FR8012HA_SOP16 Datasheet

Bluetooth Low Energy SOC with SIG Mesh integrated

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DESCRIPTION

FR8012H is a SOC (system on chip) for rapid development of Bluetooth Low Energy related products. It contains Bluetooth V5.0 (LE Mode) fully compliant system with Freqchip designed firmware and software stack. Users can develop various applications based on embedded 32-bits high performance MCU.

With Freqchip's innovational technology, FR8012H integrates,PMU, SPI flashROM with XIP mode, IIC, UART, GPIO, ADC, PWM all in a single chip, which provides customer with:

1. competitive power consumption
2. stable connection
3. low-cost BOM

The Bluetooth Smart firmware includes the L2CAP service layer protocols, Security Manager (SM), Attribute Protocol (ATT), the Generic Attribute Profile (GATT) and the Generic Access Profile (GAP). Furthermore, application profiles such as Proximity, Health Thermometer, Heart Rate, Blood Pressure, Glucose, Human Interface Device (HID) and SDK (include drivers, OS API, etc.) are supported. The SDK has integrated SIG Mesh for networking application.

FEATURES

- Compliant with Bluetooth Specification V5.0 LE, support 2M, 1M, 500K and 125K data rate
- Embedded 32-bitsProcessor
  - 12~48Mhz speed
- Internal mask 150KB ROM, up to 48KB SRAM
- Internal 4M Flash ROMfor user space software and data
- Integrated DC-DC Regulator
- Interface:
  - GPIO
  - UART
  - SPI
  - I2C
  - PWM
  - I2S
  - LED
- ROM Software:
  - BLE Profile & Protocol: GATT, LM, LC, etc.
  - Driver API
  - SIG Mesh

APPLICATIONS

- smart toy
- led control
- SIG Mesh application
- smart locks
- etc.

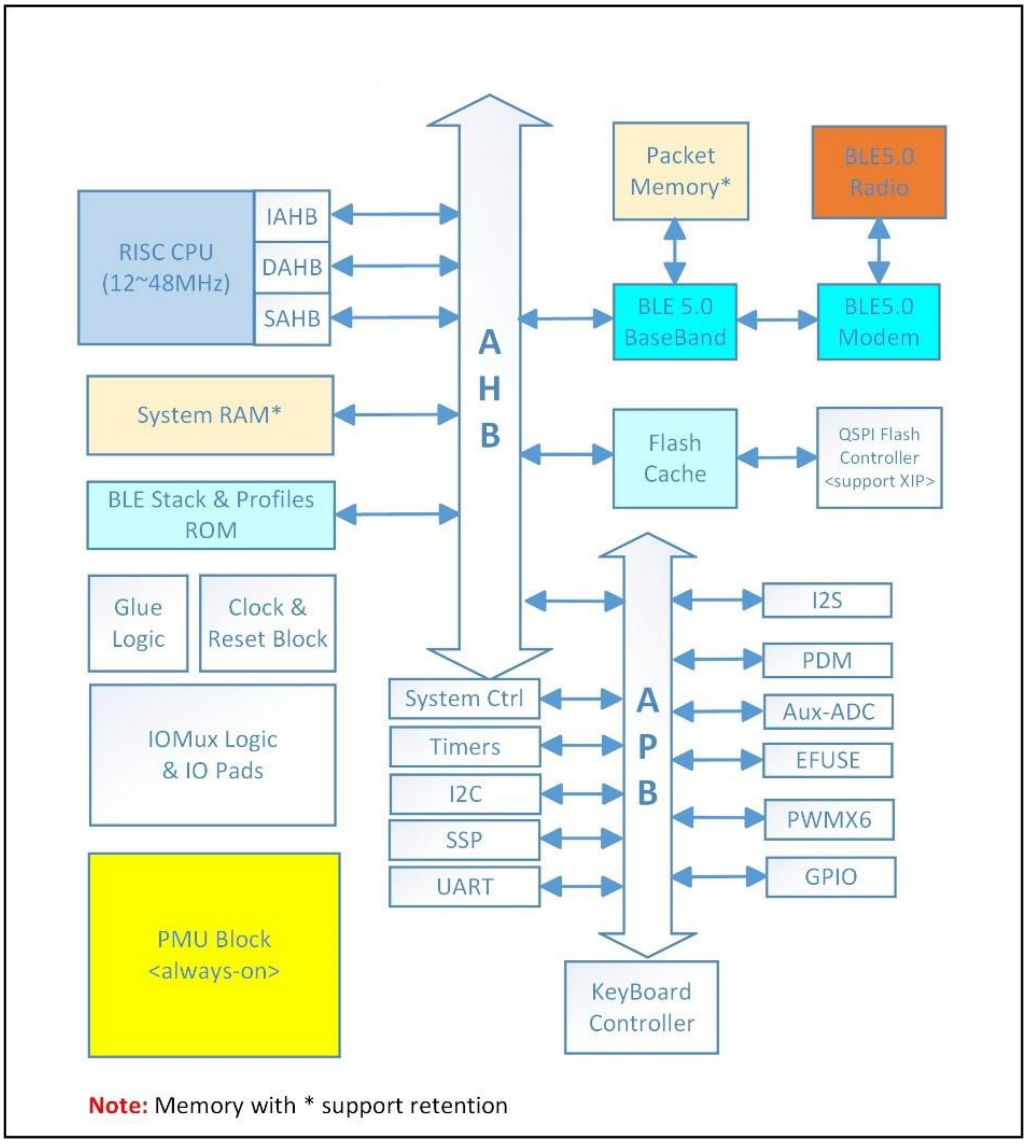
ORDERING INFORMATION

FR8012HAS -20°C ~ +105°C

SOP16, 10*3.9*1.5, 1.2pitch

1. Hardware Details

1.1 Block Diagram



1.2 Bluetooth Radio

- On-chip balun (50Ω impedance in TX and RX modes)
- No external trimming is required in production
- Qualified to Bluetooth v5.0 LE specification
- Up to 10dBm RF transmit power
- -94dBm (1M) receiver sensitivity in LDO mode
- Integrated channel filters
- Digital demodulator for improved sensitivity and co-channel rejection
- Real time digitized RSSI
- Fast AGC for enhanced dynamic range

1.3 Bluetooth Controller

- All device classes support (Broadcaster, Central, Observer, Peripheral)
- All packet types (Advertising / Data / Control)
- Encryption (AES / CCM)
- Bit stream processing (CRC, Whitening)
- Frequency hopping calculation
- Low power modes supporting internal 32.0 kHz RC oscillator or external 32.768 kHz crystal （FR8018H only）
- Supports power down of the baseband during the protocol's idle periods

1.4 Peripheral Interfaces

- UART port for Debugging and AT Commands
- IIC interface to support external EEPROM or other devices (like G-SENSOR)
- One more SPI interface to support other device (like OLED controller)
- Up to 7 general purpose IOs (7 IOs can be set in interrupt mode)
- General purpose 10-bits ADC used for ADKey and other analog input
- PWM controller
- General purpose programmable timer for various task
- Watchdog used for tracking unexpected exception

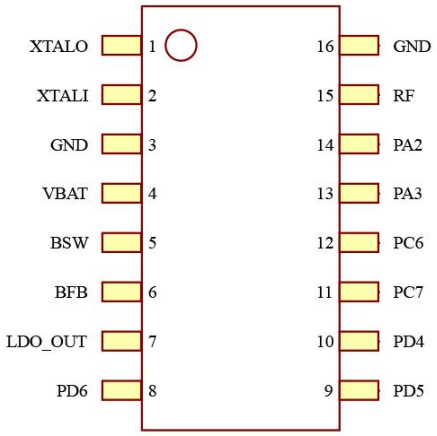
1.5 Integrated Power Control and Regulation

- Embedded Power-On-Reset
- Low power 0.9v core voltage
- On-chip high efficiency switch-mode power supply, 2.5v to 4.3v input direct from battery and programmable output voltage
- On-chip Low Dropout (LDO) Linear Regulator for internal Digital, RF and Analog circuit
- Power management features include software shutdown and hardware wake-up
- Power-on-reset cell detects low supply voltage
- Internal voltage level detector

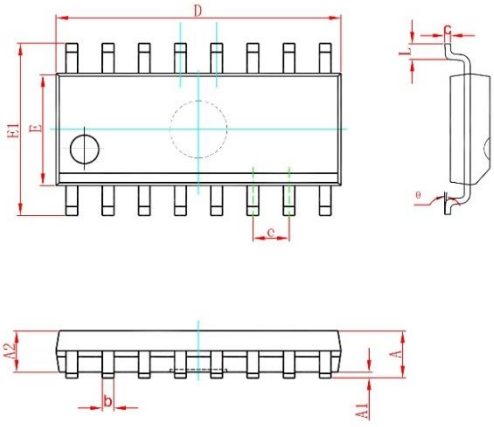
2. Package and Pin Information

2.1 Package

SOP16 10x3.9 P1.27 T1.5



2.2 Package Physical Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	9.800	10.200	0.386	0.402
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

2.3 Pins Description

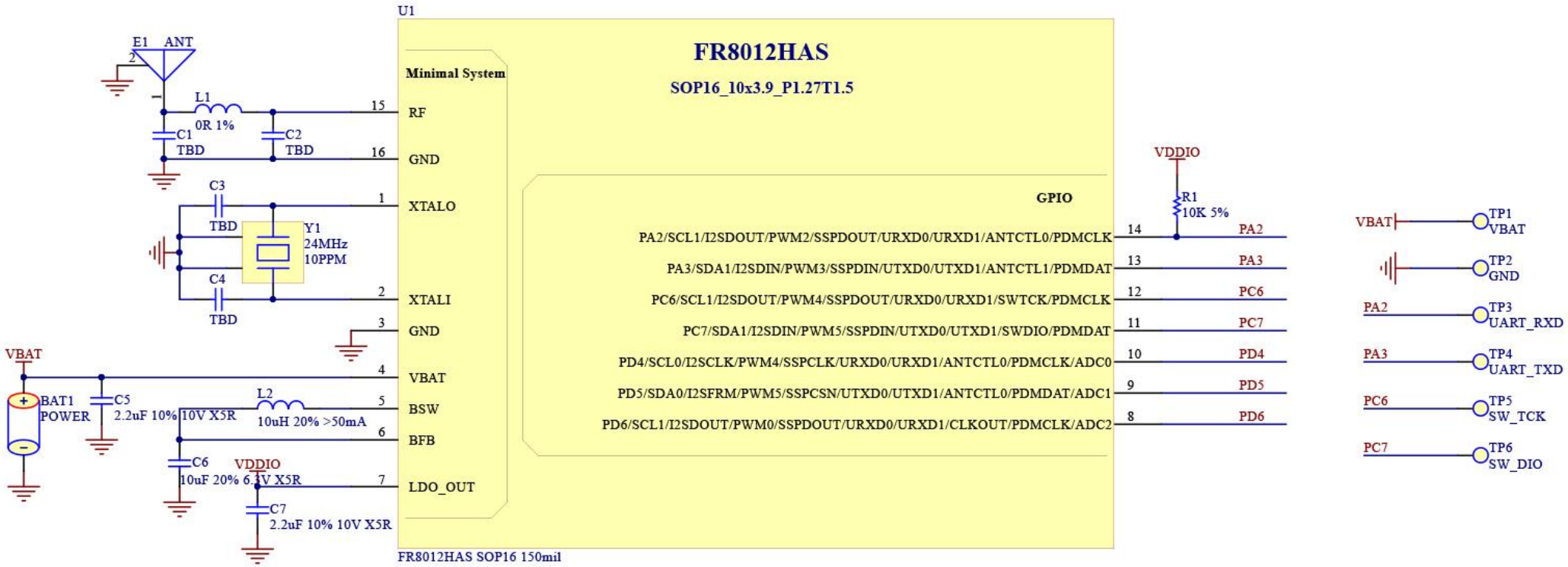
FR8012H is a CMOS device. Floating level on input signals will cause unstable device operation and abnormal current consumption. Pull-up or Pull-down resistors should be used appropriately for input or bidirectional pins.

Notation	Description
I	Digital Input
O	Digital Output
AI	Analog input
AO	Analog output
IO	Bidirectional(digital)
OD	Open Drain
PWR	Power
GND	Ground

Pin name	Pin#	Type	Description
XTALO	1	AO	crystal oscillator output
XTALI	2	AI	crystal oscillator input
GND	3	GND	Ground
VBAT	4	PWR	Positive power supply for DC/DC
BSW	5	AO	DC/DC output terminal
BFB	6	AI	DC/DC feedback input terminal
LDO_OUT	7	AO	Analog linear regulator output
PORTD6	8	I/O	PD6/SCL1/I2SDOUT/PWM0/SSPDOUT/URXD0/URXD1/CLKOUT/PDMCLK/PWM1/ADC2
PORTD5	9	I/O	PD5/SDA0/I2SFRM/PWM5/SSPCSN/UTXD0/UTXD1/ANTCTL0/PDMDAT/PWM4/ADC1
PORTD4	10	I/O	PD4/SCL0/I2SCLK/PWM4/SSPCLK/URXD0/URXD1/ANTCTL0/PDMCLK/PWM5/ADC0
PORTC7	11	I/O	PC7/SDA1/I2SDIN/PWM5/SSPDIN/UTXD0/UTXD1/SWDIO/PDMDAT/PWM4
PORTC6	12	I/O	PC6/SCL1/I2SDOUT/PWM4/SSPDOUT/URXD0/URXD1/SWTCK/PDMCLK/PWM5

PORTA3	13	I/O	PA3/SDA1/I2SDIN/PWM3/SSPDIN/UTXD0/UTXD1/ANTCTL1/PDMDAT/PWM2
PORTA2	14	I/O	PA2/SCL1/I2SDOUT/PWM2/SSPDOUT/URXD0/URXD1/ANTCTL0/PDMCLK/PWM3
RF	15	AI/O	RF input and output
GND	16	GND	Ground

2.4 Application circuit



3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Continuous operation at or beyond these conditions may permanently damage the device.

Rating		Min	Max	Unit
Storage Temperature		-40	125	℃
Core Supply Voltage		0.9	1.3	V
I/O Voltage	ALDO_OUT	1.6	3.3	V
Supply Voltage	VBAT	2.5	4.3	V

3.2 Recommended Operating Conditions

Operating Condition		**Min**	**Typ**	**Max**	**Unit**
Operating Temperature Range		-20	20	105	℃
Core Supply Voltage		0.9	1.2	1.3	V
I/O Voltage	ALDO_OUT	1.6	2.9	3.3	V
Supply Voltage	VBAT	2.5	3.3	4.3	V
Charge input voltage	VCHG	4.75	5	5.25	V

3.3 Power Consumption

Operation Mode	Average	Maximum	Unit
TX peek current (0dB)		8	mA
RX peek current		9.7	mA
Deep sleep current (include 48K retention RAM)	6.1		μA
Power off	2.7		μA

3.4 Crystal oscillator

CLOCK SOURCE	Min	Typ	Max	Unit
Main Crystal OSC(12M/24Mhz) for Bluetooth RF application				
Clock Frequency	24	24	24	MHz
Digital rim range		7.5		pf
Trim step size		0.1		pf
Tolerance		+-10		ppm
Note: XTAL Load capacitance = 7.5pf				

Contact Information

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Feedback:

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