AME, Inc.

AME5106

■ General Description

AME5106 provides low-ripple power, high efficiency, and excellent transient characteristics. The PWM control circuit is able to vary the duty ratio linearly from 0 up to 100%. This converter also contains an error amplifier circuit as well as a soft-start circuit that prevents overshoot at startup. An enable function, an over current protect function and a short circuit protect function are built inside, and when OCP or SCP happens, the operation frequency will be reduced from 350KHz to 30KHz. Also, an internal compensation block is built in to minimum external component count.

With the addition of an internal P-channel Power MOS, a coil, capacitors, and a diode connected externally, these ICs can function as step-down switching regulators. They serve as ideal power supply units for portable devices when coupled with the SOP-8L mini-package, providing such outstanding features as low current consumption. Since this converter can accommodate an input voltage up to 18V, it is also suitable for the operation via an AC adapter.

■ Features

- Input voltage: 3.6V to 18V.
- Output voltage: 0.8V to VCC.
- Duty ratio: 0% to 100% PWM control
- Oscillation frequency: 350KHz typ.
- Soft-start, Current limit, Enable function
- Thermal Shutdown function
- Built-in internal SW P-channel MOS
- SOP-8 Package
- All AME′s Lead Free Products Meet RoHS Standards

■ Applications

- PC Motherboard
- LCD Monitor
- Graphic Card
- DVD-Video Player
- Telecom Equipment
- ADSL Modem
- Printer and other Peripheral Equipment
- Microprocessor core supply
- Networking power supply

■ Typical Application
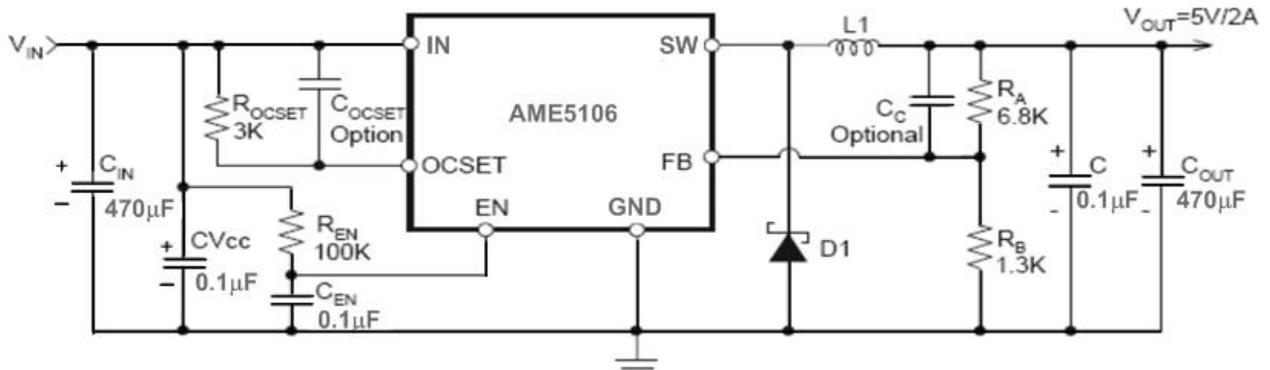
Note: $V_{OUT} = V_{FB} \times (1 + R_A/R_B)$

$R_B = 0.7K \sim 5K\ \Omega$

V$_{IN}$=12V, I$_{MAX}$=2A			
V$_{OUT}$	2.5V	3.3V	5V
L1 Value	22uH	27uH	33uH

■ Function Block Diagram

■ Pin Configuration

SOP-8
Top View

8 7 6 5

1 2 3 4

AME5106

1. FB
2. EN
3. OCSET
4. IN
5. SW
6. SW
7. GND
8. GND
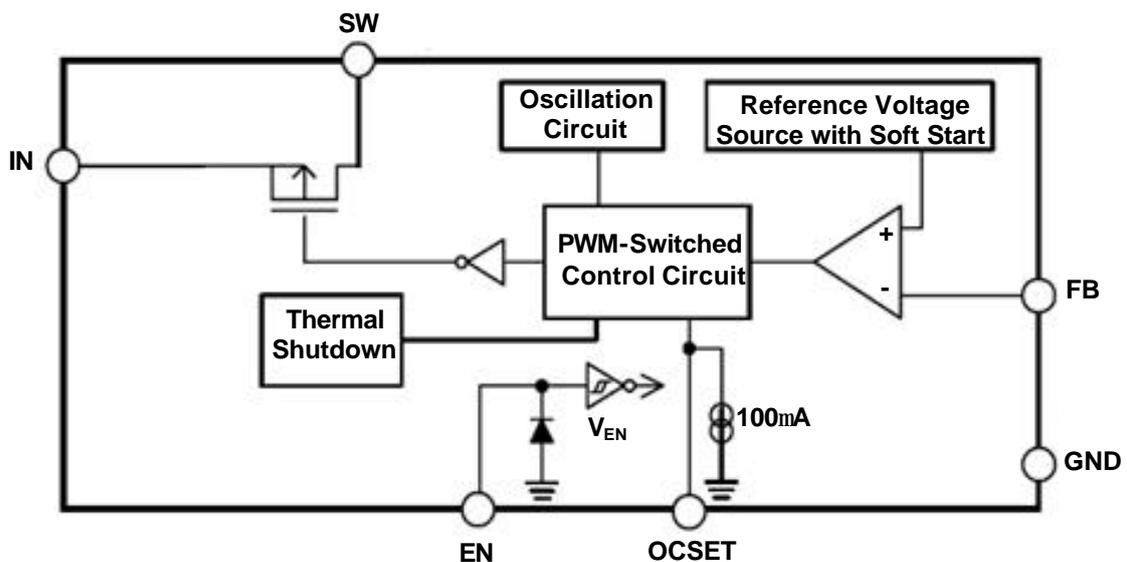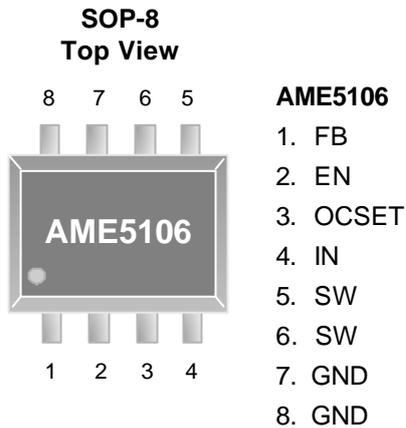
* Die Attach:
 Conductive Epoxy

■ Pin Description

Pin Number	Pin Name	Pin Description
1	FB	Output voltage Feedback input. Set the output voltage by selecting values for Ra and Rb using: $$V_{OUT} = 0.8V\left(\frac{Ra + Rb}{Rb}\right)$$ Connect the ground of the feedback network to an AGND (Analog Ground) plane which should be tied directly to the GND pin.
2	EN	Enable Control Input, active high. The enable pin is an active high control. Tie this pin above 2V to enable the device. Tie this pin below 0.8V to shut down the device. In shutdown, all function are disabled. Do not leave EN pin floating.
3	OCSET	Add an external resistor to set max output current.
4	IN	Input Supply Voltage Pin. Bypass this pin with a capacitor. The capacitor shall be placed as close to the device as possible.
5,6	SW	Switch Node Connection to Inductor.
7,8	GND	Ground. Tie directly to ground plane.

■ Ordering Information

AME5106   x   x   x   x   xxx   x

Special Feature

Output Voltage

Number of Pins

Package Type

Operating Ambient Temperature Range
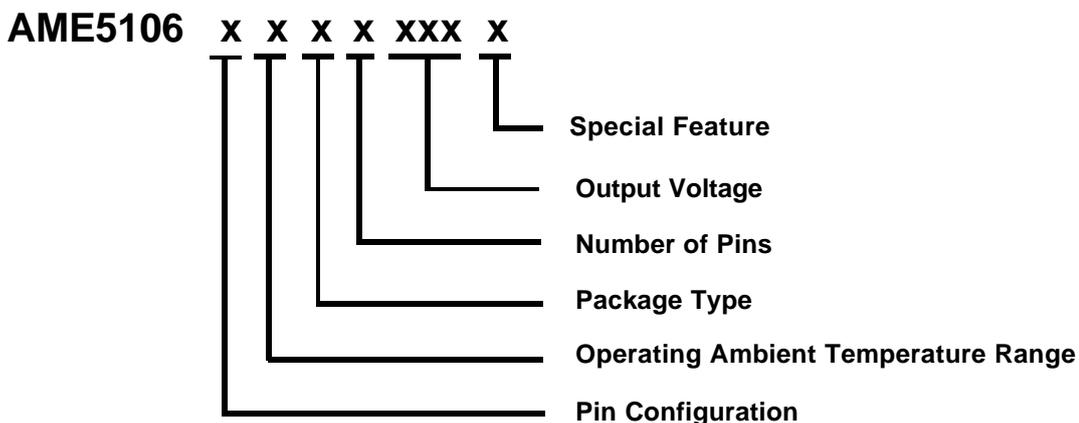
Pin Configuration

Pin Configuration	Operating Ambient Temperature Range	Package Type	Number of Pins	Output Voltage	Special Feature
A (SOP-8) 1. FB 2. EN 3. OCSET 4. IN 5. SW 6. SW 7. GND 8. GND	I: -20°C to 85°C	H: SOP	A: 8	ADJ: Adjustable	Z: Lead free

■ Ordering Information

Part Number	Marking*	Output Voltage	Package	Operating Ambient Temperature Range
AME5106AIHAADJZ	5106 AADJ yyww	ADJ	SOP-8	-20°C to 85°C

Note: ww represents the date code.
    * A line on top of the first letter represents lead free plating such as $\overline{5}$106 AADJ yyww.
Please consult AME sales office or authorized Rep./Distributor for the availability of package type.

■ Absolute Maximum Ratings

Parameter	Symbol	Maximum	Unit
Input Supply Voltage	IN	-0.3V to 22V	
EN,SW Pin Voltages	V_{EN}, V_{SW}	-0.3V to 0.3V	V
FB Pin Voltage	V_{FB}	-0.3V to V_{IN}	
ESD Classification	TBD*		

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

*HBM B: 2000~3999V

■ Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
Ambient Temperature Range	T_A	-20 to 85	^{o}C
Junction Temperature Range	T_J	-20 to 125	^{o}C
Storage Temperature Range	T_{STG}	-40 to 150	^{o}C

■ Thermal Information

Parameter	Package	Die Attach	Symbol	Maximum	Unit
Thermal Resistance* (Junction to Case)	SOP-8	Conductive Epoxy	θ_{JC}	60	^{o}C / W
Thermal Resistance (Junction to Ambient)	SOP-8		θ_{JA}	150	
Internal Power Dissipation	SOP-8		P_D	810	mW
Solder Iron (10 Sec)**				350	^{o}C

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

** MIL-STD-202G-210F

■ Electrical Specifications

V_{IN} = 12V, T_A = 25°C, Unless otherwise specified.

Parameter	Symbol	Test Condition		Min	Typ	Max	Units
Input Voltage	V_{IN}			3.6		18	V
Feedback Voltage	V_{FB}	I_{OUT}=0.1A		0.782	0.8	0.818	V
FB Pin Bias Current	I_{FB}	I_{OUT}=0.1A			0.1	0.5	μA
Switch Current	I_{SW}			2.5			A
Current Consumption During Power Off	I_{SSS}	V_{EN}=0V			10		μA
Output Voltage Line Regulation	REG_{LINE}	V_{IN}=5V to 18V			2	4	%
Output Voltage Load Regulation	REG_{LOAD}	I_{OUT}=0.1A to 2A			0.2	0.5	%
Oscillator Frequency	f_{OSC}	Measure wave form at SW pin		300	350	400	KHz
Frequency of Current Limit or Short Circuit Protect	f_{OSC1}	Measure wave form at SW pin		10			KHz
Enable High (enabled)	V_{IH_EN}	Evaluate oscillation at SW pin		2.0			V
Enable Low (shutdown)	V_{IL_EN}	Evaluate oscillation stop at SW pin				0.8	
EN High Input Current	I_{IH_EN}				20		μA
EN Low Input Current	I_{IL_EN}				-10		μA
OCSET Pin Bias Current	I_{OCSET}			75	90	105	μA
Soft Start Time	t_{SS}			0.3	2	5	mS
Internal MOSFET R_{DSON}	R_{DSON}	V_{FB}=0V	V_{IN}=5V		110	150	mΩ
			V_{IN}=12V		70	100	
Efficiency	η	V_{IN}=12V, V_{OUT}=5V, I_{OUT}=2A			92		%

■ Detailed Description

PWM Control

The AME5106 consists of DC/DC converters that employ a pulse-width modulation (PWM) system. In converters of the AME5106, the pulse width varies in a range from 0 to 100%, according to the load current. The ripple voltage produced by the switching can easily be removed through a filter because the switching frequency remains constant. Therefore, these converters provide a low-ripple power over broad ranges of input voltage and load current.

Under Voltage Lockout

The under voltage lockout circuit of the AME5106 assures that the high-side MOSFET driver outputs remain in the off state whenever the supply voltage drops below 3.3V. Normal operation resumes once VCC rises above 3.5V.

RDS(ON) Current Limiting

The current limit threshold is setting by the external resistor connecting from VCC supply to OCSET. The internal 100uA sink current crossing the resistor sets the voltage at the pin of OCSET. When the PWM voltage is less than the voltage at OCSET, an over-current condition is triggered.

$$I_{LOAD} \times R_{DS(ON)} = I_{OCSET} \times R_{OCSET}$$

See above formula for setting the current limit value.

■ Characterization Curve(For reference only)

Vin vs. FB
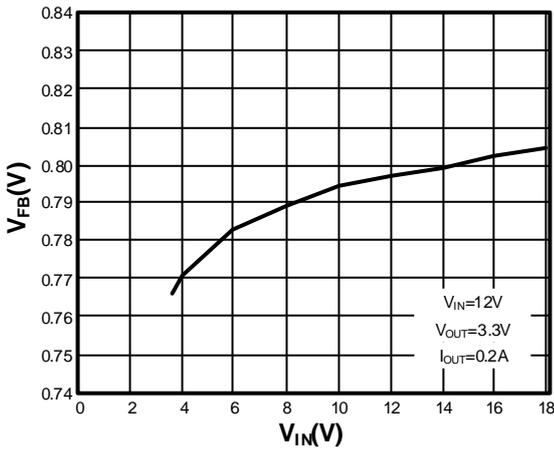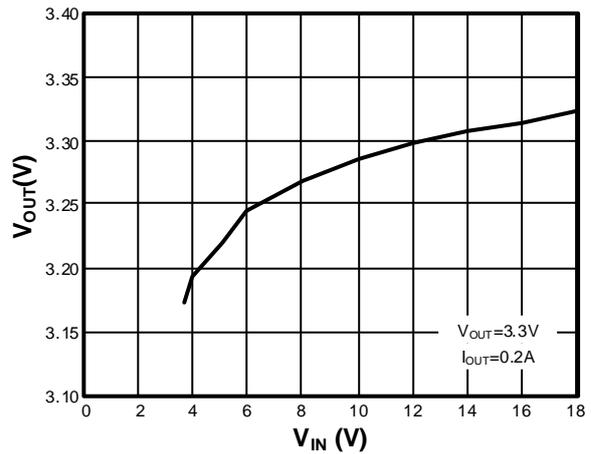
V_IN=12V
V_OUT=3.3V
I_OUT=0.2A

Line Regulation

V_OUT=3.3V
I_OUT=0.2A

Load Regulation

V_IN=12V

V_IN v.s Frequency

V_OUT=3.3V
I_OUT=0.2A

Efficiency

V_OUT=5V

V_OUT=3.3V

Vout Ripple

V_SW   5V/div

V_OUT   20 mV/div

V_IN=12V
V_OUT=3.3V
I_OUT=0.1A

AME, Inc.

AME5106
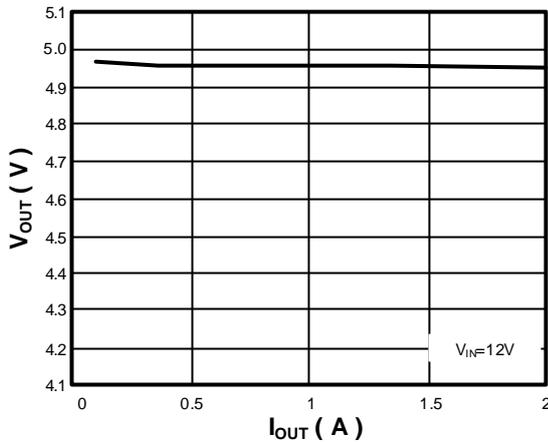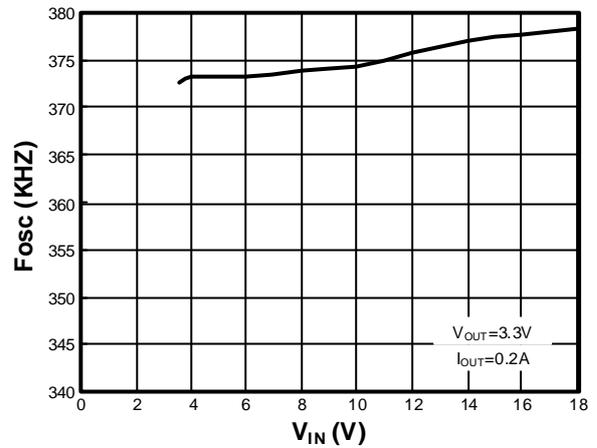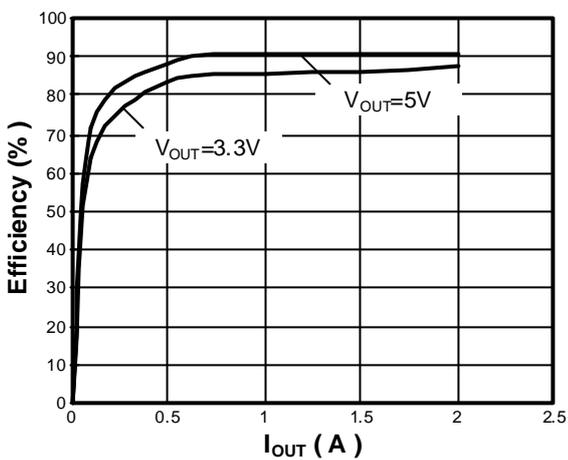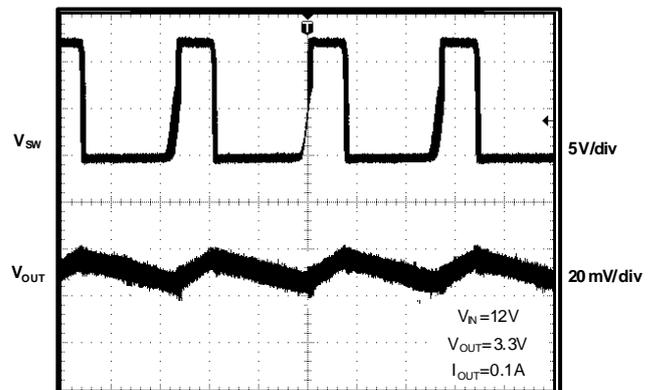
■ Characterization Curve(For reference only)

Vout Ripple

V$_{SW}$ 5V/div

V$_{OUT}$ 20mV/div

V$_{IN}$=12 V
V$_{OUT}$=3.3V
I$_{OUT}$=2A
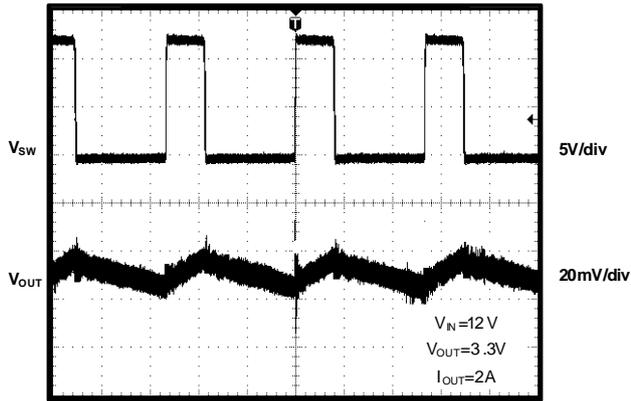
Frequency of short current protect

V$_{SW}$ 5V/div

Soft start time

V$_{IN}$=12V
V$_{OUT}$=5V
I$_{LOAD}$=2A

V$_{OUT}$ 2V/div

V$_{SW}$ 5V/div

EN   5V/div
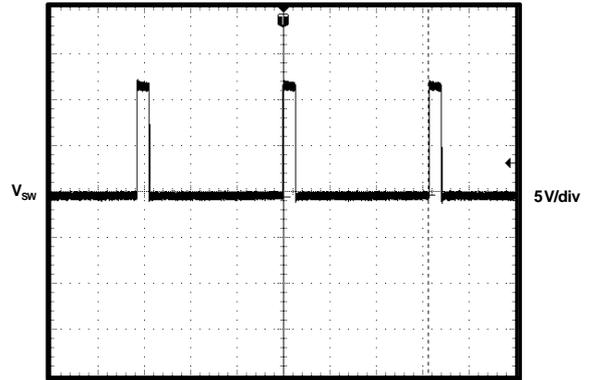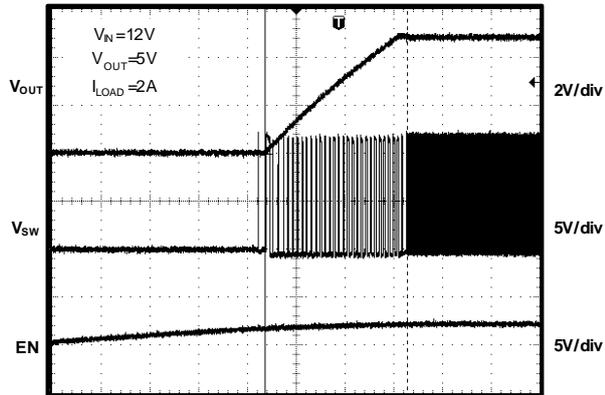
■ Tape and Reel Dimension

SOP-8
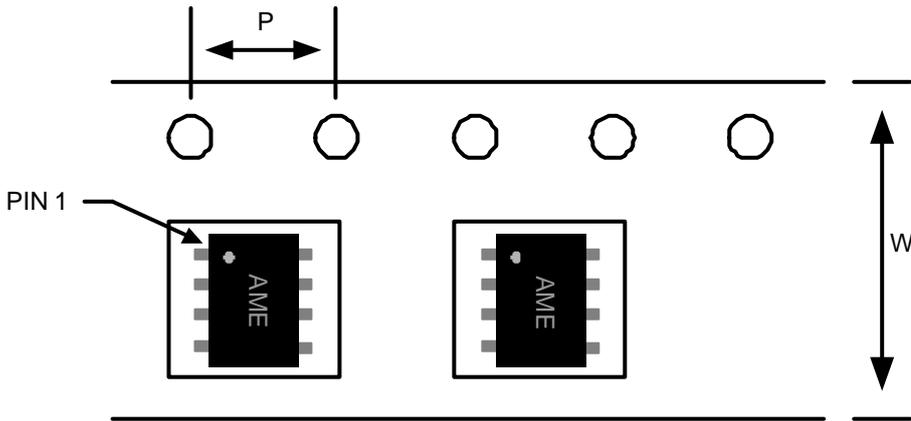
Carrier Tape, Number of Components Per Reel and Reel Size

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

■ Package Dimension

SOP-8

Top View

Side View

Front View
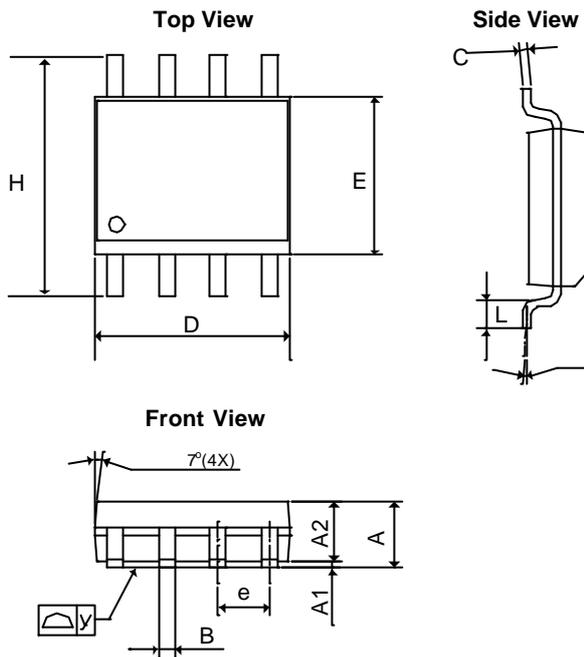
SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.05315	0.0689
A_1	0.10	0.30	0.00394	0.01181
A2	1.473 REF		0.05799 REF	
B	0.33	0.51	0.01299	0.02008
C	0.19	0.25	0.00748	0.00984
D	4.80	5.33	0.18898	0.20984
E	3.80	4.00	0.14961	0.15748
e	1.27 BSC		0.05000 BSC	
L	0.40	1.27	0.01575	0.05000
H	5.80	6.30	0.22835	0.24803
y	-	0.10	-	0.00394
q	0°	8°	0°	8°

www.ame.com.tw
E-Mail: sales@ame.com.tw

Corporate Headquarter

AME, Inc.

2F, 302 Rui-Guang Road, Nei-Hu District

Taipei 114, Taiwan.

Tel: 886 2 2627-8687

Fax: 886 2 2659-2989

U.S.A. (Subsidiary)

Analog Microelectronics, Inc.

3100 De La Cruz Blvd., Suite 201

Santa Clara, CA. 95054-2438

Tel : (408) 988-2388

Fax: (408) 988-2489