Frequency Synthesizer KSND-1099N-119+

50Ω Dual Frequency 160.5MHz (fixed) & 1073.8 to 1098.8MHz

The Big Deal

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

CASE STYLE: DK1515

Product Overview

The KSND-1099N-119+ is a Dual Frequency Synthesizer, designed to operate at fixed frequency 160.5 MHz and at frequency range 1073.8 to 1098.8 MHz for navigation systems application. The KSND-1099N-119+ 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
Dual frequency	For saving in cost and system real estate.
Low phase noise and spurious	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Robust design and construction	To enhance the robustness of KSND-1099N-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, 0.800" x 0.584" x 0.154"	The small size enables the KSND-1099N-119+ to be used in compact designs.

Surface Mount

Frequency Synthesizer

KSND-1099N-119+

50Ω Dual Frequency 160.5 MHz (fixed) & 1073.8 to 1098.8 MHz

Features

- Dual frequency
- Integrated VCO + PLL
- Low phase noise and spurious
- Robust design and construction
- Low operating voltage (VCC VCO RF/ VCO IF/PLL=+3.0V)
- Small size 0.800" x 0.584" x 0.154"

CASE STYLE: DK1515
PRICE: $41.95 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.

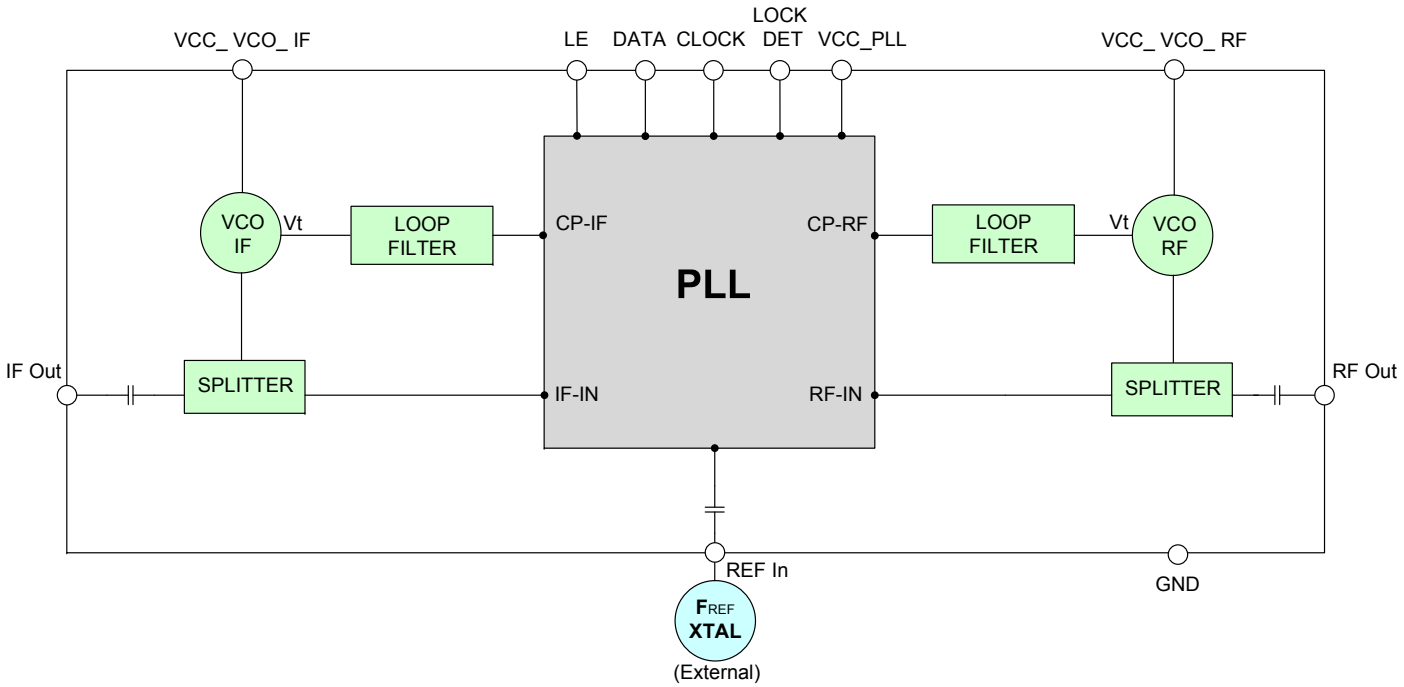
Applications

- Navigation systems

General Description

The KSND-1099N-119+ is a Dual Frequency Synthesizer, designed to operate at fixed frequency 160.5 MHz and at frequency range 1073.8 to 1098.8 MHz for navigation systems application. The KSND-1099N-119+ 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 KSND-1099N-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
IF Frequency Range (fixed)		-	160.5		160.5	
RF Frequency Range		-	1073.8	-	1098.8	MHz
IF Comparison Frequency		-	-	500	-	kHz
RF Comparison Frequency		-	-	5000	-	
RF Settling Time		Within ± 10 kHz	-	0.05	0.15	mSec
IF Output Power		-	-2.5	+0.5	+2.5	dBm
RF Output Power		-	-2.5	-0.3	+2.5	
IF SSB Phase Noise		@ 100 Hz offset	-	-95	-	dBc/Hz
		@ 1 kHz offset	-	-100	-94	
		@ 10 kHz offset	-	-100	-95	
		@ 100 kHz offset	-	-124	-120	
		@ 1 MHz offset	-	-150	-145	
RF SSB Phase Noise		@ 100 Hz offset	-	-82	-	
		@ 1 kHz offset	-	-89	-84	
		@ 10 kHz offset	-	-93	-87	
		@ 100 kHz offset	-	-98	-93	
		@ 1 MHz offset	-	-108	-104	
IF Reference Spurious Suppression		Ref. Freq. 10 MHz	-	-77	-69	dBc
RF Reference Spurious Suppression			-	-86	-75	
IF Comparison Spurious Suppression		Comp. Freq. 500 kHz	-	-74	-66	
RF Comparison Spurious Suppression		Comp. Freq. 5000 kHz	-	-86	-74	
Non - Harmonic Spurious Suppression		-	-	-90	-	
IF Harmonic Suppression		-	-	-15	-10	
RF Harmonic Suppression		-	-	-25	-20	
VCO IF Supply Voltage		+3.00	+2.95	+3.00	+3.05	V
VCO RF Supply Voltage		+3.00	+2.95	+3.00	+3.05	
PLL Supply Voltage		+3.00	+2.95	+3.00	+3.05	
VCO IF Supply Current		-	-	10	15	mA
VCO RF Supply Current		-	-	9	15	
PLL Supply Current		-	-	7	10	
Reference Input (External)	Frequency	10 (square wave)	-	10	-	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	-	2.00	-	-	V
	Input low voltage	-	-	-	0.40	
Digital Lock Detect	Locked	-	2.65	-	3.05	
	Unlocked	-	-	-	0.40	
Frequency Synthesizer PLL		-	LMX2485			
PLL Programming		-	3-wire serial 3V CMOS			
Register Map @ RF=1073.82142857 MHz, @ IF=160.5 MHz	R0_Register	-	(MSB) 11010011001100100010 (LSB)			
	R1_Register	-	(MSB) 101000001101000011 (LSB)			
	R2_Register	-	(MSB) 10100000010101 (LSB)			
	R3_Register	-	(MSB) 111111110000000101000111 (LSB)			
	R4_Register	-	(MSB) 10001000000110001111001 (LSB)			
	R5_Register	-	(MSB) 1011 (LSB)			
	R6_Register	-	(MSB) 11111001001110001001101 (LSB)			
	R7_Register	-	(MSB) 100100001111 (LSB)			

Absolute Maximum Ratings

Parameters	Ratings
VCO Supply Voltage	4V
PLL Supply Voltage	4V
Reference Frequency Voltage	-0.2Vmin, VCC PLL +0.3Vmax
Data, Clock, LE Levels	-0.2Vmin, 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

Typical Performance Data: IF frequency: 160.5 MHz

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
160.5	0.30	0.53	0.48	9.22	10.14	10.85	6.37	6.67	6.93

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
160.5	-15.93	-17.09	-18.78	-35.46	-37.57	-38.35

FREQUENCY	@TEMP.	PHASE NOISE (dBc/Hz) @OFFSETS				
		100Hz	1kHz	10kHz	100kHz	1MHz
160.5	-45°C	-95.93	-99.42	-99.66	-124.66	-151.01
	+25°C	-97.49	-101.49	-99.96	-124.15	-149.85
	+85°C	-98.53	-101.74	-100.00	-123.36	-148.62

COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 160.5MHz+(n*Freference) (dBc) note 1		
n	-45°C	+25°C	+85°C
-5	-96.23	-94.21	-92.68
-4	-95.08	-92.94	-90.96
-3	-93.83	-91.05	-88.28
-2	-89.21	-86.47	-84.37
-1	-77.11	-74.18	-72.73
0 note 2	-	-	-
+1	-77.73	-74.53	-72.97
+2	-91.34	-87.08	-84.82
+3	-98.14	-92.41	-89.22
+4	-99.51	-96.26	-92.91
+5	-99.38	-97.64	-94.15

Note 1: IF Comparison frequency 500 kHz
Note 2: All spurs are referenced to carrier signal (n=0).

REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 160.5MHz+(n*Freference) (dBc) note 3		
n	-45°C	+25°C	+85°C
-5	-102.47	-102.87	-105.22
-4	-88.21	-88.59	-91.94
-3	-87.01	-85.22	-84.75
-2	-80.86	-80.32	-79.57
-1	-83.29	-82.02	-79.62
0 note 4	-	-	-
+1	-79.29	-77.85	-77.07
+2	-80.91	-79.77	-79.42
+3	-86.56	-85.75	-85.37
+4	-85.59	-85.94	-89.27
+5	-103.15	-102.22	-105.56

Note 3: IF Reference frequency 10 MHz
Note 4: All spurs are referenced to carrier signal (n=0).

Typical Performance Data: RF frequency: 1073.8 to 1098.8 MHz

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
1073.82	-0.53	-0.35	-0.40	8.11	9.12	10.01	6.38	6.65	6.91
1086.05	-0.58	-0.35	-0.38	8.15	9.16	10.07	6.37	6.67	6.93
1098.79	-0.55	-0.29	-0.34	8.19	9.21	10.12	6.37	6.68	6.95

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
1073.82	-25.52	-27.46	-30.32	-36.54	-35.81	-35.16
1086.05	-26.67	-28.50	-31.30	-36.46	-35.94	-35.95
1098.79	-26.30	-28.27	-31.06	-34.28	-34.32	-34.58

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS +25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
1073.82	-84.44	-91.93	-97.07	-106.37	-111.79
1086.05	-85.74	-92.45	-94.18	-101.41	-110.36
1098.79	-85.67	-91.72	-94.36	-99.24	-108.57

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS -45°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
1073.82	-83.30	-91.65	-94.64	-104.56	-111.71
1086.05	-83.10	-90.66	-91.78	-99.69	-110.44
1098.79	-84.99	-93.45	-93.79	-99.36	-108.61

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS +85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
1073.82	-81.20	-94.06	-97.23	-106.51	-112.02
1086.05	-80.58	-89.77	-91.71	-98.58	-110.55
1098.79	-78.99	-89.16	-92.49	-97.93	-108.76

COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 1073.82MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 1086.05MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 1098.79MHz+(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	-84.42	-91.99	-90.61	-85.40	-92.37	-94.42	-88.32	-90.90	-99.26
-4	-84.74	-91.46	-92.00	-85.91	-92.15	-94.47	-89.72	-90.66	-98.20
-3	-85.17	-92.48	-92.47	-87.36	-92.35	-95.06	-92.00	-90.14	-97.31
-2	-85.69	-91.61	-91.11	-87.17	-93.87	-95.40	-91.98	-93.18	-93.17
-1	-86.89	-91.91	-94.67	-88.53	-94.69	-94.65	-94.69	-90.02	-93.72
0 note 2	-	-	-	-	-	-	-	-	-
+1	-89.07	-91.74	-94.11	-93.99	-88.65	-94.15	-93.64	-88.06	-92.25
+2	-90.83	-89.31	-93.46	-92.93	-89.23	-92.92	-93.75	-90.36	-91.83
+3	-90.77	-89.88	-94.97	-93.01	-88.55	-94.18	-92.93	-88.71	-92.61
+4	-91.06	-89.52	-94.89	-91.62	-89.01	-93.49	-91.91	-88.76	-92.62
+5	-91.94	-89.07	-93.91	-92.18	-88.42	-92.87	-93.31	-88.53	-93.08

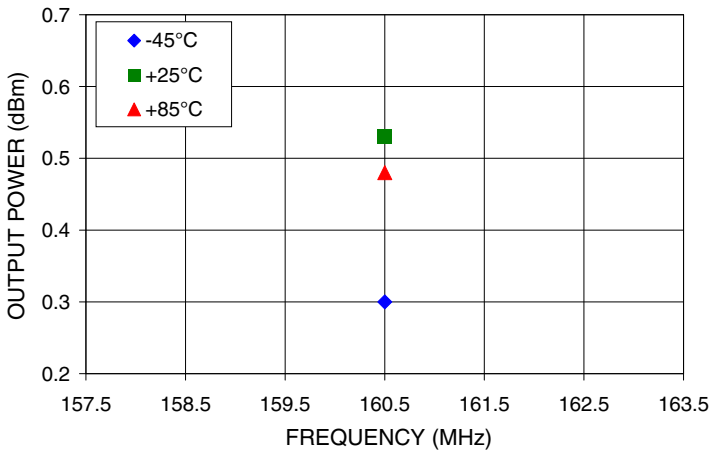
Note 1: RF Comparison frequency 5000 kHz
Note 2: All spurs are referenced to carrier signal (n=0).

REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 1073.82MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 1086.05MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 1098.79MHz+(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	-83.61	-95.61	-89.38	-83.85	-92.76	-90.94	-84.98	-93.08	-91.60
-4	-83.70	-93.12	-90.13	-84.24	-92.40	-91.47	-86.59	-92.85	-94.23
-3	-84.09	-91.42	-91.32	-84.92	-91.66	-93.10	-87.29	-92.43	-96.17
-2	-84.74	-91.46	-92.00	-85.91	-92.15	-94.47	-89.72	-90.66	-98.20
-1	-85.69	-91.61	-91.11	-87.17	-93.87	-95.40	-91.98	-93.18	-93.17
0 note 4	-	-	-	-	-	-	-	-	-
+1	-90.83	-89.31	-93.46	-92.93	-89.23	-92.92	-93.75	-90.36	-91.83
+2	-91.06	-89.52	-94.89	-91.62	-89.01	-93.49	-91.91	-88.76	-92.62
+3	-92.93	-88.48	-93.57	-92.68	-88.73	-92.58	-92.60	-88.82	-93.96
+4	-93.72	-88.53	-92.56	-93.50	-89.41	-91.83	-93.90	-90.06	-93.63
+5	-95.19	-89.07	-92.13	-94.02	-90.08	-91.74	-96.12	-92.14	-94.15

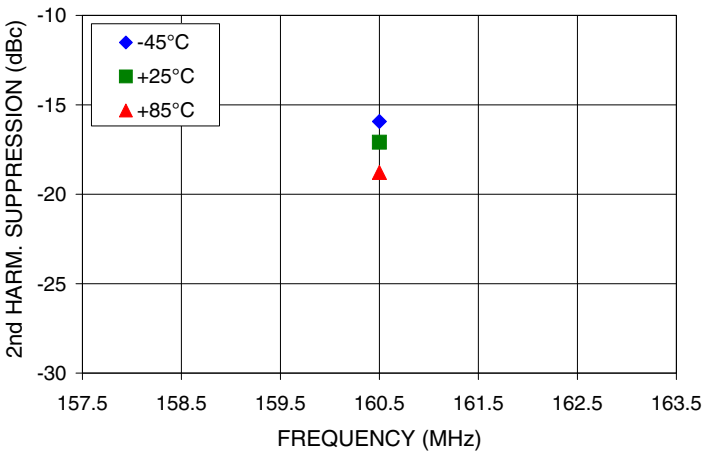
Note 3: RF Reference frequency 10 MHz
Note 4: All spurs are referenced to carrier signal (n=0).

Typical Performance Curves: IF frequency: 160.5 MHz

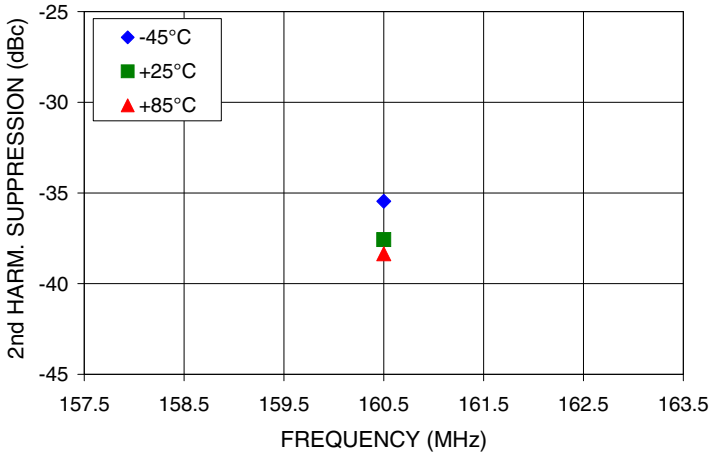
OUTPUT POWER Vs FREQUENCY (IF)



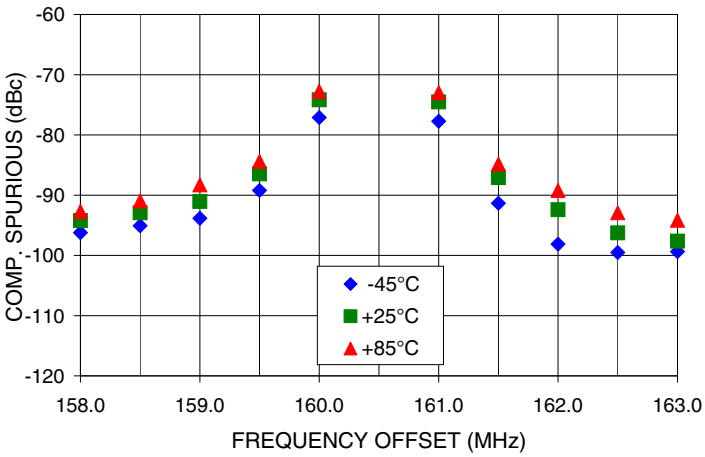
2nd HARMONIC Vs FREQUENCY (IF)



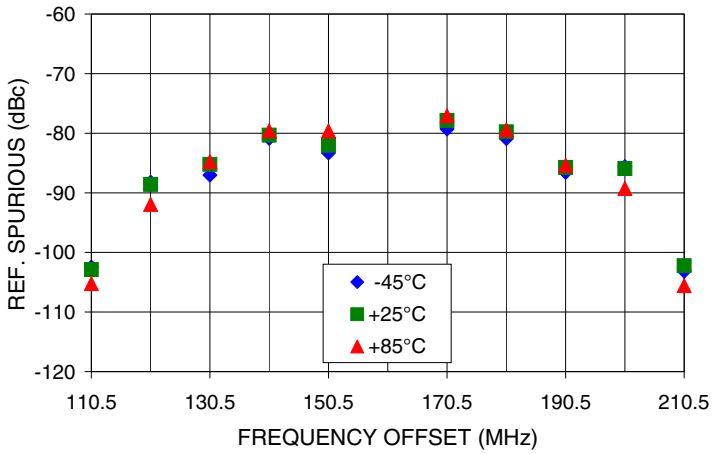
3rd HARMONIC Vs FREQUENCY (IF)



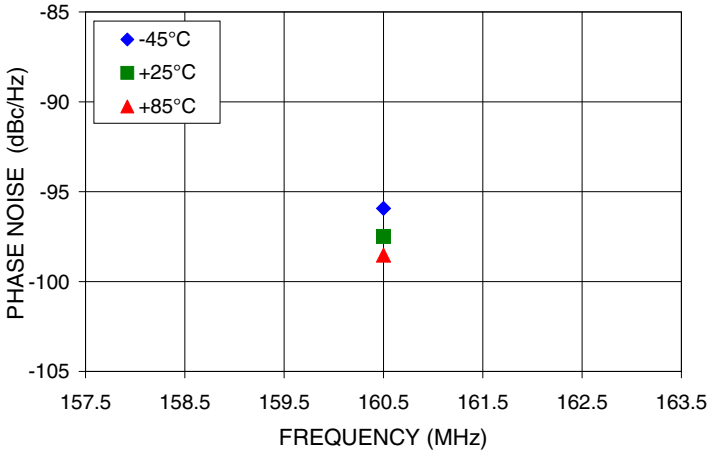
COMPARISON SPURIOUS (IF)
Vs FREQ. OFFSET @ Fcar = 160.5 MHz



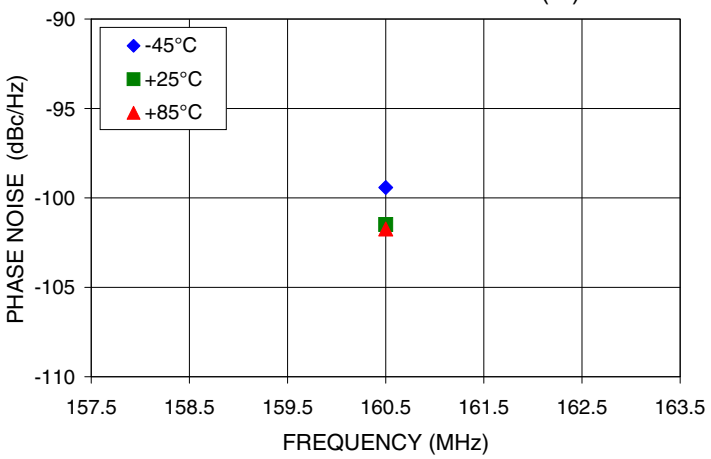
REFERENCE SPURIOUS (IF)
Vs FREQ. OFFSET @ Fcar = 160.5 MHz



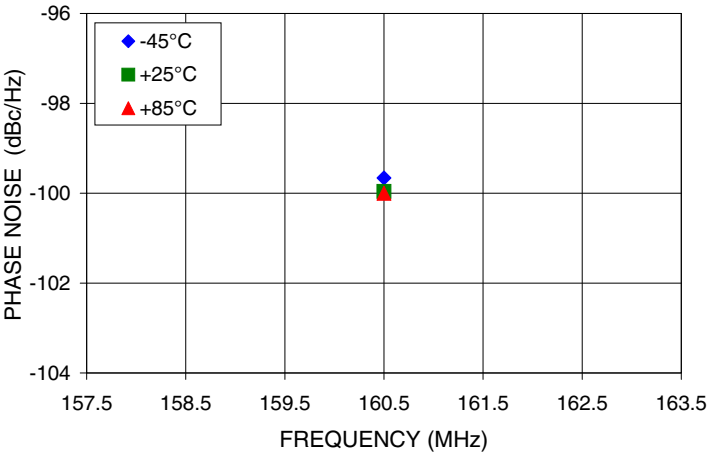
PHASE NOISE @100Hz offset (IF)



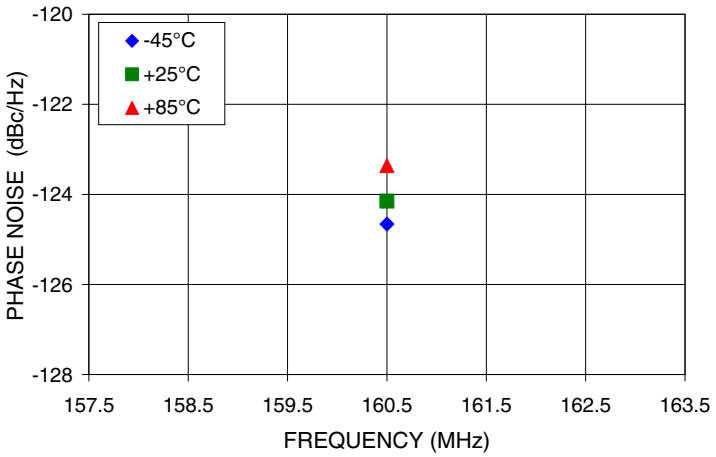
PHASE NOISE @1kHz offset (IF)



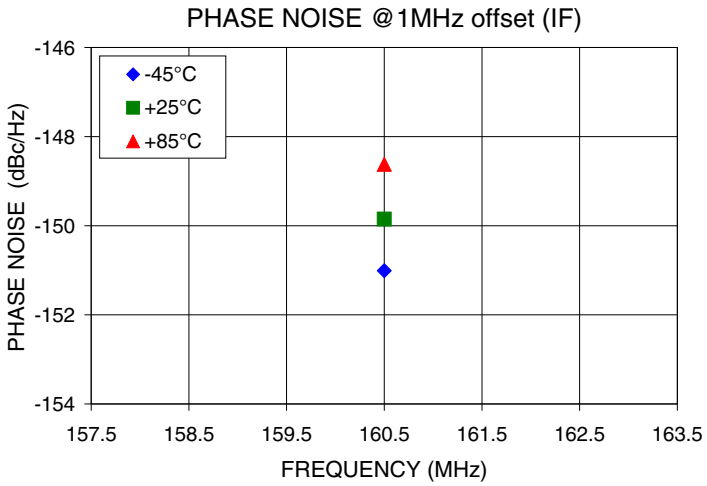
PHASE NOISE @10kHz offset (IF)



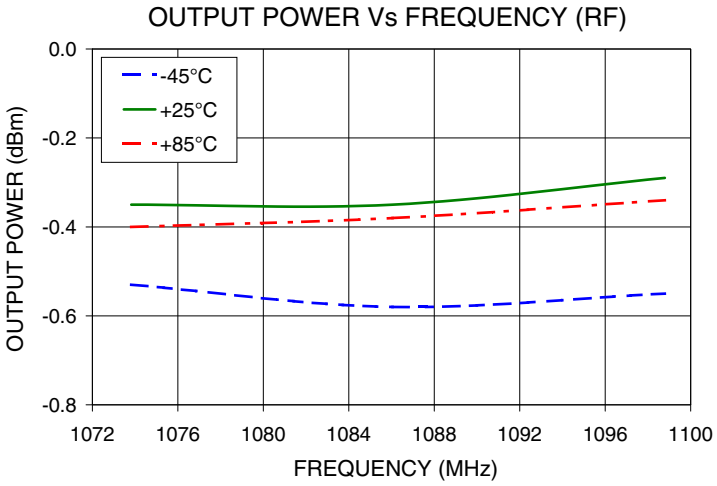
PHASE NOISE @100kHz offset (IF)

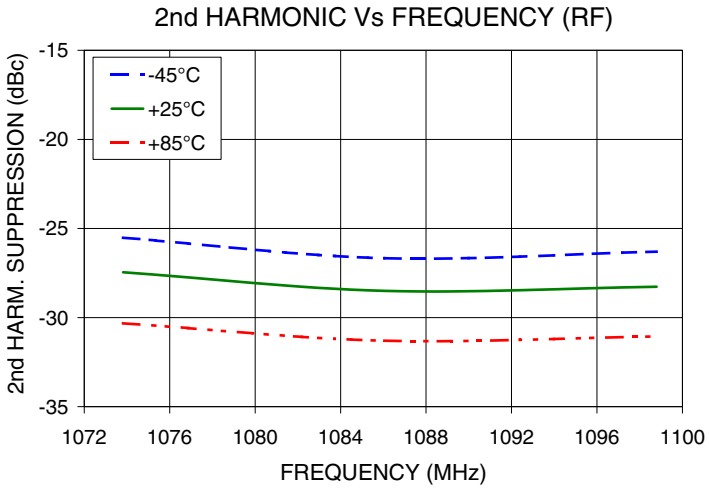


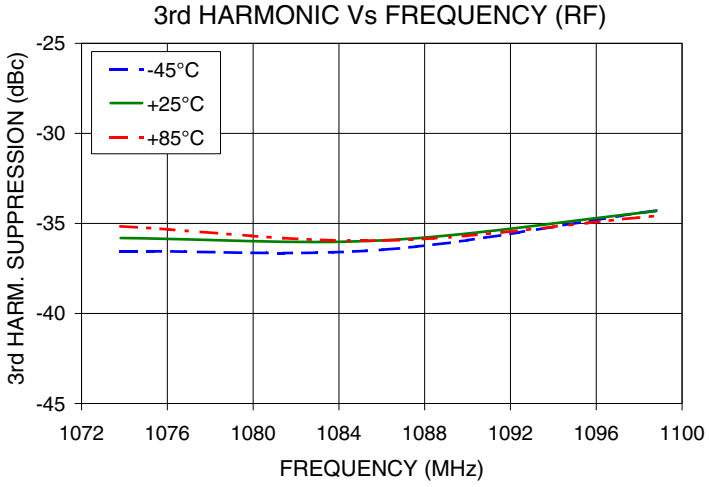
PHASE NOISE @1MHz offset (IF)



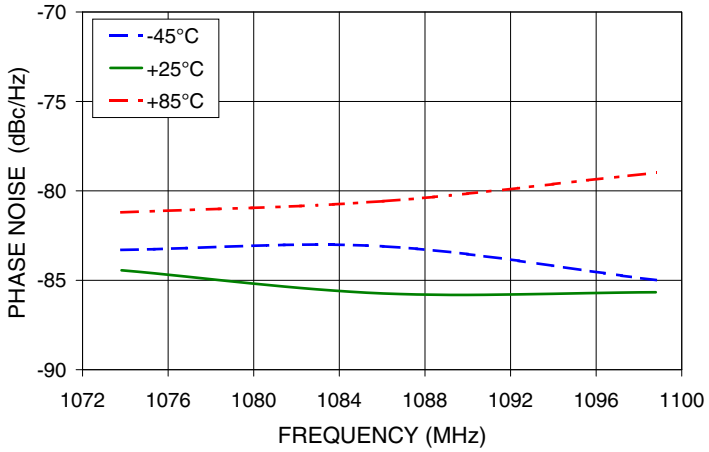
Typical Performance Curves: RF frequency: 1073.8 to 1098.8 MHz



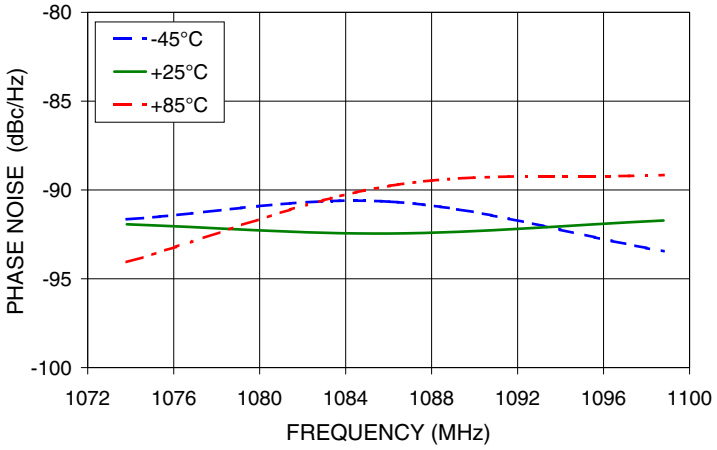




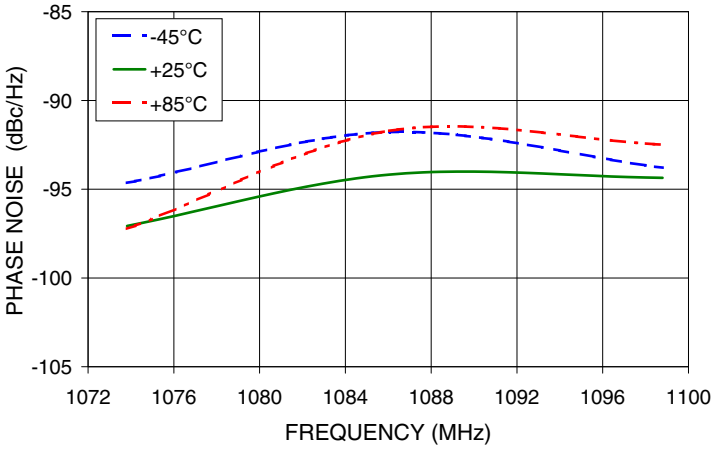
PHASE NOISE @100Hz offset (RF)



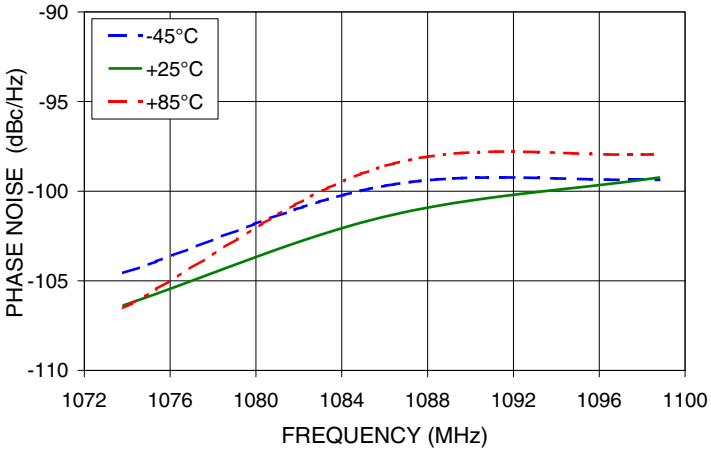
PHASE NOISE @1kHz offset (RF)



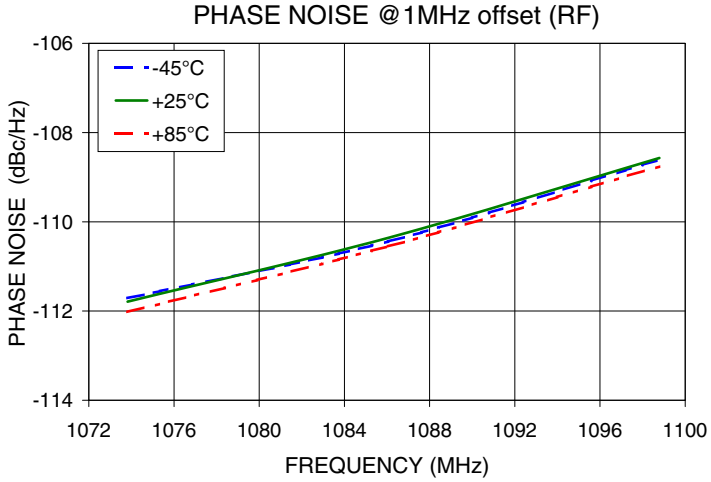
PHASE NOISE @10kHz offset (RF)



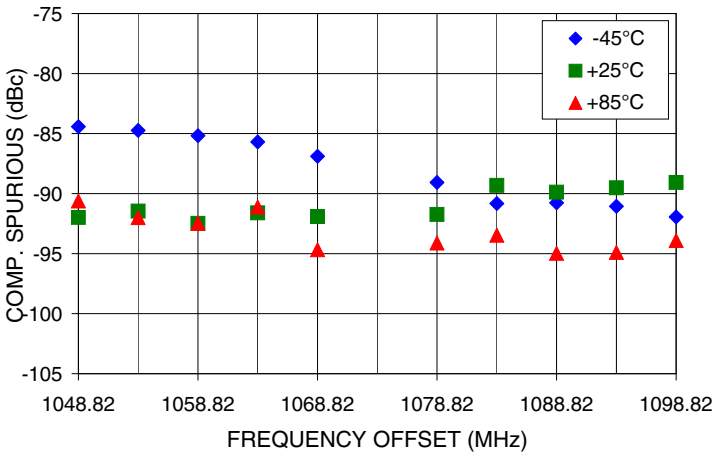
PHASE NOISE @100kHz offset (RF)



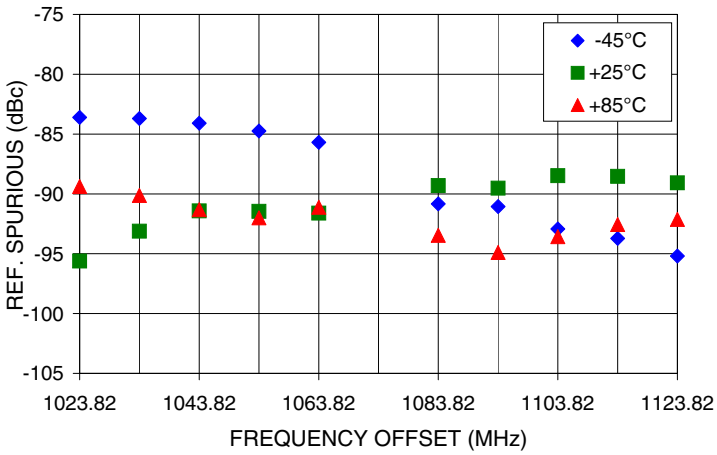
PHASE NOISE @1MHz offset (RF)



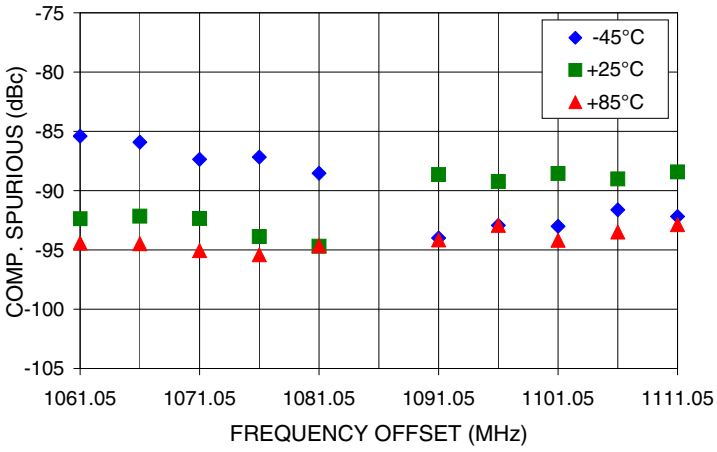
COMPARISON SPURIOUS (RF) Vs
FREQ. OFFSET @ Fcar = 1073.82 MHz



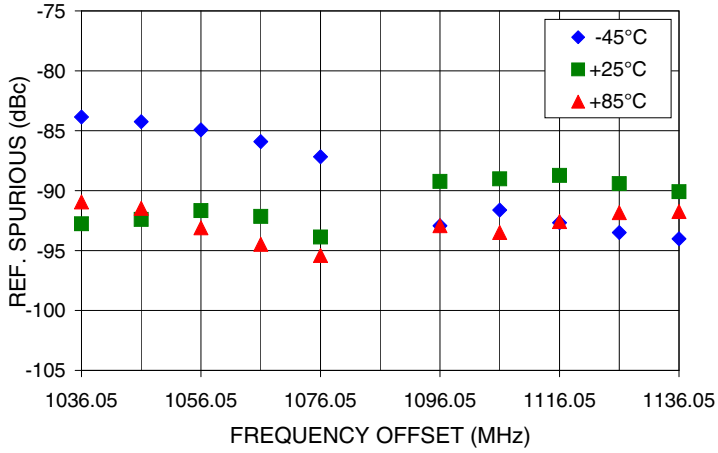
REFERENCE SPURIOUS (RF) Vs
FREQ. OFFSET @ Fcar = 1073.82 MHz



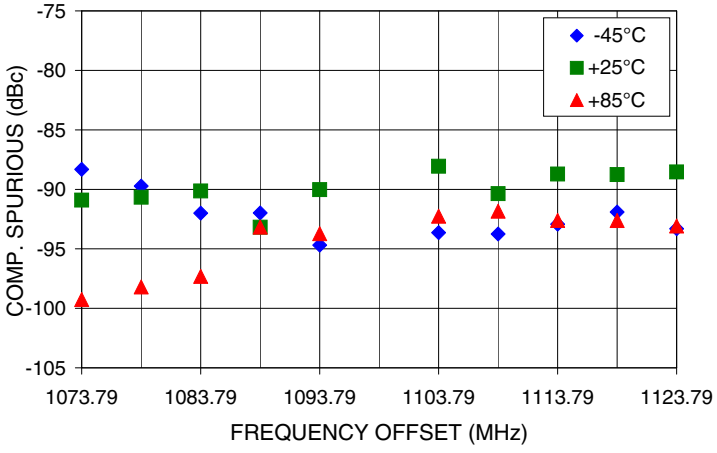
COMPARISON SPURIOUS (RF) Vs
FREQ. OFFSET @ Fcar = 1086.05 MHz



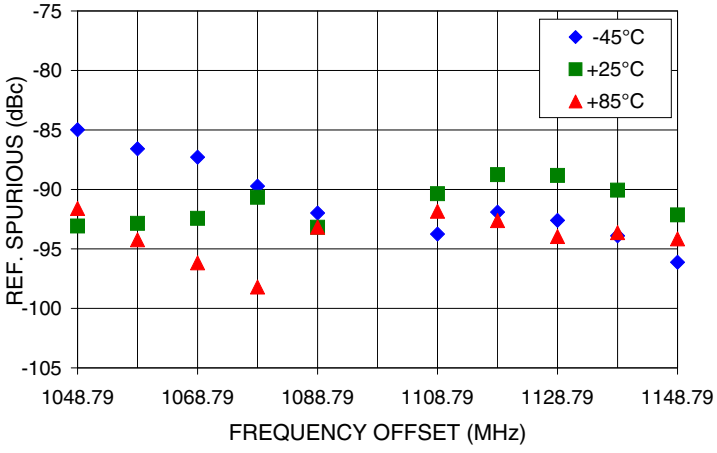
REFERENCE SPURIOUS (RF) Vs
FREQ. OFFSET @ Fcar = 1086.05 MHz



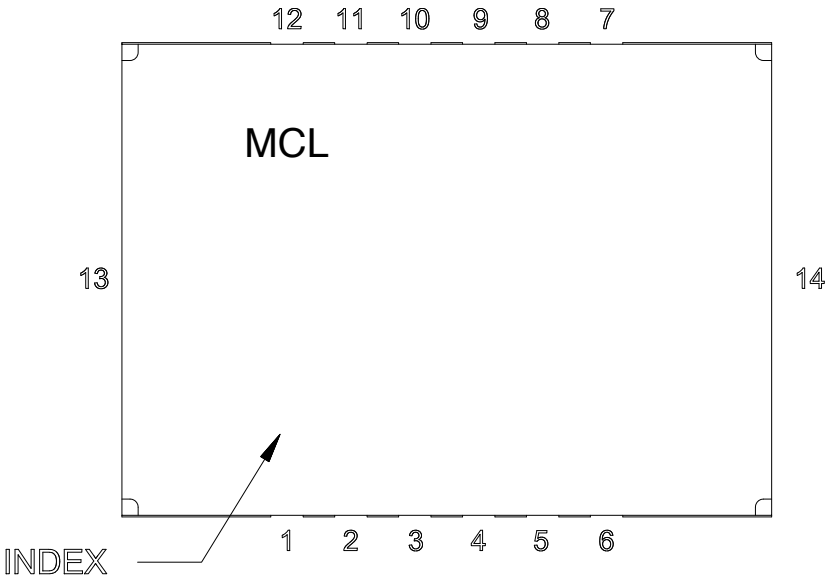
COMPARISON SPURIOUS (RF) Vs
FREQ. OFFSET @ Fcar = 1098.79 MHz



REFERENCE SPURIOUS (RF) Vs
FREQ. OFFSET @ Fcar = 1098.79 MHz



Pin Configuration

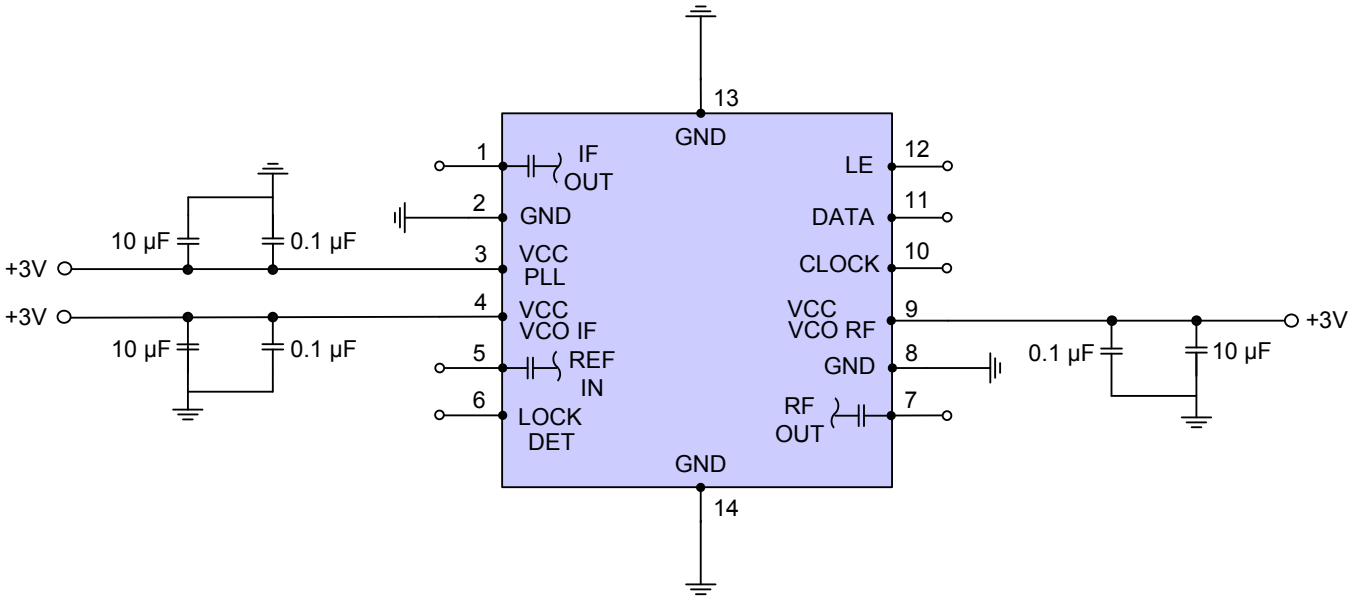


Pin Connection

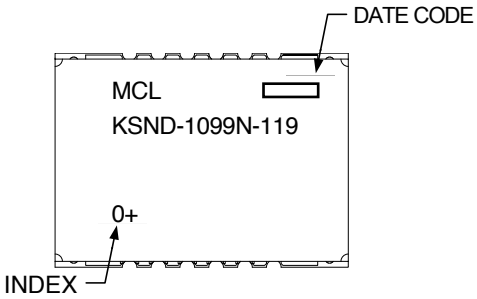
Pin Number	Function
1	IF OUT
2	GND
3	VCC PLL
4	VCC VCO IF
5	REF IN
6	LOCK DET
7	RF OUT
8	GND
9	VCC VCO RF
10	CLOCK
11	DATA
12	LE
13	GND
14	GND

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: DK1515

Tape & Reel: TR-F95

Suggested Layout for PCB Design: PL-334

Evaluation Board: TB-595+

Environment Ratings: ENV03T2