



## HMT2-458-5

## PRELIMINARY

Issue A, 06<sup>th</sup> February 2013

### 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

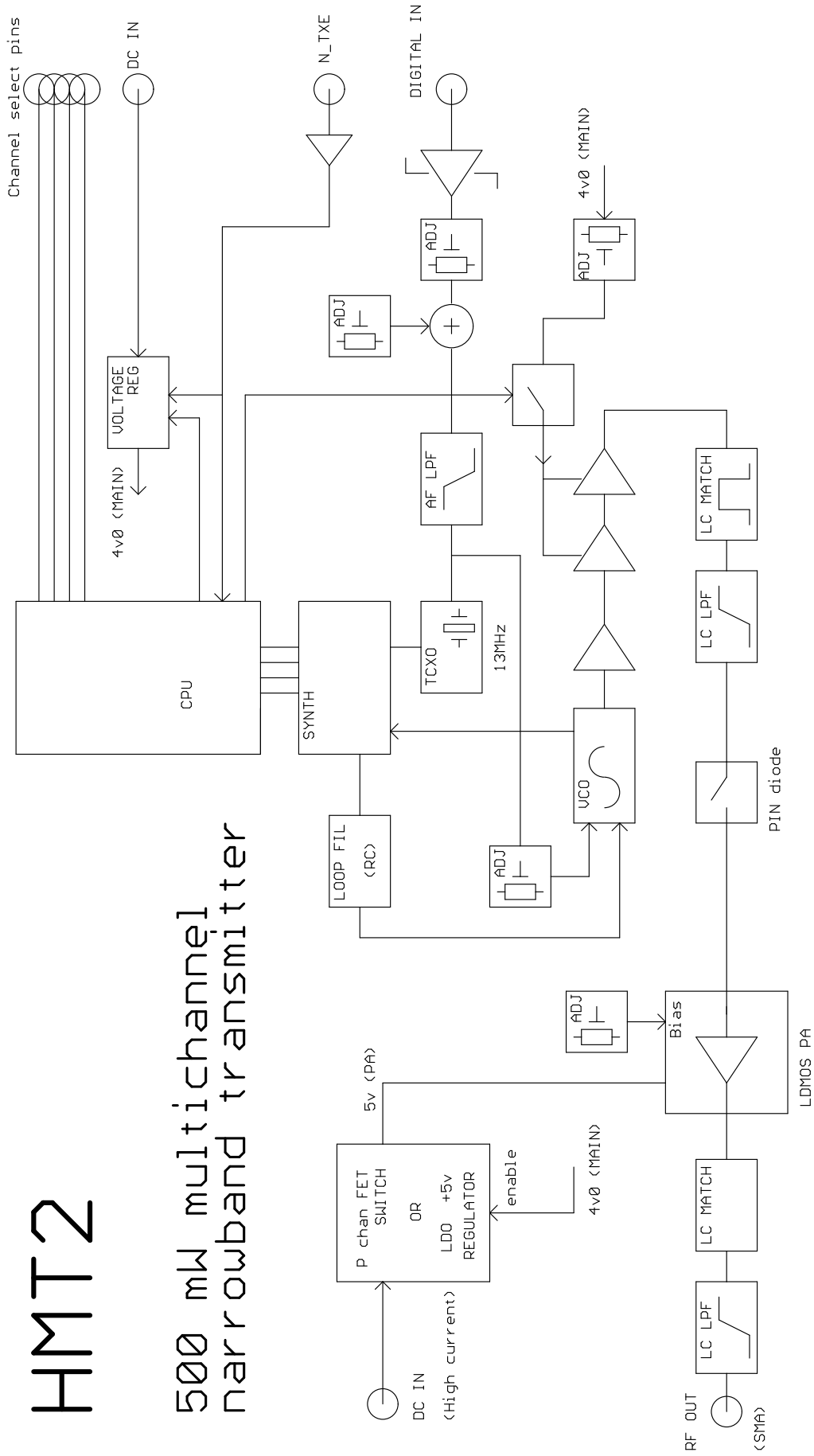


Figure 2: HMT2 block diagram

## HMT2 transmitter footprint

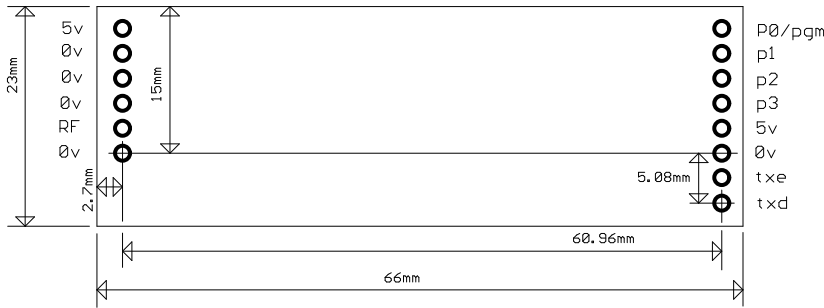


Figure 3: HMT2 Footprint (Top) view through can

## 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	TXE	Transmitter enable. Low = ON, open = off. 100K pullup to Vcc
7b	0V	Ground
8b	TXD	DC coupled input for 3V CMOS logic. $R_{in}=47k\Omega$

### 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 amplifier. 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. 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

<b>Frequency</b>	As supplied: Version 1: 458.525 - 459.1MHz (25kHz steps) Version 2: 458.8 - 459.3MHz (25KHz steps) and 461.3MHz	
<i>Frequency stability</i>	+/- 1.5kHz	
<i>Channel spacing</i>	25kHz	
<i>Number of channels</i>	16 channels controlled by parallel port 32 channels controlled via RS232 interface	
<b>Transmit</b>		
Output power	+27dBm (500mW) ±1dB	
TX on switching time	30 ms from 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)	
<b>Supply</b>	<i>Voltage</i>	+5V regulated (or 6-9V in –R version)
	<i>Current</i>	350mA nominal transmit
		<5µA standby (TXE high or floating)
<b>Interface</b>		
	<i>User</i>	8 pin 0.1" pitch single row header
	<i>RF</i>	6 pin 0.1" pitch
Recommended PCB hole size	1.2mm (min.)	
Size	66 x 23 x 9mm	
Operating temperature	-20 to +55 °C (Storage -30 to +70 °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
<b>Matching Receiver</b>		
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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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.

Further details are available on The Office of Communications (Ofcom) web site:

***<http://www.ofcom.org.uk/radiocomms/ifi/>***

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