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COLOR TELEVISION

SERVICE MANUAL

CHASSIS NO. ETA-1/ETA-1R

Please read this manual carefully before service.

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SAFETY INSTRUCTIONS AND MAINTENANCE

WARNING: BEFORE SERVICING THIS CHASSIS, READ THE "X-RAY RADIATION PRECAUTION", "SAFETY PRECAUTION" AND "PRODUCT SAFETY NOTICE" INSTRUCTION BELOW.

X-RAY RADIATION PRECAUTION

1. The EHT must be checked every time the TV is serviced to ensure that the CRT does not emit X-ray radiation as result of excessive EHT voltage. The maximum EHT voltage permissible in any operating circumstances must not exceed the rated value. When checking the EHT, use the High Voltage Check procedure in this manual using an accurate EHT voltmeter.
2. The only source of X-RAY radiation in this TV is the CRT. The TV minimizes X-RAY radiation, which ensures safety during normal operation. To prevent X-ray radiation, the replacement CRT must be identical to the original fitted as specified in the parts list.
3. Some components used in this TV have safety related characteristics preventing the CRT from emitting X-ray radiation. For continued safety, replacement component should be made after referring the PRODUCT SAFETY NOTICE below.
4. Service and adjustment of the TV may result in changes in the nominal EHT voltage of the CRT anode. So ensure that the maximum EHT voltage does not exceed the rated value after service and adjustment.

SAFETY PRECAUTION

WARNING: REFER SERVICING TO QUALIFIED SERVICE PERSONNEL ONLY.

1. The TV has a nominal working EHT voltage. Extreme caution should be exercised when working on the TV with the back removed.
 - 1.1 Do not attempt to service this TV if you are not conversant with the precautions and procedures for working on high voltage equipment.
 - 1.2 When handling or working on the CRT, always discharge the anode to the TV chassis before removing the anode cap in case of electric shock.
 - 1.3 The CRT, if broken, will violently expel glass fragments. Use shatterproof goggles and take extreme care while handling.
 - 1.4 Do not hold the CRT by the neck as this is a very dangerous practice.
2. It is essential that to maintain the safety of the customer all power cord forms be replaced exactly as supplied from factory.
3. Voltage exists between the hot and cold ground when the TV is in operation. Install a suitable isolating transformer of beyond rated overall power when servicing or connecting any test equipment for the sake of safety.

4. When replacing ICs, use specific tools or a static-proof electric iron with small power (below 35W).
5. Do not use a magnetized screwdriver when tightening or loosening the deflection yoke assembly to avoid electronic gun magnetization and decrement in convergence of the CRT.
6. When remounting the TV chassis, ensure that all guard devices, such as nonmetal control buttons, switch, insulating sleeve, shielding cover, isolating resistors and capacitors, are installed on the original place.
7. Replace blown fuses within the TV with the fuse specified in the parts list.
8. When replacing wires or components to terminals or tags, wind the leads around the terminal before soldering. When replacing safety components identified by the international hazard symbols on the circuit diagram and parts list, it must be the company-approved type and must be mounted as the original.
9. Keep wires away from high temperature components.

PRODUCT SAFETY NOTICE

CAUTION: FOR YOUR PROTECTION, THE FOLLOWING PRODUCT SAFETY NOTICE SHOULD BE READ CAREFULLY BEFORE OPERATING AND SERVICING THIS TV SET.

1. Many electrical and mechanical components in this chassis have special safety-related characteristics. These characteristics are often passed unnoticed by a visual inspection and the X-ray radiation protection afforded by them cannot necessarily be obtained by using replacements rated at higher voltages or wattage, etc. Components which have these special safety characteristics in this manual and its supplements are identified by the international hazard symbols on the circuit diagram and parts list. Before replacing any of these components read the parts list in this manual carefully. Substitute replacement components which do not have the same safety characteristics as specified in the parts list may create X-ray radiation.
2. Do not slap or beat the cabinet or CRT, since this may result in fire or explosion.
3. Never allow the TV sharing a plug or socket with other large-power equipment. Doing so may result in too large load, causing fire.
4. Do not allow anything to rest on or roll over the power cord. Protect the power cord from being walked on, modified, cut or pinched, particularly at plugs.
5. Do not place any objects, especially heavy objects and lightings, on top of the TV set. Do not install the TV near any heat sources such as radiators, heat registers, stove, or other apparatus that produce heat.
6. Service personnel should observe the SAFETY INSTRUCTIONS in this manual during use and servicing of this TV set. Otherwise, the resulted damage is not protected by the manufacturer.

SAFETY SYMBOL DESCRIPTION



The lightning symbol in the triangle tells you that the voltage inside this product may be strong enough to cause an electric shock. Extreme caution should be exercised when working on the TV with the back removed.



This is an international hazard symbol, telling you that the components identified by the symbol have special safety-related characteristics.



FDA

This symbol tells you that the critical components identified by the FDA marking have special safety-related characteristics.

UL

This symbol tells you that the critical components identified by the UL marking have special safety-related characteristics.

C UL

This symbol tells you that the critical components identified by the C-UL marking have been evaluated to the UL and C-UL standards and have special safety-related characteristics.

VDE

This symbol tells you that the critical components identified by the VDE marking have special safety-related characteristics.

MAINTENANCE

1. Place the TV set on a stable stand or base that is of adequate size and strength to prevent it from being accidentally tipped over, pushed off, or pulled off. Do not place the set near or over a radiator or heat register, or where it is exposed to direct sunlight.
2. Do not install the TV set in a place exposed to rain, water, excessive dust, mechanical vibrations or impacts.
3. Allow enough space (at least 10cm) between the TV and wall or enclosures for proper ventilation.
4. Slots and openings in the cabinet should never be blocked by clothes or other objects.
5. Please power off the TV set and disconnect it from the wall immediately if any abnormal condition are met, such as bad smell, belching smoke, sparkling, abnormal sound, no picture/sound/raster. Hold the plug firmly when disconnecting the power cord.
6. Unplug the TV set from the wall outlet before cleaning or polishing it. Use a dry soft cloth for cleaning the exterior of the TV set or CRT screen. Do not use liquid cleaners or aerosol cleaners.

ADJUSTMENTS

SET-UP ADJUSTMENTS

The following adjustments should be made when a complete realignment is required or a new picture tube is installed.

Perform the adjustments in the following order:

1. Color purity
2. Convergence
3. White balance

Notes:

The purity/convergence magnet assembly and rubber wedges need mechanical positioning.
For some picture tubes, purity/ convergence adjustments are not required.

1. **Color Purity Adjustment**

Preparation:

Before starting this adjustment, adjust the vertical sync, horizontal sync, vertical amplitude and focus.

- 1.1 Face the TV set north or south.
- 1.2 Connect the power plug into the wall outlet and turn on the main power switch of the TV set.
- 1.3 Operate the TV for at least 15 minutes.
- 1.4 Degauss the TV set using a specific degaussing coil.
- 1.5 Set the brightness and contrast to maximum.
- 1.6 Counter clockwise rotate the R /B low brightness potentiometers to the end and rotate the green low brightness potentiometer to center.
- 1.7 Receive green raster pattern signals.
- 1.8 Loosen the clamp screw holding the deflection yoke assembly and slide it forward or backward to display a vertical green zone on the screen. Rotate and spread the tabs of the purity magnet around the neck of the CRT until the green zone is located vertically at the center of the screen.
- 1.9 Slowly move the deflection yoke assembly forward or backward until a uniform green screen is obtained.
- 1.10 Tighten the clamp screw of the assembly temporarily. Check purity of the red raster and blue raster until purities of the three rasters meet the requirement.

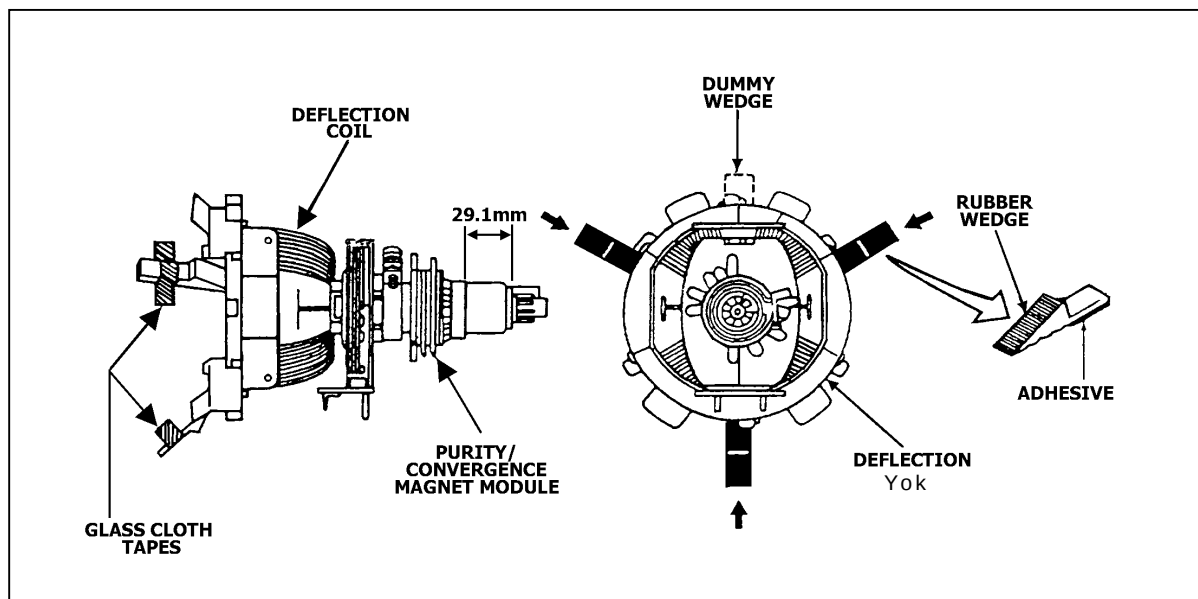


Fig. 1

2. Convergence Adjustment

Preparation:

Before attempting any convergence adjustment, the TV should be operated for at least 15 minutes.

2.1 Center convergence adjustment

2.1.1 Receive dot pattern.

2.1.2 Adjust the brightness/contrast controls to obtain a sharp picture.

2.1.3 Adjust two tabs of the 4-pole magnet to change the angle between them and red and blue vertical lines are superimposed each other on the center of the screen.

2.1.4 Turn both tabs at the same time keeping the angle constant to superimpose red and blue horizontal on the center of the screen.

2.1.5 Adjust two tabs of the 6-pole magnet to superimpose red/blue line and green line.

2.1.6 Remember red and blue movement. Repeat steps 2.1.3 ~ 2.1.5 until optimal convergence is obtained.

2.2 Circumference convergence adjustment

2.2.1 Loosen the clamp screw holding the deflection yoke assembly and allow it tilting.

2.2.2 Temporarily put the first wedge between the picture tube and deflection yoke assembly. Move front of the deflection yoke up or down to obtain better convergence in circumference. Push the mounted wedge in to fix the yoke temporarily.

2.2.3 Put the second wedge into bottom.

2.2.4 Move front of the deflection yoke to the left or right to obtain better convergence in circumference.

2.2.5 Fix the deflection yoke position and put the third wedge in either upper space. Fasten the

deflection yoke assembly on the picture tube.

- 2.2.6 Detach the temporarily mounted wedge and put it in either upper space. Fasten the deflection yoke assembly on the picture tube.
- 2.2.7 After fastening the three wedges, recheck overall convergence and ensure to get optimal convergence. Tighten the lamp screw holding the deflection yoke assembly.

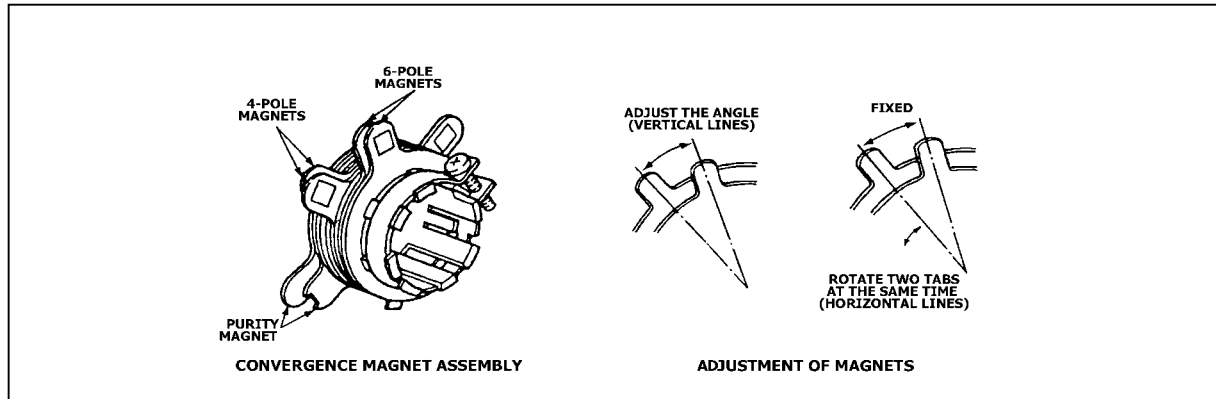


Fig. 2

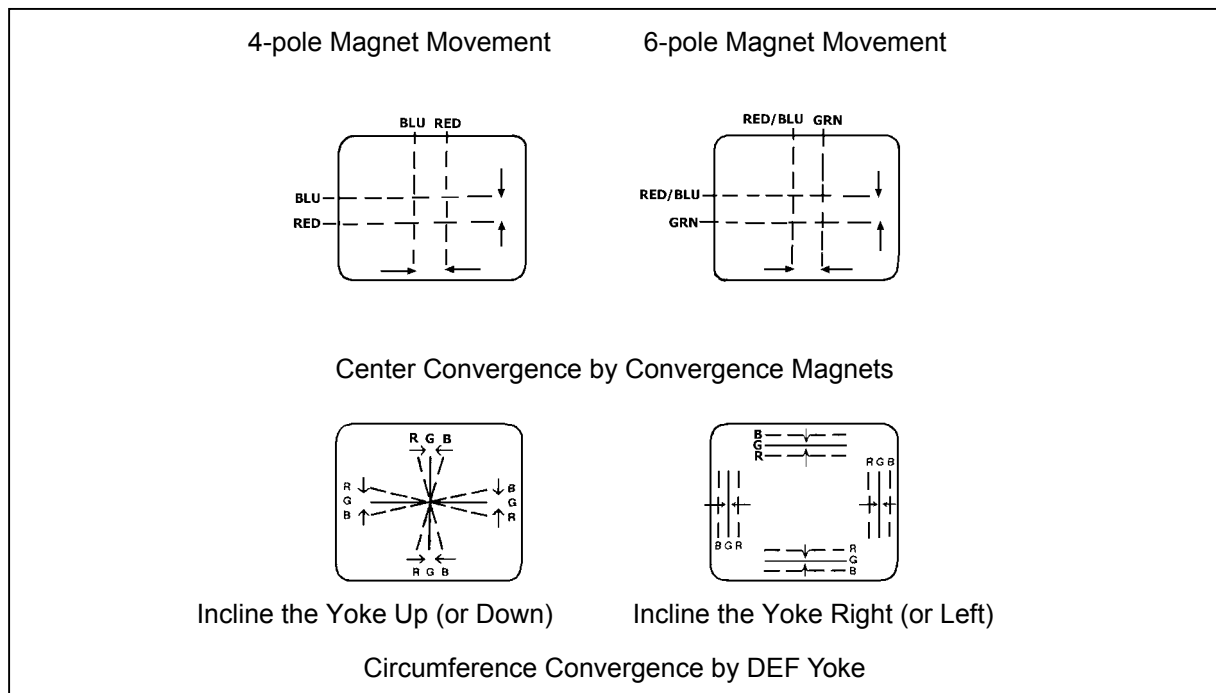


Fig.3

3. White Balance Adjustment

Generally, white balance adjustment is made with professional equipment. It's not practical to get good white balance only through manual adjustment. For TVs with I²C bus control, change the bus data to adjust white balance.

CIRCUIT ADJUSTMENTS

Preparation:

Circuit adjustments should be made only after completion of set-up adjustments.

Circuit adjustments can be performed using the adjustable components inside the TV set. For TVs with I²C bus control, first change the bus data.

1. Degaussing

A degaussing coil is built inside the TV set. Each time the TV is powered on, the degaussing coil will automatically degauss the TV. If the TV is magnetized by external strong magnetic field, causing color spot on the screen, use a specific degausser to demagnetize the TV in the following ways. Otherwise, color distortion will be shown on the screen.

- 1.1 Power on the TV set and operate it for at least 15 minutes.
- 1.2 Receive red full-field pattern.
- 1.3 Power on the specific degausser and face it to the TV screen.
- 1.4 Turn on the degausser. Slowly move it around the screen and slowly take it away from the TV.
- 1.5 Repeat the above steps until the TV is degaussed completely.

2. Confirmation and Adjustment for Voltage

Caution: +B voltage has close relation to high voltage. To prevent X-ray radiation, set +B voltage to the rated value.

- 2.1 Make sure that the supply voltage is within the range of the rated value.
- 2.2 Connect a digital voltmeter to the voltage output terminal of the main PCB. Power on the TV and set the brightness and sub-brightness to minimum. Ensure that the voltage from the main PCB reads as follows.
- 2.3 Regulate voltage adjustment components on the power section until the +B the voltage reaches the rated value.

Table 1

Test Point	Voltage (V)	Test Point	Voltage (V)
TP-130V	130V $\pm$ 1.5V	TP-18V	20V $\pm$ 1V
TP-17V	17V $\pm$ 1V	TP-5V-2	5V $\pm$ 0.3V
TP-5V-1	5V $\pm$ 0.3V	TP-8V	8V $\pm$ 0.5V
TP-11V	11V $\pm$ 1V	TP-26V	26V $\pm$ 1V
TP-200V	190V $\pm$ 5V		

Note:

It's impossible to check the power part separately from the main chassis board as the part is mounted on the main chassis board. The power components, etc. should be checked for burnout when power-on. If burned out, do not power on the TV again until the cause is found out.

3. High Voltage Inspection

Measure voltages of test points on the main PCB with the digital voltmeter. Measure the CRT high voltage with the high-voltage testing equipment and heater voltage with the high-frequency effective voltmeter. The rated values are shown as below.

Table 2

Test Point	Voltage (V)
Negative of VD461	$26 \pm 1V$
Negative of VD485	$190 \pm 5V$
CRT anode	$27 \pm 1.5KV$
Heater	$6.3 \pm 0.3V_{rms}$

4. Focus Adjustment

Caution: Dangerously high voltages are present inside the TV. Extreme caution should be exercised when working on the TV with the back removed.

4.1 After removing the back cover, look for the FBT on the main PCB. There should be a FCB on the FBT.

4.2 Power on the TV and preheat it for 15 min.

4.3 Receive a normal TV signal. Rotate knob of the FCB until you get a sharp picture.

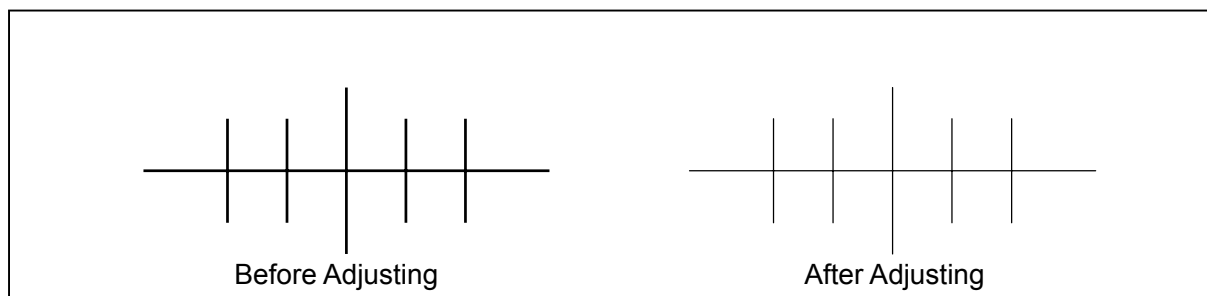


Fig. 4

5. Safety Inspection

5.1 Inspection for insulation and voltage-resistant

Perform safety test for all naked metal of the TV. Supply high voltage of 3000V AC, 50Hz (limit current of 10mA) between all naked metal and cold ground. Test every point for 3 sec. and ensure no arcing and sparking.

5.2 Requirements for insulation resistance

Measure resistance between naked metal of the TV and feed end of the power cord to be infinity with a DC-500 high resistance meter and insulation resistance between the naked metal and

degaussing coil to be over 20M Ω .

6. SERVICE mode

6.1 To enter the DESIGN/SERVICE mode

Set the volume to 0. Then press and hold the MUTE button on the remote control, and press the MENU button on the TV to enter the SERVICE mode. In this case, red "s" is displayed on the upper center of the screen. To exit from the S mode, turn off the TV set by the POWER button on the remote control.

Caution: The user service mode adjustment can be changed only when service personnel adjust the whole set data during servicing. As the control data have dramatic effects on functions and performance of the TV, service personnel should not tell user how to enter the SERVICE mode to avoid improper data settings.

6.2 Adjustments and bus data (GDET0101-07 for ETA-1/GDET0102-02 for ETA-1R)

Table 3 Function Description for Bus Data

	Symbol	Description	Data
PAGE1	OSD	OSD Horizontal Position	29
	OPT	Optional Setting	B3
	RCUT	R CUT OFF	OPT
	GCUT	G CUT OFF	OPT
	BCUT	B CUT OFF	OPT
	GDRV	G DRIVE	OPT
	BDRV	B DRIVE	OPT
	SCNT	SUB CONTRAST	05
PAGE2	CNTN	CONTRAST MIN	0A
	CNTC	CONTRAST CENTER	3B
	CNTX	CONTRAST MAX	7A
	CNTD	CONTRAST MAX IN DVD	F7
	BRTN	BRIGHT MIN.(difference from center)	20
	BRTC	BRIGHT CENTER	40
	BRTX	BRIGHT MAX.(difference from center)	20
	BRTS	SUB BRIGHT	FB
PAGE3	COLC	COLOR CENTER NTSC	33
	COLP	COLOR CENTER PAL(difference from COLC)	02
	COLD	COLOR CENTER DVD	05
	COLN	COLOR MIN.	0D
	COLX	COLOR MAX.(difference from center)	45
	TNTN	TINT MIN.(difference from center)	28
	TNTC	TINT CENTER	40
	TNTX	TINT MAX.(difference from center)	28
PAGE4	ST3	SHARP CENTER 3.58NTSC TV	19
	ST4	SHARP CENTER OTHER TV	19
	SV3	SHARP CENTER 3.58NTSC VIDEO	1D
	SV4	SHARP CENTER OTHER VIDEO	1D
	SVD	SHARP CENTER DVD	1B
	ASSH	ASYMMETRY-SHARPNESS	05

(continued)

	SHPN	SHARP MIN(difference from center)	10
	SHPX	SHARP MAX(difference from center)	16
PAGE5	ABCL	ABL date in detail	0C
	DCBS	A part of Video date in detail	15
	CLTB	The date when TV mode & SOUND SYS = B/G	8A
	CLTD	The date when TV mode & SOUND SYS = D/K	86
	CLTM	The date when TV mode & SOUND SYS = M	AC
	CLVO	The date when YUV mode & SOUND SYS != M	AD
	CLVD	The date when YUV mode & SOUND SYS = M	88
	OSDA	OSD ABL and OSD CONTRAST	01
PAGE6	HPOS	Horizontal Position	OPT
	HPS	Horizontal Position 60Hz(difference from HPOS)	OPT
	VP50	Vertical Position 50Hz	OPT
	VP60	Vertical Position 60Hz	OPT
	HIT	Hight 50Hz	OPT
	HITS	Hight 60Hz(difference from HIT)	OPT
	VLIN	V Linearity 50Hz	OPT
	VLIS	V Linearity 60Hz(difference from VLIN)	OPT
PAGE7	VSC	VS Correction 50Hz	OPT
	VSS	VS Correction 60Hz	OPT
	HBOW		OPT
	HPARA		OPT
	UBLACK		0B
	VBLACK		0B
	AGC	RF AGC	30
	HAFC	AFC GAIN	86
PAGE8	NOIS		0F
	NDTC	Noise detection count test	1F
	MUTT	Y-MUTE FOR SOFT START	00
	STAT	CONTRAST UP FOR SOFT START	00
	VL1	ALC off volume control level	09
	VL25	No use	3D
	VL50	No use	57
	VLX	No use	7F
PAGE9	VA1	volume level when ALC on(IC VER1.2_old)	19
	VA12	No use	25
	VA25	No use	3D
	VA50	No use	57
	VAX	No use	7F
	SVM	MON/SVM CO MAX SVM DL SVM GAIN	10
	VBLK	V BLK start V BLK stop	00
	VCEN	V CENTERING	17
PAGE10	VB1	volume level when ALC on(IC VER1.2_new)	09
	VB25	No use	3D
	VB50	No use	57
	VBX	No use	7F
	FLG0	FLAGS for IF	44
	FLG1	FLAGS	00
	UCOM	Miciom control	00

(continued)

	OSDF	OSD PLL DATE	6A
PAGE11	TB_COL	Menu top OSD area plane color set	9B
	BB_COL	Menu itmes OSD area plane color set	BD
	CL_COL1	Calendar OSD color	02
	CL_COL2	Calendar OSD color	02
	PYNX	Normal H.SYNC max	33
	PYNN	Normal H.SYNC min	11
	PYXS	Search H.SYNC max	22
	PYNS	Search H.SYNC min	1E
PAGE12	RCUTS	R cut offset in DVD	00
	GCUTS	G cut offset in DVD	00
	BCUTS	B cut offset in DVD	00
	GDRVS		00
	BDRVS		00
	AUSTP		04
	BBCT		04
PAGE13	STBG	S TRAP B/G	06
	STI	S TRAP I	08
	STDK	S TRAP D/K	08
	STM	S TRAP M	01
	SSBG	S TRAP HP/LP B/G	08
	SSI	S TRAP HP/LP I	08
	SSDK	S TRAP HP/LP D/K	08
	SSM	S TRAP HP/LP M	09
PAGE14	SYNC		04
	SYBBN	BB judgement	00
	SYBBF	BB judgement	00
	SYSR	Set WIN Pulse and HLOCK Pulse	20
	VCD0		00
	VCD1		00
	BL25	Balance 25	1E
	BL49	Balance 49	50
PAGE15	MODE0		29
	MODE1		0F
	OV50		00
	OV60		00
	HOTEL		00
	FM RADIO		01
	SOUND M		01
	SCR SAV		01
PAGE16	ENGLISH		01
	FRENCH		01
	GERMAN		01
	RUSSIAN		00
	INDONESIAN		01
	MALAY		01
	KOREA		01
	ARABIC		00
PAGE17	INITIAL		00
	LOCK MENU		01
	CALENDAR		01
	INFOMENU		01
	DEMOKEY		01
	SVIDEO		01
	DVDVIDEO		01
	LOGO		00

(continued)

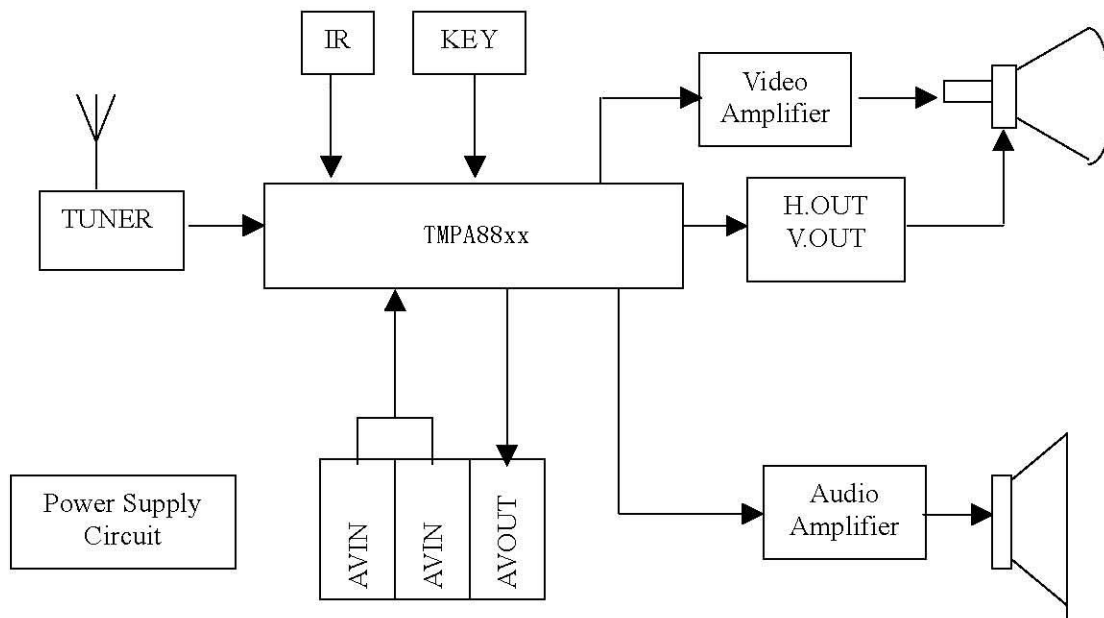
PAGE18	LOGO1COLOR		OPT
	LOGO2COLOR		OPT
	LOGO1LINE		OPT
	LOGO2LINE		OPT
	LOGO1SIZE		OPT
	LOGO2SIZE		OPT
	LG1		OPT
	LG2		OPT
PAGE19	SBY		08
	SRY		08
	SECD		10
	SEC29		00
	ZOOMOFFSET		OPT

Notes:

- ① The data sheet may differ dependent on different models.
- ② The data sheet may differ dependent on different CRTs for the same model.
- ③ PAGE19 for ETA-1R Chassis Series only.

STRUCTURE AND CHISSIS FUNCTION DESCRIPTION

1.STRUCTUE BLOCK DIAGRAM



Structure Block Diagram for ETA-1 Chassis Series

2. CHASSIS DESCRIPTION

General Description

ETA-1 chassis is applied in SF21GA63 series.

By use of Toshiba V/C/D-MCU 2IN1 IC for TV small signal processing and bus control, the chassis enables TV tuning, adjustment, control and picture correction, featuring high-integration, high-performance-to-price ratio and high-reliability and compact circuit with fewer external components. The chassis, widely used in small and medium TVs, provides much more convenience for manufacturing and technical service. It includes:

- 2IN1 IC TMPA88xxPSANG-4VB6 for PAL/NTSC small signal processing and bus control
- EEPROM AT24C16 for data memory
- LA78040 for vertical output power amplifying
- TFA9842AJ for audio power amplifying
- Thick-film IC STR-G5653 for power circuit adjustment and control

The following features are available in the chassis:

- Color systems: PAL, NTSC
- Sound systems: D/K B/G I M
- 236 programs preset
- AV stereo
- I²C bus control
- Electronic program table
- Intelligent lock
- Biorhythm
- Calendar inquiry

The chassis mainly uses the following ICs and assemblies.

Table 5 Key ICs and Assemblies

Serial No.	Position	Type	Description
1	N201	AT24C16	EERPOM
2	N202	GDET0101-07/0102-02 (TMPA88xxPSANG)	2IN1 IC (Small signal processor + micro control unit (MCU))
3	N603	TFA9842AJ	Audio power amplifier
4	N301	LA78040	Vertical scan output stage circuit
5	N801	STR-G5653	Switch-mode power supply control
6	A001	TAF5-C4I21	Tuner

SERVICE DATA

TECHNICAL DATA OF KEY ICS

1.MCU and Signal Processor for a PAL/NTSC TV

TMPA88xxCMANG /CPANG/CRANG /CSANG

1.General Description

The TMPA88xxCPANG is an integrated circuit for a PAL/NTSC TV. A MCU and a TV signal processor are integrated in a 64-pin shrink DIP package. The MCU contains 8-bit CPU, ROM, RAM, I/O ports, timer/counters, A/D converters, an on-screen display controller, remote control interfaces, IIC bus interfaces and the Closed Caption decoder. The TV signal processor contains PIF, SIF, Video, multi-standard chroma, Sync, RGB processors.

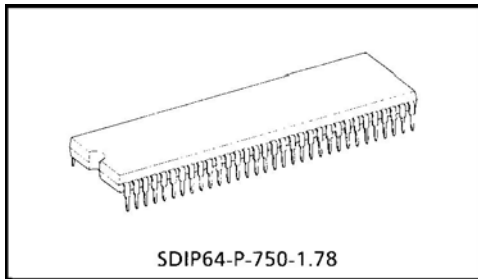
Mask ROM: TMPA88xxCMANG (ROM size: 32k)

Mask ROM: TMPA88xxCPANG (ROM size: 48k)

Mask ROM: TMPA88xxCRANG (ROM size: 56k)

Mask ROM: TMPA88xxCSANG (ROM size: 64k)

OTP ROM: TMPA88xxPSANG (ROM size: 64k)



SDIP64-P-750-1.78

Weight: 8.85 g (typ.)

2.Features

MCU

- High speed 8-bit CPU (TLCS-870/X series)
- Instruction execution time: 0.5 μ s (at 8 MHz)
- (TMPA88xxCPANG)
- 48-Kbytes ROM, 2-Kbytes RAM
- ROM correction
- 12 I/O ports
- 14-bit PWM output 1 ch for a voltage synthesizer
- 7-bit PWM output 1 channel
- 8-bit A/D converter 3 ch for a touch-key input with key ON wake-up CIRCUIT
- Remote control signal preprocessor
- Two 16-bit internal timer/counter 2 ch
- Two 8-bit internal timer/counter 2 ch
- Time base timer, watchdog timer
- 16 interrupt sources: external 5, internal 11
- IIC bus interface (multi-master)
- STOP and IDLE power saving modes

TV Processor

IF

- Integrated PIF VCO aligned automatically
- Negative demodulation PIF
- Multi-frequency SIF demodulator without external Tank-coil
- SIF BPF built-in
- SIF Trap filter built in

Video

- Integrated chroma traps
- Black stretch
- Y-gamma

Chroma

- Integrated chroma BPFs
- PAL/NTSC demodulation

CCD Decoder

- Digital data slicer for NTSC

OSD

- Clock generation for OSD display
- Clock generation for OSD display
- Font ROM characters: 384 characters
- Characters display: 32 columns $\times$ 12 lines
- Composition: 16 $\times$ 18 dots
- Size of character: 3 (line by line)
- Color of character: 8 (character by character)
- Display position: H 256/V 512 steps
- BOX function
- Fringing, smoothing, Italic, underline function
- Conform to CCD REGULATION
- Jitter elimination

RGB/Base-Band

- Integrated 1 H base-band delay line
- Base-band TINT control
- Internal OSD interface
- Half-tone and transparent for OSD
- External YCbCr interface for DVD
- RGB cut-off/drive controls by bus
- ABCL (ABL and ACL combined)

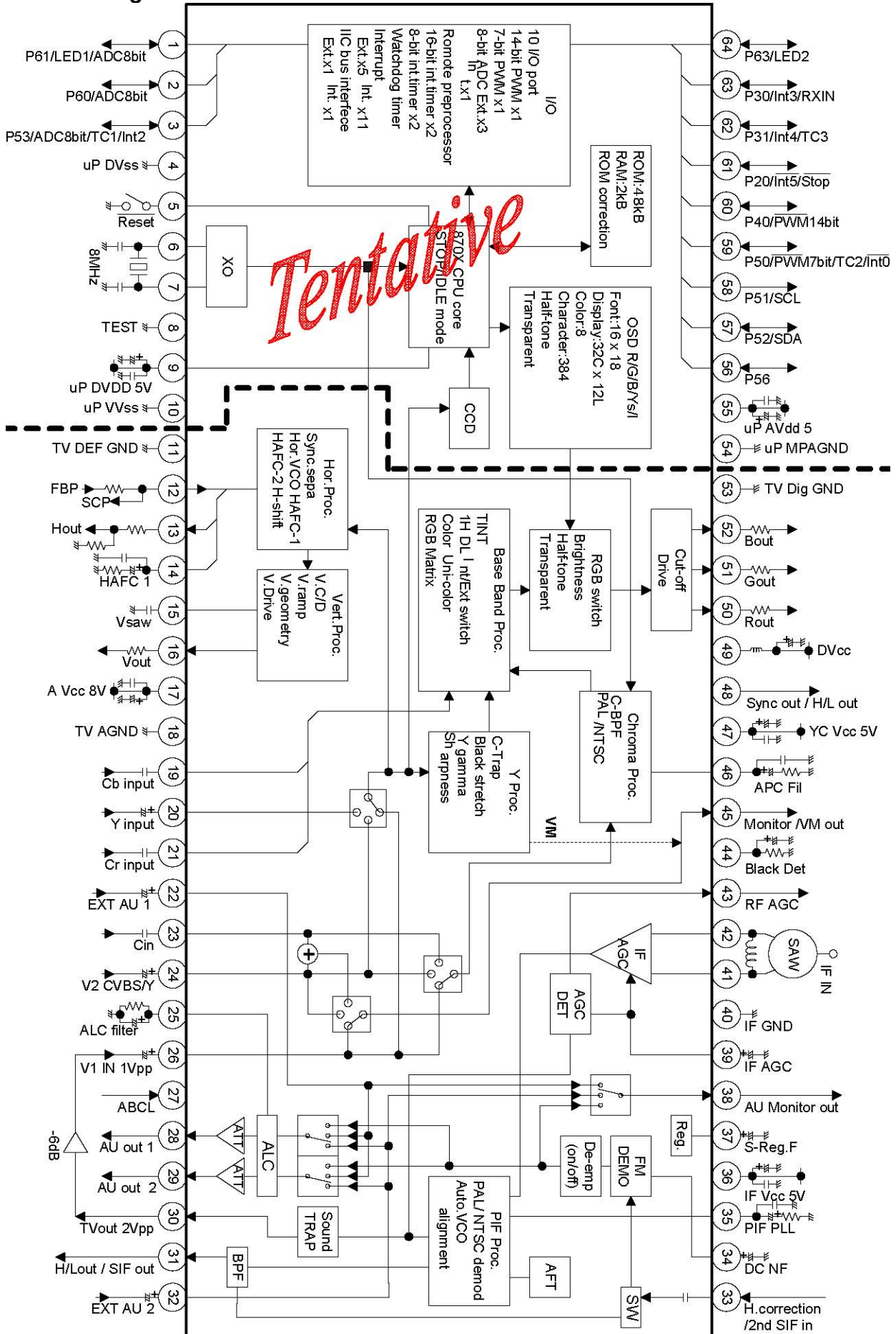
Sync.

- Integrated $f_H \times 640$ VCO
- DC coupled vertical ramp output (single)
- Sync output

AV Switch

- 2 for video
- 2 for audio(mono)
- or 1 for audio (Stereo, 2ch ATT), controlled by IIC bus
- ALC (Auto-Audio Level Control)

3. Block Diagram



4. Basic Structure

1. Internal Connections

TMPA88xx has two pieces of IC chip in one package, using Multi-Chip-Package (MCP) technology. One is a micro controller (MCU) and the other one is a signal processor (SP) for a color TV. There are some internal connections between these two ICs for handling below signals.

	Signal Name	Direction	Description
1	SCL	M to S	Internal IIC bus SCL
2	SDA	Bi-direction	Internal IIC bus SDA
3	OSD R	M to S	OSD signal connection
4	OSD G	M to S	OSD signal connection
5	OSD B	M to S	OSD signal connection
6	OSD Y/BL	M to S	OSD display control
7	OSD I, CS OUT	M to S	OSD half-tone control/Test pattern signal
8	C-Video	S to M	Composite video signal from internal video switch, for CCD
9	C-Sync	S to M	Composite sync. signal from sync. Separator, for CCD
10	HD	S to M	Horizontal timing pulse regenerated from FBP, for OSD
11	VD	S to M	Vertical timing pulse from sync. Separator, for OSD
12	CLK	M to S	8 MHz clock
13	AVDD	M to S	Reference voltage for C-Video interface
14	ADC	S to M	A/D converter monitoring RF-AGC, R-Y and B-Y

Functions of SP from MCU are controllable through the IIC bus of the internal connections.

2. Power Supply

TMPA88xx has some power supplies and GND pins. Power supplies related MCU must be applied at the first. Power supplies for H.VCC and TV D.VCC are the second with at least 100 ms delay after MCU power ON. The other power supplies are the last, which are recommended to be supplied from a regulator circuit using FBP.

3. Crystal Resonator

TMPA88xx requires only one crystal resonator, instead that a conventional two-chip solution requires two resonators at least, one for MCU and the other one for SP. An oscillation clock with the crystal resonator of TMPA88xx is supplied for MCU operation, PIF VCO automatic alignment, alignment free AFT, chroma demodulation and horizontal oscillation. The oscillation frequency is very important so that those of functions work properly, so that designing the oscillation frequency accurately is required. The spec of crystal is recommended to be within

fosc: 8 MHz $\pm$ 20 ppm

ftemp: 8 MHz $\pm$ 40 ppm (−20°C to +65°C)

While RESET of MCU is active, the MCU function stops. Hardware and software initialization sequence including power supplies control is required, because status of any hardware after the RESET period is unknown especially horizontal oscillator which is a very basic timing generator of SP operation.

5.TERMINAL INTERFACE

MCU BLOCK

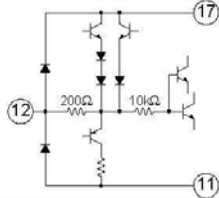
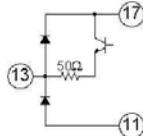
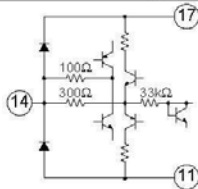
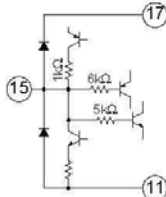
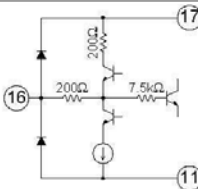
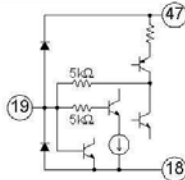
Pin No.	Pin Name	I/O	Function	Interface Circuit
1	P61 (/KWU5) (AIN5) (LED1)	I/O (Input) (Input) (Output)	Key on wake up input A/D converter analog input LED output	
2	P60 (/KWU4) (AIN4)	I/O (Input) (Input)	Key on wake up input A/D converter analog input	
3	P53 (/KWU0) (AIN0) (TC1) (INT2) (SCK1)	I/O (Input) (Input) (Input) (Input) (I/O)	Key on wake up input A/D converter analog input Timer/counter input External interrupt input SIO serial clock input / output	
4	up DVss	Power Supply	GND	—
5	Reset	I/O	Reset signal input or watchdog timer output Address trap reset output System clock reset output	

Pin No.	Pin Name	I/O	Function	Interface Circuit
6 7	Xout Xin	Output Input	X'tal connecting pins	
8	TEST	Input	Test pin for out-going test	
9	up DVdd	Power Supply	Vdd Supply 5V	
10	up VVss	Power Supply	GND for Slicer circuit	—
54	up AGND	Power Supply	GND for Oscillator circuit	—
55	up AVdd	Power Supply	Vdd for Oscillator circuit Supply 5V	—
56	P56	I/O		
57	P52 (SDA) (SO1)	I/O (I/O) (Output)	IIC bus serial data input / output SIO serial data output	

Tentative

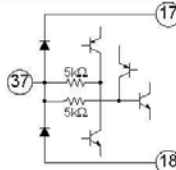
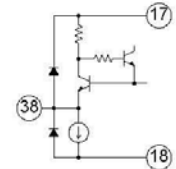
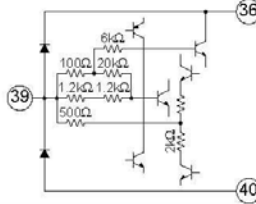
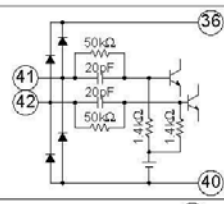
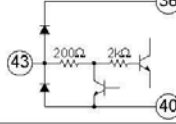
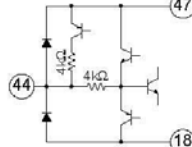
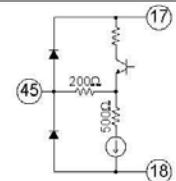
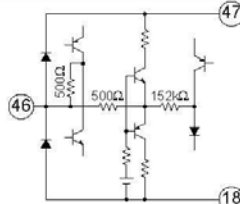
Pin No.	Pin Name	I/O	Function	Interface Circuit
63	P30 (INT3) (RXIN)	I/O (Input) (Input)	External interrupt input Remote control signal preprocessor input	
64	P63 (LED2)	I/O (Output)	LED output	

SIGNAL PROCESSOR BLOCK

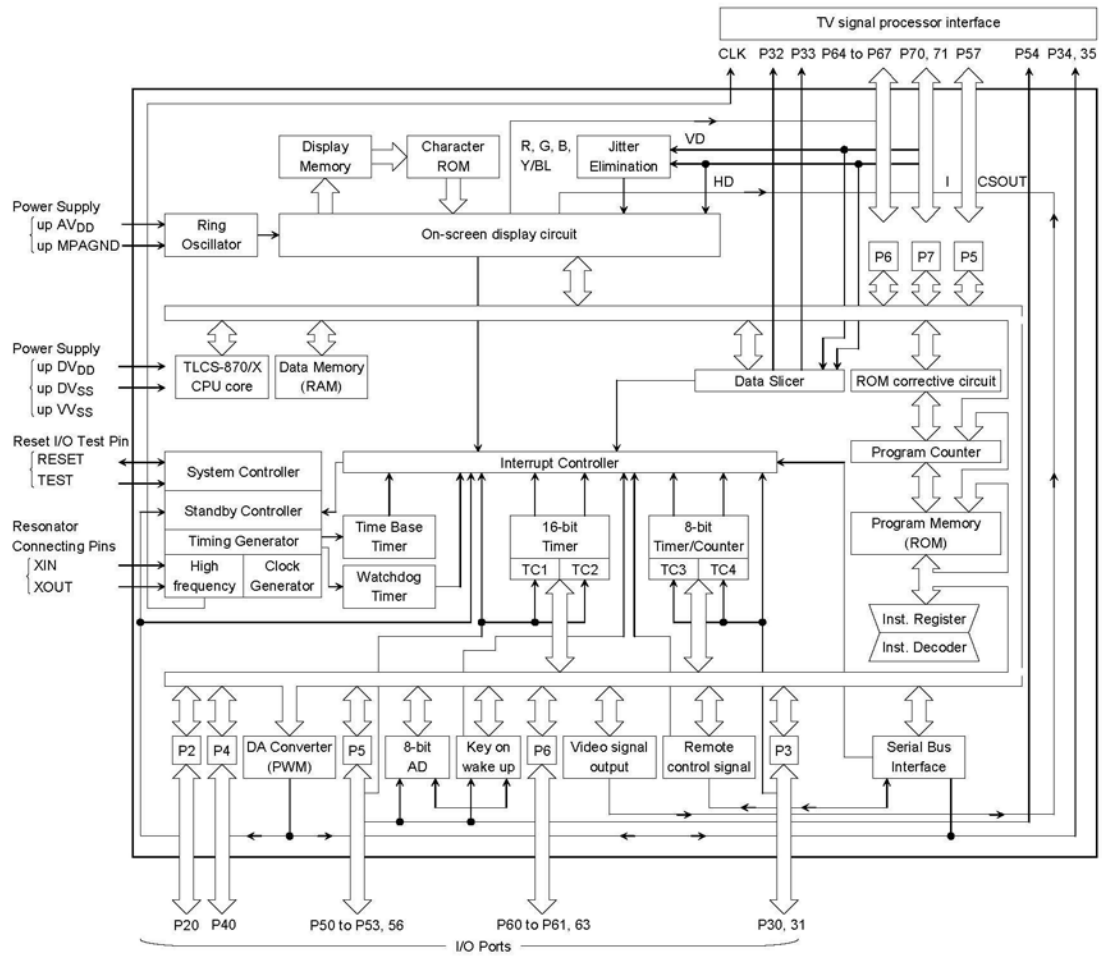
Pin No.	Pin Name	Function	Interface Circuit	I/O Signal
11	TV DEF AGND	GND terminal for TV DEF block.	—	—
12	FBP in	Input terminal for FBP.		
13	H out	Output terminal for Horizontal driving pulse.		
14	HAFC 1	Terminal to be connected capacitor for H AFC filter. This terminal voltage controls H VCO frequency.		
15	V saw	Terminal to be connected capacitor to generate V saw signal. V saw amplitude is kept constant by V AGC function.		
16	V out	Output terminal for Vertical driving pulse.		
17	AVcc 8V	Vcc terminal for DEF, RGB, Audio out and PIF out circuit. Supply 8V.	—	—
18	TV A GND	GND terminal for TV block.	—	—
19	Cb in	Input terminal for Cb signal.		

Pin No.	Pin Name	Function	Interface Circuit	Tentative
20	Y in	Input terminal for Y signal.		
21	Cr in	Input terminal for Cr signal.		
22	Ext Au1	Input terminal for Audio signal 1.		
23	C in	Input terminal for Chroma signal.		
24	V2 in	Input terminal for Video signal.		
25	ALC filter	Terminal to be connected capacitor for ALC (Audio Level Control).		
26	V1 in	Input terminal for Video signal. (Input level = 1 Vp-p)		
27	ABCL	Input terminal for ABL/ACL control.		

Pin No.	Pin Name	Function	Interface Circuit	Tentative I/O Signal
28	Au out 1	Output terminal 1 for Audio signal.		
29	Au out 2	Output terminal 2 for Audio signal.		
30	TV out	Output terminal for detected PIF signal.		
31	1bit DAC /SIF out	Output terminal for 1bit DAC or detected SIF signal.		
32	Ext Au2 in	Input terminal for Audio signal 1.		
33	H correc / SIF in	Input terminal for H correction and 2nd SIF.		
34	DC NF	Terminal to be connected capacitor for DC Negative Feedback from SIF Det output.		
35	PIF PLL	Terminal to be connected with loop filter for PIF PLL. This terminal voltage is controlled PIF VCO frequency.		
36	IF Vcc 5V	Vcc terminal for IF circuit. Supply 5V.		—

Pin No.	Pin Name	Function	Interface Circuit	Tentative I/O Signal
37	Reg Fil	Terminal to be connected capacitor for stabilizing internal bias.		
38	AUDIO Monitor out	Output terminal for External audio signal or TV audio signal selected by BUS (Audio SW).		
39	IF AGC	Terminal to be connected with IF AGC filter.		
40	IF GND	GND terminal for IF circuit.		—
41 42	IF in	Input terminals for IF signals. Pin41 and Pin42 are both input poles of differential amplifier.		
43	RF AGC	Output terminal for RF AGC control level.		
44	Black Det	Terminal to be connected with Black Det filter for black stretch.		
45	SVM / Monitor	Output terminal for monitor function. Also output terminal for SVM signal. Selectable through IIC bus		
46	APC filter	Terminal to be connected with APC filter for Chroma demodulation. This terminal voltage controls frequency of VCXO.		

Pin No.	Pin Name	Function	Interface Circuit	TV Signal
47	YC Vcc 5V	Vcc terminal for Y/C circuit. Supply 5V.	—	—
48	Sync out	Output terminal for Sync pulse. A pull up resistor is required because of its open collector output. (Pull up resistor: minimum 4.7kohm)		
49	DVCC	Vcc terminal for Digital block. This terminal voltage is clipped about 3.3V by regulator circuit. Supply DVCC voltage from A VCC 8V(#17) voltage via 270Ω.	—	—
50	R out	Output terminal for R signal.		
51	G out	Output terminal for G signal.		
52	B out	Output terminal for B signal.		
53	TV DGND	GND terminal for digital block.	—	—



2. TFA9842AJ

2-channel audio amplifier with volume control (SE: 1 W to 7.5 W)

1. General description

The TFA9842AJ contains two identical audio power amplifiers. The TFA9842AJ can be used as two Single-Ended (SE) channels with a volume control. The maximum gain is 26 dB.

The TFA9842AJ comes in a 9-pin DIL-bent-SIL (DBS9P) power package. The TFA9842AJ is pin compatible with the TFA9843AJ, TFA9843(B)J, TFA9842(B)J and TFA9841J. The difference between the TFA9843AJ and the TFA9843(B)J, TFA9842(B)J, TFA9841J is the functionality of pin 7. The TFA9843AJ has a Volume Control (VC) on pin 7. The TFA9843(B)J, TFA9842(B)J and TFA9841J have a mode select (Mode) on pin 7. The TFA9842AJ contains a unique protection circuit that is solely based on multiple temperature measurements inside the chip. This gives maximum output power for all supply voltages and load conditions with no unnecessary audio holes. Almost any supply voltage and load impedance combination can be made as long as thermal boundary conditions (number of channels used, external heatsink and ambient temperature) allow it.

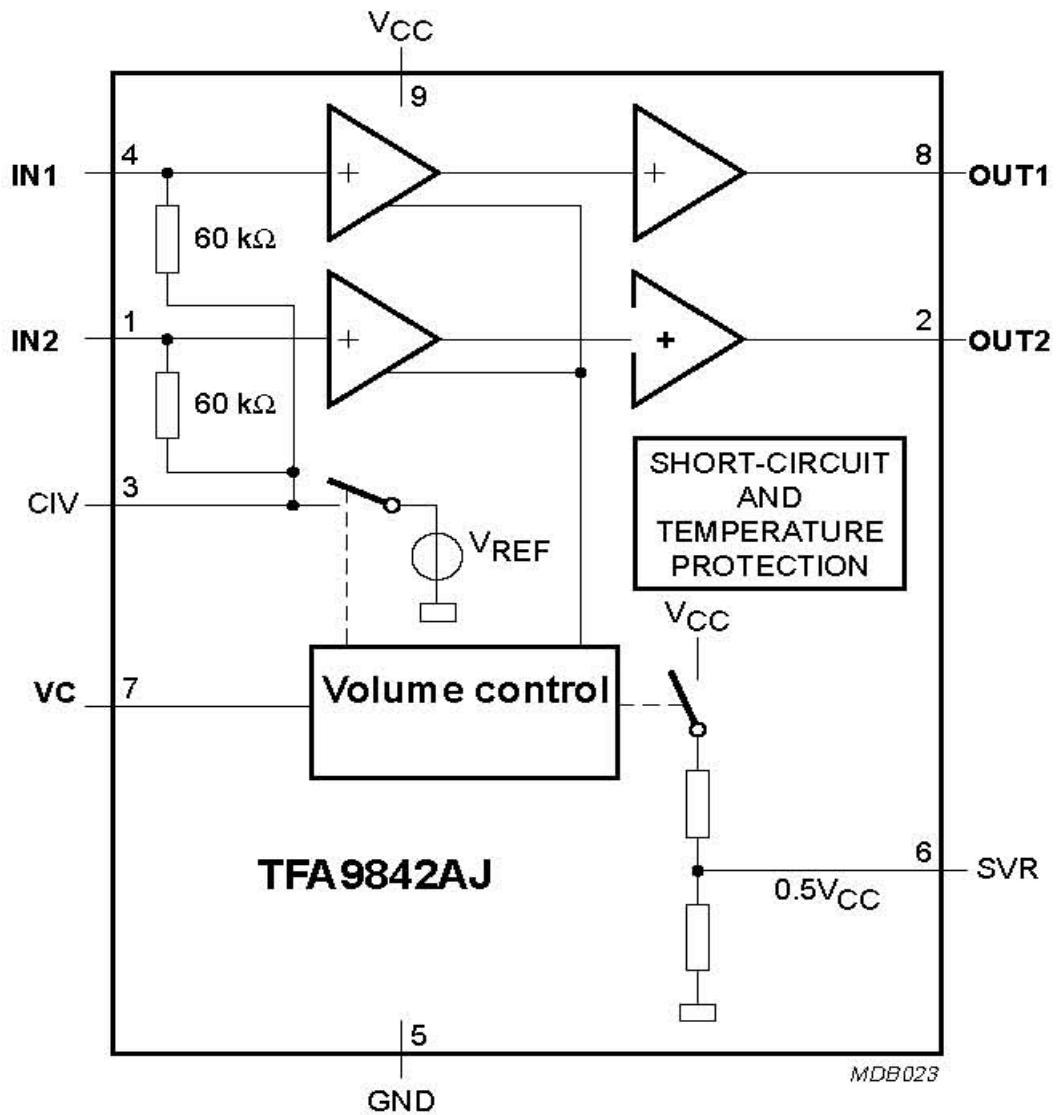
2. Features

- 2 Channel SE: 1 W to 7.5 W operation possibility
- Soft clipping
- Input clamps
- Volume control
- Standby and mute mode
- No on/off switching plops
- Low standby current
- High supply voltage ripple rejection
- Outputs short-circuit protected to ground, supply and across the load
- Thermally protected
- Pin compatible with the TFA9843AJ, TFA9843(B)J, TFA9842(B)J, TFA9841J.

3. Applications

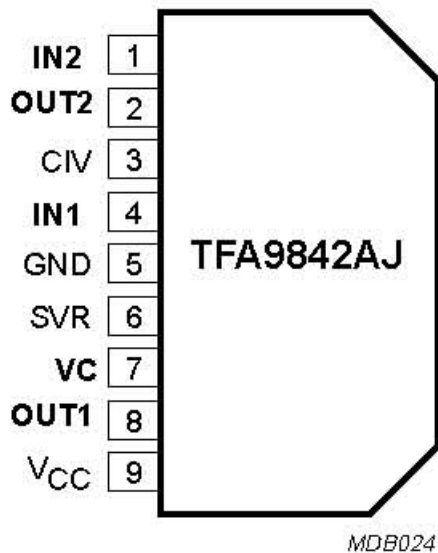
- CRT TV, LCD TV
- Monitors
- PC speakers
- Boom box
- Mini and micro audio receivers.

3. Block diagram



4. Pinning information

4.1 Pinning



4.2 Pin description

Symbol	Pin	Description
IN2	1	input 2
OUT2	2	loudspeaker terminal 2
CIV	3	common input voltage decoupling
IN1	4	input 1
GND	5	ground
SVR	6	half supply voltage decoupling (ripple rejection)
VC	7	volume control input (standby, mute and volume control)
OUT1	8	loudspeaker terminal 1
V _{CC}	9	supply voltage

4. VERTICAL SCAN OUTPUT STAGE CIRCUIT LA78040/LA78041

Both LA78040/LA78041 are vertical scan output stage power amplifiers. But there is a little bit difference between the two amplifiers, that is, LA78040 has supply voltage of 24V and output current of 1.8AP-P while LA78041 has supply voltage of 30V and output current of 2.2AP-P.

LA78040/LA78041 (N602)

Vertical Deflection Output Circuit

1) Features

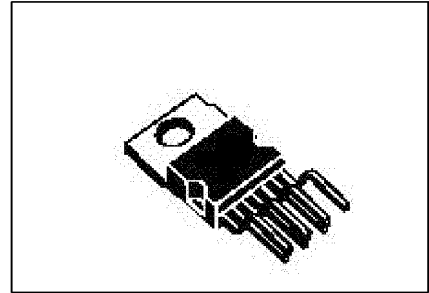
Low power dissipation due to built-in pump-up circuit

Vertical output circuit

Thermal protection circuit built in

Excellent crossover characteristics

DC coupling possible



Package Type:TO-220-7H

Fig.12

2) Block Diagram

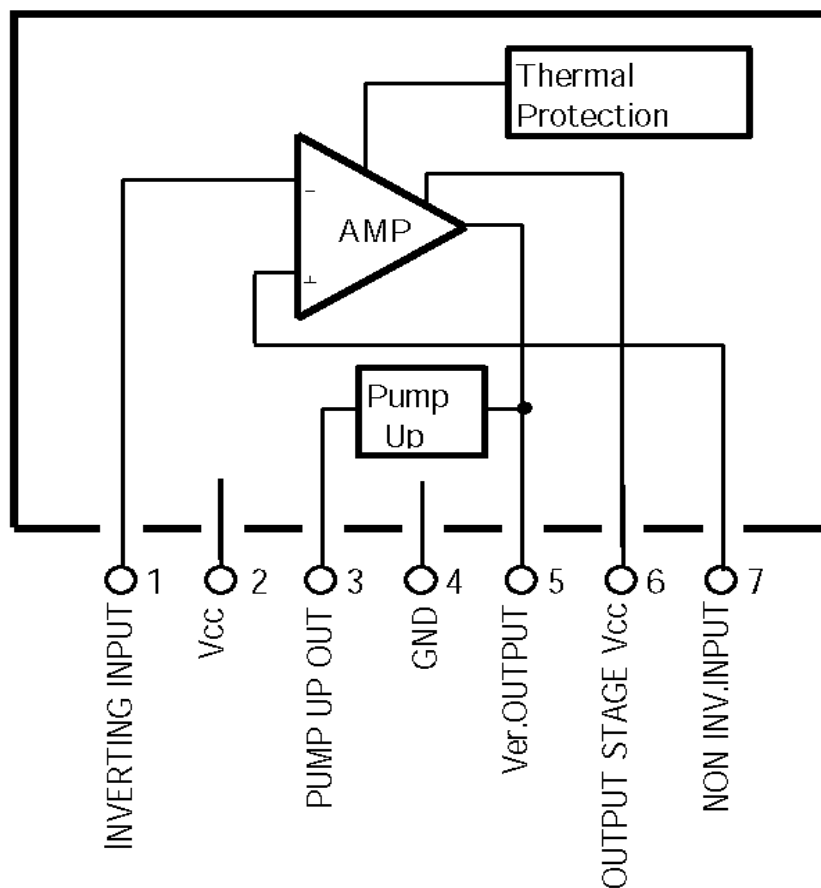


Fig.1 3 Block diagram

5. EEPROM AT24C04/08/16

1) Features

Low-voltage and Standard-voltage Operation

- 2.7 (V_{CC}=2.7V to 5.5V)

- 1.8 (V_{CC}=1.8V to 5.5V)

Internally Organized 128x8(1K), 256x8 (2K), 512x8 (4K),
1024x8 (8K) or 2048x8 (16K)

2-wire Serial Interface

Schmitt Trigger, Filtered Inputs for Noise Suppression

Bi-directional Data Transfer Protocol

100kHz (1.8V, 2.5V, 2.7V) and 400 kHz (5V) Compatibility

Write Protect Pin for Hardware Data Protection

8-byte Page (1K, 2K), 16-byte Page (4K, 8K, 16K) Write Modes

Partial Page Writes are Allowed

Self-timed Write Cycle (10 ms max)

High-reliability

- Endurance: 1 Million Write Cycles

- Data Retention: 100 Years

Automotive Grade and Extended Temperature Devices Available

8-lead PDIP, 8-lead JEDEC SOIC, 8-lead MAP and 8-lead TSSOP Package

2-wire

Serial EEPROM

AT24C01A 1K (128 x 8)

AT24C02 2K (256 x 8)

AT24C04 4K (512 x 8)

AT24C08 8K (1024 x 8)

AT24C16 6K (2048 x 8)

2) Description

The AT24C01A/02/04/08/16 provides 1024/2048/4096/8192/16384 bits of serial electrically erasable and programmable read-only memory (EEPROM) organized as 128/256/512/1024/2048 words of 8 bits each. The device is optimized for use in many industrial and commercial applications where low-power and low-voltage operations are essential. The AT24C01A/02/04/08/16 is available in space-saving 8-pin PDIP, 8-lead JEDEC SOIC, 8-lead MAP and 8-lead TSSOP packages and is accessed via a 2-wire serial interface. In addition, the entire family is available in 2.7V (2.7V to 5.5V) and 1.8V (1.8V to 5.5V) versions.

3) Pin Configuration

Table 12

Pin Name	Function
A0-A2	Address Inputs
SDA	Serial Data
SCL	Serial Clock Input
WP	Write Protect
NC	No Connect

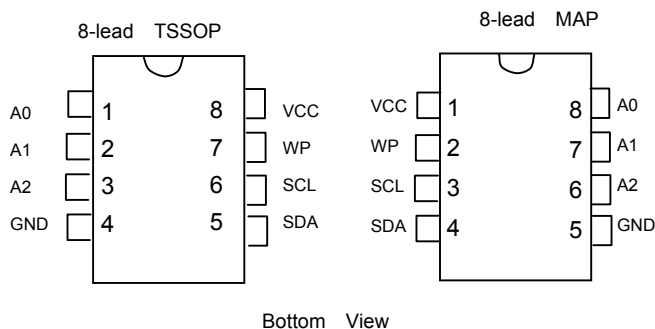


Fig. 14

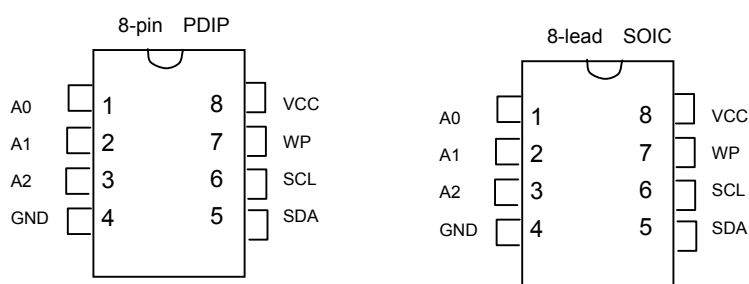


Fig. 15

4) Pin Description

SERIAL CLOCK (SCL): The SCL input is used to positive edge clock data into each EEPROM device and negative edge clock data out of each device.

SERIAL DATA (SDA): The SDA pin is bi-directional for serial data transfer. This pin is open-drain driven and may be wire-ORed with any number of other open-drain or open-collector devices.

DEVICE/PAGE ADDRESSES (A2, A1, A0): The A2, A1 and A0 pins are device address inputs that are hard wired for the AT24C01A and the AT24C02. As many as eight 1K/2K devices may be addressed on a single bus system (device addressing is discussed in detail under the Device Addressing section).

The AT24C04 uses the A2 and A1 inputs for hard wire addressing and a total of four 4K devices may be addressed on a single bus system. The A0 pin is a no connect.

The AT24C08 only uses the A2 input for hardwire addressing and a total of two 8K devices may be addressed on a single bus system. The A0 and A1 pins are no connects.

The AT24C16 does not use the device address pins, which limits the number of devices on a single bus to one. The A0, A1 and A2 pins are no connects.

WRITE PROTECT (WP): The AT24C01A/02/04/16 has a Write Protect pin that provides hardware data

protection. The Write Protect pin allows normal read/write operations when connected to ground (GND). When the Write Protect pin is connected to Vcc, the write protection feature is enabled and operates as shown in table 14.

Table 13

WP Pin Status	Part of the Array Protected				
	24C01A	24C02	24C04	24C08	24C16
At Vcc	Full (1K) Array	Full (2K) Array	Full (4K) Array	Normal Read/Write Operation	Upper Half (8K) Array
At GND	Normal Read/Write Operations				

5) Memory Organization

AT24C01A, 1K SERIAL EEPROM: Internally organized with 16 pages of 8 bytes each, the 1K requires a 7-bit data word address for random word addressing.

AT24C02, 2K SERIAL EEPROM: Internally organized with 32 pages of 8 bytes each, the 2K requires an 8-bit data word address for random word addressing.

AT24C04, 4K SERIAL EEPROM: Internally organized with 32 pages of 16 bytes each, the 4K requires a 9-bit data word address for random word addressing.

AT24C08, 8K SERIAL EEPROM: Internally organized with 64 pages of 16 bytes each, the 8K requires a 10-bit data word address for random word addressing.

AT24C16, 16K SERIAL EEPROM: Internally organized with 128 pages of 16 bytes each, the 16K requires an 11-bit data word address for random word addressing.

6) Block Diagram

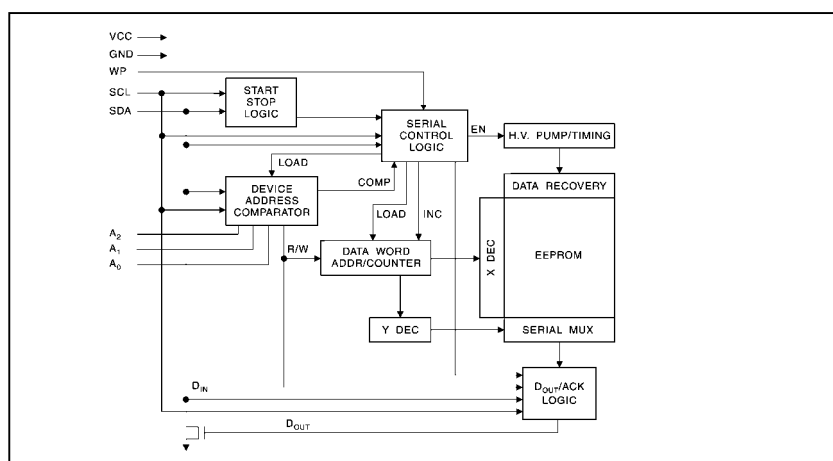


Fig.16

7) Refer to Table 21 about Functions and Data of the IC's Pins.

7. SWITCH-MODE POWER SUPPLY IC STRG5653/G8656

1). General Description

The STRG5653/G8656 are part of the STRG5600/G8600 series thick-film ICs for switch-mode power supply incorporating power MOSFET with a high-precise error amplifier. The ICs feature fewer external components, small-size and standard power supply.

The series STR-G8600 use Chip on Chip technology with the same operation principle as STR-G5600. Pin configuration, function and threshold of STR-G8600 are compatible with those of STR-G5600.

2) Block Diagram

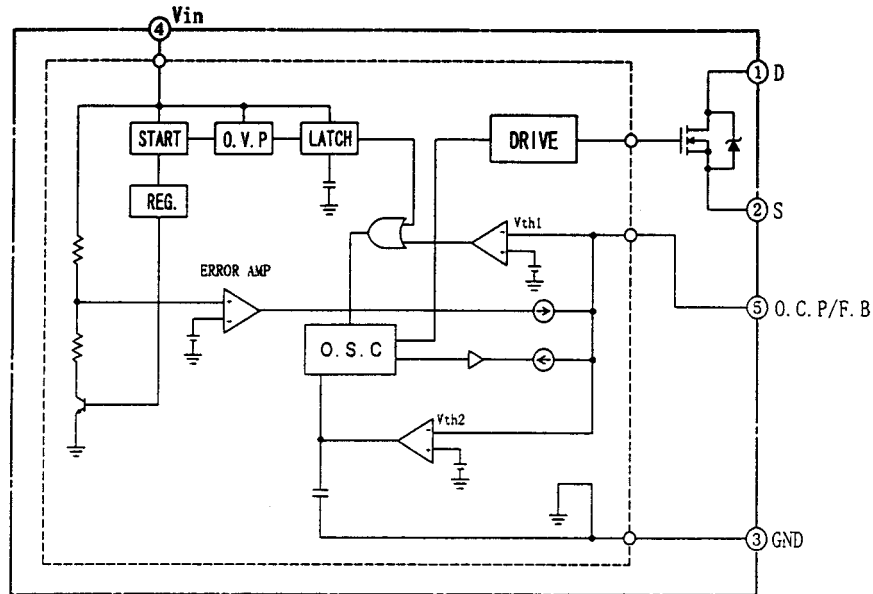


Fig.18

3) Function of Terminal

Table 15 Function of Terminal

Terminal No.	Symbols	Description	Functions
1	D	Drain Terminal	MOS FET drain
2	S	Source Terminal	MOS FET source
3	GND	Ground Terminal	Ground
4	VIN	Power supply Terminal	Input of power supply for control signals
5	O.C.P/F.B	Overcurrent/Feedback Terminal	Input of overcurrent detection signal and constant voltage signals

4) Refer to Table 22 about Functions and Data of the IC's Pins.

protection. The Write Protect pin allows normal read/write operations when connected to ground (GND). When the Write Protect pin is connected to Vcc, the write protection feature is enabled and operates as shown in table 14.

Table 13

WP Pin Status	Part of the Array Protected				
	24C01A	24C02	24C04	24C08	24C16
At Vcc	Full (1K) Array	Full (2K) Array	Full (4K) Array	Normal Read/Write Operation	Upper Half (8K) Array
At GND	Normal Read/Write Operations				

5) Memory Organization

AT24C01A, 1K SERIAL EEPROM: Internally organized with 16 pages of 8 bytes each, the 1K requires a 7-bit data word address for random word addressing.

AT24C02, 2K SERIAL EEPROM: Internally organized with 32 pages of 8 bytes each, the 2K requires an 8-bit data word address for random word addressing.

AT24C04, 4K SERIAL EEPROM: Internally organized with 32 pages of 16 bytes each, the 4K requires a 9-bit data word address for random word addressing.

AT24C08, 8K SERIAL EEPROM: Internally organized with 64 pages of 16 bytes each, the 8K requires a 10-bit data word address for random word addressing.

AT24C16, 16K SERIAL EEPROM: Internally organized with 128 pages of 16 bytes each, the 16K requires an 11-bit data word address for random word addressing.

6) Block Diagram

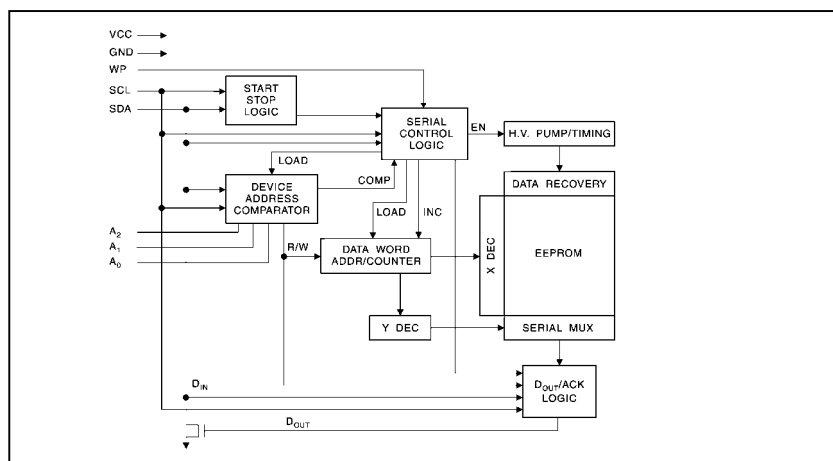


Fig.16

7) Refer to Table 21 about Functions and Data of the IC's Pins.

SERVICE DATA OF KEY ICS

Table 16 Ground Resistance of TMPA88xx Pins

Pin No	1	2	3	4	5	6
Resistance	>2000 K Ω	>2000 K Ω	-	0	5.6 K Ω	>2000 K Ω
Pin No	7	8	9	10	11	12
Resistance	>2000 K Ω	0	>2000 K Ω	0	0	>2000 K Ω
Pin No	13	14	15	16	17	18
Resistance	-	>2000 K Ω	>2000 K Ω	18.6 K Ω	10.6 K Ω	0
Pin No	19	20	21	22	23	24
Resistance	>2000 K Ω	>2000 K Ω	>2000 K Ω	107 K Ω	93.2 K Ω	3.2 K Ω
Pin No	25	26	27	28	29	30
Resistance	0.56 K Ω	24.70 K Ω	16.65 K Ω	22.04 K Ω	0.3 K Ω	3.27 K Ω
Pin No	31	32	33	34	35	36
Resistance	3.2 K Ω	107 K Ω	>2000 K Ω	>2000 K Ω	1500 K Ω	1.9 K Ω
Pin No	37	38	39	40	41	42
Resistance	>2000 K Ω	100 K Ω	>2000 K Ω	0	56 K Ω	56 K Ω
Pin No	43	44	45	46	47	48
Resistance	14.5 K Ω	220 K Ω	3.2 K Ω	>2000 K Ω	1.9 K Ω	-
Pin No	49	50	51	52	53	54
Resistance	0.7 K Ω	69 K Ω	120 K Ω	69 K Ω	0	-
Pin No	55	56	57	58	59	60
Resistance	-	-	-	-	-	>2000 K Ω
Pin No	61	62	63	64		
Resistance	>2000 K Ω	-	>2000 K Ω	-		

Note: Measured when Power-off

Table 17 Operating Voltage of TMPA88xx(N202)'s Pins

Pin No	1	2	3	4	5	6
Voltage (V)	0V	0V	5V	GND	5V	2.3V
Pin No	7	8	9	10	11	12
Voltage (V)	2.1V	GND	5V	GND	GND	1.1V
Pin No	13	14	15	16	17	18
Voltage (V)	2.2V	5.9V	4.1V	4.7V	8.3V	0V
Pin No	19	20	21	22	23	24
Voltage (V)	3.2V	2.4V	3.2V	3.8V	2.5V	2.5V
Pin No	25	26	27	28	29	30
Voltage (V)	0V	2.7V	4.5V	3.2V	3.2V	3.0V
Pin No	31	32	33	34	35	36
Voltage (V)	1.5V	3.9V	3.0V	3.1V	2.4V	5V
Pin No	37	38	39	40	41	42
Voltage (V)	2.0V	3.9V	3.0V	GND	0V	2.0V
Pin No	43	44	45	46	47	48
Voltage (V)	1.4V	2.6V	2.8V	2.3V	5.0V	4.5V
Pin No	49	50	51	52	53	54
Voltage (V)	3.4V	2.5V	2.5V	2.5V	GND	GND
Pin No	55	56	57	58	59	60
Voltage (V)	5V	0V	5V	5V	0V	5.0V
Pin No	61	62	63	64		
Voltage (V)	0V	4.5V	0.9V	0V		

Table 18 Functions and Service Data of TFA9842AJ's Pins

Pin No.	Symbol	Functions Description	Digital Multimeter	
			Reference Voltage(V)	Positive Resistance(20K Ω)
1	IN2	Input 2	4.7	18.2M Ω
2	OUT2	Loudspeaker terminal 2	9.0	28K Ω
3	CIV	Common input voltage decoupling	4.7	280K Ω
4	IN1	Input 2	4.7	18.2M Ω
5	GND	ground	0	0
6	SVR	Half supply voltage decoupling(ripple rejection)	10.4	-
7	VC	Volume control input(standby, mute and volume control)	20	11K Ω
8	OUT1	Loudspeaker terminal 1	9	-
9	VCC	supply voltage	20	1K Ω

Table 20 Functions and Service Data of LA78040's Pins

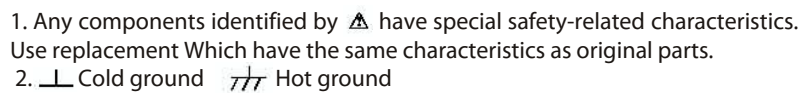
Pin No.	Function Description	GDM8145 Multimeter		
		Voltage of Pin (V)	Ground Resistance (K Ω)	
			Measure with red probe while grounding black probe.	Measure with black probe while grounding red probe.
1	INVERTING INPUT	2.04	-	2.62
2	VCC	25.02	-	1.87
3	Pump UP OUT	1.76	-	2.68
4	GND	0	0	0
5	Ver. OUTPUT	15.32	-	2.26
6	OUTPUT STAGE Vcc	25.20	∞	2.35
7	NON INV. INPUT	2.04	3.25	2.5

Table 21 Functions and Service Data of AT24C08/16 Pins

Pin No.	Function Description	Digital Multimeter		
		Reference Voltage (V)	Positive Resistance (20K Ω)	Negative Resistance (20K Ω)
1	Address input	0	0	0
2	Address input	0	0	0
3	Address input	0	0	0
4	Common ground	0	0	0
5	Clock line	5	13.79	11.22
6	Data line	5	13.70	13.13
7	PW write protect	0	0	0
8	Supply voltage	5	3.79	3.78

Table 22 Functions and Service Data of STR-G5653's Pins

Pin No.	Functions Description	Digital Multimeter		
		Reference Voltage (V)	Positive Resistance (20K Ω)	Negative Resistance (20K Ω)
1	Drain terminal	288	∞	∞
2	Source terminal	0.028	0	0
3	Ground terminal	0	0	0
4	Power supply terminal	32.24	∞	1.838
5	Overcurrent/Feedback terminal	1.85	0.68	0.68



Circuit Diagram FOR SF21GA63