MC33665A

Battery management communication gateway

Rev. 3 — 29 July 2022 Product short data sheet

1 Product profile

1.1 General description

The MC33665A is a general-purpose battery management communication gateway and transport protocol link (TPL) transceiver. The device forwards messages upcoming from different TPL (isolated daisy chain protocol of NXP) ports through a standard communication protocol. The standard communication protocol ensures compatibility with microcontrollers available in the market. The MC33665A is designed as a gateway for serial peripheral interface (SPI), CAN (FD) or universal asynchronous receiver transmitter (UART) to TPL.

In the SPI or UART variant, the device communicates directly to the MCU by using SPI or UART. The MC33665A transfers messages between MCU and battery management system (BMS) devices connected to integrated TPL ports.

In the CAN FD variant, the MC33665A can be communicated with controller area network (CAN) and CAN FD to send and receive messages to BMS devices connected on TPL ports. The device powers an external CAN transceiver to be a part of a CAN bus.

The MC33665A provides four TPL ports to communicate with other isolated BMS devices in the daisy chain. Each daisy chain port supports capacitive and inductive isolated communication, based on device capabilities use NXP battery cell controllers like MC33771C, MC33772C, and MC33775A. The MC33665A was developed following AEC-Q100 grade 1, automotive quality management (QM) device. The MC33665A is suitable to be used in safety critical applications up to ASIL D level.

1.2 Features and benefits

- MCU host interface supporting SPI, CAN (FD) or UART
  - SPI
    - Single or dual SPI mode
    - Up to 10 Mbit/s data rate
  - CAN (FD)
    - CAN up to 1 Mbit/s data rate
    - CAN FD up to 5 Mbit/s data rate
  - UART
    - Full duplex operation
    - Auto baud rate detection
    - Up to 6 MBd data rate
  - Selectable IO voltage of 5 V or 3.3 V
- Message buffering
  - Configurable response and request buffers

  - Status/handshake signals for data flow control
- Communication management unit
  - Error detection and reporting
- Multi-port TPL interface
  - Four independent TPL daisy chain ports
  - Automatic message routing based on address of TPL message
  - Support up to four TPL daisy chains and 62 nodes per chain
  - Each daisy chain features:
    - 2 Mbit/s data rate
    - Two-wire daisy chain supporting capacitive or inductive isolation
    - Loopback support
  - Compatible with TPL2 based products (for example MC33771C or MC33772C)
  - Compatible with TPL3 based products (for example MC33775A)
- Message synchronization
  - Enables synchronization of messages across all TPL daisy chain ports
  - Transmission of messages triggered by external event (SYNC)
  - Programmable time delay between messages
- Power supply options
  - Supply via external 5 V regulator or integrated 5 V regulator
  - Power mode management of the external CAN (FD) transceiver
- Operation modes
  - Active mode
  - Sleep mode (25 µA typ.)
- Wake-up of the device by
  - TPL daisy chain
  - MCU communication
  - Wake-up input
- Supports internal oscillator with or without external crystal
- General-purpose inputs/outputs (GPIOs) with assignable status and events
- I^2C-bus master interface to control external devices, for example, EEPROMs and security ICs
- Unique device ID
- AEC-Q100 grade 1 qualified: −40 °C to +125 °C ambient temperature range
- Suitable to be used in safety critical applications up to ASIL D level

2 Ordering information

Table 1. Ordering information

Type number	Package		
	Name	Description	Version
MC33665ATS4AE	LQFP48	plastic, low profile quad flat leaded package; 48 terminals; 0.50 mm pitch; 7 × 7 × 1.4 mm body	SOT1571-1
MC33665ATU4AE	LQFP48	plastic, low profile quad flat leaded package; 48 terminals; 0.50 mm pitch; 7 × 7 × 1.4 mm body	SOT1571-1
MC33665ATF4AE	LQFP48	plastic, low profile quad flat leaded package; 48 terminals; 0.50 mm pitch; 7 × 7 × 1.4 mm body	SOT1571-1

2.1 Ordering options

Table 2. Type numbers

Type number	Description
MC33665ATS4AE	SPI gateway with four TPL ports
MC33665ATU4AE	UART gateway with four TPL ports
MC33665ATF4AE	CAN FD gateway with four TPL ports

3 Block diagram

Figure 1 shows the general architecture of the MC33665A.

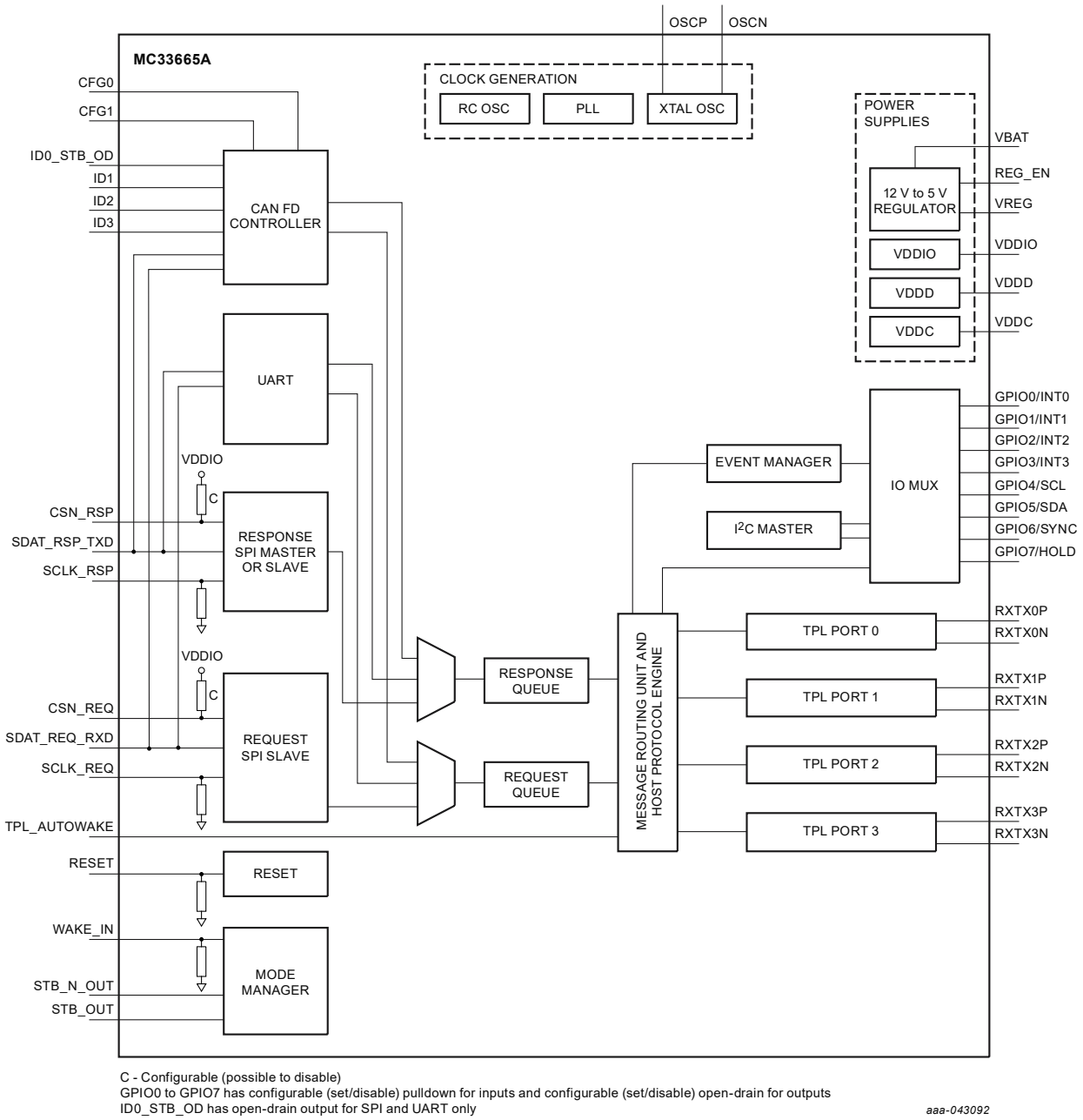

Figure 1. Block diagram

4 Limiting values

Table 3. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

T_{amb} = −40 °C to +125 °C; T_j = −40 °C to +150 °C; all voltages are defined with respect to ground; positive currents flow into the IC.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{i(VBAT)}$	input voltage on pin VBAT		−0.3	-	+40	V
V_{REG_EN}	voltage on pin REG_EN		−0.3	-	min ($V_{i(VBAT)}$ + 0.5, +40)	V
$V_{O(VREG)}$	output voltage on pin VREG		−0.3	-	+5.8	V
$V_{I(VDDD)}$	input voltage on pin VDDD		−0.3	-	+5.8	V
$V_{I(VDDC)}$	input voltage on pin VDDC		−0.3	-	+5.8	V
$V_{I(VDDIO)}$	input voltage on pin VDDIO		−0.3	-	+5.8	V
$V_{I(dig)}$	digital input voltage	GPIO0 to GPIO7, ID1 to ID3, CFG0, CFG1, SDAT_REQ_ RXD, SDAT_RSP_TXD, CSN_ RSP, CSN_ REQ, SCLK_REQ, SCLK_RSP, STB_N_OUT, STB_OUT, TPL_AUTOWAKE	−0.3	-	min (V_{VDDIO} + 0.5, 5.8)	V
		ID0_STB_OD for CAN FD	−0.3	-	min (V_{VDDIO} + 0.5, +5.8)	V
		ID0_STB_OD for SPI or UART	−0.3	-	+5.8	V
$V_{I(WAKE\_IN)}$	input voltage on pin WAKE_IN	maximum limits	−0.3	-	+40	V
$V_{i(OSCP)}$	input voltage on pin OSCP		−0.3	-	+5.8	V
$V_{i(OSCN)}$	input voltage on pin OSCN		−0.3	-	+2.75	V
$V_{bus(TPL)}$	voltage on TPL communication bus pins	RXTX0N, RXTX0P, RXTX1N, RXTX1P, RXTX2N, RXTX2P, RXTX3N, RXTX3P; Relative to VSSC	−10	-	+10	V
$V_{I(RESET)}$	input voltage on pin RESET	maximum limits	−0.3	-	+5.8	V
T_j	junction temperature		−40	-	+165	°C
T_{stg}	storage temperature		−55	-	+150	°C
$T_{reflow(peak)}$	peak reflow temperature	pin soldering temperature limit is maximum 10 s duration; not designed for immersion soldering; exceeding these limits may cause a malfunction or permanent damage to the device [1]	-	-	260	°C

[1] Package reflow capability of NXP meets Pb-free requirements for JEDEC standard J-STD-020C. For peak package reflow temperature and moisture sensitivity level (MSL), go to www.nxp.com, search by part number (remove prefixes/suffixes) and enter the core ID to view all orderable parts, and review parametrics.

5 Revision history

Table 4. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
MC33665A_SDS v.3	20220729	Product short data sheet	-	MC33665A_SDS v.2
MC33665A_SDS v.2	20220414	Product short data sheet	-	MC33665A_SDS v.1
MC33665A_SDS v.1	20211216	Preliminary short data sheet	-	-

6 Legal information

6.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
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