

Frequency Synthesizer

KSN-3580A+

50Ω 3440 to 3580 MHz

The Big Deal

- Fractional N synthesizer
- Low phase noise and spurious
- Robust design and construction
- Small size 0.800" x 0.584" x 0.240"



CASE STYLE: DK1171

Product Overview

The KSN-3580A+ is a Frequency Synthesizer, designed to operate from 3440 to 3580 MHz for WiMAX applications. The KSN-3580A+ is packaged in a metal case (size of 0.800" x 0.584" x 0.240") 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: -70 dBc typ. • Comparison Spurious: -85 dBc typ. • Reference Spurious: -85 dBc typ.	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Robust design and construction	To enhance the robustness of KSN-3580A+, 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 0.240"	The small size enables the KSN-3580A+ to be used in compact designs.



For detailed performance specs
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IF/RF MICROWAVE COMPONENTS

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.

50Ω 3440 to 3580 MHz

Features

- Fractional N synthesizer
- Integrated VCO + PLL
- Low phase noise and spurious
- Robust design and construction
- Low operating voltage (VCC VCO=+5V, VCC PLL=+3V)
- Small size 0.800" x 0.584" x 0.240"

Applications

- WiMAX

General Description

The KSN-3580A+ is a Frequency Synthesizer, designed to operate from 3440 to 3580 MHz for WiMAX application. The KSN-3580A+ is packaged in a metal case (size of 0.800" x 0.584" x 0.240) to shield against unwanted signals and noise. To enhance the robustness of KSN-3580A+, 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.



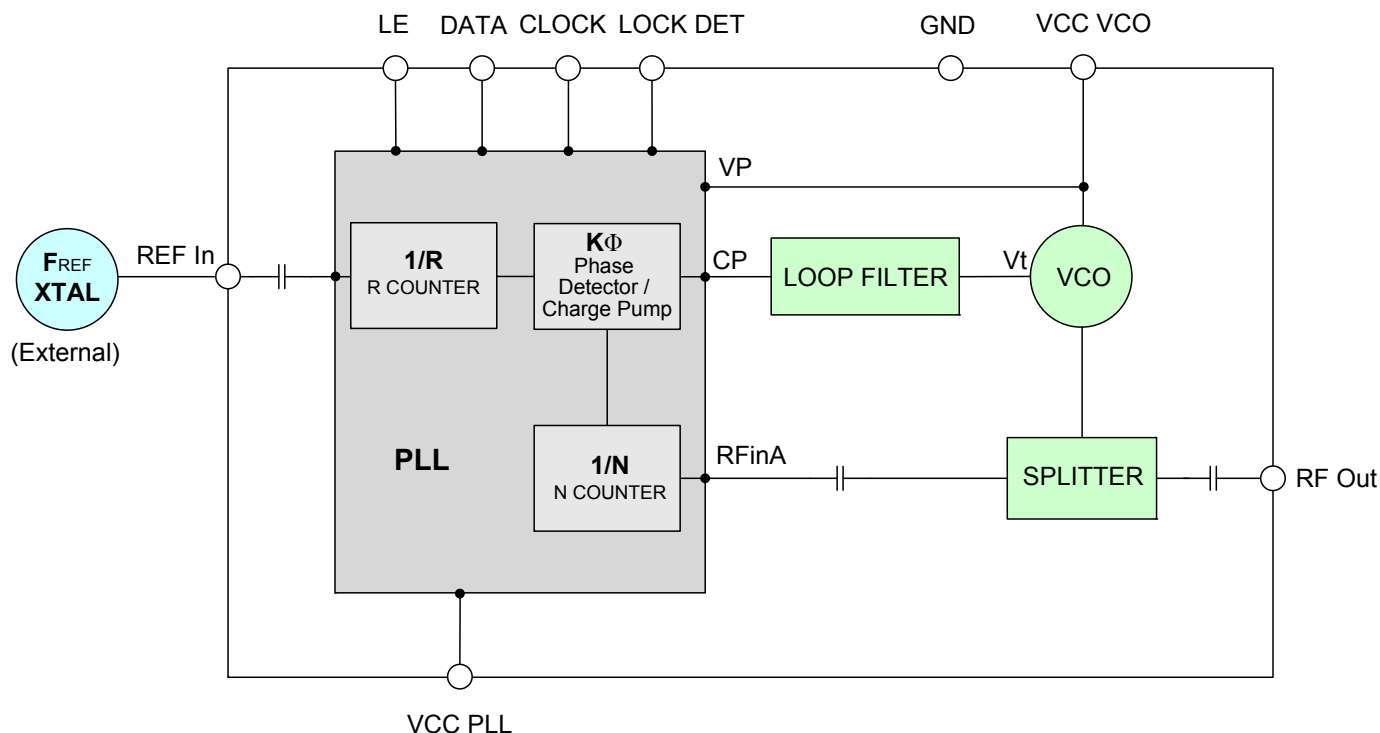
CASE STYLE: DK1171

PRICE: \$32.95 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.

Simplified Schematic



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

Parameters				Test Conditions			Min.	Typ.	Max.	Units					
Frequency Range				-			3440	-	3580	MHz					
Step Size				-			-	250	-	kHz					
Comparison Frequency				-			-	30	-	MHz					
Settling Time				Within ± 1 kHz			-	19	-	mSec					
Output Power				-			+2.0	+5.0	+7.5	dBm					
SSB Phase Noise				@ 100 Hz offset			-	-77	-	dBc/Hz					
				@ 1 kHz offset			-	-89	-84						
				@ 10 kHz offset			-	-97	-92						
				@ 100 kHz offset			-	-125	-120						
				@ 1 MHz offset			-	-146	-141						
Step Size Spurious Suppression				Step Size 250 kHz			-	-70	-60	dBc					
0.5 Step Size Spurious Suppression				0.5 Step Size 125 kHz			-	-80	-70						
Reference & Comparison Spurious Suppression				Ref. & Comp. Freq. 30 MHz			-	-85	-75						
Non - Harmonic Spurious Suppression				-			-	-90	-						
Harmonic Suppression				-			-	-25	-19						
VCO Supply Voltage				+5.00			+4.75	+5.00	+5.25	V					
PLL Supply Voltage				+3.00			+2.85	+3.00	+3.15						
VCO Supply Current				-			-	56	63	mA					
PLL Supply Current				-			-	17	25						
Reference Input (External)		Frequency		30 (square wave)			-	30	-	MHz					
		Amplitude		1			-	1	-	V _{P-P}					
		Input impedance		-			-	100	-	KΩ					
		Phase Noise @ 1 kHz offset		-			-	-145	-	dBc/Hz					
RF Output port Impedance				-			-	50	-	Ω					
Input Logic Level		Input high voltage		-			2.55	-	-	V					
		Input low voltage		-			-	-	0.55	V					
Analog Lock Detect		Locked		-			2.45	-	3.15	V					
		Unlocked		-			-	-	0.40	V					
Frequency Synthesizer PLL				-			ADF4153								
PLL Programming				-			3-wire serial 3V CMOS								
Register Map ^{NOTE 1}	R0_Register @ 3580 MHz	Fastlock	9-Bit Integer Value (Int)				12-Bit Fractional Value (Frac)							Control Bits	
		0	001110111				000000101000							00	
	R1_Register	Load Control	Muxout	Reserved	Prescaler	4-Bit R Counter	12-Bit Interpolator Modulus Value (Mod)							Control Bits	
		0	001	0	1	0001	000001111000							01	
	R2_Register	N/A				Resync	Reference Doubler	CP/2	CP Current Setting	PD Polarity	LDP	Power-Down	CP 3-State	Counter Reset	Control Bits
		00000000				0000	0	0	011	1	1	0	0	0	10
R3_Register	N/A						Reserved	Noise & Spur Mode		Reserved		Noise & Spur Mode		Control Bits	
	00000000000000						0	1111		000		1		11	

Note 1: Registers Load Sequence: R3 Register, R2 Register, R1 Register, R0 Register.

Absolute Maximum Ratings

Parameters	Ratings
VCO Supply Voltage ^{NOTE 2}	6V
PLL Supply Voltage ^{NOTE 2}	4V
VCO Supply Voltage to PLL Supply Voltage ^{NOTE 2}	-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

Note 2: 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
3440	5.05	4.71	4.24	54.96	56.39	57.38	14.90	17.12	18.37
3446	5.12	4.78	4.29	55.01	56.41	57.40	14.62	16.83	18.09
3462	5.30	4.96	4.41	55.09	56.46	57.41	14.88	17.10	18.38
3478	5.46	5.08	4.52	55.16	56.49	57.41	14.45	16.65	17.93
3494	5.56	5.15	4.58	55.22	56.52	57.40	15.04	17.28	18.58
3510	5.67	5.23	4.63	55.24	56.48	57.40	12.41	14.58	15.75
3526	5.72	5.26	4.64	55.19	56.45	57.37	14.93	17.14	18.47
3542	5.76	5.28	4.66	55.16	56.40	57.34	14.43	16.62	17.93
3558	5.75	5.21	4.63	55.11	56.39	57.32	14.90	17.13	18.45
3574	5.73	5.23	4.65	54.96	56.31	57.31	14.54	16.75	18.04
3580	5.71	5.22	4.64	54.91	56.27	57.28	14.82	17.04	18.35

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
3440	-31.51	-36.26	-34.41	-42.45	-44.72	-47.03
3446	-30.32	-35.82	-34.13	-43.14	-44.53	-47.06
3462	-30.05	-34.97	-33.84	-42.50	-43.54	-48.18
3478	-28.68	-33.72	-33.69	-42.22	-44.72	-46.62
3494	-27.03	-32.40	-34.53	-40.09	-45.76	-45.88
3510	-26.55	-32.34	-34.10	-40.70	-42.93	-45.96
3526	-27.47	-33.52	-33.86	-42.18	-43.64	-48.59
3542	-26.54	-33.36	-35.84	-46.34	-45.23	-49.85
3558	-26.36	-35.28	-36.40	-41.85	-50.23	-47.27
3574	-30.29	-36.96	-38.82	-40.44	-48.83	-49.49
3580	-30.56	-38.24	-38.87	-40.08	-47.99	-48.40

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	+25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
3440	-79.21	-88.35	-96.09	-124.60	-145.24
3446	-78.52	-88.97	-96.88	-124.60	-145.51
3462	-76.34	-90.47	-97.38	-125.04	-145.84
3478	-77.70	-91.05	-98.17	-125.29	-146.36
3494	-78.11	-88.56	-97.61	-125.83	-146.38
3510	-77.36	-89.12	-98.63	-125.69	-146.44
3526	-79.61	-90.53	-97.55	-125.53	-146.84
3542	-78.61	-91.53	-97.32	-126.00	-146.56
3558	-77.08	-90.13	-98.32	-125.78	-146.55
3574	-78.32	-90.69	-97.88	-125.85	-146.74
3580	-75.40	-90.10	-97.81	-125.50	-147.09

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	-45°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
3440	-76.10	-89.71	-94.91	-123.28	-144.71
3446	-76.82	-92.45	-95.50	-123.50	-144.74
3462	-78.06	-90.09	-95.95	-123.95	-145.28
3478	-76.67	-90.60	-96.64	-124.49	-145.99
3494	-81.24	-89.87	-96.63	-125.01	-146.55
3510	-77.51	-90.81	-96.79	-125.27	-146.57
3526	-75.29	-89.62	-97.01	-125.23	-145.76
3542	-78.52	-89.99	-97.65	-125.59	-147.71
3558	-77.33	-89.10	-97.39	-125.98	-147.45
3574	-78.03	-91.89	-96.83	-125.54	-147.13
3580	-77.61	-91.48	-96.96	-125.17	-146.89

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS				
	+85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
3440	-79.88	-90.29	-97.52	-124.93	-145.51
3446	-78.33	-90.65	-98.18	-125.07	-145.69
3462	-77.13	-90.61	-98.09	-125.49	-146.17
3478	-80.54	-91.13	-98.42	-125.22	-146.33
3494	-77.75	-90.18	-98.47	-125.53	-146.98
3510	-78.62	-91.95	-98.33	-125.94	-146.82
3526	-77.13	-88.55	-98.68	-125.56	-146.54
3542	-76.00	-89.43	-98.06	-125.43	-146.77
3558	-77.16	-89.97	-98.47	-125.55	-146.19
3574	-76.15	-89.82	-98.20	-125.65	-146.70
3580	-78.61	-91.82	-98.13	-125.57	-146.24

REFERENCE & COMPARISON SPURIOUS ORDER n	REFERENCE & COMPARISON SPURIOUS @Fcarrier 3440MHz+(n*Freference) (dBc) note 1			REFERENCE & COMPARISON SPURIOUS @Fcarrier 3512MHz+(n*Freference) (dBc) note 1			REFERENCE & COMPARISON SPURIOUS @Fcarrier 3580MHz+(n*Freference) (dBc) note 1		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5	-100.51	-107.55	-105.95	-102.80	-105.92	-103.67	-103.78	-99.91	-102.85
-4	-101.62	-107.42	-102.13	-99.29	-99.41	-102.56	-98.36	-97.79	-100.49
-3	-109.52	-115.91	-106.46	-102.22	-105.18	-105.53	-106.61	-108.48	-110.77
-2	-104.40	-100.72	-99.13	-93.75	-95.55	-97.81	-96.85	-96.56	-95.84
-1	-97.27	-96.84	-97.21	-101.92	-96.38	-100.10	-91.10	-93.88	-90.82
0 ^{note 2}	-	-	-	-	-	-	-	-	-
+1	-100.96	-98.65	-96.18	-93.05	-98.63	-90.65	-92.22	-93.14	-88.92
+2	-100.63	-105.41	-104.23	-102.78	-106.17	-112.05	-96.09	-95.99	-96.32
+3	-97.11	-100.72	-100.84	-96.71	-101.12	-104.76	-105.23	-106.04	-110.56
+4	-105.89	-102.39	-106.76	-105.99	-102.73	-109.21	-99.10	-95.71	-97.21
+5	-99.63	-107.36	-99.56	-97.23	-102.71	-96.08	-99.46	-101.75	-96.25

Note 1: Reference frequency = Comparison frequency = 30 MHz

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

STEP SIZE SPURIOUS ORDER n	0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 3440MHz+(n*Fstep size) (dBc) note 3			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 3512MHz+(n*Fstep size) (dBc) note 3			0.5 STEP SIZE & STEP SIZE SPURIOUS @Fcarrier 3580MHz+(n*Fstep size) (dBc) note 3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5.0	-109.85	-116.06	-119.09	-118.55	-115.44	-116.70	-111.03	-110.07	-113.05
-4.5	-116.78	-116.53	-120.11	-118.38	-119.51	-118.62	-120.61	-118.34	-118.54
-4.0	-115.57	-115.04	-118.75	-118.35	-117.36	-118.46	-113.22	-117.20	-118.05
-3.5	-114.81	-116.00	-117.15	-117.50	-112.33	-114.42	-115.24	-115.63	-118.75
-3.0	-112.74	-114.03	-117.22	-114.03	-112.71	-112.83	-108.12	-110.61	-107.54
-2.5	-111.70	-113.37	-115.03	-116.77	-108.87	-113.97	-114.65	-114.30	-116.24
-2.0	-105.24	-108.07	-106.87	-108.24	-111.26	-111.39	-109.57	-105.39	-104.98
-1.5	-105.81	-108.05	-102.82	-104.75	-103.73	-106.58	-105.30	-105.47	-104.63
-1.0	-89.48	-101.83	-97.95	-98.89	-99.25	-101.30	-85.30	-92.06	-90.17
-0.5	-91.11	-89.13	-89.08	-88.83	-88.93	-89.92	-86.59	-88.44	-89.94
0 ^{note 4}	-	-	-	-	-	-	-	-	-
+0.5	-89.58	-90.31	-89.43	-89.36	-89.22	-91.54	-88.64	-90.55	-90.16
+1.0	-89.52	-100.16	-96.15	-102.15	-100.13	-101.14	-85.78	-92.06	-92.57
+1.5	-106.30	-108.49	-103.15	-107.23	-108.12	-104.11	-108.91	-103.83	-107.75
+2.0	-107.87	-108.29	-105.43	-109.08	-109.79	-112.01	-111.32	-105.07	-105.75
+2.5	-115.06	-112.97	-112.15	-114.45	-113.13	-116.25	-113.34	-112.08	-113.51
+3.0	-115.13	-114.11	-116.41	-114.57	-117.97	-116.56	-112.64	-111.56	-116.44
+3.5	-113.71	-115.36	-116.70	-118.59	-116.86	-117.32	-115.71	-116.37	-117.28
+4.0	-120.02	-114.97	-118.83	-120.24	-117.21	-118.60	-113.10	-116.11	-117.08
+4.5	-118.32	-115.55	-117.96	-117.49	-121.19	-114.58	-118.00	-116.18	-119.96
+5.0	-113.51	-111.28	-119.67	-115.80	-118.45	-115.54	-110.27	-111.14	-106.01

Note 3: Step size 250 KHz

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



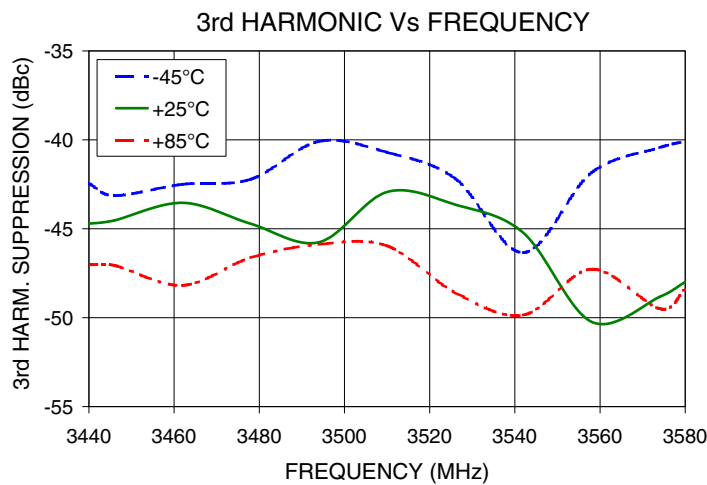
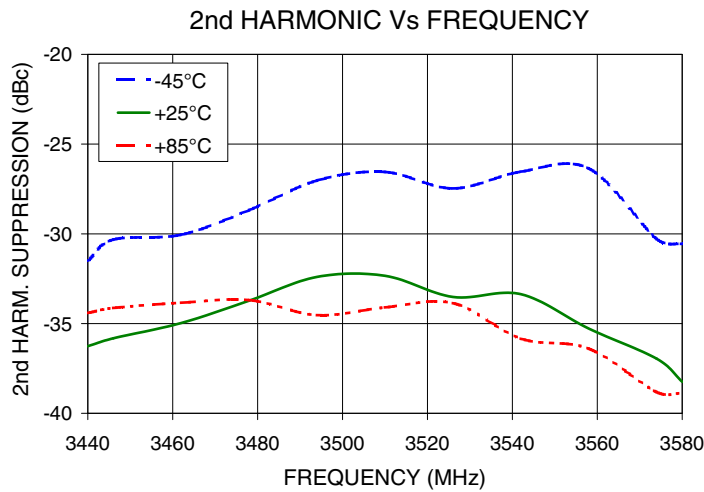
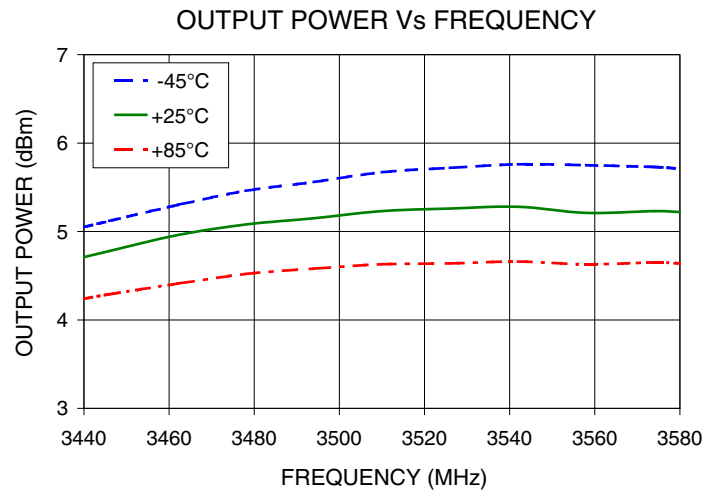
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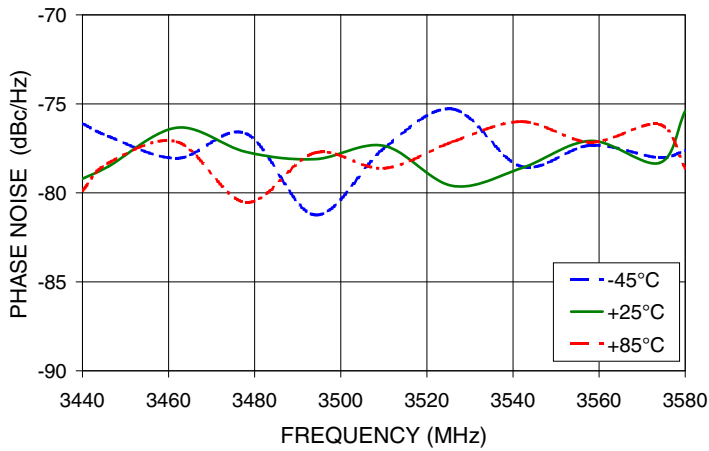
IF/RF MICROWAVE COMPONENTS

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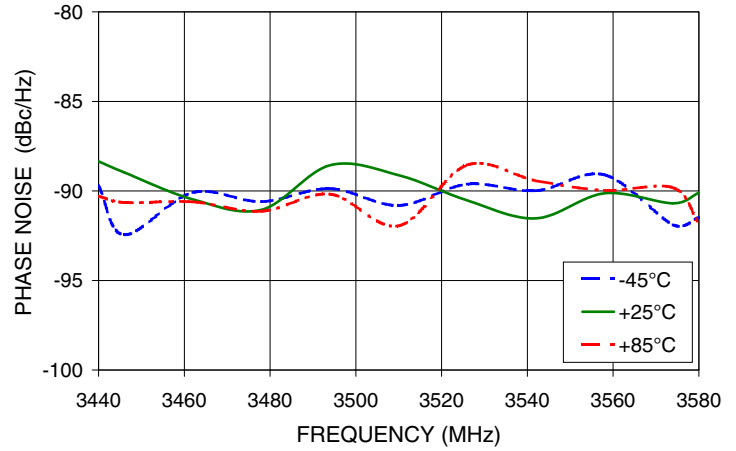
Typical Performance Curves



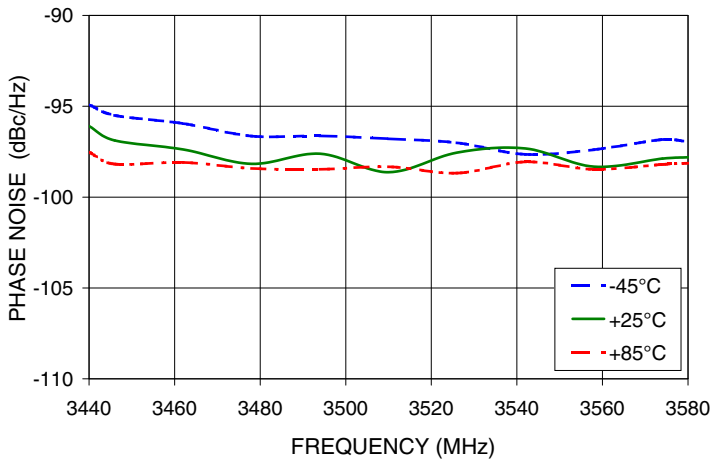
PHASE NOISE @ 100Hz offset



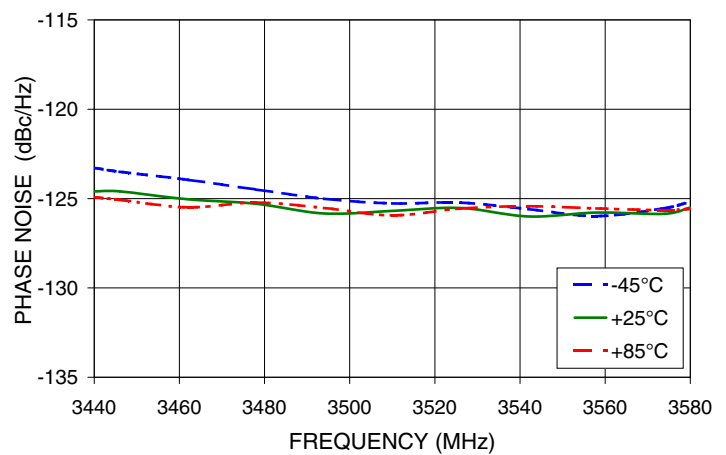
PHASE NOISE @ 1kHz offset



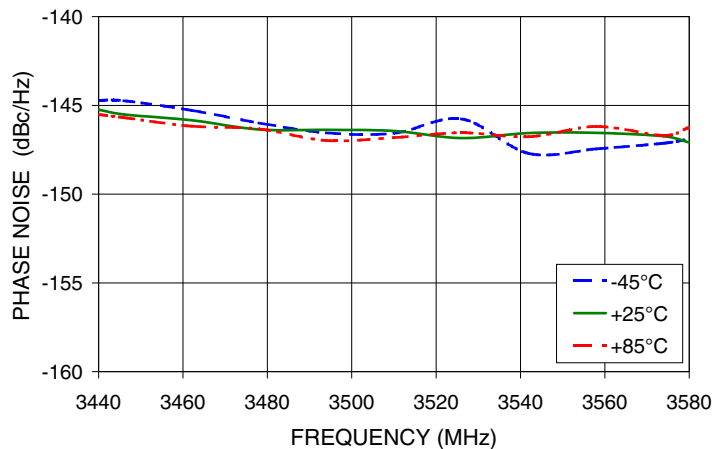
PHASE NOISE @ 10kHz offset

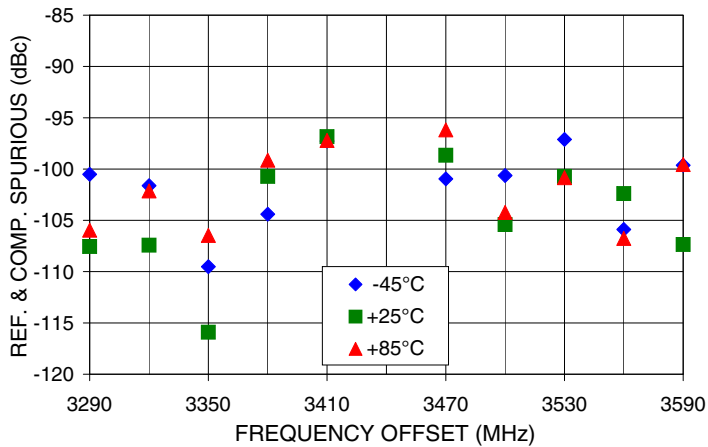
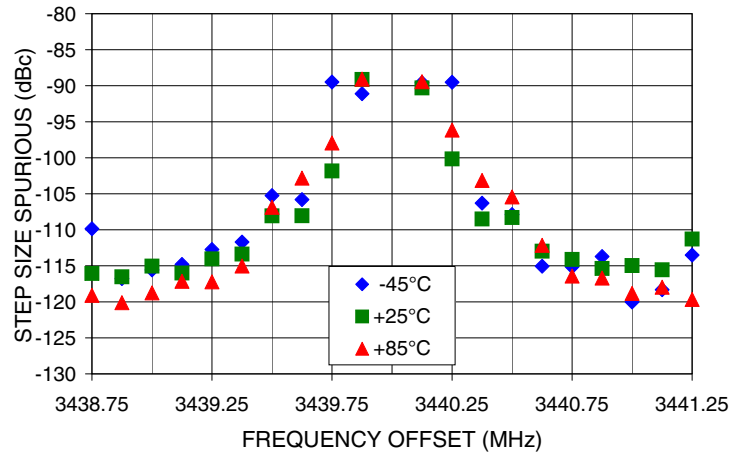
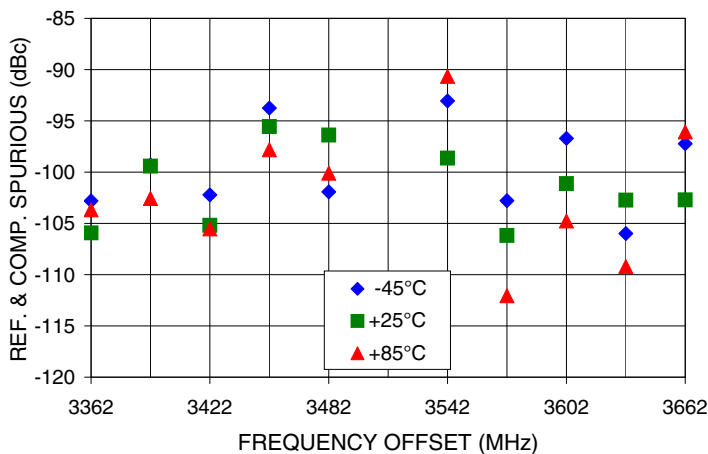
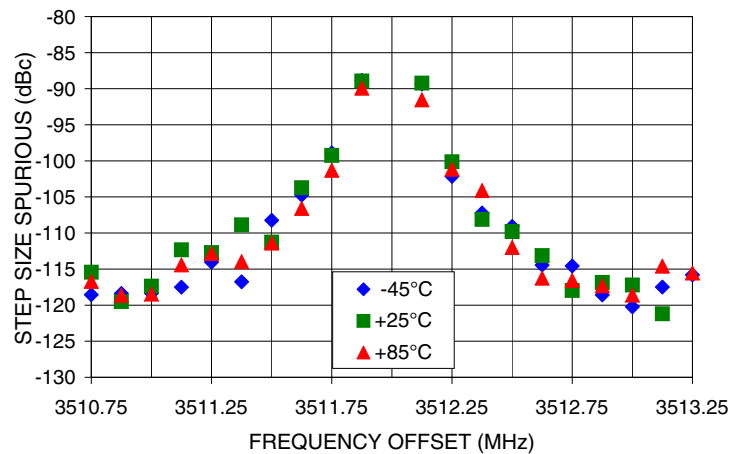
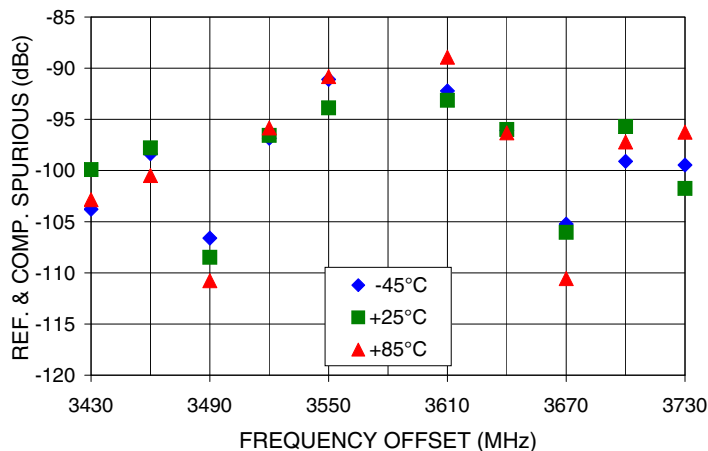
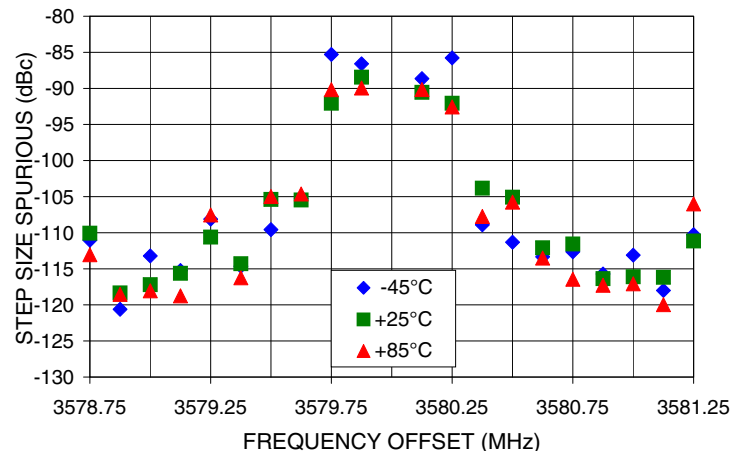


PHASE NOISE @ 100kHz offset

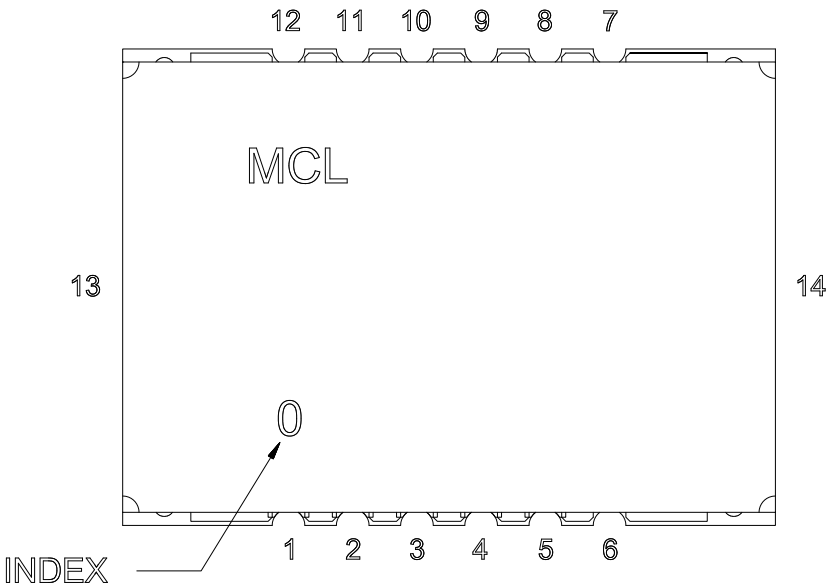


PHASE NOISE @ 1MHz offset



REFERENCE & COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 3440MHz0.5 STEP SIZE & STEP SIZE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 3440MHzREFERENCE & COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 3512MHz0.5 STEP SIZE & STEP SIZE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 3512MHzREFERENCE & COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 3580MHz0.5 STEP SIZE & STEP SIZE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 3580MHz

Pin Configuration

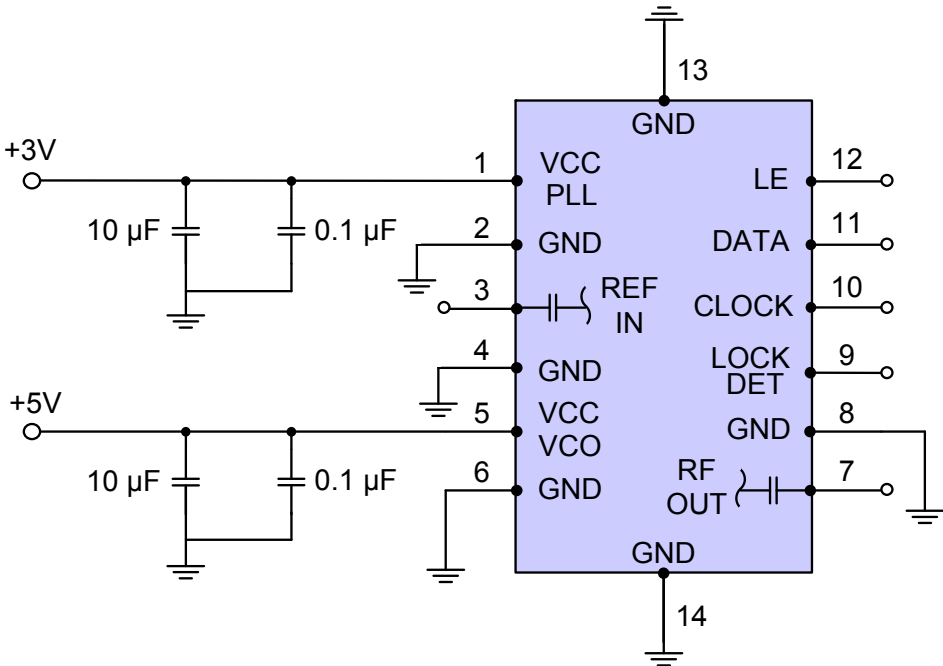


Pin Connection

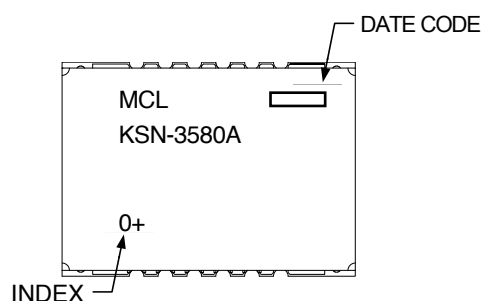
Pin Number	Function
1	VCC PLL
2	GND
3	REF IN
4	GND
5	VCC VCO
6	GND
7	RF OUT
8	GND
9	LOCK DET
10	CLOCK
11	DATA
12	LE
13	GND
14	GND

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: DK1171

Tape & Reel: TR-F28

Suggested Layout for PCB Design: PL-249

Evaluation Board: TB-567-2+

Environment Ratings: ENV03T2



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 The Design Engineers Search Engine  Provides ACTUAL Data Instantly at minicircuits.com

IF/RF MICROWAVE COMPONENTS

For detailed performance specs
& shopping online see web site

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.