

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 2²⁴ 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

Selection Table

- · 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 50 Ω 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.

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



Block Diagram



Pin Assignment





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 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	Ρ	_	Positive power supply
7	VSS	Ρ	—	Negative power supply, ground
8	PAOUT	0	Power Amplifier Output	It should be combine with external matching circuit
9	PVSS	Ρ	_	RF negative power supply, ground
10	NC	—	_	—
11	CREF	0	CMOS OUT	For Test Mode only
12	DOUT	0	CMOS OUT	Data output pin
13~16	D0~D3	I	CMOS IN	Data input and transmission enable active low. Pin 15 should be connected to ground in HT6P235A
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 VoltageV _{SS} -0.3V	to V _{ss} +3.6V	Operating Temperature
Logic Input VoltageVss-0.3V	to V _{DD} +0.3V	ESD HBM
Logic Output Voltage $V_{\rm SS}$ -0.3V	to V_{DD} +0.3V	ESD MM
Storage Temperature	5°C to 150°C	

Operating Temperature-10°C to 50°C ESD HBM......> \pm 5KV ESD MM.....> \pm 400V

D.C. Characteristics

	Ta=25°							
Symbol	Deremeter		Test condition	Min	Turn	Max Unit		
Symbol	Parameter	VDD	Condition	iviin.	iyp. wax.		Unit	
V _{DD}	Logic Supply Voltage	—	—	2.5	3.0	3.6	V	
I _{SB}	Stand-by current	3V	No load. Input pins floating	—	—	1.0	μA	
VIH	"H" Input Voltage	_	—	0.8V _{DD}	—	—	V	
VIL	"L" Input Voltage	_	—	_	_	0.2V _{DD}	V	
R _{PL}	Pull-high Resistance	3V	D0~D3, B0~B1	—	500	—	kΩ	
Іон	Hi-level output current	3V	V _{OH} =0.9V _{DD} ; D _{OUT}	_	-7	_	mA	
IOL	Low-level output current	3V	V _{OL} =0.1V _{DD} ; D _{OUT}	—	2	—	mA	

R.F. Characteristics

Specifications apply for T_a=25°C, Freq 433MHz unless otherwise noted. R_L 50Ω load (matched)

Symbol	Paramotor		Test Cond	itions	Min.	Tun	Max	Unito
Symbol	Fardilleter	V_{DD}	Cone	ditions		тур.	IVIAA.	Units
Average Data Current*		31/	@ 433MHz, POL	JT=+16dBm		25		m۸
11	50% duty cycle data	50	@ 433MHz, POL	JT=+12dBm		15		mA
Io	Data LOW current	3V				6	—	mA
RF and	Crystal							
				0		12	—	
_	Output power level	3V	OPS	PS Floating —	14	—	dBm	
				1	_	16	—	
f _{HIRC}	13.56MHz Internal RC Oscillator	3V	3V —		-0.5%	13.56	+0.5%	MHz
_	Extinction ratio for ASK 10Kbps	K 10Kbps 3V —		_	70	—	dBc	
_	Output Blanking	ut Blanking 3V STDBY transition from Low to		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.

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.



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 \sim D3 with the - B0 \sim 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 C	ondition	Group1	Group2	Unit
			0/0	1.1	0.7	
	Single bit data width E	BTS1/BTS0	0/Floating	1.2	0.8	ms
			0/1	1.3	0.9	
			Floating/0	1.4	1.0	
t _{DW}			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.

• HT6P235A

Pilot-code	A0~A21	D1~D0	"0101"
• HT6P245A			

	11101 2404										
	Pilot-code	A0~A23	D3~D0	"0101"							
ľ											

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 <u>Holtek website</u> for the latest version of the package information.

Additional supplementary information with regard to packaging is listed below. Click on the relevant section to be transferred to the relevant website page.

- Further Package Information (include Outline Dimensions, Product Tape and Reel Specifications)
- Packing Meterials Information
- Carton information



16-pin NSOP (150mil) Outline Dimensions

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Symbol		Dimensions in inch	
Symbol	Min.	Nom.	Max.
A	—	0.236 BSC	—
В	—	0.154 BSC	—
С	0.012	—	0.020
C'	_	0.390 BSC	—
D	_	—	0.069
E	_	0.050 BSC	—
F	0.004	—	0.010
G	0.016	—	0.050
Н	0.004	—	0.010
α	0°	—	8°

Symbol	Dimensions in mm					
Symbol	Min.	Nom.	Max.			
A	—	6.000 BSC	—			
В	—	3.900 BSC	—			
С	0.31	—	0.51			
C'	—	9.900 BSC	—			
D	—	—	1.75			
E	—	1.270 BSC	—			
F	0.10	—	0.25			
G	0.40	—	1.27			
Н	0.10	_	0.25			
α	0°	_	8°			

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