LOW-POWER OFF-LINE PRIMARY SIDE REGULATION CONTROLLER AP1680

General Description

The AP1680 is a high performance AC/DC power supply controller for LED drivers, battery charger and adapter applications. The device uses Pulse Frequency Modulation (PFM) method to build discontinuous conduction mode (DCM) flyback power supplies.

The AP1680 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 AP1680 achieves excellent regulation and high average efficiency, yet meets the requirement for no-load consumption less than 30mW.

The AP1680 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

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



SOT-23-6

Figure 1. Package Type of AP1680

Pin Configuration

K6 Package

(SOT-23-6)

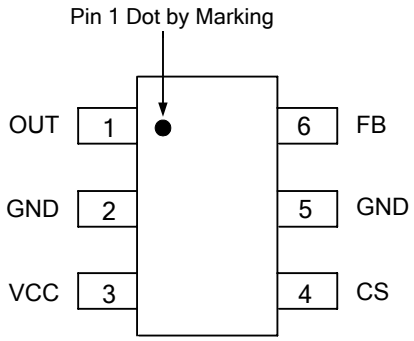


Figure 2. Pin Configuration of AP1680 (Top View)

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

Functional Block Diagram

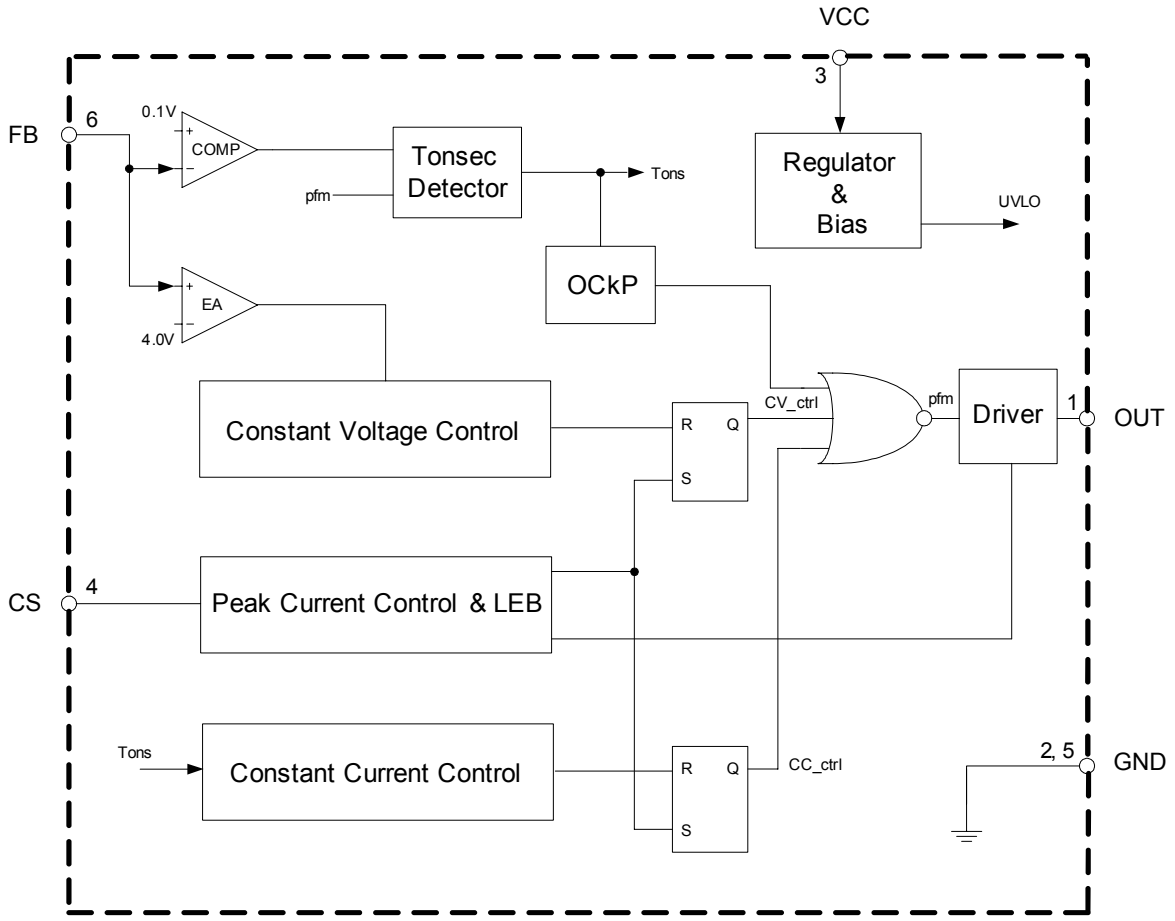
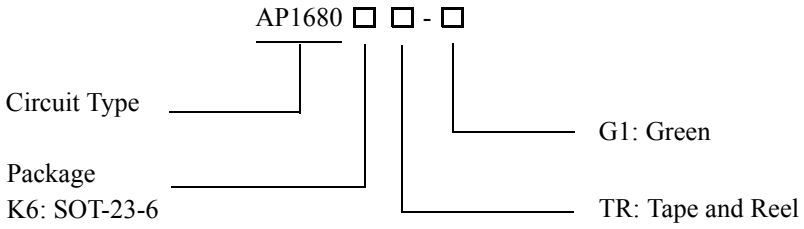


Figure 3. Functional Block Diagram of AP1680

Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-23-6	-40 to 105°C	AP1680K6TR-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.

Electrical Characteristics

(V_{CC}=15V, T_A=25°C, unless otherwise specified.)

Parameter		Symbol	Conditions	Min	Typ	Max	Unit
UVLO SECTION							
Start-up Threshold		$V_{TH\ (ST)}$		16	18.5	21	V
Minimal Operating Voltage		V_{OPR}(min)		7.2	9	10.2	V
STANDBY CURRENT SECTION							
Start-up Current		I_{ST}	V_{CC}=$V_{TH\ (ST)}$-0.5V, Before start-up			0.6	μA
Operating Current		$I_{CC(OPR)}$	Static		200	320	μA
DRIVE OUTPUT SECTION							
OUT Maximum Current	Sink	I_{OUT}		50			mA
	Source			24	30	36	
CURRENT SENSE SECTION							
Current Sense Threshold		V_{CS}		455	510	545	mV
Equivalent Current Sense Voltage Accuracy		$\frac{\Delta Vcs,\ eq}{Vcs,\ eq}$	Note 2			3	%
Pre-Current Sense		$V_{CS(PRE)}$		365	410	455	mV
Leading Edge Blanking					750		ns
FEEDBACK INPUT SECTION							
Feedback Pin Input Leakage Current		I_{FB}	V_{FB}=4V	2.0	2.5	3.1	μA
Feedback Threshold		V_{FB}		3.59	3.83	4.07	V

Note 2: The output current is given by $I_{OUT}=\frac{Vcs,eq}{Rcs} x \frac{Np}{Ns}$.

Typical Performance Characteristics

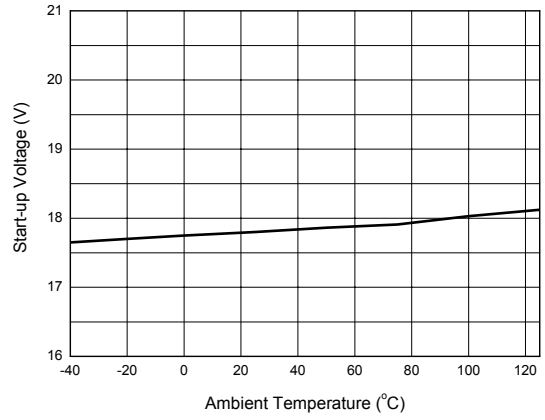


Figure 4. Start-up Voltage vs. Ambient Temperature

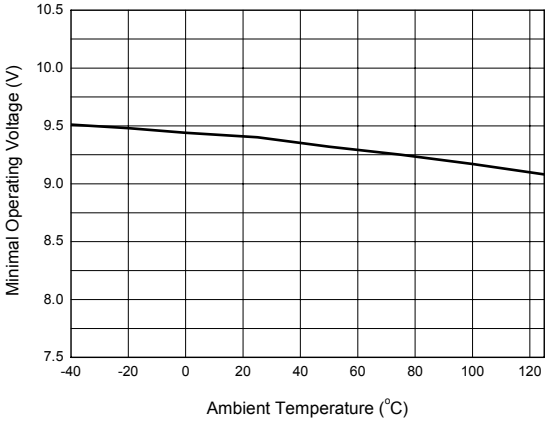


Figure 5. Mininal Operating Voltage vs. Ambient Temperature

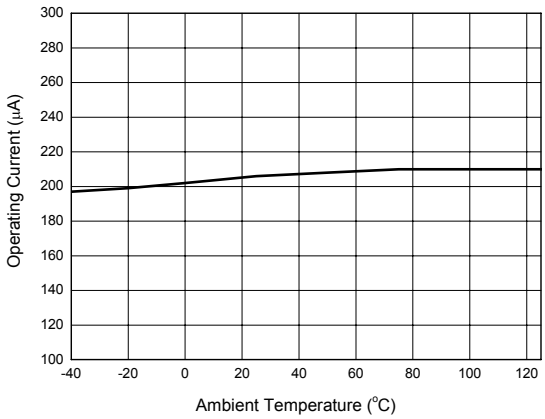


Figure 6. Operating Current vs. Ambient Temperature

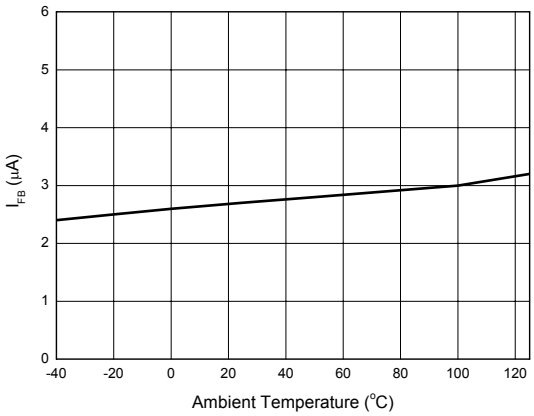


Figure 7. I_{FB} vs. Ambient Temperature

Typical Application

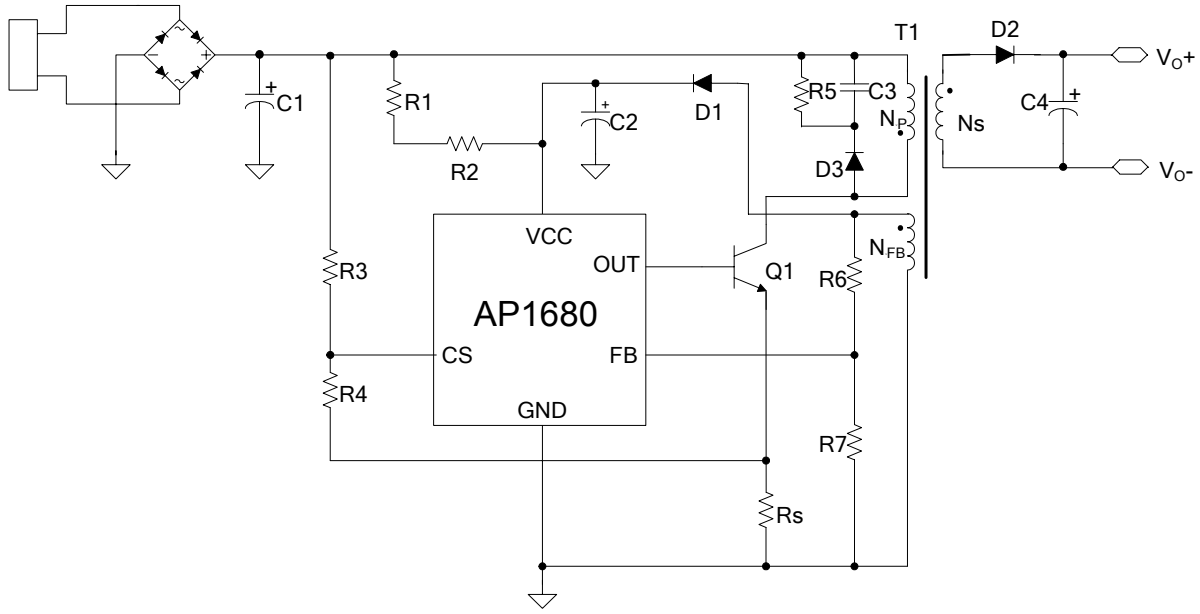
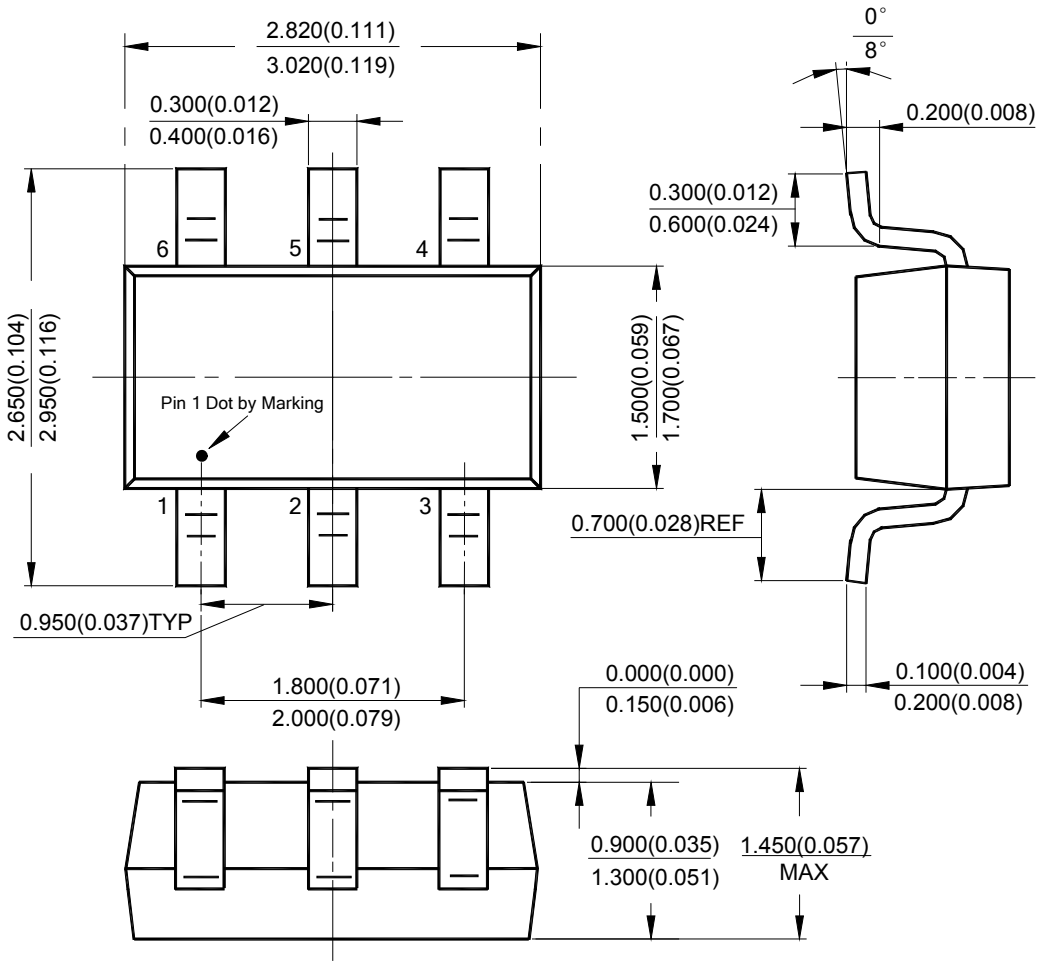


Figure 8. 16.5V/350mA Output for LED Driver

Mechanical Dimensions

SOT-23-6 **Unit: mm(inch)**





BCD Semiconductor Manufacturing Limited

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