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.

NON-CATALOG

Frequency Synthesizer

KSN-3580A+

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

CASE STYLE: DK1171

+ 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.

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.
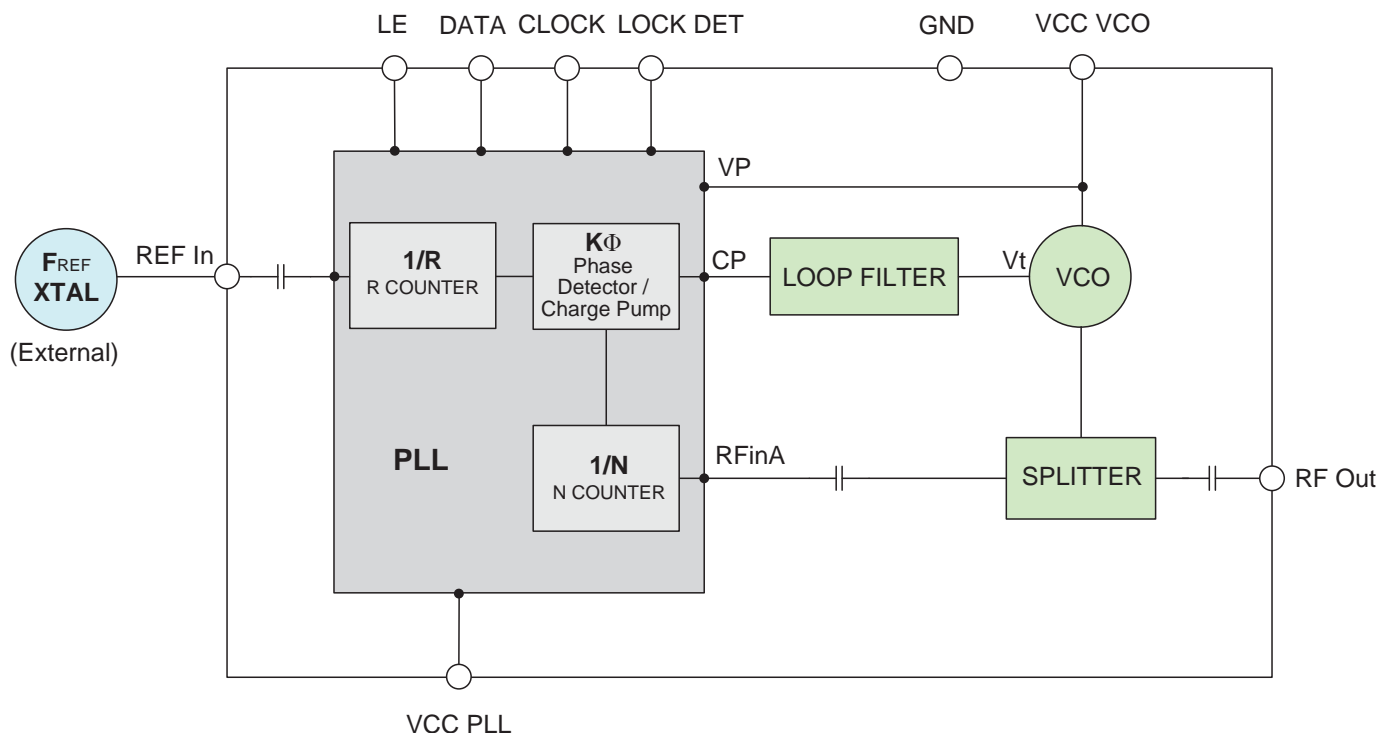
Simplified Schematic

Frequency Synthesizer

KSN-3580A+

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
		0000000000000				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.

Frequency Synthesizer

Typical Performance Data

FREQUENCY	POWER OUTPUT			VCO CURRENT			PLL CURRENT		
(MHz)	(dBm)			(mA)			(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	HARMONICS (dBc)					
(MHz)	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 Synthesizer

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

Frequency Synthesizer

KSN-3580A+

REFERENCE & COMPARISON SPURIOUS ORDER	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		
n	-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	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		
n	-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
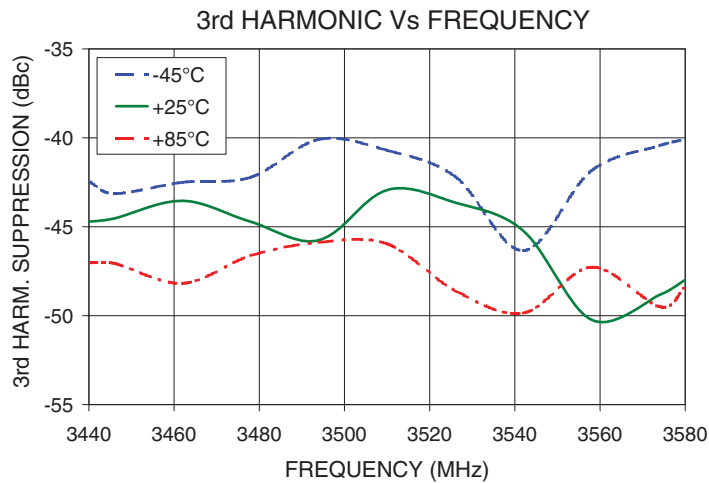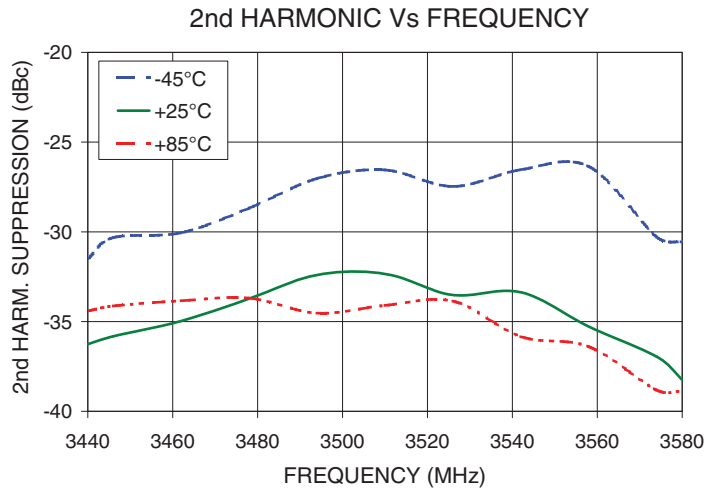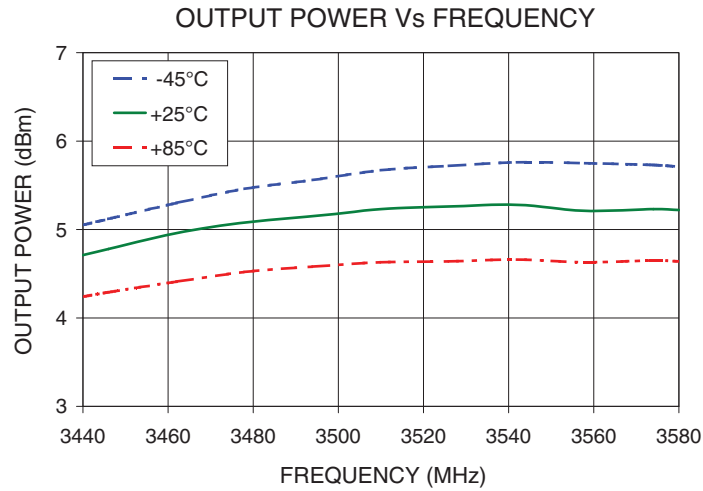Note 4: All spurs are referenced to carrier signal (n=0).

Typical Performance Curves

OUTPUT POWER Vs FREQUENCY

2nd HARMONIC Vs FREQUENCY

3rd HARMONIC Vs FREQUENCY
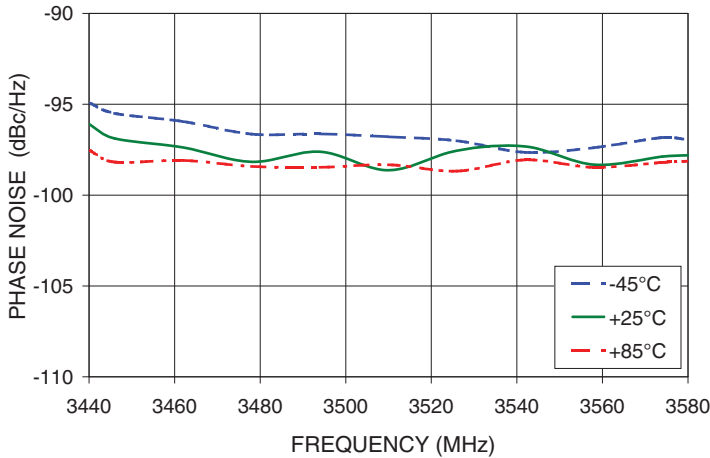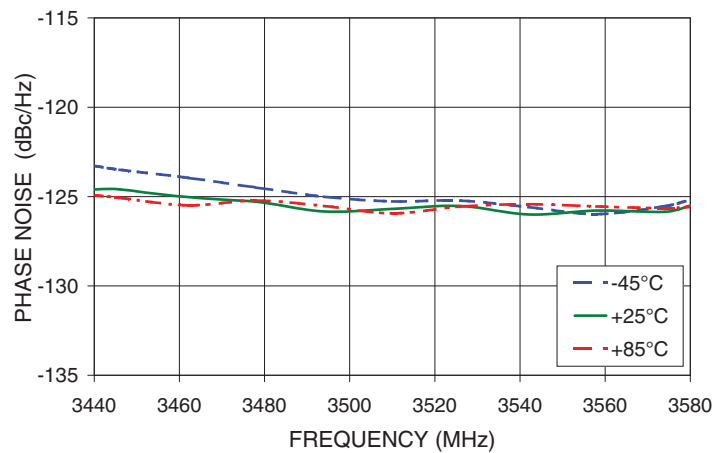
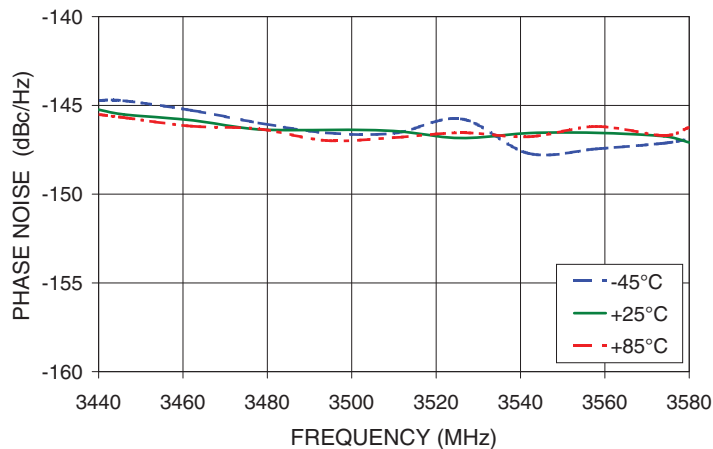## PHASE NOISE @100Hz offset

PHASE NOISE @1kHz offset
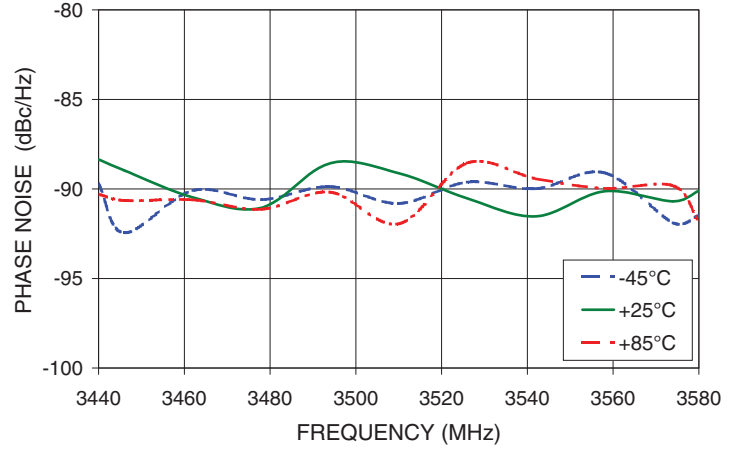
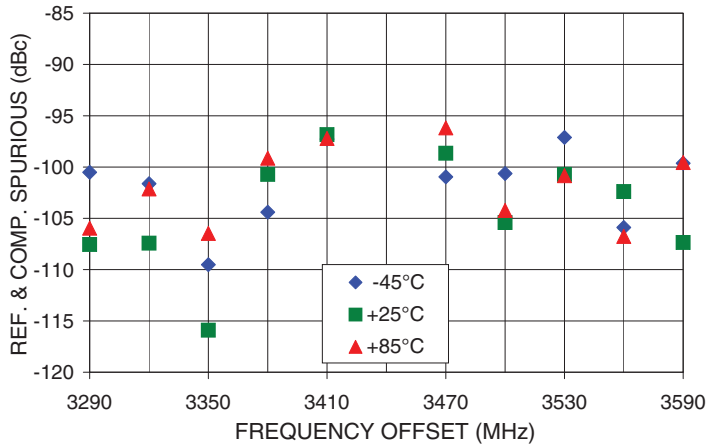## PHASE NOISE @10kHz offset

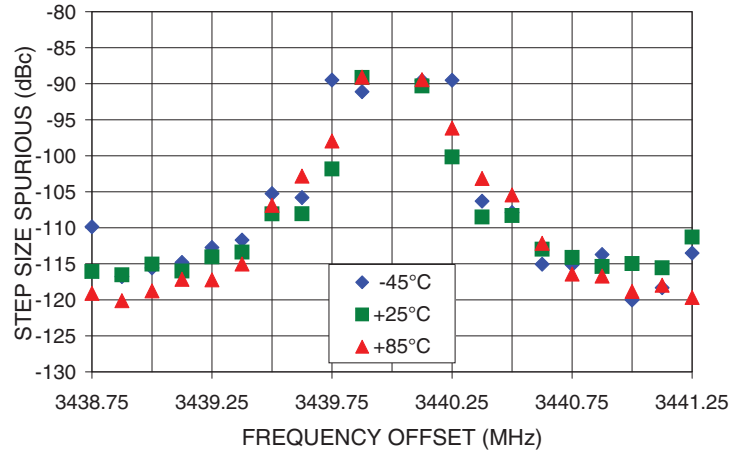## PHASE NOISE @100kHz offset

PHASE NOISE @1MHz offset

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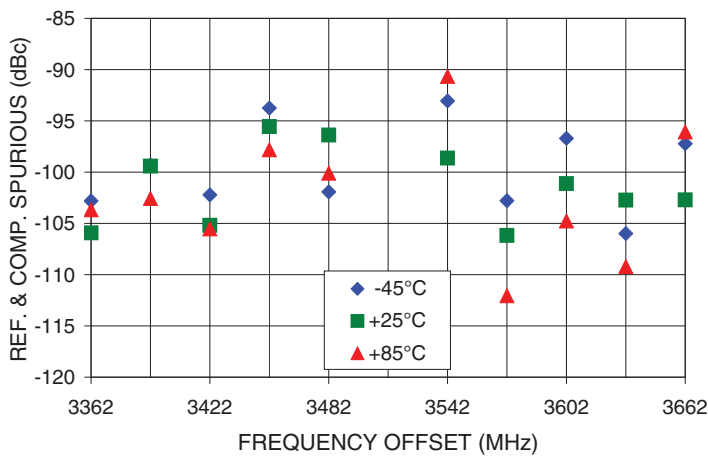### REFERENCE & COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 3440MHz

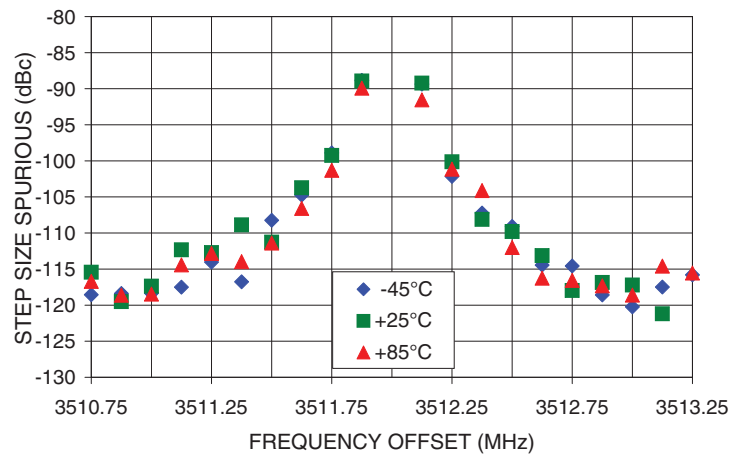### 0.5 STEP SIZE & STEP SIZE SPURIOUS
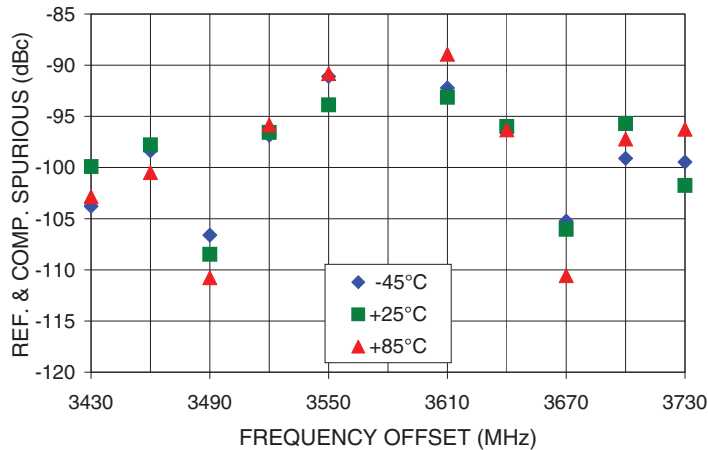### Vs FREQ. OFFSET @ Fcar = 3440MHz

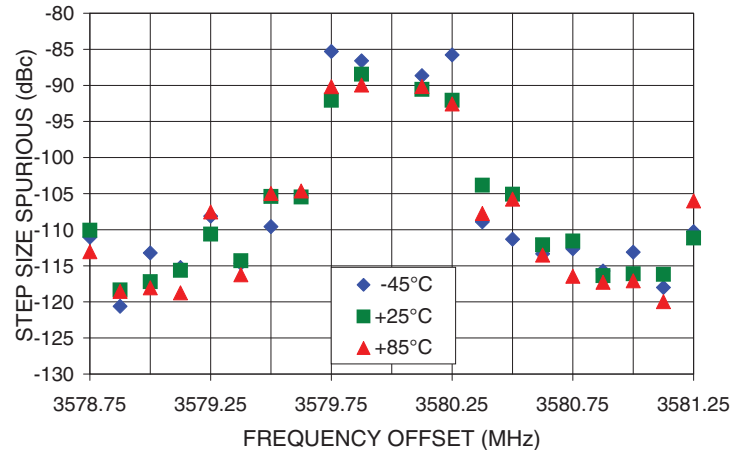### REFERENCE & COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 3512MHz

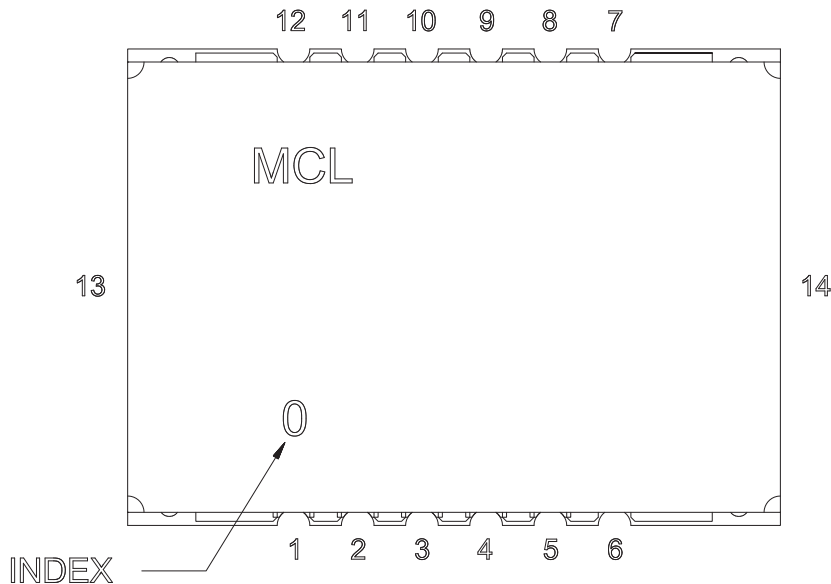### 0.5 STEP SIZE & STEP SIZE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 3512MHz

REFERENCE & COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 3580MHz

0.5 STEP SIZE & STEP SIZE SPURIOUS
Vs FREQ. OFFSET @ Fcar = 3580MHz

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For detailed performance specs & shopping online see web site

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IF/RF MICROWAVE COMPONENTS

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.

For detailed performance specs & shopping online see web site

Device Marking

DATE CODE

MCL

KSN-3580A

0+

INDEX
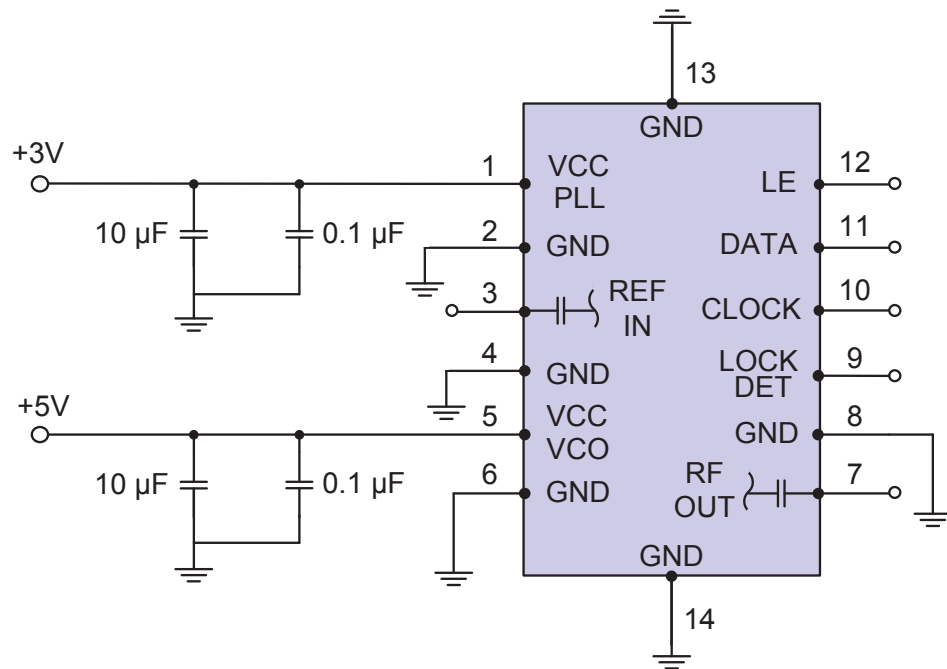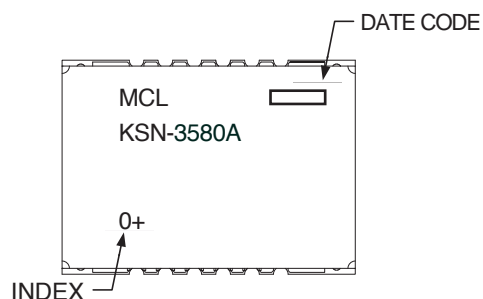
Additional Detailed Technical Information

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

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The Design Engineers Search Engine Yoni2 *Provides ACTUAL Data Instantly at* **minicircuits.com**

IF/RF MICROWAVE COMPONENTS