RADIOMETRIX

Hartcran House, 231 Kenton Lane, Harrow, Middlesex, HA3 8RP, England
Tel: +44 (0) 20 8909 9595, Fax: +44 (0) 20 8909 2233, www.radiometrix.com

RPC3G

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The RPC3G is an intelligent transceiver modules, which enable a radio network/link to be simply implemented between a number of digital devices. The module combines a BiM3G UHF RF transceiver and a 64kbps packet controller.

The RPC3G-914.50-64 is a self-contained plug-on radio port which requires only a simple antenna, 5V supply and a byte-wide I/O port on a host microcontroller (or bi-directional PC port). The module provides all the RF circuits using BiM3G-914.50-64 RF transceiver and processor intensive low level packet formatting and packet recovery functions required to inter-connect an number of microcontrollers in a radio network.

A data packet of 1 to 27 bytes downloaded by a Host microcontroller into the RPC3G's packet buffer is transmitted by the RPC3G's transceiver and will "appear" in the receive buffer of all the RPC3G's within radio range. A data packet received by the RPC3G's transceiver is decoded, stored in a packet buffer and the Host microcontroller signalled that a valid packet is waiting to be uploaded.

On receipt of a packet downloaded by the Host, the RPC3G will append to the packet: Preamble, start byte and a error check code. The packet is then coded for security and mark:space balance and transmitted through the BiM3G RF Transceiver as a 64kbps synchronous stream. One of four methods of collision avoidance (listen before TX) may be user selected.

When not in transmit mode, the RPC3G continuously searches the radio noise for valid preamble. On detection of preamble, the RPC3G synchronises to the in-coming data stream, decodes the data and validates the check sum. The Host is then signalled that a valid packet is waiting to be unloaded. The format of the packet is entirely of the users determination except the 1st byte (the Control Byte) which must specify the packet type (control or data) and the packet size. A valid received packet is presented back to the host in exactly the same form as it was given.

Additional features of the RPC3G include extensive diagnostic/debug functions for evaluation and debugging of the radio and host driver software, a built in self test function and a sleep mode / wake-up mechanism which may be programmed to reduce the average current to less than 100μA. The operating parameters are fully programmable by the host and held in EEPROM.

The transmit section of the BiM3G consists of a frequency modulated crystal locked PLL feeding a buffer amplifier and RF filter. A TX Select line controls operation. The transmitter achieves full RF output typically within 1ms of this line being pulled low. Modulation is applied at the TXD input is a serial digital stream toggling between 0V and 5V (digital drive). Modulation shaping is performed internally by a 2nd order low pass filter, which minimises spectral spreading. The RF output is filtered to ensure compliance with the appropriate regulations and fed via a TX/RX changeover RF switch to the antenna pin.

The receive section is a single conversion FM superhet with an IF of 10.7MHz. A SAW bandpass filter in the receiver front-end provides image rejection and suppression of other unwanted out-of-band signals. Like the transmitter, the receiver is controlled by its own active low RX select line. A post-detection lowpass filter establishes the signal bandwidth and ensures clean operation of the subsequent adaptive data slicer. The slicer is optimised for balanced data such as bi-phase code

Absolute maximum ratings

Exceeding the values below may cause permanent damage to the module.

Operating temperature	-20°C to +70°C
Storage temperature	-40°C to +100°C
Vcc (pin 17)	-0.3V to +16V(Dependant on version)
TX, RX select (pins 15, 16)	-9V to +5.5V
All other pins	-0.3V to +Vcc
Antenna (pin 2)	±50V DC, +10dBm RF

Performance specifications of BiM3G RF transceiver

Figures apply to standard version @ Vcc=5.0V, temperature +20°C, unless stated.

Transmitter section	pin	min.	typ.	max.	units
RF power output	2	-		0.75	mW
TX harmonics/spurious emission	2	-	-55	-40	dBm
Initial centre frequency accuracy	-	-10	0	+10	kHz
FM deviation	-	±20	±27	±35	kHz
Modulation bandwidth	-	0	-	65	kHz
Modulation distortion	-	-	5	10	%
TX spectral bandwidth @-40dBc	2	-	-	250	kHz
TXD input level: high	14	2.8	5		V
low	14	0	-	0.2	V
TX power up to full RF	2	-	1	1.5	ms

Receiver section	pin	min.	typ.	max.	units
RF sensitivity, 10dB S/N	2, 13	-	-113	-	dBm
RF sensitivity, 1ppm BER	2, 12	-	-102	-	dBm
RSSI range	2, 11	-	60	-	dB
IF bandwidth	-	-	180	-	kHz
Image rejection (f_{RF}-21.4MHz)	2	50	54	-	dB
IF rejection (10.7MHz)	2	100	-	-	dB
Local osc. leakage, conducted	2	-	-125	-110	dBm
Baseband bandwidth @ -3dB	13	0	-	50	kHz
AF output signal level	13	200	250	350	mV p-p
DC offset on AF output	13	1.5	2.0	2.5	V
Distortion on recovered AF	13	-	1	5	%
Load capacitance, AF & RXD	12, 13	-	-	100	pF
Power up to valid RSSI, $t_{PU-RSSI}$	11	-	0.5	1	ms
Power up to stable data, $t_{PU-data}$	12	-	2	10	ms
RSSI response time (rise/fall)	11	-	100	-	µs
Signal to stable data, $t_{sig-data}$	12	-	0.2	0.5	ms
Time between data transitions	14	15.6	-	1500	µs
Averaged code mark:space	14	20	50	80	%