SFH610A/615A/617A
5.3 kV TRIOS® Optocoupler
High Reliability

FEATURES
• High Current Transfer Ratios
  at 10 mA: 40–320%
  at 1.0 mA: 60% typical (>13)
• Low CTR Degradation
• Good CTR Linearity Depending on Forward Current
• Withstand Test Voltage, 5300 V_RMS
• High Collector-Emitter Voltage, V_{CE0}=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
• High Common-Mode Interference Immunity
  (Unconnected Base)
• Underwriters Lab File #52744
• VDE 0884 Available with Option 1
• SMD Option – See SFH6106/16/56 Data Sheet

DESCRIPTION
The SFH61XA features a high current transfer ratio, low
coupling capacitance and high isolation voltage. These
couplers have a GaAs infrared emitting diode emitter,
which is optically coupled to a silicon planar phototransis-
tor detector, and is incorporated in a plastic DIP-4
package.

The coupling devices are designed for signal transmission
between two electrically separated circuits.
The couplers are end-stackable with 2.54 mm spacing.
Creepage and clearance distances of >8 mm are
achieved with option 6. This version complies with IEC 950
(DIN VDE 0805) for reinforced insulation up to an opera-
tion voltage of 400 V_RMS or DC.
Specifications subject to change.

Maximum Ratings
Emitter
Reverse Voltage.................................................................6 V
DC Forward Current.............................................................60 mA
Surge Forward Current (t_P≤10 µs)....................................2.5 A
Total Power Dissipation.......................................................100 mW

Detector
Collector-Emitter Voltage ..................................................70 V
Emitter-Collector Voltage.....................................................7 V
Collector Current (t_P≤10 µs)..........................50 mA
Collector Current (t_P≤1 ms)...........................100 mA
Total Power Dissipation.......................................................150 mW

Package
Isolation Test Voltage between Emitter and Detector,
referring to Climate DIN 40046, part 2, Nov. 74.........5300 V_RMS
Creepage..............................................................................≥7 mm
Clearance..........................................................................≥2 mm
Insulation Thickness between Emitter and Detector ......≥0.4 mm
Comparative Tracking Index
  per DIN IEC 112/VDE0 303, part 1.................................≥175
Isolation Resistance
  \( V_{IO}=500 \text{ V}, T_A=25^\circ \text{C} \).............................................≥10^{12} \text{ Ω}
  \( V_{IO}=500 \text{ V}, T_A=100^\circ \text{C} \).............................................≥10^{11} \text{ 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

Dimensions in Inches (mm)

SFH610A

SFH615A/617A

Dimensions in Inches (mm)
Characteristics ($T_A=25^\circ C$)

<table>
<thead>
<tr>
<th>Description</th>
<th>Symbol</th>
<th>Unit</th>
<th>Condition</th>
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</thead>
<tbody>
<tr>
<td>Emitter (IR GaAs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward Voltage</td>
<td>$V_F$</td>
<td>1.25 ($\leq 1.65$) V</td>
<td>$I_F=60$ mA</td>
</tr>
<tr>
<td>Reverse Current</td>
<td>$I_R$</td>
<td>0.01 ($\leq 10$) $\mu$A</td>
<td>$V_R=6$ V</td>
</tr>
<tr>
<td>Capacitance</td>
<td>$C_0$</td>
<td>13 pF</td>
<td>$V_R=0$ V, $f=1$ MHz</td>
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<tr>
<td>Thermal Resistance</td>
<td>$R_{\text{INJA}}$</td>
<td>750 K/W</td>
<td></td>
</tr>
<tr>
<td>Detector (Si Phototransistor)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacitance</td>
<td>$C_{CE}$</td>
<td>5.2 pF</td>
<td>$V_{CE}=5$ V, $f=1$ MHz</td>
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<tr>
<td>Thermal Resistance</td>
<td>$R_{\text{INJA}}$</td>
<td>500 K/W</td>
<td></td>
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<tr>
<td>Package</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector-Emitter Saturation Voltage</td>
<td>$V_{\text{CESAT}}$</td>
<td>0.25 ($\leq 0.4$) V</td>
<td>$I_F=10$ mA, $I_C=2.5$ mA</td>
</tr>
<tr>
<td>Coupling Capacitance</td>
<td>$C_C$</td>
<td>0.4 pF</td>
<td></td>
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</tbody>
</table>

Current Transfer Ratio ($I_C/I_F$ at $V_{CE}=5$ V) and Collector-Emitter Leakage Current by Dash Number

<table>
<thead>
<tr>
<th>Description</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
<th>-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_C/I_F$ ($I_F=10$ mA)</td>
<td>40–80</td>
<td>63–125</td>
<td>100–200</td>
<td>160–320 %</td>
</tr>
<tr>
<td>$I_C/I_F$ ($I_F=1$ mA)</td>
<td>30 (&gt;13)</td>
<td>45 (&gt;22)</td>
<td>70 (&gt;34)</td>
<td>90 (&gt;56)</td>
</tr>
<tr>
<td>Collector-Emitter Leakage Current, $I_{CEO}$ $V_{CE}=10$ V</td>
<td>2 (≤50)</td>
<td>2 (≤50)</td>
<td>5 (≤100)</td>
<td>5 (≤100) nA</td>
</tr>
</tbody>
</table>

Switching Times (Typical)

Linear Operation (without saturation)

Load Resistance | $R_L$ | 75 | $\Omega$ |

Rise Time | $t_R$ | 2.0 | $\mu$s |

Fall Time | $t_F$ | 2.0 | $\mu$s |

Cut-off Frequency | $F_{CO}$ | 250 kHz |

Switching Operation (with saturation)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sym.</th>
<th>Dash No.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_F=20$ mA</td>
<td>$I_F=10$ mA</td>
<td>$I_F=5$ mA</td>
<td></td>
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<tr>
<td>Turn-on Time</td>
<td>$t_{ON}$</td>
<td>3.0</td>
<td>4.2</td>
</tr>
<tr>
<td>Rise Time</td>
<td>$t_R$</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Turn-off Time</td>
<td>$t_{OFF}$</td>
<td>18</td>
<td>23</td>
</tr>
<tr>
<td>Fall Time</td>
<td>$t_F$</td>
<td>11</td>
<td>14</td>
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</tbody>
</table>
Figure 1. Current transfer ratio (typ.) vs. temperature $I_T = 10\ mA$, $V_{CE} = 5\ V$

Figure 2. Output characteristics (typ.) Collector current vs. collector-emitter voltage $T_A = 25^\circ C$

Figure 3. Diode forward voltage (typ.) vs. forward current

Figure 4. Transistor capacitance (typ.) vs. collector-emitter voltage $T_A = 25^\circ C$, $f = 1\ MHz$

Figure 5. Permissible pulse handling capability. Forward current vs. pulse width Pulse cycle $D = $ parameter, $T_A = 25^\circ C$

Figure 6. Permissible power dissipation vs. ambient temperature

Figure 7. Permissible diode forward current vs. ambient temp.