# SFH690AT/690BT/690ABT

## Phototransistor Optocoupler
## Miniflat SOP Package

### FFEATURES

- **Current Transfer Ratios**
  - **SFH690AT, 50%–150%**
  - **SFH690BT, 100%–300%**
  - **SFH690ABT, 50%–300%**
- **SOP (Small Outline Package)**
- **Isolation Test Voltage, 3750 $V_{RMS}$ (1.0 s)**
- **High Collector-Emitter Breakdown Voltage, $V_{CEO}$=70 V**
- **Low Saturation Voltage**
- **Fast Switching Times**
- **Field-Effect Stable by TRIOS (TRansparent IOn Shield)**
- **Temperature Stable**
- **Low Coupling Capacitance**
- **End-Stackable, .100" (2.54 mm) Spacing**
- **Underwriters Lab File #52744**

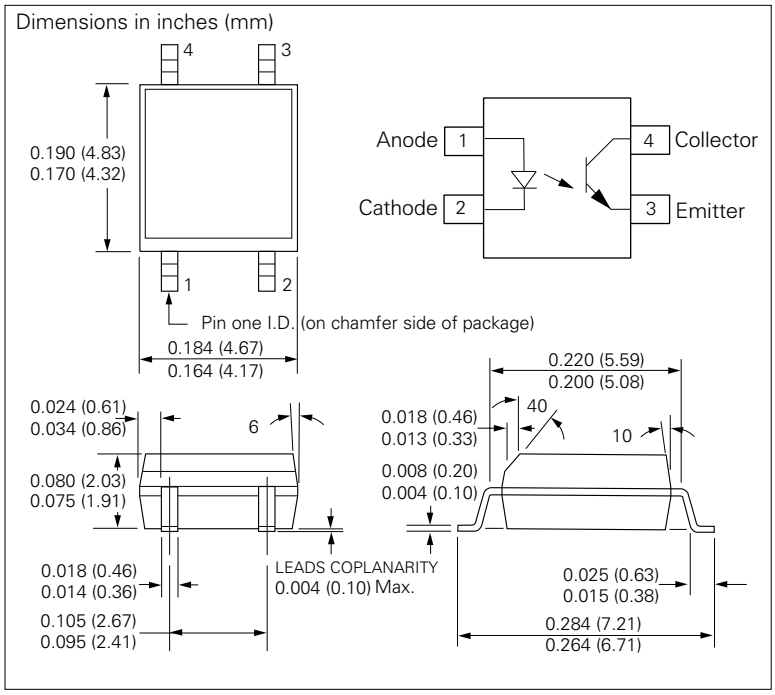
### APPLICATIONS

- **High density mounting or space sensitive PCBs**
- **PLCs**
- **Telecommunication**

### DESCRIPTION

The SFH690xT family has a GaAs infrared emitting diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a 4 pin 100 mil lead pitch miniflat package. It features a high current transfer ratio, low coupling capacitance, and high isolation voltage.

The coupling devices are designed for signal transmission between two electrically separated circuits.
The SFH690xT will be offered in tape and reel format only. There are 2000 parts per reel. For the SFH690AT, the product will be marked as SFH690A and the SFH690BT will be marked as SFH690B. The SFH690ABT will be marked as SFH690A or SFH690B.




**Absolute Maximum Ratings,** $T_A$=25°C (except where noted)

**Emitter**

| | |
|---|---|
| Reverse Voltage | 6.0 V |
| DC Forward Current | 50 mA |
| Surge Forward Current ($t_P$≤10 µs) | 2.5 A |
| Total Power Dissipation | 80 mW |

**Detector**

| | |
|---|---|
| Collector-Emitter Voltage | 70 V |
| Emitter-Collector Voltage | 7.0 V |
| Collector Current | 50 mA |
| Collector Current ($t_P$≤1.0 ms) | 100 mA |
| Total Power Dissipation | 150 mW |

**Package**

| | |
|---|---|
| Isolation Test Voltage between Emitter and Detector (1.0 s) | 3750 $V_{RMS}$ |
| Creepage | ≥5.33 mm |
| Clearance | ≥5.08 mm |
| Insulation Thickness between Emitter and Detector | ≥0.4 mm |
| Comparative Tracking Index per DIN IEC 112/VDE0 303, part 1 | ≥175 |
| Isolation Resistance | |
| $V_{IO}$=500 V, $T_A$=25°C | ≥$10^{12}$ Ω |
| $V_{IO}$=500 V, $T_A$=100°C | ≥$10^{11}$ Ω |
| Storage Temperature Range | –55 to +150°C |
| Ambient Temperature Range | –55 to +100°C |
| Junction Temperature | 100°C |
| Soldering Temperature (max. 10 s Dip Soldering Distance to Seating Plane ≥1.5 mm) | 260°C |

**Table 1. Electrical Characteristics,** $T_A$=25°C (except where noted)

| Description | Symbol | Min. | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| **Emitter (IR GaAs)** | | | | | | |
| Forward Voltage | $V_F$ | — | 1.15 | 1.4 | V | $I_F$=5 mA |
| Reverse Current | $I_R$ | — | 0.01 | 10 | µA | $V_R$=6.0 V |
| Capacitance | $C_0$ | — | 14 | — | pF | $V_R$=0.0 V, f=1.0 MHz |
| Thermal Resistance | $R_{thJA}$ | — | 750 | — | K/W | — |
| **Detector (Si Phototransistor)** | | | | | | |
| Leakage Current, Collector-emitter | $I_{CEO}$ | — | — | 100 | nA | $V_{CE}$=20 V |
| Capacitance | $C_{CE}$ | — | 2.8 | — | pF | $V_{CE}$=5.0 V, f=1.0 MHz |
| Thermal Resistance | $R_{thJA}$ | — | 500 | — | K/W | — |
| **Package** | | | | | | |
| Collector-emitter Saturation Voltage | $V_{CESAT}$ | — | 0.1 | 0.3 | V | $I_F$=10 mA, $I_C$=2.0 mA |
| Coupling Capacitance | $C_C$ | — | 0.3 | — | pF | f=1.0 MHz |

**Table 2. Current Transfer Ratio ($I_C/I_F$ at $V_{CE}$=5.0 V)**

| Description | A | B | AB |
|---|---|---|---|
| $I_C/I_F$ ($I_F$=5.0 mA) | 50 to 150% | 100 to 300% | 50 to 300% |

## Switching Times (Typical)

**Figure 1. Switching Operation** (without saturation)

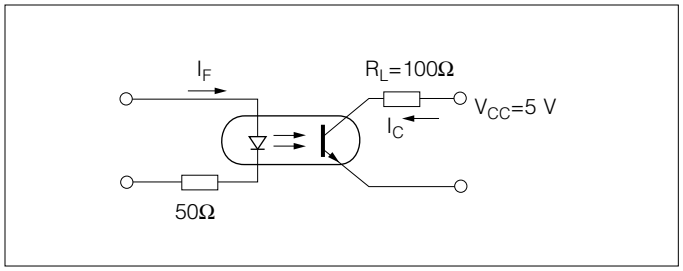



**Table 3. Switching Times**
**$I_C$=2.0 mA, $V_{CC}$=5.0 V, $T_A$=25°C**

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Load Resistance | $R_L$ | 100 | Ω |
| Rise Time | $t_R$ | 3.0 | µs |
| Fall Time | $t_F$ | 4.0 | |
| Turn on Time | $t_{ON}$ | 5.0 | |
| Turn off Time | $t_{OFF}$ | 3.0 | |

**Figure 2. Diode Forward Voltage vs. Forward Current**

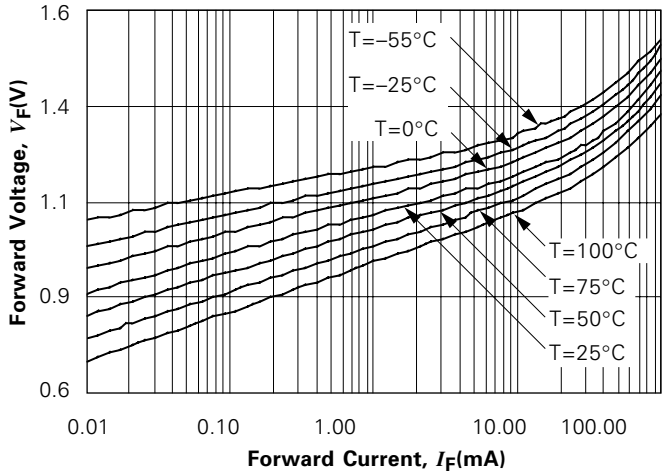



**Figure 3. Collector Current vs. Collector Emitter Voltage**

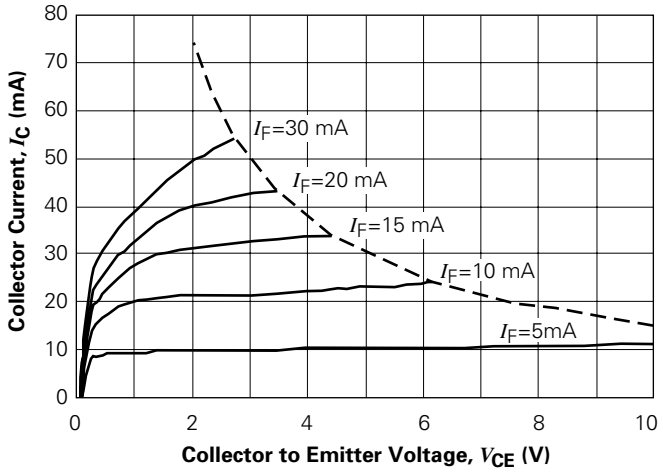



**Figure 4. Collector to Emitter Dark Current vs. Ambient Temperature**

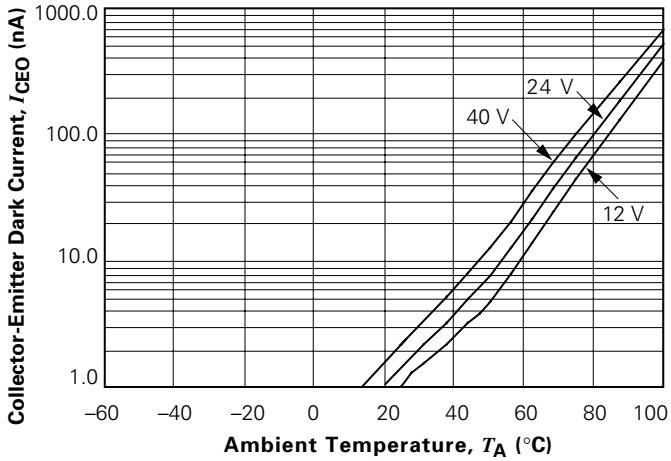



**Figure 5. Collector Current vs. Collector-Emitter Saturation Voltage**

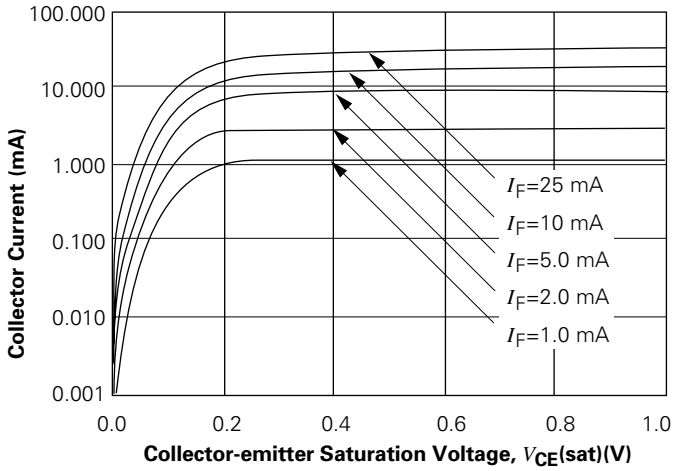



**Figure 6. Normalized Output Current vs. Ambient Temperature**

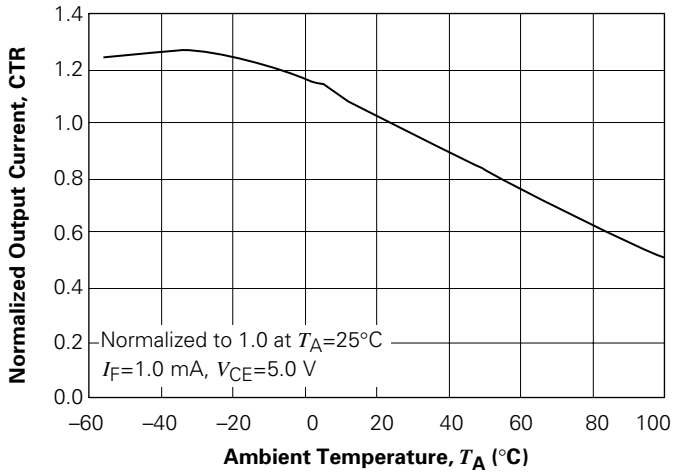



**Figure 7. Normalized Output Current vs. Ambient Temperature**

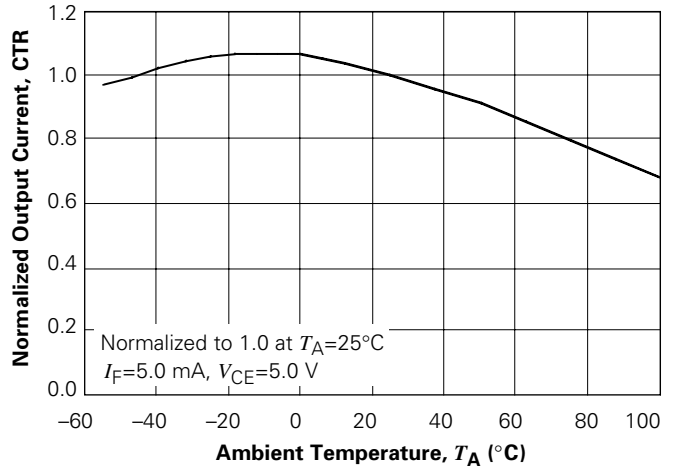


**Figure 8. Current Transfer Ratio vs. Forward Current**

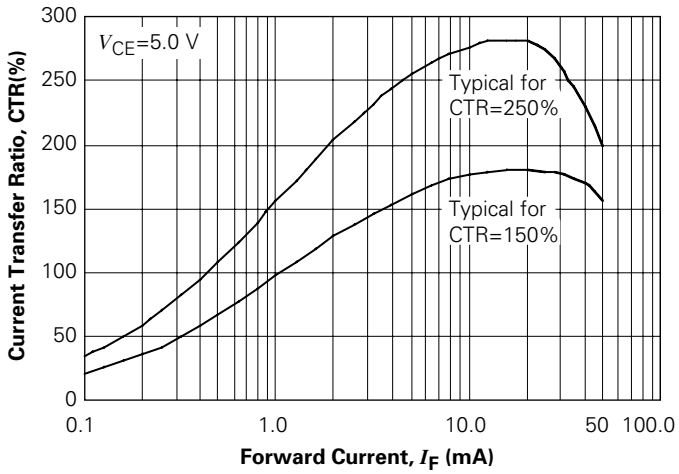



**Figure 9. Switching Time vs. Load Resistance**

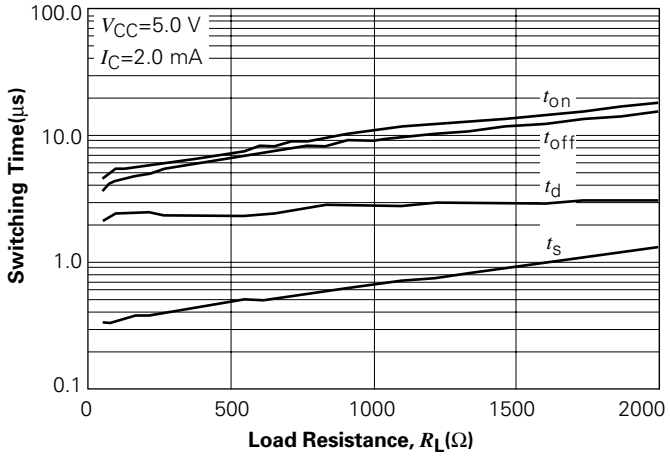



**Figure 10. Switching Time vs. Load Resistance**