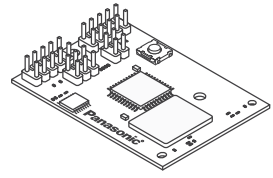


# Panasonic<sup>®</sup> ZigBee™ Communication Module IEEE 802.15.4



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. It's shipped ready to be downloaded with Freescale's 802.15.4 PHY/MAC layer and the ZigBee protocol layer. The module uses Freescale's 802.15.4 transceiver (MC13193), microcontroller (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 antennas 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. 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, 5 MHz 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: -92 dBm typical at 1.0% Packet Error Rate • Shielded RF Section for improved performance • On board printed antenna or optional connector for external antenna • Commercial and Industrial Operating Temperature Range • Power Supply Range: 2.2VDC to 3.4VDC without using RS-232 capability; 3.0 VDC to 3.4 VDC with using RS-232 capability **Applications:** • Home Automation/Appliance control and monitoring • Industrial/Security/Asset Tracking • Commercial/Electronic Labeling • Medical/Patient Monitor (non-critical) **Performance Specifications:** • **Dimensions:** 48mm x 34mm x 3mm (with onboard printed antennas) • **Operating Voltage:** 2.2 ~ 3.4 Volts DC • **Operating Temperature:** -20°C ~ 70°C • **Power Consumption:** Tx: 35mA Max., Rx: 40mA Max. • **Hybernate/Doze:** Dormant is less than 100µa • **Output RF Power:** 0 dBm typical, 3 dBm max. • **Receive Sensitivity:** -92 dBm typ. • **CPU with 4K RAM; 60K Flash; 8 bit** • **Bit Rate:** 250 Kbits/sec., 128 bytes/4ms • **Interface:** RS-232 Header, Header connector for 8 digital I/Os; and 2 analog inputs (2 ports - 10 bit A/D Converter)

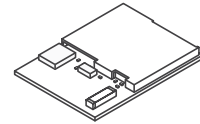


**P13479-ND** ..... \$27.40

## ZigBee™ Modem PAN455



The PAN455 module is a short range, low power, 2.4GHz ISM band transceiver which includes a complete 802.15.4 physical layer (PHY) modem. Designed for the IEEE 802.15.4 wireless standard, an appropriate microcontroller (MCU) with reference oscillator provides a cost effective solution for short-range data links and networks. Demo software is included and can be scaled to fit the application from simple point to point proprietary systems to ZigBee networking. This module complies to EN300328, ARIB STD-T66 and is FCC Part 15 Certified. **Features:** • Very small size (12.2mm x 16.4mm x 2.2mm) • 2 antenna options: Single port 50Ω or ceramic antenna • 16 selectable channels with 250 kbps in the 2.4GHz band • Low power modes for increased battery life • High sensitivity of -92 dBm typical at 1% Packet Error Rate • 0 dBm typical output power programmable over a 30 dB range • Low supply voltage (2.0V ~ 3.4V, 2.7V typical) • Link Quality and Clear Channel Assessment capability • 60K Flash and 4K RAM memory • 4 channel A/D converter with 10 bit for fast and easy conversion from analog inputs-such as temperature, pressure and fluid levels-to digital values • 3 channel 16 bit timer/pulse width modulation (TPM) outputs • BDM port for direct download programming • In total 20 digital I/O lines with programmable pull-ups and few with high-current driver • **Operating Temperature Range:** -40°C ~ 85°C **Applications:** • Remote control and wire replacement in industrial systems such as wireless sensor networks • Factory/home automation and motor/lighting control • Inventory management and RF ID tagging and AMR • Environmental, patient, or fitness monitoring

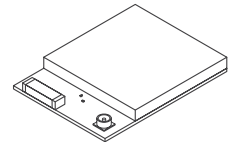


Description	Digi-Key Part No.	1	10	25	Digi-Key Part No.	Tape and Reel Pricing 500	Panasonic Part No.
2.4GHz Module with Antenna.....	P13683CT-ND	18.42	17.05	15.78	P13683TR-ND	7197.00	ENWC9A08A3EF
2.4GHz Module with SMD Pad.....	P13684CT-ND	18.42	17.05	15.78	P13684TR-ND	7197.00	ENWC9A09N4EF

## ZigBee™ Modem PAN4570



The PAN4570 module is a short range, low power, 2.4GHz ISM band transceiver using the Ember™ EM250 single chip solution for ZigBee, an IEEE802.15.4 compliant transceiver with a 16 bit XAP2b microprocessor. With an added onboard reference oscillators and optimized RF frontend circuitry PAN4570 provides the complete hardware needed for a ZigBee solution. PAN4570 utilizes EmberNet (sold separately), the Ember ZigBee compliant software stack, which is a ZigBee profile-ready platform compliant solution. A reliable Application Programming Interface based on the ZigBee specification is provided for the ease of the creation of application profiles. Additional regulator and 32kHz crystal can be mounted in addition on customer demand. **Features:** • 3 antenna options: Plug, single port 50Ω or ceramic antenna • 16 selectable channels with 250 kbps in the 2.4GHz band • 3 different power modes for increased battery life • High sensitivity of -98 dBm typical at 1% Packet Error Rate • +3 dBm output power (+5 dBm in boost mode) • Low supply voltage (2.1V ~ 3.6V, 3.0V typical) • Small size (20.0mm x 26.5mm x 3.0mm) • Onboard low power regulator • 128K Flash and 5K SRAM memory • Link quality and clear channel assessment capability • All of the 17 GPIO of EM250 are available at the module pads, which are multiplexed to GPIO, UART, SPI, I2C or up to four analog inputs to an ADC and two timer waveform outputs • Critical portions of IEEE802.15.4-2003 plus a first-line filter for non-intended packets are realized in hardware, thus reducing the workload on the µC • **Operating Temperature Range:** -40°C ~ 85°C **Applications:** • Remote control and wire replacement in industrial systems such as wireless sensor networks • Factory/home automation and motor/lighting control • Inventory management and RF ID tagging and AMR • Environmental, patient, or fitness monitoring



Description	Digi-Key Part No.	1	10	25	Digi-Key Part No.	Tape and Reel Pricing 500	Panasonic Part No.
2.4GHz Ember Module with Antenna.....	P13685CT-ND	34.52	31.94	29.56	P13685TR-ND	13485.50	ENWC9A02A3E
2.4GHz Ember Module U.FL.....	P13686CT-ND	34.52	31.94	29.56	P13686TR-ND	13485.50	ENWC9A03N2E
2.4GHz Ember Module SMD Pad.....	P13687CT-ND	34.52	31.94	29.56	P13687TR-ND	13485.50	ENWC9A04N4E

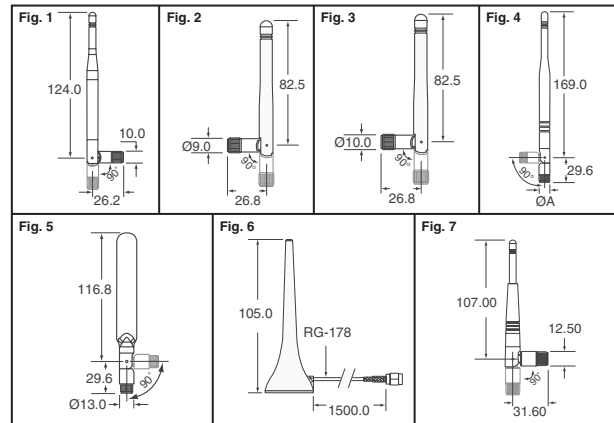
## Pulse<sup>®</sup> Wireless Antennas



**Features:** • For WLAN devices using WiFi (802.11) Bluetooth® and ZigBee™ • Omni-Directional radiation pattern provides broad 360° coverage • One-quarter wavelength dipole configuration (one-eighth for W1043) • Reverse SMA (Female) • Polarization: Vertical • Radiation: Omni • Color: Black

Fig.	Frequency	Gain (dBi)	Impedance (NOM)	VSWR	Dim. A (mm)	Digi-Key Part No.	Price Each	1	10	100	500	Pulse Part No.
1	2.4 - 2.5 GHz	3.2	50Ω	≤1.9	—	553-1310-ND	4.65	3.10	2.48	2.21	1.96	W1027
2	2.4 - 2.5 GHz	2.0	50Ω	≤2.0	—	553-1471-ND†	5.08	3.50	2.89	2.54	2.16	W1010
3	2.4 - 2.5 GHz	2.0	50Ω	≤2.0	—	553-1309-ND	4.05	2.70	2.21	1.96	1.96	W1030
4	2.4 - 2.5 GHz	3.2	50Ω	≤2.0	12.5	553-1311-ND	5.70	3.71	3.04	2.71	2.46	W1037
	2.4 - 2.5 GHz	4.9	50Ω	≤2.0	12.5	553-1476-ND	6.37	4.66	3.80	3.43	3.08	W1038
	860 - 928 MHz	1.0	50Ω	≤2.0	14.0	553-1473-ND	5.27	3.81	3.12	2.78	2.53	W1047
	902 - 928 MHz	3.0	50Ω	≤2.0	14.0	553-1474-ND	7.54	5.51	4.50	4.06	3.61	W1063
5	2.4 and 5.0 GHz	2.0	50Ω	≤2.0	—	553-1313-ND*	6.90	4.37	3.57	3.22	2.97	W1043
6	2.4 and 5.0 GHz	2.0	50Ω	≤2.0	—	553-1472-ND*	9.24	6.93	5.78	5.39	4.94	W1045
7	2.4 - 2.5 GHz	2.0	50Ω	≤2.0	—	553-1475-ND	4.81	3.42	2.80	2.50	2.25	W1034

\* Dual-band, blade style antenna † Standard SMA (Male) Connector



## Radios.INC Receiver and Transmitter Modules

Radios Inc. provides receiver and transmitter modules based on the Micrel RF line of products for applications like keyless entry, remote access, periodic data transfer, and many more. The relay modules provide a decoder along with the receiver IC, allowing for control of powered systems remotely. The handheld transmitters provide a 2-button interface for remote communication with the desired receiver with the

appropriate decoder. The HHDS-ML development systems provide an evaluation environment for range, firmware, and electrical testing. The DS-ML development systems include a breadboarding area and higher functionality testing of the devices. The HHDS-ML and DS-ML allow for development with any of the pinned receiver/transmitter modules, which are purchased separately.

Frequency (MHz)	Description	Package	Digi-Key Part No.	1	Price Each	25	100	Radios Inc. Part No.
<b>Receiver Modules</b>								
433	Receiver Module OOK	18-DIP	694-1000-ND	9.16	8.39	7.07	6.07	MRX-001-433DR-B
	Receiver Module ASK/OOK	18-DIP	694-1001-ND	9.02	8.26	6.96	5.96	MRX-010-433DR-B
	Receiver Module OOK	18-DIP	694-1002-ND	9.03	8.27	6.97	5.97	MRX-011-433DR-B
	Receiver Module OOK	18-DIP	694-1003-ND	8.99	8.23	6.94	5.94	MRX-002-433DR-B
	Receiver Module OOK with SAW Filter and Low Noise Amp (LNA)	24-DIP	694-1004-ND	15.27	13.98	11.78	10.08	MRX-002SL-433DR-B

\*Requires the purchase of desired transmitter/receiver module(s) to operate

(Continued)

More Product Available Online: [www.digkey.com](http://www.digkey.com)

**B**

Frequency (MHz)	Description	Package	Digi-Key Part No.	1	25	100	Part No.
433	Receiver Module OOK	18-DIP	694-1007-ND	9.00	8.24	6.94	MRX-007-433DR-B
	Receiver Module OOK	18-DIP	694-1008-ND	8.11	7.43	6.26	MRX-008-433DR-B
	Receiver Module OOK	18-DIP	694-1009-ND	9.00	8.24	6.94	MRX-009-433DR-B
	Receiver Module OOK with SAW Filter and Low Noise Amp (LNA)	24-DIP	694-1010-ND	12.91	11.82	9.96	MRX-009SL-433DR-B
915	Receiver Module OOK	18-DIP	694-1005-ND	9.82	8.99	7.58	MRX-005-915DR-B
	Receiver Module OOK with SAW Filter and Low Noise Amp (LNA)	24-DIP	694-1006-ND	14.15	12.95	10.91	MRX-005SL-915DR-B
<b>Transmitter Modules</b>							
433	Transmitter Module OOK	18-DIP	694-1011-ND	8.33	7.63	6.43	MTX-102-433DR-B
	Transmitter Module ASK/FSK	24-DIP	694-1013-ND	20.71	18.95	15.97	MTX-405-433DR-B
915	Transmitter Module OOK/ASK	18-DIP	694-1012-ND	10.06	9.21	7.76	MTX-103-915DR-B
<b>Transceiver Module</b>							
915	Transceiver Module FSK	24-DIP	694-1014-ND	25.84	23.65	19.93	MXR-505-915DR-B
<b>Remote Control Receiver Modules</b>							
—	Remote Control Receiver Module, 3-Relay Radios Inc Decoder	—	694-1015-ND	55.74	—	—	RCR-ML-010RI-3
	Remote Control Receiver Module, 3-Relay Keeloq Decoder	—	694-1016-ND	55.74	—	—	RCR-ML-010KL-3
	Remote Control Receiver Module, 3-Relay Holtek Decoder	—	694-1017-ND	56.13	—	—	RCR-ML-010HT-3
<b>Handheld Transmitters</b>							
433	2-Button Keyfob Transmitter, Radios Inc Encoder	—	694-1018-ND	20.44	—	—	HHTX-102-433RI-2B
	2-Button Keyfob Transmitter, Keeloq Encoder	—	694-1019-ND	21.49	—	—	HHTX-102-433KL-2B
	2-Button Keyfob Transmitter, Holtek Encoder	—	694-1020-ND	22.48	—	—	HHTX-102-433HT-2B
915	2-Button Keyfob Transmitter, Radios Inc Encoder	—	694-1021-ND	21.01	—	—	HHTX-103-915RI-2B
	2-Button Keyfob Transmitter, Keeloq Encoder	—	694-1022-ND	22.07	—	—	HHTX-103-915KL-2B
	2-Button Keyfob Transmitter, Holtek Encoder	—	694-1023-ND	23.05	—	—	HHTX-103-915HT-2B
<b>RF Development Systems for Modules</b>							
—	Microchip PIC MCU, 1-Unit	—	694-1024-ND*	95.00	—	—	HHDS-ML-P1
	Microchip PIC MCU, 2-Unit	—	694-1025-ND*	149.00	—	—	HHDS-ML-P2
	Texas Instrument MSP430 MCU, 1-Unit	—	694-1026-ND*	95.00	—	—	HHDS-ML-M1
	Texas Instrument MSP430 MCU, 2-Unit	—	694-1027-ND*	149.00	—	—	HHDS-ML-M2
	Microchip PIC MCU, 1-Unit	—	694-1028-ND*	149.00	—	—	DS-ML-P1
—	Microchip PIC MCU, 2-Unit	—	694-1029-ND*	295.00	—	—	DS-ML-P2
	Texas Instrument MSP430 MCU, 1-Unit	—	694-1030-ND*	149.00	—	—	DS-ML-M1
	Texas Instrument MSP430 MCU, 2-Unit	—	694-1031-ND*	295.00	—	—	DS-ML-M2

\*Requires the purchase of desired transmitter/receiver module(s) to operate

## RF Encoder/Decoder Chipset

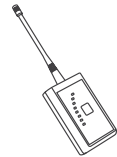
The RF Solutions RF600E and RF600D are easy to use encoder and decoder ICs. They have been designed to achieve the maximum possible range from any radio/InfraRed transmitter/receiver set. Unlike other encoder/decoder devices, the RF600E/600D provide an unprecedented level of security which prevents copying or grabbing while also obtaining optimum range from the transmitter and receiver.

**Features:** Highly secure KEELOQ® protocol • Simple to use • Stand Alone operation • Achieves maximum range from RF modules • Decoder serial output • LED indication of transmission • Directly compatible with KEELOQ® decoder • Easy learn feature of transmitters

<b>RF600D-ND</b>	Receiver/Decoder 18-DIP.....	\$8.95
<b>RF600E-ND</b>	Transmitter/Encoder 8-DIP.....	\$4.50

## Hand Held RF Meter

A miniature RF meter which can be used to show the presence of a radio signal. Briefly press the power switch and the LED bargraph shows RF activity within the local environment. The peak signal is held for one second. This can be invaluable when installing a radio system to determine if other RF signals are present (interference) and also validate the signal strength of the radio transmitter to be installed.



<b>006-315R1-ND</b>	Hand Held RF Meter 315MH.....	\$125.00
<b>006-433R2-ND</b>	Hand Held RF Meter 433MH.....	\$125.00

## Wireless Communication

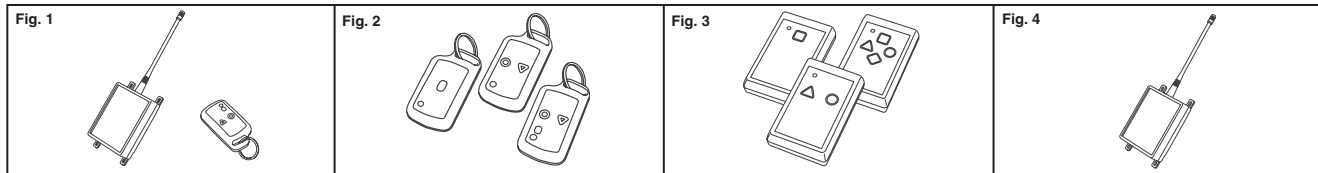


Fig.	Description	Freq. (MHz)	Digi-Key Part No.	Price Each
<b>Remote Control Systems</b>				
<b>AM Keyfob Systems</b>				
1	1 Channel System, 12/24Vdc	315	118C1-315AR1-ND	114.50
	3 Channel System, 12/24 Vdc	315	118C3-315AR1-ND	130.25
2	AM Keyfob Transmitter, 1 Button	315	AM110C1-315-ND	21.25
	AM Keyfob Transmitter, 2 Button	315	AM110C2-315-ND	22.10
	AM Keyfob Transmitter, 3 Button	315	AM110C3-315-ND	22.85
—	RF Receiver/Decoder Hybrid	315	AMHIRK-315AR3-ND	34.20
<b>FM Keyfob Systems</b>				
3	FM Handheld Transmitter, 1 Switch	315	102C1-315FR1-ND	80.00
	FM Handheld Transmitter, 2 Switch	315	102C2-315FR1-ND	88.00
	FM Handheld Transmitter, 4 Switch	315	102C4-315FR1-ND	96.00
4	FM Remote Receiver Decoder	315	008-315F-ND	144.00
<b>AM Radio Modules</b>				
<b>AM Super Hetrodyne Receivers</b>				
—	Superhetrodyne Receiver	315	AMRRQ3-315-ND	18.95
	Superhetrodyne Receiver	433	AMRRQ3-433-ND	16.75
<b>AM Miniature Super Regenerative Receiver</b>				
—	SuperRegen Receiver, Miniature	433	AMHRR30-433-ND	10.95
<b>AM Super Regenerative Receiver Modules</b>				
—	SuperRegen Receiver	315	AMHRR3-315-ND	10.49
	SuperRegen Receiver	433	AMHRR3-433-ND	10.49

Fig.	Description	Freq. (MHz)	Digi-Key Part No.	Price Each
<b>4 Pin Hybrid Transmitter Modules</b>				
—	Hybrid Transmitter Module, DIL Package	315	AMRT4-315-ND	9.99
	Hybrid Transmitter Module, DIL Package	433	AMRT4-433-ND	9.99
<b>FM Radio Modules</b>				
<b>FM Hybrid Transmitter and Receiver Modules</b>				
—	FM Transmitter, DIL Package	315	FMRTFQ1-315-ND	13.95
	FM Transmitter, DIL Package	433	FMRTFQ1-433-ND	12.99
	FM Transmitter, SIL Package	433	FMRTFQ2-433R-ND	13.50
	FM Receiver, SIL Package	315	FMRRFQ1-315-ND	28.25
	FM Receiver, SIL Package	433	FMRRFQ1-433-ND	25.75
	FM Receiver, SIL Package	433	FMRRFQ2-433-ND	22.15
<b>FM Transceiver Module</b>				
—	Transceiver Module, 2 Channels	433	FMRXQ1-433-ND	43.75
<b>RF KEELOQ® Evaluation Kits</b>				
—	RF KEELOQ® Evaluation Kit	315	RFEVAL2-315-ND	350.00
	RF KEELOQ® Evaluation Receiver	—	RFEVAL3-ND*	99.75
<b>Book</b>				
—	Introduction to Low Power Radio Book	—	BK-RADIO-ND	33.50

\*PCB Assembly only (RF Modules and antenna not supplied)

More Product Available Online: [www.digikey.com](http://www.digikey.com)

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