



## AME5106

## PWM Control 2A Buck Converter

### ■ 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.

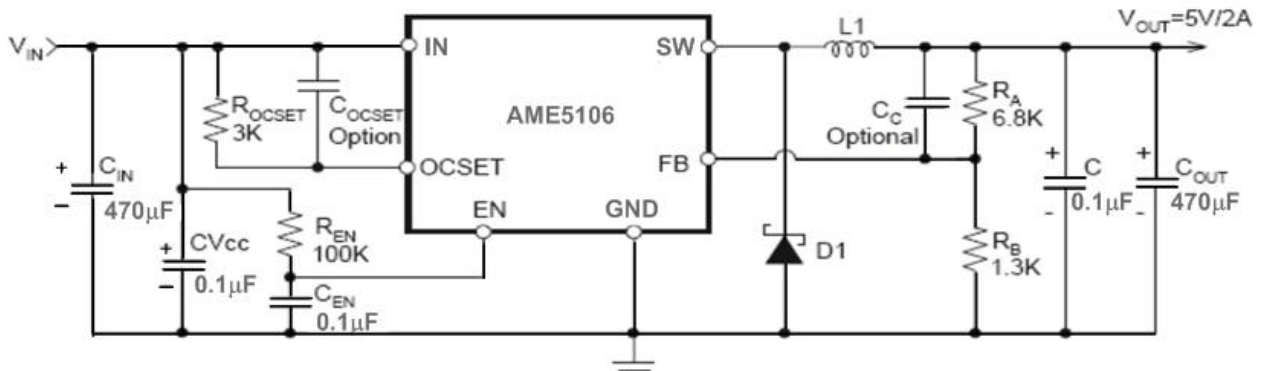
With the addition of an internal P-channel Power MOS, a coil, capacitors, and a diode connected externally, these ICs can function as step-down switching regulators. They serve as ideal power supply units for portable devices when coupled with the SOP-8L mini-package, providing such outstanding features 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

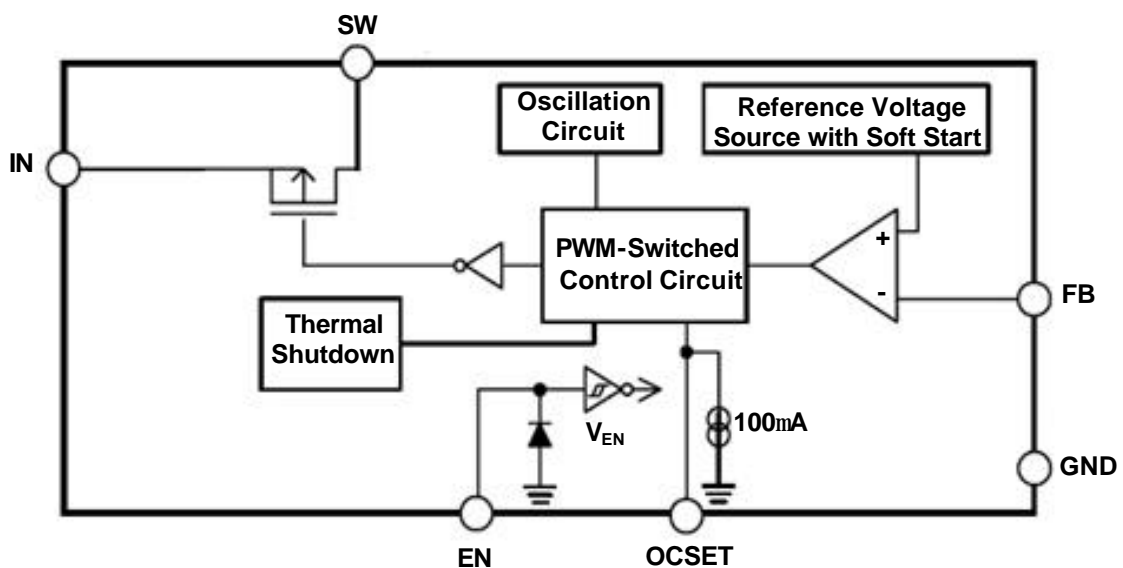
- PC Motherboard
- LCD Monitor
- Graphic Card
- DVD-Video Player
- Telecom Equipment
- ADSL Modem
- Printer and other Peripheral Equipment
- Microprocessor core supply
- Networking power supply

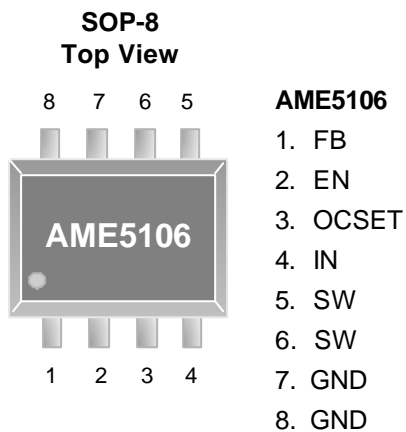
**■ Typical Application**


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	22µH	27µH	33µH

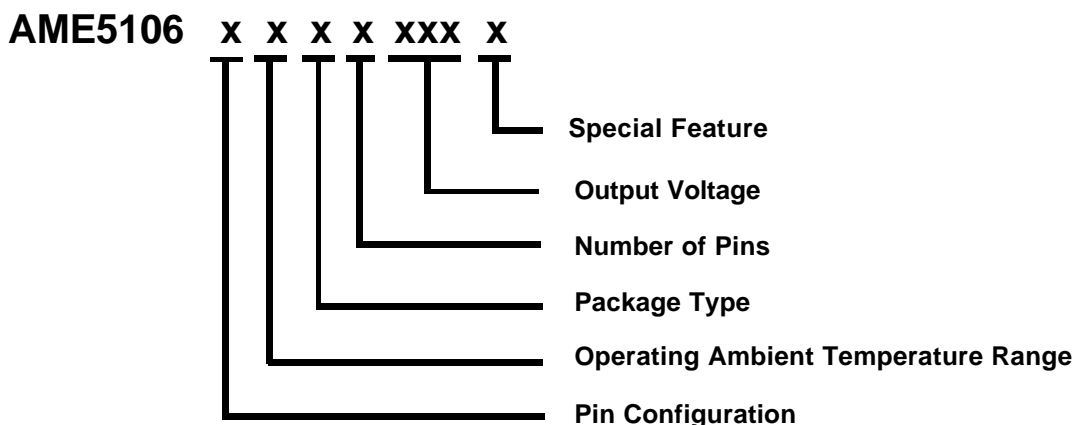
**■ Function Block Diagram**


**AME5106**
**■ Pin Configuration**


**\* 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.

**AME5106**
**■ Ordering Information**


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.

**AME5106**
**■ Absolute Maximum Ratings**

Parameter	Symbol	Maximum	Unit
Input Supply Voltage	IN	-0.3V to 22V	V
EN,SW Pin Voltages	$V_{EN}, V_{SW}$	-0.3V to 0.3V	
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	°C
Junction Temperature Range	$T_J$	-20 to 125	°C
Storage Temperature Range	$T_{STG}$	-40 to 150	°C

**■ Thermal Information**

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

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

\*\* MIL-STD-202G-210F

**AME5106**
**■ Electrical Specifications**
 $V_{IN} = 12V, T_A = 25^{\circ}C$ , 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	$\mu A$	
Switch Current	$I_{SW}$		2.5			A	
Current Consumption During Power Off	$I_{SSS}$	$V_{EN}=0V$		10		$\mu A$	
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		$\mu A$	
EN Low Input Current	$I_{IL\_EN}$			-10		$\mu A$	
OCSET Pin Bias Current	$I_{OCSET}$		75	90	105	$\mu A$	
Soft Start Time	$t_{SS}$		0.3	2	5	mS	
Internal MOSFET $R_{DS(ON)}$	$R_{DS(ON)}$	$V_{FB}=0V$	$V_{IN}=5V$		110	150	m $\Omega$
			$V_{IN}=12V$		70	100	
Efficiency	$\eta$	$V_{IN}=12V, V_{OUT}=5V, I_{OUT}=2A$		92		%	

**AME5106**

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**■ 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.

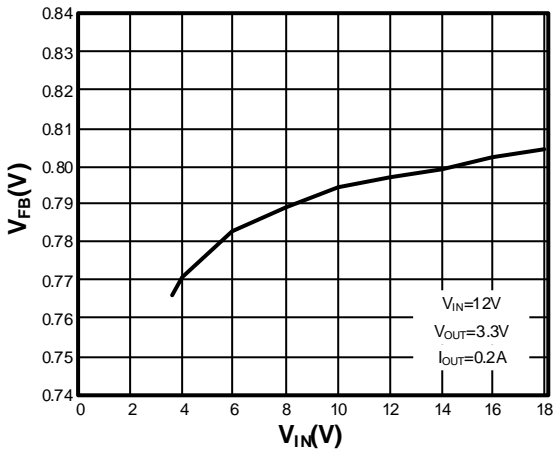
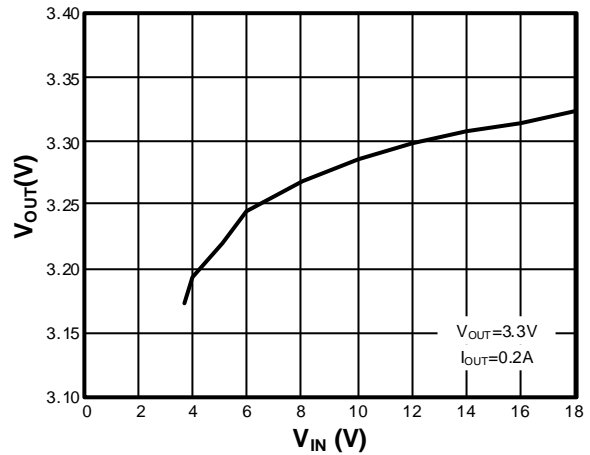
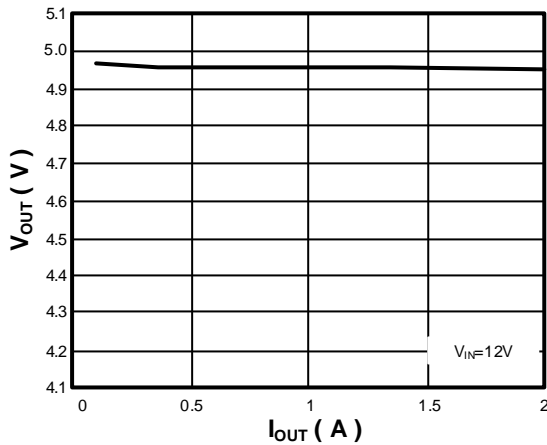
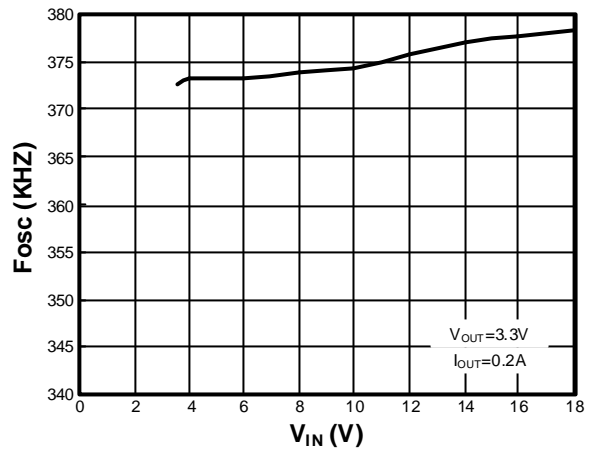
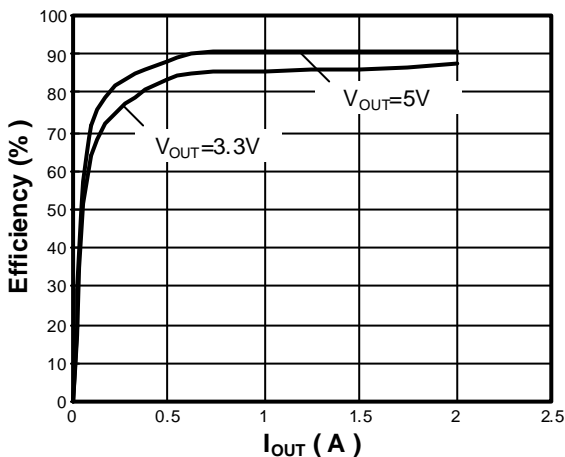
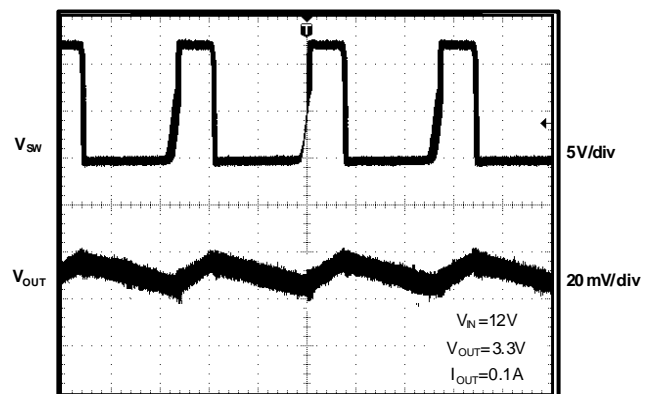
**RDS(ON) Current Limiting**

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.

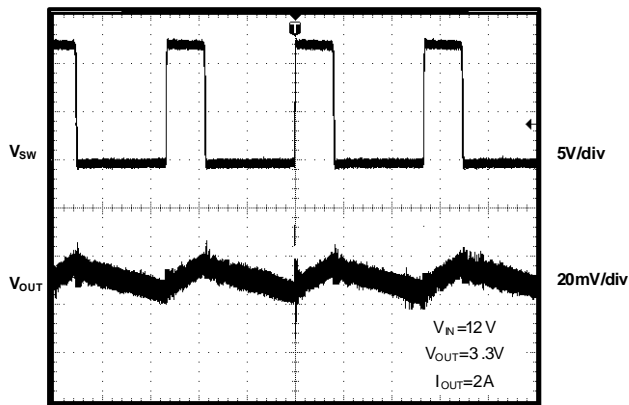
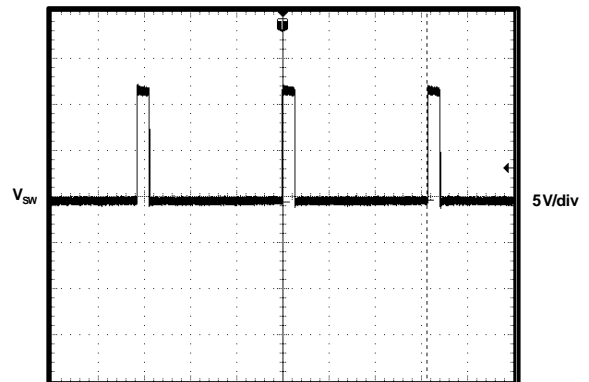
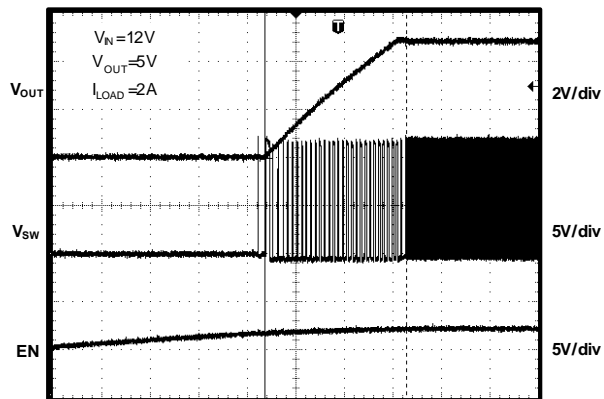
$$I_{LOAD} \times R_{DS(ON)} = I_{OCSET} \times R_{OCSET}$$

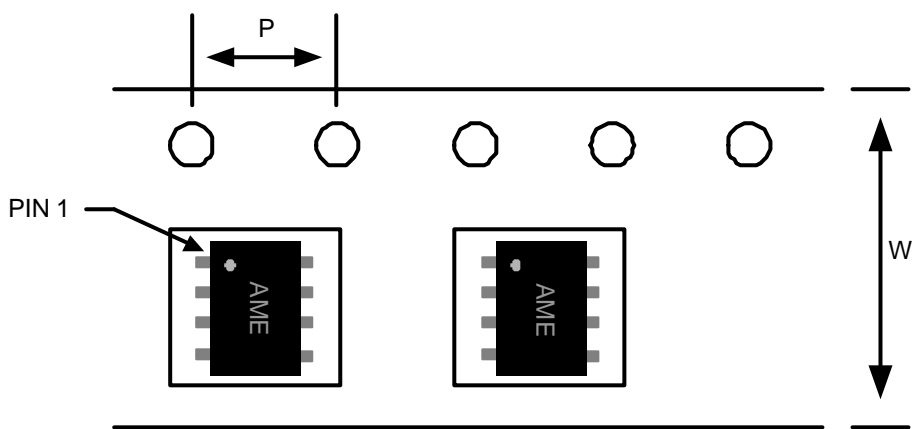
See above formula for setting the current limit value.

## ■ Characterization Curve(For reference only)

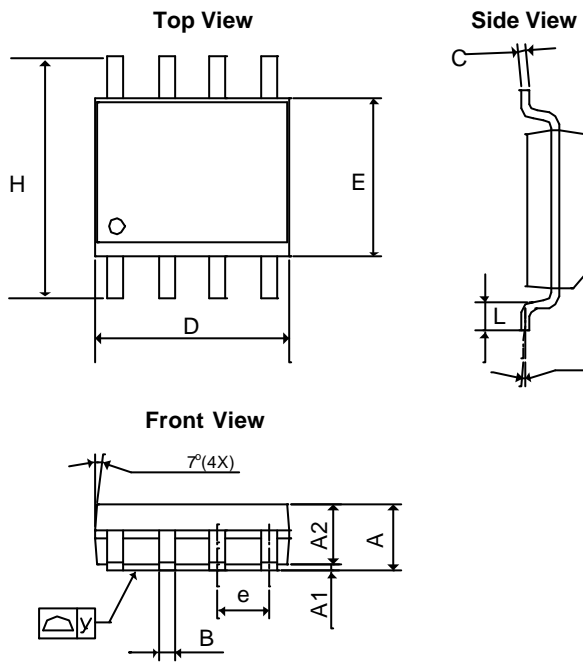
**Vin vs. FB**

**Line Regulation**

**Load Regulation**

 **$V_{IN}$  v.s Frequency**

**Efficiency**

**Vout Ripple**




**■ Characterization Curve(For reference only)**
**Vout Ripple**

**Frequency of short current protect**

**Soft start time**


**AME5106**
**■ 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**


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



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