

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

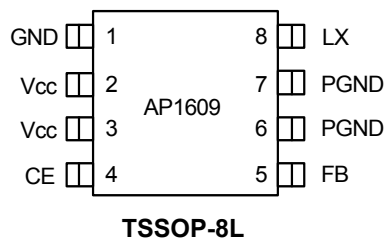
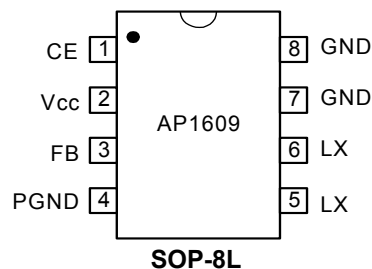
■ Features

- 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.

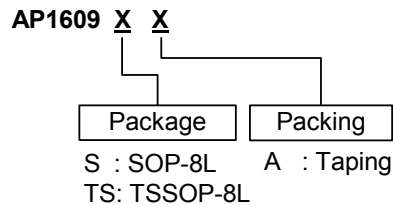
During stand-by time (CE pin "Low"), current consumption is reduced to 1 μA .

■ Pin Descriptions

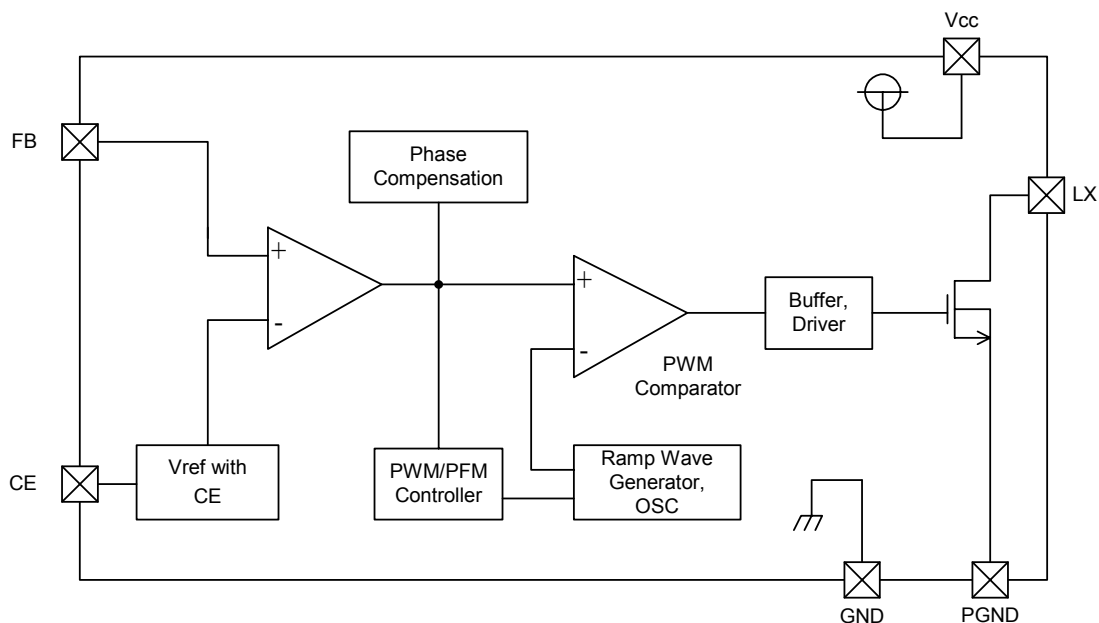
Pin Name	Pin No.		Description
	SOP	TSSOP	
FB	3	5	Feedback pin
CE	1	4	Chip Enable: H: Enable L: Disable
Vcc	2	2、3	IC signal power supply pin
PGND	4	6、7	Power MOSFET GND
LX	5、6	8	Switch Pin. Connect external inductor/diode here. Minimize trace area at this pin to reduce EMI.
GND	7、8	1	GND Pin

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

Ordering Information



Block Diagrams



Absolute Maximum Ratings

Ta=25°C

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}	-3 ~ 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

**PWM/PFM Dual Mode Step-up DC/DC Converter****■ Electrical Characteristics**

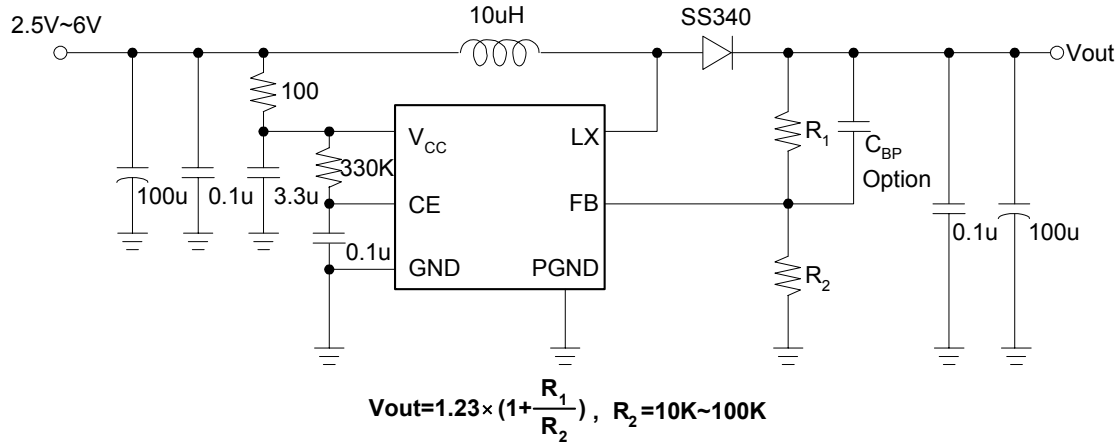
AP1609 (F_{OSC}=300kHz, V_{OUT}=5V) Ta=25 °C

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	-	%

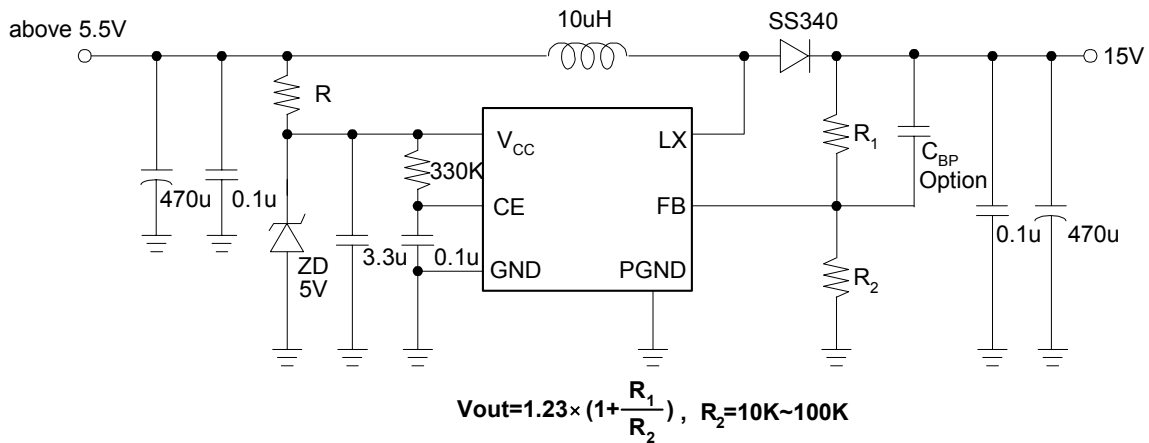
PWM/PFM Dual Mode Step-up DC/DC Converter

■ Typical Application Circuit

(1) Normal Circuit

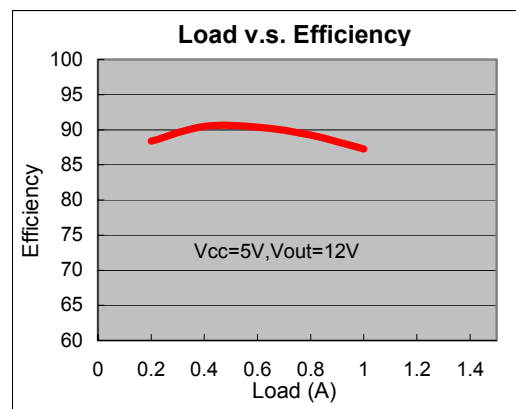
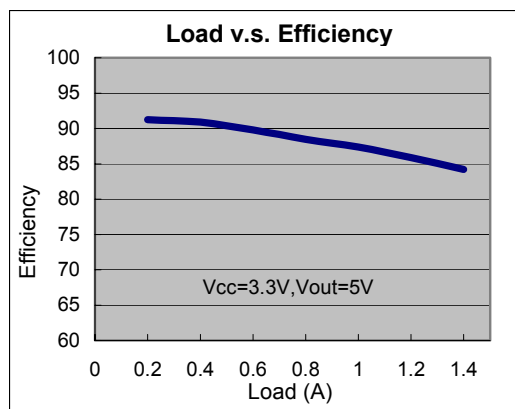
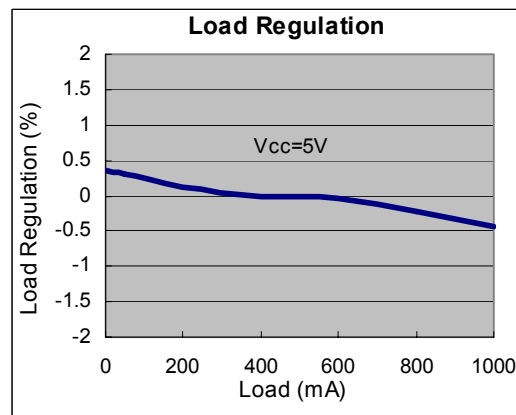
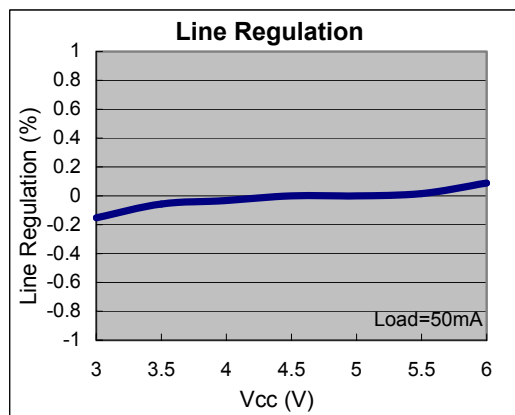
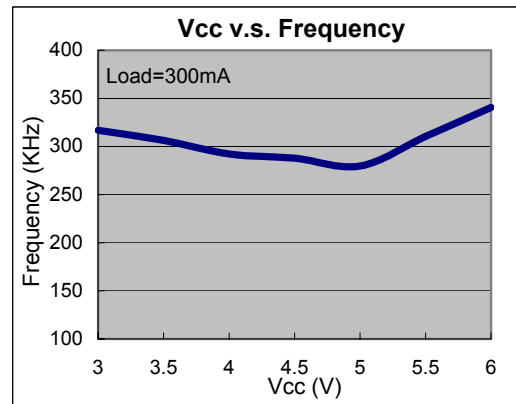
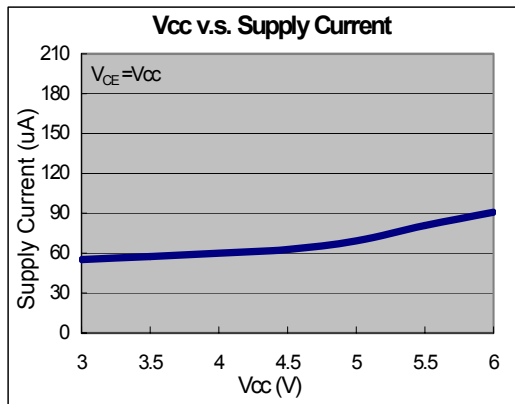


(2) HV Circuit



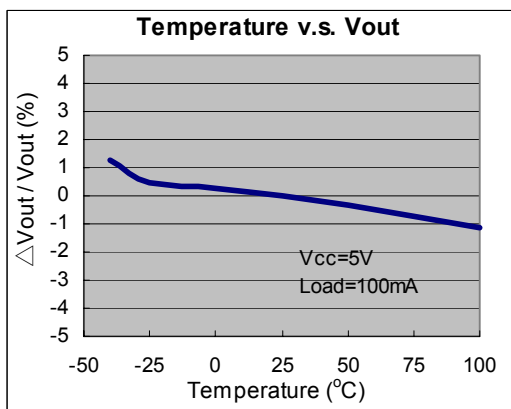
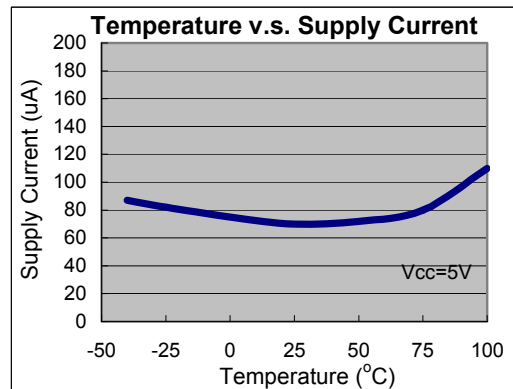
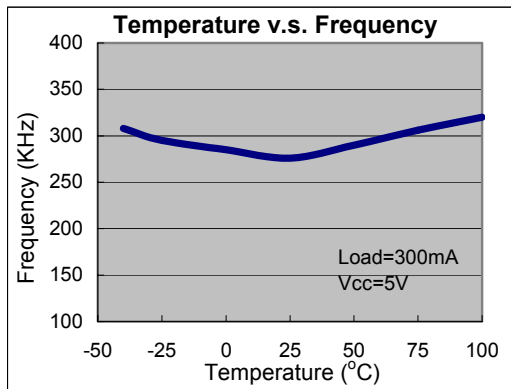
PWM/PFM Dual Mode Step-up DC/DC Converter

■ Typical Performance Characteristics

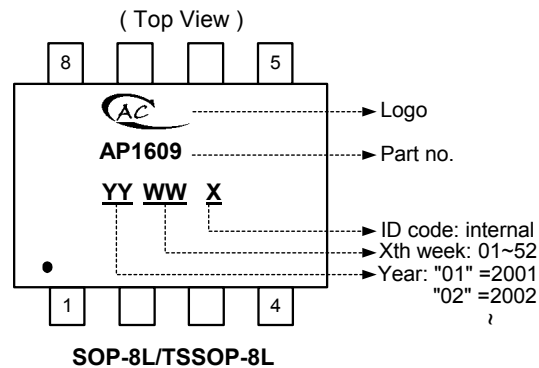


PWM/PFM Dual Mode Step-up DC/DC Converter

■ Typical Performance Characteristics (Continued)



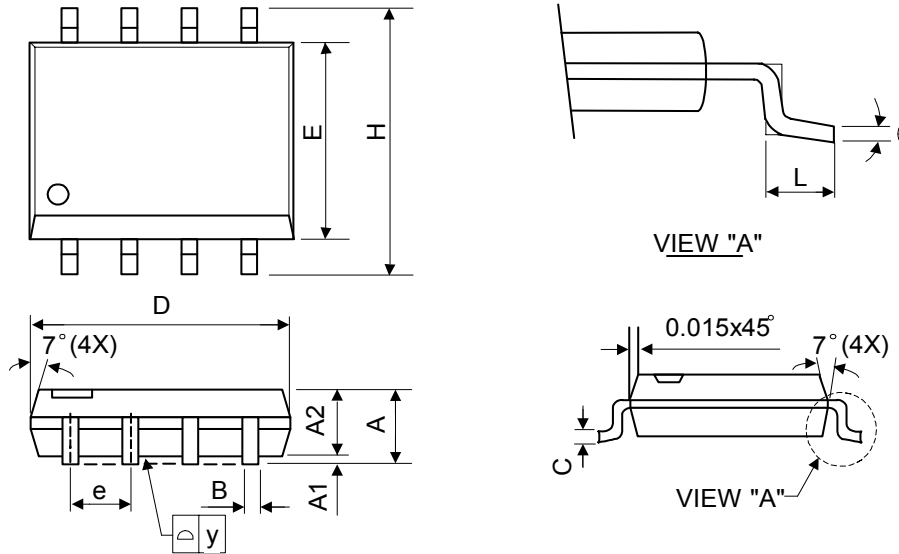
■ Marking Information



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

■ Package Information

(1) Package Type: SOP-8L

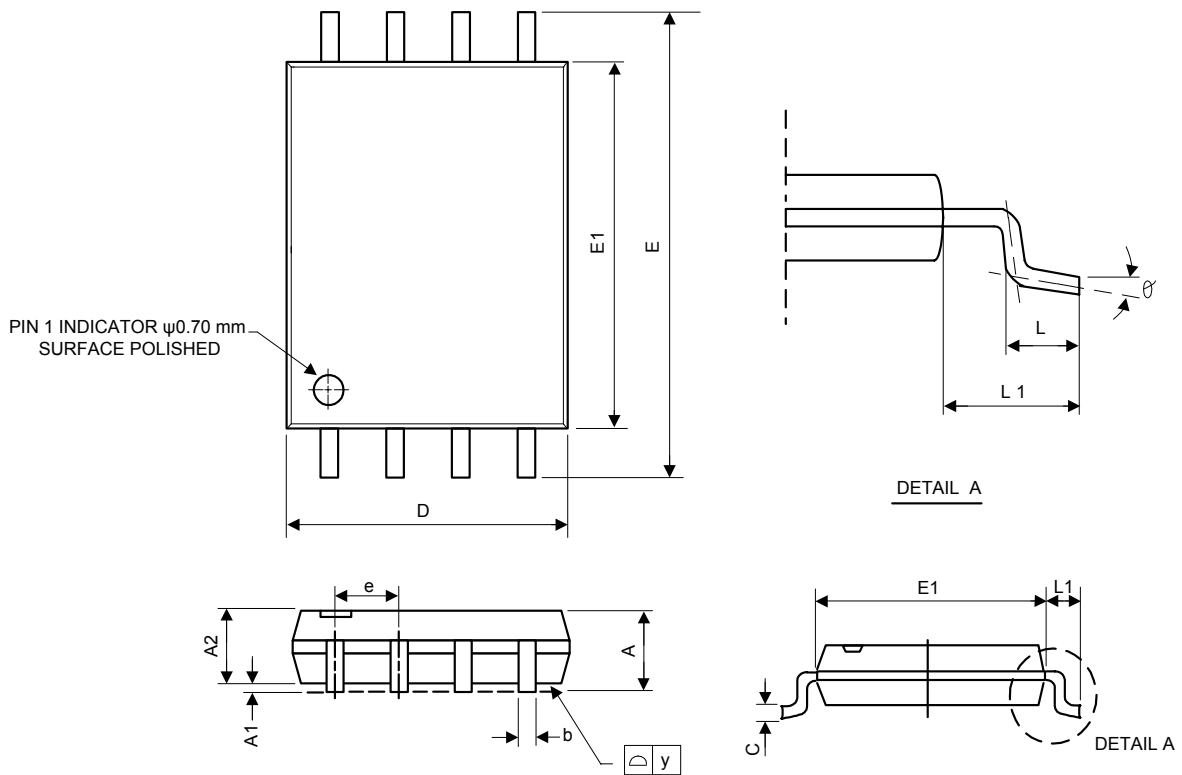


Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.40	1.60	1.75	0.055	0.063	0.069
A1	0.10	-	0.25	0.040	-	0.100
A2	1.30	1.45	1.50	0.051	0.057	0.059
B	0.33	0.41	0.51	0.013	0.016	0.020
C	0.19	0.20	0.25	0.0075	0.008	0.010
D	4.80	5.05	5.30	0.189	0.199	0.209
E	3.70	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°

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

■ Package Information (Continued)

(2) Package Type: TSSOP-8L



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°