

## **150mA Ultra Low Dropout Linear Regulator**

### **❖ GENERAL DESCRIPTION**

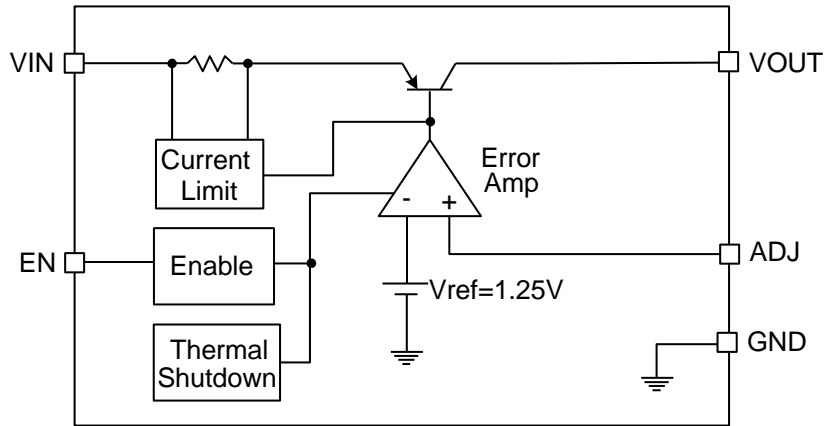
The AX1116A device is an efficient linear voltage regulator with better than 2% initial voltage accuracy, very low dropout voltage and very low ground current designed especially for hand held, battery powered applications. Other features of the device are: TTL compatible enable/shutdown control input, current limiting and thermal shutdown.

The AX1116A is available adjustable output voltage versions in a small SOT-23 5-Pin package.

### **❖ FEATURES**

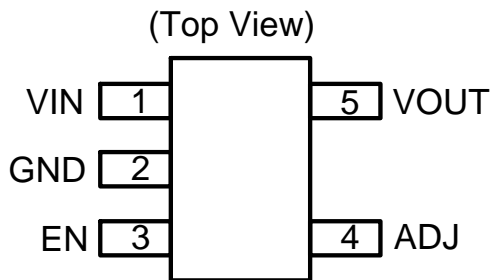
- Wide Operating range: 4.5V ~ 25V
- Adjustable output.
- 2% Voltage Reference Accuracy
- 5uA Shutdown Current
- Stable with 2.2uF Ceramic Capacitor
- Current-Limit and Thermal Shutdown Protection
- Logic input enable pin.
- Available in SOT-23-5L, Pb-Free Package.

❖ BLOCK DIAGRAM



❖ PIN ASSIGNMENT

The package of AX1116A is SOT-23-5L; the pin assignment is given by:



Name	Description
VIN	The input pin of the regulator. Typically a large storage capacitor is connected from this pin to ground to insure that the input voltage does not sag below the minimum drop out voltage during the load transient response. This pin must always be higher than $V_{OUT}$ by at least the amount of the dropout voltage and some margin in order for the device to regulate properly.
ADJ	A resistor divider from this pin to the VOUT pin and ground sets the output voltage.
EN	Enable pin. A low signal or left open on this pin shuts down the output. This pin must be tied High or to $V_{IN}$ for normal operation.
VOUT	The output of the regulator. A minimum of 2.2uF with max ESR of 1Ω capacitor must be connected from this pin to ground to insure stability.
GND	Ground pin. This pin must be connected to the lowest potential in the system and all other pins must be at higher potential with respect to this pin.

❖ **ORDER/MARKING INFORMATION**

Order Information	Top Marking
<p><b>AX1116A X X</b></p> <pre>       graph TD       A[AX1116A X X] --&gt; B[Package]       A --&gt; C[Packing]       B --&gt; B1[B : SOT-23-5L]       C --&gt; C1[Blank : Bag]       C --&gt; C2[A : Taping]           </pre> <p><b>Package</b> B : SOT-23-5L</p> <p><b>Packing</b> Blank : Bag A : Taping</p>	<p><b>RM Y WX</b></p> <pre>       graph TD       A[RM Y WX] --&gt; B[AX1116A]       A --&gt; C[ID code:internal]       A --&gt; D[WW:01~26 (A~Z) 27~52 (a~z)]       A --&gt; E[Year: 1=2011 2=2012]           </pre> <p>AX1116A</p> <p>→ ID code:internal → WW:01~26 (A~Z) 27~52 (a~z) → Year: 1=2011 2=2012</p>

❖ **ABSOLUTE MAXIMUM RATINGS** ( $T_A=25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
$V_{IN}$ Pin Voltage	$V_{IN}$	-0.3 to 27	V
EN Pin Voltage	$V_{EN}$	-0.3 to $V_{IN}$	V
Power Dissipation	PD	250	mW
Storage Temperature Range	$T_{ST}$	-65 to +150	$^\circ\text{C}$
Operating Junction Temperature Range	$T_{OP}$	-40 to +150	$^\circ\text{C}$
Thermal Resistance from Junction to case	$\theta_{JC}$	180	$^\circ\text{C/W}$
Thermal Resistance from Junction to ambient	$\theta_{JA}$	250	$^\circ\text{C/W}$

Note:  $\theta_{JA}$  is measured with the PCB copper area of approximately 1 in<sup>2</sup> (Multi-layer). That need connect to GND pin.

**❖ ELECTRICAL CHARACTERISTICS**
 $T_A=25^{\circ}\text{C}$ ,  $C_{IN}=C_{OUT}=2.2\mu\text{F}$ ,  $V_{IN}=V_{OUT} + 1\text{V}$ 

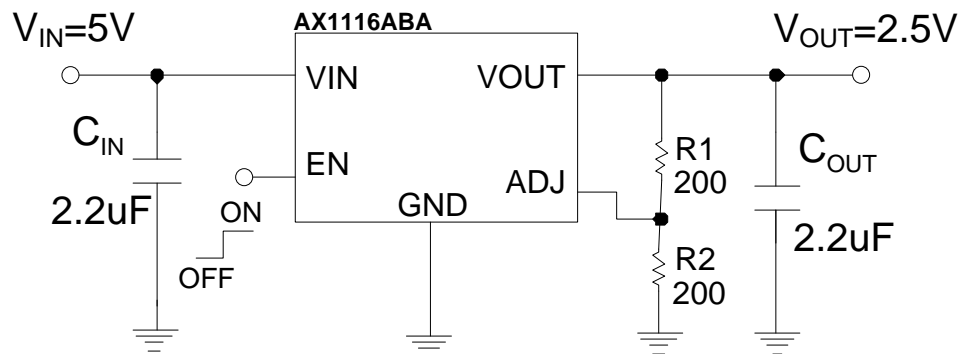
Characteristics	Symbol	Conditions	Min	Typ	Max	Units
VIN Supply Voltage	$V_{IN}$		4.5	-	25	V
Reference Voltage	$V_{FB}$		1.225	1.250	1.275	%
ADJ Pin Current	$I_{ADJ}$	$V_{IN}=2.5\text{V}$ , $V_{OUT}=V_{ADJ}$	-	0.1	-	$\mu\text{A}$
Line regulation	$V_{Line}$	$V_{OUT}+1\text{V}<V_{IN}<25\text{V}$ ; $I_{OUT}=1\text{mA}$	-	0.1	0.5	%
Load regulation (Note1)	$V_{Load}$	$V_{IN}=V_{OUT}+2\text{V}$ ; $1\text{mA}<I_{OUT}<100\text{mA}$	-	0.2	1	%
Dropout Voltage (Note2)	$V_{DROP}$	$I_{OUT}=100\mu\text{A}$	-	0.7	0.9	V
		$I_{OUT}=100\text{mA}$	-	0.9	1.1	
Ground current (Note3)	$I_{GND}$	$V_{EN}=2\text{V}$ $I_{OUT}=100\mu\text{A}$	-	200	300	$\mu\text{A}$
Shutdown Current	$I_{SD}$	$V_{EN}=0\text{V}$ to 0.8V or Open	-	5	20	$\mu\text{A}$
Minimum Load Current	$I_{Min}$		-	2	4	mA
Current Limit	CL	$V_{OUT}=0\text{V}$	200	-	-	mA
EN Pin Logic input threshold voltage	$V_{ENH}$	High (regulator ON)	2.0	-	-	V
	$V_{ENL}$	Low (regulator OFF)	-	-	0.8	V
EN Pin Input Current	$I_{ENH}$	$V_{EN}=2\text{V}$ (ON)	-	6	12	$\mu\text{A}$
	$I_{ENL}$	$V_{EN}=0\text{V}$ (OFF)	-	0.01	0.1	$\mu\text{A}$
Short Current	$I_Z$	$V_{OUT}=0\text{V}$	-	175	-	mA
Over Temperature Shutdown			-	150	-	$^{\circ}\text{C}$
Over Temperature Shutdown Hysteresis			-	10	-	$^{\circ}\text{C}$

Note1. Low duty cycle pulse testing with Kelvin connections is required in order to maintain accurate data.

Note2. Dropout voltage is defined as the minimum differential voltage between  $V_{IN}$  and  $V_{OUT}$  required to maintain regulation at  $V_{OUT}$ . It is measured when the output voltage drops 1% below its nominal value.

Note3. Ground current is the regulator quiescent current plus the pass transistor current. The total current from the supply is the sum of the load current plus the ground pin current.

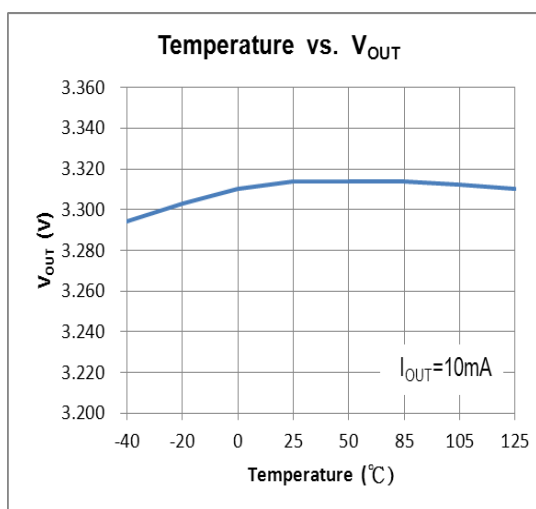
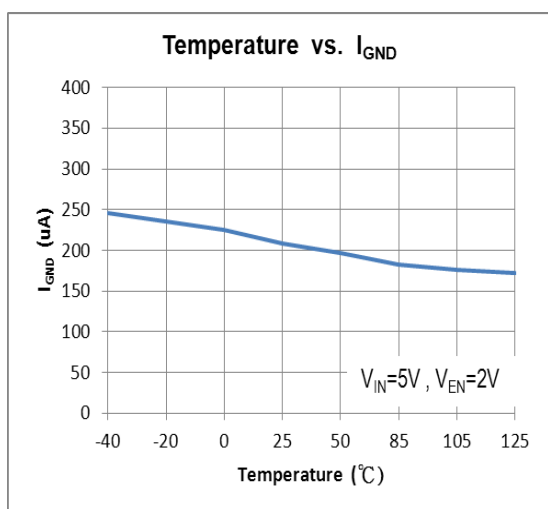
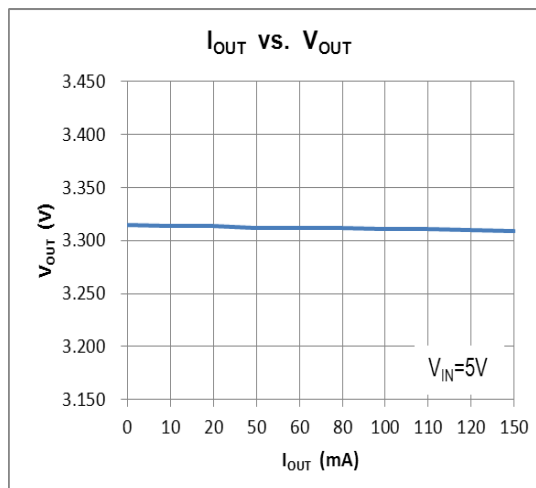
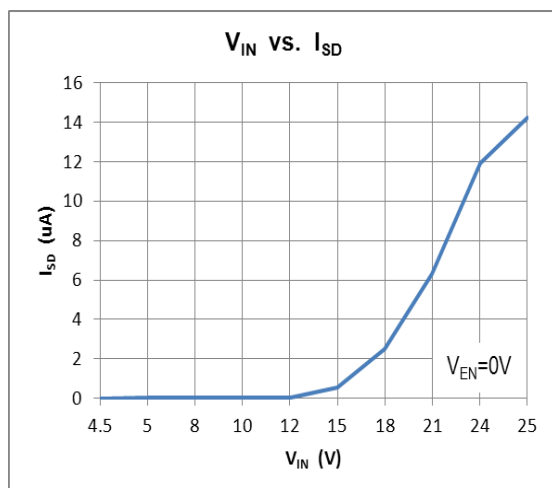
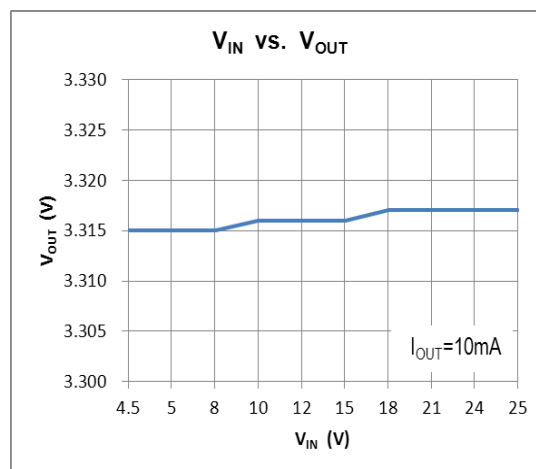
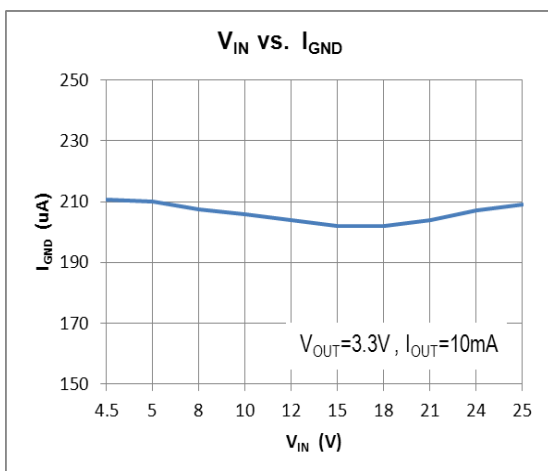
❖ APPLICATION CIRCUIT



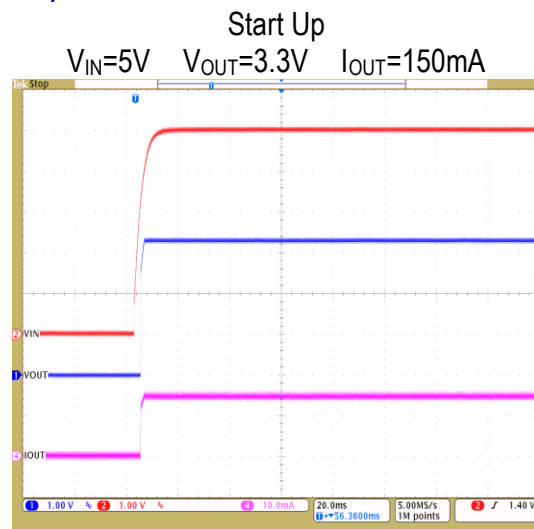
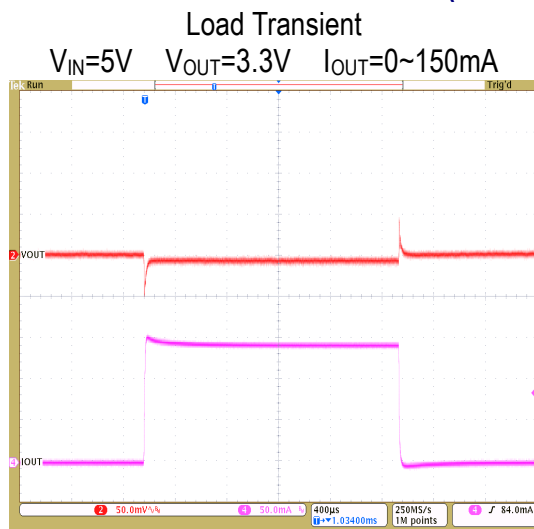
$$V_{OUT} = 1.25 * (1 + R1/R2)$$

R2 Suggest to be 200~300Ω

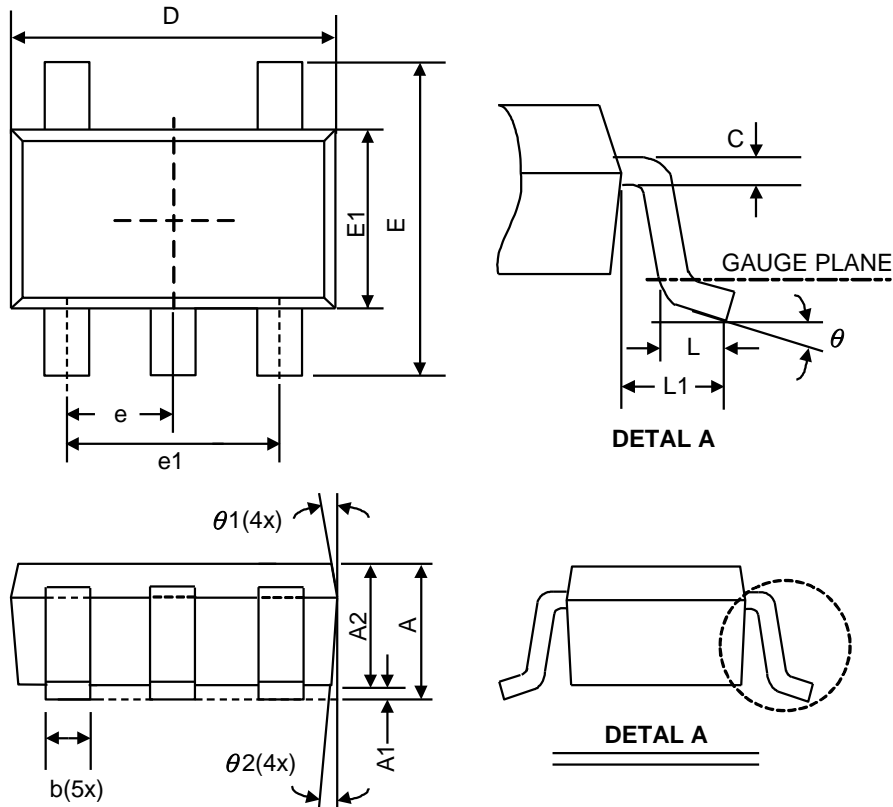
❖ TYPICAL CHARACTERISTICS



❖ TYPICAL CHARACTERISTICS (CONTINUED)



❖ PACKAGE OUTLINES



Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	1.45	-	-	0.057
A1	0.00	0.08	0.15	0	0.003	0.006
A2	0.90	1.10	1.30	0.035	0.043	0.051
b	0.30	0.40	0.50	0.012	0.016	0.020
C	0.08	0.15	0.22	0.003	0.006	0.009
D	2.70	2.90	3.10	0.106	0.114	0.122
E1	1.40	1.60	1.80	0.055	0.063	0.071
E	2.60	2.80	3.00	0.102	0.110	0.118
L	0.30	0.45	0.60	0.012	0.018	0.024
L1	0.50	0.60	0.70	0.020	0.024	0.028
e1	1.9 BSC			0.075 BSC		
e	0.95 BSC			0.037 BSC		
$\theta$	0°	4°	8°	0°	4°	8°
$\theta 1$	5°	10°	15°	5°	10°	15°
$\theta 2$	5°	10°	15°	5°	10°	15°

JEDEC outline: MO-178 AA