COLOR TELEVISION

SERVICE MANUAL

CHASSIS NO. ETA-5

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 loosing the deflection yoke assembly to avoid electronic gun magnetized 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:

① The purity/convergence magnet assembly and rubber wedges need mechanical positioning.

② 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.

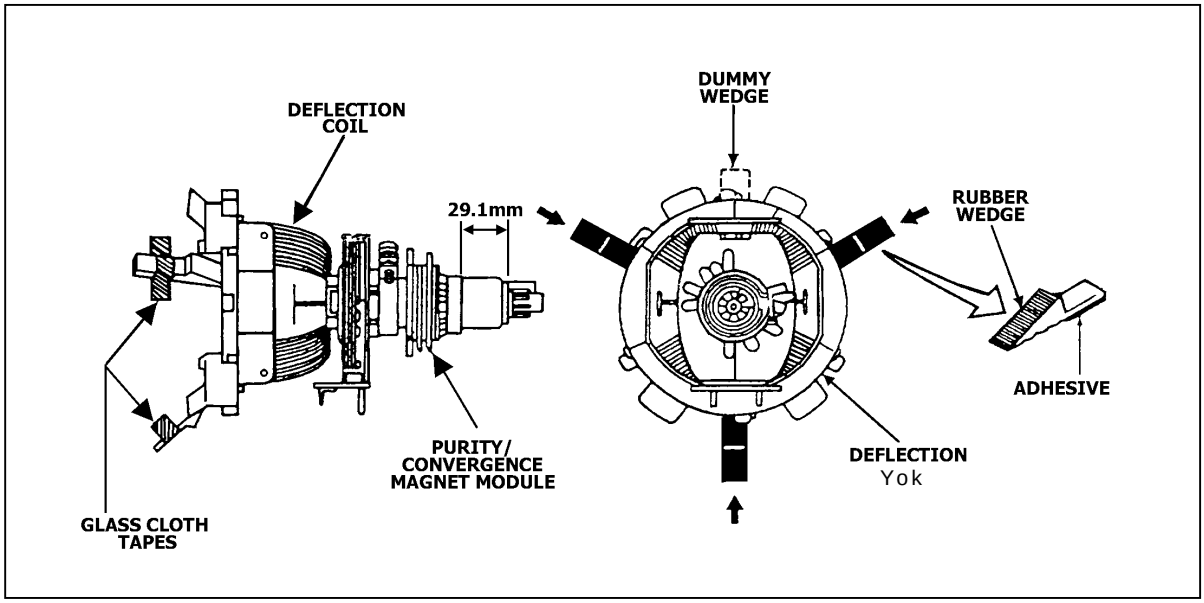


Fig. 1

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.

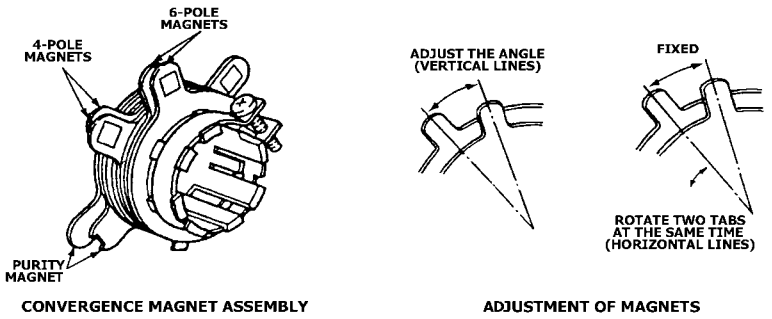


Fig. 2

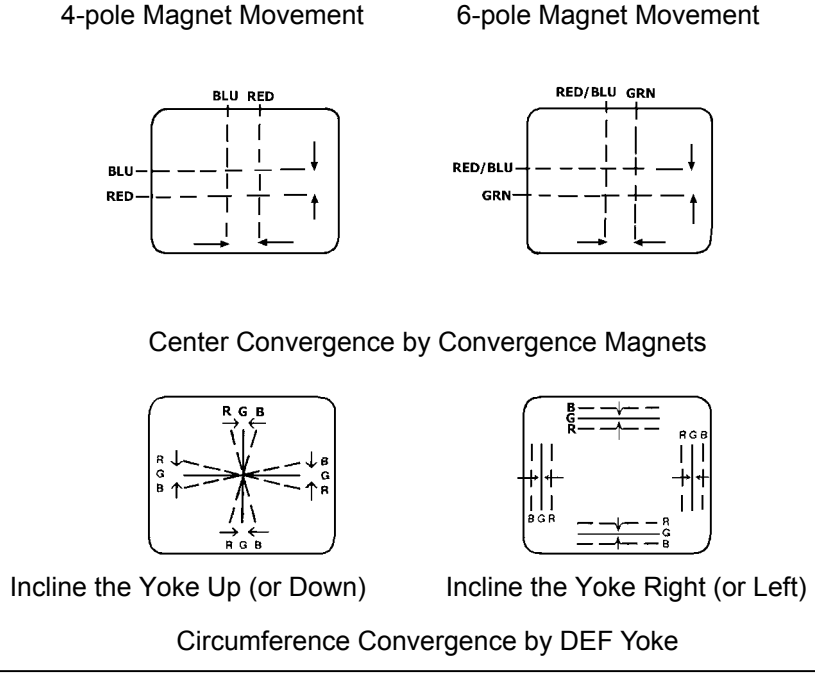


Fig.3

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 I^2C 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 I^2C 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±1.5V	TP-18V	20V±1V / 22V±1V
TP-17V	17V±1V	TP-5V-2	5V±0.3V
TP-5V-1	5V±0.3V	TP-8V	9V±0.5V
TP-11V	11V±1V	TP-26V	26V±1V / 31V±1V
TP-200V	190V±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±1V / 31V±1V
Negative of VD485	190±5V
CRT anode	27±1.5KV
Heater	6.3±0.3Vrms

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.

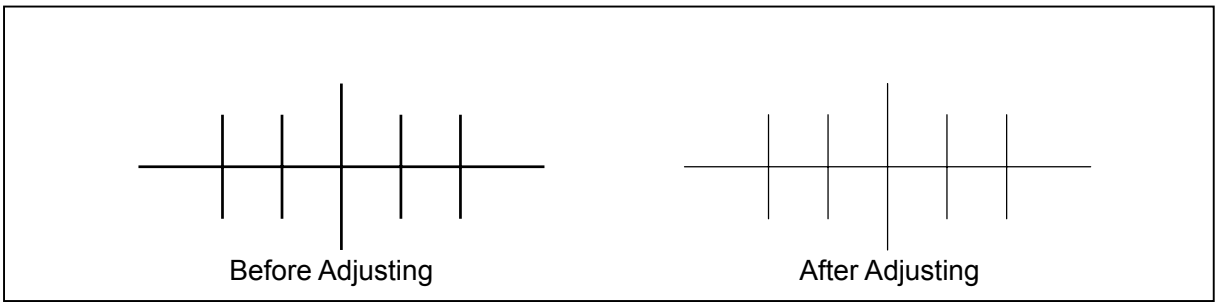


Fig. 4

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 20MΩ.

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 (CH-C05-A-V01.00(A8896CSNG7E18)

Table 3 Function Description for Bus Data

Symbol	Description		Data
Page 1			
OSD	OSD Horizontal Position	OSD 水平位置	50
OPT	Optional Setting	选项设置(换台)	B7(换台黑屏) B3（不黑屏）
RCUT	R CUT OFF Adjust	暗平衡调整	调至最佳状态
GCUT	G CUT OFF Adjust	暗平衡调整	调至最佳状态
BCUT	B CUT OFF Adjust	暗平衡调整	调至最佳状态
GDRV	G DRIVE Adjust	白平衡调整	调至最佳状态
RDRV	B DRIVE Adjust	白平衡调整	调至最佳状态
SCNT	SUB CONTRAST	副对比度	08
Page 2			
CNTN	CONTRAST MIN	对比度最小值	0A
CNTC	CONTRAST CENTER	对比中心	3B
CNTX	CONTRAST MAX	对比度最大值	66
CNTD	CONTRAST MAX IN DVD	DVD 对比度调整	F7
BRTN	BRIGHT MIN.(difference from center)	亮度最小值	35
BRTC	BRIGHT CENTER	亮度中心	35
BRTX	BRIGHT MAX.(difference from center)	亮度最大值	15
BRTS	SUB BRIGHT	副亮度	调至最佳状态

(continued)

Page 3			
COLC	COLOR CENTER NTSC	N 制色度中心	33
COLP	COLOR CENTER PAL(difference from COLC)	PAL 制色度中心	05
COLD	COLOR CENTER DVD	DVD 色度中心	05
COLN	COLOR MIN.	色度最小值	0D
COLX	COLOR MAX.(difference from center)	色度最大值	5D
TNTN	TINT MIN.(difference from center)	色调最小值	28
TNTC	TINT CENTER	色调中心	40
TNTX	TINT MAX.(difference from center)	色调最大值	28
Page 4			
ST3	SHARP CENTER 3.58NTSC TV	N 制 TV 清晰度中心	15
ST4	SHARP CENTER OTHER TV	其它制式 TV 清晰度中心	15
SV3	SHARP CENTER 3.58NTSC VIDEO	N 制 VIDEO 清晰度中心	15
SV4	SHARP CENTER OTHER VIDEO	其它制式 VIDEO 清晰度中心	15
SVD	SHARP CENTER DVD	DVD 清晰度中心	15
ASSH	ASYMMETRY-SHARPNESS	清晰度不对称	05
SHPN	SHARP MIN(difference from center)	清晰度最小值	0A
SHPX	SHARP MAX(difference from center)	清晰度最大值	0A
Page 5			
ABCL	ABL date in detail		3C
DCBS	A part of Video date in detail	部分视频详细数据	15
CLTB	The date when TV mode & SOUND SYS = B/G	TV 状态，当伴音制式为 B/G 制数据	64
CLTD	The date when TV mode & SOUND SYS = D/K	TV 状态，当伴音制式为 D/K 制数据	84
CLTM	The date when TV mode & SOUND SYS = M	TV 状态，当伴音制式为 M 制数据	A4
CLVO	The date when YUV mode & SOUND SYS != M	YUV 状态，伴音制式为非 M 制数据	AD
CLVD	The date when YUV mode & SOUND SYS = M	YUV 状态，当伴音制式为 M 制数据	88
OSDA			01
PAGE6			
HPOS	PAL Horizontal Centre Position Adjust	行中心	调至最佳位置
HPS	NTSC Horizontal Centre Position Adjust	NTSC 行中心	调至最佳位置
VP50	PAL Vertical Centre Position Adjust	场中心	调至最佳位置
VP60	NTSC Vertical Centre Position Adjust	NTSC 场中心	调至最佳位置
HIT	PAL Hight Adjust	场幅	调至最佳位置
HITS	NTSC Hight Adjust	NTSC 场幅	调至最佳位置
VLIN	PAL V Linearity Adjust	场线性	调至最佳位置
VLIS	NTSC V Linearity Adjust	NTSC 场线性	调至最佳位置
PAGE7			
VSC	PAL V Slope Adjust	场 S 校正	调至最佳位置
VSS	NTSC V Slope Adjust	NTSC 场 S 校正	调至最佳位置
HBOW	Horizontal BOW Adjust	行拱形校正	调至最佳位置
HPARA	Horizontal Parallelogram Adjust	平行四边形校正	调至最佳位置
UBLACK	U heft black electricity level		08
VBLACK	V heft black electricity level		08
AGC	RF AGC	高放 AGC	30
HAFC	AFC GAIN	AFC 增益	86

(continued)

PAGE8			
NOIS	SNC Adjust	信噪比调整	0F
NDTC	Noise detection count test		1F
MUTT	Y-MUTE FOR SOFT START	软启动静音	00
STAT	CONTRAST UP FOR SOFT START	软启动	00
VL1	TV volume control level	TV 音量为 1 时音量	15
VL25	TV volume control level	TV 音量为 25 时音量	55
VL50	TV volume control level	TV 音量为 50 时音量	65
VLX	TV volume control level	TV 音量为 100 时音量	7F
PAGE9			
W169	16：9 Horizonta Extent Adjust	16:9 模式行幅调整	调整到最佳
LANG	Language setting of factory	出厂语言设置	00
MODE4	Function setting	功能预置	0D
HBRS	NTSC Cut Right Roll	N 制行右消隐	00
HBLS	NTSC Cut Left RoLL	N 制行左消隐	00
SVM	MON/SVM CO MAX SVM DL SVM GAIN		10
VBLK	V BLK start V BLK stop		00
VCEN	V CENTERING		13
PAGE10			
VB1	AV volume control level)	AV 音量为 1 时音量	15
VB25	AV volume control level)	AV 音量为 25 时音量	55
VB50	AV volume control level)	AV 音量为 50 时音量	65
VBX	AV volume control level)	AV 音量为 100 时音量	7F
FLG0	FLAGS for IF		44
FLG1	FLAGS		12
UCOM	Miciom control	内部 ADC	00
OSDF	OSD PLL DATE	OSD 锁相环数据	7F
PAGE11			
TB_COL	Menu top OSD area plane color set	童锁菜单 BOX 颜色	9B
BB_COL	Menu itmes OSD area plane color set	其它菜单 BOX 颜色	BD
DELAY-T		开机延迟时间	01
SUR-VLX		环绕最大音量	56
DVD-H		DVD 行中心偏移量	0E
PYNN	Normal H.SYNC min	标准行同步最小值	11
PYXS	Search H.SYNC max	搜索行同步最大值	22
PYNS	Search H.SYNC min	搜索行同步最小值	12
PAGE12			
RCUTS	R cut offset in DVD	DVD 暗平衡调整	00
GCUTS	G cut offset in DVD	DVD 暗平衡调整	00
BCUTS	B cut offset in DVD	DVD 暗平衡调整	00
GDRVS	G DRIVE in DVD	DVD 白平衡调整	00
BDRVS	B DRIVE in DVD	DVD 白平衡调整	00
AUSTP			04
BBCT			06

(continued)

PAGE13			
STBG	S TRAP B/G		06
STI	S TRAP I		08
STDK	S TRAP D/K		08
STM	S TRAP M		05
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		10
PAGE14			
SYNC			00
SYBBN	BB judgement		44
SYBBF	BB judgement		40
SYSR	Set WIN Pulse and HLOCK Pulse		44
VCD0			00
VCD1			20
BL25	Balance 25		1E
BL49	Balance 49		50
PAGE15			
MODE0		伴音出厂设置	29
MODE1			0F
OV50		50Hzosd 垂直	00
OV60		60Hzosd 垂直	00
HOTEL		1：HOTEL 模式 0：无	00
UBRI		1：有 FM 0：无	01
SOUND M		1：有 M 伴音 0：无	01
AV2		1：有 0：无	01
PAGE 16			
ENGLISH		1：有英语 0：无	01
FRENCH		1：有法语 0：无	01
GERMAN		1：有德语 0：无	01
RUSSIAN		1：有俄语 0：无	01
INDONESIAN		1：有印尼语 0：无	01
MALAY		1：有马来语 0：无	01
FARSI		1：有波斯 0：无	01
ARABIC		1：有阿拉伯语 0：无	01
PAGE 17			
INITIAL		初始化	00
LOCK MENU		1：有童锁 0：无	01
CALENDAR			01
SEC-COL		SECAM 色度中心	02
DEMOKEY		1：有 DEMO 0：无	01
SVIDEO		1：有 SVIDEO 0：无	00
DVDVIDEO		1：有 DVDO 0：无	01
LOGO		1：有 LOGO 0：无	00：不需要 01：需要

PAGE 18			
LOGO1COLOR		LOGO 颜色调整	根据要求调整
LOGO2COLOR		LOGO 颜色调整	根据要求调整
LOGO1LINE		LOGO 显示行调整	根据要求调整
LOGO2LINE		LOGO 显示行调整	根据要求调整
LOGO1SIZE		LOGO 字体大小调整	根据要求调整
LOGO2SIZE		LOGO 字体大小调整	根据要求调整
LG1		LOGO 显示字符调整	根据要求调整
LG2		LOGO 显示字符调整	根据要求调整
PAGE 19			
WID	PAL Horizonta Extent Adjust	PAL 制式行幅调整	调至最佳位置
WIDS	NTSC Horizonta Extent Adjust	NTSC 制式行幅调整	调至最佳位置
DPC	PAL Pillow Shape Adjust	PAL 制式枕形失真调整	调至最佳位置
DPCS	NTSC Pillow Shape Adjust	NTSC 制式枕形失真调整	调至最佳位置
KEY	PAL Trapezia Adjust	PAL 制式梯形失真调整	调至最佳位置
KEYS	NTSC Trapezia Adjust	NTSC 制式梯形失真调整	调至最佳位置
ECCT	PAL Top Adjust	PAL 制式上边角调整	调至最佳位置
ECCB	PAL Bottom Adjust	PAL 制式下边角调整	调至最佳位置
PAGE 20			
HEHT		行 EHT 调整	04
DPC69	16:9 Pillow Shape Adjust	PAL 制式 16：9 枕形失真调整	调至最佳位置
HIT69	16:9 Hight Adjust	PAL 制式 16：9 行幅调整	调至最佳位置
TREC		Treble 中间值，调节线性	30
TREX		Treble 最大值，调节线性	60
VEHT		场 EHT 校正	00
SBY		SECAM B-Y BLACK 调整	08
SRY		SECAM R-Y BLACK 调整	08
PAGE 21			
SECD			10
SEC29			00
BASC		Bass 中间值，调节线性	40
BASX		Bass 最大值，调节线性	70
MODE3			01(有音效) 00(无音效)
BALC		Balance 中间值，调节线性	40
FVOL		FM 音量控制	13
NVOL		NICAM 音量控制	5F
PAGE 22			
HBR	PAL Cut Right Roll	PAL 制式行右卷边消隐	00
HBL	PAL Cut Left RoLL	PAL 制式行左卷边消隐	00
ECCTS	NTSC Top Adjust	NTSC 制式上边角调整	调至最佳
ECCBS	NTSC Bottom Adjust	NTSC 制式下边角调整	调至最佳

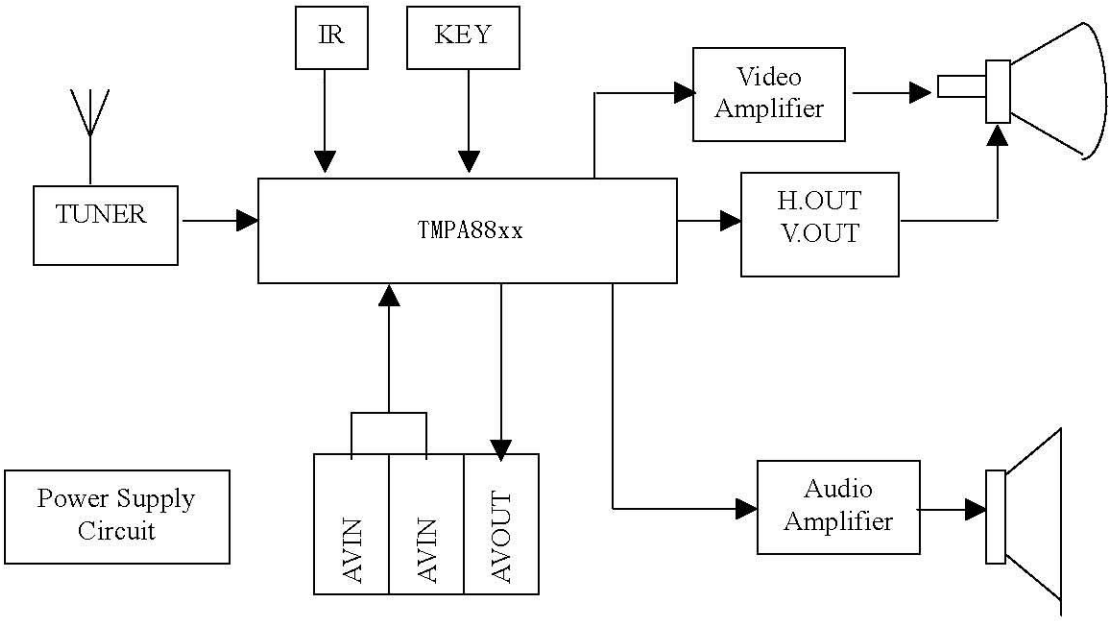
Notes:

① The data sheet may differ dependent on different models.

② The data sheet may differ dependent on different CRTs for the same model.

STRUCTURE AND CHISSIS FUNCTION DESCRIPTION

1.STRUCTUE BLOCK DIAGRAM



Structure Block Diagram for ETA-5 Chassis Series

2. CHASSIS DESCRIPTION

General Description

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 TMPA88xxCPNG for PAL/NTSC /SECAMsmall signal processing and bus control
- EEPROM AT24C16 for data memory
- LA78040 /LA78041for vertical output power amplifying
- TFA9842AJ for audio power amplifying
- Thick-film IC STR-G5653/STR-G8656 for power circuit adjustment and control

The following features are available in the chassis:

- Color systems: PAL, NTSC,SECAM
- Sound systems: D/K B/G I M
- 236 programs preset
- AV stereo
- I^2C 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	CH-C05-A-V01.00 (A8896CSNG7E18)	2IN1 IC (Small signal processor + micro control unit (MCU))
3	N603	TFA9842AJ	Audio power amplifier
4	N301	LA78040/LA78041	Vertical scan output stage circuit
5	N801	STR-G5653/STR-G8656	Switch-mode power supply control
6	A001	TAF5-C4I23	Tuner

SERVICE DATA

TECHNICAL DATA OF KEY ICS

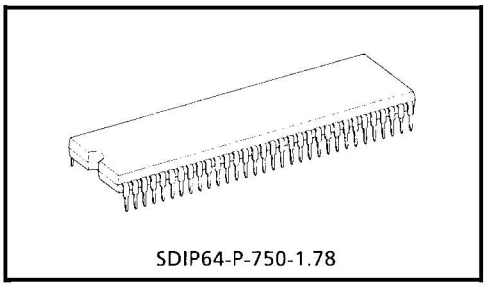
1.MCU and Signal Processor for a PAL/NTSC TV

TMPA8896CPNG /CRNG /CSNG

MCU and Signal Processor for a PAL/NTSC/SECAM TV

The TMPA8896CPNG is an integrated circuit for a PAL/NTSC/SECAM 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: TMPA8896CPNG (ROM size: 48k)
Mask ROM: TMPA8896CRNG (ROM size: 56k)
Mask ROM: TMPA8896CSNG (ROM size: 64k)
OTP ROM: TMPA8896PSNG (ROM size: 64k)



Weight: 8.85 g (typ.)

2. Features

MCU

- High speed 8-bit CPU (TLCS-870/X series)
- Instruction execution time: 0.5 μs (at 8 MHz)
- (TMPA8896CPNG)
  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

CCD Decoder

- Digital data slicer for NTSC

OSD

- Clock generation for OSD display
- Font ROM characters: 384 characters
- Characters display: 32 columns × 12 lines
- Composition: 16 × 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

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/SECAM demodulation

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)

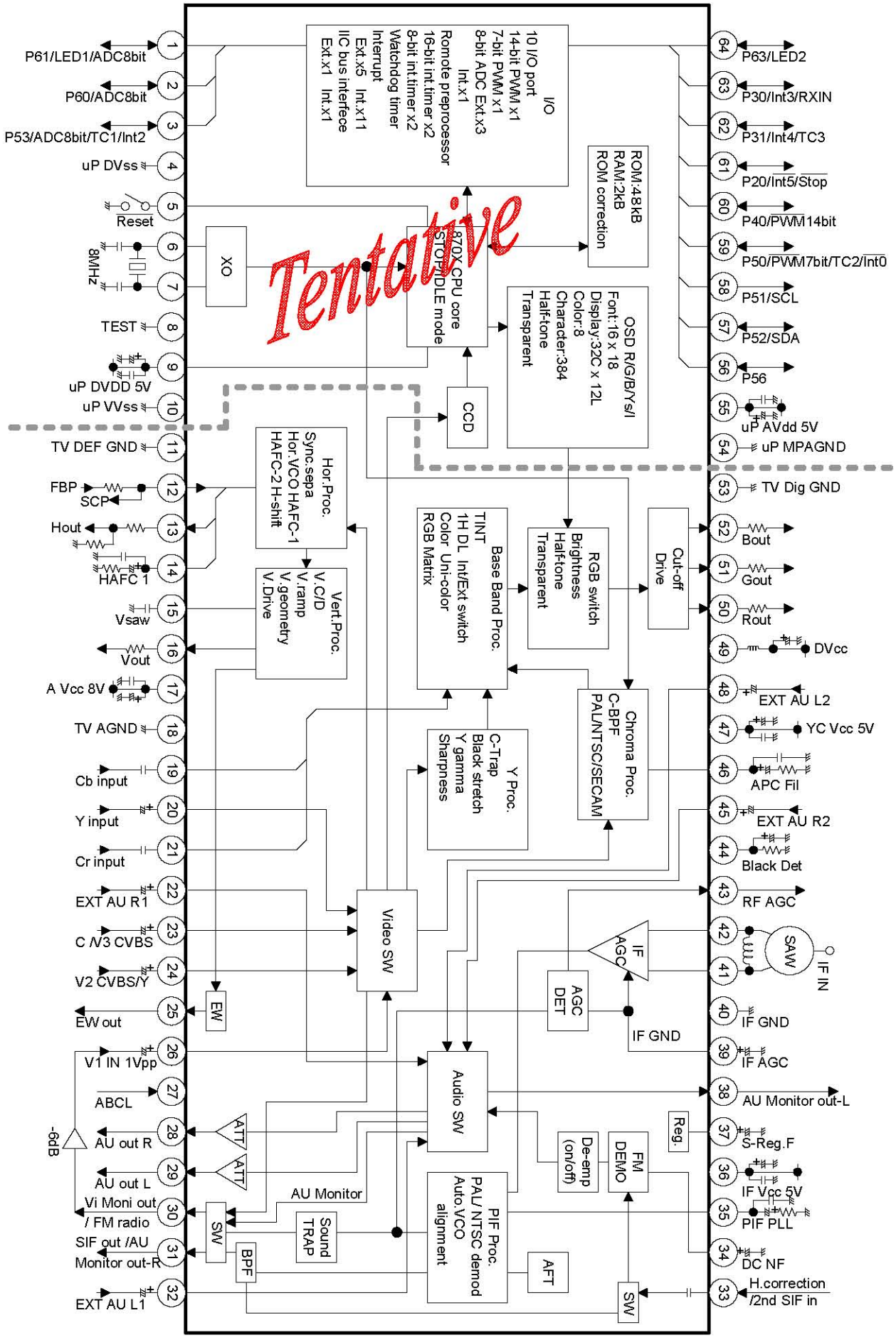
Sync.

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

AV Switch

- 3 for video
- YCbCr input
- 2 for audio(Stereo), controlled by IIC bus
- Stereo monitor output

3. Block Diagram



4. Basic Structure

1. Internal Connections

TMPA8896 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	AV_{DD}	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

TMPA8896 has some power supplies and GND pins. Power supplies related MCU must be applied at the first. Power supplies for H.V_{CC} and TV D.V_{CC} 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

TMPA8896 requires only one crystal resonator, in stead 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 TMPA8896 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

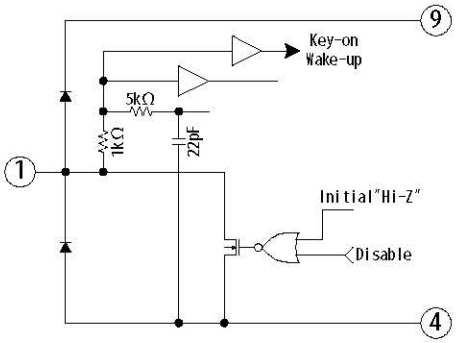
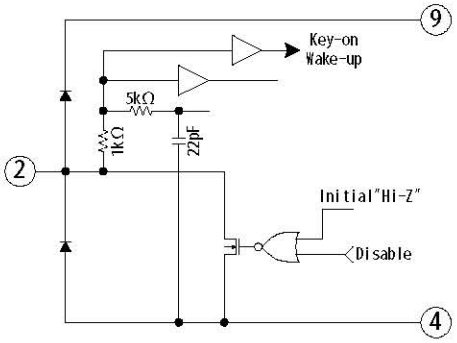
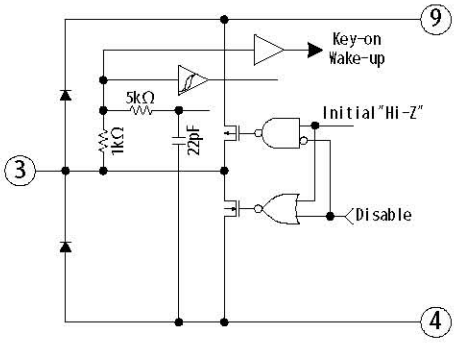
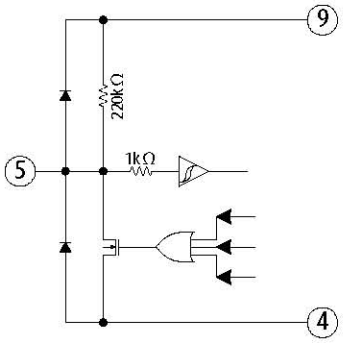
f_{osc}: 8 MHz +/–20 ppm

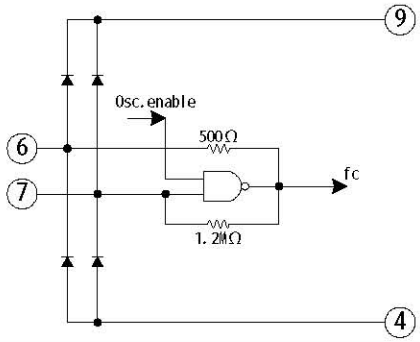
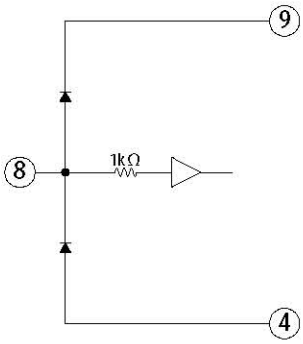
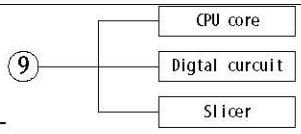
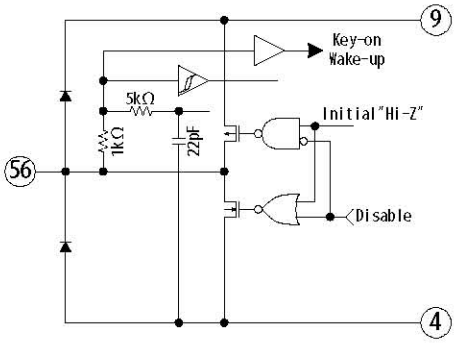
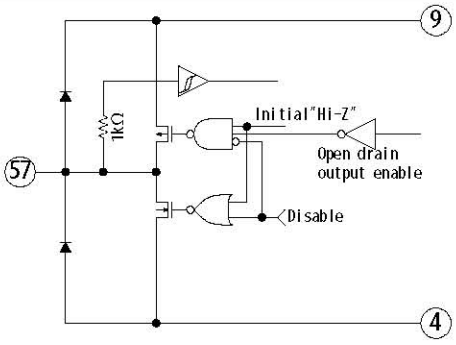
ftemp: 8 MHz +/–40 ppm (–20°C to +65°C)

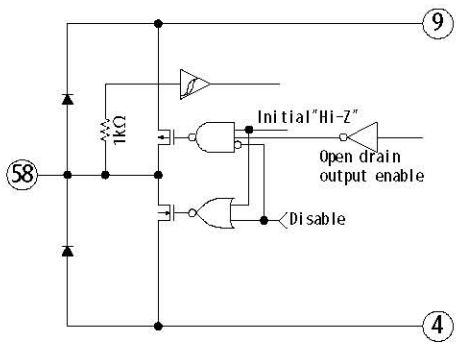
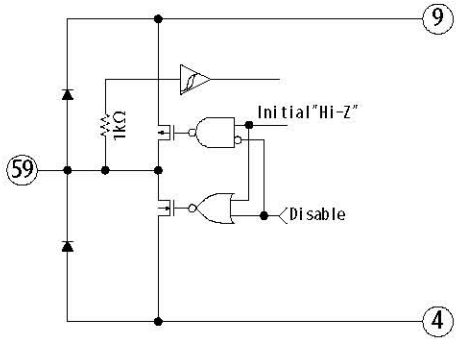
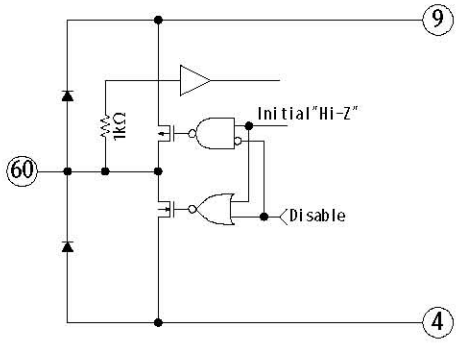
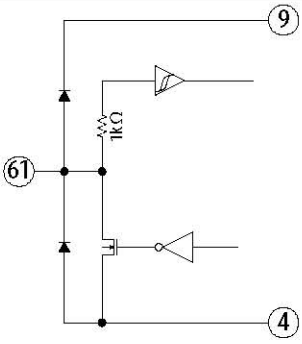
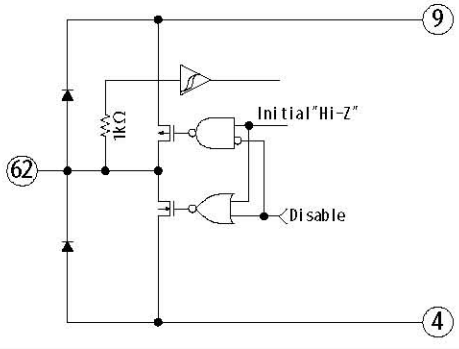
While RESET of MCU is active, the MCU function stops. Hardware and software initialization sequence including power supplies control is required, because status of any hardware after the RESET period is unknown especially horizontal oscillator which is a very basic timing generator of SP operation.

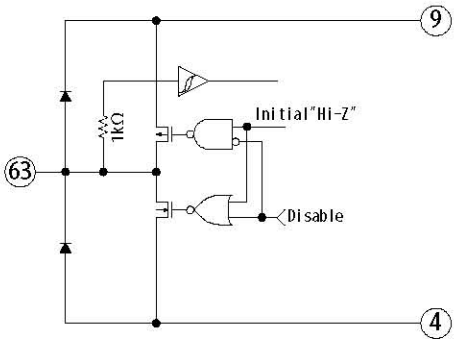
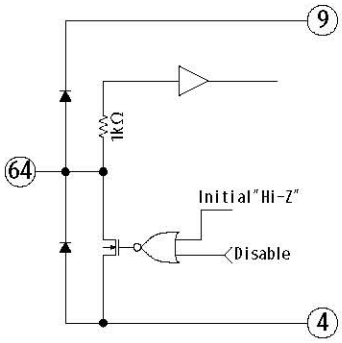
5. TERMINAL INTERFACE

MCU BLOCK

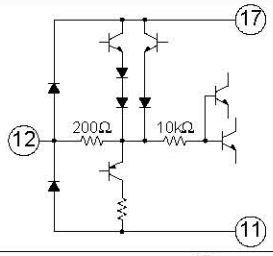
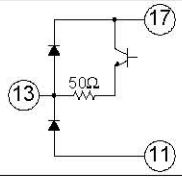
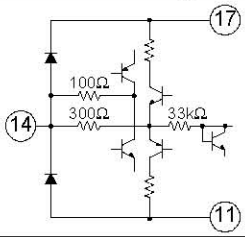
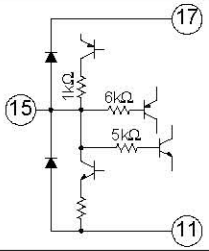
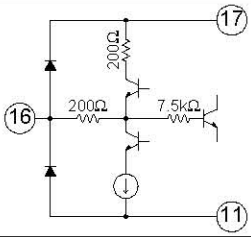
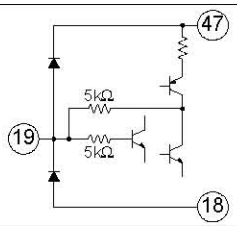
Pin No.	Pin Name	I/O	Function	Interface Circuit
1	P61 (/KWU5) (AIN5) (LED1)	I/O (Input) (Input) (Output)	Key on wake up input A/D converter analog input LED output	
2	P60 (/KWU4) (AIN4)	I/O (Input) (Input)	Key on wake up input A/D converter analog input	
3	P53 (/KWU0) (AIN0) (TC1) (INT2)	I/O (Input) (Input) (Input) (Input)	Key on wake up input A/D converter analog input Timer/counter input External interrupt input	
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	

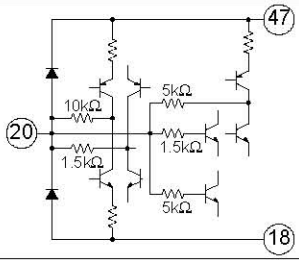
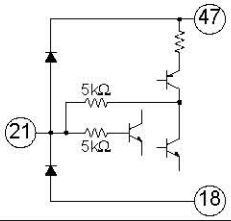
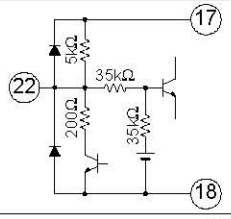
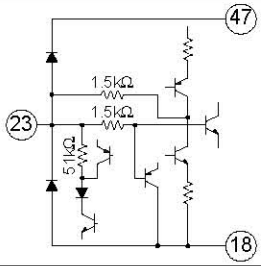
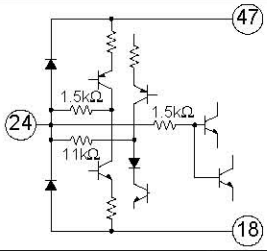
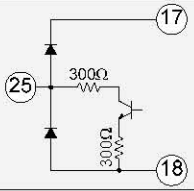
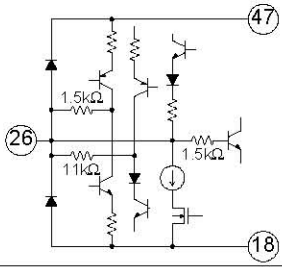
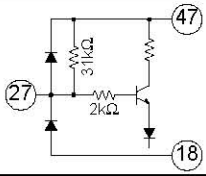
Pin No.	Pin Name	I/O	Function	Interface Circuit
6 7	Xout Xin	Output Input	X'tal connecting pins	
8	TEST	Input	Test pin for out-going test	
9	up DVdd	Power Supply	Vdd Supply 5V	
10	up VVss	Power Supply	GND for Slicer circuit	—
54	up AGND	Power Supply	GND for Oscillator circuit	—
55	up AVdd	Power Supply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

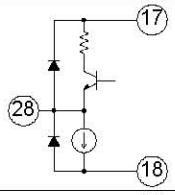
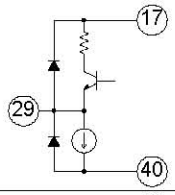
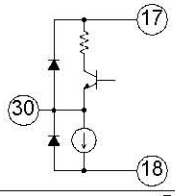
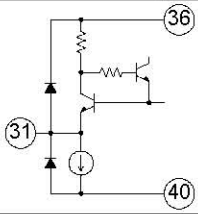
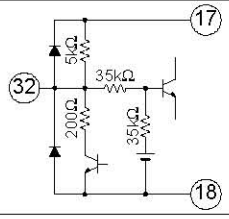
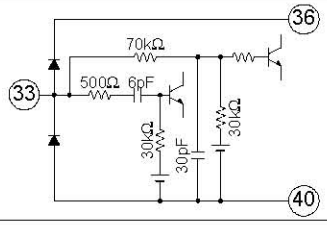
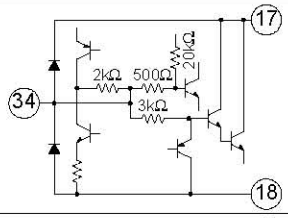
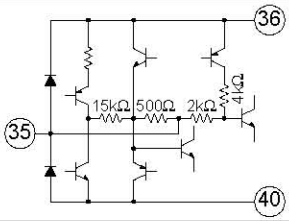
Pin No.	Pin Name	I/O	Function	Interface Circuit
58	P51 (SCL)	I/O (I/O)	IIC bus serial clock input / output	
59	P50 (/PWM8) (TC2) (INT0)	I/O (Output) (Input) (Input)	7-bit D/A conversion (PWM) output Timer/Counter input External interrupt input	
60	P40 (/PWM0)	I/O (Output)	14/12-bit D/A conversion (PWM) output	
61	P20 (/INT5) (/STOP)	I/O (Input) (Input)	External interrupt input STOP mode release signal input	
62	P31 (INT4) (TC3)	I/O (Input) (Input)	External interrupt input Timer/Counter input	

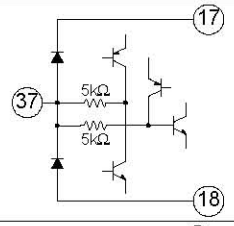
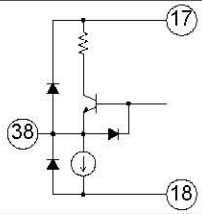
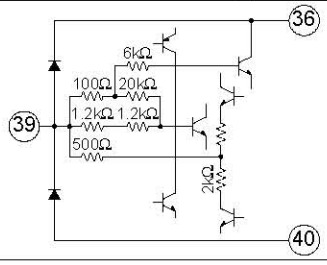
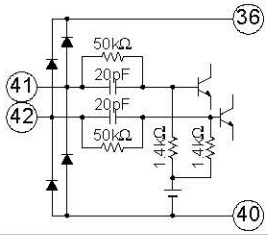
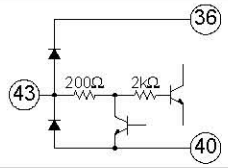
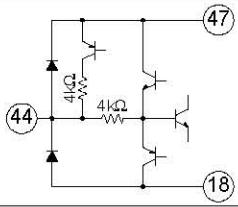
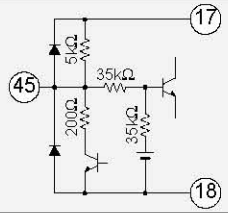
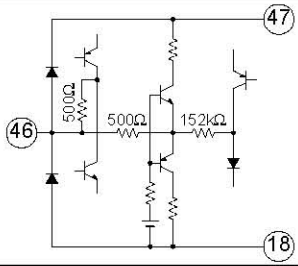
Pin No.	Pin Name	I/O	Function	Interface Circuit
63	P30 (INT3) (RXIN)	I/O (Input) (Input)	External interrupt input Remote control signal preprocessor input	
64	P63 (LED2)	I/O (Output)	LED output	

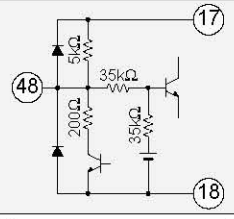
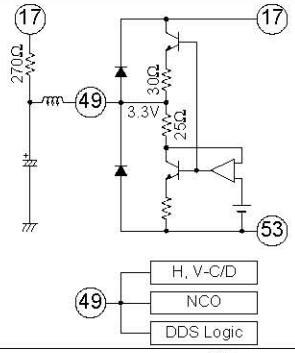
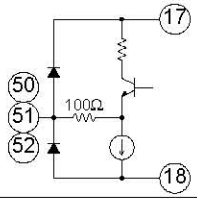
SIGNAL PROCESSOR BLOCK

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.		

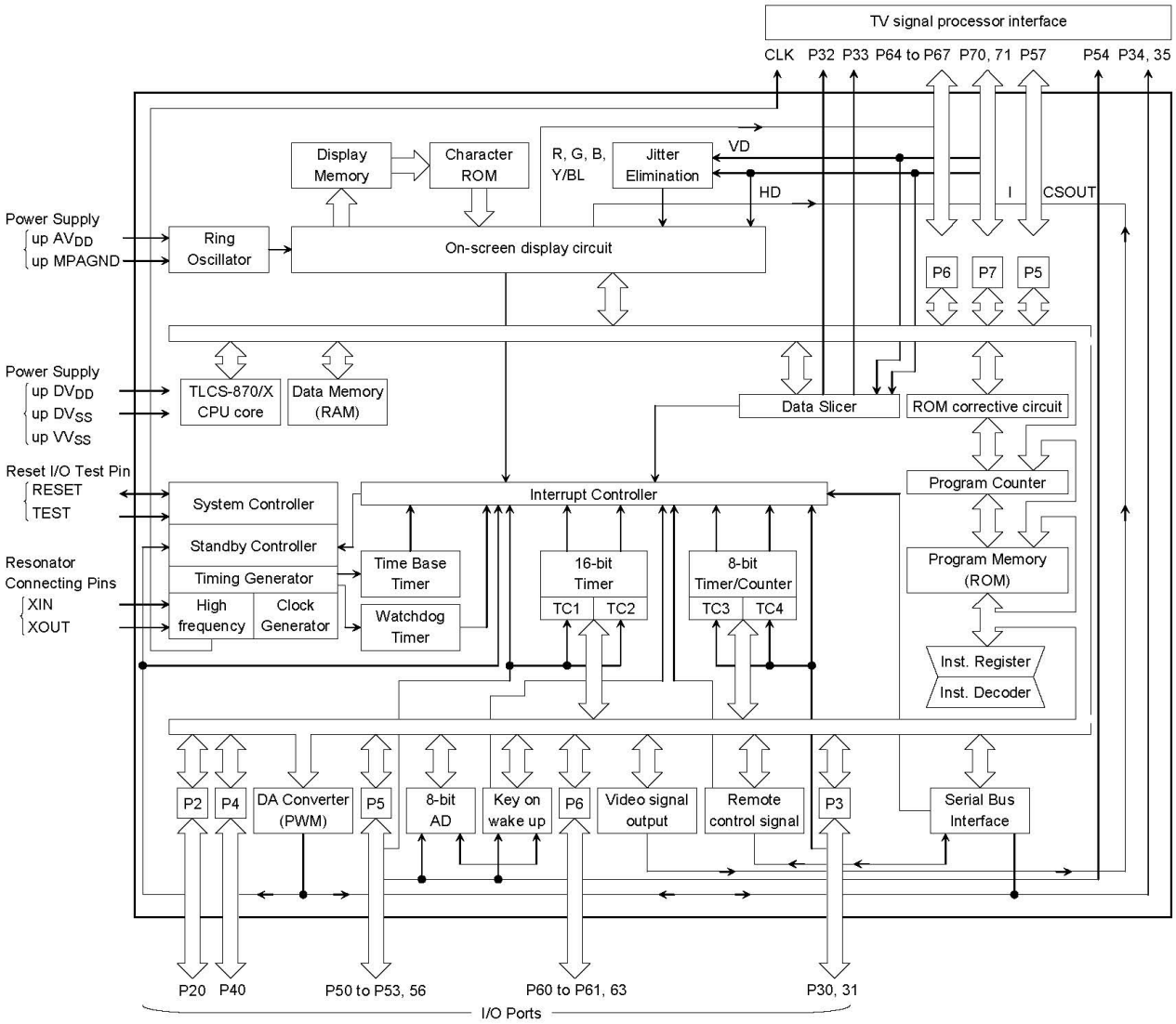
Pin No.	Pin Name	Function	Interface Circuit	I/O Signal
20	Y in	Input terminal for Y signal.		< 91 >
21	Cr in	Input terminal for Cr signal.		
22	Ext Au R1	Input terminal for Audio R signal 1.		
23	V3 / C in	Input terminal for Video or Chroma signal.		
24	V2 / Y in	Input terminal for Video or Y signal.		
25	EW-out	Output terminal for East-West correction signal.		
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	I/O Signal
28	Au out R	Output terminal for Audio R signal.		
29	Au out L	Output terminal for Audio L signal.		
30	Vi Moni ou /FM radio	Output terminal for detected PIF, video monitor or SIF of FM radio signal.		
31	SIF out AU monitor out R	Output terminal for detected SIF signal or audio monitor out R.		
32	Ext Au L1 in	Input terminal for Audio L 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	I/O Signal
37	Reg Fil	Terminal to be connected capacitor for stabilizing internal bias.		
38	AUDIO Monitor out 1	Output terminal for Audio monitor out 1.		
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	Ext Au R2 in	Input terminal for Audio R signal 2.		
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	I/O Signal
47	YC Vcc 5V	Vcc terminal for Y/C circuit. Supply 5V.	—	—
48	Ext Au L2 in	Input terminal for Audio L signal 2.		
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.	—	—

Microcontrollers Descriptions (MROM version: TMPA8896CPNG /CRNG /CSNG)



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.

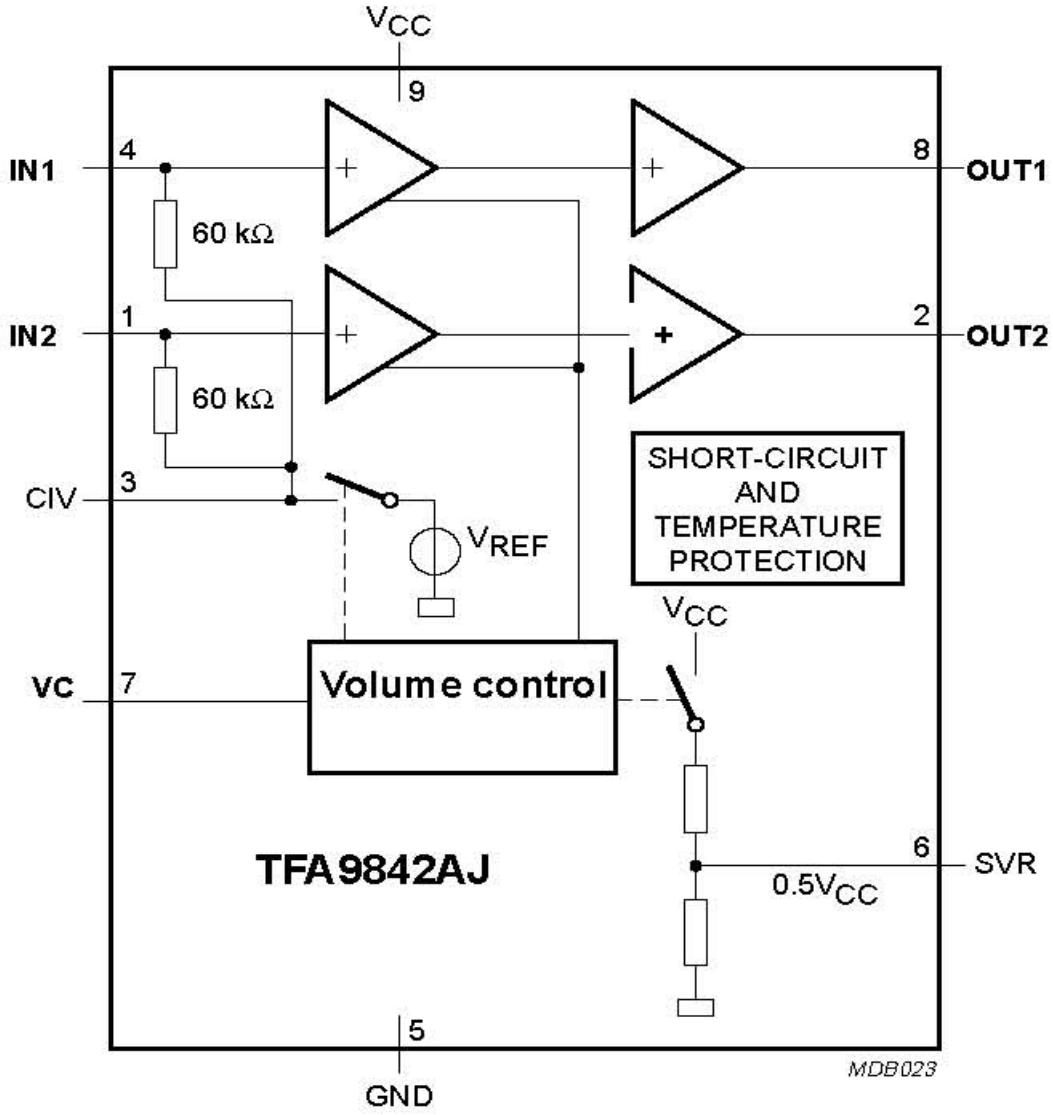
2. Features

- 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

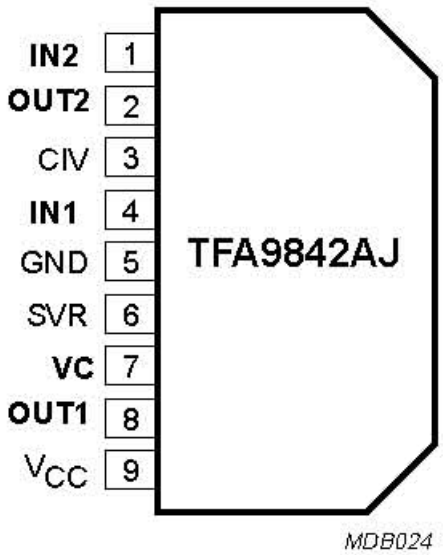
- CRT TV, LCD TV
- Monitors
- PC speakers
- Boom box
- Mini and micro audio receivers.

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

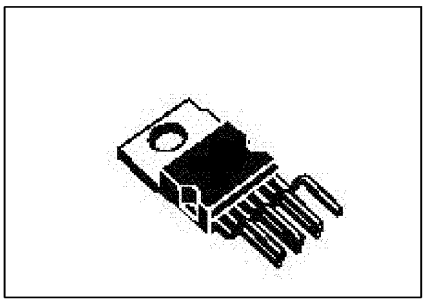
Low power dissipation due to built-in pump-up circuit

Vertical output circuit

Thermal protection circuit built in

Excellent crossover characteristics

DC coupling possible



Package Type:TO-220-7H

Fig.12

2) Block Diagram

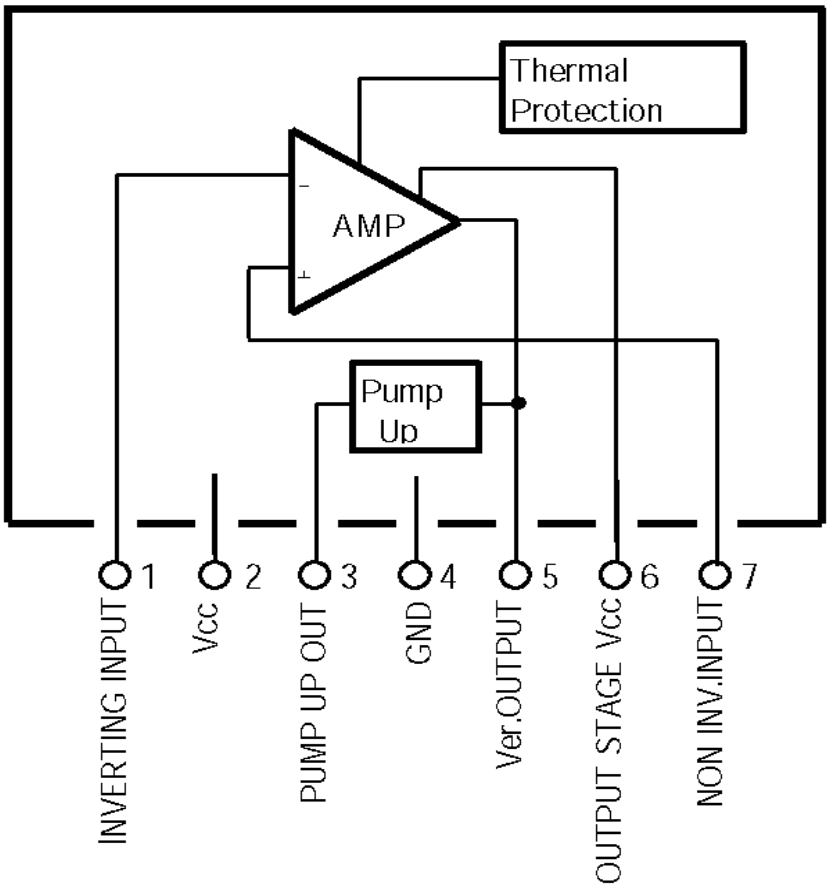


Fig.1 3 Block diagram

5．EEPROM AT24C04/08/16

1) Features

Low-voltage and Standard-voltage Operation

-2.7 (Vcc=2.7V to 5.5V)

-1.8 (Vcc=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

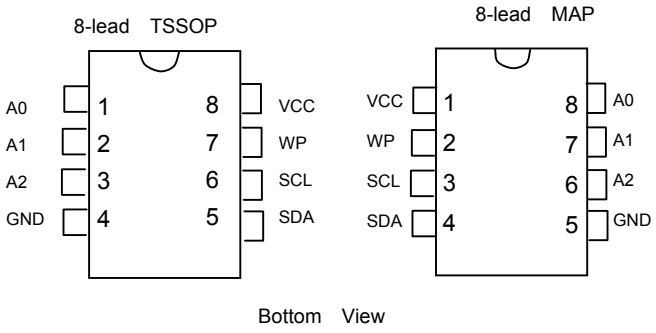


Fig. 14

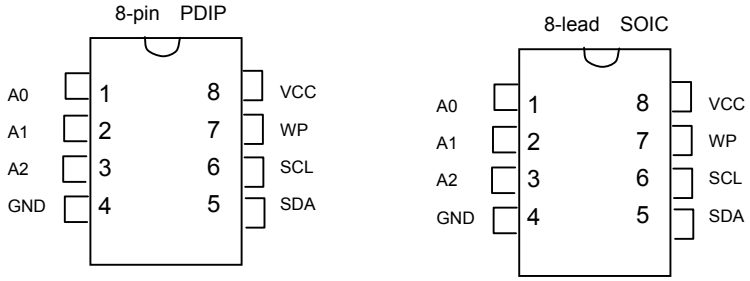


Fig. 15

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

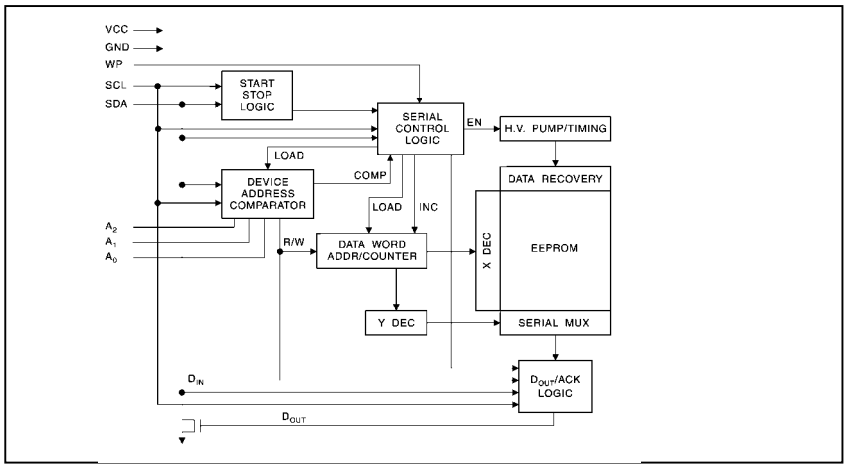


Fig.16

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

7. SWITCH-MODE POWER SUPPLY IC STR-G5653/STR-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

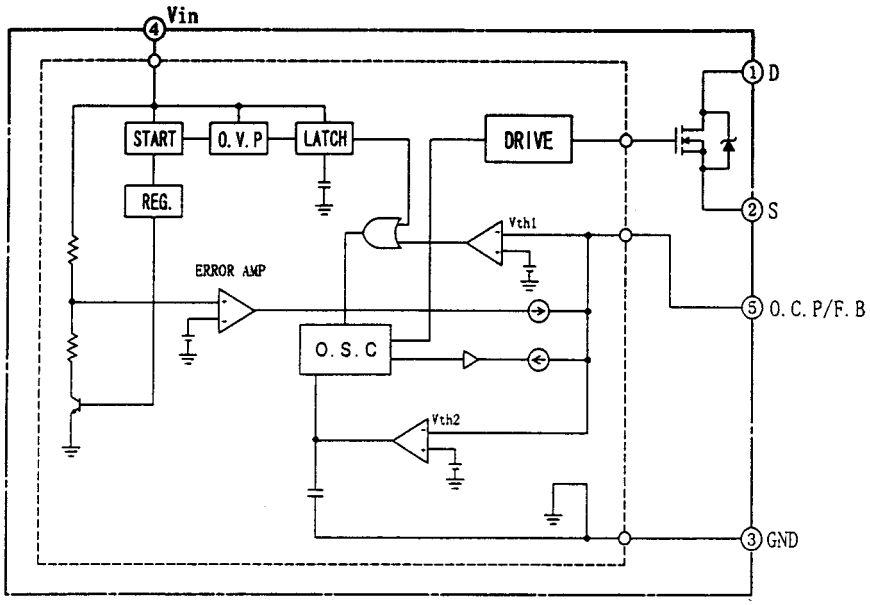


Fig.18

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

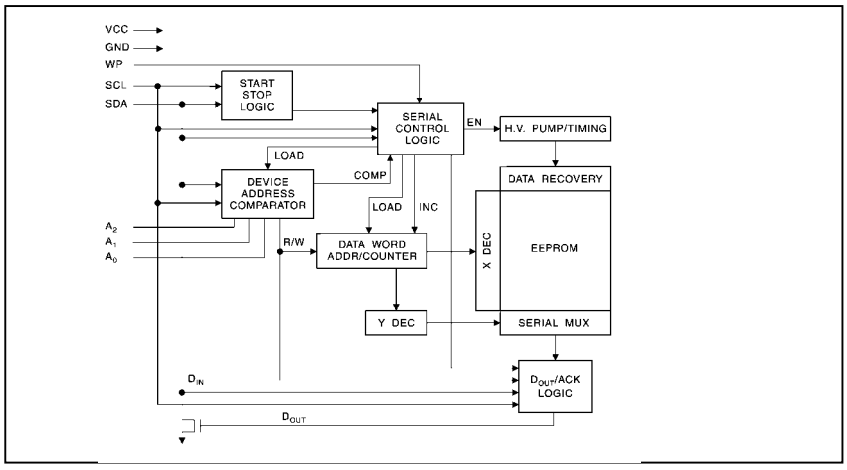


Fig.16

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

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(20KΩ)
1	IN2	Input 2	4.7	18.2MΩ
2	OUT2	Loudspeaker terminal 2	9.0	28KΩ
3	CIV	Common input voltage decoupling	4.7	280KΩ
4	IN1	Input 2	4.7	18.2MΩ
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	11KΩ
8	OUT1	Loudspeaker terminal 1	9	-
9	VCC	supply voltage	20	1KΩ

Table 20 Functions and Service Data of LA78040's Pins

Pin No.	Function Description	GDM8145 Multimeter		
		Voltage of Pin (V)	Ground Resistance (KΩ)	
			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 (20KΩ)	Negative Resistance (20KΩ)
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/G8656's Pins

Pin No.	Functions Description	Digital Multimeter		
		Reference Voltage (V)	Positive Resistance (20KΩ)	Negative Resistance (20KΩ)
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/Freedback terminal	1.85	0.68	0.68

1. Any components identified by ⚠ have special safety-related characteristics.
Use replacement Which have the same characteristics as original parts.
2. ⊥ Cold ground ⏚ Hot ground

This circuit diagram is only for reference, specifications are subject to change without reference.

Circuit Diagram FOR SF21GA63