

Application Note

SLG46880/1 Dynamic Memory Block

AN-CM-236

Abstract

The SLG46880 and SLG46881 introduce several new blocks that haven't appeared in previous GreenPAK devices. This application note describes the Dynamic Memory (DM) blocks and how to use them.

This application note comes complete with design files which can be found in the References section.

 SLG46880/1 Dynamic Memory Block

Contents

Abstract	1
Contents	2
Figures.....	2
1 Terms and Definitions.....	3
2 References	3
3 Introduction.....	4
4 DM Block Basics	4
5 Creating new DM block configurations.....	5
6 Use a DM Block to Trigger a State Transition	6
7 Using a DM Block to Interact with Blocks Outside the ASM	7
8 Design Example.....	9
9 Conclusion	9
Revision History	10

Figures

Figure 1. An Unconfigured DM Block	4
Figure 2. An Unconfigured DM Block with Colored Connections.....	4
Figure 3: DM Block Properties Panel	5
Figure 4: DM Block Configuration Counters.....	6
Figure 5: Different Ways to Trigger a State Transition.....	7
Figure 6: DM to Matrix Connections.....	8
Figure 7: DM "to Matrix" Output Properties	9
Figure 8: Design Example	9

SLG46880/1 Dynamic Memory Block

1 Terms and Definitions

ASM	Asynchronous state machine
DM	Dynamic memory

2 References

For related documents and software, please visit:

<https://www.dialog-semiconductor.com/configurable-mixed-signal>.

Download our free [GreenPAK Designer](#) software [1] to open the .gp files [2] and view the proposed circuit design. Use the [GreenPAK](#) development tools [3] to freeze the design into your own customized IC in a matter of minutes. Dialog Semiconductor provides a complete library of application notes [4] featuring design examples as well as explanations of features and blocks within the Dialog IC.

- [1] [GreenPAK Designer Software](#), Software Download and User Guide, Dialog Semiconductor
- [2] [AN-CM-236 SLG46880/1 DM Block.gp](#), [GreenPAK](#) Design File, Dialog Semiconductor
- [3] [GreenPAK Development Tools](#), [GreenPAK](#) Development Tools Webpage, Dialog Semiconductor
- [4] [GreenPAK Application Notes](#), [GreenPAK](#) Application Notes Webpage, Dialog Semiconductor

SLG46880/1 Dynamic Memory Block

3 Introduction

The main advantage of DM blocks is that they can be reconfigured to perform different functions in different states of the SLG46880/1's 12-state Asynchronous State Machine (ASM). This makes them a very flexible component, since they can be used one way in State 0 and another way in State 1.

4 DM Block Basics

There are 4 DM blocks in the Dialog GreenPAK SLG46880/1. An unconfigured DM block is shown in Figure 1. All the DM blocks in the SLG46880/1 have the following resources:

- 2 look-up tables: a 3-bit LUT and a 2-bit LUT
- 2 multiplexers
- 1 CNT/DLY
- 1 Output block

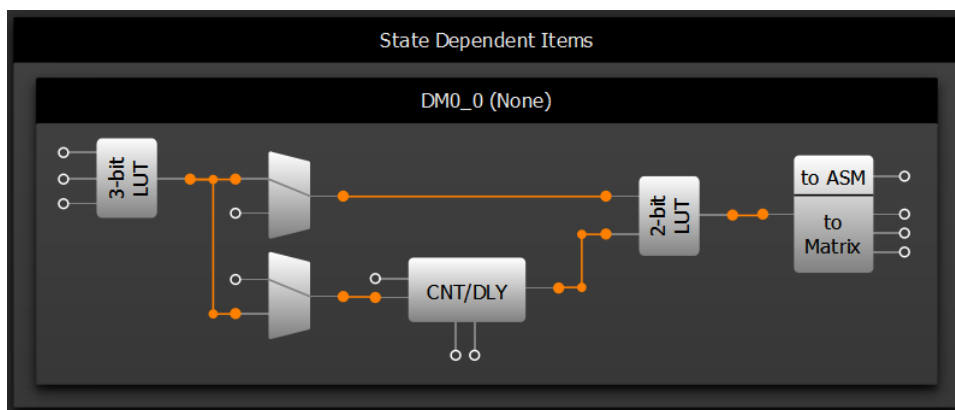


Figure 1. An Unconfigured DM Block

Figure 2 shows the same DM block with colored-in connectors. (These colors do not appear inside GreenPAK™ Designer, they are merely for illustrative purposes.) The Green connectors are inputs to the DM block from the Matrix. The orange connections are dedicated connections within the DM block, which cannot be changed or moved. The blue connectors are clock connections for the counter block. The purple connector can be used to trigger a state transition but is not a general matrix connection. The yellow connectors are matrix outputs from the DM block.

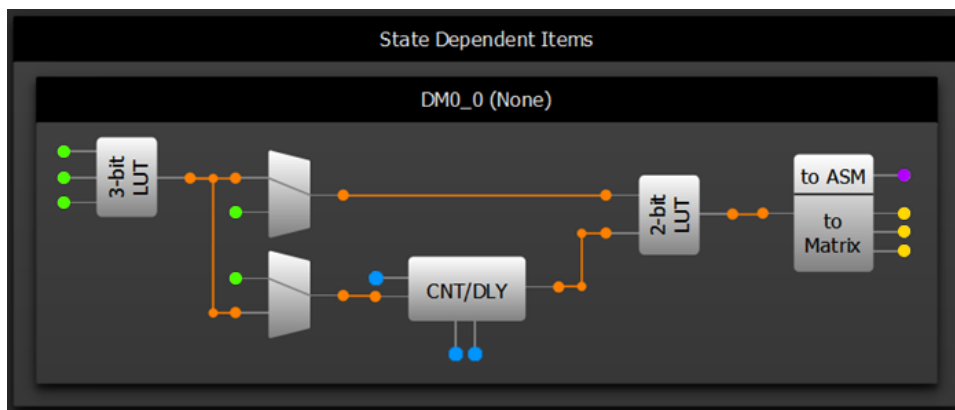


Figure 2. An Unconfigured DM Block with Colored Connections

SLG46880/1 Dynamic Memory Block

5 Creating new DM block configurations

To create a new DM block configuration, you'll need to select a DM block and open its properties panel, shown in Figure 3. Now you can create a new configuration for this DM block by clicking the "+" icon in the top right. At this point, you can rename the configuration if you wish and configure the DM block however you want, by using its properties panel. You can delete an unnecessary configuration by selecting it from the dropdown menu, and clicking the "-" button.

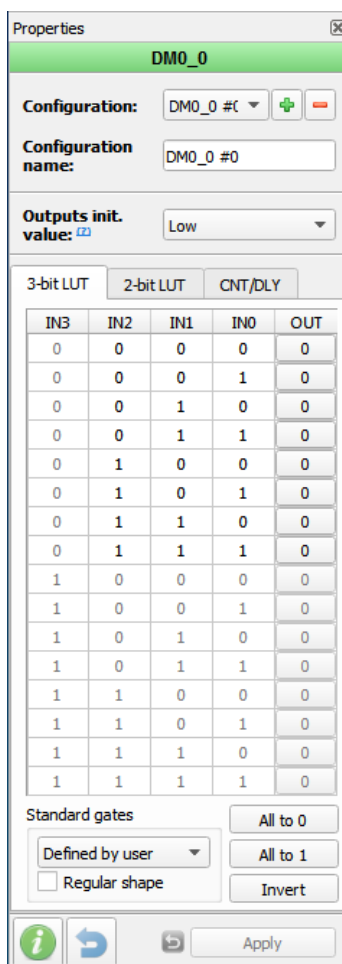


Figure 3: DM Block Properties Panel

Each DM block can have up to 6 different configurations. Any DM block configuration can be used in any of the ASM's 12 states, but only one configuration per DM block per state is permitted.

To use DM block with ASM or with blocks outside the ASM, connect ASM nReset block's nReset input to a non-GND signal.

Figure 4 shows how the resource manager bar indicates that one of the DM0_0 configurations has been used. The number of configurations for DM0_0 was increased from 0/6 to 1/6.

SLG46880/1 Dynamic Memory Block

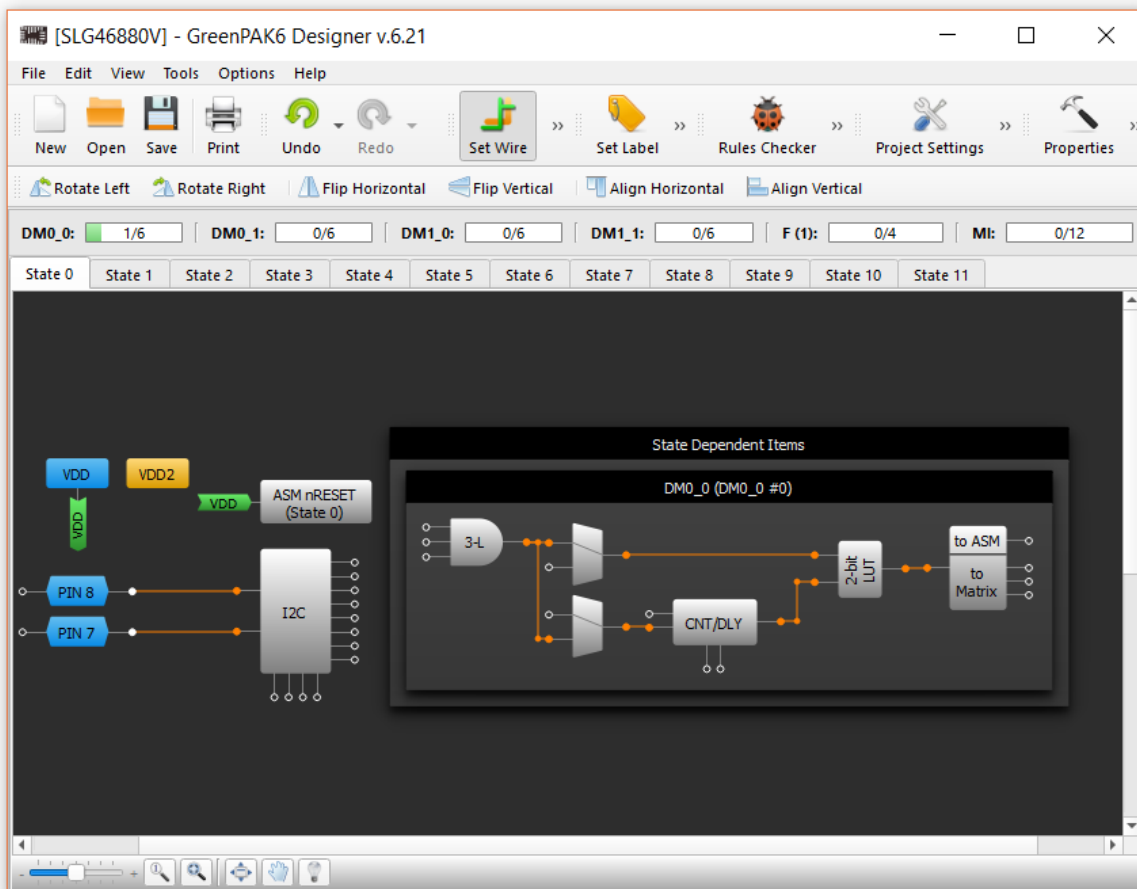


Figure 4: DM Block Configuration Counters

6 Use a DM Block to Trigger a State Transition

Figure 5 shows a few different ways to trigger a state transition. We’ve created new configurations for DM0_0 and DM1_0, and named them “myConfig” and “myConfig1”. The top DM is simply used as a 3-bit AND gate, since the top mux passes the output of the AND gate through, and the 2-bit buffer passes it along to the outputs block. (The 2-bit LUT could have also been configured as a buffer for the CNT/DLY block.) The “to ASM connector is used to trigger a state transition from State 0 to State 1.

Similarly, a matrix connection from Pin5 is used to trigger a state transition from State 0 to State 2.

Finally, DM1_0 is configured so that both muxes pass through the signal from Pin6. The counter is configured as a 100µs both edge delay, and the 2-bit LUT is an AND gate. Just like in DM0_0, the output block is used to trigger another state transition.

SLG46880/1 Dynamic Memory Block

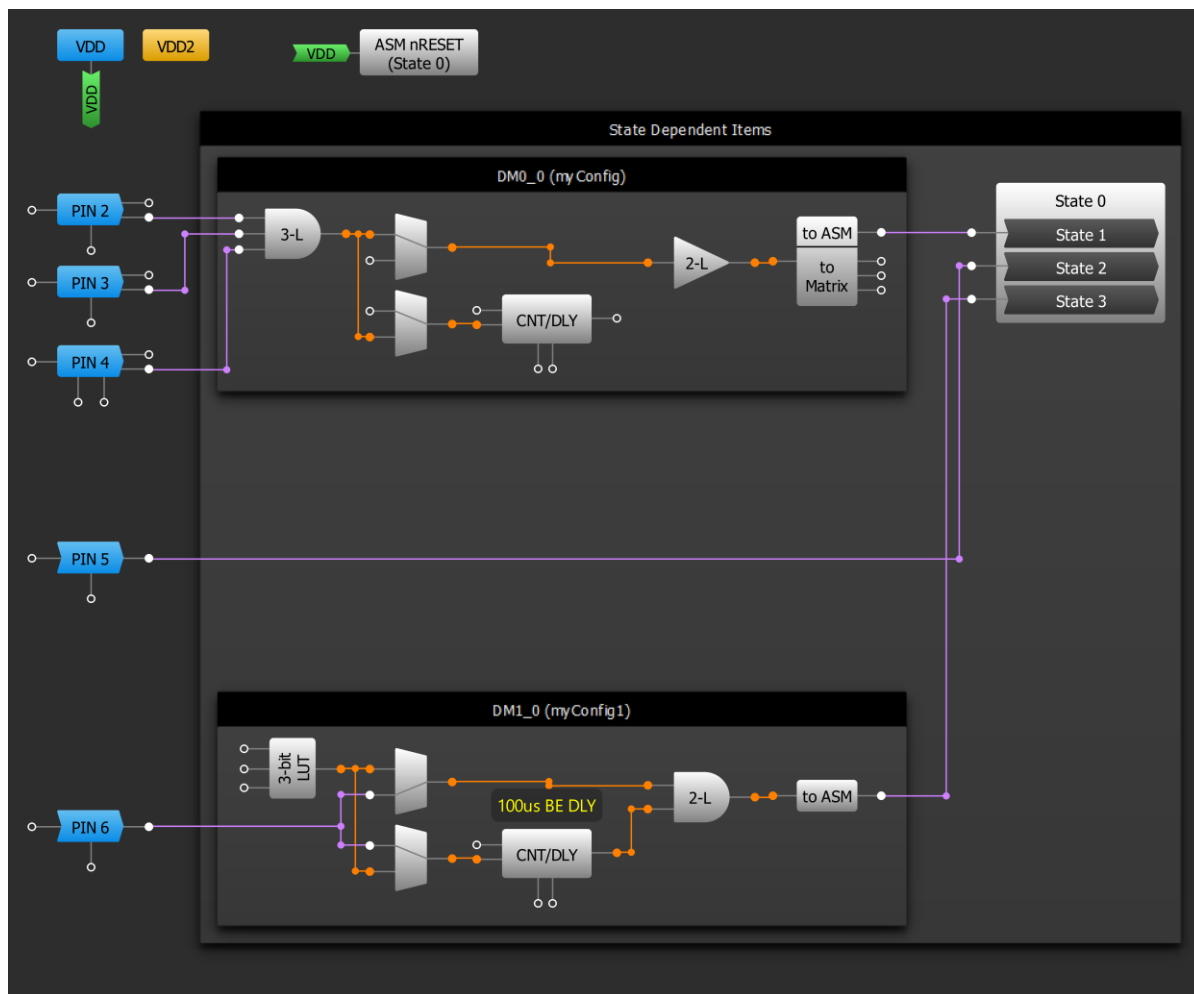


Figure 5: Different Ways to Trigger a State Transition

7 Using a DM Block to Interact with Blocks Outside the ASM

As you may have noticed in the previous section, DM0_0’s output block has 3 “to Matrix” outputs, while DM1_0’s output block doesn’t have any matrix outputs. This holds true for DM0_1 and DM1_1 as well; DM0_1 has 3 matrix outputs, while DM1_1 has none.

The 3 “to matrix” outputs can be connected to any other matrix connectors, like pins, LUTs, DFFs, etc. This is shown in [Figure 6](#).

SLG46880/1 Dynamic Memory Block

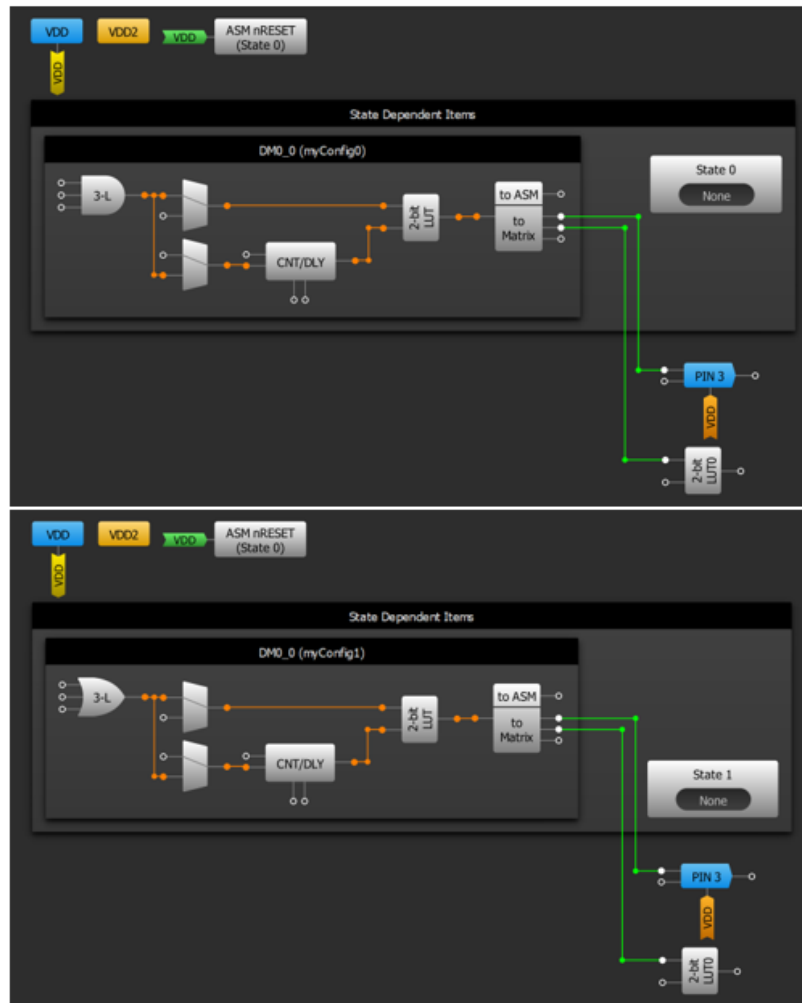


Figure 6: DM to Matrix Connections

Note that once a connection has been made between a “to Matrix” pin and other blocks outside the State Machine area, it will exist in every state, regardless of which DM configuration is used. In [Figure 6](#), the top section shows myConfig0 of DM0_0, which exists in State 0. The bottom section shows myConfig1 of DM0_0, which exists in State 1. The top “to Matrix” connection in both configurations is connected to Pin3, while the middle one is connected to 2-bit LUT0.

Only one of those “to Matrix” connections can be “active” at any time.

There are 4 options in the properties panel menu for DM0_0 and DM0_1’s output block:

- Out0/1/2 keep
- Bypass to out0, out1/2 keep
- Bypass to out1, out0/2 keep
- Bypass to out2, out1/1 keep

These settings are used to determine which of the three outputs are active in each configuration. If the first option is selected, the output of the DM block’s 2-bit LUT will not be passed to any of the three “to Matrix” outputs. The value of those three signals will remain unchanged in that state.

However, if any of the other three options are used, the output of the DM block’s 2-bit LUT will be passed to out0, out1, or out2 respectively, and the value of the other two outputs will be kept unchanged.

SLG46880/1 Dynamic Memory Block

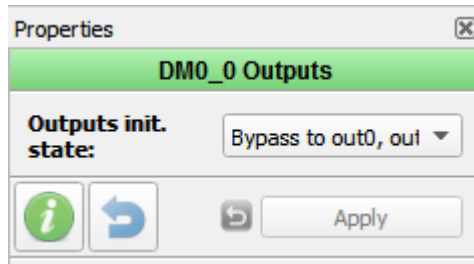


Figure 7: DM "to Matrix" Output Properties

8 Design Example

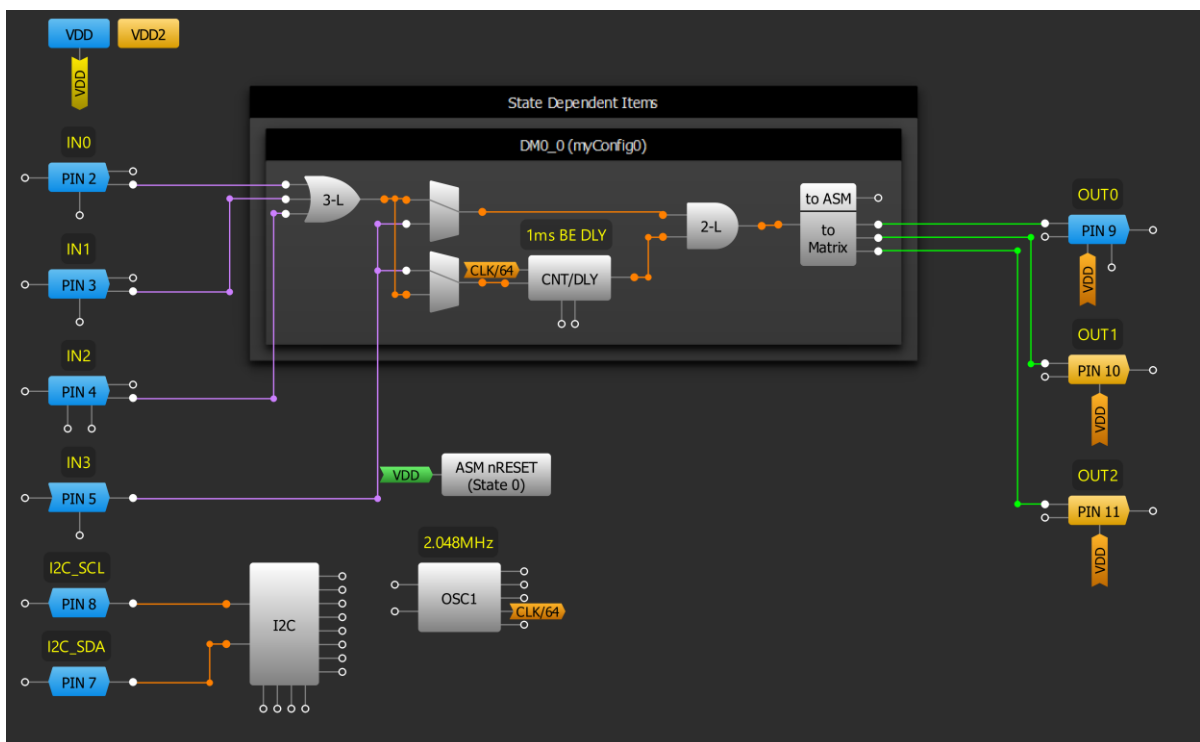


Figure 8: Design Example

In the above design example, the IN0, IN1, and IN2 are OR'd together. Meanwhile, IN3 is delayed by 1 ms and then AND'd with the output of the OR gate. The to Matrix block is configured so that the output of the DM block is sent to OUT0 in STATE0, while the values at OUT1 and OUT2 are kept.

9 Conclusion

Thanks to their reconfigurability, Dynamic Memory blocks in the Dialog GreenPAK SLG46880/1 are extremely flexible and can be used in a variety of ways. Once you get the hang of working with DM blocks, you'll be able to create more complex designs by piecing together different DM block configurations in different ASM states.

Revision History

Revision	Date	Description
1.0	19-Mar-2018	Initial Version

SLG46880/1 Dynamic Memory Block

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

Information in this document is believed to be accurate and reliable. However, Dialog Semiconductor does not give any representations or warranties, expressed 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.

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.

Customer notes that 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 are subject to Dialog Semiconductor's [Standard Terms and Conditions of Sale](http://www.dialog-semiconductor.com), available on the company website (www.dialog-semiconductor.com) unless otherwise stated.

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

© 2020 Dialog Semiconductor. All rights reserved.

Contacting Dialog Semiconductor

United Kingdom (Headquarters)
Dialog Semiconductor (UK) LTD
Phone: +44 1793 757700

Germany
Dialog Semiconductor GmbH
Phone: +49 7021 805-0

The Netherlands
Dialog Semiconductor B.V.
Phone: +31 73 640 8822

Email:
enquiry@diasemi.com

North America
Dialog Semiconductor Inc.
Phone: +1 408 845 8500

Japan
Dialog Semiconductor K. K.
Phone: +81 3 5769 5100

Taiwan
Dialog Semiconductor Taiwan
Phone: +886 281 786 222

Web site:
www.dialog-semiconductor.com

Hong Kong
Dialog Semiconductor Hong Kong
Phone: +852 2607 4271

Korea
Dialog Semiconductor Korea
Phone: +82 2 3469 8200

China (Shenzhen)
Dialog Semiconductor China
Phone: +86 755 2981 3669

China (Shanghai)
Dialog Semiconductor China
Phone: +86 21 5424 9058