NON-CATALOG

Frequency Synthesizer KSN-2457A-1C19+

50Ω 2457.6 MHz (fixed)

The Big Deal

- Low phase noise and spurious
- Fixed frequency without external programming
- Integrated microcontroller
- Robust design and construction
- Small size 0.80" x 0.58" x 0.24"

CASE STYLE: DK1171

Product Overview

The KSN-2457A-1C19+ is a Frequency Synthesizer, designed to operate at 2457.6 MHz for CATV applications. The KSN-2457A-1C19+ is packaged in a metal case (size of 0.80" x 0.58" x 0.24") to shield against unwanted signals and noise.

Key Features

Feature	Advantages
Low phase noise and spurious: • Phase noise: -110 dBc/Hz typ. @ 10 kHz offset • Comparison spurious: -95 dBc typ. • Reference spurious: -95 dBc typ.	Low phase noise and spurious improve system EVM (Error Vector Magnitude).
Robust design and construction	To enhance the robustness of KSN-2457A-1C19+, 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, 0.80" x 0.58" x 0.24"	The small size enables the KSN-2457A-1C19+ to be used in compact designs.

Surface Mount

NON-CATALOG

Frequency Synthesizer

KSN-2457A-1C19+

50Ω 2457.6 MHz (fixed)

Features

- Fixed frequency without external programming
- Integrated microcontroller
- High reliability over temperature changes
- Robust design and construction
- Low operating voltage (VCC VCO=+5V, VCC PLL=+3.3V)
- Small size 0.80" x 0.58" x 0.24"

CASE STYLE: DK1171

+RoHS Compliant

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

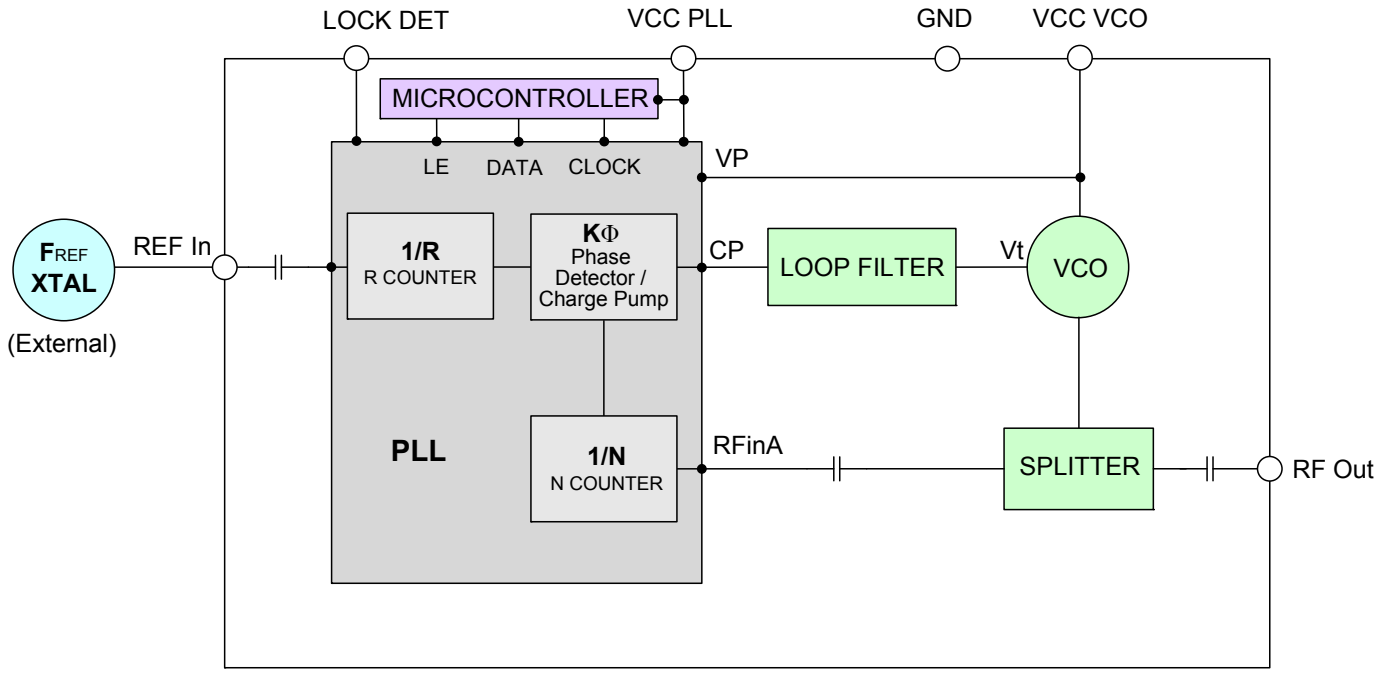
Applications

- CATV

General Description

The KSN-2457A-1C19+ is a Frequency Synthesizer, designed to operate at 2457.6 MHz for CATV applications. The KSN-2457A-1C19+ is packaged in a metal case (size of 0.80" x 0.58" x 0.24") to shield against unwanted signals and noise. To enhance the robustness of KSN-2457A-1C19+, 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



Notes

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Electrical Specifications *(over operating temperature 0°C to +70°C)*

Parameters		Test Conditions	Min.	Typ.	Max.	Units
Frequency Range (fixed)		-	2457.6	-	2457.6	MHz
Step size		-	-	10.24		MHz
Settling Time (Power on to lock)		Within ± 1 kHz	-	40	-	mSec
Output Power		-	+1	+4.5	+7	dBm
SSB Phase Noise		@ 100 Hz offset	-	-85	-	dBc/Hz
		@ 1 kHz offset	-	-90	-86	
		@ 10 kHz offset	-	-110	-105	
		@ 100 kHz offset	-	-134	-128	
		@ 1 MHz offset	-	-154	-149	
Integrated SSB Phase Noise		@100 Hz to 1 MHz	-	-55	-44	dBc
Reference Spurious Suppression		Ref. Freq. 10.24 MHz	-	-95	-73	
Comparison Spurious Suppression		Step Size 10.24 MHz	-	-95	-73	
Non - Harmonic Spurious Suppression		-	-	-90	-	
Harmonic Suppression		-	-	-36	-25	
VCO Supply Voltage		-	+4.75	+5.00	+5.25	V
PLL Supply Voltage		-	+3.15	+3.30	+3.45	
VCO Supply Current		-	-	47	55	mA
PLL Supply Current		-	-	11	20	
Reference Input (External)	Frequency	(square wave)	-	10.24	-	MHz
	Amplitude	-	-	1	-	V_{P-P}
	Input impedance	-	-	100	-	KΩ
	Phase Noise @ 1 kHz offset	-	-	-145	-	dBc/Hz
RF Output port Impedance		-	-	50	-	Ω
Digital Lock Detect	Locked	-	2.75	-	3.45	V
	Unlocked	-	-	-	0.40	V

Absolute Maximum Ratings

Parameters	Ratings
VCO Supply Voltage NOTE 1	5.8V
PLL Supply Voltage NOTE 1	3.6V
VCO Supply Voltage to PLL Supply Voltage NOTE 1	-0.3V to +5.8V
Reference Frequency Amplitude	$3.6V_{P-P}$
Data, Clock, LE Levels	N.A
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 1: Power on/off Sequence:
Power on: VCO Supply Voltage, followed by PLL Supply Voltage.
Power off: PLL Supply Voltage, followed by VCO Supply Voltage.

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Typical Performance Data

FREQUENCY (MHz)	POWER OUTPUT (dBm)			VCO CURRENT (mA)			PLL CURRENT (mA)		
	-5°C	+25°C	+75°C	-5°C	+25°C	+75°C	-5°C	+25°C	+75°C
2457.6	4.50	4.76	4.18	46.61	47.15	48.21	9.95	10.18	11.50

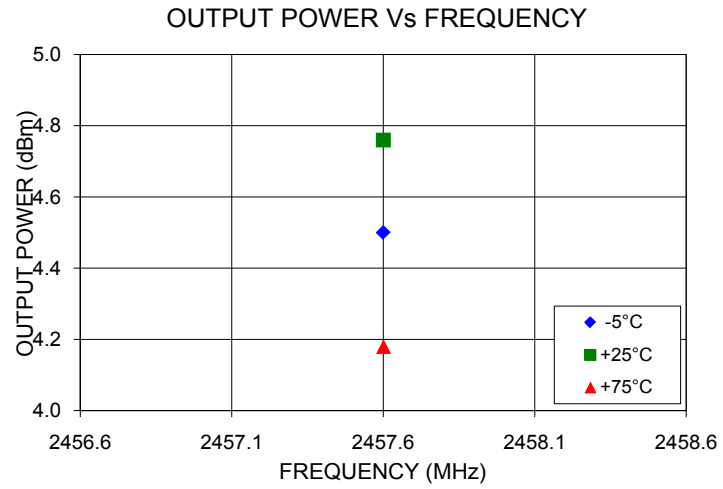
FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-5°C	+25°C	+75°C	-5°C	+25°C	+75°C
2457.6	-28.51	-35.78	-48.32	-32.70	-32.10	-31.16

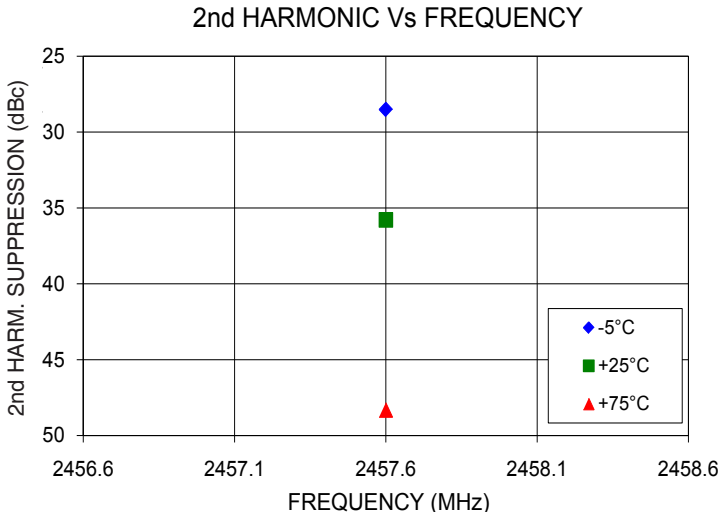
FREQUENCY	@TEMP.	PHASE NOISE (dBc/Hz) @OFFSETS				
		100Hz	1kHz	10kHz	100kHz	1MHz
2457.6	-5°C	-83.86	-92.84	-109.28	-134.78	-155.12
	+25°C	-86.44	-91.88	-109.11	-134.30	-153.75
	+75°C	-83.37	-90.44	-108.56	-132.80	-153.24

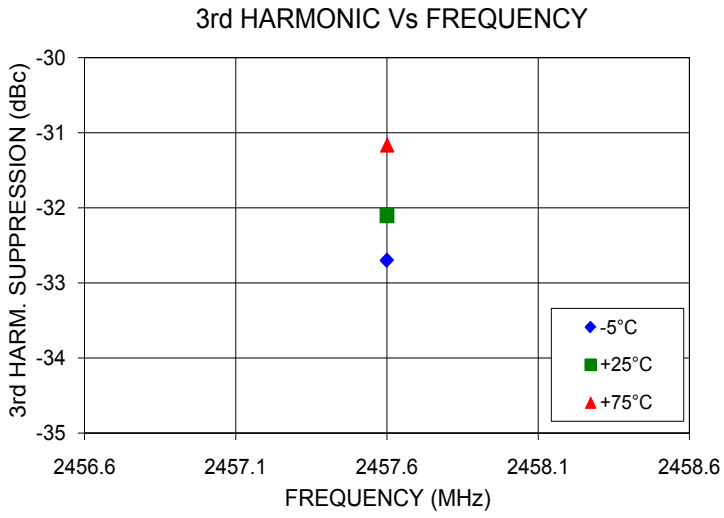
REFERENCE & COMPARISON SPURIOUS ORDER n	REFERENCE & COMPARISON SPURIOUS @Fcarrier 2457.6MHz+(n*Fref or Fcomp) (dBc) note 1		
	-5°C	+25°C	+75°C
-5	-103.83	-102.62	-119.79
-4	-102.82	-101.42	-117.14
-3	-106.95	-102.13	-118.48
-2	-106.97	-100.95	-116.65
-1	-105.63	-105.55	-108.58
0 note 2	-	-	-
+1	-95.62	-98.87	-105.56
+2	-99.30	-100.27	-108.17
+3	-104.35	-102.31	-107.55
+4	-103.36	-100.76	-109.62
+5	-103.20	-101.83	-109.43

Note 1: Comparison frequency = Reference frequency= 10.24MHz
Note 2: All spurs are referenced to carrier signal (n=0).

Typical Performance Curves







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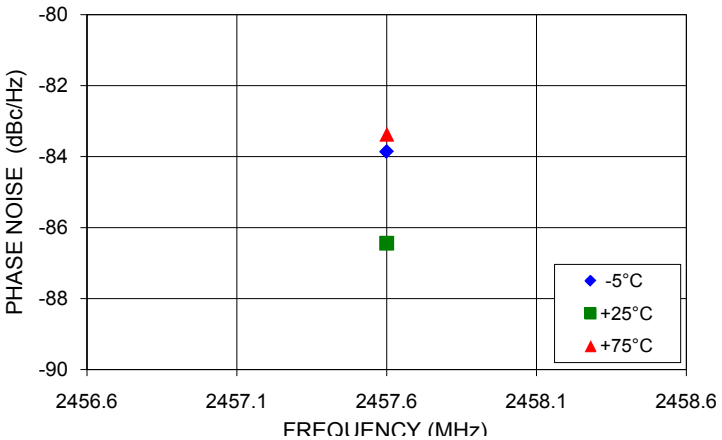
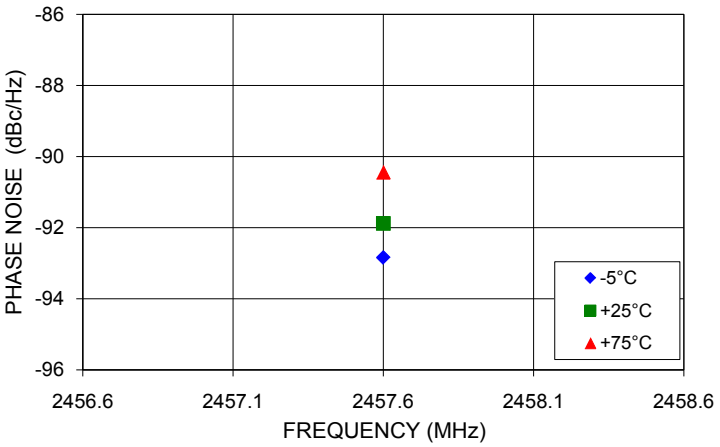
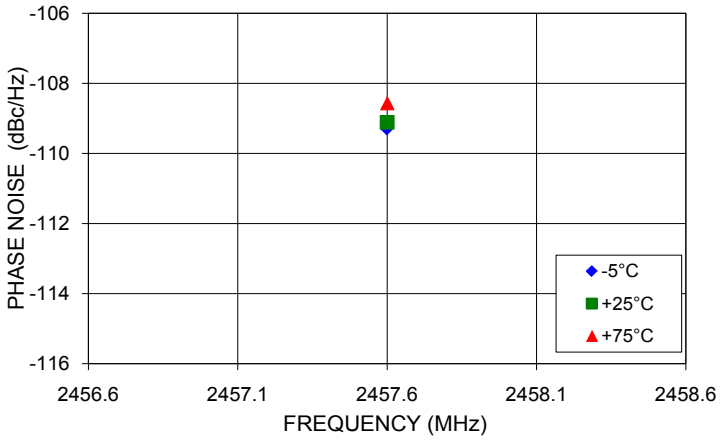
PHASE NOISE @100Hz offset



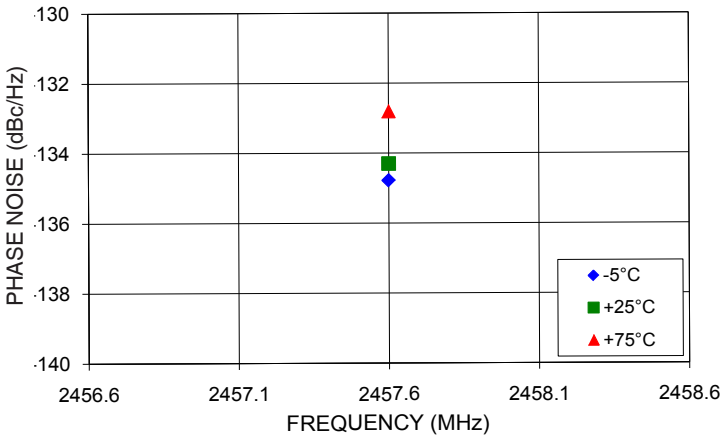
PHASE NOISE @1kHz offset



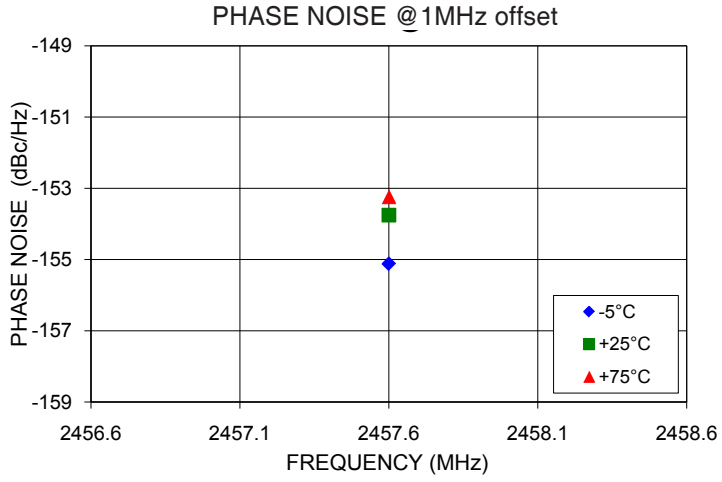
PHASE NOISE @10kHz offset



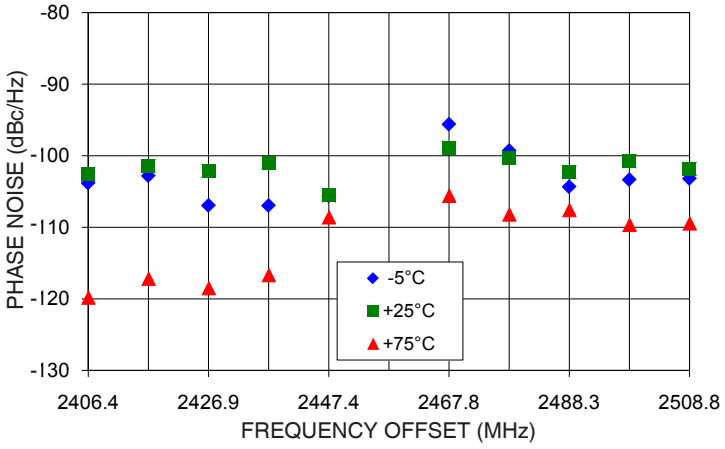
PHASE NOISE @100kHz offset



PHASE NOISE @1MHz offset



REFERENCE & COMPARISON SPURIOUS
Vs FREQ. OFFSET @ Fcar = 2457.6MHz



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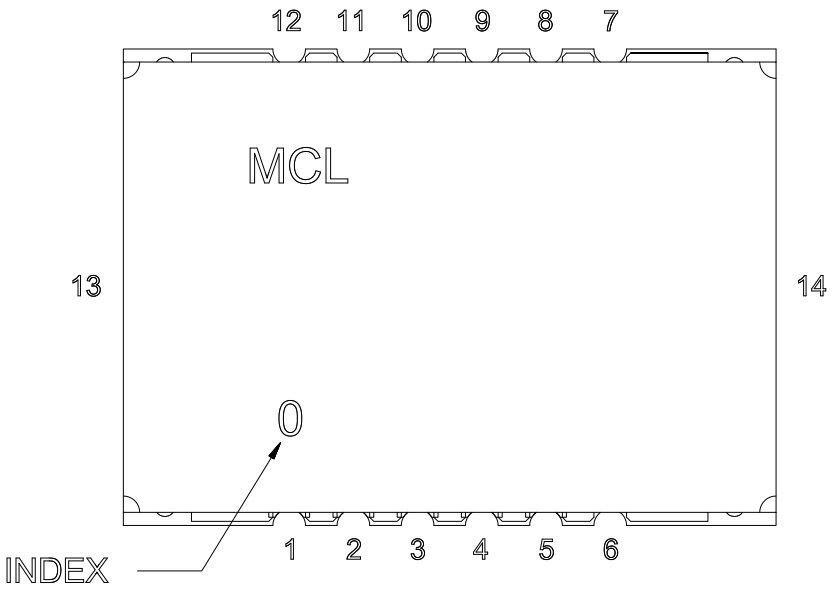
Pin Configuration

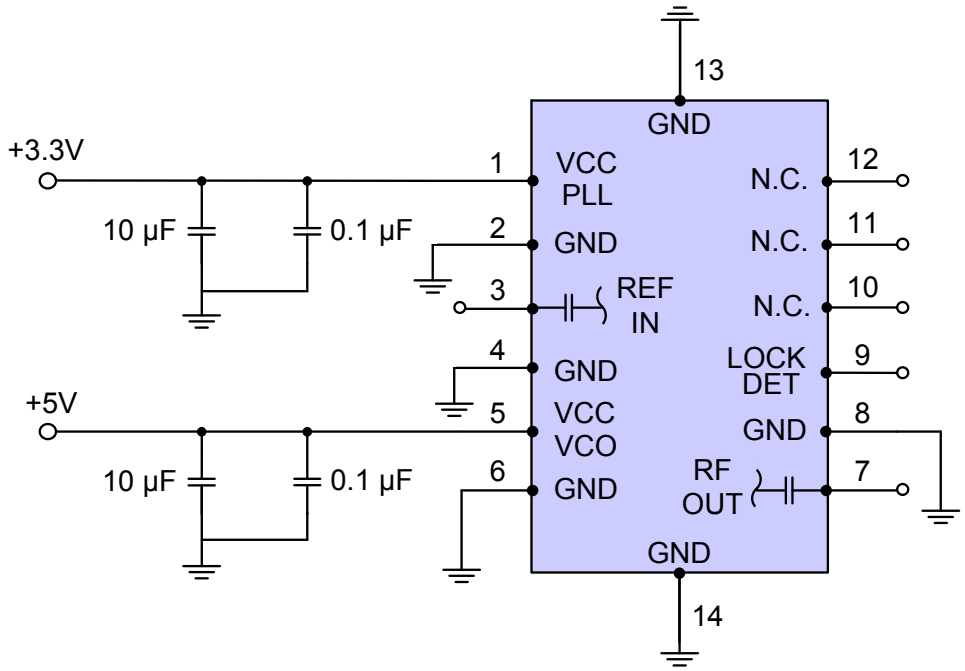


Pin Connection

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	NOT CONNECTED
11	NOT CONNECTED
12	NOT CONNECTED
13	GND
14	GND

Recommended Application Circuit

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



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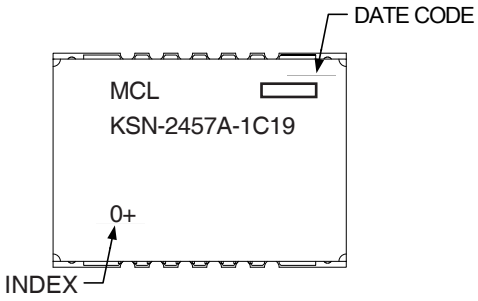
Device Marking



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: DK1171

Tape & Reel: TR-F28

Suggested Layout for PCB Design: PL-249

Evaluation Board: TB-567-1+F

Environment Ratings: ENV65T2

Synthesizer evaluation software to set PLL registers manually is available at http://www.minicircuits.com/support/software_download.html

Frequency Synthesizer KSN-2457A-1C19+

Typical Performance Data

FREQ. (MHz)	POWER OUTPUT (dBm)			HARMONICS (dBc)						VCO CURRENT (mA)			PLL CURRENT (mA)		
				F2			F3								
	-5ºC	+25ºC	+75ºC	-5ºC	+25ºC	+75ºC	-5ºC	+25ºC	+75ºC	-5ºC	+25ºC	+75ºC	-5ºC	+25ºC	+75ºC
2457.6	4.50	4.76	4.18	-28.51	-35.78	-48.32	-32.70	-32.10	-31.16	46.61	47.15	48.21	9.95	10.18	11.50

FREQ. (MHz)	PHASE NOISE (dBc/Hz) @ OFFSETS														
	-5ºC					+25ºC					+75ºC				
	100Hz	1kHz	10kHz	100kHz	1MHz	100Hz	1kHz	10kHz	100kHz	1MHz	100Hz	1kHz	10kHz	100kHz	1MHz
2457.6	-83.86	-92.84	-109.28	-134.78	-155.12	-86.44	-91.88	-109.11	-134.30	-153.75	-83.37	-90.44	-108.56	-132.80	-153.24

REFERENCE & COMPARISON SPURIOUS ORDER n	REFERENCE & COMPARISON SPURIOUS @Fcarrier 2457.6MHz± (n*Fcomparison) (dBc) NOTE 1		
	-5ºC	+25ºC	+75ºC
-5	-103.83	-102.62	-119.79
-4	-102.82	-101.42	-117.14
-3	-106.95	-102.13	-118.48
-2	-106.97	-100.95	-116.65
-1	-105.63	-105.55	-108.58
0 note 2	-	-	-
+1	-95.62	-98.87	-105.56
+2	-99.30	-100.27	-108.17
+3	-104.35	-102.31	-107.55
+4	-103.36	-100.76	-109.62
+5	-103.20	-101.83	-109.43

Note 1: Comparison frequency & Reference frequensy 10.24 MHz
Note 2: All spurs are referenced to carrier signal (n=0).

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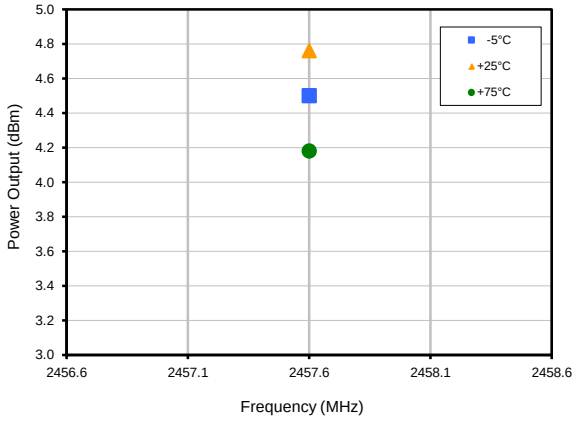
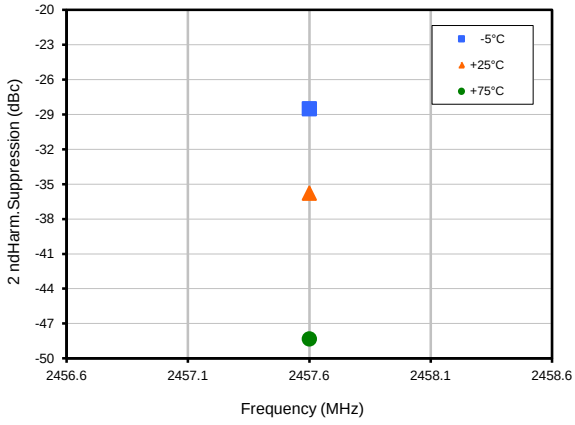
Frequency Synthesizer KSN-2457A-1C19+

Typical Performance Data

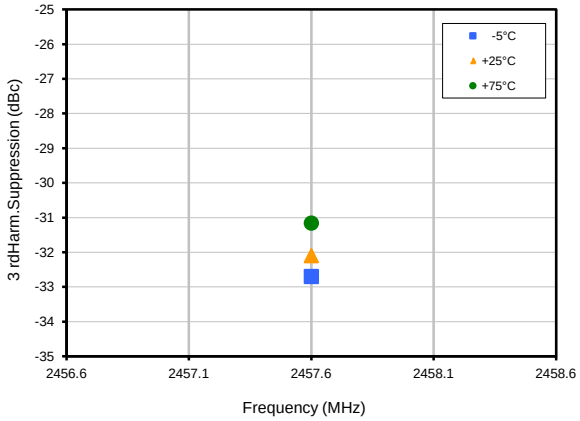
Power Output Vs Frequency



2nd Harmonics Vs Frequency



3rd Harmonics Vs Frequency



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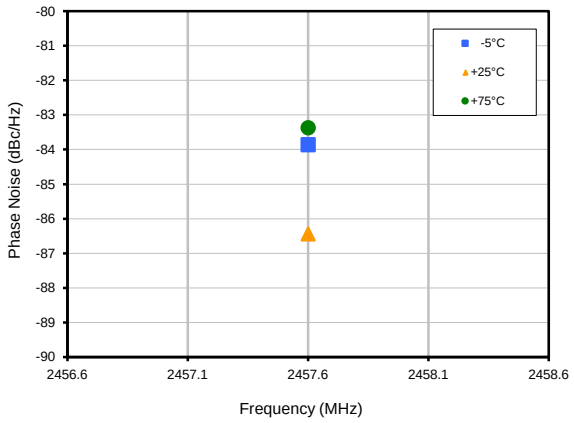
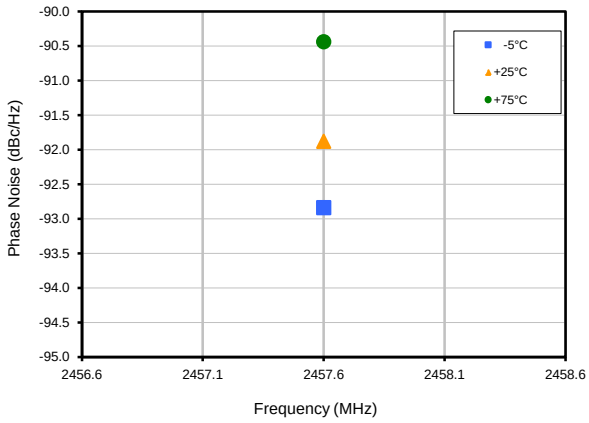
Typical Performance Data

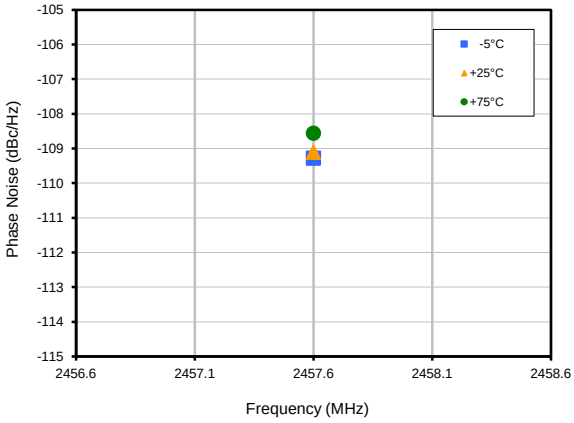
Phase Noise @ 100 Hz offset



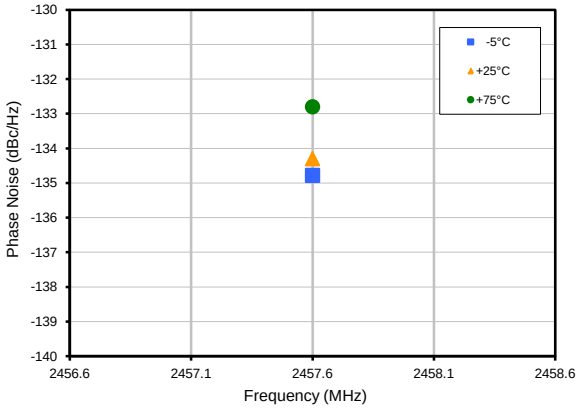
Phase Noise @ 1kHz offset



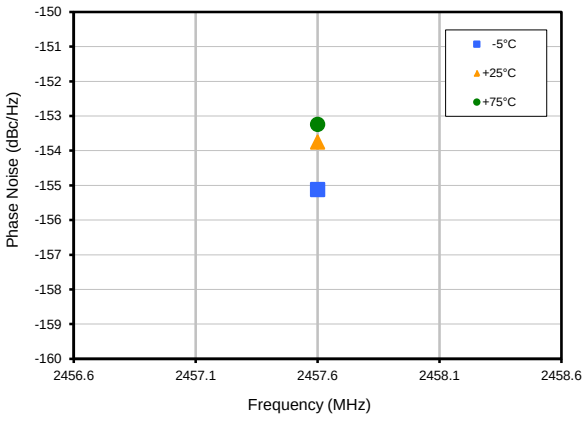
Phase Noise @ 10kHz offset



Phase Noise @ 100kHz offset



Phase Noise @ 1MHz offset



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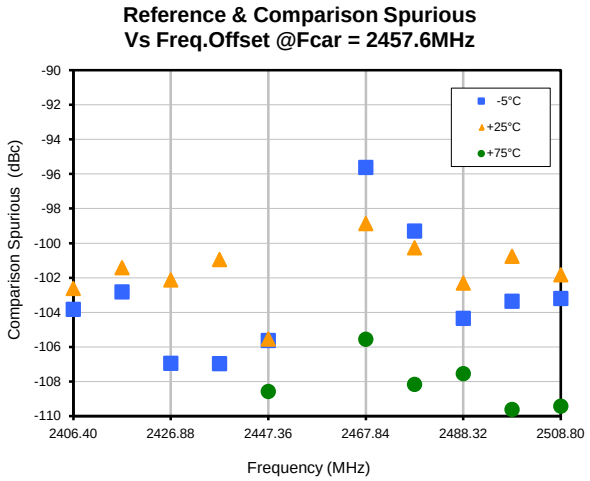
Typical Performance Data



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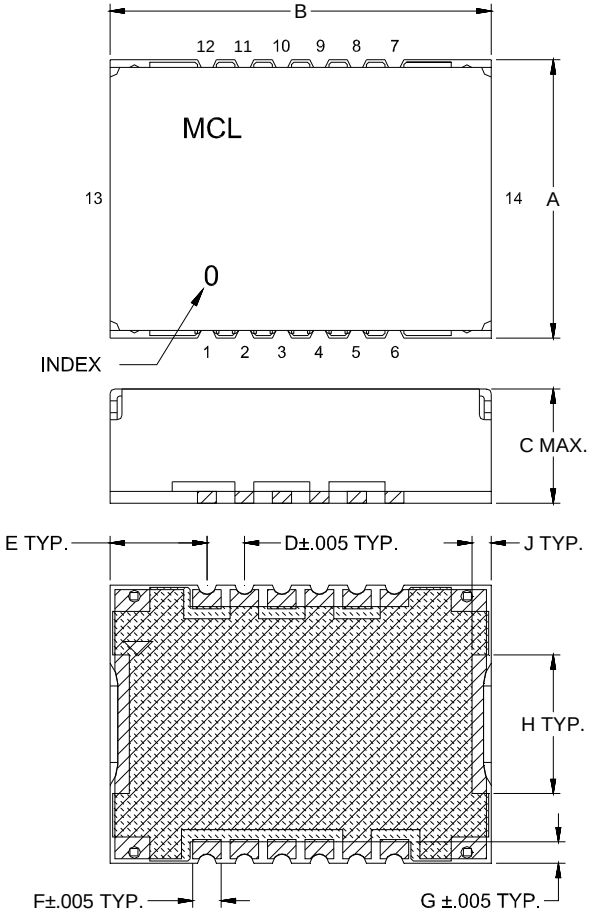
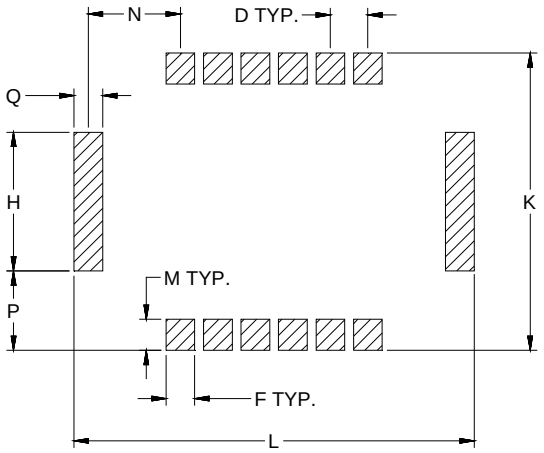
Case Style DK

Outline Dimensions

DK1171



Suggested PCB Land Pattern



METALLIZATION

SOLDER RESIST

CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	WT. GRAM
DK1171	.584 (14.83)	.800 (20.32)	.240 (6.10)	.079 (2.01)	.203 (5.16)	.060 (1.52)	.045 (1.14)	.291 (7.39)	.039 (1.0)	.624 (15.85)	.840 (21.34)	.065 (1.65)	.193 (4.90)	.170 (4.32)	.060 (1.52)	2.5

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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INTERNET http://www.minicircuits.com

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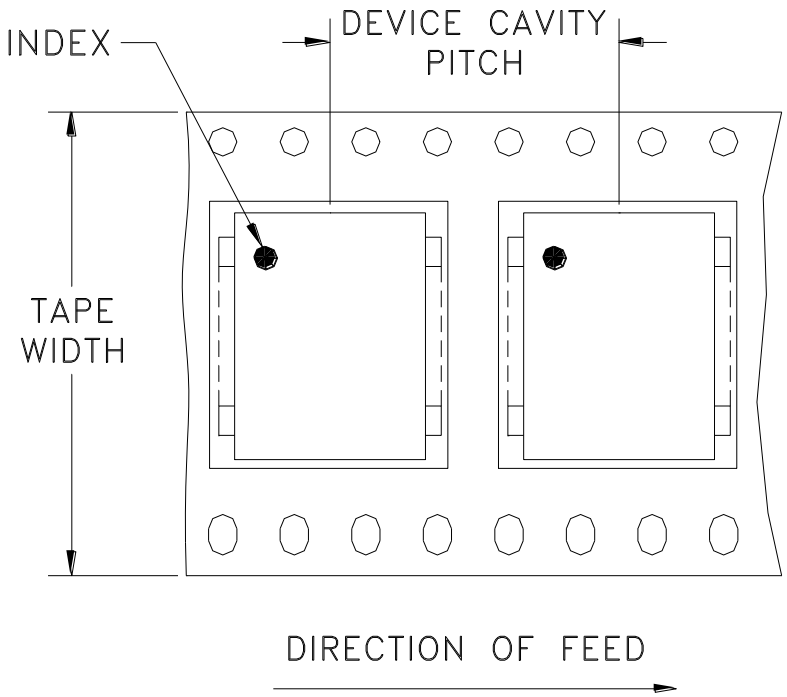
*Mini-Circuits **ISO 9001 & ISO 14001** Certified*

Tape & Reel Packaging TR-F28

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
32	20	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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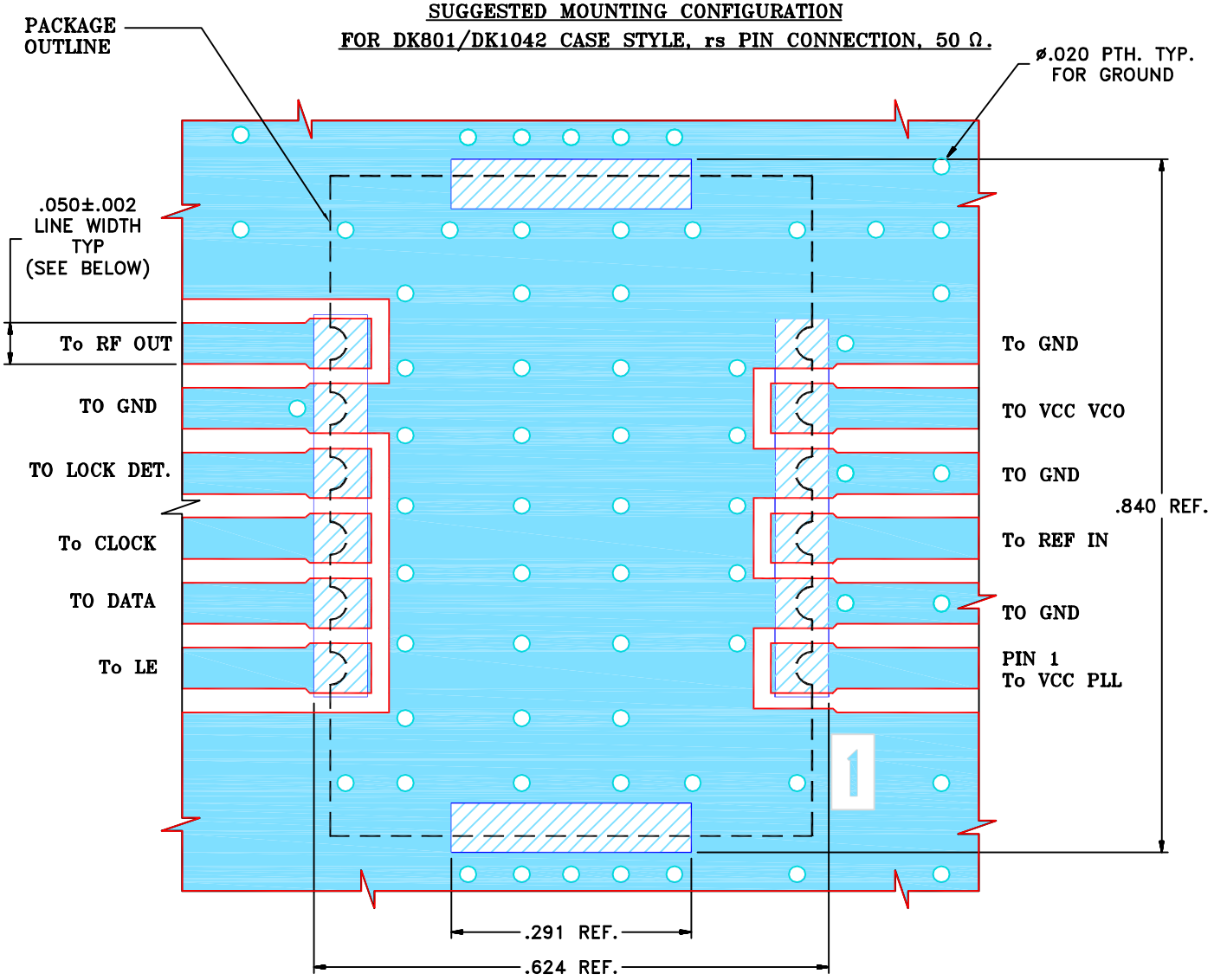
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M108069	NEW RELEASE	11/06	DK	HH
A	M110535	MODIFY GROUND PADS	03/07	DK	HH
B	M126537	DELETE CHIP COMP. & TABLE OF VALUES	03/10	DK	HH
B	R78979	DELETE CHIP COMP. & TABLE OF VALUES	03/10	DK	HH

SUGGESTED MOUNTING CONFIGURATION
FOR DK801/DK1042 CASE STYLE, rs PIN CONNECTION, 50 Ω.



NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS. .025"±.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 SOLDERMASK

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	DK (RAVON)	27 MAR 07
TOLERANCES ON:	CHECKED	RZ (RAVON)	27 MAR 07
2 PL DECIMALS ±	APPROVED	HH (RAVON)	27 MAR 07
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

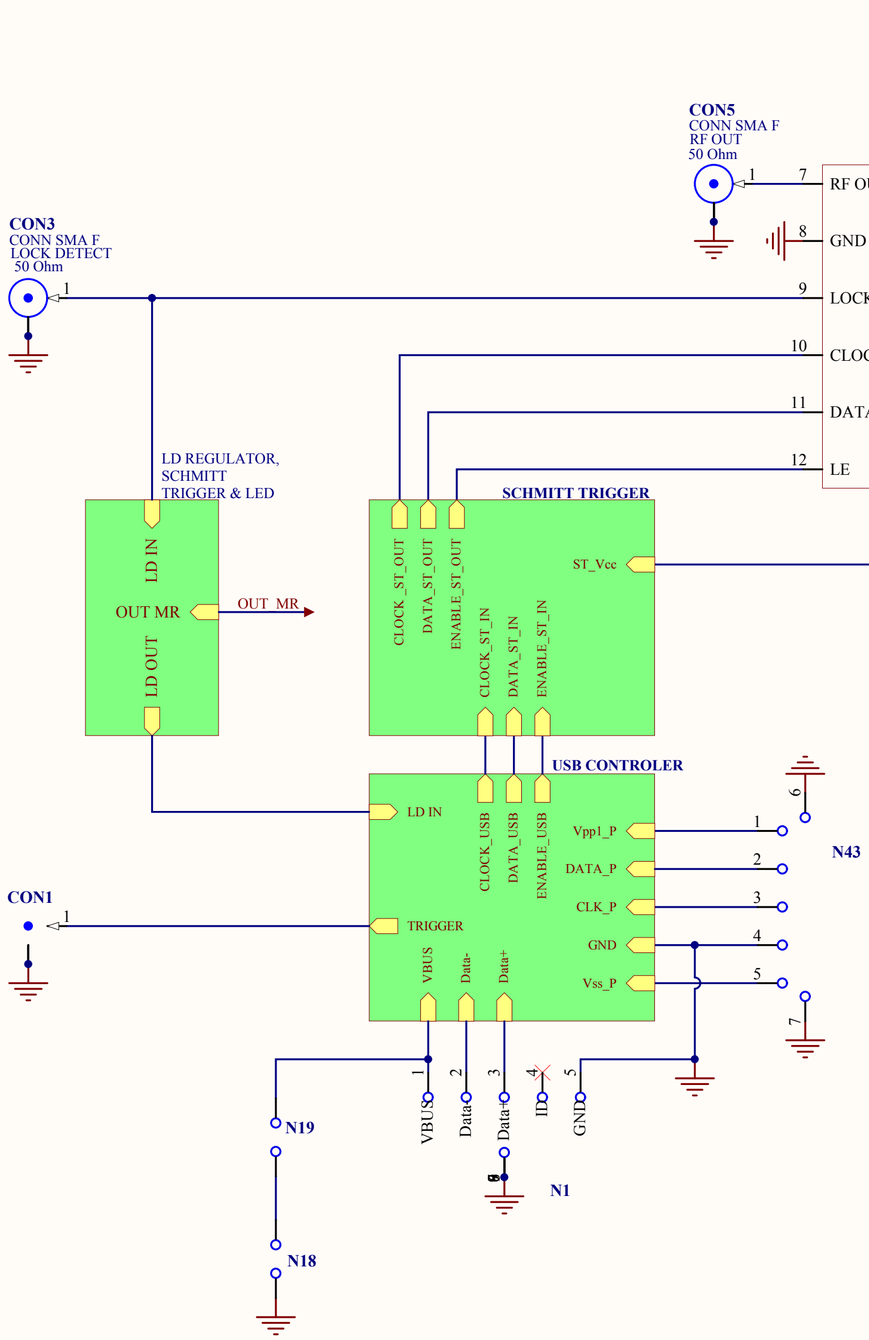
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, rs ,DK801/DK1042, KSN
TB-567+ (50 Ω)

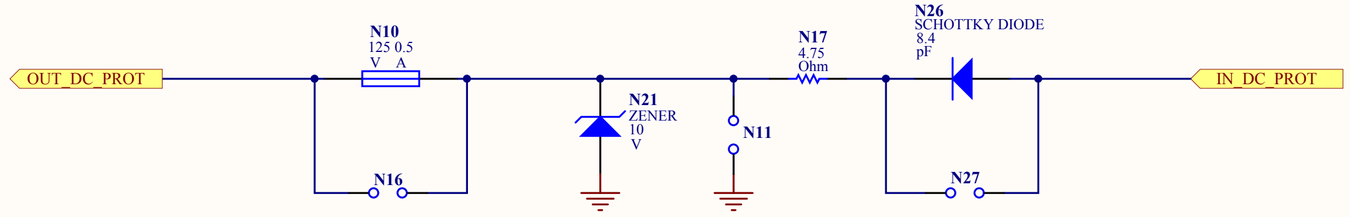
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-249	B

FILE:	SCALE:	SHEET:
98PL249	5:1	1 OF 1

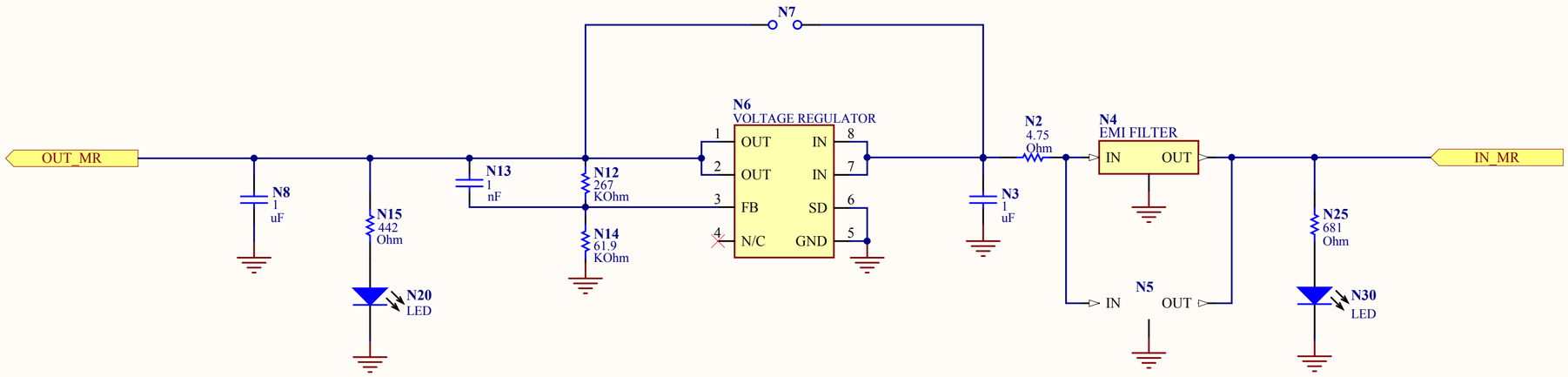
ELECTRICAL SCHEME-GENERAL
(TB for KSN)



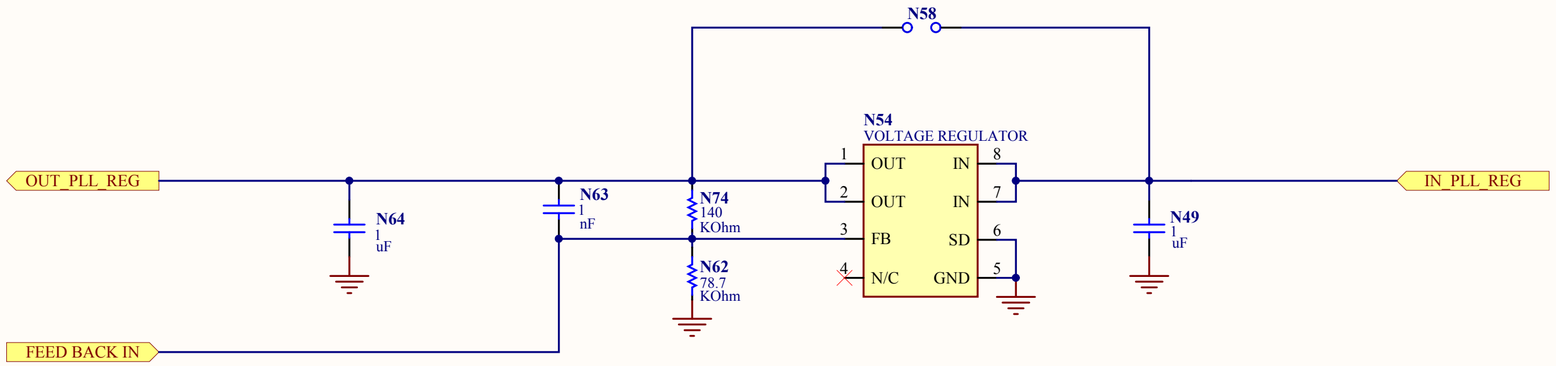
DC PROTECTIONS



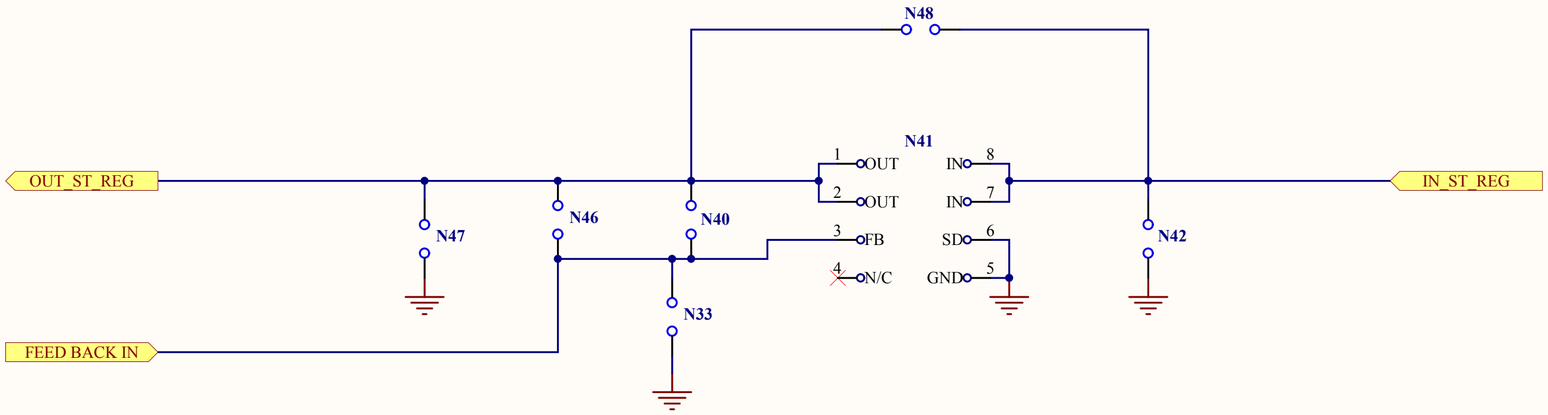
MAIN REGULATOR



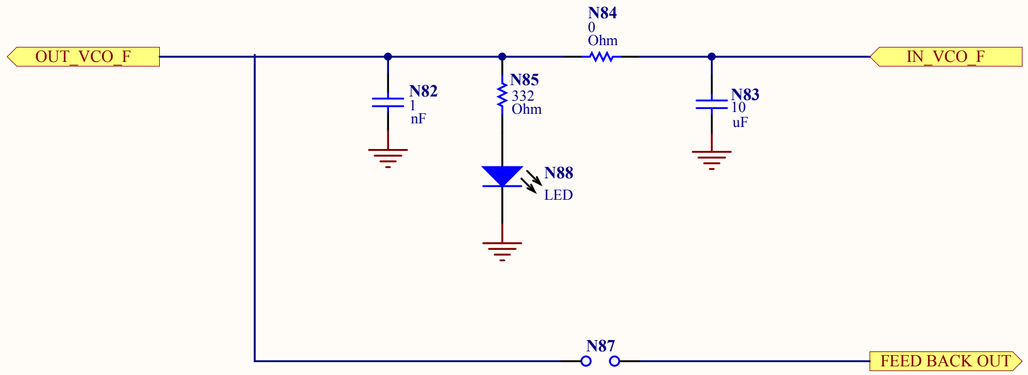
VCC PLL REGULATOR



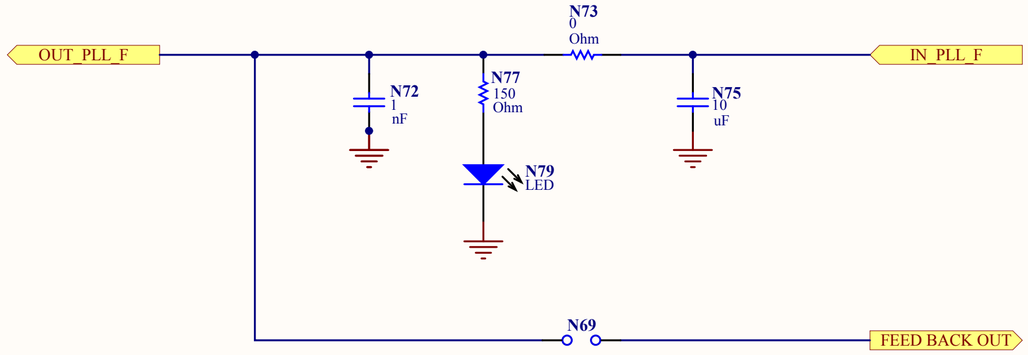
SCHMITT TRIGGER REGULATOR



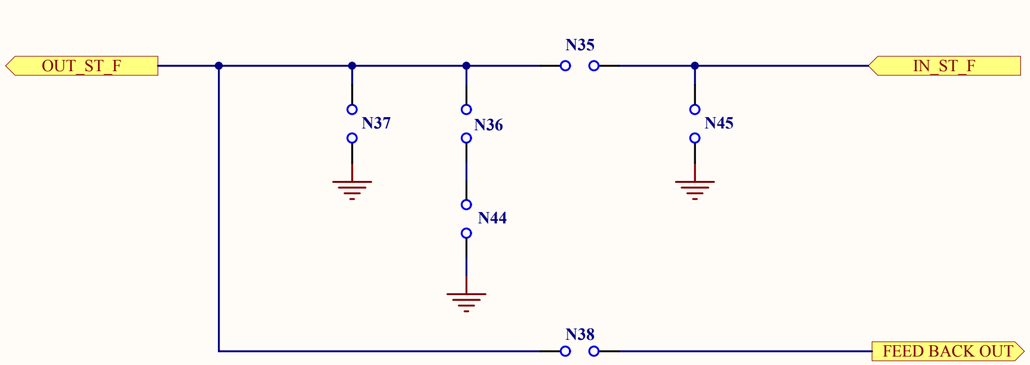
VCC VCO FILTERING



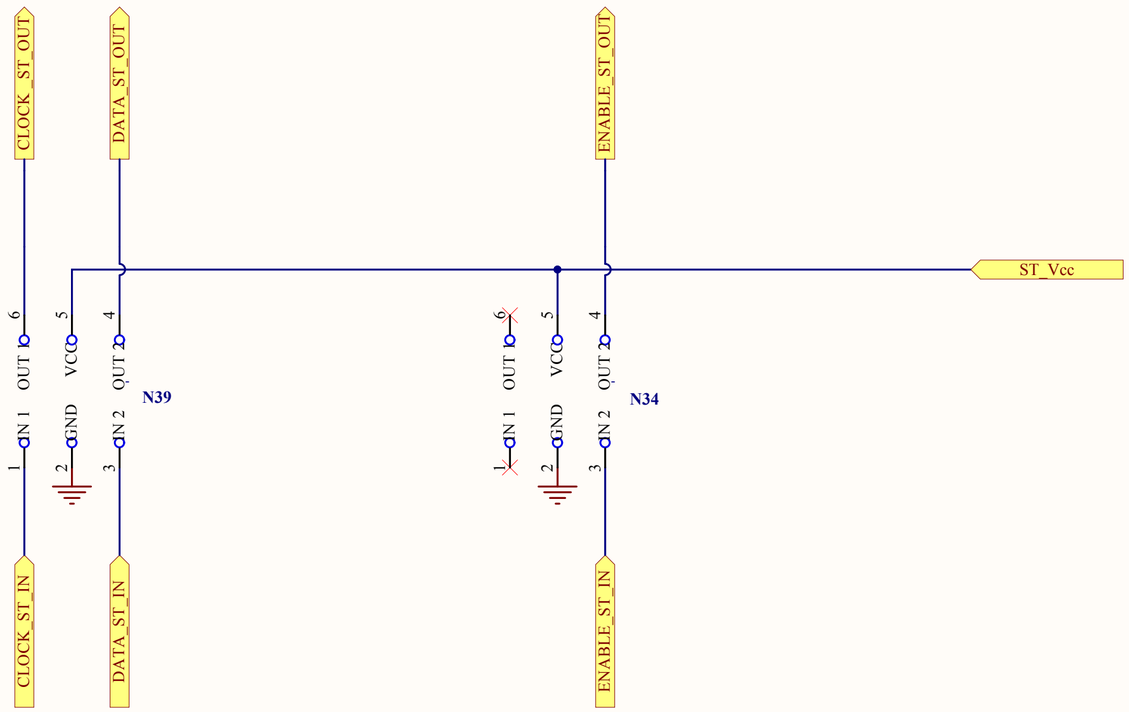
VCC PLL FILTERING



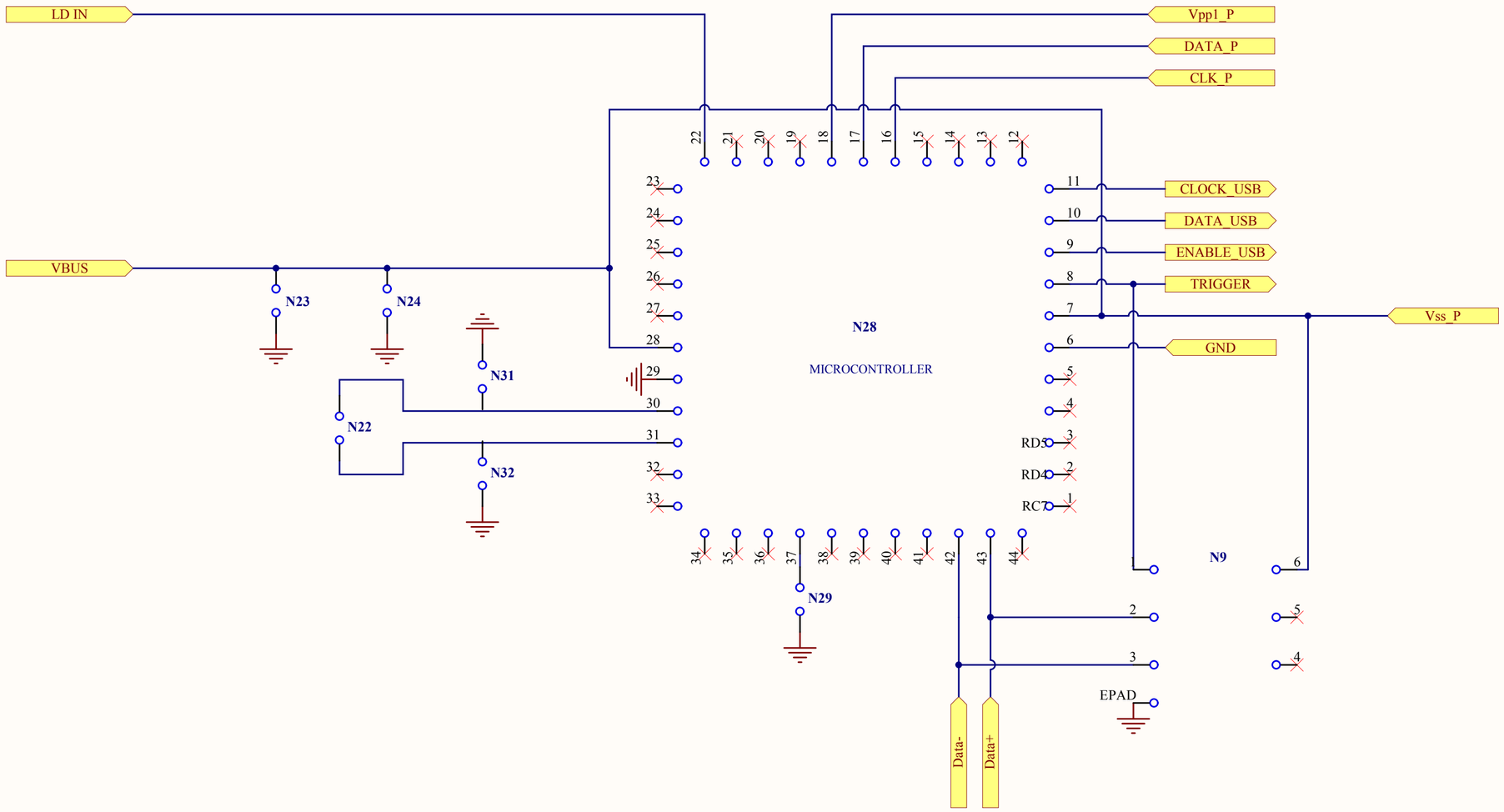
SCHMITT TRIGGER FILTERING



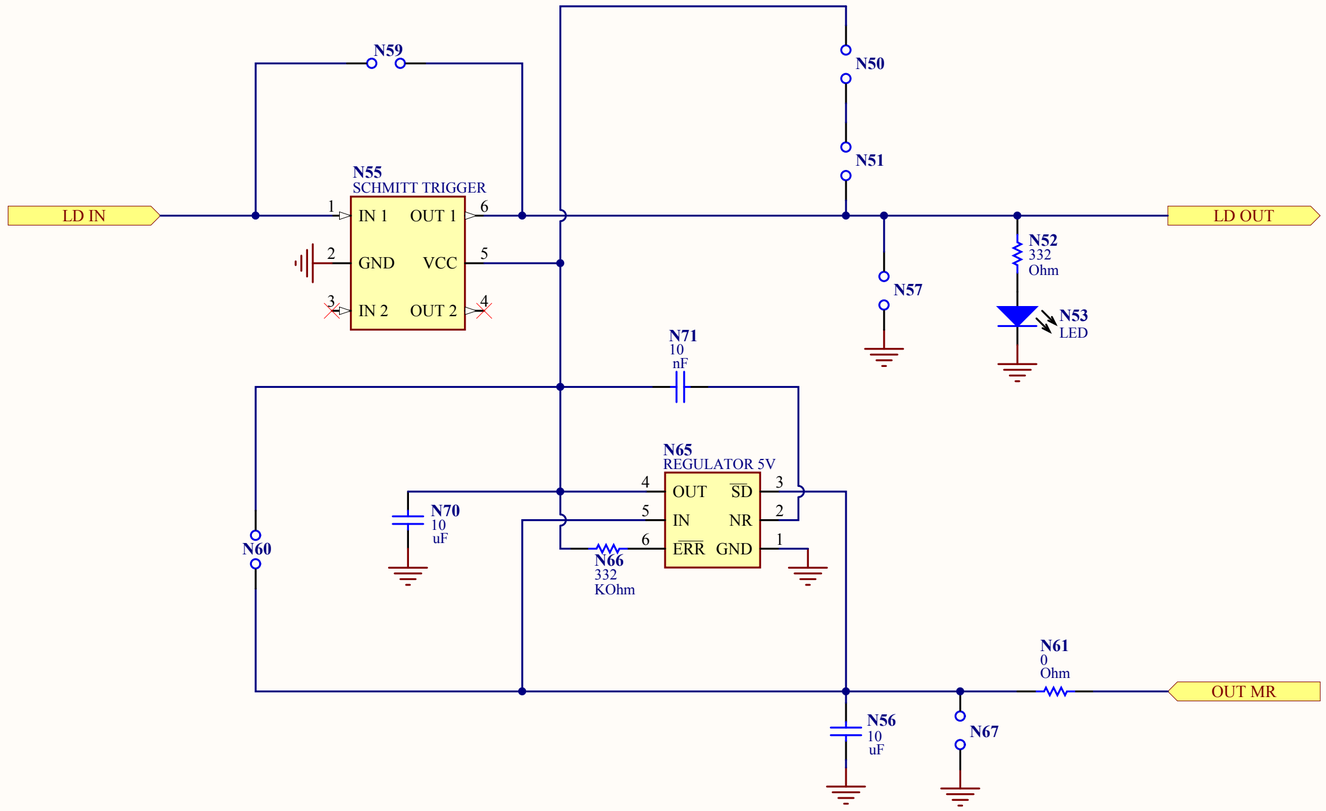
SCHMITT TRIGGER



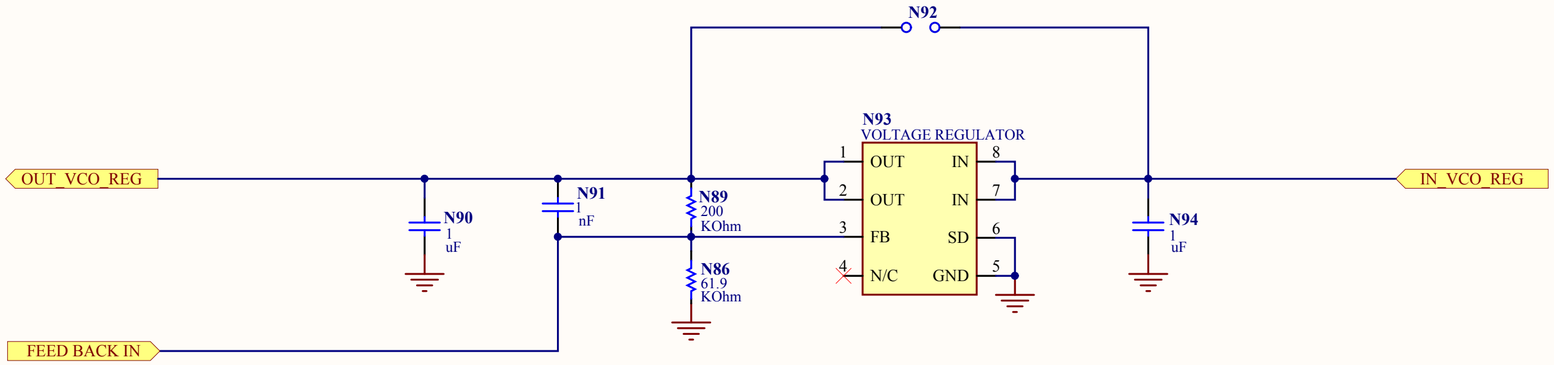
USB CONTROLER



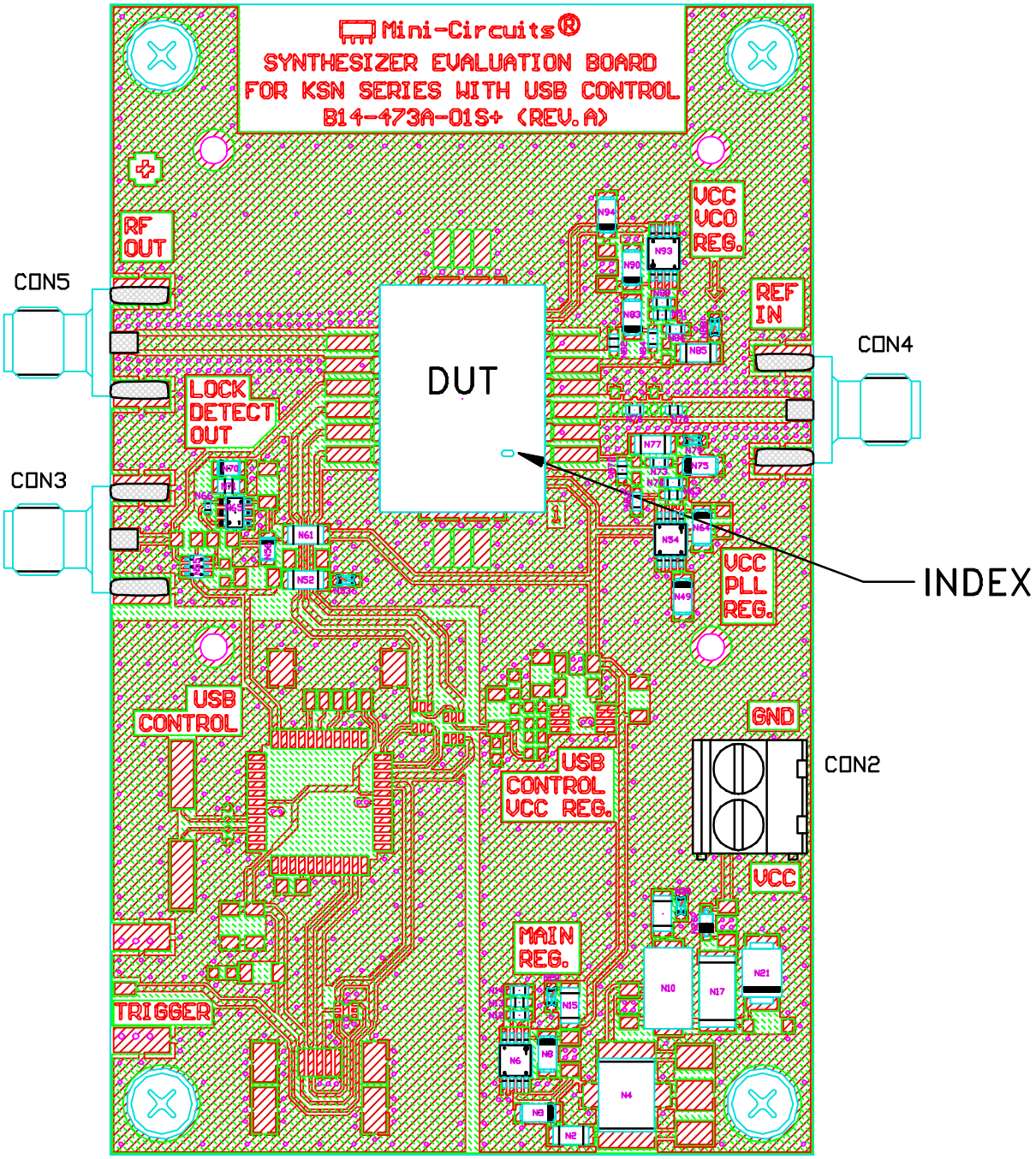
LD REGULATOR SCHMITT TRIGGER AND LED



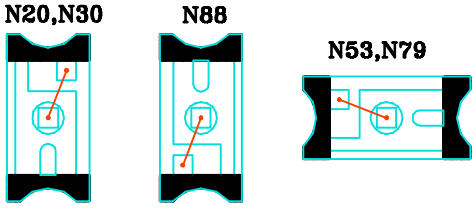
VCC VCO REGULATOR



Evaluation Board and Circuit



TB-567-1+F



NOTES:

1. SMA F JACK CONNECTORS.
2. PCB MATERIAL: FR4 OR EQUIVALENT, DIALECTRIC CONSTANT=4.7, DIALECTRIC THICKNESS=.059 INCH.

Mini-Circuits

Environmental Specifications ENV65T2

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