



# MC13143

## Product Preview

# Ultra Low Power DC - 2.4 GHz Linear Mixer

The MC13143 is a high compression linear mixer with single-ended RF input, differential IF output and differential LO inputs which consumes as little as 1.8 mW. A new circuit topology is used to achieve a high third order intermodulation intercept point, high linearity and high 1.0 dB output compression point while maintaining a linear 50  $\Omega$  input impedance. It is designed for Up or Down conversion anywhere from dc to 2.4 GHz.

**Ultra Low Power: 1.0 mA @  $V_{CC}$  = 1.8–6.5 V**

- Wide Input Bandwidth: DC–2.4 GHz
- Wide Output Bandwidth: DC–2.4 GHz
- Wide LO Bandwidth: DC–2.4 GHz
- High Mixer Linearity:  $P_{1dB} = +3.0$  dBm

**Linearity Adjustment of up to  $IP_{3in} = +20$  dBm**

- 50  $\Omega$  Mixer Input
- Single-Ended Mixer Input
- Double Balanced Mixer Operation
- Differential Open Collector Mixer Output

## ORDERING INFORMATION

| Device   | Operating Temperature Range              | Package |
|----------|--|---------|
| MC13143D | $T_A = -40^\circ$ to $+85^\circ\text{C}$ | SO–8    |

## MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , unless otherwise noted.)

| Rating                         | Symbol   | Value     | Unit |
|--------------------------------|----------|-----------|------|
| Power Supply Voltage           | $V_{CC}$ | 7.0 (max) | Vdc  |
| Operating Supply Voltage Range | $V_{CC}$ | 1.8–6.5   | Vdc  |

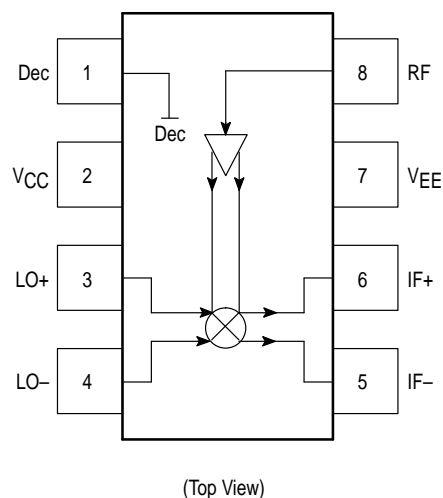
## ULTRA LOW POWER DC – 2.4 GHz LINEAR MIXER

## SEMICONDUCTOR TECHNICAL DATA



**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751  
(SO–8)

## PIN CONNECTIONS

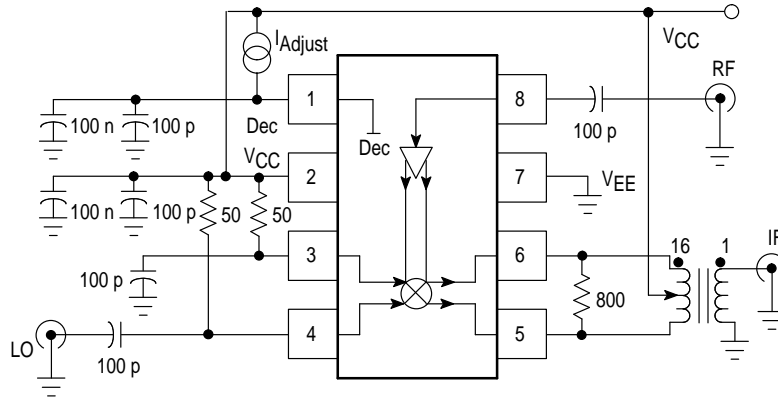


## MC13143

**ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 2.0\text{ V}$ ,  $T_A = 25^\circ\text{C}$ ,  $R_F = -30\text{ dBm}$  @ 900 MHz,  $LO = 0\text{ dBm}$  @ 950 MHz,  $IF$  @ 50 MHz.)

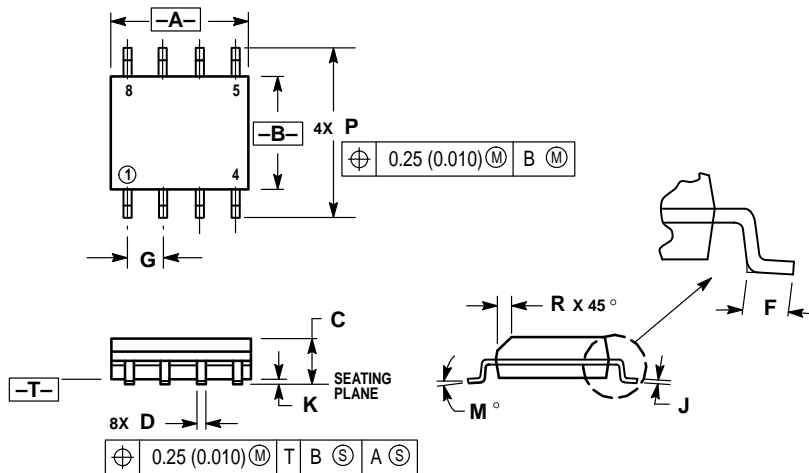
| Characteristic  | Symbol                 | Min | Typ     | Max | Unit |
|---|------------------------|-----|---------|-----|------|
| Supply Current  | $I_{CC}$               | –   | 0.7–1.3 | –   | mA   |
| Mixer Voltage Conversion Gain ( $R_P = R_L = 800\ \Omega$ ) | $VG_C$                 | –   | 9.0     | –   | dB   |
| Mixer Power Conversion Gain ( $R_P = R_L = 800\ \Omega$ )   | $PG_C$                 | –   | –3.0    | –   | dB   |
| Mixer Input Match   | $\Gamma_{in}$          | –   | –20     | –   | dB   |
| Mixer SSB Noise Figure                                      | $NF_{SSB}$             | –   | 12      | –   | dB   |
| Mixer 1.0 dB Gain Compression                               | $P_{In-1.0\text{ dB}}$ | –   | 3.0     | –   | dBm  |
| Mixer Input Third Order Intercept                           | $IP3_{in}$             | –   | –3.0    | –   | dBm  |
| LO Drive Level  | $LO_{in}$              | –   | –5.0    | –   | dBm  |
| LO Feedthrough to Mixer Out                                 | $P_{LO-IF}$            | –   | –25     | –   | dB   |
| Mixer Input Feedthrough Output                              | $P_{RFm-IF}$           | –   | –25     | –   | dB   |
| Mixer Input Feedthrough to LO                               | $P_{RFm-LO}$           | –   | –25     | –   | dB   |

**Test Circuit**



## OUTLINE DIMENSIONS


**D SUFFIX**  
**PLASTIC PACKAGE**  
CASE 751-05  
(SO-8)  
ISSUE N



## NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 4.80        | 5.00 | 0.189     | 0.196 |
| B   | 3.80        | 4.00 | 0.150     | 0.157 |
| C   | 1.35        | 1.75 | 0.054     | 0.068 |
| D   | 0.35        | 0.49 | 0.014     | 0.019 |
| F   | 0.40        | 1.25 | 0.016     | 0.049 |
| G   | 1.27 BSC    |      | 0.050 BSC |       |
| J   | 0.18        | 0.25 | 0.007     | 0.009 |
| K   | 0.10        | 0.25 | 0.004     | 0.009 |
| M   | 0°          | 7°   | 0°        | 7°    |
| P   | 5.80        | 6.20 | 0.229     | 0.244 |
| R   | 0.25        | 0.50 | 0.010     | 0.019 |

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