User's Manual

RENESAS

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Linux Interface Specification Device Driver PTP Clock

User's Manual: Software

R-Car H3/M3/M3N/E3/D3 Series

Renesas Electronics
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How to Use This Manual

- **[Readers]**
  This manual is intended for engineers who develop products which use the R-Car H3/M3/M3N/E3/D3 processor.

- **[Purpose]**
  This manual is intended to give users an understanding of the functions of the R-Car H3/M3/M3N/E3/D3 processor device driver and to serve as a reference for developing hardware and software for systems that use this driver.

- **[How to Read This Manual]**
  It is assumed that the readers of this manual have general knowledge in the fields of electrical
  — engineering, logic circuits, microcontrollers, and Linux.
  → Read this manual in the order of the CONTENTS.
  — To understand the functions of a multimedia processor for R-Car H3/M3/M3N/E3/D3
  → See the R-Car H3/M3/M3N/E3/D3 User's Manual.
  — To know the electrical specifications of the multimedia processor for R-Car H3/M3/M3N/E3/D3
  → See the R-Car H3/M3/M3N/E3/D3 Data Sheet.

- **[Conventions]**
  The following symbols are used in this manual.
  Data significance: Higher digits on the left and lower digits on the right
  Note: Footnote for item marked with Note in the text
  Caution: Information requiring particular attention
  Remark: Supplementary information
  Numeric representation: Binary ... ××××, 0b××××, or ××××B
  Decimal ... ××××
  Hexadecimal ... 0x×××× or ××××H
  Data type: Double word … 64 bit
  Word … 32 bits
  Half word ... 16 bits
  Byte ... 8 bits

Table of Contents

1. Overview

1.1 Overview

This manual explains the driver module (this module) that controls the gPTP Timer in Ethernet AVB Unit on R-Car H3/M3/M3N/E3/D3.

1.2 Function

This module controls the gPTP Timer in the Ethernet AVB Unit on the R-Car H3/M3/M3N/E3/D3.
The function on this module is the following

- Set PTP time
- Get PTP time
- Shift the time atomically
- Adjust the clock frequency
- Time stamp external events
- Period output signals

1.3 Reference

1.3.1 Standard

The following table shows the document related to module.

Table 1.1 Standards

Number	Issue	Title	Edition	Date
IEEE Std 802.1AS™-2011	IEEE STANDARDS ASSOCIATION	IEEE Standard for Local and metropolitan area networks – Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks	-	30 March 2011
-	-	PTP hardware clock infrastructure for Linux	-	-

1.3.2 Related documents

The following table shows the document related to this module.

Table 1.2 Related document

Reference No.	Issue	Title	Edition	Date
-	Renesas Electronics	R-Car Series, 3rd Generation User's Manual: Hardware	Rev.2.20	Jun. 30, 2020
-	Renesas Electronics	R-CarH3-SiP/M3-SiP/M3N-SiP System Evaluation Board Salvator-XS Hardware Manual	Rev.2.04	Jul. 17, 2018
-	Renesas Electronics	R-CarH3-Sip System Evaluation Board Salvator-X Hardware Manual RTP0RC7795SIPB0011S	Rev.1.09	May. 11, 2017
-	Renesas Electronics	R-CarM3-SiP System Evaluation Board Salvator-X Hardware Manual RTP0RC7796SIPB0011S	Rev.0.04	Oct. 3, 2016
-	Renesas Electronics	R-CarE3 System Evaluation Board Ebisu Hardware Manual RTP0RC77990SEB0010S	Rev.0.03	Apr. 11, 2018
-	Renesas Electronics	R-CarE3 System Evaluation Board Ebisu-4D (E3 board 4xDRAM) Hardware Manual	Rev.1.01	Jul. 19, 2018
-	Renesas Electronics	R-CarD3 System Evaluation Board Hardware Manual RTP0RC77995SEB0010S	Rev.1.20	Jul. 25, 2017

1.4 Restrictions

There is no restriction in this module.

2. Terminology

The following table shows the terminology related to this module.

Table 2.1 Terminology

Terms	Explanation
PTP	Precision Time Protocol
gPTP	Generalized Precision Time Protocol
PHC	PTP Hardware Clock
POSIX	Portable Operating System Interface

3. Operating Environment

3.1 Hardware Environment

The following table lists the hardware needed to use this module.

Table 3.1 Hardware specification

Name	Version	Manufacture
R-CarH3-SiP System Evaluation Board Salvator-X	-	Renesas Electronics
R-CarM3-SiP System Evaluation Board Salvator-X	-	Renesas Electronics
R-CarH3-SiP/M3-SiP/M3N-SiP System Evaluation Board Salvator-XS	-	Renesas Electronics
R-CarE3 System Evaluation Board Ebisu	-	Renesas Electronics
R-CarE3 System Evaluation Board Ebisu-4D	-	Renesas Electronics
R-CarD3 System Evaluation Board Draak	-	Renesas Electronics

3.2 Module Configuration

The following figure shows the configuration of this module.

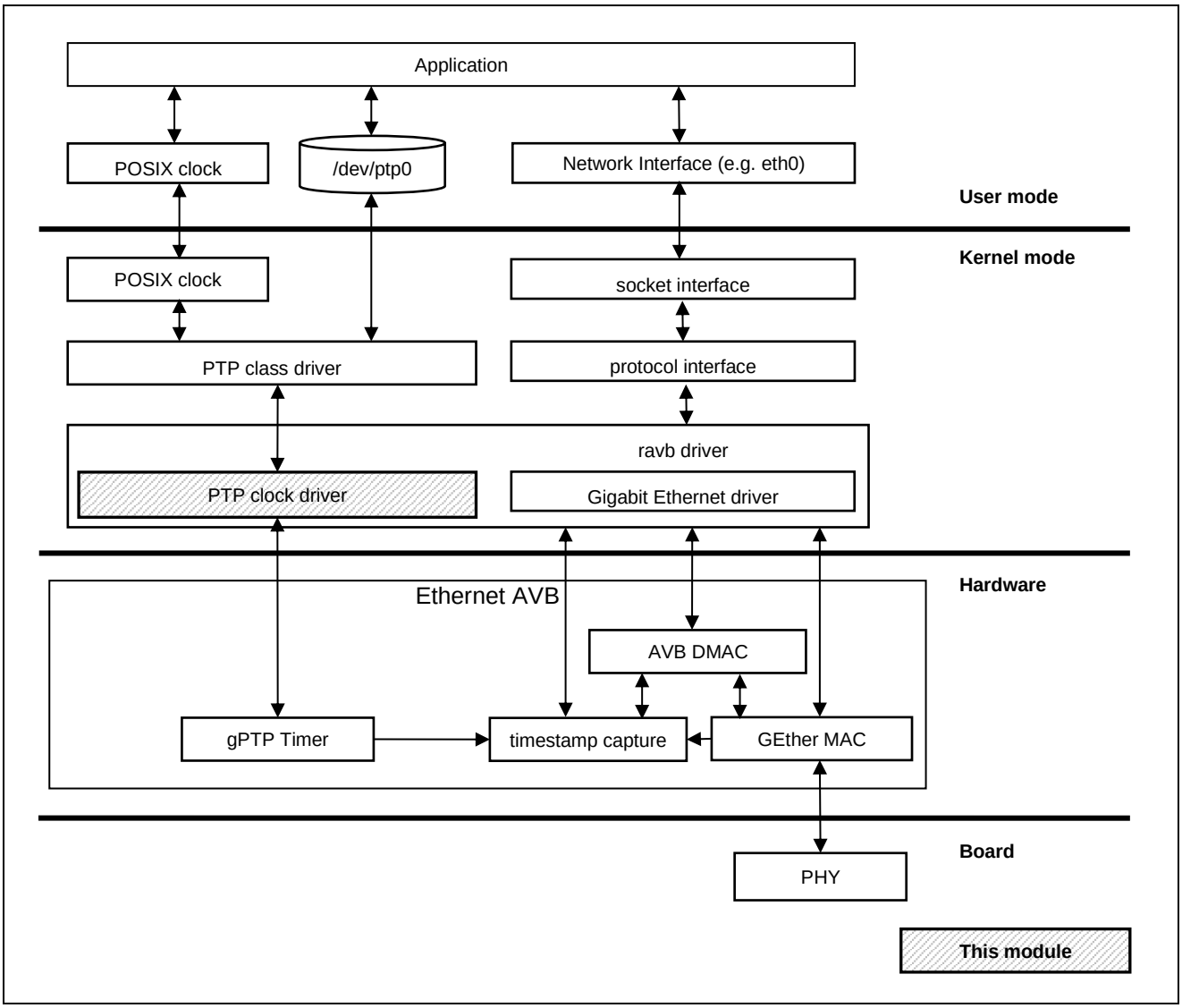

Figure 3.1 Module configuration

3.3 State Transition Diagram

There is no state transition diagram for this module.

4. External Interface

Detailed explanation is skipped because the external interface of this module is based on Linux PTP support.

Device node of this module is shown below.

Table 4.1 Device Node

Device node	Major number	Minor number
/dev/ptp0	240-254 (It is dynamically allocated)	0

Note: If using PTP clock, an associated Ethernet driver should be support timestamping function. Ethernet driver's capabilities of timestamping can be checked by using "ethtool -T".

5. Integration

5.1 Directory Configuration

The directory configuration is shown below.

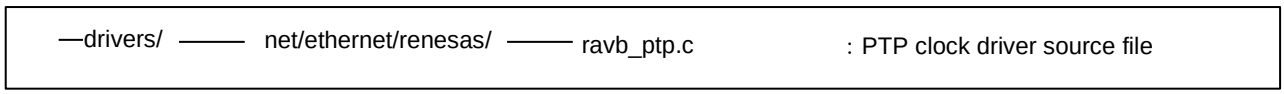

Figure 5.1 Directory Configuration

5.2 Integration Procedure

5.2.1 Kernel Configuration

To enable the function of this module, make the following setting with Kernel Configuration.

```
Device Drivers  --->
      [*]  Network device support ----->
            [*]  Ethernet driver support ----->
                  [*] Renesas devices ----->
                      <*>  Renesas Ethernet AVB support
```

Figure 5.2 Kernel Configuration

5.3 Option Setting

5.3.1 Module Parameters

There are no module parameters.

5.3.2 Kernel Parameters

There are no module parameters.

REVISION HISTORY	Linux Interface Specification Device Driver PTP Clock User's Manual: Software

Rev.	Date	Description	
		Page	Summary
0.1	Sep. 25, 2015	-	New creation.
0.2	Apr. 15, 2016	All	Add R-Car M3 support.
		2	Update related documents.
0.3	Aug. 5, 2016	2	Update related documents.
0.4	Mar. 15, 2017	2	Update related documents.
0.5	Jun. 14, 2017	2	Update related documents.
1.00	Aug. 8, 2017	All	Update document format.
1.01	Oct. 24, 2017	All	Add R-Car M3N support.
		2	Update related documents.
1.50	Jun. 29, 2018	2	Update related documents.
1.51	Mar. 28, 2018	All	Add R-Car E3 support.
1.52	Oct. 22, 2018	2	Update related documents.
2.00	Dec. 25, 2018	2	Update related documents.
		4	Add Board Ebisu-4D.
		-	Update Address List.
2.01	Apr. 17, 2019	2	Update related documents.
		-	Update Address List.
2.50	Apr. 21,2021	2	Add R-Car D3 support.
3.00	Dec. 10, 2021	-	Add Kernel v5.10.41 support

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