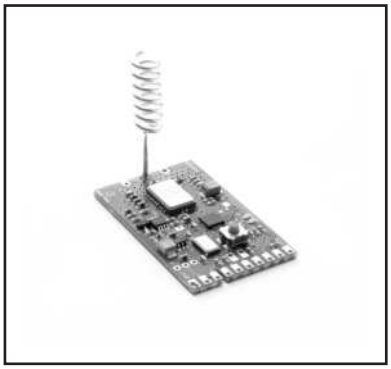
DM1810-916MN

916.50 MHz Transceiver Module

- ***Field Node with Host Serial Interface***
- ***Compatible with RFM miniMESH™ Network Protocol***
- ***3 V, Very Low Current Operation***
- ***Ready-to-Use OEM Module***



The DM1810-916MN is the 916.50 MHz field node module in the DM1810 family of RF transceivers. The DM1810 family is designed for adding wireless mesh network connectivity to a wide range of monitoring and control systems. The DM1810-916MN is equipped with a serial I/O port to interface a host microcontroller. The module also includes an analog input, a logic input, and a logic output for monitoring and control. Radio communications range in an "open field" environment is typically 600 meters/hop. The DM1810-916MN combines RFM's very low current ASH radio technology with low power microcontroller technology to achieve long battery life. This module is compatible with RFM miniMESH™ network protocol, which provides "plug-and-play" multicast mesh network routing. The DM1810-916MN is certified for operation under FCC 15.247 and Canadian RSS 210 regulations.

Absolute Maximum Ratings

Rating	Value	Units
All Input/Output Pins Except VIN	-0.3 to +3.3	V
Non-Operating Ambient Temperature Range	-40 to 85	°C

Electrical Characteristics

Characteristic	Sym	Notes	Minimum	Typical	Maximum	Units
Operating Frequency	f_O		916.30		916.70	MHz
Modulation Type				OOK on BPSK Spreading Code		
RF Encoded Data Transmission Rate				4.8		kb/s
Average Receive Input Current, No External Power Supply Load	I_R			5.5		mA
Receiver Input Signal for 10^{-3} BER, 25 °C				-100		dBm
Average Transmit Input Current, No External Power Supply Load	I_{TA}			15.75		mA
Peak Transmit Input Current, No External Power Supply Load	I_{TP}				32	mA
Peak Transmitter Output Power	P_O			10		mW
Analog Input Measurement Range (10-bit ADC)			0		VOUT	V
Analog Input Signal Source Impedance					10	K
Bind Input, Digital Input and Serial RX Logic High			2.4			V
Bind Input, Digital Input and Serial RX Logic Low					0.45	V
Digital Output and Serial TX Logic High, No Load			2.4			V
Digital Output and Serial TX Logic Low, No Load					0.3	V

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Electrical Characteristics

Characteristic	Sym	Notes	Minimum	Typical	Maximum	Units
Digital Output Source Current, 1K load				1.1		mA
Digital Output Sink Current, 1K load				1.2		mA
Serial Port Data Rate			1.2		9.6	kb/s
Average Sleep Input Current, No External Power Supply Load	I_{SA}			60		µA
Power Supply Input Voltage Range, -40 to +85 °C	VIN		3.1		10	V
Power Supply Input Voltage Range, 0 to +85 °C	VIN		2.6		10	V
Regulated Power Supply Output Voltage, VIN 3.1 to 10 V	VOUT			3.0		Vdc
Regulated Power Supply Voltage Ripple					10	mV_{P-P}
Relative Humidity Range, Non-Condensing	RH		10		90	%

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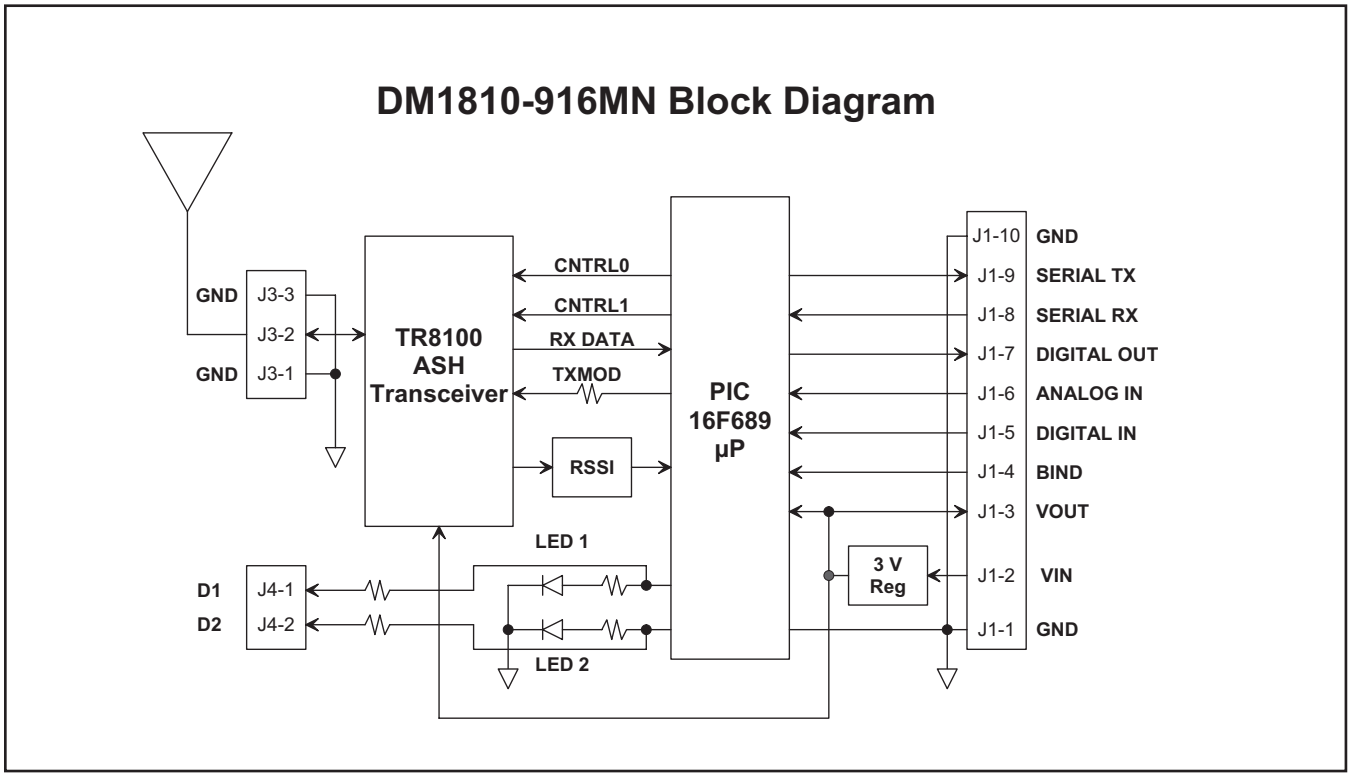


Figure 1

Theory of Operation

The major components of the DM1810-916MN include an RFM TR8100 ASH transceiver and a Microchip PIC16F689 microcontroller. The TR8100 operates on a frequency of 916.50 MHz, at a nominal output power of 10 mW.

The 16F689 provides a 9.6 kb/s serial interface for communication with a host microcontroller. A companion interface board, the IM1800, is available with USB bridge circuitry to interface the DM1810-916MN to a host PC. Three of the 16F689 I/O pins are configured for external monitoring or control. *Digital In* is configured as a logic input with a weak pull-up for sensing a contact closure to a ground pad. *Digital Out* is configured a logic output. *Analog In* is configured as a 10-bit analog-to-digital input. The DM1810 includes two LEDs that indicate the module's operating mode.

The DM1810-916MN firmware is based on RFM's miniMESH network protocol, which utilizes time-synchronized redundant routing to provide robust, deterministic packet delivery though a network with up to 15 routers. Network configuration and maintenance features are built into the miniMESH protocol, simplifying commissioning and operating logistics.

The DM1810-916MN application programming interface (API) provides straightforward, flexible support for the serial port, ADC input, digital input and digital output, including event messaging from field nodes. The firmware also includes several sleep cycling methods for extended battery life operation.

Please refer to the *DM1810 User's Guide* and the *AN1810 series Application Notes* for installation and application programming information. See the RFM web site at www.RFM.com.

DM1810-916MN FCC Certification

The DM1810-916MN hardware has been certified for operation under FCC Part 15 Rules, Section 15.247. *The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.*

FCC Notices and Labels

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

A clearly visible label is required on the outside of the user's (OEM) enclosure stating that this product contains a DM1810-916MN transceiver assembly, FCC ID: HSW-DM1810A. WARNING: This device operates under Part 15 of the FCC rules. Any modification to this device, not expressly authorized b RFM, may void the user's authority to operate this device.

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Canadian Department of Communications Industry Notice - IC: 4492A-DM1810A

This apparatus complies with Health Canada's Safety Code 6 / IC RSS 210. To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment (or its transmit antenna) that is installed outdoors may be subject to licensing.

ICES-003

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of Industry Canada.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de Classe B prescrites dans le reglement sur le brouillage radioelectrique edicte par Industrie Canada.

DM1810-916MN I/O Pad Descriptions

Pin	Name	Description
J1-1	GND	This pad is a signal and power supply ground.
J1-2	VIN	This is the power supply input pad. The allowed input voltage range is 2.6 to 10 V.
J1-3	VOUT	VOUT tracks 50 to 100 mV below VIN when VIN is in the range of 2.6 to 3.1 V. When VIN is in the range of 3.1 to 10 V, VOUT is regulated at 3.0 Vdc. Up to 10 mA can be supplied from this pad for powering external circuits such as thermistor-resistor networks. External circuitry must not impress more than 10 mV_{p-p} ripple on the regulated output voltage.
J1-4	BIND	This pad is connected to a logic input on the microcontroller, and is configured with a weak pull-up. When this pin is momentarily grounded to J1-1 or J1-10, the module is placed into the bind mode, allowing this module to be associated with other modules to form a network.
J1-5	DIGITAL IN	This pad is connected to a logic input on the microcontroller, and is configured with a weak pull-up, allowing both logic signals and contact closures referenced to J-1 or J-10 to be read. The value of this input is sent over the RF channel as a response to an RF command. The input voltage range on this pad is 0 to VOUT. Applying a voltage outside of this range may damage the module.
J1-6	ANALOG IN	This pad in the input to the microcontroller's 10-bit analog-to-digital (ADC) converter. The ADC input range is 0 to VOUT, referenced to J1-1 or J1-10. The input voltage range on this pad is 0 to VOUT. Applying a voltage outside of this range may damage the module. The ADC reading is sent over the RF channel as a response to an RF command.
J1-7	DIGITAL OUT	This pad is connected to a logic output on the microcontroller through a 1 kilohm resistor, which provides short-circuit protection. The value of this output is set or read over the RF channel as a response to an RF command.
J1-8	SERIAL RX	This pad is connected to the module's serial data input (USART). Data to this pin is received at 9.6 kb/s (default), using 8 data bits, no parity, one stop bit. The input voltage range on this pad is 0 to VOUT. Applying a voltage outside of this range may damage the module.
J1-9	SERIAL TX	This pad is connected to the module's serial data output (USART) through a 1 kilohm resistor, which provides short-circuit protection. Data from this pad is sent at 9.6 kb/s (default), using 8 data bits, no parity, one stop bit.
J1-10	GND	This pad is a signal and power supply ground.
J3-1	GND	This pad is a ground for the antenna port.
J3-2	ANT	This pad is the antenna port.
J3-3	GND	This pad is a ground for the antenna port.
J4-1	D1	This pad is the LED 1 signal.
J4-2	D2	This pad is the LED 2 signal.

CAUTION: Electrostatic Sensitive Device. Observe precautions when handling.

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DM1810-916MN I/O Pad Labels

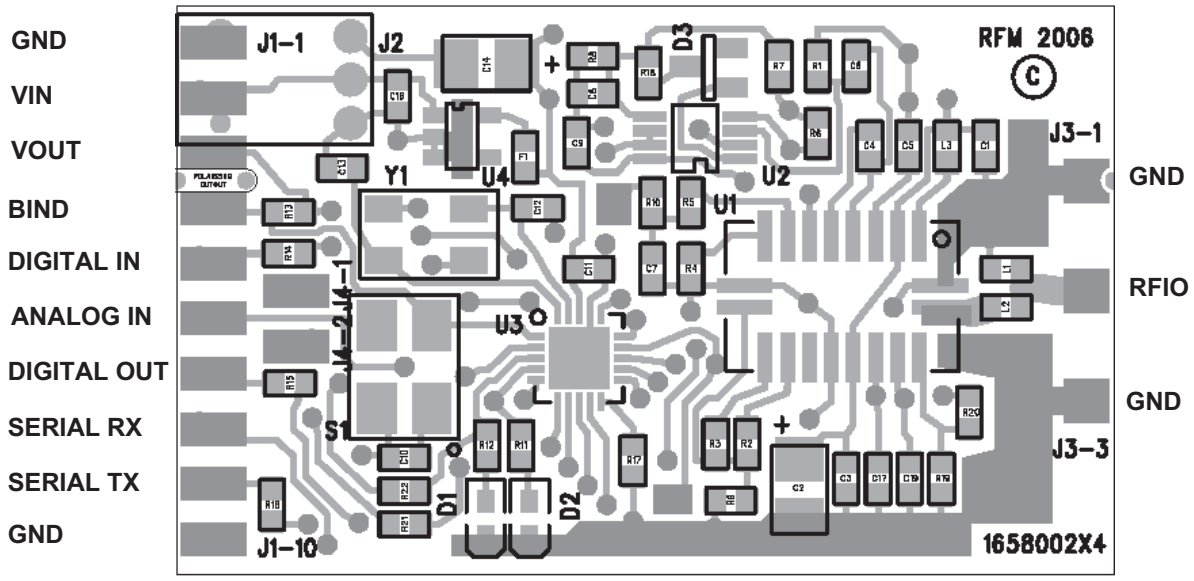
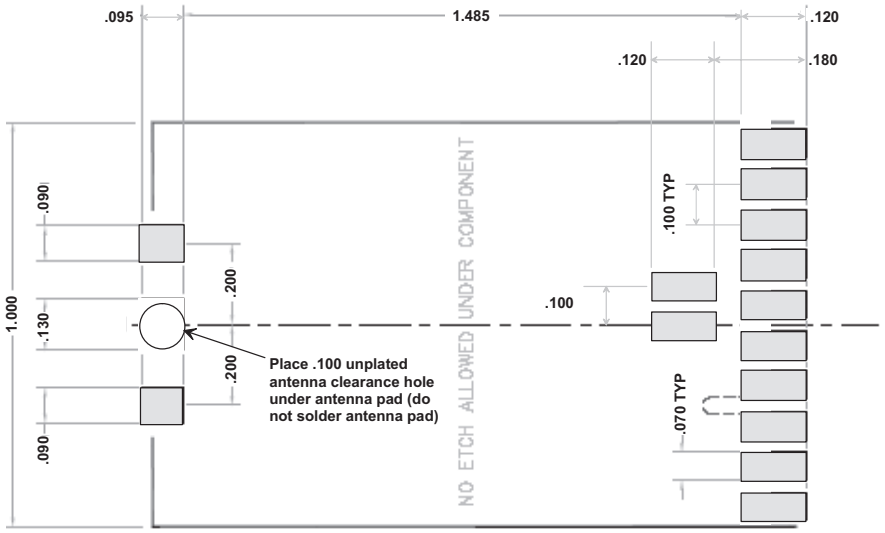


Figure 2

DM1810-916MN SMT Mounting Pattern



Dimensions in inches. PCB plus component height is .170 max; PCB plus antenna height is 2.15 max

Figure 3

Note: Specifications subject to change without notice.

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