



## HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR

AP2121

### General Description

The AP2121 series are positive voltage regulator ICs fabricated by CMOS process. Each of these ICs consists of a voltage reference, an error amplifier, a resistor network for setting output voltage, a current limit circuit for current protection and a chip enable circuit (5-pin products only).

The AP2121 series feature high ripple rejection, low dropout voltage, low noise, high output voltage accuracy, and low current consumption which make them ideal for use in various battery-powered devices.

The AP2121 series have 1.5V, 1.8V, 2.5V, 2.8V, 3.0V, 3.2V and 3.3V versions.

The AP2121 are available in standard SOT-23-3 and SOT-23-5 packages.

### Features

- Low Dropout Voltage at  $I_{OUT}=100mA$ : 150mV Typical (Except 1.5V Version)
- Low Standby Current: 0.1 $\mu A$  Typical
- Low Quiescent Current: 25 $\mu A$  Typical
- High Ripple Rejection: 70dB Typical ( $f=10kHz$ )
- Maximum Output Current: More Than 150mA (300mA Limit)
- Extremely Low Noise: 30 $\mu V_{rms}$  (10Hz to 100kHz)
- Excellent Line Regulation: 4mV Typical
- Excellent Load Regulation: 12mV Typical
- High Output Voltage Accuracy:  $\pm 2\%$
- Excellent Line Transient Response and Load Transient Response
- Compatible with Low ESR Ceramic Capacitor (as Low as 1 $\mu F$ )

### Applications

- Mobile Phones, Cordless Phones
- Wireless Communication Equipment
- Portable Games
- Cameras, Video Recorders
- Sub-board Power Supplies for Telecom Equipment
- Battery Powered Equipment



Figure 1. Package Types of AP2121

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## Pin Configuration

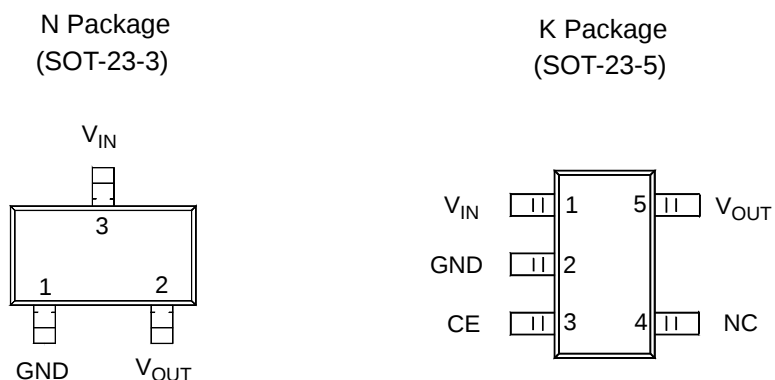


Figure 2. Pin Configuration of AP2121 (Top View)

## Pin Description

| Pin Number |          | Pin Name  | Function                                                            |
|------------|----------|-----------|---------------------------------------------------------------------|
| SOT-23-3   | SOT-23-5 |           |                                                                     |
| 3          | 1        | $V_{IN}$  | Input voltage                                                       |
| 1          | 2        | GND       | Ground                                                              |
|            | 3        | CE        | Active high enable input pin. Logic high=enable, logic low=shutdown |
|            | 4        | NC        | No connection                                                       |
| 2          | 5        | $V_{OUT}$ | Regulated output voltage                                            |

**Functional Block Diagram**

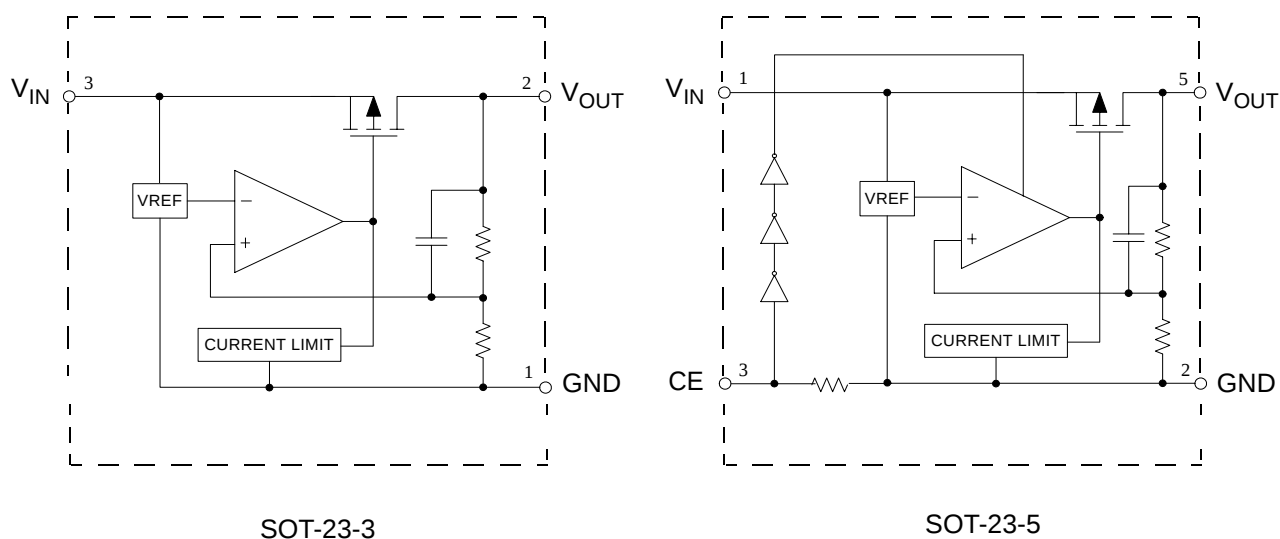
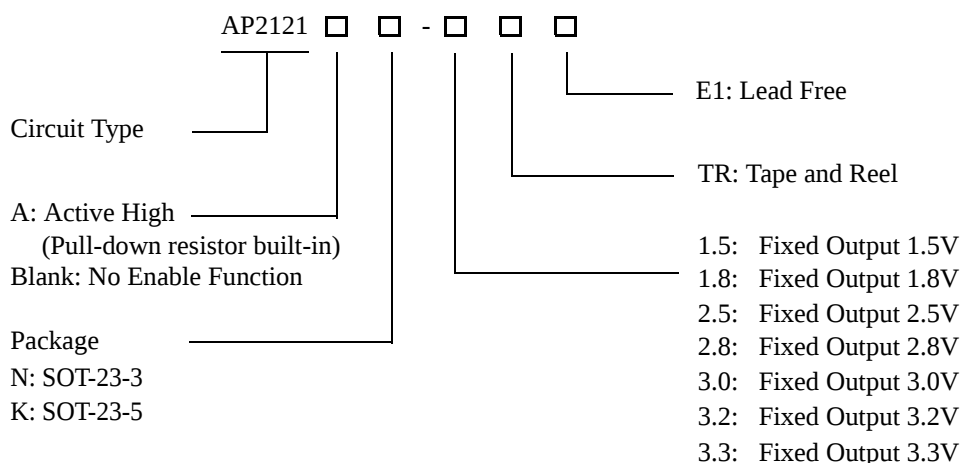


Figure 3. Functional Block Diagram of AP2121

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## Ordering Information



| Package  | Temperature Range | Condition                                 | Part Number      | Marking ID | Packing Type |
|----------|-------------------|-------------------------------------------|------------------|------------|--------------|
| SOT-23-3 | -40 to 85°C       |                                           | AP2121N-1.5TRE1  | EF1        | Tape & Reel  |
|          |                   |                                           | AP2121N-1.8TRE1  | EF3        | Tape & Reel  |
|          |                   |                                           | AP2121N-2.5TRE1  | EF4        | Tape & Reel  |
|          |                   |                                           | AP2121N-2.8TRE1  | EF5        | Tape & Reel  |
|          |                   |                                           | AP2121N-3.0TRE1  | EF6        | Tape & Reel  |
|          |                   |                                           | AP2121N-3.2TRE1  | EF7        | Tape & Reel  |
|          |                   |                                           | AP2121N-3.3TRE1  | EF8        | Tape & Reel  |
| SOT-23-5 | -40 to 85°C       | Active High (Pull-down resistor built-in) | AP2121AK-1.5TRE1 | E1Z        | Tape & Reel  |
|          |                   | Active High (Pull-down resistor built-in) | AP2121AK-1.8TRE1 | E1U        | Tape & Reel  |
|          |                   | Active High (Pull-down resistor built-in) | AP2121AK-2.5TRE1 | E1V        | Tape & Reel  |
|          |                   | Active High (Pull-down resistor built-in) | AP2121AK-2.8TRE1 | E1W        | Tape & Reel  |
|          |                   | Active High (Pull-down resistor built-in) | AP2121AK-3.0TRE1 | E1X        | Tape & Reel  |
|          |                   | Active High (Pull-down resistor built-in) | AP2121AK-3.2TRE1 | E3Z        | Tape & Reel  |
|          |                   | Active High (Pull-down resistor built-in) | AP2121AK-3.3TRE1 | E1Y        | Tape & Reel  |

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant.

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### Absolute Maximum Ratings (Note 1)

| Parameter                           | Symbol        | Value                |     | Unit |
|-------------------------------------|---------------|----------------------|-----|------|
| Input Voltage                       | $V_{IN}$      | 6.5                  |     | V    |
| Enable Input Voltage                | $V_{CE}$      | -0.3 to $V_{IN}+0.3$ |     | V    |
| Output Current                      | $I_{OUT}$     | 300                  |     | mA   |
| Junction Temperature                | $T_J$         | 150                  |     | °C   |
| Storage Temperature Range           | $T_{STG}$     | -65 to 150           |     | °C   |
| Lead Temperature (Soldering, 10sec) | $T_{LEAD}$    | 260                  |     | °C   |
| Thermal Resistance (Note 2)         | $\theta_{JA}$ | SOT-23-3             | 250 | °C/W |
|                                     |               | SOT-23-5             | 250 |      |
| ESD (Human Body Model)              | ESD           | 2000                 |     | V    |
| ESD (Machine Model)                 | ESD           | 200                  |     | V    |

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Note 2: Absolute maximum ratings indicate limits beyond which damage to the component may occur. Electrical specifications do not apply when operating the device outside of its operating ratings. The maximum allowable power dissipation is a function of the maximum junction temperature,  $T_{J(max)}$ , the junction-to-ambient thermal resistance,  $\theta_{JA}$ , and the ambient temperature,  $T_A$ . The maximum allowable power dissipation at any ambient temperature is calculated using:  $P_{D(max)} = (T_{J(max)} - T_A) / \theta_{JA}$ . Exceeding the maximum allowable power dissipation will result in excessive die temperature.

### Recommended Operating Conditions

| Parameter                            | Symbol   | Min | Max | Unit |
|--------------------------------------|----------|-----|-----|------|
| Input Voltage                        | $V_{IN}$ | 2   | 6   | V    |
| Operating Junction Temperature Range | $T_J$    | -40 | 85  | °C   |



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**Electrical Characteristics**

**AP2121-1.5 Electrical Characteristics**

( $V_{IN}=2.5V$ ,  $T_J=25^{\circ}C$ ,  $C_{IN}=1\mu F$ ,  $C_{OUT}=1\mu F$ , **Bold** typeface applies over  $-40^{\circ}C \leq T_J \leq 85^{\circ}C$ , unless otherwise specified.)

| Parameter                              | Symbol                              | Conditions                                     | Min  | Typ       | Max  | Unit              |
|----------------------------------------|-------------------------------------|------------------------------------------------|------|-----------|------|-------------------|
| Output Voltage                         | $V_{OUT}$                           | $V_{IN}=2.5V$<br>$1mA \leq I_{OUT} \leq 30mA$  | 1.47 | 1.5       | 1.53 | V                 |
| Input Voltage                          | $V_{IN}$                            |                                                |      |           | 6    | V                 |
| Output Current                         | $I_{OUT}$                           | $V_{IN}-V_{OUT}=1V$                            | 150  |           |      | mA                |
| Load Regulation                        | $V_{RLOAD}$                         | $V_{IN}=2.5V$<br>$1mA \leq I_{OUT} \leq 80mA$  |      | 12        | 40   | mV                |
| Line Regulation                        | $V_{RLINE}$                         | $2.3V \leq V_{IN} \leq 6V$<br>$I_{OUT}=30mA$   |      | 4         | 16   | mV                |
| Dropout Voltage                        | $V_{DROP}$                          | $I_{OUT}=10mA$                                 |      | 400       | 600  | mV                |
|                                        |                                     | $I_{OUT}=100mA$                                |      | 400       | 600  |                   |
|                                        |                                     | $I_{OUT}=150mA$                                |      | 400       | 600  |                   |
| Quiescent Current                      | $I_Q$                               | $V_{IN}=2.5V$ , $I_{OUT}=0mA$                  |      | 25        | 50   | $\mu A$           |
| Standby Current                        | $I_{STD}$                           | $V_{IN}=2.5V$<br>$V_{CE}$ in OFF mode          |      | 0.1       | 1    | $\mu A$           |
| Power Supply Rejection Ratio           | PSRR                                | Ripple 0.5Vp-p, $f=10kHz$<br>$V_{IN}=2.5V$     |      | 70        |      | dB                |
| Output Voltage Temperature Coefficient | $\Delta V_{OUT}/\Delta T$           | $I_{OUT}=30mA$                                 |      | $\pm 150$ |      | $\mu V/^{\circ}C$ |
|                                        | $(\Delta V_{OUT}/V_{OUT})/\Delta T$ |                                                |      | $\pm 100$ |      | ppm/ $^{\circ}C$  |
| Short Current Limit                    | $I_{LIMIT}$                         | $V_{OUT}=0V$                                   |      | 50        |      | mA                |
| RMS Output Noise                       | $V_{NOISE}$                         | $T_A=25^{\circ}C$<br>$10Hz \leq f \leq 100kHz$ |      | 30        |      | $\mu V_{rms}$     |
| CE "High" Voltage                      |                                     | CE input voltage "High"                        | 1.5  |           |      | V                 |
| CE "Low" Voltage                       |                                     | CE input voltage "Low"                         |      |           | 0.25 | V                 |
| CE Pull-down Resistance                | $R_{PD}$                            |                                                | 2.5  | 5         | 10   | $M\Omega$         |



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## Electrical Characteristics (Continued)

### AP2121-1.8 Electrical Characteristics

( $V_{IN}=2.8V$ ,  $T_J=25^{\circ}C$ ,  $C_{IN}=1\mu F$ ,  $C_{OUT}=1\mu F$ , **Bold** typeface applies over  $-40^{\circ}C \leq T_J \leq 85^{\circ}C$ , unless otherwise specified.)

| Parameter                              | Symbol                              | Conditions                                     | Min   | Typ       | Max   | Unit              |
|----------------------------------------|-------------------------------------|------------------------------------------------|-------|-----------|-------|-------------------|
| Output Voltage                         | $V_{OUT}$                           | $V_{IN}=2.8V$<br>$1mA \leq I_{OUT} \leq 30mA$  | 1.764 | 1.8       | 1.836 | V                 |
| Input Voltage                          | $V_{IN}$                            |                                                |       |           | 6     | V                 |
| Output Current                         | $I_{OUT}$                           | $V_{IN}-V_{OUT}=1V$                            | 150   |           |       | mA                |
| Load Regulation                        | $V_{RLOAD}$                         | $V_{IN}=2.8V$<br>$1mA \leq I_{OUT} \leq 80mA$  |       | 12        | 40    | mV                |
| Line Regulation                        | $V_{RLINE}$                         | $2.3V \leq V_{IN} \leq 6V$<br>$I_{OUT}=30mA$   |       | 4         | 16    | mV                |
| Dropout Voltage                        | $V_{DROP}$                          | $I_{OUT}=10mA$                                 |       | 20        | 40    | mV                |
|                                        |                                     | $I_{OUT}=100mA$                                |       | 150       | 300   |                   |
|                                        |                                     | $I_{OUT}=150mA$                                |       | 200       | 400   |                   |
| Quiescent Current                      | $I_Q$                               | $V_{IN}=2.8V$ , $I_{OUT}=0mA$                  |       | 25        | 50    | $\mu A$           |
| Standby Current                        | $I_{STD}$                           | $V_{IN}=2.8V$<br>$V_{CE}$ in OFF mode          |       | 0.1       | 1     | $\mu A$           |
| Power Supply Rejection Ratio           | PSRR                                | Ripple 0.5Vp-p, $f=10kHz$<br>$V_{IN}=2.8V$     |       | 70        |       | dB                |
| Output Voltage Temperature Coefficient | $\Delta V_{OUT}/\Delta T$           | $I_{OUT}=30mA$                                 |       | $\pm 180$ |       | $\mu V/^{\circ}C$ |
|                                        | $(\Delta V_{OUT}/V_{OUT})/\Delta T$ |                                                |       | $\pm 100$ |       | ppm/ $^{\circ}C$  |
| Short Current Limit                    | $I_{LIMIT}$                         | $V_{OUT}=0V$                                   |       | 50        |       | mA                |
| RMS Output Noise                       | $V_{NOISE}$                         | $T_A=25^{\circ}C$<br>$10Hz \leq f \leq 100kHz$ |       | 30        |       | $\mu V_{rms}$     |
| CE "High" Voltage                      |                                     | CE input voltage "High"                        | 1.5   |           |       | V                 |
| CE "Low" Voltage                       |                                     | CE input voltage "Low"                         |       |           | 0.25  | V                 |
| CE Pull-down Resistance                | $R_{PD}$                            |                                                | 2.5   | 5         | 10    | $M\Omega$         |



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## Electrical Characteristics (Continued)

### AP2121-2.5 Electrical Characteristics

( $V_{IN}=3.5V$ ,  $T_J=25^{\circ}C$ ,  $C_{IN}=1\mu F$ ,  $C_{OUT}=1\mu F$ , **Bold** typeface applies over  $-40^{\circ}C \leq T_J \leq 85^{\circ}C$ , unless otherwise specified.)

| Parameter                              | Symbol                              | Conditions                                     | Min  | Typ       | Max  | Unit              |
|----------------------------------------|-------------------------------------|------------------------------------------------|------|-----------|------|-------------------|
| Output Voltage                         | $V_{OUT}$                           | $V_{IN}=3.5V$<br>$1mA \leq I_{OUT} \leq 30mA$  | 2.45 | 2.5       | 2.55 | V                 |
| Input Voltage                          | $V_{IN}$                            |                                                |      |           | 6    | V                 |
| Output Current                         | $I_{OUT}$                           | $V_{IN}-V_{OUT}=1V$                            | 150  |           |      | mA                |
| Load Regulation                        | $V_{RLOAD}$                         | $V_{IN}=3.5V$<br>$1mA \leq I_{OUT} \leq 80mA$  |      | 12        | 40   | mV                |
| Line Regulation                        | $V_{RLINE}$                         | $3V \leq V_{IN} \leq 6V$<br>$I_{OUT}=30mA$     |      | 4         | 16   | mV                |
| Dropout Voltage                        | $V_{DROP}$                          | $I_{OUT}=10mA$                                 |      | 20        | 40   | mV                |
|                                        |                                     | $I_{OUT}=100mA$                                |      | 150       | 300  |                   |
|                                        |                                     | $I_{OUT}=150mA$                                |      | 200       | 400  |                   |
| Quiescent Current                      | $I_Q$                               | $V_{IN}=3.5V$ , $I_{OUT}=0mA$                  |      | 25        | 50   | $\mu A$           |
| Standby Current                        | $I_{STD}$                           | $V_{IN}=3.5V$<br>$V_{CE}$ in OFF mode          |      | 0.1       | 1    | $\mu A$           |
| Power Supply Rejection Ratio           | PSRR                                | Ripple 0.5Vp-p, $f=10kHz$<br>$V_{IN}=3.5V$     |      | 70        |      | dB                |
| Output Voltage Temperature Coefficient | $\Delta V_{OUT}/\Delta T$           | $I_{OUT}=30mA$                                 |      | $\pm 250$ |      | $\mu V/^{\circ}C$ |
|                                        | $(\Delta V_{OUT}/V_{OUT})/\Delta T$ |                                                |      | $\pm 100$ |      | ppm/ $^{\circ}C$  |
| Short Current Limit                    | $I_{LIMIT}$                         | $V_{OUT}=0V$                                   |      | 50        |      | mA                |
| RMS Output Noise                       | $V_{NOISE}$                         | $T_A=25^{\circ}C$<br>$10Hz \leq f \leq 100kHz$ |      | 30        |      | $\mu V_{rms}$     |
| CE "High" Voltage                      |                                     | CE input voltage "High"                        | 1.5  |           |      | V                 |
| CE "Low" Voltage                       |                                     | CE input voltage "Low"                         |      |           | 0.25 | V                 |
| CE Pull-down Resistance                | $R_{PD}$                            |                                                | 2.5  | 5         | 10   | $M\Omega$         |



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**Electrical Characteristics (Continued)**

**AP2121-2.8 Electrical Characteristics**

( $V_{IN}=3.8V$ ,  $T_J=25^{\circ}C$ ,  $C_{IN}=1\mu F$ ,  $C_{OUT}=1\mu F$ , **Bold** typeface applies over  $-40^{\circ}C \leq T_J \leq 85^{\circ}C$ , unless otherwise specified.)

| Parameter                              | Symbol                              | Conditions                                     | Min   | Typ       | Max   | Unit              |
|----------------------------------------|-------------------------------------|------------------------------------------------|-------|-----------|-------|-------------------|
| Output Voltage                         | $V_{OUT}$                           | $V_{IN}=3.8V$<br>$1mA \leq I_{OUT} \leq 30mA$  | 2.744 | 2.8       | 2.856 | V                 |
| Input Voltage                          | $V_{IN}$                            |                                                |       |           | 6     | V                 |
| Output Current                         | $I_{OUT}$                           | $V_{IN}-V_{OUT}=1V$                            | 150   |           |       | mA                |
| Load Regulation                        | $V_{RLOAD}$                         | $V_{IN}=3.8V$<br>$1mA \leq I_{OUT} \leq 80mA$  |       | 12        | 40    | mV                |
| Line Regulation                        | $V_{RLINE}$                         | $3.3V \leq V_{IN} \leq 6V$<br>$I_{OUT}=30mA$   |       | 4         | 16    | mV                |
| Dropout Voltage                        | $V_{DROP}$                          | $I_{OUT}=10mA$                                 |       | 20        | 40    | mV                |
|                                        |                                     | $I_{OUT}=100mA$                                |       | 150       | 300   |                   |
|                                        |                                     | $I_{OUT}=150mA$                                |       | 200       | 400   |                   |
| Quiescent Current                      | $I_Q$                               | $V_{IN}=3.8V$ , $I_{OUT}=0mA$                  |       | 25        | 50    | $\mu A$           |
| Standby Current                        | $I_{STD}$                           | $V_{IN}=3.8V$<br>$V_{CE}$ in OFF mode          |       | 0.1       | 1     | $\mu A$           |
| Power Supply Rejection Ratio           | PSRR                                | Ripple 0.5Vp-p, $f=10kHz$<br>$V_{IN}=3.8V$     |       | 70        |       | dB                |
| Output Voltage Temperature Coefficient | $\Delta V_{OUT}/\Delta T$           | $I_{OUT}=30mA$                                 |       | $\pm 280$ |       | $\mu V/^{\circ}C$ |
|                                        | $(\Delta V_{OUT}/V_{OUT})/\Delta T$ |                                                |       | $\pm 100$ |       | ppm/ $^{\circ}C$  |
| Short Current Limit                    | $I_{LIMIT}$                         | $V_{OUT}=0V$                                   |       | 50        |       | mA                |
| RMS Output Noise                       | $V_{NOISE}$                         | $T_A=25^{\circ}C$<br>$10Hz \leq f \leq 100kHz$ |       | 30        |       | $\mu V_{rms}$     |
| CE "High" Voltage                      |                                     | CE input voltage "High"                        | 1.5   |           |       | V                 |
| CE "Low" Voltage                       |                                     | CE input voltage "Low"                         |       |           | 0.25  | V                 |
| CE Pull-down Resistance                | $R_{PD}$                            |                                                | 2.5   | 5         | 10    | $M\Omega$         |



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## Electrical Characteristics (Continued)

### AP2121-3.0 Electrical Characteristics

( $V_{IN}=4V$ ,  $T_J=25^{\circ}C$ ,  $C_{IN}=1\mu F$ ,  $C_{OUT}=1\mu F$ , **Bold** typeface applies over  $-40^{\circ}C \leq T_J \leq 85^{\circ}C$ , unless otherwise specified.)

| Parameter                              | Symbol                              | Conditions                                     | Min  | Typ       | Max  | Unit              |
|----------------------------------------|-------------------------------------|------------------------------------------------|------|-----------|------|-------------------|
| Output Voltage                         | $V_{OUT}$                           | $V_{IN}=4V$<br>$1mA \leq I_{OUT} \leq 30mA$    | 2.94 | 3.0       | 3.06 | V                 |
| Input Voltage                          | $V_{IN}$                            |                                                |      |           | 6    | V                 |
| Output Current                         | $I_{OUT}$                           | $V_{IN}-V_{OUT}=1V$                            | 150  |           |      | mA                |
| Load Regulation                        | $V_{RLOAD}$                         | $V_{IN}=4V$<br>$1mA \leq I_{OUT} \leq 80mA$    |      | 12        | 40   | mV                |
| Line Regulation                        | $V_{RLINE}$                         | $3.5V \leq V_{IN} \leq 6V$<br>$I_{OUT}=30mA$   |      | 4         | 16   | mV                |
| Dropout Voltage                        | $V_{DROP}$                          | $I_{OUT}=10mA$                                 |      | 20        | 40   | mV                |
|                                        |                                     | $I_{OUT}=100mA$                                |      | 150       | 300  |                   |
|                                        |                                     | $I_{OUT}=150mA$                                |      | 200       | 400  |                   |
| Quiescent Current                      | $I_Q$                               | $V_{IN}=4V$ , $I_{OUT}=0mA$                    |      | 25        | 50   | $\mu A$           |
| Standby Current                        | $I_{STD}$                           | $V_{IN}=4V$<br>$V_{CE}$ in OFF mode            |      | 0.1       | 1    | $\mu A$           |
| Power Supply Rejection Ratio           | PSRR                                | Ripple 0.5Vp-p, $f=10kHz$<br>$V_{IN}=4V$       |      | 70        |      | dB                |
| Output Voltage Temperature Coefficient | $\Delta V_{OUT}/\Delta T$           | $I_{OUT}=30mA$                                 |      | $\pm 300$ |      | $\mu V/^{\circ}C$ |
|                                        | $(\Delta V_{OUT}/V_{OUT})/\Delta T$ |                                                |      | $\pm 100$ |      | ppm/ $^{\circ}C$  |
| Short Current Limit                    | $I_{LIMIT}$                         | $V_{OUT}=0V$                                   |      | 50        |      | mA                |
| RMS Output Noise                       | $V_{NOISE}$                         | $T_A=25^{\circ}C$<br>$10Hz \leq f \leq 100kHz$ |      | 30        |      | $\mu V_{rms}$     |
| CE "High" Voltage                      |                                     | CE input voltage "High"                        | 1.5  |           |      | V                 |
| CE "Low" Voltage                       |                                     | CE input voltage "Low"                         |      |           | 0.25 | V                 |
| CE Pull-down Resistance                | $R_{PD}$                            |                                                | 2.5  | 5         | 10   | $M\Omega$         |



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## Electrical Characteristics (Continued)

### AP2121-3.2 Electrical Characteristics

( $V_{IN}=4.2V$ ,  $T_J=25^{\circ}C$ ,  $C_{IN}=1\mu F$ ,  $C_{OUT}=1\mu F$ , **Bold** typeface applies over  $-40^{\circ}C \leq T_J \leq 85^{\circ}C$ , unless otherwise specified.)

| Parameter                              | Symbol                              | Conditions                                     | Min   | Typ       | Max   | Unit              |
|----------------------------------------|-------------------------------------|------------------------------------------------|-------|-----------|-------|-------------------|
| Output Voltage                         | $V_{OUT}$                           | $V_{IN}=4.2V$<br>$1mA \leq I_{OUT} \leq 30mA$  | 3.136 | 3.2       | 3.264 | V                 |
| Input Voltage                          | $V_{IN}$                            |                                                |       |           | 6     | V                 |
| Output Current                         | $I_{OUT}$                           | $V_{IN}-V_{OUT}=1V$                            | 150   |           |       | mA                |
| Load Regulation                        | $V_{RLOAD}$                         | $V_{IN}=4.2V$<br>$1mA \leq I_{OUT} \leq 80mA$  |       | 12        | 40    | mV                |
| Line Regulation                        | $V_{RLINE}$                         | $3.7V \leq V_{IN} \leq 6V$<br>$I_{OUT}=30mA$   |       | 4         | 16    | mV                |
| Dropout Voltage                        | $V_{DROP}$                          | $I_{OUT}=10mA$                                 |       | 20        | 40    | mV                |
|                                        |                                     | $I_{OUT}=100mA$                                |       | 150       | 300   |                   |
|                                        |                                     | $I_{OUT}=150mA$                                |       | 200       | 400   |                   |
| Quiescent Current                      | $I_Q$                               | $V_{IN}=4.2V$ , $I_{OUT}=0mA$                  |       | 25        | 50    | $\mu A$           |
| Standby Current                        | $I_{STD}$                           | $V_{IN}=4.2V$<br>$V_{CE}$ in OFF mode          |       | 0.1       | 1     | $\mu A$           |
| Power Supply Rejection Ratio           | PSRR                                | Ripple 0.5Vp-p, $f=10kHz$<br>$V_{IN}=4.2V$     |       | 70        |       | dB                |
| Output Voltage Temperature Coefficient | $\Delta V_{OUT}/\Delta T$           | $I_{OUT}=30mA$                                 |       | $\pm 320$ |       | $\mu V/^{\circ}C$ |
|                                        | $(\Delta V_{OUT}/V_{OUT})/\Delta T$ |                                                |       | $\pm 100$ |       | ppm/ $^{\circ}C$  |
| Short Current Limit                    | $I_{LIMIT}$                         | $V_{OUT}=0V$                                   |       | 50        |       | mA                |
| RMS Output Noise                       | $V_{NOISE}$                         | $T_A=25^{\circ}C$<br>$10Hz \leq f \leq 100kHz$ |       | 30        |       | $\mu V_{rms}$     |
| CE "High" Voltage                      |                                     | CE input voltage "High"                        | 1.5   |           |       | V                 |
| CE "Low" Voltage                       |                                     | CE input voltage "Low"                         |       |           | 0.25  | V                 |
| CE Pull-down Resistance                | $R_{PD}$                            |                                                | 2.5   | 5         | 10    | $M\Omega$         |



**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR** **AP2121**

**Electrical Characteristics (Continued)**

**AP2121-3.3 Electrical Characteristics**

( $V_{IN}=4.3V$ ,  $T_J=25^{\circ}C$ ,  $C_{IN}=1\mu F$ ,  $C_{OUT}=1\mu F$ , **Bold** typeface applies over  $-40^{\circ}C \leq T_J \leq 85^{\circ}C$ , unless otherwise specified.)

| Parameter                              | Symbol                              | Conditions                                     | Min   | Typ       | Max   | Unit              |
|----------------------------------------|-------------------------------------|------------------------------------------------|-------|-----------|-------|-------------------|
| Output Voltage                         | $V_{OUT}$                           | $V_{IN}=4.3V$<br>$1mA \leq I_{OUT} \leq 30mA$  | 3.234 | 3.3       | 3.366 | V                 |
| Input Voltage                          | $V_{IN}$                            |                                                |       |           | 6     | V                 |
| Output Current                         | $I_{OUT}$                           | $V_{IN}-V_{OUT}=1V$                            | 150   |           |       | mA                |
| Load Regulation                        | $V_{RLOAD}$                         | $V_{IN}=4.3V$<br>$1mA \leq I_{OUT} \leq 80mA$  |       | 12        | 40    | mV                |
| Line Regulation                        | $V_{RLINE}$                         | $3.8V \leq V_{IN} \leq 6V$<br>$I_{OUT}=30mA$   |       | 4         | 16    | mV                |
| Dropout Voltage                        | $V_{DROP}$                          | $I_{OUT}=10mA$                                 |       | 20        | 40    | mV                |
|                                        |                                     | $I_{OUT}=100mA$                                |       | 150       | 300   |                   |
|                                        |                                     | $I_{OUT}=150mA$                                |       | 200       | 400   |                   |
| Quiescent Current                      | $I_Q$                               | $V_{IN}=4.3V$ , $I_{OUT}=0mA$                  |       | 25        | 50    | $\mu A$           |
| Standby Current                        | $I_{STD}$                           | $V_{IN}=4.3V$<br>$V_{CE}$ in OFF mode          |       | 0.1       | 1     | $\mu A$           |
| Power Supply Rejection Ratio           | PSRR                                | Ripple 0.5Vp-p, $f=10kHz$<br>$V_{IN}=4.3V$     |       | 70        |       | dB                |
| Output Voltage Temperature Coefficient | $\Delta V_{OUT}/\Delta T$           | $I_{OUT}=30mA$                                 |       | $\pm 330$ |       | $\mu V/^{\circ}C$ |
|                                        | $(\Delta V_{OUT}/V_{OUT})/\Delta T$ |                                                |       | $\pm 100$ |       | ppm/ $^{\circ}C$  |
| Short Current Limit                    | $I_{LIMIT}$                         | $V_{OUT}=0V$                                   |       | 50        |       | mA                |
| RMS Output Noise                       | $V_{NOISE}$                         | $T_A=25^{\circ}C$<br>$10Hz \leq f \leq 100kHz$ |       | 30        |       | $\mu V_{rms}$     |
| CE "High" Voltage                      |                                     | CE input voltage "High"                        | 1.5   |           |       | V                 |
| CE "Low" Voltage                       |                                     | CE input voltage "Low"                         |       |           | 0.25  | V                 |
| CE Pull-down Resistance                | $R_{PD}$                            |                                                | 2.5   | 5         | 10    | $M\Omega$         |

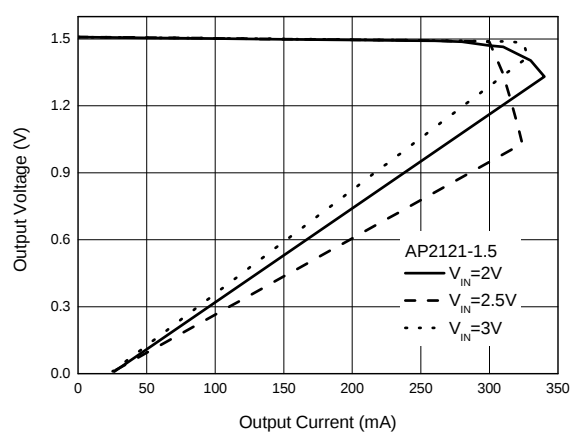
**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR****AP2121****Typical Performance Characteristics**

Figure 4. Output Voltage vs. Output Current

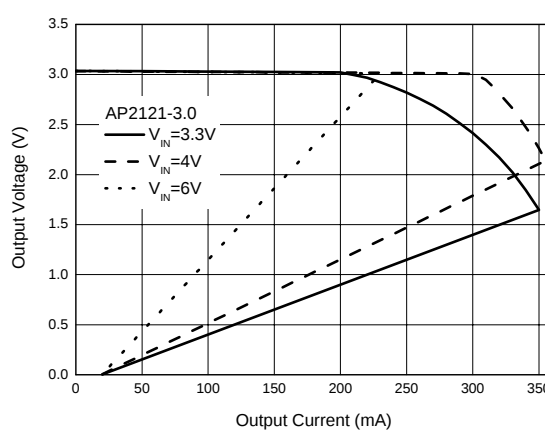


Figure 5. Output Voltage vs. Output Current

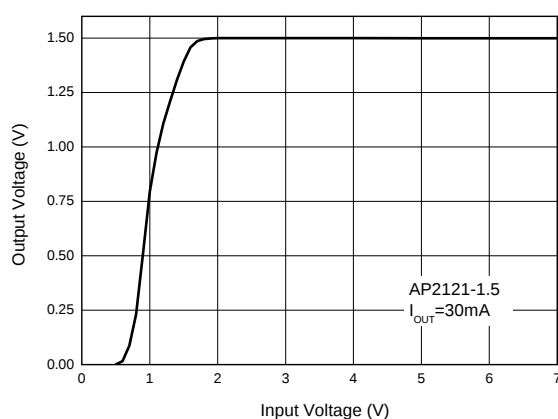


Figure 6. Output Voltage vs. Input Voltage

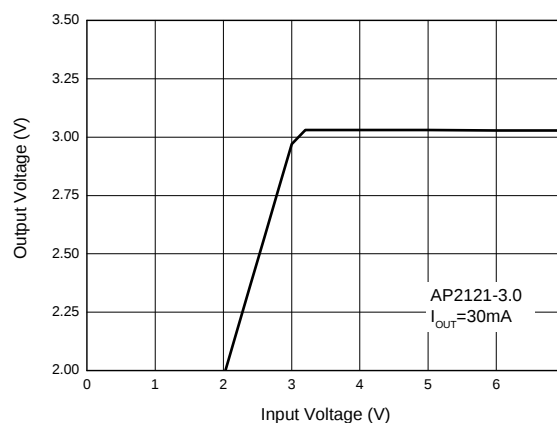


Figure 7. Output Voltage vs. Input Voltage

# HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR

AP2121

## Typical Performance Characteristics (Continued)

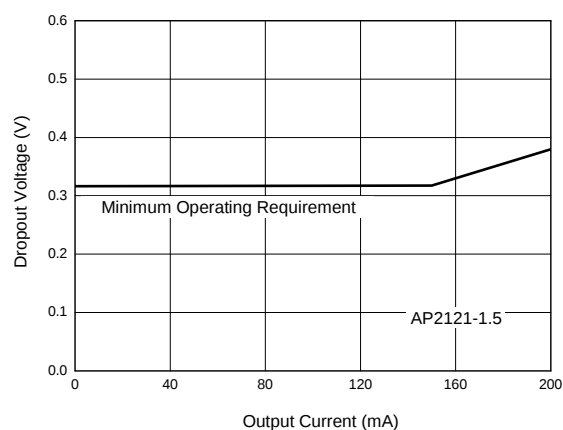


Figure 8. Dropout Voltage vs. Output Current

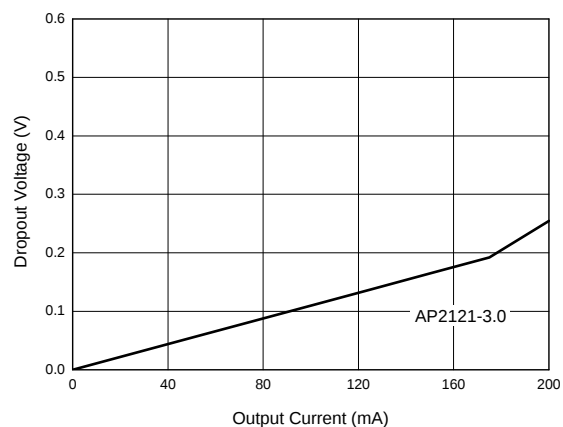


Figure 9. Dropout Voltage vs. Output Current

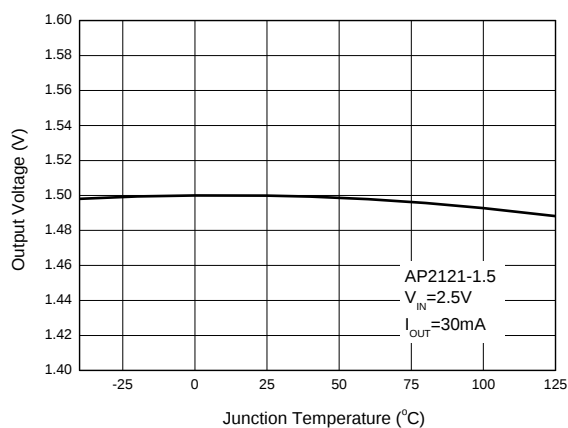


Figure 10. Output Voltage vs. Junction Temperature

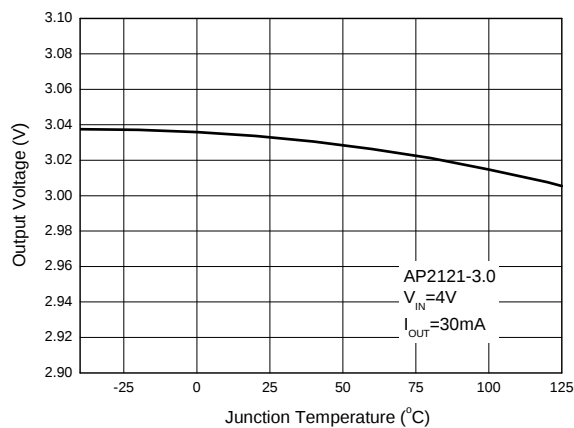


Figure 11. Output Voltage vs. Junction Temperature

**Typical Performance Characteristics (Continued)**

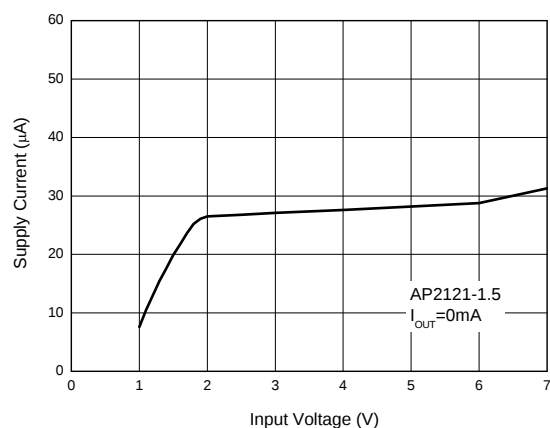


Figure 12. Supply Current vs. Input Voltage

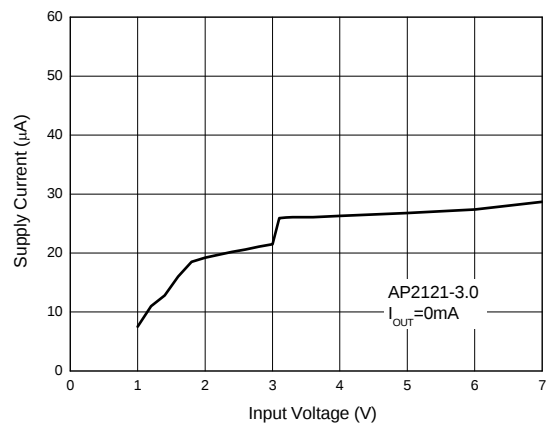


Figure 13. Supply Current vs. Input Voltage

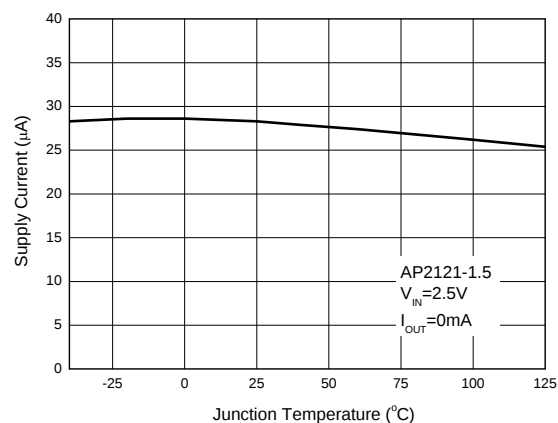


Figure 14. Supply Current vs. Junction Temperature

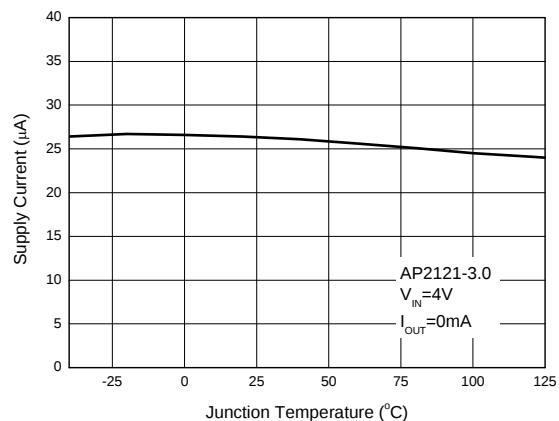


Figure 15. Supply Current vs. Junction Temperature

**Typical Performance Characteristics (Continued)**

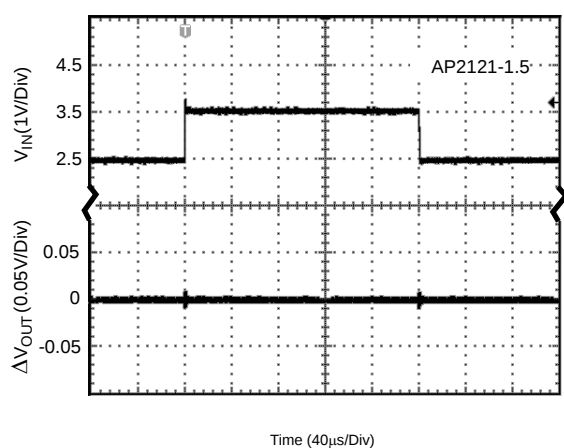


Figure 16. Line Transient  
(Conditions:  $I_{OUT}=30\text{mA}$ ,  $C_{IN}=1\mu\text{F}$ ,  $C_{OUT}=1\mu\text{F}$ )

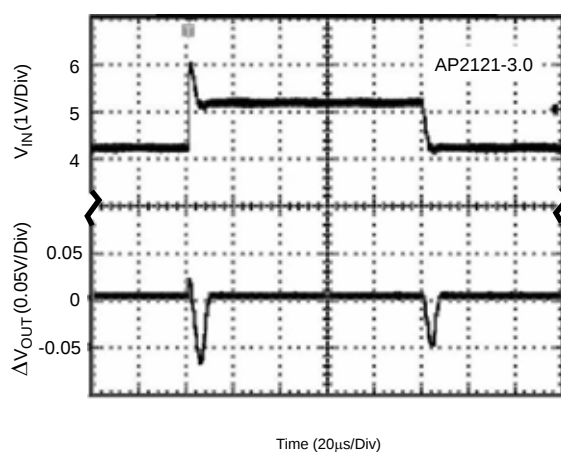


Figure 17. Line Transient  
(Conditions:  $I_{OUT}=30\text{mA}$ ,  $C_{IN}=1\mu\text{F}$ ,  $C_{OUT}=1\mu\text{F}$ )

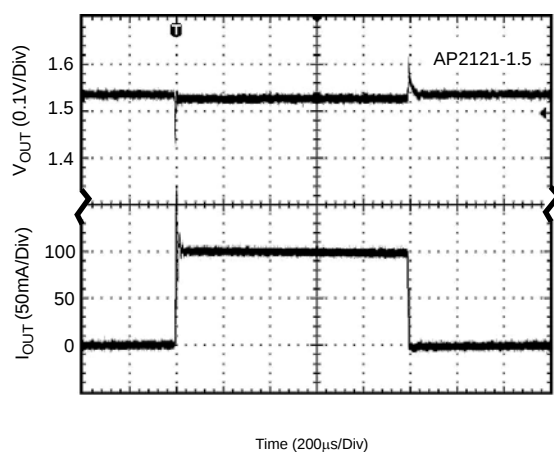


Figure 18. Load Transient  
(Conditions:  $V_{IN}=2.5\text{V}$ ,  $C_{IN}=1\mu\text{F}$ ,  $C_{OUT}=1\mu\text{F}$ )

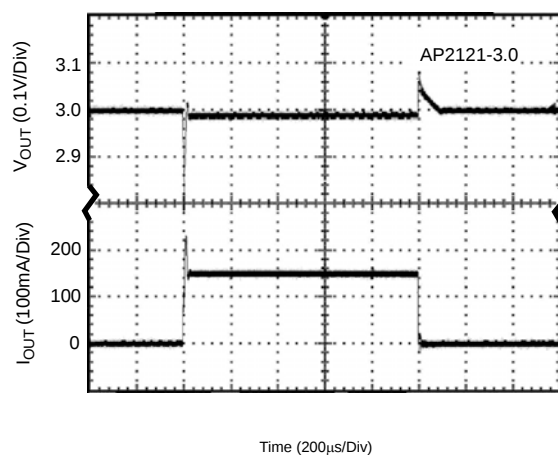


Figure 19. Load Transient  
(Conditions:  $V_{IN}=4\text{V}$ ,  $C_{IN}=1\mu\text{F}$ ,  $C_{OUT}=1\mu\text{F}$ )

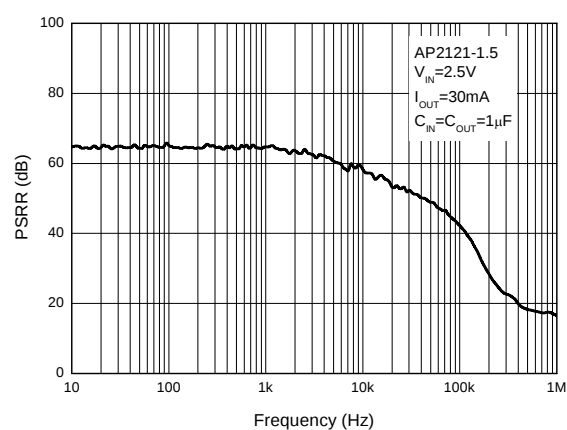
**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR****AP2121****Typical Performance Characteristics (Continued)**

Figure 20. PSRR vs. Frequency

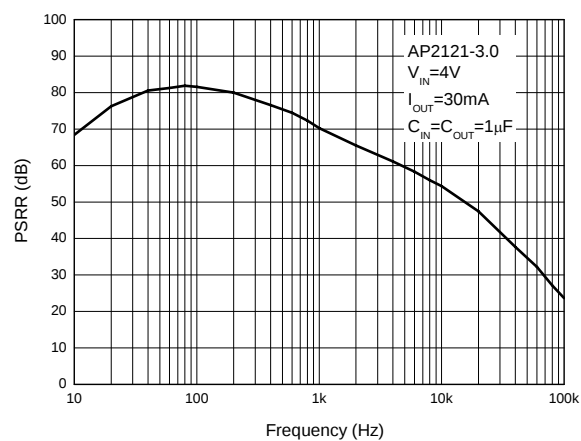
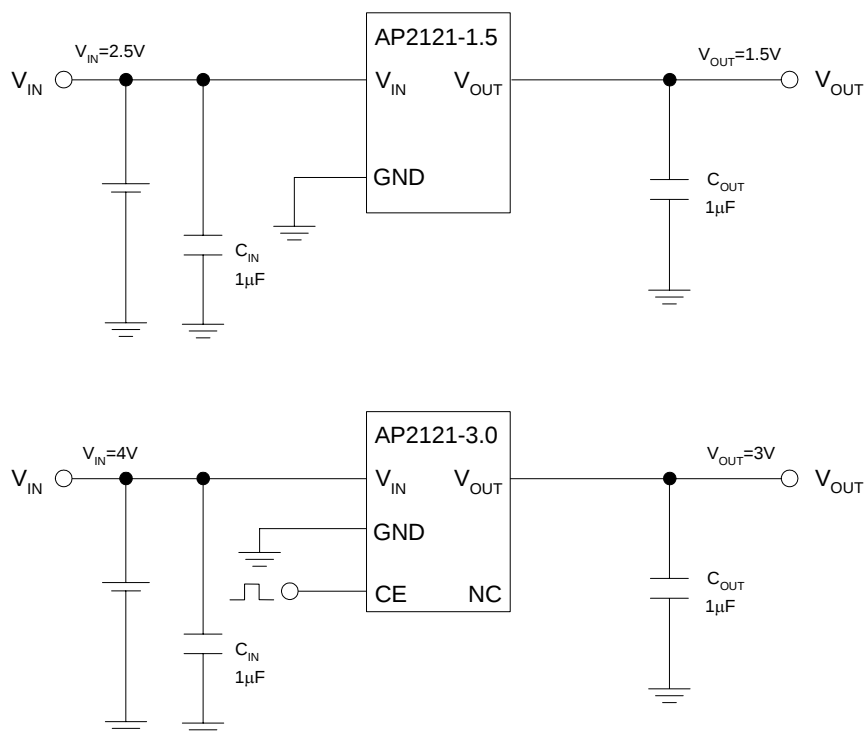


Figure 21. PSRR vs. Frequency



## Typical Application



Note: Filter capacitors are required at the AP2121's input and output. 1μF capacitor is required at the input. The minimum output capacitance required for stability should be more than 1μF with ESR from 0.01Ω to 100Ω. Ceramic capacitors are recommended.

Figure 22. Typical Application of AP2121



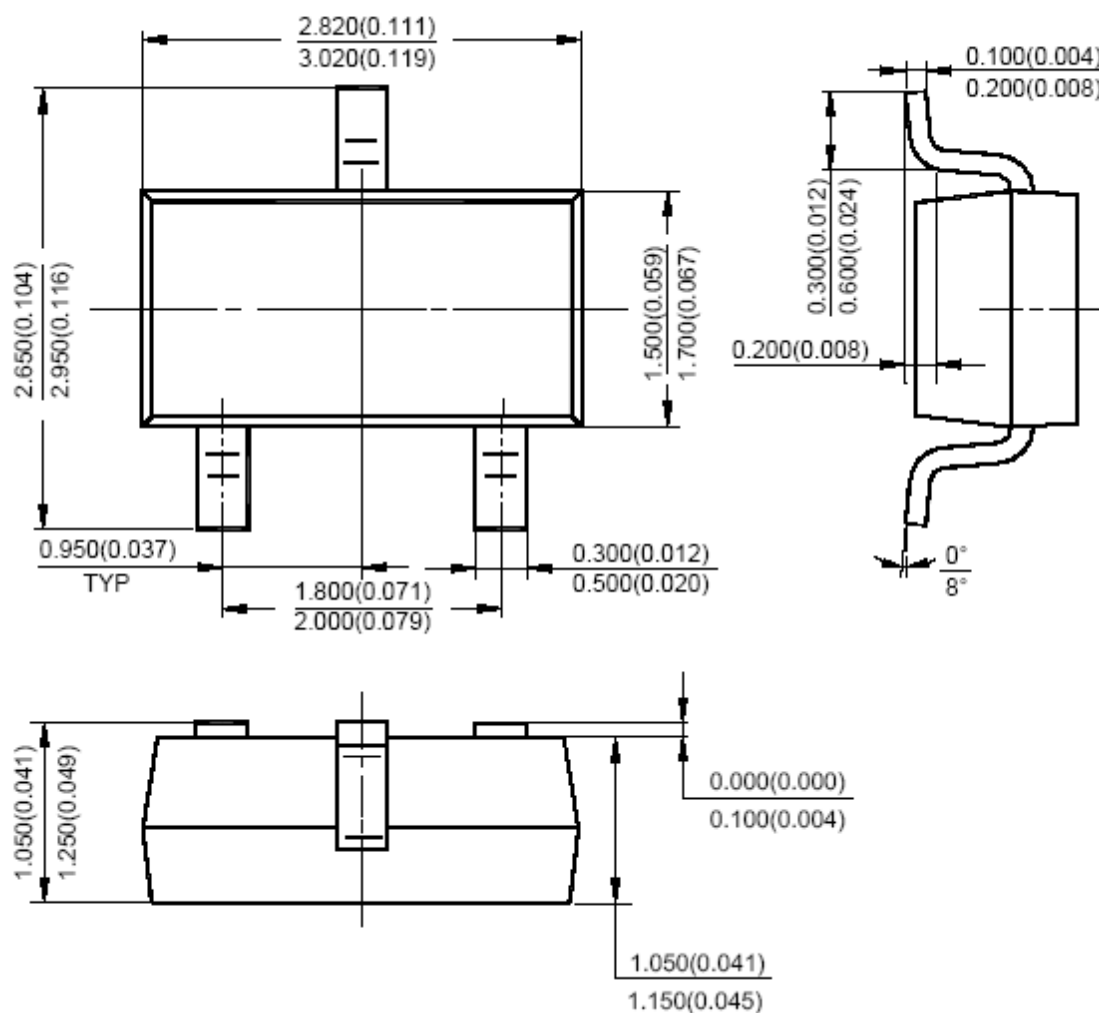
**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR**

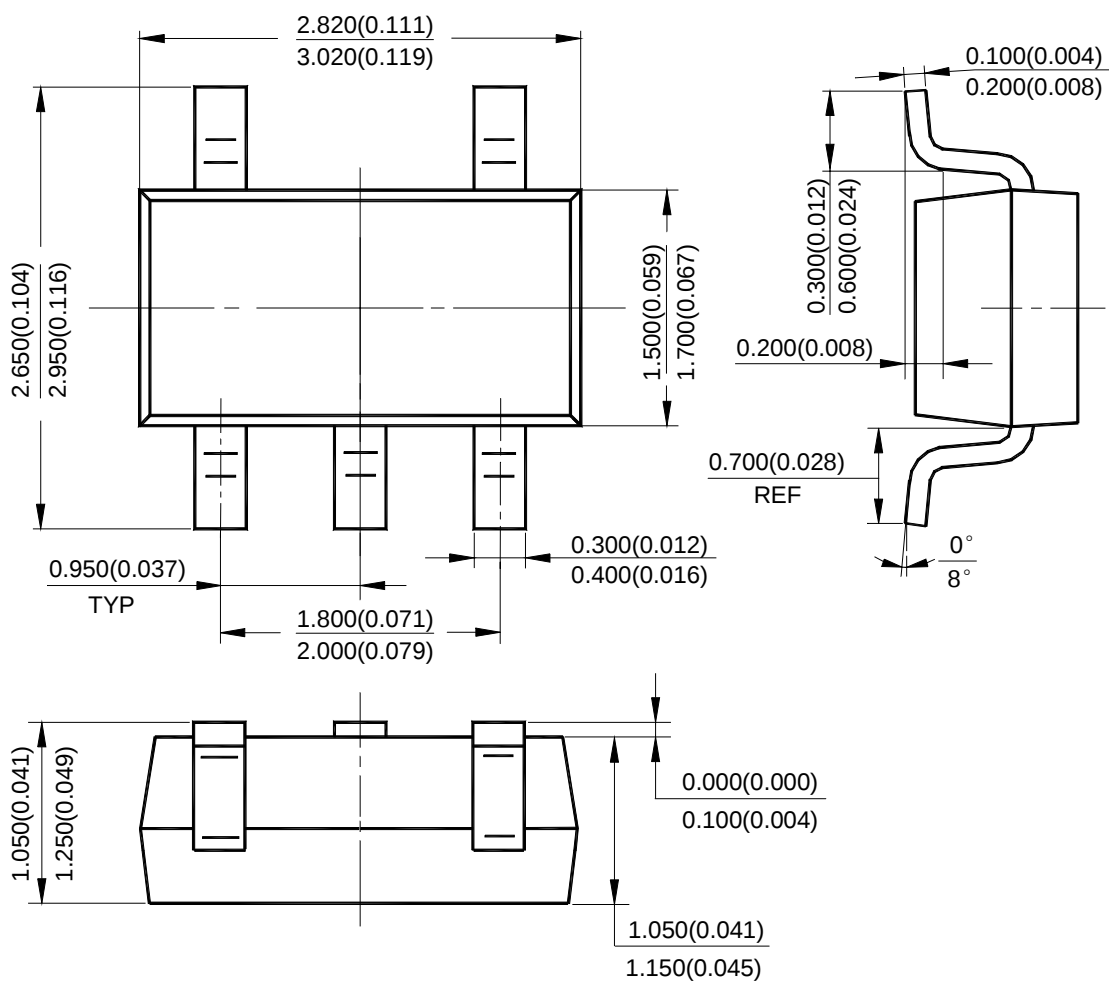
**AP2121**

**Mechanical Dimensions**

**SOT-23-3**

**Unit: mm(inch)**



**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR****AP2121****Mechanical Dimensions (Continued)****SOT-23-5****Unit: mm(inch)**



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#### MAIN SITE

**BCD Semiconductor Manufacturing Limited**  
- Wafer Fab  
**Shanghai SIM-BCD Semiconductor Manufacturing Limited**  
800, Yi Shan Road, Shanghai 200233, China  
Tel: +86-21-6485 1491, Fax: +86-21-5450 0008

**BCD Semiconductor Manufacturing Limited**  
- IC Design Group  
**Advanced Analog Circuits (Shanghai) Corporation**  
8F, Zone B, 900, Yi Shan Road, Shanghai 200233, China  
Tel: +86-21-6495 9539, Fax: +86-21-6485 9673

#### REGIONAL SALES OFFICE

**Shenzhen Office**  
**Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd. Shenzhen Office**  
**Advanced Analog Circuits (Shanghai) Corporation Shenzhen Office**  
Room E, 5F, Noble Center, No.1006, 3rd Fuzhong Road, Futian District, Shenzhen 518026, China  
Tel: +86-755-8826 7951  
Fax: +86-755-8826 7865

**Taiwan Office**  
**BCD Semiconductor (Taiwan) Company Limited**  
4F, 298-1, Rui Guang Road, Nei-Hu District, Taipei, Taiwan  
Tel: +886-2-2656 2808  
Fax: +886-2-2656 2806

**USA Office**  
**BCD Semiconductor Corporation**  
30920 Huntwood Ave. Hayward, CA 94544, U.S.A  
Tel : +1-510-324-2988  
Fax: +1-510-324-2788