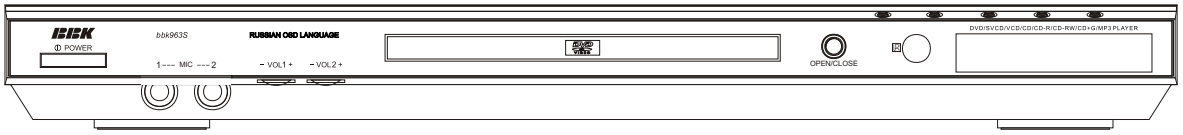
SERVICE MANUAL

BBK963S



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1. SAFETY PREAUTIONS

1.1 GENERAL GUIDELINES

1. When servicing, observe the original lead dress. if a short circuit is found, replace all parts which have been overheated or damaged by the short circuit.

2. After servicing, see to it that all the protective devices such as insulation barrier, insulation papers shields are properly installed.

3. After servicing, make the following leakage current checks to prevent the customer from being exposed to shock hazards.

2.PREVENTION OF ELECTRO STATIC DISCHARGE(ESD)TO ELECTROSTATICALLY SENSITIVE(ES)DEVICES

Some semiconductor(solid state)devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive(ES)Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor chip components. The following techniques should be used to help reduce the incidence of component damage caused by electro static discharge(ESD).

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any ESD on your body by touching a known earth ground. Alternatively, obtain and wear a commercially availabel discharging ESD wrist strap, which should be removed for potential shock reasons prior to applying power to the unit under test.

2. After removing an electrical assembly equipped with ES devices,place the assembly on a conductive surface such as alminum foil, to prevent electrostatic charge buildup or exposure of the assembly.

3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.

4. Use only an anti-static solder removal device. Some solder removal devices not classified as anti-static (ESD protected)can generate electrical charge sufficient to damage ES devices.

5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.

6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, alminum foil or comparable conductive material).

7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.

Caution

Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.

8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity(ESD).

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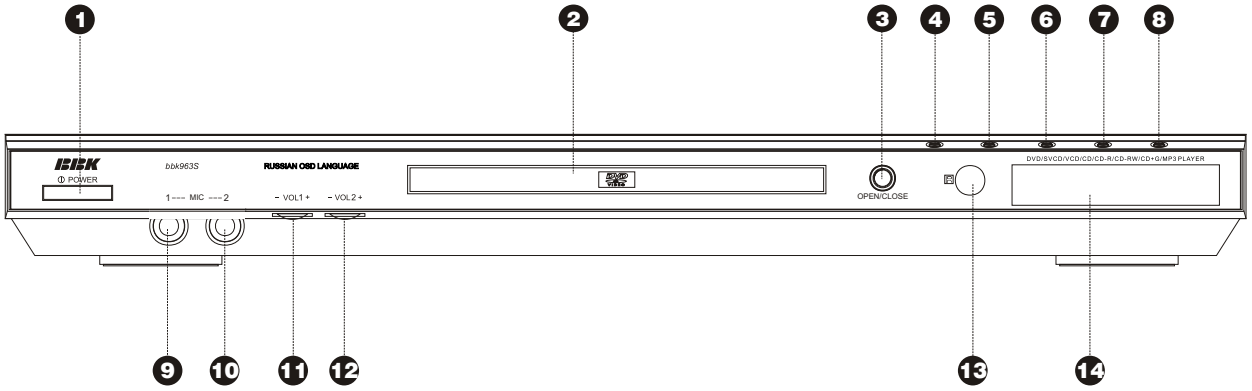
IMPORTANT SAFETY NOTICE

There are special components used in this equipment which are imporant for safety.
These parts are marked by ⚠ in the schematic diagrams, Exploded Views and replacement parts list. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent shock, fire, or other hazards. Do not modify the original design without permission of manufacturer.

3. Control Button Locations and Explanations

■ Front Panel Illustration



❶ POWER switch

❷ Disc tray

❸ OPEN/CLOSE button

❹ PLAY button

❺ PAUSE button

❻ STOP button

❼ REW button

❽ FWD button

❾ MIC 1 jack

❿ MIC 2 jack

⓫ MIC 1 VOLUME knob

⓬ MIC 2 VOLUME knob

⓭ IR SENSOR

⓮ LED display window

4.PREVENTION OF STATIC ELECTRICITY DISCHARGE

The laser diode in the traverse unit (optical pickup)may brake down due to static electricity of clothes or human body. Use due caution to electrostatic breakdown when servicing and handling the laser diode.

4.1.Grounding for electrostatic breakdown prevention

Some devices such as the DVD player use the optical pickup(laser diode)and the optical pickup will be damaged by static electricity in the working environment.Proceed servicing works under the working environment where grounding works is completed.

4.1.1. Worktable grounding

1. Put a conductive material(sheet)or iron sheet on the area where the optical pickup is placed,and ground the sheet.

4.1.2.Human body grounding

1 Use the anti-static wrist strap to discharge the static electricity from your body.

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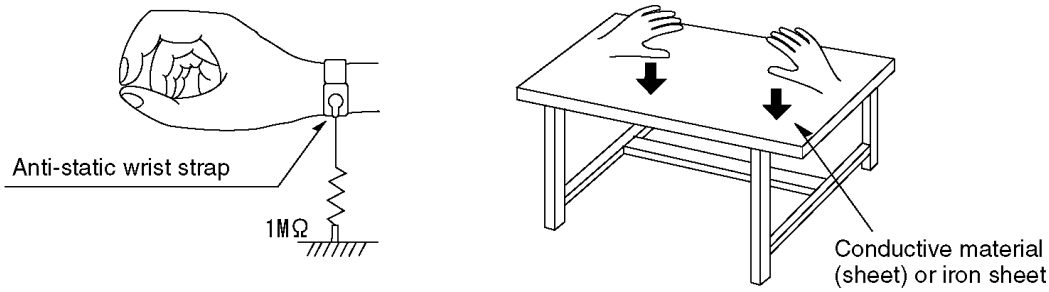


4.1.3.Handling of optical pickup

1. To keep the good quality of the optical pickup maintenance parts during transportation and before installation, the both ends of the laser diode are short-circuited.After replacing the parts with new ones, remove the short circuit according to the correct procedure. (See this Technical Guide).

2. Do not use a tester to check the laser diode for the optical pickup .Failure to do so willdamage the laser diode due to the power supply in the tester.

4.2. Handling precautions for Traverse Unit (Optical Pickup)

1. Do not give a considerable shock to the traverse unit(optical pickup)as it has an extremely high-precise structure.

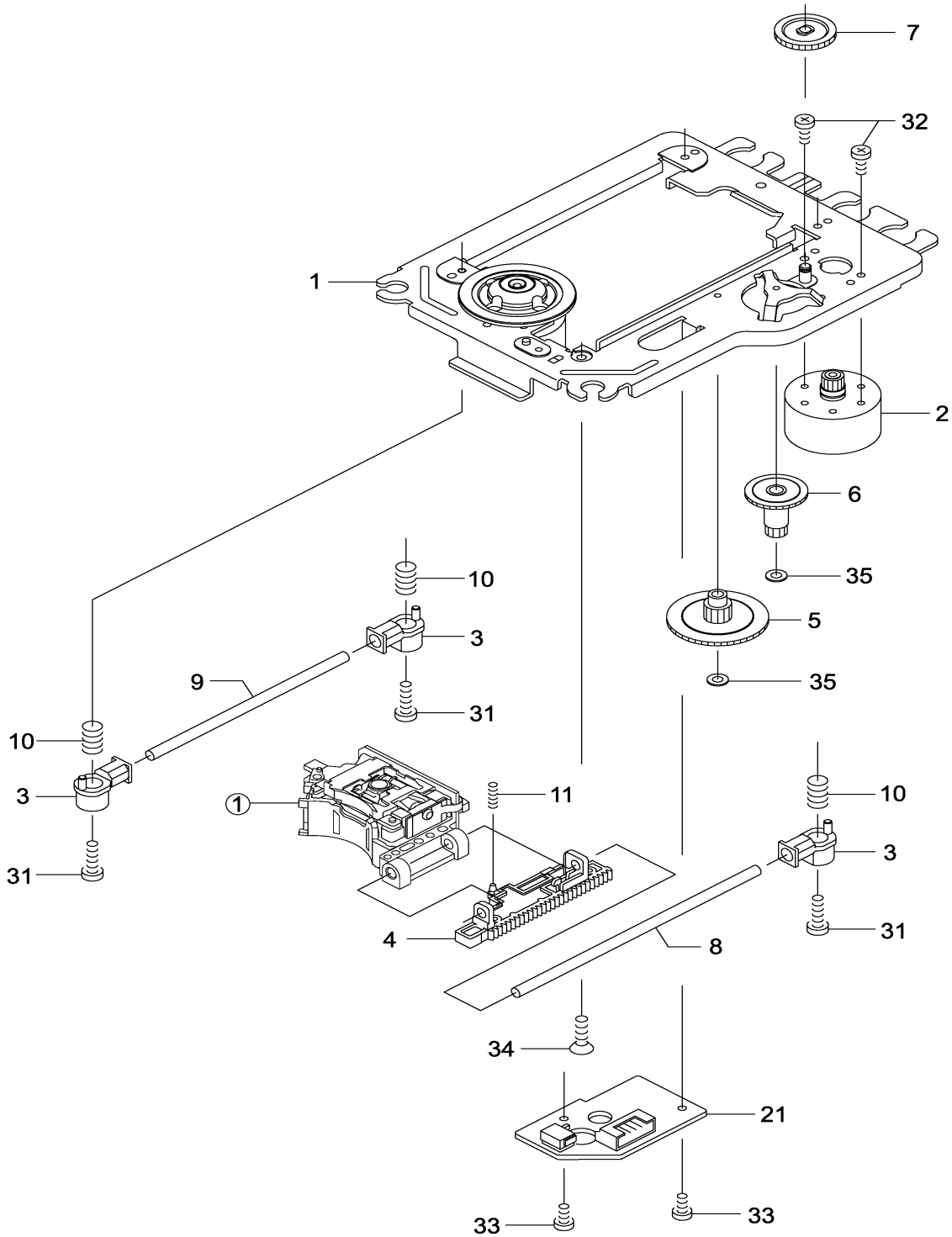
2. When replacing the optical pickup, install the flexible cable and cut is short land with a nipper. See the optical pickup replacement procedure in this Technical Guide. Before replacing the traverse unit, remove the short pin for preventingstatic electricity and install a new unit.Connect the connector as short times as possible.

3. The flexible cable may be cut off if an excessive force is applied to it.Use caution when handling the cable

4. The half-fixed resistor for laser power adjustment cannot be adjusted. Do not turn the resistor.

5. Assembling and disassembling the mechanism unit

5.1 Optical pickup Unit Explosed View and Part List



Pic (1)

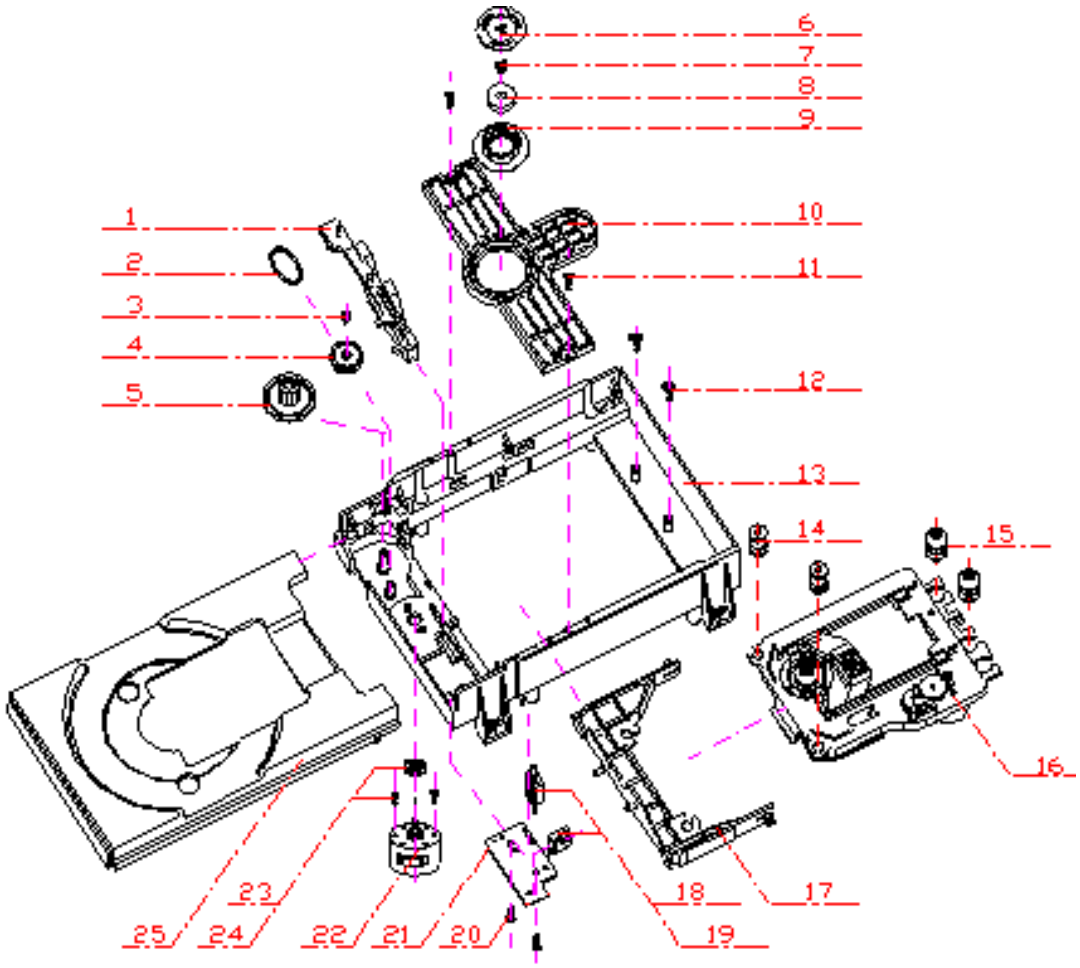
Materials to Pic (1)

No.	PARTS CODE	PARTS NAME	Q'ty
①	14692200	SF-HD60	1
1	1EA0311A06300	ASSY, CHASSIS, COMPLETE	1
2	1EA0M10A15500	ASSY, MOTOR, SLED	1
Or	1EA0M10A15501	ASSY, MOTOR, SLED	1
3	1EA2451A24700	HOLDER, SHAFT	3
4	1EA2511A29100	GEAR, RACK	1
5	1EA2511A29200	GEAR, DRIVE	1
6	1EA2511A29300	GEAR, MIDDLE, A	1
7	1EA2511A29400	GEAR, MIDDLE, B	1
8	1EA2744A03000	SHAFT, SLIDE	1
9	1EA2744A03100	SHAFT, SLIDE, SUB	1
10	1EA2812A15300	SPRING, COMP, TYOUSEI	3
11	1EA2812A15400	SPRING, COMP, RACK	1
21	1EA0B10B20100	ASSY, PWB	1
Or	1EA0B10B20200	ASSY, PWB	1
31	SEXEA25700---	SPECIAL SCREW BIN+-M2X11	3
32	SEXEA25900---	SPECIAL SCREW M1.7X2.2	2
33	SFBPN204R0SE-	SCR S-TPG PAN 2X4	2
34	SFSFN266R0SE-	SCR S-TPG FLT 2.6X6	1
35	SWXEA15400---	SPECIAL WASHER 1.8X4 X0.25	2

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

Note : This parts list is not for service parts supply.

5.2 Bracket Explosed View and Part List



Pic (2)

Materials to Pic(2)

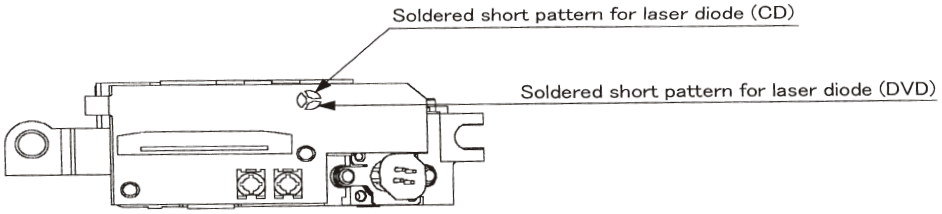
1.bracket
2.belt
3.screw
4.belt wheel
5.gearwheel
6.iron chip
7. Immobility mechanism equipment
8. Magnet
9. Platen
10. Bridge bracket
11. screw
12. screw
13. Big bracket
14. front silicon rubber
15. Back silicon rubber
16. Pick-up
17. Pick-up
18. switch
19. Five-pin flat plug
20. screw
21. PCB
22. motor
23. Motor wheel
24. screw
25.tray

Before going process with disassembly and installation, please carefully both peruse the chart and confirm the materials.

5.3 MISCELLANEOUS

5.3.1 Protection of the LD(Laser diode)

Short the parts of LD circuit pattern by soldering.



5.3.2 Cautions on assembly and adjustment

Make sure that the workbenches,jigs,tips,tips of soldering irons and measuring instruments are grounded,and that personnel wear wrist straps for ground.

Open the LD short lands quickly with a soldering iron after a circuit is connected.

Keep the power source of the pick-up protected from internal and external sources of electrical noise.

Refrain from operation and storage in atmospheres containing corrosive gases (such as H2S,SO2, NO2 and Cl2)or toxic gases or in locations containing substances(especially from the organic silicon,cyan, formalin and phenol groups)which emit toxic gases.It is particularly important to ensure that none of the above substances are present inside the unit.Otherwise,the motor may no longer run.

6.Electrical Confirmation

6.1. Video Output (Luminance Signal) Confirmation

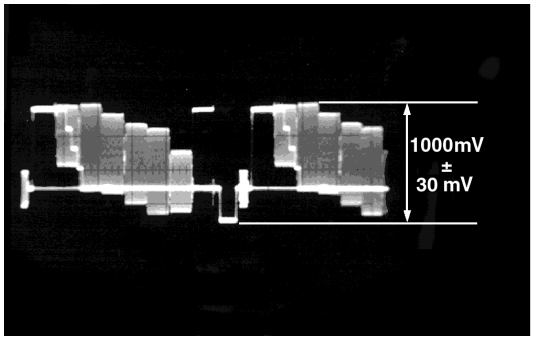
DO this confirmation after replacing a P.C.B.

Measurement point	Mode	Disc
Video output terminal	Color bar 75% PLAY(Title 46):DVDT-S15 PLAY(Title 12):DVDT-S01	DVDT-S15 or DVDT-S01
Measuring equipment,tools	Confirmation value	
200mV/dir,10 μ sec/dir	1000mVp-p±30mV	

Purpose:To maintain video signal output compatibility.

1.Connect the oscilloscope to the video output terminal and terminate at 75 ohms.

2.Confirm that luminance signal(Y+S)level is 1000mVp-p±30mV



6.2 Video Output(Chrominance Signal) Confirmation

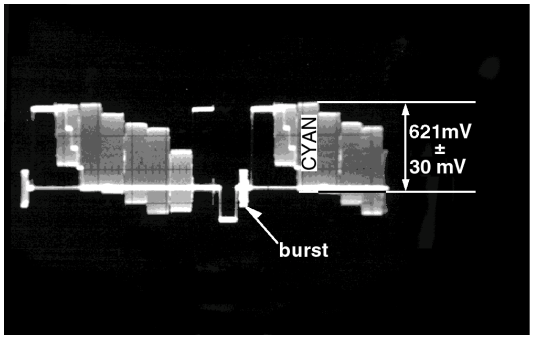
Do the confirmation after replacing P.C.B.

Measurement point	Mode	Disc
Video output terminal	Color bar 75% PLAY(Title 46):DVDT-S15 PLAY(Title 12):DVDT-S01	DVDT-S15 or DVDT-S01
Measuring equipment,tools	Confirmation value	
Screwdriver,Oscilloscope 200mV/dir,10 μ sec/dir	621mVp-p±30mV	

Purpose:To maintain video signal output compatibility.

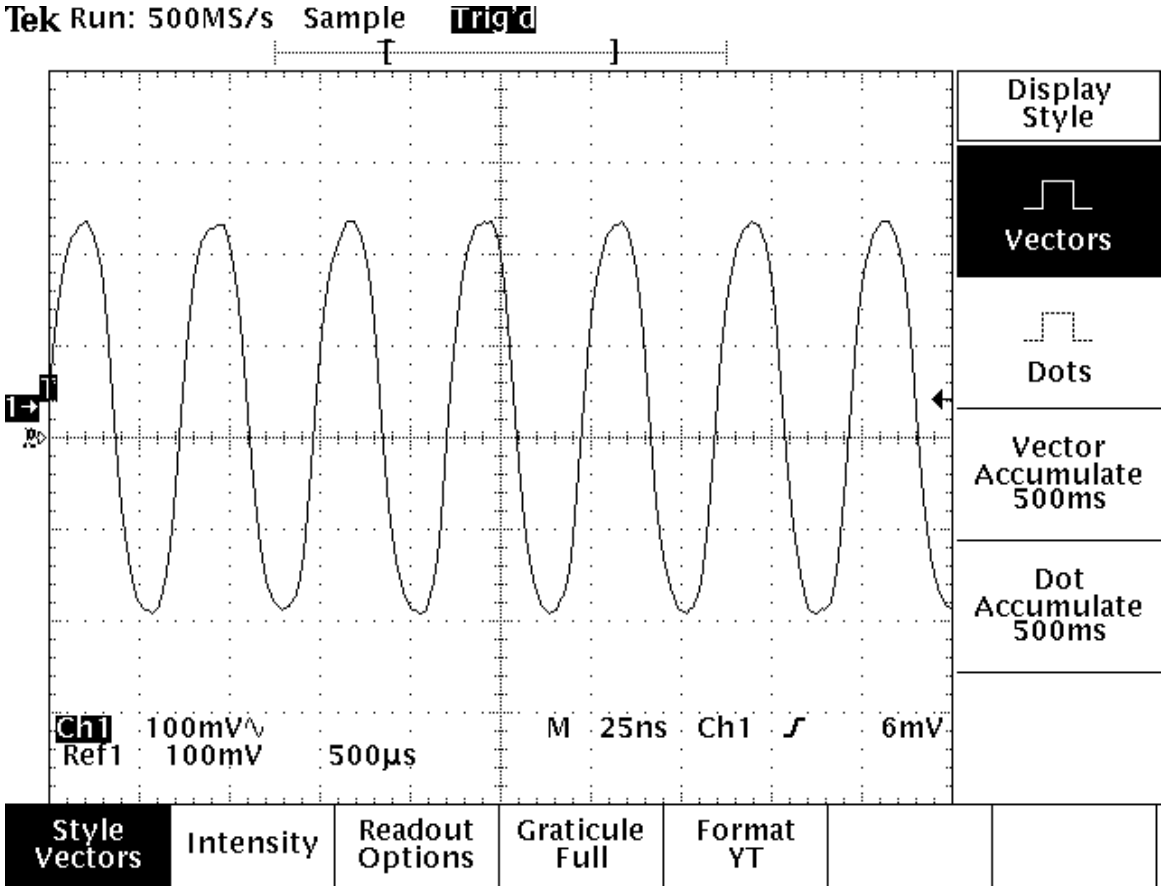
1.Connect the oscilloscope to the video output terminal and terminate at 75 ohme.

2.Confirm that the chrominance signal(C)level is 621 mVp-p±30mV

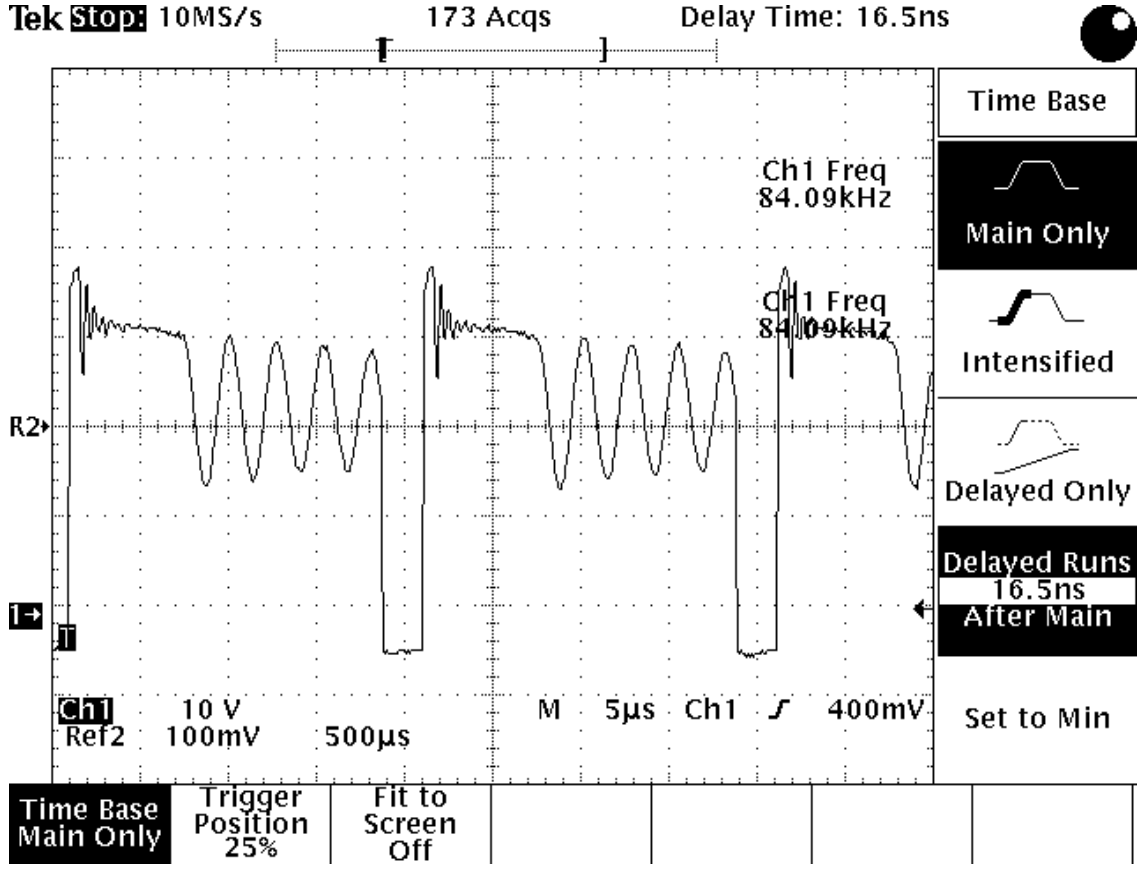


7.MPEG BOARD CHECK WAVEFORM

7.1 27MHz WAVEFORM



7.2 IC5L0380R PIN.2 WAVEFORM DIAGRAM



8. IC BLOCK DIAGRAM & DESCRIPTION

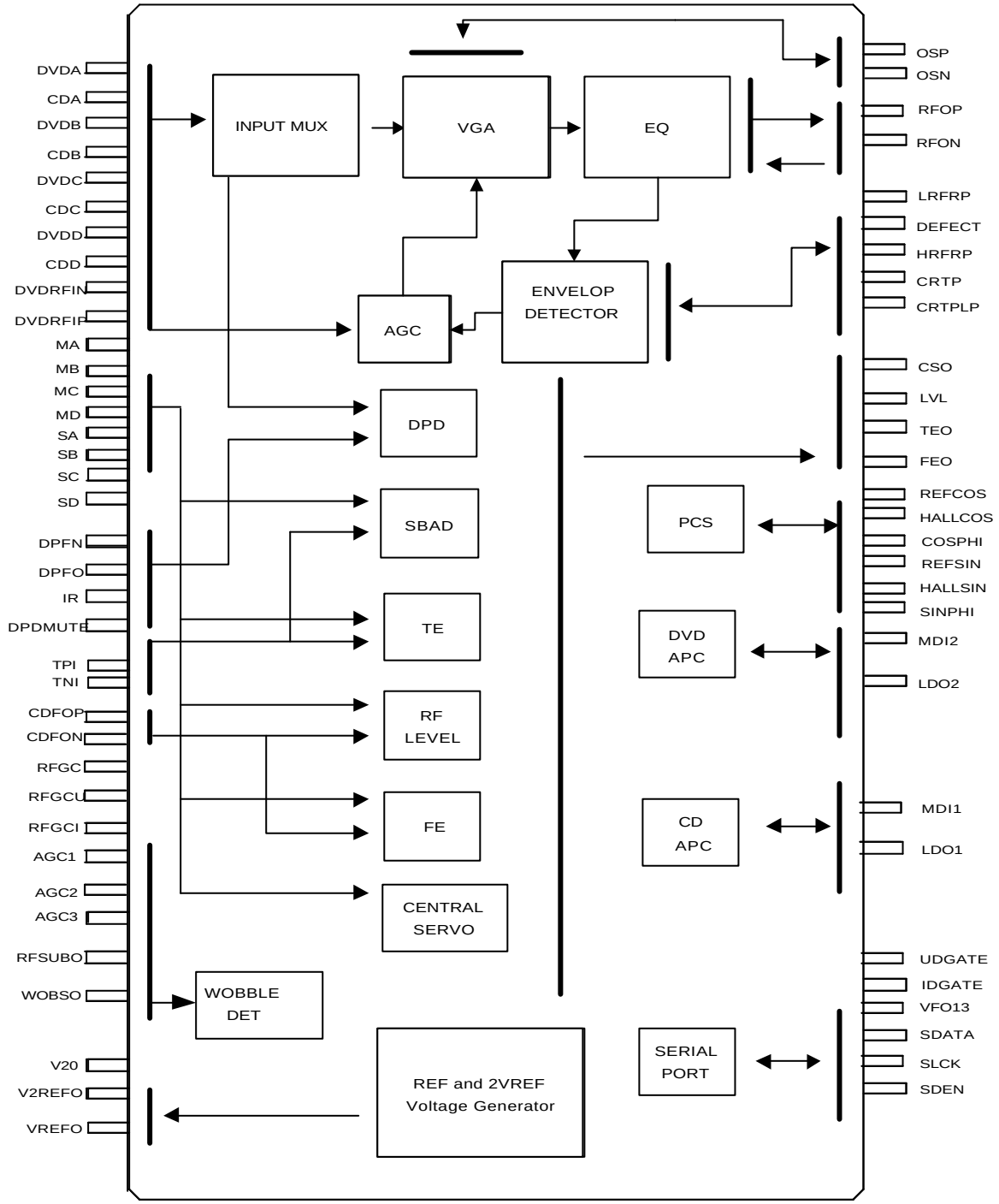
8.1 MT1336

GENERAL DESCRIPTION

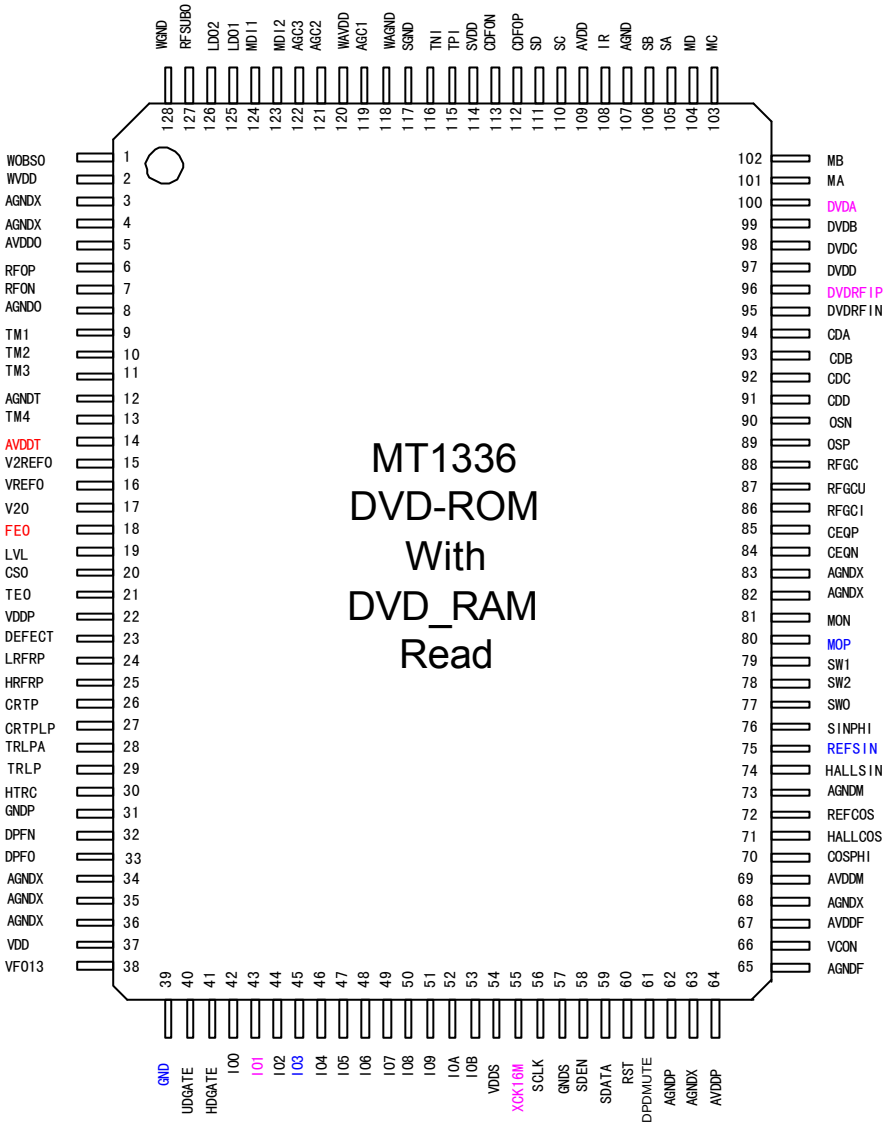
MT1336 is a high performance CMOS analog front-end IC for both CD_ROM driver up to 48XS and DVD-ROM driver up to 16XS. It also supports DVD-RAM read up to 4XS Version 2. It contains servo amplifiers to generate focusing error, 3-beam tracking error, 1 beam radial push-pull signal, RF level and SBAD for servo functions. It also includes DPD tracking error signal for DVD_ROM application. For DVD-RAM disks, there are also Differential Push-Pull (DPP) method for generating tracking signal and Differential Astigmatic Detection (DAD) for processing focusing signal. Programmable equalizer and AGC circuits are also incorporated in this chip to optimize read channel performance. In addition, this chip has dual automatic laser power control circuits for DVD-ROM (DVD-RAM) and CD-ROM seperately and reference voltage generators to reduce external components. Programmable functions are implemented by the access of internal register through bi-directional serial port to configure modes selection.

FEATURES

- RF equalizer with programmable f_c from 3MHz to 70 MHz and programmable boost from 3dB to 13dB.
- MT1336 supports at least eight different kinds of pick-up heads with versatile input configuration for both RF input stages and servo signal blocks.
- Versatile on-line AGC.
- 3 beams tracking error signal generator for CD_ROM application.
- One beam differential phase tracking error (DPD) generator for DVD_ROM application.
- Differential push pull tracki ng error (DPP) generator for DVD_RAM application.
- Focusing error signal generator for CD-ROM, DVD-ROM and DVD-RAM (DAD method).
- RF level signal generator.
- Sub-beam added signal for 3 beams CD_ROM.
- One beam push-pull signal generator for central servo application.
- High speed RF envelop detection circuit with bandwidth up to 400KHz for CD-ROM.
- Defect and Blank detection circuits.
- Dual automatic laser power control circuits with programmable level of LD monitor voltage.
- Vref=1.4V voltage and V2ref=2.8V voltage generators.
- V20=2.0V voltage for pick-up head reference.
- Bi-directional serial port to access internal registers.



MT1336 FUNCTION BLOCKS DIAGRAM



MT1336 PIN ASSIGNMENT

MT1336 PIN DESCRIPTIONS

Pin Numbers	Symbol	Type	Description
LQFP128			
RF Flag Interface			
23	DEFECT	Digital Output	Flag of bad data output status
RF SIO interface			
56	SCLK	Digital Input	RF serial clock input
58	SDEN	Digital Input	RF serial data enable
59	SDATA	Digital IO	RF serial data IO
60	RST	Digital input	Reset (active high)
55	XCK16M	Digital Input	16.9MHz for verification
RF SERVO interface			
40	UDGATE	Digital Input	Control signal for DVD-RAM
41	IDGATE	Digital Input	Control signal for DVD-RAM
38	VFO13	Digital Input	DVD-RAM Header signal
RF			
100	DVDA	Analog input	AC coupled DVD RF signal input A
99	DVDB	Analog Input	AC coupled DVD RF signal input B
98	DVDC	Analog Input	AC coupled DVD RF signal input C
97	DVDD	Analog Input	AC coupled DVD RF signal input D
95	DVDRFIN	Analog Input	AC coupled DVD RF signal input RFIN
96	DVDRFIP	Analog Input	AC coupled DVD RF signal input RFIP
94	CDA	Analog Input	AC coupled CD RF signal input A
93	CDB	Analog Input	AC coupled CD RF signal input B
92	CDC	Analog Input	AC coupled CD RF signal input C
91	CDD	Analog Input	AC coupled CD RF signal input D
90	OSN	Analog	RF Offset cancellation capacitor connecting
89	OSP	Analog	RF Offset cancellation capacitor connecting
85	CEQP	Analog	RF Offset cancellation capacitor connecting
84	CEQN	Analog	RF Offset cancellation capacitor connecting
88	RFGC	Analog	RF AGC loop capacitor connecting for DVD-ROM

87	RFGCU	Analog	RF AGC loop capacitor connecting for DVD-RAM
86	RFGCI	Analog	RF AGC loop capacitor connecting for DVD-RAM
101	MA	Analog Input	DC coupled DVD-RAM main-beam RF signal input A
102	MB	Analog Input	DC coupled DVD-RAM main-beam RF signal input B
103	MC	Analog Input	DC coupled DVD-RAM main-beam RF signal input C
104	MD	Analog Input	DC coupled DVD-RAM main-beam RF signal input D
105	SA	Analog Input	DC coupled DVD-RAM sub-beam RF signal input A
106	SB	Analog Input	DC coupled DVD-RAM sub-beam RF signal input B
110	SC	Analog Input	DC coupled DVD-RAM sub-beam RF signal input C
111	SD	Analog Input	DC coupled DVD-RAM sub-beam RF signal input D
108	IR	Analog	External current bias resistor (R=20K)
119	AGC1	Analog	Wobble AGC loop1 capacitor
121	AGC2	Analog	Wobble AGC loop2 capacitor
122	AGC3	Analog	Wobble AGC loop3 capacitor
127	RFSUBO	Analog output	Header push-pull RF output signal
1	WOBSO	Digital output	Wobble signal output
6	RFOP	Analog output	RF positive output
7	RFON	Analog output	RF negative output
TRACKING ERROR			
32	DPFN	Analog	DPD amplifier negative input
33	DPFO	Analog	DPD amplifier output
61	DPDMUTE	Digital input	DPD mute control input
116	TNI	Analog Input	3 beam satellite PD signal negative input
115	TPI	Analog Input	3 beam satellite PD signal positive input
21	TEO	Analog Output	Tracking error output
FOCUSING ERROR & RF LEVEL & CENTRAL SERVO SIGNAL			
112	CDFOP	Analog Input	CD focusing error positive input
113	CDFON	Analog Input	CD focusing error negative input
18	FEO	Analog Output	Focusing error output
19	LVL	Analog Output	RF level output
20	CSO	Analog output	Central servo signal output
ALPC			

124	MDI1	Analog Input	Laser power monitor input
125	LDO1	Analog Ou tput	Laser driver output
123	MDI2	Analog Input	Laser power monitor input
126	LDO2	Analog Output	Laser driver output
RF RIPPLE			
26	CRTP	Analog	RF top envelop filter capacitor connecting
27	CRTPLP	Analog	Defect level filter capacitor connecting
25	HRFRP	Analog output	High frequency RF ripple output or Blank detector' s output
24	LRFRP	Analog output	Low frequency RF ripple output
POWER			
67, 69	AVDD	Power	Master PLL Filter power
65, 73	AGND	GND	GND for Master PLL Filter
64	AVDD	Power	DPD Power
62	AGND	GND	DPD GND
109	AVDD	Power	RF path Power
107	AGND	GND	RF path GND
114	SVDD	Power	Servo Power
117	SGND	GND	Servo GND
2,120	WAVDD	Power	Wobble Power
128,118	WAGND	GND	Wobble GND
5	AVDDO	Power	Power for RF output
8	AGNDO	GND	GND for RF output
14	AVDDT	Power	Power for Trimming PAD
12	AGNDT	GND	GND for Trimming PAD
22	VDDP	Power	Peak Detection Power
31	GNDP	GND	Peak Detection GND
37,54	VDD	Power	Serial I/O Power
39,57	GND	GND	Serial I/O GND
REFERENCE VOLTAGE			
16	VREFO	Analog output	Reference voltage 1.4V
15	V2REFO	Analog output	Reference voltage 2.8V
17	V20	Analog Output	Reference voltage 2.0V

ALPC TRIMMING			
9	TM1	Analog input	Trimming pin for ALPC1
10	TM2	Analog input	Trimming pin for ALPC1
11	TM3	Analog input	Trimming pin for ALPC2
13	TM4	Analog input	Trimming pin for ALPC2
HIGH SPEED TRACK COUNTING			
29	TRLP	Analog	Low-pass filter capacitor connecting
28	TRLPA	Analog	Low-pass filter capacitor connecting
30	HTRC	Digital output	High speed track counting digital output
PCS			
74	HALLSIN	Analog input	Negative input of amplifier for hall sensor signal
75	REFSIN	Analog input	Positive input of amplifier for hall sensor signal
76	SINPHI	Analog output	Amplifier output for hall sensor signal
71	HALLCOS	Analog input	Negative input of amplifier for hall sensor signal
72	REFCOS	Analog input	Positive input of amplifier for hall sensor signal
70	COSPHI	Analog output	Amplifier output for hall sensor signal
FOR MONITOR ONLY			
81	MON	Analog output	
80	MOP	Analog output	
66	VCON	Analog output	
77	SWO	Analog output	Output from mux of SW1 & SW2
78	SW2	Analog input	External input for servo input select
79	SW1	Analog input	External input for servo input select
FOR SERIAL I/O			
42	IO0		
43	IO1		
44	IO2		
45	IO3		
46	IO4		
47	IO5		

48	IO6		
49	IO7		
50	IO8		
51	IO9		
52	IOA		
53	IOB		

8.2 MT1379

- Super Integration DVD player single chip
  - Servo controller and data channel processing
  - MPEG-1/MPEG-2/JPEG video decoding
  - Dolby AC-3/DTS/DVD-Audio audio decoding
  - Unified track buffer and A/V decoding buffer
  - Video processing for scaling and video quality enhancement
  - OSD & Sub-picture decoding
  - Built-in clock generator
  - Built-in TV encoder
  - Built-in progressive video output
  - Video input port and audio/SPDIF input port
- Speed Performance on Servo and Decoding
  - DVD-ROM up to 8XS
  - CD-ROM up to 24XS
  - Built-in a frequency programmable clock to μP and RSPC Decoder to optimize the performance over power
- Channel Data Processor
  - Provides interface with analog front-end processor
  - Analog data slicer for small jitter capability
  - Built-in high performance data PLL for channel data demodulation
  - EFM/EFM+ data demodulation
  - Enhanced channel data frame sync protection & DVD-ROM sector sync protection
- Servo Control and Spindle Motor Control
  - Programmable frequency error gain and phase error gain of spindle PLL to control spindle motor on CLV and CAV mode
  - Provide a varipitch speed control for CLV and CAV mode
  - Built-in ADCs and DACs for digital servo control
  - Provide 2 general PWM
  - Tray control can be PWM output or digital output
  - Built-in DSP for digital servo control
- Host Micro controller
  - Built-in 8032 micro controller
  - Built-in internal 373 and 8-bit programmable lower address port
  - 1024-bytes on-chip RAM
  - Up to 2M bytes FLASH-programming interface
  - Supports 5/3.3-Volt. FLASH interface
  - Supports power-down mode
  - Supports additional serial port
- DVD-ROM/CD-ROM Decoding Logic
  - Supports CD-ROM Mode 1, CD-ROM XA Mode 2 Form 1, CD-ROM XA Mode 2 Form 2, and CD-DA formats
  - High-speed ECC logic capable of correcting one error per each P-codeword or Q-codeword
  - Automatic sector Mode and Form detection
  - Automatic sector Header verification
  - 8-bit counter for decode completion check
  - Programmable descrambling and error correction schemes
  - Automatically repeated error corrections
  - 8-bit C2 Pointer counter
  - Decoder Error Notification Interrupt that signals various decoder errors
  - Provide error correction acceleration
- Buffer Memory Controller
  - Supports 16Mb/32Mb/64Mb/128Mb SDRAM
  - Supports 16-bit/32-bit SDRAM data bus interface
  - Build in a DRAM interface programmable clock to optimize the DRAM performance
  - Provide the self-refresh mode SDRAM
  - Programmable DRAM access cycle and refresh

cycle timings
- Block-based sector addressing
- Programmable buffering counter for buffer status tracking
- Maximum DRAM speed is 133MHz
- Support 5/3.3-Volt. DRAM Interface

■ Video Decode
- Decodes MPEG1 video and MPEG2 main level, main profile video (720/480 and 720x576)
- Maximum input bit-rate of 15Mbits/sec
- Smooth digest view function with I, P and B picture decoding
- Baseline, extended-sequential and progressive JPEG image decoding
- RLE and non-RLE BMP image decoding
- Support CD-G titles

■ Video/OSD/SPU/HLI Processor
- Arbitrary ratio vertical/horizontal scaling of video, from 0.25X to 256X
- 65535/256/16/4/2-color bitmap format OSD,
- 256/16 color RLC format OSD
- Automatic scrolling of OSD image
- Provides 4-color/32x32-pixel hardware cursor
- Fade-in, Fade out, and Wipe functions as specified in the DVD-Audio Specification and other slide show transition effects
- Progressive scan output

■ Audio Processing
- Decoder format supports:
  - Dolby Digital (AC-3) decoding
  - DTS decoding
  - MLP decoding for DVD-Audio
  - MPEG-1 layer 1/layer 2 audio decoding
  - MPEG-2 layer1/layer2 2-channel audio decoding
  - Dolby Pro Logic decoding
  - High Definition Compatible Digital (HDCD) decoding
- Up to 6 channel linear PCM output for DVD Audio / DVD Video
- Downmix function
- Support IEC 60958/61937 output
  - PCM / bit stream / mute mode
  - Custom IEC latency up to 2 frames
- Pink noise and white noise generator
- Karaoke functions
  - Microphone echo with adjustable echo level, echo -depth and delay length
  - Microphone tone control with three custom second-order IIR filter
  - Vocal mute/vocal assistant
  - Key shift up to +/- 8 keys controlled by 1/2 key
- Channel equalizer
- 3D surround processing include virtual surround and speaker separation
- Power-down control
- HDCD certified

■ TV Encoder
- Six 54MHz/12bit DA converters
- Support NTSC, PAL-BDGHI, PAL-N, PAL-M interlace TV format and 480p, 576p progressive TV format
- Automatically turn off unconnected channel(s).
- Support PC monitor (VGA)
- Support Macrovision 7.1

■ Progressive Output
- Automatic detect film or video source
- 3:2 pull down source detection
- Advanced Motion adaptive de-interlace
- Minimum external memory requirement

■ Audio/Video Output
- Line-in/SPDIF-in for versatile audio processing
- CCIR601/656 video input port
- Support picture-in-picture for video decoding and input source

■ Outline
- 216-pin LQFP package
- 3.3/2.5-Volt. Dual operating voltages

PIN DEFINITIONS

Pin Number	Symbol	Type	Description
1	IREF	Analog Input	Current reference input. It generates reference current for data PLL. Connect an external 100K resistor to this pin and PLLVSS.
2	PLLVSS	Ground	Ground pin for data PLL and related analog circuitry
3	LPIOP	Analog Output	Positive output of the low pass filter
4	LPION	Analog Output	Negative output of the low pass filter
5	LPFON	Analog output	Negative output of loop filter amplifier
6	LPFIP	Analog Input	Positive input of loop filter amplifier
7	LPFIN	Analog Input	Negative input of loop filter amplifier
8	LPFOP	Analog Output	Positive output of loop filter amplifier
9	JITFO	Analog Output	RF jitter meter output
10	JITFN	Analog Input	Negative input of the operation amplifier for RF jigger meter
11	PLLVDD3	Power	3.3V power pin for data PLL and related analog circuitry
12	FOO	Analog Output	Focus servo output. PDM output of focus servo compensator
13	TRO	Analog Output	Tracking servo output. PDM output of tracking servo compensator
14	TROPENPWM	Analog Output	Tray open output, controlled by microcontroller. This is PWM output for TRWMEN27hRW2=1 or is digital output for TRWMEN27hRW2=0
15	PWMOUT1	Analog Output	The 1st general PWM output
16	PWMOUT2	Analog Output	The 2nd general PWM output
17	DVDD2	Power	2.5V power pin for internal fully digital circuitry
18	DMO	Analog Output	Disk motor control output. PWM output
19	FMO	Analog Output	Feed motor control. PWM output
20	DVSS	Ground	Ground pin for internal fully digital circuitry
21	FG	Input	Motor Hall sensor input
22	HIGHA0	Inout 2~16MA, SR PU	Microcontroller address 8
23	HIGHA1	Inout 2~16MA, SR PU	Microcontroller address 9
24	HIGHA2	Inout 2~16MA, SR PU	Microcontroller address 10
25	HIGHA3	Inout 2~16MA, SR PU	Microcontroller address 11
26	HIGHA4	Inout 2~16MA, SR PU	Microcontroller address 12
27	HIGHA5	Inout 2~16MA, SR PU	Microcontroller address 13
28	DVSS	Ground	Ground pin for internal digital circuitry

Pin Number	Symbol	Type	Description
29	HIGHA6	Inout 2~16MA, SR PU	Microcontroller address 14
30	HIGHA7	Inout 2~16MA, SR PU	Microcontroller address 15
31	AD7	Inout 2~16MA, SR	Microcontroller address/data 7
32	AD6	Inout 2~16MA, SR	Microcontroller address/data 6
33	AD5	Inout 2~16MA, SR	Microcontroller address/data 5
34	AD4	Inout 2~16MA, SR	Microcontroller address/data 4
35	DVDD3	Power	3.3V power pin for internal digital circuitry
36	AD3	Inout 2~16MA, SR	Microcontroller address/data 3
37	AD2	Inout 2~16MA, SR	Microcontroller address/data 2
38	AD1	Inout 2~16MA, SR	Microcontroller address/data 1
39	AD0	Inout 2~16MA, SR	Microcontroller address/data 0
40	IOA0	Inout 2~16MA, SR PU	Microcontroller address 0 / IO
41	IOA1	Inout 2~16MA, SR PU	Microcontroller address 1 / IO
42	DVDD2	Power	2.5V power pin for internal digital circuitry
43	IOA2	Inout 2~16MA, SR PU	Microcontroller address 2 / IO
44	IOA3	Inout 2~16MA, SR PU	Microcontroller address 3 / IO
45	IOA4	Inout 2~16MA, SR PU	Microcontroller address 4 / IO
46	IOA5	Inout 2~16MA, SR PU	Microcontroller address 5 / IO
47	IOA6	Inout 2~16MA, SR PU	Microcontroller address 6 / IO

Pin Number	Symbol	Type	Description
48	IOA7	Inout 2~16MA, SR PU	Microcontroller address 7 / IO
49	A16	Output 2~16MA, SR	Flash address 16
50	A17	Output 2~16MA, SR	Flash address 17
51	IOA18	Inout 2~16MA, SR SMT	Flash address 18 / IO
52	IOA19	Inout 2~16MA, SR SMT	Flash address 19 / IO
53	IOA20	Inout 2~16MA, SR SMT	Flash address 20 / IO OR Videoin Data PortB 0
54	APLLVSS	Ground	Ground pin for audio clock circuitry
55	APLLVDD3	Power	3.3V Power pin for audio clock circuitry
56	ALE	Inout 2~16MA, SR PU, SMT	Microcontroller address latch enable
57	IOOE#	Inout 2~16MA, SR SMT	Flash output enable, active low / IO
58	IOWR#	Inout 2~16MA, SR SMT	Flash write enable, active low / IO
59	IOCS#	Inout 2~16MA, SR PU, SMT	Flash chip select, active low / IO
60	DVSS	Ground	Ground pin for internal digital circuitry
61	UP1_2	Inout 4MA, SR PU, SMT	Microcontroller port 1-2
62	UP1_3	Inout 4MA, SR PU, SMT	Microcontroller port 1-3
63	UP1_4	Inout 4MA, SR PU, SMT	Microcontroller port 1-4
64	UP1_5	Inout 4MA, SR PU, SMT	Microcontroller port 1-5
65	UP1_6	Inout 4MA, SR PU, SMT	Microcontroller port 1-6
66	DVDD3	Power	3.3V power pin for internal digital circuitry

Pin Number	Symbol	Type	Description
67	UP1_7	Inout 4MA, SR PU, SMT	Microcontroller port 1-7
68	UP3_0	Inout 4MA, SR PU, SMT	Microcontroller port 3-0
69	UP3_1	Inout 4MA, SR PU, SMT	Microcontroller port 3-1
70	INT0#	Inout 2~16MA, SR PU, SMT	Microcontroller interrupt 0, active low
71	IR	Input SMT	IR control signal input
72	DVDD2	Power	2.5V power pin for internal digital circuitry
73	UP3_4	Inout	Microcontroller port 3-4
74	UP3_5	Inout	Microcontroller port 3-5
75	UWR#	Inout 2~16MA, SR PU, SMT	Microcontroller write strobe, active low
76	URD#	Inout 2~16MA, SR PU, SMT	Microcontroller read strobe, active low
77	DVSS	Ground	Ground pin for internal digital circuitry
78	RD7	Inout	DRAM data 7
79	RD6	Inout	DRAM data 6
80	RD5	Inout	DRAM data 5
81	RD4	Inout	DRAM data 4
82	DVDD2	Power	2.5V power pin for internal digital circuitry
83	RD3	Inout	DRAM data 3
84	RD2	Inout	DRAM data 2
85 86	RD1 RD0	Inout Inout	DRAM data 1 DRAM data 0
87	RWE#	Output 2~16MA, SR	DRAM Write enable, active low
88	CAS#	Output 2~16MA, SR	DRAM columnaddress strobe, active low
89	RAS#	Output 2~16MA, SR	DRAM row address strobe, active low
90	RCS#	Output 2~16MA, SR	DRAM chip select, active low
91	BA0	Output 2~16MA, SR	DRAM bank address 0
92	DVSS	Ground	Ground pin for internal digital circuitry
93	RD15	Inout 2~16MA, SR PU/PD, SMT	DRAM data 15

Pin Number	Symbol	Type	Description
94	RD14	Inout 2~16MA, SR PU/PD, SMT	DRAM data 14
95	RD13	Inout 2~16MA, SR PU/PD, SMT	DRAM data 13
96	RD12	Inout 2~16MA, SR PU/PD, SMT	DRAM data 12
97	DVDD3	Power	3.3V power pin for internal digital circuitry
98	RD11	Inout 2~16MA, SR PU/PD, SMT	DRAM data 11
99	RD10	Inout 2~16MA, SR PU/PD, SMT	DRAM data 10
100	RD9	Inout 2~16MA, SR PU/PD, SMT	DRAM data 9
101	RD8	Inout 2~16MA, SR PU/PD, SMT	DRAM data 8
102	DVSS	Ground	Ground pin for internal digital circuitry
103	CLK	Output 2~16MA, SR	DRAM clock
104	CLE	Output 2~16MA, SR	DRAM clock enable
105	RA11	Output 2~16MA, SR	DRAM address bit 11 or audio serial data 3 (channel 7/8)
106	RA9	Output 2~16MA, SR	DRAM address 9
107	RA8	Output 2~16MA, SR	DRAM address 8
108	DMVDD3	Power	3.3V Power pin for DRAM clock circuitry
109	DMVSS	Ground	Ground pin for DRAM clock circuitry
110	RA7	Output 2~16MA, SR	DRAM address 7
111	DVDD3	Power	3.3V power pin for internal digital circuitry
112	RA6	Output 2~16MA, SR	DRAM address 6
113	RA5	Output 2~16MA, SR	DRAM address 5
114	RA4	Output 2~16MA, SR	DRAM address 4
115	DVSS	Ground	Ground pin for internal digital circuitry
116	DQM1	Output 2~16MA, SR	Mask for DRAM input/output byte 1

Pin Number	Symbol	Type	Description
117	DQM0	Output 2~16MA, SR	Mask for DRAM input/output byte 0
118	BA1	Output 2~16MA, SR	DRAM bank address 0
119	RA10	Output 2~16MA, SR	DRAM address10
120	DVDD2	Power	2.5V power pin for internal digital circuitry
121	RA0	Output 2~16MA, SR	DRAM address 0
122	RA1	Output 2~16MA, SR	DRAM address 1
123	RA2	Output 2~16MA, SR	DRAM address 2
124	RA3	Output 2~16MA, SR	DRAM address 3
125	DVSS	Ground	Ground pin for internal digital circuitry
126	RD31	Inout 2~16MA, SR PU/PD, SMT	DRAM data 31
127	RD30	Inout 2~16MA, SR PU/PD, SMT	DRAM data 30
128	RD29	Inout 2~16MA, SR PU/PD, SMT	DRAM data 29
129	RD28	Inout 2~16MA, SR PU/PD, SMT	DRAM data 28
130	DVDD3	Power	3.3V power pin for internal digital circuitry
131	RD27	Inout 2~16MA, SR PU/PD, SMT	DRAM data 27
132	RD26	Inout 2~16MA, SR PU/PD, SMT	DRAM data 26
133	RD25	Inout 2~16MA, SR PU/PD, SMT	DRAM data 25
134	RD24	Inout 2~16MA, SR PU/PD, SMT	DRAM data 24
135	DVSS	Ground	Ground pin for internal digital circuitry
136	DQM3	Output 2~16MA, SR	Mask for DRAM input/output byte 3
137	DQM2	Output 2~16MA, SR	Mask for DRAM input/output byte 2

Pin Number	Symbol	Type	Description
138	RD23	Inout 2~16MA, SR PU/PD, SMT	DRAM data 23 / Videoin Data PortA 7
139	RD22	Inout 2~16MA, SR PU/PD, SMT	DRAM data 22 / Videoin Data PortA 6
140	DVDD2	Power	2.5V power pin for internal digital circuitry
141	RD21	Inout 2~16MA, SR PU/PD, SMT	DRAM data 21 / Videoin Data PortA 5
142	RD20	Inout 2~16MA, SR PU/PD, SMT	DRAM data 20 / Videoin Data PortA 4
143	RD19	Inout 2~16MA, SR PU/PD, SMT	DRAM data 19 / Videoin Data PortA 3
144	RD18	Inout 2~16MA, SR PU/PD, SMT	DRAM data 18 / Videoin Data PortA 2
145	DVSS	Ground	Ground pin for internal digital circuitry
146	RD17	Inout 2~16MA, SR PU/PD, SMT	DRAM data 17 / Videoin Data PortA 1
147	RD16	Inout 2~16MA, SR PU/PD, SMT	DRAM data 16 / Videoin Data PortA 0
148	ABCK	Output 4MA	Audio bit clock
149	ALRCK	Inout 4MA, PD, SMT	(1) Audio left/right channel clock (2) Trap value in power-on reset : 1 : use external 373 0: use internal 373
150	DVDD3	Power	3.3V power pin for internal digital circuitry
151	ACLK	Inout 4MA	Audio DAC master clock (384/256 audio sample frequency)
152	MC_DATA	Input	Microphone serial input
153	SPDIF	Output 2~16MA, SR : ON/OFF	SPDIF output
154	ASDATA0	Inout 4MA PD SMT	(1) Audio serial data 0 (left/right channel) (2) Trap value in power-on reset : 1 : manufactory test mode 0 : normal operation
155	ASDATA1	Inout 4MA PD SMT	(1) Audio serial data 1 (surround left/surround right channel) (2) Trap value in power-on reset : 1 : manufactory test mode 0 : normal operation
156	ASDATA2	Inout 4MA PD SMT	(1) Audio serial data 2 (center/left channel) (2) Trap value in power-on reset : 1 : manufactory test mode 0 : normal operation

Pin Number	Symbol	Type	Description
157	ASDATA3	Inout 4MA PD SMT	(1) Audio serial data 3 (surround left/surround right channel) (2) Trap value in power-on reset : 1 : manufactory test mode 0 : normal operation OR Videoin Data PortB 1
158	ASDATA4	Inout 4MA PD SMT	(1) Audio serial data 4 (center/left channel) (2) Trap value in power-on reset : 1 : manufactory test mode 0 : normal operation OR Videoin Data PortB 2
159	DACVDDC	Power	3.3V power pin for VIDEO DAC circuitry
160	VREF	Analog input	Bandgap reference voltage
161	FS	Analog output	Full scale adjustment
162	YUV0/CIN	Output 4MA, SR	Video data output bit 0 / Compensation capacitor
163	DACVSSC	Ground	Ground pin for VIDEO DAC circuitry
164	YUV1/C	Output 4MA, SR	Video data output bit 1 / Analog chroma output
165	DACVDDB	Power	3.3V power pin for VIDEO DAC circuitry
166	YUV2/Y	Output 4MA, SR	Video data output bit 2 / Analog Y output
167	DACVSSB	Ground	Ground pin for VIDEO DAC circuitry
168	YUV3/CVBS	Output 4MA, SR	Video data output bit 3 / Analog composite output
169	DACVDDA	Power	3.3V power pin for VIDEO DAC circuitry
170	YUV4/G	Output 4MA, SR	Video data output bit 4 / Green or Y
171	DACVSSA	Ground	Ground pin for VIDEO DAC circuitry
172	YUV5/B	Output 4MA, SR	Video data output bit 5 / Blue or CB
173	YUV6/R	Output 4MA, SR	Video data output bit 6 / Red or CR
174	ICE	Input PD, SMT	Microcontroller ICE mode enable
175	BLANK#	Inout 4MA, SR SMT	Video blank area, active low / Videoin Field_601
176	VSYN	Inout 4MA, SR SMT	Vertical sync / Videoin Vsync_601
177	YUV7	Inout 4MA, SR SMT	Video data output bit 7 / Videoin Data PortB 3
178	DVSS	Ground	Ground pin for internal digital circuitry
179	HSYN	Inout 4MA, SR SMT	Horizontal sync / Videoin Hsync_601
180	SPMCLK	Input	Audio DAC master clock of SPDIF input / Videoin Data PortB 4

Pin Number	Symbol	Type	Description
181	SPDATA	Input	Audio data of SPDIF input / Videoin Data PortB 5
182	DVDD2	Power	2.5V power pin for internal digital circuitry
183	SPLRCK	Input	Audio left/right channel clock of SPDIF input / Videoin Data PortB 6
184	SPBCK	Input	Audio bit clock of SPDIF input / Videoin Data PortB 7
185	DVDD3	Power	3.3V power pin for internal digital circuitry
186	XTALO	Output	Crystal output
187	XTALI	Input	Crystal input
188	PRST	Input PD, SMT	Power on reset input, active high
189	DVSS	Ground	Ground pin for internal digital circuitry
190	VFO13	Output	The 1st, 3rd header VFO pulse output
191	IDGATE	Output	Header detect signal output
192	DVDD3	Power	3.3V power pin for internal digital circuitry
193	UDGATE	Output	DVD_RAM recording data gate signal output
194	WOBSI	Input	Wobble signal input
195	SDATA	Output	RF serial data output
196	SDEN	Output	RF serial data latch enable
197	SLCK	Output	RF serial clock output
198	BDO	Input	Flag of defect data input status
199	ADCVSS	Ground	Ground pin for ADC circuitry
200	ADIN	Analog Input	General A/D input
201	RFSUBI	Analog Input	RF subtraction signal input terminal
202	TEZISLV	Analog Input	Tracking error zero crossing low pass input
203	TEI	Analog Input	Tracking error input
204	CSO	Analog Input	Central servo input
205	FEI	Analog Input	Focus error input
206	RFLEVEL	Analog Input	Sub beam add input or RFRP low pass input
207	RFRP_DC	A Input	RF ripple detect input
208	RFRP_AC	Analog Input	RF ripple detect input (through AC coupling)
209	HRFZC	Analog Input	High frequency RF ripple zero crossing
210	PWMVREF	A Input	A reference voltage input for PWM circuitry. A typical value of 4.0 v
211	PWM2VREF	A Input	A reference voltage input for PWM circuitry. A typical value of 2.0 v
212	ADCVDD3	Power	3.3V power pin for ADC circuitry
213	RFDTSLVP	Analog Output	Positive RF data slicer level output
214	RFDTSLVN	Analog Output	Negative RF data slicer level output
215	RFIN	Analog Input	Negative input of RF differential signal
216	RFIP	Analog Input	Positive input of RF differential signal

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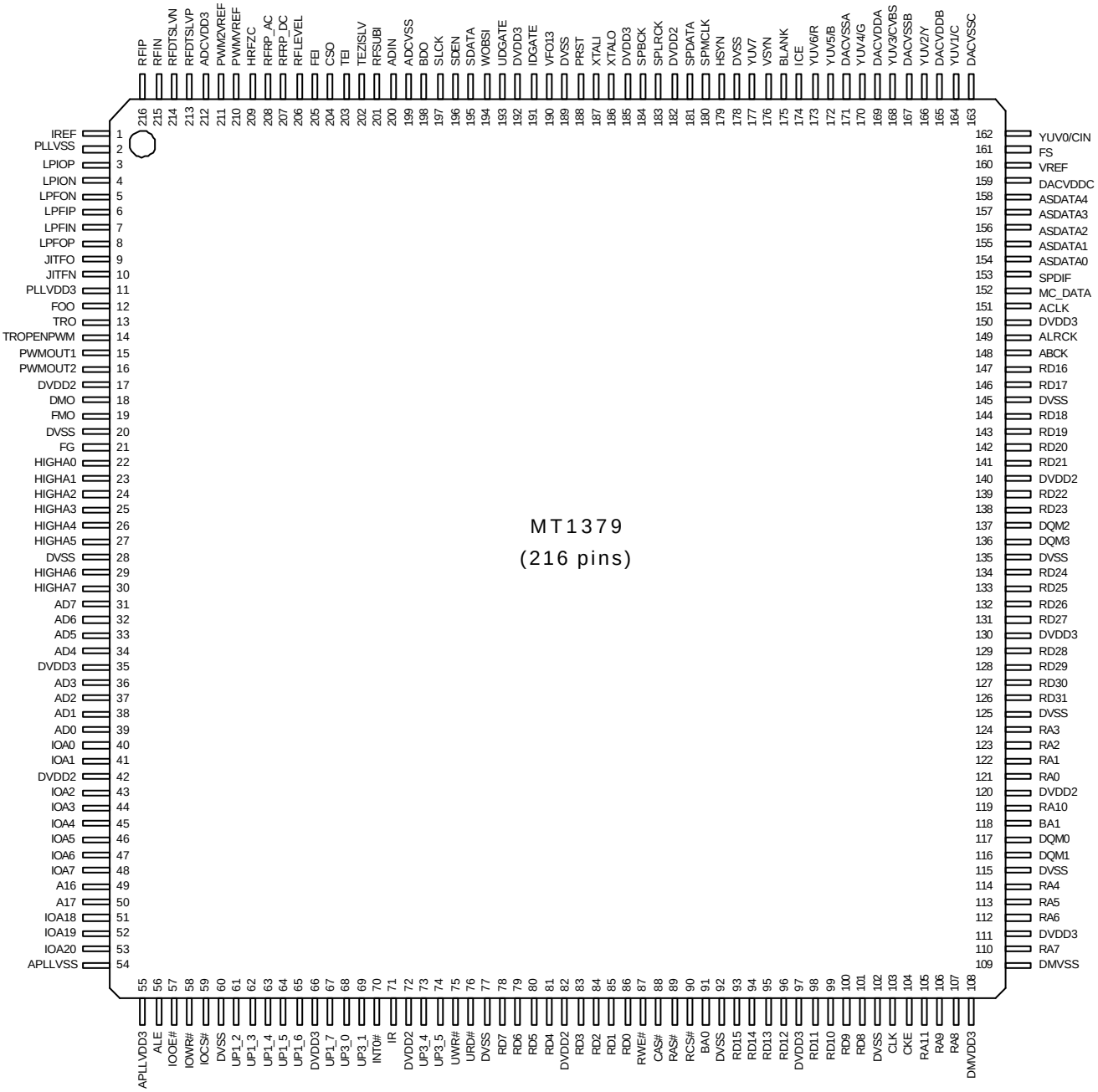
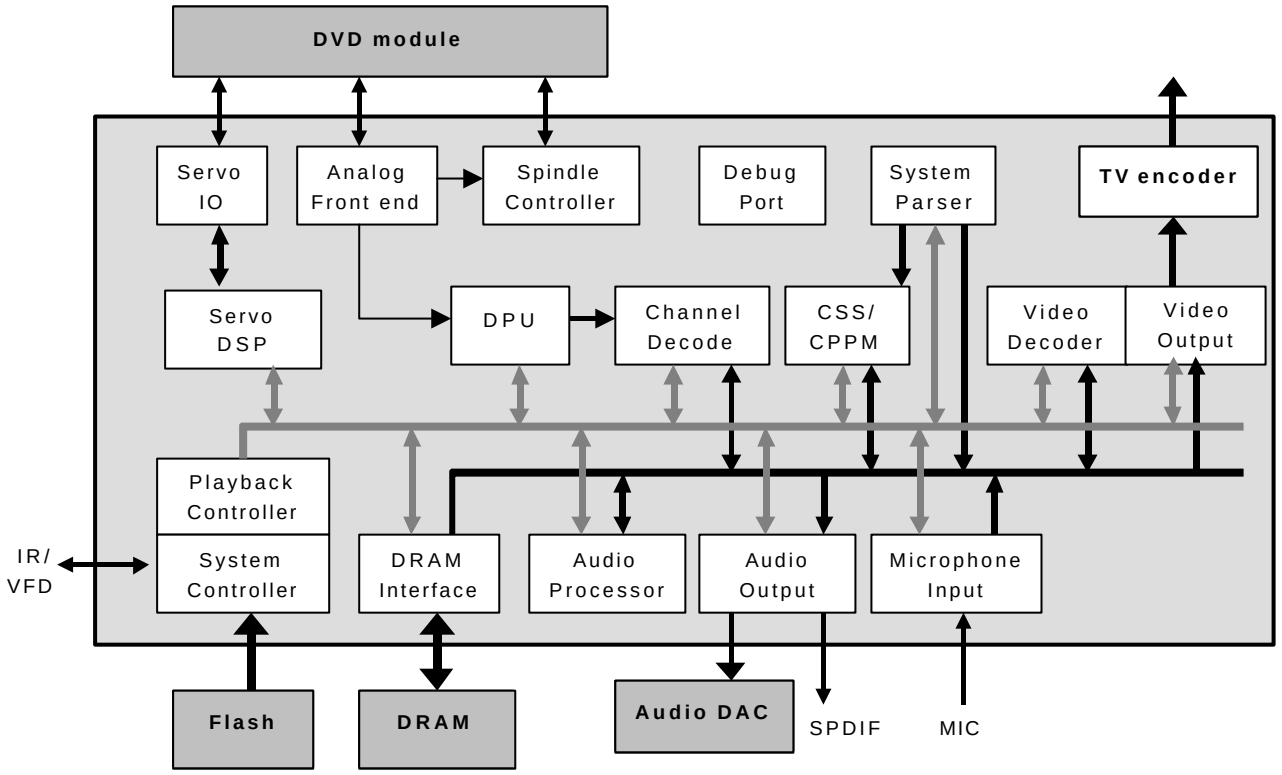


FUNCTIONAL BLOCK



Servo Controller

The servo control is accomplished through the servo DSP (Servo Digital Signal Processor) and its accessory I/O circuits. This servo DSP is capable of performing complex operations and also provides a friendly interface for the system controller. By issuing type 1 and type 2 commands from the system controller, the servo DSP can accomplish various complicated servo control functions, such as tracking, seeking and MT1336/MT1376 chip register programming. As for the servo I/O circuits, it provides interface between the input servo signals and the Servo DSP. It has built-in ADCs to digitize the servo control signal and DACs to provide signals for the actuator and sledge motor. It also has a serial interface to communicate with the MT1336/MT1376 chip.

Analog Front End

The analog front end contains a data slicer circuit and a data PLL circuit. The RF analog signal from MT1336/MT1376 is quantized by the data slicer to form the EFM/EFM+ bit stream, from which the channel bit clock is extracted by the data PLL.The EFM/EFM+bit stream and bit clock are then output to DPU for channel bit processing.

DPU

Data path unit (DPU) provides protection on data with lost synchronization patterns and demodulates EFM/EFM+ bit stream into the channel raw data that will be corrected by the decoder. The synchronization protection makes data after the synchronization pattern to be extracted even if the synchronization pattern is not found.

Spindle Controller

The spindle controller is used to control disc spindle motor. It includes a varipitch CLV clock generator, a CLV/CAV controller, and a PWM generator. The varipitch CLV clock enerator generates a reference colck for the speed of operation. The CLV/CAV

controller changes the mode and speed of operation according to servo register setting. The PWM generator generates pulse-width-modulated signal to drive disc spindle motor driver.

CSS/CPPM

The CSS/CPPM module provides functions necessary for decoding discs conforming to CSS/CPPM specification.

System Parser

The system parser is used to help the system controller to decode DVD/SVCD/VCD bitstream just after the channel decoder performing error correction. Acting as a DMA master, it moves bitstream data from RSPC buffer to video, audio, or sub-picture buffer according to system controller request. It also decrypts the scramble data of the CSS/CPPM sectors. Another function of system parser is providing system controller/DSP a DRAM memory copy controller to enhance system controller/DSP performance.

Video Decoder

The primary function of MT1379 is to support MPEG1 and MPEG2 video decoding. The video decode engine comprises of variable length decoder (VLD), inverse transformer (IT), motion compensator (MC), and block reconst ructor (BR). The video decode engine decodes the variable length encoded symbols in MPEG bitstream and performs inverse scan, inverse quantization, mismatch control and inverse discrete cosine transform onto the variable length decoded data. The motion compensator fetches prediction data from reference picture buffer according to motion vectors and motion prediciton mode for P and B pictures. Finally, the block reconstructor combines both the results of inverse transformer and motion compensator to derive the reconstructed image macroblock and write back to picture buffer.

The video decode engine can also support JPEG and BMP file decoding by common image compression hardware kernels.

Video Output

The Video Output unit contains Video Processor, SPU, OSD, Cursor, TV encoder units, it performs

- Reading decoded video from DRAM buffer
- Scaling the image
- Gamma/Brightness/Hue/Saturation adjustment and edge enhancement
- Reading and decoding SPU and OSD data from DRAM buffer
- Generating hardware cursor image
- Merging the video data, SPU, OSD and cursor

Video Processor

The Video Processor unit controls the transfer of video data stored in the DRAM to an internal or external TV encoder. It uses FIFOs to buffer outgoing luminance and chrominance data, and performs YUV420 to YUV422 conversion and arbitrary vertical/horizontal decimation/interpolation, from 1/4x to 256x. With this arbitrary ratio scaling capability, the Video Processor can perform arbitrary image conversion, such as PAL to NTSC, NTSC to PAL, MPEG1 to MPEG2, Letterbox, Pan-Scan conversion or zoom in, zoom out. It is also capible of interlace to progressive conversion.

The Video Processor unit performs the following functions:

- Requests and receives the decoded picture data from the picture buffer in external DRAM for display
- Resample vertical data to create 4:2:2 sample format
- Optionally performs vertical/horizontal resampling of both luminance and chrominance data
- Performs optional Gamma correction, luminance/chrominance adjustment, and edge enhancement

The Video Processor unit contains two 2-tap vertical filters for luminance and chrominance . These filters are used to interpolate and reposition luminance and chrominance line to improve picture quality. These filters are capble of generating up to eight, unique subline value between two consecutive scan lines. The generation of lines depends on the ratio between the height of the source image and the target image. In applications where DRAM bandwidth are critical the filters can be configured as simple line-repeating to reduce the DRAM bandwidth required.

The Video Processor unit integrates two separate horizontal postprocessing filter, a simple 2-tap linear horizontal filter and an 8-tap programmable filter. These filters are provided for scaling images horizontally along the scan line. These two filters is capable of generating up to eight, unique subpixel values between two consecutive pixels on a scan line. The generation of pixels depends on the ratio between the width of the source image and the target image.

SPU

This is a hardware sub-picture decoder. It decodes the compressed SPU image bitstream and CHG_COLCON commands according to SPU header information previously decoded by system controller. The SPU module also allows two SPU objects to be displayed at the same time. SPU image is blended with main video stream.

OSD

The OSD module can operate with 2/4/16/256 -color bitmap format (1/2/4/8 bits), and 16/256 color RLC format, all have 16 levels of transparency. In addition, it accepts an special WARP mode, which inserts one programmable RLC code in the bitmap to reduce the image size stored in DRAM. It also features automatic shadow/outline generation in 2-color mode, 2 Hilight areas, 1 ChangeColor area and 1 OSDVoid area. One OSD area can occupy the full or a partial screen, or multiple OSDs can occur in a screen at the same time, only if they don't occupy the same horizontal line. The output image is blended with the video-SPU mixed stream.

Cursor

A hardware cursor generator is integrated in Video Output Unit. The cursor image is a 32x32 4-color bitmap image, each colors are programmable. Cursor can be enlarged by 2 in both vertical and horizontal directions. Cursor image is multiplexed with video-SPU-OSD mixed stream.

Audio Interface

Audio interface consists of Audio Output Interface and Microphone Input Interface.

Audio Output Interface

The MT1379 can support up to 8 channel audio outputs. The output formats can be 16, 24, or 32-bit frames. Left alignment, right alignment, or I^2S formats are all supported.

With built-in PLL, MT1379 can provide the audio clock (ACLK) for external audio DAC at 384Fs, where Fs is usually 32KHz, 44.1KHz, 48KHz, 96KHz, or 192KHz. ACLK can also be programmed to be from outside MT1379. When ACLK is input to MT1379, the frequency could be 128**n* Fs, where *n* is from 1 to 7.

Audio raw (encoded) data or cooked (decoded) data can be output on a single line using S/PDIF interface. The output slew rate and driving force of this pad are programmable.

Microphone Input Interface

The MT1379 provides a microphone input interface. Two independent microphones' data could be input to the MT1379. There are two independent digital volume control for these two input channels. The input data formats can also be left alignment, right alignment, or I^2S formats.

System Controller

MT1379 uses an embedded Turbo-8032 as System Controller and provide ICE interface to increase the feasibility of F/W development. Also, MT1379 includes an build-in internal 373 to latch lower byte address from 8032 Port 0 and provide a glue-logic free solution. MT1379 supports up to 1M X 16 bits Flash ROM to store 8032 code, H/W related data, User data, etc. F/W upgrade can be achieved either by debug interface or by disk.

ELECTRICAL CHARACTERISTICS

Absolute Maximum Rating

Symbol	Parameters	Value	Unit
VDD3	3.3V Supply voltage	-0.3 to 3.6	V
VDD2	2.5V Supply voltage	-0.3 to 3.0	V
VDDA	Analog Supply voltage	-0.3 to 3.6	V
V_{IN}	Input Voltage	-0.3 to 5.5	V
V_{OUT}	Output Voltage	-0.3 to VDD3+0.3	V
Ta	Ambient Temperature	0 to 70	°C

DC Charateristics

Symbol	Parameters	Min	Typ	Max	Unit
V_{IH}	Input voltage high	2.4	-	3.6	V
V_{IL}	Input voltage low	-	-	0.8	V
V_{OH}	Output voltage high	3.0	-	VDD3	V
V_{OL}	Output voltage low	-	-	0.5	V
I_{IH}	High level input current			10	uA
I_{IL}	Low level input current	-10			uA
P_D	Power dissapation		1.0		W
P_{Down}	Power down mode			0.1	W

16 Megabit (2 M x 8-Bit/1 M x 16-Bit) CMOS 3.0 Volt-only Boot Sector Flash Memory

DISTINCTIVE CHARACTERISTICS

- **Single power supply operation**
  - — Full voltage range: 2.7 to 3.6 volt read and write operations for battery-powered applications
  - — Regulated voltage range: 3.0 to 3.6 volt read and write operations and for compatibility with high performance 3.3 volt microprocessors
- **Manufactured on 0.23 µm process technology**
  - — Fully compatible with 0.32 µm Am29LV160B device
- **High performance**
  - — Access times as fast as 70 ns
- **Ultra low power consumption (typical values at 5 MHz)**
  - — 200 nA Automatic Sleep mode current
  - — 200 nA standby mode current
  - — 9 mA read current
  - — 20 mA program/erase current
- **Flexible sector architecture**
  - — One 16 Kbyte, two 8 Kbyte, one 32 Kbyte, and thirty-one 64 Kbyte sectors (byte mode)
  - — One 8 Kword, two 4 Kword, one 16 Kword, and thirty-one 32 Kword sectors (word mode)
  - — Supports full chip erase
  - — Sector Protection features:

    A hardware method of locking a sector to prevent any program or erase operations within that sector

    Sectors can be locked in-system or via programming equipment

    Temporary Sector Unprotect feature allows code changes in previously locked sectors
- **Unlock Bypass Program Command**
  - — Reduces overall programming time when issuing multiple program command sequences
- **Top or bottom boot block configurations available**
- **Embedded Algorithms**
  - — Embedded Erase algorithm automatically preprograms and erases the entire chip or any combination of designated sectors
  - — Embedded Program algorithm automatically writes and verifies data at specified addresses
- **Minimum 1,000,000 write cycle guarantee per sector**
- **20-year data retention at 125°C**
  - — Reliable operation for the life of the system
- **Package option**
  - — 48-ball FBGA
  - — 48-pin TSOP
  - — 44-pin SO
- **CFI (Common Flash Interface) compliant**
  - — Provides device-specific information to the system, allowing host software to easily reconfigure for different Flash devices
- **Compatibility with JEDEC standards**
  - — Pinout and software compatible with single-power supply Flash
  - — Superior inadvertent write protection
- **Data# Polling and toggle bits**
  - — Provides a software method of detecting program or erase operation completion
- **Ready/Busy# pin (RY/BY#)**
  - — Provides a hardware method of detecting program or erase cycle completion (not available on 44-pin SO)
- **Erase Suspend/Erase Resume**
  - — Suspends an erase operation to read data from, or program data to, a sector that is not being erased, then resumes the erase operation
- **Hardware reset pin (RESET#)**
  - — Hardware method to reset the device to reading array data

This Data Sheet states AMD's current technical specifications regarding the Product described herein. This Data Sheet may be revised by subsequent versions or modifications due to changes in technical specifications.

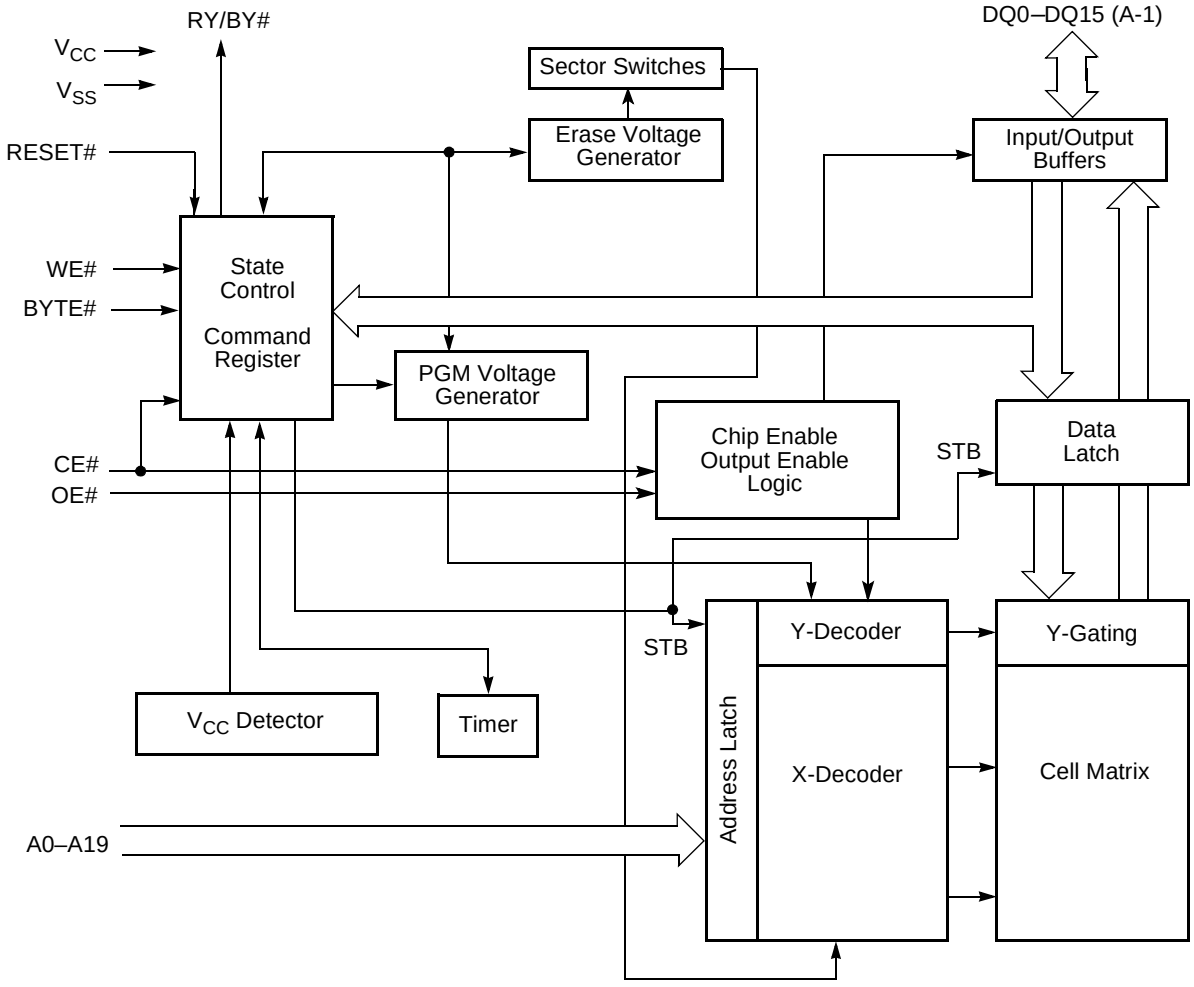
Publication# **22358** Rev: **B** Amendment/**+3**
Issue Date: **November 10, 2000**

PRODUCT SELECTOR GUIDE

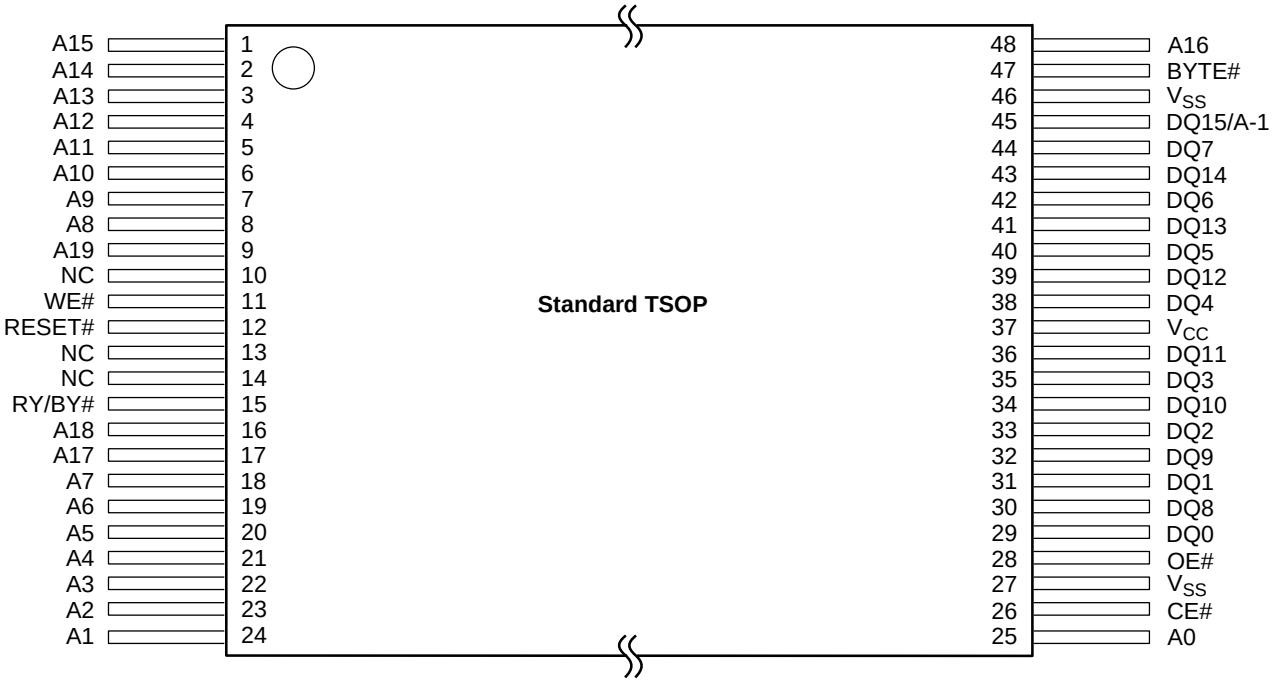
Family Part Number		Am29LV160D		
Speed Option	Voltage Range: V_{CC} = 2.7–3.6 V	**-70**	**-90**	**-120**
Max access time, ns (t_{ACC})		70	90	120
Max CE# access time, ns (t_{CE})		70	90	120
Max OE# access time, ns (t_{OE})		30	35	50

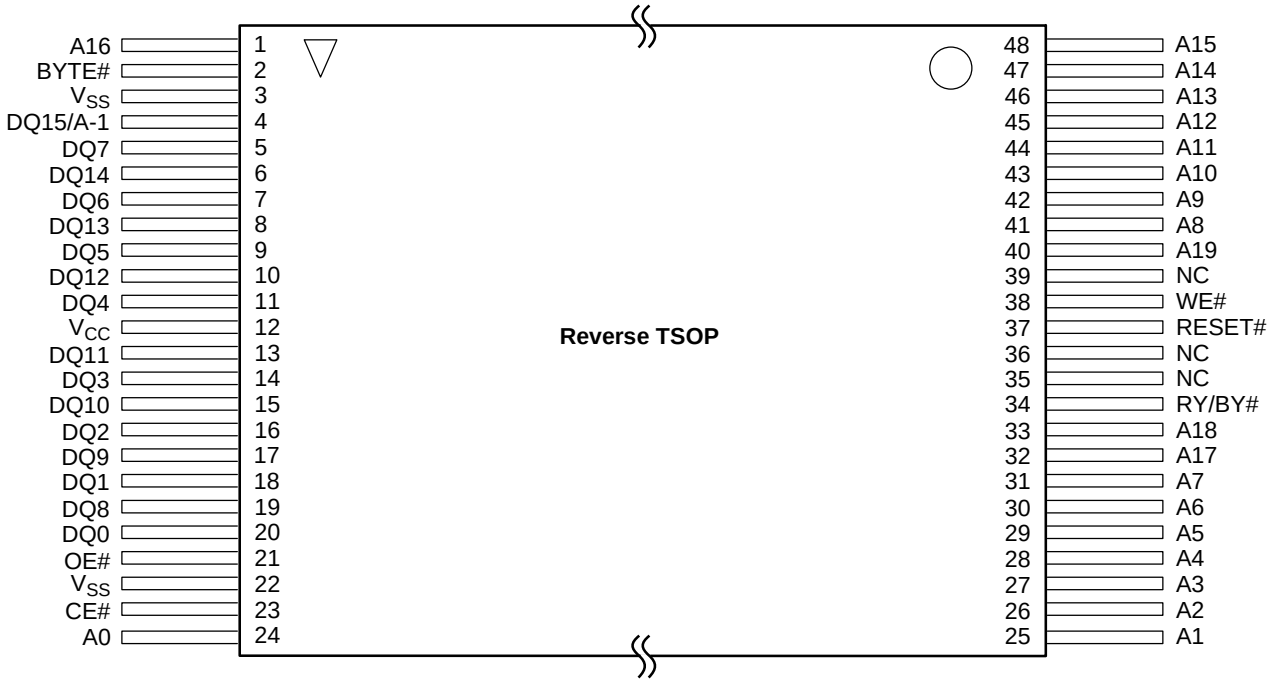
Note: *See "AC Characteristics" for full specifications.*

BLOCK DIAGRAM

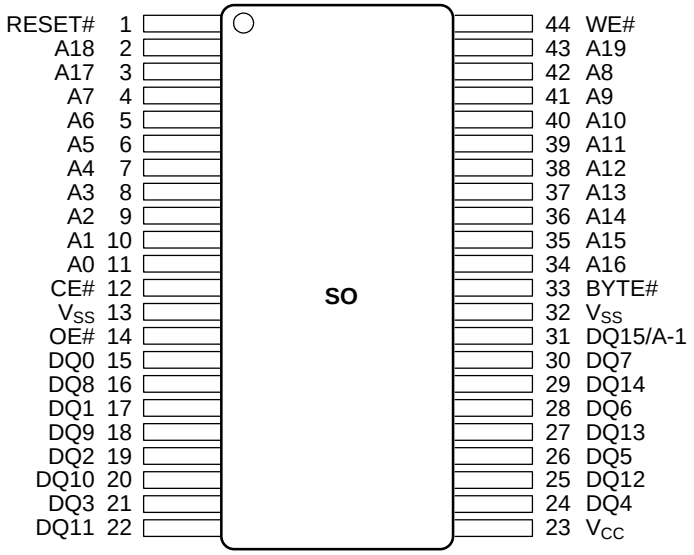


CONNECTION DIAGRAMS





CONNECTION DIAGRAMS



FBGA
Top View, Balls Facing Down

A6	B6	C6	D6	E6	F6	G6	H6
A13	A12	A14	A15	A16	BYTE#	DQ15/A-1	V_{SS}
A5	B5	C5	D5	E5	F5	G5	H5
A9	A8	A10	A11	DQ7	DQ14	DQ13	DQ6
A4	B4	C4	D4	E4	F4	G4	H4
WE#	RESET#	NC	A19	DQ5	DQ12	V_{CC}	DQ4
A3	B3	C3	D3	E3	F3	G3	H3
RY/BY#	NC	A18	NC	DQ2	DQ10	DQ11	DQ3
A2	B2	C2	D2	E2	F2	G2	H2
A7	A17	A6	A5	DQ0	DQ8	DQ9	DQ1
A1	B1	C1	D1	E1	F1	G1	H1
A3	A4	A2	A1	A0	CE#	OE#	V_{SS}

Special Handling Instructions

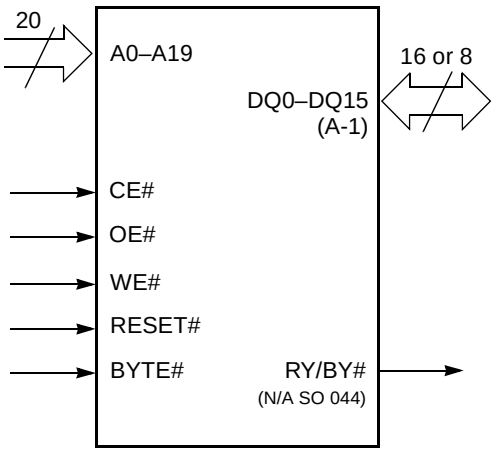
Special handling is required for Flash Memory products in FBGA packages.

Flash memory devices in FBGA packages may be damaged if exposed to ultrasonic cleaning methods. The package and/or data integrity may be compromised if the package body is exposed to temperatures above 150°C for prolonged periods of time.

PIN CONFIGURATION

A0–A19	=	20 addresses
DQ0–DQ14	=	15 data inputs/outputs
DQ15/A-1	=	DQ15 (data input/output, word mode), A-1 (LSB address input, byte mode)
BYTE#	=	Selects 8-bit or 16-bit mode
CE#	=	Chip enable
OE#	=	Output enable
WE#	=	Write enable
RESET#	=	Hardware reset pin
RY/BY#	=	Ready/Busy output (N/A SO 044)
V_{CC}	=	3.0 volt-only single power supply (see Product Selector Guide for speed options and voltage supply tolerances)
V_{SS}	=	Device ground
NC	=	Pin not connected internally

LOGIC SYMBOL



8.4 HY57V641620HG

DESCRIPTION

The Hyundai HY57V641620HG is a 67,108,864-bit CMOS Synchronous DRAM, ideally suited for the main memory applications which require large memory density and high bandwidth. HY57V641620HG is organized as 4banks of 1,048,576x16.

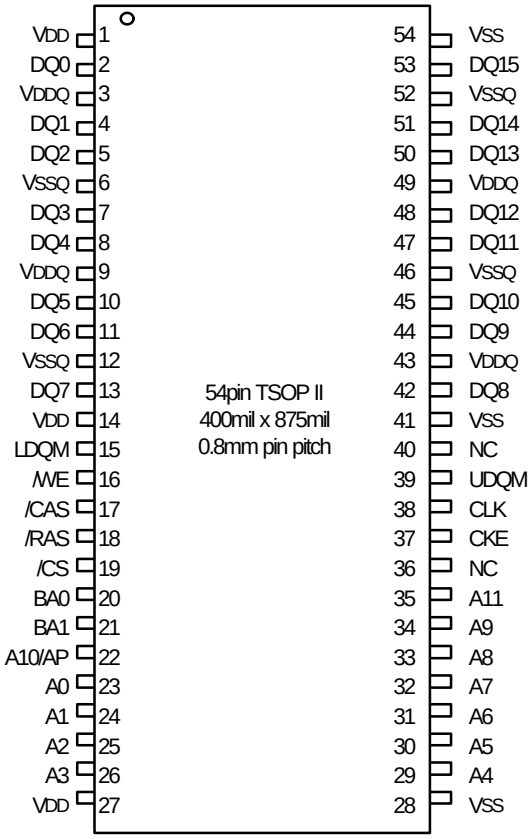
HY57V641620HG is offering fully synchronous operation referenced to a positive edge of the clock. All inputs and outputs are synchronized with the rising edge of the clock input. The data paths are internally pipelined to achieve very high bandwidth. All input and output voltage levels are compatible with LVTTL.

Programmable options include the length of pipeline (Read latency of 2 or 3), the number of consecutive read or write cycles initiated by a single control command (Burst length of 1,2,4,8 or Full page), and the burst count sequence(sequential or interleave). A burst of read or write cycles in progress can be terminated by a burst terminate command or can be interrupted and replaced by a new burst read or write command on any cycle. (This pipelined design is not restricted by a `2N` rule.)

FEATURES

- Single 3.3±0.3V power supply Note)
- All device pins are compatible with LVTTL interface
- JEDEC standard 400mil 54pin TSOP-II with 0.8mm of pin pitch
- All inputs and outputs referenced to positive edge of system clock
- Data mask function by UDQM or LDQM
- Internal four banks operation
- Auto refresh and self refresh
- 4096 refresh cycles / 64ms
- Programmable Burst Length and Burst Type
  - 1, 2, 4, 8 or Full page for Sequential Burst
  - 1, 2, 4 or 8 for Interleave Burst
- Programmable $\overline{\text{CAS}}$ Latency ; 2, 3 Clocks

PIN CONFIGURATION

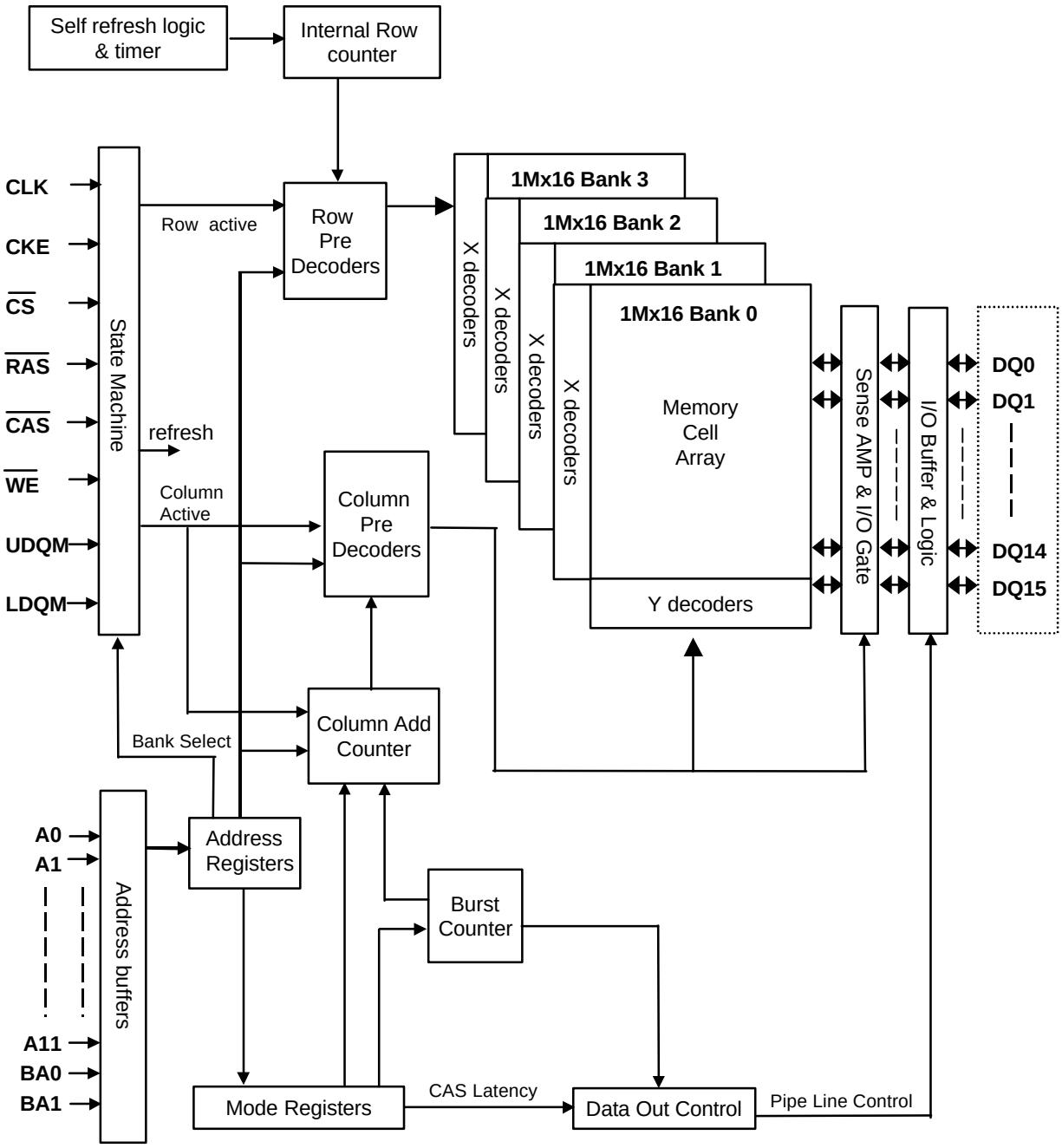


PIN DESCRIPTION

PIN	PIN NAME	DESCRIPTION
CLK	Clock	The system clock input. All other inputs are registered to the SDRAM on the rising edge of CLK
CKE	Clock Enable	Controls internal clock signal and when deactivated, the SDRAM will be one of the states among power down, suspend or self refresh
$\overline{CS}$	Chip Select	Enables or disables all inputs except CLK, CKE and DQM
BA0,BA1	Bank Address	Selects bank to be activated during $\overline{RAS}$ activity Selects bank to be read/written during $\overline{CAS}$ activity
A0 ~ A11	Address	Row Address : RA0 ~ RA11, Column Address : CA0 ~ CA7 Auto-precharge flag : A10
$\overline{RAS}$, $\overline{CAS}$, $\overline{WE}$	Row Address Strobe, Column Address Strobe, Write Enable	$\overline{RAS}$, $\overline{CAS}$ and $\overline{WE}$ define the operation Refer function truth table for details
LDQM, UDQM	Data Input/Output Mask	Controls output buffers in read mode and masks input data in write mode
DQ0 ~ DQ15	Data Input/Output	Multiplexed data input / output pin
VDD/VSS	Power Supply/Ground	Power supply for internal circuits and input buffers
VDDQ/VSSQ	Data Output Power/Ground	Power supply for output buffers
NC	No Connection	No connection

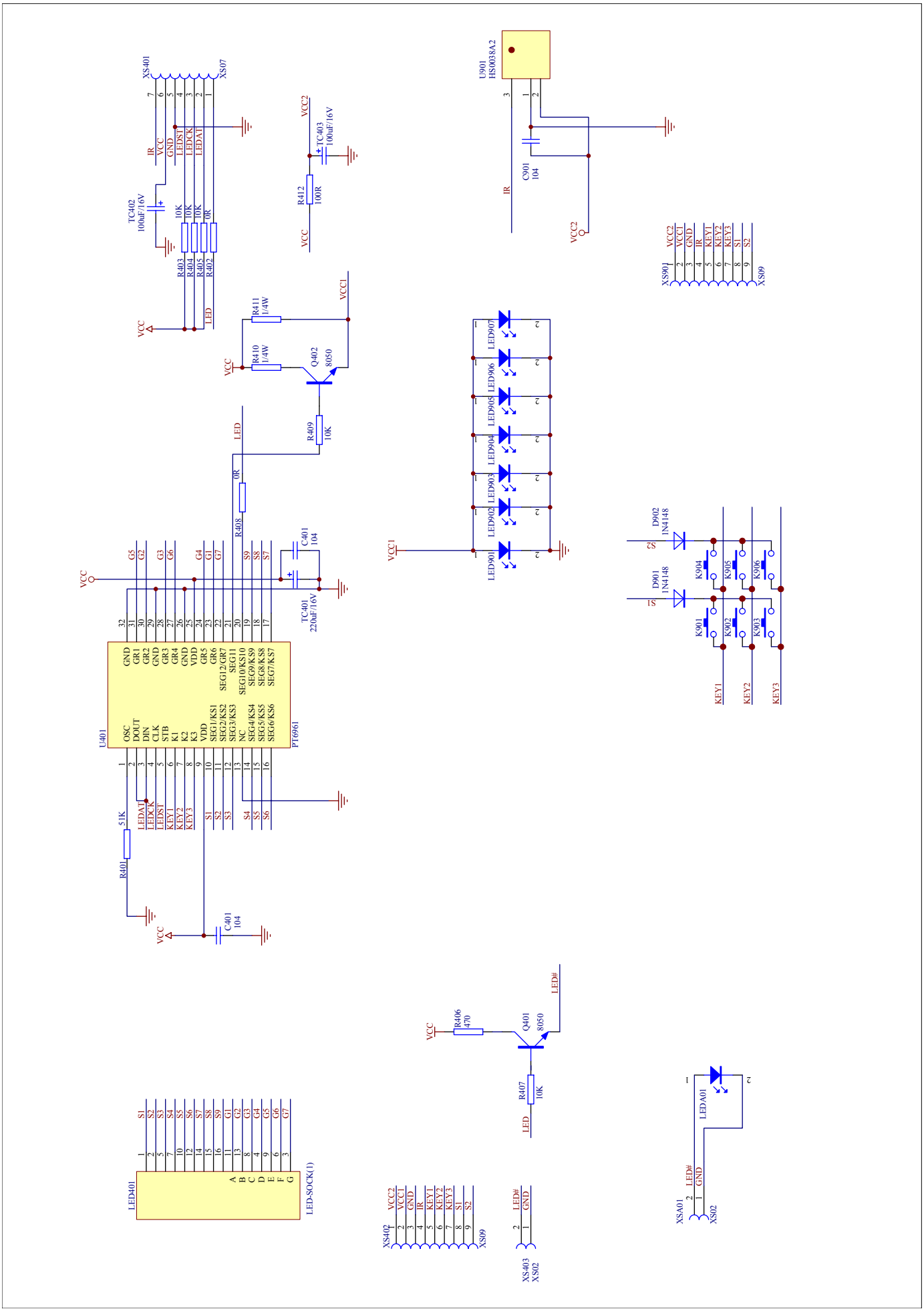
FUNCTIONAL BLOCK DIAGRAM

1Mbit x 4banks x 16 I/O Synchronous DRAM

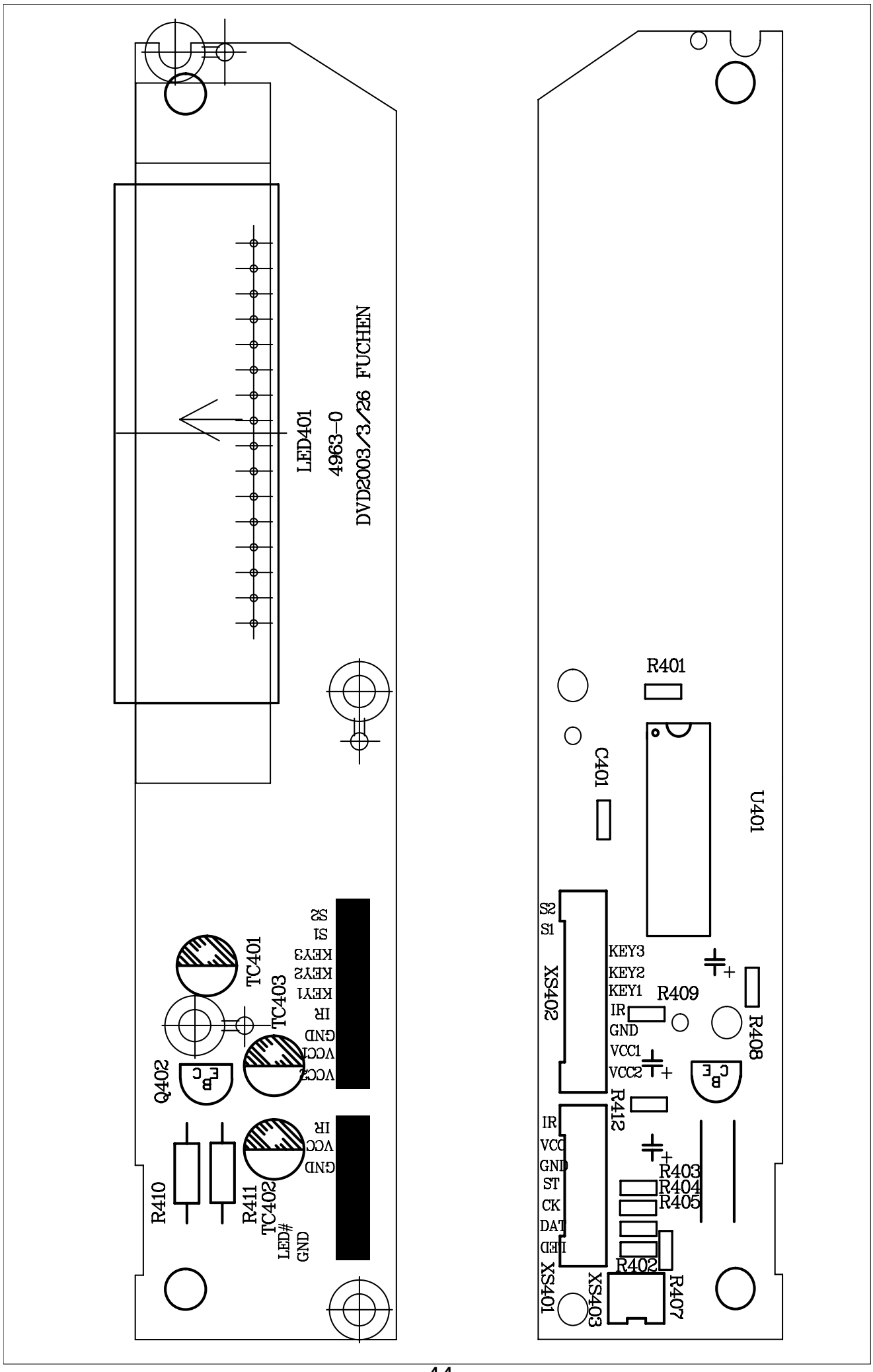


9. SCHEMATIC & PCB WIRING DIAGRAM

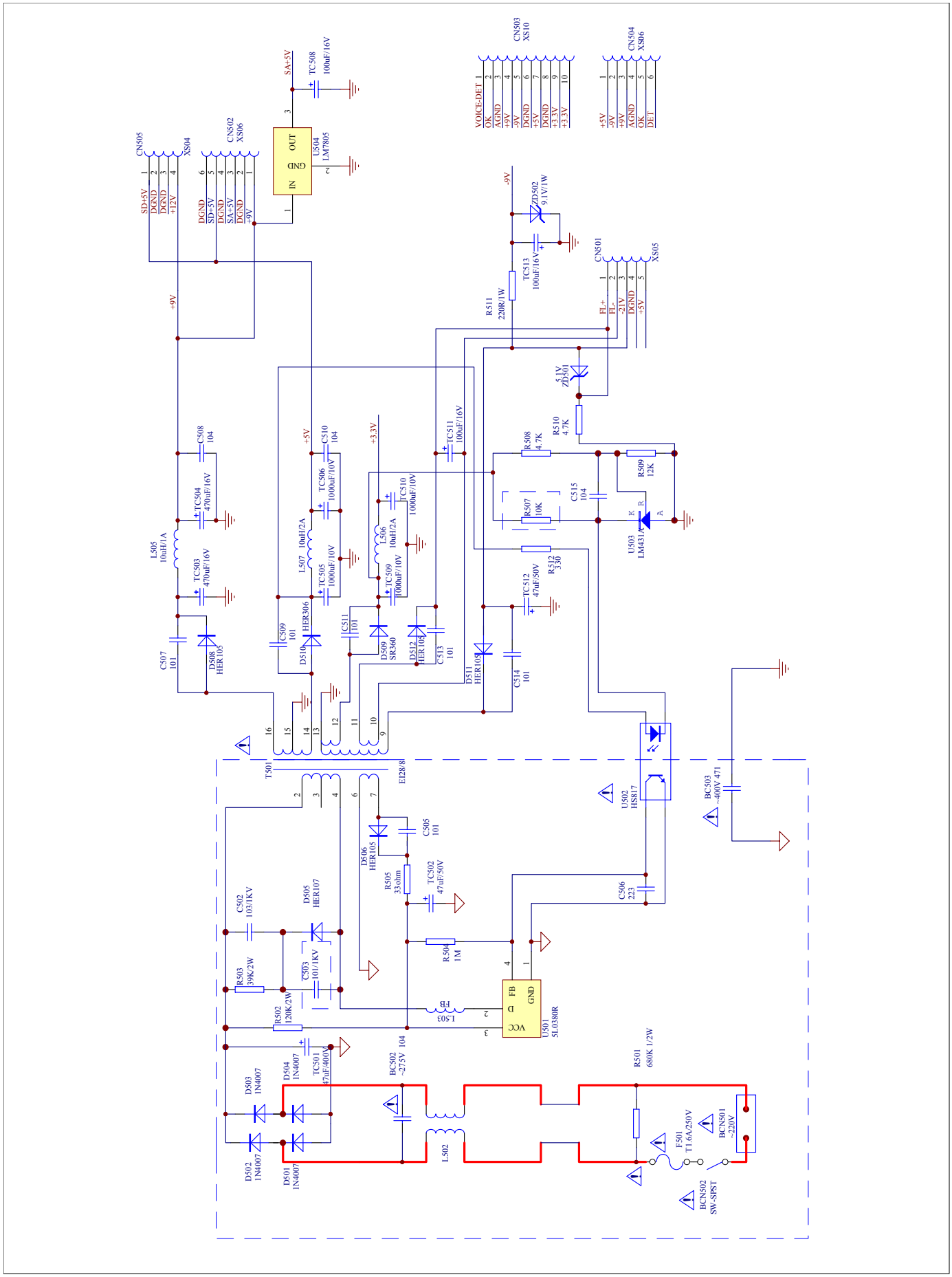
FRONT SCHEMATIC DIAGRAM



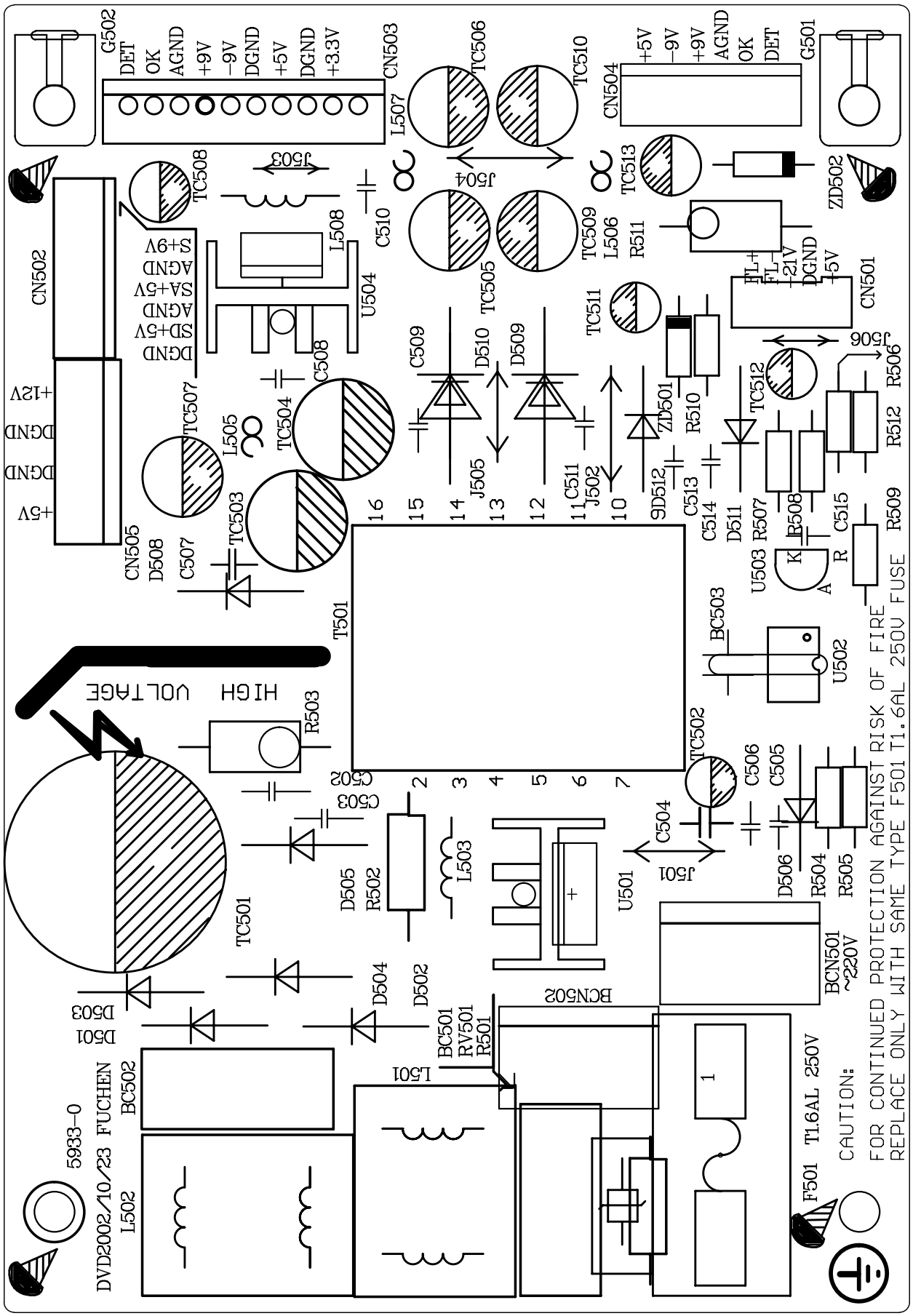
FRONT SCHEMATIC DIAGRAM



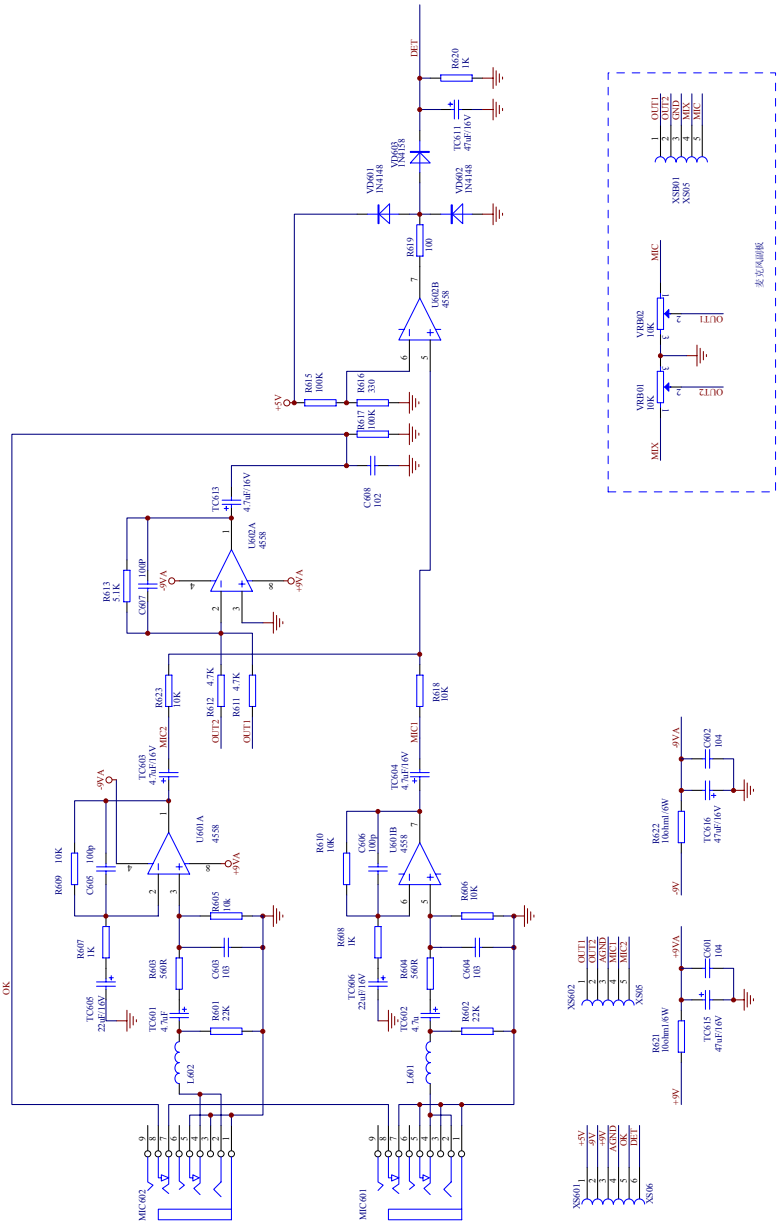
POWER BOARD SCHEMATIC DIAGRAM

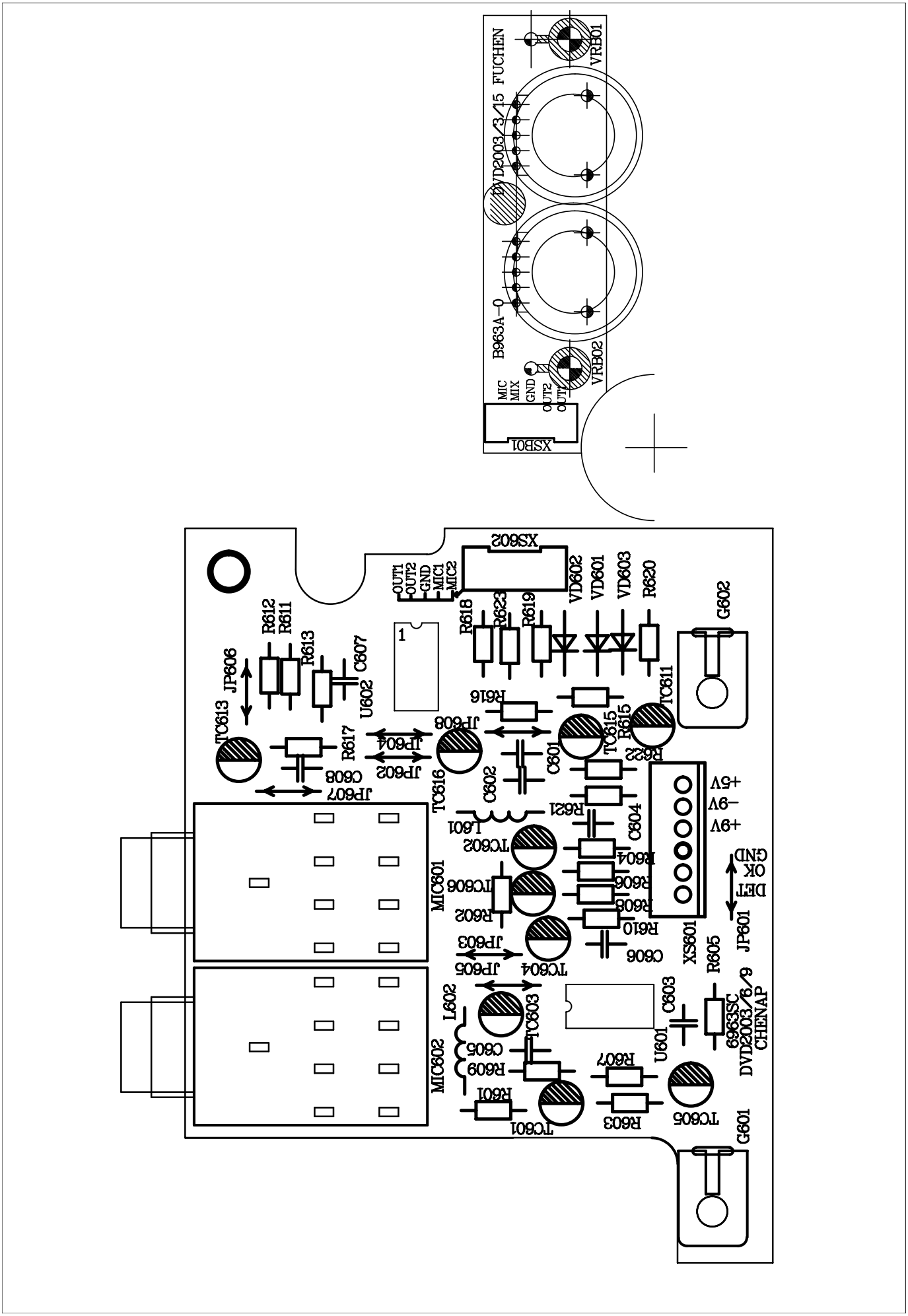


POWER BOARD SCHEMATIC DIAGRAM

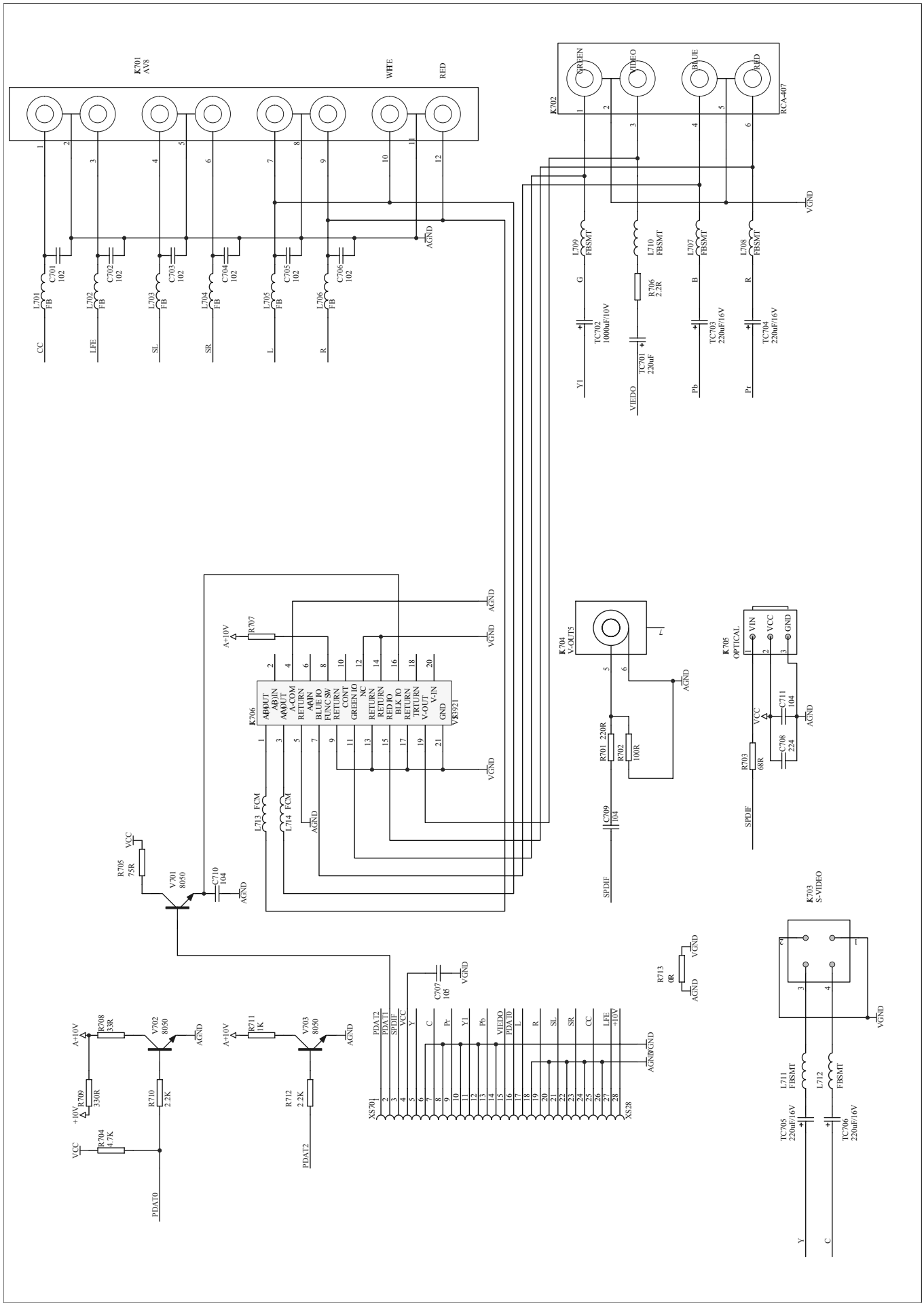


OK SCHEMATIC DIAGRAM

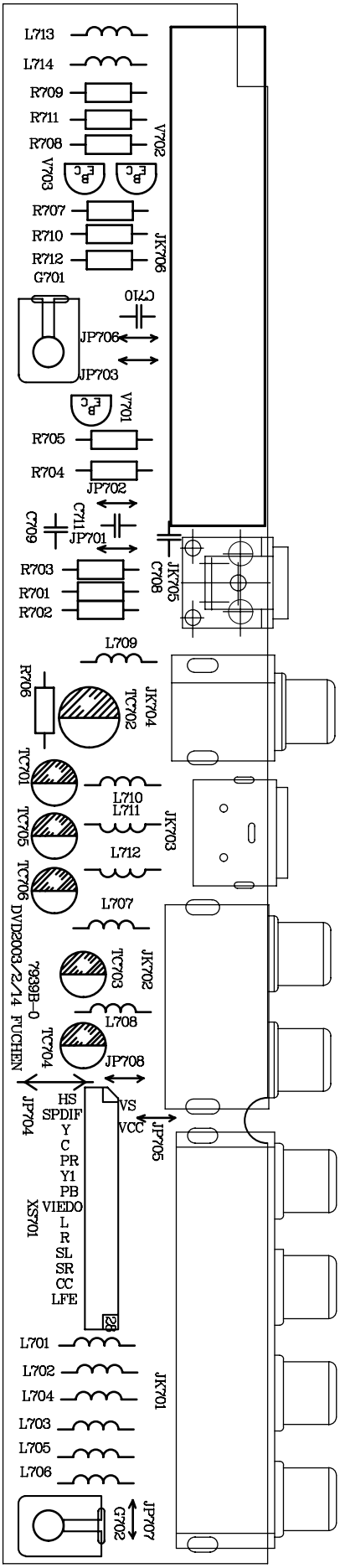



FUCHEN
VRB01
DVD2003/3/15
B963A-0
VRB02
MIC
MIX
GND
OUT2
OUT1
XSB01
XS602
OUT1
OUT2
GND
MIC1
MIC2
VD602
VD601
VD603
R620
G602
R618
R623
R619
R612
R611
R613
C607
JP606
U602
R616
TC611
TC613
JP608
TC615
R615
R622
R617
JP604
JP602
C608
C601
JP607
TC616
C602
R621
+5V
-9V
+9V
C604
L601
TC602
R604
R606
TC606
R608
MIC601
R602
R610
C606
XS601
JP601
GND
OK
DET
JP603
JP605
TC604
R605
L602
TC603
C603
6963SC
DVD2003/6/9
CHENAP
C605
R609
U601
R607
MIC602
R601
TC601
R603
TC605
G601

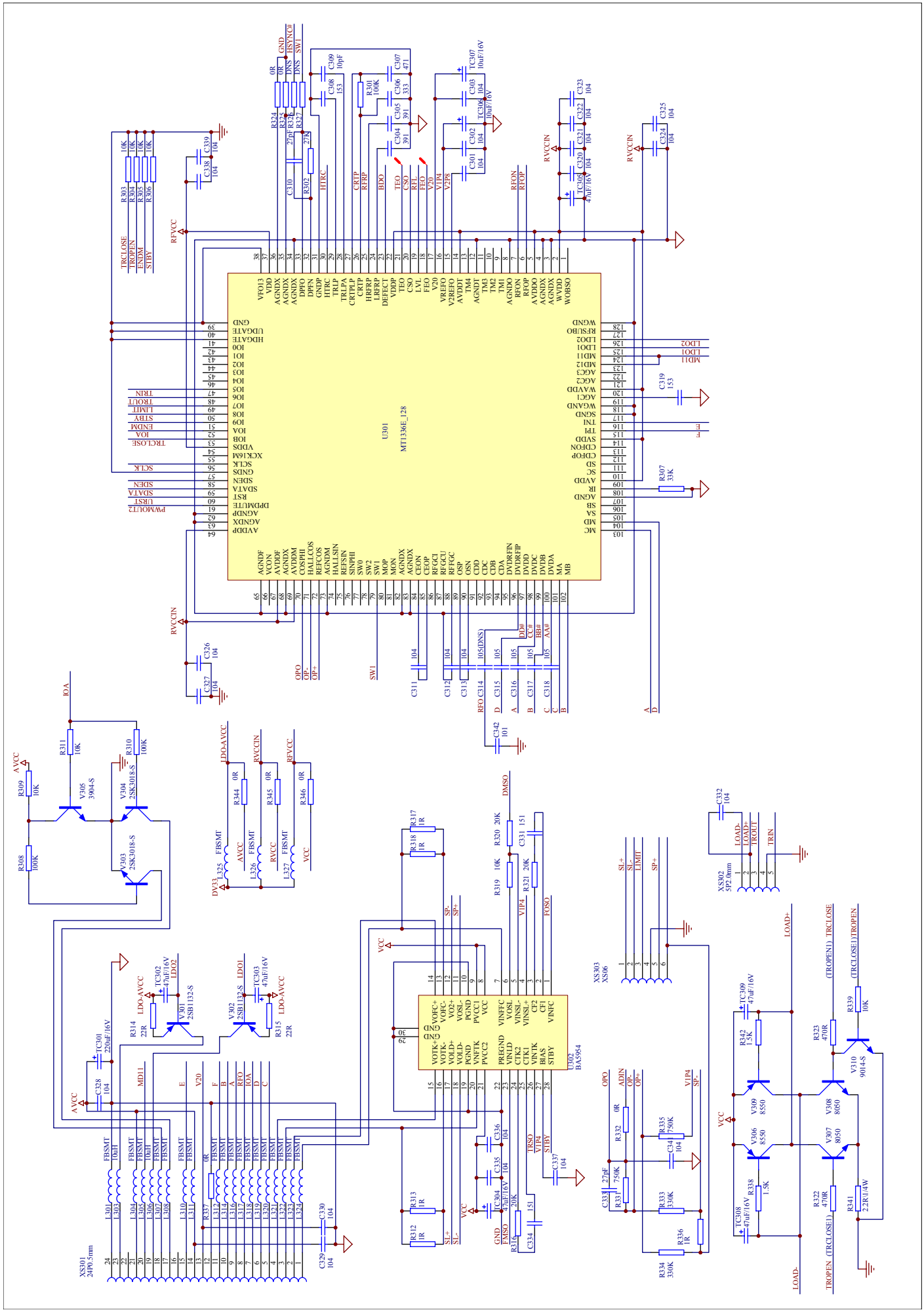
OUTPUT BOARD SCHEMATIC DIAGRAM



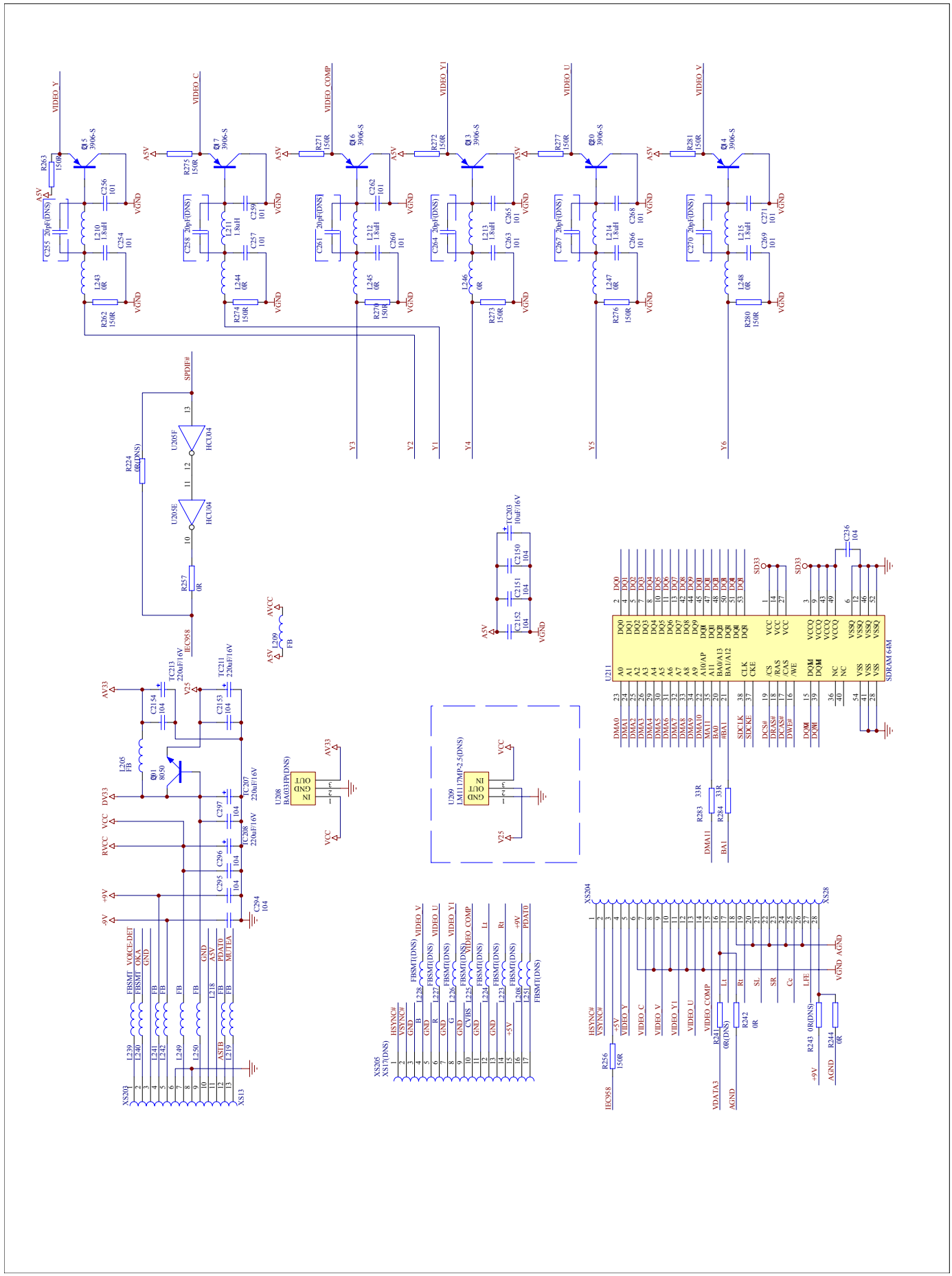
OUTPUT BOARD SCHEMATIC DIAGRAM



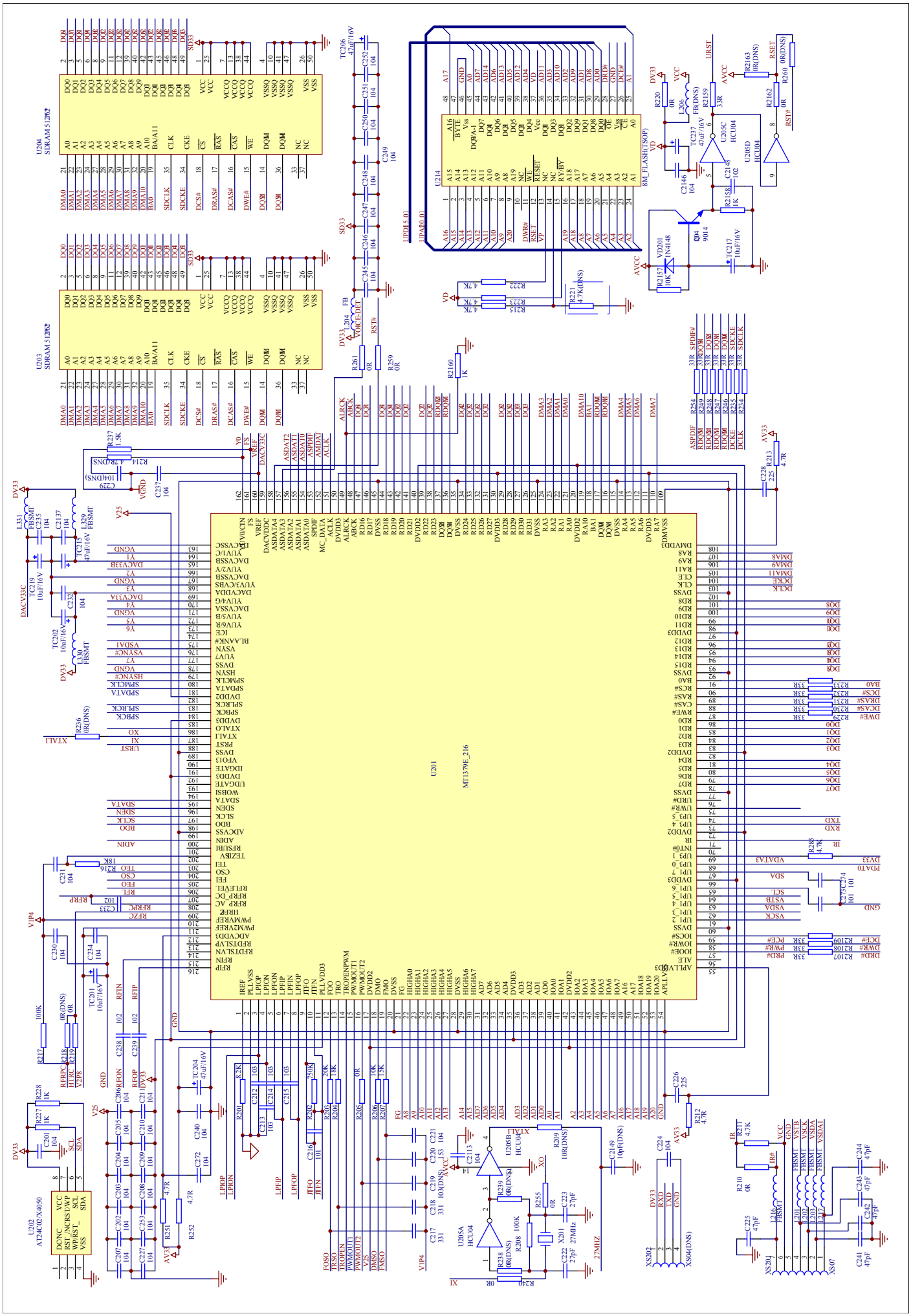
MIAN SCHEMATIC DIAGRAM



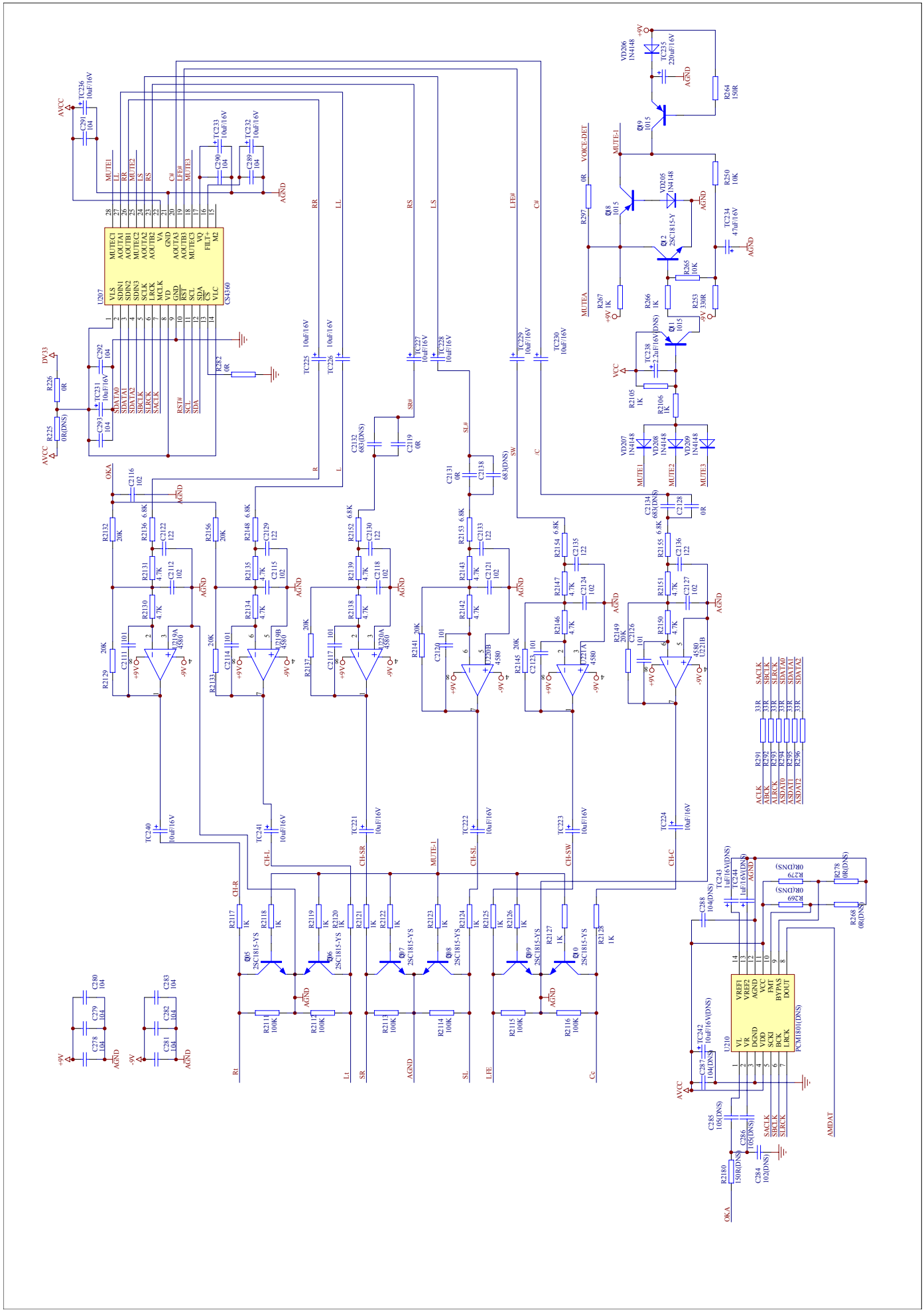
MIAN SCHEMATIC DIAGRAM



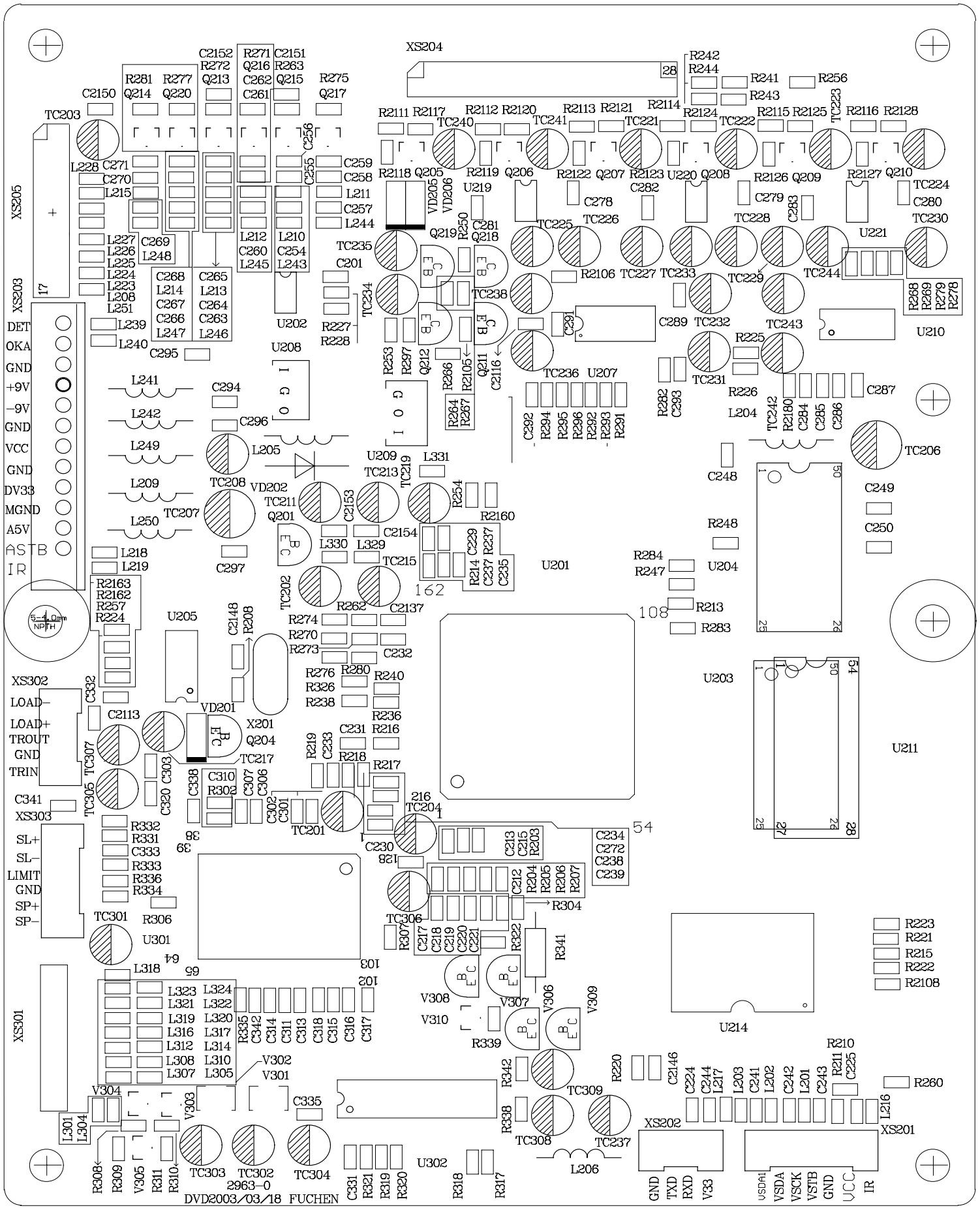
MIAN SCHEMATIC DIAGRAM



MIAN SCHEMATIC DIAGRAM



MIAN SCHEMATIC DIAGRAM



10. SPARE PARTS LIST

BBK963S（RU）MATERIAL LIST

1. DECODE BOARD

NO		MATERIAL	SPECIFICATIONS/PART NUMBER	QUANTITY	LOCATION
1		SMD RESISTOR	1/16W 0Ω ±5%	26	C2119,C2128,C2131,L243~L248,R205,R219,R220,R226,R240,R241,R243,R255,R257,R259,R282,R332,R337,R2162,R286,R268,R278
2		SMD RESISTOR	1/16W 75Ω ±5%	1	R256
3		CARBON FILM RESISTOR	1/4W2.2Ω±5%	1	R341
4		SMD RESISTOR	1/16W1Ω±5%	5	R312,R313,R317,R318,R336
5		SMD RESISTOR	1/16W 4.7Ω ±5%	4	R212,R213,R251,R252
6		SMD RESISTOR	1/16W 15Ω ±5%	2	R314,R315
7		SMD RESISTOR	1/16W 33Ω ±5%	22	R2107~R2109,R2159,R229~R235,R246,R247,R254,R283,R284,R291~R296
8		SMD RESISTOR	1/16W 470Ω ±5%	2	R322,R323
9		SMD RESISTOR	1/16W 150Ω ±5%	14	R262~R264,R270~R277,R280,R281,R2180
10		SMD RESISTOR	1/16W 330Ω ±5%	1	R253
11		SMD RESISTOR	1/16W 1K ±5%	20	R227,R228,R266,R267,R2105,R2106,R2117~R2128,R2158,R2160
12		SMD RESISTOR	1/16W 1.5K ±5%	2	R338,R342
13		SMD RESISTOR	1/16W 2K ±5%	1	R237
14		SMD RESISTOR	1/16W 4.7K ±5%	15	R222,R223,R2130,R2131,R2134,R2135,R2138,R2139,R2142,R2143,R2146,R2147,R2150,R2151,R285
15		SMD RESISTOR	1/16W 6.8K ±5%	6	R2136,R2148,R2152~R2155
16		SMD RESISTOR	1/16W 8.2K ±5%	1	R201
17		SMD RESISTOR	1/16W 10K ±5%	13	R206,R250,R265,R303~R306,R309,R311,R319,R339,R2157,R210
18		SMD RESISTOR	1/16W 15K ±5%	2	R207,R307
19		SMD RESISTOR	1/16W 20K ±5%	4	R203,R316,R320,R321
20		SMD RESISTOR	1/16W 18K ±5%	2	R204,R216
21		SMD RESISTOR	1/16W24K±5%	6	R2129,R2133,R2137,R2141,R2145,R2149
22		PRECISION SMD RESISTOR	1/16W 330K ±1%	2	R333,R334
23		PRECISION SMD RESISTOR	1/16W 750K ±1%	3	R202,R331,R335
24		CD	CD11 16V22U±20%5×11 2	1	TC217
25		SMD RESISTOR	1/16W 100K ±5%	10	R208,R2111~R2116,R217,R308,R310
26		CD	CD11 16V1U±20%5×11 2	2	TC243,TC244
27		CD	CD11 16V10U±20%5×11 2	23	TC201,TC202,TC203,TC219,TC221~TC233,TC236,TC240,TC241,TC306,TC307,TC242,
28		CD	CD11 16V220U±20%6×12 2.5	6	TC207,TC208,TC211,TC213,TC235,TC301
29		CD	CD11 16V47U±20%5×11 2	11	TC204,TC206,TC215,TC234,TC237,TC302~TC305,TC308,TC309
30		SMD CAPACITOR	50V 27P ±5% NPO 0603	3	C222,C223,C333

31		SMD CAPACITOR	50V 47P ±5% NPO 0603	14	C225,C241~C243,C254,C256,C257,C259,C260,C262,C266,C268,C269,C271
32		SMD CAPACITOR	50V 82P ±5% NPO 0603	1	C305
33		SMD CAPACITOR	50V 101 ±5% NPO 0603	10	C216,C273,C274,C342,C2111,C2114,C2117,C2120,C2123,C2126
34		SMD CAPACITOR	50V 331 ±5% NPO 0603	2	C217,C218
35		SMD CAPACITOR	50V 151 ±5% NPO 0603	2	C331,C334
36		SMD CAPACITOR	50V 391 ±10% 0603	1	C304
37		SMD CAPACITOR	50V 104 +80%-20% 0603	76	C201~C211,C221,C224,C227,C230~C232,C234~C237,C240,C246,C247,C251~C253,C272,C278~C283,C289~C297,C301~C303,C312,C313,C320~C330,C332,C335~C339,C341,C2113,C2137,C2146,C2150~C2154,C287,C288
	37.1	SMD CAPACITOR	25V 104 +80%-20% 0603	76	C201~C211,C221,C224,C227,C230~C232,C234~C237,C240,C246,C247,C251~C253,C272,C278~C283,C289~C297,C301~C303,C312,C313,C320~C330,C332,C335~C339,C341,C2113,C2137,C2146,C2150~C2154,C287,C288
38		SMD CAPACITOR	16V 105 +80%-20% 0603	6	C315~C318,C285,C286
39		SMD CAPACITOR	10V 225 +80%-20% 0805	2	C226,C228
40		SMD CAPACITOR	50V 471 ±5% NPO 0603	1	C311
41		SMD CAPACITOR	50V 102 ±10% 0603	11	C233,C238,C239,C2112,C2115,C2118,C2121,C2124,C2127,C2148,C284
42		SMD CAPACITOR	50V 122 ±10% 0603	6	C2122,C2129,C2130,C2133,C2135,C2136
43		SMD CAPACITOR	50V 103 ±10% 0603	4	C212~C215
44		SMD CAPACITOR	50V 153 ±10% 0603	3	C220,C308,C319
45		SMD CAPACITOR	16V 333 ±10% 0603	1	C306
46		SMD INDUCTOR	10UH ±10% 2012	2	L303,L306
47		SMD INDUCTOR	1.8UH ±10% 1608	6	L210~L215
48		MAGNETIC BEADS INDUCTOR	RH354708	7	L204,L205,L209,L241,L242,L249,L250
49		SMD MAGNETIC BEADS	FCM1608K-221T05	30	L201~L203,L216,L239,L240,L301,L304,L305,L307,L308,L310,L311,L312,L314,L316~L324,L329~L331,L325~L327
50		SMD DIODE	1N4148	6	VD201,VD205~VD209
	50.1	SMD DIODE	LS4148	6	VD201,VD205~VD209
	50.2	SMD DIODE	LL4148	6	VD201,VD205~VD209
51		TRIODE	C8050	3	V307,V308,Q201
52		TRIODE	8550C	2	V306,V309
53		TRIODE	9014C	1	Q204
54		TRIODE	C1815Y	1	Q212
55		SMD TRIODE	C1815	6	Q205~Q210
56		TRIODE	2SA1015	3	Q211,Q218,Q219
57		SMD TRIODE	3906	6	Q213~Q217,Q220

58		SMD TRIODE	3904	1	V305
59		SMD TRIODE	9014C	1	V310
60		SMD TRIODE	2SK3018	2	V303,V304
61		SMD TRIODE	2SB1132	2	V301,V302
62		IC	PCM1801U SOP	1	U210
63		IC	NJR5532 SOP	3	U219,U220,U221
64		IC	MM74HCU04M SOP	1	U205
	64.1	IC	HCU04 SOP	1	U205
65		IC	HY57V641620HGT-7 TSOP	1	U211
	65.1	IC	MT48LC4M16A2-7 SOP	1	U211
66		IC	CS4360 SSOP	1	U207
67		IC	24C02N SOP	1	U202
68		IC	MT1336E-C QFP	1	U301
69		IC	MT1379EE-C QFP	1	U201
70		IC	BA5954FP HSOP	1	U302
71		CRYSTAL OSCILLATOR	27.00MHz 49-S	1	X201
72		CABLE SOCKET	14P 1.0mm STRAIGHT DUAL LINE PLUG	1	XS204
73		PCB	2965-0	1	
74		SOCKET	5P 2.0mm	1	XS302
75		SOCKET	6P 2.0mm	2	XS303,XS201
76		SOCKET	11P 2.5mm	1	XS203
77		CABLE SOCKET	24P 0.5mm SMD WITH CLASP	1	XS301

2. POWER BOARD

NO		MATERIAL	SPECIFICATIONS/PART NUMBER	QUANTITY	LOCATION
1		CARBON FILM RESISTOR	1/4W33 Ω ±5% SHAPED 10	1	R505
2		CARBON FILM RESISTOR	1/4W330 Ω ±5% SHAPED 10	1	R506
3		METAL OXIDE FILM RESISTOR	1W330 Ω ±5% SHAPED R 15×8	1	R511
4		CARBON RESISTOR	1/4W10K±5% SHAPED 10	1	R507
5		CARBON RESISTOR	1/4W1M Ω ±5% SHAPED 10	1	R504
6		METAL FILM RESISTOR	1/4W4.7K±1%	1	R508
7		METAL FILM RESISTOR	1/4W12K±1% SHAPED 10	1	R509
8		METAL OXIDE FILM RESISTOR	2W39K±5% SHAPED FLAT 15×9	1	R503
	8.1	METAL OXIDE FILM RESISTOR	2W39K±5% SHAPED FLAT 15×7	1	R503
9		METAL OXIDE FILM RESISTOR	2W120K±5% SHAPED FLAT 15×7	1	R502
10		HIGH VOLTAGE RESISTOR	1/2W680K±5%	1	R501
11		PORCELAIN CAPACITOR	50V 100P ±10% 5mm	5	C505,C507,C509,C511,C514
12		PORCELAIN CAPACITOR	50V 104 ±20% 5mm	4	C504,C508,C510,C515
13		PORCELAIN CAPACITOR	1000V 101 +80%-20% 7.5mm	1	C503
	13.1	PORCELAIN CAPACITOR	1000V 101 ±10% 7.5mm	1	C503
14		PORCELAIN CAPACITOR	1000V 103 +80%-20% 7.5mm	1	C502
15		CERAMIC CAPACITOR	CT81 400V 221±20% 10mm	1	BC503
	15.1	CERAMIC CAPACITOR	CT81 400V221±10% 10mm	1	BC503
16		TERYLENE CAPACITOR	100V 223 ±10% 5mm	1	C506
17		TERYLENE CAPACITOR	275V 104 ±20% 15mm	1	BC501
	17.1	TERYLENE CAPACITOR	275V 104 ±10% 15mm	1	BC501
18		CD	GZ16V100U±20%6×12 2.5	2	TC508,TC513
	18.1	CD	CD11 16V100U±20%6×12 2.5	2	TC508,TC513
	18.2	CD	CD110 16V100U±20%6×12 2.5	2	TC508,TC513

	18.3	CD	CD11C 16V100U+20%-15%6×7 2.5	2	TC508,TC513
	18.4	CD	CD11C 16V100U±20%6×7 2.5	2	TC508,TC513
19		CD	CD11 25V470U+20%-10%10×16 5	2	TC503,TC504
	19.1	CD	CD11 25V470U±20%10×16 5	2	TC503,TC504
20		CD	CD11 50V47U±20%6×12 2.5	2	TC502,TC512
21		CD	CD11 10V1000U±20%8×16 3.5	4	TC505,TC506,TC509,TC510
	21.1	CD	CD11 10V1000U±20%8×14 3.5	4	TC505,TC506,TC509,TC510
	21.2	CD	GS 10V1000U±20%8×16 3.5	4	TC505,TC506,TC509,TC510
	21.3	CD	GS 10V1000U±20%8×14 3.5	4	TC505,TC506,TC509,TC510
22		CD	LP3 400V47U±20%22×28 10	1	TC501
	22.1	CD	LS 400V47U±20%22×25 10	1	TC501
23		MAGNETIC BEADS INDUCTOR	RH354708	1	L503
24		CHOKE COIL	VERTICAL 10UH 1A 5mm	1	L505
25		CHOKE COIL	VERTICAL 10UH 2A 5mm	2	L506,L507
26		SWITCHING POWER TRANSFORMER	BCK-28-0286	1	T501
	26.1	SWITCHING POWER TRANSFORMER	BCK2801-624	1	T501
27		DIODE	HER105	3	D506,D508,D511
28		DIODE	HER306	1	D510
29		SCHOTTKY DIODE	SR360	1	D509
30		DIODE	HER107	1	D505
31		DIODE	1N4007	4	D501~D504
32		VOLTAGE REGULATOR DIODE	9.1V 1W	1	ZD502
33		IC	5L0380R YDTU	1	U501
34		IC	LM431ACZ TO-92	1	U503
	34.1	IC	TL431C TO-226AA(LP)	1	U503
	34.2	IC	431L TO-92	1	U503
	34.3	IC	KA431AZ TO-92	1	U503
35		POWER GRID FILTER	UT-20 40mH ±20% 10×13	1	L501
36		PHOTOELECTRIC COUPLER	HS817	1	U502
37		IC	LM7805 GOLD SEALED TO-220	1	U504
38		PCB	5933-0	1	
39		SOCKET	9P 2.5mm	1	CN503
40		SOCKET	2P 2.5mm	1	CN502
41		SOCKET	6P 2.5mm	1	CN504
42		SOCKET	2P 8.0mm 2#	2	BCN501,BCN502
43		CONNECTION CORDS	Φ0.6 SHAPED 7.5mm	2	J506,J503
44		CONNECTION CORDS	Φ0.6 SHAPED 10mm	4	L502,J501,J505
45		CONNECTION CORDS	Φ0.6 SHAPED 12.5mm	2	J504,J502
46		FUSE	T1.6AL 250V	1	F501
47		FUSE	BLX-2	1	FOR F501
48		HEAT RADIATOR BOARD	11×15×25 AB009K	2	U501,U504 FOR HEAT RADIATION
	48.1	HEAT RADIATOR BOARD	11×15×25 WHITE AB905	2	U501,U504 FOR HEAT RADIATION
49		GROUND CHIP OF POWER BOARD	AB903	2	G501~G502
50		TAPPING SCREW	BT 3×8 BLACK	2	FIXED HEAT RADIATION

3. OK BOARD

NO		MATERIAL	SPECIFICATIONS/PART NUMBER	QUANTITY	LOCATION
1		CARBON FILM RESISTOR	1/6W10Ω±5% SHAPED 7.5	2	R621,R622
2		CARBON FILM RESISTOR	1/6W100Ω±5% SHAPED 7.5	1	R619
3		CARBON FILM RESISTOR	1/6W330Ω±5% SHAPED 7.5	1	R616
4		CARBON FILM RESISTOR	1/6W560Ω±5% SHAPED 7.5	2	R603,R604
5		CARBON FILM RESISTOR	1/6W1K±5% SHAPED 7.5	3	R607,R608,R620
6		CARBON FILM RESISTOR	1/6W5.1K±5% SHAPED 7.5	1	R613
7		CARBON FILM RESISTOR	1/6W10K±5% SHAPED 7.5	6	R605,R606,R618, R623,R609,R610
8		CARBON FILM RESISTOR	1/6W22K±5% SHAPED 7.5	2	R601,R602
9		CARBON FILM RESISTOR	1/6W100K±5% SHAPED 7.5	2	R615,R617
10		CARBON FILM RESISTOR	1/6W4.7K±5% SHAPED 7.5	2	R611,R612
11		PORCELAIN CAPACITOR	50V 47P ±5% NPO 5mm	2	C605,C606
	11.1	PORCELAIN CAPACITOR	50V 47P ±5% 5mm	2	C605,C606
	11.2	PORCELAIN CAPACITOR	50V 47P ±10% 5mm	2	C605,C606
12		PORCELAIN CAPACITOR	50V 100P ±10% 5mm	1	C607
13		PORCELAIN CAPACITOR	50V 103 ±10% 5mm	2	C603,C604
14		PORCELAIN CAPACITOR	50V 104 ±20% 5mm	2	C601,C602
15		PORCELAIN CAPACITOR	50V 102 ±20% 5mm	1	C608
16		CD	CD110 16V47U±20%5×11 2	3	TC611,TC615,TC616
	16.1	CD	CD11 16V47U±20%5×11 2	3	TC611,TC615,TC616
	16.2	CD	CD11C 16V47U±20%5×7 2	3	TC611,TC615,TC616
17		CD	CD11 16V4.7U±20%5×11 2	5	TC601~TC604, TC613
18		CD	CD11 16V22U±20%5×11 2	2	TC605,TC606
	18.1	CD	CD11 25V22U±20%5×11 2	2	TC605,TC606
19		MAGNETIC BEADS INDUCTOR	RH354708	2	L601,L602
20		DIODE	1N4148	3	VD601~VD603
21		IC	NJM4558D DIP	2	U601,U602
	21.1	IC	KA4558 DIP	2	U601,U602
22		PCB	6963B-0	1	
23		FLAT CABLE	6P90 2.5 2 SOCKET WITH L NEEDLE REVERSE	1	XS601
24		SOCKET	5P 2.0mm	1	XS602
25		MICROPHONE TERMINAL	CK3-6.35-4	2	MIC601,MIC602
26		CONNECTION CORDS	Φ0.6 SHAPED 7.5mm	8	JP601~JP608

4. OK SUBSIDIARY BOARD

NO		MATERIAL	SPECIFICATIONS/PART NUMBER	QUANTITY	LOCATION
1		ROTATED POTENTIOMETER	WHE101N-2-B10K±20%	2	VRB02,VRB01
2		FLAT CABLE	5P100 2.0 2 SOCKET WITH L NEEDLE REVERSE	1	XSB01
3		PCB	B963A-1	1	

5. OUTPUT BOARD

NO		MATERIAL	SPECIFICATIONS/PART NUMBER	QUANTITY	LOCATION
1		CARBON FILM RESISTOR	1/4W68Ω±5%	1	R703
2		CARBON FILM RESISTOR	1/4W100Ω±5%	1	R702
3		CARBON FILM RESISTOR	1/4W220Ω±5%	1	R701
4		CARBON FILM RESISTOR	1/4W330Ω±5%	1	R709
5		CARBON FILM RESISTOR	1/4W2.2Ω±5% SHAPED 10	1	R706

6		CARBON FILM RESISTOR	1/4W1K±5%	1	R711
7		CARBON FILM RESISTOR	1/4W33Ω±5%	1	R708
8		CARBON FILM RESISTOR	1/4W2.2K±5%	2	R710,R712
9		CARBON FILM RESISTOR	1/4W4.7K±5%	1	R704
10		CARBON FILM RESISTOR	1/4W75Ω±5%	1	R705
11		SMD CAPACITOR	50V 102 ±10% 0603	6	C701~C706
12		SMD CAPACITOR	16V 105 +80%-20% 0603	1	C707
13		PORCELAIN CAPACITOR	50V 104 ±20% 5mm	3	C709,C710,C711
	13.1	PORCELAIN CAPACITOR	50V 104 +80%-20% 5mm	3	C709,C710,C711
14		MULTILAYER CERAMIC CAPACITOR	50V 224 ±20% 5mm	1	C708
	14.1	MULTILAYER CERAMIC CAPACITOR	50V 224 ±10% 5mm	1	C708
15		TRIODE	S8050D	3	V701~V703
16		CD	CD11 16V220U±20%6×12 2.5	5	TC701,TC703~TC706
17		CD	GS 10V1000U±20%8×14 3.5	1	TC702
	17.1	CD	CD11 10V1000U±20%8×14 3.5	1	TC702
	17.2	CD	GS 10V1000U±20%8×16 3.5	1	TC702
	17.3	CD	CD11 10V1000U±20%8×16 3.5	1	TC702
18		MAGNETIC BEADS INDUCTOR	RH354708	12	L701~L712
19		ELECTRO-OPTIC TRANSFORMER	TX179ATW	1	JK705
	19.1	ELECTRO-OPTIC TRANSFORMER	TX179AT	1	JK705
20		TERMINAL SOCKET	AV4-8.4-6G-5	1	JK702
21		TERMINAL SOCKET	AV8-8.4-6G-3	1	JK701
22		SCART SOCKET	SCART-01	1	JK706
23		PCB	7939B-0	1	
24		CABLE SOCKET	14P 1.0mm STRAIGHT DUAL LINE PLUG	1	XS701
25		TERMINAL SOCKET	AV1-8.4-5G-2 BLACK	1	JK704
26		TERMINAL SOCKET	S TERMINAL	1	JK703
27		CONNECTION CORDS	Φ0.6 SHAPED 5mm	7	JP701~JP703,JP705--JP708
28		CONNECTION CORDS	Φ0.6 SHAPED 10mm	3	R707,L713,L714

6. MAIN FRONT PANEL

NO		MATERIAL	SPECIFICATIONS/PART NUMBER	QUANTITY	LOCATION
1		SOFT SPONGE SPACER	16×8×4 DOUBLE FACED, HARD	2	CONNECT LED WITH FRONT PANEL PCB
2		CD	CD11C 10V100U±20%5×7 2	3	TC401,TC402,TC403
3		LED	LTG-0275G	1	LED401
4		IC	PT6961 SOP	1	U401
5		SOCKET	2P 2.0mm	1	XS403
6		SOCKET	9P 2.0mm	1	XS402
7		SOCKET	6P 2.0mm	1	XS401
8		SMD RESISTOR	1/16W 100Ω ±5%	1	R412
9		SMD RESISTOR	1/16W 2.2Ω ±5%	1	R408
10		SMD RESISTOR	1/16W 10K ±5%	3	R403,R404,R405
11		SMD RESISTOR	1/16W 51K ±5%	1	R401
12		SMD CAPACITOR	50V 104 +80%-20% 0603	1	C401
13		PCB	4963-2	1	

7. SUBSIDIARY BOARD 1

NO		MATERIAL	SPECIFICATIONS/PART NUMBER	QUANTITY	LOCATION
1		SMD RADIATION DIODE	LTST-C930TBKT	1	LEDA01
2		FLAT CABLE	2P100 2.0 1 SOCKET RED-BLACK 28#CORD	1	XSA01
3		PCB	A963-1	1	

8. SUBSIDIARY BOARD 2

NO		MATERIAL	SPECIFICATIONS/PART NUMBER	QUANTITY	LOCATION
1		SMD CAPACITOR	50V 104 +80%-20% 0603	1	C901
2		SMD DIODE	1N4148	2	D901,D902
3		LIGHT TOUCH RESTORE SWITCH	VERTICAL 6×7×1	1	K906
4		SMD LIGHT TOUCH SWITCH	TD-BXAX-A00(160 GRAM POWER)	5	K901~K905
5		SOFE FLAT CABLE	9P70 2.0 2 SOCKET WITH L NEEDLE, THE SAME DIRECTION	1	XS901
6		IR SENSOR	HS0038B3V	1	U901
7		BUTTON STAND BOARD	DV963 GREY	1	
8		TAPPING SCREW	CB 1.7×4.2 BLACK	4	FUNCTION BUTTON AND PCB AND 4 STAND BOARDS
9		FUNCTION BUTTON	DV963 TRANSPARENT	1	
10		PCB	9963-0	1	