

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_{DD} over-voltage protection with latch (OVP)
- V_{DD} 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.

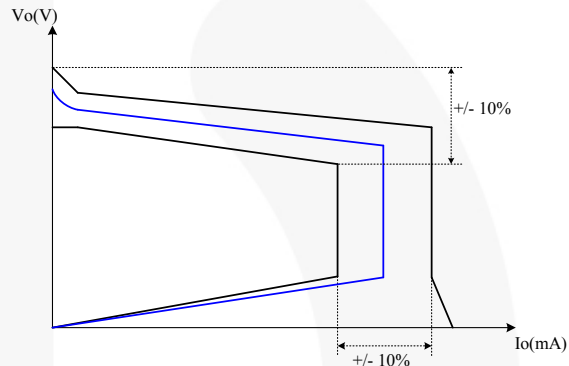
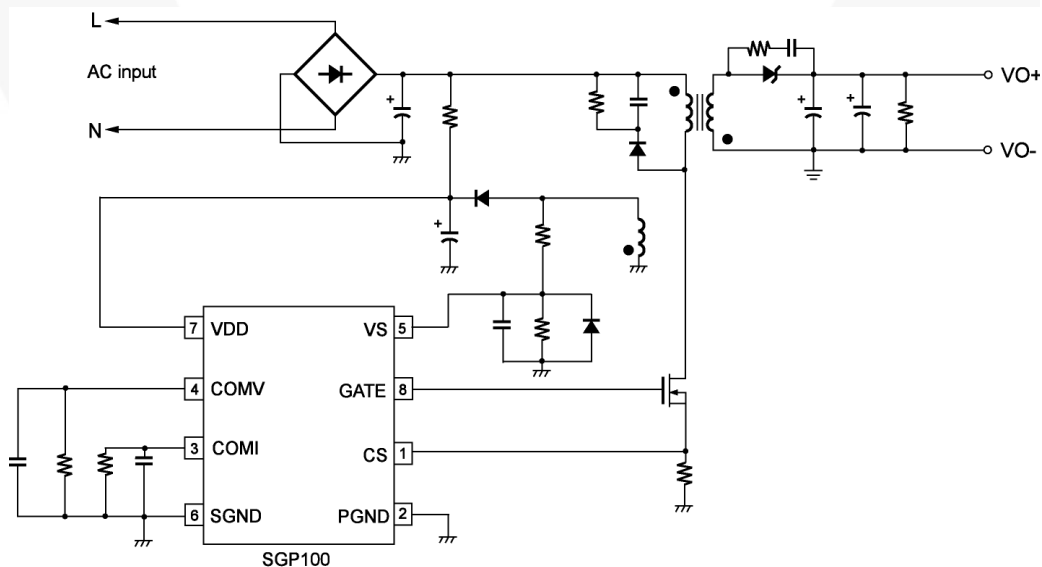
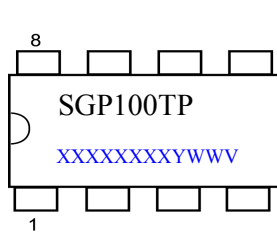


Figure 1. Typical Output V-I Characteristic

TYPICAL APPLICATION

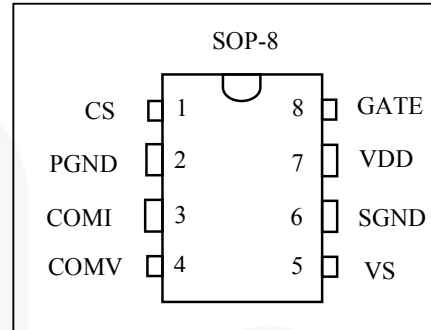


MARKING INFORMATION



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

PIN CONFIGURATION



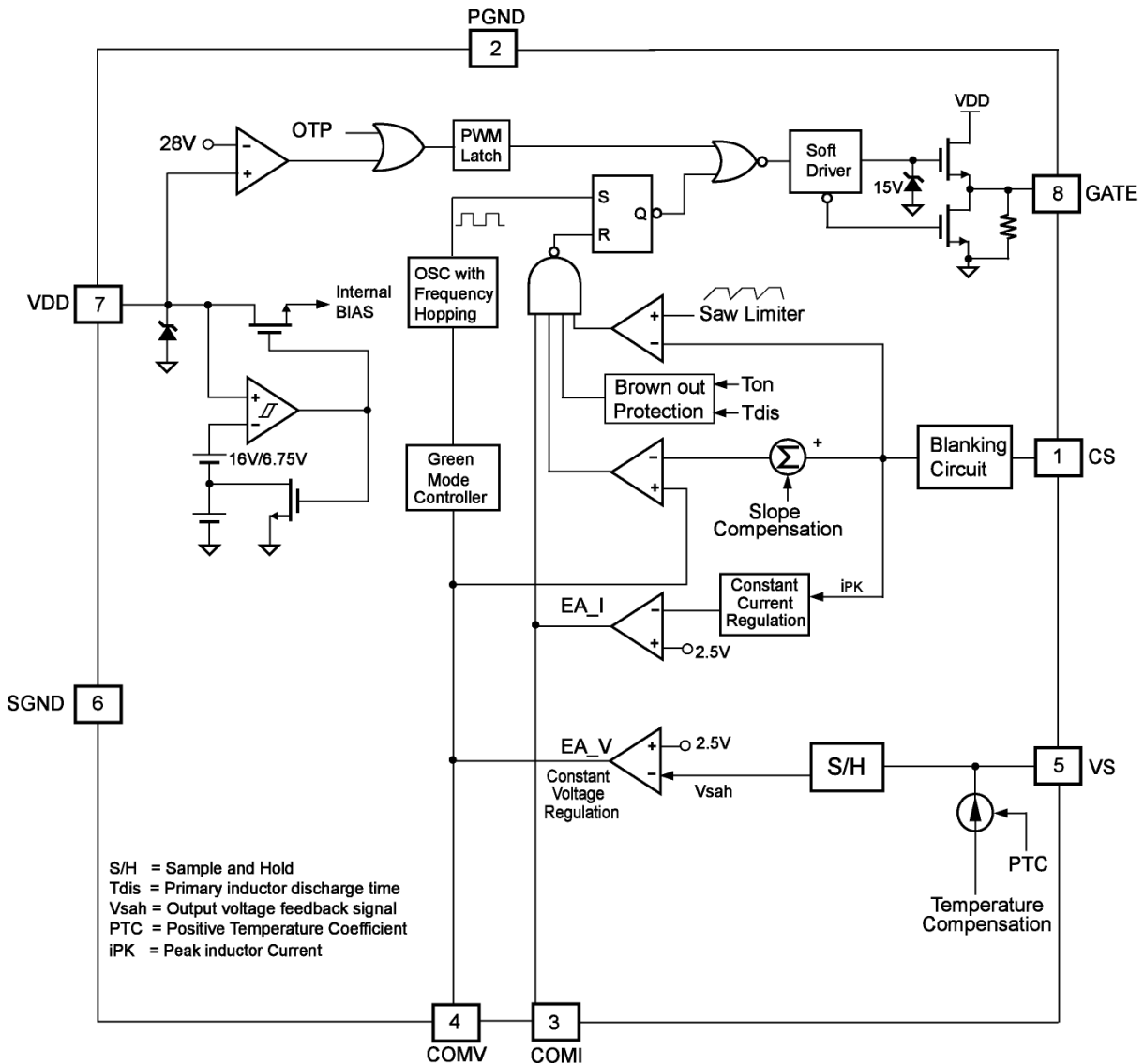
ORDERING INFORMATION

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



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ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DD}	DC Supply Voltage*	30	V
V _L	Input Voltage to CS, COMV, COMI, VS Pins	-0.3 to 7.0	V
P _D	Power Dissipation	400	mW
R _{θJC}	Thermal Resistance (Junction-to-Case)	68.3	°C/W
T _J	Operating Junction Temperature	-40 to +125	°C
T _{STG}	Storage Temperature Range	-55 to +150	°C
T _L	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 _A	Operating Ambient Temperature	-20 to +85	°C

*For proper operation.

ELECTRICAL CHARACTERISTICS

V_{CC}=15V, T_A=25°C, unless otherwise noted.

V_{DD} Section

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

Oscillator Section

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

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Voltage-Sense Section

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

* Guaranteed by design.

Current-Sense Section

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

* Guaranteed by design.

