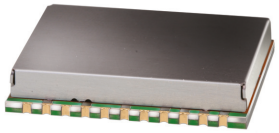
Frequency Synthesizer DSN-2050A-119+

50Ω 1130 to 2100 MHz

The Big Deal

- Low phase noise and spurious
- Robust design and construction



CASE STYLE: KL942

Product Overview

The DSN-2050A-119+ is a Frequency Synthesizer, designed to operate from 1130 to 2100 MHz for digital TV application. The DSN-2050A-119+ is packaged in a metal case (size of 1.25" x 1.00" x 0.20") to shield against unwanted signals and noise.

Key Features

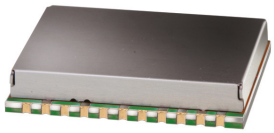
Feature	Advantages
Low phase noise and spurious: • Phase Noise: -100 dBc/Hz typ. @ 10 kHz offset • Comparison Spurious: -60 dBc typ. • Reference Spurious: -98 dBc typ.	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Robust design and construction	To enhance the robustness of DSN-2050A-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.

Surface Mount

Frequency Synthesizer

DSN-2050A-119+

50Ω 1130 to 2100 MHz



CASE STYLE: KL942
PRICE: $37.95 ea. QTY (1-9)

+RoHS Compliant
The +Suffix identifies 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=+24V)

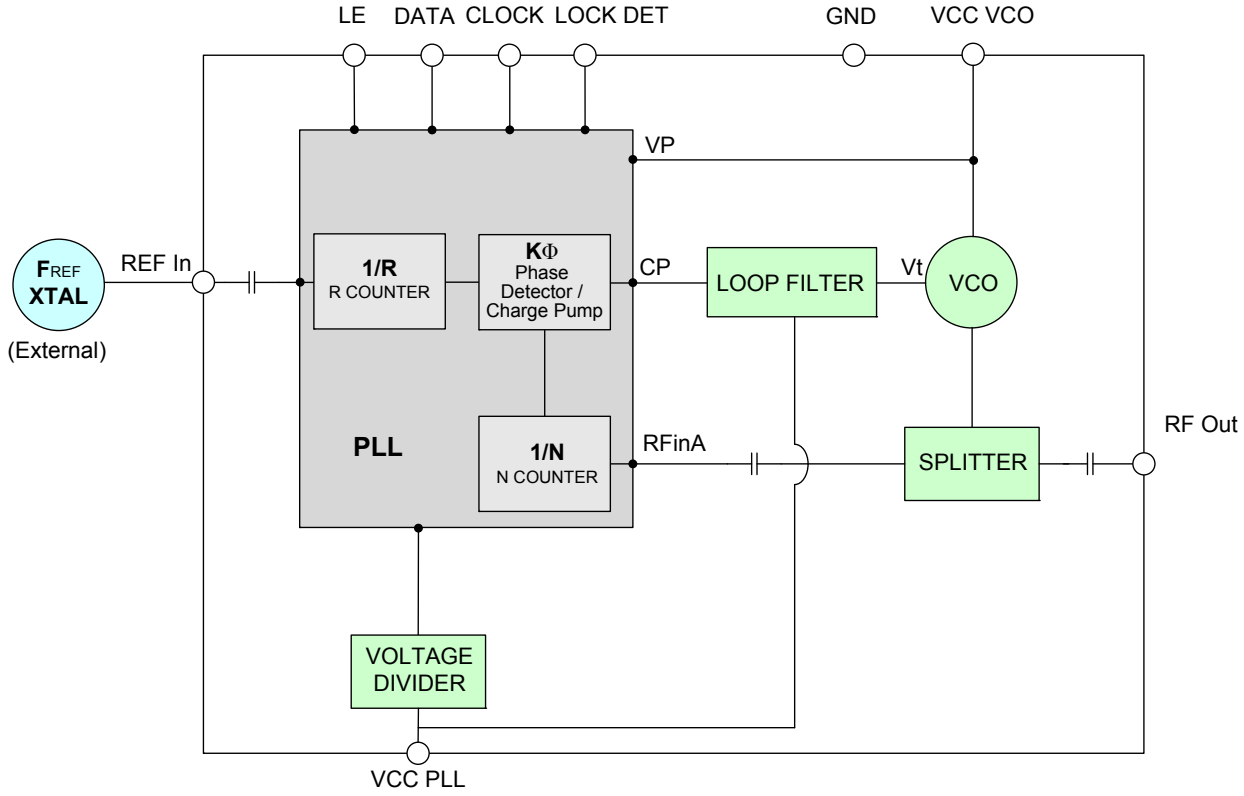
Applications

- Digital TV

General Description

The DSN-2050A-119+ is a Frequency Synthesizer, designed to operate from 1130 to 2100 MHz for digital TV application. The DSN-2050A-119+ is packaged in a metal case (size of 1.25" x 1.00" x 0.20") to shield against unwanted signals and noise. To enhance the robustness of DSN-2050A-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		-	1130	-	2100	MHz
Step Size		-	-	12.5	-	kHz
Settling Time		Within ± 1 kHz	-	600	-	mSec
Output Power		-	-2.5	+0.5	+3.5	dBm
SSB Phase Noise		@ 100 Hz offset	-	-44	-	dBc/Hz
		@ 1 kHz offset	-	-74	-67	
		@ 10 kHz offset	-	-100	-93	
		@ 100 kHz offset	-	-120	-114	
		@ 1 MHz offset	-	-140	-130	
Reference Spurious Suppression		Ref. Freq. 13 MHz	-	-98	-68	dBc
Comparison Spurious Suppression		Step Size 12.5 kHz	-	-60	-	
Non - Harmonic Spurious Suppression		-	-	-90	-	
Harmonic Suppression		-	-	-20	-8	
VCO Supply Voltage		+5.00	+4.75	+5.00	+5.25	V
PLL Supply Voltage		+24.00	+23.75	+24.00	+24.25	
VCO Supply Current		-	-	31	40	mA
PLL Supply Current		-	-	27	35	
Reference Input (External)	Frequency	13 (square wave)	-	13	-	MHz
	Amplitude	1	-	1	-	V_{P-P}
	Input impedance	-	-	100	-	KΩ
	Phase Noise @ 1 kHz offset	-	-	-130	-	dBc/Hz
RF Output port Impedance		-	-	50	-	Ω
Input Logic Level	Input high voltage	-	2.5	-	-	V
	Input low voltage	-	-	-	0.6	V
Digital Lock Detect	Locked	-	2.6	-	3.5	V
	Unlocked	-	-	-	0.4	V
Frequency Synthesizer PLL		-	ADF4113			
PLL Programming		-	3-wire serial 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
	10	0	111	111	0000	0	0	0	1	001	0	0	10

N_Register @ 2100 MHz	Reserved	CP Gain	13-Bit B Counter	6-Bit A Counter	Control Bits
	00	1	1010010000010	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	00010000010000	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	5.5V
PLL Supply Voltage NOTE 3	25.0V
VCO Supply Voltage to PLL Supply Voltage	**Note 3**
Reference Frequency Amplitude	$3.3V_{P-P}$
Data, Clock, LE Levels	0Vmin, +3.3Vmax
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 CURENT (mA)		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
1130	1.59	1.65	1.40	30.00	32.11	33.10	23.20	25.88	28.52
1147	1.55	1.58	1.33	30.08	32.18	33.15	23.21	25.89	28.53
1264	1.14	1.19	0.92	30.71	32.73	33.62	23.25	25.95	28.62
1381	0.95	1.00	0.72	31.30	33.25	34.08	23.29	26.00	28.69
1498	0.70	0.74	0.49	31.75	33.66	34.45	23.32	26.04	28.74
1615	0.40	0.45	0.25	32.05	33.97	34.74	23.35	26.09	28.79
1732	0.25	0.37	0.18	32.18	34.17	34.96	23.38	26.12	28.83
1849	-0.04	0.13	-0.04	32.13	34.22	35.09	23.40	26.15	28.87
1966	-0.24	-0.05	-0.17	31.82	34.06	35.02	23.43	26.19	28.92
2083	-0.55	-0.34	-0.41	31.38	33.75	34.82	23.45	26.22	28.95
2100	-0.52	-0.28	-0.39	31.30	33.68	34.77	23.44	26.22	28.96

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
1130	-17.67	-19.46	-20.57	-25.55	-27.64	-29.35
1147	-17.29	-19.11	-20.24	-28.84	-30.57	-32.23
1264	-14.10	-15.95	-16.99	-31.56	-33.97	-35.36
1381	-12.67	-14.51	-15.52	-36.28	-37.56	-38.35
1498	-12.54	-14.39	-15.50	-38.88	-39.78	-40.18
1615	-14.60	-16.46	-17.75	-39.48	-38.72	-38.42
1732	-19.03	-20.91	-21.78	-36.00	-37.30	-37.63
1849	-21.96	-24.26	-24.90	-40.29	-40.18	-39.42
1966	-24.40	-26.04	-26.93	-37.09	-37.44	-38.04
2083	-29.89	-30.97	-31.35	-36.85	-39.52	-38.63
2100	-30.02	-31.08	-31.31	-39.63	-40.62	-41.64

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS +25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
1130	-47.49	-72.05	-99.02	-119.68	-136.85
1147	-45.08	-71.77	-98.78	-119.64	-139.76
1264	-48.94	-74.26	-100.05	-120.67	-140.80
1381	-45.91	-74.78	-100.68	-121.53	-141.74
1498	-46.18	-73.91	-100.89	-121.97	-142.18
1615	-43.95	-74.51	-100.97	-122.09	-142.44
1732	-42.79	-76.45	-100.78	-121.92	-142.55
1849	-42.82	-72.97	-100.43	-121.61	-142.36
1966	-44.05	-72.86	-100.28	-121.41	-142.24
2083	-39.05	-74.41	-100.22	-121.28	-141.96
2100	-40.45	-74.83	-100.26	-121.32	-141.97

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS -45°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
1130	-45.69	-73.61	-100.44	-121.39	-135.03
1147	-46.29	-73.50	-100.69	-121.54	-141.53
1264	-45.46	-74.01	-101.09	-122.32	-142.28
1381	-44.71	-74.48	-102.03	-122.77	-142.80
1498	-44.46	-75.15	-101.91	-123.24	-143.03
1615	-44.39	-76.16	-102.03	-123.08	-143.21
1732	-41.23	-75.81	-101.90	-122.87	-143.10
1849	-40.25	-73.99	-101.39	-122.70	-143.09
1966	-40.19	-75.22	-100.94	-122.32	-142.81
2083	-36.60	-76.31	-100.89	-122.01	-142.41
2100	-40.84	-76.57	-100.98	-122.02	-142.49

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS +85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
1130	-39.82	-71.93	-97.60	-118.01	-137.18
1147	-43.93	-71.80	-97.67	-118.02	-138.16
1264	-41.88	-71.87	-98.57	-119.38	-139.49
1381	-41.22	-74.30	-99.67	-120.39	-140.53
1498	-38.99	-73.74	-100.12	-120.98	-141.20
1615	-37.98	-74.11	-100.05	-121.06	-141.56
1732	-40.95	-72.98	-99.84	-120.90	-141.74
1849	-39.87	-73.45	-99.33	-120.73	-141.85
1966	-38.06	-73.06	-99.09	-120.49	-141.68
2083	-39.92	-74.11	-98.95	-120.44	-141.50
2100	-36.33	-72.41	-99.08	-120.61	-141.42

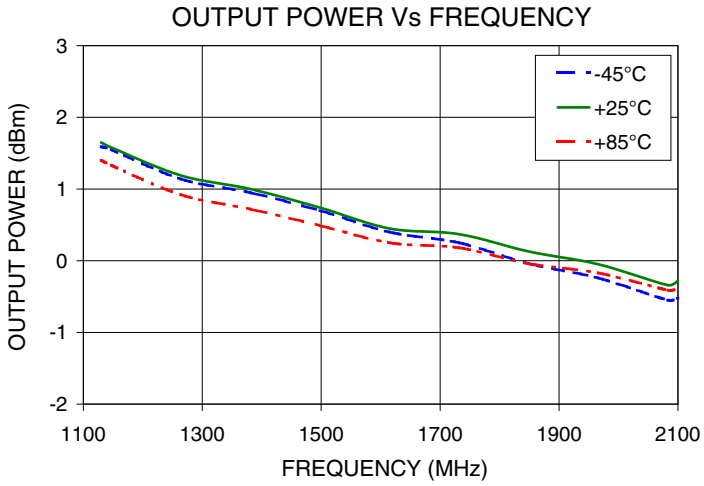
COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 1130MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 1615MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 2100MHz+(n*Fcomparison) (dBc) note 1		
n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-84.96	-85.61	-85.85	-85.35	-82.49	-86.27	-83.09	-87.03	-83.94
-4	-84.07	-85.49	-83.03	-84.90	-86.31	-86.75	-81.66	-87.38	-81.79
-3	-85.30	-83.64	-76.28	-81.87	-85.10	-86.60	-83.29	-82.87	-82.46
-2	-83.34	-84.92	-68.21	-86.66	-87.46	-83.54	-83.24	-81.15	-83.25
-1	-83.51	-81.70	-61.66	-78.97	-81.11	-67.26	-68.83	-80.53	-67.46
0 note 2	-	-	-	-	-	-	-	-	-
+1	-75.09	-83.82	-61.46	-80.72	-82.04	-67.22	-70.55	-81.00	-66.53
+2	-88.72	-84.73	-78.44	-77.16	-84.15	-85.46	-79.83	-86.30	-83.41
+3	-86.97	-86.91	-85.68	-87.50	-86.50	-83.65	-87.42	-87.06	-87.47
+4	-87.66	-82.48	-85.22	-86.21	-85.99	-85.22	-86.36	-86.87	-82.89
+5	-86.86	-83.03	-87.31	-87.34	-82.52	-86.99	-86.88	-84.25	-85.51

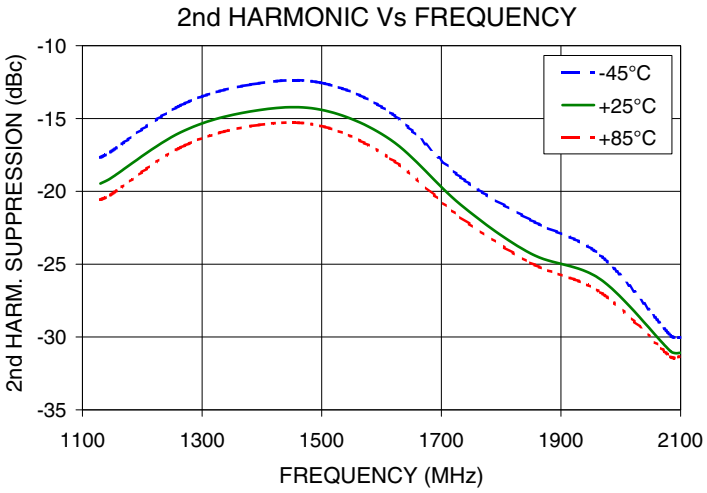
Note 1: Comparison frequency 12.5 kHz
Note 2: All spurs are referenced to carrier signal (n=0).

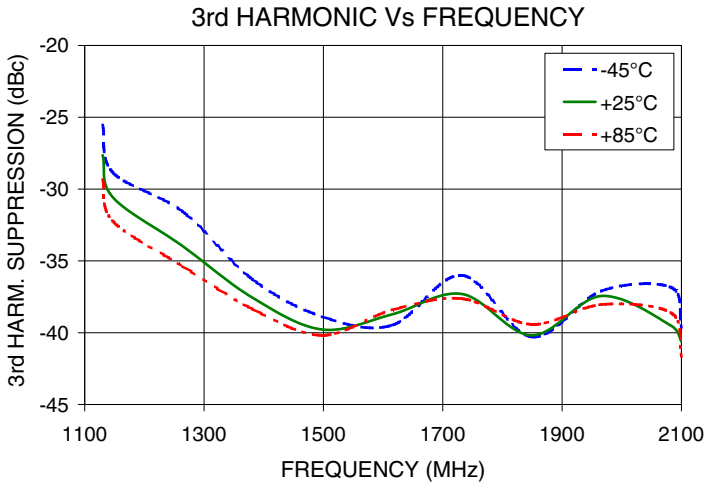
REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 1130MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 1615MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 2100MHz+(n*Freference) (dBc) note 3		
n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-124.03	-125.92	-126.07	-110.36	-111.89	-112.20	-98.71	-102.14	-103.38
-4	-127.78	-126.40	-128.39	-128.34	-128.49	-126.80	-118.27	-120.22	-121.04
-3	-118.37	-118.55	-119.04	-107.82	-109.31	-110.25	-96.45	-99.22	-100.02
-2	-131.00	-129.52	-129.63	-129.13	-129.50	-128.10	-116.65	-121.85	-122.11
-1	-108.26	-108.62	-109.49	-98.23	-99.45	-100.29	-86.79	-90.78	-91.74
0 note 4	-	-	-	-	-	-	-	-	-
+1	-107.11	-107.46	-108.88	-97.04	-99.27	-100.42	-84.64	-87.90	-88.77
+2	-128.19	-130.18	-130.34	-128.03	-126.17	-127.57	-115.62	-117.62	-118.25
+3	-116.91	-116.25	-118.77	-107.22	-109.06	-110.67	-94.52	-97.52	-99.60
+4	-130.09	-129.39	-129.60	-127.30	-126.59	-127.36	-116.25	-118.50	-120.08
+5	-123.02	-123.23	-124.23	-111.04	-112.92	-113.25	-98.63	-102.00	-104.02

Note 3: Reference frequency 13 MHz
Note 4: All spurs are referenced to carrier signal (n=0).

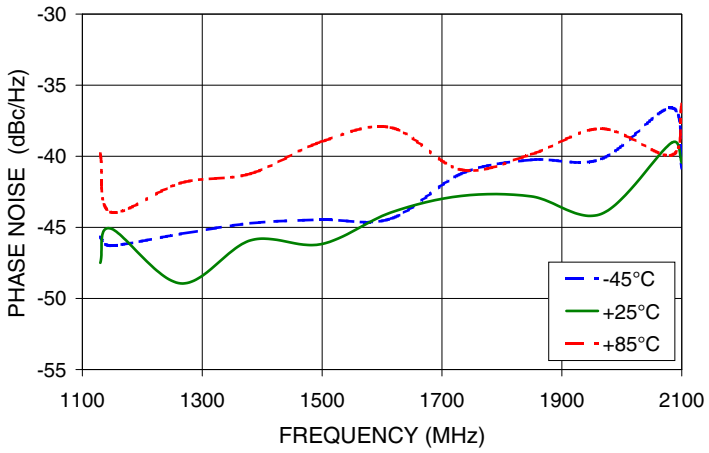
Typical Performance Curves



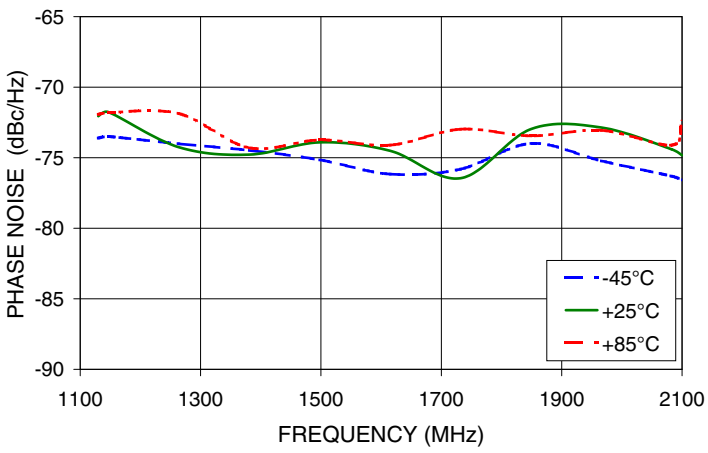




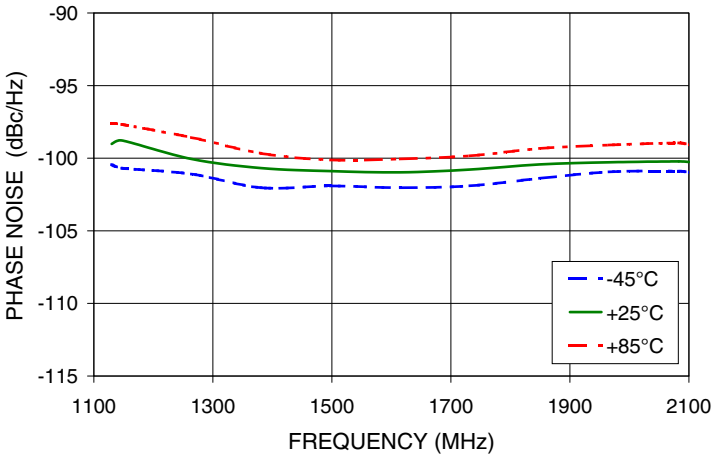
PHASE NOISE @100Hz offset



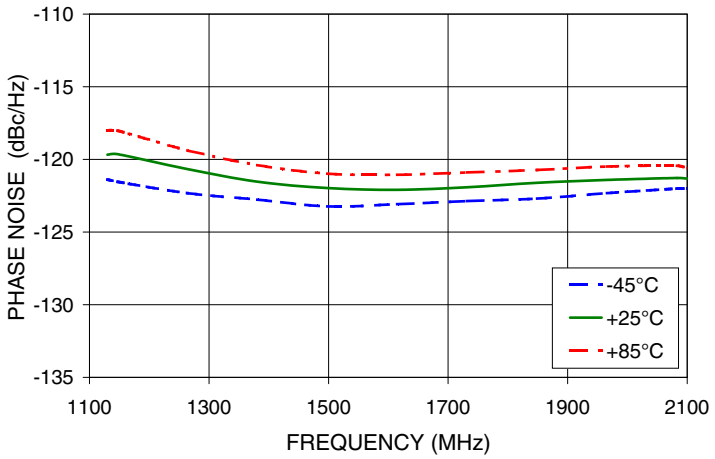
PHASE NOISE @1kHz offset



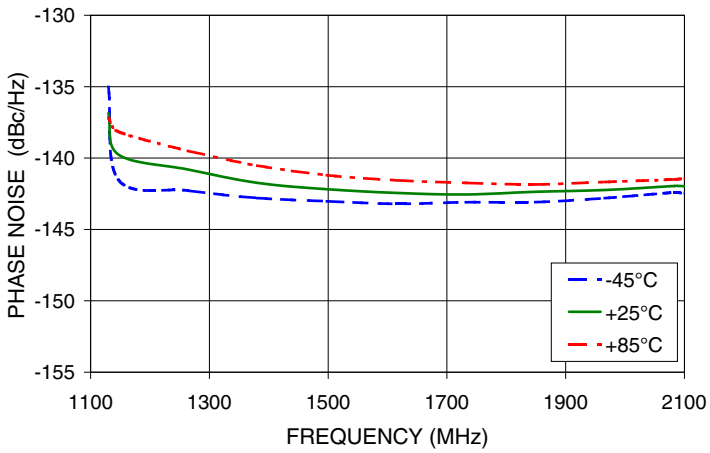
PHASE NOISE @10kHz offset



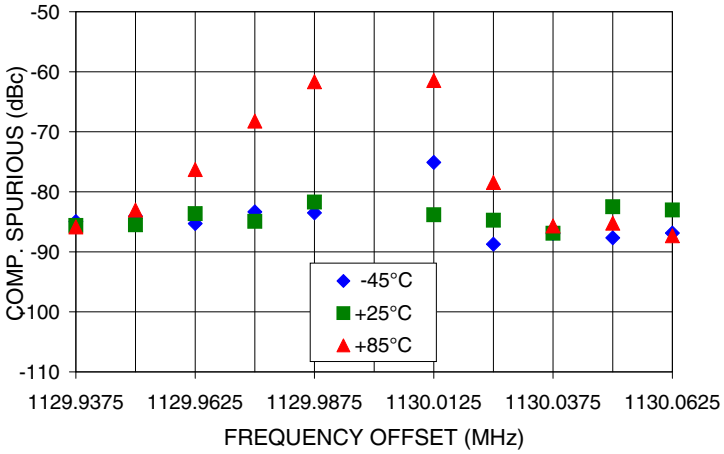
PHASE NOISE @100kHz offset



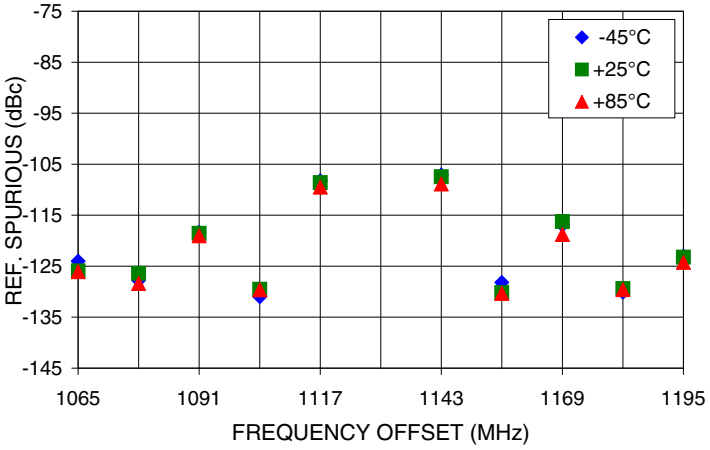
PHASE NOISE @1MHz offset



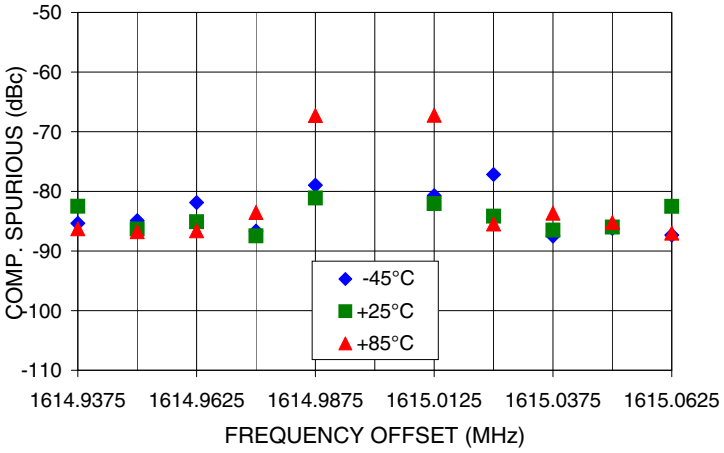
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1130MHz



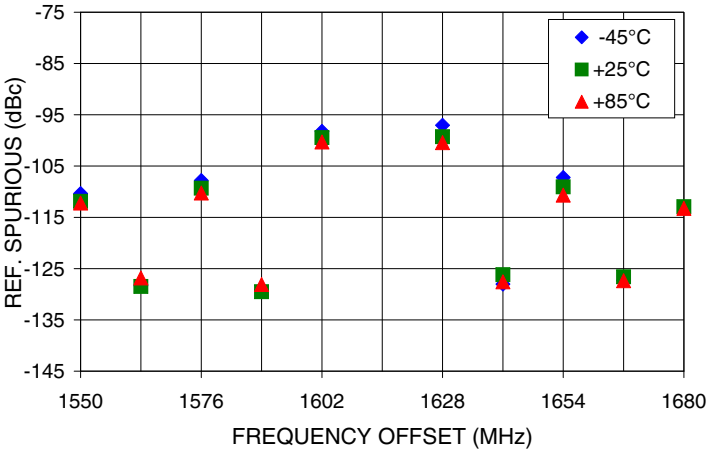
REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1130MHz



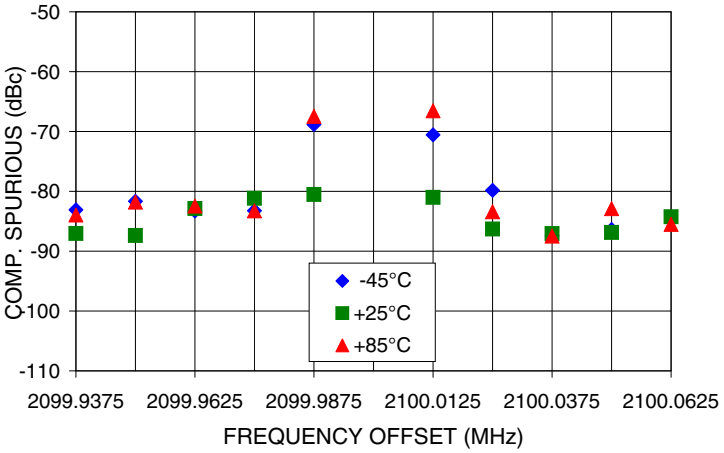
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1615MHz



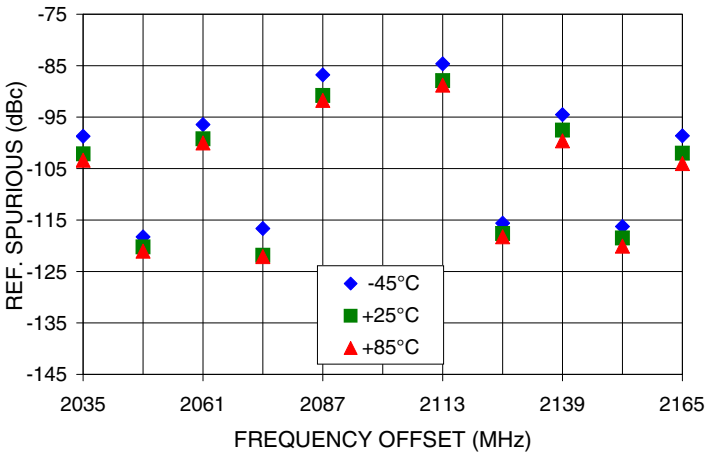
REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 1615MHz



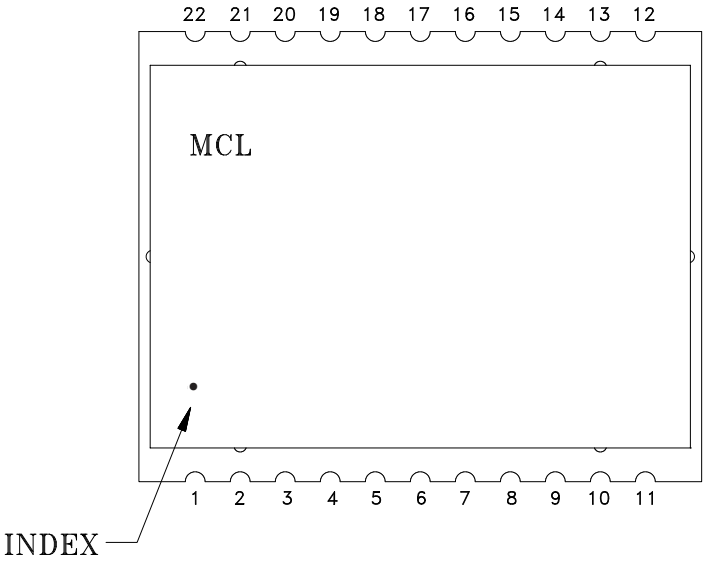
COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2100MHz



REFERENCE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2100MHz



Pin Configuration

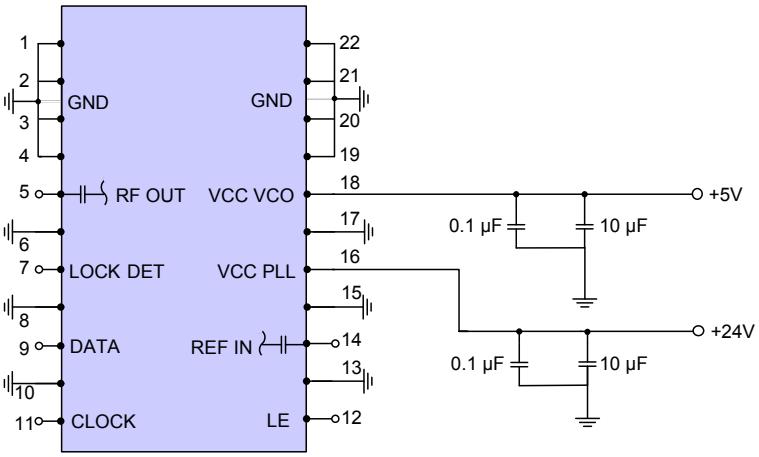


Pin Connection

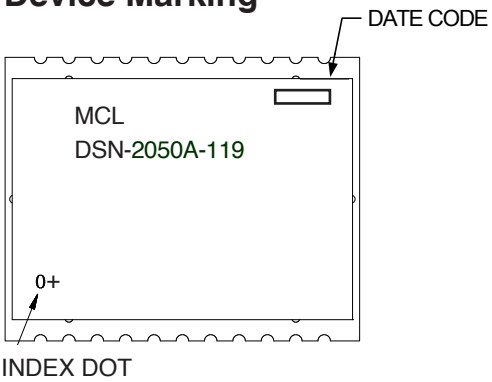
Pin Number	Function	Pin Number	Function
1	GND	12	LE
2	GND	13	GND
3	GND	14	REF IN
4	GND	15	GND
5	RF OUT	16	VCC PLL
6	GND	17	GND
7	LOCK DET	18	VCC VCO
8	GND	19	GND
9	DATA	20	GND
10	GND	21	GND
11	CLOCK	22	GND

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: KL942

Tape & Reel: TR-F97

Suggested Layout for PCB Design: PL-387

Evaluation Board: TB-553-1+

Environment Ratings: ENV65T2

Synthesizer evaluation software to set PLL registers manually is available at http://www.minicircuits.com/support/software_download.html