

# User Manual

## DA913X-30 Customer EVB

### UM-PM-64

#### **Abstract**

*This document is a user manual for the DA913x-30 Customer EVB for the DA9130, DA9131 and DA9132 PMICs. This board is referred through the document as "EVB". It provides the basic information for configuring and using the EVB.*

---

---

**DA913x User Guide**

**Contents**

**Abstract** ..... 1

**Contents** ..... 1

**Figures**..... 2

**Tables** ..... 2

**1 Terms and Definitions**..... 3

**2 References** ..... 3

**3 Introduction**..... 4

**4 Evaluation Board Hardware** ..... 4

    4.1 Quick Start ..... 5

    4.2 Using the Evaluation board ..... 6

        4.2.1 Efficiency measurements..... 6

        4.2.2 Load transient measurements ..... 6

        4.2.3 Output voltage ripple measurements..... 7

    4.3 Jumper configuration..... 7

    4.4 OTP specific configuration ..... 8

**Revision History** ..... 9

**Figures**

Figure 1: DA913x-30 Evaluation Board ..... 4

Figure 2: DA913x-30 Jumpers and headers location ..... 5

**Tables**

Table 1: Jumpers and headers overview ..... 5

Table 2: Jumpers and headers complete list..... 7

Table 3: DA9130 OTP configuration ..... 8

Table 4: DA9131 OTP configuration ..... 8

---

## DA913x User Guide

### 1 Terms and Definitions

EVB	Evaluation board
PMIC	Power management integrated circuit
PWM mode	Fixed frequency mode using Pulse Width Modulation
PFM mode	Variable frequency mode improving efficiency at low loads
Auto mode	Automatic mode switching from PFM to PWM depending on load

### 2 References

- [1] DA9130 Datasheet, Dialog Semiconductor.
- [2] DA9131 Datasheet, Dialog Semiconductor.
- [3] DA9132 Datasheet, Dialog Semiconductor
- [4] DA913x-30-A1\_sch Schematics, Dialog Semiconductor

**Note 1** References are for the latest published version, unless otherwise indicated.

DA913x User Guide

**3 Introduction**

Dialog Semiconductor's DA9130, DA9131 and DA9132 devices are power management ICs with integrated power FETs, see datasheets [1][2][3]. The DA9130 is configured as a single-channel dual-phase buck converter, while the DA9131/DA9132 are configured as a two channel, one-phase buck converters.

**4 Evaluation Board Hardware**

The DA913x-30-A Customer Evaluation board referred below as "EVB" enables the measurement and evaluation of the DA9130/DA9131/DA9132 PMIC.



Figure 1: DA913x-30 Evaluation Board



## DA913x User Guide

### 4.2 Using the Evaluation board

Before going any further, it is recommended to make sure the 4mm banana connectors are properly tightened (150N.cm maximum recommended), as can come loose after shipping and reflow cycles.

The default use case is to connect a PSU to  $V_{sys}$ , with the positive on J2 and the negative/GND on J3. The PSU should be capable of supplying at least 6 A at 3-5.5V and should be capable of remote sensing.

Once the jumpers are set and the PSU is connected, you can switch on the PSU and probe the voltage on the output rails (J4 - J25 and J5 - J19) in order to make sure the setup functions correctly.

#### 4.2.1 Efficiency measurements

It is necessary to use a reliable PSU and load, to use remote sensing as much as possible and to keep the wiring short and tidy to minimize parasitics.

The PSU should supply  $V_{sys}$  between J2 and J3 (4mm banana jacks), and its remote sense and input voltage measurement should be connected to J6.

The load can be connected to the output across J4 - J25 (4mm banana jacks), or to J20 (board edge/blade connector), and its remote sense and output voltage measurement should be connected to J8.

For DA9131 and DA9132, the load can also be connected on the second channel across J5 - J19 or J21. Remote sense and output voltage measurement should be connected to J26.

$I_{in}$  can be measured using an ammeter placed in series between J2 and the PSU.

$I_{load}$  can be measured using an ammeter placed in series between J4 or J20 and the load (J5 or J21 and the load for the second channel).

$V_{sys}$  can be measured across J6, which is connected close to the input capacitors.

$V_{out}$  can be measured across J8 (or J26 for the second channel), which is connected close to the output capacitors.

The efficiency is obtained through this formula for various voltages and loads:

$$P_{in} = V_{sys} * I_{in}$$

$$P_{out} = V_{out} * I_{load}$$

$$\eta = \frac{P_{out}}{P_{in}}$$

**Note 3** In case of the DA9131 and DA9132 chips, make sure that the load and the load sense are connected to the same channel.

**Note 4** In case of the DA9130 chip, it is possible to use the connections from both channels since they are connected in parallel.

#### 4.2.2 Load transient measurements

Just as for the efficiency measurements. it is necessary to use a reliable PSU, to use remote sensing where possible and to keep the wiring short and tidy to minimize parasitics.

The PSU should supply  $V_{sys}$  between J2 and J3 (4mm banana jacks), and its remote sense and input voltage measurement should be connected to J6.

The pulse load should be connected to J20 (board edge/blade connector). The wiring impedance is critical here.

For DA9131 and DA9132, the load can also be connected on the second channel on J21.

$I_{load}$  should be monitored on the pulse load, and  $V_{out}$  can be measured across J8 (or J26 for the second channel), which is connected close to the output capacitors. The probes and the oscilloscope should have a bandwidth greater than 20MHz.

## DA913x User Guide

### 4.2.3 Output voltage ripple measurements

It is possible to measure the output voltage ripple using a similar setup as the efficiency, and by measuring the AC voltage across the output capacitors using an oscilloscope. It is recommended to use a differential voltage probe with a bandwidth greater than 20MHz.

The voltage probe can be connected across J8 or TP5 and TP7 depending on the convenience. Those pins and pads are connected to C3 and C4 using kelvin connections.

For the second channel, the voltage probe can be connected across J26 or TP25 and TP27 depending on the convenience. Those pins and pads are connected to C19 or C20 using kelvin connections.

## 4.3 Jumper configuration

**Table 2: Jumpers and headers complete list**

Connection		Description		Default	
JMP1 to JMP4		GND points		Available for grounding scope probes	Each corner of board
J2	J3	VSYS	GND	Supply from PSU, 5V recommended	Left of EVB
J4	J25	VOUT1	GND	Channel 1 output	Top right of EVB
J5	J19	VOUT2 <sup>[Note 5]</sup>	GND	Channel 2 <sup>[Note 5]</sup> output	Bottom right of EVB
J9		GPIO header		Available for probing or using GPIOs	Top left of EVB
J15		I2C dongle header		Internal use	Top of EVB
J10 - J11 - J12		GPIO0, 1, 2 pull-up pull-down jumpers		Can be used to pull up or low each individual GPIO	Below J9
J13		GPIO3 and 4 pull-up pull-down jumpers		Can be used to pull up or low each individual GPIO	Below J9
J14		IC_EN		Jumper fitted to pull-up position, can be pulled low to disable the chip	Top-left, 4th jumper from the left
J6		VSYS sense		Available for probing or PSU remote sense	Left of J21
J8		VOUT1 sense		Available for probing or load remote sense	Left of J20
J26		VOUT2* sense		Available for probing or load remote sense	Left of J21
J20		VOUT1		Channel 1 output	Top right of EVB
J21		VOUT2 <sup>[Note 5]</sup>		Channel 2 <sup>[Note 5]</sup> output	Top right of EVB
SP1		Single-dual phase		Shorted on DA9130, open on DA9131/DA9132	Center of EVB
TP5	TP7	VOUT1	GND	Unused, available for probing	Center of EVB
TP25	TP27	VOUT2*	GND	Unused, available for probing	Center of EVB

**Note 5** VOUT2 is connected to VOUT1 on DA9130 boards.

## DA913x User Guide

## 4.4 OTP specific configuration

Table 3: DA9130 OTP configuration

OTP	Voltage A	Voltage B	GPIO0	GPIO1 <sup>[Note 6]</sup>	GPIO2 <sup>[Note 6]</sup>	GPIO3	GPIO4	I2C addr.
02	0.72	0.72V	Output enable	<b>Power Good output</b>	NC	SCL	SDA	0x64
07	0.7V	0.75V	Output enable	DVC Pull-up: Vout=0.75V Pull-down: Vout=0.7V	<b>Power Good output</b>	SCL	SDA	0xD0
08	0.8V	0.85V	Output enable	DVC Pull-up: Vout=0.85V Pull-down: Vout=0.8V	<b>Power Good output</b>	SCL	SDA	0xD0
09	0.9V	0.95V	Output enable	DVC Pull-up: Vout=0.95V Pull-down: Vout=0.9V	<b>Power Good output</b>	SCL	SDA	0xD0
10	1.0V	1.05V	Output enable	DVC Pull-up: Vout=1.05V Pull-down: Vout=1.0V	<b>Power Good output</b>	SCL	SDA	0xD0

Table 4: DA9131 OTP configuration

OTP	Vout1 A	Vout1 B	Vout2 A	Vout2 B	GPIO0	GPIO1	GPIO2 <sup>[Note 6]</sup>	GPIO3	GPIO4	I2C addr.
41	0.85V	0.85V	0.9V	0.9V	Channel 1 output enable, pull-up to enable	Channel 2 output enable, pull-up to enable	<b>Power Good 1 output</b>	SCL	SDA	0x66
42	0.8V	0.8V	0.8V	0.8V	Unused	Channel 1 output enable, pull-up to enable	Channel 2 output enable, pull-up to enable	SCL	SDA	0xD0
43	0.8V	1	1.65V	1.65V	Channel 1 DVC Pull-up: Vout=0.8V Pull-down: Vout=1.0V	Channel 1 output enable, pull-up to enable	Channel 2 output enable, pull-up to enable	SCL	SDA	0xD2

**Note 6** Items in **bold** are output only.



## DA913x User Guide

### Revision History

Revision	Date	Description
1.1	04-Feb-2022	Update
1	26-Nov-2021	Initial version.

### 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.

### Disclaimer

Unless otherwise agreed in writing, the Dialog Semiconductor products (and any associated software) referred to in this document are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of a Dialog Semiconductor product (or associated software) can reasonably be expected to result in personal injury, death or severe property or environmental damage. Dialog Semiconductor and its suppliers accept no liability for inclusion and/or use of Dialog Semiconductor products (and any associated software) in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Information in this document is believed to be accurate and reliable. However, Dialog Semiconductor does not give any representations or warranties, express or implied, as to the accuracy or completeness of such information. Dialog Semiconductor furthermore takes no responsibility whatsoever for the content in this document if provided by any information source outside of Dialog Semiconductor.

Dialog Semiconductor reserves the right to change without notice the information published in this document, including, without limitation, the specification and the design of the related semiconductor products, software and applications. Notwithstanding the foregoing, for any automotive grade version of the device, Dialog Semiconductor reserves the right to change the information published in this document, including, without limitation, the specification and the design of the related semiconductor products, software and applications, in accordance with its standard automotive change notification process.

Applications, software, and semiconductor products described in this document are for illustrative purposes only. Dialog Semiconductor makes no representation or warranty that such applications, software and semiconductor products will be suitable for the specified use without further testing or modification. Unless otherwise agreed in writing, such testing or modification is the sole responsibility of the customer and Dialog Semiconductor excludes all liability in this respect.

Nothing in this document may be construed as a license for customer to use the Dialog Semiconductor products, software and applications referred to in this document. Such license must be separately sought by customer with Dialog Semiconductor.

All use of Dialog Semiconductor products, software and applications referred to in this document is subject to Dialog Semiconductor's [Standard Terms and Conditions of Sale](#), available on the company website ([www.dialog-semiconductor.com](http://www.dialog-semiconductor.com)) unless otherwise stated.

Dialog, Dialog Semiconductor and the Dialog logo are trademarks of Dialog Semiconductor Plc or its subsidiaries. All other product or service names and marks are the property of their respective owners.

© 2022 Dialog Semiconductor. All rights reserved.

### 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.

## Contact Dialog Semiconductor

General Enquiry:

[Enquiry Form](#)

Local Offices:

<https://www.dialog-semiconductor.com/contact/sales-offices>

## 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 skilled in the art 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 for development of 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 out of 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.

(Rev.1.0 Mar 2020)

### Corporate Headquarters

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

### 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/](http://www.renesas.com/contact/)

### Trademarks

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