Description
Phototransistors are photodiode-amplifier combinations integrated within a single silicon chip. These are combined to overcome the major fault of photodiodes: unity gain. Many applications demand a greater output signal from the photodetector than can be generated by a photodiode alone. While the signal from a photodiode can always be amplified through use of an external op-amp or other circuitry, this approach is often not as practical or as cost-effective as the use of phototransistors. The phototransistor can be viewed as a photodiode whose output photocurrent is fed into the base of a conventional small-signal transistor. While not required for operation of the device as a photodetector, a base connection is often provided, allowing the designer the option of using base current to bias the transistor. The typical gain of a phototransistor can range from 100 to over 1500.

Phototransistors can be used as ambient-light detectors. When used with a controllable light source, typically an IRED, they are often employed as the detector element for optoisolators and transmissive or reflective optical switches.

All phototransistors are RoHS compliant.

Features
- Low-cost visible and near-IR photodetection
- Available with gains from 100 to over 1500
- Moderately fast response times
- Available in a wide range of packages including epoxy-coated, transfer-molded, cast, hermetic packages, chip form and surface mounting technology
- Usable with almost any visible or near-infrared light source such as IREDs, neon, fluorescent, incandescent bulbs, lasers, flame sources, sunlight, etc.
- Same general electrical characteristics as familiar signal transistors

Typical Applications
- Computer/business equipment
  - Write-protect control
  - Margin controls—printers
- Industrial
  - LED light source—light pens
  - Security systems
  - Safety shields
- Consumer
  - Coin counters
  - Lottery card readers
  - Position sensors—joysticks
  - Remote controllers—toys, appliances, audio/visual equipment
  - Games—laser tag
  - Camera shutter control

Datasheets available upon request.

Absolute Maximum Ratings
- Continuous Power Dissipation:
  - 50 mW
  - 100 mW
  - 200 mW
  - 250 mW

- Derate above 30°C:
  - 0.71 mW/°C
  - 2.5 mW/°C
  - 3.12 mW/°C

- Maximum Current:
  - 25 mA
  - 200 mA

- Lead-Soldering Temperature: 260°C (1.6 mm from case, 5 sec. max.)
NPN Phototransistors

0.25”, small area, high speed
0.04”, medium area, high sensitivity
0.05”, large area, high sensitivity

Electro-Optical Characteristics @ 25°C

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Light Current</th>
<th>Dark Current</th>
<th>Collector Breakdown</th>
<th>Emitter Breakdown</th>
<th>Saturation Voltage</th>
<th>Rise/Fall Time</th>
<th>R&lt;sub&gt;L&lt;/sub&gt;/t&lt;sub&gt;F&lt;/sub&gt; Response</th>
<th>Angular Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTT1222WH</td>
<td>1.9 mA</td>
<td>0.25 V</td>
<td>3 µsec</td>
<td>40°</td>
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<tr>
<td>VTT1223WH</td>
<td>1.5 mA</td>
<td>0.25 V</td>
<td>3 µsec</td>
<td>40°</td>
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<td>2 µsec</td>
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<td>3 µsec</td>
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<td>VTT3323WH</td>
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<td>3 µsec</td>
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<td>VTT3325WH</td>
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<td>3 µsec</td>
<td>±4°</td>
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<td>5 V</td>
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</table>

Clear T-1 3/4 (5 mm) Plastic Package
VTT1212  VTT1214  VTT1223W  VTT1227
VTT122W  VTT1225
VTT1222W  VTT1226

IRT T-1 3/4 (5mm) Plastic Package
VTT1322W  VTT1312
VTT1323W  VTT1314

Coax Hermetic (with case lead)
VTT3122E  VTT3123E

Clear Long T-1 (3 mm) Plastic Package
VTT3323LA  VTT3324LA  VTT3325LA

IRT Long T-1 (3 mm) Plastic Package
VTT3423LA  VTT3424LA  VTT3425LA

Molded, Lensed Lateral Package
VTT7122  VTT7123  VTT7125

IRT Molded, Lensed Lateral Package
VTT7222  VTT7223  VTT7225

Clear Epoxy TO-106 Ceramic Package
VTT9002  VTT9003

Epoxy Lensed TO-106 Ceramic Package
VTT9102  VTT9103
.05” x .05” NPN Phototransistors

Technical Specification

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Light Current Hfc (mW/cm²)</th>
<th>Dark Current Icmax</th>
<th>Vce(SAT) Volts</th>
<th>Vbr(CEO) Volts min.</th>
<th>Vbr(ECO) Volts min.</th>
<th>Ic/If µsec, typ.</th>
<th>Angular Response θ1/2</th>
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<tbody>
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<td>100</td>
<td>10</td>
<td>30</td>
<td>4</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Electro-Optical Characteristics @ 25°C

Table Key
- \( I_C \): Light Current
- \( I_{CEO} \): Dark Current H=0
- \( V_{BR(CEO)} \): Collector Breakdown \( I_C=100 \mu A, H=0 \)
- \( V_{BR(ECO)} \): Emitter Breakdown \( I_E=100 \mu A, H=0 \)
- \( V_{CE(SAT)} \): Saturation Voltage \( I_C=1 \text{ mA}, H=400 \text{ ft} \)
- \( t_{R/F} \): Rise/Fall Time \( I_C=1 \text{ mA}, R_L=100 \Omega \)

CR10TE
- Surface mounting device
- Solid state ceramic chip
- High thermal conductivity
- Special type (CR10TE-DLF) with daylight filter on request

* All packages are listed on our website.