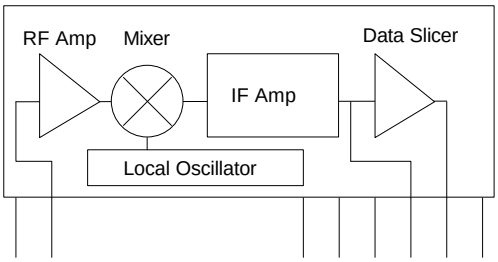
This AM superhet receiver provides greatly improved sensitivity and bandwidth over super regenerative receivers. It is ideal for upgrading car alarm, domestic alarm or other low cost applications that require improved range (up to 100 metres) and more consistent operation. The receiver can be "duty cycled" to reduce average current consumption to below 200uA which is ideal for "pager" receivers. The audio output signal can be processed to provide a signal strength output (RSSI) allowing radio link reliability to be dynamically assessed. Low radiated emissions ensure compliance with new EMC requirements. The receiver operates from a single 5V supply and is pin compatible with industry standard devices.

Features

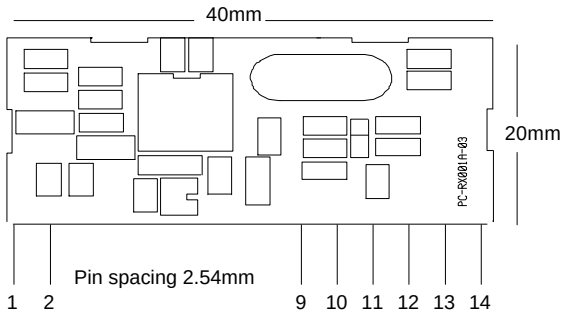
Small size PCB Mounting, Single-in-Line (SIL) style
Crystal controlled synthesiser for AM reception
Data and audio outputs
Duty cycle power saving possible
RSSI function

Applications

Pager receivers
Car alarm receivers
Domestic alarm receivers
Garage door openers



Block Diagram



Mechanical Detail

Absolute Maximum Ratings

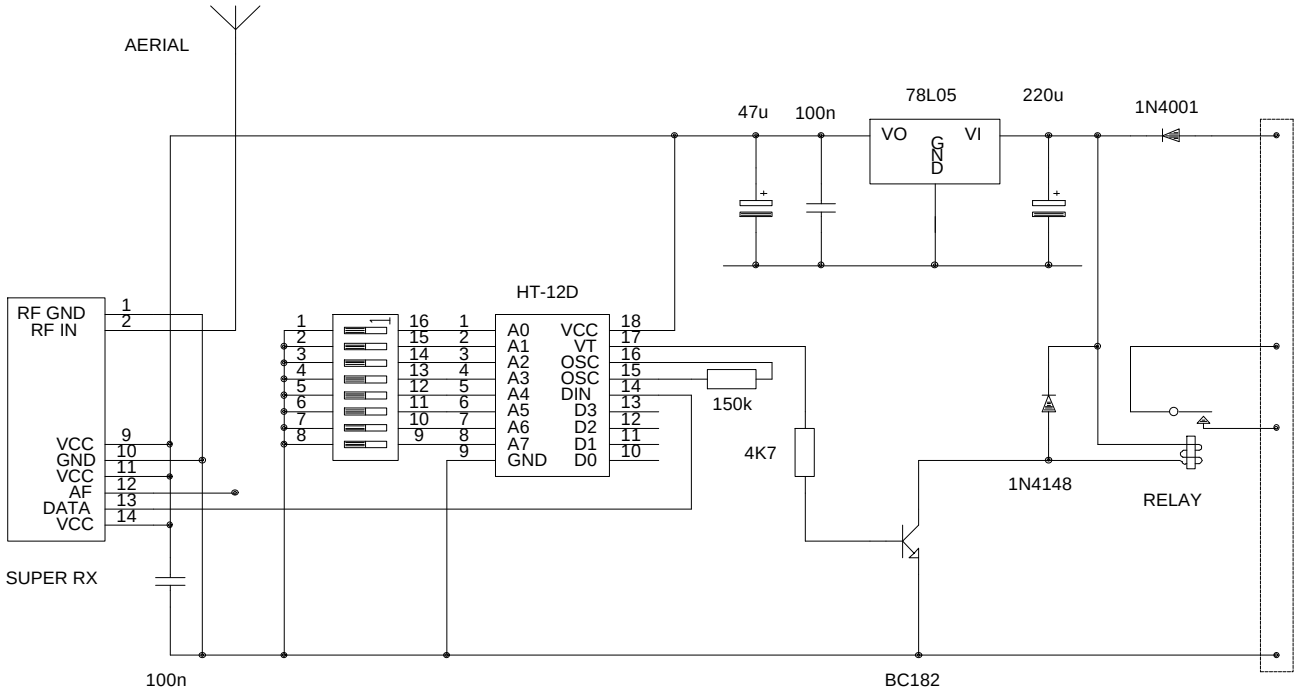
Supply Voltage Vcc, Pin 9,11,14-	0.3 to +5.25 Volts
Operating Temperature	0° C to +70° C (Commercial)
Storage temperature	-10° C to +85° C

1	RF Gnd
2	RF In
9	Vcc
10	Gnd
11	Vcc
12	Audio Out
13	Data Out
14	Vcc
N.B. Pins 9,11,14 internally connected	

Performance Data Temperature 20° C, Supply +5.0 Volt ± 5%

Parameter	Min	Typical	Max	Units	Notes
Supply Voltage	4.75	5.0	5.25	Volts	
Receive frequency (fo)		418.00		MHz	UK
Receive frequency (fo)		433.92		MHz	Europe
Sensitivity for 6dB S/N		1.4		uV	(-104 dBm)
RF Pass Band		250		kHz	
LF Pass Band	50 Hz	5	TBA	kHz	
Supply Current		2.5		mA	
Data output (logic 0)	0		0.5	Volts	10k load
(logic 1)	4.5			Volts	
Size		20 x 40x 6		mm	

Typical Application Circuit



Application

The "Super" receiver is simple to apply, requiring only a "clean" DC supply of 5 Volts, an aerial and a suitable device for decoding the incoming digital data. The various Ground and VCC pins are internally connected and are provided only to allow compatibility with other industry standard receivers. The ground pins should preferably be connected together and be returned to a substantial copper area that will act as a "ground plane". The receiver and its aerial **must** be kept well away from any circuitry that may generate harmonics that could extend into the UHF region. Even a simple crystal oscillator on a microprocessor clock can do this ! Particularly troublesome are externally bussed microprocessors and switched mode power supplies that can radiate significant energy into the ether. Good EMC practice (and testing) will reduce this likelihood which will generally manifest itself as reduced range or lack of sensitivity. It can be instructive to connect an audio amplifier to the audio output and listen to the receiver.

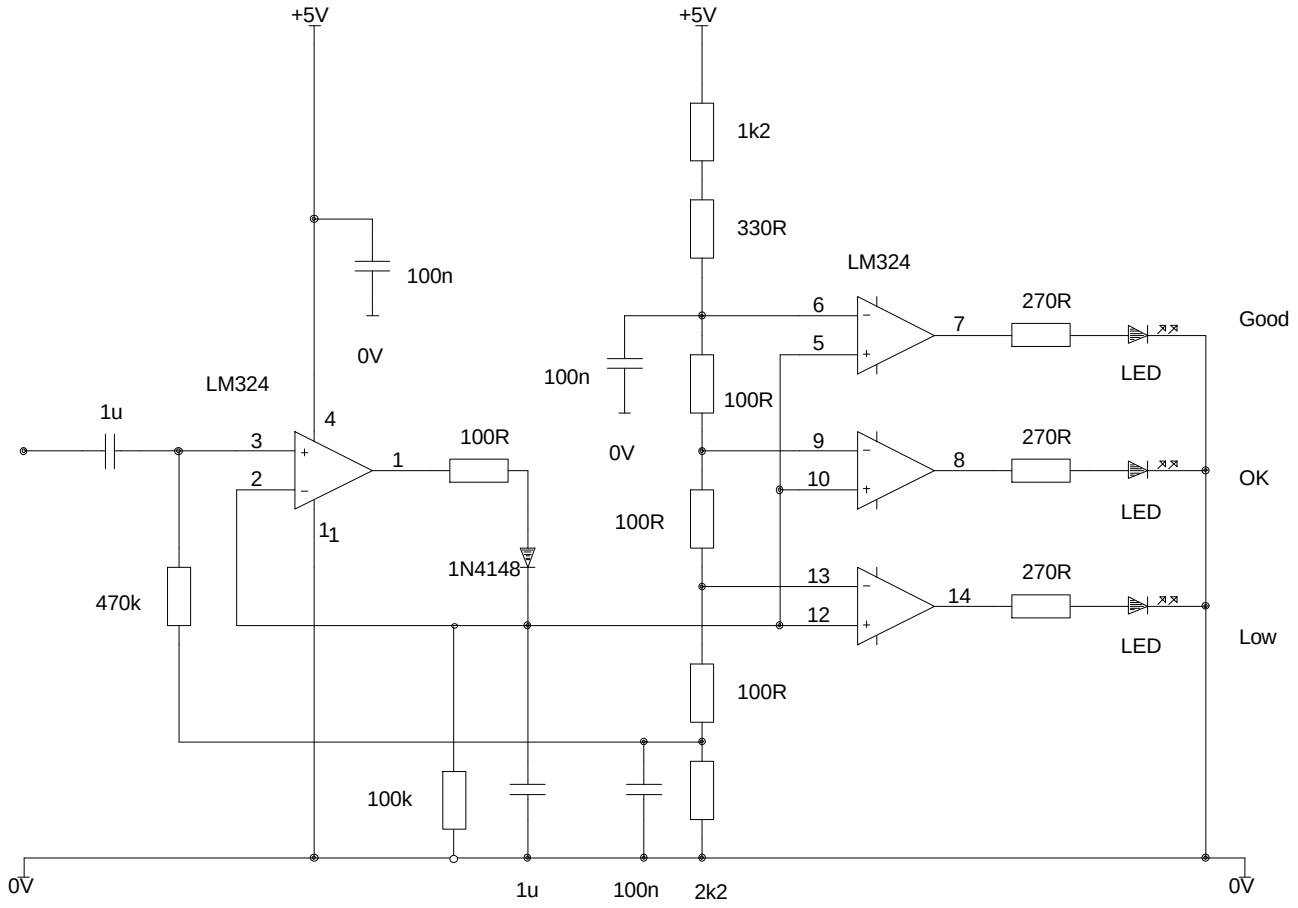
Aerials

All transmitters and receivers require aerials in order to work efficiently, the "Super" receiver is no exception ! A ¼ wave whip aerial (approximately 16cm) will provide the best performance. It should be mounted in "free space" and well away from any conductive objects or surfaces.

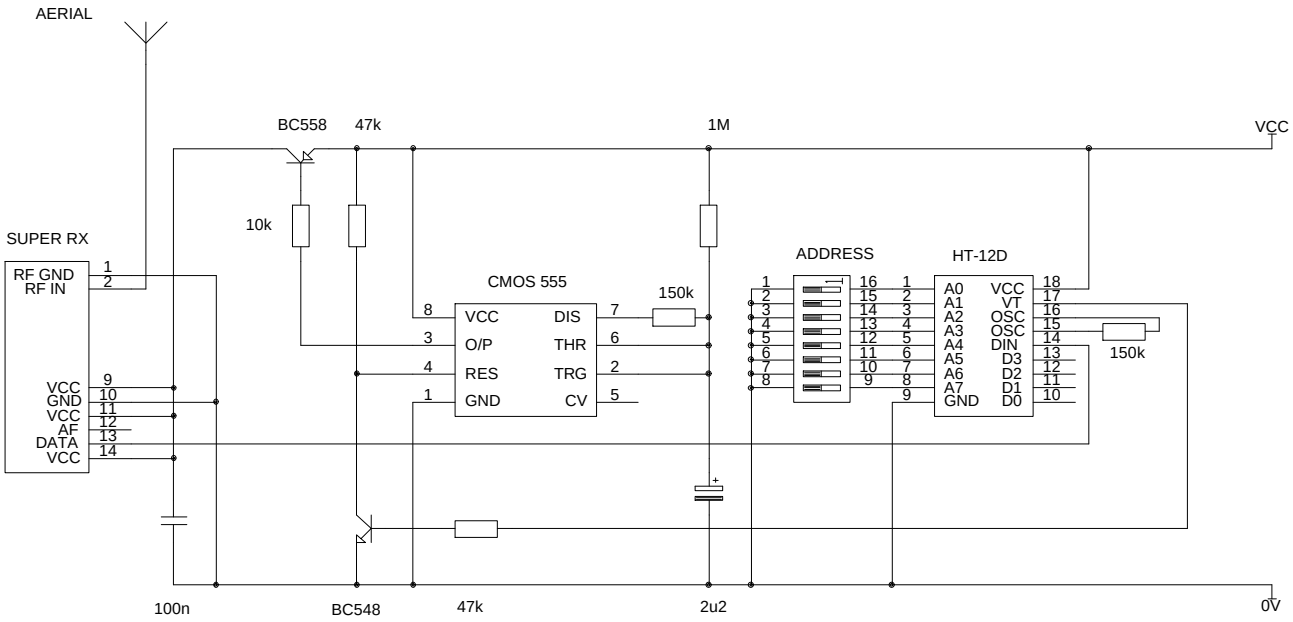
Received Signal Strength Indicator (RSSI)

The audio output (AF) pin of the "Super" receiver provides the recovered demodulated signal obtained from a logarithmic detector. Such detectors are ideally suited to digital or pulse type receivers and remove the need (and complications) of automatic gain control in an amplitude modulated receiver. The peak to peak output of the detector is a fairly accurate representation of the received signal strength and with simple external circuitry can be processed to provide a go/no go indicator which can be useful during site installation and testing. The AF output "sits" upon a DC bias at approximately mid supply voltage. This DC component is removed by AC coupling to a peak detector that stores the maximum positive peak voltage of the "pulsed" audio output.. This voltage is compared to pre-set thresholds that trip comparators to drive the output indicator LED's.

RSSI Circuit



Power Saving Circuit



Duty Cycling for Power Saving

The fast "wake-up" and settling time of the "Super" receiver allow its modest power requirement to be further reduced by duty cycling the supply voltage. A simple CMOS 555 timer circuit operating in a free running astable mode provides power to the receiver on a 1:5 duty cycle. The "on" time is set to be about 250mS allowing the receiver to power up and data to be processed by the decoder IC. If a valid code is present in the data the VT (Valid Transmission) line of the decoder goes high. The reset pin of the 555 timer is thus pulled low via a transistor inverter. This action holds the timer output low and sustains the power to the receiver. If no valid code is detected during the power on period the receiver is shut down until the next "on" time. The actual "on" and "off" times are determined by the decoder characteristics and the length of the transmission which should always exceed the "off" time. In the above example the "on" time is determined by the wake-up time plus decoding time (30mS + 200mS) and the "off" time is determined by the minimum length of transmission (1S). A power saving of 5:1 can thus be obtained reducing the average current consumption to 500uA. More sophisticated schemes employing a micro controller can quickly look for valid bit times or special characters during the "on" time thus providing even greater power savings with simplification of external circuitry being possible.

Product Order Codes

Two versions of the receiver are currently available :

Description	Order Code
LJ-RX418A-S	UK Receiver module on 418 MHz.
LJ-RX433A-S	European Receiver module on 433 MHz

As the receive frequency is controlled by a crystal, operation at any frequency from 200-500MHz is possible. Please contact the sales office for other variants of the standard product.

Document History

Issue	Date	Revision
1.0	Jan 97	Preliminary
1.1	Mar 97	Application circuit added
1.2	Jul 97	RSSI & Power save circuit added
1.3	Oct 97	Minor amendments
1.4	Apr 98	Font size increased

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