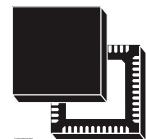


## Multiple power management for automotive vision and radar systems

**Data brief****VQFPN-48 (7x7mm)**

- Adjustable window watchdog
- Short circuit protected outputs and Fault detection pin to Microcontroller
- Low external components number
- Operating ambient temperature -40 to 125 °C
- Thermal shutdown junction temperature 175 °C
- Qualification in accordance to AEC Q100 standard

### Features

- Pre SMPS BUCK1 regulator controller, @ 0.4 MHz
- Pre SMPS BUCK2 regulator, @ 3 A, 2.4 MHz
- Post SMPS BUCK3 regulator, @ 1.5 A, 2.4 MHz
- Post SMPS BUCK4 regulator, @ 1 A, 2.4 MHz
- Boost regulator @ 300 mA
- Post Linear regulator LDO, @ 600 mA
- Precise ADC Voltage reference, @ 20 mA
- SPI interface with CRC
- Programmable slew rate/soft start
- Voltage supervisors
- Spread frequency spectrum
- Reset and reset sensitivity list

### Description

The L5965 is a multiple voltage regulator including two battery compatible BUCK pre-regulators, two BUCK post regulators, one BOOST, one LDO and a precise voltage reference regulator.

OTP (One Time Programmable) cells are used for main device parameters and power up phase programming.

An SPI interface can be used for diagnostic information and to program internal blocks parameters.

The device offers a set of features to support applications that need to fulfill functional safety requirements as defined by Automotive Safety Integrity Level (ASIL) A-B-C-D.

**Table 1. Device summary**

| Order codes | Package  | Packing |
|-------------|----------|---------|
| L5965SQ-V0Y | VQFPN-48 | Tray    |
| L5965SQ-V0T | VQFPN-48 | T&R     |

## 1 Overview

L5965 is a multichannel voltage regulator able to offer flexibility and ease of use, together with a set of features that make it compliant to applications that require a certain level of safety. The product is designed with reference to ISO26262 and includes input and output monitors, independent band-gaps, ground loss monitors, internal compensation networks, that also help reduce the BOM, digital and analog BIST, fault pin.

In this product, there are 7 different regulators. A first battery-compatible regulator, controller, that can supply several amperages of current thanks to the use of external MOS. A second regulator with integrated MOS that can be used as a pre-regulator for currents up to about 3A. Two bucks, post regulators, one boost that can be used to supply, for example, a CAN bus, one LDO and one 1% accurate reference voltage for the microcontroller. All output voltages can be selected via memory cells (OTP) that can be programmed before using the PMIC. This guarantees precision and safety, since output voltages are not susceptible to variations due to the external environment. It also contributes to reducing the number of external components. Through the OTP it is also possible to decide the switching frequency of some regulators, the current limitation, select the main buck and the system power-on sequence. Programming can also be done at customer's production line.

There is also an SPI bus, used to program the PMIC and to communicate with the microcontroller. Through this bus it is possible to set overvoltage and undervoltage thresholds, enable the spread spectrum, select the soft start time and many other things. The SPI is also used to communicate the status of the buck in case of fault, overtemperature or other events.

The maximum free run switching frequency of the bucks is 2.4MHz, modifiable through external synchronization signals.

The PMIC can manage watchdog and reset signals.

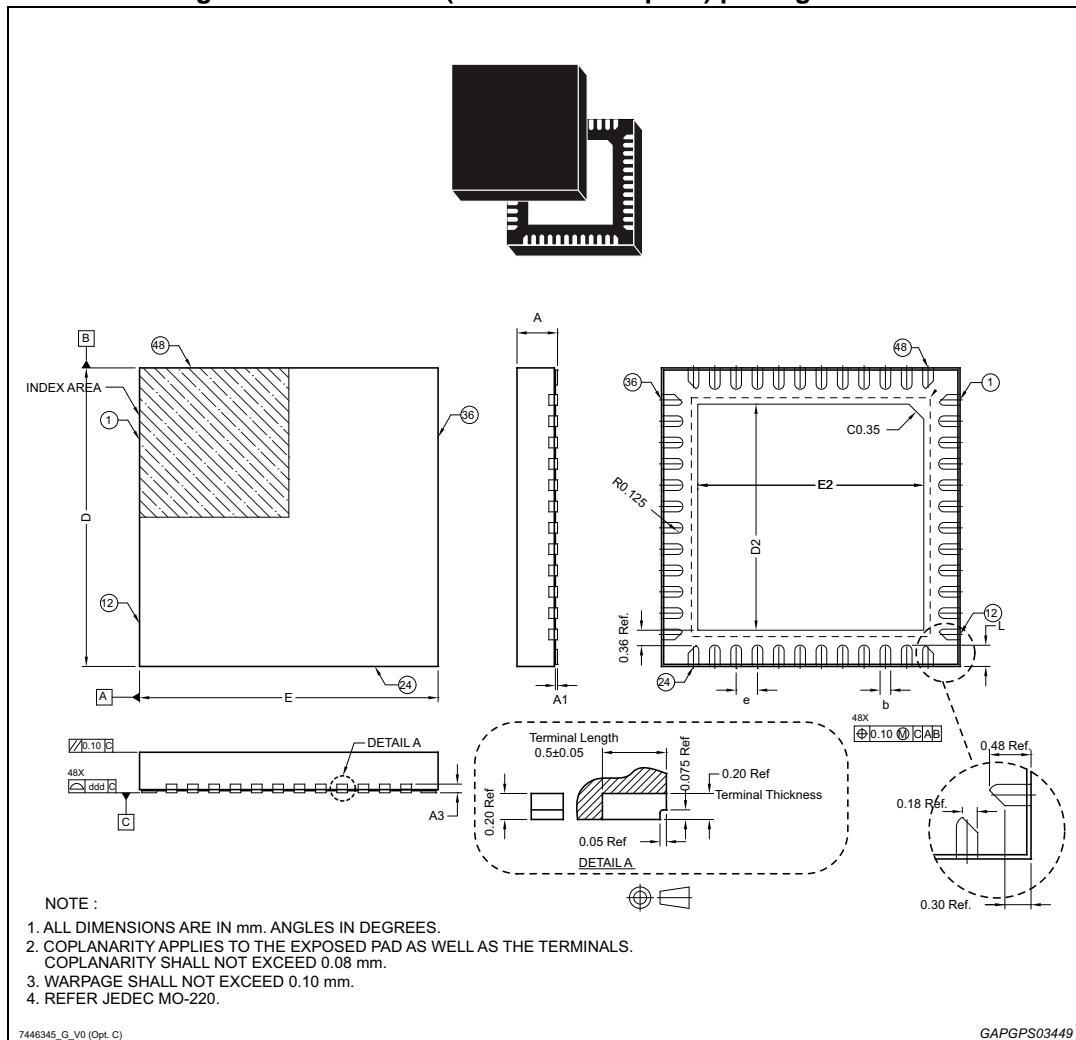
The product comes in a QFN48 slug-down package of only 7mm per side.

## 2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

## 2.1 VFQFPN-48 (7x7x1.0 mm - opt. D) package information

**Figure 1. VFQFPN-48 (7x7x1.0 mm - opt. D) package outline**



**Table 2. VFQFPN-48 (7x7x1.0 - opt. D) package mechanical data**

| Ref | Dimensions  |       |      |                       |        |        |
|-----|-------------|-------|------|-----------------------|--------|--------|
|     | Millimeters |       |      | Inches <sup>(1)</sup> |        |        |
|     | Min.        | Typ.  | Max. | Min.                  | Typ.   | Max.   |
| A   | 0.85        | 0.95  | 1.05 | 0.0335                | 0.0374 | 0.0413 |
| A1  | -           | -     | 0.05 | -                     | -      | 0.0020 |
| A2  | -           | 0.75  | -    | -                     | 0.0295 | -      |
| A3  | -           | 0.200 | -    | -                     | 0.0079 | -      |
| b   | 0.15        | 0.25  | 0.35 | 0.0059                | 0.0098 | 0.0138 |
| D   | 6.80        | 7.00  | 7.15 | 0.2697                | 0.2756 | 0.2815 |
| D2  | 5.15        | 5.30  | 5.45 | 0.2028                | 0.2087 | 0.2146 |
| E   | 6.85        | 7.00  | 7.15 | 0.2697                | 0.2756 | 0.2815 |
| E2  | 5.15        | 5.30  | 5.45 | 0.2028                | 0.2087 | 0.2146 |
| e   | 0.45        | 0.50  | 0.55 | 0.0177                | 0.0197 | 0.0217 |
| L   | 0.45        | 0.50  | 0.55 | 0.0177                | 0.0197 | 0.0217 |
| ddd | -           | -     | 0.08 | -                     | -      | 0.0031 |

1. Values in inches are converted from mm and rounded to 4 decimal digits.

### 3 Revision history

Table 3. Document revision history

| Date        | Revision | Changes  |
|-------------|----------|--|
| 18-Sep-2015 | 1        | Initial release.   |
| 10-Apr-2018 | 2        | Updated <a href="#">Section : Features</a> and <a href="#">Section : Description</a> .<br>Added <a href="#">Table 1: Device summary</a> in cover page.<br>Added <a href="#">Section 1: Overview</a> .<br>Minor text changes. |

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2018 STMicroelectronics – All rights reserved

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[STMicroelectronics:](#)

[L5965SQ-V0T](#)