SFH6943
Low Current Input Mini Optocoupler

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 \( V_{RMS} \)

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 \( V_{RMS} \) 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 (\( t_p \leq 10 \) µs): 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 \( V_{RMS} \)
- Creepage: ≥ 4 mm
- Clearance: ≥ 4 mm
- Comparative Tracking Index per DIN IEC 112/VDE0303, part 1: 175
- Isolation Resistance
  - \( V_{IO} = 100 \) V, \( T_A = 25^\circ C \): ≥ \( 10^{11} \) Ω
  - \( V_{IO} = 100 \) V, \( T_A = 100^\circ C \): ≥ \( 10^{10} \) Ω
- 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 ($T_A=25^\circ C$, unless otherwise specified)

<table>
<thead>
<tr>
<th>Description</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
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<tbody>
<tr>
<td><strong>Emitter (IR GaAs)</strong></td>
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<tr>
<td>Forward Voltage, $I_E=5$ mA</td>
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<td>V</td>
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<td>µA</td>
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<td>pF</td>
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<td>—</td>
<td>K/W</td>
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<tr>
<td><strong>Detector (Si Phototransistor)</strong></td>
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<td>Collector-Emitter Voltage, $I_CE=10$ µA</td>
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<td>pF</td>
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<tr>
<td>Thermal Resistance</td>
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<td>—</td>
<td>K/W</td>
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<td>Coupling Capacitance</td>
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<td>pF</td>
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<table>
<thead>
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<th>Description</th>
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<th>Conditions</th>
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<tr>
<td><strong>Description</strong></td>
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<td>Test Conditions</td>
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<td>Turn-on Time</td>
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<td>Fall Time</td>
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<td>2.8</td>
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<td>$I_E=0.5$ mA, $V_{CC}=5$ V</td>
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</table>

![Figure 1. Switching times (non-saturated), typical](image1)

![Figure 2. Switching waveform (non-saturated)](image2)
Figure 3. LED current versus LED voltage $V_F=f(I_F)$

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

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

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

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

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

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

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