PANCHIP

PAN211x series

Datasheet

V1.6 Apr. 2026

Panchip Microelectronics Co., Ltd.

2.4GHz Transceiver

General Description

The PAN211x is a low-cost, low-power, highly integrated transceiver that works in the ISM frequency band of 2400MHz ~2483MHz. PAN211x has low cost of system application because it only needs one MCU and a few external passive components to build a system to meet the requirements of wireless applications. Moreover, the use of PAN211x is very convenient. It only needs the MCU to configure a few registers of the chip by the SPI/I2C to transmit and receive data.

The PAN211x integrates transmitter, receiver, frequency generator, and GFSK modem. The transmitter power is adjustable (up to 9dBm). The receiver adopts a digital communication mechanism and has good performance of receiving and transmission in complex environments with strong interference.

The PAN211x is compatible with PAN1026, XN297L and Bluetooth-LE data packets. The package of PAN211x is compatible with XN297L (SOP8, 3-wire SPI function).

Key Features

- RF
  - Radio
    - Frequency band: 2400MHz ~2483MHz
    - Data rate: 2Mbps (only for 32M OSC), 1Mbps, 500kbps, 250kbps, 125kbps, 31.25kbps
    - Modulation: GFSK
    - Compatibility: Compatible with PAN1026 / XN297L/Bluetooth-LE packets
  - RF Synthesizer
    - Fully integrated synthesizer
  - Receiver
    - -95dBm @ 1Mbps
    - -88dBm @ 2Mbps
    - -98dBm @ 250kbps
    - -99dBm @ 500kbps
    - -102dBm @ 125kbps
  - Operating current
    - Deepsleep mode current: 300nA
    - Sleep mode current：800nA
    - RX current: 7mA
    - TX current: 24mA@9dBm 10.5mA@0dBm（Low Power）
  - Transmitter
    - Output power is up to 9dbm
  - Protocol Engine
    - Support up to 128 bytes payload data
    - Support automatic retransmission and ACK
    - 6 receiving channels form a 1:6 star network
- Power Management
  - Integrated voltage regulator
  - Operating voltage range: 1.8 to 3.6V
- Host Interface
  - Support 3-wire SPI and I2C
  - Up to 10Mbps SPI interface rate
  - Up to 2Mbps I2C interface rate
- Package
  - SOP8 / SOT23-8
- Operating Temperature
  - -40 ~ +85℃
- Other Features
  - Automatic scrambling and CRC check
  - RSSI
  - White list filtering of BLE mode
  - Fewer external components

Typical Applications

- TV remote control
- Smart home & security
- Wireless mouse & keyboard
- Wireless game controller
- Toys and wireless audio
- Active tag

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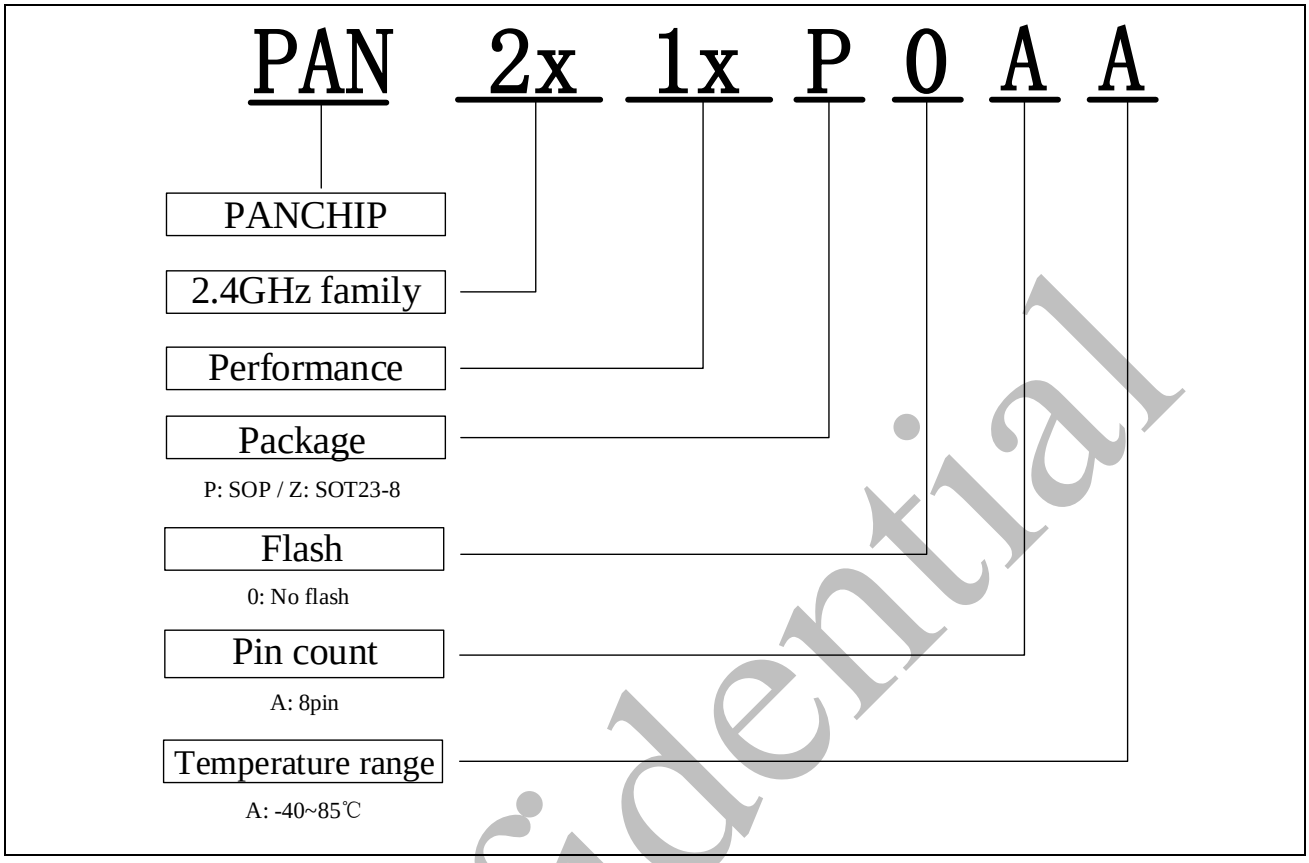
1 Naming rule



2 Ordering information

Partnumber	Type	Package	Pin Count	Temperature range	Packing
PAN2110P0AA	2.4GHz	SOP	8	-40~85℃	Tape & Reel
PAN2110Z0AA	2.4GHz	SOT23	8	-40~85℃	Tape & Reel

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

3 Block Diagram

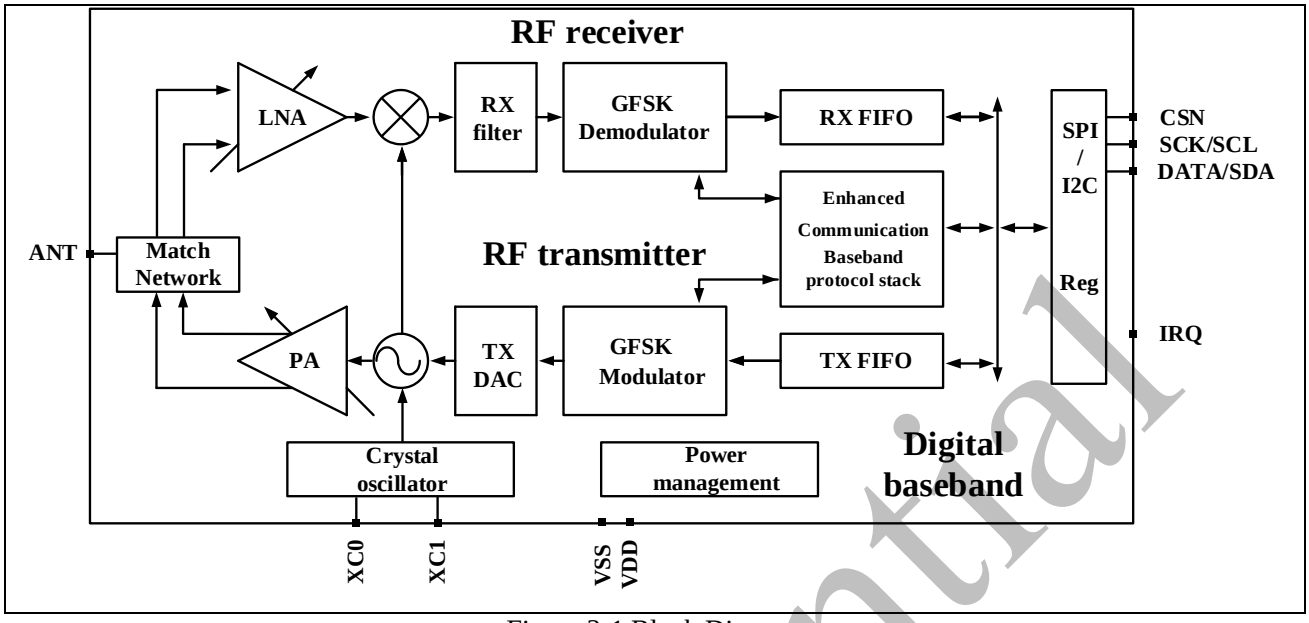


Figure 3-1 Block Diagram

4 Pin Information

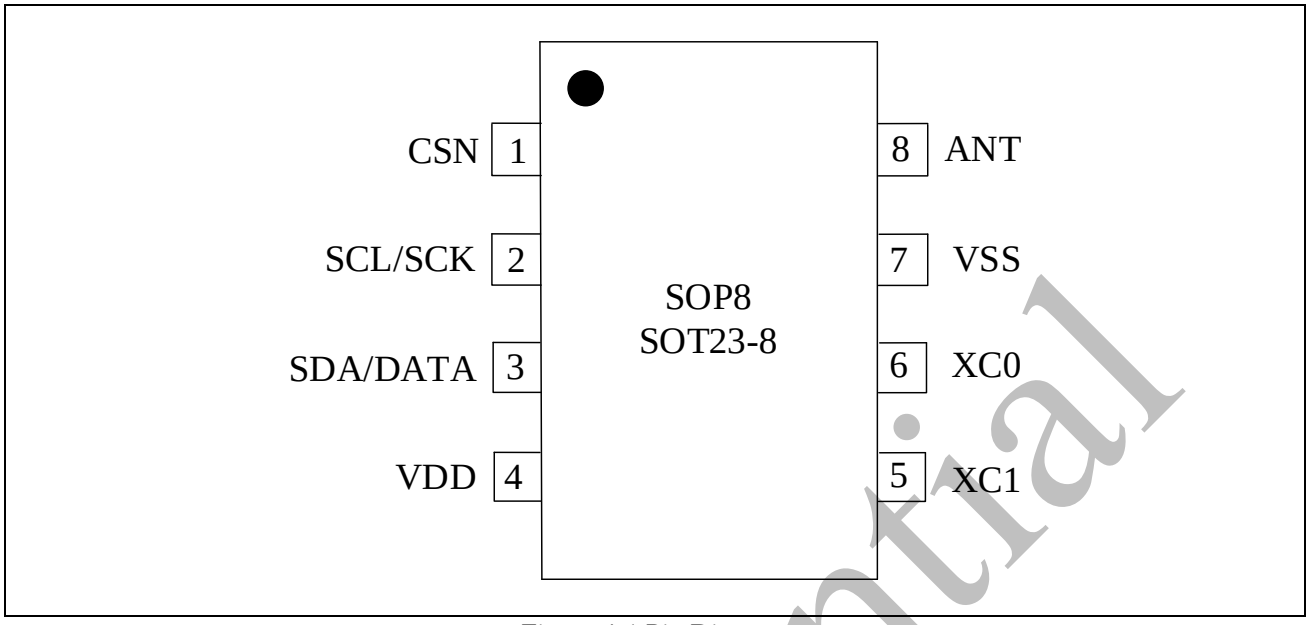


Figure 4-1 Pin Diagram

Table 4-1 Pin Descriptions

Pin No.	Pin Name	Pin Type	Description
1	CSN	I	The chip select signal of SPI
2	SCK	I	The clock signal of SPI
	SCL	I	The clock signal of I2C
3	DATA	I/O	The data input/output of 3-wire SPI
	SDA	I/O	The data input/output of I2C
4	VDD	P	Power supply input
5	XC1	AI	Crystal oscillator input
6	XC0	AO	Crystal oscillator output
7	VSS	G	Ground (GND)
8	ANT	AI	Antenna interface

5 Electrical Characteristics

Maximum and minimum values

In the notes below each table, the data obtained through comprehensive evaluation, design simulation and/or process features are not tested on the production line; based on the comprehensive evaluation, the minimum and maximum values are after the sample test. Take the average value and add and subtract three times the standard distribution (average ± 3 Σ).

5.1 RF characteristics

Table 5-1 RF characteristics

Symbol	Description	Conditions	Parameter			Unit
			Min	Typ	Max	
f_{OP}	Operating frequency		2400	-	2483	MHz
PLLres	PLL programming resolution		-	4	-	Hz
DR	Data rate		0.25	1	2	Mbps
$\Delta f_{BLE,2M}$	Frequency deviation @ BLE 2Mbps		-	500	-	kHz
$\Delta f_{BLE,1M}$	Frequency deviation @ BLE 1Mbps		-	250	-	kHz
$\Delta f_{BLE,250k}$	Frequency deviation @ BLE 250kbps		-	170	-	kHz
$\Delta f_{297L,2M}$	Frequency deviation @ 297L mode 2Mbps		-	500	-	kHz
$\Delta f_{297L,1M}$	Frequency deviation @ 297L mode 1Mbps		-	250	-	kHz
$\Delta f_{297L,250k}$	Frequency deviation @ 297L mode 250kbps		-	170	-	kHz
$f_{BLE,CS,2M}$	Channel spacing @ BLE 2Mbps		-	2	-	MHz
$f_{BLE,CS,1M}$	Channel spacing @ BLE 1Mbps		-	1	-	MHz
$f_{BLE,CS,250k}$	Channel spacing @ BLE 250kbps		-	1	-	MHz
$f_{297L,CS,2M}$	Channel spacing @ 297L mode 2Mbps		-	2	-	MHz
$f_{297L,CS,1M}$	Channel spacing @ 297L mode 1Mbps		-	1	-	MHz
$f_{297L,CS,250k}$	Channel spacing @ 297L mode 250kbps		-	1	-	MHz

Table 5-2 TX characteristics

Symbol	Description	Conditions	Parameter			Unit
			Min	Typ	Max	
P_{RFTX}	Output power		-42	-	9	dBm
P_{RFC}	RF power control range		-	51	-	dB
P_{RFCR}	RF power accuracy		-	-	±3	dB
$P_{RF1M,1}$	1st Adjacent Channel Transmit Power @1Mbps		-	TBD	-	dBc
$P_{RF1M,2}$	2nd Adjacent Channel Transmit Power @1Mbps		-	TBD	-	dBc
$P_{RF1M,\geq 3}$	3rd Adjacent Channel Transmit Power @1Mbps		-	TBD	-	dBc
$P_{RF2M,2}$	1st Adjacent Channel Transmit Power @2Mbps		-	TBD	-	dBc

$P_{RF2M,4}$	2nd Adjacent Channel Transmit Power @2Mbps		-	TBD	-	dBc
$P_{RF2M,\geq 6}$	3rd Adjacent Channel Transmit Power @2Mbps		-	TBD	-	dBc
P_{BW1M}	20dB bandwidth @1Mbps		-	1.2	-	MHz
P_{BW2M}	20dB bandwidth @2Mbps		-	2.2	-	MHz
P_{BW250k}	20dB bandwidth @250kbps		-	0.7	-	MHz
$P_{SP,1}$	Spurious @≤1GHz		-	-	-60	dBm
$P_{SP,2}$	Spurious @≥1GHz		-	-	-40	dBm

Table 5-3 RX characteristics

Symbol	Description	Conditions	Parameter			Unit
			Min	Typ	Max	
$P_{RX,MAX}$	Receive maximum input power		-	-	10	dBm
$P_{SENS,1M,BLE}$	Sensitivity, 1Mbps BLE	Sensitivity, 1Mbps ideal transmitter, ≤37 bytes, BER = 0.1%	-	-95	-	dBm
$P_{SENS,2M,BLE}$	Sensitivity, 2Mbps BLE		-	-88	-	dBm
$P_{SENS,250K}$	Sensitivity, 250kbps		-	-98	-	dBm
$P_{SENS,1MS2,BLE}$	Sensitivity, 500kbps BLE		-	-99	-	dBm
$P_{SENS,1MS8,BLE}$	Sensitivity, 125kbps BLE		-	-102	-	dBm
$P_{SENS,250KS2}$	Sensitivity, 125kbps		-	-101	-	dBm
$P_{SENS,250KS8}$	Sensitivity, 31.25kbps		-	-103	-	dBm
$P_{SENS,1M,297L}$	Sensitivity, 1Mbps 297L mode		-	-95	-	dBm
$P_{SENS,2M,297L}$	Sensitivity, 2Mbps 297L mode		-	-88	-	dBm
$P_{SENS,250K,297L}$	Sensitivity, 250kbps 297L mode		-	-98	-	dBm
$C/I_{CO,1M,BLE}$	Co-Channel interference@1Mbps		-	10	-	dB
$C/I_{1M,1M,BLE}$	Adjacent (1 MHz) interference@1Mbps		-	-7	-	dB
$C/I_{2M,1M,BLE}$	Adjacent (2 MHz) interference@1Mbps		-	-35	-	dB
$C/I_{\geq 3M,1M,BLE}$	Adjacent (≥3 MHz) interference @1Mbps		-	-39	-	dB
$C/I_{Image,1M,BLE}$	Image frequency interference @1Mbps		-	-18	-	dB
$C/I_{Image\pm 1M,1M,BLE}$	Adjacent (±1MHz) interference to in-band image frequency @1Mbps		-	-31	-	dB
$C/I_{\geq 6M,1M,BLE}$	Adjacent (≥6 MHz) interference @1Mbps		-	-44	-	dB
$C/I_{CO,2M,BLE}$	Co-Channel interference @2Mbps		-	9	-	dB
$C/I_{2M,2M,BLE}$	Adjacent (2 MHz) interference @2Mbps		-	-5	-	dB
$C/I_{4M,2M,BLE}$	Adjacent (4 MHz) interference @2Mbps		-	-34	-	dB
$C/I_{\geq 6M,2M,BLE}$	Adjacent (≥6 MHz) interference @2Mbps		-	-35	-	dB

$C/I_{Image,2M,BLE}$	Image frequency interference @2Mbps		-	-20	-	dB
$C/I_{Image±2M,2M,BLE}$	Adjacent (±2 MHz) interference to in-band image frequency		-	-31	-	dB
$C/I_{≥12M,2M,BLE}$	Adjacent (≥12 MHz) interference @2Mbps		-	-38	-	dB

Table 5-4 RSSI characteristics

Symbol	Description	Conditions	Parameter			Unit
			Min	Typ	Max	
$RSSI_{RFC}$	RSSI indication range		-100	-	-20	dBm
$RSSI_{Auu}$	RSSI accuracy		-	±2	-	dB
$RSSI_{Res}$	RSSI resolution		-	0.25	-	dB
$RSSI_{Per}$	RSSI sample period		-	0.25	-	us

Table 5-5 RF Timing characteristics

Symbol	Description	Conditions	Parameter			Unit
			Min	Typ	Max	
$T_{OSC,EN}$	32M crystal oscillator settling time		-	75	-	us
$T_{OSC,EN}$	16M crystal oscillator settling time		-	250	-	us
$T_{TX,EN}$	Time between TXEN task and READY event after channel FREQUENCY configured		73	-	-	us
$T_{RX,EN}$	Time between the RXEN task and READY event after channel FREQUENCY configured in default mode		64	-	-	us
$T_{TX,DISABLE}$	Time between DISABLE task and DISABLED event when the radio was in TX		5	-	-	us
$T_{RX,DISABLE}$	Time between DISABLE task and DISABLED event when the radio was in RX		5	-	-	us
T_{TX-RX}	The time taken to switch from TX to RX		67	-	-	us
T_{RX-TX}	The time taken to switch from RX to TX		75	-	-	us

Table 5-6 RF power characteristics

Symbol	Description	Conditions	Parameter			Unit
			Min	Typ	Max	
$I_{TX,P9dBm}$	TX only run current 9dBm		-	25	-	mA
$I_{TX,P8dBm}$	TX only run current 8dBm		-	23	-	mA
$I_{TX,P7dBm}$	TX only run current 7dBm		-	21.5	-	mA
$I_{TX,P6dBm}$	TX only run current 6dBm		-	21.4	-	mA
$I_{TX,P5dBm}$	TX only run current 5dBm		-	20	-	mA
$I_{TX,P4dBm}$	TX only run current 4dBm		-	19	-	mA
$I_{TX,P3dBm}$	TX only run current 3dBm		-	19.1	-	mA

$I_{TX,P2dBm}$	TX only run current 2dBm		-	18.5	-	mA
$I_{TX,P1dBm}$	TX only run current 1dBm		-	17.5	-	mA
$I_{TX,P0dBm}$	TX only run current 0dBm(defalut)		-	17	-	mA
$I_{TX,P0dBm}$	TX only run current 0dBm(low power)		-	10.5	-	mA
$I_{TX,P-5dBm}$	TX only run current -5dBm		-	9.5	-	mA
$I_{TX,P-8dBm}$	TX only run current -8dBm		-	8.7	-	mA
$I_{TX,P-14dBm}$	TX only run current -14dBm		-	7.2	-	mA
$I_{TX,P-19dBm}$	TX only run current -19dBm		-	6.1	-	mA
$I_{TX,P-25dBm}$	TX only run current -25dBm		-	5.3	-	mA
$I_{TX,P-40dBm}$	TX only run current -40dBm		-	4.5	-	mA
$I_{RX,1M}$	RX 1Mbps current		-	7	-	mA
$I_{RX,2M}$	RX 2Mbps current		-	7.9	-	mA
$I_{RX,250K}$	RX 250kbps current		-	7.1	-	mA

5.2 Reset characteristics

Table 5-7 nRESET input characteristics

Symbol	Description	Conditions	Parameter			Unit
			Min	Typ	Max	
V_{ILR}	Negative threshold voltage, nRESET	VDD=1.8V-3.3V ,T_A=25°C	-	-	0.22*VDD	V
V_{IHR}	Positive threshold voltage, nRESET	VDD=1.8V-3.3V ,T_A=25°C	0.48*VDD	-	-	V
V_{hys_rst}	Schmitt Trigger Voltage Hysteresis	VDD=1.8V-3.3V ,T_A=25°C	-	-	0.26*VDD	V
R_{RST}	nRESET pin internal pull-up resistor	VDD=3.3V ,T_A=25°C	-	51	-	kΩ
$t_{FR,0.3pF}$	nRESET pin input filter pulse time	VDD=3.3V ,T_A=25°C	-	TBD	-	ns

5.3 Clock characteristics

Table 5-8 32MHz HXTAL characteristics

Symbol	Description	Conditions	Parameter			Unit
			Min	Typ	Max	
f_{HXTL}	High speed crystal oscillator (HXTAL) frequency	VDD=3.3V ,T_A=25°C	-	32	-	MHz
$C_{LoadHXTL}$	Crystal load capacitance	VDD=3.3V ,T_A=25°C	7	10	12	pF
I_{DDHXTL}	HXTAL oscillator operating current	VDD=3.3V ,T_A=25°C	-	250	-	μA

t_{SUHXTL}	HXTAL oscillator startup time	VDD=3.3V ,T_A=25°C, ESR=40Ω, C_{HXTL}= 10pF	-	300	-	μs
$t_{SUHXTL\ Quick}$	HXTAL oscillator Quick startup time	VDD=3.3V ,T_A=25°C, ESR=40Ω, C_{HXTL}= 10pF	-	75	-	μs
ESR_{HXTL}	Equivalent series resistance		-	40	100	Ω
$F_{TOLHXTL}$	Frequency tolerance for the crystal	VDD=3.3V ,T_A=25°C	-20	-	20	ppm
PD_{HXTL}	Drive level	VDD=3.3V ,T_A=25°C	-	-	100	μW

Table 5-9 16MHz HXTAL characteristics

Symbol	Description	Conditions	Parameter			Unit
			Min	Typ	Max	
f_{HXTL}	High speed crystal oscillator (HXTAL) frequency	VDD=3.3V ,T_A=25°C	-	16	-	MHz
$C_{LoadHXTL}$	Crystal load capacitance	VDD=3.3V ,T_A=25°C	7	10	12	pF
I_{DDHXTL}	HXTAL oscillator operating current	VDD=3.3V ,T_A=25°C	-	210	-	μA
t_{SUHXTL}	HXTAL oscillator startup time	VDD=3.3V ,T_A=25°C, ESR=40Ω, C_{HXTL}= 10pF	-	600	-	μs
$t_{SUHXTL\ Quick}$	HXTAL oscillator Quick startup time	VDD=3.3V ,T_A=25°C, ESR=40Ω, C_{HXTL}= 10pF	-	250	-	μs
ESR_{HXTL}	Equivalent series resistance		-	40	100	Ω
$F_{TOLHXTL}$	Frequency tolerance for the crystal	VDD=3.3V ,T_A=25°C	-20	-	20	ppm
PD_{HXTL}	Drive level	VDD=3.3V ,T_A=25°C	-	-	100	μW

5.4 General operating conditions

Table 5-10 General operating conditions

Symbol	Description	Conditions	Parameter			Unit
			Min	Typ	Max	
VDD	Operating voltage	T_A=25°C	1.8	-	3.6	V
T_{ST}	Storage temperature	-	-65	-	150	℃
T_A	Ambient temperature	-	-40	-	85	℃
$T_{J\text{-}SOP8}$	Junction temperature	-	-40	-	125	℃
$R_{\theta JA\text{-}SOP8}$	Thermal resistance	-	-	41	-	℃/W

5.5 ESD characteristics

Table 5-11 ESD characteristics

Symbol	Description	Conditions	Parameter			Unit
			Min	Typ	Max	
VESDHBM[1]	ESD @ Human Body Mode	T_A=25°C	-	±4	-	kV
VESDCDM[2]	ESD @ Charge Device Mode	T_A=25°C	-	±1000	-	V
VESDMM[3]	ESD @ Machine Mode	T_A=25°C	-	±200	-	V

$I_{latchup}$[4]	Latch up current	T_A=25°C	-	±500	-	mA

Notes:

1. Determined by ANSI/ESDA/JEDEC JS-001 standard, Electrostatic Discharge Sensitivity Test - Human Body Model (HBM) - Device Level
2. Determined according to ANSI/ESDA/JEDEC JS-002 Electrostatic Discharge Sensitivity (ESD) Test Standard.
3. Determined according to JESD22-A115-C electrostatic discharge sensitivity (ESD) test standard.
4. Determined according to JEDEC EIA/JESD78 standard.

5.6 Absolute maximum ratings

Table 5-12 Absolute maximum ratings

Symbol	Description	Conditions	Parameter			Unit
			Min	Typ	Max	
VDD - VSS	Supply voltages	T_A=25°C	-0.3	-	3.6	V
VIN	I/O pin voltage	T_A=25°C	VSS-0.3	-	VDD + 0.3	V
PVDD	Extreme power consumption	VDD=3.3V, T_A=25°C	-	120	-	mW

5.7 Current characteristics

Table 5-13 Current characteristics

Symbol	Description	Conditions	Typ	Unit
Deepsleep		VDD=3.3V, T_A=25°C	0.3	µA
Sleep		VDD=3.3V, T_A=25°C	0.8	
STB1		VDD=3.3V, T_A=25°C	160	
STB2		VDD=3.3V, T_A=25°C	590	
STB3		VDD=3.3V, T_A=25°C	850	

6 Application Reference Diagram

The application reference diagram is shown in the SOP8 package. The SOT23-8 package is the same.

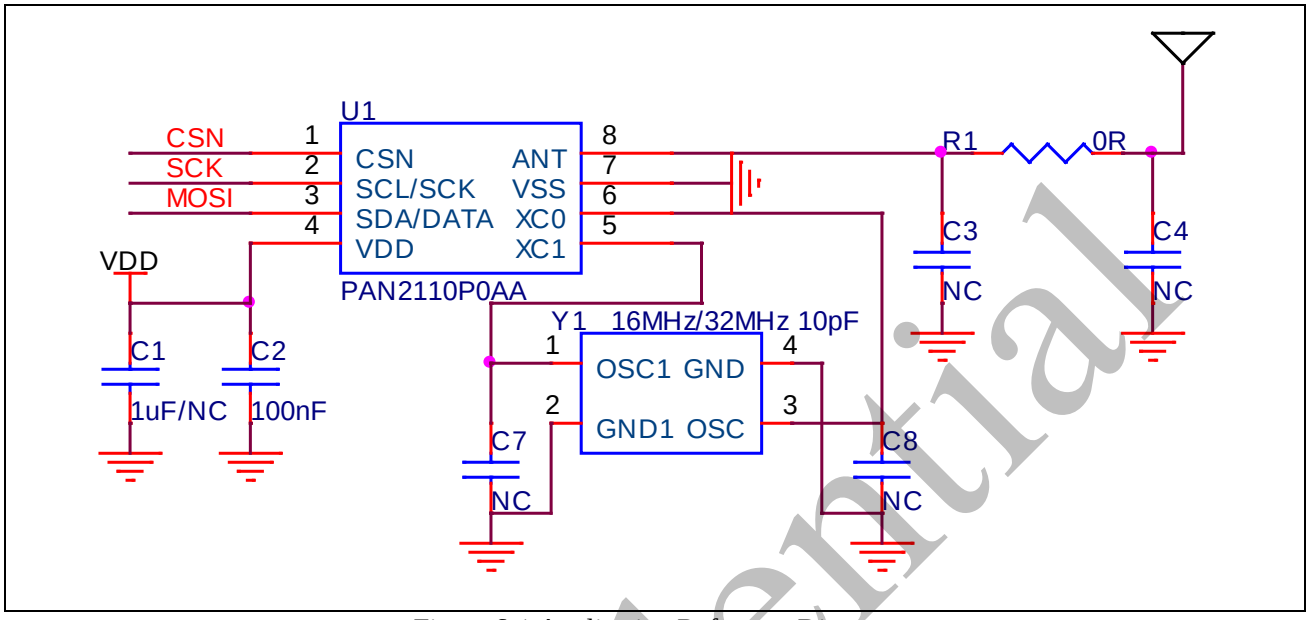


Figure 6-1 Application Reference Diagram

7 Package Dimensions

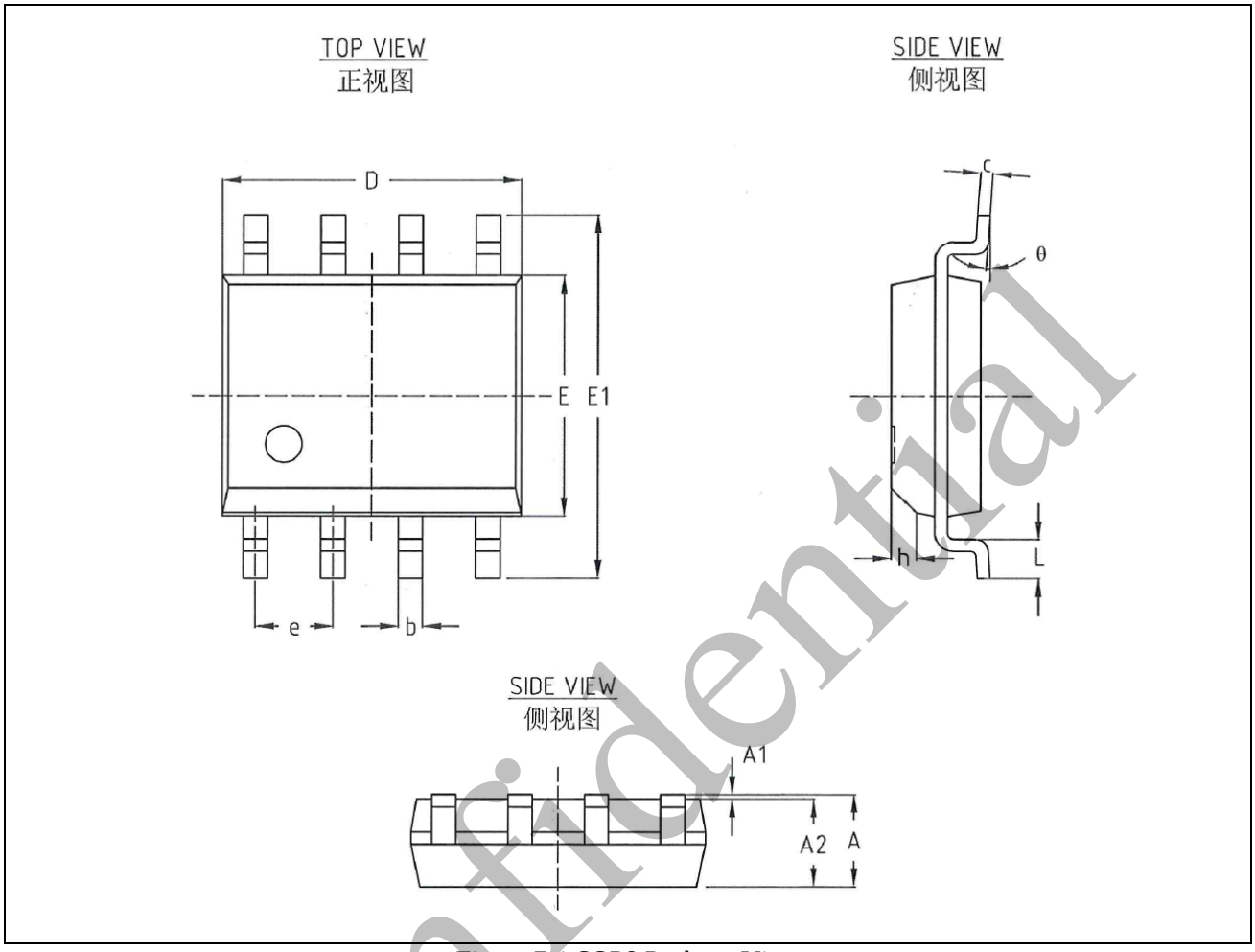


Figure 7-1 SOP8 Package View

Table 7-1 SOP8 Package Dimension

SYMBOL	MIN（mm）	NOM（mm）	MAX（mm）
A	-	-	1.80
A1	0.05	-	0.25
A2	1.25	-	1.60
b	0.35	-	0.50
c	0.19	-	0.25
D	4.80	4.90	5.00
E	3.80	3.90	4.00
E1	5.80	6.00	6.20
e	1.27 BSC		
L	0.40	-	1.00
h	0.30	-	0.50
Ø	0	-	8°

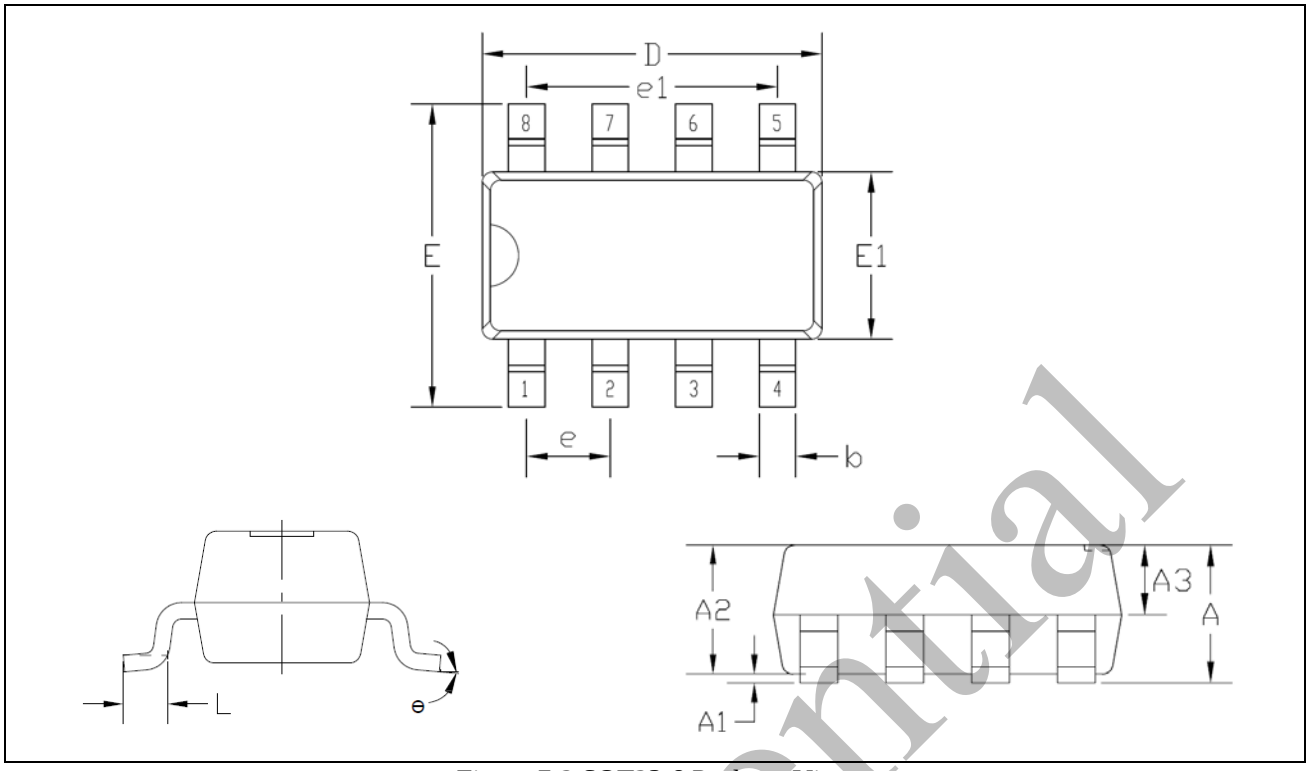


Figure 7-2 SOT23-8 Package View

Table 7-2 SOT23-8 Package Dimension

SYMBOL	MIN（mm）	NOM（mm）	MAX（mm）
A	-	-	1.33
A1	0.00	-	0.085
A2	1.15	1.20	1.25
A3	0.60	0.65	0.70
b	0.35	-	0.38
D	3.20	3.25	3.30
E	2.80	2.90	3.00
E1	1.55	1.60	1.65
e	0.775	0.80	0.825
e1	2.375	2.40	2.425
L	0.40	0.41	0.42
Ø	0	-	8°

Abbreviation

ADC	Analog-to-Digital Converter
BLE	Bluetooth-LE
CAD	Channel Activity Detection
Chirp	LFM
CRC	Cyclic Redundancy Check
CSN	SPI chip select signal
DAC	Digital-to-Analog Converter
DCDC	DC-to-DC converter
FIFO	First Input First Output
GPIO	General-purpose I/O
IRQ	Interrupt ReQuest
LDO	Low dropout regulator
LPF	Low Pass Filter
MAC	Media Access Control Layer
MCU	Micro Control Unit
OSC	Oscillator
PA	Power Amplifier
RF	Radio frequency
PLL	Phase Locked Loop
PMU	Power Management Unit
POR	Power-on Reset
RAM	Random Access Memory
RSSI	Received Signal Strength Indication
SCK	SPI Serial Clock
SF	Spreading Factor
SPI	Serial Peripheral Interface
STB	Standby Mode
Sync	Synchronize
VCO	Voltage Controlled Oscillator

Revision History

Version	Date	Content
V1.0	2024.09	Initial
V1.1	2024.11	Update the Application Reference Diagram.
V1.2	2025.01	Update the Electrical Characteristics, Ordering information.
V1.3	2025.02	Update the Application Reference Diagram.
V1.4	2025.03	Add the SOT23-8 package. Update the value of $P_{RX,MAX.}$
V1.5	2025.11	Update the Table 5-4.
V1.6	2026.04	Update the Packing.

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