

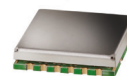
Frequency Synthesizer

SSN-1602FA+

50Ω 1402 to 1602 MHz

The Big Deal

- Fractional N synthesizer
- Low phase noise and spurious
- Very small size 0.60" x 0.60" x 0.138"



CASE STYLE: KJ1367

Product Overview

The SSN-1602FA+ is a Frequency Synthesizer, designed to operate from 1402 to 1602 MHz for Military & Avionics application. The SSN-1602FA+ is packaged in a metal case (size of 0.60" x 0.60" x 0.138") 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: -80 dBc typ. • Comparison Spurious: -75 dBc typ. • Reference Spurious: -80 dBc typ.	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Robust design and construction	To enhance the robustness of SSN-1602FA+, 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, 0.60" x 0.60" x 0.138"	The small size enables the SSN-1602FA+ to be used in compact designs.

Notes

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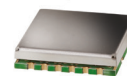
Frequency Synthesizer

SSN-1602FA+

50Ω 1402 to 1602 MHz

Features

- Fractional N synthesizer
- Integrated VCO + PLL
- Low phase noise and spurious
- Robust design and construction
- Low operating voltage (VCC VCO=+5.0V, VCC PLL=+3.3V)
- Small size 0.60" x 0.60" x 0.138"



CASE STYLE: KJ1367

+RoHS Compliant

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

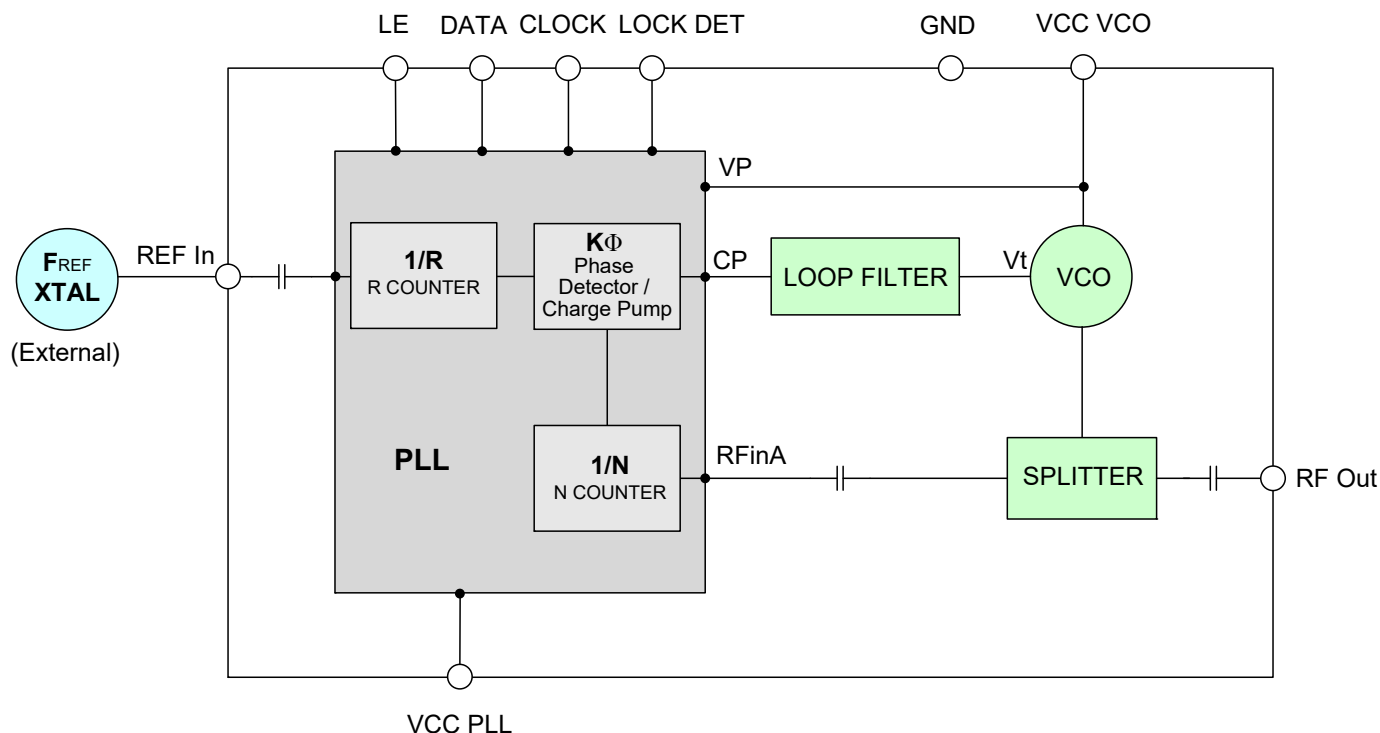
Applications

- Military & Avionics

General Description

The SSN-1602FA+ is a Frequency Synthesizer, designed to operate from 1402 to 1602 MHz for Military & Avionics application. The SSN-1602FA+ 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 SSN-1602FA+, 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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www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

Electrical Specifications (over operating temperature -20°C to +85°C)

Parameters	Test Conditions	Min.	Typ.	Max.	Units
Frequency Range	-	1402	-	1602	MHz
Step Size	-	-	200	-	kHz
Comparison Frequency	-	-	13	-	MHz
Settling Time	Within ± 1 kHz	-	25	-	mSec
Output Power	-	-2.5	+0.5	+3.5	dBm
SSB Phase Noise	@ 100 Hz offset	-	-85	-	dBc/Hz
	@ 1 kHz offset	-	-87	-81	
	@ 10 kHz offset	-	-97	-90	
	@ 100 kHz offset	-	-120	-113	
	@ 1 MHz offset	-	-140	-133	
Integrated SSB Phase Noise	@ 100Hz to 1MHz offset	-	-49	-	dBc
Step Size Spurious Suppression	Step Size 200 kHz	-	-80	-60	dBc
0.5 Step Size Spurious Suppression	0.5 Step Size 100 kHz	-	-85	-65	
Reference Spurious Suppression	Ref. Freq. 26 MHz	-	-80	-60	
Comparison Spurious Suppression	Comp. Freq. 13 MHz	-	-75	-60	
Non - Harmonic Spurious Suppression	-	-	-90	-	
Harmonic Suppression	-	-	-25	-10	V
VCO Supply Voltage	+5.00	+4.75	+5.00	+5.25	
PLL Supply Voltage	+3.30	+3.15	+3.30	+3.45	mA
VCO Supply Current	-	-	44	51	
PLL Supply Current	-	-	14	22	
Reference Input (External)	Frequency	26 (square wave)	-	26	MHz
	Amplitude	1	-	1	V _{P-P}
	Input impedance	-	-	100	K Ω
	Phase Noise @ 1 kHz offset	-	-	-135	dBc/Hz
RF Output port Impedance	-	-	50	-	Ω
Input Logic Level	Input high voltage	-	2.80	-	V
	Input low voltage	-	-	0.60	V
Digital Lock Detect	Locked	-	2.75	-	V
	Unlocked	-	-	0.40	V
Frequency Synthesizer PLL	-	ADF4153			
PLL Programming	-	3-wire serial 3.3V CMOS			
Register Map @ 1602 MHz	R0_Register	-	(MSB) 111101100000000111100 (LSB)		
	R1_Register	-	(MSB) 100001000000100000101 (LSB)		
	R2_Register	-	(MSB) 111100010 (LSB)		
	R3_Register	-	(MSB) 1111000111 (LSB)		

Absolute Maximum Ratings

Parameters	Ratings
VCO Supply Voltage	5.8V
PLL Supply Voltage	4.0V
VCO Supply Voltage to PLL Supply Voltage	-0.3V to +5.8V
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

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Typical Performance Data

FREQUENCY (MHz)	POWER OUTPUT (dBm)			VCO CURRENT (mA)			PLL CURENT (mA)		
	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C
1402	0.58	0.88	1.32	42.99	43.85	45.13	12.72	14.19	16.16
1405	0.57	0.85	1.30	43.00	43.86	45.15	12.61	14.09	16.05
1430	0.45	0.71	1.16	43.04	43.92	45.21	11.54	13.00	14.92
1455	0.44	0.65	1.15	42.93	43.98	45.28	12.62	14.11	16.08
1480	0.41	0.63	1.10	43.16	44.04	45.35	12.72	14.22	16.19
1505	0.30	0.56	1.00	43.06	44.27	45.43	12.77	14.28	16.25
1530	0.19	0.39	0.85	43.34	44.19	45.53	12.82	14.34	16.32
1555	0.20	0.38	0.83	43.42	44.29	45.63	12.88	14.39	16.36
1580	0.09	0.26	0.73	43.53	44.38	45.73	12.87	14.39	16.36
1602	0.02	0.14	0.68	43.61	44.47	45.80	12.74	14.26	16.23

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C
1402	-17.85	-19.09	-20.30	-27.42	-27.23	-30.36
1405	-18.28	-19.29	-20.67	-27.66	-27.53	-30.85
1430	-19.83	-21.24	-22.62	-26.96	-27.17	-30.22
1455	-21.17	-22.73	-23.82	-26.90	-27.33	-30.41
1480	-23.28	-24.40	-25.74	-28.11	-27.83	-31.62
1505	-25.18	-26.67	-27.61	-27.43	-28.23	-31.15
1530	-26.38	-28.11	-28.45	-26.67	-28.74	-30.22
1555	-28.30	-30.23	-30.59	-27.62	-29.29	-30.68
1580	-31.55	-32.45	-32.80	-27.87	-27.11	-30.25
1602	-31.61	-34.24	-33.66	-26.37	-26.49	-27.43

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NON-CATALOG

Frequency Synthesizer

SSN-1602FA+

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	+25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
1402	-89.51	-87.67	-96.21	-120.71	-140.39
1405	-89.03	-87.52	-96.64	-120.76	-140.96
1430	-88.67	-87.45	-96.92	-121.20	-141.49
1455	-87.80	-88.01	-96.96	-121.29	-141.48
1480	-88.09	-87.92	-97.50	-121.59	-140.92
1505	-86.79	-88.90	-97.50	-121.89	-142.11
1530	-87.64	-85.94	-97.17	-121.79	-142.00
1555	-87.54	-84.75	-97.28	-121.93	-140.33
1580	-87.36	-85.52	-97.26	-121.76	-140.91
1602	-86.39	-85.35	-97.39	-121.68	-141.16

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	-25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
1402	-86.29	-91.22	-97.40	-122.17	-142.38
1405	-86.39	-90.39	-97.60	-122.16	-142.50
1430	-86.10	-90.34	-97.92	-122.42	-142.81
1455	-87.47	-91.14	-97.73	-122.41	-142.67
1480	-85.63	-90.23	-97.97	-122.52	-142.85
1505	-87.35	-90.81	-97.86	-122.55	-142.48
1530	-86.24	-89.40	-98.06	-122.66	-140.52
1555	-85.90	-89.12	-98.14	-122.64	-142.98
1580	-85.90	-89.60	-98.21	-122.58	-143.08
1602	-85.85	-89.53	-98.23	-122.54	-142.84

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	+85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
1402	-87.91	-86.26	-93.40	-117.44	-136.84
1405	-87.42	-87.26	-93.46	-117.58	-137.74
1430	-87.51	-86.06	-94.43	-118.46	-138.78
1455	-86.55	-85.46	-94.87	-118.99	-139.36
1480	-87.33	-86.27	-95.31	-119.54	-139.85
1505	-87.14	-86.04	-95.16	-119.91	-140.06
1530	-86.35	-85.99	-95.44	-120.08	-138.52
1555	-86.94	-84.80	-95.44	-120.23	-140.04
1580	-85.79	-85.19	-95.25	-120.17	-140.63
1602	-85.77	-84.76	-95.21	-119.98	-139.96

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COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 1402MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 1502MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 1602MHz+(n*Fcomparison) (dBc) note 1		
	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C
-5	-78.01	-79.41	-79.24	-78.14	-77.03	-78.09	-77.95	-76.60	-78.14
-4	-80.67	-83.00	-83.06	-81.19	-80.27	-81.16	-80.06	-78.89	-81.38
-3	-81.19	-83.16	-83.05	-81.00	-80.68	-80.67	-79.63	-78.83	-81.32
-2	-82.04	-84.43	-84.86	-82.61	-81.87	-81.31	-81.11	-79.62	-83.30
-1	-86.28	-87.99	-93.63	-84.73	-88.46	-84.82	-88.29	-84.67	-88.21
0 note 2	-	-	-	-	-	-	-	-	-
+1	-85.11	-83.03	-83.26	-82.23	-84.96	-86.76	-85.88	-91.03	-82.89
+2	-79.24	-78.19	-77.57	-78.33	-79.18	-80.13	-79.37	-81.20	-78.70
+3	-78.29	-77.47	-77.22	-77.89	-78.28	-78.96	-77.93	-79.04	-78.23
+4	-77.58	-77.54	-77.45	-77.22	-77.92	-78.54	-77.20	-78.36	-78.09
+5	-74.99	-74.76	-75.10	-74.78	-74.99	-75.12	-74.53	-75.48	-75.57

Note 1: Comparison frequency 13 MHz

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

REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 1402MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 1502MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 1602MHz+(n*Freference) (dBc) note 3		
	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C
-5	-86.53	-89.14	-98.80	-83.58	-85.31	-89.94	-86.86	-85.93	-88.77
-4	-81.22	-81.67	-82.14	-81.78	-79.88	-82.17	-81.82	-81.12	-83.10
-3	-88.78	-94.11	-93.08	-82.20	-85.31	-89.89	-83.20	-83.32	-84.25
-2	-80.67	-83.00	-83.06	-81.19	-80.27	-81.16	-80.06	-78.89	-81.38
-1	-82.04	-84.43	-84.86	-82.61	-81.87	-81.31	-81.11	-79.62	-83.30
0 note 4	-	-	-	-	-	-	-	-	-
+1	-79.24	-78.19	-77.57	-78.33	-79.18	-80.13	-79.37	-81.20	-78.70
+2	-77.58	-77.54	-77.45	-77.22	-77.92	-78.54	-77.20	-78.36	-78.09
+3	-83.84	-84.87	-88.77	-85.75	-86.06	-86.71	-80.70	-81.86	-87.13
+4	-80.06	-80.05	-81.15	-80.44	-80.78	-82.29	-80.63	-82.43	-82.86
+5	-92.70	-92.89	-94.46	-89.51	-94.30	-92.56	-87.09	-89.02	-99.10

Note 3: Reference frequency 26 MHz

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

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STEP SIZE SPURIOUS ORDER n	0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 1402MHz+(n*Fstep size) (dBc) note 5			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 1502MHz+(n*Fstep size) (dBc) note 5			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 1602MHz+(n*Fstep size) (dBc) note 5		
	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C
-5.0	-109.45	-95.15	-97.44	-92.86	-99.34	-98.38	-98.53	-95.58	-101.16
-4.5	-111.33	-107.62	-111.70	-112.04	-110.90	-109.98	-112.77	-110.35	-109.66
-4.0	-88.33	-85.72	-84.13	-85.27	-94.65	-95.54	-94.47	-111.26	-92.61
-3.5	-111.11	-109.06	-104.66	-110.93	-113.71	-108.20	-110.22	-113.12	-111.73
-3.0	-92.70	-89.57	-89.10	-90.71	-94.38	-95.91	-104.58	-107.56	-91.63
-2.5	-106.70	-104.50	-106.93	-109.53	-108.01	-109.67	-108.00	-108.41	-109.31
-2.0	-86.57	-88.95	-89.31	-74.50	-92.96	-89.27	-85.61	-100.70	-85.54
-1.5	-101.60	-104.43	-99.96	-104.68	-102.99	-102.28	-101.51	-101.23	-103.90
-1.0	-88.76	-74.43	-74.71	-71.70	-83.29	-80.76	-83.45	-93.43	-79.63
-0.5	-87.88	-88.97	-87.50	-84.67	-89.45	-87.25	-87.98	-84.48	-87.14
0 ^{note 6}	-	-	-	-	-	-	-	-	-
+0.5	-88.09	-88.30	-86.00	-84.05	-88.00	-85.90	-80.90	-86.82	-87.84
+1.0	-86.87	-74.68	-74.93	-71.40	-85.18	-81.54	-82.48	-95.48	-80.44
+1.5	-104.58	-104.10	-100.73	-103.45	-96.73	-104.39	-103.42	-105.60	-104.66
+2.0	-85.93	-88.24	-88.75	-74.74	-93.62	-88.44	-86.10	-101.27	-85.18
+2.5	-110.57	-107.45	-105.47	-107.63	-111.34	-110.82	-103.99	-110.77	-102.64
+3.0	-93.90	-90.72	-88.68	-90.89	-94.67	-93.94	-105.83	-106.47	-93.26
+3.5	-113.30	-107.57	-110.04	-108.55	-108.79	-111.85	-109.14	-108.35	-108.32
+4.0	-88.46	-86.53	-84.11	-84.95	-95.63	-95.31	-95.12	-109.83	-92.01
+4.5	-110.54	-111.50	-105.87	-111.43	-112.32	-111.90	-110.19	-110.96	-109.85
+5.0	-107.54	-95.39	-96.97	-92.35	-99.64	-98.60	-98.25	-95.66	-102.53

Note 5: Step size 200 kHz

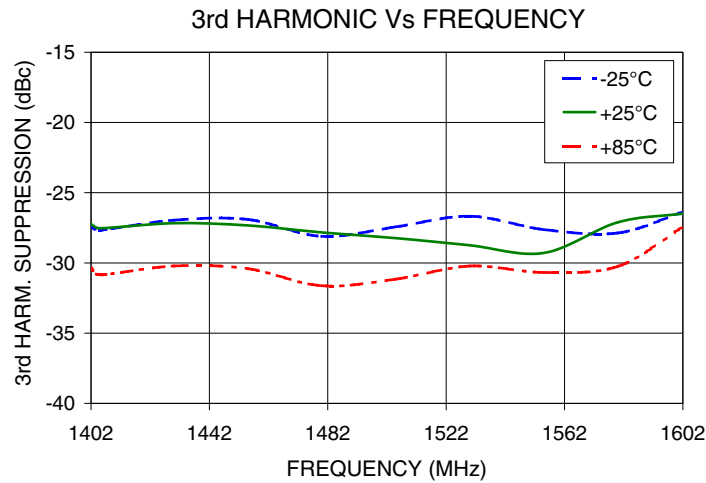
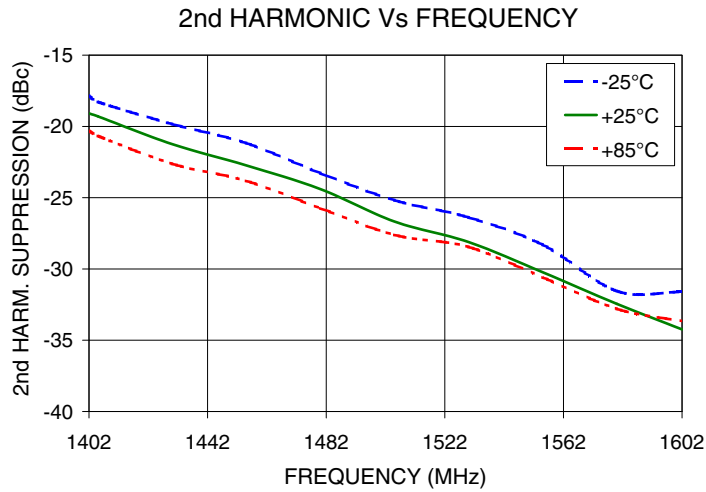
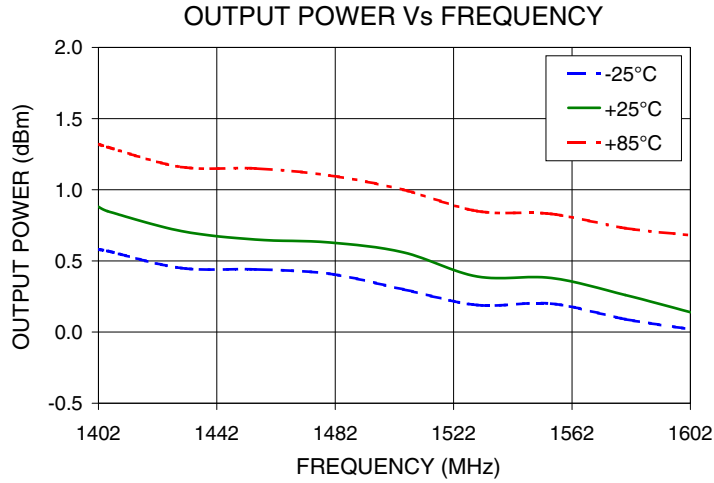
Note 6: All spurs are referenced to carrier signal (n=0).

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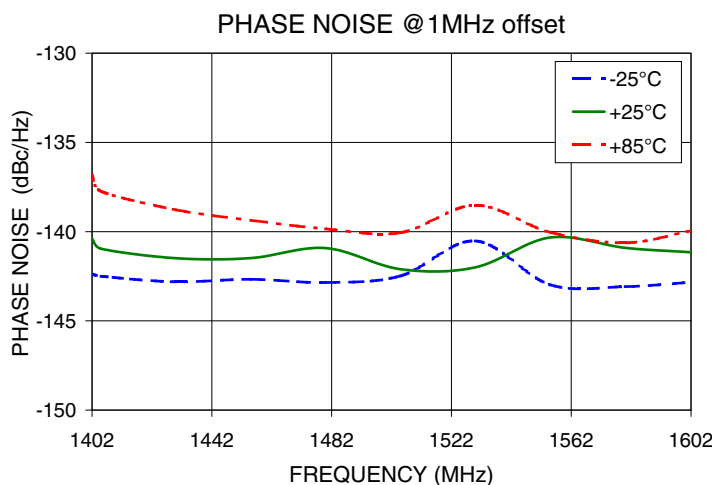
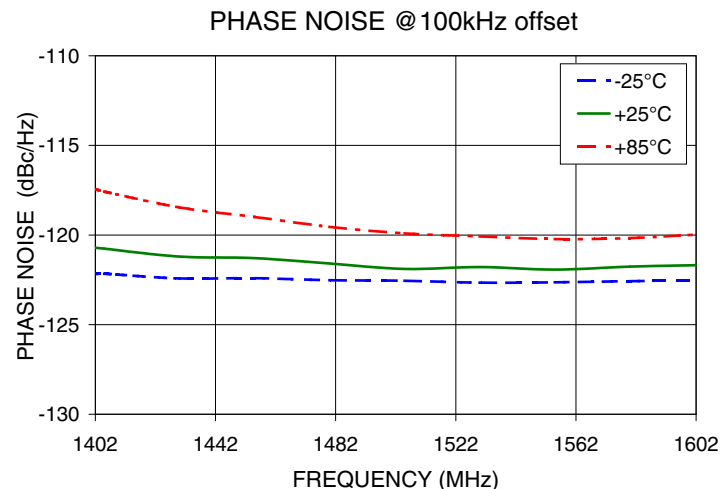
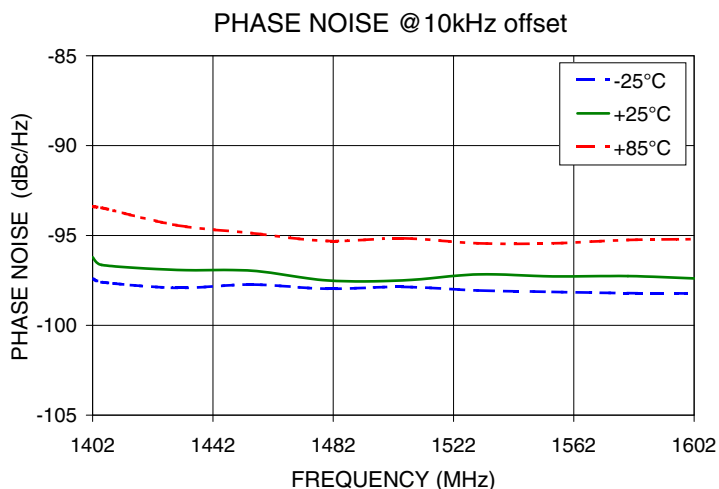
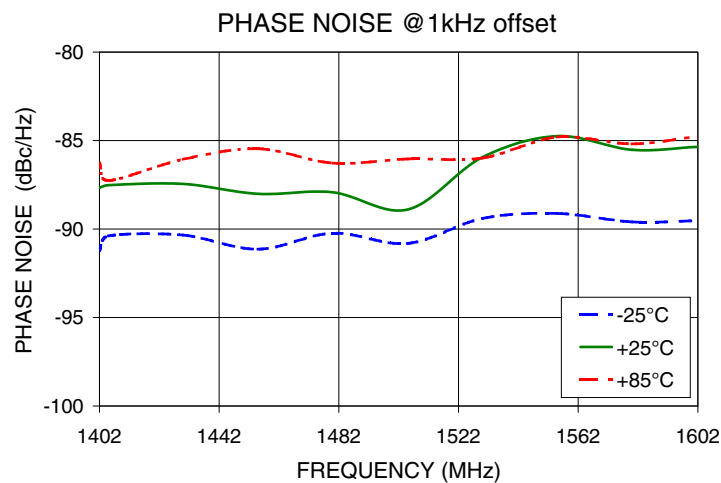
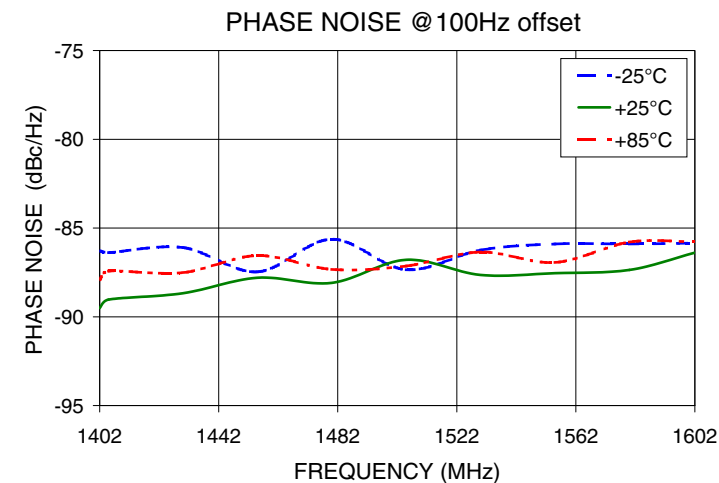
Typical Performance Curves



Notes

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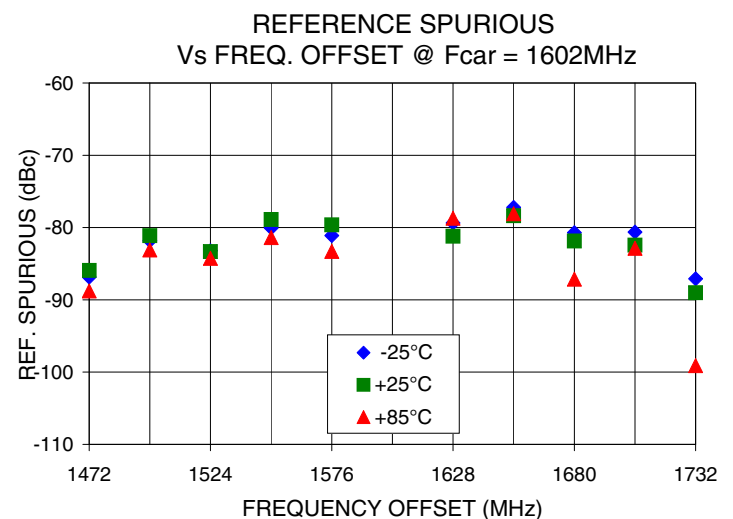
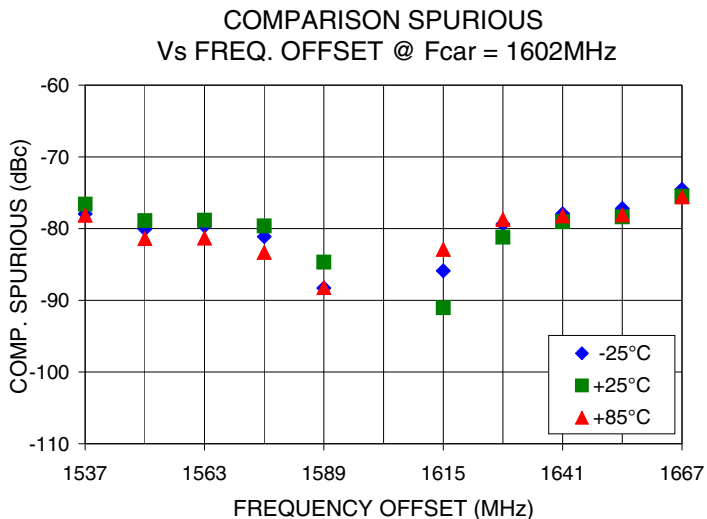
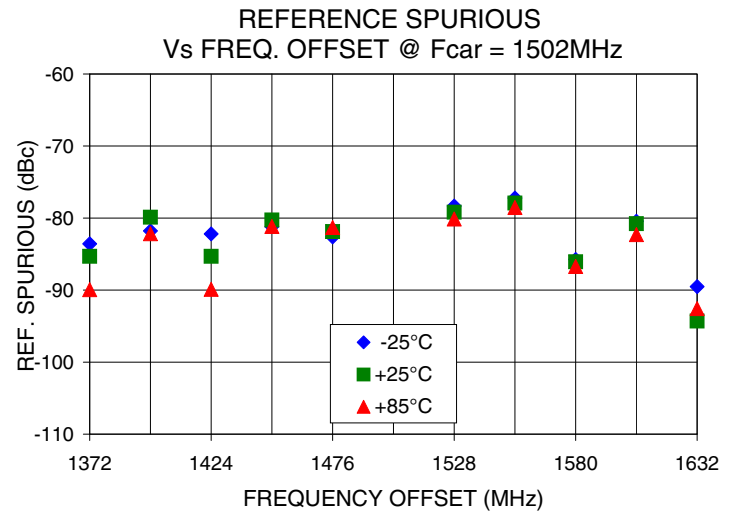
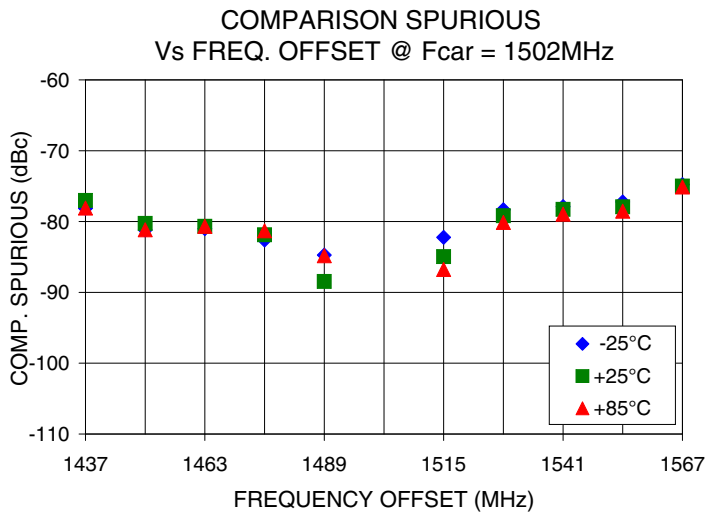
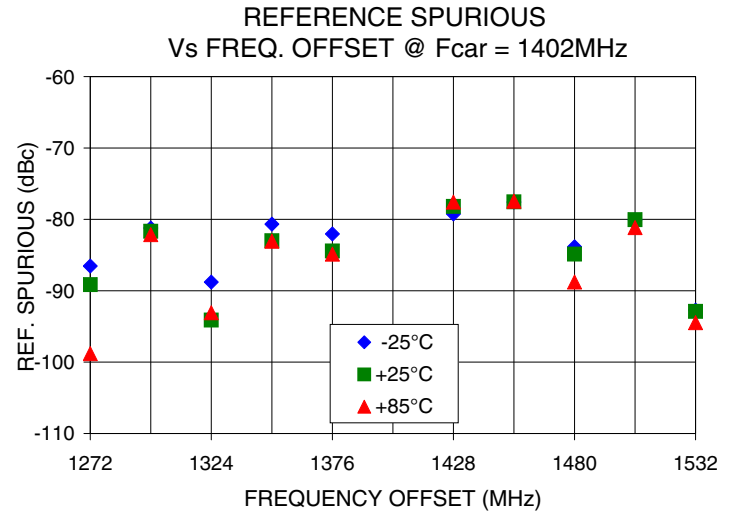
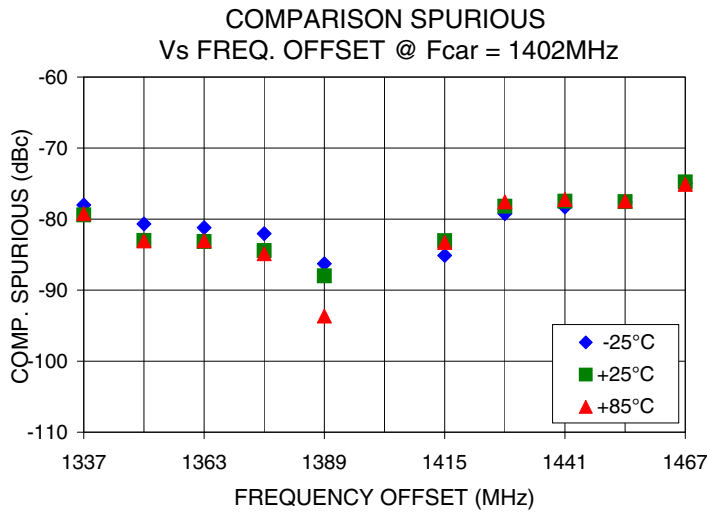




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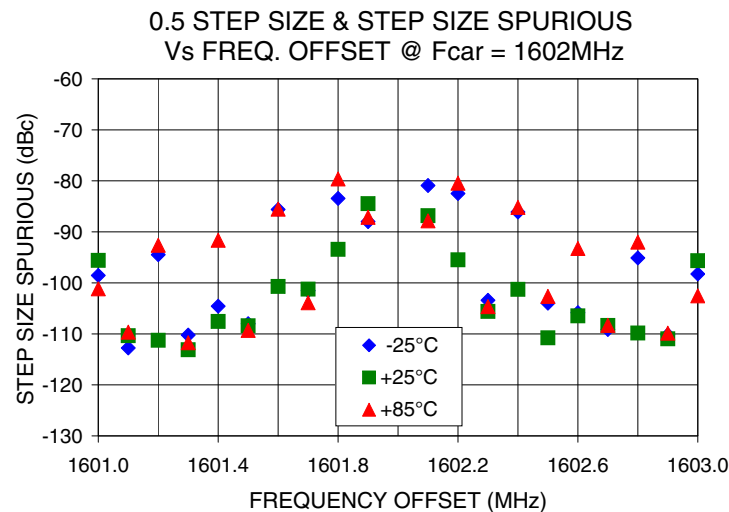
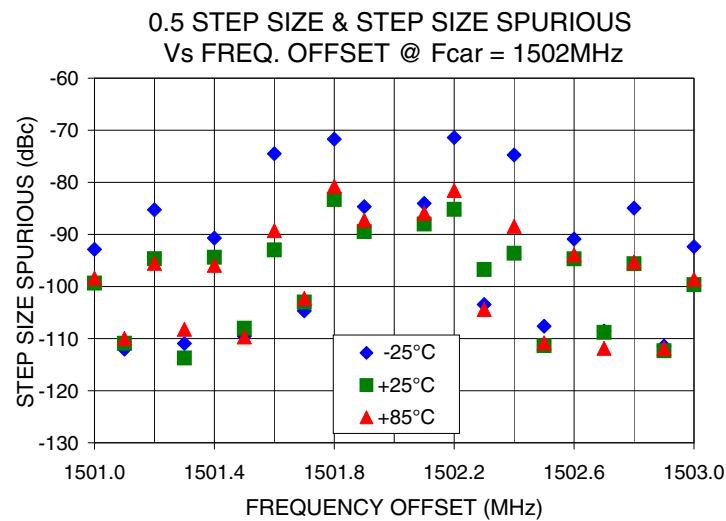
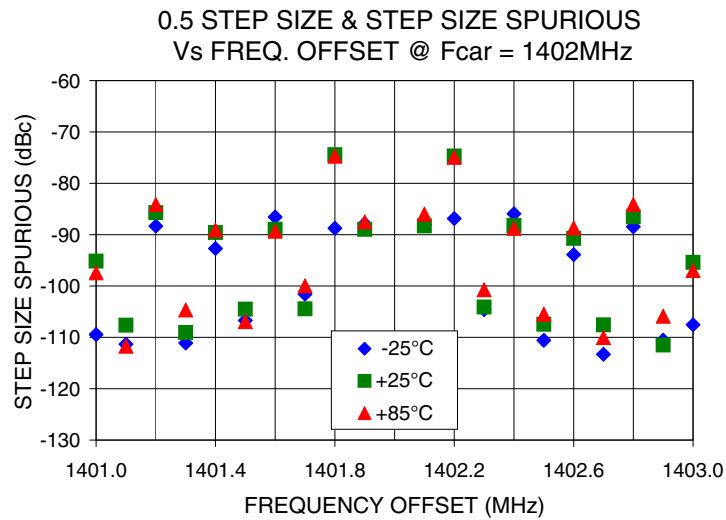




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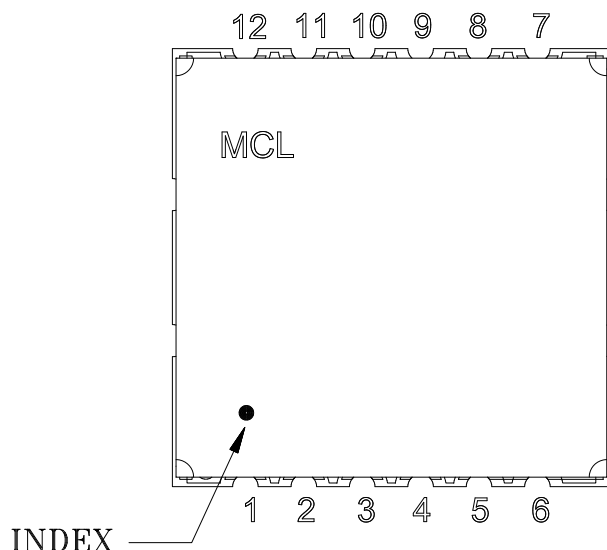


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Pin Configuration

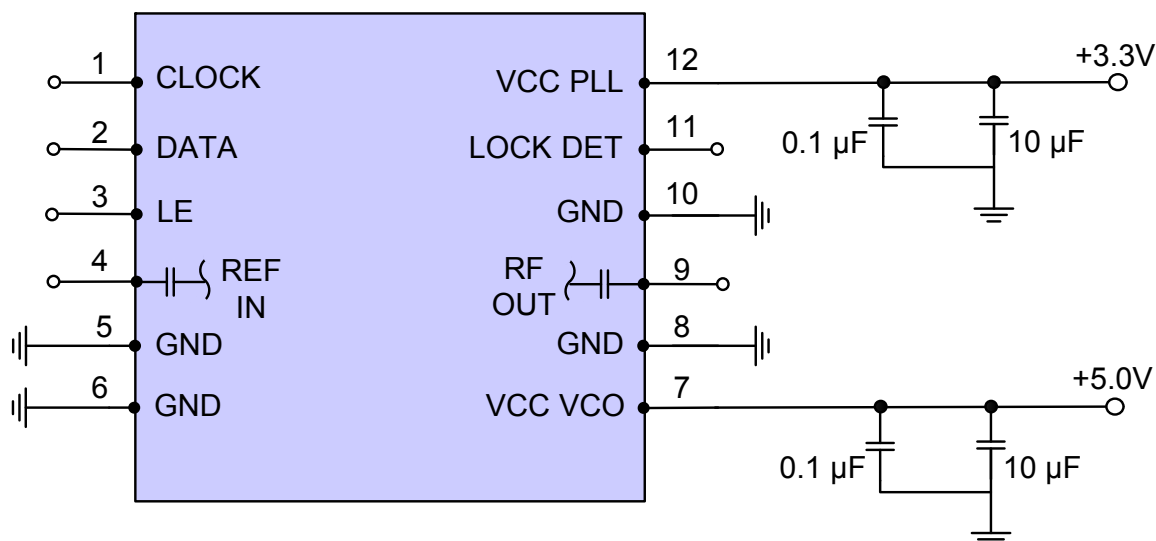


Pin Connection

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

Recommended Application Circuit

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

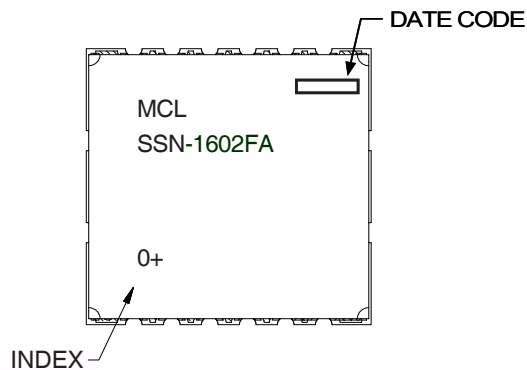


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Device Marking



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: KJ1367

Tape & Reel: TR-F95

Suggested Layout for PCB Design: PL-317

Evaluation Board: TB-552+

Environment Ratings: ENV65T2

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Typical Performance Data

FREQ. (MHz)	POWER OUTPUT (dBm)			HARMONICS						VCO CURRENT (mA)			PLL CURENT (mA)			
				(dBc)												
	-25°C	+25°C	+85°C	F2			F3			-25°C	+25°C	+85°C	-25°C	+25°C	+85°C	
				-25°C	+25°C	+85°C	-45°C	+25°C	+85°C							
1402	0.58	0.88	1.32	-17.85	-19.09	-20.30	-27.42	-27.23	-30.36	42.99	43.85	45.13	12.72	14.19	16.16	
1405	0.57	0.85	1.30	-18.28	-19.29	-20.67	-27.66	-27.53	-30.85	43.00	43.86	45.15	12.61	14.09	16.05	
1430	0.45	0.71	1.16	-19.83	-21.24	-22.62	-26.96	-27.17	-30.22	43.04	43.92	45.21	11.54	13.00	14.92	
1455	0.44	0.65	1.15	-21.17	-22.73	-23.82	-26.90	-27.33	-30.41	42.93	43.98	45.28	12.62	14.11	16.08	
1480	0.41	0.63	1.10	-23.28	-24.40	-25.74	-28.11	-27.83	-31.62	43.16	44.04	45.35	12.72	14.22	16.19	
1505	0.30	0.56	1.00	-25.18	-26.67	-27.61	-27.43	-28.23	-31.15	43.06	44.27	45.43	12.77	14.28	16.25	
1530	0.19	0.39	0.85	-26.38	-28.11	-28.45	-26.67	-28.74	-30.22	43.34	44.19	45.53	12.82	14.34	16.32	
1555	0.20	0.38	0.83	-28.30	-30.23	-30.59	-27.62	-29.29	-30.68	43.42	44.29	45.63	12.88	14.39	16.36	
1580	0.09	0.26	0.73	-31.55	-32.45	-32.80	-27.87	-27.11	-30.25	43.53	44.38	45.73	12.87	14.39	16.36	
1602	0.02	0.14	0.68	-31.61	-34.24	-33.66	-26.37	-26.49	-27.43	43.61	44.47	45.80	12.74	14.26	16.23	

FREQ. (MHz)	PHASE NOISE (dBc/Hz)														
	@ OFFSETS														
	-25°C					+25°C					+85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz	100Hz	1kHz	10kHz	100kHz	1MHz	100Hz	1kHz	10kHz	100kHz	1MHz
1402	-86.29	-91.22	-97.40	-122.17	-142.38	-89.51	-87.67	-96.21	-120.71	-140.39	-87.91	-86.26	-93.40	-117.44	-136.84
1405	-86.39	-90.39	-97.60	-122.16	-142.50	-89.03	-87.52	-96.64	-120.76	-140.96	-87.42	-87.26	-93.46	-117.58	-137.74
1430	-86.10	-90.34	-97.92	-122.42	-142.81	-88.67	-87.45	-96.92	-121.20	-141.49	-87.51	-86.06	-94.43	-118.46	-138.78
1455	-87.47	-91.14	-97.73	-122.41	-142.67	-87.80	-88.01	-96.96	-121.29	-141.48	-86.55	-85.46	-94.87	-118.99	-139.36
1480	-85.63	-90.23	-97.97	-122.52	-142.85	-88.09	-87.92	-97.50	-121.59	-140.92	-87.33	-86.27	-95.31	-119.54	-139.85
1505	-87.35	-90.81	-97.86	-122.55	-142.48	-86.79	-88.90	-97.50	-121.89	-142.11	-87.14	-86.04	-95.16	-119.91	-140.06
1530	-86.24	-89.40	-98.06	-122.66	-140.52	-87.64	-85.94	-97.17	-121.79	-142.00	-86.35	-85.99	-95.44	-120.08	-138.52
1555	-85.90	-89.12	-98.14	-122.64	-142.98	-87.54	-84.75	-97.28	-121.93	-140.33	-86.94	-84.80	-95.44	-120.23	-140.04
1580	-85.90	-89.60	-98.21	-122.58	-143.08	-87.36	-85.52	-97.26	-121.76	-140.91	-85.79	-85.19	-95.25	-120.17	-140.63
1602	-85.85	-89.53	-98.23	-122.54	-142.84	-86.39	-85.35	-97.39	-121.68	-141.16	-85.77	-84.76	-95.21	-119.98	-139.96

Typical Performance Data

COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 1402MHz± (n*Fcomparison) (dBc) NOTE 1			COMPARISON SPURIOUS @Fcarrier 1502MHz± (n*Fcomparison) (dBc) NOTE 1			COMPARISON SPURIOUS @Fcarrier 1602MHz± (n*Fcomparison) (dBc) NOTE 1		
	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C
-5	-78.01	-79.41	-79.24	-78.14	-77.03	-78.09	-77.95	-76.60	-78.14
-4	-80.67	-83.00	-83.06	-81.19	-80.27	-81.16	-80.06	-78.89	-81.38
-3	-81.19	-83.16	-83.05	-81.00	-80.68	-80.67	-79.63	-78.83	-81.32
-2	-82.04	-84.43	-84.86	-82.61	-81.87	-81.31	-81.11	-79.62	-83.30
-1	-86.28	-87.99	-93.63	-84.73	-88.46	-84.82	-88.29	-84.67	-88.21
0 ^{note 2}	-	-	-	-	-	-	-	-	-
+1	-85.11	-83.03	-83.26	-82.23	-84.96	-86.76	-85.88	-91.03	-82.89
+2	-79.24	-78.19	-77.57	-78.33	-79.18	-80.13	-79.37	-81.20	-78.70
+3	-78.29	-77.47	-77.22	-77.89	-78.28	-78.96	-77.93	-79.04	-78.23
+4	-77.58	-77.54	-77.45	-77.22	-77.92	-78.54	-77.20	-78.36	-78.09
+5	-74.99	-74.76	-75.10	-74.78	-74.99	-75.12	-74.53	-75.48	-75.57

Note 1: Comparison frequency 13 MHz

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

REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 1402MHz± (n*Freference) (dBc) NOTE 3			REFERENCE SPURIOUS @Fcarrier 1502MHz± (n*Freference) (dBc) NOTE 3			REFERENCE SPURIOUS @Fcarrier 1602MHz± (n*Freference) (dBc) NOTE 3		
	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C
-5	-86.53	-89.14	-98.80	-83.58	-85.31	-89.94	-86.86	-85.93	-88.77
-4	-81.22	-81.67	-82.14	-81.78	-79.88	-82.17	-81.82	-81.12	-83.10
-3	-88.78	-94.11	-93.08	-82.20	-85.31	-89.89	-83.20	-83.32	-84.25
-2	-80.67	-83.00	-83.06	-81.19	-80.27	-81.16	-80.06	-78.89	-81.38
-1	-82.04	-84.43	-84.86	-82.61	-81.87	-81.31	-81.11	-79.62	-83.30
0 ^{note 4}	-	-	-	-	-	-	-	-	-
+1	-79.24	-78.19	-77.57	-78.33	-79.18	-80.13	-79.37	-81.20	-78.70
+2	-77.58	-77.54	-77.45	-77.22	-77.92	-78.54	-77.20	-78.36	-78.09
+3	-83.84	-84.87	-88.77	-85.75	-86.06	-86.71	-80.70	-81.86	-87.13
+4	-80.06	-80.05	-81.15	-80.44	-80.78	-82.29	-80.63	-82.43	-82.86
+5	-92.70	-92.89	-94.46	-89.51	-94.30	-92.56	-87.09	-89.02	-99.10

Note 3: Reference frequency 26 MHz

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

Typical Performance Data

STEP SIZE SPURIOUS ORDER	0.5 STEP SIZE & STEP SIZE SPURIOUS @ Fcarrier 1402 MHz± (n*Fstep size) (dBc) NOTE 5			0.5 STEP SIZE & STEP SIZE SPURIOUS @ Fcarrier 1502 MHz± (n*Fstep size) (dBc) NOTE 5			0.5 STEP SIZE & STEP SIZE SPURIOUS @ Fcarrier 1602 MHz± (n*Fstep size) (dBc) NOTE 5		
	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C	-25°C	+25°C	+85°C
-5.0	-109.45	-95.15	-97.44	-92.86	-99.34	-98.38	-98.53	-95.58	-101.16
-4.5	-111.33	-107.62	-111.70	-112.04	-110.90	-109.98	-112.77	-110.35	-109.66
-4.0	-88.33	-85.72	-84.13	-85.27	-94.65	-95.54	-94.47	-111.26	-92.61
-3.5	-111.11	-109.06	-104.66	-110.93	-113.71	-108.20	-110.22	-113.12	-111.73
-3.0	-92.70	-89.57	-89.10	-90.71	-94.38	-95.91	-104.58	-107.56	-91.63
-2.5	-106.70	-104.50	-106.93	-109.53	-108.01	-109.67	-108.00	-108.41	-109.31
-2.0	-86.57	-88.95	-89.31	-74.50	-92.96	-89.27	-85.61	-100.70	-85.54
-1.5	-101.60	-104.43	-99.96	-104.68	-102.99	-102.28	-101.51	-101.23	-103.90
-1.0	-88.76	-74.43	-74.71	-71.70	-83.29	-80.76	-83.45	-93.43	-79.63
-0.5	-87.88	-88.97	-87.50	-84.67	-89.45	-87.25	-87.98	-84.48	-87.14
0 ^{note 6}	-	-	-	-	-	-	-	-	-
+0.5	-88.09	-88.30	-86.00	-84.05	-88.00	-85.90	-80.90	-86.82	-87.84
+1.0	-86.87	-74.68	-74.93	-71.40	-85.18	-81.54	-82.48	-95.48	-80.44
+1.5	-104.58	-104.10	-100.73	-103.45	-96.73	-104.39	-103.42	-105.60	-104.66
+2.0	-85.93	-88.24	-88.75	-74.74	-93.62	-88.44	-86.10	-101.27	-85.18
+2.5	-110.57	-107.45	-105.47	-107.63	-111.34	-110.82	-103.99	-110.77	-102.64
+3.0	-93.90	-90.72	-88.68	-90.89	-94.67	-93.94	-105.83	-106.47	-93.26
+3.5	-113.30	-107.57	-110.04	-108.55	-108.79	-111.85	-109.14	-108.35	-108.32
+4.0	-88.46	-86.53	-84.11	-84.95	-95.63	-95.31	-95.12	-109.83	-92.01
+4.5	-110.54	-111.50	-105.87	-111.43	-112.32	-111.90	-110.19	-110.96	-109.85
+5.0	-107.54	-95.39	-96.97	-92.35	-99.64	-98.60	-98.25	-95.66	-102.53

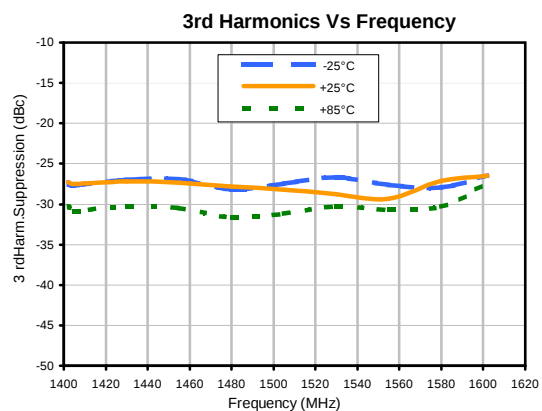
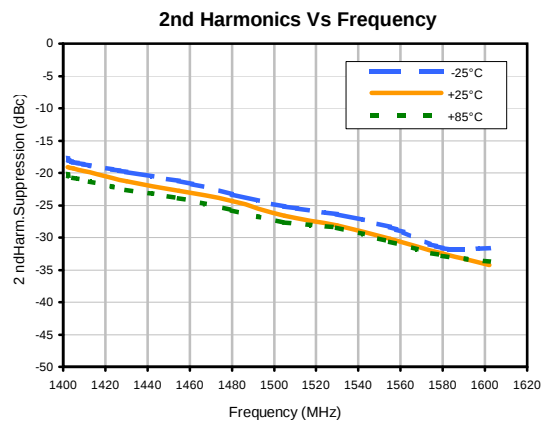
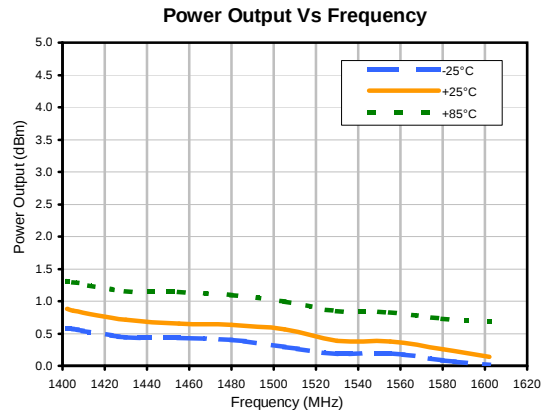
Note 5: Step size 200 kHz

Note 6: All spurs are referenced to carrier signal (n=0).

Frequency Synthesizer

Typical Performance Data

SSN-1602FA+



REV. X1
SSN-1602FA+
100831
Page 1 of 4



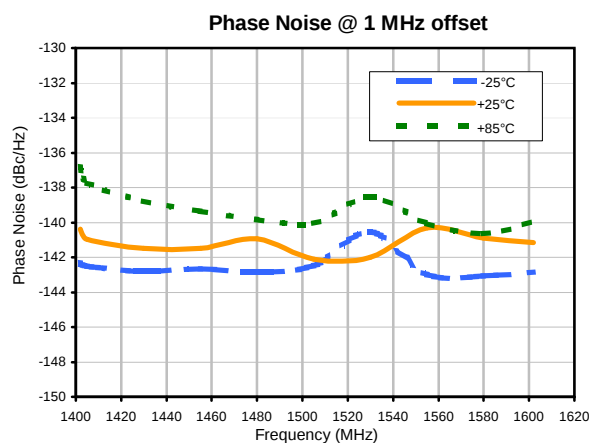
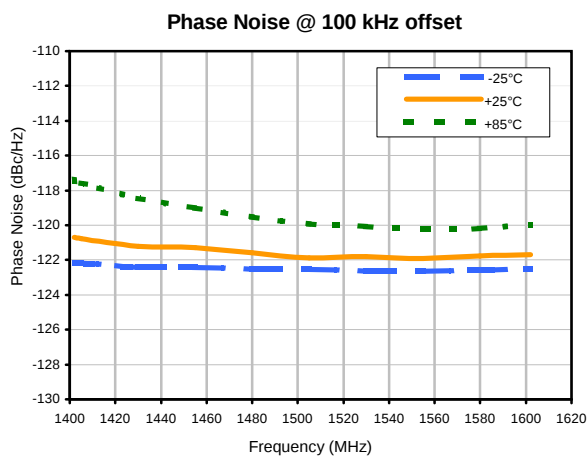
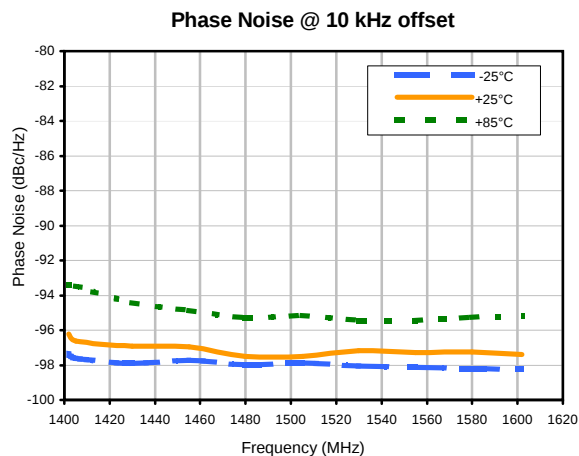
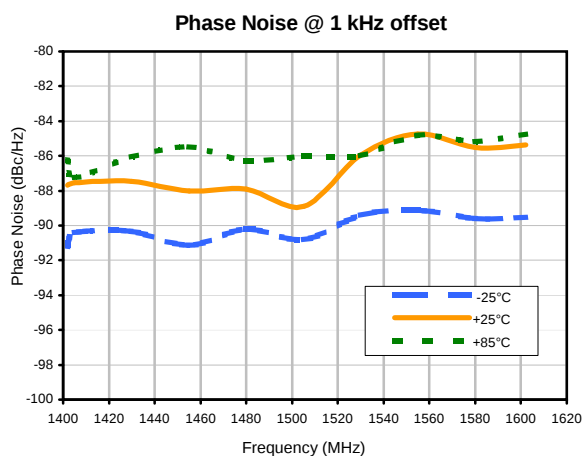
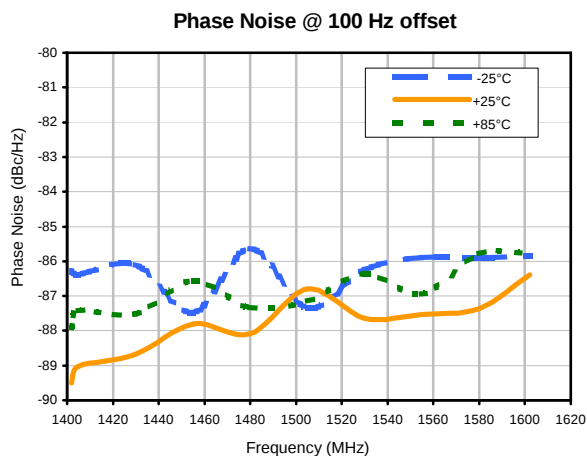
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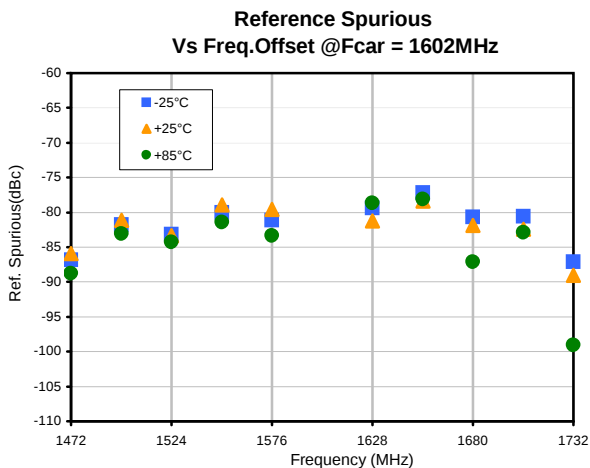
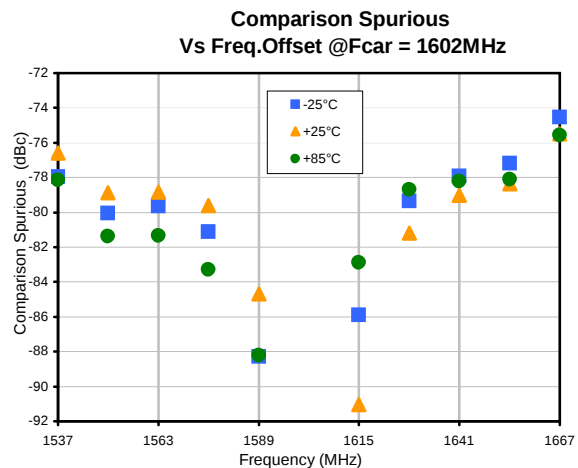
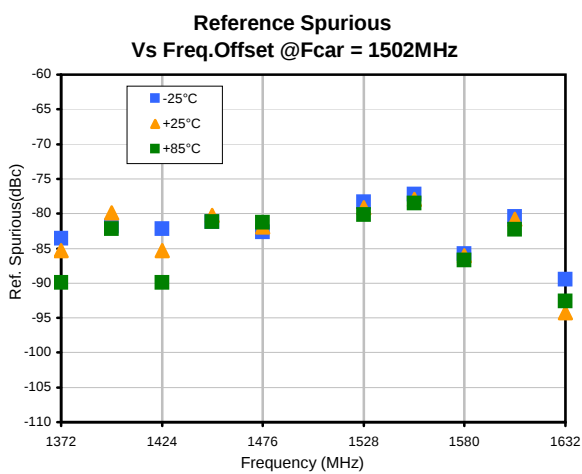
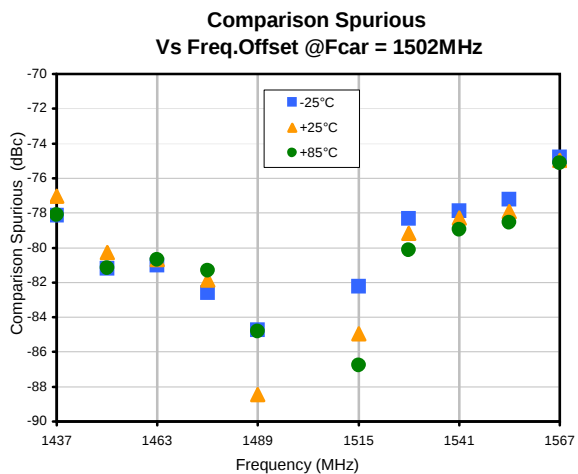
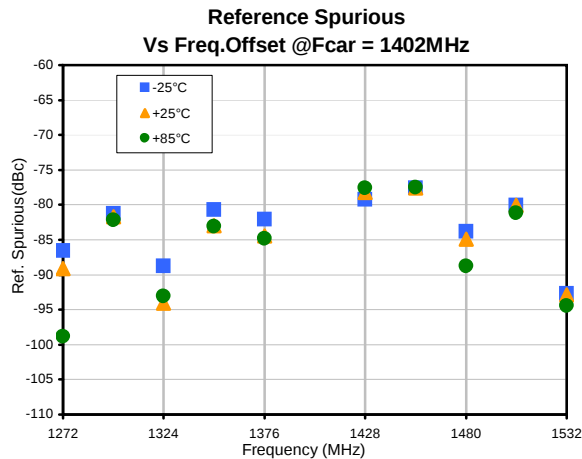
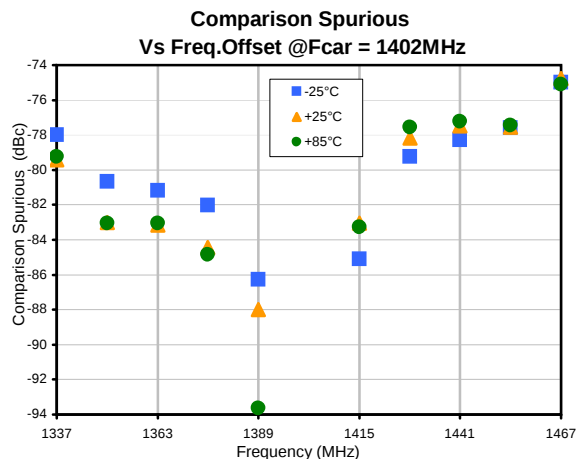
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see



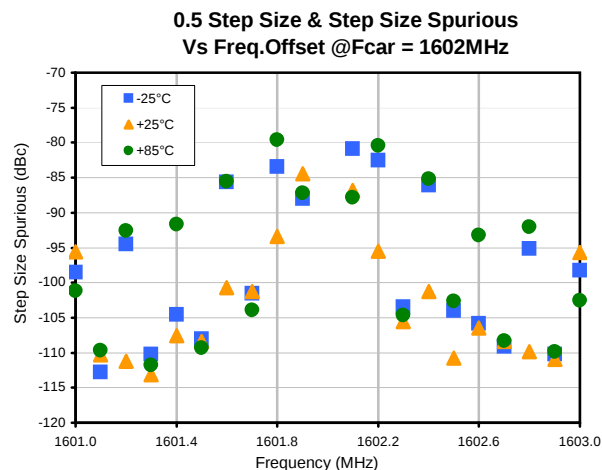
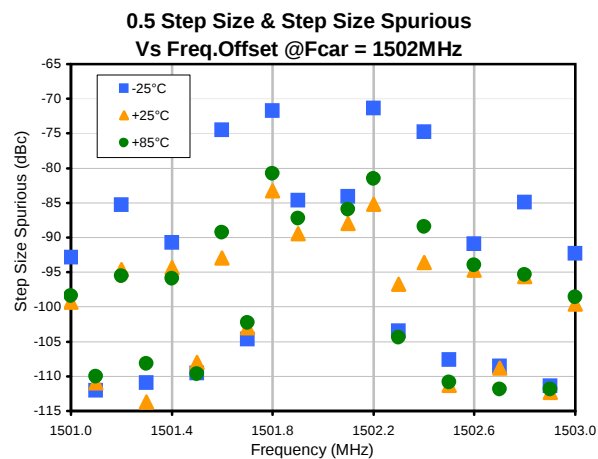
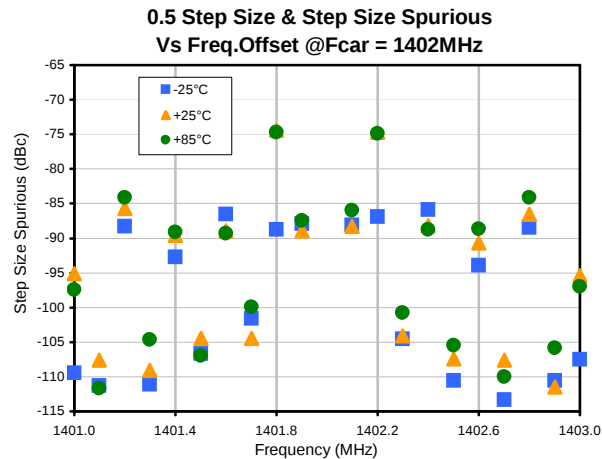
Typical Performance Data



Typical Performance Data



Typical Performance Data

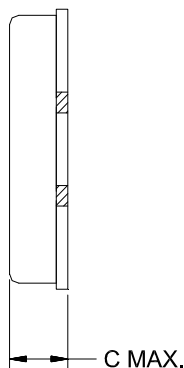
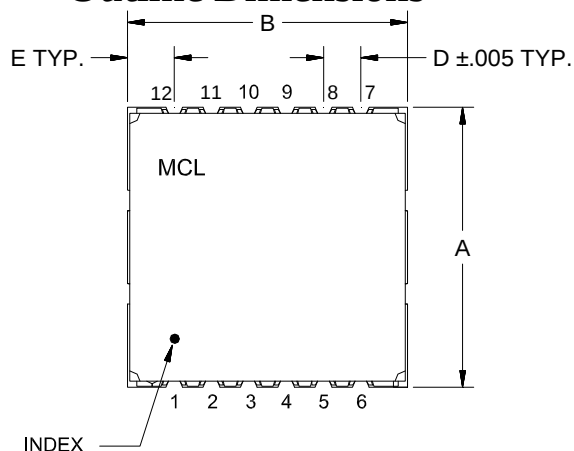


Case Style

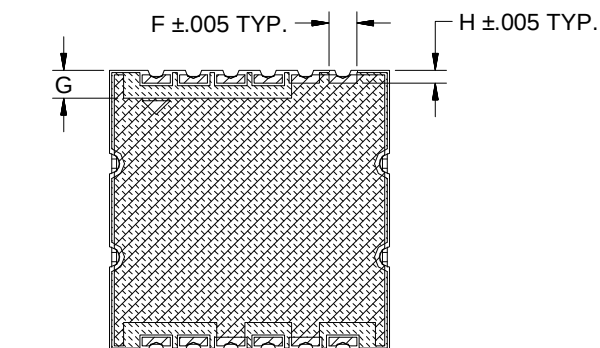
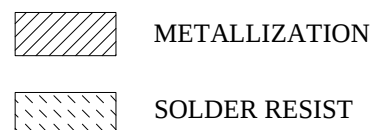
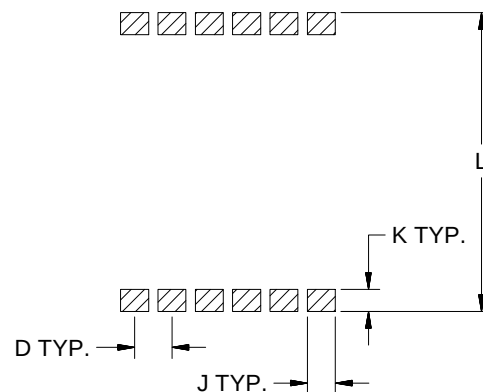
KJ

Outline Dimensions

KJ1367



PCB Land Pattern



CASE#	A	B	C	D	E	F	G	H	J	K	L	WT.GRAM
KJ1367	.600 (15.24)	.600 (15.24)	.138 (3.51)	.080 (2.03)	.100 (2.54)	.060 (1.52)	.060 (1.52)	.028 (0.71)	.060 (1.52)	.047 (1.19)	.640 (16.26)	2.0

Dimensions are in inches (mm). Tolerances: 2PL. +/- .03; 3PL. +/- .015

Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. Termination finish:

For RoHS Case Styles: 2-5 μ inch (.05-.13 microns) Gold over 120-240 μ inch (3.05-6.10 microns) Nickel plate.
All models, (+) suffix.

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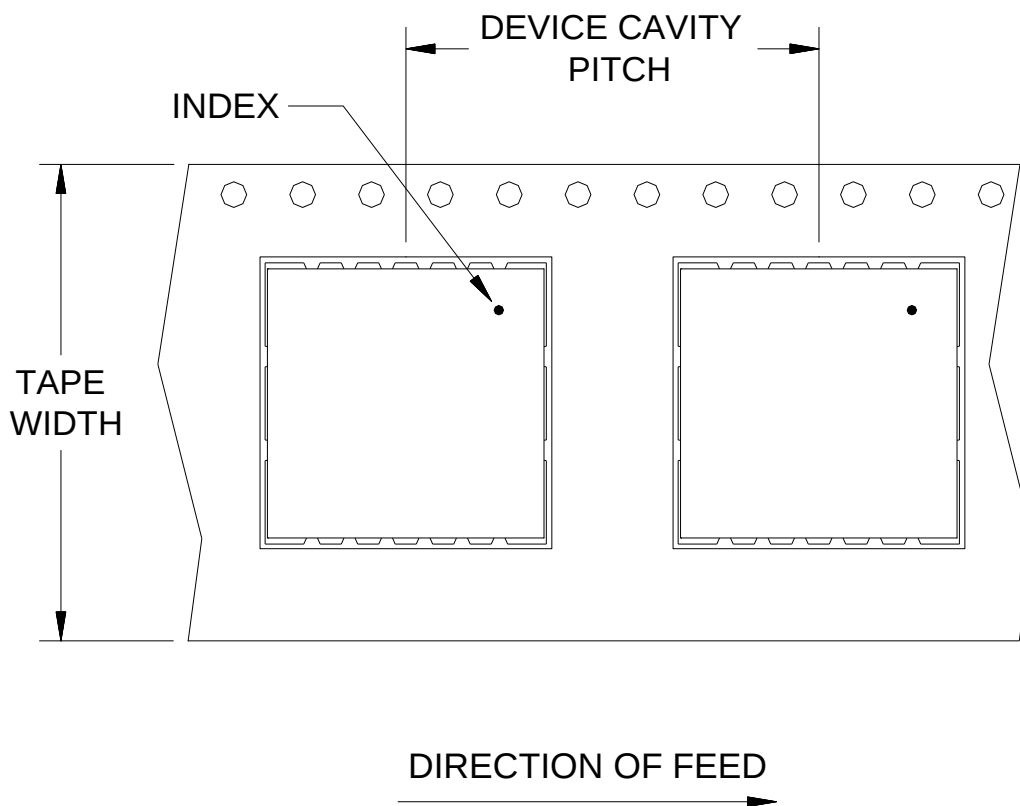


The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F95

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
24	24	13	Small quantity standards (see note)	20
				50
				100
				200
			Standard	500

Note: Please consult individual model data sheet to determine device per reel availability.

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf



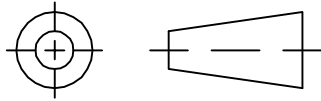
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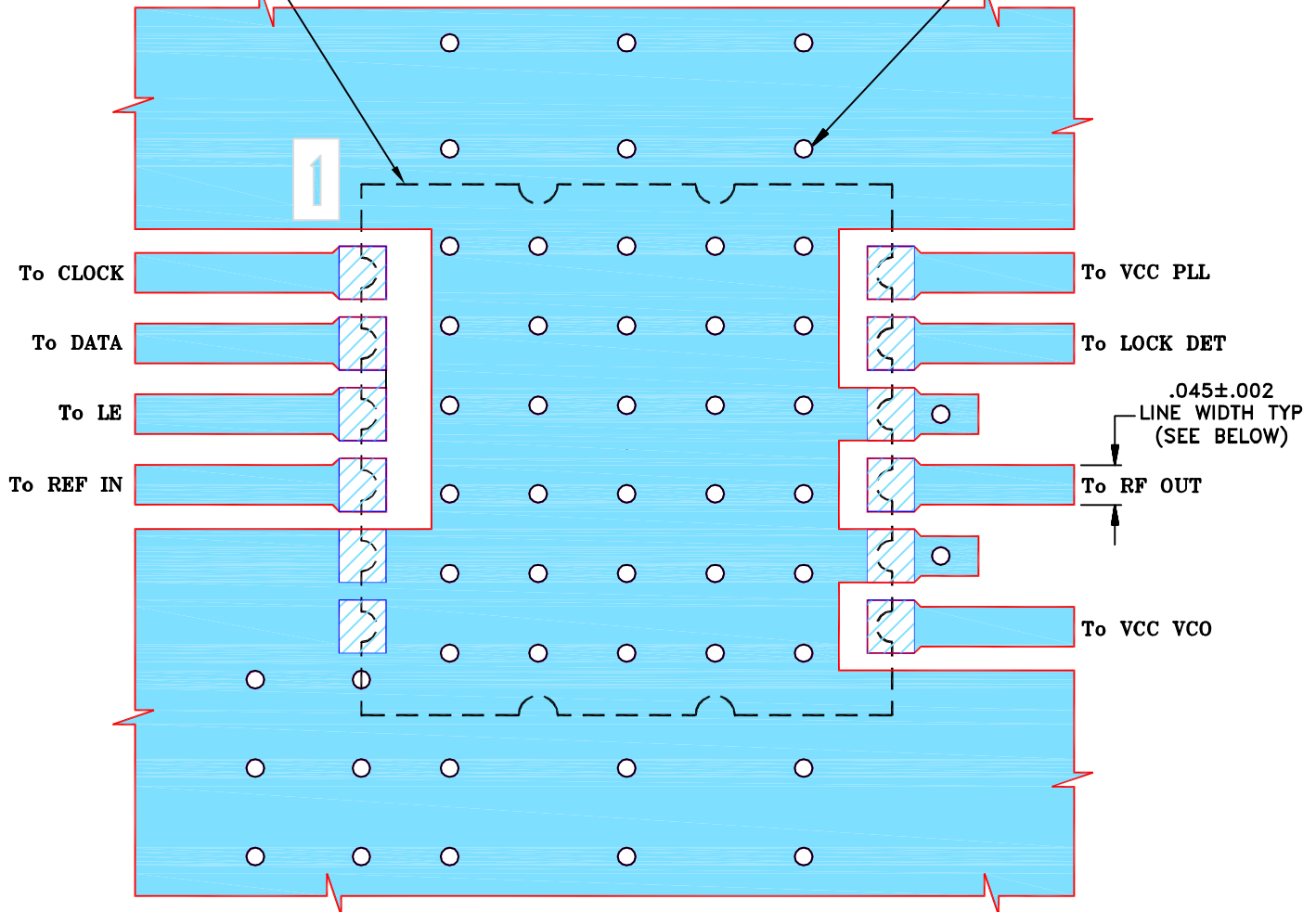
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M124738	NEW RELEASE	04/10	DK	HH
OR	R77823	NEW RELEASE	04/10	DK	HH

SUGGESTED MOUNTING CONFIGURATION

FOR KJ1367 CASE STYLE, 12SY01 PIN CONNECTION, 50 Ω .Ø.020 PTH. TYP.
FOR GROUNDPACKAGE
OUTLINE

NOTES:

1. TRACE WIDTH IS SHOWN FOR R04350B WITH DIELECTRIC THICKNESS.
.020"±.0015". 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 SOLDERMASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

TOLERANCES ON:
2 PL DECIMALS ±
3 PL DECIMALS ± .005
ANGLES ±
FRACTIONS ±

DRAWN

DK (RAVON)

06 APR 10

CHECKED

DH (RAVON)

07 APR 10

APPROVED

HH (RAVON)

07 APR 10



Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

PL, 12SY01, KJ1367, SSN
TB-552+ (50 Ω)

SIZE
A

CODE IDENT
15542

DRAWING NO:
98-PL-317

REV:
OR

FILE: 98PL317

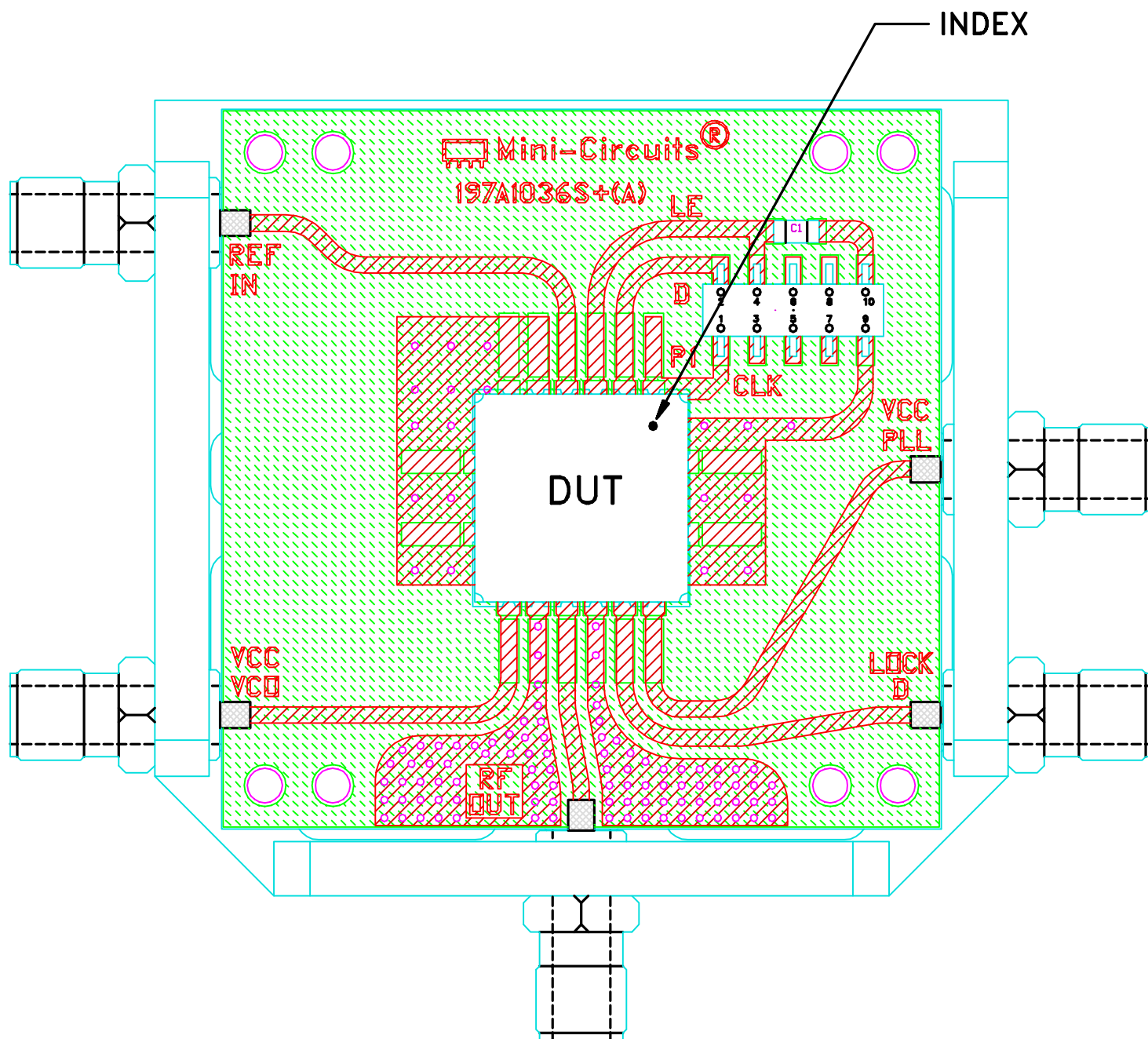
SCALE: 5:1

SHEET: 1 OF 1

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ASHEETA1.DWG REV:A DATE:01/12/95

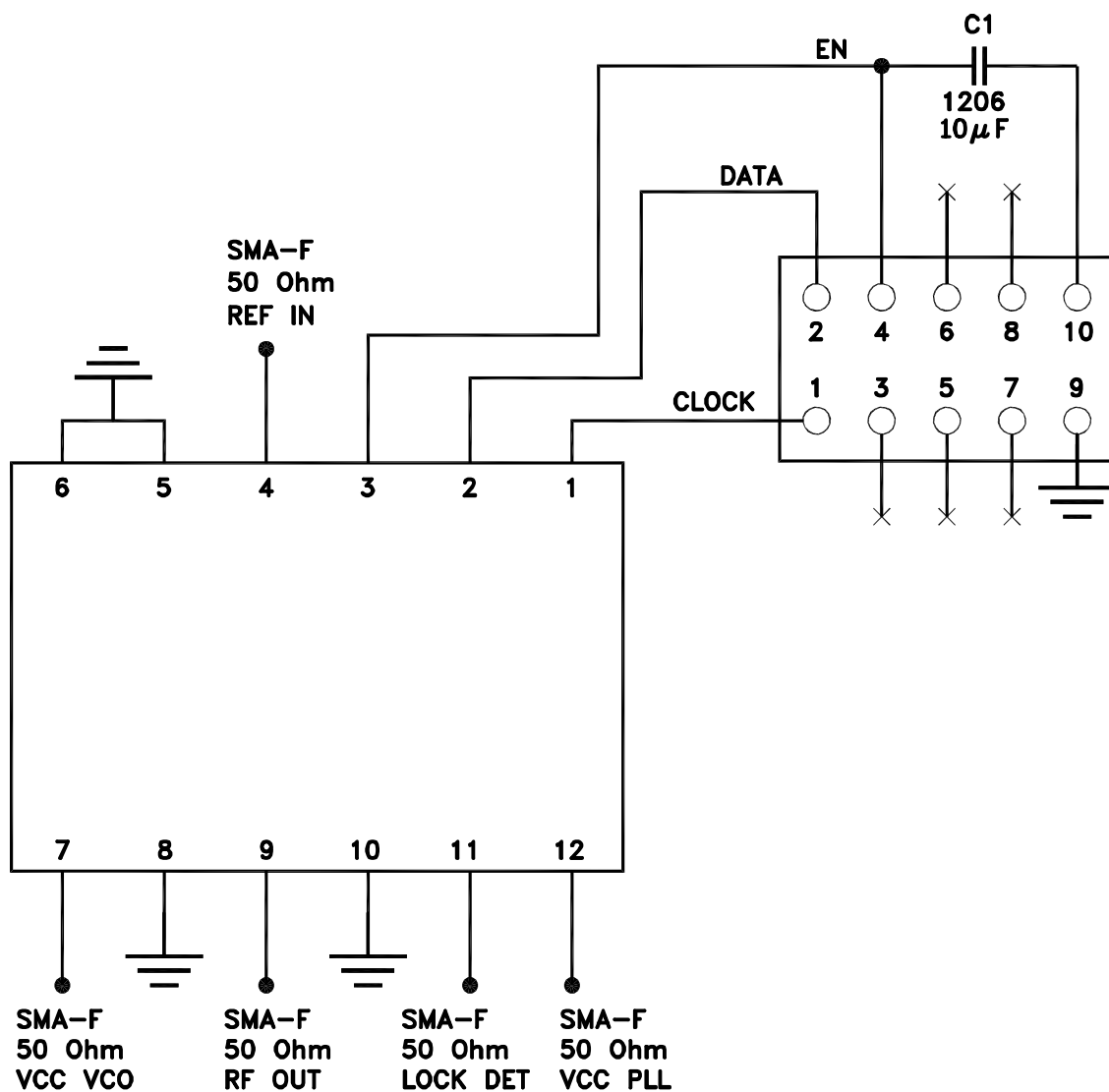
Evaluation Board and Circuit



TB-552+

NOTES:

1. SMA FEMALE CONNECTORS.
2. PCB MATERIAL: RO4350B OR EQUIVALENT, DIALECTRIC CONSTANT=3.5, DIALECTRIC THICKNESS=.020 INCH.



TB-552+ 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