

# Frequency Synthesizer

KSN-3309A-119+

50Ω 3200.25 to 3309 MHz

## The Big Deal

- Low phase noise and spurious
- Robust design and construction
- Small size 0.80" x 0.58" x 0.24"



CASE STYLE: DK1182

## Product Overview

The KSN-3309A-119+ is a Frequency Synthesizer, designed to operate from 3200.25 to 3309 MHz for digital radio application. The KSN-3309A-119+ is packaged in a metal case (size of 0.80" x 0.58" x 0.24") 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: -98 dBc/Hz typ. @ 10 kHz offset</li><li>• Comparison Spurious: -80 dBc typ.</li><li>• Reference Spurious: -100 dBc typ.</li></ul>	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Robust design and construction	To enhance the robustness of KSN-3309A-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 0.24"	The small size enables the KSN-3309A-119+ to be used in compact designs.



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50Ω 3200.25 to 3309 MHz

### Features

- Integrated VCO + PLL
- Low phase noise and spurious
- Robust Design and Construction
- Low operating voltage (VCC VCO=5.00V, VCC PLL=5.00V)
- Small size 0.80" x 0.58" x 0.24"



CASE STYLE: DK1182  
PRICE: \$29.95 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.

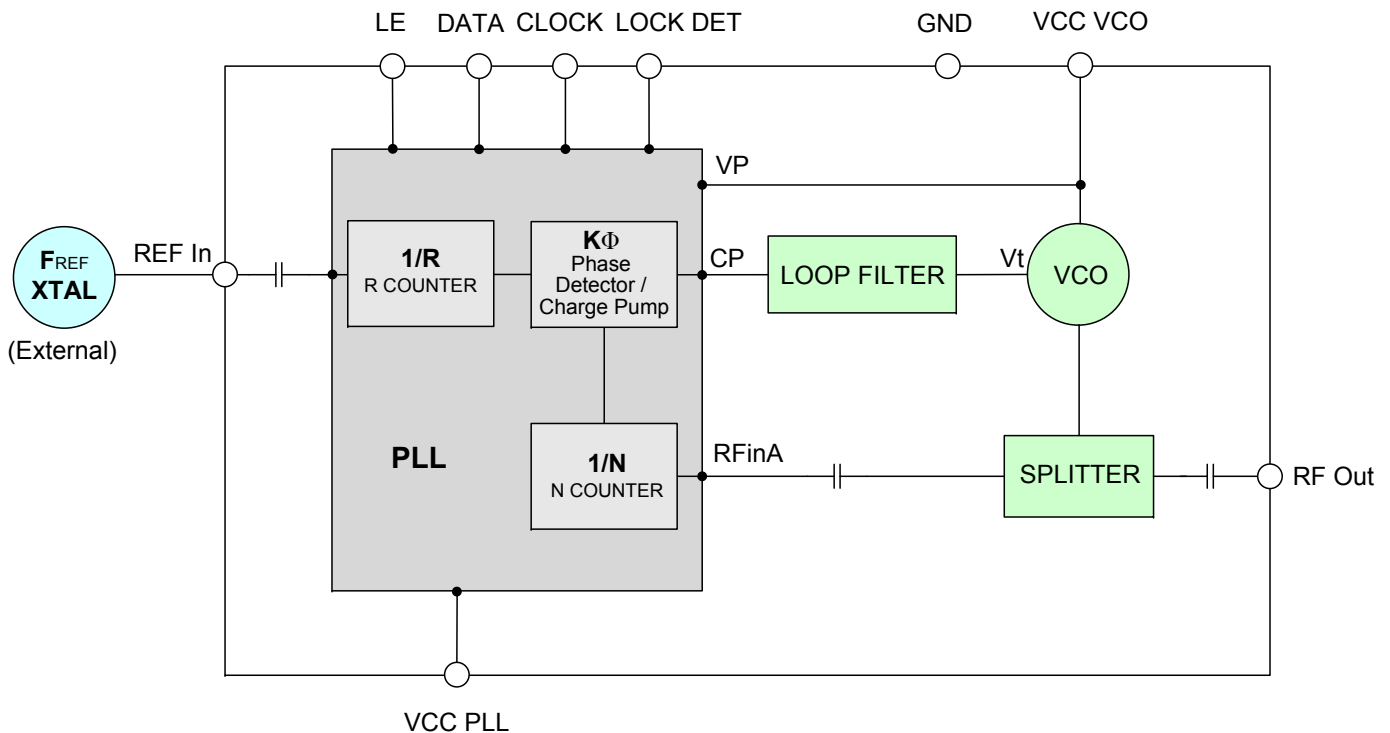
### Applications

- Digital radio

### General Description

The KSN-3309A-119+ is a Frequency Synthesizer, designed to operate from 3200.25 to 3309 MHz for digital radio application. The KSN-3309A-119+ is packaged in a metal case (size of 0.80" x 0.58" x 0.24") to shield against unwanted signals and noise. To enhance the robustness of KSN-3309A-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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**Electrical Specifications** (over operating temperature -40°C to +85°C)

Parameters	Test Conditions	Min.	Typ.	Max.	Units
Frequency Range	-	3200.25	-	3309	MHz
Step Size	-	-	250	-	kHz
Settling Time	Within ± 1 kHz	-	5	-	mSec
Output Power	-	+1.0	+3.5	+7.0	dBm
SSB Phase Noise	@ 100 Hz offset	-	-70	-	dBc/Hz
	@ 1 kHz offset	-	-72	-64	
	@ 10 kHz offset	-	-98	-93	
	@ 100 kHz offset	-	-124	-119	
	@ 1 MHz offset	-	-143	-137	
Reference Spurious Suppression	Ref. Freq. 10 MHz	-	-100	-70	dBc
Comparison Spurious Suppression	Step Size 250 kHz	-	-80	-65	
Non - Harmonic Spurious Suppression	-	-	-90	-	
Harmonic Suppression	-	-	-35	-24	
VCO Supply Voltage	5.00	4.75	5.00	5.25	
PLL Supply Voltage	5.00	4.75	5.00	5.25	V
VCO Supply Current	-	-	28	35	mA
PLL Supply Current	-	-	16	22	
Reference Input (External)	Frequency	10 (sine wave)	-	10	MHz
	Amplitude	1	-	1	V <sub>P-P</sub>
	Input impedance	-	-	100	KΩ
	Phase Noise @ 1 kHz offset	-	-	-140	dBc/Hz
RF Output port Impedance	-	-	50	-	Ω
Input Logic Level	Input high voltage	-	2.65	-	V
	Input low voltage	-	-	0.55	V
Digital Lock Detect	Locked	-	2.50	-	V
	Unlocked	-	-	0.40	V
Frequency Synthesizer PLL	-	ADF4113			
PLL Programming	-	3-wire serial 3V CMOS			
Register Map @ 3309 MHz	F_Register	-	(MSB) 100111111000000010010011 (LSB)		
	N_Register	-	(MSB) 001000011001110101010001 (LSB)		
	R_Register	-	(MSB) 000100000000000010100000 (LSB)		

**Absolute Maximum Ratings**

Parameters	Ratings
VCO Supply Voltage	5.7V
PLL Supply Voltage	6.3V
VCO Supply Voltage to PLL Supply Voltage	-0.3V to +5.5V
Reference Frequency Voltage	-0.3Vmin, +3.1Vmax
Data, Clock, LE Levels	-0.3Vmin, +3.1Vmax
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	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
	3200.25	3.87	3.42	2.93	26.69	27.68	28.58	14.40	15.87
3204.00	3.79	3.35	2.87	26.69	27.69	28.58	14.42	15.89	17.09
3221.00	3.49	3.21	2.74	26.69	27.68	28.57	14.42	15.90	17.10
3238.00	3.51	3.36	2.90	26.71	27.61	28.50	14.43	15.91	17.11
3255.00	3.94	3.48	3.09	26.59	27.59	28.46	14.44	15.92	17.12
3272.00	3.96	3.55	3.20	26.53	27.56	28.42	14.41	15.89	17.09
3289.00	3.69	3.41	3.09	26.51	27.53	28.37	14.42	15.90	17.10
3306.00	3.39	3.22	2.88	26.51	27.50	28.34	14.43	15.91	17.11
3309.00	3.34	3.20	2.86	26.51	27.49	28.34	14.44	15.93	17.13

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
3200.25	-40.51	-36.49	-33.17	-39.73	-41.78	-41.28
3204.00	-40.84	-36.84	-33.58	-40.68	-42.89	-41.98
3221.00	-40.45	-36.29	-32.87	-42.54	-40.80	-41.20
3238.00	-38.57	-35.29	-32.83	-38.47	-37.96	-38.57
3255.00	-34.99	-33.86	-31.41	-38.38	-35.90	-36.37
3272.00	-36.68	-34.67	-32.32	-37.61	-35.35	-35.91
3289.00	-35.49	-33.37	-30.58	-36.30	-35.03	-34.81
3306.00	-33.37	-32.03	-29.92	-34.92	-34.96	-35.04
3309.00	-32.85	-31.39	-29.26	-34.42	-34.64	-34.71



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FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	+25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
3200.25	-76.51	-74.92	-99.92	-126.01	-145.02
3204.00	-74.44	-73.89	-99.87	-125.71	-145.55
3221.00	-76.18	-72.83	-100.03	-126.38	-145.81
3238.00	-75.65	-75.00	-99.84	-126.37	-144.99
3255.00	-73.97	-72.01	-100.07	-126.52	-144.97
3272.00	-74.60	-75.07	-100.28	-126.44	-145.24
3289.00	-72.81	-72.24	-100.10	-126.20	-144.30
3306.00	-73.15	-72.84	-100.48	-126.23	-145.45
3309.00	-74.07	-73.65	-100.41	-126.18	-144.89

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	-45°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
3200.25	-66.37	-70.47	-97.63	-124.84	-143.23
3204.00	-64.12	-71.74	-97.39	-124.89	-143.21
3221.00	-65.30	-71.24	-97.45	-125.04	-143.32
3238.00	-65.71	-71.99	-97.37	-125.85	-143.60
3255.00	-66.19	-72.29	-97.67	-126.37	-144.88
3272.00	-66.88	-71.22	-98.11	-126.07	-144.47
3289.00	-64.78	-68.22	-98.53	-126.21	-145.12
3306.00	-64.91	-71.34	-99.21	-126.22	-142.66
3309.00	-64.65	-70.64	-99.45	-126.30	-142.72

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	+85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
3200.25	-76.41	-73.09	-98.19	-125.59	-145.22
3204.00	-73.20	-72.30	-98.12	-125.75	-145.70
3221.00	-75.25	-72.49	-98.15	-125.77	-145.27
3238.00	-74.50	-75.09	-98.02	-125.68	-145.37
3255.00	-73.68	-72.67	-98.31	-125.50	-144.02
3272.00	-74.11	-72.22	-99.12	-125.50	-144.86
3289.00	-72.24	-70.91	-98.71	-125.08	-144.46
3306.00	-72.57	-72.66	-99.08	-125.10	-144.11
3309.00	-71.38	-74.11	-99.19	-125.06	-143.45



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COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 3200.25MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 3255MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 3309MHz+(n*Fcomparison) (dBc) note 1		
	n			n			n		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-102.12	-106.36	-109.50	-101.22	-107.06	-110.55	-103.37	-108.54	-112.01
-4	-98.05	-103.80	-106.58	-98.70	-103.73	-107.04	-100.60	-105.95	-105.20
-3	-93.99	-98.69	-103.00	-94.68	-99.75	-103.45	-96.10	-100.07	-101.94
-2	-87.09	-92.16	-96.03	-88.19	-93.00	-96.41	-88.34	-92.71	-94.95
-1	-73.76	-78.97	-83.72	-74.52	-79.87	-83.01	-74.57	-79.75	-81.87
0 <sup>note 2</sup>	-	-	-	-	-	-	-	-	-
+1	-74.13	-79.50	-84.32	-74.89	-80.52	-84.21	-74.95	-79.93	-82.66
+2	-87.73	-93.43	-97.92	-88.91	-94.17	-97.76	-88.93	-93.69	-95.35
+3	-95.11	-100.56	-105.32	-95.96	-101.39	-105.63	-97.32	-101.10	-103.76
+4	-99.78	-105.19	-109.23	-100.30	-106.09	-109.15	-102.56	-107.93	-108.28
+5	-103.42	-109.79	-113.38	-102.70	-109.33	-113.74	-105.69	-109.31	-115.77

Note 1: Comparison frequency 250 kHz  
 Note 2: All spurs are referenced to carrier signal (n=0).

REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 3200.25MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 3255MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 3309MHz+(n*Freference) (dBc) note 3		
	n			n			n		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-121.81	-127.98	-118.18	-125.53	-121.18	-125.77	-124.21	-123.08	-121.20
-4	-112.86	-115.89	-114.16	-115.92	-114.64	-117.79	-118.20	-118.80	-116.05
-3	-121.24	-122.31	-124.31	-123.24	-120.49	-126.41	-121.61	-126.04	-125.74
-2	-108.66	-107.91	-107.29	-114.52	-112.21	-111.47	-118.72	-118.09	-114.46
-1	-93.41	-90.03	-90.60	-96.31	-94.39	-92.26	-96.63	-99.41	-96.70
0 <sup>note 4</sup>	-	-	-	-	-	-	-	-	-
+1	-103.51	-101.79	-95.38	-105.27	-101.22	-100.59	-109.59	-105.43	-101.50
+2	-113.81	-111.75	-115.20	-111.08	-111.39	-110.05	-111.23	-111.25	-111.26
+3	-125.18	-125.92	-126.71	-127.49	-126.65	-125.15	-126.04	-121.14	-126.89
+4	-122.39	-121.98	-123.24	-117.67	-117.72	-118.96	-118.68	-116.77	-118.17
+5	-120.77	-115.17	-118.86	-124.72	-126.75	-125.02	-123.61	-123.02	-125.27

Note 3: Reference frequency 10 MHz  
 Note 4: All spurs are referenced to carrier signal (n=0).



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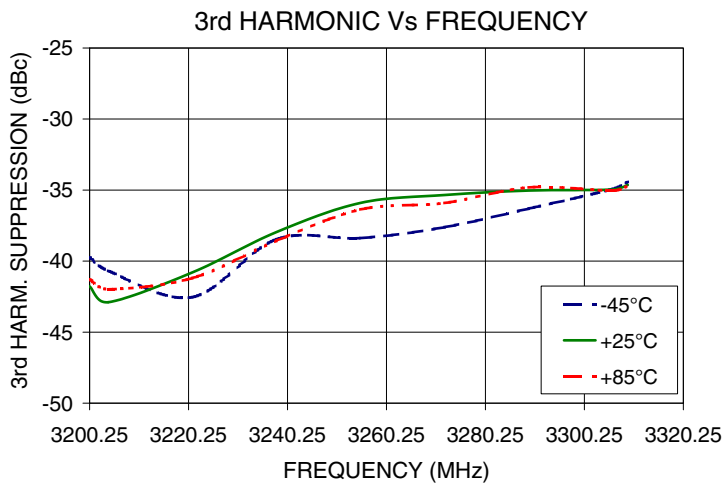
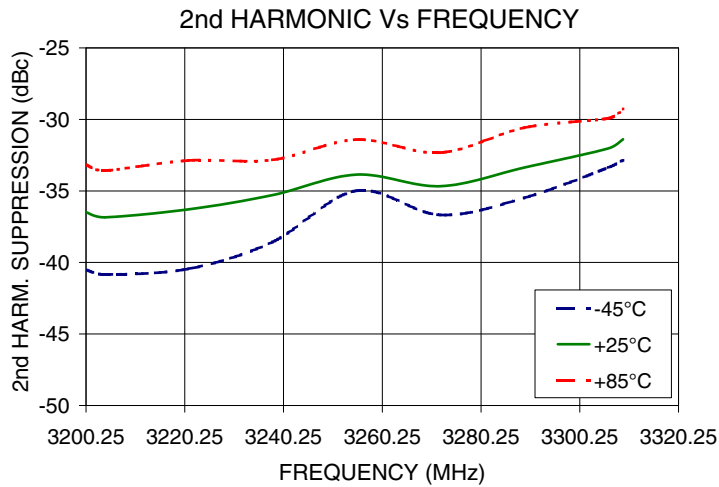
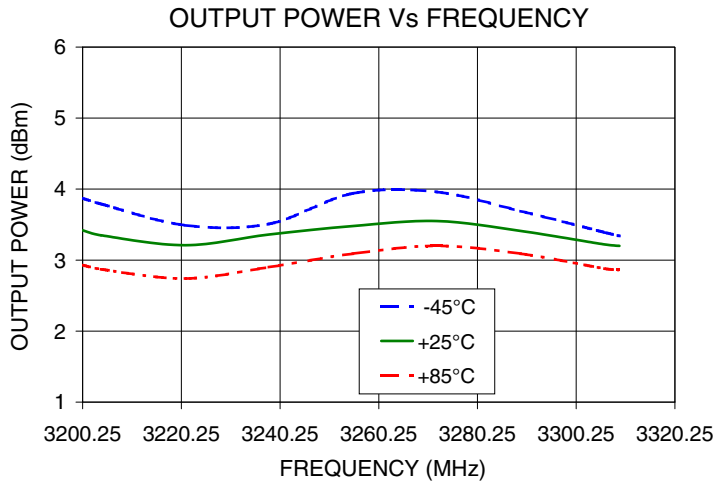


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Typical Performance Curves



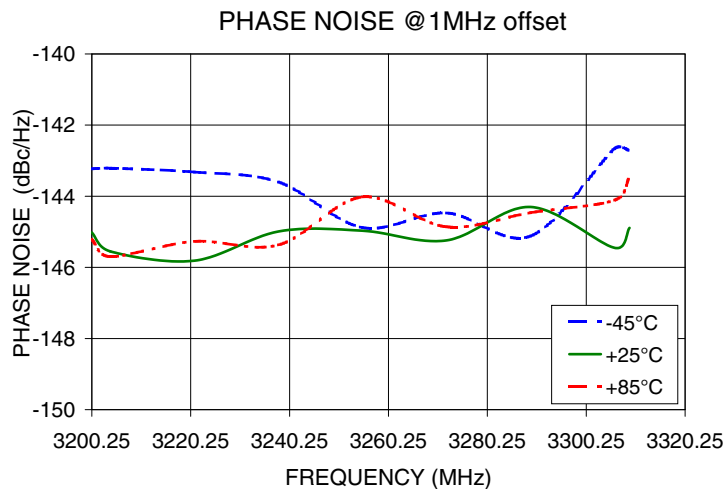
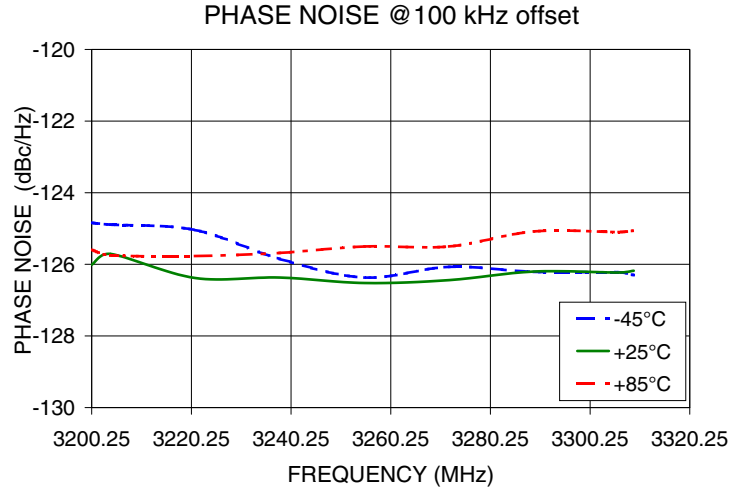
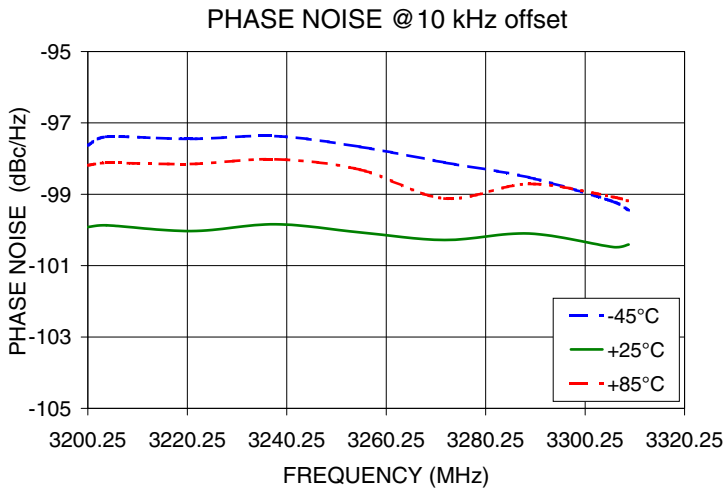
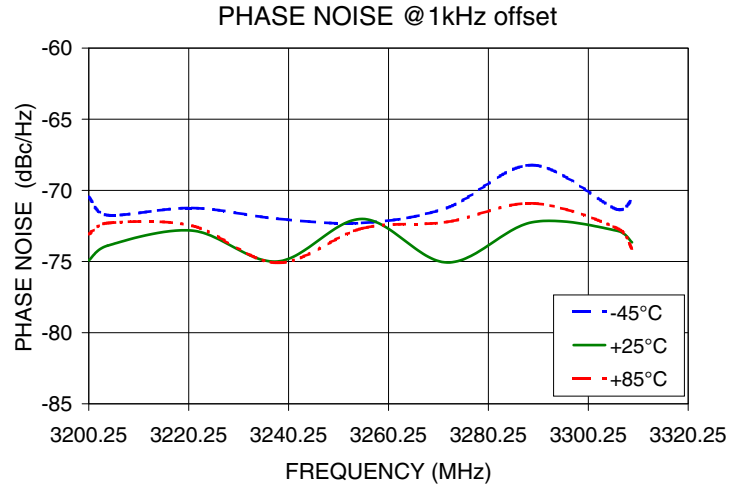
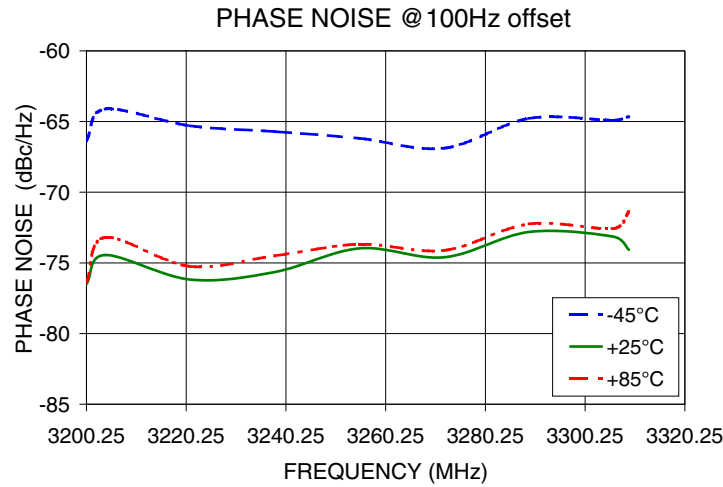
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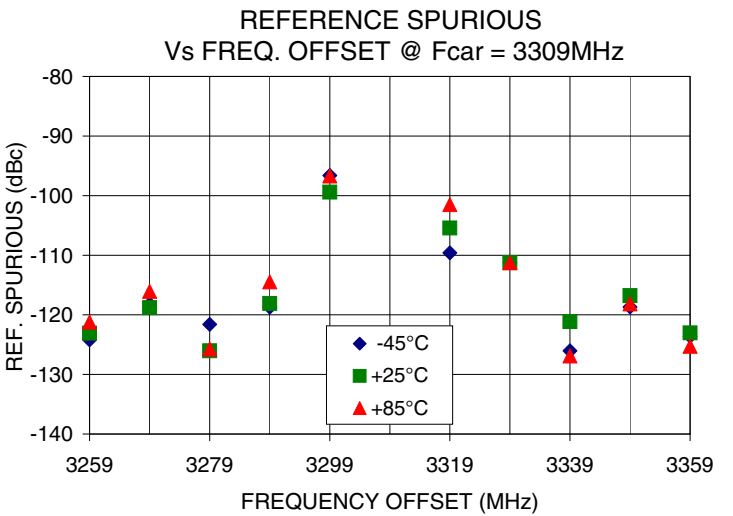
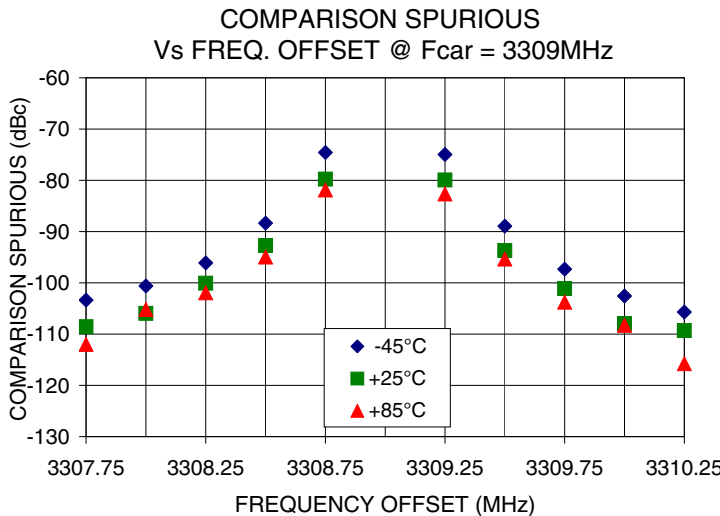
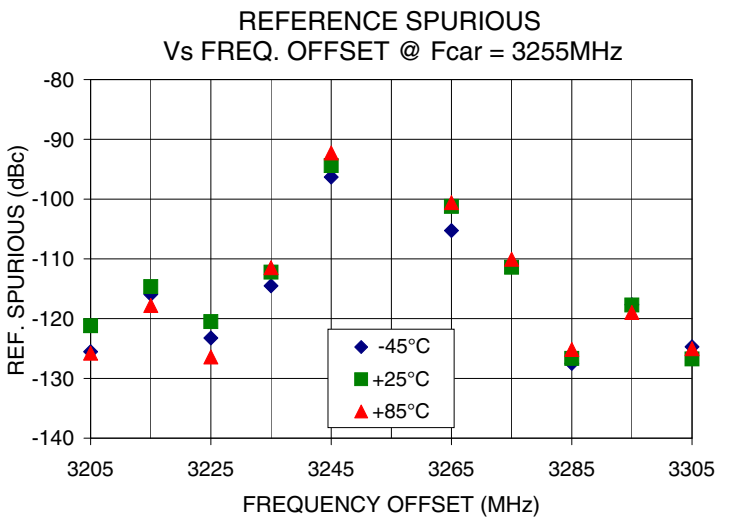
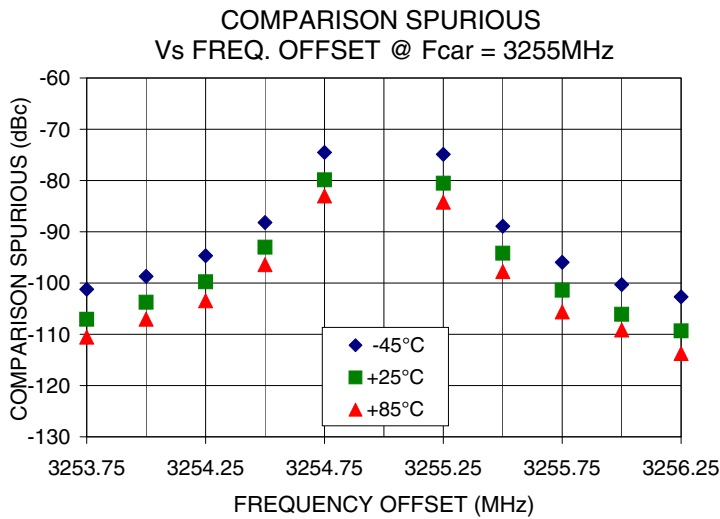
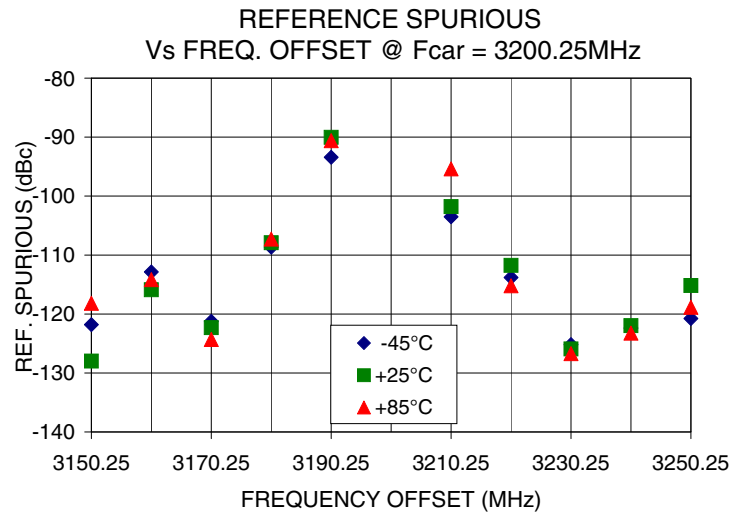
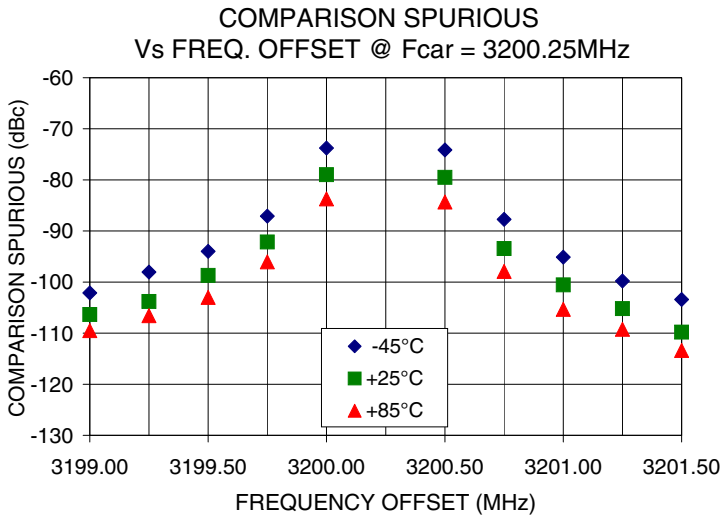


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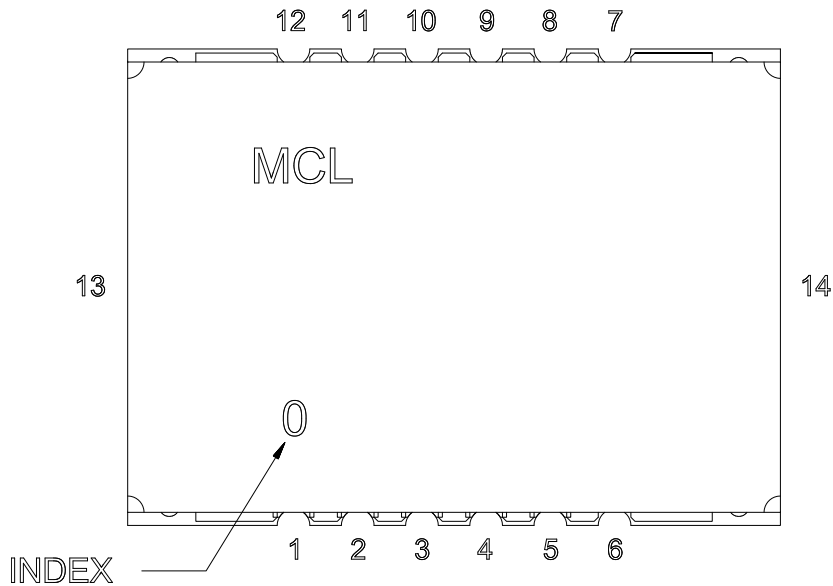


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Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained 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](http://www.minicircuits.com/MCLStore/terms.jsp).

Pin Configuration

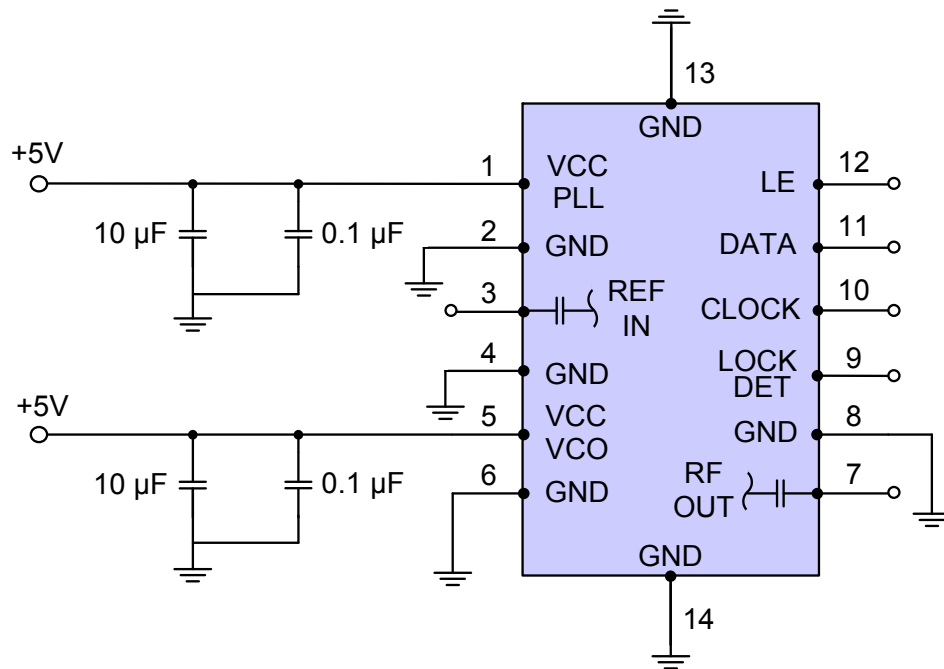


Pin Connection

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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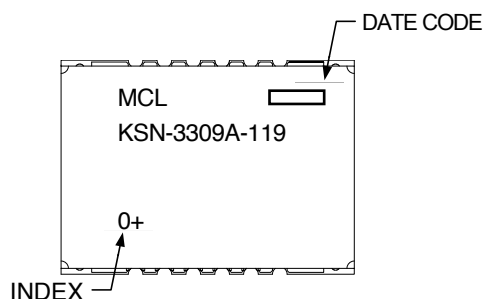


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## Device Marking



### 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:** DK1182

**Tape & Reel:** TR-F28

**Suggested Layout for PCB Design:** PL-249

**Evaluation Board:** TB-567+

**Environment Ratings:** ENV03T2



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Patent Pending

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