



HEF40106(LX) Hex Inverting Schmitt Trigger

Product Specification

Specification Revision History:

Version	Date	Description
2022-06-A1	2022-06	New
2023-04-B1	2023-04	Update the template



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1、General Description

The HEF40106 provides six inverting buffers. Each input has a Schmitt trigger circuit. The inverting buffer switches at different points for positive-going and negative-going signals. The difference between the positive voltage (V_{T+}) and the negative voltage (V_{T-}) is defined as hysteresis voltage (V_H). The HEF40106 may be used for enhanced noise immunity or to “square up” slowly changing waveforms.

It operates over a recommended V_{DD} power supply range of 3V to 15V referenced to V_{SS} (usually ground). Unused inputs must be connected to V_{DD} , V_{SS} , or another input.

Features:

- Wide supply voltage range from 3V to 15V
- Schmitt trigger input discrimination
- Fully static operation
- 5V, 10V, and 15V parametric ratings
- Standardized symmetrical output characteristics
- Specified from -40°C to +125°C
- Packaging information: SOP14/TSSOP14

Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
HEF40106BT(LX)	SOP14	HEF40106BT	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
HEF40106BTT(LX)	TSSOP14	HEF40106	5000 PCS/reel	10000 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.

2、Block Diagram And Pin Description

2.1、Block Diagram

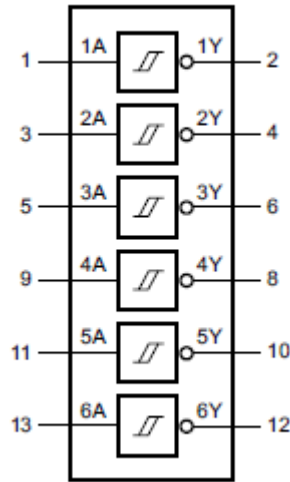
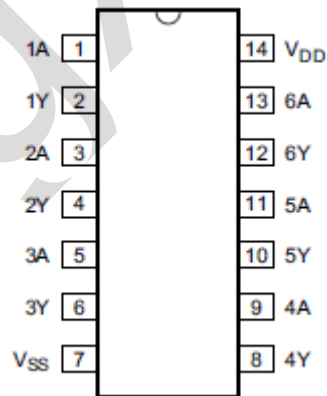


Figure 1. Functional diagram



Figure 2. Logic diagram (one inverting buffer)

2.2、Pin Configurations





2.3、Pin Description

Pin No.	Pin Name	Description
1	1A	data input
2	1Y	data output
3	2A	data input
4	2Y	data output
5	3A	data input
6	3Y	data output
7	V _{SS}	ground (0V)
8	4Y	data output
9	4A	data input
10	5Y	data output
11	5A	data input
12	6Y	data output
13	6A	data input
14	V _{DD}	supply voltage

2.4、Function Table

Input	Output
nA	nY
L	H
H	L

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

3、Electrical Parameter

3.1、Absolute Maximum Ratings

(Voltages are referenced to V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	V _{DD}	-	-0.5	+18	V
DC input current	I _{IK}	any one input	-	±10	mA
input voltage	V _I	all inputs	-0.5	V _{DD} +0.5	V
storage temperature	T _{stg}	-	-65	+150	°C
total power dissipation	P _{tot}	-	-	500	mW
device dissipation	P	per output transistor	-	100	mW
soldering temperature	T _L	10s	SOP/TSSOP	260	°C



3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{DD}	-	3	-	15	V
ambient temperature	T_{amb}	in free air	-40	-	+125	°C

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

($T_{amb}=25^{\circ}\text{C}$, voltages are referenced to V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)			$T_{amb}=25^{\circ}\text{C}$			Unit
		V_O	V_{IN}	V_{DD}	Min.	Typ.	Max.	
supply current	I_{DD}	-	0, 5	5	-	-	1	uA
		-	0, 10	10	-	-	2	uA
		-	0, 15	15	-	-	4	uA
LOW-level output current	I_{OL}	0.4	0, 5	5	0.51	1	-	mA
		0.5	0, 10	10	1.3	2.6	-	mA
		1.5	0, 15	15	3.4	6.8	-	mA
HIGH-level output current	I_{OH}	4.6	0, 5	5	-0.51	-1	-	mA
		2.5	0, 5	5	-1.6	-3.2	-	mA
		9.5	0, 10	10	-1.3	-2.6	-	mA
		13.5	0, 15	15	-3.4	-6.8	-	mA
LOW-level output voltage	V_{OL}	-	5	5	-	0	0.05	V
		-	10	10	-	0	0.05	V
		-	15	15	-	0	0.05	V
HIGH-level output voltage	V_{OH}	-	0	5	4.95	5	-	V
		-	0	10	9.95	10	-	V
		-	0	15	14.95	15	-	V
input leakage current	I_I	-	0, 15	15	-	-	± 1	uA



3.3.2、DC Characteristics 2

($T_{amb} = -40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, voltages are referenced to V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)			$T_{amb} = -40^{\circ}\text{C}$		$T_{amb} = +85^{\circ}\text{C}$		$T_{amb} = +125^{\circ}\text{C}$		Unit
		V_O	V_{IN}	V_{DD}	Min.	Max.	Min.	Max.	Min.	Max.	
supply current	I_{DD}	-	0, 5	5	-	1	-	30	-	30	μA
		-	0, 10	10	-	2	-	60	-	60	μA
		-	0, 15	15	-	4	-	120	-	120	μA
LOW-level output current	I_{OL}	0.4	0, 5	5	0.61	-	0.42	-	0.36	-	mA
		0.5	0, 10	10	1.5	-	1.1	-	0.9	-	mA
		1.5	0, 15	15	4	-	2.8	-	2.4	-	mA
HIGH-level output current	I_{OH}	4.6	0, 5	5	-0.61	-	-0.42	-	-0.36	-	mA
		2.5	0, 5	5	-1.8	-	-1.3	-	-1.15	-	mA
		9.5	0, 10	10	-1.5	-	-1.1	-	-0.9	-	mA
		13.5	0, 15	15	-4	-	-2.8	-	-2.4	-	mA
LOW-level output voltage	V_{OL}	-	5	5	-	0.05	-	0.05	-	0.05	V
		-	10	10	-	0.05	-	0.05	-	0.05	V
		-	15	15	-	0.05	-	0.05	-	0.05	V
HIGH-level output voltage	V_{OH}	-	0	5	4.95	-	4.95	-	4.95	-	V
		-	0	10	9.95	-	9.95	-	9.95	-	V
		-	0	15	14.95	-	14.95	-	14.95	-	V
input leakage current	I_I	-	0, 15	15	-	± 1	-	± 1	-	± 1	μA

3.3.3、AC Characteristics

($T_{amb} = 25^{\circ}\text{C}$, $V_{SS} = 0\text{V}$, $t_r, t_f = 20\text{ns}$, $C_L = 50\text{pF}$, $R_L = 200\text{k}\Omega$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
propagation delay time	t_{PHL}, t_{PLH}	see Figure 4 $V_{DD} = 5\text{V}$	-	140	280	ns
		$V_{DD} = 10\text{V}$	-	70	140	ns
		$V_{DD} = 15\text{V}$	-	60	120	ns
transition time	t_{THL}, t_{TLH}	see Figure 4 $V_{DD} = 5\text{V}$	-	100	200	ns
		$V_{DD} = 10\text{V}$	-	50	100	ns
		$V_{DD} = 15\text{V}$	-	40	80	ns
input capacitance	C_I	any input	-	5	7.5	pF



3.3.4、Transfer Characteristics 1

($T_{amb}=25^{\circ}\text{C}$, voltages are referenced to V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)			$T_{amb}=25^{\circ}\text{C}$			Unit
		V_O	V_{IN}	V_{DD}	Min.	Typ.	Max.	
positive-going threshold voltage	V_{T+}	-	-	5	2.2	2.9	3.6	V
		-	-	10	4.6	5.9	7.1	V
		-	-	15	6.8	8.8	10.8	V
negative-going threshold voltage	V_{T-}	-	-	5	0.9	1.9	2.8	V
		-	-	10	2.5	3.9	5.2	V
		-	-	15	4	5.8	7.4	V
hysteresis voltage	V_H	-	-	5	0.3	0.9	1.6	V
		-	-	10	1.2	2.3	3.4	V
		-	-	15	1.6	3.5	5	V

Note: See Figure 5 and Figure 6.

3.3.5、Transfer Characteristics 2

($T_{amb}=-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, voltages are referenced to GND (ground = 0V), unless otherwise specified.)

Parameter	Symbol	Conditions (V)			$T_{amb}=-40^{\circ}\text{C}$		$T_{amb}=+85^{\circ}\text{C}$		$T_{amb}=+125^{\circ}\text{C}$		Unit
		V_O	V_{IN}	V_{DD}	Min.	Max.	Min.	Max.	Min.	Max.	
positive-going threshold voltage	V_{T+}	-	-	5	2.2	3.6	2.2	3.6	2.2	3.6	V
		-	-	10	4.6	7.1	4.6	7.1	4.6	7.1	V
		-	-	15	6.8	10.8	6.8	10.8	6.8	10.8	V
negative-going threshold voltage	V_{T-}	-	-	5	0.9	2.8	0.9	2.8	0.9	2.8	V
		-	-	10	2.5	5.2	2.5	5.2	2.5	5.2	V
		-	-	15	4	7.4	4	7.4	4	7.4	V
hysteresis voltage	V_H	-	-	5	0.3	1.6	0.3	1.6	0.3	1.6	V
		-	-	10	1.2	3.4	1.2	3.4	1.2	3.4	V
		-	-	15	1.6	5	1.6	5	1.6	5	V

Note: See Figure 5 and Figure 6.

4、Testing Circuit

4.1、AC Testing Circuit

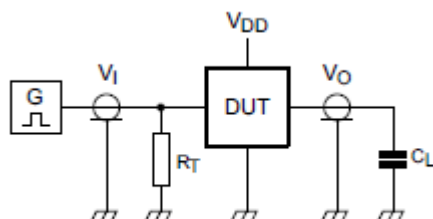


Figure 3. Test circuit for switching times

Definitions for test circuit:

DUT=Device Under Test.

C_L =Load capacitance including jig and probe capacitance.

R_T =Termination resistance should be equal to the output impedance Z_o of the pulse generator.

4.2、AC Testing Waveforms

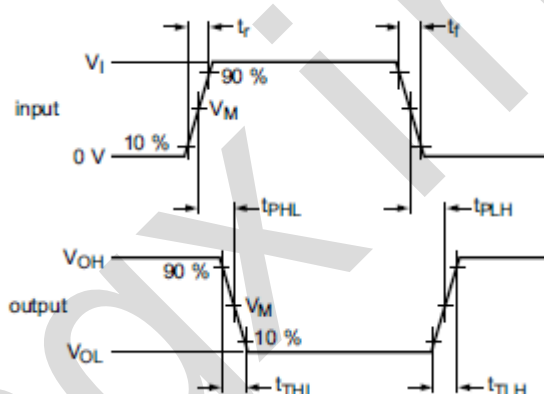


Figure 4. Propagation delay and output transition time

4.3、Transfer Characteristics Waveforms

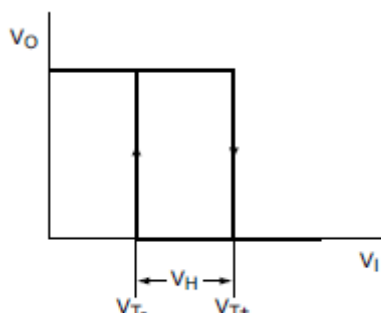


Figure 5. Transfer characteristic

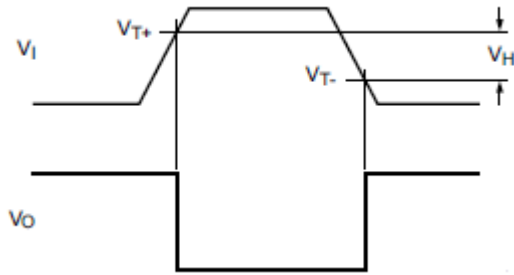


Figure 6. Waveforms showing definition of V_{T+} and V_{T-} (between limits at 30% and 70%) and V_H

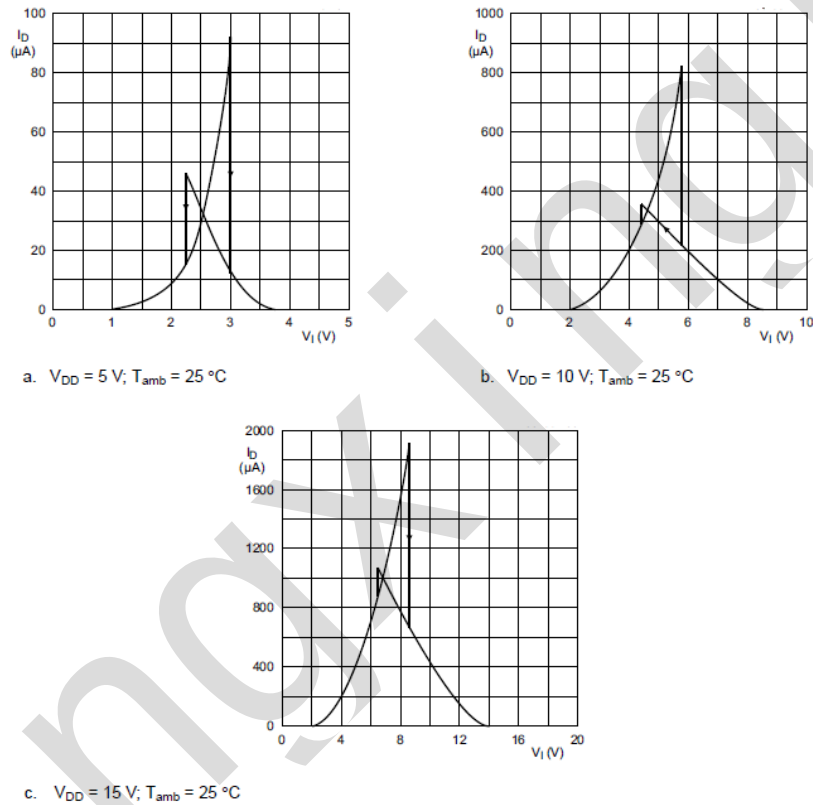


Figure 7. Typical drain current as a function of input

4.4、Measurement Points

Supply voltage	Input	Output
V_{DD}	V_M	V_M
5V to 15V	$0.5 \times V_{DD}$	$0.5 \times V_{DD}$

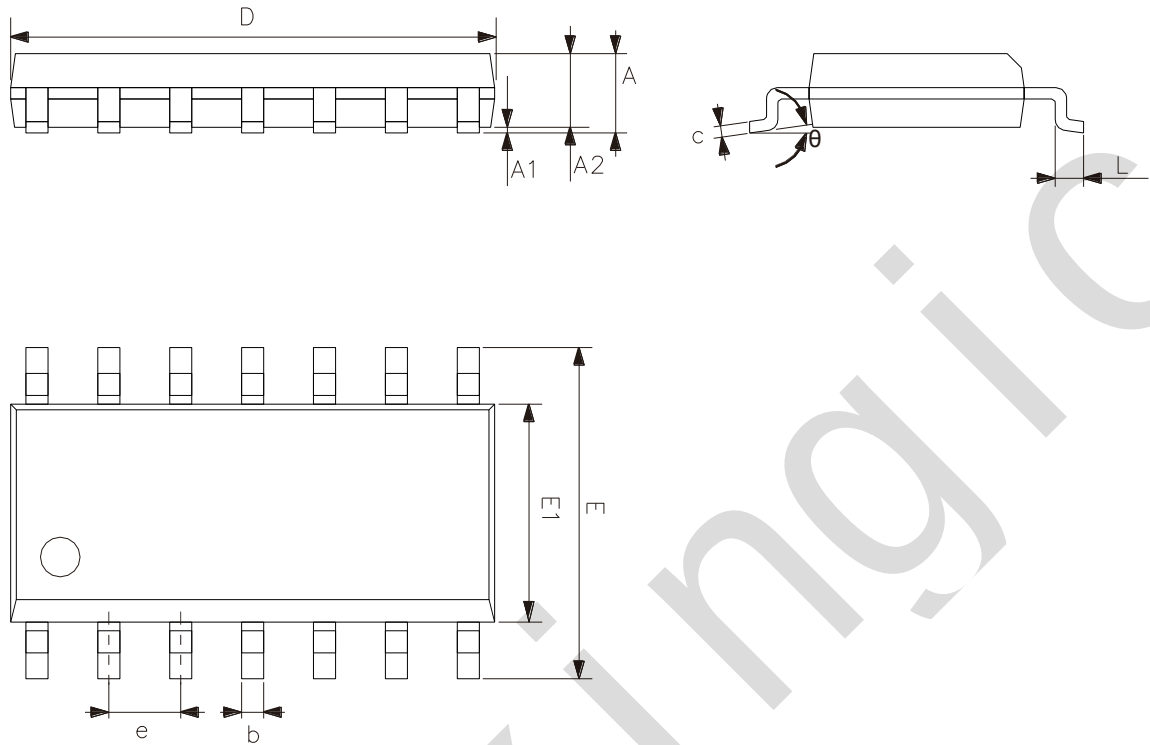
4.5、Test Data

Supply voltage	Input		Load
V_{DD}	V_I	t_r, t_f	C_L
5V to 15V	V_{SS} or V_{DD}	$\leq 20\text{ns}$	50pF



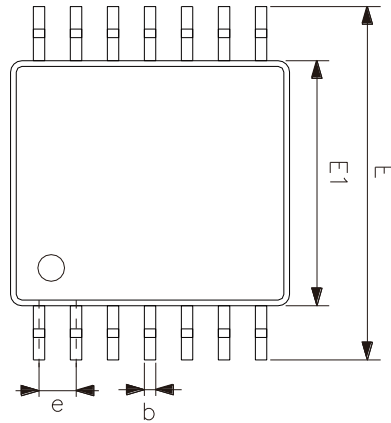
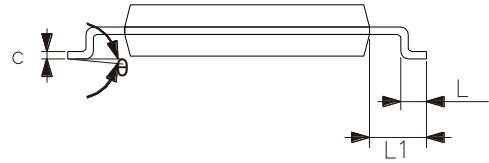
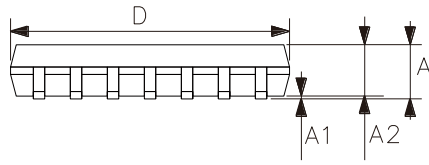
5、Package Information

5.1、SOP14



Symbol	Dimensions (mm)	
	Min.	Max.
A	1.50	1.75
A1	0.05	0.25
A2	1.30	-
b	0.33	0.50
c	0.19	0.25
D	8.43	8.76
E	5.80	6.25
E1	3.75	4.00
e	1.27	
L	0.40	0.89
θ	0°	8°

5.2、TSSOP14



Symbol	Dimensions (mm)	
	Min.	Max.
A	-	1.20
A1	0.05	0.15
A2	0.80	1.05
b	0.19	0.30
c	0.09	0.20
D	4.90	5.10
E1	4.30	4.50
E	6.20	6.60
e	0.65	
L	0.45	0.75
L1	1.00	
θ	0°	8°



6、Statements And Notes

6.1、The name and content of Hazardous substances or Elements in the product

Part name	Hazardous substances or Elements									
	Lead and lead compounds	Mercury and mercury compounds	Cadmium and cadmium compounds	Hexavalent chromium compounds	Polybrominated biphenyls	Polybrominated biphenyl ethers	Dibutyl phthalate	Butylbenzyl phthalate	Di-2-ethylhexyl phthalate	Diisobutyl phthalate
Lead frame	○	○	○	○	○	○	○	○	○	○
Plastic resin	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
The lead	○	○	○	○	○	○	○	○	○	○
Plastic sheet installed	○	○	○	○	○	○	○	○	○	○
explanation	○: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard. ×: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.									

6.2、Notes

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