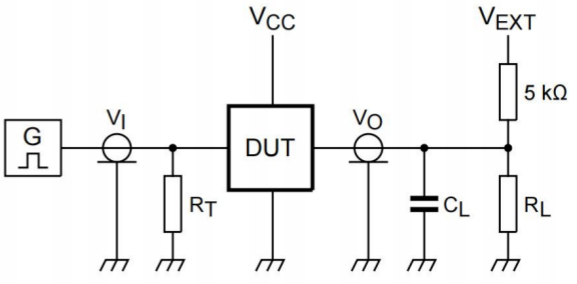
Supply voltage	Load		V_{EXT}		
V_{CC}	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
2.3 V to 3.6 V	5 pF, 10 pF, 15 pF and 30 pF	5 kΩ or 1 MΩ	open	GND	2 × V_{CC}

For measuring enable and disable times R_L = 5 kΩ.

For measuring propagation delays, setup and hold times and pulse width R_L = 1 MΩ.

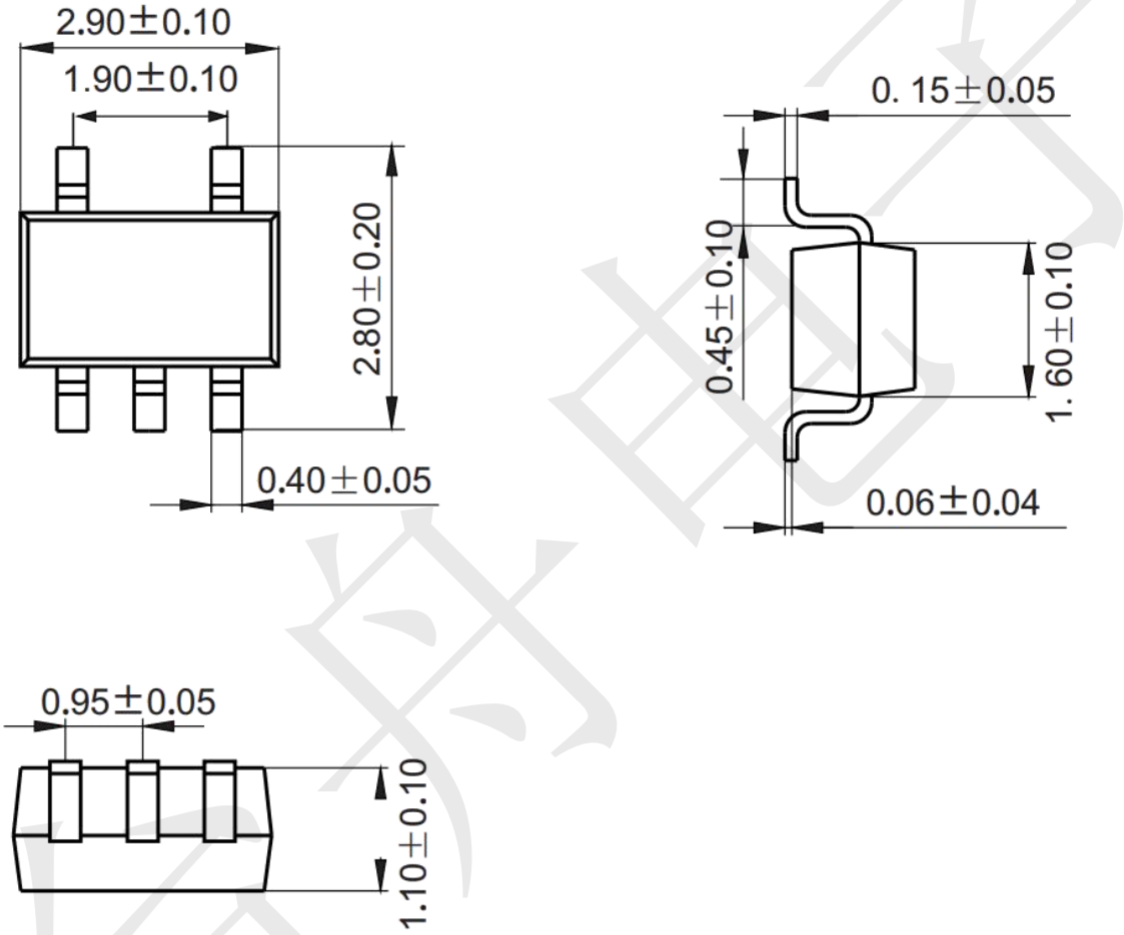
Waveforms and test circuit



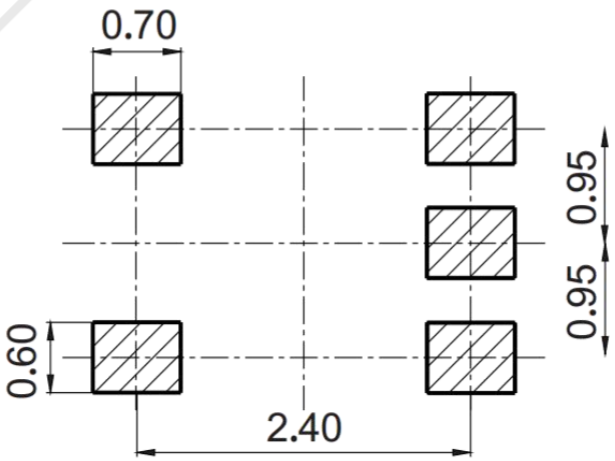


Package information (Unit: mm)

SOT23-5

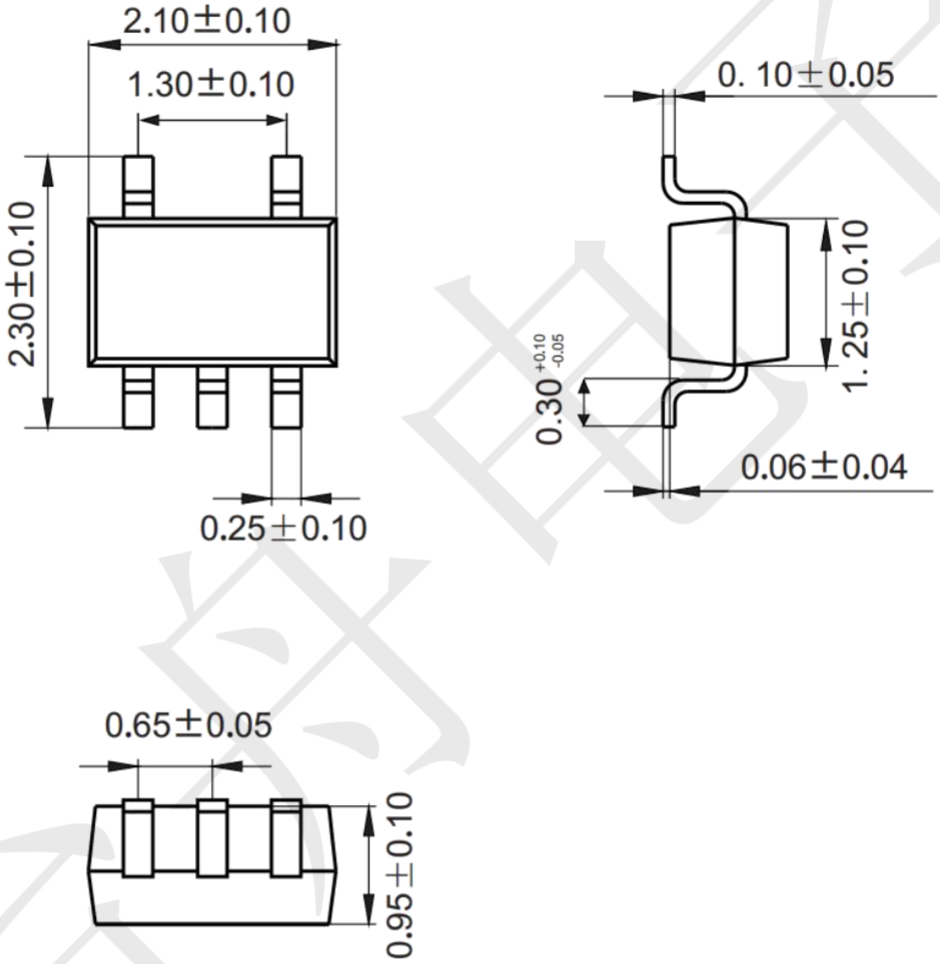


Mounting Pad Layout (unit: mm)



Package information (Unit: mm)

SOT353



Mounting Pad Layout (unit: mm)