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1 Kit Contents
➢ EvalAg7010 Evaluation Board
➢ Ag7010 Soldered to Evaluation Board

2 Additional Components
➢ I²C controller
➢ USB-C Source

3 Board Layout

Figure 1: EvalAg7010 Board Layout

3.1 Link Settings
LK1 – Input Power LED Enable
LK2 – Output Power LED Enable
LK3 – PWR good LED Enable
LK4 – CONTROL Set
LK5 – Output voltage Select
LK6 – I²C Address Set
LK7 – USB Power Request Set
LK8 – USB Voltage Request Set

3.2 Input Output Connections
J1 – Input Power DC jack
J2 & J3 – Input Power Banana Connectors
J4 – Load Output Dc Jack
J5 & J6 – Load Output Banana Connectors
J7 – I²C Interface
J8 – USB-C Connector

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4 Introduction
This Manual is a guide to using the EvalAg7010 revision 3 or greater evaluation board fitted with a Silvertel Ag7010 High Efficiency Buck Converter module for use in a wide variety of point of load (PoL) and DC-DC converter applications, including USB Power Delivery (USB-PD), Apple Lightning and Intel Thunderbolt enabled devices.

5 Input
5.1 Supply
The EvalAg7010 evaluation board can be powered using a DC Power supply connected to either J2 and J3 via banana connectors, J1 with bare wire or J8 via USB-C.

This supply should deliver between 8-24V, a lower voltage will not cause damage to the module. The DCDC converter will be enabled when its supply exceeds the configured VIN_ON setting, by default this is 6.75V.

The Ag7010 can output up to 10A of continuous output current for a maximum power output of 120W.

At this output current the Ag7010 will dissipate up to 5.1W. Any power source should be suitably rated for the desired output power, the power dissipation of the Ag7010 and any transmission power losses.

5.2 Output Voltage Adjust
The output voltage of the Ag7010 module can be adjusted by changing the location of the jumper LK5. There are four jumper locations on LK5 that can be used to set the Ag7010 to one of the pre-configured the output voltage of 3V, 5V, 9V, or 12V.

To set the output voltage to a custom value, fit a resistor to location R9 overriding the 3V output setting with the custom voltage output, please refer to the Ag7010 datasheet for details on resistor value calculation.

With no jumper present on LK5, the module will default to 3V output.

5.3 EN/DIS
The Ag7010 DCDC converter can be enabled or disabled by pulling the CONTROL pin LOW, which can be performed by connecting a jumper link to LK4, EN/DIS.

The default action is a jumper link placed on LK4 will disable the output. This pin function can be inverted or negated using the PMBus configuration.
6 I²C

The Ag7010’s I²C interface supports PMBus commands and is designed to the PMBus rev 1.3 specification.

This allows for the configuration, control, and monitoring of the DC/DC converter by a system controller. For the full command list of the I²C interface, see the Ag7010 Datasheet.

The Pin arrangement for the I²C interface on J7 is as below:

Serial Clock - Serial Data Analogue – Ground

6.1 I²C Address

Up to four Ag7010 modules can operate on the same I²C bus by configuring them to operate on different addresses. Bits 0 and 1 of the I²C address can be pulled LOW from their default HIGH state by connecting one or two jumpers vertically to LK6. Bit 0 is set by the right column of LK6, bit 1 is set by the left column of LK6.

7 USB

The EvalAg7010 rev 3 is fitted with a Diodes Inc AP33771 USB PD Sink Controller, this controller performs the role of requesting voltage and power levels from a USB-PD source.

The AP33771 uses resistor links to configure the voltage and power level request, as opposed to the AP33772, which is configured via I²C.

7.1 USB Voltage Request Select

The requested voltage from the USB-PD source is set using two jumper links on LK8. With both links present 20V will be requested from the source. With only the lower link present 15V will be requested.

If neither jumper link is present, the USB voltage will be 5V, with this voltage the I²C interface on the Ag7010 will be active, but the voltage will be too low for the DCDC converter to be enabled.

7.2 USB Power Level Request Select

The power level requested from the USB-PD source is set by placing a jumper link on the appropriate setting on LK7. If the USB-PD source device has a power contract that allows this power level at the requested voltage, power will be supplied, otherwise a mismatch will be flagged.

7.3 USB LED

The EvalAg7010 features an LED to indicate the status of the power request from the USB connection. The behaviour of the LED will be as per the Table 1 when connected to a USB-PD source.

<table>
<thead>
<tr>
<th>LED action</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Light</td>
<td>powered with &lt;500mA draw</td>
</tr>
<tr>
<td>4-sec Breathing</td>
<td>Powered and Drawing Current</td>
</tr>
<tr>
<td>Flashing - 2 second period</td>
<td>Voltage or Power request Mismatch</td>
</tr>
<tr>
<td>Flashing - 0.6 second period</td>
<td>Over Voltage Protection</td>
</tr>
</tbody>
</table>

Table 1: USB LED States
7.4 Data
The EvalAg7010 contains a USB-PD sink controller negotiating power delivery from a USB PSE for the purpose of evaluating the module for USB powered applications. There is no data Throughput for the USB-C connection.

8 Output
The Ag7010 will output 3V-12.7V and can deliver a continuous output current of 10A, for up to 120W of continuous power, the peak output power may be reduced as a result of the power source or operating conditions the module is operating in.

8.1 PWR good LED
The power good LED will illuminate when the output voltage has reached a regulated output.

9 Test Setup
Figure 2 shows a typical test set up using the EvalAg7010 evaluation board.
The equipment required: -
➢ Up to 130W USB-PD source or 24V bench power supply
➢ Application Device
➢ USB-C cable
Optional equipment: -
➢ Data source e.g. PC

Figure 2: Basic Test Setup

10 Additional information
Full operating conditions and feature set can be found in the Ag7010 product datasheet, available from www.silvertel.com.
11 Schematic
### High Efficiency Buck Converter Evaluation Board

#### Bill of Materials

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<th>Quantity</th>
<th>Description</th>
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<td>Evaluation Board</td>
</tr>
<tr>
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<td>1</td>
<td>Date: 12.0 October 2022</td>
</tr>
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<td>© Silver Telecom 2022</td>
<td>1</td>
<td>Copyright notice</td>
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<tr>
<td>EvalAg7010</td>
<td>1</td>
<td>Product name</td>
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<tr>
<td>V2.0</td>
<td>1</td>
<td>Version number</td>
</tr>
</tbody>
</table>

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### Schematic Diagram

**Note:** The schematic diagram is not provided in the image. It can be found on the following page(s) of the document.