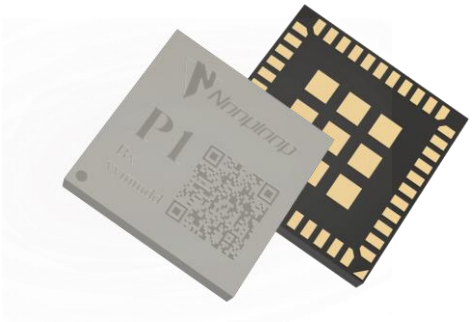
uBeacon Tag IIC Protocol

Standard precision UWB module

Version: V1.0



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1 IIC Serial Interface

The Tag IIC is a bus slave. The IIC is employed to write the data to the registers, whose content can also be read back.

The relevant IIC terminology is provided in the table below.

Table 1 IIC Terminology

Term	Description
Transmitter	The device which sends data to the bus
Receiver	The device which receives data from the bus
Master	The device which initiates a transfer, generates clock signals and terminates a transfer
Slave	The device addressed by the master

There are two signals associated with the IIC bus: the Serial Clock Line (SCL) and the Serial data Line (SDA). The latter is a bidirectional line used for sending and receiving the data to/from the interface. Both the lines must be connected to VCC through external pull-up resistors. When the bus is free, both the lines are high.

The IIC interface is implemented with fast mode (400 kHz) IIC standards.

The Slave Address (SAD) associated to the Tag is 0x08.

Table 2. SAD+Read/Write Patterns

Command	R/W	SAD+R/W
Read	1	0x11
Write	0	0x10

Unlike the standard IIC protocol, the Tag IIC interface can only read any byte length starting from the register, but it cannot exceed the maximum length. Reading and writing to the same register file requires operating on different Sub-Register Address(SUB),The document defaults to SUB as the Read SUB(SUB-R), with the Write SUB(SUB-W) equal to the SUB-R+1.

eg: Register File Location Parameter SUB is 0x3C, Its SUB-R is 0x3C, SUB-W is 0x3D.

Transfer timing reference Table 3 and Table 4.

Table 3. Transfer when master is receiving (reading) multiple bytes of data from slave

Master	Start	SAD+W		SUB-R		Start	SAD+R			ACK		NACK	STOP
Slave			ACK		ACK			ACK	Data		Data		

Table 4. Transfer when master is writing multiple bytes to slave

Master	Start	SAD+W		SUB-W		Data		Data		STOP
Slave			ACK		ACK		ACK		ACK	

2 Register Mapping

The register map overview is given in Table 5. This lists the registers in address order. Section 5 gives a detailed description of each register.

Table 5. Register Mapping

SUB	Register File Name	Length(Bytes)	Data	Read/Write Type
0x3C	Location Parameter	13	expect_location_freq	RW
			z	
			z_noise	
			smooth_window	
			max_acceleration[3]	
0x3E	Interface Parameter	1	UART	RW
			IIC	
			UWB	
0x44	Location Result	32	location_time	RO
			pos [3]	
			vel [3]	
			pos_noise [3]	
			vel_noise [3]	

3 Detailed Sub-Register Description

3.1 0x3C-Location Parameter

3.1.1 Composition

Data	Type	Multiplier	Length (Bytes)	Description
expect_location_freq	float	1	4	Expect location frequency, unit: Hz.
expect_z	float	1	4	User sets the Z-axis value, unit: m.
z_noise	uint8	100	1	User sets the Z-axis noise, unit: m.
smooth_window	uint8:4	1	4bits	Smooth window,0~5.
max_acceleration[3]	uint8	50	3	3 axis max acceleration{x,y,z},unit:m/s^2.

3.1.2 Example

Data: 00 00 80 3F 00 00 C0 3F 14 02 0A 0A 01.

Table 6. Location Parameter Parsing Example

Data		Hex	Result
expect_location_freq		00 00 80 3F	1Hz
expect_z		00 00 C0 3F	1.5m
z_noise		14	0.2m
smooth_window		02	2
max_acceleration[3]	x	0A	0.2 m/s^2.
	y	0A	0.2 m/s^2
	z	01	0.02 m/s^2

3.2 0x3E-Interface Parameter

3.2.1 Composition

Table 7. Interface Parameter Composition

Data	Type	Multiplier	Length (Bytes)	Description
UART	uint8:1	1	1bit	UART interface switch
IIC	uint8:1	1	1bit	IIC interface switch
UWB	uint8:1	1	1bit	UWB interface switch

3.2.2 Example

Data: 05.

Table 8. Interface Parameter Parsing Example

Data	Hex	Result
UART	05	1
IIC		0
UWB		1

3.3 0x40-Location Result

3.3.1 Composition

Table 9. Location Result Composition

Data	Type	Multiplier	Length(Bytes)	Description
location_time	uint64	1	8	Time on module location time.
pos [3]	float	1	12	3 axis position{x,y,z},unit:m.
vel [3]	int16	100	6	3 axis velocity{x,y,z},unit:m/s.
pos_noise [3]	uint8	100	3	3 axis position noise{x,y,z},unit:m.
vel_noise [3]	uint8	100	3	3 axis velocity noise{x,y,z},unit:m/s.

3.3.2 Example

Data: B5 23 0B 02 00 00 00 00 DD 51 b1 41 EB 58 57 41 AA E7 9A 3F FA FF 04 00 00 00 07 07 04 08 08 04

Table 10. Location Result Parsing Example

Data		Hex	Result
location_time		B5 23 0b 02 00 00 00 00	34284469 ms
pos[3]	x	DD 51 b1 41	22.164972 m
	y	EB 58 57 41	13.459208 m
	z	AA E7 9A 3F	1.210195 m
vel[3]	x	FA FF	-0.06 m/s
	y	04 00	0.04 m/s
	z	00 00	0 m/s
pos_noise [3]	x	07	0.07 m
	y	07	0.07 m
	z	04	0.04 m
vel_noise [3]	x	08	0.08 m/s
	y	08	0.08 m/s
	z	04	0.04 m/s

4 Abbreviation and Acronyms

Table 11: Abbreviation and Acronyms

Abbreviation	Full Title
UWB	Ultra Wideband
GNSS	Global Navigation Satellite System
IMU	Inertial Measurement Unit
RSSI	Received Signal Strength Indication

5 Document Version

Table 12: Update Log

Version	Date	Description
1.0	20240927	Initial release.

6 Contact

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