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STMicroelectronics UM3229 Evaluation Board User Manual

UM3229
User manual
EVAL-L5965 Evaluation board

Introduction

This document provides information concerning features and usage of the EVAL-L5965 that is the complete name for the device evaluation board.

Contents

Preface

The 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 the VQFPN-48 package.
This document describes how to use the L5965 application board in order to check device's performance (please refer to the datasheet for more information).

Hardware description and setup

This section provides a description of the main components of this evaluation kit, giving instruction for a quick setup of the system.

2.1 EVAL-L5965 board

Figure 1. Board overview
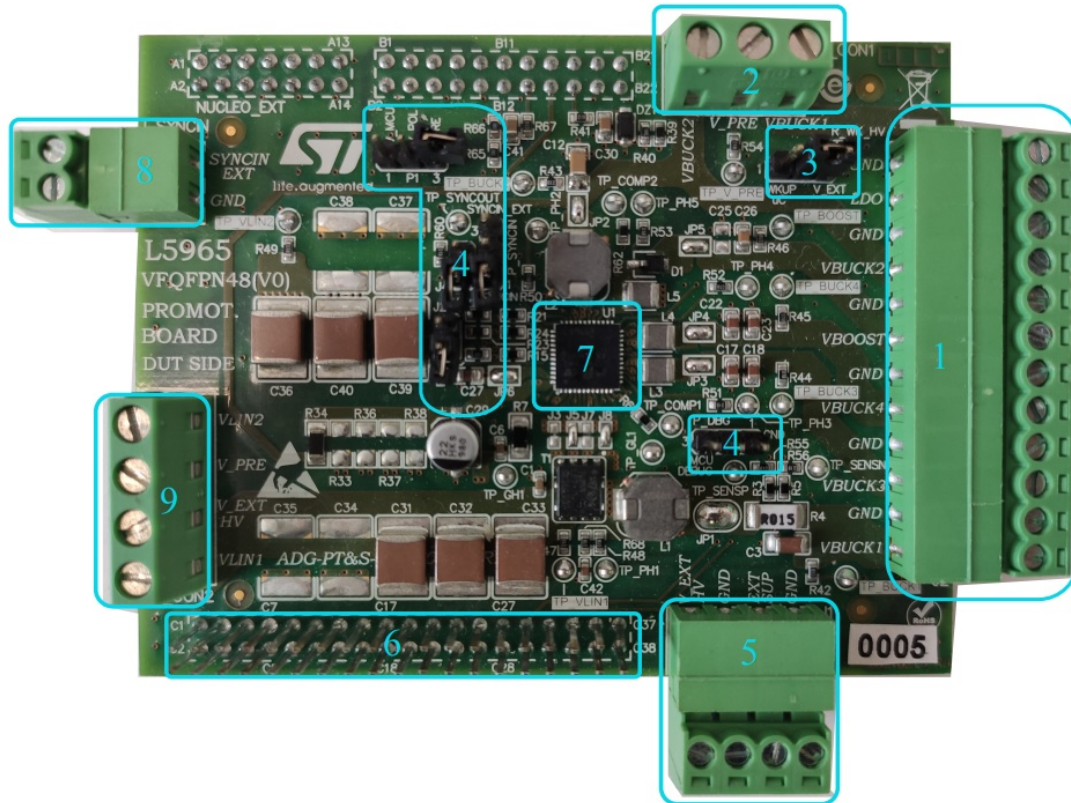
The motherboard is equipped with the following features (refer to the Figure 1, where the main parts are highlighted):

Table 1. Main parts description

Part #	Description
1	Output screw connectors for BUCK's, BOOST and LDO
2	V_PRE selection connector
3	WKUP jumper selection
4	Main jumpers of control signals
5	Screw connectors for main and auxiliary power supply (VBAT1, EXTSUP)
6	Connectors for SPI and auxiliary signals
7	Device area
8	Screw connector for SYNCIN
9	VLIN1 and VLIN2 selection connector

2.1.1 Power supply section

The board provides two main power supply inputs V_EXT_HV and EXTSUP:

- EXTSUP is intended to supply the VREG internal regulator to improve efficiency (optional)

- V_EXT_HV is intended to supply the VBAT1 pin of the device, the pre-BUCK1 and external HS MOS

The VREG is normally supplied directly from VBAT1 pin, in case is needed in can be supplied by EXTSUP. To make this transition happened is enough to provide a voltage higher than a threshold (typically 4.6 V) on EXTSUP pin.

The Figure 2 shows the schematic diagram of V_EXT_HV and EXTSUP connectors. The main component is the screw connector J1 necessary to provide voltages to the circuit. They are also equipped with a separated GND terminal for each supply. Capacitors C5 and C6 reduce the voltage fluctuations. V_EXT_HV is also present in other sections of the board to provide it as an alternative input for each regulator. This option is necessary to test a regulator independently without the influence of the previous one. The R7 resistor works as a jumper to connect or disconnect the EXTSUP supplies from the device. Anyway, the default option is to keep it connected through the resistor.

**Figure 2. VBAT schematic circuit section**
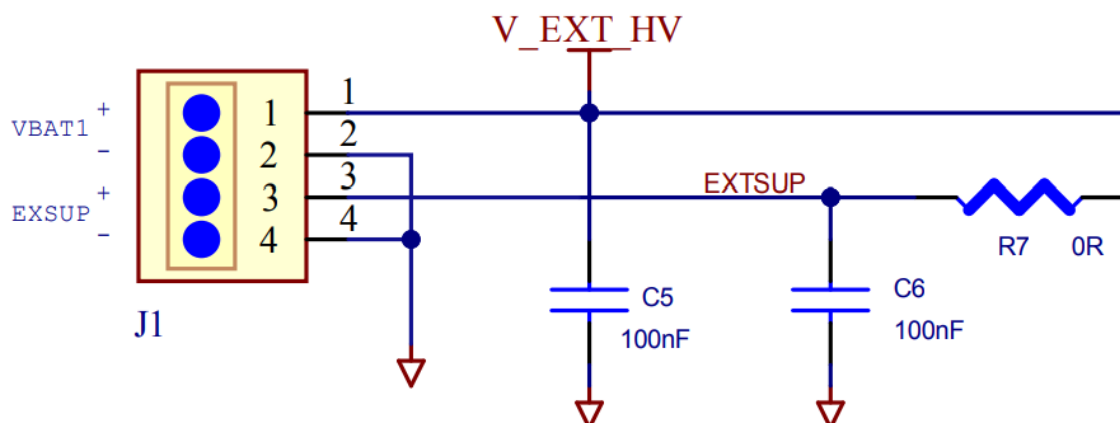
The board provide all the necessary external components and compensation network for the whole power supplies. In the Figure 3 it is reported the schematic view for BUCK2 in which are reported the external components and the external network. For other regulators like BUCK3 or BUCK4 the compensation network is not required because is internally implemented.
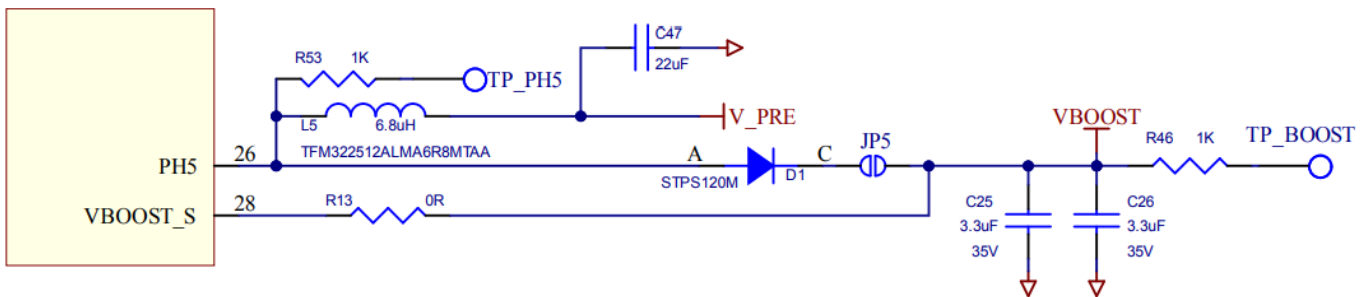
Figure 3. BUCK2 schematic circuit
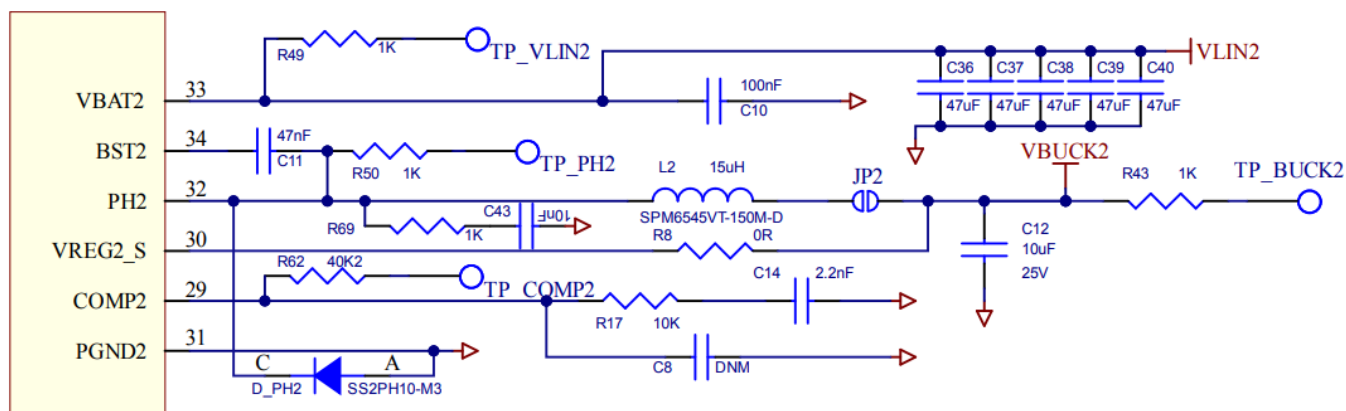
The Figure 4 shows the minimum load required by the linear regulator LDO, similar idea is applied to both linear regulators present in the device VREF and LDO. The minimum load is related to the spec requirement of a minimum current mainly for stability purposes.

Figure 4. LDO schematic circuit section detail
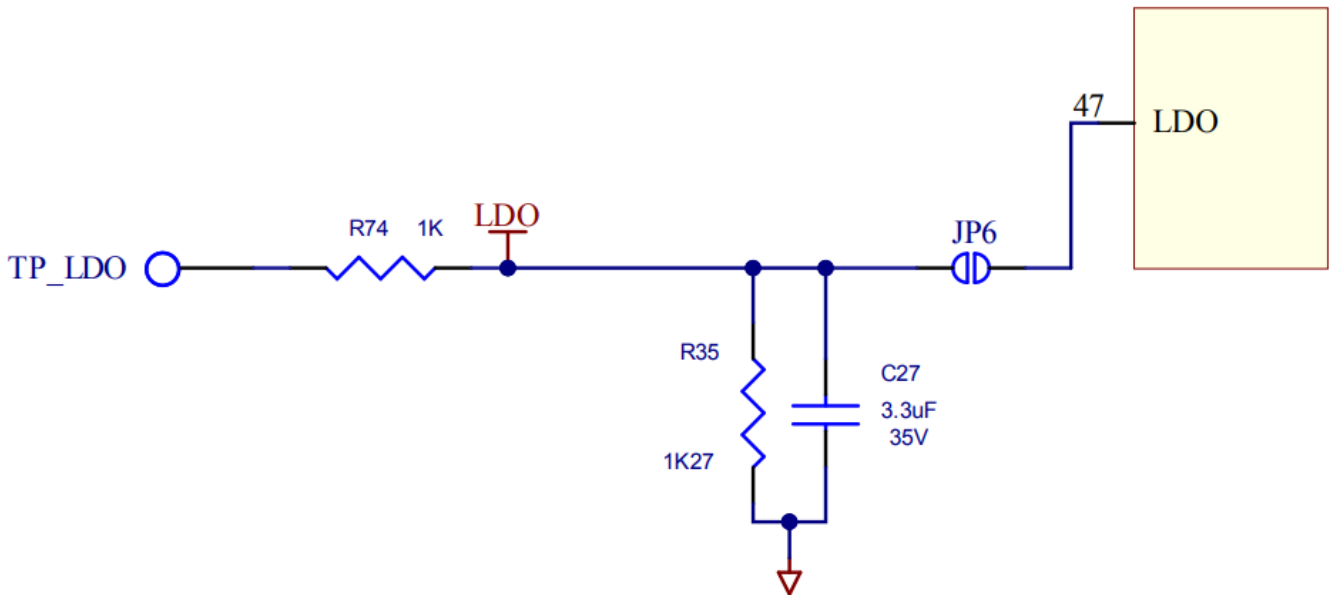
The Figure 5 shows the schematic section of BOOST converter. The main external components required are the inductor L5 that have to be chosen coherently with the maximum current required, the diode D1 and the output capacitor Cout obtained with two equal capacitors in parallel C25 and C26.
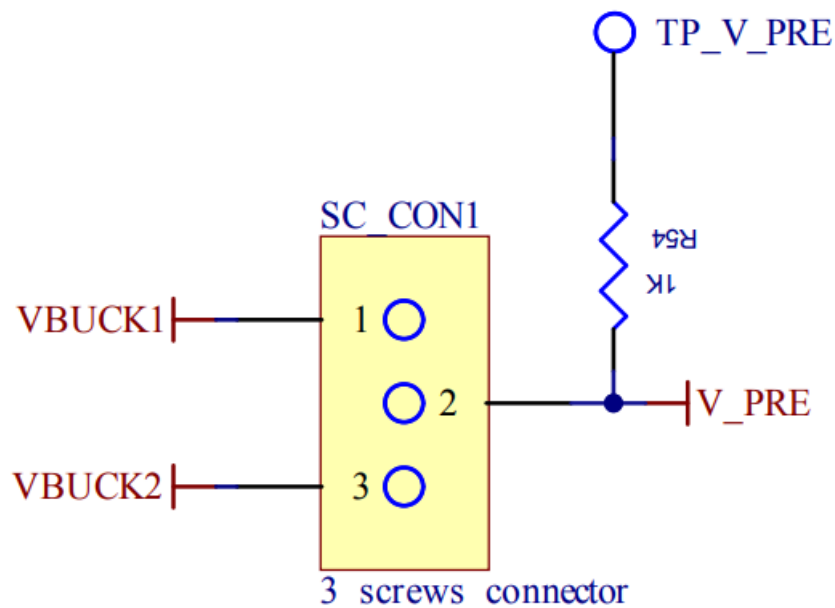
Figure 5. BOOST schematic circuit section


2.1.2 VLINE connectors

The Figure 6 and Figure 7 show the schematic section for the two connectors, SC_CON1 and SC_CON2, that select the input voltages for the different regulators.

Figure 6. SC_CON1 schematic circuit section

To select the BUCK1 as pre-regulator is needed to insert an external cable shorting the SC_CON1 connector terminal 1 and 2. Instead, shorting terminal 2 and 3 selects the BUCK2 as pre-regulator. V_PRE is the input voltage for all the post-regulators BUCK3, BUCK4 and BOOST.

Figure 7. **SC_CON2 schematic circuit section**
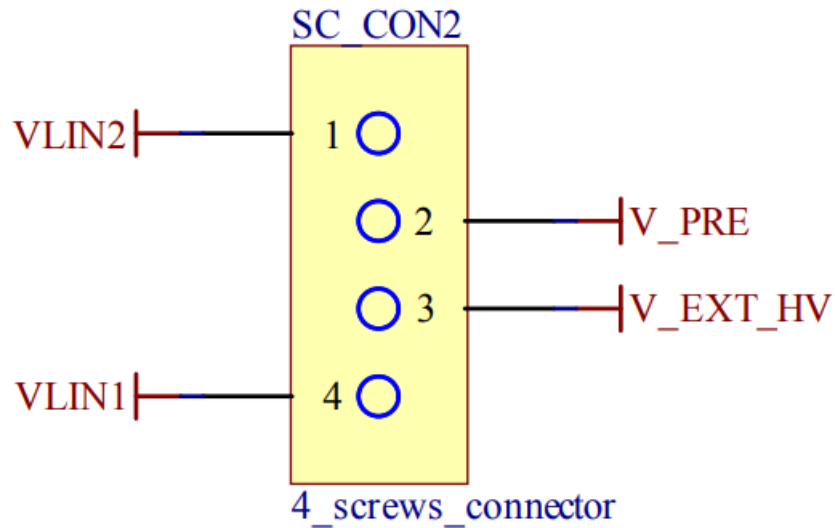
The SC_CON2 allows to define the input voltage for the BUCK1 and BUCK2. To have both connected to battery (V_EXT_HV), is necessary to use an external cable that shorts terminals 1, 3, and 4 together. Instead, if only one is the pre-regulator, for example the BUCK1, terminal 3 and 4 shall be connected. To provide the input voltage to BUCK2, configured as post-regulator, terminal 1 and 2 shall be connected.

2.1.3 Jumpers configuration

The Table 2 summarize functionality and configurations for the jumpers available on the board.
The V_POL is the voltage used as supply for the digital pin pull-up, V_MCU is a supply coming from micro board, VPRE is the supply voltage for post-regulators selected by SC_CON1 between BUCK1 and BUCK2 output.

Table 2. Jumpers configuration

Jumper	Configuration setup	
	Position 1-2	**Position 2-3**
P1	V_POL shorted with V_MCU	V_POL shorted with VPRE
P2	WKUP pin shorted with a micro signal	WKUP pin shorted with V_EXT_HV
P_DBG	DEBUG pin shorted with GND	DEBUG pin shorted with a micro signal
P_SYNCIN	SYNCIN pin shorted with a micro signal	SYNCIN pin shorted with J_SYNCIN connector
	Close	**Open**
J4	SYNCOUT pin shorted with a micro signal	SYNCOUT not connected with micro pin
J24	FAULT pin pull-up to V_POL present	FAULT pin pull-up to V_POL not present

2.2 Typical application

The Figure 8 shows an example of board standard usage. In details are highlighted the power supply connections VBAT and GND.
The demonstration board is already set to allow the evaluation of the PMIC features. To run the device properly is needed to connect a compatible voltage to the connector J1 (V_EXT_HV), to short terminal 2 (V_PRE) with terminal 3 (BUCK2) for connector SC_CON1 and to short terminal 3 (V_EXT_HV), 1 (VLIN2) and 4 (VLIN1) together for connector SC_CON2.
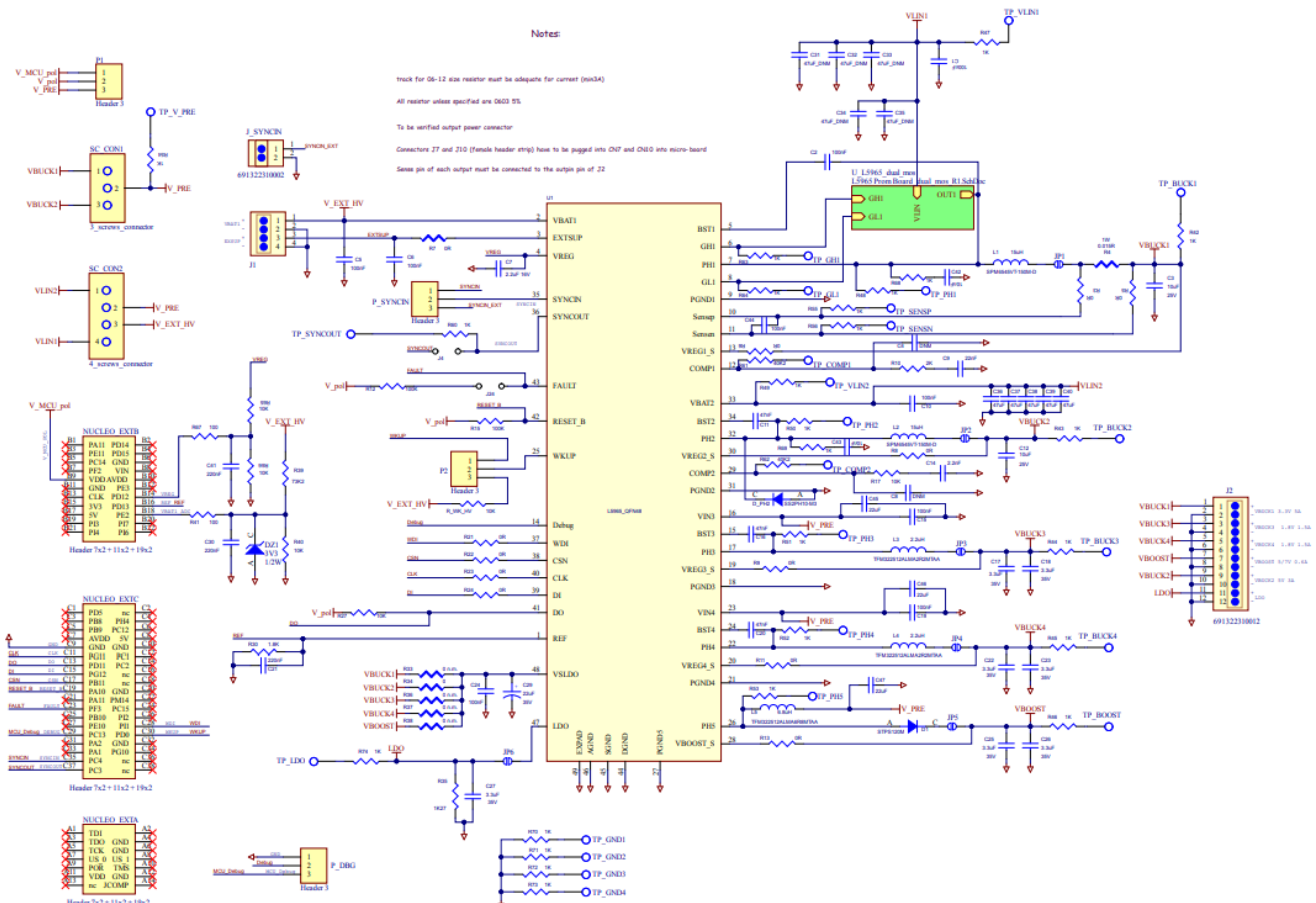BUCK2, BUCK3, BUCK4, BOOST and VREF are switched on automatically.
In the example are connected just 3 loads but in real context application can be used more loads, also more than

one load for each regulator.

Figure 8. **Board application**

2.3 Layout

Figure 9. **Assembly Top**

Figure 10. Assembly Bottom

2.4 Schematic

Figure 11. Board schematic

Programming option

The L5965 mounted on this demonstration board is programmed as follows (refer to product datasheet for more information).

Figure 12. OTP bit mapping

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8	Reset activation = 000			Device identification = 000000						OTP WD REC en = 0	BUCK1 CFG = 000			CRC		
9	Prim Id = 110			Non Prim Seqld = 111			BUCK2 CFG =01010					EnBUCK4 = 1	EnBUCK3 = 1	CRC		
10	Seqld BUCK4 = 010			Seqld BUCK3 = 001			BUCK4 CFG = 001			OvRst EN = 1	BUCK3 CFG = 000			CRC		
11	Seqld LDO = 111			Seqld BOOST = 011			EnLDO =1	EnBOOST = 1	LDO CFG = 1101				BOOST CFG = 0	CRC		
12	USR Area Protection = 111			Seqld VREF = 100			PowrOn Delay = 01		EnVREF = 1	WDG CFG = 10		VREF CFG = 10		CRC		

BUCK2 is the main regulator and provides 3.3 V at 2.6 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 providing 3.3 V. The reset is released after the power-good of the main regulator (BUCK2). In case of failures, the RESET_B signal does not 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 2 ms among them. BUCK1 and LDO should be enabled by SPI. Once enabled, BUCK1 provides 5 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.

Information on board use

This evaluation board is intended for the following uses:

- Engineering development
- Demonstrations
- Evaluation purposes only

It is not considered by STMicroelectronics to be a finished end-product fit for general consumer use. The people who handle one or more products 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 3. Document revision history

Date	Version	Changes
11-Aug-2023	1	Initial release.

IMPORTANT NOTICE – READ CAREFULLY

Documents / Resources

STMicroelectronics UM3229 Evaluation Board [pdf] User Manual
UM3229, UM3229 Evaluation Board, Evaluation Board, Board

References

- **STMicroelectronics: Our technology starts with you**
- **STMicroelectronics Trademark List - STMicroelectronics**

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