High-performance synchronous rectifier power switch with CCM
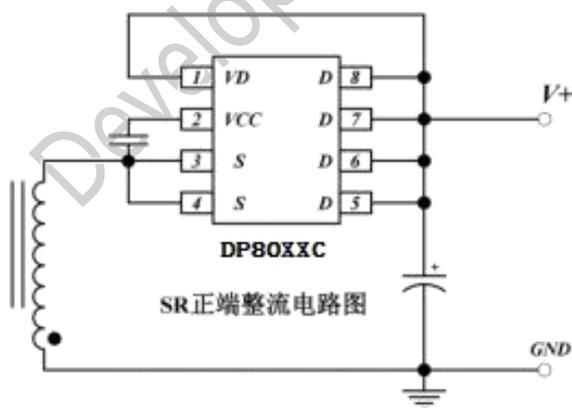
FEATURES

- Integrated 80V synchronous rectifier MOS
- Supports CCM, DCM and QR modes
- Placed on the positive end of the output, no auxiliary winding power supply
- Extremely short opening delay ~25ns
- Off Extremely Short Delay ~10ns
- Prevent mis-opening techniques
- Intelligent zero crossing detection technology
- Support output as low as 3.3V synchronous rectification reliable work
- Support switching power supply frequency up to 200kHz
- Minimalist peripheral circuits

GENERAL DESCRIPTION

The DP80XXC is a high-performance synchronous rectifier power switch that replaces Schottky rectifier diodes for system efficiency and supports CCM, DCM and QR modes.

The DP80XXC supports both positive and negative output terminals, and integrates 80V high-voltage power supply circuits, eliminating the need for additional auxiliary winding power supply and reducing system costs.

The DP80XXC uses a unique anti-mis-opening technology, which can effectively prevent SR mis-opening caused by VDS oscillation.

The DP80XXC has a very short opening delay and closing delay to achieve the highest possible efficiency. The extremely short turn-off delay allows the chip to work stably in CCM mode.

TYPICAL APPLICATION

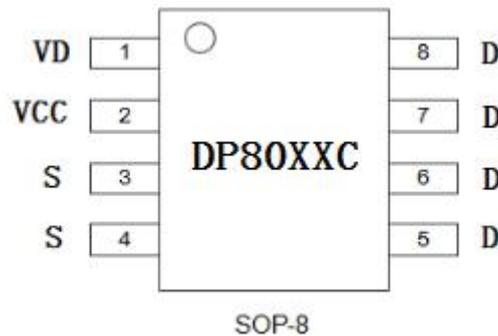- USB-PD, PPS, Fast charge/adapter
- AC to DC power supply
- Multi-port strip, charger

ACKAGING INFORMATION

Encapsulation	Description
DP80XXC	SOP8, halogen-free, braided disc pack, 4,000 PCS/plate

TYPICAL APPLICATION SCHEMATIC
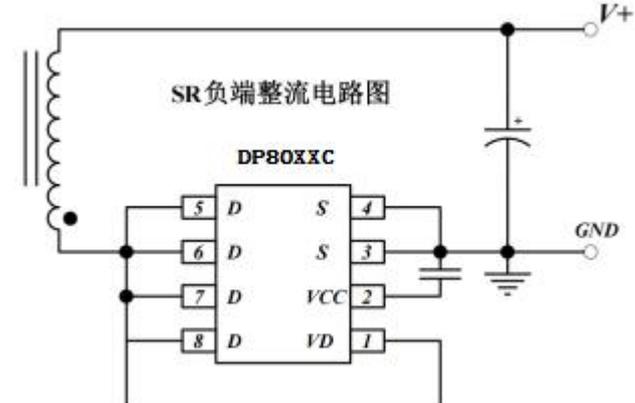
PRODUCT DESCRIPTION

➢ PIN CONFIGURATION

SOP-8

➢ PIN FUNCTION DESCRIPTION

| Pin Number	Pin name	Description
1	VD	Synchronous rectifier leak detection, internal integrated self-powered input
2	VCC	Chip power supply, internal self-powered output
3, 4	S	Chip ground, built-in synchronous rectifier source
5,6,7,8	D	Built-in synchronous rectifier drain

➢ PRODUCT MARK

DP80XXC is the product name:

XXXXXX the first X represents the last digit of the year, e.g. 2014 is 4; The second X represents the month, which is represented by 12 letters A-L; The third and fourth X represent the day, 01-31; And the last two X's represent the wafer lot number tracking code.

BLOCK DIAGRAM
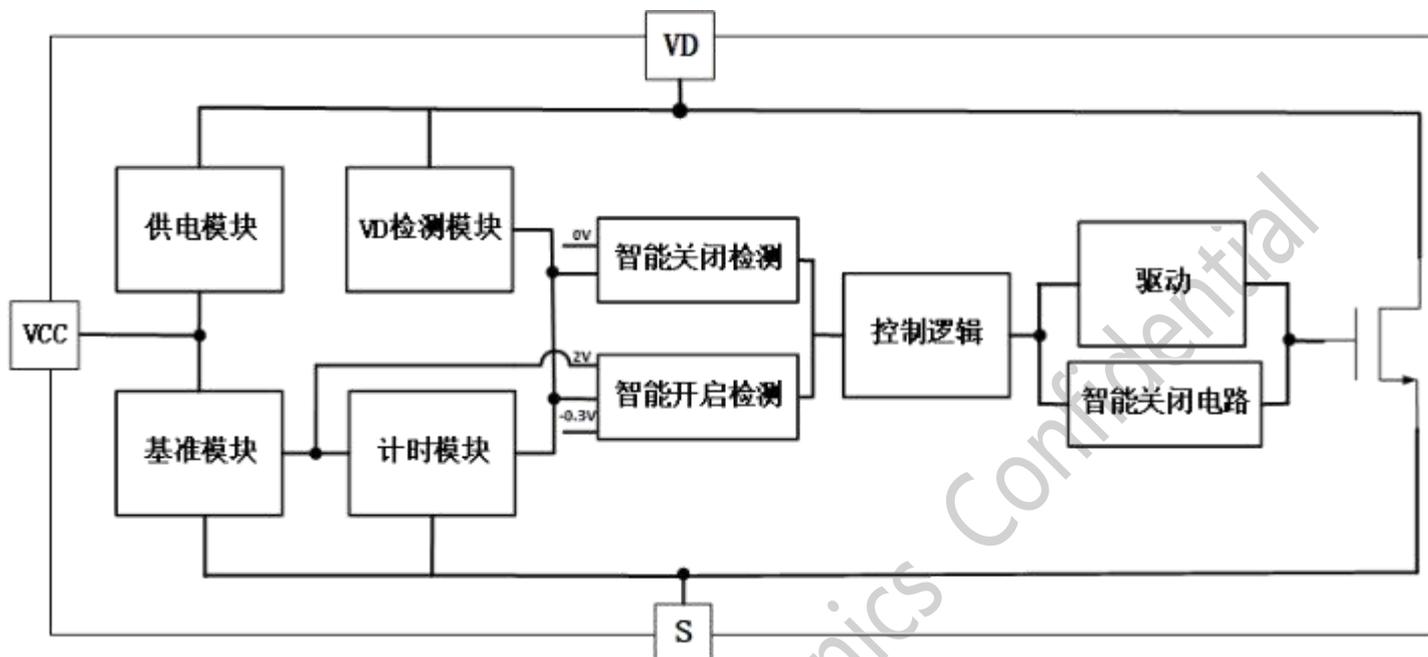
ELECTRICAL PARAMETERS

Parameters	Symbols	Conditions	Min	Typ	Max	Units
Synchronous rectifier power tube						
On-resistance (V_{gs}=10V I_d=8A)	R_{dson}	DP8020C		20		M Ω
		DP8015C		15		M Ω
		DP8010C		10		M Ω
Breakdown voltage	$V_{DSS(BR)}$		80			V
Power supply VCC						
Power on voltage	V_{CC_ON}			4.6		V
Off voltage	V_{CC_OFF}			4		V
Stable voltage	V_{CC_STB}	V_D= 14V		6		V
Working current	I_{CC}	V_{CC}=6V, F_{sw}=100KHz,		3.5		mA
Static current	$I_{q(VCC)}$	V_{CC}=6V, F_{sw}=0Hz		350		μA
Synchronous rectifier on/off control						
Adjust the voltage target value	V_{DS_REG}			- 40		mV
Turn on the voltage threshold	V_{ON_th}			- 300.		mV
Turn off the voltage threshold	V_{OFF_th}			0		mV
Opening delay	T_{D_on}			25		ns
Closing delay	T_{D_off}			10		ns
Leading edge blanking time	L_{EB}			1.2		μs
Minimum closing time	T_{OFF_min}			500		ns

LIMITING PARAMETER

Parameters	Numerical values	Units
VCC to S	-0.3 to +7	V
D to S	-0.5 to +80	V
VD to S	-0.3 to +80	V
Maximum absorbed power	2.5 (TA = +25℃)	W
Maximum junction temperature	150	℃

RECOMMENDED WORKING CONDITIONS

Parameters	Numerical values	Units
VCC to S	5 to 6	V
D to S	10 to 80	V
Knot temperature range (TJ)	-40 to +125	C
SOP-8 Thermal resistance (θJA)(3)	80	C/W

Note:

(1)Out of range chip may be damaged

(2)The maximum power is composed of three parts: maximum ambient temperature TJ(MAX), ambient thermal resistance θJA and ambient temperature TA. The maximum power in any environment is PD(MAX)=(TJ(MAX)-TA)/θJA. Exceeding the maximum tolerable power will cause the chip temperature to be very high, causing the internal circuit of the chip to enter the overheating protection and shut down.

Measure on JESDSD51-7, 4 layers PC

FUNCTION DESCRIPTION
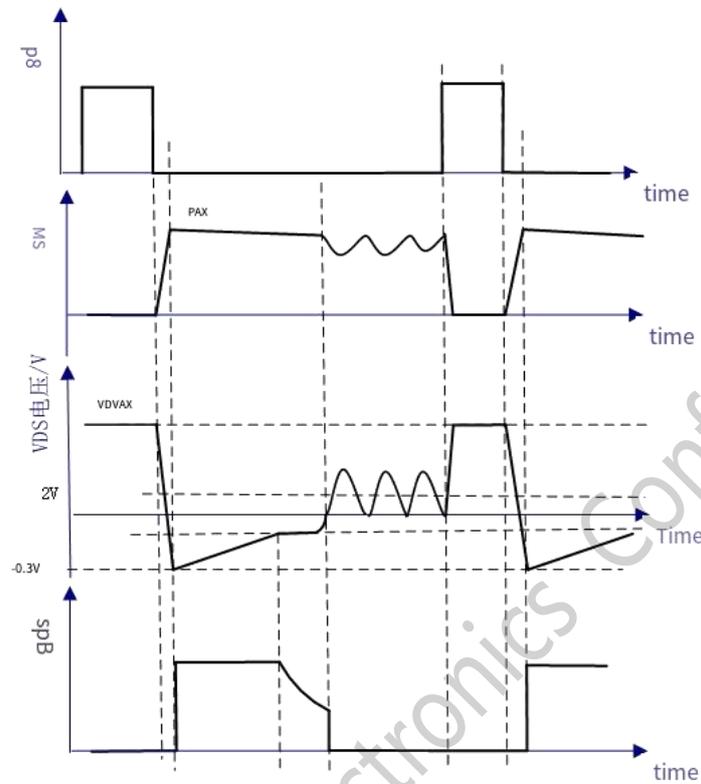
Function waveform diagram

The DP80XXC is a high-performance synchronous rectifier switch used to replace flyback secondary side Schottky diode rectifier, with a built-in low on-impedance power tube to improve system efficiency

● **Synchronous rectifier tube open judgment**

To make the synchronous rectifier open, the following two conditions must be met at the same time:

(1) Set the time of VDS>2V as t1, and set the time inside the chip as Toff_min. When t1>Toff_min, the first condition of opening the synchronous rectifier tube is met

(2) Set the time of VDS from 2V to -0.3V as t2, and the fixed time set inside the chip as t3. When t2<t3, the second condition of opening the synchronous rectifier tube is met.

● **The opening and closing process of synchronous rectifier tube**

(3) After the synchronous rectifier is turned on, a period of front blanking time (LEB) is set inside the chip, during which its shutdown threshold will be increased. The LEB is to prevent the VDS ringing after the synchronous rectifier is turned on from causing the chip to turn off mistakenly after detection. After the front blanking time is over, the closing threshold is set to zero, and the intelligent closing detection is enabled to control the gate end of the synchronous rectifier tube, so as to adjust the VDS voltage and make it stable at the adjusted voltage value. The purpose of intelligent closing detection is to reduce the closing delay and avoid the phenomenon of "crossover" in CCM (the primary side and the secondary side switch tube are on at the same time). This phenomenon generates additional energy consumption and can burn the chip in severe cases.

PACKAGE DIMENSIONS

SOP8
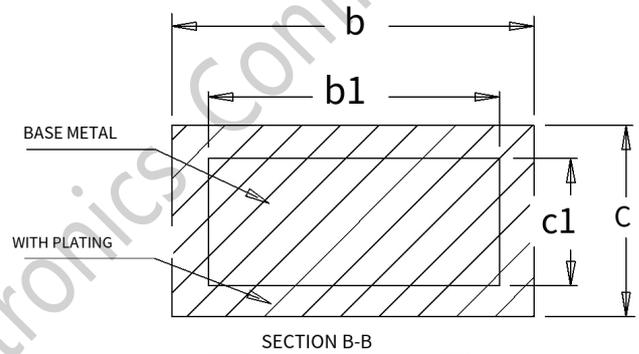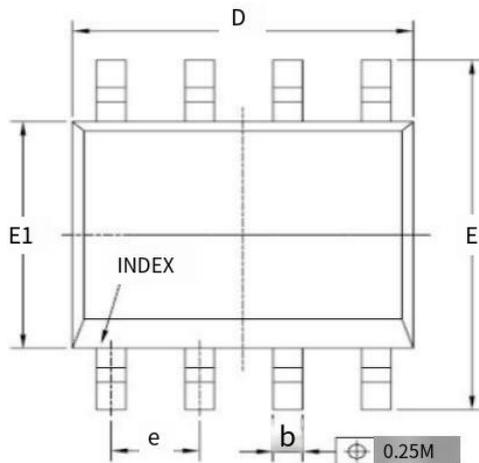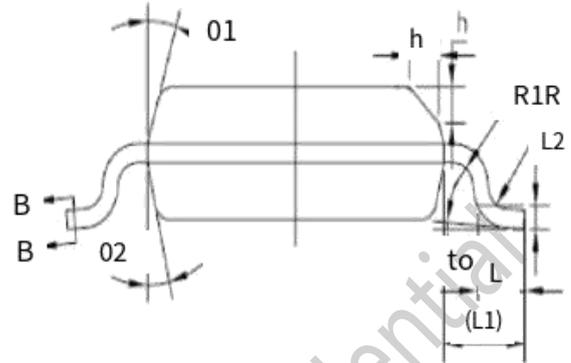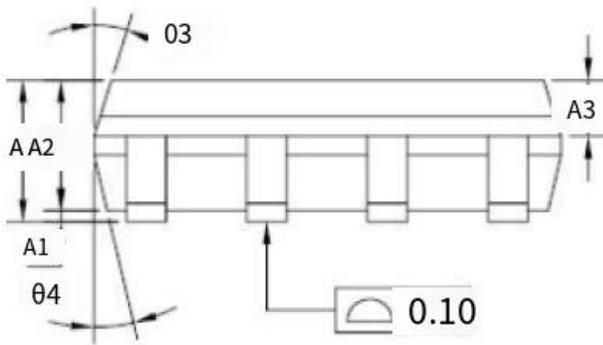
Symbol	Dimensions in Millimeters		
	Min	**Nom**	**Max**
A	1.45	1.55	1.65
A1	0.10	0.15	0.20
A2	1.353	1.40	1.453
A3	0.55	0.60	0.65
b	0.38	-	0.51
b1	0.37	0.42	0.47
c	0.17	-	0.25
c1	0.17	0.20	0.23
D	4.85	4.90	4.95
E	5.85	6.00	6.15
E1	3.85	3.90	3.95
e	1.245	1.27	1.295
L	0.45	0.60	0.75
L1	-	1.050 REF	-
L2	-	0.250 BSC	-
1-4 Θ Θ	12° REF		
h	0.40 REF		
R	0.15° REF		
R1	0.15° REF		

REVISION HISTORY

Editions	Revised Date	Redaction person	Revision content
REV1.0	2022.11.8	AE	First release

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