www.FETAudio.com

FDA-2A Manual

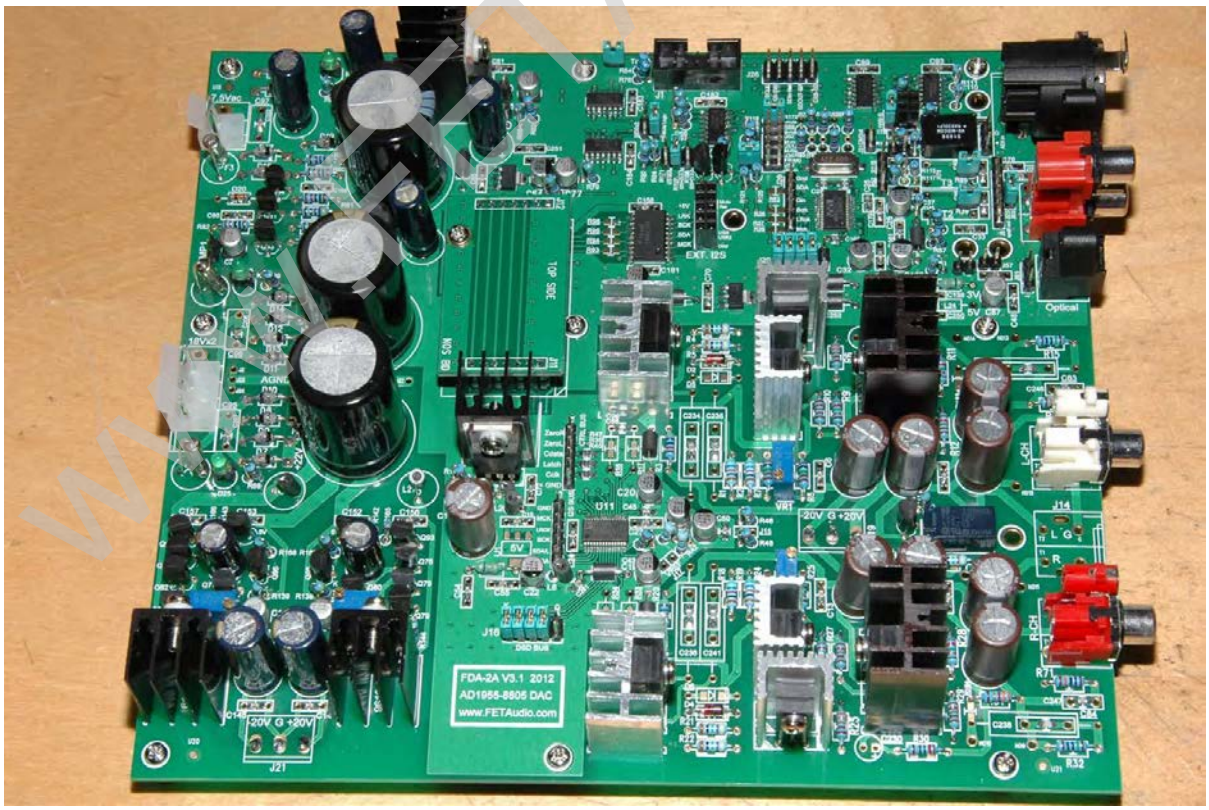
AD1955 + WM8805 Single Ended DAC

~~~~~~

*High Fidelity 24 bit*192kS/s*
Digital to Analogue Converter

~~~~~~

Designed By Spencer Cheung of FETAudio.com
Email: spencer@fetaudio.com or skcheung68@hotmail.com



A. Introduction:

FDA-2A AD1955+WM8805 DAC use the same "super sound discrete IV converter" of FDA-1B. The main difference is the change of the main DAC chip from Texas Instruments PCM1794A to Analogy Devices AD1955 in Single Ended output mode. The second minor change is the digital receiver chip from WM8804 to WM8805. Due to the use of AD1955 DAC chip in FDA-2A, it sounds smoother, more laid back, and less dynamics relative to FDA-1B PCM1794A DAC. In fact many people like this type of sound and regard it as more musical. This reminds me the sound of PCM63 in D1V33 DAC. Overall, FDA-2A DAC sounds more like the mixture of D1V33 and FDA-1B with the 24bit high resolution.

So who is the winner? To me it is a matter of taste for the choice of DAC chip to match with the rest of Hi-Fi system. Personally I think FDA-1B PCM1794A DAC is a better match to valve amplifiers and FDA-2A AD1955 DAC suit more on solid states amplifiers.

In FDA-2A, the AD1955 DAC chip will work in its reset default mode, i.e. PCM mode. Thus FDA-2A natively is able to work up to 24bit/96k with "NOS Daughter Board" due to the limitation of AD1955 default PCM mode. To let it play 24bit/192k input signal, an "ASRC Daughter Board" is required (same board used in the FDA-1B) to down sample 192k digital signal back to 96k for the AD1955 chip to decode.

On the WM8805 receiver side, it is preset to hardware mode but input logics allow it to have 4 digital inputs (2 SPDIF, 1 AES and 1 Toslink) and one I2S input with a new front panel control board. The FDA-1B front control board is also usable but it only can control 3x digital input plus 1x I2S or 4x digital input without I2S input. Moreover one of the two RCA socket (top one) on digital input section can be set to SPDIF out of WM8805 by on board jumpers. It functions as a buffer and jitter filter/cleaner of the selected digital input signal (not for I2S input).

Since this is a DIY DAC, it will work as a standalone DAC. But there are "control bus" sockets delicate to control both the AD1955 and WM8805 chips on board in software mode. This is made for DIYer to improve the DAC further for functionality and user interface. If the DIYer knows SPI & MCU software program, the DAC can be transformed into full software mode to extend the full functions of the DAC without sacrificing performance of sound. Some possible additional functions are 24bit/192k native support, DSD direct input support, , 4 more digital inputs (total 8), testing of mono mode, external digital filter mode via new module at U18 daughter board, adding display to show sample rate and working status of the DAC, slaving the internal DAC system clock to external low jitter Super Clock reference, adding a USB2.0 to I2S module via I2S input at J5 etc…

Thus this DAC design is really flexible for user to experiment with different modes of the AD1955 and WM8805 chips! The price is just a faction of the demo board of Wolfson or Analogy Devices and it has two chips on one single board. With the super sound discrete IV converter, it is able to explore the best sound from these chips available for PCM and DSD format.

B. Specifications:

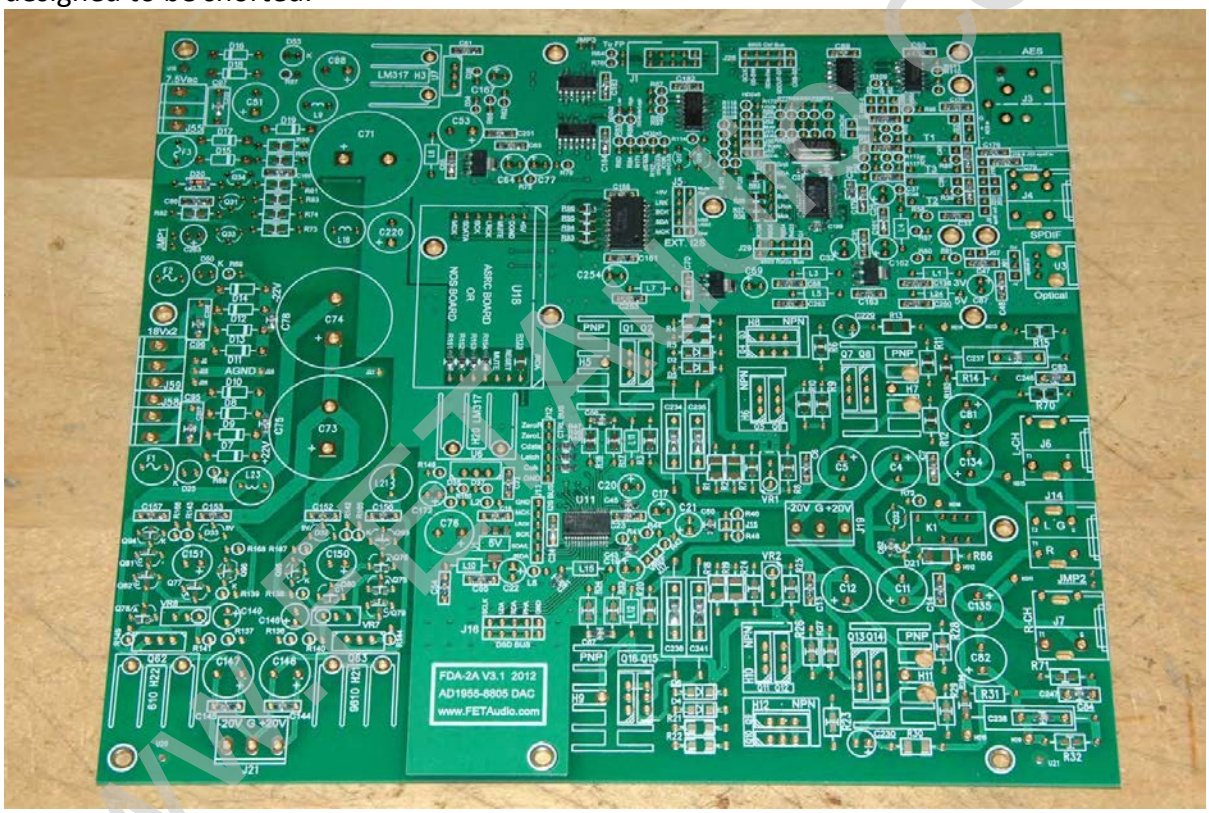
1. DAC chip AD1955 and receiver chip WM8805 plus the discrete super sound IV converter in pure class "A" operation.
2. On board full power supplier regulations for the DAC to work in standalone hardware mode with 4 digital inputs (2 SPDIF – RCA x 2, 1 AES – XLR x 1, & 1 Optical – Toslink x 1) and one I2S (2x5 2.54mm pin header) input. Moreover one of the RCA SPDIF input socket can be set to SPDIF out, but by doing so, number of RCA SPDIF input will be one only.
3. Control buses for AD1955 and WM8805 chips are provided on board and thus it can program into software mode and expand the functions of the DAC.
4. Accept up to 24bit/96k signal in NOS mode or 24bit/192k signal with ASRC Daughter Board (Use same Daughter Board options of FDA-1B).
5. Output analogy level at about 1.5Vrms at 0dBFS digital input. Distortion is about 0.02% at 1kHz 0dbFS or below 0.04% from 20Hz-20kHz. Output impedance is about 150 ohm. Output mute is provided with relay shorting the signal to ground.
6. Power supply is AC 18V x 2 and 9V x 1 (same as FDA-1B transformer); min 40VA total.
7. The form factor of the PCB is similar to the FDA-1B with one discrete IV section and one regulator removed. Since the PCB width is only 7.1 inches, it will fit into a half full size case of about 9 inches width.
8. Board: 7.1 x 8 inches double sided 1.6mm gold plated FR4; 9 x M3 supporting holes; max height part 35mm. Total fully assembled board height is 37mm.
9. The PCB layout is designed to accept both SMD and Through-Hole type components for both capacitors and resistors. Note that although the resistors hole is just a TH 5mm pitch but 0805 SMD parts can be soldered on to it.
10. Future expansion to USB 2.0 (up to 24bit/192k) input using any USB to I2S module solution is possible via the input daughter board using the I2S digital input at J5.

Component Choices:

1. Best DAC chip AD1955 and best sound receiver WM8805 are used.
2. All logic parts are selected carefully to ensure digital input can work flawlessly up to 192k sample frequency.
3. Many Toshiba obsolete transistors are eliminated and better parts are selected from various sources to ensure continue supply. Many Fairchild transistors are used for the better specifications and easily available from Mouser or Digikey.
4. Vishay MRS25 and Xicon 50ppm 1% resistors are widely used.
5. Maintain the use of Elna Silmic II capacitors in the analogy discrete IV sections for its best sonic performance.
6. Use more SMT capacitors (both E-cap and MLCC) in the digital section as they are more stable with lower ESR. Example is Panasonic FK series. The 5600p and 1500p IV low pass filter capacitors have changed to SMT COG type for more accurate and stable performance.
7. ROHS compliance is the first choice for all components.

C. Assembly Instruction

1. Please take necessary ESD precautions, as all the parts are ESD sensitive!
2. Solder all SMD IC: AD1955, WM8805, 74 Series ICs, and AMS1117, Align the markings of the parts with the text on the PCB screen-printing.
3. Solder all SMD chip capacitors (0603 or 0805 sizes) provided as per below sequence. They are 15pF x 2, 100p x 2, 470p x 2, 1u x 1, 1500p x 2, 5600p x 4, 0.01u x 2, 0.1u x 58.
4. Solder the SMT crystal 12MHz Y1 on board.
5. After that wash the PCB to remove all the flux with Isopropyl Alcohol. Use a tooth brush to clean the gap of the ICs leads. After that rinse the PCB with distilled water and dry it properly.
6. Use a multi meter to check all the leads of AD1955 and WM8805 connections to the nearest connection points. Ensure no adjacent leads are shorted together unless it is designed to be shorted.

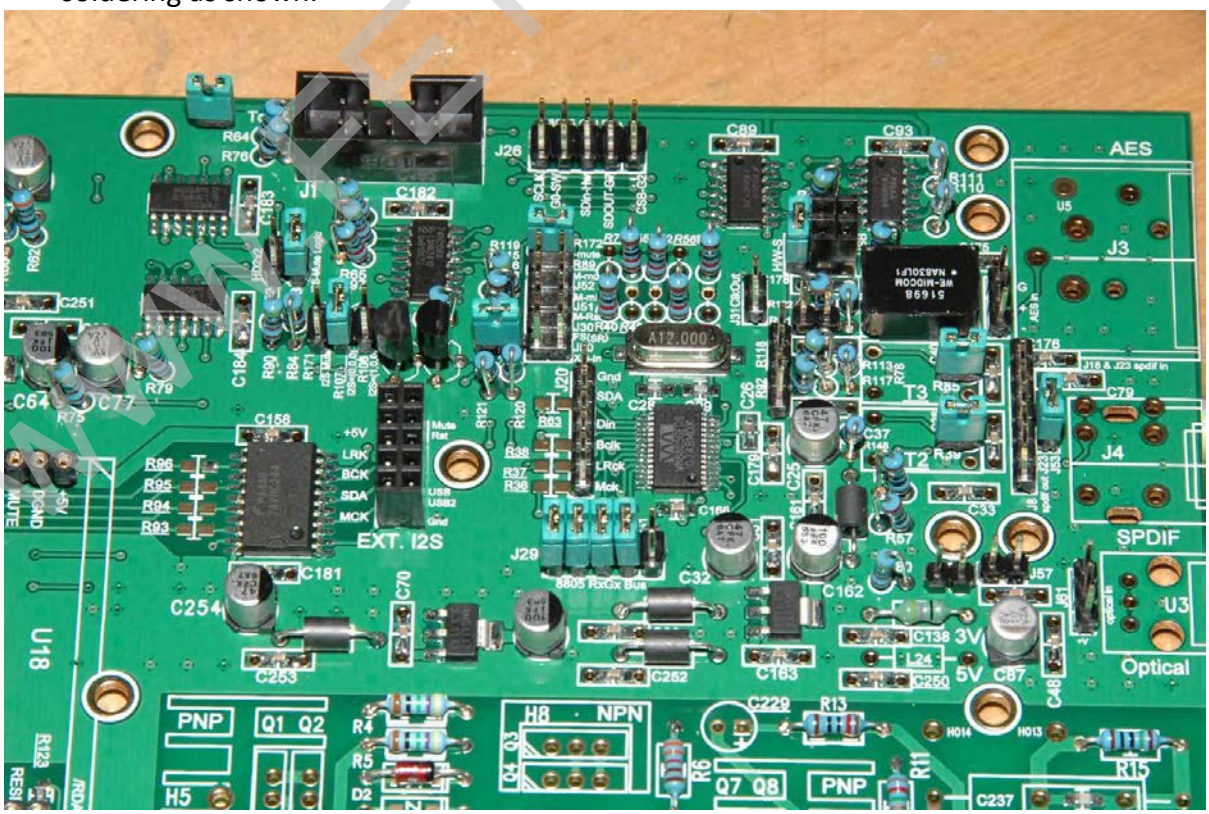


***** If you buy the kit, you will get a DAC main board with all the SMT parts pre-soldered as above *****

7. Solder the rest of the parts starting from the smallest parts first, preferably also by component type and by component value. For example, beads (except L8 and L15), Pin Headers, pulse transformer, relays, resistors, LEDs, diodes, small E-caps and TO-92 transistors, VRs, Connectors, fuses etc… Leave the big items like E-caps 10000u, 5600u, 560u, 470u, and 100u silmic, RCA/XLR sockets to be soldered at the end of the process.
8. For SMD E-capacitors (Panasonic FK and other 5mm type if provided), pull the leads straight carefully and insert into the PCB holes before soldering. Do not pull the lead too hard as it may break. Note there is polarity for these E-caps (negative at black strip or semi-circle).
9. Do not solder L8 and L15 nearby the AD1955 chip. This is only required after checking the regulator voltage is regulating at 5Vdc in the tuning procedure.
10. **There are some parts that need special attentions during assembly:**

10.1. Diodes 1N4007 x 4 pcs – D34 to D37: The cathode mark (strip or K) is not provided on the PCB, it is actually the double circles on the PCB.

10.2. Pin Headers for both male and female type – refer to photo below for the type of pin header or socket. Some pin headers will require a jumper inserted after soldering as shown.



10.3. Do not connect the 3 wires at J19 and J21. Refer to the tuning procedure for details.

10.4. Install all transistors into heat-sink with their markings all facing upward as shown below. Note that there is a mica insulation sheet between the metal body of TO-220 parts (IRF610, IRF9610 and LM317T) and the heat sink. A spring washer and plastic washer is also used for insulating the M3 screw from touching the metal body of all TO-220 parts. For the other NPN and PNP transistors, they do not need a mica sheet for insulation as the body is all 100% plastic.

10.5. If ASRC daughter board module is used, the output sample frequency Fs can be set as below:

ASRC Chip	J15	J16	Sample Frequency
SRC4192	Open	Open	96k (recommended)
SRC4192	Open	Short	48k
SRC4192	Short	Open	192k (No Output)
SRC4192	Short	Short	No Output
AD1896	Open	Open	96k (recommended)
AD1896	Open	Short	48k
AD1896	Short	Open	32k
AD1896	Short	Short	No Output

Note the orientation of the ASRC daughter board and it must be inserted like the photo below. The fixing screw should be able to be aligned to the spacer hole. The M3 spacer provided is 8mm height and a spring washer is provided and put below the spacer to increase the total height to about 9mm. Two rows of IC pin sockets are provided and to be soldered on the main board. NOS or ASRC and RJ45 daughter boards should be inserted into the main board as shown.

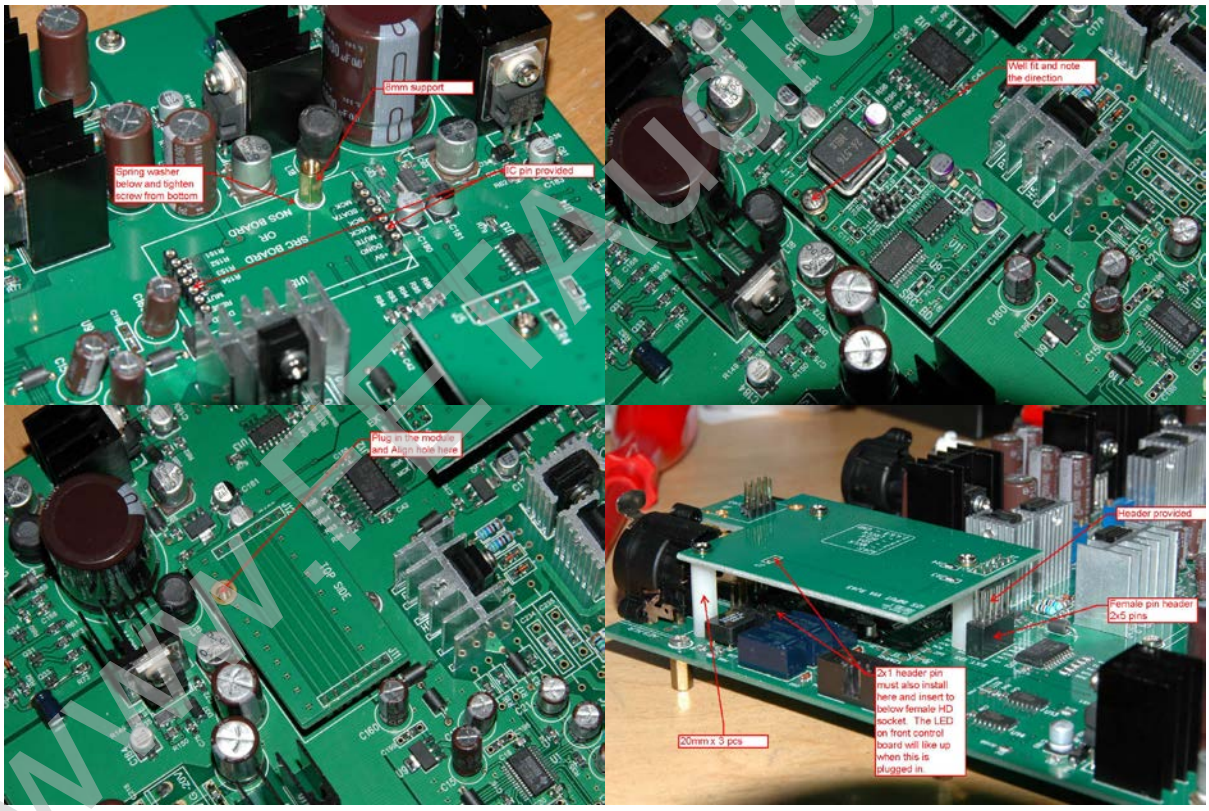


Photo above is for reference only as the main board may be a difference version.

D. Tuning and Testing Procedures:

1. With all the parts in place except the 3 wires, L8 and L15, insert the NOS daughter board in place (U18).
2. Connect AC 9V (or a regulated power supply with current limit set to 200mA at 12Vdc) to J55 (do not connect J58 and J59 to AC 18V), check the voltages at U1 big pad (5V), U6 and U7 (LM317T) metal body (not the big heat-sink that it attached to) relative to ground (DGND at U18 daughter board). The voltage at all 3 locations should be at about 5V +/- 0.1Vdc. If the voltage is outside the range, cut off the power immediately and check for wrong component used or open/short soldering.
3. Solder L8 and L15 if the regulated voltage at U1 and U6 are at 5V.
4. Then check the voltage at U8, U10, & U17 (AMS1117-3.3). The voltage at the little heat-sink of the regulators should be 3.3V +/- 0.1Vdc.
5. Plug in the Front Panel Control Board (V7.1) via J1 on both PCBs using the 10-pin flex cable provided. D1 (USB/I2S) and D5 (if set to Power LED) should be "ON". Press the toggle switch (at J2 or J14) to see if the LEDs D1 to D4 is "ON" one by one. The sequence is from D1 → D4 → D3 → D2 → D1 → D4 … and repeat.
6. Inject a digital SPDIF1 signal to J4 (lower RCA socket), the LOCK LED (D6) should be "ON" if SPDIF (D4) is selected. This shows that the digital section is locking to input signals.
7. Then remove the power at J55.
8. Connect AC18V (or a regulated power supply with current limit set to 300mA at 24Vdc) to J59, check for voltage at J21 for -20V to G points. The initial voltage should be around -15.5V to -16V. Adjust VR8 until the voltage is -20V +/- 0.02Vdc. Remove the power applied to J59.
9. Connect AC18V (or a regulated power supply with current limit set to 300mA at 24Vdc) to J58, check at J21 for +20V to G points. The initial voltage should be around 15.5V to 16V. Adjust VR7 until the voltage is +20V +/- 0.02Vdc. Remove the power applied to J58.
10. Solder the 3 wires provided from J19 to J21 at the bottom of PCB. Make sure that the wires are connected from -20V to -20V, G to G and +20V to +20V points.
11. Connect power to all J55, J59 and J58.
    Check the +20V and -20V are still at about the same voltages as before. If not, the IV section is not work properly. Cut the power immediately and do trouble shooting. The common mistake is transistor orientation wrongly mounted on the heat-sink.
12. Output DC offset adjustment:
13. Check the offset voltage at C246 (C83) inner hole relative to Ground (G point of J14). It should be around -0.45Vdc. Adjust VR1 until this voltage to below +/-1mVdc. Repeat at C247 (C84) and adjust VR2 to within +/-1mVdc offset.
14. After warm up for 30 minutes, repeat above steps 11 to 13 to ensure the offset is below 1mV by adjustment again if necessary. For normal use, the offset of +/-5mV is ok as all output has couple capacitor to block any DC from going to the output sockets.
15. Re-adjust +20V and -20V regulated voltages if necessary
16. Check the DAC AD1955 analogy pins DC offset voltage at two sides of C56 and C67 (100pf SMD capacitors). The DC voltage relative to DGND should be at about 2.7xV (close to 2.8V).
17. Check the VREF voltage of AD1955 at the J17 "Square" pad. The voltage should be close to 2.39Vdc.
18. If all the DC adjustments and check are done, proceed to AC measurements below.

19. Connect a 1kHz digital signal to the SPDIF1 input (lower RCA socket). A test CD recorded with 1kHz can be used with a CD player with SPDIF output.
20. Check the output levels for 0dBFS input signal is about 1.55Vrms at J14 T1 and T2 relative to G. Left and right channel should not be more than 0.25dB differences in levels.
21. Check that the distortion of the output 1KHz signal is about 0.022% for both channels.
22. Burn-in the DAC for an hour and go for listen test.

E. Board Interface Specifications:

1. Power Supply Connectors:

Location	Description	Format
J58	18V to 20V AC, 0.8A, 14VA	3.96mm pitch (5mm also provided)
J59	18V to 20V AC, 0.8A, 14VA	3.96mm pitch (5mm also provided)
J55	8 to 9V AC, 1.2A, 12VA	3.96mm pitch (5mm also provided)
J2/J25/J54	Chassis Ground	Connect AGND to star ground point

2. External I2S Connector J5: (5 x 2 female Pin Header; pitch 2.54mm, CMOS 3V3 logic)

Pin	Description	Marking on PCB
1	Digital Ground	GND
2	System clock 256fs	MCLK
3	USB2 LED drive (with current limit R120)	USB2
4	Serial Digital Data	SDA
5	USB LED drive (with current limit R121)	USB
6	Bit clock 64fs	BCK
7	Power up reset (Low = Reset)	RST
8	Work clock fs	LRK
9	Output Mute (Hi = Mute)	Mute
10	+5V DC Supply for plugin	+5V

3. Digital Input Socket:

Location	Description	Spec	Format
J4	SPDIF input x 2 – Lower RCA is SPDIF1; Upper RCA is SPDIF2 or SPDIF Out (Tx from WM8805)	75 ohm 24bit/192k	RCA (vertical double deck)
J3	AES input	110 ohm 24bit/192k	XLR female
U3	Optical input	Optical 24bit/192k	Toslink - TORX147
J5	See item 2 above	3.3V CMOS levels	5x2 pin header

Note: For 192k operation, an ASRC daughter must be used at U18 location.

4. Analogy Output Socket:

Location	Description	Format
J6	Left Single Ended Output	RCA (white)
J14	Left and Right output for wire connection	RCA (vertical double deck) not provided
J7	Right Single Ended Output	RCA (red)

5. J1 – Front Panel connector (for hardware mode only):

Pin	Description	Marking on PCB
1	Digital input select Binary bit 0 (0, 0, A)	Default A = 1
2	Digital input select Binary bit 1 (0, B, 0)	Default B = 1
3	Digital input select Binary bit 2 (C, 0, 0)	Default C = 0
4	USB2 LED drive from pin 1 of J62 (no current limit) AND pin 3 of J5 (with resistor R120=680R current limit).	USB2

5	DGND	
6	USB LED drive from pin 1 of J24 (no current limit) AND pin 5 of J5 (with resistor R121=680R current limit).	USB
7	+3V3 Supply from U8	
8	Lock LED drive (with resistor 680R current limit)	Lock = Un-mute
9	+3V3 Supply from U8	
10	Mute LED drive (with resistor 680R current limit)	Mute = un-lock

Default of digital input is set to (C,B,A=0,1,1), SPDIF1.

6. J26 – WM8805 Control Bus:

Pin	Description	Marking on PCB
1	DGND	
2	CSB/GPO2	CSB-G2
3	DGND	
4	SDOUT/GOP7	SDOUT-G7
5	DGND	
6	SDIN/HWMODE	SDIn-Hw
7	DGND	
8	GPO0/SWIFMODE	G0-SW
9	DGND	
10	SCLK	SCLK

Refer to WM8805 data sheet for details

7. J20 – WM8805 Digital Bus:

Pin	Description	Marking on PCB
1	DGND	GND
2	DOUT	SDA
3	DIN	Din
4	BCLK	Bclk
5	LRCLK	LRck
6	MCLK	Mck

Refer to WM8805 data sheet for details

8. J29 – WM8805 RxGx Bus:

Pin	Description	Marking on PCB
1	GPO1	G1
2	DGND	
3	RX4/GPO3	R4G3
4	DGND	
5	RX5/GOP4	R5G4
6	DGND	
7	RX6/GOP5	R6G5
8	DGND	
9	RX7/GOP6	R7G6
10	DGND	

Refer to WM8805 data sheet for details

9. J12 – AD1955 Control Bus (SPI):

Pin	Description	Marking on PCB
1	DGND	GND
2	CCLK	Cclk
3	CLATCH-BAR	Latch
4	CDATA	Cdata
5	ZEROL	ZeroL
6	ZEROR	ZeroR

Refer to AD1955 data sheet for details

10. J13 – AD1955 Digital Bus (I2S):

Pin	Description	Marking on PCB
1	DGND	GND
2	MCLK	MCK
3	LRCLK	LRCK
4	BCLK	BCK
5	SDATA/L	SDA/L
6	/RDATA	/RDA

Refer to AD1955 data sheet for details

11. J16 – AD1955 DSD Bus:

Pin	Description	Marking on PCB
1	DGND	GND
2	DGND	
3	DSD_PHASE	PHA
4	DGND	
5	DSD_RDATA	RDA
6	DGND	
7	DSD_LDATA	LDA
8	DGND	
9	DSD_SCLK	SCLK
10	DGND	

If DSD input is not used, short the all the pins to ground. Refer to AD1955 data sheet for details

12. JUMPERS, RESISTOR AND PIN HEADER DESCRIPTION:

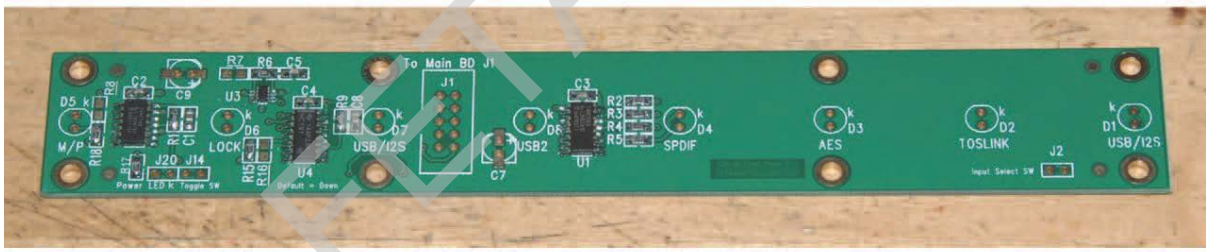
Location	Description
R53/R88	Short one of these resistors; R88 = I2S Mute at J5 pin 9 is active High; R53 = I2S Mute is active LOW. Default is R88 short (active high).
R171	If shorted, then the I2S Mute pin 9 is shorted to ground, thus the Mute conditions will depend on the setting of R53 and R88. Default is R171 open.
R107/R106	Short one of these resistors; If R107 is shorted, I2S input will be selected at (A,B,C)=(0,0,0) – this mode is for 4 input (3 digital and one I2S); If R106 is shorted, I2S input will be selected at (A,B,C)=(1,0,0) – default mode for 5 input (4 digital and one I2S)
R172/R89	Short one of these resistors; Short R172 (I-Mute) to use internal WM8805 mute control (Hardware mode); Short R89 (M-mu) to use external MCU Mute Input control at J52 (software mode).
J52	MCU mute input, active High (M-mi).
J51	MCU reset input, active Low (M-Rst).
J30	FS(SR) Sample frequency output from internal I2S bus; for MCU to measure the sample frequency
J31	Clock Out of WM8805 pin, same frequency as crystal (12Mhz) in hardware mode. Programmable clock out in software mode.
J50	XO-In for WM8805 pin 15, connect to external low jitter XO. 12Mhz crystal Y1 should be removed when external XO is used.
L1/L24	L1 and L24 are for 3V3 and 5V optical receiver at U3 respectively. Only one of the inductor should be connected per the spec of the Toslink.
L10	Provide 5V to digital supply of AD1955. Should not connect if U1 is present.
J22	Same as J3, AES input
J23	Same as J4, SPDIF1 input
J18	Same as J4, SPDIF2 input
J61	Same as U3, Toslink input
J32 / R81 / R91 / R92 / R118	For hardware mode, J32 Short, R81, R91, R92, R118 open; for software mode, reverse above.
J53	Must be shorted for SPDIF IN when T2 and T3 is not used. Open when T2 and T3 are used.
J57	Optical input with or without capacitor couple to buffer. Short is no capacitor couple.
R39	Should be shorted for SPDIF1 IN to work without T2.
J8/R85	Short only one of them; J8 is for SPDIF Out; R85 is for SPDIF2 IN without T3.
JMP1	If connected, the M3 hole near to it will be connected to analogy ground
JMP2	Short the Ground connector of Left and Right RCA sockets.
JMP3	Short to supply 3.3V to digital switch for U2 and U15 in hardware mode. Remove it for software mode.
C95/C96/C97	Can be used to connect a MOV for surge suppression, not provided
H09 to H016	Output couple capacitor connection points for large film capacitor. Two

	groups of pads are provided. Example: H09 & H10 are the same points, and H11 & H12 are the same points. Thus connect a film capacitor from H09 to H11 and/or H10 to H12. Other connections are {H013 to H015, H014 to H016}.
U18	A NOS daughter board will be provide as the default option. ASRC daughter board using AD1896 or SRC4192 can be purchased separately to plug into same location. The output sampling frequency from the ASRC BD is preset to 96k for both AD1896 and SRC4192.
T2/T3	Provide isolation of SPDIF inputs and not provided. When used, J53 should be opened and R39 and R85 should not be populated.
J14	Channel Analogy Output: T1 = Right, T2 = Left, G = Ground. This is for off board RCA connection.
J15 / J17	Not used – for VREF measurement points
R51/R52 *R50*/R54 *R49*/R55 R43/*R56* R40/*R77*	These resistors pairs decide the power on operation mode of WM8804. Solder only one 10k resistor for each pair. Default is hardware mode, master, Tx=R0, I2S 24bit. Only populated the resistors without underline markings. For software mode, refer to data sheet of WM8805 for details.
R123	Short R123 when U18 is an external digital filter module like PMD200, DF1706 etc... R123 connects the Serial Data Right Channel (/RDATA) of AD1955 to this pin14 of U18.

F. Front Panel Control Board (V7.1):

The front panel control board Version 7.1 will control the counting of two digits, that is choice of 4 inputs. In FDA-2A, it can be set to use either 4 digital input (2 x SPDIF, AES & Optical) or 3 digital input (SPDIF, AES, & Optical) and one I2S input (J5). Note that the front panel control will remember the last selection after power off as there is a static memory chips FM1106 on board. Short R107 and open R106 when this board is used for FDA-2A.

1. J1: Connect back to DAC main board via 10-pin flex cable.
2. J2 and J14 are the same toggle switch to select the digital input – SPDIF, AES, Toslink, and USB/I2S (J5).
3. J20 can be connected a external Power LED. Brightness can be adjusted by changing the value of R17.
4. R18: D5 will indicate Mute if connected. R8 should not be connected in this mode.
5. R8: D5 will be power LED indicator if connected. R18 should not be connected in this mode.
6. The front panel can be mounted to the front plate when the LEDs are populated at the bottom of the PCB.



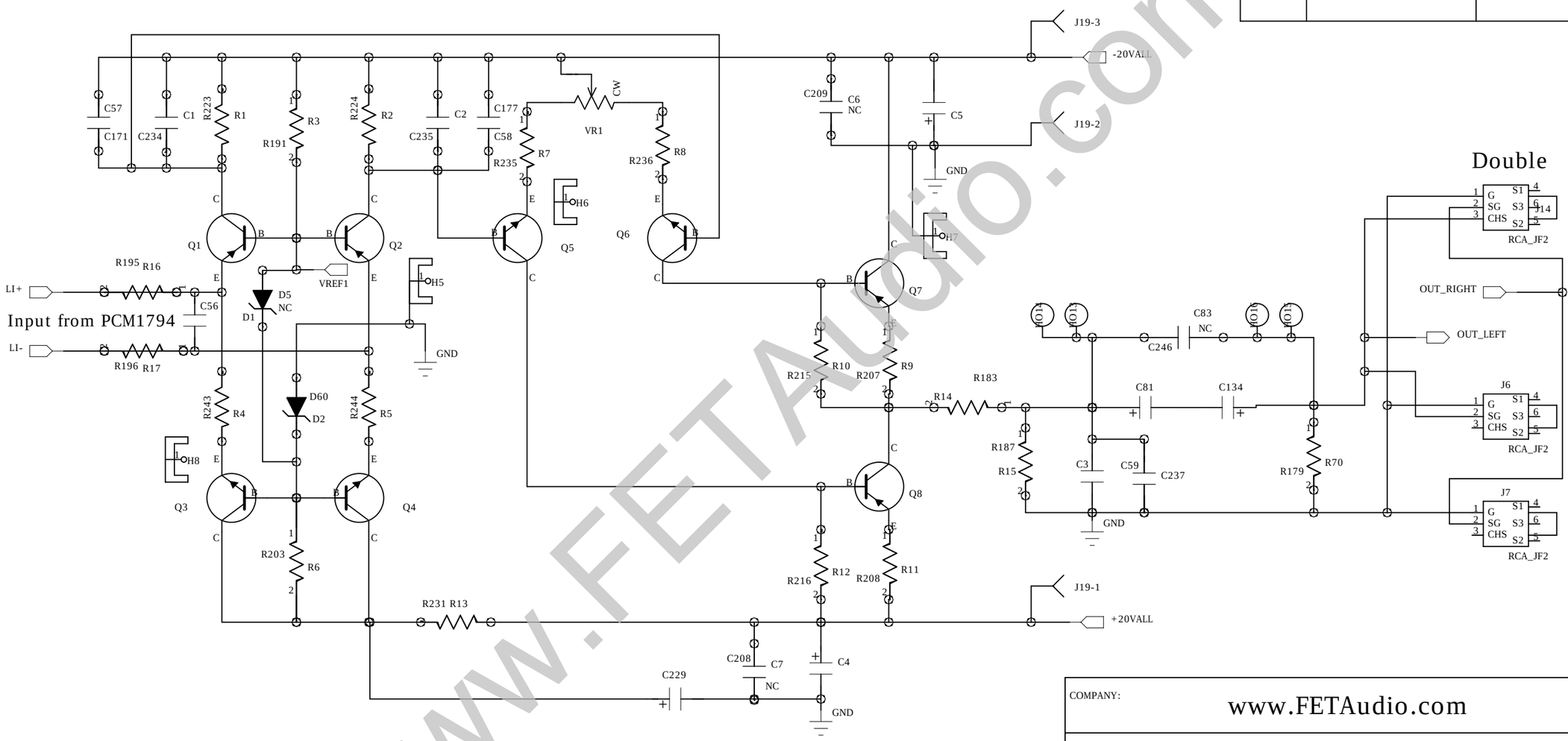
G. Attachments:

1. Circuit Diagram – 12 pages
2. BOM (Bill of Material) – 4 pages
3. FFT measurement – 9 pages
4. Jitter measurement of I2S Bus – 1 page
5. PCBs silk screen, dimension & mounting – 3 pages

~ ~ ~ E N D ~ ~ ~

REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

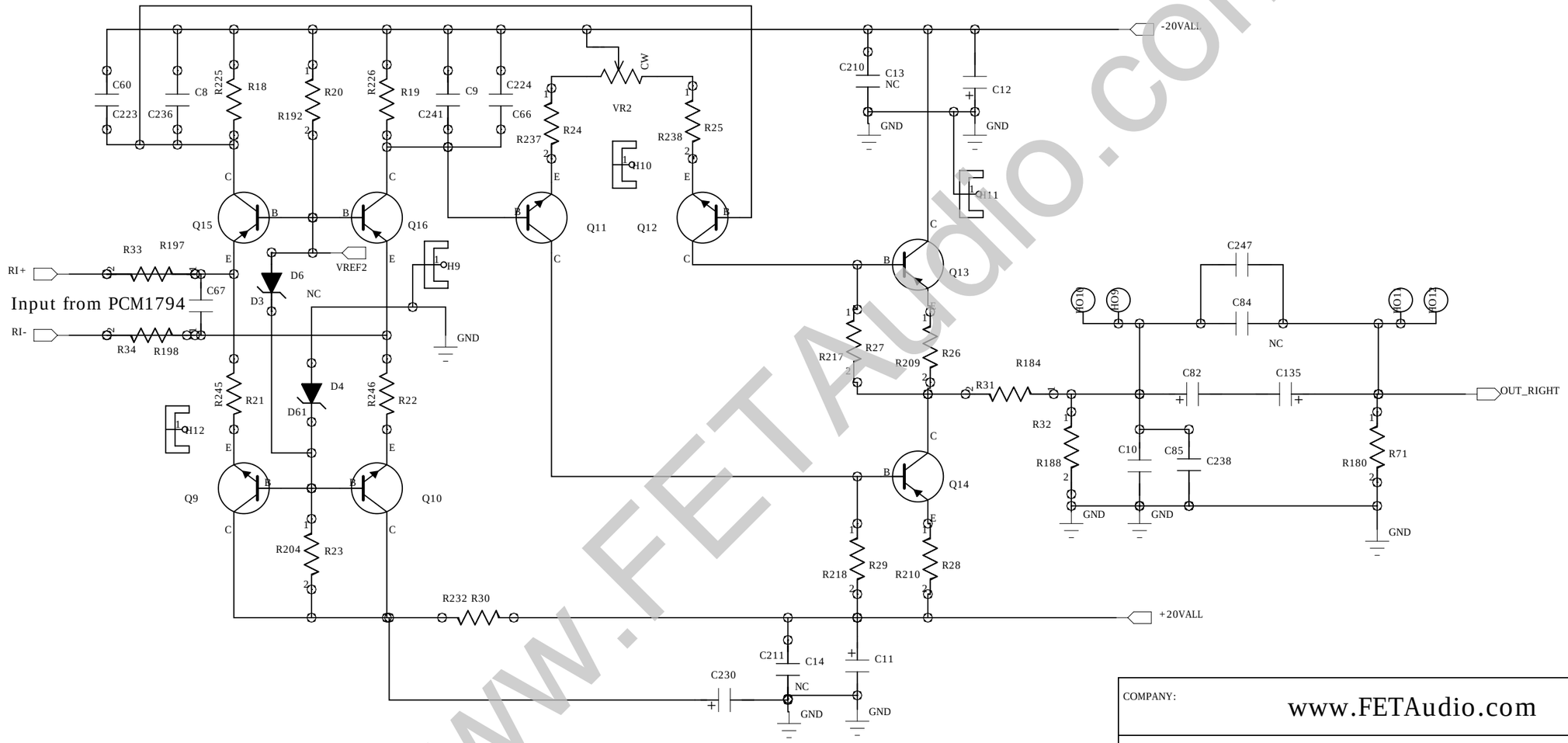
Discrete IV Left



DRAWN: Spencer Cheung	DATED: 2012-08-15	COMPANY: www.FETAudio.com	
CHECKED: <Checked By>	DATED: <Checked Date>	TITLE: FDA-2A (AD1955 + WM8805)	
QUALITY CONTROL: <QC By>	DATED: <QC Date>	CODE: 1955V3	SIZE: B
RELEASED: Spencer Cheung	DATED: 2012-08-15	DRAWING NO: FDA-2A-5	REV: 3
		SCALE: 1:1	SHEET: 1 OF 8

REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

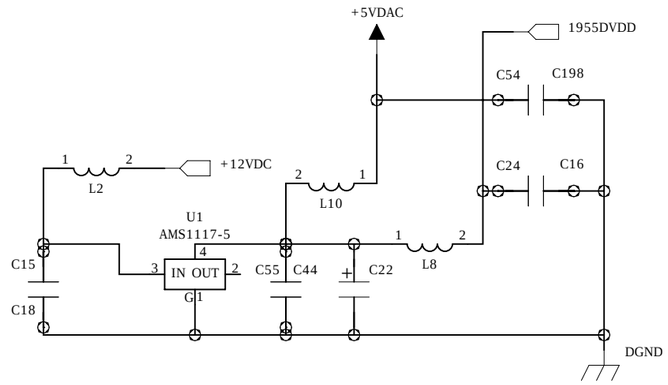
Discrete IV Right

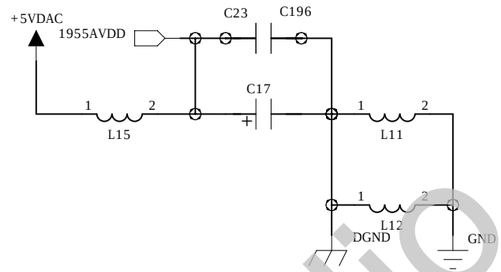


DRAWN: Spencer Cheung	DATED: 2012-08-15	COMPANY: www.FETAudio.com	
CHECKED: <Checked By>	DATED: <Checked Date>	TITLE: FDA-2A (AD1955 + WM8805)	
QUALITY CONTROL: <QC By>	DATED: <QC Date>	CODE: 1955V3	SIZE: B
RELEASED: Spencer Cheung	DATED: 2012-08-15	DRAWING NO: FDA-2A-5	REV: 3
		SCALE: 1:1	SHEET: 2 OF 8

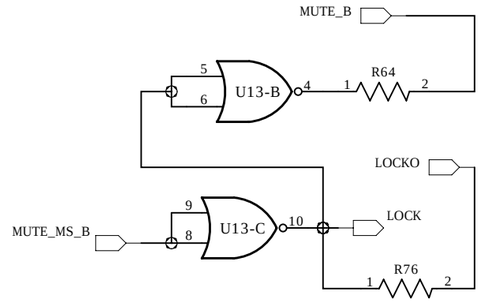
REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

AD1955 Supply



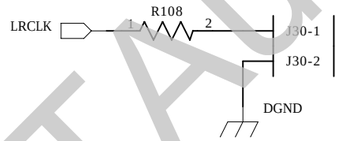


Mute / Lock LED drive



External I2S Input Connector

FS (sample rate)

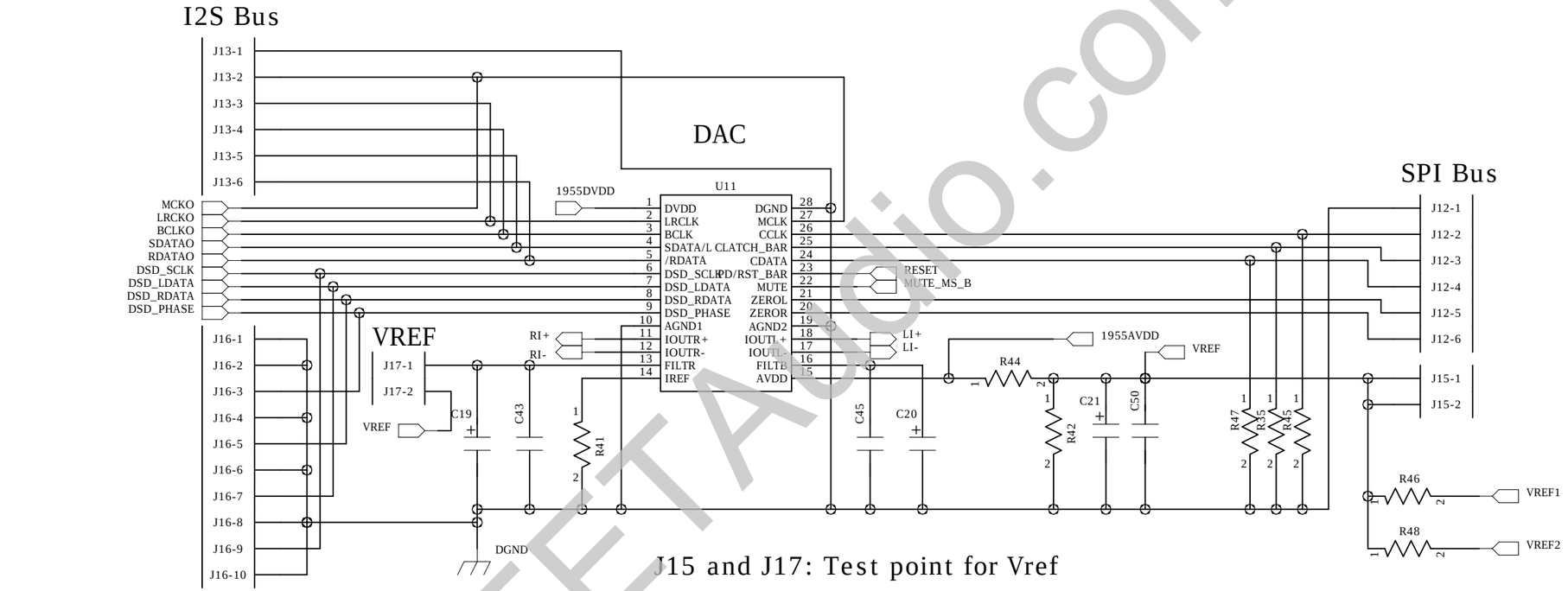


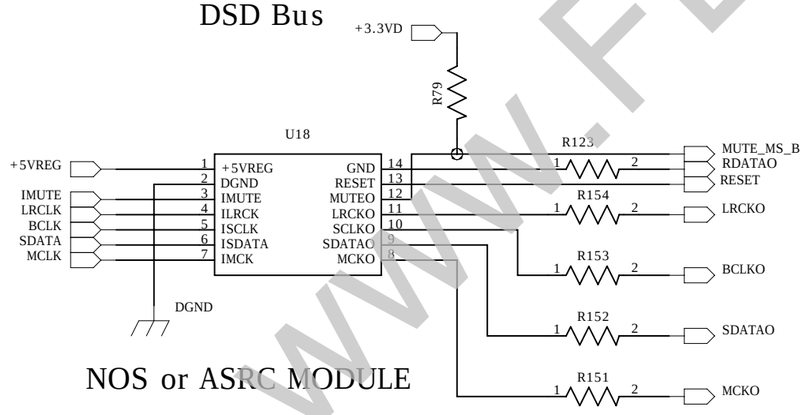
I2S Mute Logic

Mute control Sel

DRAWN: Spencer Cheung	DATED: 2012-08-15	COMPANY: www.FETAudio.com	
CHECKED: <Checked By>	DATED: <Checked Date>	TITLE: FDA-2A (AD1955 + WM8805)	
QUALITY CONTROL: <QC By>	DATED: <QC Date>	CODE: 1955V3	SIZE: B
RELEASED: Spencer Cheung	DATED: 2012-08-15	DRAWING NO: FDA-2A-5	REV: 3
		SCALE: 1:1	SHEET: 3 OF 8

REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

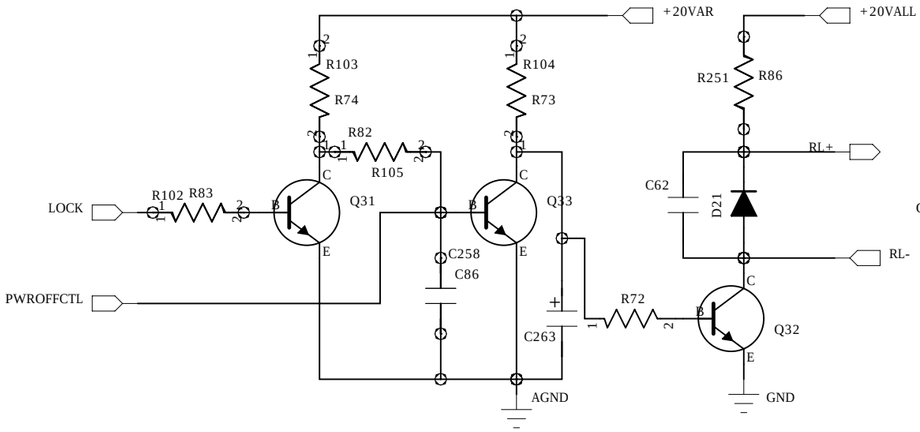




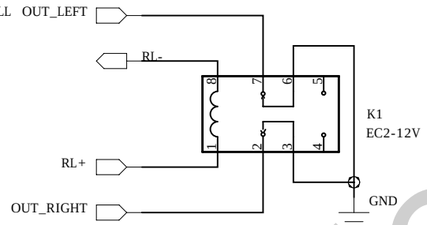
COMPANY: www.FETAudio.com					
TITLE: FDA-2A (AD1955 + WM8805)					
DRAWN: Spencer Cheung	DATED: 2012-08-15	CODE: 1955V3	SIZE: B	DRAWING NO: FDA-2A-5	REV: 3
CHECKED: <Checked By>	DATED: <Checked Date>				
QUALITY CONTROL: <QC By>	DATED: <QC Date>				
RELEASED: Spencer Cheung	DATED: 2012-08-15	SCALE: 1:1		SHEET: 4 OF 8	

REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

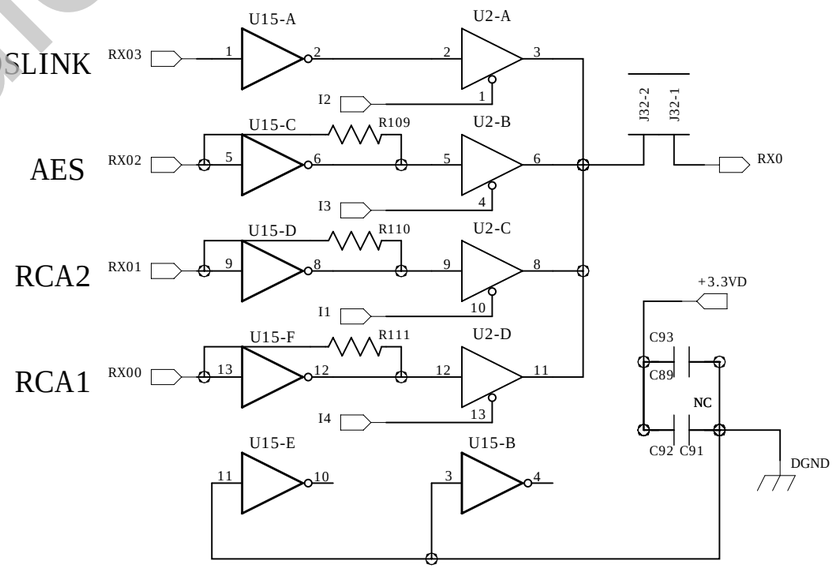
Output Muting Ckt



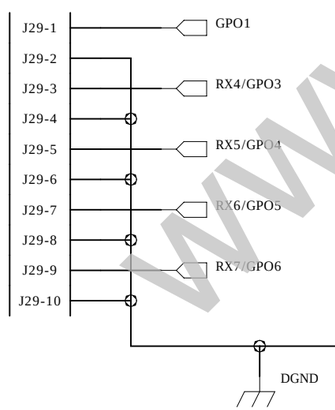
Mute Relays



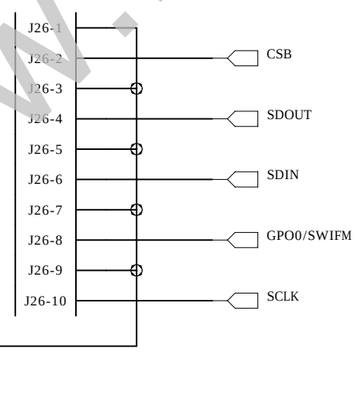
H/W-Mode
Digital input select



8805 RxGx Bus



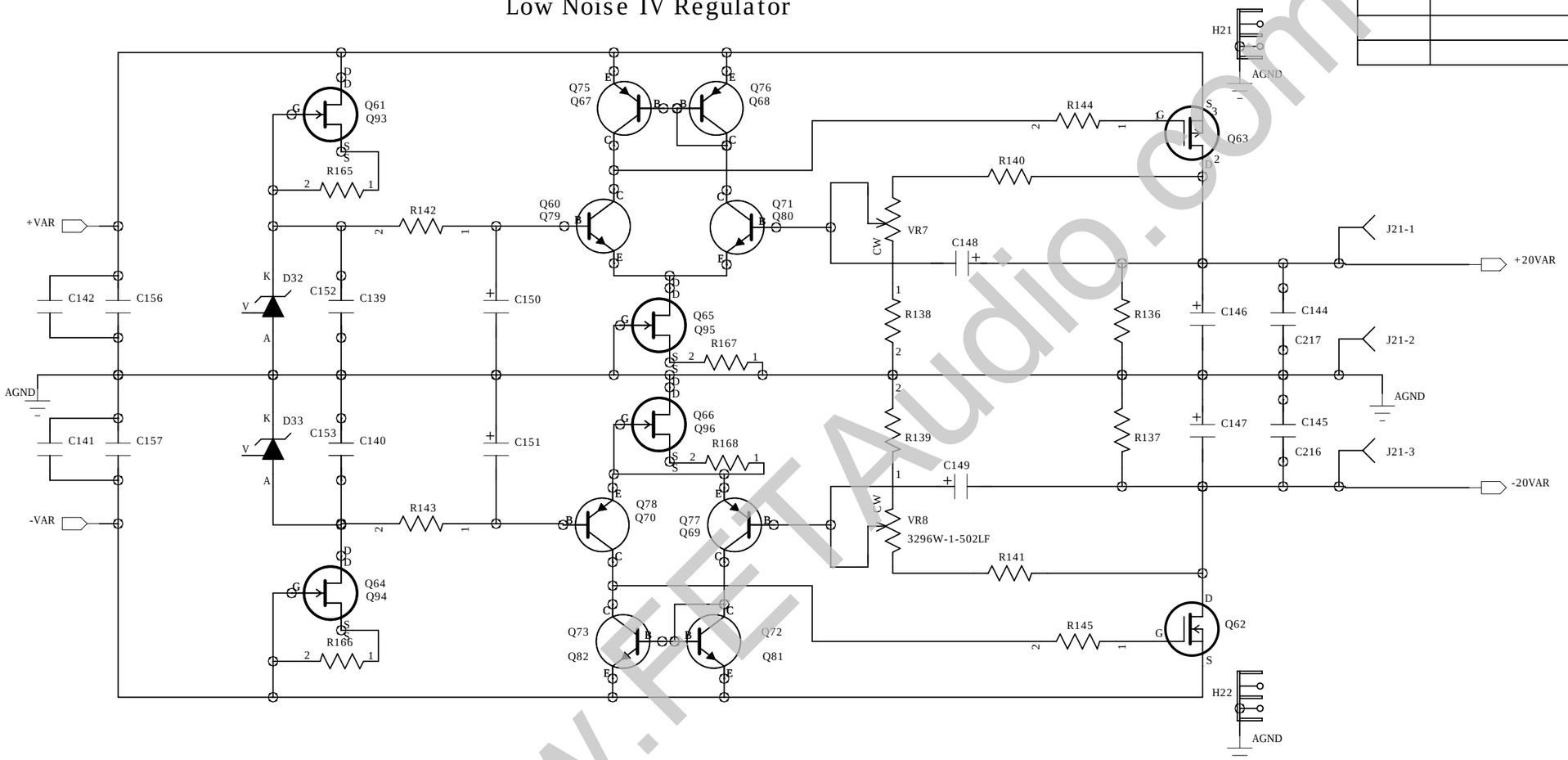
8805 Ctrl Bus



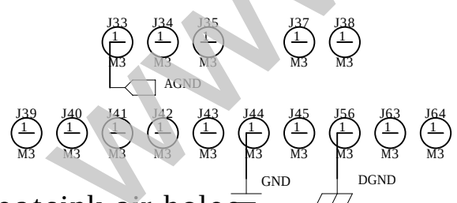
DRAWN: Spencer Cheung	DATED: 2012-08-15	COMPANY: www.FETAudio.com	
CHECKED: <Checked By>	DATED: <Checked Date>	TITLE: FDA-2A (AD1955 + WM8805)	
QUALITY CONTROL: <QC By>	DATED: <QC Date>	CODE: 1955V3	SIZE: B
RELEASED: Spencer Cheung	DATED: 2012-08-15	DRAWING NO: FDA-2A-5	REV: 3
		SCALE: 1:1	SHEET: 5 OF 8

REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

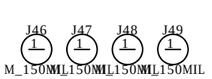
Low Noise IV Regulator



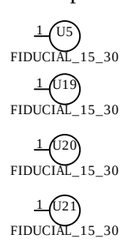
M3 Screw Holes x 16



Heatsink air holes



smt pts

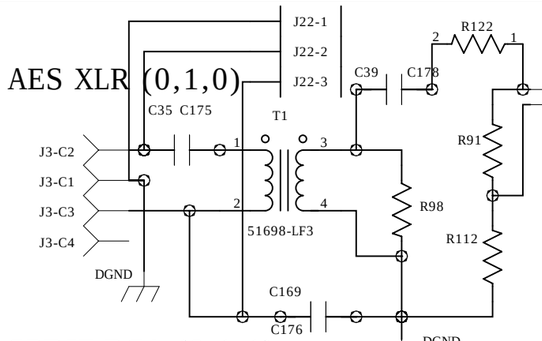


DRAWN: Spencer Cheung	DATED: 2012-08-15	COMPANY: www.FETAudio.com	
CHECKED: <Checked By>	DATED: <Checked Date>	TITLE: FDA-2A (AD1955 + WM8805)	
QUALITY CONTROL: <QC By>	DATED: <QC Date>	CODE: 1955V3	SIZE: B
RELEASED: Spencer Cheung	DATED: 2012-08-15	DRAWING NO: FDA-2A-5	REV: 3
		SCALE: 1:1	SHEET: 6 OF 8

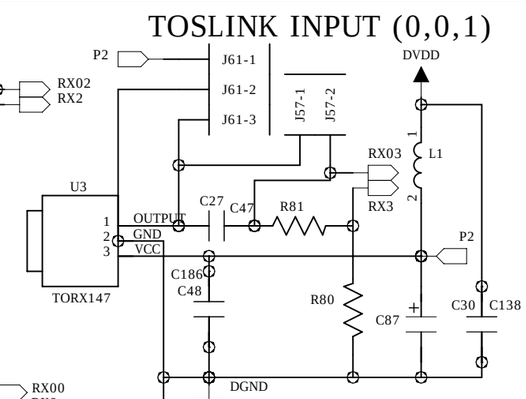
6 5 4 3 2 1

D C B A

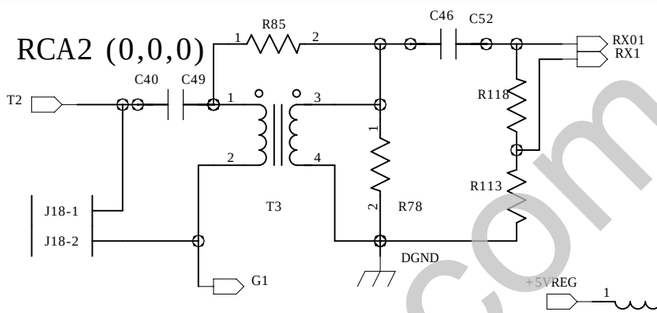
AES XLR (0,1,0)



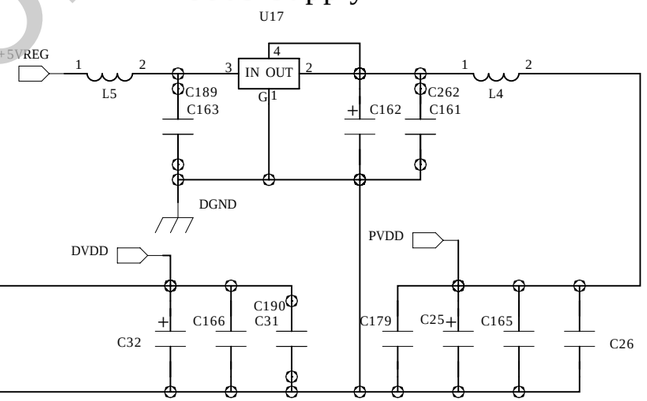
TOSLINK INPUT (0,0,1)



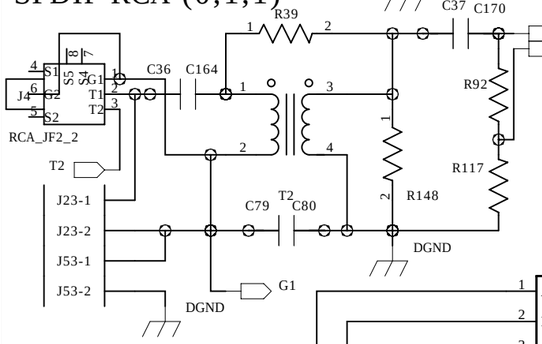
RCA2 (0,0,0)



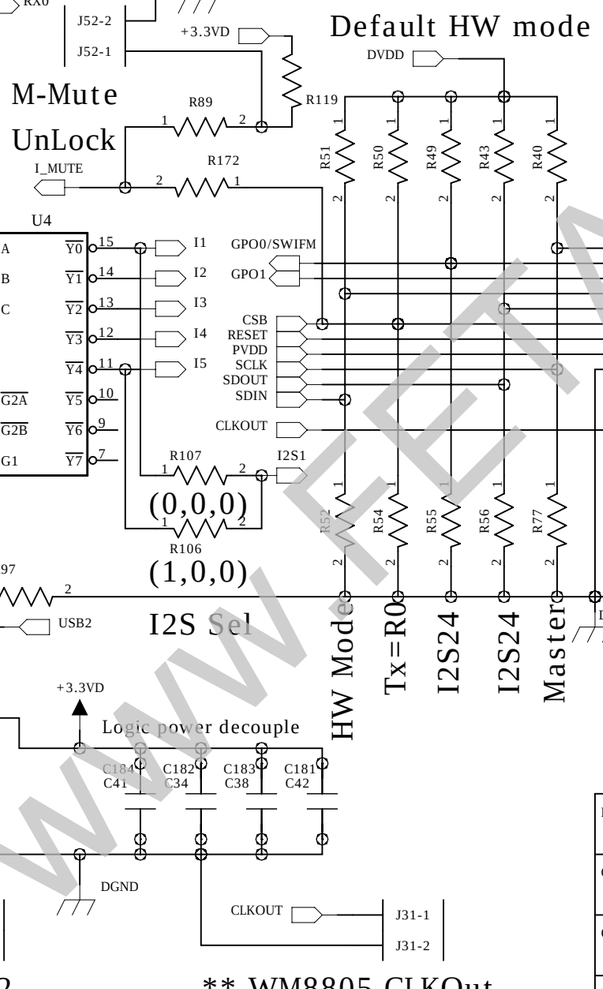
8805 Supply

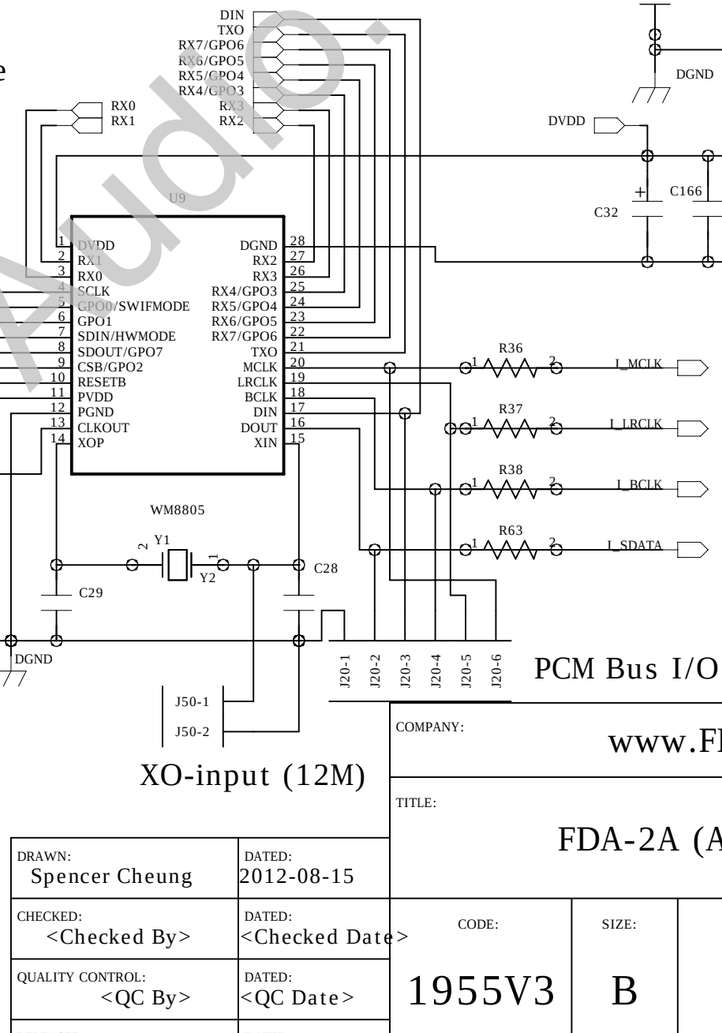


SPDIF RCA (0,1,1)

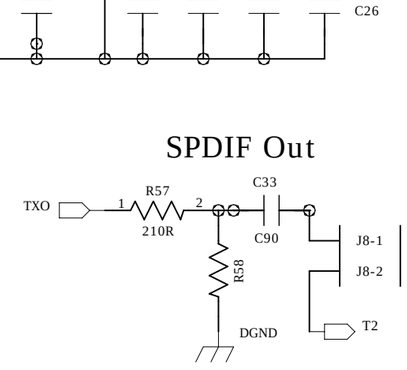


Default HW mode

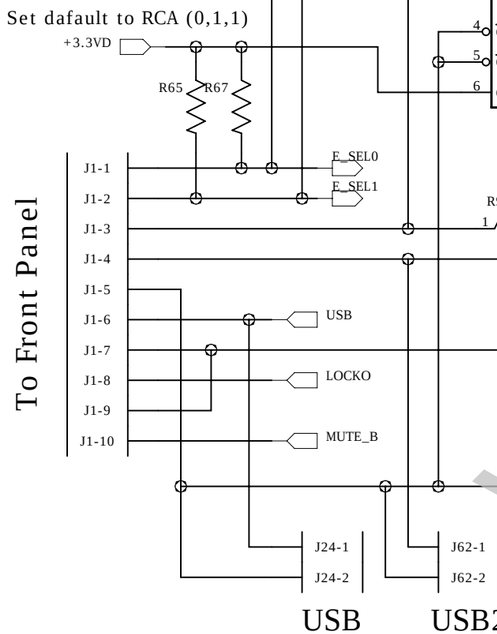




SPDIF Out



TransLess

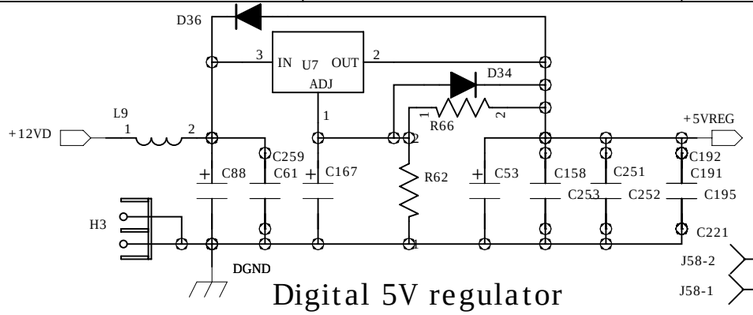


REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

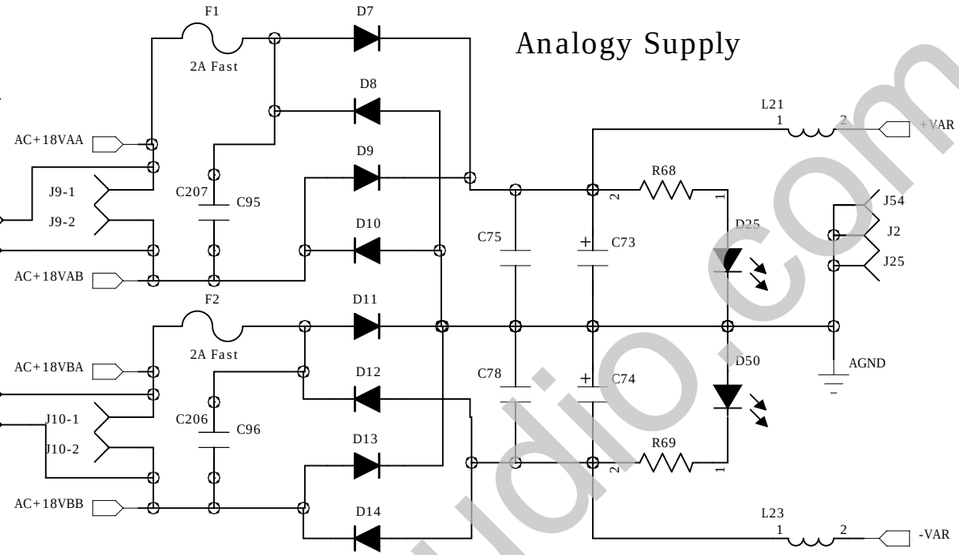
DRAWN: Spencer Cheung	DATED: 2012-08-15	COMPANY: www.FETAudio.com	
CHECKED: <Checked By>	DATED: <Checked Date>	TITLE: FDA-2A (AD1955 + WM8805)	
QUALITY CONTROL: <QC By>	DATED: <QC Date>	CODE: 1955V3	SIZE: B
RELEASED: Spencer Cheung	DATED: 2012-08-15	DRAWING NO: FDA-2A-5	REV: 3
		SCALE: 1:1	SHEET: 7 OF 8

REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

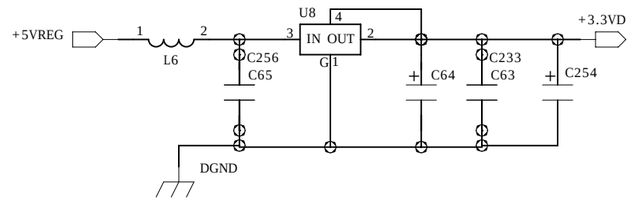
Digital 5V regulator



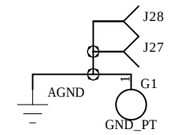
Analogy Supply



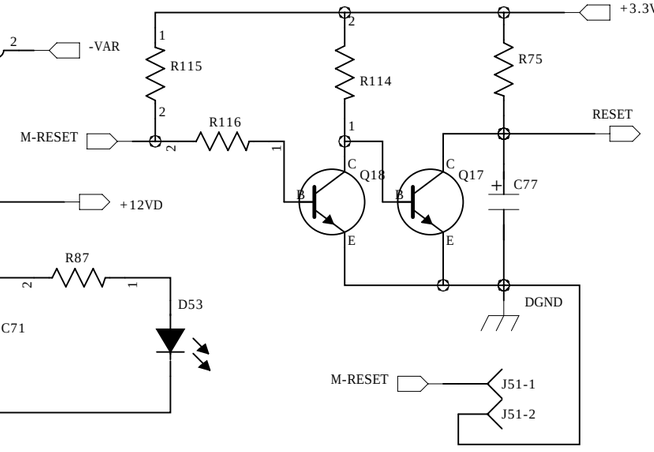
Logic 3V3 Regulator



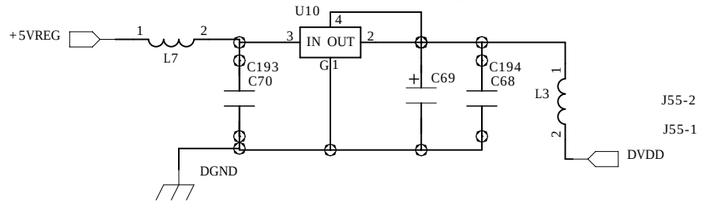
Ground Via



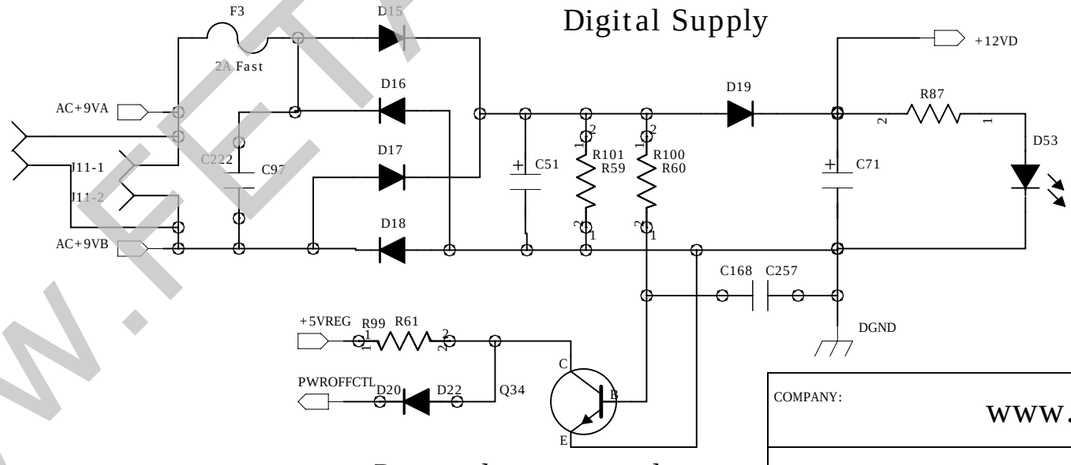
MCU Reset control
Reset active LOW



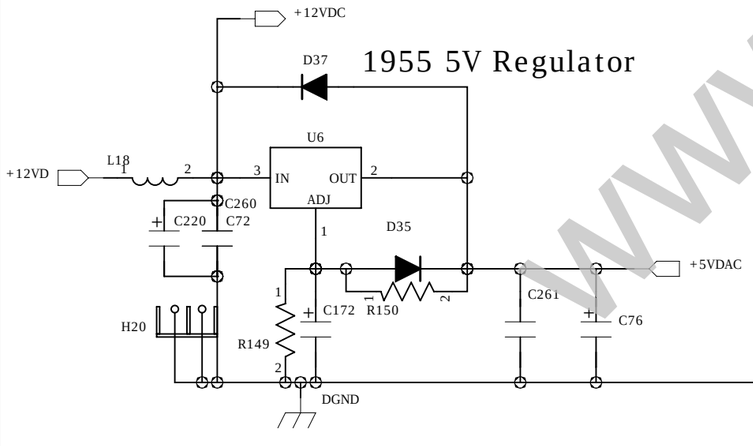
8805 3V3 Regulator



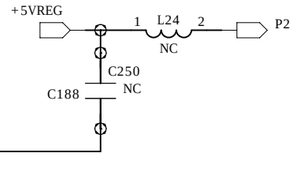
Digital Supply



1955 5V Regulator



Toslink 5V supply



Power down control

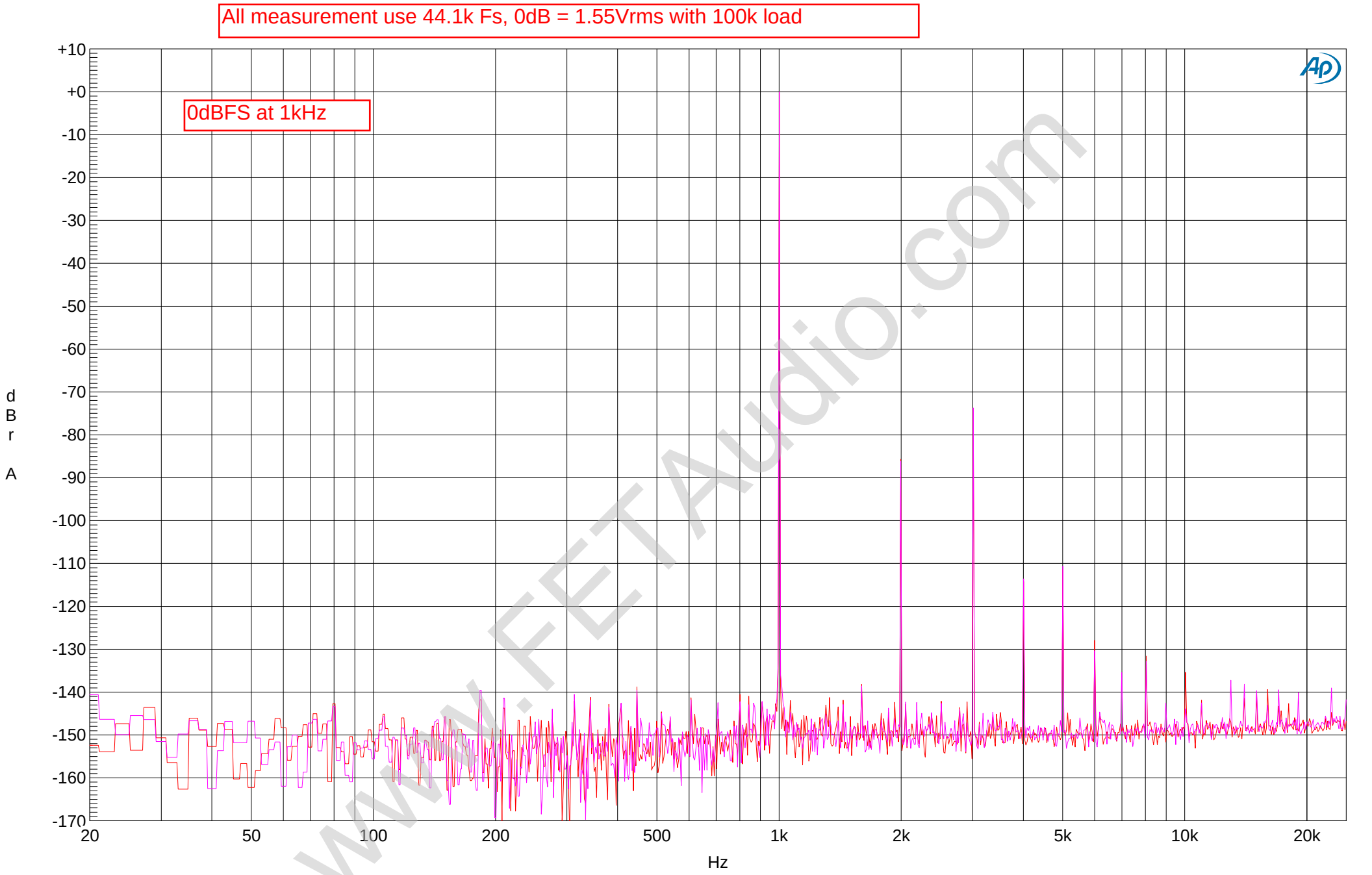
DRAWN: Spencer Cheung	DATED: 2012-08-15	COMPANY: www.FETAudio.com	
CHECKED: <Checked By>	DATED: <Checked Date>	TITLE: FDA-2A (AD1955 + WM8805)	
QUALITY CONTROL: <QC By>	DATED: <QC Date>	CODE: 1955V3	SIZE: B
RELEASED: Spencer Cheung	DATED: 2012-08-15	DRAWING NO: FDA-2A-5	REV: 3
		SCALE: 1:1	SHEET: 8 OF 8

Item	Reference	Value	Manufacturer	Qty
1	Q1-2 Q7-8 Q13-16	KSA1220AYS	Fairchild	8
2	Q17-18 Q31-34	KSC1815	Fairchild	6
3	Q3-6 Q9-12	KSC2690AYS	Fairchild	8
4	T1	51698-LF3	MIDCOM	1
5	T2-3	NC	MIDCOM	0
6	U14	74HC00D	Fairchild, NXP or TI	1
7	U13	74HC02D	Fairchild, NXP or TI	1
8	U2	74VHC125M	Fairchild, NXP or TI	1
9	U4	74HC138D	Fairchild, NXP or TI	1
10	U12	74VHC244M	Fairchild or ST	1
11	U15	74VHCU04MX	Fairchild, NXP or TI	1
12	U11	AD1955A	Analogy Device	1
13	Q79-82	KSC1845F	Fairchild	4
14	Q75-78	KSA992F	Fairchild	4
15	D7-19	BYV27-150 or SBYV-200	Vishay/Phillips	13
16	C246 C247	0.01u 50V COG	Murata or TDK	2
17	C6-7 C13-15 C23-24 C31 C33 C36-37 C40 C43 C45-47 C48 C50 C54-55 C61-63 C65 C68 C70 C72 C75 C78-79 C89 C93 C138 C144-145 C152-153 C156-158 C161 C163 C166 C175-176 C178-179 C181-184 C206-207 C222 C261 C251-253	0.1u 50V X7R	Walsin or Samsung	58
18	C56 C67	100p 50V COG	Murata or TDK	2
19	C237-238	1500p 50V COG	Murata or TDK	2
20	C28-29	15p 50V COG	Murata or TDK	2
21	C26	1u 6.3V X7R	Walsin or Samsung	1
22	C86 C168	470pF 50V X7R	Walsin or Samsung	2
23	C234-236 C241	5600p 50V COG	Murata or TDK	4
24	C250	NC	Walsin or Samsung	0
25	C71	10000u 16V	NCC KMH or Panasonic SU 22-25mm	1
26	C17 C64 C69 C162	100u 6.3V to 10V 5mm	Panasonic FK or FC	4
27	C4-5 C11-12 C76 C81-82 C134-135	100u 35V Silmic	Elna Silmic-II	9
28	C146-147	560u 35V	Panasonic FK or FC	2
29	C77 C87 C148-149 C167 C172 C263	10u to 12u 35V 5mm	Panasonic FK or FC	7
30	C150-151	100u 25V or 120u 35V 8mm	Panasonic HB or FC	2
31	C229-230	NC	Panasonic FK or FC	0
32	C51 C53 C88 C220	470u 25V or 560u 35V	Panasonic FC, or FA	4
33	C19-22 C25 C32 C254	47u 16V 5mm	Panasonic FK or FC	7
34	C73-74	5600u 35V	Panasonic Audio / SU 22-25mm max 35mm high	2
35	C95-97	NC	NC	0
36	C83-84	NC	NC	0
37	J2 J25 J27-28 J54	NC	NC	0
38	J1	2x5 Male HD flex	China Source	1
39	J15 J17	NC	NC	0
40	J30 J50-52 (R89 R172)	2x6 Male HD	China Source	1
41	J24 J62	2x1 female HD	China Source	2
42	J8 J18 J23 J31 J57	2x1 male HD	China Source	5

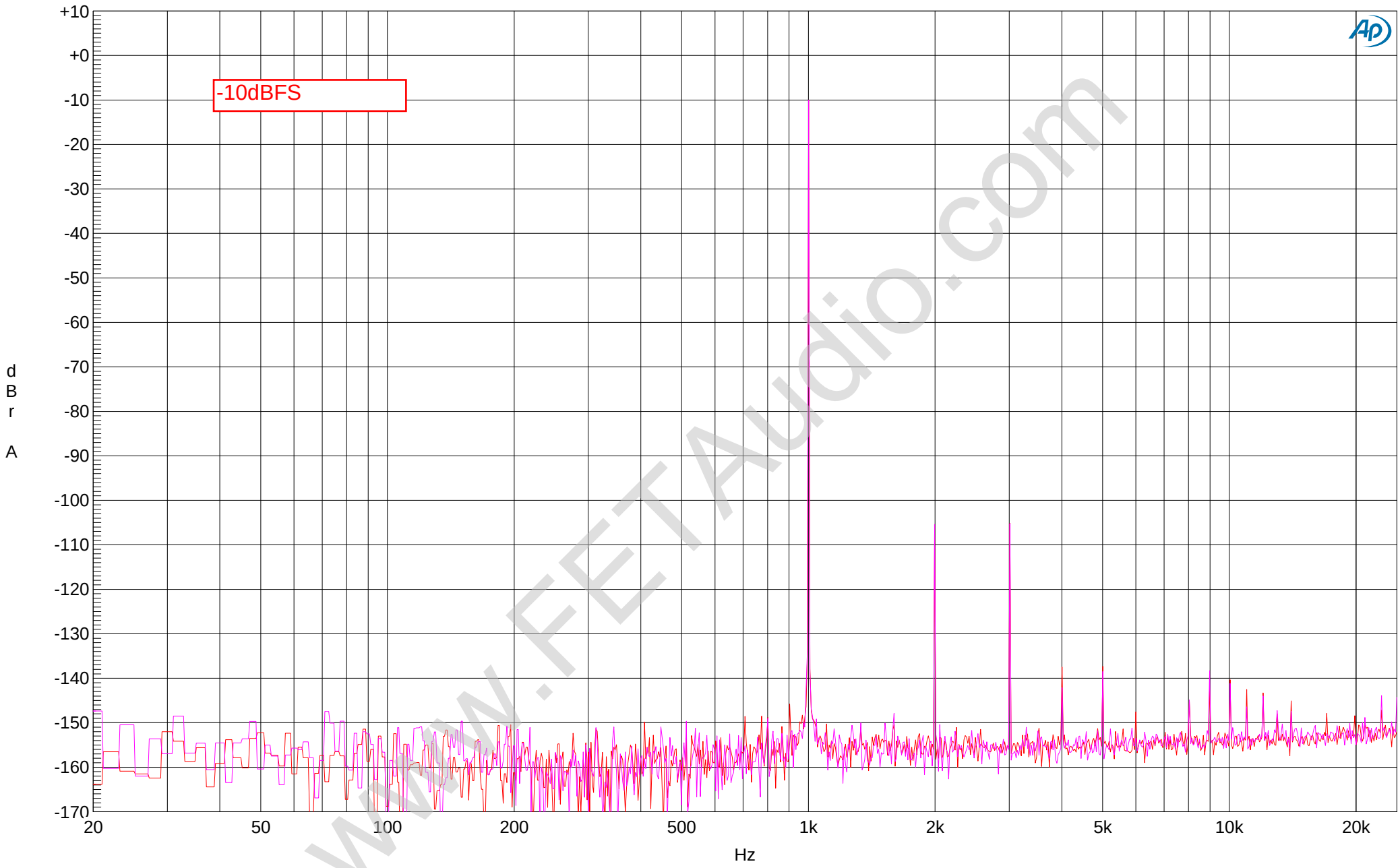
Item	Reference	Value	Manufacturer	Qty
43	J32 J53	**2x1 male HD with jumper shorted**	China Source	2
44	J55 J58-59	2x3.96mm male Connetor	China Source	3
45	J22 J61	3x1 male HD	China Source	2
46	J19 J21	150mm Con Wire	China Source	3
47	J12-13 J20	6x1 male HD	China Source	3
48	U18	NOS Module board	FETAUDIO	1
49	U18	7x1 round socket for NOS Board	China Source	2
50	D34-37	1N4007	Semtech M7	4
51	D20	1N4148	Semtech	1
52	D21	1N4148	Semtech	1
53	F1-3	2A Fast fuse	SZ Hong Lei	3
54	J16 J26 J29	**2x5 Male HD - J16, J29 with jumper shorted**	China Source	3
55	J5	2x5 female HD	China Source	1
56	H6 H8 H10 H12	HS10x15x30mm	China Source	4
57	H5 H9	HS16x24x21mm	China Source	2
58	H7 H11	HS16x24x35mm	China Source	2
59	H3 H20-22	HS16x16x25mm	China Source	4
60	L9 L18	1mH	Hualida	2
61	L1 L10	47uH	Hualida	2
62	L2 L8	Bead	Hualida	2
63	L3-7 L11-12 L15 L21 L23	Bead	Hualida	10
64	L24	NC	Hualida	0
65	Q62	IRF610	IR or Vishay	1
66	Q63	IRF9610	IR or Vishay	1
67	Q93-96	K30A-Y	Toshiba	4
68	D25 D50 D53	LED TH Green	China Source	3
69	D32-33	LM336-5V	Fairchild	2
70	U6-7	LM317T	ST	2
71	U8 U10 U17	1117-3.3V	AMS	3
72	U1	NC	AMS	0
73	J6-7	RCA H white/red	JF	2
74	J14	NC	JF	0
75	J4	RCA V double	JF	1
76	R39 R85 R88 R106 R108 R172 JMP3	**2x1 male HD with jumper shorted**	China Source	7
77	R53 R81 R89 R91-92 R107 R118 R171 JMP1 JMP2	**2x1 male HD without jumper**	China Source	10
78	R66 R144-145 R150 R165-168	100R	Xicon 271-	8
79	R35 R45 R47	10k	ASJ, Walsin, or Royalohm	3
80	R40 R43 R52 R54-55 R68-69 R97 R114-115	10k	Xicon 271-	10
81	R74 R82 R60-61 R73	10k	Xicon 271-	5
82	R58 R98	110R	Xicon 271-	2
83	R140-141	15k	Xicon 271-	2
84	R57	210R	Xicon 271-	1
85	R41	2k49	Xicon 271-	1
86	R46 R48 R122	301R	Xicon 271-	3
87	R62 R149	301R	Xicon 271-	2
88	R42 R44	475R	Xicon 271-	2

Item	Reference	Value	Manufacturer	Qty
89	R65 R67 R75 R79-80 R84 R90 R109-113 R117 R119 R136-137	47k	Xicon 271-	16
90	R59 R83	4k7	Xicon 271-	2
91	R72 R87 R116 R138-139	4k7	Xicon 271-	5
92	R64 R76 R142-143 R120-121	680R	Xicon 271-	6
93	R78 R148	75R	Xicon 271-	2
94	R49-51 R56 R77	NC	Xicon 271-	0
95	R36-38 R63 R93-96 R16-17 R33-34	NC	Xicon 271-	0
96	R183-184	NC	ASJ, Walsin, or Royalohm	0
97	R123 R151-154	47R	ASJ, Walsin, or Royalohm	5
98	R70-71	100k	Xicon 271-	2
99	R13 R30	120R	Xicon 271-	2
100	R15 R32	150R	Xicon 271-	2
101	R10 R12 R27 R29	1k21	Xicon 271-	4
102	R7-8 R24-25	2k05	Xicon 271-	4
103	R14 R31	33R2	Xicon 271-	2
104	R6 R23	3k32	Xicon 271-	2
105	R4-5 R21-22 R86	475R	Vishay MRS25	5
106	R3 R20	47k	Xicon 271-	2
107	R1-2 R18-19	562R	Vishay MRS25	4
108	R9 R11 R26 R28	82R5	Xicon 271-	4
109	K1	EC2-12V	NEC EC2, Pana HX2	1
110	U3	TORX147L	TOSHIBA or Everlight	1
111	VR1-2	500R 10T	Sichun	2
112	VR7-8	5k 10T	Sichun	2
113	U9	WM8805	Wolfson	1
114	J3	NC3FAA-H2	Neutrik	1
115	Y1	12MHz SMT	Abracon, MEC	1
116	D2 D4	1N4739A - 9.1V	Semtech	2
117	D5-6	NC	Semtech	0
118	Heatsink mouting kit	Mica TO-220	China Source	4
119	Heatsink mouting kit	Ring TO-220	China Source	4
120	Heatsink mouting kit	Spring washer M3	China Source	12
121	Heatsink mouting kit	Screw M3 x 10mm	China Source	12
122	PCB 1955V3-1	PCB 1955V3.1	China Source	1
		SMD part pre-soldered		

Item	Reference	Value	Manufacturer	Qty
1	U2	74HC14D	TEXAS INSTRUMENTS or NXP	1
2	U1	74HC138D	TEXAS INSTRUMENTS or NXP	1
3	U4	74HC191D	TEXAS INSTRUMENTS or NXP	1
4	C2-C5	0.1u 50V	Yageo, Walsin or Samsung	4
5	C1 C8	1u 6.3V	Yageo, Walsin or Samsung	2
6	C7 C9	100u 16V	Nichicon or Panasoinc	2
7	J1	2x5 2.5mm male connector	China	1
8	J2	1x2 socket 2.54mm white	China	1
9	U3	FM1106	Ramtron	1
10	D1-4 D6-7	LED Green TH	China	6
11	D8	NC	China	1
12	D5	LED Red TH	China	1
13	R1 R6 R9	47k 1%	Walsin or ASJ	3
14	R2-5 R8 R15	680R 1%	Walsin or ASJ	6
15	FP V7.1 pcb	FP V7.1 pcb	FETAUDIO	1
16	Flat cable 10 wires w/plug	12 inches 10-wire flat cable	Length = 12 inches	1
17	5x2 2.54mm plug	5x2 header plug	China	2
18	Push Switch	Push SW	China	1
19	LED/Push SW wires	2-Wire 200mm	China	1
		SMD parts presoldered		

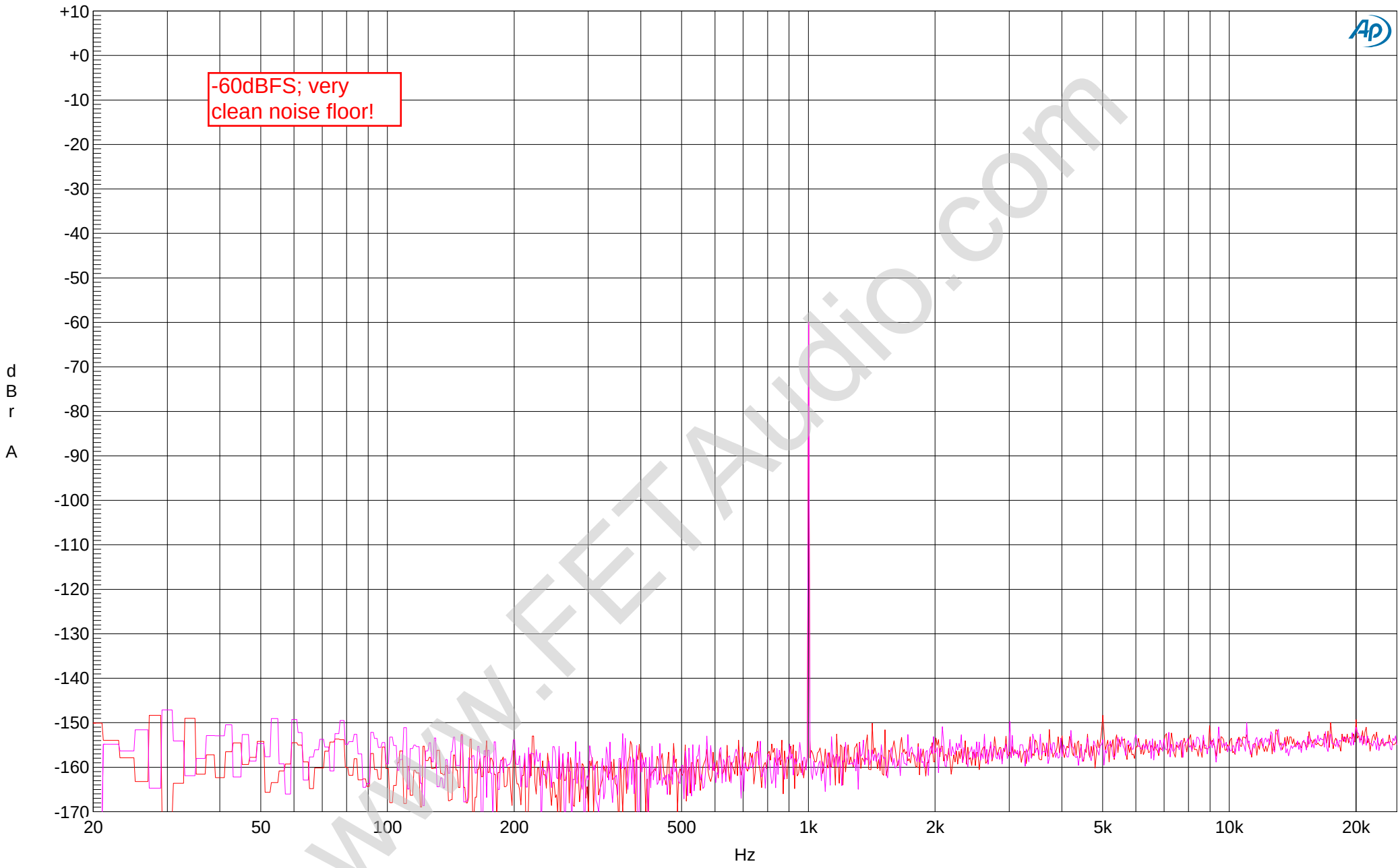


Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Red	Solid	1	Fft.Ch.1 Ampl	Left	44.1k 0dbFS
1	2	Magenta	Solid	1	Fft.Ch.2 Ampl	Left	

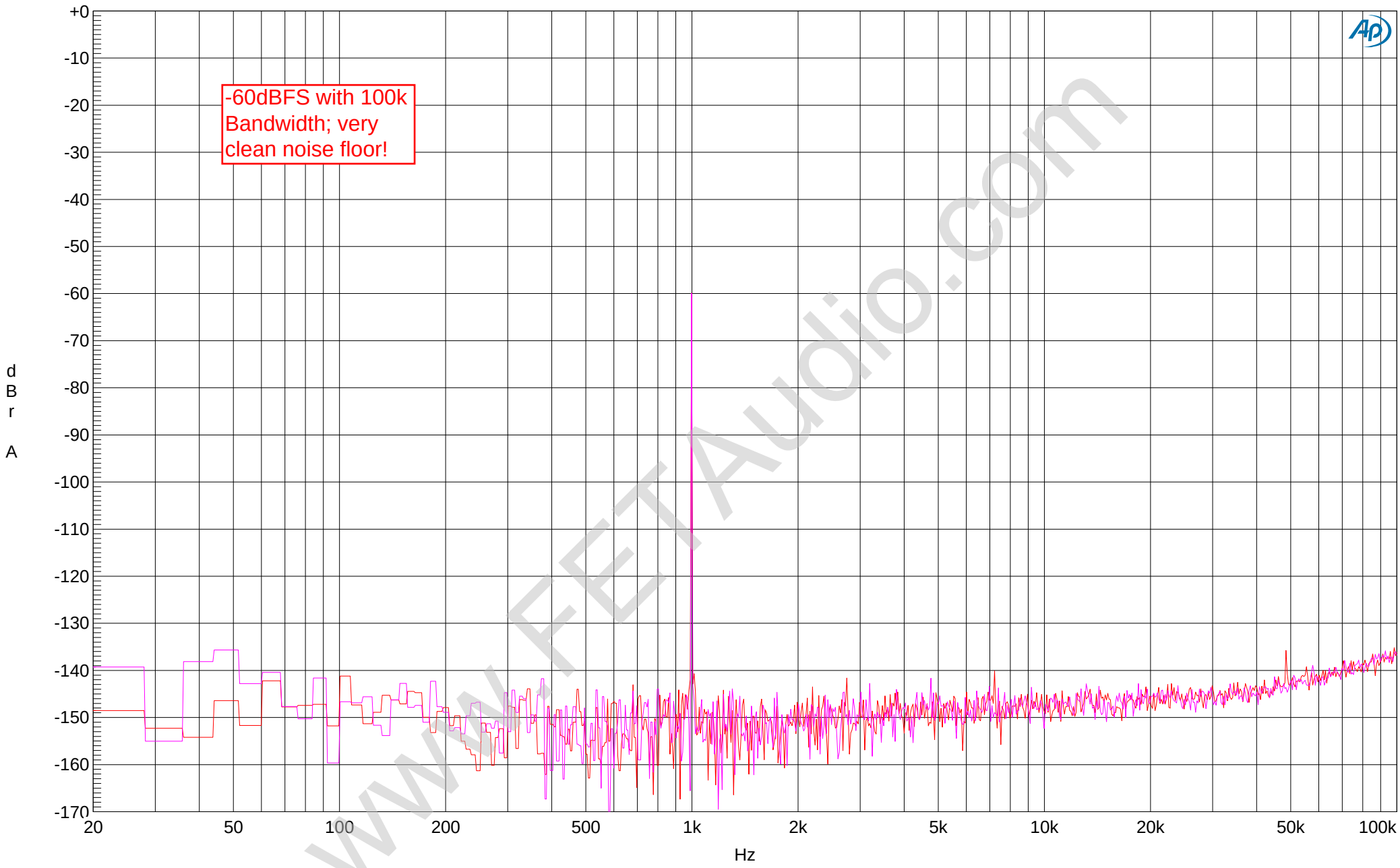


Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Red	Solid	1	Fft.Ch.1 Ampl	Left	-10dbFS
1	2	Magenta	Solid	1	Fft.Ch.2 Ampl	Left	

D-A FFT DAC 1955 SE -10dbfs.at27

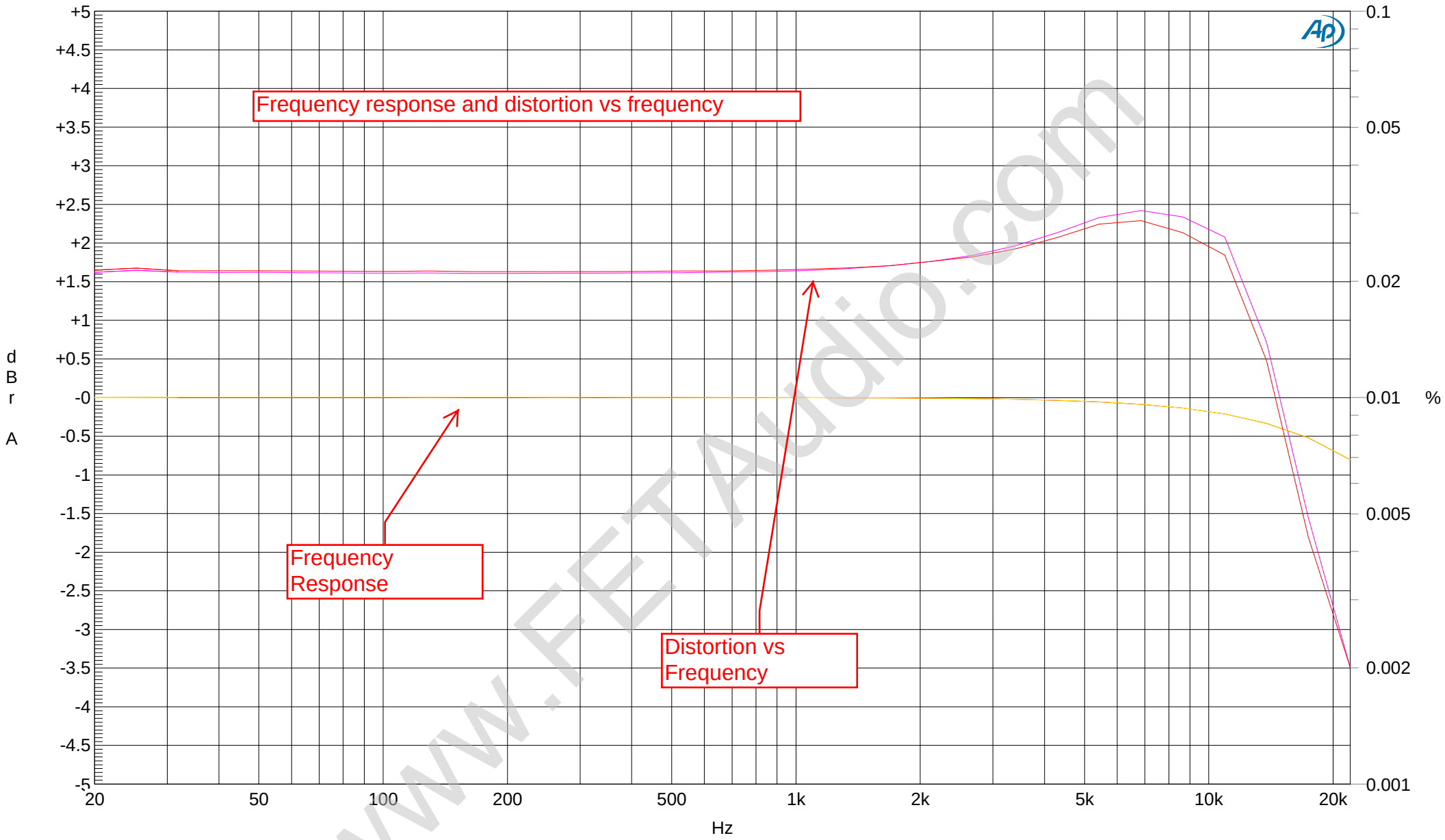


Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Red	Solid	1	Fft.Ch.1 Ampl	Left	-60dbFS
1	2	Magenta	Solid	1	Fft.Ch.2 Ampl	Left	

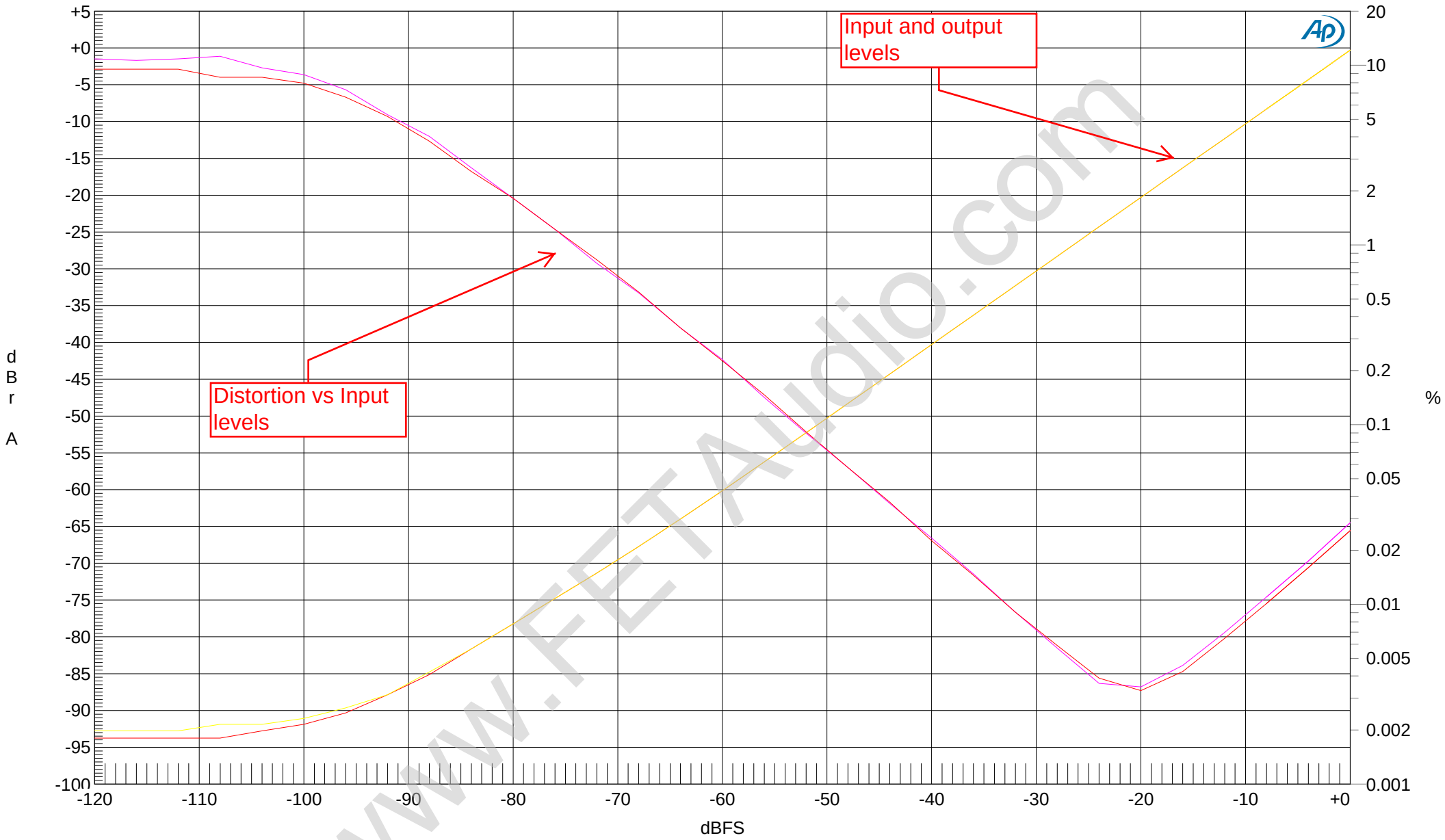


Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Red	Solid	1	Fft.Ch.1 Ampl	Left	-60dbFS 100k BW
1	2	Magenta	Solid	1	Fft.Ch.2 Ampl	Left	

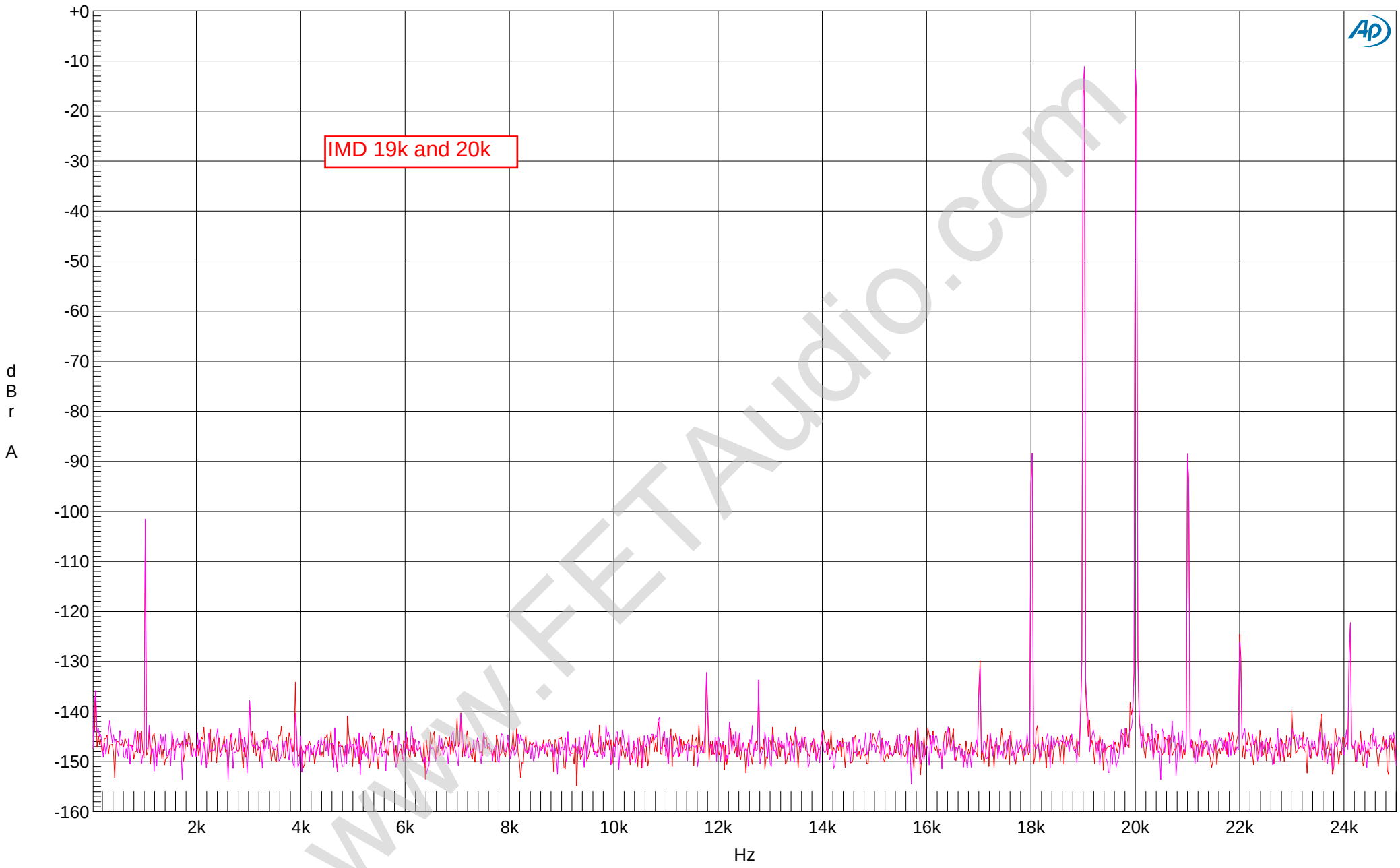
D-A FFT DAC 1955 BW 100k -60db.at27



Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Red	Solid	1	Anlr.Level A	Left	
1	2	Magenta	Solid	1	Anlr.THD+N Ratio	Right	
1	3	Yellow	Solid	1	Anlr.Level B	Left	
1	4	Red	Solid	1	Anlr.THD+N Ratio	Right	

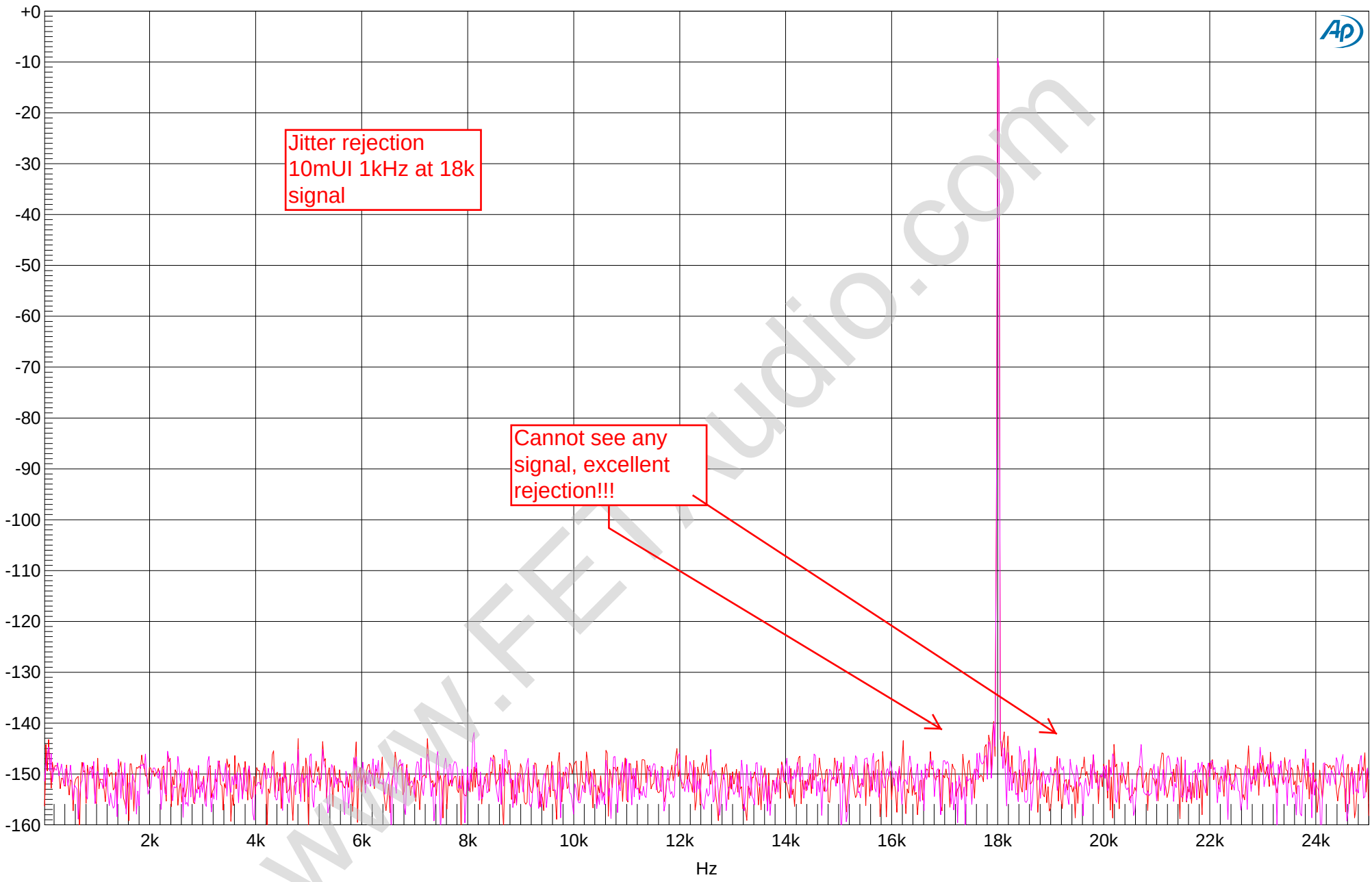


Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Red	Solid	1	Anlr.Level A	Left	
1	2	Magenta	Solid	1	Anlr.THD+N Ratio	Right	
1	3	Yellow	Solid	1	Anlr.Level B	Left	
1	4	Red	Solid	1	Anlr.THD+N Ratio	Right	



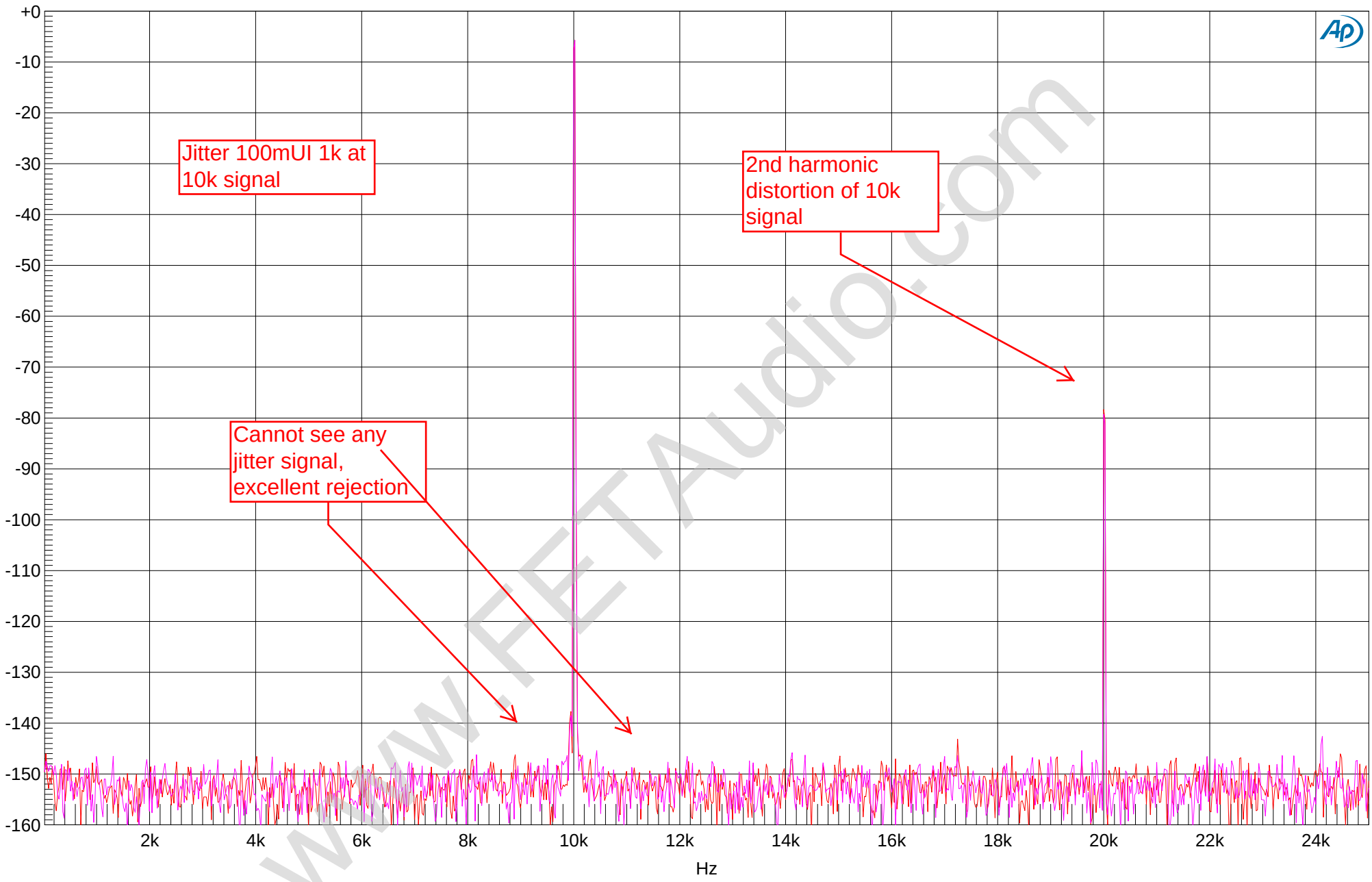
Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Red	Solid	1	Fft.Ch.1 Ampl	Left	IMD 19k and 20k
1	2	Magenta	Solid	1	Fft.Ch.2 Ampl	Left	

D-A FFT DAC 1955 IMD 19_20k.at27



Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Red	Solid	1	Fft.Ch.1 Ampl	Left	10mUI
1	2	Magenta	Solid	1	Fft.Ch.2 Ampl	Left	

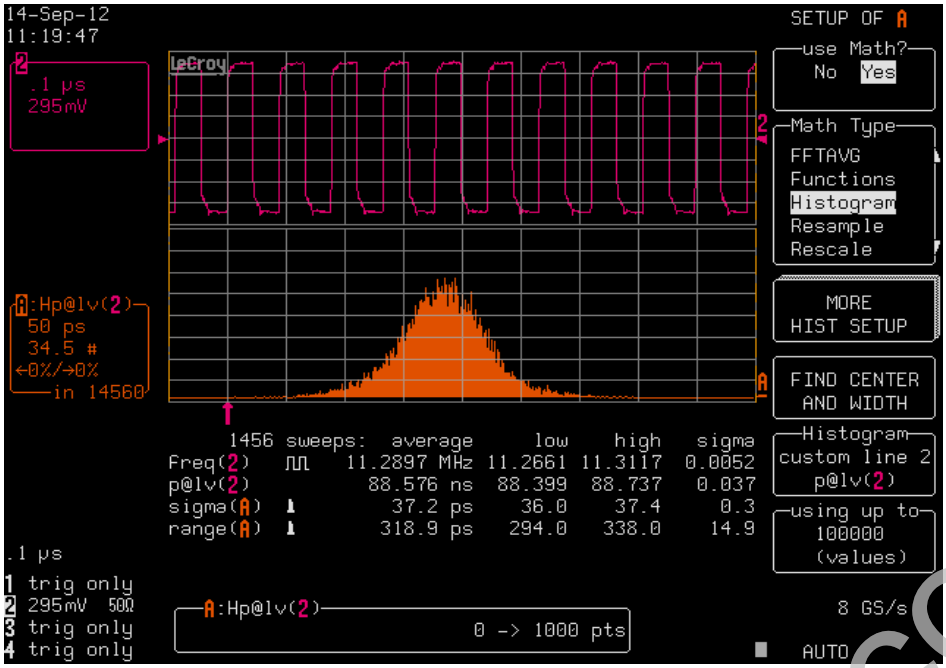
D-A FFT DAC 1955 Jitter 10mUI.at27



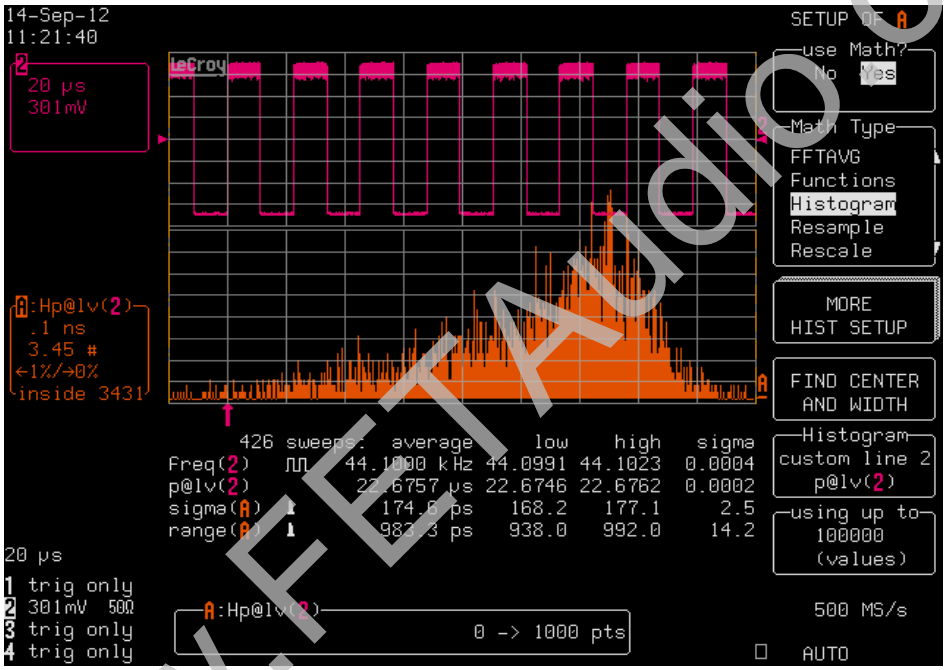
Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Red	Solid	1	Fft.Ch.1 Ampl	Left	100mUI
1	2	Magenta	Solid	1	Fft.Ch.2 Ampl	Left	

D-A FFT DAC 1955 Jitter 100mUI.at27

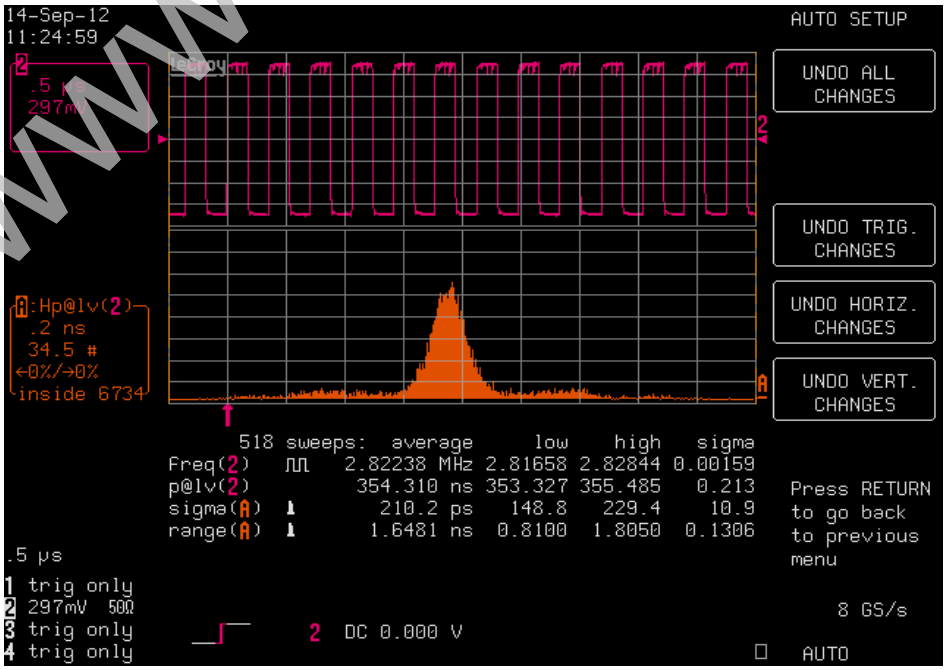
Input at SPDIF1, measured at J13 bus near to AD1955 input



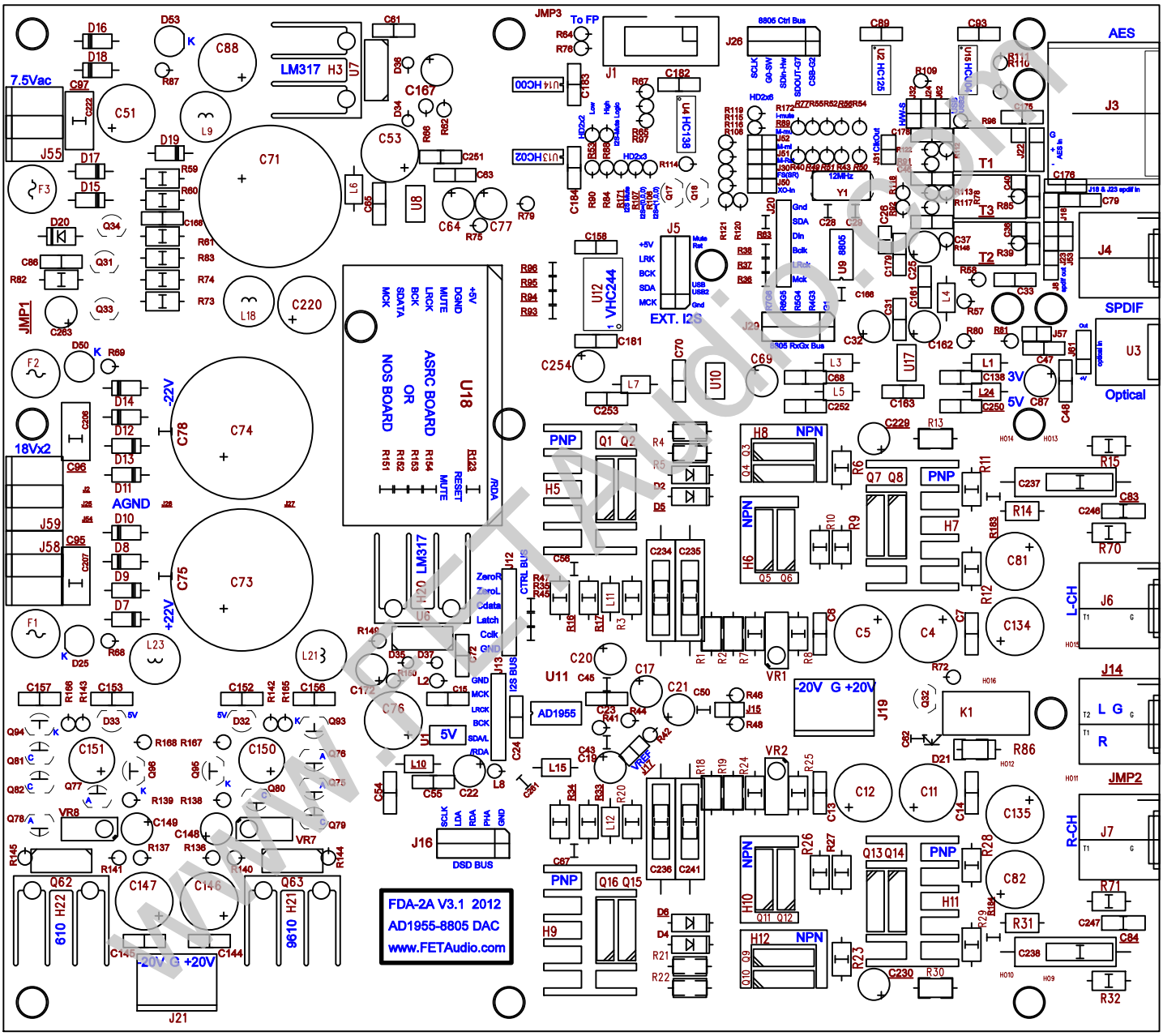
Master Clock: 37.2ps

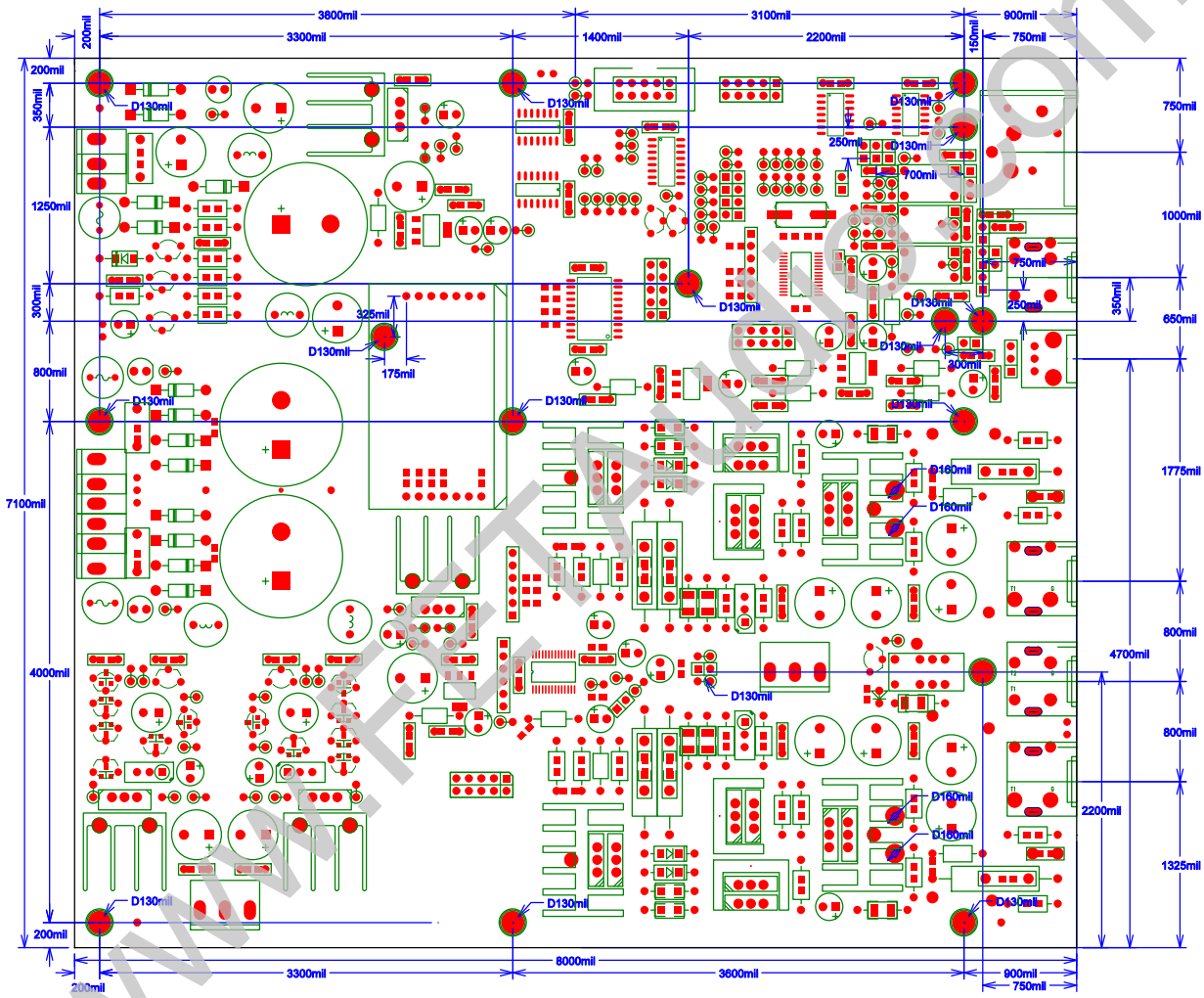


Fs: 174.6pS



Bit Clock: 210pS


FDA-2A V3.1 2012
AD1955-8805 DAC
www.FETAudio.com
7.5Vac
18Vx2
AGND
LM317 H3
NOS BOARD
OR
ASRC BOARD
U18
EXT. I2S
VHC244
AD1955
8805 Ctrl Bus
To FP
AES
SPDIF
Optical
L-CH
R-CH
DSD BUS
I2S BUS
CTRL BUS
-20V G +20V
610 H22
9610 H21
PNP
NPN
www.FETAudio.com



FDA-1-Rear_V5-RCA-mm.pc - Fri Sep 14 15:47:50 2012

Rear Panel - View from Outside