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# HMT2-458-5        PRELIMINARY        Issue 1, 31th March 2016

## NBFM Multi-channel 500mW UHF Transmitter

The HMT2 transmitter module offers a 500mW RF output in the UK 458MHz. This unit is ideally suited to applications where existing lower powered transmitters provide insufficient range. The HMT2 transmitter is a multi-channel, narrowband design, suitable for licensed and unlicensed UHF allocations. Together with a matching LMR2 receiver a one-way radio data link can be achieved over a distance of well over 5km (with a suitable antenna).



*Figure 1: HMT2-458-5*

### Features

- Conforms to EN 300 220-3 and EN 301 489-3
- PLL Synthesized transmitter with TCXO
- Data rates up to 5 kbps for standard module
- Usable range over 5km
- Fully screened
- User configurable via RS232 interface
- Low power requirements

### Applications

- Handheld terminals
- On-site paging system (e.g. Nurse call pagers)
- Heavy vehicle/machine remote controls
- Data loggers
- Industrial telemetry and telecommand
- High-end security and fire alarms
- Vehicle data up/download

### Technical Summary

- Operating frequency: 458.525 - 459.1MHz (standard)
  or 458.8 - 459.3MHz and 461.3MHz (for paging)
- 16 parallel / 32 serial select channels
- Transmit power: +27dBm (500mW) nominal
- Supply range: +5V regulated (or +6 - +9V for -R version)
- Current consumption: 350mA transmit, <5µA standby
- Data bit rate: 5kbps max. (standard module)
- Size: 66 x 23 x 9 mm
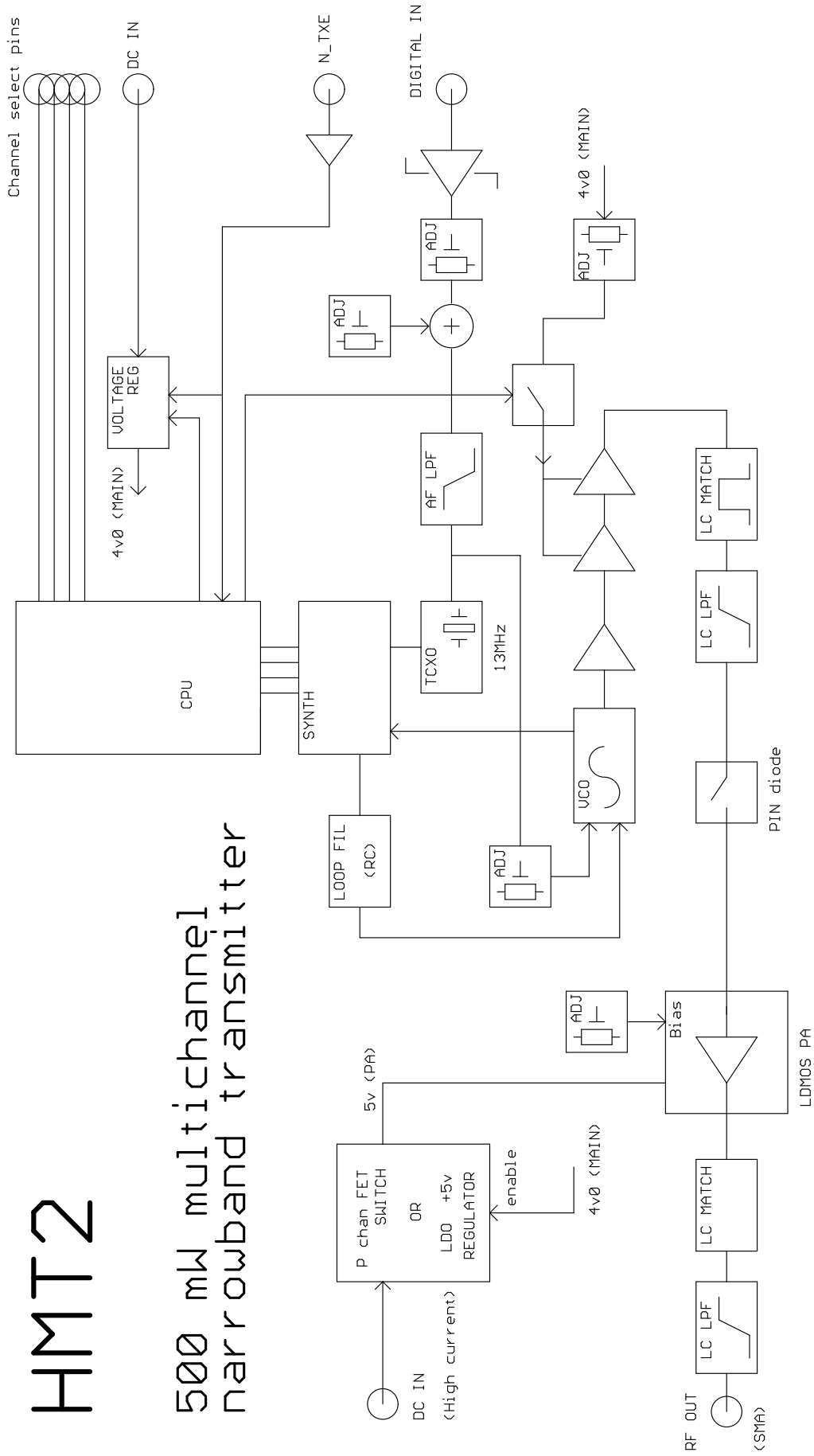
# HMT2

## 500 mW multichannel narrowband transmitter



Figure 2: HMT2 block diagram
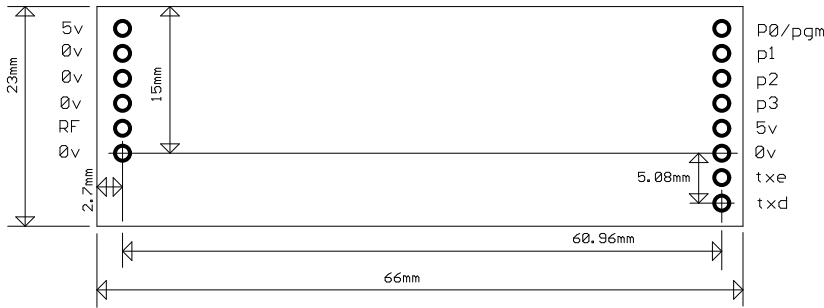
```
HMT2 transmitter footprint
```



Figure 3: HMT2 Footprint (Top) view through can

## User Interface

### Pin description

| Pin | Name | Function |
|-----|------|----------|
| 1a | Vcc | 5v regulated power supply (high current feed) |
| 2a | 0V | Ground |
| 3a | 0V | Ground |
| 4a | 0V | Ground |
| 5a | RF input | 50Ω RF input from the antenna |
| 6a | 0V | Ground |
| | | |
| 1b | P0/PGM | Channel select LSB / Serial programming (inverted logic level rs232) |
| 2b | P1 | Channel select |
| 3b | P2 | Channel select |
| 4b | P3 | Channel select MSB |
| 5b | Vcc | 5v input (low current feed) |
| 6b | 0V | Ground |
| 7b | TXE | Transmitter enable. Low = ON, open = off. 100K pullup to Vcc |
| 8b | TXD | DC coupled input for 3V CMOS logic. $R_{in}$=47kΩ |

**Notes:**
1. Serial programming is by an inverted, cmos logic level, 2400 baud RS232 datastream applied to the P0 pin.
2. Channel select inputs have pullups (50K) to 4v internal rail. Do not exceed 4v logic levels on this port.
3. Channel select inputs are active low
4. TXE has a 100K pullup to Vcc
5. All pins are on an 0.1" grid
6. Pin 1a supplies the power amplifer. This pin requires a clean, well regulated 5v supply at up to 300mA
   Pin 5b supplies the remainder of the module. It can tolerate 4.1-9v and draws up to 100mA
7. A version of the design is available with an LDO regulator in the PA feed.
   In this case pin 1a can be supplied from a 6-9v rail too
8. Pinout is compatible with FPX3, SHX1 and UHX1 transceivers, although the case is narrower and the pins associated with receive functionality are absent.

## Serial interface commands

The internal firmware for HMT2 has two versions.

> **Version 1** is IDENTICAL to our standard LMT2-458-5 (100mW) in all respects

> **Version 2** is specific to paging applications.

**Version 1: programming instruction**

2400 baud RS232. 8 bit data, no parity, 1 start bit, 1 or 2 stop bits.

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. To successfully program the unit, n_txe must be 'low' (active) to enable the unit.

| GOCHAN   aa | Serially select channel aa, where aa is ch0 to ch31 |
|---|---|
| LOAD aa   nnnnn | Set value of N register for channel aa, where aa is Channels 0 to 31 |
| SETPAR | Channel selected by 4 bit parallel inputs (ch0 to ch15 only) |
| SETSER | Channel selected by most recent GOCHAN operation |
| RVALUE   rrrr | Set value for R register |
| SINGLE nnnnn | Set value of N for single channel operation.<br>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)

$$N = \frac{f_{RF}}{f_{Channelspacing}} = \frac{458.525MHz}{25kHz} = 18341$$

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

***Note***:   *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.*

**Version 2: programming instruction**

The HMT2 provides 32 individually programmable channels

(As supplied, CH00-CH20 are programmed to 458.8 - 459.3MHz, and channels 21-31 are all set to 461.3MHz)

| GOCHAN   aa | Serially select channel aa, where aa is ch0 to ch31 |
|---|---|
| TEMP aa | select channel aa, but revert to last GOCHAN value on next key-up |
| | |
| LOAD aa    nnnnn | Set value of N register for channel aa, where aa is Channels 0 to 31 |
| RVALUE   rrrr | Set value for R register |
| | |
| <cr> | Process entry |
| / | Clear all buffers |

aa = a two digit channel number from 00 to 31  (and it MUST be two digits, so use "01" instead of "1".etc)
nnnnn = synthesizer N register value (up  to 65535)
rrrr = synthesizer R register value (up to 16383)

$$N = \frac{f_{RF}}{f_{Channelspacing}} = \frac{458.800MHz}{25kHz} = 18352$$

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

### Notes:
1. A 2400 baud cmos level 'inverted  RS232 format' (1 start bit, 8 data, 1or 2 stop bits, no parity) is used.
2. The unit echos all bytes sent back on the P3 output.
   Following any successful operation, the bytes   OK <cr> are also sent back, when the unit  is ready.
3. To successfully program the unit it must be in active state (txe low), so provision should be made to force the unit into this state while programming (the third pin on the auxiliary programming connector does this).
4. All commands except the non-volatile TEMP aa initiate an e2prom programming sequence. 50mS must be left before the next command is sent.
5. These units employs a sub-set of  the programming commands used by standard LMT module. (As the P0 pin is dedicated to serial communication only, the 'ENABLESERIALMODE' command string is NOT required.)

# Condensed specifications

| Frequency | As supplied:<br>Version 1: 458.525 - 459.1MHz (25kHz steps)<br>Version 2: 458.8 - 459.3MHz (25KHz steps) and 461.3MHz |
|---|---|
| *Frequency stability* | +/- 1.5kHz |
| *Channel spacing* | 25kHz |
| *Number of channels* | 16 channels controlled by parallel port<br>32 channels controlled via RS232 interface |
| ***Transmit*** | |
| Output power | +27dBm (500mW) ±1dB |
| TX on switching time | 30 ms from $\overline{\text{TXE}}$ transition |
| Modulation type | FSK (F3D) |
| TX modulation bandwidth | DC – 3kHz (3v  CMOS compatible DATA input) |
| Adjacent channel TX power | <-37dBm |
| TX spuri | <-36dBm   (no output in standby) |
| Spurious radiations | Compliant with ETSI EN 300 220-3 and EN 301 489-3 |
| Inputs | data (CMOS/TTL compatible) |
| | |
| ***Supply***    V*oltage* | +5V regulated (or 6-9V in –R version) |
| *Current* | 350mA nominal transmit |
| | <5µA standby ($\overline{\text{TXE}}$ high or floating) |
| **Interface** | |
| *User* | 8 pin 0.1"  pitch single row header |
| *RF* | 6 pin 0.1" pitch |
| | |
| Recommended PCB hole size | 1.2mm (min.) |
| Size | 66 x 23 x 9mm |
| | |
| Operating temperature | -20 to +55 $^{\text{o}}$C (Storage  -30 to +70 $^{\text{o}}$C) |
| Intended approval | ETSI Radio standard EN 300 220-3 and EMC standard EN 301 489-3 |

## Ordering Information:

| Part No. | Notes | Frequency band |
|---|---|---|
| HMT2-458-5 | version 1 | 458.525 - 459.1MHz |
| HMT2-460-5 | version 2 | 458.8 - 459.3MHz and 461.3MHz |
| HMT2-458-5-R | version 1; regulator version | 458.525 - 459.1MHz |
| HMT2-460-5-R | version 2; regulator version | 458.8 - 459.3MHz and 461.3MHz |
| | | |
| **Matching Receiver** | | |
| LMR2-458-5 (version 1) | | 458.525 - 459.1MHz |
| LMR2-460-5 (version 2) | | 458.8 - 459.3MHz and 461.3MHz |

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## 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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