



Product Preview

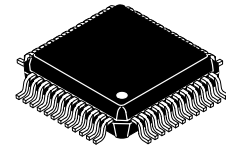
Low Power Integrated Receiver for ISM Band Applications

The MC13145 is a dual conversion integrated RF receiver intended for ISM band applications. It features a Low Noise Amplifier (LNA), two 50 Ω linear Mixers with linearity control, Voltage Controlled Oscillator (VCO), second LO amplifier, divide by 64/65 dual modulus Prescaler, split IF Amplifier and Limiter, RSSI output, Coilless FM/FSK Demodulator and power down control. Together with the transmit chip (MC13146) and the baseband chip (MC33410), a complete 900 MHz cordless phone system can be implemented. This device may be used in applications within 2.0 GHz since its RF bandwidth is greater than 2.4 GHz.

- Low (<1.8 dB @ 900 MHz) Noise Figure LNA with 14 dB Gain
- Externally Programmable Mixer linearity: IIP3 = 10(nom.) to +20 dBm (Mixer1); IIP3 = 10 (nom.) to 20 dBm (Mixer2)
- 50 Ω Mixer Input Impedance and Open Collector Output (Mixer 1 and Mixer 2); 50 Ω Second LO (LO2) Input Impedance
- Low Power 64/65 Dual Modulus Prescaler (MC12053 type)
- Split IF for Improved Filtering and Extended RSSI Range
- Internal 330 Ω Terminations for 10.7 MHz Filters
- Linear Coilless FM/FSK Demodulator with Externally Programmable Bandwidth, Center Frequency and Audio level
- 2.7 V to 6.5 V Operation, Low Current Drain (<30 mA @ 3.0 V) with Power Down Mode (<1.0 μ A)
- 2.4 GHz RF, 1.0 GHz IF1 and 50 MHz IF2 Bandwidth

MC13145

**UHF WIDEBAND
RECEIVER SUBSYSTEM
(LNA, Mixer, VCO, Prescaler,
IF Subsystem,
Coilless Detector)**



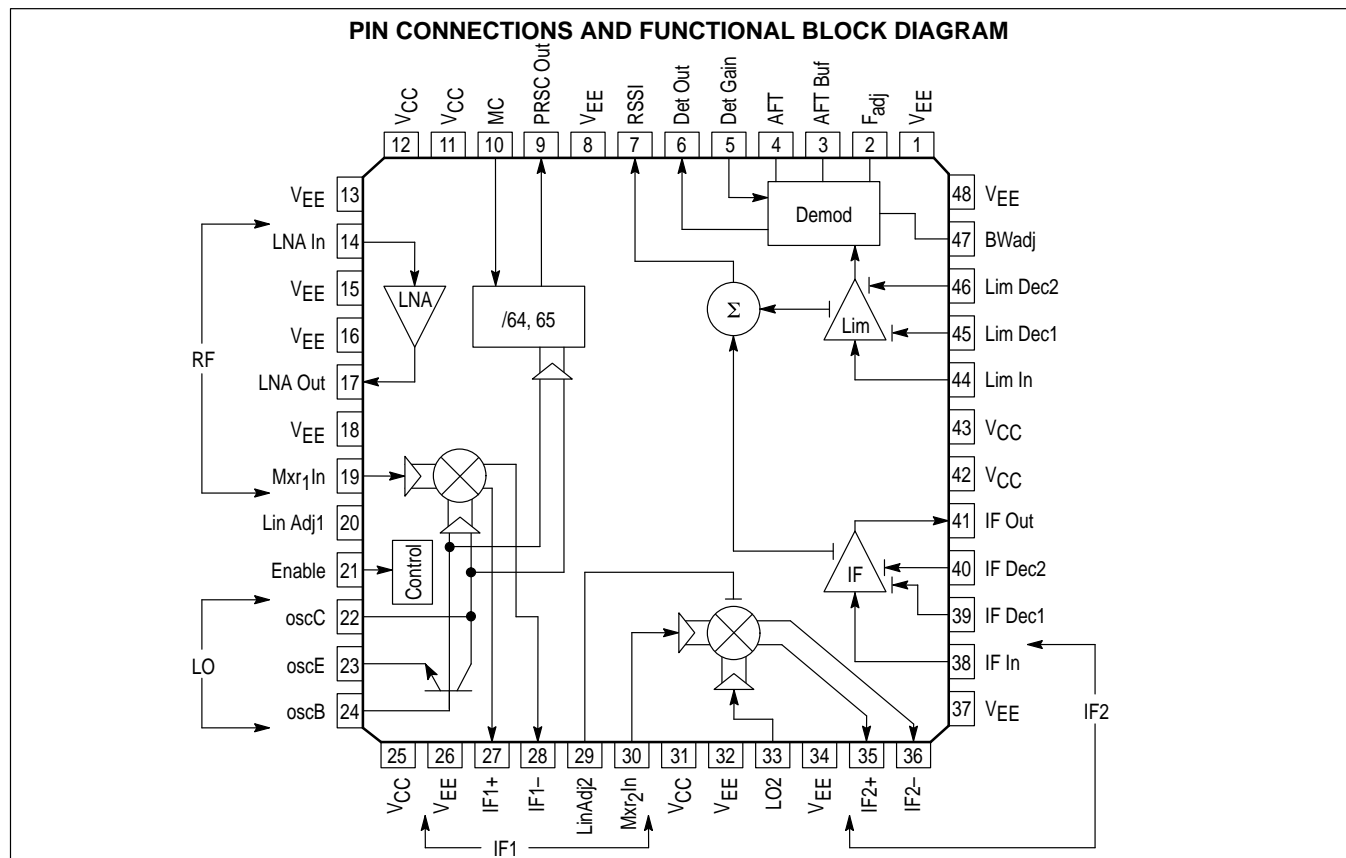
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FTA SUFFIX
PLASTIC PACKAGE
CASE 932
(LQFP-48)

ORDERING INFORMATION

| Device | Temperature Range | Package |
|------------|-------------------|---------|
| XC13145FTA | -40° to +85°C | LQFP-48 |

ESD Sensitive — Handle with Care



MC13145

OVERALL RECEIVER SPECIFICATIONS

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---------------------------|---------------|-------------|------|
| Power Supply Voltage | $V_{CC(max)}$ | 7.0 | Vdc |
| Junction Temperature | $T_J(max)$ | 150 | °C |
| Storage Temperature Range | T_{stg} | -65 to +150 | °C |

RECOMMENDED OPERATING CONDITIONS

| Rating | Symbol | Value | Unit |
|---|----------------------|-----------------|------|
| Power Supply Voltage ($T_A = 25^\circ\text{C}$) | V_{CC} V_{EE} | 2.7 to 6.5 0 | Vdc |
| Input Frequency | f_{in} | 100 to 2000 | MHz |
| Ambient Temperature Range | T_A | -40 to +85 | °C |
| Maximum Input Signal Level: – with no damage – with minor performance degradation | P_{in} | 5.0 -10 | dBm |

RECEIVER DC ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0$ Vdc; No Input Signal, unless otherwise noted)

| Characteristics | Symbol | Typical | Unit |
|---|-------------|---------|---------------|
| Total Supply Current (Enable = V_{CC}) | I_{total} | 30 | mA |
| Power Down Current (Enable = V_{EE}) | I_{total} | <1.0 | μA |

RECEIVER AC ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0$ Vdc; $F_{mod} = 1.0$ kHz; $F_{dev} = \pm 25$ kHz; IF filter bandwidth = 150 kHz, unless otherwise noted)

| Characteristics | Symbol | Typical | | Unit MHz |
|--|--------------|---------|------|-------------|
| | | 900 | 1900 | |
| 12 dB SINAD Sensitivity (with C-message filter at DetOut) | | -115 | TBD | dBm |
| 30 dB SINAD Sensitivity (No IF filter distortion within ± 40 kHz) | | -100 | TBD | dBm |
| SINAD Variation with IF Offset of ± 40 kHz (No IF filter distortion within ± 40 kHz) | | 5.0 | TBD | dB |
| RSSI Dynamic Range | | 80 | TBD | dB |
| Input 1.0 dB Compression Point (Measured at IF output) | P_{in-1dB} | -18 | TBD | dBm |
| Input 3rd Order Intercept Point (Measured at IF output) | IIP3 | -8.0 | TBD | dBm |
| Demodulator Output Swing (5.0 k Load) | | 0.5 | 0.5 | V_{pp} |
| Demodulator Bandwidth (± 1.0 dB bandwidth) | | 100 | 100 | kHz |
| Prescaler Output Level (10 k Ω /8.0 pF load) | | 0.5 | 0.5 | V_{pp} |
| Modulus Control Input Level | | 0.5 | 0.5 | V_{pp} |
| SNR @ -30 dBm Signal Input (<25 kHz deviation; with C-Message Filter) | | 50 | TBD | dB |
| Total Harmonic Distortion (<25 kHz deviation; with C-Message Filter) | | 1.0 | TBD | % |
| Spurious Response SINAD (RF In: -50 dBm) | | 12 | TBD | dB |

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INDIVIDUAL BLOCK SPECIFICATIONS

LOW NOISE AMPLIFIER ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0\text{ Vdc}$, unless otherwise noted)

| Characteristics | Symbol | Typical | | Unit MHz |
|-----------------------------------|--------------|---------|------|-------------|
| | | 900 | 1900 | |
| Amplifier Gain | S21 | 14 | TBD | dB |
| Noise Figure | NF | 1.8 | TBD | dB |
| 1.0 dB Gain Compression Point | P_{in-1dB} | -8.0 | TBD | dBm |
| 3rd Order Intercept Point | IIP3 | -5.0 | TBD | dBm |
| Reverse Isolation | S12 | -35 | TBD | dB |
| Input Impedance (with externals) | | 50 | 50 | Ω |
| Output Impedance (with externals) | | 50 | 50 | Ω |
| Input Match (with externals) | S11 | 15 | TBD | dB |
| Output Match (with externals) | S22 | 15 | TBD | dB |
| LO1 to LNA Input Leakage | | -45 | TBD | dBm |

FIRST MIXER ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0\text{ Vdc}$, unless otherwise noted)

| Characteristics | Symbol | Typical | | Unit MHz |
|---|--------------|---------|------|-------------|
| | | 900 | 1900 | |
| Power Conversion Gain ($P_{in} = -30\text{ dBm}$) | P_{gc} | 0 | TBD | dB |
| Noise Figure | NF | 13 | TBD | dB |
| 1.0 dB Gain Compression Point | P_{in-1dB} | -1.0 | TBD | dBm |
| 3rd Order Intercept Point | IIP3 | 9.0 | TBD | dBm |
| Input Impedance (single-ended) | | 50 | 50 | Ω |
| Output Impedance (differential with externals) | | 50 | 50 | Ω |
| Input Match | | 20 | TBD | dB |
| Output Match (with externals) | | 20 | TBD | dB |
| RF to IF1 Leakage | | -38 | TBD | dB |
| LO to IF1 Leakage | | -33 | TBD | dBm |
| LO to RF Leakage | | -33 | TBD | dBm |
| Mixer Out to IF in Leakage | | -80 | TBD | dB |

SECOND MIXER ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0\text{ Vdc}$, unless otherwise noted)

| Characteristics | Symbol | Typical | Unit |
|--|--------------|---------|----------|
| Noise Figure | NF | 13 | dB |
| 1.0 dB Gain Compression Point | P_{in-1dB} | -1.0 | dBm |
| 3rd Order Intercept Point | IIP3 | 9.0 | dBm |
| Input Impedance (single-ended) | | 50 | Ω |
| Output Impedance (differential with externals) | | 330 | Ω |
| Input Match | | 20 | dB |
| Output Match (with externals) | | 20 | dB |

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INDIVIDUAL BLOCK SPECIFICATIONS (continued)

LOCAL OSCILLATOR ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0\text{ Vdc}$, unless otherwise noted)

| Characteristics | Symbol | Typical | | Unit MHz |
|------------------------------------|--------|---------|------|-------------|
| | | 900 | 1900 | |
| LO Emitter Current (Enable = high) | | 2.0 | TBD | mA |
| Phase Noise @ 10 kHz Offset | | -80 | -75 | dBc/Hz |
| Modulation Sideband | | -40 | TBD | dBc |

PRESCALAR ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0\text{ Vdc}$, unless otherwise noted)

| Characteristics | Symbol | Typical | | Unit MHz |
|---|--------|----------|----------|--------------------|
| | | 900 | 1900 | |
| Divide Ratio – MC = low – MC = high | | 65 64 | 65 64 | |
| Output Impedance | | 50 | 50 | Ω |
| Prescaler Output Level (10 k Ω /8pF load) | | 0.5 | 0.5 | V _{pp} |
| MC Input Level | | 0.5 | 0.5 | V _{pp} |
| MC Current Input (optional) | | 200 | 200 | μA_{pp} |
| Prescaler Out to IF Amp and Lim Amp Input Leakage | | -85 | TBD | dBm |

IF AND LIMITING AMPLIFIERS ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0\text{ Vdc}$, unless otherwise noted)

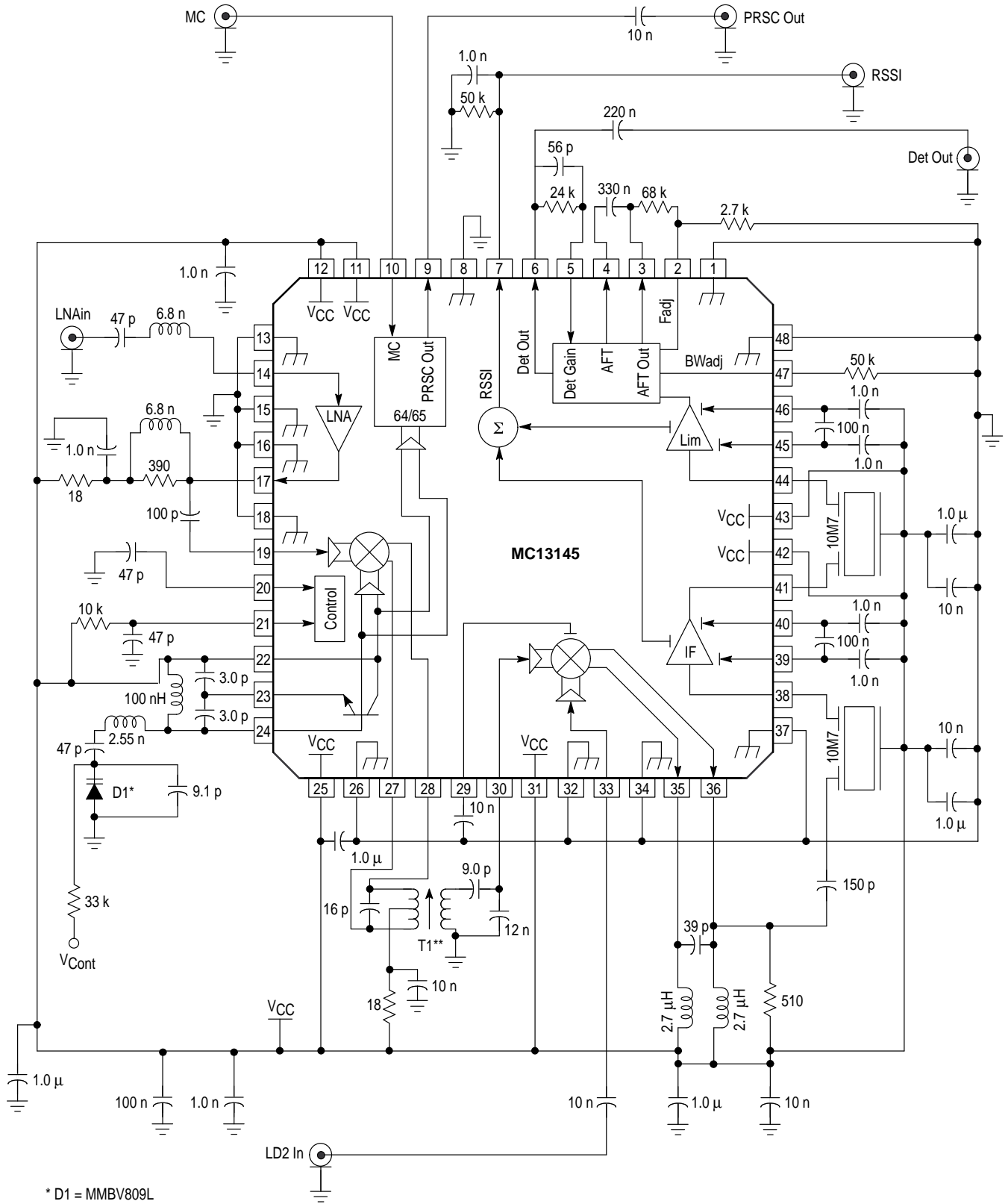
| Characteristics | Symbol | Typical | Unit |
|--|--------|---------|-------------------------|
| IF and Lim Amplifier Bandwidth | | 40 | MHz |
| IF Amplifier Gain | | 40 | dB |
| IF Amplifier Noise Figure | | 7.0 | dB |
| IF Input & Output Impedance | | 330 | Ω |
| IF Amp Input & Output Match | | 20 | dB |
| Limiting Amplifier Gain | | 85 | dB |
| Lim Amp Input Impedance | | 330 | Ω |
| Lim Amp Input Match | | 15 | dB |
| IF Amp Output to Lim Amp Input Leakage (at 10.7 MHz) | | 80 | dB |
| RSSI Dynamic Range | | 80 | dB |
| RSSI Slope | | 0.5 | $\mu\text{A}/\text{dB}$ |
| RSSI Current Range | | 0 to 40 | μA |
| RSSI Response Time | | 1.0 | μs |

COILLESS DEMODULATOR ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $V_{CC} = 3.0\text{ Vdc}$, unless otherwise noted)

| Characteristics | Symbol | Typical | Unit |
|--|--------|------------|-----------------|
| Demodulator Output (at 25 kHz deviation) | DetOut | 0.5 | V _{pp} |
| Center Frequency | | 10.7 | MHz |
| Frequency Adjust | | < 20 | MHz |
| Bandwidth Adjust | | 100 to 600 | kHz |
| Output Impedance | | 2000 | Ω |
| Settling Time (assert Enable pin) | | TBD | ms |

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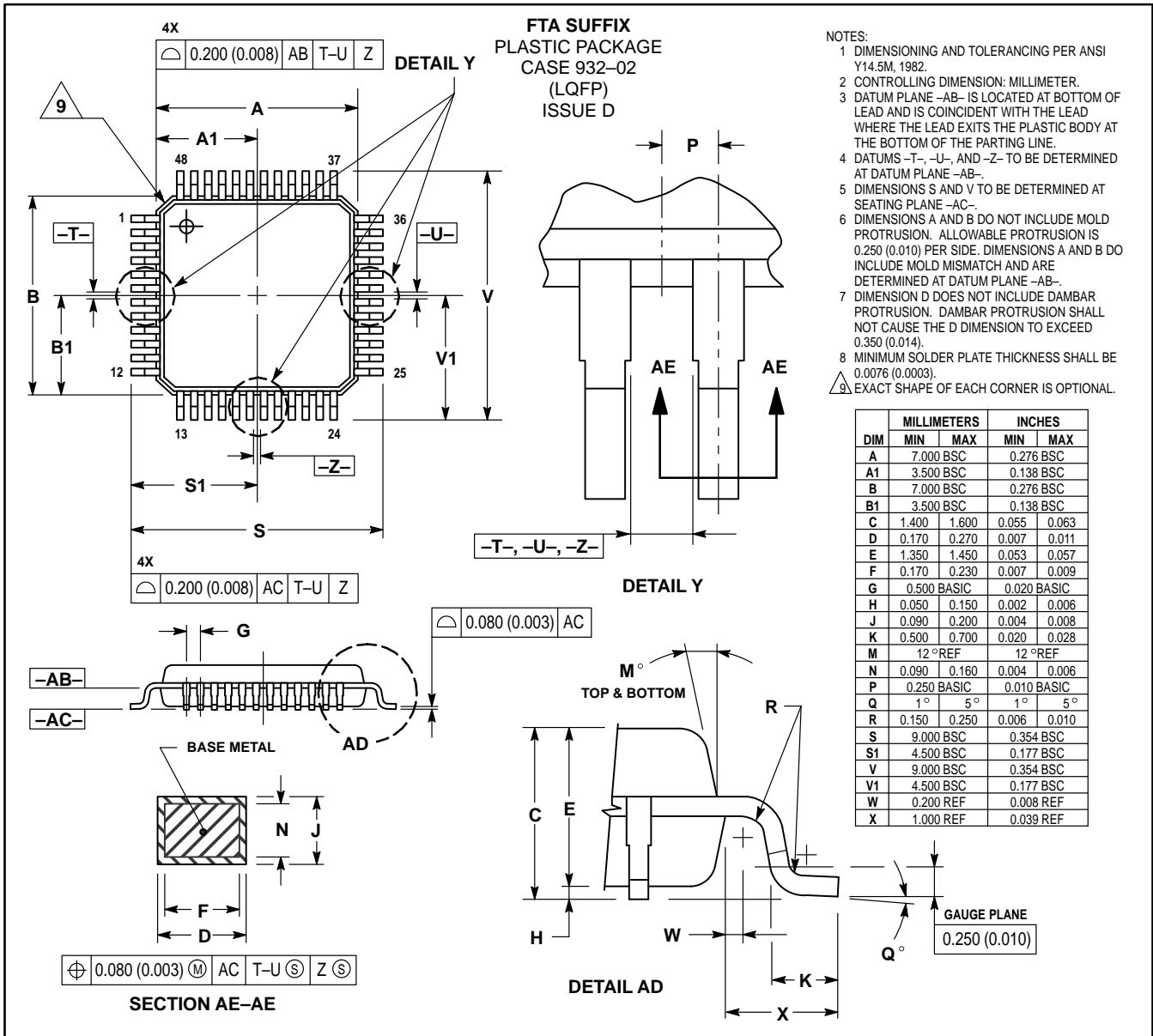
Figure 1. Application Diagram



* D1 = MMBV809L
 **T1 = Toko Part # 600ENAS-A998EK

MC13145

OUTLINE DIMENSIONS



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