

# Frequency Synthesizer **SSND-1014N-119+**

50Ω Dual Frequency 1000 and 1440 MHz (fixed)

## The Big Deal

- Dual frequency
- Low phase noise and spurious
- Very small size 0.60" x 0.60" x 0.138"



CASE STYLE: KJ1373

## Product Overview

The SSND-1014N-119+ is a Dual Frequency Synthesizer, designed to operate at two discrete, single frequency synthesizers 1000 and 1440 MHz for GPS receiver application. The SSND-1014N-119+ is packaged in a very small metal case (size of 0.60" x 0.60" x 0.138") 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).
Very small size, 0.60" x 0.60" x 0.138"	The small size enables the SSND-1014N-119+ to be used in compact designs.
Low current consumptions	Can be used in a portable system.

### Notes

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Surface Mount

# Frequency Synthesizer

## SSND-1014N-119+

50Ω Dual Frequency 1000 and 1440 MHz (fixed)

### Features

- Dual frequency
- Integrated VCO + PLL
- Low phase noise and spurious
- Robust design and construction
- Low operating voltage (VCC RF-IF=+2.5V, VCC VCO RF=+3.0V, VCC VCO IF=+3.0V)
- Small size 0.60" x 0.60" x 0.138"



CASE STYLE: KJ1373

**+RoHS Compliant**

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

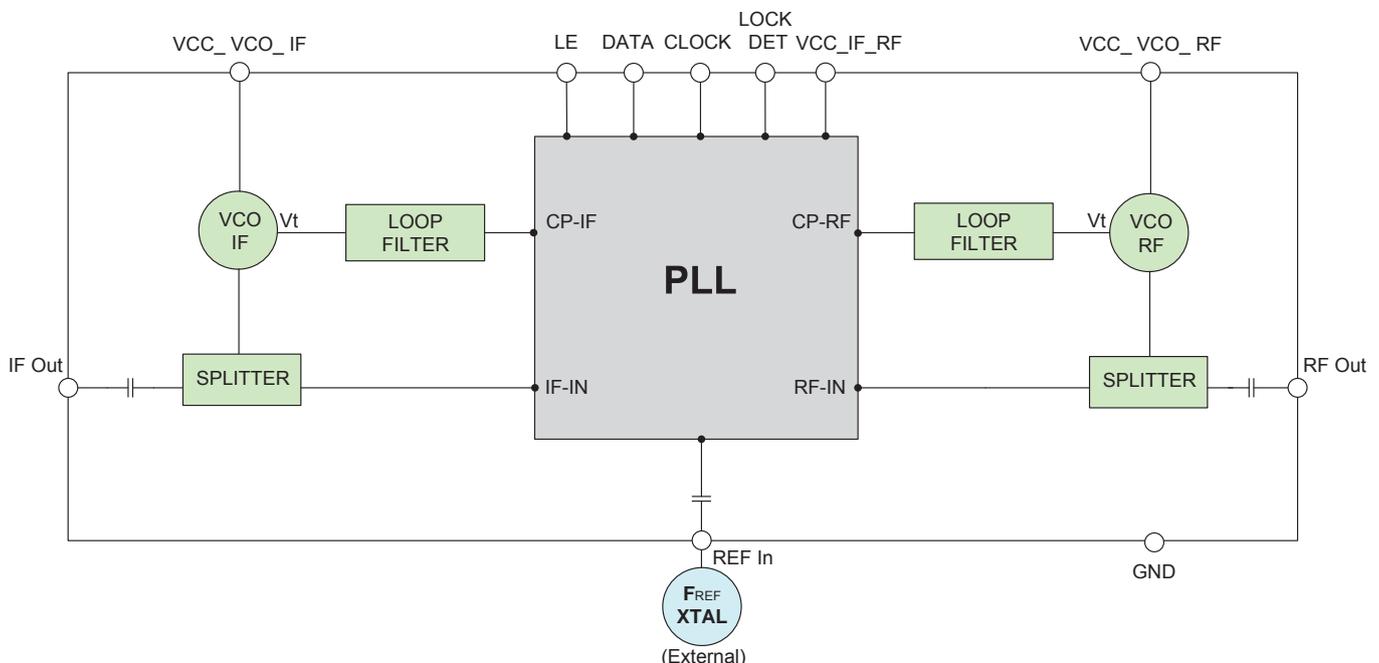
### Applications

- GPS receiver

### General Description

The SSND-1014N-119+ is a Frequency Synthesizer, designed to operate at 1000 and 1440 MHz for GPS receiver application. The SSND-1014N-119+ is packaged in a metal case (size of 0.60" x 0.60" x 0.138") to shield against unwanted signals and noise. To enhance the robustness of SSND-1014N-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



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REV. B  
M151108  
EDR-9422/4F1  
SSND-1014N-119+  
Category-A2  
RAV  
151013  
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**Electrical Specifications** (over operating temperature -40°C to +85°C)

Parameters	Test Conditions	Min.	Typ.	Max.	Units	
IF Frequency Range (Fixed)	-	1000	-	1000	MHz	
RF Frequency Range (Fixed)	-	1440	-	1440		
Comparison Frequency	-	-	2000	-	kHz	
Settling Time	Within ± 1 kHz	-	0.4	-	mSec	
IF Output Power	-	-12.0	-9.7	-8.0	dBm	
RF Output Power	-	+1.0	+2.9	+5.0		
IF SSB Phase Noise	@ 100 Hz offset	-	-84	-	dBc/Hz	
	@ 1 kHz offset	-	-92	-87		
	@ 10 kHz offset	-	-90	-86		
	@ 100 kHz offset	-	-118	-114		
	@ 1 MHz offset	-	-145	-140		
RF SSB Phase Noise	@ 100 Hz offset	-	-82	-		
	@ 1 kHz offset	-	-89	-84		
	@ 10 kHz offset	-	-89	-85		
	@ 100 kHz offset	-	-119	-115		
	@ 1 MHz offset	-	-143	-135		
IF Reference Spurious Suppression	Ref. Freq. 10 MHz	-	-80	-70	dBc	
RF Reference Spurious Suppression		-	-106	-76		
IF Comparison Spurious Suppression	Comp Freq. 2000 kHz	-	-96	-80		
RF Comparison Spurious Suppression		-	-97	-78		
Non - Harmonic Spurious Suppression	-	-	-90	-		
IF Harmonic Suppression	-	-	-30	-19		
RF Harmonic Suppression	-	-	-31	-26		
VCC RF-IF Supply Voltage	+2.50	+2.25	+2.50	+2.75	V	
VCC VCO IF Supply Voltage	+3.00	+2.95	+3.00	+3.05		
VCC VCO RF Supply Voltage	+3.00	+2.95	+3.00	+3.05		
VCC RF-IF Supply Current	-	-	6	12	mA	
VCO IF Supply Current	-	-	7	13		
VCO RF Supply Current	-	-	10	16		
Reference Input (External)	Frequency	10 (square wave)	-	10	-	MHz
	Amplitude	1	-	1	-	V <sub>P-P</sub>
	Input impedance	-	-	100	-	KΩ
	Phase Noise @ 1 kHz offset	-	-	-145	-	dBc/Hz
RF Output port Impedance	-	-	50	-	Ω	
Input Logic Level	Input high voltage	-	2.20	-	-	V
	Input low voltage	-	-	-	0.45	V
Digital Lock Detect	Locked	-	1.90	-	2.70	V
	Unlocked	-	-	-	0.40	V
Frequency Synthesizer PLL	-	LMX2433				
PLL Programming	-	3-wire serial 2.5V CMOS				
Register Map @ IF+RF Freq.	R0_Register	-	(MSB) 0000100000000000101000 (LSB)			
	R1_Register	-	(MSB) 010000000001011010000001 (LSB)			
	R2_Register	-	(MSB) 00000000000000000000010 (LSB)			
	R3_Register	-	(MSB) 110001000000000000101011 (LSB)			
	R4_Register	-	(MSB) 010000000000111110100100 (LSB)			
	R5_Register	-	(MSB) 000000000000000000000101 (LSB)			

**Absolute Maximum Ratings**

Parameters	Ratings
VCO Supply Voltage	4V
PLL Supply Voltage	3V
VCO Supply Voltage to PLL Supply Voltage	N.A
Reference Frequency Voltage	-0.5Vmin, VCC RF-IF +0.3Vmax
Data, Clock, LE Levels	-0.3Vmin, VCC RF-IF +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		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
IF	1000	-10.29	-9.72	-9.94	6.86	7.90	8.65	6.47	6.66	6.82
RF	1440	1.93	2.95	3.68	8.86	10.46	11.57	6.47	6.66	6.82

FREQUENCY		HARMONICS (dBc)					
		F2			F3		
		-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
IF	1000	-24.83	-31.22	-43.66	-49.04	-44.89	-36.17
RF	1440	-29.89	-30.87	-32.32	-57.39	-63.55	-67.75

FREQUENCY		@TEMP.	PHASE NOISE (dBc/Hz)				
			@OFFSETS				
			100Hz	1kHz	10kHz	100kHz	1MHz
IF	1000	-45°C	-82.37	-92.65	-91.73	-118.91	-146.75
		+25°C	-83.35	-90.41	-91.46	-118.35	-145.98
		+85°C	-86.92	-92.44	-91.14	-117.31	-144.69
RF	1440	-45°C	-80.87	-90.97	-89.77	-120.14	-143.76
		+25°C	-82.69	-91.08	-89.51	-119.8	-143.09
		+85°C	-82.90	-89.83	-89.92	-119.21	-142.57

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COMPARISON SPURIOUS ORDER  n	(IF) COMPARISON SPURIOUS @Fcarrier 1000MHz+(n*Fcomparison) (dBc) note 1			(RF) COMPARISON SPURIOUS @Fcarrier 1440MHz+(n*Fcomparison) (dBc) note 1		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-4	-101.21	-104.36	-102.09	-96.99	-122.86	-104.97
-3	-98.72	-105.65	-102.13	-98.11	-114.62	-96.87
-2	-93.83	-106.00	-96.70	-92.74	-116.44	-92.69
-1	-90.41	-96.24	-90.61	-85.19	-103.99	-88.86
0 note 2	-	-	-	-	-	-
+1	-87.18	-90.94	-90.61	-85.35	-104.64	-88.89
+2	-89.40	-103.62	-101.95	-92.89	-117.51	-92.77
+3	-93.28	-98.88	-108.19	-98.86	-117.27	-96.70
+4	-97.85	-100.78	-105.91	-97.13	-124.83	-104.39

Note 1: Comparison frequency 2000 kHz

Note 2: All spurs are referenced to carrier signal (n=0).

REFERENCE SPURIOUS ORDER  n	(IF) REFERENCE SPURIOUS @Fcarrier 1000MHz+(n*Freference) (dBc) note 3			(RF) REFERENCE SPURIOUS @Fcarrier 1440MHz+(n*Freference) (dBc) note 3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-107.54	-105.37	-105.57	-115.59	-103.43	-110.01
-4	-93.75	-97.17	-96.16	-117.59	-110.24	-110.38
-3	-84.36	-86.05	-86.28	-114.38	-110.76	-112.91
-2	-78.28	-78.97	-79.06	-124.24	-104.56	-119.42
-1	-75.49	-76.34	-76.07	-119.55	-107.94	-100.63
0 note 4	-	-	-	-	-	-
+1	-82.30	-82.04	-81.92	-105.29	-104.57	-110.55
+2	-83.79	-83.41	-83.57	-111.78	-110.73	-114.76
+3	-89.47	-90.36	-90.65	-123.06	-112.23	-115.98
+4	-98.90	-99.89	-101.31	-117.19	-120.43	-115.81
+5	-108.33	-112.67	-117.95	-113.26	-113.11	-112.92

Note 3: Reference frequency 10 MHz

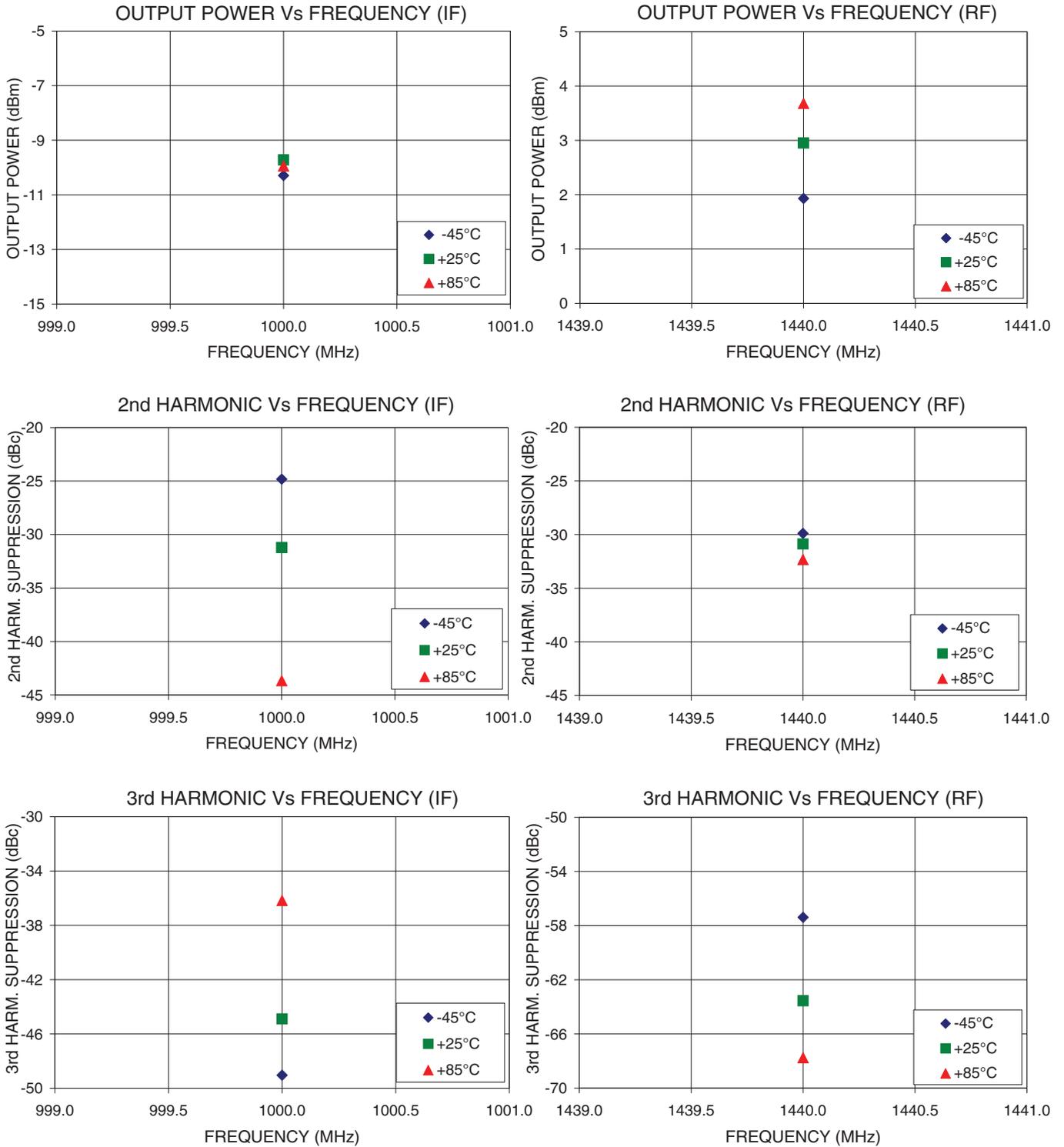
Note 4: All spurs are referenced to carrier signal (n=0).

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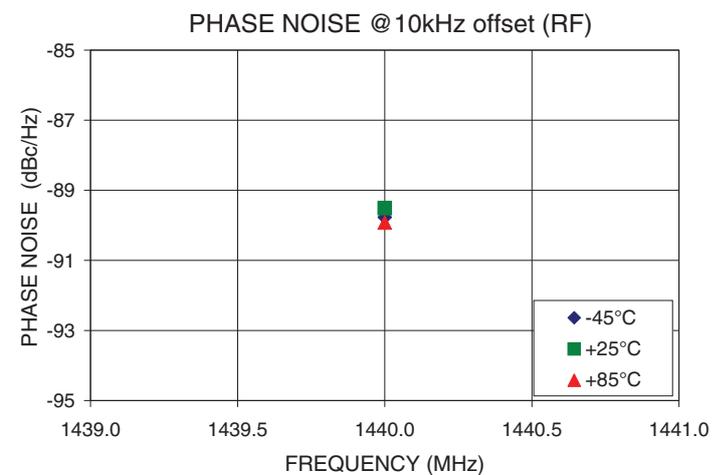
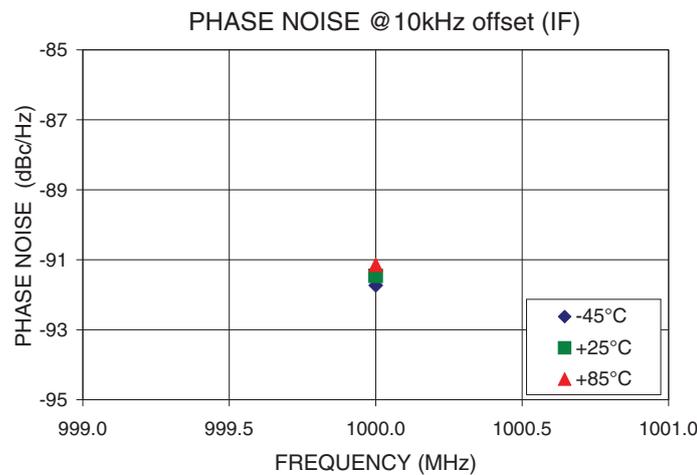
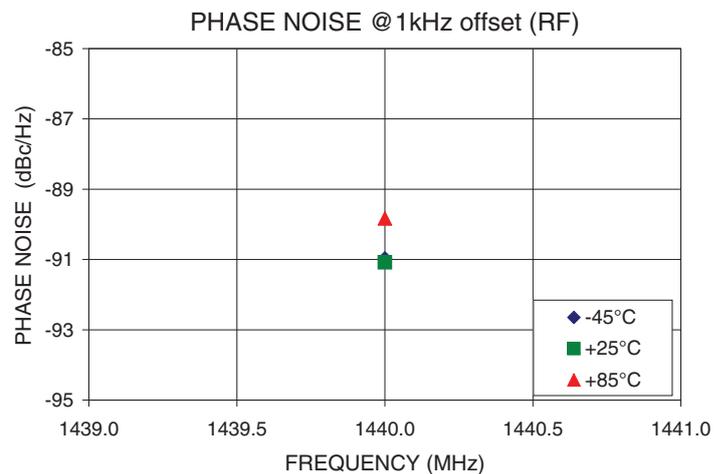
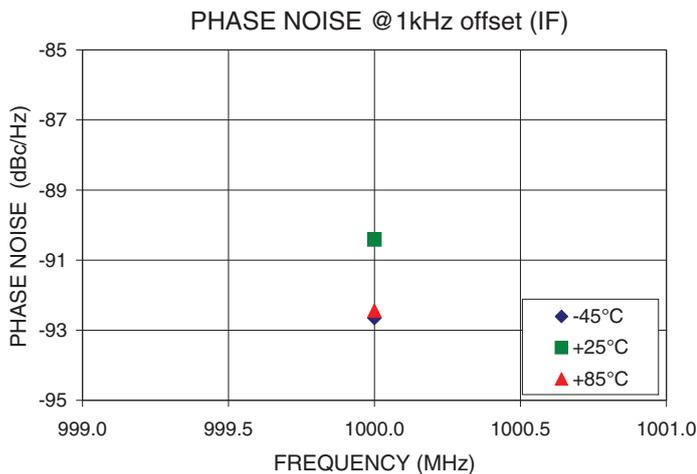
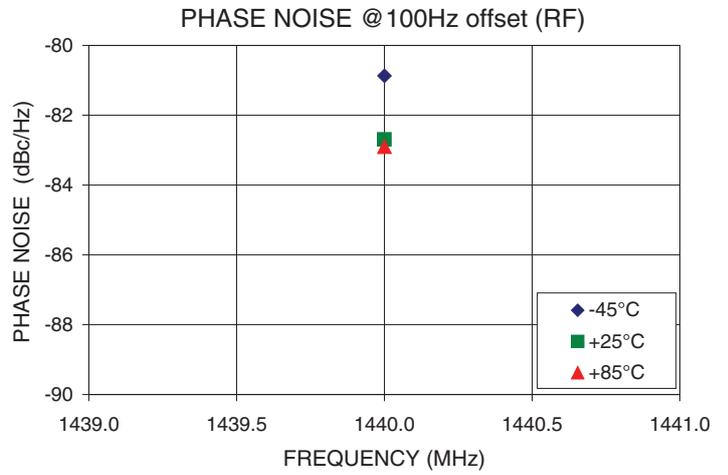
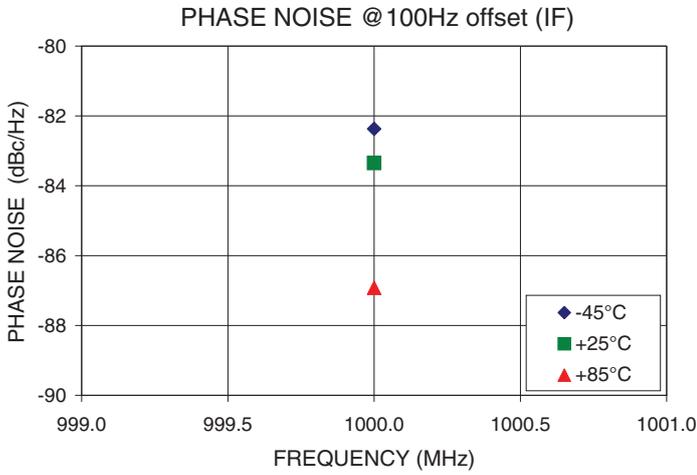
Typical Performance Curves



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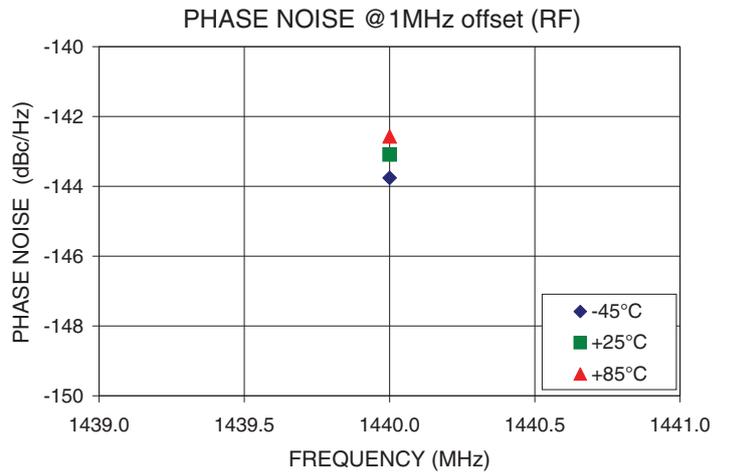
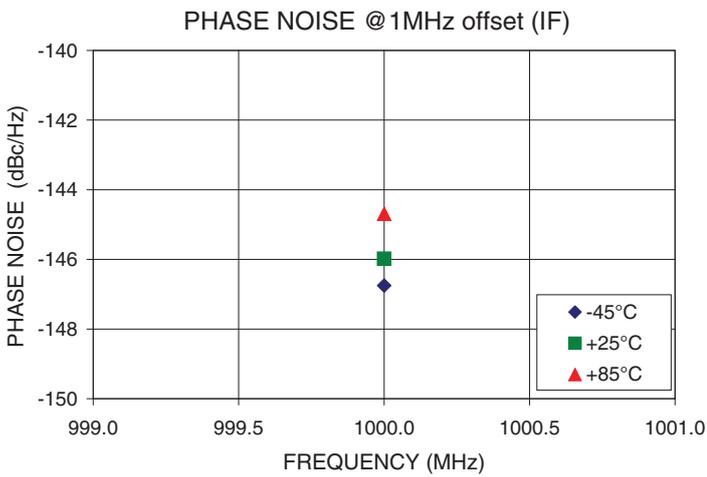
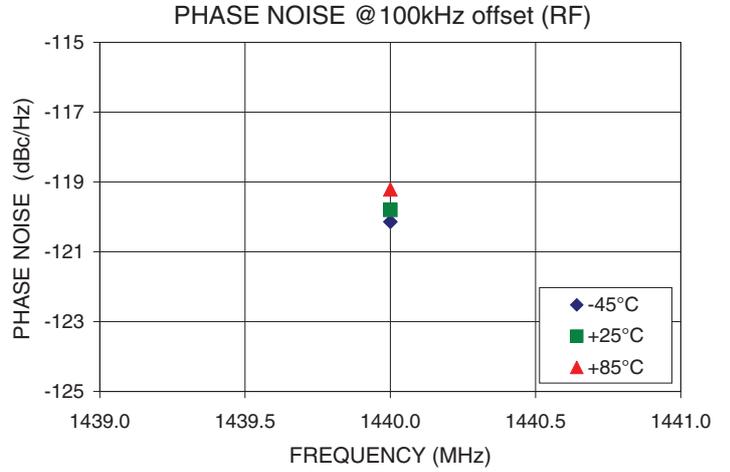
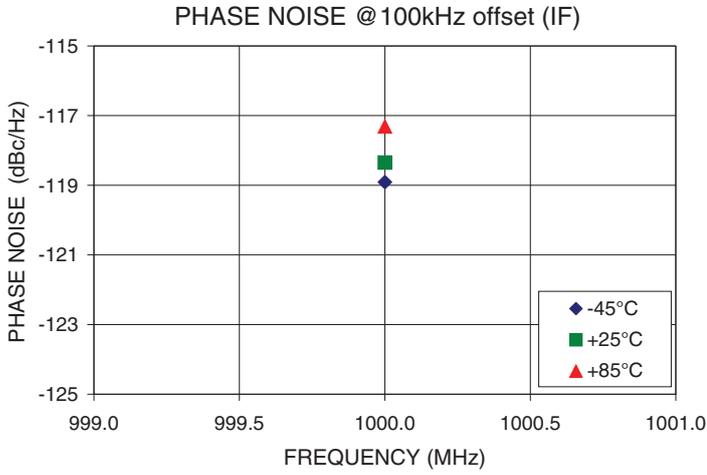




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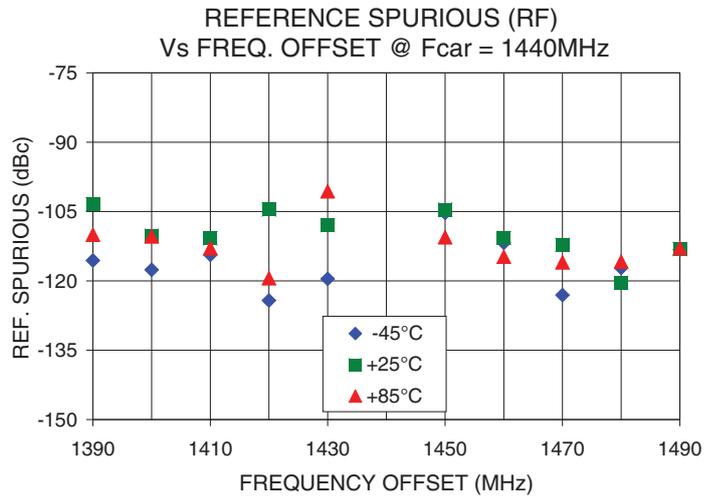
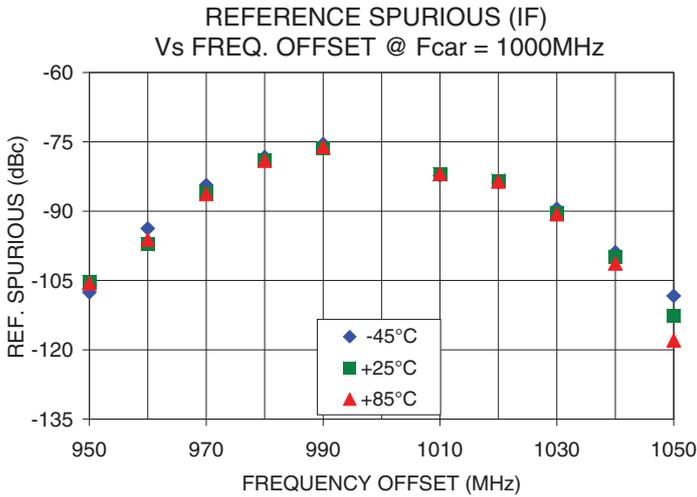
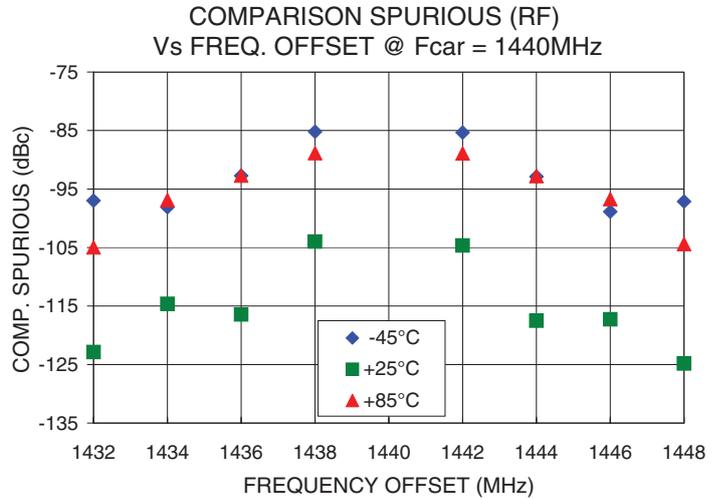
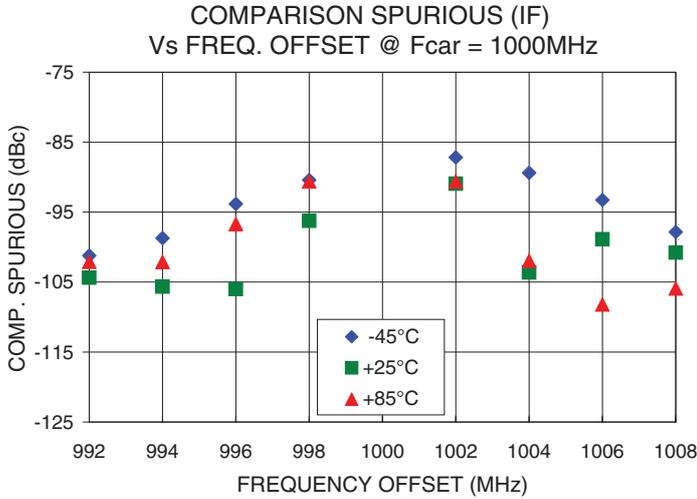




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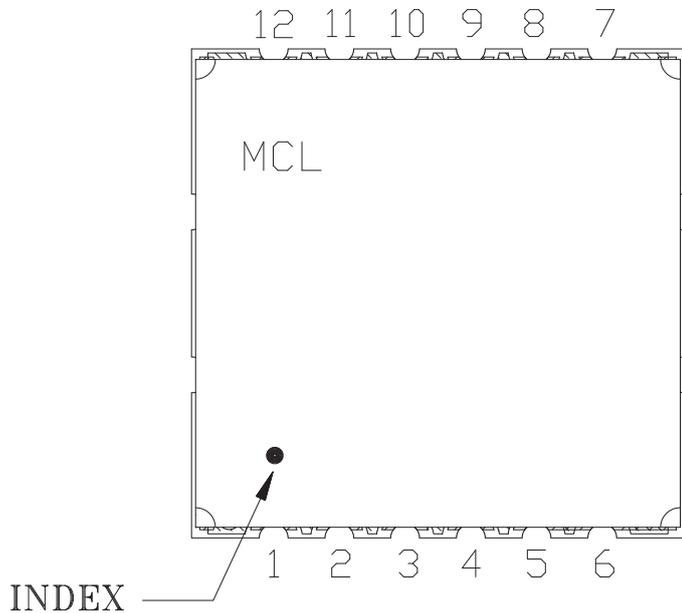


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Pin Configuration

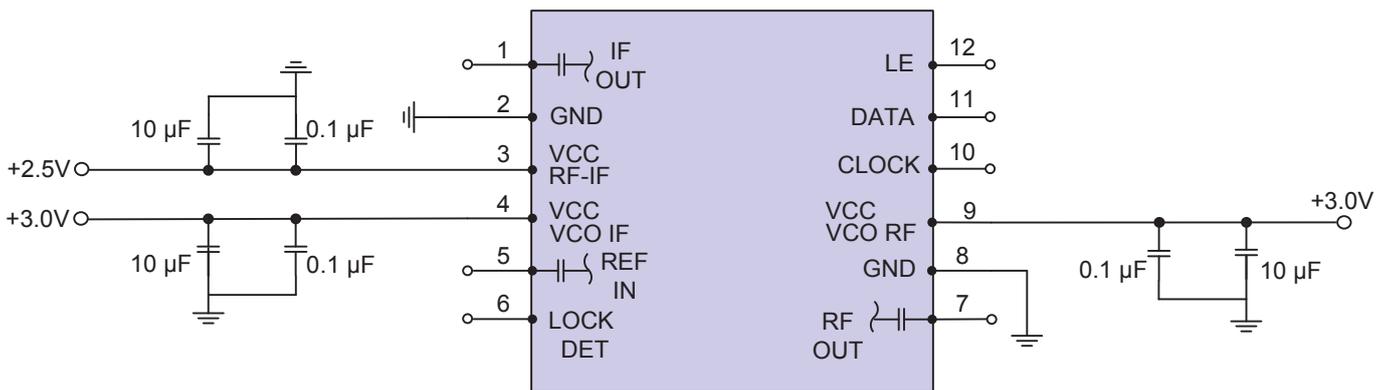


Pin Connection

Pin Number	Function
1	IF OUT
2	GND
3	VCC RF-IF
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

Recommended Application Circuit

Note: REF IN and RF OUT ports are internally AC coupled.

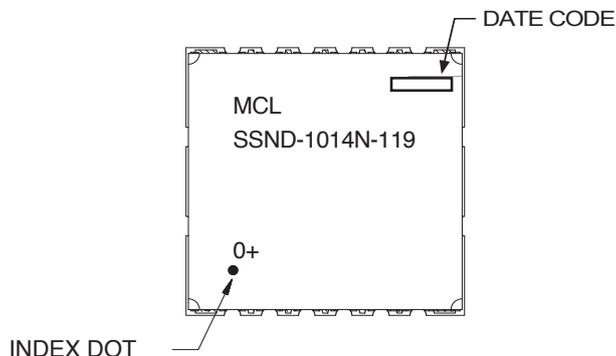


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## Device Marking



### 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:** KJ1373

**Tape & Reel:** TR-F95

**Suggested Layout for PCB Design:** PL-325

**Evaluation Board:** TB-571+

**Environment Ratings:** ENV65T2

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# Frequency Synthesizer

# SSND-1014N-119+

## Typical Performance Data

FREQ. (MHz)		POWER OUTPUT (dBm)			HARMONICS (dBc)						VCO CURRENT (mA)			PLL CURENT (mA)		
					F2			F3								
		-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
IF	1000	-10.29	-9.72	-9.94	-24.83	-31.22	-43.66	-49.04	-44.89	-36.17	6.86	7.90	8.65	6.47	6.66	6.82
RF	1440	1.93	2.95	3.68	-29.89	-30.87	-32.32	-57.39	-63.55	-67.75	8.86	10.46	11.57	6.47	6.66	6.82

FREQ. (MHz)		PHASE NOISE (dBc/Hz) @ OFFSETS														
		-45°C					+25°C					+85°C				
		100Hz	1kHz	10kHz	100kHz	1MHz	100Hz	1kHz	10kHz	100kHz	1MHz	100Hz	1kHz	10kHz	100kHz	1MHz
IF	1000	-82.37	-92.65	-91.73	-118.91	-146.75	-83.35	-90.41	-91.46	-118.35	-145.98	-86.92	-92.44	-91.14	-117.31	-144.69
RF	1440	-80.87	-90.97	-89.77	-120.14	-143.76	-82.69	-91.08	-89.51	-119.80	-143.09	-82.90	-89.83	-89.92	-119.21	-142.57

## Typical Performance Data

COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS (IF) @Fcarrier 1000MHz± (n*Fcomparison) (dBc) NOTE 1			COMPARISON SPURIOUS (RF) @Fcarrier 1440MHz± (n*Fcomparison) (dBc) NOTE 1		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-4	-101.21	-104.36	-102.09	-96.99	-122.86	-104.97
-3	-98.72	-105.65	-102.13	-98.11	-114.62	-96.87
-2	-93.83	-106.00	-96.70	-92.74	-116.44	-92.69
-1	-90.41	-96.24	-90.61	-85.19	-103.99	-88.86
0 <sup>note 2</sup>	-	-	-	-	-	-
+1	-87.18	-90.94	-90.61	-85.35	-104.64	-88.89
+2	-89.40	-103.62	-101.95	-92.89	-117.51	-92.77
+3	-93.28	-98.88	-108.19	-98.86	-117.27	-96.70
+4	-97.85	-100.78	-105.91	-97.13	-124.83	-104.39

Note 1: Comparison frequency 2000 kHz

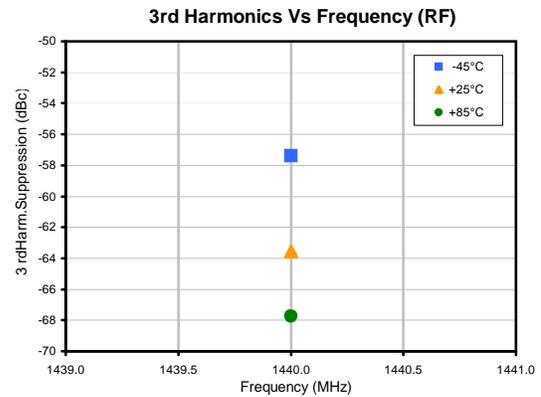
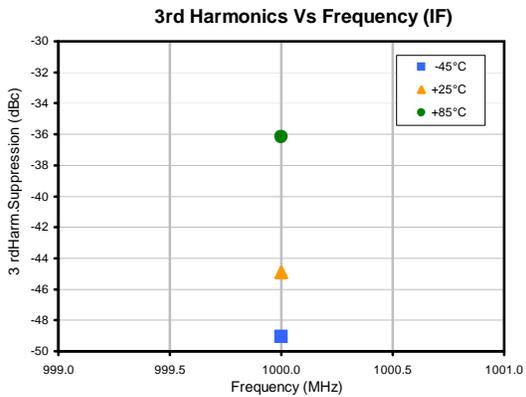
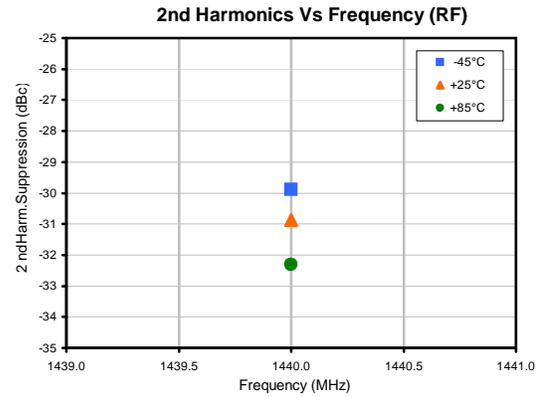
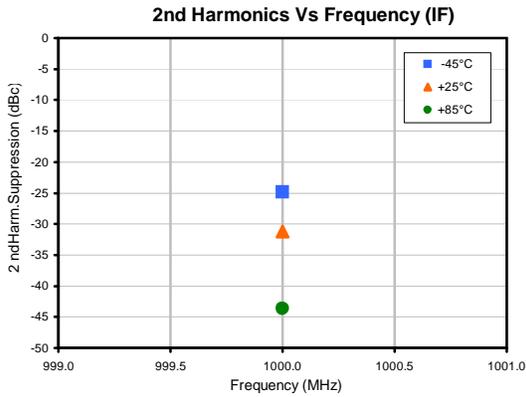
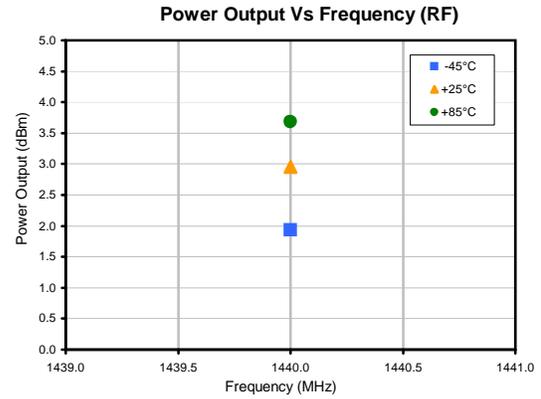
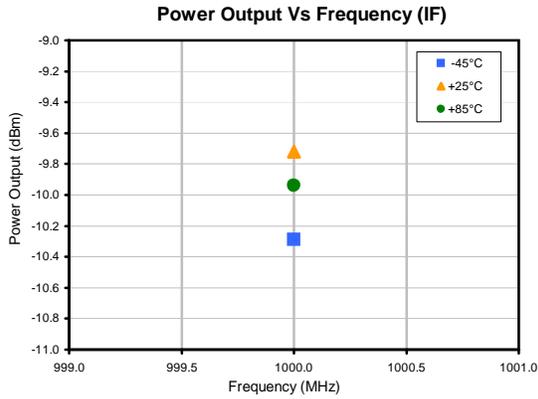
Note 2: All spurs are referenced to carrier signal (n=0).

REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS (IF) @Fcarrier 1000MHz± (n*Freference) (dBc) NOTE 3			REFERENCE SPURIOUS (RF) @Fcarrier 1440MHz± (n*Freference) (dBc) NOTE 3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-107.54	-105.37	-105.57	-115.59	-103.43	-110.01
-4	-93.75	-97.17	-96.16	-117.59	-110.24	-110.38
-3	-84.36	-86.05	-86.28	-114.38	-110.76	-112.91
-2	-78.28	-78.97	-79.06	-124.24	-104.56	-119.42
-1	-75.49	-76.34	-76.07	-119.55	-107.94	-100.63
0 <sup>note 4</sup>	-	-	-	-	-	-
+1	-82.30	-82.04	-81.92	-105.29	-104.57	-110.55
+2	-83.79	-83.41	-83.57	-111.78	-110.73	-114.76
+3	-89.47	-90.36	-90.65	-123.06	-112.23	-115.98
+4	-98.90	-99.89	-101.31	-117.19	-120.43	-115.81
+5	-108.33	-112.67	-117.95	-113.26	-113.11	-112.92

Note 3: Reference frequency 10 MHz

Note 4: All spurs are referenced to carrier signal (n=0).

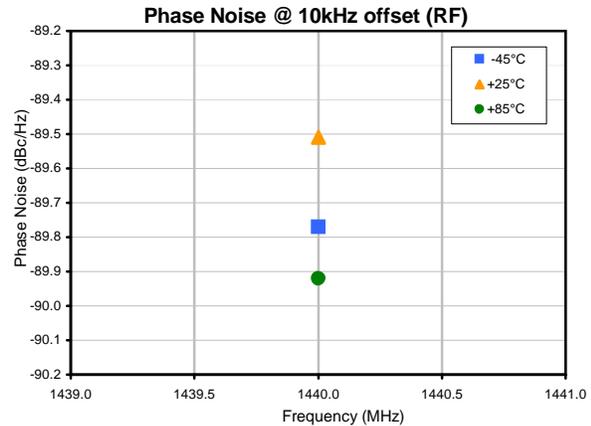
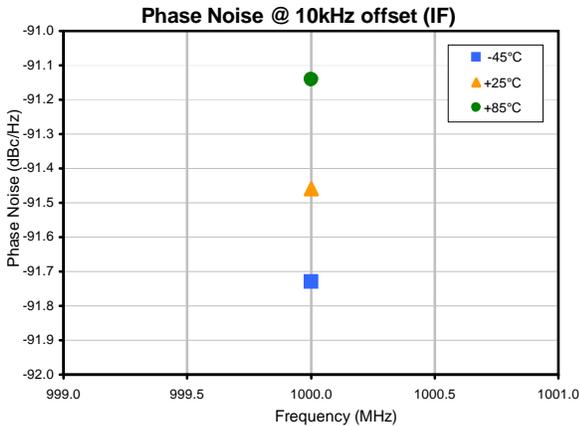
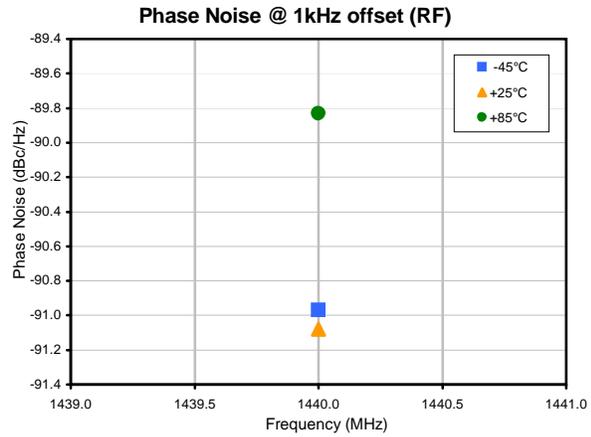
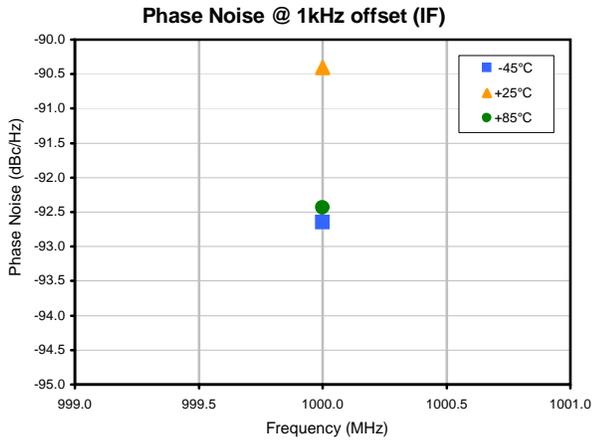
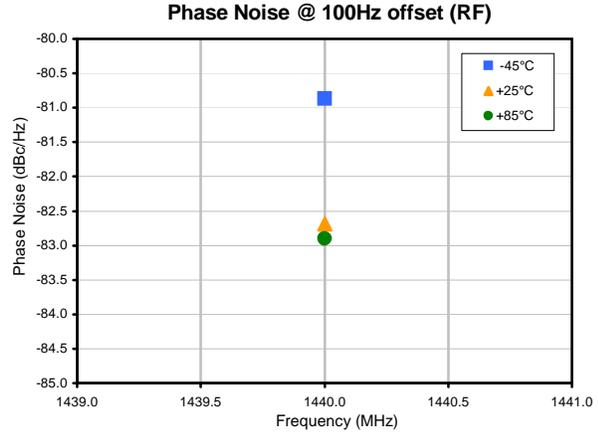
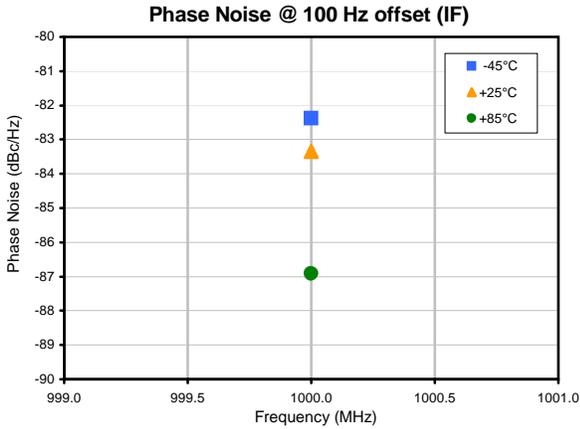
## Typical Performance Data



# Frequency Synthesizer

# SSND-1014N-119+

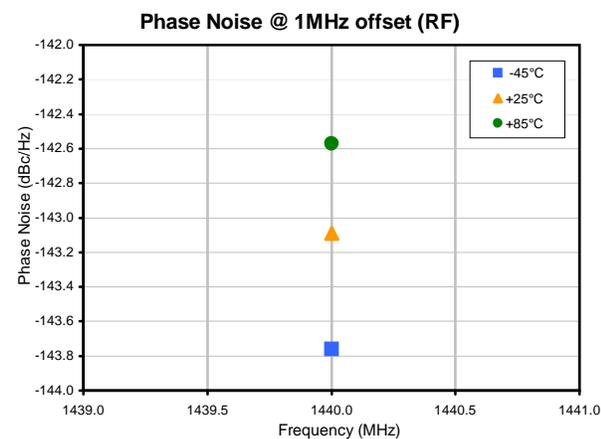
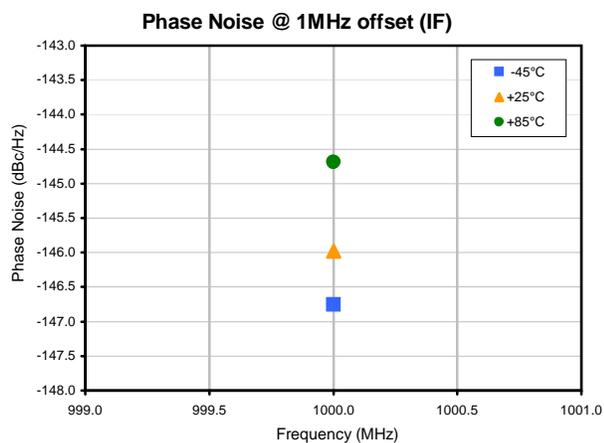
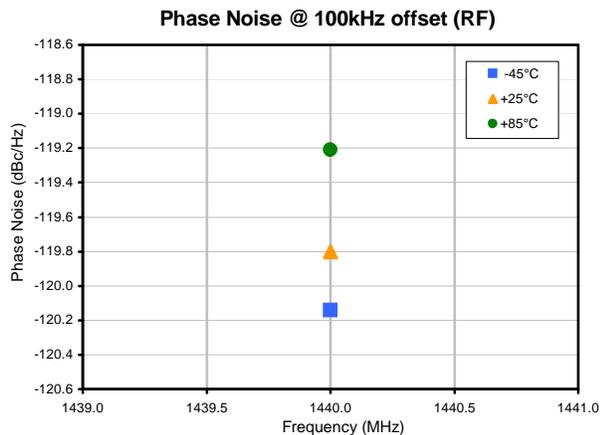
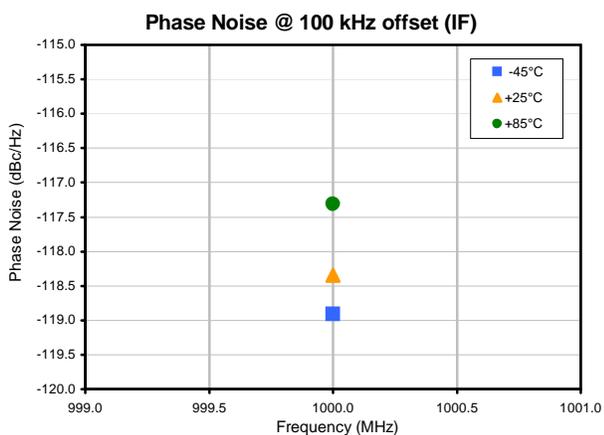
## Typical Performance Data



# Frequency Synthesizer

# SSND-1014N-119+

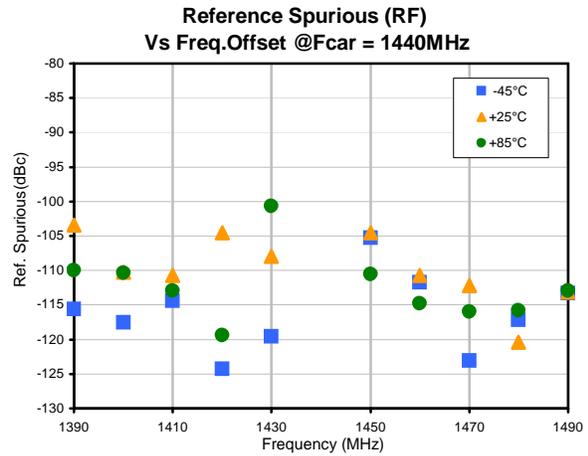
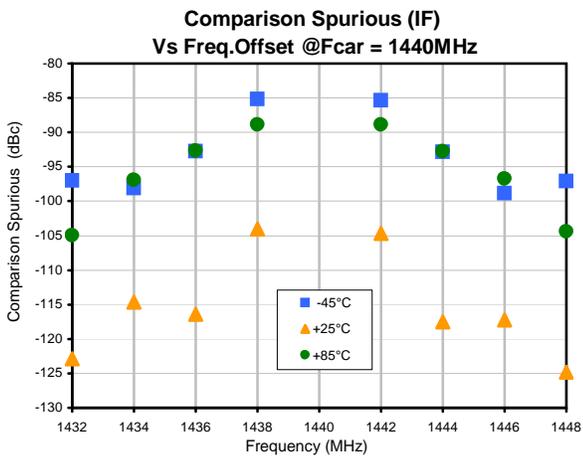
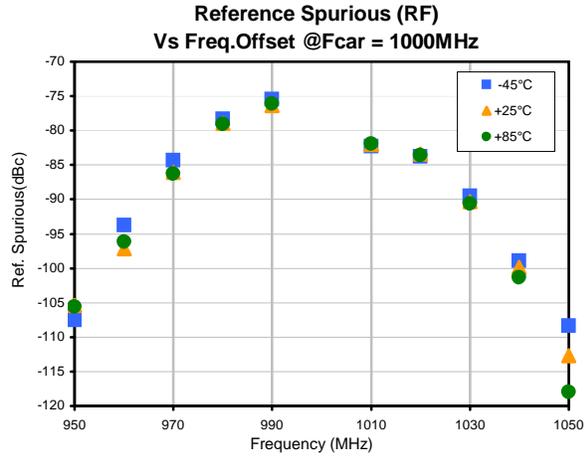
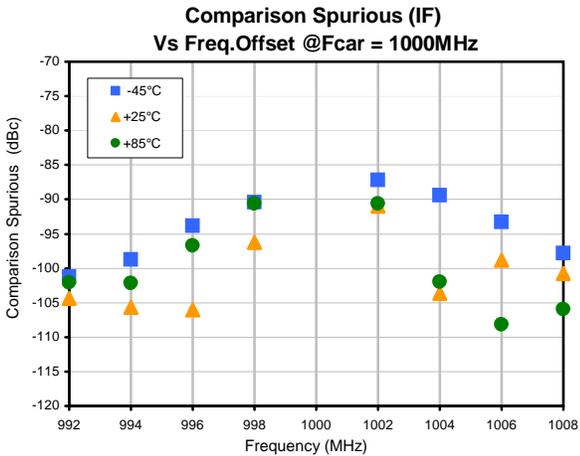
## Typical Performance Data



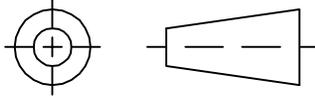
# Frequency Synthesizer

# SSND-1014N-119+

## Typical Performance Data



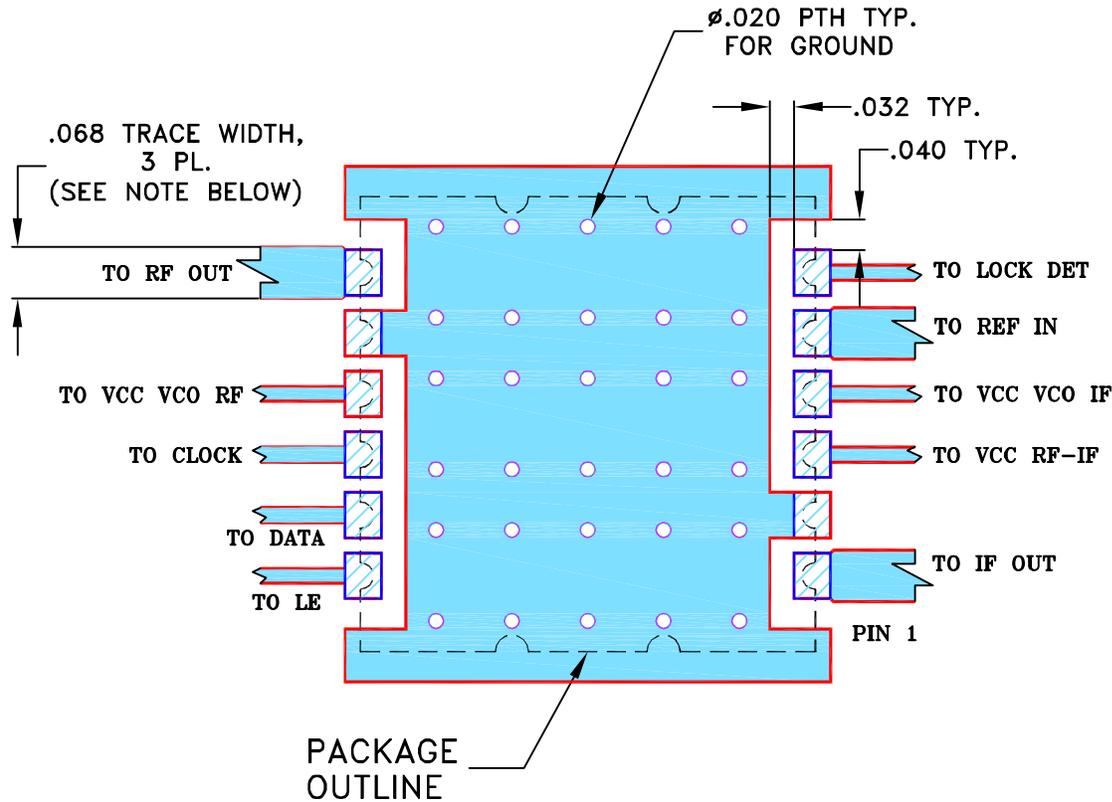
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M125920	NEW RELEASE (FROM RAVON)	04/10	DK	HH
OR	R78543	NEW RELEASE (FROM RAVON)	04/10	DK	HH

**SUGGESTED MOUNTING CONFIGURATION**  
**FOR KJ1373 CASE STYLES, 12SY02 PIN CONNECTION, 50 Ω.**



**NOTE:**

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS. .030"±.002". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.



DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DIMENSIONS ARE IN INCHES TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ±	DRAWN	DK (RAVON) 07 APR 10
	CHECKED	DH (RAVON) 08 APR 10
	APPROVED	HH (RAVON) 08 APR 10



**Mini-Circuits®**

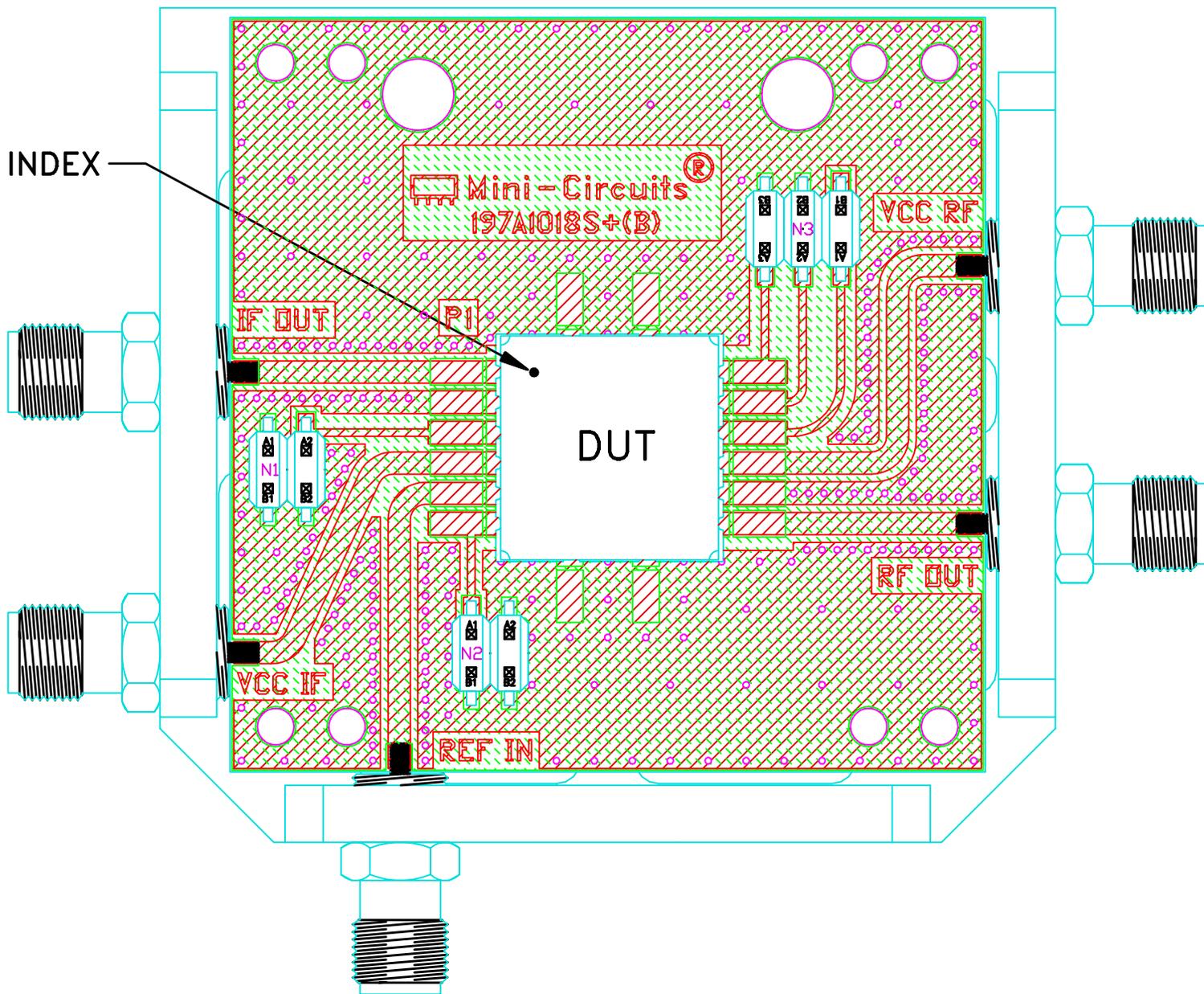
13 Neptune Avenue  
 Brooklyn NY 11235

**PL, KJ1373, 12SY02, SSND,  
 TB-571+ (50 Ω)**

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SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-325	REV: OR
FILE:	98PL325	SCALE: 4:1	SHEET: 1 OF 1

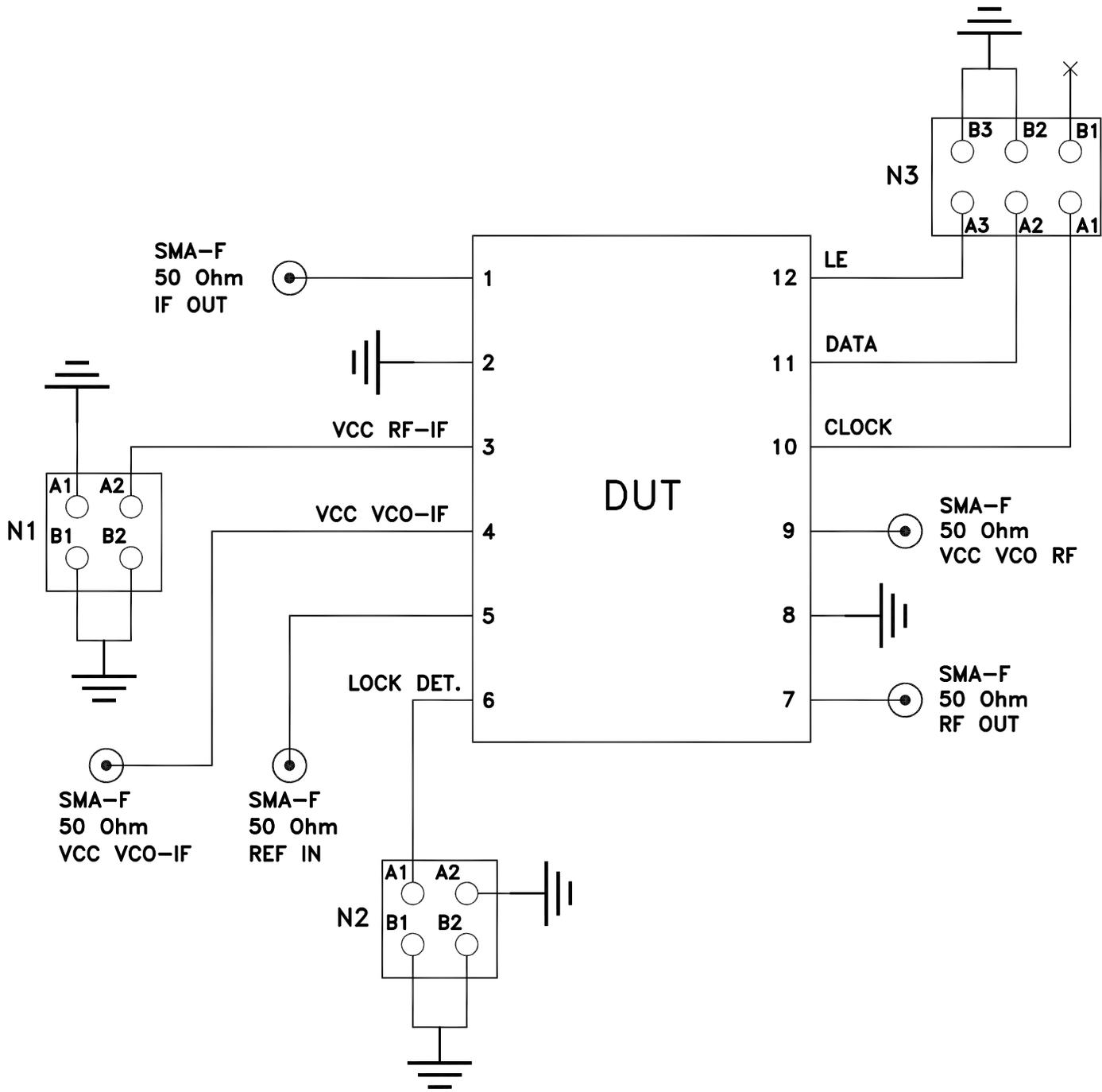
# Evaluation Board and Circuit



TB-571+

## NOTES:

1. SMA FEMALE CONNECTORS.
2. PCB MATERIAL: R04350B OR EQUIVALENT, DIALECTRIC CONSTANT=3.5, DIALECTRIC THICKNESS=.030 INCH.



TB-571+  
Schematic Diagram

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-40° to 85°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Humidity	90 to 95% RH, 240 hours, 50°C	MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Solder Reflow Heat	Sn-Pb Eutectic Process: 225°C peak Pb-Free Process, 245°C peak	J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Vibration (High Frequency)	20g peak, 20-2000 Hz, 4 times in each of three axes (total 12)	MIL-STD-883, Method 2007.3, Condition A
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215