13. Circuit Description

13-1 Overall Block Description
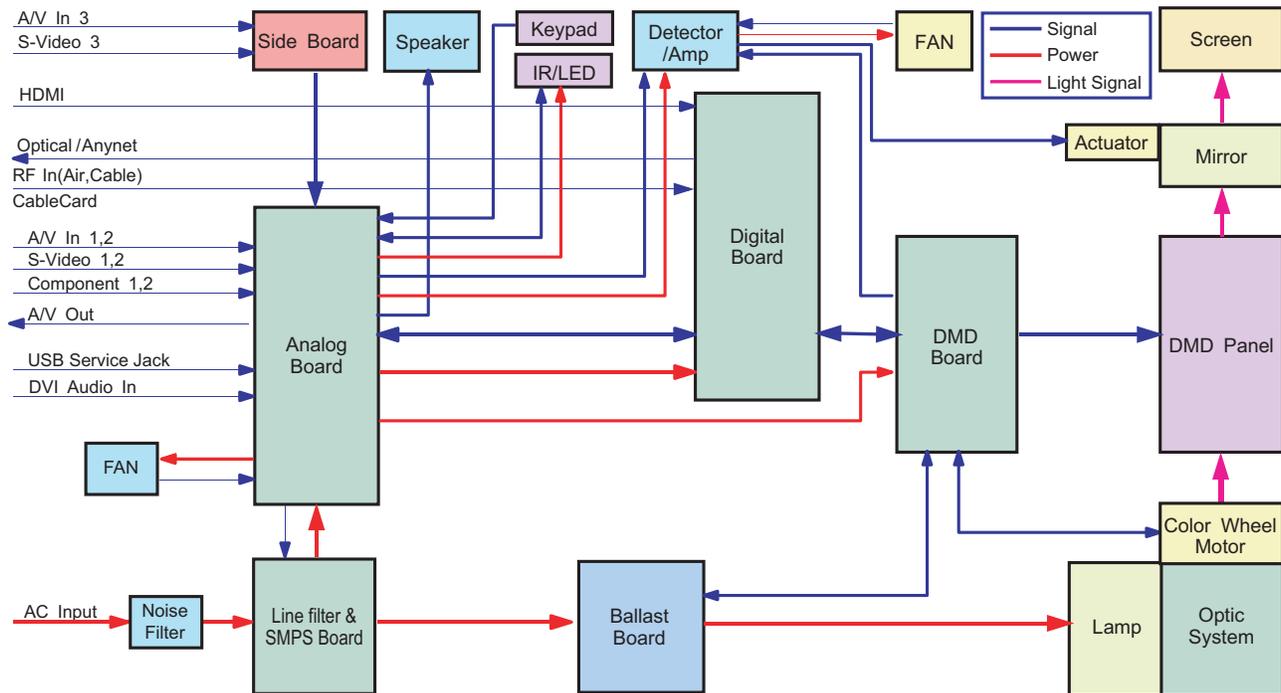
The DLP TV is largely divided into: Power part, Engine part and Analog + Digital parts.
The ass'y that consists of the DMD board, Detect (Actuator) board, lamp, ballast and optical devices is called the Engine.
The analog + digital board parts receive the AV signals to output voice signals and process the remote control signals.
The engine part displays the video data on the screen, which is generated in the analog + digital boards.

The AV signals are input through the analog and digital boards. ADV7401 processes the MUX and decoding while X226
B processes the CPU functions, MPEG and I2S.
Finally, the improved DNIe image is sent to the DMD engine board.

The final data by DNIe is processed in DDP1011 of the DMD board to display the image on the DMD panel. This image is created
by the light of the lamp through the color wheel which is enlarged and projected onto the screen.
This is the DLP of the L3 or L6 type that the actuator operates additionally during this process.

The power terminal generates the DC power needed for the product and sends it to the analog board. The analog board supplies
the power to the digital and DMD boards.
In the meantime, the power source board supplies DC220v - 400v directly to the ballast in order to light the lamp.
The ballast is like a stabilizer for lighting the lamp.

The ultimate purpose of the TV set is to project an image onto the screen and output the voice signals synchronized with the
image. And based on the DMD panel used, a 1-panel TV requires a color wheel while a 3-panel TV does not. The HD4 panel
needs an actuator while the HD2 does not. However, the drive mechanism and the overall block structure of the two panels are the
same.

13-2 Partial Block Description

13-2-1 Power Board Block Description
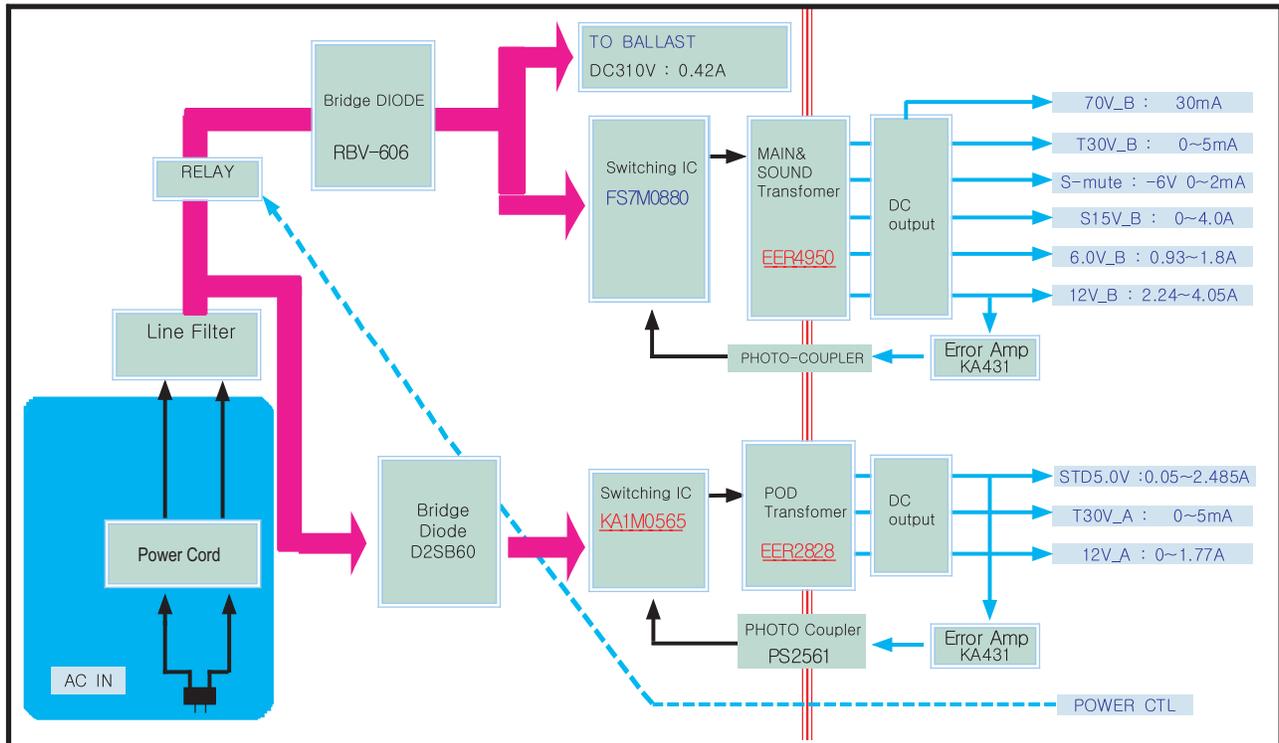
1. What is SMPS?

   This is an acronym for Switching Mode Power Supply and this is responsible for receiving AC input voltage
   (Line frequency: 50HZ~60HZ) and supplying insulated DC output.

2. SMPS Components

   1) Standby Power: A combination of ICS801 (SWITCHING IC) and TS801S (TRANS) that supplies STAND-BY 5V for operating
                     the Micom.
   2) Multi Power: The voltage supplied when the power is turned on.
                It is a combination of IC801S and T801S that supplies various voltages including D12V, A6.5V, S14.5V, T30V and
                A65V.

3. SMPS Operation

   1) SMPS System: Uses Fly-Back technology for both standby and multi power.
   2) Operation: Fly-Back is one of the most popular power-supply systems and uses less power than 200W as well as being the
                cheapest of all multi output SMPS systems.
                Let's have a look at how it operates···
                     a. Converts AC input into DC (HOT) (rectifies to DS801 before smoothing to CS801)
                     b. The converted DC voltage is high, especially compared to ground, so touching it will cause electric shock.
                        Use T801S (Trans) to insulate the secondary voltage and take advantage of the PWM operations of T801S
                        and IC801S to induce it.
                     c. The secondary induced voltage is 66KHz square wave power, which goes through the smoothing
                        cap (CS822) to be generated in the standby 5V.
                     d. Multi power also operates the same way.

4. Input&Output voltage

  1) Input voltage   * Aemrica(AC120V) - OPTION
                     * Korea(AC220V) - OPTION
                     * The others(AC100V~AC240V) - OPTION
  2) Output voltage * D12V / 2.5A - 12V , 3.3V , 1.8V : For signal processing
                     * A6.5V / 1A - For driving the tuner
                     * S14.5V / 4A -For driving sound processor
                     * T30V / 5mA - For driving the tuner
                     * A65V / 30mA - For driving the actuator

13-2-2 Digital Board Block Description
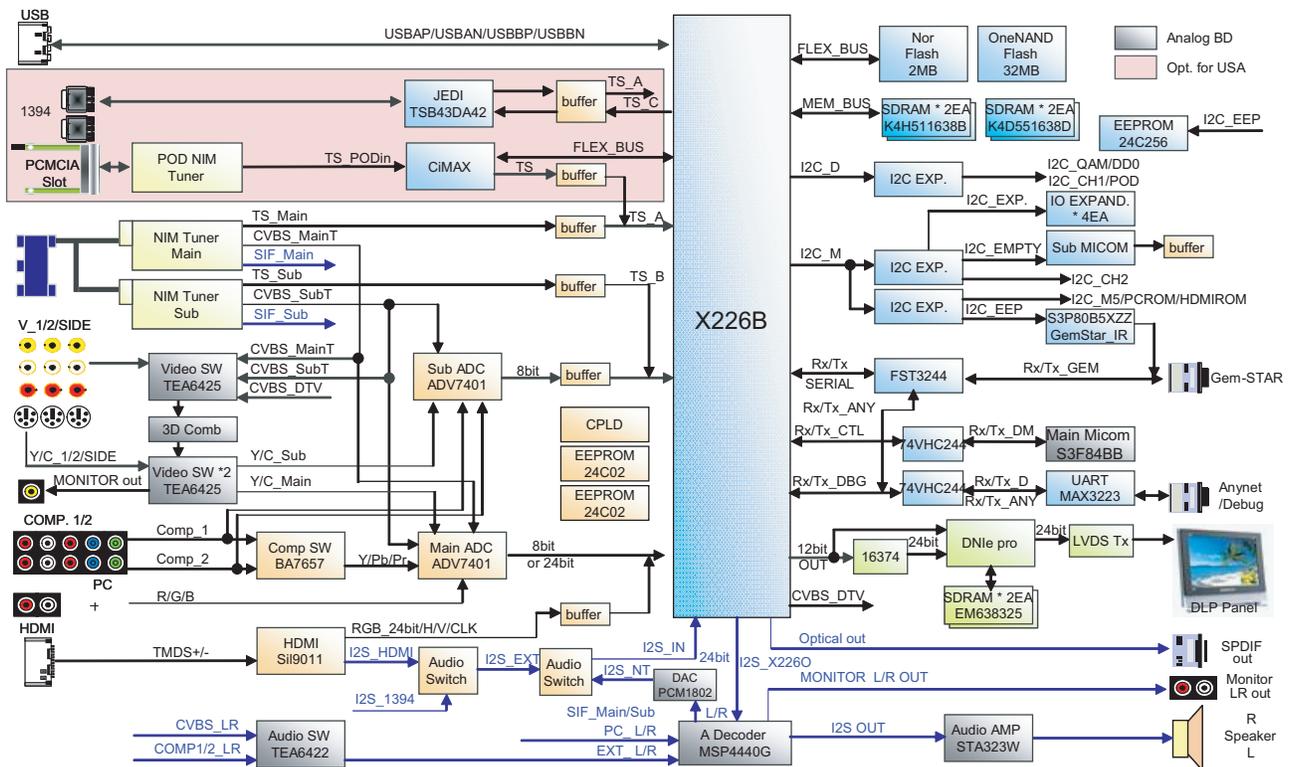
- ■ ADV7401: Analog YPBPR, CVBS, Y/C(SUPER), Input MUXING and Video Decoding
- ■ X226: CPU, + MPEG Decoder, Audio signals transferred to MSP of the analog board by I2S
- ■ DNIE: Uses a noise-filtering and picture quality improvement algorithm to implement natural colors.
- ■ Tuner: Two HD tuners, each taking the role of the analog tuner.
- ■ HDMI: Receives one input signal and transfers it to X226 in 24 bits.
- ■ Others: Anynet implementation, Optical Power Port, USB Update Port (not available for MP3)

The L3HD or L6HD digital board contains two HD tuners to implement analog as well as digital signals from air/cable broadcasting.
It decodes Y PB PR CVBS, Y/C(SUPER) and HDMI inputs using ADV7400 and silicon chips, which are transferred to X226 (ATI), a combination of the main CPU and the MPEG decoder.
All video/audio inputs are transferred to X226 for digital processing and all video output goes through DNIe to the DLP DMD board.
Audio signals are transferred to the MSP chip of the analog board using I2S and are emitted through the speaker.
It also has an Anynet port, a 5.1 channel optical port and a USB port for a S/W update.

13-2-3 Analog Board Block Description
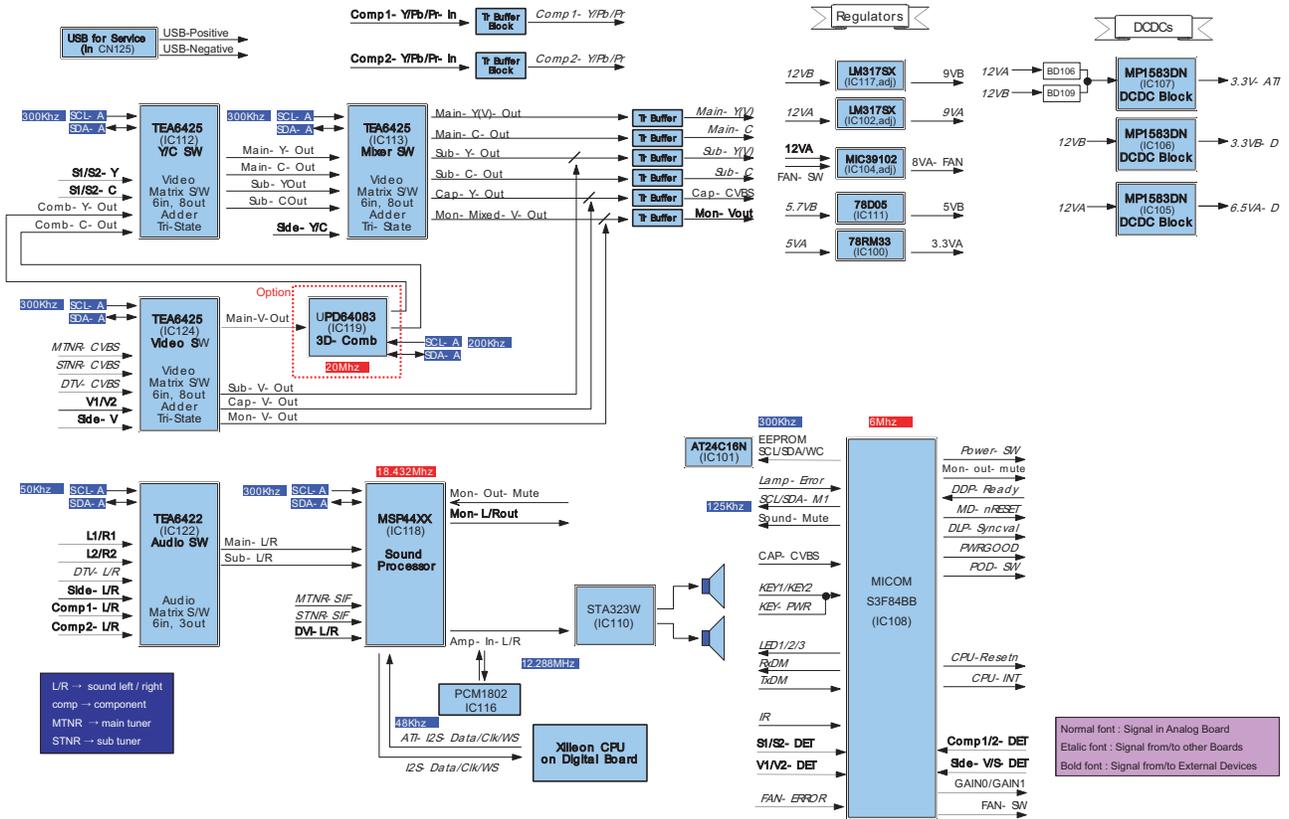
■ Analog Video Signal Processing

■ Select Sound/Video

One is selected from multiple inputs by the switching ID. MICOM decides which port is used for output.

For broadcasting signals, sub-outputs are transferred in CVBS and, the main outputs in Y/C through the 3D Comb, to the digital board.

Sound signals are selected by the switching IC, of which only one input is transferred to the speaker.

■ Detection Signal Flow

When each port is connected to a signal cable, the detection signal is "low" and can be checked by Micom scanning.

13-2-4 DMD Board Block Description
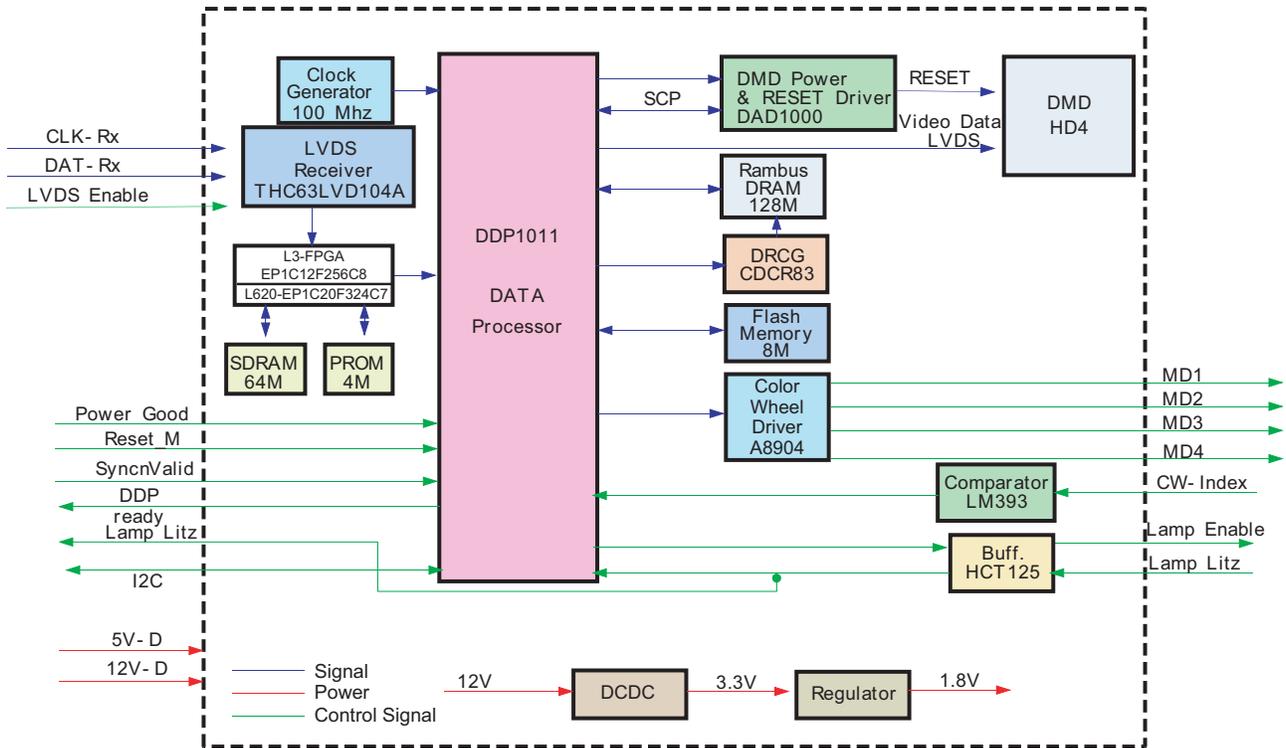

■ Controls the lamp (ON/OFF)
■ Drives the color wheel motor
■ Drives the panel
■ Controls the sensors

13-3 New Circuit Description

### 13-3-1 Output Voltage States of the DMD Board Parts
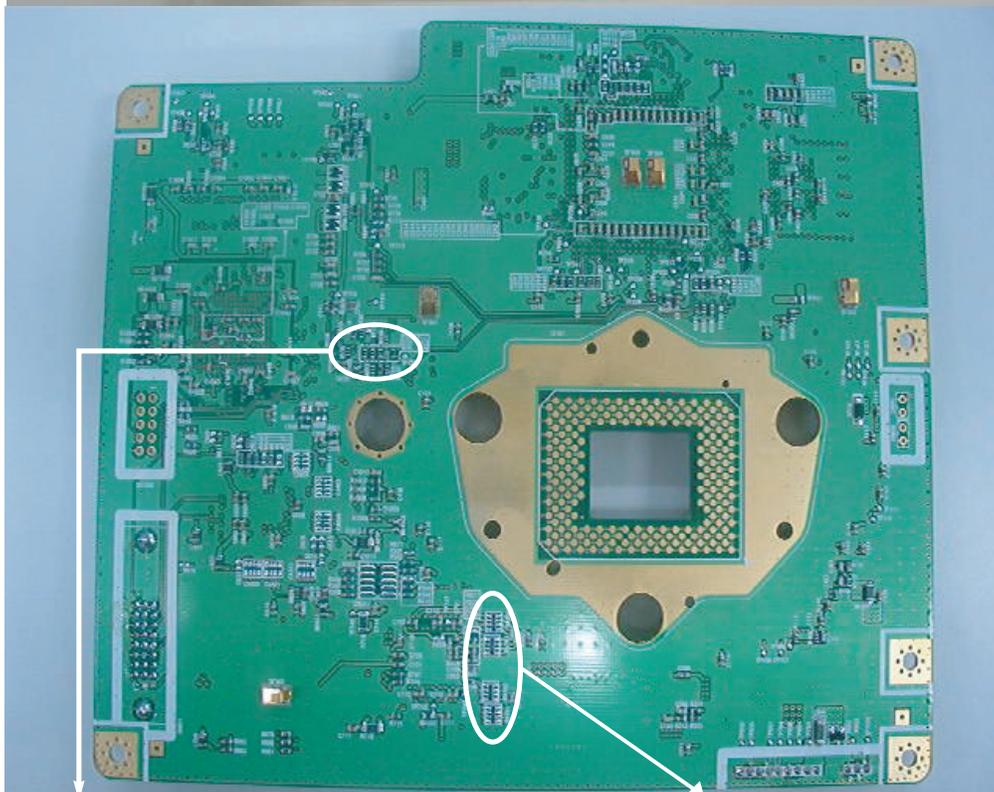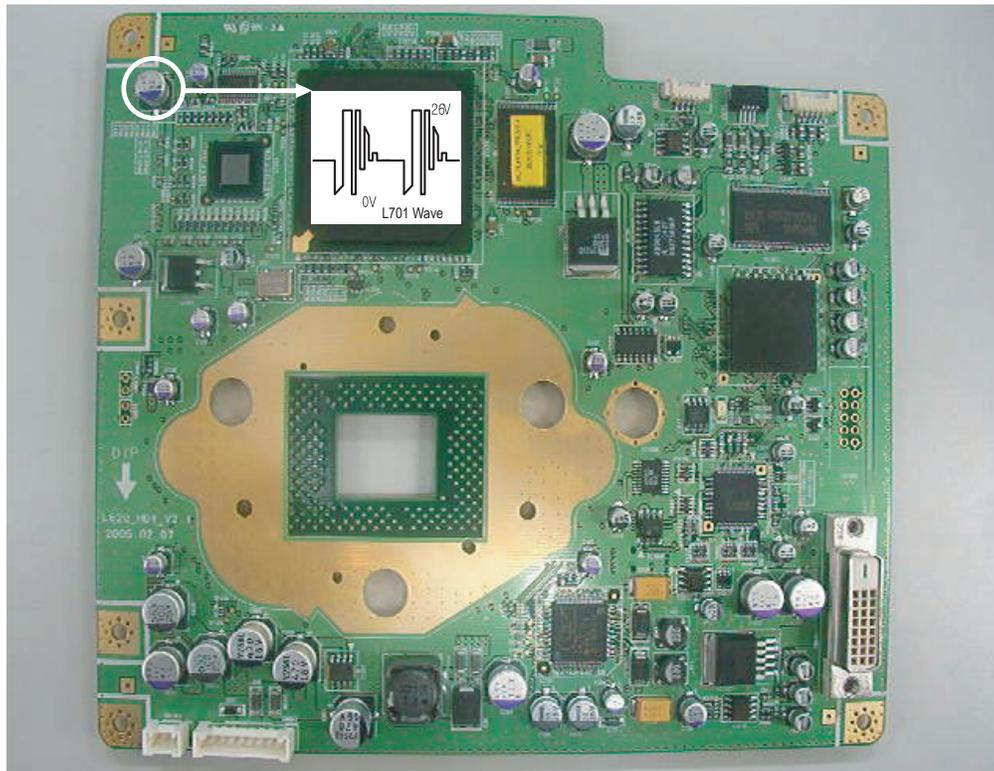
Loc.		Characteristics
R534	LAMP EN	High from DDP1010
R531	LAMP LITZ	High (5V) before the lamp turns on. Low (0V) when the lamp turns on.
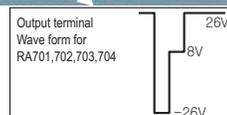
13-3-2 DMD Panel Pin Terminal Characteristics Diagram

※ Remove the heat sink attached to the DMD Board and tighten the screws in four places and then inspect the characteristics of each pin terminal.

	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
A					V		V			DA	N6	DA	N4	V		DA	N2	DA	P0	V		G		G			V	V		G	G						V		N		A
B			V							DA	P6	DA	P4			DA	P2	DA	N0											G				C							B
C								G				DA	P7	DA	P5		DA	N3	DA	N1									G										V		C
D	DA	N8	DA	P8	C		C					DA	N7	DA	N5		DA	P3	DA	P1							G											V			D
E		DA	N10	DA	P10	DA	P9	DA	N9																														V		E
F	V																																			V		V2			F
G		DA	N12	DA	P12	DA	P11	DA	N11																												V2	V2			G
H	V2		V2			DA	P13	DA	N13																													V2			H
J		V																																			V	V2			J
K	DA	P14	DA	N14	DA	P15	DA	N15																													V				K
L	DB	P14	DB	N14	DB	P15	DB	N15																												ME	V				L
M	V																										14		11						V2						M
N		V2		V2			DB	P13	DB	N13																	10		5		1						V2				N
P	DB	N10	DB	P10	DB	P11	DB	N11																					4		V				V2						P
R		V																																			V	V2			R
T	DB	N10	DB	P10	DB	P9	DB	N9																													V				T
U		DB	N8	DB	P8							DB	N7	DB	N5		DB	P3	DB	P1	6		3			T0		G							0				V		U
V							EV				DB	P7	DB	P5		DB	N3	DB	N1	13		9						G									V			V
W		V		C		C				DB	P6	DB	N4			DB	P2	DB	N0	12		8				7	T2		G		C				V					W
Y				V		V			DB	N6	DB	P4	V		DB	N2	DB	P0	V					V		2		T1	G				V							Y
	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	

The vertical lines, which may occur due to improper connections between the panel and the PCB, occur with intervals of 50 inches(26mm). If vertical lines occur with intervals of more than 26mms, it indicates a failure of the DDP1011 IC itself. If they occur with intervals of less than 26mm, it means that more than two pins have bad connections.

DA,DB output wave [Screen:WHITE]

Pin Name	Description	Pin Name	Description
V	Voltage : 3.3V	T	Test Point
V2	VCC2 : 8V	ME	Mirror Bias Extra
DA	A Channel Data Bus [When measured, there should be a waveform]	C	Clock
DB	B Channel Data Bus [When measured, there should be a waveform]	P#	A,B Channel Positive
NO.	MBRST# (Mirror Bias Rest) 26V	N#	A,B Channel Negative
G	The part from the present position to the GND (The black part is also a GND.)		

13-3-3 Description of Terminal Characteristics

Pin Name	Description
SCTRL_BN/P	B channel LVDS serial control
DCLK_BN/P	B channel LVDS CLOCK
SCPDI	SERIAL CONTROL DATA INPUT
SCPDO	SERIAL CONTROL DATA OUTPUT
SCPENB	SERIAL CONTROL ENABLE
SCPCK	SERIAL CONTROL CLOCK
DMD RESETB	DMD LOGIC RESET
MBRST(14:0)	MIRROR BIAS RESET
MBRST_EXTRA	UNUSED MIRROR BIAS RESET
SCR_CLR	TEST CLEAR PINS(NORMAL GND)
READOUTA(1:0)	A-CHANNEL SERIAL DATA OUT DURING SPAM READ TEST OPERATION
READOUTB(1:0)	B-CHANNEL SERIAL DATA OUT DURING SPAM READ TEST OPERATION
TP(2:0)	MANUFACTORING TEST POINT(NO CONNECTED DURING NORMAL CPERATION)
RSV_A(4:0)/RSV_B(4:0)	RESERVED PINS(NORMAL:GND)
EVCC	REFERENCE VOLTAGE DURING SPAM READ TEST OPERATION(NORMAL GND)
VCC2	MIRROR ELECTRODE VOLTAGE(7.3V)
VCC	LOGIC SUPPLY
VSS	LOGIC GROUND

13-3-4 Engine Failure Inspection Flow Chart for the DMD Board

No.	Description	Key Point	Remark
1	1) When the power cord is plugged in, 2) DC 330V is automatically supplied to the ballast.	Check whether the DC 330V power is supplied to the ballast.	
2	1) When the power key is pressed via the remote control, the micom of the analog board outputs high (5V) PWR signals. 2) The power board operates normally. 5V and 12V are supplied to the DMD CN602 terminal.	Check whether 5V and 12V are supplied to the CN602 terminal.	* 12V must be supplied to operate the motor.
3	1) The MTR Reset signal is supplied to the TP713 terminal of the motor IC704 from the micom on the digital board and then the motor starts to drive. 2) If the color wheel rotates for a certain time and then stops, check whether the color wheel sensor is normal. (Check the waveform on the No.2 terminal below CN502.)	After the set is powered on, check whether 5V is detected on pin No.20 of IC704. → After a while, the sound generated by the rotating color wheel is heard.	* If 5V is not detected, the motor will not operate.
4	1) Check whether the signal (SCI: START CONTROL INPUT) that turns on lamp #2 of CN504 on the DMD board is high (5V).	Check whether CN504 #2 signal is 5V.	* When SCI is high (5V), the lamp litz of CN504 is low (0V). * CN504 #2 terminal voltage changes to pulse wave form 14 seconds after (for 50 inch TV) the time that the voltage is 5V. * When about 4 seconds have passed after changing to pulse waveform, the screens are displayed on the set.
5	1) Method for checking whether the DDP1011 IC RESET is normal.	If the voltage R204 is 3V, it is normal.	

13-3-5 IC Line Up

1. Power Board

Items	Descriptions	Remarks
Main SMPS	FS7M0880, Fairchild	IC-PWM Controller ; Main Power
Stand-by SMPS [America]	KA1M0565, Fairchild	IC-PWM Controller ; Stand-by Power
Stand-by SMPS [Korea]	KA5M0165, Fairchild	IC-PWM Controller ; Stand-by Power

2. Digital Board

Items	Descriptions	Remarks
MPEG2 Decoder	X226B	CPU(MIPS), TS Demux, MPEG2 Decoder, Format converter, Deinterlacer, Scaler, USB
analog Decoder, ADC	ADV7401	Video Processor, ADC
HDMI Receiver	Sil9011	Digital Receiver for HDMI with HDCP
COMPONENT S/W	BA7657	COMPONENT S/W, H/V Sync S/W
Video Enhance	SDP32 SAMSUNG	RGB Processor
Program ROM	AT49BV x 2	32M(1M x 16) x 2, Nor-Type Flash Memory
Frame Buffer	192MB DDR, 64M ,Samsung	Frame Memory
LVDS Transmitter	THC63LVDM83R, THINE DTC34LM85A, DOESTEK	DTC34LM85A, DOESTEK
IEEE1394	JEDI(TSB43DA42A)	IEEE1394 Interface
Gemstar EPG	Yamu MICOM(3P8OB5X)	IR Blaster

3. Analog Board

Items	Descriptions	Remarks
Video Switch	TEA6425, SGS-Thomson	Video Switch IC for TV *3
Audio Switch	TEA6422, SGS-Thomson	Audio Switch IC for TV
3D-Comb	uD64083, NEC	3 Dimensional Y/C Separation LSI
Sound Module	MSP4440, Micronas	Multistandard Sound Processor With TruSorround XT
Sound AMP	TPA3001D, TI	1 Channel Digital Audio Power Amplifier *2
Micom	SDA55xx, Micronas	Micro Controller

4. DMD Board

Items	Descriptions	Remarks
DMD Driver	DDP1011, TI	DLP Data Processor
Reset, Power	DAD1000, TI	DMD Power and Reset Driver
Motor Controller	A8904, Allegro	12V VCM/Spindle Pre-Driver
Frame Buffer	K4R271669, Samsung	128M(246K x 16 x 32B), Rambus DRAM
Clock Generator	CDCR83, TI	Direct Rambus Clock Generator
Program ROM	M29W800BT, ST	8M(1M x 8 or 512K x 16), Flash Memory
Actuator Driver	Cyclone, Altera	Frame Extractor 60Hz(1 frame) $\rightarrow$ 120Hz(1/2 frame)
LVDS Receiver	THC63LVD104, Thine	LVDS Digital Receiver, 75MHz