DNT90CA
DNT90PA

Low Cost 900 MHz FHSS Transceiver Module with I/O

- ***900 MHz Frequency Hopping Spread Spectrum Transceiver***
- ***Point-to-point, Point-to-multipoint, Peer-to-peer and Store & Forward Capabilities***
- ***Transmitter Power Configurable to 40 or 158 mW***
- ***Built-in 0 dBi Chip Antenna***
- ***100 kbps RF Data Rate***
- ***128-Bit AES Encryption***
- ***Separate Serial Port for Diagnostics***
- ***Analog and Digital I/O for Sensor Applications***
- ***FCC and Canadian IC Certified for Unlicensed Operation***

The DNT90CA and DNT90PA FHSS transceiver modules provides a low-cost, versatile solution for wireless data communications in the 900 MHz ISM band. The DNT90CA/PA RF output power can be set at 40 or 158 mW. The DNT90CA/PA receiver input is protected by a low-loss SAW filter, providing an excellent combination of receiver sensitivity and out-of-band interference rejection. The DNT90CA/PA modules include analog, digital and serial I/O, providing the flexibility to serve applications ranging from cable replacements to sensor networks. The built-in chip antenna makes these modules very easy to integrate.



DNT90CA/PA Absolute Maximum Ratings

Rating	Value	Units
Power Supply Input	-0.5 to +6.5	V
All Input/Output Pins	-0.5 to +3.3	V
Non-Operating Ambient Temperature Range	-40 to +85	°C

DNT90CA/PA Electrical Characteristics

Characteristic	Sym	Notes	Minimum	Typical	Maximum	Units
Operating Frequency Range			902.76		927.24	MHz
Hop Duration		1	8		100	ms
Number of RF Channels		1	25, 26 or 52			
Modulation			FSK			
RF Data Transmission Rate			100			kbps
Receiver Sensitivity @ 10^{-5} BER				-100		dBm
Transmitter RF Output Power		1	40 or 158 mW			mW
Antenna			0 dBi Dielectric Chip Antenna			
System Topologies			Point-to-Point, Point-to-Multipoint, Peer-to-Peer and Store & Forward			
Access Scheme			Ad Hoc TDMA			

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DNT90CA/PA Electrical Characteristics

Characteristic	Sym	Notes	Minimum	Typical	Maximum	Units
ADC Input Range			0		2.7	V
ADC Input Resolution					12	bits
ADC Sample Rate				100		Hz
Signal Source Impedance for ADC Reading					10	KΩ
ADC External Reference Voltage Range			1.0		2.7	V
DAC Output Range			0		3.3	V
DAC Output Resolution					12	bits
Primary and Diagnostic Serial Port Baud Rates			1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 28.8, 38.4, 57.6, 115.2, 230.4, 250.0			kbps
Serial Peripheral Interface Data Rate			125		500	kbps
Digital I/O:						
Logic Low Input Level			-0.5		0.8	V
Logic High Input Level			2.45		3.3	V
Logic Input Internal Pull-up Resistor				20		KΩ
Power Supply Voltage Range	V_{CC}		+3.3		+5.5	Vdc
Power Supply Voltage Ripple					10	mV_{P-P}
Peak Transmit Mode Current, 158 mW Output					170	mA
Average Operating Receive Current:						
Base, Continuous Data Stream				110		mA
Remote, Linked, No Data Transmission				15		mA
Remote, Continuous Data Stream				25		mA
Sleep Current		2		3	6	µA
DNT90CA Mounting			Reflow Soldering			
DNT90PA Mounting			Socket			
Operating Temperature Range			-40		85	°C
Operating Relative Humidity Range, Non-condensing			10		90	%

Notes:

1. The DNT90CA/PA achieves regulatory certification under FHSS rules.
2. Maximum sleep current occurs at +85 °C.

CAUTION: Electrostatic Sensitive Device. Observe precautions when handling.

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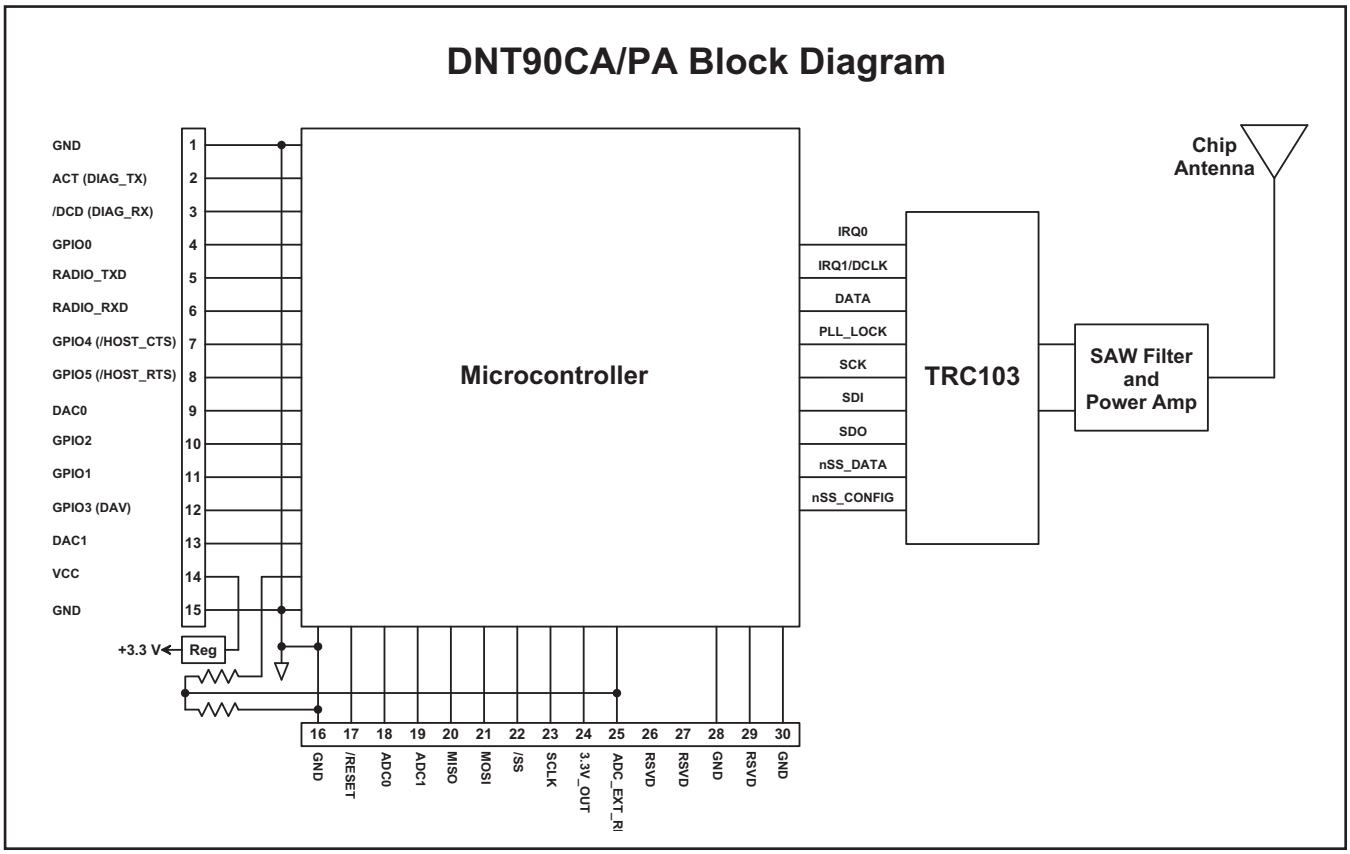


Figure 1

DNT90CA/PA Hardware

The major components of the DNT90CA/PA series radios include an RFM TRC103 900 MHz FHSS transceiver, and a low current 8-bit microcontroller. DNT90CA/PA radios operate in the 902 to 928 MHz ISM band. There are three selectable hopping patterns providing compatibility with frequency allocations in North America, South America and Australia. DNT90CA/PA radios also have two selectable output power levels: +16 dBm (40 mW) and +22 dBm (158 mW).

The DNT90CA/PA receiver is protected by a low-loss SAW filter, providing an excellent blend of receiver sensitivity and out-of-band interference rejection. All DNT90CA/PA configurations include a built-in chip antenna that simplifies integrating a DNT90CA/PA module into an application.

DNT90PA/CA radios provide a variety of hardware interfaces. There are two serial ports plus one SPI port. Either the primary serial port or the SPI port can be selected for data communications. The second serial port is dedicated to diagnostics. The primary and diagnostic serial ports support most standard baud rates up to 250 kbps. The SPI port supports data rates up to 500 kbps. DNT90CA/PA radios also include three ADC inputs, two DAC outputs, and six general-purpose digital I/O ports. Four of the digital I/O ports support an optional interrupt-from-sleep mode when configured as inputs. DNT90A radios are available in two mounting configurations. The DNT90CA is designed for solder reflow mounting. The DNT90PA is designed for plug-in connector mounting.

DNT90CA/PA Firmware

DNT90CA/PA firmware operates using Ad Hoc TDMA channel access optimized for periodic burst transmissions. DNT90CA/PA firmware operates “out of the box” using point-to-point transparent serial mode, with point-to-multipoint, peer-to-peer and store & forward system topologies also supported.

DNT90CA/PA firmware provides the user with a rich set of configuration options including a choice of hopping patterns, hopping dwell times, serial and/or SPI data port operation, serial and SPI data rate selection, RF output power selection, plus configurable analog and digital I/O lines. Data integrity is protected by 24-bit error detection, with optional ACK and automatic transmission retries or redundant transmissions. 128-bit AES encryption provides a high level of data security for sensitive applications. Sensor networks can take advantage of timer or event-based data reporting and remote node sleep cycling for extended battery life.

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DNT90CA/PA I/O Descriptions

Pin	Name	I/O	Description
1	GND	-	Power supply and signal ground. Connect to the host circuit board ground.
2	ACT (DIAG_TX)	O (O)	This pin's default configuration is data activity output. On a base, this signal blinks when a valid packet is received. On a remote, this signal blinks when a packet is transmitted. On a router, this signal blinks when a valid upstream packet is received or a downstream packet is transmitted. Alternate pin function is the diagnostic serial port output.
3	/DCD (DIAG_RX)	O (I)	This pin's default configuration is data carrier detect output. On a base, this signal is asserted when any valid packet is received, and is cleared if no packets are heard for the configured router/remote registration time-out interval. On a router or remote, this signal is asserted when the radio obtains hopping pattern synchronization, and remains asserted until no beacons are heard for 50 hops. Alternate pin function is the diagnostic serial port input.
4	GPIO0	I/O	Configurable digital I/O port 0. When configured as an input, an internal pull-up resistor can be selected and direct interrupt from sleep can be invoked. When configured as an output, the power-on state is configurable. In sleep mode the pin direction, input pull-up selection or output state are also separately configurable.
5	RADIO_TXD	O	Serial data output from the radio.
6	RADIO_RXD	I	Serial data input to the radio.
7	GPOI4 (/HOST_CTS)	I/O (O)	Default pin function is GPIO4 with the same configuration options as GPIO2. Alternate pin function is UART/SPI flow control output. The module sets this line low when it is ready to accept data from the host on the RADIO_RXD or MOSI input. When the line goes high, the host must stop sending data.
8	GPOI5 (/HOST_RTS)	I/O (I)	Default pin function is GPIO5 with the same configuration options as GPIO2. Alternate pin function is UART/SPI flow control input. The host sets this line low to allow data to flow from the module on the RADIO_TXD pin. When the host sets this line high, the module will stop sending data to the host.
9	DAC0	O	12-bit DAC 0 output. Full scale output can be referenced to the voltage at pin 25 or the 3.3 V regulated module bus voltage.
10	GPIO2	I/O	Configurable digital I/O port 2. Same configuration options as GPIO0.
11	GPIO1	I/O	Configurable digital I/O port 1. Same configuration options as GPIO0.
12	GPIO3 (DAV)	I/O (O)	Default pin function is GPIO3 with the same configuration options as GPIO0. When SPI slave mode operation is enabled, a logic high on this pin indicates when data is available to be clocked out by the SPI master.
13	DAC1	O	12-bit DAC 1 output. Same specifications and configuration options as DAC0.
14	VCC	I	Power supply input, +3.3 to +5.5 Vdc.
15	GND	-	Power supply and signal ground. Connect to the host circuit board ground.
16	GND	-	Power supply and signal ground. Connect to the host circuit board ground.
17	/RESET	I	Active low module hardware reset.
18	ADC0	I	ADC input 0. This pin is a direct ADC input when the ADC is operating in single-ended mode, or the differential negative input for positive inputs applied to ADC1 or ADC2 when the ADC is operating in differential mode. Full-scale reading can be referenced to Pin 25 for ratiometric measurements. For absolute measurements, the ADC can use the regulated supply voltage divided by 1.6 (about 2.06 V), or an external voltage applied to Pin 25. In single-ended mode, ADC measurements are 11-bit unsigned values with full scale nominally 2.7 V when referenced to a 2.7 V input on Pin 27. In differential mode, ADC measurements are 12-bit signed values.
19	ADC1	I	ADC input 1. Direct input when the ADC is operating in single-ended mode, positive differential input relative to ADC0 when the ADC is operating in differential mode.
20	MISO	I/O	This pin is the SPI master mode input or slave mode output.
21	MOSI	I/O	This pin is the SPI master mode output or slave mode input.
22	/SS	I/O	SPI active low slave select. This pin is an output when the module is operating as a master, and an input when it is operating as a slave.

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Pin	Name	I/O	Description
23	SCLK	I/O	SPI clock signal. This pin is an output when operating as a master, and an input when operating as a slave.
24	ADC2	I	ADC input 2. Direct input when the ADC is operating in single-ended mode, positive differential input relative to ADC0 when the ADC is operating in differential mode.
25	ADC_EXT_REF	I/O	ADC external reference voltage pin. The voltage at this pin can be used by the ADCs as a reference for ratiometric measurements. With no external voltage or load applied, this pin presents a nominal 2.7 V output through a 2.126 K source resistance. A low impedance external reference voltage in the range of 1 to 2.7 V may be applied to this pin as an option.
26	RSVD	-	Reserved pin. Leave unconnected.
27	RSVD	-	Reserved pin. Leave unconnected.
28	GND	-	Connect to the host circuit board ground plane.
29	RSVD	-	Reserved pin. Leave unconnected.
30	GND	-	Connect to the host circuit board ground plane.

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DNT90CA Outline and Mounting Dimensions

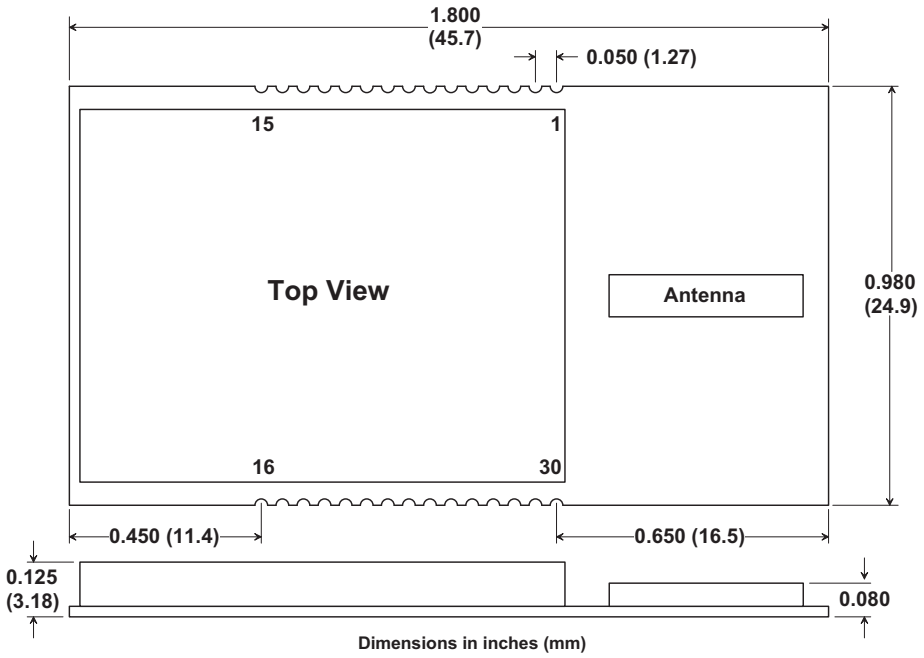


Figure 2

DNT90CA Solder Pad Dimensions

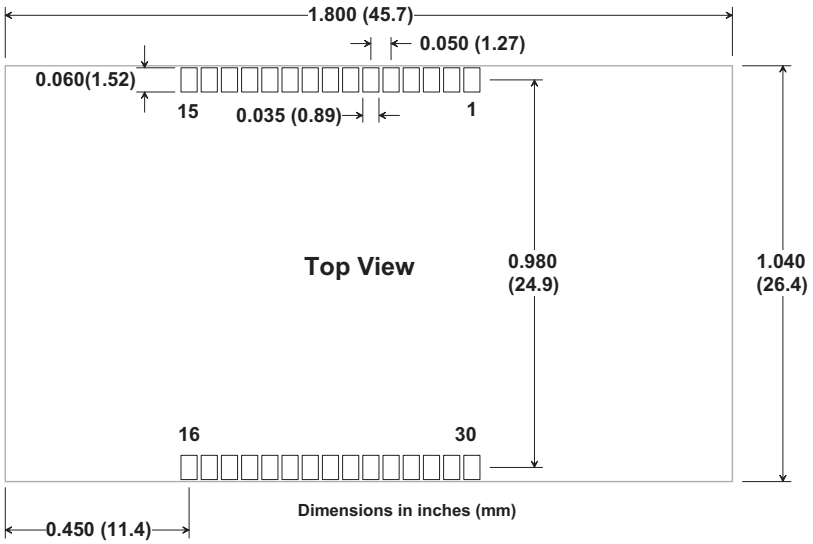


Figure 3

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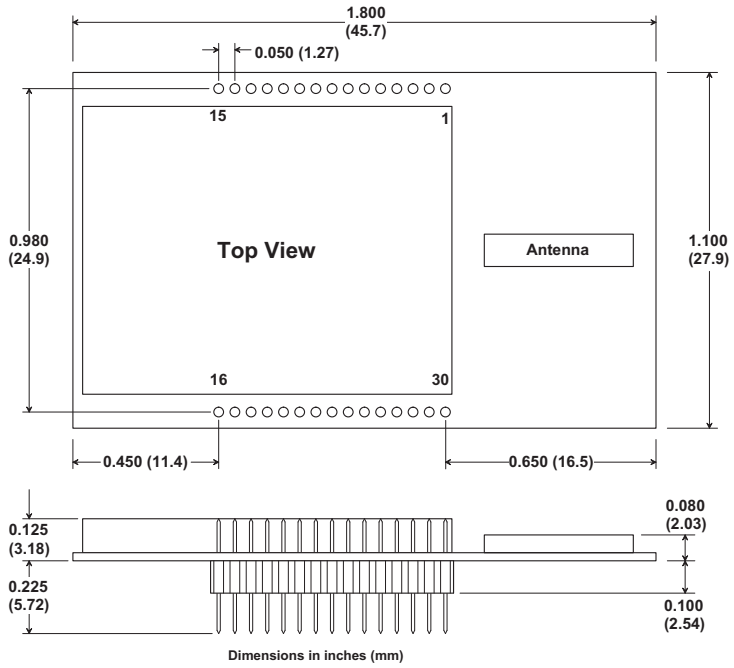


Figure 4

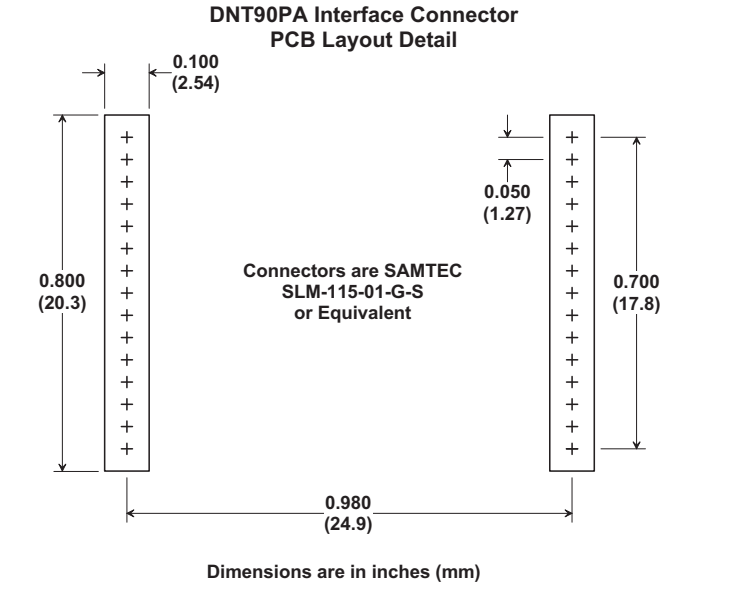


Figure 5

Note: Specifications subject to change without notice.

Part # M-0090-0000A, Rev A

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