

# Application Note

## DA9061/2/3 Configuration of nSHUTDOWN / nRESETREQ and nOFF

AN-PM-063

### Abstract

*The nSHUTDOWN and nOFF inputs (DA9063 only) and nRESETREQ (DA9061/2 only) should be correctly configured to ensure the expected device operation is achieved through a VSYS brown-out. This is achieved by selection of appropriate external pull-up supplies.*

---

---

DA9061/2/3 Configuration of nSHUTDOWN /  
nRESETREQ and nOFF

**Contents**

**Abstract** ..... 1

**Contents** ..... 2

**1 References** ..... 2

**2 Introduction**..... 3

**3 Explanation and Discussion** ..... 3

**4 Recommendations** ..... 5

**Revision History** ..... 6

**1 References**

- [1] DA9061, Datasheet, Dialog Semiconductor, 2015
- [2] DA9062, Datasheet, Dialog Semiconductor, 2015
- [3] DA9063, Datasheet, Dialog Semiconductor, 2015

## DA9061/2/3 Configuration of nSHUTDOWN / nRESETREQ and nOFF

### 2 Introduction

The configuration of nSHUTDOWN and nOFF (DA9063 only) and nRESETREQ (DA9061/2 only) should be optimised to ensure correct power-up behaviour under all conditions. For these open-drain control signals it is important to choose appropriate pull-up supplies.

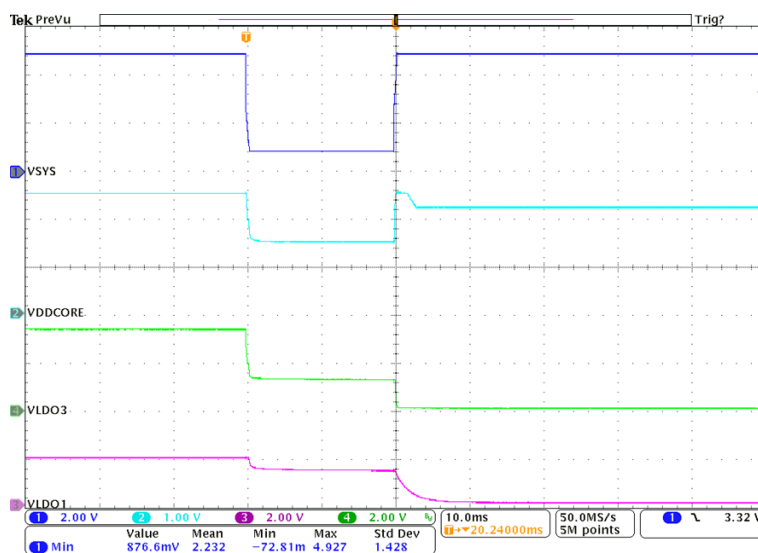
It should be considered that when the PMIC enters NO POWER Mode or RTC Mode, the PMIC supplies, including the 'always on' LDO1, will be turned off. This application note explains how the discharge of a pull-up rail can cause the nSHUTDOWN or nOFF inputs to be permanently-asserted, which then prevents the PMIC from leaving RESET Mode.

Note that the behaviour of the DA9063 nSHUTDOWN pin is the same as the DA9061/2 nRESETREQ pin. Please refer to the datasheets for explanations of the parameters discussed (VPOR, VDD\_FAULT\_LOWER and so on).

### 3 Explanation and Discussion

The PMIC may enter NO POWER Mode or RTC Mode as a result of a VDD\_FAULT condition on VSYS. Examples of such fault conditions are a brown-out 'glitch' of the VSYS supply into the range  $VPOR < VSYS < VDD\_FAULT\_LOWER$  for  $>100$  ms, or a brown-out to  $VSYS < VPOR$  of any duration. This causes an emergency shutdown of the supplies. If there is no backup battery (or it is insufficiently charged) then the VSYS fault results in the device entering NO POWER Mode. If the PMIC has RTC Mode enabled and the backup battery has sufficient charge, then the device instead enters RTC Mode.

A configuration to be avoided is illustrated in Figure 1 where nSHUTDOWN / nRESETREQ is pulled up to VLDO1. The device is shown to be stuck in RESET Mode at the right hand side of the plot. After a VSYS glitch, this same issue can be seen when the PMIC leaves either NO POWER Mode or RTC Mode. Note that the sensitivity of a particular system to the issue is dependent on the rate of rail discharge: (a) during the VSYS brown-out, and (b) after the brown-out where the PMIC regulator pull-downs are turned on. For example, Figure 1 illustrates how the discharge characteristic of VLDO3 is significantly different to VLDO1.

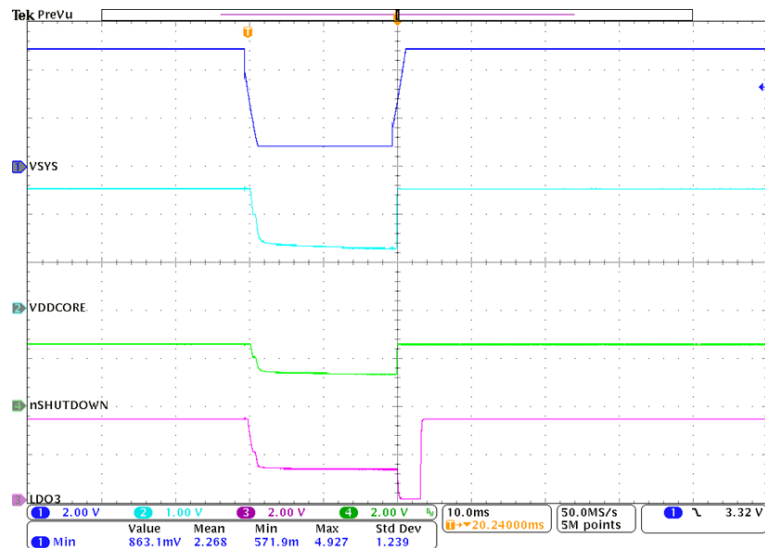


**Figure 1: nSHUTDOWN Pull-Up to VLDO1 with a VSYS Glitch of 20 ms Down to ~0.9 V (which is below VPOR). When VSYS Recovers, the PMIC Attempts to Leave NO POWER Mode. VDDCORE Rises and, at this Instant, the Regulators are Discharged via the PMIC Internal Pull-Downs. The Decaying LDO1 Supply is Seen as a Logic Negative-Edge on nSHUTDOWN Which Causes the Device to Enter RESET Mode (indicated by a reduction of VDDCORE from 2.5 V to 2.2 V). Since nSHUTDOWN is Now Permanently Low, the PMIC Cannot Exit from this State**

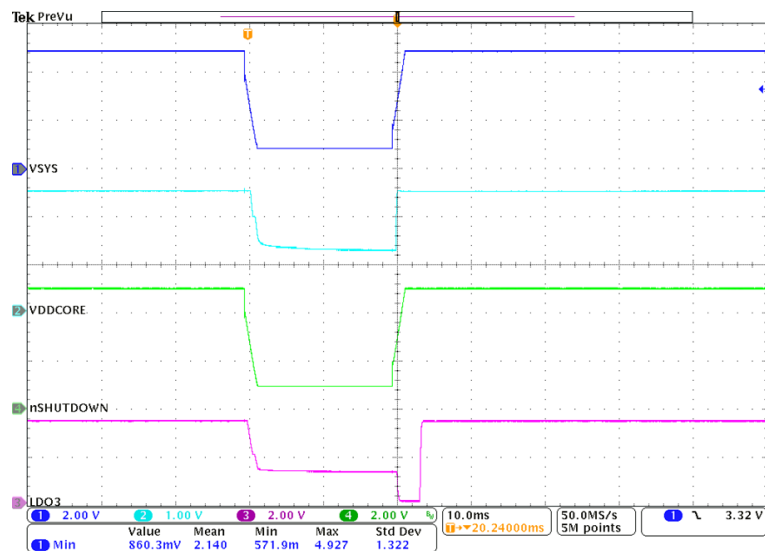
## DA9061/2/3 Configuration of nSHUTDOWN / nRESETREQ and nOFF

A solution to the issue which is simple and effective is to drive the nSHUTDOWN / nRESETREQ pull-up with VDDCORE (Figure 2) or VSYS (Figure 3). Similar treatment of the DA9063 nOFF pull-up is also required.

The reason the VSYS and VDDCORE supplies are unique in being unaffected by the issue, is that neither can undergo an on-to-off transition (creating falling edges on signals using them as a pull-up) when the system is powering-up or exiting RTC Mode.



**Figure 2: nSHUTDOWN Pull-Up to VDDCORE. The PMIC Correctly Returns to ACTIVE Mode After a 20 ms VSYS Glitch to <VPOR**



**Figure 3: nSHUTDOWN Pull-Up to VSYS. The PMIC Correctly Returns to ACTIVE Mode After a 20 ms VSYS Glitch to <VPOR**

## DA9061/2/3 Configuration of nSHUTDOWN / nRESETREQ and nOFF

### 4 Recommendations

For DA9063 designs with nOFF functionality:

1. The nOFF pull-up must be supplied from either VDDCORE (via 100 kΩ) or VSYS. Alternatively, some other truly 'always-on' external supply can be used.

For DA9061/2 and DA9063 applications:

2. nSHUTDOWN / nRESETREQ should be pulled up to either VDDCORE (via 100 kΩ) or VSYS. Alternatively, some other truly 'always-on' external supply can be used.
3. nSHUTDOWN / nRESETREQ should not be pulled up to a PMIC regulator output. This is because when the line is pulled low by a system signal the device enters RESET Mode. The device is then stuck in RESET Mode since the input's pull-up rail has been turned off.
4. nSHUTDOWN / nRESETREQ should not be pulled up to the LDO1 'always on' supply. This is because this rail is turned off as the PMIC passes through NO POWER Mode (as in the event of momentary VSYS power-loss).
5. nONKEY should be pulled up to VSYS. (A pull-up to VDDCORE would create a problem with waking-up from RTC Mode.)

Level shifters might be required where the nSHUTDOWN / nRESETREQ and nOFF signals are driven from low voltage domains. For a 1.8 V domain, this can sometimes be readily implemented by including a diode-drop in the pull-up path to VDDCORE.

---

**DA9061/2/3 Configuration of nSHUTDOWN /  
nRESETREQ and nOFF****Revision History**

<b>Revision</b>	<b>Date</b>	<b>Description</b>
1.0	14-Aug-2015	Initial version.
2.0	17-Feb-2022	File was rebranded with new logo, copyright and disclaimer

---

## DA9061/2/3 Configuration of nSHUTDOWN / nRESETREQ and nOFF

### Status Definitions

Status	Definition
DRAFT	The content of this document is under review and subject to formal approval, which may result in modifications or additions.
APPROVED or unmarked	The content of this document has been approved for publication.

### RoHS Compliance

Dialog Semiconductor's suppliers certify that its products are in compliance with the requirements of Directive 2011/65/EU of the European Parliament on the restriction of the use of certain hazardous substances in electrical and electronic equipment. RoHS certificates from our suppliers are available on request.

## IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers who are designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only to develop an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third-party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising from your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Disclaimer Rev.1.01)

### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

### Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

### Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit [www.renesas.com/contact-us/](http://www.renesas.com/contact-us/).