

REALTEK

ETHERNET CONTROLLER DEEP SLUMBER MODE (DSM)

APPLICATION NOTES (CONFIDENTIAL: Development Partners Only)

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USING THIS DOCUMENT

This document is intended for the engineer’s reference and provides detailed application information.

Though every effort has been made to ensure that this document is current and accurate, more information may have become available subsequent to the production of this guide. In that event, please contact your Realtek representative for additional information that may help in the development process.

REVISION HISTORY

Revision	Release Date	Summary
1.0	2007/05/19	First release.
1.1	2007/08/18	Revised section 2 Deep Slumber Mode Implementation, page 1. Revised Figure 1, page 2, and Figure 5, page 6. Revised section 5 Power Consumption, page 7.
1.2	2008/02/01	Revised section 2 Deep Slumber Mode Implementation, page 1.
1.3	2008/06/06	Added section 4 ACPI RMV, page 6.
1.4	2008/10/03	Added Figure 3, page 4. Revised section 5 Power Consumption, page 7.
1.5	2008/10/29	Added RTL8103E figure (Figure 2, page 3). Added Table 3 RTL8103E& RTL8103T Power Consumption, page 7.
1.6	2008/12/22	Added RTL8103T data.

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1. Introduction

This application note will help board layer designers to implement the Deep Slumber Mode (DSM) power saving feature for Realtek's Ethernet Controllers.

2. Deep Slumber Mode Implementation

When DSM is implemented, the BIOS must enable the DSM_en bit (Set I/O Register Offset 0x6D Bit7 to 1h) **before** the local machine enters the Windows system, and must follow the steps given below **after** the local machine enters the Windows system.

- The board designer must provide a circuit to connect the OGPIO pin. The BIOS then monitors the edge status of OGPIO to determine whether a cable is connected.
- When a cable is unplugged, the OGPIO will go from high to low. The BIOS must sets configuration space offset 0x44 to 03h first (the Ethernet Controller enters D3 state), cuts off VCC33 (see Figure 1 to Figure 4), and asks the local machine's OS to run a Hardware Scan, which will then remove the Ethernet Controller.
- On connection of a cable, the OGPIO will go from low to high. The BIOS must provide VCC33 and (after 100ms) ask the local machine's OS to run a Hardware Scan in order to recover all resources (E.g., IO space and Memory address). The system is then restored to a normal state.
- When DSM is disabled, the BIOS must disable DSM_en bit (Set I/O Register Offset 0x6D Bit7 to 0h).

Note 1: If Deep Slumber Mode is enabled and the network cable is unplugged, and the OS then enters S3, S4, or S5 power states, the Ethernet Controller will not support Wake-on-LAN (WOL).

Note 2: If implementing EEPROM_Less and DSM Modes at the same time, the BIOS must provide the SVID, SDID, and the Serial Number to the Realtek Ethernet IC after ISOLATEB goes from low to high.

Note 3: If the system does not provide auxiliary power to the Realtek Ethernet IC in S3/S4 states, the BIOS must enable DSM_en again when the system resumes from S3/S4 state.

Note 4: When DSM mode is implemented, the BIOS might declare _RMV code in the ACPI. Refer to section 4 ACPI RMV, page 6 for more details.

Note 5: When DSM mode is implemented, please use the recommended driver revision:

Windows Vista: 6.205 or later

Windows XP: 5.688 or later

Note 6: If the board designer wants to use ISOLATEB to disable the Ethernet Controller, follow the steps below:

- Step 1. Set I/O Register Offset 0x6E Bit0 to 0h.
- Step 2. Set I/O register Offset 0x6F Bit7 to 0h.
- Step 3. Set configuration space offset 0x44 to 03h (the Ethernet Controller enters D3 state).
- Step 4. Cut-off VCC33 (see Figure 1 to Figure 4).
- Step 5. If the board designer wants to enable the Ethernet Controller, provide VCC33 and set I/O register Offset 0x6F Bit7 to 1h.

2.1. RTL8111C(P) & RTL8111D OGPIO and ISOLATEB Circuit (64-Pin)

BIOS monitors the edge status of OGPIO

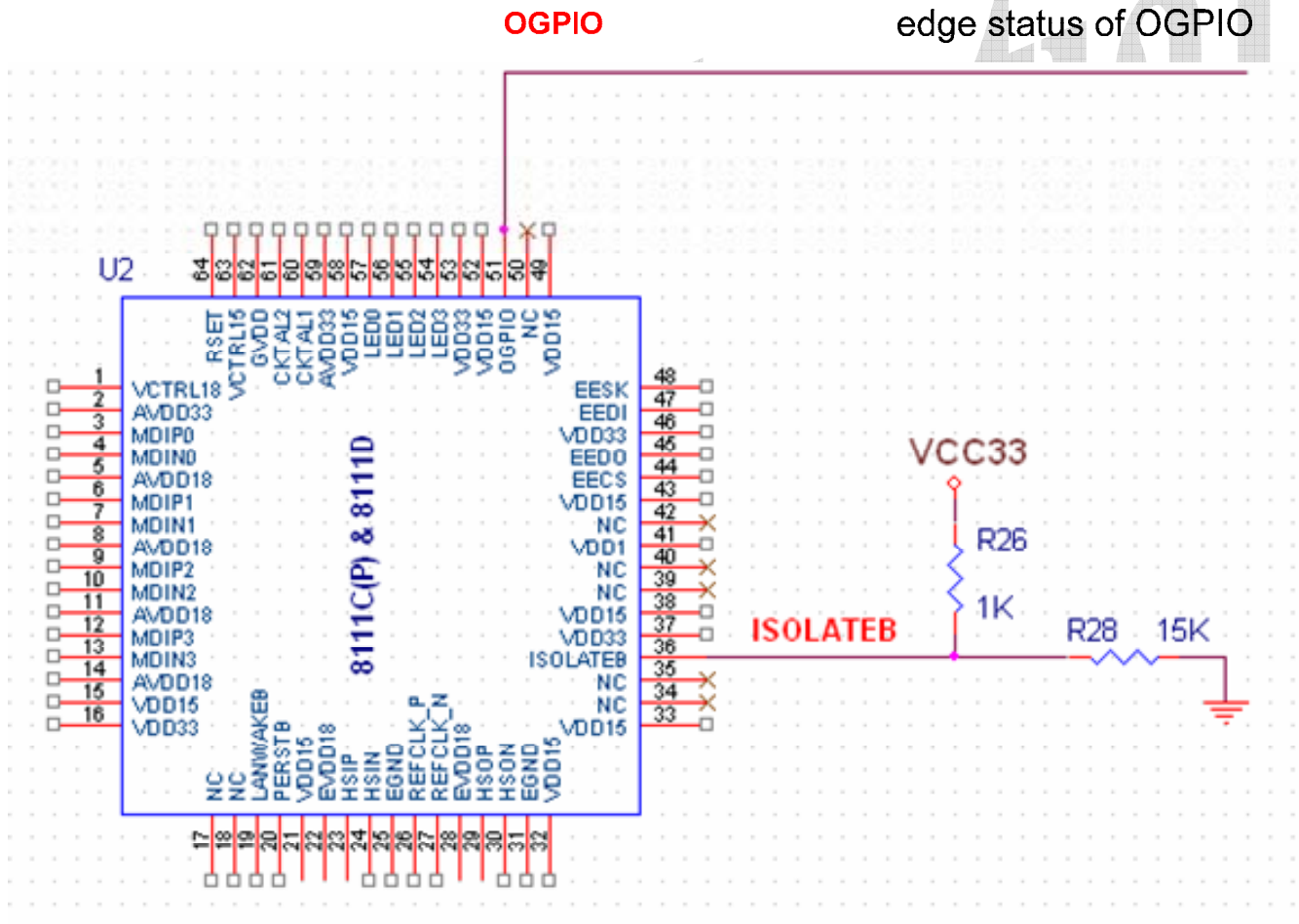


Figure 1. RTL8111C(P) & RTL8111D OGPIO and ISOLATEB Circuit (64-Pin)

2.2. RTL8103E OGPIO and ISOLATEB Circuit (64-Pin)

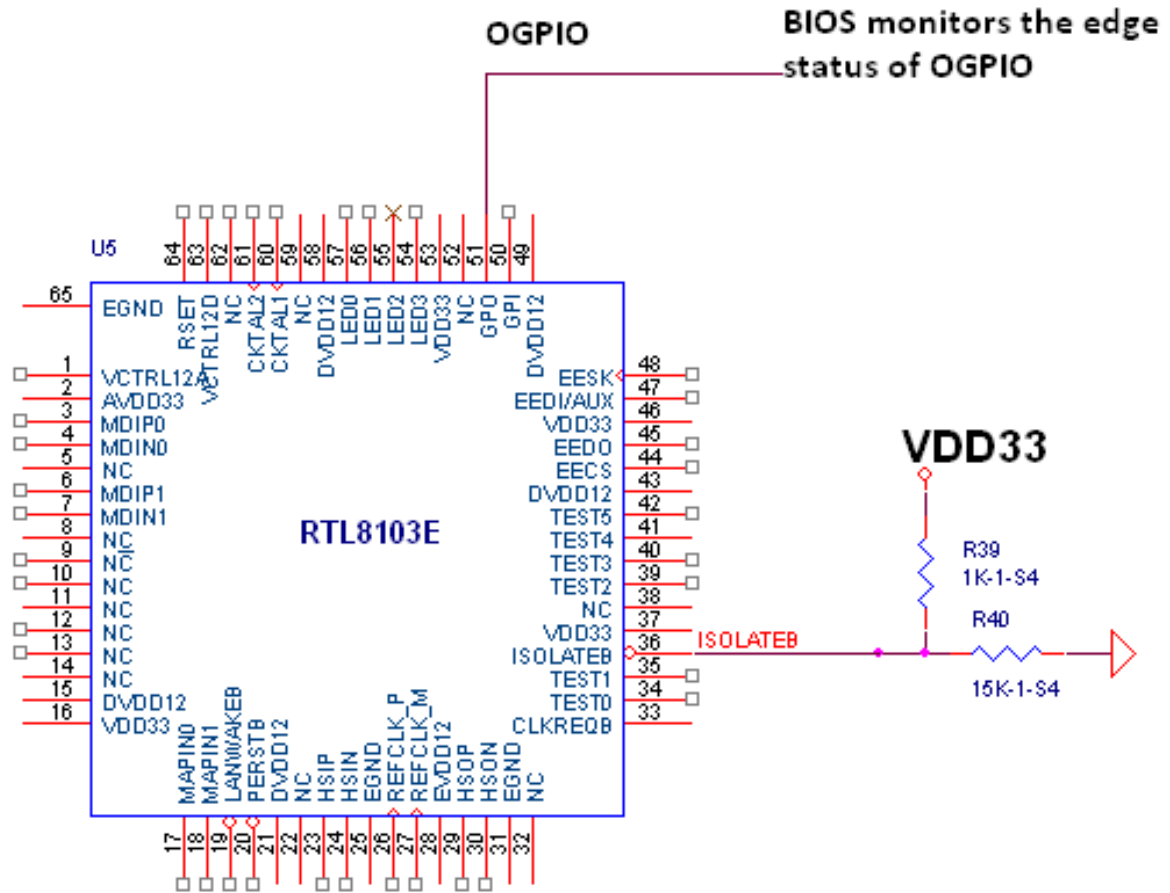


Figure 2. RTL8103E OGPIO and ISOLATEB Circuit (64-Pin)

2.3. OGPIO and ISOLATEB Circuit (48-Pin)

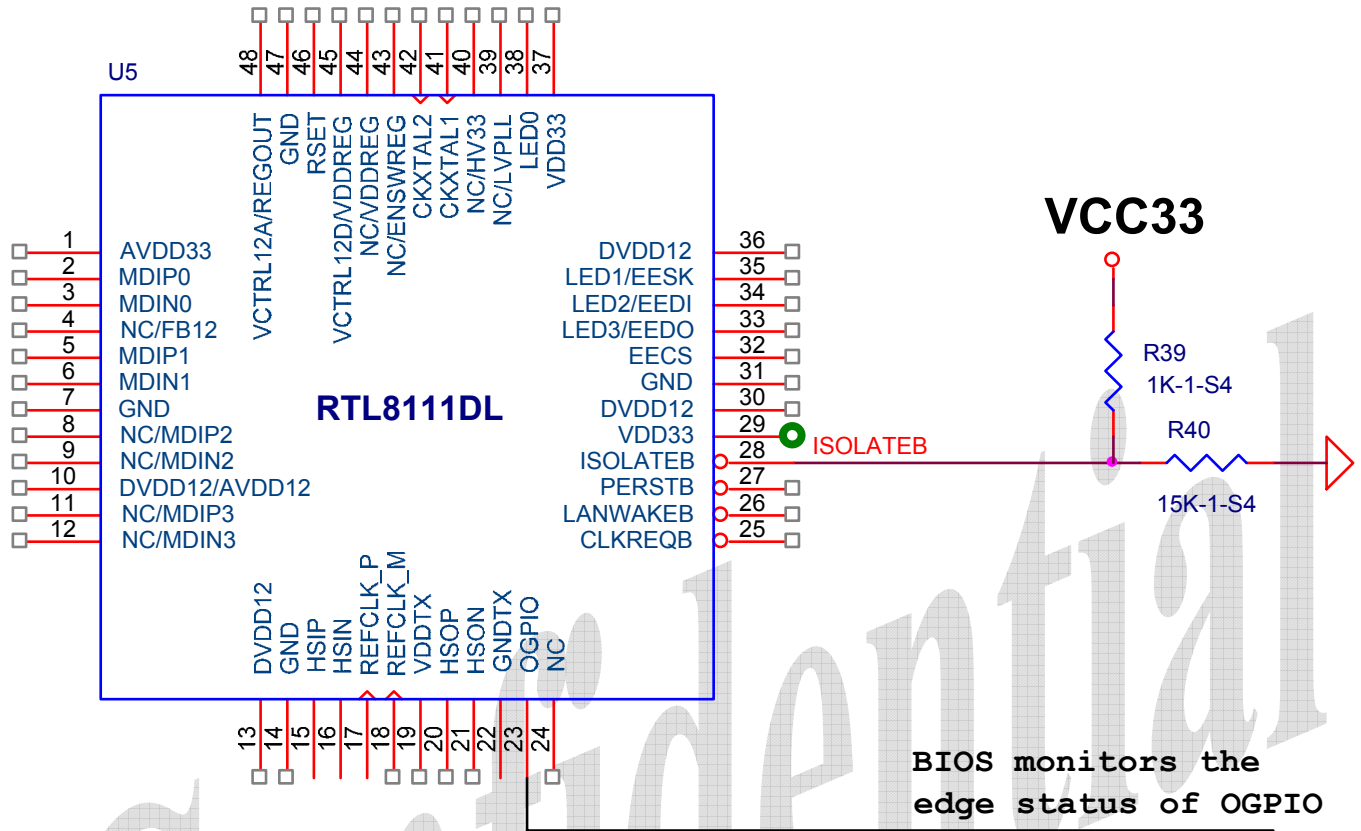


Figure 3. OGPIO and ISOLATEB Circuit (48-Pin)

2.4. RTL8103T OGPO and ISOLATEB Circuit (32-Pin)

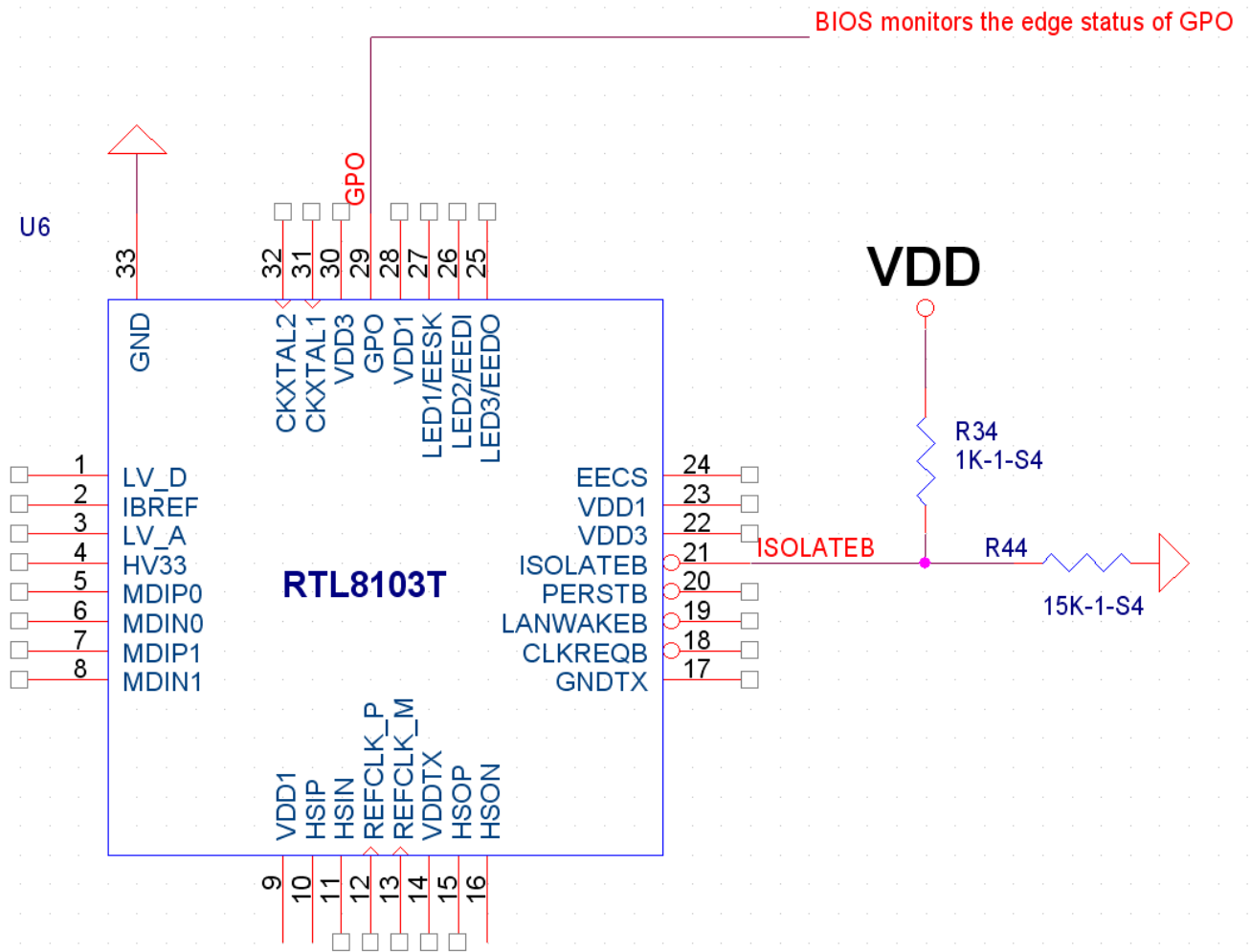


Figure 4. RTL8103T OGPO and ISOLATEB Circuit (32-Pin)

3. Deep Slumber Mode Operation

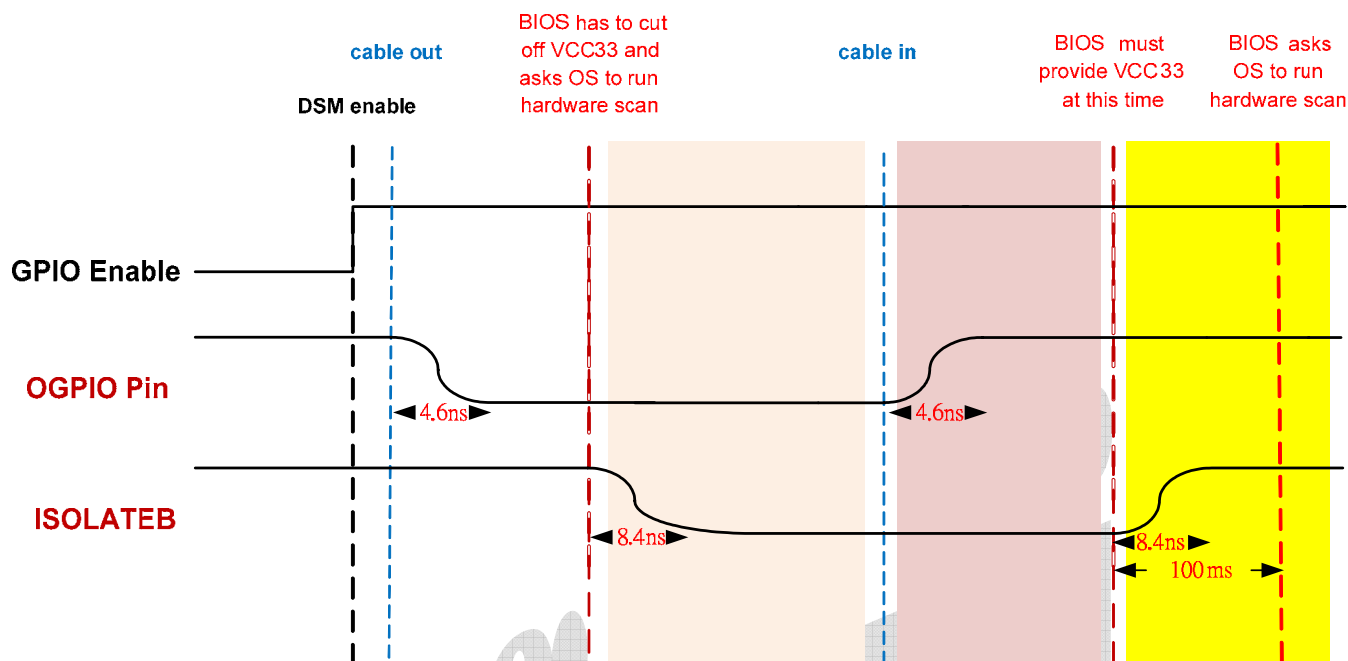


Figure 5. Deep Slumber Mode Operation

4. ACPI RMV

If the BIOS declares RMV code in ACPI to implement DSM mode, the OS will show a 'safely remove hardware' icon in the task bar, however, the LAN device is not hot-pluggable, and cannot be removed safely using this icon.

If the BIOS does not declare RMV code in ACPI, the OS will not show the 'safely remove hardware' icon. When a cable is disconnected, an error message is entered in the system event log.

Windows Vista System

- The driver can declare `surprise_remove_ok` to avoid error messages in the system event log, but the first error message is unavoidable.

Windows XP System

- The driver cannot declare `surprise_remove_ok`. The BIOS might need to define RMV code in the ACPI (a 'safely remove NIC' icon (hot plug device) will be in the task bar), otherwise an error message will appear.

The Deep Slumber Mode (DSM) function is Realtek's Ethernet Controllers special application. When a cable is unplugged, this function will reduce the power consumption of the system. However, it needs to cooperate with the BIOS and OS. The driver will declare `surprise_remove_ok` to avoid error messages in the system event log, but it cannot avoid the OS behavior (first error message). The first error message has no affect on function.

5. Power Consumption

5.1. RTL811C(P) Power Consumption

Table 1. RTL811C(P) Power Consumption

State	Current (mA)	Power (mW)
Normal (Cable Connected)	202.1	667
Link Down Power Saving	77.8	257
Deep Slumber Mode (DSM)	26.9	89

5.2. RTL811D(L) Power Consumption

Table 2. RTL811D(L) Power Consumption

State	Current (mA)	Power (mW)
Normal (Cable Connected)	161	531.3
Link Down Power Saving	35	115.5
Deep Slumber Mode (DSM)	10	33

5.3. RTL8103E & RTL8103T Power Consumption

Table 3. RTL8103E& RTL8103T Power Consumption

State	Current (mA)	Power (mW)
Normal (Cable Connected)	178	587.4
Link Down Power Saving	66	217.8
Deep Slumber Mode (DSM)	19	62.7

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