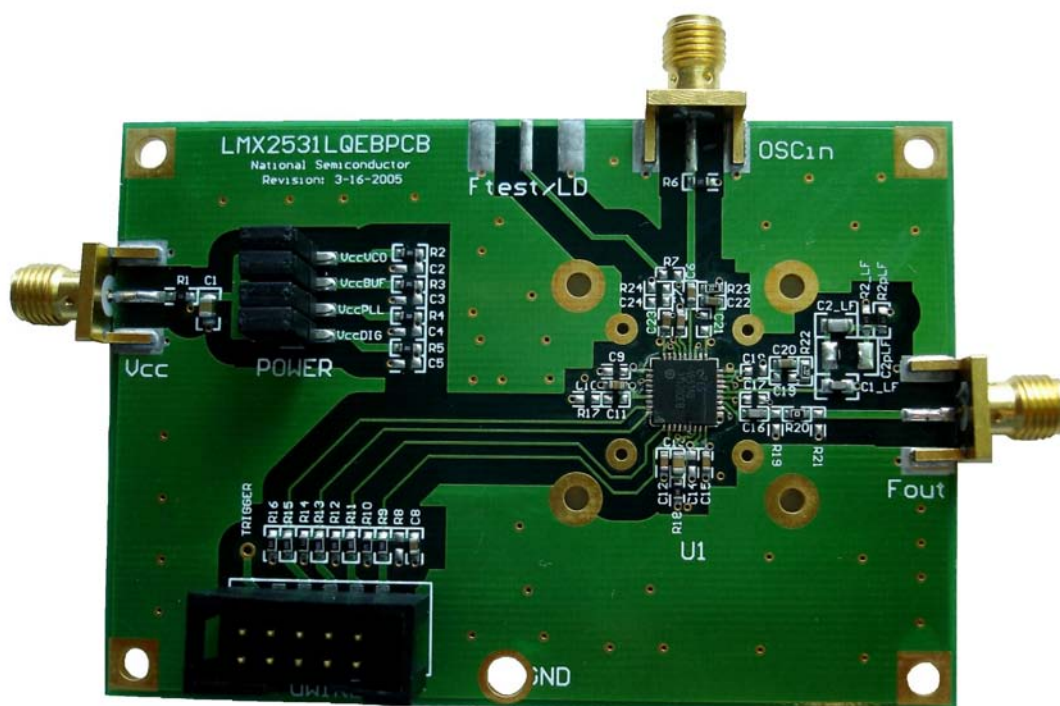




LMX2531LQ1500E

Evaluation Board Operating Instructions



National Semiconductor Corporation
Timing Devices Group

LMX2531LQ1500EFPEB Rev 10.12.2006



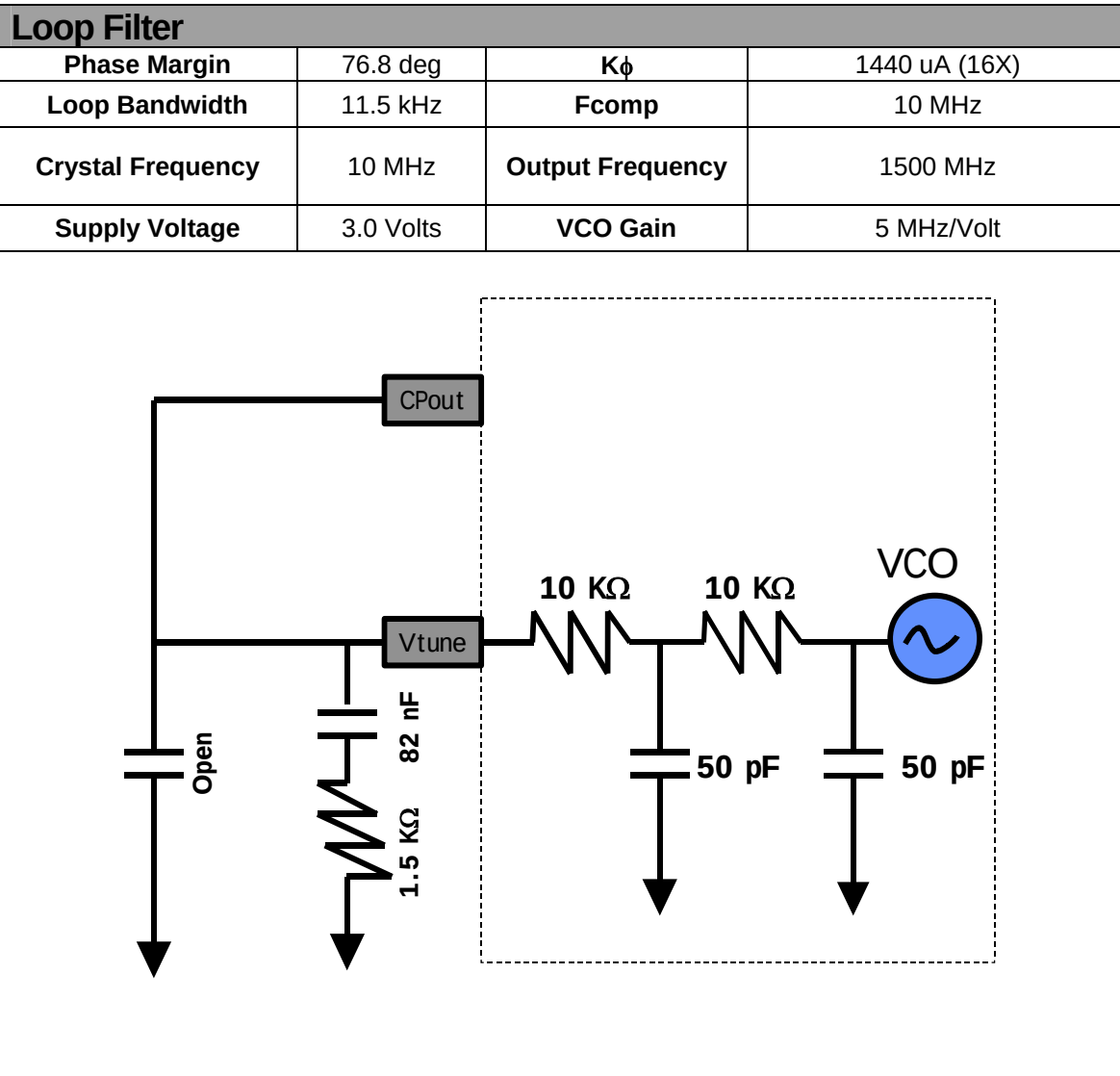
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General Description

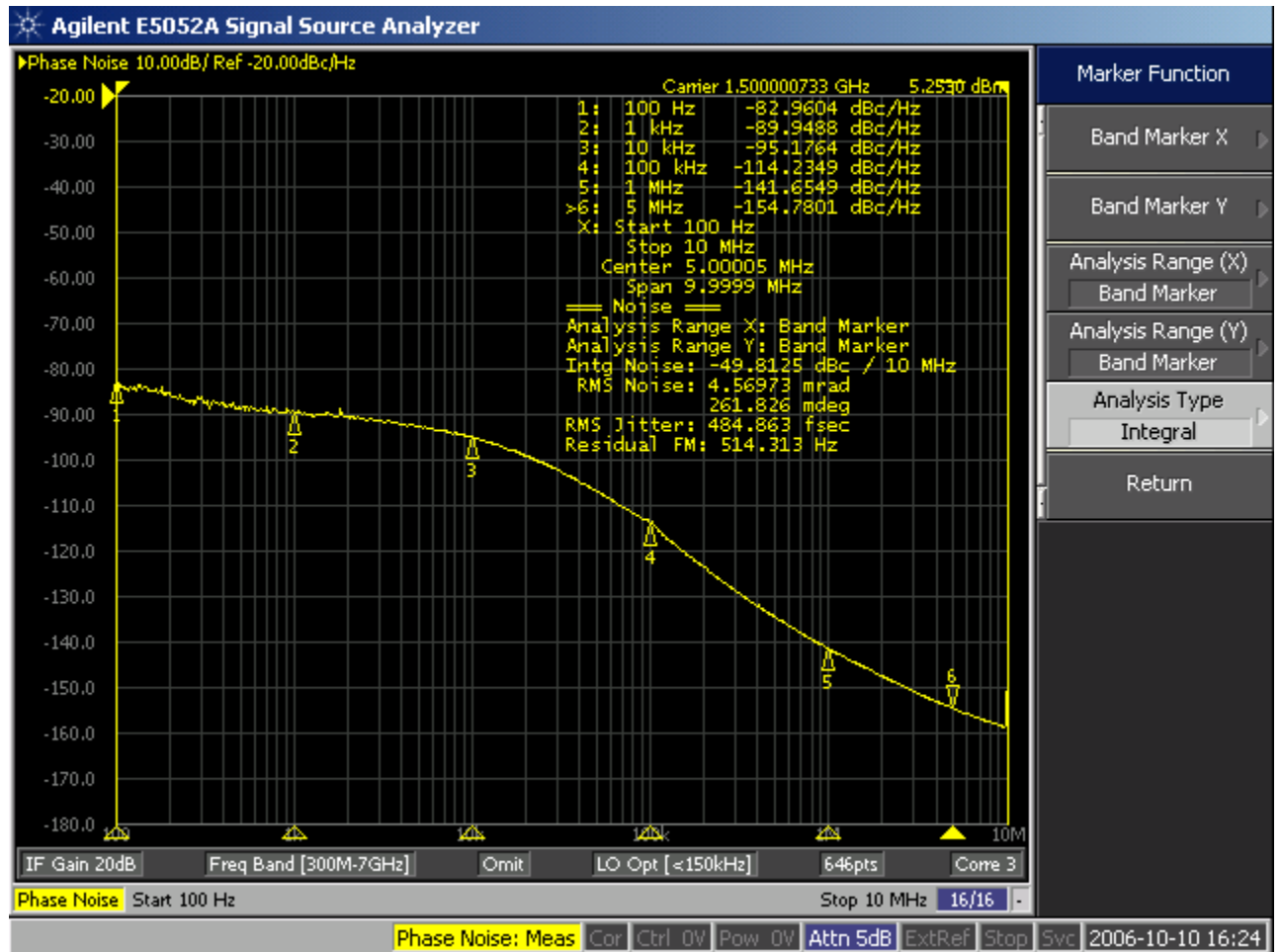
The LMX2531LQ1500E Evaluation Board simplifies evaluation of the LMX2531LQ1500E PLL/VCO synthesizer system. The board enables all performance measurements with no additional support circuitry. The evaluation board consists of a LMX2531LQ1500E device, and a cable assembly.

The cable assembly is bundled with the evaluation board for connecting to a PC through the parallel printer port. By means of **MICROWIRE™** serial port emulation, the *CodeLoader* software included can be run on a PC to facilitate the LMX2531LQ1500E internal register programming for the evaluation and measurement. In addition to this cable assembly, there is a microwire buffer board that ensures that the proper voltage levels are provided to the microwire inputs and also this reduces digital noise from computers through the parallel port.



Typical Performance Characteristics

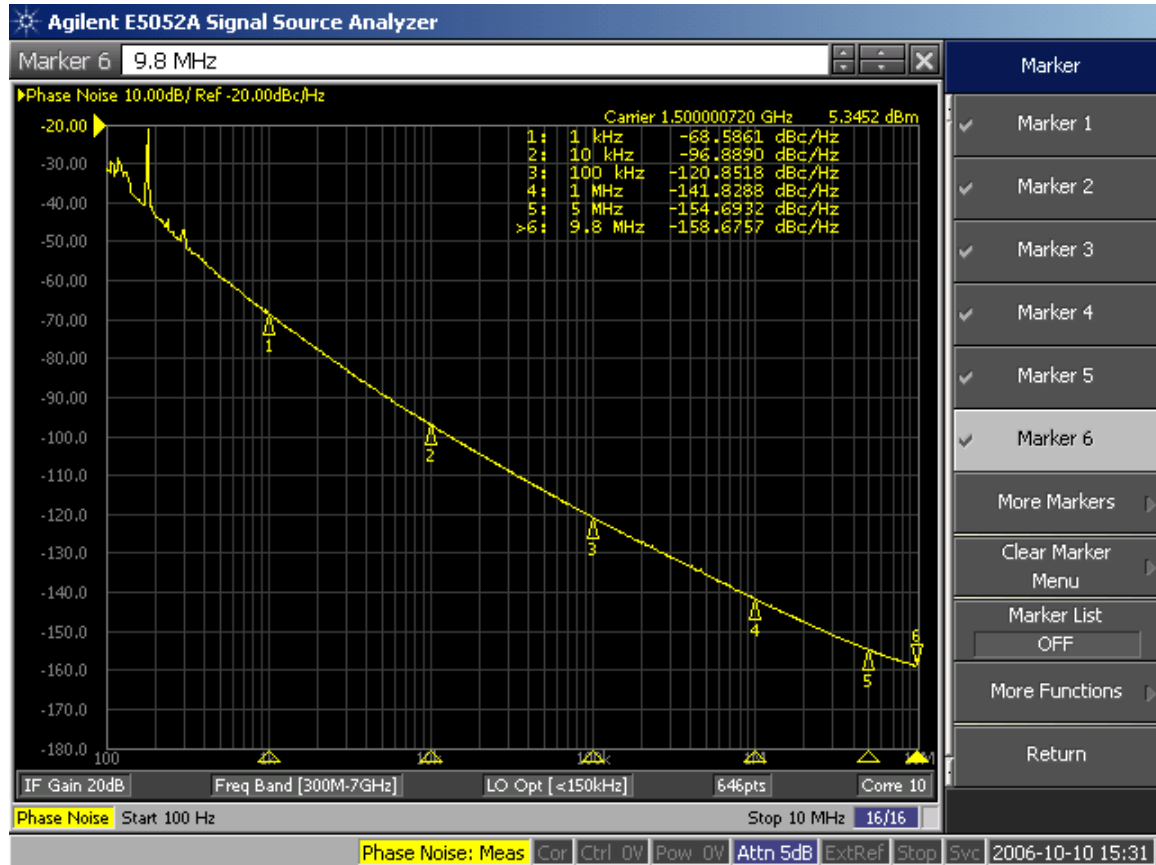
Default Design PLL Noise



The above picture was taken with default loop filter, which is optimized for minimum jitter. This jitter can be further reduced if there is a clean oscillator frequency available that is greater than 10 MHz. The jitter shown is better than 500 fs.

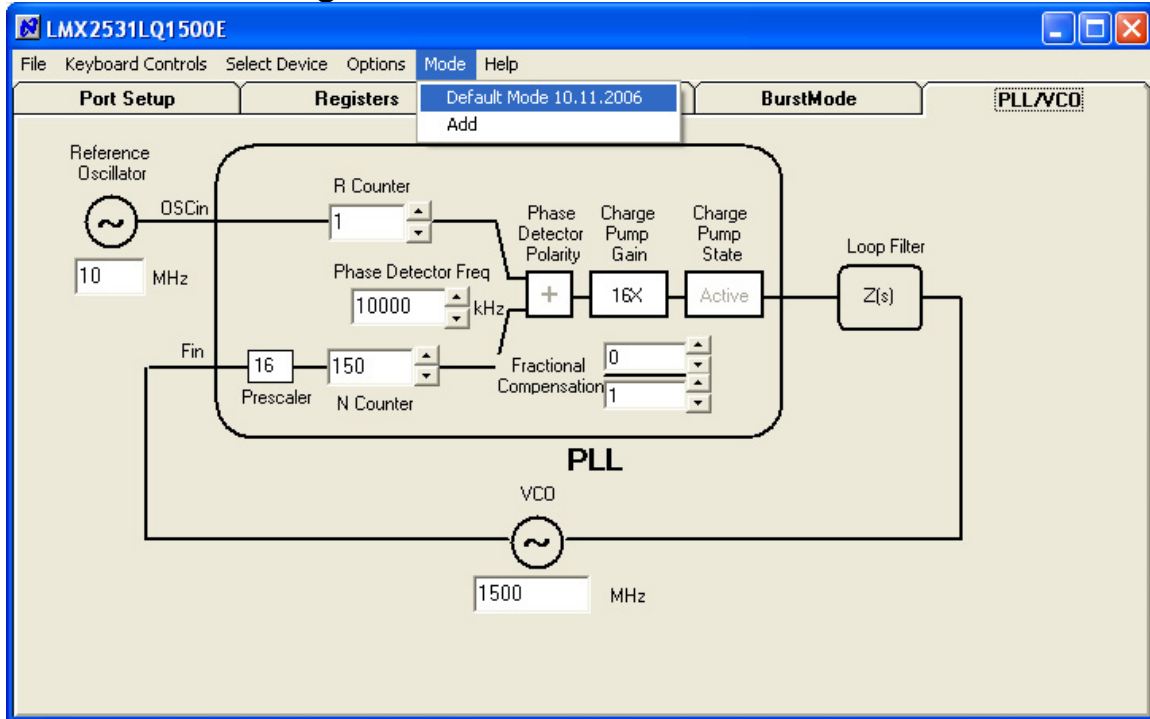
Raw VCO Noise

Raw VCO Noise



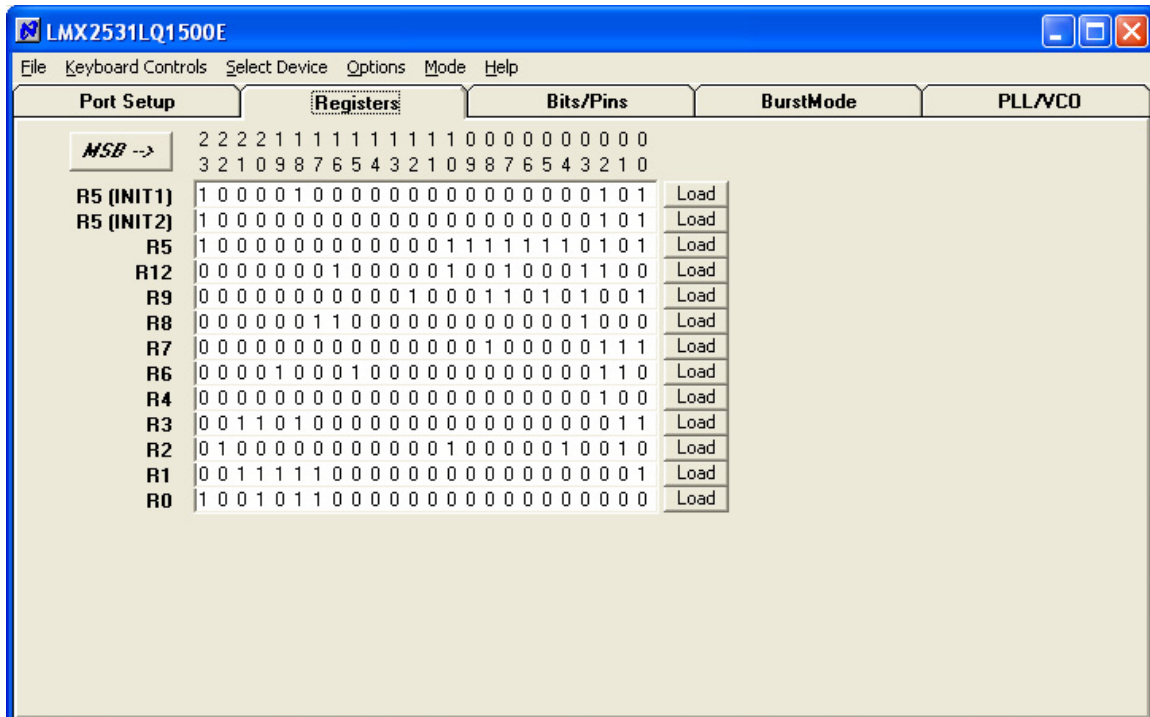
For this plot, the loop bandwidth was made very narrow to show the raw VCO phase noise.

CodeLoader Settings

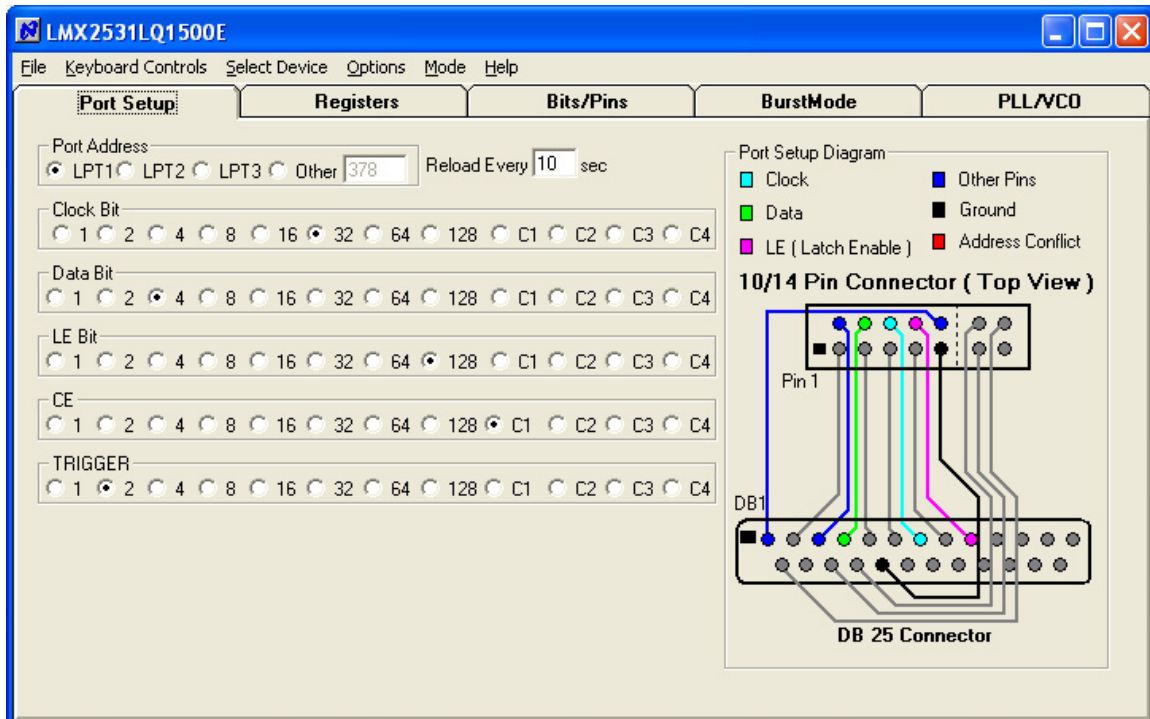


The screenshot shows the LMX2531LQ1500E CodeLoader interface with the 'Bits/Pins' tab selected. The interface is divided into several sections:

- INITIALIZATION**: REG_RST (unchecked).
- VCO OUTPUT**: DIV2 (unchecked).
- POWER CONTROLS**: EN_PLL (checked), EN_PLLLD01 (checked), EN_PLLLD02 (checked), EN_DIGLDO (checked), EN_VCO (checked), EN_VCOLDO (checked), EN_OSC (checked).
- VCO PN OPTIMIZATION**: VCO_ACISEL (8).
- VCO FREQUENCY CAL**: XTLDIV (Divide by 2), XTLSSEL (<20 MHz), XTLMAN (0), XTLMAN2 (unchecked).
- FRACTIONAL CONTROLS**: FDM (unchecked), ORDER (Reset Modulator), DITHER (Disabled).
- INTERNAL LOOP FILTER**: EN_LPFILTER (checked), C3_4_ADJ (C3=50pF, C4=50pF), R3_ADJ (10 Kohm), R4_ADJ (10 Kohm).
- FASTLOCK CONTROLS**: TOC (0), ICPFL (1X), R3_ADJ_FL (0 Ohm), R4_ADJ_FL (0 Ohm).
- LOCK DETECT**: LDDIV4 (Disabled).
- Program Pins**: CE (checked), TRIGGER (unchecked).

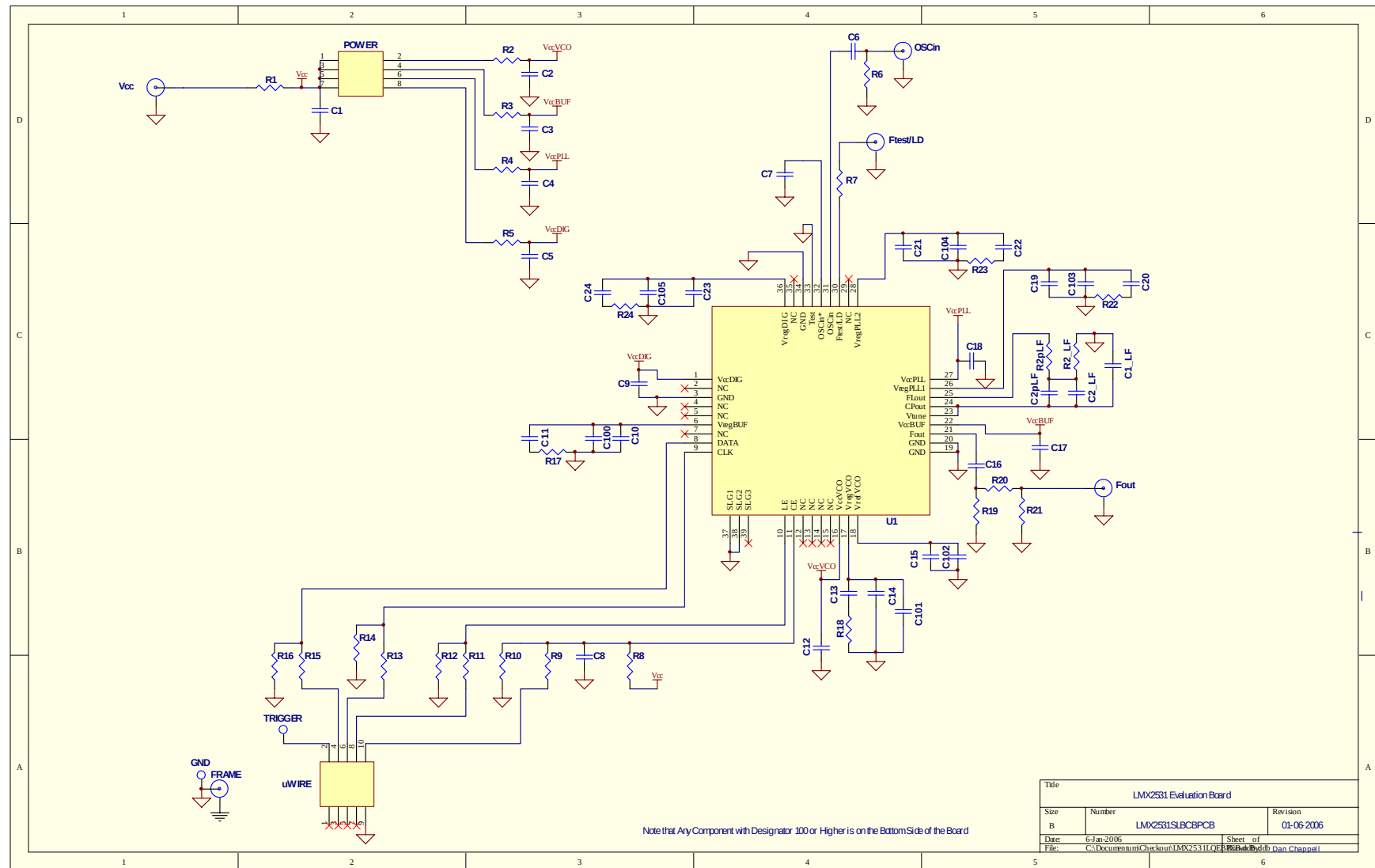


CodeLoader is set up to load the registers and initialize the part in the correct way. R5 (INIT1) and R5 (INIT 2) are just the R5 register being used to properly initialize the part. So a single CNT+L will load the part.



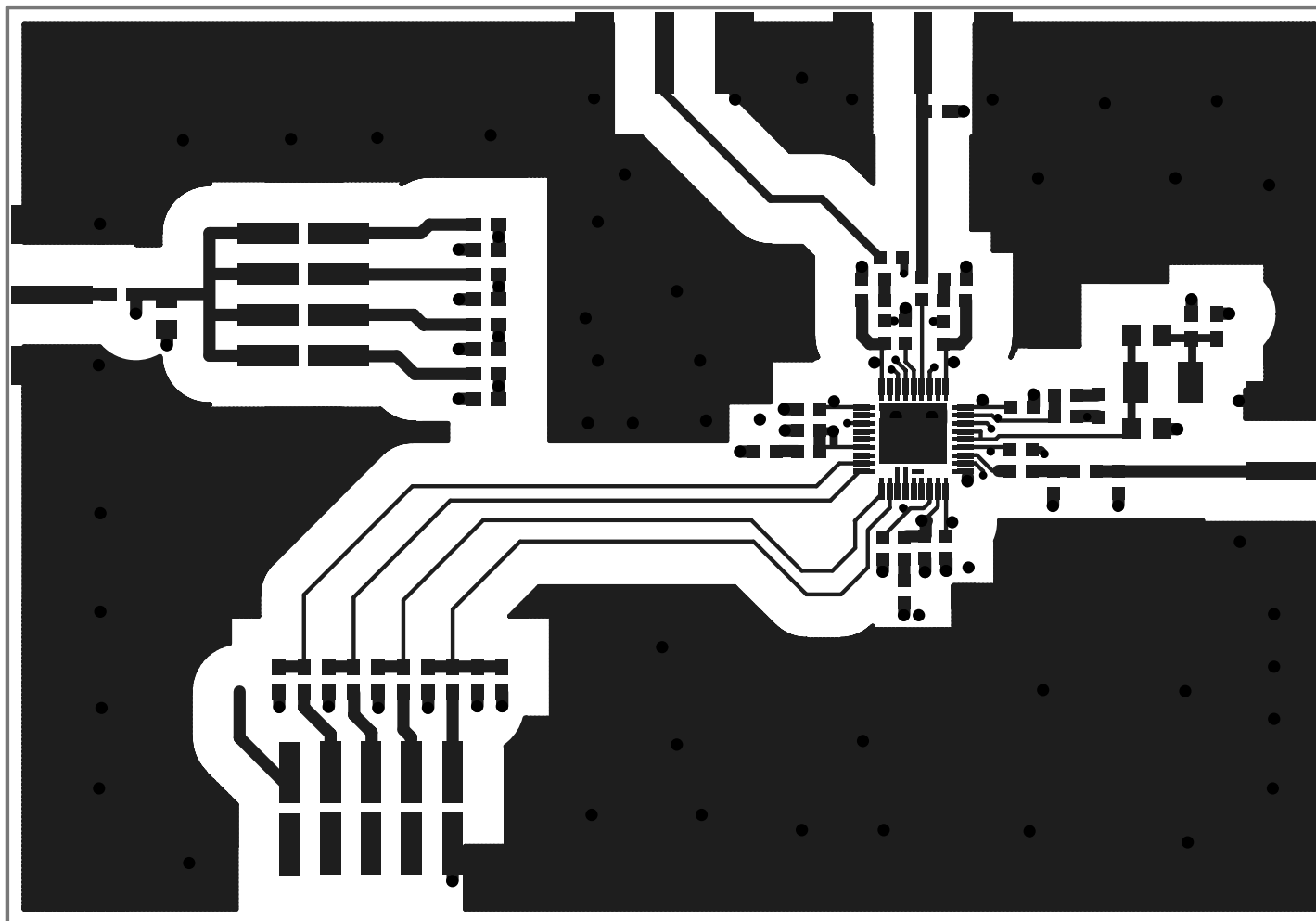
The port setup tells CodeLoader what information goes where. If this is wrong, the part will not program. Although LPT1 is usually correct, CodeLoader does not autodetect the correct port. On some laptops, it may be LPT3.

Schematic

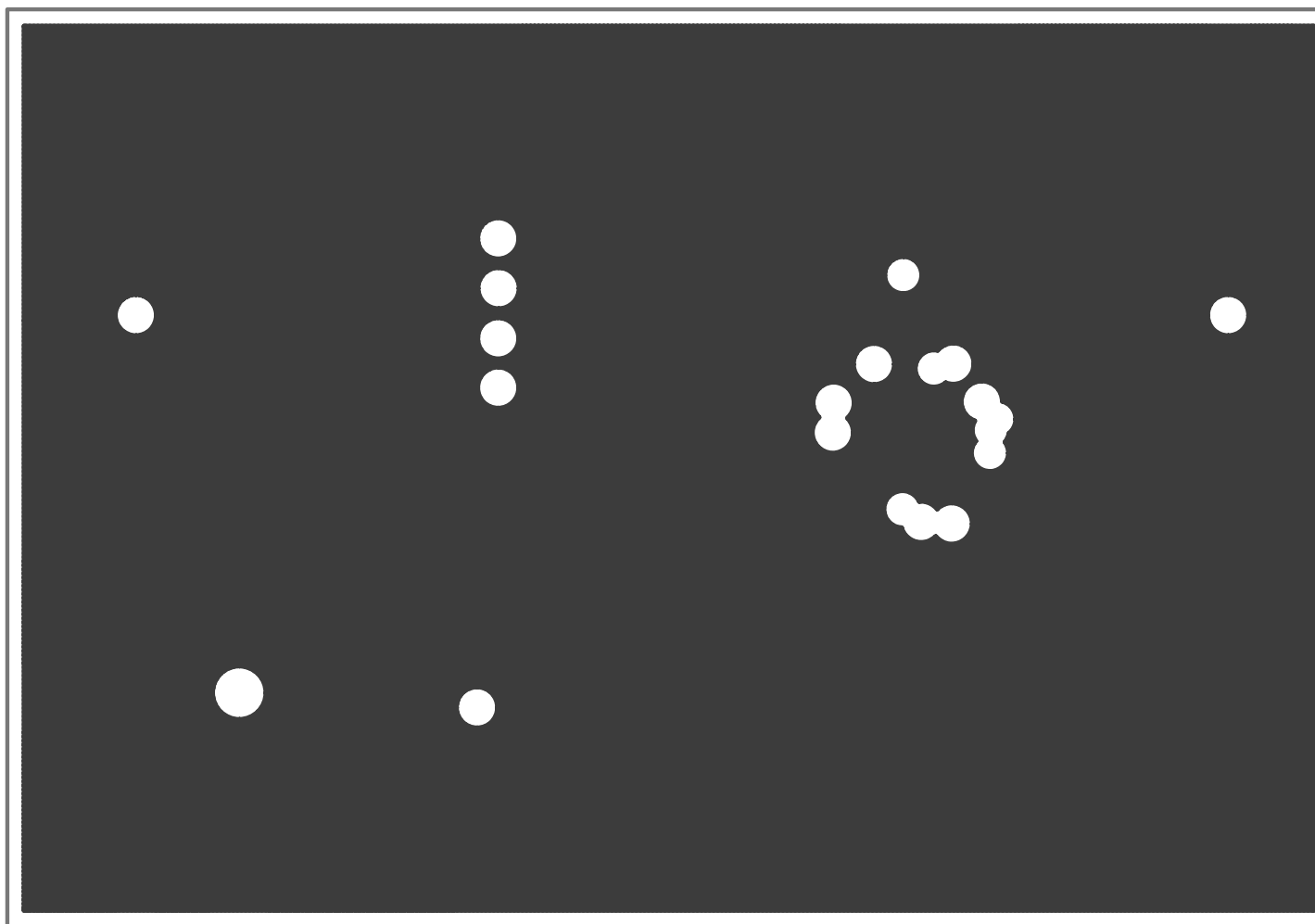


Bill of Materials				LMX2531EB					Revision 10/11/2006
Item	QTY	Manufacturer	Part #	Size	Tol	Voltage	Material	Value	Designators
0	19	n/a						Open Capacitors	C1_LF, C2pLF, C2, C3, C4, C5, C9, C11, C14, C17, C18, C19, C21, C24, C100, C101, C102, C103, C104, C105
	6							Open Resistors	R2pLF, R7, R8, R17, R19, R21, R24
	1							Open Miscellaneous	Ftest/LD
2	1	Kemet	C0603C101J5GAC	603	5%	50V	C0G	100pF	C16
3	1	Kemet	C0603C823K5RAC	603	10%	50V	X7R	82 nF	C2_LF
4	2	Kemet	C0603C103J5RAC	603	5%	50V	X7R	10nF	C10, C23
5	4	Kemet	C0603C104J3RAC	603	5%	25V	X7R	100nF	C6, C7, C12, C15
6	2	Kemet	C0603C474K4RAC	603	10%	16V	X7R	470nF	C20, C22
7	1	Kemet	C0603C105K4RAC	603	10%	16V	X5R	1uF	C8
8	1	Kemet	C0603C475K9PAC	603	10%	6.3V	X5R	4.7uF	C13
9	1	Kemet	C0805C106K8PAC	805	10%	10V	X5R	10uF	C1
10	1	Vishay	CRCW0603000ZRT1	603	5%	0.1W	Thick Film	0Ω	R20
11	2	Panasonic	P.22AHCT-ND	603	10%	0.1W	Thick Film	0.22Ω	R22, R23
12	2	Vishay	CRCW06033R3JRT1	603	5%	0.1W	Thick Film	3.3Ω	R1, R18
13	4	Vishay	CRCW0603100JRT1	603	5%	0.1W	Thick Film	10Ω	R2, R3, R4, R5
14	1	Vishay	CRCW0603510JRT1	603	5%	0.1W	Thick Film	51Ω	R6
17	1	Vishay	CRCW0603152JRT1	603	5%	0.1W	Thick Film	1.5KΩ	R2_LF
15	4	Vishay	CRCW0603103JRT1	603	5%	0.1W	Thick Film	10KΩ	R9, R11, R13, R15
16	4	Vishay	CRCW0603123JRT1	603	5%	0.1W	Thick Film	12KΩ	R10, R12, R14, R16
18	1	Comm Con Connectors	HTSM3203-8G2	2X4	n/a	n/a	Metal/Plastic	Header	POWER
19	1	FCI Electronics	52601-S10-8	2X5	n/a	n/a	Metal/Plastic	Header	uWire
20	3	Johnson Components	142-0701-851	SMA	n/a	n/a	Metal	SMA	Fout, OSCin, Vcc
21	1	National Semiconductor	LMX2531LQEBPCB	n/a	n/a	n/a	FR4 62 mil Thick	PCB Board 1st Layer 10 mils	n/a
22	1	National Semiconductor	LMX2531	LLP36	n/a	2.7	Silicon	LMX2531	U1
23	4	Com Con Connectors	CCIJ255G	2-Pin	n/a	n/a	Metal/Plastic	Shunt	Place Across: POWER: 1-2, 3-4, 5-6, 7-8
24	4	SPC Technology	SPCS-8	0.156"	n/a	n/a	Nylon	Nylon Standoffs	Place in 4 Holes in Corners of Board

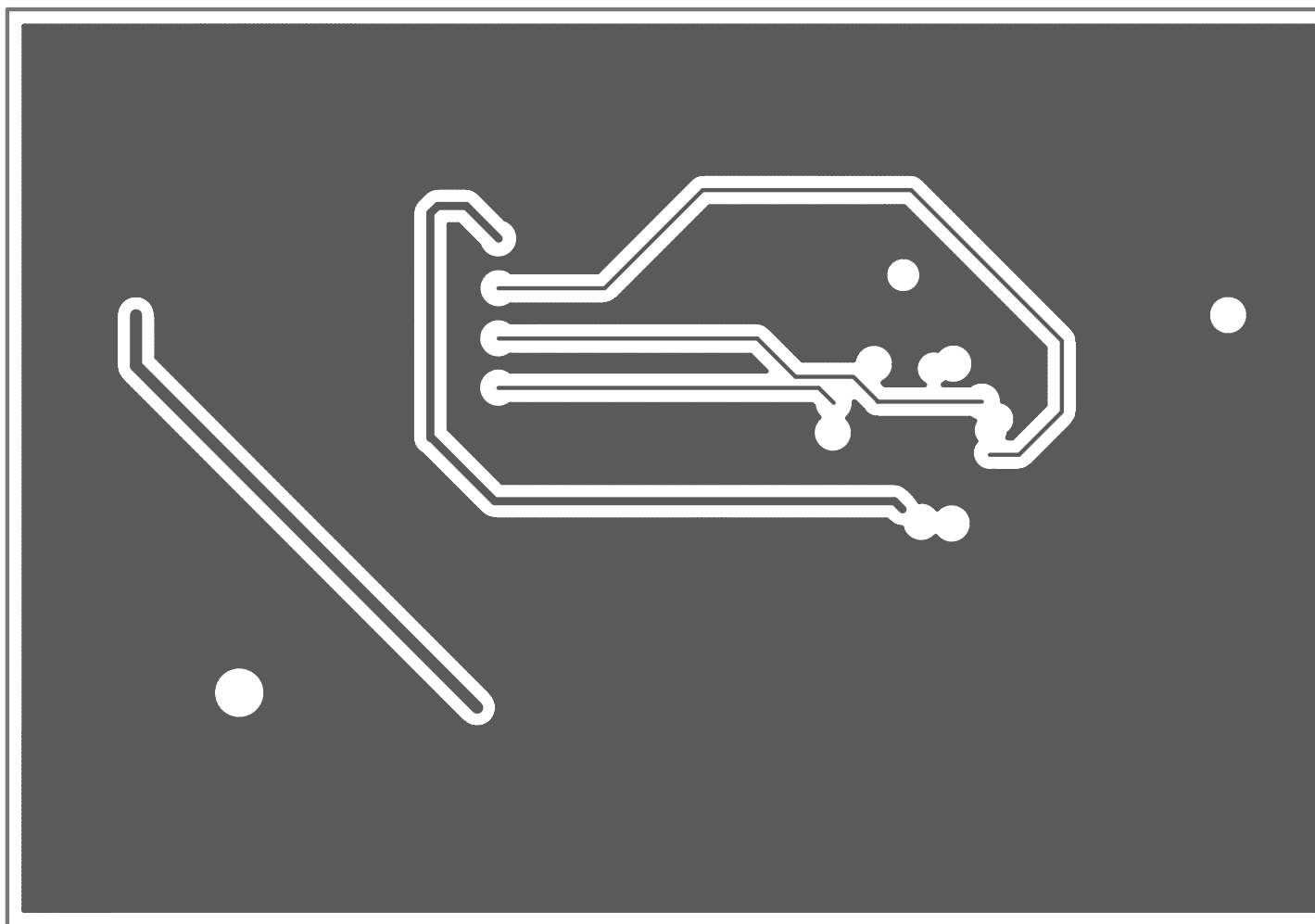
Top Layer



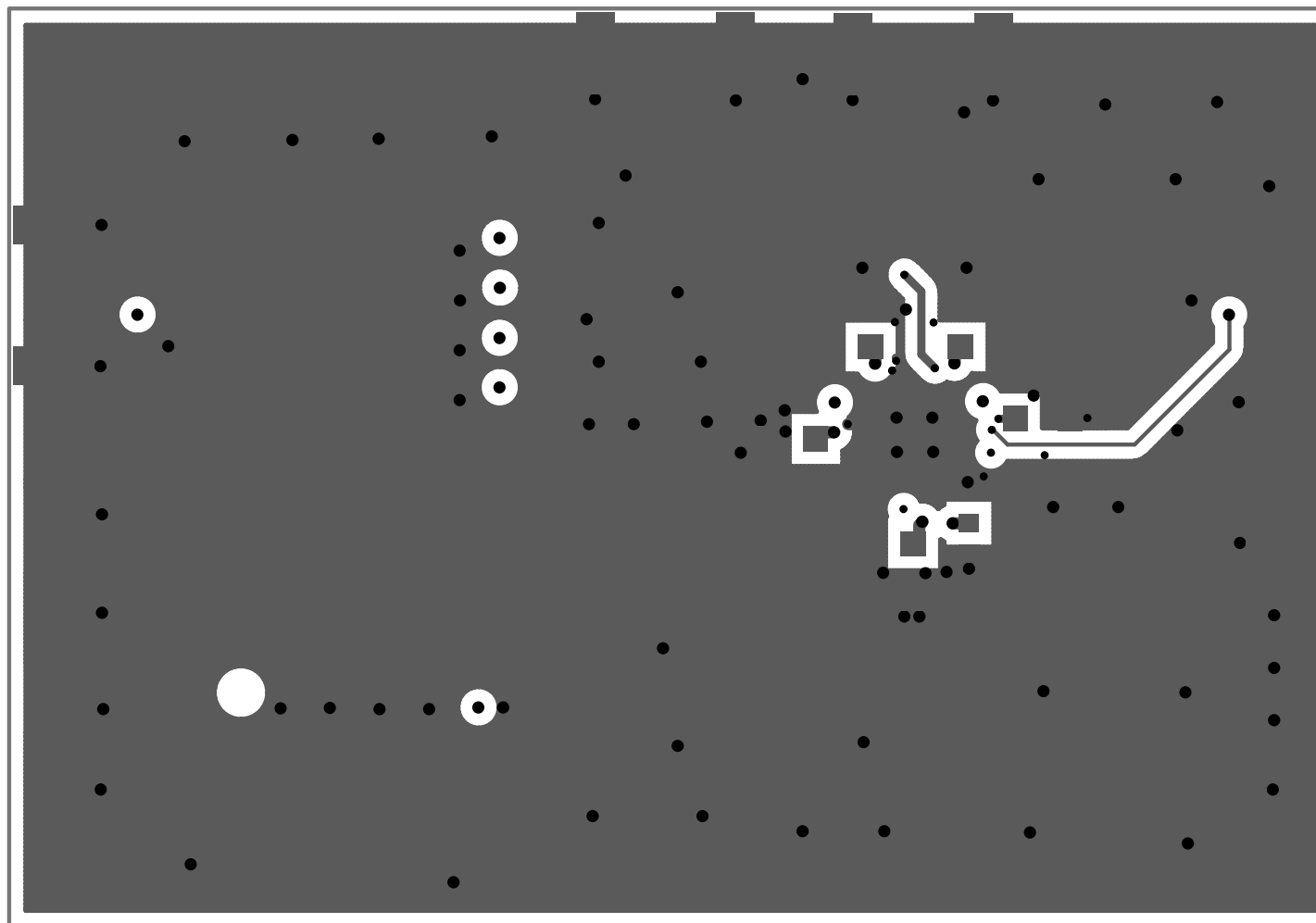
Mid Layer 1 "Ground Plane" (15 Mils Down FR4)



Mid Layer 2 "Power"

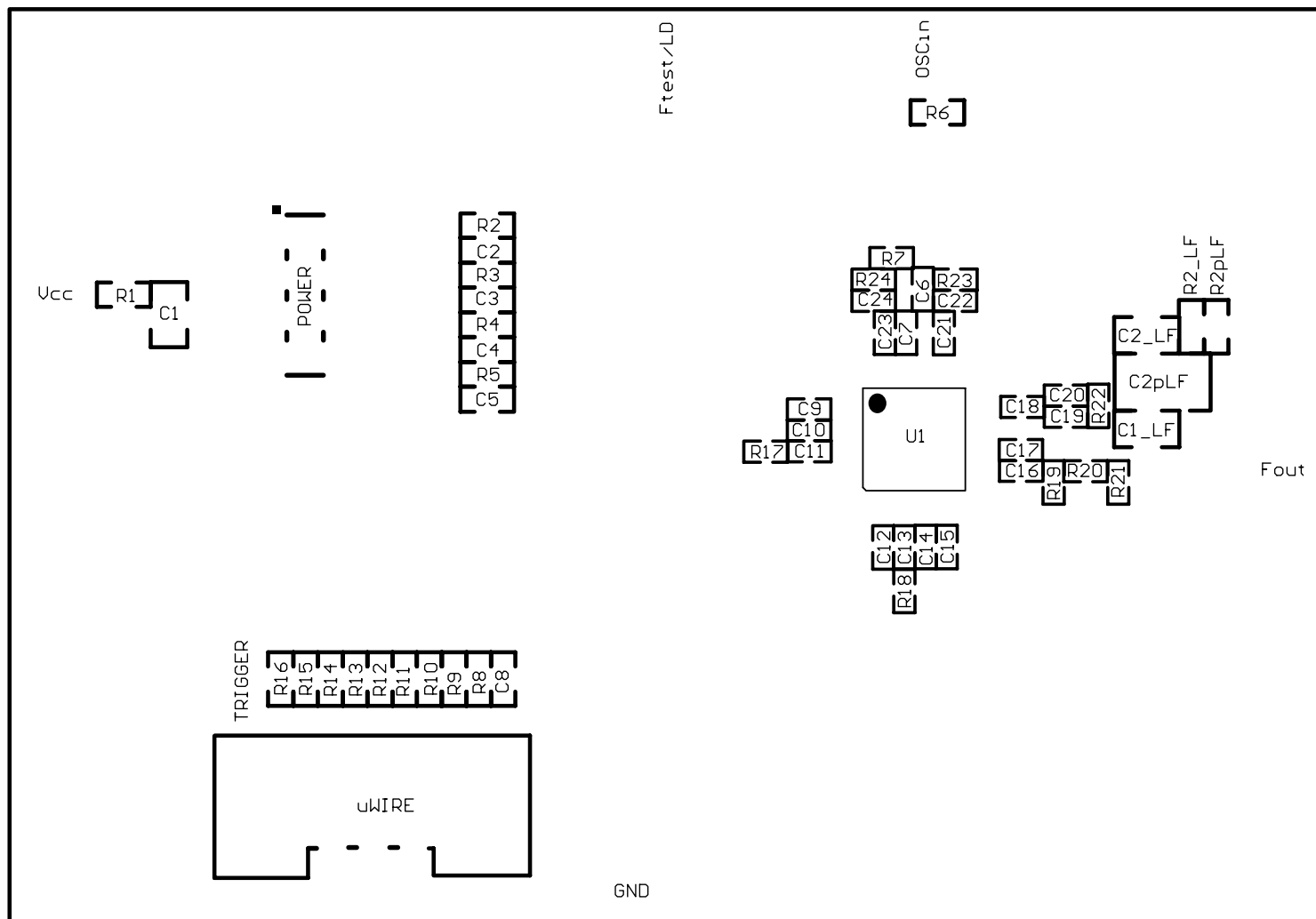


Bottom Layer "Signal"



Note: Total Board Thickness = 61 mils

Top Build Diagram



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