10G PON Chipset

System Package 1.20.1

for
10G PON Chipset PRX120
10G PON Chipset PRX126
10G PON Chipset PRX321

Release Notes

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Preface

This document gives an overview of the supported features, latest changes, and open issues for the 10G PON Chipset System Package 1.20.1, where “1.20.1” is a label for the feature set described in **Chapter 4**.

Table 2 lists the components of the system package, which is released for the devices listed under “Hardware Components”.

There will be future functional and security updates of the 10G PON Chipset System Package.

1 Delivery Content

Table 1 lists the contents of the **621015_UGW-9.x_master-10GPON-1.20.1-SW-CD_Rev1.0.zip** file.

Table 1 Contents

Item	Filename
Installation Script File	`install.sh`
License File	`MaxLinear-UGW-SLA`
Readme File	`README`

The zip file is available at **maxlinear.com/mymxl**.

2 New Features

The SDK 1.20.1 provides these new features:

- OMCI Warmstart
- Power optimization for SFU 10G/10G applications
- Integration of additional 10G PHY (Realtek RTL8261)
- ITU-T G.989 NG-PON2
- OpenWrt updated to version 22.03

Chapter 5 lists the improvements and bug fixes.

3 Components and Module Versions

This chapter enumerates the components that belong to the system package. These components are available via your local technical support or sales team.

Table 2 Components of the 10G PON Chipset System Package 1.20.1

Component Type	Version	Comment
Hardware Components		
PRX120	PRX120B0BC PRX120B1BC PRX120B2BC	Refer to [1]
PRX126	PRX126B0BI PRX126B1BI PRX126B2BI	Refer to [2], [8]
PRX321	PRX321B0BI PRX321B1BI PRX321B2BI	Refer to [3], [7]
Software Components (only the major functional components are listed)		
Software Package Version	1.20.1	This SDK patch is based on OpenWrt/LEDE.
OpenWRT/LEDE	22.03	Linux distribution for embedded devices
Linux Kernel Version	4.9.337	–
Cross Compiler GCC	11.2.0	–
UBOOT	2016.07 / 3.1.272	Boot loader
PON Subsystem	1.20.5	PON subsystem version
PON FAPI Library	1.24.4.0	PON subsystem functional API
PON Adapter Library	1.16.2	Interface layer between OMCI stack and PON FAPI
PON Mailbox Driver	1.22.3	Interface handler between PON FAPI and PON firmware
PON Multicast Driver	1.12.1	Kernel and user API multicast control driver
PON Network Library	1.20.6	PON subsystem network API
PON Image Library	2.3.2	PON image upgrade library
PON Tools	1.9.0	PON subsystem tools
PON ToD Daemon	1.4.1	–
OMCI Stack	8.17.6	ITU PON ONU management stack
Voice TAPI	4.26.0.0	–
Datapath Manager	1.0.0.168	–
KPI2UDP	3.6.0.0	–
SFP I2C Slave Driver	1.2.1	–
PON EEPROM Library	3.6.0	SFP EEPROM interface layer
IFXOS Library	1.7.2	–
CLI Library	2.9.0	Command line interface for debugging
PRX321/PRX120 GPHY Firmware	$879D_H$	B0 firmware for the integrated Ethernet PHY module

Table 2 Components of the 10G PON Chipset System Package 1.20.1 (cont'd)

Component Type	Version	Comment
PON Firmware	3.24.0.3.24 3.24.1.3.24	XGS-PON firmware for the integrated PON TC module G-PON firmware for the integrated PON TC module
PPv4 QoS Firmware	1.4.32	Firmware for the integrated QoS module
SFP Two-Wire Slave Firmware	1.0.2.1.24	Firmware for the integrated SFP two-wire slave module
Documentation		
10G PON Chipset	–	Refer to the documents in the **Literature References** section.

4 Software and Firmware Features

This chapter describes the software and firmware features of 10G PON Chipset System Package 1.20.1.

4.1 Supported Features

Table 3 lists the features contained in the software and firmware release.

The features are marked as either:

- D: Developed, but not fully tested.
- Y: Supported, that is, both developed and tested.
- N: Not supported.

This release does not cover any features described in the user documentation and contained in the delivered source code that are not marked or mentioned in this list.

This system package passed applicable BBF 247 issue 4 test cases for profiles A to F. The tests were performed with eOLT-GPON/XGS-PON equipment and test sets from MT2, as used by BBF certified test labs.

The traffic tests were performed with different OLTs.

This boot mode was used for the verification:

- Linux: External serial EEPROM/flash via Quad Serial Peripheral Interface (QSPI)

Table 3 Supported Features

Feature	Supp.	Restrictions/Comments
PON Operation Modes		
ITU-T G.984	Y	G-PON
ITU-T G.987	Y	XG-PON
ITU-T G.9807	Y	XGS-PON
ITU-T G.989	Y	NG-PON2, not including TDWM performance counters
PON Interoperability		
BBF TP-247i4	Y	Profiles A, B, C, D, E, F
Non PON Operation Modes		
Active Ethernet	D	–
ONU Management		
OMCI Stack	Y (SLA)	Test stack included, production solution depends on customer-specific requirements (IOP).
OMCI Warmstart	Y	
OLT Provisioning of UNI Interface	N	–
IP Host Managed Entity	Y	Multiple host instances supported.
OMCI Mutual Authentication	Y	–
Packet Processing		
Direct Forwarding	Y	GEM port - UNI interface forwarding without bridging.
TPID Translation	Y	Limited to 4 TPIDs
Upstream Untagged Frame Add Default VLAN Tag	Y	BBF-247 scope

Table 3 Supported Features (cont'd)

Feature	Supp.	Restrictions/Comments
Upstream Tagged Frame: One/Two/Ptag VLAN Tag Translation	Y	BBF-247 scope
Downstream Processing: Untagged Pass	N	–
Downstream Processing: Tagged Frame Translation/removal	Y	BBF-247 scope
Service Classification: ethertype+vlan+pbit	Y	BBF-247 scope
L2 Switching	Y	Unicast, multicast, and broadcast
L2 Learning/Aging	Y	With learning limitation per MAC bridge port.
L2 Performance Counter	Y	Per ingress and egress UNI/GEM port
Priority Processing	Y	Downstream and upstream PCP based queuing.
Color Marking	Y	Ingress and egress color marking as defined in traffic descriptor ME.
Standard Traffic Management	Y	Strict priority
Standard Traffic Management	Y	WRR scheduling
Standard Traffic Management	Y	Dual-token bucket shaping
Hierarchical Scheduling	Y	64 queues WRR, hierarchical
Hierarchical Scheduling	N	Hierarchical, color-aware scheduling in combination with shaping.
Buffer Reservation	Y	Buffer reservation and traffic isolation per queue, egress port.
IP Passthrough	Y	IPv4 and IPv6 packet forwarding
LAN MACsec	Y	Linux API
Dual UNI Support	Y	BBF-247 scope
IGMP / Multicast		
Filter Multicast Streams Viewed by Subscribers Supported on the SFP Based on the Destination IP Address or the Source IP and Destination IP Address (SSM)	Y	–
Downstream Multicast Traffic with VLAN VID Translation	Y	BBF-247 scope
IGMP Messages Transferable to the OLT with Unicast Rules without Trapping to CPU	D	–
Trap IGMP Messages to CPU for Snooping	Y	–
1024 Dynamic Access Control List (DACL) Entries	Y	–
Broadcast GEM Port for Downstream Broadcast and Multicast Frames Arriving at the Network Facing Interface and Forward Based on the VID to UNI Port with VLAN Action	Y	BBF-247 scope
Downstream QoS		
DS UNI Port Supports Strict Priority Scheduling (8 Queue Model)	Y	–

Table 3 Supported Features (cont'd)

Feature	Supp.	Restrictions/Comments
DS QoS Mapping Based on Outer CVLAN Tag Pbit	Y	–
DS QoS Mapping Based on Pbit before VLAN Operation	Y	–
DS QoS Mapping Based on Downstream Queue Pointer from the GEM Port	Y	BBF-247 scope
Upstream QoS		
PON Side Upstream Strict Priority Scheduling (8 Queue Model)	Y	–
Multiple GEM Port and Multiple Queue Configuration Support within One TCONT	Y	–
Upstream Queue Sharing and Non Sharing Case; specifically, Multiple GEM Ports Able to Map to One Single Queue	Y	–
Upstream GEM Sharing and Non Sharing Case	Y	–
Pbit Translation and dscp-to-pbit Translation	Y	–
Single GEM Port with Multiple Queues	Y	–
CPU QoS		
CPU QoS	Y	8 ingress CPU queues for CPU traffic
PON IP		
PLOAM Firmware	Y	–
AES Encryption and Decryption	Y	AES-128, upstream and downstream
FEC Support	Y	Upstream and downstream
Alarm and Performance Monitoring	Y	–
PON Power Saving Modes	D	Doze, cyclic, and watchful sleep
DBA Status Reporting	Y	–
Disable/Enable Dying Gasp	Y	–
Credential Update without Reboot	Y	–
PRBS Generator/Checker	Y	–
Optical Interface		
Optical Module Interface	Y	Connects to and controls the SFP-based optics or PMD devices for BOSA on board.
Two-Wire Master Interface (I^2C)	Y	Controls the optical module's or PMD's serial control bus.
Two-Wire Slave Interface (I^2C)	Y	DDMI support for external host
Two-Wire Bridge Mode (I^2C)	D	PMD calibration support
External Calibration of Optical Interfaces	Y	–
Time Synchronization		
SyncE SerDes		
G.8261 Timing and Synchronization Aspects in Packet Networks	Y	Supported except long-term hold over

Table 3 Supported Features (cont'd)

Feature	Supp.	Restrictions/Comments
G.8262 Wander Generation Limits	Y	For ITU-T G.984, ITU-T G.987, ITU-T G.9807 towards LAN UNI
G.8262 Wander and Jitter Tolerance	Y	–
G.8262 Jitter Generation Limits	Y	–
G.8262 Short Term Transient Response	Y	Optical loss for 15 s, phase error less than 1 µs.
G.8262 Long Term Hold Over	N	Not required for SFP. Requires external TCXO.
G.8263 Packet Based Equipment Clock	N	Not planned, but hardware ready.
G.8264 ESMC Generation	N	SyncE Status is supported.
SyncE GPHY		
G.8261 Timing and Synchronization Aspects in Packet Networks	Y	Supported except long term hold over
G.8262 Wander Generation Limits	Y	For ITU-T G.984, ITU-T G.987, ITU-T G.9807 towards LAN UNI
G.8262 Wander and Jitter Tolerance	Y	–
G.8262 Jitter Generation Limits	Y	–
G.8262 Short Term Transient Response	Y	Optical Loss for 15 s, phase error less than 1 µs.
G.8262 Long Term Hold Over	N	Not required for SFP. Requires external TCXO.
G.8263 Packet Based Equipment Clock	N	Not planned, but hardware ready.
G.8264 ESMC Generation	N	SyncE status is supported.
PTP V2		
PTP over SerDes	Y	Ethernet, UDP
PTP over Internal GPHY	Y	Ethernet, UDP
PTP Support on Dual Ethernet Ports	Y	–
PTP Driver Support for 1- and 2-Step Modes	Y	SYNC and DELAY_REQ packets with correct time stamp format.
/dev/ptp Devices	Y	PTP kernel API for clock control verified.
PTP Packet Rate	Y	16 and 128 packets/sec rates tests pass. No missing packets seen by Paragon-X.
PON-to-LAN PTP Clock Sync with phc2sys	Y	–
Linux PTP	Y	Version 2.0 with all MaxLinear patches
G.8273.2 Class A and Class B Compliance	Y	–
G.8273.2 MOOC	Y	–
G.8275.1 Telecom Profiles Compliance	Y	–
G.8271.1 Network Limits for Time Synchronization in Packet Networks	N	Hardware ready
Linux PTP Startup Scripts	Y	–
1PPS/ToD		
1PPS Output	Y	–
Configurable Periodic Output PPS	Y	–
ToD Output Multiplexer	Y	–

Table 3 Supported Features (cont'd)

Feature	Supp.	Restrictions/Comments
NMEA ToD	Y	GPZDA, GPZDG
G.8271 ToD	Y	–
Type B Protection Optical Loss - for less than 100 ms		
G.8262 Short Term Transient Response	Y	–
PLOAM State Machine	Y	–
Rogue ONU		
Rogue ONU	Y	–
Rogue ONU Auto-Detection	Y	Based on TX_FAULT signal from PMD
Rogue ONU Broadcast PLOAM Shutdown	Y	Laser disable or reboot
Rogue ONU Test Trigger	Y	–
FTTdp		
G.int Support	N	–
OAM		
OAM Support	Y	Kernel space API only
LCT		
LCT Local Craft Terminal	Y	–
Voice		
TAPI Demo	N	Available on request
TAPI Driver	Y	–
UBOOT		
MDIO Control for External PHY	Y	–

4.2 PON Transceivers

Table 4 lists the PON transceivers used in testing with the MaxLinear SFU reference board 10G PON Development Kit EASY PRX321 REF BOARD.

Table 4 PON Transceivers

Mode	Vendor	Model
XGS-PON	Superxon	SOGX2699-PSGA
G-PON	Municom	MUN-SFP-GPON-ONUB-B34-20-DDK

The MaxLinear SFP+ reference board 10G PON Development Kit EASY PRX126 REF BOARD V1.3 is equipped with these devices:

- MACOM M2180 PMD
- Source Photonics 10G EPON ONU BOSA (XGS-PON)

The MaxLinear SFP+ reference board 10G PON Development Kit EASY PRX126 REF BOARD V2.2 is equipped with these devices:

- Semtech GN28L96 PMD
- EZconn 10G 1270 nm / 1577 nm APD-TIA ONU BOSA, Model: EBS566272-B3216

4.3 10G Ethernet PHYs

Table 5 lists the 10G Ethernet PHYs used in testing with the MaxLinear SFU reference board 10G PON Development Kit EASY PRX321 REF BOARD.

Table 5 10G Ethernet PHYs

Mode	Vendor	Model
10G	Marvell	AQR107
10G	Marvell	AQR113
10G	Realtek	RTL8261

5 Changes

For a full list of the changes, refer to the detailed ChangeLog files, which are part of the component packages.

Table 6 Bug Fixes

Issue	Description
PONRTSYS-11901	lantiq-vmb.c did not compile with GCC 11
PONRTSYS-11948	Missing padding for short frames in VLAN pop scenarios
PONRTSYS-12182	EIP123 Linux kernel driver license was changed to GPL
PONRTSYS-12618	ptp4l reported short SO_TIMESTAMPING message
PONRTSYS-12732	USXGMII 10G PHY 100M/2.5G mode failed
PONRTSYS-12743	SDK 1.20.0 did not build on a standalone system
PONRTSYS-12844	No GEM ports existed after VLAN delete/add and admin state down/up
PONRTSYS-12846	Active Ethernet mode using WAN interface in 1G and 10G mode showed frame loss from internal GPHY to WAN
PONRTSYS-12884	BBF-247 tests failed due to incorrect LCT handling
PONRTSYS-12914	Decoding of IGMP was unsupported in tcpdump-mini

Table 7 Changes

Issue	Description
PONRTSYS-11734	Updated procd patches to provide same ubus interface as the UGW fwupgrade daemon
PONRTSYS-11753	Added Test Pattern Receiver and Checker per TWDM Wavelength
PONRTSYS-4443	Used new safeclib in pon components
PONRTSYS-8135	Added support for VLAN forwarding using extVLAN BP reassign action
PONRTSYS-11284	Moved LCT handling to user space
PONRTSYS-11753	Updated Test Pattern Receiver and Checker per TWDM Wavelength
PONRTSYS-11936	Enhanced PRBS with a parameter to select the wavelength
PONRTSYS-12360	Added default interface mode detection in the Aquantia driver
PONRTSYS-12461 PONRTSYS-12464 PONRTSYS-12465	Added detection for the OLT type. This information is passed to the PON firmware
PONRTSYS-12531	Modified the Data Path Manager to export the queue flush restore flag
PONRTSYS-12749	Disabled MACsec functionality by default (can be enabled via DTS setting)
PONRTSYS-12963	OMCI - Avoided T-CONT blocking during re-configuration

5.1 U-Boot Must Match Linux

The software image built with this SDK must be used together with a U-Boot version 2016.07-INTEL-v-3.1.210 or later, and its corresponding U-Boot environment.

5.2 Signaling of LOS on SFP+

The LOS condition is propagated from WAN to LAN port.

Note: For 1588/SyncE measurements with Paragon-X, the SFP+ ONU must be connected to an OLT to avoid LOS signaling. This is a known issue of the Paragon software.

5.3 1PPS Output Signal on SFP+

By default, the 1PPS output signal to SFP+ pin 9 is disabled in the DTS.

It is enabled in the DTS or with this PON CLI command:

```
$ pon pin_config_set 1 2
```

or with the respective PON library function.

5.4 Access via Telnet Is Not Supported

Local access via Telnet to the Linux command line is no longer supported for system security. Use SSH instead.

5.5 Signal Configuration of OPT_TX_EN and OPT_PUP_EN

The description of the configuration is incorrect in the Programmer's Guide documentation [6]. Table 8 shows the correct description.

Table 8 Optical Configuration Values

Group	Option	Unit	Range	Default	Notes
Common Settings					
common	tx_en_mode	–	0_H **AUTO** Automatic level detection 1_H **LOW** Active high output level 3_H **HIGH** Active low output level	0	This selects the polarity of the OPT_TXEN signal. The automatic mode is recommended.
	tx_pup_mode	–	1_H **LOW** Active low output level 3_H **HIGH** Active high output level	0	This selects the polarity of the OPT_TX_PUP signal.

5.6 WAN SerDes Test Function

The debug function to send an optical test signal for eye measurements was enhanced to cover multiple transmit wavelength channels. This is needed to support NG-PON2 systems.

The CLI function `pon debug_test_pattern_enable` has been enhanced by a second parameter to select the wavelength channel.

```
# pon debug_test_pattern_enable
Long Form: debug_test_pattern_enable
Short Form: dtpe

Input Parameter
- enum serdes_test_mode test_mode
   SERDES_TEST_MODE_RX = 1
   SERDES_TEST_MODE_TX_LOOP_TIMED = 2
   SERDES_TEST_MODE_TX_LOCAL_TIMED = 3
   SERDES_TEST_MODE_TX_RX = 4
   SERDES_TEST_MODE_TX_TO_RX_LOOP = 5
   SERDES_TEST_MODE_RX_TO_TX_LOOP_PMD = 6
   SERDES_TEST_MODE_RX_TO_TX_LOOP_PON = 7
- uint8_t wl_ch_id
```

For NG-PON2 applications, the valid selection depends on the optical transceiver. For example, if the transceiver offers four wavelength channels, the channels can be selected as 0, 1, 2, or 3.

For PON technologies other than NG-PON2, set `wl_ch_id = 0`.

6 Open Issues

Table 9 lists the currently open high priority issues of 10G PON Chipset System Package 1.20.1.

Table 9 Open Issues

Issue	Description	Status
PONRTSYS-10675	Occasionally there is no traffic after fiber re-connect under traffic	No fix planned
PONRTSYS-11849	The internal 2.5G Ethernet PHY does not go down when LAN interface is down	In progress
PONRTSYS-11948	Missing padding for short frames in VLAN pop scenarios	Fixed
PONRTSYS-11961	The 2.5G Ethernet link/ping in U-Boot only works after cable reconnect against Cisco switch	In progress
PONRTSYS-12182	EIP123 Linux kernel driver license change to GPL	Fixed
PONRTSYS-12327	Secure TRNG returns identical values	In progress
PONRTSYS-12736	USXGMII initialization in U-Boot fails	In progress
PONRTSYS-12739	OMCI action event fails sometimes with timeout	In progress
PONRTSYS-13011	USXGMII/XFI mode fails in 2.5G for AQR113C with Cisco Catalyst 3560CX-8XPD-S	In progress
PONRTSYS-13022	Segmentation fault in logread (write to 0) (OpenWrt limitation)	No fix planned
PONRTSYS-13024	An unexpected error message is displayed during service deactivation on a specific OLT: `ERR in vlan_flow_del():131 - pon_net_rtnl_bridge_learning_set() failed with -1`	In progress

7 Known Restrictions

Table 10 lists the currently known restrictions of 10G PON Chipset System Package 1.20.1.

Table 10 Known Restrictions

Functionality	Remark
Ethernet PHY	
In 2.5GBASE-T mode, a Bit Error Ratio (BER) exceeding IEEE 802.3 limits is sometimes observed for loop length above 80 m with Cat5e cables.	–
1000BASE-T EEE IOP issues against Marvell 88E1543, Vitesse VSC7428, Intel Ethernet Connection I219-LM, Atheros AR8151/8165/8171, Realtek RTL8218, RTL8370M, and RTL8376.	A low rate packet loss was observed on a few link-ups. Most of the failures are in DUT slave mode and at 100 m.
2.5GBASE-T EEE IOP issues against Aquantia AQC412, AQC113, and Marvell 88X3340 after testing with Spirent TestCenter.	Low rate packet loss and links drop were observed. 2.5GbE EEE support is disabled by default.
QoS	
QoS Buffer Reservation feature does not work in XGS-PON.	The effect is only visible when the number of queues dimensioned for 10G traffic is larger than 19. Configurations with two T-CONTs of eight queues each or multiple T-CONTs of one queue each are not affected. Improvements are under investigation. Refer to [10].
PON	
The pon_lib and pon_net_lib functions must be called from a single thread only. The implementation is not thread safe.	–
An OMCI software downgrade from SYS_1.19.x to SYS_1.18.x only works if SYS_1.18.x was installed initially.	If SYS_1.19.x was installed with a factory reset (such as an update from U-Boot), downgrading to SYS_1.18.x does not work.
Build Process	
The build process includes a step to select the target model to be built. This is handled through a script that is called: `./scripts/ltq_change_environment.sh switch` and selects multiple numerical options of which one must be numerically selected.	Do not use a selection in the range from `4` to `37` (individual debug model), use `3` instead (to build all debug models).

Literature References

[1] 10G PON Chipset PRX120 Data Sheet Rev. 2.5

[2] 10G PON Chipset PRX126 Data Sheet Rev. 3.6

[3] 10G PON Chipset PRX321 Data Sheet Rev. 3.5

[4] 10G PON Chipset System Overview Rev. 3.0

[5] 10G PON Chipset 10G PON Subsystem Software Overview Rev. 2.0

[6] 10G PON Subsystem Programmer's Guide Rev. 2.4

[7] 10G PON Development Kit EASY PRX321 REF BOARD V1.10.2 HW6.1.02 Hardware Design Guide Rev. 1.2

[8] 10G PON Chipset PRX126 Design Considerations Application Note Rev. 1.1

[9] 10G PON Chipset PRX126 SFP+ Thermal Design Guidelines Application Note Rev. 1.0

[10] 10G PON Chipset Packet Buffer Application Note Rev. 1.0

Attention: Refer to the latest revision of the documents.