MLX75303

Optical Switch SensorEyeC

Features

- ❑ High precision light switching level
- ❑ Low temperature dependency
- ❑ TTL and CMOS compatible
- ❑ Operating temperatures: -20..85degC (consumer) or -40..125degC (automotive)
- ❑ Supply voltage range 3V to 5.5V
- ❑ Target 0 ppm defects; guarantee <10 ppm defects
- ❑ Solder reflow 260degC, MSL3
- ❑ RoHS compliant lead-free
- ❑ Automotive version is AEC-Q100 qualified

Applications

General

- Contactless Switch
- Contactless Position Switch
- Hand presence detection, e.g. for water taps
- Range detection, e.g. staircase detection for robot vacuum cleaners
- Twilight Sensor, e.g. for sun screens, roof windows
- Security Screens

Automotive

- Steering angle measurement
- Contactless switch for steering stocks
- Headlights ON/OFF sensor
- Keyless car entry – hand presence detection

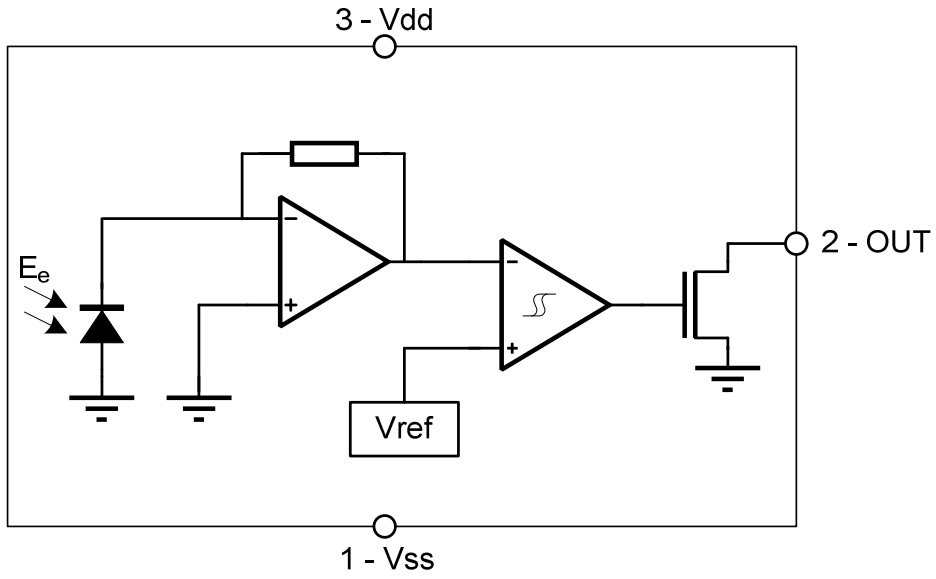
Printers/Copiers

- Paper feed detection
- Paper size and orientation detection
- Toner cartridge presence detection

Versions

Part No.	Temperature Code	Package Code	Option Code	Delivery Form
MLX75303	S -20°C to 85°C	XD SO8 Open Cavity		Tape On Reel
MLX75303	K -40°C to 125°C	XD SO8 Open Cavity		Tape On Reel

1 Functional Diagram



2 General Description

The Melexis SensorEyeC series are CMOS integrated optical sensor ICs including photodiode, transimpedance amplifier and output transistor on one chip.

The MLX75303 features a Schmitt Trigger output and is designed for high-volume automotive and non-automotive applications.

The MLX75303 block diagram is shown in Section 1 and contains following blocks: a transimpedance amplifier to convert and amplify the photocurrent of the photodiode, a voltage reference, a Schmitt trigger and an open drain output stage.

Table of Contents

3 SO8 Pin Definitions and Descriptions

Pin Number	Pin Name	Description	Type
1	Vss	Ground connection	Ground
2	OUT	Active low (= light on) output	Open drain output
3	Vdd	Power supply	Supply
4	N.C.	Not connected	Floating
5..8	N.C.	Not connected	Floating

4 Absolute Maximum Ratings

Valid for all MLX75303 versions. All voltages are referenced to Vss.

Symbol	Rating	Value	Unit
Vdd	Supply Voltage, V_{DD} (over voltage)	-0.3 to 7	V
V_{out}	DC Output Voltage	-0.3 to Vdd+0.3V	V
I_{out}	DC Output Current, per Pin	±20	mA
T_{Stg}	Storage Temperature Range, T_S	-40 to 125	°C
$V_{ESD-HBM}$	ESD Sensitivity (Human Body Model according to CDF-AEC-Q100)	4	kV
V_{ESD-MM}	ESD Sensitivity (Machine Model according to CDF-AEC-Q100)	200	V

Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

5 MLX75303 Specifications

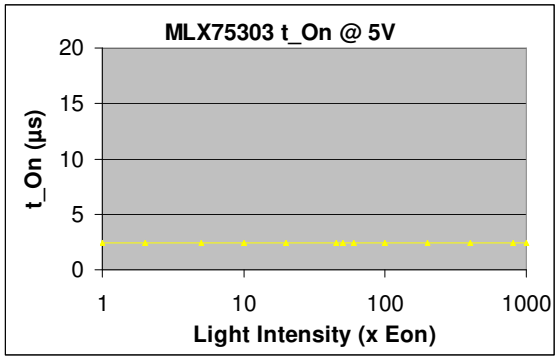
All voltages are referenced to Vss.

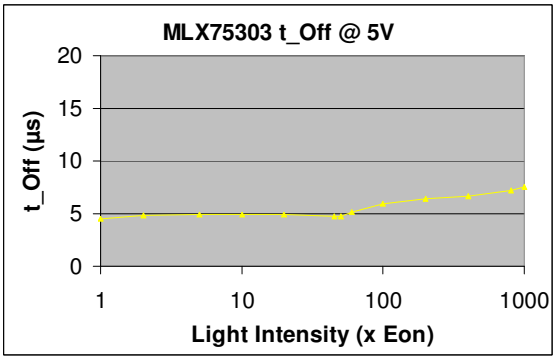
Symbol	Parameter	Conditions	Min	Typ	Max	Units	Test[1]
Vdd	Supply Voltage		3		5.5	V	V
Idd	Static Power Supply Current	At Vdd=5.5V, unloaded output			2.5	mA	V
E_{eon}	Irradiance for Threshold “on”	Vdd=5V, λ=850nm, T_{amb}=25˚C	-20%	105	+20%	µW/cm^2	V
E_{eoff}/E_{eon}	Hysteresis	Vdd=5V, λ=850nm, T_{amb}=-40 .. 85˚C T_{amb}=85 ..125˚C	60 60		80 90	% %	V V
TC	Temperature Coefficient of threshold “on”	Vdd=5V, λ=850nm		-0.44		%/K	X
E_{emax}	Maximum Irradiance	Vdd=5V, λ=850nm, T_{amb}=25˚C	15x E_{eon_max}	1000x E_{eon_max}		µW/cm^2 µW/cm^2	V X
$\lambda_{0.3}$	Spectral Bandwidth	T_{amb}=25˚C	500		1000	nm	X
V_{OL}	Output voltage low	Vdd=5.5V, E_e>E_{on}, I_{OL}=16mA	0		0.4	V	V
V_{OH}	Output voltage high	Vdd=5.5V, E_e=0			Vdd+0.3	V	X
I_{OH}	High level output current	Vdd=5.5V, E_e=0	0		1	µA	V
t_{setup}	Electrical setup-time	R_L=1kOhm, C_L=2nF, λ= 850nm	0		24	µs	V
S_{pd}	Area of photodiode			0.36		mm^2	D
t_f	Fall time	(a), E_e=E_{eon_max}	0		300	ns	X
t_{on}	Turn-on time	(a), E_e=E_{eon_max}	0	10	20	µs	V
t_{off}	Turn-off time	(a), E_e=30x E_{eon_max}	0	10	20	µs	V
t_p	Light pulse duration	(a)	20			µs	V
t_G	Light pulse rejection	(a)		2		µs	X
T_A	Operating Temperature Range	Temperature Code S Temperature Code E Temperature Code K	-20 -40 -40		85 85 125	℃ ℃ ℃	V V V

(a) Vdd=5V, R_L=1kOhm, C_L=2nF, λ= 850nm

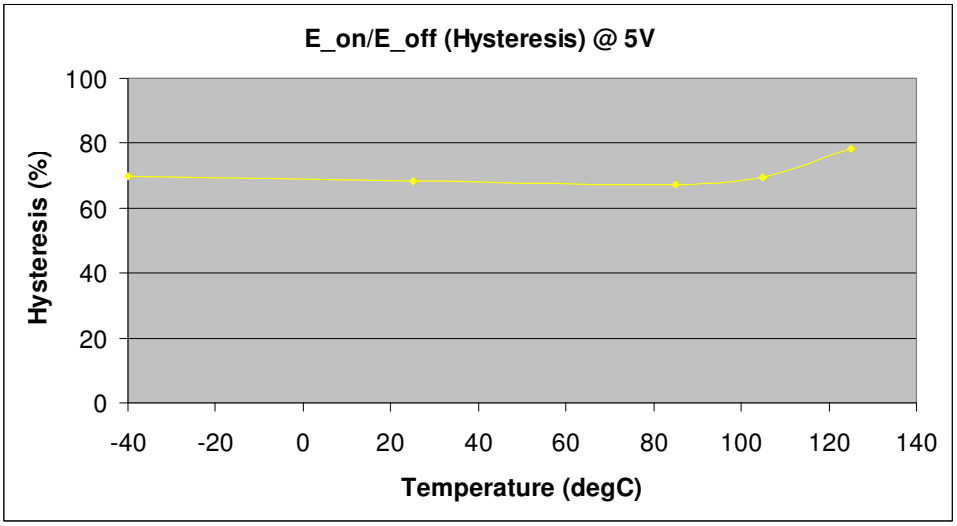
[1] The column *Test* indicates if the specific parameter is tested in production. Following symbols are used:
V: the specific parameter is tested in production
X: the specific parameter is verified in characterisation, but is not tested in production (e.g. timings and capacitances)
D: the specific parameter is guaranteed by design and is not tested as such in production

Typical t_{on} and t_{off} values for light intensities up to 1000x E_{on} (at 25degC)

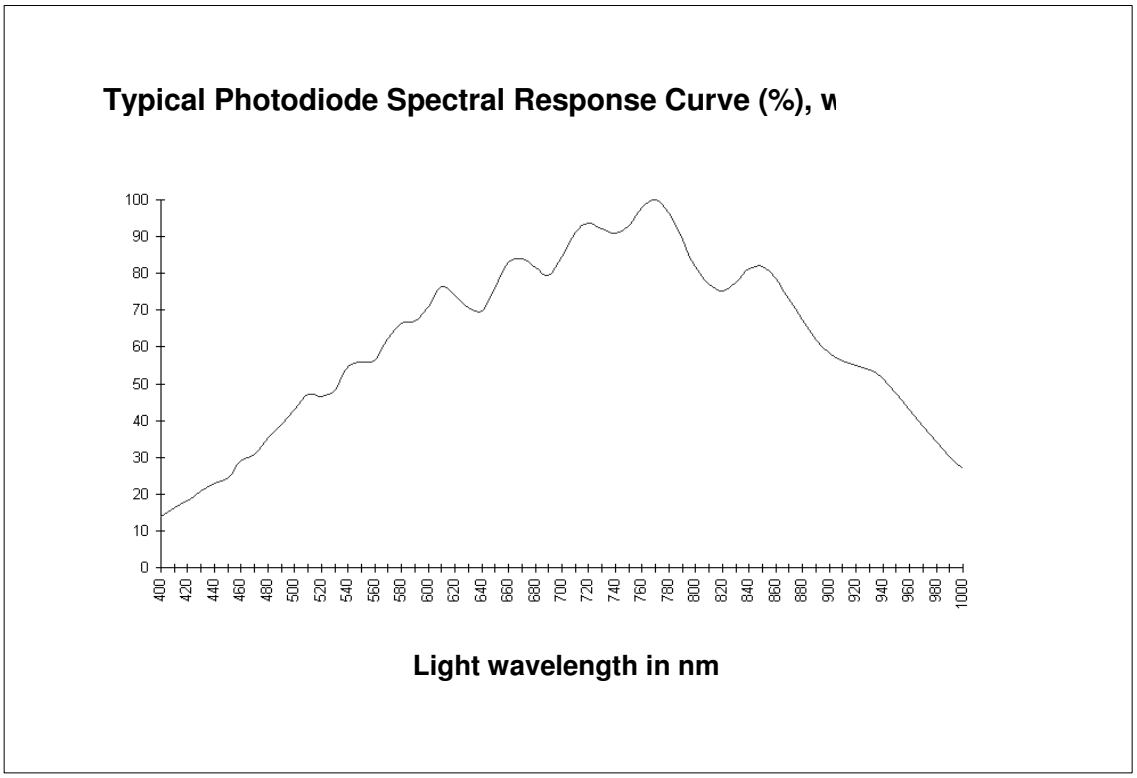




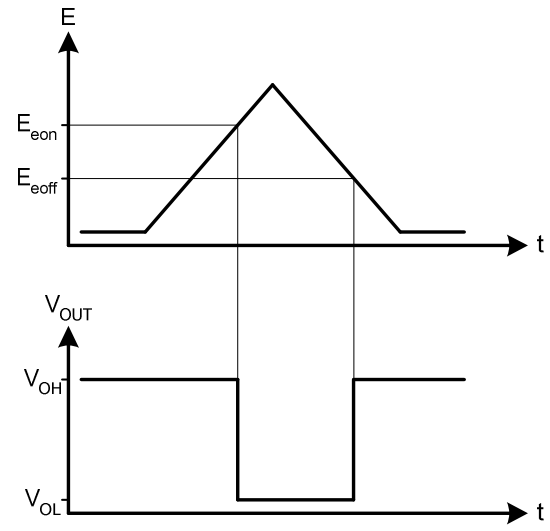
Typical Eon/Eoff (Hysteresis) value over temperature



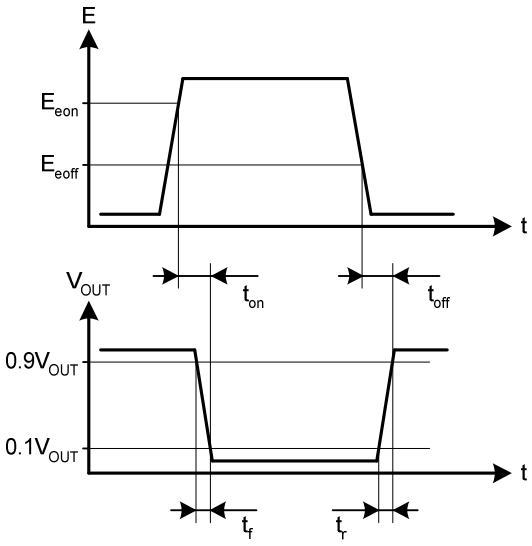
Spectral Responsivity Curve



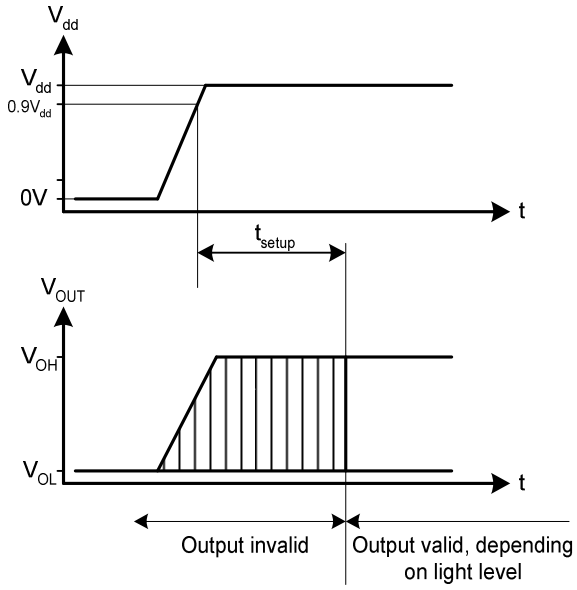
6 Timing diagrams



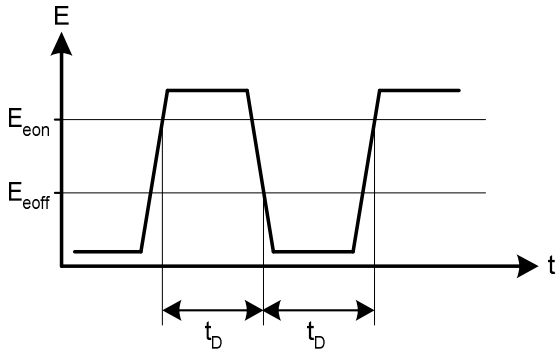
Definition of the switch-on and switch-off thresholds



Definition of the switch-on and switch-off delays



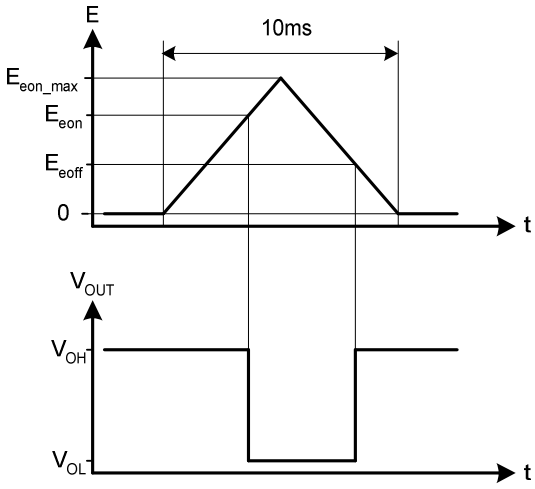
Definition of the power-on delay



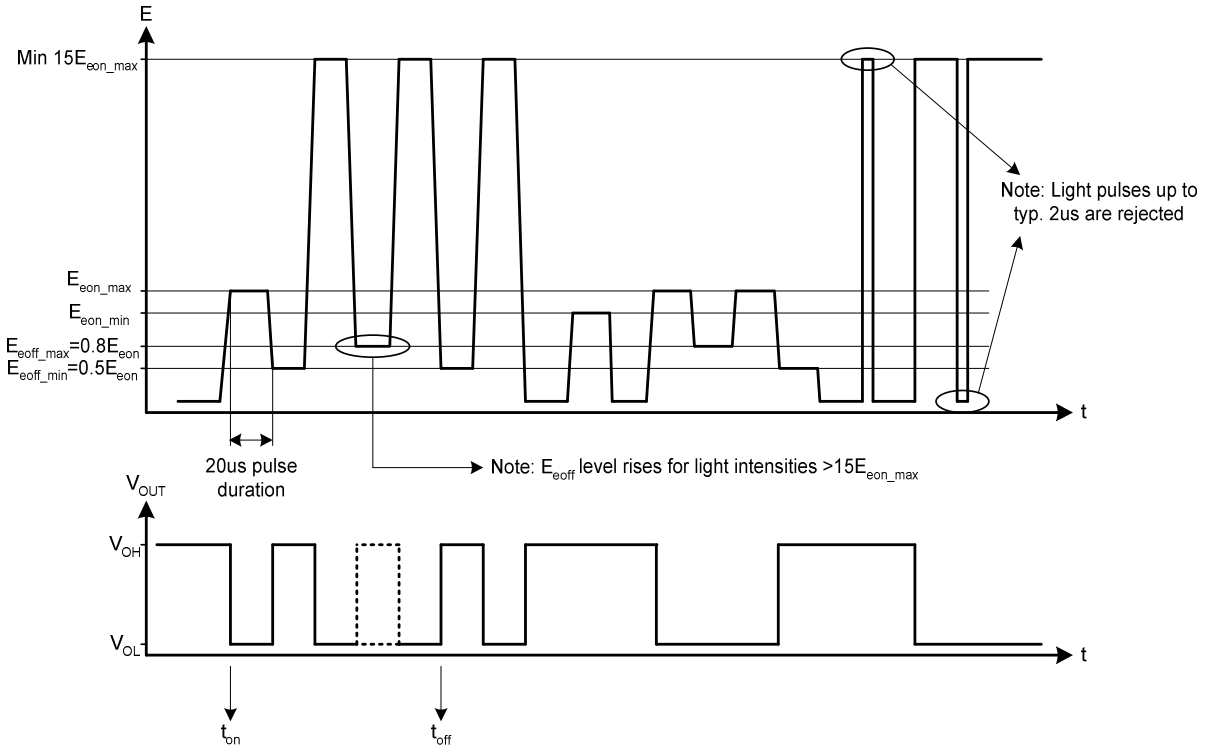
Definition of the light pulse duration

7 Test diagrams

Measurement and trimming of E_{eon}, E_{eoff} and hysteresis:

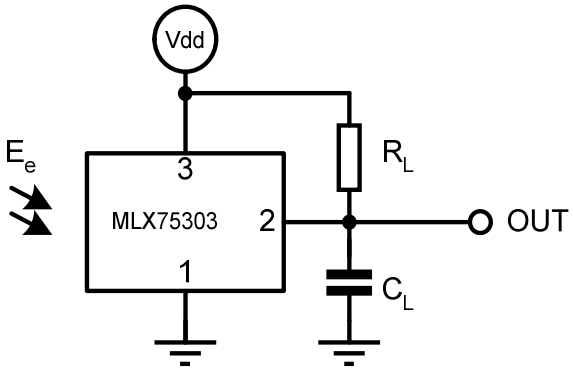


Functional check of E_{eon} and E_{eoff} thresholds and timing measurements (Go-NoGo tests):



8 Applications Information

A typical connection diagram is shown in the figure below. A load resistor R_L is needed to get a voltage level out. The load capacitance C_L is typically formed by the input capacitance of the component that is connected to the sensor output, the wiring capacitance and the output capacitance of the sensor itself.

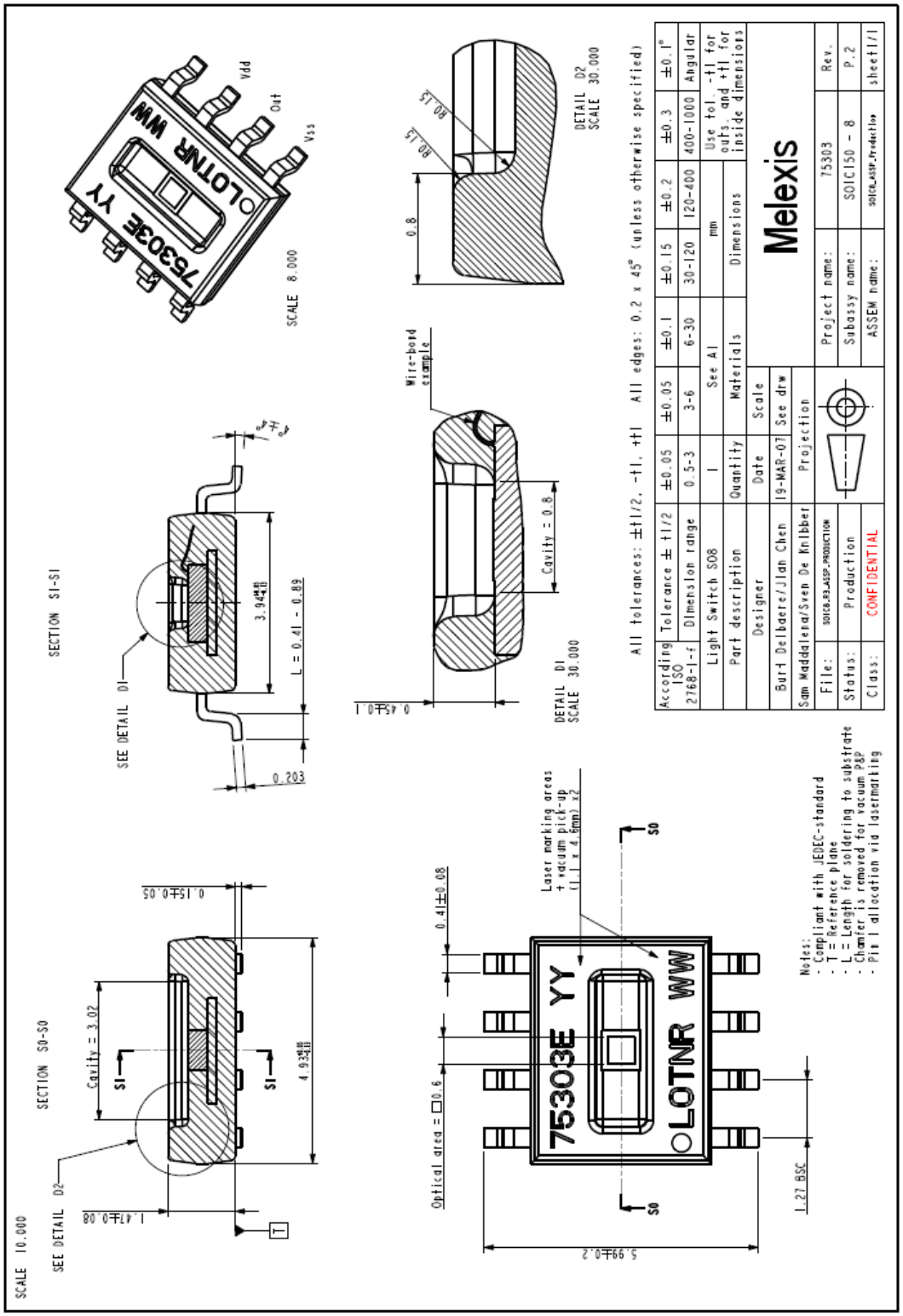


Decoupling capacitors between *Vdd* and *Vss* (1uF in parallel with 100nF) are highly recommended in all configurations.

Recommendation: every change in the application should be agreed by both parties.

9 SO8 Open Cavity Package Information

SO8 open cavity package, MSL3, 260˚C soldering profile. Lead free component.



10 Standard information regarding manufacturability of Melexis products with different soldering processes

Our products are classified and qualified regarding soldering technology, solderability and moisture sensitivity level according to following test methods:

Reflow Soldering SMD's (Surface Mount Devices)

- IPC/JEDEC J-STD-020
  Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices
  (classification reflow profiles according to table 5-2)
- EIA/JEDEC JESD22-A113
  Preconditioning of Nonhermetic Surface Mount Devices Prior to Reliability Testing
  (reflow profiles according to table 2)

Wave Soldering SMD's (Surface Mount Devices)

- EN60749-20
  Resistance of plastic- encapsulated SMD's to combined effect of moisture and soldering heat

Solderability SMD's (Surface Mount Devices)

- EIA/JEDEC JESD22-B102 and EN60749-21
  Solderability

For all soldering technologies deviating from above mentioned standard conditions (regarding peak temperature, temperature gradient, temperature profile etc) additional classification and qualification tests have to be agreed upon with Melexis.

The application of Wave Soldering for SMD's is allowed only after consulting Melexis regarding assurance of adhesive strength between device and board.

Melexis is contributing to global environmental conservation by promoting **lead free** solutions. For more information on qualifications of **RoHS** compliant products (RoHS = European directive on the Restriction Of the use of certain Hazardous Substances) please visit the quality page on our website: http://www.melexis.com/quality.asp

11 ESD Precautions

Electronic semiconductor products are sensitive to Electro Static Discharge (ESD).
Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

12 Disclaimer

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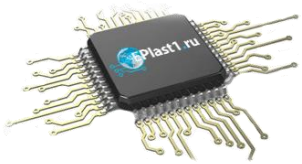

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