



**MOTOROLA  
SEMICONDUCTOR  
TECHNICAL DATA**

**Product Brief**

**Single Chip CMOS Broadband Tuner**

The MC44C800/801 Silicon Tuner ICs are highly integrated single chip broadband tuners for cable data and set-top applications. They receive 50 MHz to 861 MHz cable signals and convert them to a second IF of 36 MHz to 46 MHz.

Typical applications include Cable Data Modems, Cable Digital and Analog Settop boxes, VoIP Telephony boxes, etc. These tuners meet all DOCSIS requirements for 64 and 256 QAM.

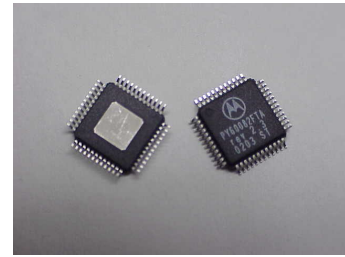
They utilize a double conversion architecture with an external first IF SAW filter at 1120 MHz, and a second IF in the range of 36 MHz to 46 MHz. Both the MC44C800 and the MC44C801 are identical, with the exception that the MC44C801 has a bus programmable variable gain LNA with 21 dB of gain control. The MC44C800 does not have the LNA.

A summary of the features is given below:

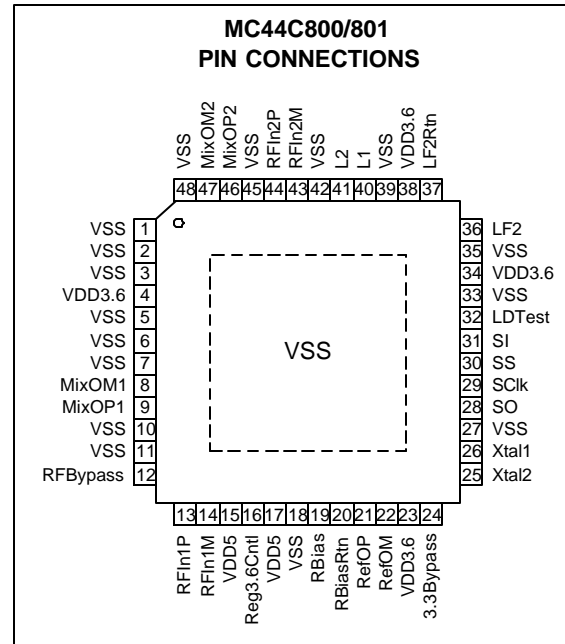
- Integrated frequency synthesizers and prescalers.
- One fully integrated VCO and one VCO requiring only an external inductor.
- Up conversion mixer.
- Down conversion mixer.
- Variable Gain LNA with 21 dB gain control (MC44C801 only).
- Reference oscillator circuit (using an external 25 MHz crystal).
- Minimum CTB of -66 dBc, CSO of -60 dBc and XMod of -57 dB with +3 dBmV AGC attack point.
- Typical noise figure of MC44C801 is 6.2 dB.
- Phase noise @ 10 KHz offset of -94 dBc/Hz, typical.
- Single 5 V supply operation.
- SPI bus interface.
- Internal self-diagnostic circuits.
- Power down mode with fast start-up.
- No external Image Filter required.

**MC44C800/801**

**SILICON TUNER IC**



TQFP48EP Package  
Exposed Pad  
0.50 mm pitch



**Ordering Information**

| Device      | Version | Temp. Range    | Package    |
|-------------|---------|----------------|------------|
| MC44C800FTA | Non-LNA | -10 C to +75 C | TQFP 48 EP |
| MC44C801FTA | LNA     | -10 C to +75 C | TQFP 48 EP |

# 1 Functional Description

The simplified block diagrams below shows the major sections of the IC. Input frequency range is 50 to 861 MHz. On the MC44C801, the gain of the internal LNA is set via the SPI bus depending on the input signal level. The MC44C800 utilizes an external variable gain device. The signal is then up converted to 1120 MHz and passed through the first IF filter. The filtered signal is then routed back on chip where it is downconverted to the second IF frequency. Additional filtering, gain and AGC are needed before the signal enters the demodulator.

## 2 Absolute Maximum Ratings

| Symbol | Parameter                     | Min | Max | Unit |
|--------|-------------------------------|-----|-----|------|
| VDD3.6 | 3.6 V Supply Voltage          |     | 3.8 | V    |
| VDD5   | 5.0 V Supply Voltage          |     | 5.5 | V    |
| Ta     | Operating Ambient Temperature | -10 | 75  | C    |
| Tstg   | Storage Temperature           | -65 | 150 | C    |

## 3 Electrical Characteristics

### 3.1 Specification Conditions:

Unless otherwise stated: VDD = 5.0 V & 3.6 V, T amb. = 25 C.

| Parameter                   | Min. | Typical | Max. | Units | Notes               |
|-----------------------------|------|---------|------|-------|---------------------|
| VDD3.6 @ 3.6 V              | 3.49 | 3.6     | 3.71 | Volts |                     |
| VDD3.6 Total Supply Current |      | 82      |      | mA    | All sections Active |
| VDD3.6 power down mode      |      | 18.4    |      | mA    |                     |
| VDD5 @ 5.0 V                | 4.75 | 5.0     | 5.25 | Volts |                     |
| VDD5 Total Supply Current   |      | 245     |      | mA    | Including LNA       |
| VDD5 power down mode        |      | 5.6     |      | mA    |                     |

### 3.2 Power Supply Voltage Connections

The power supplies connections for this part can be configured in two different ways. Both 3.6 V and 5 V power supplies can be connected to the part or just a 5 V power supply can be connected and the internal tracking regulator will provide the 3.6 V. The internal tracking regulator requires an external 2N2222 pass transistor. The power supply tolerance requirements are different depending on this configuration, as shown in the table below.

| Supply                      | VDD3.6 Tolerance | VDD5 Tolerance |
|-----------------------------|------------------|----------------|
| 3.6 V and 5 V Supplies Used | ± 3%             | ± 5%           |
| Only 5V Supply Used         | N/A              | ± 3%           |

# 4 Overall Tuner Characteristics, MC44C800

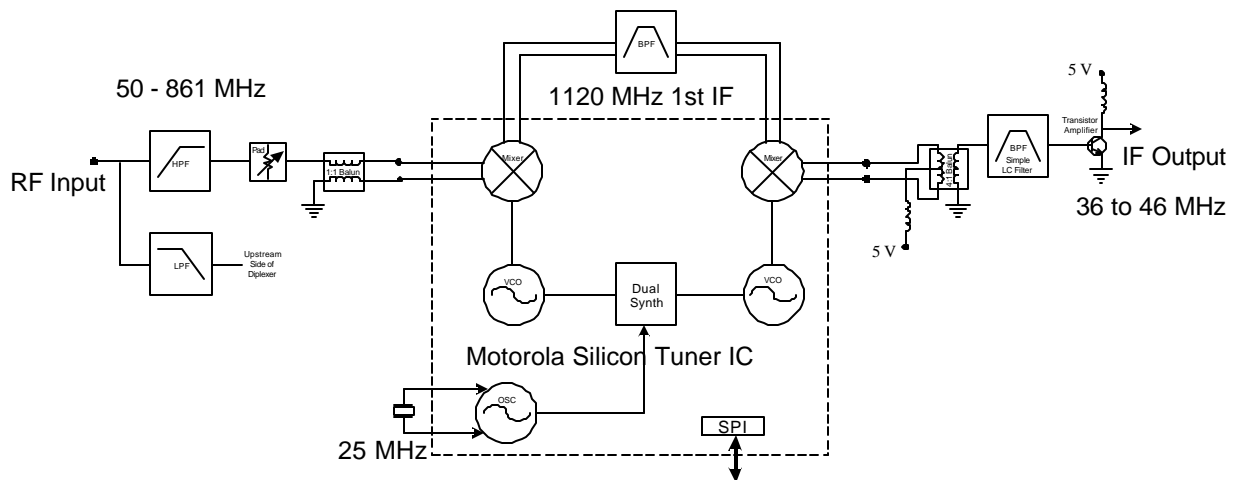
## 4.1 Electrical Specifications

Unless otherwise stated: VDD = 5.0V & 3.6V, T amb. = 25 C.

| Parameter   | Min. | Typ.      | Max. | Units  |
|---|------|-----------|------|--------|
| Frequency RF  | 50   |           | 861  | MHz    |
| Conversion Gain   |      | 30        |      | dB     |
| SSB Noise Figure at Max gain                            |      | 8         | 9    | dB     |
| Passband Gain Flatness, $\pm 2$ MHz from Center         |      | $\pm 0.5$ |      | dB     |
| LO Sideband Noise @ 10 kHz                              |      | -94       |      | dBc/Hz |
| LO Sideband Noise @ 100 kHz                             |      | -100      |      | dBc/Hz |
| CSO, +3 dBmV Attack, 137 Chan @ +15 dBmV                | -60  | -64       |      | dB     |
| CTB, +3 dBmV Attack, 137 Chan @ +15 dBmV                | -66  | -68       |      | dB     |
| Crossmodulation, +3 dBmV Attack,<br>137 Chan @ +15 dBmV | -57  | -59       |      | dB     |
| Second IF Image Rejection                               |      | -63       |      | dB     |

## 4.2 Reference Design Block Diagram

MC44C800 Simplified Reference Tuner.



# 5 Overall Tuner Characteristics, MC44C801

## 5.1 Electrical Specifications

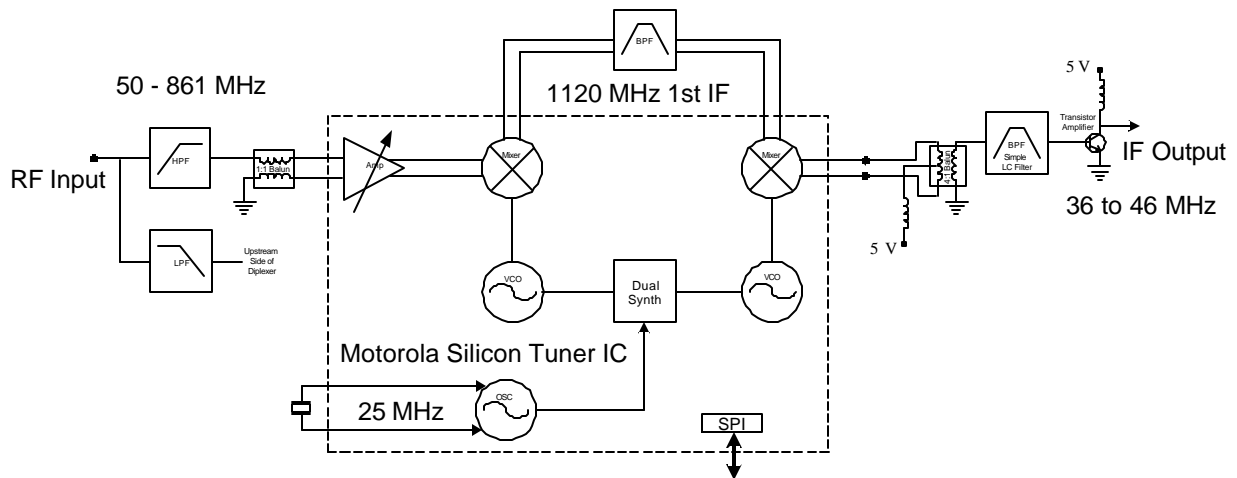
Unless otherwise stated: VDD = 5.0V & 3.6V, T amb. = 25 C.

| Parameter                                       | Min. | Typ.      | Max. | Units  |
|---|------|-----------|------|--------|
| Frequency RF                                    | 50   |           | 861  | MHz    |
| Conversion Gain                                 |      | 38        |      | dB     |
| Gain Control Range                              |      | 21        |      | dB     |
| SSB Noise Figure at Max LNA Step                |      | 6.2       |      | dB     |
| Passband Gain Flatness, $\pm 2$ MHz from Center |      | $\pm 0.5$ |      | dB     |
| LO Sideband Noise @ 10 kHz                      |      | -94       |      | dBc/Hz |
| LO Sideband Noise @ 100 kHz                     |      | -100      |      | dBc/Hz |
| CSO   |      | -66       |      | dB     |
| CTB   |      | -63       |      | dB     |
| Crossmodulation                                 |      | -58       |      | dB     |
| Second IF Image Rejection                       |      | -68       |      | dB     |

## 5.2 Reference Design Block Diagram

A complete MC44C801 reference design is available. Contact Motorola sales for details.

### MC44C801 Simplified Reference Tuner.



Motorola reserves the right to make changes without further notice to any products herein to improve reliability, function or design. Motorola does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convert any license under its patent rights of others. Motorola products are not authorized for use as components in life support devices or systems intended for surgical implant into the body or intended to support or sustain life. Buyer agrees to notify Motorola of any such intended end use whereupon Motorola shall determine availability and suitability of its products for the use intended. Motorola and are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Employment opportunity/Affirmative Action Employer.