

# Frequency Synthesizer

DSN-2620A-119+

50Ω     2000 to 2620 MHz

## The Big Deal

- Fractional N synthesizer
- Low phase noise and spurious



CASE STYLE: KL1294

## Product Overview

The DSN-2620A-119+ is a Frequency Synthesizer, designed to operate from 2000 to 2620 MHz for Military and Avionics application. The DSN-2620A-119+ is packaged in a metal case (size of 1.250" x 1.000" x 0.232") to shield against unwanted signals and noise.

## Key Features

Feature	Advantages
Low phase noise and spurious: <ul style="list-style-type: none"><li>• Phase Noise: -96 dBc/Hz typ. @ 10 kHz offset</li><li>• Step Size Spurious: -80 dBc typ.</li><li>• Comparison Spurious: -98 dBc typ.</li><li>• Reference Spurious: -98 dBc typ.</li></ul>	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Robust design and construction	To enhance the robustness of DSN-2620A-119+, each internal component is secured to the substrate with chip bonder, thereby eliminating the risk of tombstoning during subsequent solder reflow operations by the customer.

### Notes

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Surface Mount

# Frequency Synthesizer

DSN-2620A-119+

50Ω 2000 to 2620 MHz

## Features

- Fractional N synthesizer
- Integrated VCO + PLL
- Low phase noise and spurious
- Robust design and construction
- Operating voltage (VCC VCO=+8V, VCC PLL=+15V)



CASE STYLE: KL1294

**+RoHS Compliant**

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

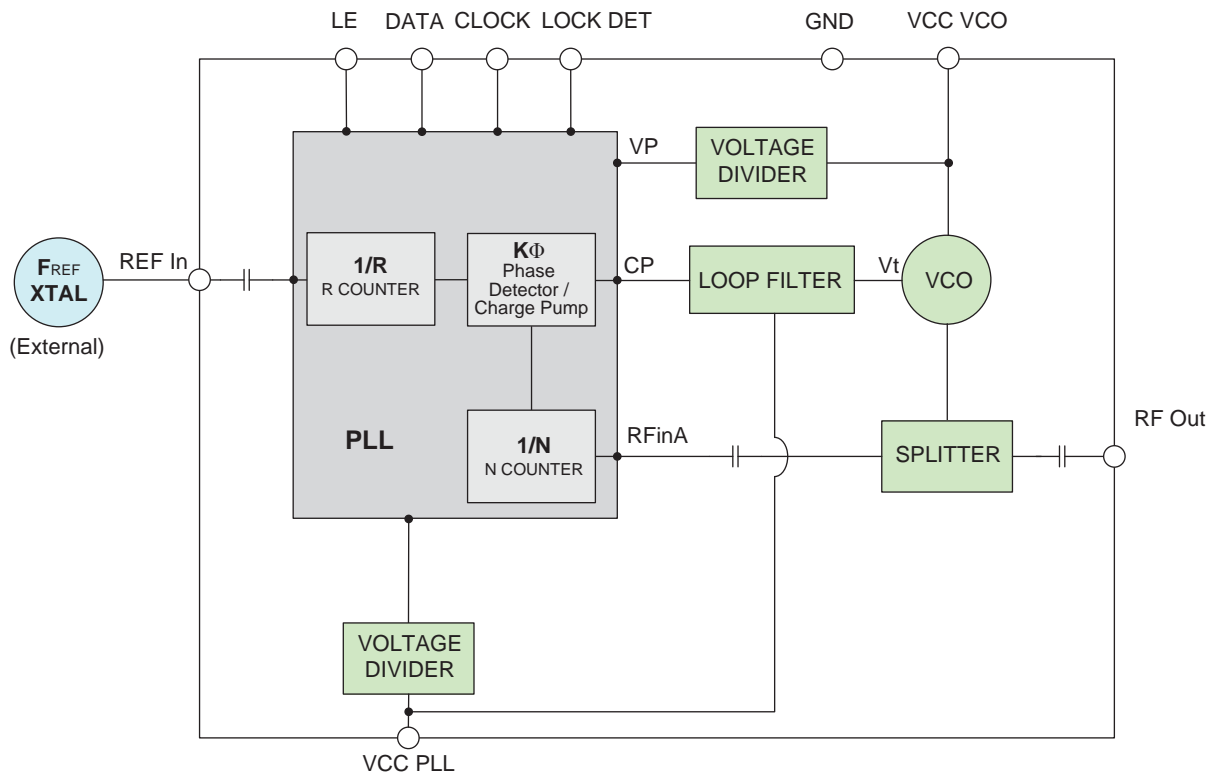
## Applications

- Military and Avionics

## General Description

The DSN-2620A-119+ is a Frequency Synthesizer, designed to operate from 2000 to 2620 MHz for Military and Avionics application. The DSN-2620A-119+ is packaged in a metal case (size of 1.250" x 1.000" x 0.232") to shield against unwanted signals and noise. To enhance the robustness of DSN-2620A-119+, each internal component is secured to the substrate with chip bonder, thereby eliminating the risk of tombstoning during subsequent solder reflow operations by the customer.

## Simplified Schematic



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REV. B  
M151108  
EDR-9871F1  
DSN-2620A-119+  
Category-F8  
RAV  
151007  
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**Electrical Specifications** (over operating temperature -32°C to +75°C)

Parameters	Test Conditions	Min.	Typ.	Max.	Units									
Frequency Range	-	2000	-	2620	MHz									
Step Size	-	-	500	-	KHz									
Comparison Frequency	-	-	10	-	MHz									
Settling Time	Within ± 1 kHz	-	1.3	-	mSec									
Output Power	-	+0.5	+3.2	+5.5	dBm									
SSB Phase Noise	@ 100 Hz offset	-	-76	-	dBc/Hz									
	@ 1 kHz offset	-	-95	-88										
	@ 10 kHz offset	-	-96	-90										
	@ 100 kHz offset	-	-112	-106										
	@ 1 MHz offset	-	-138	-133										
Integrated SSB Phase Noise	@ 100 Hz to 1MHz	-	-48	-	dBc									
Step Size Spurious Suppression	Step Size 500 kHz	-	-80	-60	dBc									
0.5 Step Size Spurious Suppression	0.5 Step Size 250 KHz	-	-70	-50										
Reference & Comparison Spurious Suppression	Ref. & Comp. Freq. 10 MHz	-	-98	-77										
Non - Harmonic Spurious Suppression	-	-	-90	-										
Harmonic Suppression	-	-	-33	-23										
VCO Supply Voltage	+8	+7.75	+8.00	+8.25	V									
PLL Supply Voltage	+15	+14.75	+15.00	+15.25										
VCO Supply Current	-	-	67	74	mA									
PLL Supply Current	-	-	22	30										
Reference Input (External)	Frequency	10 (square wave)	-	10	MHz									
	Amplitude	1	-	1	V <sub>P-P</sub>									
	Input impedance	-	-	100	KΩ									
	Phase Noise @ 1 KHz offset	-	-	-145	dBc/Hz									
RF Output port Impedance	-	-	50	-	Ω									
Input Logic Level	Input high voltage	-	2.55	-	V									
	Input low voltage	-	-	0.60	V									
Digital Lock Detect	Locked	-	2.05	-	2.90	V								
	Unlocked	-	-	-	0.40	V								
Frequency Synthesizer PLL	-	ADF4153												
PLL Programming	-	3-wire serial 3V CMOS												
Register Map @ 2620 MHz <sup>Note 1</sup>	R0_Register	9 Bit Integer Counter				12 Bit Frac Counter				Control Bits				
		Fast lock	100000110				000000000000				00			
	R1_Register	Load	Muxout	Reserved	Prescaler	R Counter				12 Bit Interpolator Modulus		Control Bits		
		0	001	0	1	0001				000000010100		01		
	R2_Register*	N/A				Resync	Ref Doubler	CP/2	CP Current	PD Polarity	Lock Detect	Power Down	CP Three State	Counter Reset
	00000000				0000	0	0	XYZ	0	1	0	0	0	10
R3_Register	N/A				Reserved	Noise & Spur Mode		Reserved		Lowest Noise	Control Bits			
	00000000000000				0	1111		000		1	11			

**Note 1:** Registers Load Sequence: R0 Register, R1 Register, R2 Register, R3 Register.

**Absolute Maximum Ratings**

Parameters	Ratings
VCO Supply Voltage <sup>Note 2</sup>	8.5V
PLL Supply Voltage <sup>Note 2</sup>	17.0V
VCO Supply Voltage to PLL Supply Voltage	<b>Note 2</b>
Reference Frequency Amplitude	3.45V <sub>P-P</sub>
Data, Clock, LE Levels	0Vmin, 3.45Vmax
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

**Note 2:** Power on/off Sequence: Power on: VCO Supply Voltage, followed by PLL Supply Voltage.  
Power off: PLL Supply Voltage, followed by VCO Supply Voltage.

**\* Refer to Charge Pump Settings**

FREQ.LOCK [MHz]	Charge Pump Settings		
	X	Y	Z
2000.0 - 2079.5	1	0	0
2080.0 - 2219.5	1	0	1
2220.0 - 2319.5	1	1	0
2320.0 - 2620.0	1	1	1

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Typical Performance Data

FREQUENCY (MHz)	POWER OUTPUT (dBm)			VCO CURRENT (mA)			PLL CURENT (mA)		
	-37°C	+25°C	+80°C	-37°C	+25°C	+80°C	-37°C	+25°C	+80°C
	2000	3.31	3.03	2.41	64.84	67.02	67.98	18.99	20.82
2046	3.39	3.11	2.48	64.92	67.09	68.04	19.95	21.82	24.21
2112	3.46	3.18	2.54	65.04	67.20	68.15	19.84	21.73	24.12
2178	3.60	3.32	2.66	65.29	67.28	68.22	19.86	21.77	24.17
2244	3.57	3.27	2.60	65.40	67.38	68.33	19.94	21.86	24.26
2310	3.54	3.28	2.59	65.43	67.44	68.38	18.98	20.89	23.28
2376	3.53	3.27	2.57	65.52	67.51	68.47	19.93	21.87	24.28
2442	3.49	3.19	2.49	65.56	67.54	68.50	19.83	21.77	24.18
2508	3.43	3.21	2.50	65.55	67.55	68.51	19.85	21.79	24.21
2574	3.27	3.06	2.35	65.59	67.56	68.53	19.91	21.87	24.28
2620	3.22	2.96	2.25	65.37	67.55	68.54	18.97	20.90	23.30

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-37°C	+25°C	+80°C	-37°C	+25°C	+80°C
2000	-32.22	-31.04	-27.86	-42.72	-42.48	-43.41
2046	-32.80	-31.28	-28.44	-41.45	-41.34	-41.54
2112	-32.65	-31.21	-28.57	-40.83	-40.70	-41.02
2178	-32.81	-31.76	-29.40	-40.67	-40.31	-39.77
2244	-32.84	-33.15	-31.46	-40.33	-39.40	-40.29
2310	-33.52	-35.84	-33.94	-41.72	-39.89	-39.79
2376	-34.87	-39.13	-36.52	-42.35	-37.89	-39.35
2442	-37.03	-39.39	-37.09	-42.62	-41.08	-44.86
2508	-39.65	-40.59	-38.16	-40.63	-42.87	-43.56
2574	-38.44	-38.90	-37.89	-45.36	-42.53	-44.33
2620	-36.50	-38.30	-37.81	-43.44	-42.45	-44.35

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FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS				
	+25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
2000	-88.18	-96.79	-97.44	-112.37	-138.57
2046	-87.37	-95.40	-96.31	-112.93	-138.59
2112	-89.31	-94.01	-96.75	-112.68	-138.64
2178	-89.52	-94.65	-96.27	-113.20	-138.82
2244	-85.39	-94.86	-96.64	-112.97	-138.87
2310	-86.45	-96.54	-96.72	-112.59	-138.88
2376	-85.22	-93.39	-96.62	-112.35	-138.52
2442	-83.70	-94.02	-96.13	-112.36	-138.45
2508	-83.15	-94.96	-95.25	-111.70	-137.95
2574	-83.50	-96.51	-94.82	-111.42	-137.62
2620	-85.42	-94.81	-94.77	-111.10	-137.46

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS				
	-37°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
2000	-84.65	-95.63	-97.53	-112.52	-139.25
2046	-83.81	-94.95	-96.62	-113.17	-139.10
2112	-84.57	-94.14	-96.33	-112.88	-139.11
2178	-85.45	-95.55	-96.22	-113.26	-139.29
2244	-84.47	-94.56	-96.61	-112.95	-139.12
2310	-84.40	-94.61	-96.48	-112.91	-139.30
2376	-83.43	-94.59	-96.48	-112.43	-139.04
2442	-83.48	-92.25	-96.17	-112.44	-138.84
2508	-82.58	-93.98	-95.13	-111.64	-138.33
2574	-82.75	-93.19	-94.64	-111.49	-137.93
2620	-84.95	-94.42	-94.56	-111.21	-137.95

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS				
	+80°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
2000	-85.27	-95.91	-96.96	-111.11	-137.67
2046	-84.98	-95.66	-96.25	-111.96	-137.63
2112	-85.73	-97.63	-96.12	-111.59	-137.72
2178	-84.74	-97.10	-95.18	-111.96	-137.83
2244	-83.72	-93.57	-95.79	-111.74	-138.12
2310	-85.92	-95.87	-95.42	-111.46	-137.86
2376	-83.47	-93.86	-96.07	-111.04	-137.51
2442	-85.07	-95.14	-96.05	-110.96	-137.48
2508	-85.58	-92.58	-95.11	-110.21	-136.96
2574	-83.87	-95.57	-94.16	-110.28	-136.58
2620	-83.24	-95.35	-94.57	-110.12	-136.49

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REFERENCE & COMPARISON SPURIOUS ORDER	REFERENCE & COMPARISON SPURIOUS @Fcarrier 2000MHz+(n*Freference) (dBc) note 1			REFERENCE & COMPARISON SPURIOUS @Fcarrier 2310MHz+(n*Freference) (dBc) note 1			REFERENCE & COMPARISON SPURIOUS @Fcarrier 2620MHz+(n*Freference) (dBc) note 1		
	n	-37°C	+25°C	+80°C	-37°C	+25°C	+80°C	-37°C	+25°C
-5	-100.26	-98.54	-109.10	-100.47	-101.98	-102.26	-107.32	-117.17	-101.32
-4	-102.01	-99.59	-119.05	-100.23	-102.81	-103.05	-109.17	-122.23	-101.34
-3	-97.44	-104.29	-113.34	-101.70	-100.67	-101.88	-110.52	-115.61	-102.27
-2	-99.79	-105.50	-110.94	-105.47	-100.94	-102.16	-112.32	-109.55	-104.59
-1	-100.27	-103.86	-103.89	-105.47	-97.48	-95.88	-107.21	-105.29	-113.63
0 <sup>note 2</sup>	-	-	-	-	-	-	-	-	-
+1	-92.92	-98.64	-103.15	-101.67	-103.29	-99.28	-103.99	-104.28	-104.56
+2	-94.90	-98.56	-108.38	-106.04	-101.42	-105.14	-104.62	-101.64	-104.20
+3	-96.44	-100.81	-105.73	-111.11	-102.19	-101.55	-110.33	-104.14	-114.66
+4	-96.10	-100.88	-104.51	-113.14	-101.97	-101.55	-106.68	-103.38	-104.37
+5	-97.15	-100.56	-101.26	-112.32	-103.86	-99.22	-109.21	-101.11	-103.94

Note 1: Reference frequency = Comparison frequency = 10 MHz

Note 2: All spurs are referenced to carrier signal (n=0).

STEP SIZE SPURIOUS ORDER	0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 2001.5MHz+(n*Fstep size) (dBc) note 3			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 2311.5MHz+(n*Fstep size) (dBc) note 3			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 2618.5MHz+(n*Fstep size) (dBc) note 3		
	n	-37°C	+25°C	+80°C	-37°C	+25°C	+80°C	-37°C	+25°C
-5.0	-99.53	-103.44	-100.12	-101.79	-100.77	-100.87	-92.54	-93.51	-93.16
-4.5	-105.92	-103.36	-102.57	-105.06	-101.90	-104.84	-100.49	-99.29	-100.06
-4.0	-94.78	-95.04	-95.21	-94.71	-95.51	-92.97	-93.98	-94.59	-94.42
-3.5	-100.35	-99.98	-100.51	-101.58	-100.78	-100.73	-98.60	-96.84	-96.63
-3.0	-87.35	-89.58	-92.08	-94.62	-106.70	-92.36	-91.27	-90.62	-91.04
-2.5	-87.47	-85.90	-86.09	-86.53	-86.47	-85.69	-89.51	-89.39	-89.15
-2.0	-82.51	-83.19	-83.18	-82.96	-83.85	-83.28	-110.03	-107.74	-108.25
-1.5	-91.47	-90.32	-87.95	-90.37	-89.45	-89.04	-83.84	-83.72	-82.83
-1.0	-88.38	-86.21	-84.14	-88.77	-85.82	-83.11	-76.50	-77.45	-76.78
-0.5	-73.22	-73.55	-72.70	-69.77	-70.34	-68.97	-71.03	-69.00	-66.85
0 <sup>note 4</sup>	-	-	-	-	-	-	-	-	-
+0.5	-73.32	-73.59	-72.17	-69.88	-70.68	-68.84	-71.41	-68.96	-66.46
+1.0	-88.03	-86.71	-83.96	-89.03	-85.06	-82.54	-76.58	-77.45	-76.46
+1.5	-92.12	-89.38	-88.29	-90.67	-88.87	-88.74	-84.00	-83.85	-82.79
+2.0	-82.70	-83.17	-83.03	-83.15	-83.95	-83.04	-109.58	-108.39	-109.51
+2.5	-87.43	-86.35	-86.05	-86.92	-86.99	-85.61	-89.23	-89.98	-88.50
+3.0	-87.05	-89.49	-93.86	-93.31	-106.87	-91.69	-92.51	-90.27	-92.89
+3.5	-100.94	-99.16	-102.51	-99.39	-99.45	-99.93	-97.10	-96.91	-97.08
+4.0	-95.18	-94.32	-95.45	-94.83	-95.33	-94.82	-93.37	-94.22	-93.57
+4.5	-108.15	-104.91	-101.88	-103.47	-104.62	-102.56	-100.54	-99.97	-100.74
+5.0	-99.74	-106.03	-101.28	-103.18	-102.79	-103.06	-92.67	-93.85	-92.68

Note 3: Step size 500 kHz

Note 4: All spurs are referenced to carrier signal (n=0).

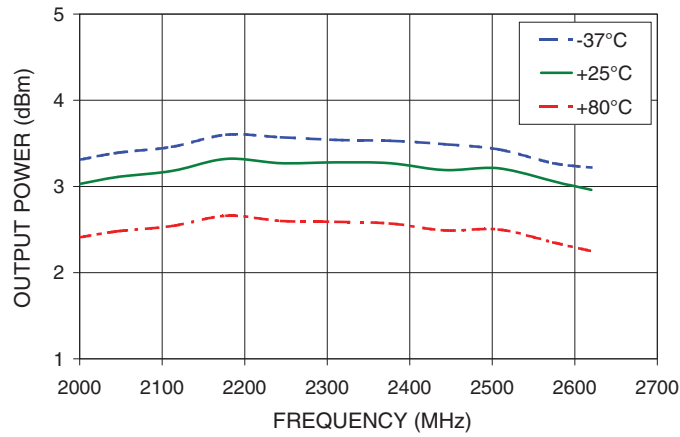
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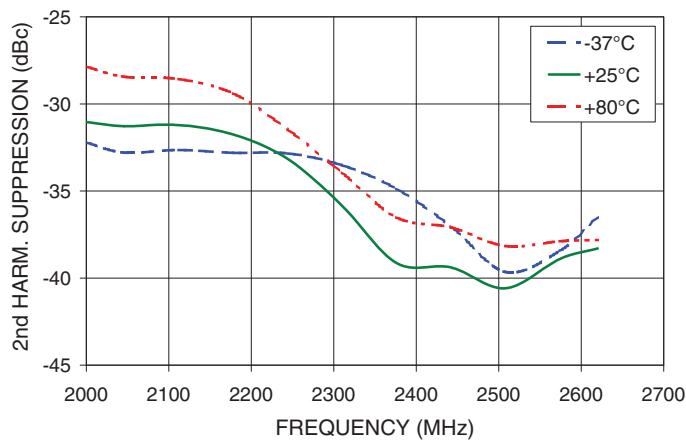


Typical Performance Curves

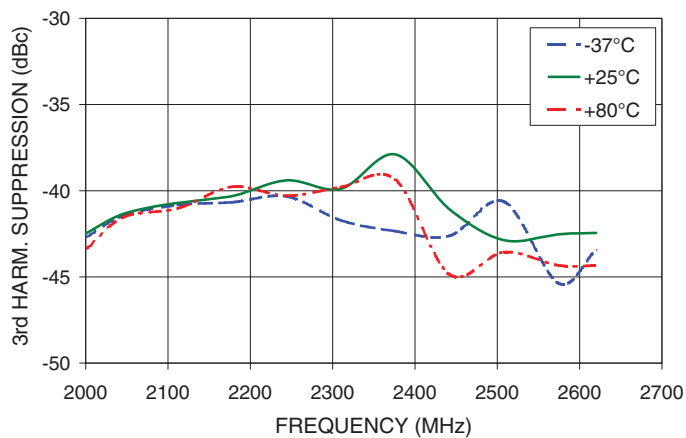
OUTPUT POWER Vs FREQUENCY



2nd HARMONIC Vs FREQUENCY



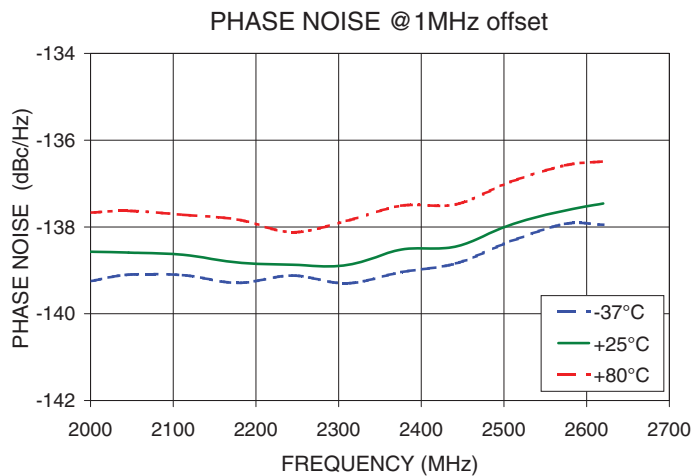
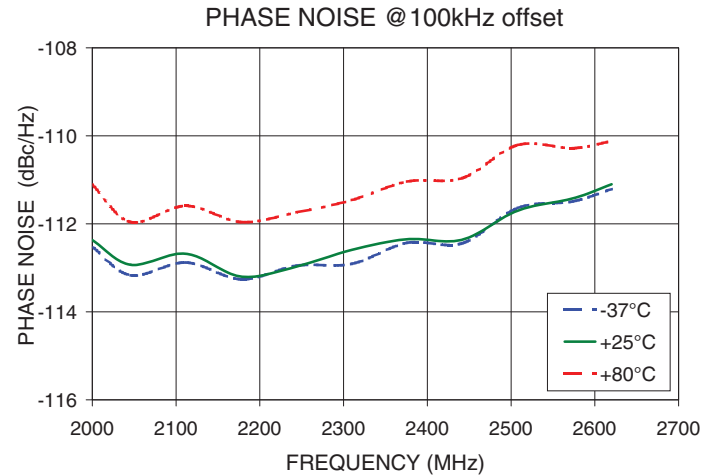
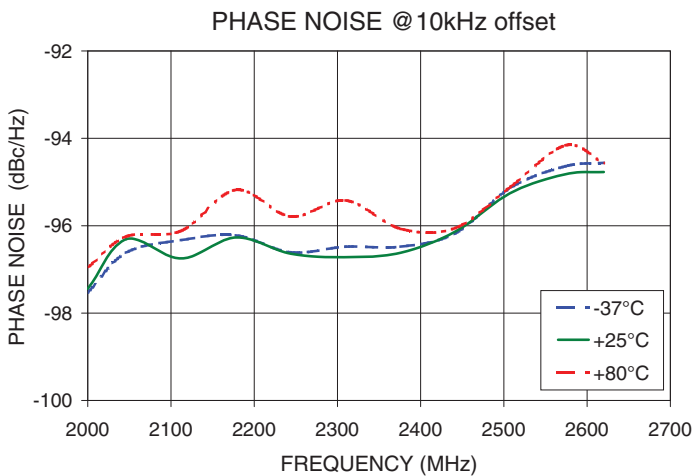
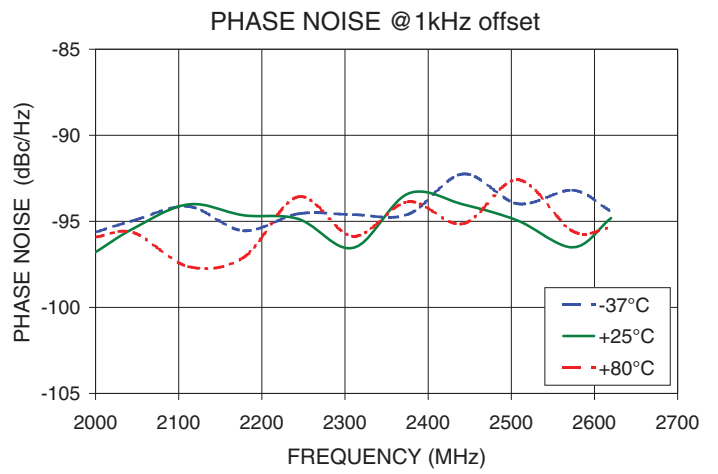
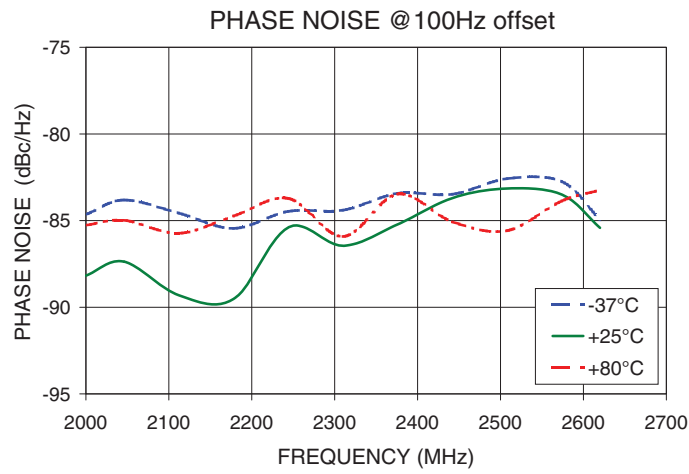
3rd HARMONIC Vs FREQUENCY



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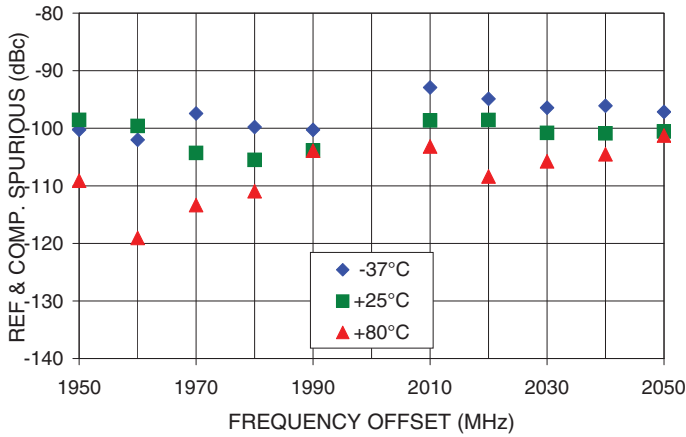


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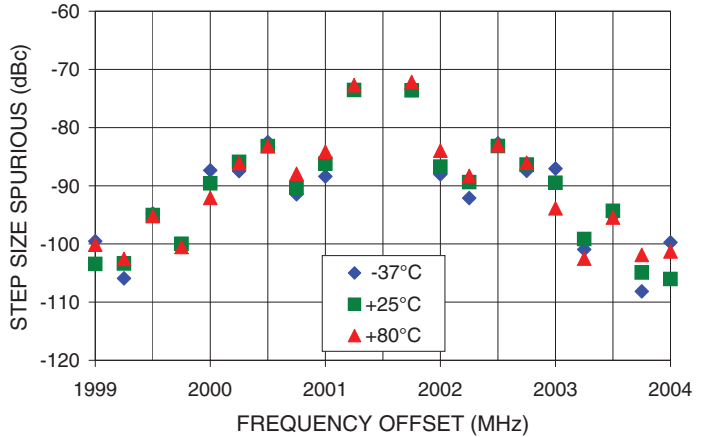




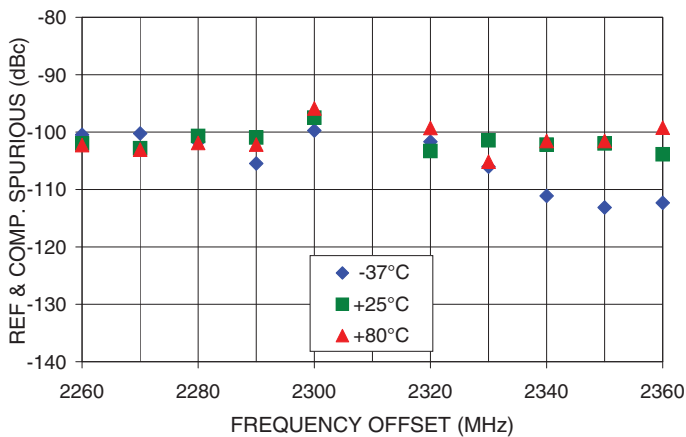
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Vs FREQ. OFFSET @ Fcar = 2000MHz



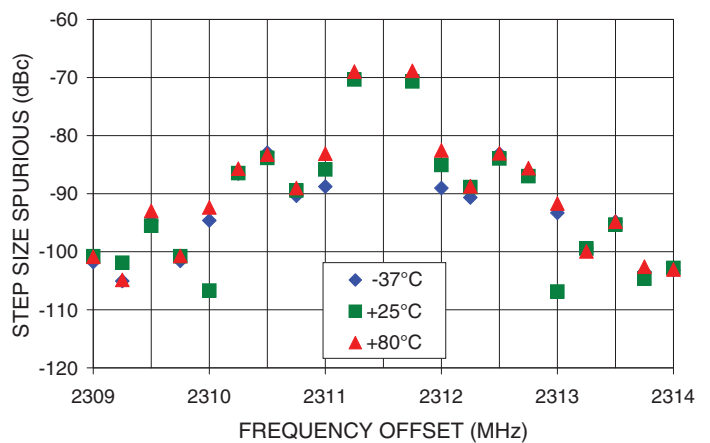
0.5 STEP SIZE & STEP SIZE SPURIOUS  
Vs FREQ. OFFSET @ Fcar = 2001.5MHz



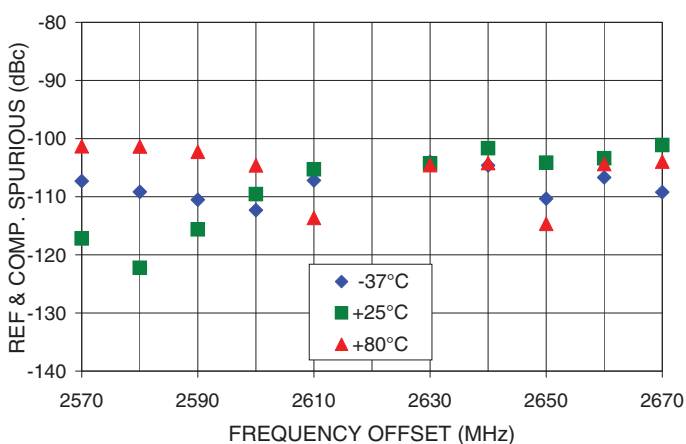
REFERENCE & COMPARISON SPURIOUS  
Vs FREQ. OFFSET @ Fcar = 2310MHz



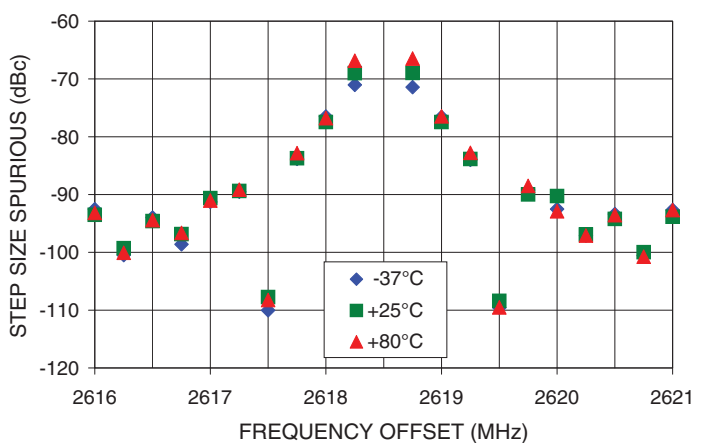
0.5 STEP SIZE & STEP SIZE SPURIOUS  
Vs FREQ. OFFSET @ Fcar = 2311.5MHz



REFERENCE & COMPARISON SPURIOUS  
Vs FREQ. OFFSET @ Fcar = 2620MHz



0.5 STEP SIZE & STEP SIZE SPURIOUS  
Vs FREQ. OFFSET @ Fcar = 2618.5MHz

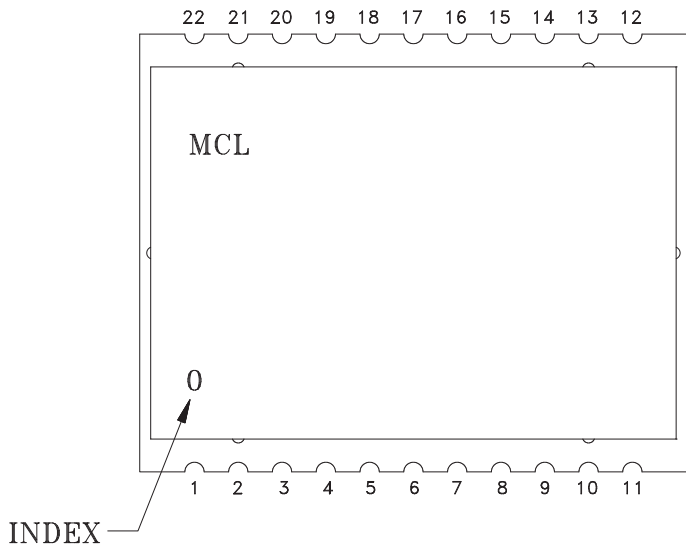


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Pin Configuration

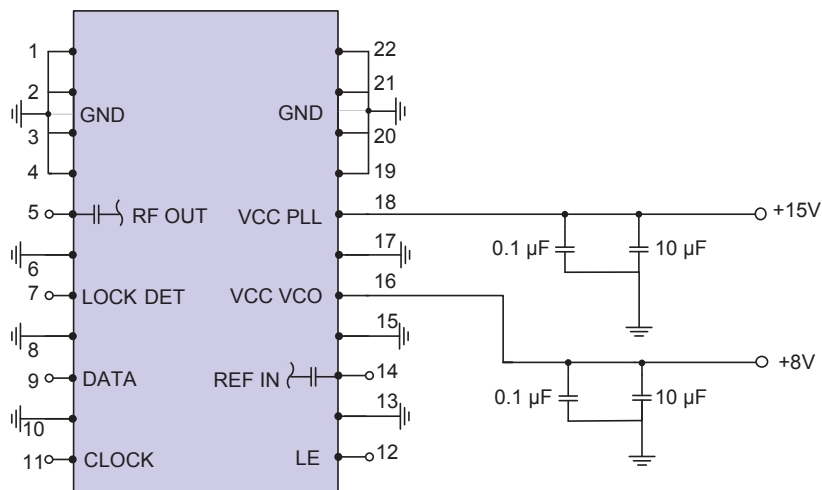


Pin Connection

Pin Number	Function	Pin Number	Function
1	GND	12	LE
2	GND	13	GND
3	GND	14	REF IN
4	GND	15	GND
5	RF OUT	16	VCC VCO
6	GND	17	GND
7	LOCK DET	18	VCC PLL
8	GND	19	GND
9	DATA	20	GND
10	GND	21	GND
11	CLOCK	22	GND

Recommended Application Circuit

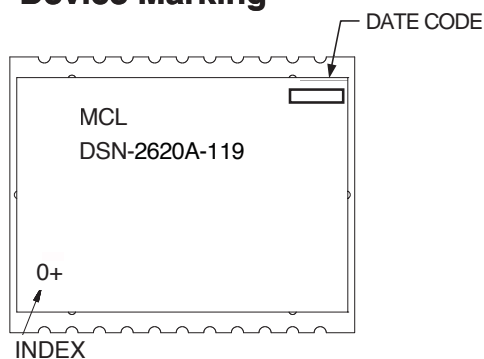
Note: REF IN and RF OUT ports are internally AC coupled.



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**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:** KL1294

**Tape & Reel:** TR-F97

**Suggested Layout for PCB Design:** PL-318

**Evaluation Board:** TB-553+

**Environment Ratings:** ENV65T2

Synthesizer evaluation software to set PLL registers manually is available at [http://www.minicircuits.com/support/software\\_download.html](http://www.minicircuits.com/support/software_download.html)

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