

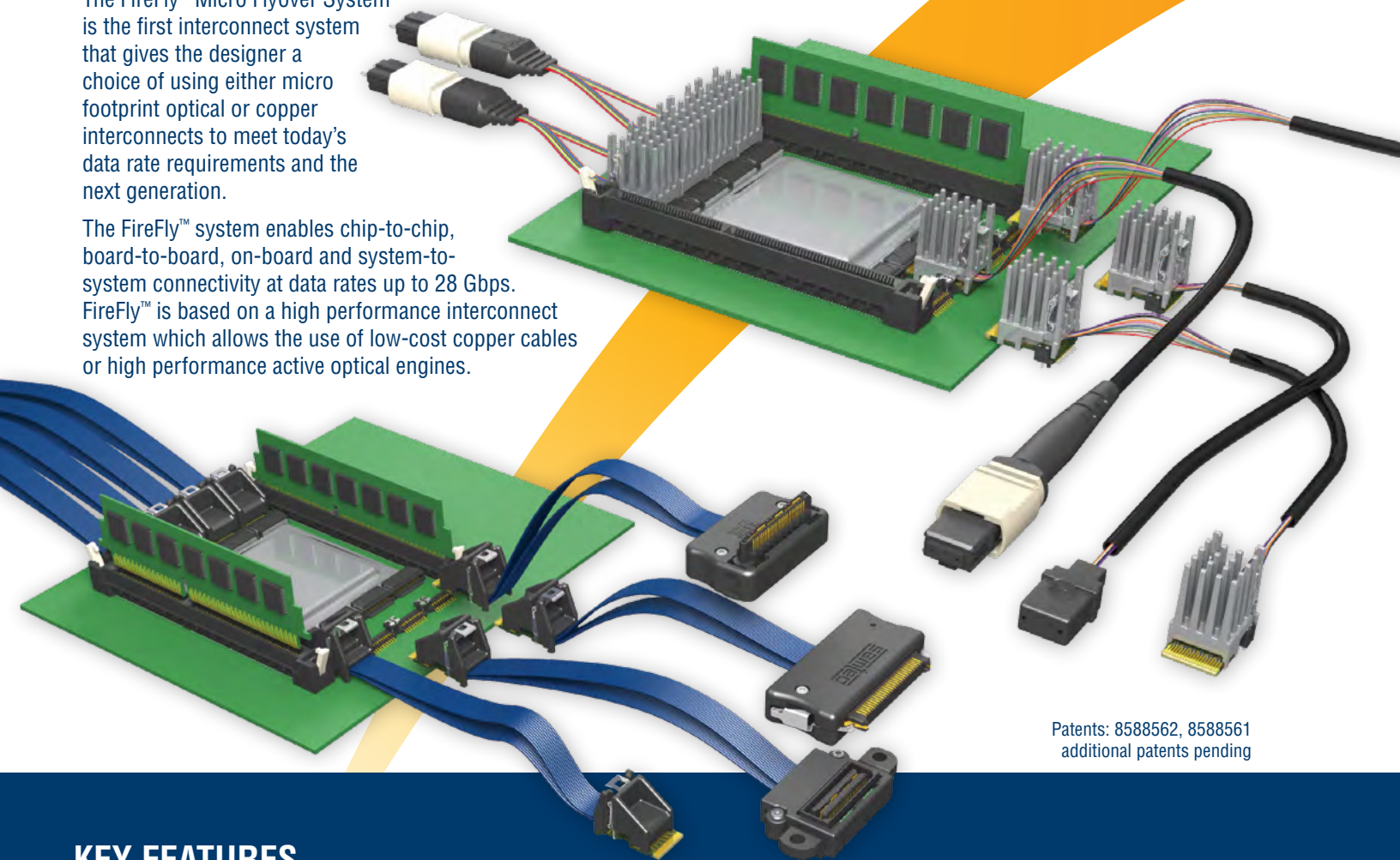
FIREFLY™

Micro Flyover System

Patented

The FireFly™ Micro Flyover System is the first interconnect system that gives the designer a choice of using either micro footprint optical or copper interconnects to meet today's data rate requirements and the next generation.

The FireFly™ system enables chip-to-chip, board-to-board, on-board and system-to-system connectivity at data rates up to 28 Gbps. FireFly™ is based on a high performance interconnect system which allows the use of low-cost copper cables or high performance active optical engines.



Patents: 8588562, 8588561
additional patents pending

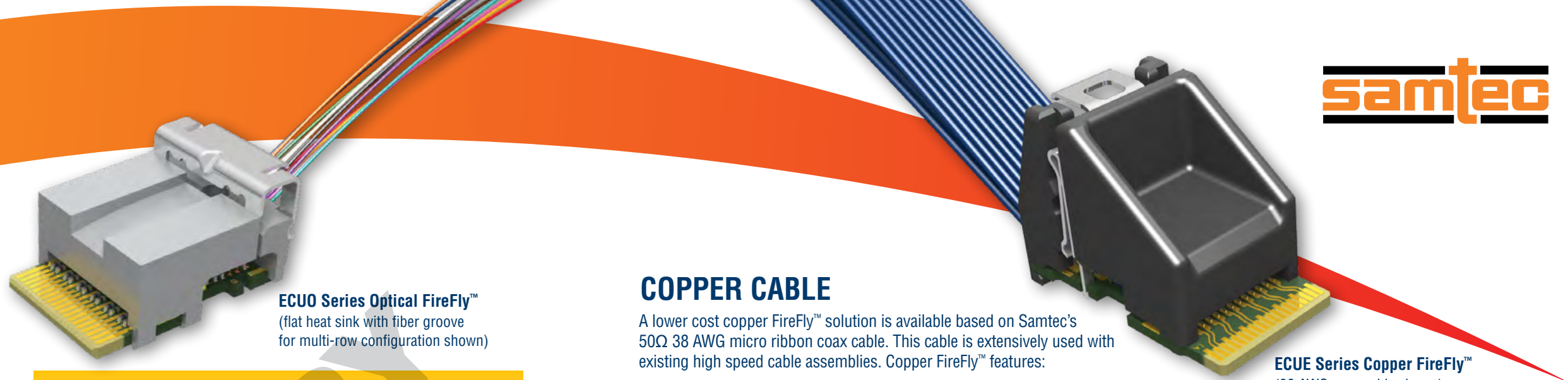
KEY FEATURES

- Data “flies” over board, simplifying board layout and enhancing signal integrity
- Low cost, high performance (to 28 Gbps) micro coax cable system ideal for short distances and test applications
- x12 unidirectional or bidirectional optical transceiver assembly achieves 14 Gbps per channel (168 Gbps aggregate); 28 Gbps (336 Gbps aggregate), and x4 bidirectional systems in development
- Easily upgrade from electrical to optical FireFly™ using the same connector system
- FireFly™ systems support all data center and HPC protocols, including Ethernet, InfiniBand™, Fibre Channel, SAS & PCIe®
- Large choice of end connectors for both optical and electrical systems
- Integral heat sinks in several default designs, including finned, flat, fiber groove for multi-row configurations, and custom designs
- Rugged board-level connector system with positive latching, weld tabs and loading guides for secure connection

FIREFLY™

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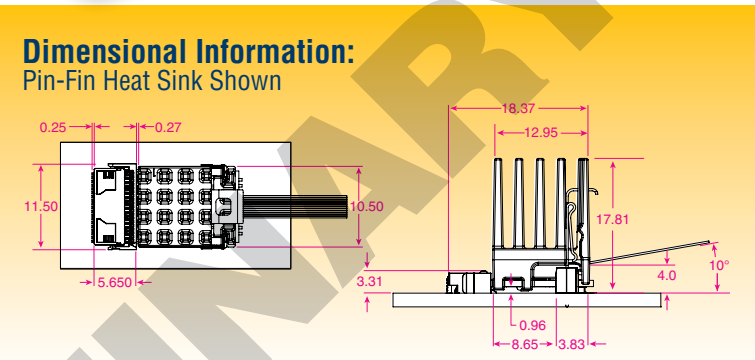


ACTIVE OPTICAL CABLE

Easily upgrade from copper to optical FireFly™ using the same connector system. Optical FireFly™ features:

- x12 unidirectional or bidirectional transceiver system
- 14 Gbps or 28 Gbps (in development) per channel
- Proven 850 nm VCSEL array technology
- Multi-mode fiber technology
- AC coupling capacitors
- Integral heat sink in several default designs, including finned, flat, fiber groove for multi-row configurations, and customs
- 10° angled fiber exit from the housing to minimize keep-out zone on the board
- Close proximity to data source simplifying board layout and enhancing signal integrity
- x4 bidirectional system in development

ECUO Series Optical FireFly™
(flat heat sink with fiber groove for multi-row configuration shown)



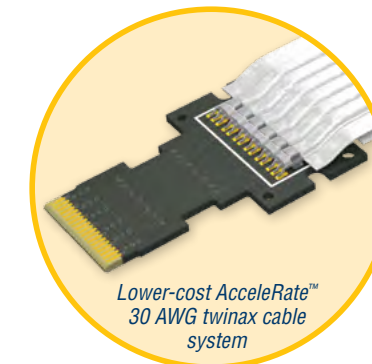
ECUO	Width	Data Rate	Overall Length	Heat Sink	Fiber Type	End 2 Options			
-U12 = x12 Tx to Rx Unidirectional Full Active Optical	-T12 = x12 Tx Unidirectional Half Active Optical	-R12 = x12 Rx Unidirectional Half Active Optical	-Y12 = x12 Bidirectional Half Active Optical (Y Configuration)	-B04 = x4 Bidirectional (in development)	-14 = 14 Gbps -28 = 28 Gbps (in development)	-“XXX” = Overall Length in Centimeters (011 cm to 999 cm) (minimum length will depend on fiber type and End 2 option specified)	-1 = Flat -2 = Pin-Fin -3 = Flat with 3-ribbon pass-through	-1 = OM3 Low Bend Radius Ribbon -2 = OM3 Low Bend Radius Loose Tube	Leave blank for Full Active Optical (-U12). -Y12 requires 24 fibers. 12 Fibers -01 = MTP®, male -02 = MTP®, female -03 = MPO, male -04 = MPO, female -05 = MT male -06 = MT female 24 Fibers -21 = MTP®, male -22 = MTP®, female -23 = MPO, male -24 = MPO, female -25 = MT male -26 = MT female

COPPER CABLE

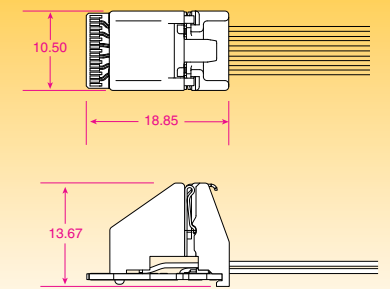
A lower cost copper FireFly™ solution is available based on Samtec's 50Ω 38 AWG micro ribbon coax cable. This cable is extensively used with existing high speed cable assemblies. Copper FireFly™ features:

- A large variety of end two connector termination options including high speed edge card, high density arrays, and high speed connectors
- Seamless integration of new and existing designs
- Performance up to 28 Gbps
- Capability to enable test and verification of connectors during manufacturing; allowing early diagnosis of data connectivity issues
- Lower-cost AcceleRate™ 100Ω 30 AWG twinax ribbon system for improved signal integrity and lower profile
- Equalized twinax AcceleRate™ system in development

ECUE Series Copper FireFly™
(38 AWG coax cable shown)



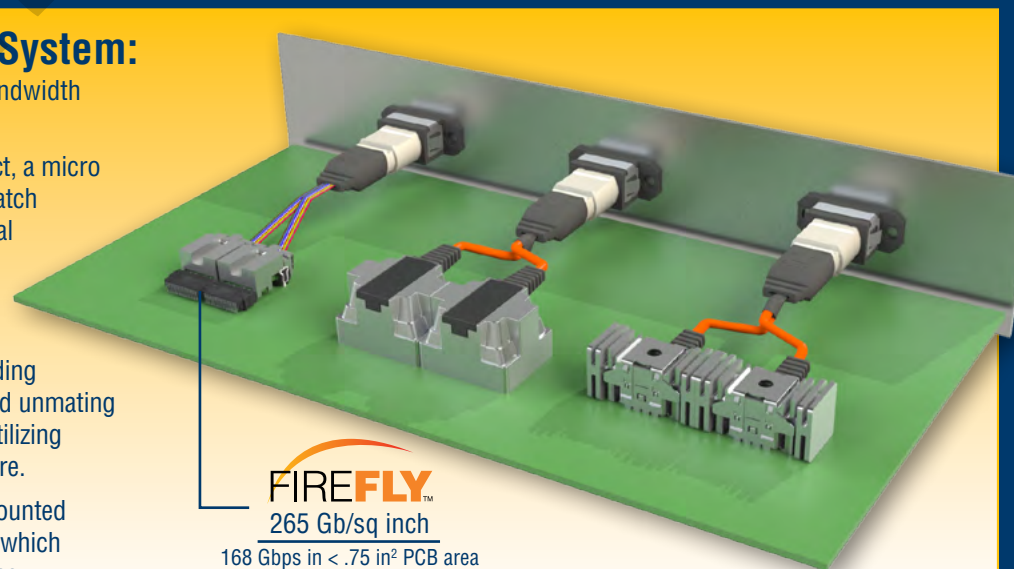
Dimensional Information:



ECUE	No. of Pairs	Overall Length	Cable Type	End 2 Options	Wiring Option
	-12	-“XXX” = Overall Length in Centimeters (007 cm to 152 cm)	-C1 = 38 AWG micro ribbon coax	-FF = ECUE Also Available = Q Rate®, Edge Rate®, Edge Card, SEARAY®, Q Series®	-01 = Pin A1 to Pin A19 -02 = Pin A1 to Pin B1 (-02 required for pinout compatibility with ECUO Series optical assemblies)

FireFly™ Micro Flyover System:

- FireFly™ has the highest 14 Gbps bandwidth density available
- The two-piece board level interconnect, a micro high speed edge card and a positive latch connector for power and control signal communications, helps ease trace routing compared to array systems.
- The rugged two-piece socket system, with weld tabs, latch locking, and loading guides, provides simplified mating and unmating compared to compression systems utilizing mechanical screw downs and hardware.
- Thermal operating conditions are accounted for by including an integral heat sink, which further simplifies the assembly process.



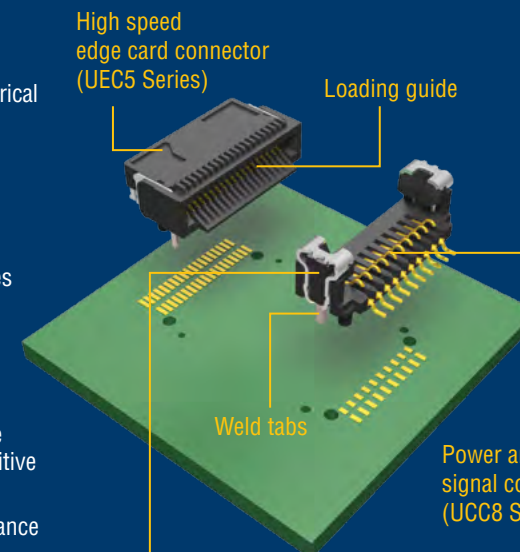
FIREFLY™
265 Gb/sq inch
168 Gbps in < .75 in² PCB area

CONNECTOR SYSTEM

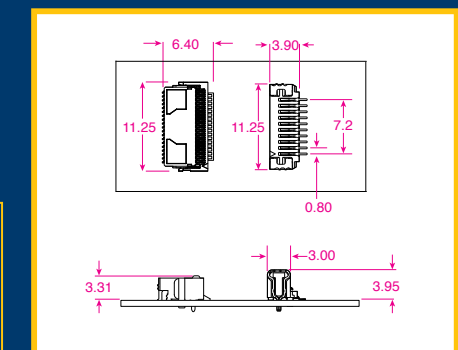
Mates with both optical (ECUO Series) and electrical (ECUE Series) FireFly™ cable assemblies.

The optical and electrical cables mount onto a board using a low insertion force two-piece connector system. This connector system can tolerate a 30 N down force.

- The high speed edge card connector provides data and supports speeds up to 28 Gbps
- The second connector provides mechanical support as well as optional power and low speed communications
- The second connector is also used to secure the cable assembly to the board using a positive latch mechanism
- Weld tabs significantly increase shear resistance of the connector to the PCB
- Part Numbers: UEC5-019-1-H-D-RA-X-A and UCC8-010-1-H-S-X-A



Dimensional Information:



Rugged positive latching feature

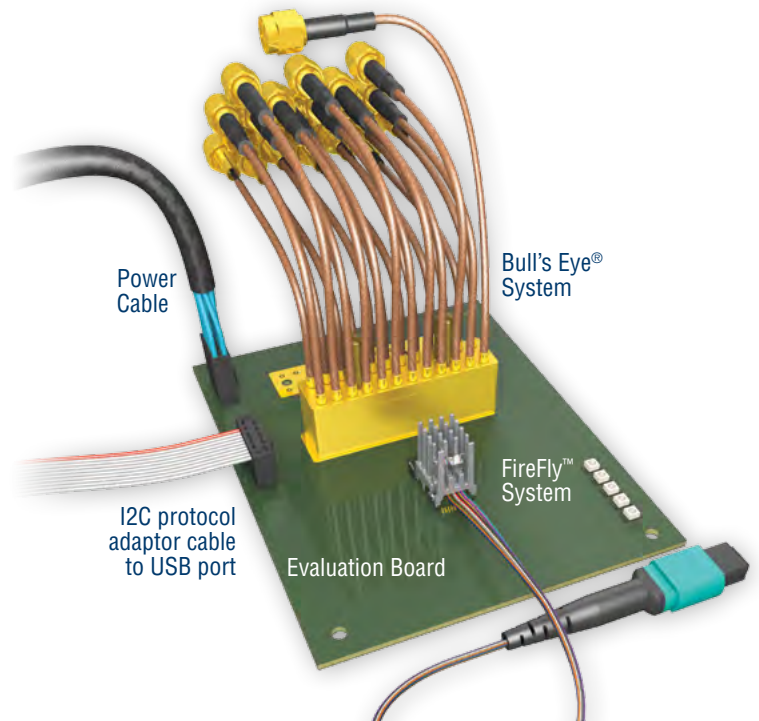
Power and low speed signal contact receptacle (UCC8 Series)

All FireFly™ designs, specifications and components are preliminary and subject to change without notice.

FIREFLY™ EVALUATION KIT

Samtec's FireFly™ Evaluation Kit allows the designer real-time evaluation of an actively running copper or electrical FireFly™ system. The designer has the flexibility to test and characterize the system in their lab, with their inputs. The evaluation board connects the FireFly™ connector system (UEC5/UCC8 Series) to a 24-position Bull's Eye® system and brings the low speed signals and power rails to various standard connectors. The Bull's Eye® system allows for connecting all 12 FireFly™ channels to various laboratory test equipment. A second Bull's Eye® connector landing pad enables de-embedding of the Bull's Eye® interconnect and PCB effects on the high speed signals. The FireFly™ Evaluation Kit is rated up to 25 Gbps. For more information please contact firefly@samtec.com.

Evaluation Kit Part Number: **FIK-FIREFLY-01**



Preliminary x12 FireFly™ Optical Parameters

Electrical Specification	Units	Min.	Typical	Max.	Notes
Operating/Mechanical Specifications					
Power Supply Voltage	V	3.15	3.30	3.45	
Power Supply Current	mA		260		Transmitter
			275		Receiver
Power Consumption	W		0.85	1.50	Transmitter
			0.90	2.15	Receiver
Heat Sink Temperature	°C	0		70	
Operating Humidity	%RH	5		90	Non-condensing
ECUO Series Pigtail Length	m	0.15		9.99	FireFly™-to-optical connector
ECUO Series AOC Length	m	0.50		9.99	
ECUE Series Copper Cable Length	m	0.07		1.50	
Cable Bend Radius	mm	7.5			

Electrical Specification	Units	Min.	Typical	Max.	Notes
Electrical Parameters					
Data Rate per Channel	Gbps	1		14.1	Data rate agnostic
Differential Input Amplitude	mV	250		1600	Peak-to-Peak Differential
Single-Ended Voltage Tolerance	V	-0.3		3.8	
Differential Output Amplitude	mV	250		760	Peak-to-Peak Differential*
Optical Parameters					
Center Wavelength	nm	840		860	
Transmitter RMS Spectral Width	nm			0.65	Standard deviation of the spectrum
Transmitter RIN ₁₂ OMA	dB/Hz			-128	
Average Power of an Off Transmitter	dBm			-30	
Optical Modulation Amplitude	dBm	-5.6		-1.2	
Extinction Ratio	dB	3			
Average Receive Power	dBm			2.4	
Receiver Sensitivity (in OMA)	dBm			-10.5	

Optical specifications are in addition to electrical/mechanical specifications previously listed. All connectorized cables use OM3 fiber. Links of up to 100 m on OM3 are supported assuming that there is a maximum of 4 optical connectors in the link each with a maximum loss of 0.5 dB. FireFly™ Optical follows the 802.3ba standard. PCIe® is a registered trademark of PCI-SIG®. MTP is a registered trademark of US Conec Ltd.

*Settable

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For more information on FireFly™ optical or copper systems visit www.samtec.com/firefly or contact FireFly@samtec.com



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