

### FEATURES

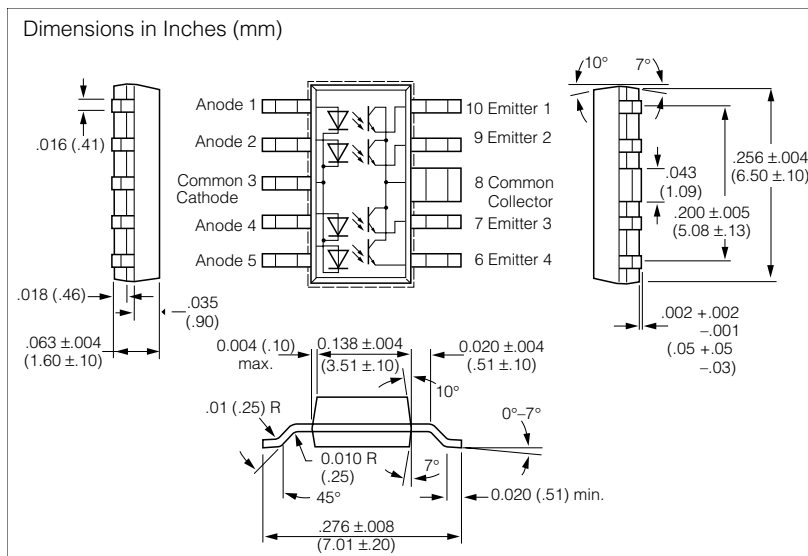
- Transistor Optocoupler in SOT223/10 Package
- End Stackable, 1.27 mm Spacing
- Low Current Input
- Very High CTR, 150% Typical at  $I_F=1$  mA,  $V_{CE}=5$  V
- Good CTR Linearity Versus Forward Current
- Minor CTR Degradation
- Field Effect Stable by TRIOS® (TRansparent IOn Shield)
- High Collector-Emitter Voltage,  $V_{CEO}=70$  V
- Low Coupling Capacitance
- High Common Mode Transient Immunity
- Isolation Test Voltage: 1768 V<sub>RMS</sub>

### APPLICATIONS

- Telecommunication
- SMT
- PCMCIA
- Instrumentation

### DESCRIPTION

The SFH6943 is a four channel mini-optocoupler suitable for high density packaged PCB application. It has a minimum of 1768 V<sub>RMS</sub> isolation from input to output. The device consists of four phototransistors as detectors. Each channel is individually controlled. The optocoupler is housed in a SOT223/10 package. All the cathodes of the input LEDs and all the collectors of the output transistors are commoned enabling a pin count reduction from 16 pins to 10 pins—a significant space savings as compared to four channels that are electrically isolated individually.



### Absolute Maximum Ratings

#### Emitter(GaAlAs)

|                                                |        |
|------------------------------------------------|--------|
| Reverse Voltage                                | .3 V   |
| DC Forward Current                             | 5 mA   |
| Surge Forward Current ( $t_P \leq 10$ $\mu$ s) | 100 mA |
| Total Power Dissipation                        | 10 mW  |

#### Detector (Si Phototransistor)

|                                         |       |
|-----------------------------------------|-------|
| Collector-Emitter Voltage               | .70 V |
| Emitter-Collector Voltage               | .7 V  |
| Collector Current                       | 10 mA |
| Surge Collector Current ( $t_P < 1$ ms) | 20 mA |
| Total Power Dissipation                 | 20 mW |

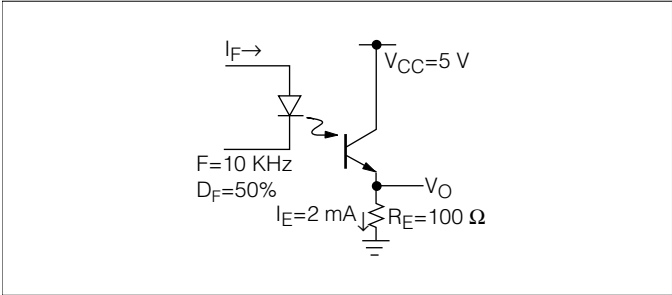
### Package Insulation

|                                                                                                                |                         |
|----------------------------------------------------------------------------------------------------------------|-------------------------|
| Isolation Test Voltage (between emitter and detector, refer to climate DIN 40046, part 2, Nov. 74), $t=1$ sec. | 1768 V <sub>RMS</sub>   |
| Creepage                                                                                                       | $\geq 4$ mm             |
| Clearance                                                                                                      | $\geq 4$ mm             |
| Comparative Tracking Index per DIN IEC 112/VDE0303, part 1                                                     | 175                     |
| Isolation Resistance                                                                                           |                         |
| $V_{IO}=100$ V, $T_A=25^\circ\text{C}$                                                                         | $\geq 10^{11}$ $\Omega$ |
| $V_{IO}=100$ V, $T_A=100^\circ\text{C}$                                                                        | $\geq 10^{10}$ $\Omega$ |
| Storage Temperature Range                                                                                      | -55 to +150°C           |
| Ambient Temperature Range                                                                                      | -55 to +100°C           |
| Junction Temperature                                                                                           | 100°C                   |
| Soldering Temperature ( $t=10$ sec. max.)                                                                      |                         |
| Dip soldering plus reflow soldering processes                                                                  | 260°C                   |

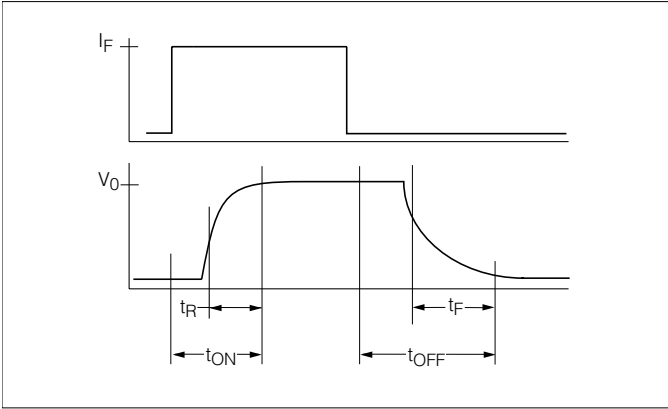
**Characteristics** ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

| Description                                               | Symbol     | Min.                   | Typ.                   | Max.                   | Unit          |                                           |
|-----------------------------------------------------------|------------|------------------------|------------------------|------------------------|---------------|-------------------------------------------|
| <b>Emitter (IR GaAs)</b>                                  |            |                        |                        |                        |               |                                           |
| Forward Voltage, $I_F=5\text{ mA}$                        | $V_F$      | —                      | 1.25                   | —                      | V             |                                           |
| Reverse Current, $V_R=3\text{ V}$                         | $I_R$      | —                      | 0.01                   | 10                     | $\mu\text{A}$ |                                           |
| Capacitance, $V_R=0\text{ V}$ , $f=1\text{ MHz}$          | $C_0$      | —                      | 5                      | —                      | pF            |                                           |
| Thermal Resistance                                        | $R_{thJA}$ | —                      | 1000                   | —                      | K/W           |                                           |
| <b>Detector (Si Phototransistor)</b>                      |            |                        |                        |                        |               |                                           |
| Collector-Emitter Voltage, $I_{CE}=10\text{ }\mu\text{A}$ | $V_{CEO}$  | 70                     | —                      | —                      | V             |                                           |
| Emitter-Collector Voltage, $I_{EC}=10\text{ }\mu\text{A}$ | $V_{ECO}$  | 7                      | —                      | —                      | V             |                                           |
| Capacitance, $V_{CE}=5\text{ V}$ , $f=1\text{ MHz}$       | $C_{CE}$   | —                      | 6                      | —                      | pF            |                                           |
| Thermal Resistance                                        | $R_{thJA}$ | —                      | 500                    | —                      | K/W           |                                           |
| <b>Package</b>                                            |            |                        |                        |                        |               |                                           |
| Coupling Capacitance                                      | $C_C$      | —                      | 1                      | —                      | pF            |                                           |
| Description                                               | Symbol     | -2                     | -3                     | -4                     | Unit          | Condition                                 |
| Coupling Transfer Ratio                                   | $I_E/I_F$  | 63–200                 | 100–320                | 160–500                | %             | $I_F=1\text{ mA}$ , $V_{CE}=1.5\text{ V}$ |
| Coupling Transfer Ratio                                   | $I_E/I_F$  | typ, 100 ( $\geq 32$ ) | typ, 160 ( $\geq 50$ ) | typ, 250 ( $\geq 80$ ) | %             | $I_F=0.5\text{ mA}$ , $V_{CC}=5\text{ V}$ |
| Collector-Emitter Leakage Current                         | $I_{CEO}$  | 50                     | 50                     | 50                     | nA            | $V_{CE}=10\text{ V}$                      |

**Figure 1. Switching times (non-saturated), typical**

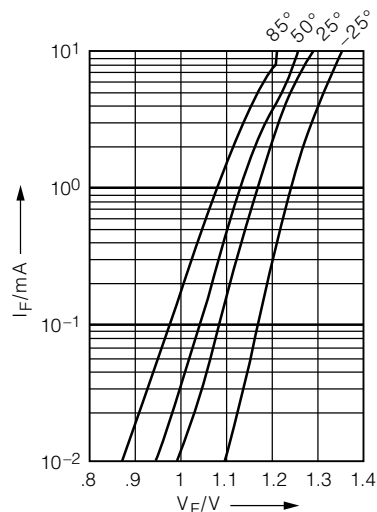


**Figure 2. Switching waveform (non-saturated)**

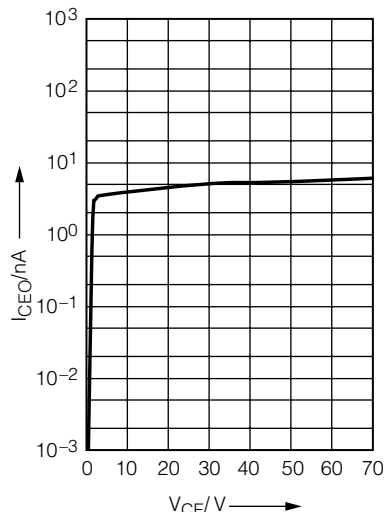


| Description   | Symbol    | Value | Unit          | Test Conditions                                                                                 |
|---------------|-----------|-------|---------------|-------------------------------------------------------------------------------------------------|
| Turn-on Time  | $t_{on}$  | 3     | $\mu\text{s}$ | $I_E=2\text{ mA}$<br>$R_E=100\text{ }\Omega$<br>$T_A=25^{\circ}\text{C}$<br>$V_{CC}=5\text{ V}$ |
| Rise Time     | $t_r$     | 2.6   |               |                                                                                                 |
| Turn-off Time | $t_{off}$ | 3.1   |               |                                                                                                 |
| Fall Time     | $t_f$     | 2.8   |               |                                                                                                 |

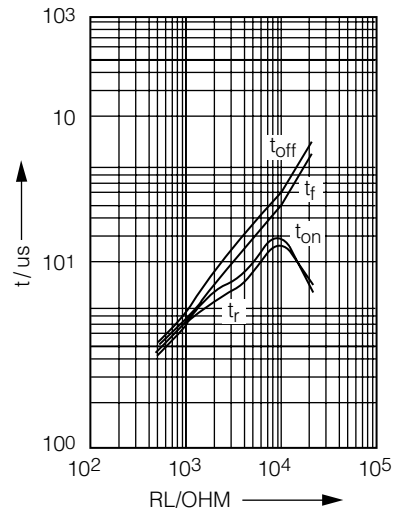
**Figure 3. LED current versus LED voltage  $V_F=f(I_F)$**



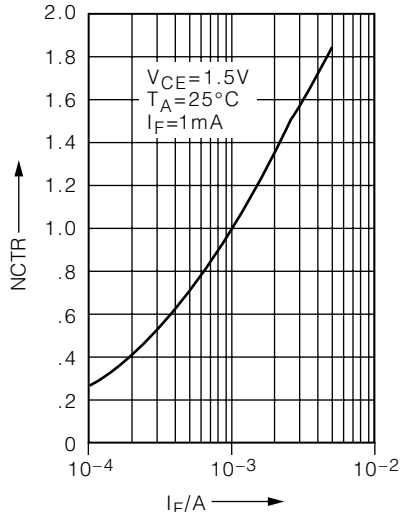
**Figure 6. Collector-emitter leakage current (typ.)  $I_F=0$ ,  $T_A=25^\circ\text{C}$ ,  $I_{CEO}=f(V_{CE})$**



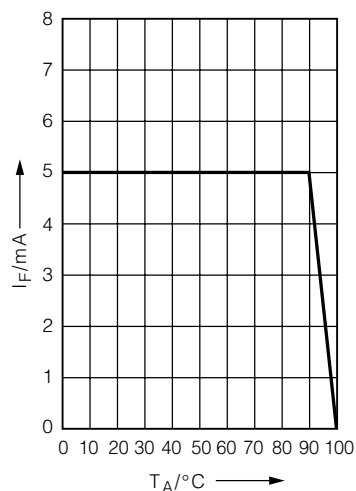
**Figure 9.  $T_A=25^\circ\text{C}$ ,  $I_F=1\text{ mA}$ ,  $V_{CC}=5\text{ V}$ ,  $t_{on}$ ,  $t_r$ ,  $t_{off}$ ,  $t_t=f(R_L)$**



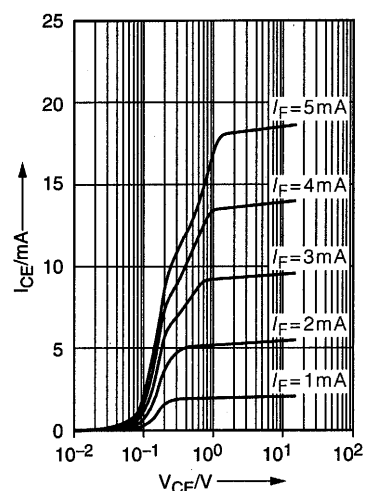
**Figure 4. Non-saturated current transfer normalized to  $I_F=1\text{ mA}$ ,  $NCTR=f(I_F)$**



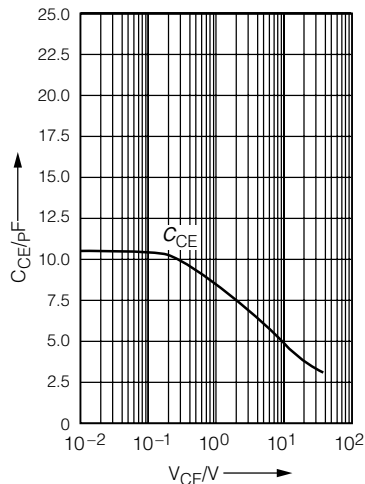
**Figure 7. Permissible forward current diode  $I_F=f(T_A=25^\circ\text{C})$**



**Figure 10. Transistor output characteristics  $T_A=25^\circ\text{C}$ ,  $I_{CE}=1$  ( $V_{CE}$ ,  $I_F$ )**



**Figure 5. Transistor capacitance (typ.)  $T_A=25^\circ\text{C}$ ,  $f=1\text{MHz}$ ,  $C_{CE}=f(V_{CE})$**



**Figure 8. Permissible power dissipation  $P_{tot}=f(T_A)$**

