Secondary-Side Synchronous Rectifier

FEATURES

◆ **Match DCM and Quasi-Resonant(QR) flyback converter**
◆ **Supports both High-side and Low-side rectification**
◆ **No need external power supply**

APPLICATIONS

◆ **Adapters/Chargers**
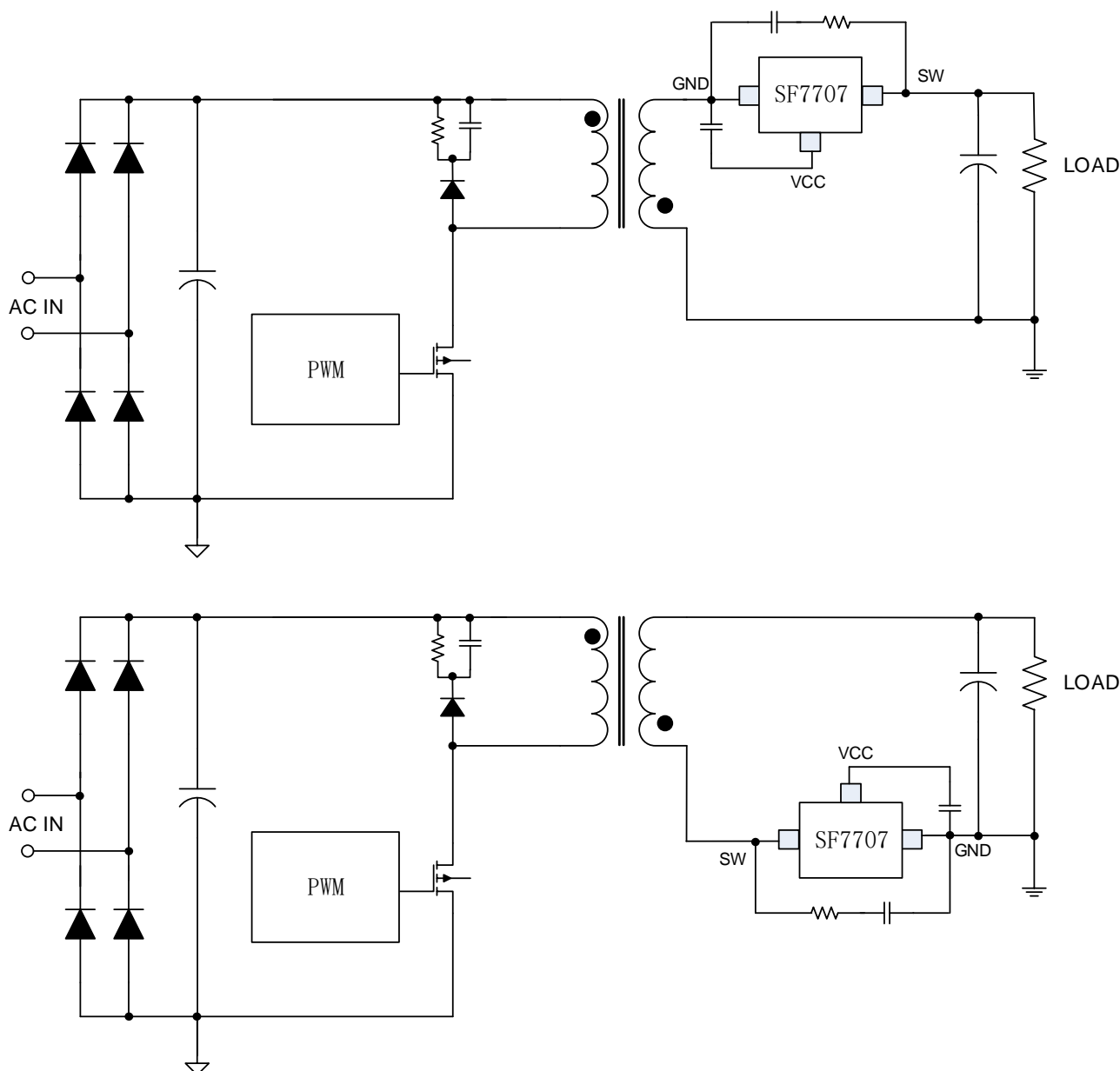◆ **Flyback converters**

GENERAL DESCRIPTION

SF7707 is a high performance secondary side switch for synchronous rectification (SR) in DCM operation flyback.
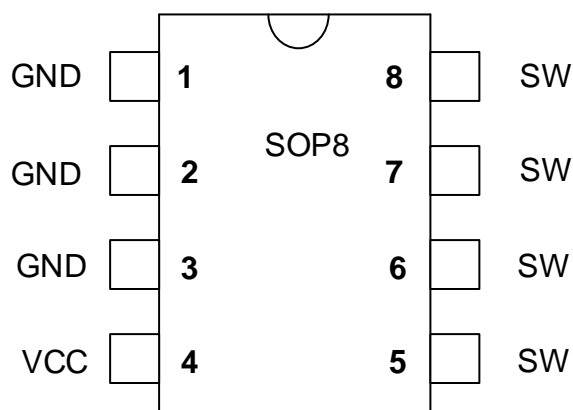
Using SF7707 to replace diode can effectively reduce the secondary side rectifier power dissipation and increase efficiency for system.

SF7707 is offered in SOP8 package.
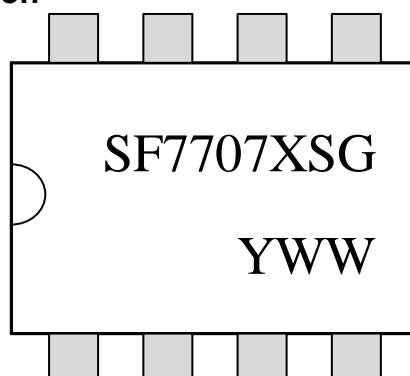
TYPICAL APPLICATION

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Pin Configuration

```
        GND  [ ] 1        8 [ ] SW
        GND  [ ] 2  SOP8  7 [ ] SW
        GND  [ ] 3        6 [ ] SW
        VCC  [ ] 4        5 [ ] SW
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Ordering Information

Part Number	Top Mark	Rdson	Package		Tape & Reel
SF7707BSGT	SF7707BSG	20mΩ	SOP8	Green	Yes
SF7707CSGT	SF7707CSG	15mΩ	SOP8	Green	Yes
SF7707DSGT	SF7707DSG	10mΩ	SOP8	Green	Yes
SF7707FSGT	SF7707FSG	7mΩ	SOP8	Green	Yes

Marking Information

SF7707XSG

YWW

X: Rdson code
  B:20mΩ
  C:15mΩ
  D:10mΩ
  F:7mΩ
YWW: Year&Week code

Pin Description

Pin Num	Pin Name	I/O	Description
1,2,3	GND	P	IC ground pin.
4	VCC	P	IC power supply pin.
5,6,7,8	SW		Drain of SR MOSFET

Block Diagram
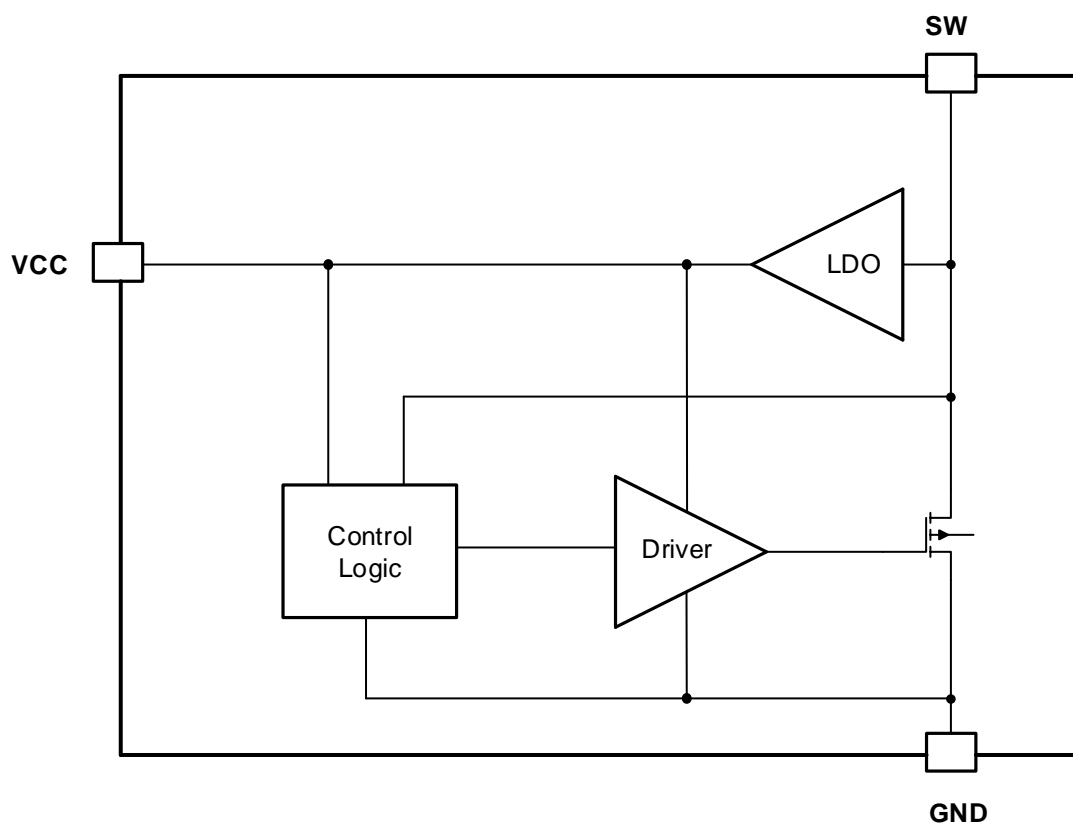
Absolute Maximum Ratings (Note 1)

Parameter		Value	Unit
SW DC Supply Voltage		45	V
VCC DC Voltage		10	V
Package Thermal Resistance (SOP8)	θ_{ja}	184	ºC/W
	θ_{jc}	85	
Maximum Junction Temperature		150	ºC
Operating Temperature Range		-40 to 85	ºC
Storage Temperature Range		-65 to 150	ºC
Lead Temperature (Soldering, 10sec.)		300	ºC
ESD Capability, HBM (Human Body Model)		2	kV
ESD Capability, MM (Machine Model)		250	V

Recommended Operation Conditions (Note 2)

Parameter	Value	Unit
Supply Voltage, VCC	7 to 9	V
Operating Ambient Temperature	-40 to 85	ºC

Note 1. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
Note 2. The device is not guaranteed to function outside its operating conditions.

ELECTRICAL CHARACTERISTICS

(T_A = 25^{O}C, VCC=8V, if not otherwise noted)

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
I_Startup	VCC Start up Current	VCC=UVLO(OFF)-0.5V			50		uA
I_VDD_Op	Operation Current	V_{FB}=3.2V, GATE=1nF			150		uA
UVLO(OFF)	VDD Under Voltage Lockout Exit (Startup)				3.8		V
UVLO(ON)	VDD Under Voltage Lockout Enter				3.6		V
VDD	VDD Operation Voltage	SW=40V, C_{VCC}=0.1uF			8		V
V_{MOS_ON}	MOS turn on threshold				-0.15		V
T_{ON_D}	MOS turn on delay				100		ns
T_{OFF_D}	MOS turn off delay				10		ns
T_{LEB}	MOS on leading edge blanking time				500		ns
T_{OFF_min}	MOS minimum off time				2.5		us
R_{dson}	Internal MOS R_{dson}	SF7707B			20		mΩ
		SF7707C			15		
		SF7707D			10		
		SF7707F			7		

OPERATION DESCRIPTION

SF7707 can replace Schottky diode to improve the efficiency in DCM flyback converters. A power supply capacitor is connected between VCC and GND. An internal LDO circuit is adopted for its power supply during the primary switch on time.

◆ UVLO and Startup Operation

When the primary switch turns on, the power start from SW pin through LDO to VCC pin. When VCC voltage achieve UVLO(OFF), the SR circuit start to work. And when the VCC voltage drop below UVLO(ON), the SR circuit enter into restart mode.

◆ Operation Mode

When the secondary current first flows through the body diode of SR MOSFET, the voltage of SW pin will be lower than V_{MOS_ON}, the SR MOSFET turns on and the conduction loss reduce, until the current through SR MOSFET decrease near to 0, which means the voltage of SW recovers to internal MOSFET turn off threshold, the SR MOSFET turns off. As shown in figure 1.
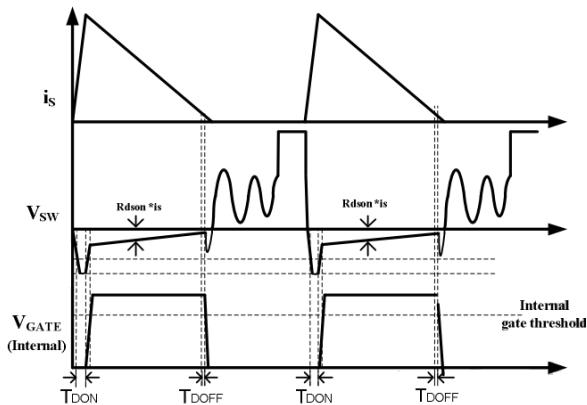

Fig.1 SR turn on and off waveform

◆ Turn-on Blanking Time

The control circuitry contains a blanking function. When the internal MOSFET is turned on, it at least last for some time, the turn on blanking time is about 500ns. During the turn on blanking period, the turn off threshold is not totally blanked, but changes the threshold current. This assures that the internal MOSFET can always be turned off even during the blanking period.

◆ RC Snubber Circuit

In some applications such as startup, output short protection, the system may go into slight CCM condition. To suppress the reverse spike voltage across the SR MOSFET, a RC snubber circuit is suggested to be place between SW and GND. As shown in figure 2.
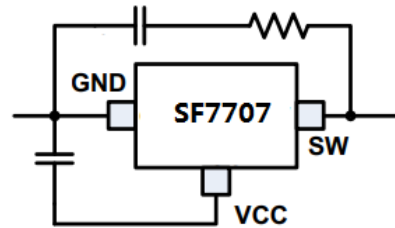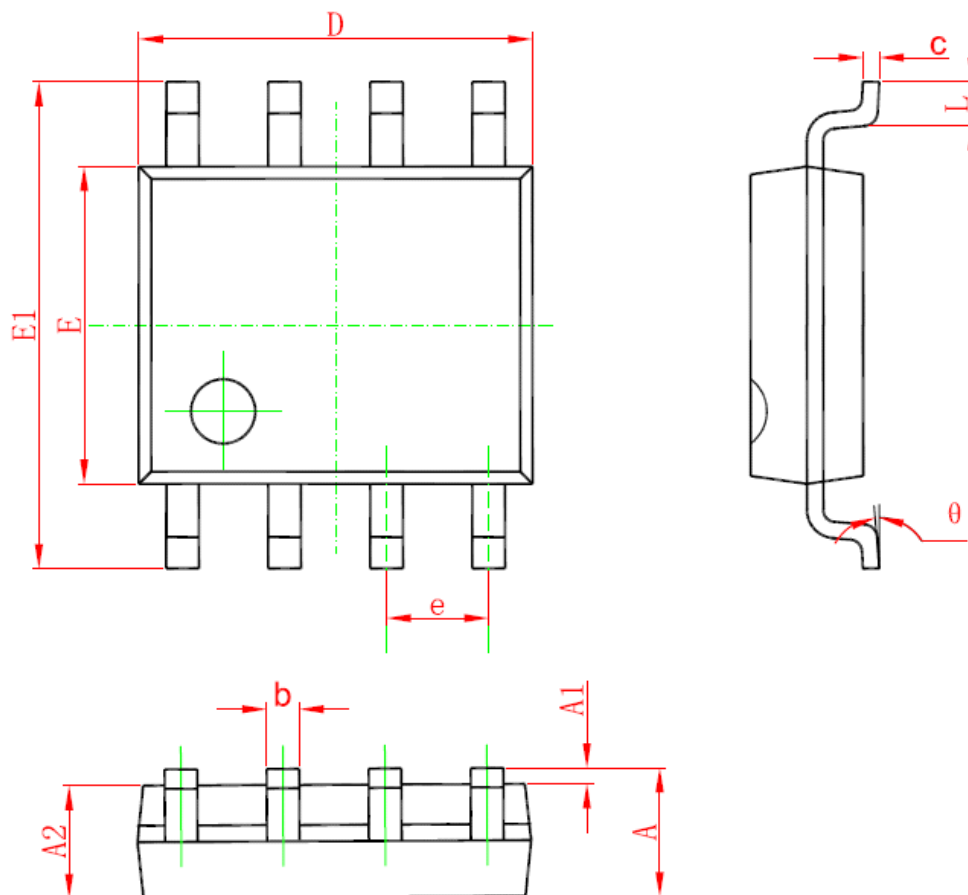

Figure 2. RC snubber for SR

PACKAGE MECHANICAL DATA

SOP8 PACKAGE OUTLINE DIMENSIONS

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	1.350	1.750	0.053	0.069
A1	0.050	0.250	0.002	0.010
A2	1.250	1.650	0.049	0.065
b	0.310	0.510	0.012	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.150	0.185	0.203
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.05 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0º	8º	0º	8º

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