PANCHIP

PAN7420

Datasheet

V1.4 Mar. 2023

Panchip Microelectronics Co., Ltd.

2.4GHz Wireless SoC Transceiver

General Description

The PAN7420 is a wireless SOC transceiver integrating 32-bit MCU and 2.4GHz, suitable for applications such as remote control, and smart toilet.

The PAN7420 has a built-in low-power MCU with a Cortex® -M0+ core and the proven KeilμVision debug development software, which supports C and assembly language. The PAN7420 includes 64K bytes of Flash program memory, 8K bytes of SRAM, USART, 16-bit advanced timer and general-purpose timer, low-power timer (LPTIM), real-time clock(RTC), up to 8 channels of 12-bit ADC, voltage comparator, SPI, I2C, and watchdog timer, with high reliability and low power consumption.

The RF transceiver of PAN7420 works in the 2.400~2.483GHz world general ISM frequency band, integrates transmitter, receiver, frequency generator, GFSK modem and other functional modules, and supports both normal mode and ACK mode, which can be used flexibly. The communication rate supports 2Mbps/1Mbps/250Kbps.

Key Features

- **MCU**
  - 32-bit ARM® Cortex®-M0+ core, running up to 48MHz
  - 64K Byte Flash
  - 8K Byte SRAM
- **Clock**
  - 4 system clocks
  - PLL
  - 5 × 16-bit timer
  - LPTIM
- **RF**
  - Radio
    - Frequency band: 2.400~2.483GHz
    - Data rate: 2Mbps, 1Mbps, 250Kbps
    - GFSK modulation
  - RF Synthesizer
    - Fully integrated synthesizer
    - ±40ppm crystal is needed for 1Mbps and 2Mbps
    - ±10ppm crystal is needed for 250Kbps
  - Receiver
    - -88dBm@1Mbps
    - Receive mode operating current 20mA
    - Sleep mode current 0.1uA
  - Transmitter
    - 25mA@0dBm
    - Transmitting output power up to 10dBm
  - Protocol engine
    - Support up to 64 bytes of payload
    - Support automatic acknowledge and automatic retransmission
    - 6 data pipes receiver for 1:6 star networks
- **Peripheral**
  - Up to 24 GPIOs
  - PWM
  - USART
  - Interrupt/Reset
  - 12-bit ADC(QFN32 8ch; SSOP24 7ch)
  - WDT
  - RTC
  - I2C
  - SPI
  - Voltage Comparator
  - POR / LVR
  - On-board emulation/ICE interface
- **Power Management**
  - Integrated voltage regulator
  - Operating voltage: 2.2V to 3.6V
- **Package**
  - QFN32 / SSOP24
- **Operating Condition**
  - Operating temperature:
    -40°C ~ 85°C (250Kbps data rate: -40~70°C)

Typical Applications

- Remote Control
- Smart Toilet

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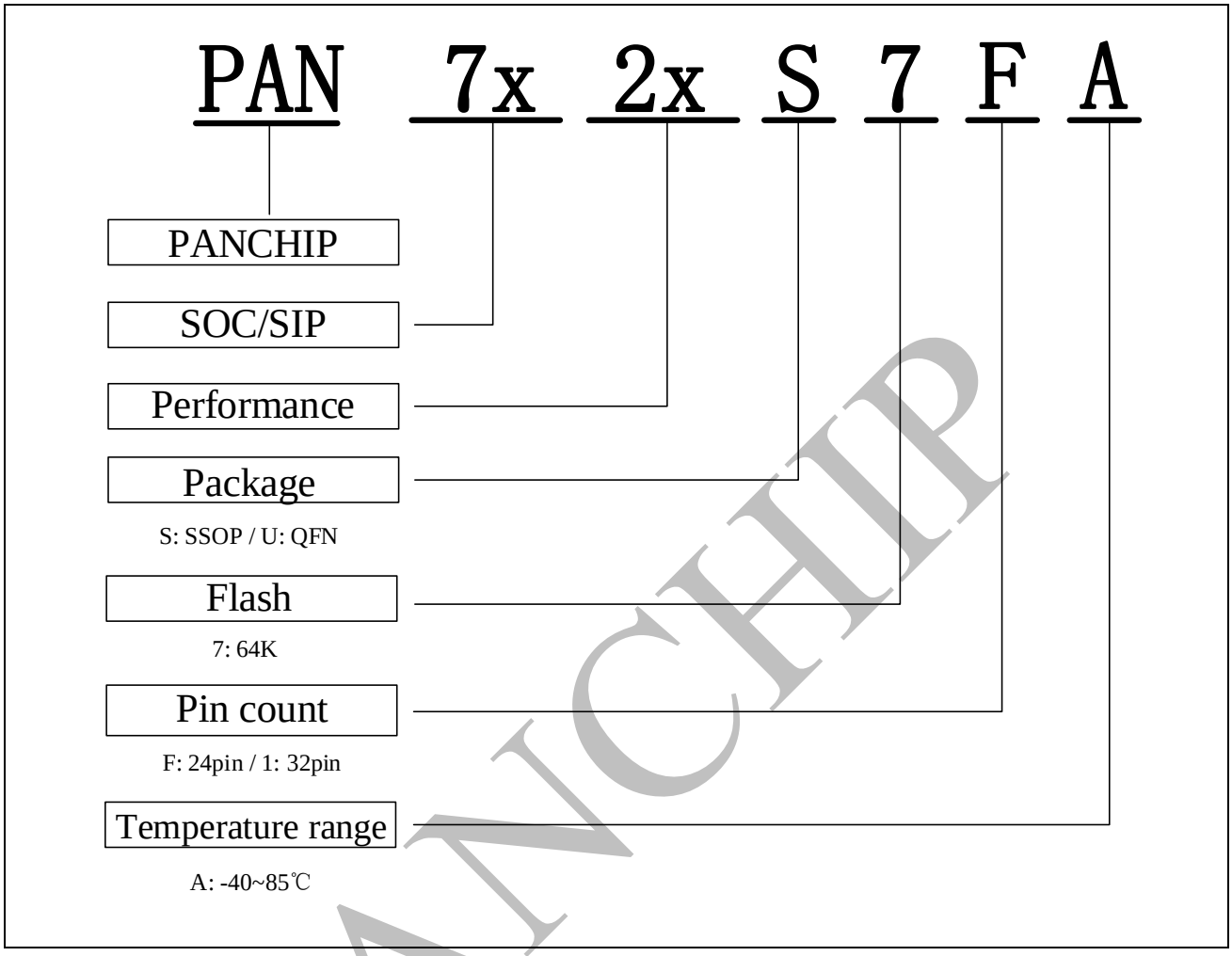
1 Naming rule



2 Order information

Part number	Type	Package	FLASH	Pin Count	Temperature range	Packing
PAN7420S7FA	SOC / SIP	SSOP	64K	24	-40~85℃	Tube
PAN7420U71A	SOC / SIP	QFN	64K	32	-40~85℃	Tape & Reel

Before ordering, please contact the sales window for the latest mass production information.

3 Block Diagram

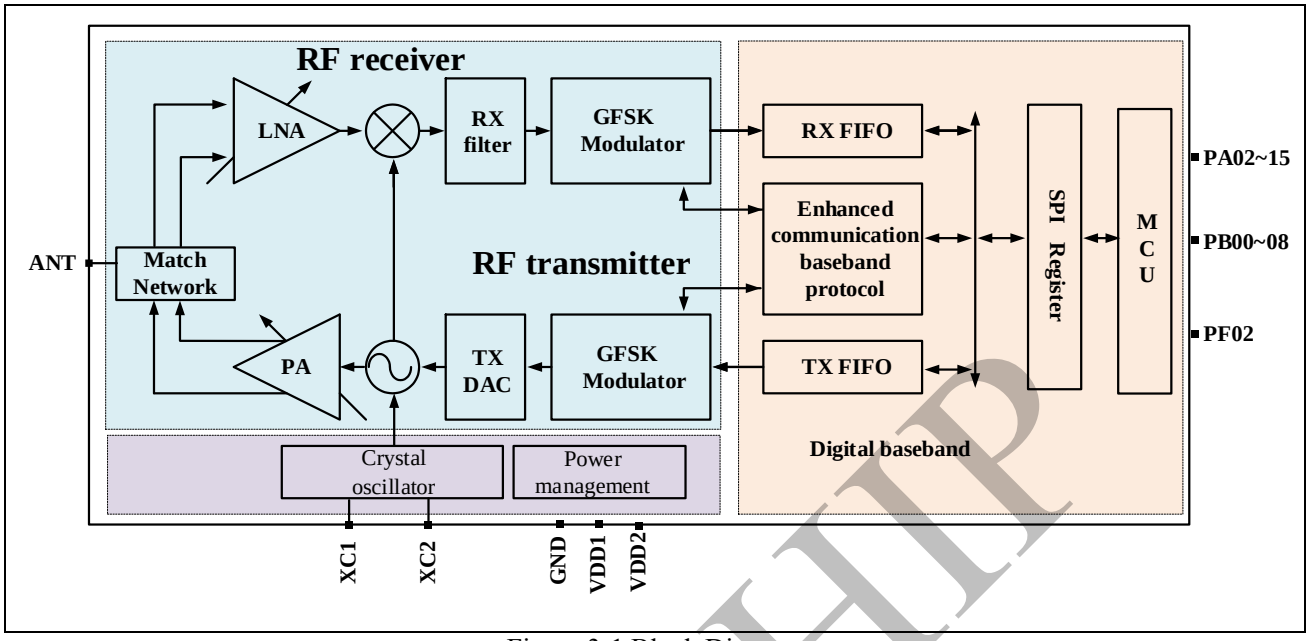


Figure 3-1 Block Diagram

4 Pin Information

4.1 Pin Diagram

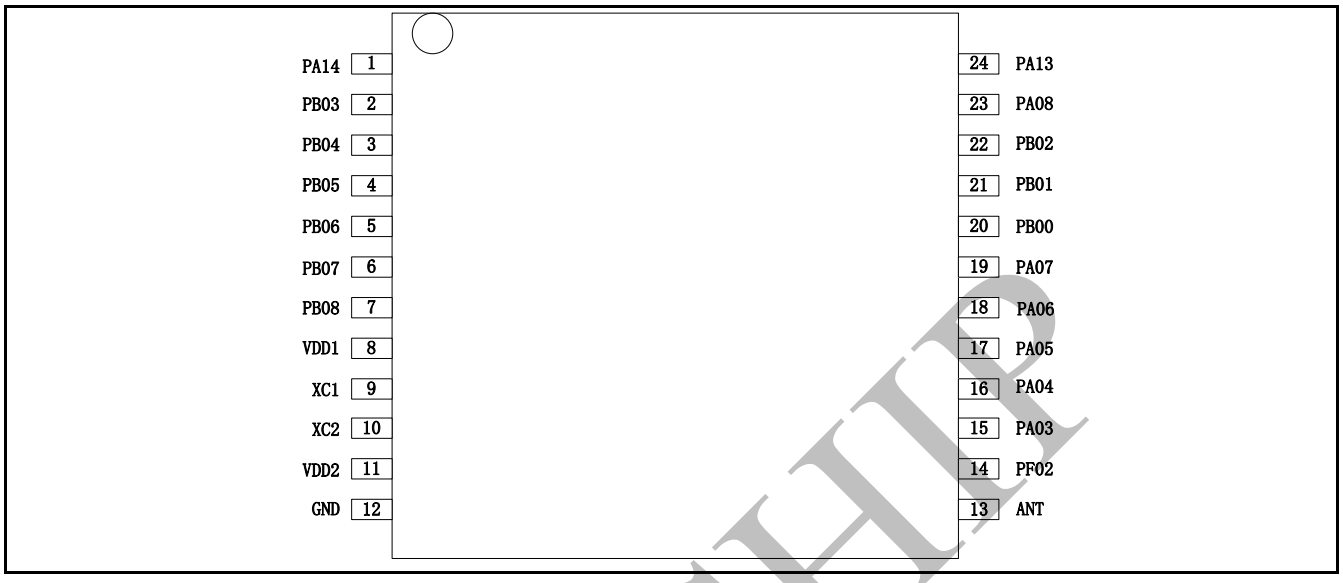


Figure 4-1 SSOP Pin Diagram

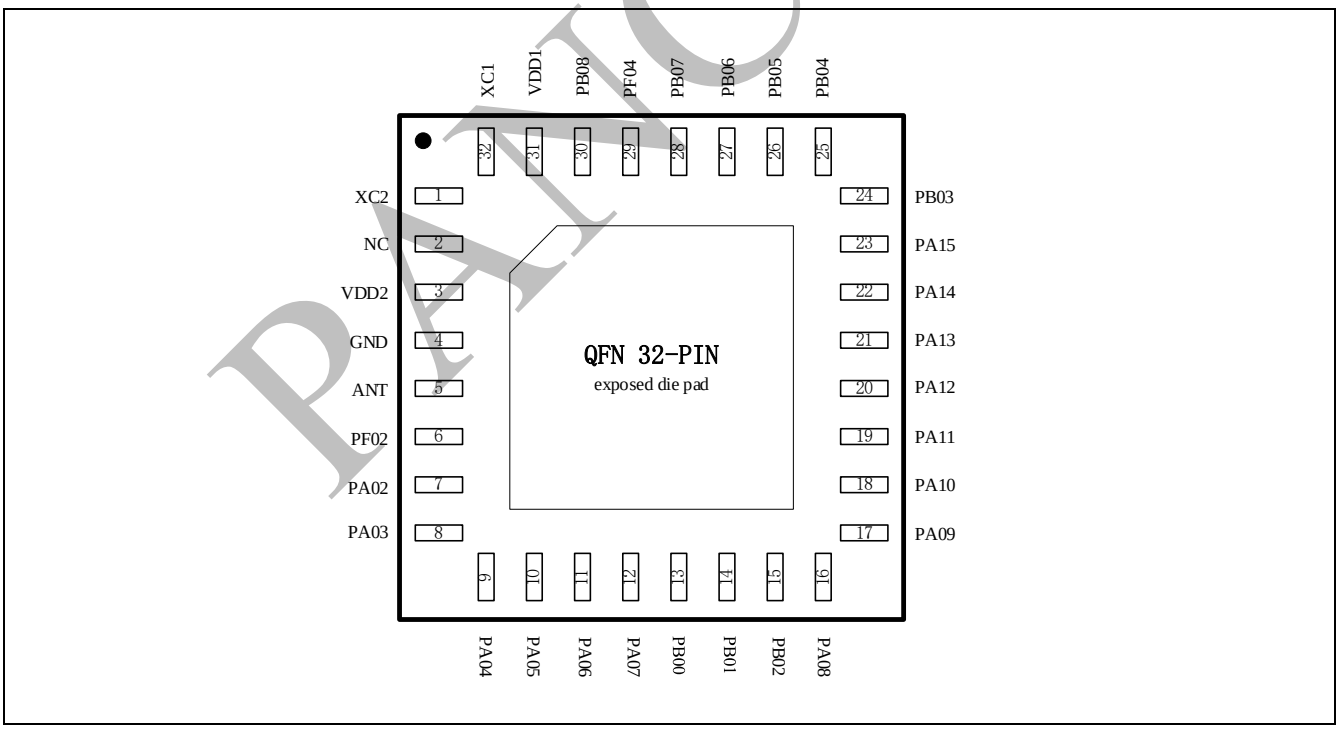


Figure 4-2 QFN Pin Diagram

4.2 Pin Descriptions

Detail pin descriptions see Table 4-1.

Table 4-1 Pin Descriptions

Package		Pin type	Pin Name	Description
QFN32	SSOP24			
1	10	AO	XC2	Crystal oscillator output
2	-	-	NC	NC
3	11	P	VDD2	RF power
4	12	P	GND	Ground
5	13	AIO	ANT	RF antenna pin
6	14	I/O	PF02	General-purpose digital input and output pin
			NRST	Reset pin
			MCO	
			SPI2_MOSI	SPI2 master output slave input pin
			USART2_RX	USART2 RX pin
7	-	I/O	PA02	General-purpose digital input and output pin
			ADC_IN2	ADC input channel 2 pin
			COMP2_INM	
			SPI1_MOSI	SPI1 master output slave input pin
			USART1_TX	USART1 TX pin
			USART2_TX	USART2 TX pin
			LED_DATA_D	
			LPUART_TX	LPUART TX pin
			COMP2_OUT	
			SPI1_SCK	SPI1 synchronous clock
			TIM3_CH1	
			I2C_SDA	I2C data pin
8	15	I/O	PA03	General-purpose digital input and output pin
			ADC_IN3	ADC input channel 3 pin
			COMP2_INP	
			SPI2_MISO	SPI2 master input slave output pin
			USART1_RX	USART1 RX pin
			USART2_RX	USART2 RX pin
			LED_DATA_E	
			EVENTOUT	
			SPI1_MOSI	SPI1 master output slave input pin
			TIM1_CH1	
			I2C_SCL	I2C clock pin
9	16	I/O	PA04	General-purpose digital input and output pin
			ADC_IN4	ADC input channel 4 pin
			SPI1_NSS	SPI1 chip select pin
			USART1_CK	USART1 CK pin
			SPI2_MOSI	SPI2 master output slave input pin

			LED_DATA_F	
			TIM14_CH1	
			USART2_CK	USART2 CK pin
			ENENTOUT	
			RTC_OUT	
			TIM3_CH3	
			USART2_TX	USART2 TX pin
10	17	I/O	PA05	General-purpose digital input and output pin
			ADC_IN5	ADC input channel 5 pin
			SPI1_SCK	SPI1 synchronous clock
			LED_DATA_G	
			LPTIM_ETR	
			EVENTOUT	
			TIM3_CH2	
			USART2_RX	USART2 RX pin
			MCO	
11	18	I/O	PA06	General-purpose digital input and output pin
			ADC_IN6	ADC input channel 6 pin
			SPI1_MISO	SPI1 master input slave output pin
			TIM3_CH1	
			TIM1_BKIN	
			LED_DATA_DP	
			TIM16_CH1	
			EVENTOUT	
			LPUART_CTS	LPUART clear to send
			COMP1_OUT	
			USART1_CK	USART1 CK pin
			RTC_OUT	
12	19	I/O	PA07	General-purpose digital input and output pin
			ADC_IN7	ADC input channel 7 pin
			SPI1_MOSI	SPI1 master output slave input pin
			TIM3_CH2	
			TIM1_CH1N	
			TIM14_CH1	
			TIM17_CH1	
			EVENTOUT	
			COMP2_OUT	
			USART1_TX	USART1 TX pin
			USART2_TX	USART2 TX pin
			I2C_SDA	I2C data pin
			SPI1_MISO	SPI1 master input slave output pin
13	20	I/O	PB00	General-purpose digital input and output pin
			ADC_IN8	ADC input channel 8 pin
			SPI1_NSS	SPI1 chip select pin
			TIM3_CH3	
			TIM1_CH2N	

			EVENTOUT	
			COMP1_OUT	
14	21	I/O	PB01	General-purpose digital input and output pin
			ADC_IN9	ADC input channel 9 pin
			COMP1_INM	
			TIM14_CH1	
			TIM3_CH4	
			TIM1_CH3N	
			LPUART_RTS	LPUART request to send
			EVENTOUT	
15	22	I/O	PB02	General-purpose digital input and output pin
			COMP1_INP	
			USART1_RX	USART1 RX pin
			USART2_RX	USART2 RX pin
			SPI2_SCK	SPI2 synchronous clock
16	23	I/O	PA08	General-purpose digital input and output pin
			SPI2_NSS	SPI2 chip select pin
			USART1_CK	USART1 CK pin
			TIM1_CH1	
			USART2_CK	USART2 CK pin
			MCO	
			EVENTOUT	
			USART1_RX	USART1 RX pin
			USART2_RX	USART2 RX pin
			SPI1_MOSI	SPI1 master output slave input pin
			I2C_SCL	I2C clock pin
17	-	I/O	PA09	General-purpose digital input and output pin
			OSC32OUT	
			SPI2_MISO	SPI2 master input slave output pin
			USART1_TX	USART1 TX pin
			TIM1_CH2	
			MCO	
			I2C_SCL	I2C clock pin
			EVENTOUT	
			I2C_SDA	I2C data pin
			TIM1_BK	
			SPI1_SCK	SPI1 synchronous clock
			USART1_RX	USART1 RX pin
18	-	I/O	PA10	General-purpose digital input and output pin
			OSC32IN	
			SPI2_MOSI	SPI2 master output slave input pin
			USART1_RX	USART1 RX pin
			TIM1_CH3	
			TIM17_BKIN	
			USART2_RX	USART2 RX pin
			I2C_SDA	I2C data pin

			EVENTOUT	
			I2C_SCL	I2C clock pin
			SPI1_NSS	SPI1 chip select pin
			USART1_TX	USART1 TX pin
			IR_OUT	
19	-	I/O	PA11	General-purpose digital input and output pin
			SPI1_MISO	SPI1 master input slave output pin
			USART1_CTS	USART1 clear to send
			TIM1_CH4	
			EVENTOUT	
			USART2_CTS	USART2 clear to send
			I2C_SCL	I2C clock pin
			COMP1_OUT	
20	-	I/O	PA12	General-purpose digital input and output pin
			SPI1_MOSI	SPI1 master output slave input pin
			USART1_RTS	USART1 request to send
			TIM1_ETR	
			USART2_RTS	USART2 request to send
			EVENTOUT	
			I2C_SDA	I2C data pin
			COMP2_OUT	
21	24	I/O	PA13	General-purpose digital input and output pin
			SWDIO	SWD IO
			IR_OUT	
			EVENTOUT	
			SPI1_MISO	SPI1 master input slave output pin
			TIM1_CH2	
			USART1_RX	USART1 RX pin
			MCO	
22	1	I/O	PA14	General-purpose digital input and output pin
			SWCLK	SWCLK pin, internally pulled up
			USART1_TX	USART1 TX pin
			USART2_TX	USART2 TX pin
			EVENTOUT	
			MCO	
23	-	I/O	PA15	General-purpose digital input and output pin
			SPI1_NSS	SPI1 chip select pin
			USART1_RX	USART1 RX pin
			USART2_RX	USART2 RX pin
			LED_COM0	
			EVENTOUT	
24	2	I/O	PB03	General-purpose digital input and output pin
			COMP2_INM	
			SPI1_SCK	SPI1 synchronous clock
			TIM1_CH2	
			USART1_RTS	USART1 request to send

			USART2_RTS	USART2 request to send
			LED_COM1	
			EVENTOUT	
25	3	I/O	PB04	General-purpose digital input and output pin
			COMP2_INP	
			SPI1_MISO	SPI1 master input slave output pin
			TIM3_CH1	
			USART2_CTS	USART2 clear to send
			USART1_CTS	USART1 clear to send
			TIM17_BKIN	
			LED_COM2	
			EVENTOUT	
26	4	I/O	PB05	General-purpose digital input and output pin
			SPI1_MOSI	SPI1 master output slave input pin
			TIM3_CH2	
			TIM16_BKIN	
			USART2_CK	USART2 CK pin
			USART1_CK	USART1 CK pin
			LPTIM_IN1	
			LED_COM3	
			COMP1_OUT	
27	5	I/O	PB06	General-purpose digital input and output pin
			COMP2_INP	
			USART1_TX	USART1 TX pin
			TIM1_CH3	
			TIM16_CH1N	
			USART2_TX	USART2 TX pin
			SPI2_MISO	SPI2 master input slave output pin
			I2C_SCL	I2C clock pin
			LPTIM_ETR	
			EVENTOUT	
28	6	I/O	PB07	General-purpose digital input and output pin
			COMP2_INM	
			PVD_IN	
			USART1_RX	USART1 RX pin
			SPI2_MOSI	SPI2 master output slave input pin
			TIM17_CH1N	
			USART2_RX	USART2 RX pin
			I2C_SDA	I2C data pin
			EVENTOUT	
29	-	I/O	PF04	Not available as input/output pin
			BOOT0	
30	7	I/O	PB08	General-purpose digital input and output pin
			SPI2_SCK	SPI2 synchronous clock
			COMP1_INP	
			TIM16_CH1	

			I2C1_SCL	I2C clock pin
			USART2_TX	USART2 TX pin
			EVENTOUT	
			LED_DATA_A	
			USART1_TX	USART1 TX pin
			SPI2_NSS	SPI2 chip select pin
			I2C_SDA	I2C data pin
			TIM17_CH1	
			IR_OUT	
31	8	P	VDD1	MCU power input
32	9	AI	XC1	Crystal oscillator input

4.3 Internal connection

Table 4-2 RF and MCU internal connection

Pin Status	RF	MCU
I S	PAD_XTAL_OCLK	PF00
I S	PAD_CSN_3V	PF01
I S	PAD_MISO_3V	PF03
I S	PAD_MOSI_3V	PA00
I S	PAD_CSK_3V	PA01

5 Application Reference Diagram

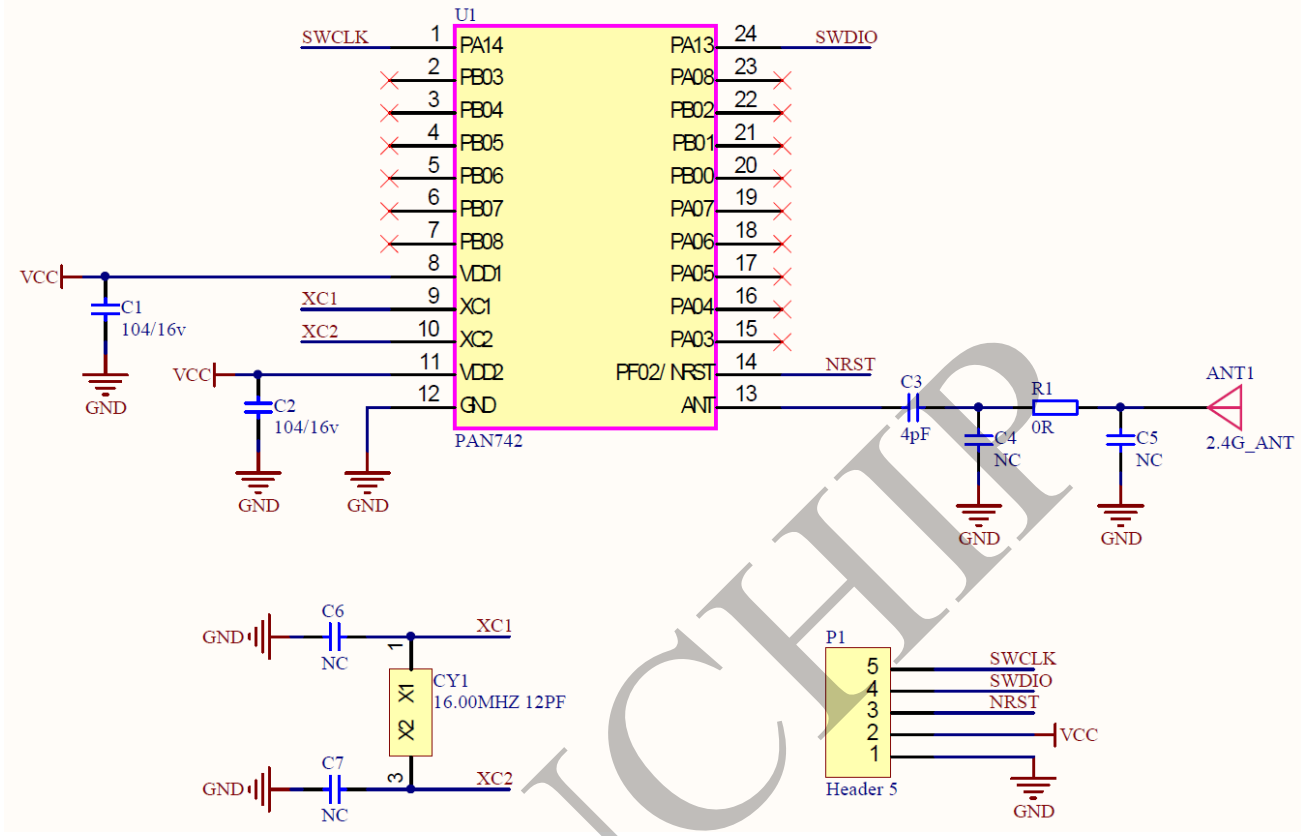


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Figure 5-1 Application Schematic of the SSOP

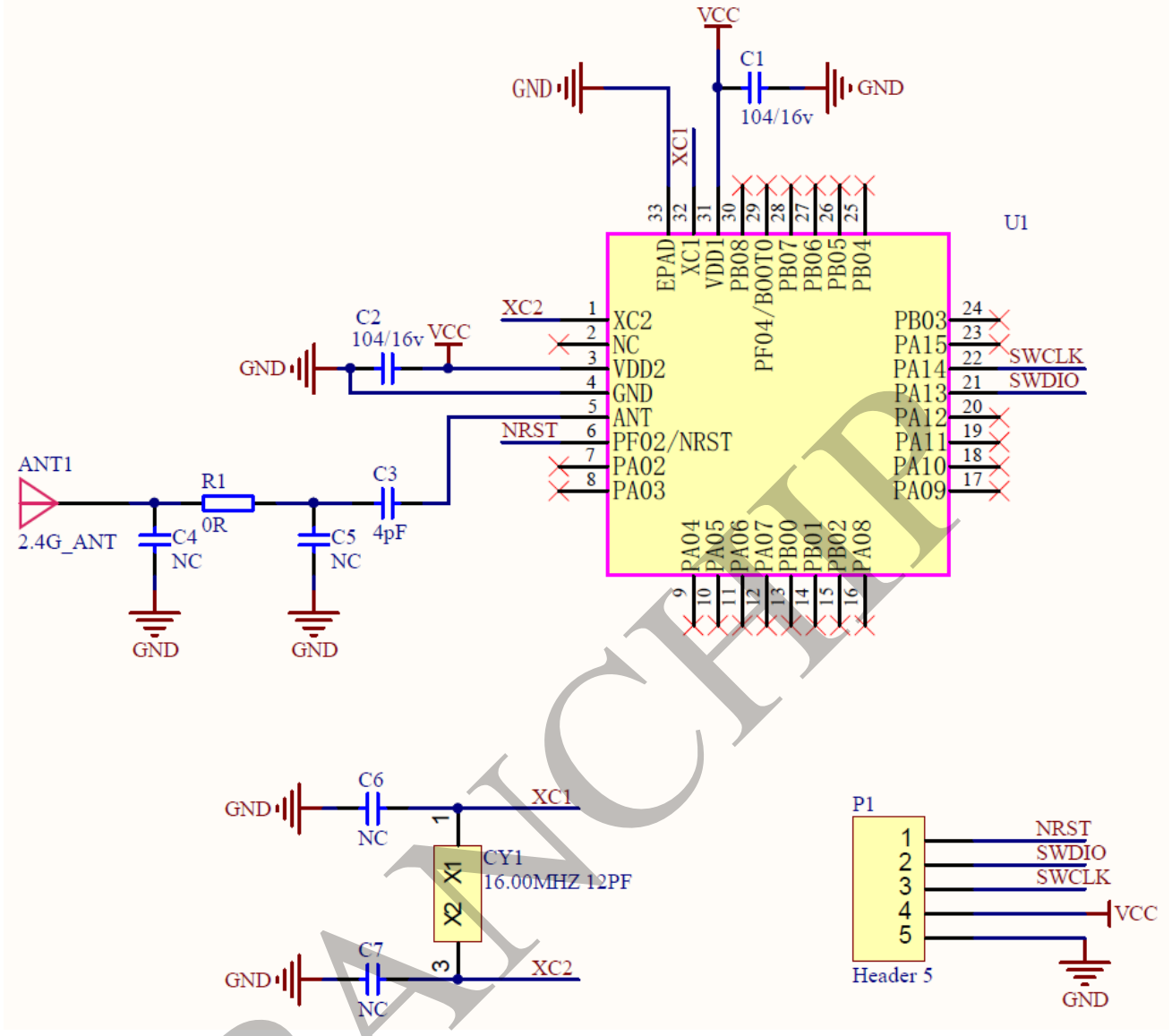

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Figure 5-2 Application Schematic of the QFN

6 Package Dimensions

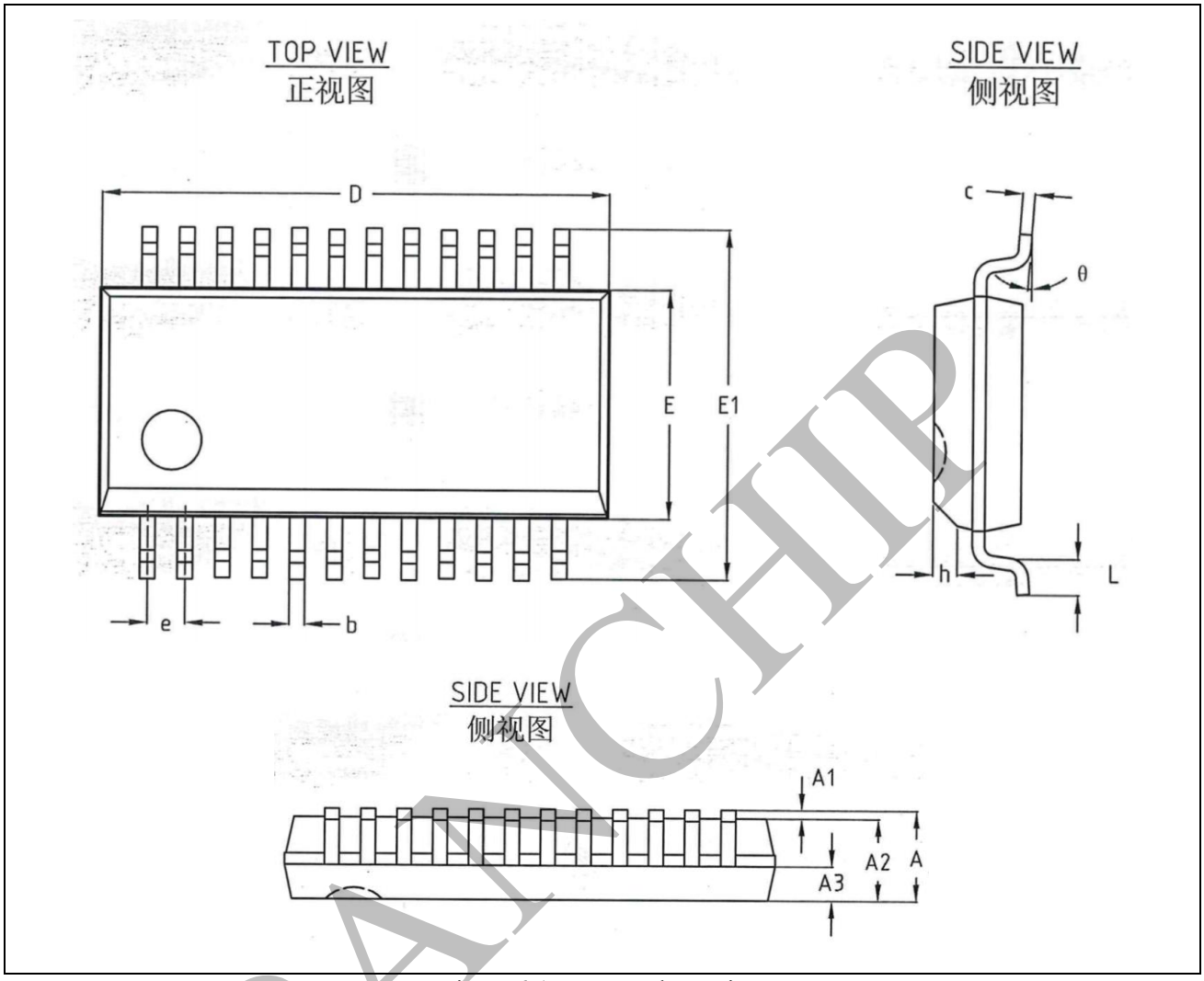

Figure 6-1 SSOP package view

Table 6-1 SSOP package dimension

SYMBOL	MIN（mm）	NOM（mm）	MAX（mm）
A	-	-	1.75
A1	0.10	-	0.25
A2	1.35	1.45	1.55
A3	0.60	0.65	0.70
b	0.23	-	0.31
c	0.19	-	0.25
D	8.50	8.60	8.70
E	3.80	3.90	4.00
E1	5.80	6.00	6.20
e	0.635BSC		
h	0.30	-	0.50
L	0.40	-	0.80
Ø	0	-	8°

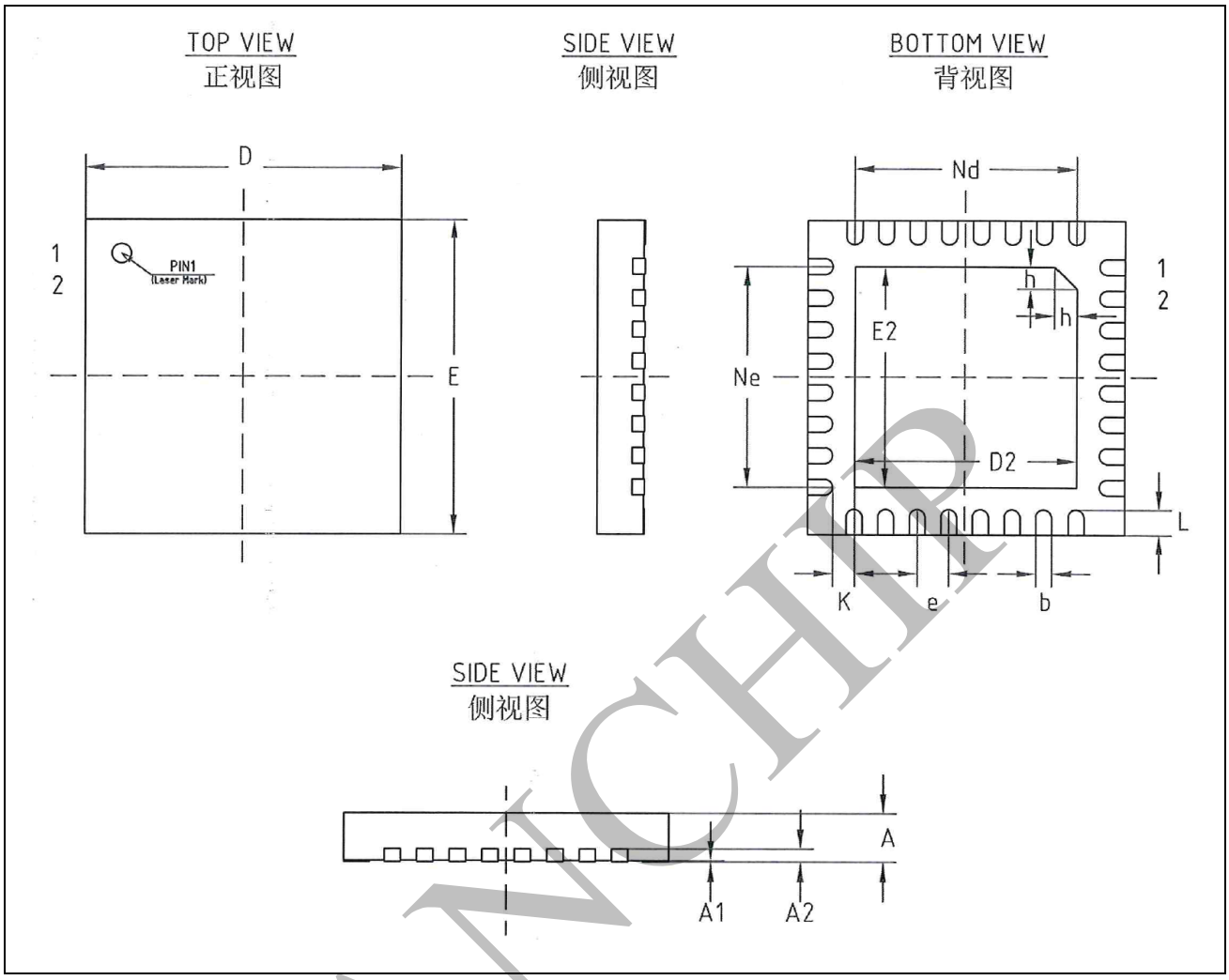

Figure 6-2 QFN package view

Table 6-2 QFN package dimension

SYMBOL	MIN（mm）	NOM（mm）	MAX（mm）
A	0.70	0.75	0.80
A1	-	0.02	0.05
A2	0.203 REF		
b	0.20	0.25	0.30
D	4.90	5.00	5.10
E	4.90	5.00	5.10
D2	3.40	3.50	3.60
E2	3.40	3.50	3.60
e	0.50 BSC		
K	0.30	0.35	0.40
L	0.35	0.40	0.45
h	0.30	0.35	0.40
Ne	3.50 BSC		
Nd	3.50 BSC		

7 Precautions

1. This product is a CMOS device and should be protected against static electricity during storage, transportation and use.
2. Grounding when device is in use.
3. Reflow temperature can not exceed 260℃.

8 Storage Conditions

1. Products should be stored in sealed packages: when the temperature is less than 30 degrees and the humidity is less than 90%, it can last for 12 months.
2. After the package is opened, the components will be used in the reflow process or other high-temperature processes. The following conditions must be met:
   1) Completed within 72 hours and the factory environment is less than 30℃≤ 60% RH.
   2) Stored in 10% RH environment.
   3) Exhaust at 125℃ for 24 hours to remove internal water vapor before used.

Abbreviation

ADC	Analog-to-Digital Converter
I2C	Inter-Integrated Circuit
GFSK	Gauss frequency Shift Keying
GPIO	General-purpose I/O
MCU	Micro Control Unit
PWM	Pulse Width Modulation
UART	Universal Asynchronous Receiver/Transmitters
RTC	Real_Time Clock
VC	Voltage comparator
SOC	System on chip
SOP	Small Out-Line Package
SPI	Serial Peripheral Interface
SRAM	Static random access memory
WDT	Watchdog Timer

Revision History

Version	Date	Content
V1.0	Jul. 2022	Initial
V1.1	Aug. 2022	Added Naming rule and Order information
V1.2	Oct. 2022	The main frequency is updated to a maximum of 48MHz
V1.3	Feb. 2023	Added QFN32 package
V1.4	Mar. 2023	Added 250Kbps data rate; updated the number of channels of the 12-bit ADC

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Contact Us

Shanghai Panchip Microelectronics Co., Ltd.
The 302 Room of Building D, No. 666 Shengxia Road
Zhangjiang Hi-Tech Park, Shanghai
People's Republic of China

021-50802371

http://www.panchip.com