samtec

FIRE**FLY**™
Micro Flyover System
Patented

ECUO/ECUE Series
Frequently Asked Questions

Q. What are the temperature and humidity limitations of FireFly™?

A. FireFly™ optical (ECUO Series) performance is currently guaranteed over the commercial temperature range (0°C to 70°C). Initial measurements indicate that it can be operated over the extended industrial temperature range (-40°C to 85°C range); however testing and qualification for this range is still underway. Note that operating continuously at high temperature reduces lifetime. Recommended long term continuous operating temperature is 50°C or less.

FireFly™ optical assemblies (ECUO Series) have been tested in damp heat (85°C / 85%) per the Telcordia GR-468 reliability standard; however FireFly™ optical assemblies (ECUO Series) are non-hermetic and are not suitable for wet environments and cannot be immersed.

The performance of the FireFly™ connector set (UEC5/UCC8 Series) is guaranteed over the military temperature range (-55°C to 125°C).

The copper assembly (ECUE Series) performance is guaranteed over the temperature range -25°C to 105°C.

Q. How often is the FireFly™ firmware updated, and how is this done?

A. Samtec does not have a planned schedule for the release for firmware for active products. Samtec does make periodical updates to the firmware for active products to add features or to resolve compatibility issues. To receive an automatic email providing notifications of new firmware releases, please email firmware.updates@samtec.com with the subject, "SUBSCRIBE".

Two methods of firmware upgrade within the field are available:

- Stand-alone GUI providing update via I2C interface outside the box
- In situ updating of I2C interface for field upgrades

Note, depending on the version being upgraded and feature sets required, the in situ option may not be supported.

Q. My application requires a different heatsink than what was initially ordered. How can the heatsink be removed and changed to one of the other versions?

A. FireFly™ heatsinks cannot be swapped after assembly as removal of the heatsink will damage the device. Samtec does offer multiple standard heatsinks and in addition can work to design a custom heatsink for your application.

Q. What Protocols does FireFly™ support?

A. FireFly™ optical assemblies (ECUO Series) support the common data center protocols that have been standardized to work over optics:

- Ethernet
- InfiniBand™
- Fibre Channel

In particular, FireFly™ is electrically interoperable with devices that follow the Ethernet 40 GbE standard and Infiniband QDR and FDR standards, which includes XLAUI, XLPPI, CPPI and SFI interfaces. Optically, FireFly™ operates at 850 nm and is interoperable with transceivers that follow the 10 GBASE-SR standard, including SFP+, QSFP+ and Avago MiniPod™ and MicroPod™ modules. It is also interoperable with devices that support the QDR and FDR InfiniBand™ standard, and devices supporting Fibre Channel. In addition, the SAS Optical 6G and 12G Protocol is supported. However, SAS is not supported with chipsets that do not implement the SAS optical protocol.

Other protocols will generally work as well when the following conditions are met:

- Maximum data rate is below 14.1 Gbps
- Minimum frequency content is above 100 MHz
- Balanced Signal (i.e. equal number of 1s and 0s)
- Continuous data transmission (i.e. idle packets are required)

Examples of protocols that work:

- 8B/10B or 64/66B based protocols
- Aurora

Example of protocols that will not work without some modification:

- Raw pixel streams (frequency content below 100 MHz)
- USB (low frequency burst signaling exotic during discovery)

PCIe® is a special case, and works under certain conditions. Please contact optics@samtec.com for more information.

Q. What is the warranty on Samtec's FireFly™?

A. Samtec FireFly™ connectors (UEC5/UCC8 Series) and copper assemblies (ECUE Series) are warrantied against defective workmanship for 30 days. FireFly™ optical assemblies (ECUO Series) are warrantied for 1 year.

Q. How can I obtain a FireFly™ User's Manual and other important documents related to FireFly™?

A. Please contact Firefly@samtec.com so that we can set up an account on the website where we store this information. We have chosen to host this on an external website so that customers are automatically notified of the availability of new versions.

Q. Can I add a custom optical connector to FireFly™ optical assemblies (ECUO Series)?

A. The connector and/or fiber can be customized; however we strongly recommend that this is done at the factory rather than at the customer site. All FireFly™ optical assemblies are tested prior to shipping. As a result, we do not offer FireFly™ with a bare fiber output. We do currently offer a variety of optical connectors as the standard (MTP, MXC, MT and LC terminations). In addition, we are in the process of evaluating rugged connector options.

It is always possible to cut off the connector and splice a custom connector in. However, this is not recommended because:

- Samtec cannot test the cables once new cables are added
- Fibers are often broken and mistakes are frequently made with the fiber connectivity
- This will void the warranty

Provided we can get or make patch cables with your desired connector at each end and can design a testing adapter, we usually can provide optical assemblies that meet your requirements.

Please contact us at optics@samtec.com to discuss your application further.

Q. **I am currently using a copper FireFly™ (ECUE Series). What is needed to transition to an optical FireFly™ (ECUO Series) module?**

A. There are several versions of the copper FireFly™ assembly (ECUE Series) providing two different pinouts with the option to use decoupling capacitors or not. By designing in the optical requirements with the initial design, no further design work is required to enable the seamless upgrade to optical.

To achieve this, these simple design rules should be followed:

- Design in the copper cable with the same pinout as the optical assembly (wiring -02)
- Select a copper assembly with decoupling capacitors rather than putting them on the board (also provides the benefit of saving board real estate)
- Route power and low speed signals to the UCC8 Series latching connector
- Select signaling protocol compatible with optical
    - Balanced signal
    - Continuous transmission (i.e. idle frames)
    - Minimum frequency component of 100 MHz

Q. **What fiber type is best for my application?**

A. FireFly™ optical (ECUO Series) signals should be transmitted over 12F or 24F OM3 multimode fiber cables with a maximum length of 100 m. The FireFly™ (ECUO Series) units themselves are supplied with a fiber pigtail made of bend insensitive fiber, in ribbon or loose tube form. The minimum bend radius of the FireFly™ pigtail is 7.5 mm allowing complex routing inside a system.

Q. **What is the FireFly™ Evaluation Kit and is it necessary?**

A. The FireFly™ Evaluation Kit (FIK-FireFly-01) is a physical link evaluation and test kit intended to save customers the time and expense of creating their own evaluation system. The Evaluation Kit will be useful for those wishing to characterize and qualify the RF performance and signal integrity of the link, such as obtaining real-time data for either the copper-based FireFly™ (ECUE Series) or optical FireFly™ (ECUO Series) assemblies.

It consists of the evaluation board (with FireFly™ connectors on board), a Bull's Eye® RF/PCB test header, an I2C to USB controller, and a USB key with software and instructions for how to use the Evaluation Kit. Two kits are required to evaluate a full link. The FireFly™ Evaluation Kit can be ordered with the standard part number FIK-FireFly-01.

System-level evaluation kits consisting of FPGA boards equipped with FireFly™ optical ports are under development and should be available in the near future.

Q. **I ordered a unidirectional FireFly™, but would like to cut it and install MTP connectors. Can I do this myself?**

A. Technically, yes, this can be done. However, expensive and specialized fiber optic cable equipment is required to prepare and process the fibers for insertion into the fiber optic connectors. Attempting to do this will void any remaining warranty. We have already had cases where customers have used outside connector suppliers to reconnect their optical assemblies and have mixed up the fiber order resulting in incorrect channel mappings.

The FireFly™ (ECUO Series) modules should be ordered with the proper optical connectivity directly from Samtec.

Q. **Is it possible for Samtec to customize certain operational features of FireFly™?**

A. A lot of FireFly™ features can be customized, such as temperature and voltage alarm settings and alarms, cable/part ID designations, along with changes in the default voltage level output or pre-emphasis. This information is stored in the EEPROM of the device. Some of these settings should not be altered and may be password protected. The FireFly™ controller software, which is available for download from Samtec's Sharefile website under NDA, is available to make simple changes to the FireFly™ module.

Q. **What are the advantages of using an optical FireFly™ (ECUO Series) versus a copper FireFly™ (ECUE Series)?**

A. Copper and optical FireFly™ are pin-to-pin compatible; however, the optical version allows transmission of data over longer distances. Optical assemblies support links up to 100 m, whereas copper will typically support 1 m lengths, assuming similar drive conditions. Optical links also provide electrical isolation providing significant noise immunity.

Q. **Where should the FireFly™ connectors/assemblies be placed on the host board?**

A. Samtec recommends placement of the FireFly™ connectors on the board as close to the IC package as possible to keep board routing effects and signal integrity degradation to a minimum. This results in the minimum power dissipation for the PHY/IC and the optical assembly thus reducing cooling requirements and further reducing the overall power budget.

Q. **I would like to run some simulations using the FireFly™ module. Does Samtec have electrical models for these parts?**

A. Samtec has a FireFly™ modeling package that was designed in Agilent (Keysight) ADS for the 14G FireFly™ module. The model gives the user complete control over voltage options and pre-emphasis settings, either in a channel or transient simulation environment. These models can be shared under NDA. Please contact optics@samtec.com for more information regarding the ADS model.

At this time, Samtec does not have IBIS models available for FireFly™.

Q. **What are the minimum/maximum allowable lengths for optical FireFly™ (ECUO Series) and what are the fiber optic cable bend limitations?**

A. The minimum length of the FireFly™ active optical cable assembly (ECUO Series) is 11 cm (however this depends on fiber and connector type), and the max length is 9.9 meters. The absolute minimum distance between a FireFly™ module and MTP optical connector is 12 cm. The maximum distance between a FireFly™ Tx and Rx module using MTP couplers and OM3 fiber optic cabling is 100 meters. The minimum bend radius of the attached fiber optic cabling is 7.5 mm.

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