



AP1605

PWM/PFM DUAL-MODE STEP-DOWN SWITCHING REGULATOR

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 and Green Package: SOP-8L
- 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.

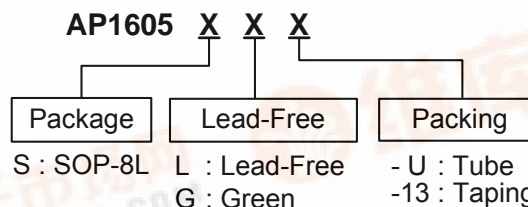
AP1605 provides low-ripple power, high efficiency, and excellent transient characteristics. The PWM/PFM control circuit is able to vary the duty ratio linearly 0%~0.25% (PFM) and 25%~100% (PWM).

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

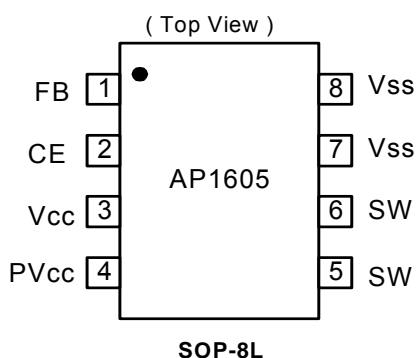


Note: 1. RoHS revision 13.2.2003. Glass and High Temperature Solder Exemptions Applied, see *EU Directive Annex Notes 5 and 7*.

Device (Note 2)	Package Code	Packaging	Tube		13" Tape and Reel	
			Quantity	Part Number Suffix	Quantity	Part Number Suffix
AP1605S	S	SOP-8L	100	-U	2500/Tape & Reel	-13

Note: 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>.

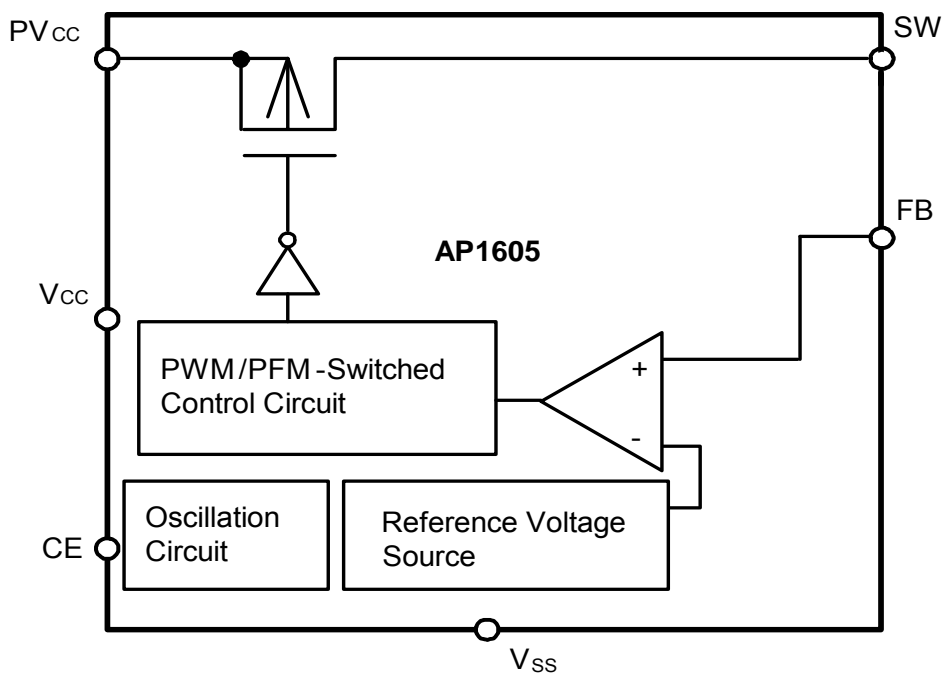
Pin Assignments



Pin Descriptions

Pin Name	Pin No. SOP	Description
FB	1	Feedback pin
CE	2	Chip Enable: H: Enable L: Disable
Vcc	3	IC signal power supply pin, add a 10Ω resistor to PVcc and a 0.1μF 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

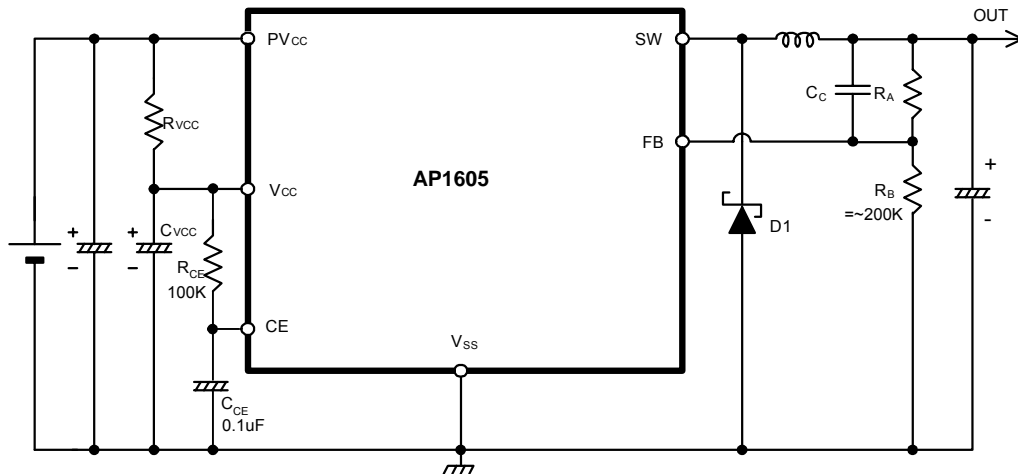
Caution: The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

Electrical Characteristics ($V_{IN} = 5V$, $T_A = 25^\circ C$, unless otherwise specified)

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

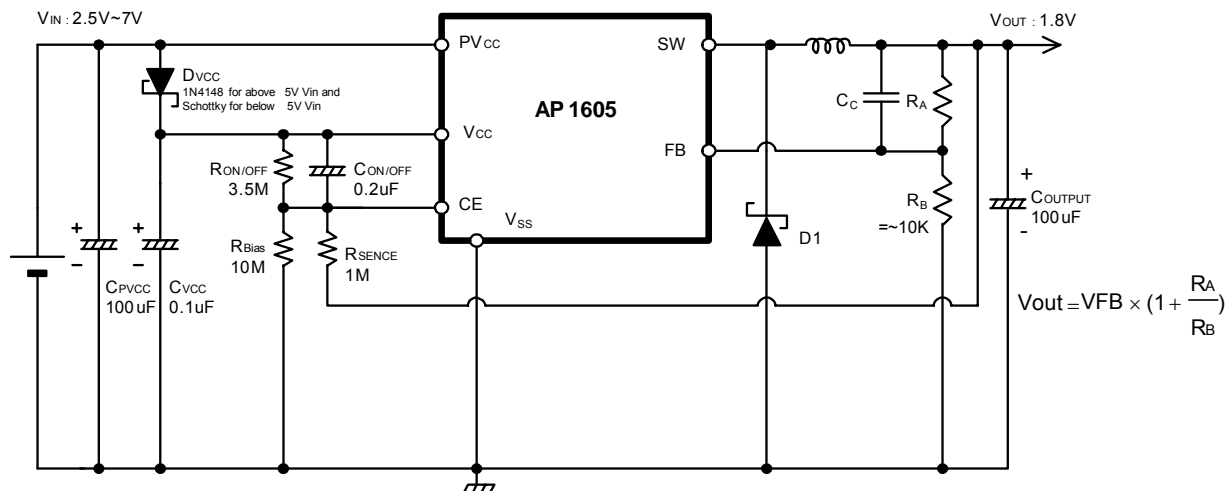
Typical Application Circuit

(1) Normal Application



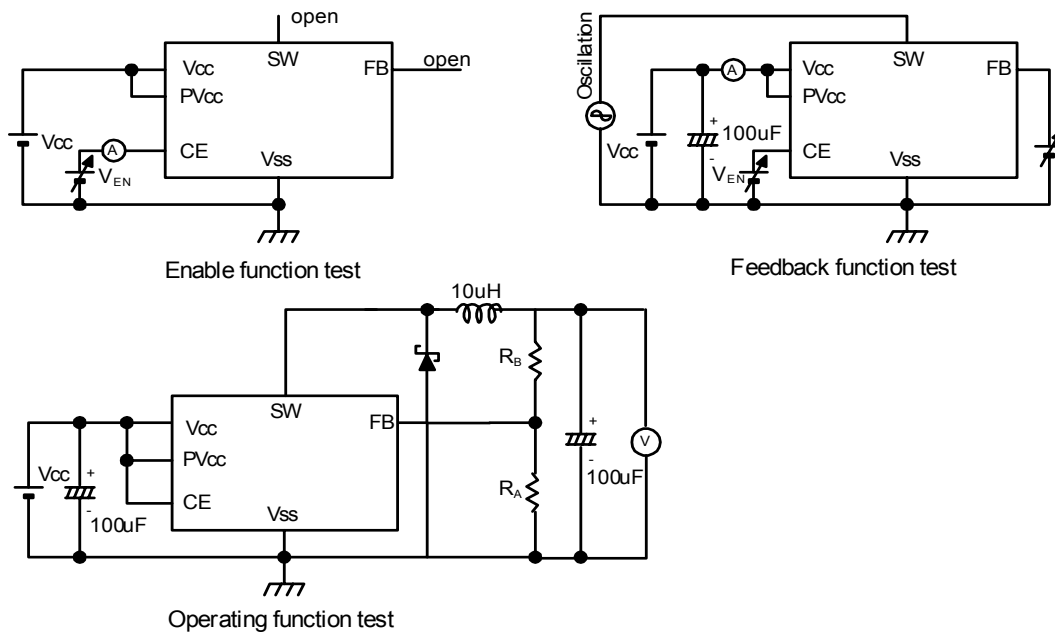
$$V_{out} = V_{FB} \times \left(1 + \frac{R_A}{R_B}\right)$$

(2) Application with Short Circuit Protection



$$V_{out} = V_{FB} \times \left(1 + \frac{R_A}{R_B}\right)$$

Test Circuit



Function Description

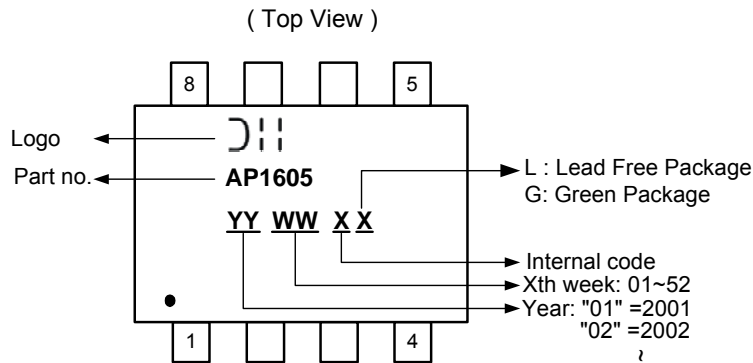
PWM/PFM Control (AP1605 Series)

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.

Marking Information

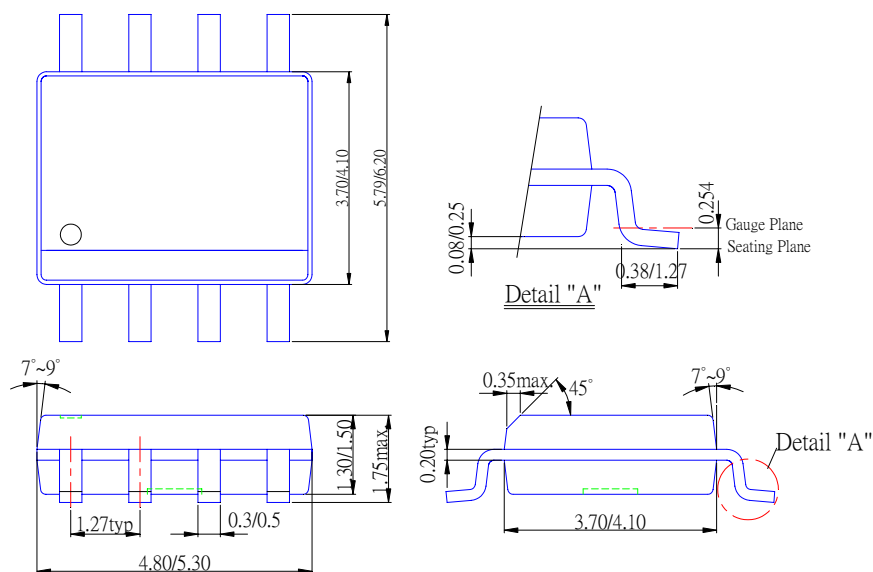
(1) SOP-8L



Device	Package	Identification Code
AP1605S	SOP-8L	AP1605

Package Information (All Dimensions in mm)

Package Type: SOP-8L





AP1605

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