

High Performance Synchronous Rectifier

Features

- Secondary side synchronous rectifier controller, built-in 40V~120V Power MOSFET, output voltage range 3.3V~20V
- Support CCM, QR, and DCM working mode
- Accurate secondary side detection
- Support constant voltage/constant current operation
- Unique VCC self-supply technology
- VCC power supply under-voltage protection
- VCC over-voltage clamp
- Support maximum frequency of ~ 160 KHz
- TSR detection time 25ns (typical value)
- Small number of peripheral components, for low-cost solution
- SOP-8 package

Description

GR9383 is a high-performance secondary side synchronous rectifier control chip and supports CCM, QR, DCM and other working modes, with special VCC self-power supply mode, it does not need one more winding for power supply, reduce peripheral components and design cost. GR9383 integrates VCC under-voltage protection, over-voltage clamp, and drive pin deinterference technology.

Applications

- Mobile phone charger
- AC/DC adapter

Typical Application Information

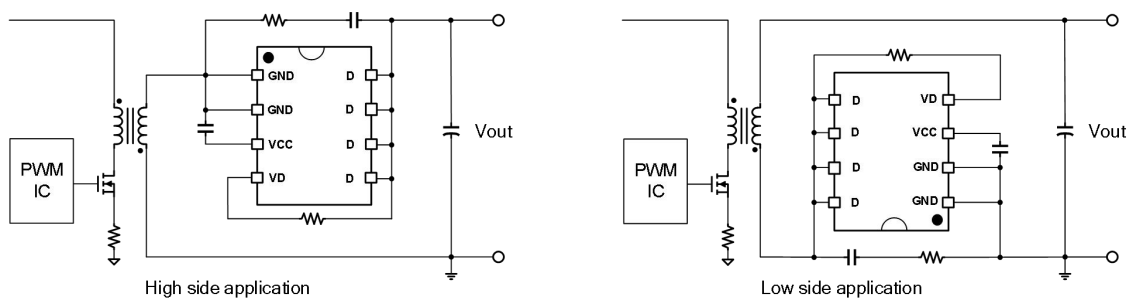


Figure 1 Application CKT of synchronous rectifier chip

Ordering and Marking Information

Naming

GR9383XXKBG

Family code ← GR9383

Code A:breakdown voltage Code B:Rdson

A:40V,B:60V,C:80V,D:100V,E:120V E:5mR,K:10mR,L:20mR,M:30mR

RoHS code
G:Green(Halogen Free) Device

Package code
KB:SOP-8

Marking

**GR9383X
XXXXXX**

Family code ← GR9383

MOS Rdson
E : 5mR
K : 10mR
L : 20mR
M : 30mR

MOS BVds
A : 40V_{min}
B : 60V_{min}
C : 80V_{min}
D : 100V_{min}
E : 120V_{min}

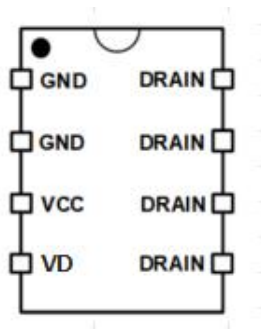
Code1 Code2 Serial No.

Code 1	M	N	O	P	...	Q	R	S	T
Year	2022	2023	2024	2025	...	2026	2027	2028	2029
Code 2	1	2	3	4	...	9	A	B	C
Month	Jan.	Feb.	Mar.	Apr.	...	Sep.	Oct.	Nov.	Dec.

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Pin Configuration

SOP-8



Pin Description

SOP-8

Pin No.	Name	Function
1,2	GND	Ground pin
3	VCC	Power supply pin
4	VD	MOSFET Drain Voltage Sense
5,6,7,8	DRAIN	Drain of built-in power MOSFET

Absolute Maximum Ratings

Drain Voltage- - - - -	-1V~ MOSFET BV (note 2)
VCC power supply voltage- - - - -	-0.3~7V
Maximum working interface temperature- - - - -	150℃
Storage temperature range- - - - -	-55℃ ~ 150℃
Lead temperature (SOP-8, tin soldering, 10 sec) - - - - -	230℃
Lead temperature (all lead-free PKG,tin soldering, 10 sec) - - - - -	260℃
ESD, voltage protection, machine mode- - - - -	300V
ESD, voltage protection, human model- - - - -	3KV

Note 1: If the component stress exceeds the listed absolute maximum rating (Absolute Maximum Ratings), it may cause permanent damage and safety will not be guaranteed. Not only the stress ratings, the component functions operate in these or any other circumstances, and the operating parts beyond the electrical specification are not included. Long time operation affects the reliability of the product.

Note 2: According to the voltage specification of the built-in power MOSFET, the product code voltage specification is described in the specification column.

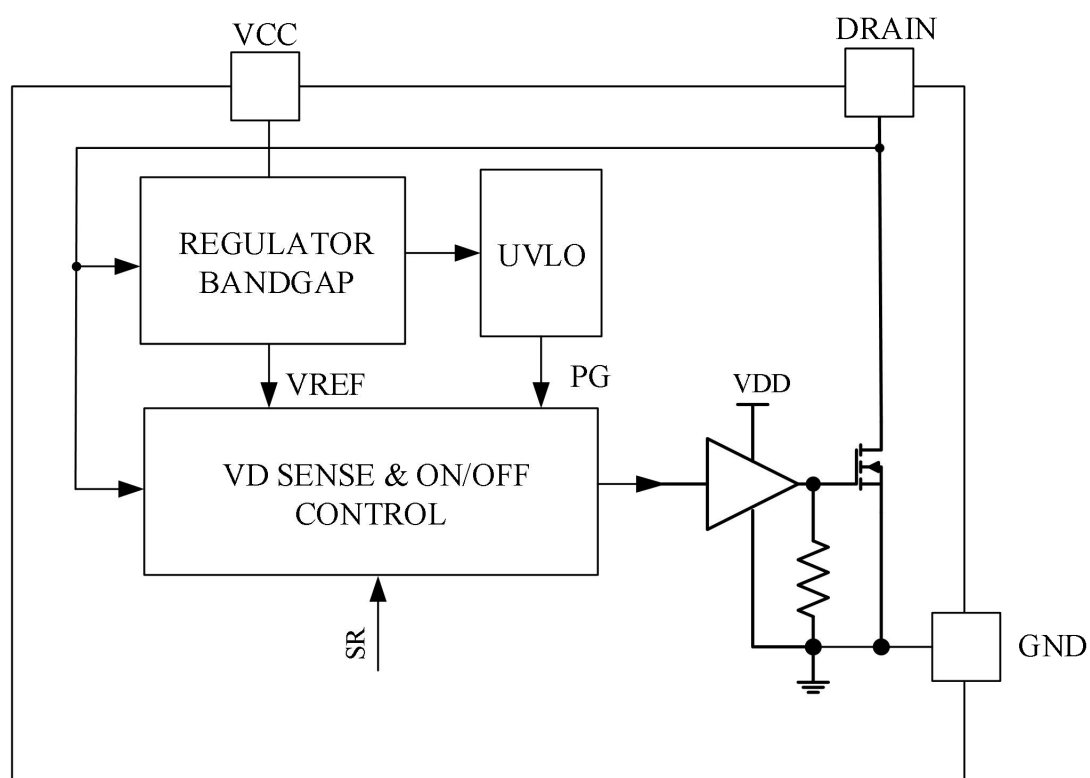
Recommended Operating Conditions

Item	minimum	maximum	unit
The surface temperature	-40	125	℃
Ambient temperature	-40	85	℃
Power supply voltage	4	6	V
VCC capacity	0.1	1	μF

Notes:

- Do not exceed the IC maximum absolute surface temperature, which is related to the IC operating power and the IC package thermal resistance.
- Put the small signal components as close to the IC pin as possible
- For VCC power supply capacitors, recommend using SMD ceramic capacitors

Block Diagram



Electrical Characteristics ($T_A = +25^{\circ}\text{C}$ unless otherwise stated, $V_{CC} = 5.0\text{V}$)

parameter		Min.	Typ.	Max.	unit
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SUPPLY VOLTAGE (VCC Pin)

VCC working voltage	VCC	4.7	5	5.3	V
Start-up voltage UVLO-ON	UVLO _{on}	3.4	3.6	3.8	V
Turn-off voltage UVLO-OFF	UVLO _{off}	2.8	3.1	3.3	V
start-up current	I _{st}			100	uA
quiescent current	I _{vcc_st}		180	300	uA

VD

SR _ ON threshold voltage	SR _{ON}		-100		mV
SR _ REG threshold voltage	SR _{OFF2}	-50	-30	-15	mV
SR _ OFF threshold voltage	SR _{OFF}		0		mV
TSR detection time (VD drop 2V~ -100 mV)			25		ns
Minimum on Time	T _{onmin}	450	600	750	ns
SR turn on delay	TD _{ON}		25	50	ns
SR turnoff delay	TD _{OFF}		15	50	ns

MOSFET
GR9383AK Note1.

Power MOSFET Rdson	RDSON		10.5	15	mΩ
Power MOSFET breakdown voltage	BV	40			V

GR9383BK

Power MOSFET Rdson	RDSON		10.5	15	mΩ
Power MOSFET breakdown voltage	BV	60			V

GR9383BE

Power MOSFET Rdson	RDSON		7.0	8.5	mΩ
Power MOSFET breakdown voltage	BV	60			V

GR9383CE

Power MOSFET Rdson	RDSON		5	7.5	mΩ
Power MOSFET breakdown voltage	BV	80			V

GR9383DE

Power MOSFET Rdson	RDSON		5.5	8.2	mΩ
Power MOSFET breakdown voltage	BV	100			V

GR9383DK

Power MOSFET Rdson	RDSON		9	12	mΩ
Power MOSFET breakdown voltage	BV	100			V

GR9383EK

Power MOSFET Rdson	RDSON		10.5	15	mΩ
Power MOSFET breakdown voltage	BV	120			V

Note1: product model suffix code GR9383XX: the first code X is to define the Power MOSFET breakdown voltage, the second code X is to define the Power MOSFET Rdson.
Only several representative products are listed in the table above, and the different MOS specifications are defined in the table below.

MOSFET specification sheet:

Product model suffix code-first code	Power MOSFET breakdown voltage	Product code suffix code-second code	Power MOSFET Rdson
A	40-50	F	Rdson <5 mohm
B	60	E	Rdson 5-10 mohm
C	80	K	Rdson 10-20 mohm
D	100	L	Rdson 20-30 mohm
E	120	M	Rdson 30-40 mohm
F	150		

Application Information

Preface

GR9383 is a high performance synchronous rectification control chip applied to the switching mode power supply, this chip can replace the short diode in the converter, in order to improve the conversion efficiency, GR9383 supports CCM, QR, and DCM working mode, self-supply function of VCC pin do not need the third winding for power supply and reduce the peripheral components and design cost.

The built-in Power MOSFET has different breakdown voltages such as 40V / 60V / 80V / 100V / 120V, which can be used in different output voltages.

VCC supply

VCC is the output pin of the self-supplied regulator, and the power supply can be stabilized by 0.1 uF ~ 1 uF capacitor filter on the VCC pin to GND. This regulator will supply the current through the internal SR MOSFET Drain of the chip.

At the same time, the VCC has undervoltage

locking, with the on voltage of 3.6V and the off voltage of 3.1V. The hysteresis voltage is 0.5V to avoid abnormal on and off during the startup process.

Synchronous rectifier is turned on

GR9383 uses the VDS voltage on SR MOS to control and judge on and off. As shown in Figure 2, when the time of SR MOS VDS dropping from 2V to SR open threshold voltage-100mV is less than the internal setting time of the chip, after 25ns of delay time, SR MOS will be turned on.

Synchronous rectifier off

When SR MOS is turned on, the VDS voltage of SR MOS will gradually rise as the continuous current on the secondary side gradually decreases. When the GR9383 detects that the VDS voltage reaches the SR off threshold voltage of 0 mV, the SR MOS will be turned off after 15ns of delay time.

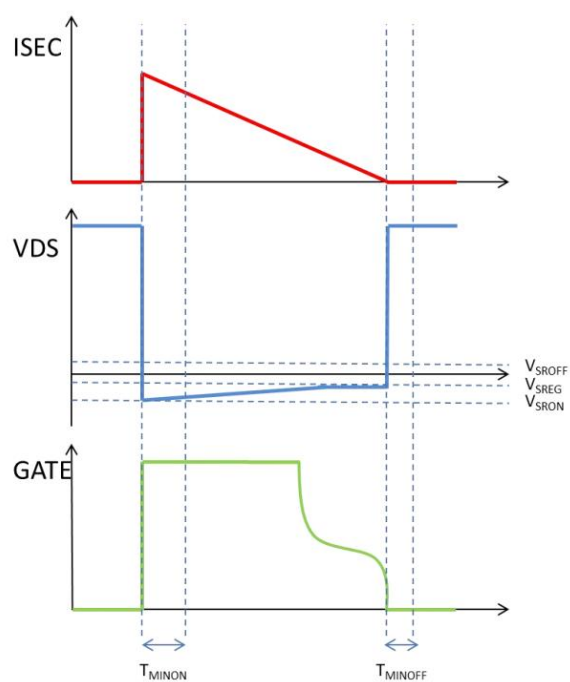
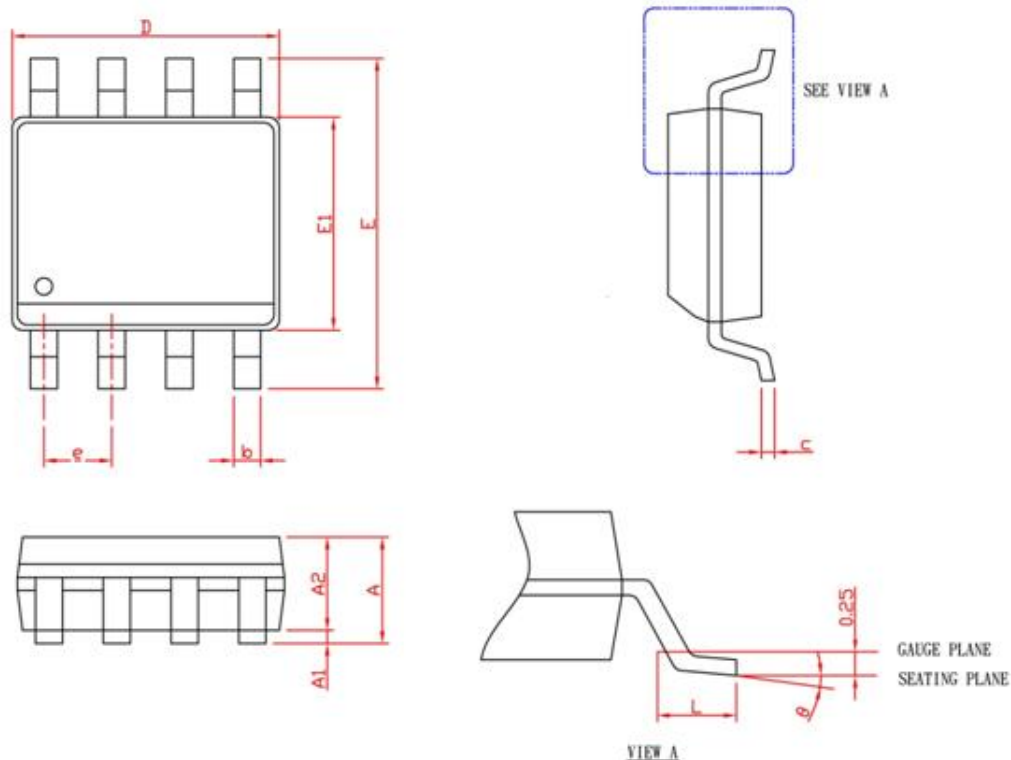


Figure2 On and off time sequence of the chip



Package Information

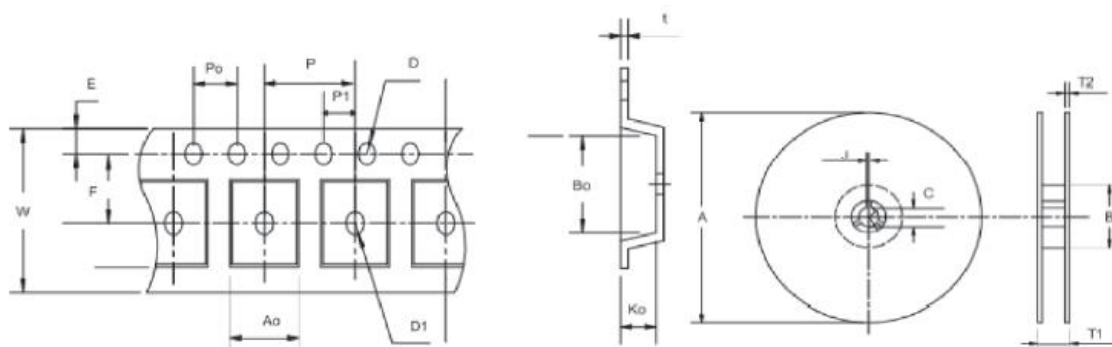


SYMBOL	SOP-8	
	MILLIMETERS	
	MIN.	MAX.
A		1.75
A1	0.10	0.25
A2	1.25	
b	0.31	0.51
c	0.10	0.25
D	4.70	5.10
E	5.80	6.20
E1	3.70	4.10
e	1.27 BSC	
L	0.40	1.27
θ	0°	8°

Notes:

1. Followed from JEDEC MS-012 AA.
2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.
3. Dimension "E" does not include inner-lead flash or protrusions. Inner-lead flash and protrusions shall not exceed 10mil per side.

Carrier Tape & Reel Dimensions



PKG TYPE	W	E	F	P0	A0	P	P1	B0	K0	A	B	T1
SOP8	12+0.3	1.75+0.1	5.5+0.05	4+0.1	6.4+0.2	8+0.1	2+0.2	5.2+0.2	2.1+0.2	330+2	50min	12.4+2/-0

(mm)

Devices Per Unit

Application	Carrier Width	Cover Tape Width	Devices Per Reel
SOP8	12	-	2500

Feed direction

SOP-8

