

Frequency Synthesizer

KSN-2170A-219+

50Ω 2110 to 2170 MHz

The Big Deal

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



CASE STYLE: DK801

Product Overview

The KSN-2170A-219+ is a Frequency Synthesizer, designed to operate from 2110 to 2170 MHz for UMTS application. The KSN-2170A-219+ 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: <ul style="list-style-type: none">• Phase Noise: -101 dBc/Hz typ. @ 10 kHz offset• Comparison Spurious: -89 dBc typ.• Reference Spurious: -97 dBc typ.	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Robust design and construction	To enhance the robustness of KSN-2170A-219+, 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-2170A-219+ 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/MCLStore/terms.jsp



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

Frequency Synthesizer

KSN-2170A-219+

50Ω 2110 to 2170 MHz



CASE STYLE: DK801

Features

- Integrated VCO + PLL
- Low phase noise and spurious
- Robust design and construction
- Low operating voltage (VCC VCO=+5V, VCC PLL=+5V)
- Small size 0.80" x 0.58" x 0.15"

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

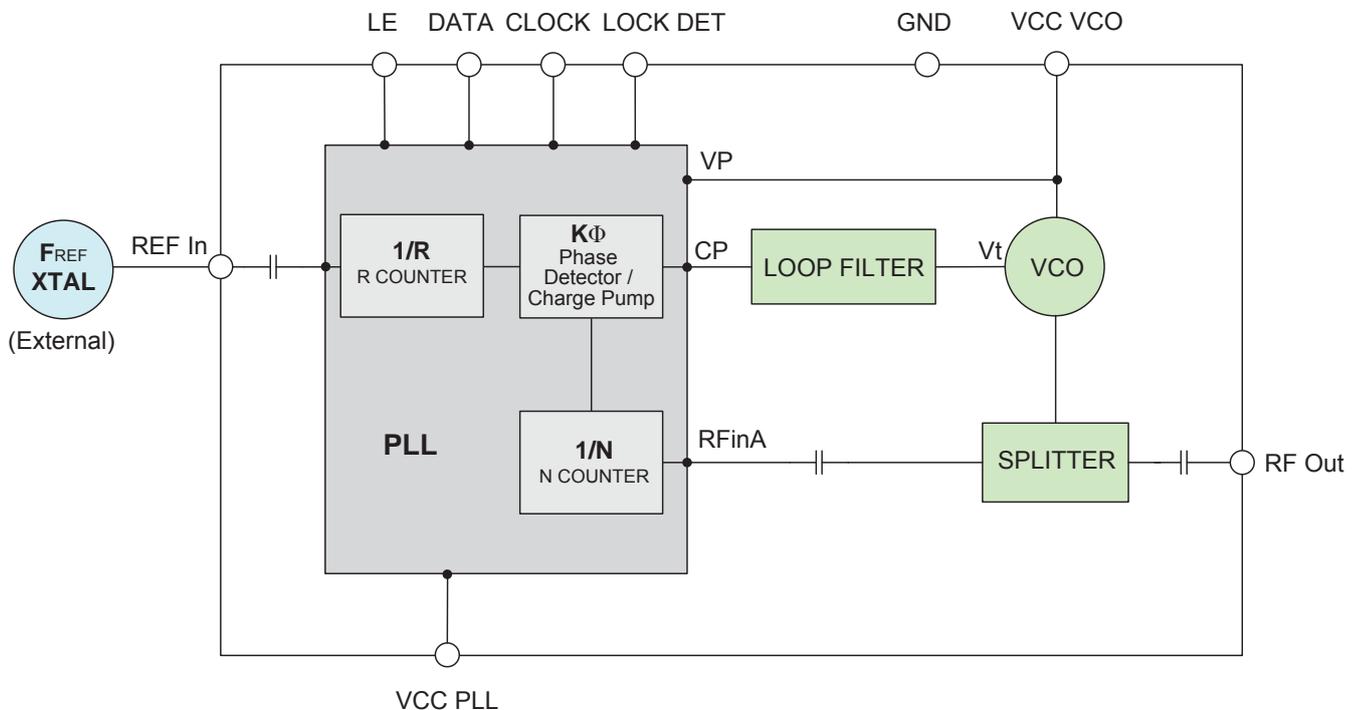
Applications

- UMTS

General Description

The KSN-2170A-219+ is a Frequency Synthesizer, designed to operate from 2110 to 2170 MHz for UMTS application. The KSN-2170A-219+ 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-2170A-219+, 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

- 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/MCLStore/terms.jsp

Electrical Specifications (over operating temperature -35°C to +85°C)

Parameters	Test Conditions	Min.	Typ.	Max.	Units	
Frequency Range	-	2110	-	2170	MHz	
Step Size	-	-	40	-	kHz	
Settling Time	Within ± 1 kHz	-	8	-	mSec	
Output Power	-	0	+2.5	+5.0	dBm	
SSB Phase Noise	@ 100 Hz offset	-	-68	-	dBc/Hz	
	@ 1 kHz offset	-	-73	-68		
	@ 10 kHz offset	-	-101	-96		
	@ 100 kHz offset	-	-125	-121		
	@ 1 MHz offset	-	-145	-140		
Reference Spurious Suppression	Ref. Freq. 15.84 MHz	-	-97	-73	dBc	
Comparison Spurious Suppression	Step Size 40 kHz	-	-89	-60		
Non - Harmonic Spurious Suppression	-	-	-90	-		
Harmonic Suppression	-	-	-39	-25		
VCO Supply Voltage	5.00	4.75	5.00	5.25	V	
PLL Supply Voltage	5.00	4.75	5.00	5.25		
VCO Supply Current	-	-	27	35	mA	
PLL Supply Current	-	-	23	30		
Reference Input (External)	Frequency	15.84 (square wave)	-	15.84	-	MHz
	Amplitude	1	-	1	-	V _{R-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	-	2.85	-	-	V
	Input low voltage	-	-	-	0.60	V
Digital Lock Detect	Locked	-	2.80	-	3.55	V
	Unlocked	-	-	-	0.60	V
Frequency Synthesizer PLL	-	ADF4106				
PLL Programming	-	3-wire serial 3.3V CMOS				
Register Map @ 2170 MHz	F_Register	-	(MSB) 100111111000000010010011 (LSB)			
	N_Register	-	(MSB) 000001101001111100101001 (LSB)			
	R_Register	-	(MSB) 000100000000011000110000 (LSB)			

Absolute Maximum Ratings

Parameters	Ratings
VCO Supply Voltage	5.8V
PLL Supply Voltage	5.3V
VCO Supply Voltage to PLL Supply Voltage	-0.3V to +5.8V
Reference Frequency Voltage	-0.3Vmin, +3.5Vmax
Data, Clock, LE Levels	-0.3Vmin, +3.5Vmax
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

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/MCLStore/terms.jsp



Typical Performance Data

FREQUENCY (MHz)	POWER OUTPUT			VCO CURRENT			PLL CURENT		
	(dBm)			(mA)			(mA)		
	-40°C	+25°C	+85°C	-40°C	+25°C	+85°C	-40°C	+25°C	+85°C
2110	2.72	2.58	2.17	26.19	27.48	28.41	22.26	23.67	24.96
2120	2.71	2.57	2.15	26.13	27.43	28.37	22.27	23.68	24.97
2130	2.71	2.56	2.13	26.07	27.38	28.34	22.27	23.68	24.98
2140	2.74	2.58	2.14	26.00	27.32	28.30	22.27	23.69	24.99
2150	2.81	2.65	2.19	25.95	27.27	28.26	22.28	23.69	24.99
2160	2.80	2.65	2.17	25.90	27.23	28.23	22.28	23.69	24.99
2170	2.77	2.62	2.14	25.85	27.19	28.20	22.28	23.69	24.99

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-40°C	+25°C	+85°C	-40°C	+25°C	+85°C
2110	-51.50	-57.50	-47.07	-36.71	-38.14	-41.62
2120	-52.99	-56.90	-46.96	-35.59	-35.83	-40.10
2130	-56.20	-52.42	-46.54	-35.22	-36.66	-40.82
2140	-57.82	-51.01	-46.13	-33.11	-35.18	-40.45
2150	-54.57	-51.04	-46.46	-34.61	-37.21	-41.20
2160	-51.21	-53.34	-47.75	-35.01	-38.27	-42.80
2170	-50.26	-57.75	-49.23	-35.73	-39.62	-43.62

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	+25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
2110	-67.92	-74.99	-101.09	-125.68	-145.94
2120	-67.74	-74.28	-100.93	-125.77	-144.67
2130	-74.87	-74.52	-100.99	-125.58	-145.74
2140	-66.70	-74.87	-101.02	-125.34	-145.56
2150	-63.84	-73.42	-101.05	-125.03	-145.36
2160	-66.49	-72.62	-100.73	-124.82	-145.19
2170	-74.88	-72.69	-100.91	-124.74	-145.34

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	-40°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
2110	-72.41	-73.40	-101.56	-125.69	-146.15
2120	-73.01	-72.94	-101.10	-125.73	-145.78
2130	-70.08	-74.77	-101.07	-125.68	-146.08
2140	-70.54	-73.18	-100.70	-125.38	-145.65
2150	-73.70	-74.35	-100.20	-125.30	-145.55
2160	-72.31	-74.46	-100.32	-125.17	-145.57
2170	-74.00	-72.55	-100.32	-125.11	-145.45

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	+85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
2110	-73.24	-74.80	-100.85	-125.07	-145.16
2120	-75.15	-75.06	-101.23	-124.76	-144.51
2130	-68.17	-74.38	-100.64	-124.73	-145.07
2140	-73.68	-74.06	-100.26	-124.58	-144.70
2150	-78.09	-73.65	-100.57	-124.36	-144.48
2160	-71.83	-75.71	-100.11	-124.16	-144.44
2170	-71.56	-73.63	-100.52	-124.25	-144.62

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/MCLStore/terms.jsp



COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 2110MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 2140MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 2170MHz+(n*Fcomparison) (dBc) note 1		
	n	-40°C	+25°C	+85°C	-40°C	+25°C	+85°C	-40°C	+25°C
-5	-111.98	-101.50	-103.14	-97.21	-105.94	-109.99	-100.07	-103.64	-107.48
-4	-106.91	-103.55	-95.98	-99.54	-95.62	-96.80	-96.65	-100.64	-106.36
-3	-100.88	-99.32	-100.32	-103.95	-98.04	-99.05	-104.64	-106.53	-103.92
-2	-96.99	-97.12	-97.82	-101.63	-94.20	-93.33	-83.24	-80.77	-84.35
-1	-88.45	-88.15	-87.12	-88.56	-87.51	-83.21	-86.89	-89.50	-79.51
0 note 2	-	-	-	-	-	-	-	-	-
+1	-88.22	-88.52	-81.85	-88.69	-91.24	-83.35	-88.45	-89.87	-79.67
+2	-95.98	-97.24	-95.11	-101.28	-95.56	-92.05	-82.92	-81.24	-82.76
+3	-100.13	-100.51	-101.16	-103.32	-96.42	-98.03	-105.46	-108.91	-104.34
+4	-103.38	-104.65	-93.38	-97.72	-96.62	-92.66	-99.78	-101.33	-108.76
+5	-106.96	-101.36	-100.45	-99.02	-102.54	-106.88	-102.00	-106.01	-108.98

Note 1: Comparison frequency 40 kHz

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

REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 2110MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 2140MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 2170MHz+(n*Freference) (dBc) note 3		
	n	-40°C	+25°C	+85°C	-40°C	+25°C	+85°C	-40°C	+25°C
-5	-131.76	-131.25	-127.08	-122.43	-128.52	-130.08	-131.55	-130.47	-128.11
-4	-121.21	-123.09	-121.94	-122.53	-126.14	-122.60	-115.91	-118.75	-118.98
-3	-124.05	-130.61	-130.54	-125.04	-131.11	-130.06	-120.38	-127.63	-129.28
-2	-120.26	-124.00	-120.29	-109.08	-109.99	-114.58	-119.67	-118.00	-121.71
-1	-100.56	-100.51	-98.57	-101.90	-98.21	-92.15	-94.80	-94.82	-115.55
0 note 4	-	-	-	-	-	-	-	-	-
+1	-93.78	-93.70	-91.93	-92.15	-91.11	-94.45	-110.83	-107.13	-102.39
+2	-117.40	-120.24	-126.62	-119.58	-120.36	-121.21	-112.52	-109.80	-116.98
+3	-112.60	-117.36	-121.38	-114.96	-120.56	-122.73	-116.11	-123.09	-127.14
+4	-112.69	-114.06	-113.70	-112.20	-114.17	-116.34	-116.95	-116.45	-114.78
+5	-120.00	-123.64	-122.75	-115.32	-122.42	-125.39	-126.71	-131.30	-127.36

Note 3: Reference frequency 15.84 MHz

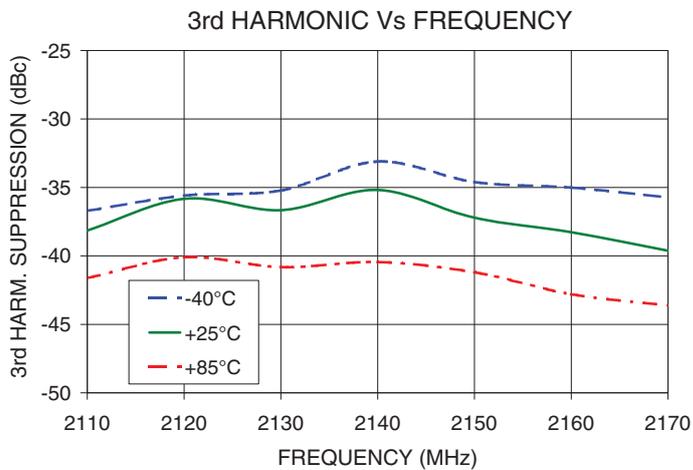
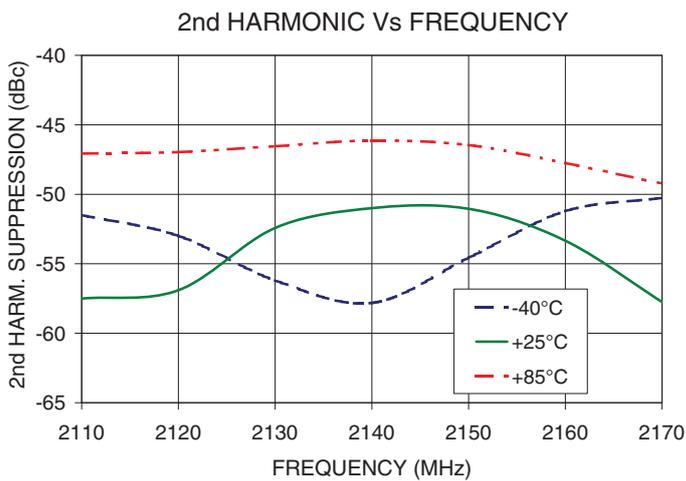
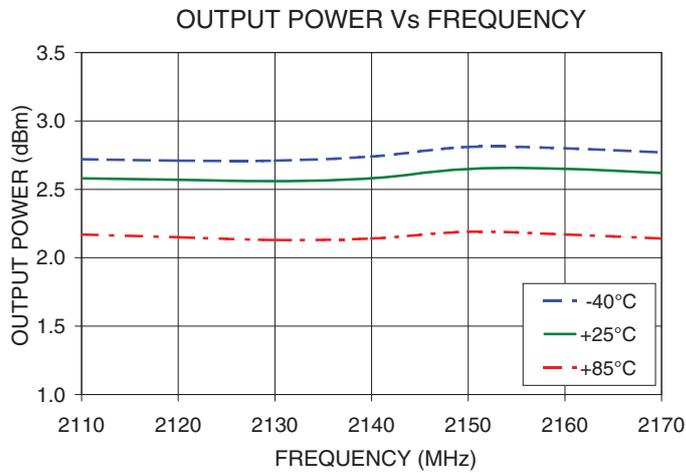
Note 4: All spurs are referenced to carrier signal (n=0).

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/MCLStore/terms.jsp



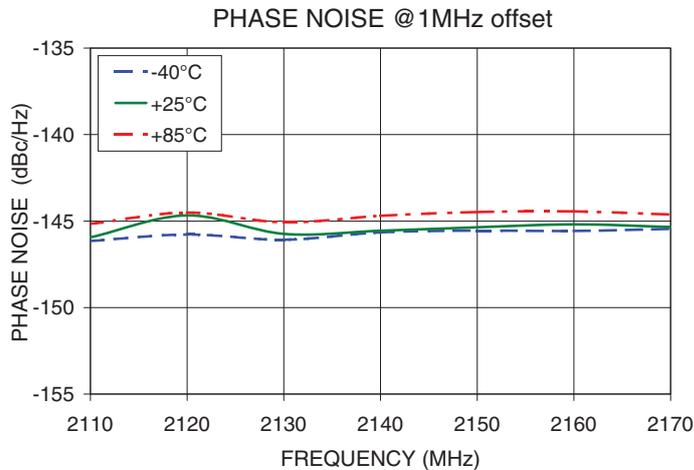
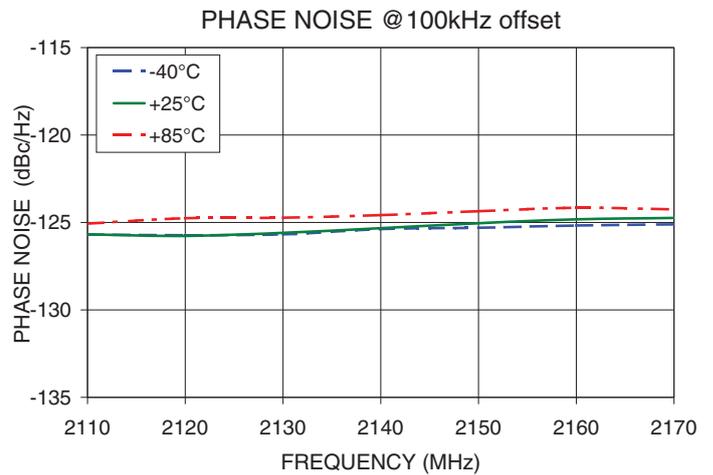
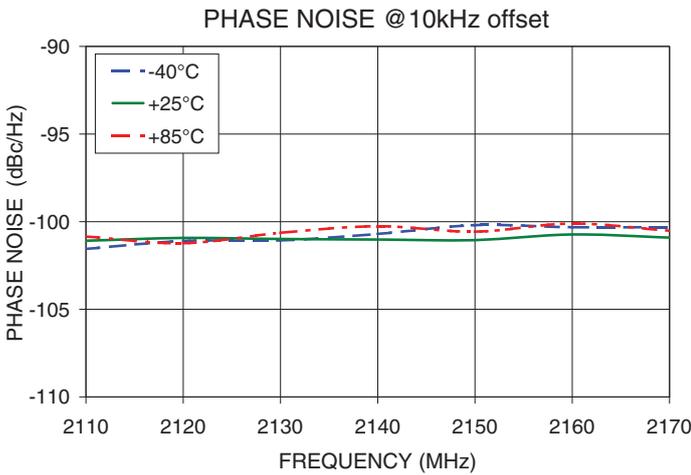
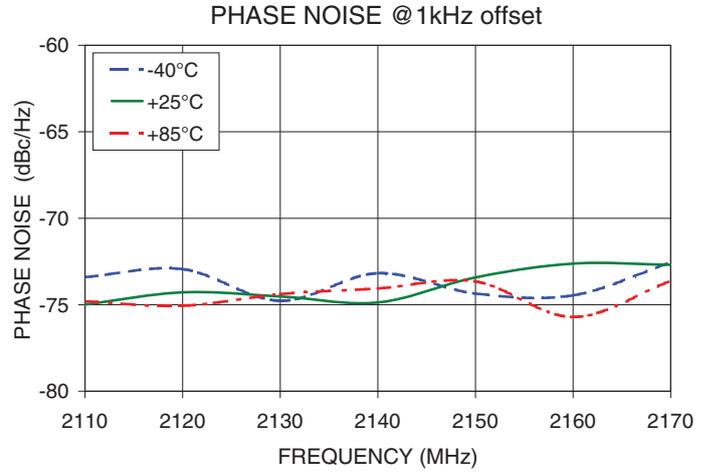
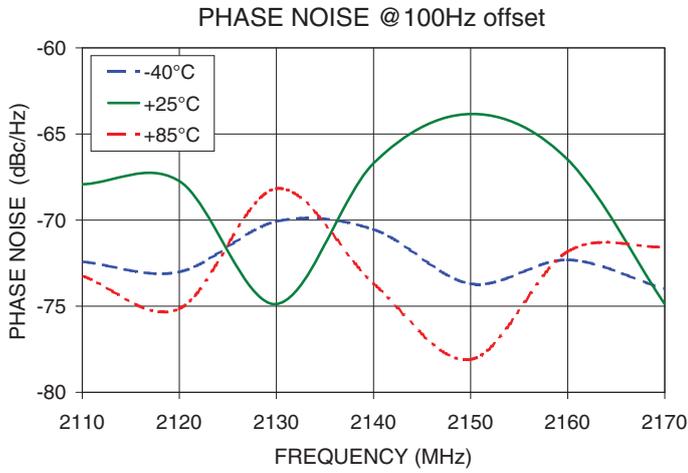
Typical Performance Curves



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/MCLStore/terms.jsp

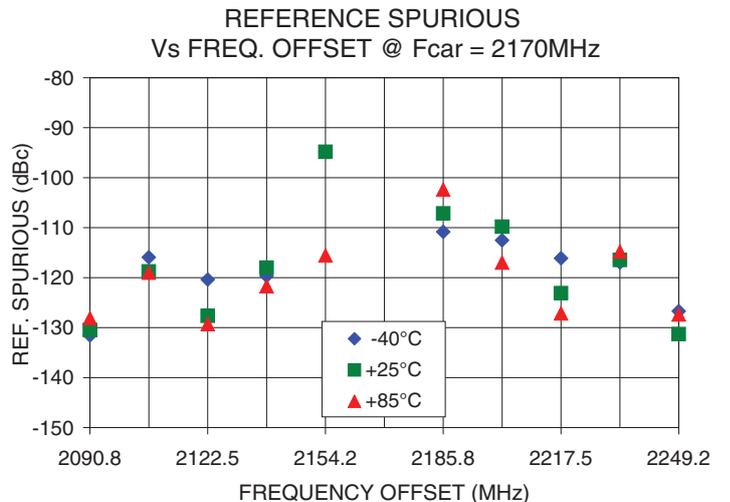
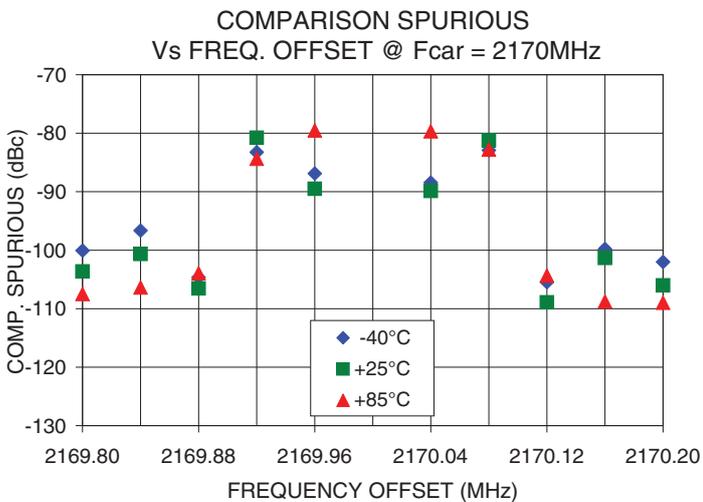
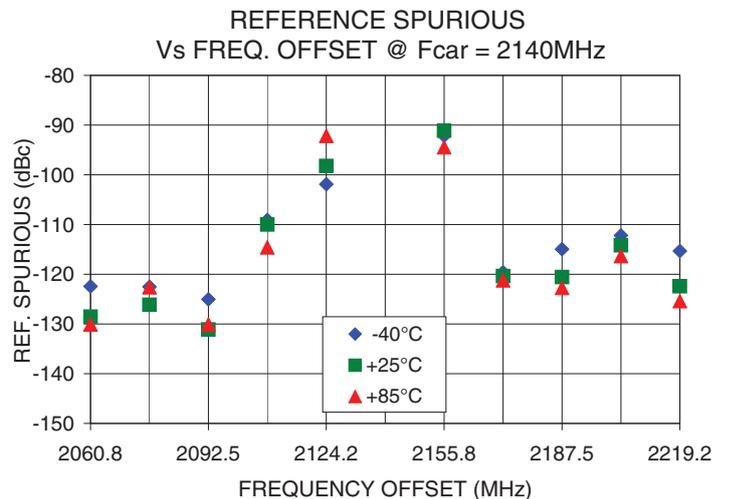
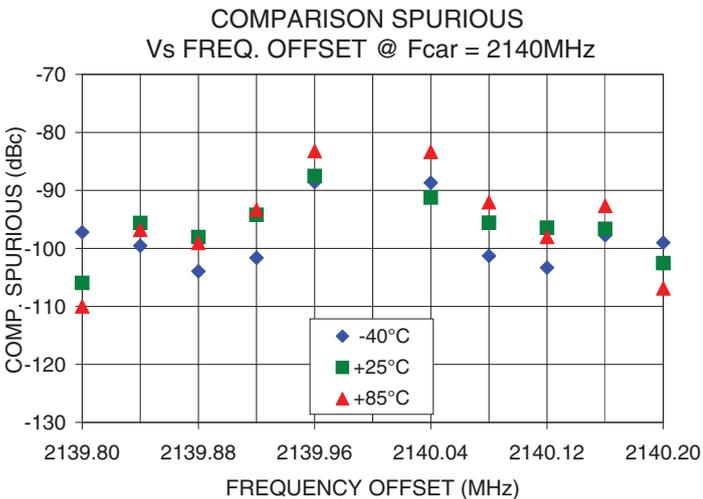
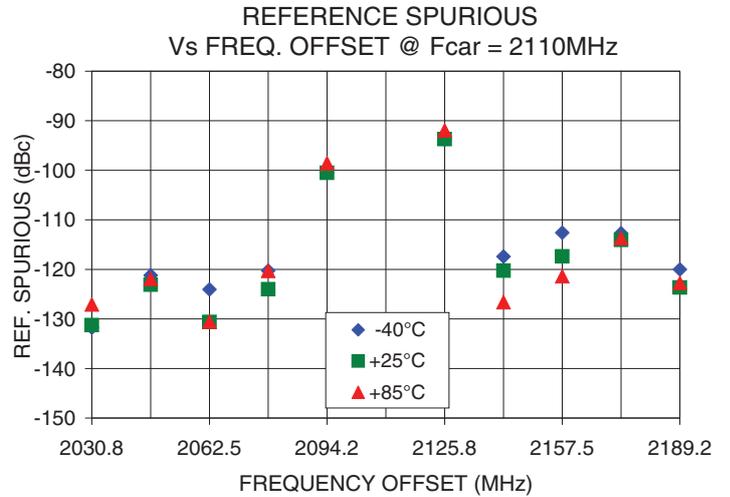
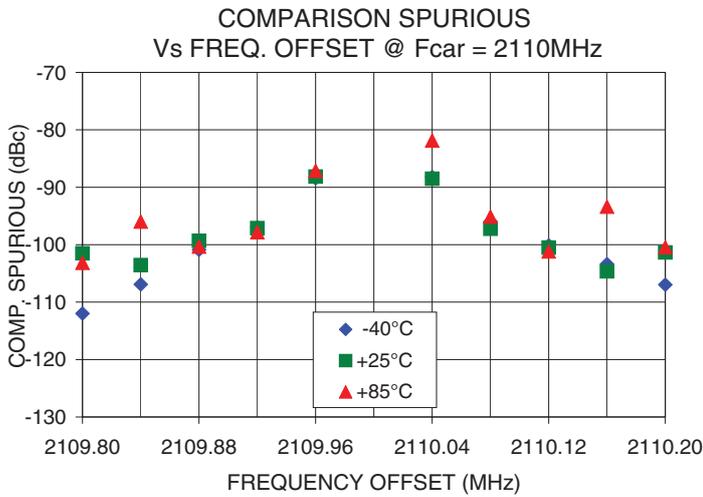




Notes

- 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/MCLStore/terms.jsp



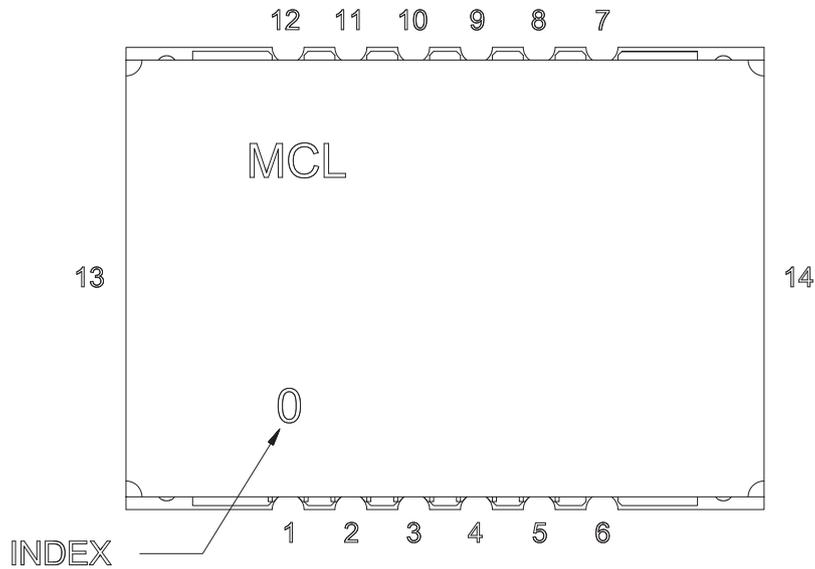


Notes

- 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-Circuits' 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/MCLStore/terms.jsp



Pin Configuration

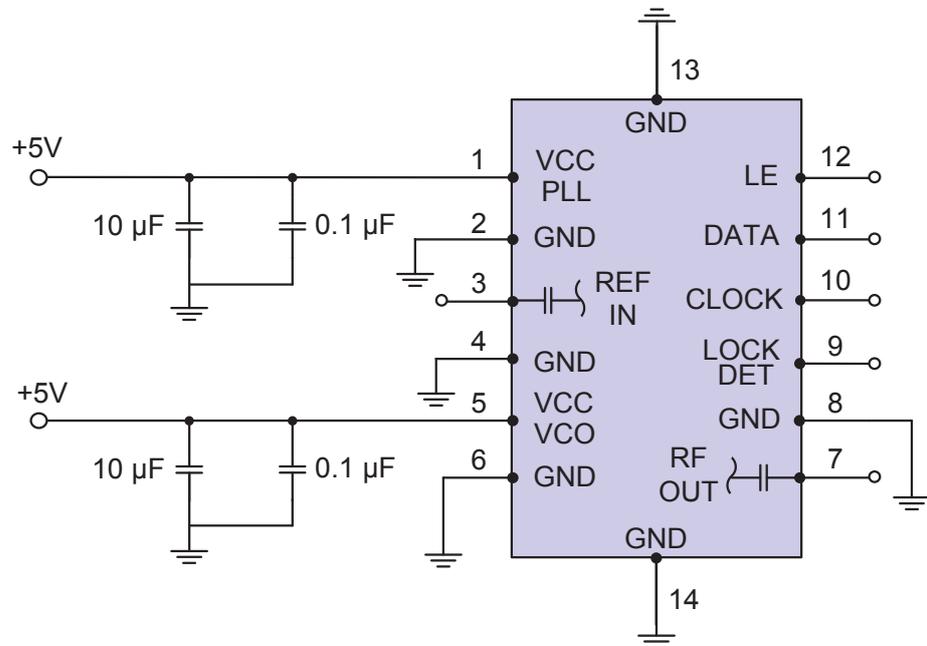


Pin Connection

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

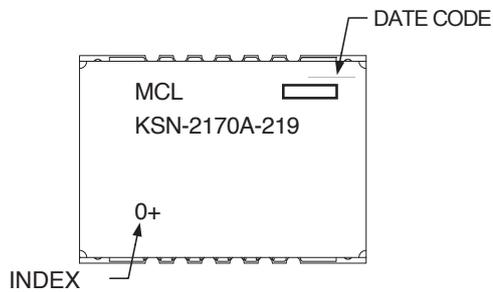
Note: REF IN and RF OUT ports are internally AC coupled.



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/MCLStore/terms.jsp



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: DK801

Tape & Reel: TR-F28

Suggested Layout for PCB Design: PL-249

Evaluation Board: TB-567+

Environment Ratings: ENV03T2

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/MCLStore/terms.jsp

