

Exhibit 4

Brief Description of Circuit Functions

The brief ckt. description of CM25+
109P4/202P4/20B4” Monitor

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1. GENERAL DESCRIPTION

The new refreshed CM25+ platform includes 109P4 using 19" flat CRT, 201B4 using 21" CRT and 202P4 using 22" flat CRT, they are so-called "Digital Controlled Auto-scan Color Display Monitor" with high resolution which can operate at horizontal scan frequency from 30KHz up to 111KHz, 115KHz and 130KHz for 109P4, 201B4 and 202P4 respectively, and vertical scan frequencies can operate from 50 to 160 Hz.

These monitors are equipped with an embedded micro-controller, which can preset the required modes, the CM25+ also provides many functions, such as digital adjustable picture, DDC2B, power management, sRGB, low emission, high immunity, --- etc.

These monitors comply with TCO99 low emission standard and also fulfill E2000 automatic power saving requirements; to reduce power consumption less than 2 watts in power saving mode, the monitor also can comply 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

The monitor is designed to adopt switching mode power supply which can operate mains input from 90VAC to 264VAC, this switching power supply apply an IC (STR-F6656 or STR-F6456) for QUASI-RESONANT MODE controller, that power MOSFET is packed inside as well. 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 output power capability is up to 150 or 180 watts for different models, then a power limiting circuit is added for different power delivery and safety reason, on main 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 rest except micro-controller.

In order to meet new requirement of E2000 - power consumption less 2 watts @ off mode, an extra second power supply is adopt, this 2nd power applies SOPS technology, not only supply the +5V to micro-controller & rest, it is also used to start up the main power supply, such design concept can reduce power dissipation in power start up circuit, to deliver enough power in normal "ON" operation, the 2nd power must work at high frequency mode, and to be switched into burst mode via micro-controller for less 2 watts requirement @ off mode (actual measuring data < 1 watt), this design has been considered and executed in low and high mains voltage.

The main power supply is designed for different screen size, including 19", 22" pure flat CRT, and 21" conventional CRT, the power consumption required in 19", 21" and 22" are about 115 watts 120 watts and 145 watts respectively, for the safety and protection reason, a reasonable power limiting point should be set for them, therefore, the power limit of 109P4 and 201B4 is set to 150 watts, for 202P4, it is 180 watts.

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 fixed to maintain a adequate voltage derating of primary switching MOSFET and secondary +230V rectified diode 31DF6 (with better

thermal performance), this is trade off design in between, the other hand, a primary DC power switch which can replace AC power switch is also reserved but symbol on the bezel must be modified for the approbation reason.

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 exist in new designed monitors but suspend / stand-by mode are deleted due to pattern infringement issue, but still reserve them for the option and future implementation required.

During Off mode operation, all the output voltages of main power are reduced to zero, only the required voltage of micro-controller is supplied by second power, then it will be used to restart the main power while monitor wake-up is required.

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 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.

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, picture 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 or six or seven capacitors plus power MOSFET switches 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 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, 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, that L4990A will shut down EHT generator if the anode voltage exceeds a certain value (29kV), this circuit is also used for over beam current protection, it will shut down EHT in case the total beam current exceeds a certain value.

C. VIDEO AMPLIFIER & DDC2B

VIDEO AMPLIFIER:

The video circuit mainly consists of pre-amplifier TDA4887, LM2402, post amplifier and DC restoration circuit, the video DC level and gain at cathode are controlled via I2C bus & software.

The red, green and blue video signals are amplified by pre-amplifier and post-amplifier, then AC couple 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.

Auto-calibrate is so called black and white level stabilization (BWLS) which is also designed in the video circuit, for the beam current limit 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 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. PURITY AND CONVERGENCE CONTROL

(Suitable for 109P4 and 202P4, but 201B4 is exclusive)

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 Weltrend ET62P2 micro-controller is used to control all required functions of monitors, the preset data are stored in EEPROM M24C16, the most important point is used “ interrupt “ to do the fast detect of mode change, then the MCU deliver a good protection behavior for horizontal output transistor during mode change.

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.