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Primary-side-control PWM Controller

SGP100

FEATURES

- Constant-voltage (CV) and constant-current (CC) control without secondary-feedback circuitry
- Green-mode function: PWM frequency linearly decreasing
- Fixed PWM frequency at 42kHz with frequency hopping to solve EMI problems
- Low start-up current: 10μA (typical)
- Low operating current: 6.5mA (typical)
- Peak-current-mode control in CV mode
- Cycle-by-cycle current limiting
- V<sub>DD</sub> over-voltage protection with latch (OVP)
- V<sub>DD</sub> under-voltage lockout (UVLO)
- Gate output maximum voltage clamped at 18V
- Fixed over-temperature protection with latch

APPLICATIONS

- Battery chargers for cellular phones, cordless phones, PDA, digital cameras, and power tools
- Replacement for linear transformer and RCC SMPS

DESCRIPTION

This highly integrated PWM controller provides several features to enhance the performance of low-power flyback converters. The proprietary topology of SGP100 enables simplified circuit design for battery charger

applications. The result is a low-cost, smaller and lighter charger than a conventional design or a linear transformer.

To minimize the standby power consumption, the proprietary green-mode function provides off-time modulation to linearly decrease PWM frequency under light-load conditions. This green-mode function allows the power supply to meet power conservation requirements. The start-up current is only 10μA, which allows large start-up resistance for further power saving.

A charger can be implemented with few external components and minimal cost. A typical output CV/CC characteristic envelope is shown in Figure 1.

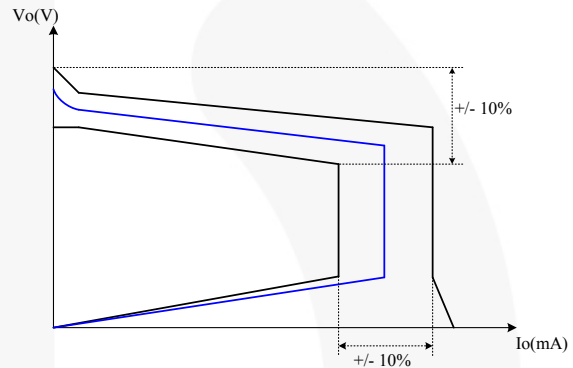
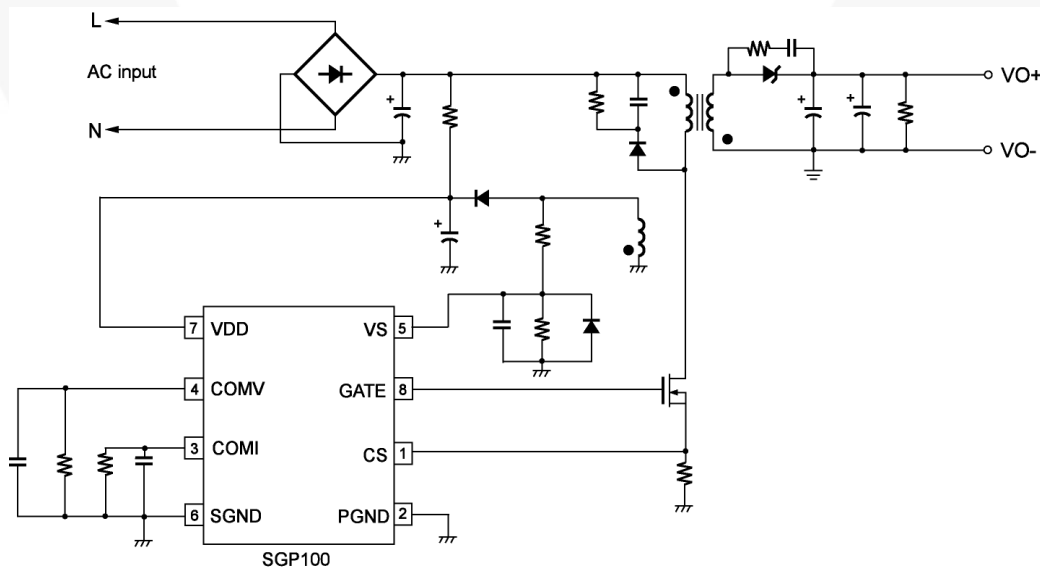
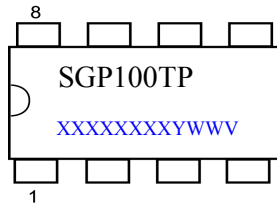


Figure 1. Typical Output V-I Characteristic

TYPICAL APPLICATION

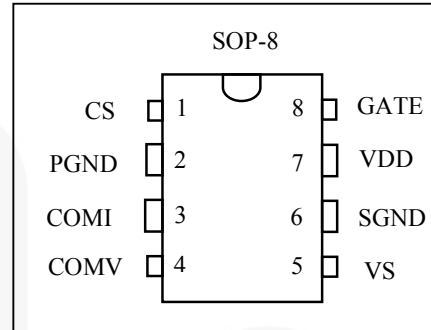


MARKING INFORMATION



T: S=SOP  
 P: Z=Lead Free + ROHS Compatible  
 Null=regular package  
 XXXXXXXX: Wafer Lot  
 Y: Year; WW: Week  
 V: Assembly Location

PIN CONFIGURATION



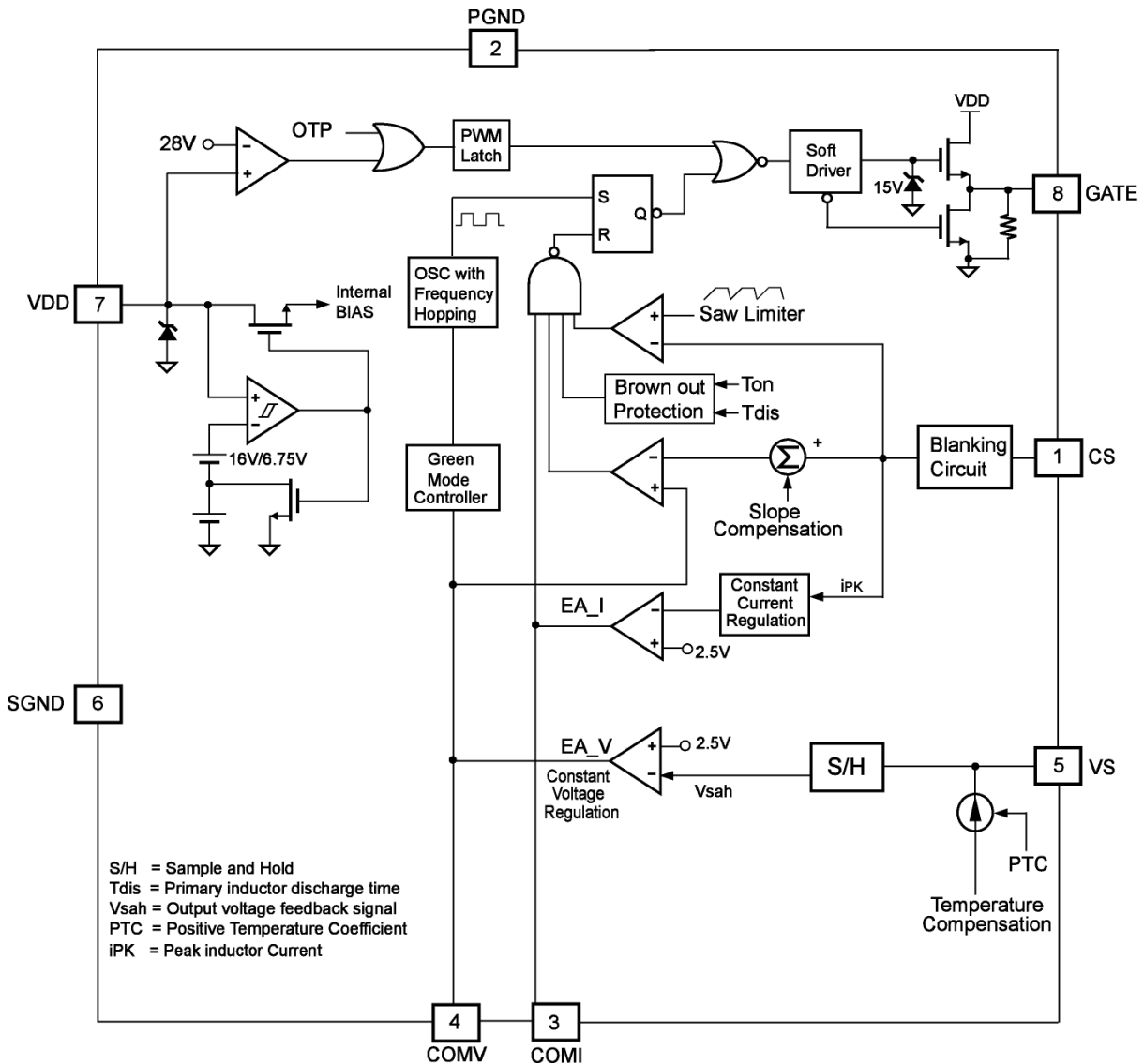
ORDERING INFORMATION

Part Number	Pb-Free	Package
SGP100SZ		8-pin SOP-8

PIN DESCRIPTIONS

Name	Pin No.	Type	Function
CS	1	Analog Input	Current sense. Connected to a current-sense resistor for peak-current-mode control in CV mode. The current-sense signal is also provided for output-current regulation in CC mode.
PGND	2	Ground	Power ground.
COMI	3	Analog Output	Current compensation. Output of the current error amplifier. Connect a capacitor between the COMI pin and SGND for frequency compensation.
COMV	4	Analog Output	Voltage compensation. Output of the voltage error amplifier. Connect a capacitor between the COMV pin and SGND for frequency compensation.
VS	5	Analog Input	Voltage sense. Output-voltage-sense input for output-voltage regulation.
SGND	6	Ground	Signal ground.
VDD	7	Supply	Power supply.
GATE	8	Driver Output	The totem-pole output driver to drive the power MOSFET.

BLOCK DIAGRAM



**Primary-side-control PWM Controller**
**SGP100**
**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>DD</sub>	DC Supply Voltage*	30	V
V <sub>L</sub>	Input Voltage to CS, COMV, COMI, VS Pins	-0.3 to 7.0	V
P <sub>D</sub>	Power Dissipation	400	mW
R <sub>θJC</sub>	Thermal Resistance (Junction-to-Case)	68.3	°C/W
T <sub>J</sub>	Operating Junction Temperature	-40 to +125	°C
T <sub>STG</sub>	Storage Temperature Range	-55 to +150	°C
T <sub>L</sub>	Lead Temperature (Wave Soldering or Infrared, 10 Seconds)	260	°C
ESD	Electrostatic Discharge Capability, Human Body Model	4.5	kV
	Electrostatic Discharge Capability, Machine Model	200	V

\*All voltage values, except differential voltages, are given with respect to the GND pin.

\*Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device.

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Max.	Unit
T <sub>A</sub>	Operating Ambient Temperature	-20 to +85	°C

\*For proper operation.

**ELECTRICAL CHARACTERISTICS**

V<sub>CC</sub>=15V, T<sub>A</sub>=25°C, unless otherwise noted.

**V<sub>DD</sub> Section**

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V <sub>OP</sub>	Continuously Operating Voltage				25	V
V <sub>DD-ON</sub>	Turn-on Threshold Voltage		15	16	17	V
V <sub>DD-OFF</sub>	Turn-off Threshold Voltage		6.25	6.75	7.25	V
I <sub>DD-ST</sub>	Start-up Current	0 < V <sub>DD</sub> < V <sub>DD-ON</sub> -0.16V		10	20	μA
I <sub>DD-OP</sub>	Operating Supply Current	V <sub>DD</sub> =20V, F <sub>S</sub> =F <sub>OSC</sub> , C <sub>L</sub> =1nF		6.5	7.5	mA
V <sub>DD-OVP</sub>	V <sub>DD</sub> Over-Voltage Protection Level		27	28	29	V
T <sub>OVP</sub>	V <sub>DD</sub> Over-Voltage Protection Debounce	F <sub>S</sub> =F <sub>OSC</sub>	90	130	180	μs
I <sub>DD-OVP</sub>	V <sub>DD</sub> Over-Voltage Protection Holding Current	V <sub>DD</sub> =5V	10	30	50	μA

**Oscillator Section**

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
F <sub>OSC</sub>	Frequency	Center frequency	39	42	45	kHz
		Frequency Hopping Range	±2.2	±2.6	±3	
T <sub>FHP</sub>	Frequency Hopping Period		2.75	3.00	3.25	ms
F <sub>OSC-N-MIN</sub>	Minimum Frequency at No-load		350	500	650	Hz
F <sub>OSC-CM-MIN</sub>	Minimum Frequency at CCM		20	25	35	kHz

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Voltage-Sense Section

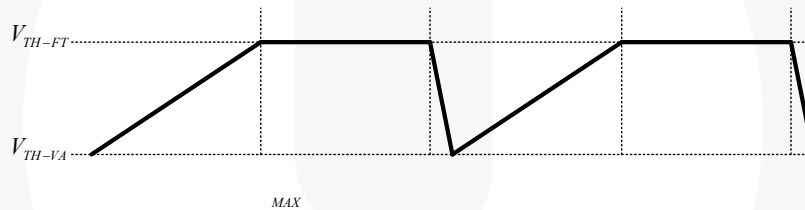
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
T <sub>RATIO</sub>	Proportion of T <sub>ON</sub> and T <sub>DIS</sub> for Brownout Protection*	T <sub>ON</sub> /T <sub>DIS</sub>		1.5		
I <sub>TC-25</sub>	CV Temperature Compensation Current		9	10	11	μA

\* Guaranteed by design.

Current-Sense Section

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Z <sub>CS</sub>	Filter Resistance			2		kΩ
T <sub>PD</sub>	Propagation Delay to GATE Output			150	200	ns
T <sub>LEB</sub>	Leading-Edge Blanking Time	T <sub>MIN-N</sub> -T <sub>PD</sub>	825	1025	1225	ns
T <sub>MIN-N</sub>	Minimum On-time at No Load		1075	1200	1350	ns
V <sub>SLOPE</sub>	Slope Compensation*		0.37	0.40	0.43	V
D <sub>SAW</sub>	Duty Cycle of SAW Limiter*		35	40	45	%
V <sub>TH-VA</sub>	Valley Threshold Voltage for Current Limit		V <sub>TH-FT</sub> - 0.4	V <sub>TH-FT</sub> - 0.25	V <sub>TH-FT</sub> - 0.1	V
V <sub>TH-FT</sub>	Flat threshold Voltage for Current Limit		1.2	1.3	1.5	V

\* Guaranteed by design.



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