MLX75303

Optical Schmitt Trigger

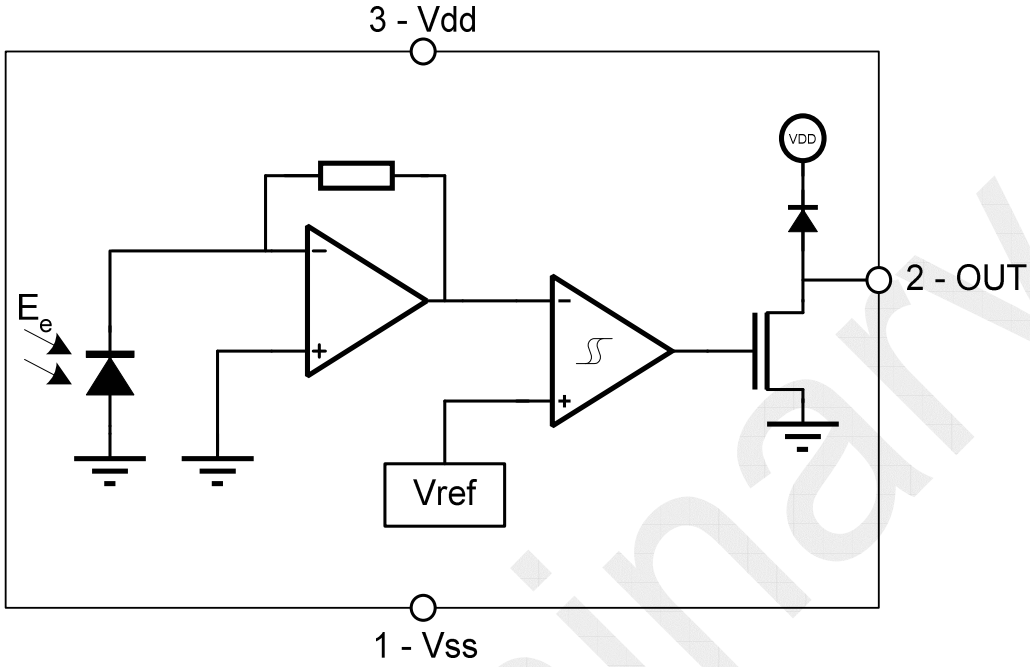
Features and Benefits

- Very high photo sensitivity
- Supply voltage range 3.0V to 5.5V
- Standard SO8 package with open cavity
- Standard DFN3x3 with open cavity
- TTL and CMOS compatible
- Open drain output
- Active low output signal
- Lead free component, suitable for lead free soldering profile 260˚C (target), MSL3
- Ideal for automotive applications

Ordering Information

Part No.	Temperature Code	Package Code	Option Code	Delivery Form
MLX75303	K -40°C to 125°C	XD SO8 Open Cavity		Tape On Reel
MLX75303	K -40°C to 125°C	XE DFN3x3 Open Cavity		Tape On Reel

1 Functional Diagram



2 General Description

The MLX75303 is a CMOS integrated optical Schmitt trigger sensor with an integrated photodiode. The sensor is intended for automotive applications wherein infrared LEDs are used.

The MLX75303 block diagram is shown in Section 1 and contains following blocks: a trans impedance 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 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	N.C.	Not connected	Floating
6	N.C.	Not connected	Floating
7	N.C.	Not connected	Floating
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

For proper operation V_{out} should be constrained to the range $Vss \leq V_{out} \leq Vdd$.

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

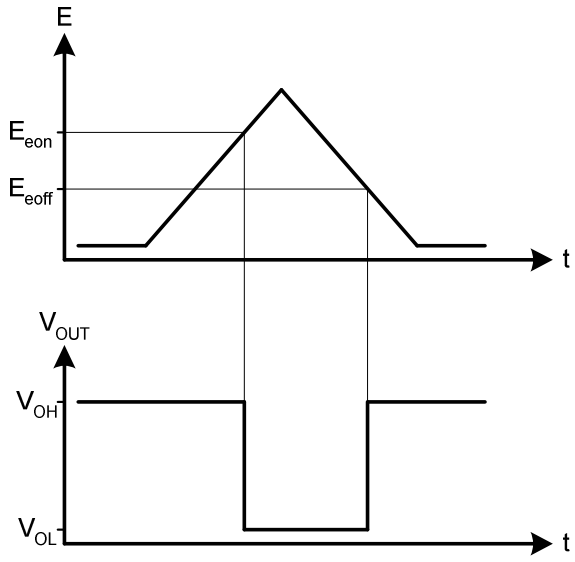
All voltages are referenced to Vss.

Symbol	Parameter	Conditions	Min	Typ	Max	Units	Test[1]
Vdd	Supply Voltage		3.0		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=880nm, T_{amb}=25˚C	-20%	110 (TBD)	+20%	µW/cm^2	V
E_{eoff}/E_{eon}	Hysteresis	Vdd=5V, λ=880nm	60		80	%	V
TC	Temperature Coefficient of threshold "on"	Vdd=5V, λ=880nm		-0.44		%/K	X
E_{emax}	Absolute Maximum Irradiance	Vdd=5V, λ=880nm, T_{amb}=25˚C		25 x E_{eon_max}		µW/cm^2	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= 880nm	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=15xE_{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		-40		125	℃	V

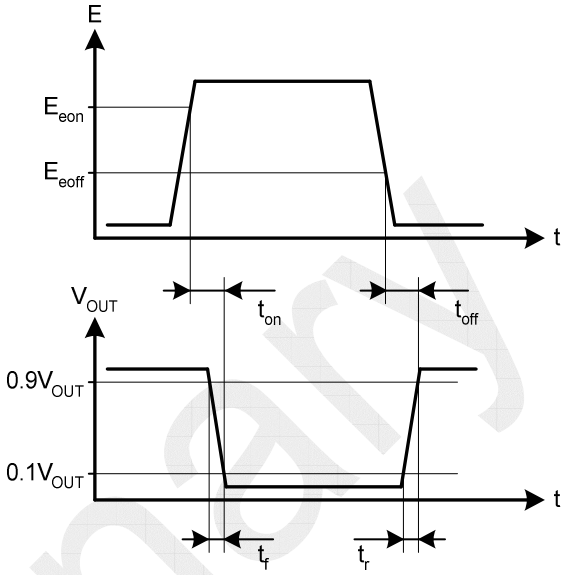
(a) Vdd=5V, R_L=1kOhm, C_L=2nF, λ= 880nm (LED type SFH421)

[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

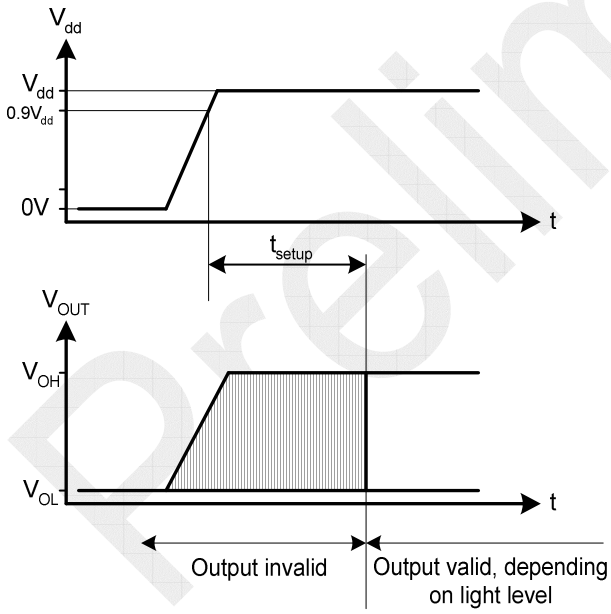
6 Timing diagrams



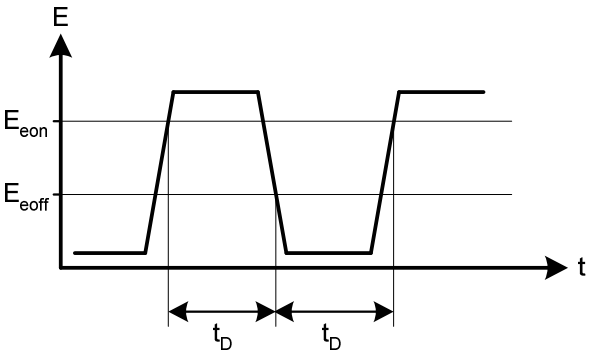
Definition of the switch-on and switch-off thresholds



Definition of the switch-on and switch-off delays



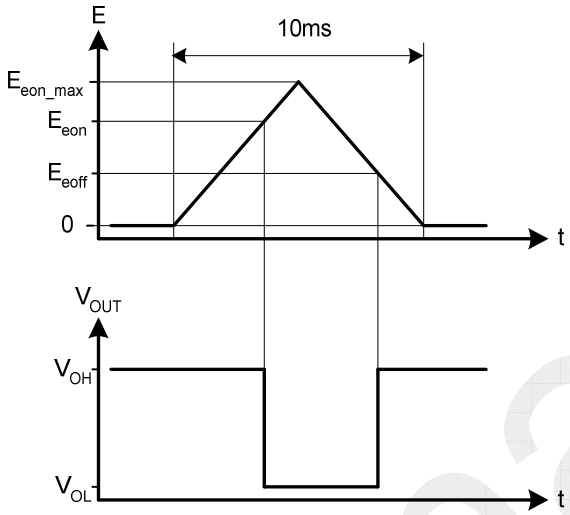
Definition of the power-on delay



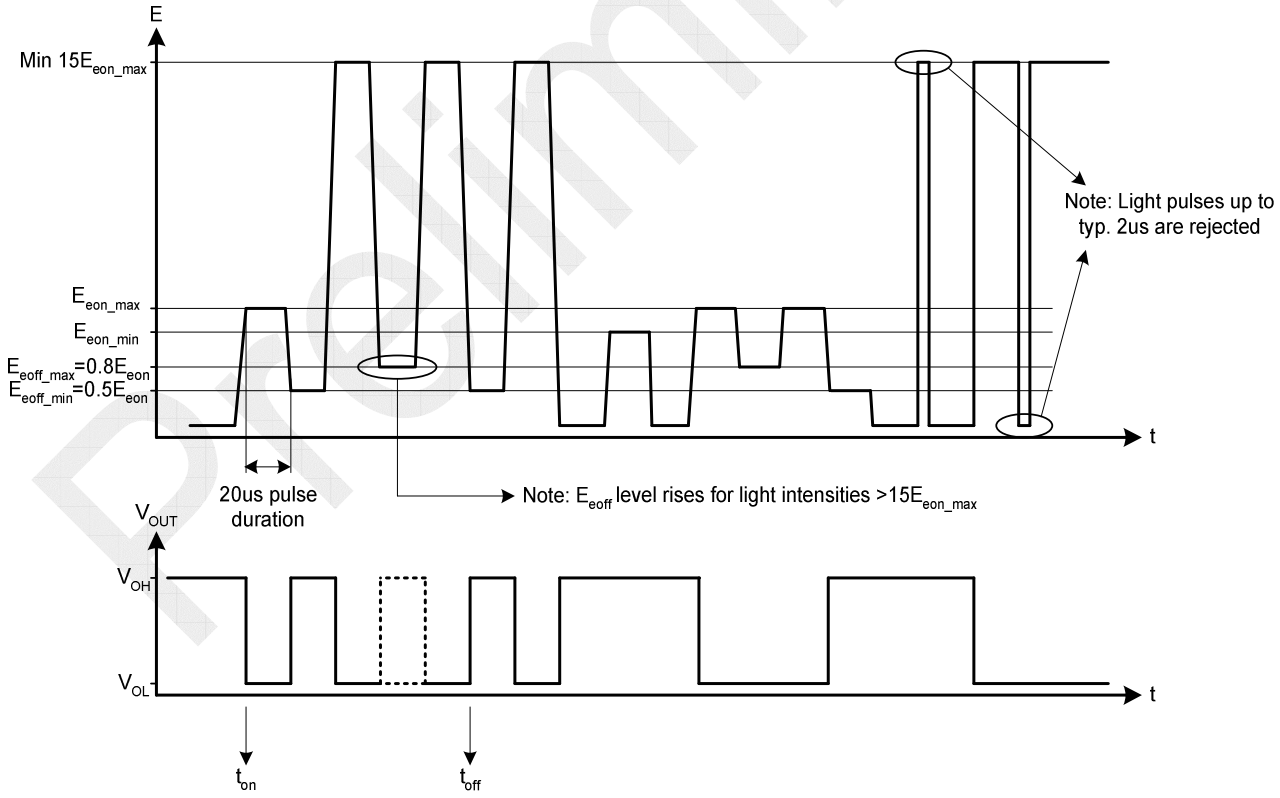
Definition of the light pulse duration

7 Test diagrams

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

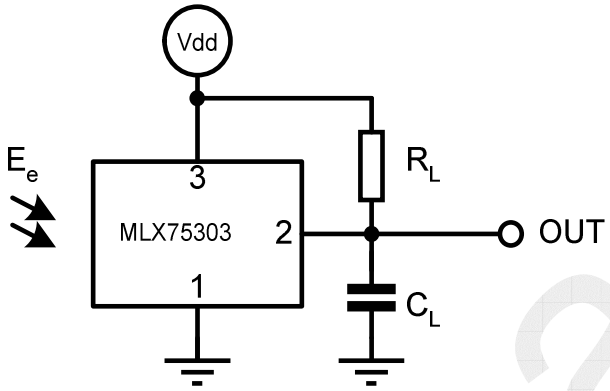


Functional check of E_{eon} and E_{eoff} thresholds and timing measurements (Go-NoGo tests):



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.

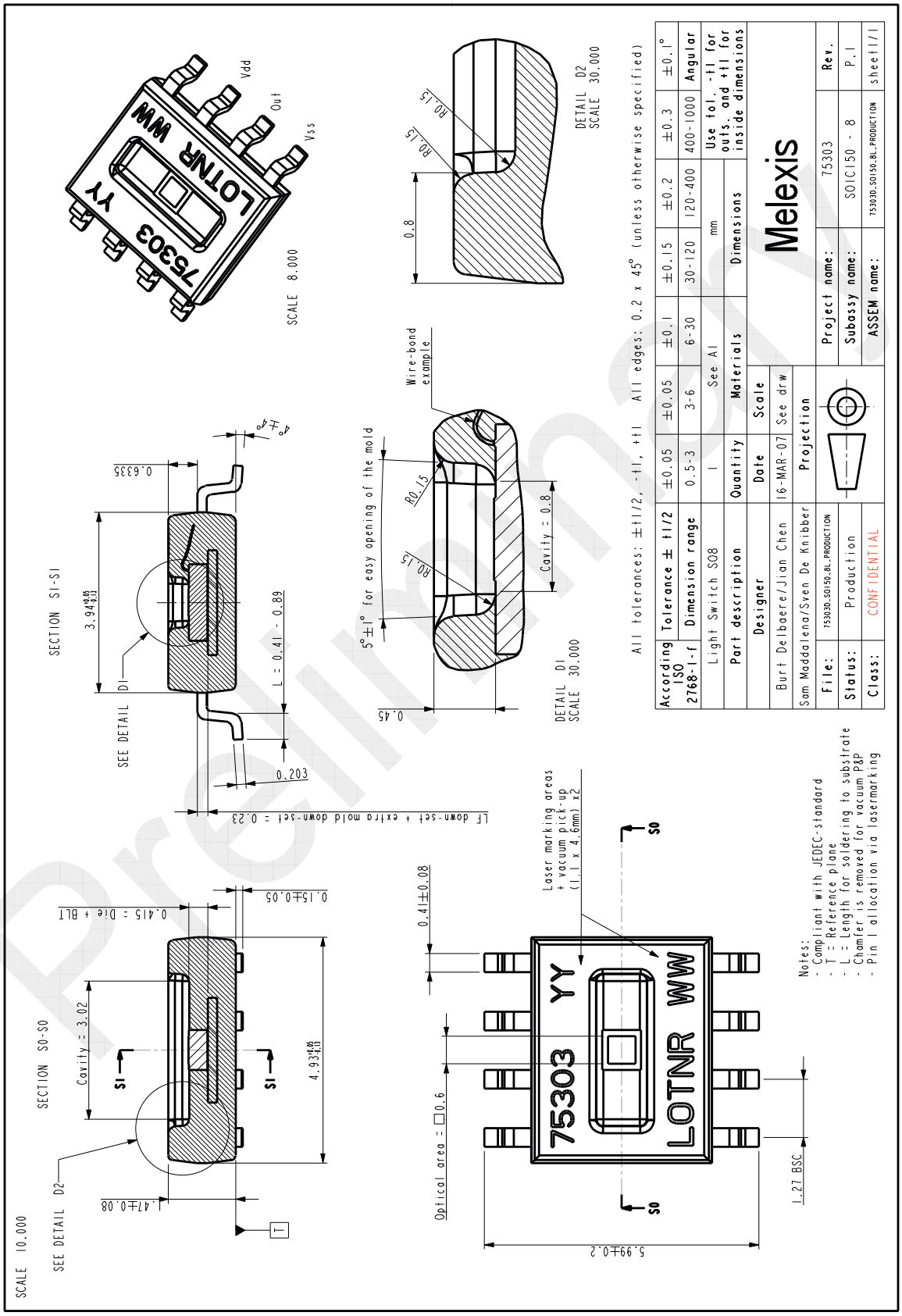


Decoupling capacitors between *Vdd* and *Vss* (1uF in parallel with 100nF) are highly recommended in all configurations.

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

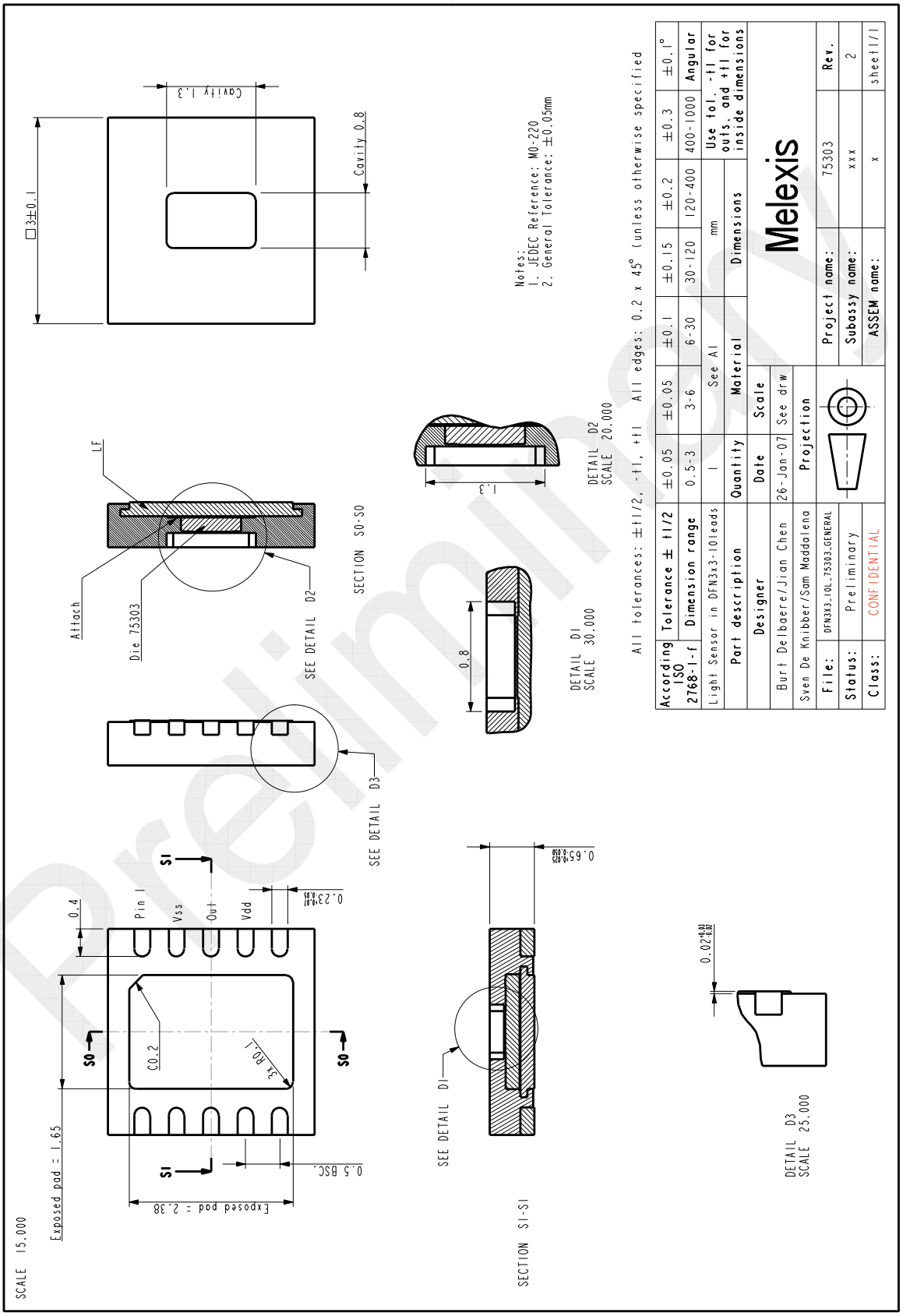
9 SO8 Open Cavity Package Information

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



10 DFN3x3 Open Cavity Package Information

DFN3x3 open cavity package, MSL3, 260˚C soldering profile (target).



According ISO 2768-1-f	Tolerance ± 1/2	±0.05	±0.05	±0.1	±0.15	±0.2	±0.3	±0.1°
	Dimension range	0.5-3	3-6	6-30	30-120	120-400	400-1000	Angular
Light Sensor in DFN3x3-10leads		1	See A1		mm		Use tol. -tl for outs, and +tl for inside dimensions	
Part description		Quantity	Material		Dimensions			
Designer		Date	Scale					
Burt Delbaere/Jian Chen		26-Jan-07	See drw					
Sven De Knibber/Sam Maddalena		Projection						
File:	DFN3X3_10L_75303_GENERAL				Project name:	75303		Rev.
Status:	Preliminary				Subassy name:	xxx		2
Class:	CONFIDENTIAL				ASSEM name:	x		sheet1/1

11 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

12 ESD Precautions

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

13 Disclaimer

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For additional information contact Melexis Direct:

Europe, Africa, Asia:
Phone: +32 1367 0495
E-mail: sales_europe@melexis.com

America:
Phone: +1 603 223 2362
E-mail: sales_usa@melexis.com

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