# 2A, Ultra-Low Dropout, Ultra-Fast CMOS LDO Regulator

## General Description

The RP1207 is a high-performance, 2A LDO regulator, offering extremely high PSRR and ultra-low dropout. Ideal for portable RF and wireless applications with demanding performance and space requirements.

The RP1207 also works with low-ESR ceramic capacitors, reducing the amount of board space necessary for power applications, critical in hand-held wireless devices.

The RP1207 consumes less than 0.1uA in shutdown mode and soft start function to prevent inrush current. The other features include ultra-low dropout voltage, high output accuracy, current limiting protection, and high ripple rejection ratio. Available in the SOP-8 (Exposed Pad) package.

## Features

- **Low Quiescent Current (Typically 380uA)**
- **Soft Start**
- **< 0.1uA Standby Current When Shutdown**
- **Low Dropout Voltage: 670mV at 2A**
- **Wide Operating Voltage Ranges : 2.5V to 5.5V**
- **Ultra Fast Load Transient**
- **Tight Load and Line Regualtion**
- **Current Limit Protection**
- **Thermal Shutdown Protection**
- **1uF MLCC Output Capacitor Stable**
- **High Power Supply Rejection Ratio**
- **RoHS Compliant and 100% Lead (Pb)-Free**

## Applications

- CDMA/GSM Cellular Handsets
- Battery-Powered Equipment
- Laptop, Palmtops, Notebook Computers
- Hand-Held Instruments
- Mini PCI & PCI-Express Cards
- PCMCIA & New Cards
- Portable Information Appliances

## Ordering Information

RP1207 □□

- Package Type
  SP : SOP-8 (Exposed Pad)
- Operating Temperature Range
  G : Green (Halogen Free with Commercial Standard)

Note :

Richpower Green products are :

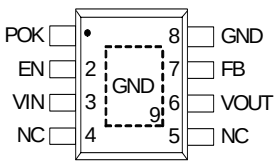
- RoHS compliant and compatible with the current requirements of IPC/JEDEC J-STD-020.
- Suitable for use in SnPb or Pb-free soldering processes.

## Marking Information

For marking information, contact our sales representative directly or through a Richpower distributor located in your area.

## Pin Configurations

(TOP VIEW)




SOP-8 (Exposed Pad)

## Typical Application Circuit

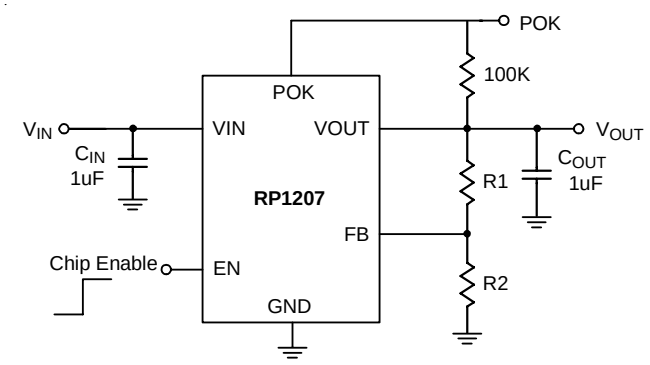


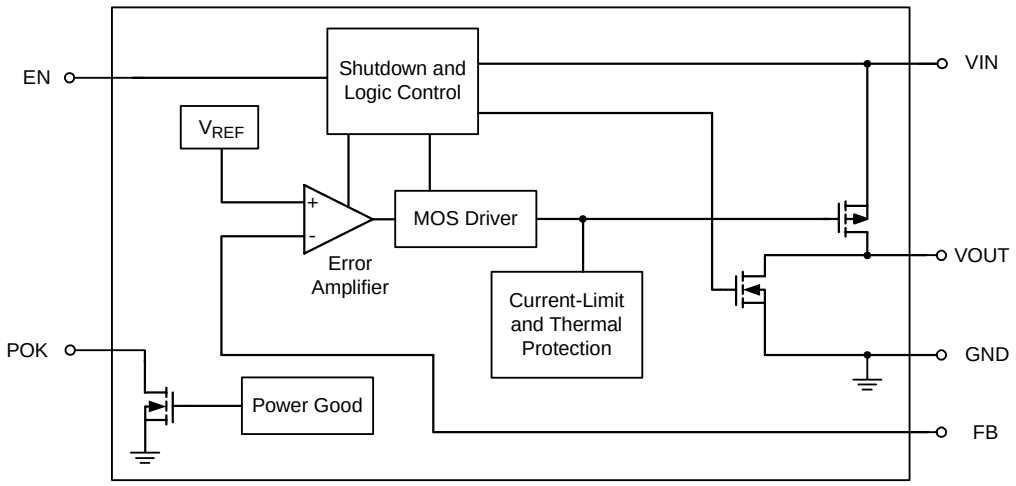

Figure 1. Adjustable Operation

$$V_{OUT} = 0.8 \times (1 + \frac{R1}{R2}) \text{ Volts}$$

## Function Pin Description

| Pin No. Adjustable Output Voltage | Pin Name | Pin Function |
|---|---|---|
| 1 | POK | POK output. Indicates regulation. |
| 2 | EN | Chip enable (Active-High). |
| 3 | VIN | Supply input. |
| 4 | NC | No Internal Connection. |
| 5 | NC | No Internal Connection. |
| 6 | VOUT | Regulator Output. |
| 7 | FB | Set the output voltage by external feedback resistors, the output voltage will be: $V_{OUT} = 0.8 \times (1 + \frac{R1}{R2})$ Volts |
| 8 | GND | Ground. |
| Exposed Pad (9) | NC | No Internal Connection. The exposed pad must be soldered to a large PCB and connected to GND for maximum power dissipation. |

## Function Block Diagram



## Absolute Maximum Ratings (Note 1)

- Supply Input Voltage ---------- 6V
- EN Input Voltage ---------- 6V
- Power Dissipation, $P_D$ @ $T_A$ = 25°C
  SOP-8 (Exposed Pad) ---------- 1.33W
- Package Thermal Resistance (Note 9)
  SOP-8 (Exposed Pad), $\theta_{JC}$ ---------- 15° C/W
  SOP-8 (Exposed Pad)-8, $\theta_{JA}$ ---------- 75° C/W
- Lead Temperature (Soldering, 10 sec.) ---------- 260°C
- Junction Temperature ---------- 150°C
- Storage Temperature Range ---------- –65°C to 150°C
- ESD Susceptibility (Note 2)
  HBM ---------- 2kV
  MM ---------- 200V

## Recommended Operating Conditions (Note 3)

- Supply Input Voltage ---------- 2.5V to 5.5V
- EN Input Voltage ---------- 0V to 5.5V
- Junction Temperature Range ---------- –40°C to 125°C
- Ambient Temperature Range ---------- –40°C to 85°C

## Electrical Characteristics

(Typical values $V_{IN}$ = $V_{OUT}$ + 1V, $C_{IN}$ = $C_{OUT}$ = 1uF, $T_A$ = 25°C unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Reference Voltage | $\Delta V_{FB}$ | $I_{OUT}$ = 1mA | 0.788 | -- | 0.812 | V |
| Current Limit | $I_{LIM}$ | $R_{LOAD}$ = 0.5Ω | 2 | -- | -- | A |
| Standby Current (Note 7) | $I_{STBY}$ | $V_{EN} \leqslant V_{IL}$ | -- | 0.1 | 1 | μA |
| Quiescent Current (Note 6) | $I_Q$ | $I_{OUT}$ = 0mA | -- | 380 | 500 | μA |
| Dropout Voltage (Note 4)) | $V_{DROP}$ | $I_{OUT}$ = 1.5A, $V_{OUT} \geqslant$ 2.5V | -- | -- | 500 | mV |
| | | $I_{OUT}$ = 2A, $V_{OUT} \geqslant$ 2.5V | -- | -- | 670 | mV |
| Line Regulation | $\Delta V_{LINE}$ | $V_{IN}$ = ($V_{OUT}$ + 0.3V) to 5.5V<br>$I_{OUT}$ = 1mA | -- | -- | 0.3 | % |
| Load Regulation (Note 5) | $\Delta V_{LOAD}$ | 10mA < $I_{OUT}$ < 2A | -- | 0.4 | -- | %/A |
| Power Supply Rejection Rate | PSRR | f = 100HZ $I_{OUT}$ =300mA | -- | –65 | -- | dB |
| | | f = 10KHZ $I_{OUT}$ =300mA | -- | –50 | -- | |

*To be continued*

| Parameter | | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| EN Threshold | Logic-Low Voltage | $V_{IL}$ | $V_{IN}$ = 3.3V | -- | -- | 0.4 | V |
| | Logic-High Voltage | $V_{IH}$ | $V_{IN}$ = 3.3V | 1.2 | -- | -- | |
| POK Threshold | | $V_{TH\_POK}$ | $V_{FB}$ with respect to reference voltage | -- | 90 | -- | % |
| Output Rising Time | | $T_{SS}$ | $C_{OUT}$ = 10uF | 150 | 240 | 350 | us |
| Thermal Shutdown Temperature | | $T_{SD}$ | $V_{IN}$ = 3.3V, Enable | -- | 165 | -- | °C |
| Thermal Shutdown Temperature | | $\Delta T_{SD}$ | | -- | 50 | -- | °C |

**Note 1.** Stresses listed as the above " Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

**Note 2.** Devices are ESD sensitive. Handling precaution is recommended.

**Note 3.** The device is not guaranteed to function outside its operating conditions.

**Note 4.** The dropout voltage is defined as $V_{IN}$ -$V_{OUT}$, which is measured when $V_{OUT}$ is $V_{OUT(NORMAL)}$ - 100mV.

**Note 5.** Regulation is measured at constant junction temperature by using a 2ms current pulse. Devices are tested for load regulation in the load range from 10mA to 2A.

**Note 6.** Quiescent, or ground current, is the difference between input and output currents. It is defined by $I_Q = I_{IN} - I_{OUT}$ under no load condition ($I_{OUT}$ = 0mA). The total current drawn from the supply is the sum of the load current plus the ground pin current.

**Note 7.** Standby current is the input current drawn by a regulator when the output voltage is disabled by a shutdown signal ($V_{EN}$ =0 , $V_{EN} \leq V_{IL}$).

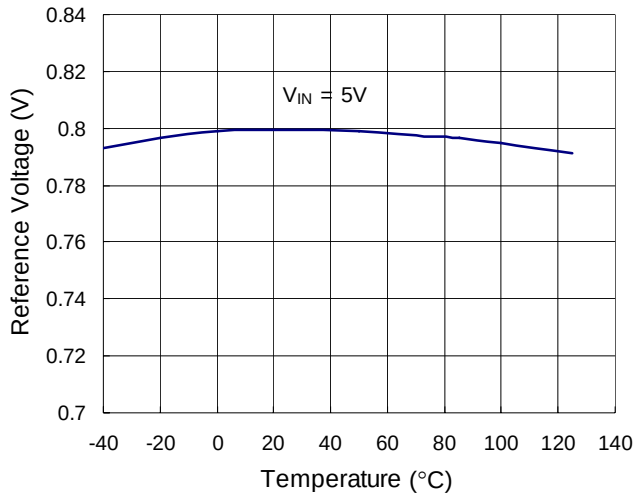
**Note 8.** Performance at -5°C ≤ $T_A$ ≤ 85°C is assured by design.

**Note 9.** $\theta_{JA}$ is measured in the natural convection at $T_A$ = 25°C on a low effective thermal conductivity test board of JEDEC 51-7 thermal measurement standard.

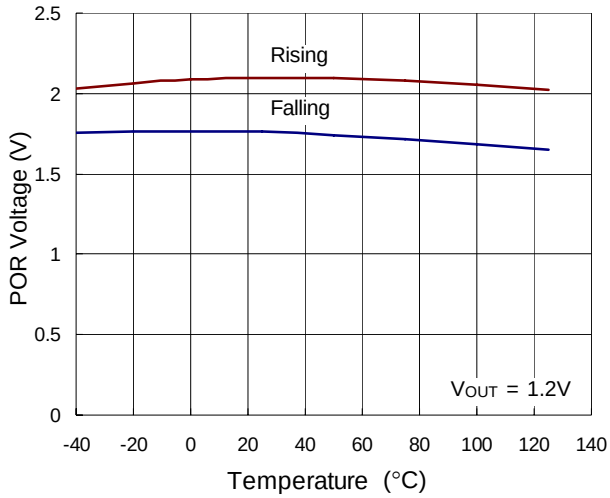
## Typical Operating Characteristics

($C_{IN}$ = $C_{OUT}$ = 1μF/X5R, $T_A$ = 25°C, unless otherwise specified )

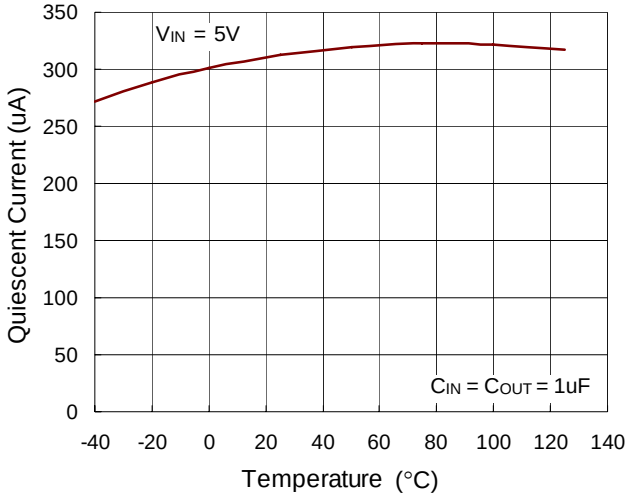
**Reference Voltage vs.Temperature**



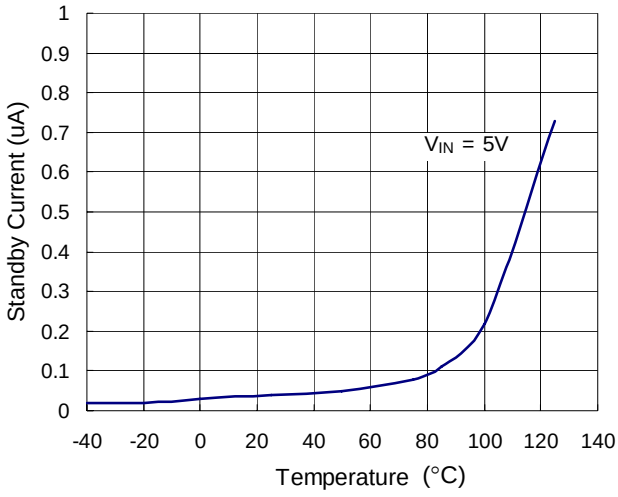

**VIN POR Threshold Voltage vs.Temperature**



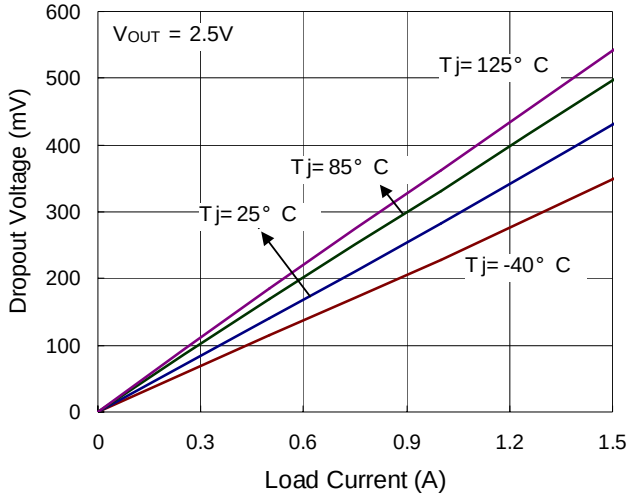

**Quiescent Current vs.Temperature**



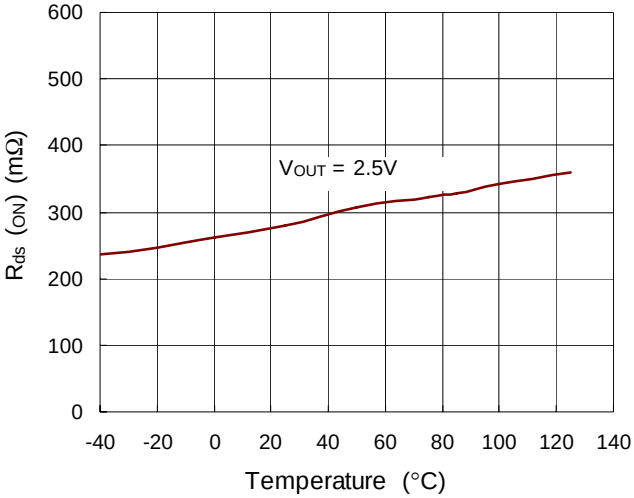

**Standby Current vs.Temperature**



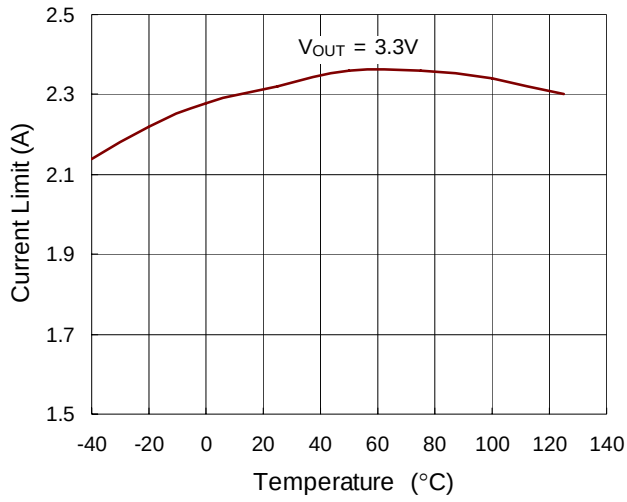

**Dropout Voltage vs.Load Current**



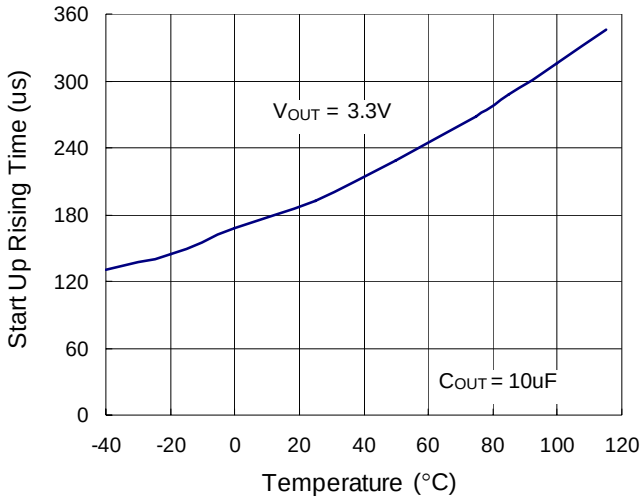

**Rds(on) vs.Temperature**



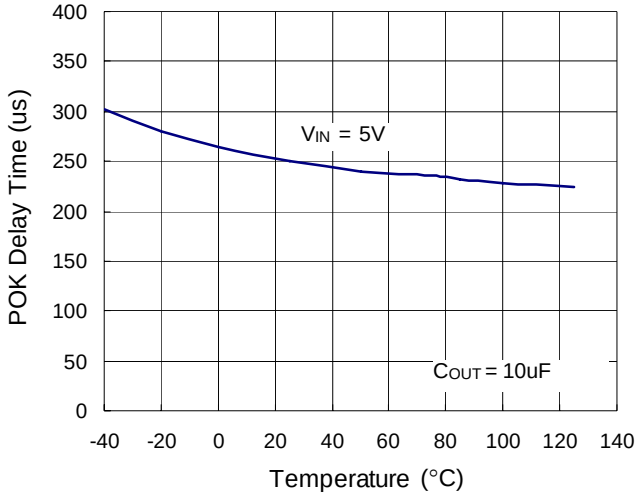
**Current Limit vs.Temperature**



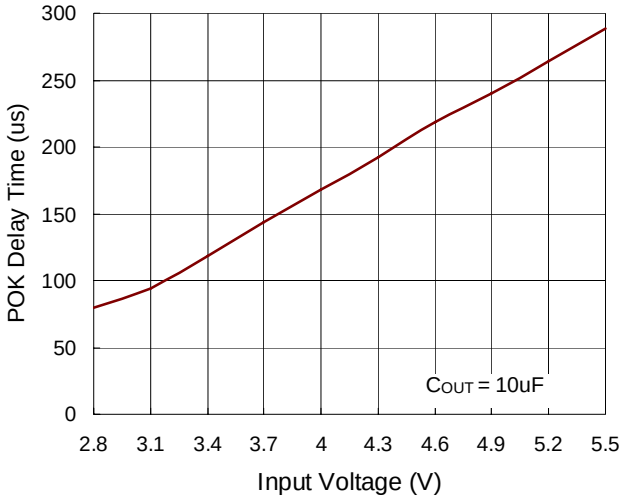

**Start Up Rising Time vs.Temperature**



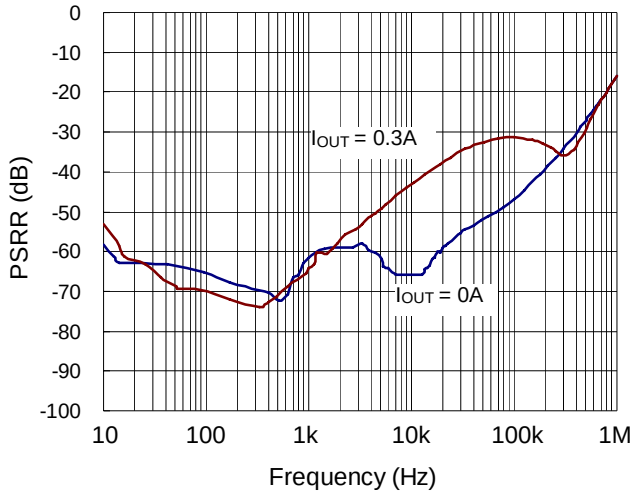

**POK Delay Time vs.Temperature**



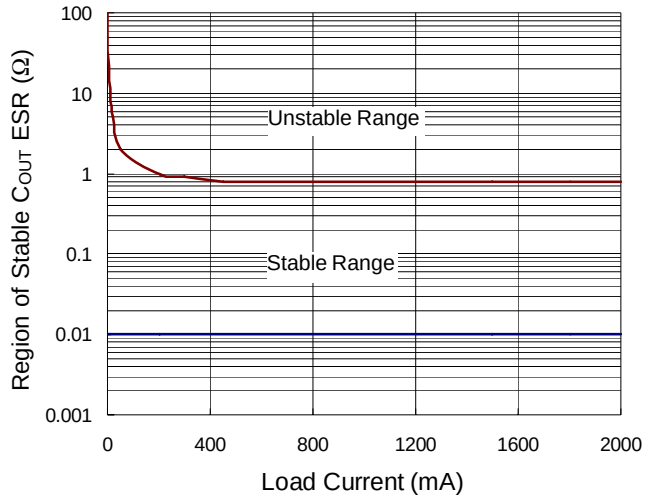

**POK Delay Time vs.Input Voltage**



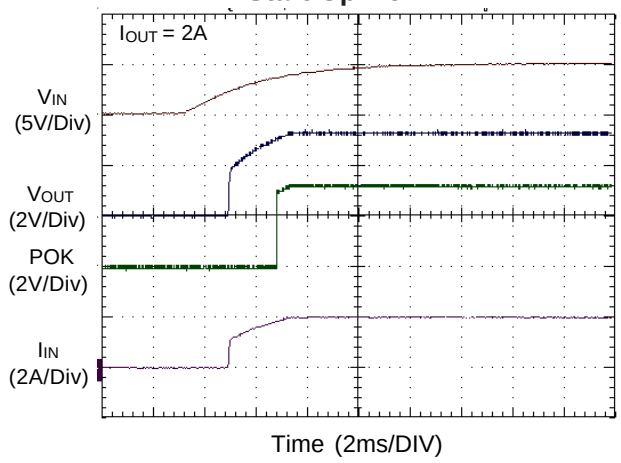

**PSRR**



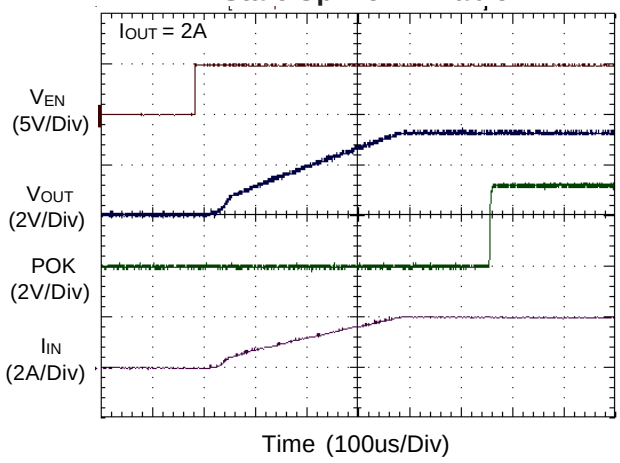

**Region of Stable $C_{OUT}$ ESR vs.Load Current**



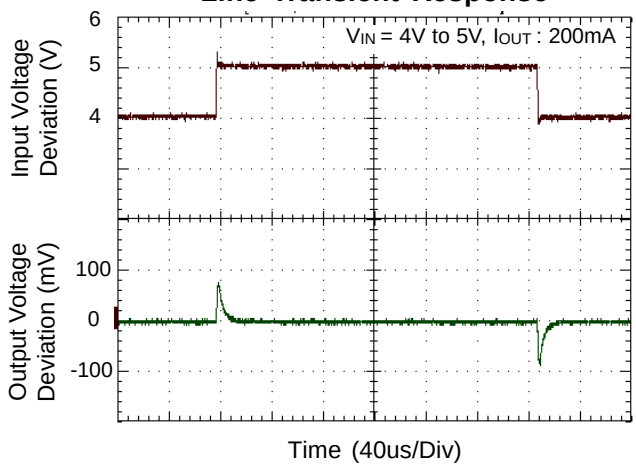
**Start Up from $V_{IN}$**



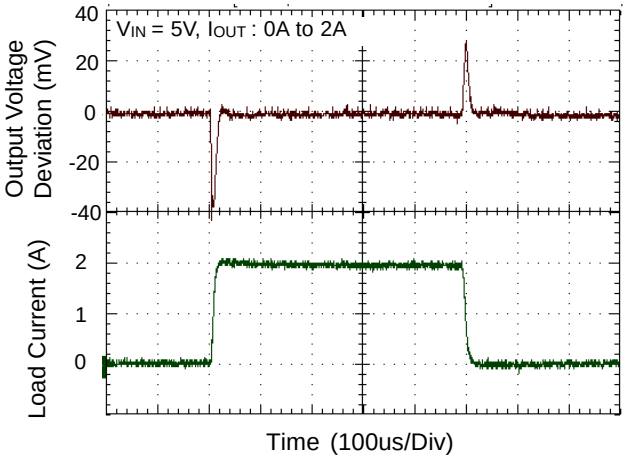

**Start Up from Enable**



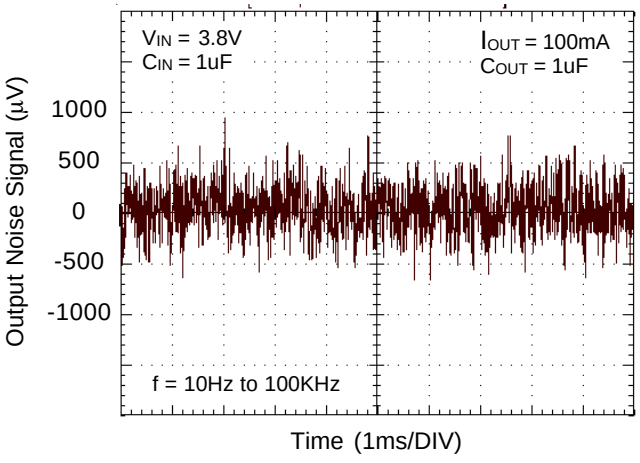

**Line Transient Response**



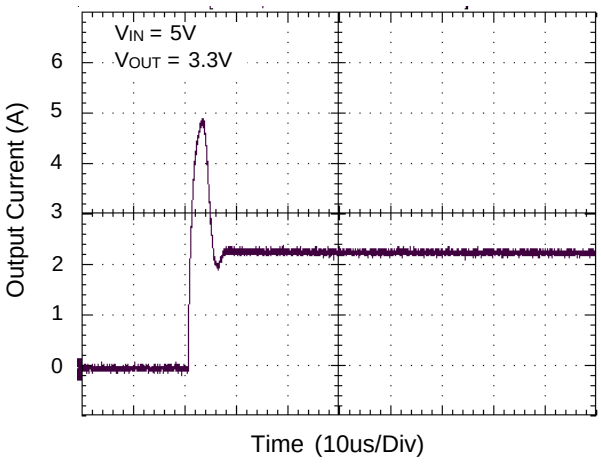

**Load Transient Response**



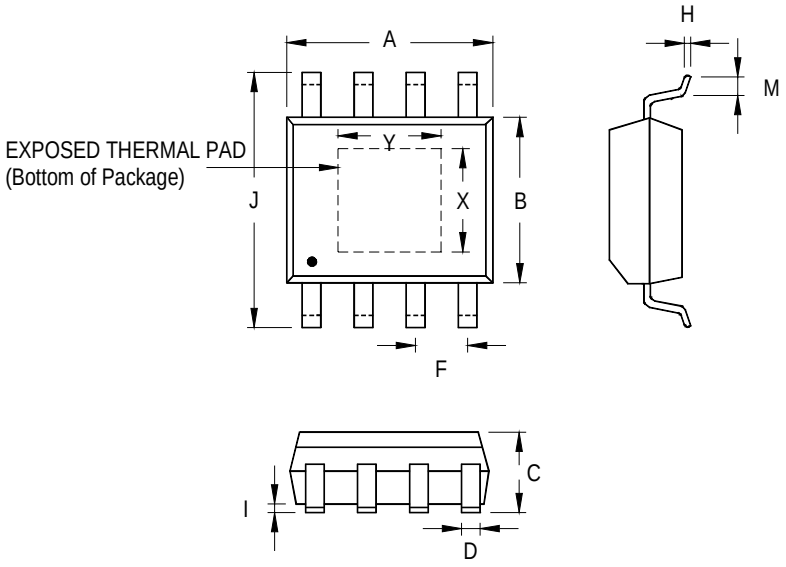

**Output Noise**




**Current Limit**



## Outline Dimension




| Symbol | | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|---|
| | | Min | Max | Min | Max |
| A | | 4.700 | 5.100 | 0.185 | 0.200 |
| B | | 3.800 | 4.000 | 0.150 | 0.157 |
| C | | 1.346 | 1.753 | 0.053 | 0.069 |
| D | | 0.330 | 0.510 | 0.013 | 0.020 |
| F | | 1.194 | 1.346 | 0.047 | 0.053 |
| H | | 0.170 | 0.254 | 0.007 | 0.010 |
| I | | 0.000 | 0.152 | 0.000 | 0.006 |
| J | | 5.790 | 6.200 | 0.228 | 0.244 |
| M | | 0.400 | 1.270 | 0.016 | 0.050 |
| Option 1 | X | 2.000 | 2.300 | 0.079 | 0.091 |
| | Y | 2.000 | 2.300 | 0.079 | 0.091 |
| Option 2 | X | 2.100 | 2.513 | 0.083 | 0.099 |
| | Y | 3.000 | 3.500 | 0.118 | 0.138 |

**8-Lead SOP (Exposed Pad) Plastic Package**

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