MC33665A

电池管理通信网关

第 1 版 — 2021 年 12 月 16 日 初始缩略版数据手册

1 产品简介

1.1 简介

MC33665A 是一款通用电池管理通信网关和变压器物理层(TPL)收发器。该设备通过标准通信协议转发来自不同 TPL（NXP 的隔离菊花链协议）端口的消息。标准通信协议可确保与市场上可用的微控制器兼容。MC33665A 旨在实现以下两种不同功能之一：增强型 TPL 收发器或 TPL 至 CAN (FD)的网关。

在增强型 TPL 收发器变种型号中，设备通过使用串行外围接口(SPI)或通用异步收发器(UART)直接与 MCU 通信。设备传输来自集成 TPL 端口的消息。

在 CAN (FD)变种型号中，MC33665A 通过 TPL 连接到电池管理系统(BMS)设备。该设备为外部控制器局域网(CAN)收发器供电，使其成为 CAN 总线的一部分，无需微控制器。

MC33665A 提供四个隔离的 TPL 菊花链端口，用于与菊花链中的其他隔离 BMS 设备进行通信。每个菊花链端口支持电容和电感隔离通信，确保与恩智浦电池管理设备（如 MC33771C、MC33772C 和 MC33775A）的互操作性。MC33665A 支持符合 ASIL D 标准的通信协议，并且符合 AEC-Q100 1 级标准。

1.2 特性和优势

- 支持 SPI、CAN (FD)或 UART 的 MCU 主机接口
  - SPI
    - 单或双 SPI 模式
    - 高达 10 Mbit/s 的数据速率
  - CAN/CAN FD
    - CAN 高达 1 Mbit/s 的数据速率
    - CAN FD 高达 5 Mbit/s 的数据速率
  - UART
    - 全双工和半双工操作
    - 自动波特率(ABR)检测
    - 高达 6 Mbit/s 的数据速率
  - 可选 5 V 或 3.3 V 的 IO 电压
- 消息缓冲
  - 可配置的响应和请求缓冲区
  - 用于数据流控制的状态/握手信号

- 通信管理单元
  - 错误检测和报告
- 多端口 TPL 接口
  - 四个独立的 TPL 菊花链端口
  - 基于 TPL 消息地址的自动消息路由
  - 支持多达 6 个 TPL 菊花链和每条链 62 个节点的协议
  - 每个菊花链具有：
    - 2 Mbit/s 的数据速率
    - 支持电容或电感隔离的双线菊花链
    - 环回支持
  - 与基于 TPL2 的产品兼容（例如 MC33771C 或 MC33772C）
  - 与基于 TPL3 的产品兼容（例如 MC33775A）
- 消息同步
  - 启用所有 TPL 菊花链端口之间的消息同步
  - 由外部事件触发的消息传输(SYNC)
  - 消息之间的时间延迟可编程
- 电源选项
  - 通过外部 5 V 稳压器或集成 5 V 稳压器供电
  - 外部 CAN (FD)收发器的电源模式管理
- 工作模式
  - 活动模式
  - 休眠模式（25 μA 典型值）
- 设备唤醒方式
  - TPL 菊花链
  - MCU 通信
  - 唤醒输入
- 支持内部振荡器和外部晶振
- 具有可分配状态和事件的通用输入/输出(GPIO)
- I^2C 总线主接口，用于控制外部设备，例如 EEPROM 和安全 IC
- 唯一设备 ID
- 符合 AEC-Q100 1 级标准：−40 °C 至+125 °C 环境温度范围
- 支持恩智浦的 ASIL D 兼容协议

2 订购信息

表 1. 订购信息

器件编号[1]	封装		
	名称	说明	版本
MC33665ATS4AE	LQFP48	塑料、薄型四侧扁平引脚封装；48 个端子；0.50 mm 间距； 7 × 7 × 1.4 mm 本体	SOT1571-1
MC33665ATU4AE	LQFP48	塑料、薄型四侧扁平引脚封装；48 个端子；0.50 mm 间距； 7 × 7 × 1.4 mm 本体	SOT1571-1
MC33665ATF4AE	LQFP48	塑料、薄型四侧扁平引脚封装；48 个端子；0.50 mm 间距； 7 × 7 × 1.4 mm 本体	SOT1571-1

[1] 如需更多订购信息和样品供应情况，请联系您当地的销售办事处。

2.1 订购选项

表 2. 器件编号

型号[1]	说明
MC33665ATS4AE	具有 SPI 和四个 TPL 端口的增强型 TPL 收发器
MC33665ATU4AE	具有 UART 接口和四个 TPL 端口的增强型 TPL 收发器
MC33665ATF4AE	具有四个 TPL 端口的 CAN (FD)网关

[1] 如需更多订购信息和样品供应情况，请联系您当地的销售办事处。

3 功能框图

图 1 显示了 MC33665A 的一般架构。

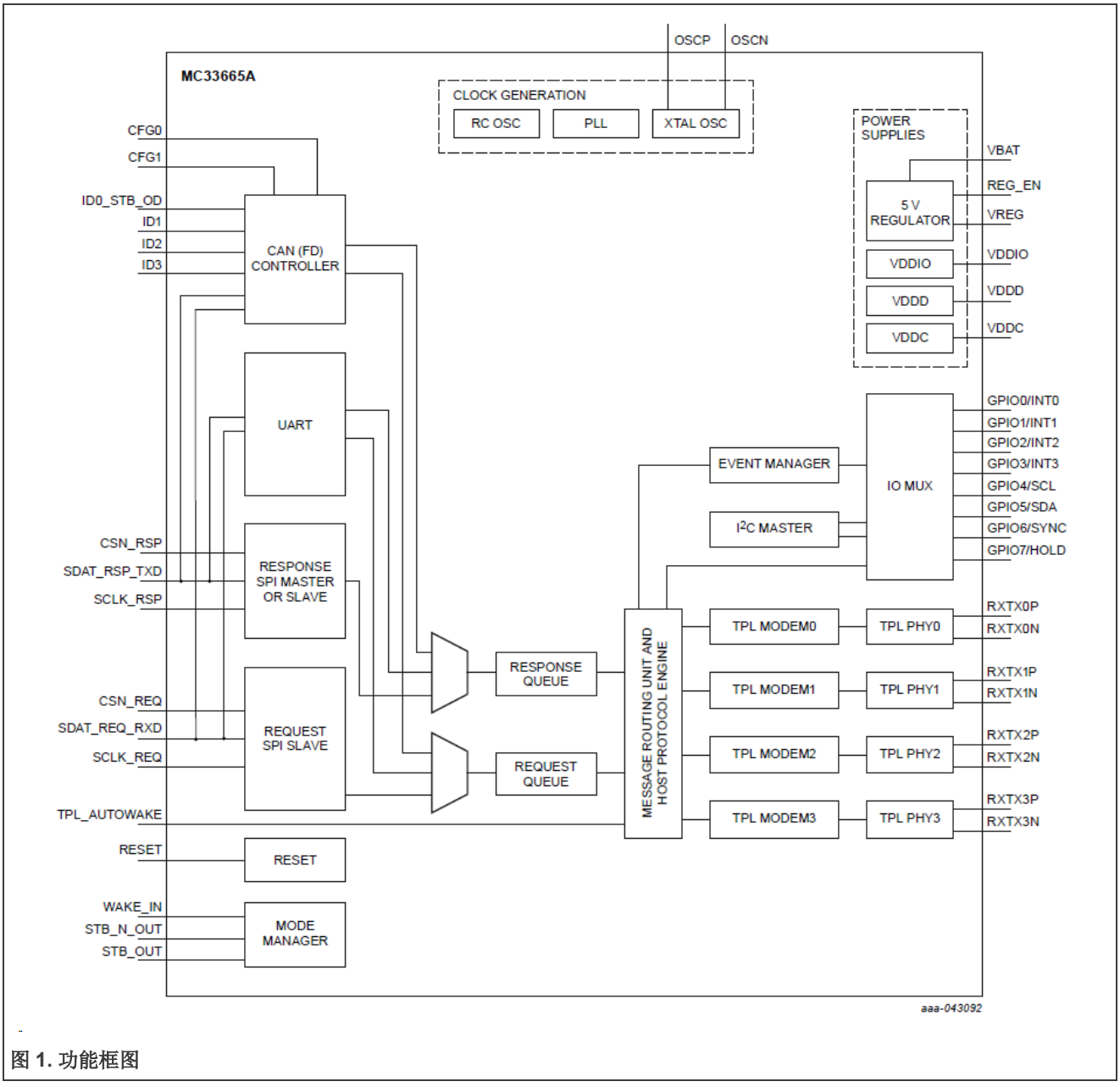

图 1. 功能框图

4 限值

表 3. 限值

依据绝对最大额定值系统(IEC 60134)。

T_a = -40 °C 至 +125 °C；T_j = -40 °C 至 +150 °C；所有电压均基于 GND 定义；正电流流入 IC。

符号	参数	条件	最小值	典型值	最大值	单位
V_{VBAT}	VBAT 电压		-0.3	-	40	V
V_{REG_EN}	REG_EN 电压		-0.3	-	最小值（VBAT + 0.5，40）	V
V_{VREG}	VREG 电压		-0.3	-	5.8	V
V_{VDDD}	VDDD 电压		-0.3	-	5.8	V
V_{VDDC}	VDDC 电压		-0.3	-	5.8	V
V_{DDIO}	VDDIO 电压		-0.3	-	5.8	V
V_{DIGIO}		数字 IO 电压：GPIOx、ID1 - ID3、CFGx、SDAT_xxx、CSN_xxx、SCLK_xxx、STB_N_OUT、STB_OUT、TPL_AUTOWAKE	-0.3	-	最小值（VDDIO + 0.5，5.8）	V
V_{DIGIO}	ID0_STB_OD	CAN (FD)产品变体	-0.3	-	最小值（VDDIO + 0.5，5.8）	V
V_{DIGIO}	ID0_STB_OD	SPI 或 UART 产品变体	-0.3	-	5.8	V
V_{WAKE_IN}	WAKE_IN 电压		-0.3	-	40	V
V_{OSCP}	OSCP 电压		-0.3	-	5.8	V
V_{OSCN}	OSCN 电压		-0.3	-	2.75	V
V_{TPL}	TPL 通信总线引脚	相对于 VSSC	-10	-	10	V
V_{RESET}	RESET 引脚输入电压		-0.3	-	5.8	V
T_j	结温最大额定值		-40	-	165	°C
T_{stg}	存储温度		-55	-	150	°C
T_{solder}	最高封装回流焊温度	引脚焊接温度限制为最长 10 秒。不适用于浸焊。超出这些限值可能会导致器件故障或永久性损坏。	-	-	260	°C

5 修订记录

表 4. 修订记录

文档 ID	发布日期	数据手册状态	更改说明	取代版本
MC33665A_SDS v.1	20211216	初始缩略版数据手册	-	-

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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发布日期：2021 年 12 月 16 日
文档编号：MC33665A_SDS