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HR 1023
318 MHz FSK Hybrid Receiver Front End

Designed for FSK receivers operating under FCC Part 15, Subpart D and E regulations

- Low noise figure and high conversion gain provides excellent receiver sensitivity
- High immunity to intermodulation distortion minimizes out of band interference
- Quartz SAW technology assures drift-free operation
- Small, rugged, hermetically-sealed package
- Compatible with HO 1008 and HO 1024 FSK hybrid transmitters

The HR 1023 receiver front end is designed for high performance 318 MHz wireless control and security systems operating under FCC Part 15, Subpart D and E regulations. The HR 1023 is designed for use with both the HO 1008 (TTL data input) and HO 1024 (CMOS data input) FSK hybrid transmitters.

The HR 1023 features a typical noise figure of 6.5 dB and a conversion gain of 28 dB. A receiver based on the HR 1023 will achieve a bit error rate of 10^{-6} @ 9.6 kbps for an input signal of 4 uV or less, assuming good engineering practice is used in the i-f and detector circuitry.

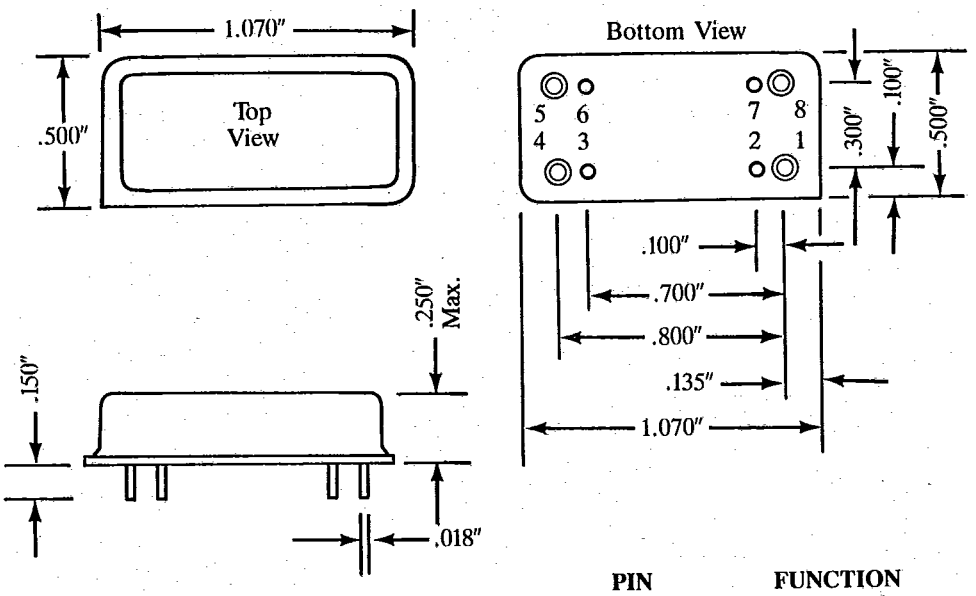
A block diagram of the HR 1023 is shown in Figure 2. An incoming 318 MHz signal is first filtered by a 3rd generation quartz SAW filter, which provides image and LO beat rejection, plus excellent immunity to intermodulation distortion. The filter exhibits a typical insertion loss of 2.5 dB and a 3 dB bandwidth of 550 kHz. The filter is followed by a low-noise amplifier, which provides about 18 dB of gain. An additional 12.5 dB of conversion gain is provided by the mixer. The local oscillator in the HR 1023 is stabilized by a quartz SAW resonator. The oscillator frequency is set at 307.3 MHz, providing an i-f output at 10.7 MHz.

The use of quartz SAW technology in the HR 1023 assures stable operation over a wide range of temperature and power supply variations. The HR 1023 is housed in a hermetically-sealed metal package, which provides excellent rf shielding and physical ruggedness.

The HR 1023 is designed for use with a 50 ohm antenna. For best results, the VSWR presented to the rf input (Pin 8) should be less than 2:1. Local oscillator leakage to the rf input is attenuated to less than one microwatt by the SAW filter. The supply voltage is applied to Pins 1 and 5, which are internally bypassed for rf. The i-f output of the HR 1023 contains some residual local oscillator energy which can be removed with a low-pass or i-f bandpass filter. If an i-f bandpass filter is used, it should have a 3 dB bandwidth of at least 400 kHz, as should the FSK detector circuitry. The i-f amplifier should have a 3 dB bandwidth greater than 400 kHz, and should exhibit good limiting performance.

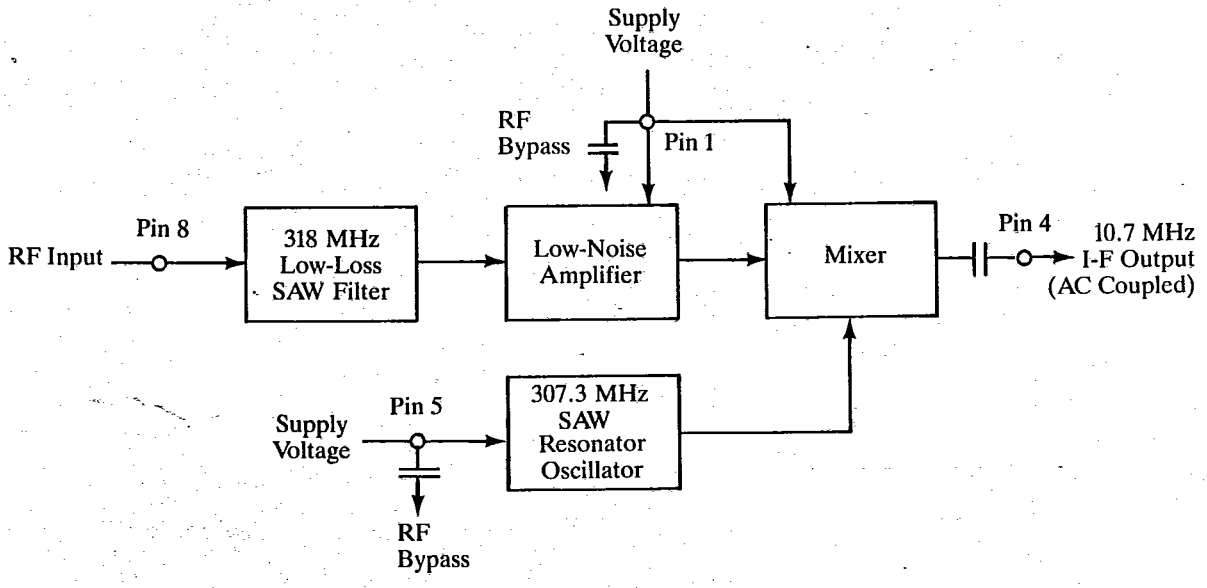
A receiver based on the Motorola MC 3356 IC is shown in Figure 3. Note that the bandwidth of the receiver is set by the low-loss SAW filter in the HR 1023. The receiver draws about 50 mA at 9 Vdc. If data is transmitted at regular intervals, the average current drain of the receiver may be reduced by switching it off immediately after a block of data is received, and turning it on just prior to the next scheduled data transmission. Allow 50 ms for the receiver to stabilize when power is applied.

NOTE: Each product utilizing the HR1023 in a receiver operating under Part 15 regulations must be certified by the Federal Communications Commission.

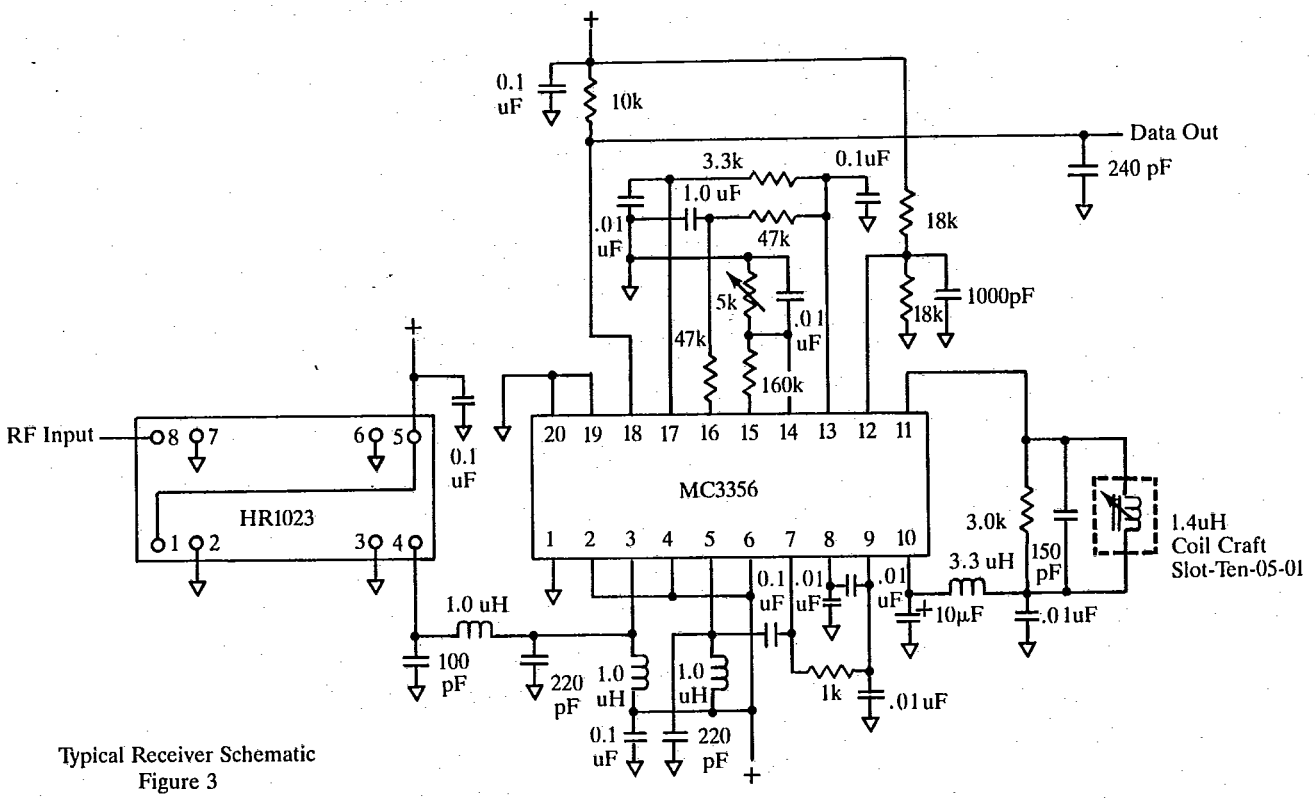


PIN	FUNCTION
1	Supply Voltage
2, 3, 6, 7	Ground
4	I.F. Output
5	Supply Voltage
8	RF Input

HR 1023 Outline Drawing
Figure 1



HR 1023 Block Diagram
Figure 2



Typical Receiver Schematic
Figure 3

HR 1023 Electrical Characterization (25°C operation unless otherwise noted)

Electrical Characteristic	Minimum Value	Typical Value	Maximum Value	Units
Input Frequency		318		MHz
3 dB Bandwidth	500	550	650	kHz
Noise Figure		6.5	9.0	dB
Conversion Gain	25	28		dB
Image Rejection	24	35		dB
Local Oscillator Leakage (1)		−34	−30	dBm
3rd Order Intercept (2)	30	38		dBm
Output Frequency (3)	10.645	10.700	10.755	MHz
Supply Voltage	6.5	9.0	10.0	Vdc
Supply Current		28	37	mA
Operating Temperature Range	−35	25	65	°C

NOTES: (1) Local oscillator leakage measured at rf input (Pin 8).
(2) 3rd-order output intercept measured between two signals below 317 MHz, or above 319 MHz, such that a 3rd-order product will occur at 318 MHz.
(3) Conversion accuracy based on input at 318.000 MHz.
(4) Absolute maximum ratings:

Supply Voltage	−0.5 Vdc, +12 Vdc
RF Input	+13 dBm
Temperature	−40°C to +85°C (storage)