

■ General Description

The AME8867 device is a low dropout linear regulator designed for up to 36V input voltage operations. With only 1.5 μ A(typical) quiescent current at light load, the device is suitable for standby micro-control unit systems, especially in continuous standby applications such as notebook, networking, industrial products and battery powered equipment.

The devices feature an integrated short-circuit and over current protection.

The AME8867 device is available in SOT-23, SOT-25, SOT-89, SOT-223 and SOP-8/PP packages.

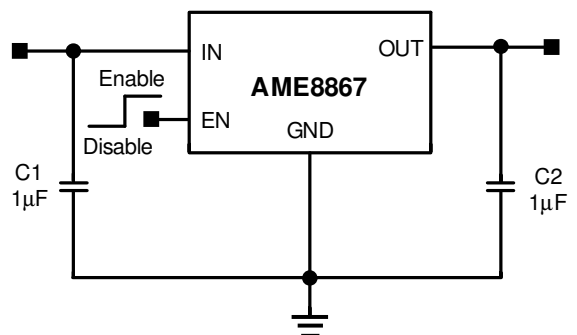
■ Features

- 4.75V to 36V Wide Input Voltage Range
- Output Voltage Tolerance: $\pm 2\%$
- Maximum Output Current: 250mA
- Ultra Low Quiescent Current: 1.5 μ A(typical)
- 1.2V Typical Low Dropout Voltage at 250mA Load Current
- Internal Over Temperature Protection
- Internal Over Current Protection
- Stable With Low ESR Ceramic Output Capacitor

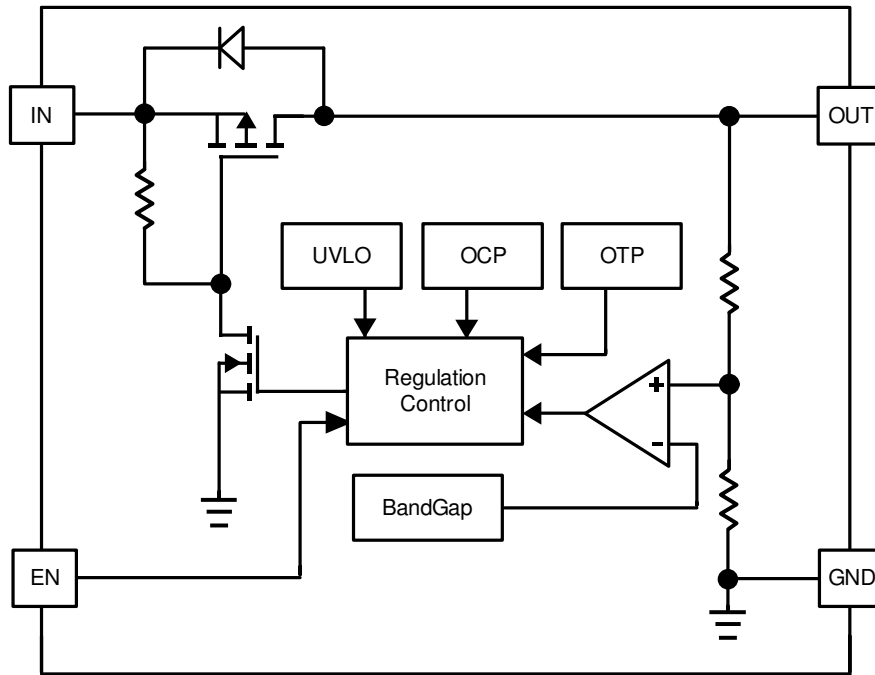
■ Applications

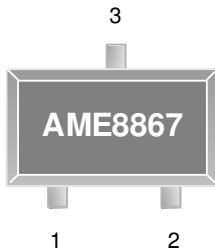
- Keep-Alive Supply in Notebook and Portable Computers
- Always-On Battery Application
- USB Power Supply
- Ultra Low Power Microcontrollers

■ Typical Application



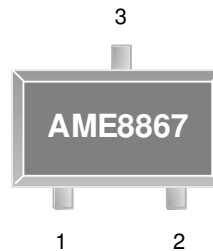
■ Functional Block Diagram



■ Pin Configuration (Contd.)
**SOT-23
Top View**

AME 8867-AETxxx

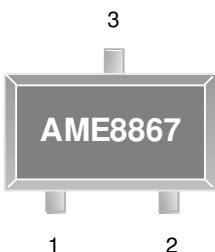
1. IN
2. OUT
3. GND

*** Die Attach:
Conductive Epoxy**

**SOT-23
Top View**

AME 8867-BETxxx

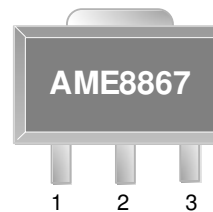
1. OUT
2. IN
3. GND

*** Die Attach:
Conductive Epoxy**

**SOT-23
Top View**

AME 8867-CETxxx

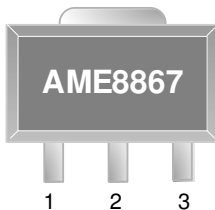
1. GND
2. OUT
3. IN

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

**SOT-89
Top View**

AME 8867-AFTxxx

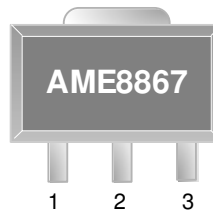
1. IN
2. GND (TAB)
3. OUT

*** Die Attach:
Conductive Epoxy**

**SOT-89
Top View**

AME 8867-BFTxxx

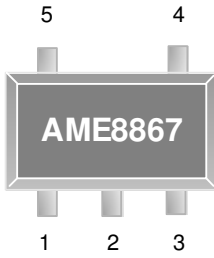
1. GND
2. IN (TAB)
3. OUT

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

**SOT-89
Top View**

AME 8867-CFTxxx

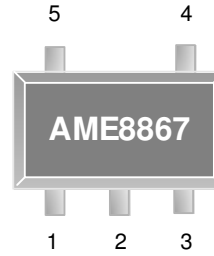
1. OUT
2. GND (TAB)
3. IN

*** Die Attach:
Conductive Epoxy**

■ Pin Configuration
**SOT-25
Top View**

AME 8867-AEVxxx

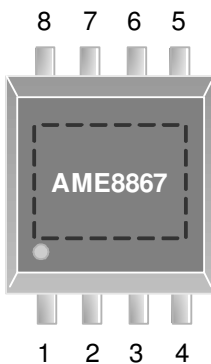
1. IN
2. GND
3. EN
4. NC
5. OUT

*** Die Attach:
Conductive Epoxy**

**SOT-25
Top View**

AME 8867-BEVxxx

1. GND
2. IN
3. OUT
4. NC
5. NC

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

**SOP-8/PP
Top View**

AME 8867-AZAxxx

1. OUT
2. GND
3. GND
4. NC
5. EN
6. GND
7. GND
8. IN

*** Die Attach:
Conductive Epoxy**

**SOT-223
Top View**

AME 8867-AGTxxx

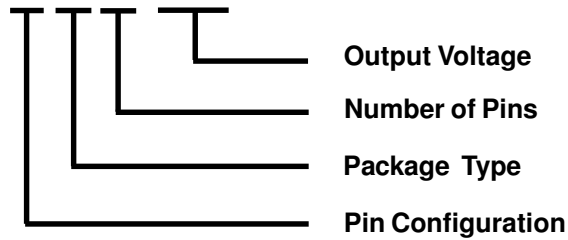
1. IN
2. GND (TAB)
3. OUT

*** Die Attach:
Conductive Epoxy**

Note:
Connect exposed pad (heat sink on the back) to GND.

■ Pin Description

Pin Name	Pin Description	Pin Number									
		SOT-23			SOT-89			SOT-223	SOT-25		SOP-8/PP
		A	B	C	A	B	C	A	A	B	A
IN	Input Voltage pin	1	2	3	1	2	3	1	1	2	8
GND	Ground.	3	3	1	2	1	2	2	2	1	2, 3, 6, 7
OUT	Output Voltage pin.	2	1	2	3	3	1	3	5	3	1
EN	Enable pin.	NA	NA	NA	NA	NA	NA	NA	3	NA	5
NC	No connection.	NA	NA	NA	NA	NA	NA	NA	4	4/5	4

AME8867
■ Ordering Information
AME8867 - x x x xxx


Pin Configuration	Package Type	Number of Pins	Output Voltage
A <small>(SOT-23)</small> 1. IN 2. OUT 3. GND	E: SOT-2X F: SOT-89 G: SOT-223 Z: SOP-8/PP	T: 3 V: 5 A: 8	330: 3.3V 440: 4.4V 500: 5.0V
B <small>(SOT-23)</small> 1. OUT 2. IN 3. GND			
C <small>(SOT-23)</small> 1. GND 2. OUT 3. IN			
A <small>(SOT-89)</small> <small>(SOT-223)</small> 1. IN 2. GND 3. OUT			
B <small>(SOT-89)</small> 1. GND 2. IN 3. OUT			
C <small>(SOT-89)</small> 1. OUT 2. GND 3. IN			
A <small>(SOT-25)</small> 1. IN 2. GND 3. EN 4. NC 5. OUT			
B <small>(SOT-25)</small> 1. GND 2. IN 3. OUT 4. NC 5. NC			
A <small>(SOP-8/PP)</small> 1. OUT 2. GND 3. GND 4. NC 5. EN 6. GND 7. GND 8. IN			

■ Absolute Maximum Ratings

Parameter	Maximum	Unit
Input Voltage	-0.3 to +45	V
Junction Temperature	125	°C
Storage Temperature	-65 to +150	
Lead Temperature (Soldering, 10sec.)	300	

Note: (1)Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to other conditions beyond those indicated under "recommended operation conditions" is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

(2)All volatge values are with respect to the GND terminal.

(3)Absolute negative voltage on these pins must not to go below -0.3V.

■ Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
Input Voltage	V_{IN}	4.75 to 36	V
Junction Temperature Range	T_J	-40 to +125	°C

Note: Refer to typical application circuit.

■ Thermal Information

Parameter	Package	Die Attach	Symbol	Maximum	Unit
Thermal Resistance* (Junction to Case)	SOT-23	Conductive Epoxy	θ_{JC}	81	°C / W
		Non-Conductive Epoxy		140	
	SOT-25	Conductive Epoxy		81	
		Non-Conductive Epoxy		140	
	SOT-89	Conductive Epoxy		40	
		Non-Conductive Epoxy		46	
	SOT-223	Conductive Epoxy		25	
	SOP-8/PP	Conductive Epoxy		19	
Thermal Resistance (Junction to Ambient)	SOT-23	Conductive Epoxy	θ_{JA}	260	°C / W
		Non-Conductive Epoxy		280	
	SOT-25	Conductive Epoxy		260	
		Non-Conductive Epoxy		260	
	SOT-89	Conductive Epoxy		180	
		Non-Conductive Epoxy		180	
	SOT-223	Conductive Epoxy		120	
	SOP-8/PP	Conductive Epoxy		84	
Internal Power Dissipation	SOT-23	Conductive Epoxy	P_D	400	mW
		Non-Conductive Epoxy		400	
	SOT-25	Conductive Epoxy		400	
		Non-Conductive Epoxy		400	
	SOT-89	Conductive Epoxy		550	
		Non-Conductive Epoxy		550	
	SOT-223	Conductive Epoxy		900	
	SOT-25	Conductive Epoxy		400	
SOP-8/PP	Conductive Epoxy	1450			
Lead Temperature (soldering 10 sec)**				300	°C

* Measure θ_{JC} on backside center of tab

** MIL-STD-202G 210F

AME8867
■ Electrical Specifications
 $V_{IN} = V_{OUT} + 2V$, $I_{OUT} = 1mA$, $C_{IN} = C_{OUT} = 1.0\mu F$, $T_J = 25^\circ C$, unless otherwise specified.

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Input Voltage	V_{IN}		4.75		36	V
DC Output Accuracy	V_{OUT}		-2%		2%	V
Line Regulation	ΔV_{LINE}	$V_{IN} = V_{OUT} + 1.5V$ to 36V		2	12	mV
Load Regulation	ΔV_{LOAD}	$I_{OUT} = 1mA$ to 100mA		0.5	1	%
		$I_{OUT} = 1mA$ to 250mA		1	2	
Dropout Voltage (Note1)	V_{DROP}	$I_{OUT} = 100mA$		400	720	mV
		$I_{OUT} = 250mA$		1200	2000	
Enable High Level	V_{ENHI}	IC is enabled	0.9		V_{IN} (Note2)	V
Enable Low Level	V_{ENLO}	IC is shutdown	0		0.4	V
Quiescent Current	I_Q			1.5	2.5	μA
Enable pin Pull High Current	I_{EN}			0.3	1	μA
Current Limit	I_{CL}		270	370		mA
Output Voltage PSRR	PSRR	$f = 100Hz$, $C_{OUT} = 1\mu F$, $I_{OUT} = 10mA$		60		dB
		$f = 1KHz$, $C_{OUT} = 1\mu F$, $I_{OUT} = 100mA$		60		
Over Temperature Shutdown	OTS			140		$^\circ C$
Over Temperature Hysteresis	OTH			20		$^\circ C$

Note:
(1) Dropout Voltage is measured at $V_{OUT} = V_{OUT(NOM)} \times 98\%$
(2) V_{EN} must be $\leq V_{IN}$

■ Detailed Description

The AME8867 family of CMOS regulator contain a PMOS pass transistor, voltage reference, error amplifier, over-current protection thermal shutdown and Power Good detection circuitry.

The P-channel pass transistor receives data from the error amplifier, over-current shutdown and thermal protection circuits. During normal operation, the error amplifier compares the output voltage to a precision reference.

Capacitor Selection and Regulator Stability

The AME8867 is stable with an output capacitor to ground of 1 μ F or greater. Ceramic capacitors have the lowest ESR and will offer the best AC performance. Conversely, Aluminum Electrolytic capacitor exhibit the highest ESR, resulting in the poorest AC response. Unfortunately, large value ceramic capacitors are comparatively expensive. One option is to parallel a 0.1 μ F ceramic capacitor with a 10 μ F Aluminum Electrolytic. The benefit is low ESR, high capacitance and low overall cost.

A second capacitor is recommended between the input and ground to stabilize V_{IN} . The input capacitor should be at least 0.1 μ F to have a beneficial effect.

Enable Pin

The Enable Pin is Active High. When activated pulled low, the MOS pass transistor shuts off and all internal circuits are powered down. In this state, the standby current is less than 1 μ A.

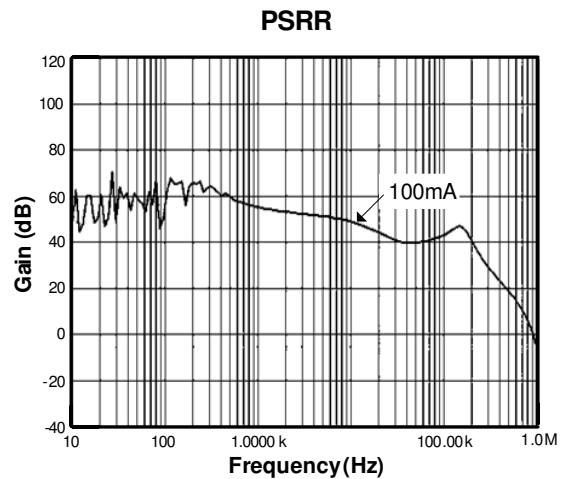
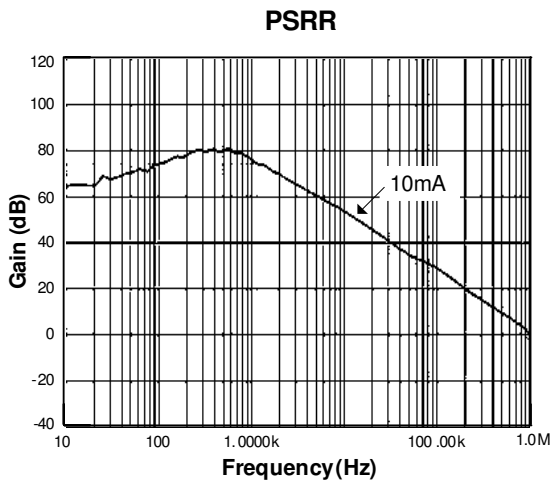
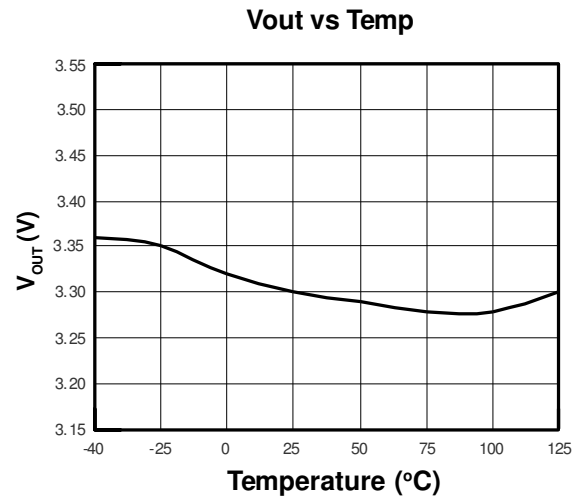
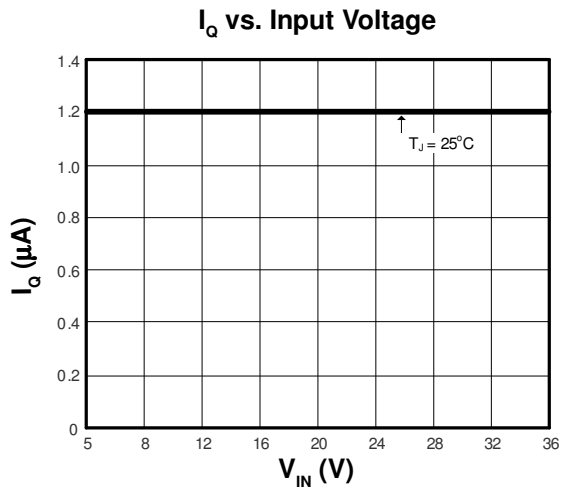
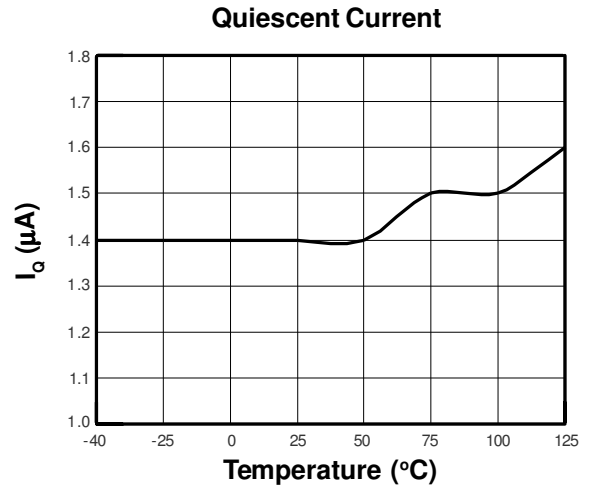
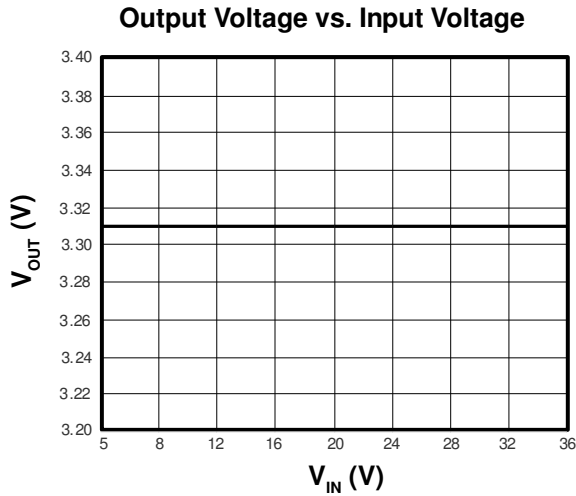
This pin can not be floating. V_{EN} must be $\leq V_{IN}$.

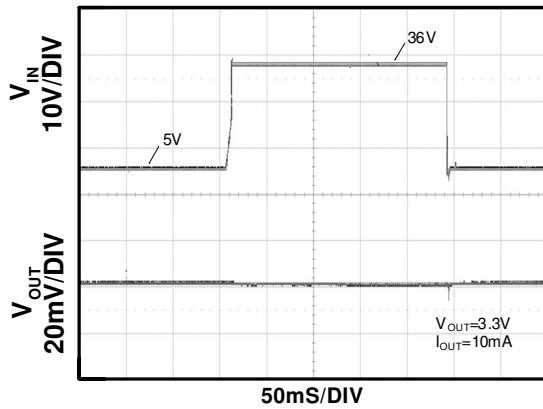
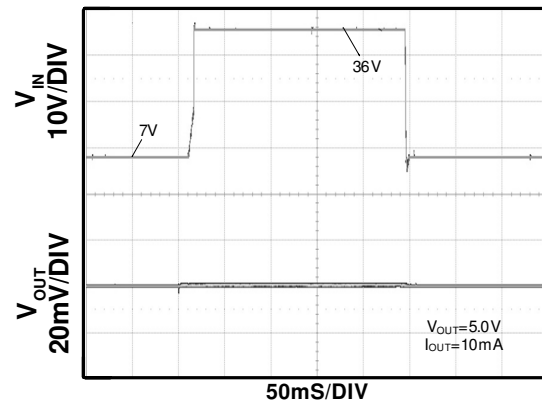
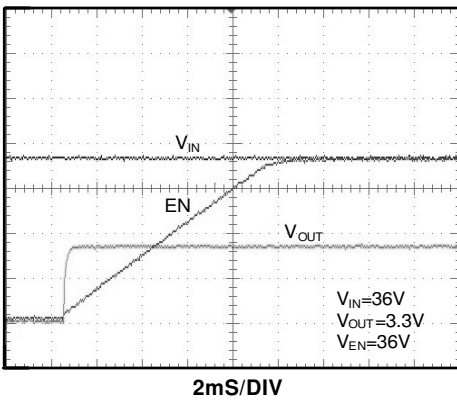
The maximum output power of the AME8867 is limited by the maximum power dissipation of the package. By calculation the power dissipation of the package as a function of the input voltage, output voltage and output current, the maximum input voltage can be obtained. The maximum power dissipation should not exceed the package's maximum power rating.

$$P_{MAX} = (V_{IN(MAX)} - V_{OUT}) \times I_{OUT}$$

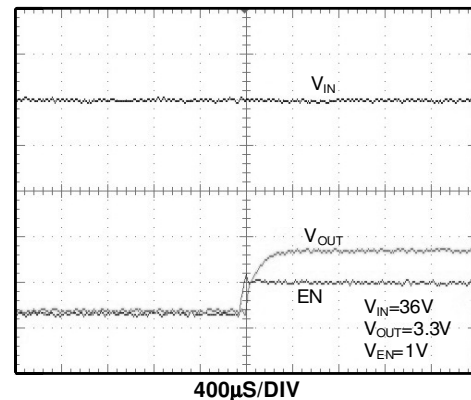
Where: $V_{IN(MAX)}$ = maximum input voltage

P_{MAX} = maximum power dissipation of the package

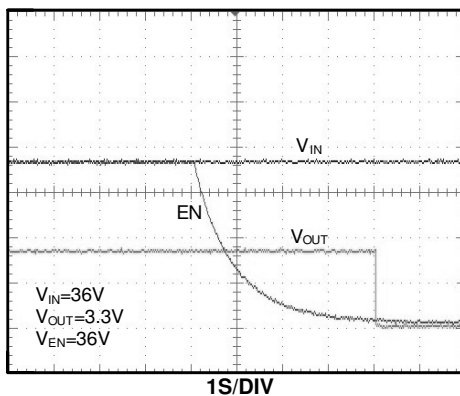
■ Characterization Curve


■ Characterization Curve
Line Transient Response

Line Transient Response

Chip Enable Transient Response


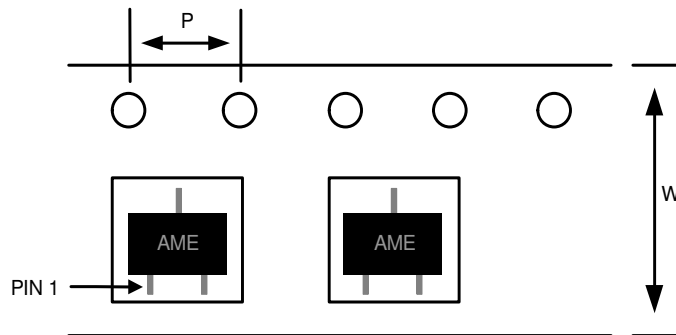
1. $V_{IN} = 10V/DIV$
2. $EN = 10V/DIV$
3. $V_{OUT} = 2V/DIV$

Chip Enable Transient Response


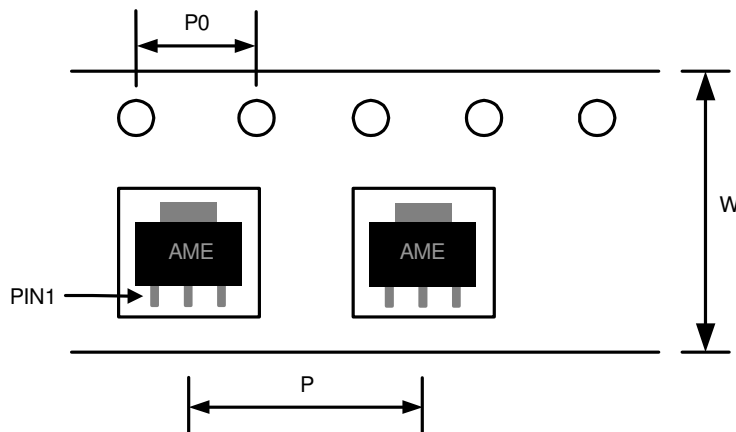
1. $V_{IN} = 5V/DIV$
2. $EN = 1V/DIV$
3. $V_{OUT} = 2V/DIV$

Chip Disable Transient Response


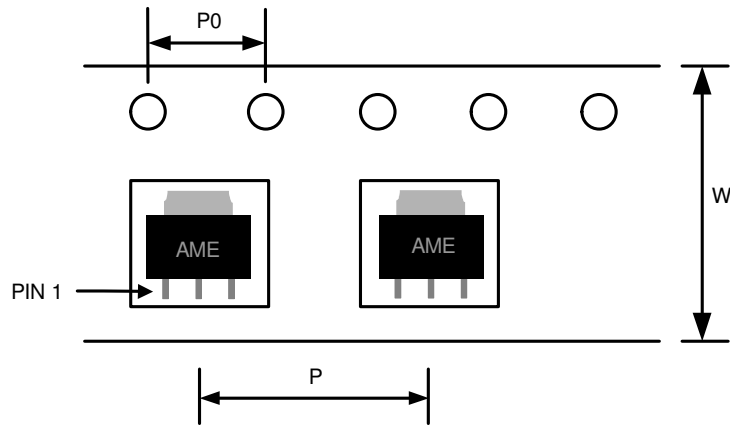
1. $V_{IN} = 10V/DIV$
2. $EN = 10V/DIV$
3. $V_{OUT} = 2V/DIV$

AME8867
■ Tape and Reel Dimension
SOT-23

Carrier Tape, Number of Components Per Reel and Reel Size

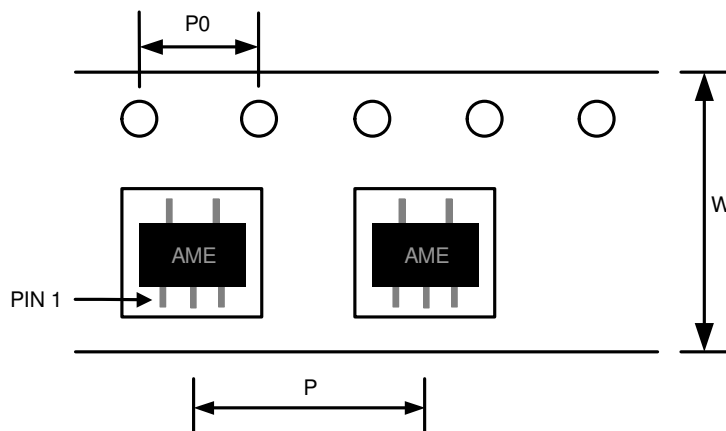
Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
SOT-23	8.0±0.1 mm	4.0±0.1 mm	3000pcs	180±1 mm

SOT-89

Carrier Tape, Number of Components Per Reel and Reel Size

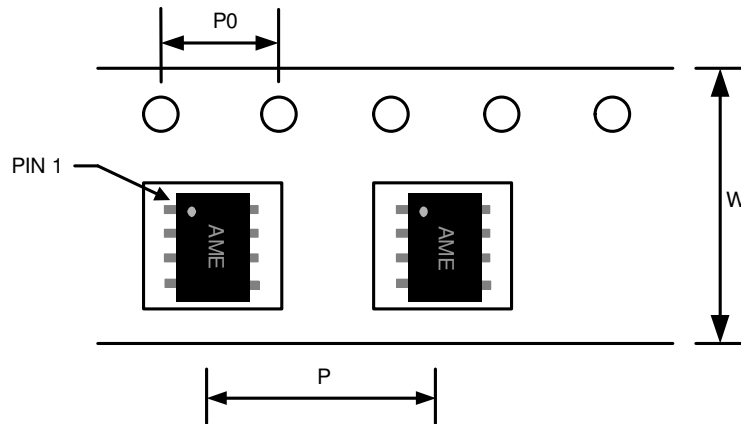
Package	Carrier Width (W)	Pitch (P)	Pitch (P0)	Part Per Full Reel	Reel Size
SOT-89	12.0±0.1 mm	8.0±0.1 mm	4.0±0.1 mm	1000pcs	180±1 mm

■ Tape and Reel Dimension
SOT-223

Carrier Tape, Number of Components Per Reel and Reel Size

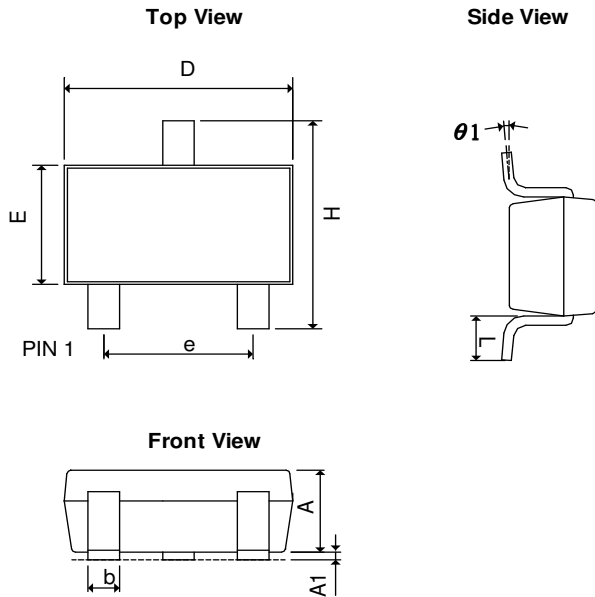
Package	Carrier Width (W)	Pitch (P)	Pitch (P0)	Part Per Full Reel	Reel Size
SOT-223	12.0±0.1 mm	8.0±0.1 mm	4.0±0.1 mm	2500pcs	330±1 mm

SOT-25

Carrier Tape, Number of Components Per Reel and Reel Size

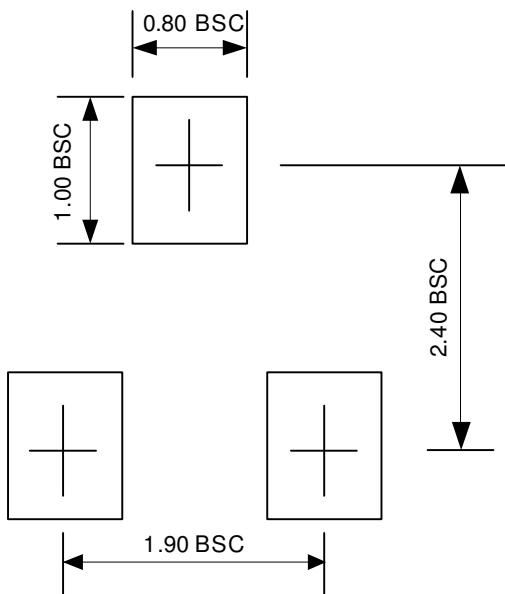
Package	Carrier Width (W)	Pitch (P)	Pitch (P0)	Part Per Full Reel	Reel Size
SOT-25	8.0±0.1 mm	4.0±0.1 mm	4.0±0.1 mm	3000pcs	180±1 mm

AME8867
■ Tape and Reel Dimension
SOP-8/PP

Carrier Tape, Number of Components Per Reel and Reel Size

Package	Carrier Width (W)	Pitch (P)	Pitch (P0)	Part Per Full Reel	Reel Size
SOP-8/PP	12.0±0.1 mm	8.0±0.1 mm	4.0±0.1 mm	2500pcs	330±1 mm

■ Package Dimension
SOT-23


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.40	0.0354	0.0551
A ₁	0.00	0.15	0.0000	0.0059
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		0.0748 BSC	
H	2.40	3.00	0.0945	0.1181
L	0.35BSC		0.0138 BSC	
$\theta 1$	0°	10°	0°	10°

■ Lead Pattern Drawing

Note:

1. Lead pattern unit description:

BSC: Basic. Represents theoretical exact dimension or dimension target.

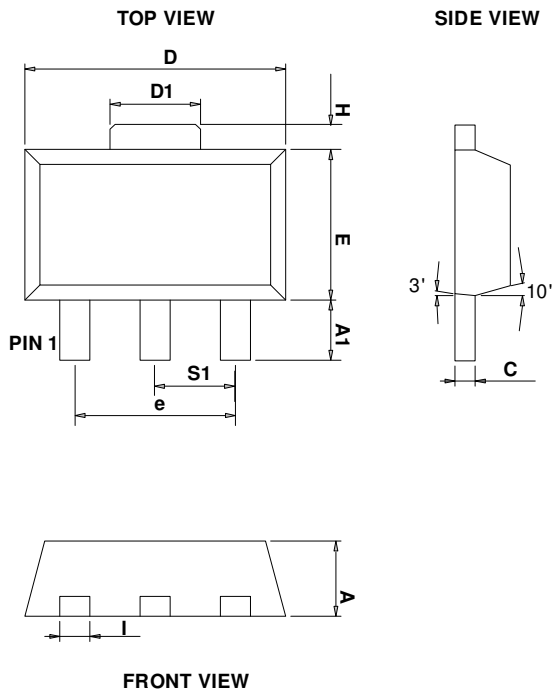
2. Dimensions in Millimeters.

3. General tolerance $\pm 0.05\text{mm}$ unless otherwise specified.

AME8867

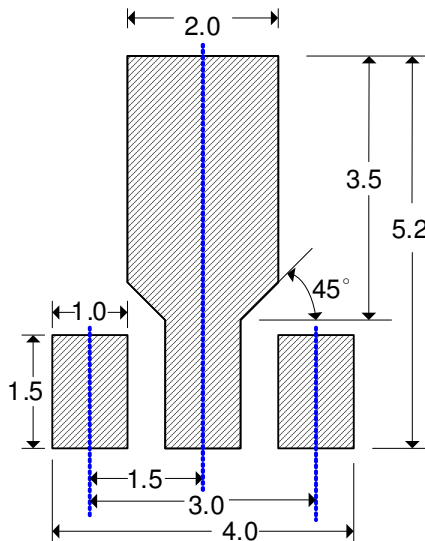
■ Package Dimension

SOT-89



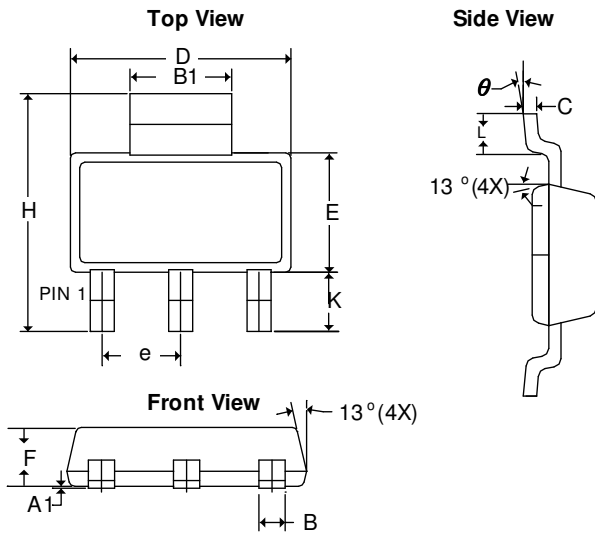
SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.39	1.60	0.0547	0.0630
A₁	0.8 REF		0.0315 REF	
C	0.35	0.44	0.0138	0.0173
D	4.39	4.60	0.1728	0.1811
D₁	1.35	1.85	0.0531	0.0728
E	2.28	2.60	0.0898	0.1024
l	0.32	0.56	0.0126	0.0220
e	3.00 REF		0.1181 REF	
H	0.70 REF		0.0276 REF	
S₁	1.50 REF		0.0591 REF	

■ Lead Pattern

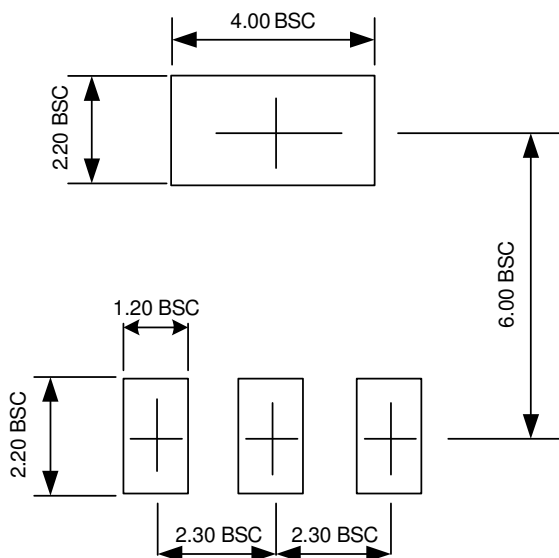


Note:

1. Dimensions in Millimeters.
2. General tolerance $\pm 0.05\text{mm}$ unless otherwise specified.

■ Package Dimension (Contd.)
SOT-223


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A ₁	0.01	0.10	0.0004	0.0039
B	0.60	0.84	0.0236	0.0330
B ₁	2.90	3.15	0.1140	0.1240
C	0.24	0.38	0.0094	0.0150
D	6.20	6.71	0.2441	0.2640
E	3.30	3.71	0.1299	0.1460
e	2.30 BSC		0.0906 BSC	
F	1.40	1.80	0.0551	0.0709
H	6.70	7.30	0.2638	0.2874
θ	0°	10°	0°	10°

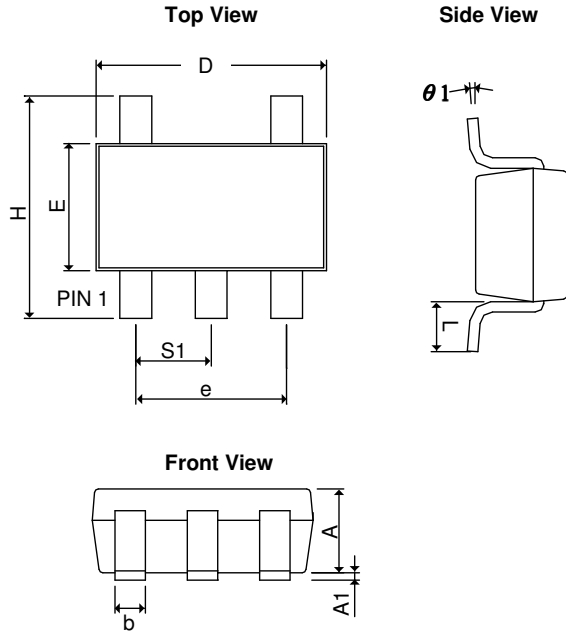
■ Lead Pattern

Note:

1. Lead pattern unit description:

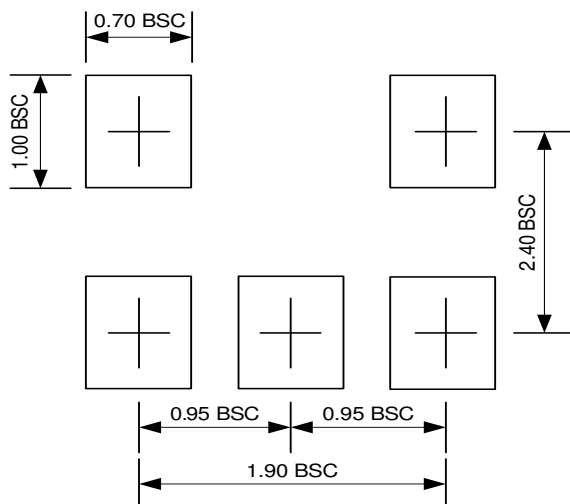
BSC: Basic. Represents theoretical exact dimension or dimension target.

2. Dimensions in Millimeters.

3. General tolerance $\pm 0.05\text{mm}$ unless otherwise specified.

AME8867
■ Package Dimension (Contd.)
SOT-25


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.30	0.0354	0.0512
A₁	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		0.0748 BSC	
H	2.60	3.00	0.1024	0.1181
L	0.37 BSC		0.0146 BSC	
θ_1	0°	10°	0°	10°
S₁	0.95 BSC		0.0374 BSC	

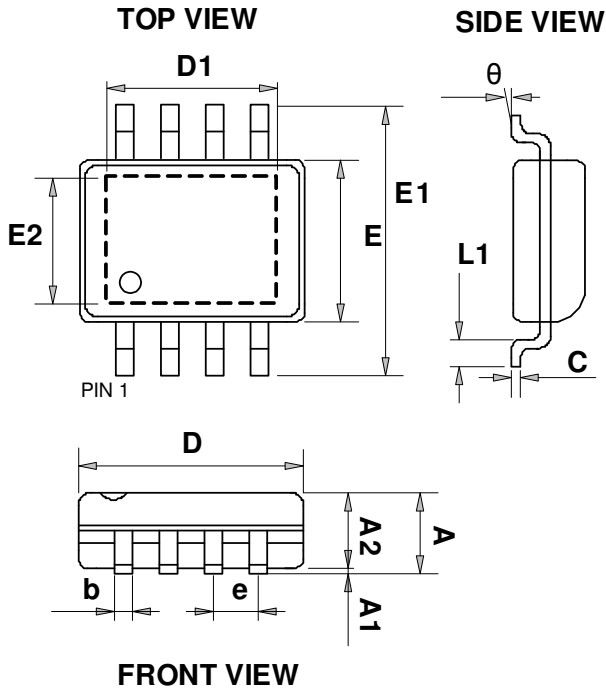
■ Lead Pattern

Note:

1. Lead pattern unit description:

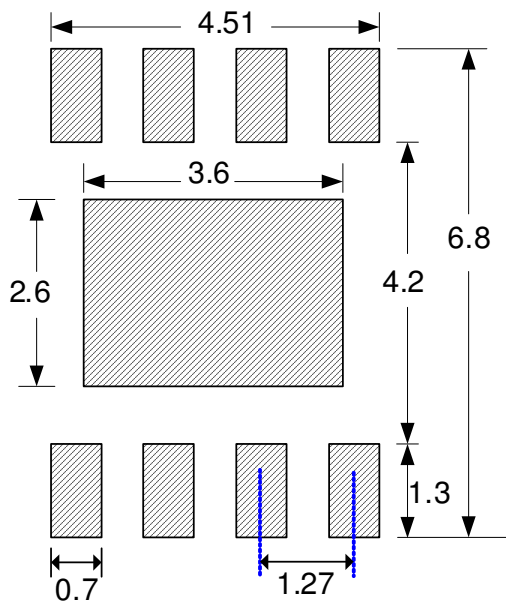
BSC: Basic. Represents theoretical exact dimension or dimension target.

2. Dimensions in Millimeters.

3. General tolerance $\pm 0.05\text{mm}$ unless otherwise specified.

■ Package Dimension
SOP-8/PP


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.000	0.150	0.000	0.006
A2	1.350	1.600	0.053	0.063
C	0.100	0.250	0.004	0.010
E	3.750	4.150	0.148	0.163
E1	5.700	6.300	0.224	0.248
L1	0.300	1.270	0.012	0.050
b	0.310	0.510	0.012	0.020
D	4.720	5.120	0.186	0.202
e	1.270 BSC		0.050 BSC	
θ	0°	8°	0°	8°
E2	2.150	2.513	0.085	0.099
D1	2.150	3.402	0.085	0.134

■ Lead Pattern


Note:

1. Dimensions in Millimeters.
2. General tolerance $\pm 0.05\text{mm}$ unless otherwise specified.



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