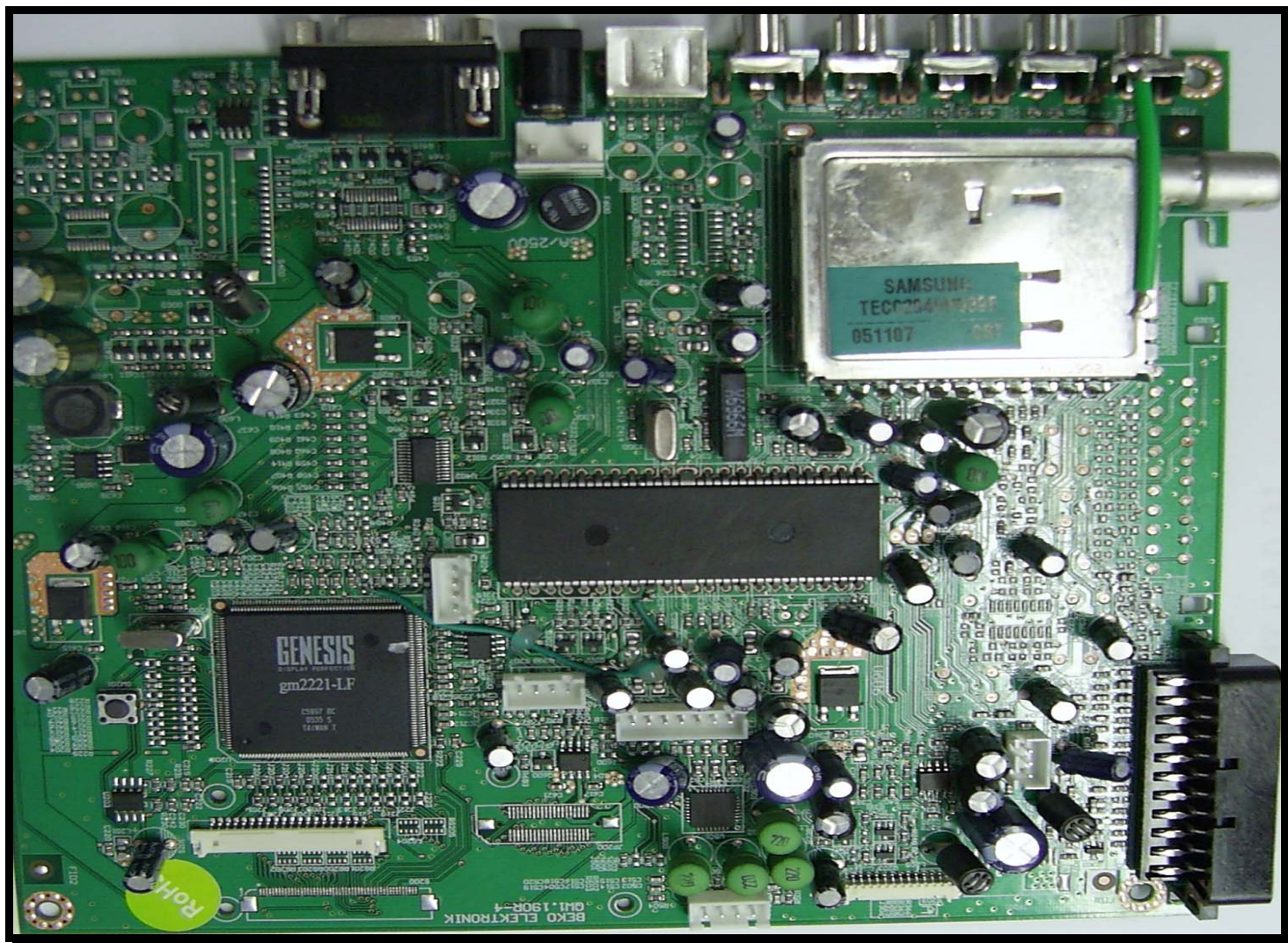


# BEKO

## COLOUR TELEVISIONS



LC CHASSIS

TFT-LCD TV SERVICE MANUAL

## CONTENTS

## PAGES

<b>Safety instructions</b>	<b>1</b>
<b>Technical specifications</b>	<b>2</b>
<b>Power rating and Panel Specifications</b>	<b>3</b>
<b>Remote control explanations</b>	<b>4</b>
<b>Service Menu of the TV</b>	<b>5</b>
<b>Set appearrances</b>	<b>9</b>
<b>Block diagram of the VCTI</b>	<b>10</b>
<b>Block diagram of Microcontroller (Genesis)</b>	<b>11</b>
<b>Block diagram of power supply</b>	<b>12</b>
<b>Data sheet of important IC's</b>	<b>14</b>
<b>Service mode items and explanations</b>	<b>12</b>
<b>Replacement part List</b>	<b>23</b>
<b>Frequency list of channels</b>	<b>28</b>

# SAFETY PRECAUTIONS

## GENERAL GUIDELINES

1. Always use the manufacturer's replacement safety components. The critical safety components marked with ∇ on the schematics diagrams should not be by other substitutes. Other substitute may create the electrical shock , fire or other hazards. Take attention to replace the spacers with the originals. Furthermore where a short circuit has occurred , replace those components that indicate evidence of overheating.
2. After servicing , see that all the protective devices such as insulation barriers, insulation papers, shields and isolation R-C combinations are correctly installed.
3. When the receiver is not being used for a long time of period of time , unplug the power cord of the Adaptor from the AC outlet.

*Color TFT LCD Module is very sensitive both electrically and physically. Users, therefore, are requested to follow the "Guidance of handling color TFT LCD Module" on the followings.*

**1 - Be careful not to make scratch on the polarizer.**

Surface of polarizer is soft and can be physically damaged easily.  
Please do not touch, push or rub polarizer surface with materials over HB hardness.

**2 - Keep clean the surface.**

Please wear rubber glove when touch the surface of LCD screen. Please use soft and anti-static material as cleaner.

**3 - Keep out of water.**

Water on/in the LCD may cause electrical short or corrosion. Please wipe out dry or water carefully.

**4 - Prevent swift Temperature & Humidity change.**

Instantaneous temperature and/or humidity change can make dew or ice which cause nonconformance such as malfunction.

**5 High temperature & high humidity reduce the life-time.**

LCD is not proper to be used at high temperature and high humidity. Please keep specified temperature and humidity condition.

**6 - Keep out of Corrosive Gas.**

Corrosive gas effect the polarizer and the circuit chemically and cause defects accordingly.

**7 - Electrostatic discharge can make Damage**

There are electro-static sensitive components such as CMOS in LCD Module. Please earth human body when handle the LCD. In addition, please do not touch the interface connector pin with bare.

**8 - Do not operate for a long time under the same pattern**

Operating LCD for a long time under the same pattern can cause image persistence and can damage it. Please follow following guidance.

1. Turn the power off when do not use.
2. Change the pattern periodically.

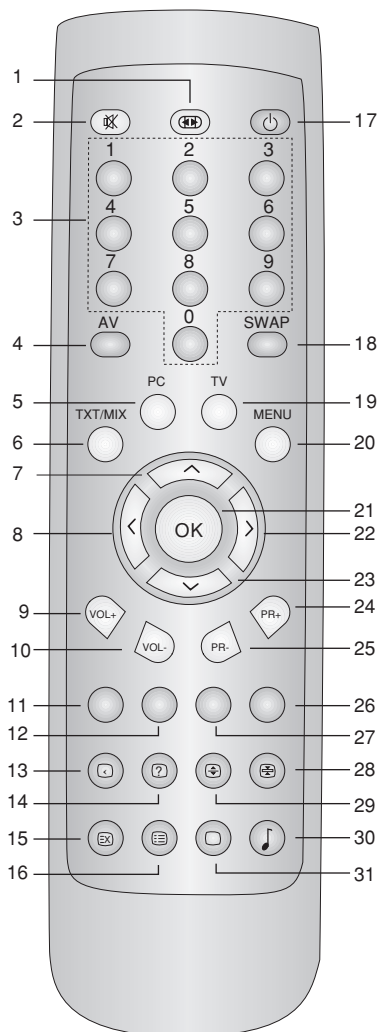
## SPECIFICATIONS

Receiving System		PAL B/G+I+D/K SECAM L/L'
Tuning System		PLL FST
Comb Filter		Adaptive 4H2H
LTI, CTI Filters		Optional
Sync On Green (SOG) support on graphics		YES
Scaling		Upto SXGA at 75Hz
Stereo Decoding (German A2, Nicam, BTSC)		German A2, Nicam
Virtual Dolby		Optional
Subwoofer		Optional
YPbPr In (Progressive)	Through D-sub 15 conn.	Optional
Number of speakers		2 (L+R)
Teletext	Level (1.5, 2.5, Teleweb)	Teletext 1.5
	Type	No Text- Optional Fast Text -Optional Top Text&Fast-Default
	List Mode	Optional
	Page Memory	10p
Supported Menu Languages		ENGLISH, DEUTSCH, DUTCH, FRANCAIS, ESPAÑOL, ITALIANO, PORTUGUESA, ΕΛΛΗΝΙΚΑ, SVENSKA, NORSK, SUOMI, TÜRKÇE, POLSKI, MAGYAR, ČEŠTINA, ROMANESTE, SLOVENČINA, DANSK, SERBIAN, РУССКИЙ, Bulgarian, Croatian >> 22 Languages
Picture Formats (4:3, 16:9, 14:9, Panorama, LetterBox, Subtitle)	4:3	YES
	16:9	4:3 Panels: Depends on LCD 16:9 Panels: YES
	14:9	4:3 Panels: NO 16: 9 Panels: Depends on LCD
	Panorama	NO
	Letterbox	4:3 Panels: NO 16: 9 Panels: Depends on LCD
	Subtitle	4:3 Panels: NO 16: 9 Panels: Depends on LCD
	Zoom	NO
WSS (Wide Screen Signalling)		Optional
ATS (Automatic Tuning System)		Frequency Search
Manual Search		Frequency Search
AFT (Auto Fine Tuning)		YES
Number of Program Storage		100
No Ident Timer		YES
Equalizer		YES
AVL (Automatic Volume Level)		YES
Sound Status Memory		YES
Picture Status Memory		YES
Zapping\Swap		Optional
Panel Lock		YES
Picture Format Switching Through Scart (Pin 8)		YES
Auto RGB Detect Through Scart (Pin 16)		YES
Timer	On\Off or Sleep	Optional
Picture Smart Modes		YES
Sound Smart Modes		YES
Simple Hotel Mode		Optional
Wake Up in PC	Stby to On in PC mode when last watched is PC	Optional
	Stby to On automatically when PC signal is available	Optional
Memory Card Reader		Optional

## POWER RATING AND PANEL SPECIFICATION

	15"	17"	20"	22W"	26"	27"	32"
<b>Adaptor Input</b>	12V	12V	15V	24V	Built-in Power	Built-in Power	Built-in Power
<b>Current rating</b>	3A	4A	4A	3A			
<b>Power consumptions</b>	48W	60W	75W	100W	130W	130W	130W
<b>St-By Power Consumption</b>	<3W	<3W	<3W	<3W	<3W	<3W	<3W
<b>Input Range</b>	100-240V/50, 60Hz	100-240V/50, 60Hz	100-240V/50, 60Hz	100-240V/50, 60Hz	100-240V/50, 60Hz	100-240V/50, 60Hz	100-240V/50, 60Hz
<b>Audio Output Power (%10) THD</b>	2X2W	2X3W	2X3W		2X7W	2X7W	2X7W
<b>Manufacturer</b>	Samsung CMO AUO	Samsung	CMO AUO	Samsung	Samsung LG-Philips AUO	Chimei	Chimei
<b>Interface</b>	Double TTL\Single LVDS	Dual LVDS	Single TTL\Single LVDS	Single LVDS	Single LVDS	Single LVDS	Single LVDS
<b>Resolution</b>	XGA (1024x768)	SXGA (1280x1024)	SVGA (800x600) VGA (640x480)	WXGA (1280x720)	WXGA (1280x768)	WXGA (1280x720)	WXGA (1280x720)
<b>Brightness (cd/m2)&gt;</b>	250	300	500	450	450	550	550
<b>Contrast&gt;</b>	300	400	500	500	400	600	600

# REMOTE CONTROL



1. Picture Format ( )
2. Temporary mute of volume (MUTE) ( )
3. Numeric buttons
4. Audio/Video (AV) ( )
5. PC mode transition ( )
6. Teletext / MIX / TV choice buttons ( )
7. Up (Menu -Teletext) ( )
8. Left (Menu) ( )
9. Volume UP ( )
10. Volume DOWN ( )
11. Red Fastext Button
12. Green Fastext Button
13. Index Button (P100) ( )
14. Question/Answer button (REVEAL) ( )
15. UPDATE Button ( )
16. SUB PAGE Button ( )
17. STAND-BY Button ( )
18. Return to Selected Program Button (SWAP) ( )
19. TV mode transition button ( )
20. Menu Button ( )
21. OK Button ( )
22. Right (Menu) ( )
23. Down (Menu/Teletext) ( )
24. Program up button (P+) ( )
25. Program down button (P-) ( )
26. Blue Fastext Button
27. Yellow Fastext Button
28. STOP Button ( )
29. Teletext enlarge button (DOUBLE) ( )
30. Equalizer selection button ( )
31. Picture control button ( )

## SERVICE MENU OF THE TV

ITEM NAME	OPTIONS/ VALUES	DEFAULT VALUES OR SETUP
-----------	--------------------	----------------------------

<b>OPTIONS</b>		
SCART 2	ON/OFF	OFF
FAV	ON/OFF	ON
SVHS	ON/OFF	ON
HOTEL MODE	ON/OFF	OFF
STBY RECALL	ON/OFF	OFF
RECALL LAST AV	ON/OFF	OFF
MSP CARRIER MUTE	ON/OFF	OFF
WSS RF	ON/OFF	ON
AUTO AV 16:9	ON/OFF	ON
FIRST ATS	ON/OFF	OFF
BACKLIGHT POL	ON/OFF	OFF
FACTORY MODE	ON/OFF	OFF

### **ADJUSTMENTS**

WHITE R	0-255	128
WHITE G	0-255	128
WHITE B	0-255	128
BRIGHTNESS	0-255	130
CONTRAST	0-257	158
COLOR	0-255	128
PRESCALE FM	0-127	37
PRESCALE NICAM	0-127	63
PRESCALE SCART	0-127	27
HOTEL VOLUME	0-63	16
AGC	0-31	23
FACTORY RESET		
SW DOWNLOAD		

### **SELECTIONS**

TUNER TYPE	PHILIPS , SAMSUNG	PHILIPS
TELETEXT	FAST&TOP , NO TEXT ,FAST	FAST&TOP
TIMER MODE	SLEEP TIMER OFF TIMER	SLEEP TIMER
MSP CLIP	REDUCE VOL          REDUCE VOLUME	REDUCE VOL
SWAP/ZAPP		ZAPP
DOLBY VIRTUEL	ON/OFF	OFF

## LC (L5C) SERVICE MENU

Service Menu is entered by pressing 9, 3, 0, 1 keys on the remote controller when the Picture icon is highlighted in the Main Menu.

Service Menu has 3 sub-menus. These are:

- Options
- Adjustments
- Selections.

Navigation through these menus can be done by pressing OK button. Every adjustment made in this menu is saved automatically.

### **OPTIONS**

Options are adjustments that the user can select On or Off.

- SCART 2
- FAV
- SVHS
- HOTEL MODE
- STAND BY
- MSP CARRIER MUTE
- WSS SCART
- FIRST ATS

### **SCART 2 / FAV / SVHS**

If a source is disabled in the Service Menu, it will be skipped during source switches. If SCART2 is enabled, SW assumes that the FAV source share the same path as the SVHS source on the HW. If it is disabled, it is assumed that FAV and SVHS share separate paths. TUNER and SCART1 are enabled by default.

### **HOTEL MODE**

Enabling Hotel Mode has two effects. First, SETUP menu is no longer accessible by the user. Second, maximum adjustable volume value is limited to HOTEL VOLUME value. This value can be adjusted in the ADJUSTMENTS sub-menu of the Service Menu.

### **STAND BY**

If this Option is OFF, the TV will stay in Stand By mode after a Power On. If this Option is ON, the TV will recall its last stand by status before the Power Off, and switch on from Stand By automatically, if the last state was 'Stand by On'.

### **MSP CARRIER MUTE**

If this option is ON, sound processor's carrier mute functionality will be enabled. The MSP will mute the sound automatically if the signal quality is bad. Setting this option Off will disable this functionality.

### **ATS**

If this option is set to ON, TV will display Country Selection menu in the next start. After some country is selected, the user will be prompted for the start of AutoProgramming process.



## **ADJUSTMENTS**

This sub-menu contains numeric adjustments. These items are:

- WHITE R
- WHITE G
- WHITE B
- BRIGHTNESS
- CONTRAST
- COLOR
- PRESCALE FM
- PRESCALE NICAM
- PRESCALE SCART
- HOTEL VOLUME

### **WHITE R / WHITE G / WHITE B**

These are used for color bias adjustment. Unlike other items in the service menu, changes will take effect immediately.

### **PRESCALE FM / PRESCALE NICAM / PRESCALE SCART**

These are prescale values that will be used for the initialization of the sound processor (MSP), at the next switch on.

### **HOTEL VOLUME**

This value is used as the volume limit, when the Hotel Mode is on.

## **SELECTIONS**

This sub-menu contains selections.

- TUNER TYPE        SAMSUNG / PHILIPS
- TELETEXT         NO TEXT / FAST / FAST&TOP
- MSP CLIP         REDUCE VOL / REDUCE TONE

### **TUNER TYPE**

One of two supported tuner can be selected from this item. System must be restarted for this change to take effect.

### **TELETEXT**

**NO TEXT:** Teletext is totally disabled. TXT/MIX button will not be functional. AUTO picture format mode will be disabled in RF, F-AV and SHVS modes. Naming and sorting functionality during Autoprogramming will be disabled.

**FAST:** TOPtext functionality will be disabled.

**FAST&TOP:** TOPtext functionality is enabled.

### **TIMER MODE**

If OFF TIMER is selected, the user will be able to enter time of the day info for the TV to switch off. If SLEEP TIMER is selected, the user can specify some time period, after which the TV will go to stand by automatically.

## MSP CLIP

This selection identifies which method will be used by the sound processor to prevent clipping effects on volume.

## AUTOPROGRAMMING

When the user selects the Autoprogram item in Setup menu, Country Selection menu is opened. The user must select a country before the Autoprogramming starts. Broadcast system will be selected according to the country selected.

Broadcast systems according to countries:

BELGIUM	BG + L
CROATIA	BG
CZECH REP.	DK
DENMARK	BG
FINLAND	BG
FRANCE	L + BG
GERMANY	BG
GREECE	BG
HUNGARY	DK
IRELAND	I
ITALY	BG
NETHERLANDS	BG
NORWAY	BG
POLAND	DK
PORTUGAL	BG
SPAIN	BG
SWEDEN	BG
SWITZERLAND	BG + L
TURKEY	BG
UNITED KINGDOM	I

For countries France, Belgium and Switzerland, autoprogramming is done twice. For Belgium and Switzerland, first BG channels will be searched, after the search in BG is done, searching will restart for L standard. If the selected country is France, the sequence of standards is reversed, thus, first L then BG.

## TELETEXT LANGUAGES

L5C SW decides which teletext language group will be used for teletext decoding, according to the country selected for autoprogramming. Teletext languages according to countries:

**EAST EUROPE:** CROATIA ,CZECH\_REP, POLAND

**WEST EUROPE:** BELGIUM ,DENMARK, FINLAND, UK, FRANCE, GERMANY, IRELAND ,ITALY ,NETHERLANDS, NORWAY, PORTUGAL, SPAIN, SWEDEN, SWITZERLAND, HUNGARY

**TURKISH-GREEK:** GREECE TURKEY

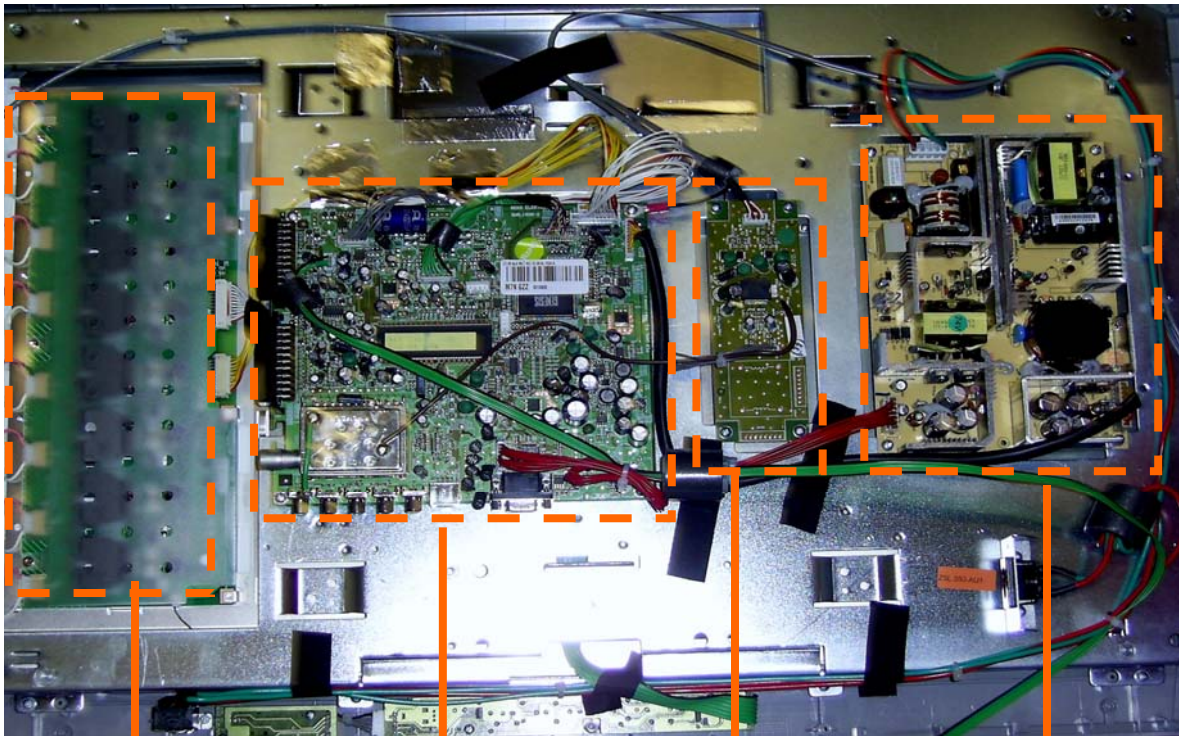
## PC MODE

PC mode can be entered by pressing PC button on the remote controller. User can return back to TV mode by pressing the PC or TV buttons.

After the switching to PC mode, VGA input will be displayed on screen, as soon as the mode (input resolution and frequency) is determined.

If there is no input from the VGA input, NO SIGNAL dialog will be displayed for 15 seconds. At the end of this period if there is no signal from VGA input, the TV will go to Sleep State. While in the sleep state, the TV will keep monitoring the VGA input. If VGA signal is detected, the TV will wake from Sleep State, to PC mode. Alternatively, the user may select to switch the TV on from Sleep State, just like switching on from Stand-by. In this case, the set will switch on from TV mode.

### SET APPEARANCE OF 26-32 INCH



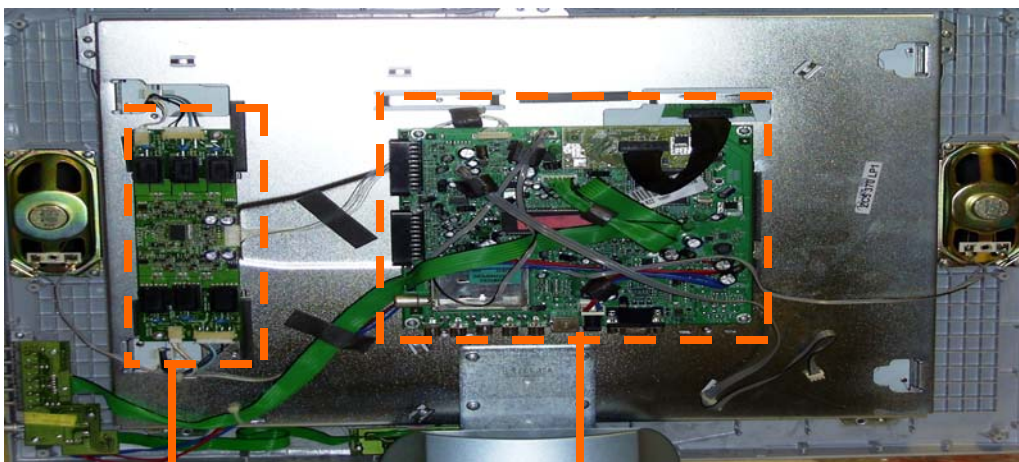
Back light module  
(Built-in Panel)

Main  
Chassis

Audio Amplifier

Power Supply board

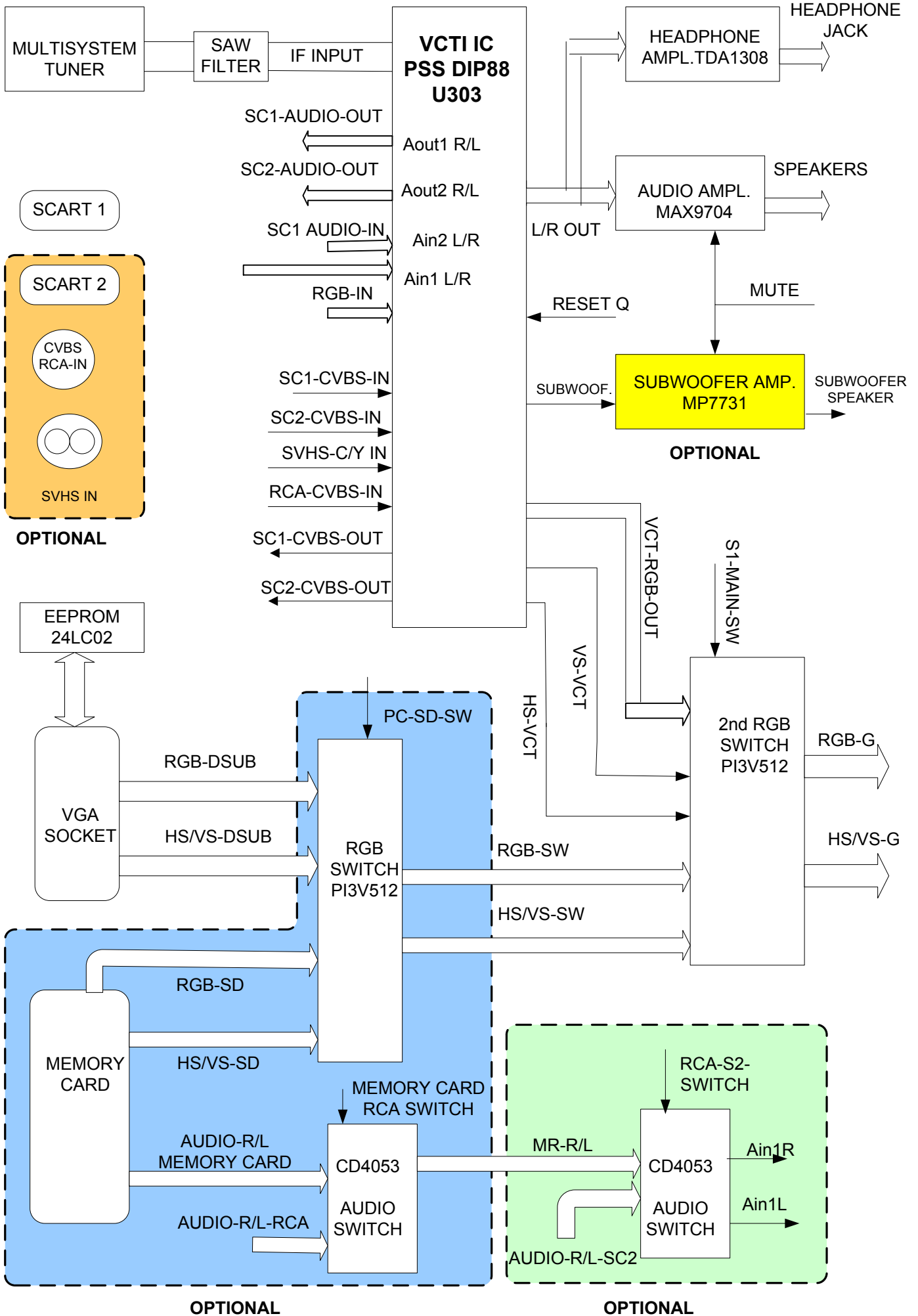
### SET APPEARANCE OF 15-23 INCH



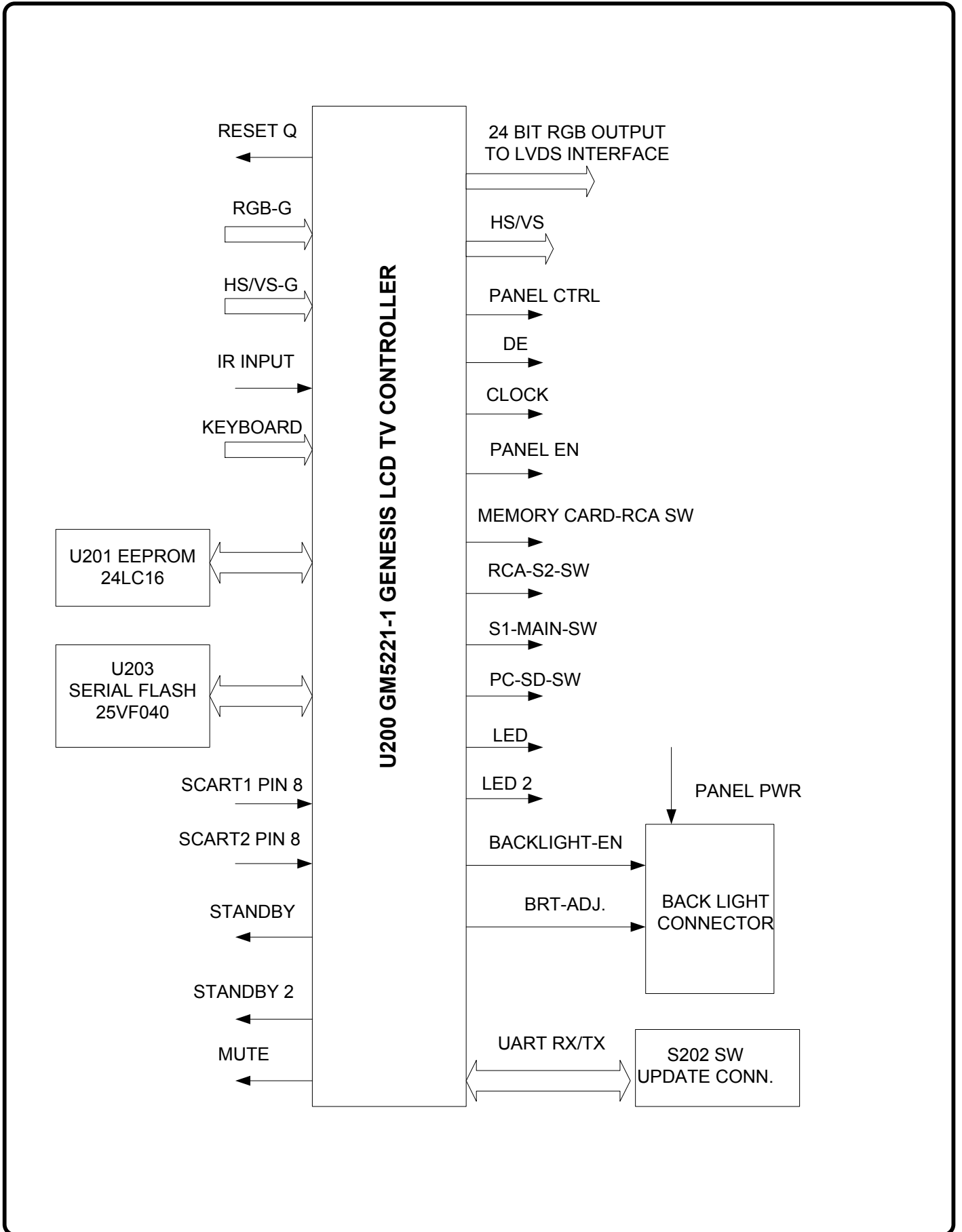
Back light module

Main  
Chassis

# BLOCK DIAGRAM OF VCTI AND PERIPHERALS

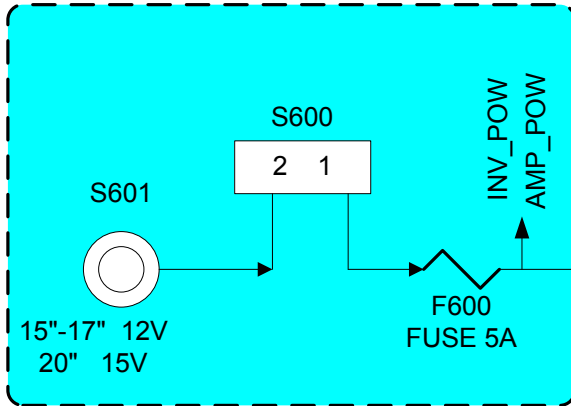


# BLOCK DIAGRAM OF GENESIS IC AND PERIPHERALS

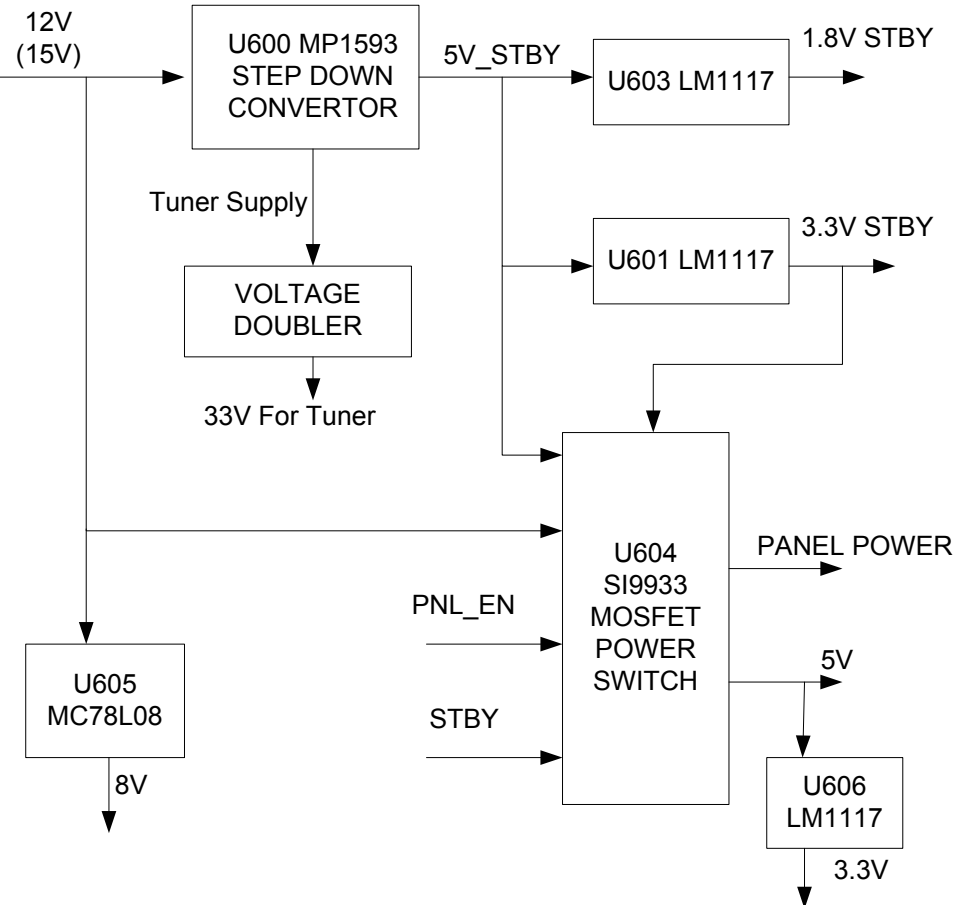
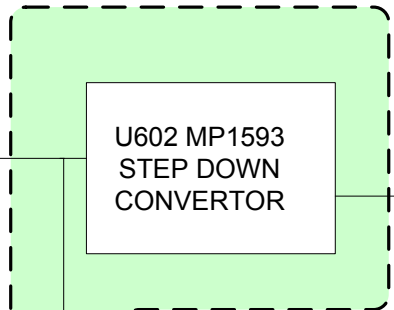
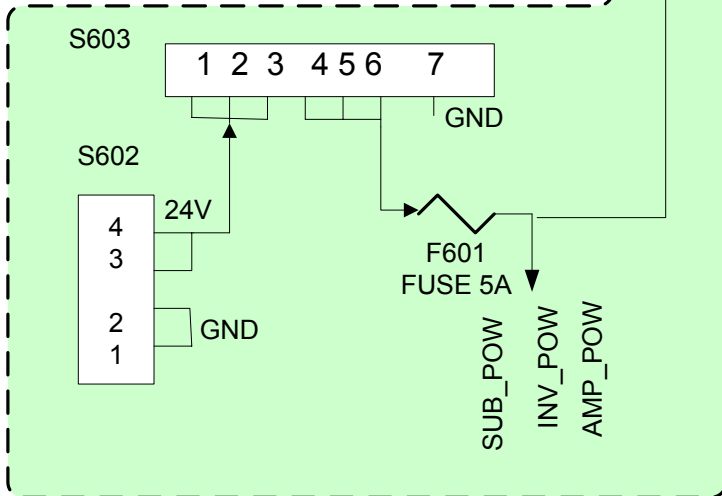


# BLOCK DIAGRAM OF 14-23 INCH POWER SUPPLY

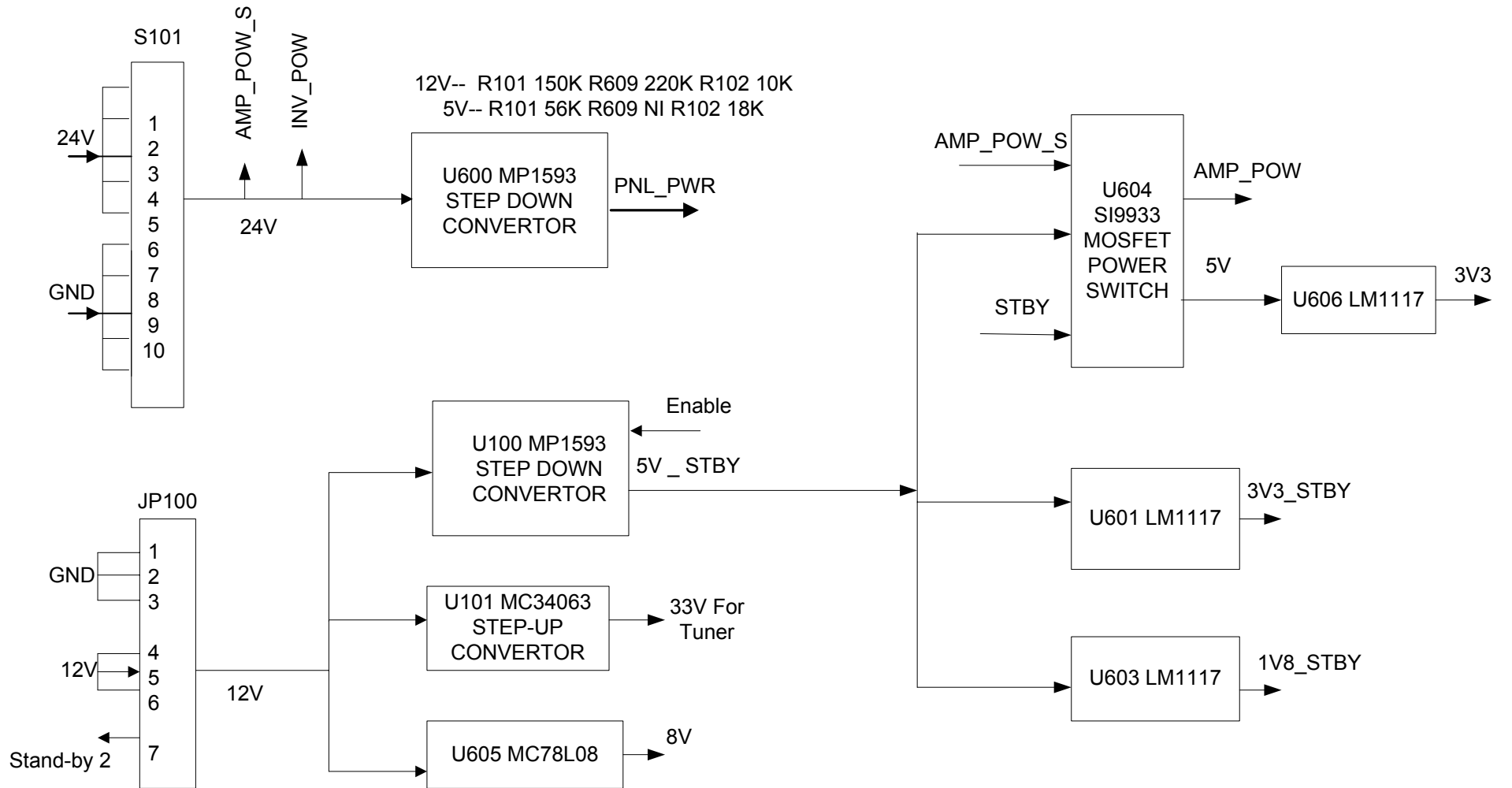
OPTIONAL FOR 14"-17"-20"



OPTIONAL FOR 20"W- 22"-23"



# BLOCK DIAGRAM OF 26 - 32 INCH POWER SUPPLY



# GENESIS GM5221 LCD TV CONTROLLER

The gm5221 is an LCD TV controller supporting resolutions up to SXGA (1280x1024). The gm5221 leverages Genesis patented advanced image-processing technology as well as a proven integrated ADC/PLL and an Ultra-Reliable DVI™ compliant digital receiver to provide excellent image quality. gm5221 also integrates a microcontroller, an OSD controller, advanced color management and dual LVDS transmitters.

## 1.1 gm5221 System Design Example

Figure 1 below shows a typical dual interface LCD TV system based on the gm5221. Designs based on the gm5221 have reduced system cost, simplified hardware and firmware design and increased reliability because only a minimal number of components are required in the system.

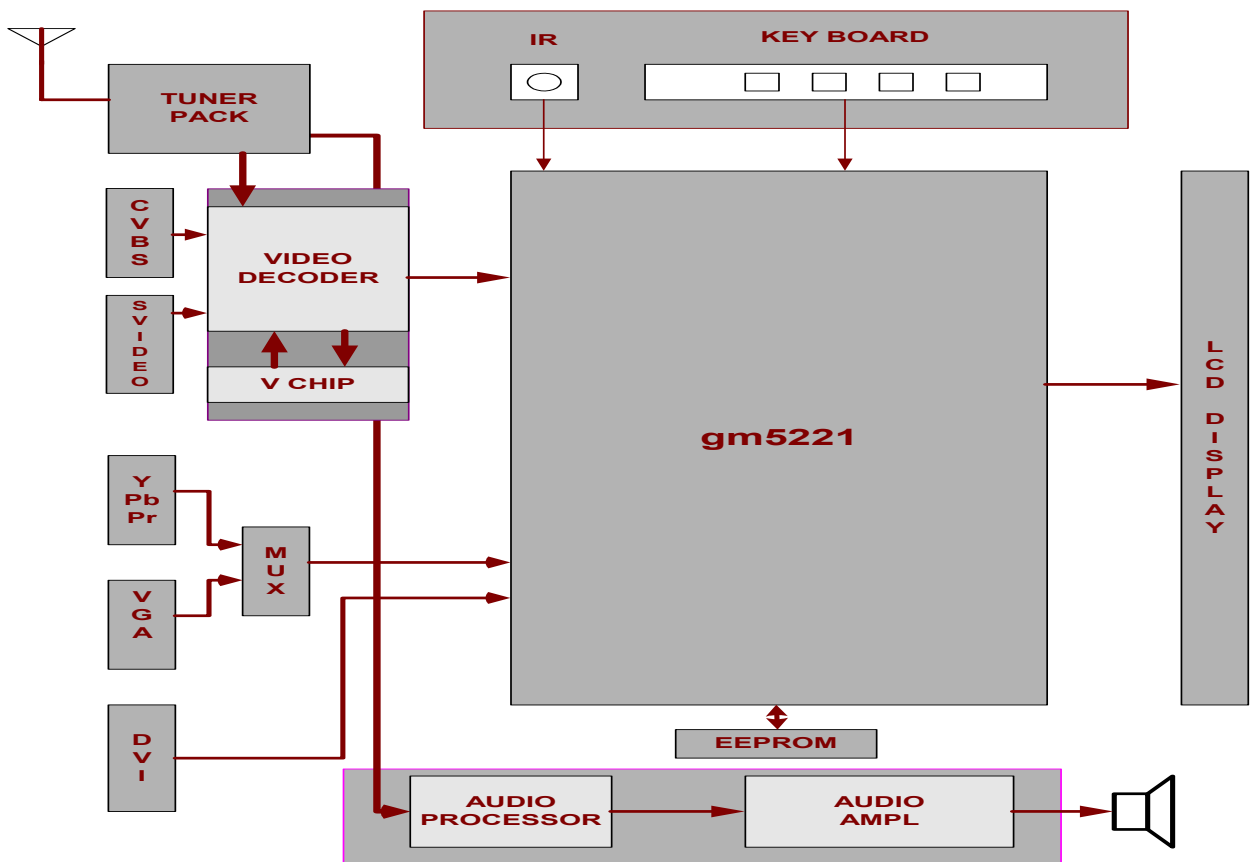


Figure 1. gm5221 System Design Example



## 1.2 gm5221 Family Features

- **Intelligent Image Processing™**
  - Fully programmable zoom ratios
  - High-quality shrink capability from UXGA resolution
  - Programmable coefficients for variable sharpness control
  - RealRecovery™ provides full color recovery image for refresh rates higher than those supported by the LCD panel
- **Analog RGB Input Port**
  - Supports SDTV RGB inputs in interlaced mode
  - Supports EDTV (480p) up to 1080i HDTV inputs
  - Supports mid level clamp for YPbPr inputs
  - Macro vision decoding
  - Supports up to 162 MHz (SXGA 75Hz / UXGA 60Hz)
  - On-chip high-performance PLLs (single reference crystal required)
  - Composite-sync, Sync-on-Green (SOG) and Sync-on-Y (SoY) support
  - Input format detection
  - Phase and image positioning
- **Ultra-Reliable DVI-Compliant Input Port**
  - Operating up to 165 MHz (up to UXGA 60Hz)
  - Direct connect to all DVI 1.0-compliant transmitters
  - High-bandwidth Digital Content Protection (HDCP)  
**Note:** HDCP function is available H version only.
- **CCIR-656 8-bit Video Input Port**
  - Supporting NTSC / PAL interlaced and progressive
  - Direct connect to commercially available video decoders
  - Spatial de-interlacing
- **Advanced Color Management**
  - Programmable gamma correction (CLUT)
  - TV color controls including hue and saturation controls
  - Full color matrix allows end-users to experience the same colors as viewed on CRTs and other displays (e.g. sRGB compliance)
  - Advanced Active Color Management™ (ACM-II) provide flesh-tone compensation and image enhancement for video preset modes like sport, nature .
  - Adaptive Contrast and Color™ (ACC) ensures full dynamic range is used in video content
- **On-chip Versatile OSD Controller**
  - On-chip RAM for high-quality programmable menus
  - 1, 2 and 4-bit per pixel character cells
  - Horizontal and vertical stretch of OSD menus
  - Blinking, transparency and blending
  - Supports two independent OSD menu rectangles
  - Proportional fonts
- **Embedded X86 On-chip Microcontroller**
  - High-performance X86 MCU with on-chip RAM and ROM
  - External parallel ROM or serial SPI ROM interface
  - Unified memory architecture simplifies chip programming
  - 23 general-purpose inputs/outputs (GPIOs) available
  - 2-wire serial bus master to control NVRAM, video decoder
  - Two DDC2Bi ports with DMA buffer to internal RAM
  - Four PWM outputs for analog backlight control, audio, etc.
  - General-purpose ADC's for keypad and temperature sensing
  - Integrated reset circuit
  - Slow clock mode for 50mW sleep mode power consumption
  - JTAG debug / ICE support for firmware debugging
- **Built-in Test Pattern Generator**
  - Simplifies manufacturing / test
- **Energy Spectrum Management (ESM™)**
  - Digital clock spectrum management
  - Eliminates EMI suppression components and shielding
- **Built-in LVDS Transmitters**
  - Four channel 6/8-bit LVDS transmitter
  - Support for 8 or 6-bit panels with high-quality dithering
  - Single / double wide up to SXGA 75Hz output
  - Pin swap, odd / even swap and red / blue group swap of RGB outputs for flexibility in board layout
- **Highly integrated System-on-a-Chip**
  - All system clocks synthesized from a single external crystal
  - 50mW power saving mode
  - 5-Volt tolerant inputs
  - Two Layer PCB support
  - On-chip reset feature to eliminate external reset component
  - Integrated Schmitt trigger for HSYNC and VSYNC

## PACKAGE

- 208-pin PQFP
- 3.3V IO and 1.8V core power supplies

## 2 gm5221 Pinout

The gm5221 devices are packaged in a 208-pin Plastic Quad Flat Pack (PQFP).

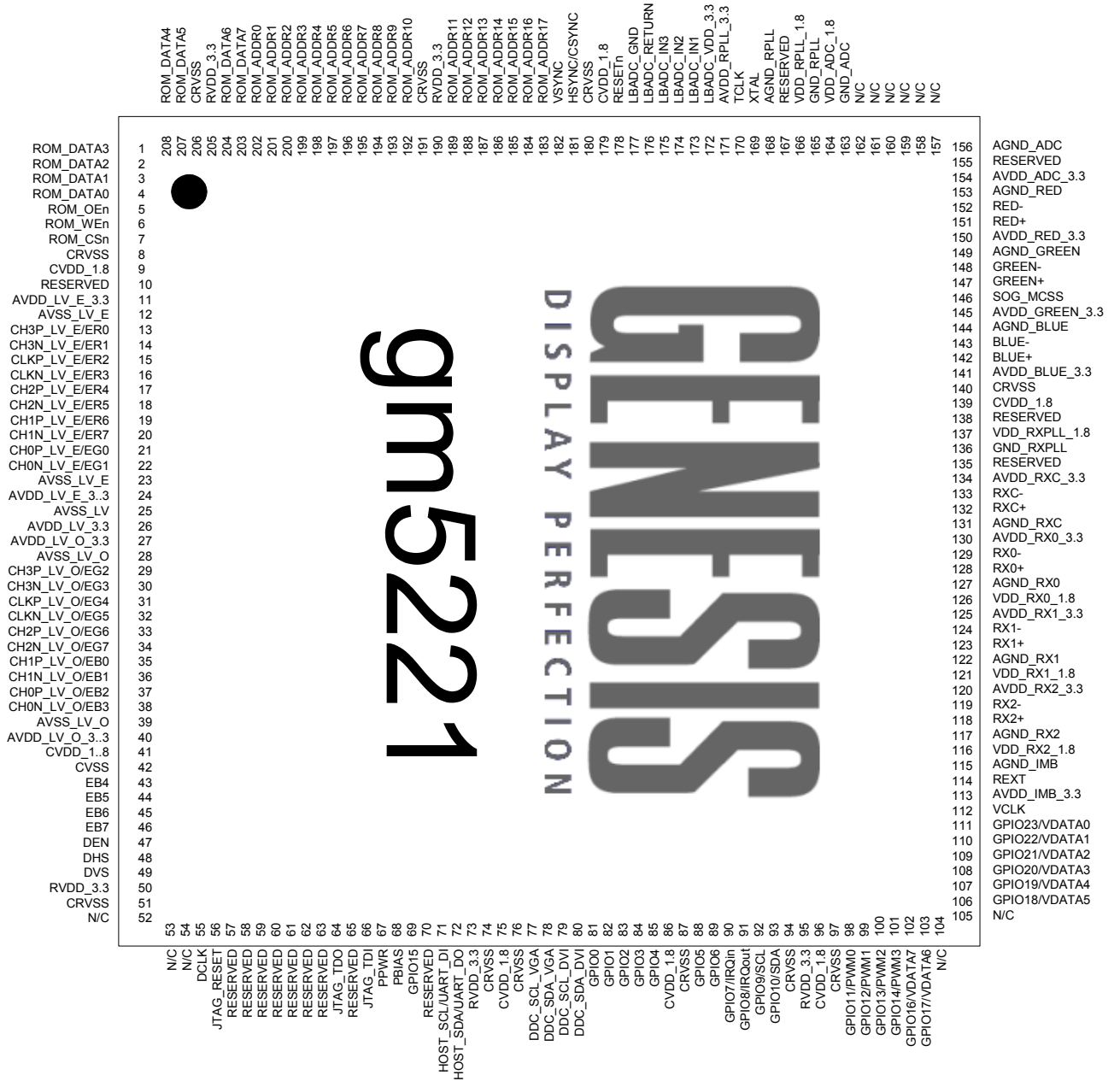


Figure 2. gm5221 Pin Out Diagram

### General Description

#### 1. Introduction

The VCT 49xxl is an IC family of high-quality single-chip TV processors. Modular design and deep-submicron technology allow the economic integration of features in all classes of single-scan TV sets. The VCT 49xxl family is based on functional blocks contained and approved in existing products like DRX 396xA, MSP 34x5G, VSP 94x7B, DDP 3315C, and SDA 55xx.

Each member of the family contains the entire IF, audio, video, display, and deflection processing for 4:3 and 16:9 50/60-Hz mono and stereo TV sets. The integrated microcontroller is supported by a powerful OSD generator with integrated Teletext & CC acquisition including on-chip page memory.

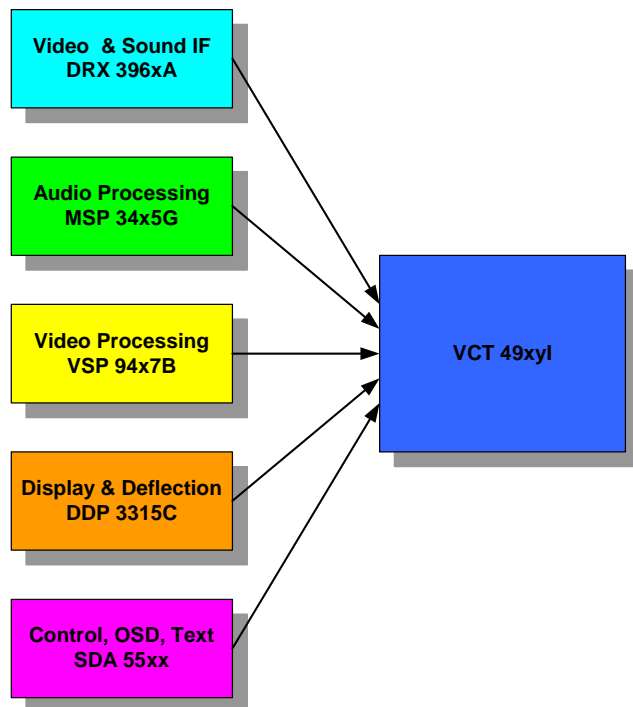


Fig. 1–1: Single-chip VCT 49xxl

#### 1.1. Features

The VCT 49xxl family offers a rich feature set, covering the whole range of state-of-the-art 50/60-Hz TV applications.

- PSSDIP88-1/-2 package
- Submicron CMOS technology
- Low-power standby mode
- Single 20.25-MHz reference crystal
- 8-bit 8051 instruction set compatible CPU
- Up to 256 kB on-chip program ROM
- WST, PDC, VPS, and WSS acquisition
- Closed Caption and V-chip acquisition
- Up to 10 pages on-chip teletext memory
- Multi-standard QSS IF processing with single SAW
- FM Radio and RDS with standard TV tuner
- TV-sound demodulation:
  - all A2 standards
  - all NICAM standards
  - BTSC/SAP with MNR (DBX optional)
  - EIA-J
- Baseband sound processing for loudspeaker channel:
  - volume
  - bass and treble
  - loudness
  - balance
  - spatial effect (e.g. pseudo stereo)
  - Micronas AROUND (virtual Dolby optional)
  - Micronas BASS
- CVBS, S-VHS, YC<sub>r</sub>C<sub>b</sub> and RGB inputs
- 4H adaptive comb filter (PAL/NTSC)
- multi-standard color decoder (PAL/NTSC/SECAM)
- Nonlinear horizontal scaling “panorama vision”
- Luma and chroma transient improvement (LTI, CTI)
- Non-linear color space enhancement (NCE)
- Dynamic black level expander (BLE)
- Scan velocity modulation output
- Soft start/stop of H-drive
- Vertical angle and bow correction
- Average and peak beam current limiter
- Nonlinear and dynamic EHT compensation
- Black switch off procedure (BSO)

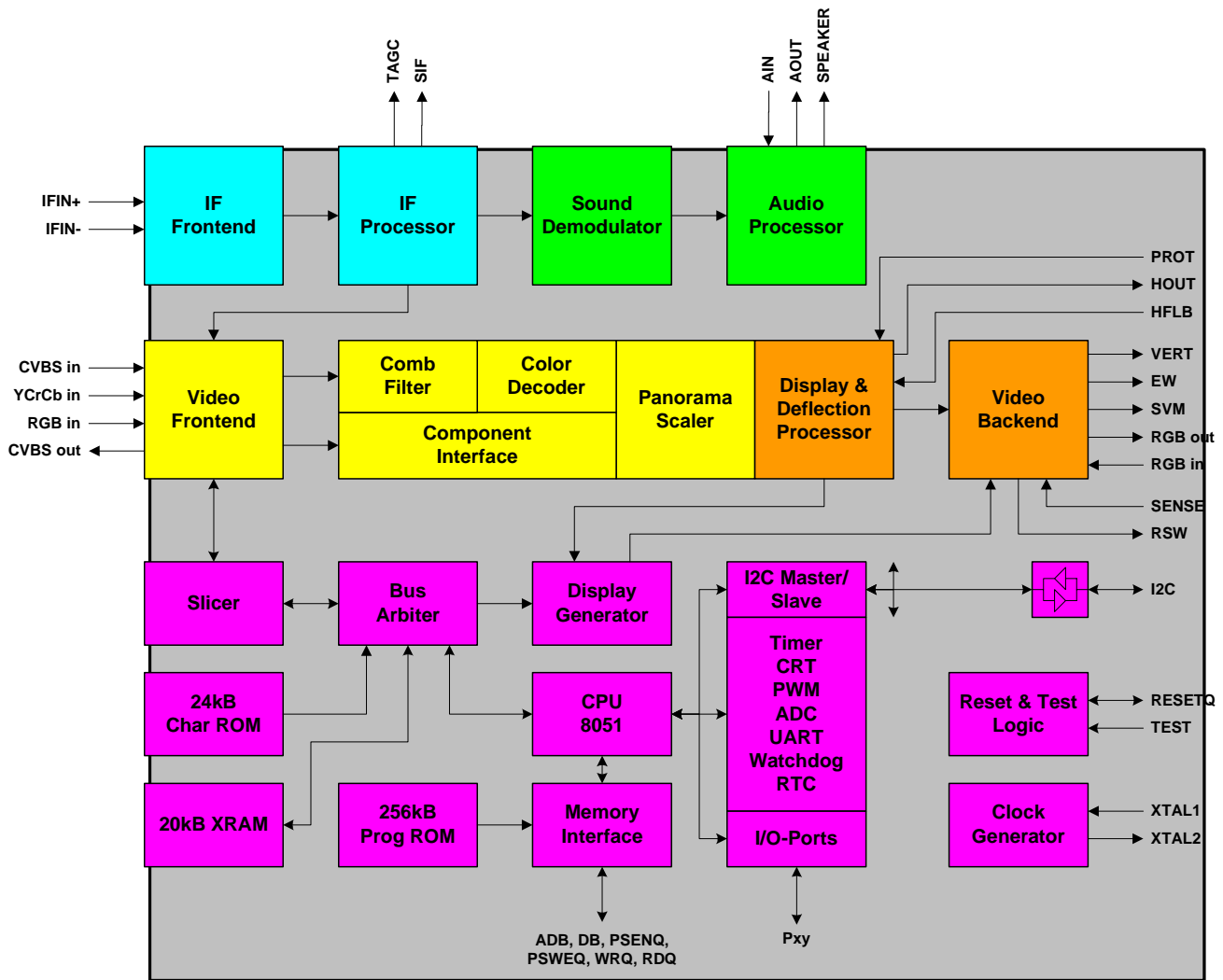
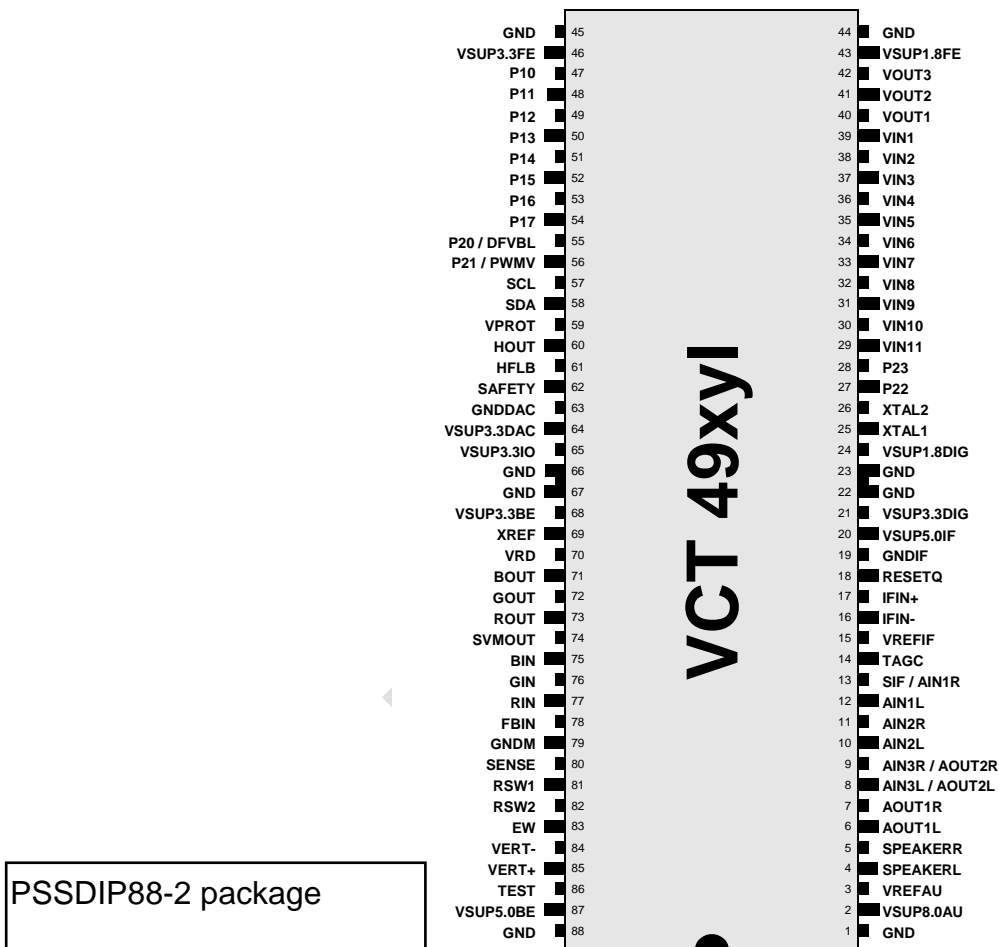


Fig. 1-2: Block diagram of the VCT 49xxI



# Si9933ADY

## Dual P-Channel PowerTrench<sup>®</sup> MOSFET

### General Description

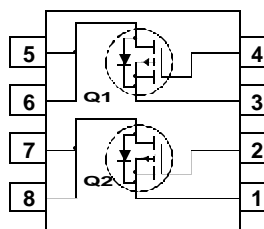
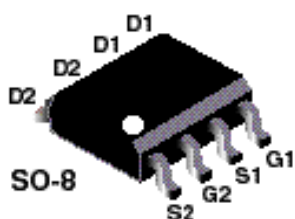
This P-Channel MOSFET is a rugged gate version of Fairchild Semiconductor's advanced PowerTrench process. It has been optimized for power management applications with a wide range of gate drive voltage (2.5V – 12V).

### Applications

- Load switch
- Motor drive
- DC/DC conversion
- Power management

### Features

- -5 A, -20 V,  $R_{DS(ON)} = 75\text{ m}\Omega$  @  $V_{GS} = -4.5\text{ V}$   
 $R_{DS(ON)} = 105\text{ m}\Omega$  @  $V_{GS} = -3.0\text{ V}$   
 $R_{DS(ON)} = 115\text{ m}\Omega$  @  $V_{GS} = -2.7\text{ V}$
- Extended  $V_{GSS}$  range ( $\pm 12\text{V}$ ) for battery applications
- Low gate charge
- High performance trench technology for extremely low  $R_{DS(ON)}$
- High power and current handling capability



### Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain-Source Voltage	-20	V
$V_{GSS}$	Gate-Source Voltage	$\pm 12$	V
$I_b$	Drain Current – Continuous (Note 1a) – Pulsed	-3.4	A
		-16	
$P_D$	Power Dissipation for Dual Operation	2	W
	Power Dissipation for Single Operation (Note 1a) (Note 1b) (Note 1c)	1.6	
		1	
		0.9	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +175	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	78	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	40	$^\circ\text{C/W}$

### Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
9933A	Si9933ADY	13"	12mm	2500 units

# MP1593

## 3A, 28V

### Step Down Converter

## Monolithic Power Systems

PRELIMINARY

### General Description

The MP1593 is a step-down regulator with an internal Power MOSFET. It achieves 3A continuous output current over a wide input supply range with excellent load and line regulation.

Current mode operation provides fast transient response and eases loop stabilization.

Fault condition protection includes cycle-by-cycle current limiting and thermal shutdown. Adjustable soft-start reduces the stress on the input source at turn-on. In shutdown mode the regulator draws 20 $\mu$ A of supply current.

The MP1593 requires a minimum number of readily available external components to complete a 3A step down DC to DC converter solution.

### Ordering Information

Part Number *	Package	Temperature
MP1593DN	SOIC8 w/ Exposed Paddle	-40 to + 85°C

\* For Tape & Reel use suffix - Z (e.g. MP1593DN-Z)

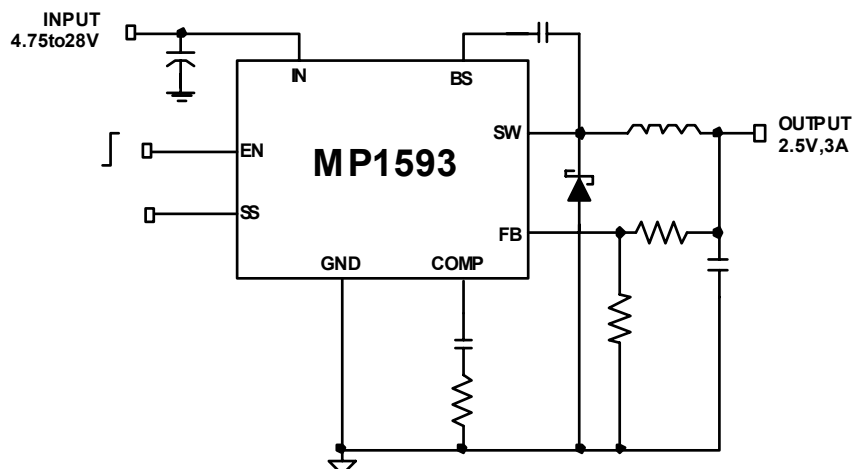
### Features

- 3A Output Current
- Programmable Soft-Start
- 100m $\Omega$  Internal Power MOSFET Switch
- Stable with Low ESR Output Ceramic Capacitors
- Up to 95% Efficiency
- 20 $\mu$ A Shutdown Mode
- Fixed 385KHz Frequency
- Thermal Shutdown
- Cycle-by-Cycle Over Current Protection
- Wide 4.75 to 28V Operating Input Range
- Output Adjustable From 1.22
- Under Voltage Lockout
- Available in 8 pin SOIC Package

### Applications

- Distributed Power Systems
- Battery Charger
- Pre-Regulator for Linear Regulators

### Typical Application Circuit



# MP1593

3A, 28V

## Step Down Converter

### Monolithic Power Systems

PRELIMINARY

#### Pin Description

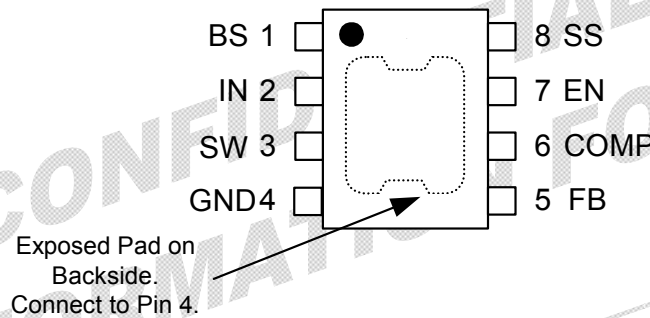


Table 1: Pin Designators

#	Name	Description
1	BS	High-Side Gate Drive Boost Input. BS supplies the drive for the high-side n-channel MOSFET switch. Connect a 10nF or greater capacitor from SW to BS to power the high side switch.
2	IN	Power Input. IN supplies the power to the IC, as well as the step-down converter switches. Drive IN with a 4.75V to 28V power source. Bypass IN to GND with a suitably large capacitor to eliminate noise on the input to the IC. See <i>Input Capacitor section</i> .
3	SW	Power Switching Output. SW is the switching node that supplies power to the output. Connect the output LC filter from SW to the output load. Note that a capacitor is required from SW to BS to power the high-side switch.
4	GND	Ground. (Note: Connect the exposed pad on backside to Pin 4).
5	FB	Feedback Input. FB senses the output voltage to regulate that voltage. Drive FB with a resistive voltage divider from the output voltage. The feedback threshold is 1.222V. See <i>Setting the Output Voltage section</i> .
6	COMP	Compensation Node. COMP is used to compensate the regulation control loop. Connect a series RC network from COMP to GND to compensate the regulation control loop. In some cases, an additional capacitor from COMP to GND is required. See <i>Compensation section</i> .
7	EN	Enable Input. EN is a digital input that turns the regulator on or off. Drive EN high to turn on the regulator, drive EN low to turn it off. An Under Voltage Lockout (UVLO) function can be implemented by the addition of a resistor divider from $V_{IN}$ to GND. For complete low current shutdown its needs to be less than 0.7V. For automatic startup, leave EN unconnected.
8	SS	Soft Start Control Input. SS controls the soft start period. Connect a capacitor from SS to GND to set the soft-start period. A 0.1 $\mu$ F capacitor sets the soft-start period to 10ms. To disable the soft-start feature, leave SS unconnected.

## REPLACEMENT PART LIST

The components which are referred positions may changes by model, size, cosmetic and specification of the LCD TV.  
Please apply web pages for current part list. The items marked with red are safety components or need to be replaced with original/approved parts.

POS	PART NUMBER	PART DESCRIPTION	POS	PART NUMBER	PART DESCRIPTION
X941	032150R	HP JACK 17"LCD TV (OLD-8R9185)	R217	172479R	RC-CHIP 4.7K J 1/16W /0603 TAPE
X940	031224R	CONN.HOUS.3P 2317-3S JST B 3B-XH-A WHITE	R222	172479R	RC-CHIP 4.7K J 1/16W /0603 TAPE
	Y10184	H.PHONE MOD-PN LCD TV L5A CHASIS	R213	172479R	RC-CHIP 4.7K J 1/16W /0603 TAPE
C940	273471R	C-PEM 47NF K 63V R:5	R406	170474R	RC-CHIP 47R J 1/16W /0603 TAPE
C941	273471R	C-PEM 47NF K 63V R:5	R407	170474R	RC-CHIP 47R J 1/16W /0603 TAPE
	Y10187R	R/C L5A SASI KUMANDA KMK-01 SILVER	R408	170474R	RC-CHIP 47R J 1/16W /0603 TAPE
	N1F110	LC SD-32W M/NX/2/K/SV/VGA/A-OSD/AU3	R409	170474R	RC-CHIP 47R J 1/16W /0603 TAPE
C639	252482R	EC 470UF 16V 12.5*10 R:5	R410	170474R	RC-CHIP 47R J 1/16W /0603 TAPE
U605	452904R	IC LM78L08ACZ	R411	170474R	RC-CHIP 47R J 1/16W /0603 TAPE
Y300	056161R	CRYSTAL 20.25MHZ HC49-U	U402	458931R	IC-CHIP PI3V512 RGB SW PERICOM
S300	031224R	CONN.HOUS.3P 2317-3S JST B 3B-XH-A WHITE	U402	450526R	IC-CHIP PI3V512QEX (QSOP24)
S301	031251R	SCART SOCKET 14.1	D301	303818R	DIODE-CHIP BAV99LT1 SOT23 T&R
Y200	056119R	CRYSTAL 14.31818MHz CL=18PF30/30PPMHC49U	Q200	401472R	TRN-CHIP 2N7002 N-CHANNEL SOT23
SW201	010844R	TACT SWITCH 2 LEG (MTSB)	Q201	401472R	TRN-CHIP 2N7002 N-CHANNEL SOT23
J310	031163R	KONN. CINCH ..... WHITE HOR.14.1	R363	170754R	RC-CHIP 75R J 1/16W /0603
J309	031164R	KONN. CINCH ..... RED HOR.14.1	R365	170754R	RC-CHIP 75R J 1/16W /0603
L200	053352R	COIL- CHOKE 10UH R0814 14.1	R366	170754R	RC-CHIP 75R J 1/16W /0603
L202	053352R	COIL- CHOKE 10UH R0814 14.1	R367	170754R	RC-CHIP 75R J 1/16W /0603
L300	053352R	COIL- CHOKE 10UH R0814 14.1	R368	170754R	RC-CHIP 75R J 1/16W /0603
L301	053352R	COIL- CHOKE 10UH R0814 14.1	R369	170754R	RC-CHIP 75R J 1/16W /0603
L312	053352R	COIL- CHOKE 10UH R0814 14.1	R415	170754R	RC-CHIP 75R J 1/16W /0603
S204	031194R	CONN.HOUS.4P 2317-4S JST B 4B-XH-A WHITE	R416	170754R	RC-CHIP 75R J 1/16W /0603
S202	031194R	CONN.HOUS.4P 2317-4S JST B 4B-XH-A WHITE	R417	170754R	RC-CHIP 75R J 1/16W /0603
SAW300	056298R	SAW FILTER X6966M	C413	290223R	CC-CHIP 22PF J 50V /0603 NPO TAPE
U303	S-SWVCTI01BG	SW IC VCTI 5LC BEKO/GRUNDIG	C414	290223R	CC-CHIP 22PF J 50V /0603 NPO TAPE
U303	S-SWVCTI01BGV	SW IC VCTI 5LC BEKO/GRUNDIG VD	R235	171107R	RC-CHIP 100R J 1/16W /0603
C629	253128R	EC 1000UF 16V 20*10 R:5 LOW ESR	R236	171107R	RC-CHIP 100R J 1/16W /0603
P400	031358R	CONN. VGA B10B	R341	171107R	RC-CHIP 100R J 1/16W /0603
R237	171250R	RC-CHIP 249R F %1 / 0603	R342	171107R	RC-CHIP 100R J 1/16W /0603
U201	452662R-2	IC-CHIP AT24C16AN 10SU2.7 TAPE&REEL	R345	171107R	RC-CHIP 100R J 1/16W /0603
U300	452706R-1	IC TDA1308T/N2 SO-G8 (T&R)	R346	171107R	RC-CHIP 100R J 1/16W /0603
U200	453296R	IC-CHIP GM2221-LF-BC 208PIN PQFP TRAY	R257	171107R	RC-CHIP 100R J 1/16W /0603
R325	170225R	RC-CHIP 22R J 1/10W /0603	R255	171107R	RC-CHIP 100R J 1/16W /0603
C371	292114R	CC-CHIP 1NF K 50V /0603 X7R	R347	171107R	RC-CHIP 100R J 1/16W /0603
C372	292114R	CC-CHIP 1NF K 50V /0603 X7R	R348	171107R	RC-CHIP 100R J 1/16W /0603
C373	292114R	CC-CHIP 1NF K 50V /0603 X7R	R357	171107R	RC-CHIP 100R J 1/16W /0603
C376	292114R	CC-CHIP 1NF K 50V /0603 X7R	R358	172104R	RC-CHIP 1K J 1/16W /0603
C377	292114R	CC-CHIP 1NF K 50V /0603 X7R	R607	172104R	RC-CHIP 1K J 1/16W /0603
C378	292114R	CC-CHIP 1NF K 50V /0603 X7R	R258	172104R	RC-CHIP 1K J 1/16W /0603
C379	292114R	CC-CHIP 1NF K 50V /0603 X7R	R423	172104R	RC-CHIP 1K J 1/16W /0603
C380	292114R	CC-CHIP 1NF K 50V /0603 X7R	R424	172104R	RC-CHIP 1K J 1/16W /0603
C381	292114R	CC-CHIP 1NF K 50V /0603 X7R	R418	172104R	RC-CHIP 1K J 1/16W /0603
C390	292114R	CC-CHIP 1NF K 50V /0603 X7R	R419	172104R	RC-CHIP 1K J 1/16W /0603
C391	292114R	CC-CHIP 1NF K 50V /0603 X7R	C394	292153R	CC-CHIP 1.5NF K 50V /0603 X7R TAPE
C392	292114R	CC-CHIP 1NF K 50V /0603 X7R	C395	292153R	CC-CHIP 1.5NF K 50V /0603 X7R TAPE
C393	292114R	CC-CHIP 1NF K 50V /0603 X7R	R401	171336R	RC-CHIP 330R J 1/16W /0603 TAPE
J304	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE	R402	171336R	RC-CHIP 330R J 1/16W /0603 TAPE
J235	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE	R385	172513R	RC-CHIP 5.1K J 1/16W /0603
J305	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE	R378	172567R	RC-CHIP 5.6K J 1/16W /0603 TAPE
J314	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE	R379	172567R	RC-CHIP 5.6K J 1/16W /0603 TAPE
R422	172686R	RC-CHIP 6.8K J 1/16W /0603	C321	294125R	CC-CHIP 100NF K 25V /0603 X7R
R398	173277R	RC-CHIP 27K J 1/16W /0603 TAPE	C446	294125R	CC-CHIP 100NF K 25V /0603 X7R



POS	PART NUMBER	PART DESCRIPTION	POS	PART NUMBER	PART DESCRIPTION
C200	294125R	CC-CHIP 100NF K 25V /0603 X7R	C448	294125R	CC-CHIP 100NF K 25V /0603 X7R
C201	294125R	CC-CHIP 100NF K 25V /0603 X7R	C449	294125R	CC-CHIP 100NF K 25V /0603 X7R
C202	294125R	CC-CHIP 100NF K 25V /0603 X7R	C450	294125R	CC-CHIP 100NF K 25V /0603 X7R
C203	294125R	CC-CHIP 100NF K 25V /0603 X7R	C451	294125R	CC-CHIP 100NF K 25V /0603 X7R
C204	294125R	CC-CHIP 100NF K 25V /0603 X7R	C456	294125R	CC-CHIP 100NF K 25V /0603 X7R
C205	294125R	CC-CHIP 100NF K 25V /0603 X7R	C609	294125R	CC-CHIP 100NF K 25V /0603 X7R
C206	294125R	CC-CHIP 100NF K 25V /0603 X7R	C610	294125R	CC-CHIP 100NF K 25V /0603 X7R
C207	294125R	CC-CHIP 100NF K 25V /0603 X7R	C615	294125R	CC-CHIP 100NF K 25V /0603 X7R
C208	294125R	CC-CHIP 100NF K 25V /0603 X7R	C616	294125R	CC-CHIP 100NF K 25V /0603 X7R
C228	294125R	CC-CHIP 100NF K 25V /0603 X7R	C617	294125R	CC-CHIP 100NF K 25V /0603 X7R
C229	294125R	CC-CHIP 100NF K 25V /0603 X7R	C619	294125R	CC-CHIP 100NF K 25V /0603 X7R
C230	294125R	CC-CHIP 100NF K 25V /0603 X7R	C620	294125R	CC-CHIP 100NF K 25V /0603 X7R
C231	294125R	CC-CHIP 100NF K 25V /0603 X7R	C621	294125R	CC-CHIP 100NF K 25V /0603 X7R
C232	294125R	CC-CHIP 100NF K 25V /0603 X7R	C622	294125R	CC-CHIP 100NF K 25V /0603 X7R
C233	294125R	CC-CHIP 100NF K 25V /0603 X7R	C623	294125R	CC-CHIP 100NF K 25V /0603 X7R
C234	294125R	CC-CHIP 100NF K 25V /0603 X7R	C624	294125R	CC-CHIP 100NF K 25V /0603 X7R
C235	294125R	CC-CHIP 100NF K 25V /0603 X7R	C316	294125R	CC-CHIP 100NF K 25V /0603 X7R
C236	294125R	CC-CHIP 100NF K 25V /0603 X7R	C327	294125R	CC-CHIP 100NF K 25V /0603 X7R
C237	294125R	CC-CHIP 100NF K 25V /0603 X7R	C242	294125R	CC-CHIP 100NF K 25V /0603 X7R
C238	294125R	CC-CHIP 100NF K 25V /0603 X7R	C311	294125R	CC-CHIP 100NF K 25V /0603 X7R
C239	294125R	CC-CHIP 100NF K 25V /0603 X7R	C312	294125R	CC-CHIP 100NF K 25V /0603 X7R
C300	294125R	CC-CHIP 100NF K 25V /0603 X7R	R200	173100R	RC-CHIP 10K J 1/10W /0603
C301	294125R	CC-CHIP 100NF K 25V /0603 X7R	R201	173100R	RC-CHIP 10K J 1/10W /0603
C302	294125R	CC-CHIP 100NF K 25V /0603 X7R	R202	173100R	RC-CHIP 10K J 1/10W /0603
C303	294125R	CC-CHIP 100NF K 25V /0603 X7R	R203	173100R	RC-CHIP 10K J 1/10W /0603
C304	294125R	CC-CHIP 100NF K 25V /0603 X7R	R243	173100R	RC-CHIP 10K J 1/10W /0603
C305	294125R	CC-CHIP 100NF K 25V /0603 X7R	R245	173100R	RC-CHIP 10K J 1/10W /0603
C306	294125R	CC-CHIP 100NF K 25V /0603 X7R	R300	173100R	RC-CHIP 10K J 1/10W /0603
C307	294125R	CC-CHIP 100NF K 25V /0603 X7R	R302	173100R	RC-CHIP 10K J 1/10W /0603
C308	294125R	CC-CHIP 100NF K 25V /0603 X7R	R304	173100R	RC-CHIP 10K J 1/10W /0603
C309	294125R	CC-CHIP 100NF K 25V /0603 X7R	R322	173100R	RC-CHIP 10K J 1/10W /0603
C310	294125R	CC-CHIP 100NF K 25V /0603 X7R	R323	173100R	RC-CHIP 10K J 1/10W /0603
C313	294125R	CC-CHIP 100NF K 25V /0603 X7R	R334	173100R	RC-CHIP 10K J 1/10W /0603
C314	294125R	CC-CHIP 100NF K 25V /0603 X7R	R604	173100R	RC-CHIP 10K J 1/10W /0603
C315	294125R	CC-CHIP 100NF K 25V /0603 X7R	R247	173100R	RC-CHIP 10K J 1/10W /0603
C317	294125R	CC-CHIP 100NF K 25V /0603 X7R	R248	173100R	RC-CHIP 10K J 1/10W /0603
C318	294125R	CC-CHIP 100NF K 25V /0603 X7R	R249	173100R	RC-CHIP 10K J 1/10W /0603
C319	294125R	CC-CHIP 100NF K 25V /0603 X7R	R250	173100R	RC-CHIP 10K J 1/10W /0603
C463	293113R	CC-CHIP 10NF K 50V /0603 X7R	R227	173100R	RC-CHIP 10K J 1/10W /0603
C405	292229R	CC-CHIP 2.2NF J 50V/0603 NPO	R228	173100R	RC-CHIP 10K J 1/10W /0603
C406	292229R	CC-CHIP 2.2NF J 50V/0603 NPO	R229	173100R	RC-CHIP 10K J 1/10W /0603
C407	292229R	CC-CHIP 2.2NF J 50V/0603 NPO	R246	173100R	RC-CHIP 10K J 1/10W /0603
C408	292229R	CC-CHIP 2.2NF J 50V/0603 NPO	R256	173100R	RC-CHIP 10K J 1/10W /0603
C251	299501R	CC-CHIP 5PF J 50V /0603 NPO	R230	173100R	RC-CHIP 10K J 1/10W /0603
C252	299501R	CC-CHIP 5PF J 50V /0603 NPO	R231	173100R	RC-CHIP 10K J 1/10W /0603
U604	401372R	TRN FDS9933A	R273	173100R	RC-CHIP 10K J 1/10W /0603
C243	291226R	CC-CHIP 220PF J 50V /0603 NPO TAPE	R386	173100R	RC-CHIP 10K J 1/10W /0603
C244	291226R	CC-CHIP 220PF J 50V /0603 NPO TAPE	R361	173183R	RC-CHIP 18K J 1/16W /0603 TAPE
C245	291226R	CC-CHIP 220PF J 50V /0603 NPO TAPE	C253	293113R	CC-CHIP 10NF K 50V /0603 X7R
C246	291226R	CC-CHIP 220PF J 50V /0603 NPO TAPE	C330	293113R	CC-CHIP 10NF K 50V /0603 X7R
C337	291476R	CC-CHIP 470PF J 50V /0603 NP0 T&R	C331	293113R	CC-CHIP 10NF K 50V /0603 X7R
C338	291476R	CC-CHIP 470PF J 50V /0603 NP0 T&R	C457	293113R	CC-CHIP 10NF K 50V /0603 X7R
C339	291476R	CC-CHIP 470PF J 50V /0603 NP0 T&R	C458	293113R	CC-CHIP 10NF K 50V /0603 X7R
C340	291476R	CC-CHIP 470PF J 50V /0603 NP0 T&R	C459	293113R	CC-CHIP 10NF K 50V /0603 X7R
C335	291561R	CC-CHIP 560PF J 50V /0603 NPO TAPE	C460	293113R	CC-CHIP 10NF K 50V /0603 X7R
C336	291561R	CC-CHIP 560PF J 50V /0603 NPO TAPE	C461	293113R	CC-CHIP 10NF K 50V /0603 X7R
C363	291561R	CC-CHIP 560PF J 50V /0603 NPO TAPE	C462	293113R	CC-CHIP 10NF K 50V /0603 X7R
Q303	401142R	TRN-CHIP BC858BLT1G SOT23	L323	053804R	COIL-CHIP 10UH K 0805

POS	PART NUMBER	PART DESCRIPTION	POS	PART NUMBER	PART DESCRIPTION
Q311	401142R	TRN-CHIP BC858BLT1G SOT23	L324	053804R	COIL-CHIP 10UH K 0805
Q312	401142R	TRN-CHIP BC858BLT1G SOT23	C386	290475R	CC-CHIP 47PF J 50V /0603 NPO TAPE
Q313	401142R	TRN-CHIP BC858BLT1G SOT23	C387	290475R	CC-CHIP 47PF J 50V /0603 NPO TAPE
R329	172276R	RC-CHIP 2.7K J 1/16W /0603	D300	304412R	DIODE-CHIP ZENER BZX84C33 SOT23
U601	453124R	IC-CHIP NCP1117DT33RK G TO-252 PACKAGE	R233	172338R	RC-CHIP 3.3K J 1/10W /0603
U606	453124R	IC-CHIP NCP1117DT33RK G TO-252 PACKAGE	R234	172338R	RC-CHIP 3.3K J 1/10W /0603
U603	453295R	IC-CHIP NCP1117DT18RK G TO252 (T&R)	R337	172338R	RC-CHIP 3.3K J 1/10W /0603
U203	453355R	IC M25P40 - VMN6T	R338	172338R	RC-CHIP 3.3K J 1/10W /0603
R374	170154R	RC-CHIP 150R J 1/16W /0603 TAPE	R324	172338R	RC-CHIP 3.3K J 1/10W /0603
R375	170154R	RC-CHIP 150R J 1/16W /0603 TAPE	C638	293235R	CC-CHIP 22NF J 16V /0603 X7R
R330	170154R	RC-CHIP 150R J 1/16W /0603 TAPE	R326	170333R	RC-CHIP 33R J 1/16W /0603 TAPE
R331	170154R	RC-CHIP 150R J 1/16W /0603 TAPE	R327	170333R	RC-CHIP 33R J 1/16W /0603 TAPE
R332	170154R	RC-CHIP 150R J 1/16W /0603 TAPE	R328	170333R	RC-CHIP 33R J 1/16W /0603 TAPE
C417	291337R	CC-CHIP 330PF J 50V /0603 NPO	R412	171107R	RC-CHIP 100R J 1/16W /0603
C418	291337R	CC-CHIP 330PF J 50V /0603 NPO	R413	171107R	RC-CHIP 100R J 1/16W /0603
L309	053806R	COIL-CHIP 8.2UH K /0805	R403	173100R	RC-CHIP 10K J 1/10W /0603
L201	053725R	COIL-CHIP 10UH %20/0805	R420	173471R	RC-CHIP 47K J 1/10W /0603
L203	053725R	COIL-CHIP 10UH %20/0805	R421	173471R	RC-CHIP 47K J 1/10W /0603
L302	053725R	COIL-CHIP 10UH %20/0805	D400	303497R	DIODE CHIP IMBD4148 SOT 23
L303	053725R	COIL-CHIP 10UH %20/0805	D401	303818R	DIODE-CHIP BAV99LT1 SOT23 T&R
L304	053725R	COIL-CHIP 10UH %20/0805	D402	303818R	DIODE-CHIP BAV99LT1 SOT23 T&R
L305	053725R	COIL-CHIP 10UH %20/0805	D403	303818R	DIODE-CHIP BAV99LT1 SOT23 T&R
L306	053725R	COIL-CHIP 10UH %20/0805	D404	303818R	DIODE-CHIP BAV99LT1 SOT23 T&R
L307	053725R	COIL-CHIP 10UH %20/0805	D405	303818R	DIODE-CHIP BAV99LT1 SOT23 T&R
L308	053725R	COIL-CHIP 10UH %20/0805	U400	453010R	IC-CHIP M24C02 - MN6TP SO8
L310	053725R	COIL-CHIP 10UH %20/0805	C627	252476R	EC 470UF 25V 11*10 R:5
L311	053725R	COIL-CHIP 10UH %20/0805	C637	252476R	EC 470UF 25V 11*10 R:5
L316	053725R	COIL-CHIP 10UH %20/0805	C347	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM
L400	053725R	COIL-CHIP 10UH %20/0805	C361	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM
R351	171476R	RC-CHIP 470R J 1/16W /0603	C362	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM
R353	171476R	RC-CHIP 470R J 1/16W /0603	C364	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM
R354	171476R	RC-CHIP 470R J 1/16W /0603	C365	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM
R414	171476R	RC-CHIP 470R J 1/16W /0603	C366	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM
C256	294234R	CC-CHIP 220NF K 16V /0603 X7R	C367	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM
C396	294234R	CC-CHIP 220NF K 16V /0603 X7R	C441	251478R	EC 47UF 16V 11*5 R:5
C397	294234R	CC-CHIP 220NF K 16V /0603 X7R	C442	251478R	EC 47UF 16V 11*5 R:5
C398	294234R	CC-CHIP 220NF K 16V /0603 X7R	C107	252476R	EC 470UF 25V 11*10 R:5
C399	294234R	CC-CHIP 220NF K 16V /0603 X7R	C112	252105R	EC 100UF 50V 12*8 R:5
L317	053804R	COIL-CHIP 10UH K 0805	C150	251222R	EC 22UF 50V RS 11*6.3 TAPING
L319	053804R	COIL-CHIP 10UH K 0805	C411	250332R	EC 3.3UF 50V 11*5 R:5
C350	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM	C443	251478R	EC 47UF 16V 11*5 R:5
C354	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM	C444	251478R	EC 47UF 16V 11*5 R:5
C355	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM	C384	251478R	EC 47UF 16V 11*5 R:5
C356	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM	C410	252105R	EC 100UF 50V 12*8 R:5
C357	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM	C368	252112R	EC 100UF 16V 11*6 R:5
C358	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM	C369	252112R	EC 100UF 16V 11*6 R:5
C360	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM	C370	252112R	EC 100UF 16V 11*6 R:5
C464	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM	C630	252112R	EC 100UF 16V 11*6 R:5
C346	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM	C631	252112R	EC 100UF 16V 11*6 R:5
C359	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM	C632	252112R	EC 100UF 16V 11*6 R:5
C409	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM	C633	252112R	EC 100UF 16V 11*6 R:5
C247	251222R	EC 22UF 50V RS 11*6.3 TAPING	C634	252112R	EC 100UF 16V 11*6 R:5
C248	251222R	EC 22UF 50V RS 11*6.3 TAPING	C635	252112R	EC 100UF 16V 11*6 R:5
C249	251222R	EC 22UF 50V RS 11*6.3 TAPING	C341	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM
C250	251222R	EC 22UF 50V RS 11*6.3 TAPING	C342	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM
C333	251222R	EC 22UF 50V RS 11*6.3 TAPING	C343	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM
C334	251222R	EC 22UF 50V RS 11*6.3 TAPING	C344	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM
C412	250479R	EC 4.7UF 50V 11*5 R:5	C345	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM

POS	PART NUMBER	PART DESCRIPTION	POS	PART NUMBER	PART DESCRIPTION
C403	294234R	CC-CHIP 220NF K 16V /0603 X7R	C348	251112R	EC 10UF 50V RS 11*5 TAPING R=5MM
C404	294234R	CC-CHIP 220NF K 16V /0603 X7R	C419	291337R	CC-CHIP 330PF J 50V /0603 NPO
C332	294125R	CC-CHIP 100NF K 25V /0603 X7R	C420	291337R	CC-CHIP 330PF J 50V /0603 NPO
C402	294125R	CC-CHIP 100NF K 25V /0603 X7R	C382	292114R	CC-CHIP 1NF K 50V /0603 X7R
C329	294125R	CC-CHIP 100NF K 25V /0603 X7R	C383	292114R	CC-CHIP 1NF K 50V /0603 X7R
R371	170754R	RC-CHIP 75R J 1/16W /0603	C388	292114R	CC-CHIP 1NF K 50V /0603 X7R
R372	170754R	RC-CHIP 75R J 1/16W /0603	C389	292114R	CC-CHIP 1NF K 50V /0603 X7R
R373	170754R	RC-CHIP 75R J 1/16W /0603	C322	294125R	CC-CHIP 100NF K 25V /0603 X7R
C421	292114R	CC-CHIP 1NF K 50V /0603 X7R	C324	294125R	CC-CHIP 100NF K 25V /0603 X7R
C422	292114R	CC-CHIP 1NF K 50V /0603 X7R	C326	294125R	CC-CHIP 100NF K 25V /0603 X7R
R301	173100R	RC-CHIP 10K J 1/10W /0603	C323	294125R	CC-CHIP 100NF K 25V /0603 X7R
R319	173100R	RC-CHIP 10K J 1/10W /0603	L318	053804R	COIL-CHIP 10UH K 0805
R387	173100R	RC-CHIP 10K J 1/10W /0603	L321	053804R	COIL-CHIP 10UH K 0805
C400	294234R	CC-CHIP 220NF K 16V /0603 X7R	R313	173471R	RC-CHIP 47K J 1/10W /0603
C401	294234R	CC-CHIP 220NF K 16V /0603 X7R	R314	173471R	RC-CHIP 47K J 1/10W /0603
Q301	401141R	TRN-CHIP BC848BLT1G SOT23	R315	173471R	RC-CHIP 47K J 1/10W /0603
Q308	401141R	TRN-CHIP BC848BLT1G SOT23	R316	173471R	RC-CHIP 47K J 1/10W /0603
Q304	401142R	TRN-CHIP BC858BLT1G SOT23	R317	173471R	RC-CHIP 47K J 1/10W /0603
Q305	401142R	TRN-CHIP BC858BLT1G SOT23	R318	173471R	RC-CHIP 47K J 1/10W /0603
Q306	401142R	TRN-CHIP BC858BLT1G SOT23	R320	173471R	RC-CHIP 47K J 1/10W /0603
R376	170154R	RC-CHIP 150R J 1/16W /0603 TAPE	R321	173471R	RC-CHIP 47K J 1/10W /0603
R377	170154R	RC-CHIP 150R J 1/16W /0603 TAPE	U302	452985R	IC-CHIP MC14053BDR2G SOIC16
R364	170754R	RC-CHIP 75R J 1/16W /0603	R335	172338R	RC-CHIP 3.3K J 1/10W /0603
R370	170754R	RC-CHIP 75R J 1/16W /0603	R336	172338R	RC-CHIP 3.3K J 1/10W /0603
R343	171107R	RC-CHIP 100R J 1/16W /0603	R333	172338R	RC-CHIP 3.3K J 1/10W /0603
R344	171107R	RC-CHIP 100R J 1/16W /0603	S125	032449R	KONN.MALE 2*15 30.LU SST
R399	171336R	RC-CHIP 330R J 1/16W /0603 TAPE	L116	053946R	COIL-CHIP B82464G4223M EPCOS
R400	171336R	RC-CHIP 330R J 1/16W /0603 TAPE	Q100	401141R	TRN-CHIP BC848BLT1G SOT23
R352	171476R	RC-CHIP 470R J 1/16W /0603	Q101	401141R	TRN-CHIP BC848BLT1G SOT23
R355	171476R	RC-CHIP 470R J 1/16W /0603	Q150	401141R	TRN-CHIP BC848BLT1G SOT23
R356	171476R	RC-CHIP 470R J 1/16W /0603	Q151	401141R	TRN-CHIP BC848BLT1G SOT23
R359	172104R	RC-CHIP 1K J 1/16W /0603	Q152	401141R	TRN-CHIP BC848BLT1G SOT23
R360	172104R	RC-CHIP 1K J 1/16W /0603	Q208	401141R	TRN-CHIP BC848BLT1G SOT23
R384	172479R	RC-CHIP 4.7K J 1/16W /0603 TAPE	R150	172479R	RC-CHIP 4.7K J 1/16W /0603 TAPE
R362	173183R	RC-CHIP 18K J 1/16W /0603 TAPE	R276	172479R	RC-CHIP 4.7K J 1/16W /0603 TAPE
R110	173229R	RC-CHIP 22K J 1/16W /0603	R277	172479R	RC-CHIP 4.7K J 1/16W /0603 TAPE
R152	170112R	RC-CHIP 2K J 1/16W /0603 TAPE	D100	303867R	DIODE-CHIP SL23 DO214AA
R106	171184R	RC-CHIP 180R J 1/16W /0603	R103	171107R	RC-CHIP 100R J 1/16W /0603
R153	171476R	RC-CHIP 470R J 1/16W /0603	R100	173100R	RC-CHIP 10K J 1/10W /0603
J100	179835R	RC-CHIP 0.75R %1 0805	R107	173100R	RC-CHIP 10K J 1/10W /0603
C113	291688R	CC-CHIP 680PF J 0603 50V NPO	R108	173100R	RC-CHIP 10K J 1/10W /0603
C101	293235R	CC-CHIP 22NF J 16V /0603 X7R	R151	173100R	RC-CHIP 10K J 1/10W /0603
U101	452667R	IC-CHIP MC34063ADR2G SO8 T&R	R155	173100R	RC-CHIP 10K J 1/10W /0603
U100	453553R	IC-CHIP MP1593DN-LF-Z DC-DC CONV SOIC8N	R156	173100R	RC-CHIP 10K J 1/10W /0603
D101	304413R	DIODE-CHIP PMEG4010EH SOD123	R104	173563R	RC-CHIP 56K J 1/16W /0603
C100	294125R	CC-CHIP 100NF K 25V /0603 X7R	J200	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE
C102	294125R	CC-CHIP 100NF K 25V /0603 X7R	J201	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE
C106	294125R	CC-CHIP 100NF K 25V /0603 X7R	J202	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE
C151	294125R	CC-CHIP 100NF K 25V /0603 X7R	J203	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE
C103	294125R	CC-CHIP 100NF K 25V /0603 X7R	J204	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE
C109	294125R	CC-CHIP 100NF K 25V /0603 X7R	J205	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE
C115	294125R	CC-CHIP 100NF K 25V /0603 X7R	J206	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE
J316	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE	J207	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE
R102	173183R	RC-CHIP 18K J 1/16W /0603 TAPE	J208	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE
R101	173563R	RC-CHIP 56K J 1/16W /0603	J209	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE
C104	293113R	CC-CHIP 10NF K 50V /0603 X7R	J318	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE
C636	292153R	CC-CHIP 1.5NF K 50V /0603 X7R TAPE	R154	172104R	RC-CHIP 1K J 1/16W /0603
R615	173563R	RC-CHIP 56K J 1/16W /0603	R157	172104R	RC-CHIP 1K J 1/16W /0603

POS	PART NUMBER	PART DESCRIPTION	POS	PART NUMBER	PART DESCRIPTION
D608	303867R	DIODE-CHIP SL23 DO214AA	R105	172224R	RC-CHIP 2.2K J 1/16W/0603 TAPE
L609	053946R	COIL-CHIP B82464G4223M EPCOS	R109	173229R	RC-CHIP 22K J 1/16W /0603
U600	453553R	IC-CHIP MP1593DN-LF-Z DC-DC CONV SOIC8N		X52527R	CABLE WITH.TERM.L=110MM YEL
C600	294125R	CC-CHIP 100NF K 25V /0603 X7R		ZF7524R	CABLE HARNESS AC POW PLUG-SW
C601	294125R	CC-CHIP 100NF K 25V /0603 X7R		L7J172	CU ASSY 32W L97. L5A (TX8193-10)
C602	294125R	CC-CHIP 100NF K 25V /0603 X7R	CN1	038889R	CONN.MALE 5 RIGHT-A 2317-5R
C603	294125R	CC-CHIP 100NF K 25V /0603 X7R	IR1	452521R-1	IR RECEIVER TSOP34838 SS1A
C604	294125R	CC-CHIP 100NF K 25V /0603 X7R	D1	303884R	LED 3MM WHITE 3V 5MA P.LIGHT
C625	293113R	CC-CHIP 10NF K 50V /0603 X7R	R2	101163R	CFR 150R J 1/4W 26MM
R601	173183R	RC-CHIP 18K J 1/16W /0603 TAPE	R1	101163R	CFR 150R J 1/4W 26MM
J307	031795R	CONN.S-VHS	R4	102141R	CFR 1K J 1/4W /6 26MM
J308	031163R	KONN. CINCH ..... WHITE HOR.14.1	R8	101494R	CFR 470R J 1/4W /6 26MM
J311	031164R	KONN. CINCH ..... RED HOR.14.1		L8J172	CU ASSY 32L97 L5A VER
J312	031165R	KONN. CINCH ..... YELLOW HOR.14.1	CN1	032997R	CONN.HOUS.2 PIN 2317-2R
S303	031251R	SCART SOCKET 14.1		TX9174	CU ASSY PN 32L94 L5A VER.
C110	253128R	EC 1000UF 16V 20*10 R:5 LOW ESR	R3	101343R	CFR 330R J 1/4W /6 26MM
S100	031658R	CONN.HOUSING.10P 2MMM 89400-1010 MOLEX	R7	101494R	CFR 470R J 1/4W /6 26MM
S149	031658R	CONN.HOUSING.10P 2MMM 89400-1010 MOLEX	R5	101189R	CFR 180R J 1/4W /6 26MM
C111	252112R	EC 100UF 16V 11*6 R:5	R6	102141R	CFR 1K J 1/4W /6 26MM
C563	253227R	EC 2200UF 35V 16*25 R:7.5	R9	102400R	CFR 3.9K J 1/4W /6 26MM
C116	253115R	EC 1000UF 16V 20*10 R:5	SOURCE	010860R	TACT SW LONG STEN
S150	031476R	CONN.HOUSING.12P 2MM 89400-1210 MOLEX	VOL+	010860R	TACT SW LONG STEN
L103	053937R	BOBIN RAD. 100UH K R:5MM LHL06TB	VOL-	010860R	TACT SW LONG STEN
C105	253131R	EC 1000UF 35V 20*13 R:5	PROG+	010860R	TACT SW LONG STEN
JP203	031281R	CON.MALE 7.LI 2317-7S JST B 7B-XH-A WHIT	PROG-	010860R	TACT SW LONG STEN
TU351	QW1136RTH1	TUNER HOR. THOMSON CTF5547	MENU	010860R	TACT SW LONG STEN
C114	253115R	EC 1000UF 16V 20*10 R:5	CN2	031396R	CON.CINCH SST 396G1-R 3?LU
JP100	032951R	CONN.HOUSING.7.LI MOLEX 89400-0710	CN3	031396R	CON.CINCH SST 396G1-R 3?LU
JP101	032951R	CONN.HOUSING.7.LI MOLEX 89400-0710	SW1	010861R	ON/OFF SWITCH BK98
	KW5502R	CABLE PANEL LVDS 32# AUO-VERS.V5 L=300MM		TW5140	LC 26"/32" AUDIO AMPLIFIER
J451	BW9524R	CABLE HARNESS DC POWER 10 PIN L5 SAMSUN	C259	250115R	EC 1UF 50V 11*5 R:5
J450	KW3506R	CON.CAB. AUDIO MODULE/L5 CHASSIS L=200	C411	250115R	EC 1UF 50V 11*5 R:5
S421	KW3524R	CABLE HARNESS 7.LI AMP. 26"-32" L5A	C460	250227R	EC 2.2UF 16V 11*5 R:5
	MW1504R	CON.CAB. PSU/AUDIO MODULE L=380 MAKARON	C484	250227R	EC 2.2UF 16V 11*5 R:5
	031491R	PLUG AC INLET TWO PHASE NOISE FILTER	C250	294476R	CC-CHIP 470NF K 16V /0805 X7R
R448	173228R	RC-CHIP 22K J 1/10W /0603	C251	294476R	CC-CHIP 470NF K 16V /0805 X7R
R465	170102R	RC-CHIP 10R J 1/8W /1206	C496	294476R	CC-CHIP 470NF K 16V /0805 X7R
R466	170102R	RC-CHIP 10R J 1/8W /1206	C258	294122R	CC-CHIP 100NF K 50V /0603 X7R
R467	172824R	RC-CHIP 8.2K J 1/16W /0603 TAPE	C473	294122R	CC-CHIP 100NF K 50V /0603 X7R
U402	453494R	IC-CHIP TRIPATH TA2024 STEREO CLAS-D T&R	C493	294122R	CC-CHIP 100NF K 50V /0603 X7R
R468	179005R	RC-CHIP 0R /0603 1.6*0.8 TAPE	C254	292114R	CC-CHIP 1NF K 50V /0603 X7R
C471	252241R	EC 220UF 35V WL 16*8 LESR/HRPL	C255	292114R	CC-CHIP 1NF K 50V /0603 X7R
C472	252241R	EC 220UF 35V WL 16*8 LESR/HRPL	C256	292114R	CC-CHIP 1NF K 50V /0603 X7R
S409	031194R	CONN.HOUS.4P 2317-4S JST B 4B-XH-A WHITE	C257	292114R	CC-CHIP 1NF K 50V /0603 X7R
S421	032951R	CONN.HOUSING.7.LI MOLEX 89400-0710	C495	292114R	CC-CHIP 1NF K 50V /0603 X7R
CAB1	KW3527R	CAB.TERM. L5/AUDIO MODULE GROUND L=280	C422	294234R	CC-CHIP 220NF K 16V /0603 X7R
S422	031387R	CON.MALE 8POL.250G1-V08	D407	303867R	DIODE-CHIP SL23 DO214AA
S423	031387R	CON.MALE 8POL.250G1-V08	D408	303867R	DIODE-CHIP SL23 DO214AA
L412	051371R	LINE FILTER 2X28MH 3A	D409	303867R	DIODE-CHIP SL23 DO214AA
	Y56913R	ADAPTOR AC12V/4A 15"CLASSII W/O GND	D410	303867R	DIODE-CHIP SL23 DO214AA
TU301	Y11137R	TUNER HOR. SAMSUNG TECC2949PG39E	L405	055622R	FERRIT BEAD-CHIP 100MHZ 4A
	C4A187F	U/K L5A KUMANDA KMK-01 SILVER BEKO S.LI	L406	055622R	FERRIT BEAD-CHIP 100MHZ 4A
	Y92913R	ADAPTOR AC12V/5A CLASS II W/O GND UK TYPE	L411	055622R	FERRIT BEAD-CHIP 100MHZ 4A
	038948R	MAIN CABLE CLSII UK TYPE	R434	173228R	RC-CHIP 22K J 1/10W /0603
	8R9183RFJ1	INVERTOR 17"W FUJITSU PLCD0817410	R435	173228R	RC-CHIP 22K J 1/10W /0603
S503	Y56502R	KAB.PANEL INTERFACE LCD TV 15 MOLEX L	R437	173228R	RC-CHIP 22K J 1/10W /0603
	X60183RSS2	INVERTOR 15 LTM150XH-L06A (PLCD2615412)	F600	054290R	FUSE 5A/250V ROUND
	ZH1183RPLP2	INVERTOR 20" LC201V02-A3KB (PLCD0320613)			

## FREQUENCY TABLE (MHz)

Channel	Number	BG	I	DK	L/L'
CH	1		49.75	49.75	47.75
CH	2	48.25	59.25	59.25	55.75
CH	3	55.25	77.25	77.25	60.50
CH	4	62.25	85.25	85.25	63.75
CH	5	175.25	93.25	93.25	176.00
CH	6	182.25	175.25	175.25	184.00
CH	7	189.25	183.25	183.25	192.00
CH	8	196.25	191.25	191.25	200.00
CH	9	203.25	199.25	199.25	208.00
CH	10	210.25	207.25	207.25	216.00
CH	11	217.25	215.25	215.25	189.25
CH	12	224.25	223.25	223.25	182.25
CH	13	53.75	45.75		196.25
CH	14	62.25	53.75		210.25
CH	15	82.25	61.75		
CH	16	175.25	69.75		
CH	17	183.25	95.25		
CH	18	192.25			
CH	19	201.25			
CH	20	210.25			
CH	21	471.25	471.25	471.25	471.25
CH	22	479.25	479.25	479.25	479.25
CH	23	487.25	487.25	487.25	487.25
CH	24	495.25	495.25	495.25	495.25
CH	25	503.25	503.25	503.25	503.25
CH	26	511.25	511.25	511.25	511.25
CH	27	519.25	519.25	519.25	519.25
CH	28	527.25	527.25	527.25	527.25
CH	29	535.25	535.25	535.25	535.25
CH	30	543.25	543.25	543.25	543.25
CH	31	551.25	551.25	551.25	551.25
CH	32	559.25	559.25	559.25	559.25
CH	33	567.25	567.25	567.25	567.25
CH	34	575.25	575.25	575.25	575.25
CH	35	583.25	583.25	583.25	583.25
CH	36	591.25	591.25	591.25	591.25
CH	37	599.25	599.25	599.25	599.25
CH	38	607.25	607.25	607.25	607.25
CH	39	615.25	615.25	615.25	615.25
CH	40	623.25	623.25	623.25	623.25
CH	41	631.25	631.25	631.25	631.25
CH	42	639.25	639.25	639.25	639.25
CH	43	647.25	647.25	647.25	647.25
CH	44	655.25	655.25	655.25	655.25

Channel	Number	BG	I	DK	L/L'
CH	45	663.25	663.25	663.25	663.25
CH	46	671.25	671.25	671.25	671.25
CH	47	679.25	679.25	679.25	679.25
CH	48	687.25	687.25	687.25	687.25
CH	49	695.25	695.25	695.25	695.25
CH	50	703.25	703.25	703.25	703.25
CH	51	711.25	711.25	711.25	711.25
CH	52	719.25	719.25	719.25	719.25
CH	53	727.25	727.25	727.25	727.25
CH	54	735.25	735.25	735.25	735.25
CH	55	743.25	743.25	743.25	743.25
CH	56	751.25	751.25	751.25	751.25
CH	57	759.25	759.25	759.25	759.25
CH	58	767.25	767.25	767.25	767.25
CH	59	775.25	775.25	775.25	775.25
CH	60	783.25	783.25	783.25	783.25
CH	61	791.25	791.25	791.25	791.25
CH	62	799.25	799.25	799.25	799.25
CH	63	807.25	807.25	807.25	807.25
CH	64	815.25	815.25	815.25	815.25
CH	65	823.25	823.25	823.25	823.25
CH	66	831.25	831.25	831.25	831.25
CH	67	839.25	839.25	839.25	839.25
CH	68	847.25	847.25	847.25	847.25
CH	69	855.25	855.25	855.25	855.25
CH	70		863,25		863.25
CH	71		871,25		
CH	72		879,25		
CH	73		887,25		160.00
CH	74	69.25			172.00
CH	75	76.25			220.00
CH	76	83.25			232.00
CH	77	90.25			244.00
CH	78	97.25			256.00
CH	79	59.25			268.00
CH	80	93.25			280.00
S	1	105.25	103.25	103.25	116.75
S	2	112.25	111.25	111.25	128.75
S	3	119.25	119.25	119.25	140.75
S	4	126.25	127.25	127.25	152.75
S	5	133.25	135.25	135.25	164.75
S	6	140.25	143.25	143.25	176.75
S	7	147.25	151.25	151.25	188.75
S	8	154.25	159.25	159.25	200.75
S	9	161.25	167.25	167.25	212.75
S	10	168.25	231.25	231.25	224.75
S	11	231.25	239.25	239.25	236.75
S	12	238.25	247.25	247.25	248.75
S	13	245.25	255.25	255.25	260.75
S	14	252.25	263.25	263.25	272.75

<b>Channel</b>	<b>Number</b>	<b>BG</b>	<b>I</b>	<b>DK</b>	<b>L/L'</b>
S	15	259.25	271.25	271.25	284.75
S	16	266.25	279.25	279.25	296.75
S	17	273.25	287.25	287.25	55.75
S	18	280.25	295.25	295.25	60.50
S	19	287.25	303.25	303.25	63.75
S	20	294.25			
S	21	303.25			303.25
S	22	311.25	311.25	311.25	311.25
S	23	319.25	319.25	319.25	319.25
S	24	327.25	327.25	327.25	327.25
S	25	335.25	335.25	335.25	335.25
S	26	343.25	343.25	343.25	343.25
S	27	351.25	351.25	351.25	351.25
S	28	359.25	359.25	359.25	359.25
S	29	367.25	367.25	367.25	367.25
S	30	375.25	375.25	375.25	375.25
S	31	383.25	383.25	383.25	383.25
S	32	391.25	391.25	391.25	391.25
S	33	399.25	399.25	399.25	399.25
S	34	407.25	407.25	407.25	407.25
S	35	415.25	415.25	415.25	415.25
S	36	423.25	423.25	423.25	423.25
S	37	431.25	431.25	431.25	431.25
S	38	439.25	439.25	439.25	439.25
S	39	447.25	447.25	447.25	447.25
S	40	455.25	455.25	455.25	455.25
S	41	463.25	463.25	463.25	463.25