

Not Recommended for New Design



AP2006

200KHz, PWM Buck DC/DC & Linear Controller

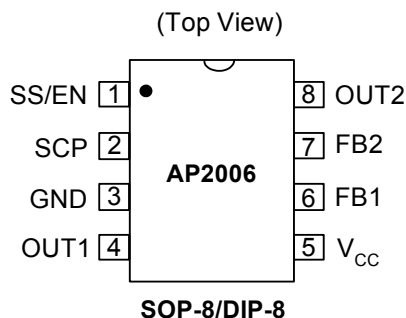
■ Features

- Provides two regulated voltages
 - one PWM Controller(Drive PMOS)
 - one Linear Controller (Drive NPN and NMOS)
- Adjustable version: 1.23+/- 2.5%.
- 250KHz $\pm 10\%$ fixed switching frequency
- Thermal-shutdown and current-limit protection
- SS/EN Soft-Start/Enable Function.
- Operating voltage can be up to 22V
- Low power standby mode
- **Pb-Free** Package: SOP8,DIP8

■ Applications

- Simple High-efficiency step-down regulator
- On-card switching regulators
- XDSL...

■ Pin Assignments



■ General Descriptions

The AP2006 series are monolithic IC's containing a PWM and a linear power controller. The PWM driving a external PMOS. Due to the reduction of the number of external components, board space can be saved easily. The external shutdown function can be controlled by logic level. It switches the IC into the standby mode. The internal compensation provides a good line and load regulation without external component. Short circuit protection prohibits the over current in the output switches. The AP2006 series operate at the switching frequency of 250KHz. Therefore, it is able to use the smaller sized filters than what used to be used with the lower frequency switching regulators. Other features include a guaranteed $\pm 3\%$ tolerance on output voltage under specified input voltage and output load conditions, and $\pm 20\%$ on the oscillator frequency. The linear controller is able to drive an external NPN transistor, with 30mA current limit pre-driver. The ICs are available in a standard SOP8/DIP8 package.

■ Pin Descriptions

| Name | Description |
|-----------------|--|
| V _{CC} | Operating voltage input |
| SCP | Short circuit protect |
| OUT1 | Connecting PMOS's Gate |
| GND | Ground |
| FB1 FB2 | Output voltage feedback control |
| SS/EN | Soft-start/Enable function |
| OUT2 | Linear Controller Driving External NPN |

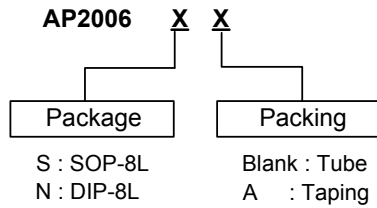
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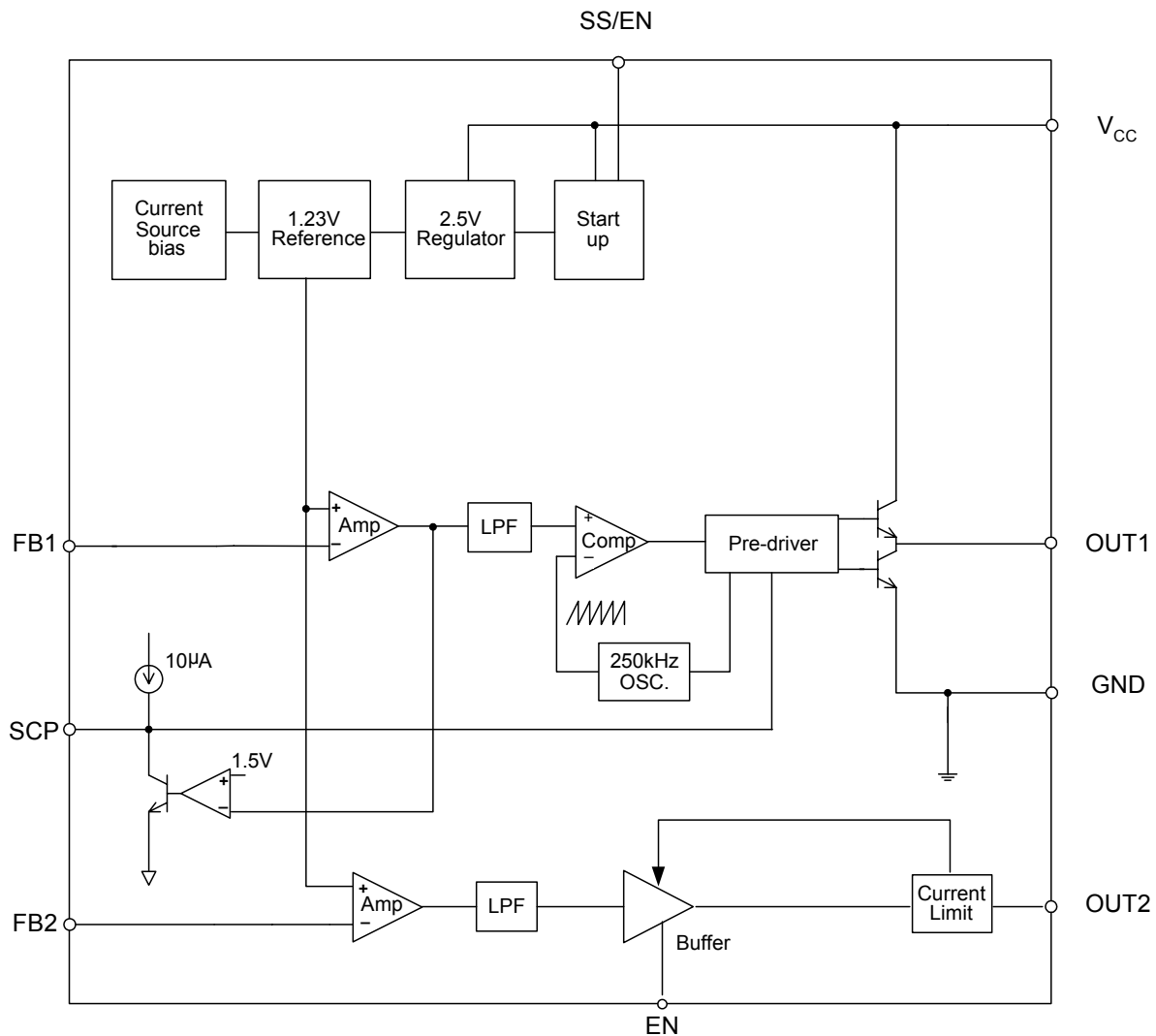
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■ Ordering Information



■ Block Diagram



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■ Absolute Maximum Ratings

| Symbol | Parameter | Rating | Unit |
|---------------------|--------------------------|---------------|------|
| V _{CC} | Supply Voltage | 22 | V |
| V _{EN} | EN Pin Input Voltage | -0.3 ≤ V ≤ 22 | V |
| V _{FB} | Feedback Pin Voltage | -0.3 ≤ V ≤ 22 | V |
| V _{OUT1/2} | Output Voltage to Ground | -0.3 ≤ V ≤ 22 | V |
| P _D | Power Dissipation | SO8 | 400 |
| | | DIP8 | 1000 |
| T _{ST} | Storage Temperature | -65 to 150 | °C |
| T _{OP} | Operating Temperature | -40 to +125° | °C |
| V _{OP} | Operating Voltage | 4.5 to 20 | V |

■ Electrical Characteristics (All Output Voltage Versions & Channels)

Unless otherwise specified AP2006, V_{in}=12V, I_{LOAD} = 0.2A.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------------------|--|--|------|------|------|------|
| V _{CC} | Supply Voltage | | 4.5 | - | 22 | V |
| I _{B1/2} | Feedback Bias Current | V _{FB1/2} =1.23V(FB1,adj Version) | - | 100 | 1000 | nA |
| F _{OSC} | Oscillator Frequency | | 200 | 250 | 300 | KHz |
| V _{SAT2} | Saturation Voltage (V _{CC} -V _{OUT2}) | I _{OUT} =20mA(no external NPN or N-MOS) V _{FB1} =0V force driver on | - | 1.2 | - | V |
| DC | Max. Duty Cycle(ON) | V _{FB1} =0V force driver on | - | 100 | - | % |
| | Min. Duty Cycle(OFF) | V _{FB1} =12V force driver off | - | 0 | - | % |
| I _Q | Quiescent Current (V _{CC}) | V _{FB1/2} =12V force driver off | - | 6 | - | mA |
| V _{IL} | Shutdown Logic Input Threshold Voltage | Low (regulator OFF) | - | - | 0.2 | V |
| | | High (regulator ON) | 1.0 | - | - | |
| I _L | EN pin Input Current | V _{LOGIC} =0.5V (regulator OFF) | - | 20 | - | uA |
| I _{CL2} | Current Limit (OUT2) | V _{CC} =5V, V _{OUT2} =V _{FB2} =0V | 25 | - | - | mA |
| V _{FB1/2} | AP2006 OUT1 Feedback Voltage | 4.75V ≤ V _{CC1} ≤ 20V | 1.20 | 1.23 | 1.26 | V |
| | AP2006 OUT2 Feedback Voltage | 3.0V ≤ V _{CC2} ≤ 20V | 1.17 | 1.20 | 1.23 | |
| V _{UT} | Upper Threshold Voltage (V _{CC}) | I _{O(REF)} = 0.1mA T _A = 25°C | - | 4.3 | - | V |
| V _{LWT} | Lower Threshold Voltage (V _{CC}) | | - | 4.1 | - | V |
| V _{HT} | Hysteresis (V _{CC}) | | - | 200 | - | mV |
| V _{IT} | Input Threshold Voltage (SCP) | T _A = 25°C | 0.60 | 0.67 | 0.75 | V |
| V _{STB} | Standby Voltage (SCP) | No pull up | 100 | 130 | 160 | mV |
| V _{LT} | Latched Input Voltage (SCP) | No pull up | - | 50 | 100 | mV |
| I _{SCP} | Input (source) Current (SCP) | V _I = 0.7V, T _A = 25°C | -5 | -10 | -20 | μA |
| I _{LEAK} | Leakage current (OUT1) | FB=12V | - | - | 10 | μA |
| I _{DRV} | Sink Current (OUT1) | V _{IN} = 12V | - | 300 | - | mA |
| | Source Current (OUT1) | V _{IN} = 12V | - | 200 | - | mA |
| V _{SAT} | Output Saturation Voltage (OUT1) | I _O = 10 mA | - | 1.0 | 1.5 | V |
| I _{SC} | Short-circuit Output Current (OUT1) | V _O = 6V, V _{FB} =12V | - | 120 | - | mA |
| V _{SS} | Soft-start Voltage | | - | 2.4 | - | V |
| I _{SS} | Constant Charge Current | | - | 10 | - | μA |

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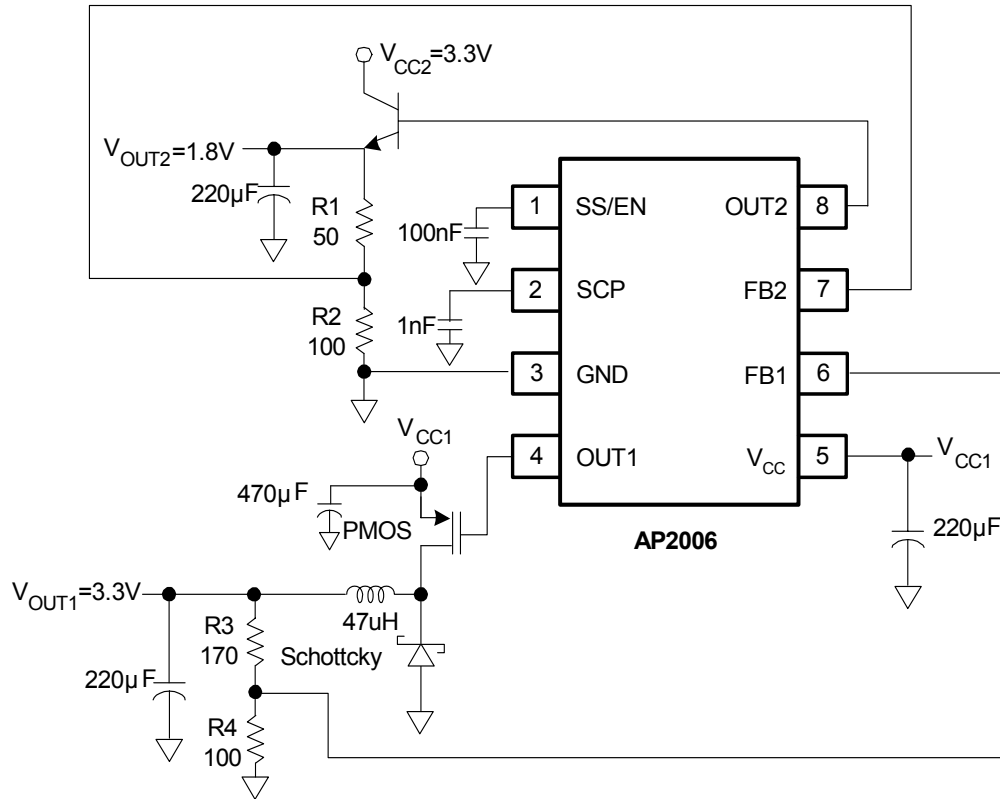


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■ Typical Application Circuit

(1) V_{OUT2} Drive NPN



$$\text{AP2006} \Rightarrow V_{OUT1} = 1.25 * (1 + R3/R4)$$
$$V_{OUT2} = 1.25 * (1 + R1/R2)$$

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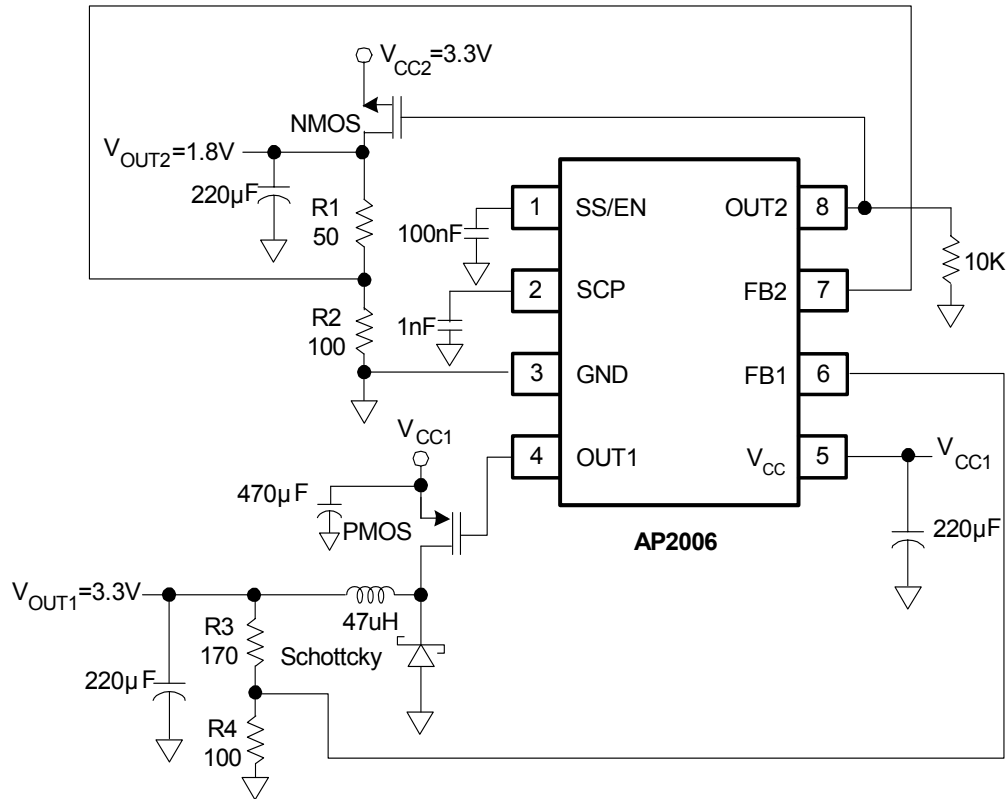


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■ Typical Application Circuit (Continued)

(2) V_{OUT2} Drive NMOS



$$\text{AP2006} \Rightarrow V_{OUT1} = 1.25 * (1 + R3/R4)$$
$$V_{OUT2} = 1.25 * (1 + R1/R2)$$

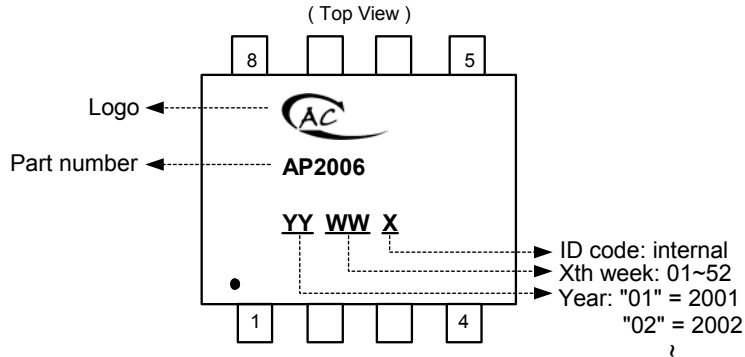
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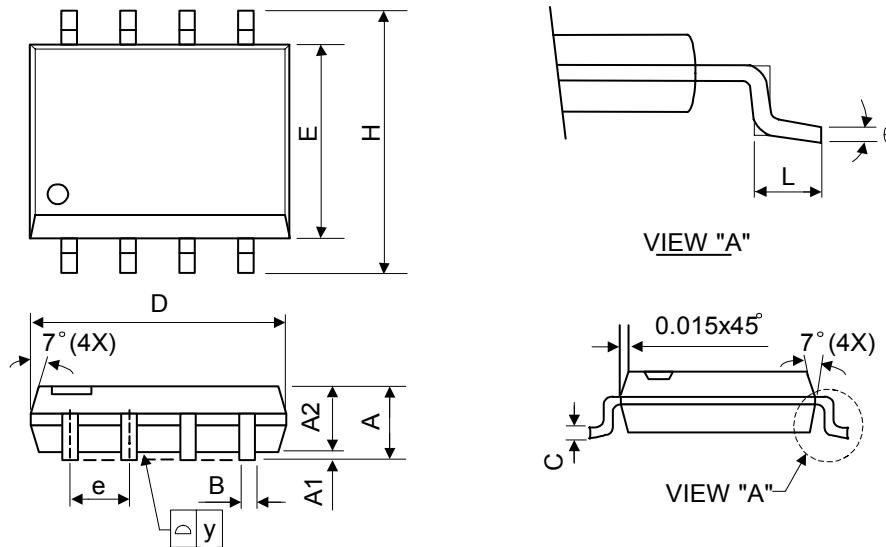
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■ Marking Information



■ Package Information

(1) SOP-8L



| Symbol | Dimensions In Millimeters | | | Dimensions In Inches | | |
|--------|---------------------------|------|------|----------------------|-------|-------|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | 1.40 | 1.60 | 1.75 | 0.055 | 0.063 | 0.069 |
| A1 | 0.10 | - | 0.25 | 0.040 | - | 0.100 |
| A2 | 1.30 | 1.45 | 1.50 | 0.051 | 0.057 | 0.059 |
| B | 0.33 | 0.41 | 0.51 | 0.013 | 0.016 | 0.020 |
| C | 0.19 | 0.20 | 0.25 | 0.0075 | 0.008 | 0.010 |
| D | 4.80 | 5.05 | 5.30 | 0.189 | 0.199 | 0.209 |
| E | 3.70 | 3.90 | 4.10 | 0.146 | 0.154 | 0.161 |
| e | - | 1.27 | - | - | 0.050 | - |
| H | 5.79 | 5.99 | 6.20 | 0.228 | 0.236 | 0.244 |
| L | 0.38 | 0.71 | 1.27 | 0.015 | 0.028 | 0.050 |
| y | - | - | 0.10 | - | - | 0.004 |
| θ | 0° | - | 8° | 0° | - | 8° |

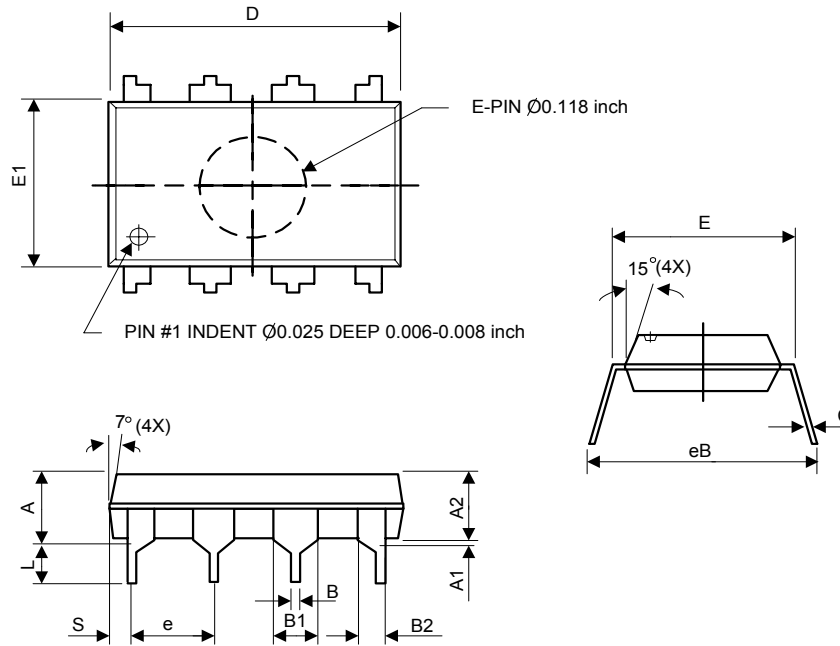
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(2) DIP-8L



| Symbol | Dimensions in millimeters | | | Dimensions in inches | | |
|--------|---------------------------|------|------|----------------------|-------|-------|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | - | - | 5.33 | - | - | 0.210 |
| A1 | 0.38 | - | - | 0.015 | - | - |
| A2 | 3.1 | 3.30 | 3.5 | 0.122 | 0.130 | 0.138 |
| B | 0.36 | 0.46 | 0.56 | 0.014 | 0.018 | 0.022 |
| B1 | 1.4 | 1.52 | 1.65 | 0.055 | 0.060 | 0.065 |
| B2 | 0.81 | 0.99 | 1.14 | 0.032 | 0.039 | 0.045 |
| C | 0.20 | 0.25 | 0.36 | 0.008 | 0.010 | 0.014 |
| D | 9.02 | 9.27 | 9.53 | 0.355 | 0.365 | 0.375 |
| E | 7.62 | 7.94 | 8.26 | 0.300 | 0.313 | 0.325 |
| E1 | 6.15 | 6.35 | 6.55 | 0.242 | 0.250 | 0.258 |
| e | - | 2.54 | - | - | 0.100 | - |
| L | 2.92 | 3.3 | 3.81 | 0.115 | 0.130 | 0.150 |
| eB | 8.38 | 8.89 | 9.40 | 0.330 | 0.350 | 0.370 |
| S | 0.71 | 0.84 | 0.97 | 0.028 | 0.033 | 0.038 |