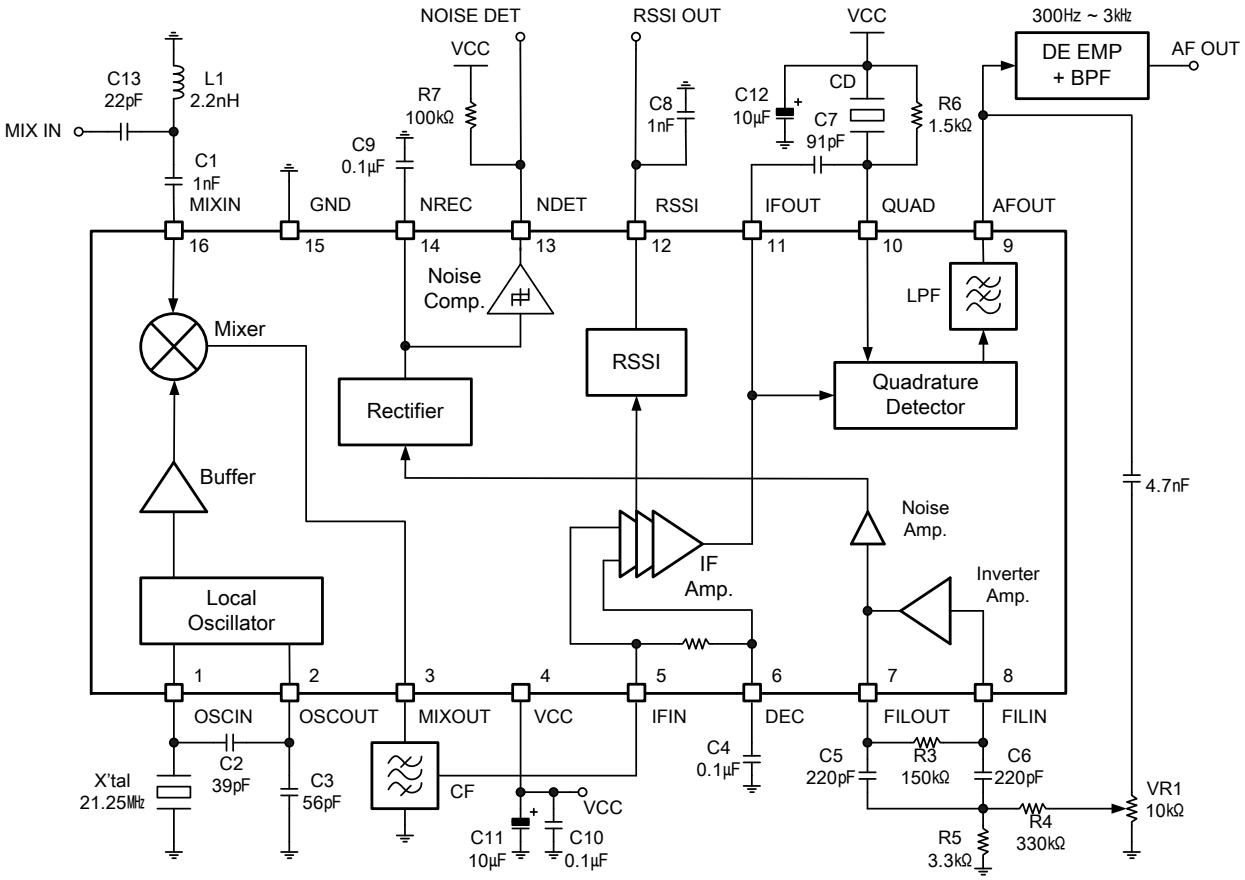
The DHF445 is a low operation voltage FM IF detector IC. It consists of mixer, IF amplifier, RSSI circuit, quadrature detector and noise detector. It is available in a 16-pin TSSOP plastic package.

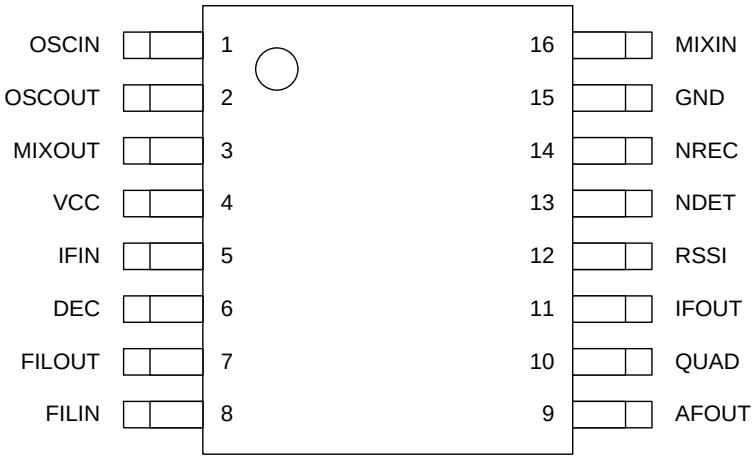
## Features

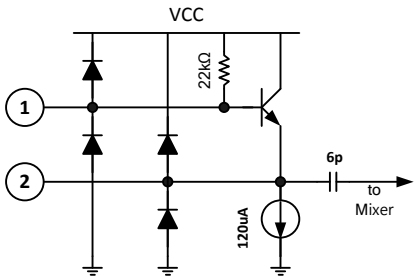
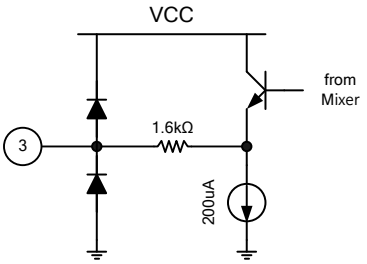
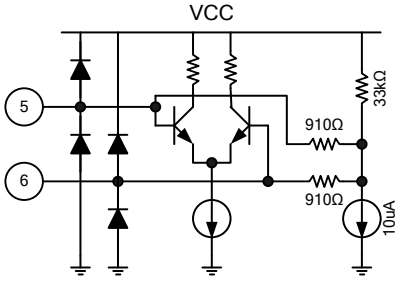
- Low operating voltage (1.8V ~ 5.5V)
- Wide mixer operating frequency (10MHz to 300MHz)
- Excellent temperature characteristics
- High sensitivity
- Ceramic and coil discriminators usable quadrature detector
- High intercept point (98dBuV)
- Built-in noise detection circuit
- RSSI function
- TSSOP16 package (Pb-free and RoHS compliant)
- TA31136 compatible (drop-in replacement)

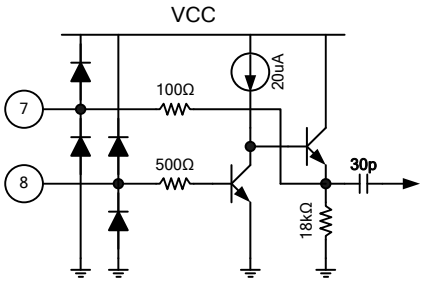
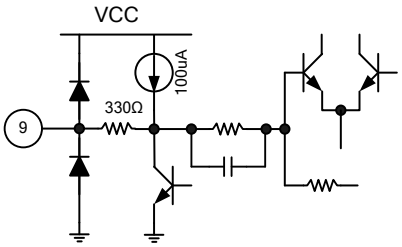
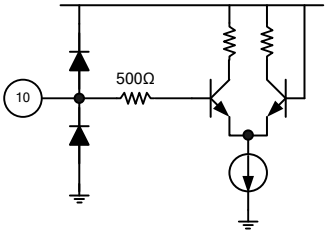
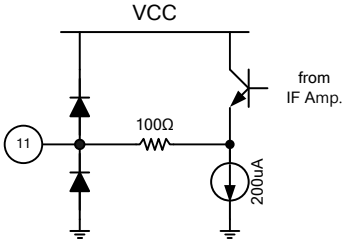
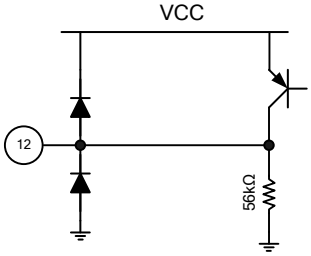
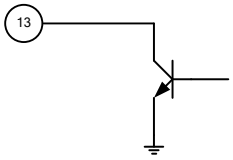
## Block Diagram & Application Circuit

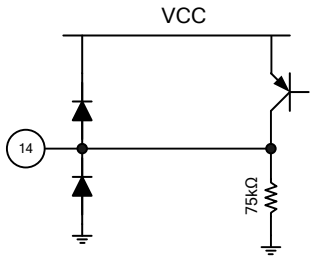
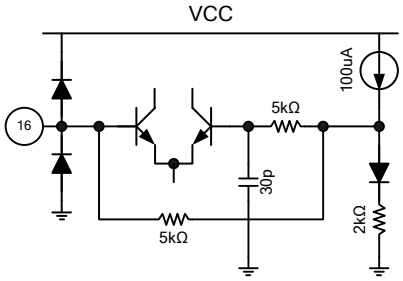


## Pin Description




| Pin No. | Mnemonic | Description | Internal Equivalent Circuit |
|---|---|---|---|
| 1 | OSCIN | Local oscillator input. |  |
| 2 | OSCOUT | Local oscillator output. | |
| 3 | MIXOUT | Mixer output. (Output impedance is around 1.8kΩ) |  |
| 4 | VCC | Power supply | |
| 5 | IFIN | IF amplifier input (Input impedance is around 1.8kΩ) |  |
| 6 | DEC | Decoupling input for bias | |

| Pin No. | Mnemonic | Description | Internal Equivalent Circuit |
|---|---|---|---|
| 7 | FILOUT | Inverter amplifier output. |  |
| 8 | FILIN | Inverter amplifier input. | |
| 9 | AFOUT | Demodulated signal output<br>(Output impedance is around 360Ω) |  |
| 10 | QUAD | Phase shift signal input<br>of quadrature detector. |  |
| 11 | IFOUT | IF Amplifier output. |  |
| 12 | RSSI | RSSI output. |  |
| 13 | NDET | Noise comparator output |  |

| Pin No. | Mnemonic | Description | Internal Equivalent Circuit |
|---|---|---|---|
| 14 | NREC | Rectifier output |  |
| 15 | GND | Ground. | |
| 16 | MIXIN | Mixer input. |  |

## Absolute Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Power Supply Voltage | $V_{CC}$ | -0.3 to 7.0 | V |
| Operating Temperature Range | $T_{OP}$ | -30 to +85 | °C |
| Storage Temperature Range | $T_{ST}$ | -50 to +150 | °C |

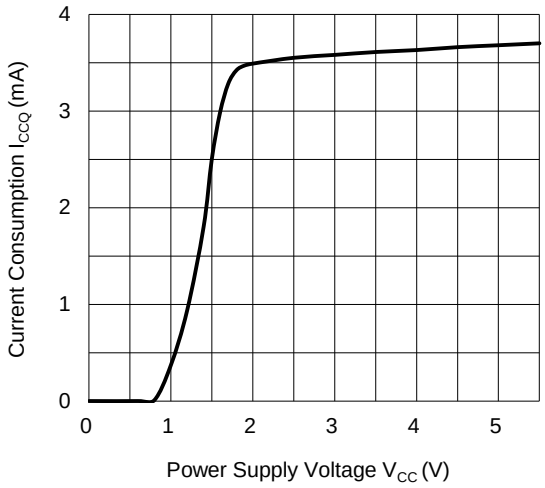
## Electrical Characteristics

( $V_{CC}$=2V, $F_{IN(MIX)}$ = 21.705MHz, $f_{IN(IF)}$ = 455kHz, Δf = ±1.5kHz, $f_{MOD}$ = 1kHz, Ta=25°C)

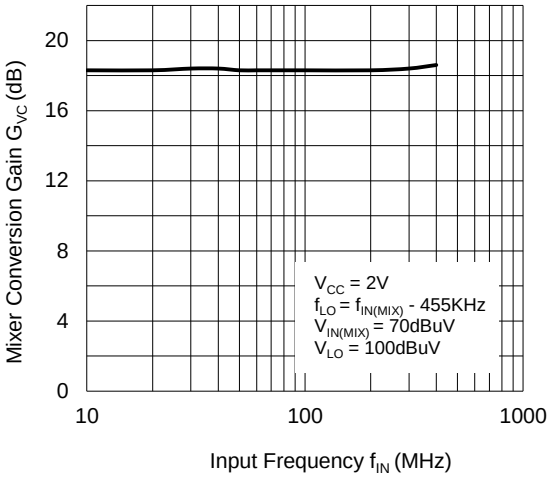
| Parameter | | Symbol | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|---|
| Power Supply Voltage | | $V_{CC}$ | | | 1.8 | 2 | 5.5 | V |
| Power Supply Current | | $I_{CCQ}$ | | | | 3.5 | | mA |
| Mixer Conversion Gain | | $G_{VC}$ | Measured through ceramic filter. [$V_{IN(MIX)}$ = 46dBuV] | | 15 | 18 | 21 | dB |
| Mixer Intercept Point | | $P_{IM}$ | Input 50Ω | | - | 98 | - | dBuV |
| Mixer Input Impedance | | $R_{IN(MIX)}$ | - | | - | 4.8 | - | kΩ |
| | | $C_{IN(MIX)}$ | | | - | 2.8 | - | pF |
| 12dB Sensitivity | | 12dB SN | - | | - | 5 | - | dBuV |
| Demodulation Output Level | | $V_{OD}$ | $V_{IN(IF)}$ = 80dBuV | | - | 100 | - | $mV_{RMS}$ |
| SN Ratio | | SN | $V_{IN(IF)}$ = 80dBuV | | 43 | 62 | - | dB |
| AM Rejection Ratio | | AMR | $V_{IN(IF)}$ = 80dBuV, AM = 30% | | - | 40 | - | dB |
| IF AMP. Input Resistance | | $R_{IN(IF)}$ | - | | 1.2 | 1.8 | - | kΩ |
| RSSI Output Voltage | | $V_{RSSI-1}$ | $V_{CC}$ = 3V | $V_{IN(IF)}$ = 30dBuV | 320 | 470 | 620 | mV |
| | | $V_{RSSI-2}$ | | $V_{IN(IF)}$ = 100dBuV | 1.4 | 2.1 | 2.6 | V |
| Noise Detection Output Voltage | | $V_{NDET}$ | I SINK = 0.2mA | | - | 0.1 | 0.5 | V |
| Noise Detection Output Leak Current | | $I_{LEAK}$ | $V_{NREC}$ = 0.6V, $V_{NDET}$ = 2V | | - | 0 | 5 | uA |
| Noise Detection Level | "H" Level | $V_{TH-H}$ | - | | - | 0.5 | 0.7 | V |
| | "L" Level | $V_{TH-L}$ | | | 0.3 | 0.4 | - | |

## Typical Performance Characteristics

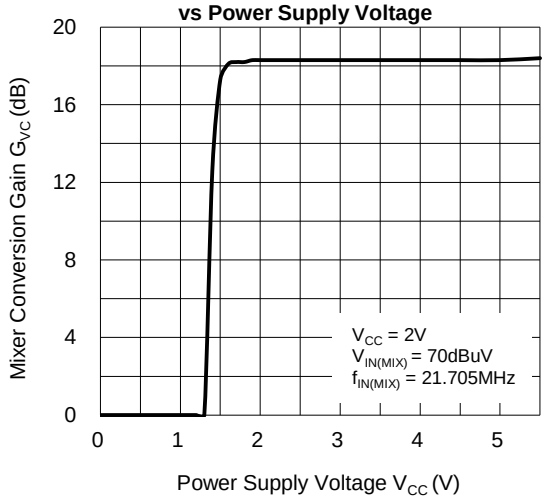
**Current Consumption**



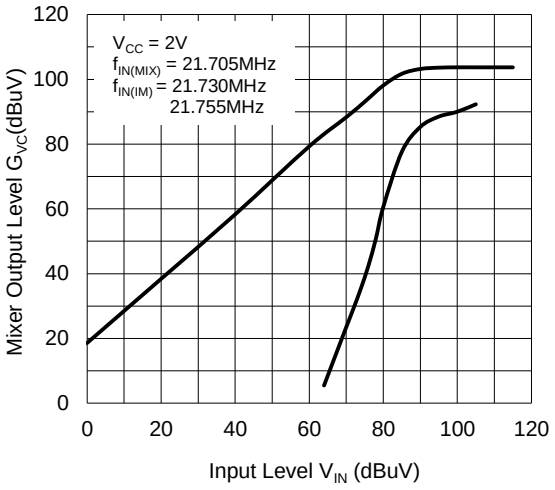

**Mixer Frequency Characteristics**



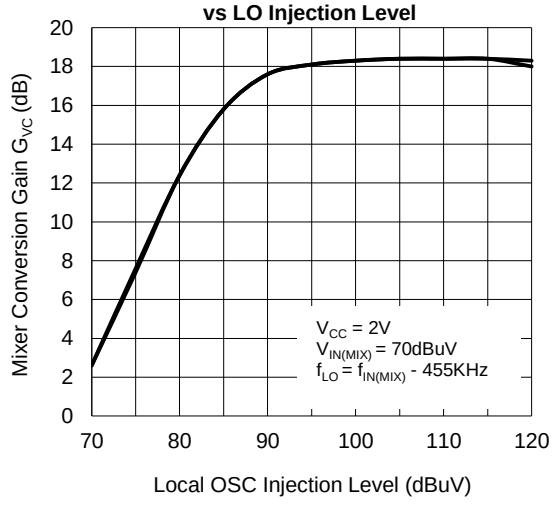

**Mixer Conversion Gain vs Power Supply Voltage**



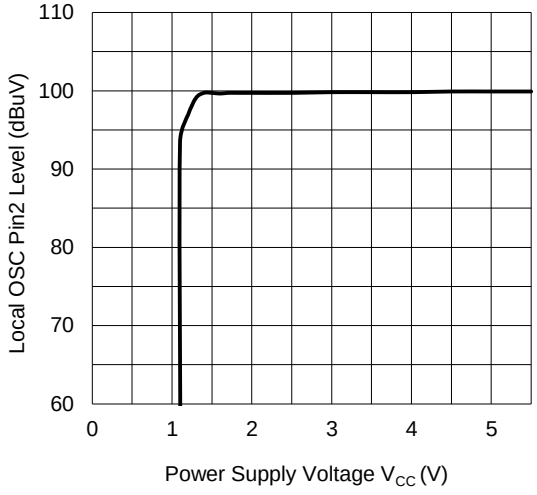

**Mixer Intercept Point**



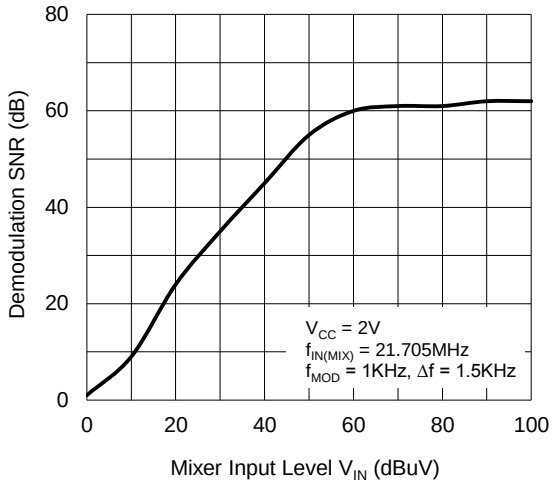

**Mixer Conversion Gain vs LO Injection Level**



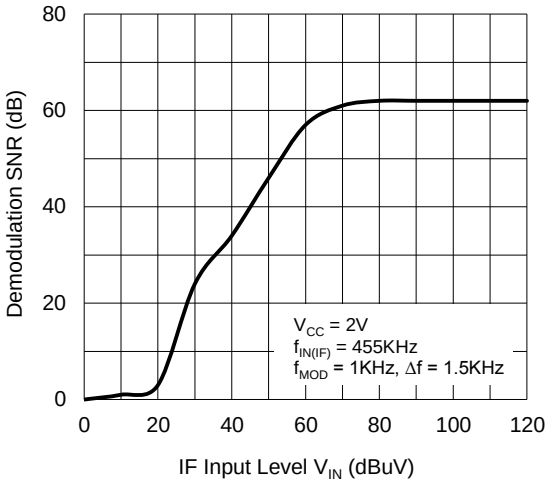

**Local OSC Level vs Power Supply Voltage**



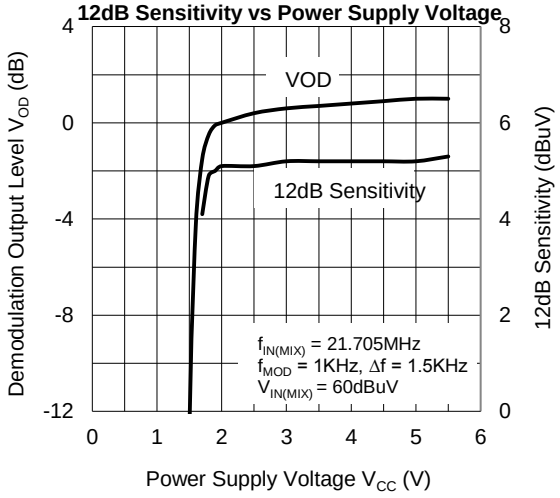
**Demodulation SNR vs Mixer Input**



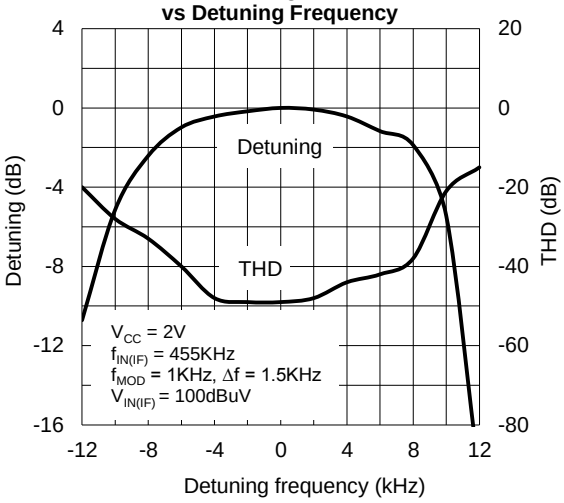

**Demodulation SNR vs IF Input**



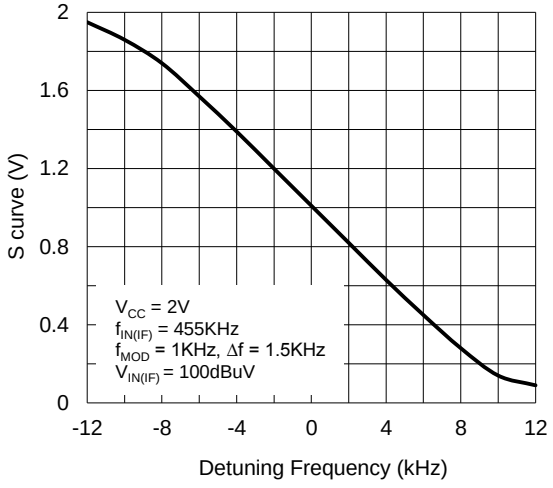

**Demodulation Output Level, 12dB Sensitivity vs Power Supply Voltage**



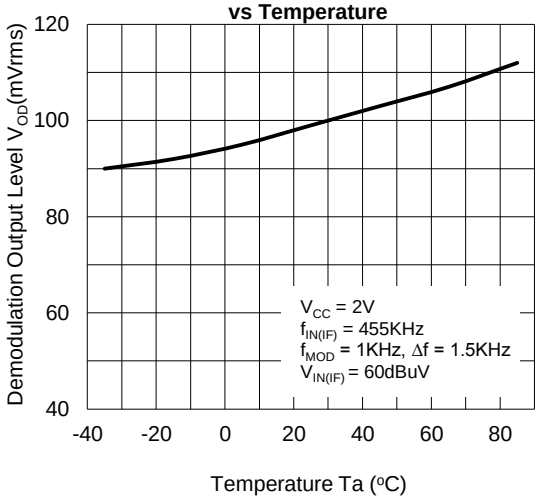

**Detuning, THD vs Detuning Frequency**



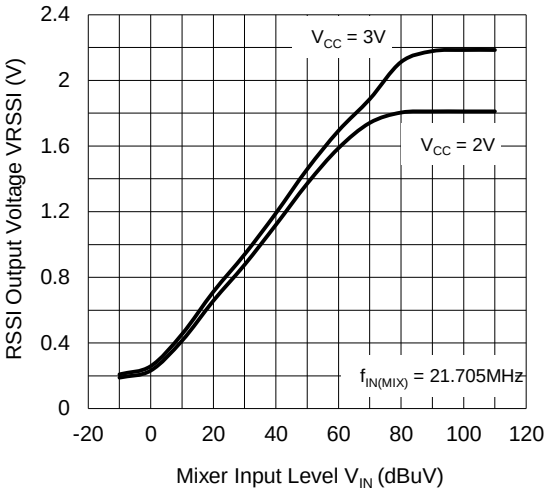

**S Curve**



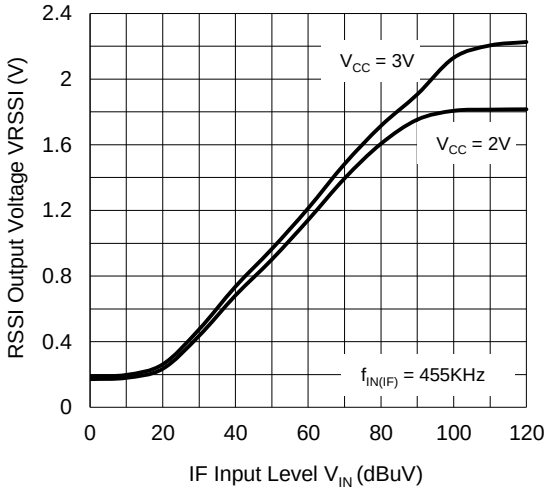

**Demodualtion Output Level vs Temperature**



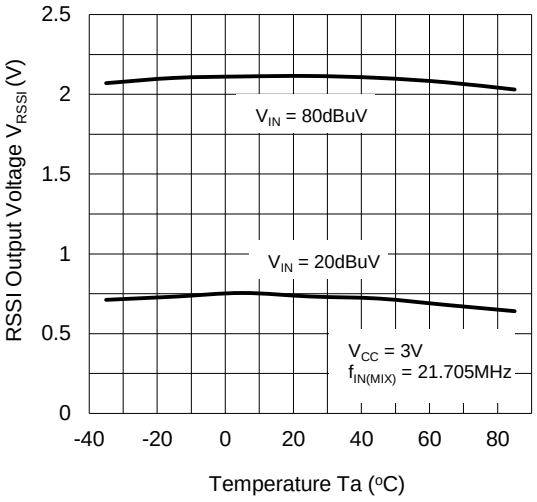
RSSI vs Mixer Input Level



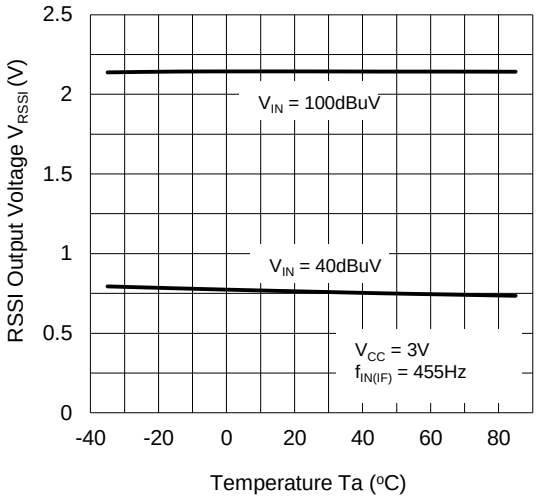

RSSI vs IF Input Level



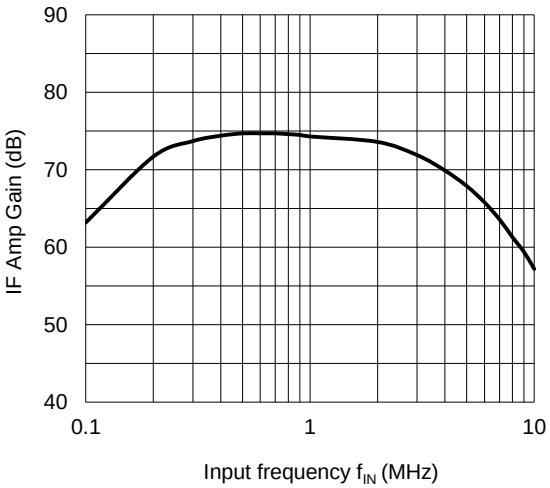

**RSSI (Mixer In) vs Temperature**



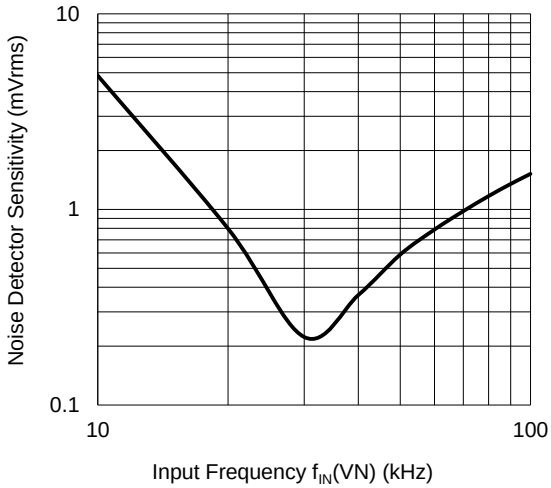

**RSSI (IF In) vs Temperature**



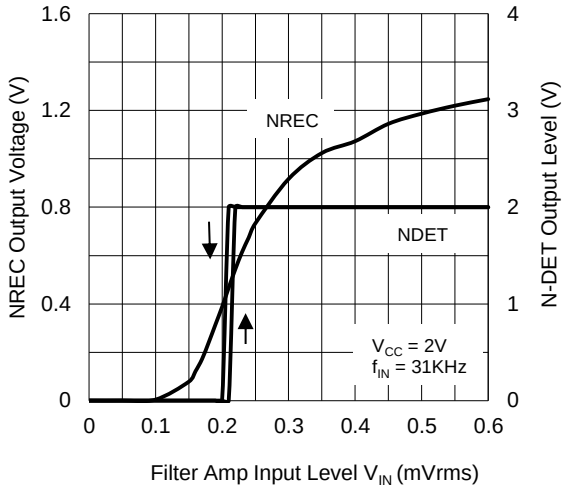

**IF Amp Gain vs Frequency**



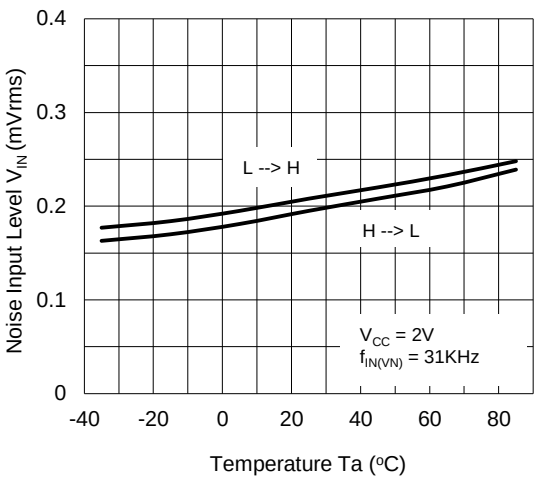

**Noise Detector Sensitivity vs Frequency**



**Noise Detection**




**Noise Detection Level vs Temperature**



## Package Dimensions