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## COR3

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# NBFM Multi-channel receiver for 868MHz SRD band

*The COR3 is a 25kHz channel narrowband multichannel Category 1 compliant receiver intended for European 869.2-869.25MHz Social Alarm application. It can also be used for any 868-870MHz band Non-Specific SRD applications. The module offers a low power, reliable data link in an industry-standard pin out and footprint.*



*Figure 1: COR3-869-5-SAL receiver*

## Features

- Conforms to EN 300 220-2 (Category 1) and EN 301 489-3
- High performance double superhet, PLL Synthesizer with TCXO
- SAW front end filter
- Data rates up to 5 kbps for standard module
- Fully screened
- Feature-rich interface (RSSI, analogue and binary digital data outputs)
- User configurable via microcontroller UART
- Low power requirements

## Applications

- Social Alarm
- Handheld terminals
- Heavy vehicle/machine remote controls
- EPOS equipment, barcode scanners
- Data loggers
- Industrial telemetry and telecommand
- In-building environmental monitoring and control
- High-end security and fire alarms
- Vehicle data up/download

## Technical Summary

- Social Alarm frequencies: CH0: 869.2125MHz, CH1: 869.2375MHz
- Custom frequency within 865MHz - 870MHz
- Up to 32 channels controlled via UART interface (16 parallel selected)
- Supply range: 4.5V - 15V
- Current consumption: 25mA receive
- Data bit rate: 5kbps max. (standard module)
- Receiver sensitivity: -120dBm (for 12 dB SINAD)
- Size: 57 x 26 x 9mm
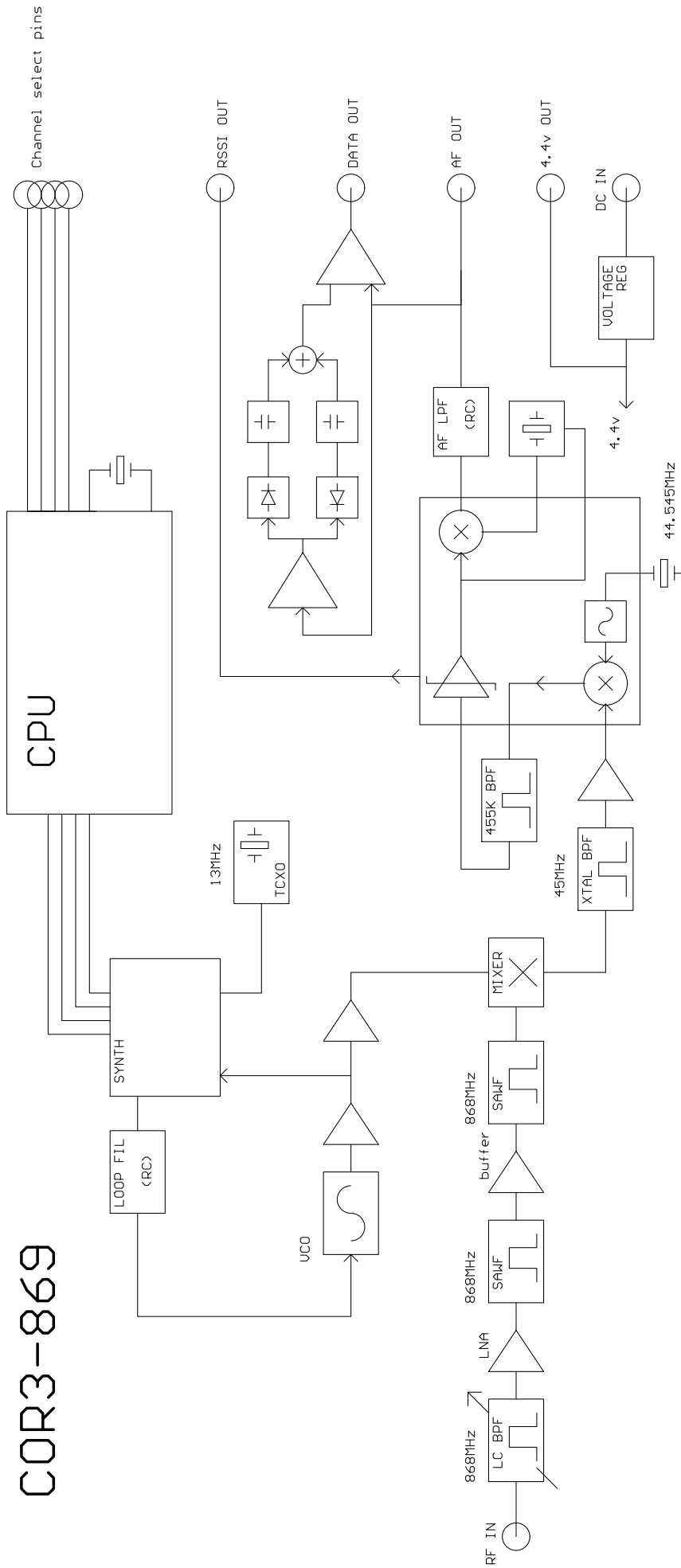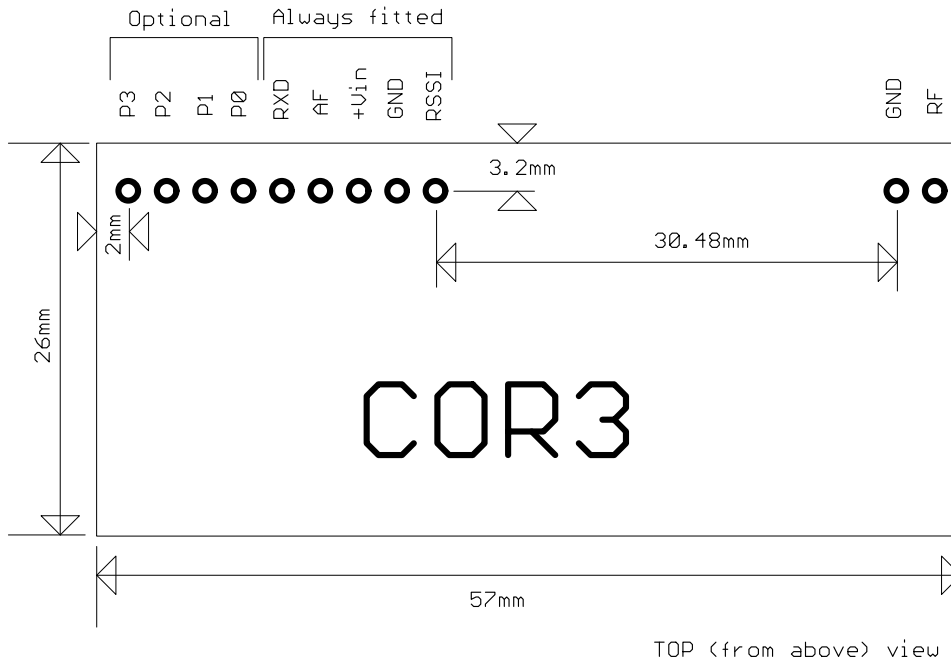
*Evaluation platforms: NBEK + COR3 carrier*

COR3-869

Channel select pins

CPU

SYNTH

LOOP FIL (RC)

VCO

13MHz

TCXO

RSSI OUT

DATA OUT

AF OUT

4.4v OUT

DC IN

VOLTAGE REG

4.4v

AF LPF (RC)

44.545MHz

455K BPF

45MHz

XTAL BPF

MIXER

buffer

868MHz SAW

868MHz SAW

LNA

868MHz LC BPF

868MHz

RF IN

*Figure 2: COR3 block diagram*

*Figure 3: COR3 Flat mounted footprint*

## Pin Description - COR3

| Pin | Name | Function |
|-----|------|----------|
| 1A | RF in | 50Ω RF input from antenna |
| 2A | RF GND | RF ground, internally connected to the module screen and pin 2 (0V) |
| | | |
| 1 | RSSI | DC level between 0.5V and 2.5V.  60dB dynamic range |
| 2 | GND | Ground (0V) |
| 3 | Vcc | Supply input   4.5V – 15V DC |
| 4 | AF | 700mV p-p audio. DC coupled, approx 1V bias |
| 5 | RXD | Open collector output of data slicer suitable for Bi-phase codes |
| | | Requires external pull-up resistor to required output voltage level |
| 6 | P0/PGM | Parallel Channel select LSB |
| | | Serial frequency programming / configuration[1] |
| 7 | P1 | Parallel Channel select |
| 8 | P2 | Parallel Channel select |
| 9 | P3 | Parallel Channel select MSB |

*Notes:*

1. There is no pull-up on the open collector RXD output.
2. P0-P3 are inverted parallel frequency select inputs. They have 10k pullups to 4.4V
3. P0 requires a 4.4V level UART (inverted RS232) serial command strings for programming
4. A version of the LMR2 firmware is used (so most variants of the LM_series will also be possible for the COR3
5. Two pinout versions are offered:  With conventional pins, out of the bottom of the unit (flat mount) and with right-angle pins, to allow 'SIL' vertical mounting.
6. The actual pinout and footprint follows the NRX1/NRX2 type radio, with the addition of P0-P3

## COR3 serial configuration commands

Serial data is sent to the unit on one of the parallel channel select pins (P0). It is very important that the unit does not 'decode' switch bounce in ordinary operation as a command string, or spurious re-writing of the e2prom will result. For this reason the user must send the 16-character string   ENABLESERIALMODE (followed by a carriage return) to fully enable the serial command mode before sending any of the command strings listed below. Command mode is disabled on power down, or on reception of a  # character. You must power the unit to successfully program it.

2400 baud, 8 bit data, no parity, 1 start bit, 1 or 2 stop bits, No flow control, 4.4V level UART (inverted RS232)

| **GOCHAN  aa** | Serial select of channel aa (0 to 31) |
| **LOAD  aa  nnnnn** | Set value of N for channel aa (channels 0 to 31) |
| **SETPAR** | Channel selected by 4 bit parallel input (0 to 15) |
| **SETSER** | Channel selected by most recent 'gochan' operation |
| **RVALUE  rrrr** | Enter value for R register |
| **SINGLE  nnnnn** | Set value of N for single channel operation. N value NOT stored in eeprom |
| **<cr>** | Process entry |
| **/** | Clear all buffers |
| **#** | Disable command mode |

aa = a two digit channel number from 00 to 31
nnnnn =  synthesizer N register value, (up  to 65535)
rrrr =  synthesizer   R register value, (up to 16383)

$$R = \frac{f_{Xtal}}{f_{channelspacing}} = \frac{13MHz}{25kHz} \text{ , So R=520}$$

$$N = \frac{f_{RF} - IF}{f_{Channelspacing}} = \frac{868MHz - 45MHz}{25kHz} = 32920$$

### *Notes:*

1. *When If an N value greater than 65536 is needed then an offset of +65536 can be selected by setting bit 15 of the R value high*
2. *A pause of at least 50ms must be allowed between command strings (EEPROM programming time) SINGLE mode does not store the N value in EEPROM. Therefore the unit is inoperative after a power down until either another valid SINGLE command is received, or mode is changed by a  GOCHAN, SETPAR or SETSER command. SINGLE mode is intended for frequency agile applications.*
3. */SETPAR command should be issued at the end of channel programming to put the module back into parallel frequency select mode*
4. *User can modify the frequency table of 32channels to any desired frequency by changing N, R values of synthesizer within ±1.5MHz of factory set Channel 0 frequency subject to the Radio Regulatory Band Allocation in the country of intended use.*

# Condensed specifications

| | |
|---|---|
| **Frequency** | Social ALarm (SAL) variant: CH0:869.2125MHz, CH1:869.2375MHz<br>User customisable frequencies: 865MHz – 870MHz<br>(Versions on any other UHF should, in principle, be possible depending on SAW filter availability) |
| *Frequency stability* | $\pm$1.5kHz |
| *Channel spacing* | 25kHz |
| *Number of channels* | 32   channels controlled via UART interface (16 parallel selected) |
| | |
| Supply          *voltage* | 4.5V - 15V DC |
| *Current* | 25mA |
| | |
| Operating temperature | -20$^{o}$C to +55$^{o}$C (Storage  -30$^{o}$C to +70$^{o}$C) |
| Size | 57 x 26 x 9 mm |
| Spurious radiations | Compliant with ETSI EN 300 220-2 (Category 1) and EN 301 489-3 |
| | |
| **Interface** | |
| *user* | 9pin 0.1" pitch molex (optionally 5 pin, without channel selects) |
| *RF* | 2pin 0.1" pitch molex |
| Recommended PCB hole size | 1.2mm (min.) |
| | |
| Intended approval | ETSI Radio standard EN 300 220-2 and EMC standard EN 301 489-3 |
| | |
| **Receive** | |
| Sensitivity | -120dBm for 12 dB SINAD |
| *blocking* | >85dB |
| *adjacent channel* | -62dB          Tested per. ETSI 300-220 v 2.3.1 |
| *Image* | >70dB |
| *spurii* | >65dB |
| Spurious radiations | Compliant with ETSI 300-220-2 (Category 1) and EN 301 489-3 |
| Outputs | RSSI, carrier detect, audio, data |
| Power on to valid audio | 28ms |
| Power on to stable data out (50:50 mark / space) | 50ms |

## Received Signal Strength Indicator

The COR3 has wide range RSSI that measures the strength of an incoming signal over a range of 60dB or more. This allows assessment of link quality and available margin and is useful when performing range tests.

The output on pin 1 of the module has a standing DC bias of up to 0.5V with no signal, rising to 2.5V at maximum indication (RF input levels of -40dBm and above). ∆Vmin-max is typically 2V and is largely independent of standing bias variations.
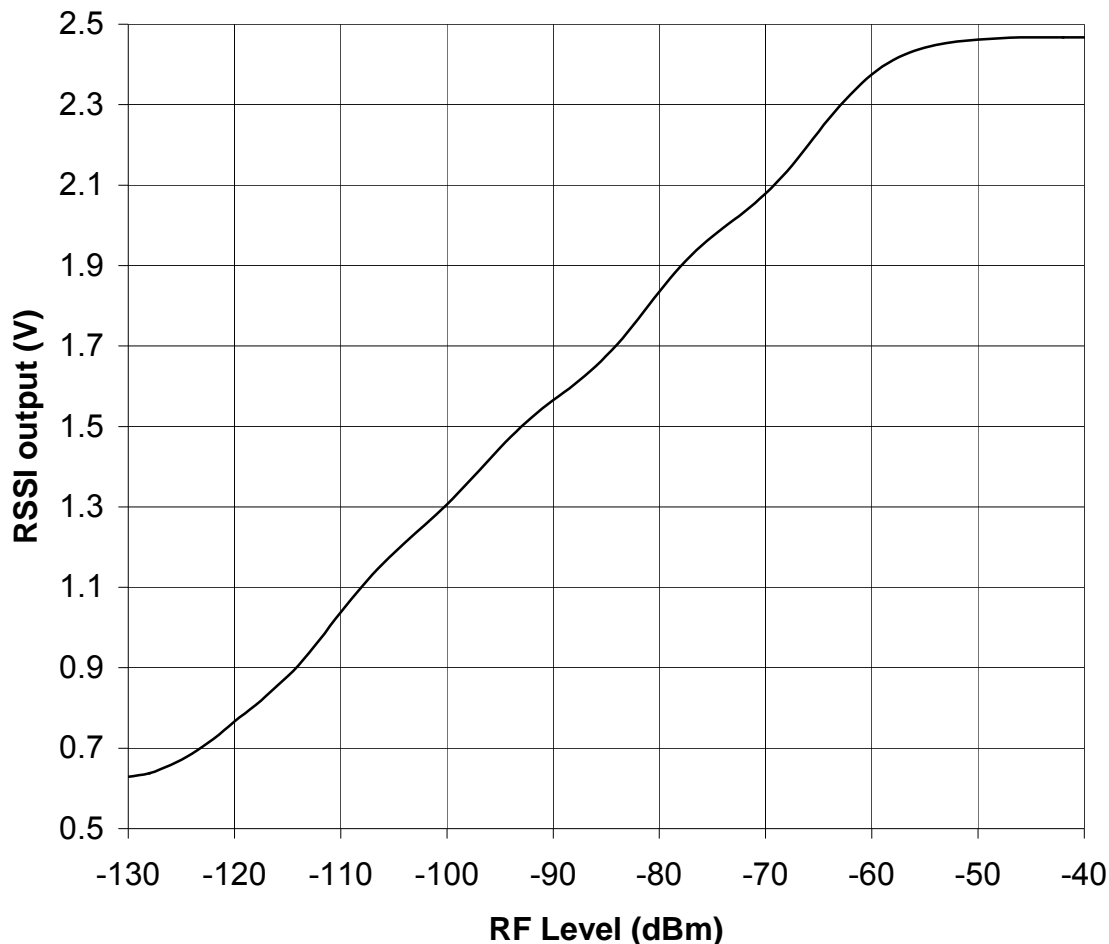


*Figure 4: RSSI voltage variation with respect to RF level at COR3*

## *Ordering Information*

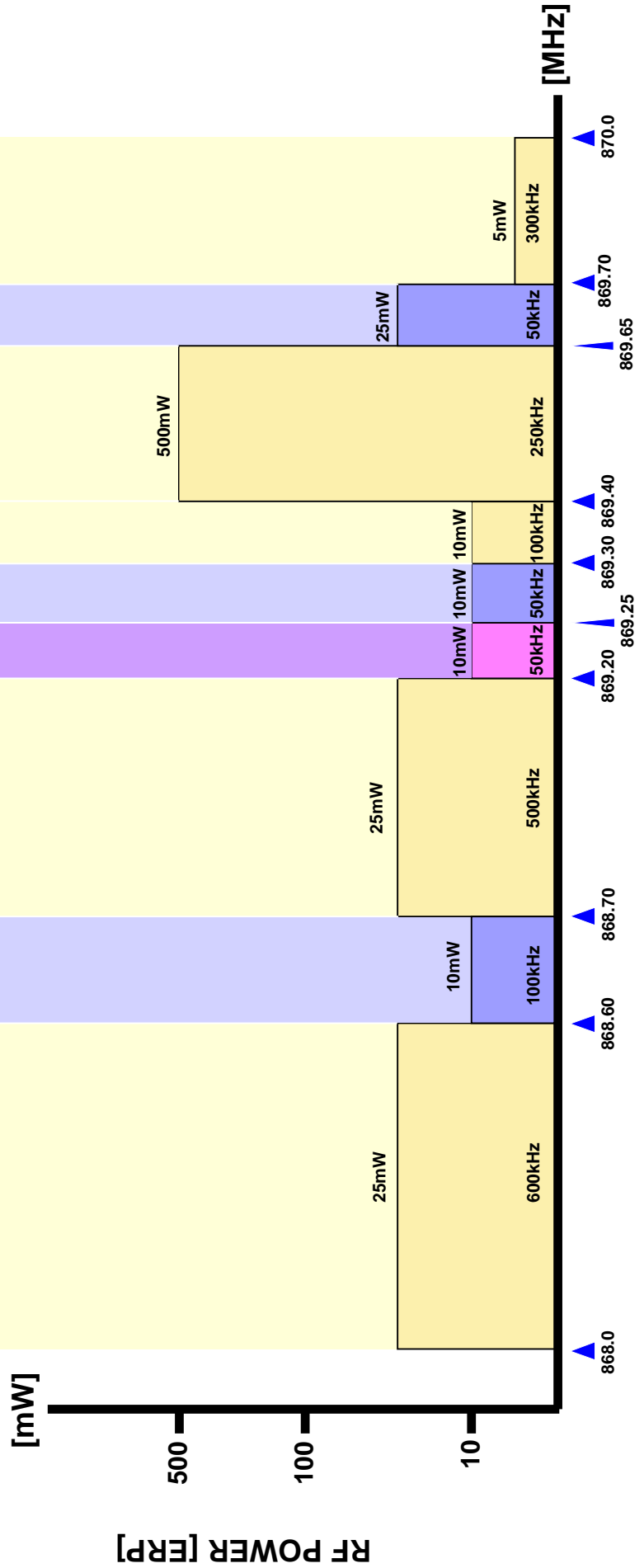| Part Number | Frequency | Module mounting | Pins |
|---|---|---|---|
| COR3-869.2125-5-H | 869.2125MHz | Horizontal Mounting, Perpendicular pins | RF, RFGND, RSSI, GND, VCC, AF, RXD |
| COR3-869-5-SAL | 869.2-869.25MHz | Vertical Mounting, Parallel pins | RF, RFGND, RSSI, GND, VCC, AF, RXD P0/PGM |
| COR3-869-5-SAL-H | 869.2-869.25MHz | Horizontal Mounting, Perpendicular pins | RF, RFGND, RSSI, GND, VCC, AF, RXD P0/PGM |
| COR3-869-5 | 868-870MHz | Vertical Mounting, Parallel pins | RF, RFGND, RSSI, GND, VCC, AF, RXD P3, P2, P1, P0/PGM |

COR3 can be user programmed to any frequency within 865MHz-870MHz SAW filter bandwidth.
It can be factory produced to a wide range of UHF sub-bands subject to availability of SAW filter.

COR3 can be mounted vertically on a PCB with parallel pins like in Figure 1.
Alternatively, COR3 can be supplied with perpendicular pins for horizontal mounting parallel to host PCB ground plane.

Number of parallel channel selection pins depends on required frequency channels.

# Appendix

## CEPT/ERC Rec 70-03, 868 MHz Band Plan

| Applications | Channel Spacing | Duty Cycle | RF Power [ERP] | Bandwidth | Frequency range [MHz] |
|---|---|---|---|---|---|
| Non-specific SRD | No Spacing | <1% or LBT | 25mW | 600kHz | 868.0 – 868.60 |
| Alarm | 25kHz or WB | <1% | 10mW | 100kHz | 868.60 – 868.70 |
| Non-specific SRD | No Spacing | <0.1% or LBT | 25mW | 500kHz | 868.70 – 869.20 |
| Social Alarm | 25kHz | <0.1% | 10mW | 50kHz | 869.20 – 869.25 |
| Alarm | 25kHz | <0.1% | 10mW | 50kHz | 869.25 – 869.30 |
| | | | 10mW | 100kHz | 869.30 – 869.40 |
| Non-specific SRD | 25kHz or Wide Band | <10% or LBT | 500mW | 250kHz | 869.40 – 869.65 |
| Alarm | 25kHz | <10% | 25mW | 50kHz | 869.65 – 869.70 |
| Non-specific SRD | No Spacing | up to 100% | 5mW | 300kHz | 869.70 – 870.0 |

RF POWER [ERP] [mW]: 500, 100, 10

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The Intrastat commodity code for all our modules is: 8542 6000

## *R&TTE Directive*

After 7 April 2001 the manufacturer can only place finished product on the market under the provisions of the R&TTE Directive. Equipment within the scope of the R&TTE Directive may demonstrate compliance to the essential requirements specified in Article 3 of the Directive, as appropriate to the particular equipment.
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