ACTIVE OPTICS

Section 8 Table of Contents

Introduction

OPTICAL TRANSCEIVERS FOR HARSH ENVIRONMENT

D-Lightsys® optoelectronic modules are transparent and protocol independent optical transmitters, receivers and transceivers designed for harsh environments, demanding applications and markets.

These products operate in a large temperature range and are available with a variety of options. There are several package options, including surface mount, pluggable as well as specific custom packages which cover data rates from DC to 10.31 Gbps.

MARKETS & APPLICATIONS

D-Lightsys® devices are robustly designed for use in harsh environment applications such as:

CIVIL AEROSPACE
Avionics, In-Flight Entertainment (IFE), Heads Up Display (HUD), Power and flight management, pressurized/unpressurized areas transmissions, sensors

MILITARY AEROSPACE
Avionics, weapons systems, power and flight management, sensors

RADARS
Remote antennas, phase array radar, satellite

NAVY & SHIPBOARD
Missile systems, communication

DATA TRANSMISSIONS
High speed data networking

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Introduction

SERIES PRESENTATION

S-LIGHT

Single channel modules for harsh environment applications with an optical pigtail version (optical cable attached). S-Light is among the world's smallest transceivers for severe environment applications.

It is the perfect fit for endpoint equipment and sensors, where low power consumption, small board real-estate and performances are key.
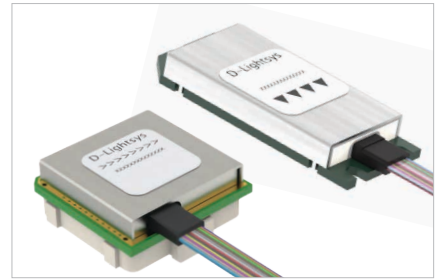
D-LIGHT

Multiple channel modules for harsh environment applications. Available in 4 or 12 channel counts, the D-Light family offers the highest channel integration density. This family has been designed for direct integration with high-speed FPGAs and SERDES to enable state of the art data and signal processing applications.

Several package options are offered, from surface mount to pluggable. D-Light is available up to 12 x 10.31 Gbps.
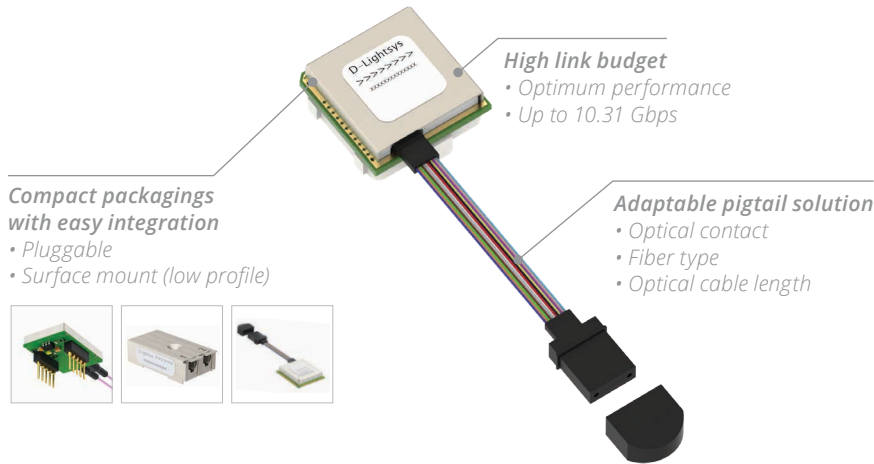
E-LIGHT

Single channel modules for harsh environment applications with a robust ARINC801 optical disconnect. E-Light transceiver is the perfect cost-effective solution when the ease of use and the thickness are key.
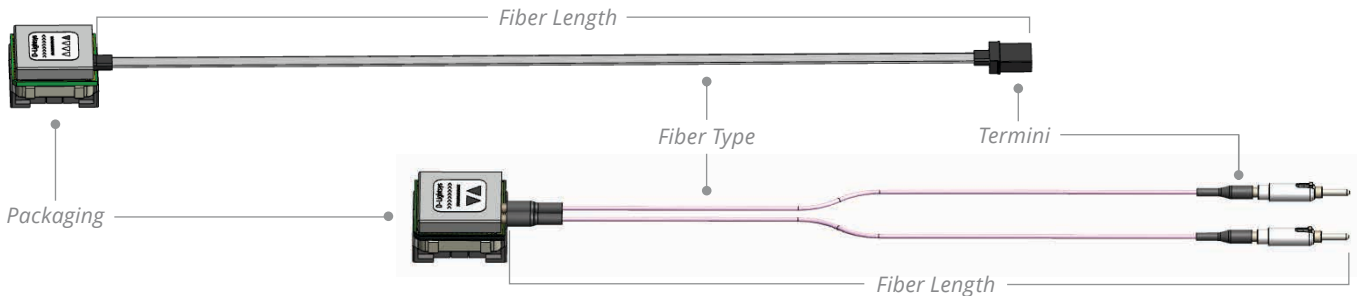
Introduction

FEATURES & BENEFITS

The D-Light and S-Light series are ruggedized solutions that can fit any type of configurations.

High link budget
• *Optimum performance*
• *Up to 10.31 Gbps*

Compact packagings with easy integration
• *Pluggable*
• *Surface mount (low profile)*

Adaptable pigtail solution
• *Optical contact*
• *Fiber type*
• *Optical cable length*

BESPOKE SOLUTION

What can be customized on S-Light & D-Light modules

Fiber Length

Fiber Type

Termini

Packaging

Fiber Length

FIBER TYPE

Various ruggedized cable options are available:

• S-Light uses single ruggedized optical cable based on multimode 50/125 µm or 62.5/125 µm fiber.

• D-Light uses 12-channel ribbon fibers compatible with high temperatures.

• E-Light module includes the LuxCis® disconnect solution compatible with multimode 50/125 µm or 62.5/125 µm optical cables.

Please refer to our cable assembly offer for more information.

FIBER LENGTH

The cable length is customized according to custom requirements. The standard length is between 40 and 500 mm.

Tolerance is 0/+5 mm. Cable strengthening options and harness integration are available.

OPTICAL CONTACTS

A large variety of termini/connectors are available.

Single fiber optic termini are used on S-Light:

• LuxCis® ARINC801, ABS1379

• Expanded beam solutions

• Telecom standards (LC, ST, etc.)

• MIL-PRF-29504

MT ferrule based connectors used for the D-Light:

• MPO

• Q-MTitan™

• C-MTitan™

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S-Light

S-LIGHT

The S-Light is a single channel device: either simplex or full-duplex (1 Tx or 1 Rx or 1 Tx and Rx).

FEATURES & BENEFITS

FEATURES	BENEFITS
Monitoring & control through I²C 2-wire serial interface	Allows channel diagnostics and signal status monitoring
Automatic monitoring of the optical power over the temperature range	Steady and optimized transmitter performances
Programmable input equalization	Compensate for PCB traces loss at high data rate
Programmable output amplitude and de-emphasis	
Very small electrical footprint with the Meg-Array receptacle (18.7 x 17.3 mm)	Compliant with high PCB densification
High optical budget link > 10 dB @ 10.31 Gbps	Compliant with most of the optical architectures (including safety margin)
Protocol agnostic	Supports standard and non-standard protocols in this range of data rates (1GbE, 10GbE, ARINC818-2, 2G/3G/4G/6G/8G Fiber Channel...)
Hot pluggable (plug and play)	Ease of use
Low power consumption	No mandatory heatsink for customer

KEY PARAMETERS

PARAMETERS	VALUE	UNITS	NOTES
Wavelength	850	nm	-
Signaling levels	LVDS / CML	-	-
Optical cable	50 / 125 / 800 62.5 / 125 / 800	µm	OM1, OM2, OM3 fibers
Data rate (max)	10.31	Gbps	3 ranges available: • 1.0 to 10.31 Gbps • 1.0 to 4.25 Gbps • DC to 10 Mbps
Transceiver case operating temperature	-40 / +90	°C	-
Power supply voltage	3.3	V	-
Transceiver power consumption (max)	250	mW	Over the full temperature range
Average output power (min)	-2	dBm	SM-255-GM / SM-1001-GM S-Light family transmitters are Class 1 laser products according to IEC 60825-1 standard
Optical extinction ratio	7	dB	2.5 Gbps ER = 5 dB 10 Gbps
Optical sensitivity (max)	-12	dBm	SM-1001-GM 10.31 Gbps for BER = 10^{-12} with a 2^{31} -1 PRBS

D-Light

D-LIGHT

The D-Light range includes multi channel optical transceivers for harsh environment applications available in 12-channel transmitter, 12-channel receiver and 4-channel transceiver (4Tx+4Rx) modules.

FEATURES & BENEFITS

FEATURES	BENEFITS
Monitoring & control through I²C 2-wire serial interface	Allows channel diagnostics and signal status monitoring
Automatic monitoring of the optical power over the temperature range	Steady and optimized transmitter performances
Programmable input equalization	Compensate for PCB traces loss at high data rate
Programmable output amplitude and de-emphasis	
Very small electrical footprint with the Meg-Array receptacle (18.7 x 17.3 mm) and the the LGA interposer (25.6 x 10.8 mm)	Compliant with high PCB densification
High optical budget link > 10 dB @ 10.31 Gbps	Compliant with most of the optical architectures (including safety margin)
Protocol agnostic	Supports standard and non-standard protocols in this range of data rates (1GbE, 10GbE, ARINC818-2, 2G/3G/4G/6G/8G Fiber Channel…)
Hot pluggable (plug and play)	Ease of use
Low power consumption	No mandatory heatsink for customer

KEY PARAMETERS

PARAMETERS	VALUE	UNITS	NOTES
Wavelength	850	nm	-
Signaling levels	LVDS / CML	-	-
Optical cable	50 /125 62.5 / 125	µm	OM1, OM2, OM3 fibers
Data rate (Max) per channel	10.31	Gbps	2 ranges available: • 1.0 to 10.31 Gbps • 1.0 to 4.25 Gbps
Transceiver case operating temperature	-40 / +90	°C	-
Power supply voltage	3.3	V	-
Transceiver power consumption (Max)	150	mW	Over the full temperature range per channel
Average output power (min/channel)	-2	dBm	D-Light family transmitters are class 1M laser products according to IEC 60825-1 standard
Optical extinction ratio	7	dB	2.5 Gps
Optical sensitivity (max)	-12	dBm	DM-4-1000 10.31 Gbps for BER = 10^{-12} with a 2^{31} -1 PRBS

Notes

Detailed technical datasheets are available upon request. Please contact your local representative.

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E-Light

E-LIGHT

The E-Light is a single channel transceiver with a ARINC801 optical disconnect (1Tx + 1Rx).

FEATURES & BENEFITS

FEATURES	BENEFITS
Monitoring & control through I²C 2-wire serial interface	Allows channel diagnostics and signal status monitoring
Automatic monitoring of the optical power over the temperature range	Steady and optimized transmitter performances
Programmable output amplitude and de-emphasis	Compensate for PCB traces loss at high data rate
Small electrical footprint (25.1 x 13.1 mm)	Compliant with high PCB densification
High optical budget link > 11 dB @ 5 Gbps	Compliant with most of the optical architectures (including safety margin)
Protocol agnostic	Supports standard and non-standard protocols in this range of data rates (1GbE, ARINC818-2, 2G/3G/4G Fiber Channel...)
Pluggable electrical connector with a mounting screw	Ease of use
Low power consumption	No mandatory heatsink for customer
ARINC801 optical disconnect	Ease of use and robustness to vibration and mechanical shocks
Optical stub interface	Easy cleaning and inspection of the optical end face

KEY PARAMETERS

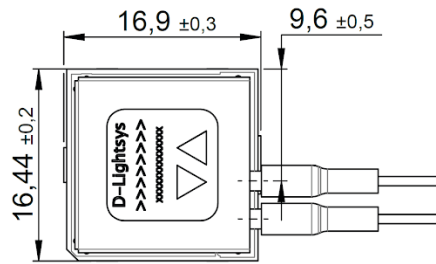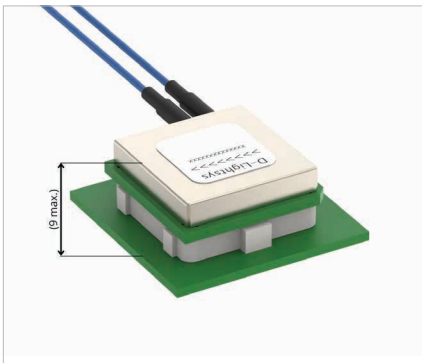| PARAMETERS	VALUE	UNITS	NOTES
Wavelength	850	nm	-
Signaling levels	LVDS / CML	-	-
Optical contact	LuxCis LM	-	-
Optical cable compatibility	Multimode 50 / 125 µm & 62.5 / 125 µm		OM1, OM2, OM3 fibers
Data rate (Max)	5	Gbps	-
Transceiver case operating temperature	-40 / +90	°C	Qualified temperature range -40 °C / +85 °C
Power supply voltage	3.3	V	-
Transceiver power consumption	430	mW	Over the full temperature range
Average output power (min/channel)	-4	dBm	D-Light transmittters are Class 1M laser products according to IEC 60825-1 standard
Optical extinction ratio	9	dB	2.5 Gbps
Optical sensitivity (max)	-15	dBm	SM-425-Ew-XM 5Gbps for BER = 10^{-12} with a 2^7 -1 PRBS

Notes

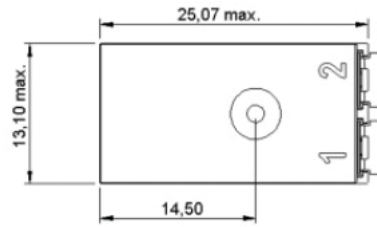*Detailed technical datasheets are available upon request. Please contact your local representative.*

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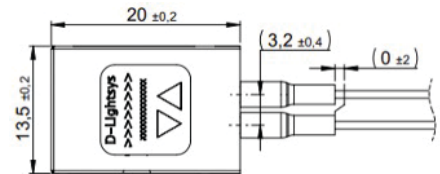*Visit www.radiall.com for more information*

Characteristics & Performance

CHARACTERISTICS & PERFORMANCE

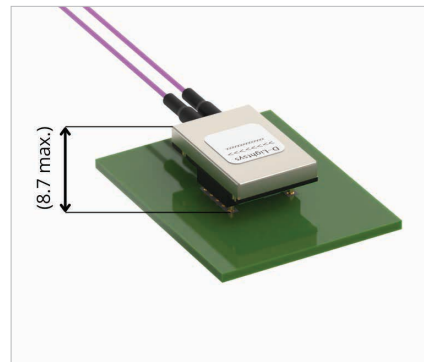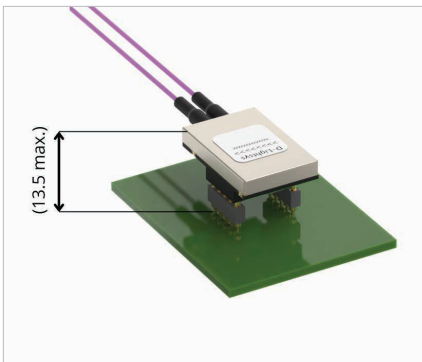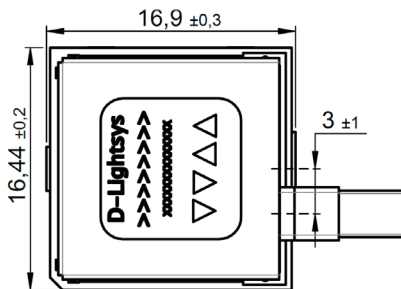### SM-255-GM / SM-1001-GM

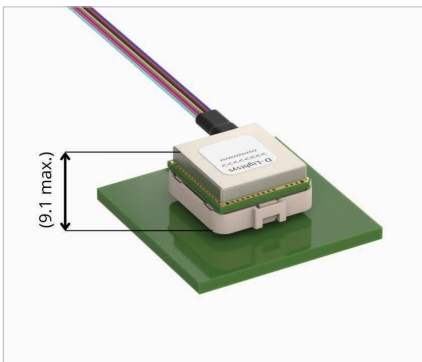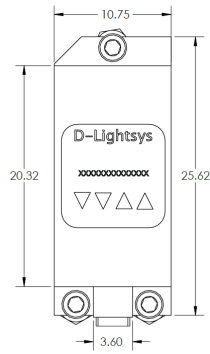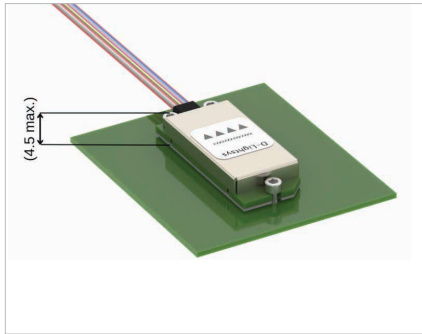### SM-425-EW-XM

SM-001-S

DM4XXXGM / DR12XXXGM / DT12XXXGM

Characteristics & Performance

DR12XXXP / DT12XXXP

Characteristics & Performance

INTERNATIONAL STANDARD DOCUMENTS COMPLIANCE

The modules are designed to withstand harsh environments and qualified based on MIL-STD-883
and ARINC804 standards.

TEST	STANDARD	CONDITIONS
Qualified temperature range	-	Up to [-40; +90 °C]
Low temperature endurance	ARINC804	Up to 1000 h @ -40 °C
High temperature endurance	ARINC804	Up to 2000 h @ 90 °C
Rapid change of temperature	MIL-STD-883	Up to -40 / +90 °C, 500 cycles, 8 °C / min., dwell time: 10 min.
Thermal shock	MIL-STD-883	Up to -40 / +100 °C x15 - 30 min dwell time
Vibration	MIL-STD-883	20 g Y axis, 9 g X&Z axis 1 hour/axis
Mechanical shock	MIL-STD-883	Up to 1500 g peak, 0.5 ms, 5x per orientation
Damp heat	ARINC804	Up to 500 h @ 40 °C HR 95%

Notes
The qualification levels can differ from one packaging to another. Detailed information is available upon request. Please contact your local representative.

Characteristics & Performance

CONFIGURATIONS

				CHANNELS		PERFORMANCES				PACKAGING				OPTICAL CONTACTS/ CONNECTORS [2]							FIBER TYPE	
				Tx	Rx	Data Rate	Optical Power Min	Sensitivity Max	Link Budget Min	GM	P	S	E	LuxCis®/ARINC801	ABS1379	LC	29504 / 4&5	MPO	Q-MTitan™	C-Mtitan™	50/125 µm	62.5/125 µm
S-LIGHT	S	M	001	S	1	1	up to 10 Mbps	-5 dBm	-17 dBm	12 dB			■		■	■	■	■				■	■
	S	M	255	GM	1	1	up to 4.25 Gbps	-2 dBm	-12 dBm	10 dB	■				■	■	■	■				■	■
	S	M	1001	GM	1	1	up to 10 Gbps	-2 dBm	-12 dBm	10 dB	■				■	■	■	■				■	■
	S	R	255	GM		1	up to 4.25 Gbps	-	-12 dBm	-	■				■	■	■	■				■	■
	S	R	1001	GM		1	up to 10 Gbps	-	-12 dBm	-	■				■	■	■	■				■	■
	S	T	255	GM	1		up to 4.25 Gbps	-2 dBm	-	-	■				■	■	■	■				■	■
	S	T	1001	GM	1		up to 10 Gbps	-2 dBm	-	-	■				■	■	■	■				■	■
D-LIGHT	D	M4	255	GM	4	4	up to 4.25 Gbps	-2 dBm	-15 dBm	13 dB	■								■	■	■	■	■
	D	M4	1000	GM	4	4	up to 12 Gbps	-2 dBm	-12 dBm	10 dB	■								■	■	■	■	
	D	R12	255	GM	12		up to 4.25 Gbps	-	-15 dBm	-	■								■	■	■	■	■
	D	R12	1000	GM	12		up to 10 Gbps	-	-12 dBm	-	■								■	■	■	■	
	D	R12	1000	P	12		TBC	-	TBC	-		■							■	■	■	■	
	D	T12	255	GM	12		up to 4.25 Gbps	-2 dBm	-	-	■								■	■	■	■	■
	D	T12	1000	GM	12		up to 10 Gbps	-2 dBm	-	-	■								■	■	■	■	
	D	T12	1000	P	12		TBC	TBC	-	-		■							■	■	■	■	
E-LIGHT	S	M	425	E1XM	1	1	up to 5 Gbps	-4 dBm	-15 dBm	11 dB				■	*LuxCis® based disconnect product Please refer to the cable assembly offer [1]*								
	S	M	425	E2XM	1	1	up to 5 Gbps	-4 dBm	-15 dBm	11 dB				■									

Notes
1. 50/125 & 62.5/125 µm fiber compatibilities
2. Feel free to contact us for other contact configurations

Characteristics & Performance

PART NUMBER BUILDER

D

SERIES PREFIX
D

FUNCTION
M4: 4-channel transceiver (4Tx+4Rx)
R12: 12-channel receiver (12Rx)
T12: 12-channel transmitter (12Tx)

DATA RATE
255: 1.0 to 4.25 Gbps
1000: 1.0 to 10.31 Gbps

PACKAGING
GM: 100-pin Meg-Array connector (Amphenol ICC)
P: 60-pin LGA interface

OPTICAL CONTACT
N: MT ferrule
M: MT ferrule with spring for VITA66 connector
O: MPO/MTP connector
Q: Q-MTitan™
C: C-MTitan™

OPTICAL FIBER
1: 50/125 μm ribbon fiber
2: 62.5/125 μm ribbon fiber
5: 50/125 μm ribbon with sleeve protection

PIGTAIL LENGTH
Length in cm

To validate your part number please contact your local Radiall representative.
Technical datasheets are available upon request.

Characteristics & Performance

PART NUMBER BUILDER

S

SERIES PREFIX
S

FUNCTION
M: Transceiver (1Tx+1Rx)
R: Receiver (1Rx)
T: Transmitter (1Tx)

DATA RATE
001: DC to 10 Mbps
255: 1.0 to 4.25 Gbps
1001: 1.0 to 10.31 Gbps

PACKAGING
S: 2 x 5-pin Small Form Factor package (SFF) [1]
GM: 100-pin Meg-Array connector (Amphenol ICC)

OPTICAL CONTACT [2]
X: LuxCis™ (ARINC801)

OPTICAL FIBER
O: 50/125/800 µm with strength member
M: 62.5/125/800 µm with strength member

PIGTAIL LENGTH
Length in cm

PART NUMBER BUILDER

E

FUNCTION
SM: Transceiver (1Tx+1Rx)

DATA RATE
425: 1.0 to 5.0 Gbps
1000: 1.0 to 10.31 Gbps

PACKAGING
E: 30-pin SlimStack plug (Molex)

OPTICAL CONTACT
X: LuxCis™ ML disconnect (ARINC801 ML)

OPTICAL COMPATIBILITY
M: Multimode fiber OM1/OM2/OM3/OM4
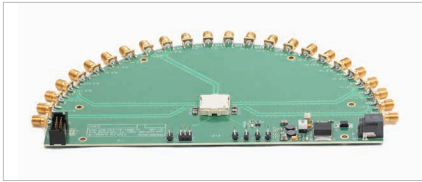
CONFORMAL COATING
C: With conformal coating option
(): Without conformal coating option

Notes
1. Only available for Data Rate option -001
2. Other connectors are available (LC, ST, MC5, 29504...). Contact sales for more information.

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Evaluation Boards & Tooling

EVALUATION BOARD

Radiall offers a full range of evaluation boards enabling full monitoring of D-Lightsys modules. A Windows PC-based software is available for complete monitoring and control.

Please contact you local representative for more information.

FMC MEZZANINE CARDS

TECHWAY & Radiall bring you a state-of-the-art Mezzanine card for standard FPGA solution with the WildcatFMC product range. These rugged optical FMCs are dedicated to markets where customers have strong environmental requirements.

Based on the latest RADIALL's D-Lightsys® components, WildcatFMC solutions offer 4 or 12 optical links at 10.31 Gbps. All the WildcatFMC mezzanine cards can be easily integrated into existing systems or into brand-new architectures.

Compliant with VITA 57.1 and VITA 57.4 standards, they fit all FMC+ carrier boards.

The WildcatFMC solutions are compliant with both air and conduction cooled environments.

Please contact you local representative for more information.

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