



TRM-xxx-DP1205

Data Guide
(Preliminary)

Wireless made simple[®]

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Description

The TRM-xx-DP1205 is a complete Radio Transceiver Module operating in the 433, 868 and 915MHz license free ISM (Industrial Scientific and Medical) frequency bands. Offering high output power and exceptional receiver sensitivity, the radio module is suitable for applications seeking to satisfy the European (ETSI EN300-220-1 and EN301 439-3) or the North American (FCC part 15.247 and 15.249) regulatory standards. The TRM-xxx-DP1205 is suitable for operation in the European social alarm bands (25kHz channel spacing). Its built-in 16-byte FIFO and full SPI simplify interfacing to the host controller.

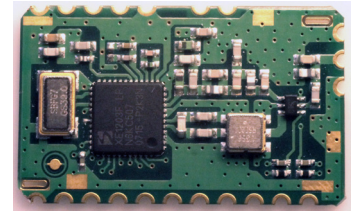


Figure 1: DP1205 Series Module

Features

- No RF knowledge required
- Direct Digital interface
- Fully assembled and tested
- Surface mount
- 30.5mm x 18.5mm
- Supply voltage 2.4V–3.6V
- Frequency synthesizer steps 500Hz
- Output power is programmable up to 15dBm
- High Rx 0.1% sensitivity down to –113dBm at 4.8kbps
- Data rate up to 152.3kbps
- Current consumption
Tx = 62mA at 15dBm,
Rx = 14mA 16-byte FIFO
- Digital RSSI (Received Signal Strength Indicator)
- Digital FEI (Frequency Error Indicator)

Applications

- Narrow-band and wide-band security systems
- Voice and data over an RF link
- Process and building control
- Access control
- Home automation
- Home appliance interconnections

Electrical Specifications

Absolute Maximum Ratings

Absolute Maximum Operating Ranges			
Description	Min.	Max.	Unit
Vdd – Power Supply	2.4	3.6	V
Operating Temperature	–40	+85	°C
Storage Temperature	–55	+125	°C
Soldering Temperature (max 15 seconds)		+260	°C

Figure 4: Absolute Maximum Operating Ratings



Warning: ESD sensitive device. Precautions should be taken when handling the device in order to prevent permanent damage.



Warning: Linx radio frequency (“RF”) products may be used to control machinery or devices remotely, including machinery or devices that can cause death, bodily injuries, and/or property damage if improperly or inadvertently triggered, particularly in industrial settings or other applications implicating life-safety concerns. No Linx Technologies product is intended for use in any application without redundancies where the safety of life or property is at risk.

The customers and users of devices and machinery controlled with RF products must understand and must use all appropriate safety procedures in connection with the devices, including without limitation, using appropriate safety procedures to prevent inadvertent triggering by the user of the device and using appropriate security codes to prevent triggering of the remote controlled machine or device by users of other remote controllers.

All RF products are susceptible to RF interface that can prevent communication.

Do not use any Linx product over the limits in this data guide.

Excessive voltage or extended operation at the maximum voltage could cause product failure. Exceeding the reflow temperature profile could cause product failure which is not immediately evident.

Do not make any physical or electrical modifications to any Linx product. This will void the warranty and regulatory and UL certifications and may cause product failure which is not immediately evident.

Detailed Electrical Specifications

Figure 5 gives the specifications of the TRM-xxx-DP1205 module under the following conditions: supply voltage VDD = 3.3V, temperature = 25°C, frequency deviation Δ_f = 5kHz, bit rate = 4.8 kbps, baseband filter bandwidth BWSSB = 10kHz, carrier frequency f_c = 434MHz for the TRM-488-DP1205, f_c = 869MHz for the TRM-868-DP1205 and f_c = 915MHz for the TRM-915-DP1205, bit error rate BER = 0.1% (measured at the output of the bit synchronizer), antenna output matched at 50Ω.

Specifications						
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
FR	Synthesized Frequency Range	TRM-433-DP1205	433		435	MHz
		TRM-868-DP1205	868		870	MHz
		TRM-915-DP1205	915		928	MHz
IDDSL	Sleep Mode Supply Current			0.2	1	μA
IDDST	Standby Mode Supply Current	39MHz running		0.85	1.1	mA
IDDR	RX Mode Supply Current			14	16.5	mA
IDDT	TX Mode Supply Current	$P_{RF} = 5\text{dBm}$		33	40	mA
		$P_{RF} = 15\text{dBm}$		62	75	mA
RFS	RF Sensitivity	A-mode		-113	-110	dBm
RFS_12	RF Sensitivity at 1.2kbps	A-mode, BER = 0.1%		-118	-115	dBm
FDA	Frequency Deviation	Programmable	1		255	kHz
DR	Bit Rate	Programmable	1.2		152.3	Kbps
RFOP	RF Output Power	Programmable				dBm
		RFOP1	-3	0		dBm
		RFOP2	+2	+5		dBm
		RFOP3	+7	+10		dBm
		RFOP4	+12	+15		dBm
TS_STR	Transmitter Wake-Up Time	From Oscillator Enabled		250	250	μs
TS_SRE	Receiver Wake-Up Time	From Oscillator Enabled		700	850	μs
TS_OS	Quartz Oscillator Wake-Up Time	Fundamental		1	2	ms
XTAL	Quartz Oscillator Frequency			39		MHz
V _{IH}	Digital Input Level High	% VDD	75			%
V _{IL}	Digital Input Level Low	% VDD			25	%

Figure 5: Detailed Specifications

Application Information

Pin-out Diagram

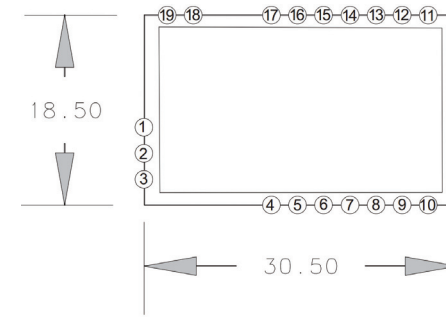


Figure 2: Pin-out Diagram

Pin Descriptions

Pin Descriptions			
Pin	Name	I/O	Description
1	GND		Ground
2	RF_IN_OUT	IN/OUT	RF Input/Output Terminal
3	GND		Ground
4	VDDA		Supply Voltage
5	GND		Ground
6	VDD		Supply Voltage
7	NSS_CONFIG	IN	SPI SELECT CONFIG
8	NSS_DATA	IN	SPI SELECT DATA/DATAIN
9	IRQ0	OUT	Interrupt (PATTERN/FIFOEMPTY)
10	GND		Ground
11	GND		Ground
12	IRQ1	OUT	Interrupt (DCLK/FIFOEMPTY)
13	DATA	IN/OUT	Data
14	CLKOUT	OUT	Output clock at reference frequency divided by 2, 4, 8, 16, 32.
15	MISO	OUT	SPI Master Input Slave Output
16	MOSI	IN	SPI Master Output Slave Input
17	SCK	IN	SPI CLOCK
18	SW(0)	IN/OUT	Transmit / Receive / Stand-by / Sleep Mode Select
19	SW(1)	IN/OUT	Transmit / Receive / Stand-by / Sleep Mode Select

Figure 3: Pin Descriptions

Functional Description

The TRM-xxx-DP1205 is a cost-effective, high-performance, RF transceiver module designed for the wireless transmission of digital information over distances of up to 8km.

The module receiver also incorporates an antenna switch and a SAW filter placed on the Rx path.

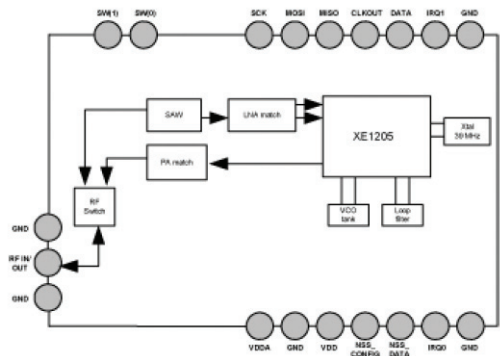


Figure 6: Antenna Switch

Data Operation Modes

The 1205 is user-programmable between two modes of operation: continuous mode and buffered mode.

Continuous mode: each bit transmitted or received is accessed directly at the DATA input/output pin.

Buffered mode: a 16-byte FIFO is used to store each data byte transmitted or received. This data is written to read from the FIFO via the SPI bus. It reduces processor overhead and reduces connections. The DATA input/output pin is not used in this operation mode. In receiver mode, two lines are dedicated to interrupt information. The interrupt pins are IRQ0 and IRQ1. IRQ0 has 3 selectable sources. IRQ1 has 2 selectable sources. Figures 7 and 8 summarize the interrupt management.

IRQ0 Interrupt Sources in Receive Mode			
IRQParam RX irq 0	MCPParam Buffered Mode	IRQ0	IRQ0 Interrupt Source
00	1	Output	No Interrupt available
01	1	Output	Write_byte
10	1	Output	/fifoempty
11	1	Output	Pattern
00	0	Output	Pattern
01	0	Output	RSSI_irq
10	0	Output	Pattern
11	0	Output	Pattern

Figure 7: IRQ0 Interrupt Sources in Receive Mode

IRQ1 Interrupt Sources in Receive Mode			
IRQParam RX irq 1	MCPParam Buffered Mode	IRQ1	IRQ1 Interrupt Sources
00	1	Output	No Interrupt available
01	1	Output	Fifofull
10	1	Output	RSSI_irq
11	1	Output	RSSI_irq
00	0	Output	DCLK
01	0	Output	DCLK
10	0	Output	DCLK
11	0	Output	DCLK

Figure 8: IRQ1 Interrupt Sources in Receive Mode

Serial Control Interface

The 1205 contains two SPI-compatible serial interfaces, one to send and read the chip configuration, the other to send and receive data in buffered mode. Both interfaces are configured in slave mode and share the same pins: MISO (Master In Slave Out), MOSI (Master Out Slave In) SCK (Serial Clock). Two additional pins are required to select the SPI interface: NSS_CONFIG to change or read the transceiver configuration and NSS_DATA to send or read data. Figure 9 shows the connections between the transceiver and a microcontroller when buffered mode is used.

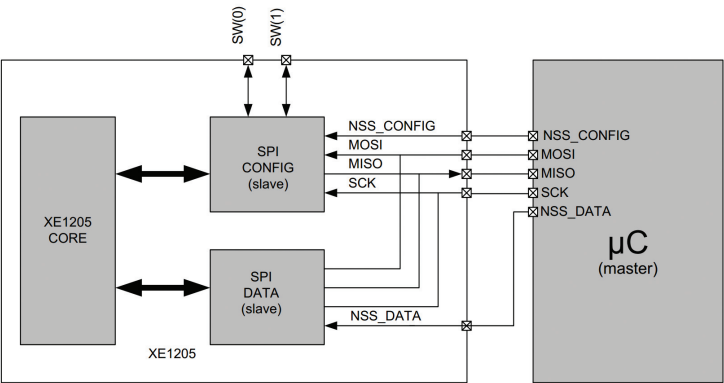


Figure 9: Serial Control Interface

Operating Modes

By default, the serial control interface is used for configuration. It is also possible to change between the four modes (sleep, stand-by, receive, transmit) by using the two-bit signal SW(1:0). This option is enabled by setting the bit MCPParam_Select_mode to '1' in the configuration register.

If MCPParam_Select_mode is low, the modes are defined by the register through the SPI_CONFIG interface and SW(1:0) may be used as an output to control, for example, an antenna switch.

Operating Modes		
MCPParam_Select_Mode Bit 5, Address 0	SWITCH (pin) SW(1:0)	MCPParam_Chip_Mode Bit 7-6, Address 0
0	Set in Output Sleep Mode-> SW(1:0) = "00" Receiver Mode-> SW(1:0) = "01" Transmitter Mode-> SW(1:0) = "10" Standy-by Mode-> SW(1:0) = "00"	00-> Sleep Mode 01-> Receieve Mode 10-> Transmit Mode 11-> Stand-by Mode
0	SW(1:0) = 00 -> Sleep Mode SW(1:0) = 01 -> Receive Mode SW(1:0) = 10 -> Transmit Mode SW(1:0) = 11 -> Stand-by Mode	x

Figure 10: DP1205 Series Operating Modes

Typical Application

The schematic in Figure 11 shows the TRM-xxx-DP1205 interfaced with a Semtech microcontroller XE8801A/02/05A/06A/07A and the 1205 used in buffered mode.

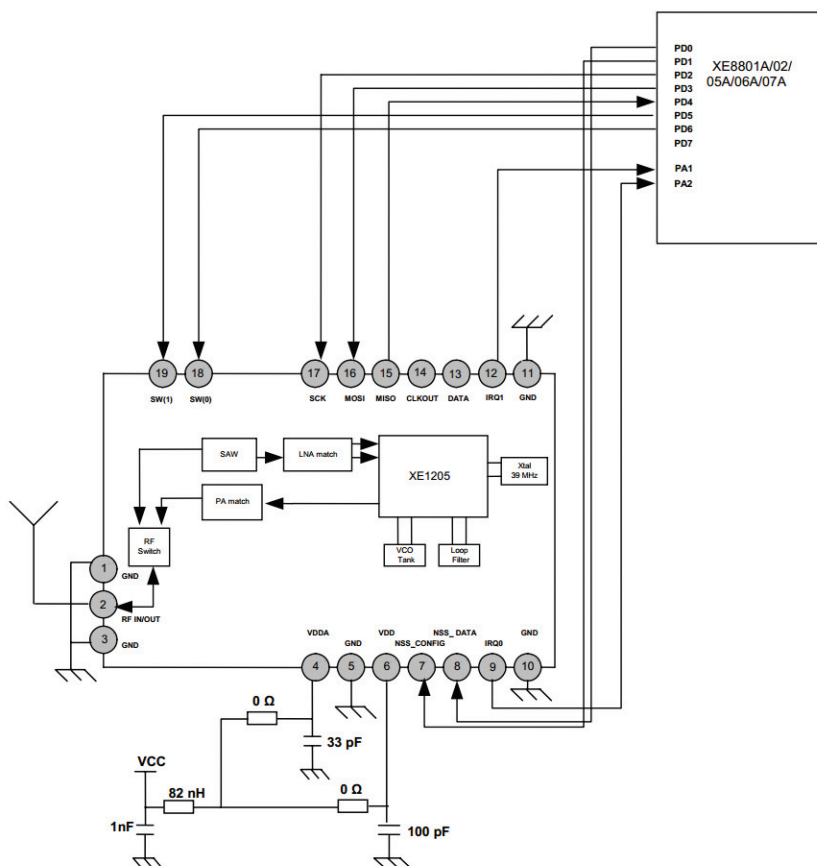


Figure 11: TRM-xxx-DP1205 and XE8801A Interfaced Schematic

Mechanical Dimensions

Figure 12 shows the physical footprint and dimensions of the TRM-xxx-DP1205, which should be implemented on the motherboard.

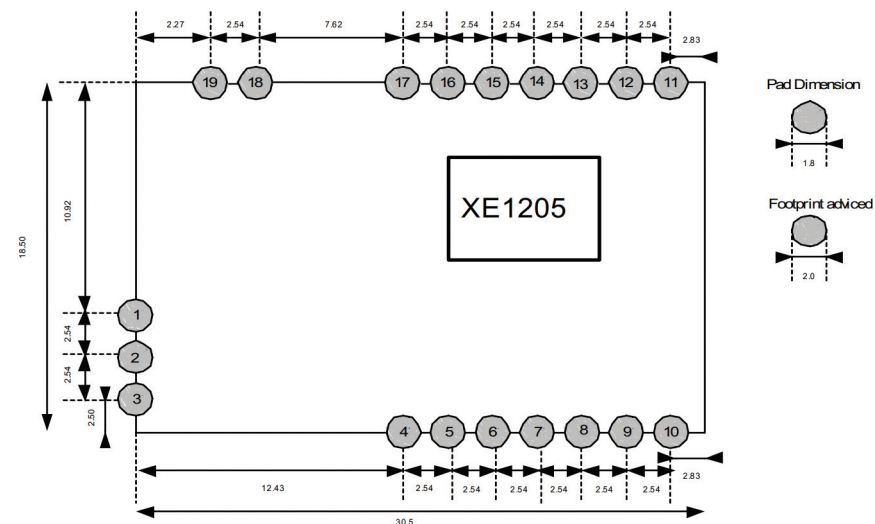


Figure 12: TRM-xxx-DP1205 Mechanical Dimensions

Custom Applications

For cost-sensitive applications, such as wireless sensors and AMR, Linx Technologies can embed the application software directly into the microcontroller built into the module. For more information on this service, please contact Linx Technologies.

Ordering Information

Ordering Information		
Part No.	Description	Radiotronix Part No.
TRM-433-DP1205	433MHz 1205 Series RF Transceiver Module	Wi.DP1205-433-R
TRM-869-DP1205	868MHz 1205 Series RF Transceiver Module	Wi.DP1205-868-R
TRM-915-DP1205	915MHz 1205 Series RF Transceiver Module	Wi.DP1205-915-R

Figure 13: Ordering Information



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