



## WFX2

Issue 1, 28 May 2012

### 500mW High power, fast, multi-channel transceiver

*The WFX2 is a high power fast-switching multi-channel narrowband FM transceiver, capable of 500mW RF power output on 458.5-459.5MHz.*



Figure 1: WFX2-458-5

#### Features

- Conforms to EN 300 220-2 and EN 301 489-3
- High performance double superhet Low noise PLL Synthesizer with TCXO
- Data rates up to 5 kbps for standard module
- Usable range over 5km
- Fully screened
- Feature-rich interface (RSSI, analogue and digital baseband)
- User configurable via serial interface

#### Applications

- Heavy vehicle/machine remote controls
- Data loggers
- Industrial / Commercial Telemetry and Telecommand
- In-building environmental monitoring and control
- High-end security and fire alarms
- Vehicle data up/download

#### Technical Summary

- Operating frequency: 458.525-459.1MHz (UK)
- Up to 256 channels (32 individually programmed channels).
- Transmit power: +27dBm (500mW) nominal
- Supply range: 5V DC
- Current consumption: 380mA transmit, 35mA receive
- Data bit rate: 5kbps max. (standard module)
- 9600baud GMSK for (-G variant)
- Receiver sensitivity: -118dBm (for 12 dB SINAD)

# WFX2-458-5

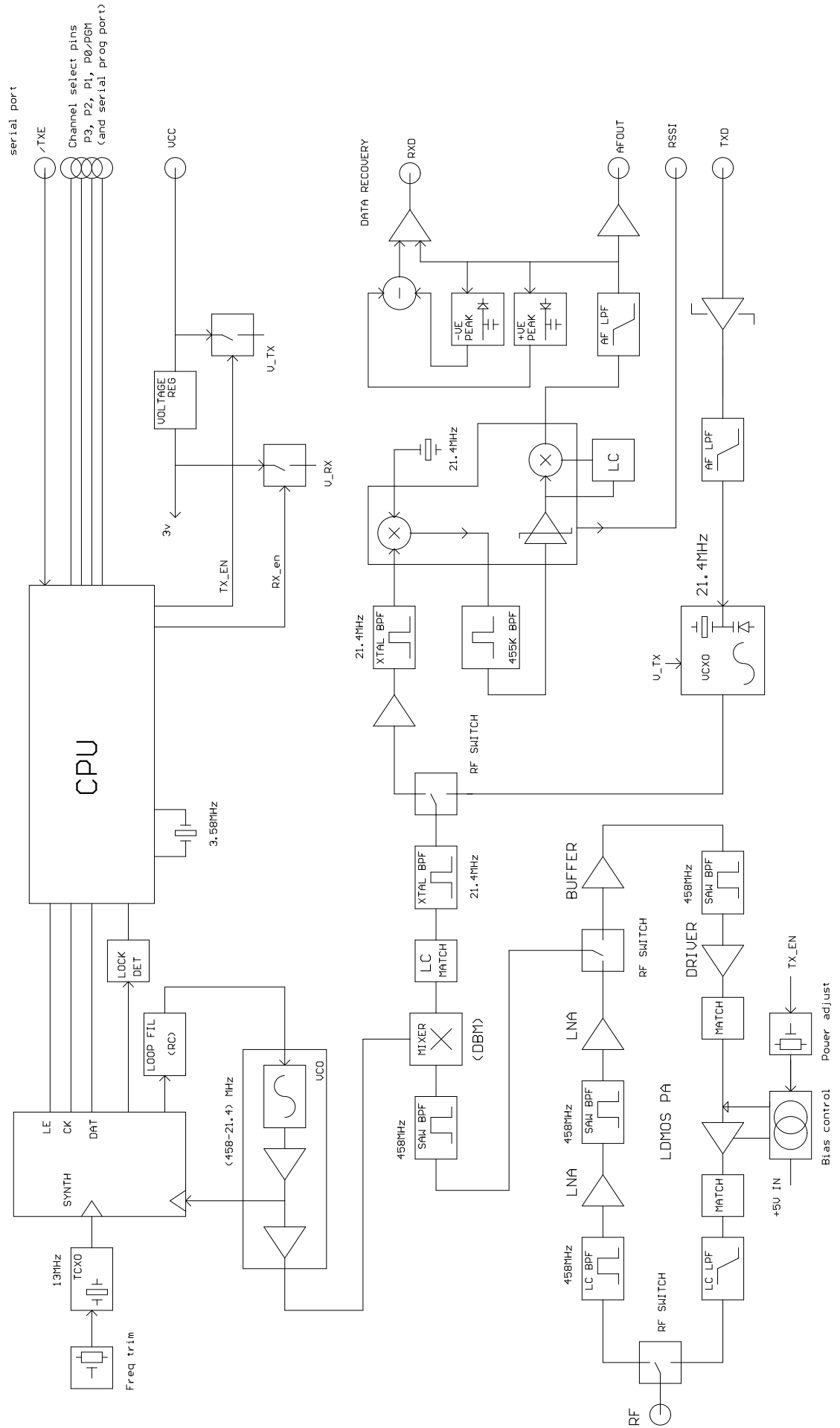
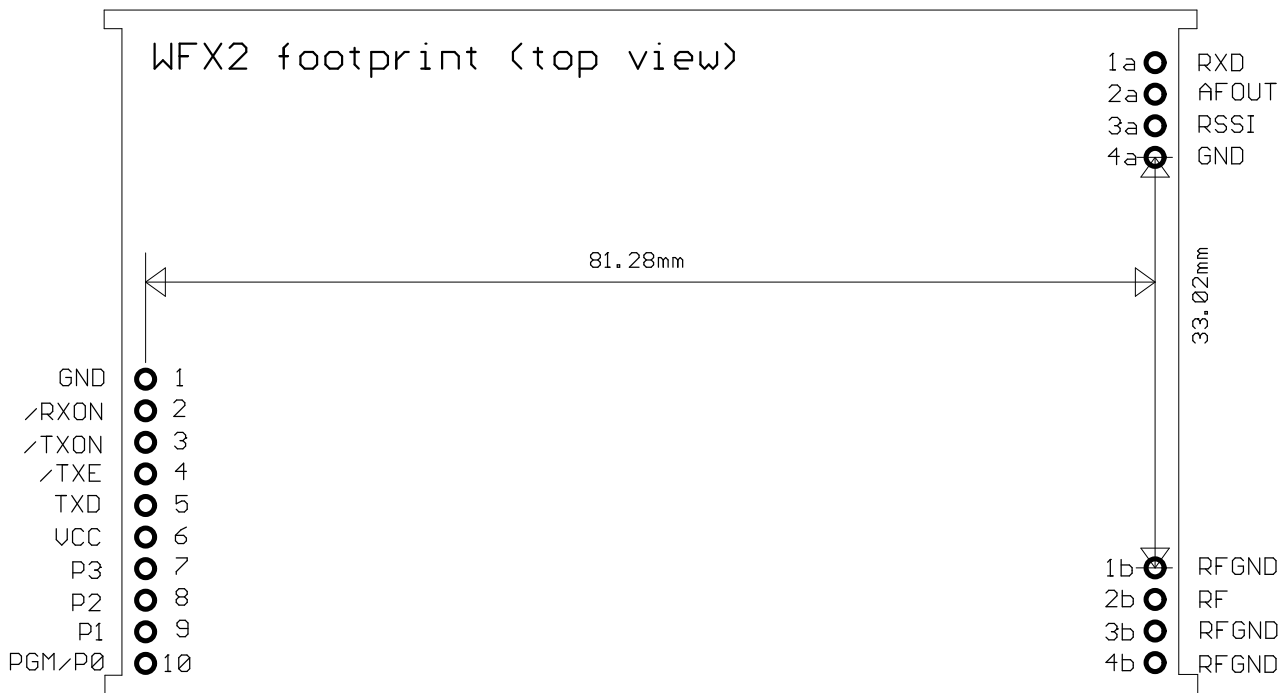


Figure 2: WFX2 Block Diagram



**Figure 3: WFX2 basic footprint**

### Pin Description

Pins		Normal mode
<b>User</b>		
1	GND	Ground
2	$\overline{\text{RXON}}$	Active Low Receiver ON Indicator logic output
3	$\overline{\text{TXON}}$	Active Low Transmitter ON Indicator logic output
4	$\overline{\text{TXE}}$	Active Low Transmit Enable Input. $\overline{\text{TXE}}=5\text{V}$ or Open for Receiver Enable
5	TXD	Transmit Data Input DC coupled for 3V-12V CMOS logic. (5kbps standard) 1V <sub>pk-pk</sub> , 2.5V biased DC coupled AFIN input (-G variant for 9600 baud GMSK)
6	VCC	Externally regulated +5V <400mA DC supply
7	P3	P3 (MSB) Parallel Channel Selection Input '0'=5V (NC), '1'=0V (GND)
8	P2	P2 Parallel Channel Selection Input '0'=5V (NC), '1'=0V (GND)
9	P1	P1 Parallel Channel Selection Input '0'=5V (NC), '1'=0V (GND)
10	P0/PGM	P0 (LSB) Parallel Channel Selection Input '0'=5V (NC), '1'=0V (GND) Serial Programming Input 5V TTL level UART format (Inverted RS232)
<b>User</b>		
1a	RXD	Open collector output of data slicer. 47k $\Omega$ internal pull-up to VCC
2a	AF	300mV <sub>pk-pk</sub> Audio. DC coupled, approx 1V bias
3a	RSSI	DC level between 0.5V and 2.5V. 60dB dynamic range
4a	GND	Ground
<b>RF</b>		
1b	RFGND	RF Ground
2b	RF	RF Input/Output for Aerial connection
3b	RFGND	RF Ground
4b	RFGND	RF Ground

#### Notes:

- There is a 47k $\Omega$  pull-up to 5V on RXD output
- Logic inputs (P3, P2, P1, P0/PGM,  $\overline{\text{TXE}}$ ) have internal pull-ups to 5V  
(Approximately 50k $\Omega$  on P3, P2 and P1. 10k $\Omega$  on P0/PGM and  $\overline{\text{TXE}}$ )
- $\overline{\text{RXON}}$  (pins 2) and  $\overline{\text{TXON}}$  (pin 3) are CMOS logic outputs from the control processor.  
For interest, pin 2 goes low when the receiver circuits are enabled  
pin 3 goes low when the transmitter circuits activate  
If both are high for more than 10ms, then this indicates the PLL is out of lock  
Normally these pins are left Not Connected (NC)  
A 2mA LED (with series 1.5k $\Omega$  resistor) from  $\overline{\text{TXON}}$  to 5V will light up when the unit transmits
- PGM uses 2400bps, 8 data bits, no parity, 1 stop bit, no flow control asynchronous data format

PGM Serial data is sent to the unit on one of the parallel channel select (P0) pin 10. This pin can also be connected to a parallel channel select switch, so 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 EEPROM will result. For this reason the user must send the 16 character string `ENABLESERIALMODE` (followed by a carriage return 0x0D) to fully enable the serial command mode before sending any of the command strings listed below. Command mode is disabled on power down, on reception of a `#` (0x23) character, or the execution of a `SETPAR` command.

Issuing a `LOCKSM` command (after an `ENABLESERIALMODE`, of course) will lock the unit into serial mode (useful if the module is never being used with parallel channel select). In this mode only a `SETPAR` will return it to the basic parallel select operation

The command decoder used in the WFX2 firmware is very simple. It consists of a six character text buffer, followed by a 16 bit numeric register (in any given command entry sequence the first six characters will be interpreted as text, then any subsequent input will be interpreted as a number. Numeric input is assumed to be in decimal)

The `<cr>` character initiates the command. The contents of the text buffer is parsed for a valid command, the command enacted and the buffer cleared. This process takes several milliseconds. If the command requires writes to the internal EEPROM, this "command latency" will extend to over fifty milliseconds.

When a `GOCHAN` command is enacted when in serial mode, the new "default" channel is stored in EEPROM. If the unit is then cycled OFF and ON again the channel will remain the last `GOCHAN` value (and the parallel port remains inactive) until another `ENABLESERIALMODE` is sent

The "channel map" relates channel number to PLL synth N register value, and hence frequency. The first 32 channels have individually programmable N values  
The remaining channels (32 to 255) are a sequential table, with programmable start frequency, maximum channel and step value

<code>GOCHAN aaa</code>	serial select of channel aaa (ch0 to 255) and program to EEPROM
<code>GOTEMP aaa</code>	volatile serial select of channel aaa (ch0 to 255)
<code>LOAD aa nnnnn</code>	set value of N for channel aa (channels 0 to 31)
<code>LOADTB nnnnn</code>	set value of N for start of sequential table (chan 32)
<code>LOADMX aaa</code>	set highest usable channel number (applies to sequential table only) setting this to zero disables the sequential table
<code>RVALUE rrrr</code>	set value for R register
<code>SINGLE nnnnn</code>	set value of N for single channel operation. N value NOT stored in e2prom
<code>INCREM x</code>	sequential table step value
<code>SETPAR</code>	channel selected by 4 bit parallel input (ch0 to 15 only) (also cancels a <code>LOCKSM</code> command)
<code>SETSER</code>	channel selected by most recent 'gochan' operation
<code>LOCKSM</code>	unit now defaults to serial operation at power up
<code>DUMPEE</code>	outputs the whole e2prom memory field at 2400 baud, using P3 as an output (128 consecutive unformatted bytes)
<code>&lt;cr&gt;</code>	process entry
<code>/</code>	clear all buffers
<code>#</code>	disable serial command mode

aaa = channel number from 0 to 255

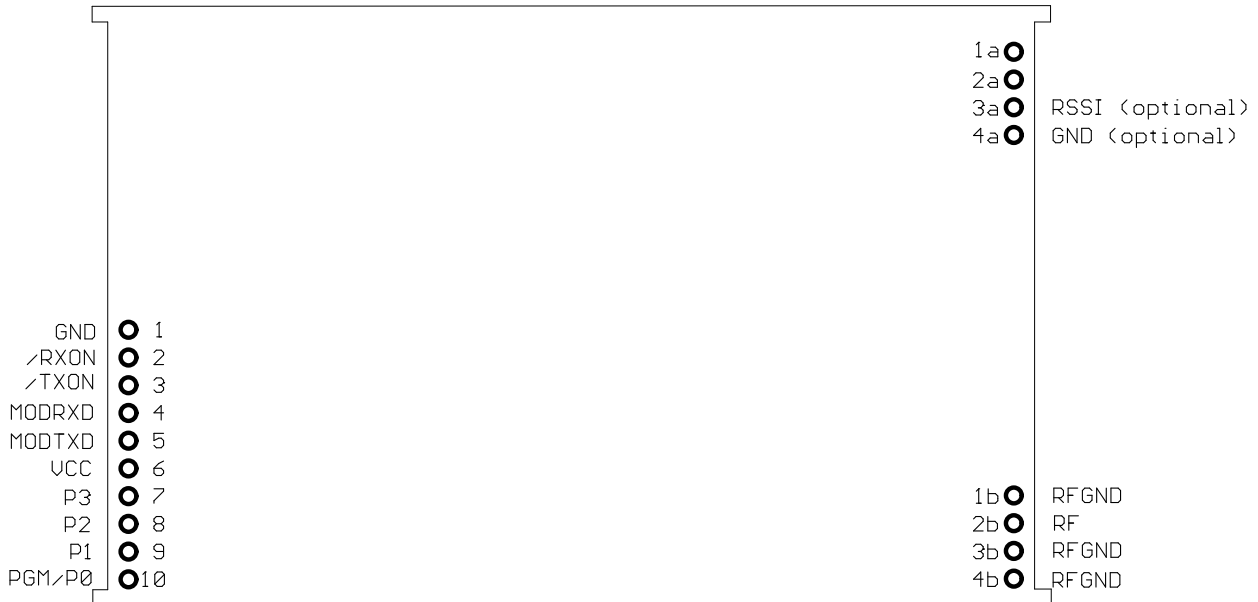
nnnnn = a synthesizer N register value, (up to 65535)

rrrr = the synthesizer R register value, (up to 16383)

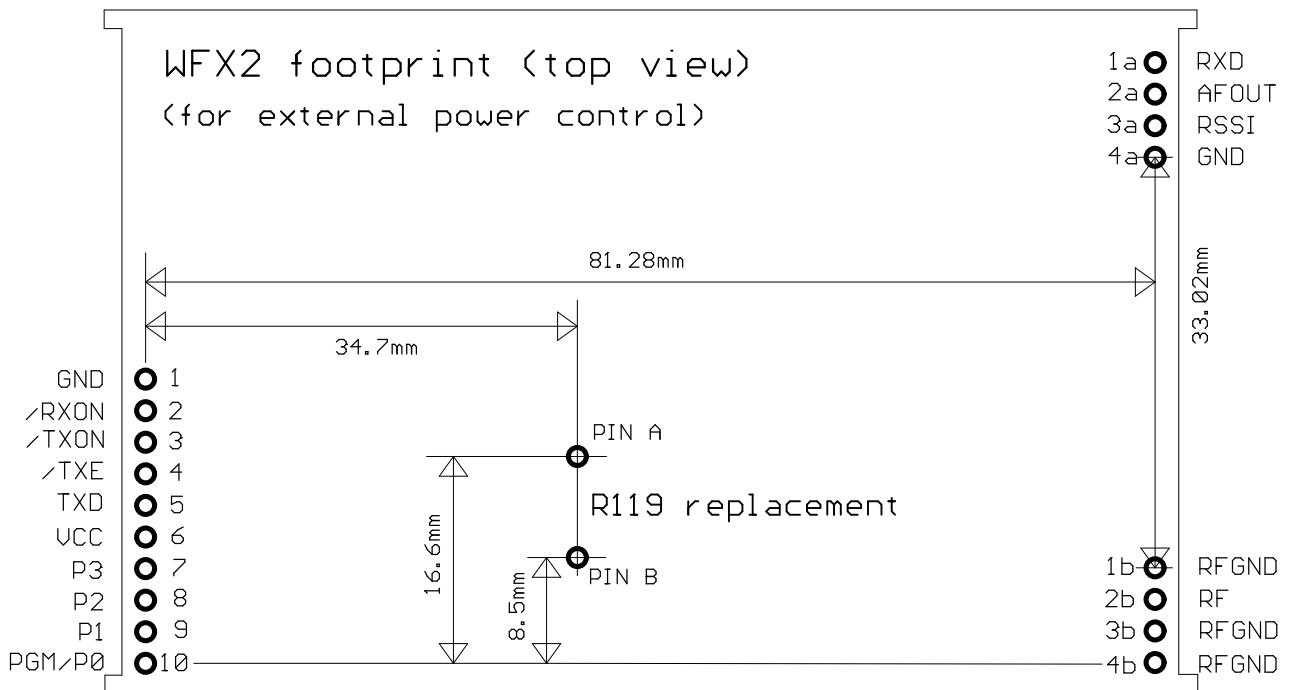
x = sequential table step value (0-7)

$$N = \frac{f_{RF} - 21.4\text{MHz}}{25\text{kHz}} = \frac{458.525\text{MHz} - 21.4\text{MHz}}{25\text{kHz}} = 17485$$

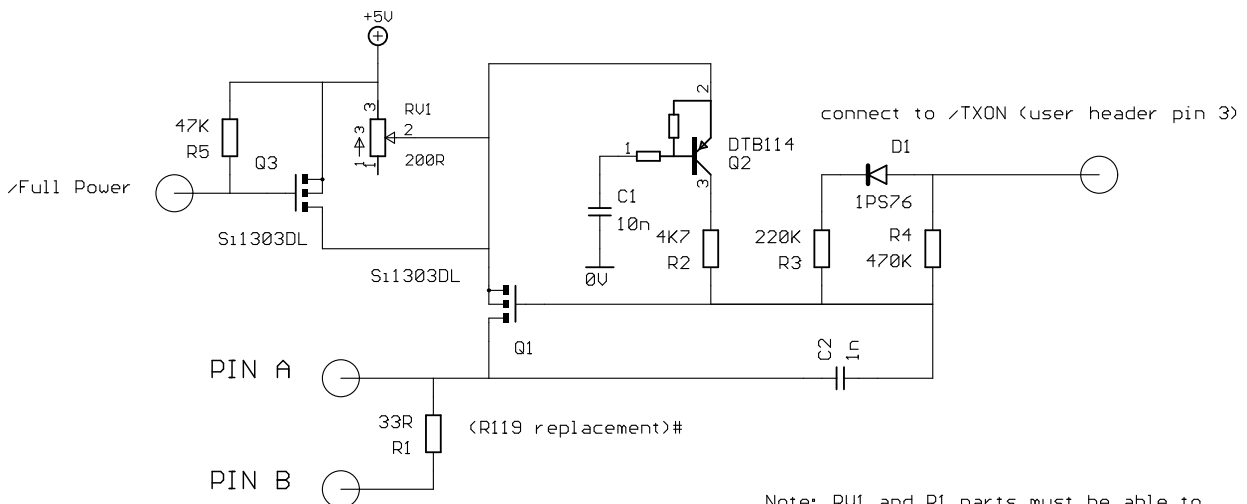
$$R = \frac{f_{TCXO}}{f_{\text{comparison frequency}}} = \frac{13\text{MHz}}{25\text{kHz}} = 520 \quad (\text{usually})$$



**Figure 4: WFX2 Modem variant footprint**



**Figure 5: WFX2 Power Control variant footprint**



Note: R1 and R4 parts must be able to handle a high power dissipation  
(at least 0.33 Watt)

**Figure 6: WFX2 external Power Control circuit**

## Condensed specifications

<b>Frequency</b>	458.525 - 459.1MHz (UK) Other country specific licence-exempt 0.5W UHF band subject to SAW filter availability
<i>Frequency stability</i>	± 1.5kHz
<i>Channel spacing</i>	25kHz or 12.5kHz (5kbps standard) 25kHz only (-G variant)
<i>Number of channels</i>	256 Consisting of 32 individually programmed channels, plus a sequential table covering the remaining 224. (All 255 can be selected via the serial interface, or 16 via 4 parallel input pins or optional on-board DIP switch)
<b>Transmit</b>	
Output power	+27dBm (500mW) ±1dB
TX on switching time	<10 ms
Modulation type	FM, FSK (F1D, F3D)
TX modulation bandwidth	DC – 3kHz Input for CMOS/TTL compatible data (a wide bandwidth -G version has DC to >5KHz and an analogue input)
Deviation	± 3kHz (for 25kHz channel spacing)
Adjacent channel TX power	-37dBm
TX Spurii	All compliant with EN 300-220 (harmonics <-36dBm)
<b>Receive</b>	
Sensitivity	-118dBm for 12 dB SINAD
<i>image / spurious</i>	-80dB
<i>blocking</i>	-88dB
<i>adjacent channel</i>	<-65dB (Tested per. ETSI EN 300 086)
Outputs	RSSI, Audio, Data
Spurious radiations	Compliant with ETSI EN 300 220-3 and EN 301 489-3
<b>Supply</b>	
<i>Voltage</i>	+5V DC (externally regulated)
<i>Current</i>	380mA nominal transmit 35mA receive
<b>Interface</b>	
<i>user</i>	10pin 0.1" pitch molex 4 pin 0.1" pitch molex (4 way DIP switch)
<i>RF</i>	4 pin 0.1" pitch molex 50Ω impedance
Operating temperature	-20 to +55 °C (Storage -30 to +70 °C)
Intended approval	ETSI EN 300 220-2 (radio) ETSI EN 301 489-3 (EMC) FCC Part 90 compliance

## Ordering Information

Part Number	Variant description
WFX2-458-5	5kbps (max) standard
WFX2-458-G	9600 baud external GMSK modem variant
WFX2-458-5-PWC	RF Power Control option
WFX2-458-G-PWC	RF Power Control option for –G variant

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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:

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