

Features

- Input voltage range: 2.2V~5.5V (V_{OUT} type)
- Oscillator frequency: 600KHz (Typ.)
- Internal reference: 1.0V (Typ.)
- High efficiency: 93% (Typ.)
- Stand-by capability: $I_{STB}=2\mu A$. (Typ.)
- Soft-start time set-up externally type possible
- Current limit and thermal shutdown protection
- Packages: SOT25-5L, SON-6L (3×3×0.8mm)
- Lead Free Finish/RoHS Compliant for Lead Free and "Green" products (Note 1)
- SOT25-5L: Available in "Green" Molding Compound (No Br, Sb)

General Description

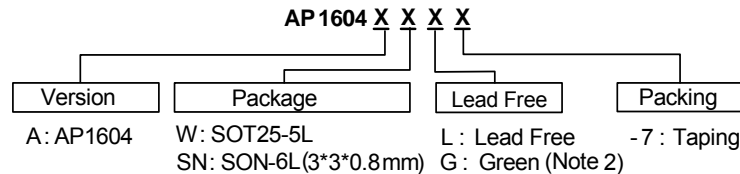
The AP1604 series are multi-functional step-down DC/DC converters with built-in speed, low ON resistance drivers. It is capable of delivering more than 800mA output current with external coil, diode and capacitor.

Output voltage is set-up by the external resistors ($\pm 2.5\%$ accuracy). The 600KHz AP1604 that can work out with small value external components comes out more compact board.

The device switches to and works under PFM mode with light loads. It remains at high efficiency for both light loads and large output current.

AP1604 can be soft-started with a proper capacitor connected between CE/SS pin and ground. The stand-by current is less than 2uA when CE/SS pin is at "LOW" status. The device is forced to switch off as the voltage at that pin is lower than the stipulated voltage.

Ordering Information



- Notes: 1. RoHS revision 13.2.2003. Glass and High Temperature Solder Exemptions Applied, see *EU Directive Annex Notes 5 and 7*.
2. Green is for SOT25-5L.

| Device (Note 3) | Package Code | Packaging | 7" Tape and Reel | |
|-----------------|--------------|-----------|------------------|--------------------|
| | | | Quantity | Part Number Suffix |
| AP1604W | W | SOT25-5L | 3000/Tape & Reel | -7 |
| AP1604SN | SN | SON-6L | 2500/Tape & Reel | -7 |

- Note: 3. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

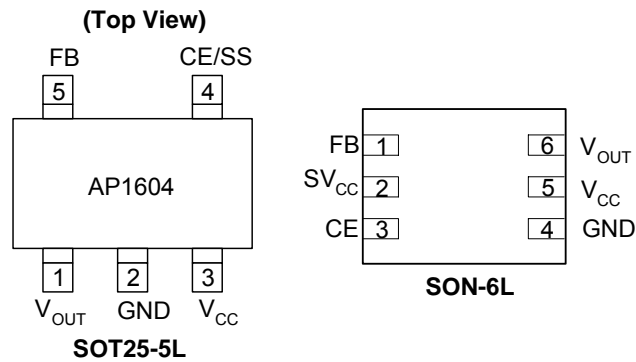
Applications

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

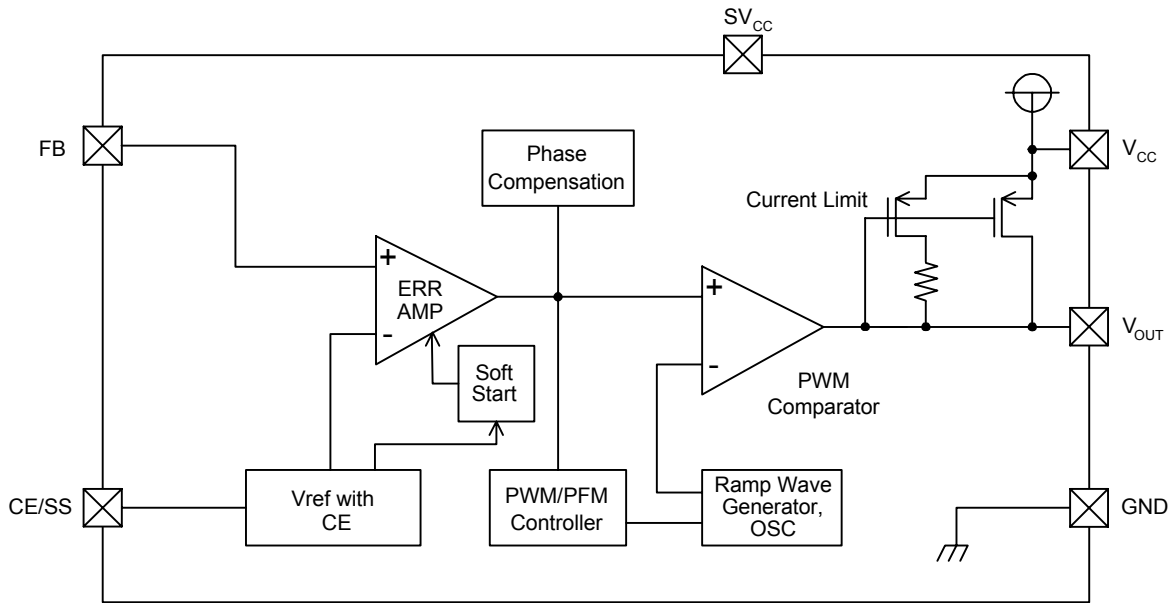
Pin Descriptions

| Pin Name | Function |
|------------------|---------------------------|
| V _{OUT} | Output Voltage |
| V _{CC} | Input Supply |
| GND | Ground |
| CE/SS | Chip Enable / Soft Start |
| FB | Feedback pin |
| SV _{CC} | Signal Power for SON only |

Pin Assignment



Block Diagram



Absolute Maximum Ratings $T_a=25^{\circ}\text{C}$

| Symbol | Parameter | Ratings | Units |
|------------------|------------------------------------|---------------------|--------------------|
| V_{CC}/SV_{CC} | V_{IN} Pin Voltage | -0.3 ~ 6.5 | V |
| V_{OUT} | V_{OUT} Pin Voltage | -0.3 ~ $V_{IN}+0.3$ | V |
| V_{FB} | FB Pin Voltage | -0.3 ~ $V_{IN}+0.3$ | V |
| $V_{CE/SS}$ | CE/SS Pin Voltage | -0.3 ~ $V_{IN}+0.3$ | V |
| P_d | Continuous Total Power Dissipation | Internal limited | |
| T_{opr} | Operating Ambient Temperature | -25 ~ +80 | $^{\circ}\text{C}$ |
| T_{stg} | Storage Temperature | -40 ~ +125 | $^{\circ}\text{C}$ |

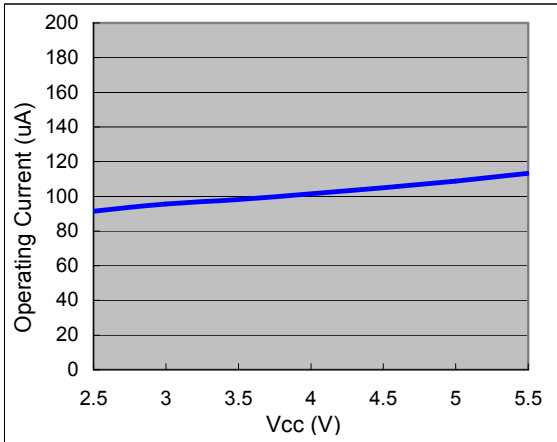
Electrical Characteristics

 $V_{IN} = 5V, V_{OUT} = 2V, \text{Load} = 300mA, T_a = 25^\circ C$

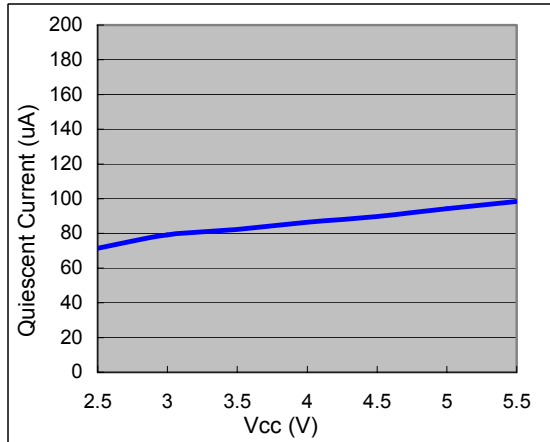
| Sym. | Parameter | Conditions | Min. | Typ. | Max. | Units |
|------------|---|--|-------|------|-------|------------|
| V_{FB} | FB | | 0.975 | 1.0 | 1.025 | V |
| V_{IN} | Input Voltage | | 2.2 | - | 5.5 | V |
| | Line Regulation | $V_{IN} = 2.2 \sim 5.5V, \text{Load} = 10mA$ | - | - | 0.12 | % |
| | Load Regulation | $I_{OUT} = 10 \sim 800mA$ | - | - | 1.2 | % |
| V_{UVLO} | UVLO Voltage (min. operating voltage) | V_{CC} , voltage required to maintain H at V_{OUT} | - | - | 2 | V |
| I_{CC} | Operating Current | CE/SS = V_{IN} , No Load | - | 100 | 150 | μA |
| I_{CCQ} | Supply Current | No external components, CE/SS = V_{IN} , $V_{FB} = 1.2V$ | - | 90 | 120 | μA |
| I_{STB} | Stand-by Current | No external components, CE/SS = 0V, $V_{FB} = 0V$ | - | 2 | - | μA |
| I_{CL} | Current Limit | peak current $V_{IN} = 5V, V_{OUT} = 2V$ | 800 | 1000 | 1200 | mA |
| Fosc | Oscillator Frequency | Load = 300mA, $V_{IN} = 5V, V_{OUT} = 2V$ | 500 | 600 | 700 | kHz |
| MAXDTY | Maximum Duty Ratio | | 85 | 90 | - | % |
| PFMDTY | PFM Duty Ratio | No load | 15 | 25 | 35 | % |
| V_{CEH} | CE/SS "High" Voltage | Apply 1.4V (min.) to CE/SS, determine V_{OUT} "High" | 1.4 | - | - | V |
| V_{CEL} | CE/SS "Low" Voltage | Same as V_{CEH} , determine V_{OUT} "Low" | - | - | 0.6 | V |
| EFF1 | Efficiency | $V_{CC} = 5V, V_{OUT} = 3.3V, \text{Load} = 300mA$ | - | 93 | - | % |
| Rdson | Rdson Condition | $I_{OUT} = 300mA, V_{IN} = 5V, V_{OUT} = 2V$ | - | 350 | 450 | m Ω |

Typical Performance Characteristics

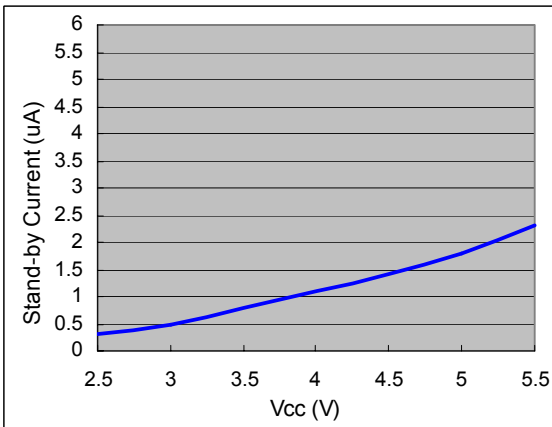
Vcc vs. Operating Current



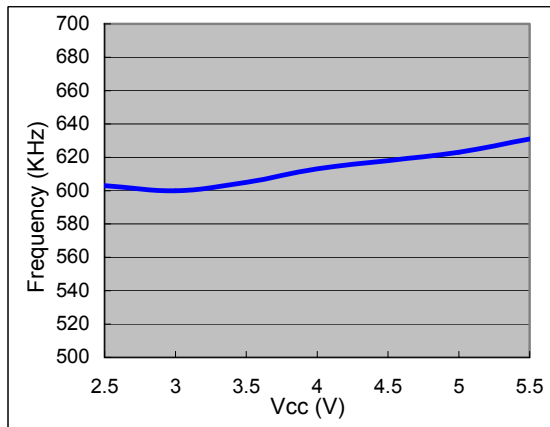
Vcc vs. Quiescent Current



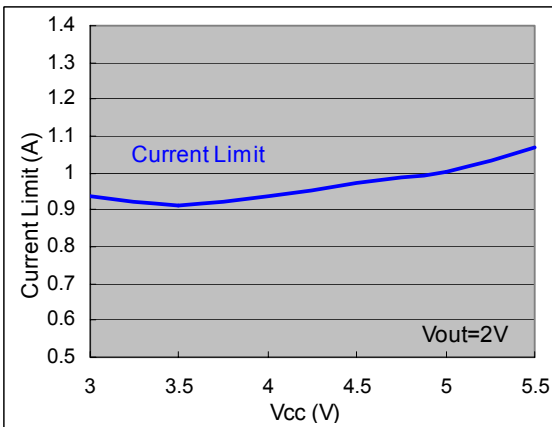
Vcc vs. Stand-by Current



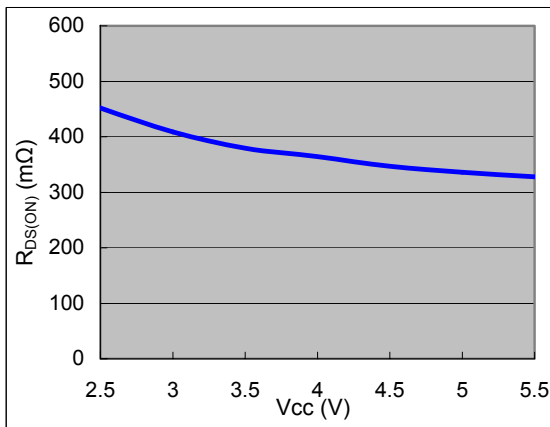
Vcc vs. Frequency



Vcc vs. Current Limit

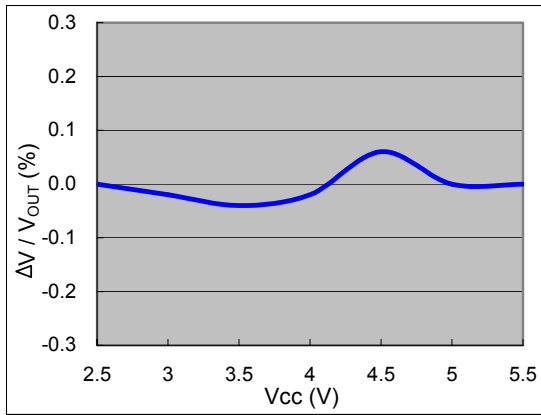


Vcc vs. R_{DS(ON)}

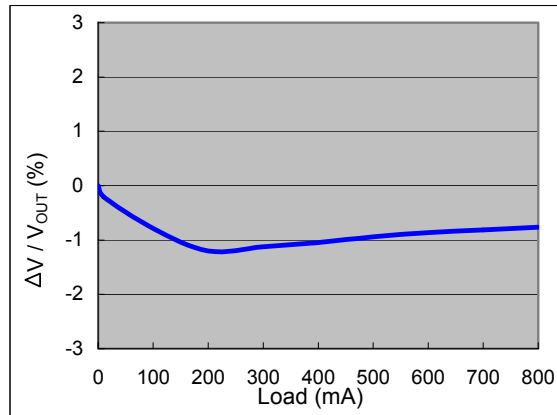


Typical Performance Characteristics (Continued)

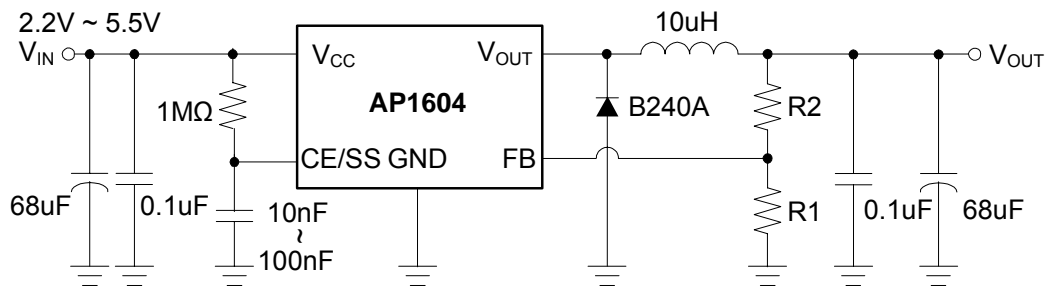
Line Regulation



Load Regulation



Typical Application Circuit

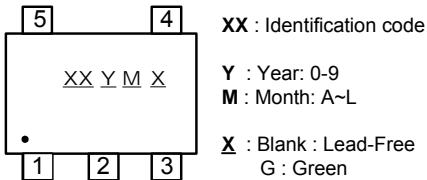


$$V_{out} = 1 \times \left(1 + \frac{R2}{R1}\right)$$

$$R1 = 100K \sim 200K$$

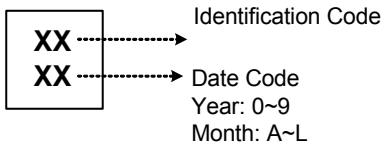
Marking Information

(1) SOT25-5L



| Part Number | Package | Identification Code |
|-------------|----------|---------------------|
| AP1604W | SOT25-5L | ER |

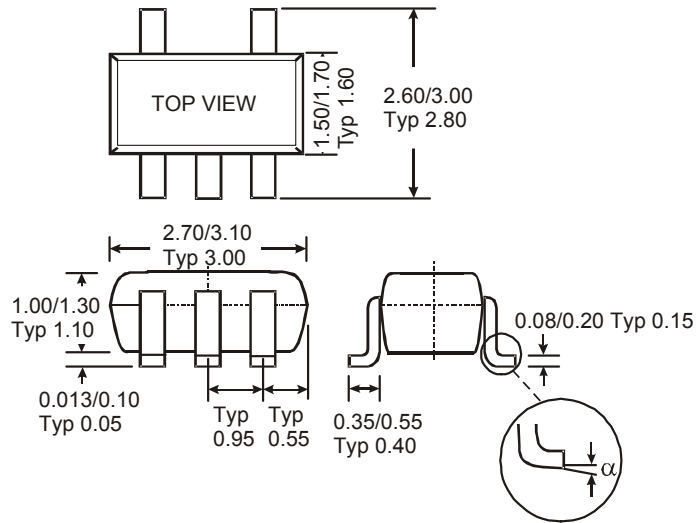
(2) SON-6L (3*3*0.8mm)



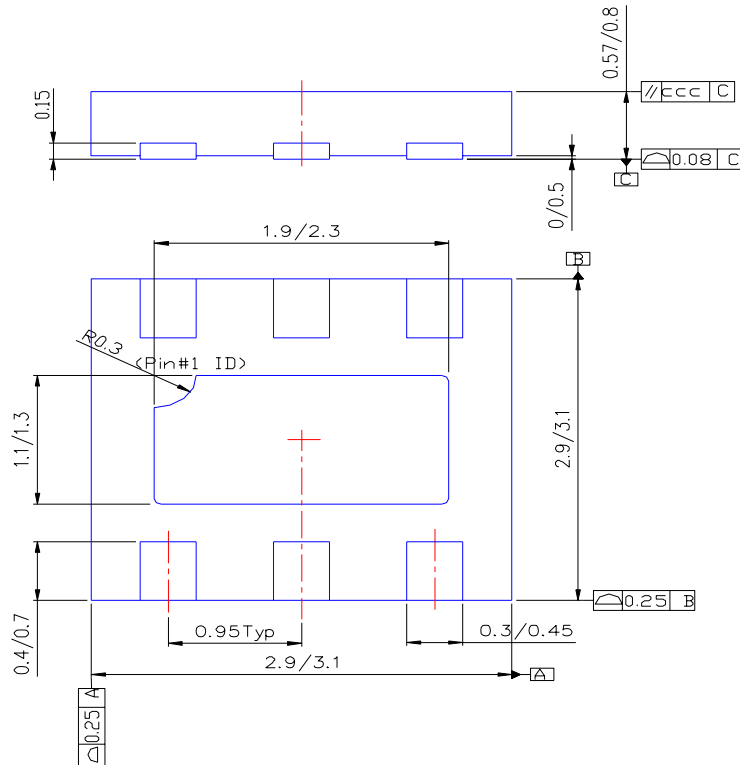
| Part Number | Package | Identification Code |
|-------------|-----------------------|---------------------|
| AP1604SN | SON-6L (3*3*0.8mm) | S4 |

Package Information

(1) Package Type: SOT25-5L



(2) SON-6L (3×3×0.8mm)



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