NON-CATALOG

Frequency Synthesizer KSN-996A-119+

50Ω 956 to 1002 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-996A-119+ is a Frequency Synthesizer, designed to operate from 956 to 1002 MHz for CDMA applications. The KSN-996A-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: • Phase Noise: -111 dBc/Hz typ. @ 10 kHz offset • Comparison Spurious: -95 dBc typ. • Reference Spurious: -108 dBc typ.	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Robust design and construction	To enhance the robustness of KSN-996A-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-996A-119+ to be used in compact designs.

Surface Mount

NON-CATALOG

Frequency Synthesizer

KSN-996A-119+

50Ω 956 to 1002 MHz

CASE STYLE: DK801

+ 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.

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"

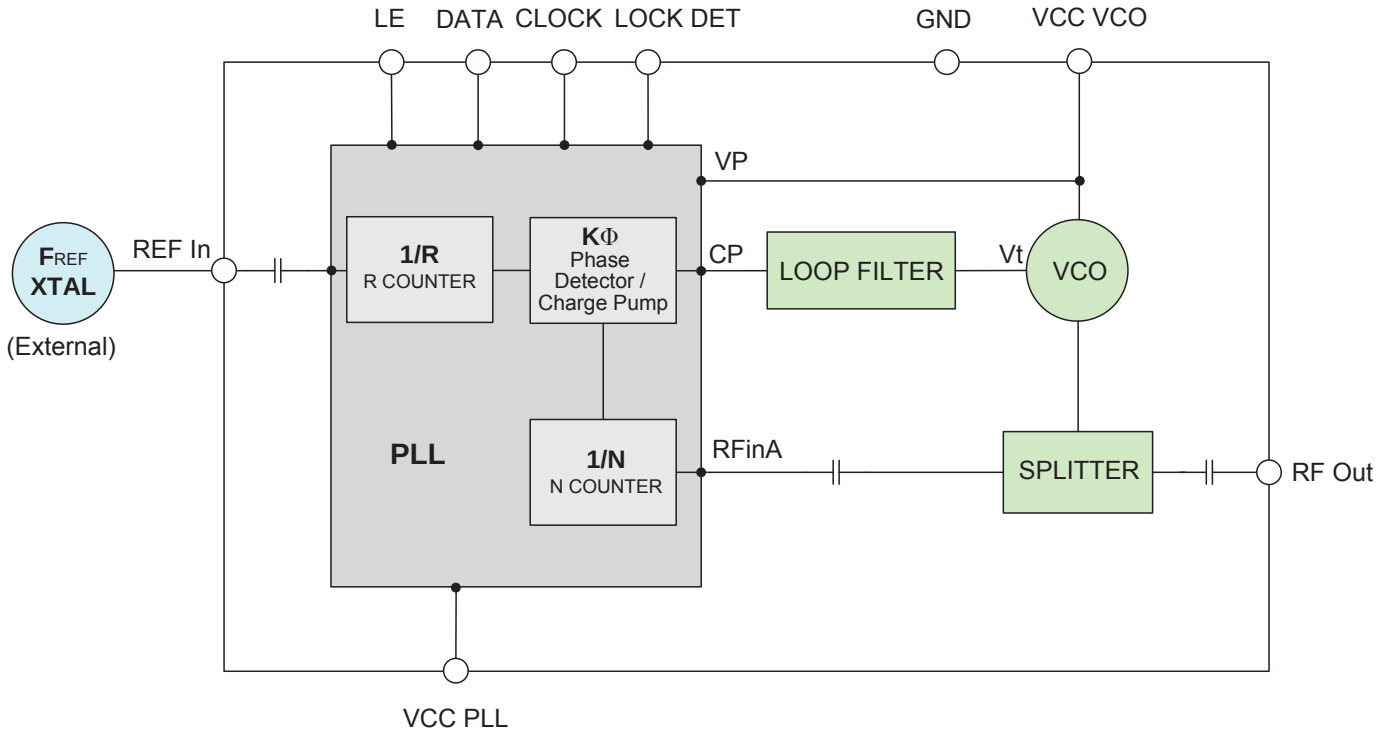
Applications

- CDMA

General Description

The KSN-996A-119+ is a Frequency Synthesizer, designed to operate from 956 to 1002 MHz for CDMA applications. The KSN-996A-119+ 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-996A-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.

Simplified Schematic



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

Parameters		Test Conditions	Min.	Typ.	Max.	Units
Frequency Range		-	956	-	1002	MHz
Step Size		-	-	1000	-	kHz
Settling Time		Within ± 1 kHz	-	3	-	mSec
Output Power		-	-2.5	+0.6	+2.5	dBm
SSB Phase Noise		@ 100 Hz offset	-	-90	-	dBc/Hz
		@ 1 kHz offset	-	-87	-78	
		@ 10 kHz offset	-	-111	-104	
		@ 100 kHz offset	-	-137	-132	
		@ 1 MHz offset	-	-157	-150	
Integrated SSB Phase Noise		@ 100 Hz to 1 MHz	-	-46	-41	dBc
Reference Spurious Suppression		Ref. Freq. 15 MHz	-	-108	-75	
Comparison Spurious Suppression		Step Size 1000 kHz	-	-95	-75	
Non - Harmonic Spurious Suppression		-	-	-90	-	
Harmonic Suppression		-	-	-33	-24	
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		-	-	34	40	mA
PLL Supply Current		-	-	11	19	
Reference Input (External)	Frequency	15 (sine wave)	-	15	-	MHz
	Amplitude	1	-	1	-	V_{P-P}
	Input impedance	-	-	100	-	KΩ
	Phase Noise @ 1 kHz offset	-	-	-140	-	dBc/Hz
RF Output port Impedance		-	-	50	-	Ω
Input Logic Level	Input high voltage	-	4.20	-	-	V
	Input low voltage	-	-	-	0.95	
Digital Lock Detect	Locked	-	4.35	-	5.25	
	Unlocked	-	-	-	0.40	
Frequency Synthesizer PLL		-	ADF4113			
PLL Programming		-	3-wire serial 5V CMOS			

Register Map [NOTE 1]

	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
F_Register [NOTE 2]	01	0	111	111	0000	0	0	0	1	001	0	0	10

	Reserved	CP Gain	13-Bit B Counter	6-Bit A Counter	Control Bits
N_Register @ 1002 MHz	00	1	0000000111110	001010	01

	Reserved	DLY	SYNC	Lock Detect Precision	Test Mode Bits	Anti-Backlash Width	14-BIT Reference Counter, R	Control Bits
R_Register	0	0	0	1	00	00	00000000001111	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 Supply Voltage [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.

Typical Performance Data

FREQUENCY (MHz)	POWER OUTPUT (dBm)			VCO CURRENT (mA)			PLL CURRENT (mA)		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
956	0.64	0.74	0.71	31.99	33.62	34.59	8.89	11.11	13.15
962	0.61	0.70	0.67	32.01	33.63	34.58	8.81	11.05	13.07
966	0.59	0.68	0.65	32.01	33.63	34.59	8.86	11.14	13.11
968	0.58	0.67	0.65	32.00	33.62	34.58	8.87	11.20	13.13
974	0.58	0.66	0.63	31.99	33.61	34.57	8.92	11.10	13.19
980	0.57	0.64	0.61	31.97	33.59	34.55	8.84	11.17	13.10
986	0.57	0.64	0.61	31.94	33.58	34.53	8.90	11.22	13.16
992	0.59	0.65	0.62	31.93	33.55	34.52	8.81	11.27	13.07
996	0.60	0.62	0.63	31.91	33.55	34.51	8.86	11.18	13.13
998	0.61	0.63	0.63	31.91	33.54	34.50	8.88	11.24	13.14
1002	0.61	0.63	0.63	31.91	33.53	34.49	8.94	11.26	13.17

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
956	-29.56	-30.96	-31.85	-50.98	-52.58	-52.97
962	-29.95	-31.33	-32.19	-51.70	-53.01	-52.91
966	-30.72	-32.10	-33.00	-51.81	-52.83	-52.61
968	-31.13	-32.53	-33.45	-51.85	-52.48	-52.27
974	-32.11	-33.59	-34.60	-52.26	-52.41	-51.70
980	-32.36	-33.88	-35.01	-52.58	-52.35	-51.42
986	-32.49	-34.02	-35.18	-53.19	-52.40	-51.30
992	-32.80	-34.38	-35.54	-53.09	-51.91	-51.77
996	-32.94	-34.61	-35.85	-52.17	-51.06	-51.04
998	-33.01	-34.72	-36.00	-51.95	-51.00	-50.52
1002	-33.15	-35.00	-36.38	-52.03	-51.11	-50.63

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS +25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
956	-93.08	-88.92	-110.12	-137.25	-157.22
962	-89.92	-87.25	-110.33	-137.39	-157.27
966	-88.48	-89.45	-109.61	-137.81	-157.67
968	-90.26	-88.04	-109.88	-137.16	-157.37
974	-89.44	-87.04	-109.30	-137.07	-156.85
980	-92.04	-88.80	-109.19	-137.15	-157.70
986	-91.13	-89.19	-109.37	-136.92	-157.35
992	-88.41	-86.81	-109.41	-136.80	-157.39
996	-87.30	-87.72	-109.81	-136.71	-157.31
998	-91.48	-85.87	-109.40	-136.67	-157.34
1002	-87.58	-84.92	-109.46	-136.28	-157.03

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS -45°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
956	-90.02	-92.42	-107.58	-137.50	-157.84
962	-89.92	-90.69	-108.65	-137.44	-158.48
966	-89.59	-91.66	-108.36	-137.40	-158.07
968	-89.21	-89.62	-108.16	-137.02	-158.19
974	-90.60	-89.70	-107.55	-136.90	-158.46
980	-88.65	-90.23	-108.12	-136.38	-158.59
986	-88.55	-88.87	-107.92	-136.46	-158.25
992	-91.05	-87.19	-108.42	-136.23	-158.17
996	-92.45	-87.86	-108.69	-136.02	-157.93
998	-88.82	-87.59	-108.36	-135.88	-157.56
1002	-90.30	-85.56	-108.88	-135.24	-157.24

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS +85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
956	-85.49	-87.88	-108.77	-136.03	-156.19
962	-85.96	-87.51	-109.52	-136.18	-156.60
966	-86.19	-87.37	-108.49	-136.28	-156.71
968	-83.40	-87.00	-108.51	-136.37	-156.49
974	-81.29	-87.55	-107.66	-136.26	-156.65
980	-83.26	-87.93	-107.96	-136.08	-156.66
986	-86.78	-84.44	-107.73	-136.02	-156.60
992	-84.94	-83.31	-107.48	-136.31	-156.56
996	-87.07	-85.10	-107.18	-135.70	-156.12
998	-85.39	-84.42	-107.08	-135.59	-156.31
1002	-84.19	-84.79	-106.84	-135.58	-155.90

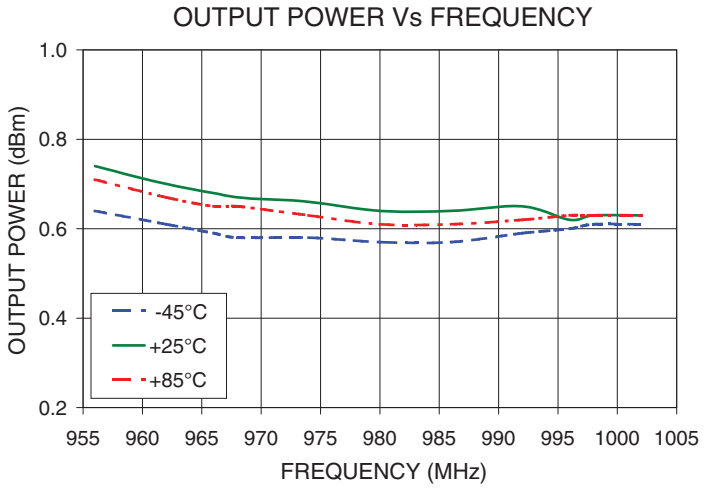
COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 956MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 981MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 1002MHz+(n*Fcomparison) (dBc) note 1		
n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-100.67	-107.87	-106.59	-101.73	-110.91	-109.63	-102.08	-118.00	-108.51
-4	-108.12	-113.72	-104.87	-100.20	-105.38	-105.89	-105.41	-108.14	-127.51
-3	-100.27	-128.13	-104.26	-97.63	-109.53	-106.10	-98.75	-104.38	-101.90
-2	-94.40	-105.71	-98.68	-94.44	-104.95	-105.31	-109.28	-97.73	-102.62
-1	-89.15	-104.76	-88.20	-87.11	-94.90	-97.15	-96.27	-89.60	-91.61
0 note 2	-	-	-	-	-	-	-	-	-
+1	-88.11	-103.11	-88.88	-87.24	-94.89	-99.50	-100.07	-90.77	-92.45
+2	-93.57	-102.97	-100.27	-94.35	-99.71	-115.16	-111.92	-98.81	-104.03
+3	-99.75	-105.28	-108.00	-97.13	-102.70	-110.92	-102.16	-109.45	-101.21
+4	-108.35	-104.49	-109.52	-98.98	-103.77	-111.15	-108.86	-109.98	-113.03
+5	-100.11	-114.83	-113.68	-100.04	-104.49	-116.70	-105.45	-109.70	-107.26

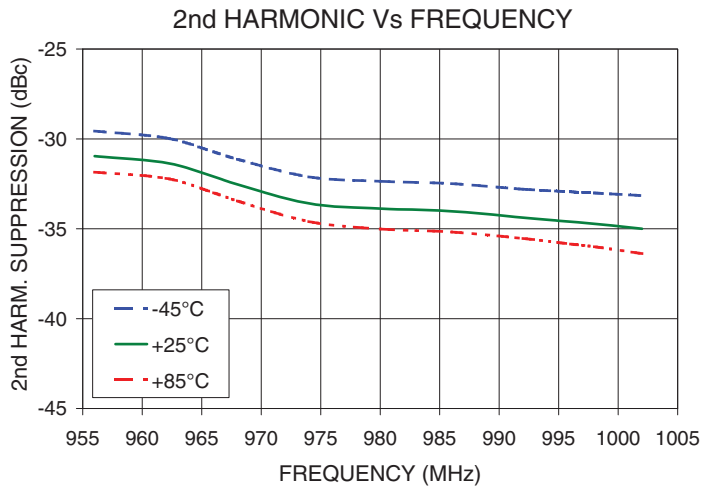
Note 1: Comparison frequency 1000 kHz
Note 2: All spurs are referenced to carrier signal (n=0).

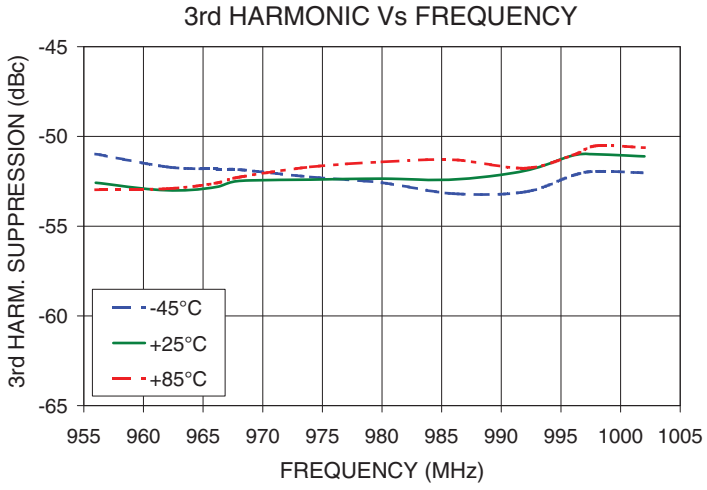
REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 956MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 981MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 1002MHz+(n*Freference) (dBc) note 3		
n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-95.57	-105.60	-101.94	-96.42	-106.88	-99.48	-97.50	-107.33	-99.54
-4	-94.90	-107.59	-96.86	-98.68	-109.17	-99.51	-101.94	-107.58	-101.23
-3	-98.81	-104.89	-112.71	-98.27	-108.33	-111.06	-100.07	-108.95	-106.34
-2	-104.45	-107.36	-115.64	-100.11	-109.92	-110.88	-103.54	-114.08	-110.34
-1	-104.10	-114.20	-120.27	-102.53	-116.73	-119.20	-104.74	-117.14	-109.98
0 note 4	-	-	-	-	-	-	-	-	-
+1	-110.07	-108.27	-119.07	-105.61	-107.29	-110.98	-119.05	-108.12	-109.28
+2	-103.64	-120.63	-112.26	-99.86	-125.67	-105.52	-107.63	-111.67	-106.25
+3	-109.17	-108.66	-110.74	-114.04	-108.53	-106.78	-119.96	-105.92	-108.27
+4	-92.69	-93.29	-93.33	-97.68	-100.43	-102.46	-97.75	-102.07	-101.11
+5	-100.71	-102.28	-102.54	-100.95	-103.58	-102.71	-101.53	-102.40	-102.27

Note 3: Reference frequency 15 MHz
Note 4: All spurs are referenced to carrier signal (n=0).

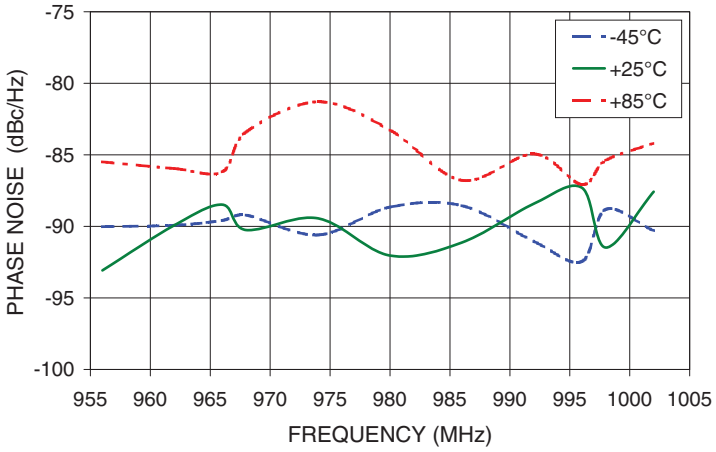
Typical Performance Curves



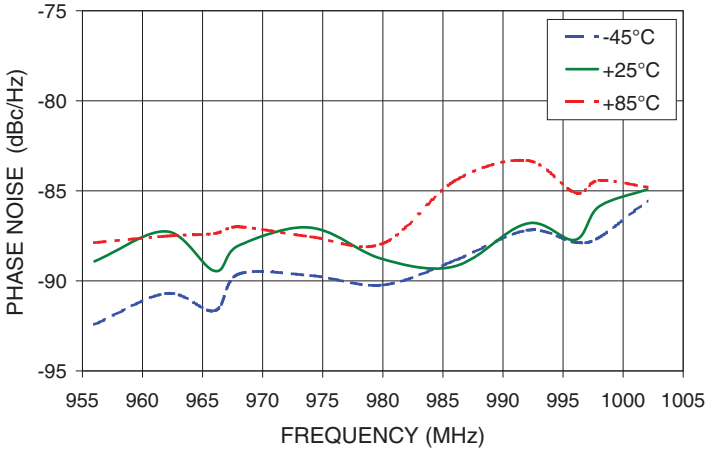




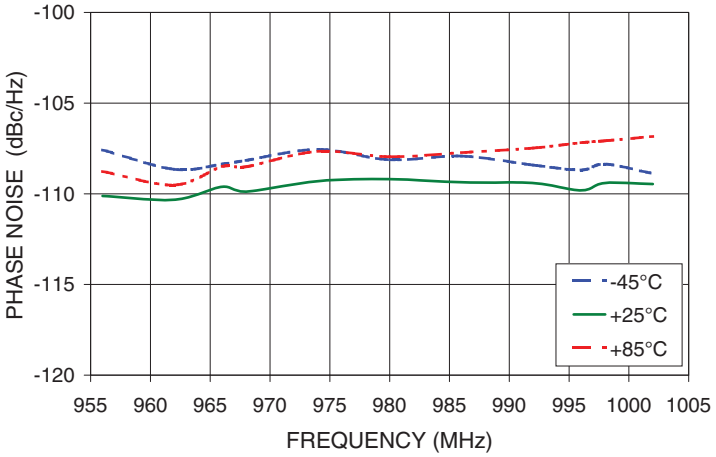
PHASE NOISE @100Hz offset



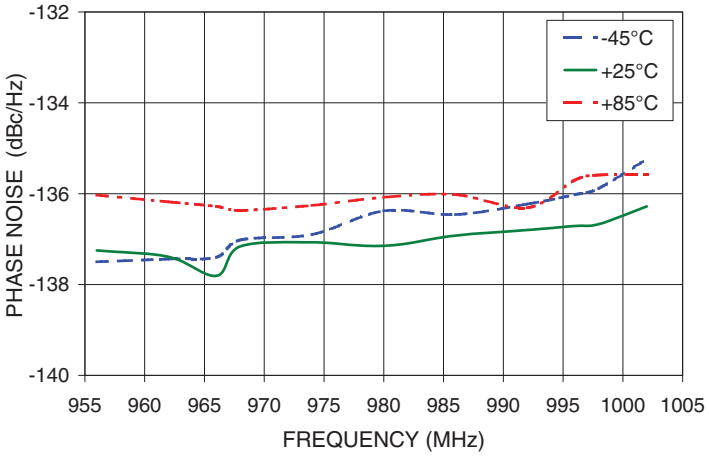
PHASE NOISE @1kHz offset



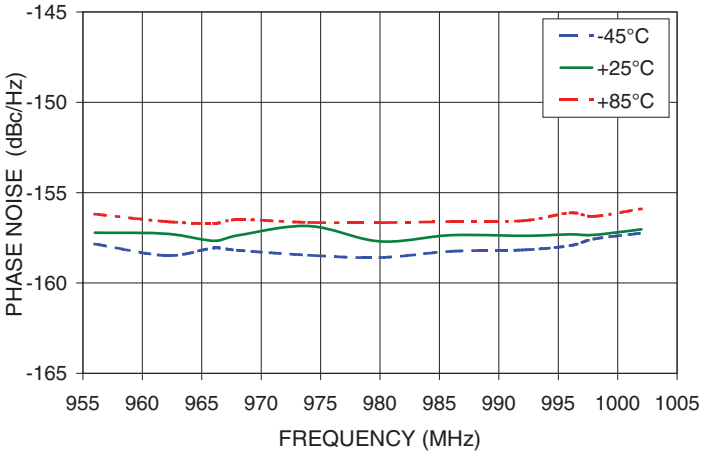
PHASE NOISE @10kHz offset



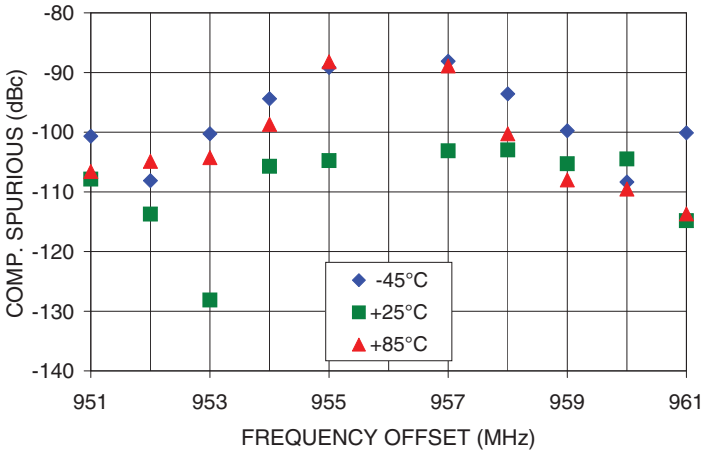
PHASE NOISE @100kHz offset



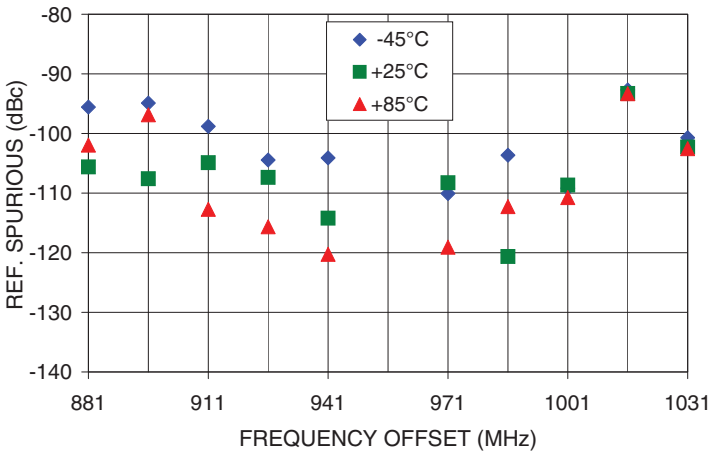
PHASE NOISE @1MHz offset



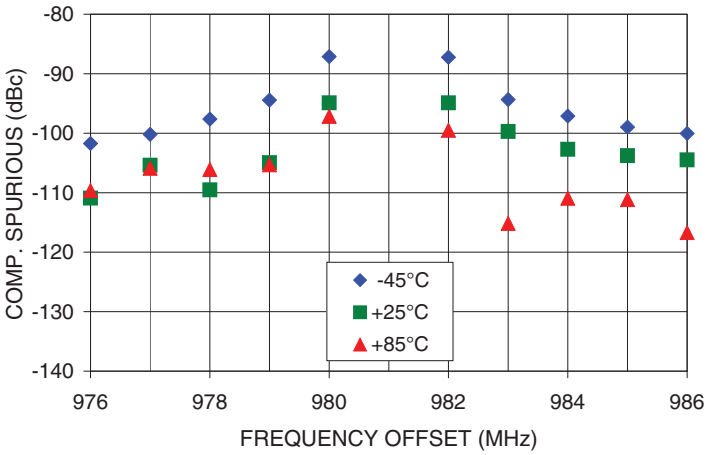
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 956MHz



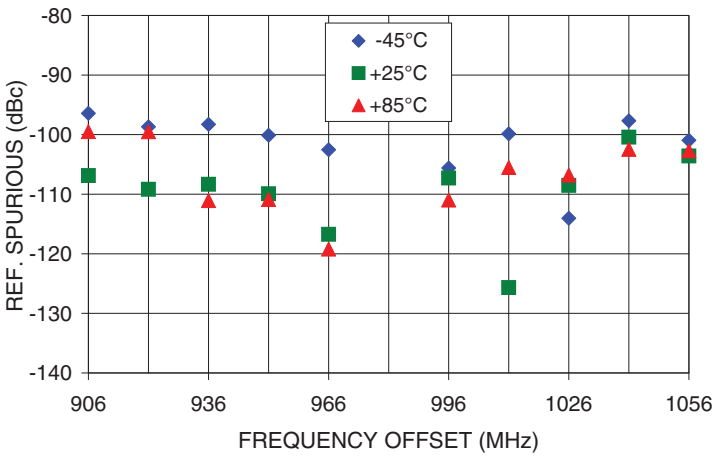
REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 956MHz



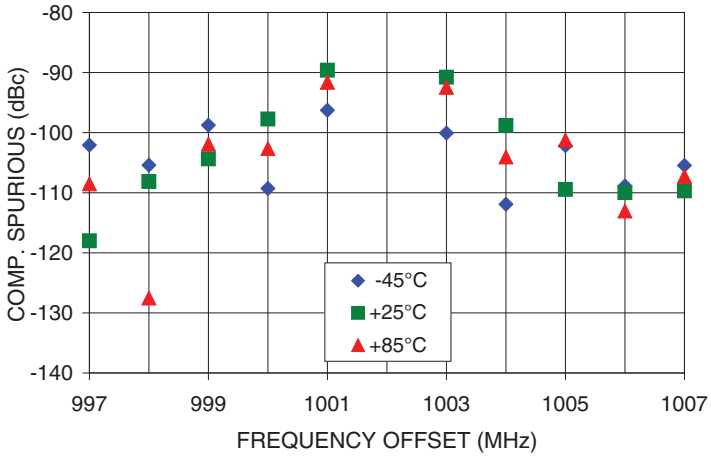
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 981MHz



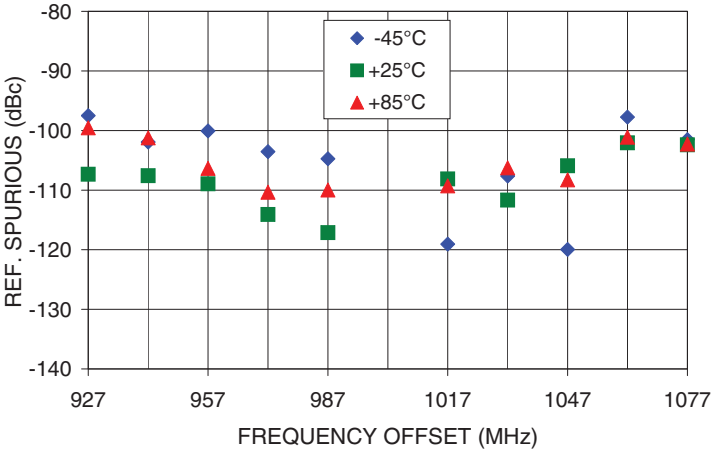
REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 981MHz



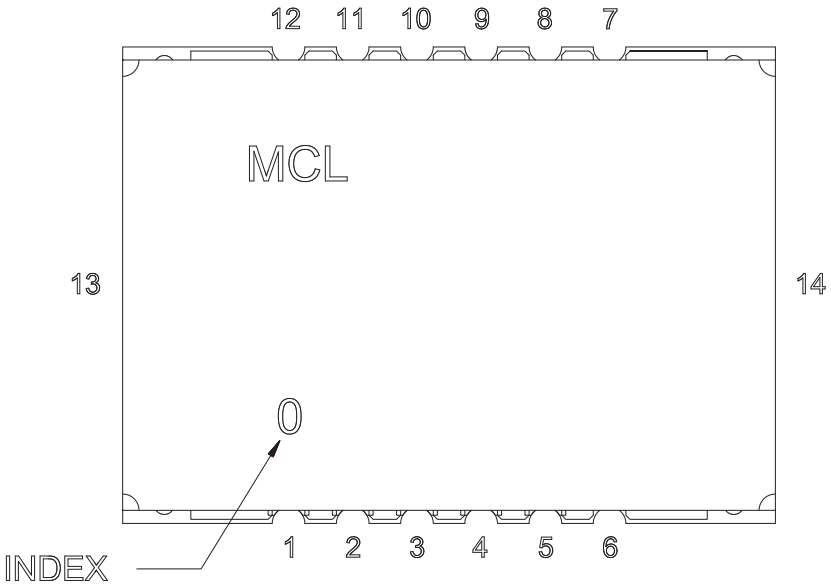
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1002MHz



REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1002MHz



Pin Configuration

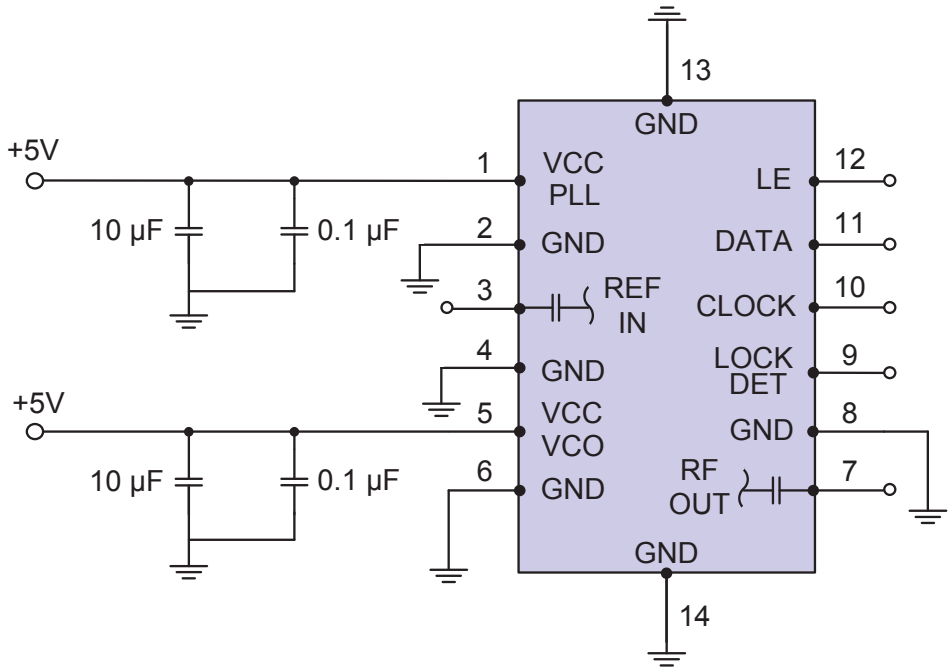


Pin Connection

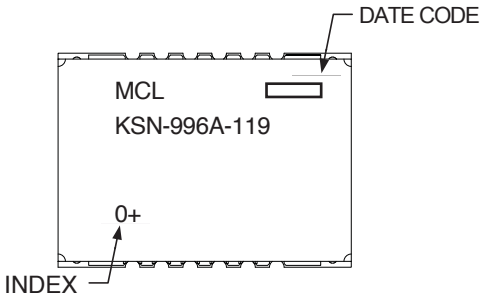
Pin Number	Function
1	VCC PLL
2	GND
3	REF IN
4	GND
5	VCC VCO
6	GND
7	RF OUT
8	GND
9	LOCK DET
10	CLOCK
11	DATA
12	LE
13	GND
14	GND

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