ISL21009-25 and ISL60002-30 Capacitive Load Drive Capability

TB475
Rev 0.00
June 10, 2008

Introduction

This report describes the capacitive load drive capability of the ISL21009-25 and ISL60002-30 voltage references. ISL21009-25 is a 2.500V reference and is specified to operate in a supply range of 3.5V to 16.5V, and comes in an 8 Ld SOIC package. ISL60002-30 is a 3.000V reference specified to operate in the range of 3.2V to 5.5V. It is available in a 3 Ld SOT package.

Test Conditions

- Both the references were tested for capacitive load drive capability at room temperature and 5.0V_{IN}.
- ISL21009-25 was tested under the following C_{OUT} conditions and a ±7mA load:

  a) No Load

  b) nF

  c) 10nF||1µF

  d) 100nF||10µF

- ISL60002-30 was tested under the following C_{OUT} conditions and a ±500µA load:

  a) No Load

  b) nF

  c) 10nF||1µF

  d) 100nF||10µF

All the capacitors used were of surface mount X7R/X5R ceramic chip type. The DUT was placed in an appropriate socket mounted on a milled copper board. The ±7mA and ±500µA loads were generated by means of a voltage pulse through a suitable through-hole resistor.

The supply voltage was provided by an Agilent 3631A. The aforementioned pulse was generated using HP3245A, and the DUT output was probed using a TDS744A oscilloscope.

Figures 1 thru 12 shows the bench test results for ISL21009-25 as a function of varying load capacitors, and Figures 13 thru 16 for ISL60002-30. The board schematic for this test setup is outlined in Figures 21 and 22.

Bench Test Results for ISL21009-25

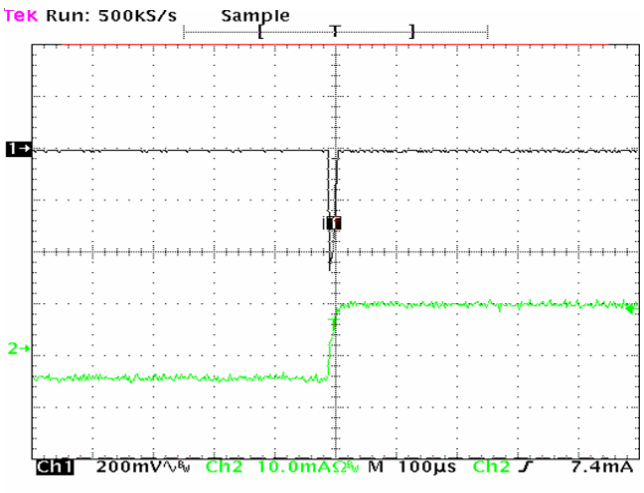

FIGURE 1. NO CAPACITIVE LOAD, V_{IN} = 5.0V, I_LOAD = ±7mA

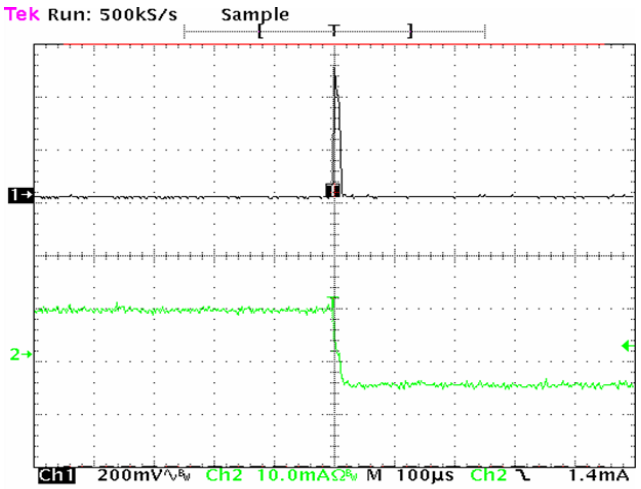

FIGURE 2. NO CAPACITIVE LOAD, V_{IN} = 5.0V, I_LOAD = ±7mA

Bench Test Results for ISL21009-25 (Continued)

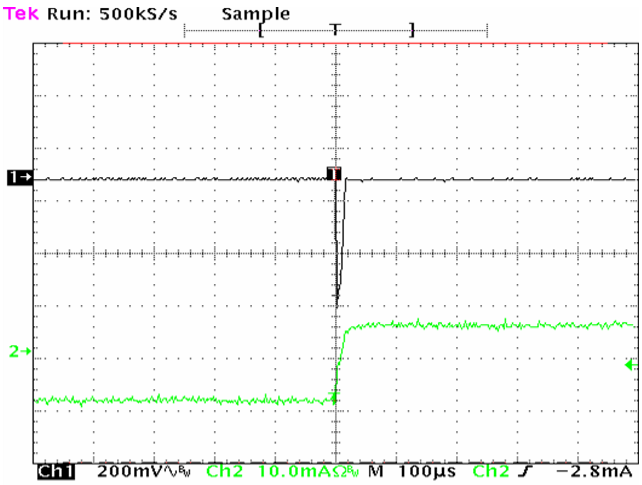

FIGURE 3. C_{OUT} = 1nF, V_{IN} = 5.0V, I_LOAD = ±7mA

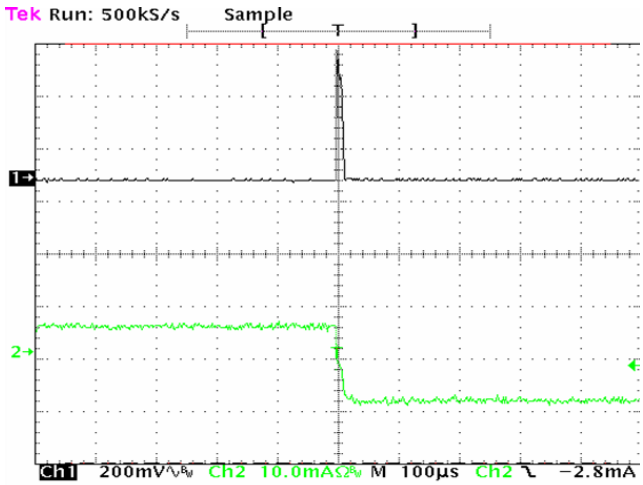

FIGURE 4. C_{OUT} = 1nF, V_{IN} = 5.0V, I_LOAD = ±7mA

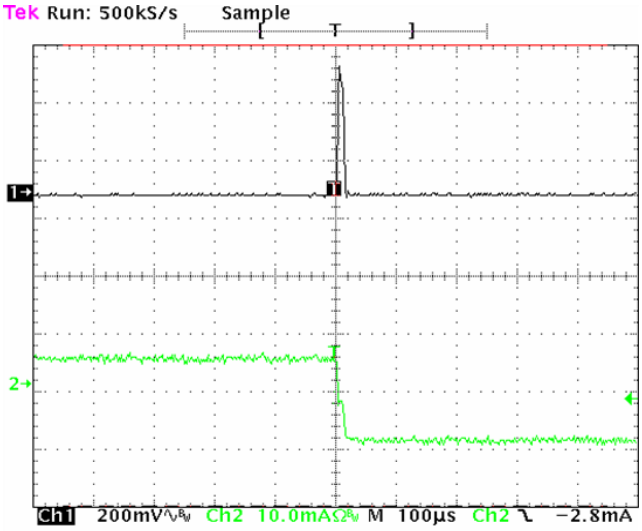

FIGURE 5. C_{OUT} = 10nF, V_{IN} = 5.0V, I_LOAD = ±7mA

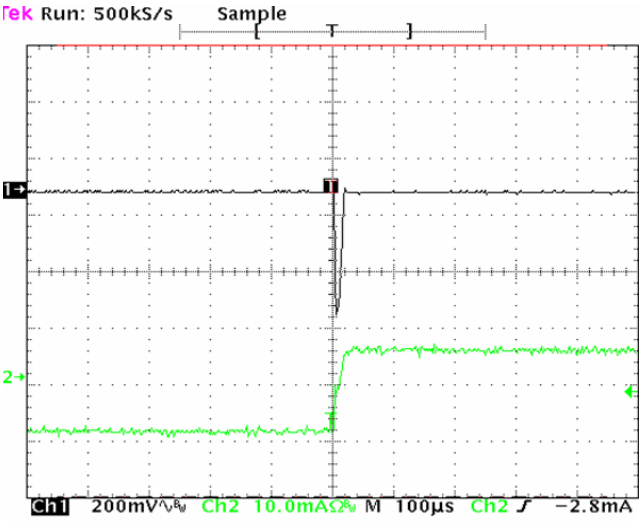

FIGURE 6. C_{OUT} = 10nF, V_{IN} = 5.0V, I_LOAD = ±7mA

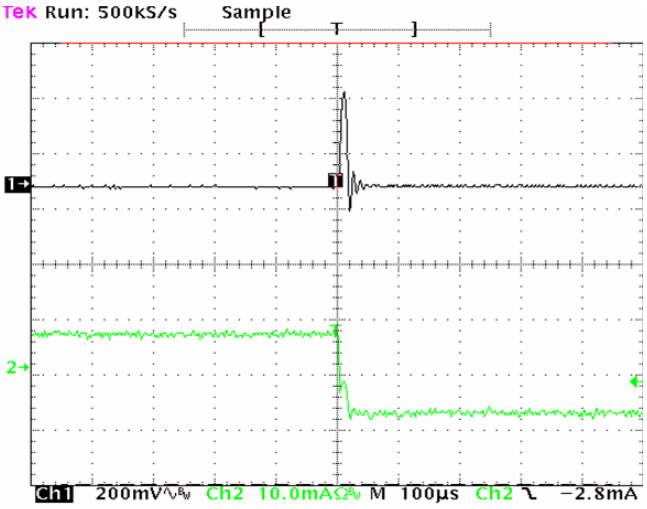

FIGURE 7. C_{OUT} = 100nF, V_{IN} = 5.0V, I_LOAD = ±7mA

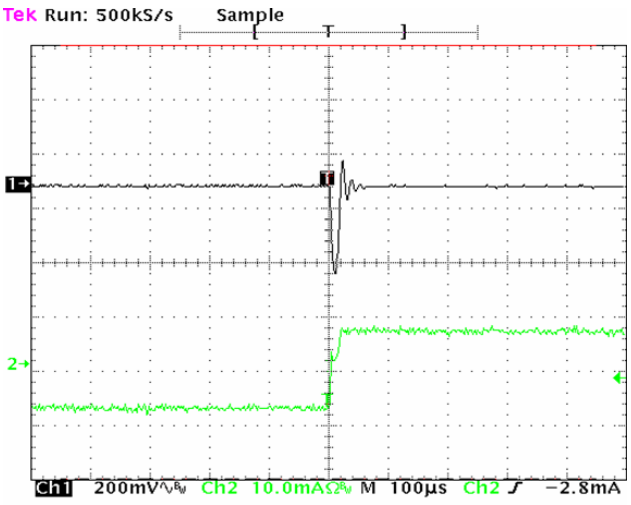

FIGURE 8. C_{OUT} = 100nF, V_{IN} = 5.0V, I_LOAD = ±7mA

Bench Test Results for ISL21009-25 (Continued)

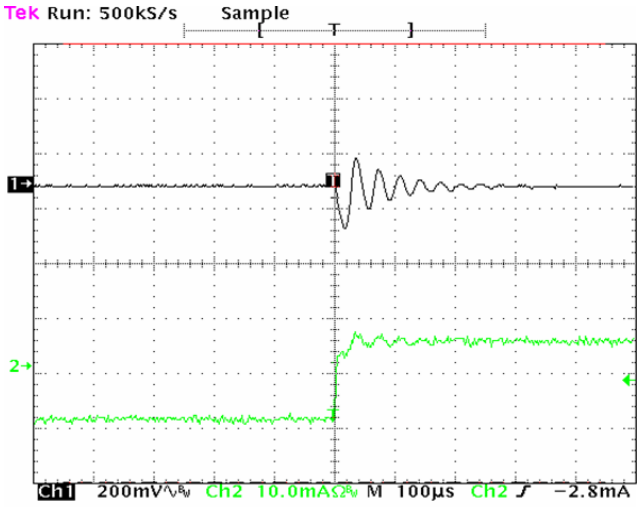

FIGURE 9. C_{OUT} = 1µF, V_{IN} = 5.0V, I_LOAD = ±7mA

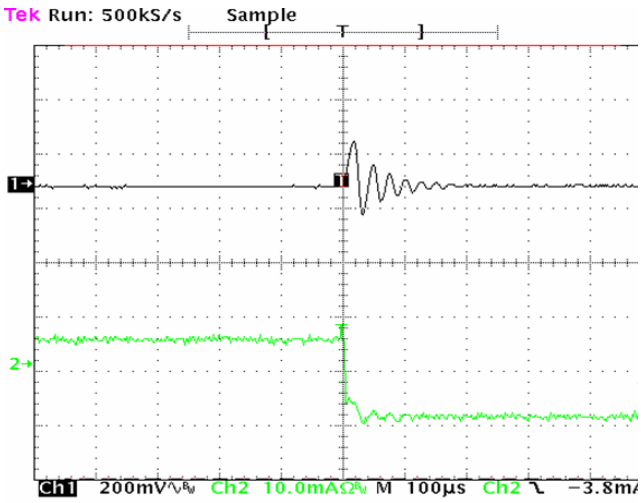

FIGURE 10. C_{OUT} = 1µF, V_{IN} = 5.0V, I_LOAD = ±7mA

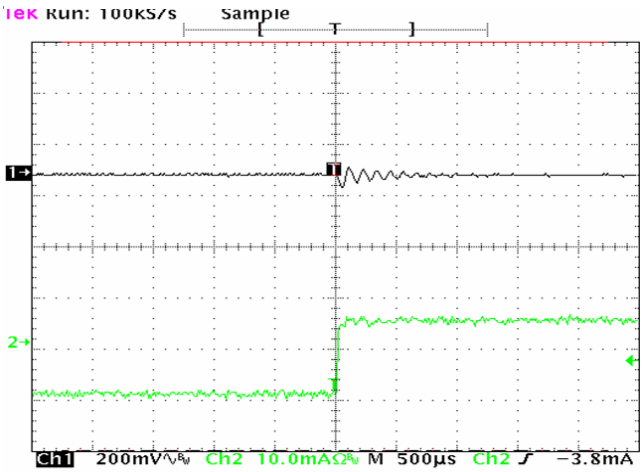

FIGURE 11. C_{OUT} = 10µF, V_{IN} = 5.0V, I_LOAD = ±7mA

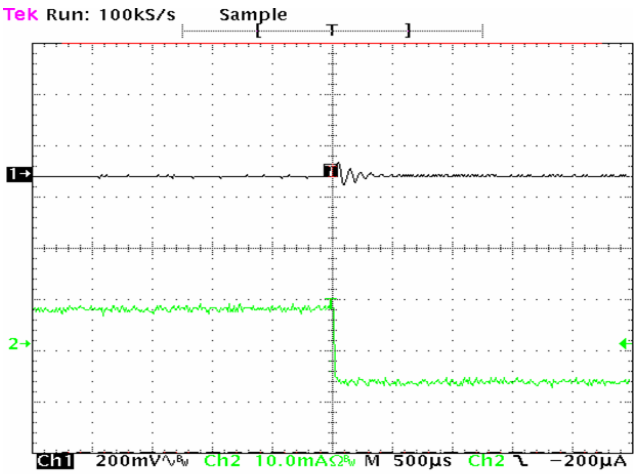

FIGURE 12. C_{OUT} = 10µF, V_{IN} = 5.0V, I_LOAD = ±7mA

Bench Test Results for ISL60002-30

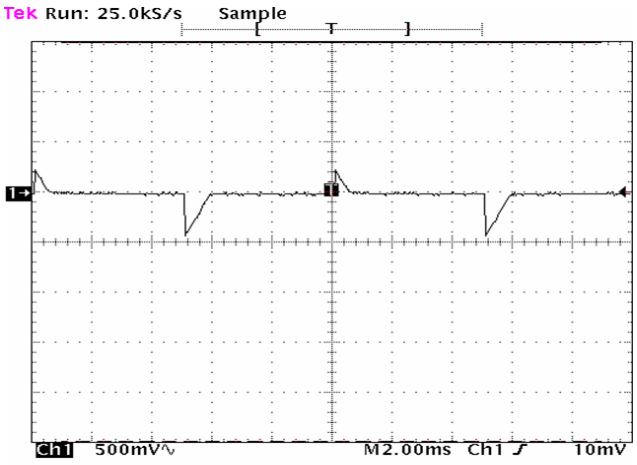

FIGURE 13. C_{OUT} = 0, V_{IN} = 5.0V, FREQ = 100Hz, I_LOAD = ±500µA

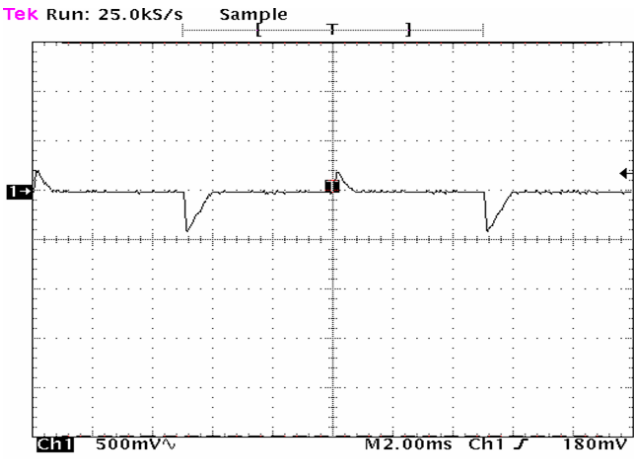

FIGURE 14. C_{OUT} = 100nF, V_{IN} = 5.0V, FREQ = 100Hz, I_LOAD = ±500µA

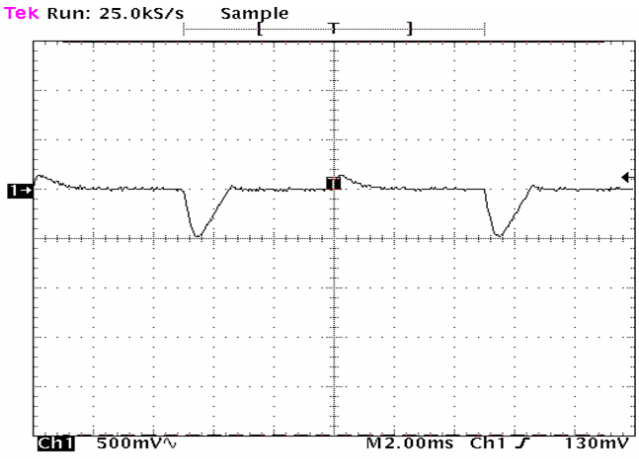

FIGURE 15. C_{OUT} = 100nF||1µF, V_{IN} = 5.0V, FREQ = 100Hz, I_LOAD = ±500µA

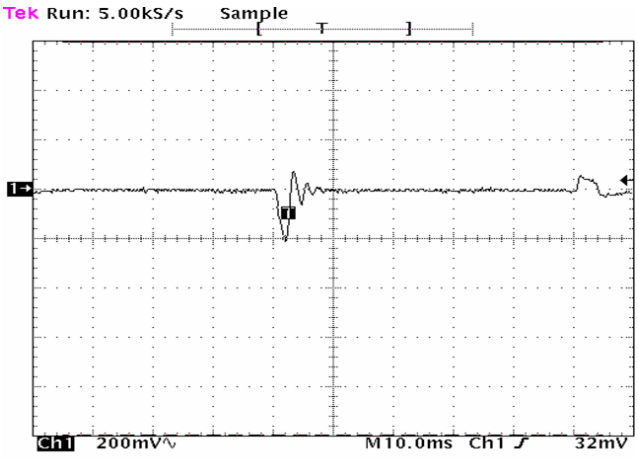

FIGURE 16. C_{OUT} = 100nF||10µF, V_{IN} = 5.0V, FREQ = 100Hz, I_LOAD = ±500µA

Bench Test at -40°C and +125°C

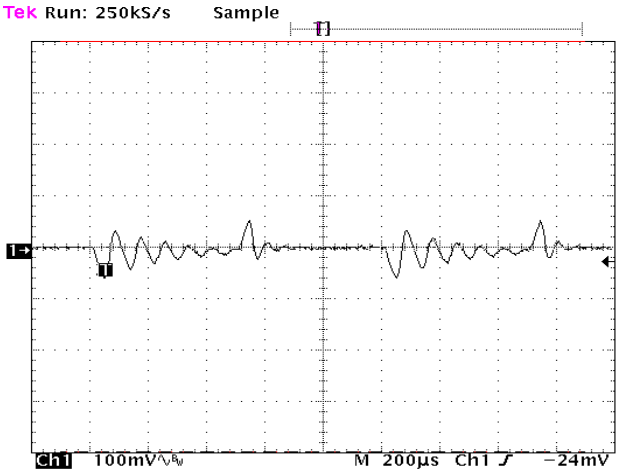

FIGURE 17. ISL21009-25
C_{OUT} = 10µF, V_{IN} = 5.0V, I_LOAD = ±500µA, -40°C

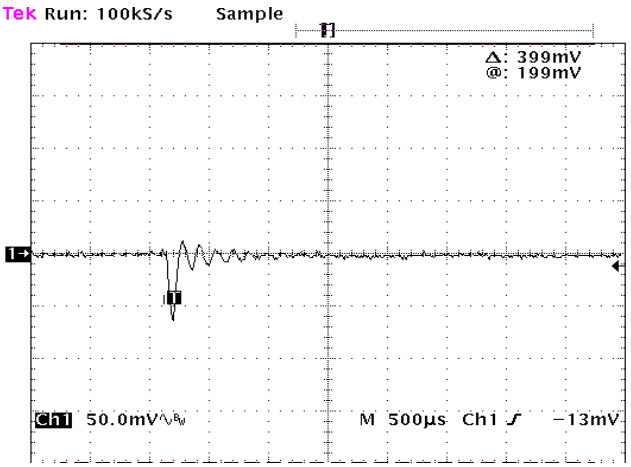

FIGURE 18. ISL21009-25
C_{OUT} = 10µF, V_{IN} = 5.0V, I_LOAD = ±500µA, +125°C

Bench Test at -40°C and +125°C (Continued)

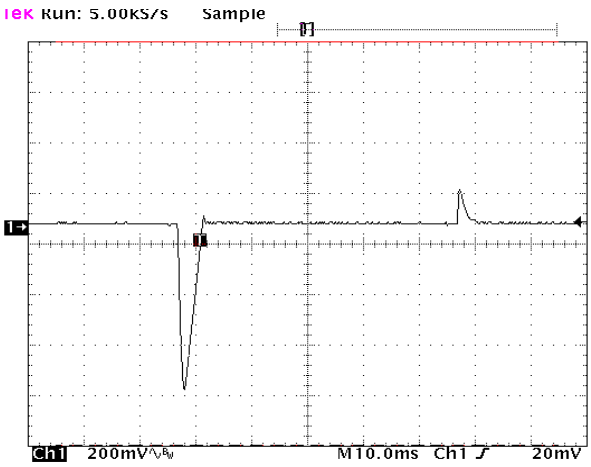

FIGURE 19. ISL60002-30
C_{OUT} = 100nF||1µF, V_{IN} = 5.0V, I_LOAD = ±500µA, -40°C

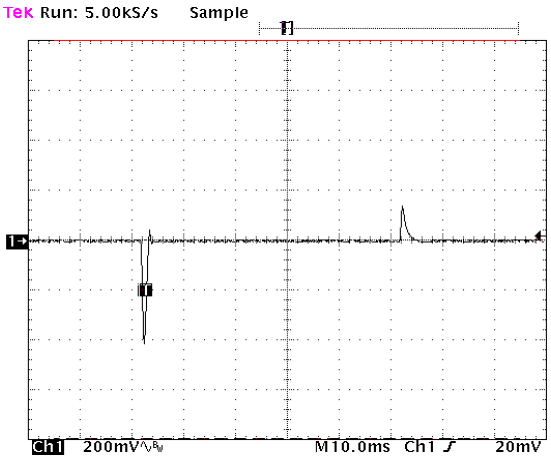

FIGURE 20. ISL60002-30
C_{OUT} = 100nF||1µF, V_{IN} = 5.0V, I_LOAD = ±500µA, +125°C

Board Schematics

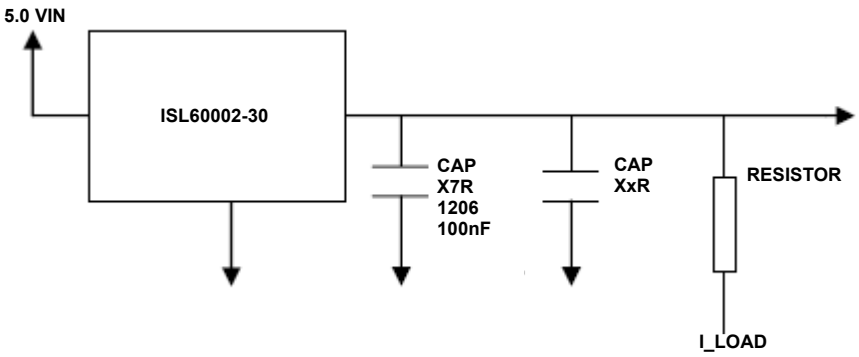

FIGURE 21. ISL60002-30 DUT TEST SETUP

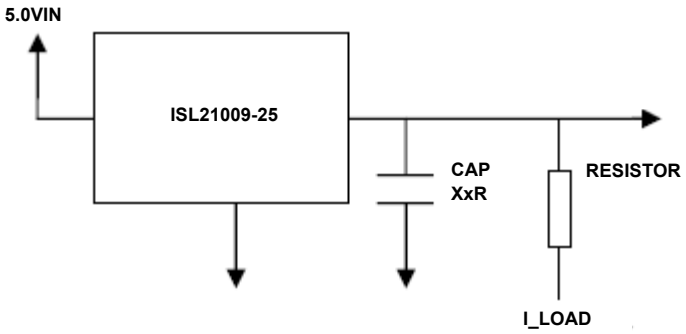

FIGURE 22. ISL21009-25 DUT TEST SETUP

Test Observation and Conclusion

Based on the bench testing of randomly picked units from available production material, the outputs of the ISL21009-25 and ISL60002-30 did not display a tendency to oscillate under varying C_{OUT} conditions. The ISL21009-25 C_{OUT} varied from no load to 10µF, and C_{OUT} conditions of ISL60002-30 were no load, 100nF, 100nF||1µF, and 100nF||10µF. As seen in the plots above, by varying output capacitors of surface mount XxR ceramic chip type, the ISL21009-25 and ISL60002-30 are not expected to oscillate.

Contact Information

Intersil Corporation
1001 Murphy Ranch Rd.
Milpitas, CA 95035
U.S.A.

Applications Manager:
Jim Pflasterer
jpflaste@intersil.com

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
5. Renesas Electronics products are classified according to the following two quality grades: “Standard” and “High Quality”. The intended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below.

   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.

   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

   Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user’s manual or other Renesas Electronics document.
6. When using Renesas Electronics products, refer to the latest product information (data sheets, user’s manuals, application notes, “General Notes for Handling and Using Semiconductor Devices” in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
7. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
9. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
10. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
11. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note 1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

(Rev.4.0-1 November 2017)

RENESAS

SALES OFFICES

Renesas Electronics Corporation

http://www.renesas.com

Refer to "http://www.renesas.com/" for the latest and detailed information.

Renesas Electronics America Inc.
1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.
Tel: +1-408-432-8888, Fax: +1-408-434-5351

Renesas Electronics Canada Limited
9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 1709 Quantum Plaza, No.27 ZhichunLu, Haidian District, Beijing, 100191 P. R. China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, 200333 P. R. China
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.
No.777C, 100 Feet Road, HAL 2nd Stage, Indiranagar, Bangalore 560 038, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.
17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5338

Colophon 7.0