



Features and Benefits

- ☐ Converts light intensity to an output frequency
- ☐ High dynamical light range
- ☐ High linearity
- ☐ Low temperature dependency
- ☐ Supply voltage range 3V to 5.5V
- ☐ Easy interface to microcontroller
- ☐ Low ppm defects
- ☐ Solder reflow 260degC, MSL3
- ☐ Automotive qualified AEC-Q100 Grade 1
- ☐ Operating temperature -40 up to 125degC
- ☐ RoHS compliant lead-free

Applications

General

- Ambient Light Sensor
- LCD Screen Backlight Dimming Sensor for Mobile Phones, Digital Frames
- LED Light Sensor
 - LED monitoring
 - Closed loop control for LED light intensity & LED color

Automotive

- Cockpit Light Dimming
- LED Headlight Closed Loop Control
- Hand Presence Detection
- Sunload Sensor

Printers/Copiers

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

Ordering Information

Part No.	Temperature Code	Package Code	Option Code	Delivery Form
MLX75304EXD	E -40 °C to 85 °C	XD SO8 Open Cavity		Tape on Reel
MLX75304EXE	E -40 °C to 85 °C	XE DFN3x3 Open Cavity		Tape on Reel
MLX75304KXD	K -40 °C to 125 °C	XD SO8 Open Cavity		Tape on Reel
MLX75304KXE	K -40 °C to 125 °C	XE DFN3x3 Open Cavity		Tape on Reel



1 General Description

The MLX75304 is a CMOS integrated Light-to-Frequency sensor with an integrated photodiode. The sensor is intended for automotive applications and responds in a range of 500nm to 1000nm.

The MLX75304 block diagram is shown in Section 2 and contains following blocks: a photodiode, a current to frequency converter to convert the photocurrent into a useful output frequency and a digital push-pull output stage.

2 Functional Diagram

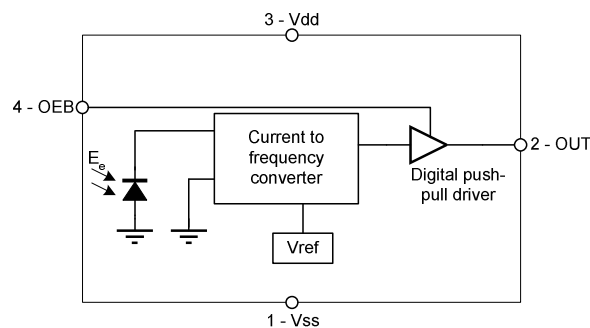


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3 Pin Definitions and Descriptions (SO8 Package)

Pin Number	Pin Name	Description	Type
1	Vss	Ground connection	Ground
2	OUT	Digital frequency output	Digital push-pull output
3	Vdd	Power supply	Supply
4	OEB	Enable for pin OUT. Active low.	Digital input with pull-down
5-8	N.C.	Not connected	Floating

4 Pin Definitions and Descriptions (DFN Package)

Pin Number	Pin Name	Description	Type
1	N.C.	Not connected	Floating
2	Vss	Ground connection	Ground
3	OUT	Digital frequency output	Digital push-pull output
4	Vdd	Power supply	Supply
5	OEB	Enable for pin OUT. Active low.	Digital input with pull-down
6-10	N.C.	Not connected	Floating

5 Absolute Maximum Ratings

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)	2	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 ≤ V_{out} ≤ Vdd.

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



6 MLX75304 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			7	mA	V
f _D	Dark frequency	(a), E _e = 0μW/cm ² At 25°C At 125°C		1 1.2		Hz kHz	
f _O	Output frequency	(a), E _e = 21.7μW/cm ²	-10%	50	+10%	kHz	
f _{FS}	Full-scale frequency ²	(a), E _e = 430μW/cm ²		1.6		MHz	
NL10	Non-linearity ³	f _O = 0 kHz to 10kHz	-1%		1%	%	
NL100	Non-linearity ³	f _O = 0 kHz to 100kHz	-2%		2%	%	
TC	Temperature coefficient	λ = 540nm λ = 880nm		0 300		ppm/K ppm/K	
t _{setup}	Electrical setup-time	95%		10	30	μs	
S _{PD}	Area of photodiode			0.36		mm ²	
λ _{0.3}	Spectral bandwidth	T _{amb} = 25°C	500		1000	nm	
	Output duty cycle			50%		%	
V _{OL}	Output voltage low	(a) I _{OH} = 5mA	0		0.4Vdd	V	
V _{OH}	Output voltage high	(a) I _{OH} = -5mA	0.6Vdd		Vdd	V	
V _{IL}	Input voltage low	(a)	0		0.3Vdd	V	
V _{IH}	Input voltage high	(a)	0.7Vdd		Vdd	V	
R _{I,PD}	Input pull down resistance	(a)	50	60	70	kOhm	
T _A	Operating Temperature Range		-40		125	°C	V

(a) Vdd=5V, C_L=50pF, λ = 880nm

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

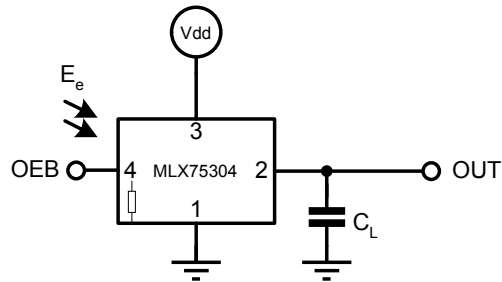
² Full-scale frequency is the maximum frequency of the device, corresponding to a typical irradiance of 430μW/cm² at a wavelength of 880nm. Note that this is a hard limit as any higher irradiance will not result in an addition increase of the output frequency.

³ Non-linearity is defined as the deviation from a line fitted in between the dark frequency and the maximum of the indicated range, expressed as a percentage of this maximum.



7 Applications Information

A typical connection diagram is shown in the figure below. 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.

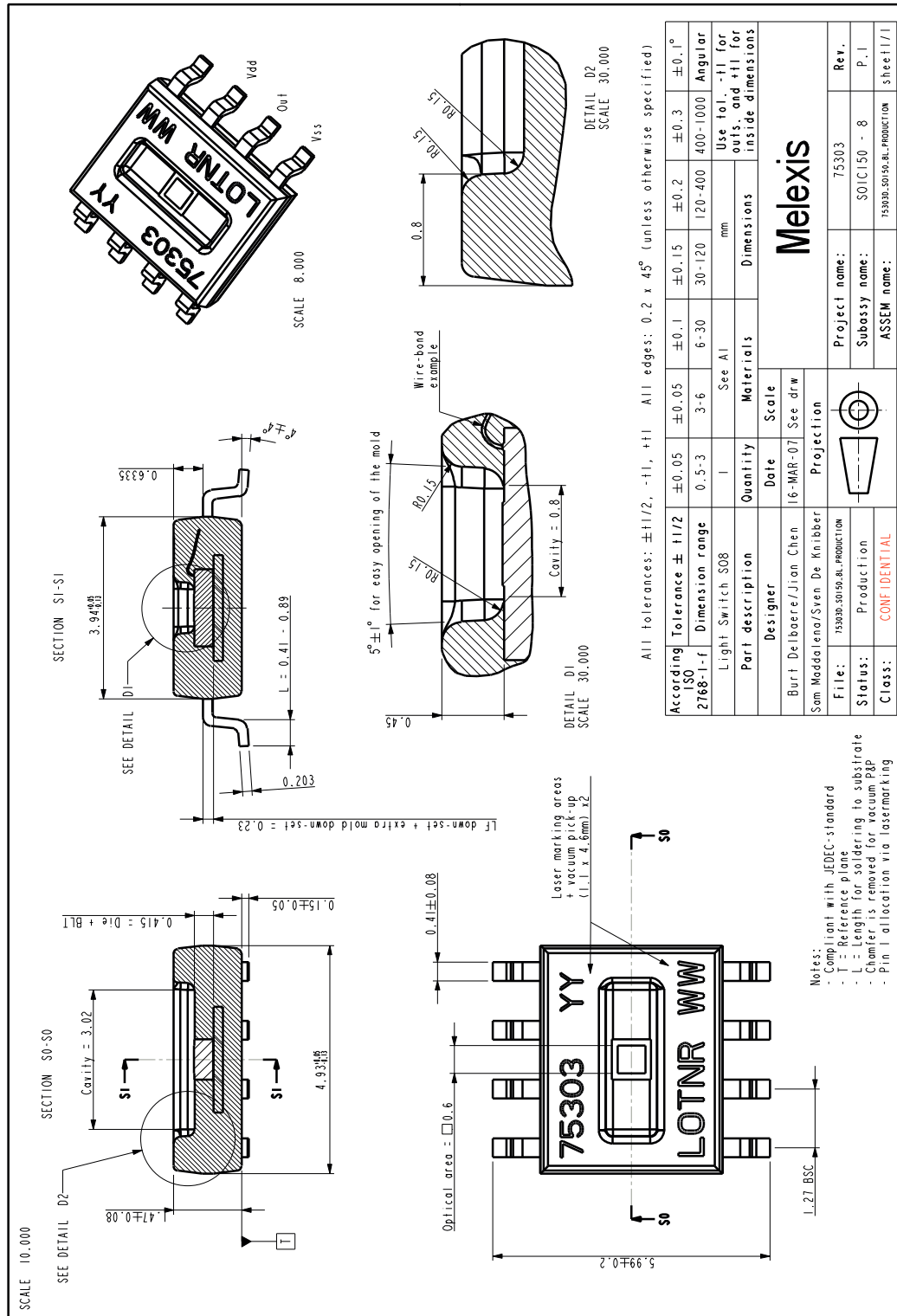


Decoupling capacitors between V_{dd} and V_{ss} (1 μ F in parallel with 100nF) are highly recommended in all configurations.



8 SO8 Open Cavity Package Information

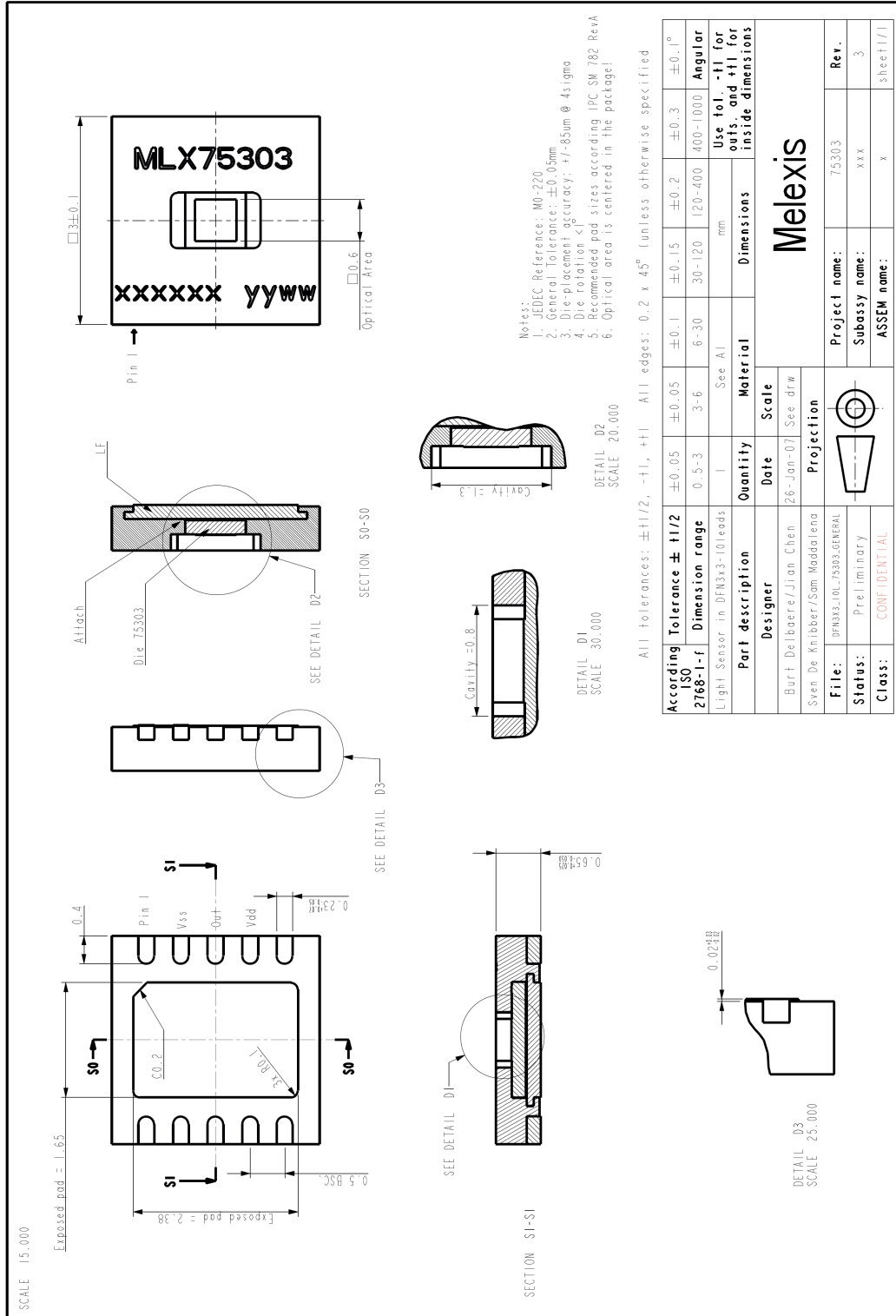
SO8 open cavity package, MSL3, 260°C soldering profile (target). Lead free component.
Same package as MLX75303 (see drawing)





9 DFN3x3 Open Cavity Package Information

DFN open cavity package, MSL3, 260°C soldering profile (target). Lead free component.
Same package as MLX75303 (see drawing)





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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