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Description

The RX3400 is a low power ASK receiver IC which is fully compatible with the Mitel KESRX01 IC and is suitable for use in a variety of low power radio applications including remote keyless entry. The RX3400 is based on a single-conversion, super-heterodyne receiver architecture and incorporates an entire phase-locked loop (PLL) for precise local oscillator generation. In addition, the RX3400 provides an RSSI output.

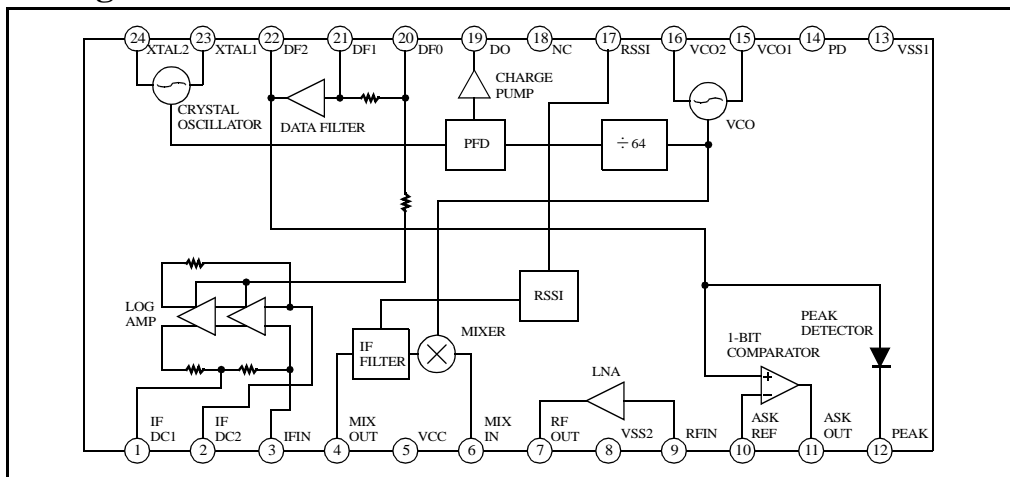
Features

- ◆ Extremely low power operation
- ◆ Low external part count
- ◆ Receiver input frequency: 290 – 460 MHz
- ◆ On-chip VCO with integrated PLL using crystal oscillator reference
- ◆ PLL power down feature
- ◆ Integrated IF and data filters
- ◆ RSSI output
- ◆ SSOP-24 package (0.64 mm pitch)

Applications

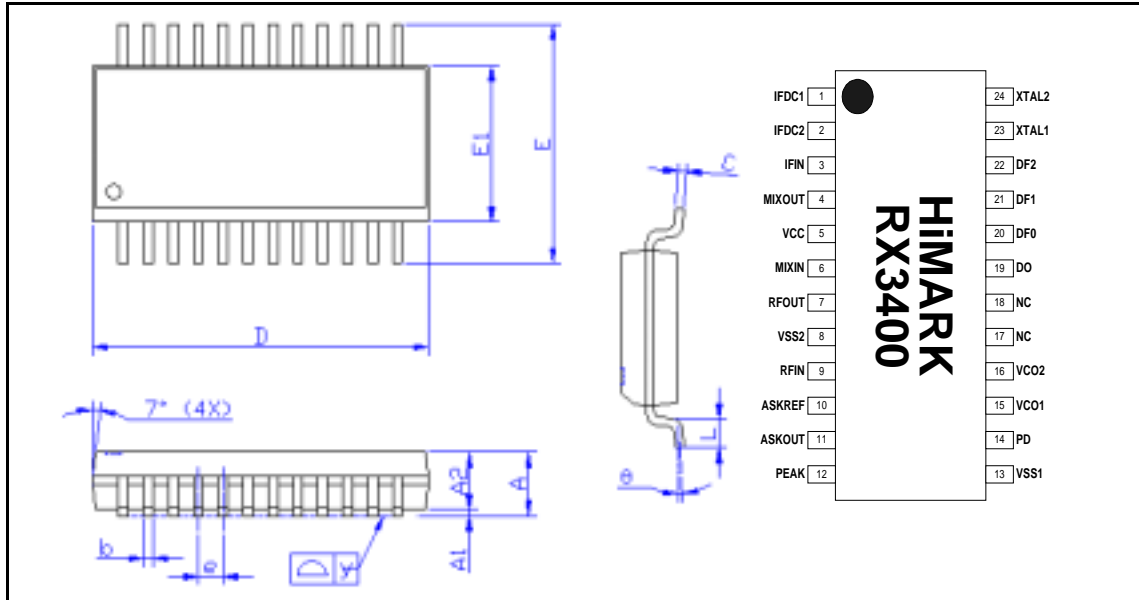
- ◆ Wireless mouse
- ◆ Video sender remote controller
- ◆ Car alarm and home security systems

Block Diagram



Package and Pin Assignment

SSOP-24 (0.64 mm pitch)



| Symbols | Dimensions in mm | | | Dimensions in inch | | |
|---------|------------------|------|------|--------------------|-------|-------|
| | min. | nom. | max. | min. | nom. | max. |
| A | 1.35 | 1.60 | 1.75 | 0.053 | 0.064 | 0.069 |
| A1 | 0.10 | — | 0.25 | 0.004 | — | 0.010 |
| A2 | — | 1.45 | — | — | 0.057 | — |
| b | 0.20 | 0.25 | 0.30 | 0.008 | 0.010 | 0.012 |
| C | 0.19 | — | 0.25 | 0.007 | — | 0.010 |
| D | 8.55 | — | 8.75 | 0.337 | — | 0.344 |
| E | 5.80 | — | 6.20 | 0.228 | — | 0.244 |
| E1 | 3.80 | — | 4.00 | 0.150 | — | 0.157 |
| e | — | 0.64 | — | — | 0.025 | — |
| L | 0.40 | — | 1.27 | 0.016 | — | 0.050 |
| y | — | — | 0.10 | — | — | 0.004 |
| θ | 0° | — | 8° | 0° | — | 8° |

Pin Descriptions

| Number | Name | Description |
|--------|--------|--|
| 1 | IFDC1 | IF amplifier feedback decoupling connections |
| 2 | IFDC2 | |
| 3 | IFIN | IF amplifier input |
| 4 | MIXOUT | Mixer output |
| 5 | VCC | Nominal 5 V supply |
| 6 | MIXIN | RF mixer input |
| 7 | RFOUT | Open collector LNA output |
| 8 | VSS2 | LNA ground |
| 9 | RFIN | LNA input |
| 10 | ASKREF | Comparator reference level |
| 11 | ASKOUT | Comparator output |
| 12 | PEAK | Peak detector output |

| Number | Name | Description |
|--------|-------|---|
| 13 | VSS1 | Ground |
| 14 | PD | PLL power down |
| 15 | VCO1 | Open collector differential VCO outputs |
| 16 | VCO2 | |
| 17 | RSSI | RSSI output |
| 18 | NC | No connection |
| 19 | DO | Loop filter output |
| 20 | DF0 | Data filter external connections |
| 21 | DF1 | |
| 22 | DF2 | |
| 23 | XTAL1 | Crystal oscillator external connections |
| 24 | XTAL2 | |

Absolute Maximum Ratings

$$V_{SS} = V_{SS1} = V_{SS2} = 0 \text{ V}$$

| Parameter | Symbol | Rating | Unit |
|-----------------------------|-----------|----------------------------------|------|
| Supply voltage | V_{CC} | $V_{SS} - 0.5$ to $V_{SS} + 8.0$ | V |
| Operating temperature range | T_{OPR} | -40 to 85 | °C |
| Storage temperature range | T_{STG} | -55 to 150 | °C |
| Soldering temperature range | T_{SLD} | 255 | °C |
| Soldering time range | t_{SLD} | 10 | s |

Recommended Operating Conditions

$$V_{SS1} = V_{SS2} = 0 \text{ V}$$

| Parameter | Symbol | Value | | | Unit |
|-----------------------|------------|-------|------|------|------|
| | | min. | typ. | max. | |
| Supply voltage range | V_{CC} | 4.75 | 5.0 | 7.0 | V |
| RF input frequency | f_{RFIN} | 290 | | 460 | MHz |
| Operating temperature | T_A | -10 | 25 | 60 | °C |

Electrical Characteristics

($V_{CC} = 4.75$ to 7.0 V, $V_{SS1} = V_{SS2} = 0$ V, $T_A = -40$ to 85 °C unless otherwise noted)

| Parameter | Symbol | Condition | Value | | | Unit |
|--|-----------------|--------------------------------|---------------------|----------|---------------------|---------|
| | | | min. | typ. | max. | |
| Current consumption | $I_{CC,total}$ | $V_{CC} = 5$ V | | 2.4 | 3.0 | mA |
| Current consumption (PLL off) | $I_{CC,noPLL}$ | $V_{CC} = 5$ V; $V_{PD} = 0$ V | | 1.8 | 2.4 | mA |
| Sensitivity ^a | α_{SENS} | $f_{RFIN} = 434$ MHz; 2 KB/s | | -103 | -100 | dBm |
| Signal handling ^b | α_{SH} | $f_{RFIN} = 434$ MHz; 2 KB/s | -30 | | | dBm |
| Integrated IF filter -3-dB low pass cutoff frequency | $f_{IF,-3dB}$ | | 450 | 550 | 750 | KHz |
| Adjacent channel rejection ^c | α_{ACR} | | | 65 | | dB |
| Peak detector source current | I_{peak} | | | 500 | | μ A |
| Peak detector leakage current | I_{leak} | | | | 250 | nA |
| Charge pump source/sink current | I_{CP} | | | ± 30 | | μ A |
| PD logic HIGH input voltage | $V_{IH,PD}$ | | $V_{CC} - 0.5$ | | $V_{CC} + 0.5$ | V |
| PD logic LOW input voltage | $V_{IL,PD}$ | | $V_{SS2} - 0.5$ | | $V_{SS2} + 0.5$ | V |
| ASKOUT logic HIGH output voltage | $V_{OH,ASKOUT}$ | $I_{load} = 10$ μ A | $0.7 \times V_{CC}$ | | | V |
| ASKOUT logic LOW output voltage | $V_{OL,ASKOUT}$ | $I_{load} = 10$ μ A | | | $0.3 \times V_{CC}$ | V |

- Sensitivity is defined as the minimum average signal level measured at the input which is necessary to achieve a bit error rate of 0.01 when the input signal is a return-to-zero (RZ) pulse with an average duty cycle of 50%. The RF input is assumed to be matched to 50 ohms.
- Signal handling is defined as the maximum input signal capable of being successfully demodulated. It is assumed that the input signal is ASK modulated with a minimum extinction ratio of 40 dB. The RF input is assumed to be matched to 50 ohms.
- Adjacent channel rejection is defined for an interfering tone α_{ACR} [dB] above the receiving threshold and 10 MHz offset from the carrier giving a 3 dB reduction in sensitivity.

Functional Description

The RX3400 ASK receiver IC incorporates an LNA; mixer; PLL-based local oscillator including VCO, fixed divider ($\div 64$), reference crystal oscillator, phase-frequency detector (PFD), and charge pump; IF filter; logarithmic amplifier; data filter; peak detector; and 1-bit comparator and is capable of demodulating ASK input signals.

PLL Power-down Function

The PLL portion of the IC can be powered up and down through the control of the PD input (pin 14). During PLL power down operation, the reference crystal oscillator, fixed VCO divider, PFD, and charge pump are all shut off and the current consumption of the IC drops by approximately 600 μA . The VCO circuitry remains on and may be configured to operate as a buffer amplifier for an external SAW-based oscillator.

1-bit Comparator

The integrated 1-bit comparator operates as a data slicer and “squares up” the data filtered RSSI output from the logarithmic amplifier. The decision threshold voltage level for the 1-bit comparator is stored on an external capacitor connected to the ASKREF pin.

Application Circuit

434 MHz

