

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

**AP2120**

**General Description**

The AP2120 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.

The AP2120 series feature high supply voltage 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 AP2120 series have 1.2V, 1.3V, 1.5V, 1.8V, 2.5V, 2.8V, 3.0V, 3.2V, 3.3V, 3.6V, 4.0V and 5.0V versions.

The AP2120 are available in standard SOT-23, SOT-89 and TO-92 packages.

**Features**

- Low Dropout Voltage at  $I_{OUT}=100mA$ : 200mV Typical (Except 1.2V, 1.3V and 1.5V Versions)
- Low Quiescent Current: 25 $\mu A$  Typical
- High Ripple Rejection: 65dB Typical ( $f=1kHz$ )
- Output Current: More Than 150mA (250mA Limit)
- Extremely Low Noise: 15 $\mu V_{rms}$ @ $V_{OUT}=1.2V, 1.3V, 1.5V$  (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

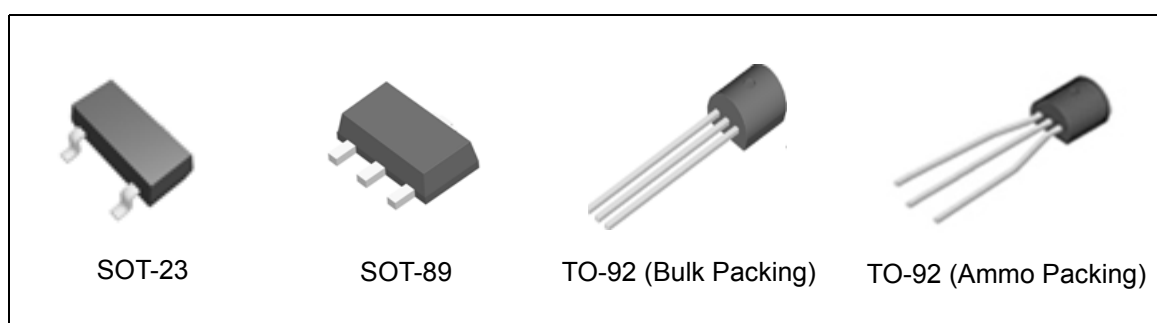


Figure 1. Package Types of AP2120

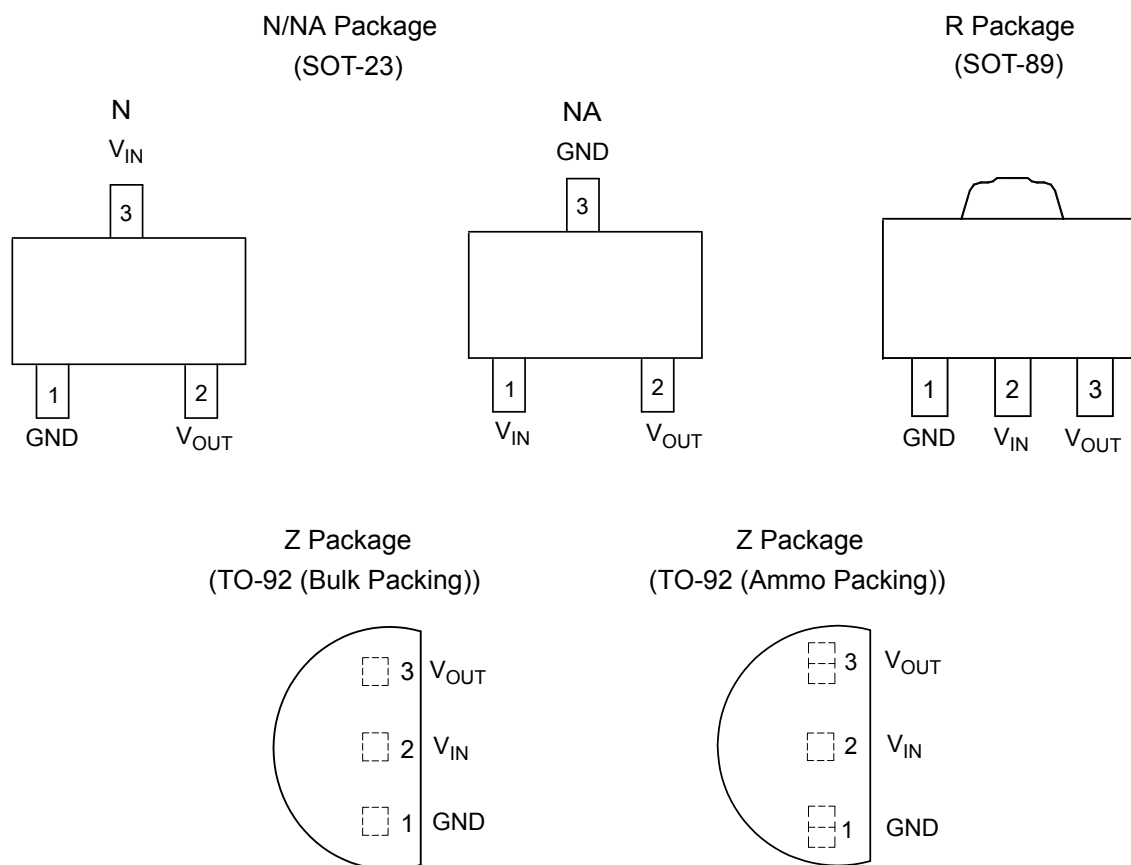
**Pin Configuration**


Figure 2. Pin Configuration of AP2120 (Top View)

**Pin Description**

Pin Number			Pin Name	Function
SOT-23 (N)	SOT-23 (NA)	SOT-89/ TO-92		
1	3	1	GND	Ground
2	2	3	$V_{OUT}$	Regulated Output Voltage
3	1	2	$V_{IN}$	Input Voltage

**Functional Block Diagram**

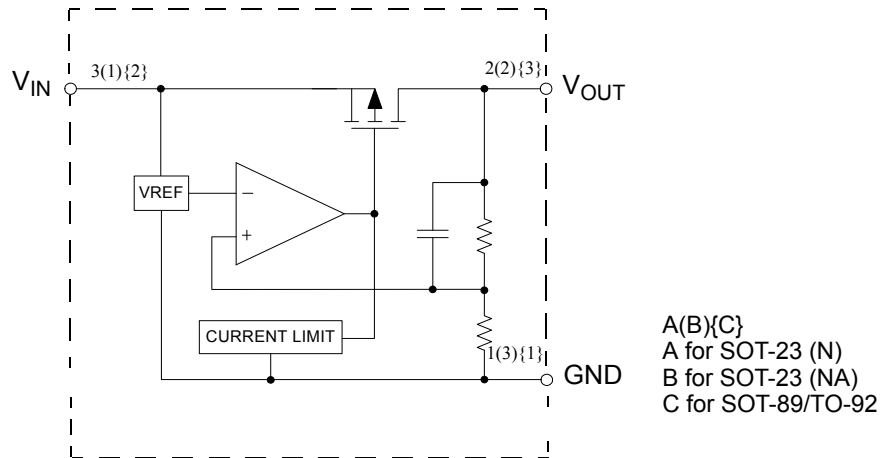
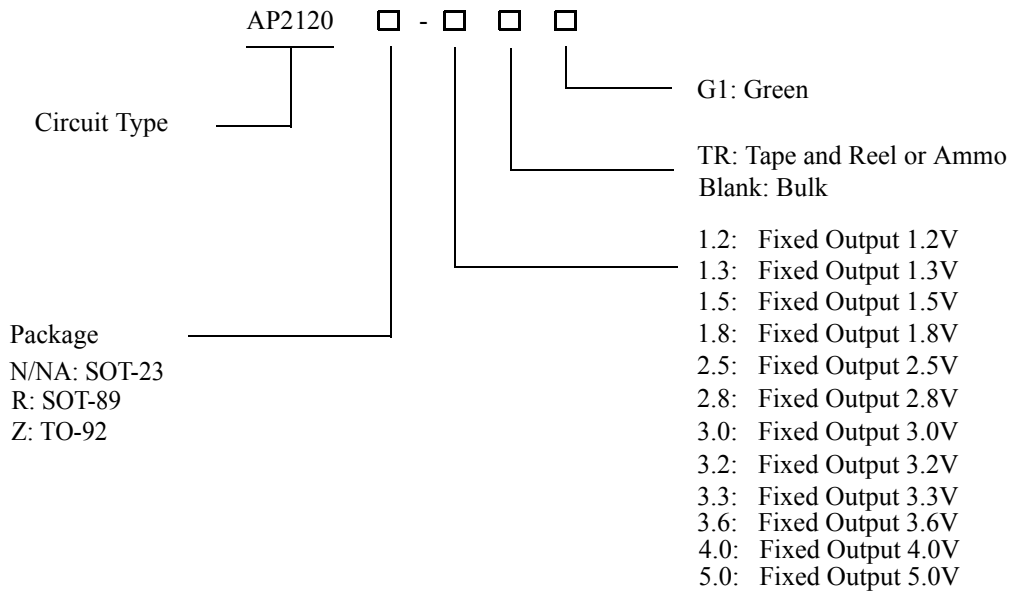


Figure 3. Functional Block Diagram of AP2120



**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR** **AP2120**

**Ordering Information**



Package	Temperature Range	Output Voltage	Part Number	Marking ID	Packing Type
SOT-23	-40 to 85°C	1.2V(N)	AP2120N-1.2TRG1	GR4	Tape & Reel
		1.3V(N)	AP2120N-1.3TRG1	GR5	Tape & Reel
		1.5V(N)	AP2120N-1.5TRG1	GR6	Tape & Reel
		1.8V(N)	AP2120N-1.8TRG1	GR7	Tape & Reel
		2.5V(N)	AP2120N-2.5TRG1	GR8	Tape & Reel
		2.8V(N)	AP2120N-2.8TRG1	GR9	Tape & Reel
		3.0V(N)	AP2120N-3.0TRG1	GS2	Tape & Reel
		3.2V(N)	AP2120N-3.2TRG1	GS3	Tape & Reel
		3.3V(N)	AP2120N-3.3TRG1	GS4	Tape & Reel
		3.6V(N)	AP2120N-3.6TRG1	GZ8	Tape & Reel
		4.0V(N)	AP2120N-4.0TRG1	GZ9	Tape & Reel
SOT-23	-40 to 85°C	3.3V(NA)	AP2120NA-3.3TRG1	GZ1	Tape & Reel
		3.6V(NA)	AP2120NA-3.6TRG1	GAA	Tape & Reel
		4.0V(NA)	AP2120NA-4.0TRG1	GBA	Tape & Reel
SOT-89	-40 to 85°C	1.2V	AP2120R-1.2TRG1	G13Q	Tape & Reel
		1.3V	AP2120R-1.3TRG1	G17Q	Tape & Reel
		1.5V	AP2120R-1.5TRG1	G22Q	Tape & Reel
		1.8V	AP2120R-1.8TRG1	G27Q	Tape & Reel



**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR** **AP2120**

**Ordering Information (Continued)**

Package	Temperature Range	Output Voltage	Part Number	Marking ID	Packing Type
SOT-89	-40 to 85°C	2.5V	AP2120R-2.5TRG1	G28Q	Tape & Reel
		2.8V	AP2120R-2.8TRG1	G31Q	Tape & Reel
		3.0V	AP2120R-3.0TRG1	G33Q	Tape & Reel
		3.2V	AP2120R-3.2TRG1	G37Q	Tape & Reel
		3.3V	AP2120R-3.3TRG1	G41Q	Tape & Reel
		3.6V	AP2120R-3.6TRG1	G42Q	Tape & Reel
		4.0V	AP2120R-4.0TRG1	G43Q	Tape & Reel
		5.0V	AP2120R-5.0TRG1	G70Q	Tape & Reel
TO-92	-40 to 85°C	1.2V	AP2120Z-1.2G1	2120Z-1.2G1	Bulk
		1.2V	AP2120Z-1.2TRG1	2120Z-1.2G1	Ammo
		1.3V	AP2120Z-1.3G1	2120Z-1.3G1	Bulk
		1.3V	AP2120Z-1.3TRG1	2120Z-1.3G1	Ammo
		1.5V	AP2120Z-1.5G1	2120Z-1.5G1	Bulk
		1.5V	AP2120Z-1.5TRG1	2120Z-1.5G1	Ammo
		1.8V	AP2120Z-1.8G1	2120Z-1.8G1	Bulk
		1.8V	AP2120Z-1.8TRG1	2120Z-1.8G1	Ammo
		2.5V	AP2120Z-2.5G1	2120Z-2.5G1	Bulk
		2.5V	AP2120Z-2.5TRG1	2120Z-2.5G1	Ammo
		2.8V	AP2120Z-2.8G1	2120Z-2.8G1	Bulk
		2.8V	AP2120Z-2.8TRG1	2120Z-2.8G1	Ammo
		3.0V	AP2120Z-3.0G1	2120Z-3.0G1	Bulk
		3.0V	AP2120Z-3.0TRG1	2120Z-3.0G1	Ammo
		3.2V	AP2120Z-3.2G1	2120Z-3.2G1	Bulk
		3.2V	AP2120Z-3.2TRG1	2120Z-3.2G1	Ammo
		3.3V	AP2120Z-3.3G1	2120Z-3.3G1	Bulk
		3.3V	AP2120Z-3.3TRG1	2120Z-3.3G1	Ammo
		3.6V	AP2120Z-3.6G1	2120Z-3.6G1	Bulk
		3.6V	AP2120Z-3.6TRG1	2120Z-3.6G1	Ammo
		4.0V	AP2120Z-4.0G1	2120Z-4.0G1	Bulk
		4.0V	AP2120Z-4.0TRG1	2120Z-4.0G1	Ammo
		5.0V	AP2120Z-5.0G1	2120Z-5.0G1	Bulk
		5.0V	AP2120Z-5.0TRG1	2120Z-5.0G1	Ammo

BCD Semiconductor's products, as designated with "G1" suffix in the part number, are RoHS compliant and Green.

**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR****AP2120****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	250	°C/W
		SOT-89	165	
		TO-92	180	
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



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

**AP2120**

**Electrical Characteristics**

**AP2120-1.2 Electrical Characteristics**

( $V_{IN}=2.2V$ ,  $T_J=25^{\circ}C$ ,  $C_{IN}=1\mu F$ ,  $C_{OUT}=1\mu F$ , **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	$V_{OUT}$	$V_{IN}=2.2V$ $1mA \leq I_{OUT} \leq 30mA$	1.176	1.2	1.224	V
Input Voltage	$V_{IN}$				6	V
Output Current	$I_{OUT}$	$V_{IN}-V_{OUT}=1V$	150			mA
Load Regulation	$V_{RLOAD}$	$V_{IN}=2.2V$ $1mA \leq I_{OUT} \leq 80mA$		12	40	mV
Line Regulation	$V_{RLINE}$	$2.2V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		4	16	mV
Dropout Voltage	$V_{DROP}$	$I_{OUT}=10mA$		700	900	mV
		$I_{OUT}=100mA$		700	900	
		$I_{OUT}=150mA$		700	900	
		$I_{OUT}=200mA$		700	900	
Quiescent Current	$I_Q$	$V_{IN}=2.2V$ , $I_{OUT}=0mA$		25	50	$\mu A$
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=1kHz$ $V_{IN}=2.2V$		65		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$		<b><math>\pm 120</math></b>		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			<b><math>\pm 100</math></b>		ppm/ $^{\circ}C$
Short Current Limit	$I_{LIMIT}$	$V_{OUT}=0V$		50		mA
RMS Output Noise	$V_{NOISE}$	$T_A=25^{\circ}C$ , $I_{OUT}=0$ $10Hz \leq f \leq 100kHz$		15		$\mu V_{rms}$



**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR** **AP2120**

**Electrical Characteristics (Continued)**

**AP2120-1.3 Electrical Characteristics**

( $V_{IN}=2.3V$ ,  $T_J=25^{\circ}C$ ,  $C_{IN}=1\mu F$ ,  $C_{OUT}=1\mu F$ , **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	$V_{OUT}$	$V_{IN}=2.3V$ $1mA \leq I_{OUT} \leq 30mA$	1.274	1.3	1.326	V
Input Voltage	$V_{IN}$				6	V
Output Current	$I_{OUT}$	$V_{IN}-V_{OUT}=1V$	150			mA
Load Regulation	$V_{RLOAD}$	$V_{IN}=2.3V$ $1mA \leq I_{OUT} \leq 80mA$		12	40	mV
Line Regulation	$V_{RLINE}$	$2.3V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		4	16	mV
Dropout Voltage	$V_{DROP}$	$I_{OUT}=10mA$		600	800	mV
		$I_{OUT}=100mA$		600	800	
		$I_{OUT}=150mA$		600	800	
		$I_{OUT}=200mA$		600	800	
Quiescent Current	$I_Q$	$V_{IN}=2.3V$ , $I_{OUT}=0mA$		25	50	$\mu A$
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=1kHz$ $V_{IN}=2.3V$		65		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$		$\pm 130$		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			$\pm 100$		ppm/ $^{\circ}C$
Short Current Limit	$I_{LIMIT}$	$V_{OUT}=0V$		50		mA
RMS Output Noise	$V_{NOISE}$	$T_A=25^{\circ}C$ , $I_{OUT}=0$ $10Hz \leq f \leq 100kHz$		15		$\mu V_{rms}$





**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR** **AP2120**

**Electrical Characteristics (Continued)**

**AP2120-1.5 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	$V_{OUT}$	$V_{IN}=2.5V$ $1mA \leq I_{OUT} \leq 30mA$	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	$V_{RLOAD}$	$V_{IN}=2.5V$ $1mA \leq I_{OUT} \leq 80mA$		12	40	mV
Line Regulation	$V_{RLINE}$	$2.3V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		4	16	mV
Dropout Voltage	$V_{DROP}$	$I_{OUT}=10mA$		400	600	mV
		$I_{OUT}=100mA$		400	600	
		$I_{OUT}=150mA$		400	600	
		$I_{OUT}=200mA$		400	600	
Quiescent Current	$I_Q$	$V_{IN}=2.5V$ , $I_{OUT}=0mA$		25	50	$\mu A$
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=1kHz$ $V_{IN}=2.5V$		65		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$		<b><math>\pm 150</math></b>		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			<b><math>\pm 100</math></b>		ppm/ $^{\circ}C$
Short Current Limit	$I_{LIMIT}$	$V_{OUT}=0V$		50		mA
RMS Output Noise	$V_{NOISE}$	$T_A=25^{\circ}C$ , $I_{OUT}=0$ $10Hz \leq f \leq 100kHz$		15		$\mu V_{rms}$



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

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**Electrical Characteristics (Continued)**

**AP2120-1.8 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	$V_{OUT}$	$V_{IN}=2.8V$ $1mA \leq I_{OUT} \leq 30mA$	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	$V_{RLOAD}$	$V_{IN}=2.8V$ $1mA \leq I_{OUT} \leq 80mA$		12	40	mV
Line Regulation	$V_{RLINE}$	$2.3V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		4	16	mV
Dropout Voltage	$V_{DROP}$	$I_{OUT}=10mA$		20	40	mV
		$I_{OUT}=100mA$		200	300	
		$I_{OUT}=150mA$		300	500	
Quiescent Current	$I_Q$	$V_{IN}=2.8V$ , $I_{OUT}=0mA$		25	50	$\mu A$
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=1kHz$ $V_{IN}=2.8V$		65		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$		<b><math>\pm 180</math></b>		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			<b><math>\pm 100</math></b>		ppm/ $^{\circ}C$
Short Current Limit	$I_{LIMIT}$	$V_{OUT}=0V$		50		mA
RMS Output Noise	$V_{NOISE}$	$T_A=25^{\circ}C$ $10Hz \leq f \leq 100kHz$		30		$\mu V_{rms}$



**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR** **AP2120**

**Electrical Characteristics (Continued)**

**AP2120-2.5 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	$V_{OUT}$	$V_{IN}=3.5V$ $1mA \leq I_{OUT} \leq 30mA$	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	$V_{RLOAD}$	$V_{IN}=3.5V$ $1mA \leq I_{OUT} \leq 80mA$		12	40	mV
Line Regulation	$V_{RLINE}$	$3V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		4	16	mV
Dropout Voltage	$V_{DROP}$	$I_{OUT}=10mA$		20	40	mV
		$I_{OUT}=100mA$		200	300	
		$I_{OUT}=150mA$		300	500	
Quiescent Current	$I_Q$	$V_{IN}=3.5V$ , $I_{OUT}=0mA$		25	50	$\mu A$
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=1kHz$ $V_{IN}=3.5V$		65		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$		<b><math>\pm 250</math></b>		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			<b><math>\pm 100</math></b>		ppm/ $^{\circ}C$
Short Current Limit	$I_{LIMIT}$	$V_{OUT}=0V$		50		mA
RMS Output Noise	$V_{NOISE}$	$T_A=25^{\circ}C$ $10Hz \leq f \leq 100kHz$		30		$\mu V_{rms}$



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**Electrical Characteristics (Continued)**

**AP2120-2.8 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	$V_{OUT}$	$V_{IN}=3.8V$ $1mA \leq I_{OUT} \leq 30mA$	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	$V_{RLOAD}$	$V_{IN}=3.8V$ $1mA \leq I_{OUT} \leq 80mA$		12	40	mV
Line Regulation	$V_{RLINE}$	$3.3V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		4	16	mV
Dropout Voltage	$V_{DROP}$	$I_{OUT}=10mA$		20	40	mV
		$I_{OUT}=100mA$		200	300	
		$I_{OUT}=150mA$		300	500	
Quiescent Current	$I_Q$	$V_{IN}=3.8V$ , $I_{OUT}=0mA$		25	50	$\mu A$
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=1kHz$ $V_{IN}=3.8V$		65		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$		<b><math>\pm 280</math></b>		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			<b><math>\pm 100</math></b>		ppm/ $^{\circ}C$
Short Current Limit	$I_{LIMIT}$	$V_{OUT}=0V$		50		mA
RMS Output Noise	$V_{NOISE}$	$T_A=25^{\circ}C$ $10Hz \leq f \leq 100kHz$		30		$\mu V_{rms}$



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**Electrical Characteristics (Continued)**

**AP2120-3.0 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	$V_{OUT}$	$V_{IN}=4V$ $1mA \leq I_{OUT} \leq 30mA$	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	$V_{RLOAD}$	$V_{IN}=4V$ $1mA \leq I_{OUT} \leq 80mA$		12	40	mV
Line Regulation	$V_{RLINE}$	$3.5V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		4	16	mV
Dropout Voltage	$V_{DROP}$	$I_{OUT}=10mA$		20	40	mV
		$I_{OUT}=100mA$		200	300	
		$I_{OUT}=150mA$		300	500	
Quiescent Current	$I_Q$	$V_{IN}=4V$ , $I_{OUT}=0mA$		25	50	$\mu A$
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=1kHz$ $V_{IN}=4V$		65		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$		<b><math>\pm 300</math></b>		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			<b><math>\pm 100</math></b>		ppm/ $^{\circ}C$
Short Current Limit	$I_{LIMIT}$	$V_{OUT}=0V$		50		mA
RMS Output Noise	$V_{NOISE}$	$T_A=25^{\circ}C$ $10Hz \leq f \leq 100kHz$		30		$\mu V_{rms}$

**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR****AP2120****Electrical Characteristics (Continued)****AP2120-3.2 Electrical Characteristics**(V<sub>IN</sub>=4.2V, T<sub>J</sub>=25°C, C<sub>IN</sub>=1μF, C<sub>OUT</sub>=1μF, **Bold** typeface applies over -40°C≤T<sub>J</sub>≤85°C, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V <sub>OUT</sub>	V <sub>IN</sub> =4.2V 1mA≤I <sub>OUT</sub> ≤30mA	3.136	3.2	3.264	V
Input Voltage	V <sub>IN</sub>				6	V
Output Current	I <sub>OUT</sub>	V <sub>IN</sub> -V <sub>OUT</sub> =1V	150			mA
Load Regulation	V <sub>RLOAD</sub>	V <sub>IN</sub> =4.2V 1mA≤I <sub>OUT</sub> ≤80mA		12	40	mV
Line Regulation	V <sub>RLINE</sub>	3.7V≤V <sub>IN</sub> ≤6V I <sub>OUT</sub> =30mA		4	16	mV
Dropout Voltage	V <sub>DROP</sub>	I <sub>OUT</sub> =10mA		20	40	mV
		I <sub>OUT</sub> =100mA		200	300	
		I <sub>OUT</sub> =150mA		300	500	
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =4.2V, I <sub>OUT</sub> =0mA		25	50	μA
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, f=1kHz V <sub>IN</sub> =4.2V		65		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	I <sub>OUT</sub> =30mA		<b>±320</b>		μV/°C
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			<b>±100</b>		ppm/°C
Short Current Limit	I <sub>LIMIT</sub>	V <sub>OUT</sub> =0V		50		mA
RMS Output Noise	V <sub>NOISE</sub>	T <sub>A</sub> =25°C 10Hz≤f≤100kHz		30		μVrms



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

**AP2120**

**Electrical Characteristics (Continued)**

**AP2120-3.3 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	$V_{OUT}$	$V_{IN}=4.3V$ $1mA \leq I_{OUT} \leq 30mA$	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	$V_{RLOAD}$	$V_{IN}=4.3V$ $1mA \leq I_{OUT} \leq 80mA$		12	40	mV
Line Regulation	$V_{RLINE}$	$3.8V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		4	16	mV
Dropout Voltage	$V_{DROP}$	$I_{OUT}=10mA$		20	40	mV
		$I_{OUT}=100mA$		200	300	
		$I_{OUT}=150mA$		300	500	
Quiescent Current	$I_Q$	$V_{IN}=4.3V$ , $I_{OUT}=0mA$		25	50	$\mu A$
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=1kHz$ $V_{IN}=4.3V$		65		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$		<b><math>\pm 330</math></b>		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			<b><math>\pm 100</math></b>		ppm/ $^{\circ}C$
Short Current Limit	$I_{LIMIT}$	$V_{OUT}=0V$		50		mA
RMS Output Noise	$V_{NOISE}$	$T_A=25^{\circ}C$ $10Hz \leq f \leq 100kHz$		30		$\mu V_{rms}$



**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR** **AP2120**

**Electrical Characteristics (Continued)**

**AP2120-3.6 Electrical Characteristics**

( $V_{IN}=4.6V$ ,  $T_J=25^{\circ}C$ ,  $C_{IN}=1\mu F$ ,  $C_{OUT}=1\mu F$ , **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	$V_{OUT}$	$V_{IN}=4.6V$ $1mA \leq I_{OUT} \leq 30mA$	3.528	3.6	3.672	V
Input Voltage	$V_{IN}$				6	V
Output Current	$I_{OUT}$	$V_{IN}-V_{OUT}=1V$	150			mA
Load Regulation	$V_{RLOAD}$	$V_{IN}=4.6V$ $1mA \leq I_{OUT} \leq 80mA$		12	40	mV
Line Regulation	$V_{RLINE}$	$4.6V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		4	16	mV
Dropout Voltage	$V_{DROP}$	$I_{OUT}=10mA$		20	40	mV
		$I_{OUT}=100mA$		200	300	
		$I_{OUT}=150mA$		300	500	
Quiescent Current	$I_Q$	$V_{IN}=4.6V$ , $I_{OUT}=0mA$		25	50	$\mu A$
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=1kHz$ $V_{IN}=4.6V$		65		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$		<b><math>\pm 330</math></b>		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			<b><math>\pm 100</math></b>		ppm/ $^{\circ}C$
Short Current Limit	$I_{LIMIT}$	$V_{OUT}=0V$		50		mA
RMS Output Noise	$V_{NOISE}$	$T_A=25^{\circ}C$ $10Hz \leq f \leq 100kHz$		30		$\mu V_{rms}$





**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR** **AP2120**

**Electrical Characteristics (Continued)**

**AP2120-4.0 Electrical Characteristics**

( $V_{IN}=5.0V$ ,  $T_J=25^{\circ}C$ ,  $C_{IN}=1\mu F$ ,  $C_{OUT}=1\mu F$ , **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	$V_{OUT}$	$V_{IN}=5.0V$ $1mA \leq I_{OUT} \leq 30mA$	3.92	4.0	4.08	V
Input Voltage	$V_{IN}$				6	V
Output Current	$I_{OUT}$	$V_{IN}-V_{OUT}=1V$	150			mA
Load Regulation	$V_{RLOAD}$	$V_{IN}=5.0V$ $1mA \leq I_{OUT} \leq 80mA$		12	40	mV
Line Regulation	$V_{RLINE}$	$5V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		4	16	mV
Dropout Voltage	$V_{DROP}$	$I_{OUT}=10mA$		20	40	mV
		$I_{OUT}=100mA$		200	300	
		$I_{OUT}=150mA$		300	500	
Quiescent Current	$I_Q$	$V_{IN}=5.0V$ , $I_{OUT}=0mA$		25	50	$\mu A$
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=1kHz$ $V_{IN}=5.0V$		65		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$		<b><math>\pm 330</math></b>		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			<b><math>\pm 100</math></b>		ppm/ $^{\circ}C$
Short Current Limit	$I_{LIMIT}$	$V_{OUT}=0V$		50		mA
RMS Output Noise	$V_{NOISE}$	$T_A=25^{\circ}C$ $10Hz \leq f \leq 100kHz$		30		$\mu V_{rms}$



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

**AP2120**

**Electrical Characteristics (Continued)**

**AP2120-5.0 Electrical Characteristics**

( $V_{IN}=6.0V$ ,  $T_J=25^{\circ}C$ ,  $C_{IN}=1\mu F$ ,  $C_{OUT}=1\mu F$ , **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	$V_{OUT}$	$V_{IN}=6.0V$ $1mA \leq I_{OUT} \leq 30mA$	4.9	5.0	5.1	V
Input Voltage	$V_{IN}$				6	V
Output Current	$I_{OUT}$	$V_{IN}-V_{OUT}=1V$	150			mA
Load Regulation	$V_{RLOAD}$	$V_{IN}=4.3V$ $1mA \leq I_{OUT} \leq 80mA$		12	40	mV
Line Regulation	$V_{RLINE}$	$5.5V \leq V_{IN} \leq 6V$ $I_{OUT}=30mA$		4	16	mV
Dropout Voltage	$V_{DROP}$	$I_{OUT}=10mA$		20	40	mV
		$I_{OUT}=100mA$		200	300	
		$I_{OUT}=150mA$		300	500	
Quiescent Current	$I_Q$	$V_{IN}=6.0V$ , $I_{OUT}=0mA$		25	50	$\mu A$
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=1kHz$ $V_{IN}=6.0V$		65		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$		<b><math>\pm 330</math></b>		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			<b><math>\pm 100</math></b>		ppm/ $^{\circ}C$
Short Current Limit	$I_{LIMIT}$	$V_{OUT}=0V$		50		mA
RMS Output Noise	$V_{NOISE}$	$T_A=25^{\circ}C$ $10Hz \leq f \leq 100kHz$		30		$\mu V_{rms}$



**Typical Performance Characteristics**

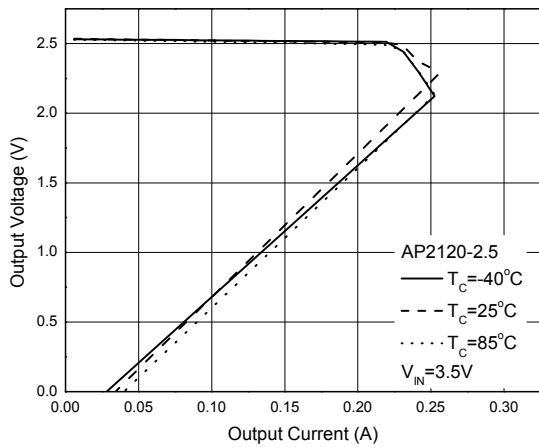


Figure 4. Output Voltage vs. Output Current

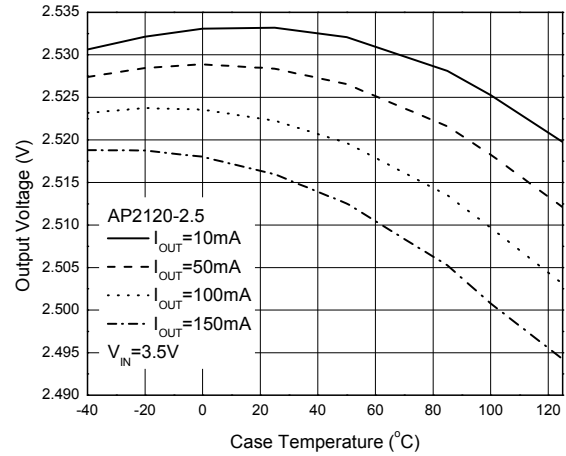


Figure 5. Output Voltage vs. Case Temperature

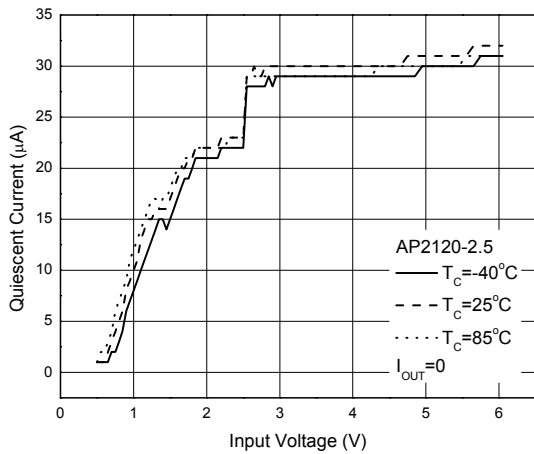


Figure 6. Quiescent Current vs. Input Voltage

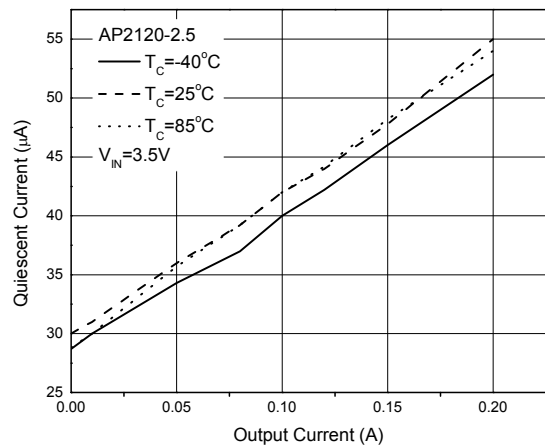


Figure 7. Quiescent Current vs. Output Current



**Typical Performance Characteristics (Continued)**

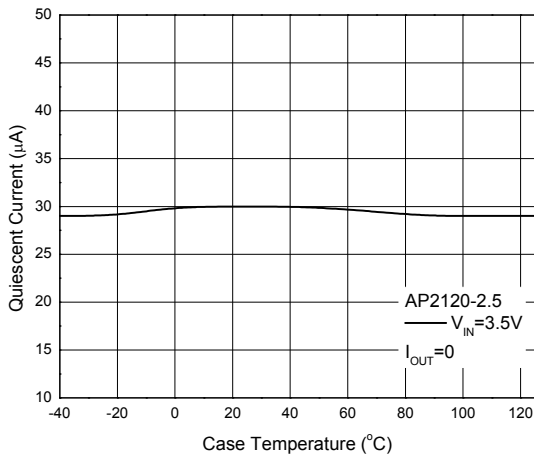


Figure 8. Quiescent Current vs. Case Temperature

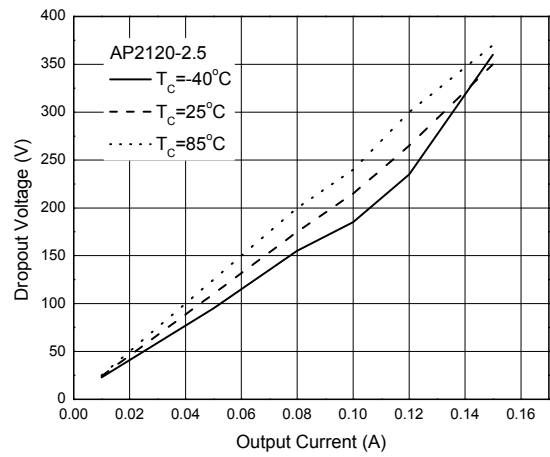


Figure 9. Dropout Voltage vs. Output Current

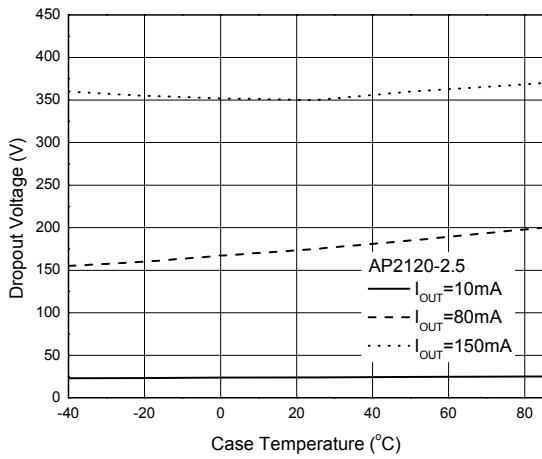


Figure 10. Dropout Voltage vs. Case Temperature

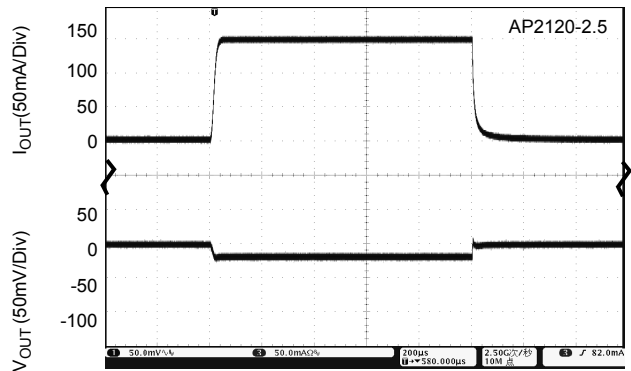


Figure 11. Load Transient ( $I_{OUT}=0$  to 150mA)

**Typical Performance Characteristics (Continued)**

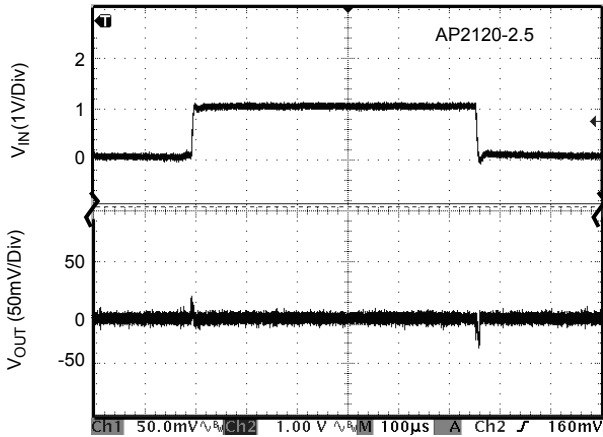


Figure 12. Line Transient  
(Condition:  $V_{IN}=2.5V$  to  $3.5V$ ,  $I_{OUT}=10mA$ )

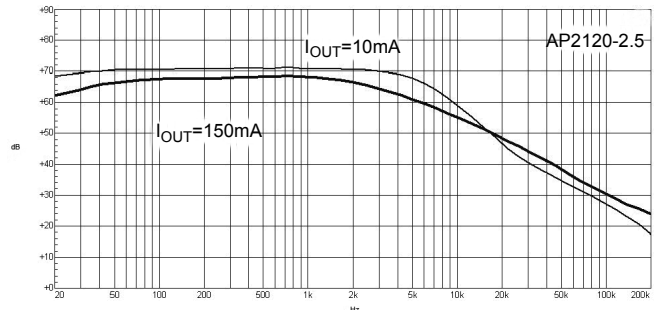


Figure 13. PSRR vs. Frequency

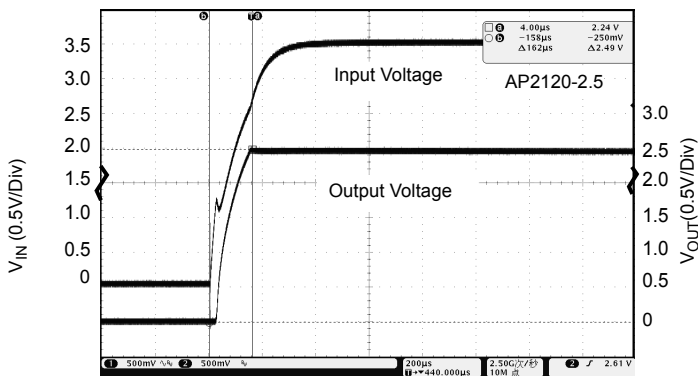
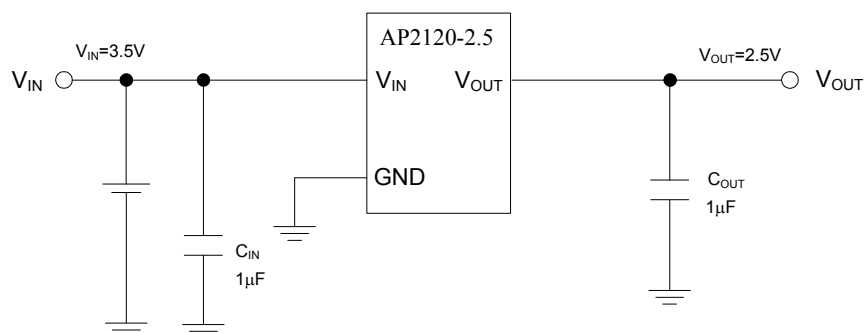


Figure 14. Start-up

**Typical Application**


Note: Filter capacitors are required at the AP2120'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 15. Typical Application of AP2120



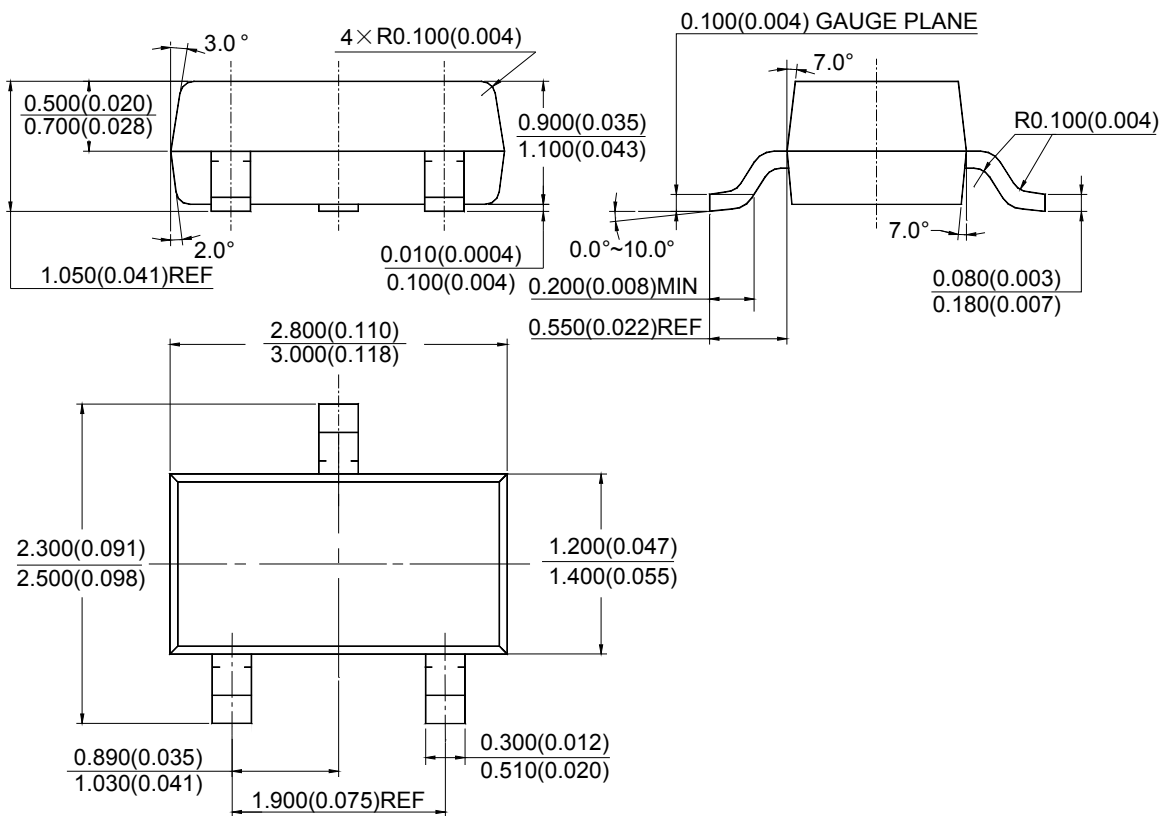
**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR**

**AP2120**

**Mechanical Dimensions**

**SOT-23**

**Unit: mm(inch)**





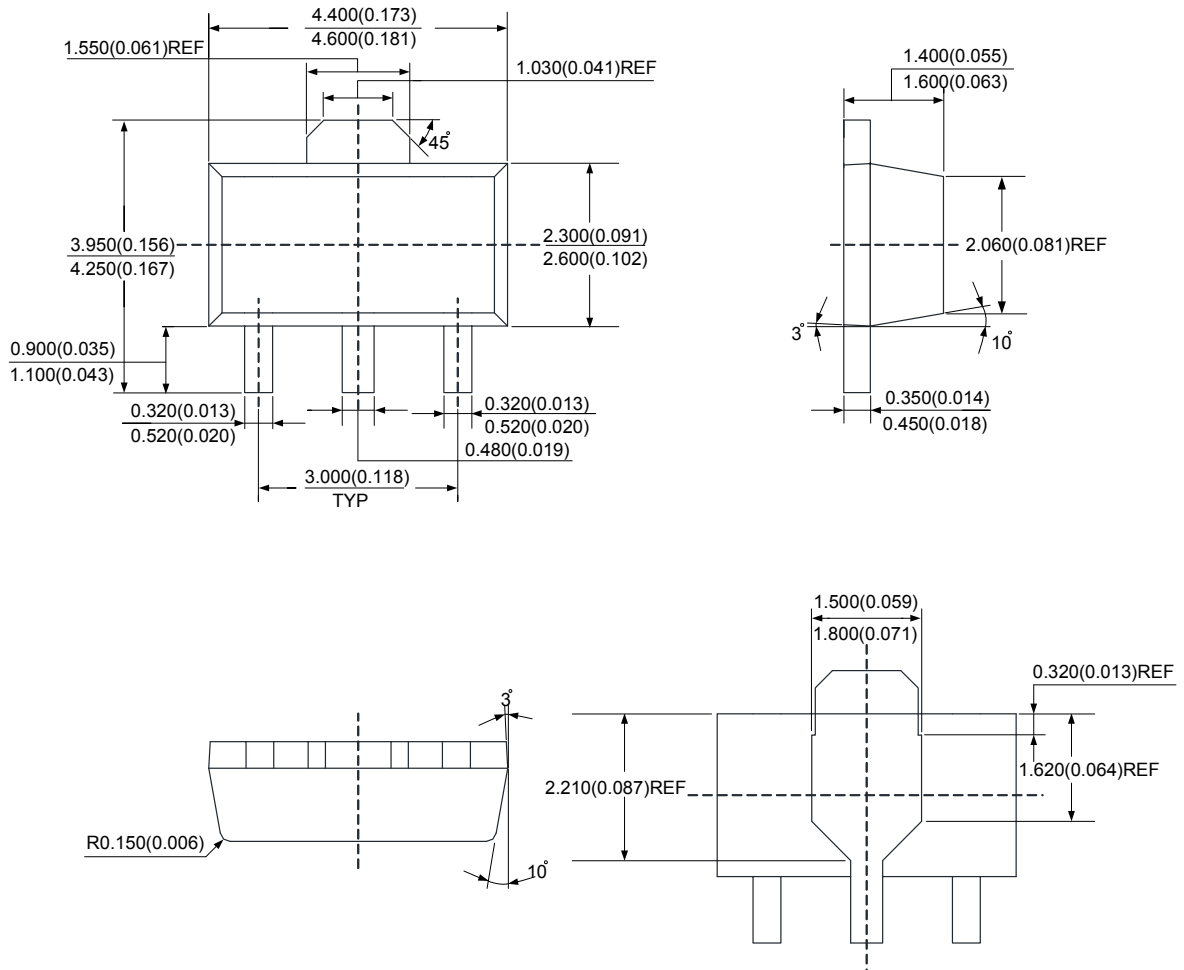
**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR**

**AP2120**

**Mechanical Dimensions (Continued)**

**SOT-89**

**Unit: mm(inch)**







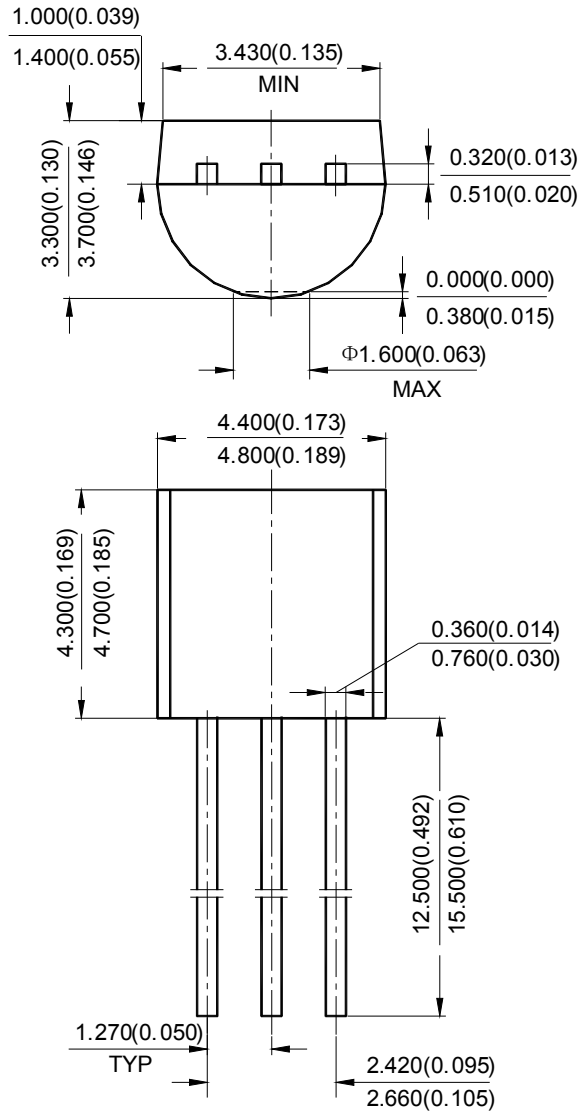
**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR**

**AP2120**

**Mechanical Dimensions (Continued)**

**TO-92 (Bulk Packing)**

**Unit: mm(inch)**





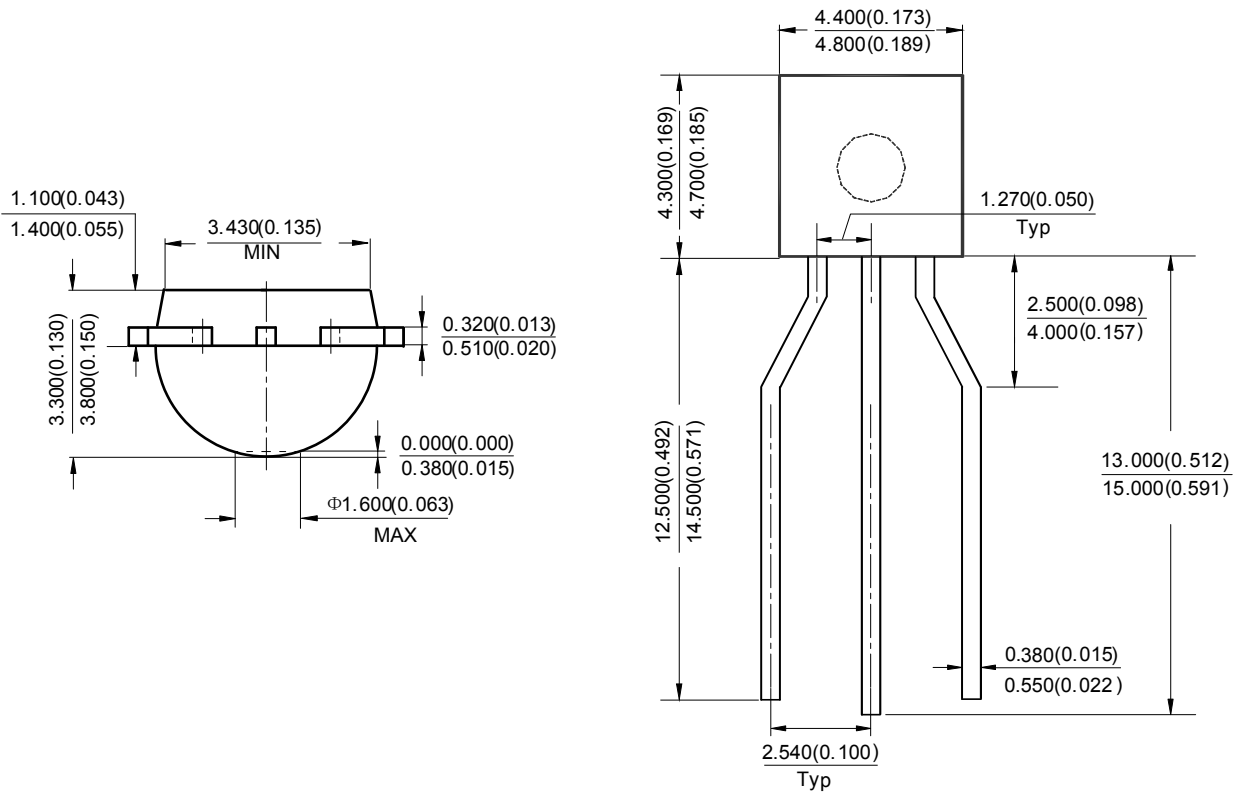
**HIGH SPEED, EXTREMELY LOW NOISE LDO REGULATOR**

**AP2120**

**Mechanical Dimensions (Continued)**

**TO-92 ( Ammo Packing)**

**Unit: mm(inch)**





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