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Linux Interface Specification Device Driver Ethernet-AVB

User's Manual: Software
R-Car H3/M3/M3N/E3/D3 Series

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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 ... xxxx, 0bxxxx, or xxxxB

Decimal ... xxxx

Hexadecimal ... 0xxxxx or xxxxH

Data type: Double word ... 64 bit

Word ... 32 bits

Half word ... 16 bits

Byte ... 8 bits

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1. Overview

1.1 Overview

This manual explains the driver module (this module) that controls the Gigabit Ethernet controller in the EthernetAVB on R-Car H3/M3/M3N/E3/D3.

1.2 Function

This module supports the following functions by controlling Ethernet AVB (hardware) on R-Car H3/M3/M3N/E3/D3.

- Transmission and reception of Ethernet frame
- 1000 Mbps and 100 Mbps transfer (R-Car E3/D3 supports 100Mbps transfer only).
- Full-duplex mode
- A MAC Address is set to a random value by default. It needs to be maintained to satisfy users' environments
- Hardware timestamping

1.3 Ethernet PHY devices

Supported Ethernet PHY device of this module is as follows.

Table 1.1 Supported Ethernet PHY Devices

Vendor	Product	Interface	Note
Micrel	KSZ9031RNX	RGMI	Support Clause 28 of IEEE 802.3 Auto-Negotiation

1.4 Connected Port

Table 1.2 Connector

Channel	Connector	Content
Ethernet	CN22	yes

1.5 Reference

1.5.1 Standard

There are no reference documents on standards.

1.5.2 Related documents

The following table shows the document related to this module.

Table 1.3 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

1.6 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
Ethernet AVB	Ethernet Audio Video Bridging

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.

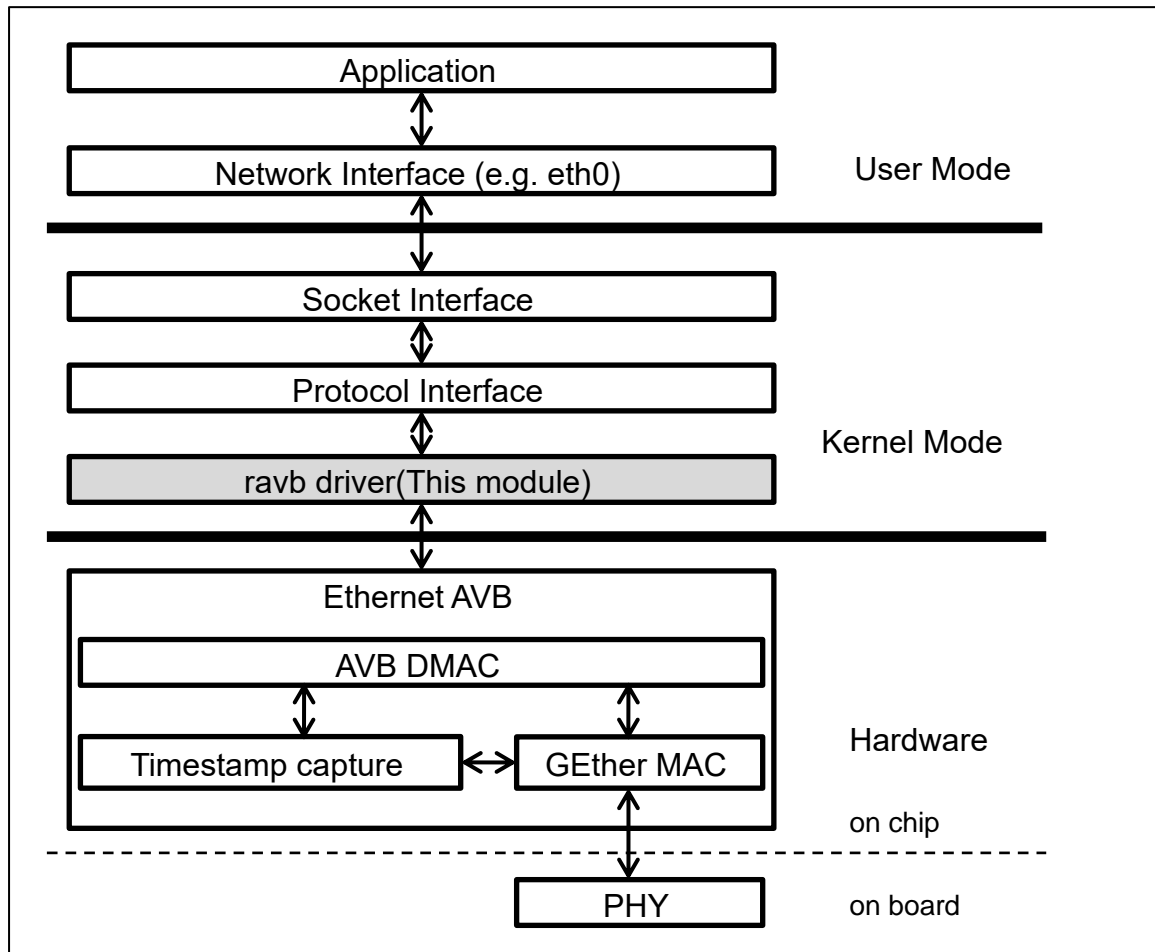


Figure 3.1 Gigabit Ethernet Module Configuration

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.

This module is associated with following Network Interfaces by default.

Table 4.1 Network Interfaces

Name	Description
eth0	Use eth0 by default configuration.

5. Integration

5.1 Directory Configuration

The directory configuration is shown below.

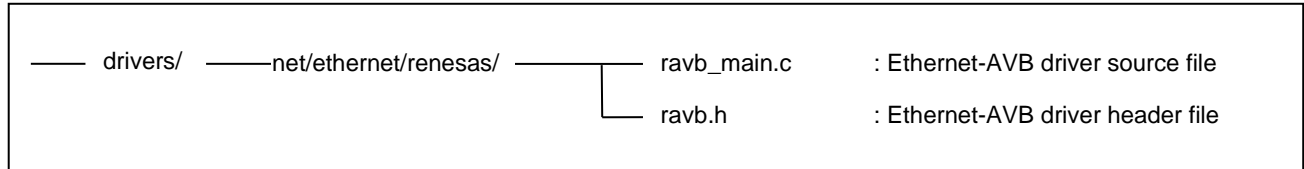


Figure 5.1 Directory Configuration

5.2 Integration Procedure

5.2.1 Kernel Configuration

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

```

[*] Networking support ---->
    Networking options ---->
        [*] TCP/IP networking
        [*]   IP: kernel level autoconfiguration
        [*]   IP: DHCP support
        [*]   IP: BOOTP support
Device Drivers --->
    [*] Network device support ---->
        [*] Ethernet driver support ---->
            [*] Renesas devices ---->
                <*> Renesas Ethernet AVB support
            --*-- PHY device support and infrastructure --->
                <*> Micrel PHYs
  
```

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 kernel parameters.

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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, 2015	2	Update related documents.
0.4	Mar. 15, 2017	2, 3	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	Jan. 29, 2018	2	Update related documents.
1.51	Mar. 28, 2018	All	Add R-Car E3 support.
1.52	Sep. 26, 2018	2	Update related documents.
		6	Fix Kernel configuration.
2.00	Dec. 25, 2018	2	Update related documents.
		3	Add Board Ebisu-4D.
		-	Update Address List.
2.01	Apr. 17, 2019	2	Update related documents.
		-	Update Address List
2.50	Apr. 21, 2021	All	Add R-Car D3 support.
		1	Update E3/D3 transfer speed.
		2	Update related documents.
3.00	Dec. 10, 2021	-	Add Kernel v5.10.41 support

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