

# Frequency Synthesizer

KSN-2554A-119+

50Ω 2416 to 2554.08 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: DK1042

## Product Overview

The KSN-2554A-119+ is a Frequency Synthesizer, designed to operate from 2416 to 2554.08 MHz for LTE base station application. The KSN-2554A-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: <ul style="list-style-type: none"><li>• Phase Noise: -94 dBc/Hz typ. @ 10 kHz offset</li><li>• Comparison Spurious: -94 dBc typ.</li><li>• Reference Spurious: -114 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-2554A-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-2554A-119+ to be used in compact designs.



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50Ω 2416 to 2554.08 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"



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.

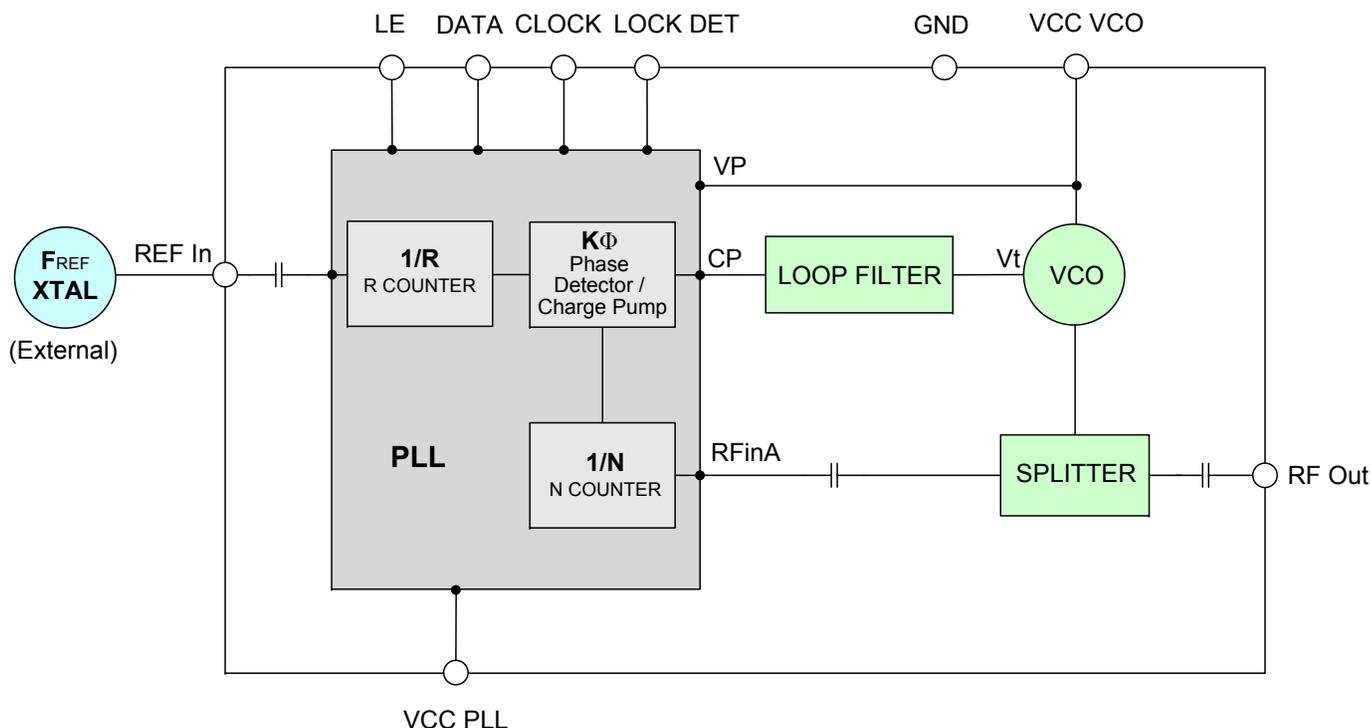
### Applications

- LTE base station

### General Description

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### 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	-	2416	-	2554.08	MHz
Step Size	-	-	160	-	kHz
Settling Time	Within ± 1 kHz	-	7	-	mSec
Output Power	-	+3	+6	+9	dBm
SSB Phase Noise	@ 100 Hz offset	-	-78	-	dBc/Hz
	@ 1 kHz offset	-	-73	-68	
	@ 10 kHz offset	-	-94	-89	
	@ 100 kHz offset	-	-123	-119	
	@ 1 MHz offset	-	-145	-140	
Reference Spurious Suppression	Ref. Freq. 30.72 MHz	-	-114	-89	dBc
Comparison Spurious Suppression	Step Size 160 kHz	-	-94	-70	
Non - Harmonic Spurious Suppression	-	-	-90	-	
Harmonic Suppression	-	-	-32	-25	
VCO Supply Voltage	5.00	4.75	5.00	5.25	
PLL Supply Voltage	5.00	4.75	5.00	5.25	V
VCO Supply Current	-	-	43	50	mA
PLL Supply Current	-	-	9	16	
Reference Input (External)	Frequency	30.72 (square wave)	-	30.72	MHz
	Amplitude	1	-	1	V <sub>P-P</sub>
	Input impedance	-	-	100	KΩ
	Phase Noise @ 1 kHz offset	-	-	-115	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	-	ADF4118			
PLL Programming	-	3-wire serial 5V CMOS			
Register Map @2554.08MHz	F_Register	-	(MSB) X0XXX00000X0010010010 (LSB)		
	N_Register	-	(MSB) 100001111100101101101 (LSB)		
	R_Register	-	(MSB) 1XXXX0000001100000000 (LSB)		

**Absolute Maximum Ratings**

Parameters	Ratings
VCO Supply Voltage	6V
PLL Supply Voltage	6V
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
	2416.00	6.28	6.14	5.77	41.84	43.15	44.33	8.34	9.68
2421.12	6.30	6.16	5.83	41.62	43.17	44.40	8.36	9.70	10.83
2437.12	6.29	6.12	5.75	41.66	43.22	44.40	8.34	9.66	10.82
2453.12	6.31	6.13	5.77	41.95	43.25	44.45	8.36	9.68	10.86
2469.12	6.31	6.12	5.71	41.97	43.29	44.66	8.38	9.70	10.89
2485.12	6.33	6.19	5.87	41.78	43.35	44.54	8.40	9.72	10.92
2501.12	6.31	6.19	5.89	42.07	43.39	44.74	8.41	9.73	10.94
2517.12	6.28	6.16	5.88	42.11	43.45	44.63	8.43	9.75	10.96
2533.12	6.25	6.12	5.85	42.15	43.59	44.66	8.45	9.76	10.98
2549.12	6.28	6.16	5.85	42.18	43.52	44.85	8.46	9.77	11.00
2554.08	6.29	6.18	5.86	42.20	43.53	44.77	8.46	9.78	11.01

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
2416.00	-30.24	-31.80	-31.86	-39.88	-42.06	-43.65
2421.12	-30.12	-31.52	-31.59	-39.88	-42.28	-44.06
2437.12	-30.99	-32.03	-31.73	-40.44	-43.81	-44.16
2453.12	-30.18	-31.03	-31.29	-41.84	-44.59	-45.66
2469.12	-31.28	-31.63	-31.68	-42.25	-45.65	-46.48
2485.12	-31.80	-32.24	-32.75	-41.74	-48.14	-49.15
2501.12	-31.64	-32.82	-32.88	-44.24	-52.36	-50.51
2517.12	-31.16	-32.77	-32.89	-44.58	-52.27	-50.80
2533.12	-31.64	-32.76	-32.69	-45.44	-50.41	-47.87
2549.12	-31.77	-32.77	-32.61	-47.85	-47.71	-45.51
2554.08	-31.75	-32.70	-32.50	-47.04	-49.36	-45.37



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FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	+25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
2416.00	-78.41	-73.73	-95.12	-124.25	-145.40
2421.12	-78.78	-73.30	-95.76	-124.21	-145.44
2437.12	-77.91	-72.85	-94.72	-124.04	-145.43
2453.12	-77.32	-72.93	-94.91	-124.11	-145.27
2469.12	-78.03	-75.06	-93.95	-123.83	-145.09
2485.12	-77.20	-75.97	-93.60	-123.60	-145.34
2501.12	-78.21	-72.56	-93.32	-123.14	-144.69
2517.12	-76.69	-72.84	-94.11	-123.23	-144.47
2533.12	-80.57	-72.31	-94.51	-122.96	-144.59
2549.12	-76.56	-73.69	-94.80	-123.03	-144.54
2554.08	-76.75	-72.14	-94.38	-123.22	-144.43

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	-45°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
2416.00	-78.61	-73.87	-95.71	-125.25	-146.61
2421.12	-78.15	-74.29	-95.67	-125.27	-146.25
2437.12	-76.91	-74.60	-95.25	-124.87	-146.28
2453.12	-77.09	-73.70	-95.25	-125.14	-146.16
2469.12	-74.56	-73.68	-94.46	-124.49	-145.75
2485.12	-77.83	-75.66	-94.53	-124.88	-146.11
2501.12	-78.33	-75.61	-94.22	-123.74	-145.27
2517.12	-79.08	-75.52	-94.29	-123.99	-145.61
2533.12	-76.54	-74.41	-94.28	-123.84	-145.38
2549.12	-78.05	-73.00	-94.52	-123.60	-145.13
2554.08	-78.55	-73.56	-94.71	-123.76	-145.08

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	+85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
2416.00	-76.77	-72.87	-94.81	-123.83	-144.52
2421.12	-79.62	-72.08	-95.51	-123.50	-144.41
2437.12	-78.98	-72.38	-94.47	-123.55	-144.61
2453.12	-79.83	-74.11	-93.65	-123.53	-144.53
2469.12	-77.52	-72.96	-93.34	-123.06	-144.15
2485.12	-79.43	-74.25	-94.53	-123.47	-144.40
2501.12	-78.07	-73.00	-93.81	-122.71	-143.88
2517.12	-79.22	-72.90	-94.46	-122.82	-143.80
2533.12	-77.06	-72.57	-93.60	-122.44	-143.86
2549.12	-75.23	-72.59	-93.26	-122.40	-143.44
2554.08	-78.01	-73.34	-93.99	-122.74	-143.42



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COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 2416MHz+(n*Fcomp.) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 2485.12MHz+(n*Fcomp.) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 2554.08MHz+(n*Fcomp.) (dBc) note 1			
	n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
	-5	-113.32	-108.90	-108.91	-117.82	-114.51	-116.34	-115.86	-113.83	-114.40
-4	-111.04	-109.92	-112.67	-109.72	-110.47	-112.91	-111.42	-113.18	-110.99	
-3	-104.22	-103.99	-107.34	-111.51	-100.75	-108.31	-110.35	-101.22	-105.30	
-2	-105.44	-100.07	-103.59	-103.79	-99.48	-104.08	-104.17	-104.29	-103.89	
-1	-91.28	-93.58	-90.98	-88.66	-95.03	-87.81	-89.32	-95.74	-85.85	
0 note 2	-	-	-	-	-	-	-	-	-	
+1	-91.67	-91.30	-90.61	-89.71	-94.87	-92.31	-87.55	-94.52	-84.99	
+2	-100.86	-99.96	-101.34	-106.10	-99.83	-106.38	-99.80	-102.84	-102.41	
+3	-107.95	-103.04	-110.57	-107.75	-102.17	-108.64	-104.49	-102.01	-108.79	
+4	-109.90	-112.12	-109.96	-115.06	-107.24	-110.65	-112.51	-112.79	-111.30	
+5	-116.71	-113.12	-116.21	-116.57	-114.34	-114.37	-115.93	-112.64	-115.30	

Note 1: Comparison frequency 160 kHz  
 Note 2: All spurs are referenced to carrier signal (n=0).

REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 2416MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 2485.12MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 2554.08MHz+(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	-106.42	-111.48	-112.83	-113.81	-120.15	-120.09	-115.03	-117.89	-120.61
-4	-110.00	-111.91	-112.42	-110.90	-112.49	-113.34	-112.23	-115.57	-114.95	
-3	-131.26	-128.08	-127.75	-130.35	-128.91	-127.32	-128.79	-128.39	-126.22	
-2	-116.30	-116.87	-116.10	-114.40	-114.57	-114.27	-115.62	-117.67	-116.29	
-1	-114.72	-116.43	-116.47	-111.44	-113.66	-117.31	-118.79	-121.01	-116.52	
0 note 4	-	-	-	-	-	-	-	-	-	
+1	-109.04	-110.12	-109.22	-108.94	-110.29	-109.78	-109.07	-108.78	-107.64	
+2	-118.47	-120.04	-119.71	-117.89	-119.41	-120.93	-119.46	-119.42	-120.37	
+3	-128.54	-129.49	-129.27	-131.68	-129.57	-129.69	-129.45	-131.47	-130.69	
+4	-109.06	-111.15	-113.17	-112.18	-113.21	-116.40	-113.16	-115.76	-117.59	
+5	-105.91	-109.94	-113.48	-113.30	-115.30	-121.64	-117.45	-120.07	-122.16	

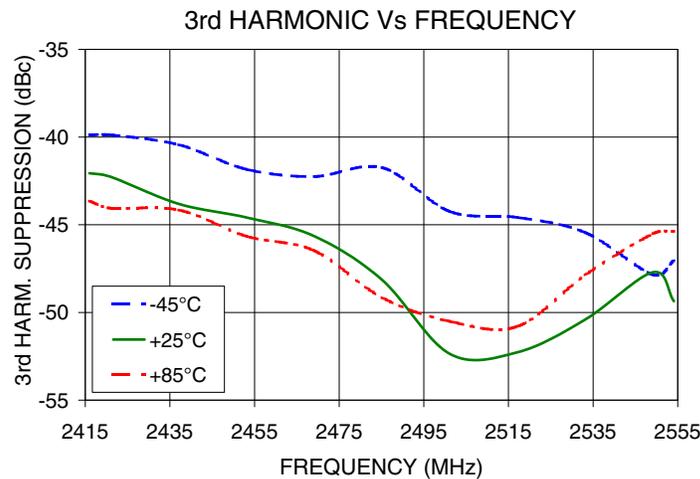
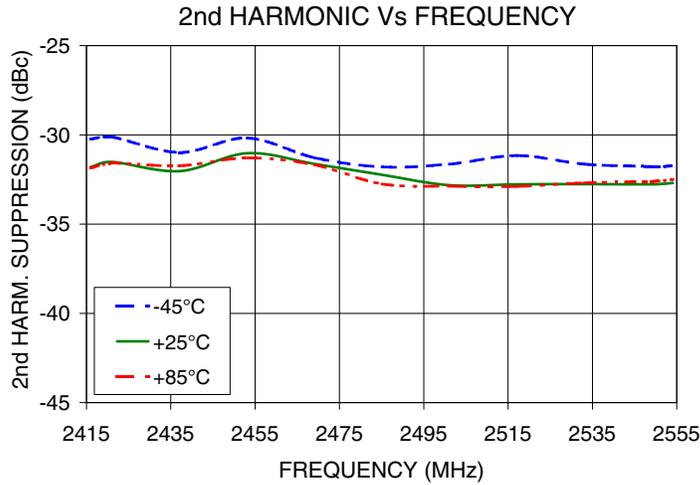
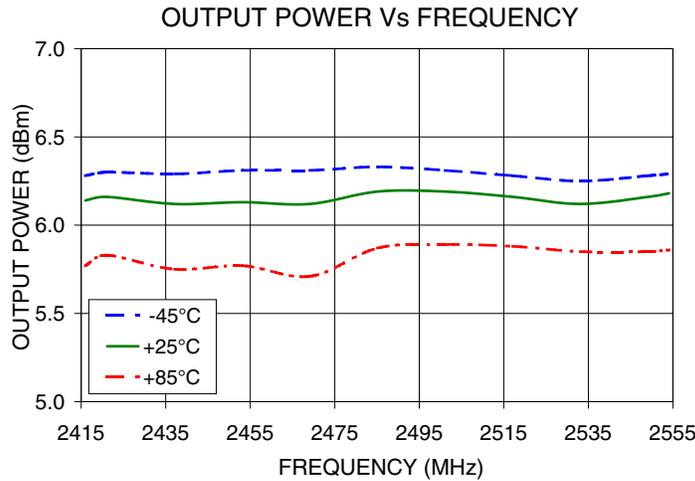
Note 3: Reference frequency 30.72 MHz  
 Note 4: All spurs are referenced to carrier signal (n=0).



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Typical Performance Curves



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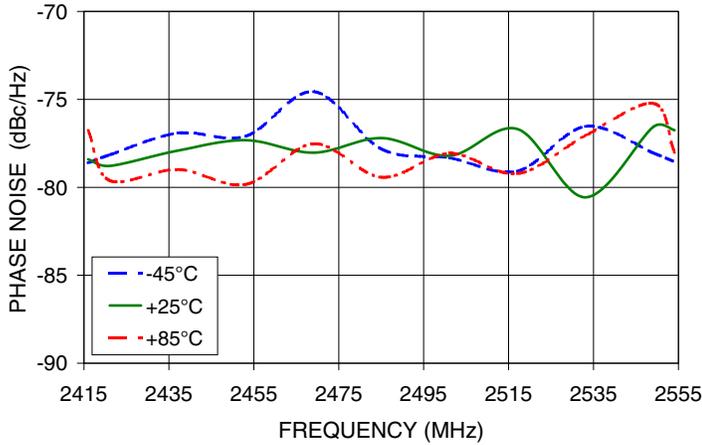


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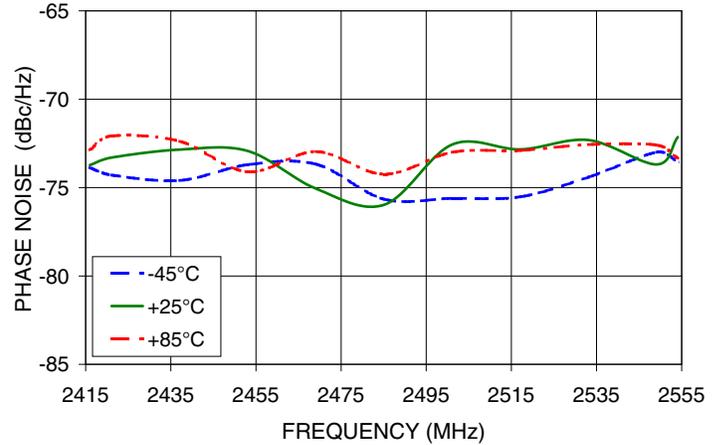


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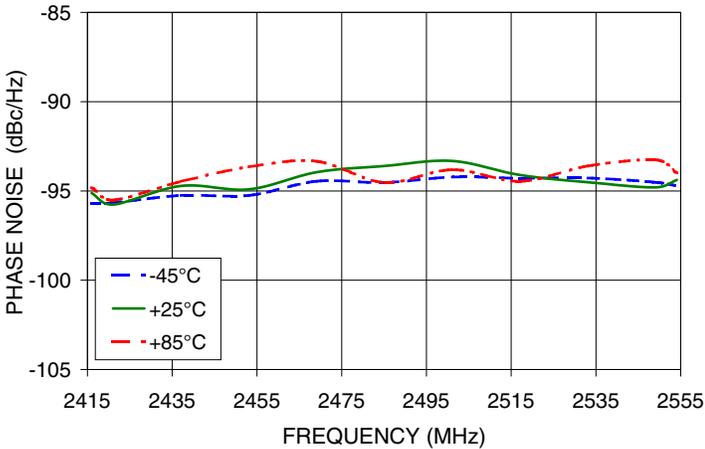
PHASE NOISE @100Hz offset



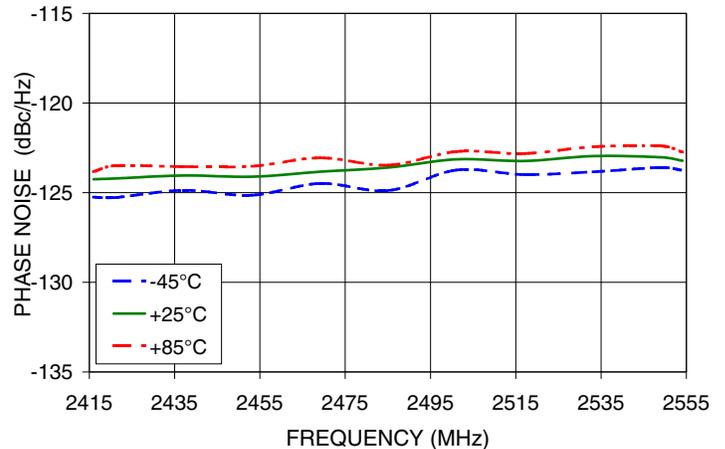
PHASE NOISE @1kHz offset



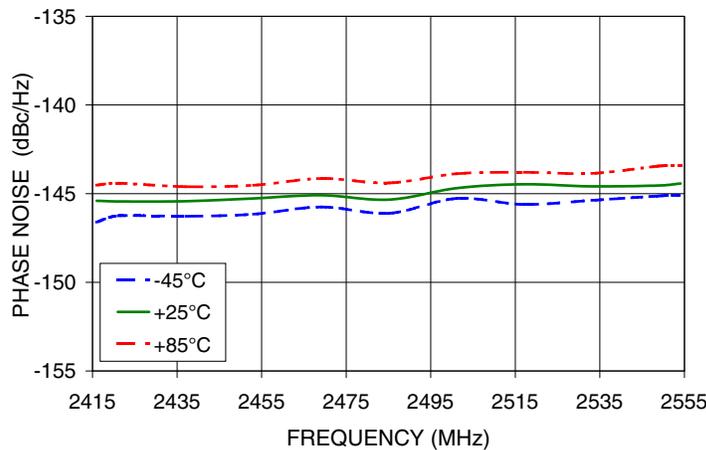
PHASE NOISE @10kHz offset



PHASE NOISE @100kHz offset



PHASE NOISE @1MHz offset



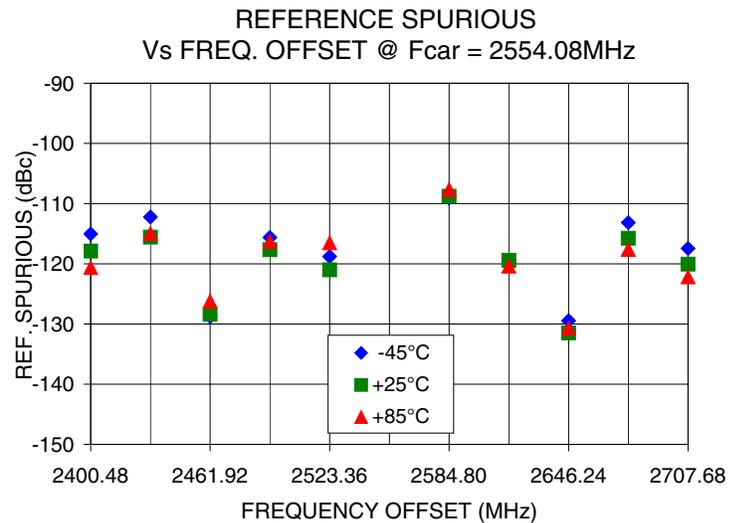
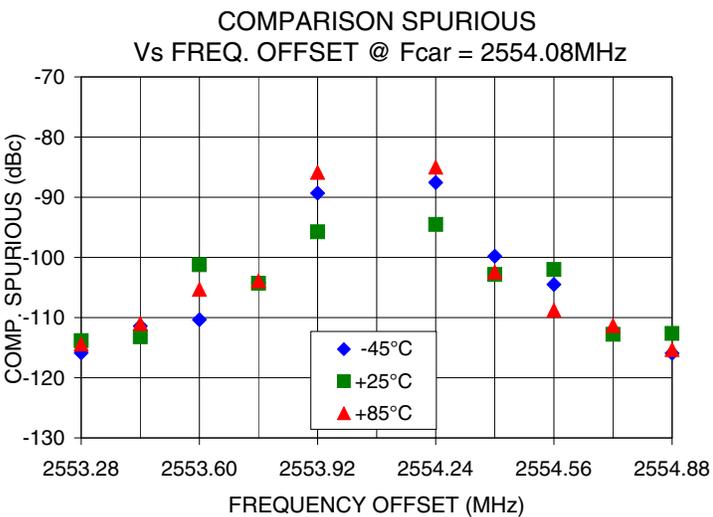
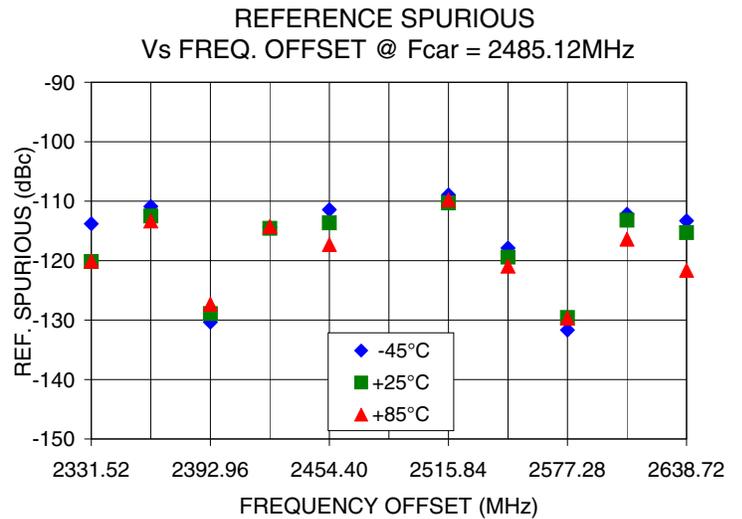
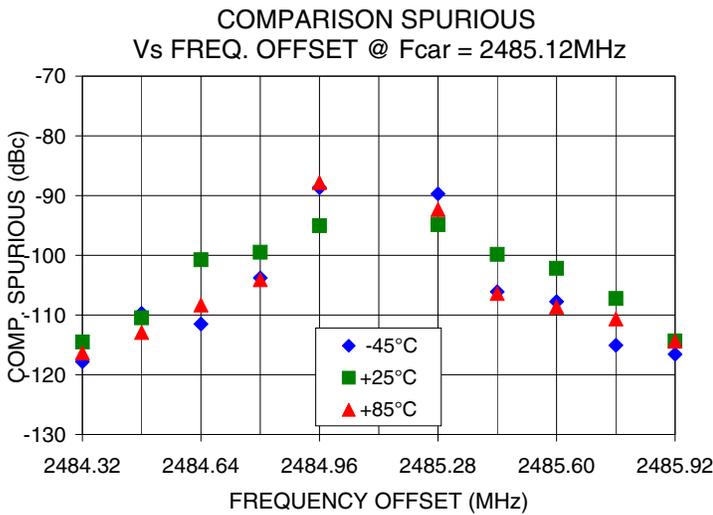
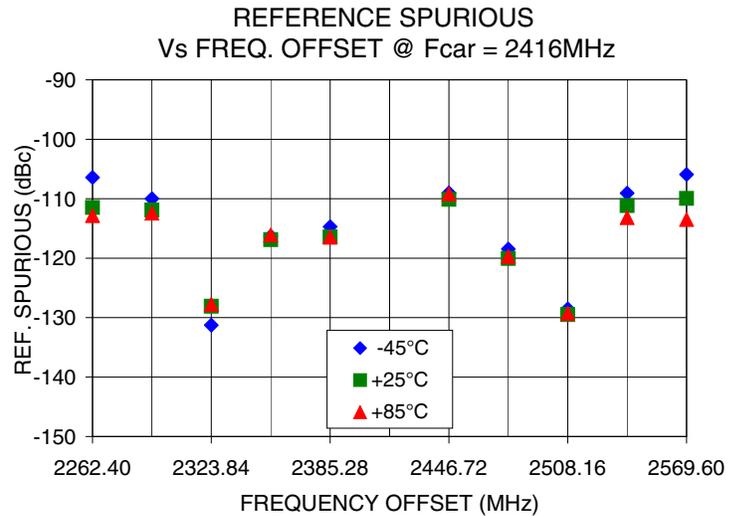
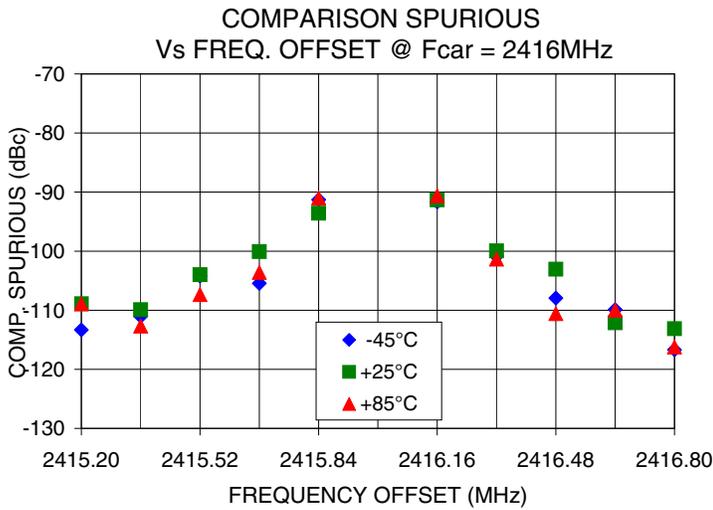
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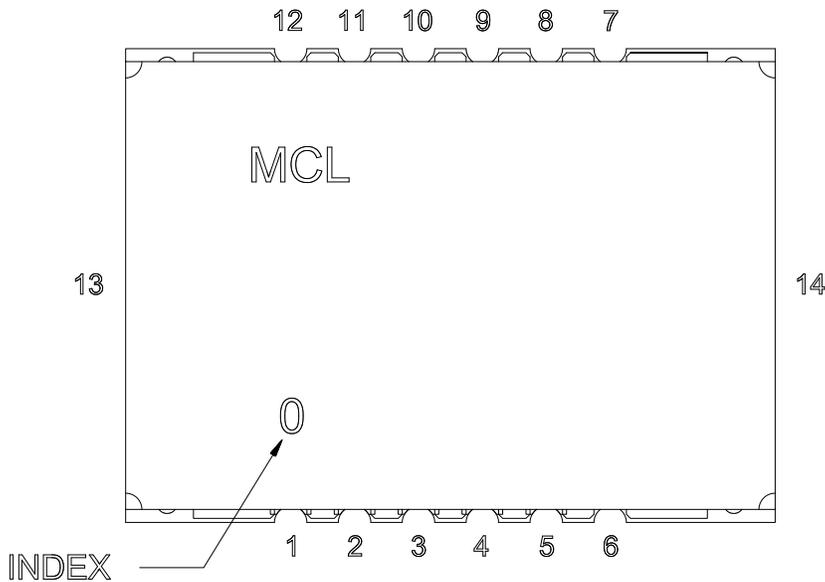


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Pin Configuration

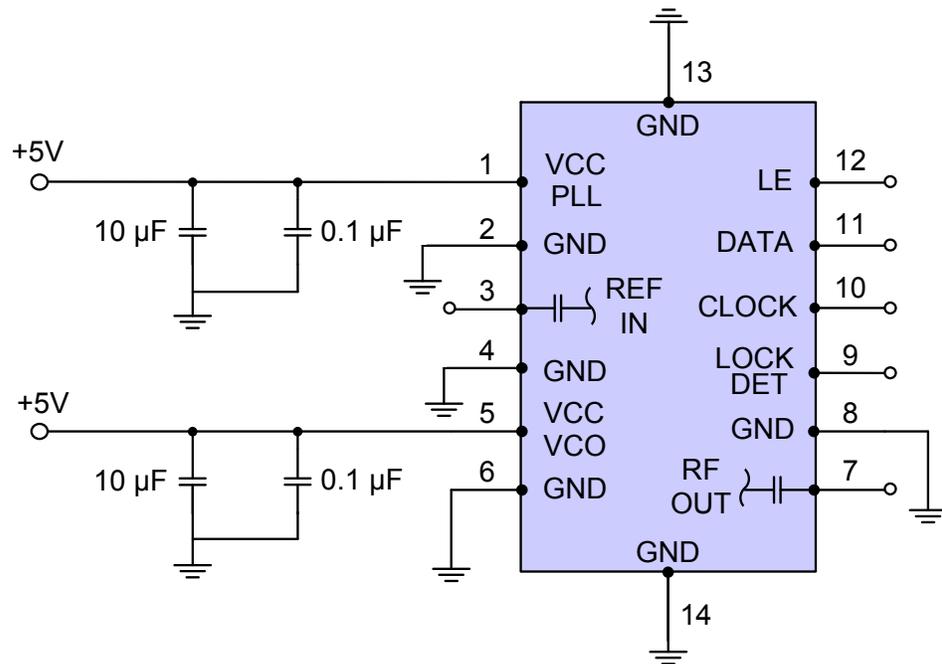


Pin Connection

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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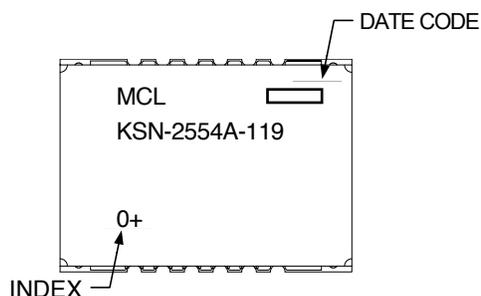


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## Device Marking



### 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+

**Environment Ratings:** ENV03T2



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