

V40 LXH-P796F Circuit Brief

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GENERAL DESCRIPTION

V40 LXH-P796F, using 17" flat high brightness CRT, are so-called "Digital Controlled Auto-scan Color Display Monitor" with high resolution which can operate at horizontal scan frequency from 30KHz up to 96KHz, and vertical scan frequencies from 48 to 160 Hz.

The monitor is equipped with an embedded micro-controller, which can preset the required modes. It also provides many functions, such as digital adjustable picture, DDC2B, power management, sRGB, low emission, high immunity, ---- etc.

The monitor complies with MPRII low emission standard and also fulfill E2000 automatic power saving requirements, to reduce power consumption to less than 2 watts in power saving mode. The monitor also complies with VESA standard and energy star computer program initiated by the EPA.

1. DESCRIPTION OF CIRCUIT DIAGRAM

This description mainly introduces the functions including power supply, power saving management, horizontal / vertical deflection, video amplifier, and micro-controller, etc.

A. POWER SUPPLY / POWER SAVING MANAGEMENT

The monitor is designed to adopt switching mode power supply which can operate mains input from 90VAC to 264VAC. This switching power supply applies an IC TEA1507. The control scheme transforms a rectified voltage source into a multi-output voltages. The control concept exhibits many desirable properties such as inherent over-load protection, stable and fast system response. A current sense circuit (R3107/08/09, etc) is equipped for power limiting (90W) and safety reason on primary power supply circuit. Secondary feedback via a photo-coupler is used to obtain a stable output voltage. The secondary outputs supply all necessary voltages for deflection and video and micro-controller.

All rectified diodes on secondary site are without lead frame (heat-sink), it gains some cost saving in thermal design, but the turn ratios of main transformer should be well determined to maintain an adequate voltage derating of primary switching MOSFET and secondary +197V rectified diode BYV36C (with better thermal performance). This is trade-off design in between. The other hand, a secondary DC power switch is also adopted. And for cost saving B+197V adjust VR is replaced with two fixed resistors (3144,3145).

This monitor can save power consumption while no sync pulses and automatically recover to normal power-on when sync signals are detected by micro-controller. The power saving off mode still exists in new designed monitors, but suspend / stand-by mode are deleted due to patent infringement issue.

During Off mode, LED will flash and all the output voltages of main power are reduced to a very low level, and the operating frequency also comes very low, and only the required voltage of micro-controller (+5V) is supplied. When the monitor is switched off it is actually in burst mode (< 2W).

B. HORIZONTAL DEFLECTION / VERTICAL DEFLECTION / EHT GENERATOR

HORIZONTAL DEFLECTION:

The heart of horizontal/vertical deflection controller is TDA4841, which can offer a complete and efficient small signal sync processing for auto-sync monitors. All functions are controlled via I2C bus.

This controller provides sync processing, which can accept separate and composite (H+V) input signals. A very short settling time after mode change for protection of external power components has been taken into account. However, it should be noted that according to V40 109F5 spec this monitor doesn't support composite (H+V) input signals to avoid some troubles.

The TDA4841 provides extensive functions like a flexible B+ controller block of H-deflection and a geometry control with facility, leading to excellent picture quality. This device also can directly drive the vertical deflection output stage. The line driver stage, the E/W output stage and all controls are tracked with the incoming frequencies. Picture can be adjusted along horizontal/vertical direction by OSD H-shift/V-shift control. The horizontal size, east/west, trapezoid corrections can be adjusted by the output of pin24 (EWout), which is led to the diode modulation circuit. S-capacitors plus power MOSFET switches and DC controlled linearity coil are designed for optimal picture linearity.

VERTICAL DEFLECTION:

The majority of vertical deflection function is integrated by two ICs : TDA4841 and TDA8172.

The TDA4841 takes care of sync polarity correction, automatic catching and holding of the vertical oscillator, generation of saw-tooth drive current for vertical output and vertical s-correction, and generation of a correct V-blanking pulse for video blanking during vertical retrace time.

The TDA8172 is a DC-coupled vertical deflection booster with differential input signals, suitable for color monitors. The output stage has thermal and soar protection, and high linear saw-tooth signal amplification to obtain the required vertical deflection current. The voltage supply at flyback time for output stage is generated by the internal flyback generator and the external diode (6401) and capacitor (2405) which make the so-called pump-up circuit.

EHT GENERATOR

The IC TDA4841 is also used as a controller to generate required extra high voltage for CRT via a buck converter (7603) which supplies the required B+ to LOT's primary. This is a conventional combination circuit of horizontal deflection and EHT generation.

Flyback transformer (LOT) transfers the primary voltage to the required anode voltage and rest tertiary output voltages. The adjustable focus (G3) and screen (G2) voltages are internally derived from the anode voltage. Another secondary winding is used to generate the voltage for G1. Dynamic focus on G4 is derived from a DAF transformer (5671) to get a good focus performance. (G4 is also adjustable in factory mode).

For safety reasons, x-ray protection circuit is included, that TDA4841 will shut down EHT generator and horizontal deflection if the anode voltage exceeds a certain value (28-29kV).

C. VIDEO AMPLIFIER & DDC2B

VIDEO AMPLIFIER:

The video circuit mainly consists of LightFrame IC TDA4823, pre-amplifier TDA4886, post amplifier LM2435T and OSD IC NT68275. The video DC level and gain at cathode are controlled via I2C bus & software. When Lightframe IC is enabled by pressing the LF key, RGB input signals will be amplified with an extra amplification factor up to 1.4.

The red, green and blue video signals are amplified by pre-amplifier and post-amplifier, then AC coupled to CRT cathodes via DC restoration circuits. Three cut-off adjustments are provided to set the video black level at cathode for all three guns. Three individual gain adjustments are also provided to adjust the white balance. Both cut-off and gain controls are digital control via micro-controller.

A spot-killer circuit (7502,7503etc) is also provided to prevent the CRT damage due to spot burn-out when the set is switched off.

DDC 2B:

Via SDA and SCL, the data about the information of the monitor, including the serial number, production codes, CRT type and applicable timings, are stored in the EEPROM. To avoid picture interference, the reading and writing processes are executed during vertical blanking which is informed by the vertical SYNC.

D. MICRO-CONTROLLER

GENERAL DESCRIPTION:

The Weltrend WT62P1 micro-controller is used to control all required functions of monitors. The preset data are stored in EEPROM M24C04. The most important point is using “ interrupt “ to do the fast detect of mode change. Then the MCU delivers a good protection behavior for horizontal output transistor during mode change.

HARDWARE DEFINITIONS:

a) KEY BOARD

There is a keypad with four keys at the front of monitor for Power-on/off and the OSD control.

- Power-on/off
To switch on/off the set.

- OSD function keys:

- Enter (OK)
Push it, to confirm the entrance or exit from the OSD window.

- + (DOWN/RIGHT/INCREASE/CONTRAST)
To select downward or rightward the parameters which are chosen from OSD.
To increase the scale of the selected parameter.
To call for brightness adjustment.

- (UP/LEFT/DECREASE/BRIGHTNESS)
To select upward or leftward the parameters which are chosen from OSD.
To decrease the scale of the selected parameter.
To call for contrast adjustment.

b) OSD will disappear and SAVE AUTOMATICALLY after non-operation.

c) Software will control the DPMS according to the SYNC status.

• FUNCTION BLOCK OF LXH-P796F 96K COMBINED-EHT

