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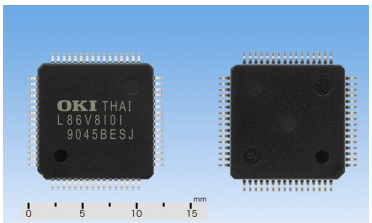
Oki Semiconductor develops image adjustment LSI with Timing Controller for small and mid-sized TFT LCDs

— Providing optimal image adjustment for TFT LCD display systems —

Oki Semiconductor has developed the ML86V8101, an image adjustment LSI incorporating a Timing Controller (TCON Note 1) for small and mid-sized TFT LCDs. Integrating image adjustment functions and a TCON onto a single chip, this LSI operates from a single 3.3-V power supply. The new chip will enhance the image quality of graphic display systems while reducing costs and space requirements.



ML86V8101

The ML86V8101 provides optimal image adjustment for TFT LCDs, with contrast and brightness adjustments and gamma correction Note 2 for digital RGB video signals. The built-in TCON enables direct connection to TFT LCD panels displaying video images in various formats, including QVGA Note 3 and QHD.Note 4 Guaranteed to operate across a temperature range of -40°C to +85°C, the LSI is ideally suited for use in vehicle-mounted graphic display systems, including car navigation systems, audio systems equipped with a display monitor,Note 5 and RSEs.Note 6

We are currently shipping ML86V8101 samples. A full-scale product launch is scheduled for August 2009.

[Development background]

Of the various electronic devices incorporating graphic display systems, vehicle-mounted camera systems Note 7 in particular have seen a notable increase in worldwide demand in recent years. And, among display systems for such camera systems, demand for car audio systems with TFT LCDs is expected to grow, alongside the ubiquitous car navigation systems. Many audio systems that feature display panels are built simply by adding a display monitor to an existing car audio system, a highly cost-effective approach. Optimizing the image quality for the needs of each such system poses a technical challenge.

In response, we have developed the ML86V8101. This LSI enables optimal image adjustments for audio systems featuring display panels, as well as other graphic display systems.

The LSI also enhances image quality for audio systems with display panels, currently popular

due to their relative affordability when compared with car navigation systems.

[Features]

Image adjustment functions and TCON on a single chip powered by a single 3.3-V power supply

One chip operating from a single 3.3-V power supply integrates image adjustment functions and TCON, making it possible to enhance the image quality of graphic display systems while reducing costs and space requirements inside the systems.

Shared RGB and independent R/B contrast adjustments

Allows contrast adjustments by adjusting the overall curve for the input image data. Following adjustments of the RGB curve, the R and B channels can be adjusted individually.
Independent R/B adjustment allows more fine-tuned adjustments to suit specific systems than ever before.

Shared RGB and independent R/B brightness adjustments

Allows brightness adjustments by adding an offset to input image data. Following adjustments in brightness for the RGB channel, the system permits individual brightness adjustment of the R and B channels.
Independent R/B adjustment allows more fine-tuned adjustments to suit each specific system than ever before.

Independent RGB gamma correction

Controls linearity between input image data and output image data by establishing nine control points. Linearity can be controlled separately for R, G, and B.

Built-in TCON

Outputs up to four horizontal control signals and three vertical control signals. Capable of controlling operational timing for the TFT LCD with various resolutions ranging from QVGA to QHD.

Multi-gradation color simulation

Reduces errors in internal data processing using the low two bits of the internal data for multi-gradation color simulation. With either dithering Note 8 or FRC,Note 9 the two low bits are used to simulate multi-gradation color correction, resulting in a system with 8-bit color gradation based on 6-bit output per RGB color.

Reliable operation within vehicle temperature range

Guaranteed to operate at temperatures from -40°C to +85°C; suitable for both household and vehicle-mounted graphic display systems.

[Future developments]

Future goals include system refinements and higher-value-added image adjustment LSIs. For example, we are considering a dynamic contrast adjustment function Note 10 and other functions to improve image quality, and an LVDS Note 11 interface.

[Sales plan]

- Product name : ML86V8101TBZ03A
- Sample shipment : Currently shipping
- Product launch : August 2009

[Overview/features]

- Digital video input: 18-bit RGB input
- Contrast adjustment: Shared RGB and independent R/B contrast adjustment
- Brightness adjustment: Shared RGB and independent R/B brightness adjustment
- Gamma correction: RGB independent adjustment
- Display interface: 18-bit RGB output, data clock
  Up to 4 horizontal and 3 vertical control signals
  Display enable signal, alternating signal
- Host interface: I²C bus
- Operating temperature range: -40°C to +85°C
- Operating frequency: Max. 50 MHz
- Supply voltage: I/O 3.3 V ±0.30 V, logic 3.3 V ±0.30 V
- Package: TQFP 64 pins (P-TQFP64-1010-0.50-ZK1)
- Product name: ML86V8101TBZ03A (lead-free)

[Glossary]

Note 1: TCON

Stands for Timing Controller. It outputs a horizontal control signal, vertical synchronizing signal, and data clock tailored to the timing of various TFT LCDs. This function enables compatibility with a wide range of TFT LCDs.

Note 2: Gamma correction

Adjusts the brightness and color hue of video signals by controlling linearity between input and output image data.

Since the characteristics of TFT LCDs vary from monitor to monitor, the brightness and color hue of an input image can also vary. Gamma correction is used to correct such errors.

Note 3: QVGA

Stands for Quarter Video Graphics Array, a display resolution standard. A QVGA screen consists of 320 x 240 dots. Called “quarter” because it is one-fourth (a quarter) of the area/pixel count corresponding to the VGA (640 x 480 dots) resolution standard.

Note 4: QHD

Stands for Quarter High Definition, a display resolution standard. A QHD display screen has a resolution of 960 x 540 dots. *High-definition (HD)* refers to a resolution of 720 or more pixels. It is called “quarter high definition” because it is one-forth (a quarter) of full HD (1920 x 1080).

Note 5: Audio system with a display monitor

A car audio system with a display function added. These systems are also used as display monitors for vehicle-mounted camera systems. Demand is growing for audio

systems featuring such display systems because the cost of building such systems is lower than for car navigation systems.

Note 6: RSE

Stands for Rear Seat Entertainment—DVD/digital TV systems designed for passengers seated in the rear seats of a vehicle.

Note 7: Vehicle-mounted camera system

Onboard analog video camera systems used for surveillance of the rear, sides, and corners of a vehicle.

Note 8: Dithering

Dither is noise deliberately introduced into sample data to minimize the appearance of quantization errors. This process of adding such signals or data is called dithering.

Note 9: FRC

Stands for Frame Rate Control. It simulates perceived colors based on frame rewriting (high frame rates), based on the persistent after-image effects perceived by the human eye. Alternating two colors at high speed creates the illusion of the intermediate color. FRC changes data at four frames per second to simulate three intermediate colors in all (2-bit FRC), resulting in apparent 8-bit color gradation using 6-bit output per RGB color.

Note 10: Dynamic contrast

Adjusts the brightness of the backlight in real-time based on the image to optimize contrast ratios. When the overall image is dark, brightness is reduced. If the overall image is bright, brightness is increased. Dark images are made darker and bright images made brighter, increasing contrast ratios.

Note 11: LVDS

Stands for Low Voltage Differential Signaling. Data transmission using differential signals of low amplitude (approximately 350 mV) through two wiring patterns making up a balanced cable or on a printed circuit board (PCB).

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