
Technical Application Note TAN2005004

Buffering a GPIO pin strobe output signal using an optocoupler to drive external devices
Revised July 10, 2008

1.1. Subject

Technical Application Note (TAN2005004): Buffering a GPIO pin strobe output signal using an optocoupler to drive external devices.

1.2. Applicable Product(s)

This TAN applies to all PGR Imaging Products that implement general purpose input/output (GPIO) functionality and the ability to output a strobe pulse. This includes:

- *Flea* (all models)
- *Scorpion* (all models)
- *Dragonfly* (all models)
- *Dragonfly Express* (all models)

1.3. Application Note Description

The purpose of this Technical Application Note is to provide the user with the ability to drive an external device, such as a strobe light, LED, or other apparatus, that requires more power or voltage than the Applicable Product's GPIO pins are capable of generating.

For example, the *Flea* GPIO pins are TTL 3.3V pins protected by two diodes to +3.3V and GND in parallel. The pins have almost no drive strength (less than 1mA), and are therefore unable to trigger many external devices, such as the X-Strobe™ strobe described here:

<http://optoelectronics.perkinelmer.com/content/RelatedLinks/xstrobemanual.pdf>

In order to trigger such a device, which requires a +5V TTL pulse and 20mA of current, the signal off the GPIO pins must be buffered with a transistor or driver, such as an optocoupler, to lower the impedance. This TAN describes alternatives for users who wish to:

1. Purchase an off-the-shelf optocoupler solution; or
2. Build their own optocoupler circuit.

1.3.1. General Considerations

1.3.1.1. General Purpose Input/Output Pins

The Applicable Product(s) is/are equipped with a set of general purpose input/output (GPIO) pins that can be accessed via the GPIO connector on the back of the camera. Different products may use

different connectors; consult your camera's *Technical Reference* or *Getting Started* manual for part numbers and specifications, GPIO connector pin layouts, and GPIO electrical characteristics.

1.3.1.2. Testing Tools

To configure and test the information presented in this TAN:

1. **Connect the camera's GPIO pins to an oscilloscope or external device.** External devices can include an external light source or LED or other device that can be triggered. By connecting the appropriate GPIO pins to an external device or oscilloscope, you can verify that the camera is outputting a strobe pulse of the correct delay, duration and pattern. Consult your camera's *Technical Reference* or *Getting Started* manual for:
 - a. GPIO connector pin layouts; and
 - b. GPIO electrical characteristics.
2. **Access the camera's register space.** The easiest way to try this is using the FlyCap demo software included with the *PGR FlyCapture SDK*. For register definitions and individual bit descriptions, please refer to the "Strobe Signal Output Registers" section of the *PGR IEEE-1394 Digital Camera Register Reference*. The latest versions of PGR FlyCapture and the Register Reference can be downloaded from <http://www.ptgrey.com/support/downloads/>.

1.3.2. Related Technical Application Notes

- TAN2005002: Setting a GPIO pin to strobe using DCAM 1.31 Strobe Signal Output registers.

1.3.3. Buffering GPIO Output

1.3.3.1. Buying an Off-the-Shelf Solution

An optocoupler with a buffered input, such as a Fairchild H11L1-M, may work for a variety of situations. This part can be found at:

<http://www.fairchildsemi.com/pf/H1/H11L1-M.html>

See the figure below for an example test circuit, showing a PGR *Flea* connected to the Fairchild H11L1-M, which is connected in turn to an LED.

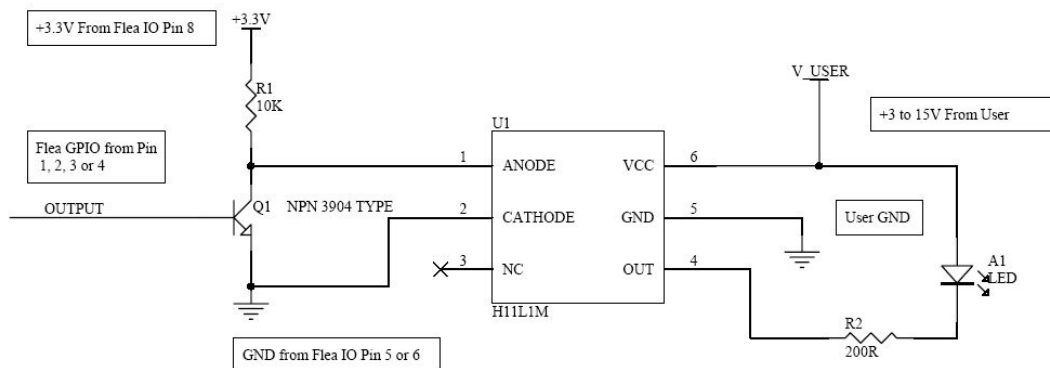


Figure 1: Fairchild H11L1-M Test Circuit for PGR Flea Camera

1.3.3.2. Building a Circuit (Advanced Users)

For users with electronics or electrical engineering knowledge who wish to build their own circuit to attach to (for example) an LED:

1. Obtain a general purpose NPN transistor (for example, a 3904 type).
2. Connect the base to the GPIO line, the emitter to ground, and the collector to the cathode of the LED in the optoisolator.
3. The anode of the LED should be connected to +3.3V in series with an appropriate current limiting resistor (100 ohms for 33mA, 200 ohms for 16.5mA).

See the figure below for an example circuit diagram. In the case of the X-Strobe™ device described above, the NPN can be attached directly, since the optoisolator and resistor is internal to the strobe light.

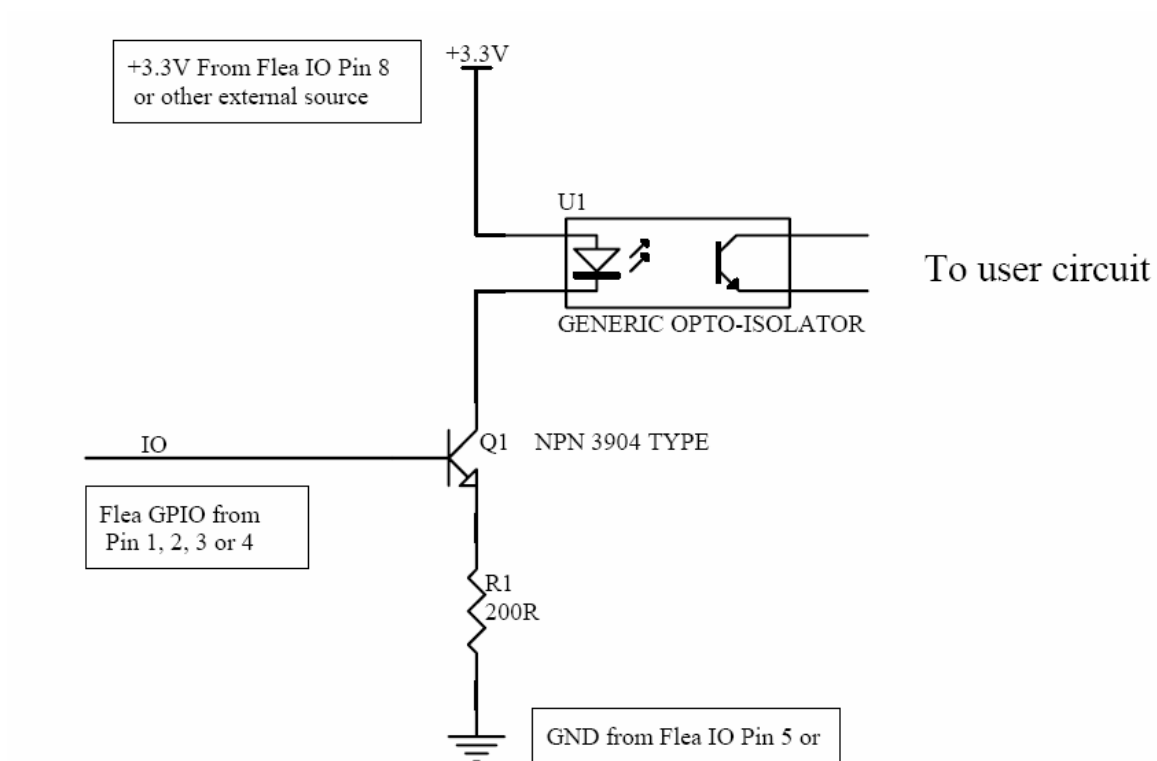


Figure 2: Example optocoupler interface for PGR Flea camera