

## Features

- Low current consumption:  
In operation: 100µA max.  
Power off: 2µA max.
- Input voltage: 2.5V to 7V  
Adjustable version ( $\pm 2.5\%$ )
- PWM/PFM dual Mode
- Oscillation frequency: 300KHz (Typ.)
- With a power-off function.
- Built-in internal SW P-channel MOS
- Lead Free package: SOP-8L
- SOP-8L: Available in "Green" Molding Compound (No Br, Sb)
- Lead Free Finish/ RoHS Compliant (Note 1)

## General Description

AP1605 consists of CMOS step-down switching regulator with PWM/PFM dual mode control. These devices include a reference voltage source, oscillation circuit, error amplifier, internal PMOS and etc.

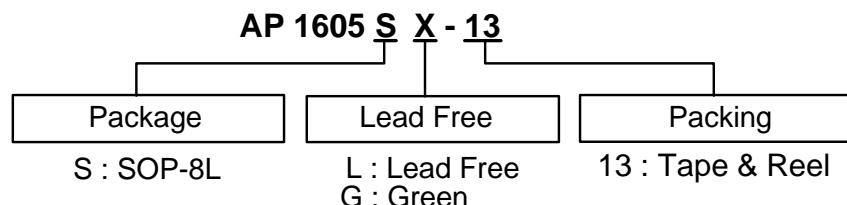
AP1605 provides low-ripple power, high efficiency, and excellent transient characteristics. The PWM/PFM control circuit is able to vary the duty ratio linearly 0%~0.25% (PFM) and 25%~100% (PWM).

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 of up to 7V, it is also ideal when operating via an AC adapter.

## Applications

- On-board power supply of battery devices for portable telephones, electronic notebooks, PDA, and other hand-held sets
- Power supplies for audio equipment, including portable CD players and headphone stereo equipment
- Fixed voltage power supply for cameras, video equipment and communications equipment
- Power supplies for microcomputers.
- Conversion from four Ni-H or Ni-Cd cells or two lithium-ion cells to 3.3V/3V
- Conversion of AC adapter input to 5V/3V

## Ordering Information



Device	Package Code	Packaging (Note 2)	13" Tape and Reel	
			Quantity	Part Number Suffix
AP1605SL-13	S	SOP-8L	2500/Tape & Reel	-13
AP1605SG-13	S	SOP-8L	2500/Tape & Reel	-13

Notes: 1. EU Directive 2002/95/EC (RoHS). All applicable RoHS exemptions applied. Please visit our website at [http://www.diodes.com/products/lead\\_free.html](http://www.diodes.com/products/lead_free.html).

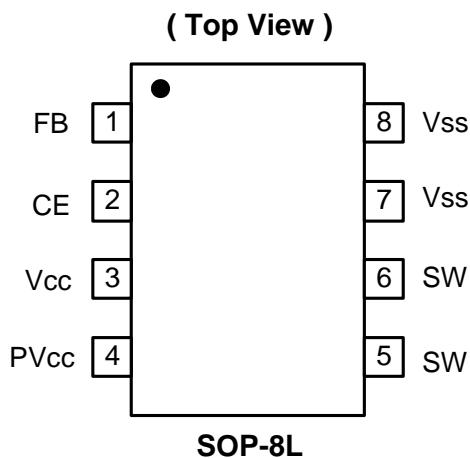
2. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.



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## Pin Assignments

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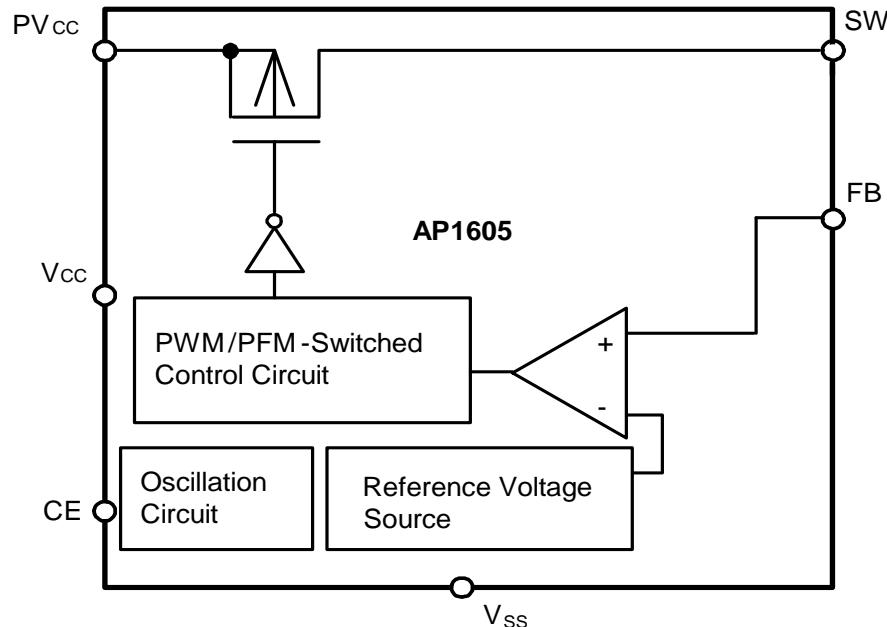

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## Pin Descriptions

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Pin Name	Pin No.	Description
FB	1	Feedback pin
CE	2	Chip Enable: H: Enable L: Disable
Vcc	3	IC signal power supply pin, add a $10\Omega$ resistor to PVcc and a $0.1\mu F$ capacitor to GND.
PVcc	4	IC power supply pin
SW	5, 6	Switch Pin. Connect external inductor/diode here. Minimize trace area at this pin to reduce EMI.
Vss	7, 8	GND Pin

## Block Diagram



## Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
$V_{CC}$	$V_{CC}$ Pin Voltage	$V_{SS} - 0.3$ to $V_{SS} + 8$	V
$PV_{CC}$	$PV_{CC}$ Pin Voltage	$V_{SS} - 0.3$ to $V_{SS} + 8$	V
FB	FB Pin Voltage	$V_{SS} - 0.3$ to $V_{SS} + 8$	V
$V_{CE}$	ON/OFF Pin Voltage	$V_{SS} - 0.3$ to $V_{SS} + 8$	V
$V_{SW}$	Switch Pin Voltage	$V_{SS} - 0.3$ to $V_{IN} + 0.3$	V
$P_D$	Power Dissipation	1200	mW
$T_{OPR}$	Operating Temperature Range	-20 to +85	°C
$T_{STG}$	Storage Temperature Range	-20 to +125	°C

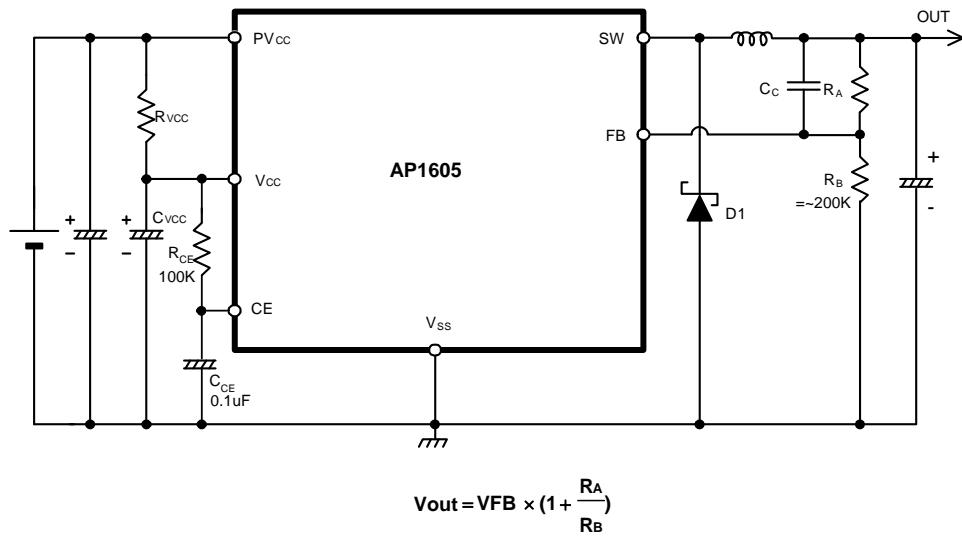
Caution: The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

**Electrical Characteristics (V<sub>IN</sub> = 5V, T<sub>A</sub> = 25°C, unless otherwise specified)**

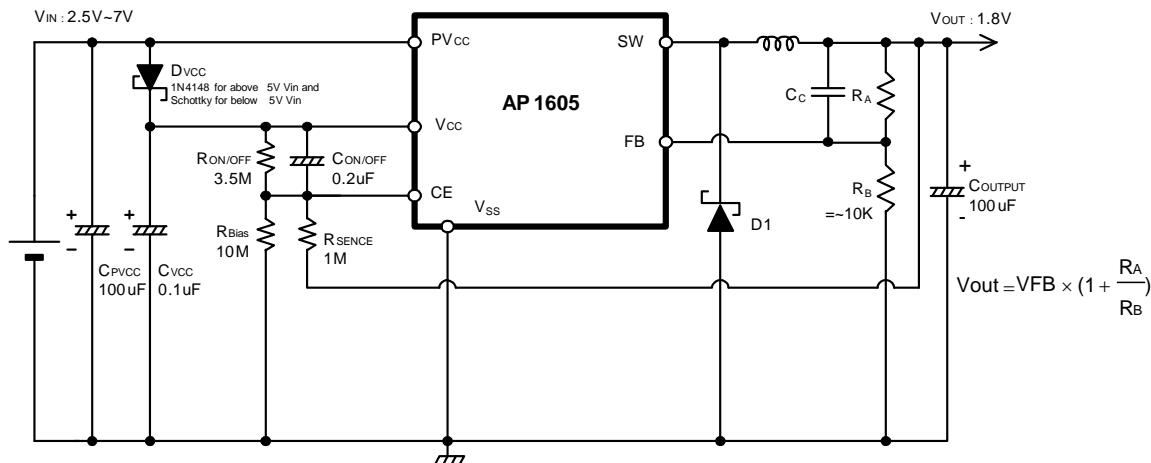
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V <sub>IN</sub>	Input Voltage	AP1605 Series	2.5	--	7	V
V <sub>REF</sub>	Internal Reference Voltage		1.1625	1.2	1.2375	V
V <sub>UVLO</sub>	UVLO Voltage	Voltage required to maintain V <sub>OUT</sub>	--	--	2.2	V
MAXDTY	Maximum Duty Ratio		100	--	--	%
PFMDTY	PFM Duty Ratio		15	25	35	%
I <sub>SW</sub>	Switch Current	Duty = 50%	3	--	--	A
I <sub>SS</sub>	Current Consumption POWER <sub>ON</sub>	V <sub>OUT</sub> = 2.5V	--	35	100	µA
I <sub>SSS</sub>	Current Consumption During Power Off	V <sub>ON/OFF</sub> = 0V	--	--	2	µA
ΔV <sub>OUT1</sub>	Line Regulation	2.5V~7V @ I <sub>OUT</sub> = 0.1A	--	0.2	0.5	%
ΔV <sub>OUT2</sub>	Load Regulation	0.1A~3A	--	1	1.5	%
F <sub>OSC</sub>	Oscillation Frequency		220	300	380	KHz
V <sub>CEH</sub>	CE Pin "High" Voltage	Evaluate oscillation at SW pin	0.65	--	--	*V <sub>CC</sub>
V <sub>CEL</sub>	CE Pin "Low" Voltage	Evaluate oscillation stop at SW pin	--	--	0.2	
I <sub>SH</sub>	Power-Off Pin Input	--	-0.1	--	0.1	µA
I <sub>SL</sub>	Leakage Current	--	-0.1	--	0.1	µA
EFFI	Efficiency	V <sub>IN</sub> = 5V, V <sub>OUT</sub> = 2.5V I <sub>OUT</sub> = 1A	--	93	--	%

## Typical Application Circuit

### (1) Normal Application



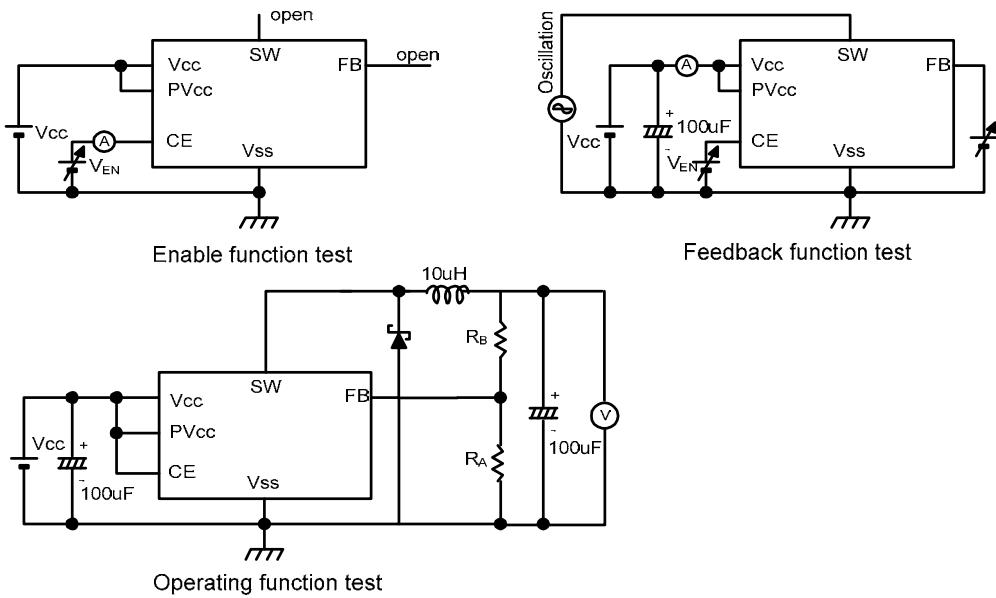
### (2) Application with Short Circuit Protection



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## Test Circuit

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## Functional Description

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### PWM/PFM Control (AP1605 Series)

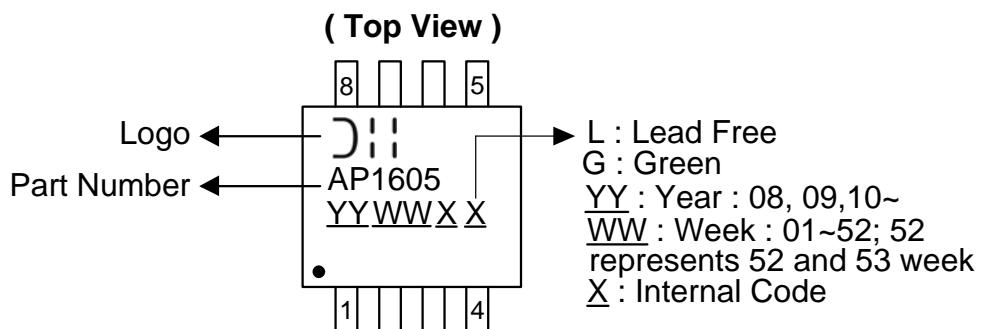
The AP1605 consists of DC/DC converters that employ a PWM/PFM auto-switch system. In converters of the AP1605, the PFM mode varies in a range of duty cycle from 0% to 25%, and the PWM mode varies in a range of duty cycle from 25% to 100% according to the load current, and yet ripple voltage produced 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.

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## Marking Information

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### (1) SOP-8L

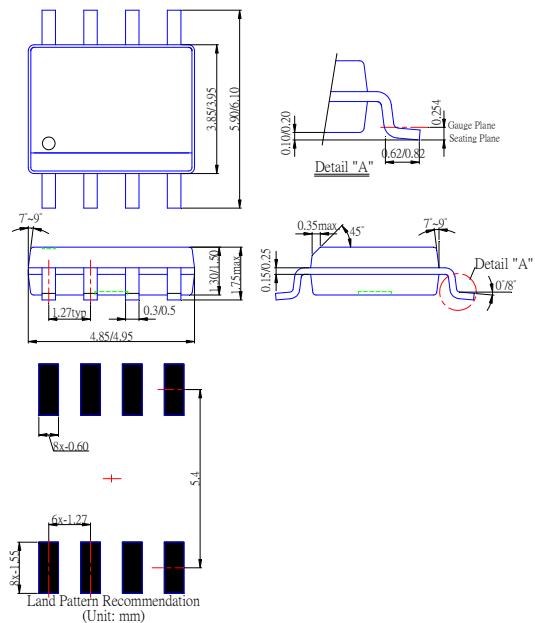



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## Package Information ( All Dimensions in mm )

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### (1) Package Type: SOP-8L





AP1605

**PWM/PFM DUAL-MODE STEP-DOWN SWITCHING  
REGULATOR**

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