

# Gemini Series

Mil-Dtl-38999 Optical Transceiver Dongle, GbE, 1x/2xFC or sFPDP Applications, Multimode, 850nm

## Single Port, Dongle

### FEATURES

- Compliant with ANSI Fibre Channel FC-PI / PI-2 and IEEE-802.3:2005 Gigabit Ethernet
- Compliant with ANSI / VITA 17.1 sFPDP @ 2.5Gbps
- Optical fiber link distances up to 550 Meters (50/125µ 500MHz\*Km MMF)
- Maximum optical channel bit error rate less than  $1 \times 10^{-12}$
- Operating temperature range from -40°C to +85°C
- Shock, vibration and immersion resistant per Mil-Std-810 and Mil-Std-1344
- Olive drab cadmium over nickel plating meets stringent EMI / RFI performance specifications
- Aluminum alloy Mil-Dtl-38999 housings are strong, durable, corrosion resistant and light weight
- Mil-T-29504 compliant optical fiber connector interface
- Connector insert configuration conforms to Mil-Std-1560

### APPLICATIONS

Gemini series optical transceiver dongles enable high speed network communications over long distances in harsh environments.

- Fibre Channel, sFPDP or Gigabit Ethernet switches and peripherals
- Telecom and datacom switch / router rack-to-rack links
- Storage or computation clusters

The Mil-Dtl-38999, Series III shells provide sealed optical interfaces that are water-tight to Mil-Std-810 / IP67 / NEMA-4x when mated.

The multimode optical fiber interface supports applications where copper cable link distance, bandwidth, weight or bulk make the use of twisted pair, twinax or quadax copper conductors unacceptable.



One TX & One RX Channel Operating from 1.0 to 2.5Gbps

### DESCRIPTION

Gemini series optical fiber transceiver dongles consist of optoelectronic transmitter and receiver functions integrated into a bulkhead mounted Mil-Dtl-38999, Series III receptacle connector. The optical transmitters are 850nm VCSEL lasers. The transmitter input lines are driven with differential CML signals applied to the transmitter (TX+ and TX-) lines. Dual loop, temperature compensated, VCSEL drivers convert the transmitter input signals to suitable VCSEL bias and modulation currents. The optical receivers consist of PIN and preamplifier assemblies and limiting post-amplifiers. Outputs from the receivers consist of differential CML data signals on the receiver (RX+ and RX-) lines and single ended CMOS indicator functions on the Loss of Signal (LOS) lines. A CMOS fault signal is generated on the TX Fault line by the module controller upon any monitored internal optical or electrical fault condition.

The receiver data lines are squelched upon LOS assertion, preventing errant data packet generation when an invalid incoming optical signal is presented to the transceiver. The electrical interface to the Gemini series optical transceiver dongles is a Mil-Dtl-38999 plug connector with Size 22 electrical contacts.

Gemini series optical fiber transceiver dongles are vibration isolated, environmentally hardened components designed for use in harsh environment applications.

- Sealed against liquid and solid contaminants
- Shock and vibration resistant

### ORDERING INFORMATION

Application	Product Number
GbE, 1x/2xFC or sFPDP	G38R-2S1D-FW
See Appendix A3 for more part number options	

Single Port Gemini Series Mil-Dtl-38999 Optical Transceiver Dongle,  
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## ABSOLUTE MAXIMUM RATINGS

Absolute maximum limits mean that no catastrophic damage will occur if the product is subjected to these ratings for short periods, provided each limiting parameter is in isolation and all other parameters have values within the performance specification. It should not be assumed that limiting values of more than one parameter can be applied to the product at the same time.

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Storage Temperature	$T_s$	-55		+100	°C
Supply Voltage	$V_{CC}$	-0.5		+4.5	V
TX_DIS Input Voltage	$V_I$	-0.5		$V_{CC} + 0.5$	V
Differential Input Voltage (p-p)	$V_D$			2.2	V
RX Output Current	$I_O$			50	mA

## RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Operating Temperature	$T_A$	-40		+85	°C
Supply Voltage	$V_{CC}$	+3.135		+3.465	V
TX Common Mode Voltage	$V_{CM}$		2.0		V
TX Differential Input Voltage (p-p)	$V_D$	0.25		2.2	V
Power Supply Noise (p-p)	$N_P$			200	mV

## SPECIFICATIONS COMPLIANCE

Requirement	Feature	Condition	Notes
MIL-STD-883	ESD	Class II	2200V
MIL-STD-810	Vibration	30.0g	18mS
MIL-STD-810	Shock	40.0g	6-9mS
MIL-STD-810	Immersion	1.0 meter	2 .0Hours
MIL-STD-1344	Flame Resistance	Method 1012	30 Seconds
MIL-STD-1344	Damp Heat	10 Cycles	24 Hours
MIL-STD-38999	Mating Durability	500 Cycles	<0.5dB Change
FDA / CDRH / IEC-825-1	Eye Safety	Class 1	No Safety Interlocks Required

## MATERIALS

Item	Detail	Notes
Shell	Aluminum Alloy	
Shell Plating	Olive Drab Cadmium over Nickel	QQ-P-416, QQ-N-290
Insert	Thermoplastic	
Interfacial Seal	Elastomer	
Alignment Sleeves	Composite Polymer	
Printed Circuits	Polyimide / FR-4	Mil-P-31032 Type 4

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**OPTICAL TRANSMITTERS  $T_A$  = Operating Temperature Range,  $V_{CC}$  = 3.135V to 3.465V**

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Output Power (BER<10 <sup>-12</sup> )	$P_o$	-9.5		-4.0	dBm
Optical Output Wavelength	$\lambda_{OUT}$	830	850	860	nM
Spectral Width	$\Delta\lambda_{RMS}$			0.85	nM
Extinction Ratio	ER		9.0		dB
Optical Rise, Fall Time (20% to 80%)	$t_{R,F}$			150	pS

**OPTICAL RECEIVERS  $T_A$  = Operating Temperature Range,  $V_{CC}$  = 3.135V to 3.465V**

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Sensitivity (BER<10 <sup>-12</sup> , ER=9.0) 125Mbps to 1.25Gbps 2.125Gbps	$P_i$	-17.0 -15.0		0.0	dBm
Optical Wavelength	$\lambda_{IN}$	830		860	nM
RX Data Output - Low	$V_{OL} - V_{CC}$	-1.810		-1.475	V
RX Data Output - High	$V_{OH} - V_{CC}$	-1.165		-0.880	V

**POWER SUPPLY CURRENT  $T_A$  = Operating Temperature Range,  $V_{CC}$  = 3.135V to 3.465V**

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Current per Port	$I_{CCT}$		100	140	mA

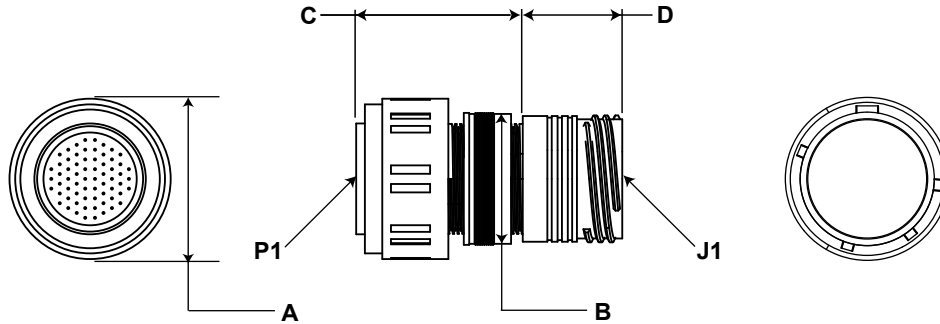
**OPTICAL LINK DISTANCES**

Protocol	62.5/125 $\mu$ 200MHz*Km	50/125 $\mu$ 500MHz*Km
2xFibre Channel - ANSI X3.297 FC-PI	150M	300M
Gigabit Ethernet - IEEE-802.3:2005	275M	550M
1xFibre Channel - ANSI X3.297 FC-PH-2	300M	500M

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**OUTLINE DIMENSIONS**

Dimensions are shown as: inches (mm)



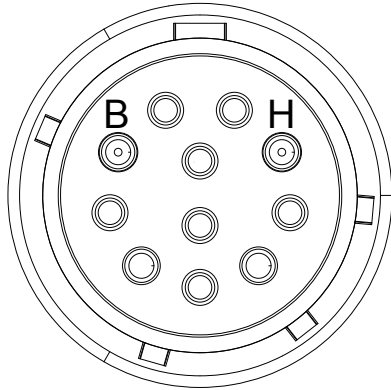
**Outline Dimensions**

Shell Size Code	Shell Size	J1	P1	A	B	C	D
F	19	D38999 / 20WF11SN - W / O Flange	D38999 / 26WF35PN	1.52 (38.5)	1.23 (31.2)	1.54 (39.1)	0.92 (23.4)

Single Port Gemini Series Mil-Dtl-38999 Optical Transceiver Dongle,  
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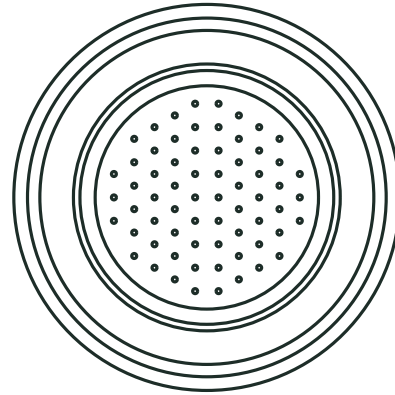
## OPTICAL TRANSCEIVER INSERT ARRANGEMENT

**TOP**  
**Optical Interface**



Front face of the optical transceiver insert shown, fiber optic cable plug opposite - see Appendix A2 for details

**TOP**  
**Electrical Interface**



Back face of the optical transceiver dongle insert shown - see Electrical Pin Assignment pages for details

## OPTICAL TRANSCEIVER RECEPTACLE PORT ASSIGNMENTS

FUNCTION	OPTICAL		ELECTRICAL	
	TX	RX	TX (-,+)	RX (-,+)
0	B	H	6,13	54,61

Single Port Gemini Series Mil-Dtl-38999 Optical Transceiver Dongle,  
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### ELECTRICAL PIN FUNCTIONS

Pin Number	Symbol (Port)	Description	Logic Family
1	GND	Ground	N/A
2	GND	Ground	N/A
3	N/C	No Internal Connection	N/A
4	N/C	No Internal Connection	N/A
5	GND	Ground	N/A
6	TX-	Transmitter Data Input	CML (Internally AC Coupled) Internal 100Ω differential termination
7	GND	Ground	N/A
8	GND	Ground	N/A
9	N/C	No Internal Connection	N/A
10	N/C	No Internal Connection	N/A
11	GND	Ground	N/A
12	GND	Ground	N/A
13	TX+	Transmitter Data Input	CML (Internally AC Coupled) Internal 100Ω differential termination
14	GND	Ground	N/A
15	N/C	No Internal Connection	N/A
16	N/C	No Internal Connection	N/A
17	GND	Ground	N/A
18	GND	Ground	N/A
19	N/C	No Internal Connection	N/A
20	GND	Ground	N/A
21	GND	Ground	N/A
22	GND	Ground	N/A
23	GND	Ground	N/A
24	N/C	No Internal Connection	N/A
25	TX VCC	Transmitter Power Supply	N/A
26	TX Dis	Transmit Disable - Input Logic 1: Disable Optical Output Logic 0: Enable Optical Output	CMOS Internal 4.7KΩ to 10.0KΩ pullup
27	GND	Ground	N/A
28	GND	Ground	N/A
29	TX Fault	Internal TX Fault Indicator - Output Satisfactory Operation: Logic "0" Output Internal Fault: Logic "1" Output	Open Drain CMOS
30	GND	Ground	N/A

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### ELECTRICAL PIN FUNCTIONS

Pin Number	Symbol (Port)	Description	Logic Family
32	N/C	No Internal Connection	N/A
33	N/C	No Internal Connection	N/A
34	RX VCC	Receiver Power Supply	N/A
35	LOS	Loss of Signal - Output Satisfactory Optical Input: Logic "0" Output Unsatisfactory Optical Input: Logic "1" Output	Open Drain CMOS
36	GND	Ground	N/A
37	GND	Ground	N/A
38	GND	Ground	N/A
39	N/C	No Internal Connection	N/A
40	N/C	No Internal Connection	N/A
41	N/C	No Internal Connection	N/A
42	N/C	No Internal Connection	N/A
43	GND	Ground	N/A
44	GND	Ground	N/A
45	N/C	No Internal Connection	N/A
46	GND	Ground	N/A
47	GND	Ground	N/A
48	GND	Ground	N/A
49	GND	Ground	N/A
50	N/C	No Internal Connection	N/A
51	N/C	No Internal Connection	N/A
52	GND	Ground	N/A
53	GND	Ground	N/A
54	RX-	Receiver Data - Input	CML (Internally AC Coupled)
55	GND	Ground	N/A
56	N/C	No Internal Connection	N/A
57	N/C	No Internal Connection	N/A
58	N/C	No Internal Connection	N/A
59	GND	Ground	N/A
60	GND	Ground	N/A
61	RX+	Receiver Data - Input	CML (Internally AC Coupled)
62	GND	Ground	N/A
63	N/C	No Internal Connection	N/A
64	GND	Ground	N/A
65	GND	Ground	N/A
66	GND	Ground	N/A

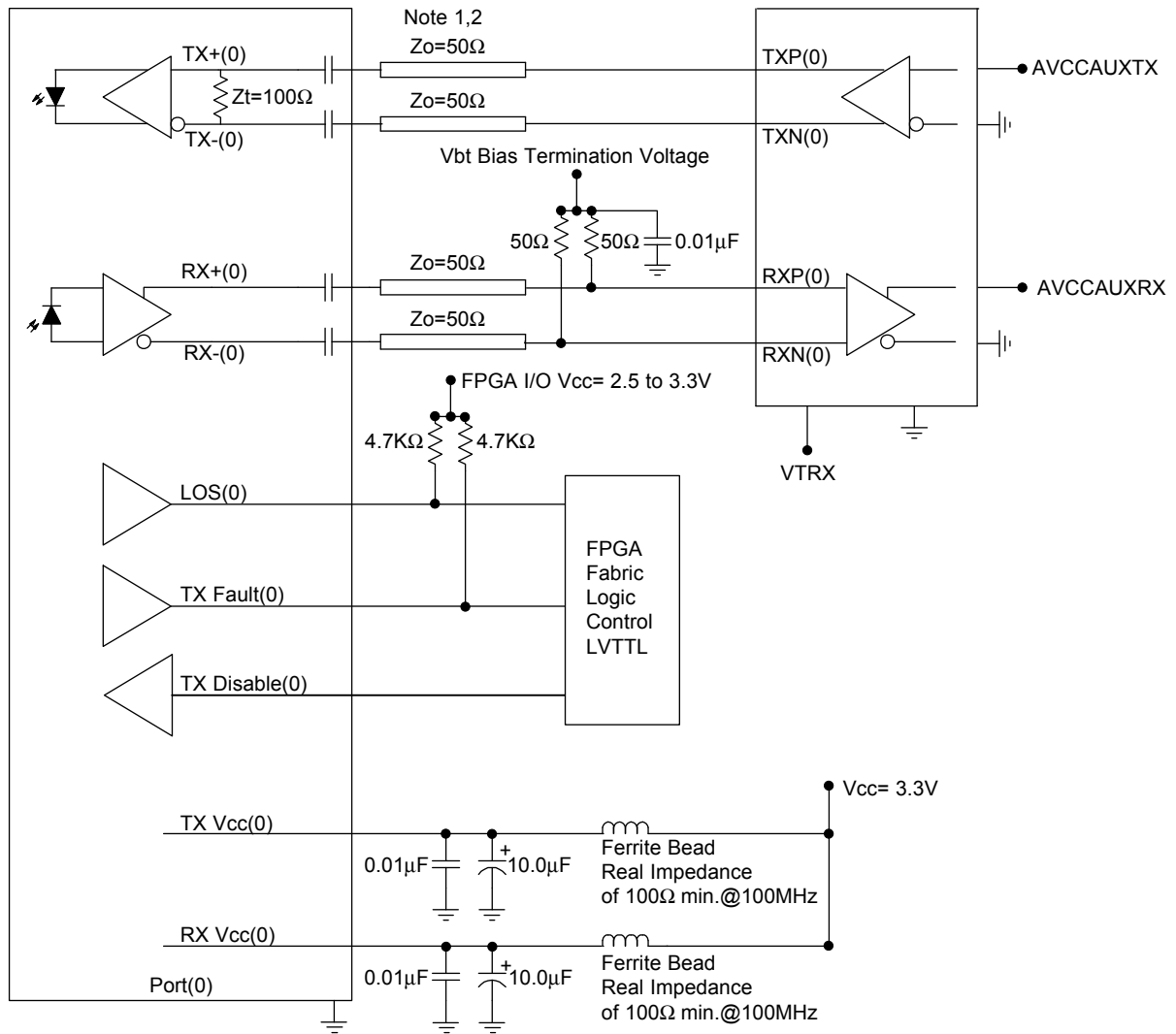
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**APPLICATION SCHEMATIC**

For Xilinx Rocket I/O Interfaces

**Bulkhead Transceiver**

**Xilinx Rocket I/O**



Typical application schematic shown  
For alternate applications or termination  
techniques, please consult the Factory

Note: 1  
When using controlled impedance cable  
(Coaxial cable) and Pre\_Emphasis,  
lengths of 1.0meter are obtainable.

Note: 2  
50 Ohm impedance termination shown.  
For alternate impedance requirements,  
please consult the Factory.

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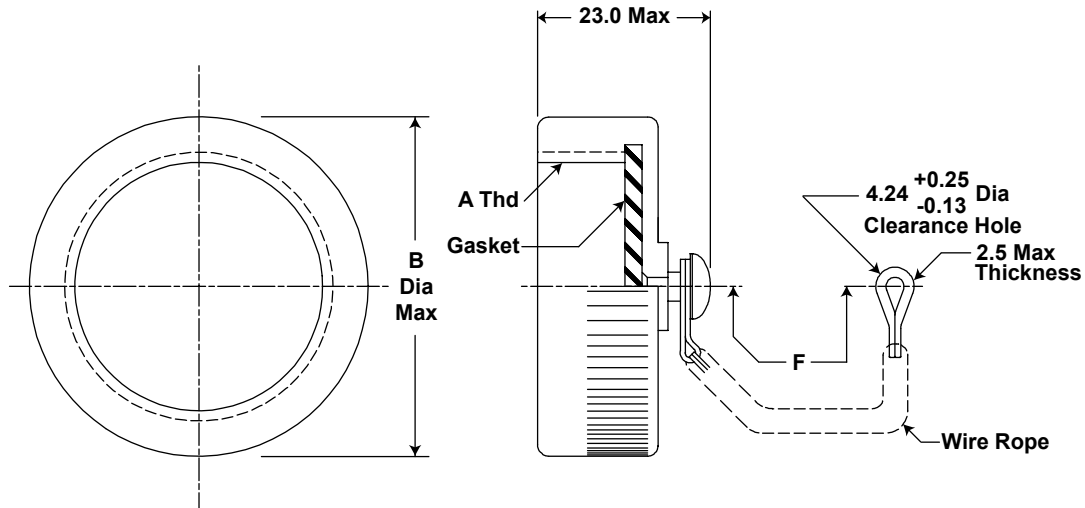
## APPENDIX A1

### RECEPTACLE PROTECTION CAPS

#### \*MIL-DTL-38999/33 PROTECTION CAP PART NUMBERS

MS RECEPTACLE CAP P/N

\*D38999/33W19R



\*See DSCC or SAE QPL for Approved Suppliers  
<http://www.dsccl.dla.mil/programs/qmlqpl/QPLdetail.asp?QPL=38999>

#### MIL-DTL-38999/33 Outline Dimensions - mm

Shell Size Code	Shell Size	A Thread (inches)	B Max Dia	F +13.0 -7.0
F	19	1.2500-0.1P-0.3L-TS	39.0	127.00

## APPENDIX A2

### MIL-DTL-38999 FIBER OPTIC CABLE PLUG / MIL-T-29504 PIN TERMINI

\*See DSCC or SAE QPL for Approved Suppliers

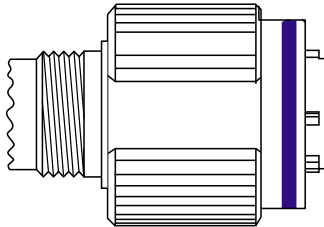
<http://www.dscclia.mil/programs/qmlqpl/QPLdetail.asp?QPL=38999>

#### \*D38999 PLUG - PIN INSERT

##### MIL-DTL-38999 CABLE PLUG

MS PLUG P/N

\*D38999/26WF11PN



#### \*FIBER OPTIC PIN TERMINUS

##### MIL-T-29504 PIN TERMINUS

MS PIN TERMINUS P/N

\*M29504/04-xxxx\*\*



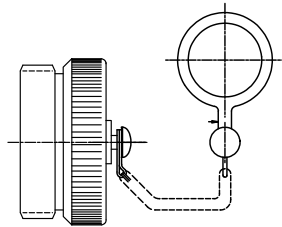
\*\*defined by fiber optic cable configuration

#### \*CABLE PROTECTION CAP

##### D38999/32 PLUG PROTECTION CAP

MS PLUG CAP P/N

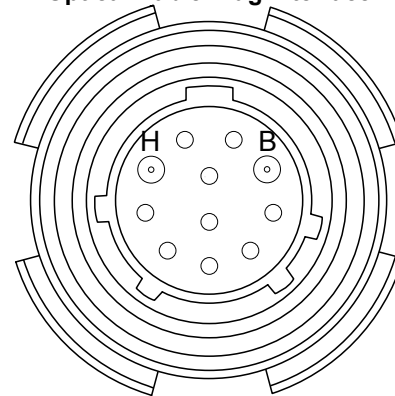
\*D38999/32W19N



#### D38999 PLUG PORT FUNCTIONS

PORT NUMBER	TX	RX
0	B	H

TOP  
Optical Cable Plug Interface



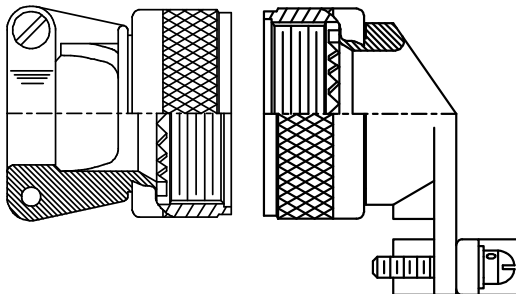
Front face of the optical cable plug pin insert shown. Transceiver insert opposite.

#### \*CABLE BACKSHELL

##### MIL-C-85049 CABLE BACKSHELL

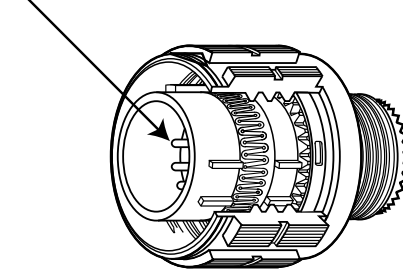
MS BACKSHELL P/N

\*MS85049/xxxxxx\*\*



\*\*Straight or angled backshell - defined by application / mounting configuration

Pin Termini



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