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VHF Narrow Band FM 2 Watt multi channel

The QPT1 transmitter module offers a 2 watt RF output VHF radio link, in either a robust aluminium extruded casing, or a smaller footprint PCB mounted shield can. This unit is ideally suited to applications where existing lower powered transmitters provide insufficient range. The QPT1 transmitter is a multi-channel, narrowband design, suitable for licensed and unlicensed VHF allocations, FCC part 90 operation, and the 2M amateur band. Together with a matching LMR1 or RX1M receiver a one-way radio data link can be achieved over a distance of well over 10km (with a suitable antenna)."

Figure 1: QPT1-173-5-12k5-FCC-EAS

Features

- Compliant with FCC part 90
- PLL synthesizer with TCXO
- Data rates up to 5 kbps for standard module
- Usable range over 10km
- Re-programmable via RS232 interface

Applications

- Amateur radio
- MURS units
- Industrial telemetry and telecommand
- High-end security systems
- APRS systems
- Vehicle data up/download
- ROV/machinery controls

Technical Summary

- Operating frequency: 144.000 - 144.775 (25KHz steps)
- Any 2MHz segment in 135 - 175MHz
- 16 channels selected by parallel interface
- or 32 channels by serial command
- Transmit power: 2 W (+33dBm) nominal (1 watt version available)
- Supply range: 12V (11 – 15V)
- Current consumption: 550mA typ.
- Data bit rate: 5kbps max
- Size: 68 x 55 x 15mm (pcb mounted version)
  - 83 x 64 x 30 mm (extrusion case version)
  - (dimensions do not include connectors)

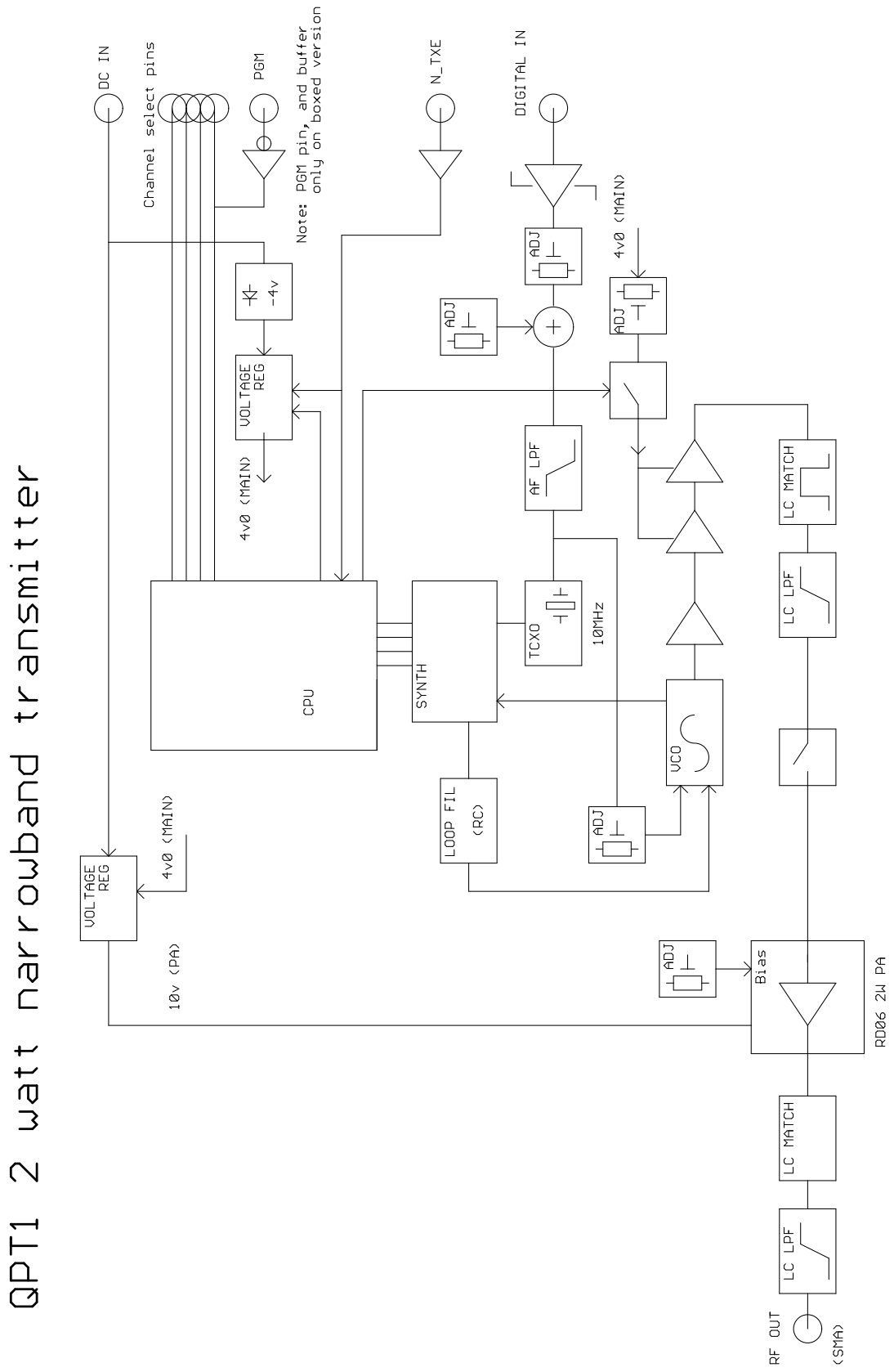

Figure 2: QPT1 block diagram

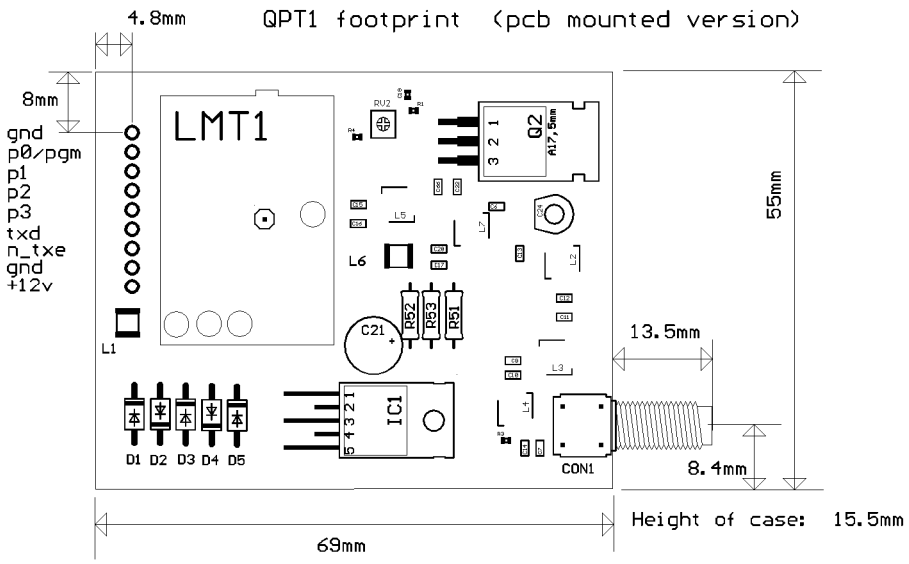

Figure 3: QPT1 footprint (top view through can)

Pin description (PCB mounted version)

Pin	Name	Function
1	Vcc	12V DC supply (11-15V). 550mA typ. current drain
2	0V	Ground
3	$\overline{\text{TXE}}$	Transmitter enable. Low = ON, open = off. 100K pullup to (raw Vin -4v)
4	TXD	DC coupled input for 3V CMOS logic. R_{in}=47kΩ
5	P3	Parallel Channel select MSB
6	P1	Parallel Channel select
7	P2	Parallel Channel select
8	P0	Parallel Channel select (LSB) and serial programming/control input (inverted logic level RS232)
9	0V	Ground

Notes:

1. No 'modem version' is available, but the PL_ and CX series firmware can be used
2. Parallel port has a 50K pullups to internal 4v rail
3. **Caution**. The TXD and P0-P3 inputs are not high voltage tolerant. Low voltage logic, or switches to ground, are required.
4. Overall thermal power dissipation in normal use is around 4 watts, rising to 6-7 watts under aerial fault conditions.
5. This is a 2 watt output product. Good grounding , good quality aerials, properly mounted, and a low impedence power supply are required if full performance is to be reliably obtained. If feasible, we recommend mounting the module, and the board it is on, inside a metal enclosure, with the RF connctor exiting through a bulkhead. All signal and power feeds should be filtered and/or decoupled.
   Failure to observe these measures can cause modulation distortion ('recirculation' effects) or instability. Also be aware of the effect that the strong RF fields generated by this device (and it's aerial) can have upon other adjacent circuitry if this is not properly screened, filtered or otherwise protected. Regulators, sensitive analogue circuitry, and microprocessors seem especially interference prone.
6. Two watts of RF at VHF can cause an unpleasant and painful burn. Be careful
7. This design uses the LMT1 100mW transmitter as an internal component

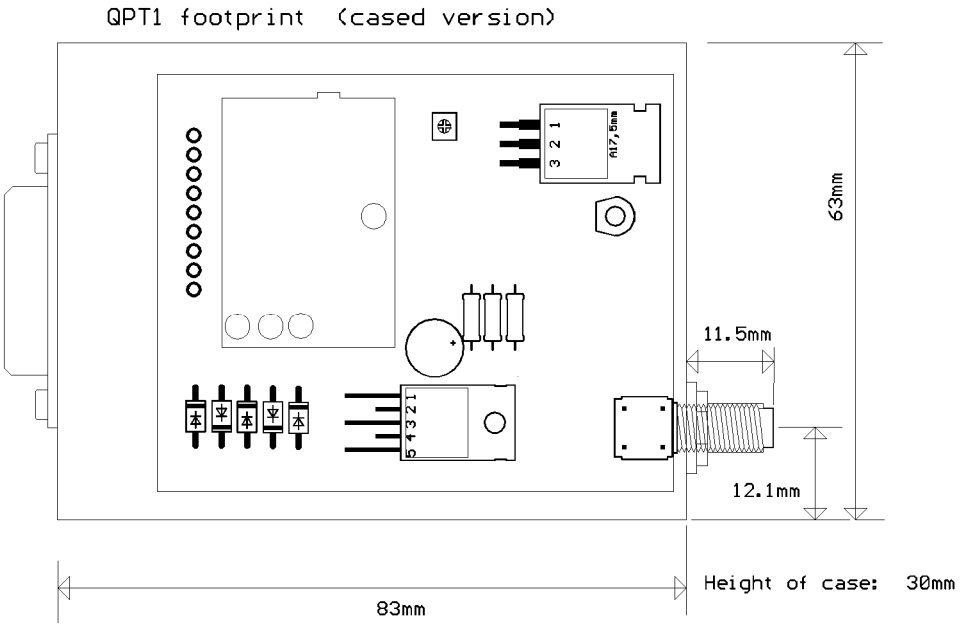

Figure 3: QPT1 footprint (top view through casing)

Pin description (15 way D type connector)

Pin	Name	Function
1	TXD	DC coupled input for 3V CMOS logic. R_{in}=47kΩ
2	$\overline{\text{TXE}}$	Transmitter enable. Low = ON, open = off. 100K pullup to (raw Vin -4v)
3 -8	N/C	(reserved for future products)
9	0V	Ground
10	P3	Parallel Channel select MSB
11	P1	Parallel Channel select
12	P2	Parallel Channel select
13	P0	Parallel Channel select (LSB) and serial programming/control input (inverted logic level RS232)
14	PGM	True RS232 input (inverter to pin 13)
15	Vcc	12V DC supply (11-15V). 550mA typ. current drain

Notes:

1. No 'modem version' is available, but the PL_ and CX series firmware can be used
2. Parallel port has a 50K pullups to internal 4v rail, and 5v transorbs to ground
3. **Caution**. The TXD and P0-P3 inputs are not high voltage tolerant. Low voltage logic, or switches to ground, are required.
4. A simple RS232 voltage tolerant transistor inverter connects pin 14 to P0/PGM
5. Overall thermal power dissipation in normal use is around 4 watts, rising to 6-7 watts under aerial fault conditions.
6. This is a 2 watt output product. Good grounding , good quality aerials, properly mounted, and a low impedence power supply are required if full performance is to be reliably obtained.
   Be aware of the effect that the strong RF fields generated by this device (and it's aerial) can have upon other adjacent circuitry if this is not properly screened, filtered or otherwise protected. Regulators, sensitive analogue circuitry, and microprocessors seem especially interference prone.
7. Two watts of RF at VHF can cause an unpleasant and painful burn. Be careful
8. This design uses the LMT1 100mW transmitter as an internal component
9. For visual reference, this unit uses an Evatron-type REAS80 extrusion

Serial interface commands

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)

***For QPT1 Transmitter*:**

$$R = \frac{f_{Xtal}}{f_{channelspacing}} = \frac{10MHz}{25kHz}$$, So R=400

$$N_{TX} = \frac{f_{RF}}{f_{Channelspacing}} = \frac{173.250MHz}{25kHz} = 6930$$

Notes: *1. A pause of at least 50ms must be allowed between command strings (EEPROM programming time).*
2. 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.

Condensed specifications

Frequency	As supplied: 144.000 - 144.775MHz (25kHz steps) North American: 173.20375 - 173.39625MHz (12.5kHz steps) 154.45625 - 154.47875MHz (12.5kHz steps) General: any +/-2MHz band in 135-175MHz
Frequency stability	±1.5kHz
Channel spacing	25kHz (12.5kHz for North America)
Number of channels	16 channels controlled by parallel port or 32 via serial RS232 interface
Operating temperature	-20 ºC to +55 ºC (Storage -30 ºC to +70 ºC)
Transmitter	
Output power	+33dBm (2W) ±1dB
Peak deviation	±3kHz (±1.5kHz @ 12.5kHz channel spacing)
TX on switching time	30ms from $\overline{\text{TXE}}$ transition
Modulation type	FSK (F3D)
TX modulation bandwidth	DC – 5kHz (3V CMOS compatible)
Adjacent channel TX power	<-37dBm
TX spurious	<-36dBm (no RF output in Standby)
Supply	
Voltage	11 – 15V
Current	550mA nominal transmit <5µA standby ($\overline{\text{TXE}}$ high or floating)
Inputs	data (CMOS/TTL compatible)
Size	68 x 55 x 15mm (pcb mounted version) 83 x 64 x 30 mm (extrusion case version) *(dimensions do not include connectors)*
Interface *User*	9 pin 0.1" pitch header (pcb mounted version) 15 pin D type socket (extrusion case version)
RF	SMA bulkhead connector
Recommended PCB hole size	1.2mm (pcb mounted version)

Ordering Information

Part No.	Description	Channel spacing	Frequency band (MHz)
QPT1-144-5	PCB mounted TX	25kHz	144.000 - 146.000
QPT1-144-5-EAS	TX in extrusion case	25kHz	144.000 - 146.000
LMR1-144-5	Receiver	25kHz	144.000 - 146.000
QPT1-154-5-12k5-FCC	PCB mounted TX	12.5kHz	154.000 - 156.000
QPT1-154-5-12k5-FCC- EAS	TX in extrusion case	12.5kHz	154.000 - 156.000
LMR1-154-5-12K5-FCC	Receiver	12.5kHz	154.000 - 156.000
QPT1-173-5-FCC	PCB mounted TX	12.5kHz	173.000 - 175.000
QPT1-173-5-12k5-FCC-EAS	TX in extrusion case	12.5kHz	173.000 - 175.000
LMR1-173-5-12K5-FCC	Receiver	12.5kHz	173.000 - 175.000
QPT1-xxx-5	Where xxx is any 2MHz band from 135MHz to-175MHz		
QPT1-xxx-5-12k5			
QPT1-xxx-5-EAS			
QPT1-xxx-5-12k5-EAS			
LMR1-xxx-5			
LMR1-xxx-5-12k5			

FCC Part 90.238 Telemetry frequency channels (12.5KHz spacing)

Channels	173MHz band	154MHz band
CH0	173.20375	154.45625
CH1	173.21000	154.46375
CH 2	173.23750	154.47125
CH 3	173.28750	154.47875
CH 4	173.31250	154.45625
CH 5	173.33750	154.46375
CH 6	173.36250	154.47125
CH 7	173.39625	154.47875

Data sheet links:
http://www.radiometrix.co.uk/dsheets/qpt1.pdf
http://www.radiometrix.co.uk/dsheets/lmt1lmr1.pdf

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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/

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