

Frequency Synthesizer

KSN-3500A-119+

50Ω 3000 to 3450 MHz

The Big Deal

- Fractional N synthesizer
- Low phase noise and spurious
- Robust design and construction
- Small size 0.80" x 0.58" x 0.15"



CASE STYLE: DK1042

Product Overview

The KSN-3500A-119+ is a Frequency Synthesizer, designed to operate from 3000 to 3450 MHz for internet wireless application. The KSN-3500A-119+ is packaged in a metal case (size of 0.80" x 0.58" x 0.15") to shield against unwanted signals and noise.

Key Features

Feature	Advantages
Low phase noise and spurious: • Phase Noise: -95 dBc/Hz typ. @ 10 kHz offset • Step Size Spurious: -53 dBc typ. • Comparison Spurious: -79 dBc typ. • Reference Spurious: -79 dBc typ.	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Robust design and construction	To enhance the robustness of KSN-3500A-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.
Small size, 0.80" x 0.58" x 0.15"	The small size enables the KSN-3500A-119+ to be used in compact designs.

Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
 B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
 C. The parts covered by this specification document 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/MCStore/terms.jsp



50Ω 3000 to 3450 MHz

Features

- Fractional N synthesizer
- Integrated VCO + PLL
- Low phase noise and spurious
- Robust design and construction
- Low operating voltage (VCC VCO=+7V, VCC PLL=+3V)
- Small size 0.80" x 0.58" x 0.15"



CASE STYLE: DK1042

+RoHS Compliant

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

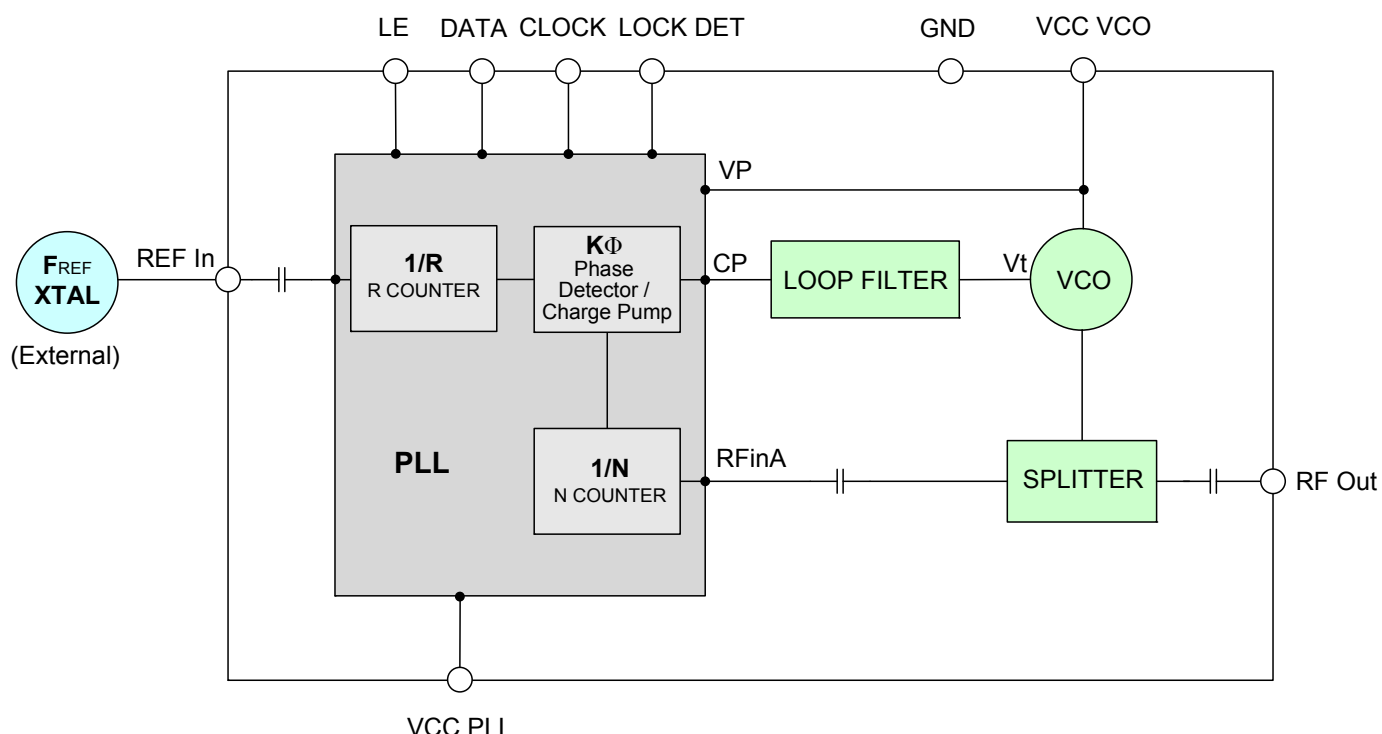
Applications

- Internet wireless

General Description

The KSN-3500A-119+ is a Frequency Synthesizer, designed to operate from 3000 to 3450 MHz for internet wireless application. The KSN-3500A-119+ is packaged in a metal case (size of 0.80" x 0.58" x 0.15") to shield against unwanted signals and noise. To enhance the robustness of KSN-3500A-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



Notes

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www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

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M157541
EDR-9733/1MPF1
KSN-3500A-119+
Category-B4
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Page 2 of 11

Electrical Specifications (over operating temperature -40°C to +70°C)

Parameters		Test Conditions	Min.	Typ.	Max.	Units
Frequency Range		-	3000	-	3450	MHz
Step Size		-	-	1000	-	kHz
Comparison Frequency		-	-	10	-	MHz
Settling Time		Within ± 1 kHz	-	0.15	-	mSec
Output Power		-	+1	+4	+7	dBm
SSB Phase Noise	@ 100 Hz offset		-	-80	-	dBc/Hz
	@ 1 kHz offset		-	-90	-83	
	@ 10 kHz offset		-	-95	-89	
	@ 100 kHz offset		-	-96	-90	
	@ 1 MHz offset		-	-125	-120	
Integrated SSB Phase Noise		@ 0.1 kHz to 300 kHz	-	-40	-35	dBc
Step Size Spurious Suppression		Step Size 1000 kHz	-	-53	-32	dBc
0.5 Step Size Spurious Suppression		0.5 Step Size 500 kHz	-	-46	-28	
Reference Spurious Suppression		Ref. Freq. 10 MHz	-	-79	-60	
Comparison Spurious Suppression		Comp. Freq. 10 MHz	-	-79	-60	
Non - Harmonic Spurious Suppression		-	-	-90	-	
Harmonic Suppression		-	-	-38	-22	V
VCO Supply Voltage		+7.00	+6.85	+7.00	+7.15	
PLL Supply Voltage		+3.00	+2.85	+3.00	+3.15	mA
VCO Supply Current		-	-	40	54	
PLL Supply Current		-	-	13	21	
Reference Input (External)	Frequency	10 (square wave)	-	10	-	MHz
	Amplitude	1	-	1	-	V _{P-P}
	Input impedance	-	-	100	-	K Ω
	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	-	-	-	0.55	V
Digital Lock Detect	Locked	-	2.45	-	3.15	V
	Unlocked	-	-	-	0.40	V
Frequency Synthesizer PLL		-	ADF4153			
PLL Programming		-	3-wire serial 3V CMOS			
Register Map @ 3450 MHz	R0_Register	-	(MSB) 101011001000000000000000 (LSB)			
	R1_Register	-	(MSB) 1010001000000000101001 (LSB)			
	R2_Register	-	(MSB) 1110100010 (LSB)			
	R3_Register	-	(MSB) 1111000111 (LSB)			

Absolute Maximum Ratings

Parameters	Ratings
VCO Supply Voltage	10V
PLL Supply Voltage	4V
VCO Supply Voltage to PLL Supply Voltage	N.A.
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

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Typical Performance Data

FREQUENCY (MHz)	POWER OUTPUT (dBm)			VCO CURRENT (mA)			PLL CURENT (mA)		
	-45°C	+25°C	+75°C	-45°C	+25°C	+75°C	-45°C	+25°C	+75°C
3000	3.53	3.51	3.76	34.83	38.87	44.02	13.82	13.61	15.48
3010	3.58	3.60	3.82	34.82	38.88	43.89	13.81	13.62	15.47
3070	3.71	3.87	3.94	34.85	38.91	44.02	13.81	13.62	15.48
3130	3.80	4.12	4.03	34.87	38.90	43.90	13.81	13.64	15.47
3190	3.85	4.46	4.07	34.73	38.83	43.79	13.81	13.64	15.48
3250	3.92	4.51	3.98	34.69	38.70	43.62	13.81	13.64	15.48
3310	4.05	4.57	3.90	34.52	38.51	43.52	13.81	13.64	15.47
3370	3.80	4.58	3.63	34.26	38.29	43.17	13.81	13.64	15.47
3430	3.21	4.29	3.09	34.07	38.05	43.01	13.81	13.64	15.48
3450	3.12	4.20	2.98	33.97	37.97	42.93	13.81	13.64	15.48

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-45°C	+25°C	+75°C	-45°C	+25°C	+75°C
3000	-46.05	-48.44	-47.90	-36.23	-38.51	-41.01
3010	-50.73	-49.75	-47.97	-37.45	-39.63	-42.14
3070	-50.63	-52.65	-51.41	-38.38	-40.96	-43.75
3130	-49.07	-49.10	-51.37	-41.03	-43.44	-45.07
3190	-49.83	-49.87	-47.84	-44.06	-43.79	-43.97
3250	-41.57	-43.14	-43.41	-44.23	-42.60	-42.29
3310	-41.97	-43.90	-45.14	-44.13	-43.18	-42.85
3370	-34.87	-37.52	-39.35	-42.61	-41.20	-41.01
3430	-33.43	-35.90	-37.75	-40.72	-40.27	-40.30
3450	-33.13	-35.54	-37.50	-41.29	-41.28	-41.26

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NON-CATALOG

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FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS				
	+25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
3000	-82.35	-90.81	-96.21	-95.39	-124.84
3010	-82.57	-90.84	-95.83	-95.43	-124.91
3070	-83.04	-90.52	-95.98	-95.39	-124.97
3130	-81.65	-90.05	-95.77	-95.22	-124.59
3190	-80.87	-89.14	-96.04	-94.94	-124.33
3250	-79.79	-90.27	-96.08	-94.98	-124.32
3310	-80.70	-90.27	-95.94	-95.38	-125.46
3370	-81.22	-88.42	-95.57	-95.58	-125.67
3430	-83.32	-88.45	-95.58	-96.29	-126.37
3450	-82.27	-89.28	-95.12	-96.60	-126.73

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS				
	-45°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
3000	-77.71	-88.88	-96.83	-95.79	-125.09
3010	-80.93	-89.48	-96.24	-95.91	-125.16
3070	-79.09	-89.80	-96.46	-95.78	-125.14
3130	-77.11	-89.83	-96.35	-95.69	-124.87
3190	-77.28	-88.97	-95.81	-95.38	-124.66
3250	-79.28	-89.66	-96.35	-95.47	-124.52
3310	-77.59	-88.49	-95.90	-95.51	-125.37
3370	-77.53	-89.56	-96.12	-95.82	-125.46
3430	-79.66	-87.16	-95.30	-96.32	-126.03
3450	-79.04	-87.27	-95.11	-96.83	-126.50

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS				
	+75°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
3000	-74.92	-92.36	-96.56	-95.03	-123.52
3010	-75.21	-92.50	-96.54	-95.08	-123.75
3070	-74.86	-92.09	-96.45	-95.10	-123.60
3130	-75.48	-91.83	-96.08	-94.80	-123.27
3190	-74.40	-91.35	-96.03	-94.57	-123.01
3250	-75.38	-90.93	-95.98	-94.77	-123.48
3310	-74.16	-91.03	-95.98	-95.22	-124.56
3370	-75.25	-92.67	-95.58	-95.52	-124.79
3430	-74.51	-91.79	-95.92	-96.18	-125.52
3450	-74.22	-91.81	-95.55	-96.76	-126.00

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REFERENCE & COMPARISON SPURIOUS ORDER	REFERENCE & COMPARISON SPURIOUS @Fcarrier 3001MHz+(n*Fcomp or Fref) (dBc) note 1			REFERENCE & COMPARISON SPURIOUS @Fcarrier 3251MHz+(n*Fcomp or Fref) (dBc) note 1			REFERENCE & COMPARISON SPURIOUS @Fcarrier 3499MHz+(n*Fcomp or Fref) (dBc) note 1		
	-45°C	+25°C	+75°C	-45°C	+25°C	+75°C	-45°C	+25°C	+75°C
-5	-112.22	-111.42	-116.42	-111.71	-113.63	-115.14	-108.36	-115.33	-108.18
-4	-113.34	-109.02	-115.47	-108.35	-109.91	-111.94	-106.32	-112.25	-108.49
-3	-110.53	-102.72	-108.79	-115.30	-104.14	-102.51	-104.31	-106.29	-102.42
-2	-94.53	-104.39	-98.86	-107.11	-97.54	-95.56	-103.17	-102.85	-97.27
-1	-76.47	-77.35	-77.76	-79.84	-78.31	-78.54	-82.56	-84.26	-82.54
0 ^{note 2}	-	-	-	-	-	-	-	-	-
+1	-77.01	-77.85	-78.11	-80.15	-78.76	-78.59	-81.90	-83.60	-83.03
+2	-95.28	-100.17	-98.51	-105.10	-98.19	-94.76	-98.20	-102.48	-99.13
+3	-108.07	-118.33	-116.67	-110.66	-104.55	-100.63	-100.81	-102.48	-106.06
+4	-109.50	-115.84	-116.05	-112.44	-110.79	-107.26	-107.22	-106.42	-114.22
+5	-112.08	-114.37	-114.40	-111.80	-105.39	-112.23	-106.72	-109.08	-114.54

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 3001MHz+(n*Fstep size) (dBc) note 5			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 3251MHz+(n*Fstep size) (dBc) note 5			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 3499MHz+(n*Fstep size) (dBc) note 5		
	-45°C	+25°C	+75°C	-45°C	+25°C	+75°C	-45°C	+25°C	+75°C
-5.0	-78.89	-79.79	-78.79	-78.36	-79.46	-78.93	-82.16	-84.06	-83.93
-4.5	-65.95	-66.67	-65.83	-65.55	-66.41	-66.02	-69.46	-71.08	-79.63
-4.0	-68.22	-69.03	-68.12	-67.95	-68.76	-68.29	-72.02	-73.38	-72.52
-3.5	-69.38	-69.86	-68.94	-68.85	-69.53	-69.18	-72.87	-74.28	-66.32
-3.0	-59.26	-59.83	-59.01	-58.74	-59.52	-59.19	-62.73	-64.19	-72.21
-2.5	-66.71	-67.20	-66.27	-66.17	-66.75	-66.46	-70.29	-71.62	-71.68
-2.0	-48.04	-48.63	-47.76	-47.52	-48.26	-47.92	-51.57	-52.96	-69.08
-1.5	-61.51	-62.53	-61.62	-60.99	-62.16	-61.73	-64.97	-66.64	-56.99
-1.0	-56.50	-56.50	-56.59	-56.49	-56.29	-56.24	-59.95	-60.81	-53.60
-0.5	-43.83	-43.76	-42.91	-43.09	-43.11	-43.19	-46.95	-48.31	-58.17
0 ^{note 6}	-	-	-	-	-	-	-	-	-
+0.5	-43.67	-43.49	-43.01	-43.06	-43.34	-43.13	-46.96	-48.33	-59.38
+1.0	-56.55	-56.68	-56.65	-56.79	-56.43	-56.58	-60.11	-60.93	-53.65
+1.5	-61.30	-62.40	-61.39	-60.77	-61.83	-61.60	-64.89	-66.60	-57.08
+2.0	-48.02	-48.59	-47.75	-47.53	-48.27	-47.93	-51.58	-53.00	-68.91
+2.5	-67.44	-68.03	-67.19	-67.00	-67.69	-67.36	-70.79	-72.17	-71.97
+3.0	-59.09	-59.65	-58.85	-58.61	-59.41	-59.08	-62.68	-64.15	-72.16
+3.5	-69.61	-70.14	-69.29	-69.07	-69.90	-69.56	-73.06	-74.52	-66.47
+4.0	-68.43	-69.16	-68.30	-68.06	-68.92	-68.52	-72.16	-73.58	-72.54
+4.5	-66.13	-66.82	-65.97	-65.71	-66.66	-66.22	-69.59	-71.29	-79.60
+5.0	-79.17	-80.30	-79.25	-79.07	-79.95	-79.27	-82.64	-84.94	-84.52

Note 3: Step size 1000 kHz

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

Notes

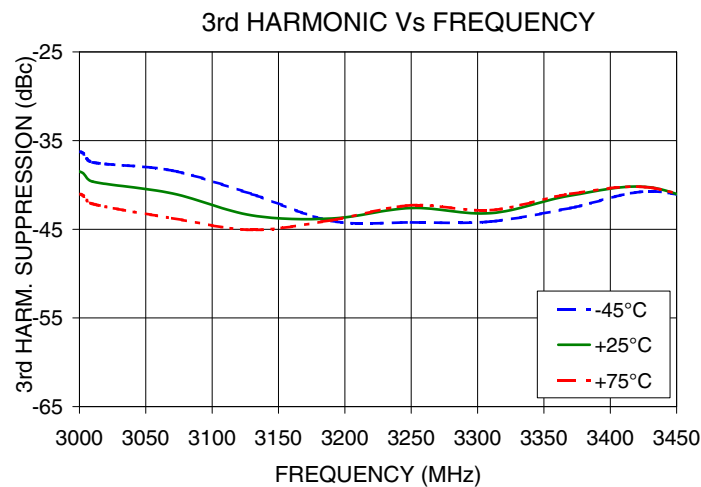
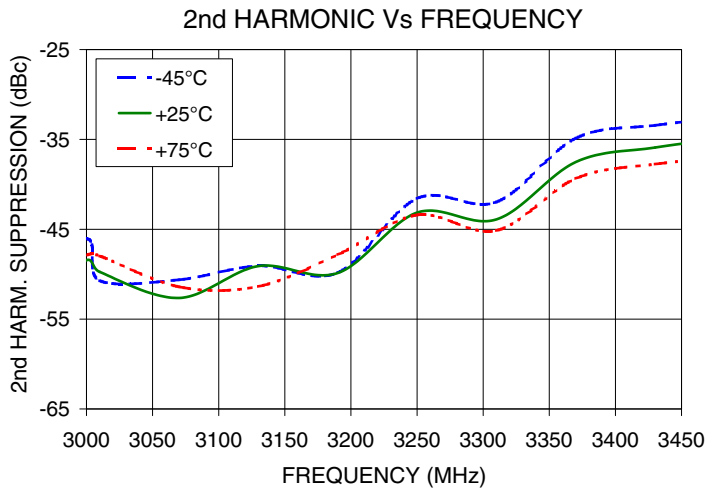
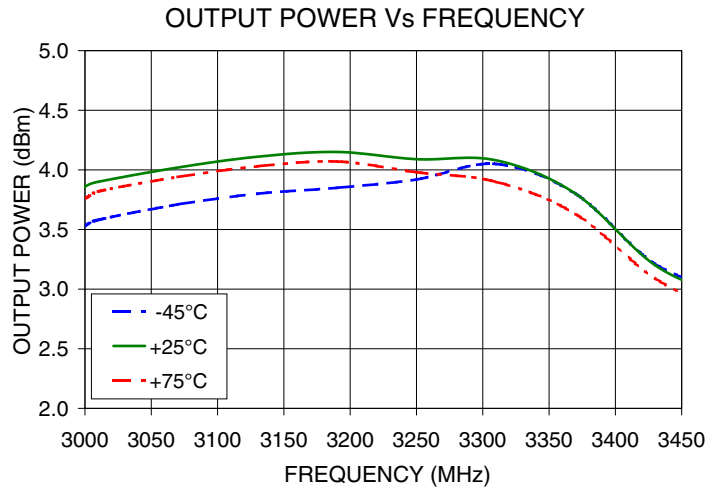
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Typical Performance Curves

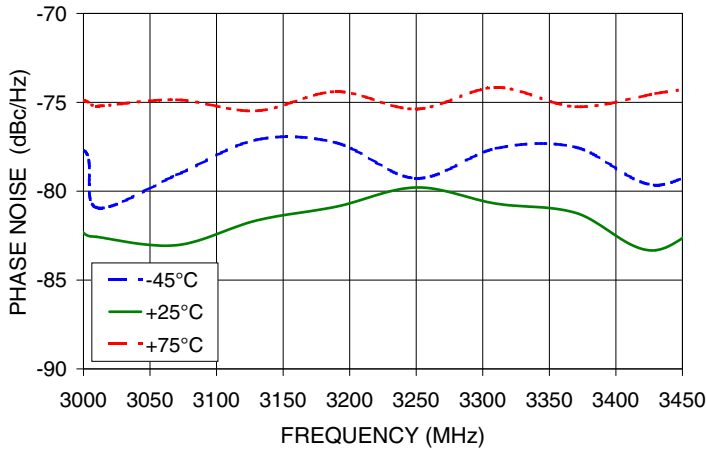


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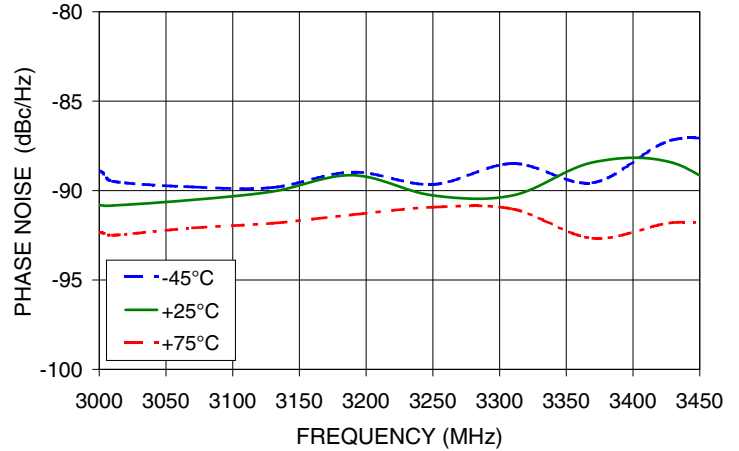
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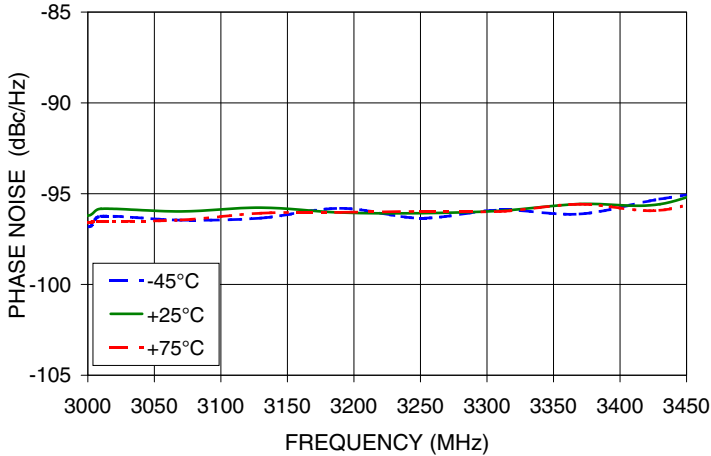
PHASE NOISE @ 100Hz offset



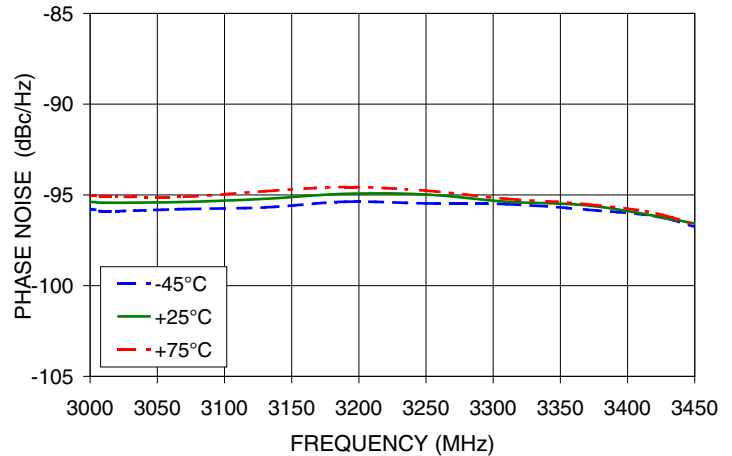
PHASE NOISE @ 1kHz offset



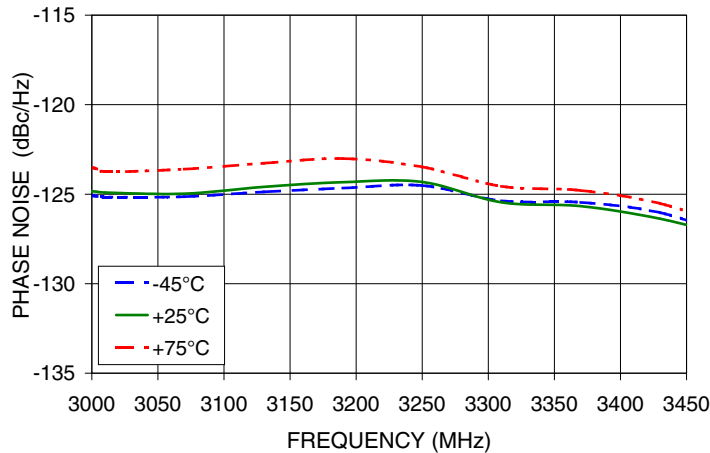
PHASE NOISE @ 10kHz offset



PHASE NOISE @ 100kHz offset



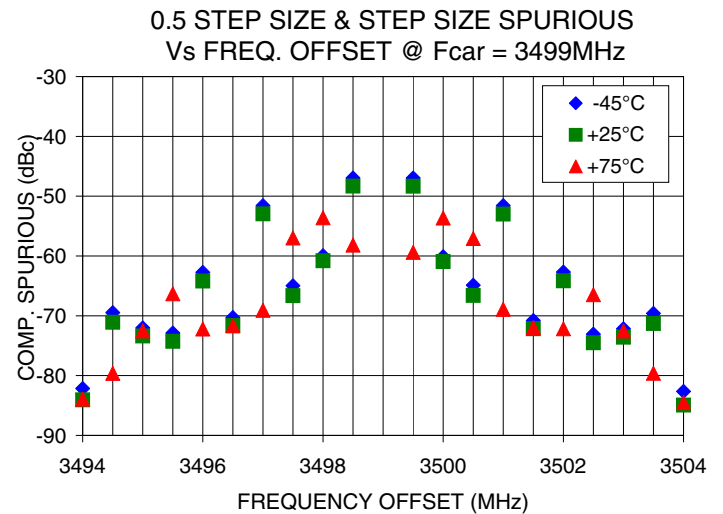
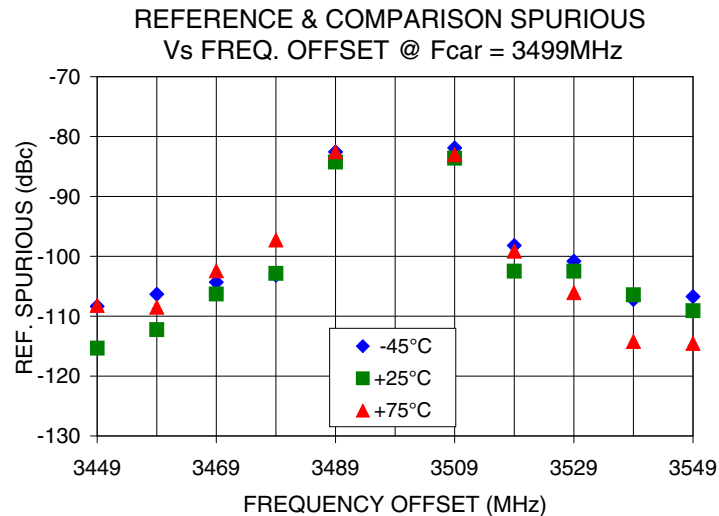
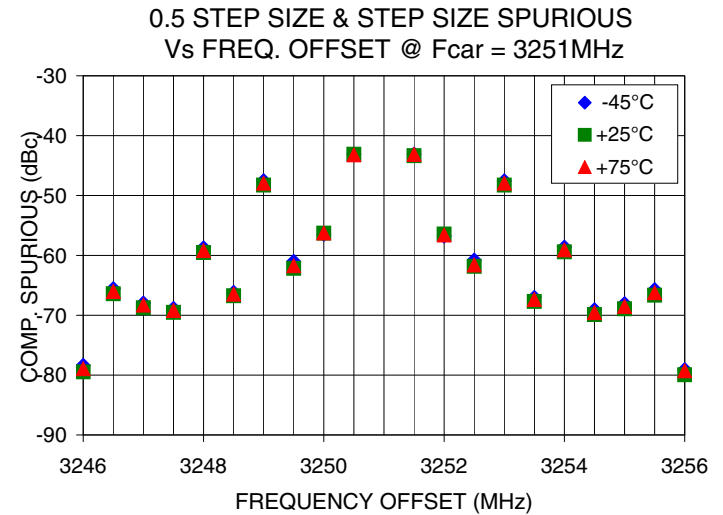
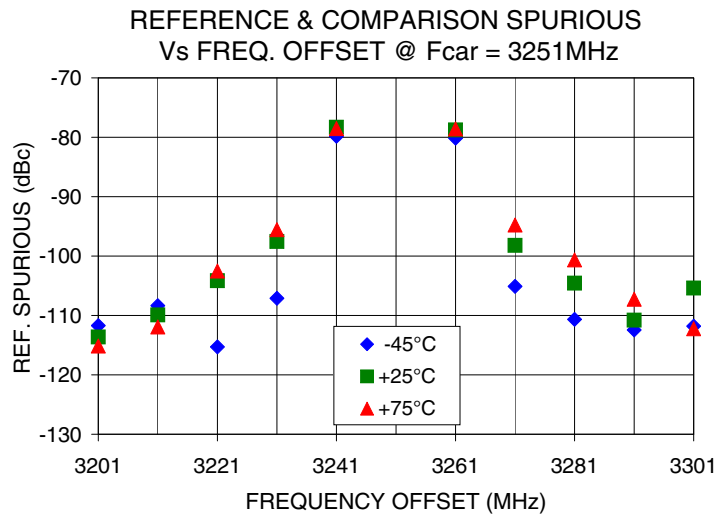
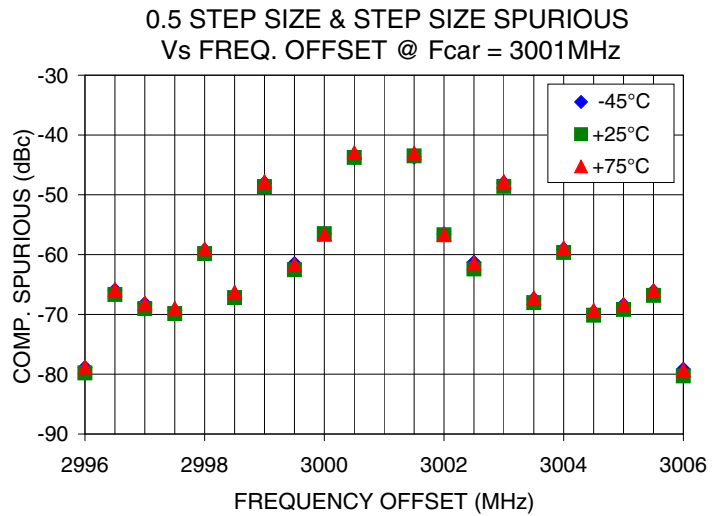
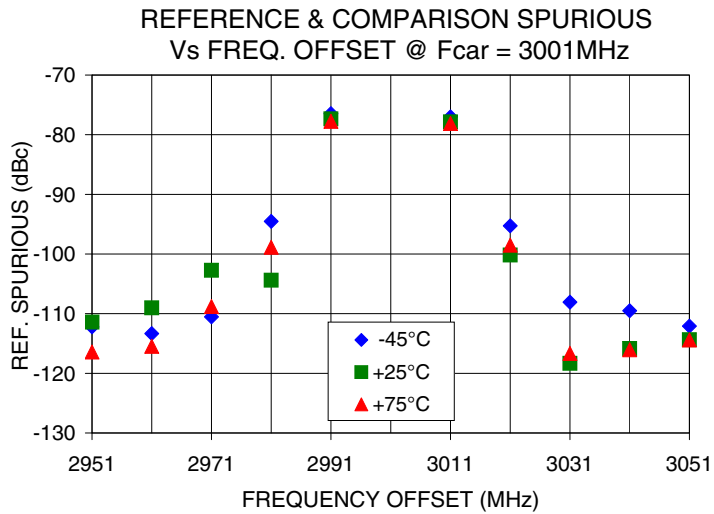
PHASE NOISE @ 1MHz offset



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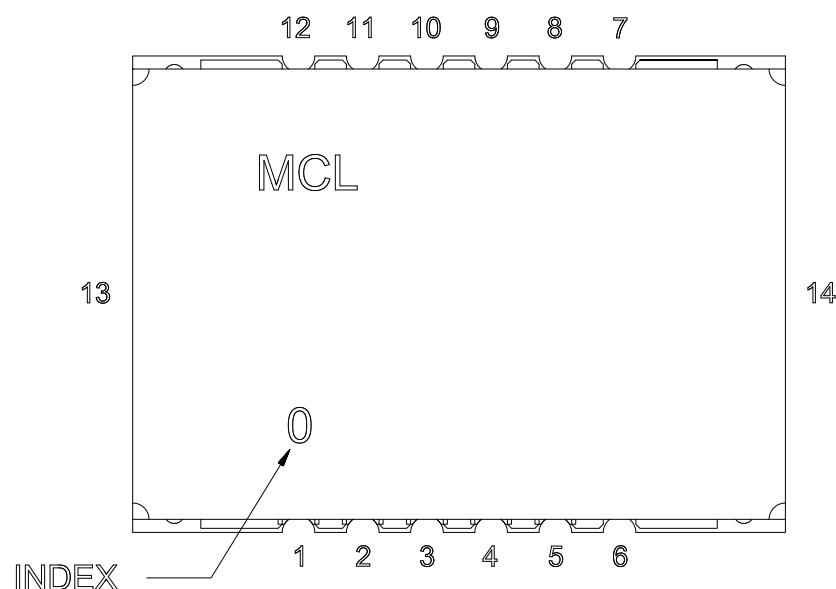


Notes

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Pin Configuration

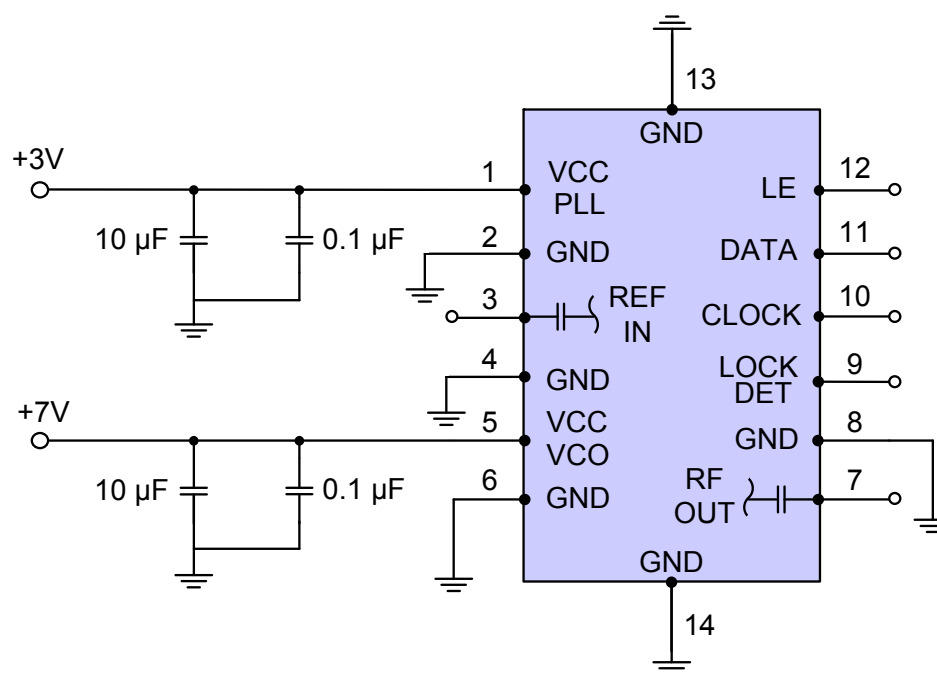


Pin Connection

Pin Number	Function
1	VCC PLL
2	GND
3	REF IN
4	GND
5	VCC VCO
6	GND
7	RF OUT
8	GND
9	LOCK DET
10	CLOCK
11	DATA
12	LE
13	GND
14	GND

Recommended Application Circuit

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

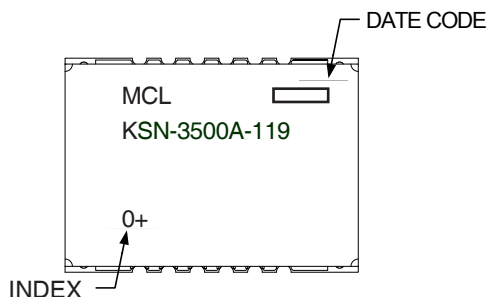


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Device Marking



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: DK1042

Tape & Reel: TR-F28

Suggested Layout for PCB Design: PL-249

Evaluation Board: TB-567-6+

Environment Ratings: ENV03T2

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