Circuit Description

1   Input Power and Charger

The battery charger of XMSH01HM is bq24045. The bq24045 is highly integrated Li-Ion and Li-Pol linear chargers devices targeted at space-limited portable applications. The device operate from USB port in XMSH01HM. The bq2404x has a single power output that charges the battery. A system load is placed in parallel with the battery.

The battery which used bq24045 is charged in three phases: conditioning, constant current and constant voltage. In all charge phases, an internal control loop monitors the junction temperature and reduces the charge current if an internal temperature threshold is exceeded.

The pre-charge current and charge termination threshold are programmed via an external resistor which is 5mA and 2mA. The fast charge current is 20mA, it is programmed via an external resistor too.

2   MCU

The DA14580 integrated circuit has a fully integrated radio transceiver and baseband processor for Bluetooth$^\circledR$ Smart. It can be used as an application processor as well as a data pump in fully hosted systems. The DA14580 contains an embedded One-Time-Programmable (OTP) memory for storing Bluetooth$^\circledR$ profiles as well as custom application code. The qualified Bluetooth$^\circledR$ Smart protocol stack, stored in a dedicated ROM, as well as the customer application software run on the embedded ARM Cortex M0 processor. Low leakage Retention RAM is used to store sensitive data and connection information while in Deep Sleep mode. The Bluetooth Smart firmware includes the L2CAP service layer protocols, Security Manager (SM), Attribute Protocol (ATT), the Generic Attribute Profile (GATT) and the Generic Access Profile (GAP). Furthermore, application profiles such as Proximity, Health Thermometer, Heart Rate, Blood Pressure, Glucose and Human Interface Device

(HID) are supported. The transceiver interfaces directly to the antenna and is fully compliant with the Bluetooth® V4.0 standard. The DA14580 has dedicated hardware for the Link Layer implementation of Bluetooth® Smart and interface controllers for enhanced connectivity capabilities.

It has a 2M-bit Serial flash memories to storage user information and code file.

3 Sensor

The ADXL362 is an ultralow power, 3-axis MEMS accelerometer that consumes less than 2 μA at a 100 Hz output data rate and 270 nA when in motion triggered wake-up mode. Unlike accelerometers that use power duty cycling to achieve low power consumption, the ADXL362 does not alias input signals by undersampling; it samples the full bandwidth of the sensor at all data rates.

The ADXL362 always provides 12-bit output resolution; 8-bit formatted data is also provided for more efficient single-byte transfers when a lower resolution is sufficient. Measurement ranges of ±2 g, ±4 g, and ±8 g are available, with a resolution of 1 mg/LSB on the ±2 g range.

In addition to its ultralow power consumption, the ADXL362 has many features to enable true system level power reduction. It includes a deep multimode output FIFO, a built-in micro-power temperature sensor, and several activity detection modes including adjustable threshold sleep and wake-up operation that can run as low as 270 nA at a 6 Hz (approximate) measurement rate. A pin output is provided to directly control an external switch when activity is detected, if desired. In addition, the ADXL362 has provisions for external control of sampling time and/or an external clock.

4 LED and LED Driver

The LP5562 is a four-channel LED driver designed to produce variety of lighting effects. The device has a program memory for creating variety of lighting sequences. When the program memory has been loaded, the LP5562 can operate independently

without processor control. The LP5562 is able to automatically enter power save mode, when LED outputs are not active and thus lowering current consumption. Four independent LED channels have accurate programmable current sinks, from 0 mA to 25.5 mA with 100 μA steps and flexible PWM control. Each channel can be configured into each of the three program execution engines. Program execution engines have program memory for creating desired lighting sequences with PWM control. The LP5562 has four pin-selectable I2C™ addresses.

There are three full color LED in XMSH01HM. They are used to display the information such as fuel gauge and clock alarm.