

Features and Benefits

- Panoramic aspect ratio
- High sensitivity in low light conditions
- Wide temperature range
- High input dynamic range snapshot shutter
- High output dynamic range
- Plastic overmolded package
- Single 3.3V power supply
- Automotive AEC-Q100, RoHS compliant
- Optical area in the middle of the device
- HDR mode for tunnels and application fusion

Application Examples

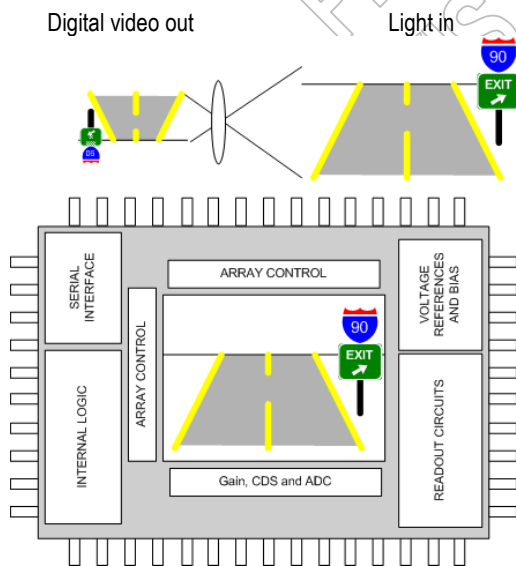
- Lane departure warning or lane keeping
- High beam and spot beam assist
- Night vision
- Traffic jam assist
- Road sign and pedestrian recognition
- Advanced cruise control
- Intersection traffic light monitoring
- Industrial applications
- Surveillance, security
- Near infra-red imaging
- High temperature imaging

Ordering Information

Part No.	Temperature Code	Package Code
MLX75307	K (-40°C to 125°C)	MG (MQFP52)
MLX75307	K (-40°C to 125°C)	UC (wafer)

Other versions available.

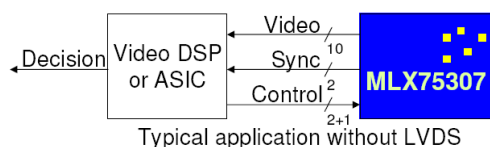
1 Functional Diagram



2 General Description

The automotive graded MLX75307 is our 3rd generation fully integrated CMOS image sensor. Its panoramic resolution and large pixel size make it optimal for front vision applications including night operation with high absolute sensitivity and outstanding SNR. Its snapshot shutter with high dynamic range allows for capture of fast moving scenes in presence of bright light sources and dark shadows. Its wide operation temperature range of -40 till 125°C allow for a positioning just under the roof behind the windshield. The cavity overmolded plastic package gives direct access to the silicon surface for optimal lens positioning. The sensor is intended to be used with an external microcontroller, DSP or ASIC.

The MLX75307 has been characterized according to the EMVA1288 standard. Melexis is a member of the European Machine Vision Association 1288 standardization committee. The EMVA1288 standard can be downloaded for free from emva.org.



3 Unique Features

Unique features

- Automotive overmolded plastic package.
- Large pixel
- Fail safe operation
- Optical area centered in the plastic package
- Novel black pixel reference
- Flexible operation
- Characterized according to EMVA1288.

Special features

- Single voltage supply
- Excellent SNR and low light sensitivity

Panoramic VGA (the panoramic aspect ratio is more suited for automotive front vision applications)

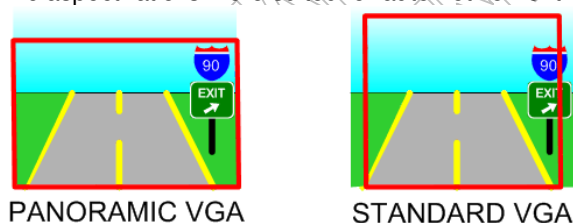


Figure 1: Comparison between panoramic VGA and standard VGA

4 Introduction

The MLX75307 is the 3rd generation of the Melexis fully integrated CMOS image sensor for automotive. Its panoramic resolution and large pixel make it optimal for front vision applications including night operation featuring high absolute sensitivity and outstanding SNR. Its snapshot shutter (i.e. non-rolling) with high dynamic range allows for acquisition of fast moving scenes in presence of bright light sources and dark shadows. Its wide operation temperature ranges from -40 to +125°C electrical (-40 to +105°C for complying with optical specifications) allows for a positioning just under the roof behind the windshield. The cavity overmolded plastic package gives direct access to the silicon surface for optimal lens positioning. The sensor is intended to be used with an external microcontroller, DSP or ASIC for control and image processing.

With respect to response function, several options are possible. The main operation mode provides a mainly linear response function with 10 bits linear unsigned binary representation. In order to enhance the low light levels response, the 10 bits response can be extended to a 12:10 companding response, virtually behaving as a 12 bits response. Further, it is possible to set a programmable low light level in pixel gain (skimming, increase of low light sensitivity). Finally, in order to accommodate extreme in scene contrasts, it is possible to select a piecewise linear response function with compression of high light levels (multiple slopes response).

Readout is performed over a digital parallel interface. Reduction of the number of readout rows provides a linear decrease in readout time. Reduction of the read out number of columns must respect a minimum row time, otherwise the line break will automatically be increased. Generally in readout the sensor is master over the digital output bus. However, in a line trigger mode, it is possible to request the transmission of individual lines only.

The digital part controls the integration sequence, the readout sequence and the operation mode of the sensor. The digital control part also manages the data interfaces. There is a bi-directional serial configuration interface, permitting to read from and write to a bench of registers. While the serial configuration interface is a “slave”, the digital data output interface is generally “master” over the data bus.

The sensor features several operation modes. All operation modes are based on a global shutter synchronous timing scheme. As an extension of the global shutter mode it is possible to set shorter exposure times in up to 3 smaller sub-windows. Exposure time can overlap the readout time with some restrictions. It is the user responsibility to set appropriate trigger delays in order not to over-trigger the device. The sensor can be run with an external self trigger in a free running mode (without automatic adjustment of the exposure settings) or with an external frame trigger.



The MLX75307 has been characterized according to the EMVA1288 standard. Melexis is a member of the European Machine Vision Association (EMVA) 1288 standardization committee. The EMVA1288 standard can be downloaded for free from emva.org or standard1288.org. The goal of the EMVA1288 standard is to define test hardware, test algorithms, formulas and test conditions for image sensors intended to be used in image processing applications. The clear advantage is to speak the same language in all datasheets to make the device evaluation and comparison easier. Another goal is to summarize the physical model of imagers.

5 Summary of General Specifications

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Resolution				750x400		pixels
Noise equivalent illumination		At 550nm, 10ms integration time, flushed reset mode			(0.02)	Lux
Saturation with non-linear response		At 550nm	(100000)			Lux
Programmable integration time		$T_{A,elec}$	160E-9	1E-3	100E-3	s
DSNU		In 10 bit representation, ambient temperature, 5ms integration time			2	DN
PRNU		In 10 bit representation, ambient temperature, 5ms integration time			3	%
Global shutter efficiency		At 880nm	99.4			%
Full well capacity				80000		Electrons
Responsivity non-skimming		At 630nm	30	43		DN/nJ/cm ²
Responsivity skimming		At 630nm	100	150		DN/nJ/cm ²
Total QE		At 630nm, including geometrical fill factor	38	42		%
SNR linear		Saturation signal over read noise at 10ms integration time	56			dB
SNR in-scene non-linear		Intra-scene saturation illumination at 1ms integration time	102			dB
Supply voltage	V		3.0	3.3	3.6	V

Power consumption	P _{tot}	T _{A,elec} With 20pF load, 50MHz, maximum toggling, minimum integration time, maximum area, LVDS coding mode Regular use		600	1000	mW
					500	mW
Resolution				750x400		
Pixel size				10x10		um*um
Typical frame rate		Interleaved integration and readout at 7ms integration time 1ms integration time, standard mode		140		fps
				130		fps
Analog gain			-3	0	+27	dB
Spectral range			400		1000	nm
Dynamic range (maximum intra scene)				110		dB
Dynamic range (maximum multi-scene)				190		dB
Production electrical test	100% at 3 temperatures					
Production optical test	100% at 3 temperatures					

Table 1: General specifications, all values preliminary until measured

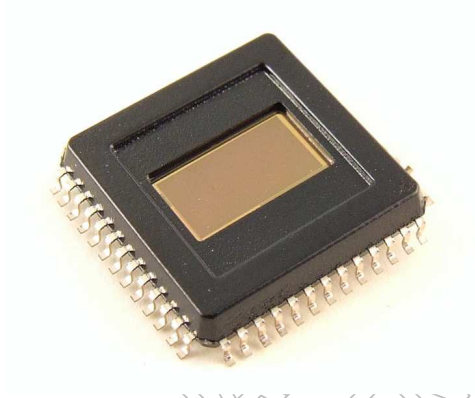
6 Summary of Operating Conditions

This table is valid for the temperature range T_{A,elec} = -40°C to 125°C.

Parameter	Symbol	Min	Typ	Max	Units
Analog power supply	VDDA	3.0	3.3	MIN(VDDIO;3.6)	V
Digital power supply	VDDD	3.0	3.3	MIN(VDDIO;3.6)	V
IO power supply voltage	VDDIO	3.0	3.3	3.6	V
Input clock frequency	Fclk	10	50	50.1	MHz
Illumination power	Pillum	<1		>100000	Lux

Table 2: Operating conditions

ANNEX A: Package Information MQFP52



14x14mm body
16x16mm including leads

PRELIMINARY
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