FS

100G DWDM QSFP28 C13~C60 PAM4 80KM DOM Transceiver

DWDM2-Q28100G-80

Application

• High bandwidth connectivity for Data Center Interconnection

• 100G Ethernet Metro-Access over DWDM

• P to P Access Network

Features

• Hot pluggable QSFP28 MSA form factor

• Up to 80km reach for G.652 SMF with transport white box

• Single +3.3V power supply

• Temperature Range 0 to 70°C

• Transmitter: Cooled EML 2*27.5Gbaud/s DWDM TOSA

• Receiver: 2*27.5Gbaud/s Pin-PD ROSA

• 4*25G CAUI4 electrical interface

• Integrated SFEC with high coding gain

• PAM4 modulation format on 100GHz ITU DWDM wavelength grid compatible

• Dual CS adaptor

• Compatible with RoHS6

Product Specifications

I. Ordering information

Part No	Specifications						
	Package	Data rate	Tx	Pout	Rx Sen.	Top	Others
DWDM2-Q28100G-80	QSFP28	103.125 Gbps	Cooled EAM DFB-LD	-1~+4 dBm	-12.5@BER 4E-3	0~70℃	DDM

*: Capable of 4.8Tbps/fiber with transport white box contains Mux/Demux, EDFA, adaptive CD compensation.

II. Absolute Maximum Ratings

Parameter	Symbol	Unit	Min	Max
Storage Temperature Range	Ts	oC	-40	+85
Relative Humidity	RH	%	5	85
Power Supply Voltage	Vcc	V	-0.5	+3.6
Operating Case Temperature Range	Tc	oC	0	+70
Receiver Damage Threshold Per Lane	Pdag	dBm	+5.2	

III. Recommended Operating Conditions

Parameter	Units	MIN.	TYP.	MAX.	Notes
Recommended Operating Conditions					
Operating Case Temperature	° C	0		+70	
Power Supply Voltage	V	3.135	3.3	3.465	
Control Input Voltage High	V	2		Vcc+0.3	
Control Input Voltage Low	V	-0.3		0.8	
Rx Diff Data Output Load	Ω		100		
Power Dissipation	W		5		Tc = 70 ° C, Vcc = 3.465V, End of Life

For electrical characteristics, refer to CAUI-4 chip-to-module draft specifications (IEEE P802.3bm Annex 83E). The CAUI-4 host output shall meet the specifications defined below while measured at TP1 for transmitter, TP4 for receiver.
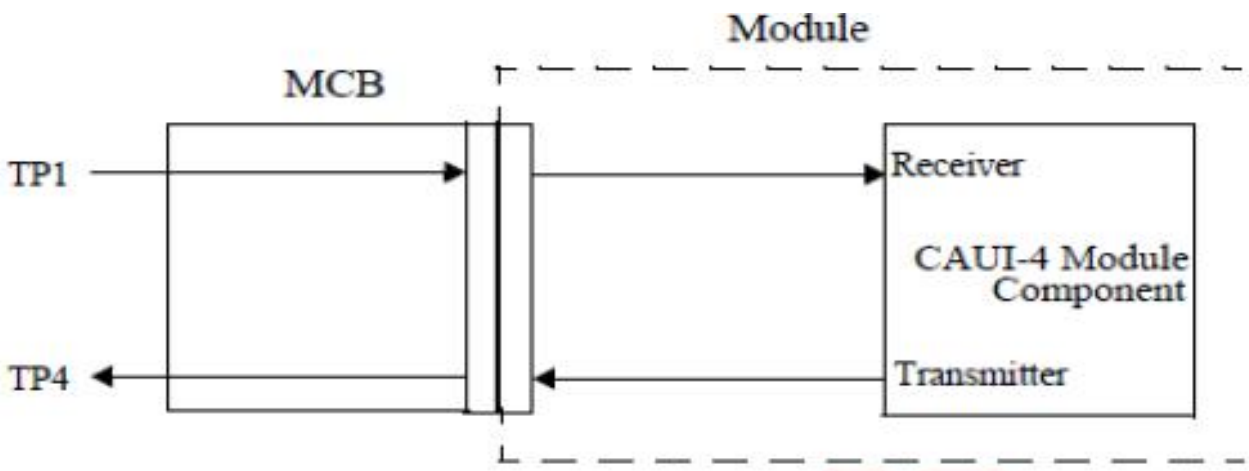

Figure 1: Module CAUI-4 compliance test point

IV. Transmitter Electrical Specification (TP1)

Parameter	Comment	Min	Typ	Max	Unit
Signaling Rate, each lane		Typ -100 ppm	25.7813	Typ +100 ppm	Gb/s
DC Common Mode Output Voltage		-350	---	2850	mV
Differential Return Loss	See template1	---	---	---	dB
Common to Differential Mode Conversion Return Loss	See template2	---	---	---	dB
Differential Termination Mismatch	At 1 MHz	---	---	10	%

V. Receiver Electrical Specification (TP4)

Parameter	Comment	Min	Typ	Max	Unit
Signaling Rate, each lane		Typ - 100 ppm	25.7813	Typ + 100 ppm	Gb/s
Common-Mode AC Output Voltage		---	---	17.5	mV
Differential pk-pk output voltage swing		---	---	900	mVpp
Eye Width	EW15 at 10-15 probability; PRBS 29-1	0.57	---	---	UI
Eye Height Differential	EH15 at 10-15 probability; PRBS 29-1	228	---	---	mV
Vertical Eye Closure		---	---	5.5	dB
Differential Output Return Loss	See template1	---	---	---	dB
Common to Differential ModeConversion Return Loss	See template2	---	---	---	dB
Differential Termination Mismatch		---	---	10	%
Transition Time (20% to 80%)		12	---	---	ps
DC Common Mode Voltage3		-350	---	2850	mV

Notes:
1. Reference IEEE P802.3bm Annex 83E, Figure 83E-7 for template
2. Reference IEEE P802.3bm Annex 83E, Figure 83E-8 for template

VI. Transmitter Optical Specification (TP2)

Parameter	Units	MIN.	TYP.	MAX.	Notes
Optical output power	dBm	-1		+4	
Transmitter Rate	Gbps		55.04318		55.04318*2λ
Lane center wavelength spacing	GHz		100		
Center wavelength	nm		See Wavelength Table		
Extinction ratio	dB		6		
Side-mode suppression Ratio	dB	30			
RIN OMA	dB/Hz			-132	
Optical Return Loss Tolerance	dB			20	
Transmitter reflectance	dB			-12	
Dispersion Tolerance	ps/nm	-150		50	Residual dispersion (RD) after DCM, and at worst ONSR

VII. Receiver Optical Specification(TP3)

Parameter	Units	MIN.	TYP.	MAX.	Notes
Receive Rate	Gbps		55.04318		55.04318*2λ
Center Wavelength	nm		See Wavelength Table		
Receiver reflectance	dB			-26	
Receiver Power, each lane	dBm	-12.5		6	
Required OSNR	dB	31			Pre-FEC BER 4E-3
LOS Assert	dBm	-26			
LOS De-assert	dBm			-11	
LOS Hysteresis	dB	1			
RSSI Accuracy	dB	-3		3	

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VIII. Wavelength Table:

Product No.	TX1			TX2		
	Ch. No.	Frequency (THz)	Center Wavelength (nm)	Ch. No.	Frequency (THz)	Center Wavelength (nm)
	C13	191.30	1567.13	C14	191.40	1566.31
	C15	191.50	1565.50	C16	191.60	1564.68
	C17	191.70	1563.86	C18	191.80	1563.05
	C19	191.90	1562.23	C20	192.00	1561.42
	C21	192.10	1560.61	C22	192.20	1559.79
	C23	192.30	1558.98	C24	192.40	1558.17
	C25	192.50	1557.36	C26	192.60	1556.55
	C27	192.70	1555.75	C28	192.80	1554.94
	C29	192.90	1554.13	C30	193.00	1553.33
	C31	193.10	1552.52	C32	193.20	1551.72
	C33	193.30	1550.92	C34	193.40	1550.12
DWDM2-Q28100G-80	C35	193.50	1549.32	C36	193.60	1548.51
	C37	193.70	1547.72	C38	193.80	1546.92
	C39	193.90	1546.12	C40	194.00	1545.32
	C41	194.10	1544.53	C42	194.20	1543.73
	C43	194.30	1542.94	C44	194.40	1542.14
	C45	194.50	1541.35	C46	194.60	1540.56
	C47	194.70	1539.77	C48	194.80	1538.98
	C49	194.90	1538.19	C50	195.00	1537.40
	C51	195.10	1536.61	C52	195.20	1535.82
	C53	195.30	1535.04	C54	195.40	1534.25
	C55	195.50	1533.47	C56	195.60	1532.68
	C57	195.70	1531.90	C58	195.80	1531.12
	C59	195.90	1530.33	C60	196.00	1529.55

Notes:
The two channels of the transceiver meet above wavelength table. And other channel wavelength configurations are acceptable for customize design.
All the specification is designed by single wavelength.

IX. Electric Ports Definition

NO	PIN	DEFINITION	DESCRIPTION	NOTE
1	1	GND	Ground	1
2	2	Tx2n	Transmitter Inverted Data Input	
3	3	Tx2p	Transmitter Non-Inverted Data Input	
4	4	GND	Ground	1
5	5	Tx4n	Transmitter Inverted Data Input	
6	6	Tx4p	Transmitter Non-Inverted Data Input	
7	7	GND	Ground	1
8	8	ModSelL	Module Select	
9	9	ResetL	Module Reset	
10	10	VccRx	+3.3V Power Supply Receiver	2
11	11	SCL	2-Wire Serial Interface Clock	
12	12	SDA	2-Wire Serial Interface Data	
13	13	GND	Ground	1
14	14	Rx3p	Receiver Non-Inverted Data Output	
15	15	Rx3n	Receiver Inverted Data Output	
16	16	GND	Ground	1
17	17	Rx1p	Receiver Non-Inverted Data Output	
18	18	Rx1n	Receiver Inverted Data Output	
19	19	GND	Ground	1
20	20	GND	Ground	1
21	21	Rx2n	Receiver Inverted Data Output	
22	22	Rx2p	Receiver Non-Inverted Data Output	
23	23	GND	Ground	1
24	24	Rx4n	Receiver Inverted Data Output	
25	25	Rx4p	Receiver Non-Inverted Data Output	

26	26	GND	Ground	1
27	27	ModPrsL	Module Present	
28	28	IntL	Interrupt	
29	29	VccTx	+3.3 V Power Supply transmitter	2
30	30	Vcc1	+3.3 V Power Supply	2
31	31	LPMode	Low Power Mode	
32	32	GND	Ground	1
33	33	Tx3p	Transmitter Non-Inverted Data Input	
34	34	Tx3n	Transmitter Inverted Data Input	
35	35	GND	Ground	1
36	36	Tx1p	Transmitter Non-Inverted Data Input	
37	37	Tx1n	Transmitter Inverted Data Input	
38	38	GND	Ground	1

NOTE:
1. GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground plane.
2. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 3 below. Vcc Rx, Vcc1 and VccTx may be internally connected within the module in any combination. The connector pins are each rated for a maximum current of 2000mA.

X. Memory Map
SFF-8636

SFF-8636 defines a common management interface for 4-lane pluggable transceiver modules, direct attach modules and shielded cable assemblies. It sets the EEPROM memory space as follows:

2-Wire Serial Address 1010000x
Lower Page 00h
0 Identifier
1- 2 Status
3- 21 Interrupt Flags
22- 33 Module Monitors
34- 81 Channel Monitors
82- 85 Reserved
86- 98 Control
99 Reserved
100-106 Free Side Device and Channel Mask
107 Reserved
108-112 Free Side Device Properties
113-118 Reserved
119-122 Password Change Entry Area (Optional)
123-126 Password Entry Area (Optional)
127 Page Select Byte

Upper Page 00h	Optional Page 01h	Optional Page 02h	Optional Page 03h (Cable Assemblies)
128 Identifier	128 CC_APPS	128-255 User EEPROM Data	128-175 Free Side Device Thresholds
129-191 Base ID Fields	129 AST Table Length (TL)		
	130 Application Code Entry 0		
	132-133 Application Code Entry 0		
	134-253 other entries		
192-223 Extended ID			176-223 Channel Threshold
224-255 Vendor Specific ID			224-225 Reserved
			226-227 Vendor Specific
			238-241 Channel Controls
			242-253 Channel Monitor Masks
	254-255 Application Code Entry TL		254-255 Reserved

XI. DDM

DDM accuracy:

Parameters	Unit	Requirements	Note
temperature	℃	+/-3	
voltage	V	+/-5%	
Ibias	mA	+/-10%	
Rx power	dB	+/-3.0	
Tx power	dB	+/-3.0	

DDM Alarm & warning threshold is listed below:

Parameters	Unit	Requirements	Description
Temp low warning	℃	0	Min. case temperature
Temp high warning	℃	70	Max. case temperature
Voltage low warning	V	3.135	-5% Vcc target
Voltage high warning	V	3.465	+5% Vcc target
Tx power low warning	dBm	-1	Min. optical power in DS.
Tx power high warning	dBm	7	Max. optical power in DS.
Rx power low warning	dBm	-8.4	Sensitivity
Rx power high warning	dBm	4.2	Overload
Temp low alarm	℃	-10	Warning-10 ℃
Temp high alarm	℃	+80	Warning+10 ℃
Voltage low alarm	V	2.97	-10% Vcc target
Voltage high alarm	V	3.63	+10% Vcc target
Tx power low alarm	dBm	-4	Warning -3dB
Tx power high alarm	dBm	10	Warning +3dB
Rx power low alarm	dBm	-11.4	Warning -3dB
Rx power high alarm	dBm	7.2	Warning +3dB

XII. Recommended Power Supply Filter
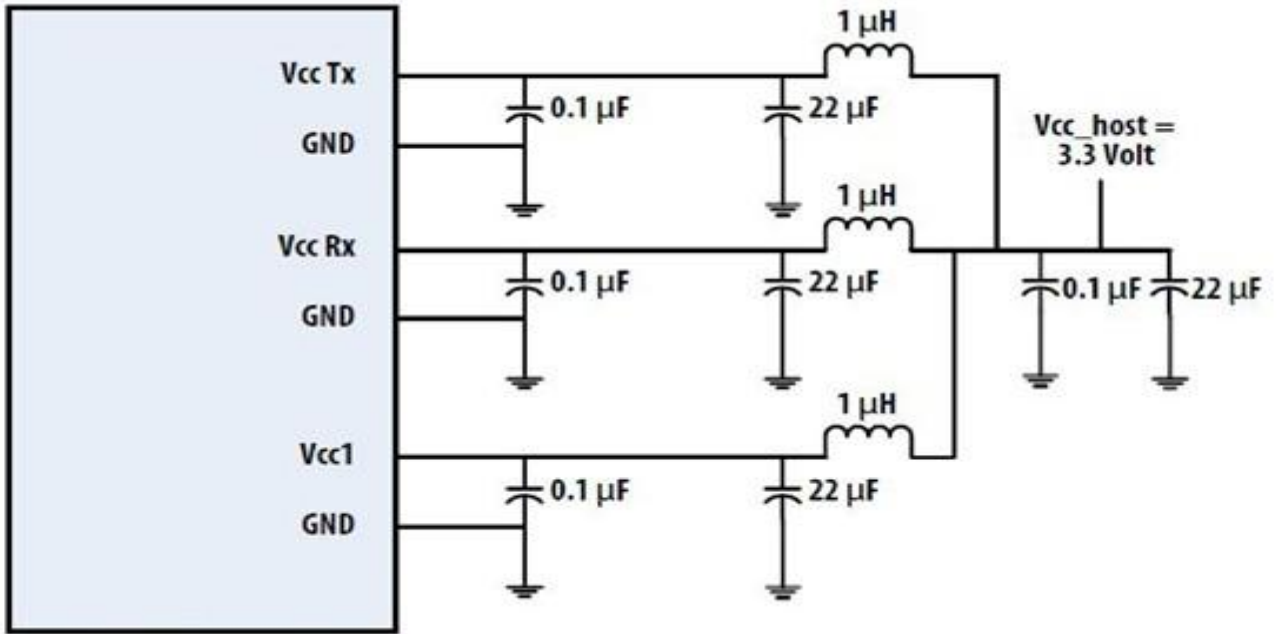
XIII. Mechanical Drawings

38	GND
37	Tx1n
36	Tx1p
35	GND
34	Tx3n
33	Tx3p
32	GND
31	LPMode/TxDis
30	Vcc1
29	VccTx
28	IntL/RxLOSL
27	ModPrsL
26	GND
25	Rx4p
24	Rx4n
23	GND
22	Rx2p
21	Rx2n
20	GND

Module Card Edge

Top Side
Viewed From Top

GND	1
Tx2n	2
Tx2p	3
GND	4
Tx4n	5
Tx4p	6
GND	7
ModselL	8
ResetL	9
VccRx	10
SCL	11
SDA	12
GND	13
Rx3p	14
Rx3n	15
GND	16
Rx1p	17
Rx1n	18
GND	19

Bottom Side
Viewed From Bottom
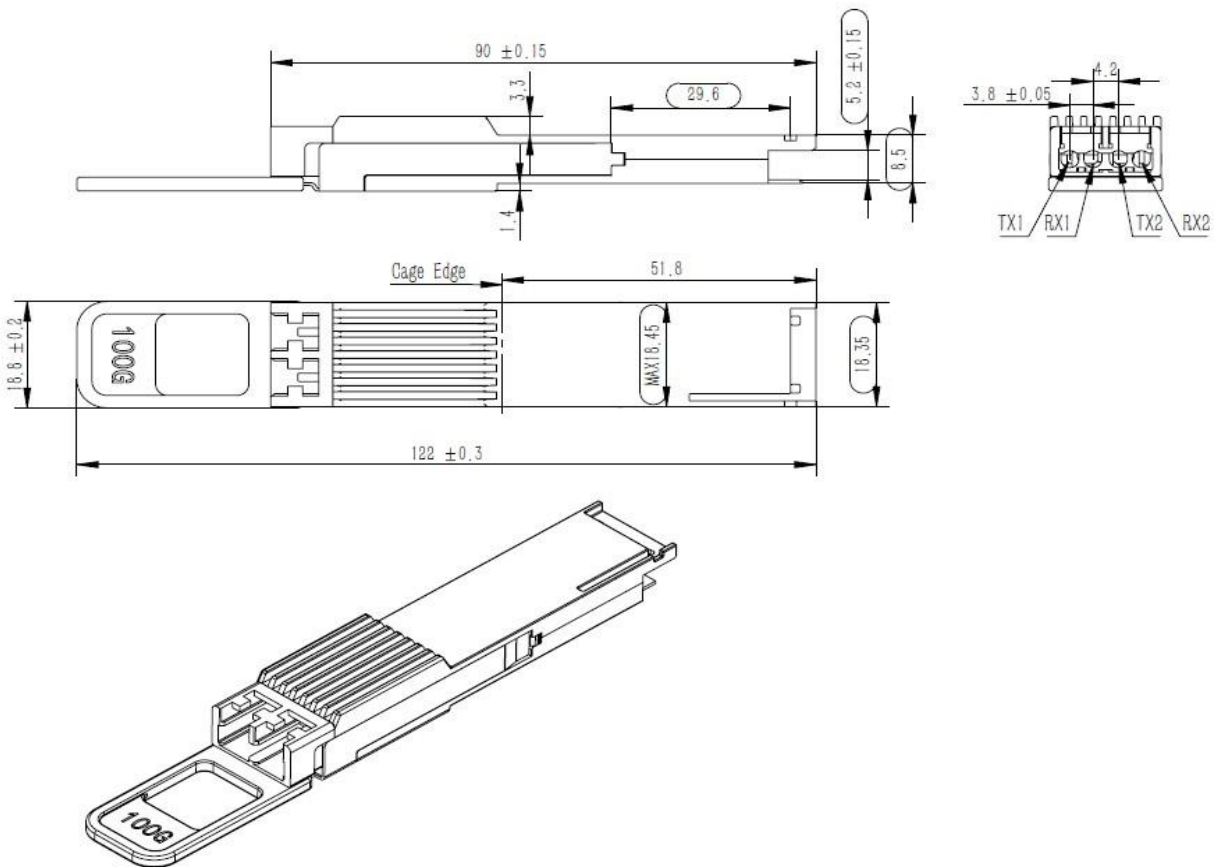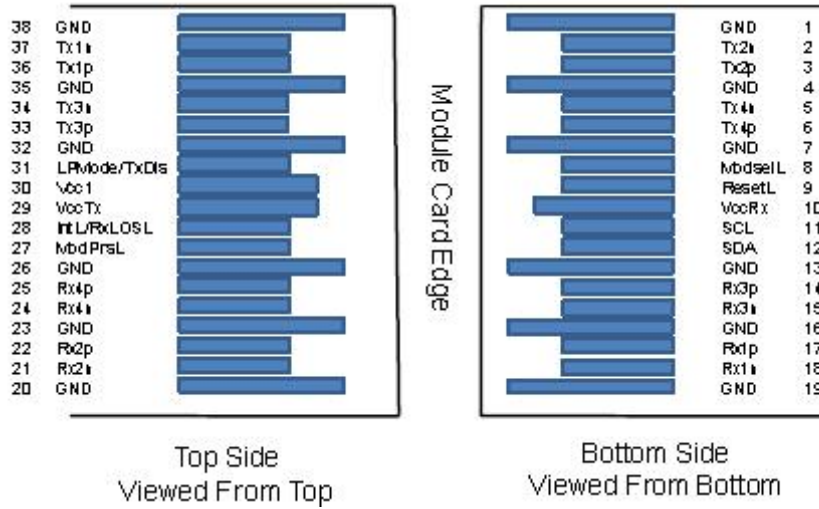
XiV. ESD

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected Environment.

Test Center

FS.COM transceivers are tested to ensure connectivity and compatibility in our test center before shipped out. FS.COM test center is supported by a variety of mainstream original brand switches and groups of professional staff, helping our customers make the most efficient use of our products in their systems, network designs and deployments.

The original switches could be found nowhere but at FS.COM test center, eg: Juniper MX960 & EX 4300 series, Cisco Nexus 9396PX & Cisco ASR 9000 Series, HP 5900 Series & HP 5406R ZL2 V3(J9996A), Arista 7050S-64, Brocade ICX7750-26Q & ICX6610-48, Avaya VSP 7000 MDA 2, etc.

Cisco ASR 9000 Series(A9K-MPA-1X40GE)

ARISTA 7050S-64(DCS-7050S-64)

Juniper MX960

Brocade ICX 7750-26Q

Extreme Networks X670V VIM-40G4X

Mellanox M3601Q

Dell N4032F

HP 5406R ZL2 V3(J9996A)

AVAYA 7024XLS(7002QQ-MDA)

Test Assured Program

FS.COM truly understands the value of compatibility and interoperability to each optics. Every module FS.COM provides must run through programming and an extensive series of platform diagnostic tests to prove its performance and compatibility. In our test center, we care of every detail from staff to facilities—professionally trained staff, advanced test facilities and comprehensive original-brand switches, to ensure our customers to receive the optics with superior quality.

Our smart data system allows effective product management and quality control according to the unique serial number, properly tracing the order, shipment and every part.
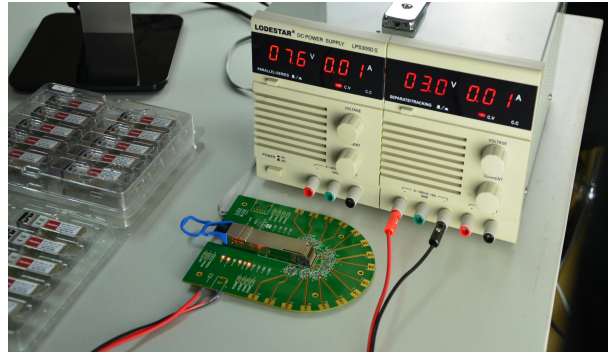
Our in-house coding facility programs all of our parts to standard OEM specs for compatibility on all major vendors and systems such as Cisco, Juniper, Brocade, HP, Dell, Arista and so on.

With a comprehensive line of original-brand switches, we can recreate an environment and test each optics in practical application to ensure quality and distance.

The last test assured step to ensure our products to be shipped with perfect package.

United Kingdom

Russia

Germany

United States

China

Singapore

Australia

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