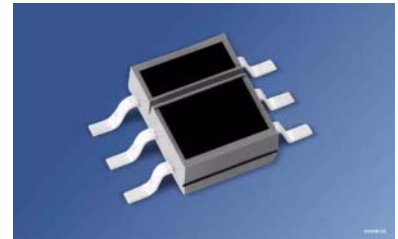


# Reflexlichtschranke Reflective Interrupter

## SFH 9202



### Wesentliche Merkmale

- Optimaler Arbeitsabstand 1 mm bis 5 mm
- IR-GaAs-Lumineszenzdiode in Kombination mit einem Si-NPN-Fototransistor
- Tageslichtsperrfilter
- Geringe Sättigungsspannung
- Sender und Empfänger galvanisch getrennt

### Anwendungen

- Positionsmelder
- Endabschalter
- Drehzahlüberwachung
- Bewegungssensor

### Features

- Optimal operating distance 1 mm to 5 mm
- IR-GaAs-emitter in combination with a Silicon NPN phototransistor
- Daylight cut-off filter
- Low saturation voltage
- Emitter and detector electrically isolated

### Applications

- Position reporting
- End position switch
- Speed monitoring
- Motion transmitter

| Typ<br>Type  | Bestellnummer<br>Ordering Code | $I_{CE}$<br>$I_F = 10 \text{ mA}$ , $V_{CE} = 5 \text{ V}$ , $d = 1 \text{ mm}$<br>mA |
|--------------|--------------------------------|---------------------------------------------------------------------------------------|
| SFH 9202     | Q62702-P5039                   | 0.063 ... 0.8                                                                         |
| SFH 9202-2/3 | Q62702-P5009                   | 0.063 ... 0.2                                                                         |
| SFH 9202-3/4 | Q62702-P5010                   | 0.10 ... 0.32                                                                         |
| SFH 9202-4/5 | Q62702-P5472                   | 0.16 ... 0.50                                                                         |
| SFH 9202-5/6 | Q62702-P5435                   | 0.25 ... 0.80                                                                         |

**Grenzwerte**  
**Maximum Ratings**

| Bezeichnung<br>Parameter | Symbol<br>Symbol | Wert<br>Value | Einheit<br>Unit |
|--------------------------|------------------|---------------|-----------------|
|--------------------------|------------------|---------------|-----------------|

**Sender** (GaAs-Diode)**Emitter** (GaAs diode)

|                                        |           |    |    |
|----------------------------------------|-----------|----|----|
| Sperrspannung<br>Reverse voltage       | $V_R$     | 5  | V  |
| Vorwärtsgleichstrom<br>Forward current | $I_F$     | 50 | mA |
| Verlustleistung<br>Power dissipation   | $P_{tot}$ | 80 | mW |

**Empfänger** (Si-Fototransistor)**Detector** (silicon phototransistor)

|                                                                                                    |           |     |    |
|----------------------------------------------------------------------------------------------------|-----------|-----|----|
| Dauer-Kollektor-Emitter-Sperrspannung<br>Continuous collector-emitter voltage                      | $V_{CE}$  | 16  | V  |
| Kollektor-Emitter-Sperrspannung, ( $t \leq 1$ min)<br>Collector-emitter voltage, ( $t \leq 1$ min) | $V_{CE}$  | 30  |    |
| Emitter-Kollektor-Sperrspannung<br>Emitter-collector voltage                                       | $V_{EC}$  | 7   |    |
| Kollektorstrom<br>Collector current                                                                | $I_C$     | 10  | mA |
| Verlustleistung<br>Total power dissipation                                                         | $P_{tot}$ | 100 | mW |

**Reflexlichtschranke****Light Reflection Switch**

|                                                          |                                         |                |    |
|----------------------------------------------------------|-----------------------------------------|----------------|----|
| Lagertemperatur<br>Storage temperature range             | $T_{stg}$                               | - 40 ... + 100 | °C |
| Umgebungstemperatur<br>Ambient temperature range         | $T_A$                                   | - 40 ... + 100 |    |
| Elektrostatistische Entladung<br>Electrostatic discharge | ESD                                     | 2              | KV |
| Umweltbedingungen / Environment conditions               | 3 K3 acc. to EN 60721-3-3 (IEC 721-3-3) |                |    |

**Kennwerte** ( $T_A = 25\text{ °C}$ )**Characteristics**

| Bezeichnung<br>Parameter                                          | Symbol<br>Symbol | Wert<br>Value        | Einheit<br>Unit |
|-------------------------------------------------------------------|------------------|----------------------|-----------------|
| <b>Sender</b> (GaAs-Diode)<br><b>Emitter</b> (GaAs diode)         |                  |                      |                 |
| Durchlaßspannung<br>Forward voltage<br>$I_F = 50\text{ mA}$       | $V_F$            | 1.25 ( $\leq 1.65$ ) | V               |
| Sperrstrom<br>Reverse current<br>$V_R = 5\text{ V}$               | $I_R$            | 0.01 ( $\leq 1$ )    | $\mu\text{A}$   |
| Kapazität<br>Capacitance<br>$V_R = 0\text{ V}, f = 1\text{ MHz}$  | $C_O$            | 25                   | pF              |
| Wärmewiderstand <sup>1)</sup><br>Thermal resistance <sup>1)</sup> | $R_{thJA}$       | 400                  | K/W             |

**Empfänger** (Si-Fototransistor)**Detector** (silicon phototransistor)

|                                                                                                                              |            |                 |     |
|------------------------------------------------------------------------------------------------------------------------------|------------|-----------------|-----|
| Kapazität<br>Capacitance<br>$V_{CE} = 5\text{ V}, f = 1\text{ MHz}$                                                          | $C_{CE}$   | 5               | pF  |
| Kollektor-Emitter-Reststrom<br>Collector-emitter leakage current<br>$V_{CE} = 20\text{ V}$                                   | $I_{CEO}$  | 1 ( $\leq 50$ ) | nA  |
| Fotostrom (Fremdlichtempfindlichkeit)<br>Photocurrent (outside light density)<br>$V_{CE} = 5\text{ V}, E_v = 1000\text{ Lx}$ | $I_P$      | 1               | mA  |
| Wärmewiderstand <sup>1)</sup><br>Thermal resistance <sup>1)</sup>                                                            | $R_{thJA}$ | 400             | K/W |

**Kennwerte** ( $T_A = 25\text{ °C}$ )**Characteristics** (cont'd)

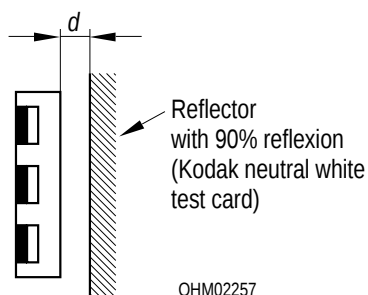
| Bezeichnung<br>Parameter | Symbol<br>Symbol | Wert<br>Value | Einheit<br>Unit |
|--------------------------|------------------|---------------|-----------------|
|--------------------------|------------------|---------------|-----------------|

**Reflexlichtschranke****Light Reflection Switch**

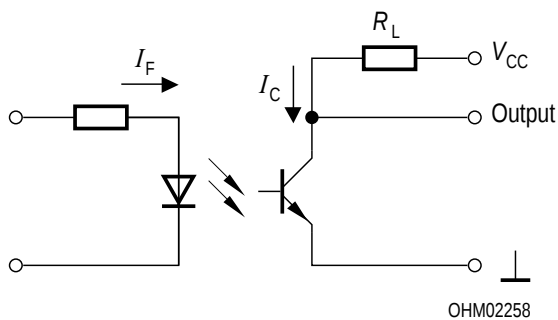
|                                                                                                                                                                                                          |                                             |                     |                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------|--------------------------------|
| Kollektor-Emitterstrom<br>Collector-emitter current<br>Kodak neutral white test card, 90% Reflexion<br>$I_F = 10\text{ mA}$ ; $V_{CE} = 5\text{ V}$ ; $d = 1\text{ mm}$                                  | $I_{CE\text{ min.}}$<br>$I_{CE\text{ max}}$ | 63<br>800           | $\mu\text{A}$<br>$\mu\text{A}$ |
| Kollektor-Emitter-Sättigungsspannung<br>Collector-emitter saturation voltage<br>Kodak neutral white test card, 90% Reflexion<br>$I_F = 10\text{ mA}$ ; $d = 1\text{ mm}$ ; $I_C = 20\text{ }\mu\text{A}$ | $V_{CE\text{ sat}}$                         | 0.15 ( $\leq 0.6$ ) | V                              |

<sup>1)</sup> Montage auf PC-Board mit  $> 5\text{ mm}^2$  Padgröße

<sup>1)</sup> Mounting on pcb with  $> 5\text{ mm}^2$  pad size



**Schaltzeiten** ( $T_A = 25\text{ °C}$ ,  $V_{CC} = 5\text{ V}$ ,  $I_C = 100\text{ }\mu\text{A}^{1)}$ ,  $R_L = 1\text{ k}\Omega$ )  
**Switching Times**

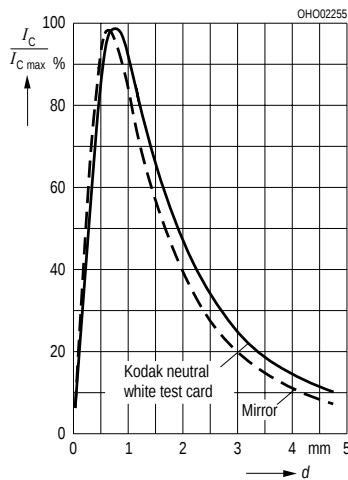


| Bezeichnung<br>Parameter       | Symbol<br>Symbol                     | Wert<br>Value | Einheit<br>Unit |
|--------------------------------|--------------------------------------|---------------|-----------------|
| Einschaltzeit<br>Turn-on time  | $t_{\text{ein}}$<br>$t_{\text{on}}$  | 40            | $\mu\text{s}$   |
| Anstiegszeit<br>Rise time      | $t_r$                                | 30            | $\mu\text{s}$   |
| Ausschaltzeit<br>Turn-off time | $t_{\text{aus}}$<br>$t_{\text{off}}$ | 45            | $\mu\text{s}$   |
| Abfallzeit<br>Fall time        | $t_f$                                | 40            | $\mu\text{s}$   |

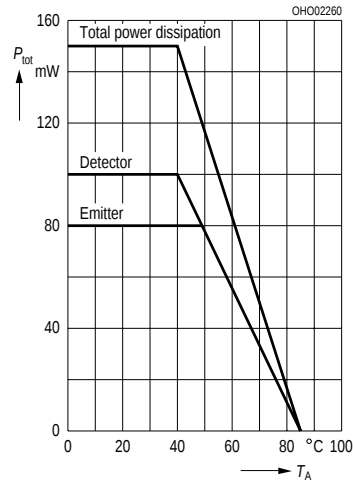
<sup>1)</sup>  $I_C$  eingestellt über den Durchlaßstrom der Sendediode, den Reflexionsgrad und den Abstand des Reflektors vom Bauteil ( $d$ )

<sup>1)</sup>  $I_C$  as a function of the forward current of the emitting diode, the degree of reflection and the distance between reflector and component ( $d$ )

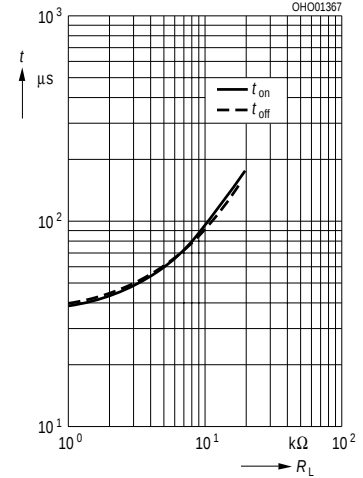
**Collector Current**  $\frac{I_C}{I_{Cmax}} = f(d)$



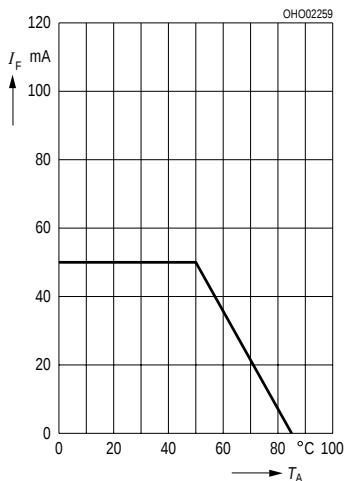
**Permissible Power Dissipation for Diode and Transistor**  $P_{tot} = f(T_A)$



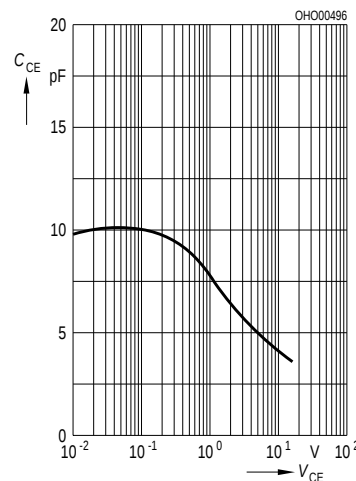
**Switching Characteristics**  $t = f(R_L)$   
 $T_A = 25^\circ\text{C}$ ,  $I_F = 10\text{ mA}$



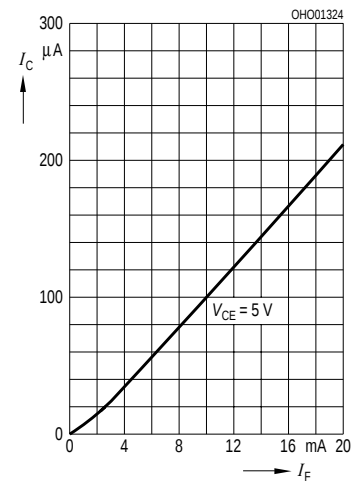
**Max. Permissible Forward Current**  
 $I_F = f(T_A)$



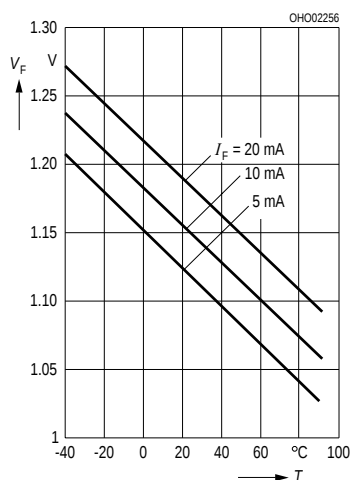
**Transistor Capacitance (typ.)**  
 $C_{CE} = f(V_{CE})$ ,  $T_A = 25^\circ\text{C}$ ,  $f = 1\text{ MHz}$



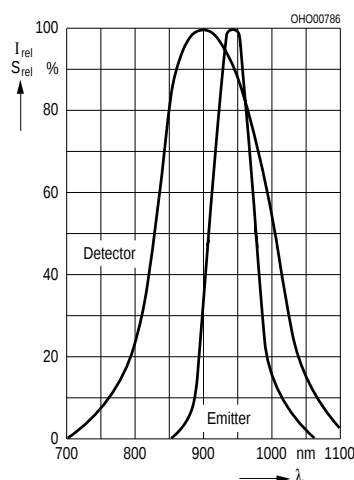
**Collector Current**  $I_C = f(I_F)$ , spacing  
 $d$  to reflector = 1 mm, 90% reflection



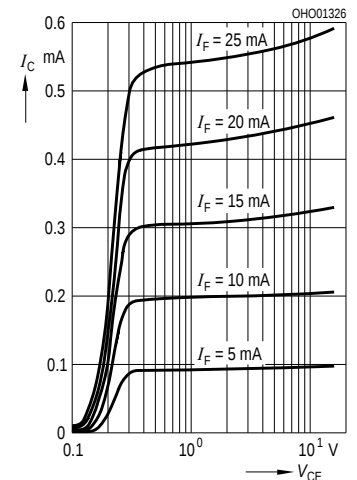
**Forward Voltage (typ.) of the Diode**  $V_F = f(T)$



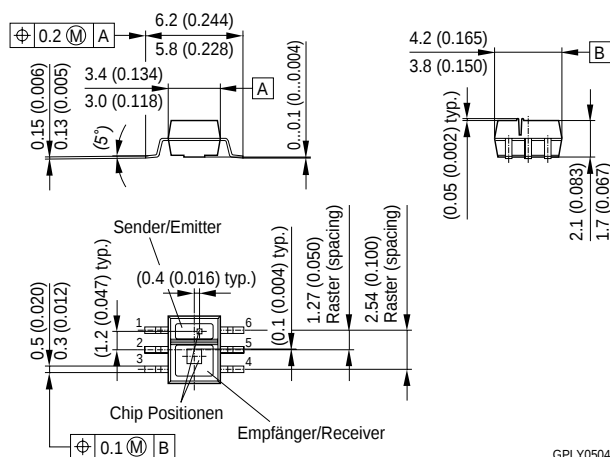
**Relative Spectral Emission of Emitter (GaAs)**  $I_{rel} = f(\lambda)$  and  
**Detector (Si)**  $S_{rel} = f(\lambda)$



**Output Characteristics (typ.)**  
 $I_C = f(V_{CE})$ , spacing to reflector:  
 $d = 1\text{ mm}$ , 90% reflection,  $T_A = 25^\circ\text{C}$



## Maßzeichnung Package Outlines



| Type     | 1     | 2 | 3       | 4         | 5 | 6       |
|----------|-------|---|---------|-----------|---|---------|
| SFH 9202 | Anode | – | Emitter | Collector | – | Cathode |

Maße werden wie folgt angegeben: mm (inch) / Dimensions are specified as follows: mm (inch).

## Löthinweise Soldering Conditions

| Bauform<br>Type | Drypack<br>Level acc.<br>to<br>IPS-stand.<br>020 | Tauch-, Schwalllötung<br>Dip, Wave Soldering |                           | Reflowlötung<br>Reflow Soldering |                              | Kolbenlötung<br>Iron Soldering |
|-----------------|--------------------------------------------------|----------------------------------------------|---------------------------|----------------------------------|------------------------------|--------------------------------|
|                 |                                                  | Peak Temp.<br>(solderbath)                   | Max. Time in<br>peak zone | Peak Temp.<br>(package<br>temp.) | Max. Time<br>in Peak<br>Zone | (Iron temp.)                   |
| SFH 9202        | 4                                                | n. a.                                        | –                         | 245 °C                           | 10 sec.                      | n.a.                           |

Bitte Verarbeitungshinweise für SMT-Bauelemente beachten!  
Please observe the handling guidelines for SMT devices!

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