PerkinElmer Optoelectronics has been a leading manufacturer of analog optical isolators (AOI) for over twenty years and makes a broad range of standard parts under its trademark VACTROL®.

There are many kinds of optical isolators, but the most common is the LED/phototransistor type. Other familiar types use output elements such as light-sensitive SCRs, Triacs, FETs and ICs. The major application for these silicon-based devices is to provide electrical isolation of digital lines connected between different pieces of equipment. The principle of operation is very simple. When an input current is applied to the LED, the output phototransistor turns on. The only connection between the LED and phototransistor is through light—not electricity—thus the term optical isolator. These optical isolators are primarily digital in nature with fast response times for interfacing with logic gates. Rise and fall times of a few microseconds, faster for some isolators, are typical.

The AOI also uses an optical link between input and output. The input element is an LED and the output element is always a photoconductive cell or, simply a photocell. Together, the coupled pair act as an electrically variable potentiometer. Since the output element of the AOI is a resistor, the voltage applied to this output resistor may be DC and/or AC and the magnitude may be as low as zero or as high as the maximum voltage rating. Because the input will control the magnitude of a complex waveform in a proportional manner, this type of isolator is an analog-control element. AOIs may be used in the ON-OFF mode but the fastest response time is only in the millisecond range. A level-sensitive Schmitt trigger is required between the AOI and logic gates when used in digital circuits.

### Features
- High input-to-output voltage isolation
- True resistance element output
- Single- or dual-element outputs available
- Low cost
- Suitable for AC or DC use
- Wide range of input-to-output characteristics
- Low drive current
- Low “on” resistance, high “off” resistance
- Complete solid-state construction

### Typical Applications
- DC Isolators
- Feedback Elements in Automatic Gain Control Circuits
- Audio Limiting and Compression
- Noiseless Switching
- Logic Interfacing
- Remote Gain Control for Amplifiers
- Photochoppers
- Noiseless Potentiometers

### Principle of Operation
Analog Optical Isolators are used in many different types of circuits and applications.

### Available Related Products
- VTL5C Series
- LT3011 Series
- LT9900 Series

Datasheets available upon request

### Absolute Maximum Ratings @ 25°C
- **Maximum Temperatures**
  - Storage and Operating: –40°C to 75°C
  - Cell Power: 175 mW
  - Derate Above 30°C: 3.9 mW/°C
  - LED Current: 40 mA
  - Derate Above 30°C: 0.9 mA/°C
  - LED Reverse Breakdown Voltage: 3.0 V
  - LED Forward Voltage Drop @ 20 mA: 2.0 V (1.65 V Typ.)
    - VTL5C8 = 2.8 V (2.2 V typ.)
    - VTL5C9 = 2.8 V (2.2 V typ.)
    - VTL5C10 = 2.8 V (2.2 V typ.)
- **Minimum Isolation Voltage @ 70% Rel. Humidity**: 2500 VRMS
- **Output Cell Capacitance**: 5.0 pF
- **Input/Output Coupling Capacitance**: 0.5 pF
Analog Optical Isolators—
VTLS5 Series

PerkinElmer Optoelectronics’ line of AOIs consists of a light-tight package which houses a light source and one or more photoconductive cells. Through control of the input current or voltage applied to the AOI, the output resistance can be varied. The output resistance can be made to switch between an “on” and “off” state or made to track the input signal in an analog manner. Because a small change in input signal can cause a large change in output resistance, AOIs have been found to provide a very economical and technically superior solution for many applications.

VTLS5C Series

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<th>Technical Specification</th>
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Specification Notes

LED Current: Since the input has a substantially constant voltage drop, a current-limiting resistance is required.

ON Resistance: Dark adapted resistance measured after 24 or more hours of no input.

OFF Resistance: Measured 10 sec. after removal of the input. The ultimate resistance is many times greater than the value at 10 sec.

Response Time: Ascent measured to 63% of final conductance from the application of 40 mA input. The conductance rise time to a specified value is increased at reduced input drive while the conductance decay time to a specified value is decreased. Typical matching and tracking from 0.4 to 40 mA is 25%.

All readings taken at standard light A (2854 K color temperature) after 2 hours of preillumination at 500 lux.

LT Series Key

R1mA Output Resistance at If=1 mA
R20mA Output Resistance at If=20 mA
R01 Dark Resistance after 1 sec (If=0)
R05 Dark Resistance after 5 sec (If=0)
Top Operating Temperature Range
Tst Storage Temperature Range
Vi Input/Output Insulation Voltage
TC Module Thermal Coefficient
Ton Rise Time to 63% of final R20
Toff Decay Time to 37% of initial R20
Ca Output Capacity
Vmax Operating Voltage at If=0
Pmax Output Power Dissipation at 25°C

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