

## **Circuits Description of 109P 19" Monitor**

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## 1. GENERAL DESCRIPTION

The CM25+ 109P 19" is a Digital Controlled Auto-scan Color Display Monitor with high resolution. This monitor can operate at horizontal scan frequencies from 30 to 110K Hz. and vertical scan frequencies from 50 to 160 Hz.

This monitor is equipped with an embedded micro-controller, which can preset the required modes. The CM25+ provides many functions, such as digital adjustable picture, DDC1/2B, power management, low emission, high immunity, etc.

This monitor complies with TCO99 low emission standard and also fulfills E2000 automatic power saving requirements. To reduce power consumption less than 8 watts in standby or suspend mode and less than 3 watts in off mod, the monitor also complies with VESA standard and energy star computer program initiated by the EPA..

## 2. DESCRIPTION OF CIRCUIT DIAGRAM

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

### A. POWER SUPPLY / POWER SAVING MANAGEMENT

#### *POWER SUPPLY:*

The monitor is designed as switch mode power supply which can operate mains input from 90VAC to 264VAC. The power supply uses an IC (STR-F6656) for QUASI-RESONANT MODE. The control scheme transforms a switching converter from a voltage source into a multi-output voltage. The control concept is exhibited many desirable properties such as inherent over-load protection, stable and fast system response.

The maximum power consumption is up to 150 watts. A power limiting circuit is added for safety reason.

On main power supply circuit, secondary feedback via a photo-coupler is used to obtain a stable output voltage. The secondary feedback supplies all necessary voltages for deflection and video and rest.

#### *POWER SAVING MANAGEMENT:*

This monitor can save power consumption while no sync pulses or automatically recover to normal power when sync signals are detected by micro-controller.

During the stand-by mode operation all the output voltages are reduced to around 10% of the nominal value and only the heater voltage and the 5V to supply the up are sustained. In this condition the heater voltage is less than the nominal value and it is around 5.5V.

During Off mode operation all the output voltages are reduced to around 10% of the nominal value like in stand-by mode and the heater voltage is removed, only the micro-controller is supplied.

The power consumption is less than 8 watts during standby / suspend modes, and less than 3 watts during off mode.

## B. HORIZONTAL DEFLECTION / VERTICAL DEFLECTION / EHT GENERATOR

### *HORIZONTAL DEFLECTION:*

The heart of horizontal/vertical deflection controller is TDA4856, which can offer a complete and efficient small signal sync processing for auto-sync monitors. All functions are controlled by I2C bus.

This controller provides sync processing, which can accept separate and composite (H+V) input signals. A very short settleing time after mode change for protection of external power components has been taken into account.

The TDA4856 provides extensive functions like a flexible B+ controller block of H-deflection and a geometry control with facilities, 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.

Raster can be adjusted along horizontal direction by OSD H-shift control.

The horizontal size, east/west, trapezoid corrections are obtained by varying the supply voltage of H-deflection circuit via buck converter.

Five capacitors switch and DC controlled linearity coil are designed for optimal screen linearity.

### *VERTICAL DEFLECTION:*

The majority of vertical deflection function is integrated by two ICs : TDA4856 and TDA9379.

The TDA4856 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 lines.

The TDA9379 is a DC-coupled vertical deflection booster with differential input signals is suitable for color monitor. The output stage has thermal and soar protection, and high linear saw-tooth signal amplification to obtain the required vertical deflection current.

### EHT GENERATOR

The IC L4990A is used as a controller to generate required extra high voltage for CRT, the transformer (LOT) transfers the voltage to required 25kV of anode voltage and rest tertiary output voltage.

The adjustable focus (G3) and screen (G2) voltages are internally derived from the anode voltage.

Other secondary windings are used to generate the voltages for G1. For 19 inches monitor also provides dynamic focus on G4 to get a good focus performance. (G4 is also adjustable).

For safety reasons, x-ray protection circuit is included. L4990A will shut down EHT generator if the anode voltage exceeds a certain value (29kV).

This circuit is also used for beam current overload protection. Shut down EHT in case the total beam current exceeds a certain limit to protect both CRT and LOT.

### C. VIDEO AMPLIFIER & DDC1/2B

#### *VIDEO AMPLIFIER:*

The heart of video circuit is TDA4886A. This controller can drive the monolithic post-amp LM2402 without buffer stage. The video DC level and gain at cathode are controlled by software.

The red, green and blue video signals are amplified by the post-amplifier and AC couple to output stage then send to the CRT cathodes via DC restoration.

Three cut-off adjustments are provided to set the video black level at cathode for all three guns. Also three individual gain adjustments are provided to adjust the white balance. Both cut-off and gain controls are digital control via micro-controller.

Auto-calibrate is so called black and white level stabilization (BWLS) which is also designed in the video circuit.

For limiting the beam current and preventing the local doming, the beam current limit will automatically reduce the video swing in case the maximum beam current is exceeded.

A spot-killer circuit is also added to prevent the CRT damage due to spot burn out when the set is switched off.

#### *DDC 1/2B:.*

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

(24LC21). To avoid picture interference, the reading and writing processes are executed during vertical blanking which is informed by the vertical SYNC.

#### **D. PURITY AND CONVERGENCE CONTROL**

There are four corner coils (purity coils) are installed around the CRT and these coils are driven by four DC amplifiers respectively, they provide the purity correction via digital control, also temperature compensation are available for environment and funnel temperature changed.

The convergence coils are combined with deflection yoke, they are also driven by DC amplifiers.

Via OSD menu, two control functions H-convergence and V-convergence can be selected to adjust the convergence of CRT by using digital control.

#### **E. MICRO-CONTROLLER**

##### *GENERAL DESCRIPTION:*

The Philips P87C380 micro-controller is used to control the monitor. The preset data are stored in EEPROM ST24W16.

##### *HARDWARE DEFINITION:*

###### **a) KEY BOARD**

There are five keypads at the front of monitor for the OSD control.

- OSD function key:

- Enter

Push it, to confirm the entrance or exit from the OSD window

- UP

To select the parameters which are chosen from OSD.

- DOWN

To select the parameters which are chosen from OSD.

- RIGHT

To adjust the parameter which are chosen from OSD to right side

- LEFT

To adjust the parameter which are chosen from OSD to left side

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

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

### 3. VIDEO PRESET MOSES

#### **Pre-set Video Resolution and Sync Polarities**

Resolution modes	H frequency	V frequency	H	V
1024 x 768	60.0K	75Hz (VESA/75)	+	+
1024 x 768	68.7K	85Hz (VESA/85)	+	+
1280 x 1024	80.0K	75Hz (VESA/75)	+	+
1280 x 1024	91.0K	85Hz (VESA/85)	+	+
1600 x 1200	93.0K	75Hz (VESA/75)	+	+
1600 x 1200	106.3K	85Hz (VESA/85)	+	+
1792 x 1344	106.3K	75Hz (VESA/75)	x	x