AKD7756-HF

AK7756 Hands Free Evaluation Rev.0

GENERAL DESCRIPTION

AKD7756-HF is a Hands-free evaluation kit for the AK7756 which is an audio processor with PCM interface, EEPROM interface, mono voice audio CODEC and microphone pre-amplifier. A speaker amplifier is integrated in this evaluation kit for easy evaluation of Hands-free function by connecting external microphones and speaker units. It is possible to access to the AKD7756-HF via USB interface, and adjustment of voice quality and noise attenuation level can be made with Windows GUI applications. An external Flash Memory for DSP programming is integrated into this kit enabling a stand-alone operation. In addition, an easy connection to a mobile phone is provided by integrated Blue Tooth module for evaluations.

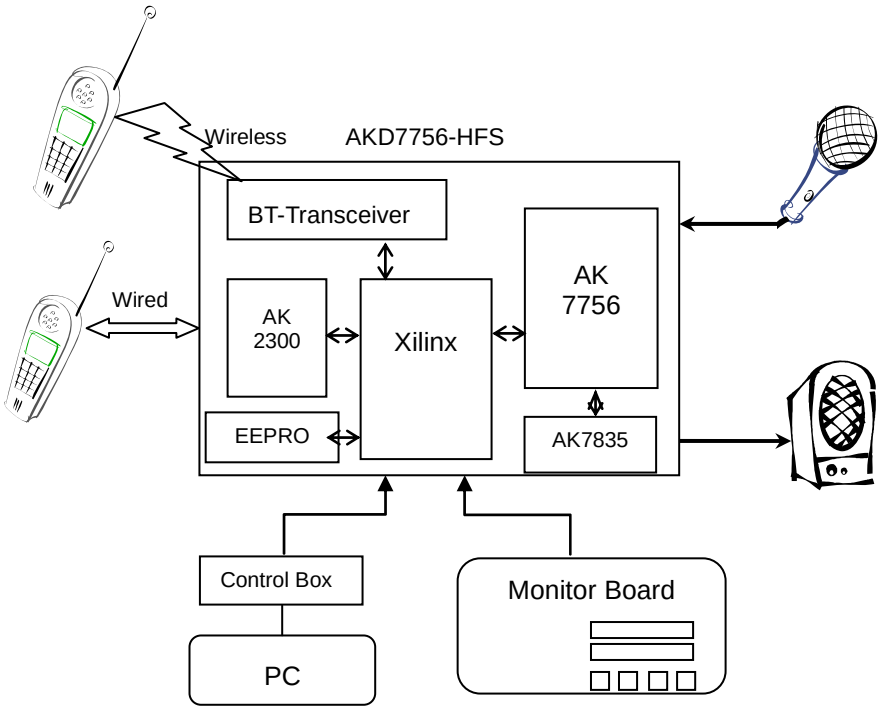
■ Ordering guide

AKD7756-HF

- AK7756 Hands Free System (HFS) Box
- USB Control Adapter
- Monitoring Board
- AD-DC Converter for main power supply
- Control Soft

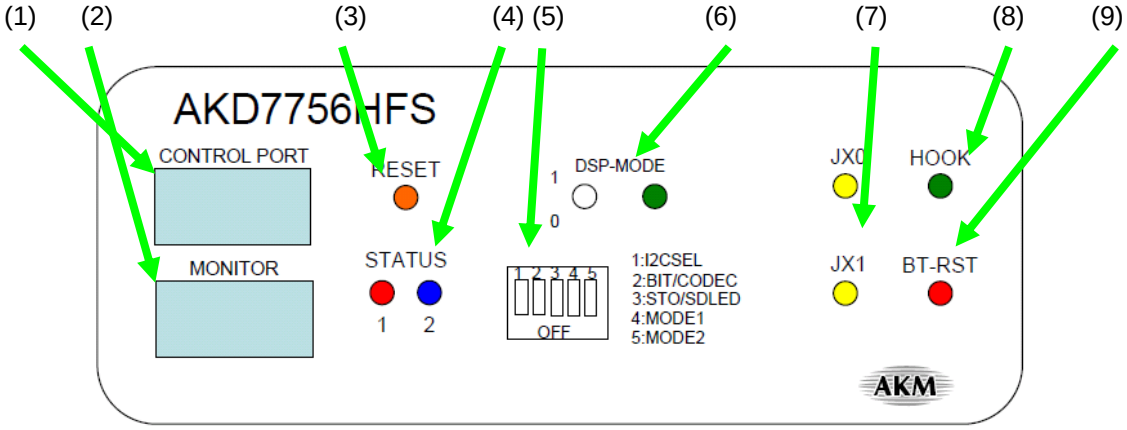
FUNCTION

☐Write/Read access to PRAM, CRAM, OFREG and control registers of AK7756
☐ In/Output Ports: MIC-IN/SPK-OUT/S-AMPOUT/TEL-IN/TEL-OUT
☐ Flash Memory (EEPROM) for parameter storage and stand-alone operation
☐ Blue-Tooth transceiver

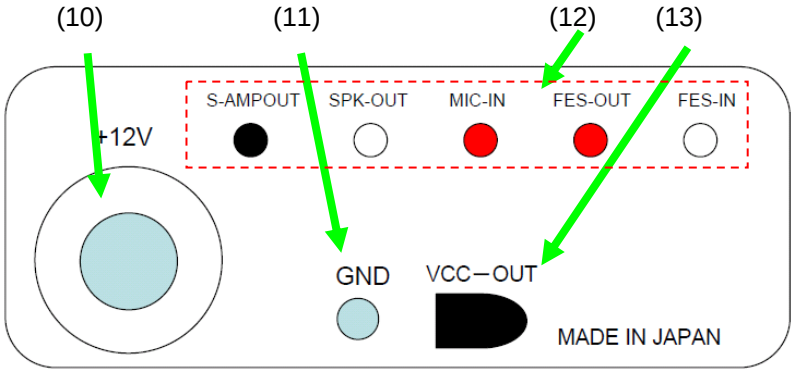


BOARD DIAGRAM

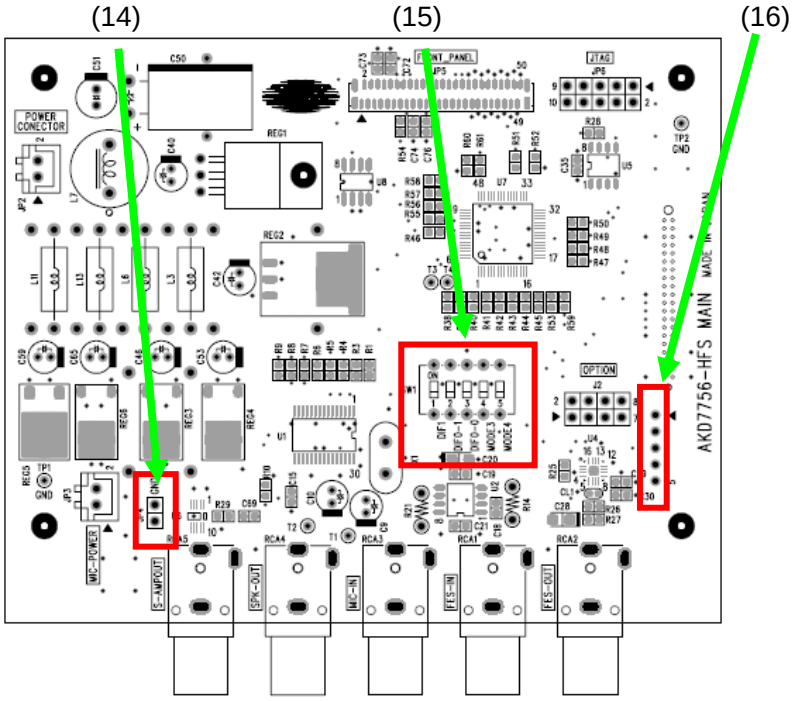
■ Front Panel



■ Rear Panel



■ Main Board



■ Description

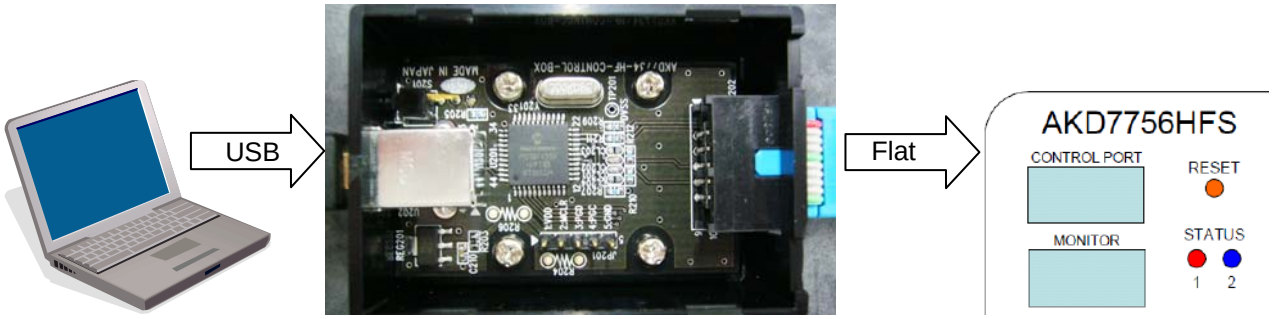
No.	Name	Function
(1)	CONTROL PORT	This port is used when the control code is written to the AK7756 via PC, or when flash memory data is downloaded.
(2)	MONITOR	Connector for monitoring board.
(3)	Reset (push switch)	Without Control box AK7756 IRSTN pin control (PUSH: RESET). With Control box: Disabled When controlling the AKD7756-HF by a PC, this reset switch is not valid and a reset should be made by control soft.
(4)	STATUS (LED)	RED: It shows a status of the AK7756's STO pin. (Light: "H", Off: "L") BLUE: It shows a Bluetooth status. (Blinking: pairing wait, Off: paring complete)
(5)	FRONT DIP SW	1:I2CSEL Control BUS select of the AK7756 **H:I2C**, L: 4WIRE 2:BT/CODEC Far-end connection select **H: Wireless (Blue Tooth)** L: Wired (AK2300) 3:STO/SDLED AK7756 Pin No. 10 output select (STO/RDY/SDOUT1 pin) **H: MONITER LED** L: FRONT PANEL LED 4:MODE1 AK7756 Pin No. 6 control when I2CSEL (EXTEEP pin) H: No. 6pin of AK7756 is "H" **L: No. 6pin of AK7756 is "L"** 5:MODE2 AK7756 Pin No. 17 control (JX1 pin) H: Controlled by DSP MODE **L: Controlled by FRONT DIP SW**
(6)	DSP MODE (LED + Toggle Switch)	Human Interface Function (JX1) 0: L 1: H
(7)	JX0/JX1 (push switch)	Human Interface Function (JX) Push: H Release: L
(8)	HOOK (push switch)	Bluetooth Unconnected: The AKD7756 becomes stand-by sate when pushing this switch for seven seconds. Bluetooth connected: Off Hook / On Hook can be controlled by this switch.
(9)	BT – RST (push switch)	Reset Control of internal Bluetooth module Push: Reset Release: Reset release;
(10)	+12V (power supply)	12VDC Power Supply. Supply 12V by attached power cable.
(11)	GND	Ground
(12)	Analog interface	RCA ports for analog Inputs/Outputs MIC-IN: AIN input of the AK7756 (Single-End, Microphone Input) FES–OUT: VR output of the AK2300 (Wire Phone Voice Output) FES-IN: VFTN input of the AK2300 (Wire Phone Voice Input) SPK-OUT: AOUT output of the AK7756 (Line Output) S-AMPOUT: VCP/N output of the AK7835 (Speaker Output)
(13)	VCC-OUT	For external MICBIAS. Outputs 5V
(14)	SPK_PDN	Control of the AK7835 Short: Power Down Open: Power Up
(15)	PCB DIP SW1	1:DIF1 Data Interface Select of the AK2300 **L: PCM_Short, I2S** H: PCM_Long, Left justified 2,3:DIF0[1:0] Data interface switch of the AK2300 [DIF0_1,DIF0_0]=[L,L]A-law =[L,H]μ -law =**[H,x]**Linear PCM (x: don't care) 4:MODE3 Reserved **(Low: default)** 5:MODE4 Reserved **(Low: default)**
(16)	D_BT_IF port (JP1: 5pin header)	When using other Bluetooth Transceiver or PCM Codec, connect them to this interface. The integrated Bluetooth module should be disconnected.

		I/O ports of the AK7756 are used when an external Bluetooth module is in master mode.

Pin#	Name	Function
1	BT-SDI	AK7756-SDOUT1 Output
2	BT-SDO	AK7756-SDIN1 Input
3	BT-LRCK	AK7756 LRCK Input
4	BT-BICK	AK7756 BICK Input
5	GND	Ground

Table 1. Main Board Functions (Bold: Default Setting)

■ USB Control Adapter (USB to 10 pin flat) Box



TheAKD7756-HF should be connected to a PC via an USB control box. The USB control box is connected to a PC with an USB cable and theAKD7756-HF with 10-pin flat cable. TheAKD7756-HF can be controlled by a PC with this USB control adapter.

■ Evaluation Mode (Bluetooth mode)

Front panel, DIP-SW2: Set to “H”.

1. Bluetooth Mode (with Built-in Bluetooth module)
(1) Rear Connector: MIC-IN and a microphone, SAMPOUT and speakers are connected.

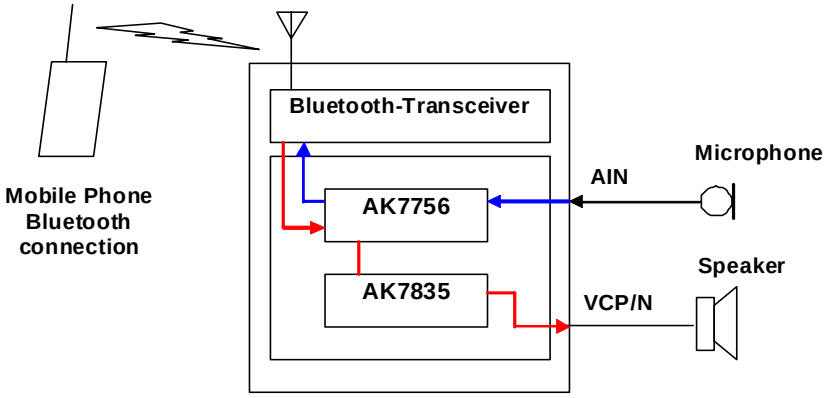


Figure 1. Bluetooth Mode Data Flow

(2) Evaluation Flow

<Bluetooth Pairing>

• Power on the AKD7756-HF.
• Push and hold the HOOK button on front panel of the AKD7756-HF for more than seven seconds. When releasing the button, LED of the status2 is ON and the AKD7756-HF becomes Bluetooth pairing wait state.
• Set a mobile phone into Bluetooth search state.
• Search result is displayed.
• Select [Free2move WA] from the search result and register it.
• Enter [0000] when password is required.
• Bluetooth registration complete message will be displayed.
• Select the registered machine and connect them when power-on the AKD7754-HF next time.

The peripheral search flow will not be the same way, depending on a mobile phone. (ex. A password for mobile phone may be required) Please refer to the usage manual of the mobile phone for details.

<Call & Disconnect>

Receive: When hear the ring tone, push the HOOK button on front panel of the AKD7756-HF
Transmit: Push the HOOK button on front panel of the AKD7756-HF after making a call by mobile phone.
Disconnect: Push the HOOK button on front panel of the AKD7756-HF.

<Note>

The built-in Bluetooth module can register three mobile phones at a maximum. The fourth mobile phone can not be registered when it already has three registered mobile phones. In this case, all registered mobiles should be unregistered once to register the fourth mobile. The built-in Bluetooth module can be initialized by pressing the HOOK button and BE-RST button in front panel of the AKD7756-HF for more than five seconds to cancel registered mobiles.

CONTROL SOFTWARE MANUAL

■ Evaluation Board and Control Software Set-up

1) Connect the AKD7756-HF to the USB control box.

2) Connect the AC-DC adaptor to the +12V port of the AKD7756-HF.

3) Connect the USB control box to a PC with USB cable.

The USB control box is recognized as HID (Human Interface Device) on the PC. When it can not be recognized correctly (e.g., recognized as an unknown device), please push the reset button (yellow) of the USB control box.

4) Insert the attached CD-ROM into the CD-ROM driver of the PC. Access the CD-ROM and execute "AK7756HF.exe".

5) When using Bluetooth, connect a mobile phone to Bluetooth Module. Refer to the evaluation flow of above-mentioned in Bluetooth mode.

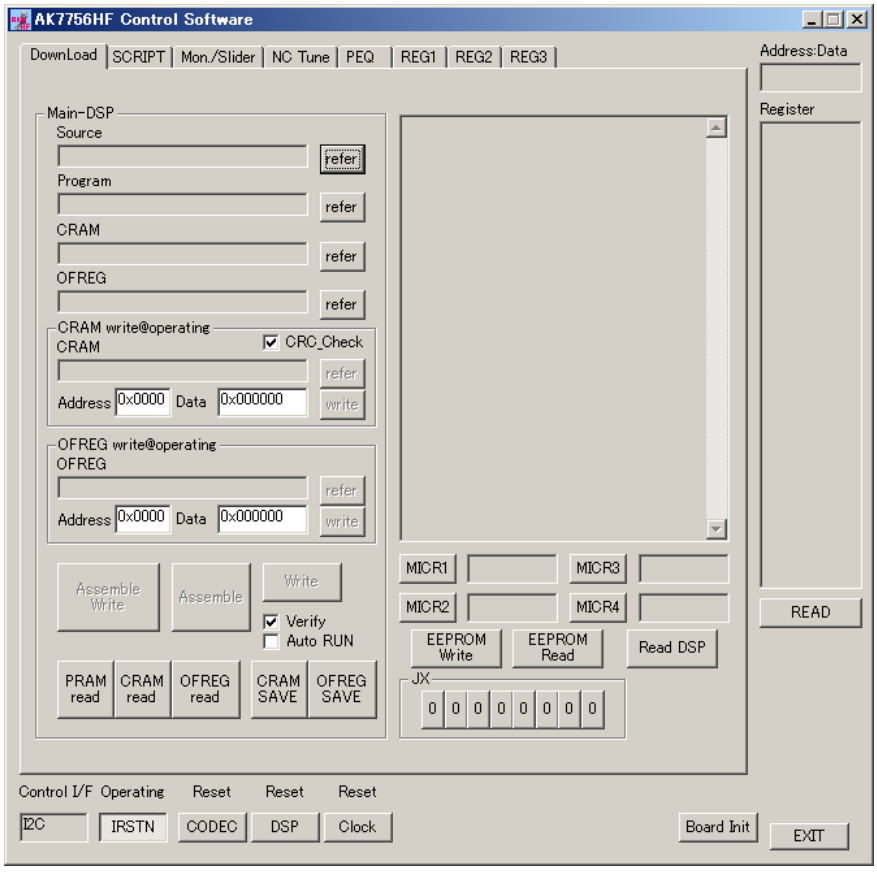


Figure 2. Startup Screen of the Control Software

Note: The software must run again when disconnecting a USB control box from the PC.

■ Control Software Functions

1. Code Downloading

There are three code areas in the AK7756 as below.

Code Area	Alias	Function
Control Register	CONT	AK7756 operation mode setup
Program RAM	PRAM	RAM for HF program code
Coefficient RAM	CRAM	Setting parameters used on the HF program

Table 2. AK7756 Code Area

(Note 1) Setting programs can be provided by AKM on request.

The setting can be made by SCRIPT writing mode of the GUI.

Write CONT

Example:
File Name:
set_RegScript.txt

After writing a setting program, press CODEC and DSP buttons to power-up. The AK7756 starts operation.
(DSP= “H”, CODEC= “H”)

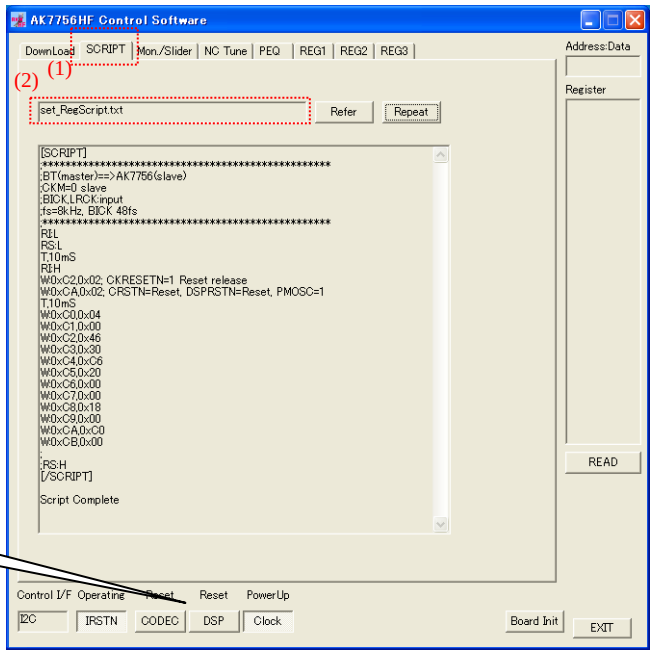


Figure 3. Control S/W [Script] tab screen

Write PRAM and CRAM

Example:
PRAM File:
AK7756HF_T1.obj
CRAM File:
AK7756HF_T1.cra

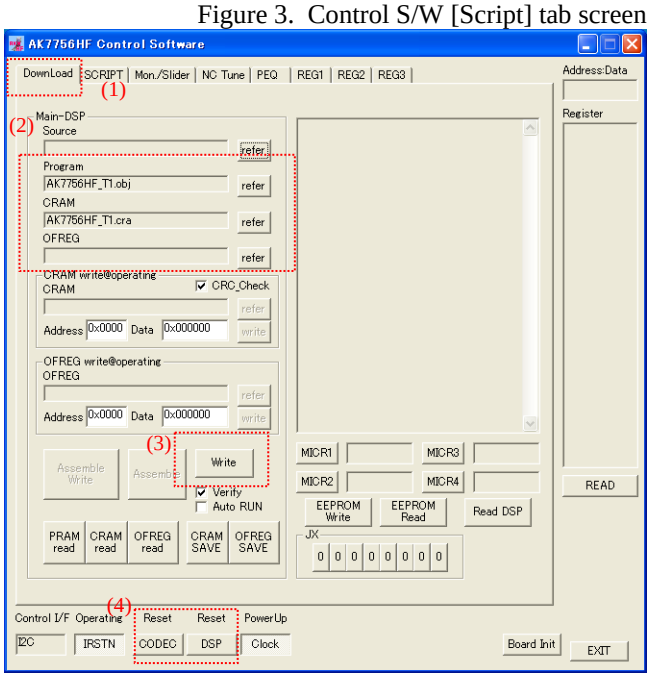


Figure 4. Control S/W [Download] tab screen

■ Parametric Equalizers

The parametric equalizers as follows are included in HF code.

Name	Function	CRAM Address
Receiving-PEQ	Filter for receiving sound 4-band IIR	1st Band:(1C4h) ~ (1C8h) 2nd Band:(1C9h) ~ (1CDh) 3rd Band:(1CEh) ~ (1D2h) 4th Band:(1D3h) ~ (1D7h)
Sending-PEQ	Filter for transmitting sound 8-band (4+4) IIR	1st Band:(1D8h) ~ (1DCh) 2nd Band:(1DDh) ~ (1E1h) 3rd Band:(1E2h) ~ (1E6h) 4th Band:(1E7h) ~ (1EBh) 5th Band:C(478h) ~ C(47Ch) 6th Band:C(47Dh) ~ C(481h) 7th Band:C(482h) ~ C(486h) 8th Band:C(487h) ~ C(48Bh)
MIC-Comp-PEQ	Spatial distortion correction filter 2-band IIR fixed 4-band IIR variable	Fix Band:C(399h) ~ C(39Dh) Fix Band:C(39Eh) ~ C(3A2h) 1st Band:C(1ECh) ~ C(1F0h) 2nd Band:C(1F1h) ~ C(1F5h) 3rd Band:C(1F6h) ~ C(1FAh) 4th Band:C(1FBh) ~ C(1FFh)
MIC_IN_PEQ	MIC Filter 2-band IIR fixed 4-band IIR variable	Fix Band:C(3A4h) ~ C(3A8h) Fix Band:C(3A9h) ~ C(3ADh) 1st Band:C(214h) ~ C(218h) 2nd Band:C(219h) ~ C(21Dh) 3rd Band:C(21Eh) ~ C(222h) 4th Band:C(223h) ~ C(227h)
SPK_OUT_PEQ	Speaker Output Filter 8-band (4+4) IIR	1st Band:C(3B1h) ~ C(3B5h) 2nd Band:C(3B6h) ~ C(3BAh) 3rd Band:C(3BBh) ~ C(3BFh) 4th Band:C(3C0h) ~ C(3C4h) 5th Band:C(200h) ~ C(204h) 6th Band:C(205h) ~ C(209h) 7th Band:C(20Ah) ~ C(20Eh) 8th Band:C(20Fh) ~ C(213h)

Table 3. HF PEQ tables

5 types of filters can be selected on GUI software.

Type	Name
DIP	Boost and decompress for specific frequency
LPF12	Low Pass Filter 12dB/oct
HPF12	High Pass Filter 12dB/oct
LPF6	Low Pass Filter 6dB/oct
HPF6	High Pass Filter 6dB/oct

Table 4. Filter attribute table

8 bands adjustments can be made in RUN state by GUI.

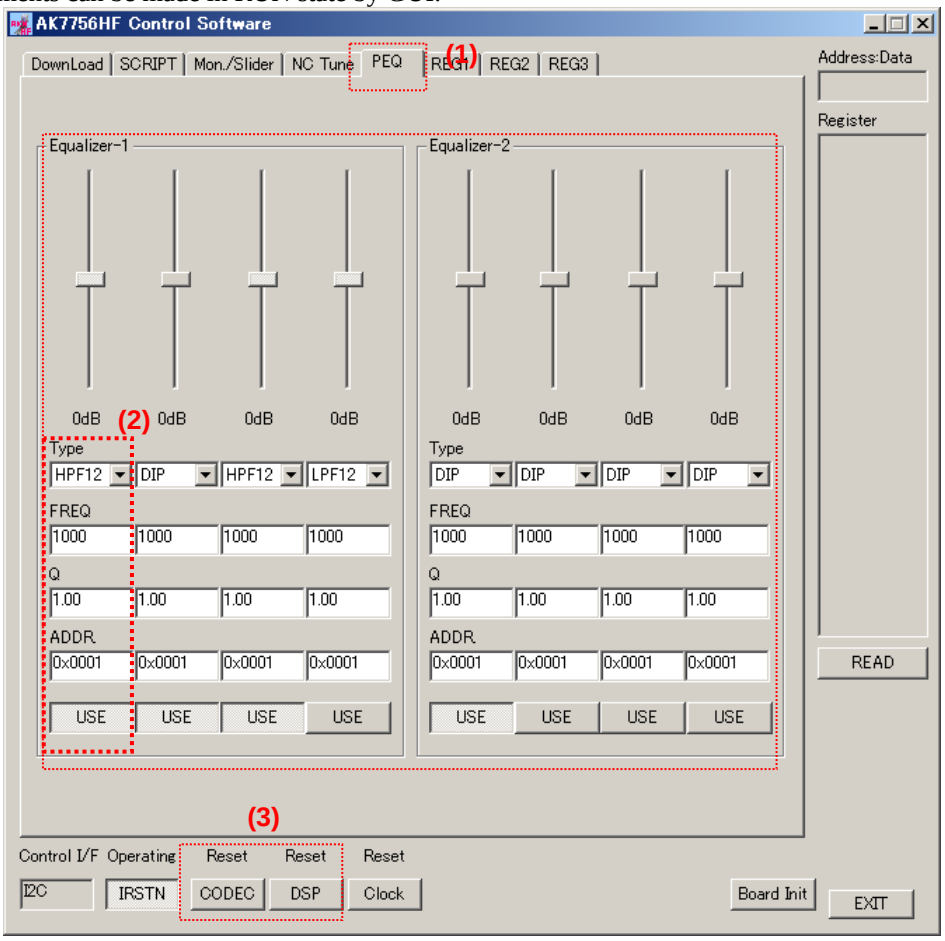


Figure 5. Control S/W [PEQ] tab screen

(1) Select [PEQ] tab to open Equalizer dialogue.

(2) Push down the [USE] button to write this operation setting to the DSP.
Set the initial address of the PEQ band, which need to be modified, to [ADDR].
Set quality factor of the filter to [Q].
Set a cutoff frequency of the filter to [FREQ].
Use the [Type] pull-down menu box to select a filter type.
When filter type is “DIP”, the slid bar is available for setting.

(3) This function is enabled only when CODEC and DSP buttons are pushed down (CODEC and DSP are in RUN state).

■ Noise Canceller

The noise canceller sets optional noise attenuation for 6 divided voice bands.
This noise cancel adjustment is made with the real time NC parameter adjustment function of GUI software as shown in the following diagram.

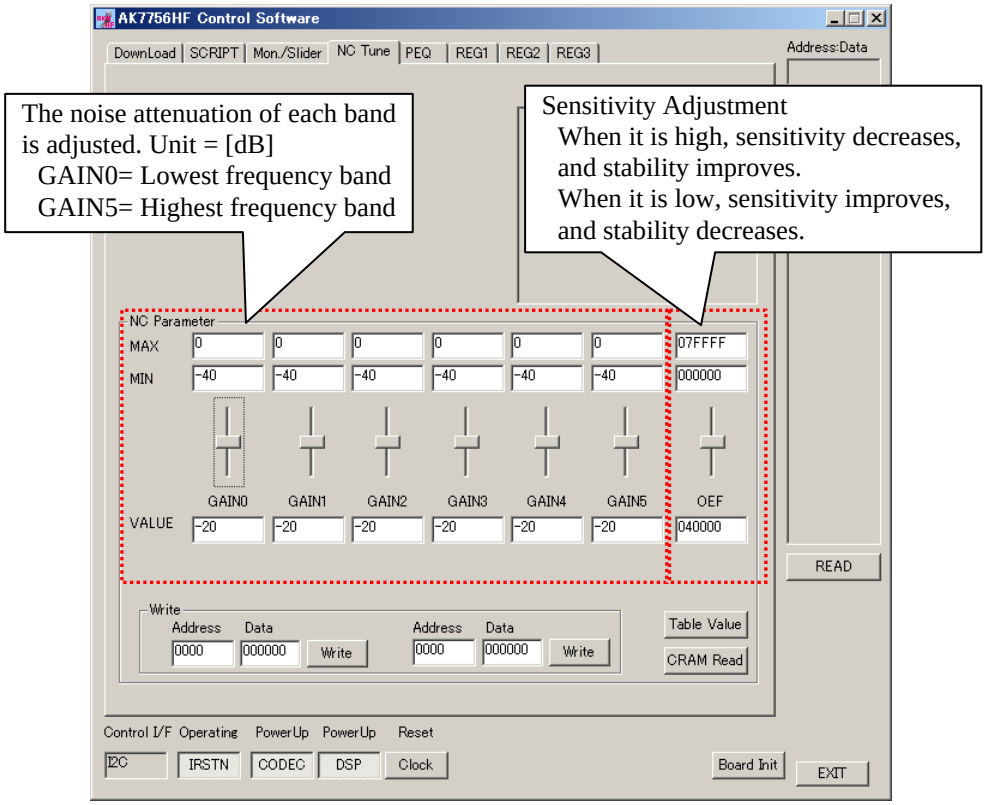


Figure 6. Control S/W [NC Tune] tab screen

■ Parameter Adjustment

Set the parameters in CRAM to adjust Hands Free setting.
In this instruction manual, CRAM addresses are expressed as C (xx). Address = 4Ch is shown below as an example.
Example:

C(4Ch)	CRAM Address 4Ch

A corresponding example to the CRAM file is shown below.

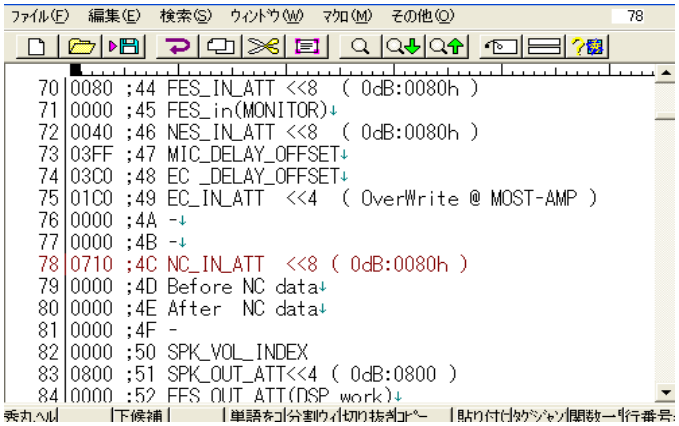


Figure 7. AK7756 CRAM File Format

Figure 7 shows that 0710h is stored to C(0004Ch) when this file is downloaded.

With GUI, it is possible to make adjustment of 8 CRAM parameters simultaneously in RUN state.

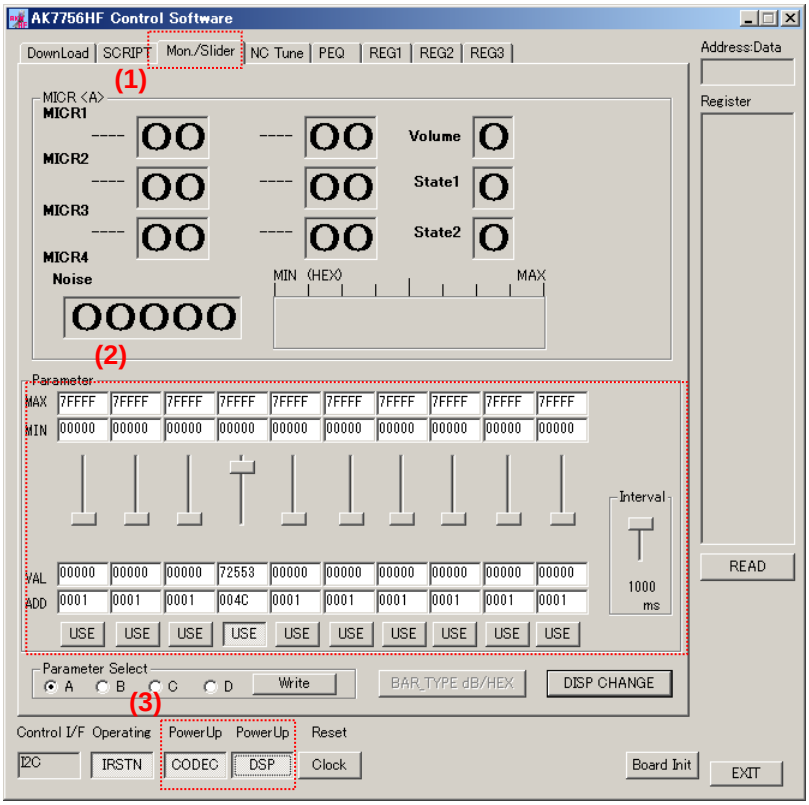


Figure 8. Control S/W [Mon/Slider] tab screen

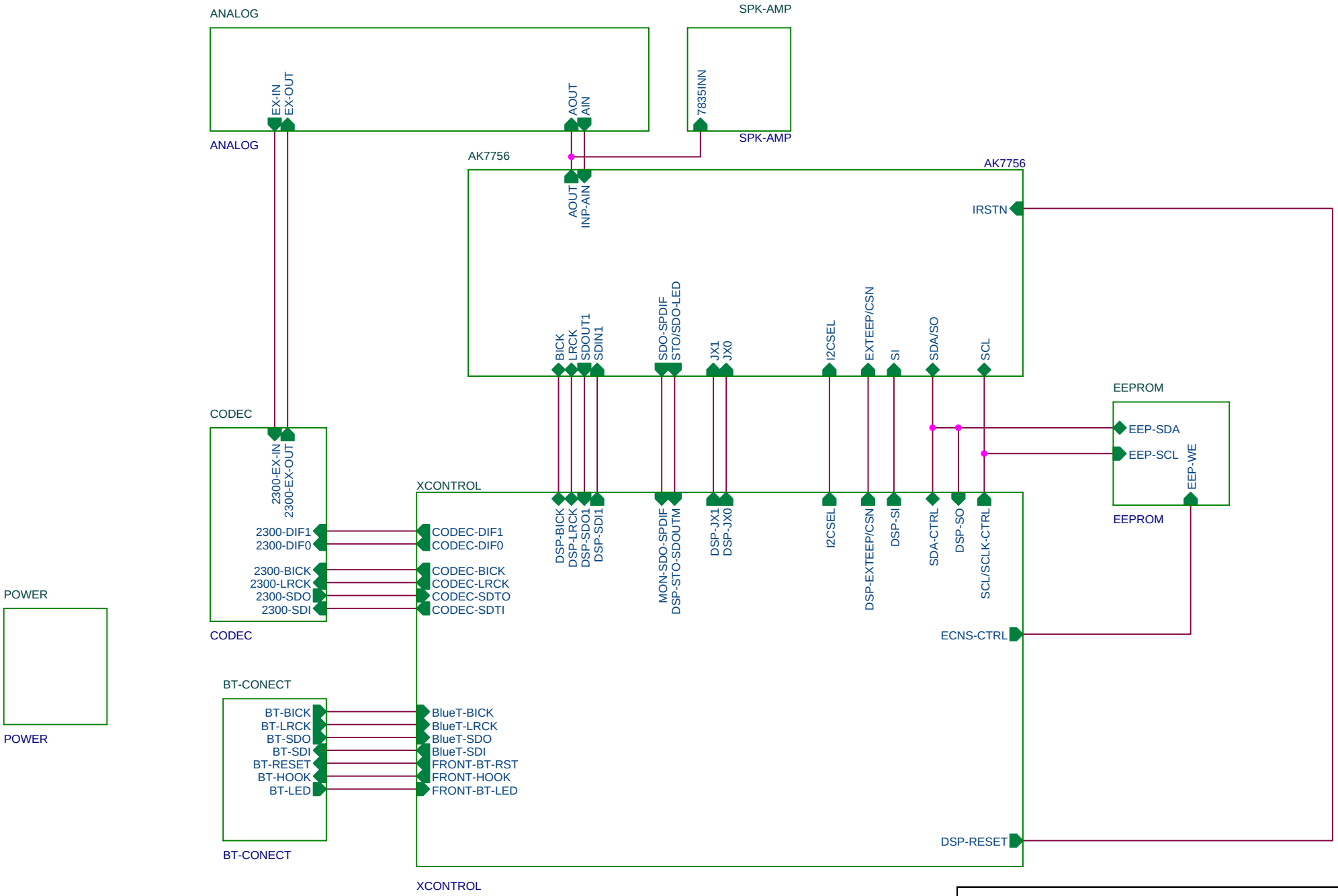
(1) Select [Mon/Slider] tab.
(2) Push down the [USE] button to write this operation setting to the DSP.
First, write the address to [ADDR].
Without using the slid bar, it is also possible to input the value to [VAL].
Set the range of the slide bar to [MAX] and [MIN]. (Usually 7FFF ~ 0000)
(3) This function is enabled only when CODEC and DSP buttons are pushed down. (CODEC and DSP are in RUN state)

REVISION HISTORY

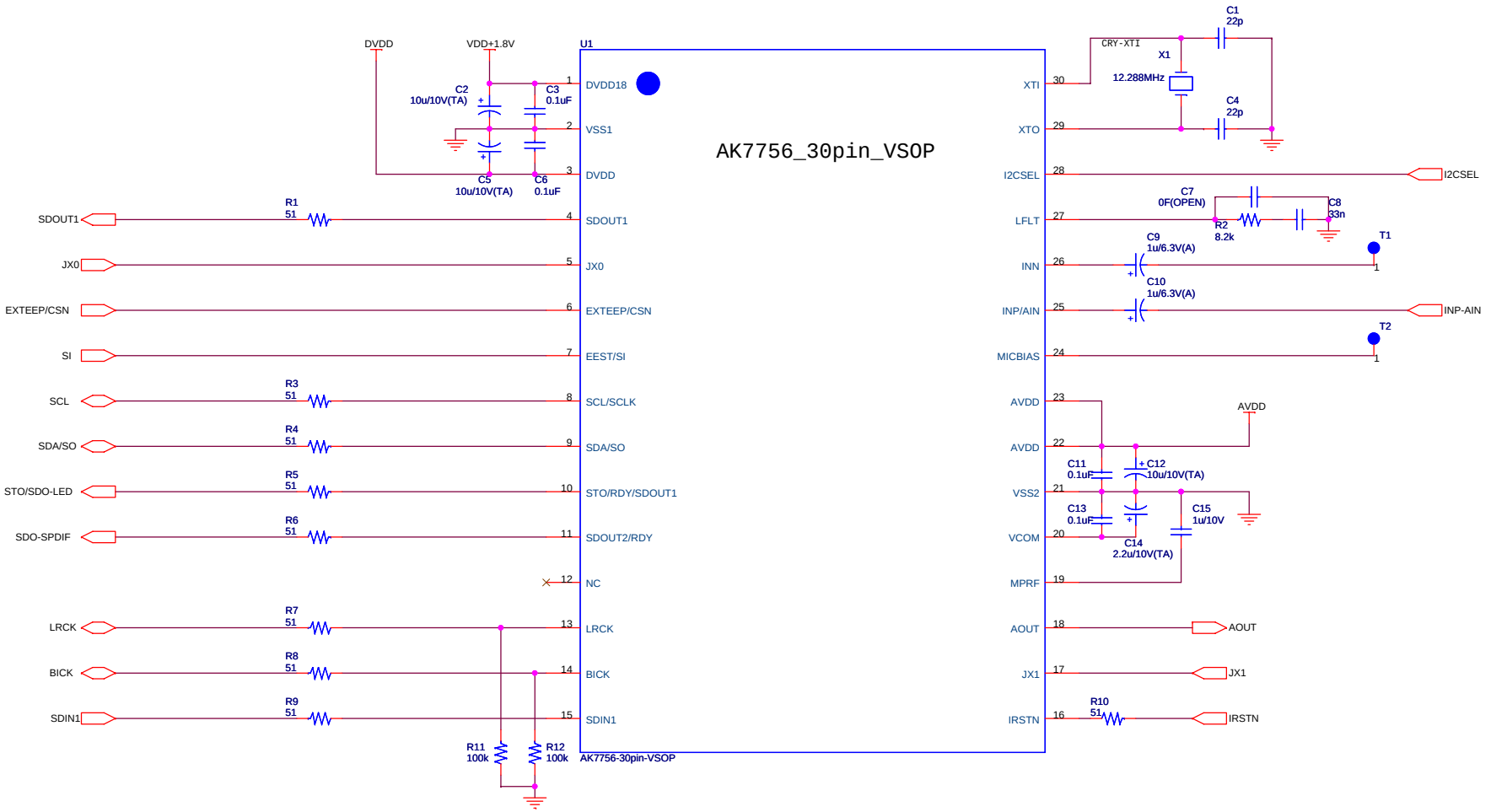
Date (yy/mm/dd)	Manual Revision	Board Revision	Reason	Page	Contents
10/06/30	KM101400	0	First Edition		

IMPORTANT NOTICE

- These products and their specifications are subject to change without notice.
  When you consider any use or application of these products, please make inquiries the sales office of Asahi Kasei Microdevices Corporation (AKM) or authorized distributors as to current status of the products.
- Descriptions of external circuits, application circuits, software and other related information contained in this document are provided only to illustrate the operation and application examples of the semiconductor products. You are fully responsible for the incorporation of these external circuits, application circuits, software and other related information in the design of your equipments. AKM assumes no responsibility for any losses incurred by you or third parties arising from the use of these information herein. AKM assumes no liability for infringement of any patent, intellectual property, or other rights in the application or use of such information contained herein.
- Any export of these products, or devices or systems containing them, may require an export license or other official approval under the law and regulations of the country of export pertaining to customs and tariffs, currency exchange, or strategic materials.
- AKM products are neither intended nor authorized for use as critical components$_{Note1)}$ in any safety, life support, or other hazard related device or system$_{Note2)}$, and AKM assumes no responsibility for such use, except for the use approved with the express written consent by Representative Director of AKM. As used here:
  Note1) A critical component is one whose failure to function or perform may reasonably be expected to result, whether directly or indirectly, in the loss of the safety or effectiveness of the device or system containing it, and which must therefore meet very high standards of performance and reliability.
  Note2) A hazard related device or system is one designed or intended for life support or maintenance of safety or for applications in medicine, aerospace, nuclear energy, or other fields, in which its failure to function or perform may reasonably be expected to result in loss of life or in significant injury or damage to person or property.
- It is the responsibility of the buyer or distributor of AKM products, who distributes, disposes of, or otherwise places the product with a third party, to notify such third party in advance of the above content and conditions, and the buyer or distributor agrees to assume any and all responsibility and liability for and hold AKM harmless from any and all claims arising from the use of said product in the absence of such notification.

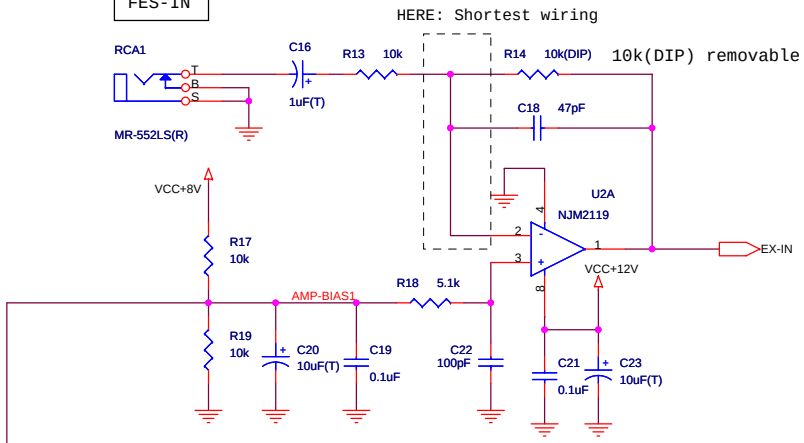


Title	AKD7756-HF	
Size: A4	Document Number: TOP	Rev: 1.0
Date: Thursday, November 19, 2009	Sheet 1 of 9	

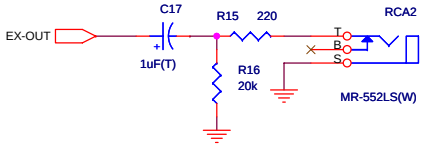


Title	AKD7756-HF	
Size A3	Document Number AK7756	Rev 1.0
Date: Friday, October 30, 2009	Sheet 2 of 9	

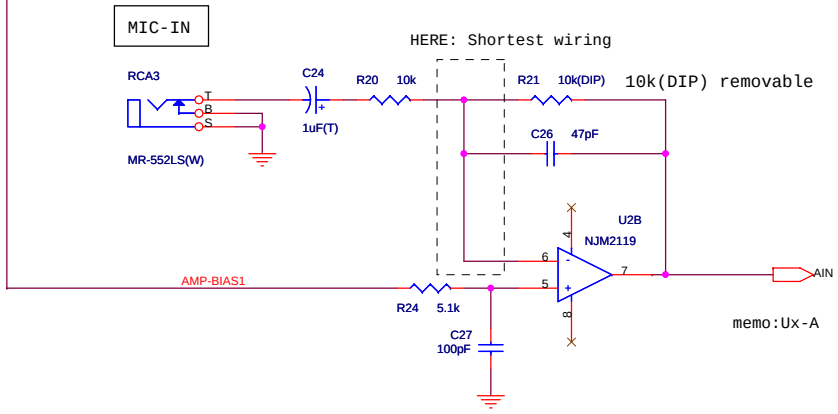
FES-IN



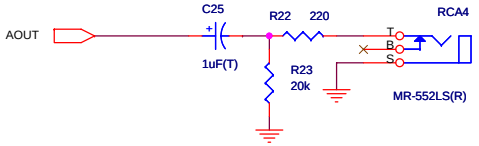
FES-OUT



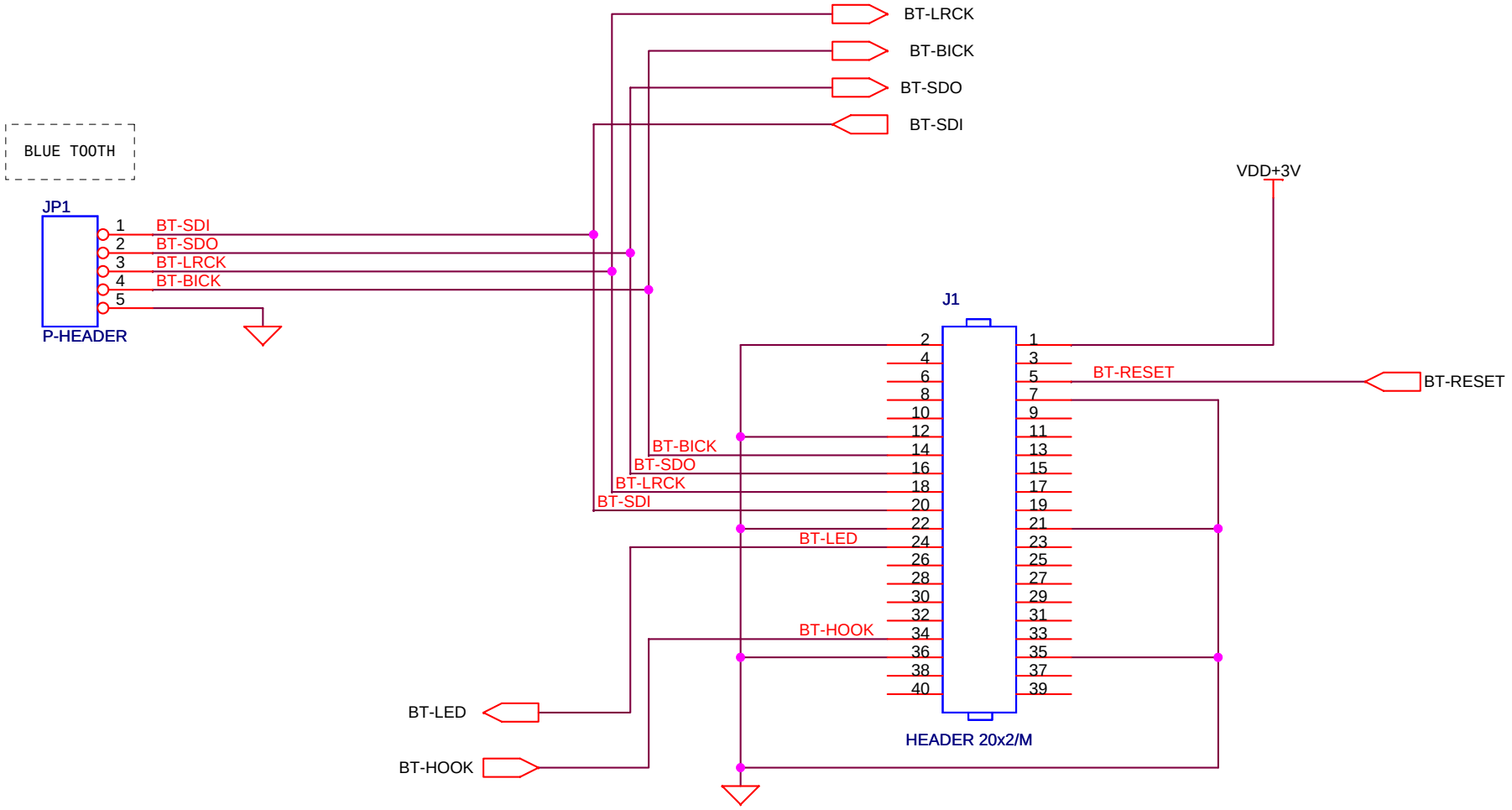
MIC-IN



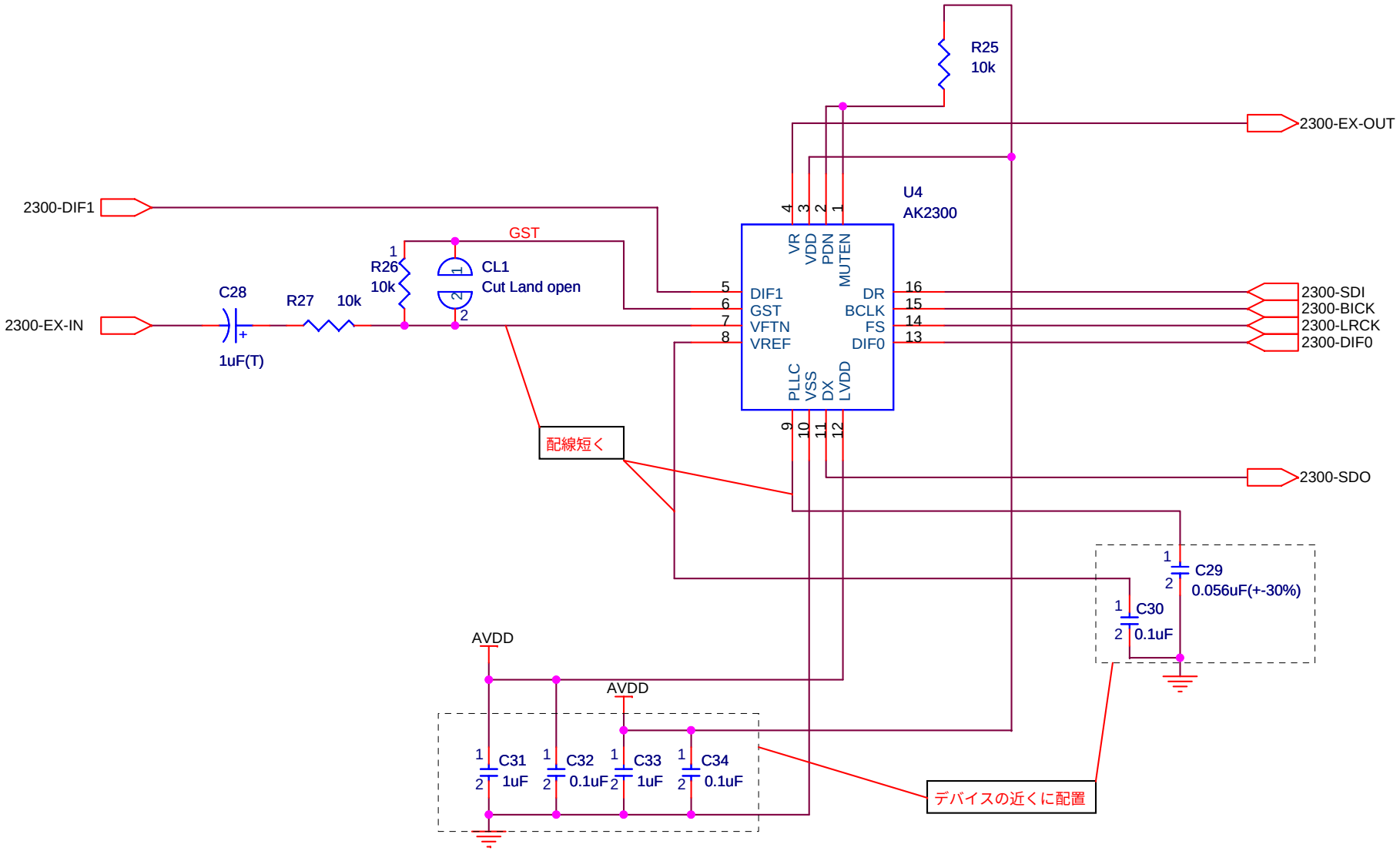
SPK-OUT



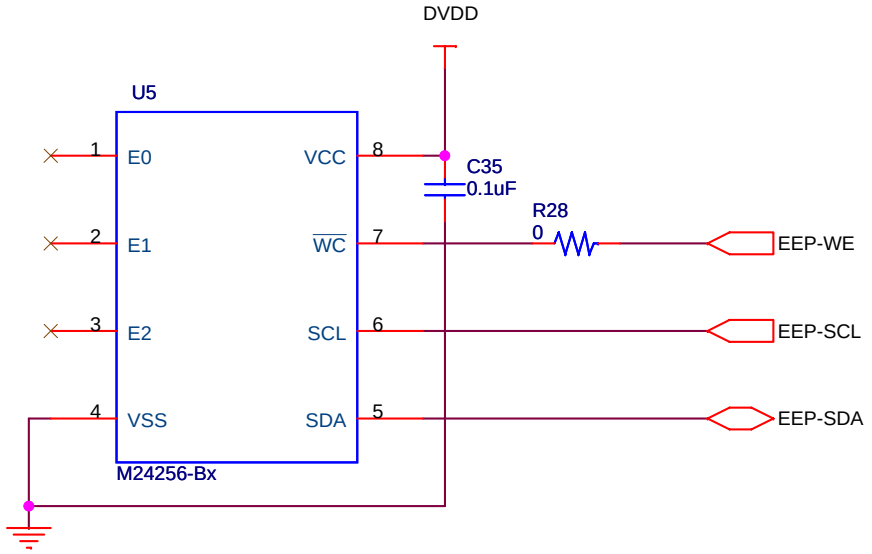
Title	AKD7756-HF	
Size A3	Document Number ANALOG	Rev 1.0
Date: Thursday, November 19, 2009	Sheet 3 of 9	



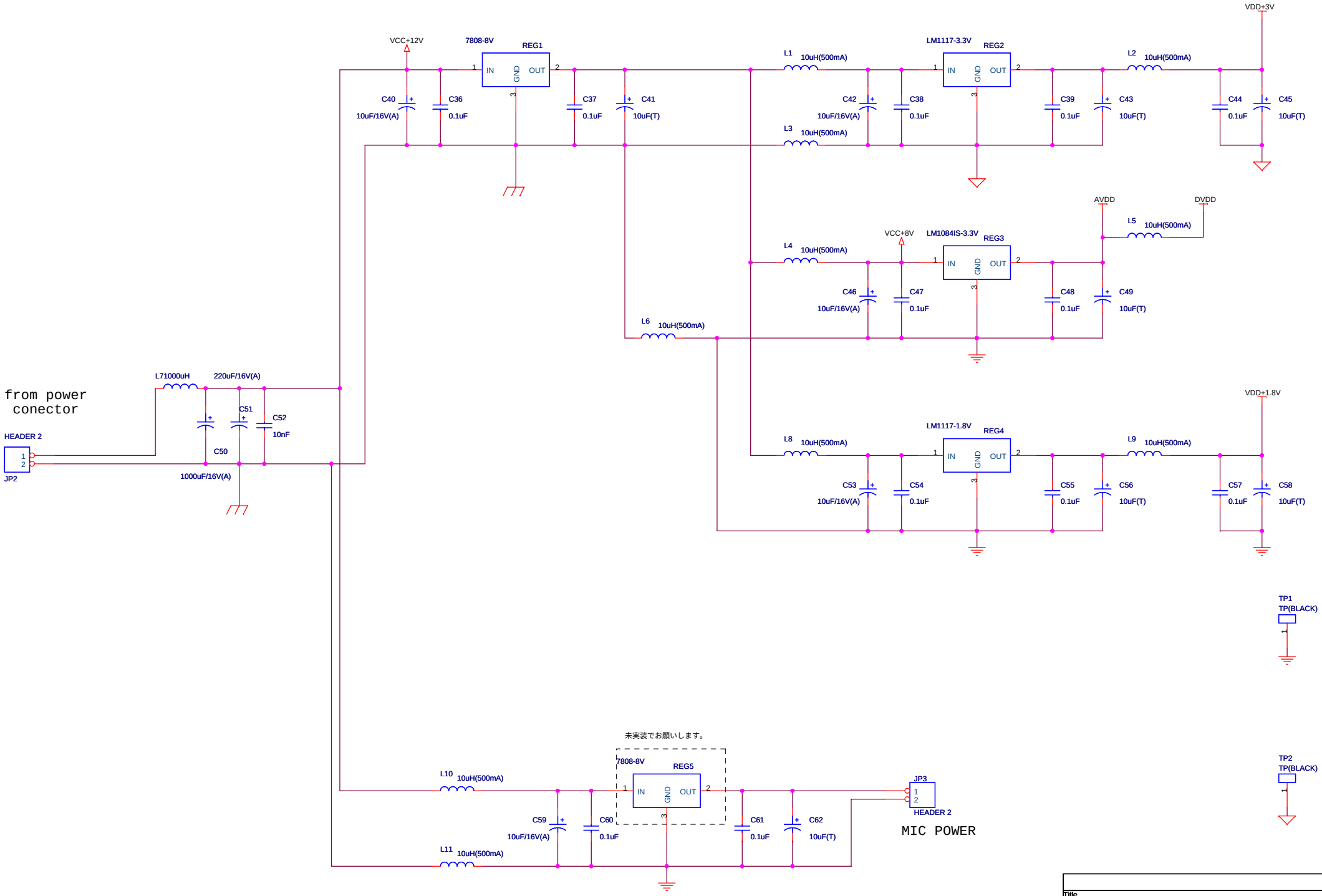
Title	AKD7756-HF		
Size A	Document Number	BT-CONECT	Rev 1.0
Date: Thursday, November 19, 2009	Sheet 4 of 9		



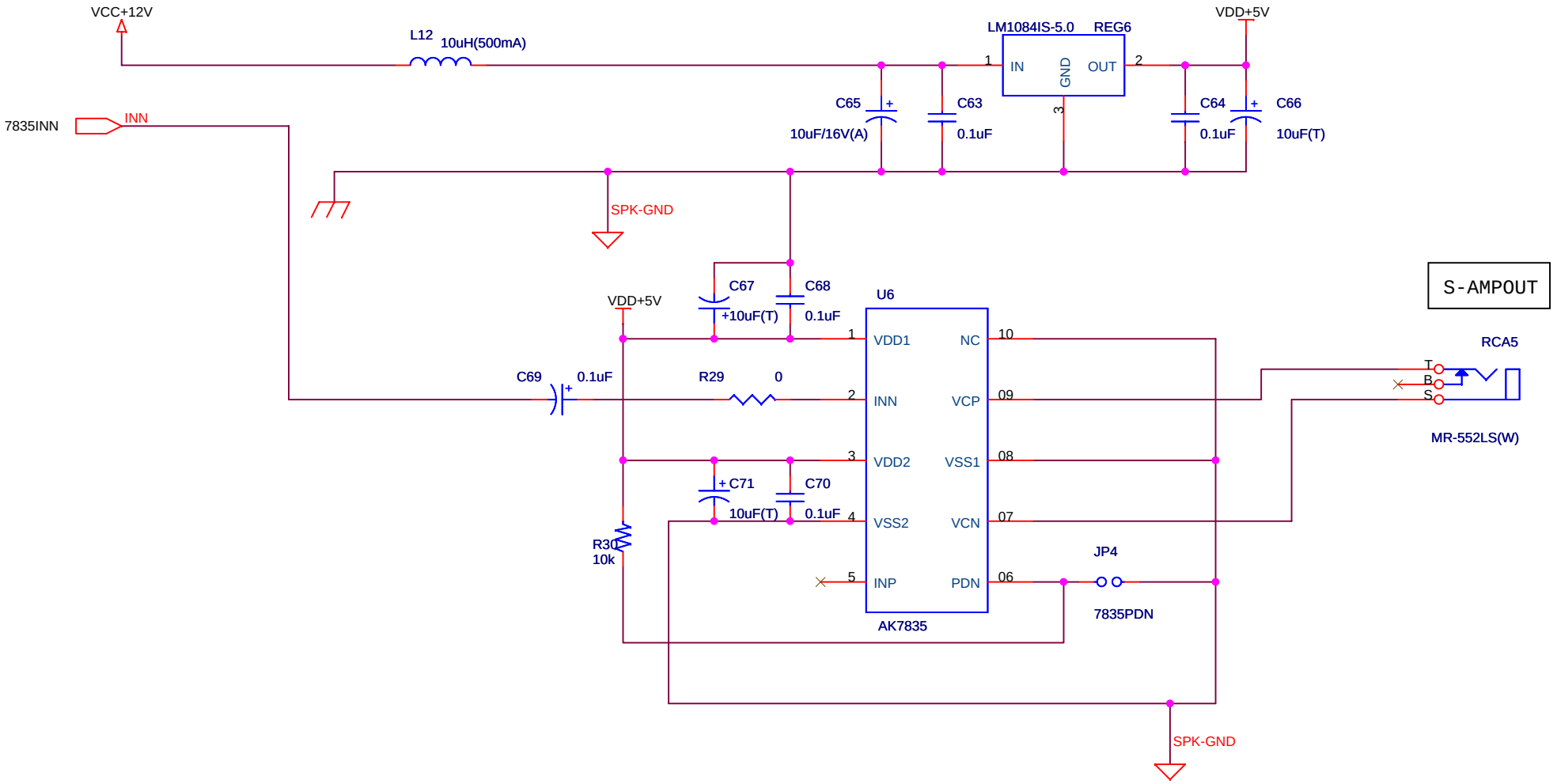
Title	AKD7756-HF		
Size A	Document Number CODEC		Rev 1.0
Date: Friday, October 30, 2009		Sheet 5 of 9	



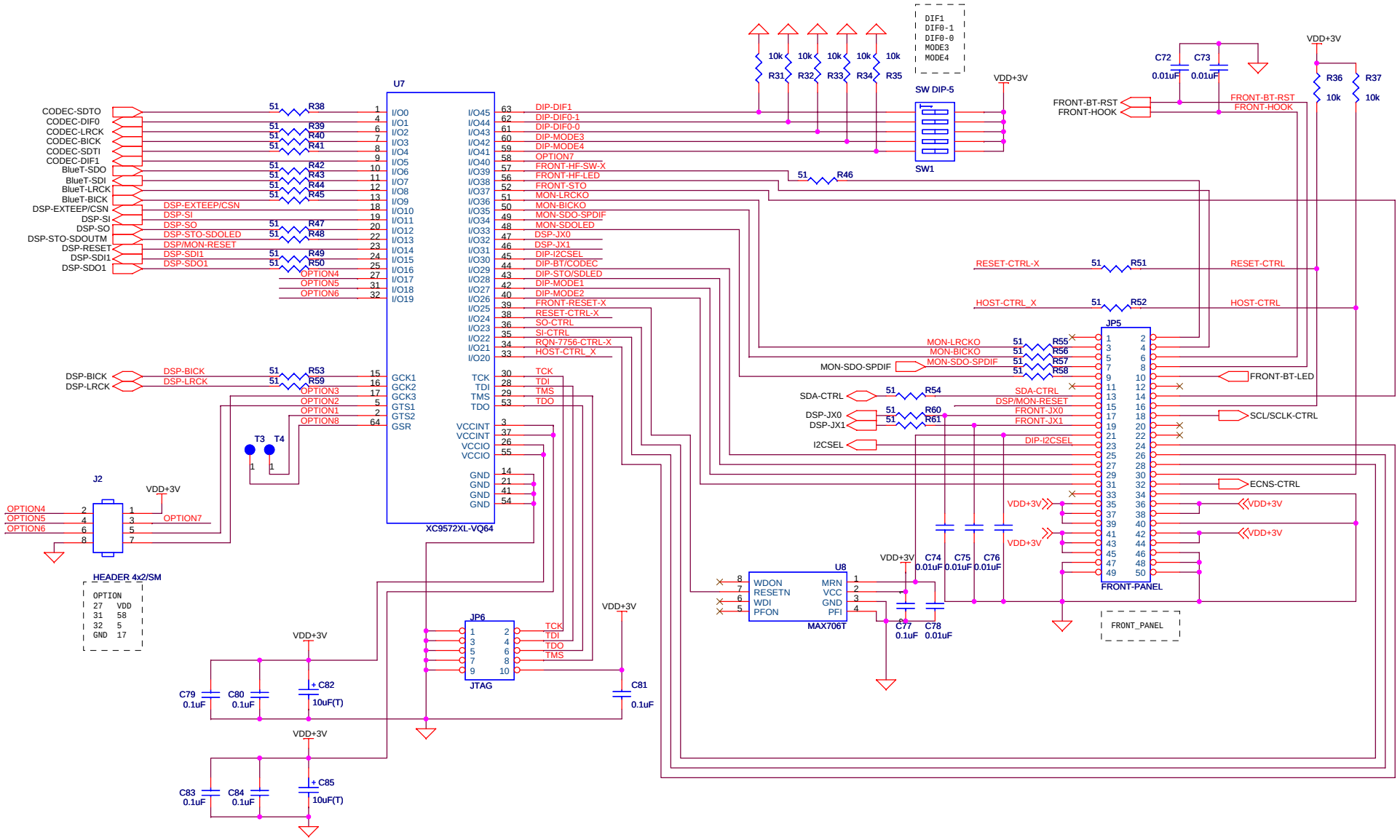
Title	AKD7756-HF	
Size: A	Document Number: EEPROM	Rev: 1.0
Date: Friday, October 30, 2009	Sheet 6 of 9	



Title	AKD7756-HF	
Size A3	Document Number POWER	Rev 1.0
Date: Thursday, November 19, 2009	Sheet 7 of 9	



Title	AK7756-HF	
Size A4	Document Number SPK-AMP	Rev 1.0
Date: Friday, April 02, 2010	Sheet 8 of 9	



Title	AKD7756-HF XCONTROL	
Size A3	Document Number	Rev 1.0
Date: Thursday, November 19, 2009	Sheet 9 of 9	