ISL12022MA Enhanced RTC Module

TB484
Rev 0.00
June 1, 2010

Introduction

Intersil recently introduced the ISL12022MA Real Time Clock (RTC) device. The device is software compatible to the ISL12022M. The ISL12022MA features enhanced immunity to ESD per the IEC61000-4-2 standard, and also provides improved resistance to system leakage related to environmental moisture.

This Technical Brief provides information on the enhancements made on the ISL12022MA versus the ISL12022M.

Product Enhancements to Support Applications Requiring Performance to IEC61000-4-2 ESD Specifications

The IEC61000-4-2 is purely a systems-level test specification, and is not intended to document the performance of individual components. However, those designs which are unable to provide ESD shielding for sensitive ICs in their systems are preforming testing in the same manner as IEC61000-4-2 testing at the board/component level, to ensure that their systems will pass the product qualification testing required in their market.

Since the ISL12022M does not have physical contact outside the system, ESD discharges will not damage the device directly. But the ESD event will emit an electromagnetic interference (EMI) that can interrupt the sensitive ISL12022M crystal resonator circuit.

Testing to IEC61000-4-2 is done using the Contact Discharge method. During the ESD testing, the ESD gun's discharge tip has physical contact with the coupling plane and is placed within 3cm of the ISL12022M. Up to 10,000 ESD discharges are performed to check for any possible impact to the operation of the device. The original ISL12022M meets the 3kV Human Body Model (HBM) and 300V Machine Model (MM) ESD requirements of the test, but does not meet the 8kV minimum requirement of the Level 4 Contact Discharge (CD) test.

After technical analysis, a minor redesign of the lead frame to address antenna effects was implemented. Testing has demonstrated successful operation under the Contact Discharge test with ESD levels in excess of 12kV. Operating in the recommended layout, a circuit using the ISL12022MA has demonstrated that the device meets the requirements of the IEC standard.

Product Enhancements Providing Reduced Sensitivity to High Environmental Moisture

Due to very low operating current levels, oscillators utilizing common 32kHz crystals are known to be very sensitive to leakage currents, which can cause the oscillator frequency to suffer high drift, or cease operation. Flux is an important component of the soldering process which acts as a wetting agent, and also prevents oxidation. The application of excessive flux or incomplete activation will result in a residue which is known to be hydrophobic (moisture-absorbing), and conductive. It can cause intermittent conduction or complete failure in a circuit.

The residue, although clear and seemingly harmless after assembly, can after a few days to a few months (depending on the surrounding environment) absorb enough moisture to form a white layer of conductive dendrites on components, and the circuit board itself. Recommended practice from all flux manufactures is to properly clean the flux residue from the board after assembly using established equipment and methods. Also, in applications requiring environmental qualifications in the presence of high humidity a conformal coating is usually applied to the board to achieve optimal reliability. However, proper cleaning procedures are not always observed, and the additional cost and handling process of a conformal coating is not always considered worthwhile.

After receiving feedback from customers regarding functional issues related to flux residue, the design of the ISL12022M module package was evaluated with consideration given to leakage currents. Additional improvements were implemented to minimize the impact of this issue on the operation of the device. Bench evaluation and testing demonstrates that the upgraded ISL12022MA operates dependably in the presence of highly elevated moisture levels. Very large amounts of accumulated flux residue can still cause functional issues, however, users will find that manufacturing flows following the most basic cleaning procedures, followed by the application of a conformal coat for extra protection, will result in dependable operation.

In order to take maximum advantage of the enhancements discussed above, users can follow the grounding layout shown in Figure 2. Note that this enhancement incurs no functional change to the operation of the device but only provides improved ESD performance under requirements of IEC61000-4-2, and greater reliability and reduced sensitivity to board leakage in applications requiring operation in environments involving condensing moisture. There is no need for users satisfied with the operation of the ISL12022M to switch to the ISL12022MA, unless they wish to take advantage of these enhancements.

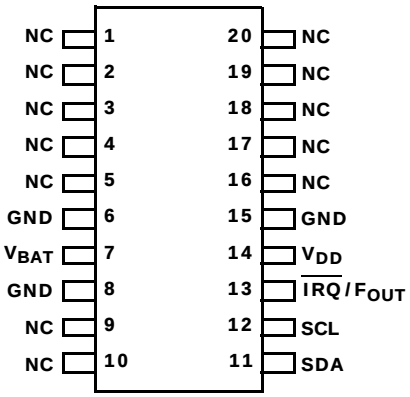

FIGURE 1. ISL12022M PINOUT

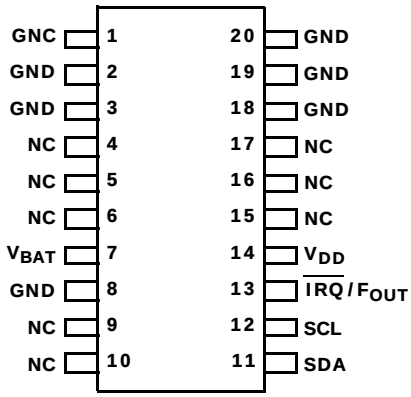

FIGURE 2. ISL12022MA PINOUT

Conclusion

Proper grounding and shielding techniques are always recommended to protect sensitive Integrated Circuits from ESD discharge. Also, users can avoid functional issues in sensitive low-power oscillator circuitry due to high environmental humidity levels by observing proper flux cleaning/removal procedures, to avoid conductive dendrites build-up, and, if possible, the application of conformal coating to achieve optimal dependability in high-humidity applications. In many cases, this ideal situation is not easily achieved. Intersil has enhanced the popular ISL12022M 3-in-1 RTC Module to create the ISL12022MA, which provides extra performance for users needing to meet the requirements of the IEC61000-4-2 ESD Standard, and also to minimize flux residue/moisture-related operational issues.

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(Rev.4.0-1 November 2017)

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