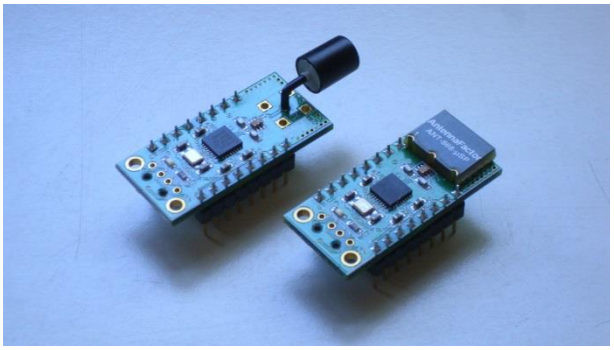
Ninthway Radio Network Technology

DATA SHEET

MCK4000 NINTHWAY TRANSCEIVER MODULE NTM_4

Ninthway Transceiver Module		
	Article number:	NTM_4_planar NTM_4_SMA
	Size:	PCB 16.2 x 47,4 mm
	Function:	General transceiver module for all radio communication in the Ninthway High Secure Radio Network
	Standards:	EN300-220-1 EN300-220-2 EN300-220-3 IEEE 802.15.4 EN54-25

Specifications

Description	The NTM transmitter receiver device is based on the IEEE 802.15.4 standard using Offset-QPSK modulation and Direct Sequence Spread Spectrum coding. It transmits data frames with a payload of up to 100 bytes, bidirectional @ 100 kbps in accordance with EN300-220 CDMA or Listen Before Talk protocol in the 865-870 MHz frequency band with auto acknowledge. Or digital audio data bidirectional @ 500kbps on the 863-865 MHz band without acknowledge under CSMA-CA. It can easily be adapted for the Chinese or American market. Due to the SPREAD SPECTRUM coding the receiver is not sensitive to blocking by co users in the band. The incorporated 32 bit ARM0 microcontroller takes care of transceiver data handling and application data handling. The transceiver can either be used in a BASIC MODE as modem device controlled by an application or in APPLICATION MODE as a network device that masters the application it is built in. The software houses a number of PUBLIC MODES that enables the user to build up a complete network of sensor and actors, repeater stations and gateways to applications controllers. Besides public modes PRIVATE MODES can be incorporated to handle particular OEM requirements. This can either be done by the manufacturer or the OEM as a third party addition (see Application note 3).

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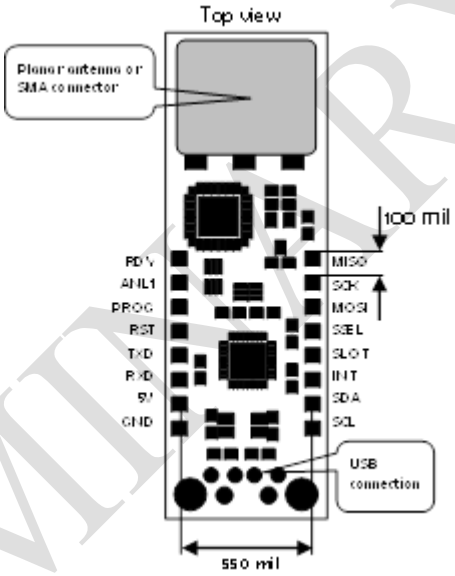
	Preparation of the individual transceiver is either done: - via a wired RS232 link with a PC (using Hyper terminal or the Ninthway NTMcomm program) - or wireless via a peer to peer connection with a program module connected to a PC
Mounting instructions *INT:* external wake up interrupt and program mode pin (active low). *ANL1:* analogue input max 3.3V *SDA:* I2C data line (OC) *SCL:* I2C clock line (OC) If no I2C is applied these pins are used as digital I/O pins. *SLOT/PROG:* available as general digital I/O *RDY/MISO/MOSI/SCK/SSEL* SPI bus connection for VORN applications. *TXD/RXD* pins for serial communication. *RST* active low resets the NTM	 Foot print: DIL 16 socket 550 x 700 mil. Pin step: 100 mil. Keep area under antenna clear from ground.
Connections	- 2 wire I2C 400 kHz/1MHz connection - 2 wire UART connection 115.2 Kbaud - 4 wire SPI 6 MHz - analogue input - 2 digital I/O - outgoing interrupt for data received (active low) - wake up interrupt - 5V - GND - USB type A
Parameters	Device addressing: - Individually addressable between 0 – 65535 - Network address between 0 – 65535

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	- Group or actor address between 0 – 65535 - OEM_ID (fixed by manufacturer) System: - Low supply voltage level detection: in dV (default = 40 dV) - To save power NTM normally sleeps and awakes shortly every 2.5 s. This can be switched off, to keep the transceiver constantly active (at cost of battery life). - Periodic status broadcasts can be in steps of 10 seconds to a maximum of 2550 s, to confirm the presence of the NTM and check the radio link.
Indicators	- Red led (transceiver activity or Master mode) - Green led (application activity) - Yellow (USB activity)
Transceiver power **Receiver** **Transmitter** **Bandwidth**	The NTM_4 applies the same radio technology as the NTM_3 but has an additional frontend stage. The frontend receiver improves the signal to noise ratio of the incoming signal with 5 dB. This improves the range of a set of NTM's with about 100%. System noise factor : 2 dB. Input gain: 16 dB. Receiver insertion loss: 1.5 dB. Minimum required S/N: 10 dB for an bitrate error < $1\%_0$. The frontend transmitter allows a setting of the transmission power between: -11 to +30 dBm. Transmitter insertion loss: 3 dB. Due to the built in band filter harmonics power is < -70 dBc - @ 100 kb/s: 260 kHz (@ 6 dB) @ 500 kb/s: 645 kHz (@ 6 dB)
Power supply	- 5V nominal. Minimum 3.8V - During transmission 40 – 800 mA - During reception < 30 mA - During power save mode <10 µA - Typical current consumption with 5 minute status broadcast interval is: - 0.1 Ah/year
Range	Range between transmitter and receiver is determined by many factors. - Antenna gain or loss - Fading losses.

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	- Obstacle attenuation losses. NTM_4_planar has an antenna loss of 6 dB and a theoretical range of 15 km. Examples of range calculations can be found in application note 1.
I²C addressing	NTM.address = 0x54h + *SLOT**2 The signal level on pin SLOT of the NTM provides a choice between I²C address 0x54h or 0x56h I2C registers: 00 – 15 Transceiver parameters 16 -- 31 Application parameters 32 – 131 Frame payload Other I2C addresses used by the NTM are: 0x5E; 0x90;
Data input via I²C	If the NTM is powered down, awaken the NTM via a low signal on the INT pin. It will start the application service routine. As I2C master the application program will read the slave I2C device that triggered the interrupt. As I2C slave the interrupt needs to be immediately followed by the I2C interrupt signal. Data received via I²C registers 32 to 131 is sent as payload of a frame with the characteristics set by the values in register 0 - 15. Details of the I2C register can be found in the NTM Application note 1.
Data input via UART	The NTM will only communicate via UART when it is awake and the program jumper is in place. This is not required during remote programming.
USB	The NTM has a USB client connection that is not yet functional, but will be an alternative to the UART bus. It is mainly meant for direct connection to a PC like USB stick.
Data output	In function 0 mode the received frames are either sent to the UART or stored in the I²C (Determined by Flags1.1). In other modes the received frames are handled by the API. The API determines whether or not data is sent to I2C or UART or SPI.
NTM modes	The standard version not only houses the software for using the transceiver, but also a number of ready available applications. These applications can be activated by setting the FUNC parameter in the NTM. **Function 0: SAPI** In this mode the NTM acts as a transparent transceiver. Signals on the digital inputs of a transmitter are mirrored on the digital outputs of a receiver. The value of the analogue input is presented in a I2C register or at the UART output (if parameters are properly set).

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	Data provided via the I2C data buffer of a transmitter is broadcasted as soon as the I2C loading is finished and presented by a receiver in its I2C data buffer or at its UART output. Data delivered at the transmitter UART by the SENT or SENF command are immediately transformed into a frame as specified by the pre-programmed NTM parameters and broadcasted. It is presented by a receiver in its I2C data buffer or at its UART output. Via the commands RMOT and CGRP, NTMs parameters of remote NTMs and applications can be controlled. Signals on the data pins and analogue input are periodically measured. The values are broadcasted with the status broadcast. In this set up one-to-many and many to one communication is possible. Devices can operate in power saving mode or continuous active. The transmission range can be extended with the use of NTM repeaters. **Function 1: API, general alarm device interface** Aimed at fire and intruder alarm applications. It is thought that several different applications use the same network of repeaters. In network mode a device is only visible to a particular application. More on this mode can be found in the Ninthway secure radio network sheet and i.e. the datasheet of the SPI_PERI. **Function 2: Repeater** A repeater provides possibility to extend the range of NTM transceivers in the radio network. It provides a way to reach and control NTM's anywhere in the network. More information can be found in the repeater datasheet. **Function 3: Gateway** A gateway provides a connection between the radio network and an application controller. It is similar to the Ninthway repeater except for the gateway connection and it does not repeat received frames. More information is available in the gateway datasheet. **Function 4: VORN** In this function the NTM acts as a audio streaming device. More information can be found in the NCA datasheet and application note … **Function 7: Nurse Call station** The NCB_1 is designed as a multipurpose warn station. It uses an 8 channel I2C extender of which four channels are dedicated as switch inputs and four are available as inputs or outputs to be configured at will. Two input switches are already built in.

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Additional information	Application note 1; Programming the NTM Application note 2; Ninthway high secure radio network Application Note 3; Adding your own application program software Datasheet SPI_PERI Datasheet Ninthway repeater station Datasheet Ninthway gateway station Datasheet NCA