

## DC890B QuickStart Guide

### DESCRIPTION

Demonstration circuit DC890B along with QuickEval-II™ software provides a USB based Windows PC hosted digital data acquisition system supporting CMOS/LVDS output ADCs up to 250Mps. The DC890B must be powered from an external  $6\pm 0.5$ VDC power supply when operating in LVDS mode. When operating in CMOS mode, the external power supply is optional. The Linear Technology supplied QuickEval-II evaluation software automatically detects the DC890B and can also detect many of the standard ADC demonstration circuits boards. The DC890B will not enable LVDS mode unless an external 6.0VDC power source is available. The QuickEval-II system provides for fast and easy performance evaluation of high speed

ADCs. FastDAACS collects up to 256K word samples and then performs various analyses on the data including calculating SNR, SINAD, THD, SFDR and ENOB. The digitized input, an FFT of the collected data, the Primitive Wave of the sample set or an IFFT of modified frequency domain data is plotted to a display window to facilitate analyzing distortion products and sources. Figure 1 shows a picture of the DC890B. The DC890B is connected to the ADC demonstration circuit via a 100 pin edge connector, to the PC by a USB A-B cable and to an optional power supply either by a 5mm power plug or optionally by turrets. Figure 2 details the connections.

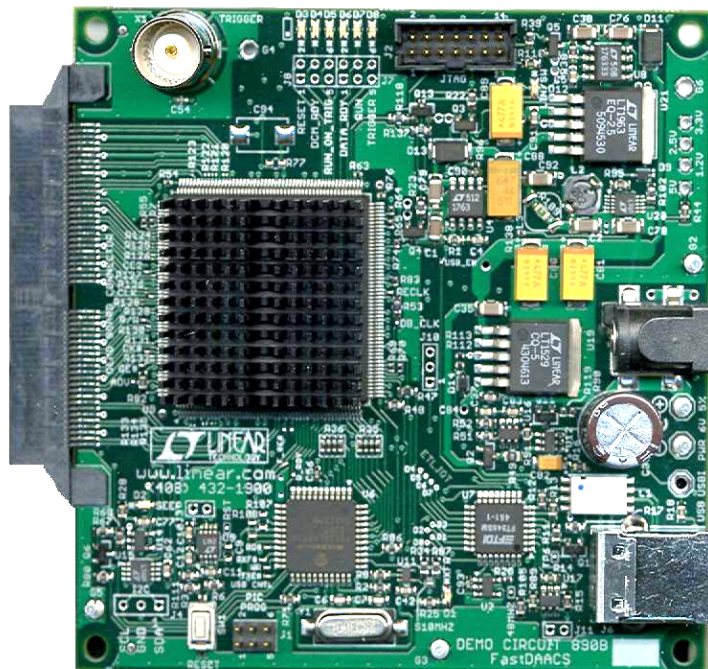


Figure 1. DC890B FastDAACS Board

## OPERATING PRINCIPLES

The DC890B is capable of collecting a block of data samples from an ADC demonstration circuit initiated either by an internally generated trigger or an externally supplied 2.5V CMOS level trigger of user-selected edge. The external trigger is TTL or CMOS compatible (the trigger line is diode clamped to the 2.5V Rail through a 475Ω resistor). Refer to the QuickEval-II

Software Help for information on the various operating modes and options. The Conversion clock to the DC890B is supplied via the ADC demonstration circuit either from an optional on board oscillator if installed or an external signal generator connected to the ADC demonstration circuit.

## QUICK START PROCEDURE

To prevent damage to the DC890B, it is important to follow the equipment setup procedure outlined below:

1. Do not plug the DC890B into the PC USB port before running the installation program
2. Download the QuickEval-II installation program from <http://www.linear.com/software/>.
3. Run the QuickEval-II installation program and follow the on-screen instructions.

❑ **NOTE:** The QuickEval-II evaluation software requires a PC running Windows98, 2000, or XP with an available USB port.

4. Connect the DC890B to the USB port and supply external power to the DC890B, if you will be using the LVDS mode. Do not use a USB cable longer than 2m or the board may not reset properly. (See note in trouble shooting section.)
5. Connect only 2.5V CMOS or LVDS output ADC demonstration circuits directly to the DC890B via the 100 pin edge connector. All Linear Technology DC890 compatible demo boards meet these requirements. Apply DC power to the ADC demonstration circuit.
6. Each ADC demonstration board also comes with a Quick Start guide similar to this one and should be referred to for specific usage details relevant to the demonstration circuit being evaluated.

Please refer to it for proper jumper settings, input power requirements and input signal levels and frequency ranges.

7. Apply an appropriate conversion clock and analog input signal to the ADC demonstration board.
8. Open the QuickEval-II software and from the **Configure** Menu, select *FastDAACS*. Then also from the **Configure** menu, click on **Device** and scroll through the list of Linear Technology Corporation ADCs and select the device part number on the attached demo board.
9. Select **Processing Options** (the hammer icon) menu and verify that under **Trigger Mode**, **No Trigger Wait** is selected
10. Enter the exact sample rate in Mhz and select the sample size in the provided fields in QuickEval-II page 1.
11. If the sampled signal is not coherent with the encode clock, select an appropriate windowing function from the pull down menu.
12. Initiate a data collection cycle by clicking the green **Collect** button; it will turn red during the collection cycle. An FFT should appear on the screen along with a plot of the sampled data. Make sure the input level is not over ranging the ADC. See online help for specific guidance on using the QuickEval-II Software.

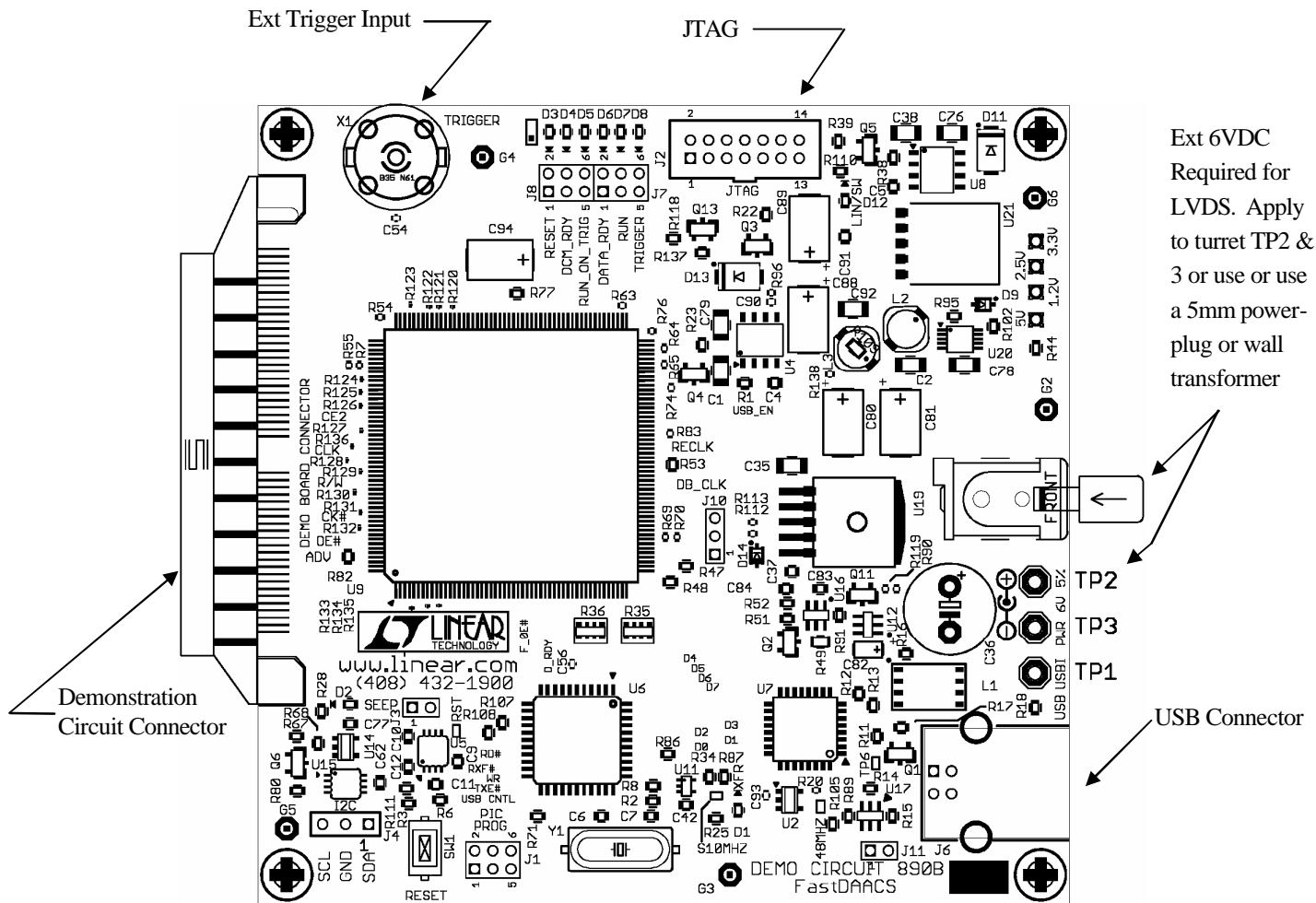


Figure 2. DC890B FastDAACS Basic Connection Locations

## USEFUL SOFTWARE TOOLS

The QuickEval-II software includes tools for automatic software updates and for quickly retrieving documentation from the World Wide Web.

The Download Datasheets feature is particularly useful to laptop users, who can use this feature to download the data sheets and Quick Start guides in one step, thus making them available even when the laptop is not connected to the Internet.

NOTE: Adobe Acrobat reader is required to view the documents and is available at <http://www.adobe.com>.

**To update the QuickEval-II software (requires an internet connection):**

- Choose “Update Program” from the Tools menu.

This automatically updates the main program and drivers for individual demo circuits.

**To view the Quick Start Guide for the DC890B demonstration board:**

- Choose “View Controller QS Guide” from the View menu.

**To View the Quick Start Guide for the Device:**

- Choose “View Device QS Guide” from the View menu. This will bring up the product page in your de-

fault browser. Select documentation for “Reference Design”.

**To download data sheets (requires an internet connection):**

Choose “Download Data Sheets” from the Tools menu.

All datasheets and Quick Start guides for all products in the QuickEval-II family are downloaded to the QuickEval-II program folder and placed in the *dsheets* folder.

## OPTIONAL CONNECTIONS TO THE DC890B

In CMOS mode the DC890B can operate from the USB power, however in LVDS mode, the Spartan-III FPGA IO ring drivers draw considerable supply current to bias the active LVDS terminations. The DC890B has provisions for a 5mm power plug for an external 6V  $\pm 0.5V$  supply. The DC890B automatically detects the presence of external power and disables the USB power input.

X1: The DC890B has provisions for an external trigger input, Edge selectable by software. This permits initiating data block capture by an external event.

J2: A JTAG connector is provided for downloading custom FPGA software to the board. Grounding pin

3 of J2 automatically puts the FPGA into JTAG programming mode. User developed code can be loaded into the FPGA without compromising the factory installed code. JUMPER PINS 4 & 6 OF PIC Programming connector J1 to disable the microcontroller when using custom FPGA code. Refer to the schematic for further details. **This feature is provided due to customer requests. Development of custom code will not be supported by the factory.**

J7 & J8 locations (not installed) provide access to 6 additional FPGA pins for test purposes. These pins also drive LED indicators useful for debug purposes. Xilinx provides logic analysis and data collection features through JTAG via ChipScope.

## LED INDICATORS

**The DC890B provides system status via 8 LEDs:**

**LED-1.TRANSFER** – Indicates a USB data transfer from the QuickEval-II to the PC is in progress.

**LED-2.SEEP** – Indicates access of the optional demonstration circuit Serial Electrically Erasable PROM on select demonstration boards. Information in this SEEP permits QuickEval-II software to configure the DC890B properly for the device under evaluation using the auto detect demo board feature in the Config/Device Menu.

**LED-3.RST** – Indicates assertion of either a hard or soft reset.

**LED-4.DCM\_RDY**– In LVDS mode, led 4 blinks to alert the user that the sample clock is either

not present or outside the required frequency range (Fin must be  $> 50$  MHz). A steady on condition indicates the Digital Clock Module is locked to the input sample clock. In CMOS mode LED 4 functions as a Power On/FPGA programmed Indicator.

**LED-5.RUN ON TRIGGER** – Indicates that the board is set to run on trigger (versus halt on trigger mode).

**LED-6.DATA\_RDY** – Indicates completion of data block acquisition.

**LED-7.RUN** – Indicates the board is ARMED to collect a block of data.

**LED-8.TRIGGER** – indicates that a trigger was received and data collection has started.

## CIRCUIT DETAILS

A schematic, parts list and parts placement drawings are attached to the end of this Quick Start Guide for reference only.

## TROUBLE SHOOTING GUIDE

**Problem:** DC890B is plugged in, but QuickEval-II software still does not recognize DC890B board.

**Solution:** Assuming that the USB hardware in your computer is operational (Try verifying an operational USB port with another USB device such as a USB Memory stick, printer or scanner if available.), the likely cause is improper installation of the USB drivers, which results in Windows recognizing the DC890B as an “Unknown Device”. If this is the case, the problem can be corrected by the following procedure:

- 1) Unplug the DC890B board from the USB port.
- 2) Re-install the QuickEval-II Software. **CAREFULLY** following the on-screen instructions. This **MAY** require a reboot of your computer. The on-screen instructions will inform you if that is the case.
- 3) If the problem persists, please choose “Contact Software Support” from the Tools Menu for assistance from LTC staff.

**Problem:** Demonstration circuit software loads properly, but will not run or gives “Device Not Accessible” errors.

**Solution:** Verify the demonstration circuit is properly powered up and a correct (signal level and frequency) conversion clock is applied. (The DC890B can operate from the USB port power in CMOS mode but will not load the FPGA with the LVDS code unless external power is detected.) Set the correct sample rate for the applied conversion clock as QuickEval-II software uses the sample size and rate to determine the watch dog time out period to reset the DC890B if the USB bus should hang. Refer to

the appropriate demonstration circuit Quick Start Guide for details.

**Problem:** Collected data samples look like noise or appear corrupted.

**Solution:** Make sure the proper device has been selected in the QuickEval-II software, the factory jumper settings are present and for LVDS output demo boards, external power is applied to the DC890B otherwise the captured data will not be properly interpreted.

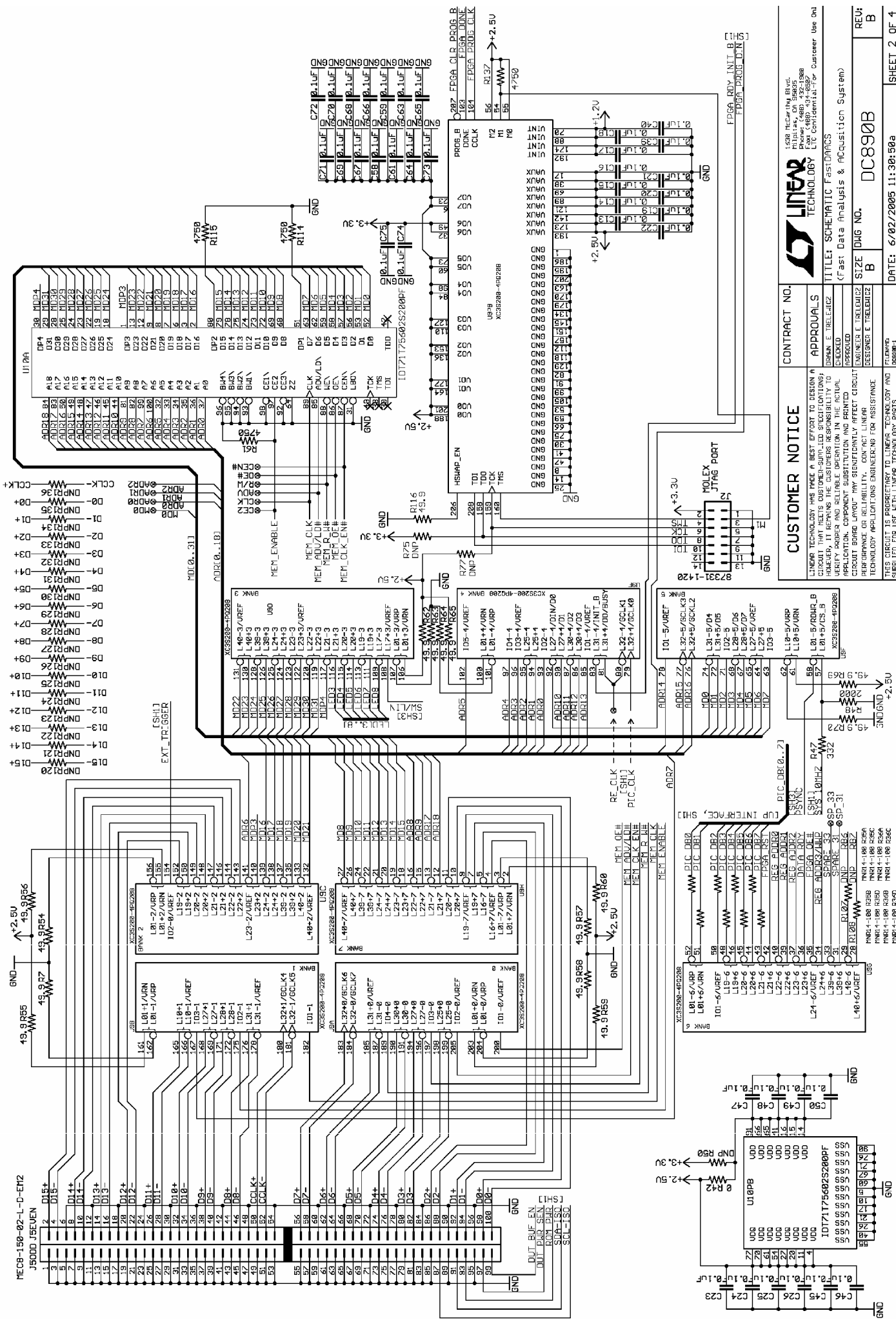
**Problem:** QuickEval-II reports it cannot reset the DC890B.

**Solution:** Make sure either a powered USB port is used or external power is supplied. **DO NOT USE A USB CABLE LONGER THAN 2 METERS.** The time delay of a longer USB cable may result in the DC890B intercepting the reset.

**Problem:** USB Bus appears to be hung.

**Solution:** As the DC890B is used in a lab environment where power may be inappropriately sequenced, cables unintentionally disconnected etc, some users have reportedly had their USB bus hang. This condition is easily rectified by right clicking properties under my computer -> Hardware -> Device Manager -> and then right clicking on the appropriate USB bus controller and again selecting properties. The device status generally reports that it is working properly. Select the Advanced tab. You will notice a refresh button. Device manager has queried the port and as a result reset the bus.

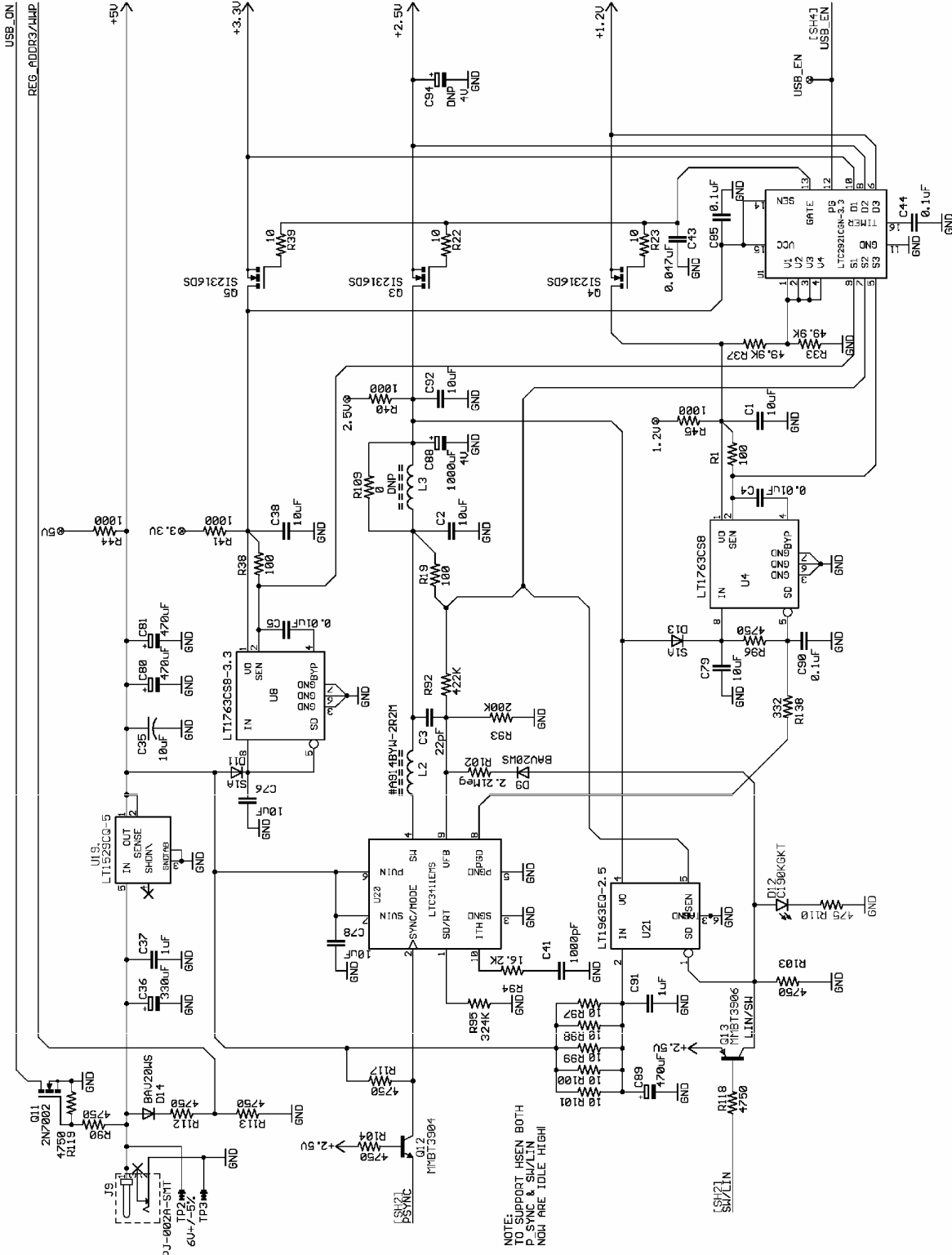




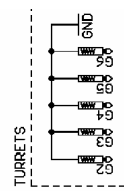
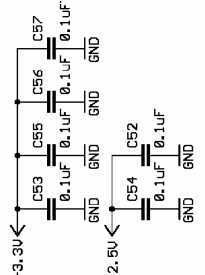
<b>CUSTOMER NOTICE</b>		<b>CONTRACT NO.</b>	
LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS. HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL CREDIT BOARD LAYOUT. ANY SIGNIFICANTLY AFFECT CLOSURE PERFORMANCE OR RELIABILITY. DON ACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.		APPROVALS	
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS		DRAWN E. TRELEZCZ	
		CHECKED	
		DESIGNER E. TRELEZCZ	
		TITLE SCHEMATIC FASTDACs	
		PROJECT (Fast Data Analysis & Acquisition System)	
		SIZE (8.5" x 11")	
		DATE: 6/02/2005 11:30:50a	
		REV: B	
		DC890B	
		SHEET 2 OF 4	

1508 Rectifier Blvd.  
 Phone: (408) 432-1988  
 Fax: (408) 432-0887  
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USB\_ON [SH4]  
REG\_ADDR3/AMP [SH1]



NOTE:  
TO SUPPORT HSEN BOTH  
P\_SYNC & SHV/LIN  
NGM ARE IDLE HIGH

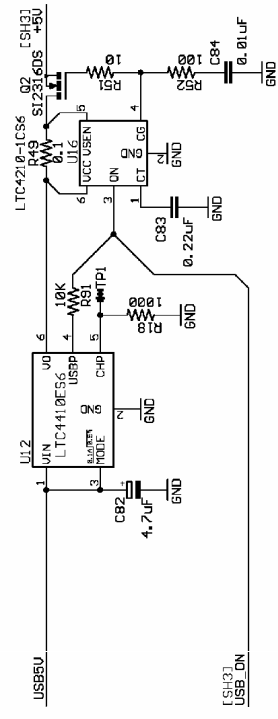
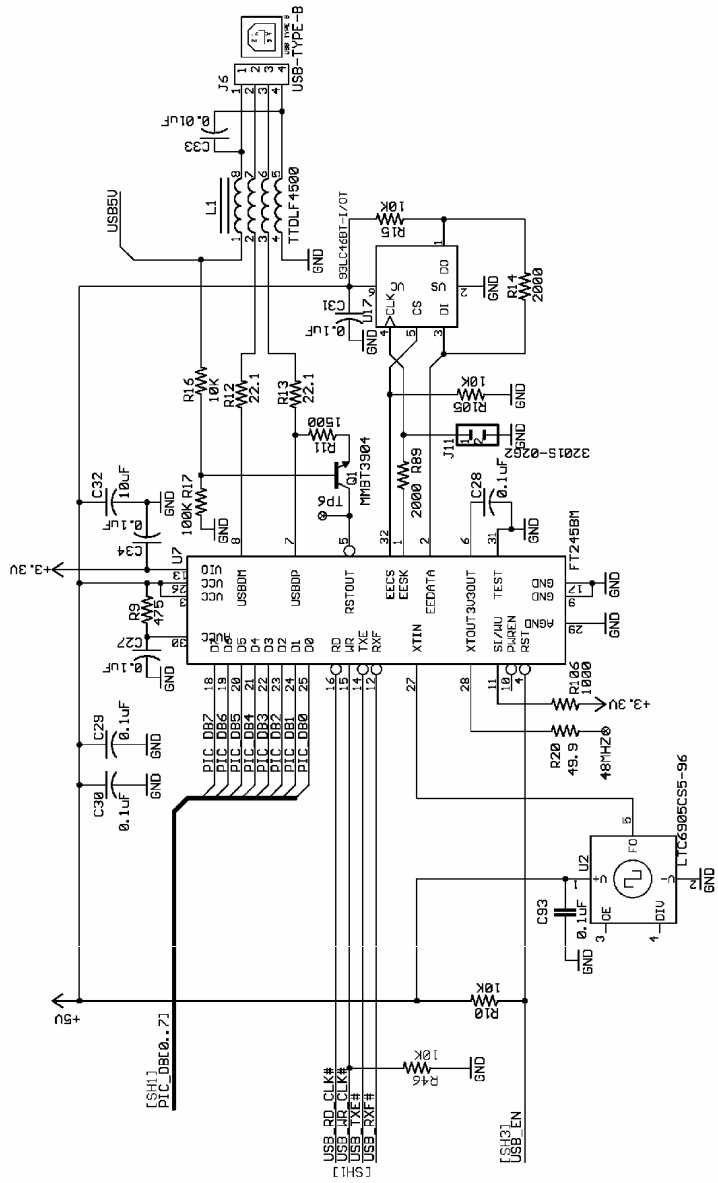


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ENGINEER E TRELICZ	ENGINEER E TRELICZ
DESIGNER E TRELICZ	DESIGNER E TRELICZ

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 890B

FastDAACS

<b>Item</b>	<b>Qty</b>	<b>Reference</b>	<b>Part Description</b>	<b>Manufacturer / Part #</b>
1	3	C80,C81,C89	CAP,TANT,470uF,10V,20%, 7343	AVX TPSE477M010R0050
2	0	C94 (Opt)	CAP,TANT,470uF,10V,20%, 7343	AVX TPSE477M010R0050
3	0	C88 (Opt)	CAP, POLY-TA, 1000uF, 4V 20%,7343	KEMET T530X108M004ASE006
4	1	C88	CAP, POLY-TA, 680uF, 4V 20%, 7343	KEMET,T520D687M004ASE025
5	1	C36	CAP, 330uF16V 20PCT	NICHICON UPL1C331MPH6
6	9	C1,C2,C32,C35,C38,C76,C78, C79,C92	CAP, X5R 10uF 6.3V 20% 1206	TAIYO YUDEN JMK316BJ106ML-T
7	1	C82	CAP,TANT,4.7uF,10V,20%,3216	AVX TAJA475M010R
8	5	C8,C37,C60,C77,C91	CAP, X7R 1uF 10V 10% 0603	AVX, 0603ZD105KAT
9	1	C83	CAP, X5R 0.22uF 16V 20% 0603	AVX, 0603YD224MAT
10	15	C11,C12,C27-31,C34,C42,C44, C52,C53,C57,C62,C85	CAP, X7R 0.1uF 16V 10% 0603	AVX 0603YC104KAT
11	43	C13-26,C39,C40,C45-50,C54-56, C58,C59,C61,C63-75,C90,C93	CAP, X5R,0.1uF,10V,10%,0402	AVX, 0402ZD104KAT
12	1	C43	CAP, X7R 0.047uF 16V 10% 0603	AVX 0603YC473KAT
13	5	C4,C5,C33,C84,C87	CAP, X7R 0.01uF 16V 10% 0603	AVX 0603YC103KAT
14	1	C10	CAP, X7R 2200pF 25V 10% 0603	AVX 06033C222KAT2A
15	0	C9 (Opt)	CAP, X7R 2200pF 25V 10% 0603	AVX 06033C222KAT2A
16	1	C41	CAP, X7R 1000pF 25V 10% 0603	AVX 06033C102KAT2A
17	0	C86 (Opt)	CAP, X7R 1000pF 25V 10% 0603	AVX 06033C102KAT2A
18	1	C51	CAP, NPO,100pF,25V,10% 0603	AVX 06033A101KAT2A
19	3	C3,C6,C7	CAP, NPO 22pF 50V 10% 0603	AVX 06035A220KAT
20	9	D1-8,D12	LED, GRN 0603	LITE ON LTST-C190KGKT
21	1	D10	DIODE, DUAL SCHOTTKY, SOT23	DIODES INC. BAT54S
22	2	D11,D13	RECTIFIER,GP,1A,50V,SMA	DIODE INC, S1A
23	2	D9,D14	DIODE, GP 200V 200MA ,SOD323	DIODES INC. BAV20WS
24	1	J1	HEADER, 3X2, 2mm	COMM CON 2202S-06G2
25	0	J7,J8 (Opt)		
26	1	J2	HEADER, 2X7, 2mm	MOLEX, 87831-1420
27	0	J3,J11 (Opt)	HEADER, 2X1, 2mm	COMM CON 3201S-02G2
28	1	J4	HEADER, 3X1,100MIL	COMM CON 3801S-03G2

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<b>Item</b>	<b>Qty</b>	<b>Reference</b>	<b>Part Description</b>	<b>Manufacturer / Part #</b>
29	1	J5	CON,EDGE,100PIN, 0.063	SAMTEC MEC8-150-02-L-D-EM2
30	1	J6	CON, USB-B, 4 PINS, SINGLE THR. HOLE	MILL-MAX, 897-30-004-90-000
31	1	J9	CONNECTOR, POWER 5mm	CUI INC. PJ-002A-SMT
32	0	J10 (Opt)	HEADER, 3X1, 2mm	COMM CON 3201S-03G2
33	1	L1	CHOKE, COMMON MODE, QUAD, 5uH	COILCRAFT TTDLF4500
34	1	L2	IND, PWR, 2.2UH, D52LC	TOKO D52LC #A914BYW-2R2M
35	0	L3 (Opt)	IND, PWR, 2.2UH, D52LC	TOKO D52LC #A914BYW-2R2M
36	5	Q1,Q6,Q8,Q9,Q12	XSTR, NPN, SOT23	DIODES INC. MMBT3904-7
37	2	Q7,Q13	XSTR, PNP SOT23	DIODES INC, MMBT3906-7
38	4	Q2,Q3,Q4,Q5	XSTR, MOSFET,SOT23	VISHAY,SI2316DS
39	2	Q10,Q11	XSTR, MOSFET,SOT23	DIODES INC. SEMI, 2N7002-7
40	1	R102	RES, 2.21MEG OHMS 1% 1/16W 0603	AAC CR16-2214FM
41	1	R92	RES, 422K OHMS 1% 1/16W 0603	AAC CR16-4223FM
42	1	R95	RES, 324K OHMS 1% 1/16W 0603	AAC CR16-3243FM
43	1	R93	RES, 200K OHMS 1% 1/16W 0603	AAC CR16-2003FM
44	5	R6,R17,R67,R68,R79	RES, 100K OHMS 1% 1/16W 0603	AAC CR16-1003FM
45	1	R94	RES, 16.2K OHMS 1% 1/16W 0603	AAC CR16-1622FM
46	1	R3	RES, 14K OHMS 1% 1/16W 0603	AAC CR16-1402FM
47	14	R4,R10,R15,R16,R46,R66,R71, R72,R73,R82,R84,R88,R91,R105,	RES, 10K OHMS 1% 1/16W 0603	AAC CR16-1002FM
48	10	R61,R81,R83,R90,R96,R112-R115,R119	RES, 4.75K OHMS 1% 1/16W 0402	VISHAY, CRCW04024751F
49	6	R21,R103,R104,R117,R118,R137	RES, 4.75K OHMS 1% 1/16W 0603	AAC CR16-4751FM
50	0	R77 (Opt)	RES, 4.75K OHMS 1% 1/16W 0603	AAC CR16-4751FM
51	4	R14,R48,R85,R89	RES, 2K OHMS 1% 1/16W 0603	AAC CR16-2001FM
52	1	R11	RES, 1.5K OHMS 1% 1/16W 0603	AAC CR16-1501FM
53	9	R8,R18,R40,R41,R44,R45,R78,R80, R106	RES, 1.00K OHMS 1% 1/16W 0603	AAC CR16-1001FM
54	0	R75,R107,R108 (Opt)	RES, 1.00K OHMS 1% 1/16W 0603	AAC CR16-1001FM
55	12	R9,R25-32,R43,R110,R111	RES, 475 OHM 1% 1/16W 0603	AAC CR16-4750FM

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56	2	R47,R53	RES, 332 OHM 1% 1/16W 0603	VISHAY, CRCW04023320F
57	3	R74,R76,R138	RES, 332 OHM 1% 1/16W 0402	AAC CR05-3320FM
58	5	R1,R2,R19,R38,R52	RES, 100 OHM 1% 1/16W 0603	AAC CR16-1000FM
59	0	R120-R136 (Opt)	RES, 100 OHM 1% 1/20W 0201	VISHAY, CRCW0201-101J200RT7
60	17	R7,R20,R24,R54,R55-60,R62-65, R69,R70,R116	RES, 49.9 OHM 1% 1/16 0402	AAC CR05-49R9FM
61	3	R34,R86,R87	RES, 33.2 OHMS 1% 1/16W 0603	AAC CR16-33R2FM
62	2	R12,R13	RES, 22.1 OHMS 1% 1/16W 0603	AAC CR16-22R1FM
63	4	R22,R23,R39,R51	RES, 10 OHMS 5% 1/16W 0603	AAC CR16-100JM
64	5	R97-101	RES, 10 OHMS 1% 1/8W 1206	AAC CR18-10R0FM
65	1	R42	RES, 0 OHM JUMPER 0402	VISHAY CRCW04020000ZSTDE
66	0	R50 (Opt)	RES, 0 OHM JUMPER 0402	VISHAY CRCW04020000ZSTDE
67	1	R109	RES, 0 OHM JUMPER 0805	AAC CJ10-000M
68	1	R49	RES, 0.1 OHMS 1% 1/8W 0805	Vishay WSL0805R1000FEA
69	3	R5,R33,R37	RES, 49.9K OHMS 1% 1/16W 0603	AAC CR16-4992FM
70	2	R35,R36	RES 2X4 ARRAY, CHIP, 100 OHM, ISO	ROHM MNR14E0ABJ101
71	1	SW1	SWITCH, LIGHT TOUCH, 2 PINS	PANASONIC, EVQPPDA25
72	5	TP2-3,G2,G3,G5	TURRET	MILL MAX 2308-2
73	0	TP1,G4,G6 (Opt)		
74	1	U17	I.C., 93LC46BT-I/OT, SOT23-6	MICROCHIP 93LC46BT-I/OT
75	1	U7	I.C., FT245BM, LQFP32	FUTURE TECH.,(FTDICHIP) FT245BM
76	1	U10	IDT71T75602S200PF	IDT71T75602S200PF
77	0	U10 (Opt)	71V2556S200PF	71V2556S200PF
78	1	U19	IC, LT1529CQ-5	LINEAR TECH. LT1529CQ-5
79	1	U4	IC, LT1763CS8	LINEAR TECH. LT1763CS8
80	1	U8	IC, LT1763CS8-3.3	LINEAR TECH. LT1763CS8-3.3
81	1	U5	IC, LTC1726EMS8-2.5	LINEAR TECH. LTC1726EMS8-2.5
82	2	U3,U14 (tape & reel)	IC, LTC1844ES5-3.3	LINEAR TECH. LTC1844ES5-3.3
83	1	U21	IC, LDO,1.5A,DD-5(Q PKG)	LINEAR TECH, LT1963EQ-2.5

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 890B

FastDAACS

<b>Item</b>	<b>Qty</b>	<b>Reference</b>	<b>Part Description</b>	<b>Manufacturer / Part #</b>
84	1	U1	IC, LTC2921CGN-3.3	LINEAR TECH. LTC2921CGN-3.3
85	1	U16	IC, LTC4210-1CS6	LINEAR TECH. LTC4210-1CS6
86	1	U15	IC, LTC4300A-1CMS8	LINEAR TECH. LTC4300A-1CMS8
87	1	U12	IC, LTC4410ES6	LINEAR TECH. LTC4410ES6
88	1	U2	IC, OSC,SOT23-5	LINEAR TECH, LTC6905CS5-96
89	1	U11	IC, NC7SP17P5X	FAIRCHILD, NC7SP17P5X
90	1	U18	IC, FF,DUAL, HC, TSSOP14	PHILIPS, 74HC74PW
91	1	U6 (in trays)	IC, PIC16LF877A-I/PT	MICROCHIP, PIC16LF877A-I/PT
92	1	U9	IC, XC3S200-4PQ208	XILINX, XC3S200-4PQ208
93	1	U13	IC, SEEPROM,4MEG,SO8	ST MICRO, M25P40-VMN6TP
94	1	U20	IC, SWREG,SYNC,BUCK,	LINEAR LTC3411EMS
95	1	X1	CONN, BNC 50 OHM	CONNEX 112404
96	1	Y1	CRYSTAL, 10MHZ, HC49-SMT	ECS INC. ECS-100-18-5P
97	4		Stand Off, 1/4 X 4-40	Microplastic
98	4		Screw, 4-40 - 1/4"	Screw
99	1		PCB, PRINTED CIRCUIT BOARD	DEMO CIRCUIT 890B
100	1		HEATSINK,BGA (FOR U9)	AAVID/THERMALLOY, 374324B00035