

1、 General Description

The 74HC14 and 74HCT14 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC14 and 74HCT14 provide six inverting buffers with Schmitt-trigger action. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

Features:

- Applications:
 - Wave and pulse shapers
 - Astable multivibrators
 - Monostable multivibrators
- ESD protection:
 - HBM EIA/JESD22-A114-A exceeds 2000 V
 - MM EIA/JESD22-A115-A exceeds 200 V
- Specified from -40 to +85 °C
- Multiple package options: DIP14/SOP14/TSSOP14

2、 Block Diagram And Pin Description

2.1 、 Block Diagram

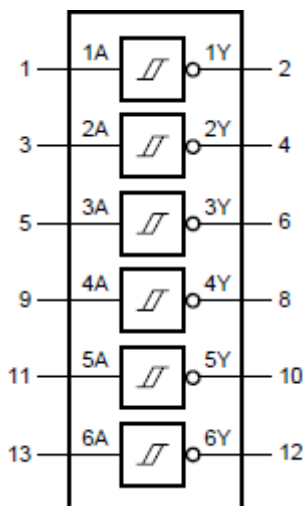


Fig.1 Logic symbol

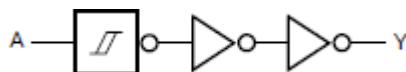


Fig.2 Logic diagram (one Schmitt trigger)

2.2、Pin Configurations

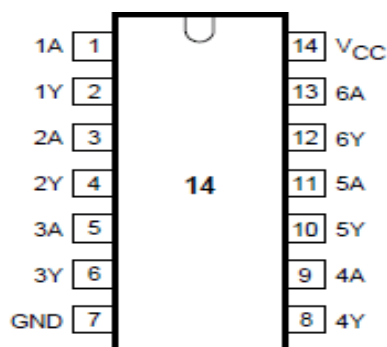


Fig.3 Pin configuration

2.3、Pin Description

PIN	SYMBOL	DESCRIPTION	PIN	SYMBOL	DESCRIPTION
1	1A	data input	8	4Y	data output
2	1Y	data output	9	4A	data input
3	2A	data input	10	5Y	data output
4	2Y	data output	11	5A	data input
5	3A	data input	12	6Y	data output
6	3Y	data output	13	6A	data input
7	GND	ground (0 V)	14	V _{CC}	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

In accordance with the Absolute Maximum System (IEC 60134); voltages are referenced to GND (ground = 0 V)

PARAMETER	SYMBOL	CONDITIONS	MIN.	MAX.	UNIT
supply voltage	V_{CC}		-0.5	+7	V
input diode current	I_{Ik}	$V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$	—	± 20	mA
output diode current	I_{Ok}	$V_O < -0.5V$ or $V_O > V_{CC} + 0.5V$	—	± 20	mA
output source or sink current	I_O	$-0.5V < V_O < V_{CC} + 0.5V$	—	± 25	mA
VCC or GND current	I_{CC}, I_{GND}		—	50	mA
storage temperature	T_{stg}		-65	+125	°C
power dissipation	P_{tot}	$T_{amb} = -40$ to $+125^\circ C$ DIP14 packages; note 1	—	750	mW
		$T_{amb} = -40$ to $+125^\circ C$ Other packages; note 2	—	500	
Soldering Temperature	T_L	10s	DIP	245	°C
			SOP	250	

Notes

1. For DIP14 packages: above $70^\circ C$ the value of PD derates linearly with 12 mW/K.
2. For SOP14 packages: above $70^\circ C$ the value of PD derates linearly with 8 mW/K.
For TSSOP14 packages: above $60^\circ C$ the value of PD derates linearly with 5.5 mW/K.

3.2、Recommended Operating Conditions

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
supply voltage	V_{CC}		2.0	5.0	6.0	V
input voltage	V_I		0	—	V_{CC}	V
output voltage	V_O		0	—	V_{CC}	V
operating ambient temperature	T_{amb}		-40	+25	+85	°C

3.3、Electrical Characteristics

3.3.1 DC Characteristics 1 (Tamb = 25°C, GND=0)

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH-level output voltage	V _{OH}	V _I =V _{IH} or V _{IL}	V _{CC} =2.0V I _O =-20uA	1.9	2.0	—	V
			V _{CC} =4.5V I _O =-20uA	4.4	4.5	—	V
			V _{CC} =6.0V I _O =-20uA	5.9	6.0	—	V
			V _{CC} =4.5V I _O =-4.0mA	3.98	4.32	—	V
			V _{CC} =6.0V I _O =-5.2mA	5.48	5.81	—	V
LOW-level output voltage	V _{OL}	V _I =V _{IH} or V _{IL}	V _{CC} =2.0V I _O =20uA	—	0	0.1	V
			V _{CC} =4.5V I _O =20uA	—	0	0.1	V
			V _{CC} =6.0V I _O =20uA	—	0	0.1	V
			V _{CC} =4.5V I _O =4.0mA	—	0.15	0.26	V
			V _{CC} =6.0V I _O =5.2mA	—	0.16	0.26	V
input leakage current	I _{LI}	V _{CC} =6.0V V _I = V _{CC} or GND		—	—	0.1	uA
quiescent supply current	I _{CC}	V _{CC} =6.0V V _I = V _{CC} or GND;I _O =0		—	—	2.0	uA

3.3.2 DC Characteristics 2 (Tamb = -40~+85°C, GND=0)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH-level output voltage	V _{OH}	V _I =V _{IH} or V _{IL}	V _{CC} =2.0V I _O =-20uA	1.9	—	—	V
			V _{CC} =4.5V I _O =-20uA	4.4	—	—	V
			V _{CC} =6.0V I _O =-20uA	5.9	—	—	V
			V _{CC} =4.5V I _O =-4.0mA	3.84	—	—	V
			V _{CC} =6.0V I _O =-5.2mA	5.34	—	—	V
LOW-level output voltage	V _{OL}	V _I =V _{IH} or V _{IL}	V _{CC} =2.0V I _O =20uA	—	—	0.1	V
			V _{CC} =4.5V I _O =20uA	—	—	0.1	V
			V _{CC} =6.0V I _O =20uA	—	—	0.1	V
			V _{CC} =4.5V I _O =4.0mA	—	—	0.33	V
			V _{CC} =6.0V I _O =5.2mA	—	—	0.33	V
input leakage current	I _{LI}	V _{CC} =6.0V V _I = V _{CC} or GND		—	—	1.0	uA
quiescent supply current	I _{CC}	V _{CC} =6.0V V _I =V _{CC} or GND;I _O =0		—	—	20	uA

3.3.3 Transfer Characteristics 1 (Tamb = 25°C, GND=0)

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
positive-going threshold	V_{T+}	VCC=2.0V	0.7	1.18	1.5	V
		VCC=4.5V	1.7	2.38	3.15	V
		VCC=6.0V	2.1	3.14	4.2	V
negative-going threshold	V_{T-}	VCC=2.0V	0.3	0.52	0.90	V
		VCC=4.5V	0.9	1.40	2.00	V
		VCC=6.0V	1.2	1.89	2.60	V
hysteresis ($V_{T+} - V_{T-}$)	V_H	VCC=2.0V	0.2	0.68	1.0	V
		VCC=4.5V	0.4	0.98	1.4	V
		VCC=6.0V	0.6	1.25	1.6	V

3.3.4 Transfer Characteristics 2 (Tamb = -40~+85°C, GND=0)

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
positive-going threshold	V_{T+}	VCC=2.0V	0.7	—	1.5	V
		VCC=4.5V	1.7	—	3.15	V
		VCC=6.0V	2.1	—	4.2	V
negative-going threshold	V_{T-}	VCC=2.0V	0.3	—	0.90	V
		VCC=4.5V	0.90	—	2.00	V
		VCC=6.0V	1.20	—	2.60	V
hysteresis ($V_{T+} - V_{T-}$)	V_H	VCC=2.0V	0.2	—	1.0	V
		VCC=4.5V	0.4	—	1.4	V
		VCC=6.0V	0.6	—	1.6	V

3.3.5 AC Characteristics 1

(Tamb=25°C, GND=0, $t_r=t_f=6.0\text{ns}$, $C_L=50\text{pF}$, See Figs 6 and 7)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
propagation delay nA to nY	t_{PHL}/t_{PLH}	VCC=2.0V	—	41	125	ns
		VCC=4.5V	—	15	25	ns
		VCC=6.0V	—	12	21	ns
output transition time	t_{THL}/t_{TLH}	VCC=2.0V	—	19	75	ns
		VCC=4.5V	—	7	15	ns
		VCC=6.0V	—	6	13	ns

3.3.6、AC Characteristics 2

($T_{amb}=25^{\circ}\text{C}$, $GND=0$, $t_r=t_f=6.0\text{ns}$, $C_L=50\text{pF}$, See Figs 6 and 7)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
propagation delay nA to nY	t_{PHL}/t_{PLH}	$V_{CC}=2.0\text{V}$	—	—	155	ns
		$V_{CC}=4.5\text{V}$	—	—	31	ns
		$V_{CC}=6.0\text{V}$	—	—	26	ns
output transition time	t_{THL}/t_{TLH}	$V_{CC}=2.0\text{V}$	—	—	95	ns
		$V_{CC}=4.5\text{V}$	—	—	19	ns
		$V_{CC}=6.0\text{V}$	—	—	15	ns

4、AC Testing Circuit

4.1、Transfer Characteristic Waveforms

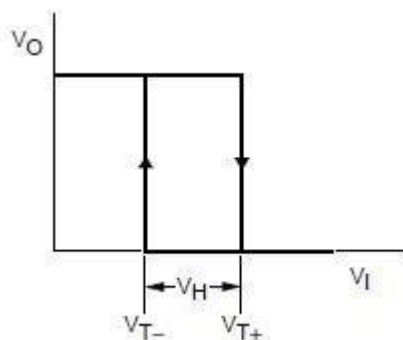


Fig.4 Transfer characteristic

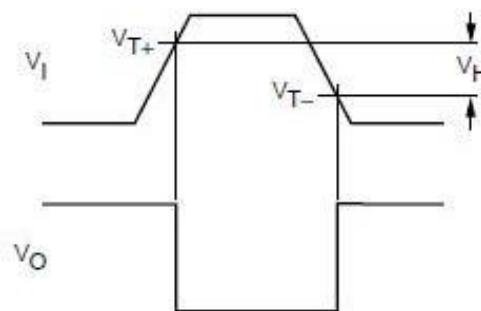


Fig.5 The definitions of V_{T+} , V_{T-} and V_H

NOTE: V_{T+} and V_{T-} are between limits of 20% and 70%.

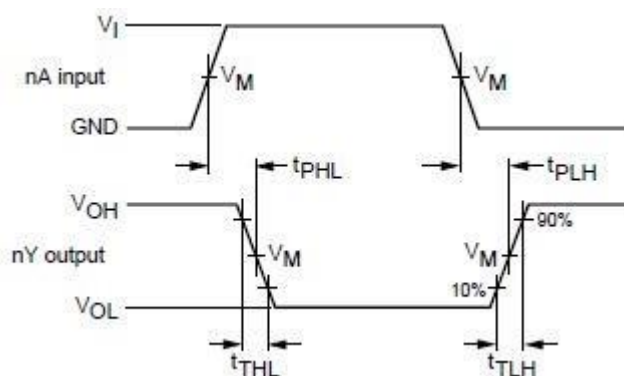


Fig.6 The input (nA) to output (nY) propagation delays and output transitions times.

74HC14/74HCT14: $V_M = 50\%$; $V_I = GND$ to V_{CC} . 74HCT14: $V_M = 1.3\text{ V}$; $V_I = GND$ to 3.0 V .

4.2、AC Testing Circuit

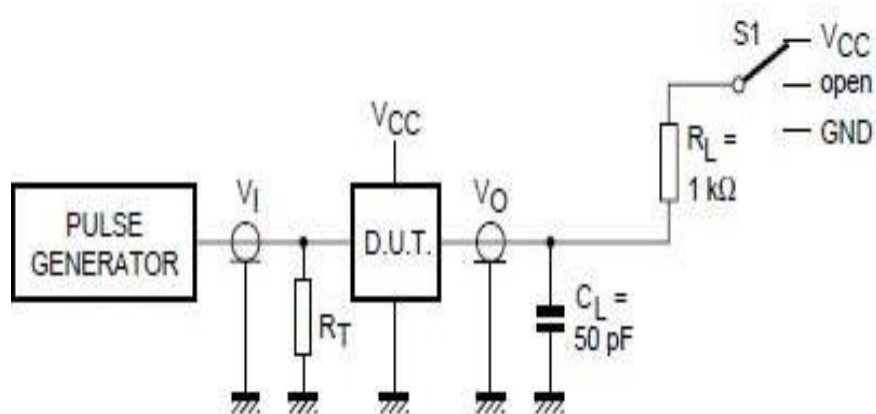


Fig.7 Load circuitry for switching times.

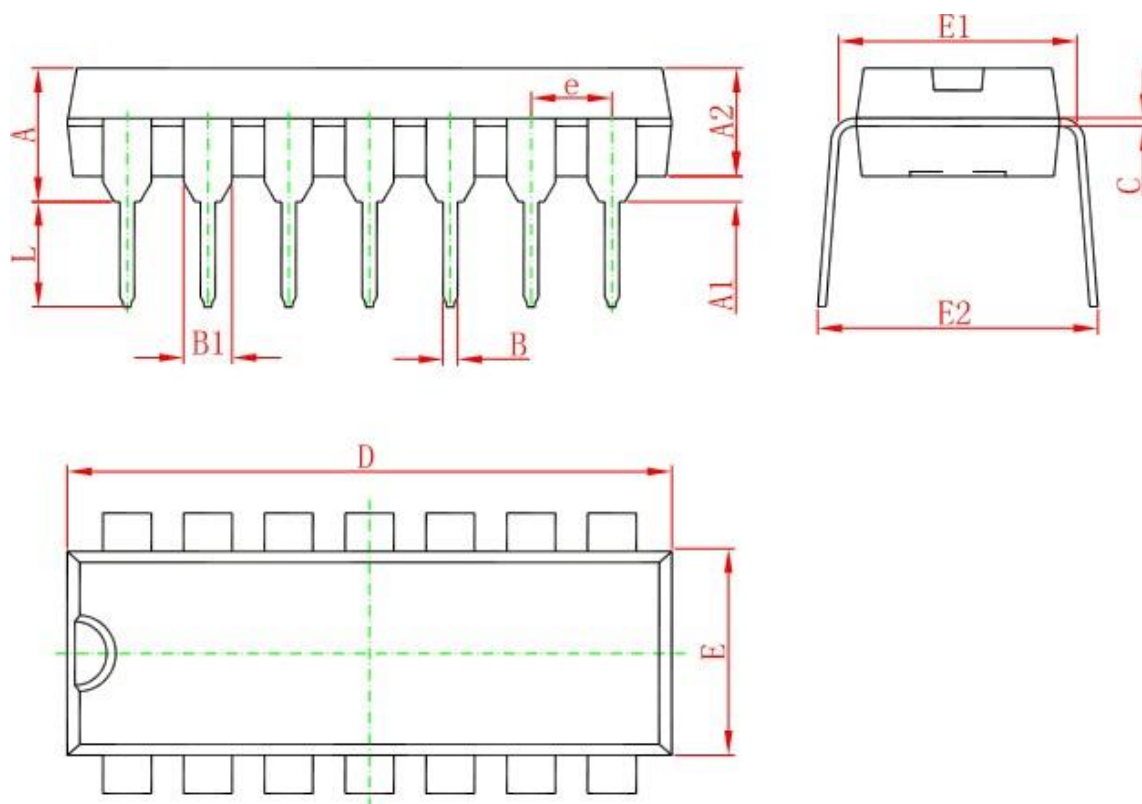
TEST	S1
T_{PLH}/T_{PHL}	OPEN
T_{PLZ}/T_{PZL}	VCC
T_{PHZ}/T_{PZH}	GND

Definitions for test circuit:

1. R_L = Load resistor.
2. C_L = load capacitance including jig and probe capacitance.
3. R_T = termination resistance should be equal to the output impedance Z_o of the pulse generator.

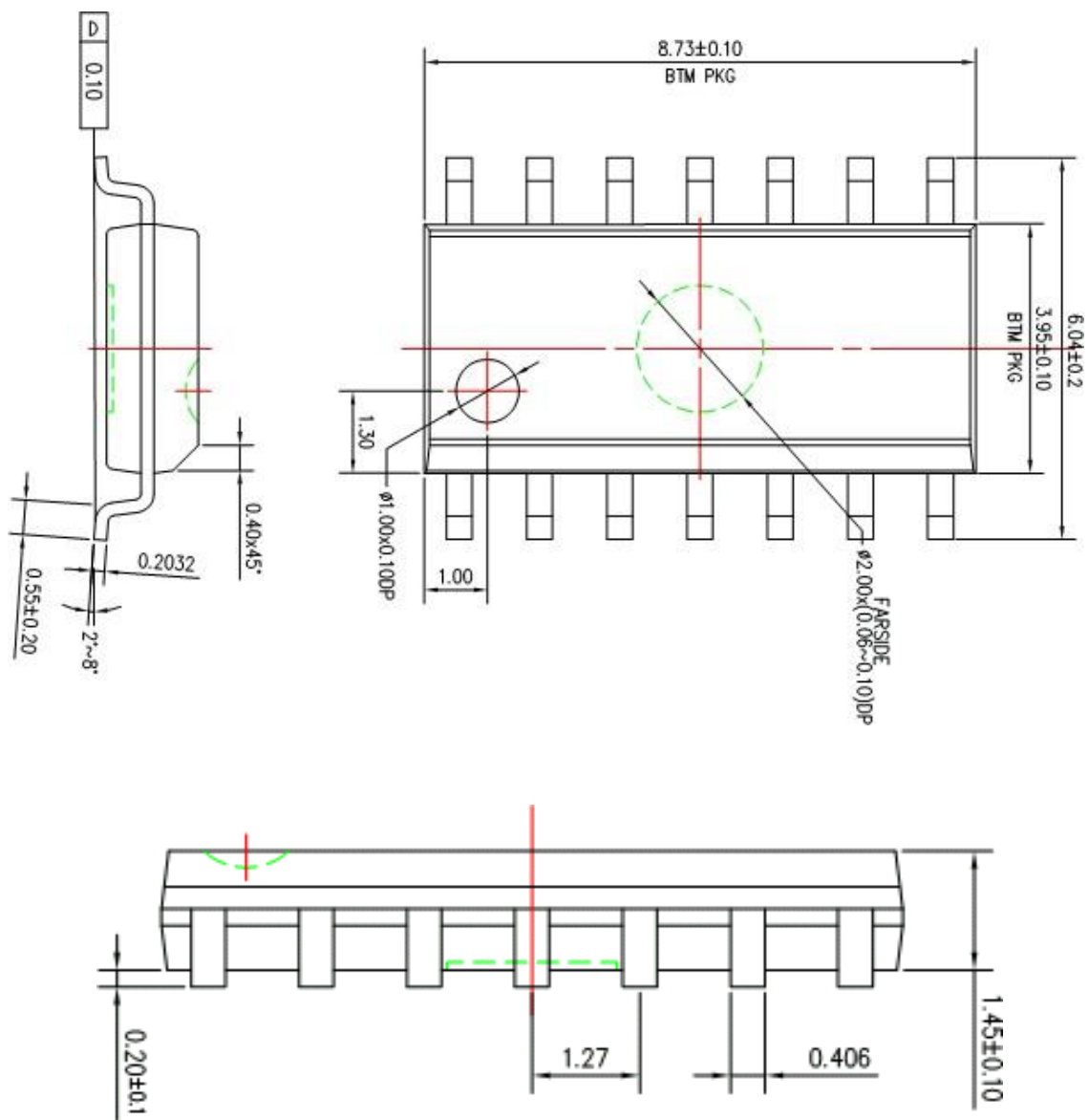
5、Package Information

5.1、DIP14

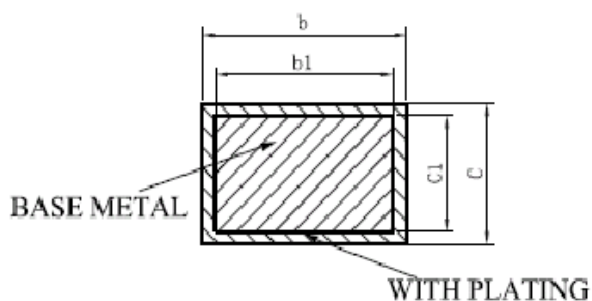
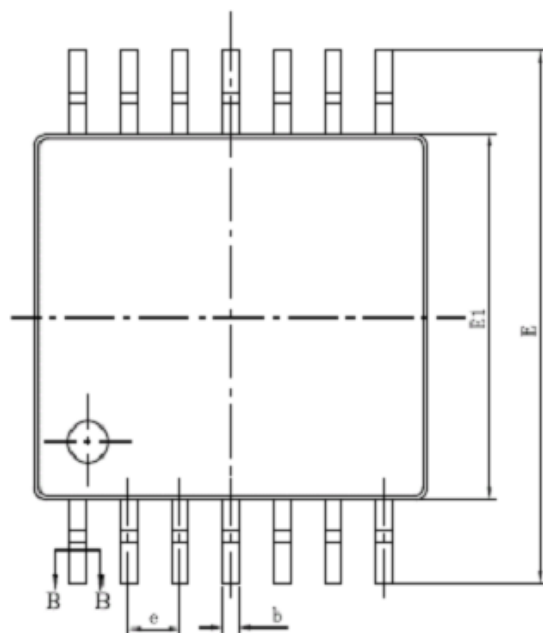
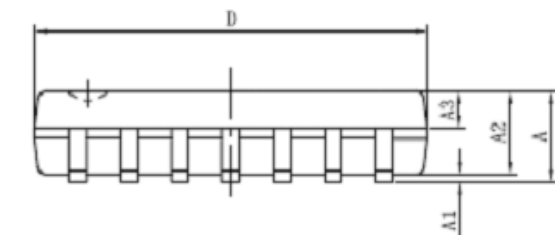


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.360	0.008	0.014
D	18.800	19.200	0.740	0.756
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540 (BSC)		0.100 (BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354

5.2、SOP14



5.3、TSSOP14



SECTION B-B

SYMBOL	MILLIMETER	
	MIN	MAX
A	—	1.20
A1	0.05	0.15
A2	0.90	1.05
A3	0.39	0.49
b	0.20	0.30
b1	0.19	0.25
c	0.13	0.19
c1	0.12	0.14
D	4.86	5.06
E1	4.30	4.50
E	6.20	6.60
e	0.65BSC	
L	0.45	0.75
L1	1.00BSC	
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
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.					