

ISL71010BM50EV1Z

User's Manual: Evaluation Board

High Reliability

ISL71010BM50EV1Z

Evaluation Board

UG136
Rev.0.00
Oct 24, 2017

1. Overview

The ISL71010BM50EV1Z evaluation board measures the performance of the high precision 5.0V [ISL71010B50](#) voltage reference. The reference has a wide input voltage range from 7V to 30V and an initial accuracy of $\pm 0.05\%$. The voltage noise of $4.2\mu V_{p-p}$ in the 0.1Hz to 10Hz range and maximum output voltage temperature coefficient of 10ppm/ $^{\circ}C$ makes the ISL71010B50 ideal for high-end applications.

The evaluation board includes voltage input test points (VIN and GND) for a power supply input, as well as a pair of test points for the output (VOUT and GND). The resistor location designated as R_2 and the capacitor location designated as C_3 allow for VOUT output load testing. The R_2 resistor location accepts surface mount or through-hole style resistors and C_3 comes populated with a 0.1 μF load capacitor. Additionally, an R-C damper network can be connected to VOUT by installing a jumper at J1.

1.1 Key Features

- Voltage input test points for connection of a power supply
- Convenient output test points to measure VOUT of the voltage reference
- R_2 and C_3 allow for VOUT output load testing
- Additional R-C damper network can be connected at VOUT by installing a jumper at J1

1.2 Specifications

This evaluation board has been configured and optimized for the following conditions:

- $V_{IN} = 7V$ to 30V
- 10 μF and 0.1 μF input decoupling capacitors, 1nF compensation capacitor, and 0.1 μF load capacitor
- R_2 load resistance of $\geq 250\Omega$
- Selectable 10 μF and 2.21k Ω damper network at the output by installing a jumper at J1
- Board temperature: $+25^{\circ}C$

1.3 Ordering Information

Part Number	Output Voltage (V)	Description
ISL71010BM50EV1Z	5.0V	Evaluation board

1.4 Related Literature

- For a full list of related documents, visit our website
 - [ISL71010B50](#) product page
 - [ISL71010B25](#) product page

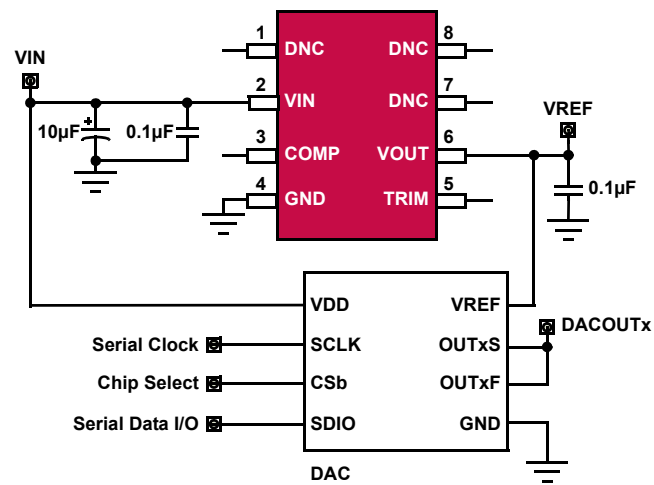


Figure 1. ISL71010BM50EV1Z Block Diagram

2. Functional Description

The ISL71010BM50EV1Z evaluation board provides a simple platform to demonstrate the features and evaluate the performance of the ISL71010B50 voltage reference. It provides easy access to the pins of the ISL71010B50 IC. The schematic, bill of materials, and top silkscreen for the board are shown on [pages 6](#) through [8](#).

[Figures 8](#) through [18](#) show performance data taken using the ISL71010BM50EV1Z evaluation board and basic lab equipment.

The following sections explain how to use the evaluation board.

2.1 Basic Layout of the Evaluation Board

Refer to [Figure 3 on page 6](#) or the actual ISL71010BM50EV1Z evaluation board for the basic layout.

The schematic of the evaluation board is shown in [Figure 4 on page 6](#). The ISL71010BM50EV1Z contains the ISL71010B50 voltage reference (U1), input decoupling capacitors (C_1 , C_2), a compensation capacitor (C_5), and a load capacitor (C_3). Different resistor values can be applied at (R_2) for testing of the voltage reference at different loads. The R_2 resistor location accepts surface mount or through-hole style resistors.

The power supply leads attach to TP1 and TP2 (VIN, GND). The ISL71010B50 IC requires a DC supply in the range of 7.0V to 30V for proper operation. The power supply should be capable of delivering 100mA of current.

The output is measured at test points TP3 and TP4 (VOUT, GND), and is best measured with a high precision voltmeter (such as the Agilent 3458A 8 - 1/2 digit multimeter).

The R-C damper network (R_1 , C_4) is populated and can be connected to the reference output by adding a shunt to the R-C jumper (J1). The damper network improves stability by reducing transient load ringing with high value ($>0.47\mu\text{F}$) load capacitance.

2.1.1 Components Parts List

Table 1. Components Parts List

Reference Designator	Value	Description
C_1	10 μF	Bypass capacitor
C_2	0.01 μF	Bypass capacitor
C_3	0.1 μF	Load capacitor
C_4	10 μF	Damper capacitor
C_5	1nF	Compensation capacitor
R_1	2.21k Ω	Damper resistor
R_2	DNP	Optional load resistor
U1	ISL71010BMB50Z	SOIC 8 Ld package
J1	DNP	Damper jumper

2.2 Operating Range

The ISL71010B50 IC requires a V_{IN} DC supply in the range of 7.0V to 30V for proper operation. The power supply should be capable of delivering 100mA of current.

The ISL71010B50 IC V_{OUT} can source 20mA of current and sink -10mA of current. For normal operation the R_2 load resistor should be selected to be $\geq 250\Omega$. Note: With V_{OUT} shorted to ground the IC will limit the current to $\leq 75\text{mA}$.

2.3 Quick Start Guide

- (1) Gather the external supply and equipment needed to operate the board:
 - (a) 7V to 30V DC power supply.
 - (b) Precision voltmeter (Agilent 3458A digital multimeter or equivalent).
- (2) Attach the evaluation board to a DC power supply at test points TP1 and TP2 labeled VIN and GND as shown in [Figure 2](#). Attach the positive terminal at VIN (TP1) and the negative terminal at GND. The supply should be capable of delivering 7V to 30V and 100mA of current.
- (3) Connect a precision voltmeter at test points TP3 and TP4 labeled VOUT and GND as indicated in [Figure 2](#).
- (4) Set the supply voltage to 10V.
- (5) Turn the DC power supply ON. The voltmeter should read $5.0V \pm 0.05\%$.
- (6) Change the DC power supply voltage to 20V. The voltmeter should continue to read 5.0V.
- (7) Vary the DC power supply voltage over the range of 7V to 30V and the voltmeter should continue to read 5.0V.
- (8) Performance at different resistive loads can be evaluated by changing R₂ with different resistor values.

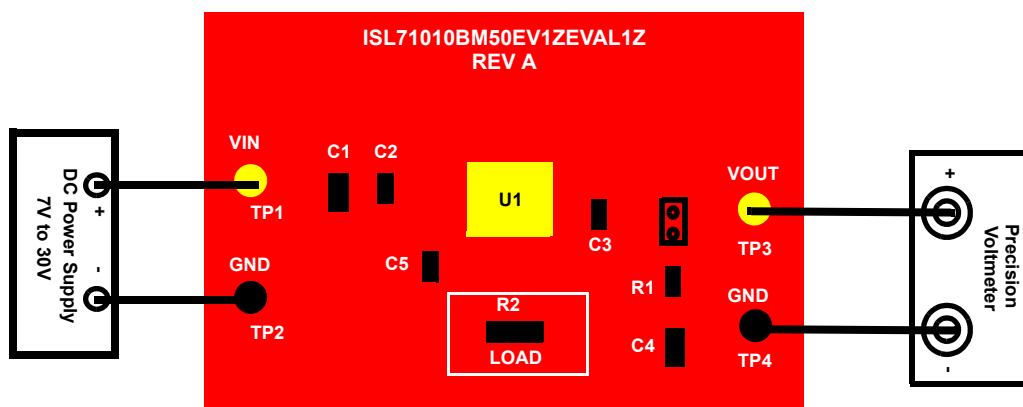


Figure 2. Basic Evaluation Test Setup Block Diagram (Measure V_{OUT} of the Voltage Reference)

3. PCB Layout Guidelines

3.1 ISL71010BM50EV1Z Evaluation Board

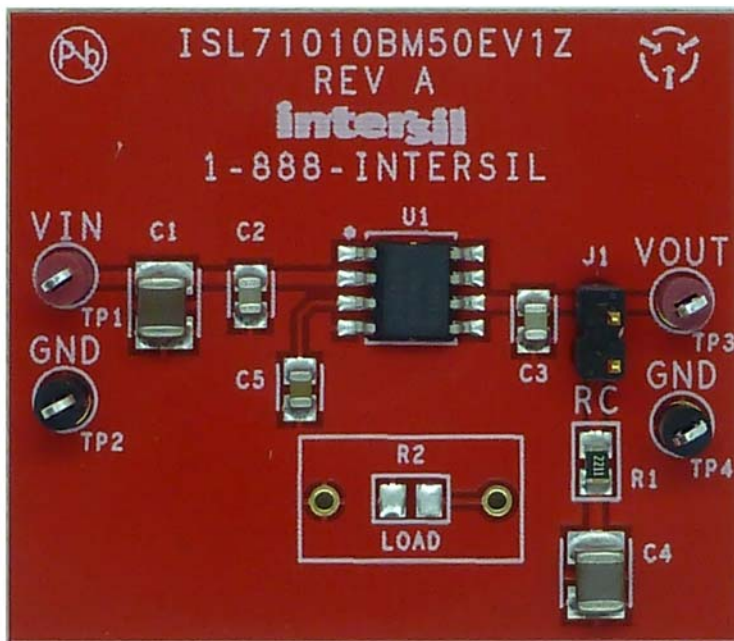


Figure 3. ISL71010BM50EV1Z Evaluation Board

3.2 ISL71010BM50EV1Z Evaluation Board Schematic

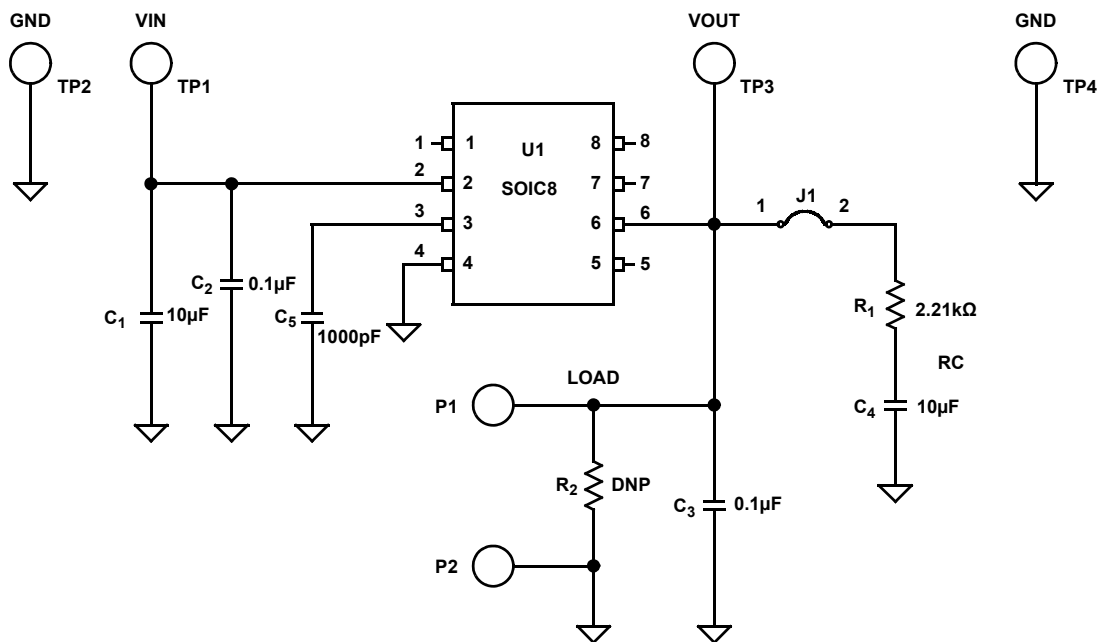


Figure 4. ISL71010BM50EV1Z Evaluation Board Schematic

3.3 Bill of Materials

Qty	Reference Designator	Description	Mfr	Manufacturer Part Number
1	-	PWB-PCB, ISL71010BM50EV1Z, Rev A, ROHS	IMAGINEERING INC	ISL71010BM50EV1ZREVAPCB
1	C5	CAP, SMD, 0805, 1000pF, 50V, 10%, X7R, ROHS	PANASONIC	ECJ-2VB1H102K
2	C2, C3	CAP, SMD, 0805, 0.1µF, 50V, 10%, X7R, ROHS	KEMET	C0805C104K5RACTU
2	C1, C4	CAP, SMD, 1210, 10µF, 50V, 10%, X5R, ROHS	TAIYO YUDEN	UMK325BJ106KM-T
2	TP1, TP3	CONN - MINI TEST PT, VERTICAL, RED, ROHS	KEYSTONE	5000
2	TP2, TP4	CONN - MINI TEST PT, VERTICAL, BLK, ROHS	KEYSTONE	5001
1	J1	CONN-HEADER, 1x2, RETENTIVE, 2.54mm, 0.230x0.120, ROHS	BERG/FCI	69190-202HFL
1	U1	IC - PREC. VOLTAGE REFERENCE, 8P, SOIC, 5.0VOUT, ROHS	INTERSIL	ISL71010BMB50Z-TK
1	R2	RESISTOR, SMD, 0805, DNP	-	-
1	R1	RESISTOR, SMD, 0805, 2.21kΩ, 1/8W, 1%, TF, ROHS	YAGEO	RC0805FR-072K21L
1	Place assy in bag.	BAG, STATIC, 2X3, ZIP LOC	-	2X3-STATIC-BAG
1	-	LABEL-DATE CODE_LINE 1: YRWK/REV#, LINE 2: BOM NAME	INTERSIL	LABEL-DATE CODE

3.4 Board Layout

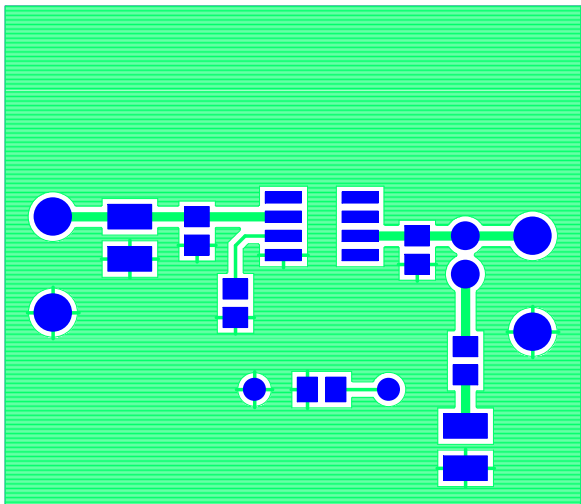


Figure 5. Top Layer

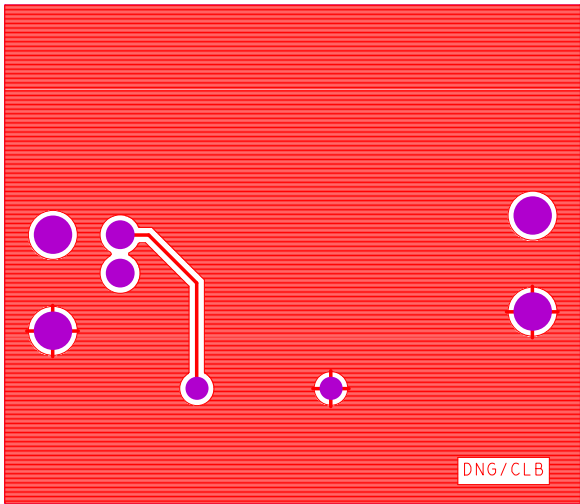


Figure 6. Bottom Layer

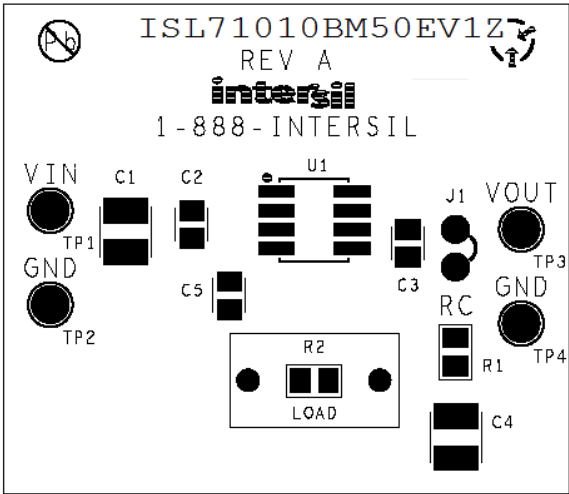


Figure 7. Top Layer Silk Screen

4. Typical Performance Curves

Unless otherwise noted: $V_{IN} = 10V$, $I_{OUT} = 0mA$, $C_{OUT} = 0.1\mu F$, $COMP = 1nF$, $T_A = +25^\circ C$

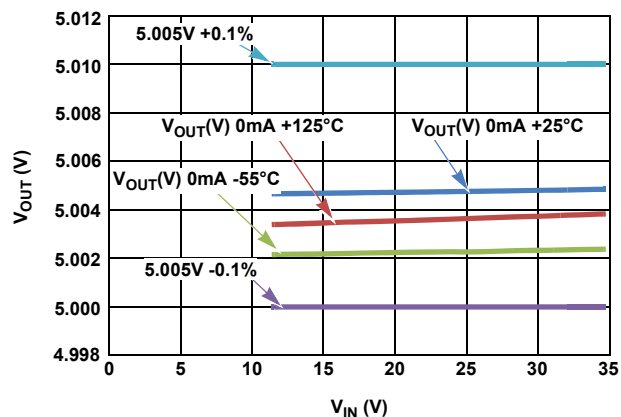


Figure 8. V_{OUT} Accuracy Over Temperature

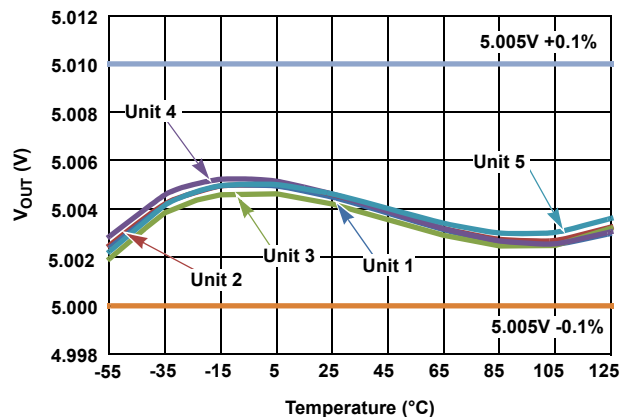


Figure 9. 5.005V V_{OUT} Limits Plot

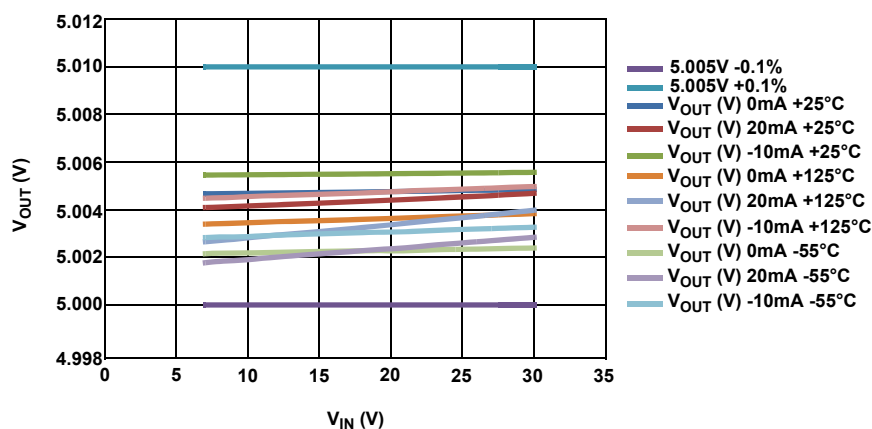


Figure 10. V_{OUT} vs V_{IN} AT 0mA, 20mA, and -10mA

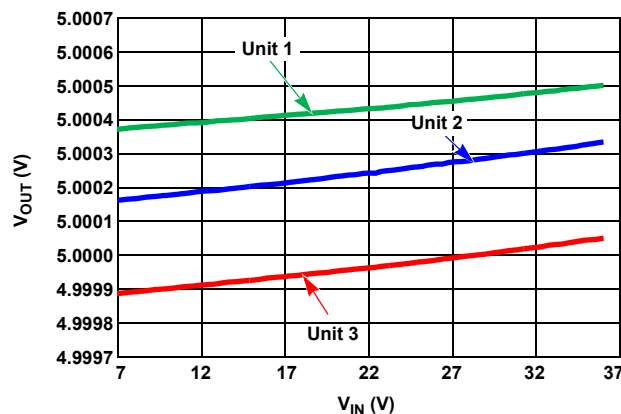


Figure 11. Line Regulation, Three Units

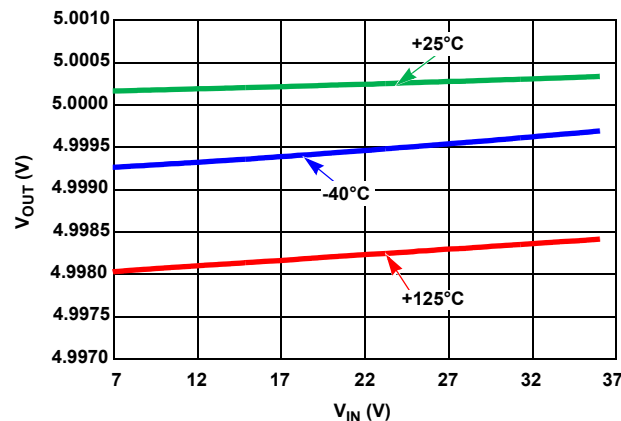


Figure 12. Line Regulation, Three Temperatures

Unless otherwise noted: $V_{IN} = 10V$, $I_{OUT} = 0mA$, $C_{OUT} = 0.1\mu F$, $COMP = 1nF$, $T_A = +25^\circ C$ (Continued)

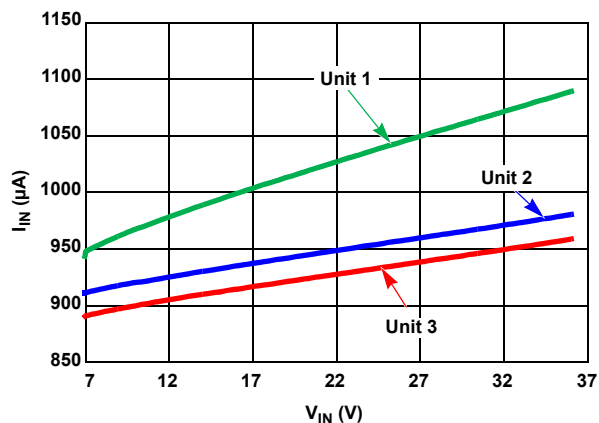


Figure 13. I_{IN} vs V_{IN} , Three Units

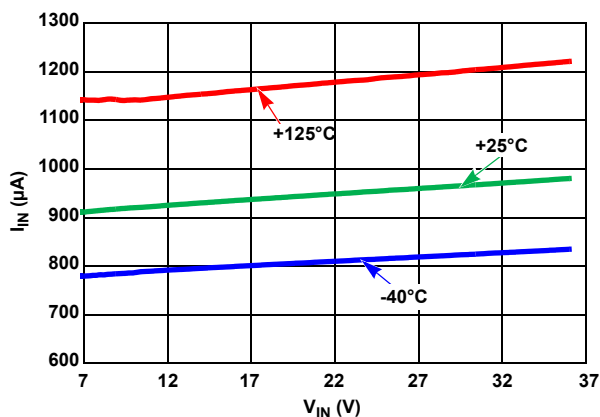


Figure 14. I_{IN} vs V_{IN} , Three Temperatures

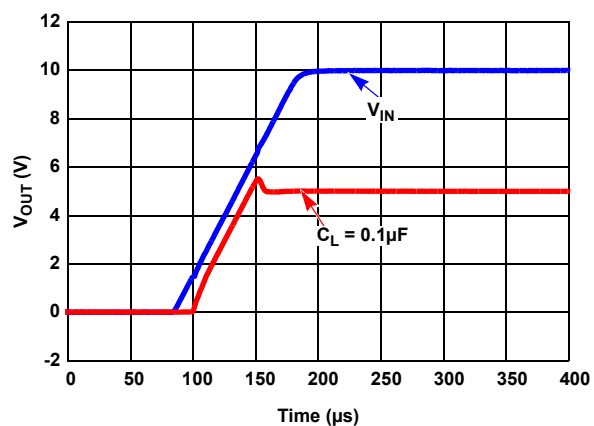


Figure 15. Turn-On Time with $0.1\mu F$

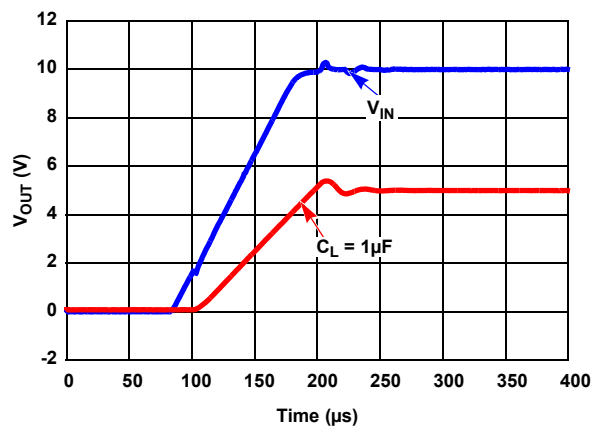


Figure 16. Turn-On Time with $1\mu F$

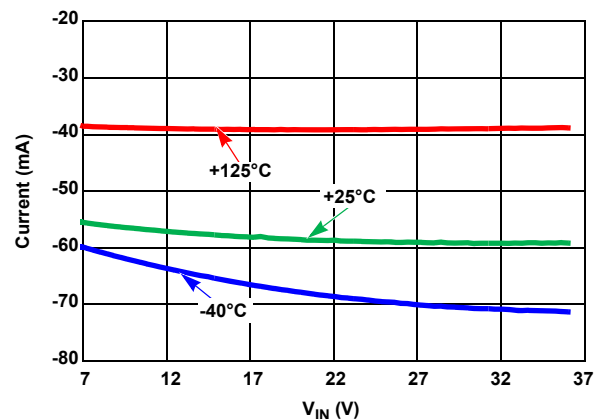


Figure 17. Short-Circuit to GND

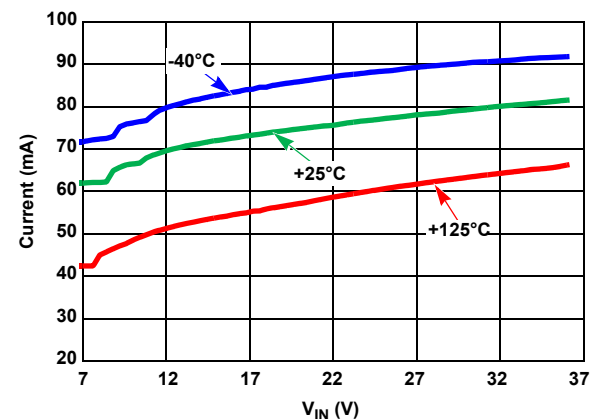


Figure 18. Short-Circuit to V_{IN}

5. Revision History

Rev.	Date	Description
0.00	Oct 24, 2017	Initial release

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