Secondary-Side Synchronous Rectifier

FEATURES

- **Match DCM and Quasi-Resonant(QR) flyback converter**
- **Supports Low-side Rectification**
- **Max 85kHz Switching Frequency**
- **Fast Turn-off Total Delay of 30ns**
- **Compatible with Energy Star**
- **~150uA Low Quiescent Current**

APPLICATIONS

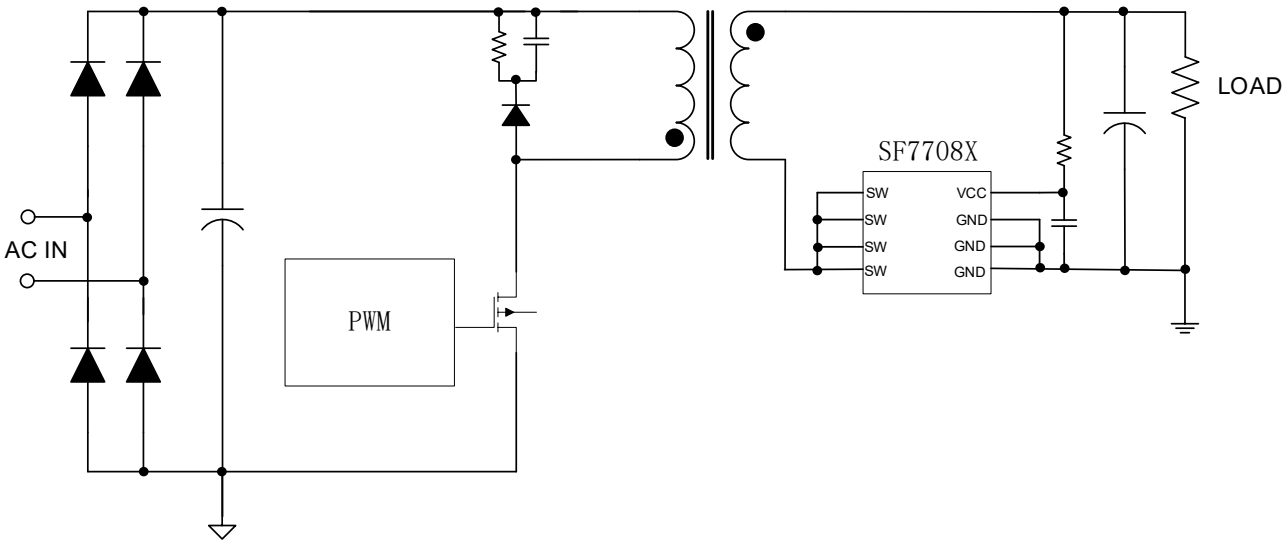
- **Adapters/Chargers**
- **Flyback converters**

GENERAL DESCRIPTION

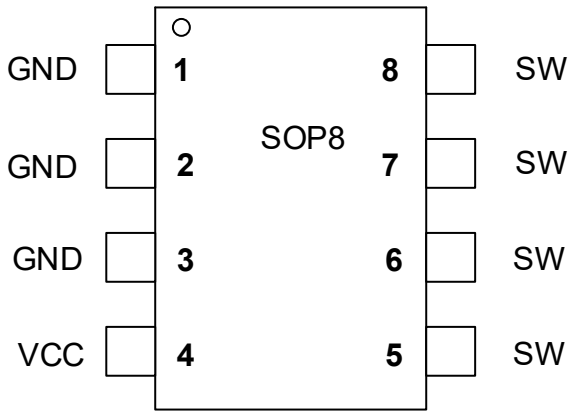
SF7708X is a synchronous rectifier for switch mode power supplies, which combines an N-Channel MOSFET and a driver circuit designed for synchronous rectification in DCM and QR operation. The synchronous rectification can effectively reduce the secondary side rectifier power dissipation and provide high performance solution. By sensing MOSFET SW-to-source voltage,SF7708X can output ideal drive signal with less external components. It can provide high performance solution for 5V output voltage application.

SF7708X is offered in SOP8 package.

TYPICAL APPLICATION



Pin Configuration

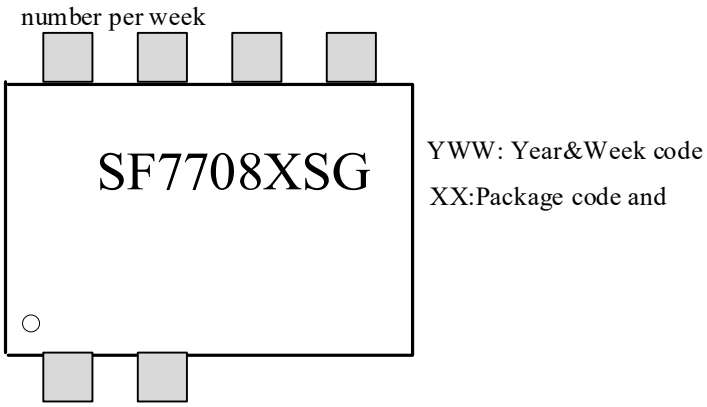


Ordering Information

Part Number	Top Mark	Rdson	Package		Tape & Reel
SF7708BSGT	SF7708BSG	22mΩ	SOP8（*）	Green	Yes
SF7708CSGT	SF7708CSG	12mΩ	SOP8（*）	Green	Yes
SF7708DSGT	SF7708DSG	10mΩ	SOP8（*）	Green	Yes

（*）MSL(Moisture Sensitivity Level) is level 3. Absorbed moisture could be sensitive to damage during solder reflow, so it's recommended to take floor life into consideration, according to IPC/JEDEC J-SMD-020E(Moisture/Reflow Sensitivity Classification for Non-hermetic Surface Mount Devices).

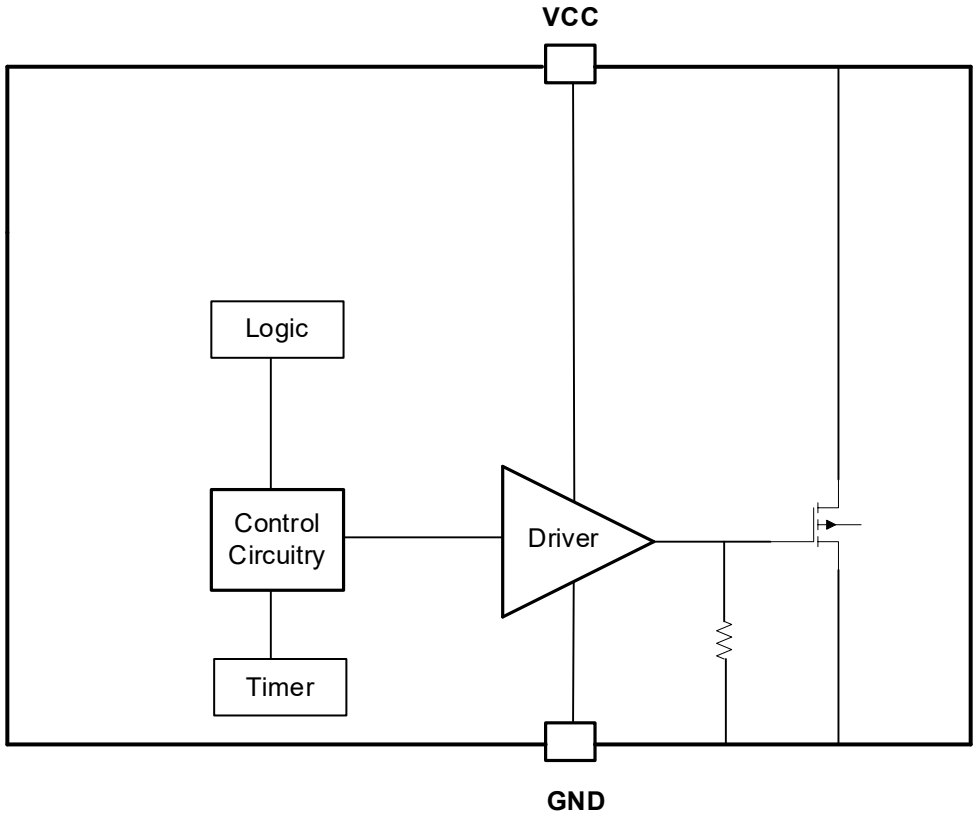
Marking Information



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 internal N-MOS

Block Diagram



Absolute Maximum Ratings (at TA = 25°C)

Characteristics	Symbol	Rating	Unit
VCC to GND		-0.3 to 6.5	V
SW to GND	SF7708B/C/D	-0.3 to 38/40/45	V
Operating Junction Temperature		-40 to 150	°C
Storage Junction Temperature		-55 to 150	°C
Thermal Resistance from Junction to case	θ_{JC}	80	°C/W
Thermal Resistance from Junction to ambient	θ_{JA}	160	°C/W

ELECTRICAL CHARACTERISTICS

(T_A = 25°C, VCC=5V, if not otherwise noted)

Characteristics	Symbol	Conditions	Min	Typ	Max	Units
Input Voltage	Vcc		3.6	-	6.0	V
UVLO Voltage	V_{UVLO}			2.3		V
UVLO Hysteresis				0.2		V
Vcc voltage clamp	Vovp			6.2		V
Quiescent Current	I_{CCQ}	no switch	-	150	-	uA
Turn on Threshold	VTH_ON			-170		mV
Driver Voltage Regulator	Vreg			-37		mV
Turn OFF Threshold	VTH_OFF			-20		mV
Turn-off Total Delay	Toff_delay			30		nS
Minimum on time	Tmin			1.7		uS
NMOS RDS_{ON}	R_{DS}	SF7708B/C/D		22/12/10		mΩ
Breakdown Voltage	BVDSS	SF7708B/C/D	38/40/45			V
Thermal shutdown Temp	T_{SD}		-	150	-	°C
Thermal Shutdown Hysteresis	T_{SH}		-	30	-	°C

OPERATION DESCRIPTION

The SF7708X supports operation in DCM and Quasi-Resonant topologies. Operating in either a DCM or Quasi-Resonant topology, the control circuitry controls the gate in forward mode and will turn the gate off when the MOSFET current is fairly low.

◆ VCC Under voltage lockout(UVLO)

When the Vcc is below UVLO threshold, the part is in sleep mode and the internal N-MOS will be turn off.

◆ Turn ON phase

When the synchronous MOSFET is conducting, current will flow through its body diode which generates a negative Vds across it. Because this body diode voltage drop is much smaller than the turn on threshold of the control circuitry (-170mV), which will then turn on the N-MOS.

◆ Conducting Phase

When the synchronous N-MOS is turned on, Vds becomes to rise according to its on resistance, as the current become smaller Vds rises above the Driver Voltage Regulator (-37mV), the circuitry starts pulling down the gate driver which leads to the VDS be regulated to a fixed voltage (the internal reference).

◆ Turn OFF phase

When the Vds rises to trigger the turn off threshold(-20mV), the N-MOS gate voltage is pulled to low after about 30nS delay by the control circuitry, a 1.7uS blanking time is added after the synchronous N-MOS is turn off to avoid error trigger because of the ringing.

◆ Blanking

The SF7708X control circuitry contains a blanking function. When it pulls the MOSFET OFF, it makes sure that the OFF state at least lasts for about ~1.7us, so it is not recommended to set the synchronous period less than 1.6us in flyback converter, otherwise shoot through may occur During normal operation.

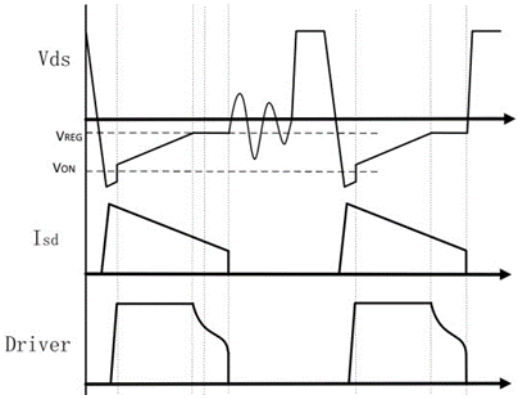
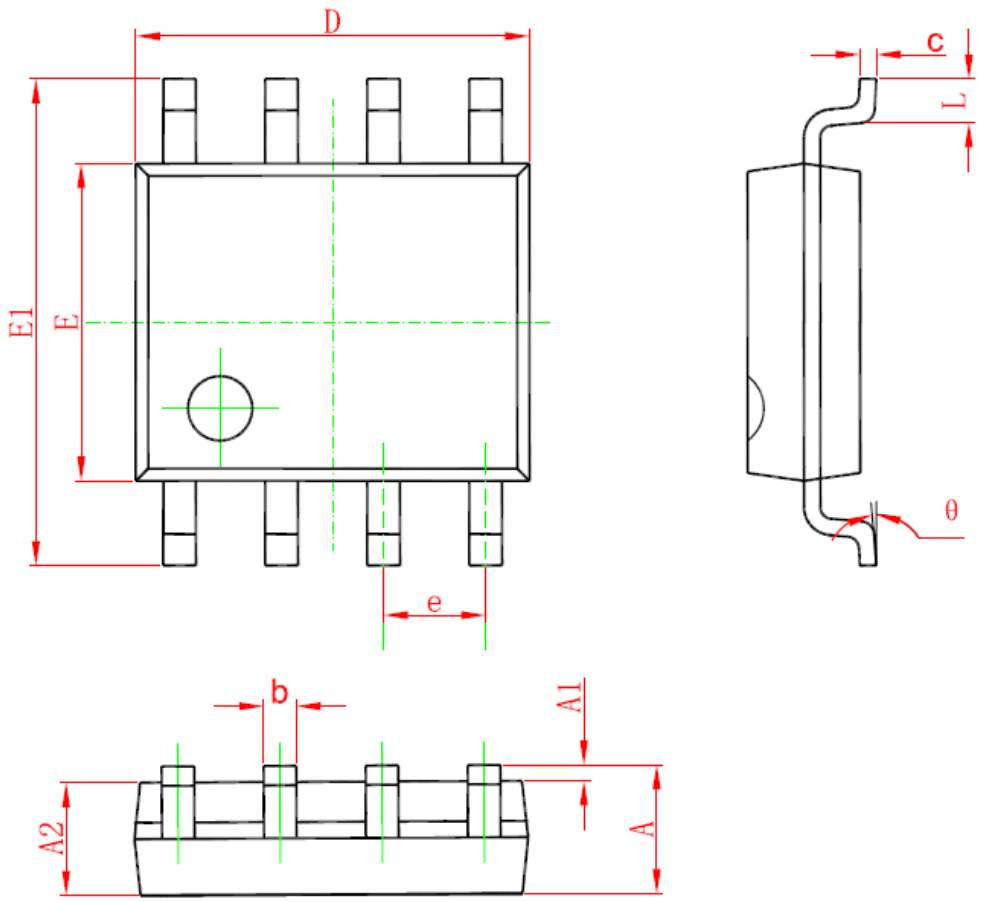


Fig.1 Operation in DCM mode

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	0°	8°	0°	8°

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