

**150mA EXTREMELY LOW NOISE LDO REGULATOR****AP2121****General Description**

The AP2121 series are positive voltage regulator ICs designed 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 have features of 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, 2.5V and 3.2V 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 μA Typical (Except 1.5V Version)
- Low Quiescent Current: 25 μA Typical
- High Ripple Rejection: 70dB Typical ($f=10kHz$)
- Excellent Line Regulation: 4mV Typical
- Excellent Load Regulation: 12mV Typical
- High Output Voltage Accuracy: $\pm 2\%$
- Excellent Line Transient Response and Load Transient Response
- Low ESR Ceramic Capacitor Available
- ESD (Human Body Model): 2kV

Applications

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

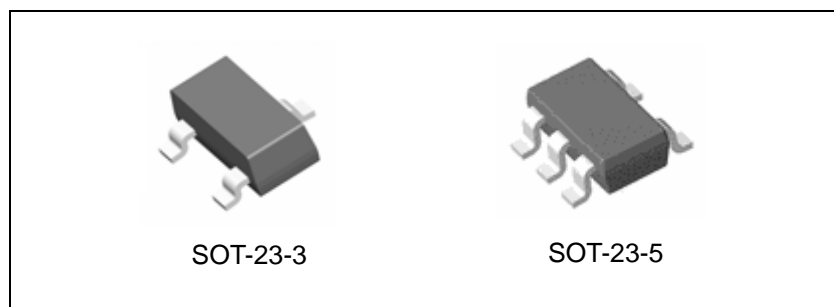


Figure 1. Package Types of AP2121

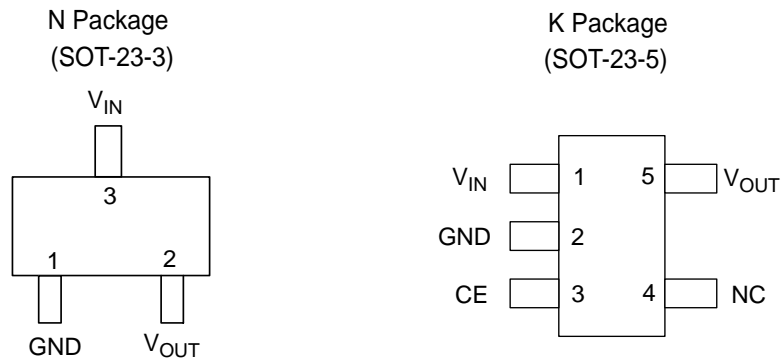
**150mA EXTREMELY LOW NOISE LDO REGULATOR****AP2121****Pin Configuration**

Figure 2. Pin Configuration of AP2121 (Top View)

Pin Description

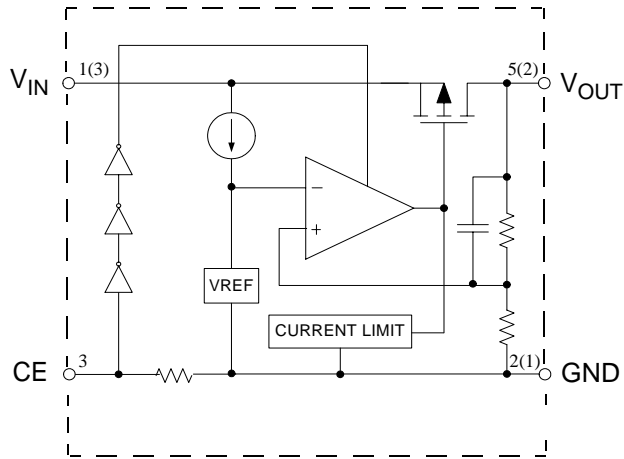
Pin Number		Pin Name	Function
SOT-23-3	SOT-23-5		
3	1	V_{IN}	Input voltage
1	2	GND	Ground
	3	CE	Active high enable input pin. Logic high=enable, logic low=shutdown
	4	NC	No connection
2	5	V_{OUT}	Regulated output voltage



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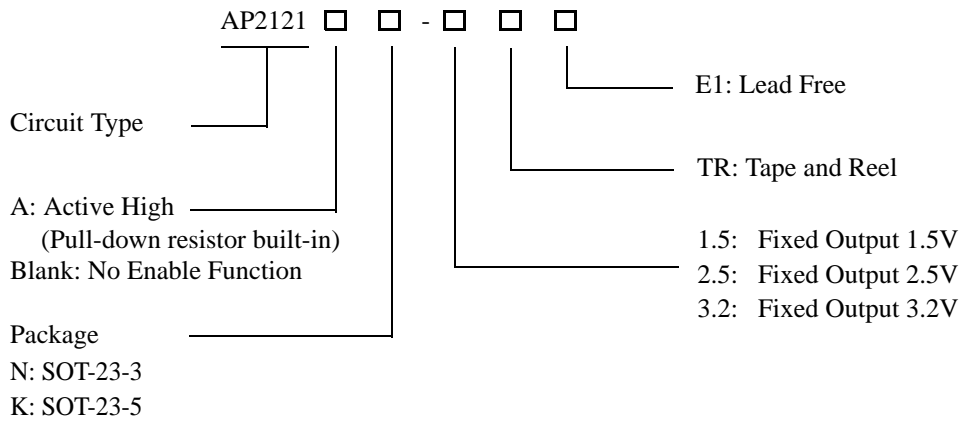
Functional Block Diagram



SOT-23-5 (SOT-23-3)

Figure 3. Functional Block Diagram of AP2121

Ordering Information



**150mA EXTREMELY LOW NOISE LDO REGULATOR****AP2121****Ordering Information (Continued)**

Package	Temperature Range	Condition	Part Number		Marking ID		Packing Type
			Tin Lead	Lead Free	Tin Lead	Lead Free	
SOT-23-3	-40 to 125°C			AP2121N-1.5TRE1		EF1	Tape & Reel
SOT-23-5		Active High (Pull-down resistor built-in)		AP2121AK-2.5TRE1		E1V	Tape & Reel
		Active High (Pull-down resistor built-in)		AP2121AK-3.2TRE1		E3Z	Tape & Reel

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

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	6.5	V
Output Current	I_{OUT}	300	mA
Storage Temperature Range	T_{STG}	-65 to 150	°C
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	°C
ESD (Human Body Model)		2000	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.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_{IN}		6	V
Operating Junction Temperature Range	T_J	-40	125	°C



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Electrical Characteristics

AP2121-1.5V Electrical Characteristics

($V_{IN}=2.5V$, $T_J=25^{\circ}C$, $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$, 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}	$I_{OUT}=100mA$		400	600	mV
Quiescent Current	I_Q	$V_{IN}=2.5V$, $I_{OUT}=0mA$		25	50	μA
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=10kHz$, $V_{IN}=2.5V$		70		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$, $-40^{\circ}C \leq T_J \leq 125^{\circ}C$		± 150		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$	$I_{OUT}=30mA$, $-40^{\circ}C \leq T_J \leq 125^{\circ}C$		± 100		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		μV_{rms}



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Electrical Characteristics (Continued)

AP2121-2.5V Electrical Characteristics

($V_{IN}=3.5V$, $T_J=25^{\circ}C$, $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$, 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}	$I_{OUT}=100mA$		150	300	mV
Quiescent Current	I_Q	$V_{IN}=3.5V$, $I_{OUT}=0mA$		25	50	μA
Standby Current	I_{STD}	$V_{IN}=3.5V$, V_{CE} in OFF mode		0.1	1	μA
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=10kHz$, $V_{IN}=3.5V$		70		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$, $-40^{\circ}C \leq T_J \leq 125^{\circ}C$		± 250		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$	$I_{OUT}=30mA$, $-40^{\circ}C \leq T_J \leq 125^{\circ}C$		± 100		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		μV_{rms}
CE "High" Voltage		CE input voltage "High"	1.5		V_{IN}	V
CE "Low" Voltage		CE input voltage "Low"	0		0.25	V
CE pull-down resistance	R_{PD}		2.5	5	10	$M\Omega$



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Electrical Characteristics (Continued)

AP2121-3.2V Electrical Characteristics

($V_{IN}=4.2V$, $T_J=25^{\circ}C$, $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}	$V_{IN}=4.2V$, $1mA \leq I_{OUT} \leq 30mA$	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}	$V_{IN}=4.2V$, $1mA \leq I_{OUT} \leq 80mA$		12	40	mV
Line Regulation	V_{RLINE}	$3.7V \leq V_{IN} \leq 6V$, $I_{OUT}=30mA$		4	16	mV
Dropout Voltage	V_{DROP}	$I_{OUT}=100mA$		150	300	mV
Quiescent Current	I_Q	$V_{IN}=4.2V$, $I_{OUT}=0mA$		25	50	μA
Standby Current	I_{STD}	$V_{IN}=4.2V$, V_{CE} in OFF mode		0.1	1	μA
Power Supply Rejection Ratio	PSRR	Ripple 0.5Vp-p, $f=10kHz$, $V_{IN}=4.2V$		70		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=30mA$, $-40^{\circ}C \leq T_J \leq 125^{\circ}C$		± 320		$\mu V/^{\circ}C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$	$I_{OUT}=30mA$, $-40^{\circ}C \leq T_J \leq 125^{\circ}C$		± 100		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		μV_{rms}
CE "High" Voltage		CE input voltage "High"	1.5		V_{IN}	V
CE "Low" Voltage		CE input voltage "Low"	0		0.25	V
CE pull-down resistance	R_{PD}		2.5	5	10	$M\Omega$



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Typical Performance Characteristics

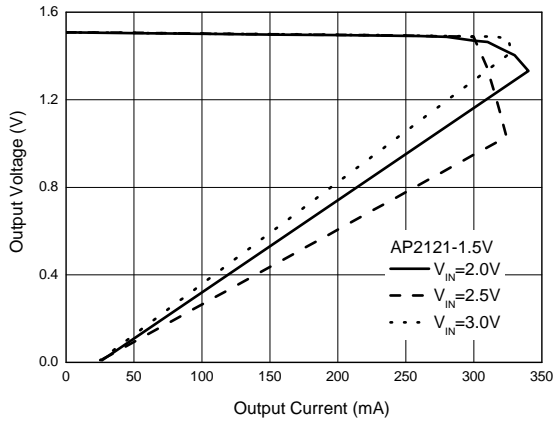


Figure 4. Output Voltage vs. Output Current

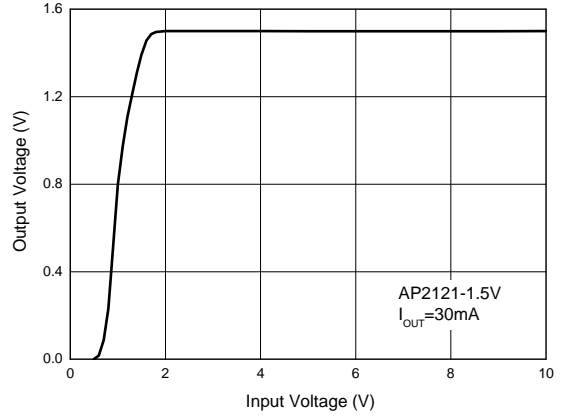


Figure 5. Output Voltage vs. Input Voltage

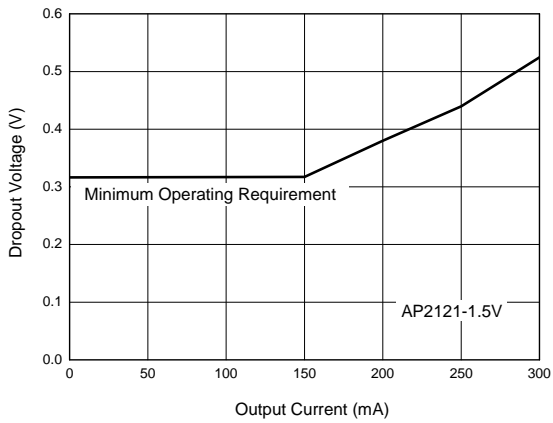


Figure 6. Dropout Voltage vs. Output Current

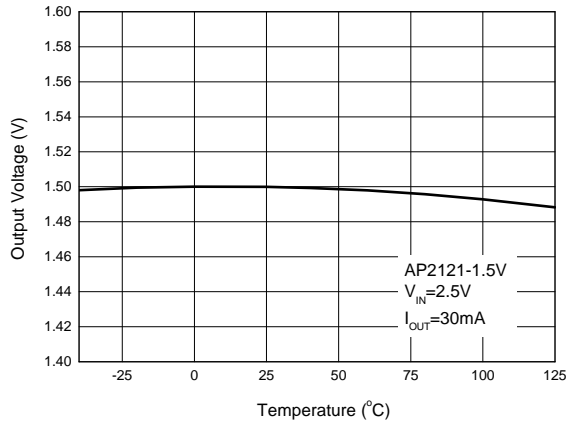


Figure 7. Output Voltage vs. Temperature



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Typical Performance Characteristics (Continued)

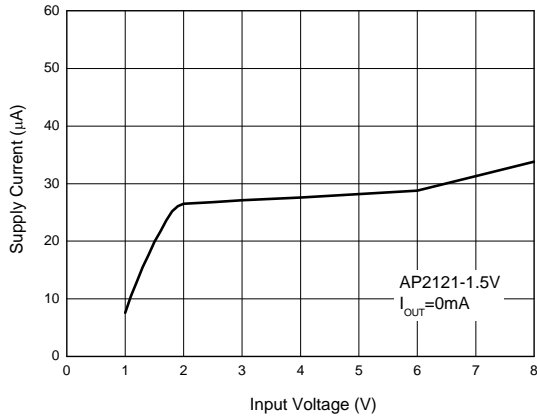


Figure 8. Supply Current vs. Input Voltage

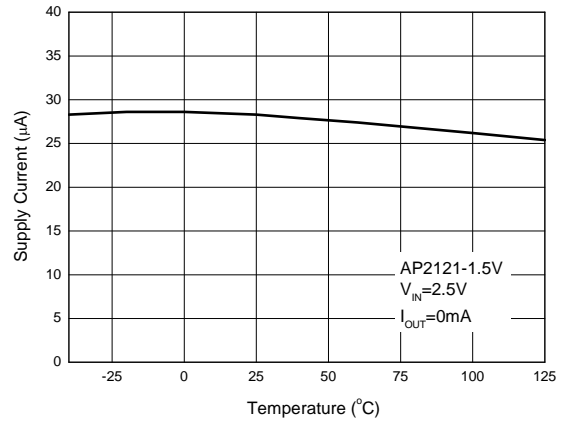


Figure 9. Supply Current vs. Temperature

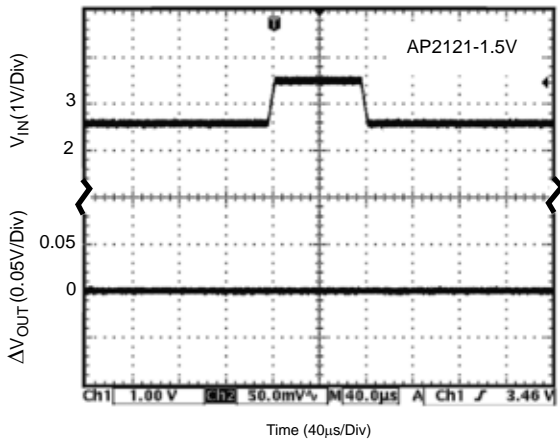


Figure 10. Line Transient
(Conditions: $I_{OUT}=30mA$, $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$)

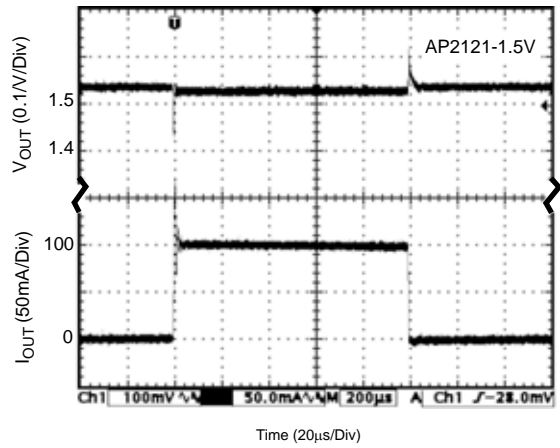


Figure 11. Load Transient
(Conditions: $V_{IN}=2.5V$, $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$)



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Typical Performance Characteristics (Continued)

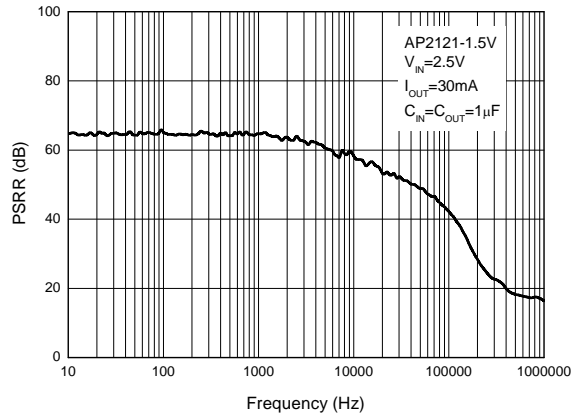


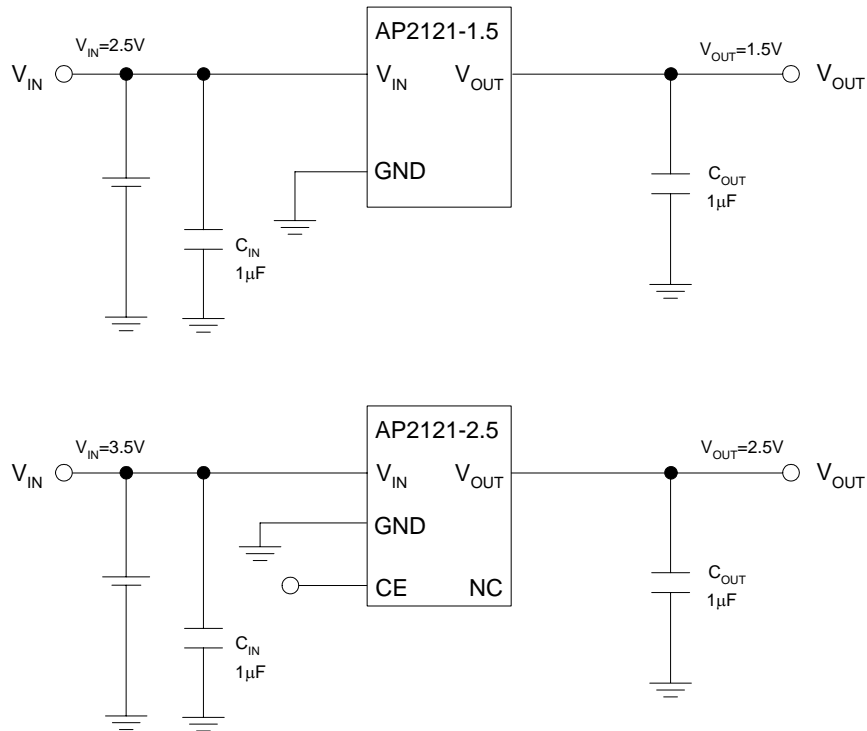
Figure 12. PSRR vs. Frequency



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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 0.1Ω to 10Ω. Ceramic capacitors are recommended.

Figure 13. Typical Application of AP2121



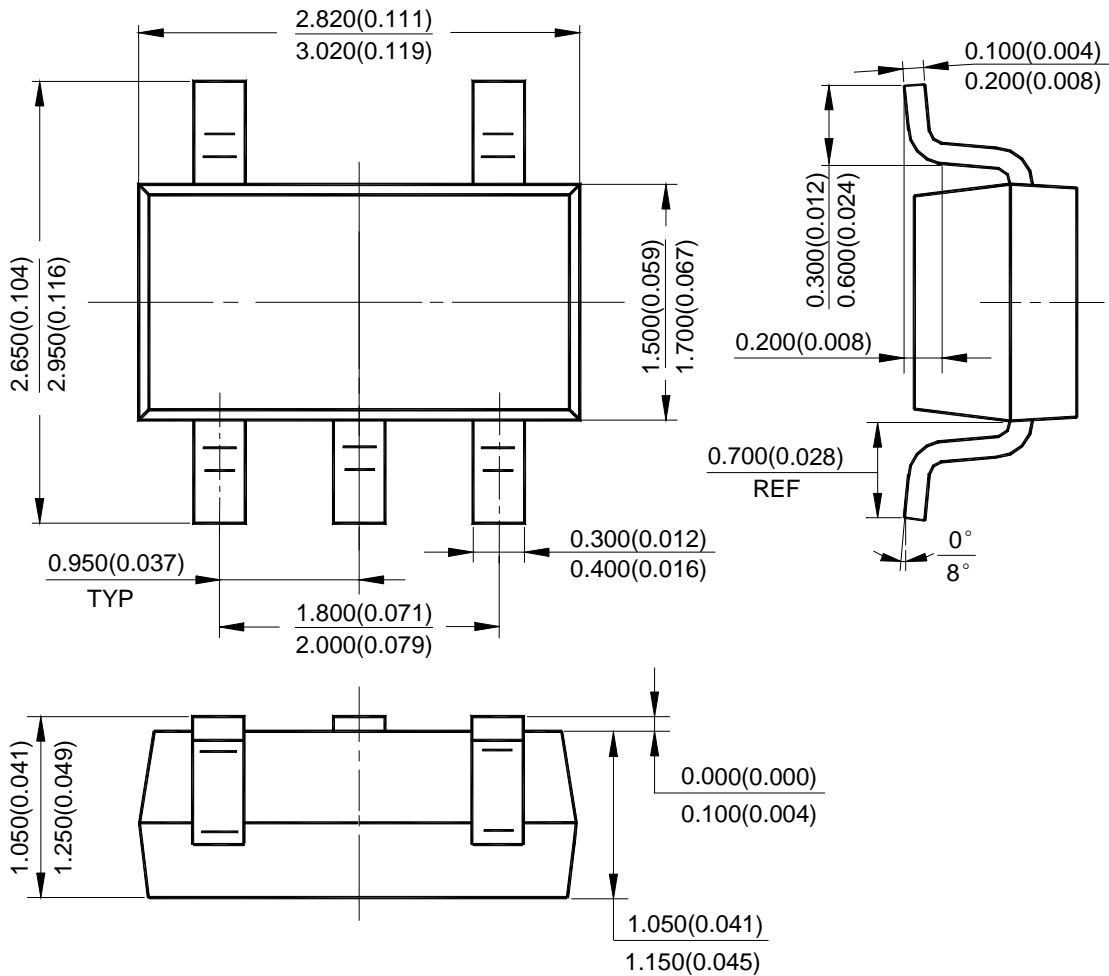
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Mechanical Dimensions (Continued)

SOT-23-5

Unit: mm(inch)





BCD Semiconductor Manufacturing Limited

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