MOTOROLA

MC13141

Product Preview

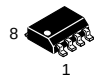
Low Power DC – 1.8 GHz LNA and Mixer

LOW POWER DC – 1.8 GHz LNA AND MIXER

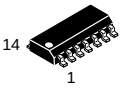
SEMICONDUCTOR TECHNICAL DATA

The MC13141 is intended to be used as a first amplifier and down converter for RF applications. It features wide band operation, low noise, high gain and high linearity while maintaining low current consumption. The circuit consists of a Low Noise Amplifier (LNA), a Local Oscillator amplifier (LO_{amp}), a mixer, an Intermediate Frequency amplifier (IF_{amp}) and a dc control section.

- Wide RF Bandwidth: DC–1.8 GHz
- Wide Mixer Bandwidth: DC–1.8 GHz
- Wide IF Bandwidth: DC–150 MHz
- Low Power: 7.0 mA @ V_{CC} = 2.7–6.5 V
- High Mixer Linearity: $Pi_{1.0\ dB}$ = – 2.0 dBm, IP_{3in} = + 3.0 dBm
- Linearity Adjustment Increases IP_{3in} (Not Available in SOIC8)
- Single–Ended 50 Ω Mixer Input
- Double Balanced Mixer Operation
- Single Ended 800 Ω Mixer Output



D SUFFIX
PLASTIC PACKAGE
CASE 751
(SO–8)



D SUFFIX
PLASTIC PACKAGE
CASE 751A
(SO–14)

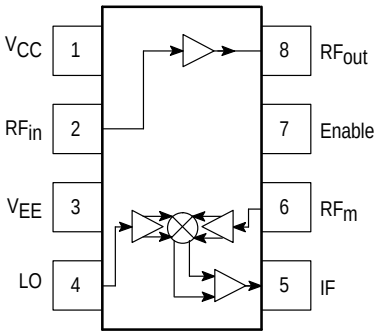
FTB SUFFIX
PLASTIC PACKAGE
CASE 976
(Thin QFP)

ORDERING INFORMATION

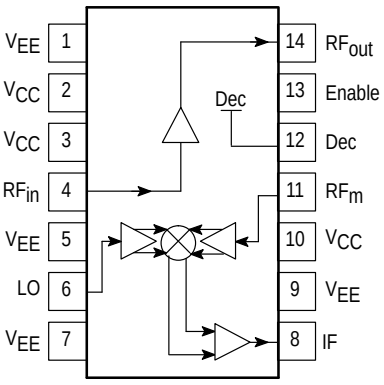
Device	Operating Temperature Range	Package
MC13141D	T_A = – 40 ° to +85°C	SO–8
MC13141D		SO–14
MC13141FTB		TQFP–20

PIN CONNECTIONS

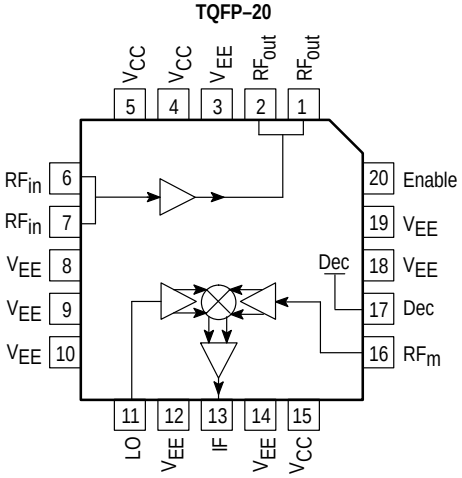
SO–8



SO–14



TQFP–20



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MAXIMUM RATINGS (T_A = 25°C, unless otherwise noted.)

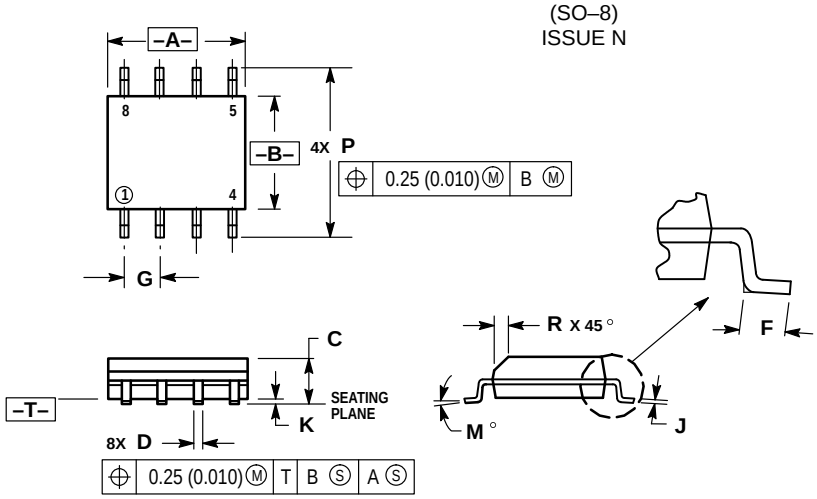
Rating	Symbol	Value	Unit
Power Supply Voltage	V_{CC}	7.0 (max)	Vdc
Operating Supply Voltage Range	V_{CC}	2.7–6.5	Vdc

ELECTRICAL CHARACTERISTICS (SOIC8 Package, V_{CC} = 3.0 V, T_A = 25°C, LO_{in} = –10 dBm @ 950 MHz, IF @ 50 MHz.)

Characteristic	Symbol	Min	Typ	Max	Unit
Supply Current (Power Down)	I_{CC}	–	100	–	pA
Supply Current (Power Up)	I_{CC}	–	5.5–8.5	–	mA
Amplifier Gain	S_{21}	–	17	–	dB
Amplifier Reverse Isolation	S_{12}	–	– 25	–	dB
Amplifier Input Match	$\Gamma_{in\ amp}$	–	–10	–	dB
Amplifier Output Match	$\Gamma_{out\ amp}$	–	–15	–	dB
Amplifier 1.0 dB Gain Compression	$Pin_{–1.0\ dB}$	–	–15	–	dBm
Amplifier Input Third Order Intercept	$IP3_{in}$	–	– 5.0	–	dBm
Amplifier Noise Figure (50 Ω)	NF	–	2.5	–	dB
Mixer Voltage Conversion Gain (R_P = R_L = 800 Ω)	VG_C	–	15	–	dB
Mixer Power Conversion Gain (R_P = R_L = 800 Ω)	PG_C	–	3.0	–	dB
Mixer Input Match	$\Gamma_{in\ M}$	–	– 20	–	dB
Mixer SSB Noise Figure	NF_{SSBM}	–	17.0	–	dB
Mixer 1.0 dB Gain Compression	$Pin_{–1.0\ dBM}$	–	– 2.0	–	dBm
Mixer Input Third Order Intercept	$IP3_{inM}$	–	3.0	–	dBm
LO Drive Level	LO_{In}	–	–10	–	dBm
RF_{in} Feedthrough to RF_m	$P_{RFin–Rin}$	–	– 25	–	dB
RF_{out} Feedthrough to RF_m	$P_{RFout–RFm}$	–	– 25	–	dB
LO Feedthrough to IF	$P_{LO–IF}$	–	– 25	–	dB
LO Feedthrough to RF_{in}	$P_{LO–RFin}$	–	– 25	–	dB
LO Feedthrough to RF_m	$P_{LO–RFm}$	–	– 25	–	dB
Mixer RF Feedthrough to IF	$P_{RFm–IF}$	–	– 25	–	dB
Mixer RF Feedthrough to RF_{in}	$P_{RFm–RFin}$	–	– 25	–	dB

OUTLINE DIMENSIONS

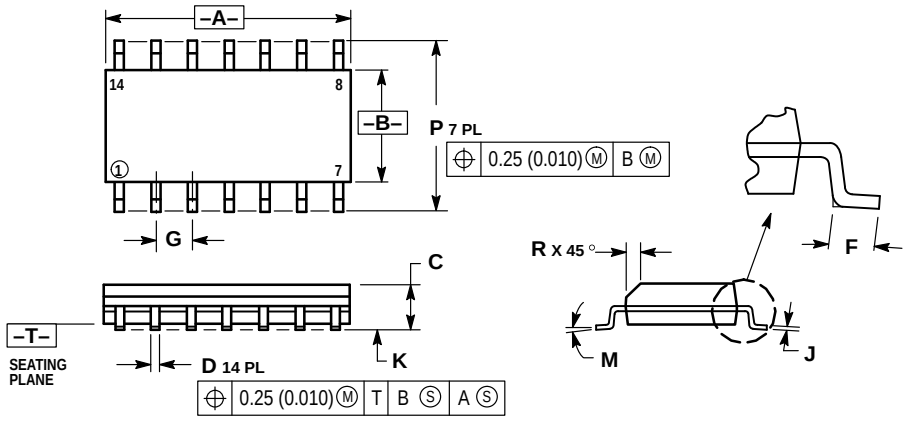
D SUFFIX
PLASTIC PACKAGE
CASE 751–05
(SO–8)
ISSUE N



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.

	MILLIMETERS		INCHES	
DIM	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

D SUFFIX
PLASTIC PACKAGE
CASE 751A–03
(SO–14)
ISSUE F



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.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
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	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0 °	7 °	0 °	7 °
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

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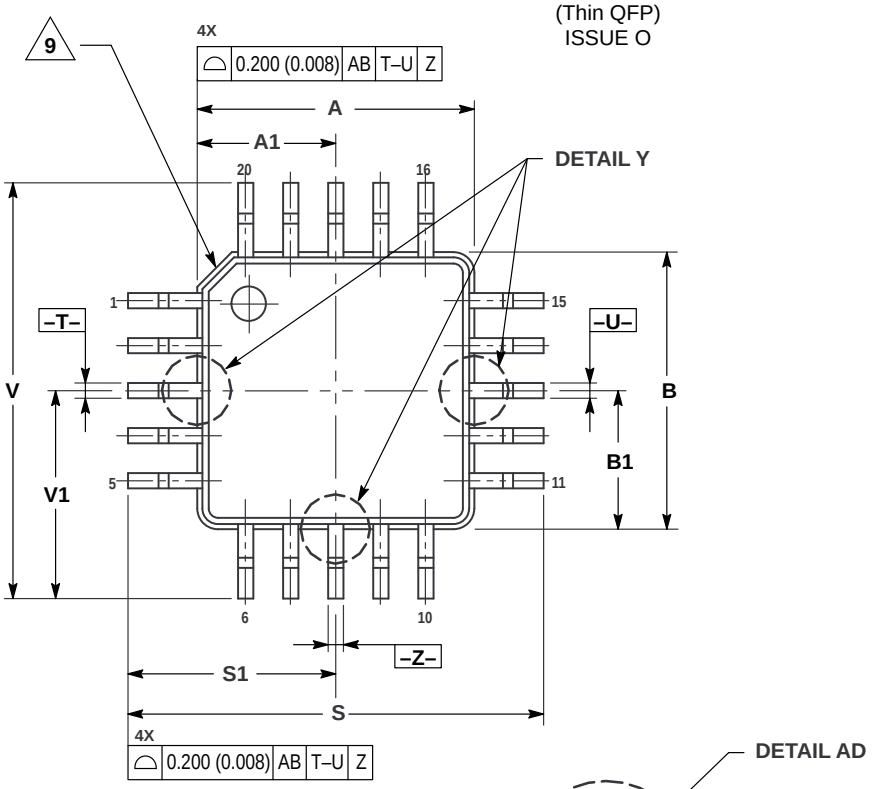
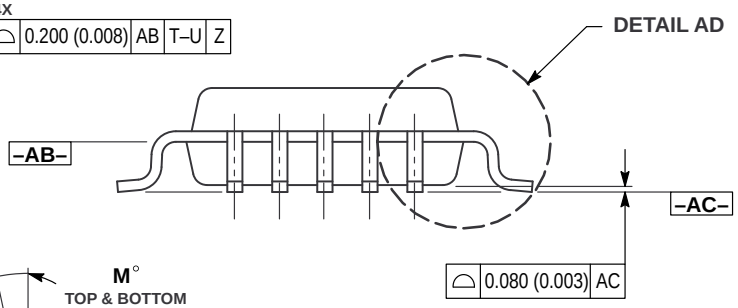
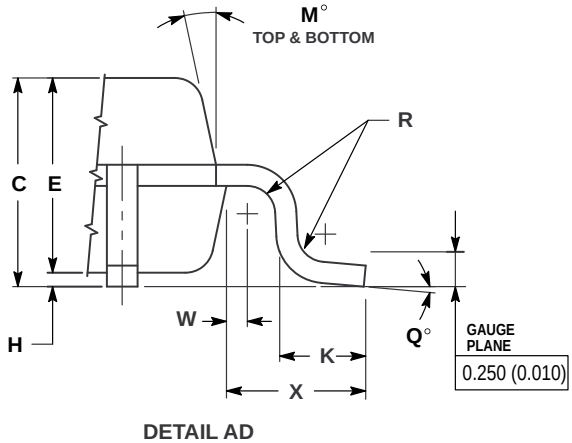
OUTLINE DIMENSIONS

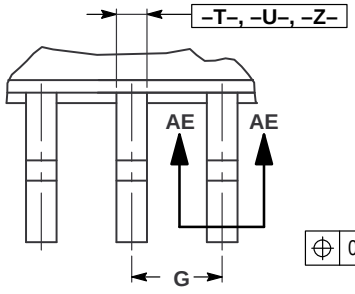
FTB SUFFIX
PLASTIC PACKAGE
CASE 976–01
(Thin QFP)
ISSUE O



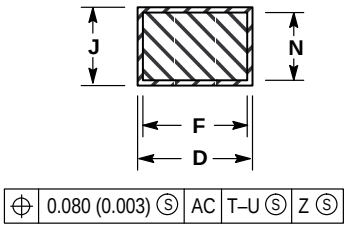




DETAIL AD



DETAIL Y



SECTION AE–AE

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DATUM PLANE –AB– IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
4. DATUMS –T–, –U–, AND –Z– TO BE DETERMINED AT DATUM PLANE –AB–.
5. DIMENSIONS S AND V TO BE DETERMINED AT DATUM PLANE –AC–.
6. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.250 (0.010) PER SIDE. DIMENSIONS A AND B DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE –AB–.
7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE D DIMENSION TO EXCEED 0.350 (0.014).
8. MINIMUM SOLDER PLATE THICKNESS SHALL BE 0.0076 (0.0003).
9. EXACT SHAPE OF EACH CORNER IS OPTIONAL.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.000 BSC		0.157 BSC	
A1	2.000 BSC		0.079 BSC	
B	4.000 BSC		0.157 BSC	
B1	2.000 BSC		0.079 BSC	
C	1.400	1.600	0.055	0.063
D	0.170	0.270	0.007	0.011
E	1.350	1.450	0.053	0.057
F	0.170	0.230	0.007	0.009
G	0.650 BSC		0.026 BSC	
H	0.050	0.150	0.002	0.006
J	0.090	0.200	0.004	0.008
K	0.500	0.700	0.020	0.028
M	12° REF		12° REF	
N	0.090	0.160	0.004	0.006
P	0.250 BSC		0.010 BSC	
Q	1°	5°	1°	5°
R	0.150	0.250	0.006	0.010
S	6.000 BSC		0.236 BSC	
S1	3.000 BSC		0.118 BSC	
V	6.000 BSC		0.236 BSC	
V1	3.000 BSC		0.118 BSC	
W	0.200 REF		0.008 REF	
X	1.000 REF		0.039 REF	

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