LOW-POWER OFF-LINE PRIMARY SIDE REGULATION CONTROLLER

Description

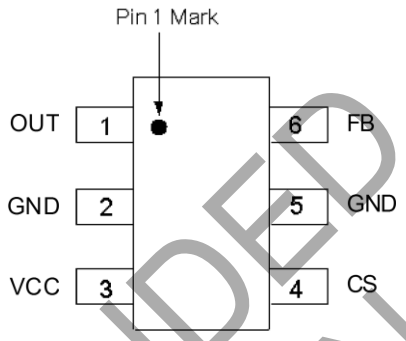
The AP1680 is a high performance AC/DC power supply controller for LED drivers, battery charger and adapter applications. The device uses Pulse Frequency Modulation (PFM) method to build discontinuous conduction mode (DCM) flyback power supplies.

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.

Pin Assignments

(Top View)



SOT-23-6

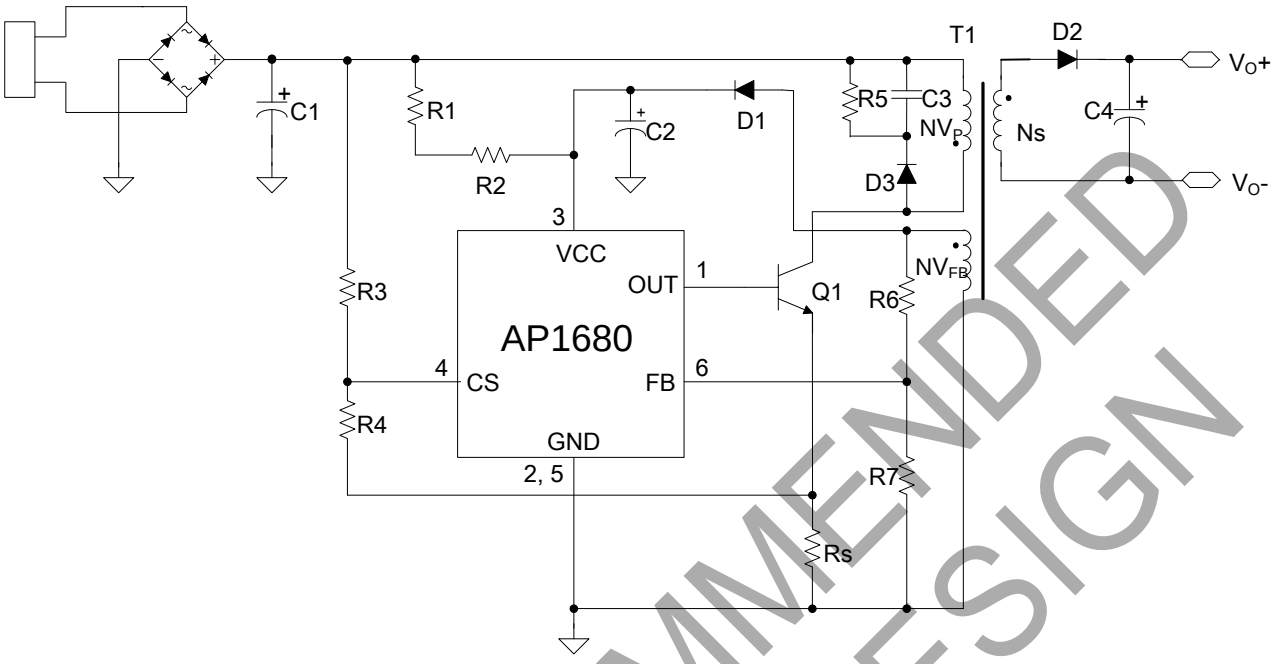
Features

- 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
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

Applications

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

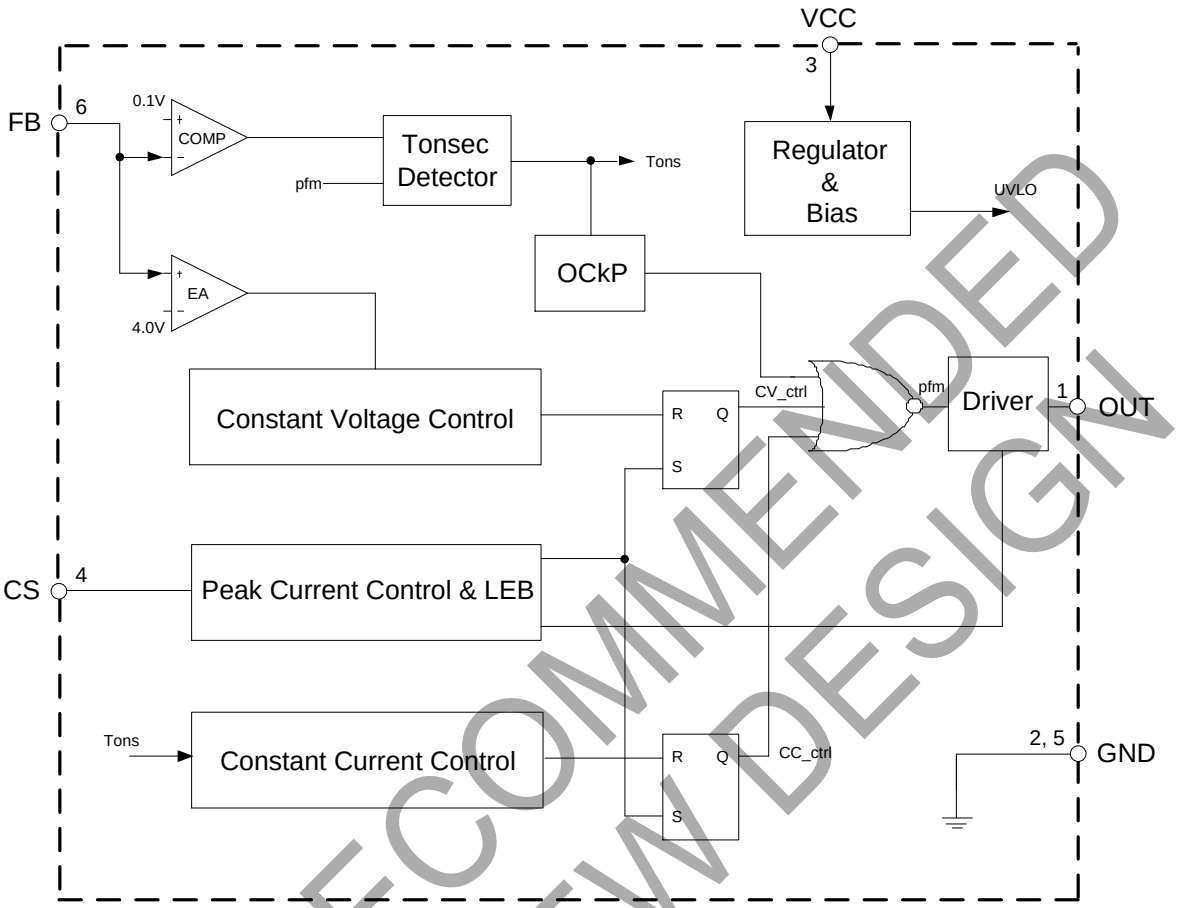
Typical Applications Circuit



Pin Descriptions

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



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* can cause permanent damage to the device. Exposure to *Absolute Maximum Ratings* for extended periods can affect device reliability.

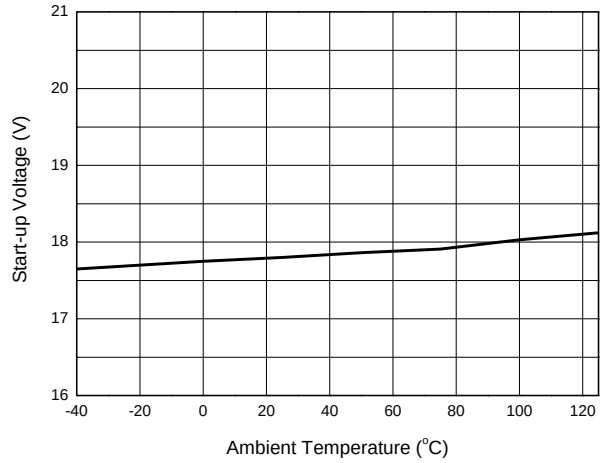
Electrical Characteristics (V_{CC} = 15V, T_A = +25°C, unless otherwise specified.)

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

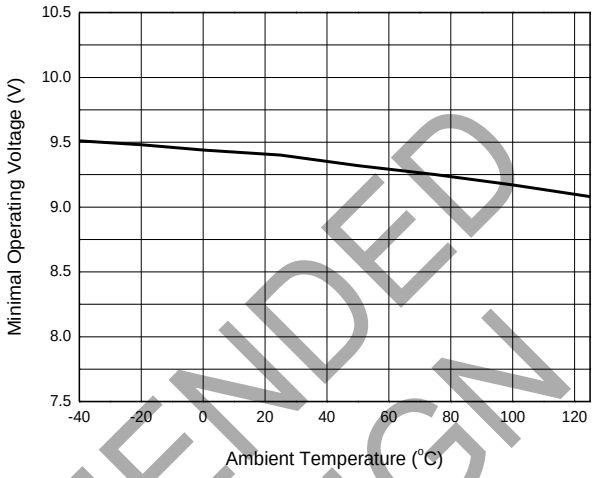
Note 2: The output current is given by $I_{OUT} = \frac{Vcs,eq}{Rcs} \times \frac{Np}{Ns}$.

Performance Characteristics

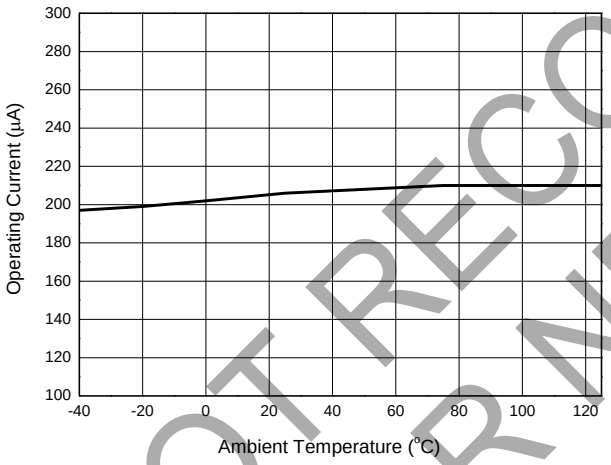
Start-up Voltage vs. Ambient Temperature



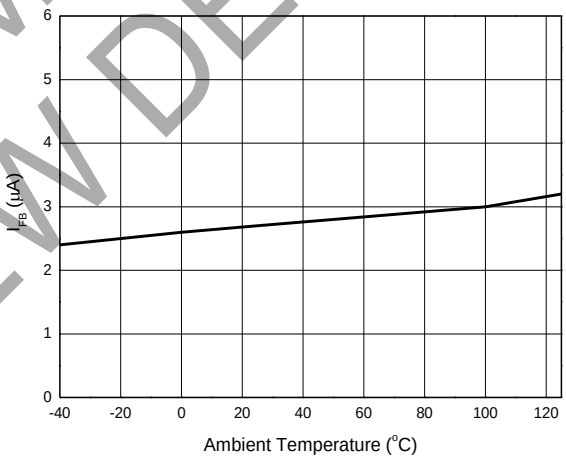
Minimal Operating Voltage vs. Ambient Temperature



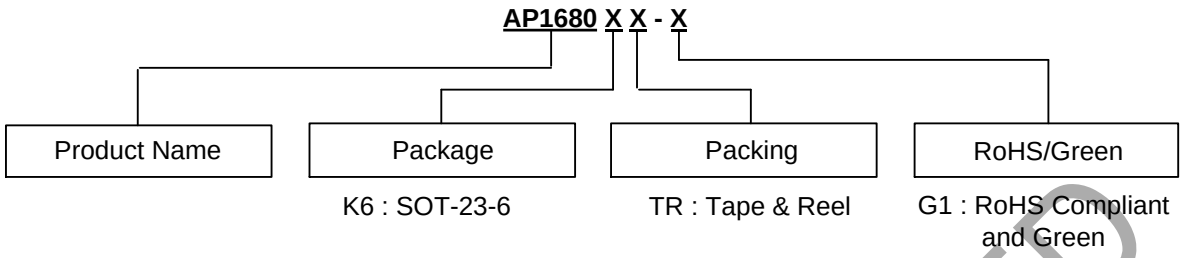
Operating Current vs. Ambient Temperature



I_{FB} vs. Ambient Temperature



Ordering Information

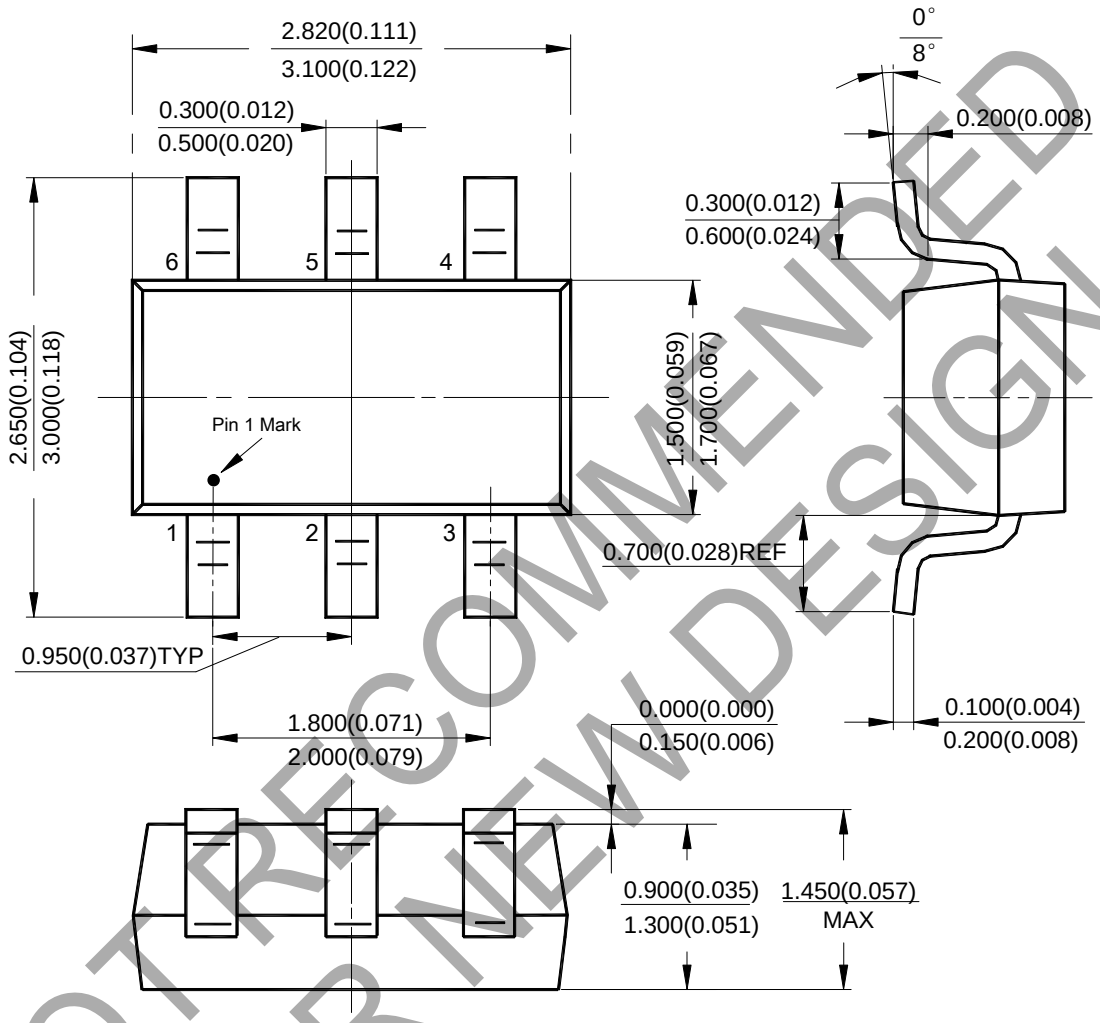


Package	Temperature Range	Part Number	Marking ID	Packing
SOT-23-6	-40 to +105°C	AP1680K6TR-G1	GBF	Tape & Reel

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

Please see http://www.diodes.com/package-outlines.html for the latest version.

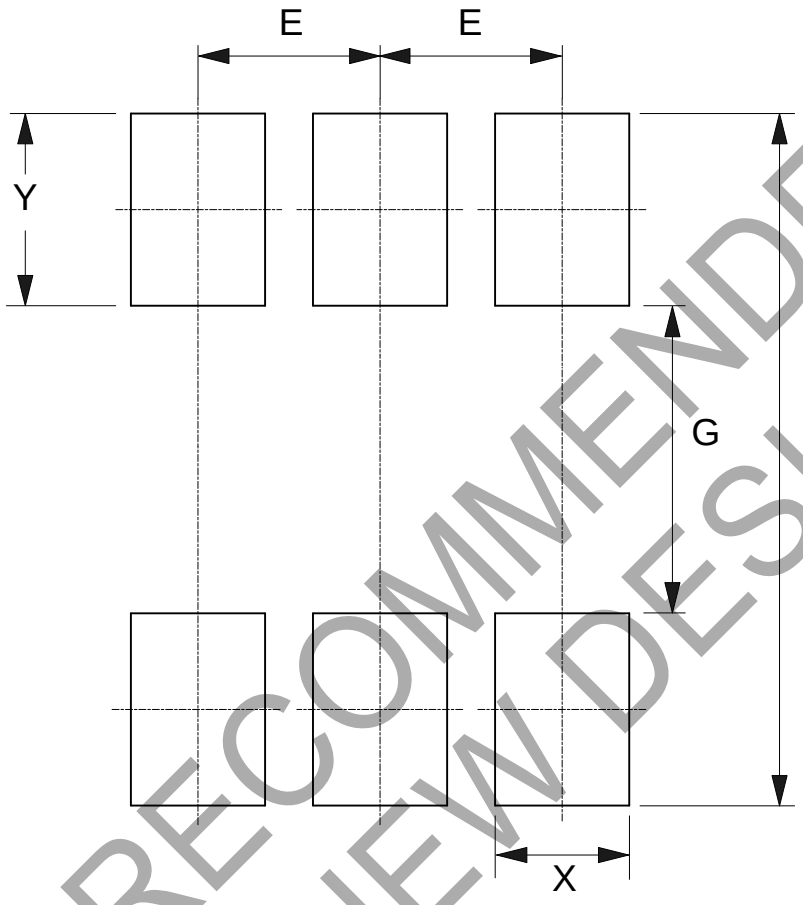
(1) Package Type: SOT-23-6



Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

(1) Package Type: SOT-23-6



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037

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