



GSM900 Evaluation Board For PLL Frequency Synthesizer

EVAL-ADF4113EB1

FEATURES

Self-Contained Board including Synthesizer, VCO and Loop Filter for generating GSM frequencies (819MHz to 915MHz)

Designed for 20kHz Loop Bandwidth

Accompanying Software allows complete control of synthesizer functions from PC

Battery Operated: Choice of 3V or 5V supplies

Typical Phase Noise Performance of $-91\text{dBc}/\text{Hz}$ @ 1kHz offset

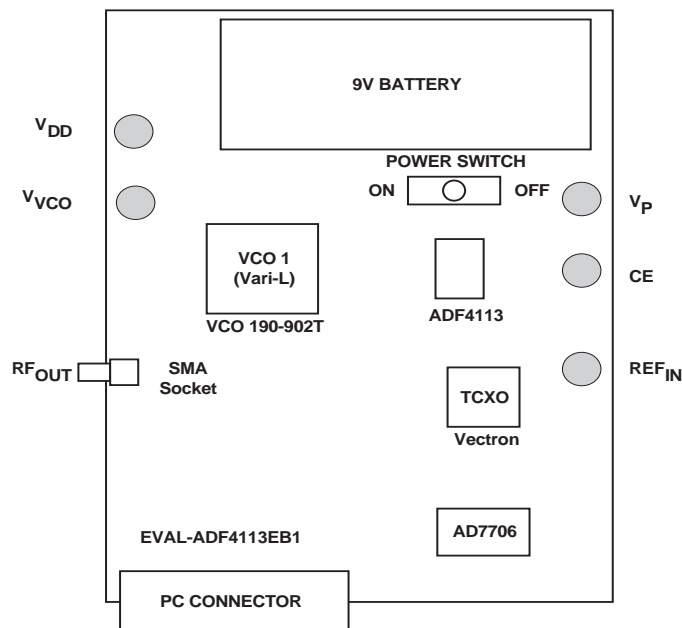
Typical Spurious Performance of better than -90dBc at 200kHz offset from carrier

GENERAL DESCRIPTION

This board is designed to allow the user to evaluate the performance of the ADF4113 Frequency Synthesizer for PLL's (Phase Locked Loops). The block diagram of the board is shown below. It contains the ADF4113 synthesizer, a pc connector, SMA connector for the reference input, power supplies and RF output. There is also a loop filter (20kHz bandwidth) and a VCO on board. A cable is included with the board to connect to a pc printer port.

The package also contains windows software to allow easy programming of the synthesizer.

BLOCK DIAGRAM



REV.PrB 04/00

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Hardware Description

The evaluation board comes with a cable for connecting to the printer port of a PC. The silk screen and cable diagram for the evaluation board are shown below. The board schematic is shown on pages 3 and 4.

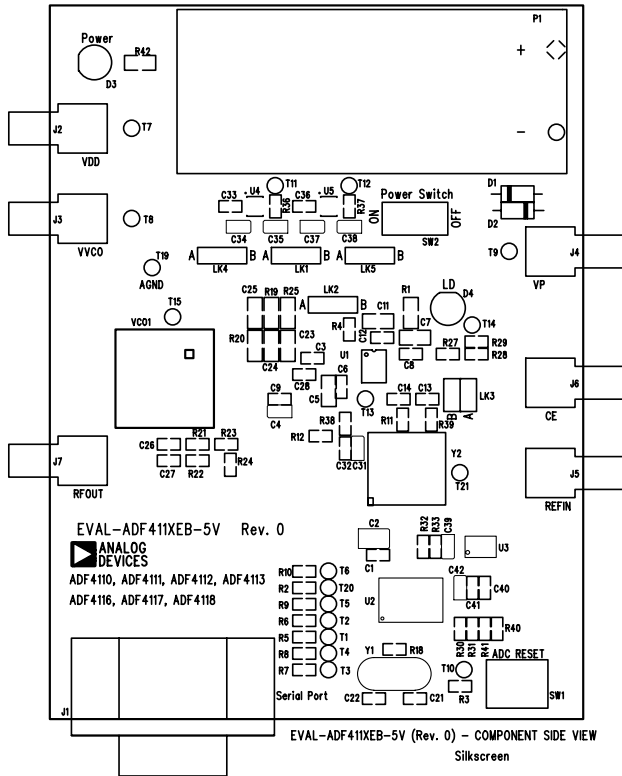


Figure 1. Evaluation Board Silkscreen

The board is powered from a single 9V battery. The power supply circuitry allows the user to choose either 3V or 5V for the ADF4113 V_{DD} and V_P , and for the VCO supply. The default settings are 3V for the ADF4113 V_{DD} and 5V for the ADF4113 V_P and for the VCO supply. **It is very important to note that the ADF4113 V_{DD} should never exceed the ADF4113 V_P . This can damage the device.**

All components necessary for LO generation are on-board. The 13MHz TCXO from Vectron provides the necessary Reference Input. The PLL is made up of the ADF4113, passive loop filter (20kHz bandwidth) and the VCO 190-902 from Vari-L. The output is available at RFOUT through a standard SMA connector. If the user wishes they may use their own power supplies and reference input. In this case, they need to insert SMA connectors to as shown on the silkscreen and block diagram.

The AD7706 A/D converter is used to monitor the power supply voltage and current consumption of the ADF4113. This helps the user pick the optimum synthesizer settings for power consumption and also provides an alert if the battery voltage is too low to sustain the required 3V or 5V for the board supply.

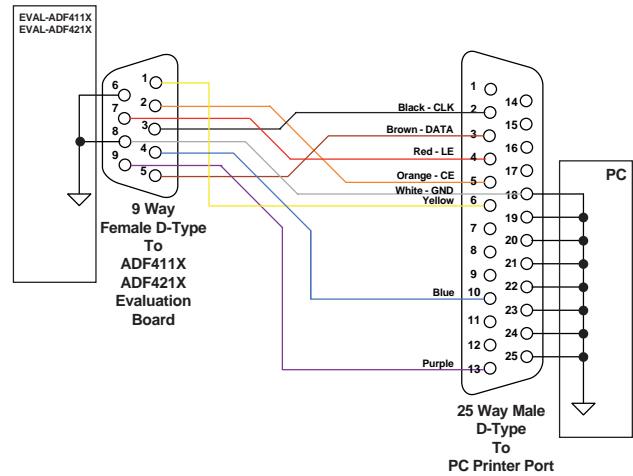


Figure 2. PC Cable Diagram

Loop component values shown in the circuit diagram are for 900MHz RF output, 5mA CP current, VCO190-902T, 200kHz channel spacing and 20kHz loop bandwidth.

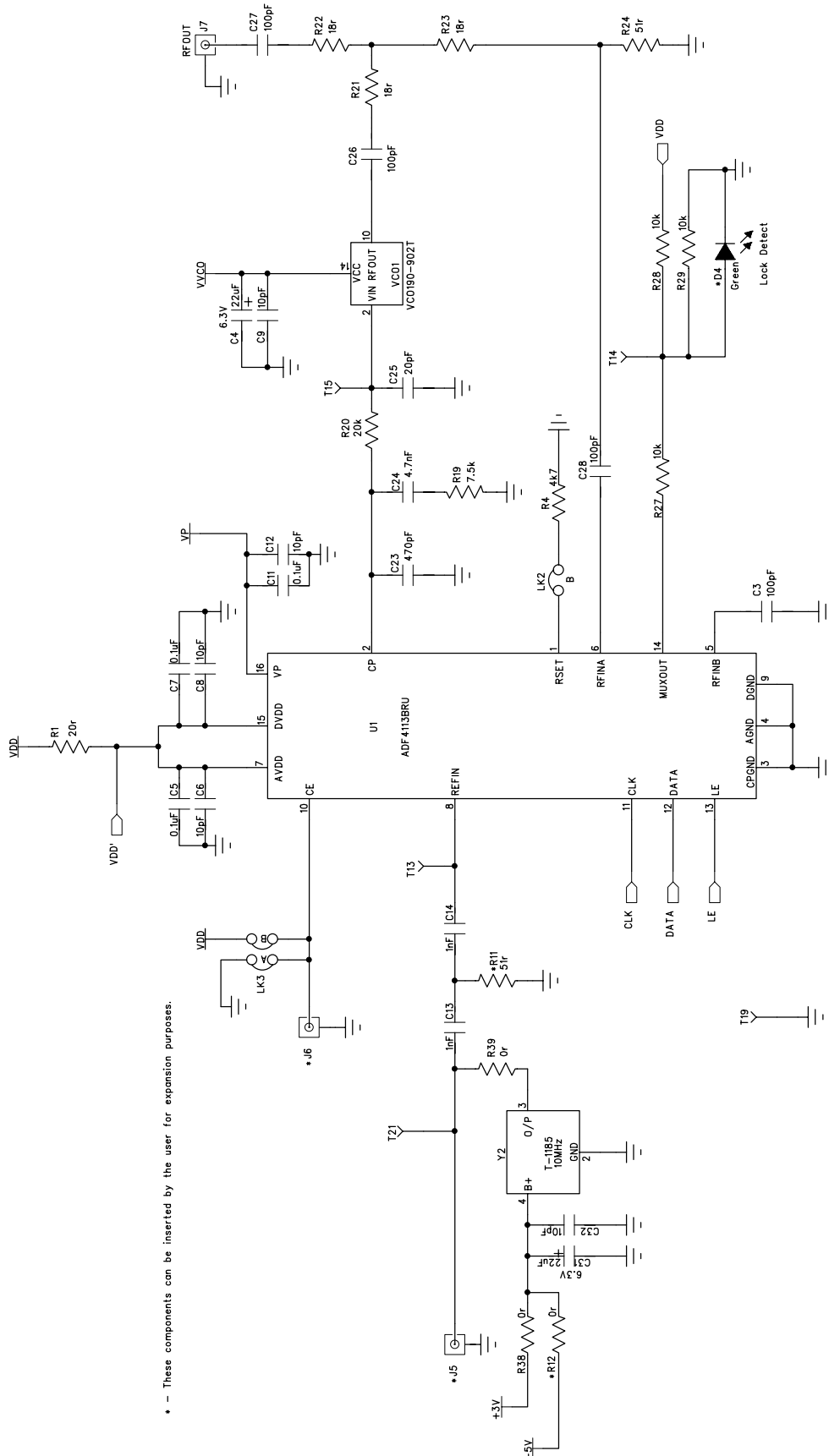


Figure 3. Evaluation Board Circuit Diagram (Page 1)

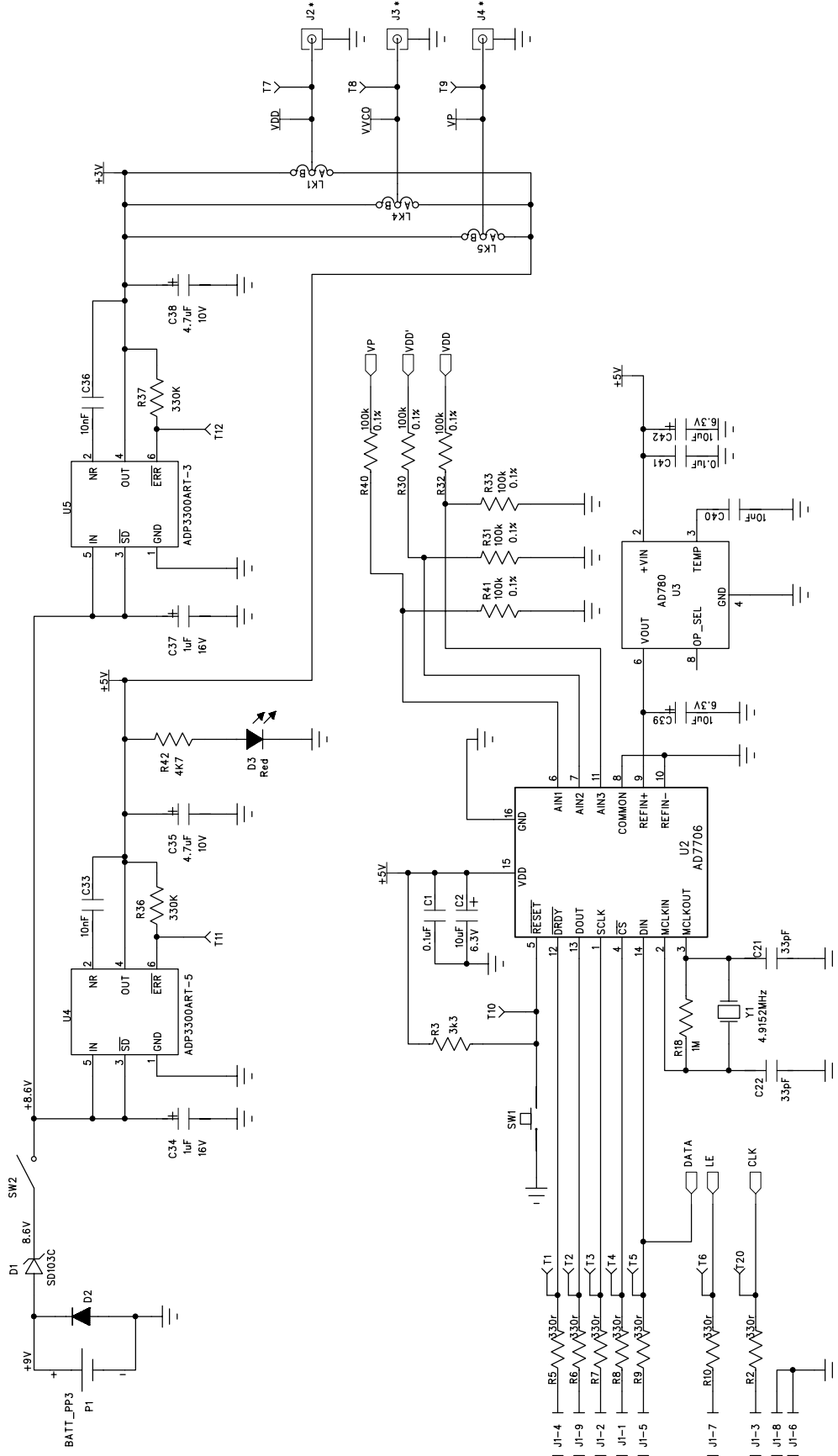


Figure 4. Evaluation Board Circuit Diagram (Page 2)

Software Description

The evaluation board software is contained on a CD-ROM which comes in the package. To load the software the user should click on "setup.exe", then the install wizard installs the software. Follow the on-screen directions. The software will be installed in a default directory called "C:/Program Files/Analog Devices". To run the software, simply go to the Start Menu and choose Program/ADF4XXX/ADF4XXX_rev0. This will open the software for the evaluation board. The user will be asked to choose which device is being evaluated. Click on the ADF4113 button. Hit OK. The window shown below will now appear.

In this panel, click on the "Eval Board" button. Choose ADF4113EB1 from the list on offer. Hit OK. The synthesizer will now be programmed with the correct settings for a GSM system working at 900MHz. 200kHz PFD frequency is set up, 32/33 prescaler is chosen and charge pump current of 5mA is programmed.

If the user wishes to change any of the settings then place the cursor over the desired parameter (RF VCO Output Frequency, for example) and click once. This brings up a screen where it is possible to either type in a new value of output frequency or else increment and decrement by the channel spacing.

The software also allows monitoring of the device supply voltage, supply current and the charge pump voltage. Simply hit the "Update Voltage and Current Display" button to get an up-to-date reading.

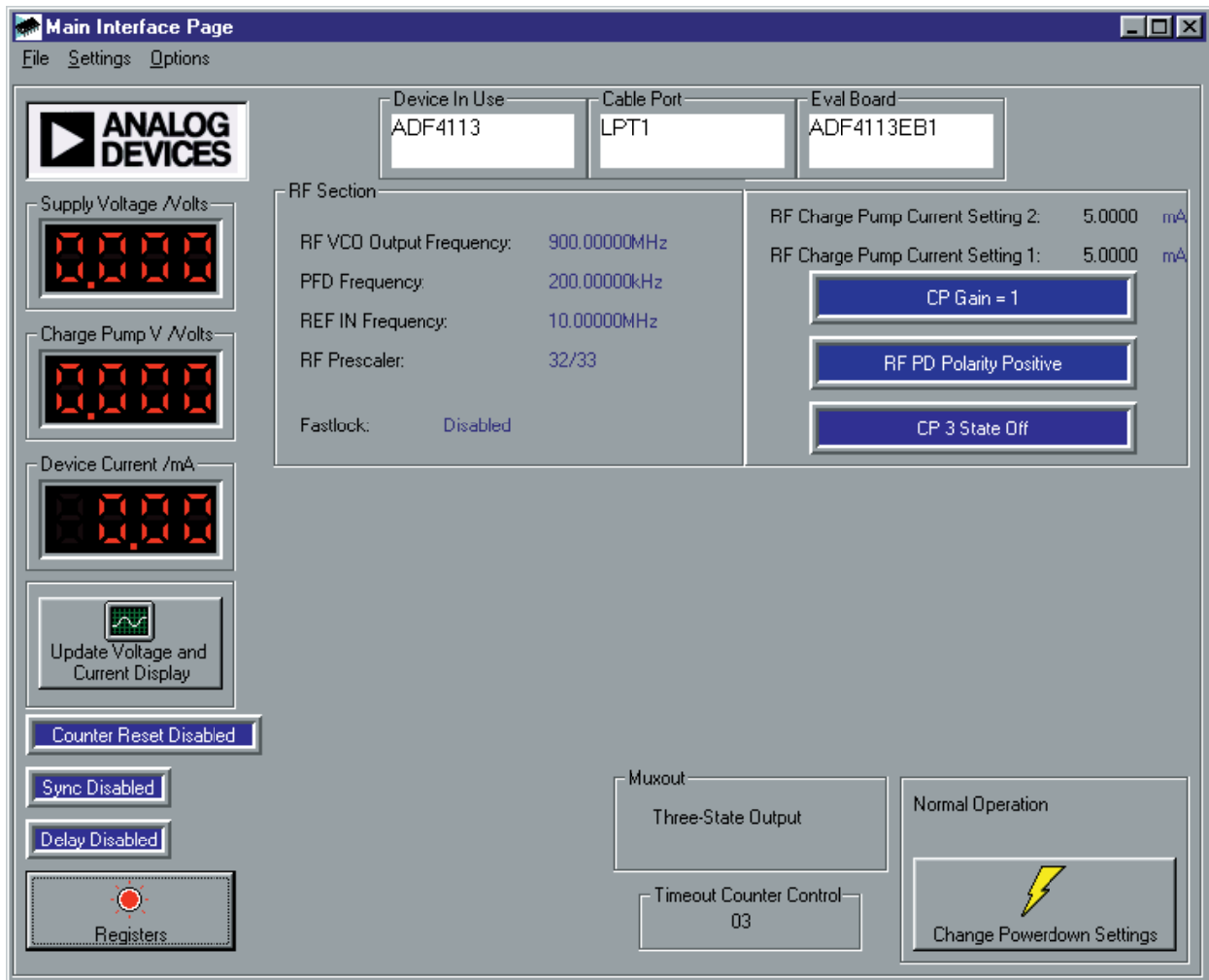


Figure 5. Software Front Panel

Table 1. Bill of Materials for the EVAL-ADF4113EB1

Qty	Reference Designator	Description	Manufacturer	PCB DECAL	VALUE
1	U1	ADF4113BRU	ADI	TSSOP-16	ADF4113BRU
1	U2	AD7706BR	ADI	SO16WB	AD7706BR
1	U3	AD780AR	ADI	SO8NB	AD780AR
1	U4	ADP3300ART-5	ADI	SOT23-6	ADP3300ART-5
1	U5	ADP3300ART-3	ADI	SOT23-6	ADP3300ART-3
1	VCO1	VCO190-902T	Vari-L (Acal Elect. = Dist)		VCO190-902T
1	Y1	4.9152MHz Crystal	Vectron International	HC49 low profile	VXA4-1011
1	Y2	10 MHz TCXO	Vectron International		T-1185
1	D1	SD103C Schottky Diode	General Semiconductor	DO35	SD103C
1	D2	IN4001		DO35	FEC 365-117
1	D3	Red Low Power LED	Vishay	LED	FEC 657-130
1	D4	Green Low Power LED (Do Not Insert)	Vishay	LED	FEC 657-141
2	C1 C41	0.1uF Multi Layer Ceramic Capacitor	Murata	Case 0603	FEC 499-675
1	C2	10uF 6.3V Tantalum Capacitor	AVX	CAP\TAJ_B	FEC 197-014
4	C3 C26 C27 C28	100pF Multi Layer Ceramic Capacitor	Murata	Case 0603	FEC 499-122
2	C4 C31	22uF 6.3V Tantalum Capacitor	AVX	CAP\TAJ_A	FEC 197-038
3	C5 C7 C11	0.1uF Multi Layer Ceramic Capacitor	Murata	Case 0805	FEC 317-627
5	C6 C8 C9 C12 C32	10pF Multi Layer Ceramic Capacitor	Murata	Case 0603	FEC 499-110
2	C13 C14	1nF Multi Layer Ceramic Capacitor	Murata	Case 0603	FEC 317-202
2	C21 C22	33pF Multi Layer Ceramic Capacitor	Murata	Case 0603	FEC 498-555
1	C23	470pF Multi Layer Ceramic Capacitor	Murata	Case 0805	
1	C24	4.7nF Multi Layer Ceramic Capacitor	Murata	Case 0805	
1	C25	20pF Multi Layer Ceramic Capacitor	Murata	Case 0805	
3	C33 C36 C40	10nF Multi Layer Ceramic Capacitor	Murata	Case 0603	FEC 499-146
2	C34 C37	1uF 16V Tantalum Capacitor	AVX	CAP\TAJ_A	FEC 498-701
2	C35 C38	4.7uF 10V Tantalum Capacitor	AVX	CAP\TAJ_A	FEC 498-658
2	C39 C42	10uF 6.3V Tantalum Capacitor	AVX	CAP\TAJ_A	FEC 197-014
1	R1	20r 5% Resistor (Surface Mount)	Multicomp	Case 0805	FEC 771-132
7	R2 R5 R6 R7 R8 R9 R10	330r 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-143
1	R3	3k3 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-290
1	R4	4k7 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-318
2	R11 R25	Do Not Insert		Case 0805	
1	R18	1M 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-598
1	R19	7k5 1% Resistor (Surface Mount)		Case 0805	
1	R20	20k 1% Resistor (Surface Mount)		Case 0805	
3	R21 R22 R23	18r 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-021
1	R24	51r 1% Resistor (Surface Mount)	Multicomp	Case 0603	
3	R27 R28 R29	10k 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-355
6	R30 R31 R32 R33 R40 R41	100k 0.1% Resistor (Surface Mount)	Meggitt	Case 0603	FEC 911-471
2	R36 R37	330K 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 911-537
2	R38 R39	0r 1% Resistor (Surface Mount)	Multicomp	Case 0603	FEC 772-227
1	R12	0r 1% Resistor - Do Not Insert	Multicomp	Case 0603	FEC 772-227
1	R42	4k7 1% Resistor (Surface Mount)	Multicomp	Case 0805	FEC 911-938
1	SW1	Push Button Switch	Omron	SWPB-SMALL	FEC 176-986
1	SW2	SPDT Switch - (Washable)	Apem	SW_SIP-3P	FEC 150-559
18	T1-15 T19-21	Red Testpoint	W Hughes	TESTPOINT	FEC-240-345
1	J1	9 PIN D-TYPE MALE (HORIZ)	McMurdo	DCON9M	FEC 150-750
5	J2 J3 J4 J5 J6	Do Not Insert		SMA	
2	J7	GOLD 50Ω SMA SOCKE	Pasternack	SMA	PE4118
3	LK1 LK4 LK5	3 pin header	Harwin	SIP-3P	FEC 512-047
1	LK2-B	Wire Link			
1	LK3	2 pin header	Harwin	SIP-2P	FEC 512-035
4	LK1 LK3-5	Shorting Shunt	Harwin		FEC 150-410
2	P1	Pair PCB snap-on battery connector	Keystone	BATT_PP3	FEC 723-988
1	P1	9V PP3 Battery	Duracell		FEC 908-526
4	Each Corner	Rubber Stick-On Feet	3M		FEC 148-922
1	EVAL-ADF411XEB1	PCB	ADI		
		Parts Free issued by ADI.			
		Leave position blank - Do not insert.			
		Vari-L - UK Distributors - Acal Electronics Tel 0044 1252 858585			