

## 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

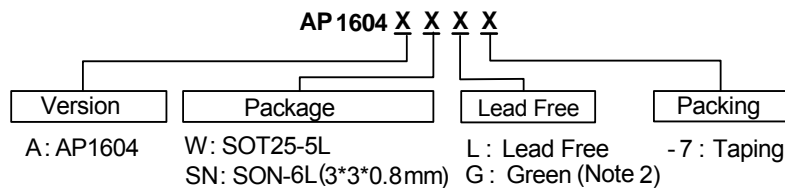
The AP1604 series are multi-functional step-down DC/DC converters with built-in speed, low ON resistance drivers. It is capable of delivering more than 800mA output current with external coil, diode and capacitor.

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>.

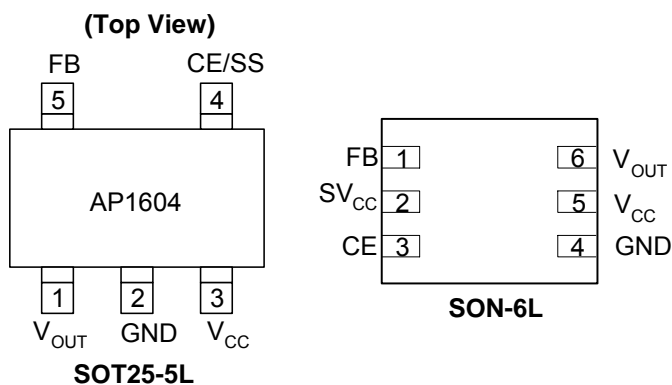
**Applications**

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

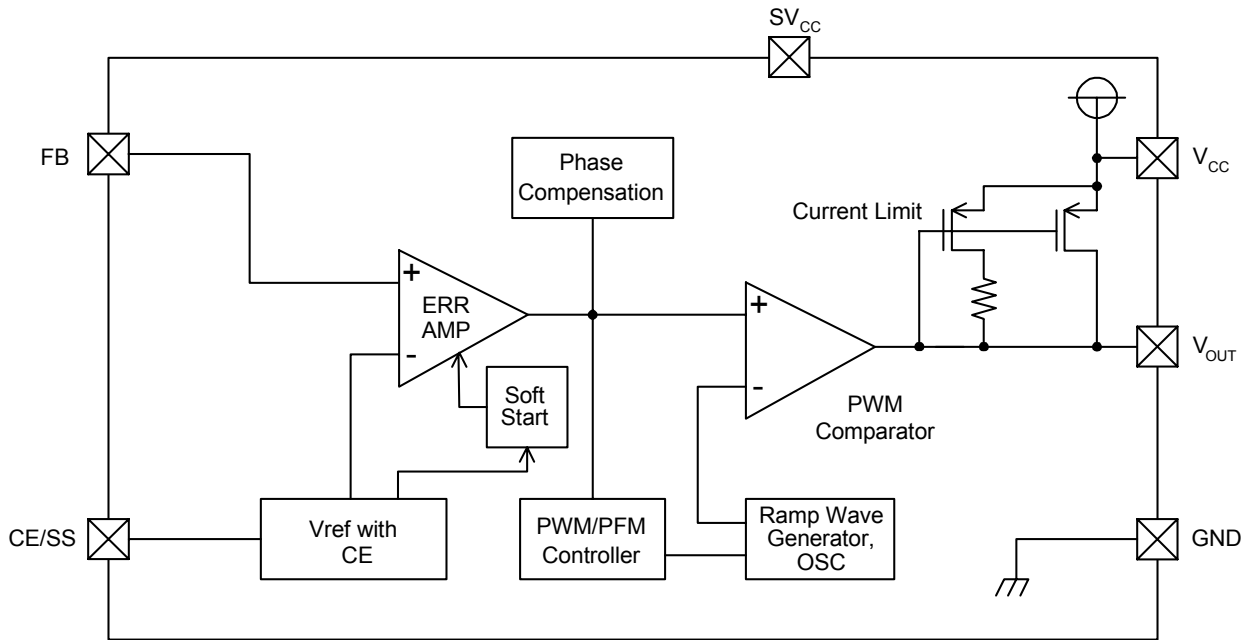
**Pin Descriptions**

Pin Name	Function
V <sub>OUT</sub>	Output Voltage
V <sub>CC</sub>	Input Supply
GND	Ground
CE/SS	Chip Enable / Soft Start
FB	Feedback pin
SV <sub>CC</sub>	Signal Power for SON only

**Pin Assignment**



**Block Diagram**



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

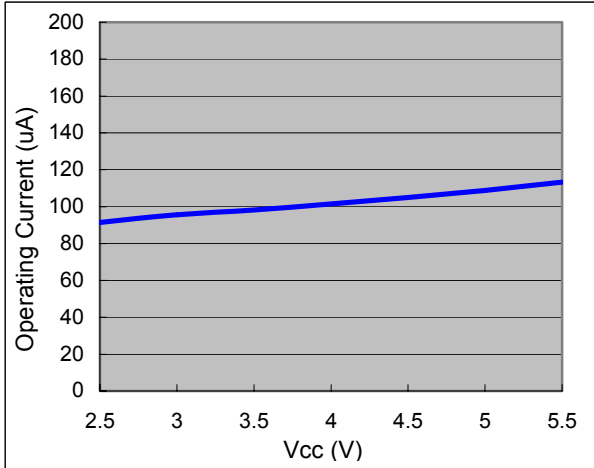
Symbol	Parameter	Ratings	Units
$V_{CC}/SV_{CC}$	$V_{IN}$ Pin Voltage	-0.3 ~ 6.5	V
$V_{OUT}$	$V_{OUT}$ Pin Voltage	-0.3 ~ $V_{IN}+0.3$	V
$V_{FB}$	FB Pin Voltage	-0.3 ~ $V_{IN}+0.3$	V
$V_{CE/SS}$	CE/SS Pin Voltage	-0.3 ~ $V_{IN}+0.3$	V
$P_d$	Continuous Total Power Dissipation	Internal limited	
$T_{opr}$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

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

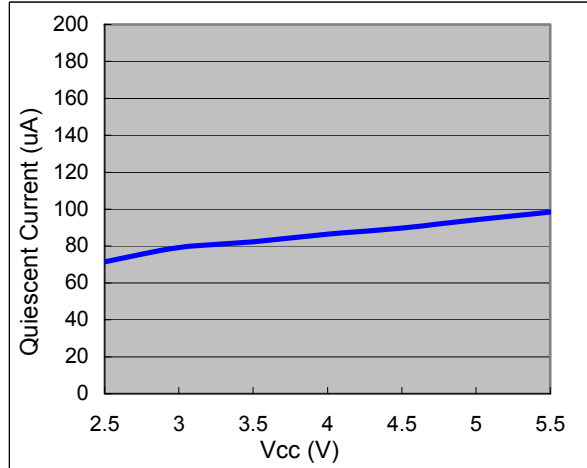
Sym.	Parameter	Conditions	Min.	Typ.	Max.	Units
$V_{FB}$	FB		0.975	1.0	1.025	V
$V_{IN}$	Input Voltage		2.2	-	5.5	V
	Line Regulation	$V_{IN} = 2.2 \sim 5.5V, \text{Load} = 10mA$	-	-	0.12	%
	Load Regulation	$I_{OUT} = 10 \sim 800mA$	-	-	1.2	%
$V_{UVLO}$	UVLO Voltage ( min. operating voltage )	$V_{CC}$ , voltage required to maintain H at $V_{OUT}$	-	-	2	V
$I_{CC}$	Operating Current	CE/SS = $V_{IN}$ , No Load	-	100	150	$\mu A$
$I_{CCQ}$	Supply Current	No external components, CE/SS = $V_{IN}$ , $V_{FB} = 1.2V$	-	90	120	$\mu A$
$I_{STB}$	Stand-by Current	No external components, CE/SS = 0V, $V_{FB} = 0V$	-	2	-	$\mu A$
$I_{CL}$	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
EFFI	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 $\Omega$

**Typical Performance Characteristics**

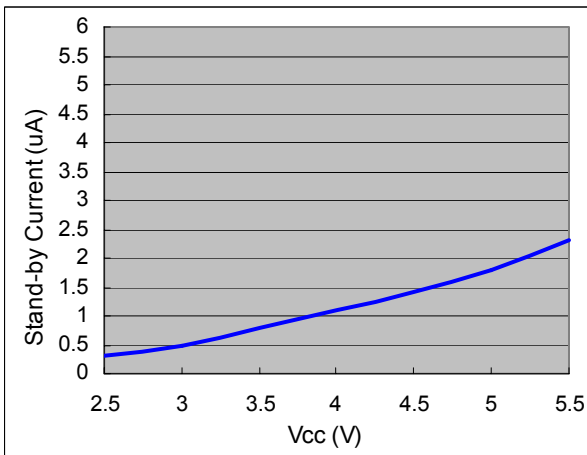
**Vcc vs. Operating Current**



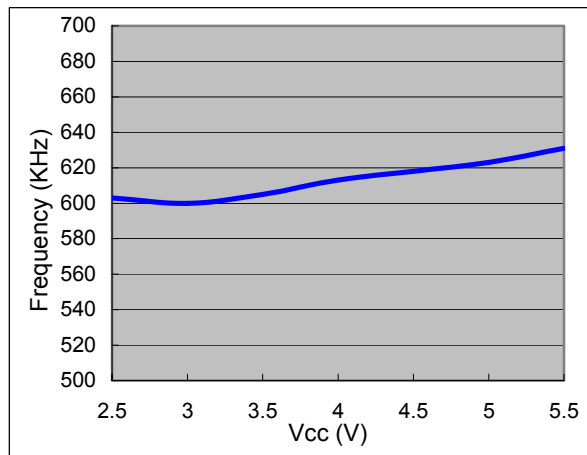
**Vcc vs. Quiescent Current**



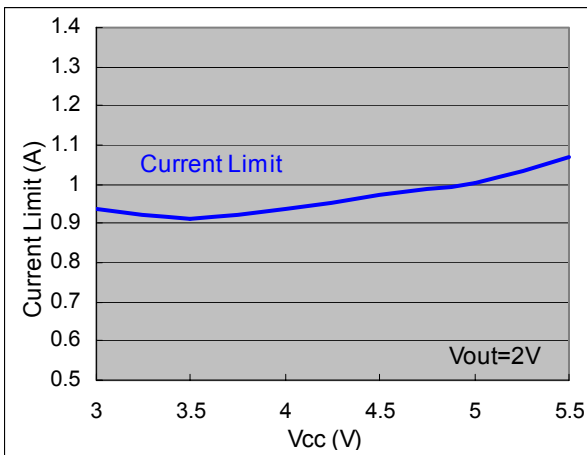
**Vcc vs. Stand-by Current**



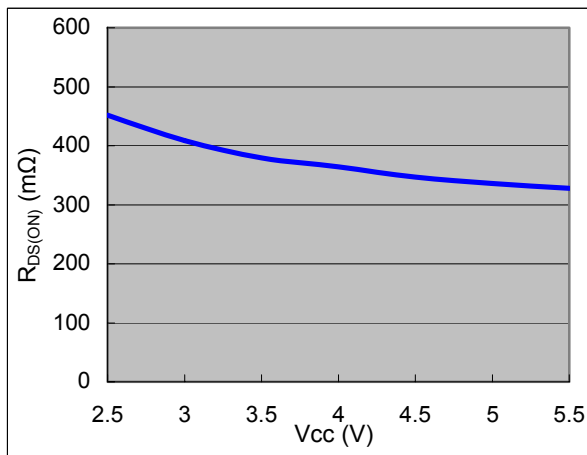
**Vcc vs. Frequency**



**Vcc vs. Current Limit**

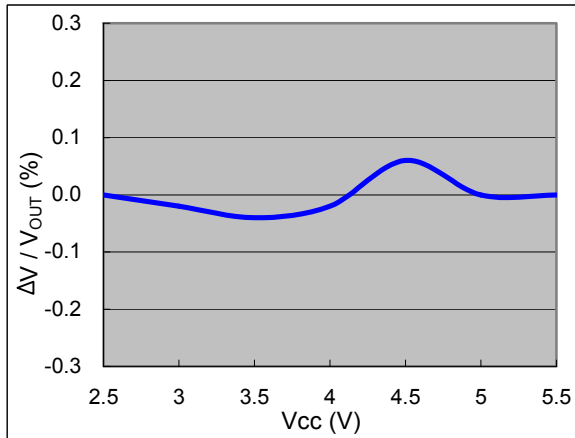


**Vcc vs. R<sub>DS(ON)</sub>**

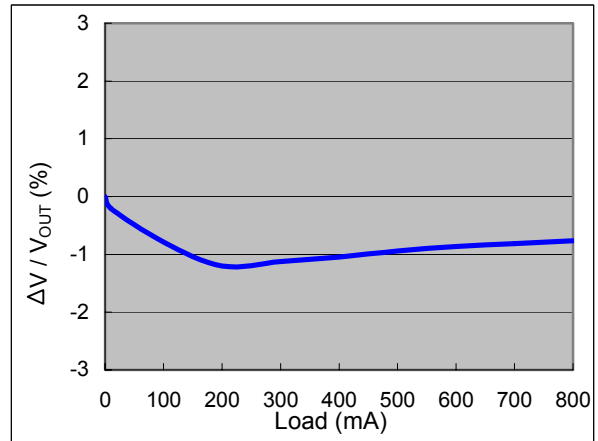


**Typical Performance Characteristics (Continued)**

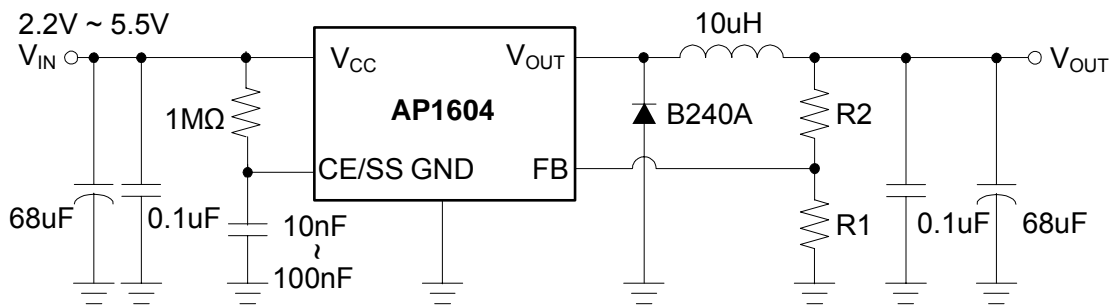
**Line Regulation**



**Load Regulation**



**Typical Application Circuit**

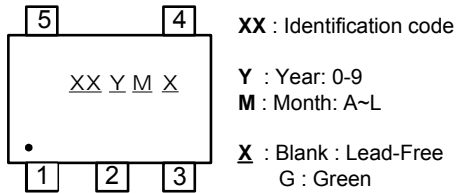


$$V_{out} = 1 \times \left( 1 + \frac{R2}{R1} \right)$$

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

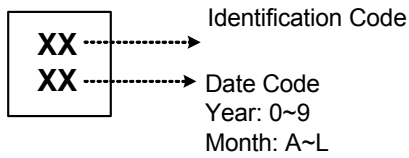
**Marking Information**

**(1) SOT25-5L**



Part Number	Package	Identification Code
AP1604W	SOT25-5L	ER

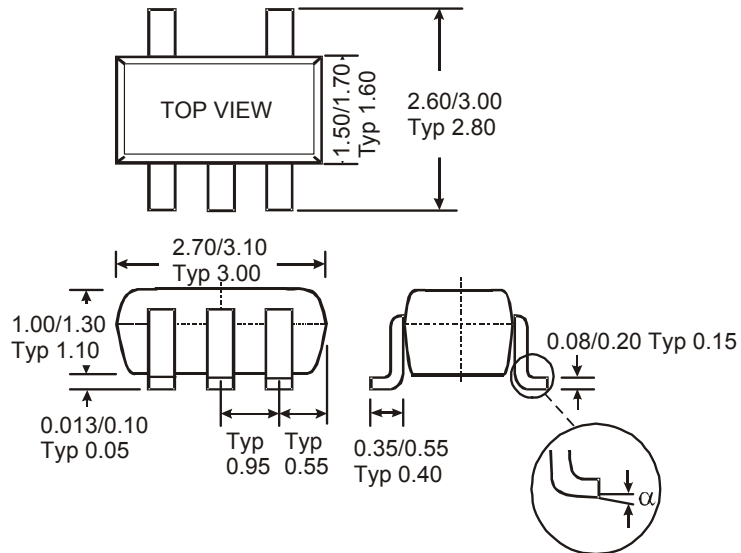
**(2) SON-6L (3\*3\*0.8mm)**



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

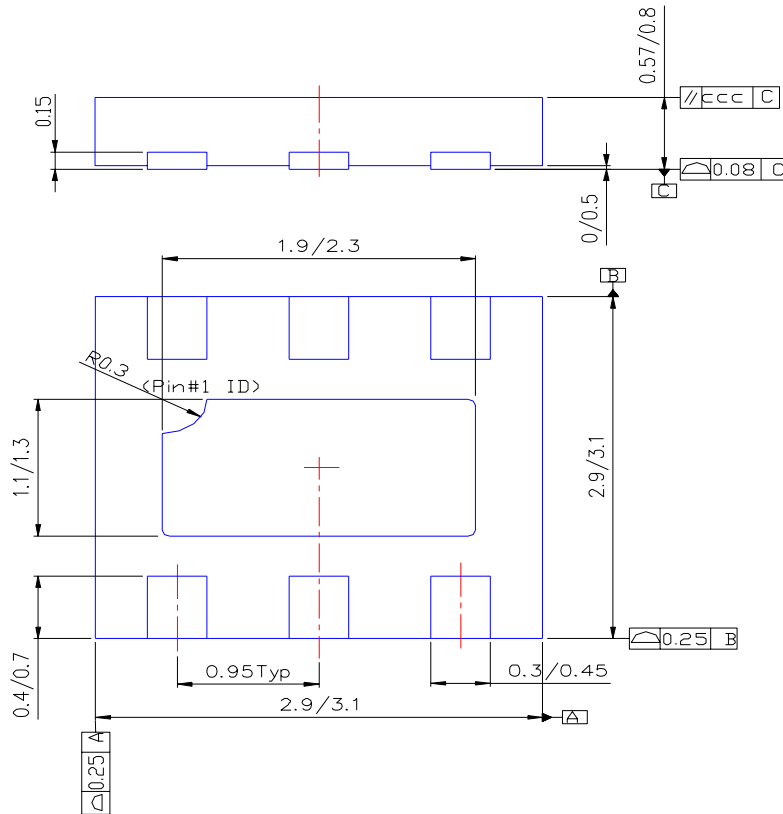
**Package Information**

**(1) Package Type: SOT25-5L**



**(2) SON-6L (3×3×0.8mm)**





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