Features

- **KPCS Band CDMA and GPS Operation**
- **Low Current Consumption**
- **Excellent Noise and IP3 Performance**
- **Adjustable Third Order Intercept on LNA Stage**
- **Flexible IF Frequency Range from 80 MHz to 230 MHz**
- **Excellent Cross Modulation Performance**

Applications

- **Quad-mode/Dual-band CDMA IS-95/98 Based Mobile Phones with GPS Support**
- **Other Familiar Applications**

Benefits

- **High Linearity Eliminates Potential Call Drop Issues Associated with Gain Switching**
- **Most Compact Integrated Receiver for K-PCS and A-GPS Applications**
- **IM98 IMD Requirements Met with two Gain States Simplifying Calibration Procedure**
- **Best in Class A-GPS CascadeGgain for Maximum Take-over**
- **TX LO Buffer Included**
- **Few External Components**
- **Fully ESD Protected**

Electrostatic sensitive device.
Observe precautions for handling.

2.8 V Dual-band/ Dual-mode RF Receiver for K-PCS/GPS

T0352

Preliminary (Summary)

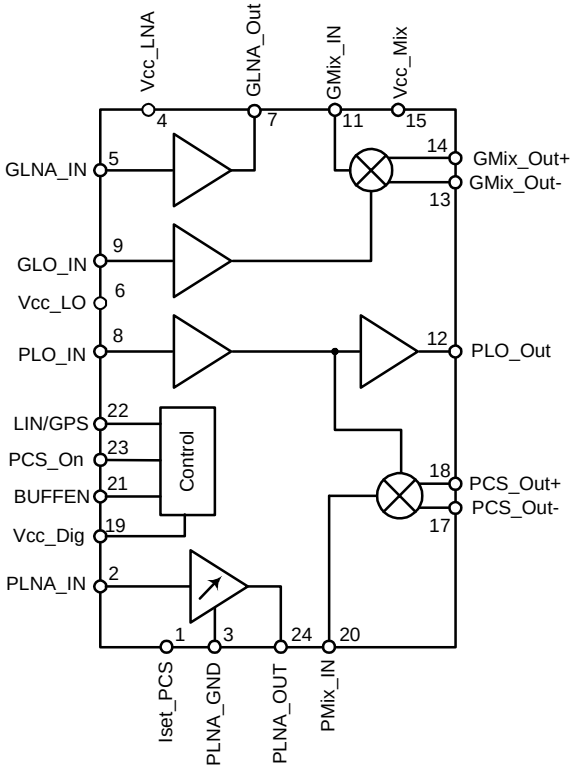
Description

The T0352 is a CDMA front-end receiver RFIC designed for dual-band, dual-mode operation. The device supports Korean PCS (K-PCS) CDMA and A-GPS operation. The IF range is from 80 MHz to 230 MHz with external tuning. The K-PCS low noise amplifier has an adjustable third order intercept (IP3) to minimize inter-modulation and cross-modulation effects. The mixers are designed for differential IF outputs (single-ended or differential IF outputs for GPS modes), and they feature excellent linearity and low noise figure.

The T0352 device is available in a 4 mm × 4 mm MLF package with 24 pins. This front-end receiver is capable of meeting all electrical requirements in accordance with the TIA/EIA 98-C Wireless Communication standard.

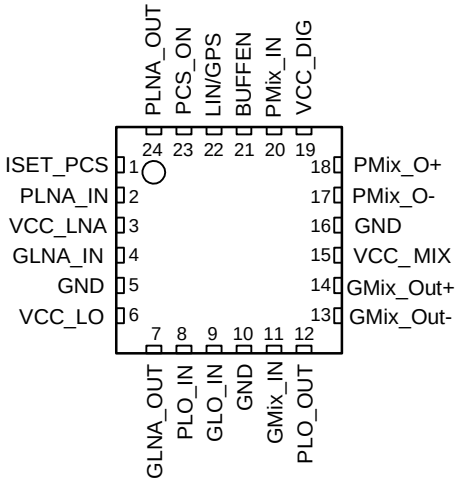
Rev. 4579AS–CDMA–11/02

Figure 1. Block Diagram



Pin Configuration

Figure 2. Pinning HP-VFQFP-N24



Pin Description

Pin	Symbol	Function
1	Iset_PCS	Bias resistor for K-PCS LNA. For typical bias use a 560 Ω resistor to ground which set the bias current for HGHL mode.
2	PLNA_IN	PCS LNA input. Requires a DC blocking capacitor and an L-C (shunt C/series L) matching network for optimum gain, intercept and noise performance.
3	Vcc_LNA	Power supply pin for K-PCS LNA. Bypass with a capacitor as close to the pin as possible.
4	GLNA_IN	GPS LNA input. Requires LC match, see Pin 2.
5	GLNA_GND	GPS LNA emitter-ground. The LNA emitter ground should be grounded immediately to the ground plane to reduce stray inductance and capacitance that may affect performance.
6	Vcc_LO	Supply voltage for LO buffer.
7	GLNA_OUT	GPS LNA output.
8	PLO_IN	K-PCS LO input.
9	GLO_IN	GPS LO input.
10	GND	Device ground.
11	GMix_IN	GPS mixer input.
12	PLO_OUT	K-PCS LO buffer output. Internally matched to 100 Ω. Does not require a blocking capacitor.
13	GMix_OUT-	Negative GPS IF output.
14	GMix_OUT+	Positive GPS IF output.
15	Vcc_Mix	Supply voltage for all mixers.
16	GND	Device ground.
17	PMix_OUT-	Negative CDMA IF output.
18	PMix_OUT+	Positive CDMA IF output.
19	Vcc_DIG	Supply voltage for logic control circuits.
20	PMix_IN	K-PCS Mixer RF input.
21	BUFFEN	LO output buffer enable. Set BUFFEN pin HIGH to power up the PCS LO buffer output.
22	LIN/GPS	–
23	PCS_ON	Logic input for activating PCS LNA; Logic high selects PCS. Logic low means inactive.
24	PLNA_OUT	PCS LNA output. Requires a pull-up inductor to Vcc and a series blocking capacitor, which can be used as the output matching network.
–	Paddle	Device ground and heat sink, requires good thermal path; RF reference plane.

Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Supply voltages, no RF applied	V_{CC}	-0.5 to +4.0	V
Logic control voltages	V_{CTRL}	-0.5 to + V_{CC} +0.5	V
Supply current	I_{CC}	50.0	mA
RF and LO input signals	P_{LO} ; $G_{LO;}$ PLNA_IN; GLNA_IN;	5.0	dBm
I_{SET_PCS}; I_{SET_CELL}	LNA IP3 Adjustment	1	mA
Operating case temperature	T_C	-40 to +100	°C
Storage temperature	T_{STG}	-55 to +150	°C

Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient	R_{thJA}	TBD	K/W

DC Supply Characteristics

Test conditions: Unless otherwise noted, the following conditions apply to typical performance specification under static conditions (no RF applied): V_{CC} = +2.75 V, T_{amb} = 25°C.

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
	All Modes								
	Supply voltage		3, 15, 19	V_{CC}	2.7	2.8	3.3	V	
	Control voltage high		23, 21, 22	V_{CTRL}	1.7			V	
	Control voltage low		21, 22, 23	V_{CTRL}			0.5	V	
	LO Rx buffer supply current		15	I_{CC_MIX}		7.0		mA	
	LO Tx buffer current	BUFFEN = High	15	I_{CC_MIX}		6.0		mA	
	Logic-high current		21, 22, 23	I_{CTRL}			100	µA	
	Logic-low current		21, 22, 23	I_{CTRL}	-5.0			µA	
	Power-down supply current	PCS_On, LIN = Low	3, 13, 14, 15, 17, 18, 19, 24	I_{CC}			10	µA	

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

AC Electrical Characteristics

Test conditions: Unless otherwise noted, the following conditions apply to typical performance specification under static conditions: V_{CC} = +2.75 V, T_{amb} = 25°C, all RF inputs and outputs with a return loss of 10 dB minimum.

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
	General Performance								
	Operating frequency range	K-PCS band	2, 20	f_{PCS}	1840	1855	1870	MHz	
		A-GPS band	4, 11	f_{GPS}		1575.42		MHz	
	LO frequency range	K-PCS band: IF = 183.6 MHz	8	f_{LOPCS}	1656		1686	MHz	
			8	f_{LOPCS}	2023		2053	MHz	
		GPS band: IF = 183.6 MHz	9	f_{LOGPS}		1391.82		MHz	
			9	f_{LOGPS}		1759.02		MHz	
	IF frequency range	K-PCS and GPS Band	13, 14, 17, 18	f_{IF}	80	85	230	MHz	
	LO input power level	K-PCS and GPS Band	8, 9	P_{LO}	-10	-5	0	dBm	
	LO Tx buffer output power level	K-PCS band; not matched at dedicated frequency	12	P_{LOOUT}	-8	-3		dBm	

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Cascade RF Electrical Characteristics (K-PCS Band)

Test conditions: Unless otherwise noted, the following conditions apply to typical performance specification under static conditions: V_{CC} = +2.75 V, T_{amb} = 25°C, RF = 1960 MHz; LO = 2045 MHz; IF = 85 MHz; LO input = -5.0 dBm; RF input = -30 dBm (high gain mode)

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
	Combined LNA and Mixer Performance (CDMA Modulation)								
	High-gain High-linearity Mode (HGHL)								
	Gain	PCS_On = High; LIN = High		G		26		dB	
	Noise figure			NF		2.2		dB	
	Input IP3			IIP3		-1.5		dBm	
	Supply current			I_{CC}		30		mA	
	High-gain Low-linearity Mode (HGLL, Paging Mode)								
	Gain	PCS_On = High; LIN = Low		G		25.3		dB	
	Noise figure			NF		2.2		dB	
	Input IP3			IIP3		-5.3		dBm	
	Supply current			I_{CC}		24		mA	

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Cascade RF Electrical Characteristics (GPS Band)

Test conditions: Unless otherwise noted, the following conditions apply to typical performance specification under static conditions: V_{CC} = +2.75 V, T_{amb} = 25°C, RF = 1575.42 MHz; LO = 1490.42 MHz; IF = 85 MHz; LO input = -5.0 dBm; RF input = -45 dBm

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
	Combined LNA and Mixer Performance								
	A-GPS LNA PERFORMANCE								
	Gain	PCS_On = Low; LIN = High		G		37		dB	
	Noise figure			NF		1.5		dB	
	Input IP3			IIP3		-17.5		dBm	
	Supply current			I_{CC}		21		mA	

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Typical Electrical Characteristics LNA and Mixer Separately (K-PCS Band)

Test conditions: Unless otherwise noted, the following conditions apply to typical performance specification under static conditions: V_{CC} = +2.75 V, T_{amb} = 25°C, RF = 1960 MHz; LO = 2045 MHz; IF = 85 MHz; LO input = -5.0 dBm; RF input = -25 dBm (high gain mode)

No.	Parameters	Test Conditions	Gain (dB)	NF (dB)	IIP3 (dBm)	Type*
	K-PCS Band, High-gain High-linearity Mode (HGHL); CDMA Modulation					
	K-PCS LNA	PCS_On = High; LIN = High	15.5	1.6	9.0	
	K-PCS mixer		13.5	6.2	11.0	
	K-PCS Band, High-gain Low-linearity Mode (HGLL); CDMA Modulation					
	K-PCS LNA	PCS_On = High; LIN = Low	15	1.6	7.5	
	K-PCS mixer		13.3	6.0	7.5	

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Typical Electrical Characteristics LNA and Mixer separately (GPS Band)

Test conditions: Unless otherwise noted, the following conditions apply to typical performance specification under static conditions: V_{CC} = +2.75 V, T_{amb} = 25°C, RF = 1575.42 MHz; LO = 1490.42 MHz; IF = 85 MHz; LO input = -5.0 dBm; RF input = -35 dBm

No.	Parameters	Test Conditions	Gain (dB)	NF (dB)	IIP3 (dBm)	Type*
	A-GPS Mode					
	GPS LNA	PCS_On = High; LIN = Low	19.5	1.5	-2.8	
	GPS Mixer		17.5	5.9	-3.0	

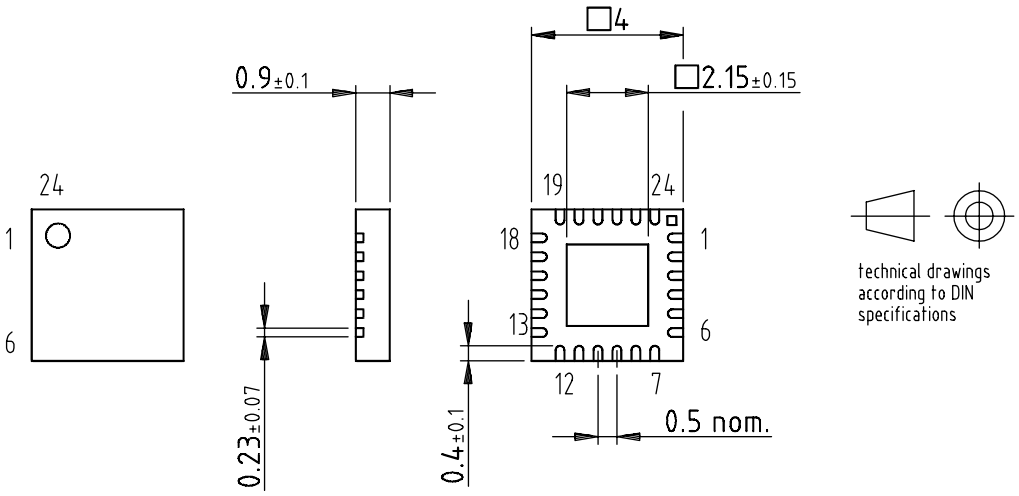
*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Ordering Information

Extended Type Number	Package	Remarks
T0352	HP-VFQFP-N24	4 mm × 4 mm

Package Information

Package: HP-VFQFP-N24
(acc. JEDEC OUTLINE No. MO-220)
Dimensions in mm



Drawing-No.: 6.543-5086.01-4
Issue: 1; 26.02.02

Note: 1. GND solder mask opening is not centered on the package.

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