Frequency Synthesizer KSN-2400A-219+

50Ω 2300 to 2400 MHz

The Big Deal

- Fractional N synthesizer
- 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-2400A-219+ is a Frequency Synthesizer, designed to operate from 2300 to 2400 MHz for TD-SCDMA application. The KSN-2400A-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: • Phase Noise: -97 dBc/Hz typ. @ 10 kHz offset • Step Size Spurious: -72 dBc typ. • Comparison Spurious: -100 dBc typ. • Reference Spurious: -102 dBc typ.	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Robust design and construction	To enhance the robustness of KSN-2400A-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-2400A-219+ to be used in compact designs.

Surface Mount

Frequency Synthesizer

KSN-2400A-219+

50Ω 2300 to 2400 MHz

Features

- Fractional N synthesizer
- 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.

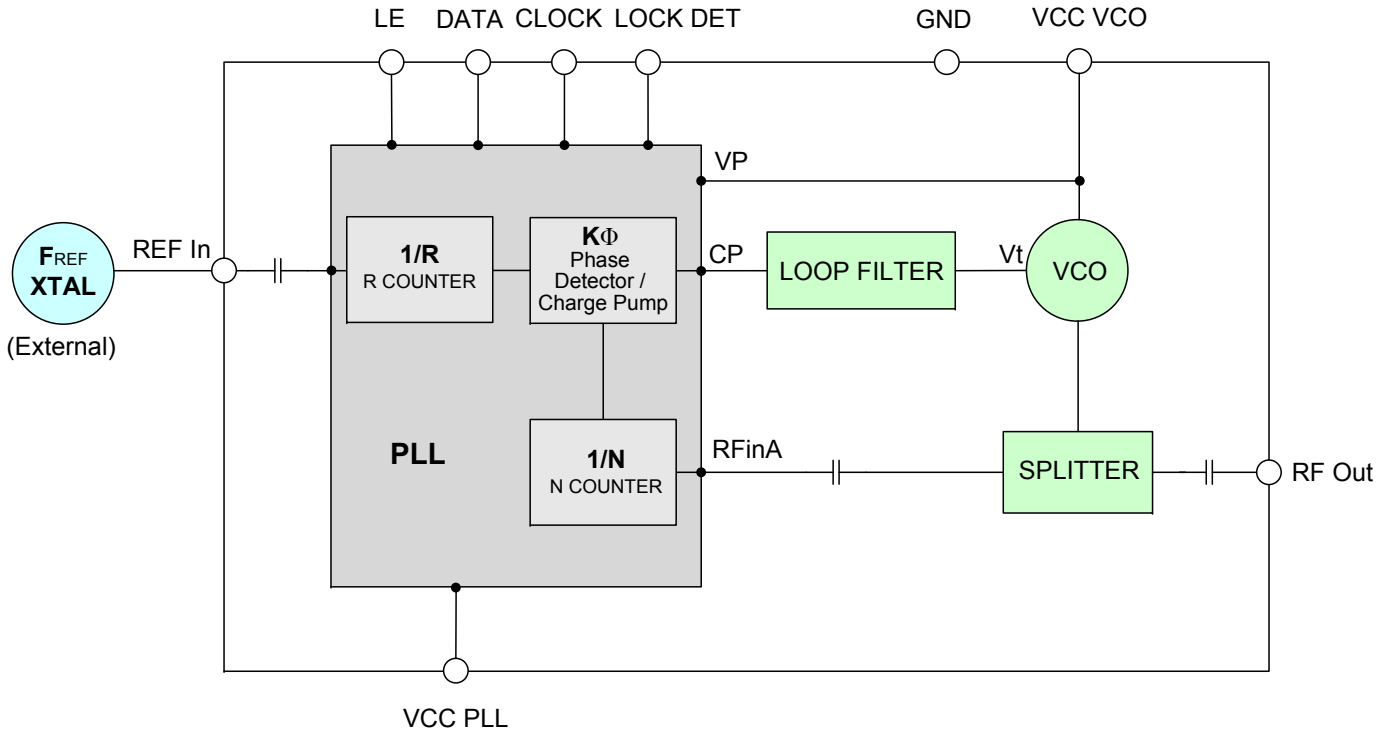
Applications

- TD-SCDMA

General Description

The KSN-2400A-219+ is a Frequency Synthesizer, designed to operate from 2300 to 2400 MHz for TD-SCDMA application. The KSN-2400A-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-2400A-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



REV. A
M129826
EDR-9393F1
KSN-2400A-219+
Category-A2
RAV
101207

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

Parameters		Test Conditions	Min.	Typ.	Max.	Units
Frequency Range		-	2300	-	2400	MHz
Step Size		-	-	20	-	kHz
Comparison Frequency		-	-	15.36	-	MHz
Settling Time		Within ± 1 kHz	-	25	-	mSec
Output Power		-	+2	+5	+7	dBm
SSB Phase Noise		@ 100 Hz offset	-	-76	-	dBc/Hz
		@ 1 kHz offset	-	-82	-76	
		@ 10 kHz offset	-	-97	-88	
		@ 100 kHz offset	-	-127	-122	
		@ 1 MHz offset	-	-148	-142	
Integrated SSB Phase Noise		@1kHz to 5MHz	-	-47	-42	dBc
Step Size Spurious Suppression		Step Size 20 kHz	-	-72	-42	dBc
0.5 Step Size Spurious Suppression		0.5 Step Size 10 kHz	-	-70	-51	
Reference Spurious Suppression		Ref. Freq. 30.72 MHz	-	-102	-76	
Comparison Spurious Suppression		Comp. Freq. 15.36 MHz	-	-100	-75	
Non - Harmonic Spurious Suppression		-	-	-90	-	
Harmonic Suppression		-	-	-31	-21	
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		-	-	45	52	mA
PLL Supply Current		-	-	38	46	
Reference Input (External)	Frequency	30.72 (square wave)	-	30.72	-	MHz
	Amplitude	1	-	1	-	V_{P-P}
	Input impedance	-	-	100	-	KΩ
	Phase Noise @ 1 kHz offset	-	-	-135	-	dBc/Hz
RF Output port Impedance		-	-	50	-	Ω
Input Logic Level	Input high voltage	-	2.65	-	-	V
	Input low voltage	-	-	-	0.55	V
Digital Lock Detect	Locked	-	2.55	-	3.30	V
	Unlocked	-	-	-	0.40	V
Frequency Synthesizer PLL		-	ADF4153			
PLL Programming		-	3-wire serial 3.15V CMOS			
Register Map @ 2400 MHz	R0_Register	-	(MSB) 10011100000011000000000 (LSB)			
	R1_Register	-	(MSB) 10100100011000000000001 (LSB)			
	R2_Register	-	(MSB) 111100010 (LSB)			
	R3_Register	-	(MSB) 11 (LSB)			

Absolute Maximum Ratings

Parameters	Ratings
VCO Supply Voltage	5.8V
PLL Supply Voltage	6.2V
VCO Supply Voltage to PLL Supply Voltage	-0.3V to +5.8V
Reference Frequency Voltage	-0.3Vmin,+ 3.25Vmax
Data, Clock, LE Levels	-0.3Vmin,+ 3.25Vmax
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)		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
2300	5.31	5.17	4.93	43.23	44.39	45.73	37.60	38.21	39.80
2310	5.31	5.17	4.94	43.30	44.44	45.76	37.67	38.29	39.87
2330	5.25	5.12	4.89	43.42	44.52	45.82	37.63	38.25	39.84
2350	5.10	4.96	4.72	43.47	44.61	45.89	37.45	38.07	39.66
2370	5.16	4.96	4.70	43.59	44.68	45.96	37.62	38.24	39.84
2390	5.35	5.14	4.86	43.68	44.77	46.04	37.66	38.29	39.89
2400	5.40	5.21	4.93	43.74	44.82	46.08	37.50	38.13	39.73

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
2300	-28.83	-30.70	-37.26	-37.57	-35.82	-39.86
2310	-29.38	-32.51	-36.58	-38.23	-37.41	-42.12
2330	-26.16	-32.76	-37.08	-34.93	-37.74	-39.12
2350	-27.06	-27.43	-35.75	-35.77	-34.23	-39.72
2370	-28.87	-30.66	-34.30	-42.29	-38.33	-42.66
2390	-27.99	-31.02	-35.28	-38.64	-40.27	-42.68
2400	-28.15	-29.72	-36.03	-38.53	-38.82	-41.11

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS +25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
2300	-74.88	-79.48	-97.99	-127.56	-147.98
2310	-74.08	-79.56	-97.94	-127.61	-148.12
2330	-76.72	-81.38	-95.81	-127.68	-147.95
2350	-75.15	-80.74	-95.91	-127.56	-148.26
2370	-74.14	-79.80	-97.68	-127.22	-147.86
2390	-75.20	-79.54	-96.40	-127.51	-147.88
2400	-74.08	-79.86	-97.26	-127.40	-147.84

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS -45°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
2300	-75.27	-79.97	-95.45	-128.61	-149.27
2310	-74.13	-79.51	-95.35	-128.72	-149.48
2330	-70.62	-80.10	-94.84	-128.61	-149.76
2350	-72.79	-79.52	-93.17	-128.37	-148.92
2370	-76.56	-79.88	-93.81	-128.65	-149.82
2390	-73.03	-79.84	-92.91	-128.70	-149.54
2400	-74.59	-80.25	-94.39	-128.41	-149.27

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS +85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
2300	-76.36	-83.19	-97.73	-125.82	-146.12
2310	-77.23	-81.43	-98.34	-125.86	-146.19
2330	-78.05	-83.04	-95.63	-125.71	-146.06
2350	-77.28	-82.58	-96.18	-125.55	-145.88
2370	-75.88	-81.43	-96.52	-125.63	-145.98
2390	-76.15	-81.32	-95.95	-125.47	-145.82
2400	-74.83	-82.39	-96.72	-125.38	-145.98

COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 2300MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 2350MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 2400MHz+(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	-107.09	-112.50	-115.62	-106.91	-106.61	-114.58	-103.37	-116.11	-120.21
-4	-101.11	-103.72	-103.89	-97.99	-102.81	-100.23	-108.68	-99.86	-100.70
-3	-101.78	-113.21	-108.15	-102.54	-106.30	-103.58	-107.34	-101.05	-102.46
-2	-99.73	-105.65	-96.36	-101.24	-100.50	-94.26	-102.94	-97.54	-98.78
-1	-99.41	-106.71	-100.77	-101.38	-102.50	-100.75	-100.38	-98.53	-100.01
0 note 2	-	-	-	-	-	-	-	-	-
+1	-108.92	-100.68	-97.96	-96.37	-97.38	-106.76	-99.71	-100.19	-98.15
+2	-104.41	-97.03	-90.64	-97.42	-107.18	-104.35	-102.82	-104.70	-101.56
+3	-129.42	-105.25	-102.46	-102.32	-115.68	-111.92	-99.65	-113.33	-115.15
+4	-103.72	-101.03	-101.44	-100.57	-105.55	-105.27	-103.11	-102.29	-103.38
+5	-104.61	-109.74	-106.67	-104.59	-117.33	-106.27	-106.33	-103.61	-107.99

Note 1: Comparison frequency 15.36 MHz
Note 2: All spurs are referenced to carrier signal (n=0).

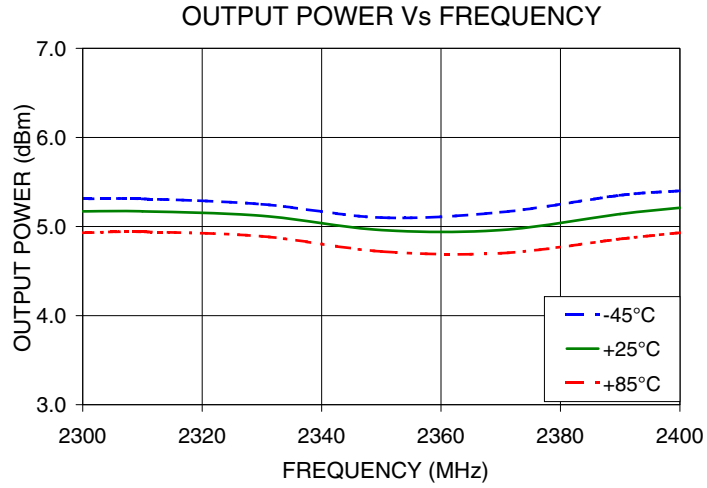
REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 2300MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 2350MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 2400MHz+(n*Freference) (dBc) note 3		
n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-92.10	-95.75	-99.34	-94.02	-95.28	-96.88	-95.75	-97.87	-97.16
-4	-92.92	-94.78	-95.08	-92.19	-94.65	-95.22	-93.55	-92.18	-95.40
-3	-100.51	-109.54	-104.89	-109.46	-106.27	-110.01	-100.28	-110.92	-105.97
-2	-101.18	-103.90	-103.66	-97.75	-102.31	-100.01	-107.39	-99.97	-100.61
-1	-99.62	-106.54	-97.16	-101.36	-100.66	-94.37	-102.54	-97.34	-98.65
0 note 4	-	-	-	-	-	-	-	-	-
+1	-104.72	-97.19	-91.02	-97.35	-108.35	-104.80	-103.88	-105.80	-101.15
+2	-103.30	-100.91	-101.46	-100.37	-104.95	-104.68	-104.45	-101.94	-103.12
+3	-107.10	-111.70	-107.02	-117.46	-111.94	-104.46	-106.25	-106.89	-118.80
+4	-100.60	-100.95	-99.43	-96.33	-100.47	-101.32	-97.92	-99.11	-101.10
+5	-100.79	-99.52	-103.36	-98.57	-100.09	-105.77	-99.44	-101.76	-114.42

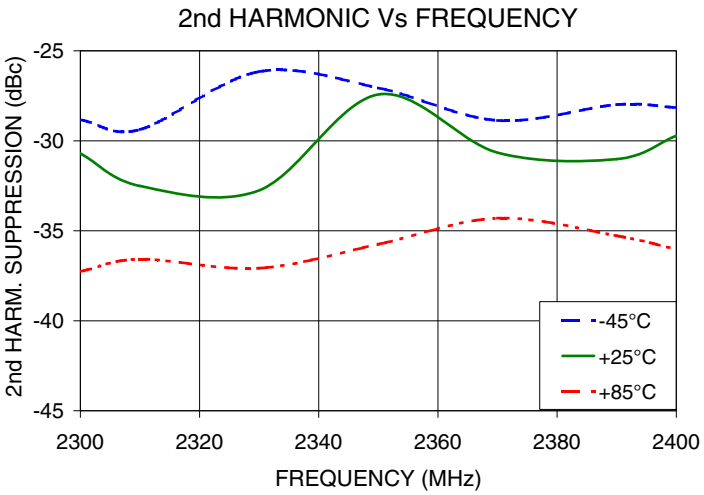
Note 3: Reference frequency 30.72 MHz
Note 4: All spurs are referenced to carrier signal (n=0).

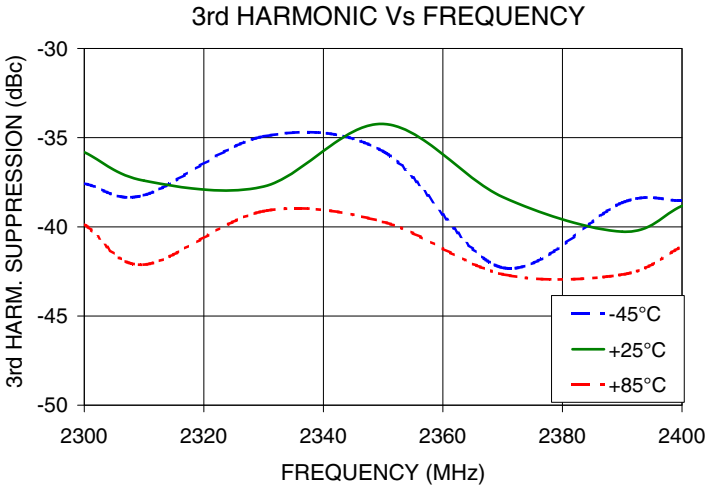
STEP SIZE SPURIOUS ORDER	0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 2300MHz+(n*Fstep size) (dBc) note 5			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 2350MHz+(n*Fstep size) (dBc) note 5			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 2400MHz+(n*Fstep size) (dBc) note 5		
n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5.0	-84.13	-86.10	-87.69	-86.37	-85.10	-83.44	-86.16	-84.32	-84.44
-4.5	-81.58	-85.72	-86.89	-86.49	-85.63	-83.31	-86.24	-84.38	-85.52
-4.0	-83.35	-82.42	-85.43	-71.39	-70.27	-79.92	-87.24	-83.27	-82.85
-3.5	-86.02	-83.98	-85.95	-82.15	-84.14	-83.60	-86.50	-85.86	-85.56
-3.0	-84.49	-81.12	-86.78	-86.26	-87.53	-82.67	-81.29	-86.83	-86.69
-2.5	-85.13	-87.18	-86.98	-86.06	-84.08	-82.13	-82.87	-87.54	-86.31
-2.0	-85.33	-88.00	-83.81	-88.54	-85.39	-85.92	-84.13	-84.47	-83.30
-1.5	-83.52	-83.68	-84.43	-76.79	-81.12	-84.10	-88.37	-87.41	-82.96
-1.0	-66.43	-71.04	-72.37	-77.58	-83.24	-84.06	-60.97	-64.09	-64.51
-0.5	-69.92	-72.08	-68.66	-68.49	-70.46	-65.74	-68.92	-70.98	-70.50
0 note 6	-	-			-			-	
+0.5	-69.16	-71.64	-68.61	-66.43	-66.14	-67.46	-67.59	-72.58	-68.36
+1.0	-67.85	-71.19	-72.32	-79.99	-83.35	-80.06	-61.14	-65.39	-64.39
+1.5	-85.15	-86.67	-85.66	-77.95	-83.13	-80.92	-83.42	-86.67	-84.28
+2.0	-83.51	-86.31	-86.22	-87.35	-86.65	-87.70	-83.04	-87.51	-82.74
+2.5	-85.67	-87.60	-82.74	-82.60	-82.31	-82.53	-81.51	-86.04	-87.05
+3.0	-84.48	-85.53	-87.07	-87.74	-85.78	-80.96	-86.71	-85.97	-84.34
+3.5	-83.67	-85.21	-84.25	-86.03	-85.30	-84.01	-84.24	-86.89	-82.29
+4.0	-86.20	-85.64	-86.19	-70.28	-70.55	-81.52	-84.72	-85.01	-82.51
+4.5	-85.28	-85.53	-86.41	-87.78	-84.72	-87.47	-87.11	-83.18	-87.67
+5.0	-86.61	-88.17	-87.67	-85.93	-85.55	-86.03	-86.58	-88.12	-86.79

Note 5: Step size 20 kHz
Note 6: All spurs are referenced to carrier signal (n=0).

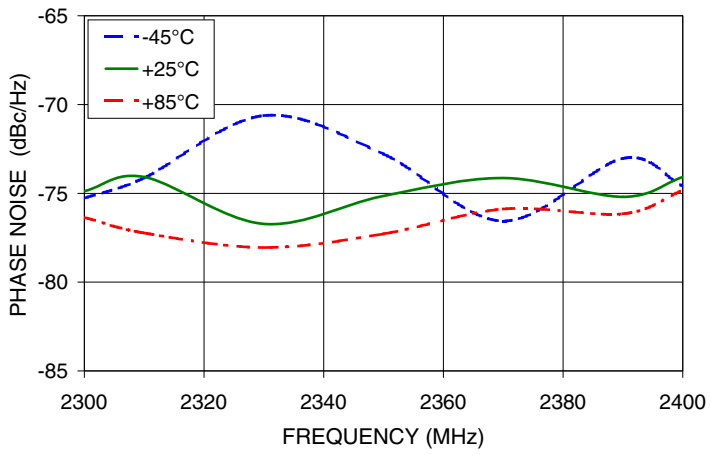
Typical Performance Curves



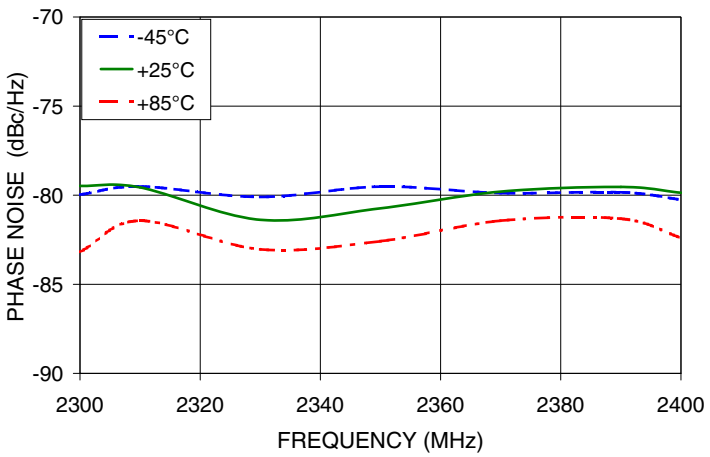




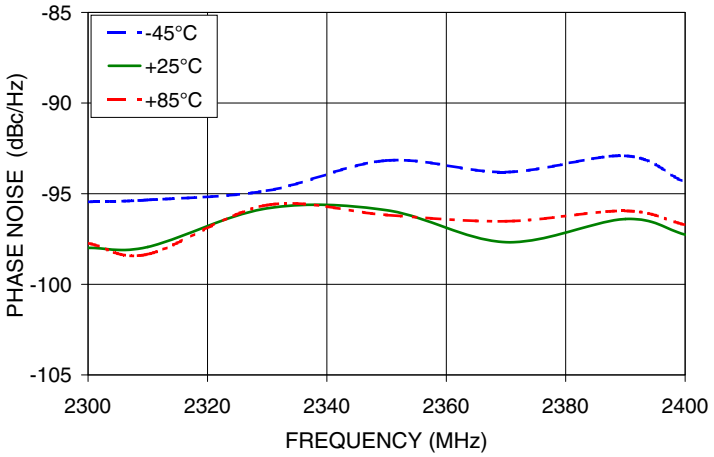
PHASE NOISE @100Hz offset



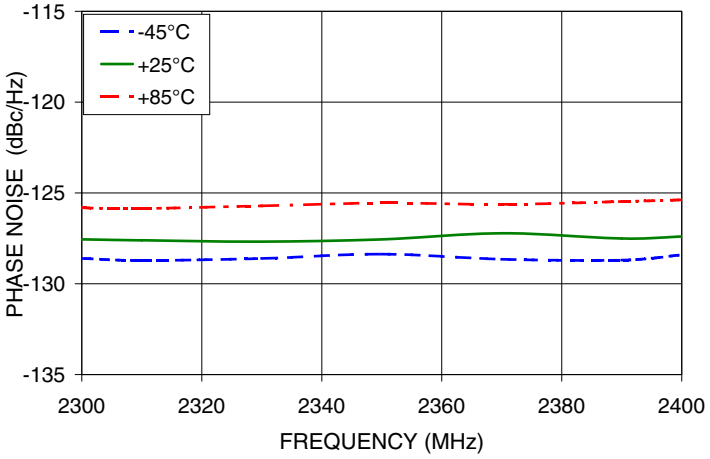
PHASE NOISE @1kHz offset



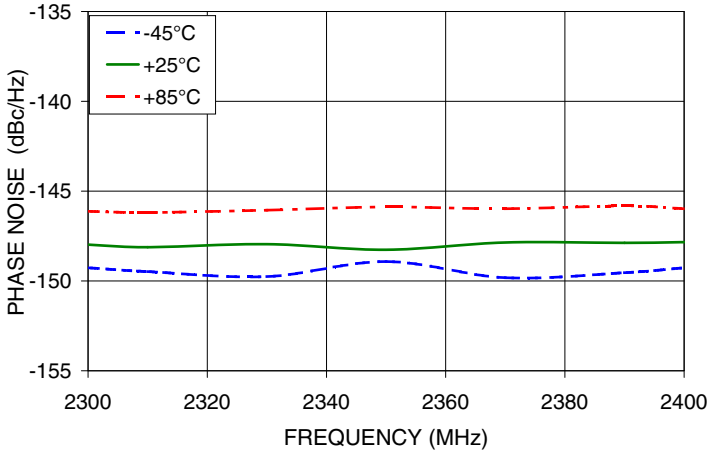
PHASE NOISE @10kHz offset



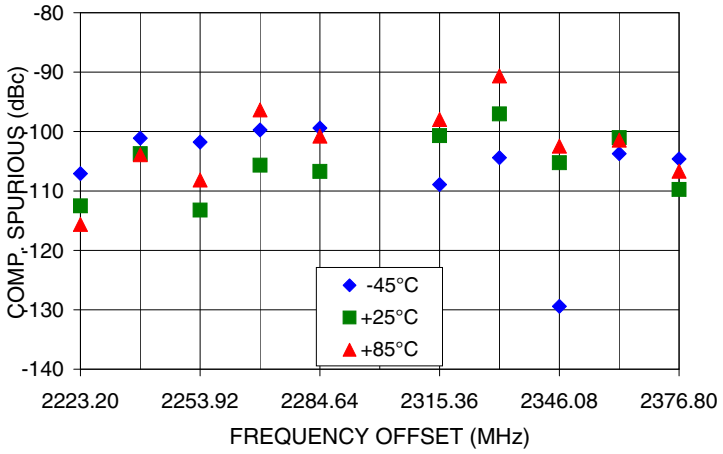
PHASE NOISE @100kHz offset



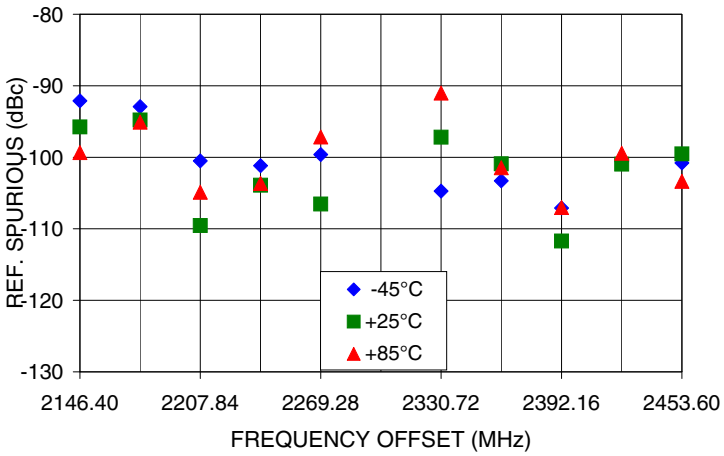
PHASE NOISE @1MHz offset



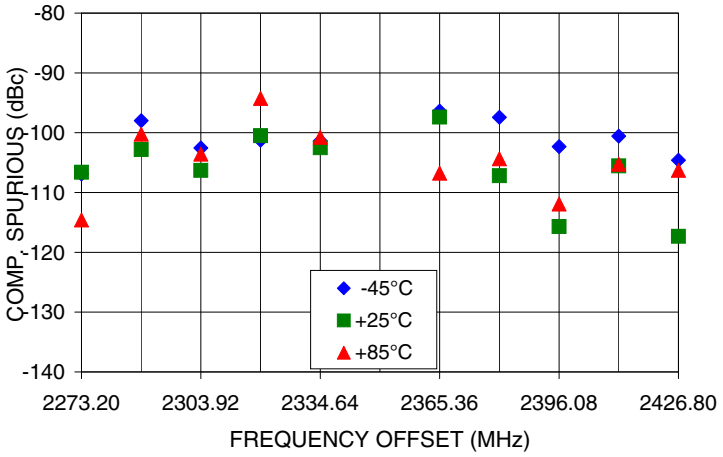
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2300MHz



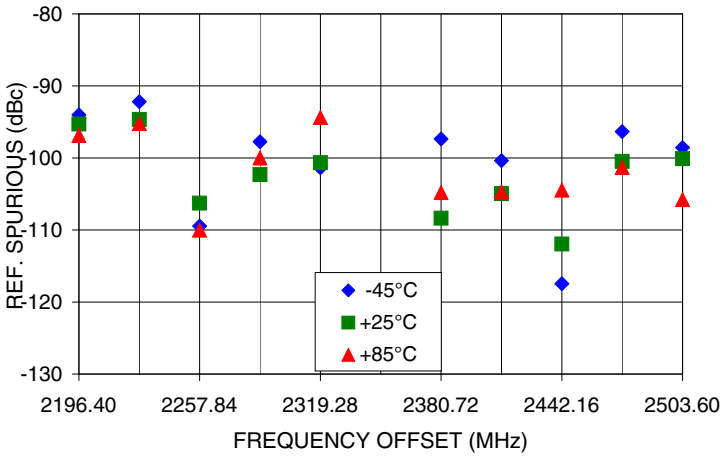
REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2300MHz



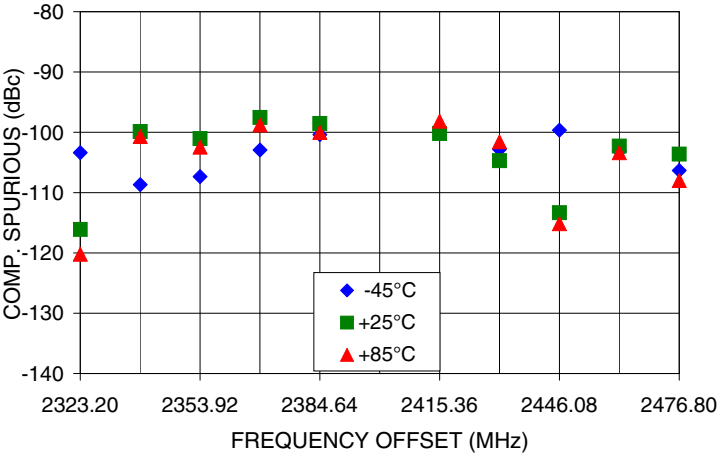
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2350MHz



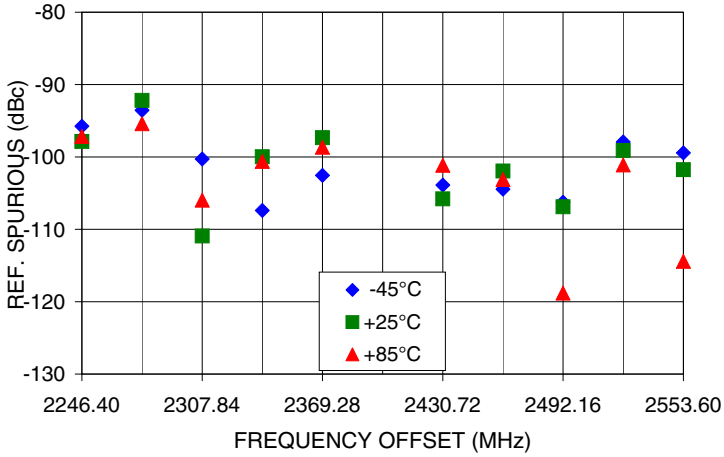
REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2350MHz

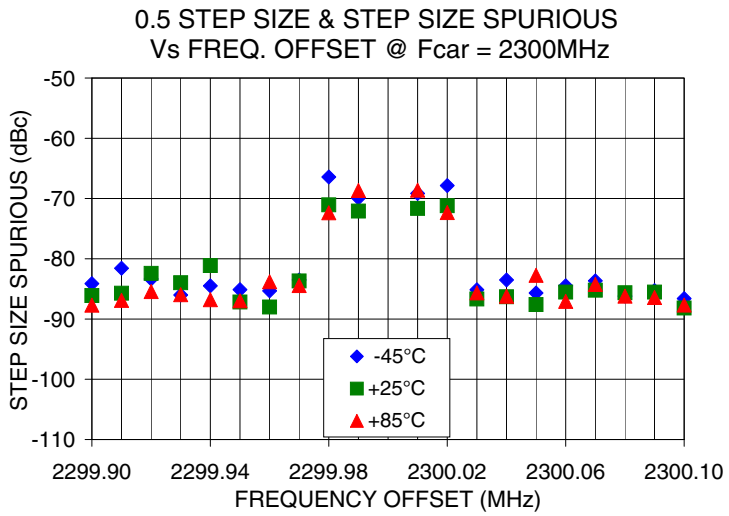


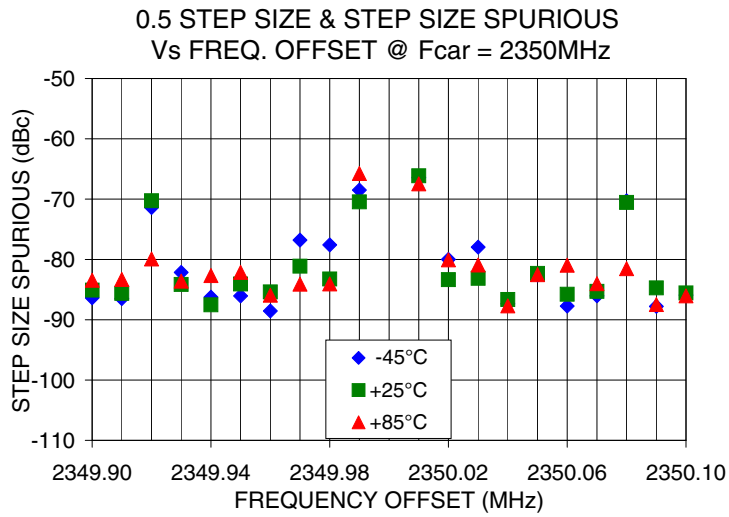
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2400MHz

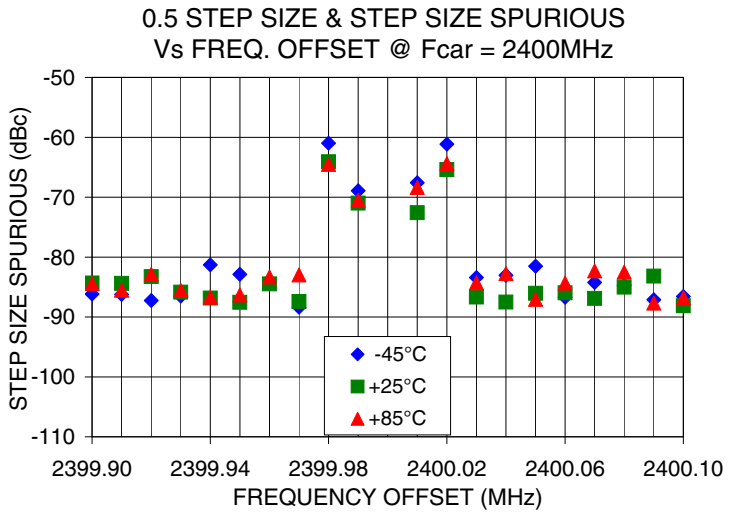


REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2400MHz

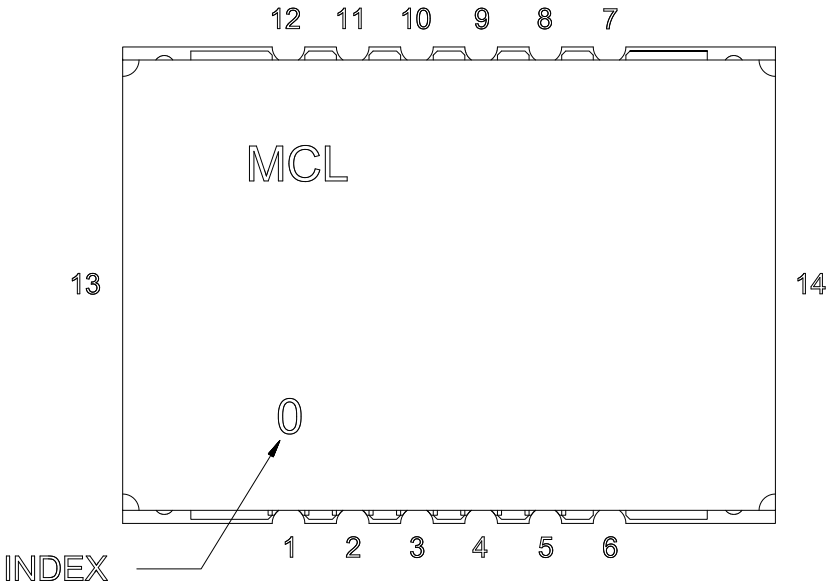








Pin Configuration

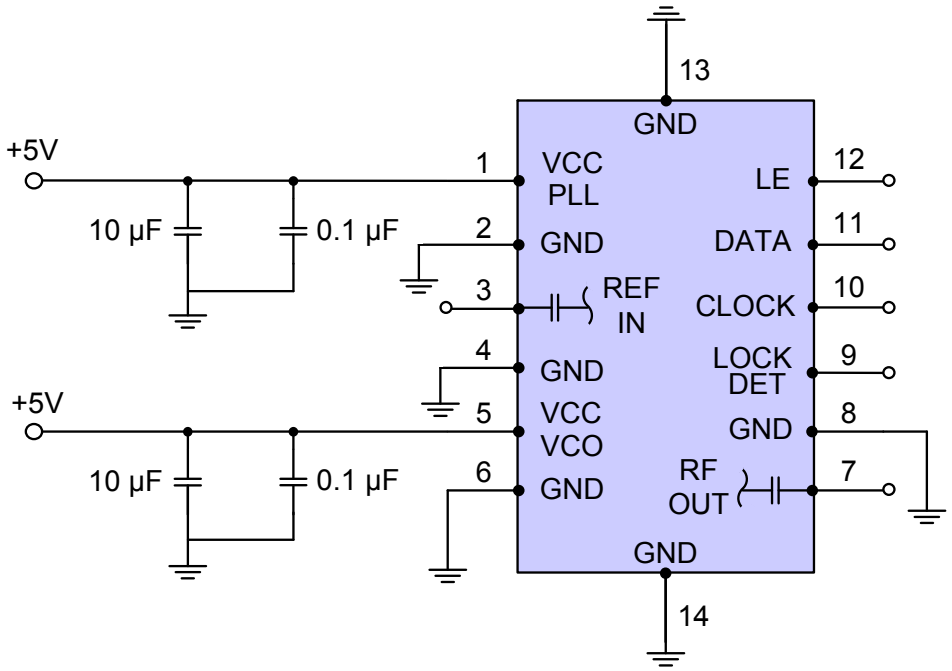


Pin Connection

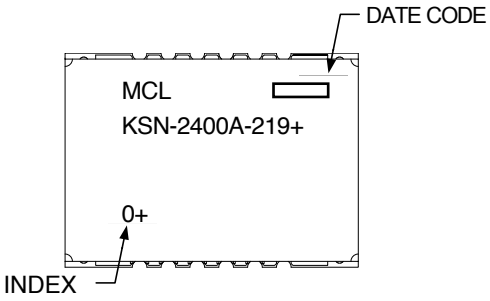
Pin Number	Function
1	VCC PLL
2	GND
3	REF IN
4	GND
5	VCC VCO
6	GND
7	RF OUT
8	GND
9	LOCK DET
10	CLOCK
11	DATA
12	LE
13	GND
14	GND

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: DK1042

Tape & Reel: TR-F28

Suggested Layout for PCB Design: PL-249

Evaluation Board: TB-567+

Environment Ratings: ENV03T2