

Typical Applications

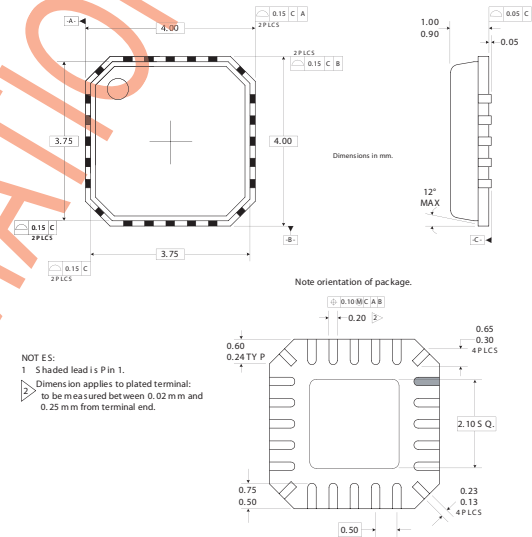
Target applications are products using the GSM, CDMA, WLAN, GPS, PCS/DCS and AMPS wireless communication standards.

- General receive path downconversion
- CDMA and AMPS/TACS cellular phones

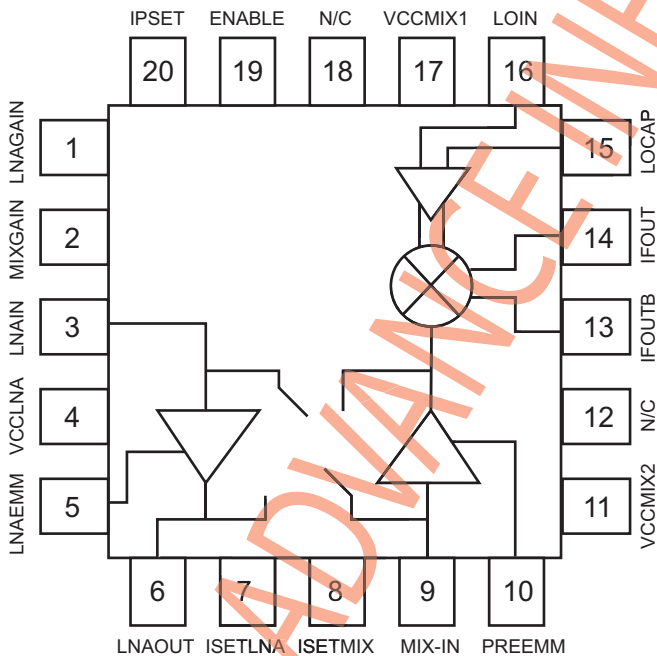
Product Overview

The TRFS-151 is a low noise 900 MHz receiver front end. It incorporates a dual-gain low noise amplifier and a dual-gain downconversion mixer, which when combined with off-chip filtering, provide all the circuitry necessary to meet the IS-98B CDMA standard for cellular phones.

Package Style: LCC,20-pin 4x4



Pinout and Block Diagram



Key Features

- Complete radio front-end
- Compatible with IS-98B CDMA cellular and AMPS standard
- Low power consumption
- Low noise
- Adjustable gain

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Circuit Description

LNA: The LNA input and output are matched to 50 ohms using off-chip matching circuitry. The LNA gain is controlled with pin LNAgain. Gain, linearity and noise figure can be optimized using an external inductor from pin LNAEMM to ground. The LNA Linearity can be improved with the use of digital pin IPSET. This pin increases LNA bias current by 30%, which increases LNA linearity.

Mixer: The mixer circuit consists of a dual-gain preamplifier, a mixer core, and a LO buffer. The dual-gain preamplifier is very similar to the LNA circuit described above. It requires external input matching to 50 ohms, utilizes an external inductor connected to pin PREEMM, and is gain controlled with pin MIXgain. The mixer core is a standard double-balanced Gilbert Cell. The mixer outputs are differential open collector IF outputs which require a DC path to VCC. The mixer LO input (LOIN) is buffered and applied to the mixer core LO inputs. The LO input buffer requires an external bypass connection (pin LOCAP).

Power and Biasing: The ENABLE pin is used to power on and off the entire chip. The LNA bias current can be adjusted using a resistor from the ISETLNA pin to ground. The mixer, mixer preamplifier, and LO buffer cell currents can together be adjusted using a resistor from the ISETMIX pin to ground.

Power and Frequencies

Parameter	Expected Min	Typ Value	Expected Max	Units
LNA and Mixer RF Frequency Range	800	900	1000	MHz
LO Frequency Range	800		1000	MHz
Mixer IF Output Frequency Range	0.1		250	MHz
Chip OFF I _{supply}		<1		uA
Example chip ON I _{supply} (LNA high gain, Mixer High Gain, no LNA IP3 boost)				mA
Operating Temperature	-30	25	85	degC
VCC Operating Voltage	2.7	2.85	3.0	V

Typical Performance

Parameter	Exp Value	Units	Notes
LNA high gain			
Gain	14	dB	
NF	1.4	dB	
IIP3	+8	dBm	
I _{supply}	5	mA	
LNA high IP3			
Gain	14	dB	
NF	1.4	dB	
IIP3	+10.5	dBm	
I _{supply}	6.7	mA	
LNA low gain			
Gain	-4	dB	
NF	4	dB	
IIP3	+19	dBm	
I _{supply}	0	mA	
Mixer high gain			
Gain	13	dB	
NF	6	dB	SSB
IIP3	+1	dBm	
I _{supply}	14.5	mA	
Mixer low gain			
Gain	7	dB	
NF	13	dB	SSB
IIP3	+8	dBm	
I _{supply}	11.5	mA	
Mixer LO			
LO input level	-10	dBm	

Pin #	Pin Name	Purpose and Usage
1	LNAGAIN	CMOS input to switch LNA Gain.
2	MIXGAIN	CMOS input to switch Mixer Preamp Gain.
3	LNAIN	LNA input, 900 MHz
4	VCCLNA	Positive power connection for LNA Circuit.
5	LNAEMM	Emitter connection for LNA amplifying transistor
6	LNAOUT	LNA Output.
7	ISETLNA	Adjustment for LNA bias current.
8	ISETMIX	Adjustment for Mixer, mixer preamp, and LO buffer bias current.
9	MIXIN	Mixer preamplifier input, 900 MHz.
10	PREEMM	Emitter connection for Mixer preamp amplifying transistor
11	VCCMIX2	Secondary positive power connection for Mixer circuitry. Shorted on-chip to VCCMIX1.
12	N/C	No connection
13	IFOUTB	Inverting Mixer output, 100 MHz typical.
14	IFOUT	Noninverting Mixer output, 100 MHz typical.
15	LOCAP	External bypass for LO buffer.
16	LOIN	Mixer LO input, single-ended (700-1000MHz)
17	VCCMIX1	Primary positive power connection for Mixer circuitry.
18	N/C	No connection
19	ENABLE	CMOS input to toggle chip power.
20	IPSET	CMOS input to toggle LNA high IP3 mode
paddle	ground	Bottom of package connection to PCB ground.

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