

congatec Application Note #36

Affected Products	Products featuring the congatec 5 th Gen Board Controller
Subject	S5e Implementation
Confidential/Public	Public
Author	CJR

Revision History

Revision	Date (yyyy-mm-dd)	Author	Changes
1.0	2018-09-19	CJR	Initial release of document
1.1	2022-02-18	CJR	Added a Power Loss Control feature restriction to section 3 Updated template

Preface

This Application Note explains how the congatec Embedded BIOS and congatec Board Controller (cBC) support the very low power System Mode S5e (Enhanced Soft Off state). This power state is congatec proprietary and therefore not described in standard PC architecture literature.

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Symbols

The following are symbols used in this application note.



Notes call attention to important information that should be observed.



Cautions warn the user about how to prevent damage to hardware or loss of data.



Warnings indicate that personal injury can occur if the information is not observed.

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Terminology

Term	Description
cBC	congatec Board Controller
S5	Soft Off system state defined in the ACPI specification
S5e	congatec specific enhanced Soft Off state
S0	Working system state defined in the ACPI specification
G3	Mechanical Off state defined in the ACPI specification

1 S5e Introduction

The lowest power consumption state S5 (Soft Off) defined by ACPI typically draws about 0.5W. This is too much for many battery powered applications. The proprietary S5e (Enhanced S5) state of congatec draws less than 1 mW.

This is achieved by the congatec Board Controller (cBC) taking control of the power rails and only listening to the following events:

- Power Button
- Sleep Button
- SMB Alert#

In case the cBC detects one of the above events, it turns on the power rails accordingly and transitions the system to the S0 state (in case of power button and sleep button) or to the S5 state (in case of SMB Alert#).



Caution

Before using the S5e state, you must consider the restrictions and risk described in section 3 of this document.

2 S5e Configuration

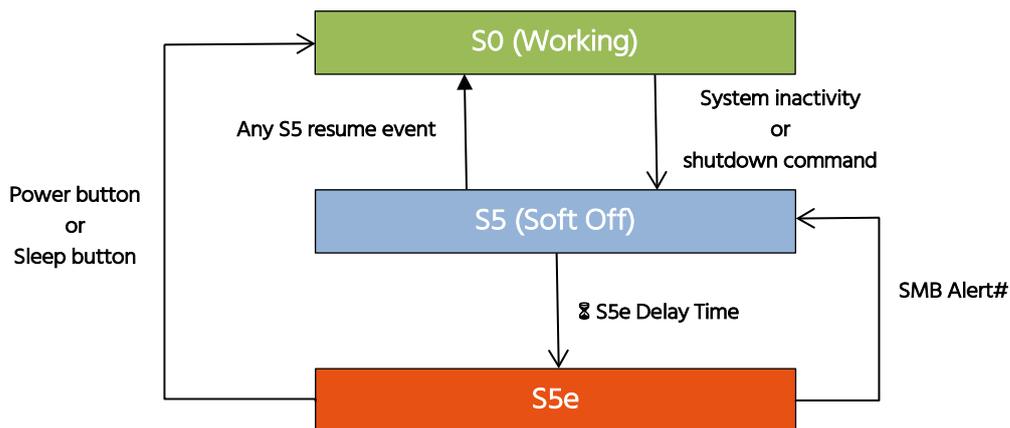
The S5e configuration can be changed in the BIOS setup menu. To access the BIOS setup menu, press the or <F2> key during POST and navigate to the Boot menu.

```

S5e [Enabled]
S5e Delay time (sec) 10
Power Button Wake [Enabled]
SMBUS Alert Wake [Disabled]
Sleep Button Wake [Disabled]
    
```

Feature	Description
S5e	S5e is disabled by default. Enable to activate S5e support. Caution: Read section 3 of this document before enabling.
S5e Delay time (sec)	The cBC will wait for x seconds to transition the system from the S5 state to the S5e state.
Power Button Wake	If enabled, power button event transitions system to S0.
SMBUS Alert Wake	If enabled, SMBUS Alert event transitions system to S5.
Sleep Button Wake	If enabled, sleep button event transitions system to S0.

The flow chart below explains the S0-S5-S5e transitions.



3 S5e Restrictions and Risk

Several restrictions and a risk must be considered before enabling S5e.

Restrictions:

- System in S5e state cannot be resumed by some chipset-initiated wake events like RTC Wake, Wake on LAN, and USB Keyboard/Mouse.
- The cBC will not enter S5e if the watchdog is enabled for automated S0-S5-S0 cycle testing.
- If the Power Loss Control is in “Last State” mode, the S5e Delay Time must be set to > 30 seconds for the Power Loss Control feature to function properly.

Risk:

- All standby powered signals are switched off in S5e state. This may not be a problem on SBCs or full custom designs where S5e support can be properly implemented. However, COM form factors don't consider an S5e state and may expect defined voltage levels on standby powered signals. This means that the module may operate out of spec when S5e is enabled. There is a low risk that the carrier board or the CPU module may not work as expected anymore. One reason could be power leakage onto the module while in S5e state. System designers must be aware of this risk when enabling S5e support.

For more information about congatec's proprietary S5e, please contact congatec technical support at support@congatec.com.