

**Green-Power Current Mode PWM Power Switch****GENERAL DESCRIPTION**

GS176PN combines a dedicated current mode PWM controller with a high voltage power MOSFET. It is optimized for high performance, low standby power, and cost effective off-line flyback converter applications in sub 15W range. GS176PN offers complete protection coverage with automatic self-recovery feature including Cycle-by-Cycle current limiting (OCP), over load protection (OLP), VCC over voltage clamp and under voltage lockout (UVLO). Excellent EMI performance is achieved with GS proprietary frequency shuffling technique together with soft switching control at the totem pole gate drive output. The tone energy at below 20KHZ is minimized in the design and audio noise is eliminated during operation. GS176PN is offered in DIP-8 package.

FEATURES

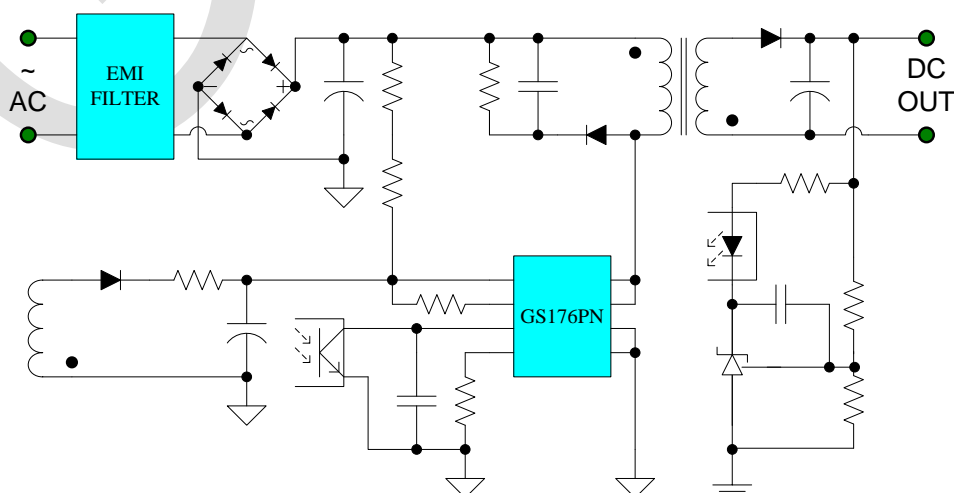
- Power on Soft Start Reducing MOSFET Vds Stress
- Frequency shuffling for EMI
- Burst Mode Control For Improved Efficiency and Minimum Standby power Design
- Audio Noise Free Operation

- Normal 50 KHz Switching Frequency
- Internal Synchronized Slope Compensation
- Low VCC Startup Current and Low Operating Current
- Leading Edge Blanking on Current Sense Input
- Pb-Free DIP-8
- Good Protection Coverage With Auto Self-Recovery
 - ◇ VCC Over Voltage Clamp and Under Voltage Lockout with Hysteresis (UVLO)
 - ◇ Line Input Compensated Cycle-by-Cycle Over-current Threshold Setting For Constant Output Power Limiting Over Universal Input Voltage Range
 - ◇ Overload Protection (OLP)
 - ◇ Over Voltage Protection (OVP)

APPLICATIONS

Offline AC/DC flyback converter for

- VCR, SVR, STB, DVD&DVCD Player SMPS
- Set-Top Box Power
- Battery Charger
- Digital Cameras and Camcorder Adaptor
- Auxiliary Power Supply for PC and Server
- Open-frame SMPS

TYPICAL APPLICATION

Output Power Table

	Package	230 VAC ±15%		85-265VAC	
		Adapter1	Peak or Open Frame2	Adapter1	Peak or Open Frame2
GS176PN	DIP8	14W	17W	13W	15W

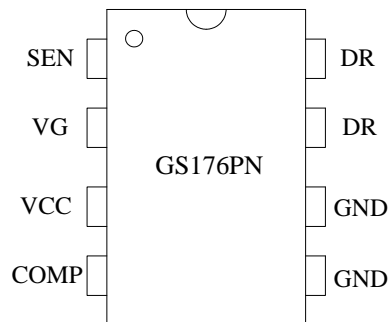
Table 1.

Notes:

1. Minimum continuous power in a typical non-ventilated enclosed adapter measured at 50 °C ambient. Use of an external heatsink will increase power capability.
2. Minimum peak power capability in any design or minimum continuous power in an open frame design (see Key Application Considerations).
3. Packages: P: DIP8.

GENERAL INFORMATION

Pin Assignment(DIP8)



Pin Descriptions

Pin Name	Description
SEN	HV MOSFET Source Pin. Current sense input.
VG	Internal Gate Driver Power Supply.
VCC	IC DC power supply Input.
COMP	Feedback input pin. The PWM duty cycle is determined by voltage level into this pin and the current-sense signal at Pin 4.
GND	Ground
DR	HV MOSFET Drain Pin. The Drain pin is connected to the primary lead of the transformer.

Absolute Maximum Ratings

Parameter	Value
Drain Voltage (off state)	-0.3V to 650V
VCC Voltage	-0.3V to 30V
VG Input Voltage	-0.3V to 30V
VCC Clamp Continuous Current	10 mA
COMP Input Voltage	-0.3V to 7V
Sense/Source Input Voltage	-0.3V to 7V
Min/Max Operating junction Temperature TJ	-20°C to 115°C
Min/Max Storage Temperature Tstg	-55°C to 160°C
Lead Temperature (Soldering, 10secs)	260°C

Note: Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. Exposure to absolute maximum-rated conditions for extended periods may affect device reliability.

Electrical Characteristics

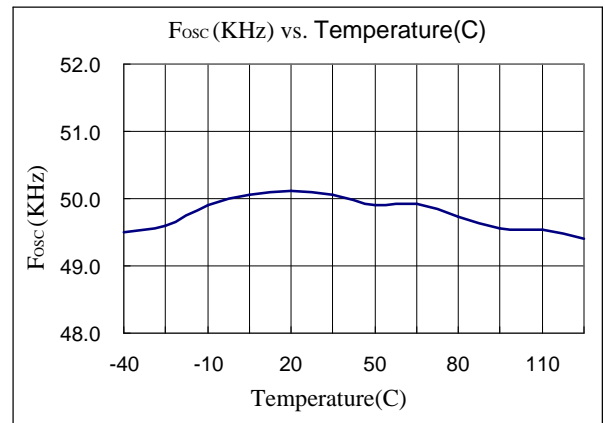
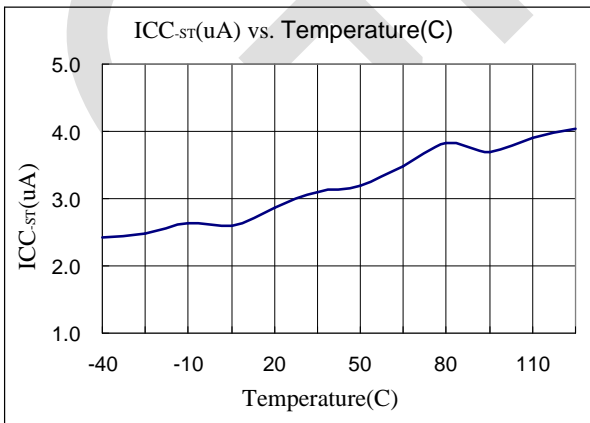
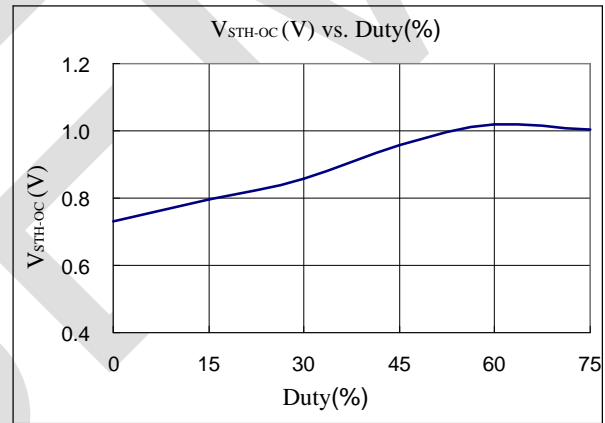
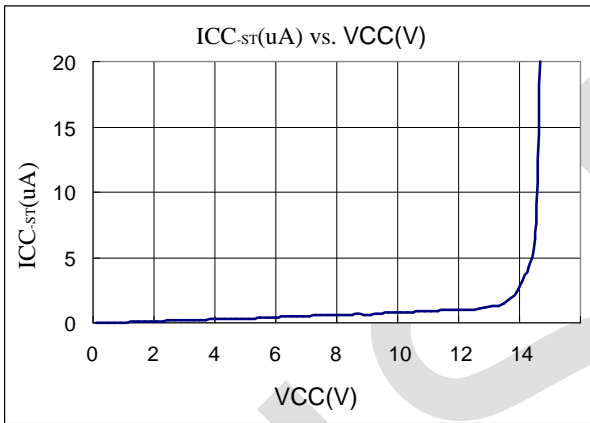
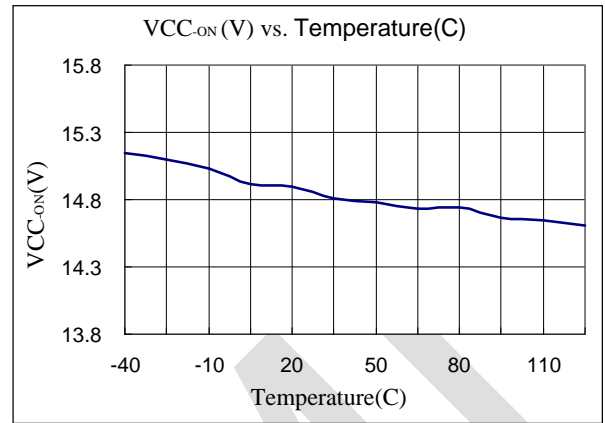
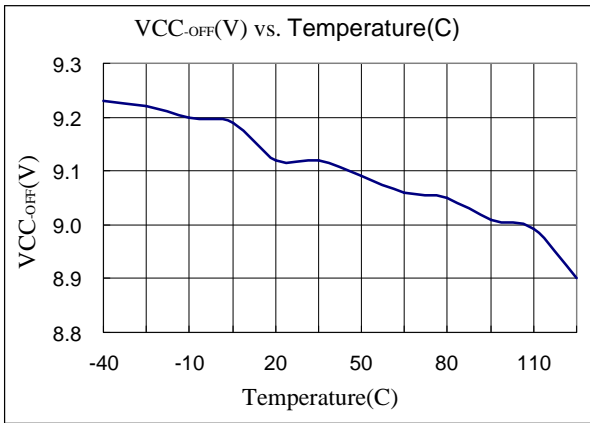
(Ta=25°C unless otherwise noted, VCC = 16V)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Supply Voltage (VCC)						
VCC-ON	Turn-On Threshold Voltage		14.3	14.9	16	V
VCC-OFF	Turn-Off Threshold Voltage, Under Voltage Lockout on VCC(UVLO)		8.4	9.2	9.8	V
ICC-ST	VCC Start up Current	VCC=VCC-ON-0.1V		3	20	uA
ICC-OP	Operation Current	VCOMP=3V		1.5	3	mA
VCC-OVP	Over voltage protection voltage	S=0V, COMP=3V Ramp up VCC until gate clock is off	27.0	28.5	30.0	V
VCC-CLAMP	VCC Zener clamp Voltage	ICC=10mA		30		V
Feedback Input Section(COMP pin)						
VCOMP-OPEN	COMP Output High Voltage		5.2	5.5	6.0	V

$I_{COMP-SHORT}$	COMP pin short circuit current	Short COMP pin to GND and measure current		0.55		mA
V_{TH-OD}	Zero Duty Cycle COMP Threshold Voltage			0.70		V
$V_{COMP-OL}$	COMP Open-loop Trigger Level			3.80		V
T_{D-OLP}	The delay time of COMP pin Open Loop Protection			50		mS
$Z_{COMP-IN}$	Input Impedance			4		K Ω
Current Sense Input(Source/Sense Pin)						
Soft start time				4		ms
T_{LEB}	Leading-Edge Blanking Time			300		ns
$Z_{SENSE-IN}$	Input Impedance			40		K Ω
T_{D-OC}	Over Current Detection and Control Delay	From Over Current Occurs till the Gate drive output start to turn off		120		nS
$V_{STHPE-OC}$	Peak Threshold Voltage for Current Limit	COMP=3.3V Max Duty Cycle Internal Current Limiting Threshold Voltage	0.85	0.9	0.95	V
$V_{STHVA-OC}$	Valley Threshold Voltage for Current Limit	COMP=3.3V Zero Duty Cycle Internal Current Limiting Threshold Voltage	0.65	0.70	0.75	V
Oscillator Section						
F_{OSC}	Normal Oscillation Frequency		45	50	55	KHz
Δf_T	Frequency Temperature Stability			5		%
Δf_{VCC}	Frequency Voltage Stability			5		%
D_{MAX}	Maximum duty cycle	COMP=3.3V, CS=0V	70	80	90	%
$F_{OSC-BURST}$	Burst Mode Base Frequency			22		KHz
Δf_{OSC}	Frequency Modulation range /Base frequency	Frequency Shuffling	-4		4	%
		Peak-Peak Jitter		4		KHz
Power MOSFET Section						
BV_{DSS}	MOSFET Drain Source Breakdown Voltage	VGS=0V, IDS=250uA	650			V
R_{DS-ON}	Static Drain to Source On Resistance	VGS=10V, IDS=1A	GS176PN	4.6	5.2	Ω

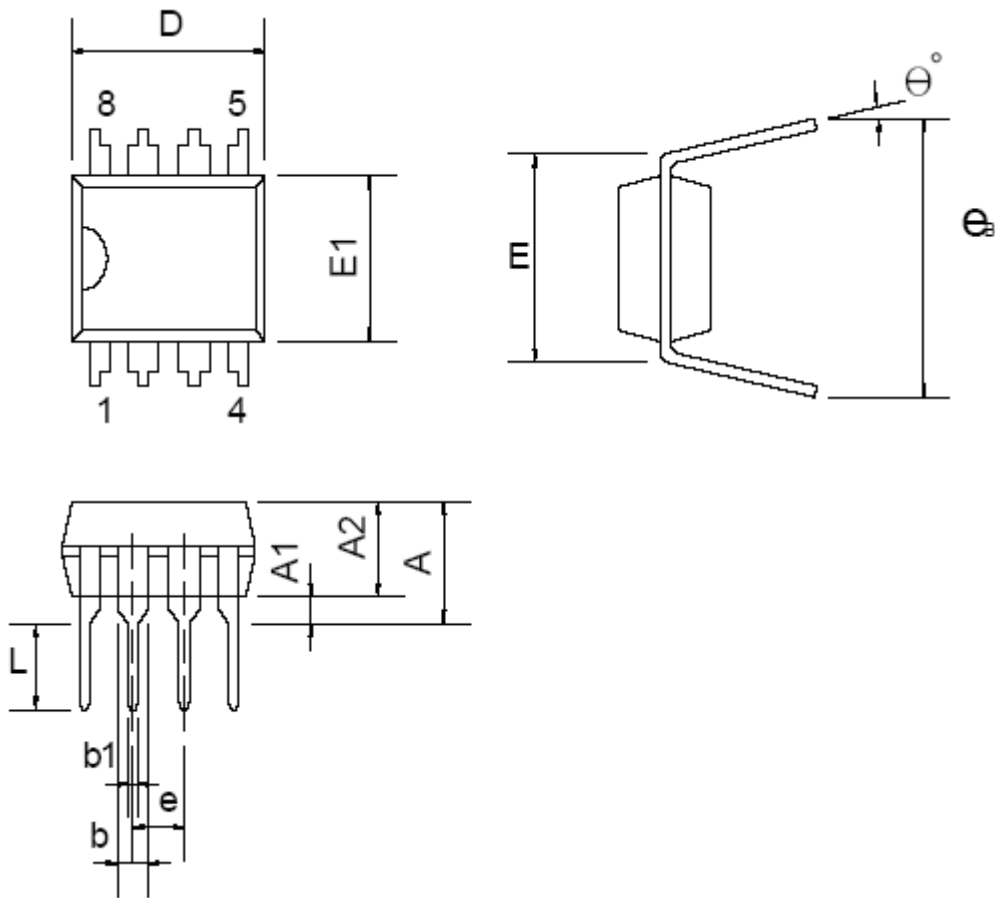
CHARACTERIZATION PLOTS

The characteristic graphs are normalized at TA=25°C.



PACKAGE DIMENSIONS

DIP-8L



Dimensions

Symbol	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			5.334			0.210
A1	0.381			0.015		
A2	3.175	3.302	3.429	0.125	0.130	0.135
b		1.524			0.060	
b1		0.457			0.018	
D	9.017	9.271	10.160	0.355	0.365	0.400
E		7.620			0.300	
E1	6.223	6.350	6.477	0.245	0.250	0.255
e		2.540			0.100	
L	2.921	3.302	3.810	0.115	0.130	0.150
eB	8.509	9.017	9.525	0.335	0.355	0.375
θ°	0°	7°	15°	0°	7°	15°