NEW PRODUCT

Description

The AP3984 is a power switcher for power supplies with better conversion efficiency, better voltage & current accuracy, and improved protection functions. Typical applications include charger, adapter for ADSL, home appliance power supply and PC auxiliary power supplies. The AP3984 with built in BJT, regulates the output voltage and current in the primary side by piece-wise pulse frequency modulation (p-PFM) and primary current peak amplitude modulation (AM) in discontinuous conduction mode (DCM). The system operating frequency reduces linearly from heavy load to light load in each interval of the p-PFM, and operating frequency is fixed at medium load by varying primary current peak amplitude.

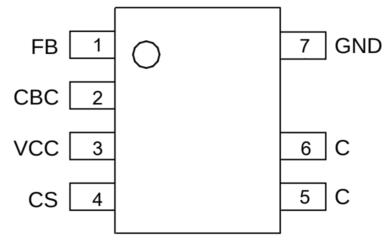
The AP3984 has good transient characteristics in combination with the secondary side IC like AP4341/AP43410. Typically, minimal voltage of 4.3V at PCB side can be achieved for dynamic test of 5V application system.

The AP3984 provides operating frequency dithering function to improve EMC performance of power supply. The AP3984 also has programmable cable voltage drop compensation function by external resistor.

The AP3984 is packaged in SO-7.

Pin Assignments

(Top View)



SO-7

Applications

- Adapters
- Set Top Boxes
- Auxiliary Supplies
- Appliances

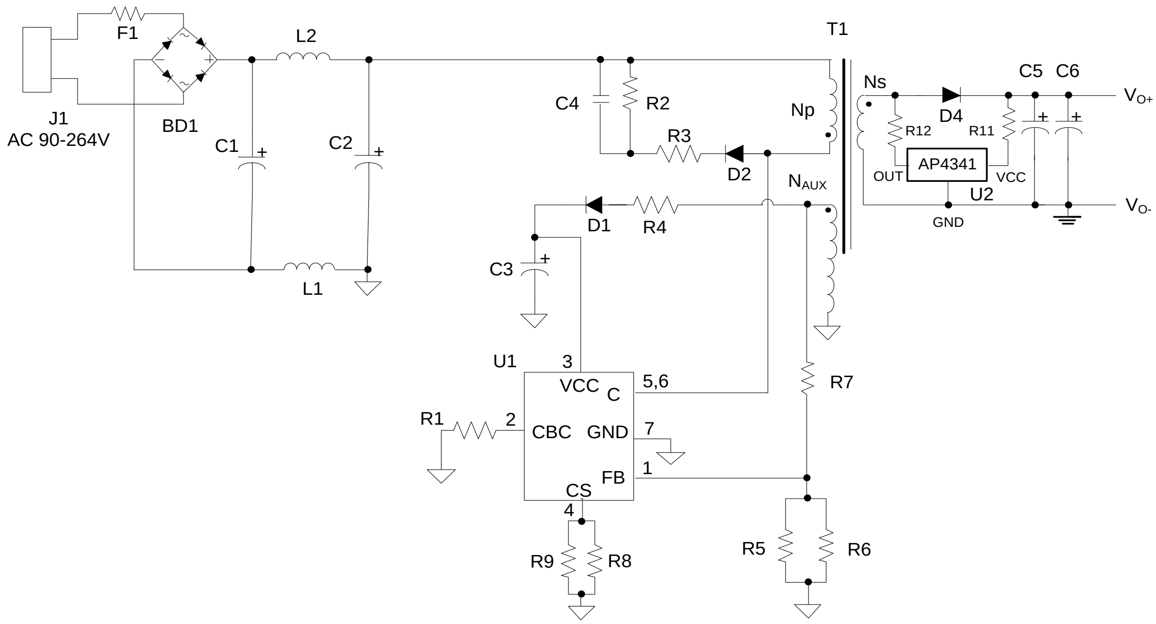
Features

- Primary Side Control for Eliminating Opto-coupler
- Built-in 700V BJT
- Excellent Transient Characteristics
- High Voltage and Super-speed Start up
- External Adjustable Output Cable Voltage Drop Compensation
- Ultra-low No-load Power Consumption(<10mW)
- Multiple PWM/PFM Mode to Improve Audio Noise and Efficiency
- Valley-on for Higher Efficiency and Better EMI
- Multiple Protections:
  - Over Voltage Protection (OVP)
  - Output Short Circuit Protection (SCP)
  - Over Temperature Protection (OTP)
- **Totally Lead-free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

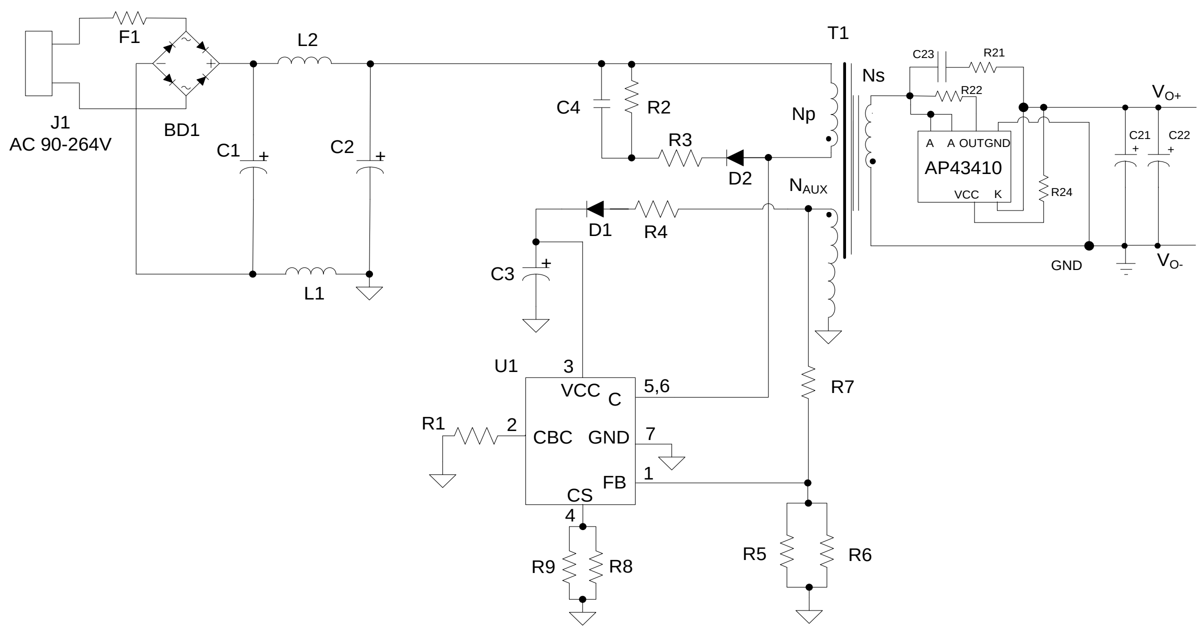
Note: 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

NEW PRODUCT

Typical Applications Circuit



For AP3984+AP4341 (5V/1A)



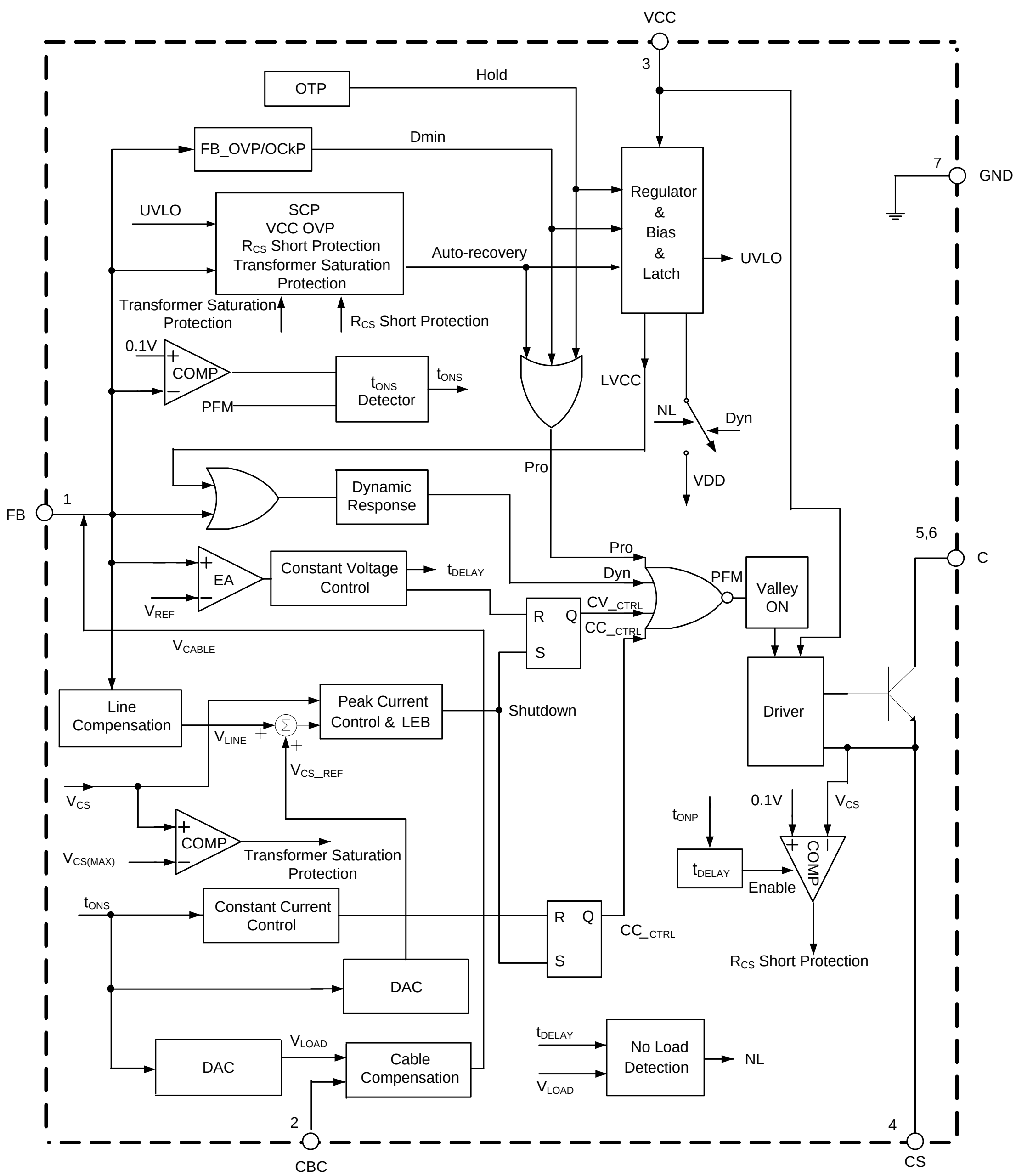
For AP3984+AP43410 (5V/1A)

NEW PRODUCT

Pin Descriptions

Pin Number	Pin Name	Function
1	FB	The voltage feedback from auxiliary winding
2	CBC	This pin connects a resistor to GND for output cable compensation
3	VCC	This pin receives rectified voltage from the auxiliary winding of the transformer
4	CS	Current sense for primary side of transformer
5, 6	C	This pin is connected with an internal power BJT's collector
7	GND	This pin is the signal reference ground

Functional Block Diagram



NEW PRODUCT

Absolute Maximum Ratings (Note 4)

Symbol	Parameter	Rating	Unit
V_{CC}	Supply Voltage	-0.3 to 28.5	V
V_{CS}, V_{CBC}	Voltage on CS, CBC Pin	-0.3 to 7.4	V
V_{FB}	FB Input Voltage	-0.7 to 7.4	V
V_{CBO}	Collector-Emitter Voltage	700	V
I_{CDC}	Collector DC Current	1.5	A
T_J	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature	-65 to +150	°C
T_{LEAD}	Lead Temperature (Soldering, 10 sec)	+260	°C
–	ESD (Machine Model)	200	V
–	ESD (Human Body Model)	2000	V
P_D	Total Power Dissipation	0.75	W

Note 4: 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.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	–	25	V
T_{OP}	Operating Temperature Range	-40	+105	°C
$f_{S(MAX)}$	Maximum Operating Frequency	–	60	kHz

Thermal Impedance (Note 5)

Symbol	Parameter	Value	Unit
θ_{JA}	Junction to Ambient	95	°C/W
θ_{JC}	Junction to Case	50	°C/W

Note 5: When mounted on a standard single-sided FR-4 board with 300mm^2 Cu (at least 35µm thick) connected to all collectors and CS pins.

Electrical Characteristics (@V_{CC}=15V, T_J=+25°C, unless otherwise specified.)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
STARTUP AND UVLO SECTION						
V_{TH_ST}	Turn-on Voltage	–	11	13	15	V
$V_{OPR(MIN)}$	Turn-off Voltage	–	4.1	4.6	5.1	V
LVCC	Minimum V_{CC}	At no load and hold mode	5.5	6	6.5	V
STANDBY CURRENT SECTION						
I_{ST}	Turn-on Current	V_{CC}=V_{TH_ST}-1V before startup	0.01	0.2	0.6	µA
I_{CC_OPR}	Operating Current	Static current	450	500	650	µA
I_{CC_NL}	Standby Current	At no load	5	17.5	30	µA

Electrical Characteristics (@V_{CC}=15V, T_J=+25°C, unless otherwise specified.) (Cont.)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
FREQUENCY JITTER SECTION						
$\Delta V_{CS}/V_{CS}$	V_{CS} Modulation	NL to full load	4.5	5	5.5	%
t_{MOD}	V_{CS} Modulation Frequency		366	488	610	µs
CURRENT SENSE SECTION						
V_{CS_H}	Peak Current Sense Voltage in Heavy Load	45% to 100% of full load	540	600	660	mV
V_{CS_L}	Peak Current Sense Voltage in Light Load	0% to 7% full load	216	240	264	mV
R_{LINE}	Built-in Line Compensation Resistor	–	108	120	132	Ω
t_{LEB}	Leading Edge Blanking	–	400	600	800	ns
CONSTANT VOLTAGE SECTION						
V_{FB}	Feedback Threshold Voltage	Closed loop test of V_{OUT}	2.45	2.5	2.55	V
$V_{CABLE(MAX)}$	Cable Compensation Voltage	–	1.4	1.45	1.5	V
CONSTANT CURRENT SECTION						
t_{ONS}/t_{SW}	Secondary Winding Conduction Duty	Tested @V_{FB}=2V	–	4/8	–	–
VALLEY-ON SECTION						
$t_{VAL\text{-}ON}$	Valid Off Time of Valley-On	From the end of t_{ONS}	20	26	32	µs
DYNAMIC SECTION						
$V_{TRIGGER}$	Trigger Voltage for Dynamic Function	–	40	62.5	85	mV
t_{DELAY}	Delay Time for Dynamic Function	From the end of t_{ONS}	95	122	150	µs
V_{UV_H}	Under Voltage of FB Pin for V_{CS_H}	–	2.23	2.275	2.32	V
POWER BJT SECTION						
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	I_C=0.5A	–	–	0.3	V
h_{FE}	DC Current Gain	–	14	17	–	–
I_{CEO}	Leakage Current	–	–	–	60	µA
DRIVER SECTION						
I_{SOURCE}	Peak Driver Source Current	@ CP Test	27.6	30	32.4	mA
$R_{DS(ON)}$	Sink Resistance	@ CP Test	2	2.3	2.6	Ω
PROTECTION FUNCTION SECTION						
$V_{FB(OVP)}$	Over Voltage Protection at FB Pin	–	3.5	3.75	4	V
$V_{CC(OVP)}$	Over Voltage Protection at VCC Pin	–	27	28.5	30	V
$t_{ONP(MAX)}$	Maximum Turn-on Time	–	13	17.5	22	µs
$t_{OFF(MAX)}$	Maximum Off Time	–	11	14	17	ms
$V_{CS(MIN)}$	Minimum Peak Current Sense Voltage at $t_{ONP(MAX)}$	–	135	150	165	mV
$V_{FB(SCP)}$	Short Circuit Protection	V_{FB} @ Hiccup	1.46	1.5	1.54	V
t_{SCP}	Time under $V_{FB(SCP)}$	–	32	51.5	71	ms
T_{OTP}	Shutdown Temperature	–	+135	+150	+165	ºC
T_{HYS}	Temperature Hysteresis	–	+30	+40	+50	ºC

Operation Description

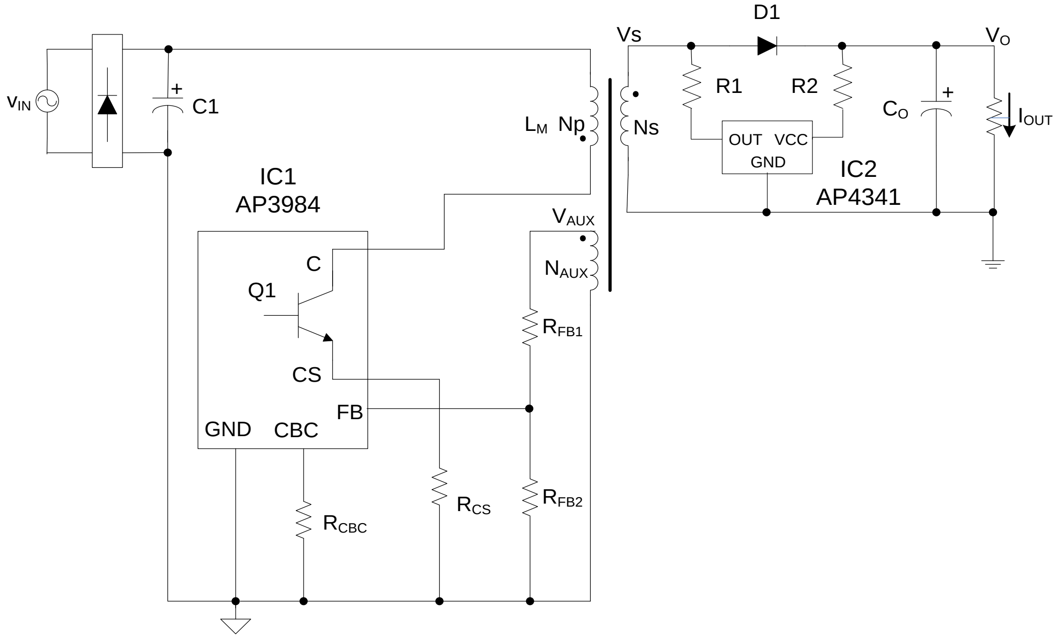


Figure 1. Simplified Flyback Converter Controlled by AP3984

Constant Primary Peak Current

The primary $I_P(t)$ current is sensed by a current sense resistor R_{CS} as shown in Figure 1.

The current rises up linearly at a rate of:

$$\frac{dI_P(t)}{dt} = \frac{V_{BULK}(t)}{L_M} \quad (1)$$

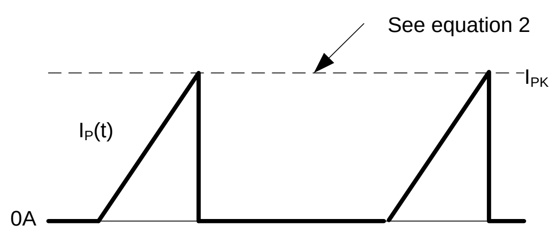


Figure 2. Primary Current Waveform

As illustrated in Figure 2, when the current $I_P(t)$ rises up to I_{PK}, the switch Q1 turns off. The constant peak current is given by:

$$I_{PK} = \frac{V_{CS}}{R_{CS}} \quad (2)$$

The energy stored in the magnetizing inductance L_M each cycle is therefore:

$$E_g = \frac{1}{2} \cdot L_M \cdot I_{PK}^2 \quad (3)$$

So the power transferring from input to output is given by:

$$P = \frac{1}{2} \cdot L_M \cdot I_{PK}^2 \cdot f_{SW} \quad (4)$$

Where f_{SW} is the switching frequency. When the peak current I_{PK} is constant, the output power depends on the switching frequency f_{SW}.

Operation Description (Cont.)

Constant Voltage Operation

The AP3984 captures the auxiliary winding feedback voltage at FB pin and operates in constant-voltage (CV) mode to regulate the output voltage. Assuming the secondary winding is master, the auxiliary winding is slave during the D1 on-time. The auxiliary voltage is given by:

$$V_{AUX} = \frac{N_{AUX}}{N_S} \cdot (V_O + V_D) \cdots\cdots\cdots (5)$$

Where V_D is the diode forward drop voltage, N_{AUX} is the turns of auxiliary winding, and N_S is the turns of secondary winding.

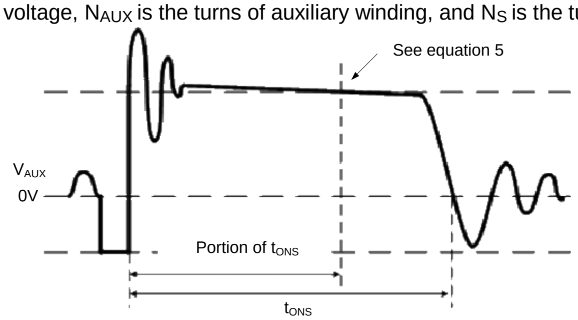


Figure 3. Auxiliary Voltage Waveform

The output voltage is different from the secondary voltage in a diode forward drop voltage V_D which depends on the current. If the secondary voltage is always detected at a constant secondary current, the difference between the output voltage and the secondary voltage will be a fixed V_D. The voltage detection point is portion of t_{ONS} after D1 is turned on. The CV loop control function of AP3984 then generates a D1 off-time to regulate the output voltage.

Constant Current Operation

The AP3984 is designed to work in constant current (CC) mode. Figure 4 shows the secondary current waveforms.

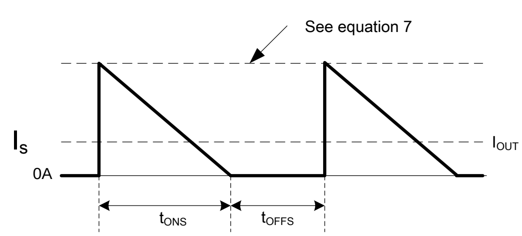


Figure 4. Secondary Current Waveform

In CC operation, the CC loop control function of AP3984 will keep a fixed proportion between D1 on-time t_{ONS} and D1 off-time t_{OFFS} by discharging or charging the built-in capacitance connected. This fixed proportion is

$$\frac{t_{ONS}}{t_{OFFS}} = \frac{4}{4} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (6)$$

The relation between the output constant-current and secondary peak current I_{PKS} is given by:

$$I_{OUT} = \frac{1}{2} \cdot I_{PKS} \cdot \frac{t_{ONS}}{t_{ONS} + t_{OFFS}} \cdots\cdots\cdots (7)$$

At the instant of D1 turn-on, the primary current transfers to the secondary at an amplitude of:

$$I_{PKS} = \frac{N_P}{N_S} \cdot I_{PK} \cdots\cdots\cdots\cdots\cdots\cdots (8)$$

Thus the output constant current is given by:

$$I_{OUT} = \frac{1}{4} \cdot \frac{N_P}{N_S} \cdot I_{PK} \cdots\cdots\cdots\cdots\cdots\cdots (9)$$

Operation Description (Cont.)

Multiple Segment Peak Current

As to the original PFM PSR system, the switching frequency decreases with decreasing of output current, which will encounter audible noise issue since switching frequency decreases to audio frequency range about less than 20kHz.

In order to avoid audible noise issue, AP3984 uses 3-segment primary peak current control method at constant voltage (CV) mode, the current sense threshold voltage is multiple segments with different loading, as shown in Figure 5, which are V_{CS_H} for high load, varied V_{CS_M} for medium load and V_{CS_L} for light load. In no load and ultra light load condition (NL mode), the current reference is also V_{CS_L}. But the operation in NL mode is different, which will be described in next section.

It can be seen from the following figure that with multiple segment peak current control, AP3984 power system can keep switching frequency above 24kHz from light load to heavy load and guarantee the audible noise free performance.

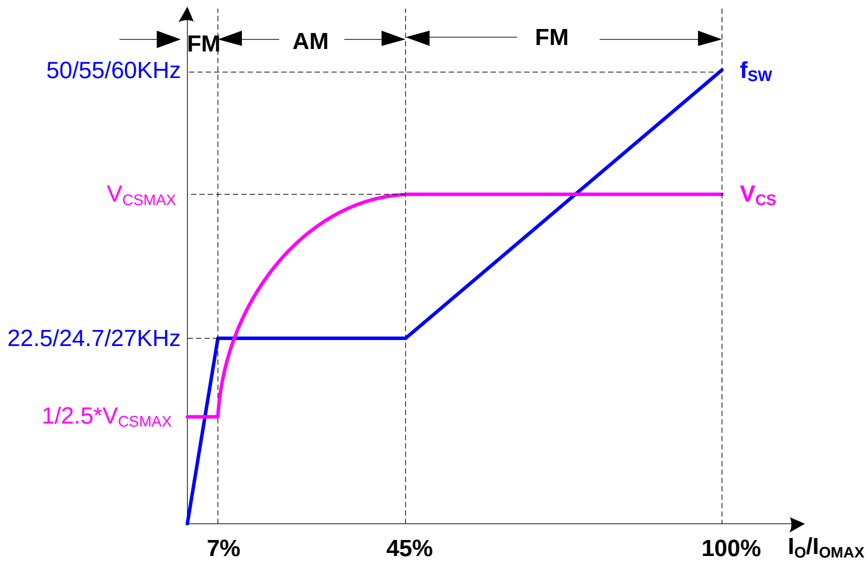


Figure 5. Segment Peak Current and Operating Frequency at CV Mode

Amplitude Modulation (AM)

The power transferring from the input to the output is given by:

$$P = \frac{1}{2} \times L_M \times I_{PK}^2 \times f_{SW} \quad \cdots\cdots (10)$$

$$\eta \times \frac{1}{2} \times L_P \times I_{PK}^2 \times f_{SW} = P_O = V_O \times I_O \quad \cdots\cdots (11)$$

Where, f_{SW} is the switching frequency, η is the transferring efficiency.

In AP3984, the high load mode and light load mode adopt the frequency modulation (FM), and the medium load mode uses the amplitude modulation (AM).

During AM, the frequency is fixed, V_{CS_M} is varied. Below is the analysis of V_{CS_M}.
We can get the square root equation from the following equation:

$$\eta \times \frac{1}{2} \times L_P \times I_{PK}^2 \times f_{SW} = \eta \times \frac{1}{2} \times L_P \times \left(\frac{V_{CS}}{R_{CS}}\right)^2 \times f_{SW} = V_O \times I_O \quad \cdots\cdots (12)$$

So, $$V_{CS} = \sqrt{\frac{2 \cdot R_{CS}^2 \cdot V_O \cdot I_O}{\eta \cdot L_p \cdot f_{SW}}} \quad \cdots\cdots (13)$$

Operation Description (Cont.)

During AM, the frequency is fixed, assume V_O and η are constants, we can get

$$V_{CS} = k \cdot \sqrt{I_O} \qquad \left(k = \sqrt{\frac{2 \cdot R_{CS}^{\ 2} \cdot V_O}{\eta \cdot L_p \cdot f_{SW}}} \right) \text{.........(14)}$$

NL Mode Operation

At no load and ultra light load, the AP3984 works at no load mode (NL mode) and the output voltage is detected by AP4341. In order to achieve ultra low standby power at NL mode, the static current (I_{CC_NL}) of the AP3984 is reduced to 17.5μA.

• The conditions of exiting NL mode---V_{CPC}>60mV or t_{OFF}<256μs

• The conditions of entering NL mode-- V_{CPC}<60mV and t_{OFF}≥256μs

At NL mode, the internal reference voltage V_{DD} is pulled to ground. For normal NL working state, there are two mechanisms that make the AP3984 re-establish the V_{DD}, then generate the PFM pulse to turn on primary switch. One is when the AP4341 detects the output voltage is lower than its trigger voltage. The AP4341 OUT pin emits a periodical pulse current. This pulse current will generate a pulse voltage on feedback winding through the transformer coupling. When the FB pin of AP3984 detects this pulse (>75mV is valid), the AP3984 re-establishes the V_{DD} and turns on primary switch to provide one energy pulse to supply output terminal and primary VCC voltage. The other is when VCC voltage of the AP3984 lower than LVCC voltage (about 7.5V). To achieve low standby power, the lower switching frequency is necessary. But if the off time is too long, the VCC voltage will reduce to very low level. This mechanism is better to avoid VCC voltage being lower than $V_{OPR(MIN)}$.

Leading Edge Blanking

When the power switch is turned on, a turn-on spike will occur on the sense-resistor. To avoid false-termination of the switching pulse, a 500ns leading-edge blanking is built in. During this blanking period, the current sense comparator is disabled and the driver can't be switched off.

Valley Turn-on

When the off time (t_{OFF}) is lower than $t_{VAL\text{-}ON}$, AP3984 power system can work with valley turn-on. It can reduce BJT switching on power losses which is resulted from the equivalent output capacitance to achieve highest overall efficiency. At the same time, because of valley turn-on the switching frequency has the random jitter feature, which will benefit for conductive EMI performance. And valley turn-on can also reduce the power switch turn on spike current and then achieve the better radiative EMI performance.

Adjustable Line Compensation

Since there is a constant delay time from the CS pin voltage reaching the given V_{CS} reference to the power BJT turning off, the real primary peak current value always has a gap with the ideal value. The gap value changes with different input line voltage, which is caused by different current rising slope, results in different system constant current value.

In order to eliminate the constant current deviation due to line voltage, the adjustable line compensation is introduced to AP3984 design. The negative voltage of FB pin which is linear to the line voltage is added up to V_{CS} reference by a certain proportion and create an adjustable compensation voltage to clear up the primary current gap, so that the excellent line regulation of output current will be achieved.

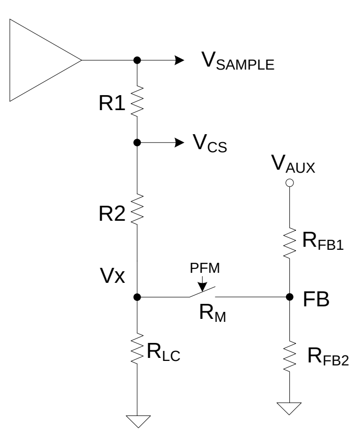


Figure 6. Adjustable Line Compensation Circuit

NEW PRODUCT

Operation Description (Cont.)

$$\Delta V_{CS} = -\frac{R_1}{R_1 + R_2} \cdot \frac{N_{AUX}}{N_P} \cdot \frac{R_{LC}}{R_{LC} + R_M + R_{FB1}} \cdot V_{LINE} \quad \cdots\cdots\cdots(15)$$

So, the AP3984 can change the line compensation capability by adjusting the upper resistor at FB pin (R_{FB1}). Higher resistance means lower line compensation capability.

Adjustable Cable Compensation

To meet the voltage drop of different output cables, the AP3984 can realize the adjustable cable compensation.

As shown in Figure 7, V_{CBC} follows the V_{LOAD} that reflects the power system loading percentage.

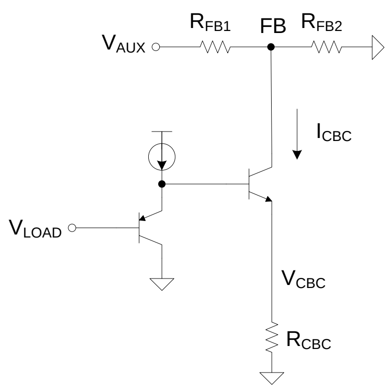


Figure 7. Adjustable Cable Compensation Circuit

If the CBC resistance (R_{CBC}) and R_{FB1} are fixed, the current (I_{CBC}) flowing through the CBC resistance (R_{CBC}) also follows the changing of the V_{LOAD}:

$$I_{CBC} = \frac{V_{LOAD}}{R_{CBC}} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots(16)$$

The voltage change (ΔV_{AUX}) of auxiliary winding (V_{AUX}) is varied with the V_{LOAD}:

$$\Delta V_{AUX} = R_{FB1} \cdot I_{CBC} = \frac{R_{FB1}}{R_{CBC}} \cdot V_{LOAD} \quad \cdots\cdots\cdots\cdots (17)$$

The V_O changing (ΔV_O) which $\triangle V_{AUX}$ reflects is also changed with V_{LOAD}:

$$\Delta V_O \approx \frac{N_S}{N_{AUX}} \cdot \Delta V_{AUX} = \frac{N_S}{N_{aux}} \cdot \frac{R_{FB1}}{R_{CBC}} \cdot V_{LOAD} \quad \cdots\cdots(18)$$

So, we can achieve the right cable compensation by adjusting R_{CBC}. The 90kΩ resistance can ensure about 350mV cable compensation from no load to full load.

Protection

The AP3984 has various built-in single-point fault protection features: FB over voltage protection, VCC over voltage protection, output short circuit protection, FB open circuit protection, transformer saturation protection and current sense resistor fault (short or open) protection, over temperature protection. The fault conditions to trigger these protections are different and protection modes to enter after the protections are triggered are different.

Protection Mode

The AP3984 has three protection modes: D_{MIN}, auto-recovery and hold. The Operation Principles are different.

When FB over voltage protection and FB open circuit protection are triggered, the AP3984 enters the D_{MIN} mode whereby the AP3984 immediately shuts down and signals a pulse to turn on the primary switch after $t_{OFF(MAX)}$, that detects if the fault condition is removed. If the fault

NEW PRODUCT

Operation Description (Cont.)

condition is removed before V_{CC} is still higher than $V_{OPR(MIN)}$, the device will enter normal operating mode. If not, the AP3984 will remain off and wait for another $t_{OFF(MAX)}$. When V_{CC} drops to $V_{OPR(MIN)}$, the AP3984 will enter the restart process, and VCC voltage changes between $V_{TH(ST)}$ and $V_{OPR(MIN)}$ until $V_{FB(OVP)}$ condition is removed.

When over temperature protection is activated, the device enters the hold mode. Once the hold mode is triggered, the AP3984 doesn't signal any pulse until the fault condition is removed, and VCC Voltage is hold not lower than LVCC voltage.

When other fault protections are triggered, the device enters the auto-recovery mode. Once the AP3984 enters the auto-recovery mode, the device shuts down immediately and doesn't signal any pulse, the VCC current is decreased from operating current (mean: 550μA) to standby current (mean: 17.5μA). Until VCC voltage drops to $V_{OPR(MIN)}$, the AP3984 will enter the restart process, and VCC voltage changes between $V_{TH(ST)}$ and $V_{OPR(MIN)}$ until the fault condition is removed. The slope of VCC voltage to discharge is very small, and the time to drop to $V_{OPR(MIN)}$ is very long. It can decrease the average power dissipation at a fault condition.

Short Circuit Protection (SCP)

Short Circuit Protection (SCP) detection principle is similar to the normal output voltage feedback detection by sensing FB pin voltage. When the detected FB pin voltage is below $V_{FB(SCP)}$ for a duration of about t_{SCP}, the SCP is triggered. Then the AP3984 enters hiccup mode that the IC immediately shuts down and then restarts, so that the VCC voltage changes between V_{TH_ST} and UVLO threshold until $V_{FB(SCP)}$ condition is removed.

As to the normal system startup, the time duration of FB pin voltage below $V_{FB(SCP)}$ should be less than t_{SCP} to avoid entering SCP mode. But for the output short condition or the output voltage below a certain level, the SCP mode should happen.

Figure 8 is the AP3984 normal start-up waveform that the voltage of FB pin is above $V_{FB(SCP)}$ during t_{SCP} after VCC gets to the V_{TH_ST}, which doesn't enter the SCP mode. As shown in Figure 9, V_{OUT} is short and the voltage of FB pin is lower than $V_{FB(SCP)}$ during t_{SCP}, the AP3984 triggers the SCP and enters hiccup mode.

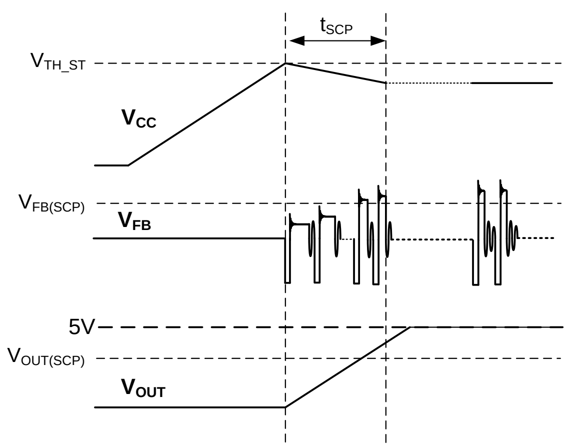


Figure 8. Normal Start-up

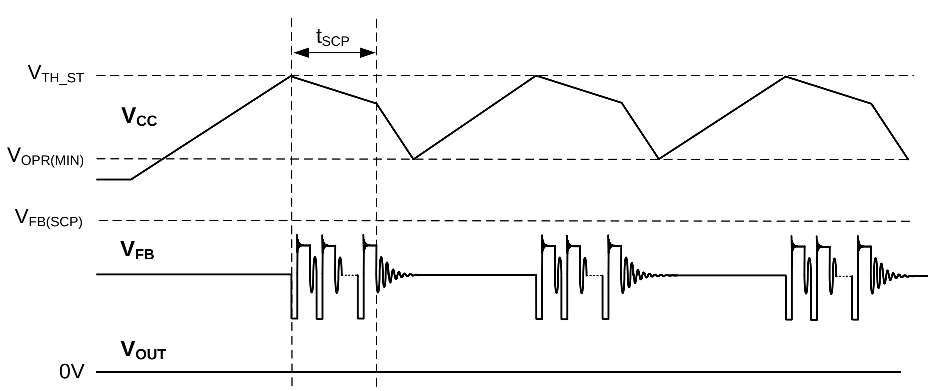


Figure 9. Short Circuit Protection (SCP) and Hiccup Mode

Operation Description (Cont.)

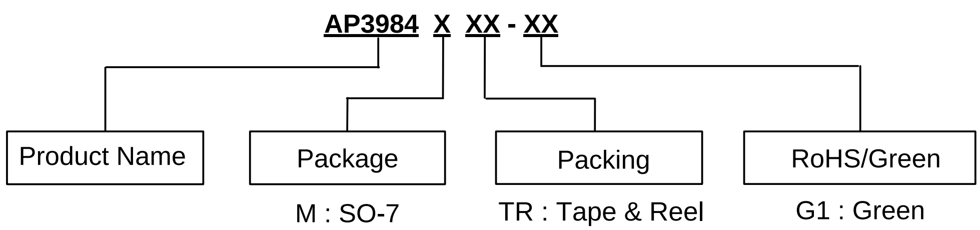
Transformer Saturation Protection via Primary Peak Current Limitation

When the power system works abnormally with transformer saturated, the voltage of CS pin will increase promptly and be over the $V_{CS(MAX)}$. If two consecutive pulses exceed a threshold value ($V_{CS(MAX)}$), the device shuts down and enters auto-recovery mode.

Over Temperature Protection (OTP)

If the IC junction temperature exceeds the threshold of +150ºC, the AP3984 shuts down immediately and enters the hold mode. If the junction temperature decreases to hysteresis temperature of +100ºC, the AP3984 can recover to normal operation. If not, the power system keeps the hold mode.

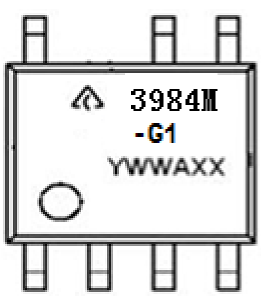
Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing
SO-7	-40°C to +105°C	AP3984MTR-G1	3984M-G1	4000/Tape & Reel

Marking Information

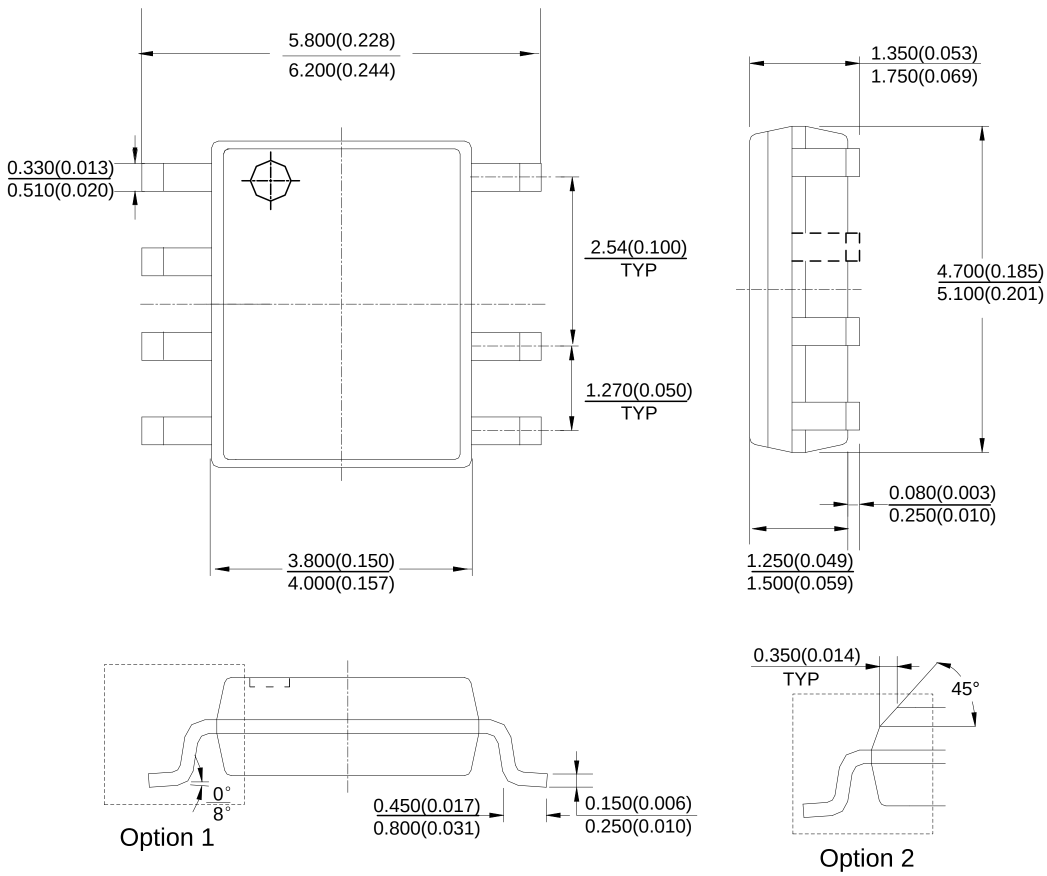
(Top View)



First and Second Lines: Logo and Marking ID
Third Line: Date Code
Y: Year
WW: Work Week of Molding
A: Assembly House Code
XX: 7^{th} and 8^{th} Digits of Batch No.

Package Outline Dimensions (All dimensions in mm(inch).)

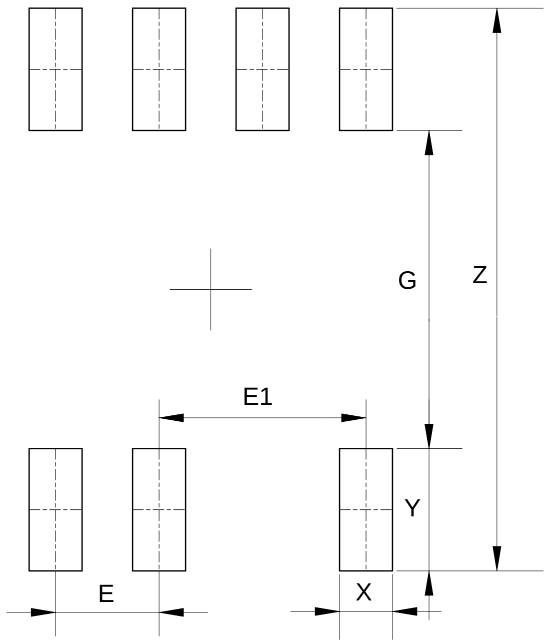
(1) Package Type: SO-7



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

Suggested Pad Layout

(1) Package Type: SO-7



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)	E1 (mm)/(inch)
Value	6.900/0.272	3.900/0.154	0.650/0.026	1.500/0.059	1.270/0.050	2.540/0.100

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

http://moschip.ru/get-element

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9