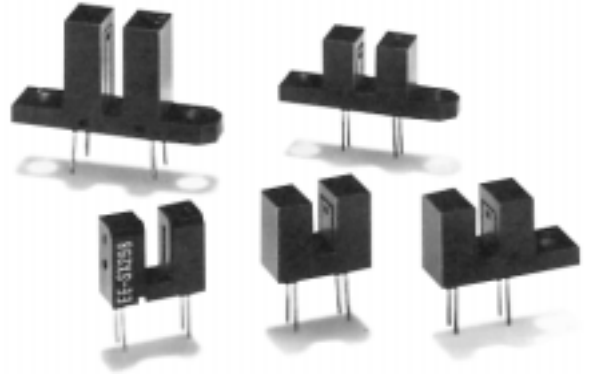


## EE-SX298/SM3/SJ3W-B/SM3B/SK3W-B

Low-cost Photodarlington Output  
with Low Driving Input and High  
Transmission Efficiency

- 1.5-mA output (min.) with only 3-mA forward LED current
- Best suited to drive CMOS IC



## Ordering Information

| Appearance                                                                          | Sensing method | Slot width | Slot depth | Sensing object       | Output configuration       | Weight        | Part number |
|-------------------------------------------------------------------------------------|----------------|------------|------------|----------------------|----------------------------|---------------|-------------|
|  | Transmissive   | 3 mm       | 7.5 mm     | Opaque, 0.5 x 2 mm   | Photodarlington transistor | Approx. 0.6 g | EE-SX298    |
|  |                |            | 13 mm      | Opaque, 0.8 x 0.8 mm |                            | Approx. 1.4 g | EE-SM3      |
|  |                |            | 7 mm       |                      |                            | Approx. 0.8 g | EE-SM3B     |
|  |                |            |            |                      |                            | Approx. 0.6 g | EE-SJ3W-B   |
|  |                |            |            | Approx. 0.7 g        |                            | EE-SK3W-B     |             |

# Specifications

## ■ ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

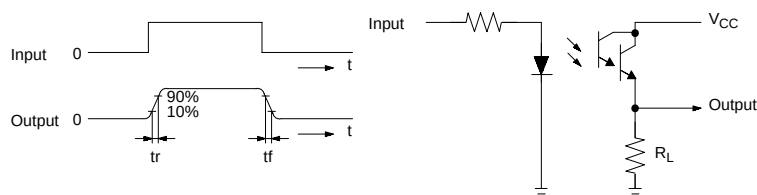
| Item                |                           | Symbol    | Rated value                        |                                  |
|---------------------|---------------------------|-----------|------------------------------------|----------------------------------|
|                     |                           |           | EE-SX298                           | EE-SM3/SM3B/<br>SJ3W-B/SK3W-B    |
| Emitter             | Forward current           | $I_F$     | 50 mA*                             | 15 mA*                           |
|                     | Reverse voltage           | $V_R$     | 4 V                                | 4 V                              |
| Detector            | Collector-emitter voltage | $V_{CEO}$ | 35 V                               | 24 V                             |
|                     | Collector current         | $I_C$     | 20 mA                              | 20 mA                            |
|                     | Collector dissipation     | $P_C$     | 100 mW*                            | 75 mW*                           |
| Ambient temperature | Operating                 | $T_{opr}$ | -25°C to 85°C<br>(-13°F to 185°F)  | -20°C to 60°C<br>(-4°F to 140°F) |
|                     | Storage                   | $T_{stg}$ | -40°C to 100°C<br>(-40°F to 212°F) | -20°C to 80°C<br>(-4°F to 176°F) |

\*Refer to Engineering Data if the ambient temperature is not within the normal room temperature range.

## ■ CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

| Item        |                                      | Symbol               | EE-SX298                   |                                                                       | EE-SM3/SM3B/SJ3W-B/SK3W-B |                                                                                |
|-------------|--------------------------------------|----------------------|----------------------------|-----------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------|
|             |                                      |                      | Value                      | Condition                                                             | Value                     | Condition                                                                      |
| Input       | Forward voltage                      | $V_F$                | 1.2 V typ.<br>1.4 V max.   | $I_F = 20 \text{ mA}$                                                 | 2 V typ.<br>2.6 V max.    | $I_F = 15 \text{ mA}$                                                          |
|             | Reverse current                      | $I_R$                | 10 $\mu\text{A}$ max.      | $V_R = 4 \text{ V}$                                                   | 5 $\mu\text{A}$ max.      | $V_R = 4 \text{ V}$                                                            |
|             | Peak emission wavelength             | $\lambda_p(L)$       | 940 nm typ.                | $I_F = 20 \text{ mA}$                                                 | 700 nm typ.               | $I_F = 3 \text{ mA}$                                                           |
| Output      | Dark current                         | $I_D$                | 2 nA typ.<br>1,000 nA max. | $V_{CE} = 10 \text{ V}, 0/x$                                          | 20 nA typ.<br>250 nA max. | $V_{CE} = 10 \text{ V}, 0/x$                                                   |
|             | Peak spectral sensitivity wavelength | $\lambda_p(P)$       | 780 nm typ.                | $V_{CE} = 5 \text{ V}$                                                | 800 nm typ.               | $V_{CE} = 10 \text{ V}^{**}$                                                   |
| Combination | Light current (collector current)    | $I_L$                | 0.5 mA min.<br>20 mA max.  | $I_F = 1 \text{ mA}$<br>$V_{CE} = 2 \text{ V}$                        | 1.5 to 120 mA             | $I_F = 3 \text{ mA}$<br>$V_{CE} = 10 \text{ V}$                                |
|             | Collector-emitter saturated voltage  | $V_{CE}(\text{sat})$ | 0.75 V typ.                | $I_F = 2 \text{ mA}$<br>$I_L = 0.5 \text{ mA}$                        | 0.9 V typ.                | $I_F = 3 \text{ mA}$<br>$I_L = 0.5 \text{ mA}$                                 |
|             | Rising time*                         | $t_r$                | 70 $\mu\text{s}$ typ.      | $V_{CC} = 5 \text{ V}$<br>$R_L = 100 \Omega$<br>$I_L = 20 \text{ mA}$ | 180 $\mu\text{s}$ typ.    | $V_{CC} = 5 \text{ V}$<br>$R_L = 0.1 \text{ k}\Omega$<br>$I_L = 10 \text{ mA}$ |
|             | Falling time*                        | $t_f$                | 70 $\mu\text{s}$ typ.      |                                                                       | 60 $\mu\text{s}$ typ.     |                                                                                |

\*The following illustrations show the rising time,  $t_r$ , and the falling time,  $t_f$ .



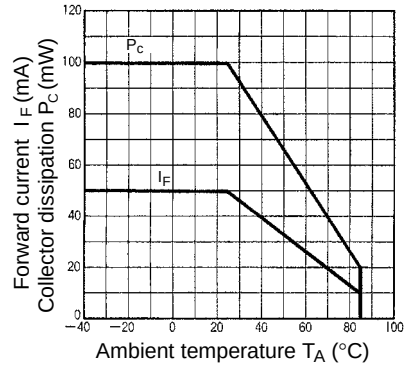
\*\*The peak spectrum sensitivity wavelength,  $\lambda_p(P)$  of the EE-SM3 is 750 nm (typical).

# Engineering Data

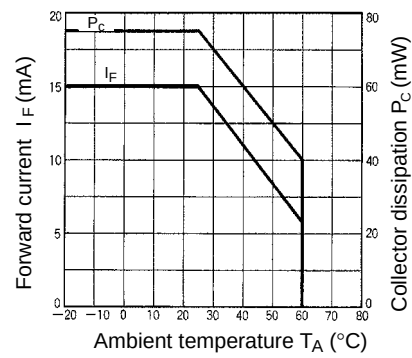
Note: The operating conditions of the photomicrosensor must be within the absolute maximum rating ranges.

## ■ TEMPERATURE CHARACTERISTICS

EE-SX298

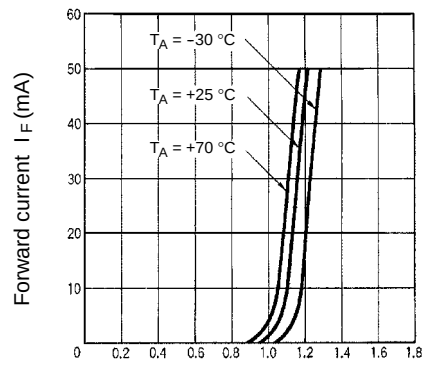


EE-SM3/-SM3B/-SJ3W-B/SK3W-B

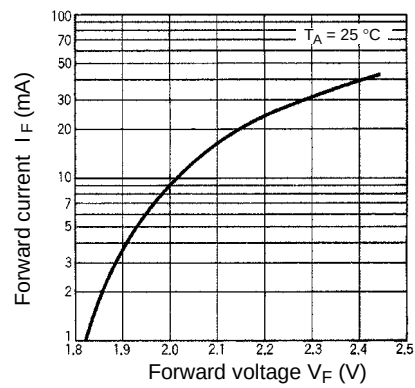


## ■ INPUT CHARACTERISTICS (TYPICAL)

EE-SX298

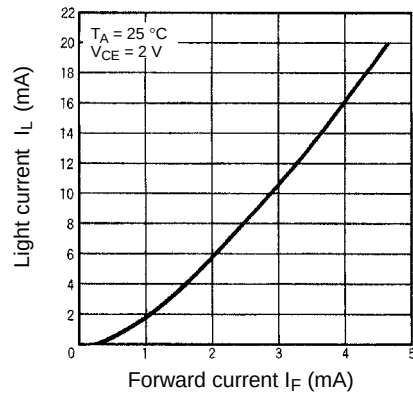


EE-SM3/SM3B/SJ3W-B/SK3W-B



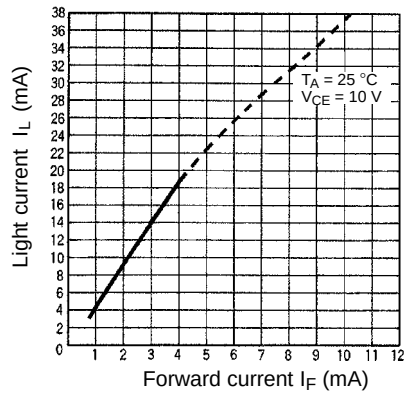
## ■ INPUT/OUTPUT CHARACTERISTICS (TYPICAL)

EE-SX298



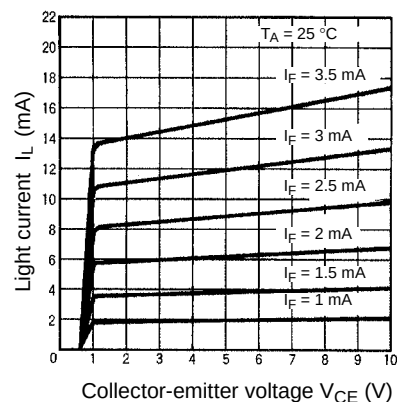
## ■ FORWARD VOLTAGE $V_F$ (V)

EE-SM3/SM3B/SJ3W-B/SK3W-B

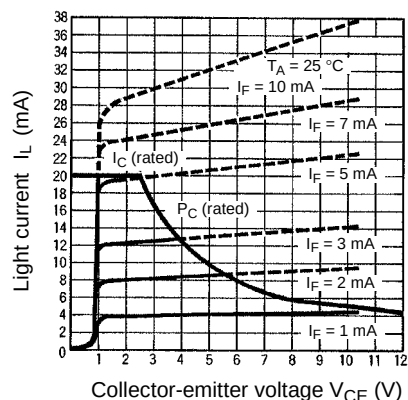


## ■ OUTPUT CHARACTERISTICS (TYPICAL)

EE-SX298

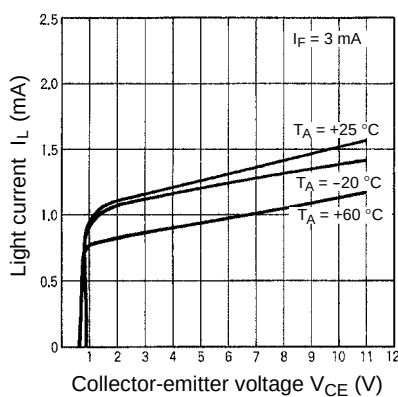


EE-SM3/SM3B/SJ3W-B/SK3W-B

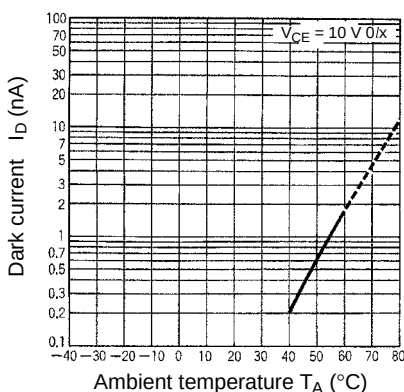


## ■ OUTPUT CHARACTERISTICS TEMPERATURE DEPENDENCY (TYPICAL)

EE-SM3/SM3B/SJ3W-B/SK3W-B

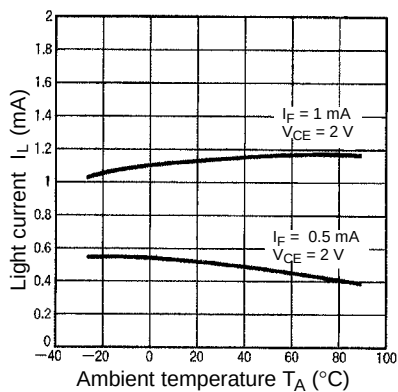


## ■ DARK CURRENT TEMPERATURE DEPENDENCY (TYPICAL)



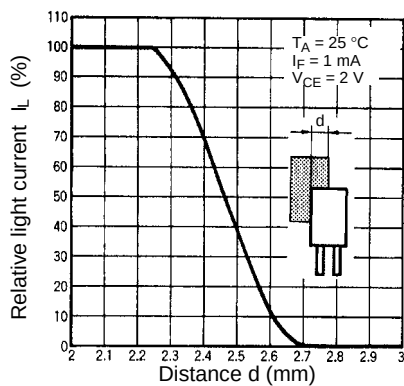
## ■ LIGHT CURRENT TEMPERATURE DEPENDENCY (TYPICAL)

EE-SX298



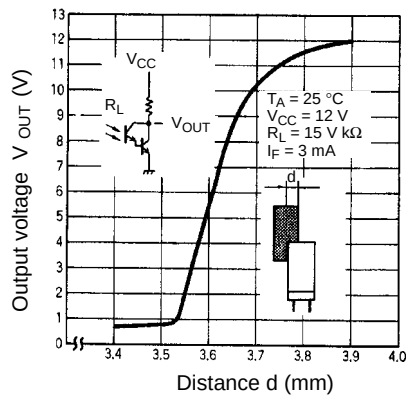
## ■ SENSING POSITION CHARACTERISTICS (TYPICAL)

EE-SX298

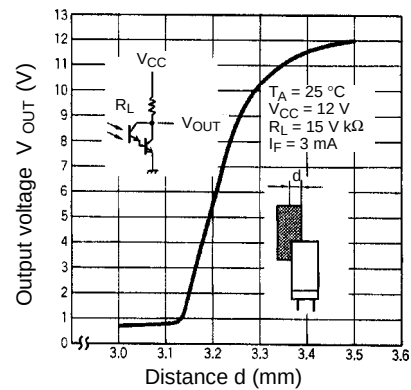


## ■ SENSING POSITION CHARACTERISTICS (TYPICAL), CONTINUED

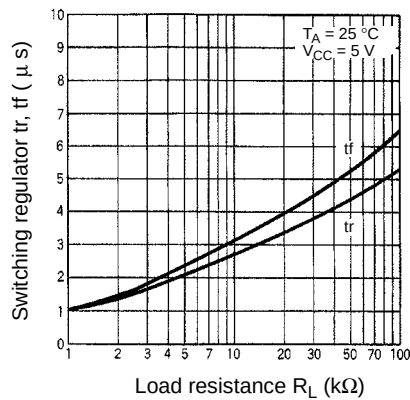
EE-SM3



EE-SM3B/SJ3W-B/SK3W-B



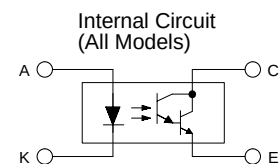
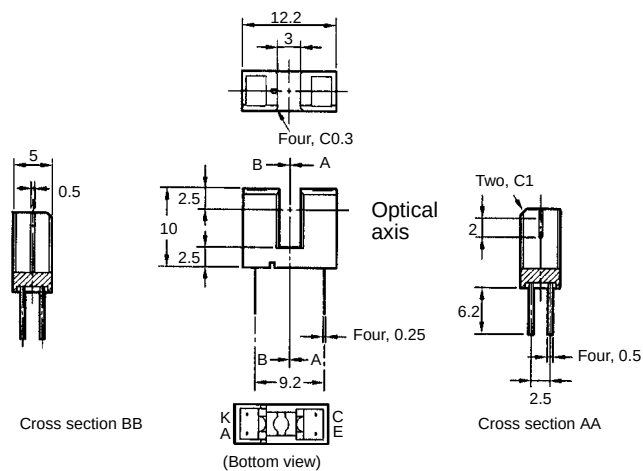
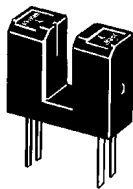
## ■ SWITCHING CHARACTERISTICS (TYPICAL)



## Dimensions

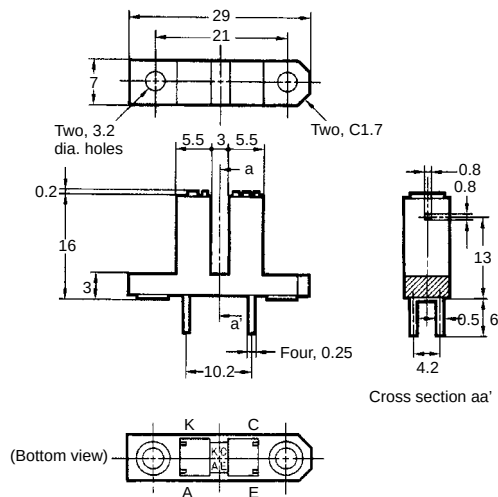
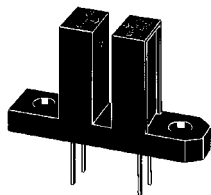
Unit: mm (inch)

### ■ EE-SX298

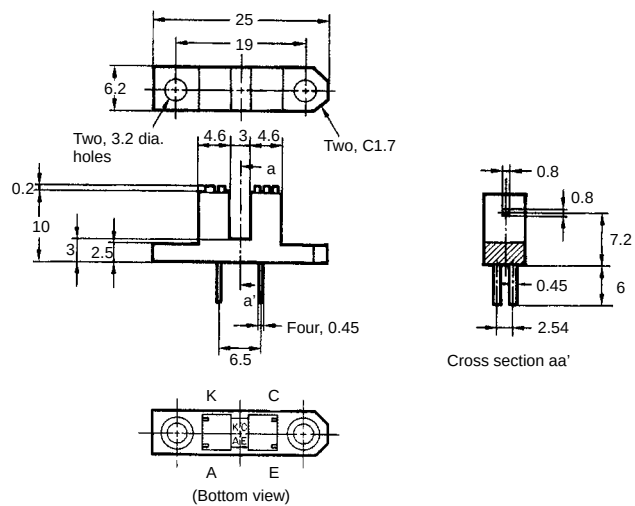
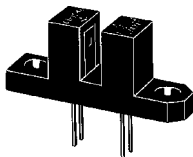


| Terminal No. | Name      |
|--------------|-----------|
| A            | Anode     |
| K            | Cathode   |
| C            | Collector |
| E            | Emitter   |

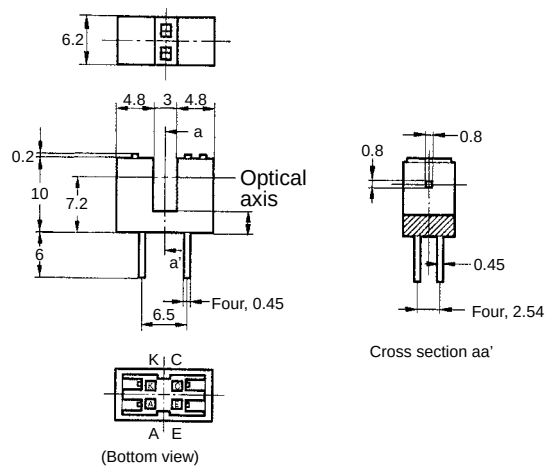
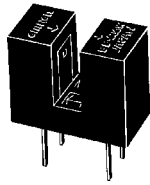
## ■ EE-SM3



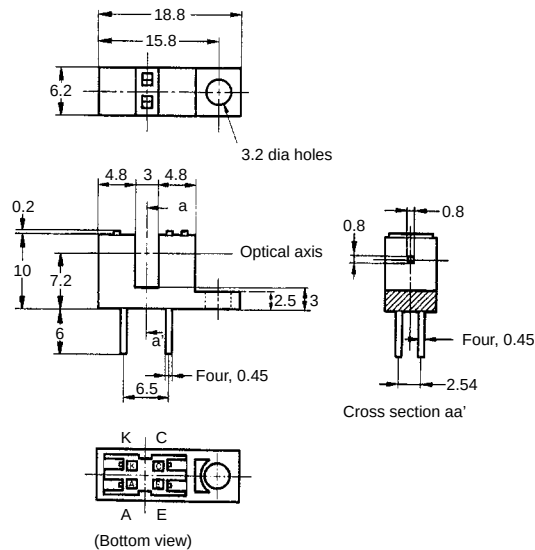
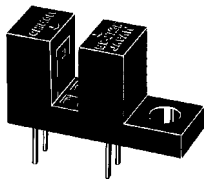
## ■ EE-SM3B



## ■ EE-SJ3W-B



## ■ EE-SK3W-B



## Precautions

Refer to the Technical Information Section for general precautions.

**NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.**

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