L5965 is a multichannel voltage regulator specifically designed to support applications that need to fulfill functional safety requirements as defined by Automotive Safety Integrity Level (ASIL).

It is available in VQFN-48 package.

This document describes how to use the L5965 application board in order to check device’s performance.

Please refer to the datasheet.

**Figure 1. L5965 evaluation board**
1 Board description

The demo board is an evaluation tool for L5965. L5965 embeds 1 controller and 1 buck that can both be supplied by the car battery and used as pre-regulators, 2 buck post-regulators, 1 boost, 1 linear regulator and 1 precise voltage reference. For further details on the device please refer to the datasheet.

Useful connectors available on the board:
- J1 = VBUCK1 (Buck1 output connector)
- J2 = VBAT1 (Battery input power supply, supplying Buck1 and Buck2)
- J3 = SYNCIN and ground pin connections
- J4 = SYNCOUT and ground pin connections
- J5 = Service/Voltage signals/VREF output connector
- J6 = EXTSUP (Alternative IC power supply connector)
- J11 = VBUCK2 (Buck2 output connector)
- J12 = SPI bus connector
- J14 = VBUCK3 (Buck3 output connector)
- J17 = VBUCK4 (Buck4 output connector)
- J18 = VSLDO LDO (Ldo input power supply connector)
- J21 = LDO (Ldo output connector)
- J22 = VBOOST (Boost output connector)

![Figure 2. Board top view design](image-url)
2 Board operation

The demonstration board is already set to allow the evaluation of the PMIC features. For a basic use, no preliminary operation is necessary. Just connect a compatible voltage to the connector J2 (VBAT1) and check the output signals on proper connectors.

Buck2, Buck3, Buck4, Boost and Vref are switched on automatically.

Buck1 and Ldo have been programmed in order to be enabled by SPI (for instruction, please read the product datasheet, chapter 5). The Ldo input (J18) has to be connected by a wire with the output of a Buck regulator (Buck2, for instance, on J11).
The L5965 mounted on this demonstration board is programmed as follows (see product datasheet, chapter 6.8).

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
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<tbody>
<tr>
<td>8</td>
<td>Reset activation = 000</td>
</tr>
<tr>
<td>9</td>
<td>Device identification = 000000</td>
</tr>
<tr>
<td>10</td>
<td>OTP_CFG = 0</td>
</tr>
<tr>
<td>11</td>
<td>BUCK1_CFG = 0</td>
</tr>
<tr>
<td>12</td>
<td>CFC</td>
</tr>
<tr>
<td>13</td>
<td>00</td>
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</table>

**Figure 3. OTP programming**

Buck2 is the main regulator and provides 3.3 V at 3 A and 0.4 MHz. This is the pre-regulator that supplies the others. Buck3 is the second regulator to switch on, and provides 2 V. Buck4 is the third regulator, supplying 1.8 V. The fourth regulator to start is the Boost, providing 5 V and the latest one is the VREF, 3.3 V.

The reset is released after the Power Good of the main regulator (Buck2). In case of failures, the RESET_B signal doesn't affect the State Machine, then the regulator can still be evaluated in this condition. Also an overvoltage cannot assert a reset. All these regulators turn on with a delay of 10 ms among them.

Buck1 and Ldo should be enabled by SPI. Once enabled, Buck1 provides 1.2 V and the Ldo supplies 1.3 V at 600 mA.

A watchdog is not required to operate the PMIC and rewriting OTP programming is forbidden.
SPI signals are available on the J12 connector. The SPI bus can be also used to monitor the PMIC diagnostics.

Figure 4. Demo board SPI connector
Figure 5. Board schematic
6 Information on board use

This evaluation board/kit is intended for the following uses:

- Engineering development
- Demonstrations
- Evaluation purposes only

It is not considered by ST Microelectronics (STM) to be a finished end-product fit for general consumer use. The people who handle the product(s) must have electronics training and must observe good engineering standard practices.

For this reason the goods being provided are not intended to be complete in terms of required design, marketing, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This evaluation board/kit does not fall within the purpose of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.
### Revision history

Table 1. Document revision history

<table>
<thead>
<tr>
<th>Date</th>
<th>Version</th>
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<tbody>
<tr>
<td>17-Jun-2019</td>
<td>1</td>
<td>Initial release.</td>
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