SNA6G14 6-channel Schmitt-Trigger Inverter

Features

- Operating Voltage Range:1.65V to 5.5V
- Low Power Consumption:1µA (Max)
- Operating Temperature Range: -40°C to +125°C
- Inputs Accept Voltage to 5.5V
- High Output Drive: ±24mA at V_{CC}=3.0V
- I_{off} Supports Partial-Power-Down Mode Operation
- Packages: SOIC-14, TSSOP-14

Applications

- AC Receiver
- Home Theaters
- Blu-ray Players and Home Theaters
- Desktops or Notebook PCs
- Digital Video Cameras (DVC)
- Mobile Phones
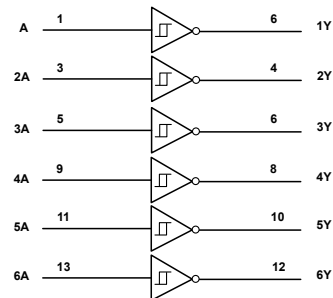- Personal Navigation Device (GPS)
- Portable Media Player

General Description

The SNA6G14 6-channel Schmitt-trigger inverter is designed for 1.65V to 5.5V V_{CC} operation.

The SNA6G14 device contains one inverter and performs the Boolean function Y= $\overline{A}$. The device functions as an independent inverter with Schmitt-trigger inputs, so the device has different input threshold levels for positive-going (V_{T+}) and negative going (V_{T-}) signals to provide hysteresis (ΔV_T) which makes the device tolerant to slow or noisy input signals.

This device is fully specified for partial-power-down applications using I_{off}. The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

Simplified Schematic

Ordering Information

Part Number	V_{OUT} (V)	Package	Ordering Number	Packing Option
SNA6G14	XX	SOIC-14	SNA6G14Q00COF	Tape and Real, 4000
SNA6G14	XX	TSSOP-14	SNA6G14Q00COF	Tape and Real, 4000

[1] XX indicates 0.8V~5.0V. For example, 33 means product outputs 3.3V.
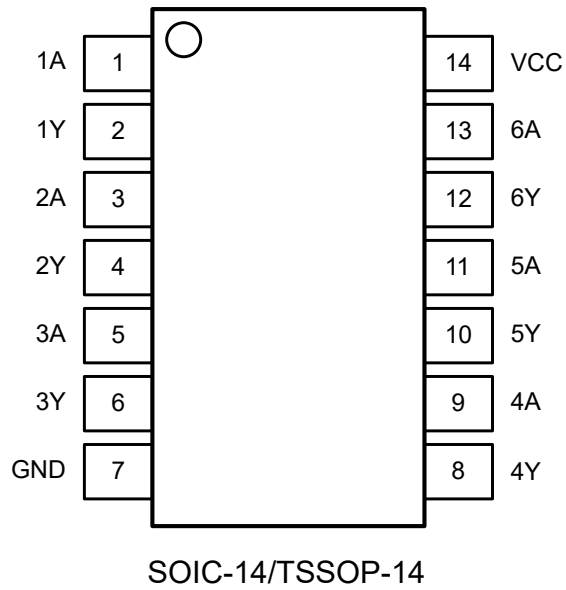
Function Table

Inputs	Output
A	Y
H	L
L	H

Y= $\overline{A}$, H=HIGH Logic Level, L=LOW Logic Level.

Contents

1 Pin Description

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         ┌──────────────────────┐
  1A  │ 1  ◯                14 │  VCC
  1Y  │ 2                   13 │  6A
  2A  │ 3                   12 │  6Y
  2Y  │ 4                   11 │  5A
  3A  │ 5                   10 │  5Y
  3Y  │ 6                    9 │  4A
  GND │ 7                    8 │  4Y
         └──────────────────────┘
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SOIC-14/TSSOP-14

Pin SOIC-14/TSSOP-14	Name	I/O TYPE	Function
1/3/5/9/11/13	A	I	Input
7	GND	P	Ground pin
2/4/6/8/10/12	Y	O	Output
14	VCC	P	Power pin

2 Specifications

2.1 Absolute Maximum Ratings

Over operating ambient temperature range (unless otherwise noted)[1][2].

Parameter		Symbol	Min	Max	Unit
Supply voltage range		V_{CC}	-0.5	6.5	V
Input voltage range [2]		V_I	-0.5	6.5	V
Voltage range applied to any output in the high-impedance or power-off state [2]		V_O	-0.5	6.5	V
Voltage range applied to any output in the high or low state [2][3]		V_O	-0.5	V_{CC}+0.5	V
Input clamp current	V_I<0	I_{IK}		-50	mA
Output clamp current	V_O<0	I_{OK}		-50	mA
Continuous output current		I_O		±50	mA
Continuous current through V_{CC} or GND				±100	mA
Junction Temperature		T_J		150	°C
Storage Temperature Range		T_{STG}	-65	150	°C

> **Note:**
>
> [1] Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability;
>
> [2] The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
>
> [3] The value of V_{CC} is provided in the Recommended Operating Conditions table.

2.2 ESD Ratings

Parameter	Symbol		Value	Unit
Electrostatic discharge	V_{ESD}	Human-body model (HBM)	±8000	V
		Machine model (MM)	±500	

2.3 Thermal Information

Thermal Metric	Symbol	SOIC-14	TSSOP-14	Unit
Junction-to-ambient thermal resistance	$R_{\theta JA}$	122.2	141.2	°C/W
Junction-to-case (top) thermal resistance	$R_{\theta JC(top)}$	80.9	78.8	°C/W
Junction-to-board thermal resistance	$R_{\theta JB}$	80.6	85.8	°C/W
Junction-to-top characterization parameter	ψ_{JT}	40.4	27.7	°C/W
Junction-to-board characterization parameter	ψ_{JB}	80.3	85.5	°C/W
Junction-to-case (bottom) thermal resistance	$R_{\theta JC(bot)}$	N/A	N/A	°C/W

2.4   Recommanded Operating Range

Parameter	Symbol	Conditions	Min	Max	Unit
Supply voltage	V_{CC}	Operating	1.65	1.65	V
		Data retention only	1.5		
Input voltage	V_I		0	5.5	V
Output voltage	V_O		0	V_{CC}	V
Operating temperature	T_A		-40	+125	°C

2.5   Electrical Characteristics

Parameter		Conditions	Temp	Min	Typ	Max	Unit
V_{T+}		V_{CC}=1.65V	Full	0.75		1.05	V
		V_{CC}=2.3V		1.25		1.55	
		V_{CC}=3V		1.5		2.1	
		V_{CC}=4.5V		2.3		3.0	
		V_{CC}=5.5V		2.8		3.4	
V_{T-}		V_{CC}=1.65V	Full	0.3		0.6	V
		V_{CC}=2.3V		0.35		0.65	
		V_{CC}=3V		0.45		0.75	
		V_{CC}=4.5V		0.7		1.0	
		V_{CC}=5.5V		0.85		1.15	
ΔV_T		V_{CC}=1.65V	Full	0.35		0.6	V
		V_{CC}=2.3V		0.6		1.2	
		V_{CC}=3V		1.05		1.65	
		V_{CC}=4.5V		1.6		2.0	
		V_{CC}=5.5V		1.95		2.25	
V_{OH}		I_{OH}=−100μA ,V_{CC}=1.65V to 5.5V	Full	V_{CC}-0.1			V
		I_{OH}=−4mA ,V_{CC}=1.65V		1.2			
		I_{OH}=−8mA ,V_{CC}=2.3V		1.9			
		I_{OH}=−16mA ,V_{CC}=3V		2.4			
		I_{OH}=−24mA ,V_{CC}=3V		2.3			
		I_{OH}=−32mA ,V_{CC}=4.5V		3.8			
V_{OL}		I_{OL}=100μA, V_{CC}=1.65V to 5.5V	Full			0.1	V
		I_{OL}=4mA , V_{CC}=1.65V				0.45	
		I_{OH}=8mA ,V_{CC}=2.3V				0.3	
		I_{OH}=16mA ,V_{CC}=3V				0.4	
		I_{OH}=24mA ,V_{CC}=3V				0.55	
		I_{OH}=32mA ,V_{CC}=4.5V				0.55	
I_I	A input	V_I=5.5V or GND,V_{CC}=0V to 5.5V	+25°C		±0.1	±1	μA
			Full			±5	
I_{off}		V_I or V_O=5.5V,V_{CC}=0V	+25°C		±0.1	±1	μA
			Full			±10	
I_{CC}		V_I=5.5V or GND,I_O=0,V_{CC}=1.65V to 5.5V	+25°C		0.1	1	μA
			Full			10	

Parameter	Conditions	Temp	Min	Typ	Max	Unit
ΔI_{CC}	One input at V_{CC}-0.6V, Other inputs at V_{CC} or GND, V_{CC}=3V to 5.5V	Full			500	µA

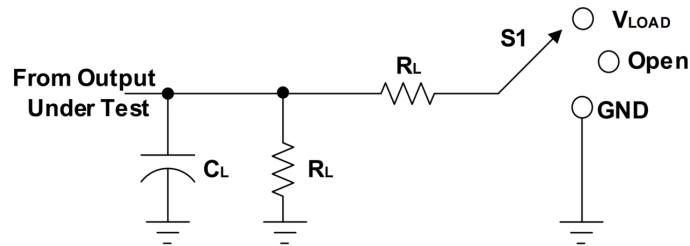## 2.6   Switching Characteristics

Over recommended operating free-air temperature range (-40°C to 125°C, unless otherwise noted.)

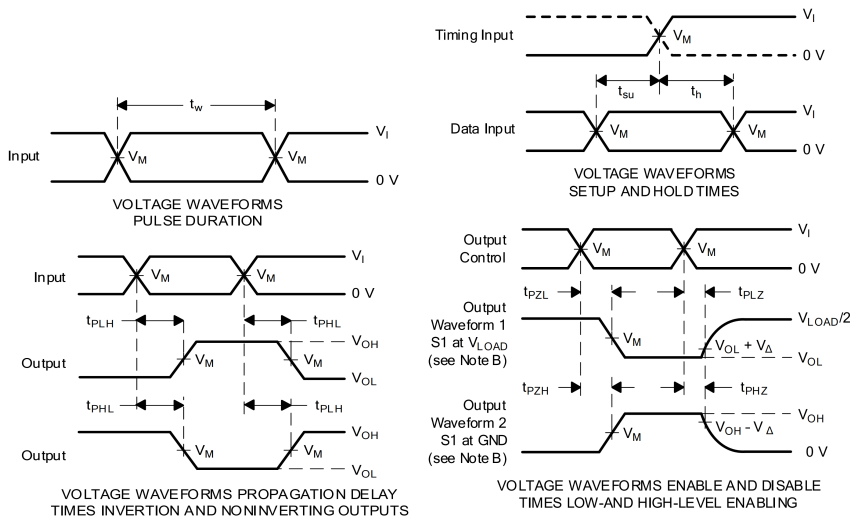| Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Propagation Delay	t_{pd}	V_{CC}=1.8V±0.15V	C_L=30pF, R_L=500Ω		7.5		ns
		V_{CC}=2.5V±0.2V	C_L=30pF, R_L=500Ω		3.6		ns
		V_{CC}=3.3V±0.3V	C_L=50pF, R_L=500Ω		3.1		ns
		V_{CC}=5V±0.5V	C_L=50pF, R_L=500Ω		2.7		ns
Input Capacitance	C_i	V_{CC}=3.3V	V_I=V_{CC} or GND		4		pF
Power dissipation capacitance	C_{pd}	V_{CC}=1.8V	f=10MHz		20		pF
		V_{CC}=2.5V			21		pF
		V_{CC}=3.3V			22		pF
		V_{CC}=5V			25		pF

> **Note:** All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

3   Parameter Measurement Information

TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_Δ
	V_I	T_r/T_f					
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	2 X V_{CC}	30pF	1kΩ	0.15V
2.5V±0.2V	V_{CC}	≤2ns	$V_{CC}/2$	2 X V_{CC}	30pF	500Ω	0.15V
3.3V±0.3V	3V	≤2.5ns	1.5V	6V	50pF	500Ω	0.3V
5V±0.5V	V_{CC}	≤2.5ns	$V_{CC}/2$	2 X V_{CC}	50pF	500Ω	0.3V

VOLTAGE WAVEFORMS
PULSE DURATION

VOLTAGE WAVEFORMS PROPAGATION DELAY
TIMES INVERTION AND NONINVERTING OUTPUTS

VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES

VOLTAGE WAVEFORMS ENABLE AND DISABLE
TIMES LOW-AND HIGH-LEVEL ENABLING

Note:

[1] C_L includes probe and jig capacitance.

[2] Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control.
    Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.

[3] All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50Ω.

[4] The outputs are measured one at a time, with one transition per measurement.

[5] t_{PLZ} and t_{PHZ} are the same as t_{dis}.

[6] t_{PZL} and t_{PZH} are the same as t_{en}.

[7] t_{PLH} and t_{PHL} are the same as t_{pd}.

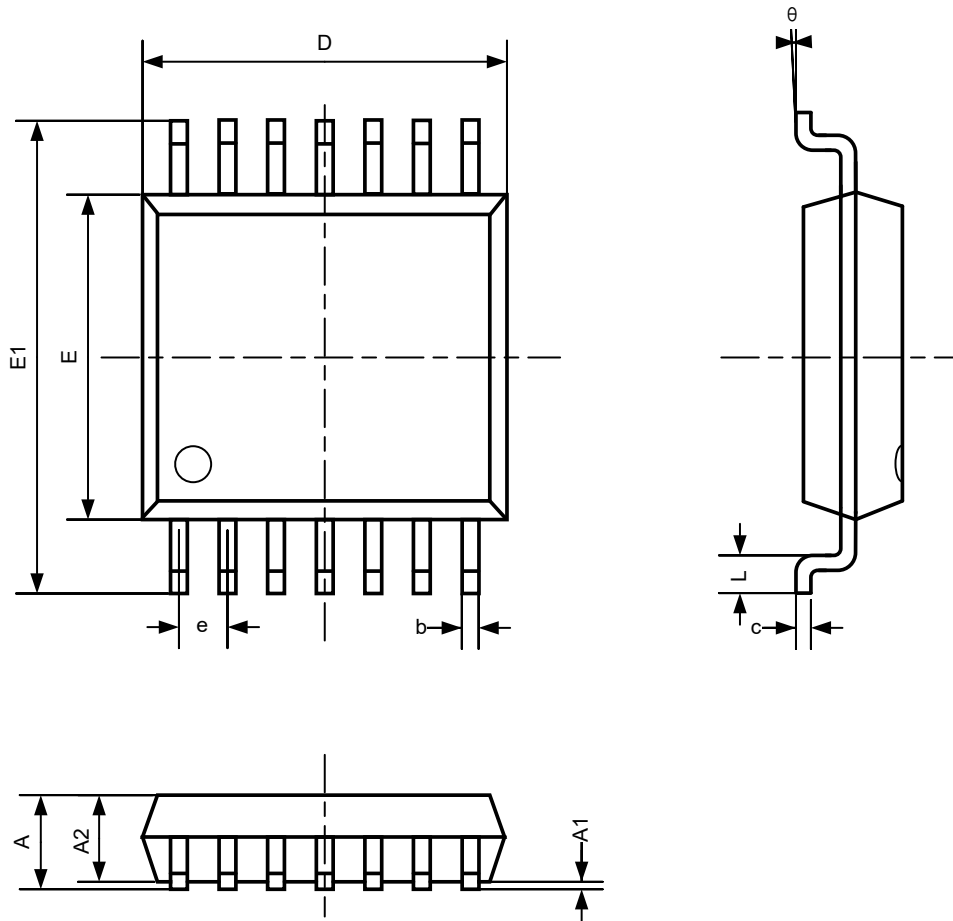[8] All parameters and waveforms are not applicable to all devices.

4   Package Outline

4.1   SOIC-14

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.250	1.650	0.049	0.065
b	0.360	0.490	0.014	0.019
c	0.130	0.250	0.005	0.010
D	8.530	8.730	0.336	0.344
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 BSC		0.050 BSC	
L	0.450	0.800	0.018	0.032
θ	0°	8°	0°	8°

4.2   TSSOP-14

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	**Max**	**Min**	**Max**
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.000	0.031	0.039
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.900	5.100	0.193	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500	0.700	0.020	0.028
θ	1°	7°	1°	7°

5   Revision History

Version	Date	Description
0.1	2022/10/31	Initial release
0.2	2023/04/19	Update some specification informations