350mA, Micropower, Very Low Dropout Linear Regulator

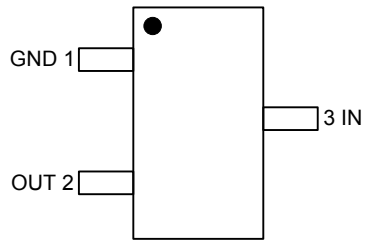
Applications

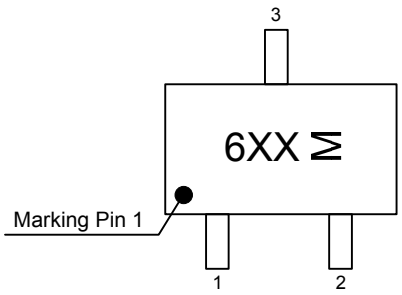
- Bluetooth/802.11 Cards
- PDAs and Notebook Computers
- Portable Instruments and Battery-Powered Systems
- Cellular Phones

Features

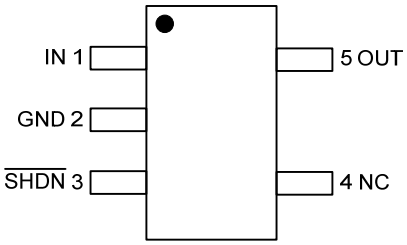
- Very Low Dropout: 150mV (Max) at 150mA
- Maximum Input Voltage: 6.0V
- ±2% Voltage Accuracy at V_{OUT}>1.5V
  ±30mV Voltage Accuracy at V_{OUT}≤1.5V
- Fast Transient Response
- Under Voltage Lockout
- Output Current Limit
- Stable with 1μF Output Capacitor
- Short-Circuit and Thermal Overload Protection
- Low Profile SOT23-3, SOT23-5, SOT89-5 and DFN6 2.0×2.0 Packages

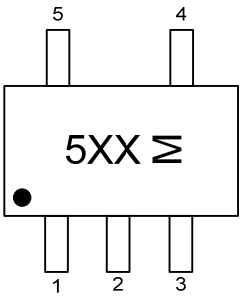
Pin Configurations **Top View**



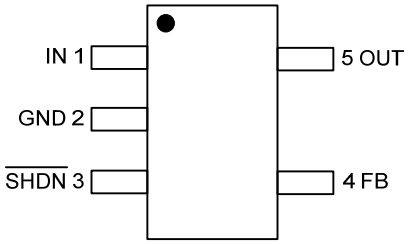


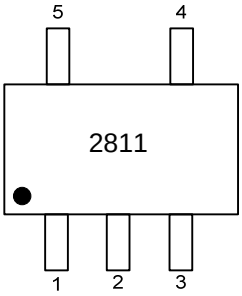
M: Month Code
ADP124AUJZ
SOT23-3



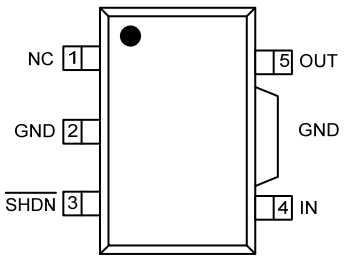


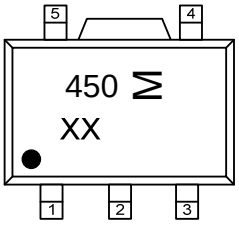
M: Month Code
ADP123AUJ
SOT23-5





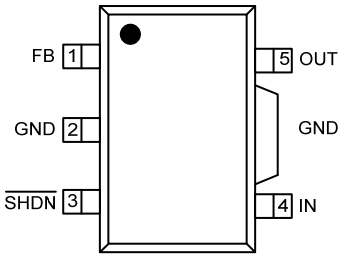
M: Month Code
ADP123AUJZ-R7
SOT23-5

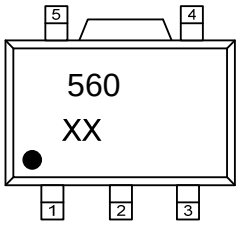




XX: Week Code
ADP123BU
SOT89-5

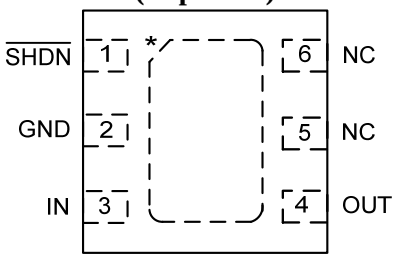
Pin Configurations (Continued) **Top View**

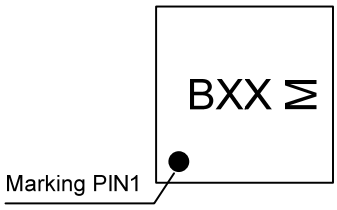




XX: Week Code
ADP123BUJ
SOT89-5

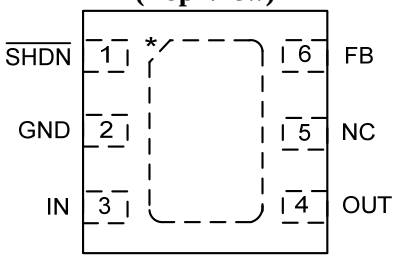
(Top View)

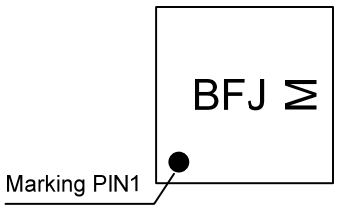




M: Month Code
ADP123C
DFN6 2.0×2.0

(Top View)





M: Month Code
ADP123D
DFN6 2.0×2.0

* The tab on the bottom of the package enhances thermal performance and is electrically connected to GND (substrate level). It is recommended that the tab be connected to the ground plane on the board. If not, the tab can be left open.

Pin Description

Pin Number			Symbol	Function
ADP124XXX	**ADP123XXX (Fixed V_{OUT})**	**ADP123AUJZ-R7 (Adjustable V_{OUT})**		
3	1	1	IN	Power Supply
1	2	2	GND	Ground
-	3	3	$\overline{SHDN}$	Shutdown Input: High=Activate LDO, Low=Shutdown LDO
-	4	-	NC	Not Connected
2	5	5	OUT	Voltage Regulated Output
-	-	4	FB	Output Voltage Feedback

Pin Description (Continued)

Pin Number				Symbol	Function
ADP123BXX (Fixed V_{OUT})	**ADP123BXX (Adjustable V_{OUT})**	**ADP123C-XX (Fixed V_{OUT})**	**ADP123EXXX (Adjustable V_{OUT})**		
4	4	3	3	IN	Power Supply
2	2	2	2	GND	Ground
3	3	1	1	$\overline{SHDN}$	Shutdown Input: High=Activate LDO, Low=Shutdown LDO
1	-	5,6	5	NC	Not Connected
5	5	4	4	OUT	Voltage Regulated Output
-	1	-	6	FB	Output Voltage Feedback

Ordering Information (Continued)

Part Number	Output Voltage	Packaging Type	Marking Code	Shipping Qty
ADP123AUJZ-R7	ADJ	SOT23-5	5CT	3000pcs/7Inch Tape & Reel
ADP123AUJZ-1.0	1.0V		5JA	
ADP123AUJZ-1.1	1.1V		5JB	
ADP123AUJZ-1.2	1.2V		5J2	
ADP123AUJZ-1.3	1.3V		5J3	
ADP123AUJZ-1.4	1.4V		5J4	
ADP123AUJZ-1.5	1.5V		5J5	
ADP123AUJZ-1.6	1.6V		5J6	
ADP123AUJZ-1.7	1.7V		5J7	
ADP123AUJZ-1.8	1.8V		5J8	
ADP123AUJZ-1.9	1.9V		5J9	
ADP123AUJZ-2.0	2.0V		5NA	
ADP123AUJZ-2.1	2.1V		5NB	
ADP123AUJZ-2.2	2.2V		5N2	
ADP123AUJZ-2.3	2.3V		5N3	
ADP123AUJZ-2.4	2.4V		5N4	
ADP123AUJZ-2.5	2.5V		5N5	
ADP123AUJZ-2.6	2.6V		5N6	
ADP123AUJZ-2.7	2.7V		5N7	
ADP123AUJZ-2.8	2.8V		5N8	
ADP123AUJZ-2.9	2.9V		5N9	
ADP123AUJZ-3.0	3.0V		5PA	
ADP123AUJZ-3.1	3.1V		5PB	
ADP123AUJZ-3.2	3.2V		5HP	
ADP123AUJZ-3.3	3.3V		5CU	
ADP123AUJZ-3.4	3.4V		5P4	
ADP123AUJZ-3.5	3.5V		5P5	
ADP123AUJZ-3.6	3.6V		5P6	
ADP123AUJZ-3.7	3.7V		5P7	
ADP123AUJZ-3.8	3.8V		5P8	
ADP123AUJZ-3.9	3.9V		5P9	
ADP123AUJZ-4.0	4.0V		5PC	

Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V_{IN}	Supply Voltage on IN Pin		-0.3 to +7.5	V
$V_{\overline{SHDN}}$	Voltage on $\overline{SHDN}$ Pin		-0.3 to +7.5	V
V_{FB}	Voltage on FB Pin		-0.3 to +7.5	V
V_{OUT}	Voltage on OUT Pin		-0.3 to +7.5	V
	Output Short-Circuit Duration		Indefinite	
θ_{JA}	Junction Thermal Resistance	SOT23-3	+225	°C/W
		SOT23-5	+215	
		SOT89-5	+66	
		DFN6 2.0×2.0	+110	
T_J	Operating Junction Temperature		-40 to +125	°C
T_{STG}	Storage Temperature Range		-65 to +150	°C
T_L	Lead Temperature for Soldering 10 Seconds		+300	°C

Electrical Characteristics

$V_{\overline{SHDN}}=V_{IN}=V_{OUT}+1V$, $C_{IN}=C_{OUT}=1.0\mu F$, $T_A=25°C$, unless noted.

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
V_{IN}	Input Voltage Range			2.5		6.0	V
V_{UVLO}	Input Under Voltage Lockout	V_{IN} Falling		1.8		2.4	V
I_Q	Operating Quiescent Current	$V_{IN}=4.3V$, $I_{OUT}=0mA$			90	130	μA
		$V_{IN}=4.3V$, $I_{OUT}=350mA$			190	300	
$I_{\overline{SHDN}}$	Shutdown Leakage Current					1	μA
I_{OUT}	Output Current			350			mA
V_{FB}	Feedback Reference Voltage	$V_{IN}=2.5V$ to 6.0V		0.98	1.00	1.02	V
	Output Voltage Accuracy	$0mA \le I_{OUT} \le 350mA$	$V_{OUT}>1.5V$	-2		+2	%
			$V_{OUT} \le 1.5V$	-30		+30	mV
ΔV_{DO} (Note 5)	Dropout Voltage	$I_{OUT}=150mA$			110	150	mV
I_{LIMIT}	Output Current Limit	$V_{IN} \ge 2.5V$		550			mA
t	Startup Time Response	$R_L=68\Omega$, $C_{OUT}=1\mu F$			44		μs
V_{IL}	$\overline{SHDN}$ Input Low Voltage	$V_{IN}=6.0V$				0.4	V
V_{IH}	$\overline{SHDN}$ Input High Voltage	$V_{IN}=6.0V$		2.0			V
	$\overline{SHDN}$ Input Current	$\overline{SHDN}=V_{IN}$ or GND		-1		+1	μA
T_{SHDN}	Thermal-Shutdown Temperature				160		°C
ΔT_{SHDN}	Thermal-Shutdown Hysteresis				20		°C
	Line Regulation	$V_{OUT}+1V \le V_{IN} \le V_{OUT}+2V$, $V_{IN} \ge 2.5V$ $I_{OUT}=10mA$			0.09		%/V
	Load Regulation	$V_{IN}=V_{OUT}+1V$, $V_{IN} \ge 2.5V$ $1mA \le I_{OUT} \le 150mA$			0.2		%
	Output Voltage Noise	10Hz to 100kHz $C_{IN}=1\mu F$, $V_{OUT}=3.3V$, $I_{OUT}=150mA$			195		μV_{RMS}
PSRR	Power Supply Ripple Rejection	$V_{IN}=V_{OUT}+1V$ $I_{OUT}=100mA$	f=100Hz		63		dB
			f=1kHz		55		
			f=10kHz		40		

Note 5: ΔV_{DO} just defined for device with $V_{OUT} \ge 2.5V$.

Typical Application Circuit

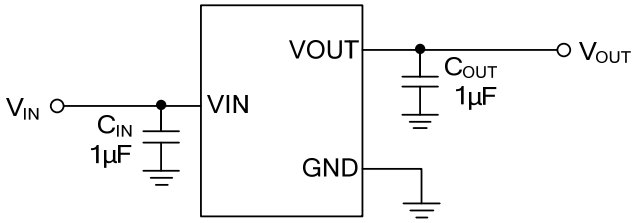


Figure 1. ADP124xx Typical Application Circuit

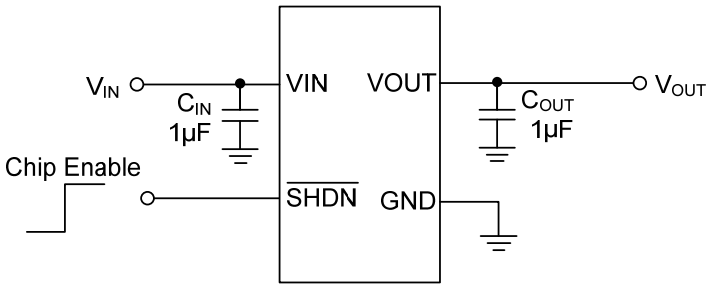


Figure 2. ADP123xxxx

Typical Application Circuit

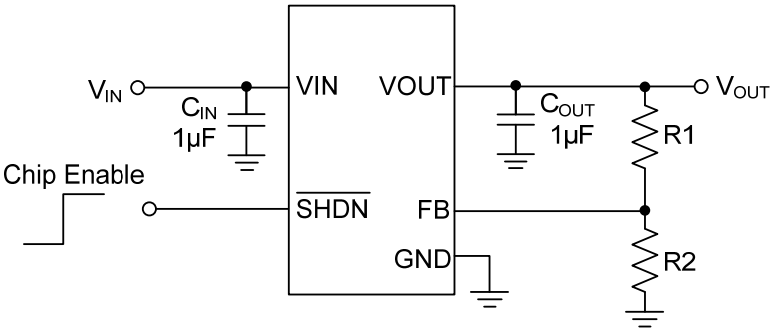


Figure 3. ADP123xxx (Adjustable V_{OUT})

Typical Application Circuit

ADP123xxxx Output Voltage Setting

The output voltage of the ADP123 adjustable regulator is programmed using an external resistor divider as shown in Figure 3. The output voltage is calculated using:

$$V_{OUT} = V_{FB}\left(1+\frac{R1}{R2}\right)$$

Where: V_{FB}=1.00V (Typ) (the internal reference voltage)

Resistors R1 and R2 should be chosen for approximately 3-5μA divider current. Lower value resistors can be used but offer no inherent advantage and waste more power. Higher values should be avoided, as leakage currents at FB increase the output voltage error. The recommended design procedure is to choose R2=200kΩ to set the divider current at 5μA and then calculate R1 using:

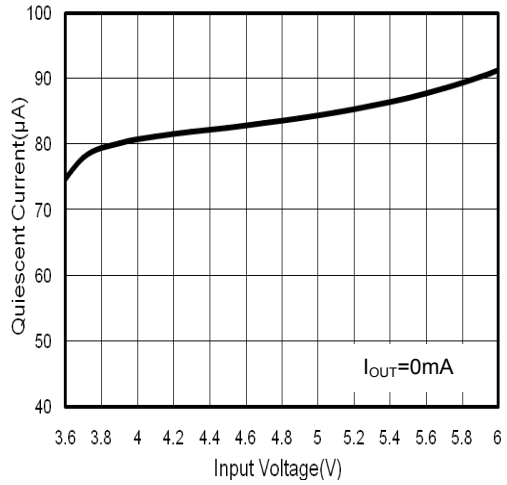
$$R1 = \left(\frac{V_{OUT}}{V_{FB}} - 1\right) \times R2$$

Where: V_{FB}=1.00V (Typ).

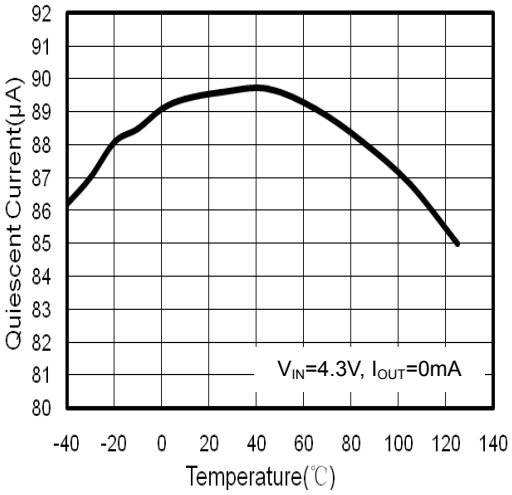
Typical Performance Characteristics

(Shown for 3.3V Output Option)

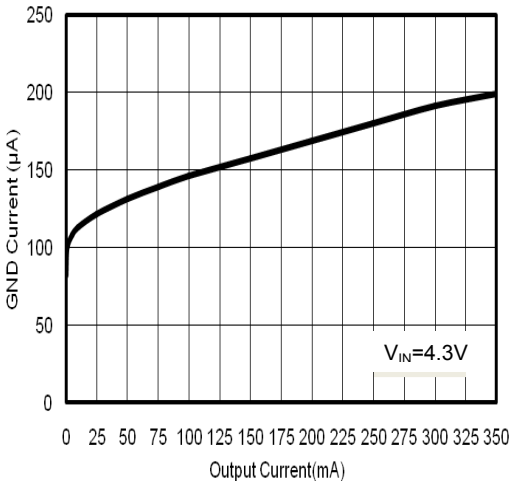
Quiescent Current vs. Input Voltage



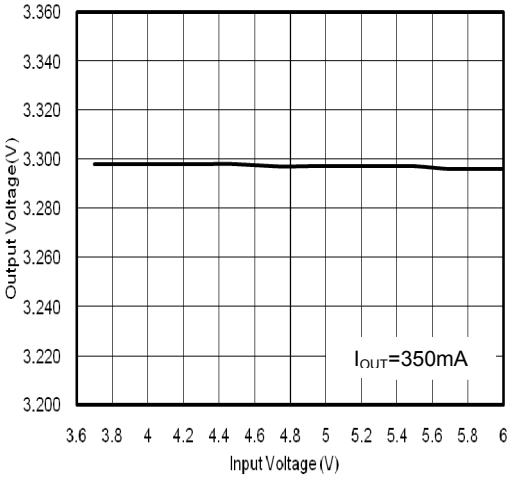
Quiescent Current vs. Temperature



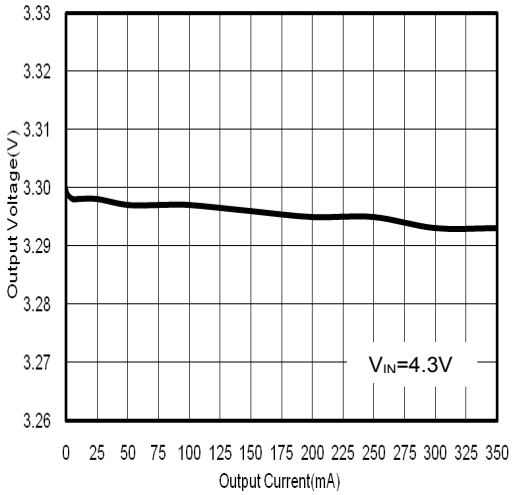
GND Current vs. Output Current



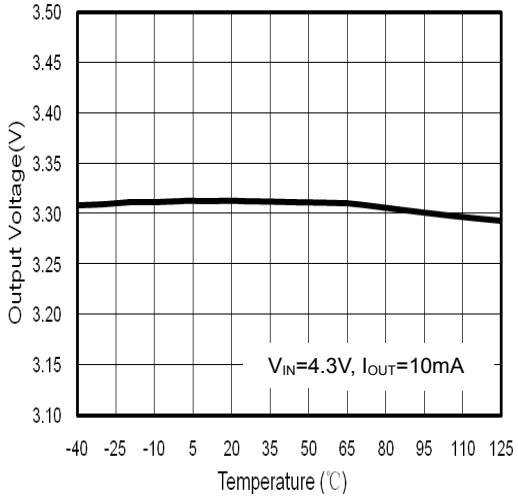
Output Voltage vs. Input Voltage



Output Voltage vs. Output Current



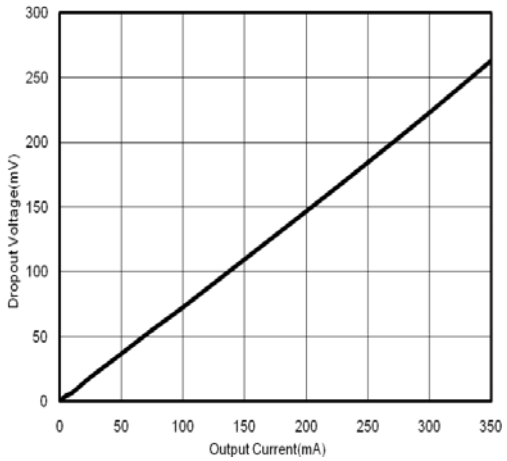
Output Voltage vs. Temperature



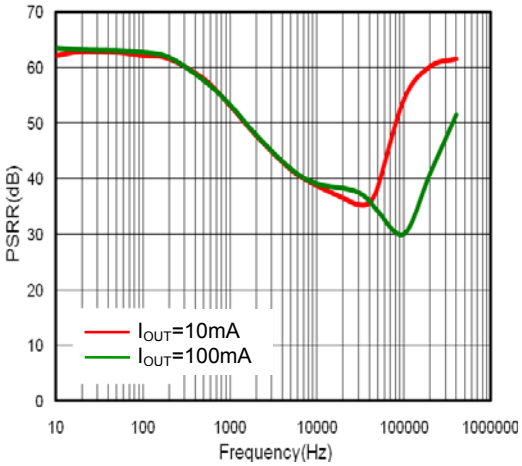
Typical Performance Characteristics (Continued)

(Shown for 3.3V Output Option)

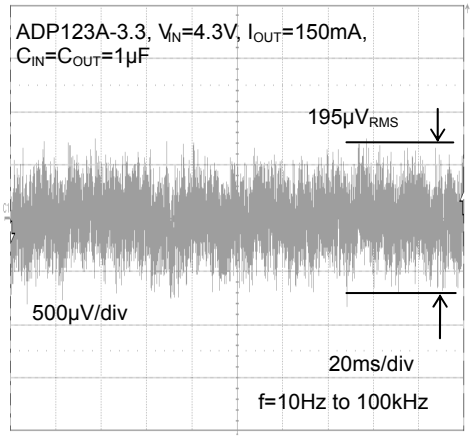
Dropout Voltage vs. Output Current



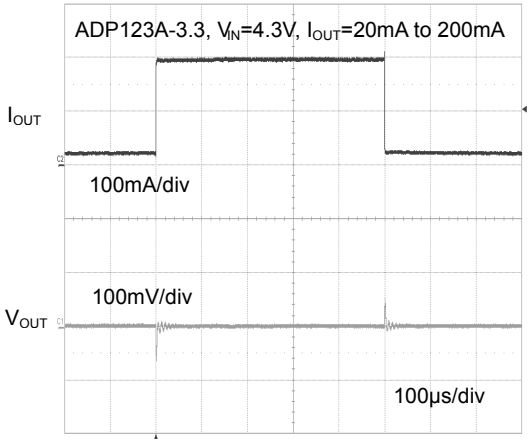
PSRR vs. Frequency



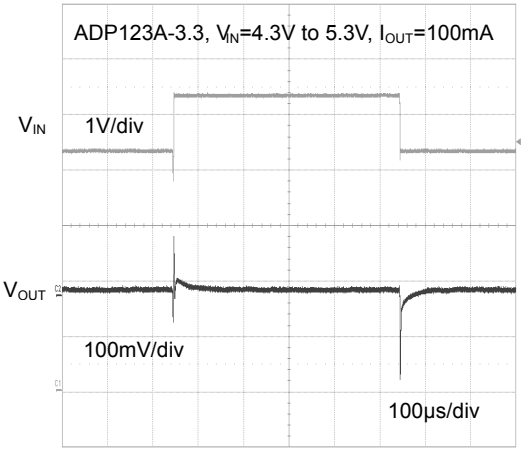
Noise



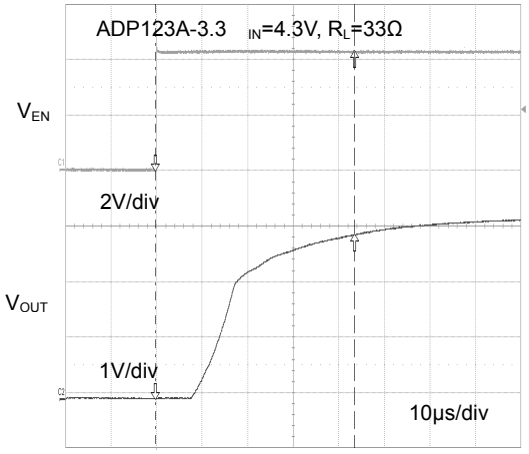
Load Transient Response



Line Transient Response



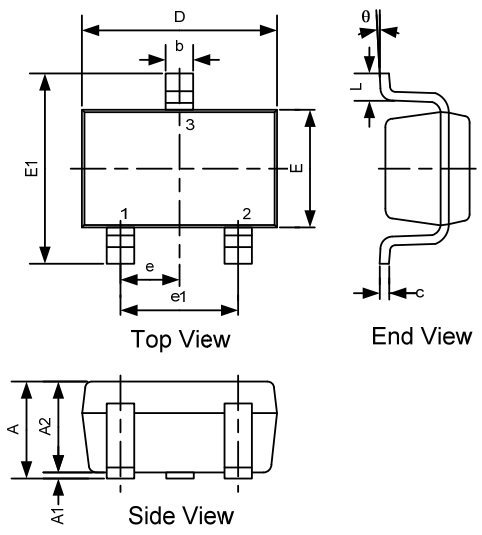
Startup Waveform



Package Information

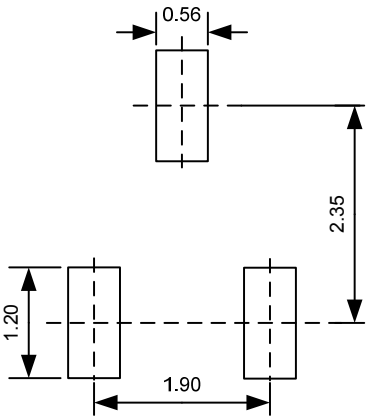
ADP124xxx: SOT23-3

Outline Drawing



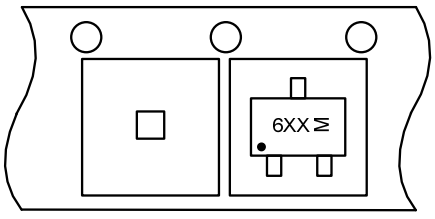
DIMENSIONS						
Symbol	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	1.013	1.15	1.40	0.040	0.045	0.055
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	1.00	1.10	1.30	0.039	0.043	0.051
b	0.30	-	0.50	0.012	-	0.020
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.82	-	3.10	0.111	-	0.122
E	1.50	1.60	1.70	0.059	0.063	0.067
E1	2.60	2.80	3.00	0.102	0.110	0.118
e	0.95REF			0.037REF		
e1	1.90REF			0.075REF		
L	0.30	-	0.60	0.012	-	0.024
θ	0°	-	8°	0°	-	8°

Land Pattern



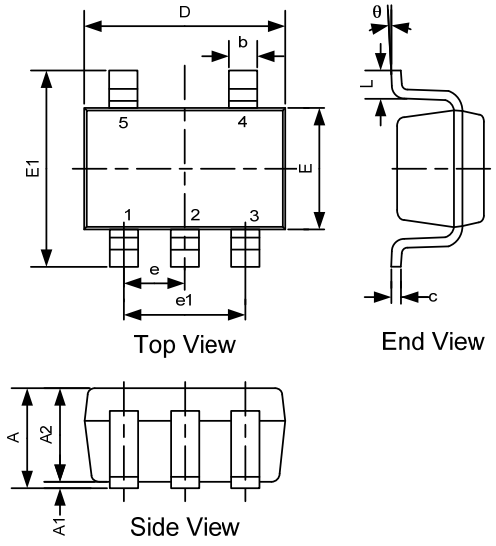
NOTES:
1. Compound dimension: 2.92×1.60;
2. Unit: mm;
3. General tolerance ±0.05mm unless otherwise specified;
4. The layout is just for reference.

Tape and Reel Orientation



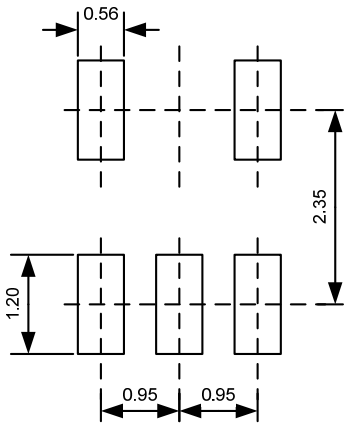
ADP123Axxx: SOT23-5

Outline Drawing



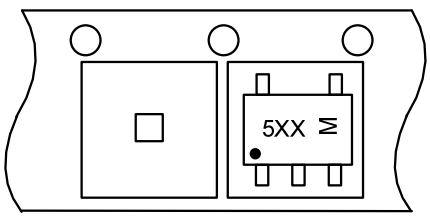
DIMENSIONS						
Symbol	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	1.013	1.15	1.40	0.040	0.045	0.055
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	1.00	1.10	1.30	0.039	0.043	0.051
b	0.30	-	0.50	0.012	-	0.020
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.82	-	3.10	0.111	-	0.122
E	1.50	1.60	1.70	0.059	0.063	0.067
E1	2.60	2.80	3.00	0.102	0.110	0.118
e	0.95REF			0.037REF		
e1	1.90REF			0.075REF		
L	0.30	-	0.60	0.012	-	0.024
θ	0°	-	8°	0°	-	8°

Land Pattern



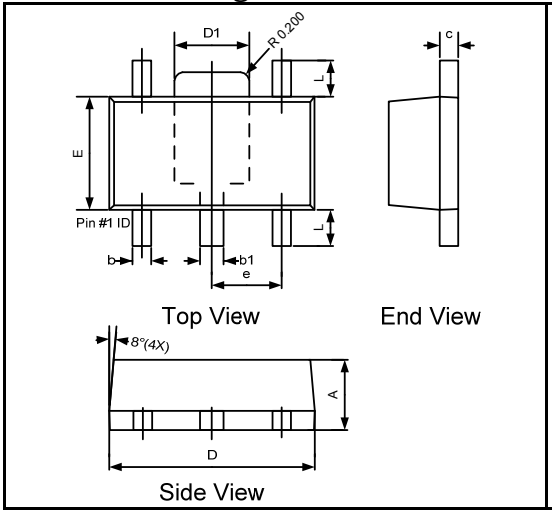
NOTES:
1. Compound dimension: 2.92×1.60;
2. Unit: mm;
3. General tolerance ±0.05mm unless otherwise specified;
4. The layout is just for reference.

Tape and Reel Orientation



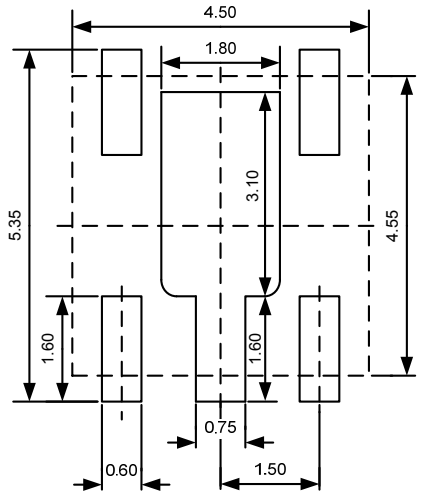
ADP123Bxxx: SOT89-5

Outline Drawing



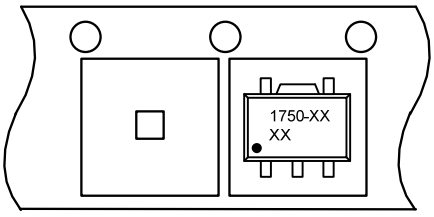
DIMENSIONS						
Symbol	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	1.40	1.50	1.60	0.055	0.059	0.063
b	0.32	-	0.54	0.013	-	0.021
b1	0.38	-	0.62	0.015	-	0.024
c	0.35	-	0.44	0.014	-	0.017
D	4.40	4.50	4.60	0.173	0.177	0.181
D1	1.40	-	1.83	0.055	-	0.072
E	2.30	2.50	2.60	0.091	0.098	0.102
e	1.50TYP			0.059TYP		
L	0.65	-	1.20	0.026	-	0.047

Land Pattern



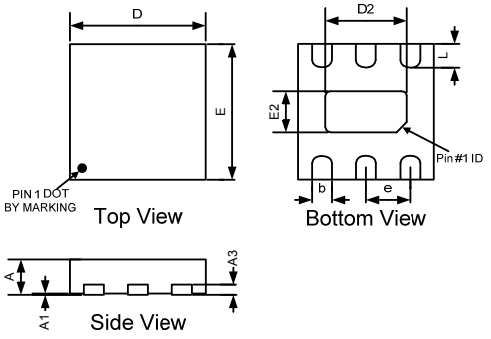
NOTES:
1. Compound dimension: 4.50×2.50;
2. Unit: mm;
3. General tolerance ±0.05mm unless otherwise specified;
4. The layout is just for reference.

Tape and Reel Orientation



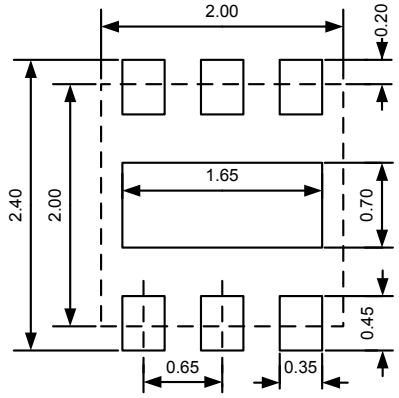
ADP123Dxxx: DFN6 2.0×2.0

Outline Drawing



DIMENSIONS						
Symbol	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	0.55	-	0.80	0.022	-	0.031
A1	0.00	-	0.05	0.000	-	0.002
A3	0.20REF			0.008REF		
b	0.25	0.30	0.35	0.010	0.012	0.014
D	1.924	2.00	2.076	0.076	0.079	0.082
D2	1.35	-	1.75	0.053	-	0.069
E	1.924	2.00	2.076	0.076	0.079	0.082
E2	0.65	-	1.06	0.026	-	0.042
e	0.65BSC			0.026BSC		
L	0.224	-	0.45	0.009	-	0.018

Land Pattern



NOTES:
1. Compound dimension: 2.00×2.00；
2. Unit: mm;
3. General tolerance ±0.05mm unless otherwise specified;
4. The layout is just for reference.

Tape and Reel Orientation

