Features

- Operating voltage: 2.5V~3.6V
- Average operating current
  - 20mA @ V_{DD}=3.0V, 12dBm
  - 30mA @ V_{DD}=3.0V, 16dBm
- Standby current: 1.0μA (Max.) @ V_{DD}=3V
- Up to 4 data pins
- 2 compound data trigger pins
- Up to 2^{24} address codes
- Integrated 13.56MHz RC oscillator
- 8 bit time using 2 pin selection
- Integrated UHF transmitter
- Frequency: 433MHz
- Supports ASK/OOK modulation
- 3 output power levels: 12dBm/14dBm/16dBm using a single pin selection
- Minimal external components
- High noise immunity
- 16-Pin NSOP package

Applications

- Burglar alarm systems
- Smoke and fire alarm systems
- Personal alarm systems
- Car/garage door controllers
- Home/office/car security systems
- Other remote control systems

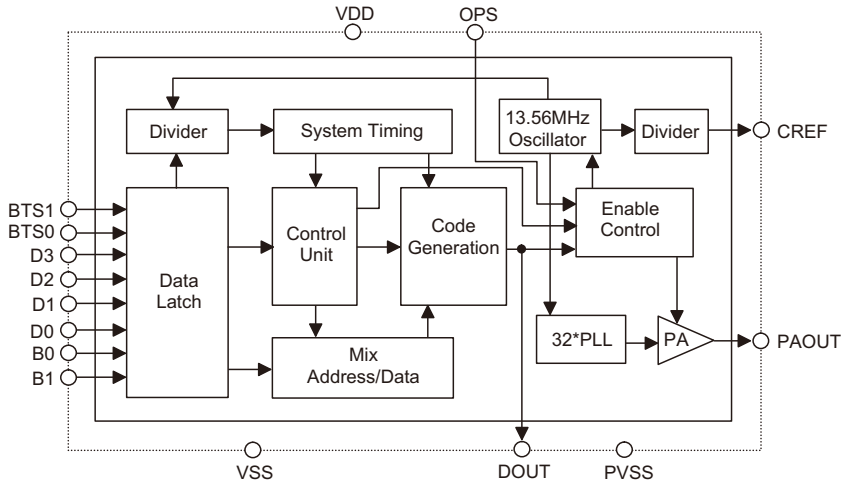
General Description

The devices are a series of encoders which include a fully integrated 433MHz ASK transmitter for remote control system applications. They form a highly functionally integrated device series which can be described as true “switch-in, antenna-out” monolithic devices. The devices encode 24 or 28 bits of address and data information and then serially transmits it via their DOUT pin upon receipt of a transmission enable signal which is provided by data pins, D0~D3 or B0~B1. The devices also encode the address and data information into a coded waveform which is transmitted out on their PAOUT pin for RF modulation. Two areas stand out for special attention, those of power delivery and operating temperature. In terms of power, the HT6P2x5A is capable of delivering +16dBm into a 50Ω load, a power level which enables a small form factor transmitter, such as a key fob transmitter, to operate over a long distance. In terms of temperature, the HT6P2x5A can operate from -10˚C to 50˚C with very little frequency drift. Additionally the devices are extremely easy to use and having a fully integrated oscillator require only a minimum of external components to implement a complete and versatile transmitter. For longer distance remote control, the devices operate together with an ASK/OOK – Amplitude Shift Keying/On-Off Keyed – UHF wide-band super-regenerative receiver.

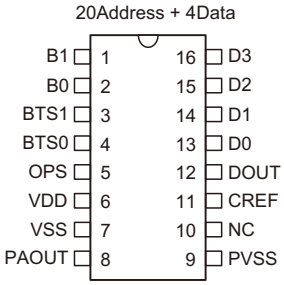
Selection Table

Part No.	V_{DD}	Addr. No.	Data No.	Compound Data No.	Trig.	Frequency Band	RF Type	Package
HT6P225A	2.5V~3.6V	20	4	2	Data Low	433MHz	ASK TX	16 NSOP
HT6P235A	2.5V~3.6V	22	2	1	Data Low	433MHz	ASK TX	16 NSOP
HT6P245A	2.5V~3.6V	24	4	2	Data Low	433MHz	ASK TX	16 NSOP

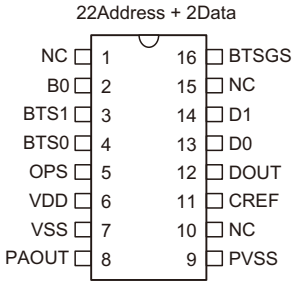
Block Diagram



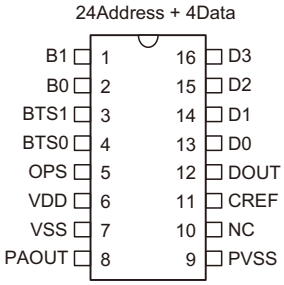
Pin Assignment



HT6P225A
16 NSOP-A



HT6P235A
16 NSOP-A

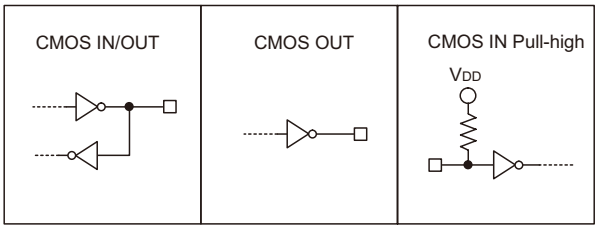


HT6P245A
16 NSOP-A

Pin Description

Pin No.	Pin Name	I/O	Internal Connection	Description
1~2	B1~B0	I	CMOS IN	Compound pins. B0 is for D0 and D3 while B1 is for D1 and D2 in the HT6P225A/HT6P245A/devices B0 is for D0 and D1 in the HT6P235A
3~4	BTS1~BTS0	I	CMOS IN	Bit Time Select Pins. Externally set to V_{DD}, Ground or floating to provide eight bit width selections as shown in the functional description section.
5	OPS	I	CMOS IN	Output Power Select pin. Externally set to V_{DD}, Ground or floating to provide three power output selections VDD: 16dBm, Floating: 14dBm, GND: 12dBm
6	VDD	P	—	Positive power supply
7	VSS	P	—	Negative power supply, ground
8	PAOUT	O	Power Amplifier Output	It should be combine with external matching circuit
9	PVSS	P	—	RF negative power supply, ground
10	NC	—	—	—
11	CREF	O	CMOS OUT	For Test Mode only
12	DOUT	O	CMOS OUT	Data output pin
13~16	D0~D3	I	CMOS IN	Data input and transmission enable active low
16	BTSGS HT6P235A only	I	CMOS IN	Bit time group select, 0: Bit time group 1 1: Bit time group 2 as shown in the functional description section. This pin must be tied either high or low and not be allowed to float

Approximate Internal Connections



Absolute Maximum Ratings

Logic Supply Voltage ..... V_{SS}-0.3V to V_{SS}+3.6V
Logic Input Voltage ..... V_{SS}-0.3V to V_{DD}+0.3V
Logic Output Voltage ..... V_{SS}-0.3V to V_{DD}+0.3V

Storage Temperature .....-55°C to 150°C
Operating Temperature.....-10°C to 50°C

Note: These are stress ratings only. Stresses exceeding the range specified under "Absolute Maximum Ratings" may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

D.C. Characteristics

Ta=25°C

Symbol	Parameter	Test condition		Min.	Typ.	Max.	Unit
		V_{DD}	condition				
V_{DD}	Logic Supply Voltage	—	—	2.5	3.0	3.6	V
I_{SB}	Stand-by current	3	No load. Input pins floating	—	—	1.0	μA
V_{IH}	"H" Input Voltage	—	—	0.8V_{DD}	—	—	V
V_{IL}	"L" Input Voltage	—	—	—	—	0.2V_{DD}	V
R_{PL}	Pull-high Resistance	3	D0~D3, B0~B1	—	500	—	kΩ
I_{OH}	Hi-level output current	3	V_{OH}=0.9V_{DD}; D_{OUT}	—	-7	—	mA
I_{OL}	Low-level output current	3	V_{OL}=0.1V_{DD}; D_{OUT}	—	2	—	mA

R.F. Characteristics

Specifications apply for V_{DD}=3.0V, T_A=25°C, Freq 433MHz unless otherwise noted. R_L 50Ω load (matched)

Symbol	Parameter	Test Conditions			Min	Typ	Max	Units
		V_{DD}	Conditions					
I_1	Average Data Current* 50% duty cycle data	3V	@ 433MHz, POUT=+16dBm		—	30	—	mA
			@ 433MHz, POUT=+12dBm			20		
I_0	Data LOW current	3V	—		—	4	—	mA
RF and Crystal								
—	Output power level	3V	OPS	0	—	12	—	dBm
				Floating	—	14	—	
				1	—	16	—	
f_{HIRC}	13.56MHz Internal RC Oscillator	2.5V~3.6V	T_A=–10°C to 50°C		-1%	13.56	+1%	MHz
—	Extinction ratio for ASK 10Kbps	3V	—		—	70	—	dBc
—	Output Blanking	3V	STDBY transition from LOW to HIGH		—	500	—	μs
—	ASK to RF Out Response Time	3V	Delta between ASK Input Transition from Low to High to RF Output Transition from Low to High		—	1	—	μs

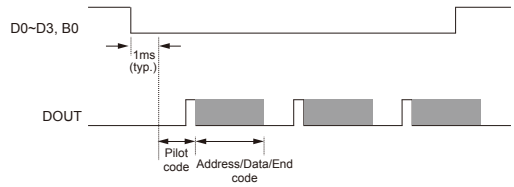
Note: It is recommended that the VDD power on rise time should be less than 500us to allow the device to power up normally and start normal operation.

Functional Description

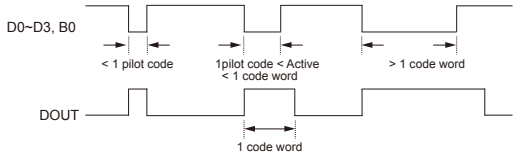
The HT6P2x5A encodes the address code and data set into a special waveform and output it to the D_{OUT}. This waveform is fed to the RF modulator for transmission.

Normal Operation

The HT6P2x5A series encodes and transmits address/data to a decoder upon receipt of a trigger signal. The transmission function of the HT6P2x5A series are enabled by the data inputs, D0~D3 with the – B0~B1 pins using active low conditions.



The transmission sequence is Pilot, Address, Data, End code.



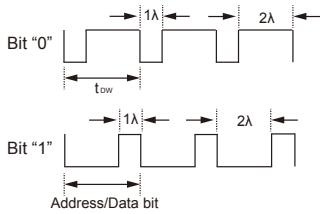
Transmission Timing Diagram

1.1 Code bits

A code bit is the basic component of the encoded waveform, and can be classified as either an address/data bit or a Pilot-code which is a synchronous bit.

1.2 Address/Data bit waveform

An address/data bit can be designated as either bit ”0” or “1” if it is in a high or low state respectively. A single bit waveform consists of three pulse cycles, as shown the diagram.



Note: 1. Bit “0” consists of a “low” pulse for 1λ then changes to a “high” pulse for 2λ.

2. Bit “1” consists of a “low” pulse for 2λ then changes to a “high” pulse for 1λ.

1.3 Single-Bit Data Width

There are 8 different single-bit data widths as shown in the table, selected using the BTS1 and BTS0 control pins.

Symbol	Parameter	Pin Condition		Group1	Group2	Unit
t_{DW}	Single bit data width	BTS1/BTS0	0/0	1.1	0.7	ms
			0/Floating	1.2	0.8	
			0/1	1.3	0.9	
			Floating/0	1.4	1.0	
			Floating/ Floating	1.5	2.0	
			Floating/1	1.6	2.1	
			1/0	1.76	2.2	
			1/ Floating	1.9	2.3	
			1/1	NC	NC	—

Note: 1. Group2 is only available for HT6P235A.

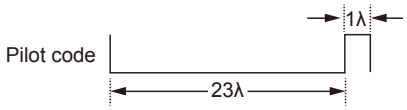
2. The BTS0 and BTS1 pins can be set to either “1”, “0” or “ Floating”.

3. The BTS0 and BTS1 pins must not both be “1”, this can result in erroneous operation.

4. If an overlapping bit time situation exists then choose the nearest time bit value. For example if the desired bit time is 1.46ms, then a choice of 1.5ms is preferred.

1.4 Synchronous Bit Waveform

For the HT6P2x5A device, a synchronous bit waveform is 8-bits long. It exhibits a low pulse for 23λ followed by a high pulse for 1λ as shown in the diagam.



1.5 Code Word

A group of code bits is called a code word. A code word consists of one Pilot-code or synchronous bit followed by the address/data bits and the end-code.

- **HT6P225A**

Pilot-code	A0~A19	D3~D0	"0101"

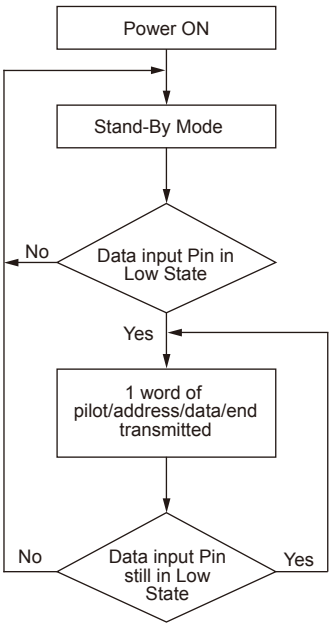
- **HT6P235A**

Pilot-code	A0~A21	D1~D0	"0101"

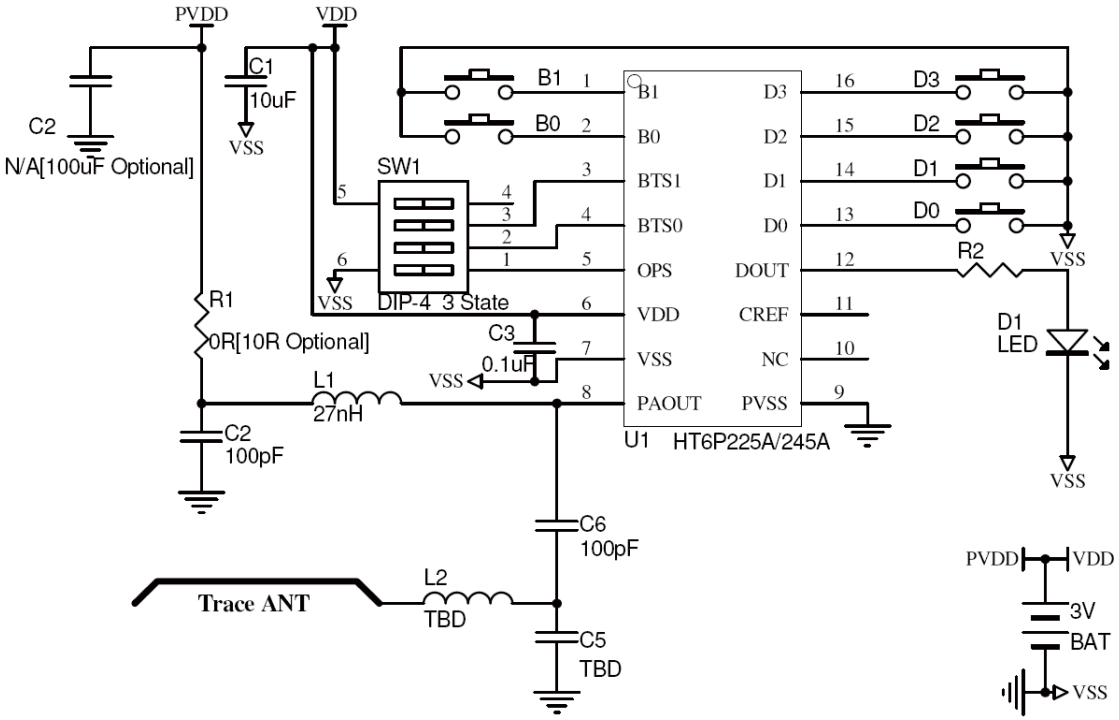
- **HT6P245A**

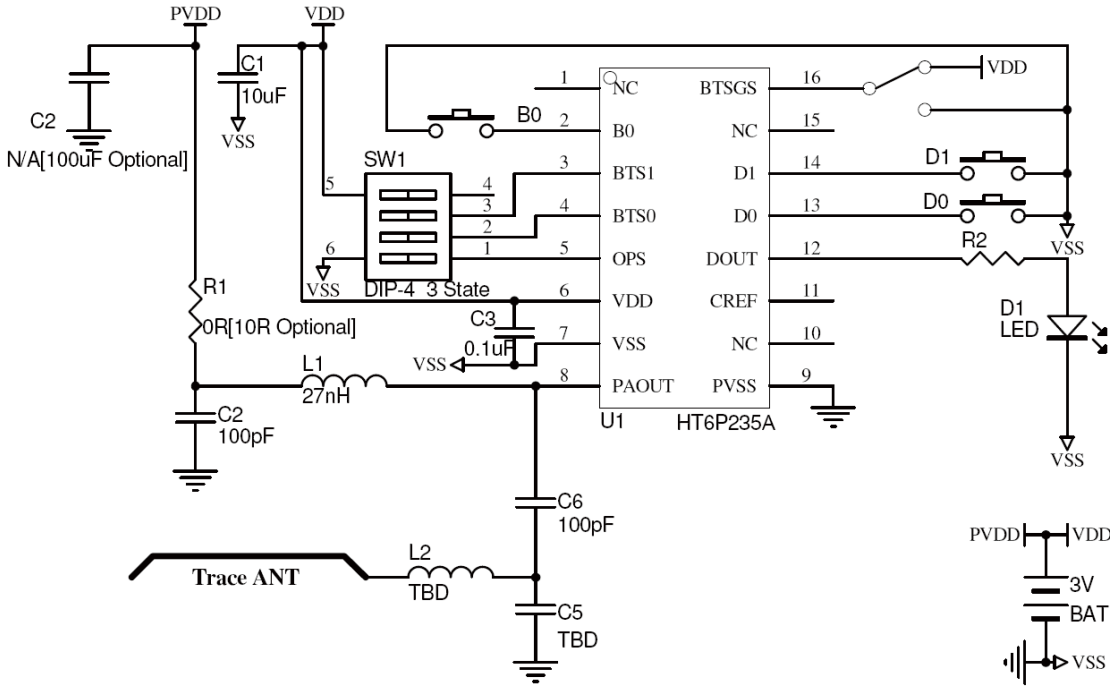
Pilot-code	A0~A23	D3~D0	"0101"

1.6 Operation Flowchart



Application Circuits

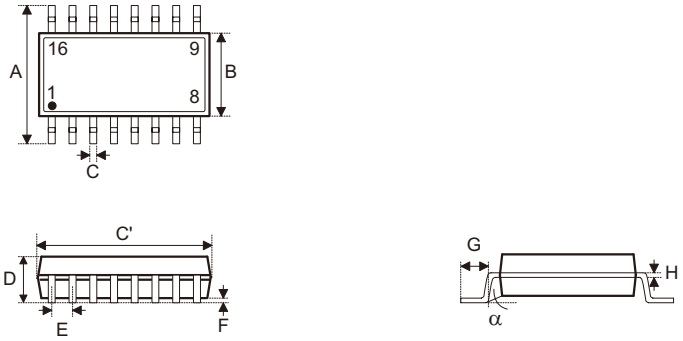




Package Information

Note that the package information provided here is for consultation purposes only. As this information may be updated at regular intervals users are reminded to consult the Holtek website (http://www.holtek.com.tw/english/literature/package.pdf) for the latest version of the package information.

16-pin NSOP (150mil) Outline Dimensions

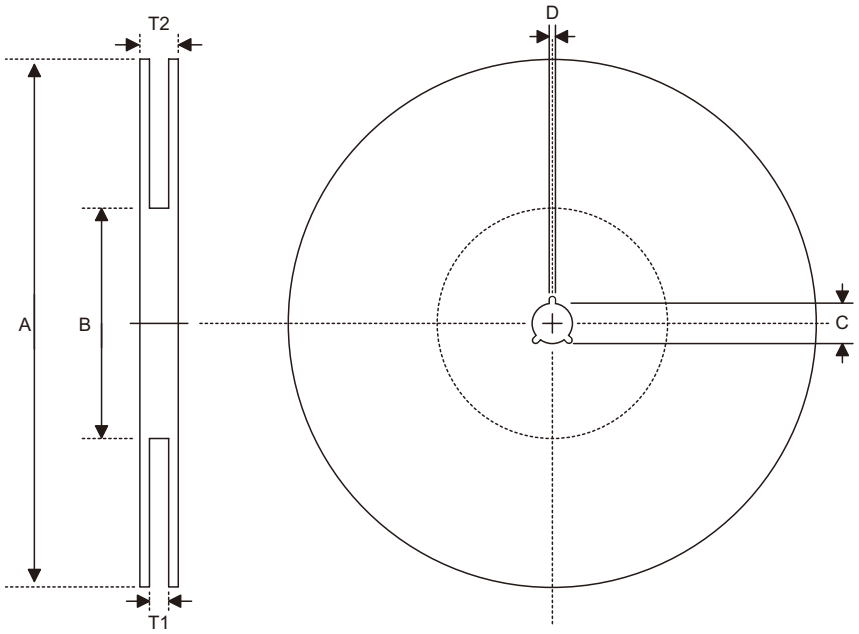


MS-012

Symbol	Dimensions in inch		
	Min.	Nom.	Max.
A	0.228	—	0.244
B	0.150	—	0.157
C	0.012	—	0.020
C′	0.386	—	0.402
D	—	—	0.069
E	—	0.050	—
F	0.004	—	0.010
G	0.016	—	0.050
H	0.007	—	0.010
α	0°	—	8°

Symbol	Dimensions in mm		
	Min.	Nom.	Max.
A	5.79	—	6.20
B	3.81	—	3.99
C	0.30	—	0.51
C′	9.80	—	10.21
D	—	—	1.75
E	—	1.27	—
F	0.10	—	0.25
G	0.41	—	1.27
H	0.18	—	0.25
α	0°	—	8°

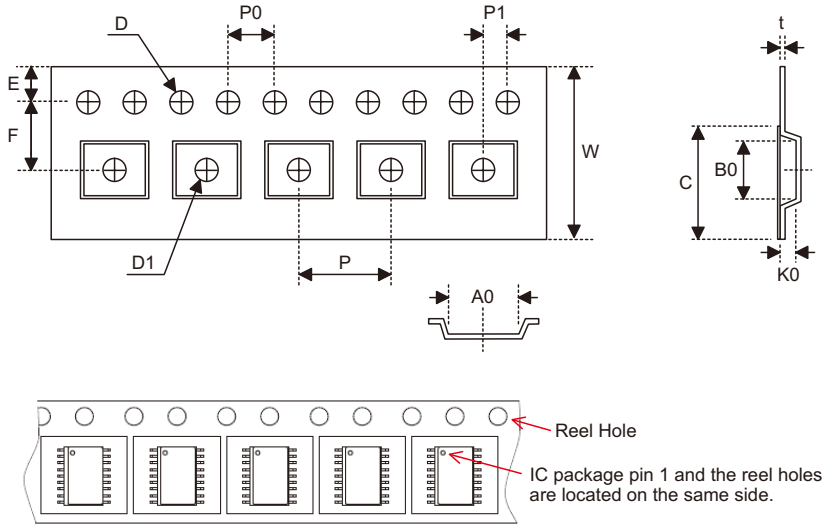
Reel Dimensions



16-pin NSOP(150mil)

Symbol	Description	Dimensions in mm
A	Reel Outer Diameter	330.0±1.0
B	Reel Inner Diameter	100.0±1.5
C	Spindle Hole Diameter	$13.0^{+0.5/-0.2}$
D	Key Slit Width	2.0±0.5
T1	Space Between Flang	$16.8^{+0.3/-0.2}$
T2	Reel Thickness	22.2±0.2

Carrier Tape Dimensions



16-pin NSOP (150mil)

Symbol	Description	Dimensions in mm
W	Carrier Tape Width	16.0±0.3
P	Cavity Pitch	8.0±0.1
E	Perforation Position	1.75±0.1
F	Cavity to Perforation(Width Direction)	7.5±0.1
D	Perforation Diameter	$1.55^{+0.10/-0.00}$
D1	Cavity Hole Diameter	$1.50^{+0.25/-0.00}$
P0	Perforation Pitch	4.0±0.1
P1	Cavity to Perforation(Length Direction)	2.0±0.1
A0	Cavity Length	6.5±0.1
B0	Cavity Width	10.3±0.1
K0	Cavity Depth	2.1±0.1
t	Carrier Tape Thickness	0.30±0.05
C	Cover Tape Width	13.3±0.1

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