HEF4528(LX)
Dual Monostable Multivibrator

Product Specification

Specification Revision History:

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

Contents

1、General Description.......... 3

2、Block Diagram And Pin Description 5

2.1、Block Diagram 5

2.2、Pin Configurations.......... 6

2.3、Pin Description.......... 6

2.4、Function Table.......... 7

3、Electrical Parameter 7

3.1、Absolute Maximum Ratings.......... 7

3.2、Recommended Operating Conditions 7

3.3、Electrical Characteristics.......... 8

3.3.1、DC Characteristics 1.......... 8

3.3.2、DC Characteristics 2.......... 8

3.3.3、AC Characteristics.......... 9

4、Testing Circuit 10

4.1、AC Testing Circuit 10

4.2、AC Testing Waveforms.......... 10

4.3、Measurement Points 11

4.4、Test Data 11

5、Package Information.......... 12

5.1、SOP16 12

6、Statements And Notes 13

6.1、The name and content of Hazardous substances or Elements in the product.......... 13

6.2、Notes 13

1、General Description

The HEF4528 is a dual retriggerable-resetable monostable multivibrator. Each multivibrator has an active LOW input (n$\overline{A}$), and active HIGH input (nB), an active LOW clear direct input (n$\overline{CD}$), an output (nQ) and its complement (n$\overline{Q}$), and two external timing component connecting pins (nCEXT, always connected to ground, and nREXT/CEXT).

An external timing capacitor (C_{EXT}) must be connected between nCEXT and nREXT/CEXT and an external resistor (R_{EXT}) must be connected between nREXT/CEXT and V_{DD}. The output pulse duration is determined by the external timing components C_{EXT} and R_{EXT}. A HIGH-to-LOW transition on n$\overline{A}$ when nB is LOW or a LOW-to-HIGH transition on nB when n$\overline{A}$ is HIGH produces a positive pulse (LOW-HIGH-LOW) on nQ and a negative pulse (HIGH-LOW-HIGH) on n$\overline{Q}$ if the n$\overline{CD}$ is HIGH. A LOW on n$\overline{CD}$ forces nQ LOW, n$\overline{Q}$ HIGH and inhibits any further pulses until n$\overline{CD}$ is HIGH.

It operates over a recommended V_{DD} power supply range of 3V to 12V 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 12V
- Fully static operation
- 5V and 10V parametric ratings
- Standardized symmetrical output characteristics
- Specified from -40℃ to +125℃
- Packaging information: SOP16

Ordering Information:

Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
HEF4528BT(LX)	SOP16	HEF4528BT	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm

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

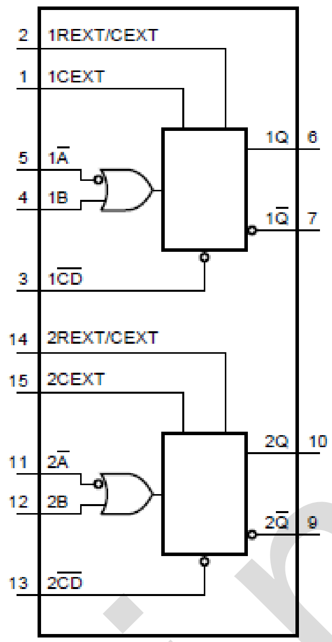


Figure 1. Functional diagram

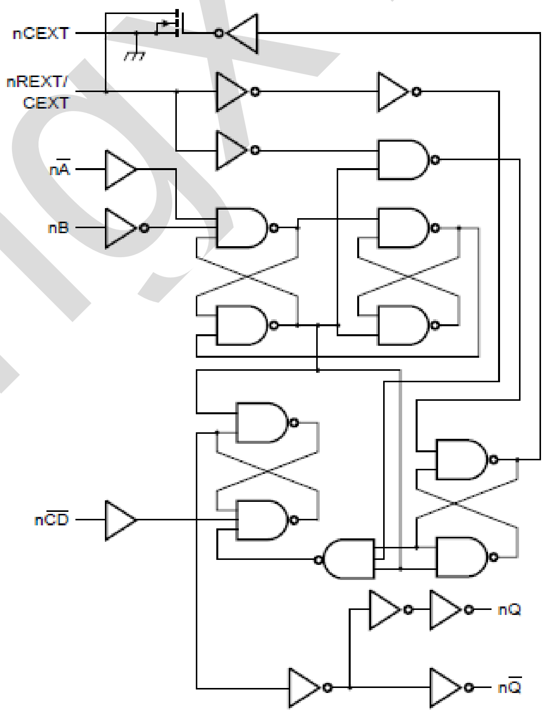
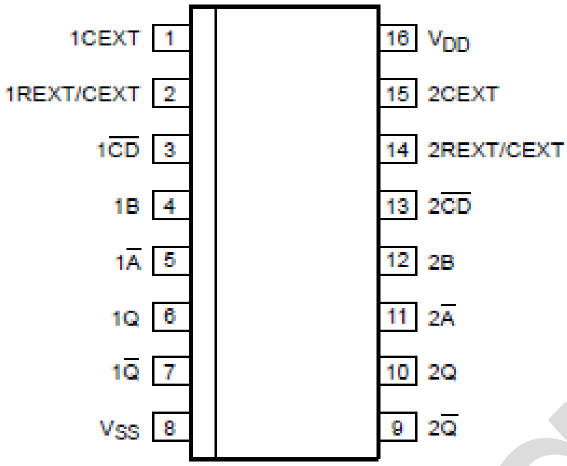


Figure 2. Logic diagram for one monostable multivibrator

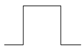
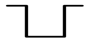
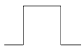
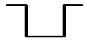
2.2、Pin Configurations



2.3、Pin Description

Pin No.	Pin Name	Description
1	1CEXT	external capacitor connection (always connected to ground)
2	1REXT/ CEXT	external capacitor/resistor connection
3	1$\overline{CD}$	clear direct input (active LOW)
4	1B	input (LOW-to-HIGH triggered)
5	1$\overline{A}$	input (HIGH-to-LOW triggered)
6	1Q	output
7	1$\overline{Q}$	complementary output (active LOW)
8	V_{SS}	ground (0V)
9	2$\overline{Q}$	complementary output (active LOW)
10	2Q	output
11	2$\overline{A}$	input (HIGH-to-LOW triggered)
12	2B	input (LOW-to-HIGH triggered)
13	2$\overline{CD}$	clear direct input (active LOW)
14	2REXT/ CEXT	external capacitor/resistor connection
15	2CEXT	external capacitor connection (always connected to ground)
16	V_{DD}	supply voltage

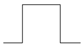
2.4、Function Table

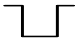
Input			Output	
$n\overline{A}$	**nB**	**$n\overline{CD}$**	**nQ**	**$n\overline{Q}$**
↓	L	H		
H	↑	H		
X	X	L	L	H

Note:

[1] H=HIGH voltage level; L=LOW voltage level; X=don't care;

[2] ↑=positive-going clock transition; ↓=negative-going transition;

[3]  =one HIGH level output pulse, with the pule width determined by C_{EXT} and R_{EXT};

[4]  =one LOW level output pulse, with the pulse width determined by C_{EXT} and R_{EXT}.

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	+14	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	℃
total power dissipation	P_{tot}	-		-	500	mW
device dissipation	P	per output transistor		-	100	mW
Soldering temperature	T_L	10s	SOP	260		℃

3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{DD}	-	3	-	12	V
ambient temperature	T_{amb}	in free air	-40	-	+125	℃

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

(T_{amb}=25℃, voltages are referenced to V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions			T_{amb}=25℃			Unit
		$\|I_O\|$(uA)	V_O(V)	V_{DD}(V)	Min.	Typ.	Max.	
supply current	I_{DD}	0	-	5	-	-	20	uA
		0	-	10	-	-	40	uA
LOW-level output current	I_{OL}	-	0.4	5	0.44	-	-	mA
		-	0.5	10	1.1	-	-	mA
HIGH-level output current	I_{OH}	-	2.5	5	-	-	-1.4	mA
		-	4.6	5	-	-	-0.44	mA
		-	9.5	10	-	-	-1.1	mA
LOW-level output voltage	V_{OL}	<1	-	5	-	-	0.05	V
		<1	-	10	-	-	0.05	V
HIGH-level output voltage	V_{OH}	<1	-	5	4.95	-	-	V
		<1	-	10	9.95	-	-	V
LOW-level input voltage	V_{IL}	<1	-	5	-	-	1.5	V
		<1	-	10	-	-	3	V
HIGH-level input voltage	V_{IH}	<1	-	5	3.5	-	-	V
		<1	-	10	7	-	-	V
input leakage current	I_I	-	-	12	-	-	±1.0	uA

3.3.2、DC Characteristics 2

(T_{amb}=-40℃ to +125℃, voltages are referenced to V_{SS} (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions			T_{amb}=-40℃		T_{amb}=+85℃		T_{amb}=+125℃		Unit
		$\|I_O\|$(uA)	V_O(V)	V_{DD}(V)	Min.	Max.	Min.	Max.	Min.	Max.	
supply current	I_{DD}	0	-	5	-	20	-	150	-	150	uA
		0	-	10	-	40	-	300	-	300	uA
LOW-level output current	I_{OL}	-	0.4	5	0.52	-	0.36	-	0.36	-	mA
		-	0.5	10	1.3	-	0.9	-	0.9	-	mA
HIGH-level output current	I_{OH}	-	2.5	5	-	-1.7	-	-1.1	-	-1.1	mA
		-	4.6	5	-	-0.52	-	-0.36	-	-0.36	mA
		-	9.5	10	-	-1.3	-	-0.9	-	-0.9	mA
LOW-level output voltage	V_{OL}	<1	-	5	-	0.05	-	0.05	-	0.05	V
		<1	-	10	-	0.05	-	0.05	-	0.05	V
HIGH-level output voltage	V_{OH}	<1	-	5	4.95	-	4.95	-	4.95	-	V
		<1	-	10	9.95	-	9.95	-	9.95	-	V
LOW-level input voltage	V_{IL}	<1	-	5	-	1.5	-	1.5	-	1.5	V
		<1	-	10	-	3	-	3	-	3	V
HIGH-level input voltage	V_{IH}	<1	-	5	3.5	-	3.5	-	3.5	-	V
		<1	-	10	7	-	7	-	7	-	V
input leakage current	I_I	-	-	12	-	±1.0	-	±1.0	-	±1.0	uA

3.3.3、AC Characteristics

(T_{amb}=25℃, V_{SS}=0V, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH to LOW propagation delay	t_{PHL}	n$\overline{A}$ or nB to n$\overline{Q}$; see Figure 5	V_{DD}=5V	-	140	280	ns
			V_{DD}=10V	-	50	100	ns
		n$\overline{CD}$ to nQ; see Figure 5	V_{DD}=5V	-	105	210	ns
			V_{DD}=10V	-	40	85	ns
LOW to HIGH propagation delay	t_{PLH}	n$\overline{A}$ or nB to nQ; see Figure 5	V_{DD}=5V	-	155	305	ns
			V_{DD}=10V	-	60	115	ns
		n$\overline{CD}$ to n$\overline{Q}$; see Figure 5	V_{DD}=5V	-	120	240	ns
			V_{DD}=10V	-	50	105	ns
transition time	t_t	nQ, n$\overline{Q}$; see Figure 5	V_{DD}=5V	-	60	120	ns
			V_{DD}=10V	-	30	60	ns
recovery time	t_{rec}	n$\overline{CD}$ to n$\overline{A}$ or nB; see Figure 6	V_{DD}=5V	0	-75	-	ns
			V_{DD}=10V	0	-30	-	ns
set-up time	t_{su}	n$\overline{CD}$ to n$\overline{A}$ or nB; see Figure 6	V_{DD}=5V	0	-105	-	ns
			V_{DD}=10V	0	-40	-	ns
pulse width	t_W	n$\overline{A}$ LOW; minimum width; see Figure 6	V_{DD}=5V	50	25	-	ns
			V_{DD}=10V	30	15	-	ns
		nB HIGH; minimum width; see Figure 6	V_{DD}=5V	50	25	-	ns
			V_{DD}=10V	30	15	-	ns
		n$\overline{CD}$ LOW; minimum width; see Figure 6	V_{DD}=5V	60	30	-	ns
			V_{DD}=10V	35	15	-	ns
		nQ or n$\overline{Q}$; R_{EXT}=5kΩ; C_{EXT}=15pF; see Figure 6	V_{DD}=5V	-	235	-	ns
			V_{DD}=10V	-	155	-	ns
		nQ or n$\overline{Q}$; R_{EXT}=10kΩ; C_{EXT}=1nF; see Figure 6	V_{DD}=5V	-	5.45	-	us
			V_{DD}=10V	-	4.95	-	us
pulse width variation	Δt_W	nQ output variation over temperature range	V_{DD}=5V	-	±3	-	%
			V_{DD}=10V	-	±2	-	%
		nQ output variation over voltage range V_{DD} ±5%	V_{DD}=5V	-	±2	-	%
			V_{DD}=10V	-	±1	-	%
external timing resistor	R_{EXT}	see Figure 4	V_{DD}=5V	5	-	2	MΩ
			V_{DD}=10V	5	-	2	MΩ
external timing capacitor	C_{EXT}	see Figure 4	V_{DD}=5V	no limits			-
			V_{DD}=10V	no limits			-
input capacitance	C_I	-		-	-	7.5	pF

Note:

[1] t_t is the same as t_{TLH} and t_{THL}.

[2] For other R_{EXT}, C_{EXT} combinations and C_{EXT}<0.01uF, see Figure 4.

[3] For other R_{EXT}, C_{EXT} combinations and C_{EXT}>0.01uF, use formula $t_W=K\times R_{EXT}\times C_{EXT}$.

where: t_W=output pulse width (s);

R_{EXT}=external timing resistor (Ω);

C_{EXT}=external timing capacitor (F);

K=0.42 for V_{DD}=5V;

K=0.32 for V_{DD}=10V;

K=0.30 for V_{DD}=15V.

[4] T_{amb}=-40℃ to +85℃; Δt_W is referenced to t_W at T_{amb}=25℃.

4、Testing Circuit

4.1、AC Testing Circuit

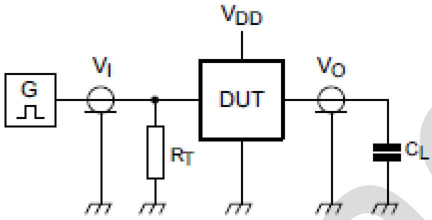


Figure 3. Test circuit for switching times

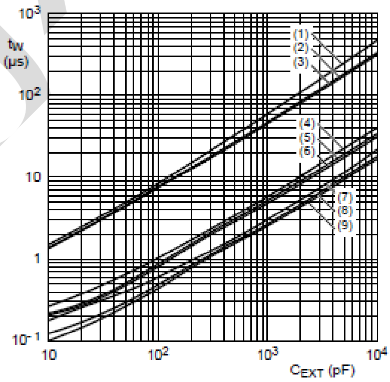
Definitions for test circuit:

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



(1) R_{EXT} = 100 kΩ, V_{DD} = 5 V.
(2) R_{EXT} = 100 kΩ, V_{DD} = 10 V.
(3) R_{EXT} = 100 kΩ, V_{DD} = 15 V.
(4) R_{EXT} = 10 kΩ, V_{DD} = 5 V.
(5) R_{EXT} = 10 kΩ, V_{DD} = 10 V.
(6) R_{EXT} = 10 kΩ, V_{DD} = 15 V.
(7) R_{EXT} = 5 kΩ, V_{DD} = 5 V.
(8) R_{EXT} = 5 kΩ, V_{DD} = 10 V.
(9) R_{EXT} = 5 kΩ, V_{DD} = 15 V.

Figure 4. Output pulse width (t_W) as a function of external timing capacitor (C_{EXT})

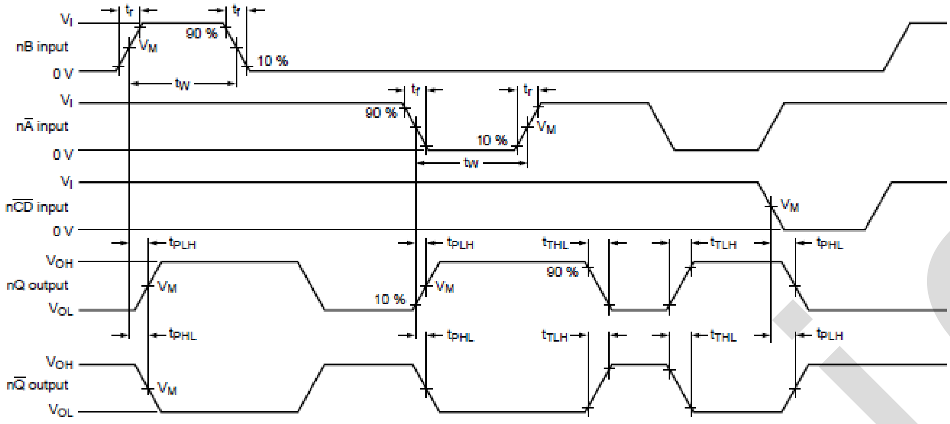


Figure 5. Waveforms showing propagation delays and transition times

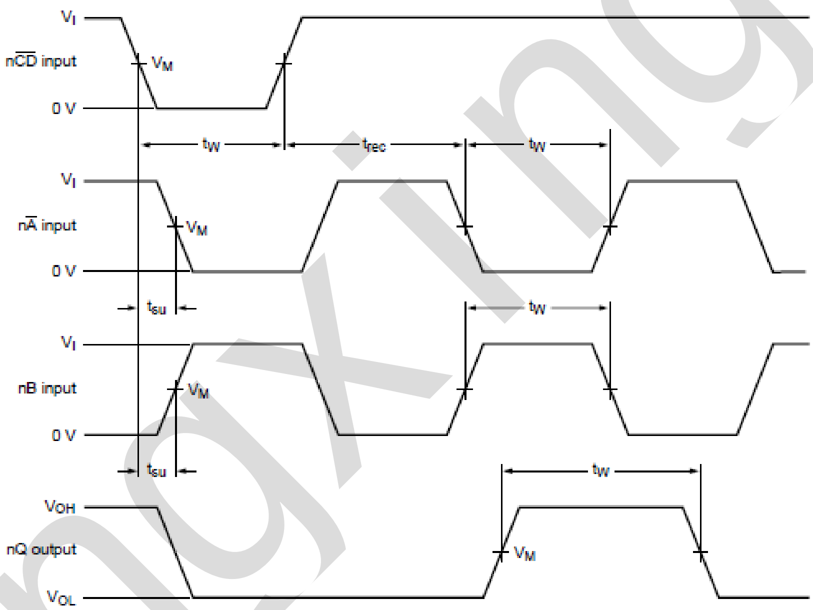


Figure 6. Waveforms showing minimum n$\overline{A}$, nB, and nQ pulse widths and set-up and recovery times

4.3、Measurement Points

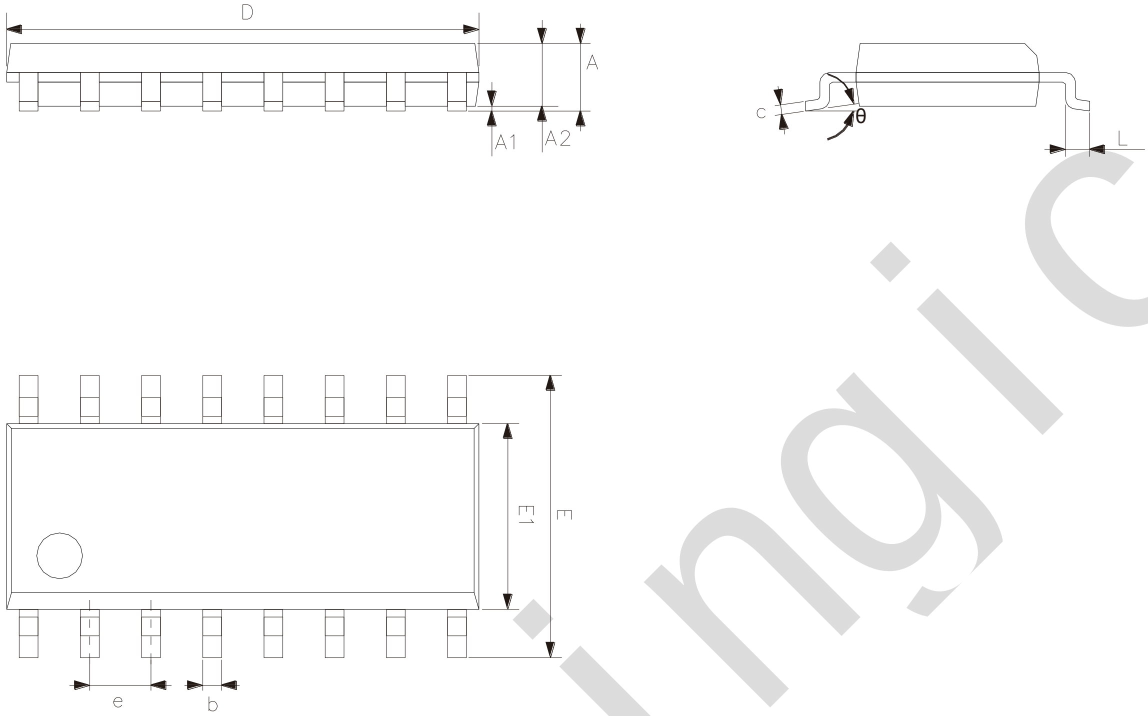
Supply voltage	Input	Output
V_{DD}	V_M	V_M
5V to 12V	$0.5 \times V_{DD}$	$0.5 \times V_{DD}$

4.4、Test Data

Supply voltage	Input		Load
V_{DD}	V_I	t_r , t_f	C_L
5V to 12V	V_{SS} or V_{DD}	$\leq$ 20ns	50pF

5、Package Information

5.1、SOP16



Symbol	Dimensions (mm)	
	Min.	Max.
A	1.35	1.80
A1	0.10	0.25
A2	1.25	1.55
b	0.33	0.51
c	0.19	0.25
D	9.50	10.10
E	5.80	6.30
E1	3.70	4.10
e	1.27	
L	0.35	0.89
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.									