

# Slotted and Reflective Switches

## Application Bulletin 249



### Application Guidelines for the OPB Series (except surface mount versions)

(Answers to 6 most frequently asked questions regarding use of Optical Switches)

This document will help in the application of Optek reflective and slotted optical switches which use plastic housings. These application guidelines and tips cover the areas of: Electrostatic Discharge Sensitivity (ESD), Soldering, Cleaning and De-fluxing, Chemical Exposure, Mounting, and Moisture Sensitivity.

#### Electrostatic Discharge Sensitivity (ESD) Handling Considerations

The OPB series of Optical sensors have a class 3A, ESDS sensitivity classification. Optek packages these devices in antistatic material. It is extremely rare that these products encounter damage from electrostatic discharge under normal assembly conditions but it is recommended that operator grounding straps be used. The ESDS Component Sensitivity Classification—Human Body Model (Per ESD STM5.1-2001) is listed below.

This Standard establishes a procedure for evaluating the ESD sensitivity of components to a defined human body model. It covers test procedures and provides a means of component sensitivity classification.

Documentation for ESD STM5.1-2001 is available at <http://www.apcee.com/nmage/stm5101.pdf>

#### Soldering Guidelines

The OPB series of Optical sensors feature various mounting and wire styles. These solder guidelines apply to the OPB devices which are designed to be PCB mounted, and not the type supplied with “flying leads”, commonly referred to as “Wired”. Normal soldering IPC/EIA J-STD-001 Class 2 solder practices apply. Documentation is available at: [http://www.ipc.org/4.0\\_knowledge/4.1\\_standards/j-std-001csaddendum.pdf](http://www.ipc.org/4.0_knowledge/4.1_standards/j-std-001csaddendum.pdf)

Solder type may be 63/37 (Sn-Pb) or RoHS compliant SAC (Sn-Ag-Cu). Flux may be no-clean or RMA (Rosin Mildly Activated) type.

Maximum heat exposure to the leads (solder area) is 260°C for 10 seconds or less duration. Maximum heat exposure to the plastic housing is 150°C for one minute.

#### Cleaning/De-Flux Techniques

The OPB series of Optical sensors feature plastic molded housings. With few exceptions, the plastics used are Polysulfone or Polycarbonate, and are sensitive to certain chemicals that may attack it. These plastic housings are soluble in chlorinated hydrocarbons and ketones. Care must be taken in post-solder cleaning procedures. Avoid using chlorinated solvents as they will be a problem for the plastic and can cause cracking or “crazing” of the plastic surface, depending on length of exposure and temperature. Water based cleaners like aqueous saponifiers mostly work well. There are now more options available in the aqueous cleaning of printed circuit assemblies than ever before. These alternatives fill a need which was created by the necessity to move away from ozone depleting substances, as well by as a desire not to use cleaning solvents which simply trade one problem for another. The inorganic based saponifiers are an example of recent innovative approaches to “effective” aqueous defluxing, and have unique environmental and worker safety advantages.



PCB Mount



Flying Leads / Wired

Class	Voltage Range
Class 0	< 250 volts
Class 1A	250 volts to < 500 volts
Class 1B	500 volts to <1,000 volts
Class 1C	1,000 volts to 2,000 volts
Class 2	2,000 volts to 4,000 volts
Class 3A	4,000 volts to < 8,000 volts
Class 3B	> = 8,000 volts

#### General Note

TT Electronics reserves the right to make changes in product specification without notice or liability. All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

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If these Water Based cleaning agents are not available, the only cleaning chemicals recommended safe for the OPB sensors are Isopropanol and Methanol. The sensor body, or housing, is not a sealed unit. Avoid trapping liquids in the interior when cleaning as this can degrade the optical/electrical performance of the sensor. As a rule spray and wipe, don't submerge.

### Chemical Exposure

In addition to the chemical exposure considerations mentioned in the previous section, the plastic housings of the OPB sensors can be easily damaged by hydrocarbons from either fumes or direct contact. Care must be taken if considering some type of epoxy attachment or screw thread-lock type of epoxy or glue. Above all, avoid Cyanoacrylates (eg: Super Glue), exposure will disintegrate the plastic. It will cause surface stress cracking and can continue over time to break up the plastic, causing the housing to literally fall apart. Heat also accelerates this process.

To avoid stress cracking we suggest using ND Industries "ND VIBRA\_TITE"© Formula 3 for thread locking. This product evaporates fast without causing structural failure to the molded plastic.

### Mechanical Fastening

When using a bolt and nut or threaded screw to mount an OPB series optical switch containing the mounting feature, be careful not to over tighten the hardware. Maximum recommended torque is 0.68 N•m (Newton Metre) or 6 in/lbs. (inch pounds). Exceeding this torque could permanently damage the sensor housing and adversely affect the optical/electrical performance of the product. Recommended bolt/ screw size is U.N.C. or U.N.F #4 or I.S.O. M3.0, non-tapered/flat with an appropriate fitting washer. Follow the guidelines in the previous section "Chemical Exposure" when applying thread locking adhesives.

### Moisture Sensitivity Levels

With reference to IPC/JEDEC Moisture Sensitivity Levels (MSL), all OPTEK OPB series of Optical sensors are moisture sensitivity level one (1) and least prone to moisture induced fracturing. The concern with moisture absorption and retention inside the package is that the trapped moisture will vaporize and exert tremendous internal package stresses when the device is subjected to sudden, elevated temperature, such as during board mounting. Different package types exhibit different sensitivity levels to moisture ingress and its effects. For example, through-hole packages absorb moisture per volume at a slower rate than the thinner, surface-mount packages.

MSL is not a concern with OPTEK OPB sensors. These devices are manufactured using lead frame based throughhole LEDs and Photosensors, which are MSL level one and have unlimited MSL floor life.

For electrical considerations of the OPB Series, please read Application Bulletin 213, Application Circuits for the Phototransistor Switch.

IPC / JEDEC J-STD-20 MSL CLASSIFICATION CHART						
Level	Floor Life		Soak Requirements			
	Time	Cond.	Time	Standard	Accelerated	
		degC/%RH		Cond	Time	Cond
				DegC/%RH		debC/%RH
1	unlimited	<=30/85%	168+5/-0	85/85	n/a	n/a
2	1 year	<=30/60%	168+5/-0	85/60	n/a	n/a
2a	4 weeks	<=30/60%	696+5/-0	30/60	120+1/-0	60/60
3	168 hours	<=30/60%	192+5/-0	30/60	40+1/-0	60/60
4	72hours	<=30/60%	96+2/-0	30/60	20+0.5/-0	60/60
5	48 hours	<=30/60%	72+2/-0	30/60	15+0.5/-0	60/60
5a	24 hours	<=30/60%	48+2/-0	30/60	10+0.5/-0	60/60
6	TOL*	<=30/60%	TOL	30/60	n/a	60/60

\* TOL means "Time on Label", or the time indicated on the label of the packaging.  
For more information on this subject visit JEDEC at [www.jedec.org](http://www.jedec.org)

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