



## 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<br>-20 °C to 85 °C  | XD<br>SO8 Open Cavity |             | Tape On Reel  |
| MLX75303 | K<br>-40 °C to 125 °C | XD<br>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**

|           |  |           |
|-----------|--|-----------|
| <b>1</b>  | <b>Functional Diagram.....</b>   | <b>2</b>  |
| <b>2</b>  | <b>General Description .....</b>   | <b>2</b>  |
| <b>3</b>  | <b>SO8 Pin Definitions and Descriptions.....</b>   | <b>4</b>  |
| <b>4</b>  | <b>Absolute Maximum Ratings .....</b>  | <b>4</b>  |
| <b>5</b>  | <b>MLX75303 Specifications .....</b>   | <b>5</b>  |
| <b>6</b>  | <b>Timing diagrams .....</b>   | <b>7</b>  |
| <b>7</b>  | <b>Test diagrams.....</b>  | <b>8</b>  |
| <b>8</b>  | <b>Applications Information.....</b>   | <b>9</b>  |
| <b>11</b> | <b>SO8 Open Cavity Package Information.....</b>  | <b>10</b> |
| <b>12</b> | <b>Standard information regarding manufacturability of Melexis products with<br/>different soldering processes .....</b> | <b>11</b> |
| <b>13</b> | <b>ESD Precautions .....</b>   | <b>11</b> |
| <b>14</b> | <b>Disclaimer.....</b>   | <b>12</b> |

### 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 <sub>DD</sub> (over voltage)               | -0.3 to 7        | V    |
| V <sub>out</sub>     | DC Output Voltage  | -0.3 to Vdd+0.3V | V    |
| I <sub>out</sub>     | DC Output Current, per Pin                                   | ±20              | mA   |
| T <sub>Stg</sub>     | Storage Temperature Range, T <sub>S</sub>                    | -40 to 125       | °C   |
| V <sub>ESD-HBM</sub> | ESD Sensitivity (Human Body Model according to CDF-AEC-Q100) | 4                | kV   |
| V <sub>ESD-MM</sub>  | 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

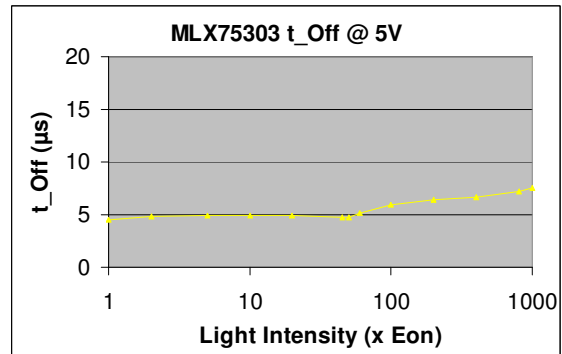
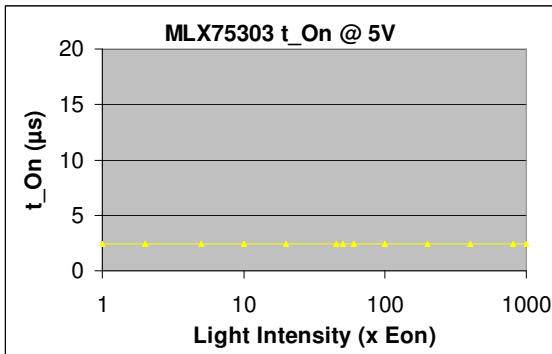
All voltages are referenced to Vss.

| Symbol                              | Parameter                                 | Conditions   | Min                         | Typ   | Max             | Units                                    | Test <sup>1</sup> |
|-------------------------------------|---|--|-----------------------------|-------|-----------------|--|-------------------|
| Vdd                                 | Supply Voltage                            |  | 3                           |       | 5.5             | V  | V                 |
| Idd                                 | Static Power Supply Current               | At Vdd=5.5V,<br>unloaded output  |                             |       | 2.5             | mA                                       | V                 |
| E <sub>eon</sub>                    | Irradiance for Threshold "on"             | Vdd=5V, λ=850nm,<br>T <sub>amb</sub> =25°C   | -20%                        | 105   | +20%            | μW/cm <sup>2</sup>                       | V                 |
| E <sub>eoff</sub> /E <sub>eon</sub> | Hysteresis                                | Vdd=5V, λ=850nm,<br>T <sub>amb</sub> =-40 .. 85°C<br>T <sub>amb</sub> =85 .. 125°C | 60<br>60                    |       | 80<br>90        | %<br>%                                   | V<br>V            |
| TC                                  | Temperature Coefficient of threshold "on" | Vdd=5V, λ=850nm  |                             | -0.44 |                 | %/K                                      | X                 |
| E <sub>emax</sub>                   | Maximum Irradiance                        | Vdd=5V, λ=850nm,<br>T <sub>amb</sub> =25°C   | 15x<br>E <sub>eon_max</sub> |       |                 | μW/cm <sup>2</sup><br>μW/cm <sup>2</sup> | V<br>X            |
| λ <sub>0.3</sub>                    | Spectral Bandwidth                        | T <sub>amb</sub> =25°C   | 500                         |       | 1000            | nm                                       | X                 |
| V <sub>OL</sub>                     | Output voltage low                        | Vdd=5.5V, E <sub>e</sub> >E <sub>on</sub> ,<br>I <sub>OL</sub> =16mA               | 0                           |       | 0.4             | V  | V                 |
| V <sub>OH</sub>                     | Output voltage high                       | Vdd=5.5V, E <sub>e</sub> =0  |                             |       | Vdd+0.3         | V  | X                 |
| I <sub>OH</sub>                     | High level output current                 | Vdd=5.5V, E <sub>e</sub> =0  | 0                           |       | 1               | μA                                       | V                 |
| t <sub>setup</sub>                  | Electrical setup-time                     | R <sub>L</sub> =1kOhm, C <sub>L</sub> =2nF,<br>λ= 850nm                            | 0                           |       | 24              | μs                                       | V                 |
| S <sub>pd</sub>                     | Area of photodiode                        |  |                             | 0.36  |                 | mm <sup>2</sup>                          | D                 |
| t <sub>f</sub>                      | Fall time                                 | (a), E <sub>e</sub> =E <sub>eon_max</sub>  | 0                           |       | 300             | ns                                       | X                 |
| t <sub>on</sub>                     | Turn-on time                              | (a), E <sub>e</sub> =E <sub>eon_max</sub>  | 0                           | 10    | 20              | μs                                       | V                 |
| t <sub>off</sub>                    | Turn-off time                             | (a), E <sub>e</sub> =30x E <sub>eon_max</sub>                                      | 0                           | 10    | 20              | μs                                       | V                 |
| t <sub>p</sub>                      | Light pulse duration                      | (a)  | 20                          |       |                 | μs                                       | V                 |
| t <sub>G</sub>                      | Light pulse rejection                     | (a)  |                             | 2     |                 | μs                                       | X                 |
| T <sub>A</sub>                      | Operating Temperature Range               | Temperature Code S<br>Temperature Code E<br>Temperature Code K                     | -20<br>-40<br>-40           |       | 85<br>85<br>125 | °C<br>°C<br>°C                           | V<br>V<br>V       |

(a) Vdd=5V, R<sub>L</sub>=1kOhm, C<sub>L</sub>=2nF, λ= 850nm

<sup>1</sup> 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

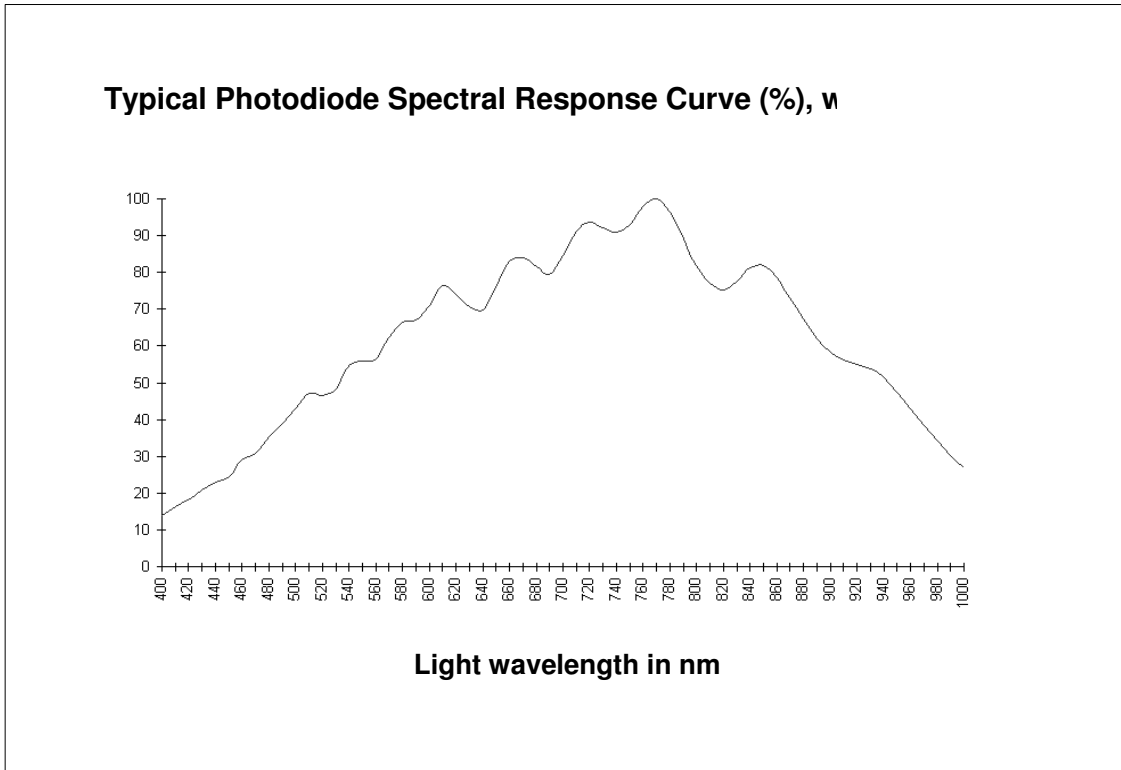
Typical  $t_{on}$  and  $t_{off}$  values for light intensities up to 1000x  $E_{on}$  (at 25degC)



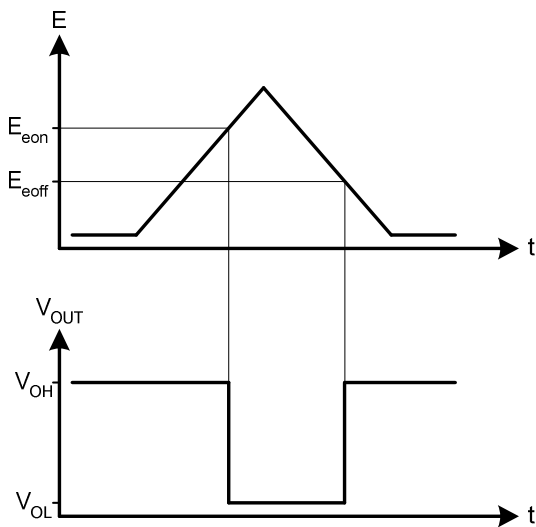
Typical E<sub>on</sub>/E<sub>off</sub> (Hysteresis) value over temperature



**Spectral Responsivity Curve**



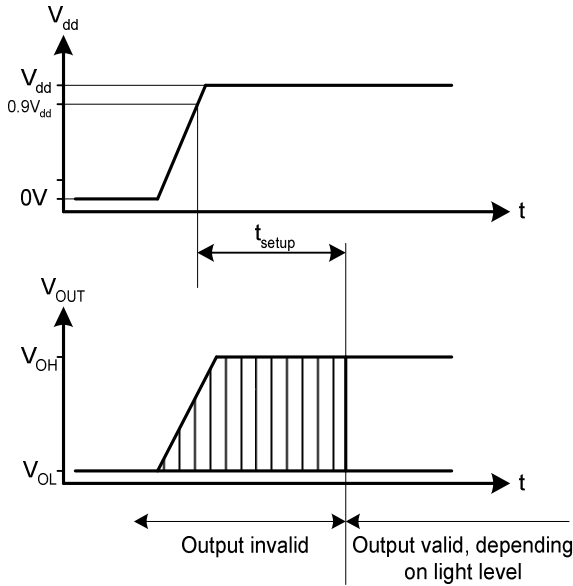
**6 Timing diagrams**



Definition of the switch-on and switch-off thresholds



Definition of the switch-on and switch-off delays



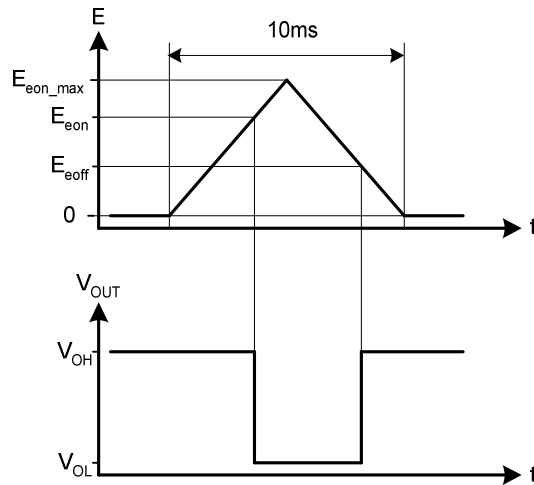
Definition of the power-on delay



Definition of the light pulse duration

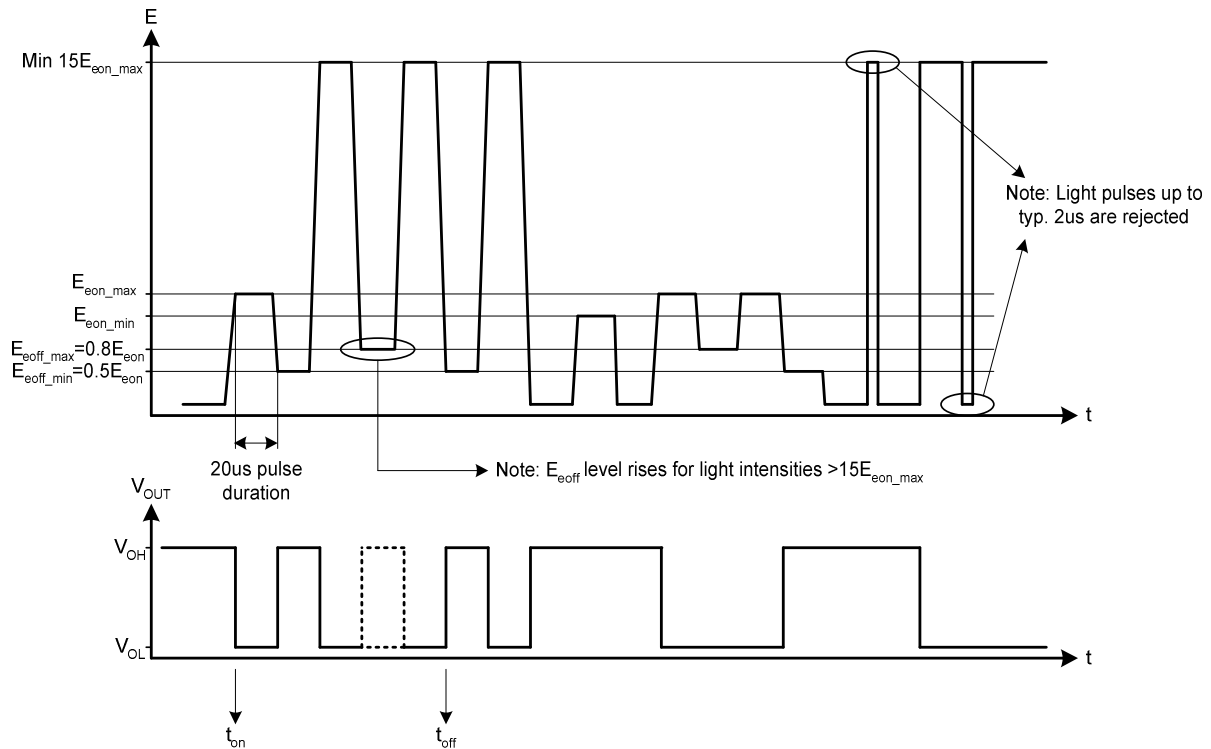
## 7 Test diagrams

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





Functional check of  $E_{e_{on}}$  and  $E_{e_{off}}$  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.

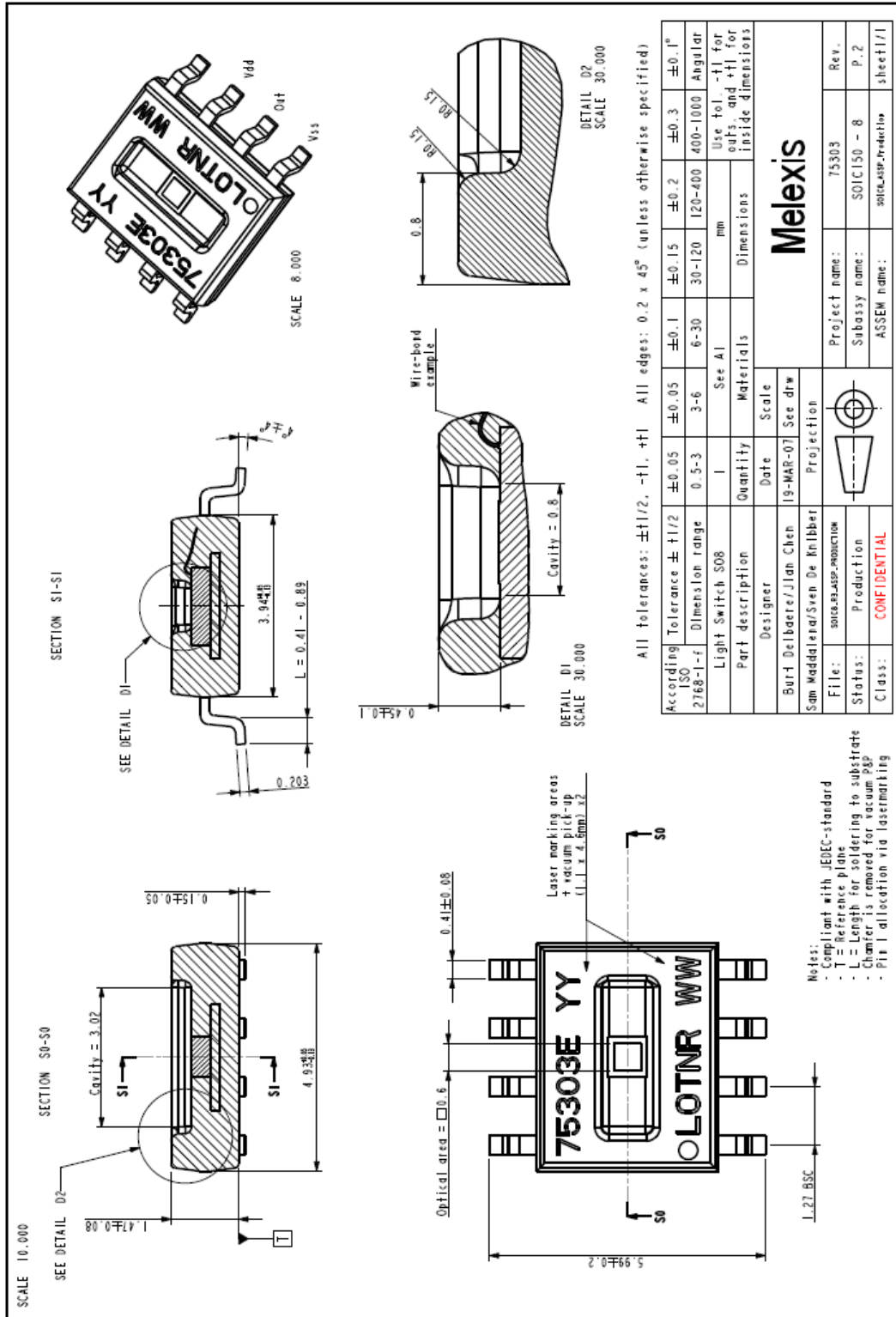


Decoupling capacitors between  $V_{dd}$  and  $V_{ss}$  (1uF in parallel with 100nF) are highly recommended in all configurations.

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 Developments)**

- 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 Developments)**

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

### **Solderability SMD's (Surface Mount Developments)**

- 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**

Devices sold by Melexis are covered by the warranty and patent indemnification provisions appearing in its Term of Sale. Melexis makes no warranty, express, statutory, implied, or by description regarding the information set forth herein or regarding the freedom of the described devices from patent infringement. Melexis reserves the right to change specifications and prices at any time and without notice. Therefore, prior to designing this product into a system, it is necessary to check with Melexis for current information. This product is intended for use in normal commercial applications. Applications requiring extended temperature range, unusual environmental requirements, or high reliability applications, such as military, medical life-support or life-sustaining equipment are specifically not recommended without additional processing by Melexis for each application.

The information furnished by Melexis is believed to be correct and accurate. However, Melexis shall not be liable to recipient or any third party for any damages, including but not limited to personal injury, property damage, loss of profits, loss of use, interrupt of business or indirect, special incidental or consequential damages, of any kind, in connection with or arising out of the furnishing, performance or use of the technical data herein. No obligation or liability to recipient or any third party shall arise or flow out of Melexis' rendering of technical or other services.

© 2005 Melexis NV. All rights reserved.

---

For additional information contact Melexis Direct:

|  |  |
|--|--|
| Europe, Africa, Asia:  | America:   |
| Phone: +32 1367 0495   | Phone: +1 603 223 2362   |
| E-mail: <a href="mailto:sales_europe@melexis.com">sales_europe@melexis.com</a> | E-mail: <a href="mailto:sales_usa@melexis.com">sales_usa@melexis.com</a> |

ISO/TS 16949 and ISO14001 Certified

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкуренеспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный)

Email: [org@lifeelectronics.ru](mailto:org@lifeelectronics.ru)