

# SPT-XDXXTG-ZR+

**10Gb/s 100km DWDM XFP Transceiver**  
**Hot Pluggable, Duplex LC, 100GHz, DWDM EML&APD, Single mode**

## Features

- Support multi protocol from 9.95Gb/s to 11.3Gb/s
- Hot pluggable 30 pin connector
- Compliant with XFP MSA
- Transmission distance of 100km over single mode fiber
- DWDM EML laser transmitter
- APD Receiver
- 100GHz ITU Grid, C Band
- Duplex LC connector
- 2-wire interface for management and diagnostic monitor
- XFI electrical interface with AC coupling
- Power supply voltages : +3.3V, +5V
- Temperature range 0°C to 70°C
- Power dissipation: <3.5W
- RoHS Compliant Part

## Applications

- 10GBASE-ZR/ZW Ethernet
- Sonet OC-192/SDH
- 10G Fiber channel
- DWDM Networks

## Description

SOPTO's Small Form Factor 10Gb/s (XFP) transceivers are compliant with the current XFP Multi-Source Agreement (MSA) Specification. The high performance cooled DWDM TUNABLE transmitter and high sensitivity APD receiver provide superior performance for SONET/SDH, 10G FC and Ethernet applications up to 100km optical links.

## Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
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Storage Temperature	T <sub>ST</sub>	-40	+85	°C
Case Operating Temperature	T <sub>IP</sub>	0	+70	°C
Supply Voltage 1	V <sub>CC3</sub>	-0.5	+4.0	V
Supply Voltage 2	V <sub>CC5</sub>	-0.5	+6.0	V

### Electrical Characteristics (TOP = 0 to 70 °C)

Parameter	Symbol	Min	Typ	Max	Unit	Note	
Supply Voltage 1	V <sub>cc5</sub>	4.75		5.25	V		
Supply Voltage 2	V <sub>cc3</sub>	3.13		3.45	V		
Supply Current – V <sub>cc5</sub> supply	I <sub>cc5</sub>			250	mA		
Supply Current – V <sub>cc3</sub> supply	I <sub>cc3</sub>			500	mA		
Module total power	P			3.5	W		
<b>Transmitter</b>							
Input differential impedance	R <sub>in</sub>		100		Ω	1	
Differential data input swing	V <sub>in,pp</sub>	150		820	mV		
Transmit Disable Voltage	V <sub>D</sub>	2.0		V <sub>cc</sub>	V		
Transmit Enable Voltage	V <sub>EN</sub>	GND		GND+0.8	V		
Transmit Disable Assert Time	T <sub>off</sub>			100	ms		
Tx Enable Assert Time	T <sub>on</sub>			100	ms		
<b>Receiver</b>							
Differential data output swing	V <sub>out,pp</sub>	300	500	850	mV		
Data output rise time	t <sub>r</sub>			35	ps	2	
Data output fall time	t <sub>f</sub>			35	ps	2	
LOS Fault	V <sub>LOS fault</sub>	V <sub>cc</sub> – 0.5		V <sub>ccHOST</sub>	V	3	
LOS Normal	V <sub>LOS norm</sub>	GND		GND+0.5	V	3	
Power Supply Rejection	PSR	See Note 4 below					4

#### Notes

1. After internal AC coupling.
2. 20 – 80 %
3. Loss of Signal is open collector to be pulled up with a 4.7k – 10kohm resistor to 3.15 – 3.6V. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
4. Per Section 2.7.1. in the XFP MSA Specification.

### Optical Parameters(TOP = 0 to 70 °C)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
<b>Transmitter</b>						

Operating Date Rate	BR	9.95		11.3	Gb/s	
Bit Error Rate	BER			$10^{-12}$		
Maximum Launch Power	$P_{MAX}$	0		5	dBm	1
Optical Wavelength-End Of Life	$\lambda$	X-100	X	X+100	pm	
Optical Wavelength-Beginning Of Life	$\lambda$	X-25	X	X+25	pm	
Optical Extinction Ratio	ER	8.2			dB	
Spectral Width@-20dB	$\Delta\lambda$			1	nm	
Sidemode Supression ratio	SSRmin	30			dB	
Rise/Fall Time (20%~80%)	Tr/Tf			35	ps	
Average Launch power of OFF Transmitter	$P_{OFF}$			-30	dBm	
Tx Jitter	Txj	Compliant with each standard requirements				
Optical Eye Mask		IEEE802.3ae				2
<b>Receiver</b>						
Operating Date Rate	BR	9.95		11.3	Gb/s	
Receiver Sensitivity	Sen			-24	dBm	2
Maximum Input Power	$P_{MAX}$	-7			dBm	2
Optical Center Wavelength	$\lambda_C$	1260		1600	nm	
Receiver Reflectance	Rrx			-27	dB	
LOS De-Assert	LOS <sub>D</sub>			-24	dBm	
LOS Assert	LOS <sub>A</sub>	-34			dBm	
LOS Hysteresis	LOS <sub>H</sub>	0.5		5	dB	

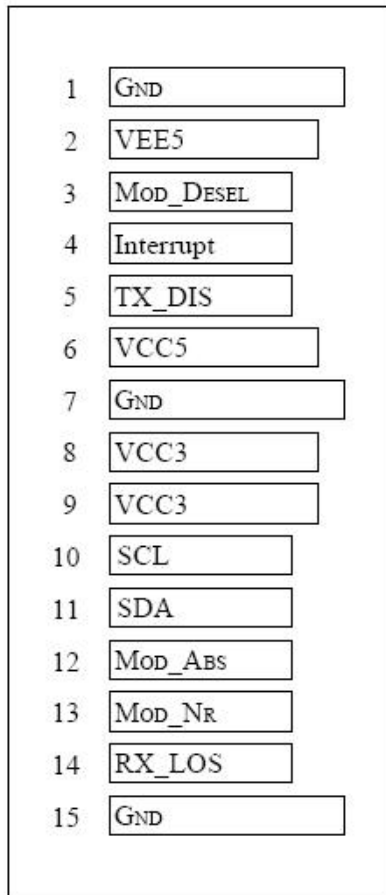
Notes:

1. The optical power is launched into SMF.
2. Measured with a PRBS  $2^{31}-1$  test pattern @10.3125Gbps BER< $10^{-12}$ .

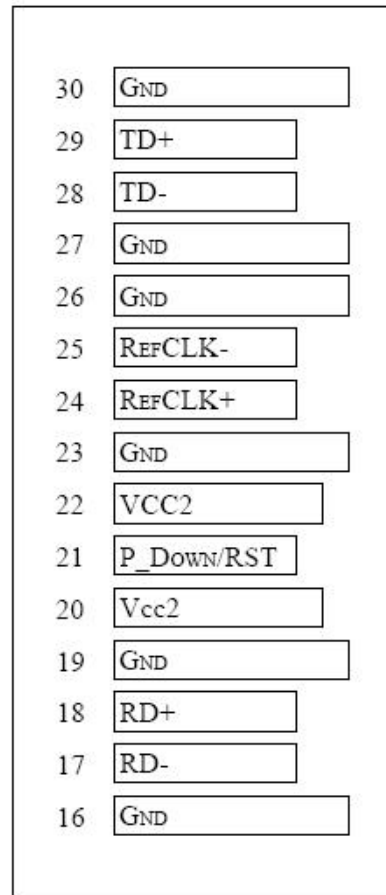
## Pin Definitions

### Pin Assignment

Diagram of Host Board Connector Block Pin Numbers and Name



Bottom of Board  
(As view through top of board)



Top of Board

**Pin Description:**

Pin	Logic	Symbol	Name/Description	Ref.
1		GND	Module Ground	1
2		VEE5	Optional -5.2 Power Supply – Not required	
3	LVTTL-I	Mod-Desel	Module De-select; When held low allows the module to respond to 2-wire serial interface commands	
4	LVTTL-O	Interrupt	Interrupt (bar); Indicates presence of an important condition which can be read over the serial 2-wire interface	2
5	LVTTL-I	TX_DIS	Transmitter Disable; Transmitter laser source turned off	
6		VCC5	+5 Power Supply	
7		GND	Module Ground	1
8		VCC3	+3.3V Power Supply	
9		VCC3	+3.3V Power Supply	
10	LVTTL-I	SCL	Serial 2-wire interface clock	2



11	LVTTL-I/O	SDA	Serial 2-wire interface data line	2
12	LVTTL-O	Mod_Abs	Module Absent; Indicates module is not present. Grounded in the module.	2
13	LVTTL-O	Mod_NR	Module Not Ready;	2
14	LVTTL-O	RX_LOS	Receiver Loss of Signal indicator	2
15		GND	Module Ground	1
16		GND	Module Ground	1
17	CML-O	RD-	Receiver inverted data output	
18	CML-O	RD+	Receiver non-inverted data output	
19		GND	Module Ground	1
20		VCC2	+1.8V Power Supply – Not required	
21	LVTTL-I	P_Down/RST	Power Down; When high, places the module in the low power stand-by mode and on the falling edge of P_Down initiates a module reset	
			Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle.	
22		VCC2	+1.8V Power Supply – Not required	
23		GND	Module Ground	1
24	PECL-I	RefCLK+	Reference Clock non-inverted input, AC coupled on the host board – Not required	3
25	PECL-I	RefCLK-	Reference Clock inverted input, AC coupled on the host board – Not required	3
26		GND	Module Ground	1
27		GND	Module Ground	1
28	CML-I	TD-	Transmitter inverted data input	
29	CML-I	TD+	Transmitter non-inverted data input	
30		GND	Module Ground	1

Note

1. Module circuit ground is isolated from module chassis ground within the module.
2. Open collector; should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15V and 3.45V.
3. A Reference Clock input is not required.

## Digital Diagnostic Functions

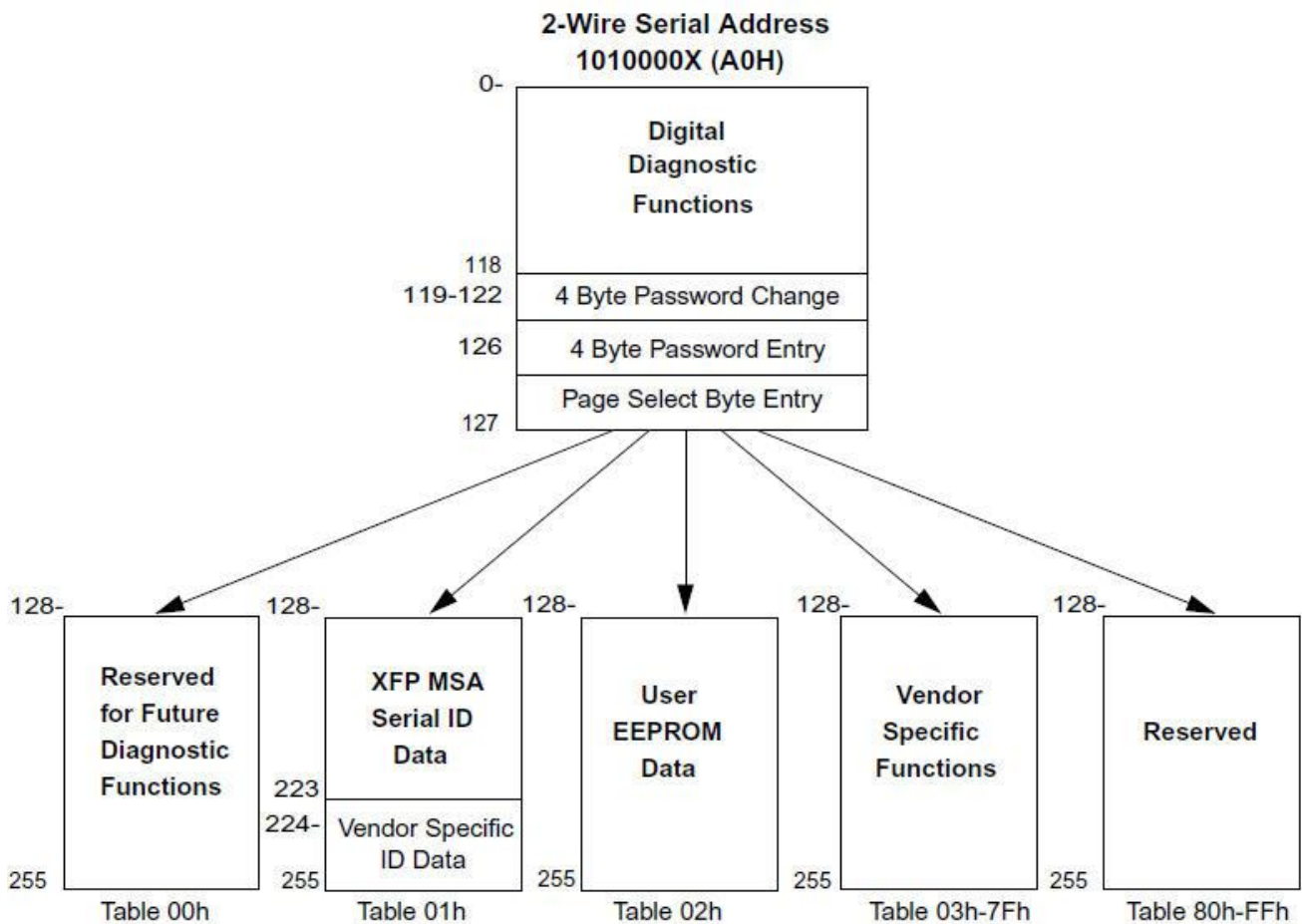
As defined by the XFP MSA 1, SOPTO's XFP transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- ✓ Transceiver temperature
- ✓ Laser bias current
- ✓ Transmitted optical power
- ✓ Received optical power
- ✓ Transceiver supply voltage

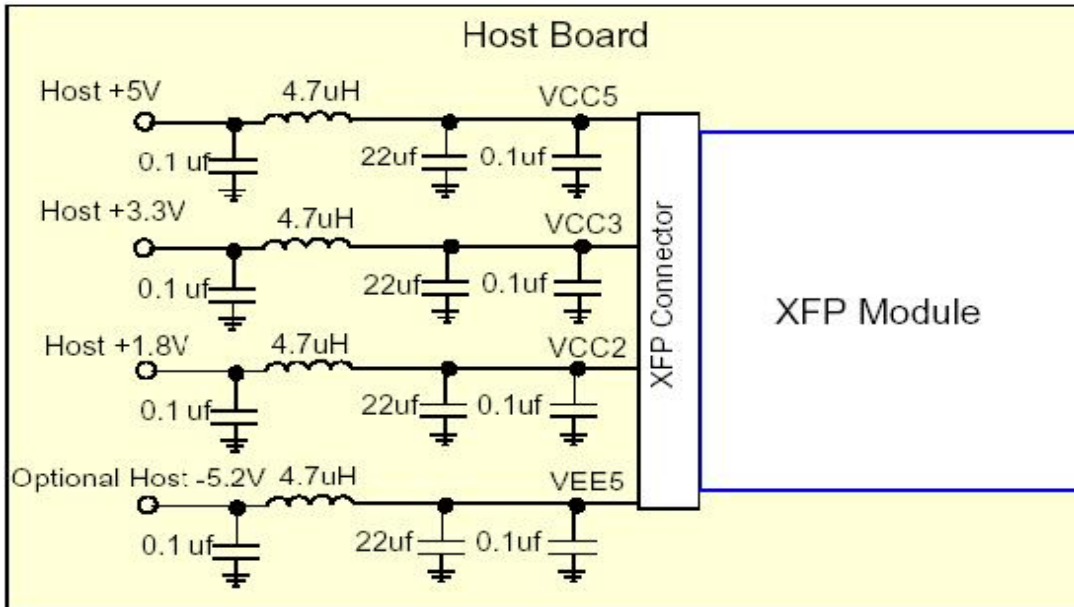
It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the XFP transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the XFP transceiver. The serial data signal (SDA pin) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially. The 2-wire serial interface provides sequential or random access to the 8 bit parameters, addressed from 000h to the maximum address of the memory.

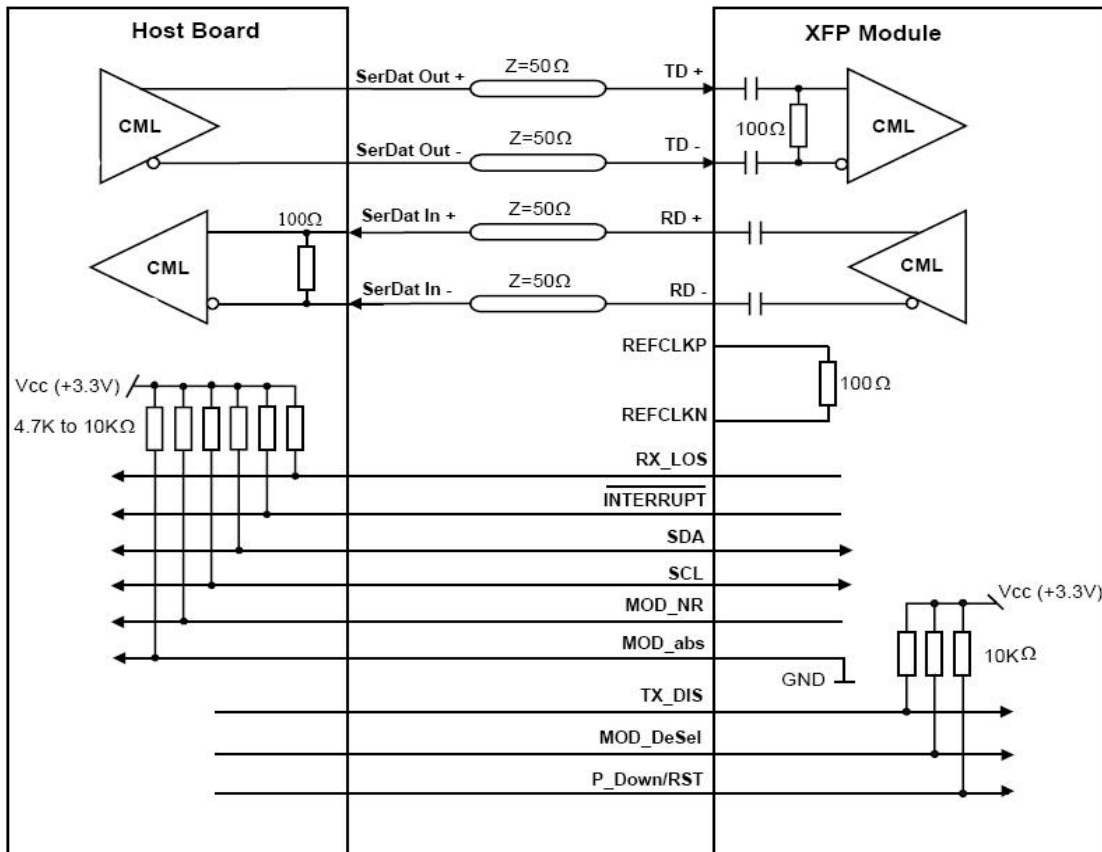
For more detailed information including memory map definitions, please see the XFP MSA Specification.



## Recommended Circuit

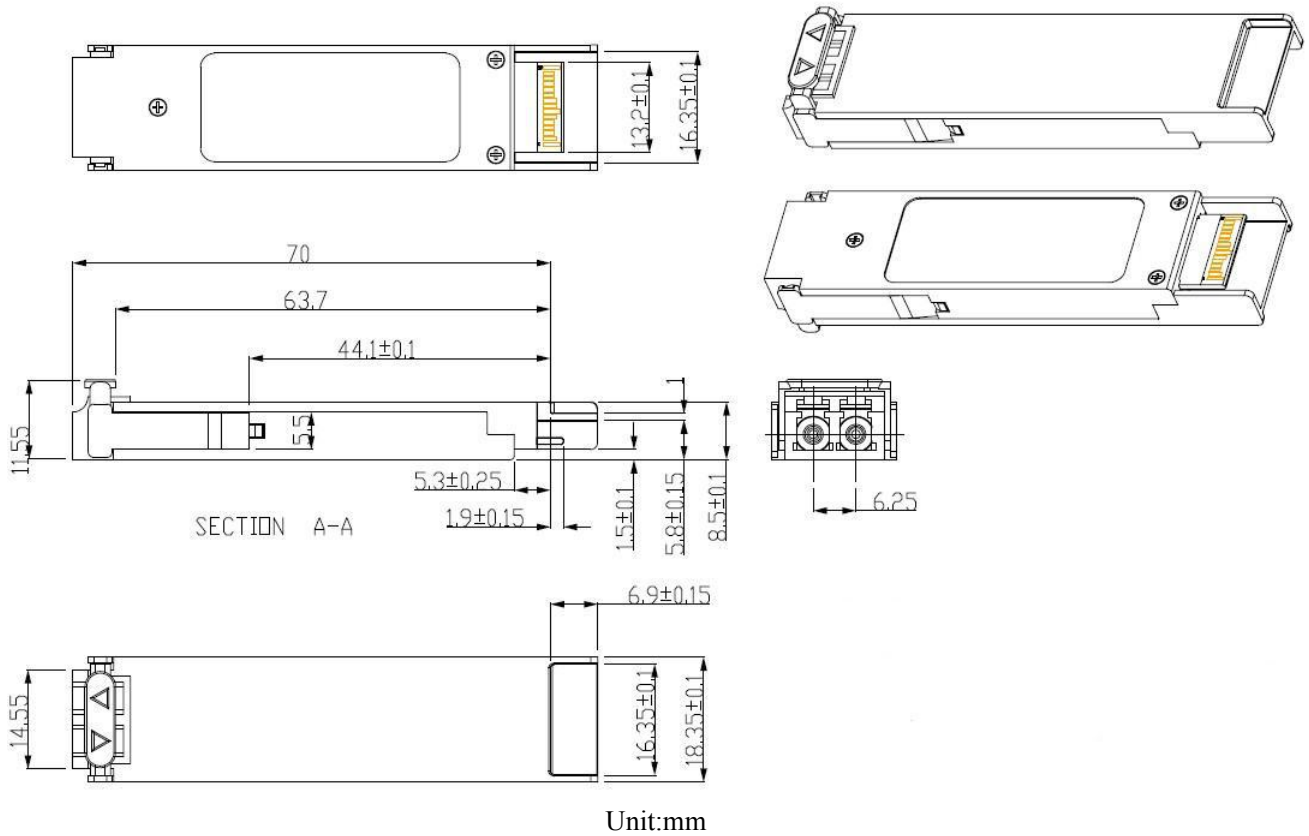


**Recommended Host Board Power Supply Circuit**



**Recommended High-speed Interface Circuit**

## Mechanical Dimensions



### Ordering information

Part Number	Product Description
SPT-XDXXTG-ZR+	DWDM XFP, 10Gbps, 100km, 0°C ~ +70°C, With DDM

Note: XX = 17~61 (ITU Channel C-band)

C-band	Central Wavelength(nm)	Frequency (THZ)
C61	1528.77	196.1
C60	1529.55	196.0
C59	1530.33	195.9
C58	1531.12	195.8
C57	1531.90	195.7
C56	1532.68	195.6
C55	1533.47	195.5
C54	1534.25	195.4
C53	1535.04	195.3
C52	1535.82	195.2
C51	1536.61	195.1
C50	1537.40	195.0
C49	1538.19	194.9
C48	1538.98	194.8



C47	1539.77	194.7
C46	1540.56	194.6
C45	1541.35	194.5
C44	1542.14	194.4
C43	1542.94	194.3
C42	1543.73	194.2
C41	1544.53	194.1
C40	1545.32	194.0
C39	1546.12	193.9
C38	1546.92	193.8
C37	1547.72	193.7
C36	1548.51	193.6
C35	1549.32	193.5
C34	1550.12	193.4
C33	1550.92	193.3
C32	1551.72	193.2
C31	1552.52	193.1
C30	1553.33	193.0
C29	1554.13	192.9
C28	1554.94	192.8
C27	1555.75	192.7
C26	1556.55	192.6
C25	1557.36	192.5
C24	1558.17	192.4
C23	1558.98	192.3
C22	1559.79	192.2
C21	1560.61	192.1
C20	1561.42	192.0
C19	1562.23	191.9
C18	1563.05	191.8
C17	1563.86	191.7

Note: If you need more customized services, please contact us.

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