



**THE DATASHEET OF  
AP2120N-1.8TRG1**



## 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 and TO-92 packages.

## Features

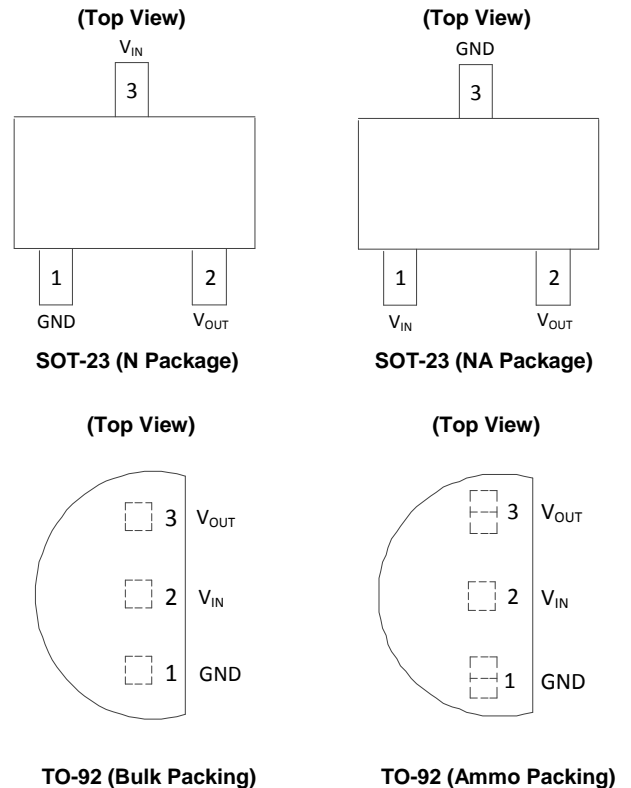
- Low Dropout Voltage at  $I_{OUT} = 100\text{mA}$ : 200mV Typical (Except 1.2V, 1.3V and 1.5V Versions)
- Low Quiescent Current: 25 $\mu\text{A}$  Typical
- High Ripple Rejection: 65dB Typical ( $f = 1\text{kHz}$ )
- Output Current: More Than 150mA (250mA Limit)
- Extremely Low Noise: 15 $\mu\text{Vrms}$ @ $V_{OUT} = 1.2\text{V}, 1.3\text{V}, 1.5\text{V}$  (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 $\mu\text{F}$ )
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Applications

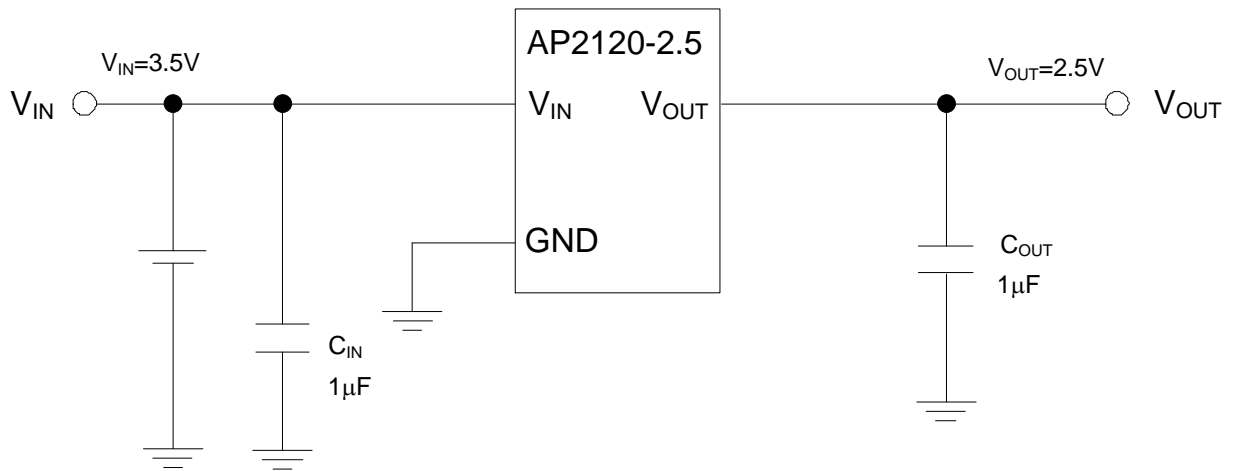
- Mobile Phones, Cordless Phones
- Wireless Communication Equipment
- Portable Games
- Cameras, Video Recorders
- Sub-Board Power Supplies for Telecom Equipment
- Battery Powered Equipment

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

## Pin Assignments



**Typical Applications Circuit**

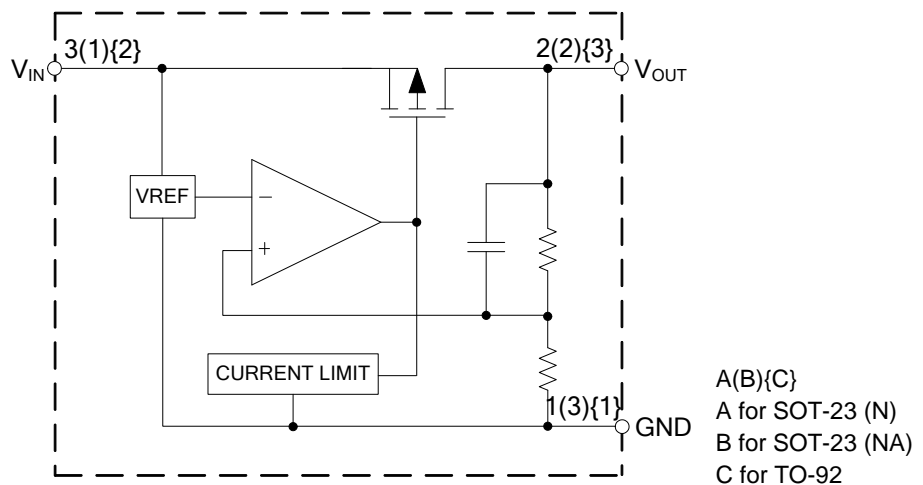


Note: Filter capacitors are required at the AP2120's input and output. 1µF capacitor is required at the input. The minimum output capacitance required for stability should be more than 1µF with ESR from 0.01Ω to 100Ω. Ceramic capacitors are recommended.

**Pin Descriptions**

Pin Number			Pin Name	Function
SOT-23 (N)	SOT-23 (NA)	TO-92		
1	3	1	GND	Ground
2	2	3	V <sub>OUT</sub>	Regulated Output Voltage
3	1	2	V <sub>IN</sub>	Input Voltage

**Functional Block Diagram**



## Absolute Maximum Ratings (Note 4)

Symbol	Parameter	Rating		Unit
V <sub>IN</sub>	Input Voltage	6.5		V
V <sub>CE</sub>	Enable Input Voltage	-0.3 to V <sub>IN</sub> +0.3		V
I <sub>OUT</sub>	Output Current	300		mA
T <sub>J</sub>	Junction Temperature	+150		°C
T <sub>STG</sub>	Storage Temperature Range	-65 to +150		°C
T <sub>LEAD</sub>	Lead Temperature (Soldering, 10s)	+260		°C
θ <sub>JA</sub>	Thermal Resistance (Junction to Ambient) (Note 5)	SOT-23	250	°C/W
		TO-92	180	
ESD	ESD (Human Body Model)	2000		V
ESD	ESD (Machine Model)	200		V

- Notes:
- Stresses greater than those listed under "Absolute Maximum Ratings" can 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 can affect device reliability.
  - Absolute maximum ratings indicate limits beyond which damage to the component can 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<sub>J(max)</sub>, the junction-to-ambient thermal resistance, θ<sub>JA</sub>, and the ambient temperature, T<sub>A</sub>. 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

Symbol	Parameter	Min	Max	Unit
V <sub>IN</sub>	Input Voltage	2	6	V
T <sub>J</sub>	Operating Junction Temperature Range	-40	+85	°C

## 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.)

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

## 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.)

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

## 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.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{OUT}$	Output Voltage	$V_{IN} = 2.5V$ $1mA \leq I_{OUT} \leq 30mA$	1.47	1.5	1.53	V
$V_{IN}$	Input Voltage	—	—	—	6	V
$I_{OUT}$	Output Current	$V_{IN} - V_{OUT} = 1V$	150	—	—	mA
$V_{RLOAD}$	Load Regulation	$V_{IN} = 2.5V$ $1mA \leq I_{OUT} \leq 80mA$	—	12	40	mV
$V_{RLINE}$	Line Regulation	$2.3V \leq V_{IN} \leq 6V$ $I_{OUT} = 30mA$	—	4	16	mV
$V_{DROP}$	Dropout Voltage	$I_{OUT} = 10mA$	—	400	600	mV
		$I_{OUT} = 100mA$	—	400	600	
		$I_{OUT} = 150mA$	—	400	600	
		$I_{OUT} = 200mA$	—	400	600	
$I_Q$	Quiescent Current	$V_{IN} = 2.5V$ , $I_{OUT} = 0mA$	—	25	50	$\mu A$
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, $f = 1kHz$ $V_{IN} = 2.5V$	—	65	—	dB
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	$I_{OUT} = 30mA$	—	<b><math>\pm 150</math></b>	—	$\mu V/^\circ C$
$(\Delta V_{OUT}/V_{OUT})/\Delta T$			—	<b><math>\pm 100</math></b>	—	ppm/ $^\circ C$
$I_{LIMIT}$	Short Current Limit	$V_{OUT} = 0V$	—	50	—	mA
$V_{NOISE}$	RMS Output Noise	$T_A = +25^\circ C$ , $I_{OUT} = 0$ $10Hz \leq f \leq 100kHz$	—	15	—	$\mu V_{rms}$

## 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.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{OUT}$	Output Voltage	$V_{IN} = 2.8V$ $1mA \leq I_{OUT} \leq 30mA$	1.764	1.8	1.836	V
$V_{IN}$	Input Voltage	—	—	—	6	V
$I_{OUT}$	Output Current	$V_{IN} - V_{OUT} = 1V$	150	—	—	mA
$V_{RLOAD}$	Load Regulation	$V_{IN} = 2.8V$ $1mA \leq I_{OUT} \leq 80mA$	—	12	40	mV
$V_{RLINE}$	Line Regulation	$2.3V \leq V_{IN} \leq 6V$ $I_{OUT} = 30mA$	—	4	16	mV
$V_{DROP}$	Dropout Voltage	$I_{OUT} = 10mA$	—	20	40	mV
		$I_{OUT} = 100mA$	—	200	300	
		$I_{OUT} = 150mA$	—	300	500	
$I_Q$	Quiescent Current	$V_{IN} = 2.8V$ , $I_{OUT} = 0mA$	—	25	50	$\mu A$
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, $f = 1kHz$ $V_{IN} = 2.8V$	—	65	—	dB
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	$I_{OUT} = 30mA$	—	<b><math>\pm 180</math></b>	—	$\mu V/^\circ C$
$(\Delta V_{OUT}/V_{OUT})/\Delta T$			—	<b><math>\pm 100</math></b>	—	ppm/ $^\circ C$
$I_{LIMIT}$	Short Current Limit	$V_{OUT} = 0V$	—	50	—	mA
$V_{NOISE}$	RMS Output Noise	$T_A = +25^\circ C$ $10Hz \leq f \leq 100kHz$	—	30	—	$\mu V_{rms}$

## 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.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{OUT}$	Output Voltage	$V_{IN} = 3.5V$ $1mA \leq I_{OUT} \leq 30mA$	2.45	2.5	2.55	V
$V_{IN}$	Input Voltage	—	—	—	6	V
$I_{OUT}$	Output Current	$V_{IN} - V_{OUT} = 1V$	150	—	—	mA
$V_{RLOAD}$	Load Regulation	$V_{IN} = 3.5V$ $1mA \leq I_{OUT} \leq 80mA$	—	12	40	mV
$V_{RLINE}$	Line Regulation	$3V \leq V_{IN} \leq 6V$ $I_{OUT} = 30mA$	—	4	16	mV
$V_{DROP}$	Dropout Voltage	$I_{OUT} = 10mA$	—	20	40	mV
		$I_{OUT} = 100mA$	—	200	300	
		$I_{OUT} = 150mA$	—	300	500	
$I_Q$	Quiescent Current	$V_{IN} = 3.5V$ , $I_{OUT} = 0mA$	—	25	50	$\mu A$
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, $f = 1kHz$ $V_{IN} = 3.5V$	—	65	—	dB
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	$I_{OUT} = 30mA$	—	<b><math>\pm 250</math></b>	—	$\mu V/^\circ C$
$(\Delta V_{OUT}/V_{OUT})/\Delta T$			—	<b><math>\pm 100</math></b>	—	ppm/ $^\circ C$
$I_{LIMIT}$	Short Current Limit	$V_{OUT} = 0V$	—	50	—	mA
$V_{NOISE}$	RMS Output Noise	$T_A = +25^\circ C$ $10Hz \leq f \leq 100kHz$	—	30	—	$\mu V_{rms}$

## 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.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{OUT}$	Output Voltage	$V_{IN} = 3.8V$ $1mA \leq I_{OUT} \leq 30mA$	2.744	2.8	2.856	V
$V_{IN}$	Input Voltage	—	—	—	6	V
$I_{OUT}$	Output Current	$V_{IN} - V_{OUT} = 1V$	150	—	—	mA
$V_{RLOAD}$	Load Regulation	$V_{IN} = 3.8V$ $1mA \leq I_{OUT} \leq 80mA$	—	12	40	mV
$V_{RLINE}$	Line Regulation	$3.3V \leq V_{IN} \leq 6V$ $I_{OUT} = 30mA$	—	4	16	mV
$V_{DROP}$	Dropout Voltage	$I_{OUT} = 10mA$	—	20	40	mV
		$I_{OUT} = 100mA$	—	200	300	
		$I_{OUT} = 150mA$	—	300	500	
$I_Q$	Quiescent Current	$V_{IN} = 3.8V$ , $I_{OUT} = 0mA$	—	25	50	$\mu A$
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, $f = 1kHz$ $V_{IN} = 3.8V$	—	65	—	dB
$\Delta V_{OUT}/\Delta T$	Output Voltage	$I_{OUT} = 30mA$	—	<b><math>\pm 280</math></b>	—	$\mu V/^\circ C$
$(\Delta V_{OUT}/V_{OUT})/\Delta T$	Temperature Coefficient		—	<b><math>\pm 100</math></b>	—	ppm/ $^\circ C$
$I_{LIMIT}$	Short Current Limit	$V_{OUT} = 0V$	—	50	—	mA
$V_{NOISE}$	RMS Output Noise	$T_A = +25^\circ C$ $10Hz \leq f \leq 100kHz$	—	30	—	$\mu V_{rms}$

### 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.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{OUT}$	Output Voltage	$V_{IN} = 4V$ $1mA \leq I_{OUT} \leq 30mA$	2.94	3.0	3.06	V
$V_{IN}$	Input Voltage	—	—	—	6	V
$I_{OUT}$	Output Current	$V_{IN} - V_{OUT} = 1V$	150	—	—	mA
$V_{RLOAD}$	Load Regulation	$V_{IN} = 4V$ $1mA \leq I_{OUT} \leq 80mA$	—	12	40	mV
$V_{RLINE}$	Line Regulation	$3.5V \leq V_{IN} \leq 6V$ $I_{OUT} = 30mA$	—	4	16	mV
$V_{DROP}$	Dropout Voltage	$I_{OUT} = 10mA$	—	20	40	mV
		$I_{OUT} = 100mA$	—	200	300	
		$I_{OUT} = 150mA$	—	300	500	
$I_Q$	Quiescent Current	$V_{IN} = 4V$ , $I_{OUT} = 0mA$	—	25	50	$\mu A$
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, $f = 1kHz$ $V_{IN} = 4V$	—	65	—	dB
$\Delta V_{OUT}/\Delta T$	Output Voltage	$I_{OUT} = 30mA$	—	<b><math>\pm 300</math></b>	—	$\mu V/^\circ C$
$(\Delta V_{OUT}/V_{OUT})/\Delta T$	Temperature Coefficient		—	<b><math>\pm 100</math></b>	—	ppm/ $^\circ C$
$I_{LIMIT}$	Short Current Limit	$V_{OUT} = 0V$	—	50	—	mA
$V_{NOISE}$	RMS Output Noise	$T_A = +25^\circ C$ $10Hz \leq f \leq 100kHz$	—	30	—	$\mu V_{rms}$

## Electrical Characteristics (continued)

**AP2120-3.2 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.)

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

## 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.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{OUT}$	Output Voltage	$V_{IN} = 4.3V$ $1mA \leq I_{OUT} \leq 30mA$	3.234	3.3	3.366	V
$V_{IN}$	Input Voltage	—	—	—	6	V
$I_{OUT}$	Output Current	$V_{IN} - V_{OUT} = 1V$	150	—	—	mA
$V_{RLOAD}$	Load Regulation	$V_{IN} = 4.3V$ $1mA \leq I_{OUT} \leq 80mA$	—	12	40	mV
$V_{RLINE}$	Line Regulation	$3.8V \leq V_{IN} \leq 6V$ $I_{OUT} = 30mA$	—	4	16	mV
$V_{DROP}$	Dropout Voltage	$I_{OUT} = 10mA$	—	20	40	mV
		$I_{OUT} = 100mA$	—	200	300	
		$I_{OUT} = 150mA$	—	300	500	
$I_Q$	Quiescent Current	$V_{IN} = 4.3V$ , $I_{OUT} = 0mA$	—	25	50	$\mu A$
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, $f = 1kHz$ $V_{IN} = 4.3V$	—	65	—	dB
$\Delta V_{OUT}/\Delta T$	Output Voltage	$I_{OUT} = 30mA$	—	<b><math>\pm 330</math></b>	—	$\mu V/^\circ C$
$(\Delta V_{OUT}/V_{OUT})/\Delta T$	Temperature Coefficient		—	<b><math>\pm 100</math></b>	—	ppm/ $^\circ C$
$I_{LIMIT}$	Short Current Limit	$V_{OUT} = 0V$	—	50	—	mA
$V_{NOISE}$	RMS Output Noise	$T_A = +25^\circ C$ $10Hz \leq f \leq 100kHz$	—	30	—	$\mu V_{rms}$

## 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.)

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

## 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.)

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

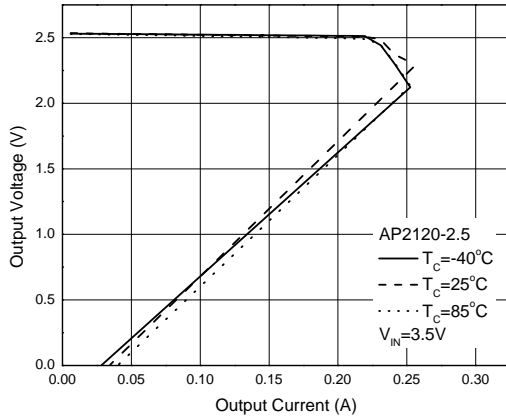
## Electrical Characteristics (continued)

**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.)

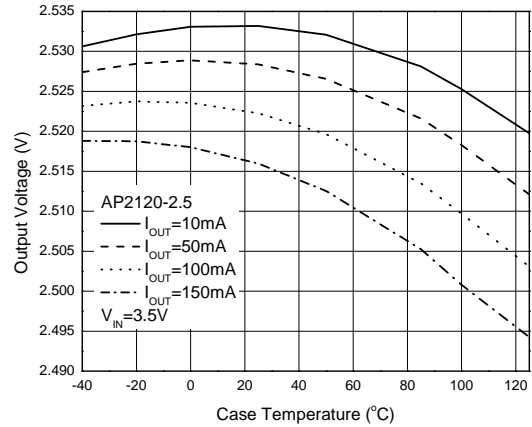
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{OUT}$	Output Voltage	$V_{IN} = 6.0V$ $1mA \leq I_{OUT} \leq 30mA$	4.9	5.0	5.1	V
$V_{IN}$	Input Voltage	—	—	—	6	V
$I_{OUT}$	Output Current	$V_{IN} - V_{OUT} = 1V$	150	—	—	mA
$V_{RLOAD}$	Load Regulation	$V_{IN} = 4.3V$ $1mA \leq I_{OUT} \leq 80mA$	—	12	40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

**Performance Characteristics**

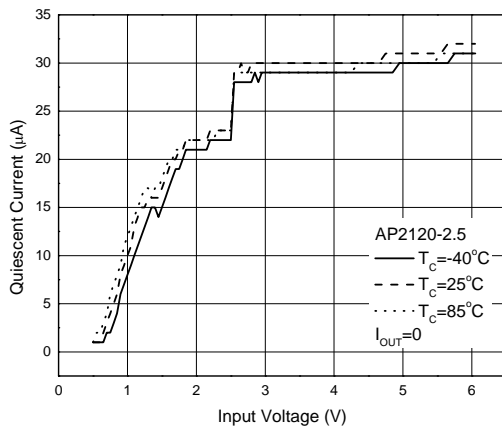
**Output Voltage vs. Output Current**



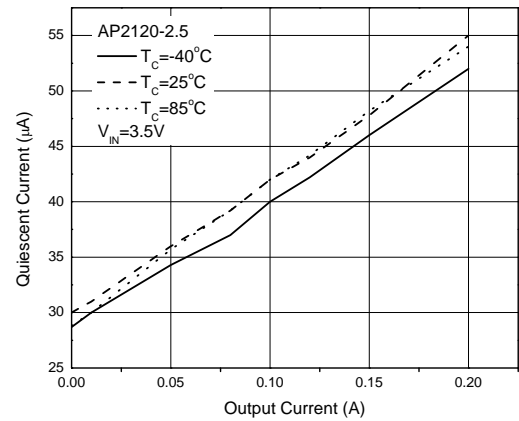
**Output Voltage vs. Case Temperature**



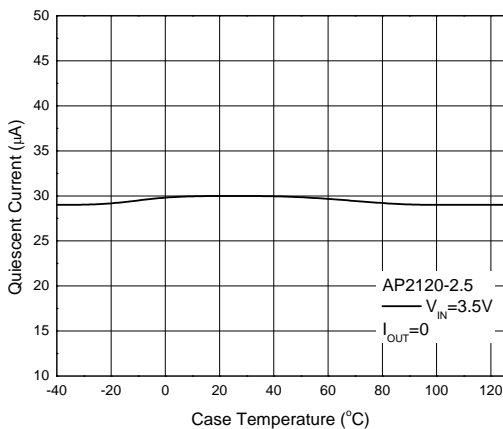
**Quiescent Current vs. Input Voltage**



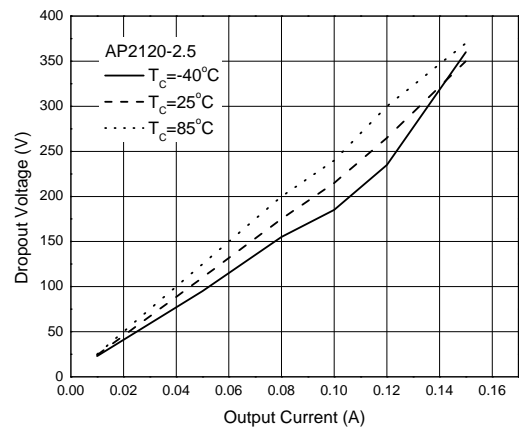
**Quiescent Current vs. Output Current**



**Quiescent Current vs. Case Temperature**

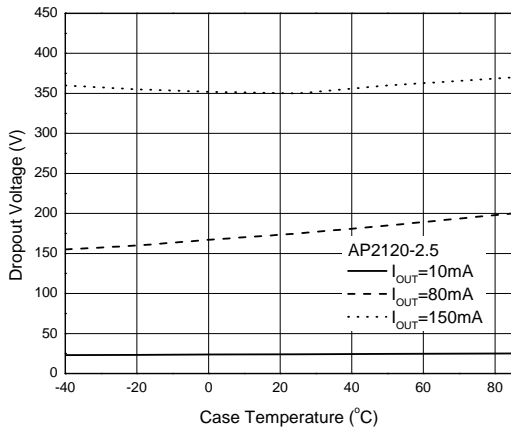


**Dropout Voltage vs. Output Current**

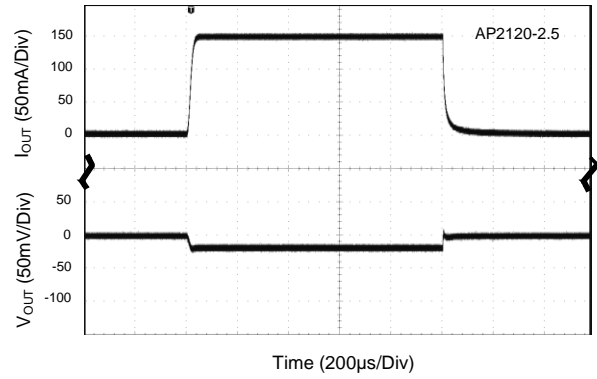


**Performance Characteristics** (continued)

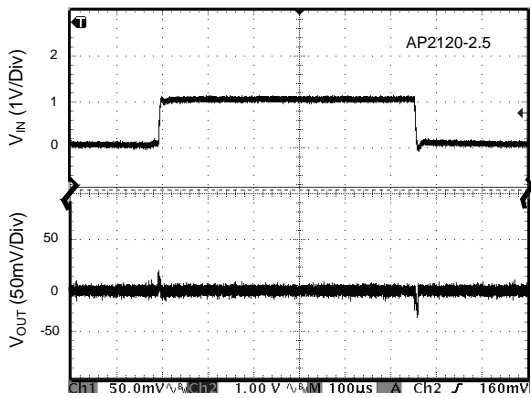
**Dropout Voltage vs. Case Temperature**



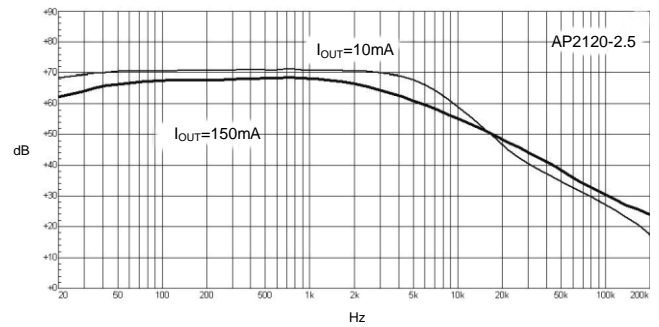
**Load Transient ( $I_{OUT}=0$  to 150mA)**



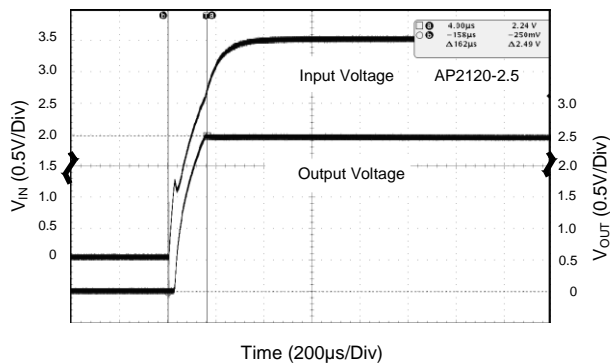
**Line Transient (Condition:  $V_{IN}=2.5\text{V}$  to  $3.5\text{V}$ ,  $I_{OUT}=10\text{mA}$ )**



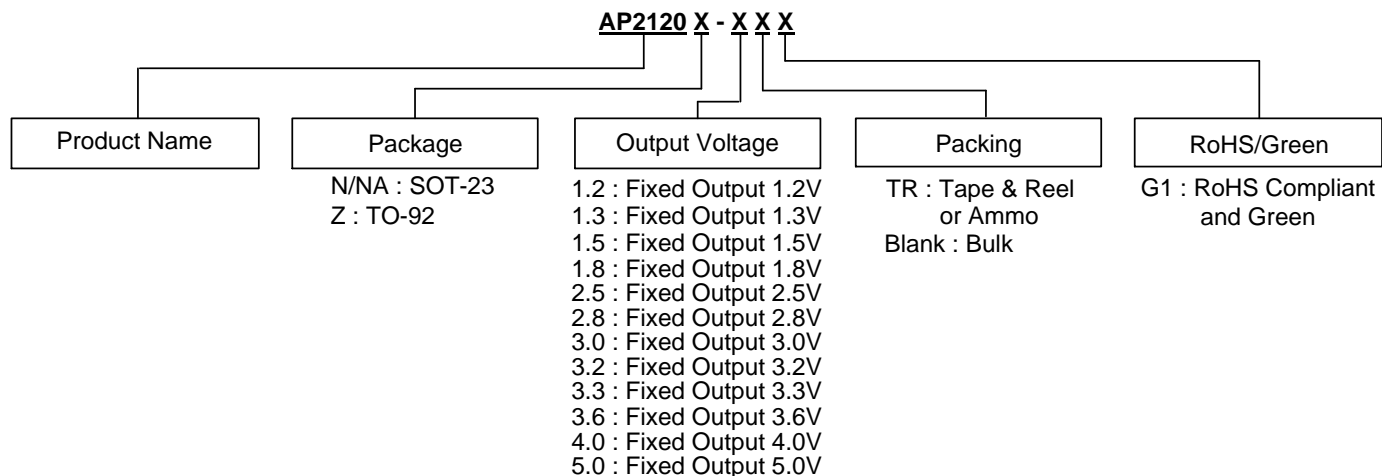
**PSRR vs. Frequency**



**Start-Up**



## Ordering Information



Package	Temperature Range	Output Voltage	Part Number	Marking ID	Packing
SOT-23	-40 to +85°C	1.2V(N)	AP2120N-1.2TRG1	GR4	3000/Tape & Reel
		1.3V(N) (NRND) (Note 6)	AP2120N-1.3TRG1	GR5	3000/Tape & Reel
		1.5V(N)	AP2120N-1.5TRG1	GR6	3000/Tape & Reel
		1.8V(N)	AP2120N-1.8TRG1	GR7	3000/Tape & Reel
		2.5V(N)	AP2120N-2.5TRG1	GR8	3000/Tape & Reel
		2.8V(N) (NRND) (Note 6)	AP2120N-2.8TRG1	GR9	3000/Tape & Reel
		3.0V(N)	AP2120N-3.0TRG1	GS2	3000/Tape & Reel
		3.2V(N)	AP2120N-3.2TRG1	GS3	3000/Tape & Reel
		3.3V(N)	AP2120N-3.3TRG1	GS4	3000/Tape & Reel
		3.6V(N)	AP2120N-3.6TRG1	GZ8	3000/Tape & Reel
		4.0V(N)	AP2120N-4.0TRG1	GZ9	3000/Tape & Reel
SOT-23	-40 to +85°C	5.0V(N)	AP2120N-5.0TRG1	GS5	3000/Tape & Reel
		3.3V(NA)	AP2120NA-3.3TRG1	GZ1	3000/Tape & Reel
		3.6V(NA)	AP2120NA-3.6TRG1	GAA	3000/Tape & Reel
		4.0V(NA)	AP2120NA-4.0TRG1	GBA	3000/Tape & Reel

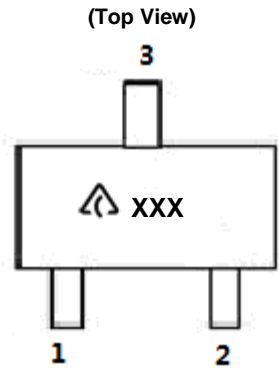
Note: 6. NRND: Not Recommended for New Design.

**Ordering Information** (continued)

Package	Temperature Range	Output Voltage	Part Number	Marking ID	Packing
TO-92	-40 to +85°C	1.2V	AP2120Z-1.2G1	2120Z-1.2G1	1000/Bulk
		1.2V	AP2120Z-1.2TRG1	2120Z-1.2G1	2000/Ammo
		1.3V	AP2120Z-1.3G1	2120Z-1.3G1	1000/Bulk
		1.3V	AP2120Z-1.3TRG1	2120Z-1.3G1	2000/Ammo
		1.5V	AP2120Z-1.5G1	2120Z-1.5G1	1000/Bulk
		1.5V	AP2120Z-1.5TRG1	2120Z-1.5G1	2000/Ammo
		1.8V	AP2120Z-1.8G1	2120Z-1.8G1	1000/Bulk
		1.8V	AP2120Z-1.8TRG1	2120Z-1.8G1	2000/Ammo
		2.5V	AP2120Z-2.5G1	2120Z-2.5G1	1000/Bulk
		2.5V	AP2120Z-2.5TRG1	2120Z-2.5G1	2000/Ammo
		2.8V	AP2120Z-2.8G1	2120Z-2.8G1	1000/Bulk
		2.8V	AP2120Z-2.8TRG1	2120Z-2.8G1	2000/Ammo
		3.0V	AP2120Z-3.0G1	2120Z-3.0G1	1000/Bulk
		3.0V	AP2120Z-3.0TRG1	2120Z-3.0G1	2000/Ammo
		3.2V	AP2120Z-3.2G1	2120Z-3.2G1	1000/Bulk
		3.2V	AP2120Z-3.2TRG1	2120Z-3.2G1	2000/Ammo
		3.3V	AP2120Z-3.3G1	2120Z-3.3G1	1000/Bulk
		3.3V	AP2120Z-3.3TRG1	2120Z-3.3G1	2000/Ammo
		3.6V	AP2120Z-3.6G1	2120Z-3.6G1	1000/Bulk
		3.6V	AP2120Z-3.6TRG1	2120Z-3.6G1	2000/Ammo
4.0V	AP2120Z-4.0G1	2120Z-4.0G1	1000/Bulk		
4.0V	AP2120Z-4.0TRG1	2120Z-4.0G1	2000/Ammo		
5.0V	AP2120Z-5.0G1	2120Z-5.0G1	1000/Bulk		
5.0V	AP2120Z-5.0TRG1	2120Z-5.0G1	2000/Ammo		

**Marking Information**

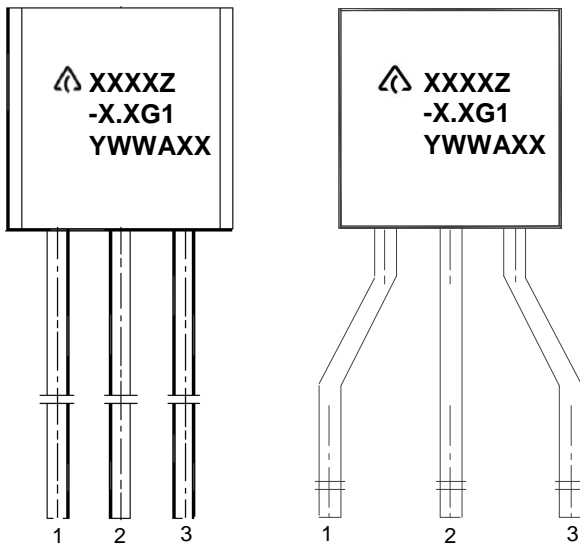
(1) SOT-23



 : Logo  
 XXX: Marking ID  
 (See Ordering Information)

(2) TO-92

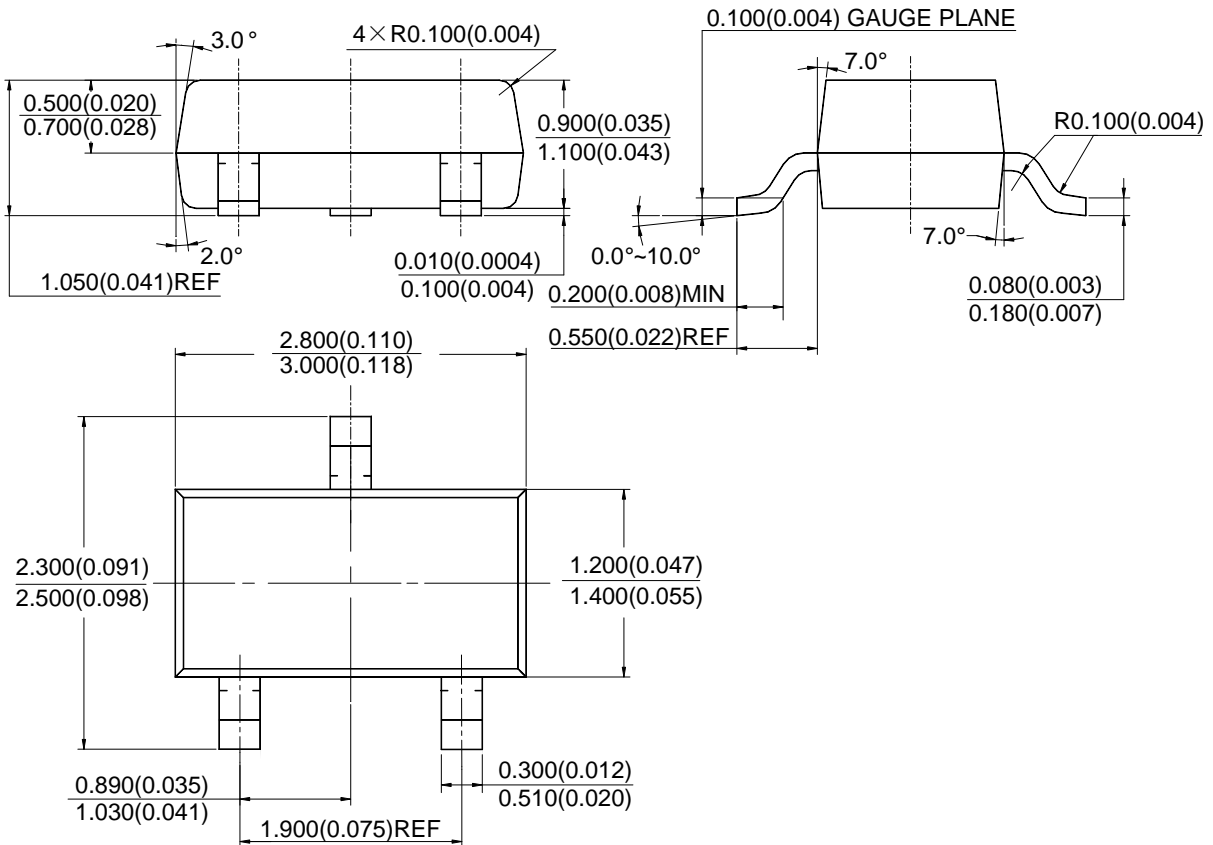
(Front View)



First and Second Lines: Logo and Marking ID  
 (See Ordering Information)  
 Third Line: Date Code  
 Y: Year  
 WW: Work Week of Molding  
 A: Assembly House Code  
 XX: 7<sup>th</sup> and 8<sup>th</sup> Digits of Batch Number

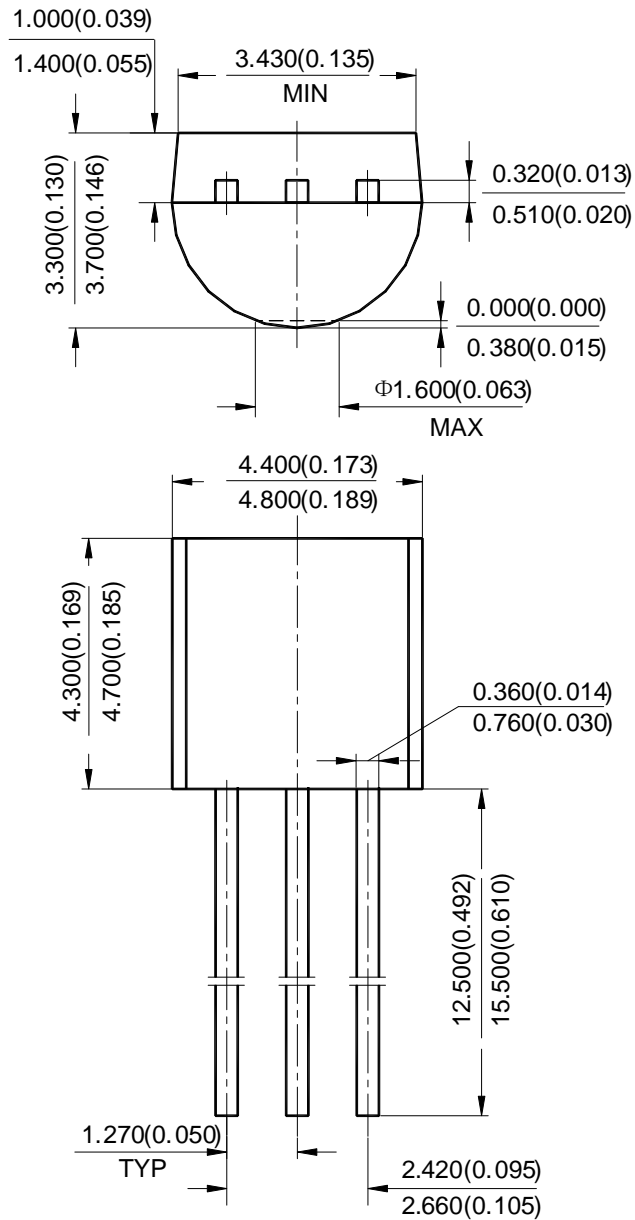
**Package Outline Dimensions** (All dimensions in mm(inch).)

(1) Package Type: SOT-23



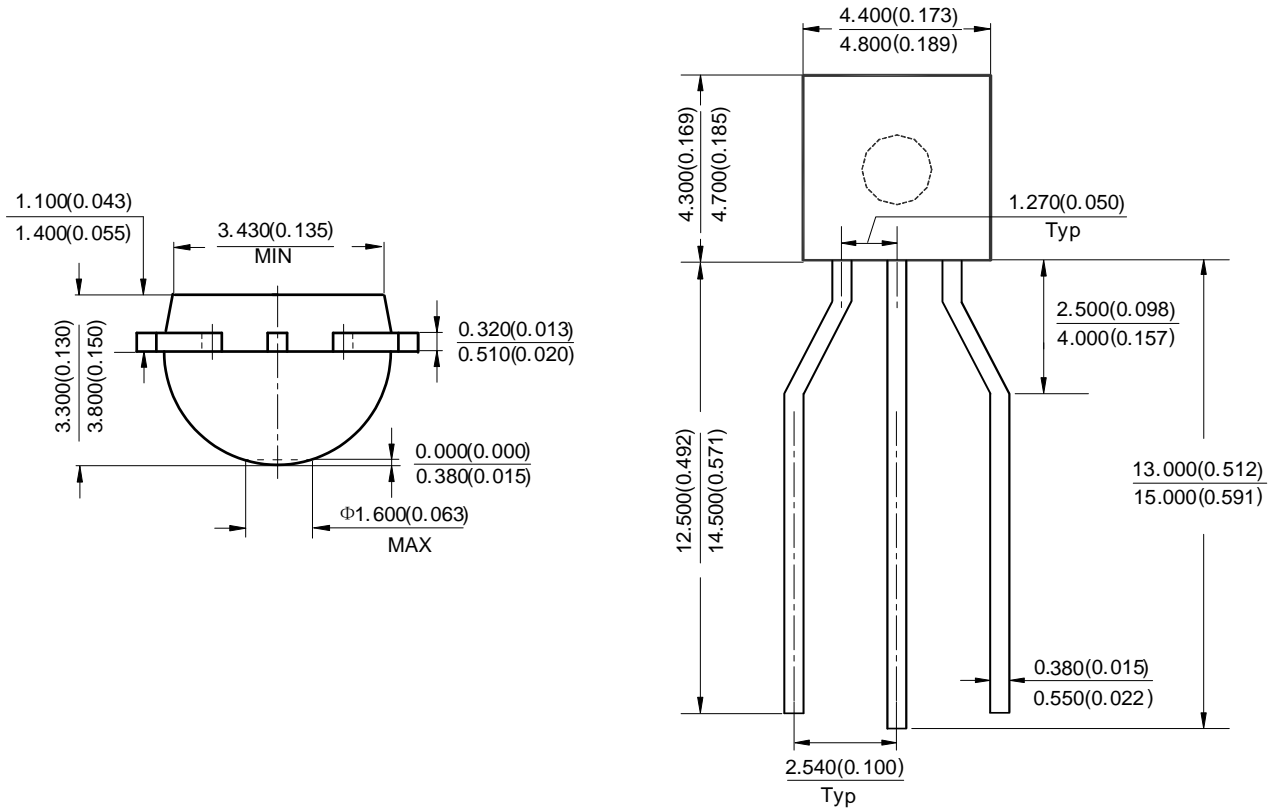
**Package Outline Dimensions** (continued) (All dimensions in mm(inch).)

(2) Package Type: TO-92 (Bulk Packing)



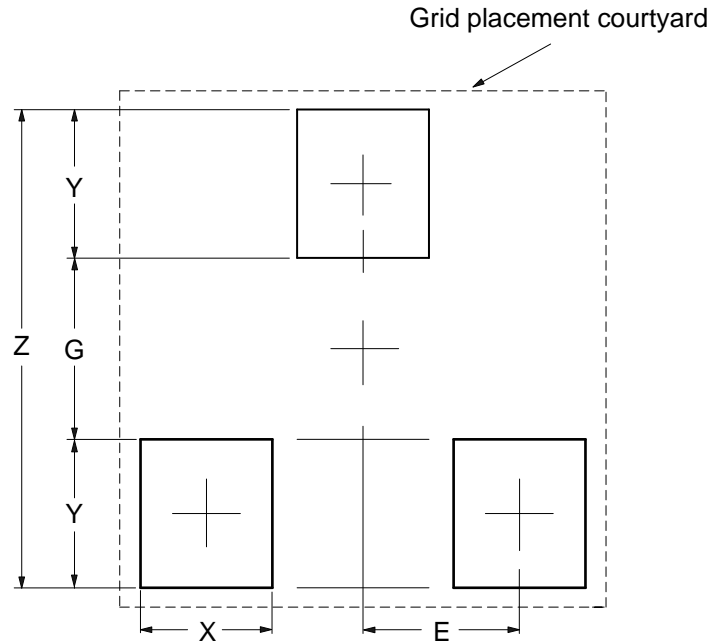
**Package Outline Dimensions** (continued) (All dimensions in mm(inch).)

(3) Package Type: TO-92 ( Ammo Packing)



**Suggested Pad Layout**

(1) SOT-23



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)
Value	2.900/0.114	1.100/0.043	0.800/0.031	0.900/0.035	0.950/0.037

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