

Technical Application Note TAN2008004

New GPIO Pin Functionality in Flea2 FL2G-xx and Ladybug3 Models
Revised September 21, 2009

1.1. Subject

Technical Application Note (TAN2008004): New GPIO Pin Functionality in Flea2 FL2G-xx and Ladybug3 Models

1.2. Applicable Product(s)

- *Flea2 FL2G-13S2M/C-C*
- *Flea2 FL2G-50S5M/C-C*
- *Ladybug3 LD3-20S4C*

1.3. Application Note Description

The purpose of this Technical Application Note is to document the new general purpose input/output (GPIO) pin functionality that is available in Flea2 FL2G-xx and Ladybug3 cameras, which includes pin opto-isolation and separated ground pins.

1.4. Overview

With the introduction of the Flea2 FL2G-13S2M/C, FL2G-50S5M/C and Ladybug3 20S4C models, the GPIO functionality has been enhanced to provide one opto-isolated input pin and one opto-isolated output pin. The opto-isolators provide protection against voltage spikes or ground loop conditions that may otherwise cause damage to the camera. It is also designed to meet industrial application requirements for +5 V to +24 V triggering and strobe, and minimize the need for external current limiting resistors.



Customers requiring four output lines (e.g. for sending a strobe pulse off each pin) will be directly affected by this change due to the presence of only 3 possible output lines (one opto-isolated, two bi-directional).

1.5. FL2G and FL2 GPIO Comparison

The following section details the similarities and differences in GPIO functionality between the new FL2G and original FL2 models.



All Flea2 FL2 and FL2G models use the same Hirose HR25-7TR-8SA female GPIO connector.

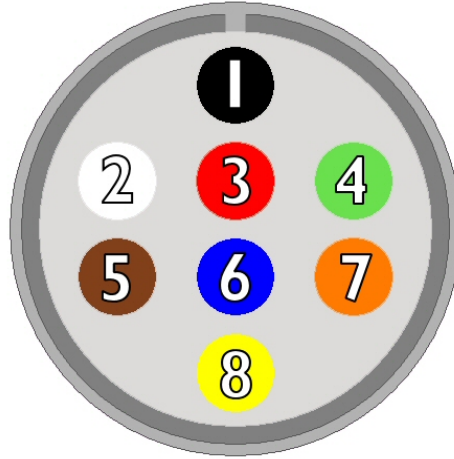


Figure 1: Hirose 8-pin connector used on FL2 and FL2G

Spec	FL2	FL2G
GPIO0 (Pin 1)	Bi-directional input/output Default direction: input Default function: trigger	Opto-isolated input (+3.3 V to +30 V) Direction: input Default function: trigger in Input delay time: 4 μ s
GPIO1 (Pin 2)	Bi-directional input/output Default direction: output	Opto-isolated open collector output (+3.3V to +30V) Direction: output Default function: strobe Drive strength: 25 mA at 30 V
GPIO2 (Pin 3)	Bi-directional input/output Default direction: output	
GPIO3 (Pin 4)	Bi-directional input/output Default direction: input	
GND (Pin 5)	Ground pin for all pins	Ground pin for bi-directional IO, V _{ext} , +3.3 V
GND (Pin 6)	Ground pin for all pins	Ground pin for opto-isolated IO pins
V _{ext} (Pin 7)	Power camera externally	
+3.3V (Pin 8)	Power external devices	

1.6. GPIO0 (Opto-Isolated Input) Circuit

The figure below shows the schematic for the opto-isolated input circuit.

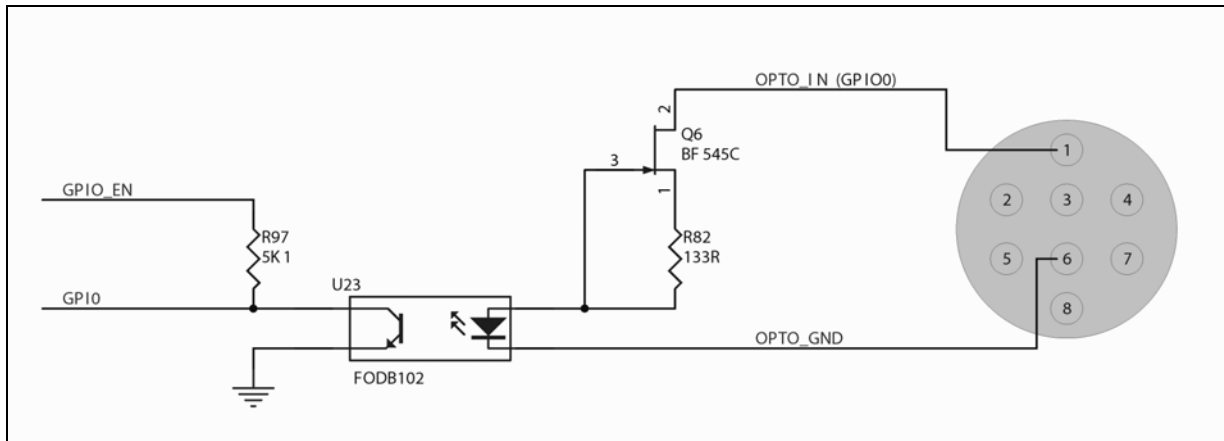


Figure 2: Optical input circuit

- Logical 0 input voltage: 0 VDC to +1 VDC (voltage at OPTO_IN)
- Logical 1 input voltage: +1.5 VDC to +30 VDC (voltage at OPTO_IN)
- Maximum input current: 8.3 mA
- Behavior between 1 VDC and 1.5 VDC is undefined and input voltages between those values should be avoided
- Input delay time: 4 μ s

1.7. GPIO1 (Opto-Isolated Output) Circuit

The figure below shows the schematic for the opto-isolated output circuit. The maximum current allowed through the opto-isolated output circuit is 25mA (limit by PTC resistor), and the output impedance is 140 Ω .

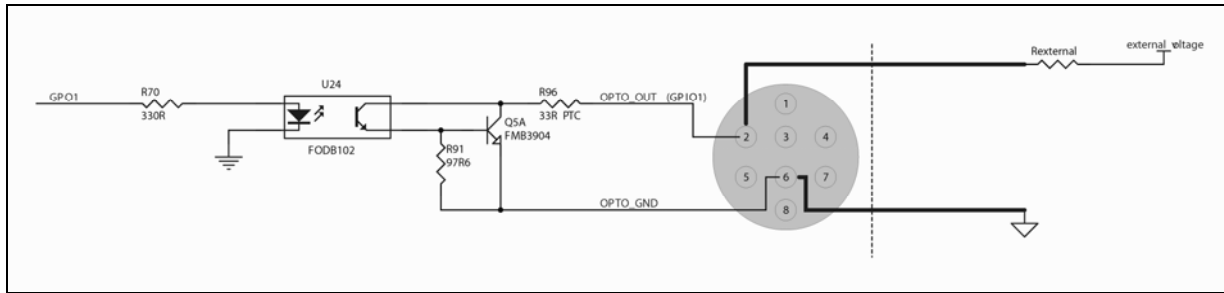


Figure 3: Optical output circuit

1.7.1.1. Response Time

The following table lists the switching times for the opto-isolator in the output pin, assuming an output VCC of 5 V and a 1 k Ω resistor.

Parameter	Value
Delay Time	9 μ s
Rise Time	16.8 μ s
Storage Time	0.52 μ s
Fall Time	2.92 μ s

1.7.1.2. Sample Voltage / Resistor Combinations

The following table lists several external voltage and resistor combinations that have been tested to work with the opto-isolated output.

External Voltage	External Resistor	OPTO_OUT Voltage	OPTO_OUT Current
3.3 V	1 k Ω	0.56 V	2.7 mA
5 V	1 k Ω	0.84 V	4.2 mA
12 V	2.4 k Ω	0.91 V	4.6 mA
24 V	4.7 k Ω	1.07 V	5.1 mA
30 V	4.7 k Ω	1.51 V	13.3 mA

1.8. GPIO2 / 3 (Bi-Directional) Circuit

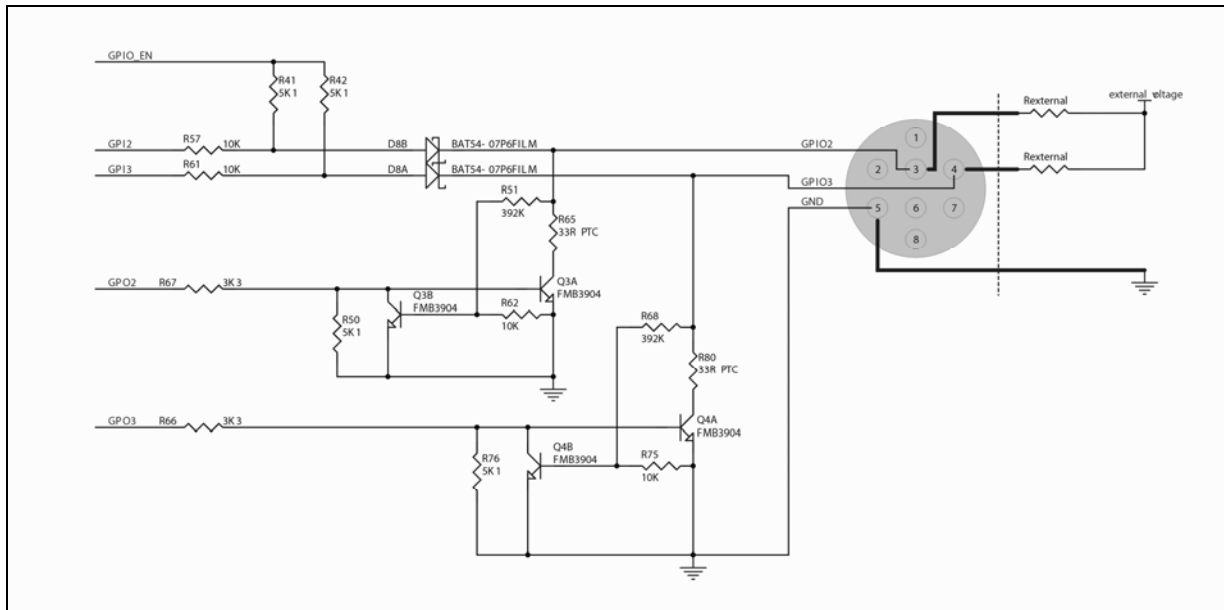


Figure 4: GPIO2 / 3 Circuit

1.8.1. Input Side

- Logical 0 input voltage: 0 VDC to +0.5 VDC (voltage at GPIO2 / 3)
- Logical 1 input voltage: +1.5 VDC to +30 VDC (voltage at GPIO2 / 3)
- Behavior between 0.5 VDC and 1.5 VDC is undefined and input voltages between those values should be avoided



To avoid damage, connect the ground (GND) pin first before applying voltage to the GPIO line.

1.8.2. Output Side

The maximum output current allowed through the bi-directional circuit is 25mA (limit by PTC resistor), and the output impedance is 40Ω.

The following table lists several external voltage and resistor combinations that have been tested to work with the bi-directional GPIO when configured as output.

External Voltage	External Resistor (R_{external})	GPIO2/3 Voltage
3.3 V	1 kΩ	0.157 V
5 V	1 kΩ	0.218 V
12 V	1 kΩ	0.46 V
24 V	1 kΩ	0.86 V
30 V	1 kΩ	0.966 V

The following table lists the switching times for a standard GPIO pin, assuming an output VCC of 5V and a 1kΩ resistor.

Parameter	Value
Delay Time	0.28 μs
Rise Time	0.06 μs
Storage Time	0.03 μs
Fall Time	0.016 μs

1.9. Additional Downloads and Support

Access more Technical Application Notes on the web at www.ptgrey.com/support/downloads.

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Product Downloads

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Contacting Technical Support

Before contacting Technical Support, have you:

1. *Read the product documentation and user manual?*
2. *Searched the Knowledge Base?*
3. *Downloaded and installed the latest version of software and/or firmware?*

If you have done all the above and still can't find an answer to your question, contact our Technical Support team at www.ptgrey.com/support/contact/.