DigitalClarity® *Technology*

1/4-Inch VGA CMOS Active-Pixel Digital Image Sensor

Simple Designs with an All-in-One Imager for Automotive Applications

Automotive makers are incorporating cutting-edge features for safety, security, and convenience in their car and commercial vehicle designs—high-tech applications that are driven by CMOS image sensors. Micron, the recognized leader in the CMOS image sensor industry, offers several high-speed, high-performance imagers designed specifically to meet the requirements of the demanding automotive environment. In cars and commercial vehicles, the MT9V125 can provide protection by enabling biometric security and providing content theft identification. It can increase drivers' awareness of their surroundings by displaying what's happening next to the vehicle, behind it, or in the back seat.

MT9V125 Applications

- Blind spot, parking assistance
- Rear-view, side-view video
- Passenger viewing
- Mirror replacement/assistance
- Vehicle and contents theft identification
- Biometric identification/security
- Accident reconstruction

Sophisticated but Simple

The MT9V125 incorporates sophisticated camera functions on-chip and is programmable through a simple two-wire serial interface. Its three dedi-cated control pins, left/right image mirroring, and LVDS on/off reduce the need for additional chips for power setup. NTSC- and PAL-formatted outputs are integrated on the device, and its flexible signal path supports a wide variety of system architectures. Because the sensor does not require an encoder chip for formatting, this lowers the bill of materials (BOM) and dramatically reduces costs.

Dependable in Severe Conditions

Electronic components used in the automotive environment need to perform under rigorous operating conditions. Bright or dark, hot or cold, the MT9V125 can output full-color video at VGA-quality resolution (640H x 480V). In fact, the part excels under extreme conditions, with an operating temperature range of -40°C to +105°C and a minimum detectable light level of <2.5 lux.
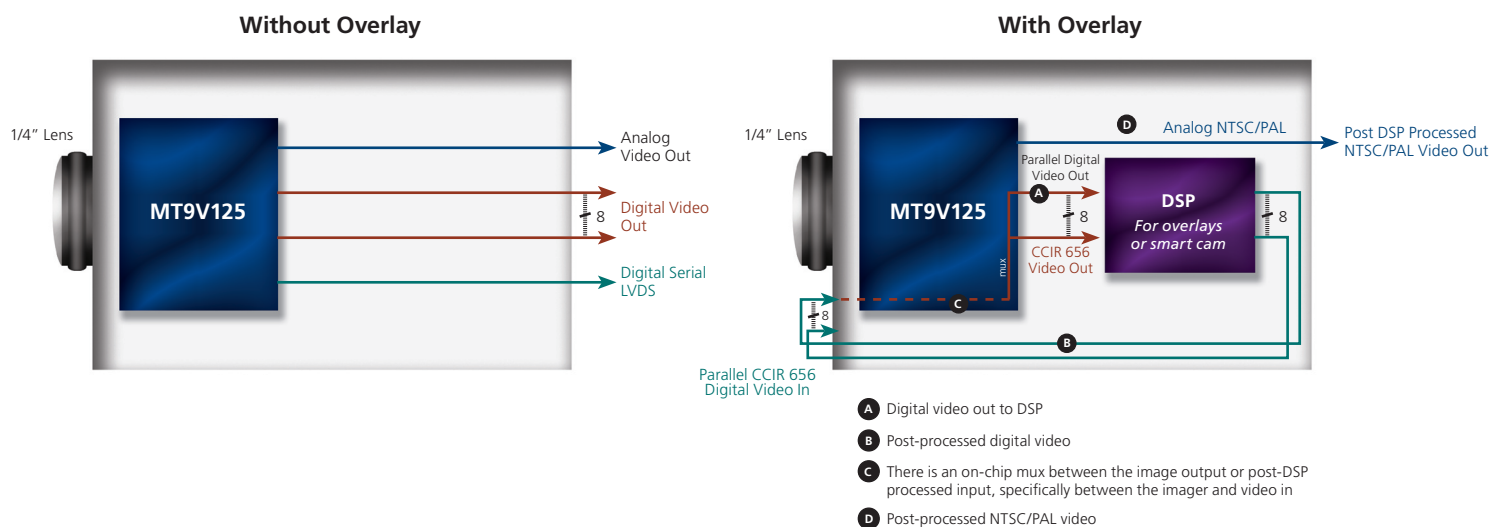
Added Value

In addition to a complete line of high-performance CMOS image sensors, Micron also manufactures industrial temperature DRAM and NAND Flash for automotive applications. For more information about the MT9V125, as well as our other industrial temperature products, call us at 208-368-3900 or visit us on the Web at *www.micron.com*.

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Specifications

- **Pixel Size:** 5.6μm x 5.6μm

- **Array Format (Active):** 640H x 480V

- **Imaging Area:** 3.584mm x 2.688mm

- **Color Filter Array:** RGB Paired Bayer color filters

- **Optical Format:** 1/4-inch

- **Frame Rate:** 30 MHz

- **Scan Mode:** CCIR 656 interlaced

- **Shutter:** Electronic rolling shutter (ERS)

- **Automatic Functions:** Color recovery and correction, sharpening, programmable gamma correction, auto black level offset correction, auto exposure, white balance, lens shading correction, and flicker avoidance

- **Programmable Controls:** Gain, frame rate, ADC reference, left-right and top-bottom image reversal

- **ADC:** 10 bit, on-chip

- **Data Rate:** 27 MHz

- **Responsivity:** 2 V/lux-sec (550nm)

- **Data Output Formats:** ITU_R BT .656 (YCBCR), 565RGB, 555RGB, 444RGB, Interlaced output

- **Dynamic Range:** >69dB

- **Maximum Analog Gain:** 15.875

- **Supply Voltage:** 2.8V ±10%

- **Power Consumption:** <300mW (@ 30 fps)

- **Functioned Temp. Range:** -40°C to +85°C

- **Operating Temp. Range:** -40°C to +105°C

- **Storage Temp. Range:** -40°C to +125°C

- **Package:** 52-pin IBGA, 9mm x 9mm

Implementation Examples

Without Overlay

1/4" Lens — MT9V125 — Analog Video Out / Digital Video Out (8) / Digital Serial LVDS

With Overlay

1/4" Lens — MT9V125 — Parallel Digital Video Out — (A) Digital video out to DSP — (8) — DSP *For overlays or smart cam* — (8) — (D) Analog NTSC/PAL — Post DSP Processed NTSC/PAL Video Out

CCIR 656 Video Out

mux — (C)

(8) Parallel CCIR 656 Digital Video In

(B)

A Digital video out to DSP

B Post-processed digital video

C There is an on-chip mux between the image output or post-DSP processed input, specifically between the imager and video in

D Post-processed NTSC/PAL video

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MT9V125 Features and Benefits

	Features	Benefits
Shutter	Dual electronic rolling shutter (DERS)	Provides excellent video capture, especially in low-light conditions by featuring 60Hz field rates that have integration times as high as 33ms. (Results were not achieved by running 60Hz frame rates and throwing out every other line as others often do when reporting this.)
Pixel Size	5.6µm x 5.6µm	Is formatted for a 1/4-inch lens, which is a standard format that enables small camera designs.
Video Formats	NTSC/PAL (true two field) analog composite video output ITU-R BT.656 parallel output (8-bit, interlaced)	Outputs to either NTSC or PAL format. The video output is formatted directly on the chip to go directly to an NTSC or PAL input (display) device. Because the sensor does not require an encoder chip, this lowers the bill of materials (BOM) and dramatically reduces costs.
Digital Video Input	Post-processed video and overlay support	Enables the customer to feed the post-processed video (lens correction and static or dynamic overlays) back into the imager to use the on-chip DAC and NTSC encoder. Reduces BOM and cost and increases reliability.
System-on-a-Chip	Completely integrated camera system	Consists of a color processing pipeline, and a measurement and control logic block (the camera controller). The block continuously accumulates image brightness and color statistics. The IFP automatically adjusts exposure, white balance, black reference, flicker avoidance, color saturation, and defect identification and correction.
Programmable Controls	Gamma, exposure, gain, windowing, frame rate, ADC reference, left-right and top-bottom image reversal	Enables a camera with the same bill of material (BOM) to be used in both forward- and rear-looking systems through image reversal. The user can program the size of a region for downsizing.
Frame Rates	VGA: 30 fps NTSC: 30 fps @ 27 MHz PAL: 25 fps @ 27 MHz	Offers real-time frame rates at full resolution to match those of automotive displays.
Digital Scan Mode	CCIR 656 interlaced	Captures high-quality video with progressive scan mode, which outputs in standard color digital video format.
Data Formats	Progressive or interlaced, Parallel or LVDS (serial)	Offers a selectable output data format, providing flexibility; supports parallel or serial digital interlaced output formats (CCIR 656, YUV 4:2:2); and supports raw progressive or interlaced digital output. The serial LVDS output mode significantly reduces wire count.
Minimum Detectable Light	<2.5 lux, color Superior low-light performance	Performs extremely well under low-light conditions, making it ideal for a wide range of automotive display applications.
Dynamic Range	>70dB	Features a dynamic range that exceeds that of automotive displays for high-quality video in very light or very dark conditions.
Spectral Range	450nm–1,050nm >40% QE at 550nm	Detects a spectral range from deep blue (DB) to NIR, with a peak response matching that of the human eye.
Programming Capability	Two-wire serial programming interface	Incorporates sophisticated camera functions on-chip and is programmable through a simple two-wire serial interface.
Three Dedicated Control Pins	Left/right image mirroring LVDS on/off	Reduces the need for additional chips for power setup.
Temperature Ranges	Operating: -40°C to +105°C Storage: -40°C to +125°C	Withstands extreme temperatures, providing dependable operation under severe conditions.
Package	AECQ-100 qualified 52-ball IBGA BGA: 0.5mm ball 1.0mm centers	Excels under extreme conditions with automotive-qualified IBGA package.

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