

■ General Description

The AME8907 is an ultra-small linear regulator(LDO) featuring ultra-low quiescent current and low dropout that is able to source 350mA with excellent transient performance.

The AME8907's ultra-low I_Q (1.3 μ A) is designed specifically for the applications requiring extreme low quiescent current. This LDO could increase battery life through maintaining low I_Q consumption even in dropout mode.

The feature of 1.3 μ A low quiescent current and 0.1 μ A shutdown current are ideal for the battery application with long service life. The other features include current limit function, over temperature protection and output discharge function.

Package available in SOT-25, DFN-4A(1x1x0.4mm) and DFN-6D (2x2x0.75mm).

■ Features

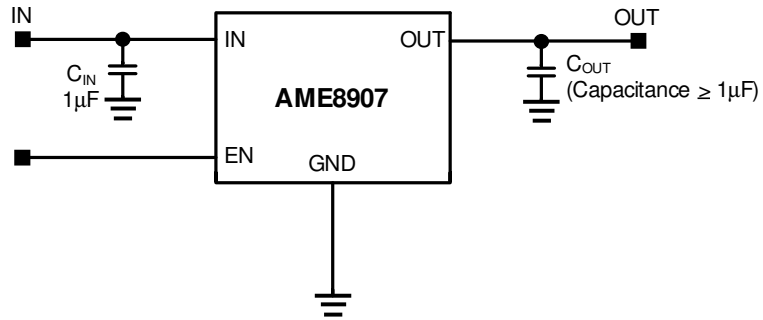
- Input Voltage Range: 1.2V to 5.5V
- Output Voltage Range:
 - Fixed Version_ from 0.8V to 4.5V
 - ADJ Version_ from 0.8V to 5.0V
- Output Voltage Tolerance: $\pm 1\%$
- Dropout Voltage: 150mV(typ) @350mA, $V_{OUT}=2.5V$
- Low Quiescent Current: 1.3 μ A
- High PSRR: 80dB @1kHz
- Output Noise: 25 μ Vrms
- Over Temperature Protection
- Over Current Protection
- Output Active Discharge Function

■ Applications

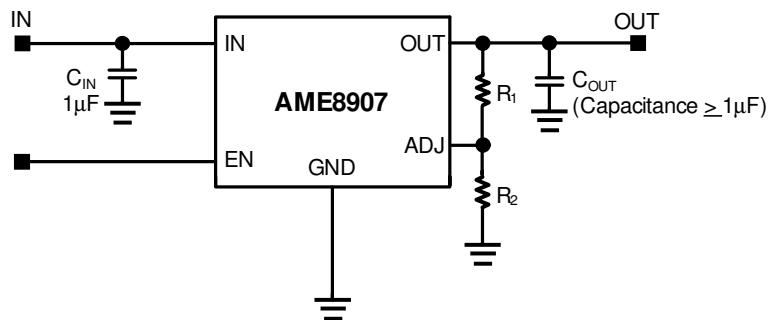
- Portable Device, Tablet and Smartphone
- Camera, VCR and Car Dashboard Camera
- Cam Application Required Low Noise and Illuminance
- Communications and Infrastructure
- AR and VR Application
- FA Equipment, Smart Meter

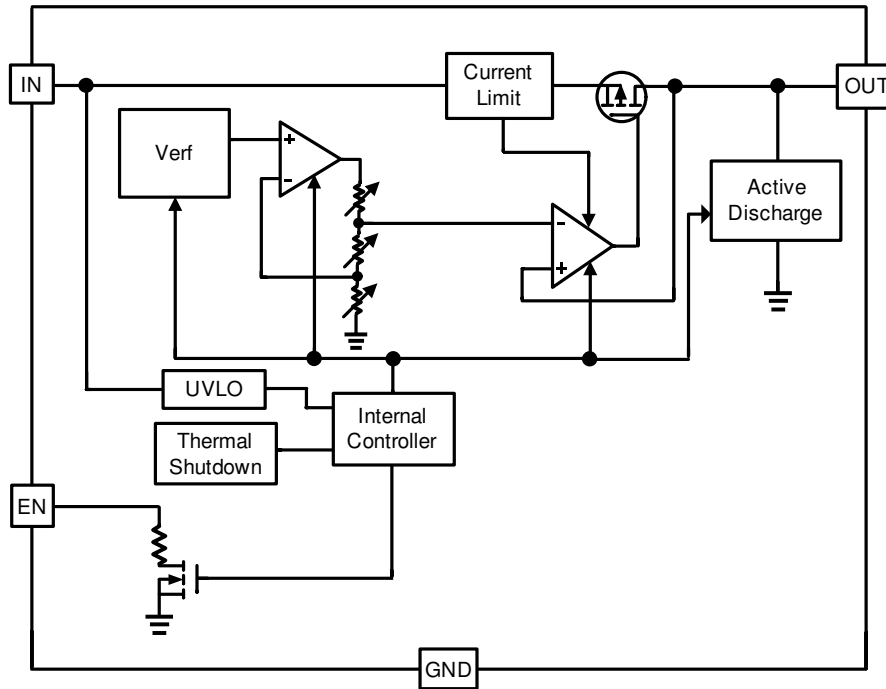
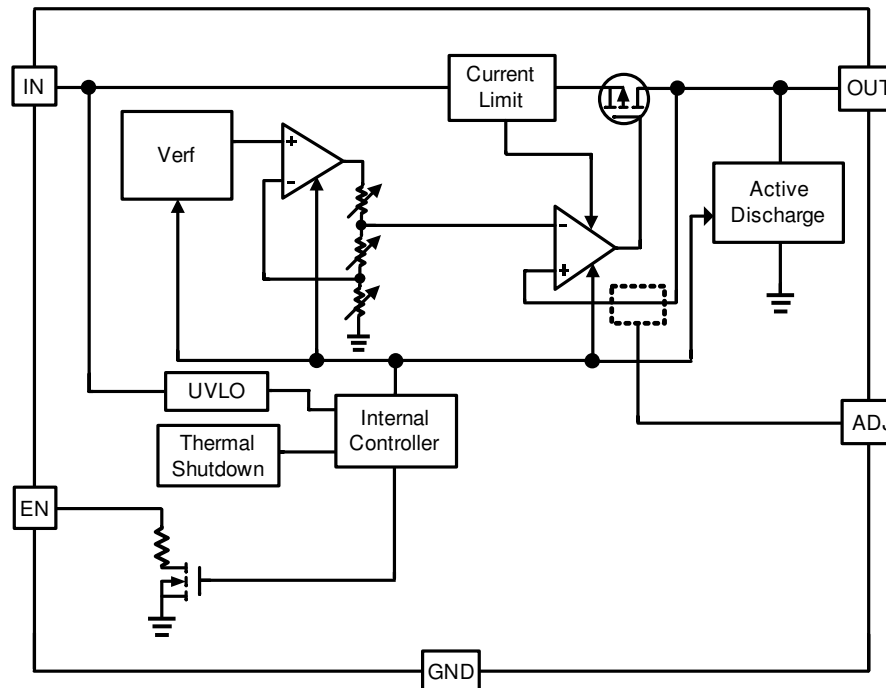
■ Typical Applications

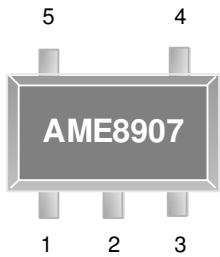
A. Fixed Mode



B. ADJ Mode

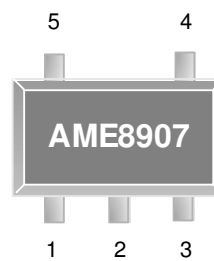


■ Functional Block Diagram
Fixed Version

ADJ Version


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

AME8907-AEVxxx

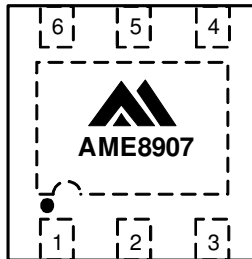
1. IN
2. GND
3. EN
4. NC
5. OUT

*** Die Attach:
Conductive Epoxy**

**SOT-25
Top View**

AME8907-DEVADJ

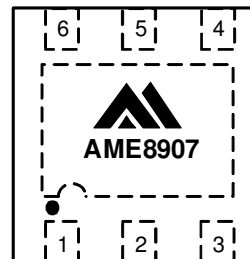
1. IN
2. GND
3. EN
4. ADJ
5. OUT

*** Die Attach:
Conductive Epoxy**

**DFN-6D
(2x2x0.75mm)
Top View**

AME8907-AVYxxx

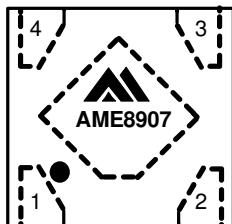
1. OUT
2. NC
3. GND
4. EN
5. NC
6. IN

*** Die Attach:
Conductive Epoxy**

**DFN-6D
(2x2x0.75mm)
Top View**

AME8907-BVYADJ

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

*** Die Attach:
Conductive Epoxy**

**DFN-4A
(1x1x0.4mm)
Top View**

AME8907-AVUxxx

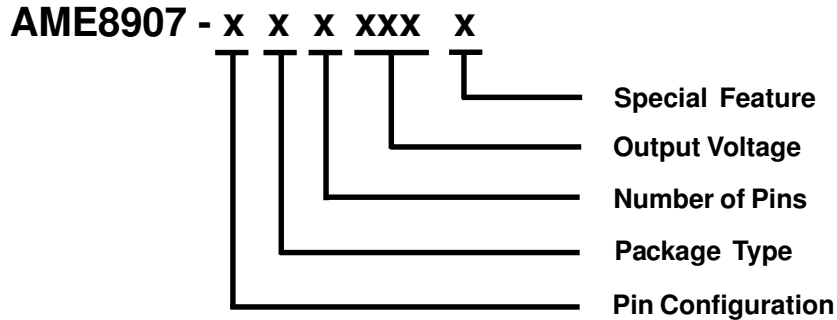
1. OUT
2. GND
3. EN
4. IN

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

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

■ Pin Description

Pin Name	Pin Description	Pin Number				
		SOT-25		DFN-4A	DFN-6D	
		A	D	A	A	B
IN	Input Voltage pin.	1	1	4	6	6
GND	Ground.	2	2	2	3	3
OUT	Output Voltage pin.	5	5	1	1	1
EN	Enable pin.	3	3	3	4	4
ADJ	ADJ pin.	NA	4	NA	NA	2
NC	No connection.	4	NA	NA	2, 5	5

■ Ordering Information


Pin Configuration	Package Type	Number of Pins	Output Voltage	Special Feature
A (SOT-25) 1. IN 2. GND 3. EN 4. NC 5. OUT	E: SOT-2X V: DFN	U: 4 V: 5 Y: 6	100 : 1.0V 120 : 1.2V 150 : 1.5V 180 : 1.8V 250 : 2.5V 280 : 2.8V 300 : 3.0V 330 : 3.3V ADJ : ADJ	Blank: Tape & Reel(3K/Reel) R: Tape & Reel(10K/Reel)
A (DFN-4A) 1. OUT 2. GND 3. EN 4. IN				
A (DFN-6D) 1. OUT 2. NC 3. GND 4. EN 5. NC 6. IN				
B (DFN-6D) 1. OUT 2. ADJ 3. GND 4. EN 5. NC 6. IN				

■ Absolute Maximum Ratings

Parameter		Maximum	Unit
Input Voltage		- 0.3 to 6	V
Enable Voltage		- 0.3 to 6	V
Output Voltage		- 0.3 to 6	V
ESD Classification	HBM	± 4	kV
	MM	± 200	V
	CDM	± 1000	V

■ Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
Input Voltage	V_{IN}	1.2 to 5.5	V
Output Voltage Range	V_{OUT}	0.8 to 5.0	V
Ambient Temperature Range	T_A	-40 to +85	°C
Junction Temperature Range	T_J	-40 to +125	
Storage Temperatures Range	T_{STG}	-65 to +150	

■ Thermal Information

Parameter	Package	Die Attach	Symbol	Maximum	Unit
Thermal Resistance* (Junction to Case)	SOT-25	Conductive Epoxy	θ_{JC}	81	°C / W
	DFN-4A	Non-Conductive Epoxy		140	
	DFN-6D	Conductive Epoxy		16	
Thermal Resistance (Junction to Ambient)	SOT-25	Conductive Epoxy	θ_{JA}	260	°C / W
	DFN-4A	Non-Conductive Epoxy		190	
	DFN-6D	Conductive Epoxy		66	
Internal Power Dissipation	SOT-25	Conductive Epoxy	P_D	400	mW
	DFN-4A	Non-Conductive Epoxy		525	
	DFN-6D	Conductive Epoxy		1515	
Lead Temperature (soldering 10 sec)**				300	°C

* Measure θ_{JC} on top of package.

** MIL-STD-202G210F

■ Electrical Specifications
 $V_{IN} = V_{OUT} + 1V$, $T_A = 25^\circ C$ unless otherwise noted

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Output Voltage Range	V_{OUT}		0.8		5	V
Output Voltage Accuracy	$V_{OUT,ACC}$	$I_{LOAD} = 1mA$	-1%		1%	V
Reference Voltage	V_{REF}	$I_{LOAD} = 1mA$	0.792	0.8	0.808	V
Line Regulation	REG_{LINE}	$V_{OUT} + 0.5V \leq V_{IN} \leq 5.5V$ $I_{OUT} = 1mA$		0.02	0.5	%
Load Regulation	REG_{LOAD}	$1mA < I_{LOAD} < 350mA$		20	50	mV
Dropout Voltage ($I_{LOAD} = 350mA$)	V_{DROP}	$V_{out} < 1.2V$		0.49	0.75	V
		$1.2V \leq V_{out} < 1.8V$		0.28	0.45	
		$1.8V \leq V_{out} < 2.5V$		0.18	0.3	
		$2.5V \leq V_{out} < 5.0V$		0.15	0.23	
Quiescent Current	I_Q	$I_{LOAD} = 0mA$		1.3	2.5	μA
Shutdown Current	I_{SHDN}	$V_{IN} = 5.5V$, $V_{EN} = 0V$		0.015	0.5	μA
Shutdown Leakage Current		$V_{OUT} = 0V$, $V_{EN} = 0V$		0.011		μA
Output Voltage PSRR (Fixed V_{OUT} Mode)	PSRR	$I_{OUT} = 1mA$, $f = 1kHz$		80		dB
Current Limit	I_{LIM}	$V_{OUT} = 90\%$ of $V_{OUT(NOM)}$	450			mA
EN Input Current	I_{EN}	$V_{EN} = 5.5V$		0.015	0.5	μA
Enable High Level	$V_{EN(HI)}$	$V_{IN} = 5.5V$	0.9		V_{IN}	V
Enable Low Level	$V_{EN(LO)}$	$V_{IN} = 5.5V$	0		0.4	V
Output Voltage Noise	eN	BW = 10Hz to 100kHz		25		μV_{RMS}
Discharge Resistance	R_{DSG}	EN = 0V, $V_{OUT} = 0.1V$		10		Ω
Over Temperature Shutdown	OTS	$I_{OUT} = 1mA$		160		$^\circ C$
Over Temperature Hysteresis	OTH	$I_{OUT} = 1mA$		30		$^\circ C$

■ Detailed Description

Overview

The AME8907 is a low dropout linear regulator (LDO) featuring low quiescent current with excellent line and load transient performance designated for power-sensitive applications. The 1% accuracy of output voltage provides low output noise, high power supply rejection ratio(PSRR) and low-dropout voltage.

Enable Pin

Enable pin is powered-on in Active-High mode. During pulled-low mode, the MOS transistor is off and all of internal circuits are powered down. When the EN pin is floating, the internal mode is pulled-down.

Adjustable Version

The output voltage of regulator is determined by external resistor dividers. While external resistor divider is connected to ADJ pin, the output voltage is calculated by the following equation:

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

For AME8907, the range of output voltage is from 0.8V to 5V.

R1 and R2 should be high enough to maintain low quiescent current but the exceeding value of R1+R2 will reduce stability. In general, when R1 and R2 are above 10K Ω , LDO will reach adequate stability and generate reasonable layout precautions. To improve stability, keep parasitics on the ADJ pin to a minimum and lower R1 and R2 values.

Under-Voltage Lockout(UVLO)

UVLO keeps the output shutdown until the internal circuitry is operating properly.

Input and Output Capacitor Selection

AME8907 is designed to stabilize a wide range of output capacitors. The ESR of output capacitor relates to stability. The larger ESR of output capacitor decreases the peak deviations and improves transient response during current changes.

The different types of capacitor(aluminum, ceramic and tantalum) have different characterizations, such as temperature and voltage coefficients. All of ceramic capacitors are manufactured with a variety of dielectrics, each with different behavior across temperature and applications. Common dielectrics are X5R, X7R and Y5V. It is recommended to use 1 μ F to 10 μ F X5R or X7R dielectric ceramic capacitors with 30m Ω to 50m Ω ESR range between device outputs and ground for stability. The AME8907 is designed to remain stable through ceramic capacitors with low ESR and larger capacitance. The ESR of output capacitor is very important because it generates a zero to provide phase lead for loop stability.

There is no requirement for the ESR on the input capacitor but it is voltage and temperature coefficient must be considered for the environment of device application.

Auto Discharge

The auto discharge function could quickly force the output voltage to zero. When the LDO is disabled, the output capacitor is quickly discharged to reduce the output voltage to nearly zero. This function is very useful for the applications with quick ON/OFF function.

■ Detailed Description (Contd.)

Thermal Consideration

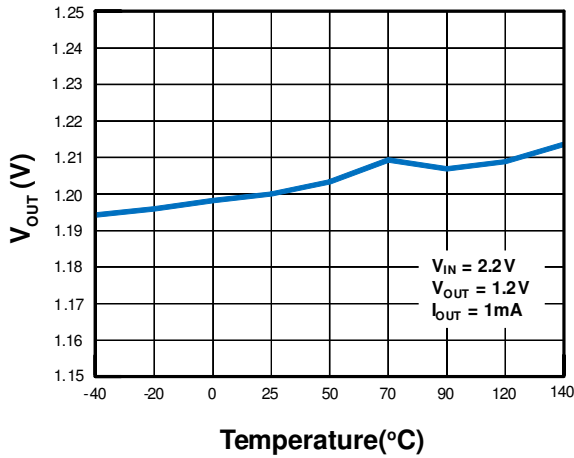
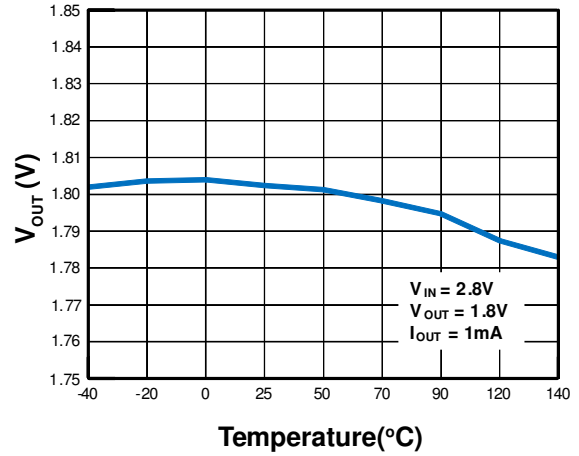
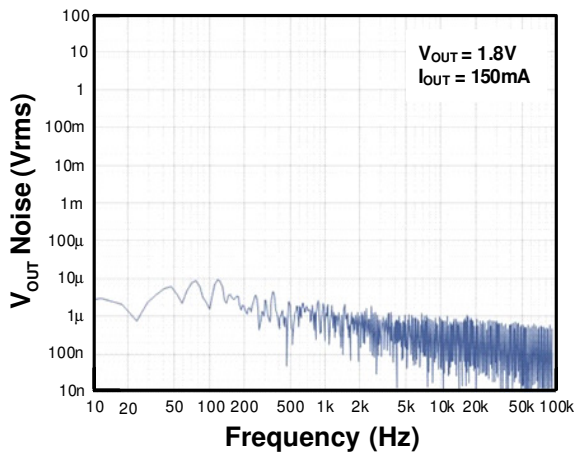
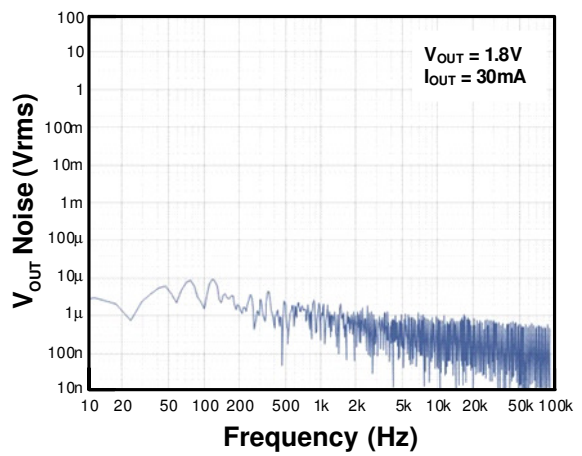
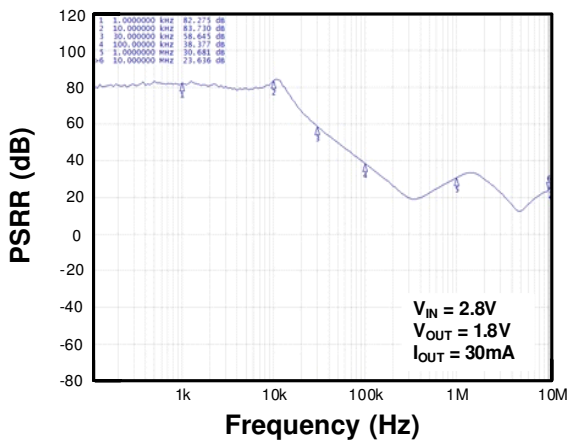
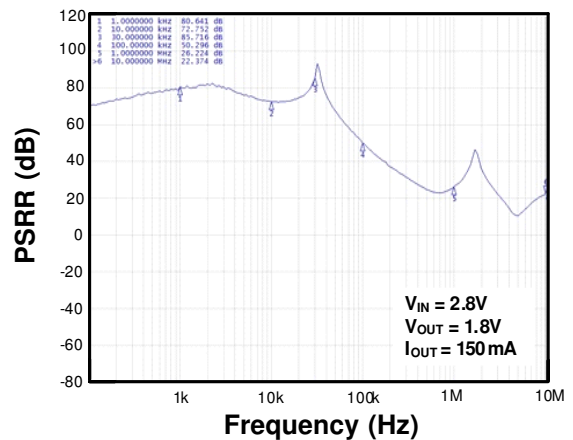
The power handling capability of device will be limited by allowable operating junction temperature(125°C). The maximum output power of AME8907 is limited by the maximum power dissipation of each package. The calculation of power dissipation is according to input voltage, output voltage and output current. The maximum power dissipation should not exceed the package' s maximum power rating.

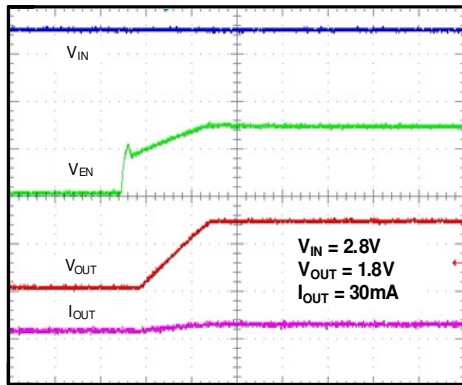
$$P_{MAX} = (V_{IN-MAX} - V_{OUT}) \times I_{OUT}$$

Where:

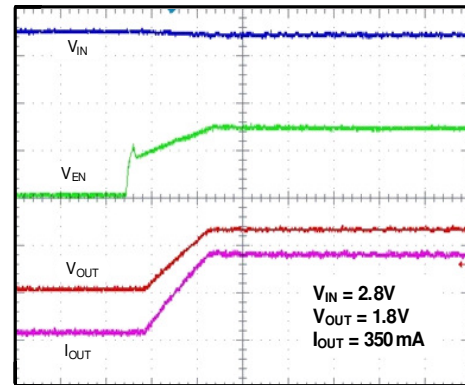
V_{IN-MAX} = maximum input voltage

P_{MAX} = maximum power dissipation of the package

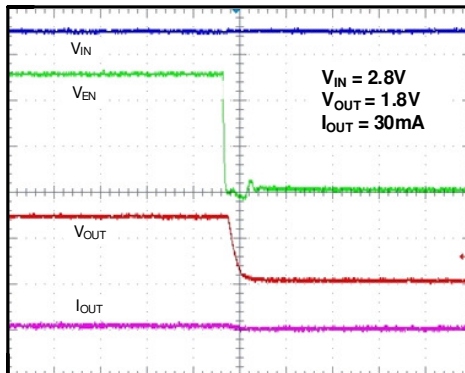
■ Characterization Curve
Output Voltage

Output Voltage

Output Noise

Output Noise

PSRR vs Frequency

PSRR vs Frequency


■ Characterization Curve (Contd.)
Power On Transition

Time (400 μ s/Div)

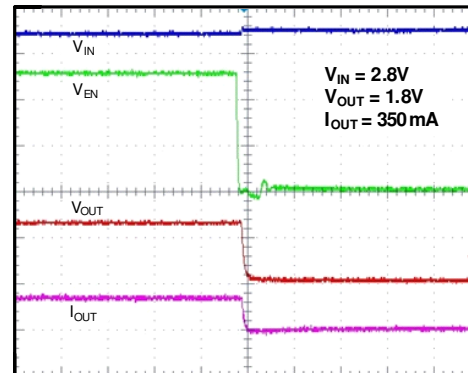
1. $V_{IN} = 2V/Div$
2. $V_{EN} = 2V/Div$
3. $V_{OUT} = 2V/Div$
4. $I_{OUT} = 200mA/Div$

Power On Transition

Time (400 μ s/Div)

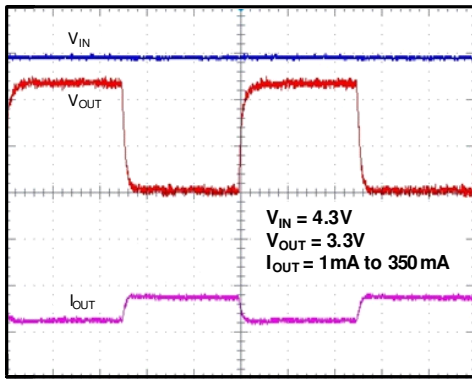
1. $V_{IN} = 2V/Div$
2. $V_{EN} = 2V/Div$
3. $V_{OUT} = 2V/Div$
4. $I_{OUT} = 200mA/Div$

Power Off Transition

Time (100 μ s/Div)

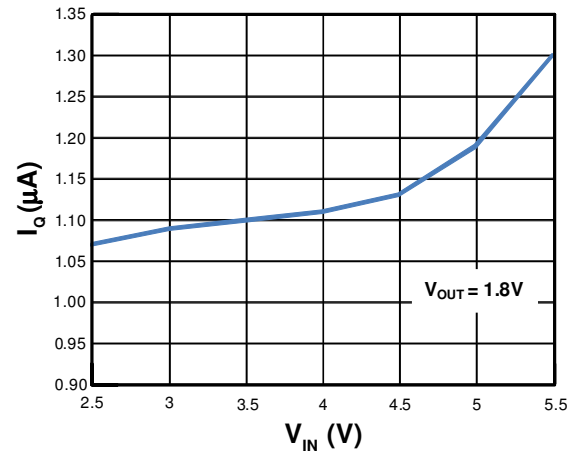
1. $V_{IN} = 2V/Div$
2. $V_{EN} = 2V/Div$
3. $V_{OUT} = 2V/Div$
4. $I_{OUT} = 200mA/Div$

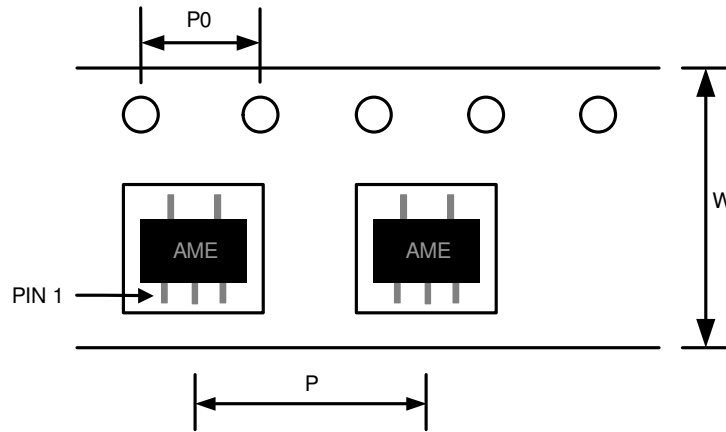
Power Off Transition

Time (100 μ s/Div)

1. $V_{IN} = 2V/Div$
2. $V_{EN} = 2V/Div$
3. $V_{OUT} = 2V/Div$
4. $I_{OUT} = 200mA/Div$

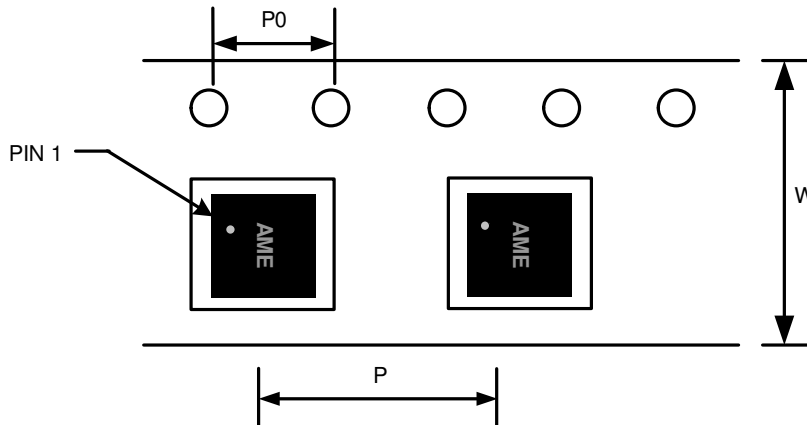
■ Characterization Curve (Contd.)
Load Transition

Time (100 μ s/Div)

1. $V_{IN} = 5V/Div$
2. $V_{OUT} = 10mV/Div$
3. $I_{OUT} = 500mA/Div$

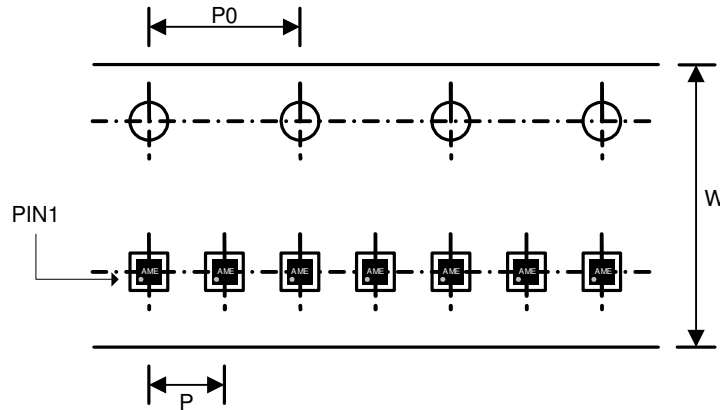
Quiescent Current


AME8907
■ Tape and Reel Dimension
SOT-25

Carrier Tape, Number of Components Per Reel and Reel Size

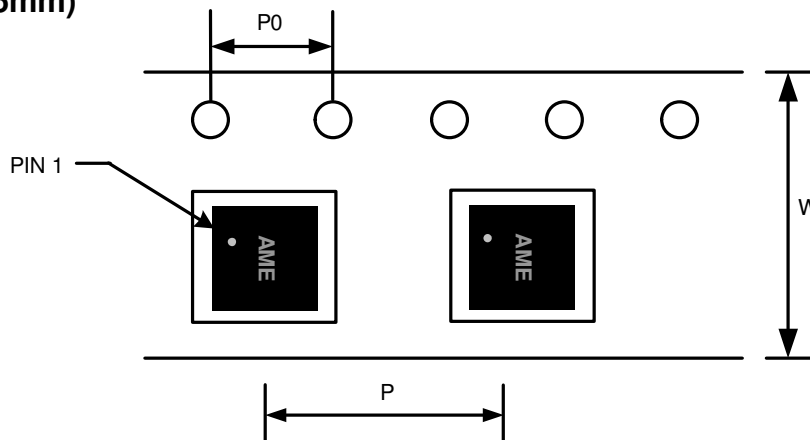
Package	Carrier Width (W)	Pitch (P)	Pitch (P0)	Part Per Full Reel	Reel Size
SOT-25	8.0±0.1 mm	4.0±0.1 mm	4.0±0.1 mm	3000pcs	180±1 mm

**DFN-4A
(1x1x0.4mm)**

Carrier Tape, Number of Components Per Reel and Reel Size

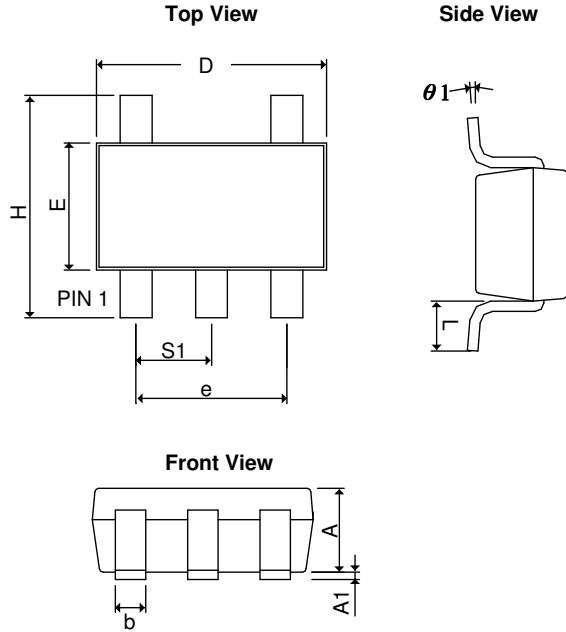
Package	Carrier Width (W)	Pitch (P)	Pitch (P0)	Part Per Full Reel	Reel Size
DFN-4A (1x1x0.4mm)	8.0±0.1mm	4.0±0.1 mm	4.0±0.1 mm	3000pcs	180±1 mm

■ Tape and Reel Dimension (Contd.)
**DFN-4A
(1x1x0.4mm)**

Carrier Tape, Number of Components Per Reel and Reel Size

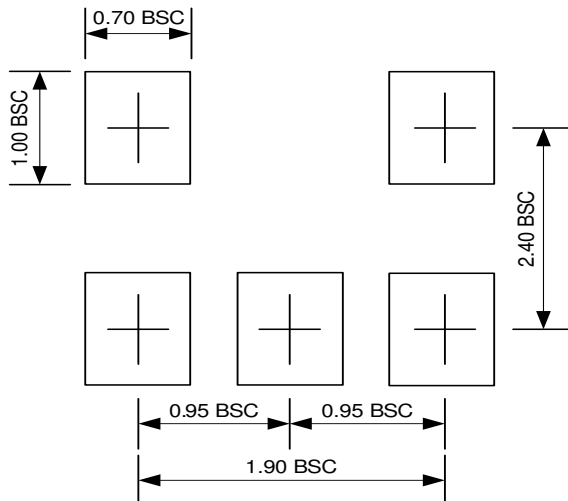
Package	Carrier Width (W)	Pitch (P)	Pitch (P0)	Part Per Full Reel	Reel Size
DFN-4A (1x1x0.4mm)	8.0±0.1mm	2.0±0.1 mm	4.0±0.1 mm	10000pcs	180±1 mm

**DFN-6D
(2x2x0.75mm)**

Carrier Tape, Number of Components Per Reel and Reel Size

Package	Carrier Width (W)	Pitch (P)	Pitch (P0)	Part Per Full Reel	Reel Size
DFN-6D (2x2x0.75mm)	8.0±0.1 mm	4.0±0.1 mm	4.0±0.1 mm	3000pcs	180±1 mm

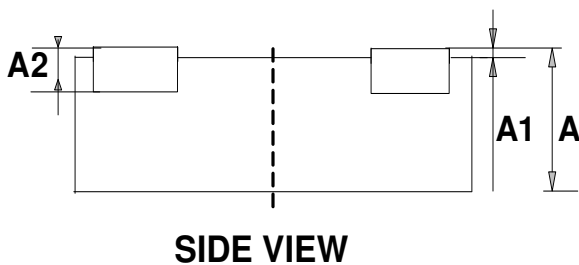
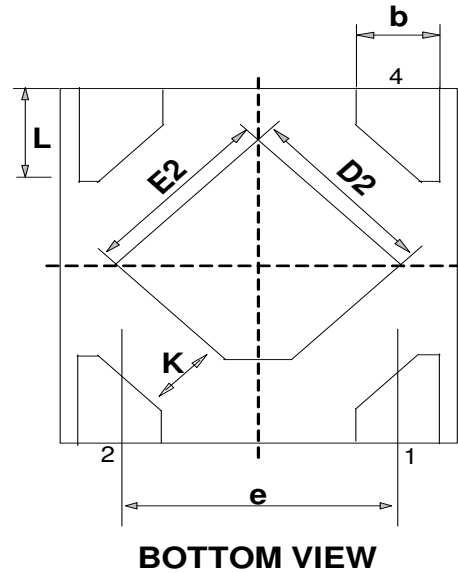
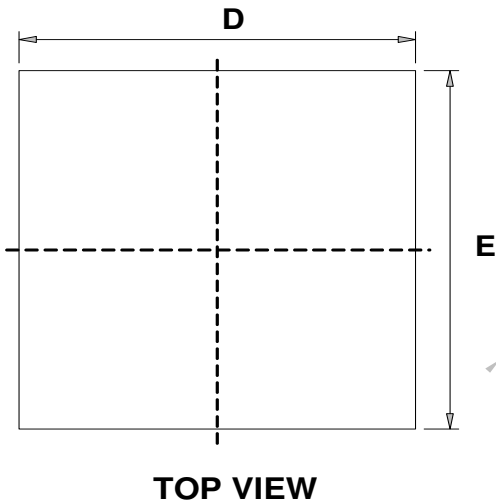
■ Package Dimension
SOT-25


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	
θ₁	0°	10°	0°	10°
S₁	0.95 BSC		0.0374 BSC	

■ Lead Pattern

Note:
1. Lead pattern unit description:

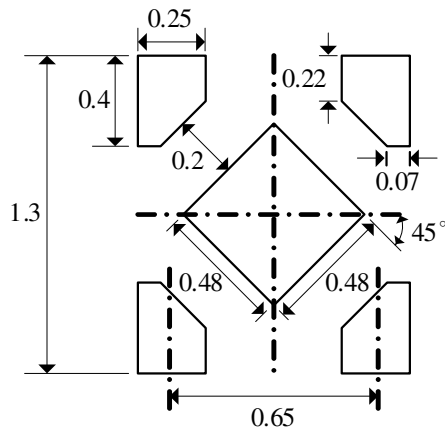
BSC: Basic. Represents theoretical exact dimension or dimension target.

2. Dimensions in Millimeters.
3. General tolerance ± 0.05 mm unless otherwise specified.

■ Package Dimension (Contd.)
**DFN-4A
(1x1x0.4mm)**


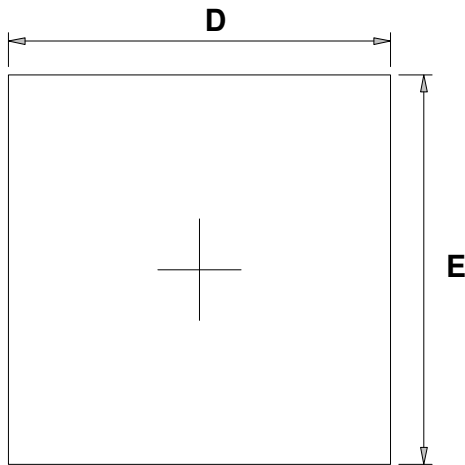
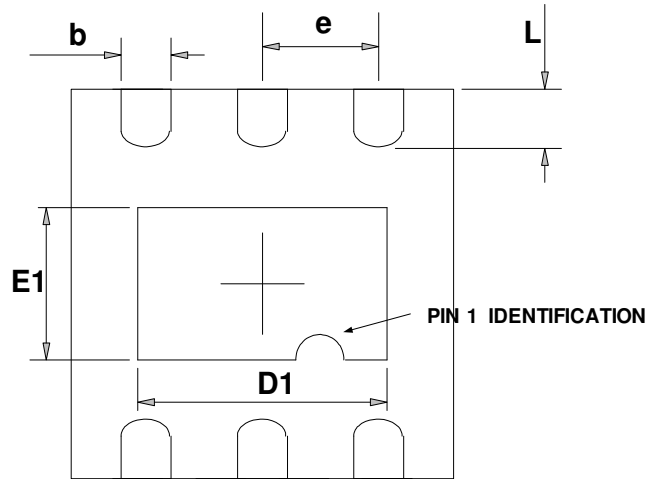
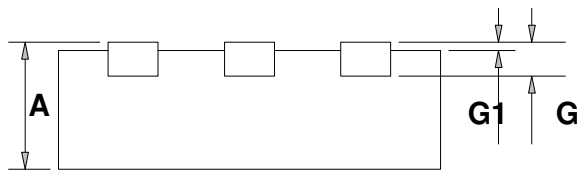
SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.320	0.400	0.013	0.016
A1	0.000	0.050	0.000	0.002
A2	0.102 REF		0.004 REF	
b	0.150	0.300	0.006	0.012
D	0.950	1.050	0.037	0.041
E	0.950	1.050	0.037	0.041
e	0.650 BSC		0.026 BSC	
D2	0.380	0.580	0.015	0.023
E2	0.380	0.580	0.015	0.023
L	0.200	0.300	0.008	0.012
K	0.200 REF		0.008 REF	

■ Lead Pattern Drawing (Contd.)

DFN-4A
(1x1x0.4mm)

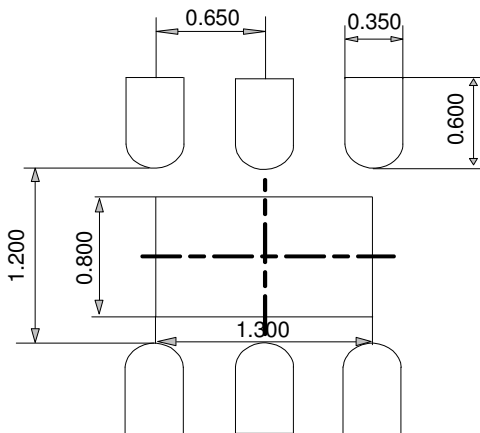
Note:

1. Dimensions in Millimeters.

■ Package Dimension (Contd.)
**DFN-6D
(2x2x0.75mm)**

TOP VIEW

BOTTOM VIEW

REAR VIEW

SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
D	1.900	2.100	0.075	0.083
E	1.900	2.100	0.075	0.083
e	0.650 TYP		0.026 TYP	
D1	1.100	1.650	0.043	0.065
E1	0.600	1.050	0.024	0.041
b	0.180	0.350	0.007	0.014
L	0.200	0.450	0.008	0.018
G	0.178	0.228	0.007	0.009
G1	0.000	0.050	0.000	0.002

■ Lead Pattern Drawing (Contd.)

DFN-6D
(2x2x0.75mm)**Note:**

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



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Life Support Policy:

These products of AME, Inc. are not authorized for use as critical components in life-support devices or systems, without the express written approval of the president of AME, Inc.

AME, Inc. reserves the right to make changes in the circuitry and specifications of its devices and advises its customers to obtain the latest version of relevant information.

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