

## ■ General Description

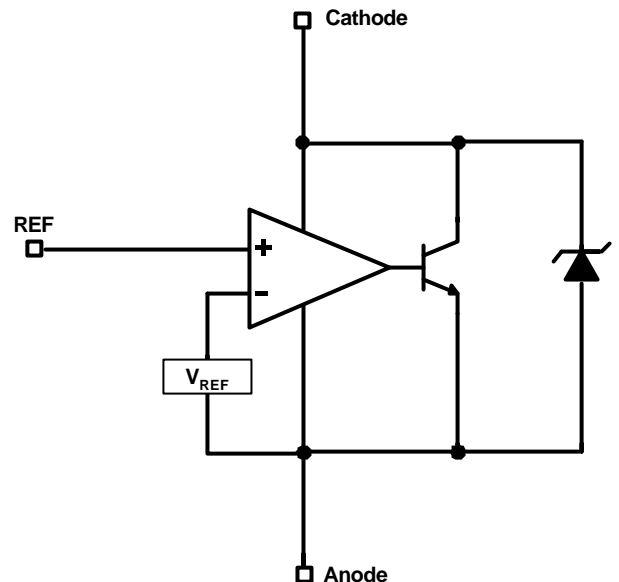
The AME431B series ICs are 3-terminal adjustable shunt regulator with guaranteed temperature stability over a full operation range. These ICs feature sharp turn-on characteristics, low temperature coefficient and low output impedance, which make them ideal substitutes for Zener diodes in applications such as switching power supply, charger and other adjustable regulators.

The reference is set to 1.24V for AME431Bxxxxx12. The output voltage can be set to 1.24V to 16V for  $V_{REF}=1.24V$  part type with two external resistors.

The AME431B precision reference is offered in two reference tolerance: 0.5% and 1.0%

The 5 main packages have low thermal impedance which allows operation over a wide range of  $-40^{\circ}C$  to  $+125^{\circ}C$ .

## ■ Functional Block Diagram



## ■ Features

- Very Accurate Reference Voltage : 0.15% Typical
- High Stability under Capacitive Load
- Low Temperature Deviation: 4.5mV Typical
- Low Equivalent Full-range Temperature Coefficient with 20PPM/ $^{\circ}C$  Typical
- Low Dynamic Output Resistance:  $0.2\Omega$  Typical
- Sink Current Capacity from 1mA to 100mA
- Low Output Noise
- Available in 7 Packages: TO-92, SOT-23, TSOT-23, SOT-89, SOP-8 and SOT-25, TSOT-25
- All AME' s Lead Free Products Meet RoHS Standards

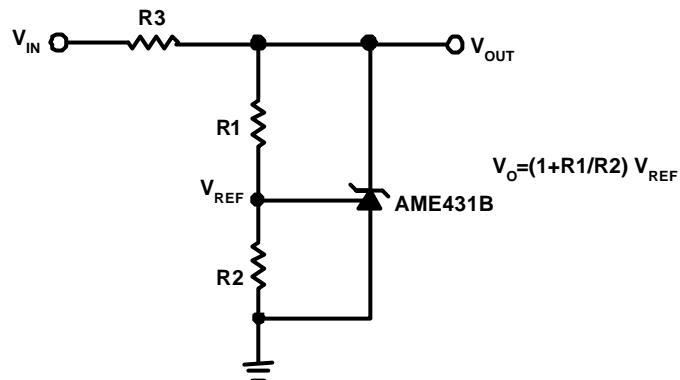
## ■ Applications

- Adjustable Power Supplies
- Linear Regulators
- Battery Operated Computer
- Portable Electronics
- Instrumentation
- Switching Power Supply
- Mother Board
- LCD Monitor
- Note Book Computer

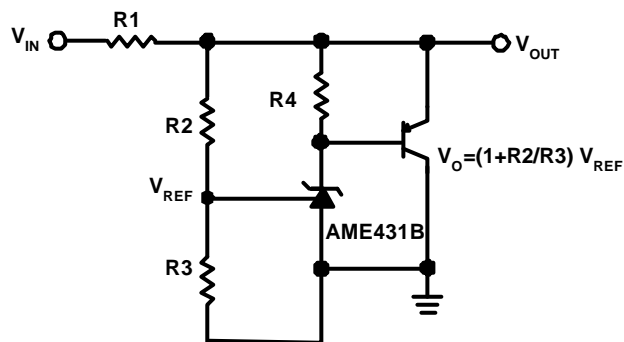
## AME431B-1.24V

### ■ Typical Applications

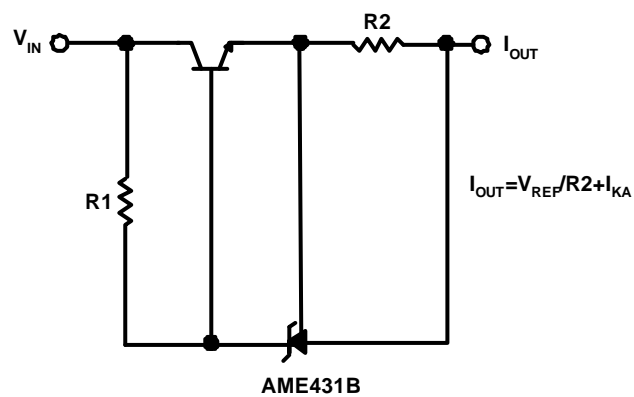
Shunt Regulator



High Current Shunt Regulator



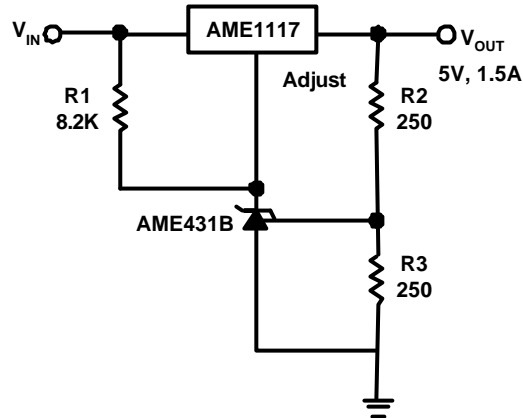
Current Source or Current Limit



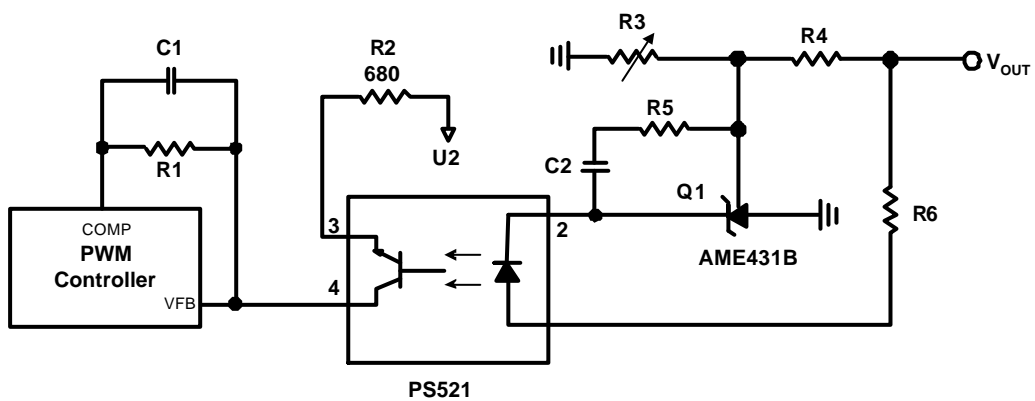
## AME431B-1.24V

### ■ Typical Applications (contd.)

Precision 5V 1.5A Regulator

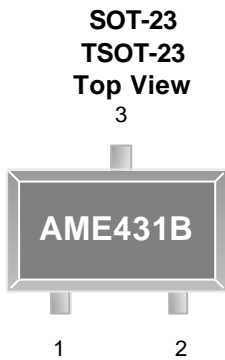


Precision 5V 1.5A Regulator



## AME431B-1.24V

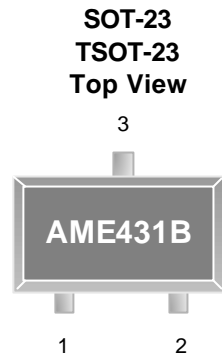
### ■ Pin Configuration



**AME431BAJETXXXX**

1. Cathode
2. REF
3. Anode

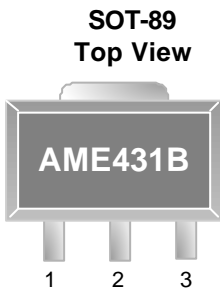
\* Die Attach:  
**Conductive Epoxy**



**AME431BBJETXXXX**

1. REF
2. Cathode
3. Anode

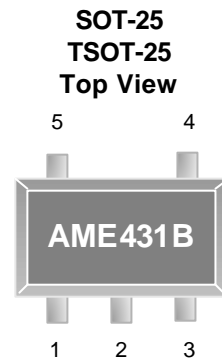
\* Die Attach:  
**Conductive Epoxy**



**AME431BAJFTXXXX**

1. REF
2. Anode
3. Cathode

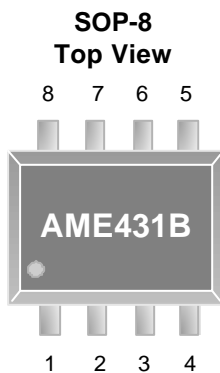
\* Die Attach:  
**Conductive Epoxy**



**AME431BAJEVXXXX**

1. NC
2. NC
3. Cathode
4. REF
5. Anode

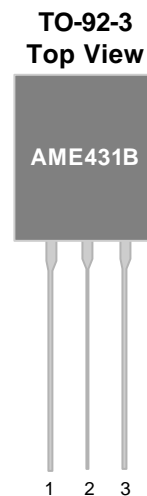
\* Die Attach:  
**Non-Conductive Epoxy**



**AME431BAJHAXXXX**

1. Cathode
2. Anode
3. Anode
4. NC
5. NC
6. Anode
7. Anode
8. REF

\* Die Attach:  
**Conductive Epoxy**



**AME431BAJATXXXX**

1. REF
2. Anode
3. Cathode

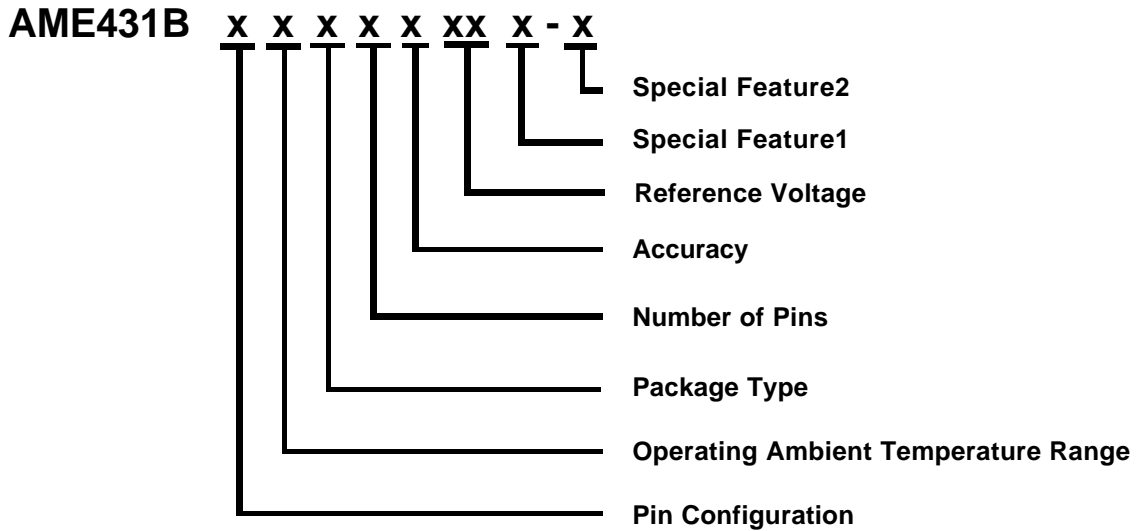
\* Die Attach:  
**Conductive Epoxy**



# Adjustable Precision Shunt Regulator

## AME431B-1.24V

### Ordering Information



Pin Configuration	Operating Ambient Temperature Range	Package Type	Number of Pins	Accuracy	Reference Voltage	Special Feature1	Special Feature2 (For TO-92 Package Only)
A 1. Cathode <small>(SOT-23)</small> 2. REF <small>(TSOT-23)</small> 3. Anode  B 1. REF <small>(SOT-23)</small> 2. Cathode <small>(TSOT-23)</small> 3. Anode  A 1. REF <small>(SOT-89)</small> 2. Anode 3. Cathode  A 1. REF <small>(TO-92-3)</small> 2. Anode 3. Cathode  A 1. Cathode <small>(SOP-8)</small> 2. Anode 3. Anode 4. NC 5. NC 6. Anode 7. Anode 8. REF  A 1. NC <small>(SOT-25)</small> 2. NC <small>(TSOT-25)</small> 3. Cathode 4. REF 5. Anode	J: -40°C to +125°C	A: TO-92 E: SOT-2X F: SOT-89 H: SOP	A: 8 T: 3 V: 5	A: 0.5% B: 1.0%	12: 1.24V	L: Low profile Y: Lead free & Low profile Z: Lead free	<b>Package Lead Pitch</b> N/A: Taping 5.08mm 1: Bulk 2.54mm



# AME431B-1.24V

## Adjustable Precision Shunt Regulator

### ■ Ordering Information (contd.)

Part Number	Marking*	Reference Voltage	Accuracy	Package	Operating Ambient Temperature Range
AME431BAJETA12	AZNww	1.24V	0.5%	SOT-23	- 40°C to +125°C
AME431BAJETA12L	AZNww	1.24V	0.5%	SOT-23	- 40°C to +125°C
AME431BAJETA12Y	AZNww	1.24V	0.5%	SOT-23	- 40°C to +125°C
AME431BAJETA12Z	AZNww	1.24V	0.5%	SOT-23	- 40°C to +125°C
AME431BAJETB12	AZOww	1.24V	1.0%	SOT-23	- 40°C to +125°C
AME431BAJETB12L	AZOww	1.24V	1.0%	SOT-23	- 40°C to +125°C
AME431BAJETB12Y	AZOww	1.24V	1.0%	SOT-23	- 40°C to +125°C
AME431BAJETB12Z	AZOww	1.24V	1.0%	SOT-23	- 40°C to +125°C
AME431BBJETA12	AZPww	1.24V	0.5%	SOT-23	- 40°C to +125°C
AME431BBJETA12L	AZPww	1.24V	0.5%	SOT-23	- 40°C to +125°C
AME431BBJETA12Y	AZPww	1.24V	0.5%	SOT-23	- 40°C to +125°C
AME431BBJETA12Z	AZPww	1.24V	0.5%	SOT-23	- 40°C to +125°C
AME431BBJETB12	AZQww	1.24V	1.0%	SOT-23	- 40°C to +125°C
AME431BBJETB12L	AZQww	1.24V	1.0%	SOT-23	- 40°C to +125°C
AME431BBJETB12Y	AZQww	1.24V	1.0%	SOT-23	- 40°C to +125°C
AME431BBJETB12Z	AZQww	1.24V	1.0%	SOT-23	- 40°C to +125°C
AME431BAJEVA12	BAWww	1.24V	0.5%	SOT-25	- 40°C to +125°C
AME431BAJEVA12L	BAWww	1.24V	0.5%	TSOT-25	- 40°C to +125°C
AME431BAJEVA12Z	BAWww	1.24V	0.5%	SOT-25	- 40°C to +125°C
AME431BAJEVA12Y	BAWww	1.24V	0.5%	TSOT-25	- 40°C to +125°C

Note: yyww & ww represents the date code and pls refer to Date Code Rule before Package Dimension.

\* A line on top of the first letter represents lead free plating such as  $\bar{A}$ ZN

Please consult AME sales office or authorized Rep./Distributor for output voltage and package type availability.

**AME431B-1.24V**
**■ Ordering Information**

Part Number	Marking*	Reference Voltage	Accuracy	Package	Operating Ambient Temperature Range
AME431BAJEVB12	BAVww	1.24V	1.0%	SOT-25	- 40°C to +125°C
AME431BAJEVB12L	BAVww	1.24V	1.0%	TSOT-25	- 40°C to +125°C
AME431BAJEVB12Z	BAVww	1.24V	1.0%	SOT-25	- 40°C to +125°C
AME431BAJEVB12Y	BAVww	1.24V	1.0%	TSOT-25	- 40°C to +125°C
AME431BAJFTA12Z	A431B BKYww	1.24V	0.5%	SOT-89	- 40°C to +125°C
AME431BAJATA12Z	AME12 431B AJATA yyww	1.24V	0.5%	TO92-3	- 40°C to +125°C
AME431BAJATA12Z-1	AME12 431B AJATA yyww	1.24V	0.5%	TO92-3	- 40°C to +125°C
AME431BAJATB12Z	AME12 431B AJATB yyww	1.24V	1.0%	TO92-3	- 40°C to +125°C
AME431BAJATB12Z-1	AME12 431B AJATB yyww	1.24V	1.0%	TO92-3	- 40°C to +125°C

**AME431B-1.24V**


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**■ Absolute Maximum Ratings**

Parameter	Maximum	Unit
Cathode Current	100	mA
Cathode Voltage	18	V

Caution: Stress above the listed absolute maximum rating may cause permanent damage to the device

**■ Recommended Operating Conditions**

Parameter	Rating		Unit
Supply Current	1 to 100		mA
Operation Voltage Range	1.24 to 16		V
Ambient Temperature Range	$T_A$	-40 to +125	°C
Junction Temperature Range	$T_J$	-40 to +125	°C
Storage Temperature Range	$T_{STG}$	-65 to +150	°C



**■ Thermal Information**

Parameter	Package	Die Attach	Symbol	Maximum	Unit
Thermal Resistance (Junction to Case)	SOT-23** TSOT-23	Conductive Epoxy	$\theta_{JC}$	81	$^{\circ}\text{C} / \text{W}$
	SOT-89*			40	
	TO-92-3**			80	
	SOP-8**			60	
	SOT-25** TSOT-25	Non-Conductive Epoxy		140	
Thermal Resistance (Junction to Ambient)	SOT-23 TSOT-23	Conductive Epoxy	$\theta_{JA}$	260	$^{\circ}\text{C} / \text{W}$
	SOT-89			180	
	TO-92-3			150	
	SOP-8			150	
	SOT-25 TSOT-25	Non-Conductive Epoxy		280	
Internal Power Dissipation	SOT-23 TSOT-23	Conductive Epoxy	$P_D$	400	mW
	SOT-89			550	
	TO-92-3			625	
	SOP-8			810	
	SOT-25 TSOT-25	Non-Conductive Epoxy		400	
Maximum Junction Temperature				150	$^{\circ}\text{C}$
Solder Iron (10 Sec)***				350	$^{\circ}\text{C}$

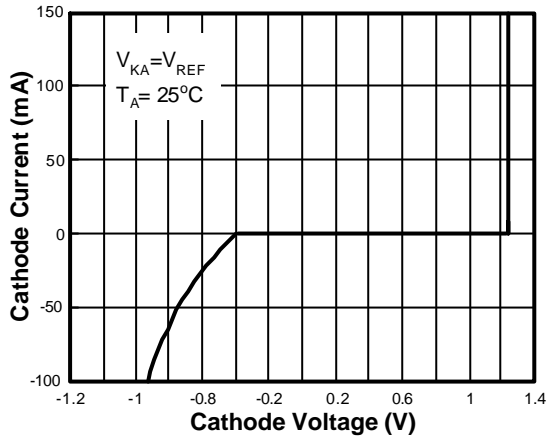
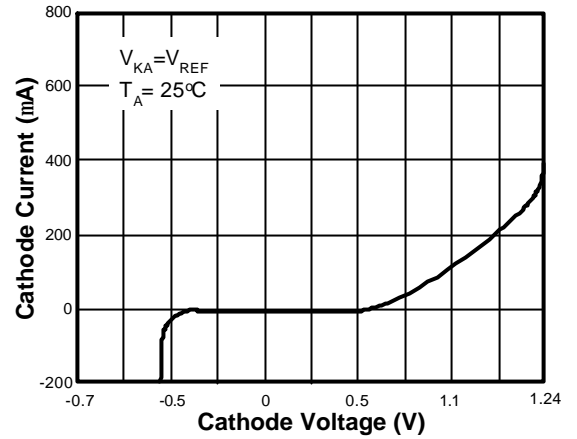
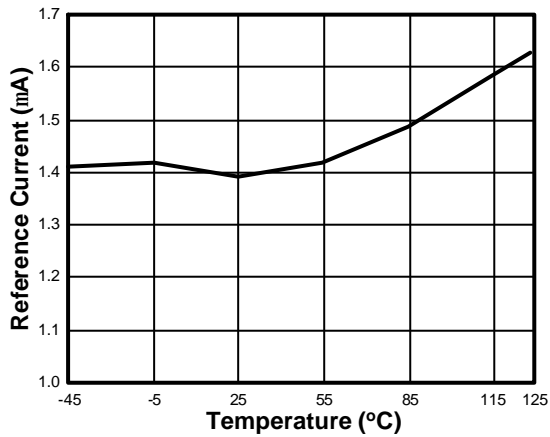
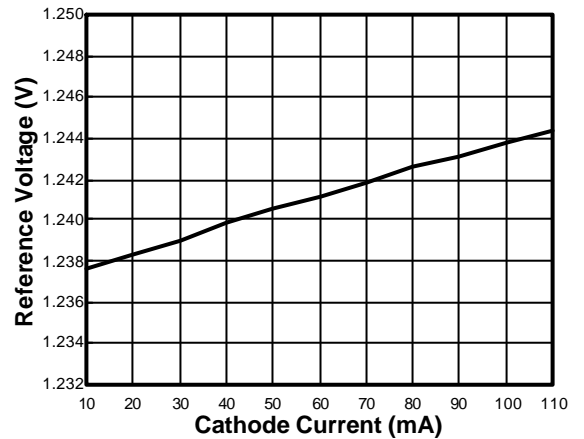
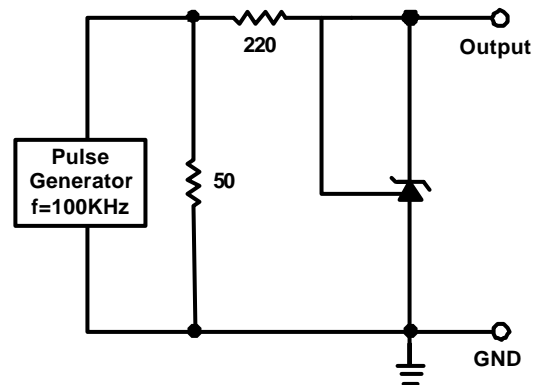
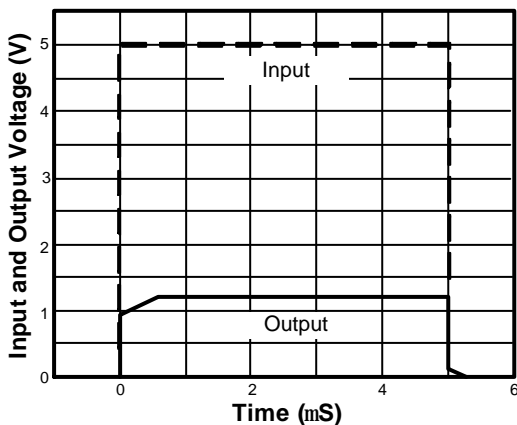
\* Measure  $\theta_{JC}$  on backside center of tab.

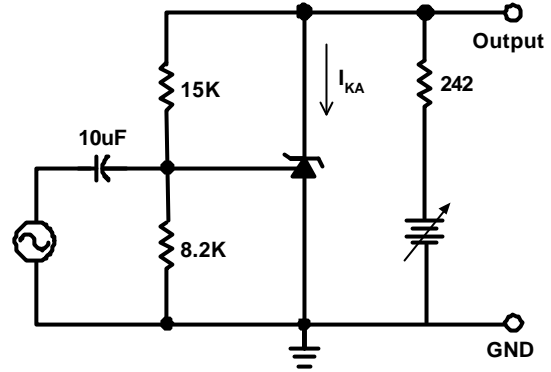
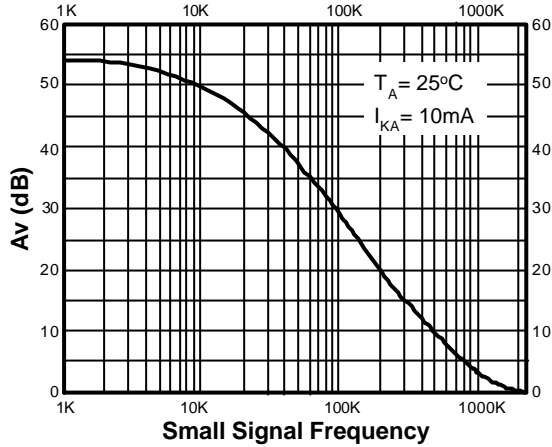
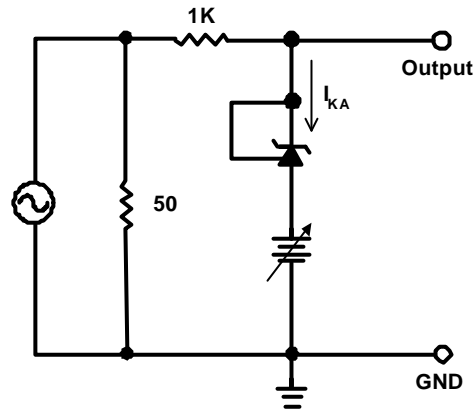
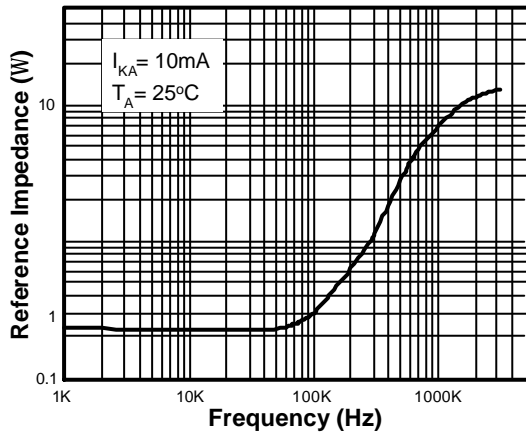
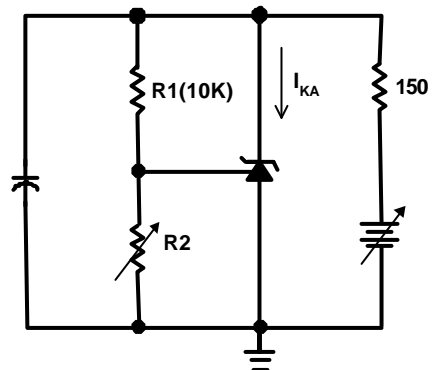
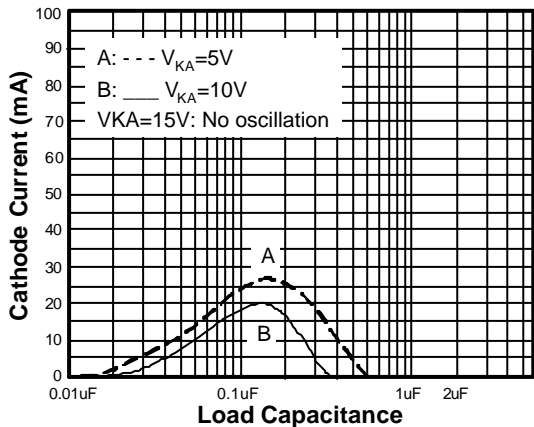
\*\* Measure  $\theta_{JC}$  on center of molding compound if IC has no tab.

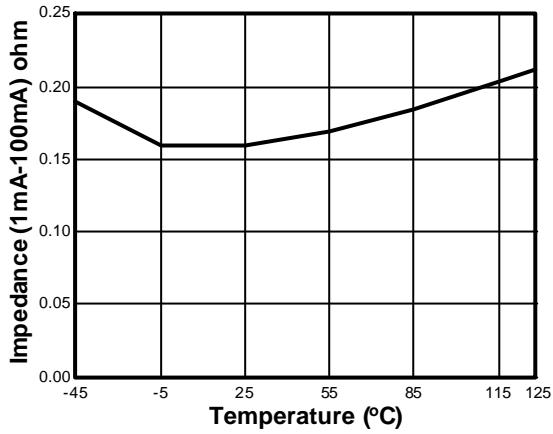
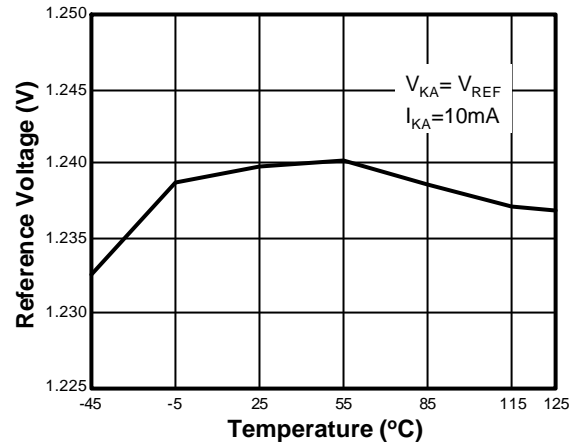
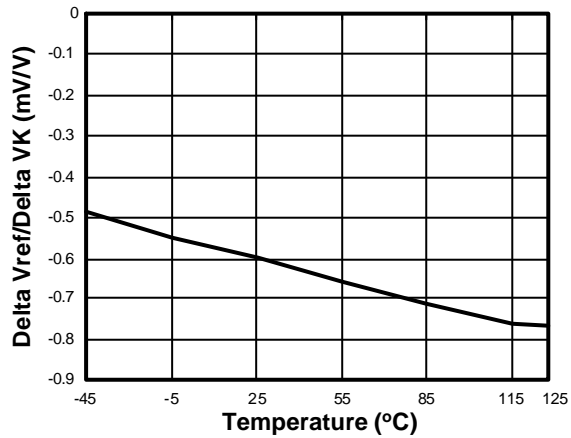
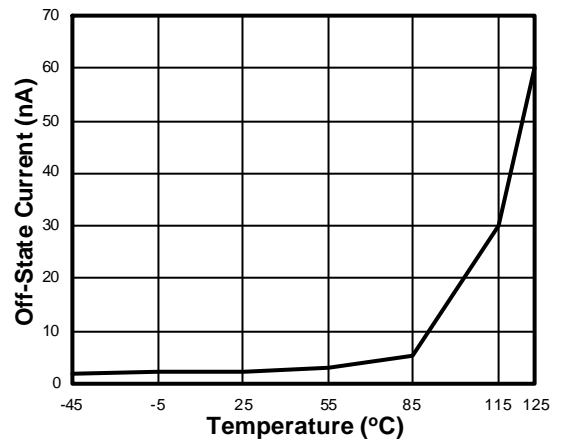
\*\*\* MIL-STD-202G210F

**AME431B-1.24V**
**■ Electrical Specifications**
 $T_A = 25^\circ\text{C}$ ,  $I_{REF}=10\text{mA}$  unless otherwise specified

Parameter	Test Circuit	Symbol	Test Condition	Min	Typ	Max	Units	
Reference Voltage	0.5%	1	$V_{KA} - V_{REF}$ , $I_{KA}=10\text{mA}$	1.234	1.240	1.246	V	
	1.0%			1.228	1.240	1.252		
Deviation of Reference Voltage Over Temperature	1	$\Delta V_{REF}$	$V_{KA} = V_{REF}$ $I_{KA}=10\text{mA}$	$0^\circ\text{C} \sim +70^\circ\text{C}$	-	2	10	mV
				$-40^\circ\text{C} \sim +85^\circ\text{C}$	-	3	10	
Ratio of Change in Reference Voltage to the Change in Cathode Voltage	2	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	$I_{KA}=10\text{mA}$	$\Delta V_{KA} =$ 5V to $V_{REF}$	-	-0.5	-1.5	mV/V
				$\Delta V_{KA} =$ 16V to 5V	-	-0.5	-1.5	
Reference Input Current	2	$I_{REF}$	$I_{KA}=10\text{mA}$ $R1=10\text{K}\Omega$ , $R2=\infty$	-	0.15	0.4	$\mu\text{A}$	
Deviation of Reference Current Over Full Temperature Range	2	$\Delta I_{REF}$	$R1=10\text{K}\Omega$ , $R2=\infty$ $I_{KA}=10\text{mA}$ $T_A = -40^\circ\text{C} \sim +85^\circ\text{C}$	-	0.1	0.4	$\mu\text{A}$	
Minimum Cathode Current for Regulation	1	$I_{KA}$ (MIN)	$V_{KA}=V_{REF}$	-	55	80	$\mu\text{A}$	
Off-State Cathode Current	3	$I_{KA}$ (OFF)	$V_{KA}=18\text{V}$ , $V_{REF}=0\text{V}$	-	0.04	0.1	$\mu\text{A}$	
Dynamic Impedance	1	$Z_{KA}$	$V_{KA} = V_{REF}$ , $I_{KA}=1$ to $100\text{mA}$ $F \leq 1\text{KHz}$	-	0.05	0.15	$\Omega$	

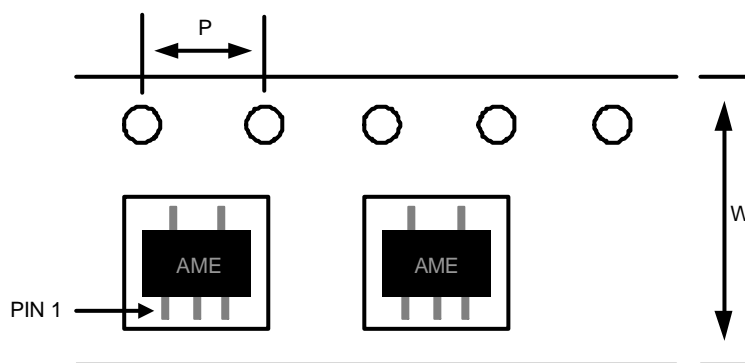
**Cathode Current vs. Cathode Voltage**

**Current vs. Cathode Voltage**

**Reference Current vs. Temperature**

**Reference Voltage vs. Cathode Current**

**Small Signal Voltage Gain vs. Frequency**


**Small Signal Voltage Gain vs. Frequency**

**Reference Impedance vs. Frequency**

**Stability Boundary Conditions vs. Load Capacitance**


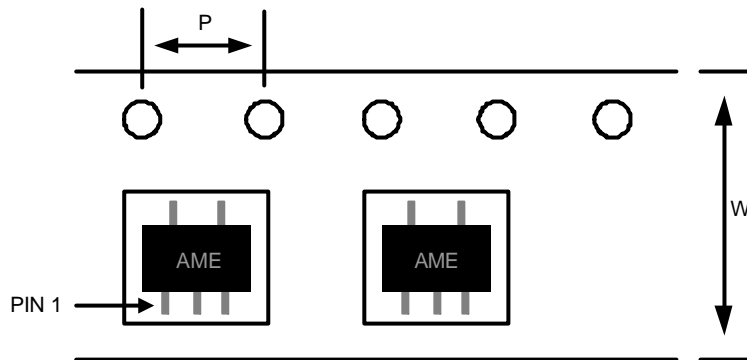
**Impedance vs. Temperature**

**Reference Voltage vs. Temperature**

**Delta Reference Voltage vs. Temperature**

**Off-State Current vs. Temperature**


**AME431B-1.24V**
**■ Date Code Rule**

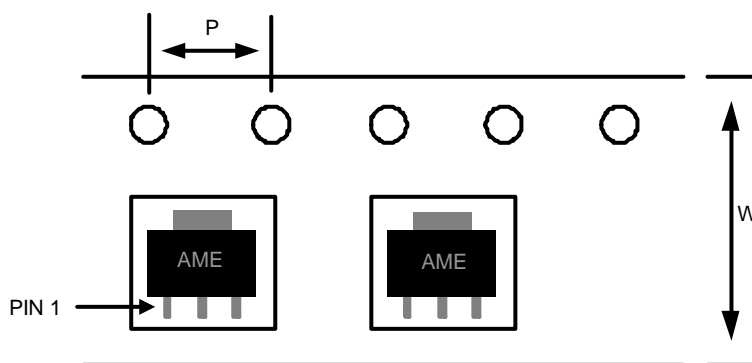
Marking			Date Code		Year
A	A	A	W	W	xxx0
A	A	A	W	<u>W</u>	xxx1
A	A	A	<u>W</u>	W	xxx2
A	A	A	<u>W</u>	<u>W</u>	xxx3
A	A	<u>A</u>	W	W	xxx4
A	A	<u>A</u>	W	<u>W</u>	xxx5
A	A	<u>A</u>	<u>W</u>	W	xxx6
A	A	<u>A</u>	<u>W</u>	<u>W</u>	xxx7
A	<u>A</u>	A	W	W	xxx8
A	<u>A</u>	A	W	<u>W</u>	xxx9

**■ Tape and Reel Dimension**
**SOT-25**

**Carrier Tape, Number of Components Per Reel and Reel Size**

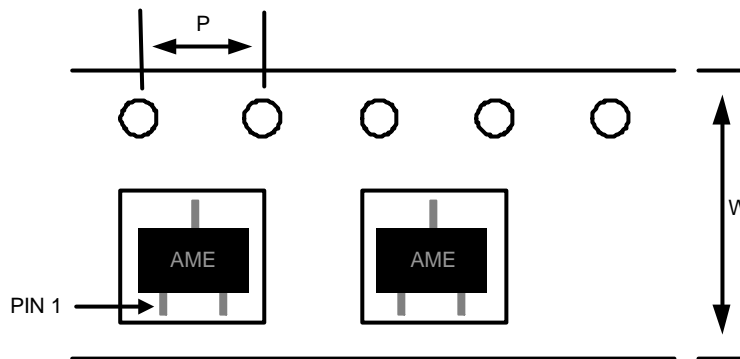
Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
SOT-25	8.0±0.1 mm	4.0±0.1 mm	3000pcs	180±1 mm

**AME431B-1.24V**
**■ Tape and Reel Dimension**
**TSOT-25**

**Carrier Tape, Number of Components Per Reel and Reel Size**

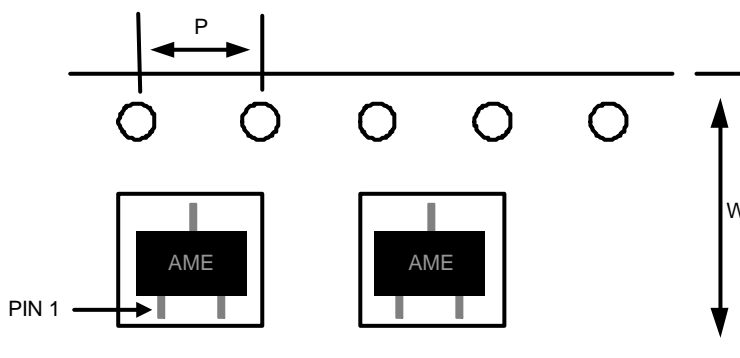
Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
TSOT-25	8.0±0.1 mm	4.0±0.1 mm	3000pcs	180±1 mm

**SOT-89**

**Carrier Tape, Number of Components Per Reel and Reel Size**

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
SOT-89	12.0±0.1 mm	4.0±0.1 mm	1000pcs	180±1 mm

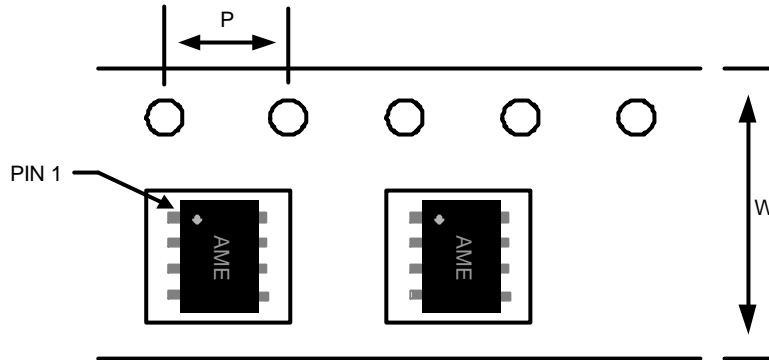
**AME431B-1.24V**
**■ Tape and Reel Dimension**
**SOT-23**

**Carrier Tape, Number of Components Per Reel and Reel Size**

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
SOT-23	8.0±0.1 mm	4.0±0.1 mm	3000pcs	180±1 mm

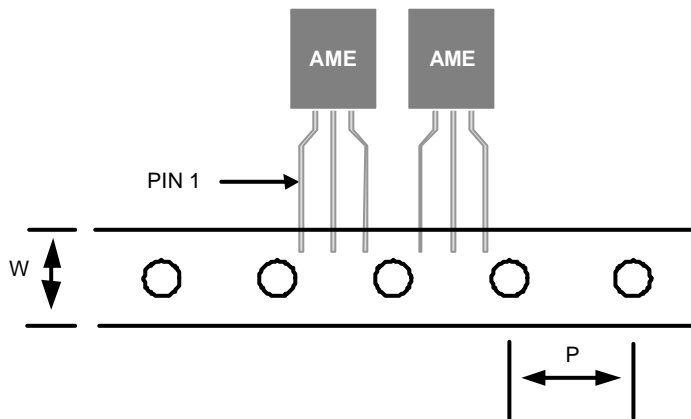
**TSOT-23**

**Carrier Tape, Number of Components Per Reel and Reel Size**

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
TSOT-23	8.0±0.1 mm	4.0±0.1 mm	3000pcs	180±1 mm



**AME431B-1.24V**
**■ Tape and Reel Dimension**
**SOP-8**

**Carrier Tape, Number of Components Per Reel and Reel Size**

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
SOP-8	12.0±0.1 mm	4.0±0.1 mm	2500pcs	330±1 mm

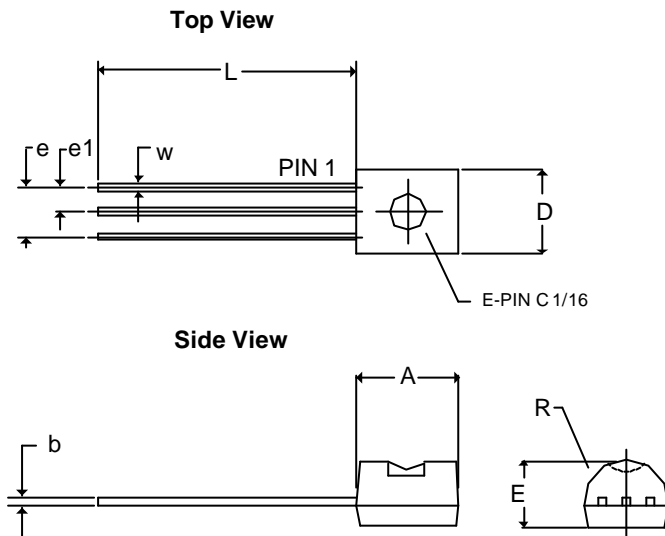
**TO-92-3**

**Carrier Tape, Number of Components Per Reel and Reel Size**

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
TO-92-3	18.0 <sup>+1.0</sup> <sub>-0.5</sub> mm	12.7±0.2 mm	2000pcs	N/A

## AME431B-1.24V

### ■ Package Dimension

#### TO-92-3 (bulk pack)

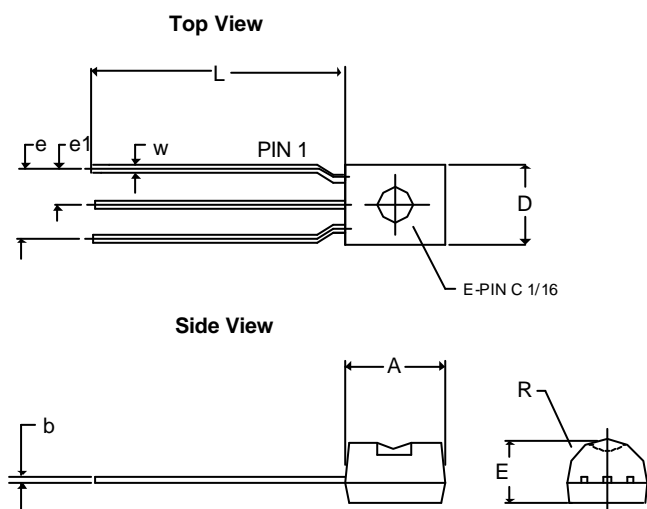


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
<b>A</b>	2.80	4.95	0.1102	0.1949
<b>b</b>	0.40REF		0.0157REF	
<b>E</b>	3.94REF		0.1551REF	
<b>e</b>	2.54REF		0.1000REF	
<b>e1</b>	1.27REF		0.0500REF	
<b>L</b>	12.70	15.49	0.5000	0.6098
<b>R</b>	2.29		0.0902	
<b>W</b>	0.35	0.76	0.0138	0.0299
<b>D</b>	3.80	4.95	0.1496	0.1949

Notes:

1. Package outline exclusive of any mold flashes dimension.
2. Package outline exclusive of burr dimension.
3. Lead pitch=2.54mm is bulk pack.
4. Lead pitch=5.08mm is tape pack.

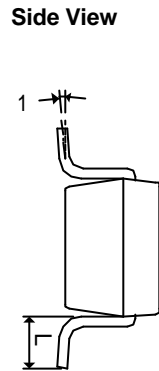
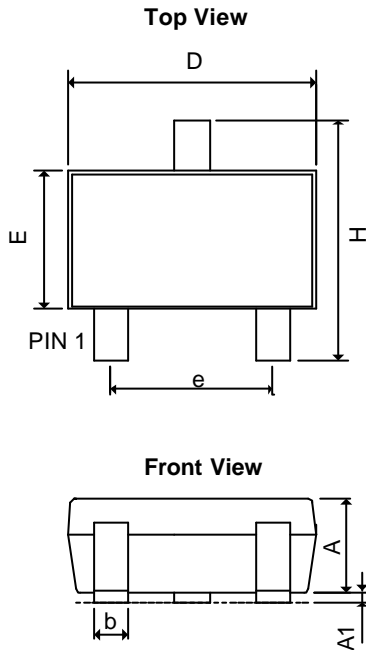
#### TO-92-3 (tape pack)



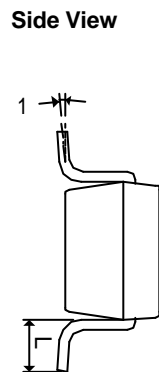
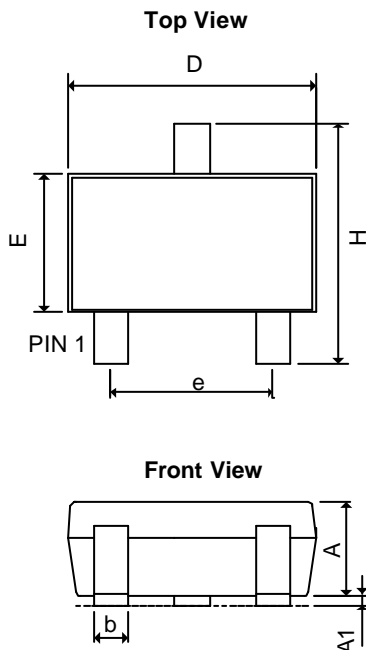
SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
<b>A</b>	2.80	4.95	0.1102	0.1949
<b>b</b>	0.40REF		0.0157REF	
<b>E</b>	2.40	3.94	0.0945	0.1551
<b>e</b>	5.08REF		0.2REF	
<b>e1</b>	2.54REF		0.1REF	
<b>L</b>	12.70	15.49	0.5000	0.6098
<b>R</b>	2.00		0.0787	
<b>W</b>	0.35	0.76	0.0138	0.0299
<b>D</b>	3.80	4.95	0.1496	0.1949

Notes:

1. Package outline exclusive of any mold flashes.
2. Package outline exclusive of burr dimension.
3. Lead pitch=2.54mm is bulk pack.
4. Lead pitch=5.08mm is tape pack.

**■ Package Dimension**
**SOT-23**


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
<b>A</b>	1.00	1.40	0.0394	0.0551
<b>A<sub>1</sub></b>	0.00	0.15	0.0000	0.0059
<b>b</b>	0.35	0.50	0.0138	0.0197
<b>D</b>	2.70	3.10	0.1063	0.1220
<b>E</b>	1.40	1.80	0.0551	0.0709
<b>e</b>	1.90 BSC		0.0748 BSC	
<b>H</b>	2.40	3.00	0.09449	0.11811
<b>L</b>	0.35BSC		0.0138BSC	
<b>q1</b>	0°	10°	0°	10°

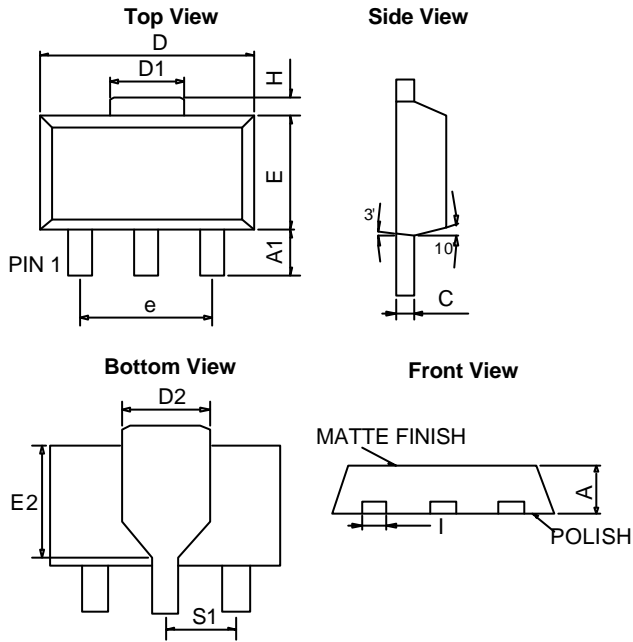
**TSOT-23**


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
<b>A+A<sub>1</sub></b>	0.80	1.30	0.0315	0.0512
<b>b</b>	0.35	0.50	0.0138	0.0197
<b>D</b>	2.70	3.10	0.1063	0.1220
<b>E</b>	1.20	1.80	0.0472	0.0709
<b>e</b>	1.90 BSC		0.0748 BSC	
<b>H</b>	2.40	3.00	0.09449	0.11811
<b>L</b>	0.35BSC		0.0138BSC	
<b>81</b>	0°	10°	0°	10°

## AME431B-1.24V

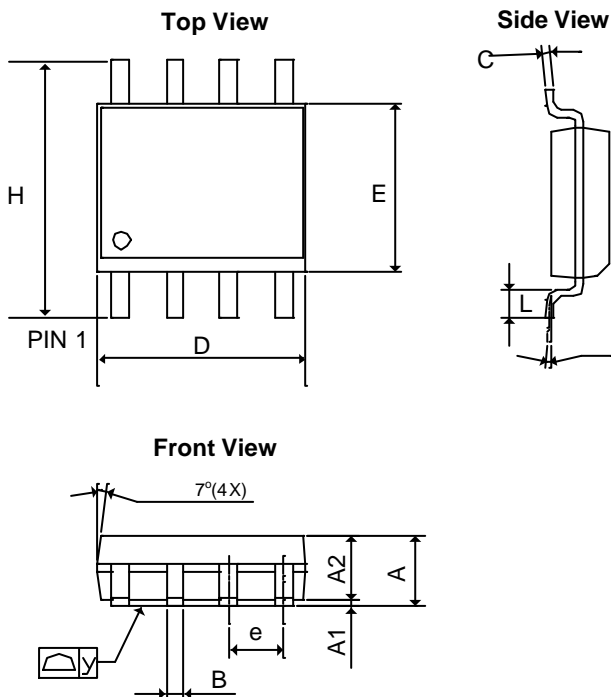
### ■ Package Dimension

#### SOT-89



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.39	1.60	0.05472	0.06299
A <sub>1</sub>	0.8 REF		0.03150 REF	
C	0.35	0.44	0.01378	0.01732
D	4.39	4.60	0.17283	0.18110
D <sub>1</sub>	1.35	1.83	0.05315	0.07205
E	2.28	2.60	0.08976	0.10236
I	0.36	0.56	0.01417	0.02204
e	3.00 REF		0.11811 REF	
H	0.70 REF		0.02756 REF	
S1	1.50 REF		0.05906 REF	
E2	2.05	2.60	0.08071	0.10236
D2	1.50	1.85	0.05905	0.07283

#### SOP-8

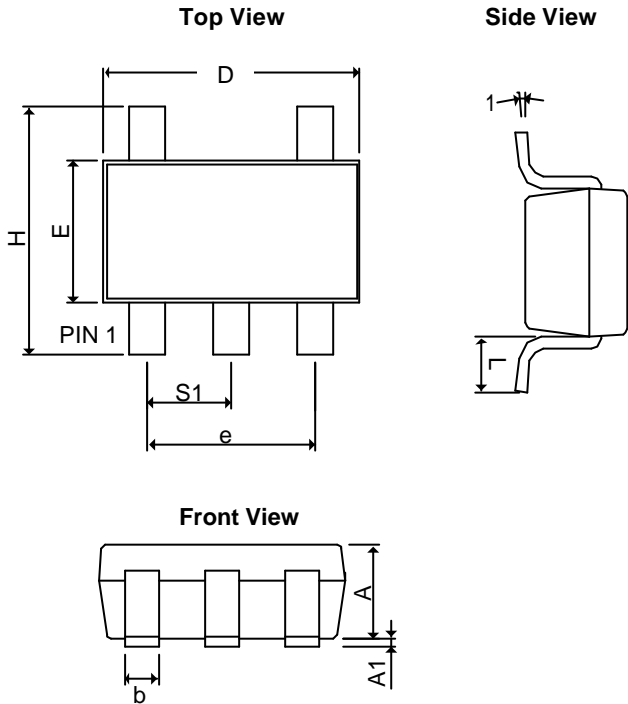


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.05315	0.0689
A <sub>1</sub>	0.10	0.30	0.00394	0.01181
A <sub>2</sub>	1.473 REF		0.05799 REF	
B	0.33	0.51	0.01299	0.02008
C	0.19	0.25	0.00748	0.00984
D	4.80	5.33	0.18898	0.20984
E	3.80	4.00	0.14961	0.15748
e	1.27 BSC		0.05000 BSC	
L	0.40	1.27	0.01575	0.05000
H	5.80	6.30	0.22835	0.24803
y	-	0.10	-	0.00394
q	0°	8°	0°	8°

## AME431B-1.24V

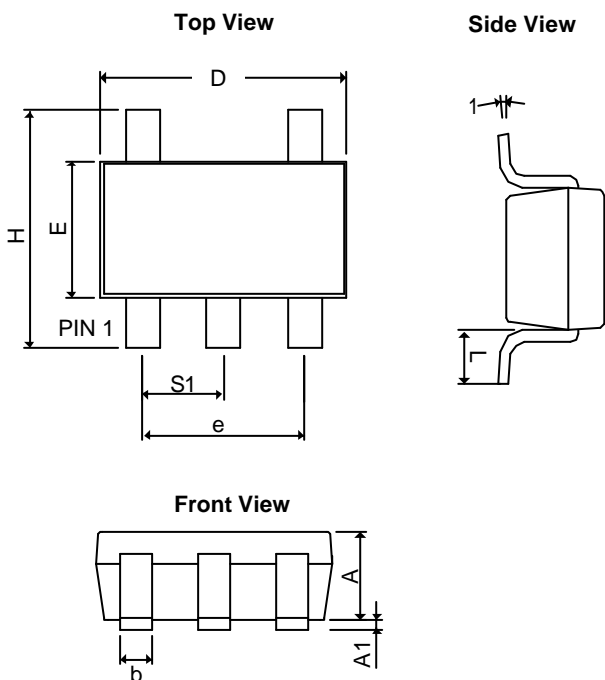
### ■ Package Dimension

#### SOT-25



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.20REF		0.0472REF	
A <sub>1</sub>	0.00	0.15	0.0000	0.0059
b	0.30	0.55	0.0118	0.0217
D	2.70	3.10	0.1063	0.1220
E	1.40	1.80	0.0551	0.0709
e	1.90 BSC		0.07480 BSC	
H	2.60	3.00	0.10236	0.11811
L	0.37BSC		0.0146BSC	
q1	0°	10°	0°	10°
S <sub>1</sub>	0.95BSC		0.0374BSC	

#### TSOT-25



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A+A <sub>1</sub>	0.90	1.25	0.0354	0.0492
b	0.30	0.50	0.0118	0.0197
D	2.70	3.10	0.1063	0.1220
E	1.40	1.80	0.0551	0.0709
e	1.90 BSC		0.07480 BSC	
H	2.40	3.00	0.09449	0.11811
L	0.35BSC		0.0138BSC	
q1	0°	10°	0°	10°
S <sub>1</sub>	0.95BSC		0.0374BSC	



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