

# 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"><li>• Phase Noise: -101 dBc/Hz typ. @ 10 kHz offset</li><li>• Comparison Spurious: -89 dBc typ.</li><li>• Reference Spurious: -97 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-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.



IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS9100 CERTIFIED RoHS compliant

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50Ω 2110 to 2170 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

- 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.



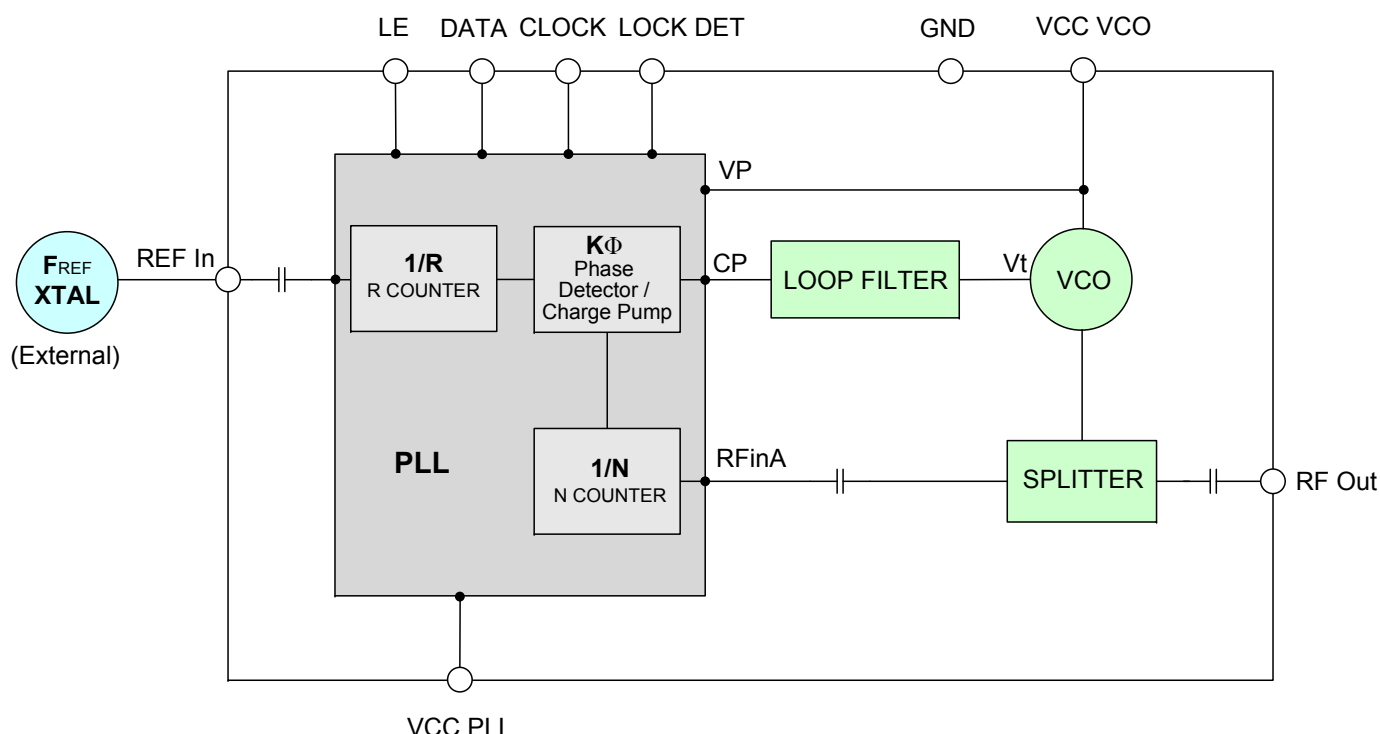
CASE STYLE: DK801

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 methodologies and qualifications.

## Simplified Schematic



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REV. OR  
M126018  
EDR-7838F1  
KSN-2170A-219+  
Category-A1  
RAV  
100323  
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**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 $\pm 1$ 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 <sub>P-P</sub>
	Input impedance	-	-	100	-	K $\Omega$
	Phase Noise @ 1 kHz offset	-	-	-135	-	dBc/Hz
RF Output port Impedance		-	-	50	-	$\Omega$
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



## Typical Performance Data

FREQUENCY (MHz)	POWER OUTPUT (dBm)			VCO CURRENT (mA)			PLL CURENT (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



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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		
	-40°C	+25°C	+85°C	-40°C	+25°C	+85°C	-40°C	+25°C	+85°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 <sup>note 2</sup>	-	-	-	-	-	-	-	-	-
+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		
	-40°C	+25°C	+85°C	-40°C	+25°C	+85°C	-40°C	+25°C	+85°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 <sup>note 4</sup>	-	-	-	-	-	-	-	-	-
+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).



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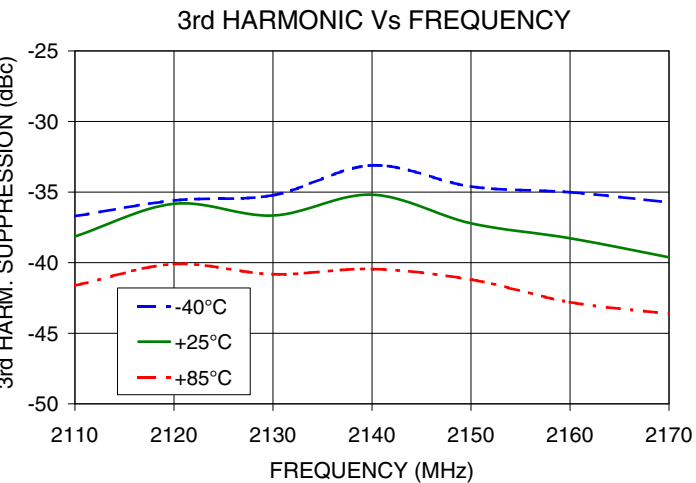
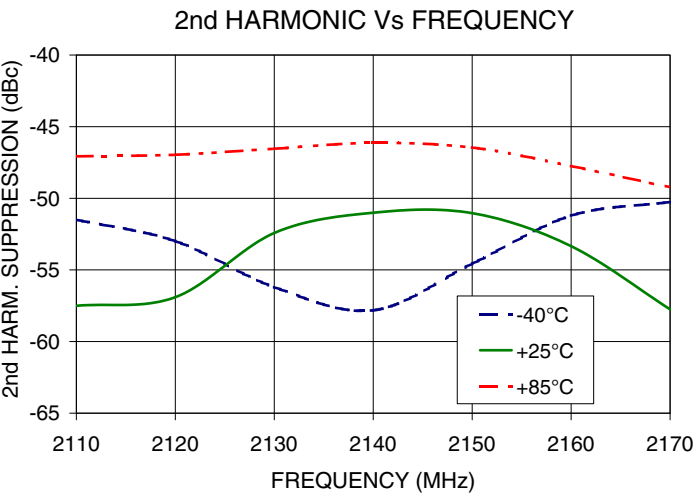
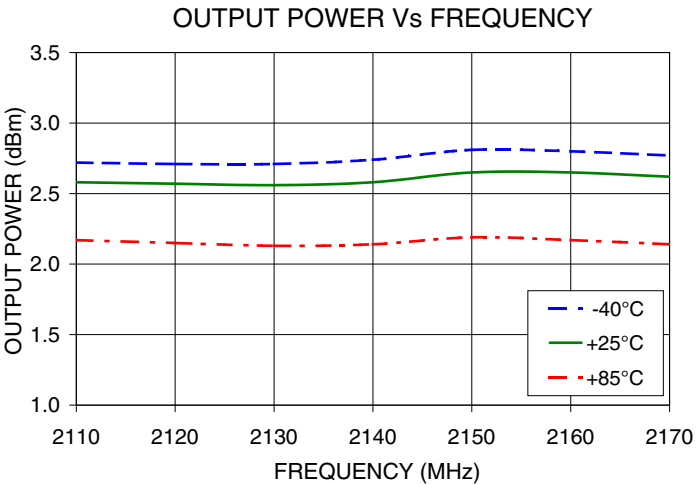
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Typical Performance Curves



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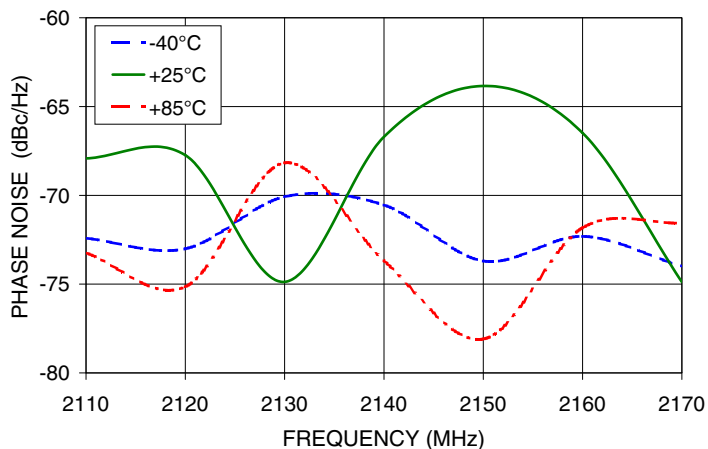


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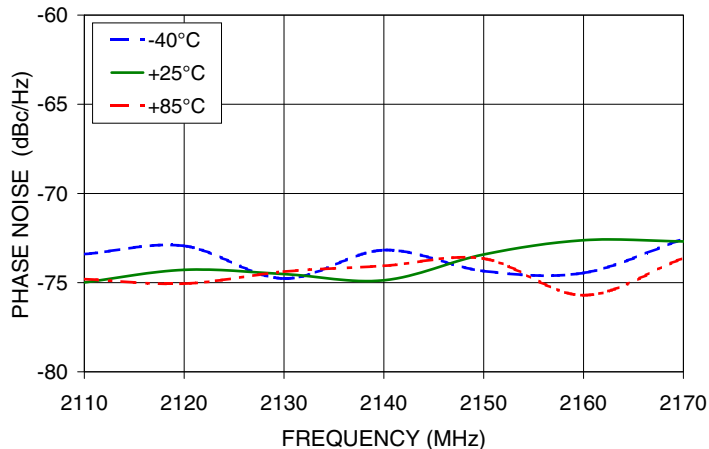


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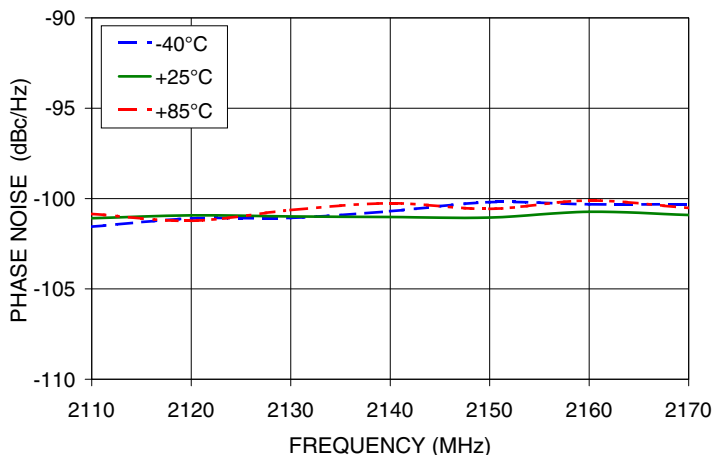
PHASE NOISE @100Hz offset



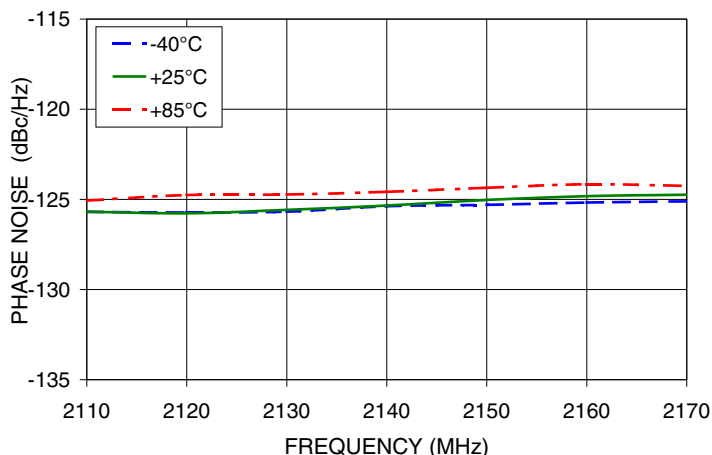
PHASE NOISE @1kHz offset



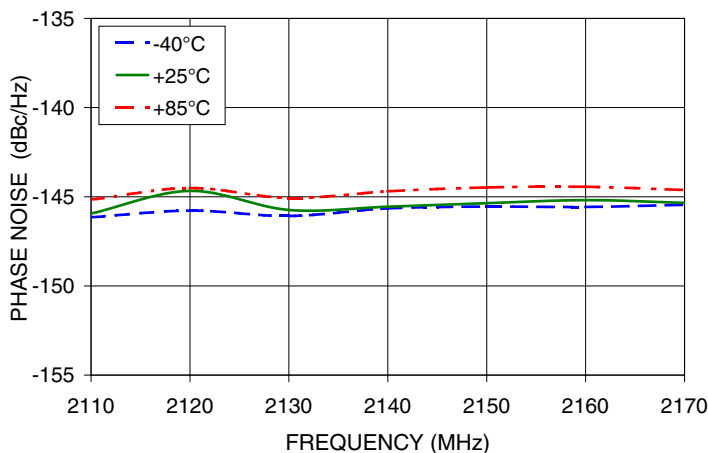
PHASE NOISE @10kHz offset



PHASE NOISE @100kHz offset



PHASE NOISE @1MHz offset



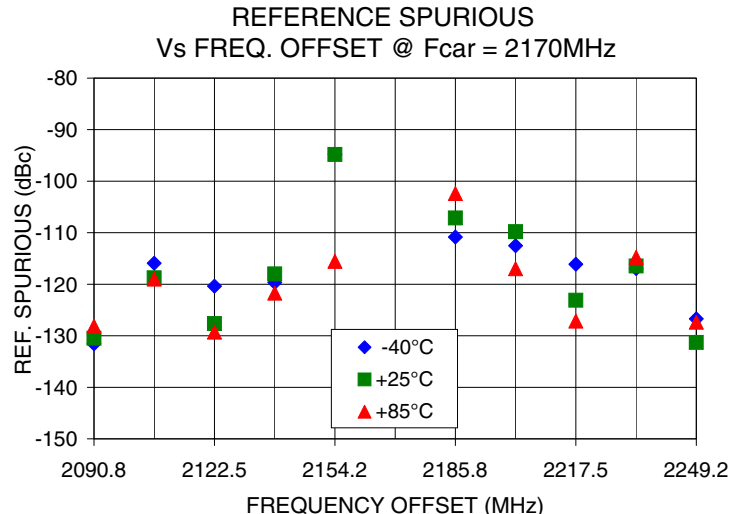
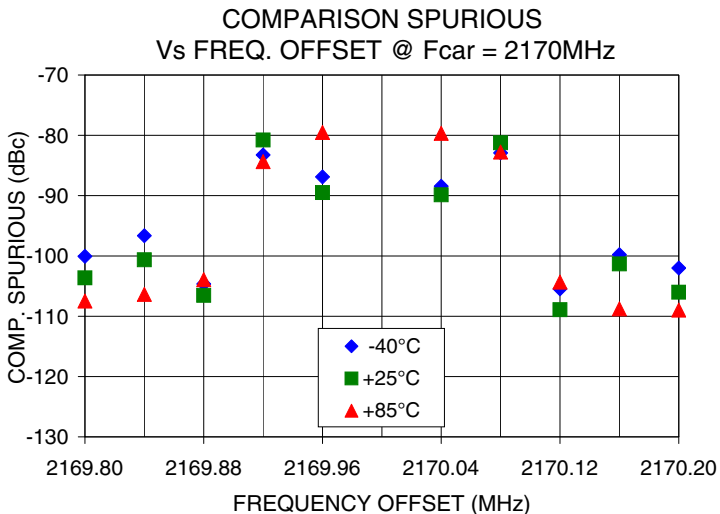
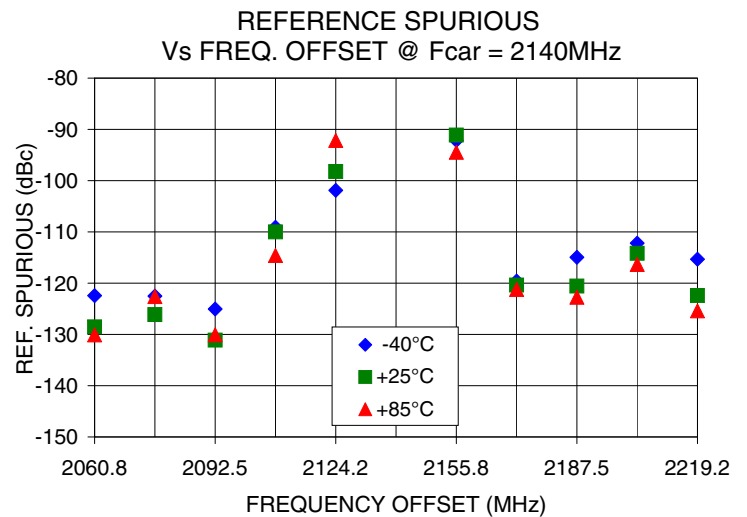
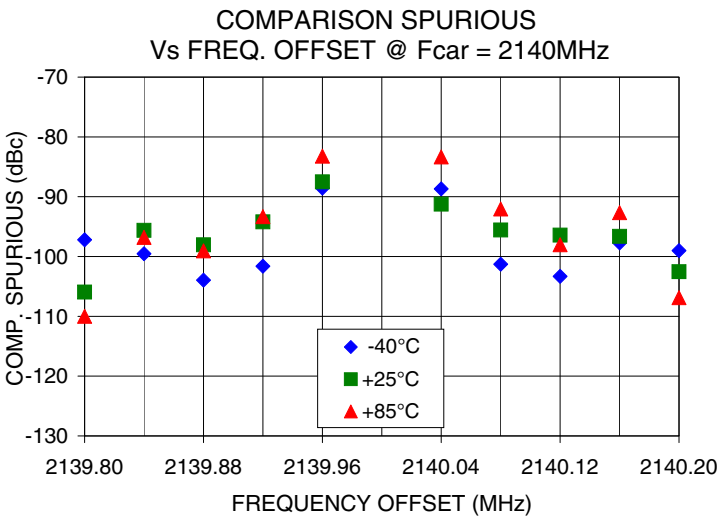
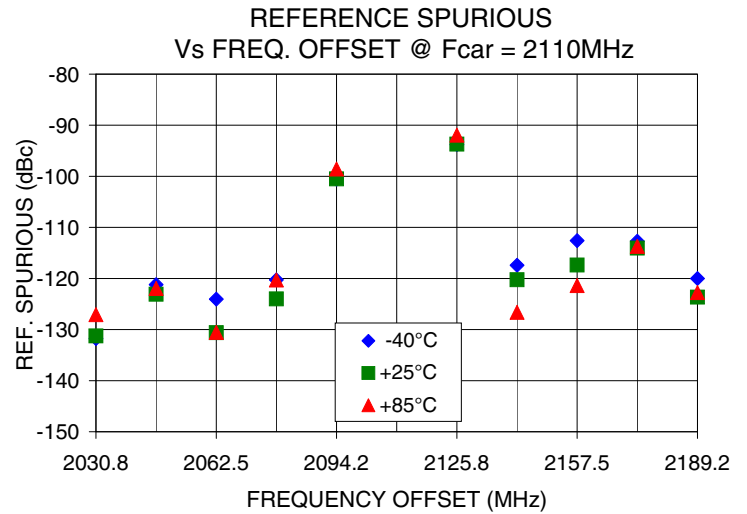
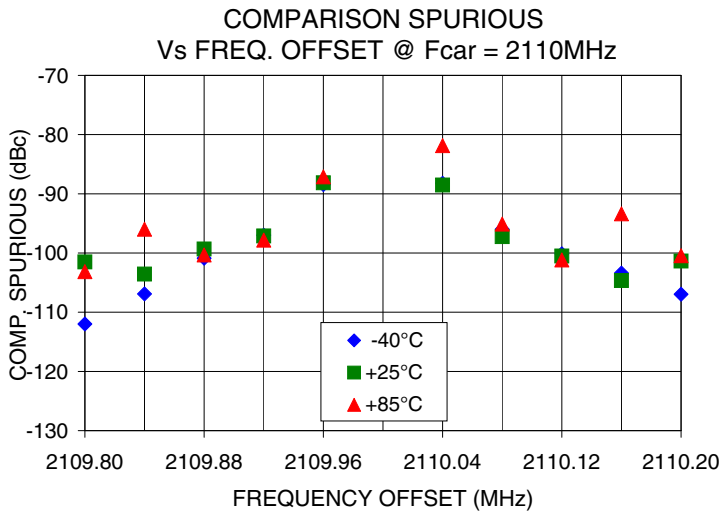
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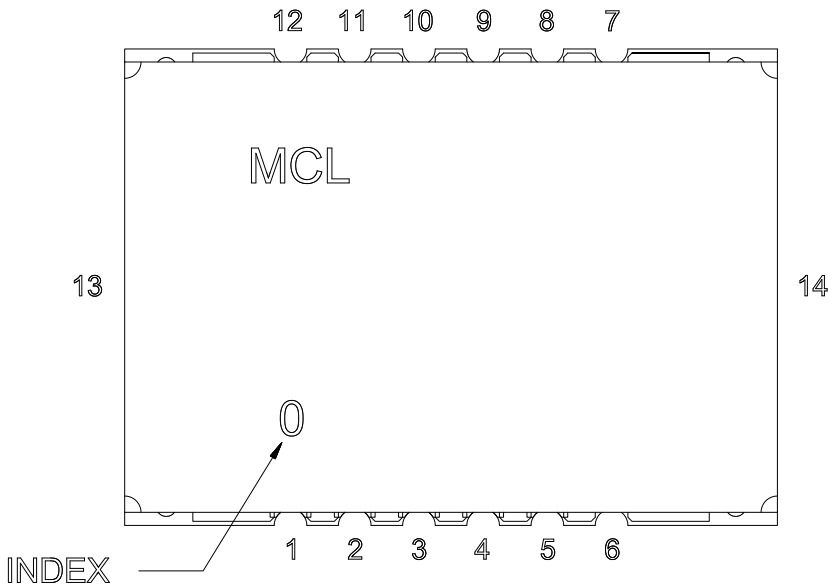
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Pin Configuration

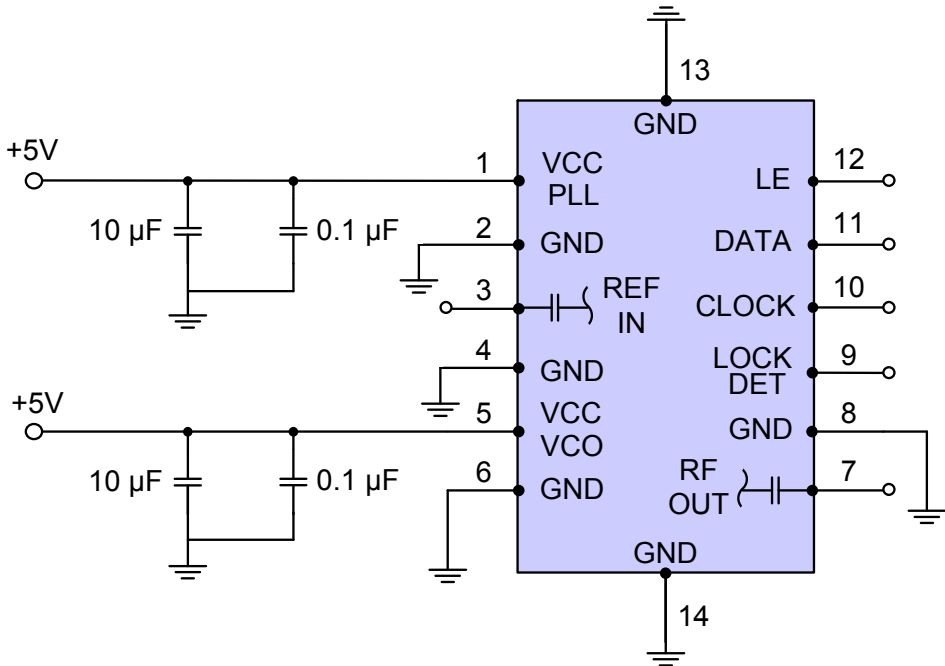


Pin Connection

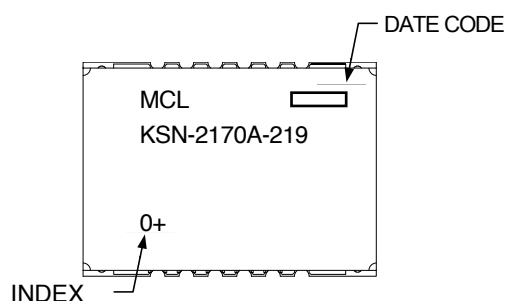
Pin Number	Function
1	VCC PLL
2	GND
3	REF IN
4	GND
5	VCC VCO
6	GND
7	RF OUT
8	GND
9	LOCK DET
10	CLOCK
11	DATA
12	LE
13	GND
14	GND

Recommended Application Circuit

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



## 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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