Frequency Synthesizer

RSN-749AF+

50Ω 714 to 749 MHz

The Big Deal

- Fractional N synthesizer
- Fast settling time, 0.04 msec max
- Low phase noise and spurious
- High reliability over temperature changes
- Small size 0.910" x 0.910" x 0.252"

CASE STYLE: JG1228

Product Overview

The RSN-749AF+ is a Frequency Synthesizer, designed to operate from 714 to 749 MHz for GSM application. The RSN-749AF+ is packaged in a metal case (size of 0.910" x 0.910" x 0.252") to shield against unwanted signals and noise.The RSN-749AF+ Frequency Synthesizer can be used as local oscillators in the upconversion and down-conversion sections of wireless receivers and transmitters, with very high reliability over temperature changes due to use of high quality components which are secured to substrate with chip adhesive in addition to solder

Key Features

Feature	Advantages
Low phase noise and spurious: • Phase Noise: -104 dBc/Hz typ. @ 10 kHz offset • Step Size Spurious: -78 dBc typ. • Comparison Spurious: -111 dBc typ. • Reference Spurious: -103 dBc typ.	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Fast settling time	Less than 0.04 msec Max within 5 deg can be used for fast settling applications.
Small size, 0.910" x 0.910" x 0.252"	The small size enables the RSN-749AF+ to be used in compact designs.

Surface Mount

Frequency Synthesizer

RSN-749AF+

50Ω 714 to 749 MHz

Features

- Fractional N synthesizer
- Fast settling time, 0.04 msec max
- Low phase noise and spurious
- High reliability over temperature changes
- Low operating voltage
  (VCC VCO=+5.5V, VCC PLL=+3.3V, VCC CP=+5.0V)
- Small size 0.910" x 0.910" x 0.252"

CASE STYLE: JG1228
PRICE: $54.95 ea. QTY (1-9)

+ RoHS compliant in accordance with EU Directive (2002/95/EC)

The +Suffix has been added in order to identify RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications.

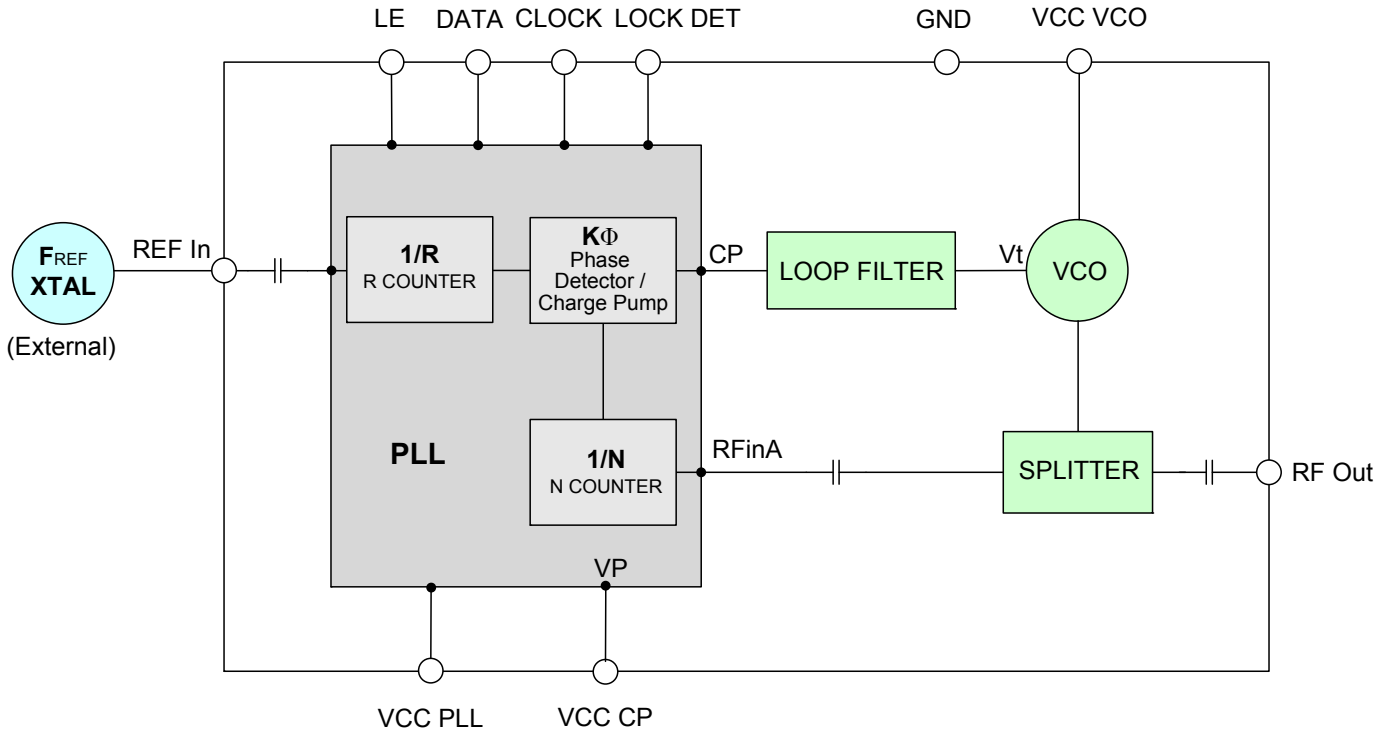
Applications

- GSM

General Description

The RSN-749AF+ is a Frequency Synthesizer, designed to operate from 714 to 749 MHz for GSM application. The RSN-749AF+ is packaged in a metal case (size of 0.910" x 0.910" x 0.252") to shield against unwanted signals and noise.The RSN-749AF+ Frequency Synthesizer can be used as local oscillators in the upconversion and down-conversion sections of wireless receivers and transmitters, with very high reliability over temperature changes due to use of high quality components which are secured to substrate with chip adhesive in addition to solder.

Simplified Schematic



REV. A
M127436
EDR-8931/1F1
RSN-749AF+
Category-G10
RAV
100518

Electrical Specifications *(over operating temperature -40°C to +85°C)*

Parameters		Test Conditions	Min.	Typ.	Max.	Units
Frequency Range		-	714	-	749	MHz
Step Size		-	-	200	-	kHz
Comparison Frequency		-	-	13	-	MHz
Settling Time		Within ± 5 deg	-	0.025	0.040	mSec
Output Power		-	+2	+5	+8	dBm
SSB Phase Noise		@ 100 Hz offset	-	-91	-	dBc/Hz
		@ 1 kHz offset	-	-101	-96	
		@ 10 kHz offset	-	-104	-100	
		@ 100 kHz offset	-	-106	-101	
		@ 1 MHz offset	-	-151	-146	
Integrated SSB Phase Noise		@100 Hz to 1 MHz	-	-51	-	dBc
Step Size Spurious Suppression		Step Size 200 kHz	-	-78	-63	dBc
0.5 Step Size Spurious Suppression		0.5 Step Size 100 kHz	-	-80	-65	
Reference Spurious Suppression		Ref. Freq. 52 MHz	-	-103	-85	
Comparison Spurious Suppression		Comp. Freq. 13 MHz	-	-111	-81	
Non - Harmonic Spurious Suppression		-	-	-90	-	
Harmonic Suppression		-	-	-22	-15	
VCO Supply Voltage		+5.50	+5.20	+5.50	+5.80	V
PLL Supply Voltage		+3.30	+3.15	+3.30	+3.45	
CP Supply Voltage		+5.00	+4.80	+5.00	+5.20	
VCO Supply Current		-	-	74	83	mA
PLL Supply Current		-	-	23	31	
CP Supply Current		-	-	20	25	
Reference Input (External)	Frequency	52 (square wave)	-	52	-	MHz
	Amplitude	1	-	1	-	V_{P-P}
	Input impedance	-	-	100	-	KΩ
	Phase Noise @ 1 kHz offset	-	-	-135	-	dBc/Hz
RF Output port Impedance		-	-	50	-	Ω
Input Logic Level	Input high voltage	-	2.80	-	-	V
	Input low voltage	-	-	-	0.60	V
Digital Lock Detect	Locked	-	2.75	-	3.45	V
	Unlocked	-	-	-	0.40	V
Frequency Synthesizer PLL		-	ADF4193			
PLL Programming (Note*)		-	3-wire serial 3.3V CMOS			
Register Map @ 749 MHz	R0_Register	-	(MSB) 11100100000000101000000 (LSB)			
	R1_Register	-	(MSB) 10000001000001001 (LSB)			
	R2_Register	-	(MSB) 10 (LSB)			
	R3_Register	-	(MSB) 1111011 (LSB)			
	R4_Register	-	(MSB) 100001110010100 (LSB)			
	R5_Register	-	(MSB) 101 (LSB)			
	R6_Register	-	(MSB) 1001000000001110 (LSB)			
	R7_Register	-	(MSB) 111 (LSB)			

Note* : Tested with GSM900RX_13M_PHASE CODE (GSM900/GSM850 RX, version 1.0) from "Analog Devices" recommendation for ADF4193 PLL.
Download Phase Code file

Absolute Maximum Ratings

Parameters	Ratings
VCO Supply Voltage	+6.3V
PLL Supply Voltage	+3.6V
CP Supply Voltage	+5.8V
CP Supply Voltage to PLL Supply Voltage	-0.3V to 5.8V
Reference Frequency Voltage	-0.3Vmin, VCC PLL +0.3Vmax
Data, Clock, LE Levels	-0.3Vmin, VCC PLL +0.3Vmax
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +100°C

Permanent damage may occur if any of these limits are exceeded

Typical Performance Data

FREQUENCY (MHz)	POWER OUTPUT (dBm)			VCO CURRENT (mA)			PLL CURENT (mA)			CP CURENT (mA)		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
714	5.06	4.55	3.17	72.67	75.65	77.68	21.25	24.00	26.24	20.00	20.12	20.25
717	5.21	4.56	3.19	72.59	75.55	77.57	21.82	24.30	26.85	20.00	20.12	20.25
723	5.27	4.61	3.24	72.40	75.34	77.37	21.54	24.32	26.35	20.00	20.12	20.23
729	5.32	4.68	3.31	72.21	75.14	77.15	21.77	24.52	26.68	20.00	20.12	20.24
735	5.40	4.75	3.37	71.99	74.90	76.92	21.50	24.25	26.50	20.00	20.12	20.24
741	5.52	4.80	3.41	71.74	74.63	76.67	21.53	24.29	26.61	20.00	20.11	20.25
747	5.57	4.82	3.42	71.44	74.34	76.42	21.64	24.32	26.76	20.00	20.12	20.26
749	5.56	4.82	3.41	71.34	74.25	76.34	21.45	24.22	26.71	20.00	20.11	20.26

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
714	-24.88	-22.16	-18.87	-42.93	-40.34	-40.90
717	-25.08	-22.22	-18.93	-43.22	-40.38	-40.83
723	-24.99	-22.08	-18.76	-43.37	-40.18	-40.54
729	-25.10	-22.08	-18.72	-43.33	-40.18	-40.37
735	-25.36	-22.13	-18.69	-42.43	-39.26	-39.53
741	-25.63	-22.13	-18.63	-42.99	-39.80	-39.88
747	-26.20	-22.58	-19.02	-42.53	-39.60	-39.56
749	-26.41	-22.76	-19.21	-42.68	-39.67	-39.58

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS +25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
714	-96.23	-102.20	-105.41	-105.55	-152.78
717	-94.45	-100.75	-104.92	-105.74	-152.70
723	-95.37	-101.95	-104.56	-105.83	-152.37
729	-95.71	-101.43	-104.80	-106.21	-152.28
735	-95.47	-101.73	-104.65	-106.62	-151.61
741	-93.72	-102.29	-103.94	-107.42	-151.00
747	-96.84	-101.60	-104.15	-107.49	-149.40
749	-95.42	-101.67	-104.66	-107.52	-150.17

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS -45°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
714	-95.03	-100.91	-104.67	-106.13	-153.58
717	-94.23	-101.53	-104.57	-106.21	-153.85
723	-94.99	-99.42	-103.75	-106.57	-153.37
729	-92.80	-100.20	-103.83	-106.80	-153.54
735	-93.52	-101.26	-104.00	-107.08	-152.74
741	-94.21	-99.90	-103.76	-107.92	-152.14
747	-93.23	-100.44	-103.77	-107.98	-150.62
749	-93.90	-101.35	-103.96	-108.05	-150.57

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS +85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
714	-97.25	-102.55	-105.32	-104.93	-151.88
717	-97.28	-102.09	-104.61	-105.01	-151.89
723	-97.46	-102.01	-104.66	-105.18	-151.90
729	-98.29	-101.11	-104.26	-105.54	-152.02
735	-97.70	-101.06	-104.57	-105.77	-151.94
741	-95.17	-100.62	-103.51	-106.42	-152.01
747	-96.36	-102.04	-104.43	-106.45	-151.97
749	-96.91	-101.88	-104.00	-106.56	-151.28

COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 714MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 731.4MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 749MHz+(n*Fcomparison) (dBc) note 1		
n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-116.83	-120.84	-115.56	-116.53	-122.93	-117.67	-116.98	-125.57	-120.82
-4	-115.25	-122.89	-116.69	-119.48	-123.12	-117.53	-118.53	-123.86	-119.99
-3	-124.80	-125.47	-118.83	-124.01	-125.67	-119.67	-120.90	-127.76	-120.80
-2	-118.19	-119.90	-113.53	-120.50	-124.15	-113.74	-118.74	-124.90	-117.38
-1	-113.91	-113.76	-111.12	-118.56	-119.40	-108.72	-112.79	-122.97	-114.01
0 note 2	-	-	-	-	-	-	-	-	-
+1	-114.81	-111.48	-115.09	-117.14	-116.46	-110.83	-112.57	-125.24	-114.89
+2	-117.33	-114.84	-125.69	-117.84	-119.60	-118.65	-120.39	-128.24	-125.62
+3	-119.62	-120.82	-127.70	-121.18	-122.68	-119.14	-118.77	-126.05	-124.55
+4	-116.73	-116.33	-123.58	-119.22	-118.38	-124.71	-119.85	-125.37	-126.72
+5	-115.18	-114.09	-115.93	-118.50	-115.82	-116.88	-115.98	-117.03	-119.34

Note 1: Comparison frequency 13 MHz
Note 2: All spurs are referenced to carrier signal (n=0).

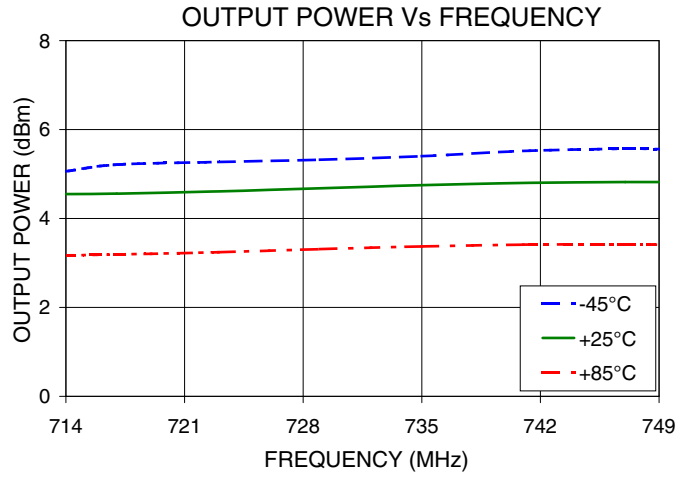
REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 714MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 731.4MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 749MHz+(n*Freference) (dBc) note 3		
n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-124.46	-125.07	-126.21	-123.80	-124.54	-124.72	-119.68	-125.75	-126.40
-4	-125.93	-126.18	-126.06	-124.26	-125.68	-126.02	-125.99	-125.25	-125.41
-3	-125.89	-120.35	-121.32	-126.14	-119.15	-119.63	-122.14	-118.56	-118.93
-2	-108.05	-103.21	-101.39	-111.98	-107.38	-105.11	-116.03	-111.35	-107.77
-1	-119.19	-122.01	-117.83	-123.88	-121.73	-116.94	-127.52	-123.68	-120.51
0 note 4	-	-	-	-	-	-	-	-	-
+1	-116.03	-117.06	-121.54	-118.12	-120.31	-124.77	-121.34	-125.78	-128.21
+2	-104.25	-106.75	-105.40	-109.06	-110.44	-108.20	-113.20	-115.62	-112.28
+3	-124.12	-117.85	-119.07	-120.65	-118.43	-121.81	-121.49	-119.82	-121.63
+4	-125.61	-129.99	-128.63	-124.56	-126.75	-124.92	-126.31	-126.35	-122.36
+5	-126.59	-130.42	-129.86	-127.63	-124.22	-130.49	-128.71	-131.00	-127.02

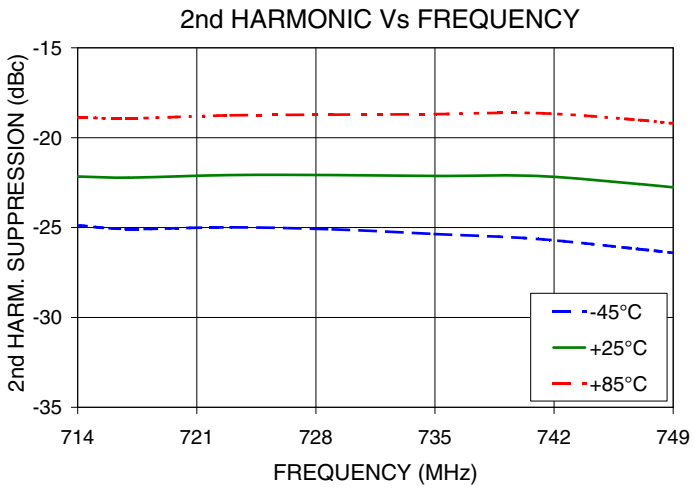
Note 3: Reference frequency 52 MHz
Note 4: All spurs are referenced to carrier signal (n=0).

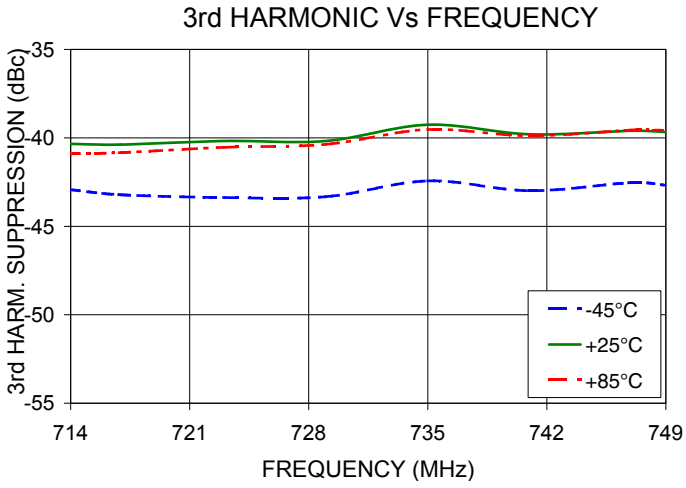
STEP SIZE SPURIOUS ORDER	0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 714MHz+(n*Fstep size) (dBc) note 5			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 731.4MHz+(n*Fstep size) (dBc) note 5			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 749MHz+(n*Fstep size) (dBc) note 5		
n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5.0	-107.94	-97.89	-92.75	-114.20	-118.44	-103.16	-118.66	-117.94	-115.14
-4.5	-118.28	-117.51	-118.25	-116.62	-116.36	-116.42	-117.82	-120.10	-118.82
-4.0	-100.47	-105.39	-108.87	-108.39	-108.03	-105.63	-112.51	-105.81	-106.54
-3.5	-115.46	-116.41	-113.74	-110.21	-116.85	-114.85	-118.31	-115.95	-117.04
-3.0	-100.97	-97.24	-96.79	-99.85	-96.84	-110.17	-111.24	-94.42	-95.97
-2.5	-111.34	-108.73	-109.58	-111.63	-110.60	-111.66	-112.11	-112.79	-107.94
-2.0	-90.50	-93.41	-90.77	-89.97	-90.47	-89.40	-95.98	-86.14	-91.12
-1.5	-103.63	-99.71	-103.58	-101.70	-101.61	-103.90	-105.27	-105.90	-100.37
-1.0	-80.27	-75.11	-86.13	-76.96	-78.45	-77.38	-72.98	-72.64	-81.26
-0.5	-82.00	-80.29	-77.96	-80.57	-82.14	-77.56	-82.54	-84.57	-82.79
0 note 6	-	-	-	-	-	-	-	-	-
+0.5	-76.86	-82.58	-82.85	-80.01	-78.94	-84.42	-83.81	-84.22	-86.10
+1.0	-82.05	-75.46	-86.96	-77.02	-79.04	-77.50	-73.20	-72.70	-80.49
+1.5	-101.16	-102.72	-102.07	-100.59	-104.48	-104.47	-104.87	-99.38	-99.66
+2.0	-92.86	-94.67	-89.61	-89.61	-90.29	-89.24	-96.36	-86.42	-89.63
+2.5	-107.90	-110.25	-112.31	-108.43	-111.53	-112.08	-109.55	-113.88	-111.47
+3.0	-101.85	-97.23	-96.52	-101.13	-96.33	-110.85	-112.32	-93.82	-95.59
+3.5	-117.91	-113.51	-113.08	-114.10	-109.36	-113.91	-117.45	-116.60	-113.90
+4.0	-100.04	-105.66	-111.24	-108.64	-109.25	-106.44	-112.24	-105.17	-107.64
+4.5	-118.86	-117.90	-120.15	-109.27	-106.82	-108.45	-115.10	-117.58	-116.83
+5.0	-108.15	-97.50	-92.75	-114.17	-116.93	-102.32	-118.44	-115.39	-116.23

Note 5: Step size 200 kHz
Note 6: All spurs are referenced to carrier signal (n=0).

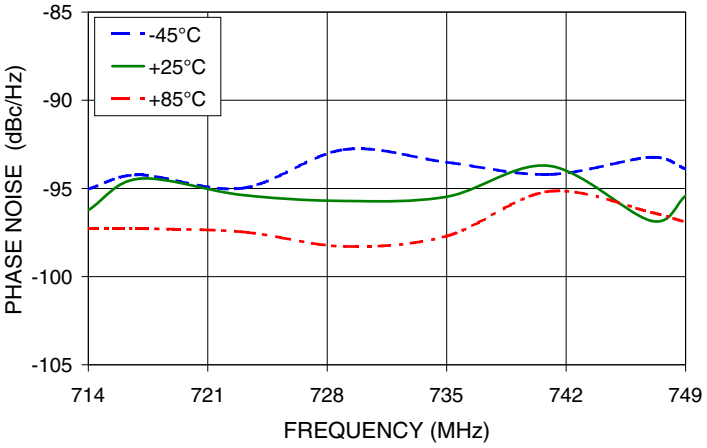
Typical Performance Curves



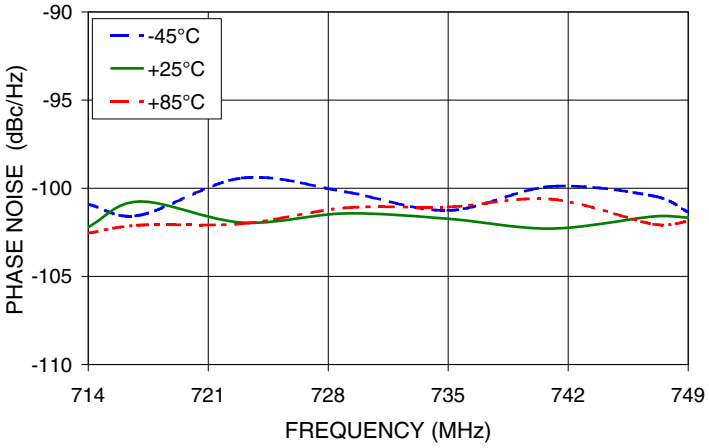




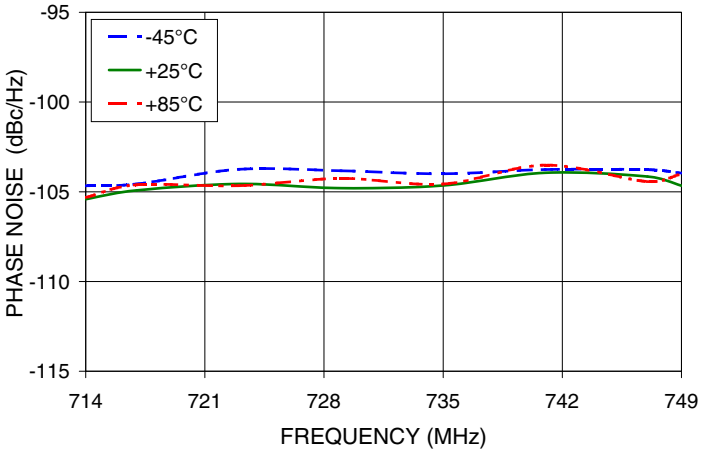
PHASE NOISE @100Hz offset



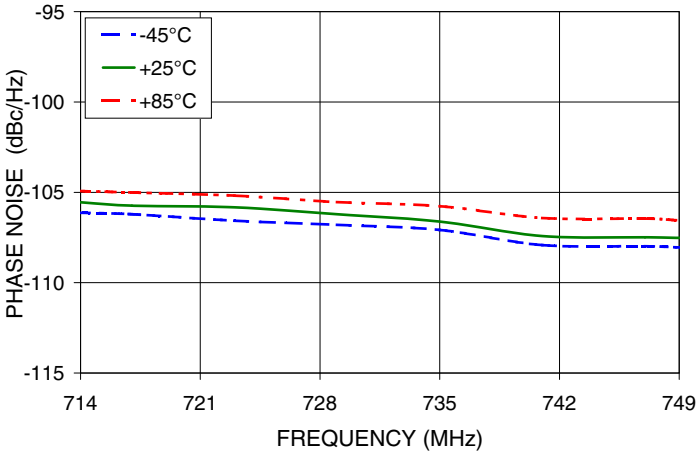
PHASE NOISE @1kHz offset



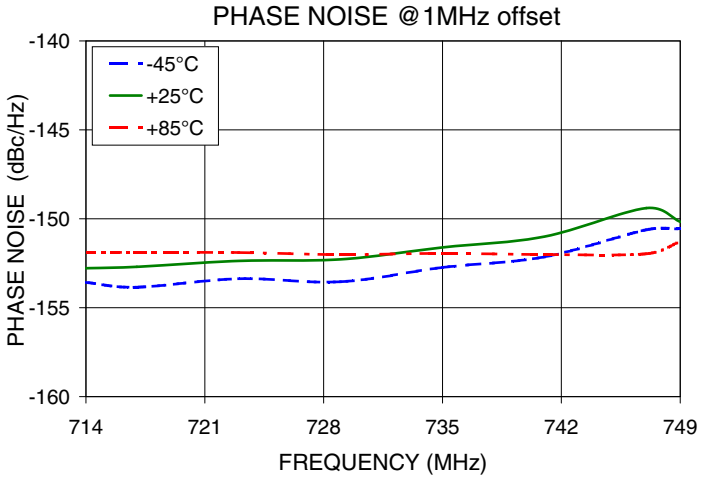
PHASE NOISE @10kHz offset



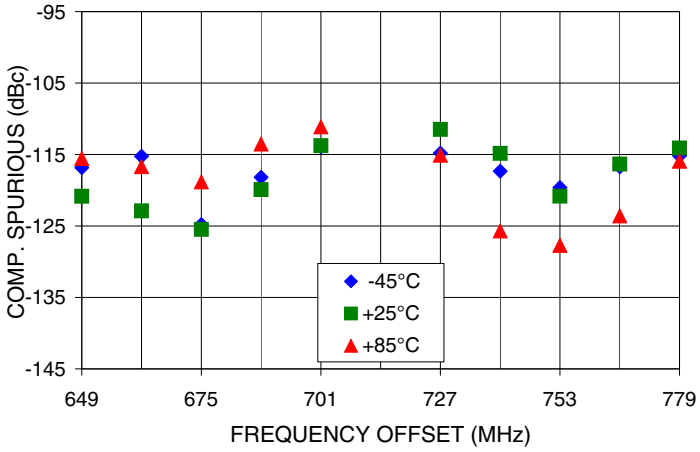
PHASE NOISE @100kHz offset



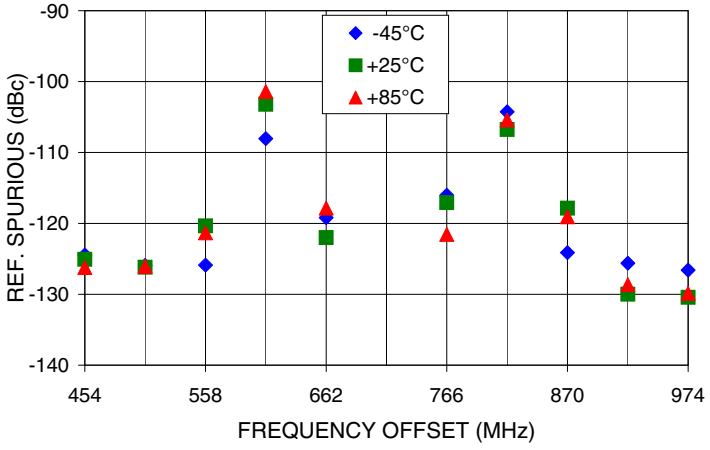
PHASE NOISE @1MHz offset



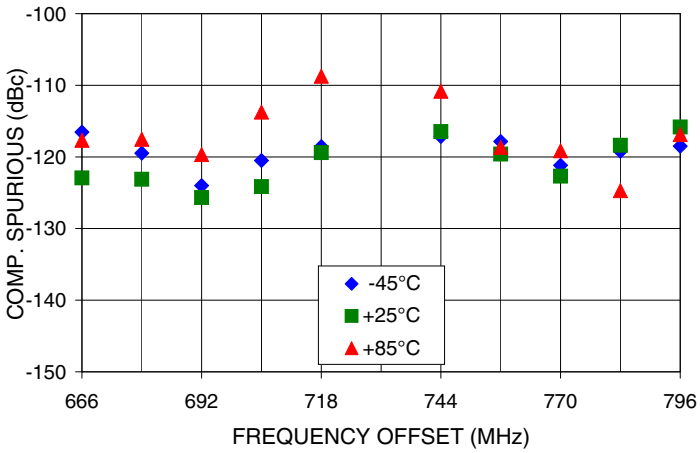
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 714MHz



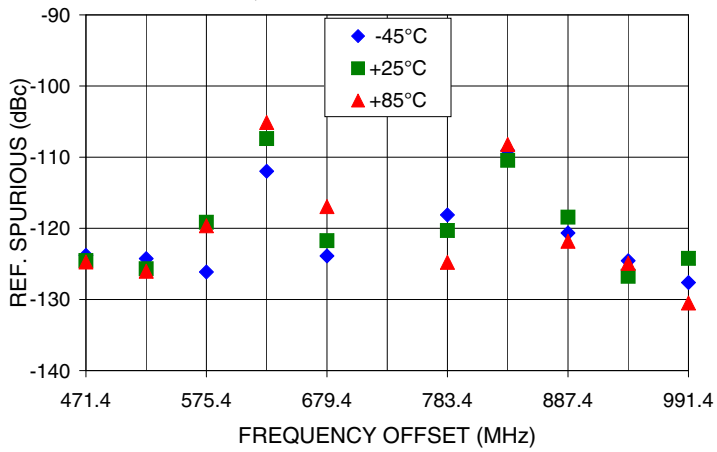
REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 714MHz



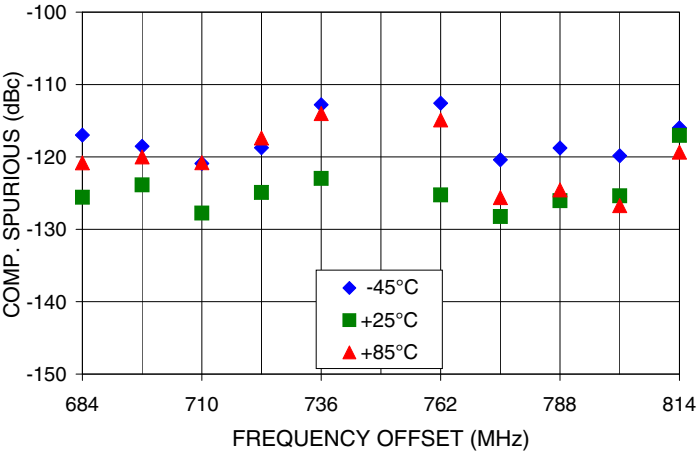
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 731.4MHz



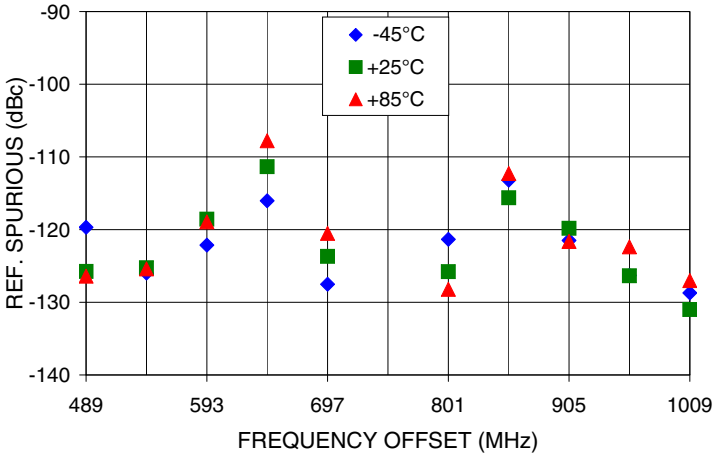
REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 731.4MHz



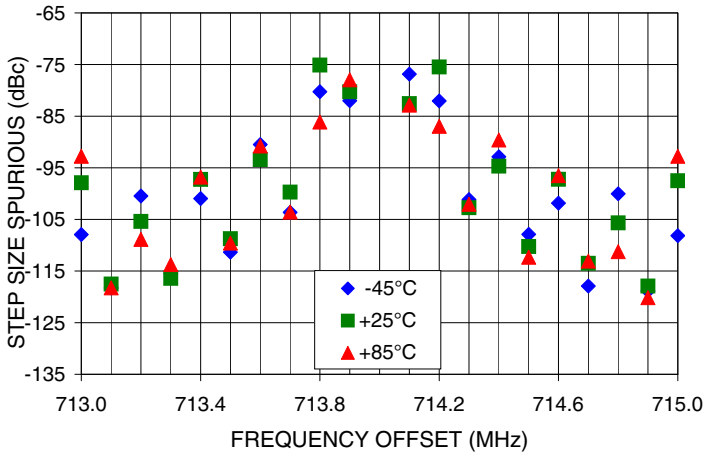
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 749MHz



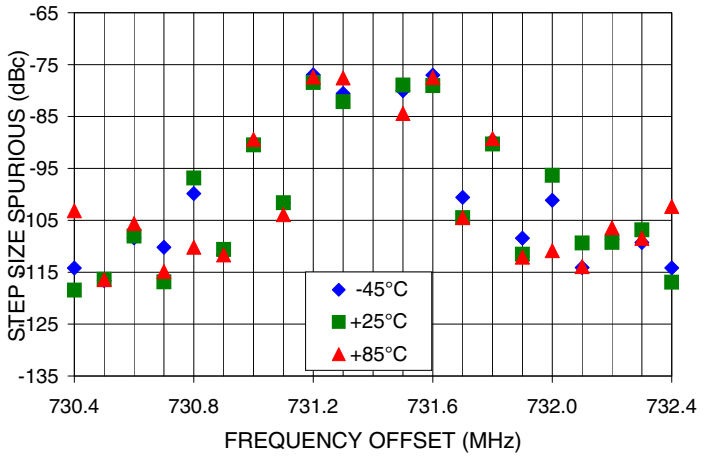
REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 749MHz



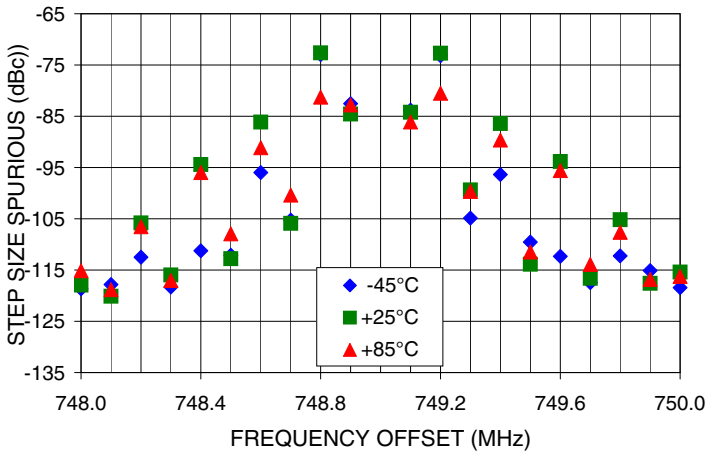
0.5 STEP SIZE & STEP SIZE SPURIOUS
Vs FREQ. OFFSET @ Fcar =714MHz



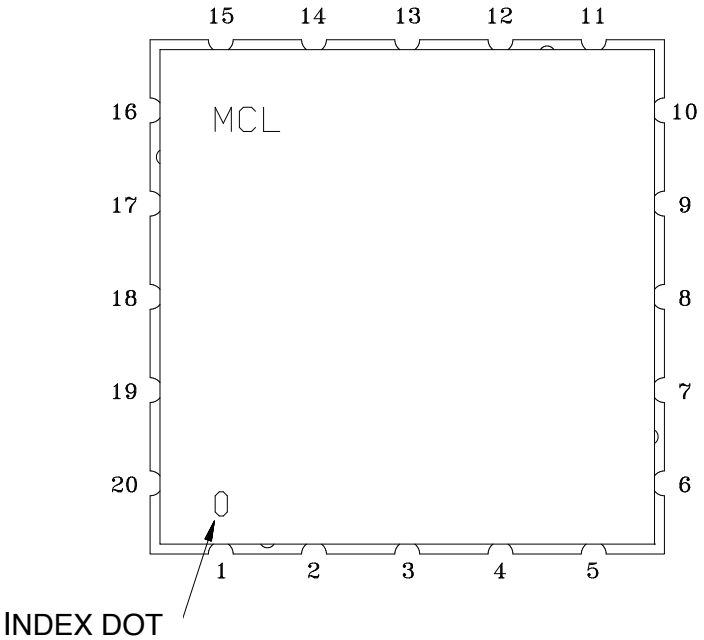
0.5 STEP SIZE & STEP SIZE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 731.4MHz



0.5 STEP SIZE & STEP SIZE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 749MHz



Pin Configuration

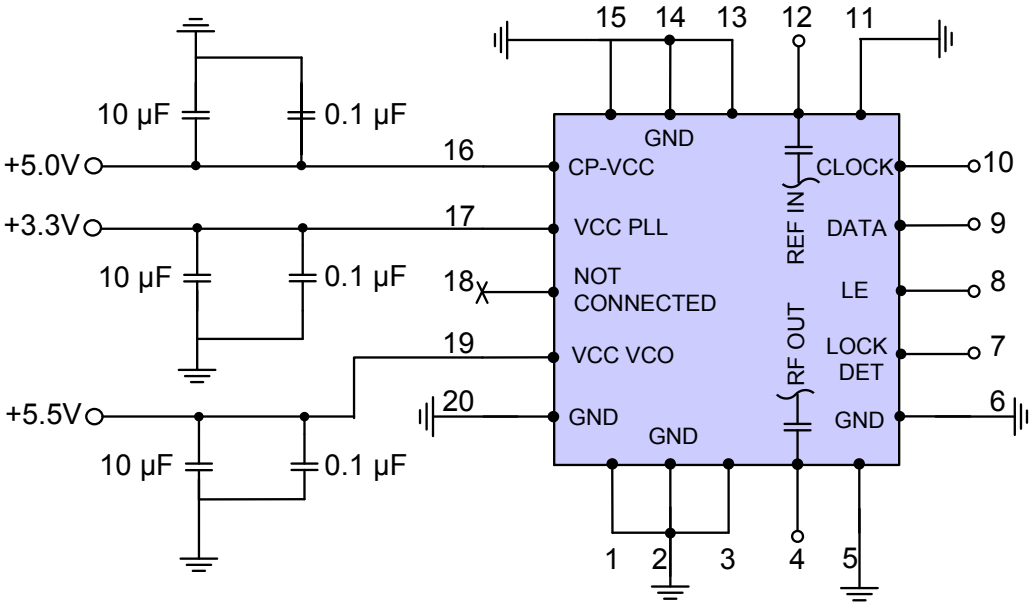


Pin Connection

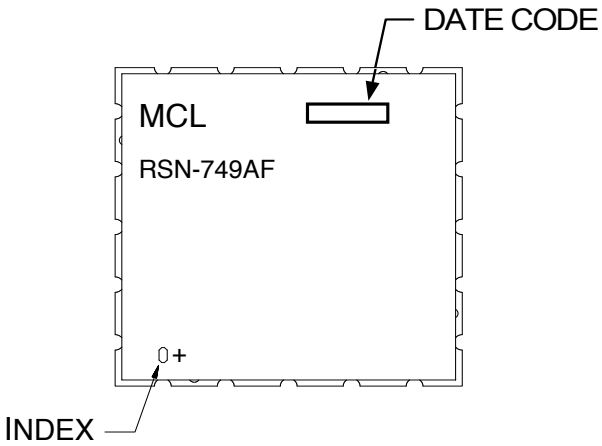
Pin Number	Function
1	GND
2	GND
3	GND
4	RF OUT
5	GND
6	GND
7	LOCK DET
8	LE
9	DATA
10	CLOCK
11	GND
12	REF IN
13	GND
14	GND
15	GND
16	VCC CP
17	VCC PLL
18	Not Connected
19	VCC VCO
20	GND

Recommended Application Circuit

Note: REF IN and RF OUT ports are internally AC coupled.



Device Marking



Additional Detailed Technical Information

Additional information is available on our web site. To access this information enter the model number on our web site home page.

Case Style: JG1228

Tape & Reel: TR-F99

Suggested Layout for PCB Design: PL-319

Evaluation Board: TB-554+

Environment Ratings: ENV03T2