

**LOW-POWER OFF-LINE PRIMARY SIDE REGULATION CONTROLLER AP3766****General Description**

The AP3766 is a high performance AC/DC power supply controller for battery charger and adapter applications. The device uses Pulse Frequency Modulation (PFM) method to build discontinuous conduction mode (DCM) flyback power supplies.

The AP3766 provides accurate constant voltage, constant current (CV/CC) regulation while removing the opto-coupler and secondary control circuitry. It also eliminates the need of loop compensation circuitry while maintaining stability. The AP3766 achieves excellent regulation and high average efficiency, yet meets the requirement for no-load consumption less than 30mW.

The AP3766 is available in SOT-23-6 package.

**Features**

- Primary Side Control for Rectangular Constant Current and Constant Voltage Output
- Sub-microampere Start-up Current
- 30mW No-load Input Power Feasible
- Tight CC Regulation Performance
- Eliminates Opto-coupler and Secondary CV/CC Control Circuitry
- Eliminates Control Loop Compensation Circuitry
- Flyback Topology in DCM Operation
- Random Frequency Modulation to Reduce System EMI
- Built-in Soft Start
- Open Feedback Protection
- Short Circuit Protection
- SOT-23-6 Package

**Applications**

- Adapters/Chargers for Cell/Cordless Phones, PDAs, MP3 and Other Portable Apparatus
- LED Drivers
- Standby and Auxiliary Power Supplies

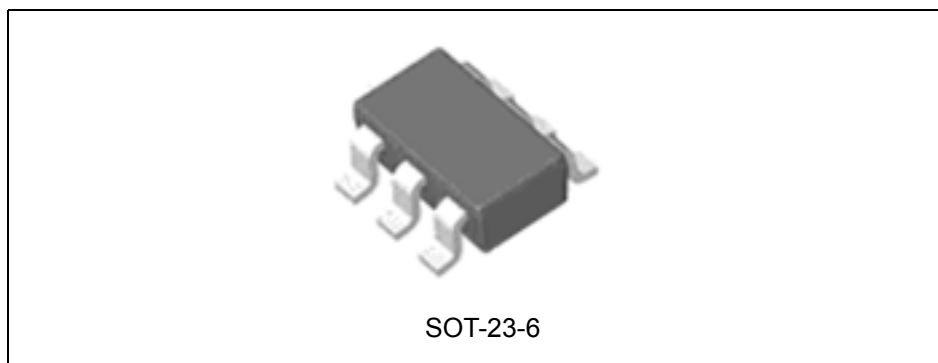


Figure 1. Package Type of AP3766

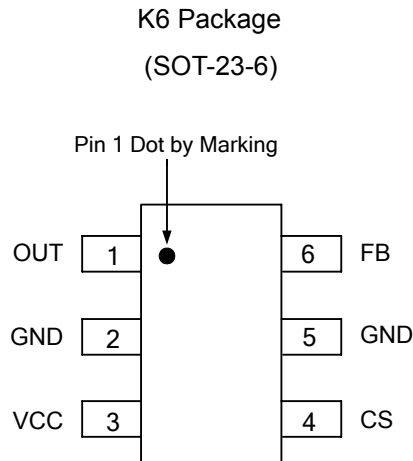
**LOW-POWER OFF-LINE PRIMARY SIDE REGULATION CONTROLLER AP3766**
**Pin Configuration**


Figure 2. Pin Configuration of AP3766 (Top View)

**Pin Description**

Pin Number	Pin Name	Function
1	OUT	This pin drives the base of external power NPN switch
2, 5	GND	Ground
3	VCC	Supply voltage
4	CS	The primary current sense
6	FB	The voltage feedback from the auxiliary winding



**LOW-POWER OFF-LINE PRIMARY SIDE REGULATION CONTROLLER AP3766**

**Functional Block Diagram**

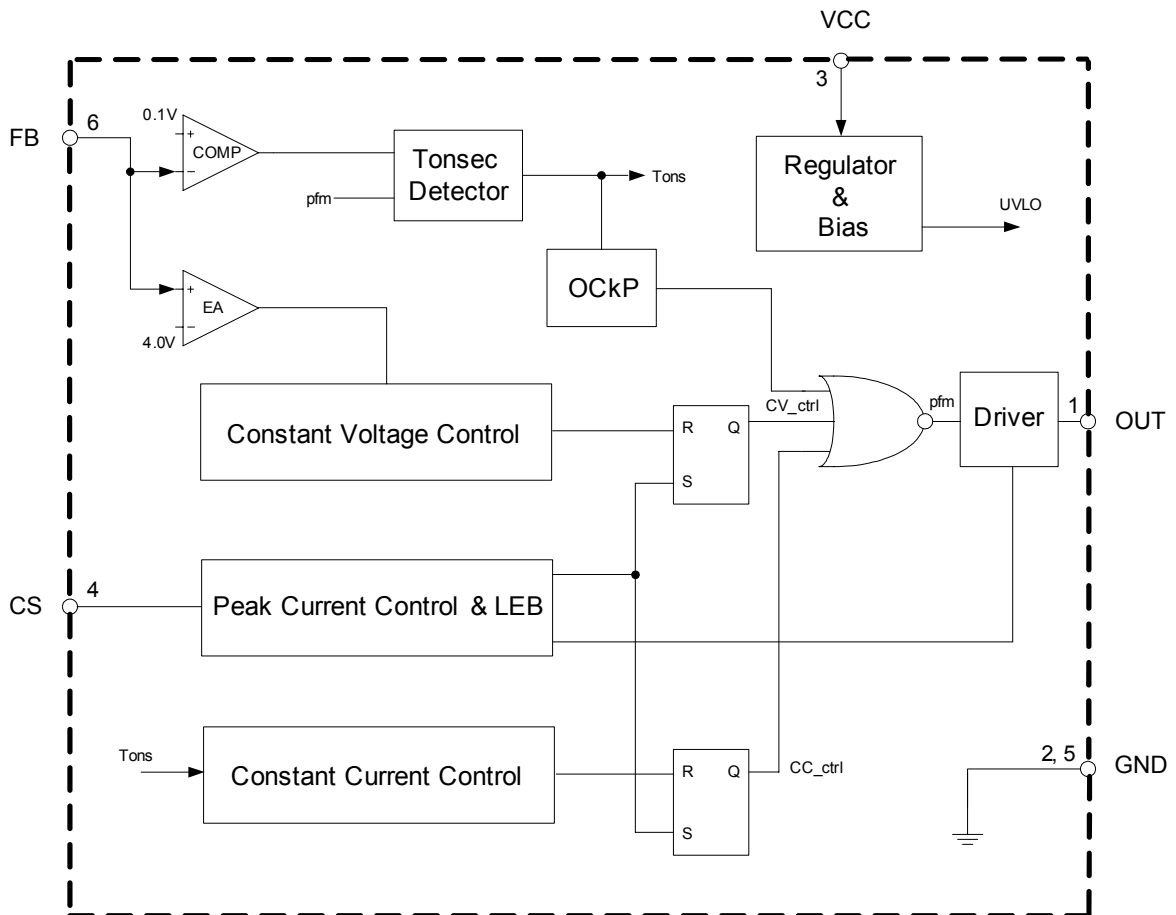
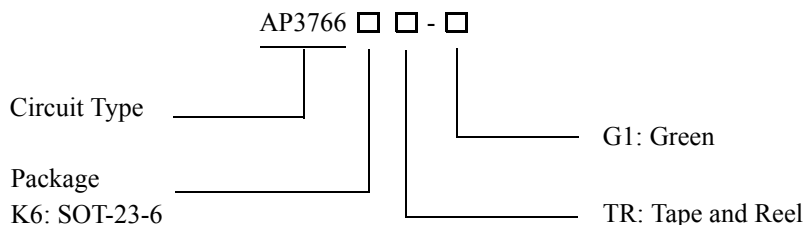


Figure 3. Functional Block Diagram of AP3766

**LOW-POWER OFF-LINE PRIMARY SIDE REGULATION CONTROLLER AP3766****Ordering Information**

Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-23-6	-40 to 85°C	AP3766K6TR-G1	GBF	Tape & Reel

BCD Semiconductor's products, as designated with "G1" suffix in the part number, are RoHS compliant and Green.

**Absolute Maximum Ratings (Note 1)**

Parameter	Value	Unit
Supply Voltage VCC	-0.3 to 36	V
Voltage at CS, OUT to GND	-0.3 to 7	V
FB Input	-40 to 10	V
Output Current at OUT	Internally limited	A
Operating Junction Temperature	150	°C
Storage Temperature	-65 to 150	°C
Lead Temperature (Soldering, 10s)	300	°C
Thermal Resistance Junction-to-Ambient	250	°C/W
ESD (Machine Model)	200	V
ESD (Human Body Model)	2000	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.



**LOW-POWER OFF-LINE PRIMARY SIDE REGULATION CONTROLLER AP3766**

**Electrical Characteristics**

( $V_{CC}=15V$ ,  $T_A=25^{\circ}C$ , unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
<b>UVLO SECTION</b>						
Start-up Threshold	$V_{TH(ST)}$		16	18.5	21	V
Minimal Operating Voltage	$V_{OPR(min)}$		7.2	9	10.2	V
<b>STANDBY CURRENT SECTION</b>						
Start-up Current	$I_{ST}$	$V_{CC} = V_{TH(ST)} - 0.5V$ , Before start-up			0.6	$\mu A$
Operating Current	$I_{CC(OPR)}$	Static		200	320	$\mu A$
<b>DRIVE OUTPUT SECTION</b>						
OUT Maximum Current	Sink	$I_{OUT}$	50			mA
	Source		24	30	36	
<b>CURRENT SENSE SECTION</b>						
Current Sense Threshold	$V_{CS}$		455	510	545	mV
Pre-Current Sense	$V_{CS(PRE)}$		365	410	455	mV
Leading Edge Blanking				750		ns
<b>FEEDBACK INPUT SECTION</b>						
Feedback Pin Input Leakage Current	$I_{FB}$	$V_{FB}=4V$	2.0	2.5	3.1	$\mu A$
Feedback Threshold	$V_{FB}$		3.59	3.83	4.07	V



**LOW-POWER OFF-LINE PRIMARY SIDE REGULATION CONTROLLER AP3766**

**Typical Performance Characteristics**

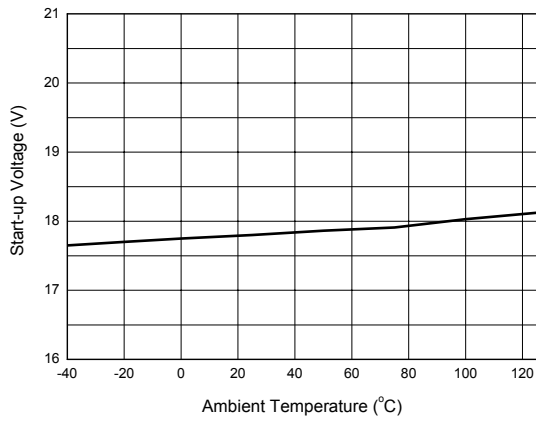


Figure 4. Start-up Voltage vs. Ambient Temperature

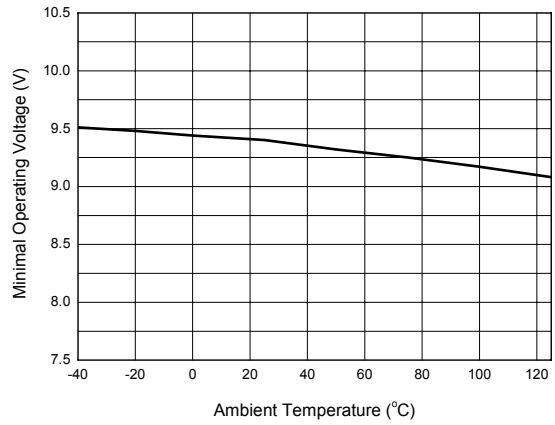


Figure 5. Minimal Operating Voltage vs. Ambient Temperature

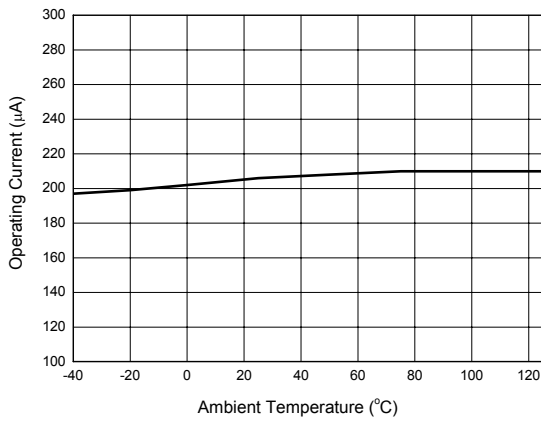


Figure 6. Operating Current vs. Ambient Temperature

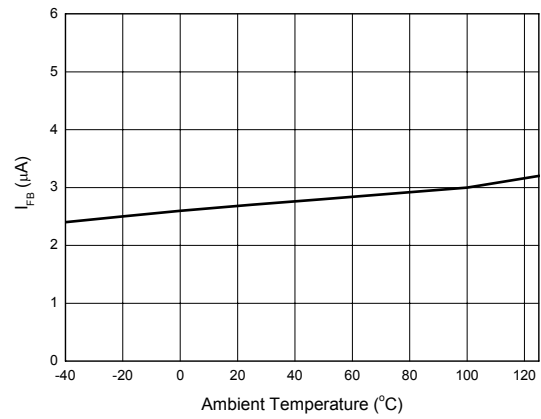


Figure 7. I<sub>FB</sub> vs. Ambient Temperature

**Typical Application**

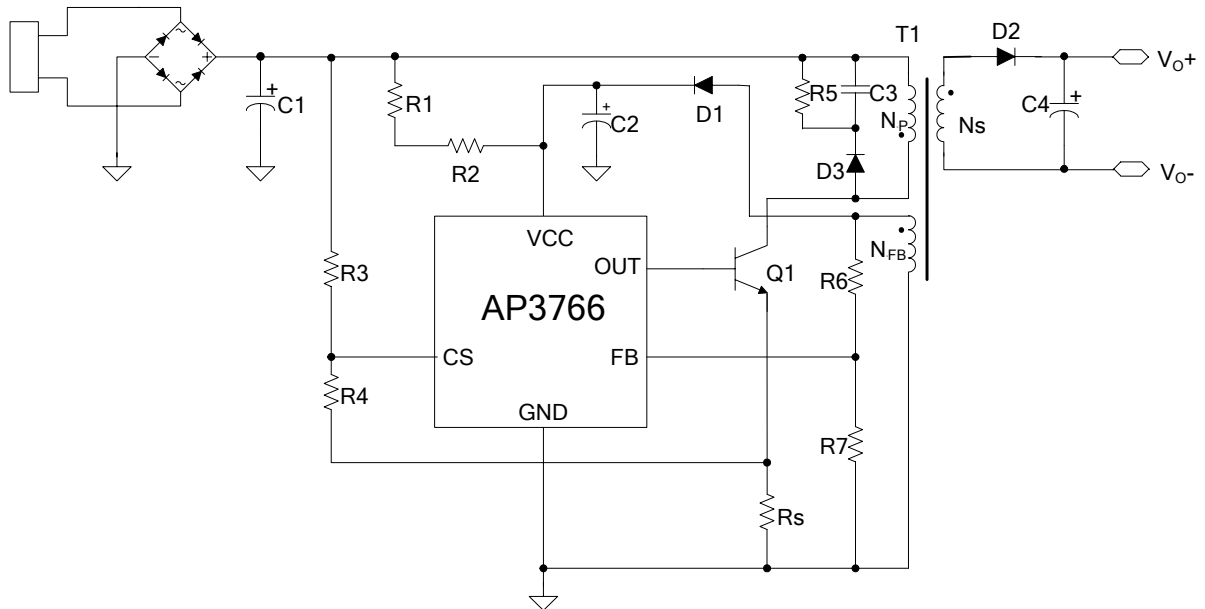


Figure 8. 5V/700mA Output for Battery Charger of Mobile Phone

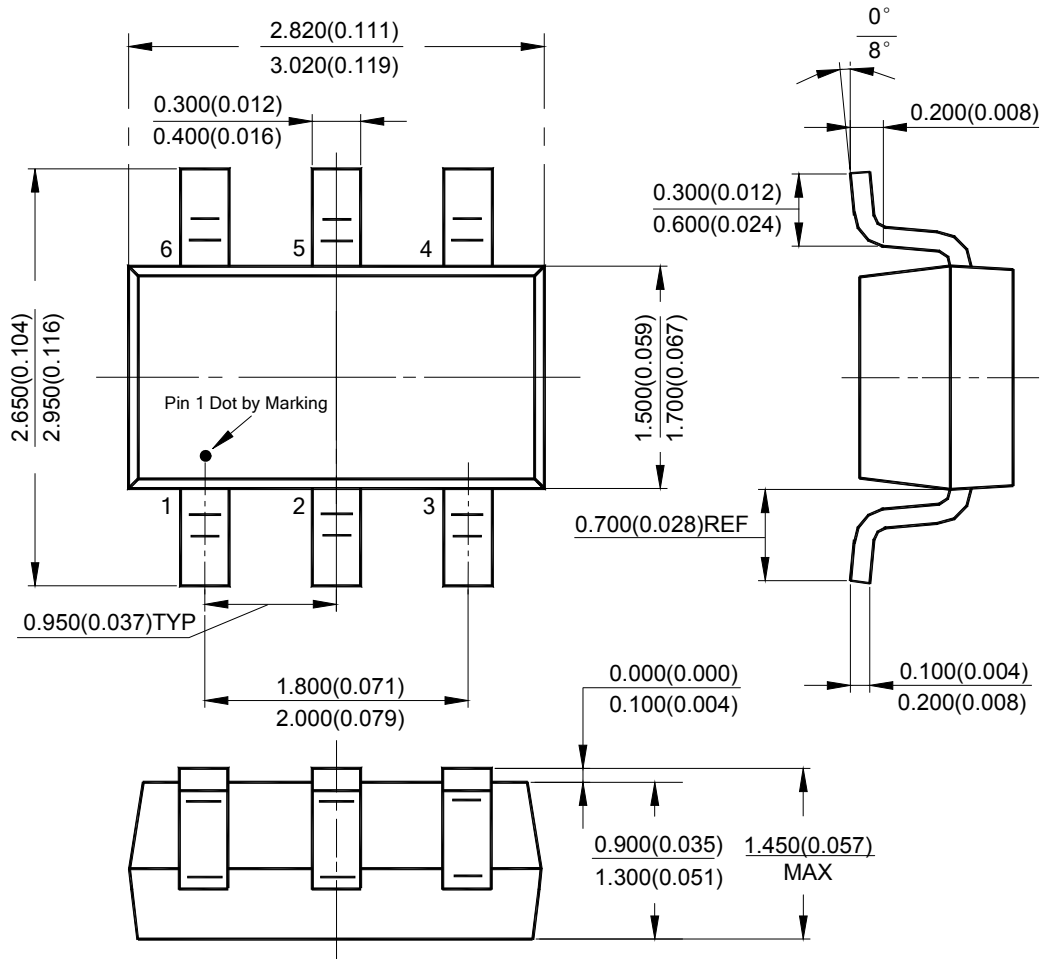


**LOW-POWER OFF-LINE PRIMARY SIDE REGULATION CONTROLLER AP3766**

**Mechanical Dimensions**

**SOT-23-6**

**Unit: mm(inch)**







## **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 Semiconductor Manufacturing Limited**

No. 1600, Zi Xing Road, Shanghai Zizhu Science-based Industrial Park, 200241, China  
Tel: +86-21-24162266, Fax: +86-21-24162277

##### **- Wafer Fab**

##### **Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd.**

800 Yi Shan Road, Shanghai 200233, China  
Tel: +86-21-6485 1491, Fax: +86-21-5450 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, China  
Tel: +86-755-8826 7951  
Fax: +86-755-8826 7865

##### **Taiwan Office**

##### **BCD Semiconductor (Taiwan) Company Limited**

4F, 298-1, Rui Guang Road, Nei-Hu District, Taipei, Taiwan  
Tel: +886-2-2656 2808  
Fax: +886-2-2656 2806

##### **USA Office**

##### **BCD Semiconductor Corp.**

30920 Huntwood Ave. Hayward, CA 94544, USA  
Tel : +1-510-324-2988  
Fax: +1-510-324-2788