NON-CATALOG

Frequency Synthesizer DSN-2000A-419+

50Ω 1420 to 2000 MHz

The Big Deal

- Fractional N synthesizer
- Low phase noise and spurious

CASE STYLE: KL1294

Product Overview

The DSN-2000A-419+ is a Frequency Synthesizer, designed to operate from 1420 to 2000 MHz for Military and Avionics application. The DSN-2000A-419+ 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: • Phase Noise: -98 dBc/Hz typ. @ 10 kHz offset • Step Size Spurious: -80 dBc typ. • Comparison Spurious: -100 dBc typ. • Reference Spurious: -100 dBc typ.	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Robust design and construction	To enhance the robustness of DSN-2000A-419+, 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.

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Surface Mount

NON-CATALOG

Frequency Synthesizer

DSN-2000A-419+

50Ω 1420 to 2000 MHz

CASE STYLE: KL1294

Features

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

+ 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.

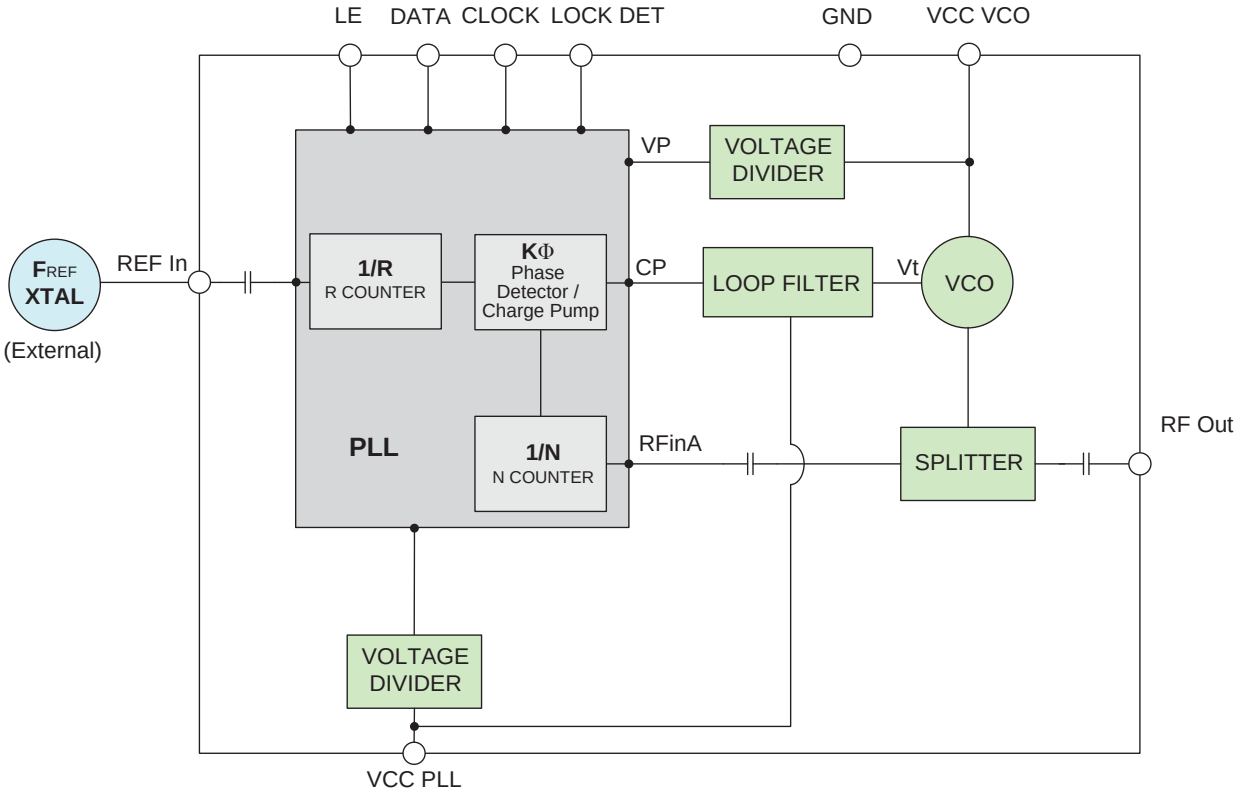
Applications

- Military and Avionics

General Description

The DSN-2000A-419+ is a Frequency Synthesizer, designed to operate from 1420 to 2000 MHz for military and avionics application. The DSN-2000A-419+ 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-2000A-419+, 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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Electrical Specifications *(over operating temperature -32°C to +75°C)*

Parameters		Test Conditions	Min.	Typ.	Max.	Units
Frequency Range		-	1420	-	2000	MHz
Step Size		-	-	500	-	KHz
Comparison Frequency		-	-	10	-	MHz
Settling Time		Within ± 1 kHz	-	3	-	mSec
Output Power		-	+2	+4	+6	dBm
SSB Phase Noise		@ 100 Hz offset	-	-79	-	dBc/Hz
		@ 1 kHz offset	-	-97	-89	
		@ 10 kHz offset	-	-98	-93	
		@ 100 kHz offset	-	-112	-105	
		@ 1 MHz offset	-	-143	-137	
Integrated SSB Phase Noise		@100 Hz to 1MHz	-	-51	-	dBc
Step Size Spurious Suppression		Step Size 500 kHz	-	-80	-70	dBc
0.5 Step Size Spurious Suppression		0.5 Step Size 250 KHz	-	-86	-70	
Reference & Comparison Spurious Suppression		Ref. Freq. 10 MHz	-	-100	-80	
Non - Harmonic Spurious Suppression		-	-	-90	-	
Harmonic Suppression		-	-	-44	-30	
VCO Supply Voltage		+8	+7.75	+8.00	+8.25	V
PLL Supply Voltage		+15	+14.75	+15.00	+15.25	
VCO Supply Current		-	-	64	70	mA
PLL Supply Current		-	-	23	31	
Reference Input (External)	Frequency	10 (square wave)	-	10	-	MHz
	Amplitude	1	-	1	-	V_{P-P}
	Input impedance	-	-	100	-	KΩ
	Phase Noise @ 1 KHz offset	-	-	-145	-	dBc/Hz
RF Output port Impedance		-	-	50	-	Ω
Input Logic Level	Input high voltage	-	2.65	-	-	V
	Input low voltage	-	-	-	0.65	V
Digital Lock Detect	Locked	-	2.15	-	3.00	V
	Unlocked	-	-	-	0.40	V
Frequency Synthesizer PLL		-	ADF4153			
PLL Programming		-	3-wire serial 3V CMOS			
Register Map @ 2000 MHz	R0_Register	-	(MSB) 00110010000000000000000 (LSB)			
	R1_Register	-	(MSB) 00010100010000000010100 01 (LSB)			
	R2_Register *	-	(MSB) 00000000000000YX10100010 (LSB)			
	R3_Register	-	(MSB) 00000000000000011110001 11 (LSB)			

*** Refer to Charge Pump Settings**

FREQ.LOCK [MHz]	Charge Pump Settings	
	Y	X
1420.0 - 1750.0	0	1
1750.5 - 2000.0	1	0

Absolute Maximum Ratings

Parameters	Ratings
VCO Supply Voltage	8.5V
PLL Supply Voltage	18.0V
VCO Supply Voltage to PLL Supply Voltage	N.A
Reference Frequency Voltage	0Vmin, +3.6Vmax
Data, Clock, LE Levels	0Vmin, +3.6Vmax
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

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Typical Performance Data

FREQUENCY (MHz)	POWER OUTPUT (dBm)			VCO CURRENT (mA)			PLL CURENT (mA)		
	-37°C	+25°C	+85°C	-37°C	+25°C	+85°C	-37°C	+25°C	+85°C
1420	4.56	4.54	4.20	62.26	63.61	64.88	19.98	21.70	23.91
1462	4.43	4.41	4.05	62.32	63.69	64.93	20.90	22.66	24.92
1524	4.54	4.52	4.18	62.40	63.75	64.99	21.00	22.79	25.07
1586	4.47	4.46	4.12	62.46	63.81	65.03	21.00	22.80	25.09
1648	4.51	4.48	4.18	62.47	63.85	65.04	20.92	22.72	25.02
1710	4.42	4.41	4.11	62.44	63.85	65.03	19.97	21.75	24.03
1772	4.43	4.42	4.09	62.47	63.95	65.17	20.88	22.69	25.01
1834	4.61	4.59	4.26	62.37	63.88	65.13	20.99	22.80	25.14
1896	4.46	4.45	4.13	62.30	63.82	65.07	20.98	22.80	25.15
1958	4.48	4.46	4.15	62.26	63.76	65.03	20.90	22.72	25.06
2000	4.38	4.37	4.04	62.26	63.73	65.00	19.95	21.75	24.08

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-37°C	+25°C	+85°C	-37°C	+25°C	+85°C
1420	-34.41	-37.06	-39.46	-52.45	-52.12	-54.95
1462	-39.69	-42.14	-44.09	-54.36	-54.21	-55.57
1524	-43.57	-45.03	-47.13	-50.95	-52.02	-52.55
1586	-43.86	-45.42	-46.72	-48.39	-47.81	-48.20
1648	-43.80	-45.51	-47.25	-44.44	-46.56	-46.90
1710	-43.78	-45.35	-46.67	-45.21	-45.72	-44.79
1772	-43.02	-44.56	-45.49	-39.36	-40.01	-40.31
1834	-44.08	-45.46	-46.45	-39.38	-40.04	-40.52
1896	-42.82	-44.22	-45.64	-38.34	-38.49	-40.34
1958	-43.17	-44.60	-46.63	-37.69	-39.21	-39.60
2000	-42.83	-44.55	-48.27	-37.50	-37.93	-38.36

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FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS +25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
1420	-90.03	-97.49	-99.57	-112.31	-143.09
1462	-89.51	-96.60	-98.85	-112.50	-143.09
1524	-92.44	-97.81	-98.52	-112.54	-142.95
1586	-90.31	-98.06	-97.80	-112.69	-143.04
1648	-89.67	-96.99	-97.67	-112.68	-143.14
1710	-88.17	-95.68	-97.67	-112.90	-143.26
1772	-88.59	-95.26	-98.35	-112.07	-143.31
1834	-84.98	-95.34	-98.82	-112.22	-143.14
1896	-88.21	-94.40	-98.47	-112.42	-143.27
1958	-86.23	-95.31	-97.31	-112.89	-143.15
2000	-88.15	-96.81	-96.91	-112.88	-143.06

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS -37°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
1420	-88.30	-97.75	-99.11	-112.78	-144.63
1462	-87.14	-97.24	-99.15	-113.02	-144.59
1524	-85.54	-97.28	-98.20	-113.05	-144.46
1586	-86.37	-95.25	-98.93	-113.12	-144.33
1648	-86.16	-97.12	-97.17	-113.44	-144.31
1710	-84.96	-95.18	-97.74	-113.50	-144.26
1772	-83.13	-96.47	-98.46	-112.25	-144.06
1834	-84.96	-94.65	-98.28	-112.30	-143.88
1896	-84.03	-92.54	-97.98	-112.74	-143.79
1958	-83.63	-93.40	-97.75	-112.90	-143.71
2000	-85.35	-95.45	-97.90	-113.26	-143.78

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS +85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
1420	-90.81	-99.24	-98.97	-110.79	-140.80
1462	-90.36	-98.12	-97.66	-111.26	-140.82
1524	-89.03	-99.40	-98.38	-111.16	-140.93
1586	-92.02	-98.33	-96.62	-111.28	-141.00
1648	-90.57	-98.17	-97.32	-111.53	-141.43
1710	-90.84	-98.10	-96.76	-111.62	-141.63
1772	-89.13	-96.29	-98.15	-110.84	-141.71
1834	-88.24	-98.22	-98.05	-110.97	-141.75
1896	-89.11	-98.28	-97.43	-111.37	-141.86
1958	-87.17	-97.00	-97.38	-111.56	-141.76
2000	-87.62	-97.99	-97.14	-111.82	-141.84

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REFERENCE & COMPARISON SPURIOUS ORDER	REFERENCE & COMPARISON SPURIOUS@Fcarrier 1420.5MHz+(n*Freference) (dBc) note 1			REFERENCE & COMPARISON SPURIOUS @Fcarrier 1700.5MHz+(n*Freference) (dBc) note 1			REFERENCE & COMPARISON SPURIOUS @Fcarrier 1999.5MHz+(n*Freference) (dBc) note 1		
n	-37°C	+25°C	+85°C	-37°C	+25°C	+85°C	-37°C	+25°C	+85°C
-5	-99.45	-113.48	-101.79	-100.50	-102.93	-106.82	-107.37	-110.42	-104.16
-4	-102.42	-105.56	-101.29	-100.55	-102.36	-110.02	-111.18	-108.95	-105.97
-3	-101.16	-102.80	-100.00	-100.93	-100.82	-110.07	-111.03	-108.80	-104.48
-2	-99.03	-101.40	-100.89	-102.49	-100.21	-109.87	-115.28	-105.09	-104.62
-1	-97.83	-101.79	-101.55	-107.42	-100.16	-112.24	-117.74	-100.52	-103.86
0 note 2	-	-	-	-	-	-	-	-	-
+1	-96.47	-107.23	-98.26	-106.35	-101.70	-102.18	-100.90	-107.17	-114.19
+2	-97.59	-105.31	-99.61	-106.67	-105.76	-100.78	-106.36	-112.46	-107.69
+3	-98.58	-103.59	-102.33	-104.63	-118.39	-99.00	-107.34	-108.02	-106.05
+4	-100.18	-102.33	-105.35	-103.78	-121.38	-98.07	-106.83	-103.56	-106.35
+5	-100.82	-100.09	-104.56	-104.42	-110.09	-99.07	-106.58	-100.92	-106.72

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 1420.5MHz+(n*Fstep size) (dBc) note 3			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 1700.5MHz+(n*Fstep size) (dBc) note 3			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 1999.5MHz+(n*Fstep size) (dBc) note 3		
n	-37°C	+25°C	+85°C	-37°C	+25°C	+85°C	-37°C	+25°C	+85°C
-5.0	-104.97	-107.96	-104.83	-103.57	-105.55	-106.74	-110.68	-119.28	-114.88
-4.5	-123.99	-116.45	-120.31	-119.53	-123.96	-117.39	-111.63	-115.69	-114.32
-4.0	-106.41	-103.87	-104.92	-107.07	-105.09	-108.57	-102.44	-105.25	-106.55
-3.5	-107.56	-116.73	-109.36	-108.58	-114.00	-110.33	-121.47	-116.48	-110.45
-3.0	-119.78	-110.42	-108.81	-115.93	-112.36	-116.78	-111.75	-113.83	-109.22
-2.5	-99.46	-102.41	-101.97	-102.74	-101.61	-104.02	-97.03	-99.36	-99.95
-2.0	-101.81	-101.31	-102.93	-107.92	-108.46	-108.69	-95.67	-97.96	-95.02
-1.5	-95.96	-96.43	-95.37	-97.79	-97.26	-96.63	-100.82	-96.95	-100.72
-1.0	-92.61	-85.34	-91.69	-84.09	-87.89	-94.89	-92.76	-80.01	-90.64
-0.5	-86.00	-84.89	-87.33	-86.87	-87.64	-85.14	-87.77	-88.13	-90.79
0 note 4	-	-	-	-	-	-	-	-	-
+0.5	-85.98	-85.48	-85.98	-86.00	-86.15	-84.84	-86.79	-87.92	-91.44
+1.0	-91.19	-85.06	-91.66	-84.96	-88.83	-95.36	-95.78	-80.78	-90.84
+1.5	-95.85	-96.23	-94.86	-96.84	-98.16	-96.93	-99.02	-96.33	-102.32
+2.0	-100.89	-102.42	-101.84	-109.71	-108.66	-108.48	-95.23	-97.72	-94.89
+2.5	-100.37	-101.63	-102.46	-102.25	-100.69	-102.99	-97.19	-100.93	-98.66
+3.0	-113.05	-110.69	-105.32	-111.21	-120.71	-115.28	-110.93	-116.51	-108.00
+3.5	-107.67	-110.31	-107.60	-106.81	-112.60	-107.03	-122.97	-113.68	-110.15
+4.0	-105.64	-105.49	-105.20	-111.19	-104.59	-111.67	-102.44	-105.16	-106.21
+4.5	-118.03	-119.50	-111.15	-122.64	-114.29	-116.93	-112.35	-112.62	-115.87
+5.0	-104.82	-107.47	-105.17	-104.50	-103.31	-106.72	-111.05	-115.00	-115.42

Note 3: Step size 500 KHz
Note 4: All spurs are referenced to carrier signal (n=0).

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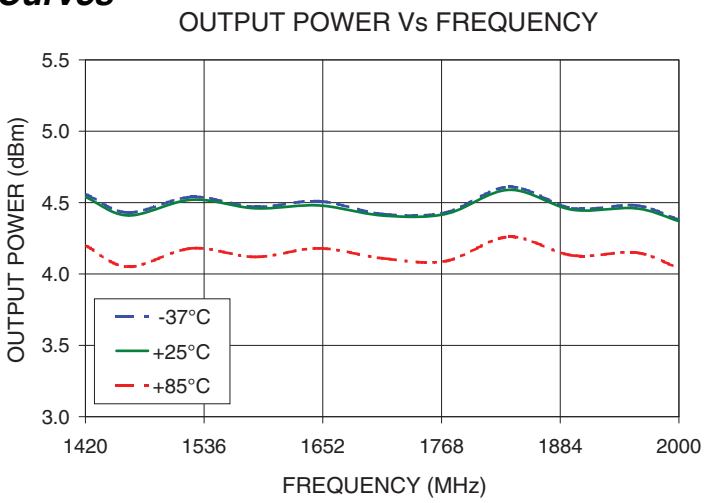
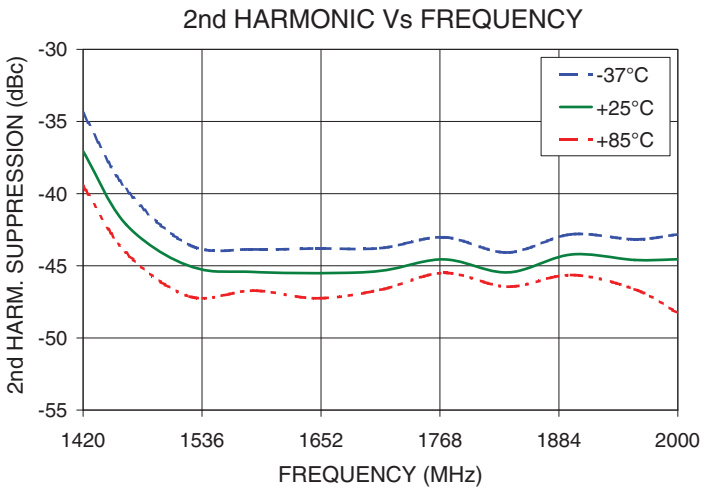
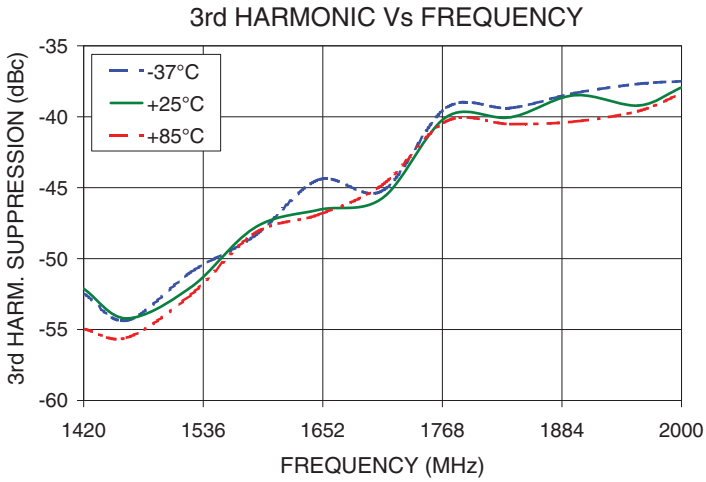
Typical Performance Curves







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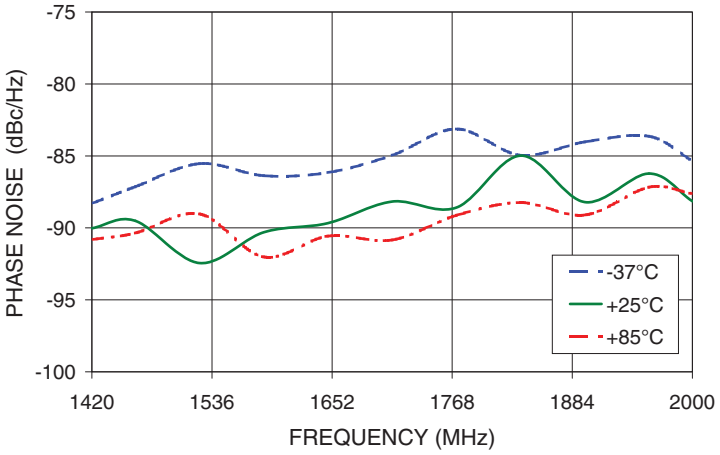
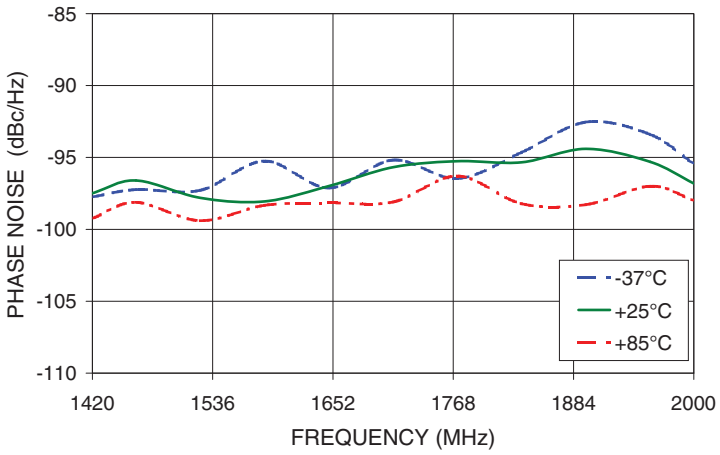
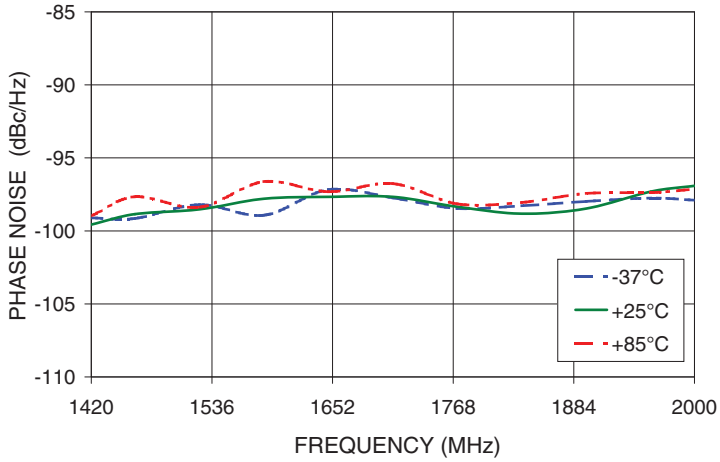
PHASE NOISE @100Hz offset



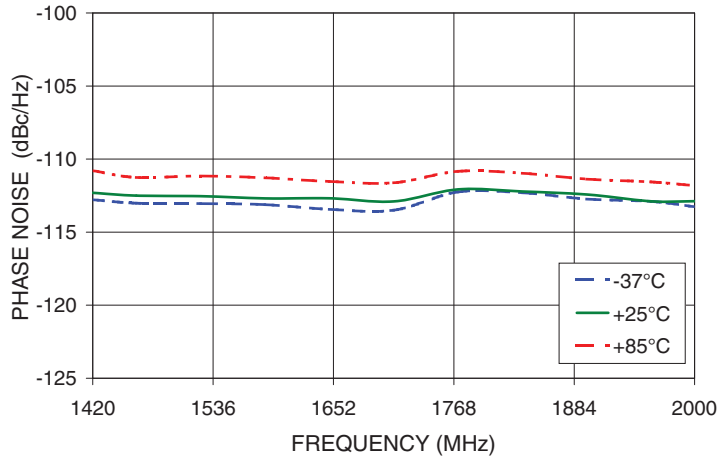
PHASE NOISE @1kHz offset



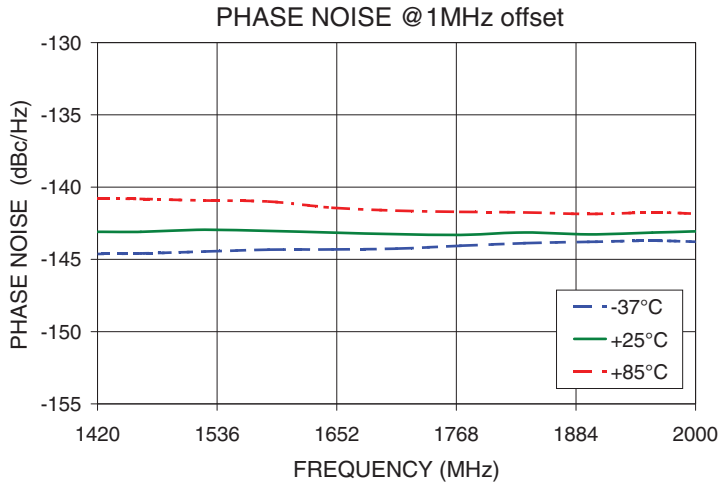
PHASE NOISE @10kHz offset



PHASE NOISE @100kHz offset



PHASE NOISE @1MHz offset



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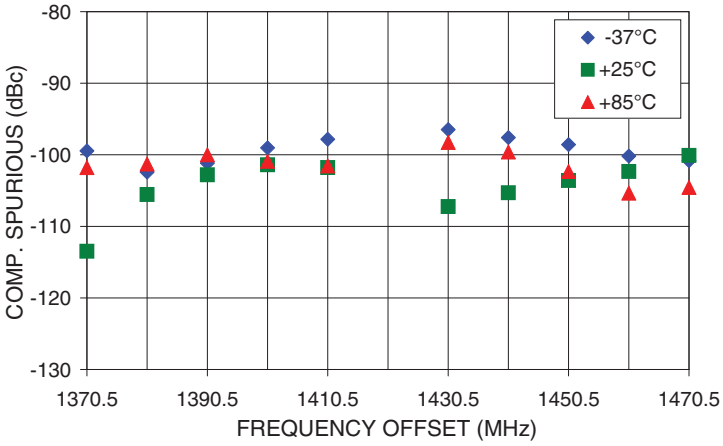
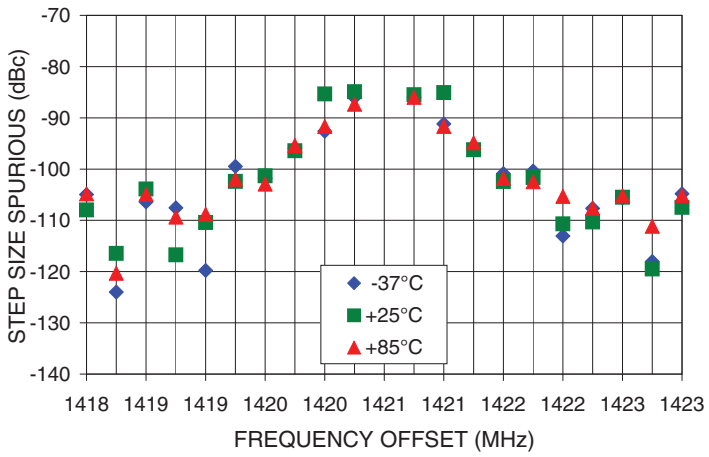
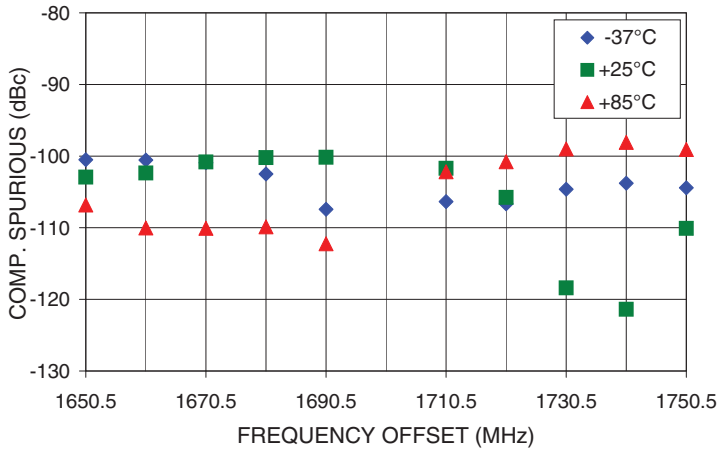
REFERENCE & COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1420.5MHz



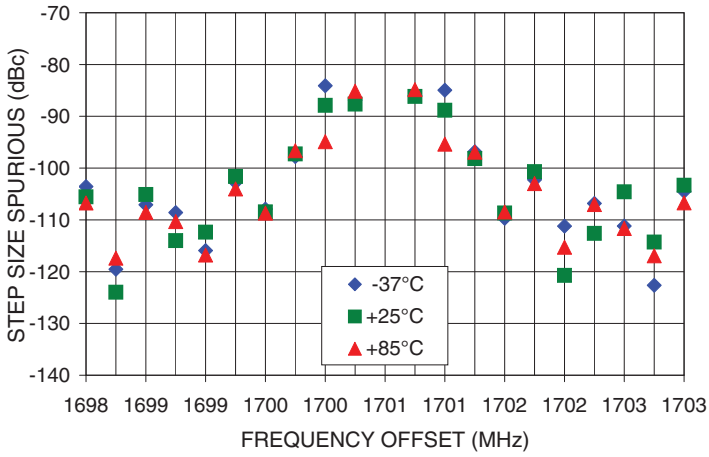
0.5 STEP SIZE & STEP SIZE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1420.5MHz



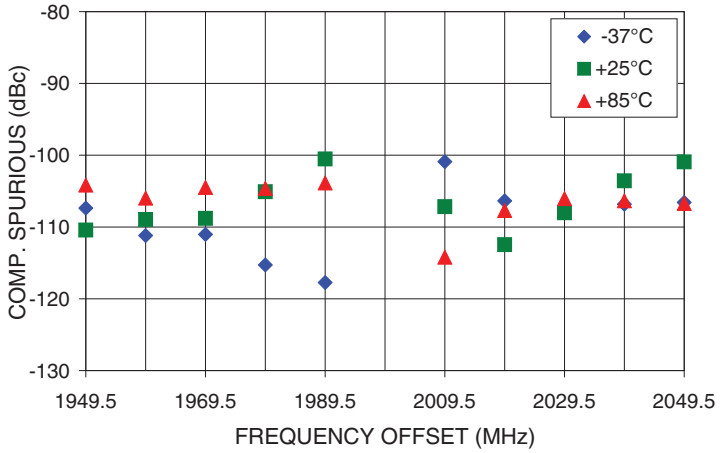
REFERENCE & COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1700.5MHz



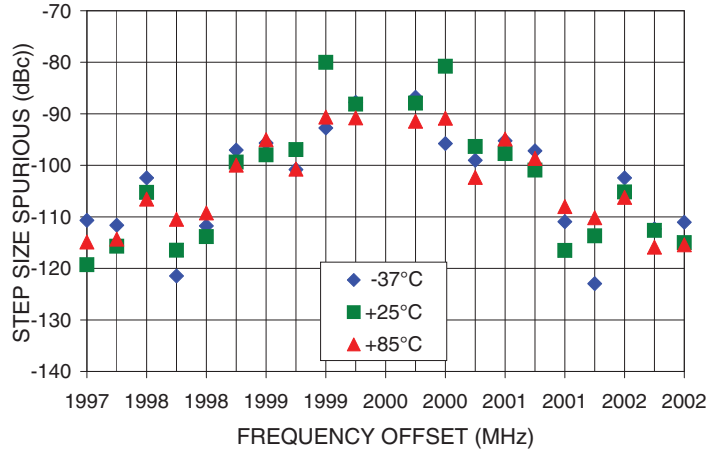
0.5 STEP SIZE & STEP SIZE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1700.5MHz



REFERENCE & COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1999.5MHz

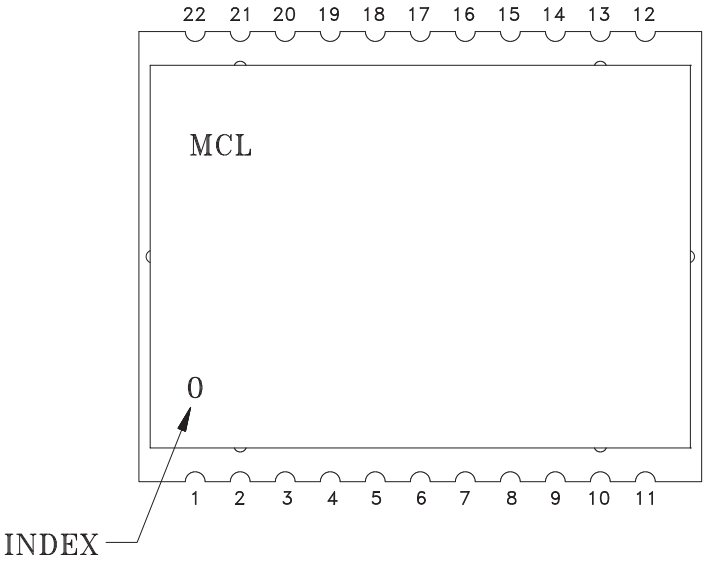


0.5 STEP SIZE & STEP SIZE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1999.5MHz



Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.

Pin Configuration

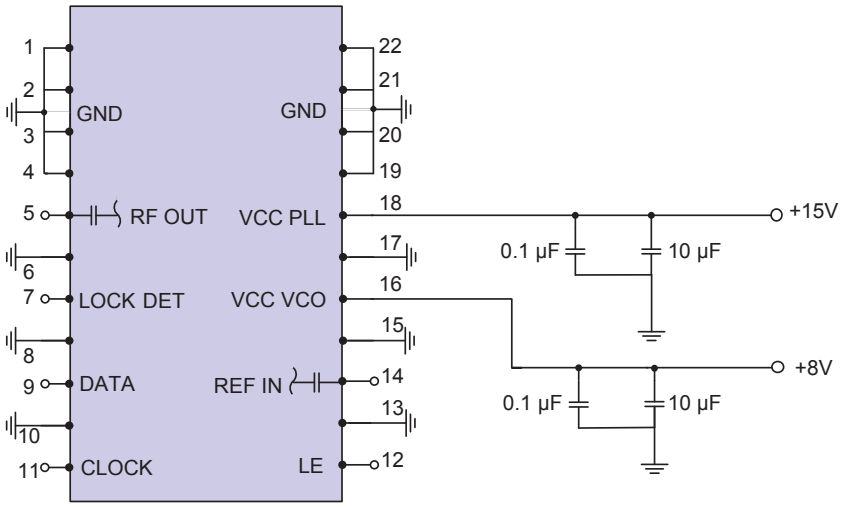


Pin Connection

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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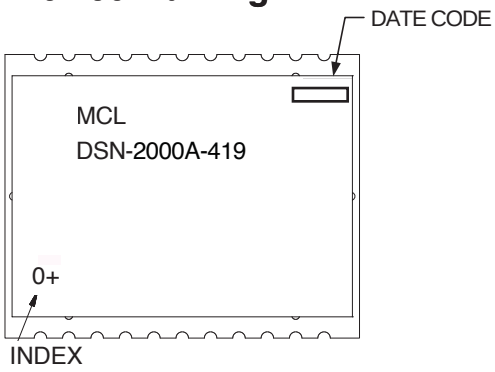
Device Marking



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: ENV03T2

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