# 10Gbps 40km DWDM XFP Optical Transceiver

## *RTXM226-5XX*

## Features

- *Compliant with XFP MSA Rev.4.0*
- *Data Rate from 9.95 Gbps to 11.3Gbps*
- *100GHz ITU Grid, C Band*
- *DWDM-rated EML transmitter*
- *PIN receiver*
- *10G XFI interface*
- *Transmission distance up to 40km*
- *LC duplex receptacle package*
- *Low power dissipation (Max 3.5W)*
- *Hot Pluggable*
- *Built in digital diagnostic Functions*
- *Operating case temperature range:-5°C~70°C*
- *RoHS compliant*

## Applications

- *DWDM Networks*
- *SONET OC-192&SDH STM 64*
- *10Gigabit Ethernet*
- *10Gigabit Fiber Channel*

# Absolute Maximum Ratings

| Parameter | Symbol | Unit | Min | Max |
|---|---|---|---|---|
| Supply Voltage 1 | Vcc3 | V | -0.5 | 4.0 |
| Supply Voltage 2 | Vcc5 | V | -0.5 | 6.0 |
| Storage Temperature | $T_s$ | °C | -40 | 85 |
| Operating Case Temperature | $T_c$ | °C | -5 | 70 |
| Relative humidity (Non condensation) | - | % | 5 | 90 |

# Recommended Operating Conditions

| Parameter | Symbol | Unit | Min | Typ | Max |
|---|---|---|---|---|---|
| Operating Case Temperature | $T_C$ | °C | -5 | - | 70 |
| Supply Voltage 1 | $V_{CC3}$ | V | 3.13 | 3.3 | 3.47 |
| Supply Current 1 | $I_{CC3}$ | mA | - | - | 750 |
| Supply Voltage 2 | $V_{CC5}$ | V | 4.75 | 5.0 | 5.25 |
| Supply Current 2 | $I_{CC5}$ | mA | - | - | 500 |
| Power Dissipation | - | W | - | | 3.5 |

# Electrical Characteristics

***(Tested under recommended operating conditions, unless otherwise noted)***

## High Speed Electrical Interface

| Parameter | Symbol | Unit | Min | Typ | Max | Note |
|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | |
| Input differential impedance | Rin | Ω | - | 100 | - | |
| Differential data input swing | Vin,pp | mV | 120 | - | 1000 | |
| Transmit Disable Voltage | VD | V | 2.0 | - | Vcc3+0.3 | |
| Transmit Enable Voltage | VEN | V | 0 | - | +0.8 | |
| Transmit Disable Assert Time | - | us | - | - | 10 | |
| **Receiver** | | | | | | |
| Differential data output swing | Vout,pp | mV | 400 | 650 | 800 | |
| Data output rise time | Tr | ps | 24 | - | - | |
| Data output fall time | Tf | ps | 24 | - | - | |
| LOS Fault | - | V | 2 | - | Vdd3+0.3 | 1 |
| LOS Normal | - | V | 0 | - | +0.8 | |

**Note1:** Vdd3 is host +3.3V power supply.

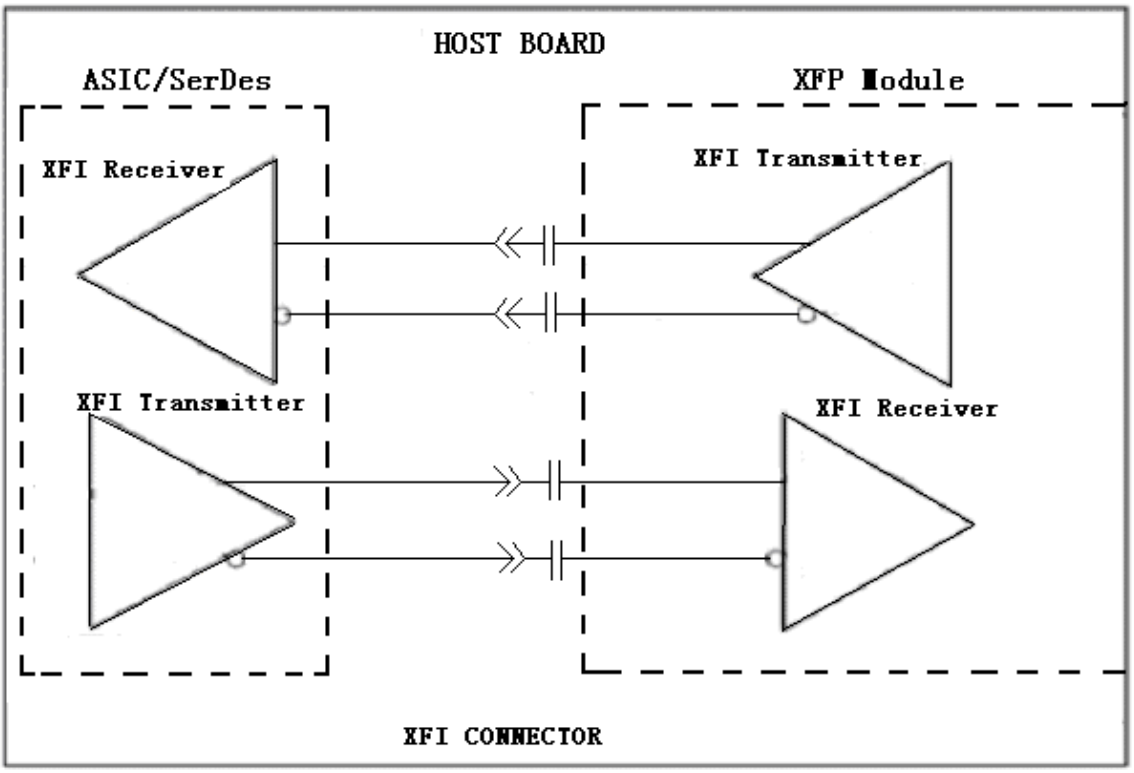


**Figure 1.** High Speed Electrical Interface

## Low Speed Electrical Interface

| Parameter | Symbol | Unit | Min | Max | Note |
|---|---|---|---|---|---|
| LVTTL-I | $V_{IH}$ | V | 2.0 | Vcc3+0.3 | |
| (Tx_Dis,P_Down/RST) | $V_{IL}$ | V | -0.3 | 0.8 | |
| LVTTL-O | $V_{OH}$ | V | Vdd3-0.5 | Vdd3+0.3 | 1 |
| (Interrupt,Mod_NR,Rx_Los) | $V_{OL}$ | V | 0.0 | 0.4 | |
| LVTTL-I | $V_{IH}$ | V | Vdd3*0.7 | Vdd3+0.5 | |
| (SCL,SDA) | $V_{IL}$ | V | -0.3 | Vdd3*0.3 | 1 |
| LVTTL-O | $V_{OH}$ | V | Vdd3-0.5 | Vdd3+0.3 | |
| (SCL,SDA) | $V_{OL}$ | V | 0.0 | 0.4 | |
| Leakage Current | $I_L$ | μA | -10 | 10 | |
| $I^2C$ Clock Rate | | KHz | | 400 | |

**Note 1:** Vdd3 is host +3.3V power supply.

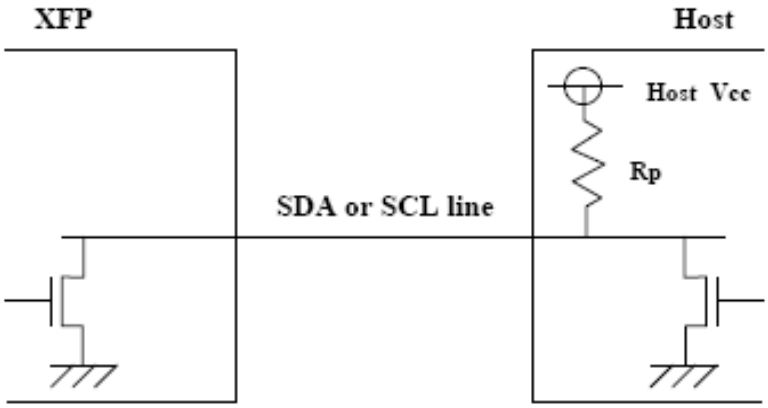


**Figure 2.** Open Drain Type Connection for $I^2C$

# Optical Characteristics

***(Tested under recommended operating conditions, unless otherwise noted)***

| Parameter | Symbol | Unit | Min | Typ | Max | Note |
|---|---|---|---|---|---|---|
| **Optical transmitter Characteristics** | | | | | | |
| Data rate | - | Gbps | 9.95 | - | 11.3 | |
| Optical Power | Po | dBm | -1 | - | 2 | ITU-T G.691 |
| Wavelength | | nm | 1528.77 | | 1563.05 | |
| Center Wavelength Spacing | | GHz | | 100 | | |
| Wavelength Tolerance | | pm | -50 | | +50 | |
| Extinction Ratio | ER | dB | 8.2 | - | - | ITU-T G.691 |
| SMSR | - | dB | 30 | - | - | |
| Eye diagram | Compliant with ITU-T G.691 STM-64 eye mask | | | | | |
| Dispersion penalty | | dB | - | - | 2 | 800ps/nm |
| **Optical receive Characteristics** | | | | | | |
| Data rate | - | Gbps | 9.95 | - | 11.3 | |
| Receiver Sensitivity | - | dBm | - | - | -15 | ER=8.2 |
| Overload | - | dBm | -1 | - | - | |
| Optical Return Loss | - | dB | 27 | - | - | |
| LOS De-Assert | - | dBm | - | - | -20 | |
| LOS Assert | - | dBm | -27 | - | | |
| LOS Hysteresis | - | dB | 0.5 | - | 6 | |

# Block Diagram

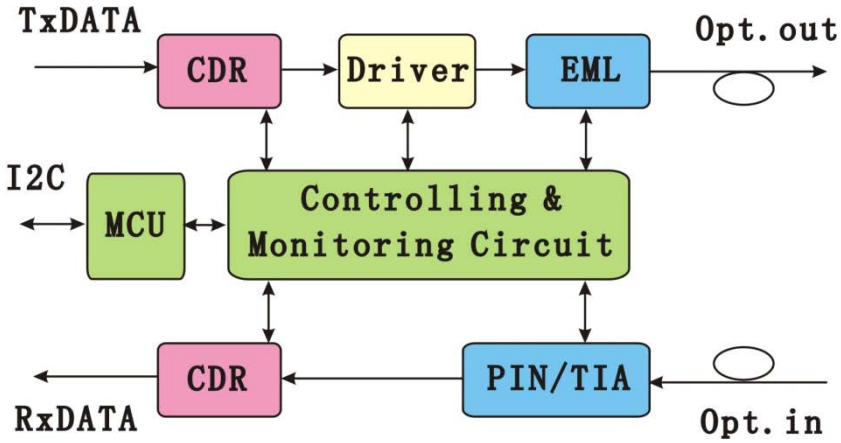


**Figure 3.** Block Diagram for RTXM226-5XX

# Pin Description

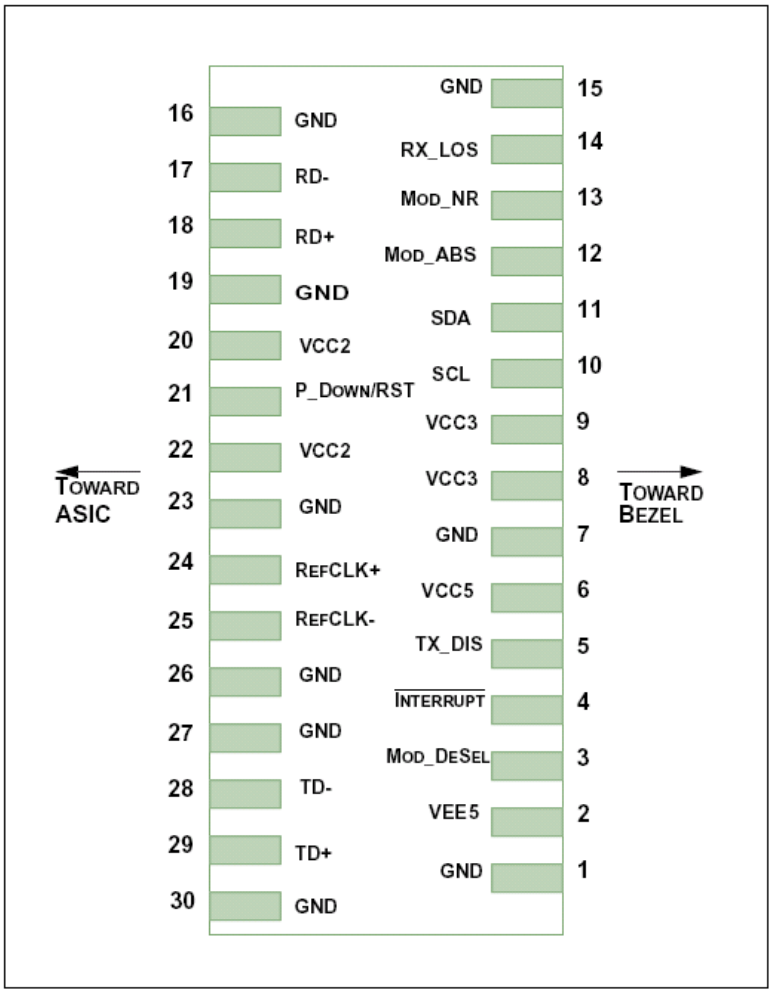


**Figure 4.** Host PCB XFP Pinout Top View

## Module Electrical Pin Definition

| Pin | Logic | Symbol | Name/Description | Note |
|---|---|---|---|---|
| 1 | | GND | Module Ground | 1 |
| 2 | | VEE5 | Optional -5.2V Power Supply ***(Not Required)*** | |
| 3 | LVTTL-I | Mod_DeSel | Module De-select; When held low allows module to respond to 2-wire serial interface | |
| 4 | LVTTL-O | $\overline{\text{Interrupt}}$ | $\overline{\text{Interrupt}}$; Indicates presence of an important condition which can be read over the 2-wire serial interface | 2 |
| 5 | LVTTL-I | TX_DIS | Transmitter Disable; Turns off transmitter laser output | |
| 6 | | VCC5 | +5V Power Supply | |
| 7 | | GND | Module Ground | 1 |
| 8 | | VCC3 | +3.3V Power Supply | |
| 9 | | VCC3 | +3.3V Power Supply | |
| 10 | LVTTL-I/O | SCL | 2-Wire Serial Interface Clock | 2 |
| 11 | LVTTL-I/O | SDA | 2-Wire Serial Interface Data Line | 2 |
| 12 | LVTTL-O | Mod_Abs | Indicates Module is not present. Grounded in the Module | 2 |
| 13 | LVTTL-O | Mod_NR | Module Not Ready; Indicating Module Operational Fault | 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, requires the module to limit power consumption to 1.5W or below. 2-Wire serial interface must be functional in the low power mode.<br>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)*** | |
| 25 | PECL-I | RefCLK- | Reference Clock Inverted Input, AC coupled on the host board ***(Not Required)*** | |
| 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 |

**Note1:** Module ground pins GND are isolated from the module case and chassis ground within the module.

**Note2:** Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.

# Digital Diagnostic Functions

As defined by the XFP MSA digital diagnostic functions are provided via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- Transceiver Temperature
- Tx Bias Current
- Tx Optical Power
- RX Received Optical Power
- Transceiver +3.3V&+5.0V Supply Voltage

# Typical Application Circuit For Power Supply

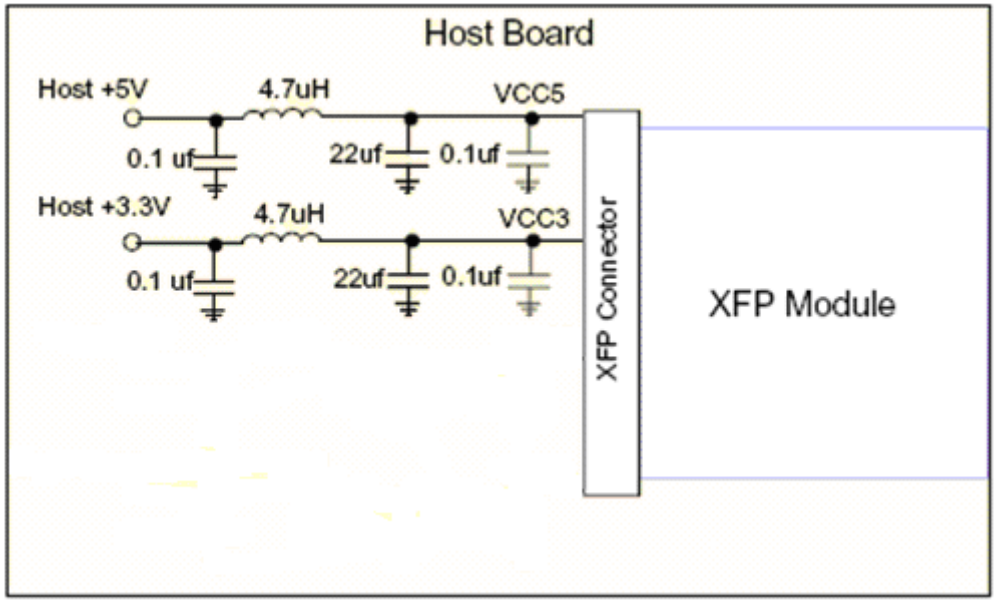


**Figure 5.** Example of Host Board Supply Filtering Network

# Package Outline

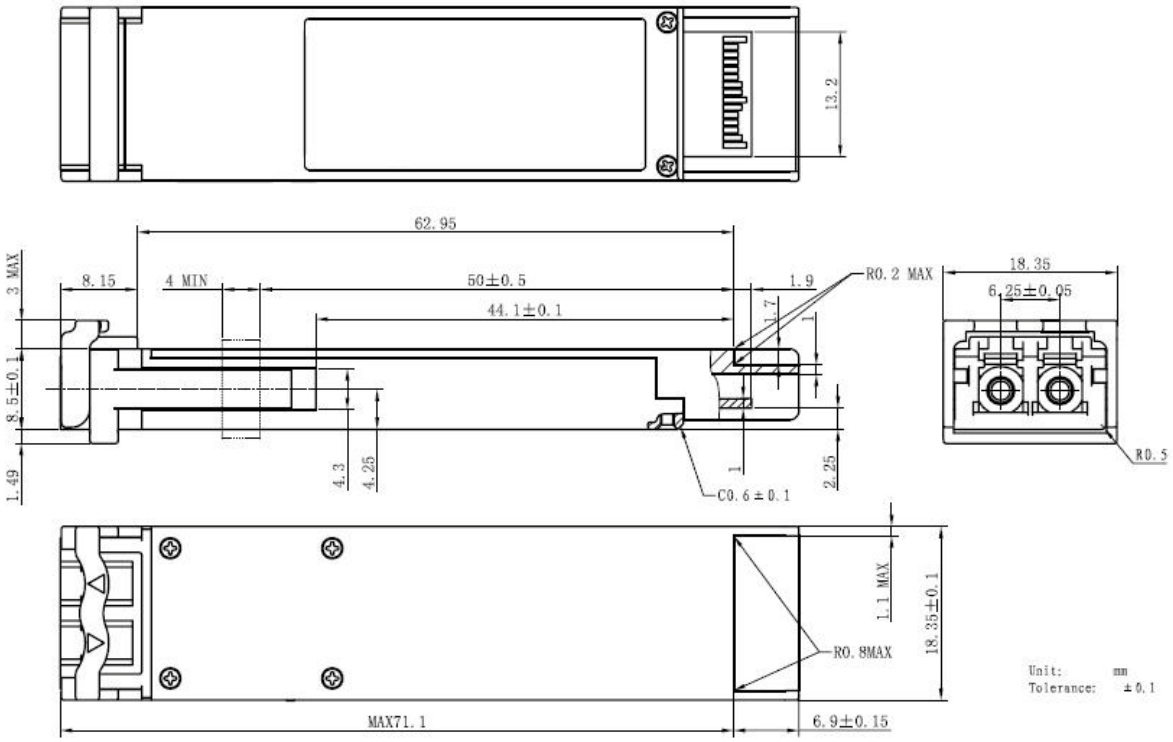


**Figure 6.** Package Outline

# Regulatory Compliance

| Feature | Test Method | Performance |
|---|---|---|
| Laser Eye Safety | FDA 21 CFR 1040.10 and 1040.11<br>IEC 60825-1: 1994+ A11: 1996+ A2: 2001<br>IEC 60825-2: 2004 + A1: 2006<br>EN 60825-1:1994+A1:2002+A2:2001<br>EN 60825-2: 2004 | Compliant with Class 1 laser product |
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883E Method 3015.7<br>Human Body Model | Class 1 (>1.5kV) |
| Electrostatic Discharge (ESD) Immunity | IEC 61000-4-2: 2001 | Class 2 (>4.0kV) |
| Electromagnetic Interference (EMI) | FCC Part 15 Subpart J Class B<br>CISPR22:1997+A1:2000+A2:2002, Class B<br>EN55022:1998+A1:2000+A2:2003, Class B | Compliant with standards |

# Ordering Information

| Part No. | Specification | | | | | | | | Application |
|---|---|---|---|---|---|---|---|---|---|
| | Package | Data rate | Laser | Optical Power | Detector | Sensitivity | Temp | Reach | |
| RTXM226-5XX | XFP | 9.95G ~ 11.3G | DWDM-rated EML transmitter | -1 ~ 2dBm | PIN | < -15dBm | -5~70°C | 40km | SONET OC-192 IR-2<br>SDH STM S-64.2,<br>10GBASE-ER<br>10G Fiber Channel |

| Product Code | Frequency(THz) | Center Wavelength(nm) |
|---|---|---|
| RTXM226-518 | 191.8 | 1563.05 |
| RTXM226-519 | 191.9 | 1562.23 |
| RTXM226-520 | 192.0 | 1561.42 |
| RTXM226-521 | 192.1 | 1560.61 |
| RTXM226-522 | 192.2 | 1559.79 |
| RTXM226-523 | 192.3 | 1558.98 |
| RTXM226-524 | 192.4 | 1558.17 |
| RTXM226-525 | 192.5 | 1557.36 |
| RTXM226-526 | 192.6 | 1556.55 |
| RTXM226-527 | 192.7 | 1555.75 |
| RTXM226-528 | 192.8 | 1554.94 |
| RTXM226-529 | 192.9 | 1554.13 |
| RTXM226-530 | 193.0 | 1553.33 |
| RTXM226-531 | 193.1 | 1552.52 |
| RTXM226-532 | 193.2 | 1551.72 |
| RTXM226-533 | 193.3 | 1550.92 |
| RTXM226-534 | 193.4 | 1550.12 |
| RTXM226-535 | 193.5 | 1549.32 |
| RTXM226-536 | 193.6 | 1548.51 |
| RTXM226-537 | 193.7 | 1547.72 |
| RTXM226-538 | 193.8 | 1546.92 |
| RTXM226-539 | 193.9 | 1546.12 |
| RTXM226-540 | 194.0 | 1545.32 |
| RTXM226-541 | 194.1 | 1544.53 |
| RTXM226-542 | 194.2 | 1543.73 |
| RTXM226-543 | 194.3 | 1542.94 |
| RTXM226-544 | 194.4 | 1542.14 |
| RTXM226-545 | 194.5 | 1541.35 |

| | | |
|---|---|---|
| RTXM226-546 | 194.6 | 1540.56 |
| RTXM226-547 | 194.7 | 1539.77 |
| RTXM226-548 | 194.8 | 1538.98 |
| RTXM226-549 | 194.9 | 1538.19 |
| RTXM226-550 | 195.0 | 1537.40 |
| RTXM226-551 | 195.1 | 1536.61 |
| RTXM226-552 | 195.2 | 1535.82 |
| RTXM226-553 | 195.3 | 1535.04 |
| RTXM226-554 | 195.4 | 1534.25 |
| RTXM226-555 | 195.5 | 1533.47 |
| RTXM226-556 | 195.6 | 1532.68 |
| RTXM226-557 | 195.7 | 1531.90 |
| RTXM226-558 | 195.8 | 1531.12 |
| RTXM226-559 | 195.9 | 1530.33 |
| RTXM226-560 | 196.0 | 1529.55 |
| RTXM226-561 | 196.1 | 1528.77 |



Edition: Apr. 2009
Published by Wuhan Telecommunication Devices Co., Ltd.