

# Frequency Synthesizer

KSN-409A-219+

50Ω 409.6 MHz (fixed)

## The Big Deal

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



CASE STYLE: DK1042

## Product Overview

The KSN-409A-219+ is a Frequency Synthesizer, designed to operate 409.6MHz for military lab application. The KSN-409A-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: -109 dBc/Hz typ. @ 10 kHz offset</li><li>• Comparison spurious: -80 dBc typ.</li><li>• Reference spurious: -105 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-409A-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-409A-219+ to be used in compact designs.



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# Frequency Synthesizer

**KSN-409A-219+**

50Ω 409.6 MHz (fixed)

## Features

- Integrated VCO + PLL
- Low phase noise and spurious
- Robust design and construction
- Low operating voltage (VCC VCO=+5V, VCC PLL=+3.3V)
- Small size 0.80" x 0.58" x 0.15"



CASE STYLE: DK1042  
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.*

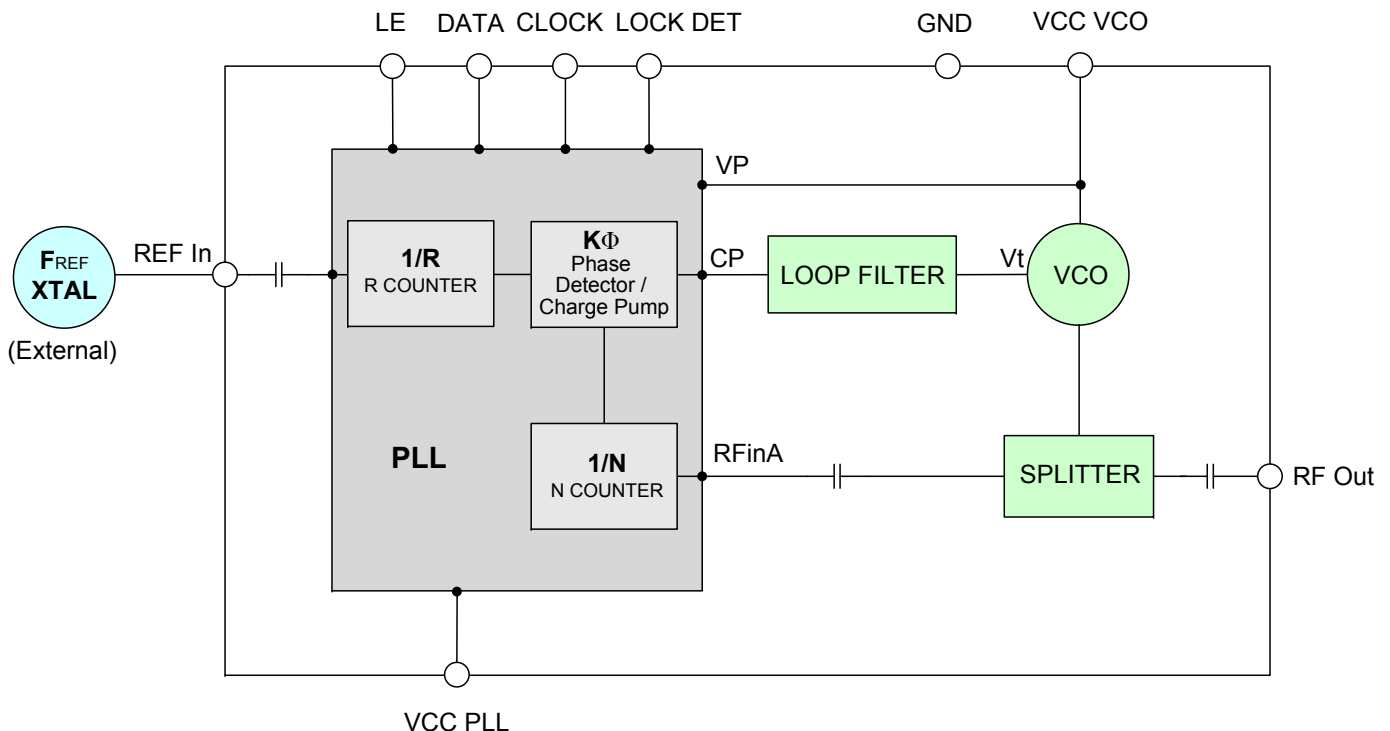
## Applications

- Military lab

## General Description

The KSN-409A-219+ is a Frequency Synthesizer, designed to operate 409.6MHz for military lab application. The KSN-409A-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-409A-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 -20°C to +85°C)

Parameters	Test Conditions	Min.	Typ.	Max.	Units
Frequency Range	-	409.6	-	409.6	MHz
Step size	-	-	400	-	kHz
Settling Time	Within ± 1 kHz	-	2	-	mSec
Output Power	-	+3.0	+5.3	+8.0	dBm
SSB Phase Noise	@ 100 Hz offset	-	-92	-	dBc/Hz
	@ 1 kHz offset	-	-97	-90	
	@ 10 kHz offset	-	-109	-105	
	@ 100 kHz offset	-	-135	-130	
	@ 1 MHz offset	-	-156	-150	
Reference Spurious Suppression	Ref. Freq. 10 MHz	-	-105	-90	dBc
Comparison Spurious Suppression	Step Size 400 kHz	-	-80	-70	
Non - Harmonic Spurious Suppression	-	-	-90	-	
Harmonic Suppression	-	-	-35	-29	dBc
VCO Supply Voltage	+5.00	+4.75	+5.00	+5.25	V
PLL Supply Voltage	+3.30	+3.15	+3.30	+3.45	
VCO Supply Current	-	-	35	41	mA
PLL Supply Current	-	-	10	17	
Reference Input (External)	Frequency	10 (sine wave)	-	10	MHz
	Amplitude	1.0	-	1.0	V <sub>P-P</sub>
	Input impedance	-	-	100	KΩ
	Phase Noise @ 1 kHz offset	-	-	-145	dBc/Hz
RF Output port Impedance	-	-	50	-	Ω
Input Logic Level	Input high voltage	-	2.80	-	V
	Input low voltage	-	-	0.60	V
Digital Lock Detect	Locked	-	2.75	3.85	V
	Unlocked	-	-	0.40	V
Frequency Synthesizer PLL	-	ADF4113			
PLL Programming	-	3-wire serial 3.3V CMOS			
Register Map @ 409.6 MHz	F_Register	-	(MSB) 10111111000000010010010 (LSB)		
	N_Register	-	(MSB) 10000001000000000000001 (LSB)		
	R_Register	-	(MSB) 10000000000000001100100 (LSB)		

**Absolute Maximum Ratings**

Parameters	Ratings
VCO Supply Voltage	6V
PLL Supply Voltage	6V
VCO Supply Voltage to PLL Power Supply	-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)		
	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C
	409.6	5.18	5.27	5.10	33.44	34.67	35.71	8.22	9.81

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C
409.6	-33.77	-35.60	-38.68	-46.56	-47.66	-50.52

FREQUENCY	@TEMP.	PHASE NOISE (dBc/Hz)				
		@ OFFSETS				
		100Hz	1kHz	10kHz	100kHz	1MHz
409.6	-25°C	-93.63	-96.20	-107.98	-134.40	-154.90
	+25°C	-94.13	-97.91	-109.72	-135.63	-156.15
	+85°C	-95.30	-97.11	-108.79	-135.65	-155.85

COMPARISON SPURIOUS ORDER n	COMPARISON SPURIOUS @Fcarrier 409.6MHz+(n*Fcomparison) (dBc) note 1		
	-25°C	+25°C	+85°C
-5	-93.66	-96.13	-103.35
-4	-91.31	-93.16	-99.37
-3	-89.56	-91.68	-97.98
-2	-85.19	-88.86	-95.86
-1	-79.89	-80.03	-76.78
0 note 2	-	-	-
+1	-79.81	-79.35	-76.67
+2	-85.46	-89.25	-96.21
+3	-89.73	-91.37	-98.54
+4	-91.93	-93.67	-99.98
+5	-94.29	-97.35	-105.09

REFERENCE SPURIOUS ORDER n	REFERENCE SPURIOUS @Fcarrier 409.6MHz+(n*Freference) (dBc) note 3		
	-25°C	+25°C	+85°C
-5	-104.66	-110.78	-105.32
-4	-110.18	-108.61	-108.86
-3	-107.15	-111.44	-110.82
-2	-112.30	-115.92	-111.15
-1	-110.42	-113.51	-119.58
0 note 4	-	-	-
+1	-111.38	-112.44	-115.94
+2	-110.61	-116.05	-120.16
+3	-110.22	-111.55	-112.88
+4	-111.18	-112.16	-116.67
+5	-104.93	-104.60	-110.74

Note 1: Comparison frequency 400 kHz  
 Note 2: All spurs are referenced to carrier signal (n=0).

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

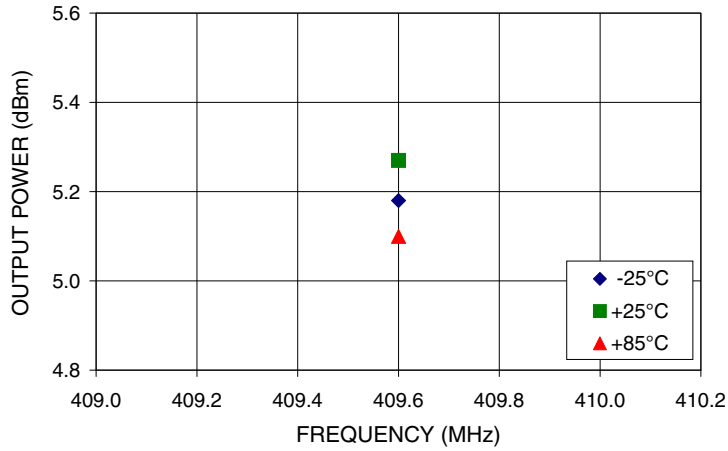


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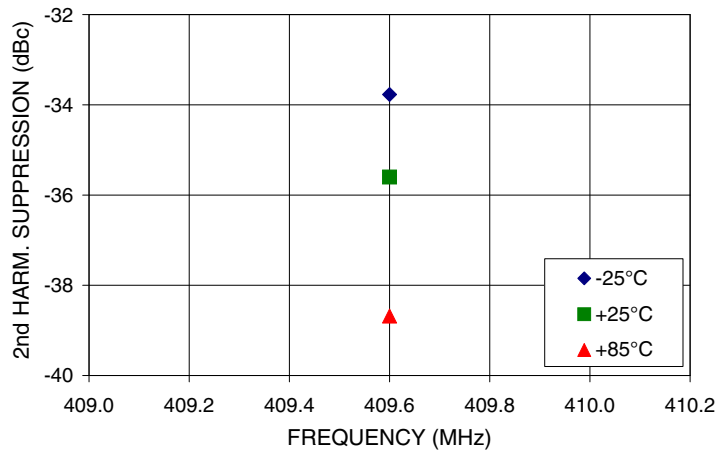
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Typical Performance Curves

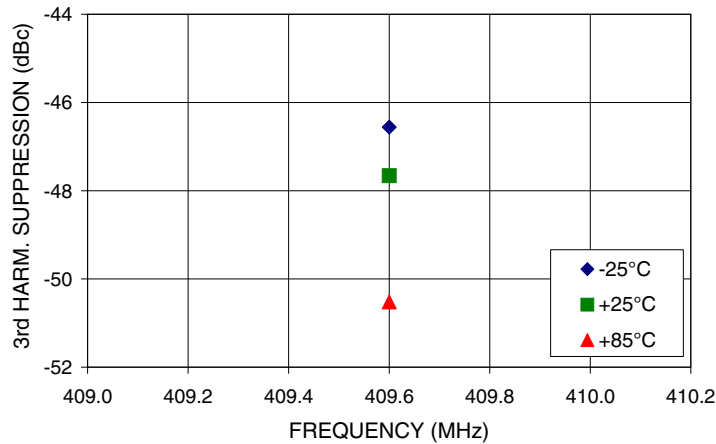
OUTPUT POWER Vs FREQUENCY



2nd HARMONIC Vs FREQUENCY



3rd HARMONIC Vs FREQUENCY



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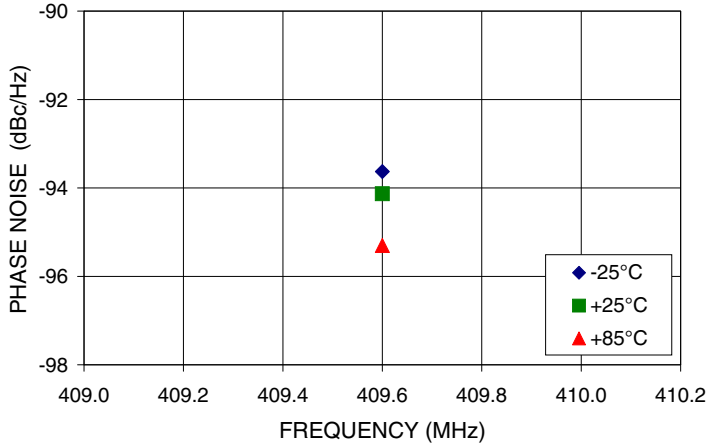


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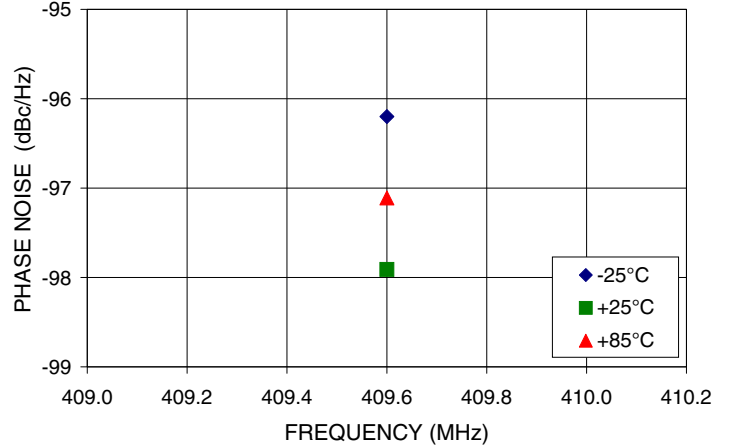


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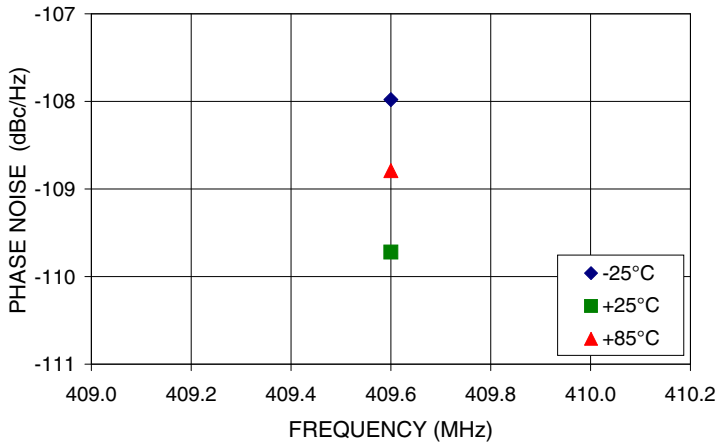
PHASE NOISE @ 100Hz offset



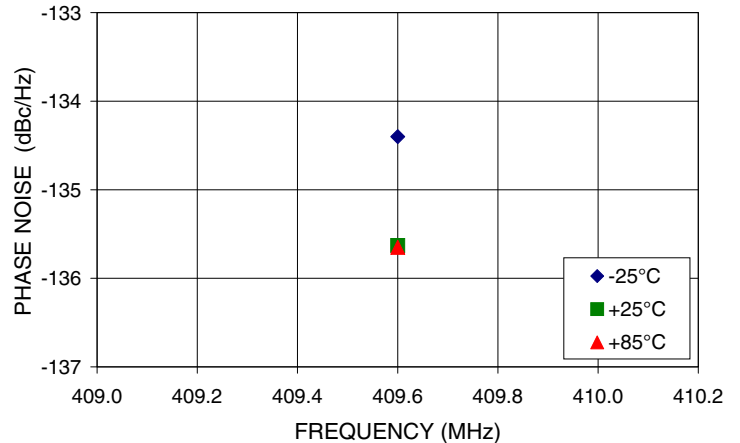
PHASE NOISE @ 1kHz offset



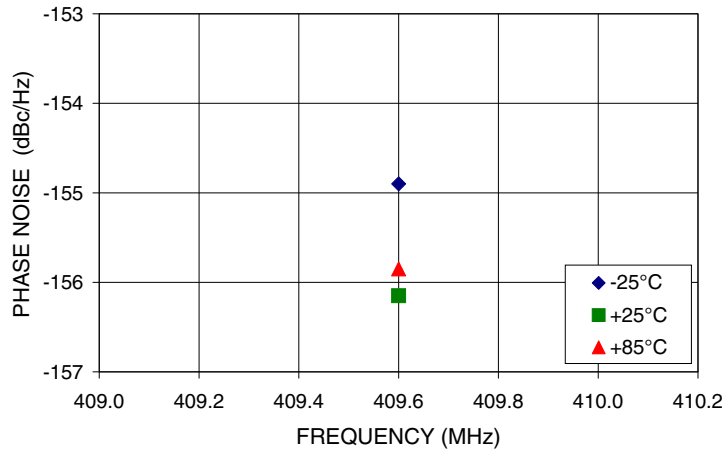
PHASE NOISE @ 10kHz offset



PHASE NOISE @ 100kHz offset



PHASE NOISE @ 1MHz offset



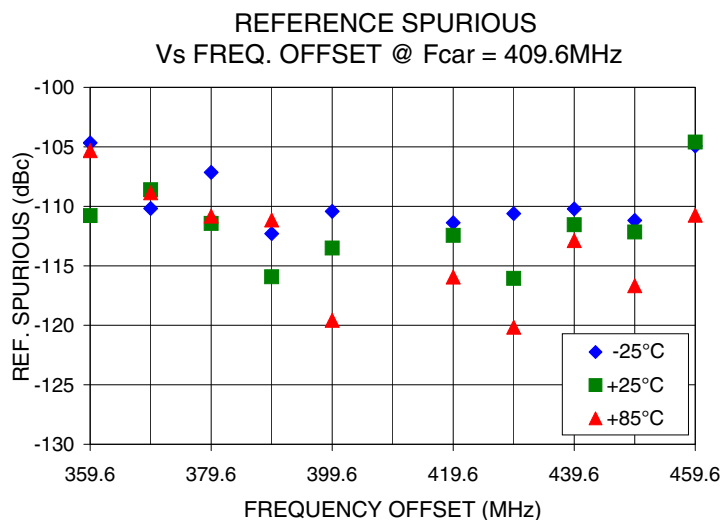
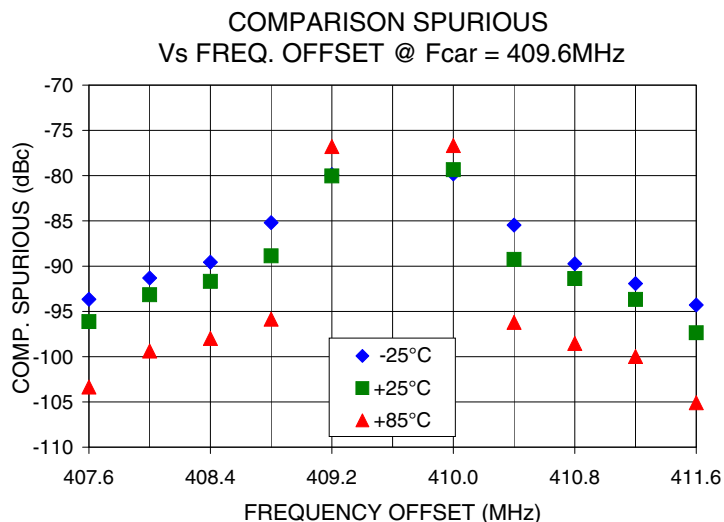
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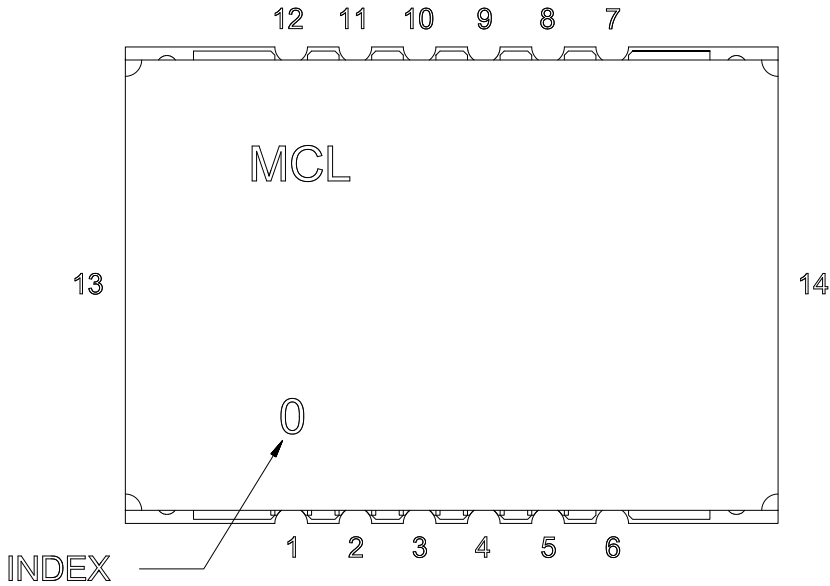


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Pin Configuration

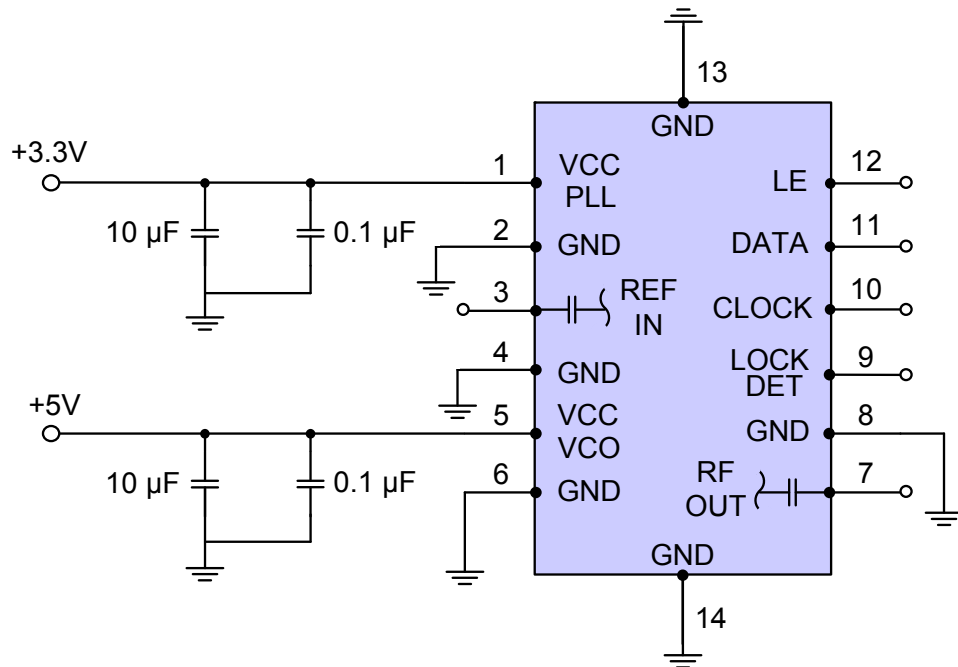


Pin Connection

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.



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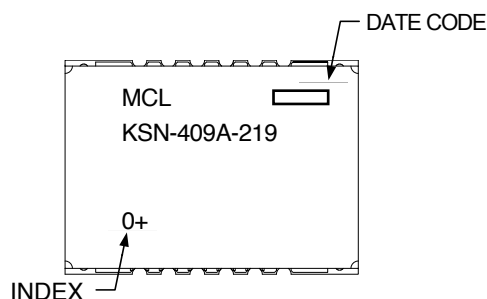


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## Device Marking



### 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:** DK1042

**Tape & Reel:** TR-F28

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

**Evaluation Board:** TB-567-1+

**Environment Ratings:** ENV03T2



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