

NON-CATALOG

Frequency Synthesizer

KSN-409A-219+

50Ω 409.6 MHz (fixed)

The Big Deal

- Low phase noise and spurious
- Robust design and construction
- Small size 0.800" x 0.584" x 0.154"



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 0.800" x 0.584" x 0.154") to shield against unwanted signals and noise.

Key Features

Feature	Advantages
Low phase noise and spurious: <ul style="list-style-type: none">• Phase noise: -109 dBc/Hz typ. @ 10 kHz offset• Comparison spurious: -80 dBc typ.• Reference spurious: -105 dBc typ.	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, 0.800" x 0.584" x 0.154"	The small size enables the KSN-409A-219+ to be used in compact designs.



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IFIRF MICROWAVE COMPONENTS

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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 0.800" x 0.584" x 0.154"



CASE STYLE: DK1042
PRICE: Contact Sales Dept.

+ 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.

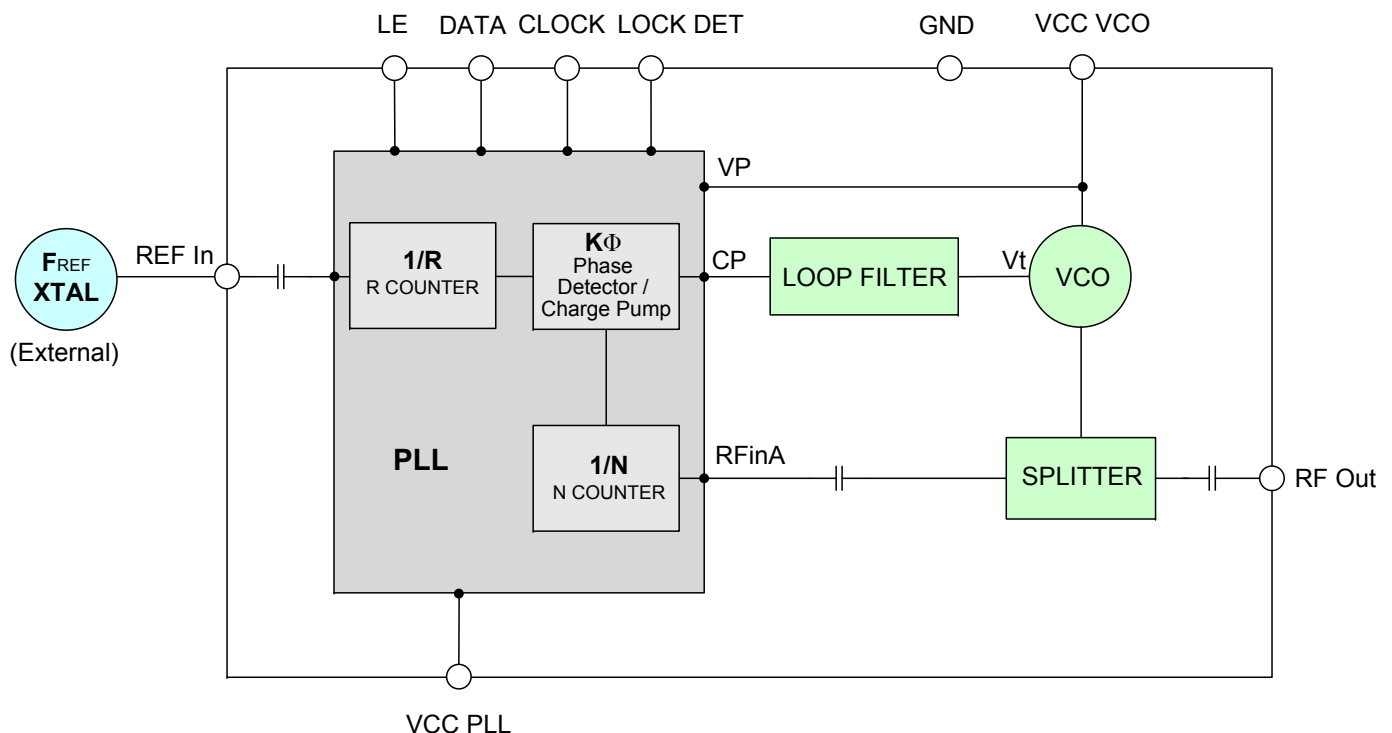
Applications

- 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 0.800" x 0.584" x 0.154") 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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Frequency Synthesizer

KSN-409A-219+

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 _{P-P}							
		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	-	3.45	V							
		Unlocked	-	-	-	0.40	V							
Frequency Synthesizer PLL		-	ADF4113											
PLL Programming		-	3-wire serial 3.3V CMOS											
Register Map ^{NOTE 1}	F_Register ^{NOTE 2}	Prescaler Value	Power-Down 2	Current Setting 2	Current Setting 1	Timer Counter Control	Fastlock Mode	Fastlock Enable	CP Three-State	PD Polarity	Muxout Control	Power-Down 1	Counter Reset	Control Bits
		01	0	111	111	0000	0	0	0	1	001	0	0	10
	N_Register @409.6MHz	Reserved	CP Gain	13-Bit B Counter							6-Bit A Counter			Control Bits
		00	1	0000001000000							000000			01
R_Register	Reserved	DLY	SYNC	Lock Detect Precision	Test Mode Bits	Anti-Backlash Width	14-BIT Reference Counter, R							Control Bits
	0	0	0	1	00	00	0000000011001							00

Note 1: Registers Load Sequence: Initialization Register, F Register, R Register, N Register.

Note 2: For the Initialization Register use Register F with Control Bits 11.

Absolute Maximum Ratings

Parameters	Ratings
VCO Supply Voltage ^{NOTE 3}	6V
PLL Supply Voltage ^{NOTE 3}	6V
VCO Supply Voltage to PLL Power Supply ^{NOTE 3}	-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

Note 3: Power on/off Sequence: Power on: VCO Supply Voltage, followed by PLL Supply Voltage. Power off: PLL Supply Voltage, followed by VCO Supply Voltage.



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Typical Performance Data

FREQUENCY (MHz)	POWER OUTPUT (dBm)			VCO CURRENT (mA)			PLL CURRENT (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	COMPARISON SPURIOUS @Fcarrier 409.6MHz+(n*Fcomparison) (dBc) note 1		
	-25°C	+25°C	+85°C
n			
-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

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

REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 409.6MHz+(n*Freference) (dBc) note 3		
	-25°C	+25°C	+85°C
n			
-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 3: Reference frequency 10 MHz
 Note 4: All spurs are referenced to carrier signal (n=0).

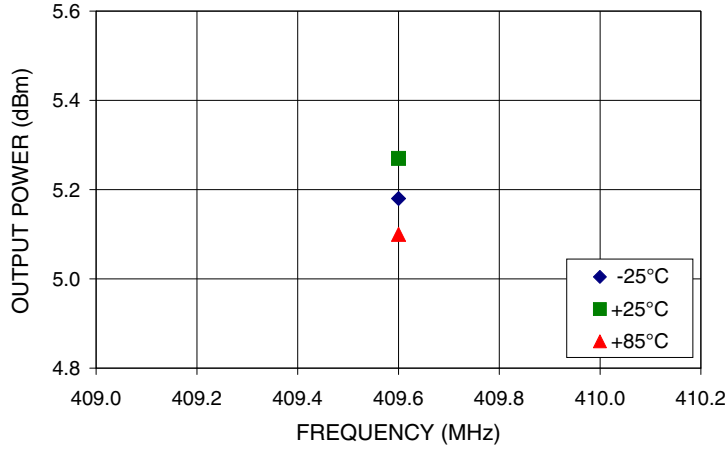
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Frequency Synthesizer

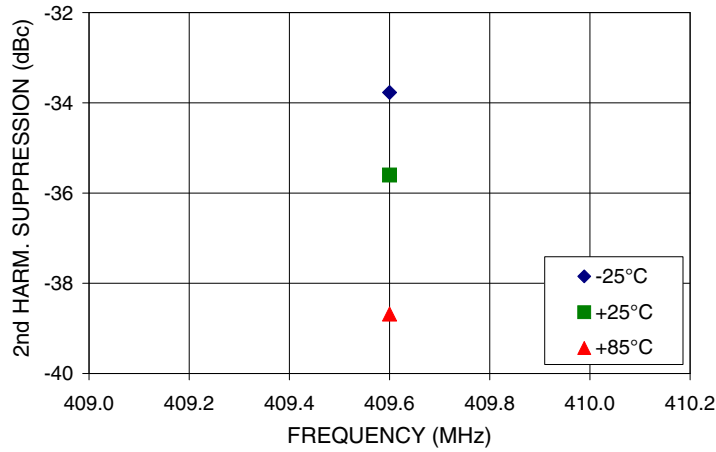
KSN-409A-219+

Typical Performance Curves

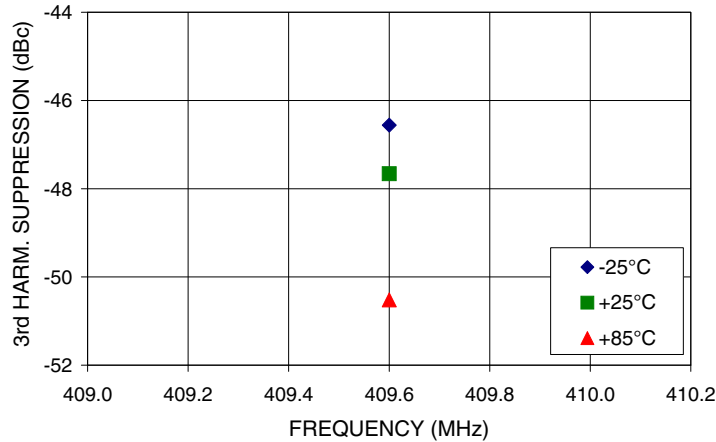
OUTPUT POWER Vs FREQUENCY



2nd HARMONIC Vs FREQUENCY



3rd HARMONIC Vs FREQUENCY



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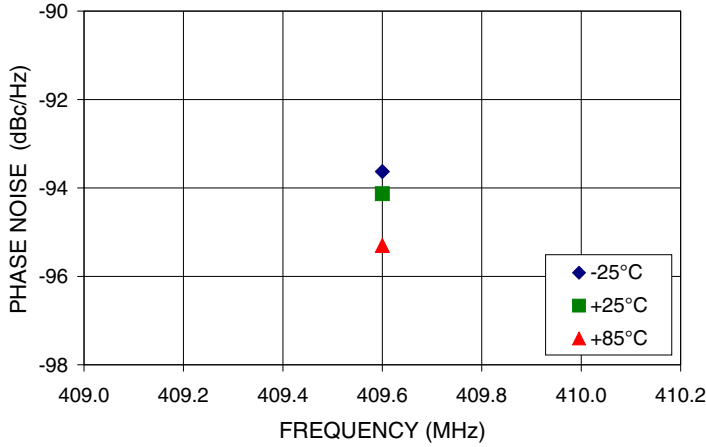
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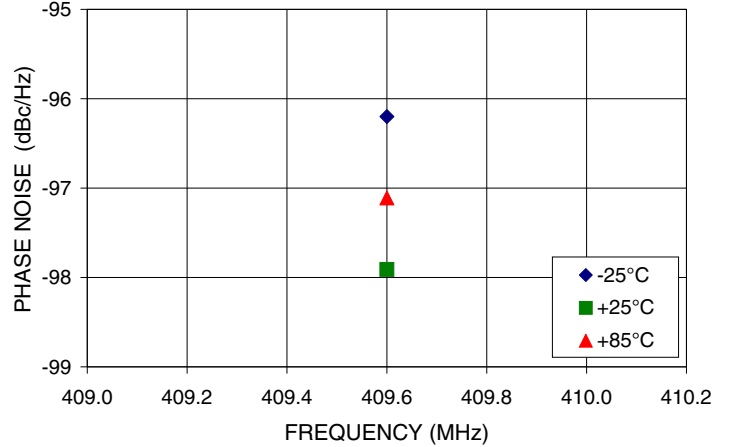
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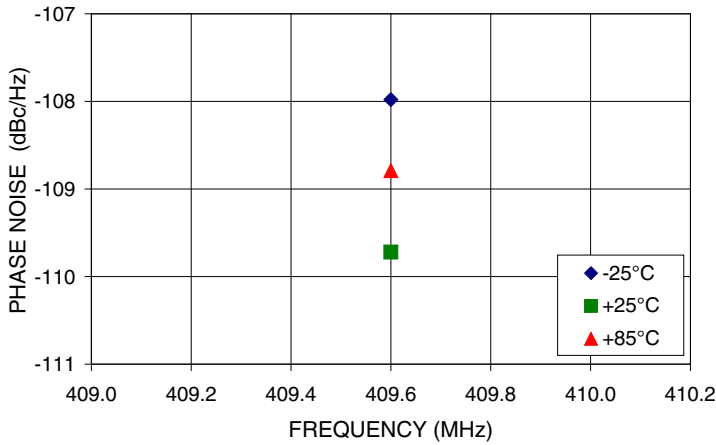
PHASE NOISE @ 100Hz offset



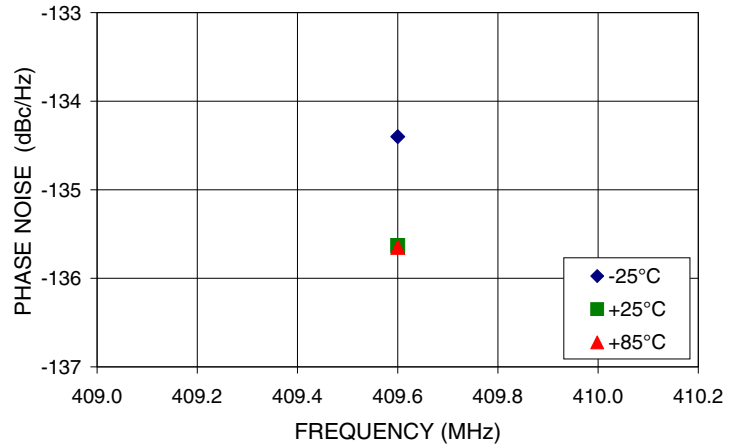
PHASE NOISE @ 1kHz offset



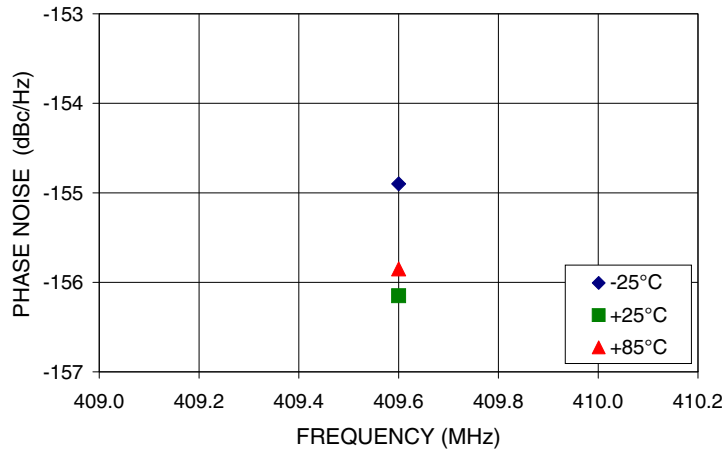
PHASE NOISE @ 10kHz offset



PHASE NOISE @ 100kHz offset



PHASE NOISE @ 1MHz offset



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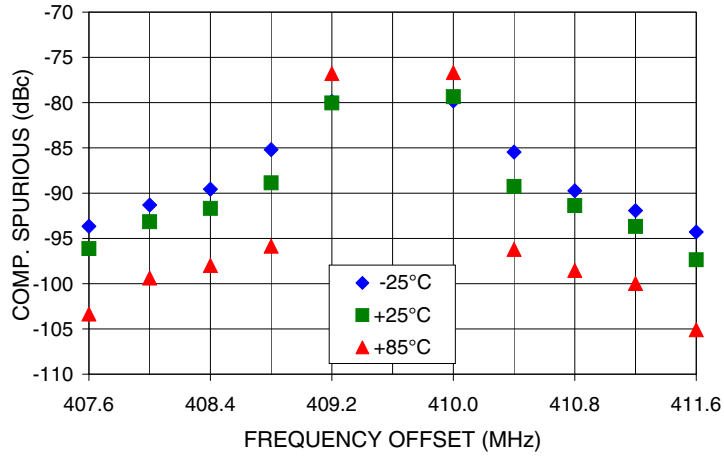
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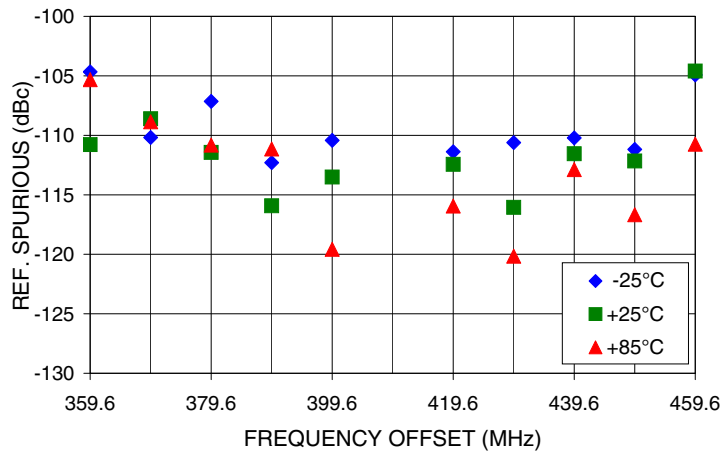
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COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 409.6MHz



REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 409.6MHz

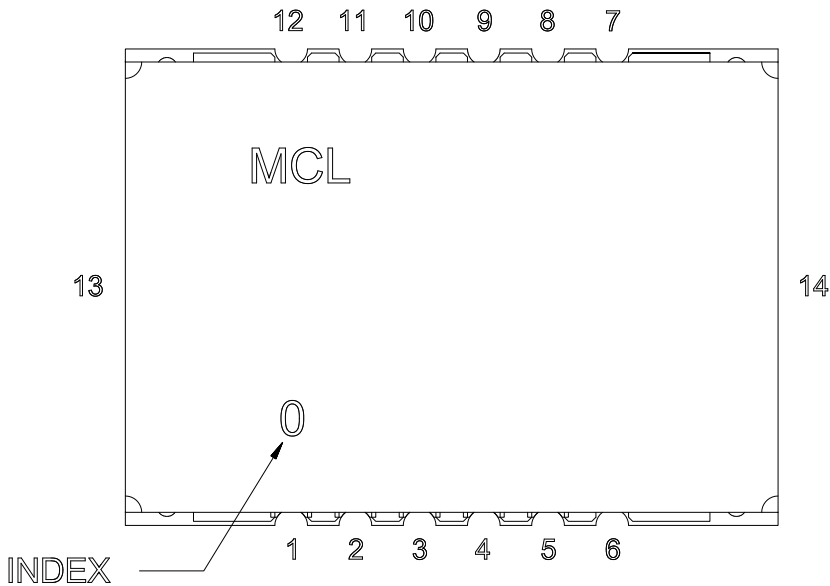


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Frequency Synthesizer

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Pin Configuration

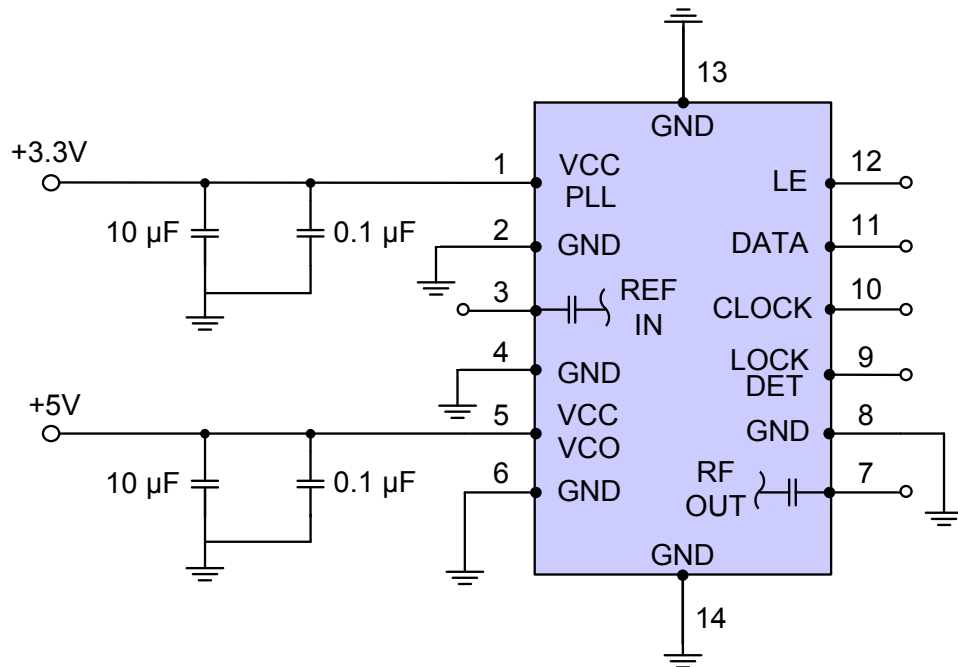


Pin Connection

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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IF/RF MICROWAVE COMPONENTS

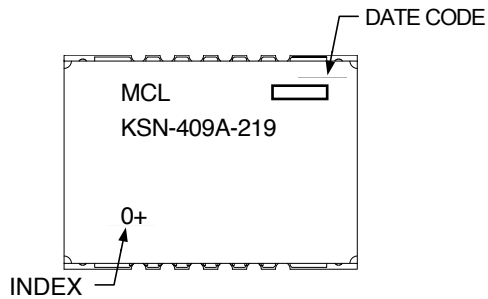
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Device Marking



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