

Frequency Synthesizer

KSN-716A-119+

50Ω 698 to 716 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-716A-119+ is a Frequency Synthesizer, designed to operate from 698 to 716 MHz for base station application. The KSN-716A-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: -110 dBc/Hz typ. @ 10 kHz offset • Comparison Spurious: -77 dBc typ. • Reference Spurious: -116 dBc typ.	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Robust design and construction	To enhance the robustness of KSN-716A-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-716A-119+ to be used in compact designs.



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50Ω 698 to 716 MHz

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"

Applications

- Base station

General Description

The KSN-716A-119+ is a Frequency Synthesizer, designed to operate from 698 to 716 MHz for base station application. The KSN-716A-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-716A-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.



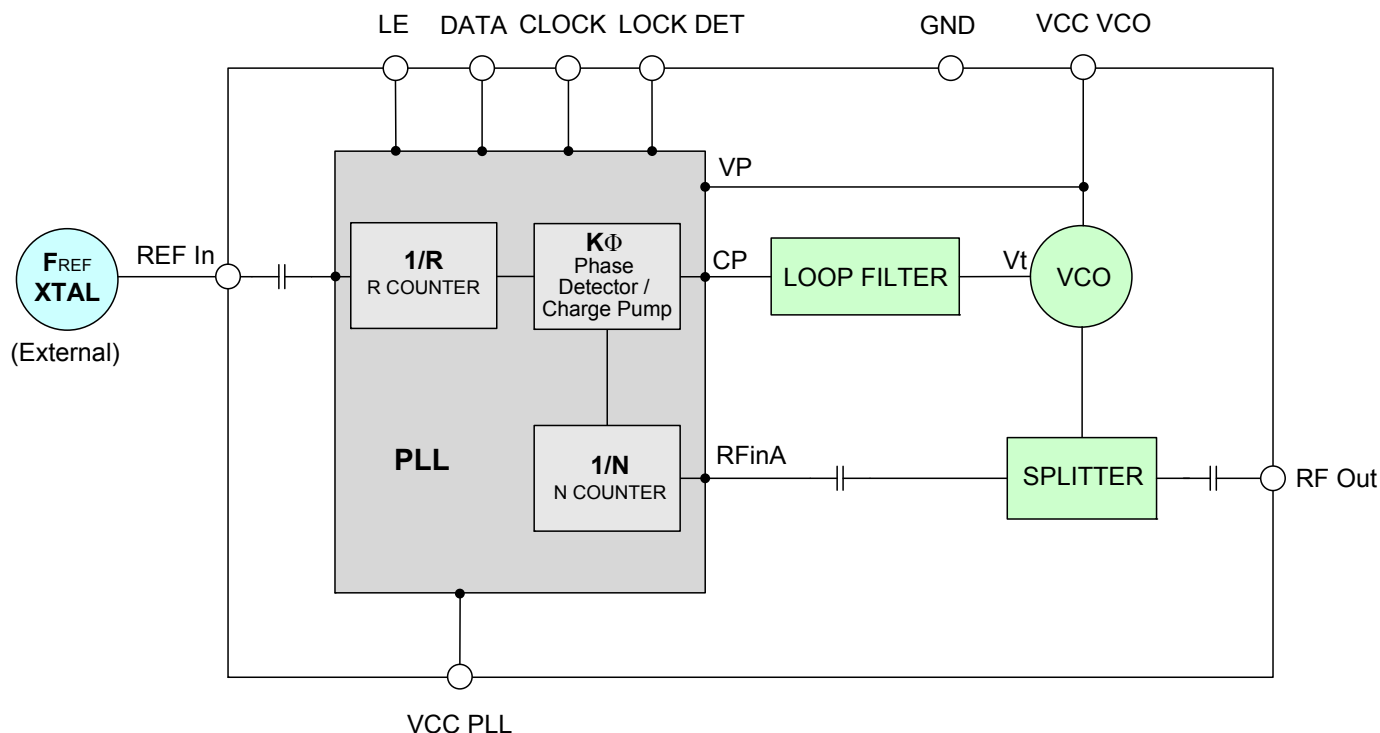
CASE STYLE: DK801

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
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Simplified Schematic



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REV. OR
M126018
EDR-8977F1
KSN-716A-119+
Category-A1
RAV
100314
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Electrical Specifications (over operating temperature -40°C to +85°C)

Parameters		Test Conditions	Min.	Typ.	Max.	Units
Frequency Range		-	698	-	716	MHz
Step Size		-	-	50	-	kHz
Settling Time		Within ± 1 kHz	-	20	-	mSec
Output Power		-	-2.5	0	+2.5	dBm
SSB Phase Noise		@ 100 Hz offset	-	-75	-	dBc/Hz
		@ 1 kHz offset	-	-80	-74	
		@ 10 kHz offset	-	-110	-106	
		@ 100 kHz offset	-	-131	-127	
		@ 1 MHz offset	-	-148	-143	
Integrated SSB Phase Noise		@100 Hz to 1MHz	-	-44	-33	dBc
Reference Spurious Suppression		Ref. Freq. 15 MHz	-	-116	-85	dBc
Comparison Spurious Suppression		Step Size 50 kHz	-	-77	-55	
Non - Harmonic Spurious Suppression		-	-	-90	-	
Harmonic Suppression		-	-	-28	-22	
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		-	-	35	40	mA
PLL Supply Current		-	-	11	19	
Reference Input (External)	Frequency	15 (square wave)	-	15	-	MHz
	Amplitude	1	-	1	-	V _{P-P}
	Input impedance	-	-	100	-	K Ω
	Phase Noise @ 1 kHz offset	-	-	-140	-	dBc/Hz
RF Output port Impedance		-	-	50	-	Ω
Input Logic Level	Input high voltage	-	4.20	-	-	V
	Input low voltage	-	-	-	0.95	V
Digital Lock Detect	Locked	-	4.35	-	5.25	V
	Unlocked	-	-	-	0.40	V
Frequency Synthesizer PLL		-	ADF4113			
PLL Programming		-	3-wire serial 5V CMOS			
Register Map @ 716 MHz	F_Register	-	(MSB) 010111111000000010010011 (LSB)			
	N_Register	-	(MSB) 001000110111111100000001 (LSB)			
	R_Register	-	(MSB) 000100000000010010110000 (LSB)			

Absolute Maximum Ratings

Parameters	Ratings
VCO Supply Voltage	6.8V
PLL Supply Voltage	6.8V
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			VCO CURRENT			PLL CURENT		
	(dBm)			(mA)			(mA)		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
698.0	0.03	0.15	0.19	33.74	34.76	35.57	9.64	11.85	14.21
700.0	0.05	0.16	0.20	33.76	34.77	35.58	9.63	11.85	14.21
702.0	0.07	0.18	0.22	33.77	34.79	35.60	9.63	11.85	14.21
704.0	0.08	0.19	0.23	33.78	34.80	35.61	9.64	11.86	14.22
706.0	0.09	0.20	0.24	33.80	34.82	35.63	9.64	11.86	14.22
708.0	0.10	0.21	0.25	33.81	34.83	35.64	9.65	11.86	14.23
710.0	0.11	0.22	0.25	33.82	34.85	35.66	9.65	11.86	14.23
712.0	0.11	0.22	0.25	33.83	34.87	35.67	9.65	11.87	14.23
714.0	0.11	0.22	0.25	33.84	34.88	35.68	9.65	11.88	14.24
716.0	0.10	0.22	0.24	33.85	34.89	35.69	9.65	11.87	14.23

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
698.0	-27.92	-27.98	-29.25	-39.53	-41.14	-43.86
700.0	-27.81	-27.86	-29.17	-39.68	-41.48	-44.30
702.0	-27.79	-27.75	-29.10	-39.81	-41.55	-44.42
704.0	-27.77	-27.64	-29.03	-39.94	-41.62	-44.54
706.0	-27.95	-27.74	-29.13	-40.16	-41.83	-44.77
708.0	-28.33	-28.05	-29.41	-40.45	-42.18	-45.12
710.0	-28.71	-28.35	-29.69	-40.75	-42.52	-45.46
712.0	-29.06	-28.74	-30.10	-40.86	-42.72	-45.70
714.0	-29.41	-29.13	-30.51	-40.97	-42.93	-45.94
716.0	-29.67	-29.44	-30.81	-40.95	-43.03	-46.14



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FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	+25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
698.0	-75.41	-80.89	-110.04	-132.14	-148.09
700.0	-75.92	-79.75	-110.28	-132.13	-147.44
702.0	-76.15	-80.04	-110.31	-132.02	-147.93
704.0	-76.38	-80.33	-110.34	-131.91	-148.42
706.0	-76.01	-80.45	-110.31	-131.80	-148.81
708.0	-75.04	-80.38	-110.23	-131.67	-149.08
710.0	-74.07	-80.32	-110.15	-131.55	-149.35
712.0	-75.11	-80.40	-109.95	-131.45	-148.97
714.0	-76.14	-80.48	-109.74	-131.36	-148.60
716.0	-73.65	-80.11	-109.62	-131.27	-147.55

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	-45°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
698.0	-77.04	-82.09	-110.84	-132.47	-147.89
700.0	-75.01	-81.82	-110.58	-132.32	-151.51
702.0	-76.19	-81.64	-110.38	-132.24	-150.81
704.0	-77.36	-81.47	-110.18	-132.15	-150.10
706.0	-77.42	-81.20	-110.14	-132.03	-149.50
708.0	-76.37	-80.85	-110.26	-131.87	-149.01
710.0	-75.31	-80.49	-110.38	-131.71	-148.51
712.0	-75.49	-80.13	-109.90	-131.57	-148.27
714.0	-75.68	-79.78	-109.43	-131.43	-148.03
716.0	-75.64	-79.19	-109.80	-130.46	-151.13

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	+85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
698.0	-73.71	-80.29	-110.05	-129.50	-151.28
700.0	-75.60	-81.28	-110.31	-131.54	-151.15
702.0	-75.23	-80.30	-110.15	-131.46	-151.11
704.0	-74.86	-79.32	-110.00	-131.38	-151.08
706.0	-74.53	-79.27	-109.91	-131.30	-150.73
708.0	-74.26	-80.16	-109.89	-131.21	-150.08
710.0	-73.98	-81.04	-109.87	-131.13	-149.43
712.0	-74.07	-80.04	-109.66	-131.04	-149.09
714.0	-74.16	-79.04	-109.45	-130.95	-148.75
716.0	-74.49	-80.22	-109.88	-130.94	-148.94



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COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 698MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 707MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 716MHz+(n*Fcomparison) (dBc) note 1		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-89.26	-96.74	-102.32	-87.41	-99.92	-98.06	-88.36	-85.25	-90.37
-4	-87.75	-95.20	-97.92	-85.72	-95.85	-96.57	-96.81	-88.64	-92.23
-3	-83.94	-90.92	-90.39	-81.97	-93.69	-90.36	-91.00	-85.61	-87.93
-2	-81.31	-85.92	-85.97	-78.59	-90.02	-85.43	-86.93	-84.95	-81.56
-1	-75.65	-83.67	-82.96	-74.47	-89.34	-80.99	-84.69	-76.39	-78.85
0 ^{note 2}	-	-	-	-	-	-	-	-	-
+1	-76.68	-84.05	-83.37	-74.48	-86.74	-80.75	-89.86	-78.06	-77.71
+2	-81.60	-85.66	-88.64	-77.97	-88.08	-85.30	-84.19	-82.46	-82.79
+3	-82.53	-91.81	-90.25	-81.83	-89.40	-92.65	-96.47	-88.33	-91.57
+4	-86.83	-96.73	-96.31	-87.16	-97.00	-97.57	-99.03	-87.90	-92.71
+5	-89.78	-98.27	-100.86	-86.53	-104.10	-100.11	-87.35	-85.57	-90.92

Note 1: Comparison frequency 50 kHz

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

REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 698MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 707MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 716MHz+(n*Freference) (dBc) note 3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-115.34	-115.15	-112.55	-116.53	-114.61	-114.43	-116.86	-115.04	-115.74
-4	-103.19	-103.71	-104.47	-103.68	-103.53	-103.72	-104.04	-104.17	-104.24
-3	-126.51	-120.24	-120.40	-123.94	-124.03	-122.69	-125.11	-119.05	-120.80
-2	-107.70	-108.58	-109.21	-108.25	-108.44	-109.00	-108.43	-108.51	-108.74
-1	-115.01	-123.89	-121.67	-114.24	-122.94	-121.56	-116.66	-127.83	-126.77
0 ^{note 4}	-	-	-	-	-	-	-	-	-
+1	-116.35	-125.42	-127.16	-118.58	-126.92	-124.14	-120.12	-128.28	-126.16
+2	-109.31	-110.49	-110.47	-111.45	-112.76	-110.63	-111.05	-111.71	-111.08
+3	-117.78	-120.39	-117.38	-118.50	-121.00	-118.46	-121.99	-121.87	-117.97
+4	-104.28	-105.53	-105.80	-105.00	-106.11	-105.65	-105.37	-105.99	-105.54
+5	-118.98	-119.91	-115.98	-122.76	-119.36	-116.45	-120.57	-117.28	-115.42

Note 3: Reference frequency 15 MHz

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



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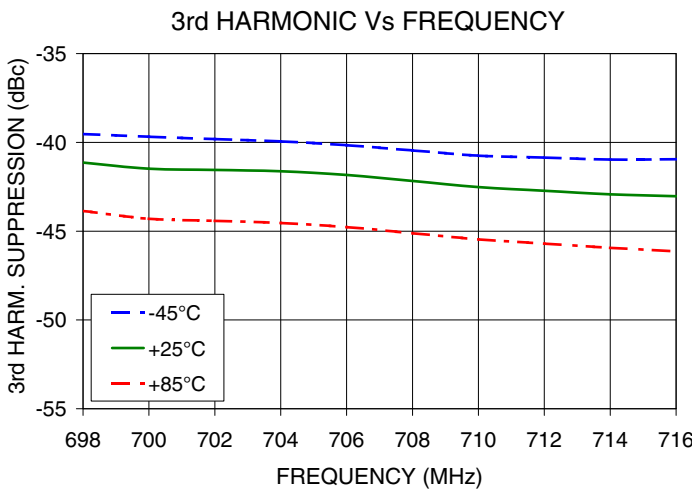
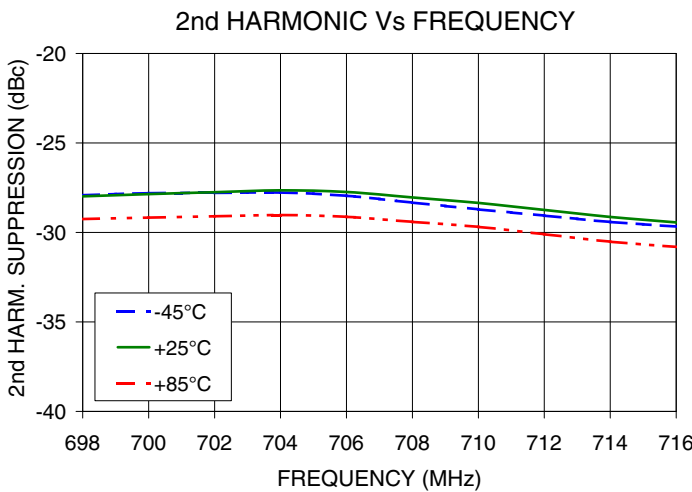
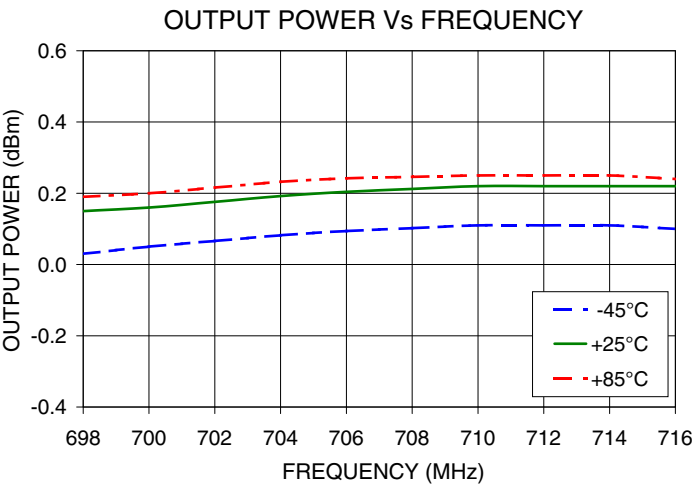


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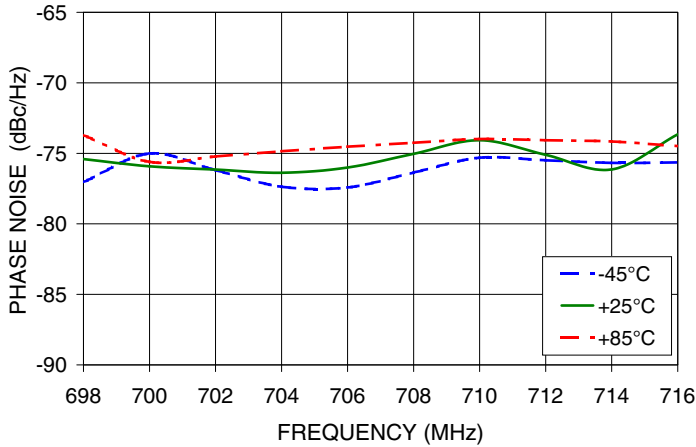
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Typical Performance Curves

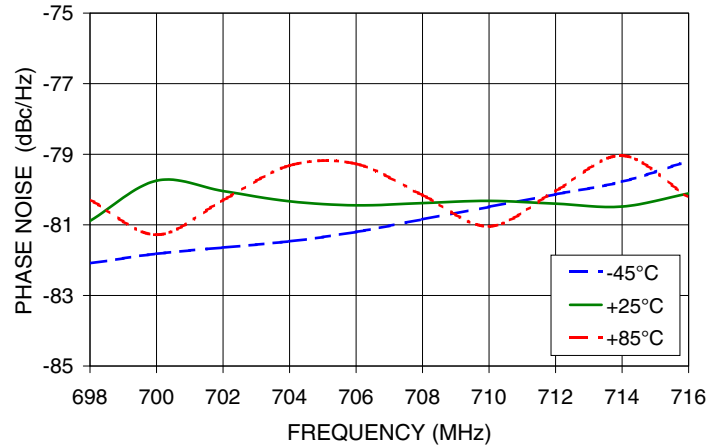


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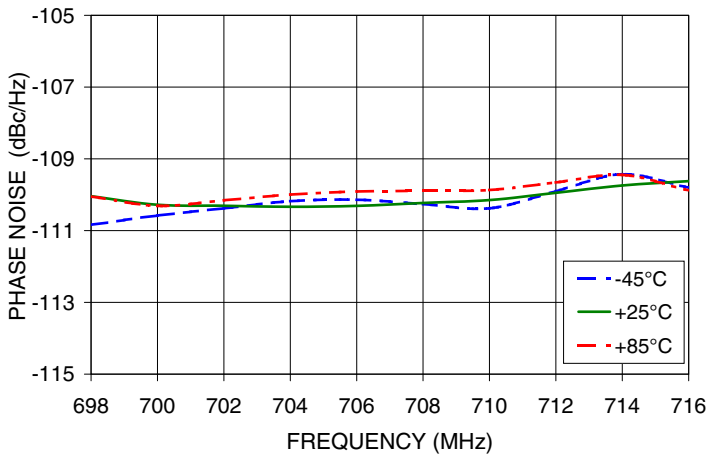
PHASE NOISE @ 100 Hz offset



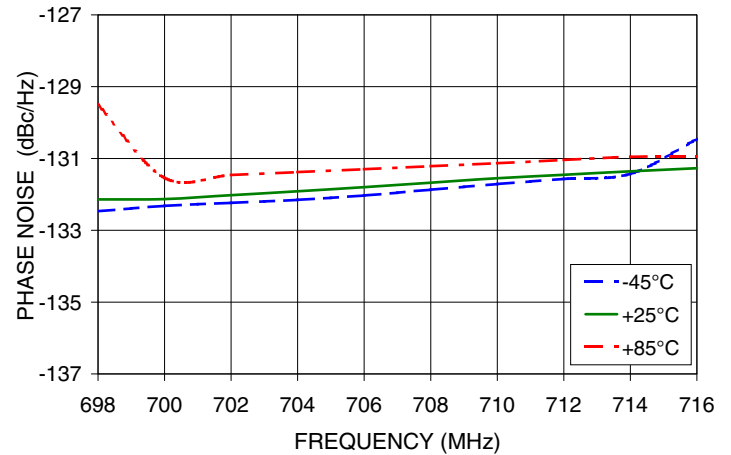
PHASE NOISE @ 1 kHz offset



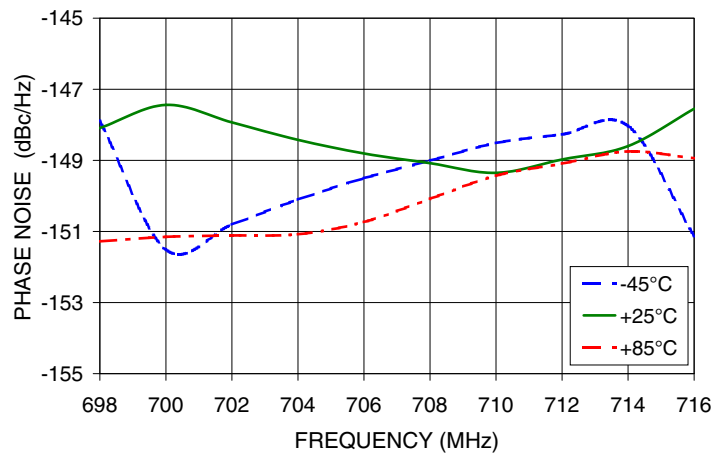
PHASE NOISE @ 10 kHz offset



PHASE NOISE @ 100 kHz offset



PHASE NOISE @ 1MHz offset



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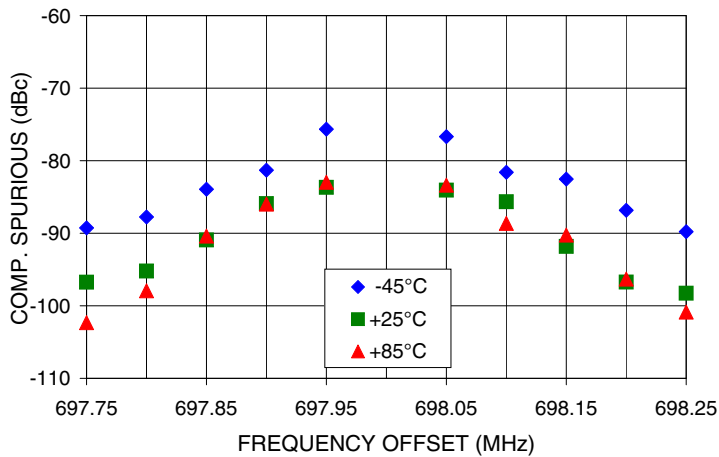


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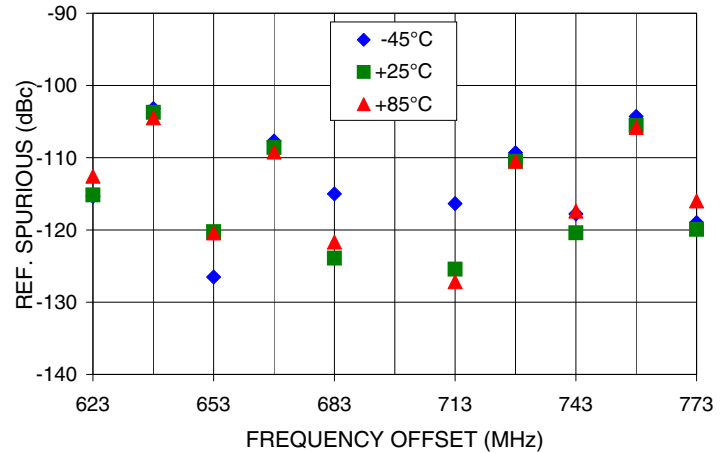


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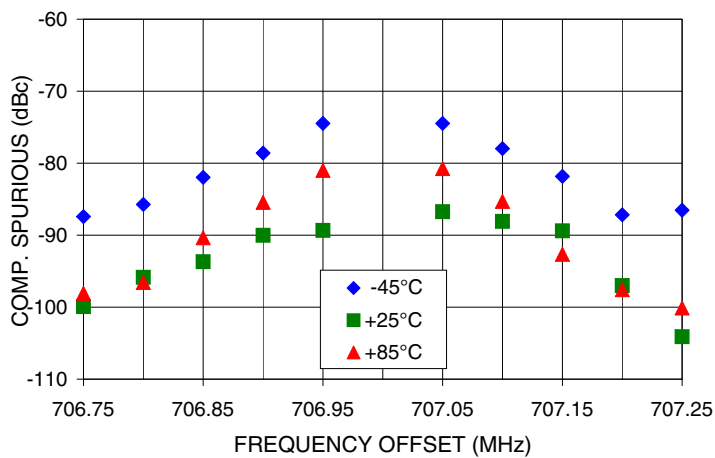
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 698MHz



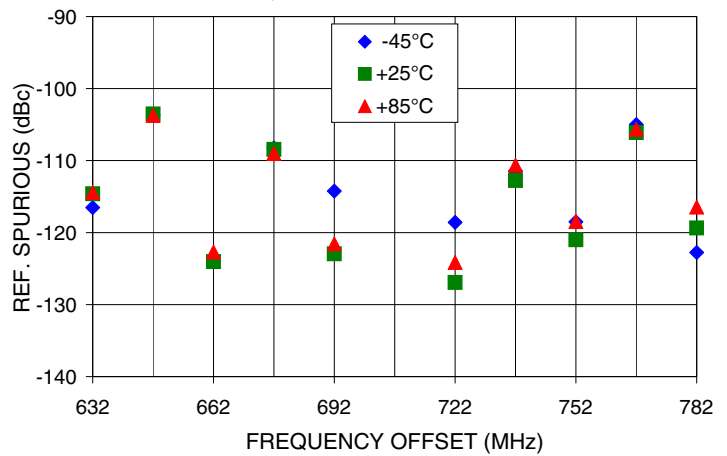
REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 698MHz



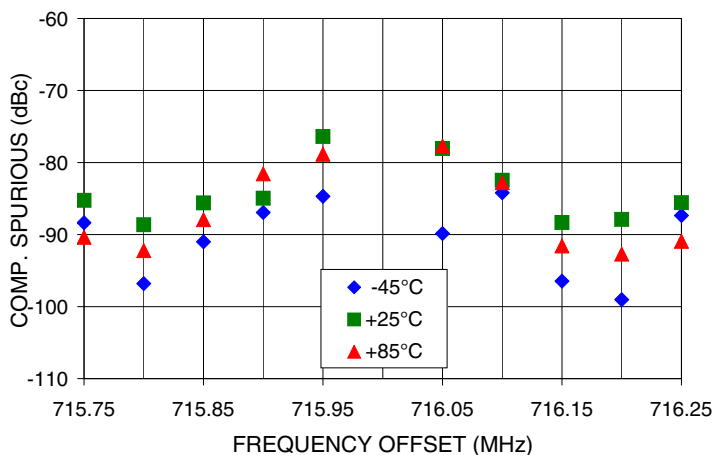
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 707MHz



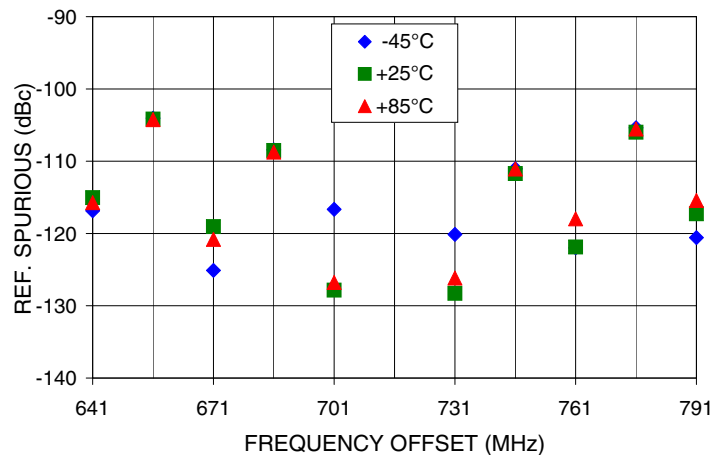
REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 707MHz



COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 716MHz



REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 716MHz



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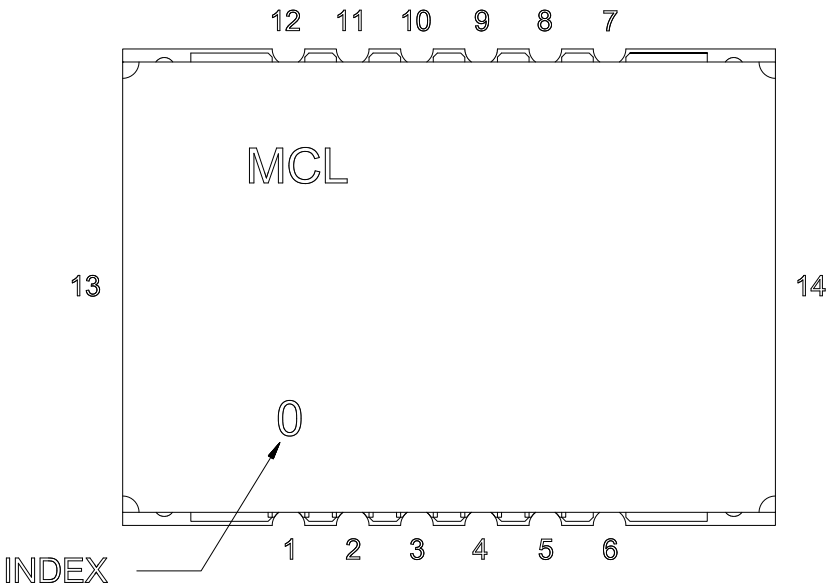


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Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained 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.

Pin Configuration

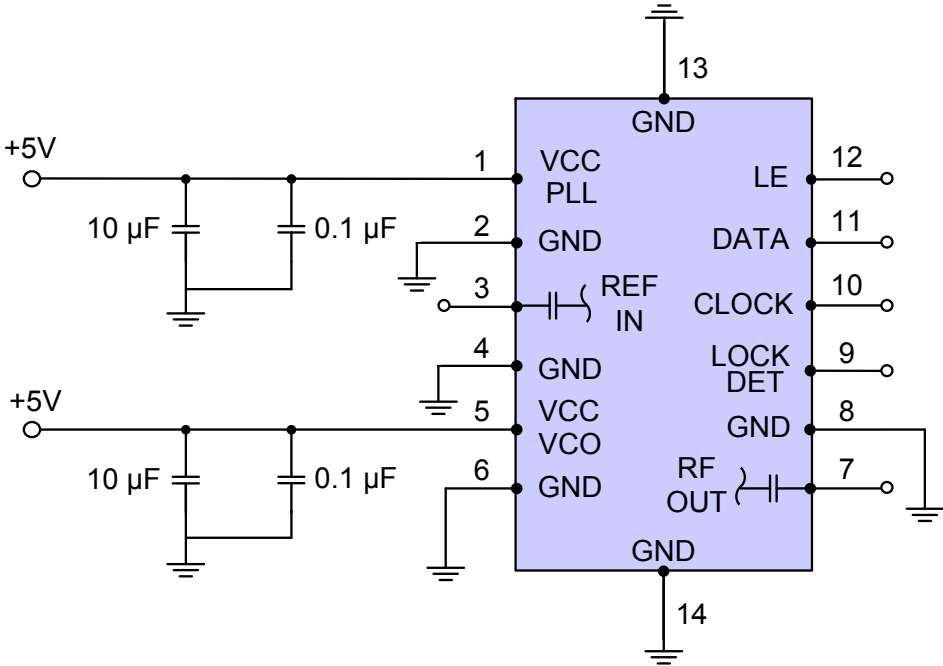


Pin Connection

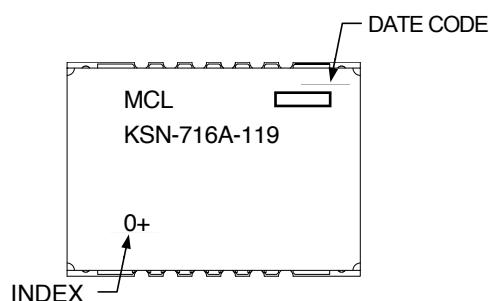
Pin Number	Function
1	VCC PLL
2	GND
3	REF IN
4	GND
5	VCC VCO
6	GND
7	RF OUT
8	GND
9	LOCK DET
10	CLOCK
11	DATA
12	LE
13	GND
14	GND

Recommended Application Circuit

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



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



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