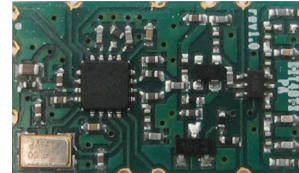




Double Frequency RF Transmitter

Applications

- 433/868 MHz ISM band systems
- Consumer Electronics
- Wireless audio
- Alarm and security systems
- Home and building automation
- Wireless sensor networks
- Industrial monitoring and control



Product Description

BIT48TX/PA is a very low cost RF transmitter module designed for short and medium range wireless applications.

This module is intended for ISM (Industrial, Scientific and Medical) frequency band @ 433, 868/915 MHz.

The Transceiver module supports various modulation formats and has a configurable data rate up to 500 kbps. The communication range can be increased by enabling a Forward Error Correction option, which is integrated in the module.

BIT48TX/PA provides extensive hardware support for packet handling, data buffering, burst transmissions.

The main operating parameters and the 64-byte transmit FIFO of **BIT48TX/PA** can be controlled via an SPI interface. In a typical system, the **BIT48TX/PA** will be used together with a microcontroller.

BIT48TX/PA has a very small package: only 13 x 23 mm ready for SMT assembly.

BIT48TX/PA is based on the well-proven [CC1150](#) Chipcon Products from Texas Instruments.

Key Features

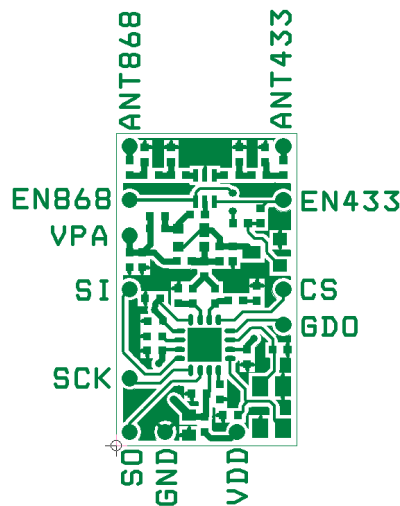
- Small size (13 x 23 mm package, 12 pins).
- Frequency bands:
 1. 400 – 464 MHz
 2. 800 – 928 MHz
- High output power (up to 18 dBm).
- Ideal for multi-channel operation.
- Programmable output power up to + 18 dBm @ VPA = 12V.
- Ideal for multi-channel operation.
- Suitable for frequency hopping systems due to a fast settling frequency synthesizer.

- Optional Forward Error Correction with interleaving.

Features (continued from front page)

- 64-byte TX data FIFO
- Efficient SPI interface: All registers can be programmed with one “burst” transfer.
- Programmable data rate up to 500 kbps
- OOK/ASK, FSK, GFSK e MSK modulation format supported.
- Pb-free (RoHS compliant) package.

1. Pin-Out



Pin #	Pin Name	Pin Type	Descrizione
P1	EN868	Digital Input	Transmit 868 enable signal
P2	V _{PA}	Power	2.2V – 12V power amplifier supply connection
P3	SI	Digital Input	Serial configuration interface, data input
P4	SCK	Digital Input	Serial configuration interface, clock input
P5	SO	Digital Output	Serial configuration interface, data output
P6	GND	Ground	Ground Connection
P7	V _{DD}	Power	1.8V – 3.6V frequency sintethyzer supply connection
P8	GDO	Digital I/O	Digital Output pin for general use: <ul style="list-style-type: none"> ▪ Test signal ▪ FIFO status signals ▪ Clock output, down-divided from XOSC ▪ Serial input TX data
P9	CS	Digital Input	Serial configuration interface, chip select
P10	EN433	Digital Input	Transmit 433 enable signal
P11	ANT433	RF Out	433 MHz Antenna Connection
P12	ANT868	RF Out	868 MHz Antenna Connection

2. Electrical Specification

Parameter	Test conditions	Units	Min	Typ	Max	
V_{DD}		V	1.8	-	3.6	
V_{PA}		V	1.8	-	12	
V_{IL}	SI, SCK, SO, CS and GDO pin	V	0	-	0.7	
	EN868 and EN433 pin	V	0	-	0.2	
V_{IH}	SI, SCK, SO, CS and GDO pin	V	$V_{DD}-0.7$	-	V_{DD} 7.5	
	EN868 and EN433 pin	V	2.3	-		
V_{OL}	SI, SCK, SO, CS and GDO pin Up to 4mA output current	V	0	-	0.5	
V_{OH}	SI, SCK, SO, CS and GDO pin Up to 4mA output current	V	$V_{DD}-0.3$	-	V_{DD}	
P_{OUT}	CC1150 configured @ -1dBm output power 433 or 868 TX mode $V_{PA} = 1.8V$	dBm	-	10	-	
	$V_{PA} = 3V$	dBm	-	13.5	-	
	$V_{PA} = 5V$	dBm	-	15	-	
	$V_{PA} = 7.2V$	dBm	-	17	-	
	$V_{PA} = 12V$	dBm	-	18	-	
Current consumption	• Stand-by mode	EN433 = EN868 = 0V CC1150 in stand-by	nA	-	300	-
	• $I_{VPA} + I_{VDD}$	EN433 = 3V ; EN868 = 0V; $V_{PA} = 3V$ CC1150 configured @ -1dBm output power 433 MHz TX mode @ 13.5 dBm ANT433 output power .	mA	-	49	-
	• $I_{VPA} + I_{VDD}$	EN433 = 0V ; EN868 = 3V; $V_{PA} = 3V$ CC1150 configured @ -1dBm output power 868 MHz TX mode @ 13.5 dBm ANT868 output power .	mA	-	49	-



3. Development Tools

Configuration of main operating parameters are easily achieved using the SmartRF® Studio software described below.

It is strongly recommended not to use CC1150 output power configuration below $-1dBm$ in order to achieve better performance in terms of spurious emission.

3.1. Technical Documents:

Data sheet CC1150 available for download from:

<http://focus.ti.com/docs/prod/folders/print/cc1150.html>

3.2. Configuration Software

BIT48TX/PA can be configured using the SmartRF® Studio software, available for download from <http://www.chipcon.com> or <http://www.ti.com/lpw>. The SmartRF® Studio software is highly recommended for obtaining optimum register settings, and for evaluating performance and functionality. A screenshot of the SmartRF® Studio user interface for CC1150 is shown in Figure.

Calculation Window - CC1150 - SmartRF® Studio

File Settings Help

Current chip values:

- IOCFG1 [0x01]: 0x00
- IOCFG00 [0x02]: 0x00
- IOCFG0A1 [0x02]: 0x00
- IOCFG0A2 [0x02]: 0x00
- FIFOTHR [0x03]: 0x00
- SYNCR [0x04]: 0x00
- SYNCO [0x05]: 0x00
- PKTLEN [0x06]: 0x00
- PKCTRL0 [0x08]: 0x00
- CHANNR [0x0A]: 0x00
- FREQ2 [0x0D]: 0x00
- FREQ1 [0x0E]: 0x00
- FREQ0 [0x0F]: 0x00
- MDMCFG4 [0x10]: 0x00
- MDMCFG3 [0x11]: 0x00
- MDMCFG2 [0x12]: 0x00
- MDMCFG1 [0x13]: 0x00
- MDMCFG0 [0x14]: 0x00
- DEVIATN [0x15]: 0x00
- MCSM1 [0x17]: 0x00
- MCSM0 [0x18]: 0x00
- FREND0 [0x22]: 0x00
- FSCAL3 [0x23]: 0x00
- FSCAL2 [0x24]: 0x00
- FSCAL1 [0x25]: 0x00
- FSCAL0 [0x26]: 0x00
- FSTEST [0x29]: 0x00
- PTEST [0x2A]: 0x00
- TEST2 [0x2C]: 0x00
- TEST1 [0x2D]: 0x00

MARCSSTATE: 0

DBW: 0 kHz Lock

GDO1 output pin configuration.

Normal View Register View Notes

Chip revision: F (VERSION = 0x04)

X-tal frequency: 26.000000 MHz

RF output power: 0 dBm PA ramping

Deviation: 5.157471 kHz

Datarate: 1.199484 kBaud

Modulation: 2-FSK Manchester

RF frequency: 868.299866 MHz

Channel: 199.951172 kHz

Channel number: 0

Preferred settings:

Datarate	Deviation	Modulation
1.2 kBaud	5.2 kHz	2-FSK
2.4 kBaud	5.2 kHz	2-FSK
4.8 kBaud	25.4 kHz	2-FSK
10 kBaud	19 kHz	2-FSK
38.4 kBaud	20 kHz	2-FSK
76.8 kBaud	32 kHz	2-FSK
100 kBaud	47 kHz	2-FSK
250 kBaud	0	MSK

Correlation:

Register Components

- PA value = 0x60
- RF output power -> PATABLE
- FREQ2 = 0x21
- RF Frequency -> FREQ[23:16]
- FREQ1 = 0x65
- RF Frequency -> FREQ[15:8]
- FREQ0 = 0x6A
- RF Frequency -> FREQ[7:0]
- MDMCFG4 = 0x85
- Data rate (exponent) -> DRATE_E
- MDMCFG3 = 0x83
- Data rate (mantissa) -> DRATE_M
- MDMCFG2 = 0x03
- Modulation -> MOD_FORMAT[2:0]
- Manchester enable -> MANCHESTER_EN
- MDMCFG1 = 0x22
- Channel spacing (exponent) -> CHANSPC_E
- MDMCFG0 = 0xF8
- Channel spacing (mantissa) -> CHANSPC_M

Reset CC1150 and write settings Copy settings to Register View

Simple TX Packet TX

Length config: Variable Sync word: 32 bits Preamble count: 4 bytes CRC Manual init

Packet length: 10 Packet count: 200 Address:

Random: Text: Hex:

00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 11 12 13 14 1

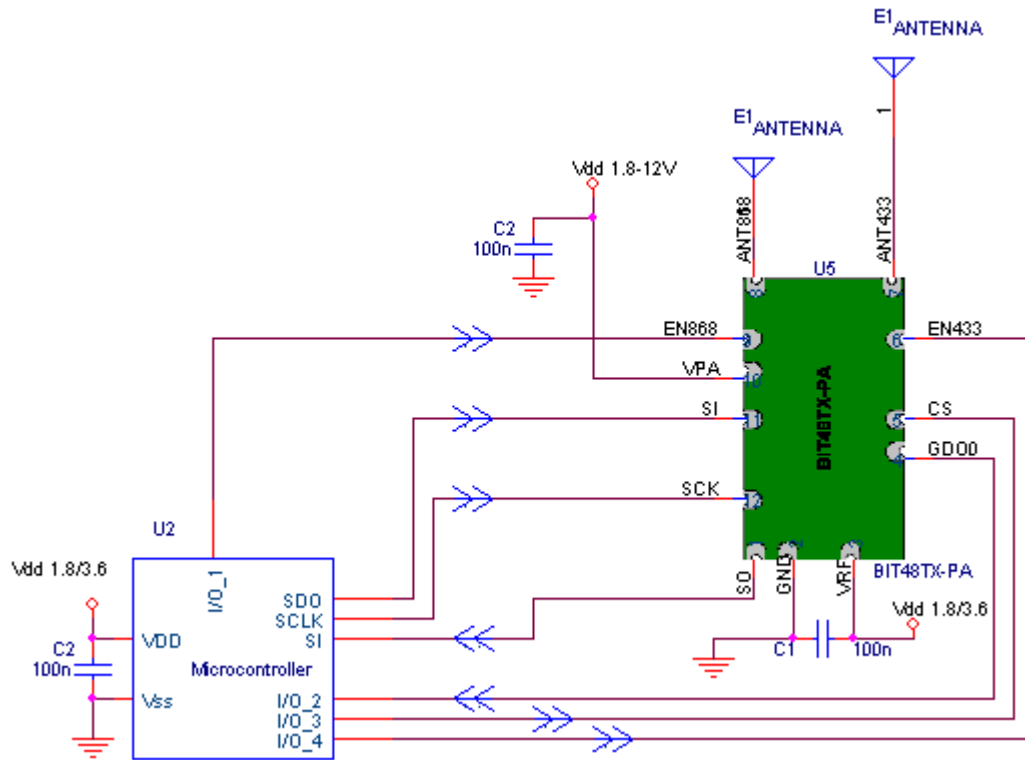
Initialize MDMCFG1 = 0x20

- Preamble count -> NUM_PREAMBLE[2:0]
- Forward Error Correction -> FEC_EN
- MDMCFG2 = 0x03
- Sync mode -> SYNC_MODE[2:0]
- PKCTRL0 = 0x05
- Packetformat -> PKT_FORMAT[1:0]
- CRC operation -> CRC_EN
- Forced to 1 by FW
- Packet config -> LENGTH_CONFIG[1:0]
- Forced to 1 by FW

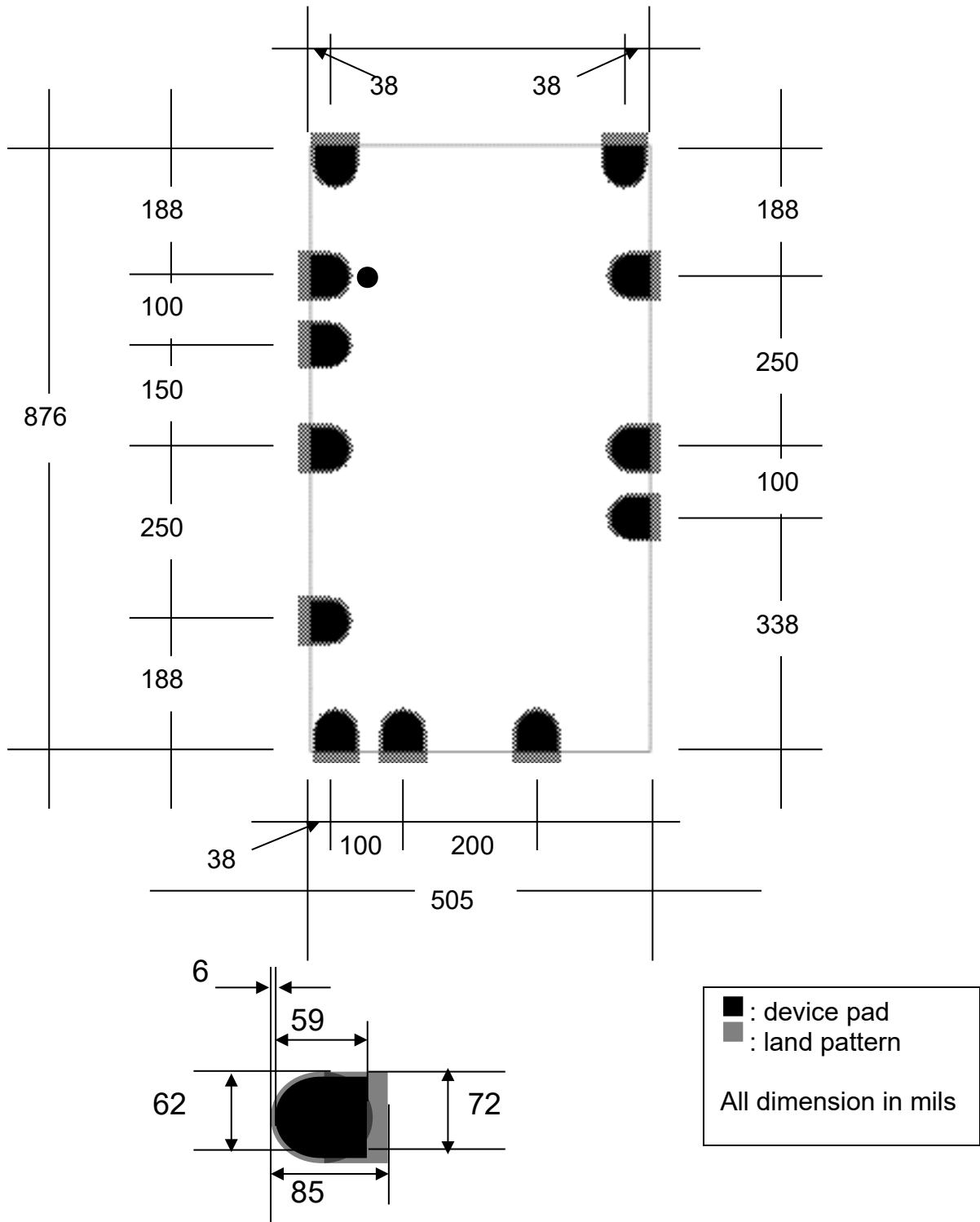
Start buffered TX Stop TX

Device ID: Not Connected Last executed command: Date: 23.03.2009, Time: 19:31:21

4. Typical application



5. Package Description and Recommended Footprint



The area underneath the module should be covered with solder resist in order to prevent short circuiting the test pads on the back side of the module. A solid ground plane is preferred.



6. General Information

a. Disclaimer

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Compliance with regulations is dependent on complete system performance. It is the customer's responsibility to ensure that the system complies with regulations.

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