

# Frequency Synthesizer

KSN-885A-219+

50Ω 866 to 885 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-885A-219+ is a Frequency Synthesizer, designed to operate from 866 to 885 MHz for base station application. The KSN-885A-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"><li>• Phase Noise: -114 dBc/Hz typ. @ 10 kHz offset</li><li>• Comparison Spurious: -70 dBc typ.</li><li>• Reference Spurious: -107 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-885A-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-885A-219+ to be used in compact designs.

### Notes

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# Frequency Synthesizer

**KSN-885A-219+**

50Ω 866 to 885 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

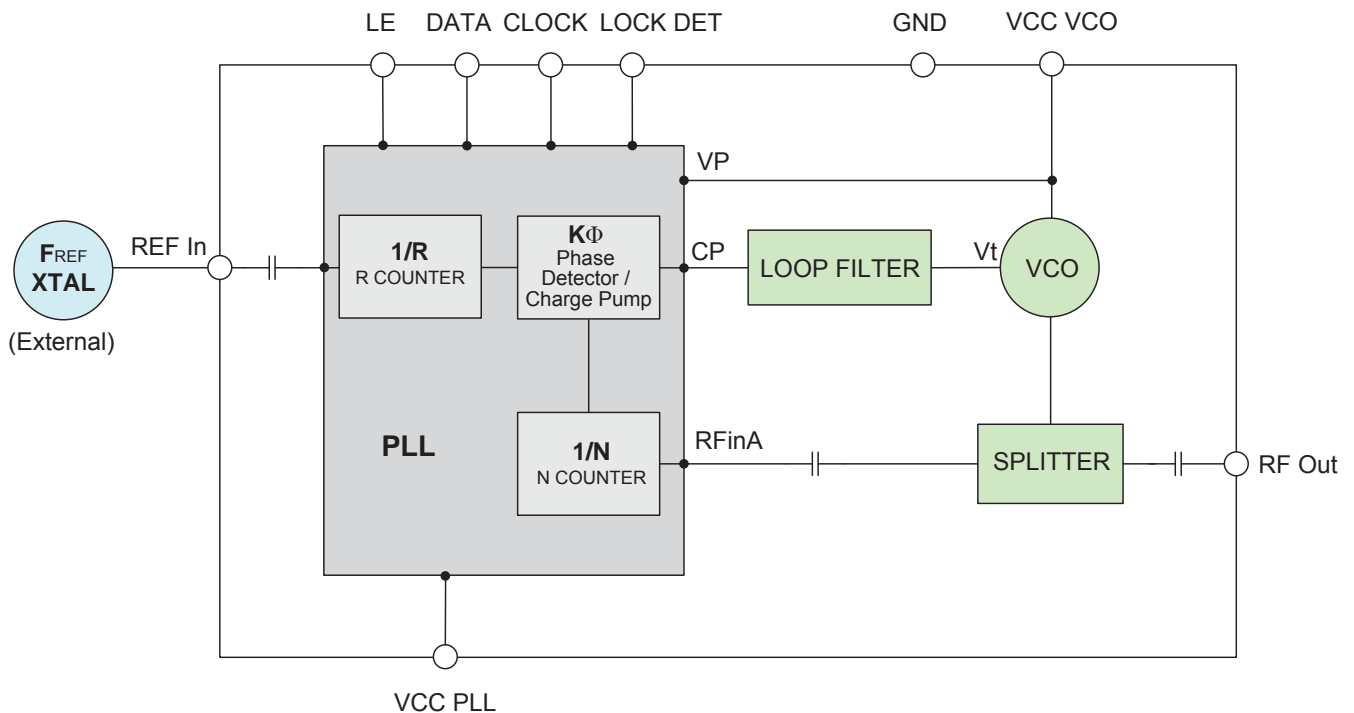
## Applications

- Base station

## General Description

The KSN-885A-219+ is a Frequency Synthesizer, designed to operate from 866 to 885 MHz for base station application. The KSN-885A-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-885A-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



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**Electrical Specifications** (over operating temperature -40°C to +85°C)

Parameters	Test Conditions	Min.	Typ.	Max.	Units	
Frequency Range	-	866	-	885	MHz	
Step Size	-	-	20	-	kHz	
Settling Time	Within $\pm 1$ kHz	-	20	-	mSec	
Output Power	-	-2.5	+0.8	+2.5	dBm	
SSB Phase Noise	@ 100 Hz offset	-	-72	-	dBc/Hz	
	@ 1 kHz offset	-	-83	-75		
	@ 10 kHz offset	-	-114	-107		
	@ 100 kHz offset	-	-137	-130		
	@ 1 MHz offset	-	-155	-150		
Integrated SSB Phase Noise	@100Hz - 1MHz	-	-44	-38	dBc	
Reference Spurious Suppression	Ref. Freq. 15 MHz	-	-107	-84	dBc	
Comparison Spurious Suppression	Step Size 20 kHz	-	-70	-60		
Non - Harmonic Spurious Suppression	-	-	-90	-		
Harmonic Suppression	-	-	-28	-20		
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	-	-	34	40	mA	
PLL Supply Current	-	-	11	19		
Reference Input (External)	Frequency	15 (square wave)	-	15	-	MHz
	Amplitude	1.0	0.8	1.0	1.2	V <sub>P-P</sub>
	Input impedance	-	-	100	-	K $\Omega$
	Phase Noise @ 1 kHz offset	-	-	-140	-	dBc/Hz
RF Output port Impedance	-	-	50	-	$\Omega$	
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 @ 885 MHz	F_Register	-	(MSB) 010111111000000010010011 (LSB)			
	N_Register	-	(MSB) 001010101100110100101001 (LSB)			
	R_Register	-	(MSB) 00010000000101110111000 (LSB)			

**Absolute Maximum Ratings**

Parameters	Ratings
VCO Supply Voltage	6.3V
PLL Supply Voltage	6.3V
VCO Supply Voltage to PLL Supply Voltage	-0.3V to +5.5V
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	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
866.0	0.68	0.89	0.84	32.27	34.02	35.15	9.19	11.56	13.81
868.0	0.67	0.87	0.83	32.27	34.01	35.16	9.20	11.57	13.82
870.0	0.66	0.86	0.82	32.27	34.01	35.16	9.20	11.57	13.83
872.0	0.65	0.85	0.81	32.26	34.02	35.17	9.21	11.58	13.83
874.0	0.64	0.84	0.80	32.26	34.02	35.17	9.21	11.58	13.84
876.0	0.63	0.82	0.80	32.26	34.02	35.17	9.21	11.58	13.84
878.0	0.62	0.81	0.79	32.25	34.01	35.17	9.21	11.58	13.84
880.0	0.61	0.80	0.78	32.24	34.01	35.18	9.22	11.59	13.85
882.0	0.60	0.79	0.77	32.23	34.00	35.18	9.22	11.59	13.85
885.0	0.59	0.79	0.77	32.22	34.00	35.19	9.23	11.60	13.86

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
866.0	-27.26	-27.49	-29.76	-44.54	-46.95	-51.08
868.0	-27.53	-27.77	-30.00	-44.65	-47.12	-51.03
870.0	-27.64	-27.92	-30.11	-44.79	-47.17	-51.09
872.0	-27.75	-28.06	-30.22	-44.92	-47.22	-51.15
874.0	-27.86	-28.21	-30.33	-45.06	-47.27	-51.21
876.0	-27.88	-28.24	-30.33	-45.44	-47.57	-51.51
878.0	-27.79	-28.17	-30.23	-46.06	-48.13	-52.05
880.0	-27.71	-28.09	-30.12	-46.67	-48.70	-52.59
882.0	-27.62	-28.02	-30.02	-47.29	-49.26	-53.13
885.0	-27.70	-28.07	-30.07	-48.03	-50.12	-54.04

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FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS				
	+25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
866.0	-73.33	-83.81	-114.78	-137.37	-156.24
868.0	-70.15	-84.19	-114.71	-137.34	-154.83
870.0	-70.97	-84.21	-114.68	-137.37	-155.04
872.0	-71.80	-84.22	-114.66	-137.39	-155.25
874.0	-72.62	-84.24	-114.63	-137.42	-155.46
876.0	-72.60	-84.45	-114.63	-137.43	-155.50
878.0	-71.73	-84.86	-114.64	-137.43	-155.36
880.0	-70.87	-85.26	-114.65	-137.42	-155.21
882.0	-70.00	-85.67	-114.66	-137.42	-155.07
885.0	-71.68	-83.96	-114.58	-137.25	-154.51

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS				
	-45°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
866.0	-66.23	-79.59	-110.84	-133.75	-153.11
868.0	-67.70	-79.36	-110.96	-133.80	-153.19
870.0	-67.10	-79.32	-110.86	-133.81	-153.36
872.0	-66.49	-79.29	-110.75	-133.82	-153.53
874.0	-65.89	-79.25	-110.65	-133.83	-153.70
876.0	-65.56	-79.43	-110.60	-133.80	-153.74
878.0	-65.49	-79.83	-110.60	-133.74	-153.67
880.0	-65.42	-80.24	-110.59	-133.69	-153.60
882.0	-65.35	-80.64	-110.59	-133.63	-153.53
885.0	-64.91	-79.64	-110.67	-133.57	-153.25

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS				
	+85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
866.0	-71.29	-81.23	-112.50	-134.56	-154.62
868.0	-72.04	-80.84	-112.71	-134.64	-154.10
870.0	-72.06	-81.27	-112.65	-134.67	-154.22
872.0	-72.09	-81.71	-112.60	-134.70	-154.33
874.0	-72.11	-82.14	-112.54	-134.73	-154.45
876.0	-71.79	-82.45	-112.52	-134.79	-154.46
878.0	-71.14	-82.63	-112.53	-134.88	-154.36
880.0	-70.48	-82.82	-112.54	-134.97	-154.25
882.0	-69.83	-83.00	-112.55	-135.06	-154.15
885.0	-72.91	-82.26	-112.92	-134.91	-155.06

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COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 866MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 875MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 885MHz+(n*Fcomparison) (dBc) note 1			
	n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
	-5	-85.56	-82.27	-87.40	-87.20	-83.00	-86.89	-86.38	-88.71	-86.55
-4	-83.38	-84.15	-85.05	-87.17	-87.43	-87.04	-86.55	-81.54	-86.10	
-3	-84.84	-79.68	-85.94	-83.69	-87.87	-84.64	-84.43	-85.93	-85.82	
-2	-81.80	-81.92	-81.03	-81.00	-82.32	-83.40	-80.69	-82.80	-80.12	
-1	-74.09	-71.09	-73.49	-69.11	-70.89	-75.77	-68.15	-70.81	-71.16	
0 <sup>note 2</sup>	-	-	-	-	-	-	-	-	-	
+1	-73.18	-71.07	-72.23	-68.63	-71.48	-74.49	-68.13	-70.96	-71.51	
+2	-83.99	-84.28	-84.69	-81.57	-83.03	-82.89	-80.37	-79.30	-82.13	
+3	-85.81	-85.81	-85.25	-86.12	-81.89	-86.82	-86.32	-79.97	-86.71	
+4	-87.20	-86.44	-85.63	-85.85	-85.23	-86.28	-85.29	-82.07	-86.03	
+5	-88.09	-80.67	-87.11	-87.76	-85.77	-85.41	-87.13	-86.14	-86.69	

Note 1: Comparison frequency 20 kHz  
 Note 2: All spurs are referenced to carrier signal (n=0).

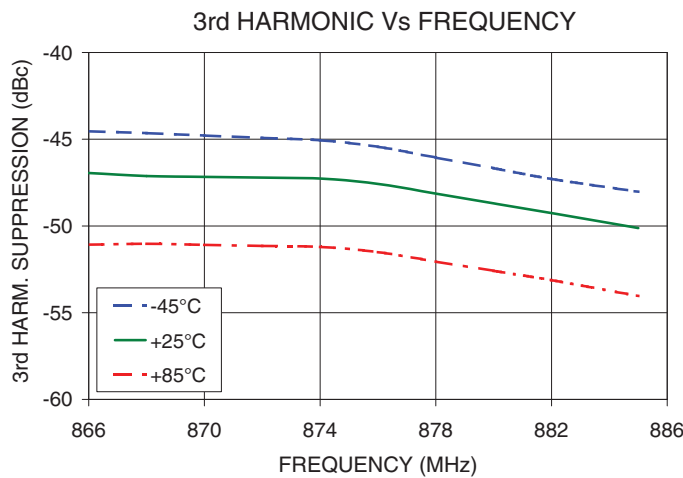
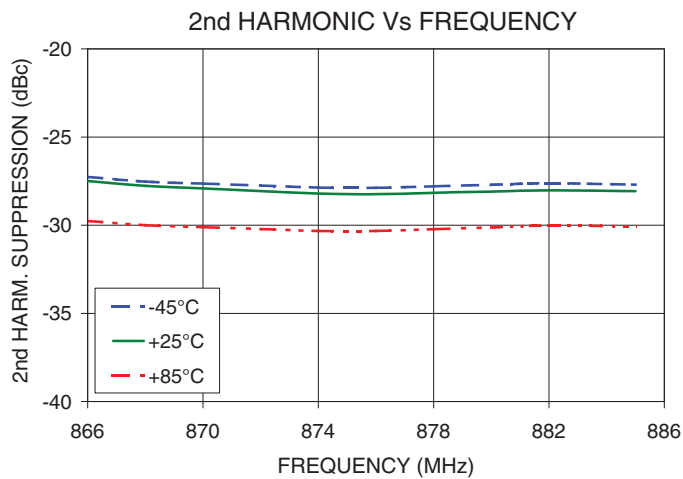
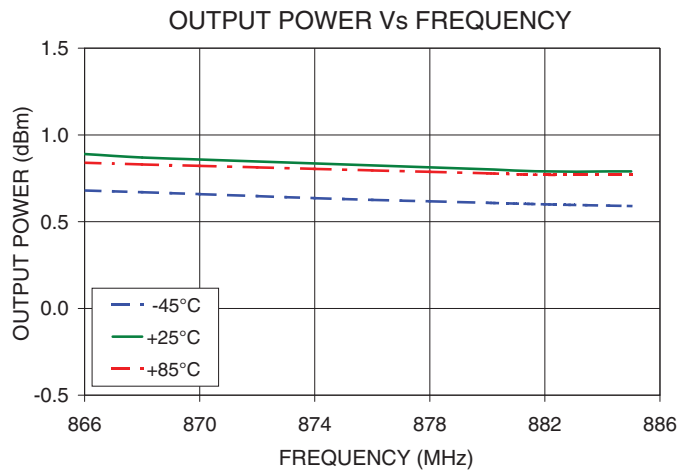
REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 866MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 875MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 885MHz+(n*Freference) (dBc) note 3			
	n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
	-5	-114.91	-117.33	-112.79	-114.94	-117.86	-115.07	-115.59	-125.30	-113.14
-4	-108.80	-109.83	-109.25	-108.12	-109.12	-109.11	-114.15	-114.87	-114.83	
-3	-114.54	-126.65	-113.60	-115.70	-124.58	-115.67	-115.60	-110.73	-112.74	
-2	-111.28	-113.05	-114.06	-112.93	-113.08	-117.40	-104.97	-111.87	-114.83	
-1	-115.52	-123.42	-114.95	-114.25	-128.77	-114.45	-115.42	-108.25	-111.66	
0 <sup>note 4</sup>	-	-	-	-	-	-	-	-	-	
+1	-111.07	-116.16	-115.55	-113.88	-117.14	-114.63	-113.05	-112.98	-114.75	
+2	-109.36	-107.43	-108.70	-108.37	-106.64	-108.93	-104.76	-105.27	-106.56	
+3	-114.70	-117.09	-115.17	-112.90	-117.52	-113.64	-114.32	-114.73	-113.50	
+4	-105.19	-103.52	-103.93	-102.91	-103.17	-104.14	-101.83	-102.70	-104.14	
+5	-113.18	-113.47	-110.13	-112.54	-115.89	-114.37	-111.11	-110.67	-109.59	

Note 3: Reference frequency 15 MHz  
 Note 4: All spurs are referenced to carrier signal (n=0).

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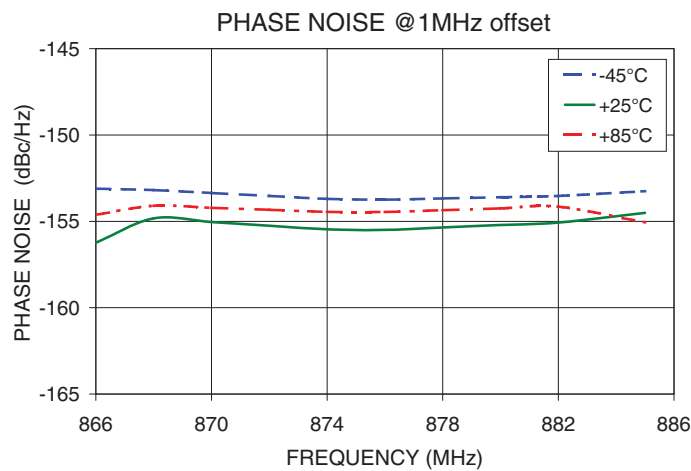
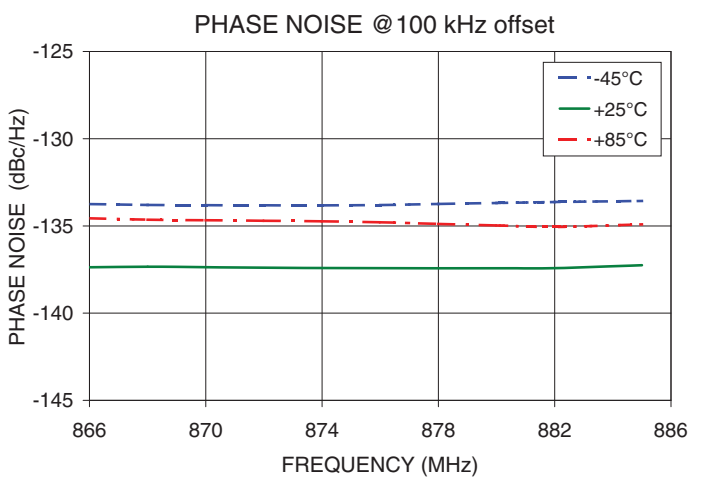
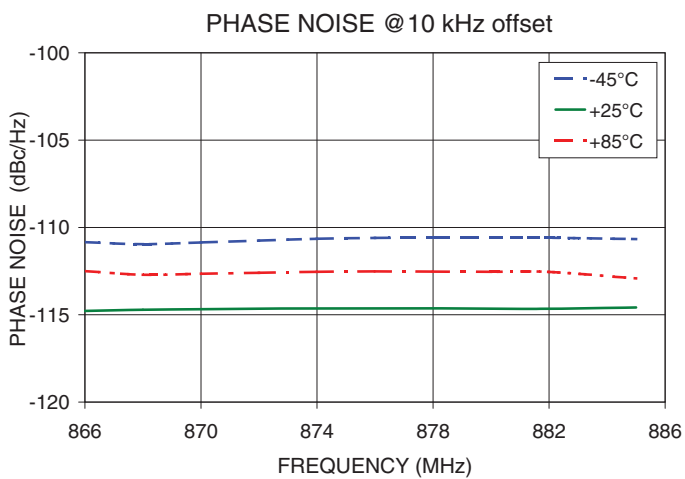
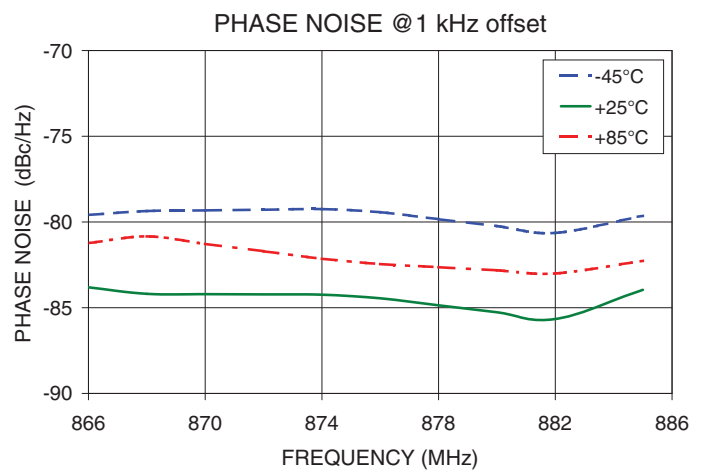
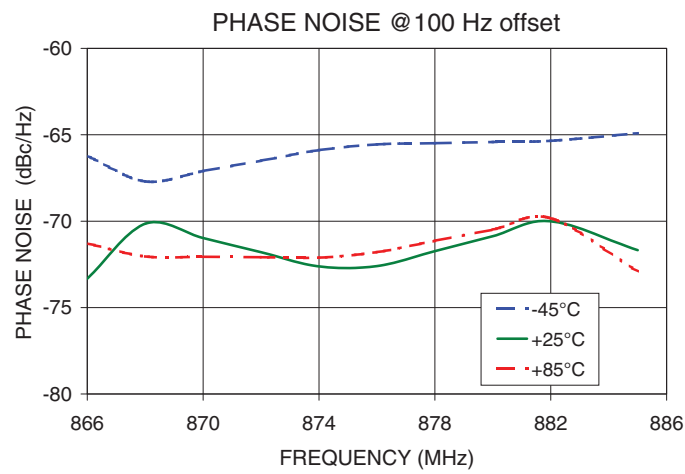
Typical Performance Curves



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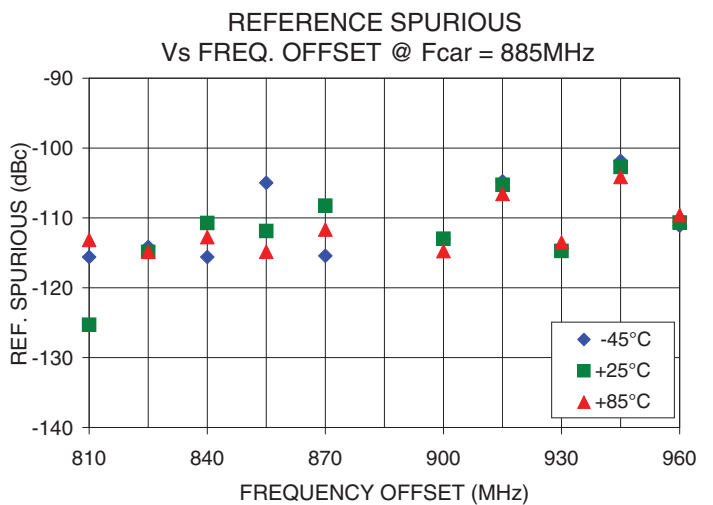
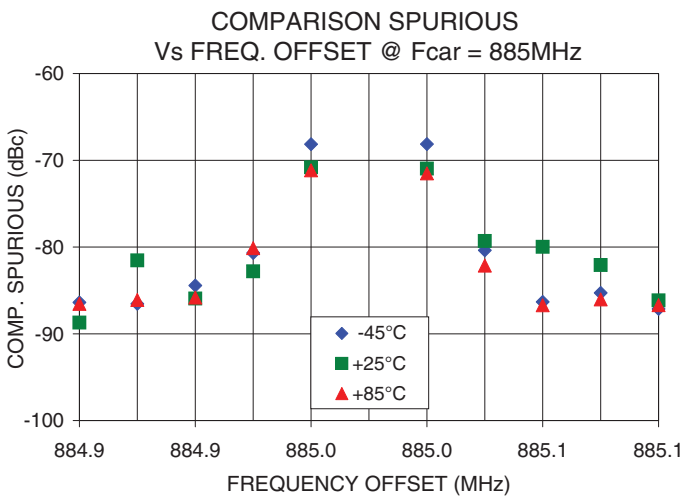
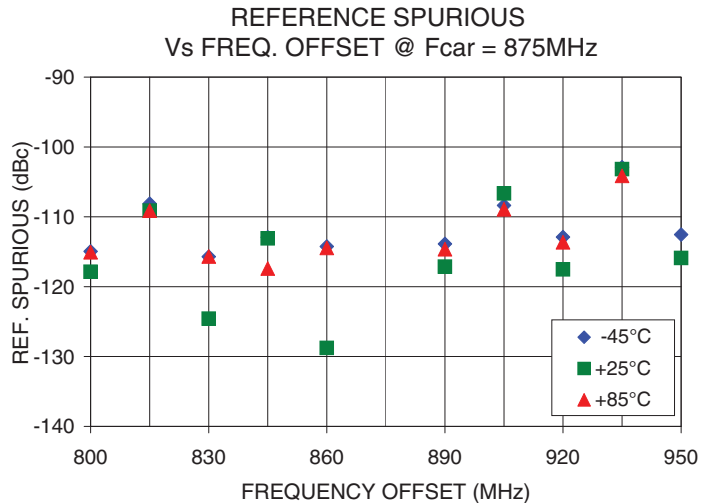
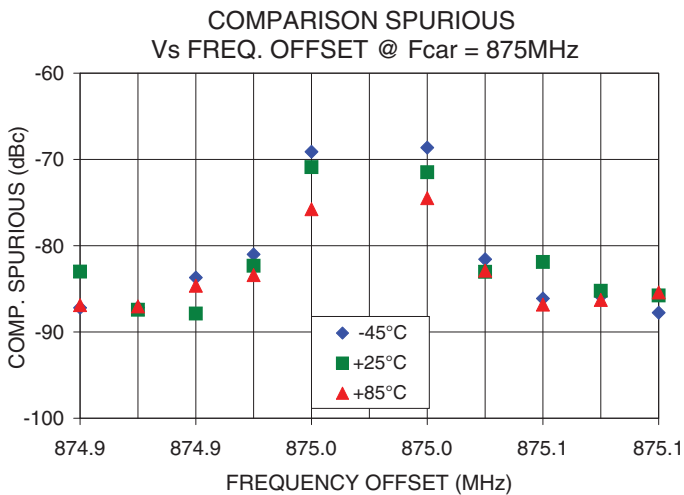
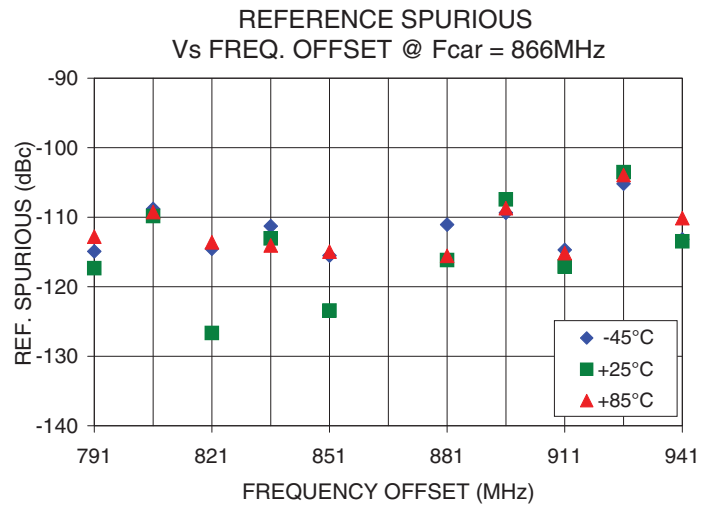
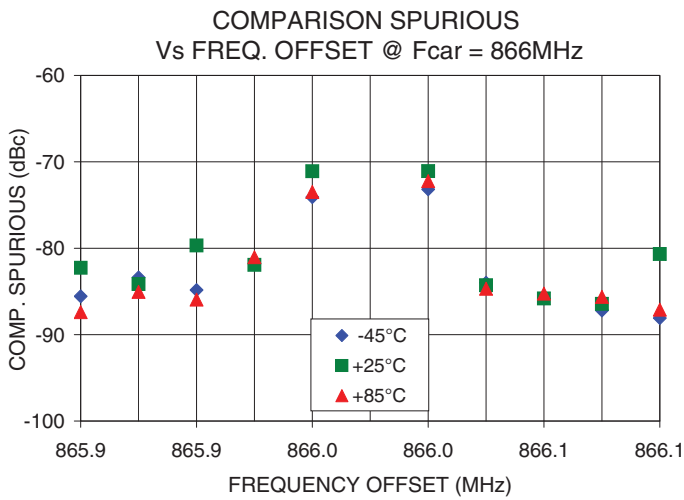


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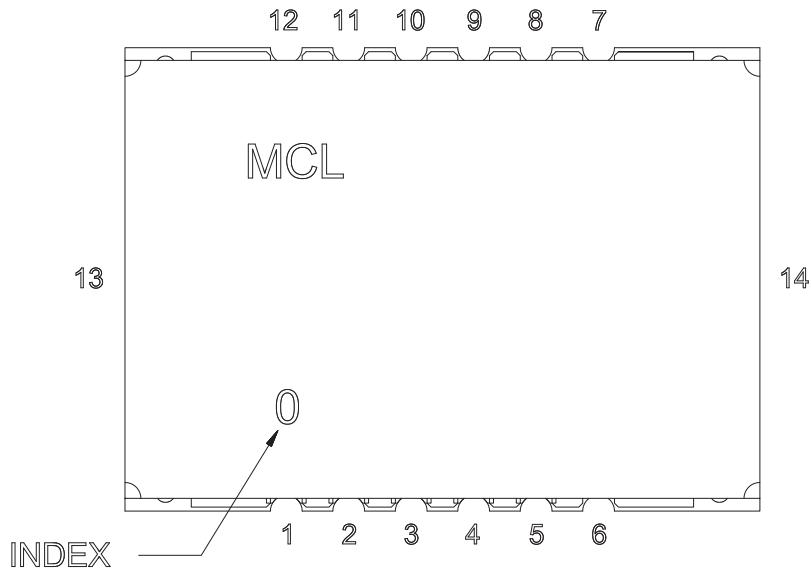


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Pin Configuration

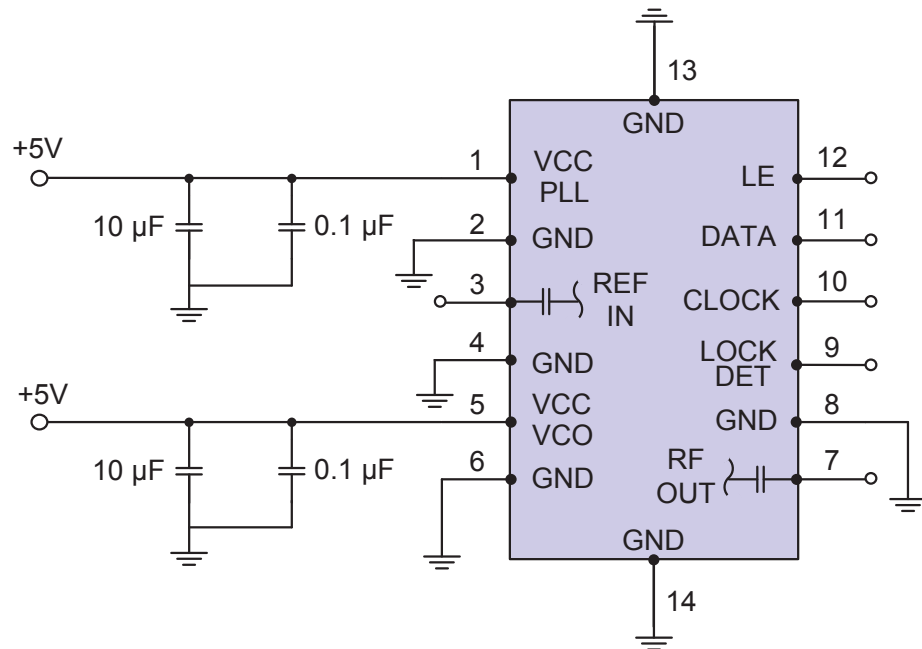


Pin Connection

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.

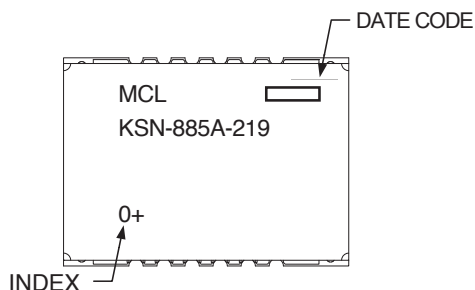


Notes

- 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.
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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:** DK801

**Tape & Reel:** TR-F28

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

**Evaluation Board:** TB-567+

**Environment Ratings:** ENV03T2

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