High Performance Synchronous Rectifier with CCM

FEATURES

- Integrated 60V Synchronous Rectifier MOS
- Suitable for CCM, DCM, QR operation
- Without auxiliary winding power supply at high side application
- Start-up delay extremely short~25ns
- Shutdown delay extremely short~10ns
- False switch-on prevention technology
- Intelligent zero crossing detection technology
- Support low output voltage 3.3V; SR reliable operating
- Up to 200kHz operation frequency
- Extremely simple external circuit

GENERAL DESCRIPTION

DP60XXC is high-performance synchronous rectifier power switch that replaces Schottky rectifier diodes to improve system efficiency and supports CCM, DCM, and QR modes.

DP60XXC Supports low side and high side application, integrated 60V high voltage power supply circuit, no need additional auxiliary winding power supply, reduces system cost.

DP60XXC adopts unique false turn-on prevention technology, which can prevent SR false turn-on caused by VDS oscillation effectively.

DP60XXC With short turn-on and turn-off delay time, to achieve highest efficiency possibly. Extremely short turn-off delay enables stable operation in CCM mode.

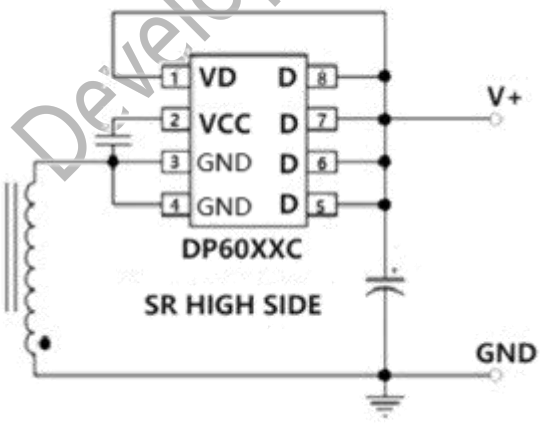
APPLICATION

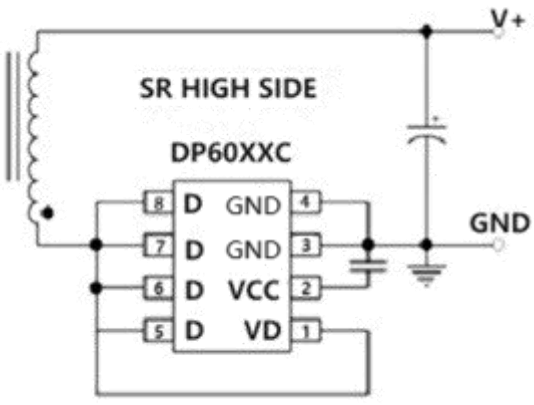
- USB-PD, PPS, fast charge/ adapter
- AC to DC power supply
- Multi-port plug, Charger

PACKAGE INFORMATION

Package	Description	MSL
SOP-8	Halogen free, 4000 pcs/reel	3

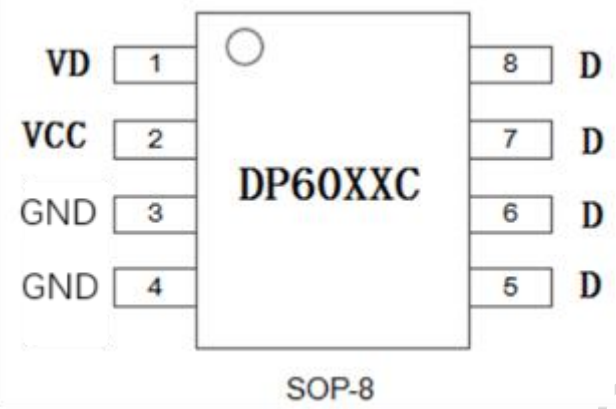
TYPICAL APPLICATION





PRODUCTS INFORMATION

➢ PIN CONFIGURATION



➢ PIN CONFIGURATION

Pin NO.	Pin Name	Description
1	VD	SR Drain detection, integrated self-power supply at input side
2	VCC	Internal self-power supply
3,4	GND	Built-in synchronous rectifier source
5,6,7,8	D	Built-in synchronous rectifier drain

➢ MARKING INFORMATION

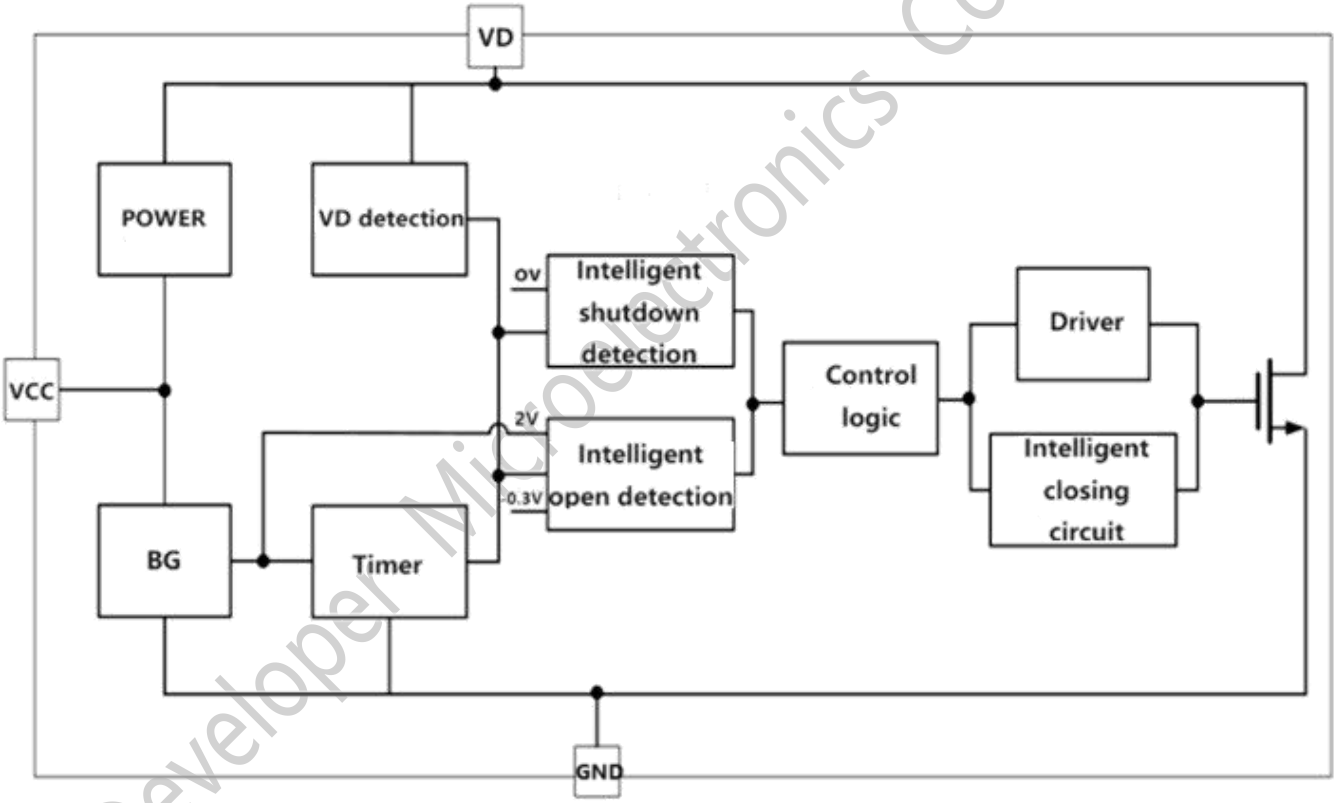
DP60XXC for product name:

XXXXXX The first X represents the last year,2014 is 4; The second X represents the month, in A-L 12 letters; The third and fourth X on behalf of the date, 01-31 said; The last two X represents the wafer batch code

➢ ABSOLUTE MAXIMUM RATINGS

Parameter	Value	Unit
VCC to GND	-0.3 to +7	V
D to GND	-0.5 to +60	V
VD to GND	-0.3 to +60	V
Maximum power consumption (2)	2.5 (T_A = +25°C)	W
Maximum Junction Temperature	150	°C

BLOCK DIAGRAM



ELECTRICALCHARACTERISTICS (Ta=25°C, if not otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ.	Max	Unit
Internal synchronous MOSFET						
On-resistance (V_{gs}=10V I_d=8A)	R_{dson}	DP6010C		8	10	mΩ
		DP6015C		12	15	mΩ
breakdown voltage	$V_{DSS(BR)}$		60			V
Power VCC						
Turn-On Voltage	V_{CC_ON}			4.6		V
Shutdown Voltage	V_{CC_OFF}			4		V
Stabilized voltage	V_{CC_STB}	V_D= 14V		6		V
Operating Current	I_{CC}	V_{CC}=6V, F_{sw}=100KHz,		3.5		mA
quiescent current	$I_{q(VCC)}$	V_{CC}=6V, F_{sw}=0Hz		350		μA
Synchronous rectifier turn-on/off control						
Target voltage value Adjustment	V_{DS_REG}			-40		mV
Open Voltage Threshold	V_{ON_th}			-300		mV
Off Voltage Threshold	V_{OFF_th}			0		mV
Turn on delay	T_{D_on}			25		ns
Turn off delay	T_{D_off}			10		ns
Leading edge blanking time	L_{EB}			1.2		μs
Minimum Turn off time	T_{OFF_min}			500		ns

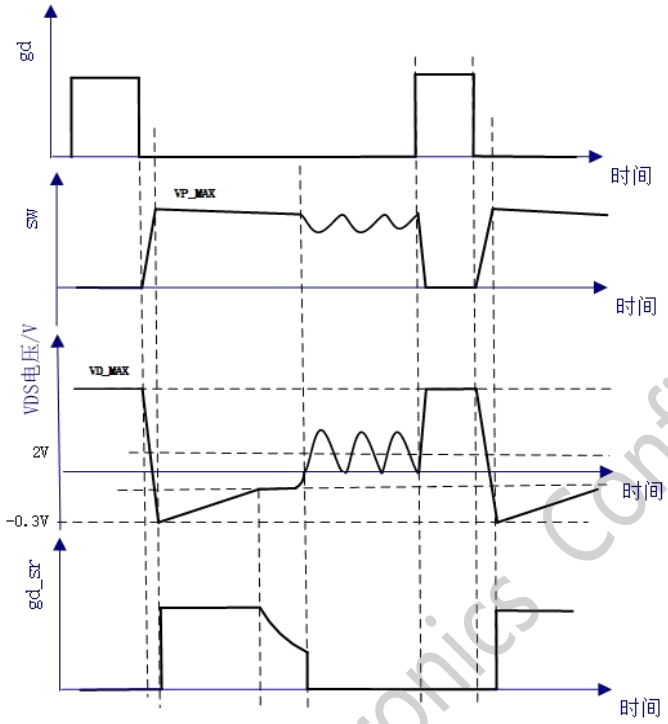
Recommended working conditions

Parameter	Value	Unit
VCC to GND	5 to 6	V
Junction temperature range (TJ)	-40 to +125	℃
SOP-8 Thermal resistance (θJA)(3)	80	℃/W

Note:

1. Chips may be damaged out of range
2. The maximum power withstood is determined by the maximum ambient temperature TJ(MAX), ambient thermal resistance θJA and Temperature TA. Maximum power in any environment calculate by PD(MAX)=(TJ(MAX)-TA)/θJA. Exceeding the maximum tolerable power can lead to extremely high chip temperatures, causing the chip's internal circuitry to enter overheat protection and shut down.
3. Test on JESDSD51-7, 4 layers PCB

FUNCTIONAL DESCRIPTION



Function Waveform

DP60XXC is a family of secondary side synchronous rectifier, that replaced Schottky diodes by combined with an ultra low on state resistance power MOSFET for high efficiency flyback converters.

- **System Start-Up Operation**

For the synchronous rectifier to turn on, the following 2 conditions must be met simultaneously:

(1) Let VDS>2V the time as t1, and the internal chip setting time as Toff_min, when t1>Toff_min, synchronous rectifier turns on, which can meet the first condition.

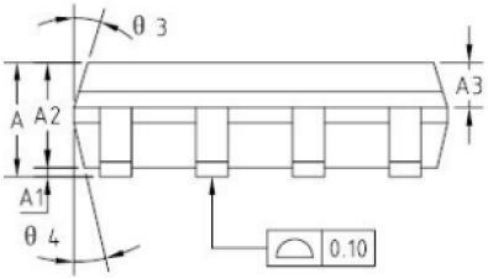
(2) Let VDS from 2V to -0.3V, the time as t2, and the internal chip setting fix time as T3, when t2<t3, synchronous rectifier turns on, which can meet the second condition.

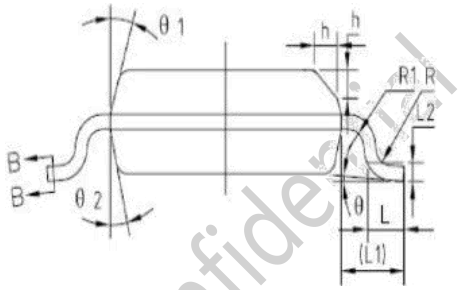
- **Synchronous rectifier turn on and turn off phase**

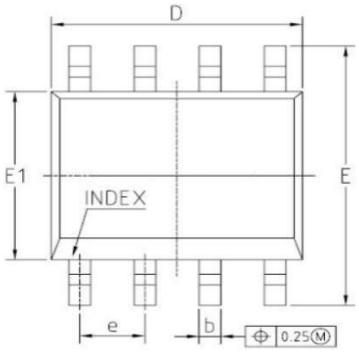
Synchronous rectifier turns on, internal chip sets a period of Leading-Edge Blanking Time (LEB), during this period shutdown threshold value will be increased. LEB is used to avoid to shut down incorrectly after detection while VDS start ringing when synchronous rectifier turns on. After the LEB time is over, the shutdown threshold is set to zero and the intelligent shutdown detection is enabled to control the gate side of the synchronous rectifier to adjust the VDS voltage and stabilize it. The purpose of the intelligent turn-off detection is to reduce the turn-off delay and avoid the "crossover" phenomenon (Primary side MOS and secondary side MOS in simultaneous conduction) during CCM. This phenomenon will generate additional energy loss, and in serious cases, the chip will be burned.

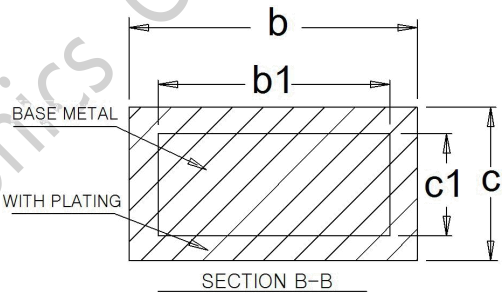
PACKAGE DIMENSION

SOP8









Symbol	Dimensions in Millimeters		
	Min	Nom	Max
A	1.45	1.55	1.65
A1	0.10	0.15	0.20
A2	1.353	1.40	1.453
A3	0.55	0.60	0.65
b	0.38	-	0.51
b1	0.37	0.42	0.47
c	0.17	-	0.25
c1	0.17	0.20	0.23
D	4.85	4.90	4.95
E	5.85	6.00	6.15
E1	3.85	3.90	3.95
e	1.245	1.27	1.295
L	0.45	0.60	0.75
L1	-	1.050REF	-
L2	-	0.250BSC	-
Θ1-Θ4	12° REF		
h	0.40REF		
R	0.15° REF		
R1	0.15° REF		

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