Dust Networks

SmartMesh® LTP5900 Integration Guide

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About This Guide

This document provides the design guidelines essential for incorporating a LTP5900. The document covers design, layout, EMI, some device configuration and manufacturing considerations.

Audience

This document is intended for system developers, hardware designers, and layout engineers.

Related Documents

The following related documents are available:

LTP5900-WHM SmartMesh WirelessHART Mote PCB Module

LTP5900 Module RF Shield

Eterna Serial Programmer Guide

ETERNA1 User Guide

Conventions and Terminology

This guide uses the following text conventions:

- `Computer type` indicates information that you enter, such as a URL.
- **Bold type** indicates buttons, fields, and menu commands.
- *Italic type* is used to introduce a new term.
- **Note:** Notes provide more detailed information about concepts.
- **Caution:** Cautions advise about actions that might result in loss of data.
- **Warning:** Warnings advise about actions that might cause physical harm to the hardware or your person.

Revision History

Revision	Date	Description
040-0111 rev 1	2/14/2012	Initial Release
040-0111 rev 2	7/19/2012	Corrected part number references
040-0111 rev 3	10/24/2013	Update doc number and references

Design Guidelines

Schematic Design

The LTP5900 includes sufficient power supply filtering and decoupling capacitance such that additional filtering should not be necessary for most battery-powered designs. Care must be taken to avoid large transient voltages on the supply as the LTP5900 steps up its current consumption (see the section on Supply Design below).

Supply Design

Due to the heavy duty cycling, the LTP5900's current consumption can change substantially over a short period. This does not represent an issue for systems with supplies having low source impedance (less than 5 Ohms). Regulated supplies, however, may have difficulty in the sudden changes in current consumption (more than an order of magnitude in less than 1 µs), resulting in transient voltages on the supply co-incident with the higher current consumption of the radio operation. To ensure proper operation of the radio, a supply should be able to ramp from 250 µA to 10 mA in less than 1 µs without generating a transient greater than 200 mV. For systems with regulated supplies, consultation with Linear Technology Applications Engineering is strongly recommended.

EMI Considerations

Like all radio devices, the radio incorporated in the LTP5900 can be sensitive to EMI. The LTP5900 is designed with an RF Shield sufficient to allow the radio to operate in most environments. In environments with high AC and DC magnetic fields, the use of a mu-metal shield is recommended instead. Therefore, a custom design based upon the LTP5900 would be needed. Further, RF shield thickness is application-dependent. Consult Linear Technology Application Engineering for support.

In designs that include switching power supply(ies) resulting in switching currents through an inductor, it is essential to keep the inductor(s) a minimum of 1.25" from the LTP5900 radio, preferably on the opposite side of a PCB, separated by a ground plane. Noise generated through the inductor can interfere with radio operation.

Antenna ESD Considerations

The antenna pin is a particularly sensitive node for electro-static discharge (ESD) since it must detect small, high-frequency signals. ESD damage to the LTP5900 may result in decreased receive or transmit performance, or other system failure. Many applications for the LTP5900 have an exposed antenna that provides an entry point for ESD events. Proper consideration of antenna design as well as antenna protection can substantially improve ESD robustness in harsh environments.

A radome (protective covering) made of highly resistive material may be used to prevent direct contact with the antenna and/or dissipate charge. To avoid ESD events caused by triboelectric charging generated by wind passing over the antenna in dry climates, the radome design should consider bulk and surface resistivity as well as the size of the gap between the antenna metal and the interior of the radome.

In general, DC-grounded antennas (in which the antenna and ground have a DC short) provide superior protection to ESD events. DC-grounded antennas are highly recommended in harsh environments. Additionally, a DC path-to-earth ground should be provided whenever possible to help bleed off accumulated charge from the antenna as well as leak charge from the radome.

While these general guidelines should improve robustness to ESD events, individual implementations may have unique factors that complicate ESD protection. Upon request, Linear Technology can provide contact information for an external consultant able to perform a review for ESD and other system considerations.

Voltage Supervision and Reset

The LTP5900 includes a power-on reset to safely set its own state during power up, and includes a brown-out circuit that immediately halts flash erase cycles and interrupts flash write cycles at the next 32-bit boundary, generating an interrupt to the CPU and maintaining state for the CPU to correct should the power supply return to normal operating levels. In the interest of avoiding flash corruption, it is not considered best practice to connect the LTP5900 $\overline{\text{RST}}$ lead to a voltage supervisor or to asynchronously assert $\overline{\text{RST}}$ without previously suspending network and flash activity.

Design for Manufacture

The schematic shown in Figure 1 shows a header, J3, intended to provide an interface to allow programming the LTP5900. A mechanism to program the LTP5900 is prudent for development. The header, Molex 87831-1020, provides connectivity through a cable to the DC9010 USB serial programmer described in the Eterna Serial Programmer Guide. The programmer software provided for controlling the programmer allows users to program and verify pages in flash, and optionally the entire flash contents. Note that the programmer provided by Dust Networks has a limited capability for supplying current to the DUT.

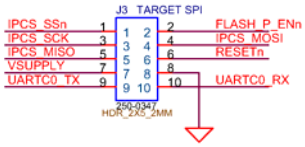

Figure 1 Programming Header Example Schematic

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Document Status	Product Status	Definition
Advanced Information	Planned or under development	This document contains the design specifications for product development. Dust Networks reserves the right to change specifications in any manner without notice.
Preliminary	Engineering samples and pre-production prototypes	This document contains preliminary data; supplementary data will be published at a later date. Dust Networks reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. The product is not fully qualified at this point.
No identification noted	Full Production	This document contains the final specifications. Dust Networks reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Obsolete	Not in production	This document contains specifications for a product that has been discontinued by Dust Networks. The document is printed for reference information only.