

PWM/PFM Dual Mode Step-up DC/DC Converter

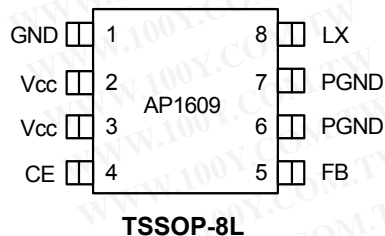
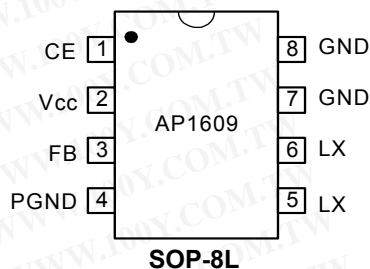
■ Features

- Input Voltage Range: 2.5~6V
- Output Voltage Range: 3.0~17V ($\pm 2.5\%$)
- PWM/PFM Switching Control
- Oscillator Frequency: 300kHz ($\pm 20\%$)
- High Efficiency: 91% (Typ.)
- Stand-by Current: $I_{STB} = 1\mu A$. (Typ.)
- Built-in internal N-Channel MOS
- **Pb-Free** Package: SOP-8L/TSSOP-8L

■ Applications

- Electronic Information Organizers
- Palmtops
- Cellular and portable phones
- Portable Audio Systems
- Various Multi-function Power Supplies

■ Pin Assignment



■ General Descriptions

The AP1609 is high efficient step-up DC/DC converter. Large output current is possible having a built in internal N channel MOSFET, and using an external coil and diode.

Output voltage is programmable with 1.23V of standard voltage supply internal, and using externally connected components, output voltage (FB) can be set up at will.

With a 300kHz switching frequency, the size of the external components can be reduced.

Control switches from PFM to PWM during light loads with the AP1609 (PWM/PFM switchable) and the series is highly efficient from light loads to large output currents.

During stand-by time (CE pin "Low"), current consumption is reduced to $1\mu A$.

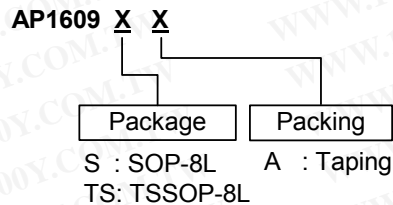
■ Pin Descriptions

| Pin Name | Pin No. | | Description |
|----------|---------|-------|--|
| | SOP | TSSOP | |
| FB | 3 | 5 | Feedback pin |
| CE | 1 | 4 | Chip Enable: H: Enable L: Disable |
| Vcc | 2 | 2、3 | IC signal power supply pin |
| PGND | 4 | 6、7 | Power MOSFET GND |
| LX | 5、6 | 8 | Switch Pin. Connect external inductor/diode here. Minimize trace area at this pin to reduce EMI. |
| GND | 7、8 | 1 | GND Pin |

勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-54151736
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

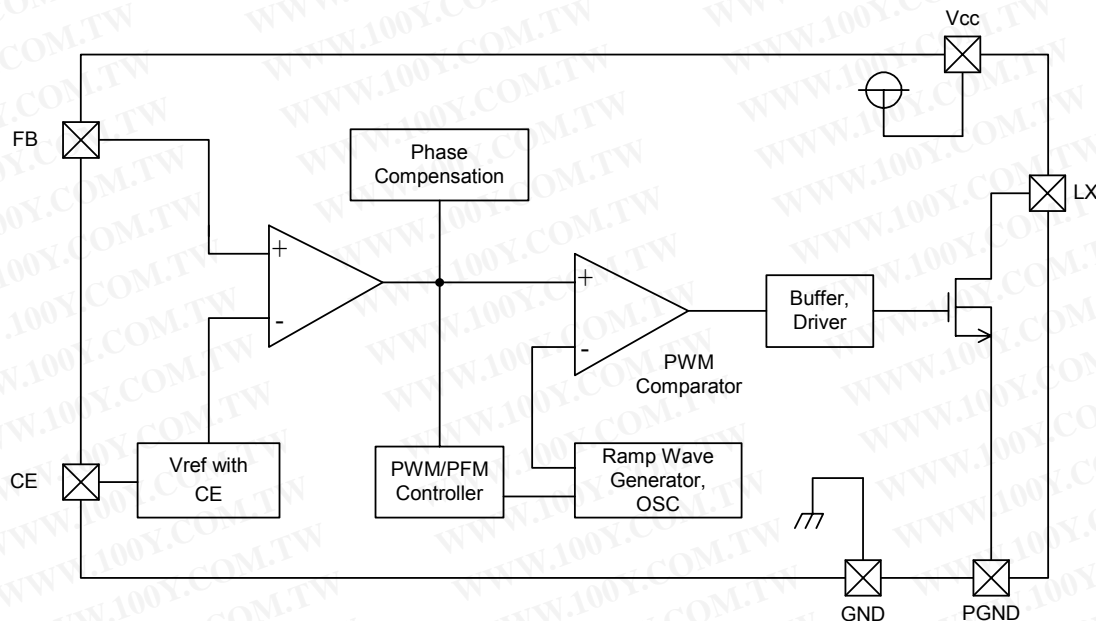
PWM/PFM Dual Mode Step-up DC/DC Converter

Ordering Information



勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-54151736
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

Block Diagrams



Absolute Maximum Ratings

| Parameter | Symbol | Ratings | | Units |
|------------------------------------|-----------|---------------------|------|-------|
| V_{IN} Pin Voltage | V_{CC} | -0.3 ~ 7 | | V |
| FB Pin Voltage | V_{FB} | -0.3 ~ $V_{CC}+0.3$ | | V |
| CE Pin Voltage | V_{CE} | -0.3 ~ $V_{CC}+0.3$ | | V |
| Switch Voltage (LX to GND) | V_{SW} | -0.3 ~ 18 | | V |
| Switch Current | I_{LX} | -2.2 ~ 0.2 | | A |
| Continuous Total Power Dissipation | Pd | SOP-8L | 1200 | mW |
| | | TSSOP-8L | 700 | |
| Operating Ambient Temperature | T_{opr} | -20 ~ +80 | | °C |
| Storage Temperature | T_{stg} | -20 ~ +125 | | °C |

Ta=25°C



PWM/PFM Dual Mode Step-up DC/DC Converter

■ Electrical Characteristics

AP1609

(F_{OSC} = 300kHz, V_{OUT} = 5V)T_a = 25 °C

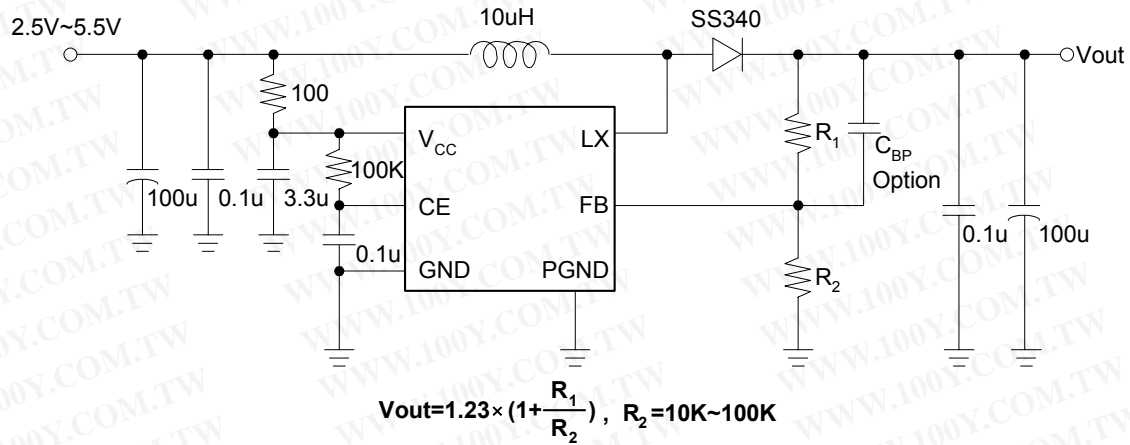
| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|----------------------------------|---------------------|---|------|------|------|------------------|
| FB Voltage | V _{FB} | | 1.20 | 1.23 | 1.26 | V |
| Input Voltage | V _{CC} | | 2.5 | - | 6 | V |
| Output Voltage | V _{OUT} | | 3.0 | - | 17 | V |
| Maximum Switching Output Current | I _{OUT} | | 2.4 | - | - | A |
| Drain-Source On-state Resistance | R _{DS(ON)} | I _D = 2.4A | - | 100 | - | mΩ |
| Quiescent Current | I _{CCQ} | No load, FB=2V, CE=High | - | 80 | 130 | μA |
| Shutdown Current | I _{SD} | No load, CE=Low | - | 1 | - | μA |
| Oscillator Frequency | F _{OSC} | Measuring of EXT waveform, V _{IN} = output voltage + 0.3V | 240 | 300 | 360 | kHz |
| Maximum Duty Ratio | MAXDTY | | 80 | - | - | % |
| PFM Duty Ratio | PFMDTY | No load | 15 | 25 | 35 | % |
| CE "High" Voltage | V _{CEH} | No external components, V _{FB} = 0V, apply 0.65V _{CC} (min.) to CE, Chip enable | 0.65 | - | - | *V _{CC} |
| CE "Low" Voltage | V _{CEL} | Same as V _{CEH} , Chip disable | - | - | 0.20 | *V _{CC} |
| Efficiency | EFFI | | - | 91 | - | % |

勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-54151736
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

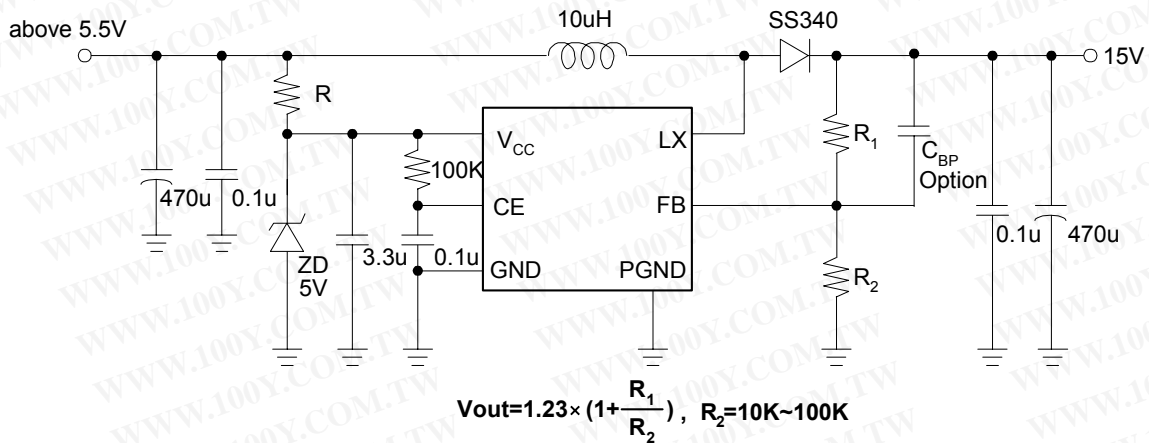
PWM/PFM Dual Mode Step-up DC/DC Converter

■ Typical Application Circuit

(1) Normal Circuit



(2) HV Circuit

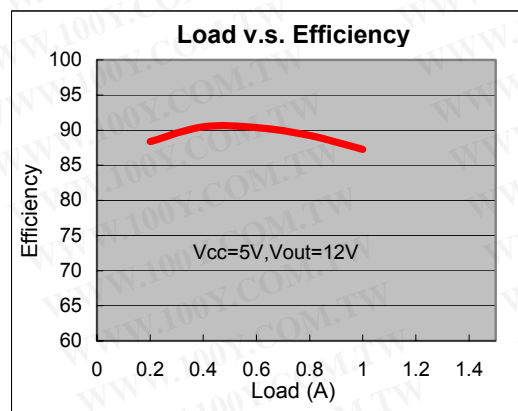
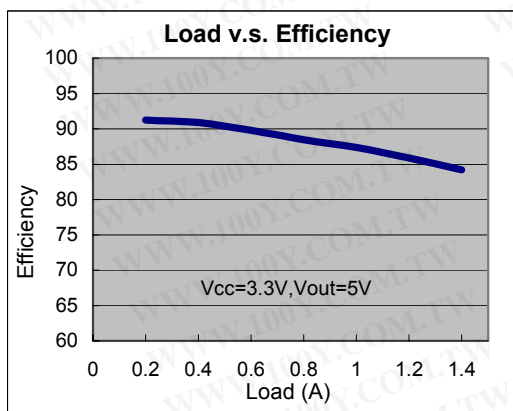
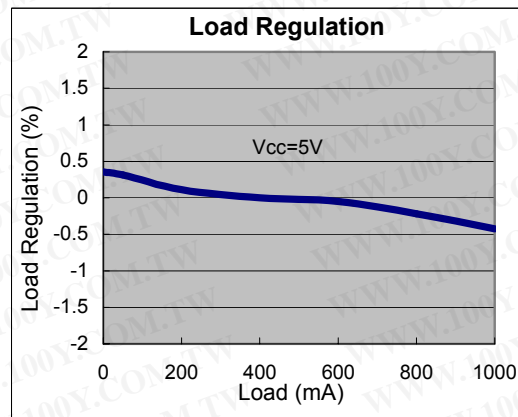
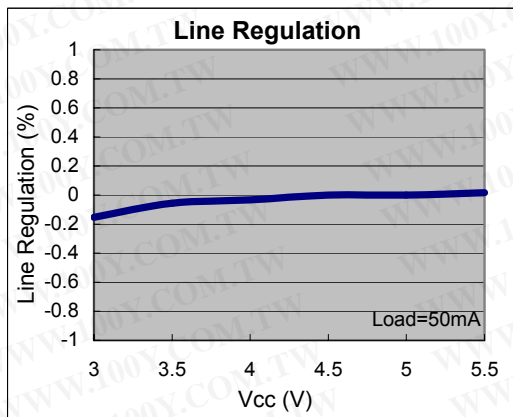
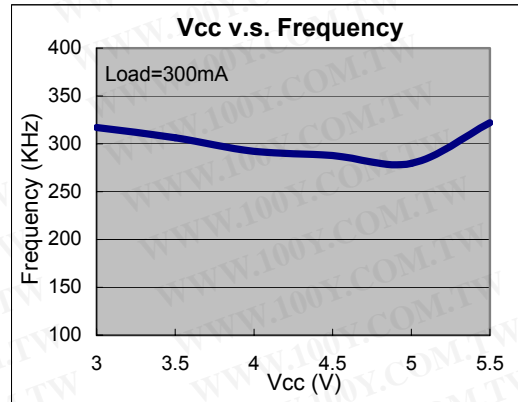
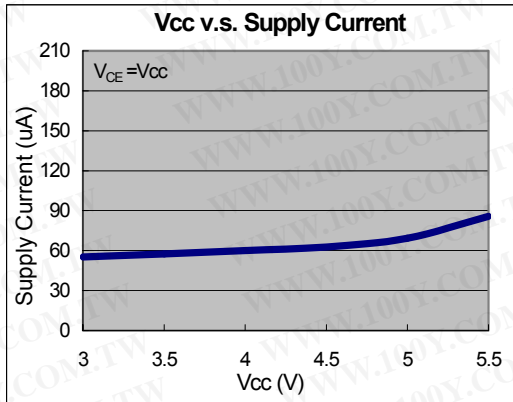


勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-54151736
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)



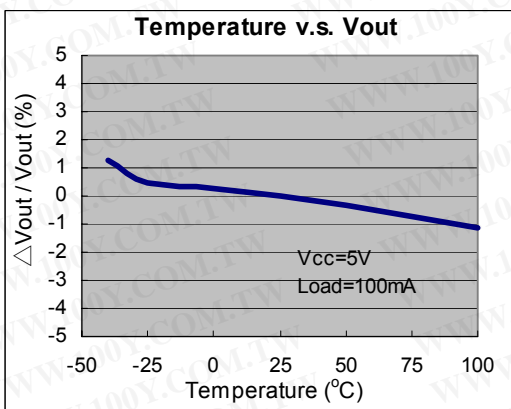
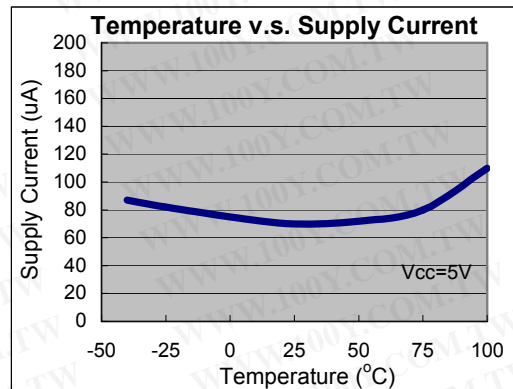
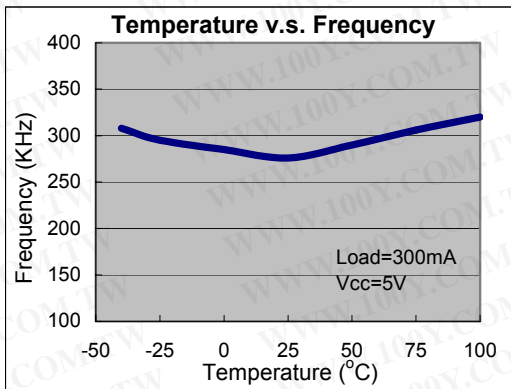
PWM/PFM Dual Mode Step-up DC/DC Converter

Typical Performance Characteristics



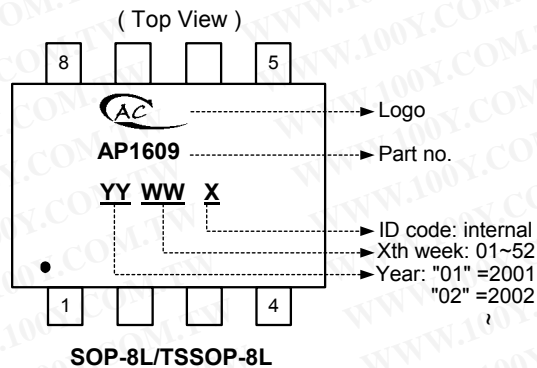
PWM/PFM Dual Mode Step-up DC/DC Converter

■ Typical Performance Characteristics (Continued)



勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-54151736
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

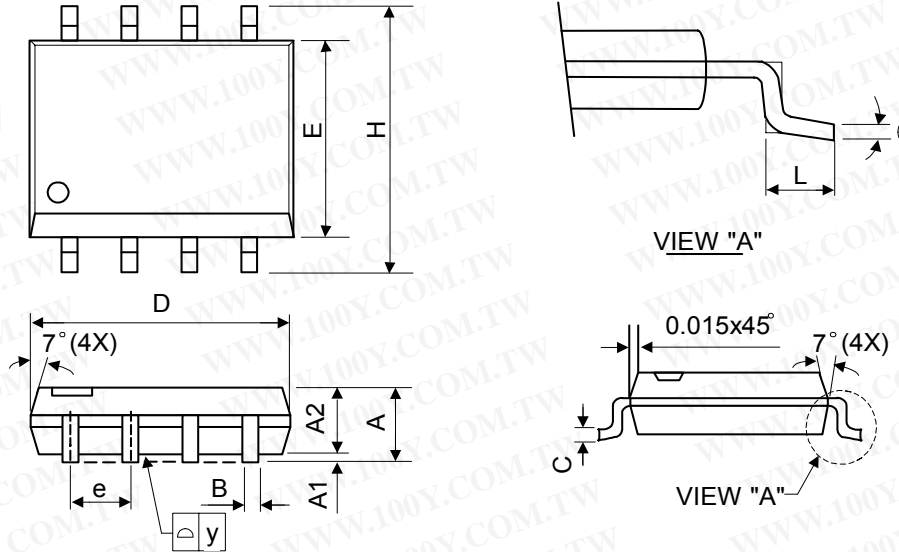
■ Marking Information



PWM/PFM Dual Mode Step-up DC/DC Converter

■ Package Information

(1) Package Type: 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 | 0.162 |
| 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° |

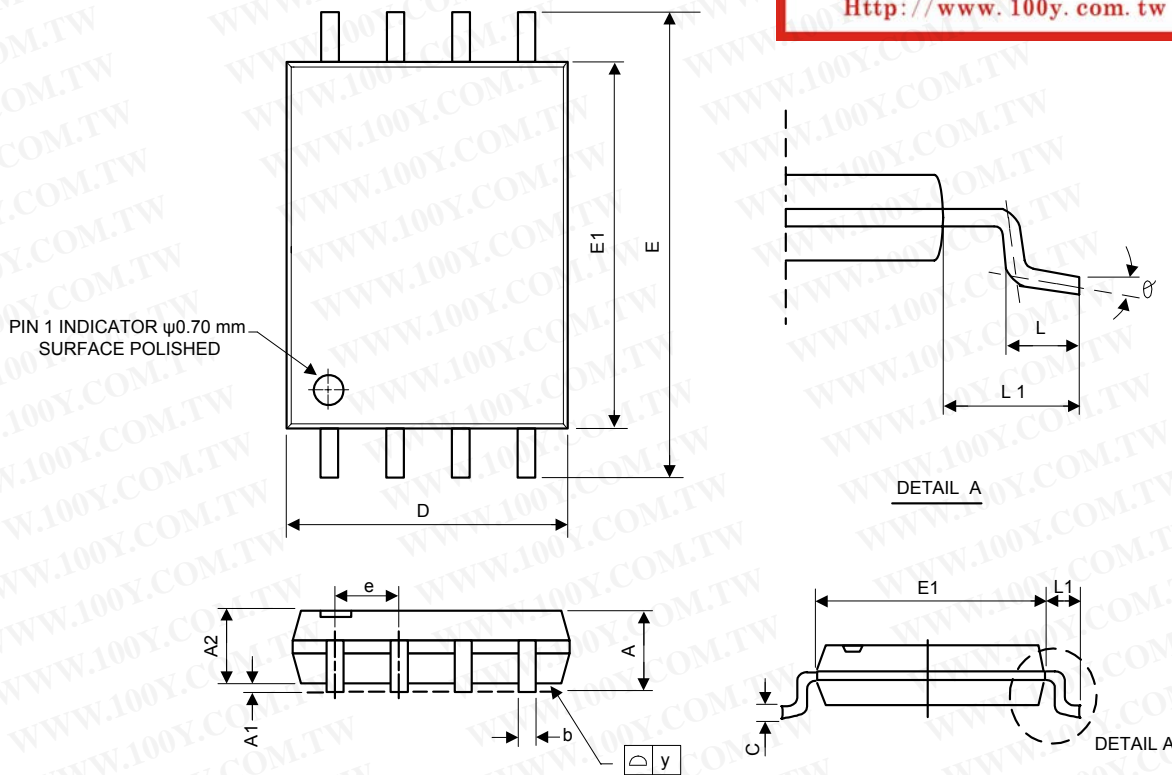
勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-54151736
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

PWM/PFM Dual Mode Step-up DC/DC Converter

■ Package Information (Continued)

(2) Package Type: TSSOP-8L

勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-54151736
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)



| Symbol | Dimensions In Millimeters | | | Dimensions In Inches | | |
|--------|---------------------------|------|------|----------------------|-------|-------|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | 1.05 | 1.10 | 1.20 | 0.041 | 0.043 | 0.047 |
| A1 | 0.05 | 0.10 | 0.15 | 0.002 | 0.004 | 0.006 |
| A2 | - | 1.00 | 1.05 | - | 0.039 | 0.041 |
| b | 0.20 | 0.25 | 0.28 | 0.008 | 0.01 | 0.011 |
| C | - | 0.13 | - | - | 0.005 | - |
| D | 2.90 | 3.05 | 3.10 | 0.114 | 0.12 | 0.122 |
| E | 6.20 | 6.40 | 6.60 | 0.244 | 0.252 | 0.26 |
| E1 | 4.30 | 4.40 | 4.50 | 0.169 | 0.173 | 0.177 |
| e | - | 0.65 | - | - | 0.026 | - |
| L | 0.50 | 0.60 | 0.70 | 0.02 | 0.024 | 0.028 |
| L1 | 0.90 | 1.00 | 1.10 | 0.035 | 0.039 | 0.043 |
| y | - | - | 0.10 | - | - | 0.004 |
| θ | 0° | 4° | 8° | 0° | 4° | 8° |