

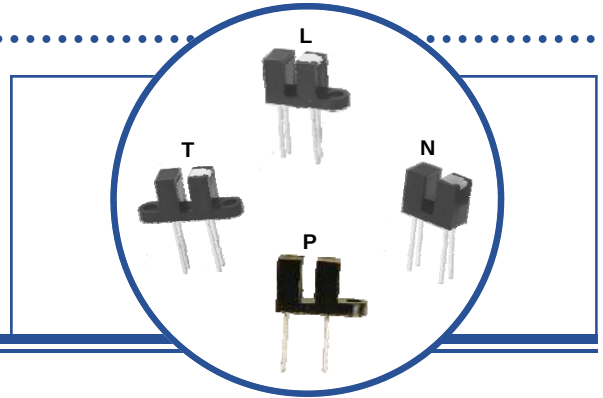
# High Reliability Slotted Optical Switch

## OPB870, OPB871, OPB872 (TX, TXV)



### Features:

- 0.125" (3.175 mm) slot width
- Choice of aperture (0.050" or 0.010" width)
- PCBoard mounting
- TX and TXV devices processed to MIL-PRF-19500
- S level processing available
- Hermetically sealed components



### Description:

Each **OPB870**, **OPB871** and **OPB872 (TX, TXV)** phototransistor device provides the flexibility of a custom device from a standard product line. Building from a standard housing with a 0.125" (3.175 mm) wide slot and 0.425" ( mm) leads for PCBoard mounting, a user can choose aperture width, opaque or IR transmissive housing shell material and mounting tab configuration.

Housings are made from an opaque grade of injection-molded plastic to minimize sensitivity to both visible and near-infrared light. Discrete shells exposed on the parallel faces inside each device's throat are made from either IR transmissive plastic (for applications where dust protection is needed) or from opaque plastic with aperture openings (for applications that require maximum protection against ambient light).

*TX and TXV devices are processed to OPTEK's military screening program patterned after MIL-PRF-19500.*

*Please refer to Application Bulletins 208 and 210 for additional design information and reliability (degradation) data.*

Contact your local representative or OPTEK for more information.

### Applications:

- Non-contact object sensing
- Assembly line automation
- Machine automation
- Equipment safety
- Machine safety
- Military and harsh environments



RoHS

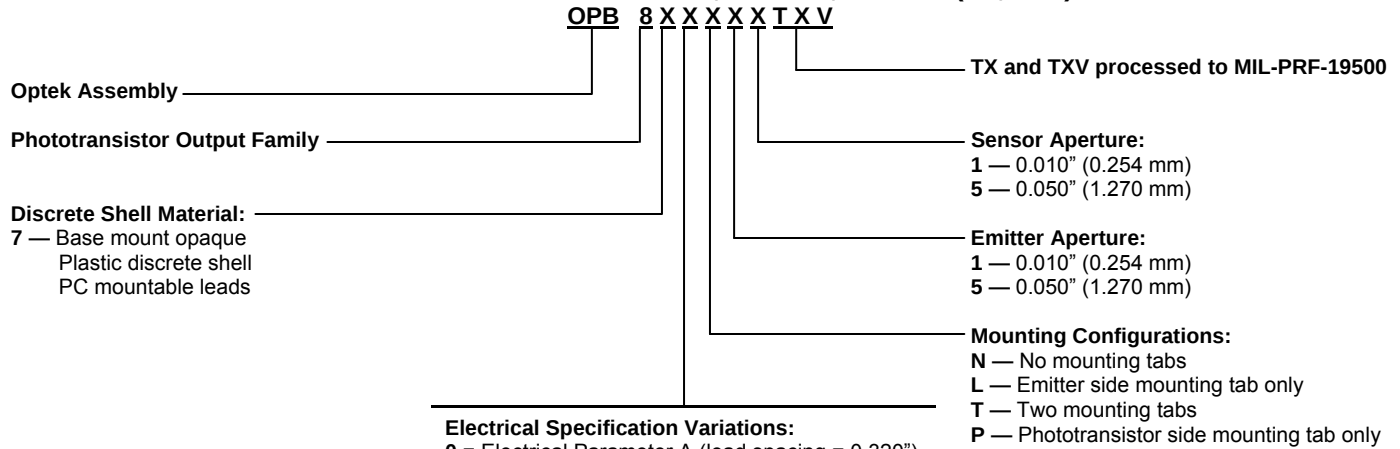
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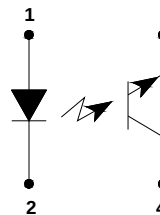
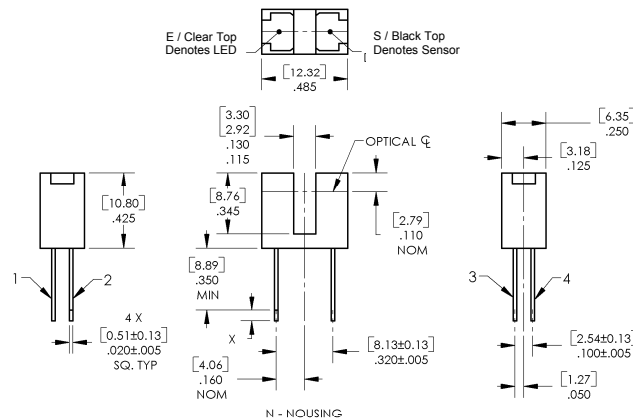
### Part Number Guide — OPB870, OPB871, OPB872 (TX, TXV)



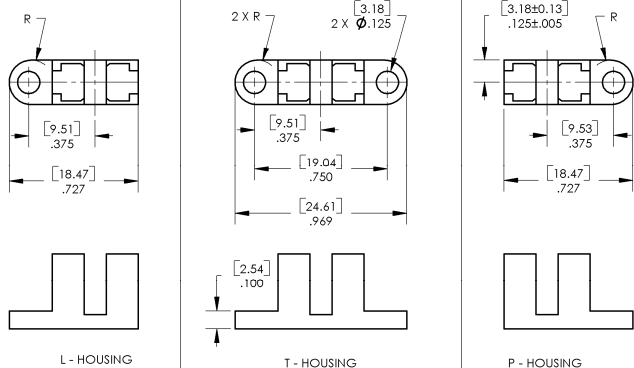
#### Electrical Specification Variations:

0 = Electrical Parameter A (lead spacing = 0.320")  
 1 = Electrical Parameter B (lead spacing = 0.320")  
 2 = Electrical Parameter C (lead spacing = 0.320")

**Note:** Assemblies with dual 0.010" apertures are currently available only with electrical



TOLERANCES ARE  $\pm .010"$  [.25].



DIMENSIONS ARE IN: [MILLIMETERS]  
 INCHES

| Pin # | Emitter | Pin # | Transistor/Diode  |
|-------|---------|-------|-------------------|
| 1     | Anode   | 3     | Collector / Anode |
| 2     | Cathode | 4     | Emitter / Cathode |

#### CONTAINS POLYSULFONE

To avoid stress cracking, we suggest using ND Industries' **Vibra-Tite** for thread-locking. **Vibra-Tite** evaporates fast without causing structural failure in OPTEK's molded plastics.

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## OPB870, OPB871, OPB872 (TX, TXV)



### Absolute Maximum Ratings ( $T_A = 25^\circ \text{C}$ unless otherwise noted)

|                                           |                   |
|-------------------------------------------|-------------------|
| Storage Temperature <sup>(1)</sup>        | -65° C to +150° C |
| Operating Temperature <sup>(1)</sup>      | -65° C to +125° C |
| Lead Soldering Temperature <sup>(3)</sup> | 240° C            |

### Input LED

|                                                       |        |
|-------------------------------------------------------|--------|
| Forward DC Current                                    | 50 mA  |
| Peak Forward Current (1 $\mu$ s pulse width, 300 pps) | 1.0 A  |
| Reverse DC Voltage                                    | 2.0 V  |
| Power Dissipation <sup>(2)</sup>                      | 100 mW |

### Output Phototransistor/Diode

|                           |                       |
|---------------------------|-----------------------|
| Collector-Emitter Voltage | 50 V                  |
| Emitter-Collector Voltage | 7.0 V                 |
| Collector DC Current      | 30 mA                 |
| Power Dissipation         | 100 mW <sup>(2)</sup> |

#### Notes:

- (1) Derate linearly 1.00 mW/ $^\circ \text{C}$  above 25° C.
- (2) Cleaning agents methanol and isopropanol are recommended. Spray or wipe; do not submerge.
- (3) RMA flux is recommended. Duration can be extended to 10 seconds maximum when flow soldering.
- (4) All parameters were tested using pulse technique.

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**Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| SYMBOL | PARAMETER | MIN | TYP | MAX | UNITS | TEST CONDITIONS |
|--------|-----------|-----|-----|-----|-------|-----------------|
|--------|-----------|-----|-----|-----|-------|-----------------|

**Input Transistor/Diode**

|       |                 |                      |             |                      |               |                                                                                                                               |
|-------|-----------------|----------------------|-------------|----------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------|
| $V_F$ | Forward Voltage | 1.00<br>1.20<br>0.80 | -<br>-<br>- | 1.70<br>1.90<br>1.60 | V             | $I_F = 20.0\text{ mA}$<br>$I_F = 20.0\text{ mA}, T_A = -55^\circ\text{C}$<br>$I_F = 20.0\text{ mA}, T_A = -100^\circ\text{C}$ |
| $I_R$ | Reverse Current | -                    | -           | 10                   | $\mu\text{A}$ | $V_R = 2.0\text{ VDC}$                                                                                                        |

**Output Transistor**

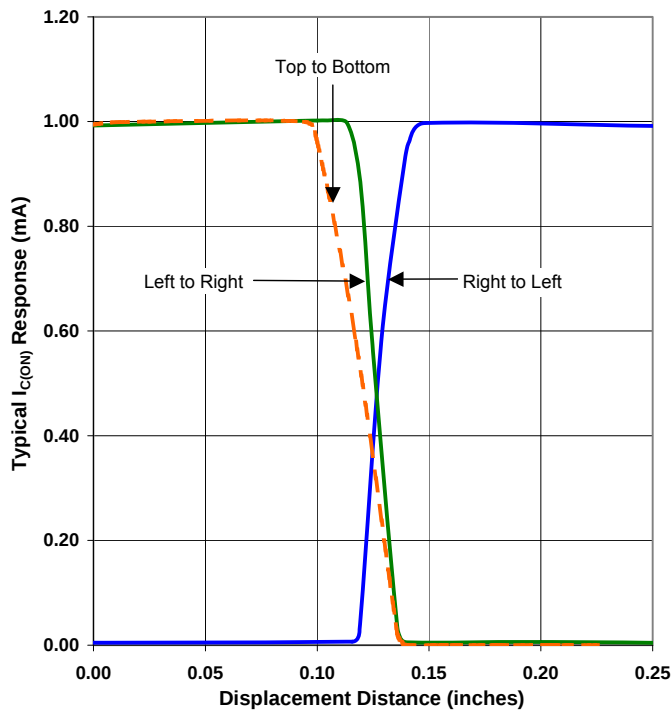
|               |                                     |     |        |            |                     |                                                                                                 |
|---------------|-------------------------------------|-----|--------|------------|---------------------|-------------------------------------------------------------------------------------------------|
| $V_{(BR)CEO}$ | Collector-Emitter Breakdown Voltage | 50  | -      | -          | V                   | $I_C = 1.0\text{ mA}, I_F = 0$                                                                  |
| $V_{(BR)ECO}$ | Emitter-Collector Breakdown Voltage | 7.0 | -      | -          | V                   | $I_E = 100\text{ }\mu\text{A}, I_F = 0$                                                         |
| $I_{C(off)}$  | Collector-Emitter Dark Current      |     | -<br>- | 100<br>100 | nA<br>$\mu\text{A}$ | $V_{CE} = 10.0\text{ V}, I_F = 0$<br>$V_{CE} = 10.0\text{ V}, I_F = 0, T_A = 100^\circ\text{C}$ |

**Coupled**

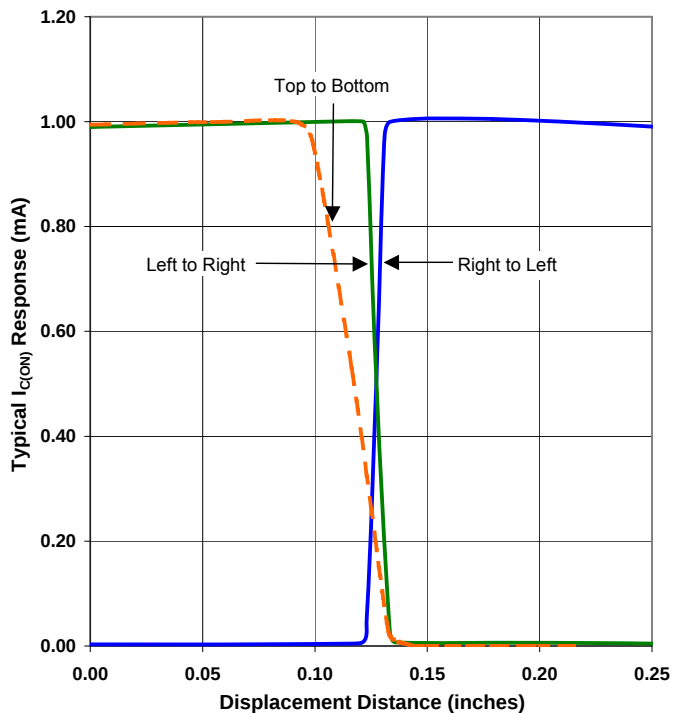
|               |                                                                    |                    |             |                      |               |                                                                                                                                                                                                      |
|---------------|--------------------------------------------------------------------|--------------------|-------------|----------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_{C(ON)}$   | On-State Collector Current <sup>(4)</sup>                          |                    |             |                      |               |                                                                                                                                                                                                      |
|               | Parameter A<br>OPB870<br>OPB870<br>OPB870                          | 500<br>200<br>200  | -<br>-<br>- | -<br>-<br>-          | $\mu\text{A}$ | $V_{CE} = 10.0\text{ V}, I_F = 20.0\text{ mA}$<br>$V_{CE} = 10.0\text{ V}, I_F = 20.0\text{ mA}, T_A = -55^\circ\text{C}$<br>$V_{CE} = 10.0\text{ V}, I_F = 20.0\text{ mA}, T_A = 100^\circ\text{C}$ |
|               | Parameter B<br>OPB871<br>OPB871<br>OPB871                          | 1000<br>400<br>400 | -<br>-<br>- | -<br>-<br>-          | $\mu\text{A}$ | $V_{CE} = 5.0\text{ V}, I_F = 10.0\text{ mA}$<br>$V_{CE} = 5.0\text{ V}, I_F = 10.0\text{ mA}, T_A = -55^\circ\text{C}$<br>$V_{CE} = 5.0\text{ V}, I_F = 10.0\text{ mA}, T_A = 100^\circ\text{C}$    |
|               | Parameter C<br>OPB872<br>OPB872<br>OPB872                          | 1800<br>800<br>800 | -<br>-<br>- | -<br>-<br>-          | $\mu\text{A}$ | $V_{CE} = 0.4\text{ V}, I_F = 20.0\text{ mA}$<br>$V_{CE} = 0.4\text{ V}, I_F = 20.0\text{ mA}, T_A = -55^\circ\text{C}$<br>$V_{CE} = 0.4\text{ V}, I_F = 20.0\text{ mA}, T_A = 100^\circ\text{C}$    |
| $V_{CE(SAT)}$ | Collector-Emitter Saturation Voltage<br>OPB870<br>OPB871<br>OPB872 | -<br>-<br>-        | -<br>-<br>- | 0.30<br>0.30<br>0.30 | V             | $I_C = 400\text{ }\mu\text{A}, I_F = 20.0\text{ mA}$<br>$I_C = 800\text{ }\mu\text{A}, I_F = 10.0\text{ mA}$<br>$I_C = 1800\text{ }\mu\text{A}, I_F = 20.0\text{ mA}$                                |
| $t_r$         | Output Rise Time<br>OPB870<br>OPB871<br>OPB872                     | -<br>-<br>-        | -<br>-<br>- | 15.0<br>20.0<br>20.0 | $\mu\text{s}$ | $V_{CC} = 10.0\text{ V}$<br>$I_F = 20.0\text{ mA}$<br>$R_L = 1000\Omega$                                                                                                                             |
| $t_f$         | Output Fall Time<br>OPB870<br>OPB871<br>OPB872                     | -<br>-<br>-        | -<br>-<br>- | 15.0<br>20.0<br>20.0 | $\mu\text{s}$ | $V_{CC} = 10.0\text{ V}$<br>$I_F = 20.0\text{ mA}$<br>$R_L = 1000\Omega$                                                                                                                             |

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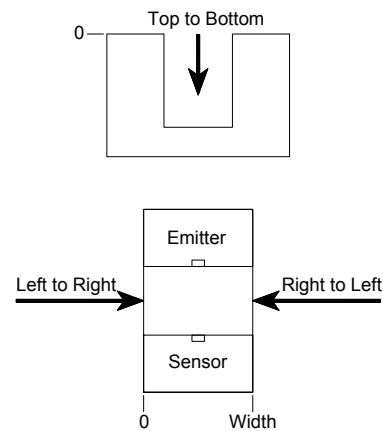
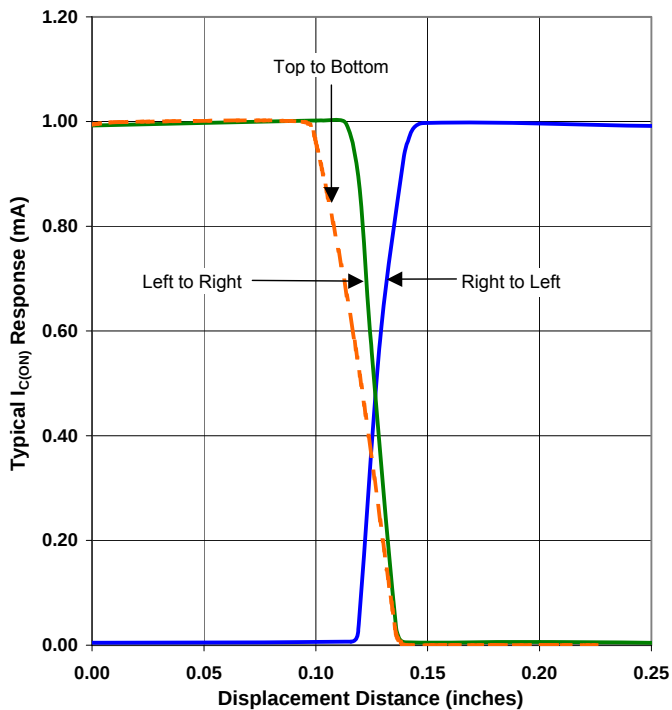
Aperture Configuration 51 - Flag Next to Emitter



Aperture Configuration 51 - Flag Next to Sensor

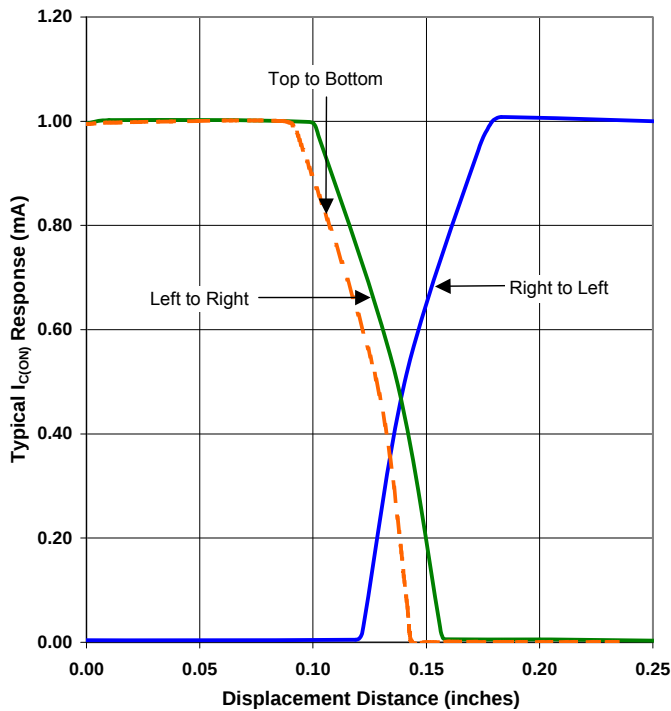


Aperture Configuration 51 - Flag in Middle of Slot

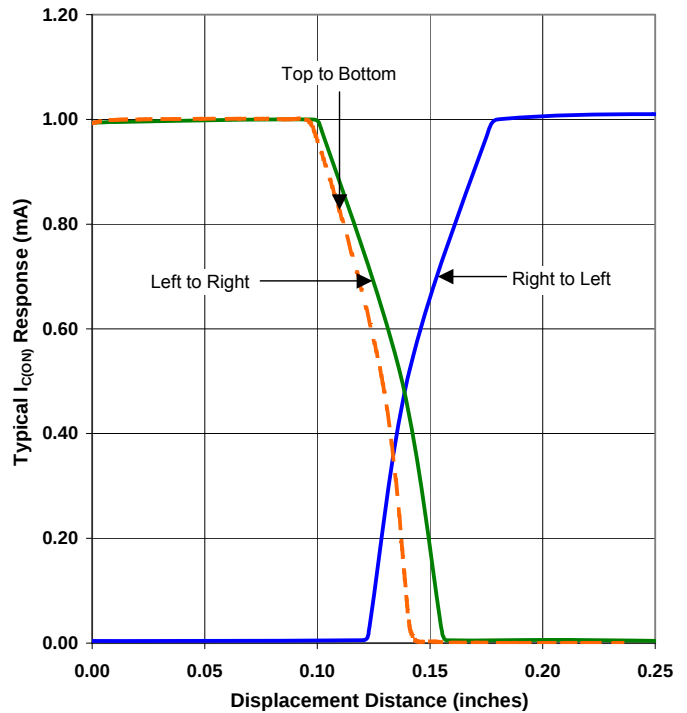


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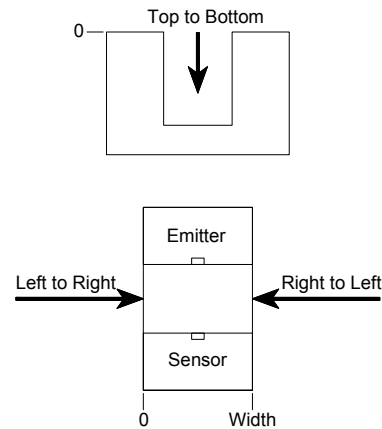
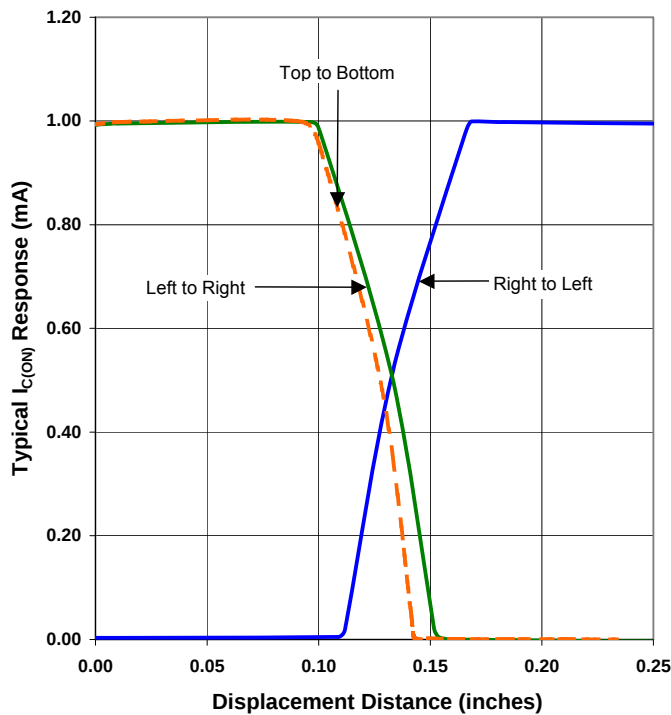
Aperture Configuration 55 - Flag Next to Emitter



Aperture Configuration 55 - Flag Next to Sensor



Aperture Configuration 55 - Flag in Middle of Slot



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