Pin Configuration

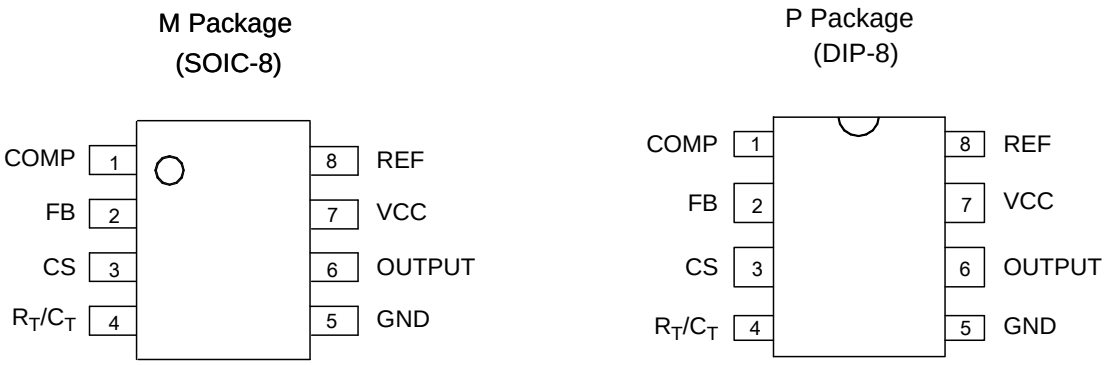


Figure 2. Pin Configuration of AP384XG (Top View)

Pin Description

Pin Number	Pin Name	Function
1	COMP	This pin is the Error Amplifier output and is made available for loop compensation.
2	FB	The inverting input of the Error Amplifier. It is normally connected to the switching power supply output through an external resistor divider.
3	CS	It is used either for current sense (normal mode) or skip cycle level selection (standby mode).
4	R_T/C_T	The oscillator frequency and maximum output duty cycle are programmed by connecting resistor R_T to REF and capacitor C_T to ground.
5	GND	The ground pin.
6	OUTPUT	This output directly drives the gate of a power MOSFET. Peak currents up to 1.0 A are sourced and sunk by this pin.
7	VCC	The power supply pin.
8	REF	This is the reference output. It provides charging current for capacitor C_T through resistor R_T.

Functional Block Diagram

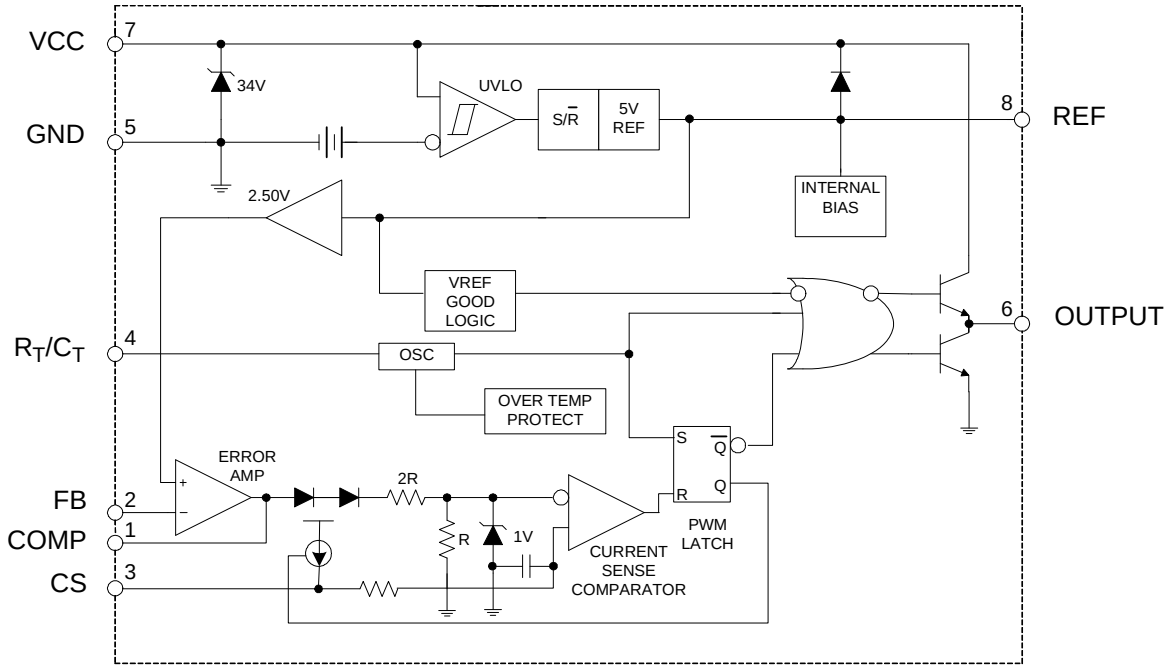
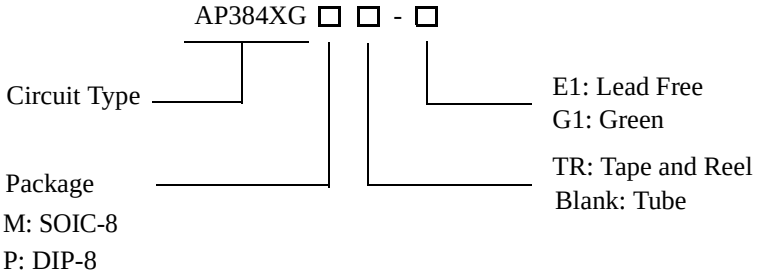


Figure 3. Functional Block Diagram of AP384XG

Ordering Information



Package	Tempera-ture Range	Part Number		Marking ID		Packing Type
		Lead Free	Green	Lead Free	Green	
SOIC-8	-40 to 85°C	AP3842/3/4/5GM-E1	AP3842/3/4/5GM-G1	3842/3/4/5GM-E1	3842/3/4/5GM-G1	Tube
		AP3842/3/4/5GMTR-E1	AP3842/3/4/5GMTR-G1	3842/3/4/5GM-E1	3842/3/4/5GM-G1	Tape & Reel
DIP-8	-40 to 85°C	AP3842/3/4/5GP-E1	AP3842/3/4/5GP-G1	AP3842/3/4/5GP-E1	AP3842/3/4/5GP-G1	Tube

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green packages.

Absolute Maximum Ratings (Note 1, 2)

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	30	V
Gate Output Current	I_O	± 1	A
Analog Inputs (pin2, 3)	V(ANA)	-0.3 to 6.3	V
Error Amp Output Sink Current	I_{SINK}(E.A)	20	mA
Power Dissipation at T_A< 25 °C (DIP-8)	P_D (Note 3)	1000	mW
Power Dissipation at T_A<25 °C (SOIC-8)	P_D (Note 3)	460	mW
Storage Temperature Range	T_{STG}	-65 to 150	°C
Ambient Temperature	T_A	-40 to 85	°C
Lead Temperature (Soldering, 10sec)	T_{LEAD}	+300	°C
ESD (Machine Model)		300	V

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Note 2: All voltages are with respect to pin GND and all currents are positive into specified terminal.

Note 3: Board thickness 1.6mm, board dimension 90mm X 90mm.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Oscillation Frequency	f		500	KHz
Ambient Temperature	T_A	-40	85	°C

Electrical Characteristics

(V_{CC}=15V, R_T=10kΩ C_T=3.3nF, T_A=25°C, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
REFERENCE SECTION						
Reference Output Voltage	V_{REF}	T_A=25°C, I_{REF}=1mA	4.95	5.00	5.05	V
Total Output Variation		Line, Load, Temp.	4.9		5.10	V
Line Regulation	ΔV_{REF}	12V ≤ V_{CC} ≤25V		4	15	mV
Load Regulation	ΔV_{REF}	1mA ≤ I_{REF} ≤20mA		4	15	mV
Short Circuit Output Current	I_{SC}	T_A=25°C		-100	-180	mA
Temperature Stability		(Note 6)		0.3		mV/°C
UNDER VOLTAGE LOCK OUT SECTION						
Start-up Threshold		AP3842G/AP3844G	15	16	17	V
		AP3843G/AP3845G	7.8	8.4	9.0	
Minimum Operating Voltage		AP3842G/AP3844G	8.5	10	11.5	V
		AP3843G/AP3845G	7.0	7.6	8.2	
TOTAL STANDBY CURRENT SECTION						
Start-up Current		AP3842G/AP3844G, V_{CC}=14V		50	80	μA
		AP3843G/AP3845G, V_{CC}=6.5V		50	80	
Operating Current		V_{FB}=0, V_{CS}=0, C_L=1nF		8		mA
Standby Operating Current		V_{FB}=2.7V, V_{CS}=0.5V		6		mA
Zener Voltage		I_{CC}=25mA	30	34		V
PWM SECTION						
Maximum Duty Cycle		AP3842G/AP3843G	94	96		%
		AP3844G/AP3845G	46	48	50	
Minimum Duty Cycle					0	%
OSCILLATOR SECTION						
Oscillation Frequency	f	T_A=25°C	47	52	57	KHz
Oscillator Amplitude	V_{OSC}	Pin RT/CT, peak to peak		1.7		V
Temperature Stability				2		%
Voltage Stability		12V ⩽ V_{CC} ⩽ 25V		0.2	1	%
Discharge Current		$V_{RT/CT}$ = 2V (Note 4)	8.5	9.5	10.5	mA

Note 4: This parameter is measured with RT=10kΩ to $V_{REF,}$ it contributes 0.3mA of current to the measured value. So the total current flowing into the CT pin will be 0.3mA higher than the measured value approximately.

Electrical Characteristics (Continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
ERROR AMPLIFIER SECTION						
Input Voltage	V_I	V_{COMP}=2.5V	2.45	2.50	2.55	V
Output Sink Current	I_{SINK}	V_{COMP}=1.1V	6	10		mA
Output Source Current	I_{SOURCE}	V_{COMP}=5V	-0.5	-0.8		mA
High Output Voltage	V_{OH}	R_L=15kΩ to GND	5	7		V
Low Output Voltage	V_{OL}	R_L=15kΩ to pin REF		0.7	1.1	V
Voltage Gain		2V ≤ V_O ≤ 4V	65	90		dB
Power Supply Rejection Ratio	PSRR	12V ≤ V_{CC} ≤ 25V	60	70		dB
CURRENT SENSE SECTION						
Maximum Input Signal	V_I(MAX)	V_{COMP}=5V (Note 5)	0.9	1	1.1	V
Gain	GV	0V ≤ V_{CS} ≤ 4V (Note 5, 6)	2.85	3	3.15	V/V
Power Supply Rejection Ratio	PSRR	12V ≤ V_{CC} ≤ 25V (Note 5, 7)		70		dB
Delay to Output		V_{CS}= 0 to 2V (Note 7)		150	250	ns
Input Bias Current	I_{BIAS}	V_{OUTPUT}=High		-3	-10	μA
Leading Edge Blanking Duration	T_{LEB}			250		ns
OUTPUT SECTION						
Low Output Voltage	V_{OL}	I_{SINK} = 20mA		0.2	0.4	V
		I_{SINK} = 200mA		1.4	2.2	V
High Output Voltage	V_{OH}	I_{SOURCE} = 20mA	13	13.5		V
		I_{SOURCE} = 200mA	12	13		V
Rise Time	t_R	T_A=25°C, C_L=1nF		150	250	ns
Fall Time	t_F	T_A=25°C, C_L=1nF		50	150	ns
SKIP CYCLE MODE SECTION						
Source Current (@CS)		V_{OUTPUT}=Low, T_A=25°C	180	200	220	μA
OVER-TEMPERATURE PROTECT SECTION						
Shutdown Temperature	T_{SHUT}			155		°C
Temperature Hysteresis	T_{HYS}			25		°C
Thermal Resistance (Junction to Case)	θ_{JC}	SOIC-8		18		°C/W
		DIP-8		12		

Note 5: Parameters are tested at trip point of latch with Vpin2 = 0.
Note 6: Here gain is defined as:

$$A=\frac{\Delta VPin\ 1}{\Delta VPin\ 3},\ 0 \le Vpin3 \le 0.8V$$

Note 7: These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (Continued)

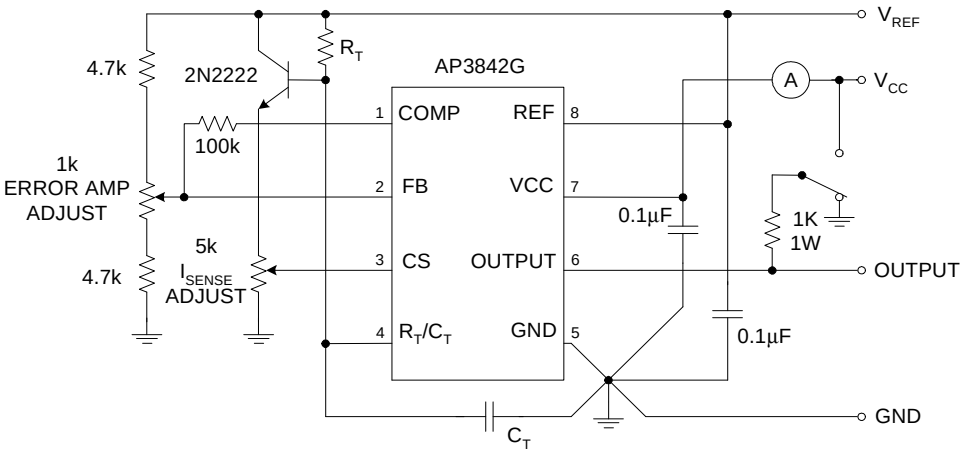


Figure 4. Basic Test Circuit

Figure 4 is the basic test circuit for AP384XG. In testing, the high peak currents associated with capacitive loads necessitate careful grounding techniques. Timing and bypass capacitors should be connected close to pin 5 in a single point ground. The transistor and 5k potentiometer are used to sample the oscillator waveform and apply an adjustable ramp to pin 3.

Typical Performance Characteristics

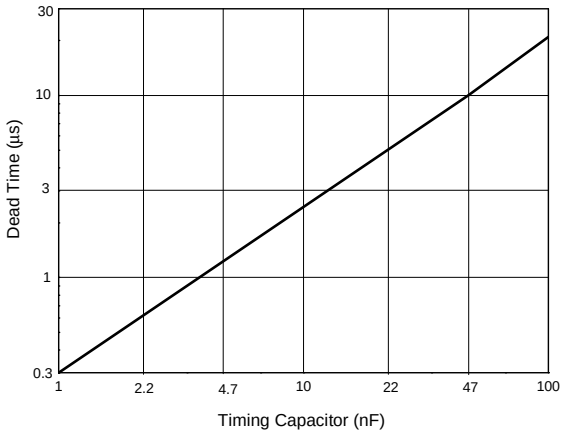


Figure 5. Oscillator Dead Time vs. Timing Capacitor

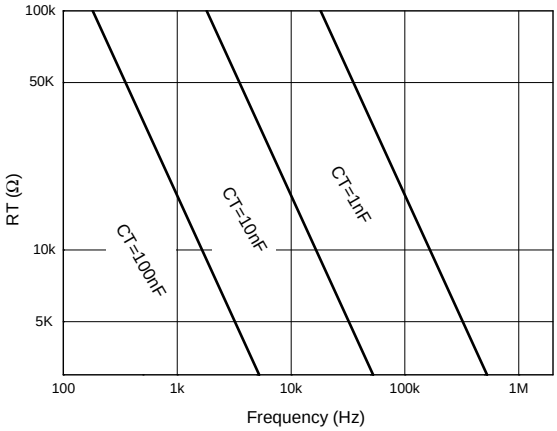


Figure 6. Timing Resistor vs. Frequency

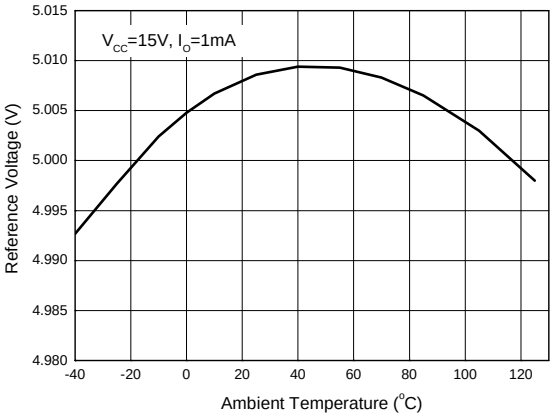


Figure 7. Reference Voltage vs. Ambient Temperature

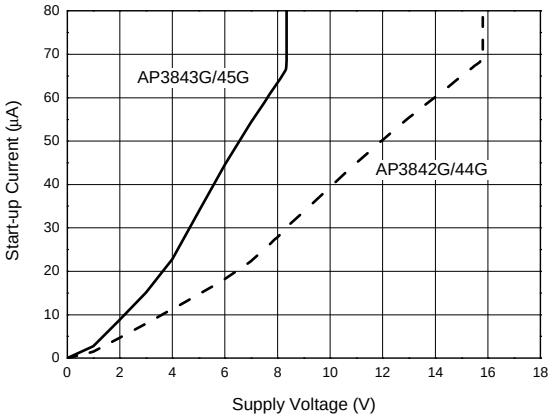


Figure 8. Start-up Current vs. Supply Voltage

Typical Performance Characteristics (Continued)

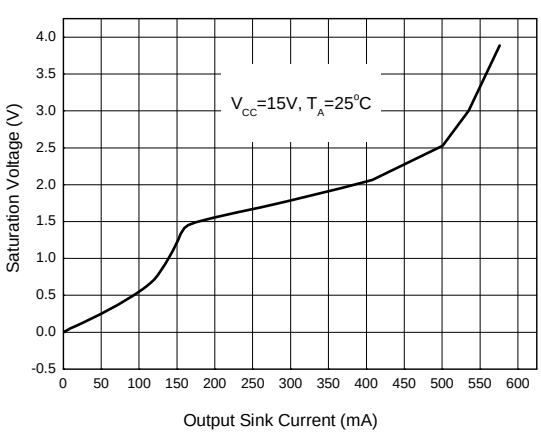


Figure 9. Output Saturation Characteristics

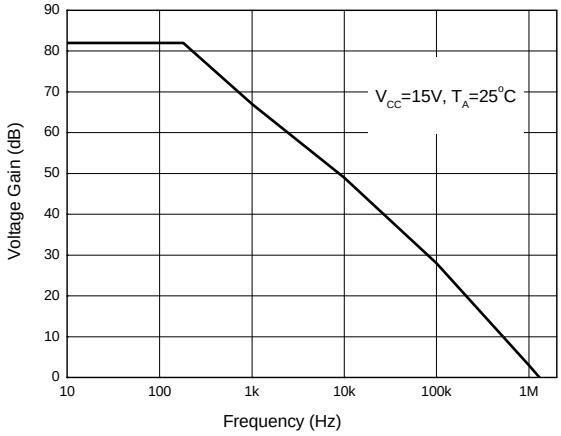


Figure 10. Error Amplifier Open-Loop Frequency Response

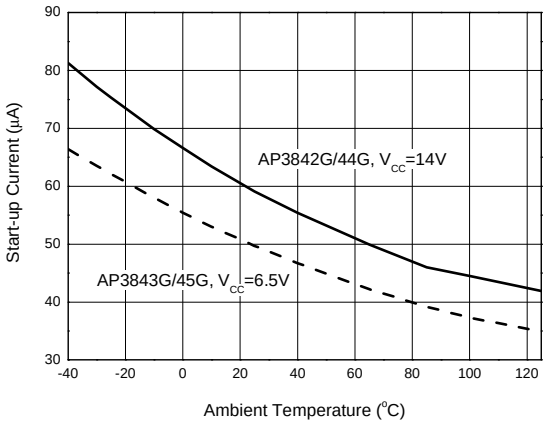


Figure 11. Start-up Current vs. Ambient Temperature

Typical Application

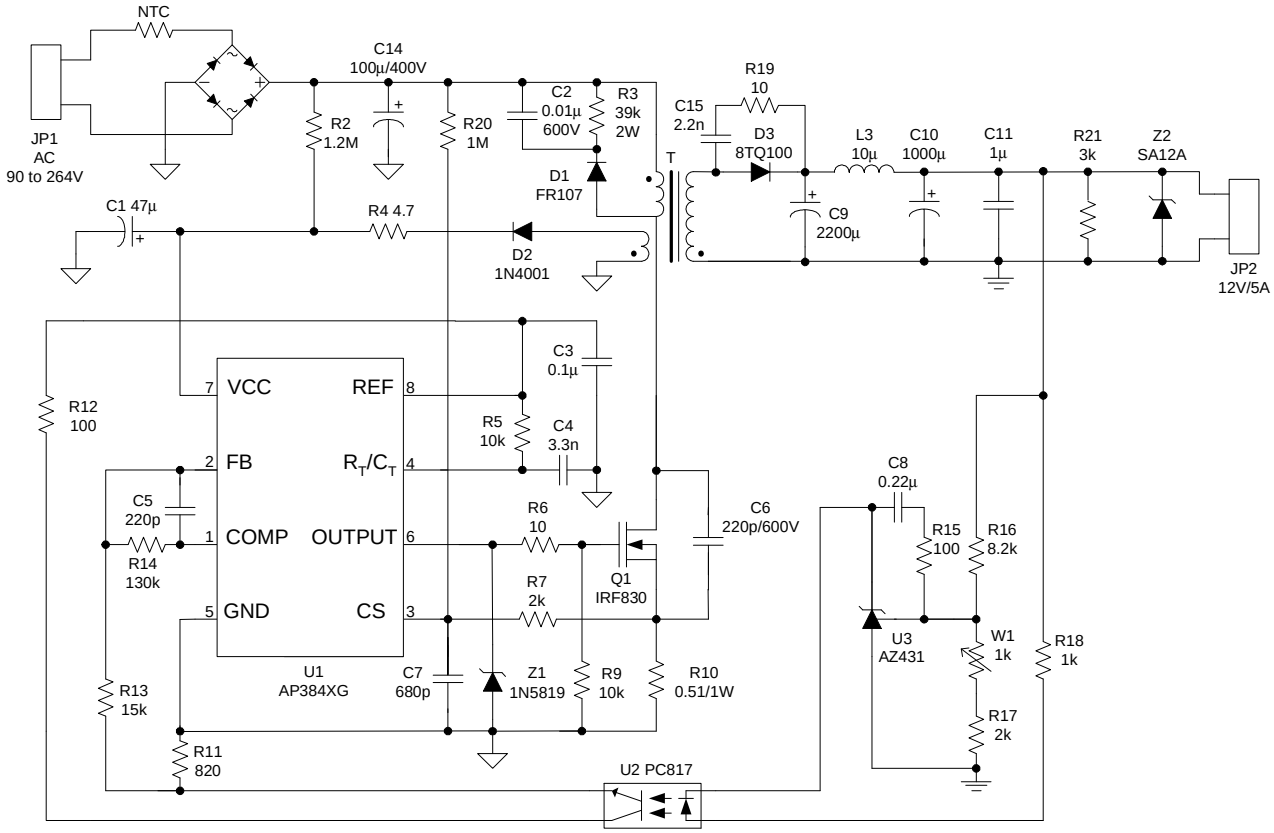
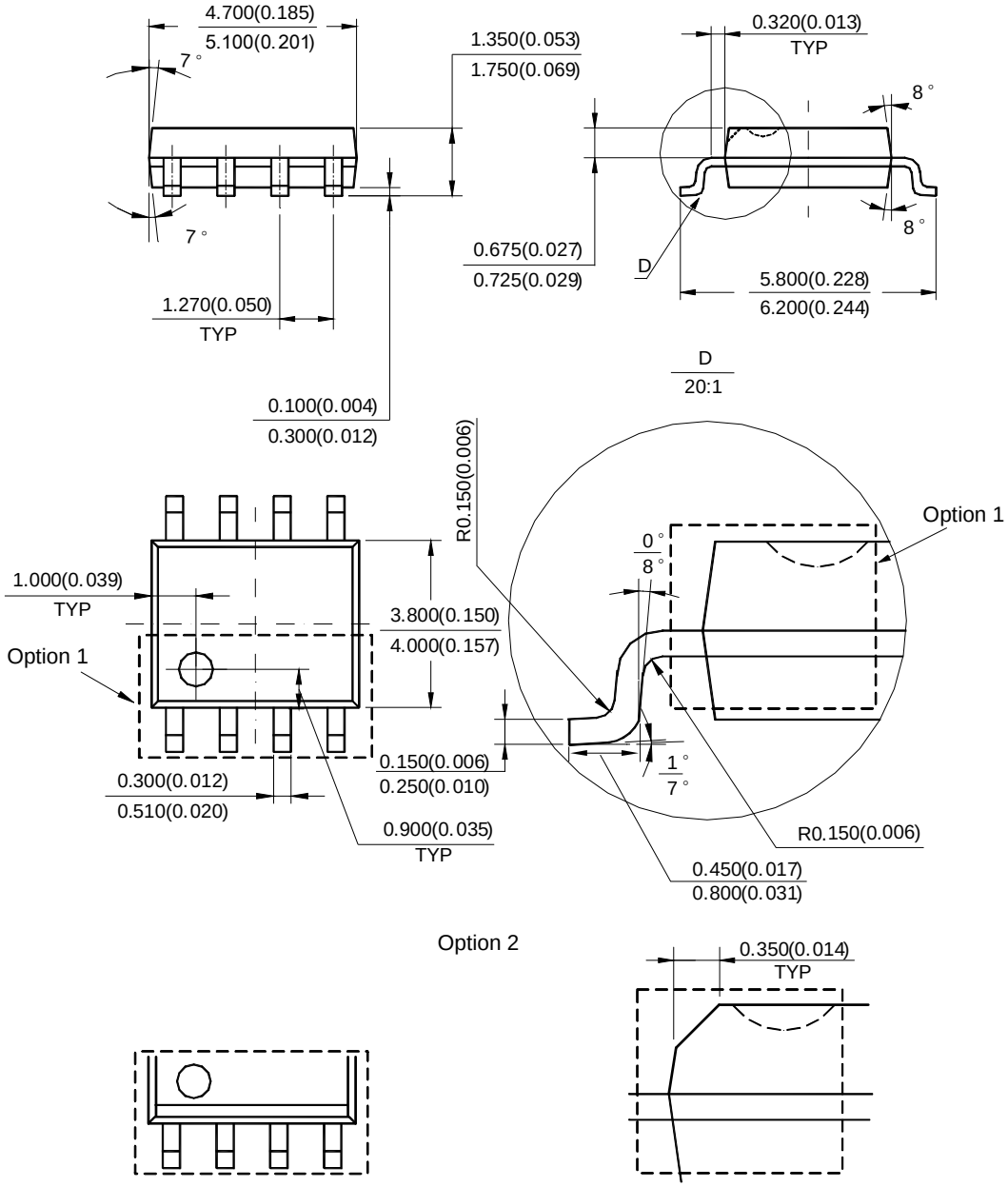


Figure 12. Typical Application of AP384XG in AC/DC Converter

Mechanical Dimensions

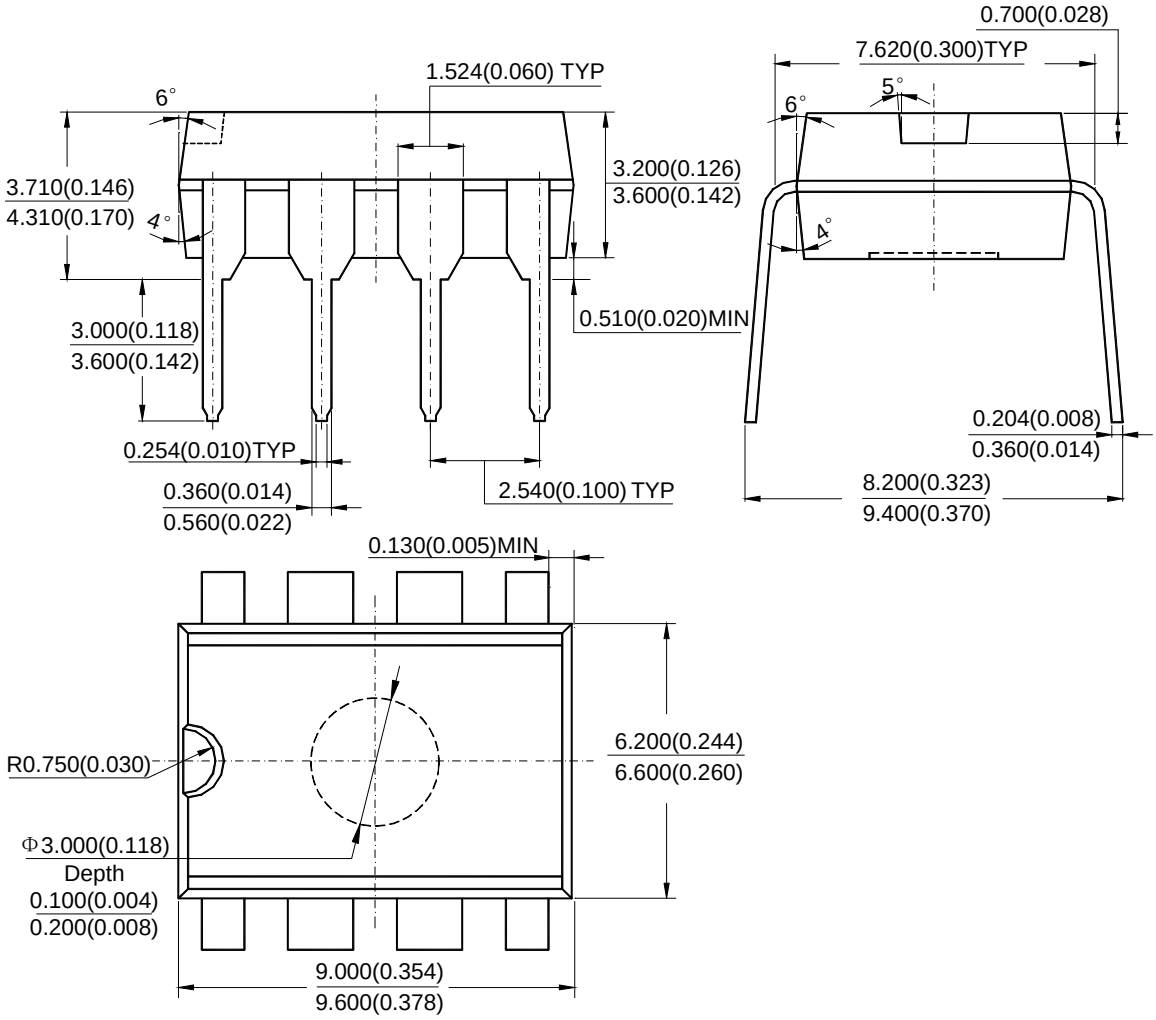
SOIC-8 **Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.

Mechanical Dimensions (Continued)

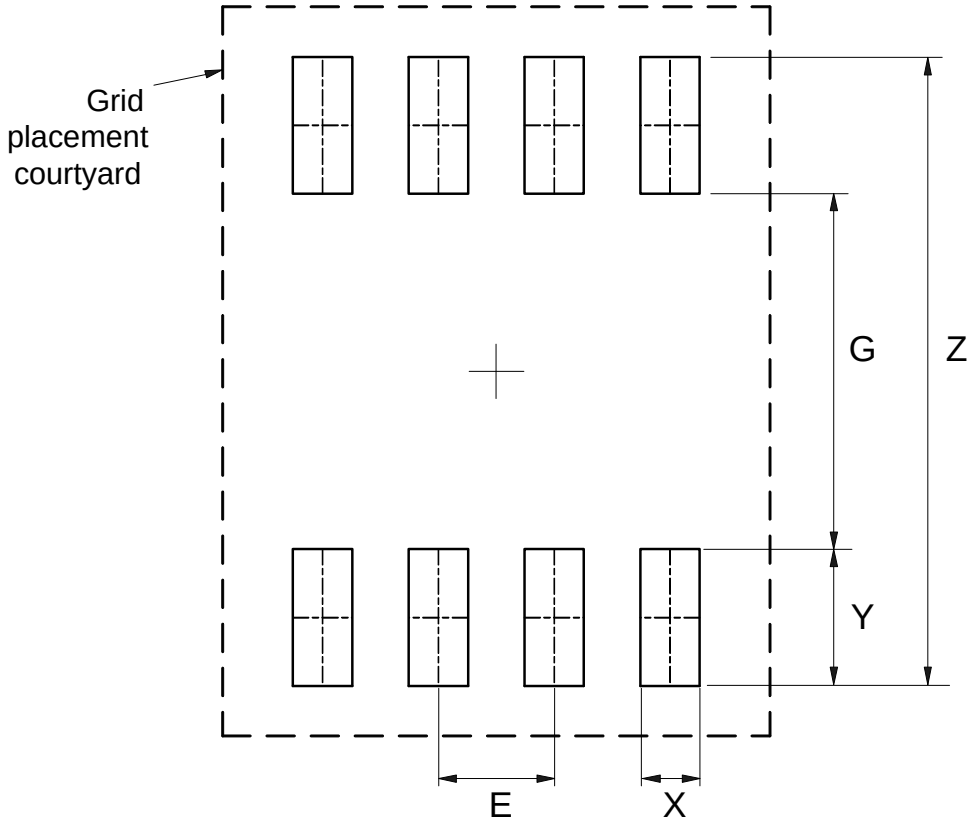
DIP-8 **Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.

Mounting Pad Layout

SOIC-8 **Unit: mm(inch)**



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)
Value	6.900/0.272	3.900/0.154	0.650/0.026	1.500/0.059	1.270/0.050

BCD Semiconductor Manufacturing Limited

http://www.bcdsemi.com

IMPORTANT NOTICE

BCD Semiconductor Manufacturing Limited reserves the right to make changes without further notice to any products or specifications herein. BCD Semiconductor Manufacturing Limited does not assume any responsibility for use of any its products for any particular purpose, nor does BCD Semiconductor Manufacturing Limited assume any liability arising out of the application or use of any its products or circuits. BCD Semiconductor Manufacturing Limited does not convey any license under its patent rights or other rights nor the rights of others.

MAIN SITE

- Headquarters
BCD (Shanghai) Micro-electronics Limited
No. 1600, Zi Xing Road, Shanghai ZiZhu Science-based Industrial Park, 200241, P. R.C.
Tel: +86-021-2416-2266, Fax: +86-021-2416-2277

- Wafer Fab
Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd.
800 Yishan Road, Shanghai 200233, China
Tel: +021-6485-1491, Fax: +86-021-5450-0008

REGIONAL SALES OFFICE

Shenzhen Office
Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd., Shenzhen Office
Unit A Room 1203,Skyworth Bldg., Gaoxin Ave.1.S., Nanshan District
Shenzhen 518057, China
Tel: +86-0755-8660-4900, Fax: +86-0755-8660-4958

Taiwan Office (Taipei)
BCD Semiconductor (Taiwan) Company Limited
3F, No.17, Lane 171, Sec. 2, Jiu-Zong Rd., Nei-Hu Dist., Taipei(114), Taiwan, R.O.C
Tel: +886-2-2656 2808
Fax: +886-2-2656-2806/26562950

Taiwan Office (Hsinchu)
BCD Semiconductor (Taiwan) Company Limited
8F, No.176, Sec. 2, Gong-Dao 5th Road, East District
HsinChu City 300, Taiwan, R.O.C
Tel: +886-3-5160181, Fax: +886-3-5160181

USA Office
BCD Semiconductor Corp.
48460 Kato Road, Fremont, CA 94538, USA
Tel: +1-510-668-1950
Fax: +1-510-668-1990

Korea Office
BCD Semiconductor Limited Korea office.
Room 101-1112, Digital-Empire II, 486 Sin-dong,
Yeongtong-Gu, Suwon-city, Gyeonggi-do, Korea
Tel: +82-31-695-8430