

PAN802154HAR00

2.4 GHz Low Power Module for the IEEE802.15.4 Standard

Introduction

Panasonic's PAN802154 Module is a Low Rate / Low Power communication device based upon the Freescale™ ZigBee Sensor Application Reference Design (SARD) development platform. It operates in the ISM 2.4 GHz band, and is fully compliant with the IEEE 802.15.4 standard. The PAN802154 is shipped ready to be downloaded with Freescale's 802.15.4 PHY/ MAC layer and the ZigBee protocol layer.

The module uses the Freescale's 802.15.4 transceiver (MC13193), micro controller (GT60) and is licensed to use all released Freescale ZigBee Protocol stack layer software. Further, the PAN802154 has an on-board RS-232 interface IC and two on-board printed antennae that are etched on both sides of the board for optimum RF sensitivity. The entire RF section is shielded to prevent RF leakage and further improve RF performance.

The PAN802154 is tested to fully comply with current FCC requirements for 2.4 GHz ISM band application allowing the customer to complete and bring the end product to the market much quicker. The application profile or program can be developed with in-house SW staff or with any third-party SW development contractor including Panasonic.

Features

- Fully supports ZigBee™, 802.15.4, or Simple MAC Application
- 2.4 GHz ISM, ZigBee™
- 16 Channels, 5MHz channel spacing, Full Spectrum Encode and Decode (IEEE Standard 802.15.4); up to 250 Kbps bit rate.
- RS-232 port; 2 Analog Inputs selectable to 10bit A/D Converter; and up to 8 Digital I/O ports on easy to connect header connector
- Background Debug Feature
- 1 Switch and 1 LED for control and monitoring
- Output power: 0dBm typical
- RX Sensitivity: -92dBm typical at 1.0% Packet Error Rate.
- Shielded RF Section for improved performance
- On board printed antennae or optional connector for external antennae
- Commercial and Industrial Operating Temperature Range
- Power Supply Range:
 - 2.2VDC to 3.4 VDC without using RS-232 capability
 - 3.0VDC to 3.4 VDC with using RS-232 capability

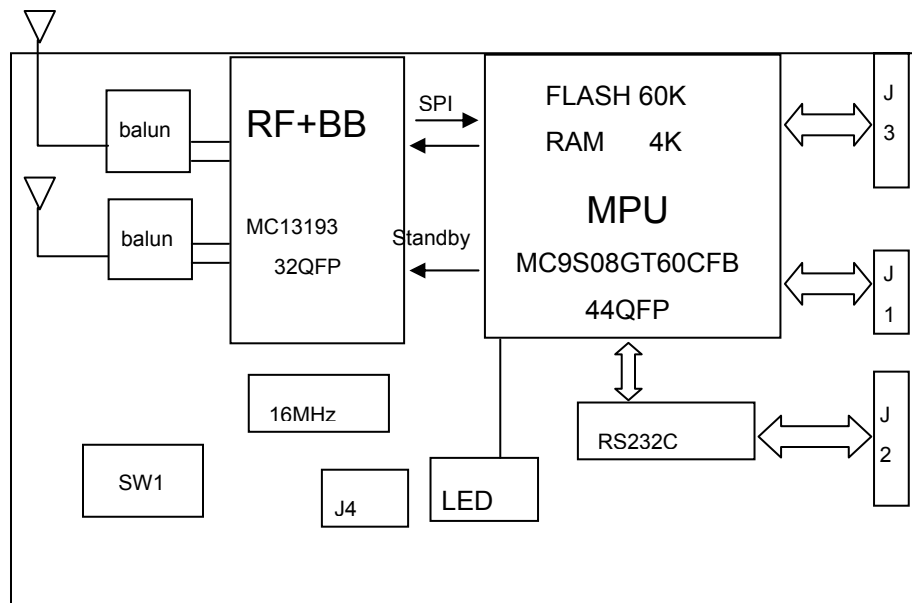


Figure One: Block Diagram

Absolute maximum ratings

Item	Rated value	Explanation
DC power supply	2.2V - +3.4V for radio communication 3.0V - +3.4V for RS-232 Operation	
Maximum Signal Input Level	-0.3V - +3.4V	At condition of -20 to +75 deg. C range
Rated DC current	100 mA	At condition of -20 to +75 deg. C range

RF performance

No	Item	Specification								condition
		-20 to +70 Deg C			-40 to +85 Deg C			802.15.4	Unit	
		Min	Typ	Max	Min	typ	Max			
1	Transmitting Power	-3	1*	3*	-3	1*	3*	-3	dBm	*Continuous when set PA to maximum output
2	Frequency tolance	-25		25	-40		40	+/-40	ppm	
3	6dB Bandwidth	0.5			0.5			0.5	MHz	FCC15.247
4	Receiver jamming resistance:Adjacent Channel rejection	0	23		0	23		0	dBr	+/-1 channel Selected channel -82dBm
5	Receiver jamming resistance Alternate Channel rejection	-30	-35		-30	-35		-30	dBr	+/-2 channel Selected channel -82dBm
6	Spurious Emission			-20			-20	-20	dBr	
7	Receiver sensitivity		-92			-92		-85	dBm	1% PER
8	DC Tx/Rx current		35	60**		35	60**	-	mA	**for Coordinator FFD
9	DC idle current									
	Without RS-232C		4.8	17		4.8	18		mA	Dependent upon the use of SMAC or ZB stacks
	With RS-232C		8.6	20		8.6	21		mA	
10	DC doze current		80			TBD		-	uA	Xtal ON, Clock out off

Components and Descriptions

J3: General Purpose Header

Header J3 is intended to be used as a general purpose I/O header. A power and GND pin are also provided to allow connection to external components.

Hdr. Pin #	MCU Port/Pin Name	Function	Remarks
J3-1	PTA7	General purpose digital I/O	Pins may be configured as active-high or active low external interrupts for J3-1 through J3-4. Pins J3-5 and J3-6 may be configured as active-low external interrupts
J3-2	PTA6		
J3-3	PTA5		
J3-4	PTA4		
J3-5	PTA0		
J3-6	PTA1		
J3-7	VDD	Digital Power Pin	To provide power external to PAN802154 or vice versa.
J3-8	GND	GND	
J3-9	PTB0	Analog input or general purpose digital I/O	Connected to MCU Analog-to-digital 10 bit A/D converter
J3-10	PTB1		

J3 Pin Out

J2: Serial Port Header

Header J2 is a serial port header for connection to a PC's serial port. The header contains an RS-232 level TX line, an RX line, and GND.

It is important to note that although the MCU and the Transceiver radio can work as low as 2.4 VDC, proper operation for RS-232 requires VCC to be greater than 3.0 volts DC.

Hdr. Pin #	RS-232 Pin Name	Function	Remarks
J2-1	-	N/C	
J2-2	-	N/C	
J2-3	RS232_TX	Transmit line for serial port	RS-232 level transmit signal
J2-4	-	N/C	
J2-5	RS232_RX	Receive line for serial port	RS-232 level receive signal
J2-6	-	N/C	
J2-7	-	N/C	
J2-8	-	N/C	
J2-9	GND	Ground	
J2-10	-	N/C	

J2 Pin Out

J4: Power/GND Header

Header J4 is the power connector for the PAN802154.

Hdr. Pin #	Pin Name	Function	Remark
J4-1	GND	Ground	
J4-2	VCC	VCC	Refer to specification for operating voltage
J4-3	GND	Ground	
J4-4	AD_REF	Analog-to-digital converter reference voltage	All analog signals are measured with respect to this voltage reference

J4 Pin Out

J1: BDM Programming header/Debugger

Header J1 provides the connection for the Flash programmer and software debugger.

Hdr. Pin #	Pin Name	Function	Remarks
J1-1	PTG0/BKG0	Serial Programming Line or General Purpose I/O	This line controls the loading of new program code to the MCU. Pin has 4.7K pull-up. After code is loaded, acts as digital I/O.
J1-2	GND	Ground	
J1-3	-	N/C	
J1-4	/RESET	Reset to MCU	Active-low reset
J1-5	-	N/C	
J1-6	VCC	Provides power to BDM debugger module	

J1 Pin Out

SW1: General Purpose Switch

SW1 is a general-purpose switch that connects to PTA2. Pressing the switch will pull the signal to GND. The internal pull-up for PTA2 must be enabled to use this switch in an application.

D1: LED

The LED is connected to PTD0 through a 330-ohm resistor. Setting the PTD0 pin to an output and setting the value high will turn on the LED. Setting the pin low will turn off the LED.

U4: MCU

U4 is the Micro-Controller Unit -- Freescale part number: MC9S08GT60CFB. It has an 8-bit microprocessor, 60K byte Flash, 4 K byte RAM, and a 10 bit A/D converter. In addition to its capability to process the 802.15.4 PHY/MAC and protocol stack, it still has plenty of processing power left to run simple, normal sensor/actuator applications.

U3: RF IC

U3 is the radio frequency transceiver --Freescale part number: MC13193. This transceiver together with U4 MCU forms a fully compliant IEE 802.15.4 IEEE Standard radio. The whole RF section that encompasses U3, all passive components and baluns are shielded to improve overall RF performance.