MIPOT HI-TECH COMPANY

RF WIRELESS

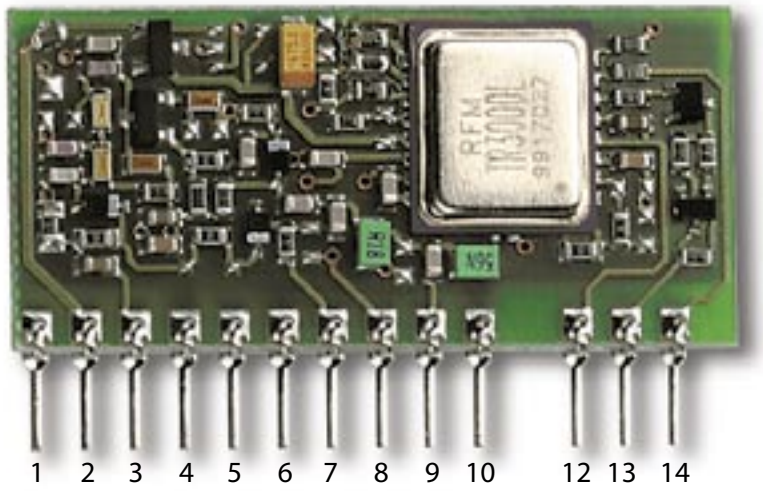
OOK TRANSCEIVER 3-2000467

433.92 MHz / p.n. 3-2000467

DESCRIPTION:

The 3-2000467 module is an On-Off Key transceiver operating at 433,92 MHz, low consumption and low cost. In transmission the typical power output is 10 mW (+10 dBm) and the receiver sensitivity reaches –100 dBm. There is an auxiliary pin for RF input/output to use when in transmission is sufficient 1 mW (0 dBm) power output and it wants to limit the current consumption. In power down mode the 3-2000467 current consumption is about 5 µA and so is perfect for battery supply systems.

PIN CONFIGURATION AND DEFINITION:



1	N.C.
2	+VccTR
3	RFH
4	GND
5	+Boost
6	GND
7	CTRL1
8	CTRL0
9	RFL
10	GND
12	T.P.
13	RXD
14	TXD

LIMIT VALUES:

Transceiver Power Supply+Vcc (pin 2):	from -0,3 to 5,2 V
Booster Power Supply+Boost (pin 5):	from -0,3 to 5,2 V
Voltage Range on CTRL1 e CTRL0 (pin 7 e 8):	from -0,3 to 3,8 V
Operative Temperature:	from -40 to +85°C
Storage Temperature:	from -50 to +100°C

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ELECTRICAL CHARACTERISTICS:

Parameter	*Min.*	*Tip.*	*Max.*	*Units*
Transceiver Power Supply +Vcc (pin 2)	4,5		5,2	V
Booster Power Supply +Boost (pin 5)	4,5		5,2	V
Voltage Range on CTRL1 e CTRL0 (pin 7 e 8)	0		3,8	V
Receiver Electrical Characteristics:				
VOL on RX Data (pin 13)		0		V
VOH on RX Data (pin 13) +Vcc = 4,5 … 5,0 V	3,4		3,9	V
Current Consumption +Vcc = 4,5 … 5,0 V	3,4		3,6	mA
Carrier Frequency f0		433.92		MHz
Frequency Bandwidth at –3 dB		f0 ± 300		KHz
Sensitivity for 2400 baud	-94	-97		dBm
Sensitivity for 19200 baud	-93	-95		dBm
Sensitivity for 38400 baud	-92	-94		dBm
Rejection ±30 MHz	55			dB
RX Switching On Time			250	_S
Transmitter Electrical Characteristics:				
VIL on TX Data (pin 14)		0		V
VIH on TX Data (pin 14) a +Vcc = 4,5 … 5,0 V			5	V
Current Consumption +Vcc = 4,5 … 5,0 V square wave modulation and 50% Duty Cycle		22		mA
Carrier frequency f0	433,62		434,22	MHz
Data Transmission Rate	1200		38400	baud
Power Output +Vcc, VIH = +5,0 V	+7.5	+10		dBm
Second Harmonic Level (868 MHz) +Vcc = 4,5 … 5,0 V			-36	dBm
Third Harmonic Level (1302 MHz) +Vcc = 4,5 … 5,0 V			-30	dBm
Fourth Harmonic Level (1736 MHz) +Vcc = 4,5 … 5,0 V			-30	dBm
Radiated Emissions	According to I-ETS-300-220 and I-ETS-300-683			
TX Switching On time			15	µs
Power Down Mode Electrical Characteristics:				
Current Consumption			5	µA

PIN DESCRIPTION:

Pin	*Name*	*Description*
1	N.C.	Not Connected
2	+VccTR	Power Supply
3	RFH	RF Input/Output. In transmission the power output is 10 mW. An antenna with 50 Ω characteristic impedance can be connected , see three examples below. **Note:** if this pin is used then the ausiliary pin RFL (pin 9) must be not connected.

Isolated copper wire with 0,5 mm thick
Solenoid diameter: 3,2 mm
24 coils 3 mm spaced

Antenna on PCB
Strip thickness: 1 mm
Ring Area: from 4 to 10 cm^2
fp (feed point): from 15 to 25% of the entire antenna lenght
C: variable capacity 1,5… 5 pF

Conductive wire, strip on PCB or their combination up to 17,3 cm total lenght

Note: the brought back values over there are pure indicative. Optimal antenna matching goes searched using adequate instrumentation (for es. Networks Analyzer).

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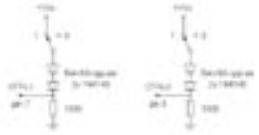
PIN DESCRIPTION:

Pin	Name	Description
4	GND	Ground (0 V)
5	+Boost	Booster Power Supply : this pin supplies the 10 mW RF amplifier stage. **Note:** supply the booster only during transmission (see pin 7 description – CTRL1); if the power otput is 1 mW (using pin RFL) this pin must be connected to ground or not connected
6	GND	Ground (0 V)
7	CTRL1	The transceiver function mode is defined throught the inputs CTRL1, CTRL0 and +Boost according to the following table :

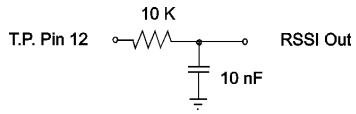
Function	CTRL1	CTRL0	+Boost
Power down	0	0	0
OOK Transmission 10 mW (pin RFH)	0	1	1
OOK Transmission 1 mW (pin RFL)	0	1	0
Not Define	1	0	X
Receiving Mode	1	1	0

Note: as it turns out from the Electrical Characteristics, the maximum voltage on CTRL1 and CTRL0 input is 3,8 V, inferior to +VccTR and +Boost. The following solution is recommended :



8	CTRL0	See pin 7 description (CTRL1)
9	RFL	RF Input/Output . In transmission the power output is 1 mW. To this pin an antenna with 50 Ω characteristic impedance can be connected. For the antenna see pin RFH description (pin 3) **Note:** if this pin is used then is necessary to remove the thick film resistor Rlow (10 K_). See figure

10	GND	Ground(0 V)
12	T.P.	Test Point: rapresents the demodulated signal not squared. In receiving mode the characteristic impedance of this pin is about 1 K_, while in trasmission and power down mode becomes very high. If the received signal has 50% duty cycle, the si-gnal on T.P. changes to 10 mV/dB and can reach the 685 mV. For a smaller duty cycle the two value above are proportionally lower. It is possible to obtain a RSSI function on the received signal measuring the value of offset that the T.P. assumes during the reception of the signal. The simpler outline in order to obtain a RSSI le-vel is the following:



Typical values for the RSSI levels are:

	T.P. Offset	RF Signal Level
Max	2.10 V	- 50 dBm
	2.03 V	- 60 dBm
	1.97 V	- 70 dBm
	1.92 V	- 80 dBm
	1.86 V	- 90 dBm
	1.79 V	-100 dBm
Min	1.77 V	In absence of RF signal

The applications of the RSSI signal can be:
- level indicator of the radio signal.
- battery economizer, since avoid the use of the booster in presence of strong signal.
- keeping the booster off, when two devices are very near, avoids the saturation of the
- receiver. It is recommended to disable the booster when the RSSI level is greater than 2 V :

If RSSI < 2.0 V Tx booster = ON
If RSSI > 2.0 V Tx booster = OFF

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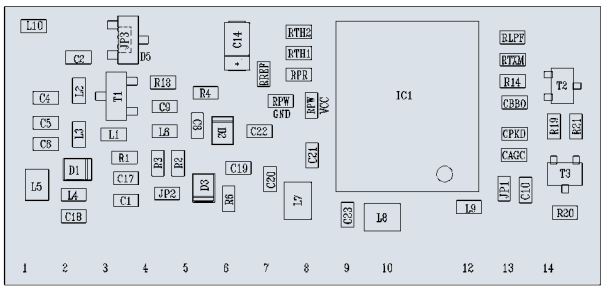
PIN DESCRIPTION:

Pin	Name	Description
13	RXD	Data Output in Receiving Mode
14	TXD	Data Input in Trasmission. **Note: in receiving and power down mode on this pin must be a zero logical level**

CUSTOMIZING THE TRANSCEIVER :

The Transceiver is supplied in a standard configuration, whose performances are described in the technical characteristics. Various configurations are possible in order to optimize the behavior in base of the digital signal characteristics. In the figure and in the following table the positions and the indicative values of the involved components are brought back.



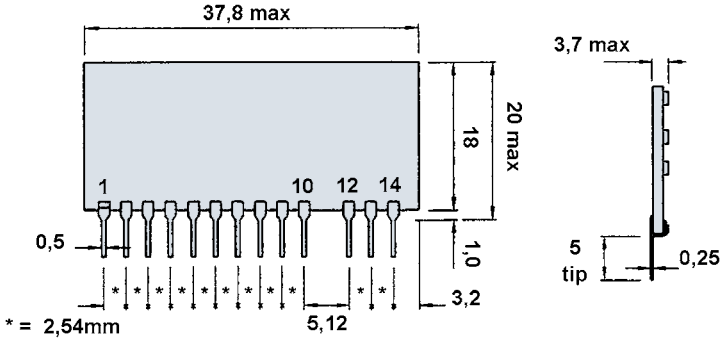
Description	Symbol	Operation Mode					Default Values
		OOK	OOK	ASK	ASK	Units	
Data Trasmission Rate		2.4	19.2	57.6	115.2	kbps	1.2 ÷ 38.4
Min. Impulse Width							
Single Bit		417	52	17	8	_S	-
Max. Impulse Width 4 Bit		1666	208	69	34	µS	-
Capacitor	CAGC	-	-	4700	2200	pF	-
Capacitor	CPKD	-	-	2	1	nF	10
Capacitor	CBBO	100	15	5.6	2.7	nF	150
Resistor	RTXM	8.2	8.2	8.2	8.2	K	12
Resistor	RLPF	240	30	25	12	K	30
Resistor	RREF	100	100	100	100	K	100
Resistor	RTH2	-	-	100	100	K	82
Resistor	RTH1	10	27	100	100	K	100
Resistor	RPR	1100	330	160	160	K	330
Resistore	RPW	270 vs GND	270 vs GND	1000 vs Vcc	1000 vs Vcc	K	270 vs GND

MODIFYING THE VOLTAGE SUPPLY :

Refering to the Fig. 1, the Transceiver can be configure in order to work with 5 V or 3 V power supply applying the following changes :

Vcc	D5 - BAV99	JP3 - 0 ohm	R3	RTXM
5 V	MOUNTED	NOT MOUNTED	22K	12K
3 V	NOT MOUNTED	MOUNTED	15K	8K2

MECHANICAL DIMENSIONS:



More information about the integrated circuit TR1001 employed for theTransceiver realization can be find on the manufacturer website: RFM.com.

Mipot S.p.A. reserves the right to modify the specifications without notice.

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