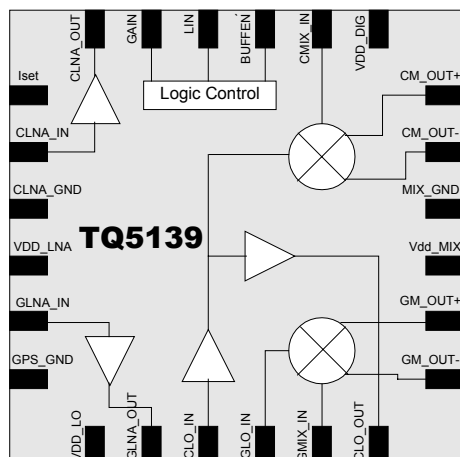


WIRELESS COMMUNICATIONS DIVISION



Product Description:

The TQ5139 is a CDMA Rx Receiver designed for Cell-band, Dual-mode operation. The device supports Cell CDMA and A-GPS. The IF range is from 80 MHz to 230MHz with external tuning. The Low Noise Amplifiers have 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.

This device is available in a 4X4 mm MLF package with 24 pins. The TQ5139 front-end receiver is capable of meeting all electrical requirements in accordance with the TIA/EIA 98-C Wireless Communication standard.

Selected Cascade Electrical Specifications:

Operating Mode (Cascade)	Cascade Gain (dB)	Cascade NF (dB)	Cascade IP3 (dBm)	Current (mA)
Cell-Band, High-Gain, High Linearity	28.5	2.1	-6.5	26
A-GPS	33.0	1.9	-19.0	17.5

Note 1: Test Conditions CDMA Mode: $V_{CC}=2.75VDC$, $T_c=25^{\circ}C$, IS-95/98 Modulation, Data includes the following image reject filters (CELL - SAWTEK P/N 855924, GPS - SAWTEK P/N 856135)

TQ5139

PRELIMINARY DATA SHEET (V 0.6)

2.8V SiGe Dual-Mode CDMA Rx Receiver

Features

- Cell-CDMA and GPS operation
- Excellent Cross Modulation Performance
- Low current consumption
- 10 dBm Cell LNA IIP3
- 7.5 dBm Cell Mixer IIP3
- Excellent Noise and Gain performance
- Adjustable third order intercept on LNA stage
- Flexible IF frequency range from 80 – 230 MHz
- LO Buffer included
- Small 4x4mm Package
- Full ESD Protection
- Few external components

System Advantage

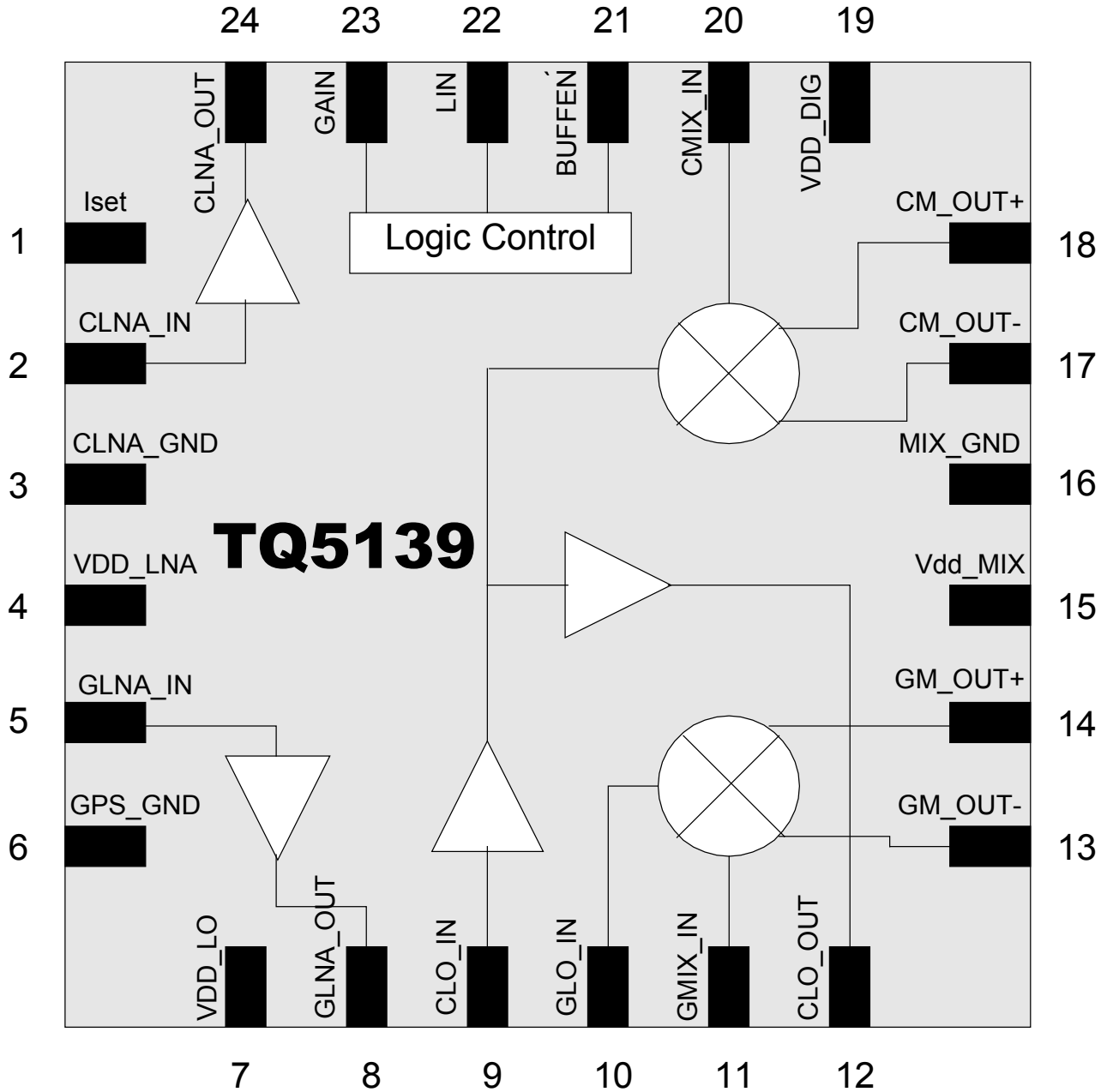
- Most compact integrated receiver for Cell CDMA and A-GPS applications
- IS-98 IMD requirements met with 2 gain states simplifying calibration procedures
- High mixer linearity eliminates potential call drop issues associated with gain switching
- Best in class A-GPS cascade gain for maximum takeover

Applications

- Cell band/A-GPS CDMA (IS-95/98) based mobile phones

TQ5139-Preliminary
Data Sheet (V 0.6)

Package Pin-Outs:



Pin Descriptions:

Pin Name	Pin #	Description and Usage
Iset	1	Bias resistor for Cell LNA. For typical bias use a 390 ohm resistor to ground which set the bias current for HGHL mode.
CLNA_IN	2	Cell LNA input. Requires a blocking capacitor and an L-C (shunt C/series L) matching network for optimum gain, intercept and noise performance.
CLNA_GND	3	Cell 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.
VDD_LNA	4	Power supply pin for GPS and Cell LNAs. Bypass with a capacitor as close to the pin as possible.
GLNA_IN	5	GPS LNA input. Requires LC match.
GPS_GND	6	GPS ground.
VDD_LO	7	Supply voltage for LO buffers.
GLNA_OUT	8	GPS LNA output.
CLO_IN	9	Cell LO input.
GLO_IN	10	GPS LO input.
GMIX_IN	11	GPS Mixer input.
CLO_OUT	12	Cellular LO buffer output. Internally matched to 100ohms. Does not require a blocking capacitor.
GM_OUT-	13	Negative GPS IF output.
GM_OUT+	14	Positive GPS IF output.
Vdd_MIX	15	Supply voltage for all mixers.
MIX_GND	16	Mixer Ground.
CM_OUT-	17	Negative Cell Mixer output.
CM_OUT+	18	Positive Cell Mixer output.
VDD_DIG	19	Supply voltage for Logic Control Circuits.
CMIX_IN	20	Cell RF input to Cell CDMA mixer.
BUFFEN/GPS	21	Cell LO output buffer enable or GPS enable. Set BUFFEN/GPS pin HIGH to power up the Cell LO buffer output when Cell band is selected. When both Gain and LIN are low, set BUFFEN/GPS pin HIGH to power up the GPS application.
LIN	22	Logic input for high or low linearity. Logic HIGH selects High Linearity
GAIN	23	Gain Select Logic input for Cellular band. Logic high selects High Gain.
CLNA_Out	24	Cell LNA output. Requires a pull-up inductor to Vcc and a series blocking capacitor, which can be used as part of the output-matching network.

TQ5139-Preliminary Data Sheet (V 0.6)

Absolute Maximum Ratings

Symbol	Parameter	Absolute Maximum Value	Units
VDD_LNA, VDD_LO, Vdd_MIX, VDD_DIG	Power Supply Voltage	-0.5 to 4.0	VDC
GAIN, LIN, BUFFEN/GPS	Logic Control Lines	-0.5 to 4.0	VDC
Icc_LNA, Icc_LO, Icc_MIX, Icc_DIG	Supply Currents	50	mA
GLO_IN, CLO_IN	LO Input Levels	+5.0	dBm
CLNA_IN, GLNA_IN	LNA Input	+5.0	dBm
Iset	LNA IP3 Adjustment Input	1	mA
T _C	Case Temperature, Survival	-40 to +100	°C
T _{STG}	Storage Temperature	-40 to +150	°C

Note: The part may not survive all maximums applied simultaneously.

General Electrical Characteristics^{1,2,3}

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
Radio Frequency Range	Cellular Band	869	881.5	894	MHz
	A-GPS Band		1575.42		MHz
LO Frequency Range	Cellular Band, IF=85.38MHz	Low	783	809	MHz
		High	954	970	MHz
	GPS Band, IF=85.38MHz	Low	1490.04		MHz
		High	1660.80		MHz
IF Range	Cellular and GPS Bands	80	85.38	230	MHz
LO Input Power Level	Cellular and GPS Bands	-10	-5	0	dBm
LO Tx Buffer Output Power Level	Cellular Band	-8	-5.5		dBm

Note 1: Test Conditions: V_{CC}=2.75VDC, T_C = 25 °C unless otherwise specified.

Note 2: Min./Max. limits are at +25 °C case temperature unless otherwise specified.

Note 3: TriQuint Test Board.

Cascade RF Electrical Characteristics (Cell Band, CDMA Modulation)^{1,2}

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
High Gain, High-Linearity Mode					
Cascade Conversion Gain	Gain = High, LIN = High		28.5		dB
Cascade Noise Figure			2.1		dB
Cascade Input IP3			-6.5		dBm
Supply Current			26		mA
High Gain, Low-Linearity Mode					
Cascade Conversion Gain	Gain = High, LIN = Low		28		dB
Cascade Noise Figure			2.1		dB
Cascade Input IP3			-9.2		dBm
Supply Current			19		mA
Low Gain					
Cascade Conversion Gain	Gain = Low, LIN = High		12		dB
Cascade Noise Figure			11		dB
Cascade Input IP3			10		dBm
Supply Current			23		mA

Note 1: Test conditions (devices screened for Conversion Gain, Noise Figure and IIP3 to the above limits): Vcc=2.75V, RF=881.5MHz, LO=966.88MHz, IF=85.38MHz, LO input = -5.0dBm, RF input = -40dBm (High Gain Mode), unless otherwise specified. TriQuint Test Board. Data includes image reject filter (SAWTEK P/N 855924)

Note 2: Min./Max. limits are at +25 °C case temperature unless otherwise specified.

TQ5139-Preliminary Data Sheet (V 0.6)

Cascade RF Electrical Characteristics (GPS Band)^{1,2}

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
GPS Mode	Gain = Low, LIN = Low, BUFFEN/GPS= High				
Cascade Conversion Gain			33		dB
Cascade Noise Figure			1.9		dB
Cascade Input IP3			-19		dBm
Supply Current			17.5		mA

Note 1: Test conditions (devices screened for Conversion Gain, Noise Figure and IIP3 to the above limits): Vcc=2.75V, RF=1575.42MHz, LO=1490.04MHz, IF=85.38MHz, LO input = -5.0dBm, RF input = -50dBm, unless otherwise specified. TriQuint Test Board. Data includes image reject filter (SAWTEK P/N 856135)

Note 2: Min./Max. limits are at +25 °C case temperature unless otherwise specified.

DC Supply Electrical Characteristics (All-Modes)^{1,2}

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
Supply Voltage		2.7	2.75	3.3	V
Control Voltage High		1.7			V
Control Voltage Low				0.5	V
LO Rx Buffer Supply Current			8		mA
LO Tx Buffer Current	BUFFEN/GPS = High		5		mA
Logic Current	Low, High	-5		100	μA
Power Down Supply Current	BUFFEN/GPS = Low, Gain = Low, LIN = Low			10	μA

Note 1: Test conditions: Vcc=2.75V

Note 2: Min./Max. limits are at +25 °C case temperature unless otherwise specified.

Typical Electrical Characteristics (Cell Band)-LNA and Mixer only¹

Parameter	Conditions	Gain (dB)	NF (dB)	IIP3 (dBm)
High Gain, High-Linearity Mode	Gain = High, LIN = High			
Cell LNA		16.2	1.6	10
Cell Mixer		14.5	6.5	6.5
High Gain, Low-Linearity Mode	Gain = High, LIN = Low			
Cell LNA		15.5	1.6	3.7
Cell Mixer		14.3	6.0	3.8
Low Gain	Gain = Low, LIN = High			
Cell LNA		-1	3.9	20

Note 1: Test conditions: Vcc=2.75V, RF=881.5MHz, Tc = +25 °C, LO=966.88MHz, IF=85.38MHz, LO input = -5.0dBm, RF input = -25dBm (High Gain Mode), unless otherwise specified. TriQuint Test Board.

Typical Electrical Characteristics (GPS Band)-LNA and Mixer only¹

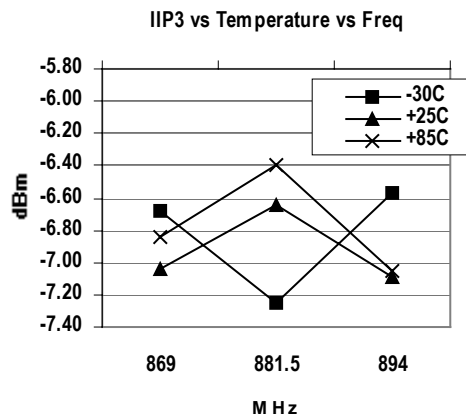
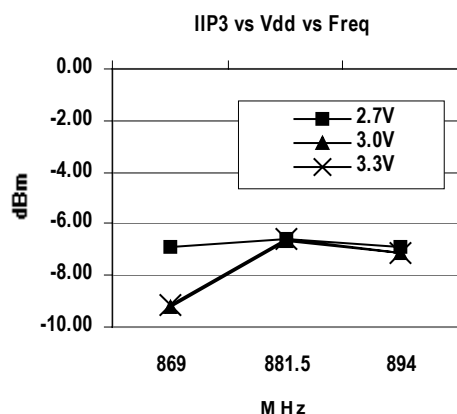
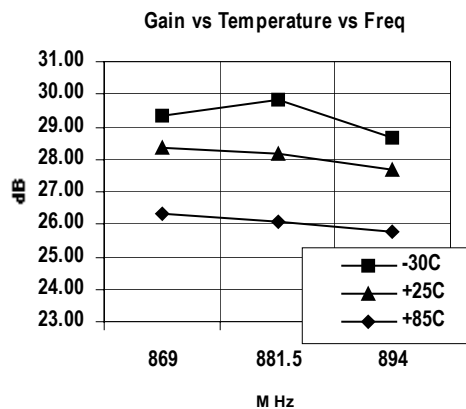
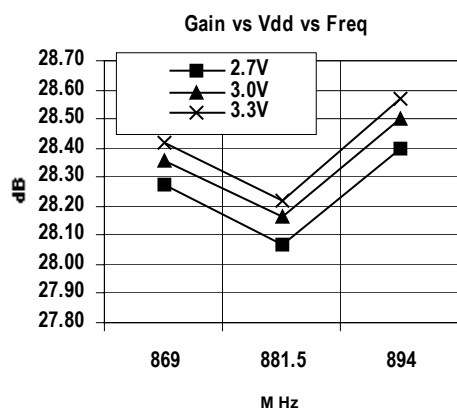
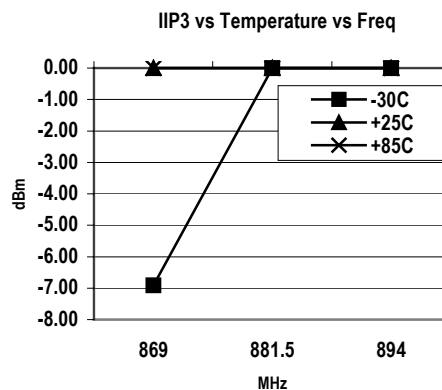
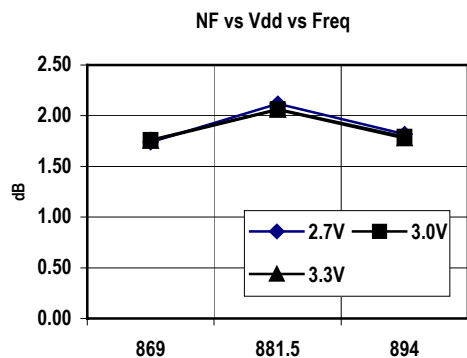
Parameter	Conditions	Gain (dB)	NF (dB)	IIP3 (dBm)
A-GPS Mode	Gain = Low, LIN = Low, BUFFEN/GPS= High			
GPS LNA		18	1.6	-1.8
GPS Mixer		16	5.5	-1.4

Note 1: Test conditions: Vcc=2.75V, Tc=+25 °C, RF=1575.42MHz, , LO=1490.04MHz, IF=85.38MHz, LO input = -5.0dBm, RF input = -35dBm, unless otherwise specified. TriQuint Test Board.

TQ5139-Preliminary Data Sheet (V 0.6)

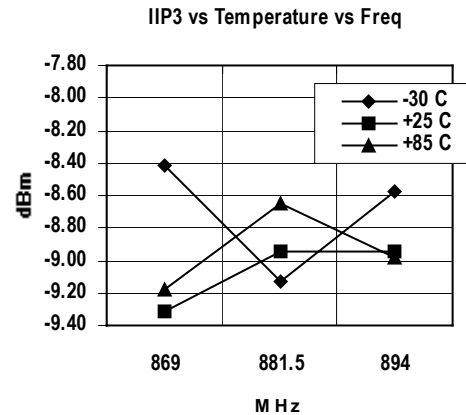
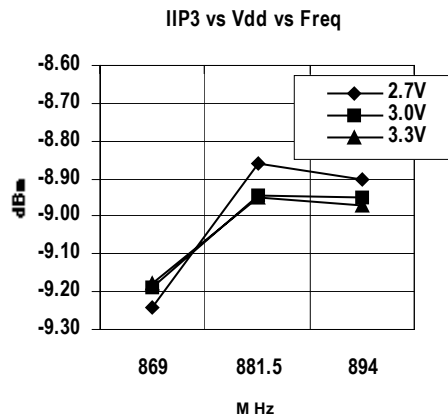
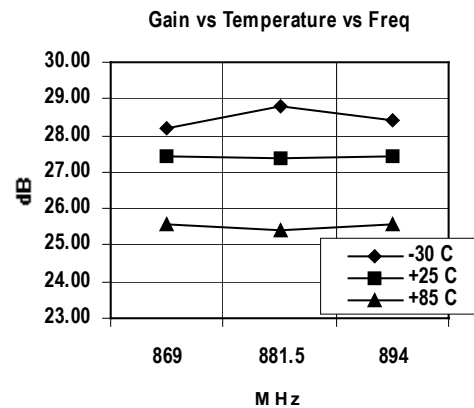
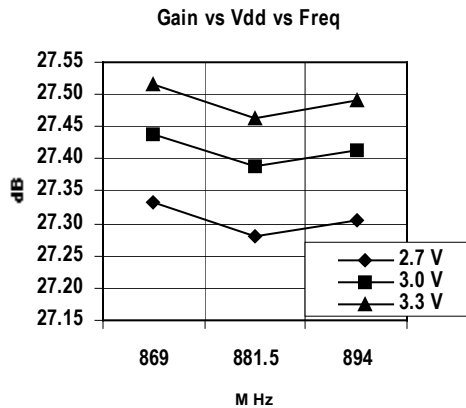
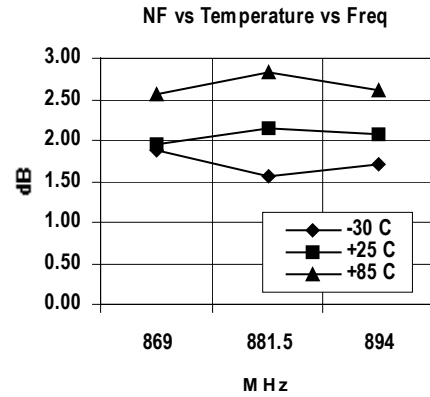
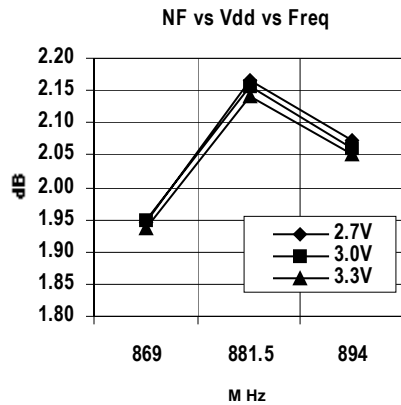
CDMA Cell-band Typical Performance – High Gain, High Linearity Mode

Test Conditions (Unless Otherwise Specified): Vdd=+3.0V; Tc=+25C; LO=xxx.xMHz, -5 dBm.



CDMA Cell-band Typical Performance – High Gain, Low Linearity Mode

Test Conditions (Unless Otherwise Specified): Vdd=+3.0V; Tc=+25C; LO=xxx.xMHz, -5 dBm.

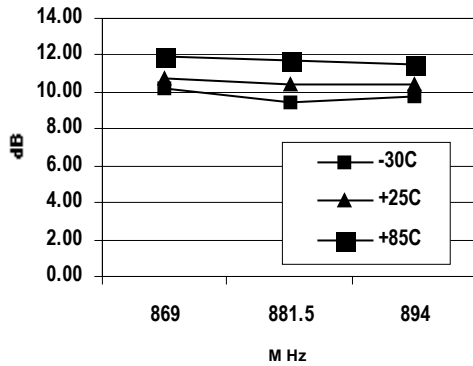


TQ5139-Preliminary Data Sheet (V 0.6)

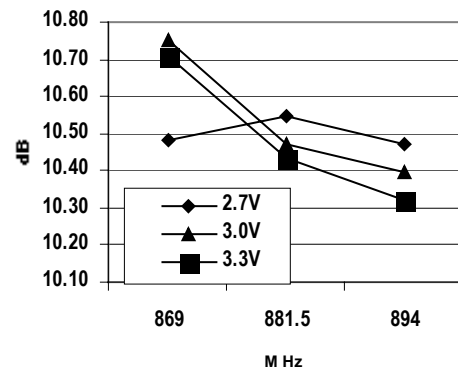
CDMA Cell-band Typical Performance – Low Gain Mode

Test Conditions (Unless Otherwise Specified): Vdd=+3.0V; Tc=+25C; LO=xxx.xMHz, -5 dBm.

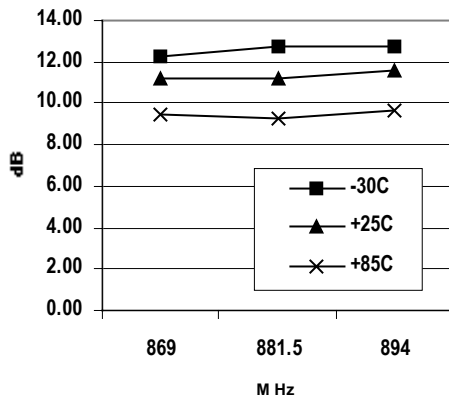
Noise Figure vs Temperature vs Freq



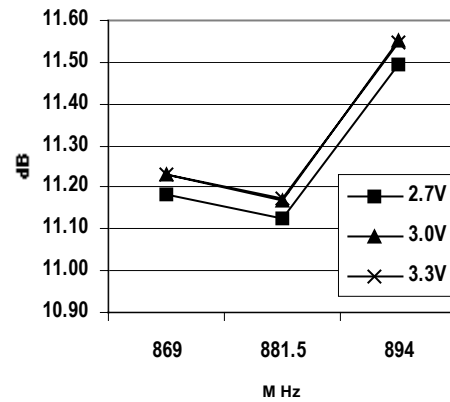
Noise Figure vs Vdd vs Freq



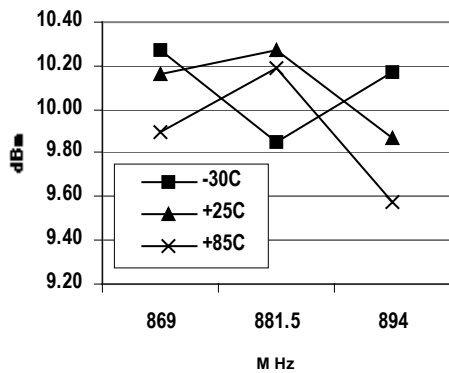
Gain vs Temperature vs Freq



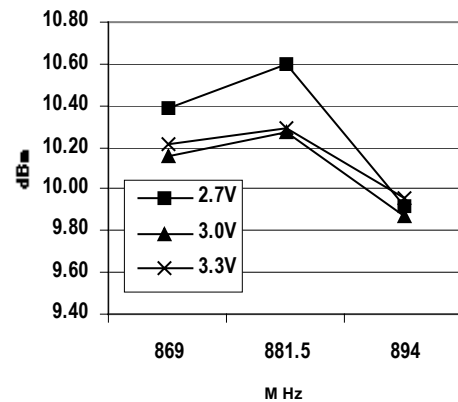
Gain vs Voltage vs Freq



IIP3 vs Temperature vs Freq

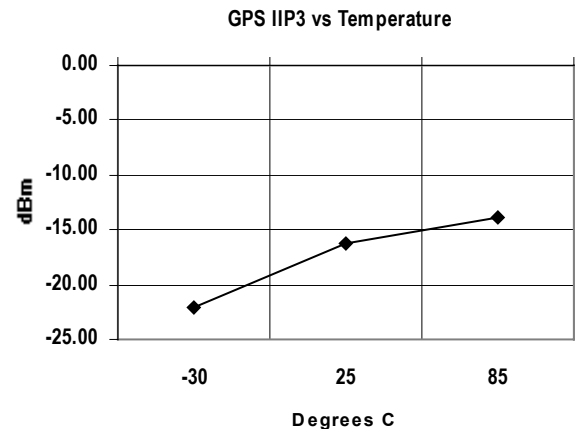
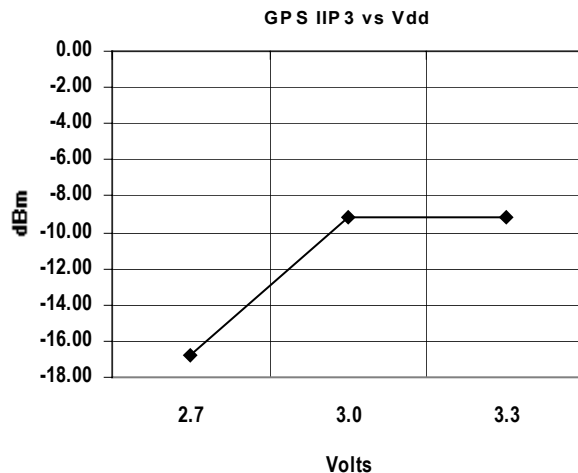
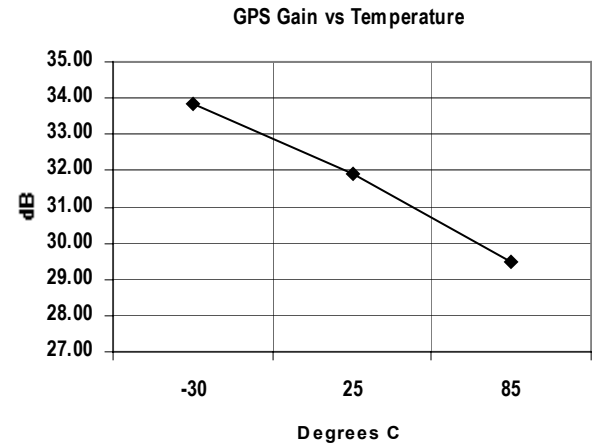
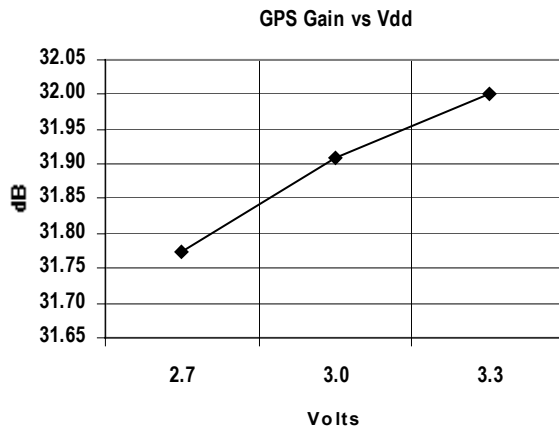
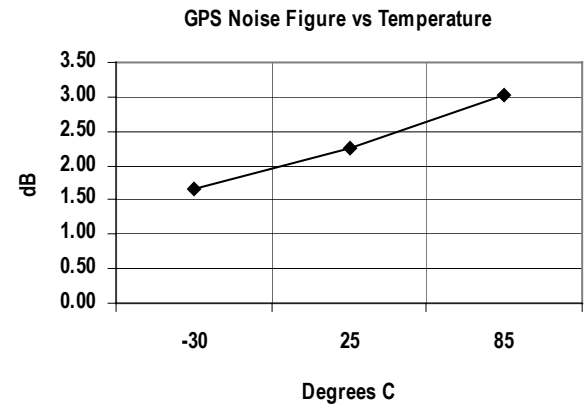
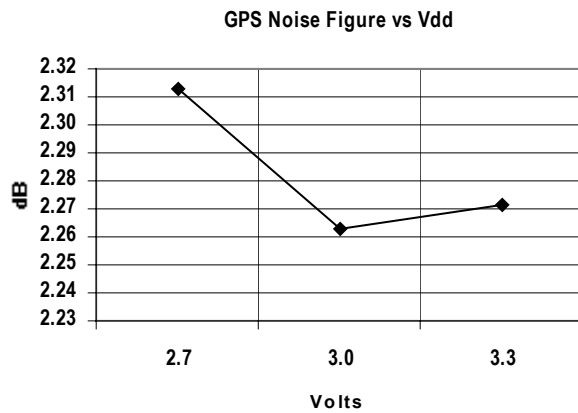


IIP3 vs Vdd vs Freq



CDMA Cell-band Typical Performance – GPS Mode

Test Conditions (Unless Otherwise Specified): $V_{dd}=+3.0V$; $T_c=+25^{\circ}C$; $LO=xxx.xMHz$, -5 dBm .



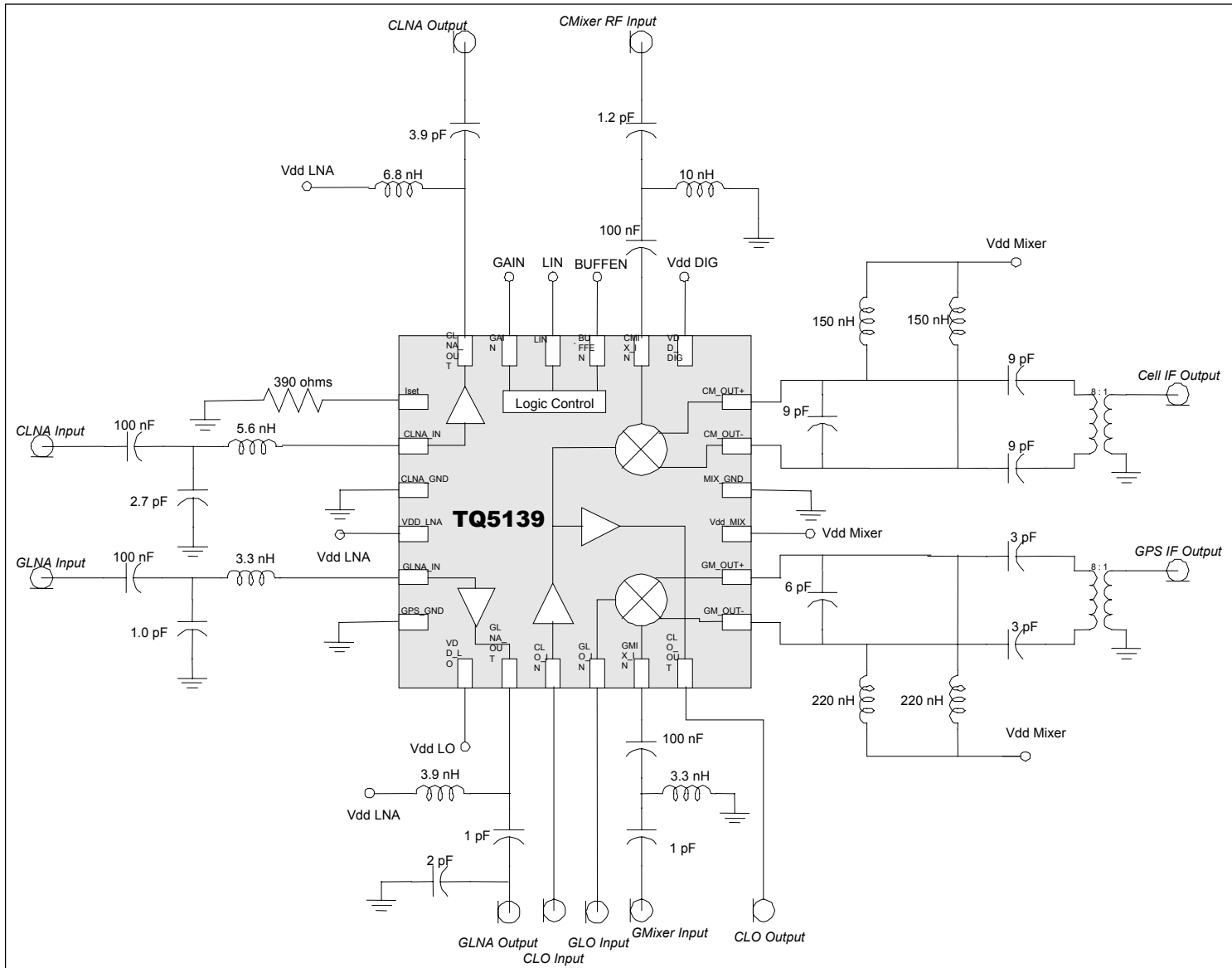
**TQ5139-Preliminary
Data Sheet (V 0.6)**

Mode Programming Truth Table¹

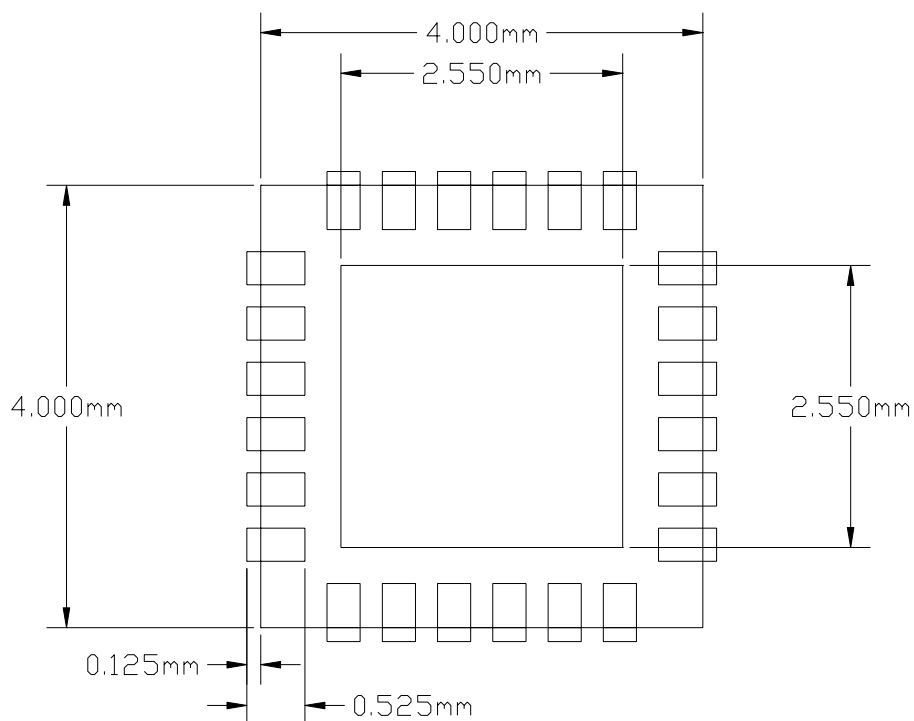
Mode		Logic Inputs		
		Gain	LIN	BUFFEN/GPS
Shut Down	All circuits off	Low	Low	Low
	High-gain, high-linearity (HGHL)	High	High	X
Cell Mode	High-gain, low-linearity (HGLL)	High	Low	X
	Low-Gain (LG)	Low	High	X
GPS Mode		Low	Low	High

¹The symbol X (“don’t care”) means a logic input does not affect an operating mode.

Application/Test Circuit:



Recommended PC board layout to Accept 24 Pin Module Package:

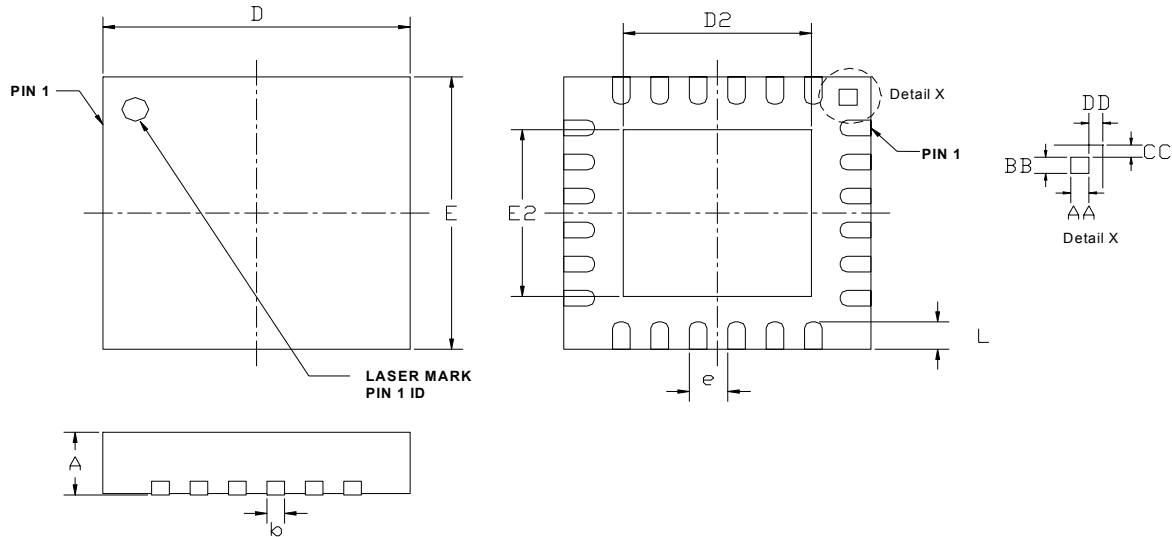


Notes:

- 1 Only ground signal traces are allowed directly under the package
- 2 Primary dimensions are in millimeters

Package Type: 24 Pin Plastic Module Package

JEDEC DESIGNATION	DESCRIPTION	METRIC	ENGLISH	NOTE
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A	OVERALL HEIGHT	0.90 +/- .10 mm	.035 +/- .004 in	1
b	TERMINAL WIDTH	0.23 +/- .07 mm	.009 +/- .003 in	1
D	PACKAGE LENGTH	4.00 mm BSC	.157 in	1
D2	EXPOSED PAD LENGTH	2.45 +/- .15 mm	.084 +/- .006 in	1
e	TERMINAL PITCH	0.50 mm BSC	.020 in	1
E	PACKAGE WIDTH	4.00 mm BSC	.157 in	1
E2	EXPOSED PAD WIDTH	2.45 +/- .15 mm	.084 +/- .006 in	1
L	TERMINAL LENGTH	0.40 +/- .10 mm	.016 +/- .004 in	1
AA	PIN 1 ID LENGTH	0.235 mm BSC	.009 in	1
BB	PIN 1 ID WIDTH	0.235 mm BSC	.009 in	1
CC	PIN 1 ID TO EDGE	0.18 mm BSC	.007 in	1
DD	PIN 1 ID TO EDGE	0.18 mm BSC	.007 in	1

Notes: Primary dimensions are in metric millimeters. The English equivalents are calculated and subject to rounding error.

TQ5139-Preliminary
Data Sheet (V 0.6)

Additional Information

For latest specifications, additional product information, worldwide sales and distribution locations, and information about TriQuint:

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Email: info_wireless@tqs.com

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