

# ISL21010

## Micropower Voltage Reference

FN7896  
Rev 6.00  
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The [ISL21010](#) is a precision, low dropout micropower bandgap voltage reference in a space-saving SOT-23 package. It operates from a single 2.2V to 5.5V supply (minimum voltage is dependent on voltage option) and provides a  $\pm 0.2\%$  accurate reference. The ISL21010 provides up to 25mA output current sourcing with low 150mV dropout voltage.

Output voltage options include 1.024V, 1.2V, 1.5V, 2.048V, 2.5V, 3.0V, 3.3V, and 4.096V. The low supply current and low dropout voltage combined with high accuracy make the ISL21010 ideal for precision battery powered applications.

## Applications

- Battery management/monitoring
- Low power standby voltages
- Portable instrumentation
- Consumer/medical electronics
- Lower cost industrial and instrumentation
- Power regulation circuits
- Control loops and compensation networks
- LED/diode supply

## Features

- Reference output voltages ..... 1.024V, 1.25V, 1.5V, 2.048V, 2.5V, 3.0V, 3.3V, 4.096V
- Precision 0.2% initial accuracy
- Input voltage range:
  - ISL21010-10, -12, -15 -20 ..... 2.2V to 5.5V
  - ISL21010-25 ..... 2.6V to 5.5V
  - ISL21010-30 ..... 3.1V to 5.5V
  - ISL21010-33 ..... 3.4V to 5.5V
  - ISL21010-41 ..... 4.2V to 5.5V
- Output current source capability ..... 25mA
- Operating temperature range. .... -40°C to +125°C
- Output voltage noise ( $V_{OUT} = 2.048V$ ) ..... 58 $\mu V_{P-P}$  (0.1Hz to 10Hz)
- Supply current ..... 48 $\mu A$  (typical)
- Tempco ..... 50ppm/°C
- Package ..... 3 Ld SOT-23
- Pb-free (RoHS compliant)

## Related Literature

For a full list of related documents, visit our website:

- [ISL21010DFH310](#), [ISL21010DFH312](#), [ISL21010CFH315](#), [ISL21010CFH320](#), [ISL21010CFH325](#), [ISL21010CFH330](#), [ISL21010CFH333](#), and [ISL21010CFH341](#) device pages

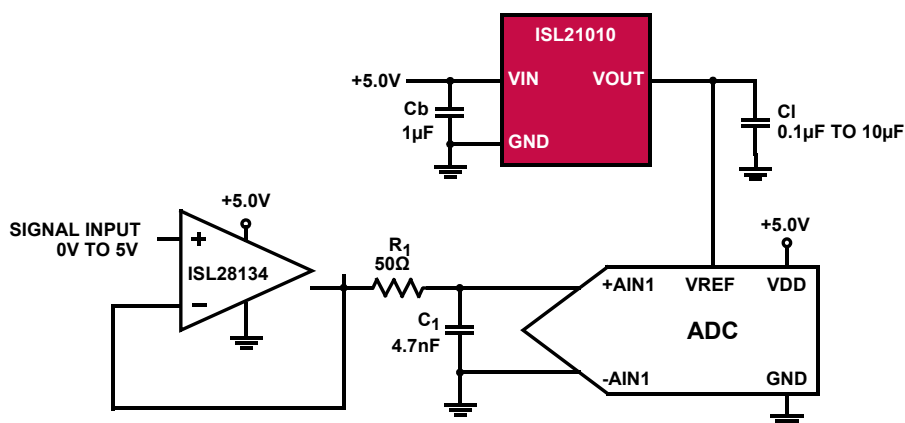


FIGURE 1. TYPICAL APPLICATION DIAGRAM

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# Typical Application Circuit

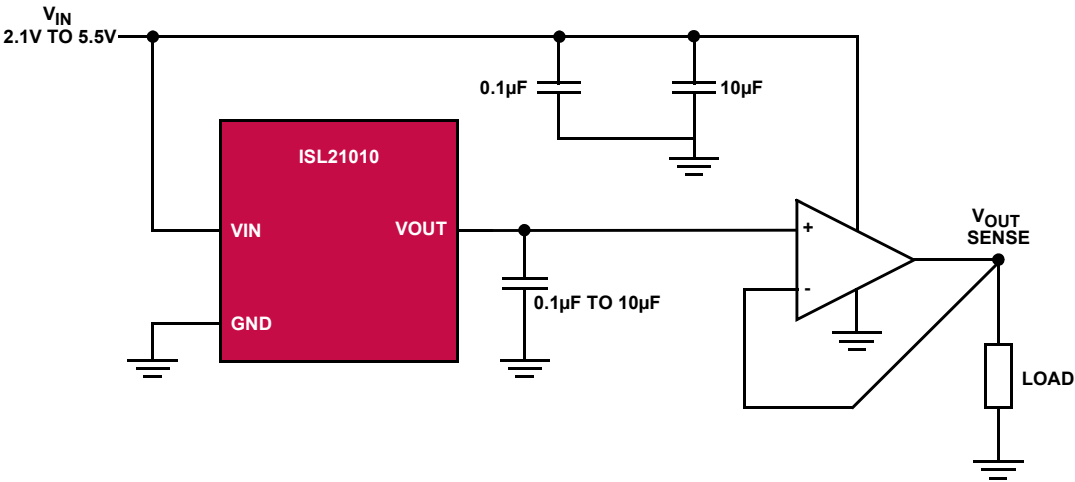
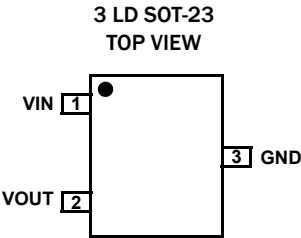


FIGURE 2. KELVIN SENSED LOAD

## Pin Configuration



## Pin Descriptions

| PIN NUMBER | PIN NAME | DESCRIPTION              |
|------------|----------|--------------------------|
| 1          | VIN      | Input voltage connection |
| 2          | VOUT     | Voltage reference output |
| 3          | GND      | Ground connection        |

## Ordering Information

| PART NUMBER<br>(Notes 2, 3, 4) | PART<br>MARKING                  | TAPE & REEL<br>QUANTITY<br>(UNITS) (Note 1) | V <sub>OUT</sub> OPTION (V) | INITIAL<br>ACCURACY (%) | TEMP. RANGE (°C) | PACKAGE<br>(RoHS Compliant) | PKG.<br>DWG. # |
|--------------------------------|----------------------------------|---------------------------------------------|-----------------------------|-------------------------|------------------|-----------------------------|----------------|
| ISL21010DFH310Z-T              | BEBA                             | 3k                                          | 1.024                       | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010DFH310Z-TK             | BEBA                             | 1k                                          | 1.024                       | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010DFH310Z-T7A            | BEBA                             | 250                                         | 1.024                       | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010DFH312Z-T              | BECA                             | 3k                                          | 1.25                        | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010DFH312Z-TK             | BECA                             | 1k                                          | 1.25                        | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010DFH312Z-T7A            | BECA                             | 250                                         | 1.25                        | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010CFH315Z-TK             | BDRA                             | 1k                                          | 1.5                         | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010CFH315Z-T7A            | BDRA                             | 250                                         | 1.5                         | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010CFH320Z-TK             | BDSA                             | 1k                                          | 2.048                       | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010CFH320Z-T7A            | BDSA                             | 250                                         | 2.048                       | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010CFH325Z-TK             | BDTA                             | 1k                                          | 2.5                         | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010CFH325Z-T7A            | BDTA                             | 250                                         | 2.5                         | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010CFH330Z-TK             | BDVA                             | 1k                                          | 3.0                         | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010CFH330Z-T7A            | BDVA                             | 250                                         | 3.0                         | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010CFH333Z-TK             | BDWA                             | 1k                                          | 3.3                         | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010CFH333Z-T7A            | BDWA                             | 250                                         | 3.3                         | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010CFH341Z-TK             | BDYA                             | 1k                                          | 4.096                       | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL21010CFH341Z-T7A            | BDYA                             | 250                                         | 4.096                       | ±0.2                    | -40 to +125      | 3 Ld SOT-23                 | P3.064         |
| ISL2101010EV1Z                 | ISL21010DFH310Z Evaluation Board |                                             |                             |                         |                  |                             |                |
| ISL2101012EV1Z                 | ISL21010DFH312Z Evaluation Board |                                             |                             |                         |                  |                             |                |
| ISL2101015EV1Z                 | ISL21010CFH315Z Evaluation Board |                                             |                             |                         |                  |                             |                |

### NOTES:

1. See [TB347](#) for details about reel specifications.
2. These Pb-free plastic packaged products employ special Pb-free material sets, molding compounds/die attach materials, and 100% matte tin plate plus anneal (e3 termination finish, which is RoHS compliant and compatible with both SnPb and Pb-free soldering operations). Pb-free products are MSL classified at Pb-free peak reflow temperatures that meet or exceed the Pb-free requirements of IPC/JEDEC J STD-020.
3. For Moisture Sensitivity Level (MSL), see the [ISL21010DFH310](#), [ISL21010DFH312](#), [ISL21010CFH315](#), [ISL21010CFH320](#), [ISL21010CFH325](#), [ISL21010CFH330](#), [ISL21010CFH333](#), [ISL21010CFH341](#) device pages. For more information about MSL, see [TB363](#).
4. The part marking is located on the bottom of the part.

## Absolute Maximum Ratings

|                                |                         |
|--------------------------------|-------------------------|
| Max Voltage                    |                         |
| $V_{IN}$ to GND                | -0.5V to +6.5V          |
| $V_{OUT}$ (pin) to GND (10s)   | -0.5V to $V_{IN}$ +0.5V |
| Input Voltage Slew Rate (Max)  | 1V/ $\mu$ s             |
| Temperature Range (Industrial) | -40°C to +125°C         |
| ESD Rating                     |                         |
| Human Body Model               | 5.5kV                   |
| Machine Model                  | 300V                    |
| Charged Device Model           | 2kV                     |

## Thermal Information

|                                                             |                           |                      |
|-------------------------------------------------------------|---------------------------|----------------------|
| Thermal Resistance (Typical)                                | $\theta_{JA}$ (°C/W)      | $\theta_{JC}$ (°C/W) |
| 3 Ld SOT-23 Package (Notes 5, 6)                            | 275                       | 110                  |
| Continuous Power Dissipation ( $T_A = +125^\circ\text{C}$ ) | 99mW                      |                      |
| Storage Temperature Range                                   | -65°C to +150°C           |                      |
| Pb-Free Reflow Profile                                      | see <a href="#">TB493</a> |                      |

## Recommended Operating Conditions

|                                                                     |                 |
|---------------------------------------------------------------------|-----------------|
| Temperature                                                         | -40°C to +125°C |
| Supply Voltage                                                      |                 |
| $V_{OUT} = 1.024\text{V}, 1.25\text{V}, 1.5\text{V}, 2.048\text{V}$ | 2.2V to 5.5V    |
| $V_{OUT} = 2.5\text{V}$                                             | 2.6V to 5.5V    |
| $V_{OUT} = 3.0\text{V}$                                             | 3.1V to 5.5V    |
| $V_{OUT} = 3.3\text{V}$                                             | 3.4V to 5.5V    |
| $V_{OUT} = 4.096\text{V}$                                           | 4.2V to 5.5V    |

CAUTION: Do not operate at or near the maximum ratings listed for extended periods of time. Exposure to such conditions can adversely impact product reliability and result in failures not covered by warranty.

### NOTES:

- $\theta_{JA}$  is measured with the component mounted on a high-effective thermal conductivity test board in free air. See [TB379](#) for details.
- For  $\theta_{JC}$ , the "case temp" location is taken at the package top center.

**Electrical Specifications (ISL21010-10,  $V_{OUT} = 1.024\text{V}$ )**  $V_{IN} = 3.0\text{V}$ ,  $T_A = +25^\circ\text{C}$ ,  $I_{OUT} = 0\text{A}$ , unless otherwise specified. **Boldface limits apply across the operating temperature range, -40°C to +125°C.**

| PARAMETER                                                 | SYMBOL                            | TEST CONDITIONS                                      | MIN<br>(Note 7) | TYP   | MAX<br>(Note 7) | UNIT                |
|-----------------------------------------------------------|-----------------------------------|------------------------------------------------------|-----------------|-------|-----------------|---------------------|
| Output Voltage                                            | $V_{OUT}$                         |                                                      |                 | 1.024 |                 | V                   |
| $V_{OUT}$ Accuracy at $T_A = +25^\circ\text{C}$ (Note 11) | $V_{OA}$                          |                                                      | -0.2            |       | +0.2            | %                   |
| Output Voltage Temperature Coefficient (Note 8)           | TC $V_{OUT}$                      |                                                      |                 | 15    | <b>50</b>       | ppm/°C              |
| Input Voltage Range                                       | $V_{IN}$                          |                                                      | <b>2.2</b>      |       | <b>5.5</b>      | V                   |
| Supply Current                                            | $I_{IN}$                          | $T_A = +25^\circ\text{C}$                            |                 | 46    | 80              | $\mu\text{A}$       |
|                                                           |                                   | $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$    |                 | 60    | <b>100</b>      | $\mu\text{A}$       |
| Line Regulation                                           | $\Delta V_{OUT} / \Delta V_{IN}$  | $2.2\text{V} \leq V_{IN} \leq 5.5\text{V}$           |                 | 5     | <b>100</b>      | $\mu\text{V/V}$     |
| Load Regulation                                           | $\Delta V_{OUT} / \Delta I_{OUT}$ | Sourcing: $0\text{mA} \leq I_{OUT} \leq 25\text{mA}$ |                 | 15    | <b>110</b>      | $\mu\text{V/mA}$    |
|                                                           |                                   | Sinking: $-1\text{mA} \leq I_{OUT} \leq 0\text{mA}$  |                 | 17    |                 | $\mu\text{V/mA}$    |
| Short-Circuit Current                                     | $I_{SC}$                          | $T_A = +25^\circ\text{C}$ , $V_{OUT}$ tied to GND    |                 | 118   |                 | mA                  |
| Turn-On Settling Time                                     | $t_R$                             | $V_{OUT} = \pm 0.1\%$ , $C_{OUT} = 1\mu\text{F}$     |                 | 300   |                 | $\mu\text{s}$       |
| Ripple Rejection                                          |                                   | $f = 120\text{Hz}$                                   |                 | 70    |                 | dB                  |
| Output Voltage Noise                                      | $e_N$                             | $0.1\text{Hz} \leq f \leq 10\text{Hz}$               |                 | 24    |                 | $\mu\text{V}_{P-P}$ |
| Broadband Voltage Noise                                   | $V_N$                             | $10\text{Hz} \leq f \leq 1\text{kHz}$                |                 | 14    |                 | $\mu\text{V}_{RMS}$ |
| Thermal Hysteresis (Note 10)                              | $\Delta V_{OUT} / \Delta T_A$     | $\Delta T_A = +165^\circ\text{C}$                    |                 | 100   |                 | ppm                 |
| Long Term Stability                                       | $\Delta V_{OUT} / \Delta t$       | 1000 hours, $T_A = +25^\circ\text{C}$                |                 | 110   |                 | ppm                 |

**Electrical Specifications (ISL21010-12,  $V_{OUT} = 1.25V$ )**  $V_{IN} = 3.0V$ ,  $T_A = +25^\circ C$ ,  $I_{OUT} = 0A$ , unless otherwise specified.  
**Boldface limits apply across the operating temperature range,  $-40^\circ C$  to  $+125^\circ C$ .**

| PARAMETER                                           | SYMBOL                            | TEST CONDITIONS                             | MIN<br>(Note 7) | TYP  | MAX<br>(Note 7) | UNIT            |
|-----------------------------------------------------|-----------------------------------|---------------------------------------------|-----------------|------|-----------------|-----------------|
| Output Voltage                                      | $V_{OUT}$                         |                                             |                 | 1.25 |                 | V               |
| $V_{OUT}$ Accuracy at $T_A = +25^\circ C$ (Note 11) | $V_{OA}$                          |                                             | -0.2            |      | +0.2            | %               |
| Output Voltage Temperature Coefficient (Note 8)     | TC $V_{OUT}$                      |                                             |                 | 15   | <b>50</b>       | ppm/ $^\circ C$ |
| Input Voltage Range                                 | $V_{IN}$                          |                                             | <b>2.2</b>      |      | <b>5.5</b>      | V               |
| Supply Current                                      | $I_{IN}$                          | $T_A = +25^\circ C$                         |                 | 46   | 80              | $\mu A$         |
|                                                     |                                   | $T_A = -40^\circ C$ to $+125^\circ C$       |                 |      | <b>100</b>      | $\mu A$         |
| Line Regulation                                     | $\Delta V_{OUT} / \Delta V_{IN}$  | $2.2 V \leq V_{IN} \leq 5.5V$               |                 | 1    | <b>100</b>      | $\mu V/V$       |
| Load Regulation                                     | $\Delta V_{OUT} / \Delta I_{OUT}$ | Sourcing: $0mA \leq I_{OUT} \leq 25mA$      |                 | 35   | <b>110</b>      | $\mu V/mA$      |
|                                                     |                                   | Sinking: $-1mA \leq I_{OUT} \leq 0mA$       |                 | 50   |                 | $\mu V/mA$      |
| Short-Circuit Current                               | $I_{SC}$                          | $T_A = +25^\circ C$ , $V_{OUT}$ tied to GND |                 | 118  |                 | mA              |
| Turn-On Settling Time                               | $t_R$                             | $V_{OUT} = \pm 0.1\%$ , $C_{OUT} = 1\mu F$  |                 | 300  |                 | $\mu s$         |
| Ripple Rejection                                    |                                   | $f = 120Hz$                                 |                 | 68   |                 | dB              |
| Output Voltage Noise                                | $e_N$                             | $0.1Hz \leq f \leq 10Hz$                    |                 | 27   |                 | $\mu V_{P-P}$   |
| Broadband Voltage Noise                             | $V_N$                             | $10Hz \leq f \leq 1kHz$                     |                 | 17   |                 | $\mu V_{RMS}$   |
| Thermal Hysteresis (Note 10)                        | $\Delta V_{OUT} / \Delta T_A$     | $\Delta T_A = +165^\circ C$                 |                 | 100  |                 | ppm             |
| Long Term Stability                                 | $\Delta V_{OUT} / \Delta t$       | 1000 hours, $T_A = +25^\circ C$             |                 | 110  |                 | ppm             |

**Electrical Specifications (ISL21010-15,  $V_{OUT} = 1.5V$ )**  $V_{IN} = 3.0V$ ,  $T_A = +25^\circ C$ ,  $I_{OUT} = 0A$ , unless otherwise specified.  
**Boldface limits apply across the operating temperature range,  $-40^\circ C$  to  $+125^\circ C$ .**

| PARAMETER                                           | SYMBOL                            | TEST CONDITIONS                             | MIN<br>(Note 7) | TYP | MAX<br>(Note 7) | UNIT            |
|-----------------------------------------------------|-----------------------------------|---------------------------------------------|-----------------|-----|-----------------|-----------------|
| Output Voltage                                      | $V_{OUT}$                         |                                             |                 | 1.5 |                 | V               |
| $V_{OUT}$ Accuracy at $T_A = +25^\circ C$ (Note 11) | $V_{OA}$                          |                                             | -0.2            |     | +0.2            | %               |
| Output Voltage Temperature Coefficient (Note 8)     | TC $V_{OUT}$                      |                                             |                 | 15  | <b>50</b>       | ppm/ $^\circ C$ |
| Input Voltage Range                                 | $V_{IN}$                          |                                             | <b>2.2</b>      |     | <b>5.5</b>      | V               |
| Supply Current                                      | $I_{IN}$                          | $T_A = +25^\circ C$                         |                 | 46  | 80              | $\mu A$         |
|                                                     |                                   | $T_A = -40^\circ C$ to $+125^\circ C$       |                 |     | <b>100</b>      | $\mu A$         |
| Line Regulation                                     | $\Delta V_{OUT} / \Delta V_{IN}$  | $2.2 V \leq V_{IN} \leq 5.5V$               |                 | 9   | <b>100</b>      | $\mu V/V$       |
| Load Regulation                                     | $\Delta V_{OUT} / \Delta I_{OUT}$ | Sourcing: $0mA \leq I_{OUT} \leq 25mA$      |                 | 37  | <b>110</b>      | $\mu V/mA$      |
|                                                     |                                   | Sinking: $-1mA \leq I_{OUT} \leq 0mA$       |                 | 50  |                 | $\mu V/mA$      |
| Short-Circuit Current                               | $I_{SC}$                          | $T_A = +25^\circ C$ , $V_{OUT}$ tied to GND |                 | 118 |                 | mA              |
| Turn-On Settling Time                               | $t_R$                             | $V_{OUT} = \pm 0.1\%$ , $C_{OUT} = 1\mu F$  |                 | 300 |                 | $\mu s$         |
| Ripple Rejection                                    |                                   | $f = 120Hz$                                 |                 | 66  |                 | dB              |
| Output Voltage Noise                                | $e_N$                             | $0.1Hz \leq f \leq 10Hz$                    |                 | 35  |                 | $\mu V_{P-P}$   |
| Broadband Voltage Noise                             | $V_N$                             | $10Hz \leq f \leq 1kHz$                     |                 | 20  |                 | $\mu V_{RMS}$   |
| Thermal Hysteresis (Note 10)                        | $\Delta V_{OUT} / \Delta T_A$     | $\Delta T_A = +165^\circ C$                 |                 | 100 |                 | ppm             |
| Long Term Stability                                 | $\Delta V_{OUT} / \Delta t$       | 1000 hours, $T_A = +25^\circ C$             |                 | 110 |                 | ppm             |

**Electrical Specifications (ISL21010-20,  $V_{OUT} = 2.048V$ )**  $V_{IN} = 3.0V$ ,  $T_A = +25^\circ C$ ,  $I_{OUT} = 0A$ , unless otherwise specified. **Boldface limits apply across the operating temperature range,  $-40^\circ C$  to  $+125^\circ C$ .**

| PARAMETER                                           | SYMBOL                            | TEST CONDITIONS                             | MIN<br>(Note 7) | TYP   | MAX<br>(Note 7) | UNIT            |
|-----------------------------------------------------|-----------------------------------|---------------------------------------------|-----------------|-------|-----------------|-----------------|
| Output Voltage                                      | $V_{OUT}$                         |                                             |                 | 2.048 |                 | V               |
| $V_{OUT}$ Accuracy at $T_A = +25^\circ C$ (Note 11) | $V_{OA}$                          |                                             | -0.2            |       | +0.2            | %               |
| Output Voltage Temperature Coefficient (Note 8)     | TC $V_{OUT}$                      |                                             |                 | 15    | <b>50</b>       | ppm/ $^\circ C$ |
| Input Voltage Range                                 | $V_{IN}$                          |                                             | <b>2.2</b>      |       | <b>5.5</b>      | V               |
| Supply Current                                      | $I_{IN}$                          | $T_A = +25^\circ C$                         |                 | 46    | 80              | $\mu A$         |
|                                                     |                                   | $T_A = -40^\circ C$ to $+125^\circ C$       |                 |       | <b>100</b>      | $\mu A$         |
| Line Regulation                                     | $\Delta V_{OUT} / \Delta V_{IN}$  | $2.2 V \leq V_{IN} \leq 5.5V$               |                 | 37    | <b>130</b>      | $\mu V/V$       |
| Load Regulation                                     | $\Delta V_{OUT} / \Delta I_{OUT}$ | Sourcing: $0mA \leq I_{OUT} \leq 25mA$      |                 | 18    | <b>110</b>      | $\mu V/mA$      |
|                                                     |                                   | Sinking: $-1mA \leq I_{OUT} \leq 0mA$       |                 | 10    |                 | $\mu V/mA$      |
| Short-Circuit Current                               | $I_{SC}$                          | $T_A = +25^\circ C$ , $V_{OUT}$ tied to GND |                 | 118   |                 | mA              |
| Turn-On Settling Time                               | $t_R$                             | $V_{OUT} = \pm 0.1\%$ , $C_{OUT} = 1\mu F$  |                 | 300   |                 | $\mu s$         |
| Ripple Rejection                                    |                                   | $f = 120Hz$                                 |                 | 66    |                 | dB              |
| Output Voltage Noise                                | $e_N$                             | $0.1Hz \leq f \leq 10Hz$                    |                 | 58    |                 | $\mu V_{P-P}$   |
| Broadband Voltage Noise                             | $V_N$                             | $10Hz \leq f \leq 1kHz$                     |                 | 26    |                 | $\mu V_{RMS}$   |
| Thermal Hysteresis (Note 10)                        | $\Delta V_{OUT} / \Delta T_A$     | $\Delta T_A = +165^\circ C$                 |                 | 100   |                 | ppm             |
| Long Term Stability                                 | $\Delta V_{OUT} / \Delta t$       | 1000 hours, $T_A = +25^\circ C$             |                 | 50    |                 | ppm             |

**Electrical Specifications (ISL21010-25,  $V_{OUT} = 2.5V$ )**  $V_{IN} = 3.0V$ ,  $T_A = +25^\circ C$ ,  $I_{OUT} = 0A$ , unless otherwise specified. **Boldface limits apply across the operating temperature range,  $-40^\circ C$  to  $+125^\circ C$ .**

| PARAMETER                                           | SYMBOL                            | TEST CONDITIONS                             | MIN<br>(Note 7) | TYP | MAX<br>(Note 7) | UNIT            |
|-----------------------------------------------------|-----------------------------------|---------------------------------------------|-----------------|-----|-----------------|-----------------|
| Output Voltage                                      | $V_{OUT}$                         |                                             |                 | 2.5 |                 | V               |
| $V_{OUT}$ Accuracy at $T_A = +25^\circ C$ (Note 11) | $V_{OA}$                          |                                             | -0.2            |     | +0.2            | %               |
| Output Voltage Temperature Coefficient (Note 8)     | TC $V_{OUT}$                      |                                             |                 | 15  | <b>50</b>       | ppm/ $^\circ C$ |
| Input Voltage Range                                 | $V_{IN}$                          |                                             | <b>2.6</b>      |     | <b>5.5</b>      | V               |
| Supply Current                                      | $I_{IN}$                          | $T_A = +25^\circ C$                         |                 | 46  | 80              | $\mu A$         |
|                                                     |                                   | $T_A = -40^\circ C$ to $+125^\circ C$       |                 |     | <b>100</b>      | $\mu A$         |
| Line Regulation                                     | $\Delta V_{OUT} / \Delta V_{IN}$  | $2.6 V \leq V_{IN} \leq 5.5V$               |                 | 62  | <b>245</b>      | $\mu V/V$       |
| Load Regulation                                     | $\Delta V_{OUT} / \Delta I_{OUT}$ | Sourcing: $0mA \leq I_{OUT} \leq 25mA$      |                 | 29  | <b>110</b>      | $\mu V/mA$      |
|                                                     |                                   | Sinking: $-1mA \leq I_{OUT} \leq 0mA$       |                 | 50  |                 | $\mu V/mA$      |
| Dropout Voltage (Note 9)                            | $V_{INDO}$                        | $I_{OUT} = 10mA$                            |                 | 60  | <b>150</b>      | mV              |
| Short-Circuit Current                               | $I_{SC}$                          | $T_A = +25^\circ C$ , $V_{OUT}$ tied to GND |                 | 118 |                 | mA              |
| Turn-On Settling Time                               | $t_R$                             | $V_{OUT} = \pm 0.1\%$ , $C_{OUT} = 1\mu F$  |                 | 300 |                 | $\mu s$         |
| Ripple Rejection                                    |                                   | $f = 120Hz$                                 |                 | 62  |                 | dB              |
| Output Voltage Noise                                | $e_N$                             | $0.1Hz \leq f \leq 10Hz$                    |                 | 67  |                 | $\mu V_{P-P}$   |
| Broadband Voltage Noise                             | $V_N$                             | $10Hz \leq f \leq 1kHz$                     |                 | 37  |                 | $\mu V_{RMS}$   |
| Thermal Hysteresis (Note 10)                        | $\Delta V_{OUT} / \Delta T_A$     | $\Delta T_A = +165^\circ C$                 |                 | 100 |                 | ppm             |
| Long Term Stability                                 | $\Delta V_{OUT} / \Delta t$       | 1000 hours, $T_A = +25^\circ C$             |                 | 110 |                 | ppm             |

**Electrical Specifications (ISL21010-30,  $V_{OUT} = 3.0V$ )**  $V_{IN} = 5.0V$ ,  $T_A = +25^\circ C$ ,  $I_{OUT} = 0A$ , unless otherwise specified.  
**Boldface limits apply across the operating temperature range,  $-40^\circ C$  to  $+125^\circ C$ .**

| PARAMETER                                           | SYMBOL                            | TEST CONDITIONS                             | MIN<br>(Note 7) | TYP | MAX<br>(Note 7) | UNIT            |
|-----------------------------------------------------|-----------------------------------|---------------------------------------------|-----------------|-----|-----------------|-----------------|
| Output Voltage                                      | $V_{OUT}$                         |                                             |                 | 3.0 |                 | V               |
| $V_{OUT}$ Accuracy at $T_A = +25^\circ C$ (Note 11) | $V_{OA}$                          |                                             | -0.2            |     | +0.2            | %               |
| Output Voltage Temperature Coefficient (Note 8)     | TC $V_{OUT}$                      |                                             |                 | 15  | <b>50</b>       | ppm/ $^\circ C$ |
| Input Voltage Range                                 | $V_{IN}$                          |                                             | <b>3.1</b>      |     | <b>5.5</b>      | V               |
| Supply Current                                      | $I_{IN}$                          | $T_A = +25^\circ C$                         |                 | 48  | 80              | $\mu A$         |
|                                                     |                                   | $T_A = -40^\circ C$ to $+125^\circ C$       |                 |     | <b>100</b>      | $\mu A$         |
| Line Regulation                                     | $\Delta V_{OUT} / \Delta V_{IN}$  | $3.1 V \leq V_{IN} \leq 5.5V$               |                 | 73  | <b>230</b>      | $\mu V/V$       |
| Load Regulation                                     | $\Delta V_{OUT} / \Delta I_{OUT}$ | Sourcing: $0mA \leq I_{OUT} \leq 25mA$      |                 | 48  | <b>110</b>      | $\mu V/mA$      |
|                                                     |                                   | Sinking: $-1mA \leq I_{OUT} \leq 0mA$       |                 | 10  |                 | $\mu V/mA$      |
| Dropout Voltage (Note 9)                            | $V_{INDO}$                        | $I_{OUT} = 10mA$                            |                 | 60  | <b>150</b>      | mV              |
| Short-Circuit Current                               | $I_{SC}$                          | $T_A = +25^\circ C$ , $V_{OUT}$ tied to GND |                 | 126 |                 | mA              |
| Turn-On Settling Time                               | $t_R$                             | $V_{OUT} = \pm 0.1\%$ , $C_{OUT} = 1\mu F$  |                 | 300 |                 | $\mu s$         |
| Ripple Rejection                                    |                                   | $f = 120Hz$                                 |                 | 62  |                 | dB              |
| Output Voltage Noise                                | $e_N$                             | $0.1Hz \leq f \leq 10Hz$                    |                 | 86  |                 | $\mu V_{p-p}$   |
| Broadband Voltage Noise                             | $V_N$                             | $10Hz \leq f \leq 1kHz$                     |                 | 36  |                 | $\mu V_{RMS}$   |
| Thermal Hysteresis (Note 10)                        | $\Delta V_{OUT} / \Delta T_A$     | $\Delta T_A = +165^\circ C$                 |                 | 100 |                 | ppm             |
| Long Term Stability                                 | $\Delta V_{OUT} / \Delta t$       | 1000 hours, $T_A = +25^\circ C$             |                 | 50  |                 | ppm             |

**Electrical Specifications (ISL21010-33,  $V_{OUT} = 3.3V$ )**  $V_{IN} = 5.0V$ ,  $T_A = +25^\circ C$ ,  $I_{OUT} = 0A$ , unless otherwise specified.  
**Boldface limits apply across the operating temperature range,  $-40^\circ C$  to  $+125^\circ C$ .**

| PARAMETER                                           | SYMBOL                            | TEST CONDITIONS                             | MIN<br>(Note 7) | TYP | MAX<br>(Note 7) | UNIT            |
|-----------------------------------------------------|-----------------------------------|---------------------------------------------|-----------------|-----|-----------------|-----------------|
| Output Voltage                                      | $V_{OUT}$                         |                                             |                 | 3.3 |                 | V               |
| $V_{OUT}$ Accuracy at $T_A = +25^\circ C$ (Note 11) | $V_{OA}$                          |                                             | -0.2            |     | +0.2            | %               |
| Output Voltage Temperature Coefficient (Note 8)     | TC $V_{OUT}$                      |                                             |                 | 15  | <b>50</b>       | ppm/ $^\circ C$ |
| Input Voltage Range                                 | $V_{IN}$                          |                                             | <b>3.4</b>      |     | <b>5.5</b>      | V               |
| Supply Current                                      | $I_{IN}$                          | $T_A = +25^\circ C$                         |                 | 48  | 80              | $\mu A$         |
|                                                     |                                   | $T_A = -40^\circ C$ to $+125^\circ C$       |                 |     | <b>100</b>      | $\mu A$         |
| Line Regulation                                     | $\Delta V_{OUT} / \Delta V_{IN}$  | $3.4 V \leq V_{IN} \leq 5.5V$               |                 | 80  | <b>320</b>      | $\mu V/V$       |
| Load Regulation                                     | $\Delta V_{OUT} / \Delta I_{OUT}$ | Sourcing: $0mA \leq I_{OUT} \leq 25mA$      |                 | 45  | <b>110</b>      | $\mu V/mA$      |
|                                                     |                                   | Sinking: $-1mA \leq I_{OUT} \leq 0mA$       |                 | 10  |                 | $\mu V/mA$      |
| Dropout Voltage (Note 9)                            | $V_{INDO}$                        | $I_{OUT} = 10mA$                            |                 | 60  | <b>150</b>      | mV              |
| Short-Circuit Current                               | $I_{SC}$                          | $T_A = +25^\circ C$ , $V_{OUT}$ tied to GND |                 | 126 |                 | mA              |
| Turn-On Settling Time                               | $t_R$                             | $V_{OUT} = \pm 0.1\%$ , $C_{OUT} = 1\mu F$  |                 | 300 |                 | $\mu s$         |
| Ripple Rejection                                    |                                   | $f = 120Hz$                                 |                 | 61  |                 | dB              |
| Output Voltage Noise                                | $e_N$                             | $0.1Hz \leq f \leq 10Hz$                    |                 | 95  |                 | $\mu V_{p-p}$   |
| Broadband Voltage Noise                             | $V_N$                             | $10Hz \leq f \leq 1kHz$                     |                 | 40  |                 | $\mu V_{RMS}$   |
| Thermal Hysteresis (Note 10)                        | $\Delta V_{OUT} / \Delta T_A$     | $\Delta T_A = +165^\circ C$                 |                 | 100 |                 | ppm             |
| Long Term Stability                                 | $\Delta V_{OUT} / \Delta t$       | 1000 hours, $T_A = +25^\circ C$             |                 | 50  |                 | ppm             |

**Electrical Specifications (ISL21010-41,  $V_{OUT} = 4.096V$ )**  $V_{IN} = 5.0V$ ,  $T_A = +25^\circ C$ ,  $I_{OUT} = 0A$ , unless otherwise specified. **Boldface limits apply across the operating temperature range,  $-40^\circ C$  to  $+125^\circ C$ .**

| PARAMETER                                           | SYMBOL                            | TEST CONDITIONS                             | MIN<br>(Note 7) | TYP   | MAX<br>(Note 7) | UNIT            |
|-----------------------------------------------------|-----------------------------------|---------------------------------------------|-----------------|-------|-----------------|-----------------|
| Output Voltage                                      | $V_{OUT}$                         |                                             |                 | 4.096 |                 | V               |
| $V_{OUT}$ Accuracy at $T_A = +25^\circ C$ (Note 11) | $V_{OA}$                          |                                             | -0.2            |       | +0.2            | %               |
| Output Voltage Temperature Coefficient (Note 8)     | TC $V_{OUT}$                      |                                             |                 | 15    | <b>50</b>       | ppm/ $^\circ C$ |
| Input Voltage Range                                 | $V_{IN}$                          |                                             | <b>4.2</b>      |       | <b>5.5</b>      | V               |
| Supply Current                                      | $I_{IN}$                          | $T_A = +25^\circ C$                         |                 | 48    | 80              | $\mu A$         |
|                                                     |                                   | $T_A = -40^\circ C$ to $+125^\circ C$       |                 |       | <b>100</b>      | $\mu A$         |
| Line Regulation                                     | $\Delta V_{OUT} / \Delta V_{IN}$  | $4.2 V \leq V_{IN} \leq 5.5V$               |                 | 106   | <b>550</b>      | $\mu V/V$       |
| Load Regulation                                     | $\Delta V_{OUT} / \Delta I_{OUT}$ | Sourcing: $0mA \leq I_{OUT} \leq 25mA$      |                 | 50    | <b>140</b>      | $\mu V/mA$      |
|                                                     |                                   | Sinking: $-1mA \leq I_{OUT} \leq 0mA$       |                 | 50    |                 | $\mu V/mA$      |
| Dropout Voltage (Note 9)                            | $V_{INDO}$                        | $I_{OUT} = 10mA$                            |                 | 60    | <b>150</b>      | mV              |
| Short-Circuit Current                               | $I_{SC}$                          | $T_A = +25^\circ C$ , $V_{OUT}$ tied to GND |                 | 126   |                 | mA              |
| Turn-On Settling Time                               | $t_R$                             | $V_{OUT} = \pm 0.1\%$ , $C_{OUT} = 1\mu F$  |                 | 300   |                 | $\mu s$         |
| Ripple Rejection                                    |                                   | $f = 120Hz$                                 |                 | 58    |                 | dB              |
| Output Voltage Noise                                | $e_N$                             | $0.1Hz \leq f \leq 10Hz$                    |                 | 112   |                 | $\mu V_{P-P}$   |
| Broadband Voltage Noise                             | $V_N$                             | $10Hz \leq f \leq 1kHz$                     |                 | 56    |                 | $\mu V_{RMS}$   |
| Thermal Hysteresis (Note 10)                        | $\Delta V_{OUT} / \Delta T_A$     | $\Delta T_A = +165^\circ C$                 |                 | 100   |                 | ppm             |
| Long Term Stability                                 | $\Delta V_{OUT} / \Delta t$       | 1000 hours, $T_A = +25^\circ C$             |                 | 110   |                 | ppm             |

## NOTES:

7. Compliance to datasheet limits is assured by one or more methods: production test, characterization, and/or design.
8. Over the specified temperature range. Temperature coefficient is measured by the box method whereby the change in  $V_{OUT}$  is divided by the temperature range; in this case,  $-40^\circ C$  to  $+125^\circ C = +165^\circ C$ .
9. Dropout Voltage is the minimum  $V_{IN} - V_{OUT}$  differential voltage measured at the point where  $V_{OUT}$  drops 1mV from  $V_{IN} = \text{nominal}$  at  $T_A = +25^\circ C$ .
10. Thermal Hysteresis is the change of  $V_{OUT}$  measured at  $T_A = +25^\circ C$  after temperature cycling over a specified range,  $\Delta T_A$ .  $V_{OUT}$  is read initially at  $T_A = +25^\circ C$  for the device under test. The device is temperature cycled and a second  $V_{OUT}$  measurement is taken at  $+25^\circ C$ . The difference between the initial  $V_{OUT}$  reading and the second  $V_{OUT}$  reading is then expressed in ppm. For  $\Delta T_A = +165^\circ C$ , the device under test is cycled from  $+25^\circ C$  to  $-40^\circ C$  to  $+125^\circ C$  to  $+25^\circ C$ .
11. Post-reflow drift for the ISL21010 devices may shift up to 4.0mV based on simulated reflow at  $260^\circ C$  peak temperature, three passes. The system design engineer must take this into account when considering the reference voltage after assembly.

## Typical Performance Characteristics Curves ( $V_{OUT} = 1.024V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified.

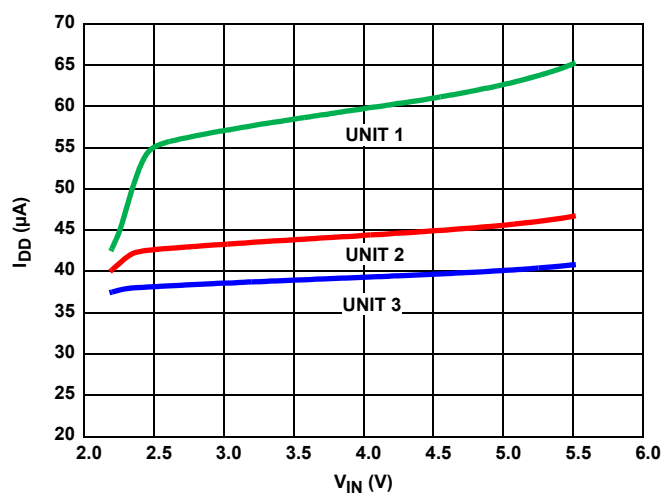
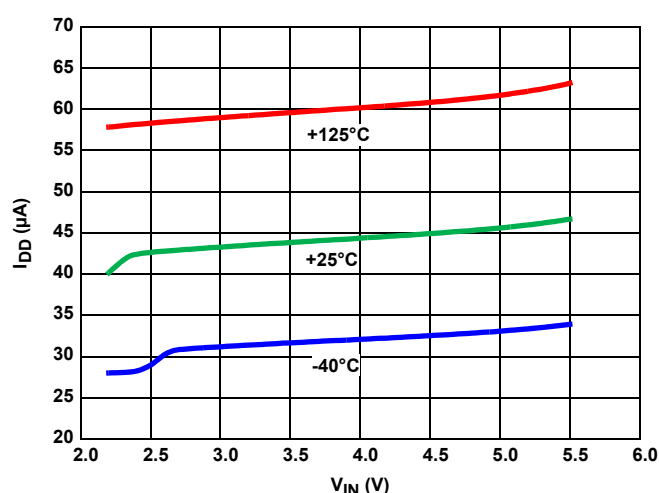
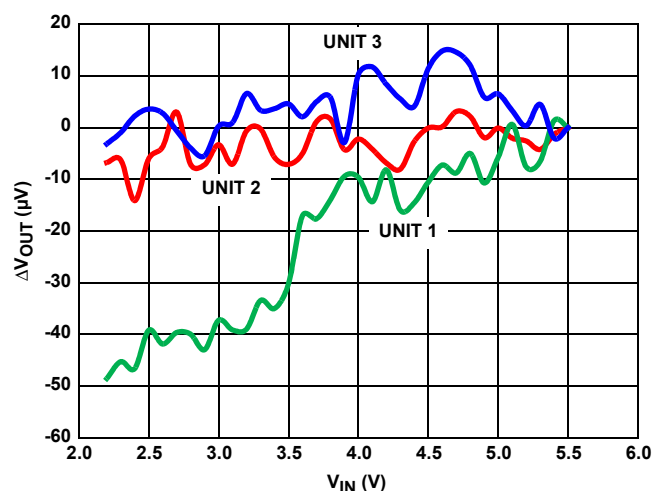
FIGURE 3.  $I_{IN}$  vs  $V_{IN}$ , THREE UNITSFIGURE 4.  $I_{IN}$  vs  $V_{IN}$ , OVER-TEMPERATURE

FIGURE 5. LINE REGULATION, THREE UNITS

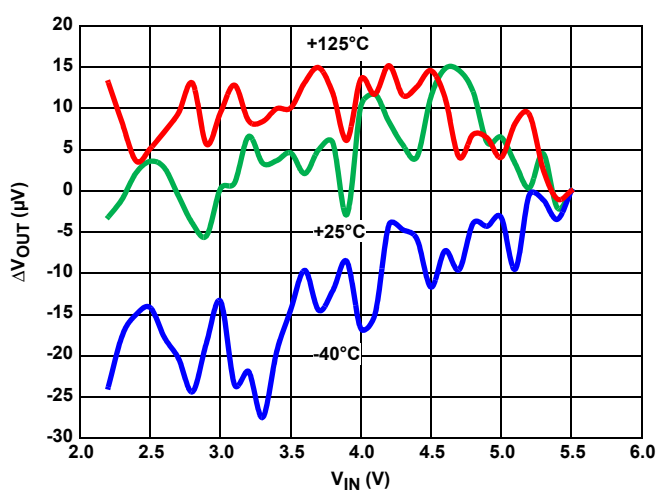
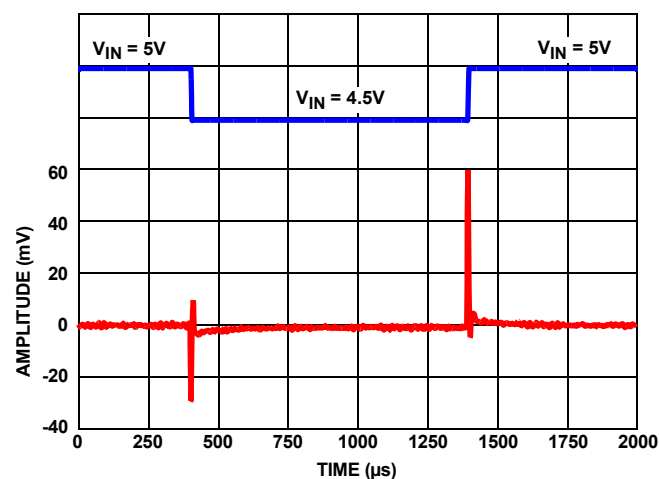
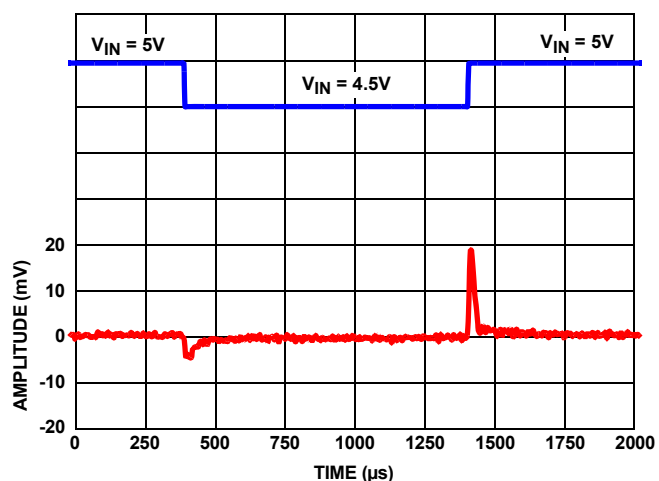


FIGURE 6. LINE REGULATION OVER-TEMPERATURE

FIGURE 7. LINE TRANSIENT RESPONSE WITH  $0.22\mu F$  LOADFIGURE 8. LINE TRANSIENT RESPONSE WITH  $10\mu F$  LOAD

# Typical Performance Characteristics Curves ( $V_{OUT} = 1.024V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

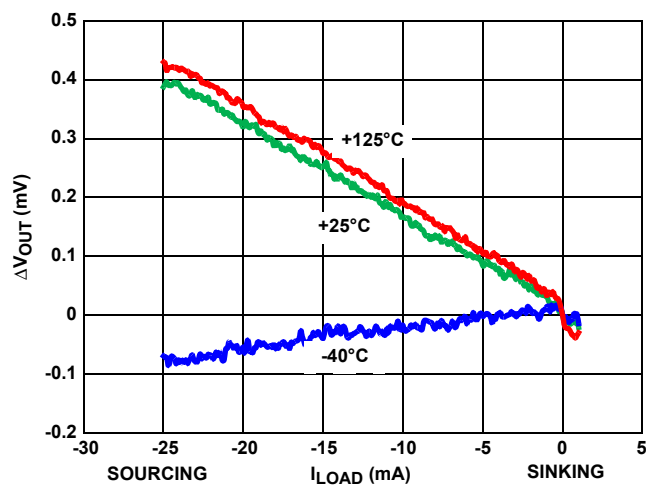


FIGURE 9. LOAD REGULATION OVER-TEMPERATURE

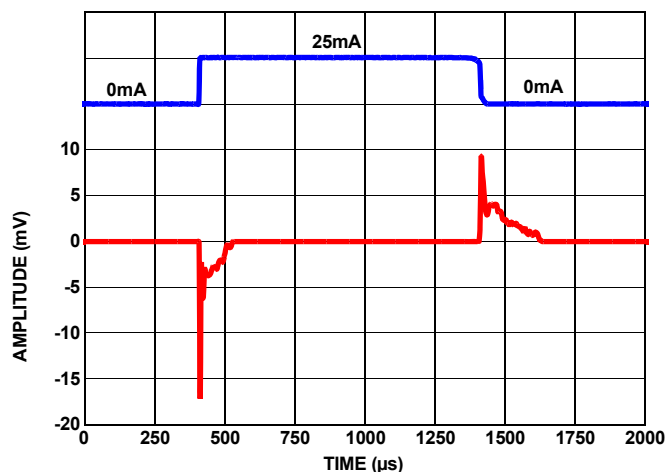


FIGURE 10. LOAD TRANSIENT RESPONSE AT 25mA LOAD AT 1μF

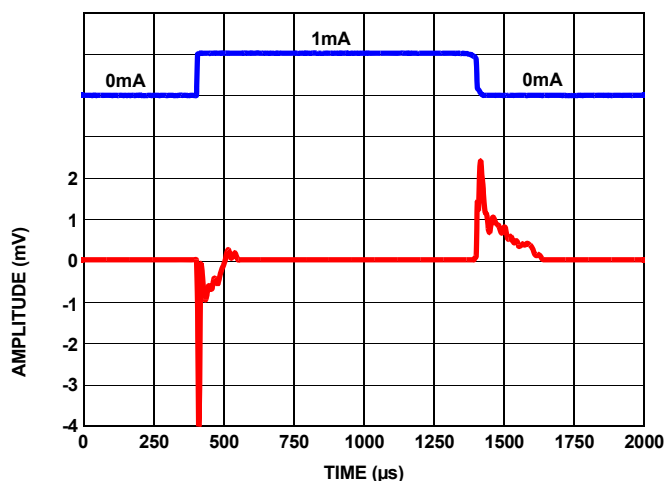


FIGURE 11. LOAD TRANSIENT RESPONSE AT 1mA LOAD AT 1μF

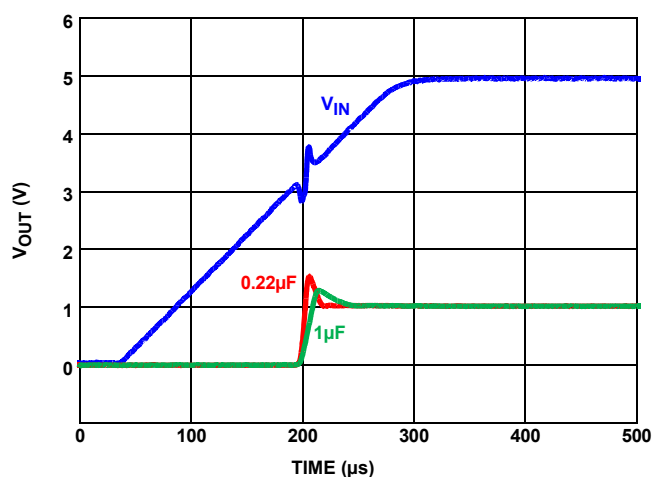


FIGURE 12. TURN-ON TIME

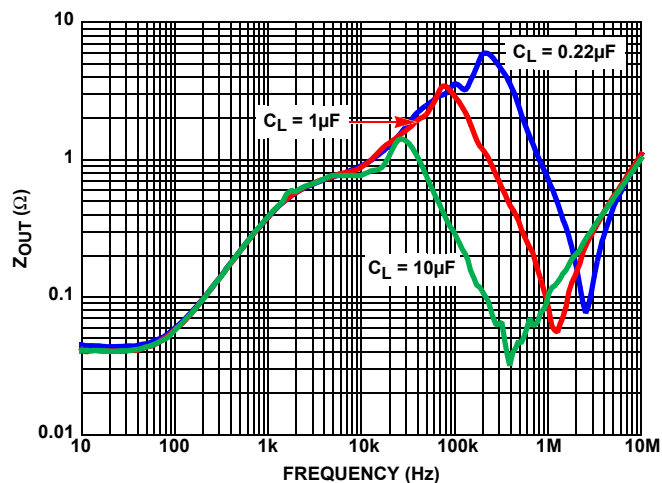
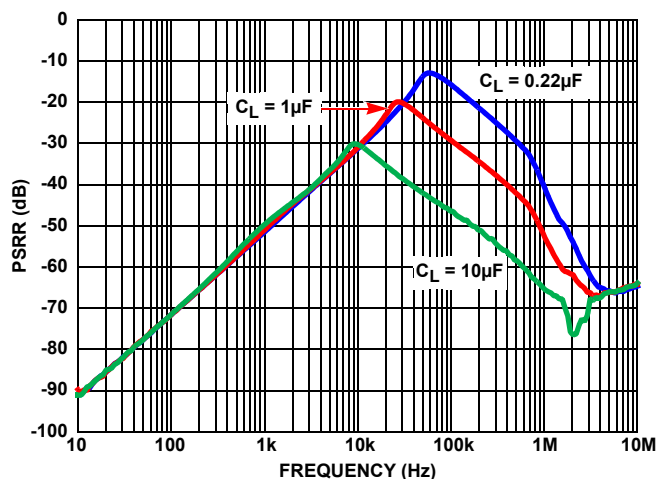
FIGURE 13.  $Z_{OUT}$  vs FREQUENCY

FIGURE 14. RIPPLE REJECTION AT DIFFERENT CAPACITIVE LOADS

## Typical Performance Characteristics Curves ( $V_{OUT} = 1.024V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

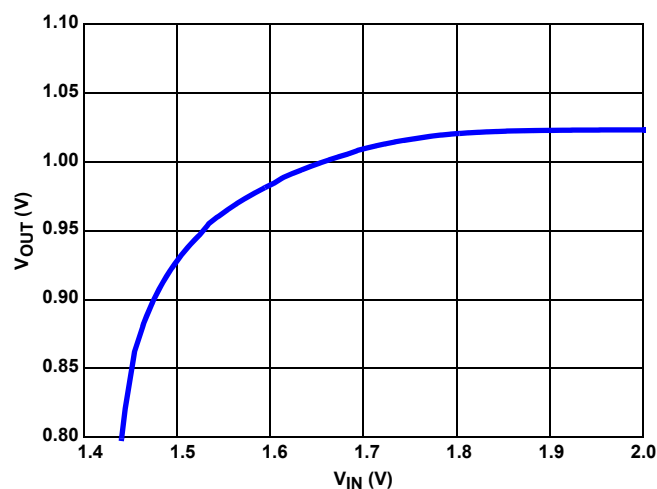


FIGURE 15. DROPOUT (10mA SOURCED LOAD)

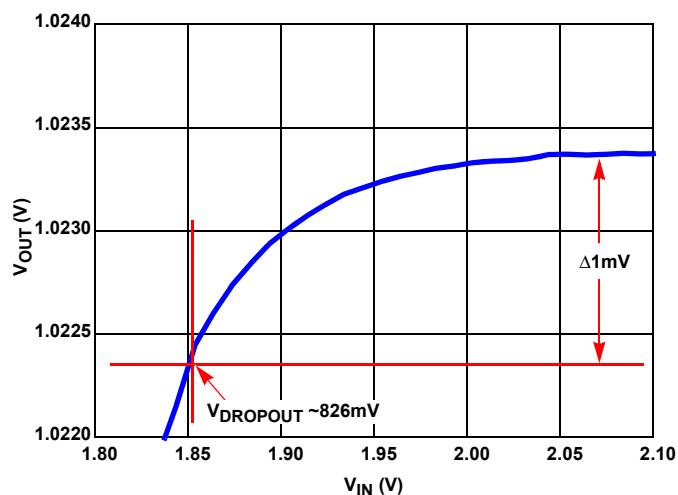


FIGURE 16. DROPOUT ZOOMED (10mA SOURCED LOAD)

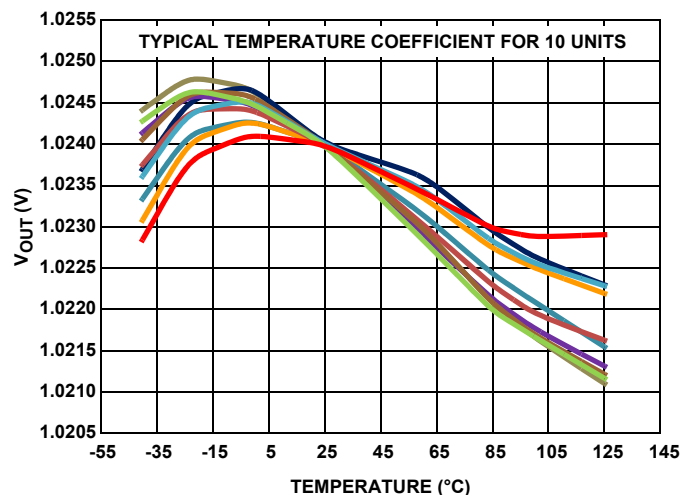
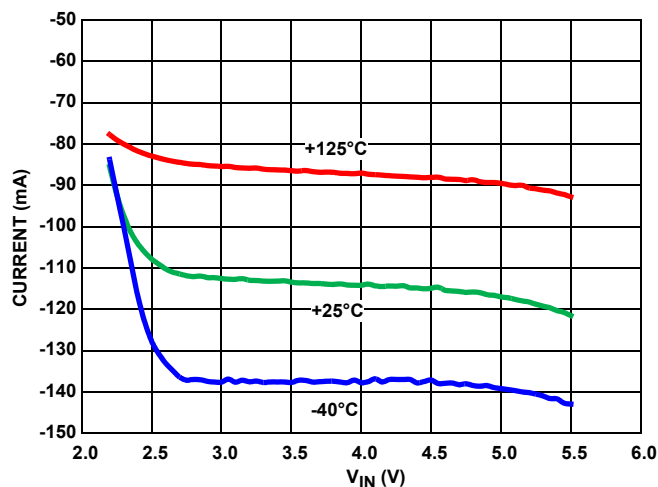
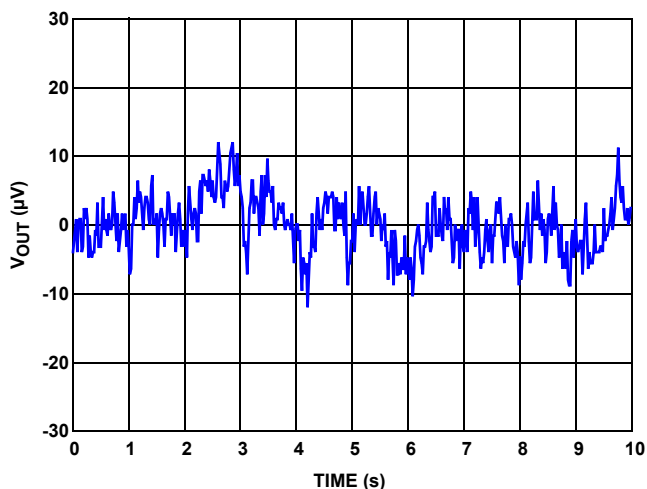
FIGURE 17.  $V_{OUT}$  vs TEMPERATURE

FIGURE 18. SHORT CIRCUIT TO GND

FIGURE 19.  $V_{OUT}$  vs NOISE, 0.1Hz TO 10Hz

## Typical Performance Characteristics Curves ( $V_{OUT} = 1.25V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified.

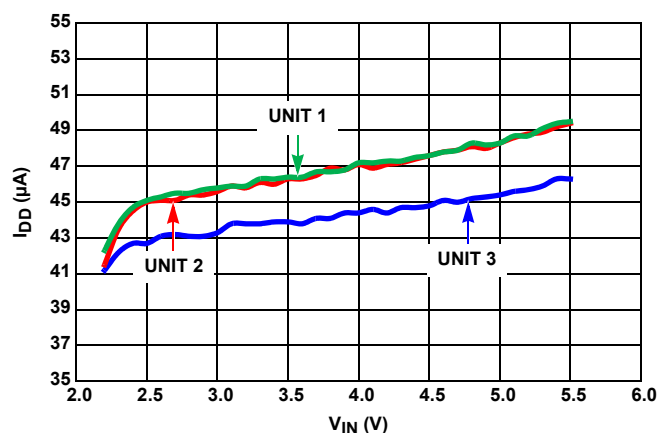
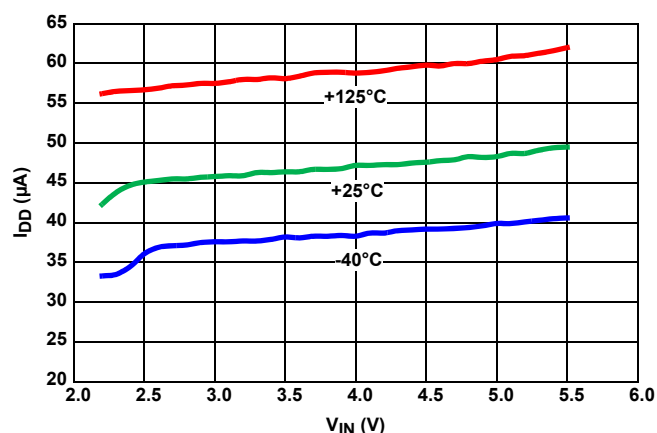
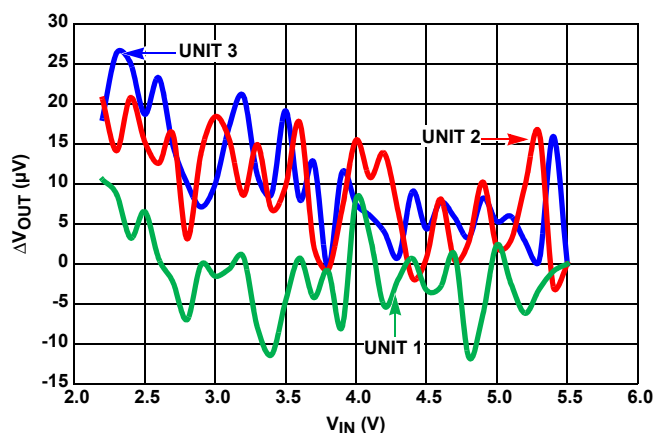
FIGURE 20.  $I_{IN}$  vs  $V_{IN}$ , THREE UNITSFIGURE 21.  $I_{IN}$  vs  $V_{IN}$ , OVER-TEMPERATURE

FIGURE 22. LINE REGULATION, THREE UNITS

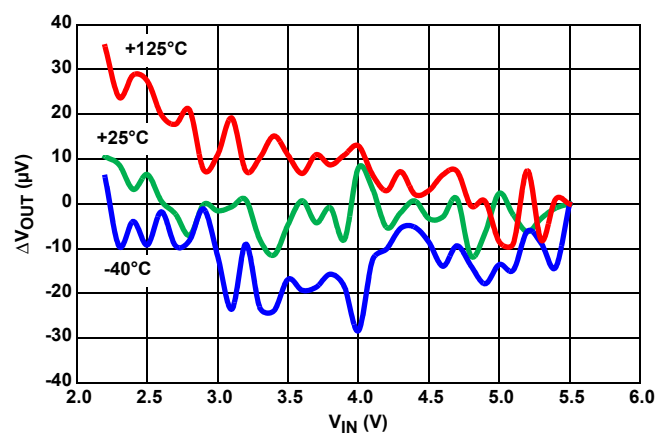
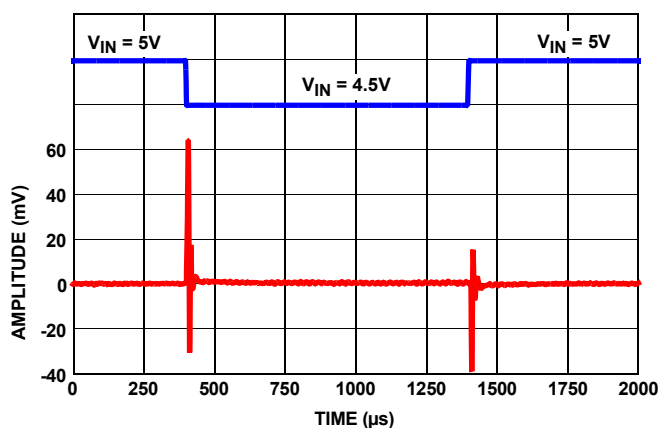
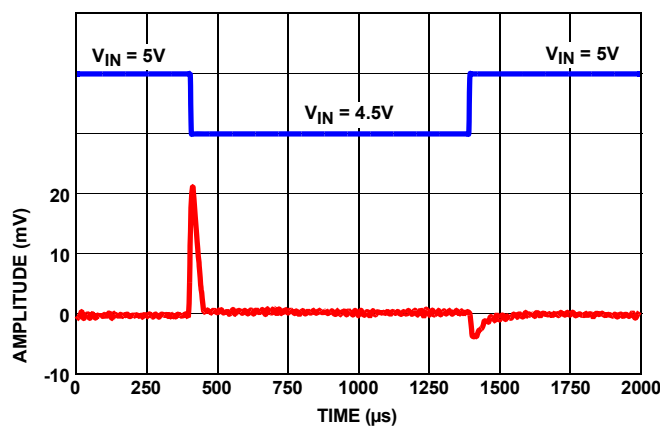


FIGURE 23. LINE REGULATION OVER-TEMPERATURE

FIGURE 24. LINE TRANSIENT RESPONSE WITH 0.1 $\mu F$  LOADFIGURE 25. LINE TRANSIENT RESPONSE WITH 10 $\mu F$  LOAD

## Typical Performance Characteristics Curves ( $V_{OUT} = 1.25V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

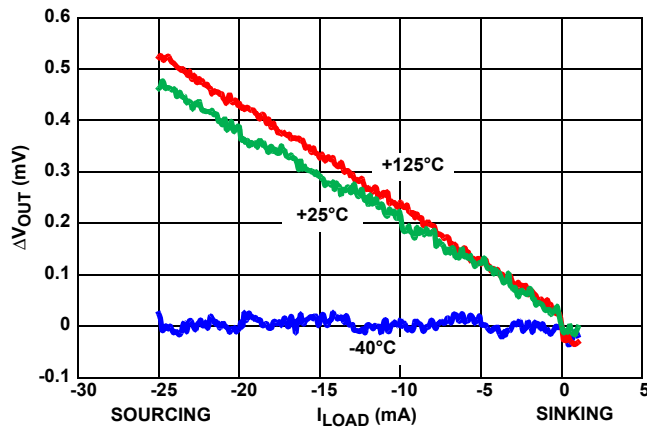


FIGURE 26. LOAD REGULATION OVER-TEMPERATURE

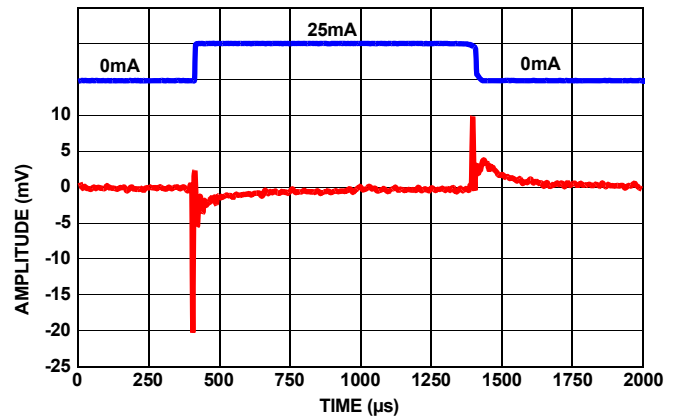
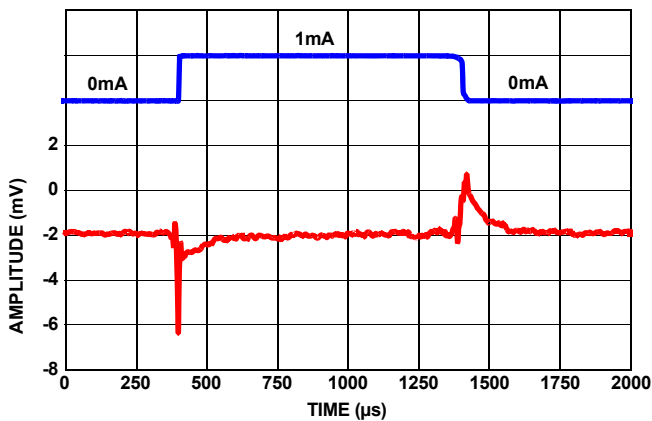
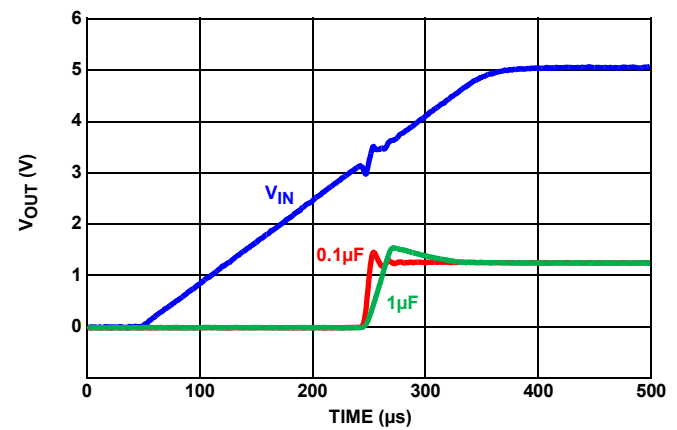
FIGURE 27. LOAD TRANSIENT RESPONSE AT 25mA LOAD AT 1 $\mu$ FFIGURE 28. LOAD TRANSIENT RESPONSE AT 1mA LOAD AT 1 $\mu$ F

FIGURE 29. TURN-ON TIME

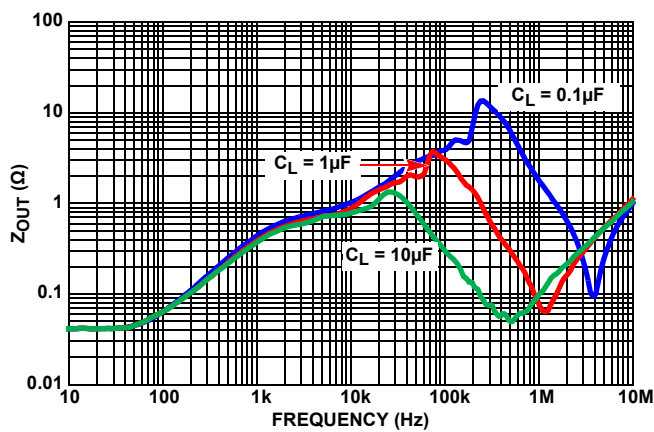
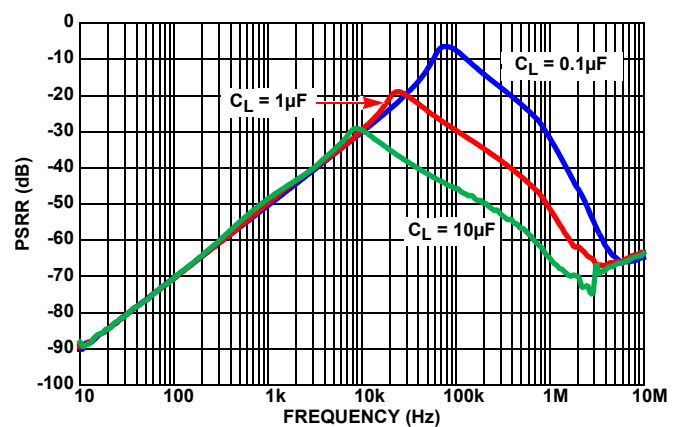
FIGURE 30.  $Z_{OUT}$  vs FREQUENCY

FIGURE 31. RIPPLE REJECTION AT DIFFERENT CAPACITIVE LOADS

## Typical Performance Characteristics Curves ( $V_{OUT} = 1.25V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

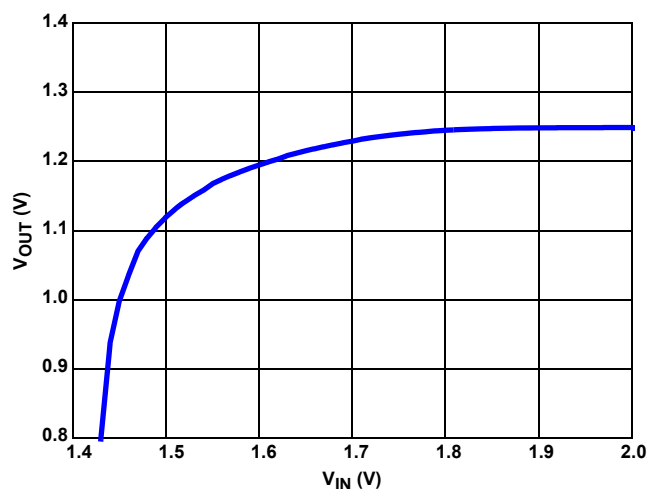


FIGURE 32. DROPOUT (10mA SOURCED LOAD)

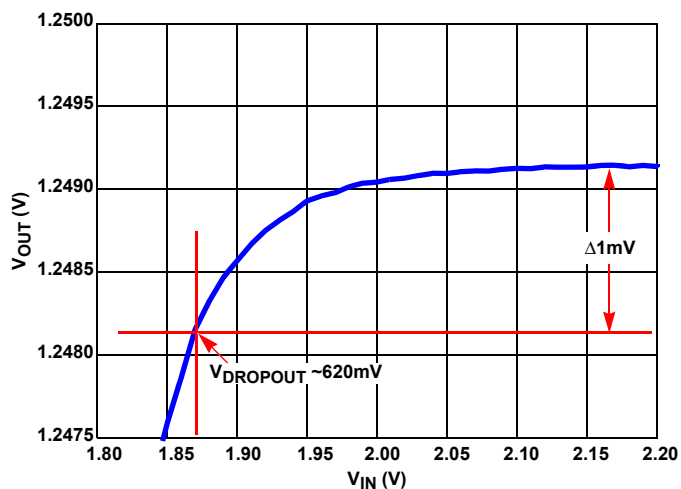


FIGURE 33. DROPOUT ZOOMED (10mA SOURCED LOAD)

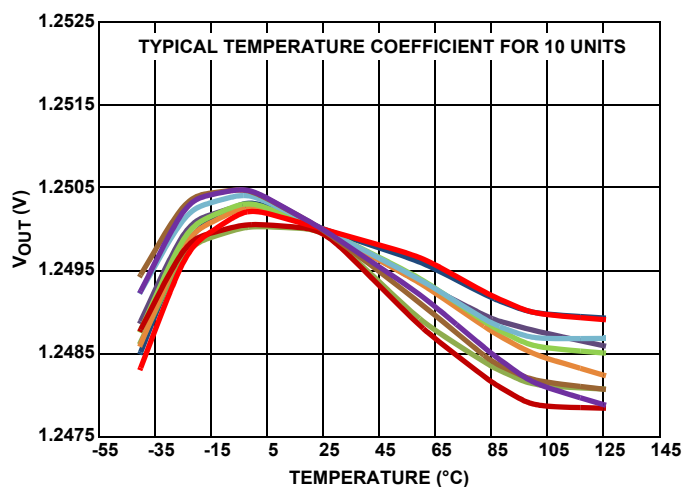
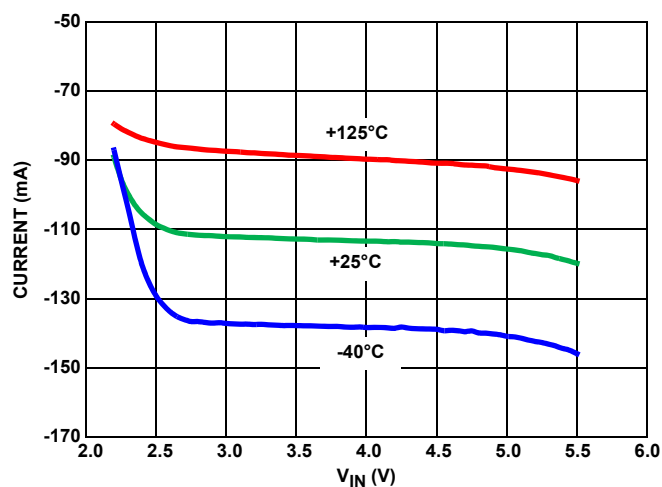
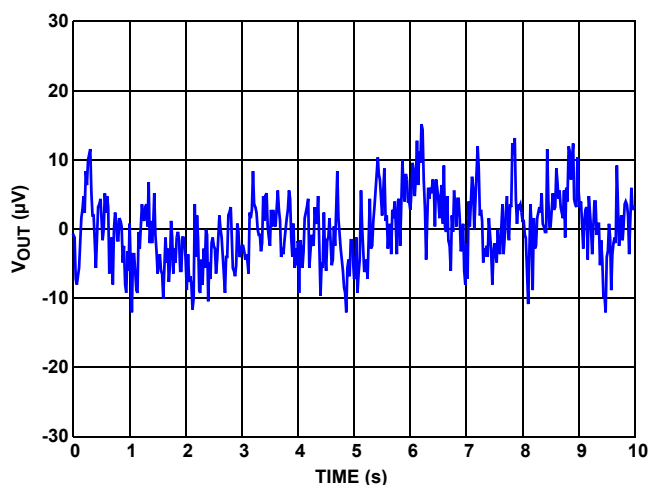
FIGURE 34.  $V_{OUT}$  vs TEMPERATURE

FIGURE 35. SHORT-CIRCUIT TO GND

FIGURE 36.  $V_{OUT}$  vs NOISE, 0.1Hz TO 10Hz

# Typical Performance Characteristics Curves ( $V_{OUT} = 1.5V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified.

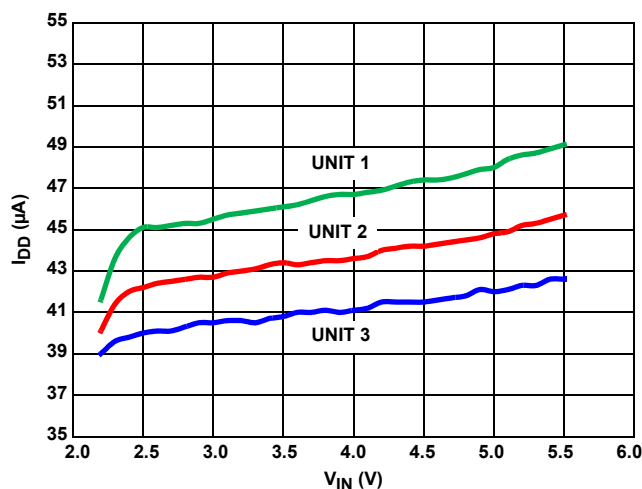
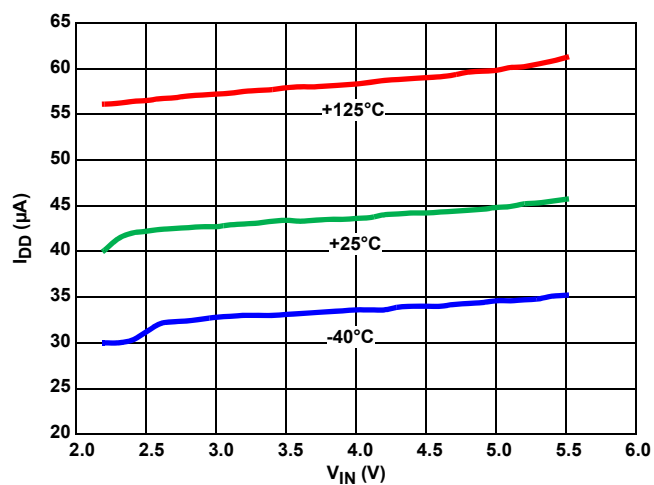
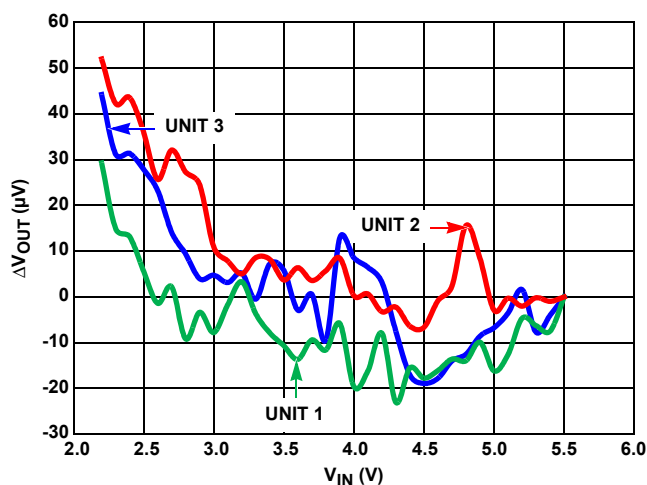
FIGURE 37.  $I_{IN}$  vs  $V_{IN}$ , THREE UNITSFIGURE 38.  $I_{IN}$  vs  $V_{IN}$ , OVER-TEMPERATURE

FIGURE 39. LINE REGULATION, THREE UNITS

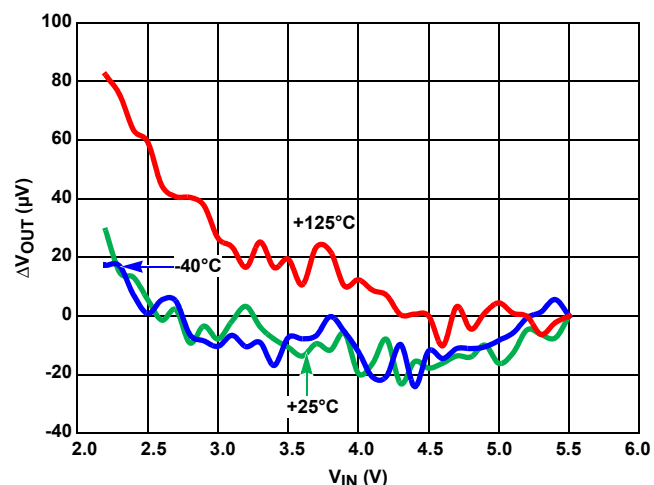


FIGURE 40. LINE REGULATION OVER-TEMPERATURE

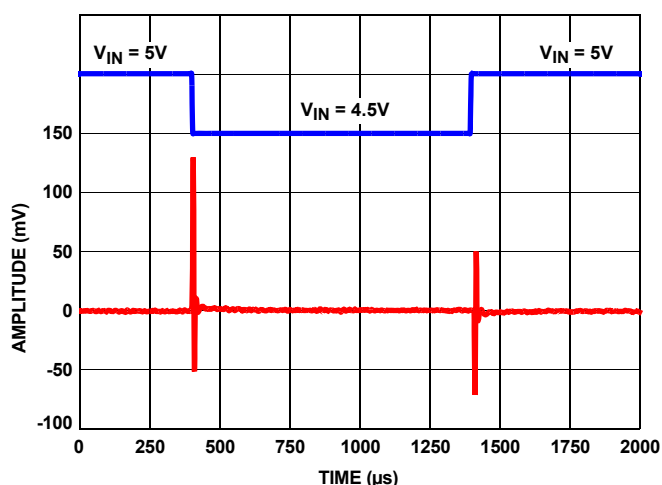


FIGURE 41. LINE TRANSIENT RESPONSE WITH 0.1µF LOAD

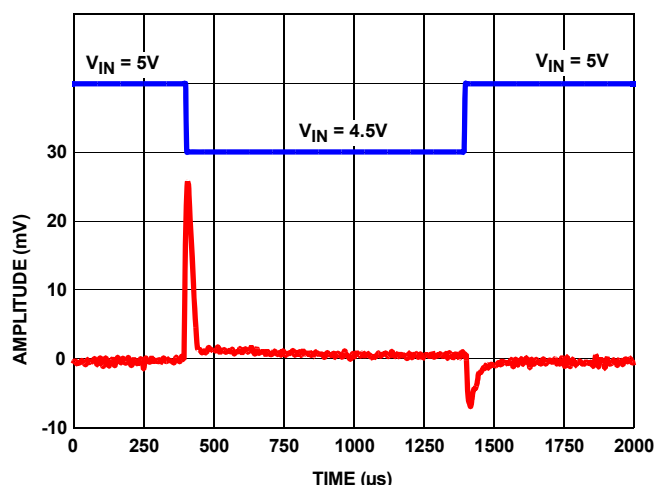


FIGURE 42. LINE TRANSIENT RESPONSE WITH 10µF LOAD

# Typical Performance Characteristics Curves ( $V_{OUT} = 1.5V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

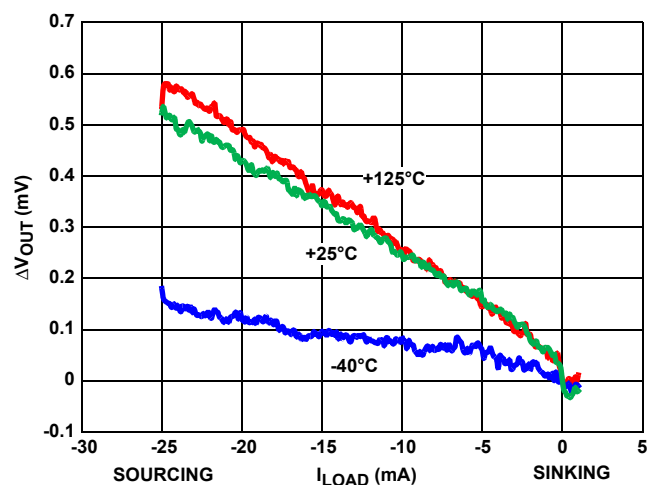


FIGURE 43. LOAD REGULATION OVER-TEMPERATURE

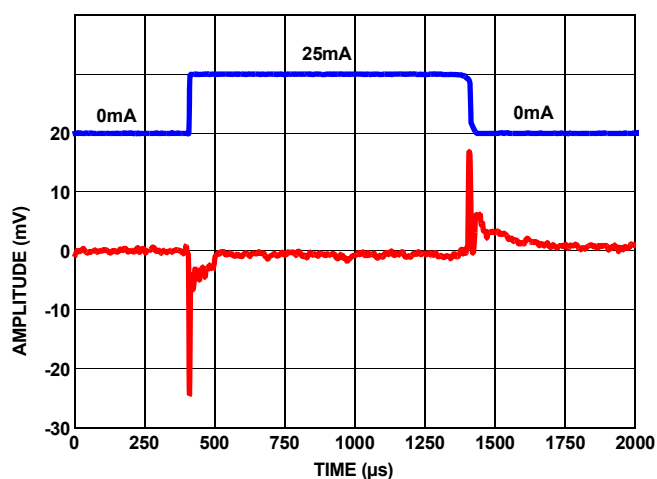
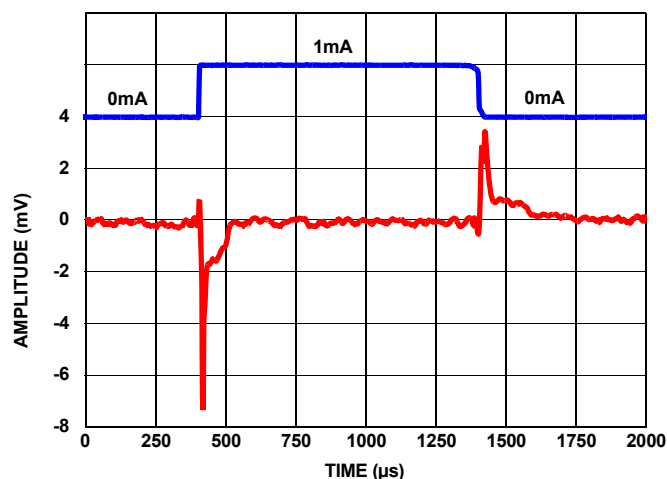
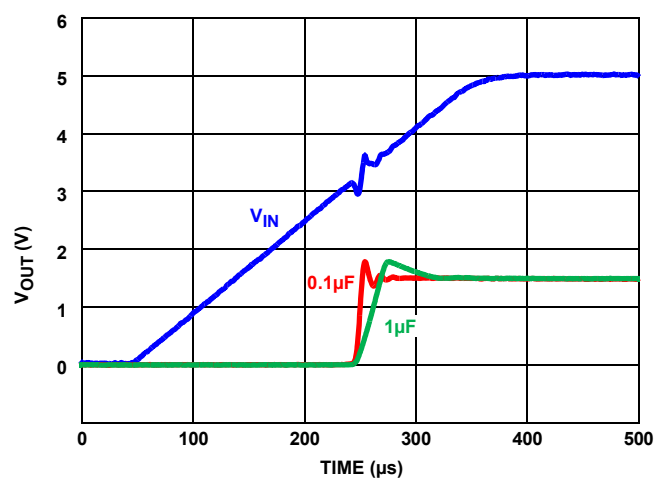
FIGURE 44. LOAD TRANSIENT RESPONSE AT 25mA LOAD AT 1 $\mu$ FFIGURE 45. LOAD TRANSIENT RESPONSE AT 1mA LOAD AT 1 $\mu$ F

FIGURE 46. TURN-ON TIME

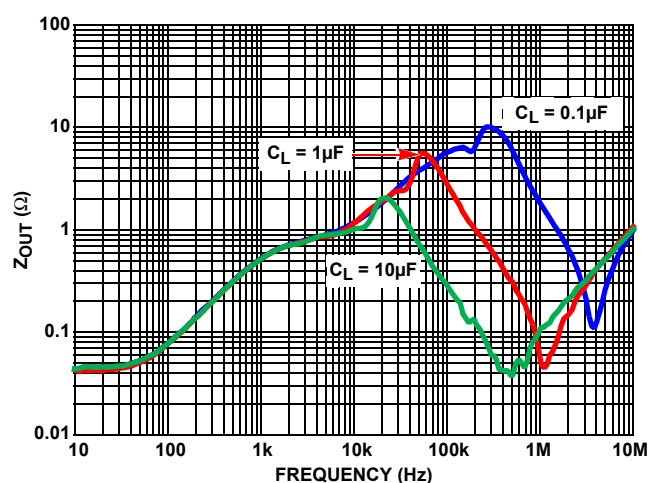
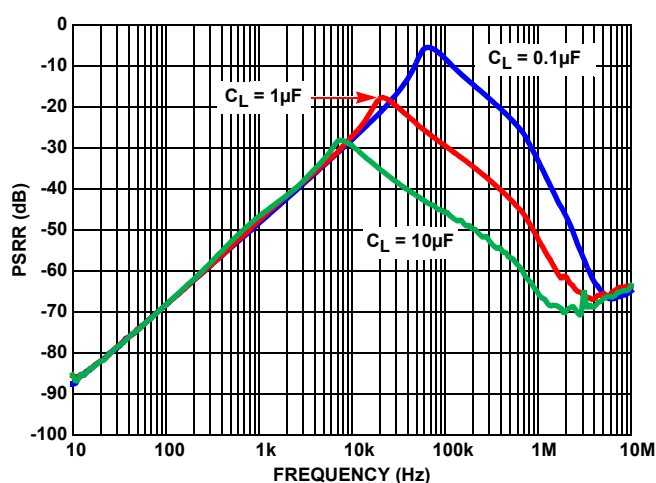
FIGURE 47.  $Z_{OUT}$  vs FREQUENCY

FIGURE 48. RIPPLE REJECTION AT DIFFERENT CAPACITIVE LOADS

## Typical Performance Characteristics Curves ( $V_{OUT} = 1.5V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

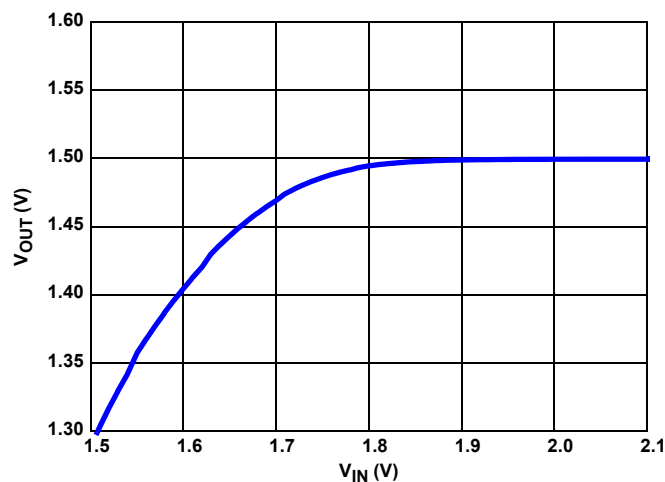


FIGURE 49. DROPOUT (10mA SOURCED LOAD)

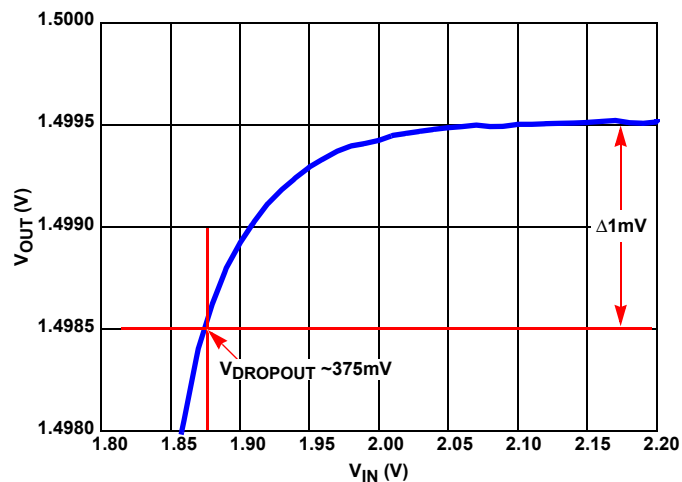


FIGURE 50. DROPOUT ZOOMED (10mA SOURCED LOAD)

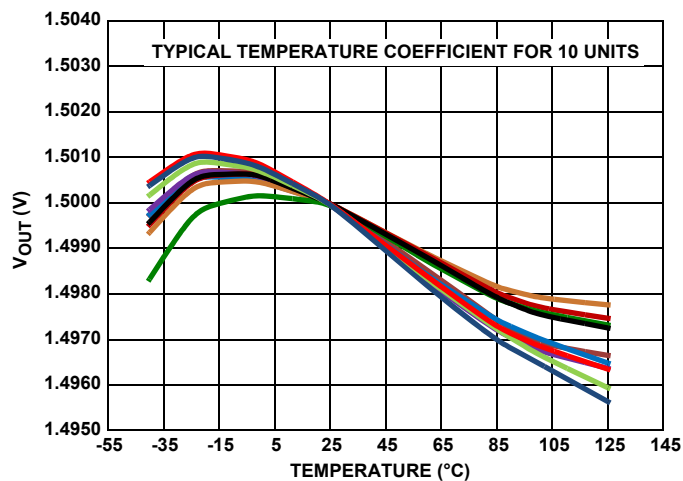
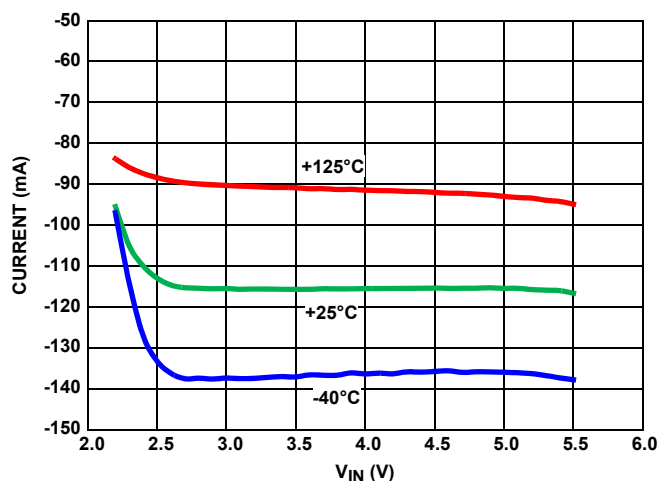
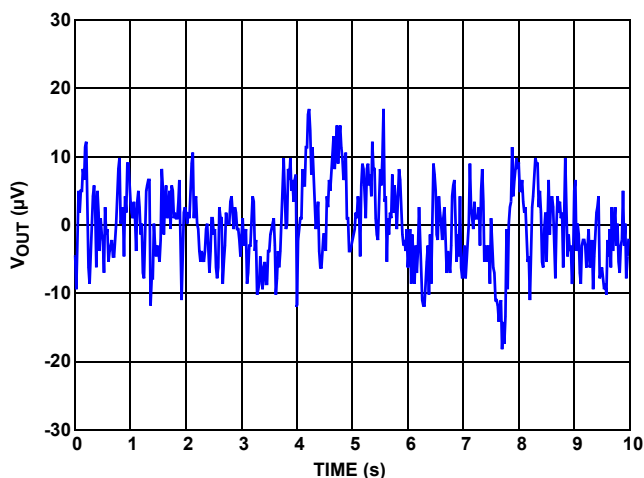
FIGURE 51.  $V_{OUT}$  vs TEMPERATURE

FIGURE 52. SHORT-CIRCUIT TO GND

FIGURE 53.  $V_{OUT}$  vs NOISE, 0.1Hz TO 10Hz

## Typical Performance Characteristics Curves ( $V_{OUT} = 2.048V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified.

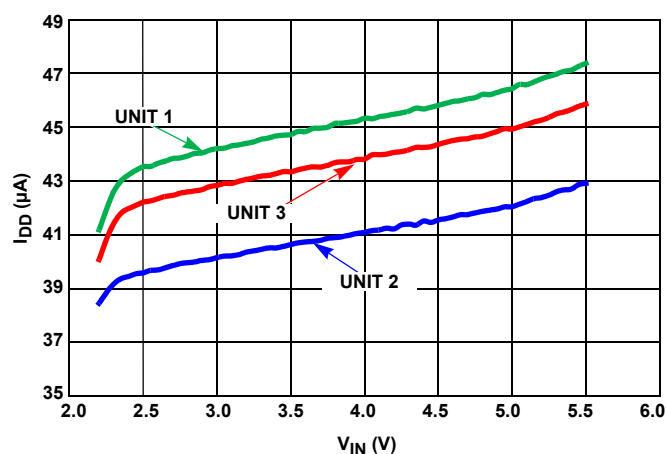
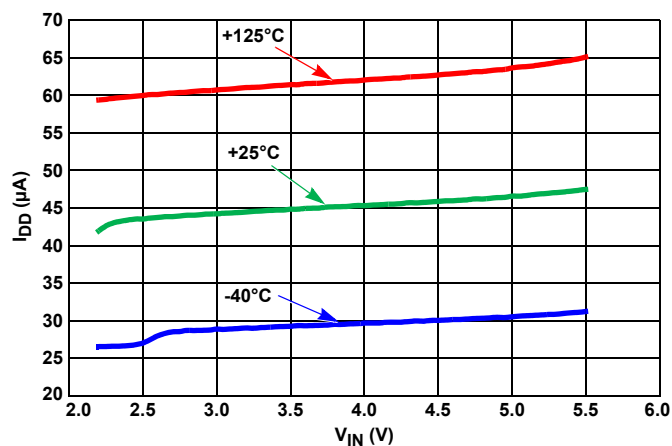
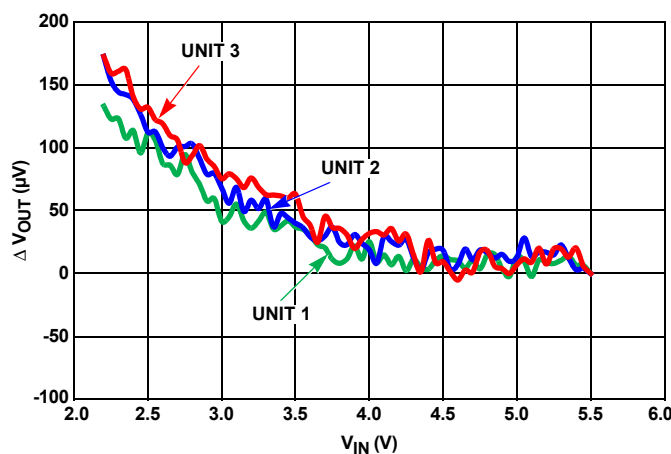
FIGURE 54.  $I_{IN}$  vs  $V_{IN}$ , THREE UNITSFIGURE 55.  $I_{IN}$  vs  $V_{IN}$ , OVER-TEMPERATURE

FIGURE 56. LINE REGULATION, THREE UNITS

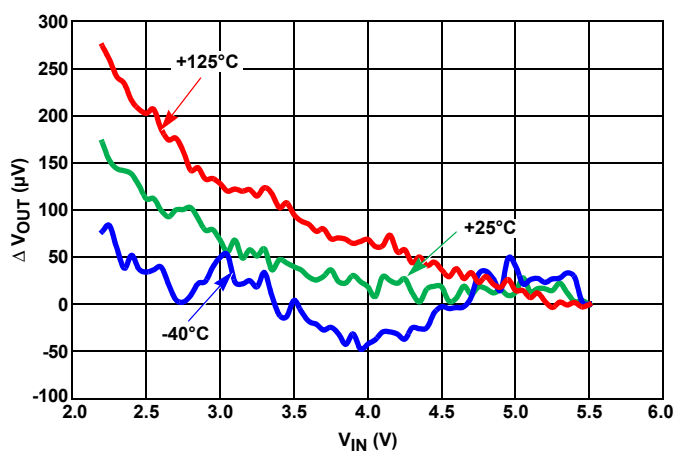
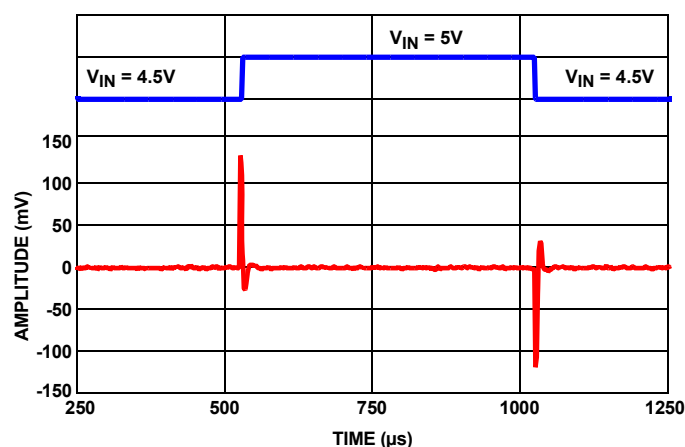
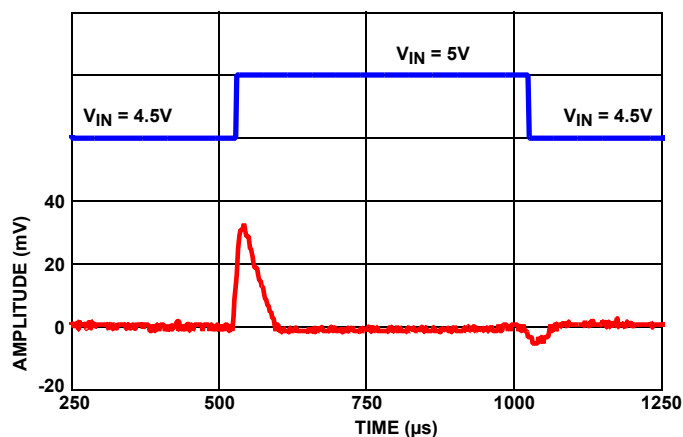


FIGURE 57. LINE REGULATION OVER-TEMPERATURE

FIGURE 58. LINE TRANSIENT RESPONSE WITH  $0.1\mu F$  LOADFIGURE 59. LINE TRANSIENT RESPONSE WITH  $10\mu F$  LOAD

## Typical Performance Characteristics Curves ( $V_{OUT} = 2.048V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

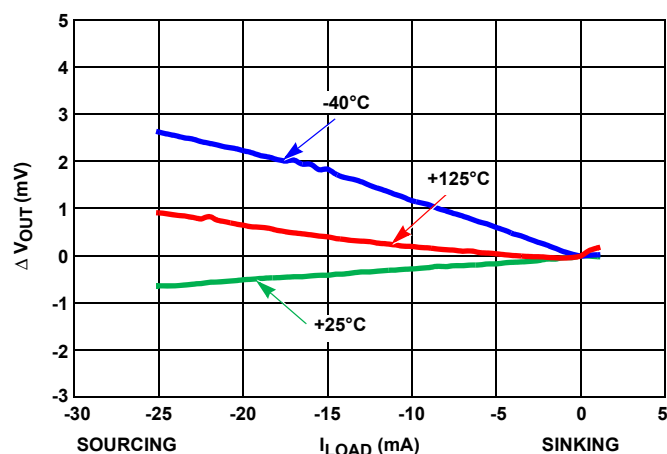


FIGURE 60. LOAD REGULATION OVER-TEMPERATURE

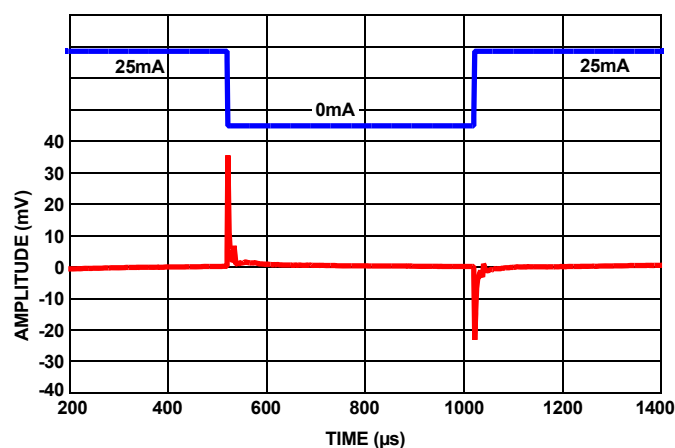
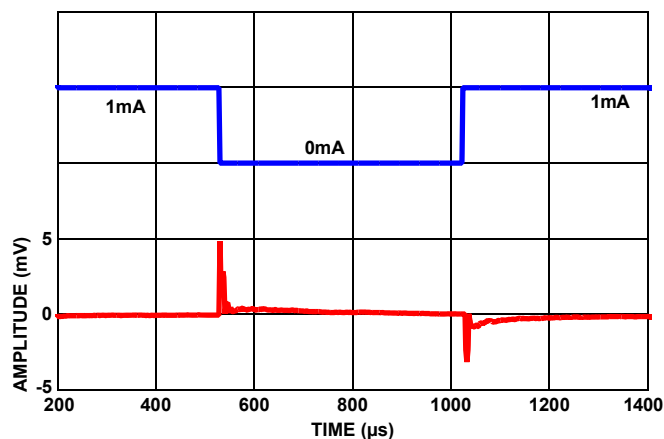
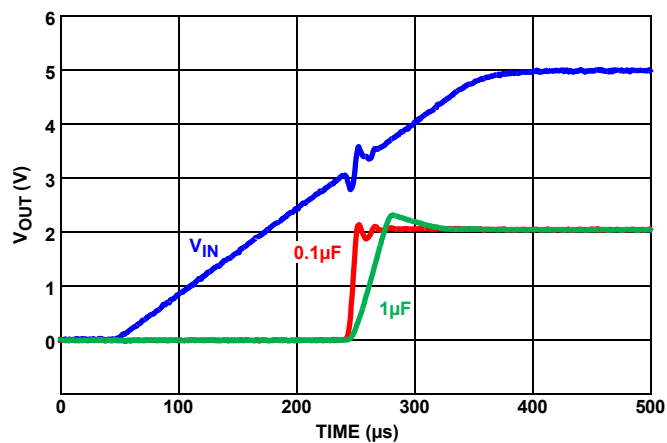
FIGURE 61. LOAD TRANSIENT RESPONSE AT 25mA LOAD AT 1 $\mu F$ FIGURE 62. LOAD TRANSIENT RESPONSE AT 1mA LOAD AT 1 $\mu F$ 

FIGURE 63. TURN-ON TIME

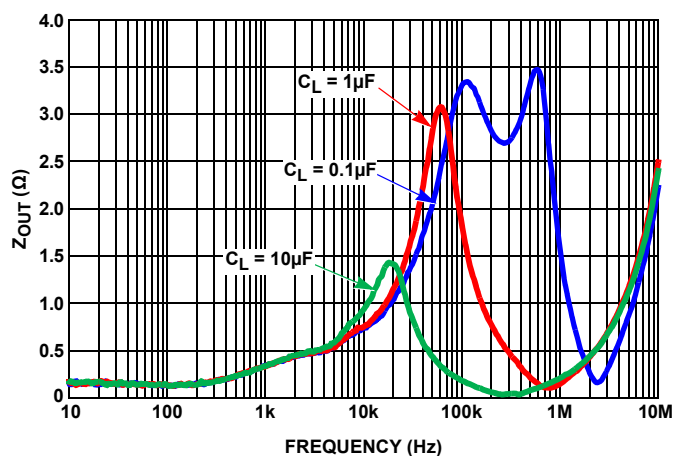
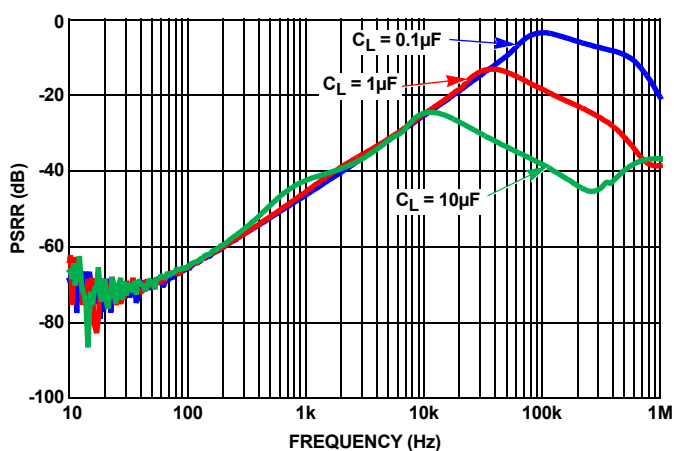
FIGURE 64.  $Z_{OUT}$  vs FREQUENCY

FIGURE 65. RIPPLE REJECTION AT DIFFERENT CAPACITIVE LOADS

## Typical Performance Characteristics Curves ( $V_{OUT} = 2.048V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

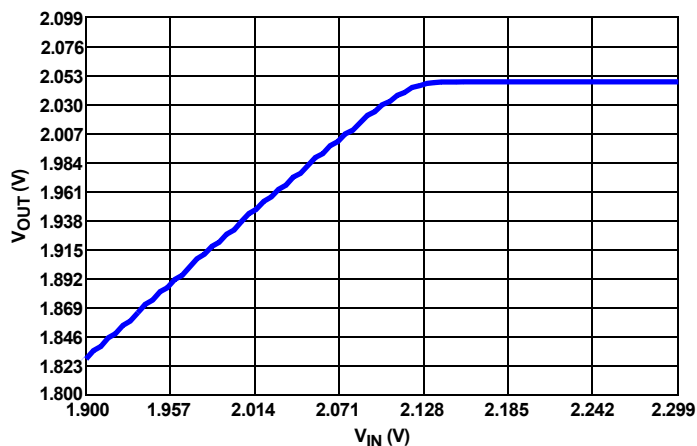


FIGURE 66. DROPOUT (10mA SOURCED LOAD)

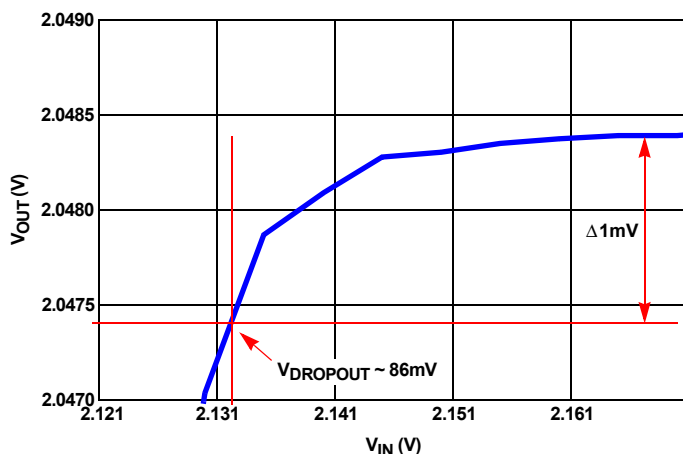


FIGURE 67. DROPOUT ZOOMED (10mA SOURCED LOAD)

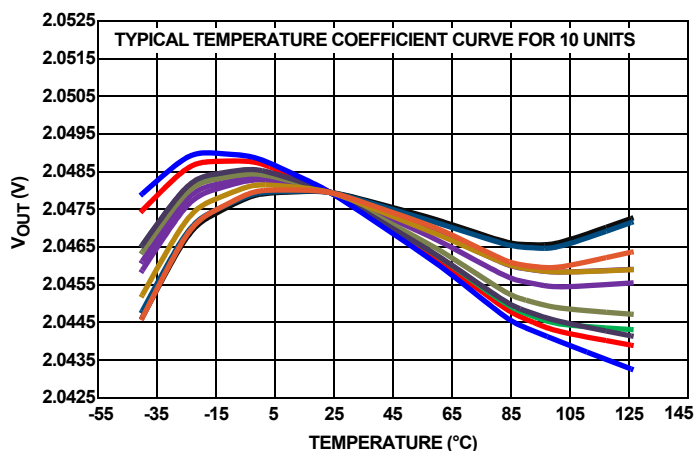
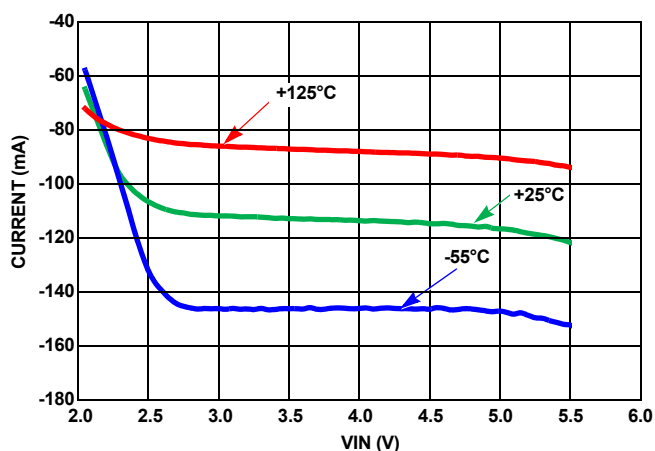
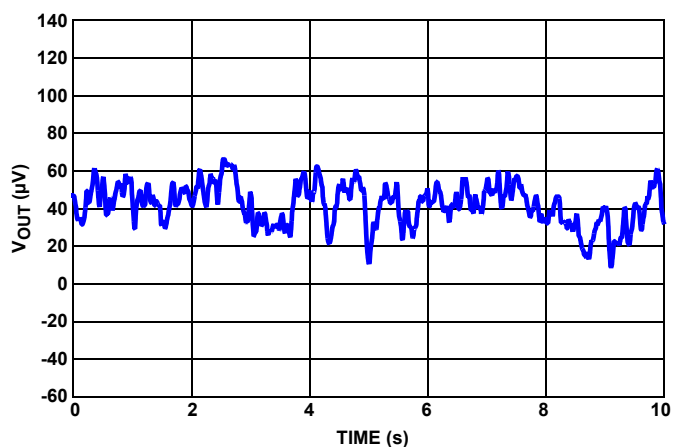
FIGURE 68.  $V_{OUT}$  vs TEMPERATURE

FIGURE 69. SHORT-CIRCUIT TO GND

FIGURE 70.  $V_{OUT}$  vs NOISE, 0.1Hz TO 10Hz

## Typical Performance Characteristics Curves ( $V_{OUT} = 2.5V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified.

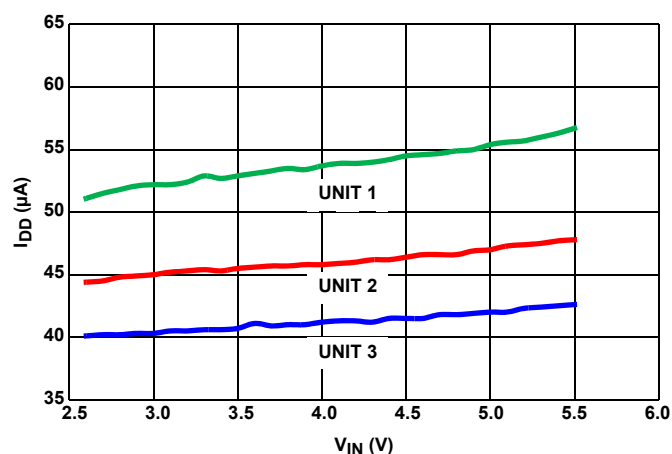
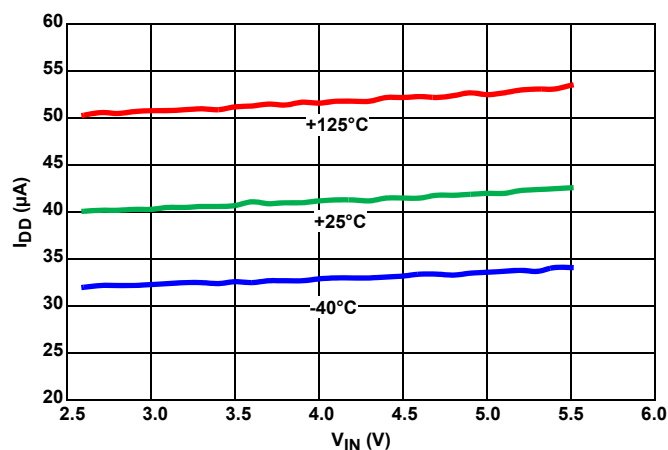
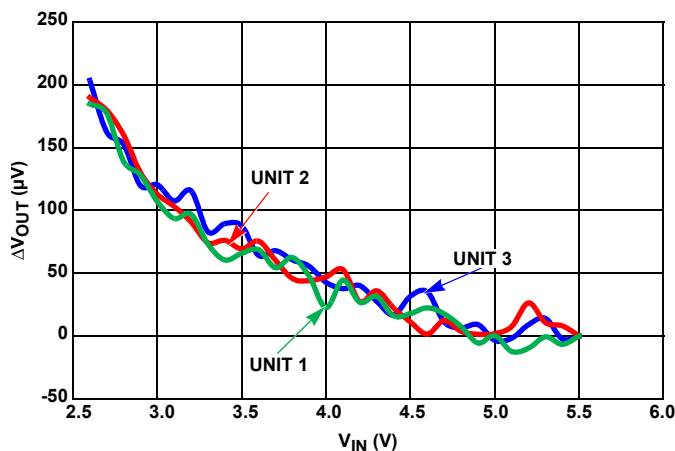
FIGURE 71.  $I_{IN}$  vs  $V_{IN}$ , THREE UNITSFIGURE 72.  $I_{IN}$  vs  $V_{IN}$ , OVER-TEMPERATURE

FIGURE 73. LINE REGULATION, THREE UNITS

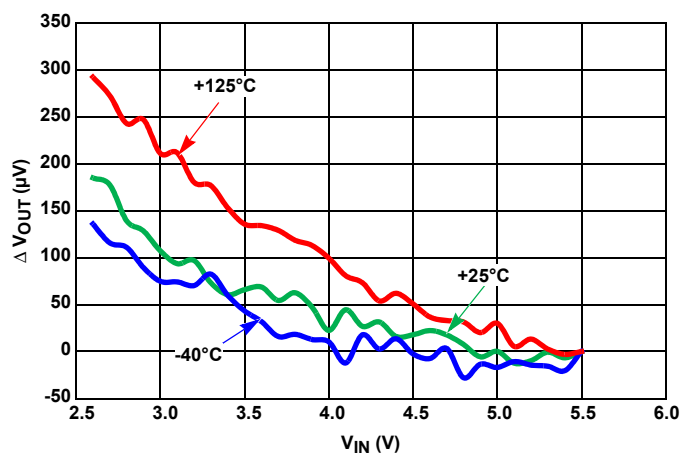


FIGURE 74. LINE REGULATION OVER-TEMPERATURE

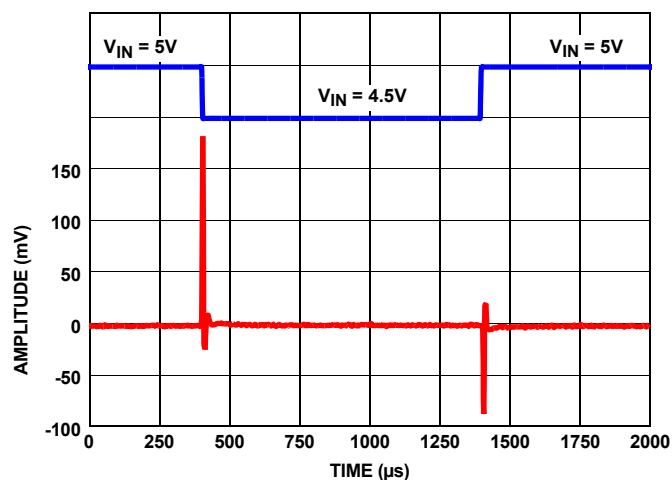


FIGURE 75. LINE TRANSIENT RESPONSE WITH 0.1µF LOAD

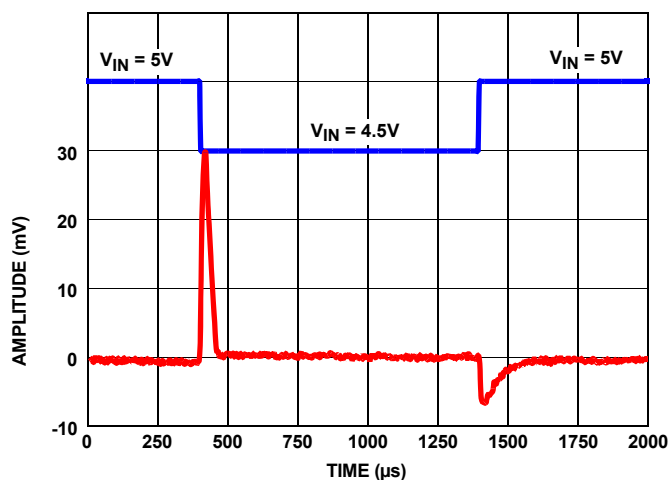


FIGURE 76. LINE TRANSIENT RESPONSE WITH 10µF LOAD

## Typical Performance Characteristics Curves ( $V_{OUT} = 2.5V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

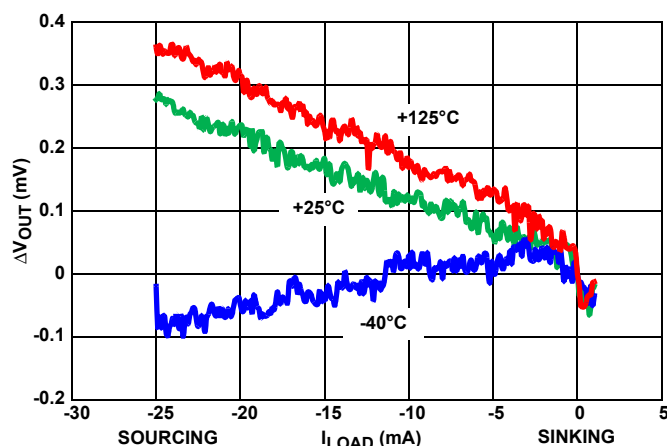


FIGURE 77. LOAD REGULATION OVER-TEMPERATURE

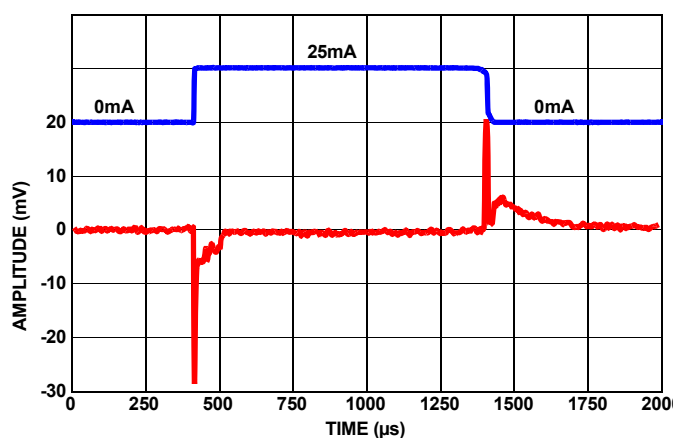


FIGURE 78. LOAD TRANSIENT RESPONSE AT 25mA LOAD AT 1μF

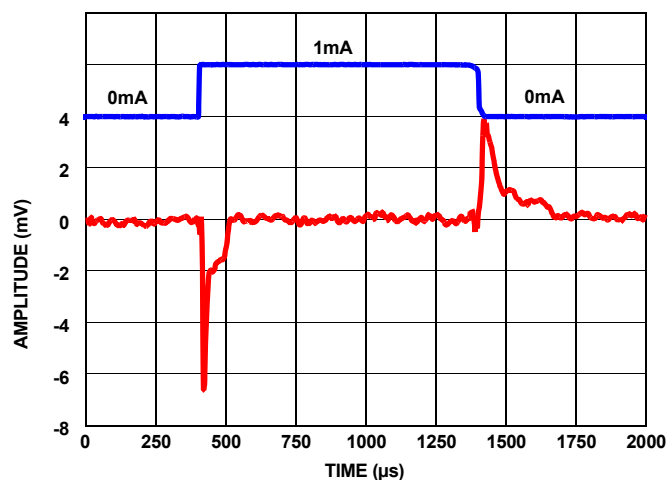


FIGURE 79. LOAD TRANSIENT RESPONSE AT 1mA LOAD AT 1μF

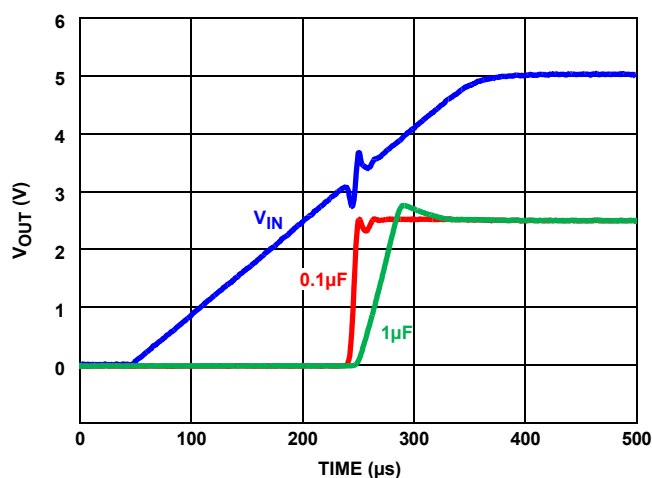


FIGURE 80. TURN-ON TIME

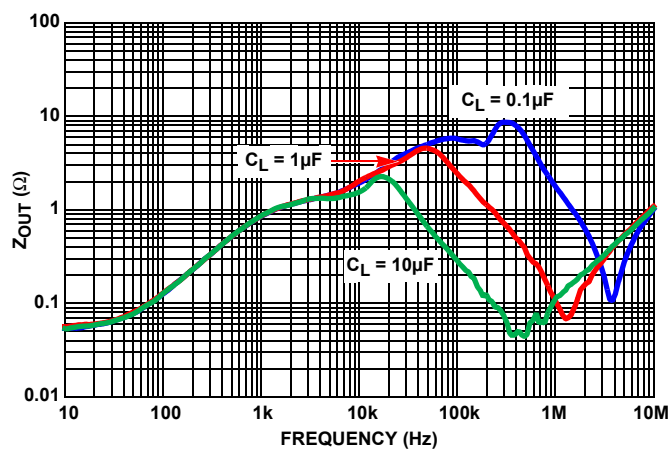
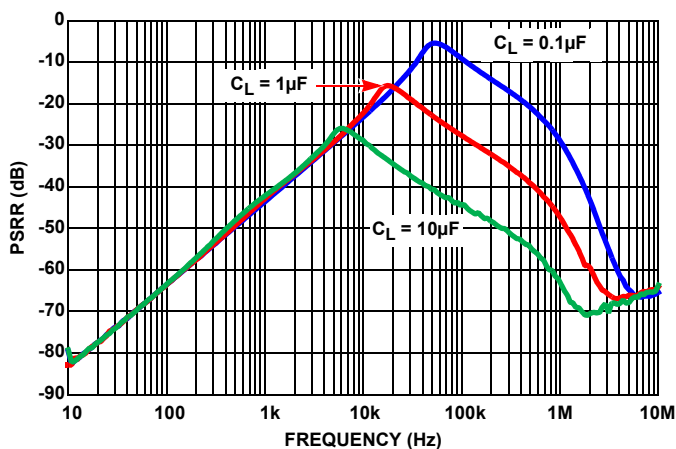
FIGURE 81.  $Z_{OUT}$  vs FREQUENCY

FIGURE 82. RIPPLE REJECTION AT DIFFERENT CAPACITIVE LOADS

## Typical Performance Characteristics Curves ( $V_{OUT} = 2.5V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

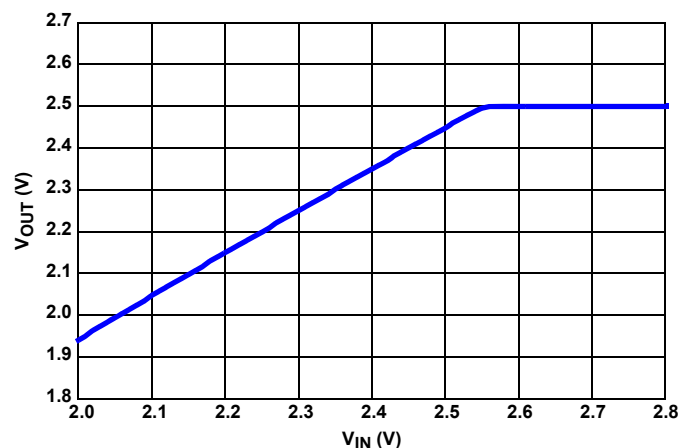


FIGURE 83. DROPOUT (10mA SOURCED LOAD)

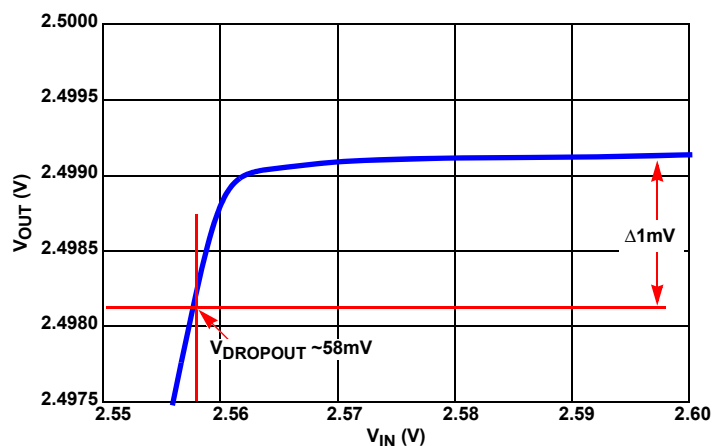


FIGURE 84. DROPOUT ZOOMED (10mA SOURCED LOAD)

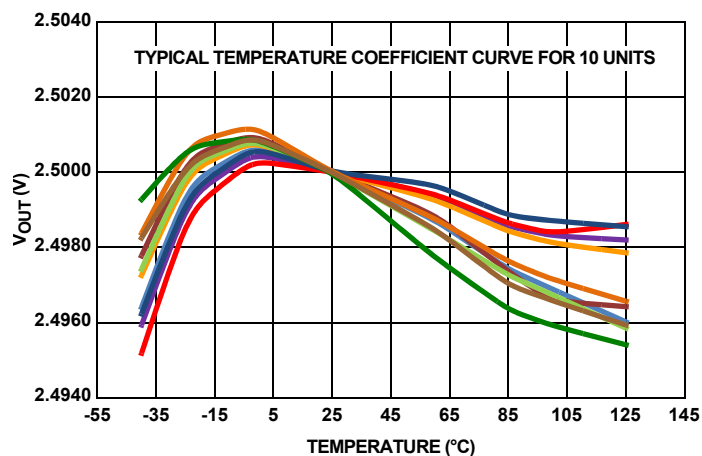
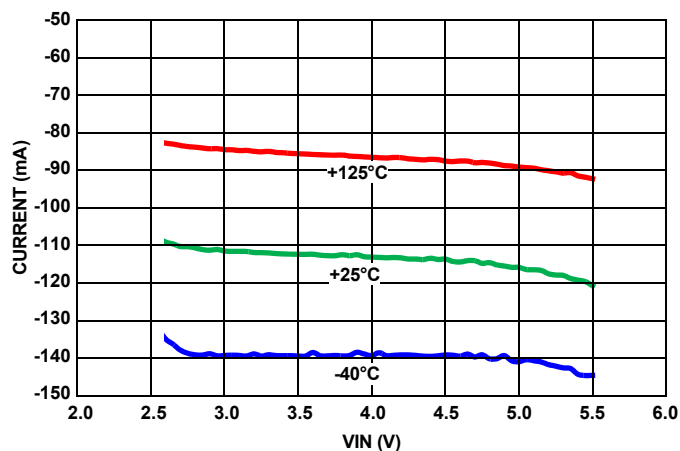
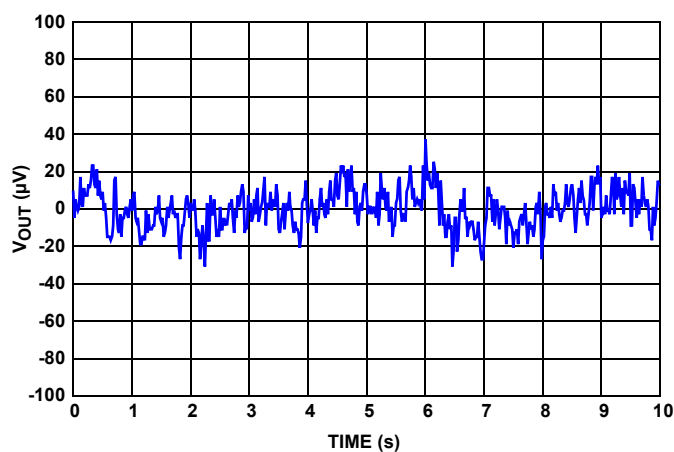
FIGURE 85.  $V_{OUT}$  vs TEMPERATURE

FIGURE 86. SHORT-CIRCUIT TO GND

FIGURE 87.  $V_{OUT}$  vs NOISE, 0.1Hz TO 10Hz

## Typical Performance Characteristics Curves ( $V_{OUT} = 3.0V$ ) $V_{IN} = 5.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified.

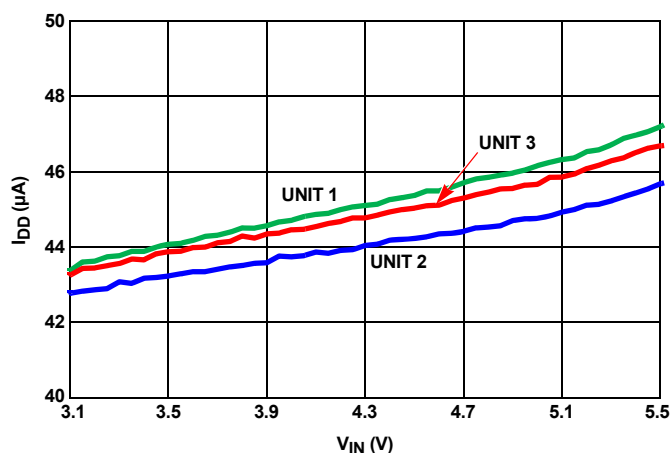
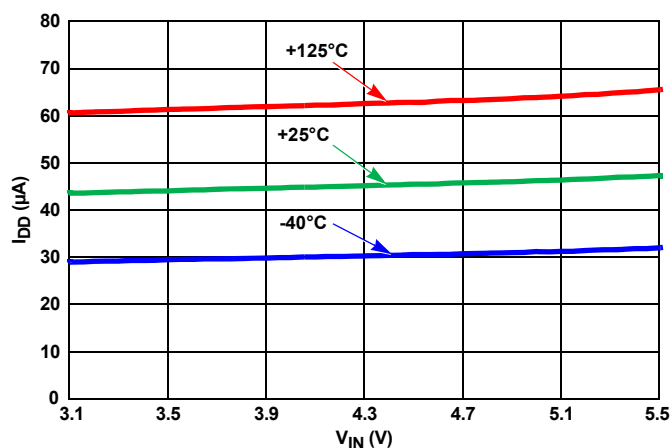
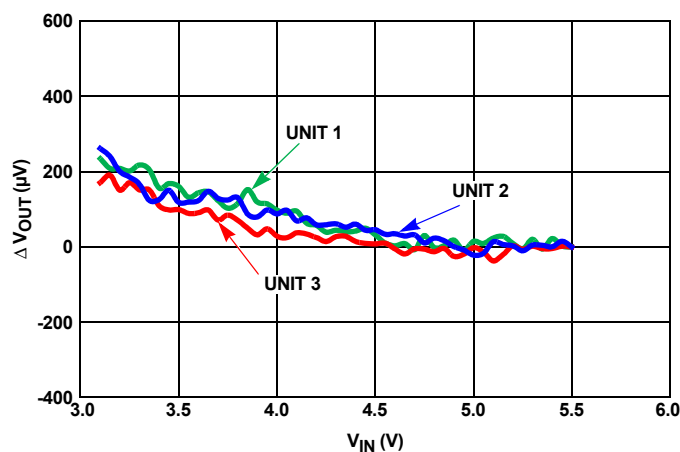
FIGURE 88.  $I_{IN}$  vs  $V_{IN}$ , THREE UNITSFIGURE 89.  $I_{IN}$  vs  $V_{IN}$ , OVER-TEMPERATURE

FIGURE 90. LINE REGULATION, THREE UNITS

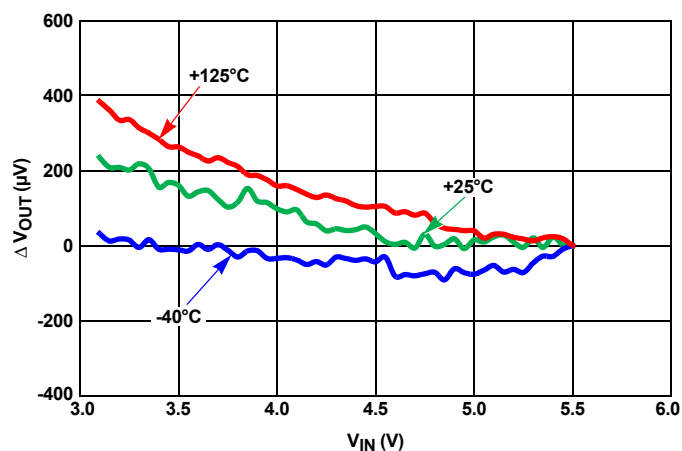
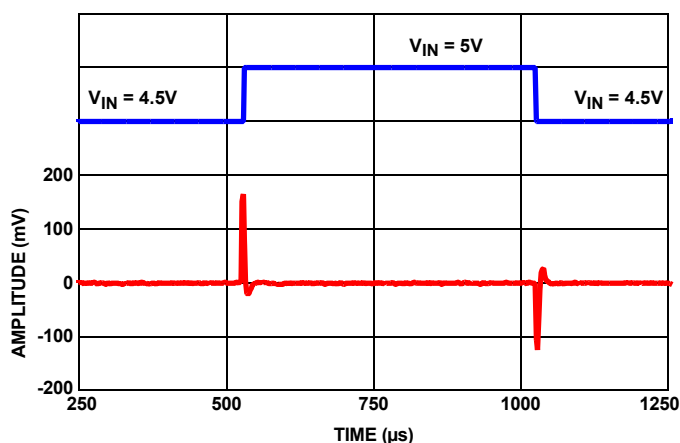
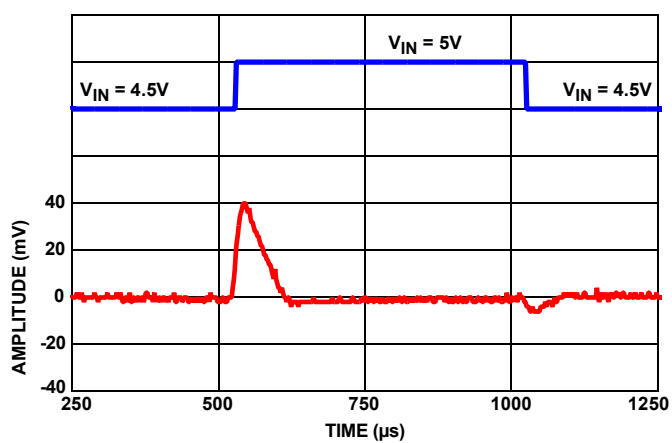


FIGURE 91. LINE REGULATION OVER-TEMPERATURE

FIGURE 92. LINE TRANSIENT WITH  $0.1\mu F$  LOADFIGURE 93. LINE TRANSIENT RESPONSE WITH  $10\mu F$  LOAD

# Typical Performance Characteristics Curves ( $V_{OUT} = 3.0V$ ) $V_{IN} = 5.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

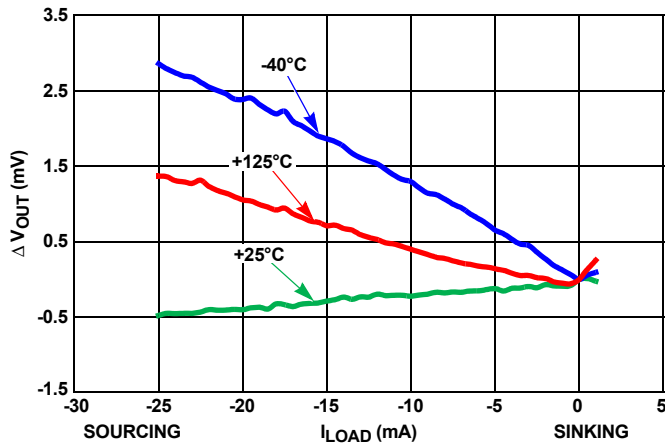


FIGURE 94. LOAD REGULATION OVER-TEMPERATURE

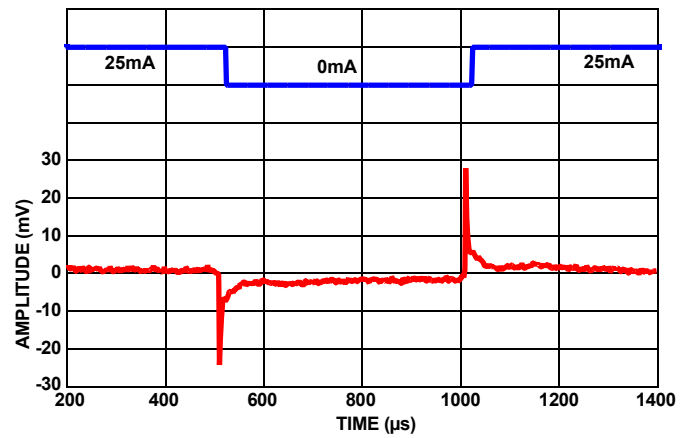


FIGURE 95. LOAD TRANSIENT RESPONSE AT 25mA LOAD AT 1μF

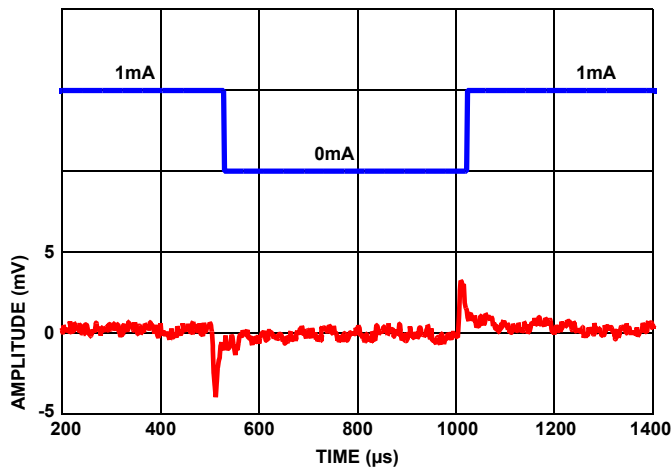


FIGURE 96. LOAD TRANSIENT RESPONSE AT 1mA LOAD AT 1μF

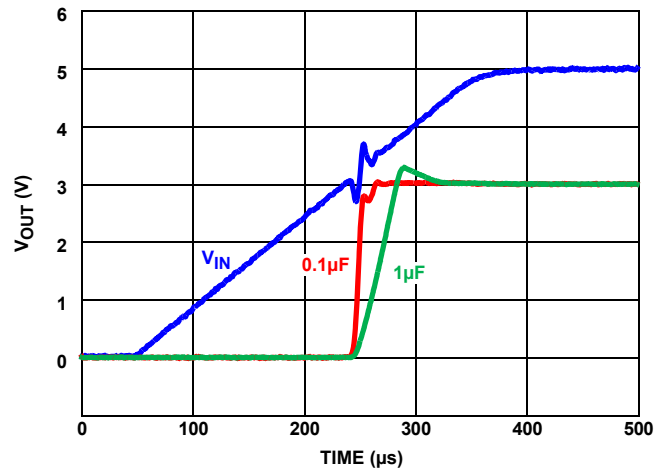


FIGURE 97. TURN-ON TIME

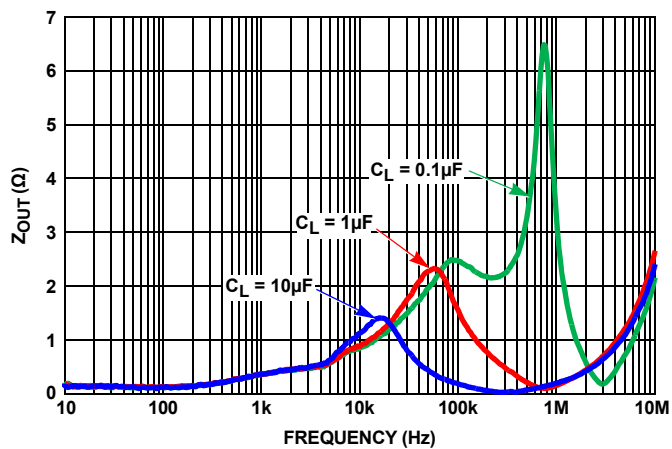
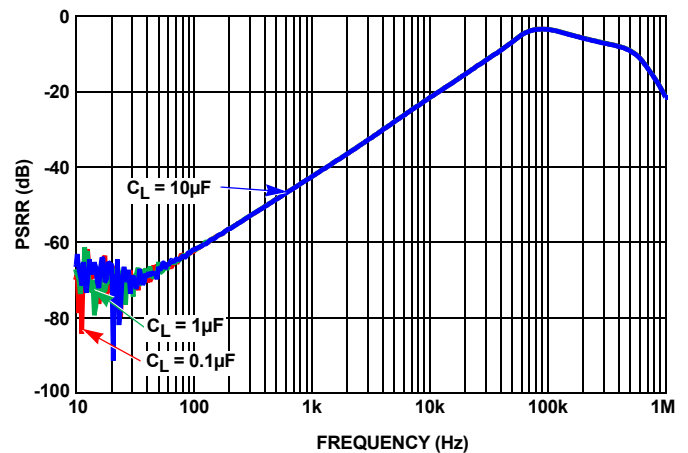
FIGURE 98.  $Z_{OUT}$  vs FREQUENCY

FIGURE 99. RIPPLE REJECTION AT DIFFERENT CAPACITIVE LOADS

## Typical Performance Characteristics Curves ( $V_{OUT} = 3.0V$ ) $V_{IN} = 5.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

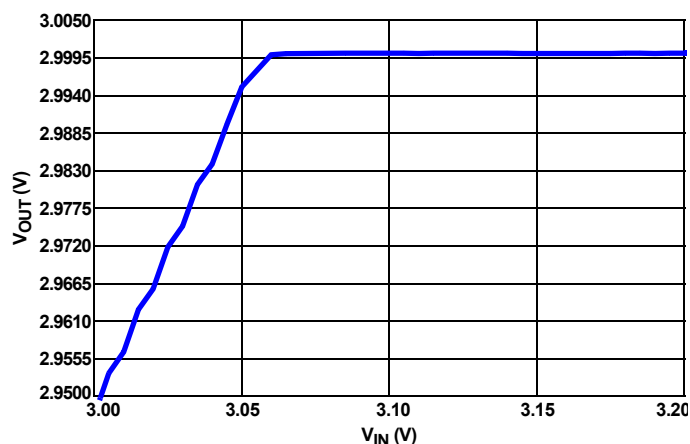


FIGURE 100. DROPOUT (10mA SOURCED LOAD)

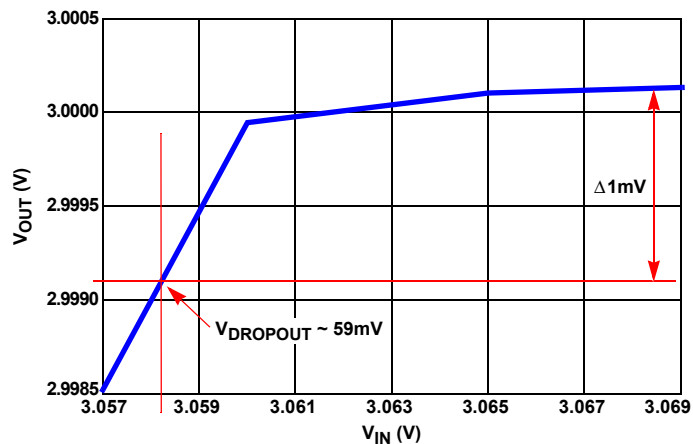


FIGURE 101. DROPOUT ZOOMED (10mA SOURCED LOAD)

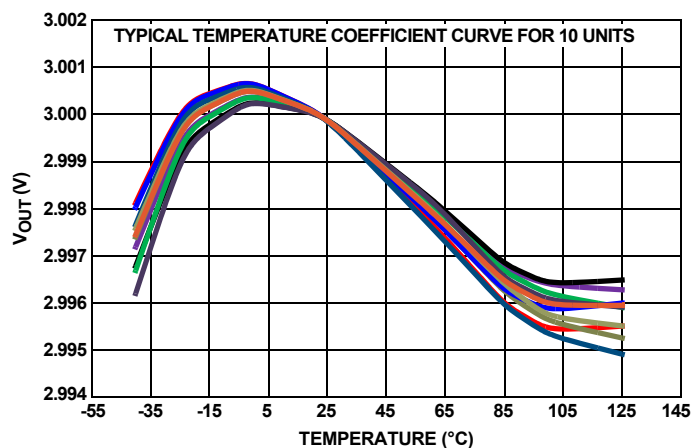
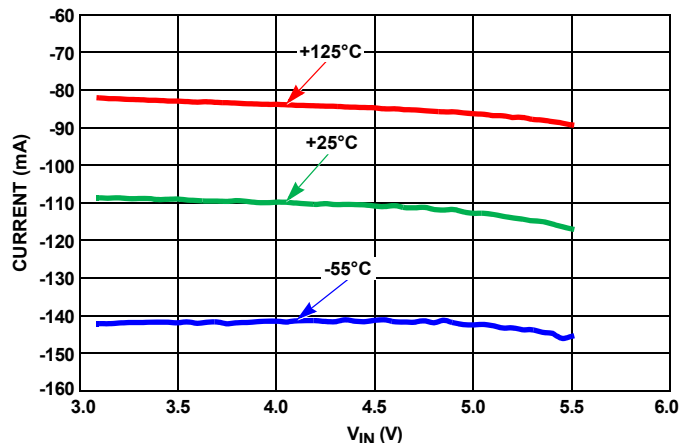
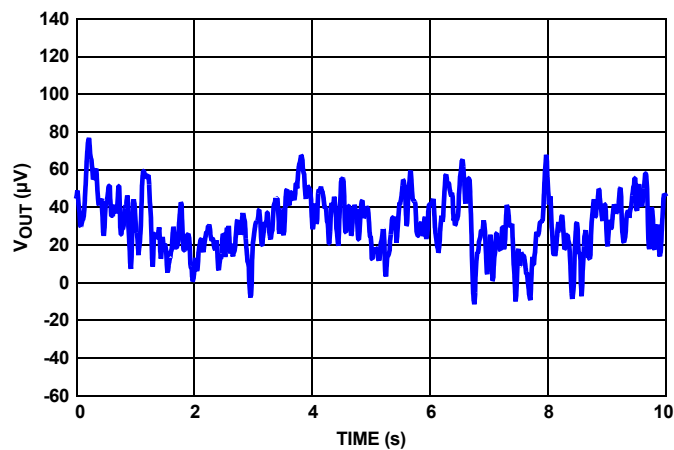
FIGURE 102.  $V_{OUT}$  vs TEMPERATURE

FIGURE 103. SHORT-CIRCUIT TO GND

FIGURE 104.  $V_{OUT}$  vs NOISE, 0.1Hz TO 10Hz

## Typical Performance Characteristics Curves ( $V_{OUT} = 3.3V$ )

$V_{IN} = 5.0V$ ,  $I_{OUT} = 0mA$ ,  
 $T_A = +25^\circ C$  unless otherwise specified.

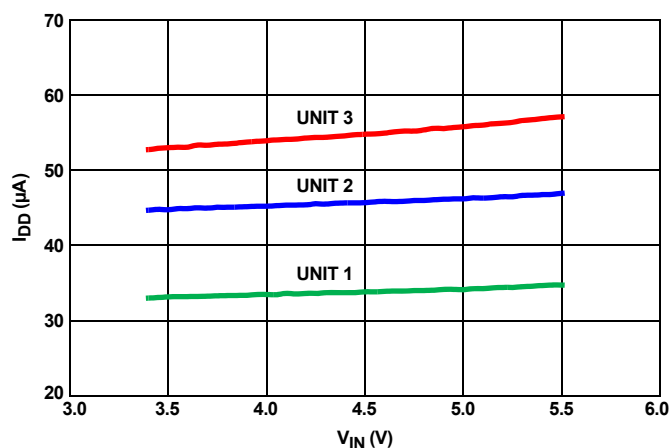
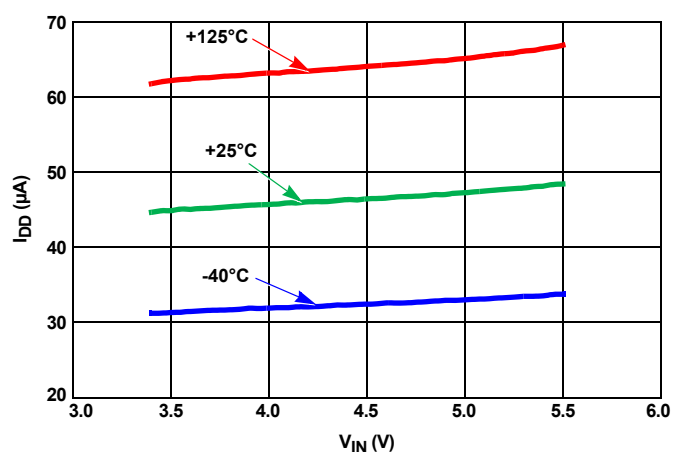
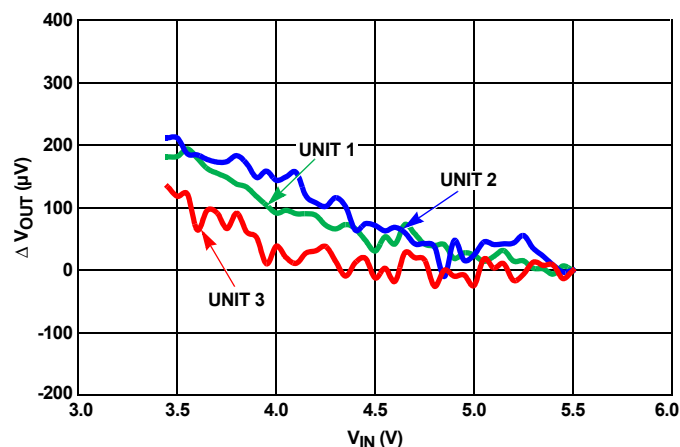
FIGURE 105.  $I_{IN}$  vs  $V_{IN}$ , THREE UNITSFIGURE 106.  $I_{IN}$  vs  $V_{IN}$ , OVER-TEMPERATURE

FIGURE 107. LINE REGULATION, THREE UNITS

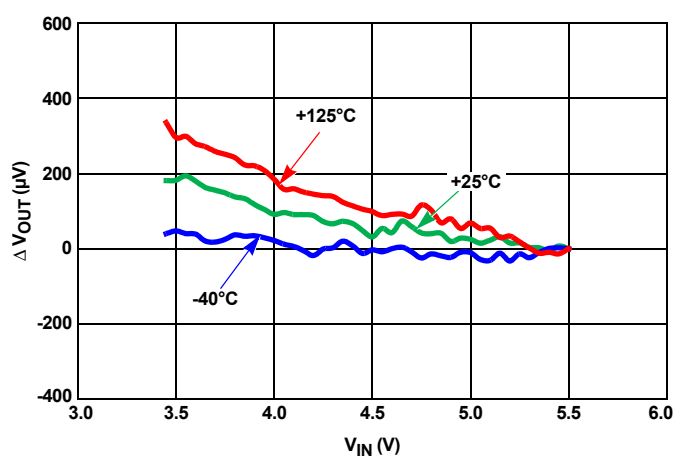


FIGURE 108. LINE REGULATION OVER-TEMPERATURE

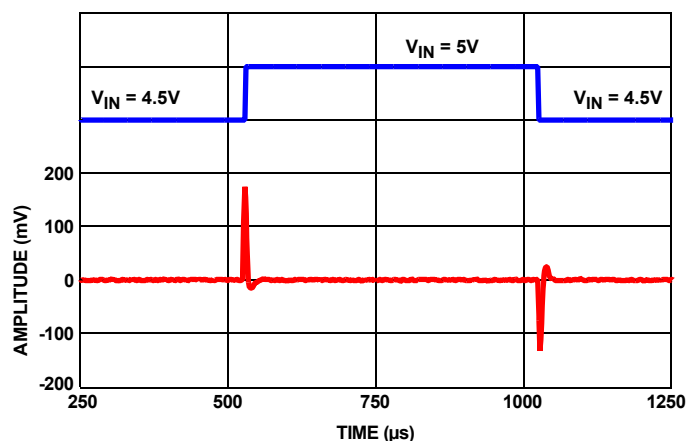


FIGURE 109. LINE TRANSIENT WITH 0.1µF LOAD

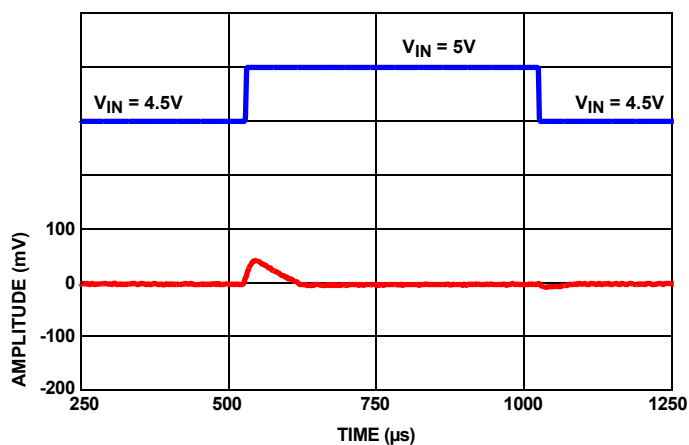


FIGURE 110. LINE TRANSIENT RESPONSE WITH 10µF LOAD

# Typical Performance Characteristics Curves ( $V_{OUT} = 3.3V$ ) $V_{IN} = 5.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

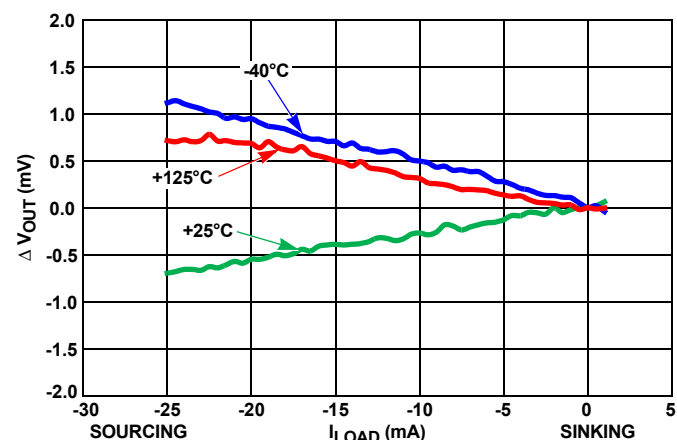


FIGURE 111. LOAD REGULATION OVER-TEMPERATURE

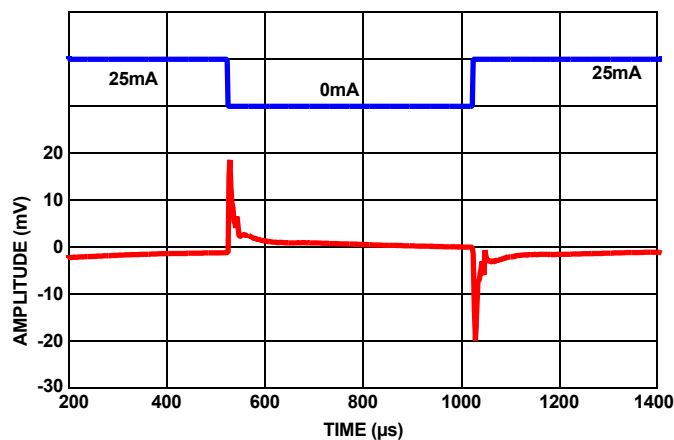


FIGURE 112. LOAD TRANSIENT RESPONSE AT 25mA LOAD AT 1μF

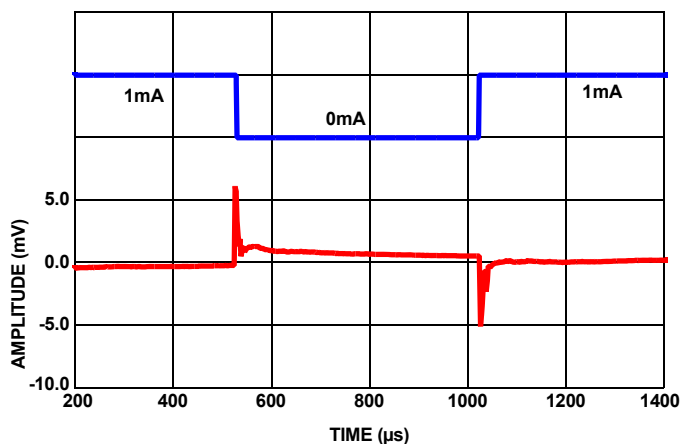


FIGURE 113. LOAD TRANSIENT RESPONSE AT 1mA LOAD AT 1μF

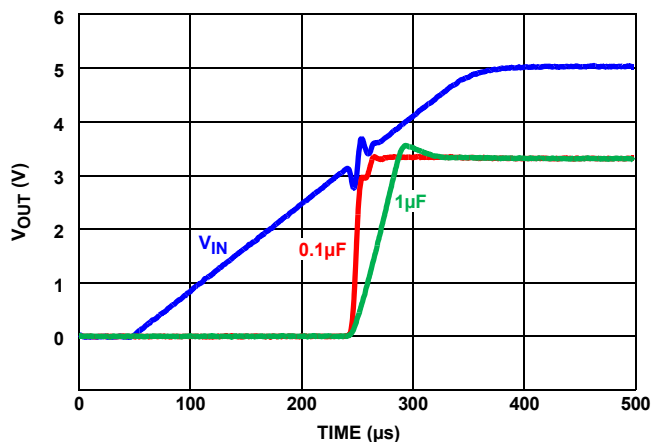


FIGURE 114. TURN-ON TIME

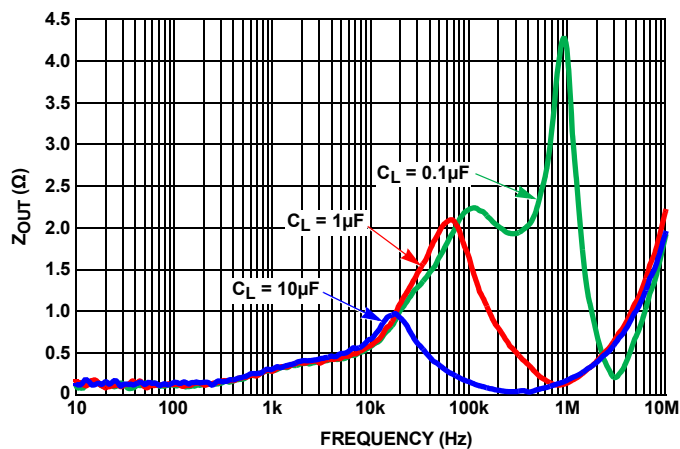
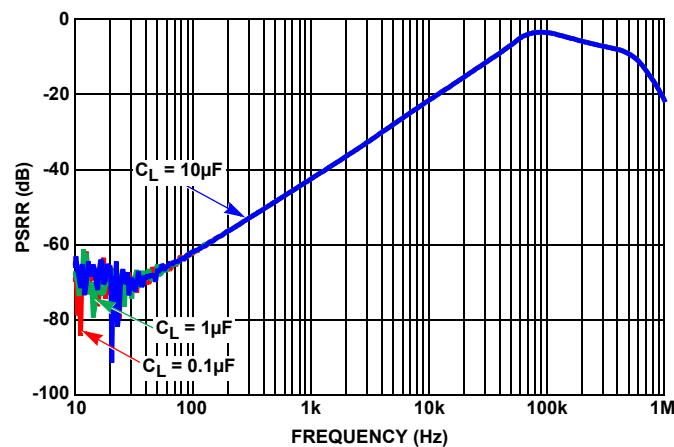
FIGURE 115.  $Z_{OUT}$  vs FREQUENCY

FIGURE 116. RIPPLE REJECTION AT DIFFERENT CAPACITIVE LOADS

## Typical Performance Characteristics Curves ( $V_{OUT} = 3.3V$ ) $V_{IN} = 5.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

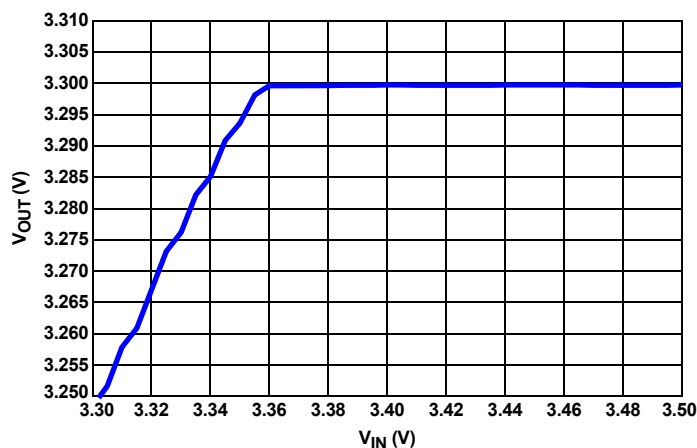


FIGURE 117. DROPOUT (10mA SOURCED LOAD)

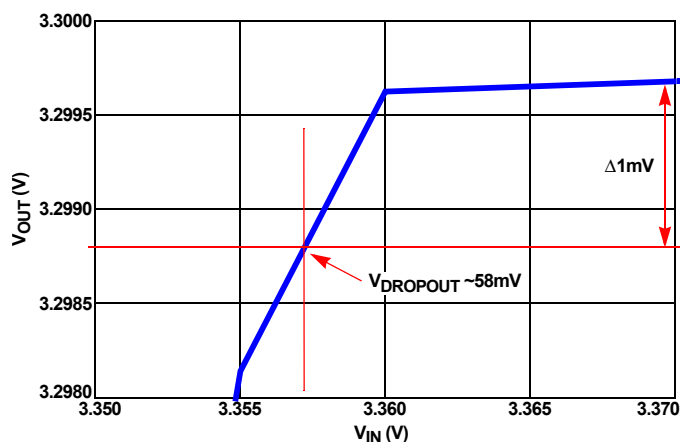


FIGURE 118. DROPOUT ZOOMED (10mA SOURCED LOAD)

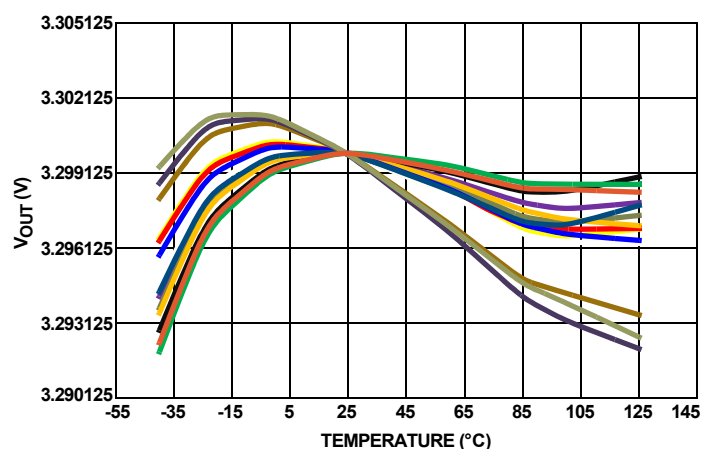
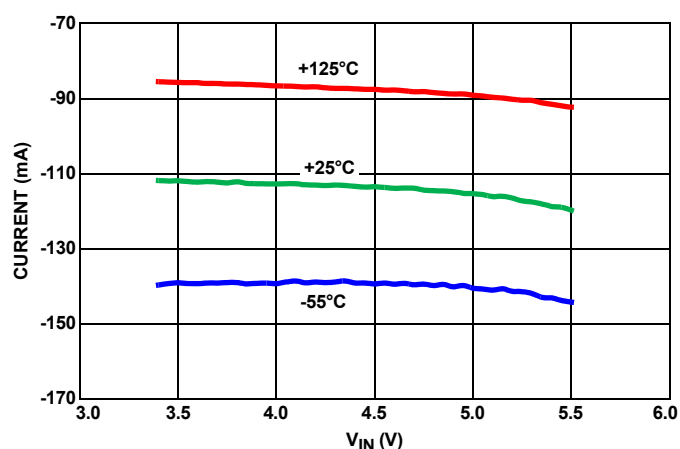
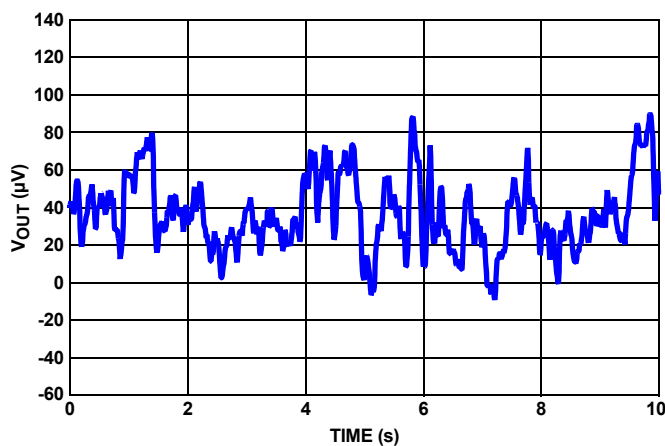
FIGURE 119.  $V_{OUT}$  vs TEMPERATURE

FIGURE 120. SHORT-CIRCUIT TO GND

FIGURE 121.  $V_{OUT}$  vs NOISE, 0.1Hz TO 10Hz

## Typical Performance Characteristics Curves ( $V_{OUT} = 4.096V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified.

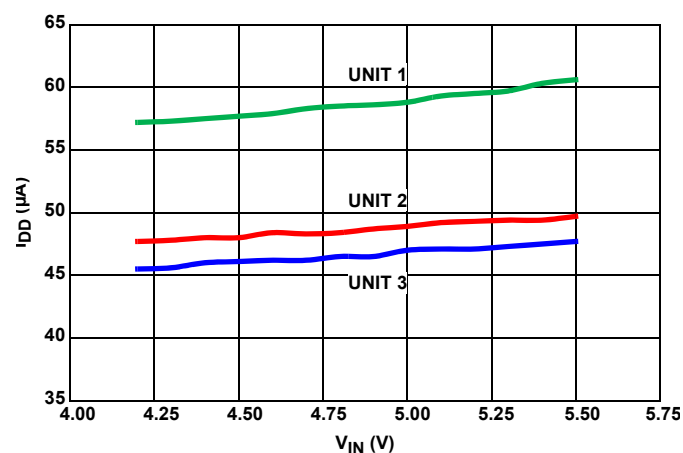
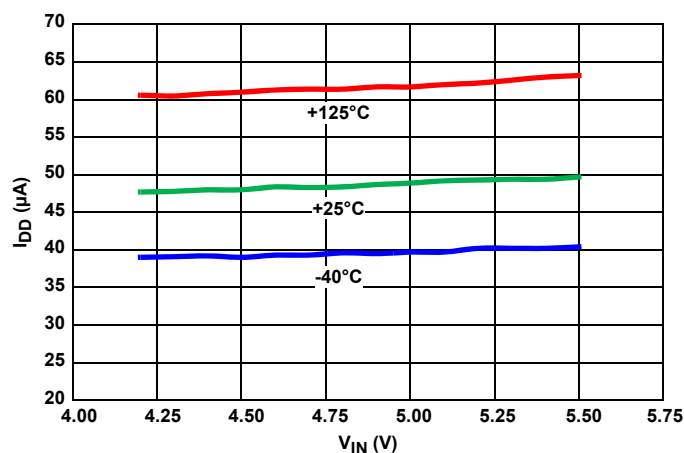
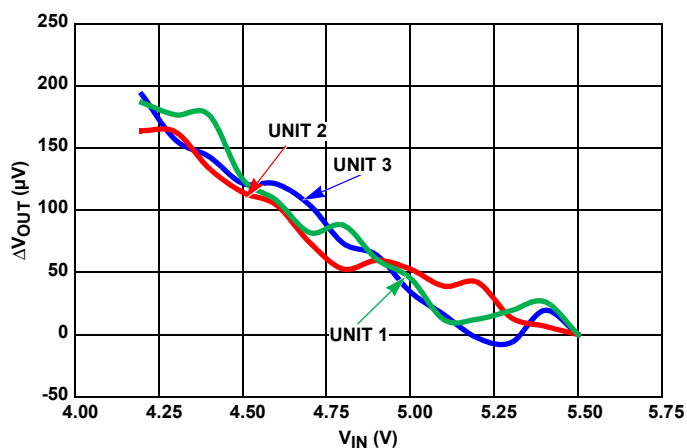
FIGURE 122.  $I_{IN}$  vs  $V_{IN}$ , THREE UNITSFIGURE 123.  $I_{IN}$  vs  $V_{IN}$ , OVER-TEMPERATURE

FIGURE 124. LINE REGULATION, THREE UNITS

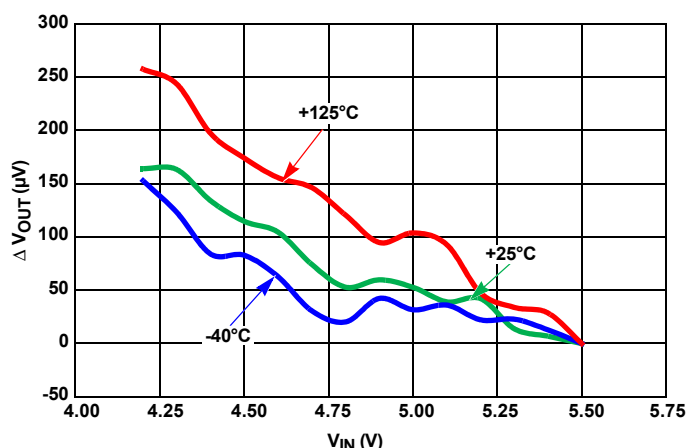


FIGURE 125. LINE REGULATION OVER-TEMPERATURE

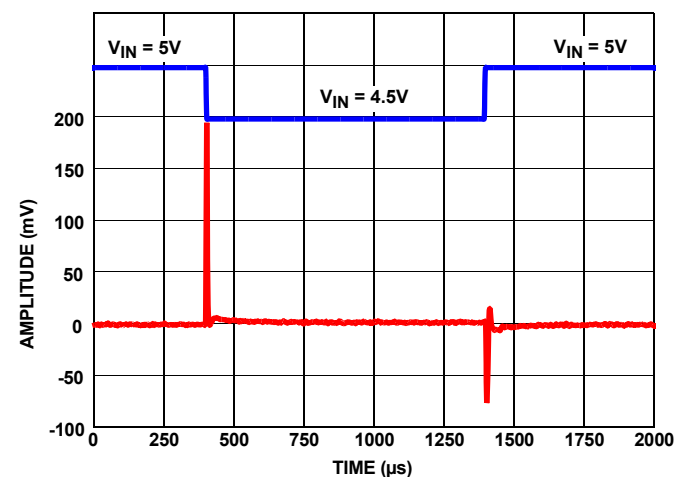


FIGURE 126. LINE TRANSIENT RESPONSE WITH 0.1µF LOAD

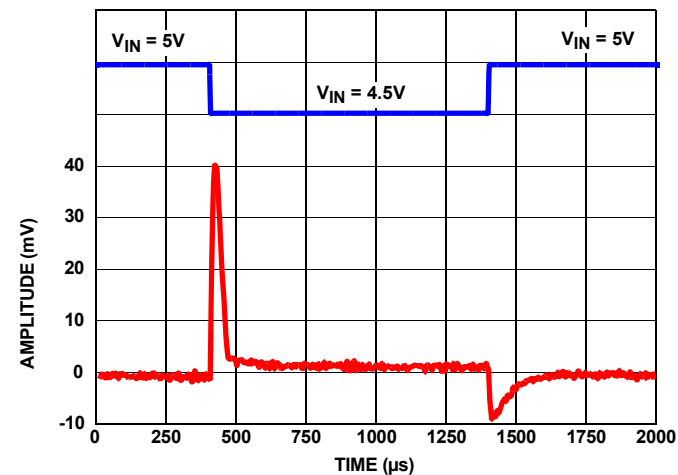


FIGURE 127. LINE TRANSIENT RESPONSE WITH 10µF LOAD

# Typical Performance Characteristics Curves ( $V_{OUT} = 4.096V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

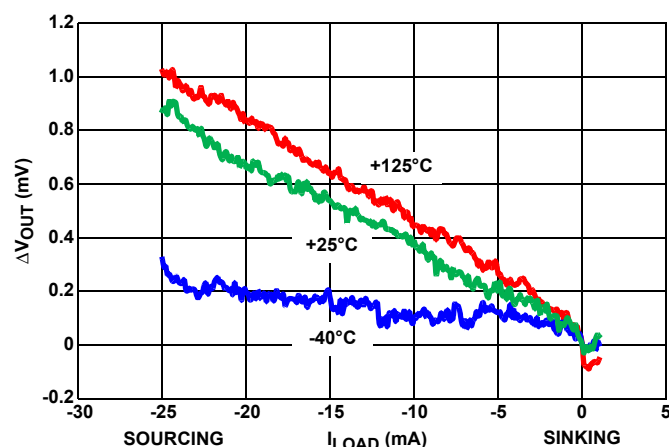


FIGURE 128. LOAD REGULATION OVER-TEMPERATURE

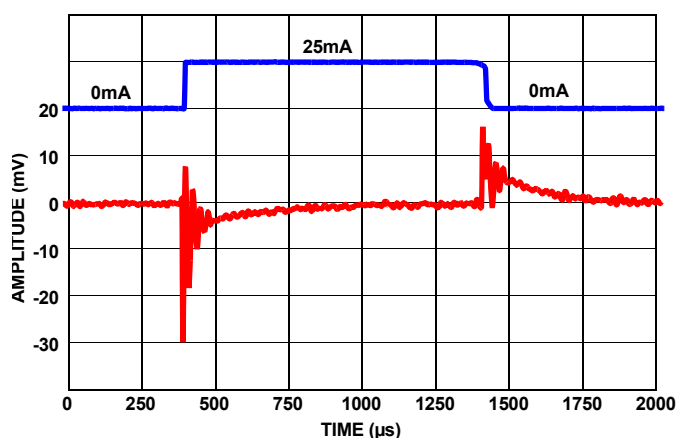


FIGURE 129. LOAD TRANSIENT RESPONSE AT 25mA LOAD AT 1μF

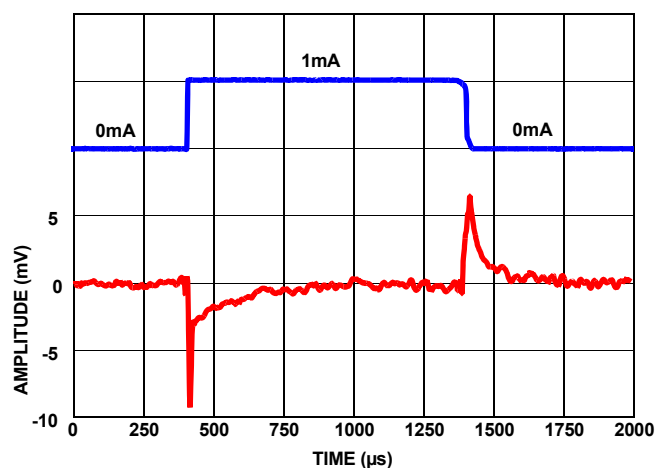


FIGURE 130. LOAD TRANSIENT RESPONSE AT 1mA LOAD AT 1μF

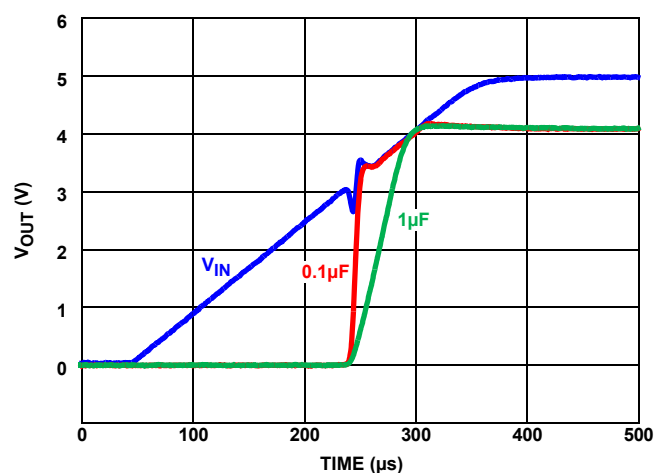


FIGURE 131. TURN-ON TIME

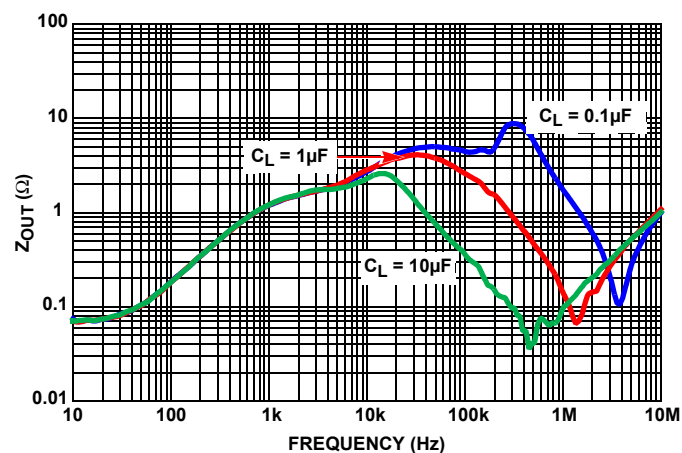
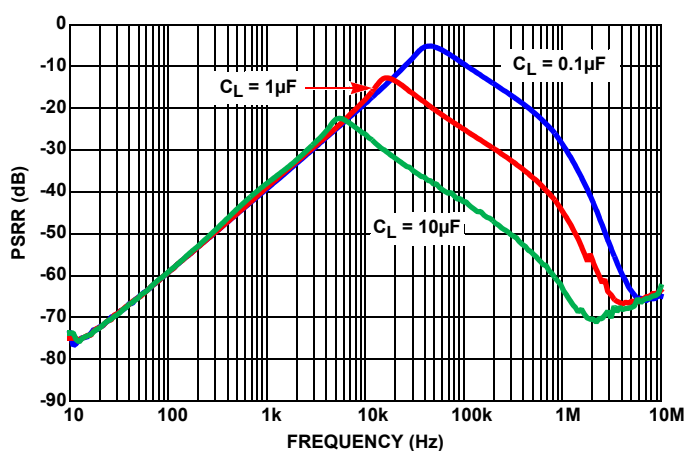
FIGURE 132.  $Z_{OUT}$  vs FREQUENCY

FIGURE 133. RIPPLE REJECTION AT DIFFERENT CAPACITIVE LOADS

## Typical Performance Characteristics Curves ( $V_{OUT} = 4.096V$ ) $V_{IN} = 3.0V$ , $I_{OUT} = 0mA$ , $T_A = +25^\circ C$ unless otherwise specified. (Continued)

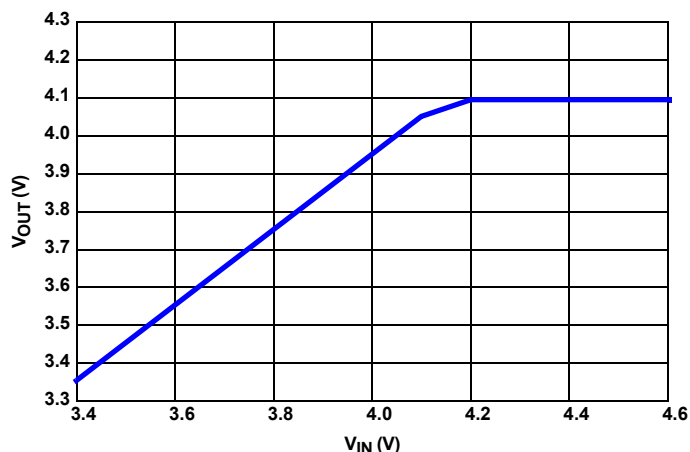


FIGURE 134. DROPOUT (10mA SOURCED LOAD)

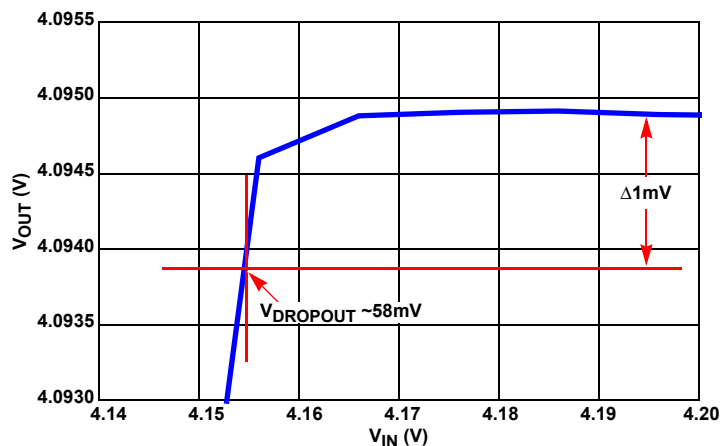


FIGURE 135. DROPOUT ZOOMED (10mA SOURCED LOAD)

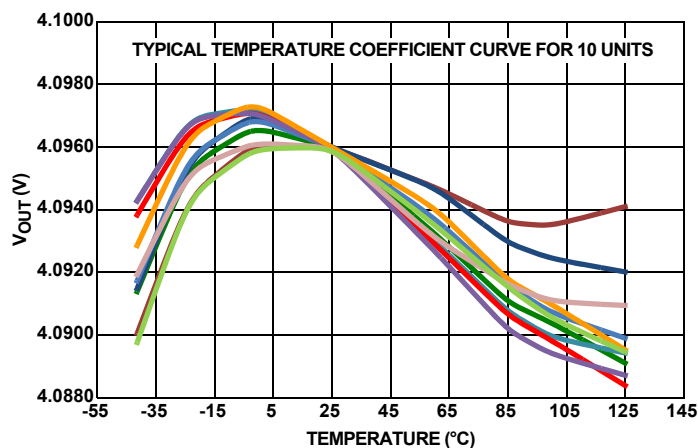
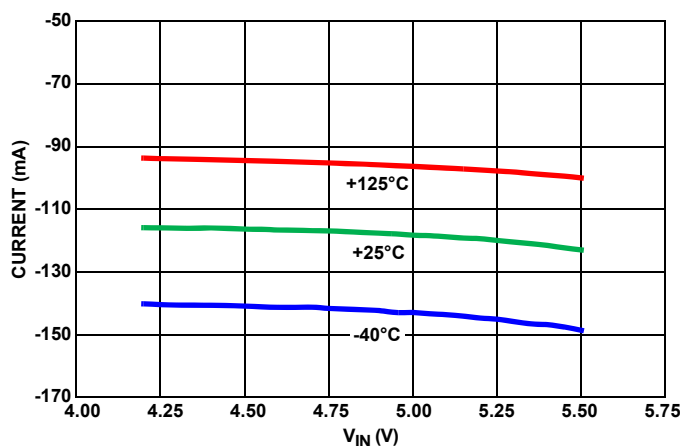
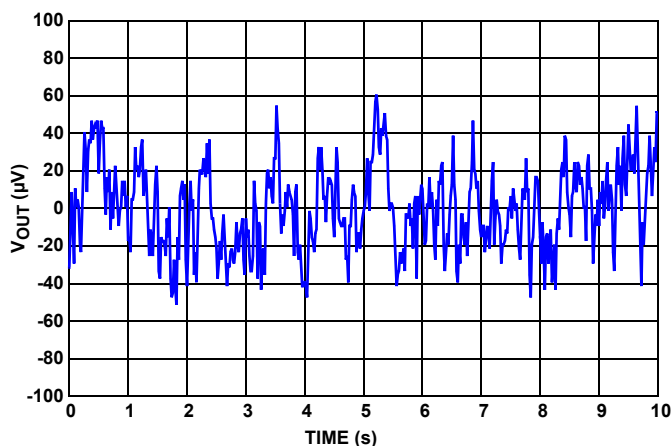
FIGURE 136.  $V_{OUT}$  vs TEMPERATURE

FIGURE 137. SHORT-CIRCUIT TO GND

FIGURE 138.  $V_{OUT}$  vs NOISE, 0.1Hz TO 10Hz

## Applications Information

### Micropower Operation

The ISL21010 consumes very low supply current due to the proprietary bandgap technology. Low noise performance is achieved using optimized biasing techniques. Supply current is typically 48 $\mu$ A and noise in the 0.1Hz to 10Hz bandwidth is 58 $\mu$ V<sub>P-P</sub> to 100 $\mu$ V<sub>P-P</sub> ( $V_{OUT}$  = 2.048V, 3.0V, and 3.3V) benefiting precision, low noise portable applications such as handheld meters and instruments.

Data converters in particular can use the ISL21010 as an external voltage reference. Low power DAC and ADC circuits achieve maximum resolution with lowest noise. The ISL21010 maintains output voltage during conversion cycles with fast response, although it is helpful to add an output capacitor, typically 1 $\mu$ F.

### Board Mounting Considerations

For applications requiring the highest accuracy, review the board mounting location. The ISL21010 uses a plastic SOIC package, which subjects the die to mild stresses when the Printed Circuit Board (PCB) is heated and cooled and slightly changes the shape. Placing the device in areas subject to slight twisting degrades the accuracy of the reference voltage due to these die stresses. It is normally best to place the device near the edge of a board, or on the shortest side because the axis of bending is most limited at that location. Mounting the device in a cutout also minimizes flex. Mounting the device on flexprint or extremely thin PCB material causes reference accuracy loss.

### Board Assembly Considerations

Bandgap references provide high accuracy and low temperature drift but some PCB assembly precautions are necessary. Normal output voltage shifts of 100 $\mu$ V to 4mV can be expected with Pb-free reflow profiles or wave solder on multilayer FR4 PCBs. Avoid excessive heat or extended exposure to high reflow or wave solder temperatures; this can reduce device initial accuracy.

### Noise Performance and Reduction

The recommended capacitive load range for the ISL21010 is from 0.1 $\mu$ F to 10.0 $\mu$ F (0.22 $\mu$ F minimum required for 1.024V option) to ensure stability and best transient performance. Parallel 0.1 $\mu$ F (0.22 $\mu$ F for 1.024V) and 10 $\mu$ F capacitors can be used to optimize performance as well. The noise specification stated in the Electrical Specification tables (starting on [page 5](#)) is for 0.1 $\mu$ F (0.22 $\mu$ F for 1.024V option) capacitive load. Larger values reduce the output noise level.

### Cycling $V_{IN}$ On-Off-On (CAUTION)

The ISL21010 is NOT designed for applications requiring rapid cycling of  $V_{IN}$ . Power the  $V_{IN}$  pin down to 0V for one minute before turning the part back on.

## Revision History

The revision history provided is for informational purposes only and is believed to be accurate, but not warranted. Please visit our website to make sure you have the latest revision.

| DATE         | REVISION | CHANGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Apr 19, 2019 | FN7896.6 | Added Cycling $V_{IN}$ On-Off-On (CAUTION) section on page 34.<br>Updated disclaimer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Mar 30, 2018 | FN7896.5 | Updated Related Literature section.<br>Added new parts and updated notes in the Ordering Information table on page 4.<br>Removed About Intersil section and updated disclaimer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Feb 12, 2016 | FN7896.4 | Removed DAQ on a stick reference from "Related Literature" on page 1.<br>Updated "Ordering Information" on page 4 by adding column for tape and reel option.<br>Updated HBM value to kV (5500V to 5.5kV) in "Absolute Maximum Ratings" on page 5.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Jan 8, 2015  | FN7896.3 | On page 1, in the Related Literature section added AN1853 and AN1883.<br>On page 4, updated the ordering information table by adding the (-T7A) products.<br>Changed the y-axis units on Figure 19 on page 12 from "(V)" to "(μV)".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Jun 23, 2014 | FN7896.2 | Added Curves for Voltage Refs 1.25V, 1.024V, 1.5V, 2.5V and 4.096V<br>Updated POD with following changes:<br>In Detail A, changed lead width dimension from 0.13+/-0.05 to 0.085-0.19<br>Changed dimension of foot of lead from 0.31+/-0.10 to 0.38+/-0.10<br>In Land Pattern, added 0.4 Rad Typ dimension<br>In Side View, changed height of package from 0.91+/-0.03 to 0.95+/-0.07                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Nov 28, 2011 | FN7896.1 | On page 1, Features: removed "Coming Soon" from ISL21010-10, -12, -15; ISL21010-25; and ISL21010-40 voltage options; combined -20 option with -10, -12, -15; changed -40 to -41<br>On page 4, Ordering Information: added parts ISL21010DFH310Z-TK, ISL21010DFH312Z-TK, ISL21010CFH315Z-TK, ISL21010CFH325Z-TK, ISL21010CFH341Z-TK<br>On page 5, Recommended Operating Conditions: added $V_{OUT} = 1.024V, 1.25V, 1.5V, 2.048V, 2.2V$ to 5.5V; $V_{OUT} = 2.5V, \dots, 2.6V$ to 5.5V; $V_{OUT} = 4.096V, \dots, 4.2V$ to 5.5V<br>On page 5 through page 9, added Electrical Specifications tables for (ISL21010-10, $V_{OUT} = 1.024V$ ), (ISL21010-12, $V_{OUT} = 1.25V$ ), (ISL21010-15, $V_{OUT} = 1.5V$ ), (ISL21010-41, $V_{OUT} = 4.096V$ )<br>On page 7, Electrical Specifications (ISL21010-20, $V_{OUT} = 2.048V$ ): changed $V_{OUT}/T_A$ , Thermal Hysteresis, TYP from 50 to 100<br>On page 9, Note 9: changed "... where $V_{OUT}$ drops 1mV from $V_{IN} = 5.0V$ at $T_A = +25^\circ C$ ." to "... where $V_{OUT}$ drops 1mV from $V_{IN} = \text{nominal}$ at $T_A = +25^\circ C$ ."<br>On page 26, Figure 95, changed title from "LOAD REGULATION OVER-TEMPERATURE" to "LOAD TRANSIENT RESPONSE AT 25mA LOAD". Figure 27, changed title from "LOAD TRANSIENT RESPONSE" to "LOAD TRANSIENT RESPONSE AT 1mA LOAD".<br>On page 27, Figure 100, and page 30, Figure 117, changed figure titles to indicate 10mA instead of 1mA source load.<br>On page 29, Figure 112, changed title from LOAD REGULATION OVER-TEMPERATURE" to "LOAD TRANSIENT RESPONSE AT 25mA LOAD". Figure 113, changed title from "LOAD TRANSIENT RESPONSE" to "LOAD TRANSIENT RESPONSE AT 1mA LOAD"<br>On page 34, under "Noise Performance and Reduction", added reference to capacitive load range for 1.024V option. |
| Aug 9, 2011  | FN7896.0 | Initial Release                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

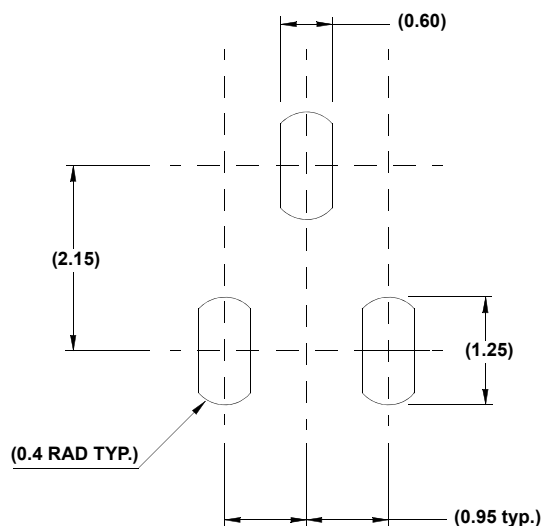
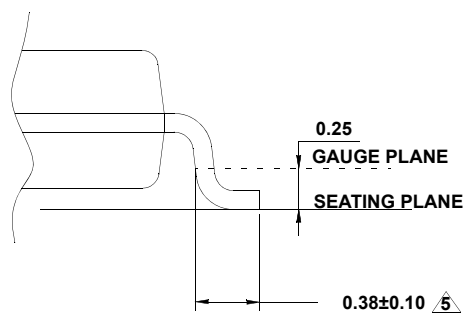
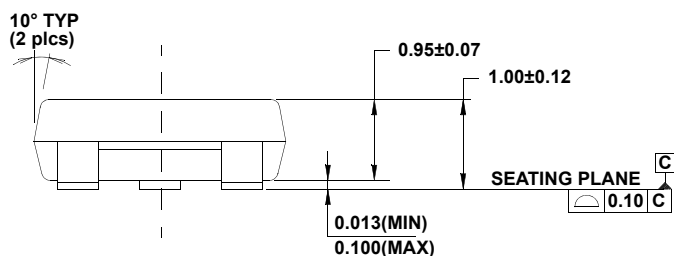
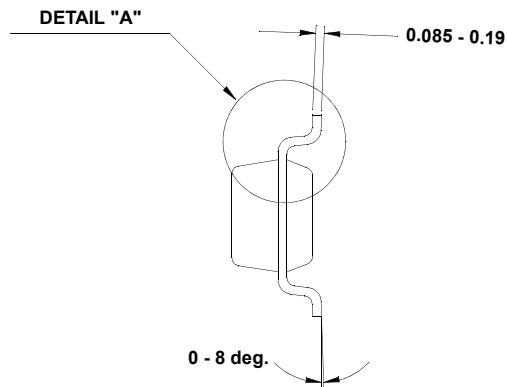
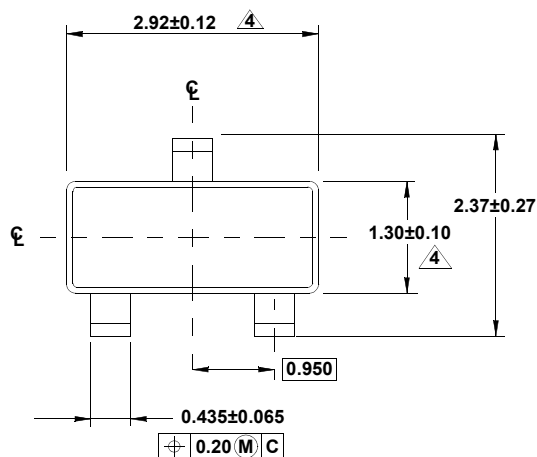
# Package Outline Drawing

**P3.064**

**3 LEAD SMALL OUTLINE TRANSISTOR PLASTIC PACKAGE (SOT23-3)**

Rev 3, 3/12

For the most recent package outline drawing, see [P3.064](#).



## NOTES:

1. Dimensions are in millimeters.  
Dimensions in ( ) for Reference Only.
2. Dimensioning and tolerancing conform to AMSEY14.5m-1994.
3. Reference JEDEC TO-236.
4. Dimension does not include interlead flash or protrusions.  
Interlead flash or protrusions shall not exceed 0.25mm per side.
5. Footlength is measured at reference to gauge plane.

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