SY5007

Flyback Regulator

With Primary Side CC/CV Control For Adapters and Chargers

Advanced Design Specification

General Description

SY5007 is a single stage Flyback regulator targeting at Constant Current/Constant Voltage (CC/CV) applications. Both the output current and voltage are sensed on the primary side, eliminating the opto-isolator and the secondary side feedback circuitry, and minimizing the overall system cost.

SY5007 adopts the quasi-resonant operation and the adaptive PWM/PFM control to achieve the highest average efficiency and the best EMI performance. The no-load switching frequency can be as low as 500Hz, minimizing the no-load power loss

SY5007 has programmable cable compensation to provide a better load regulation for the output voltage at the cable terminals.

SY5007 provides reliable protections including VIN Over Voltage Protection, Short Circuit Protection (SCP), Over Temperature Protection (OTP), Output over voltage protection (OVP), VSEN/ISEN pin short protection, VSEN pin upper divider resistor disconnect protection. Furthermore, it increased dedicated pin for external over-temperature protection.

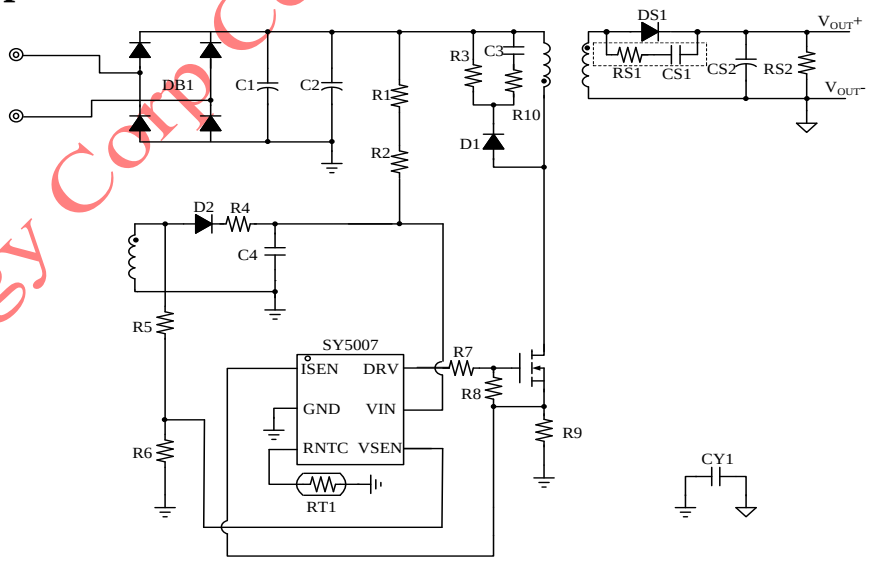
Features

- Tight PSR CC/CV Regulation Over Entire Operating Range
- QR-mode Operation for High Efficiency
- PWM/PFM Control for High Average Efficiency
- Fast Dynamic Load Transient Response
- Cable Compensation for Better Load Regulation
- Low Start Up Current: 5μA Max
- Minimum Frequency Limitation 500Hz
- Reliable Protections for OVP, SCP, OTP,OCP
- Reliable Protections for Safety Requirement
- Dedicated Pins for External Over-temperature Protection
- Maximum Switching Frequency Limitation 125kHz
- Compact Package: SOT23-6

Applications

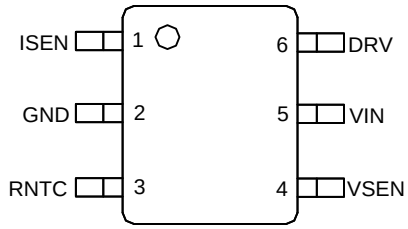
- AC/DC Adapters
- Battery Chargers

Typical Applications



Ordering Information

SY5007 □(□□)□
- Temperature Code
- Package Code
- Optional Spec Code



Pinout (Top view)

Ordering Number	Package	Top Mark
SY5007ABC	SOT23-6	hYxyz

x=year code, y=week code, z= lot number code

Pinout

Pin Number	Pin Name	Pin Description
1	ISEN	Current sense pin. Connect this pin to the source of the primary switch.
2	GND	Ground pin.
3	RNTC	Temperature detection pin. Used for external over-temperature protection (OTP) by connecting an NTC resistor from this pin to Ground.
4	VSEN	Output voltage sense pin. This pin receives the auxiliary winding voltage by a resistor divider. The value of the resistor divider also programs the cable impedance. This pin also senses the winding voltage to provide the QR operation.
5	VIN	Power supply pin.
6	DRV	Gate driver pin. Connect this pin to the gate of primary MOSFET.

Absolute Maximum Ratings (Note 1)

VIN ---------- -0.3V~26V
DRV ---------- -0.3V~15V
Supply Current I_{VIN} ---------- 20mA
VSEN ---------- -0.3V~3.6V
ISEN ---------- -0.3V~3.6V
RNTC ---------- -0.3V~3.6V
Power Dissipation, @ T_A = 25°C SOT23-6 ---------- 0.6W
Package Thermal Resistance (Note 2)
SOT23-6, θ_{JA} ---------- 170°C/W
SOT23-6, θ_{JC} ---------- 130°C/W
Temperature Range ---------- -45°C to 150°C
Lead Temperature (Soldering, 10 sec.) ---------- 260°C
Storage Temperature Range ---------- -65°C to 150°C

Recommended Operating Conditions

VIN ---------- 9V~20V
ISEN ---------- 0V~1V
Junction Temperature Range ---------- -40°C to 125°C
Ambient Temperature Range ---------- -40°C to 105°C

Electrical Characteristics

(V_{VIN} = 12V (Note 3), T_A = 25°C unless otherwise specified)

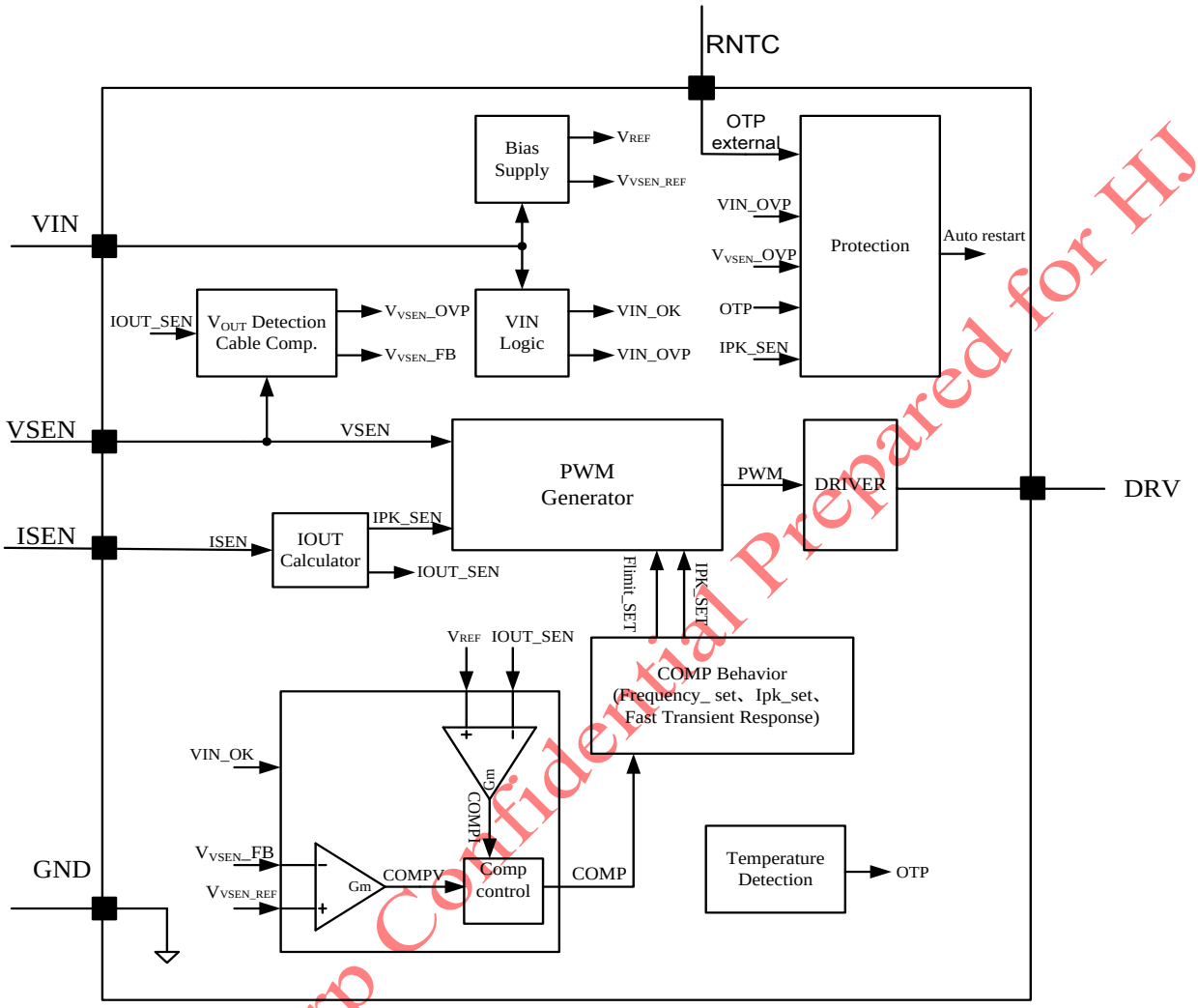
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Power Supply Section						
VIN Operating Range	V_{VIN_RANGE}		9		20	V
VIN Turn-on Threshold	V_{VIN_ON}			21		V
VIN Turn-off Threshold	V_{VIN_OFF}			7.7		V
VIN OVP Voltage	V_{VIN_OVP}			V_{VIN_ON}+3		V
Start Up Current	I_{ST}	V_{VIN}<V_{VIN_OFF}		2.5	5	μA
Operating Current	I_{VIN}	f=100kHz		1.5		mA
Quiescent Current	I_Q	f=500Hz		140		μA
Shunt Current in OVP Mode	I_{VIN_OVP}	V_{VIN}>V_{VIN_OVP}-0.1		14		mA
Current Feedback Modulator Section						
Internal Reference Voltage	V_{REF}			0.42		V
ISEN Pin Section						
Current Limit Voltage	V_{ISEN_LIM}	V_{FBV}<0.4V		0.7		V
		V_{FBV}>0.4V		1		V
VSEN Pin Section						
OVP Voltage Threshold	V_{VSEN_OVP}			1.5		V
Internal Reference Voltage	V_{VSEN_REF}			1.25		V
Cable Compensation Coefficient	K_3			25		μA/V
RNTC Pin Section						
Internal Reference Voltage	V_{REFR}			1.2		V
Shutdown Current Source	I_{SD}			100		μA
Gate Driver Section						
Gate Driver Voltage	V_{Gate}			12		V
Maximum Source Current	I_{SOURCE_MAX}			160		mA
Maximum Sink Current	I_{SINK_MAX}			800		mA
Max ON Time	T_{ON_MAX}			26		μs
Min ON Time	T_{ON_MIN}			300		ns
Max OFF Time	T_{OFF_MAX}			2		ms
Min OFF Time	T_{OFF_MIN}			1.8		μs
Minimum Switching Period	T_{PERIOD_MIN}			8		μs
Thermal Section						
Thermal Shutdown Temperature	T_{SD}			150		°C
Thermal Shutdown Temperature Hysteresis	T_{SD_HYS}			20		°C

Note 1: Stresses beyond the "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

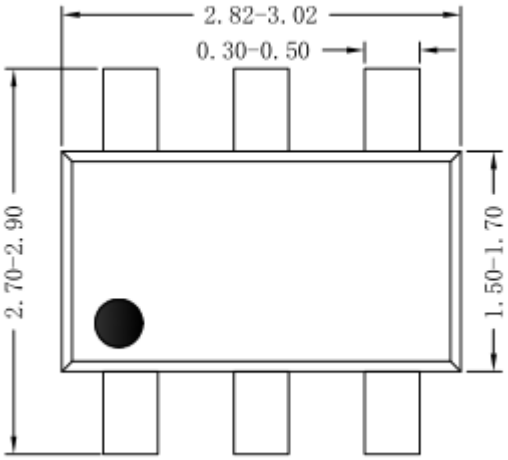
Note 2: θ_{JA} is measured in the natural convection at T_A = 25°C on a low effective single layer thermal conductivity test board of JEDEC 51-3 thermal measurement standard. Test condition: Device mounted on "2 x 2" FR-4 substrate PCB, 2oz copper, with minimum recommended pad on top layer and thermal via to bottom layer ground plane.

Note 3: Increase VIN pin voltage gradually higher than V_{VIN_ON} voltage to start the IC first, then set VIN to 12V.

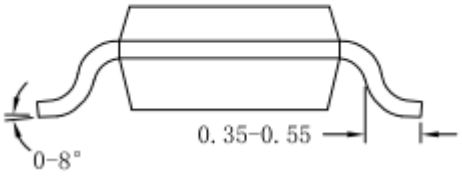
Block Diagram



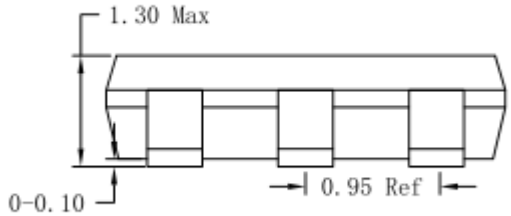
SOT23-6 Package outline & PCB layout design



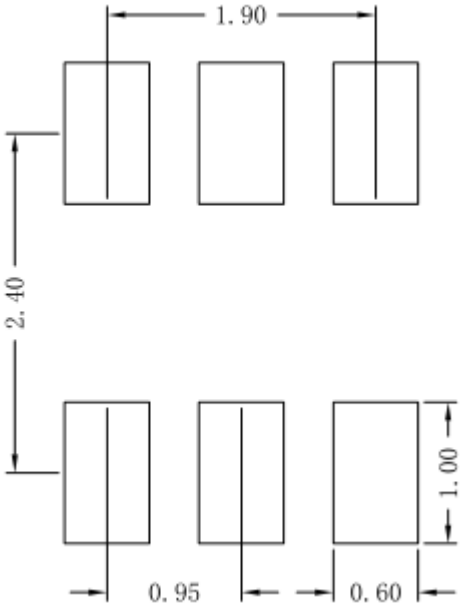
Top View



Side View



Side View



Recommended Pad Layout

Notes: **All dimension in millimeter and exclude mold flash & metal burr.**