



# SP6012

## Synchronous Rectifier Driver

### DESCRIPTION

The fundamental of SP6012 synchronous rectifier (SR) driver IC is based on our U.S. patented methods that utilize the principle of “prediction” logic circuit. The IC deliberates previous cycle timing to control the SR in present cycle by “predictive” algorithm that makes adjustments to the turn-off time, in order to achieve maximum efficiency and avoid cross-conduction at the same time. It also maintains the MOSFET’s body diode conduction at minimum level. The SP6012 is capable to adapt in almost all existing forward converters with few adjustments considered necessary.

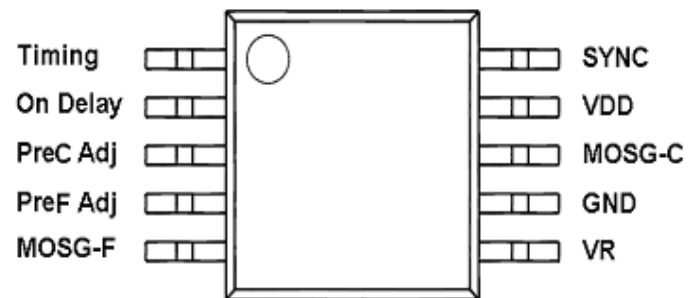
### FEATURES

- Offers 4 to 8% efficiency improvement over Schottky Diodes (depend on drive configuration of the SR).
- Drives all level Power MOSFET.
- Prediction gate timing control.
- Minimum MOSFET body diode conduction.
- Operating frequency up to 650 KHz.
- Synchronize to transformer secondary voltage waveform.

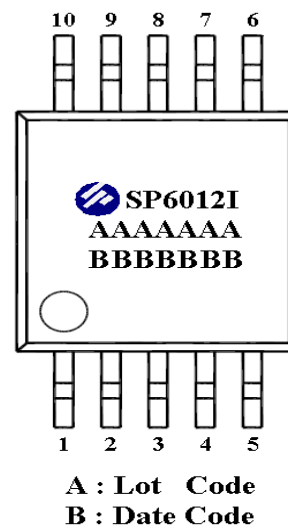
### APPLICATIONS

- Servers & workstations
- Storage area network power supplies
- Telecommunication converters
- Embedded systems
- Industrial & commercial systems using high current processors

### PIN CONFIGURATION (SOP-10P)



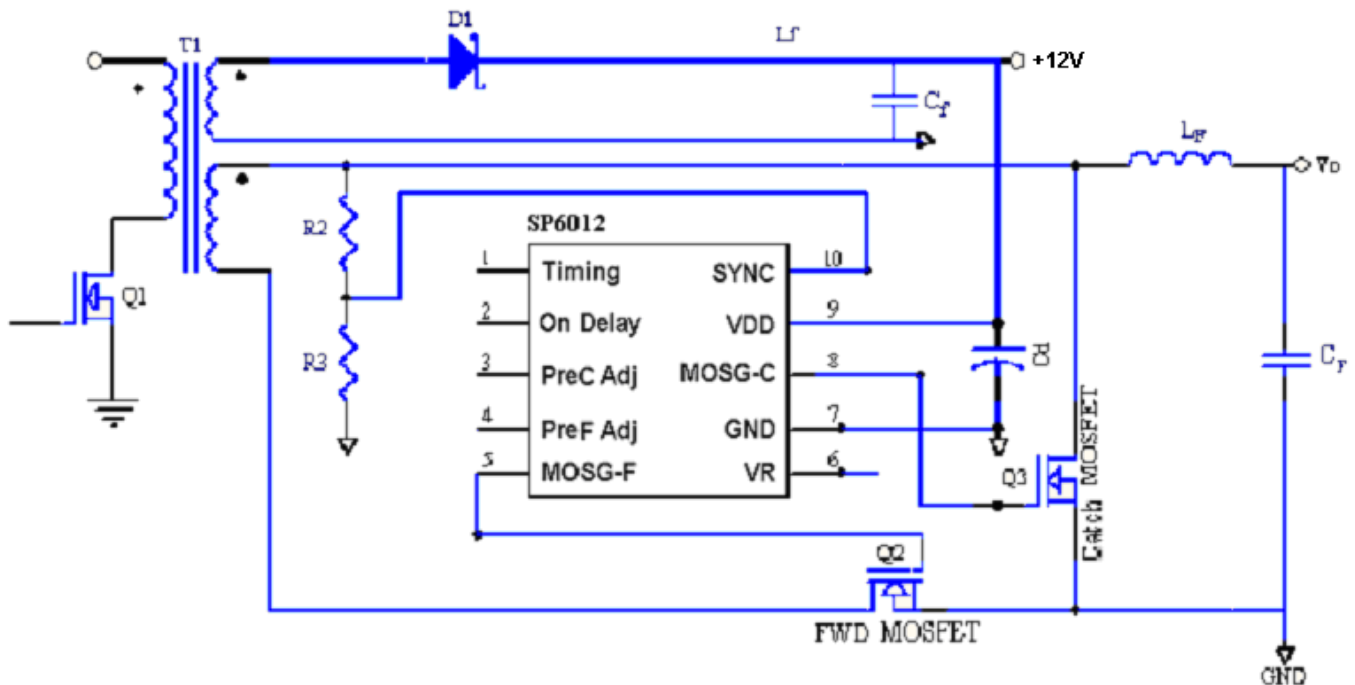
### PART MARKING (SOP-10P)





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## TYPICAL APPLICATION CIRCUIT



## PIN DESCRIPTION

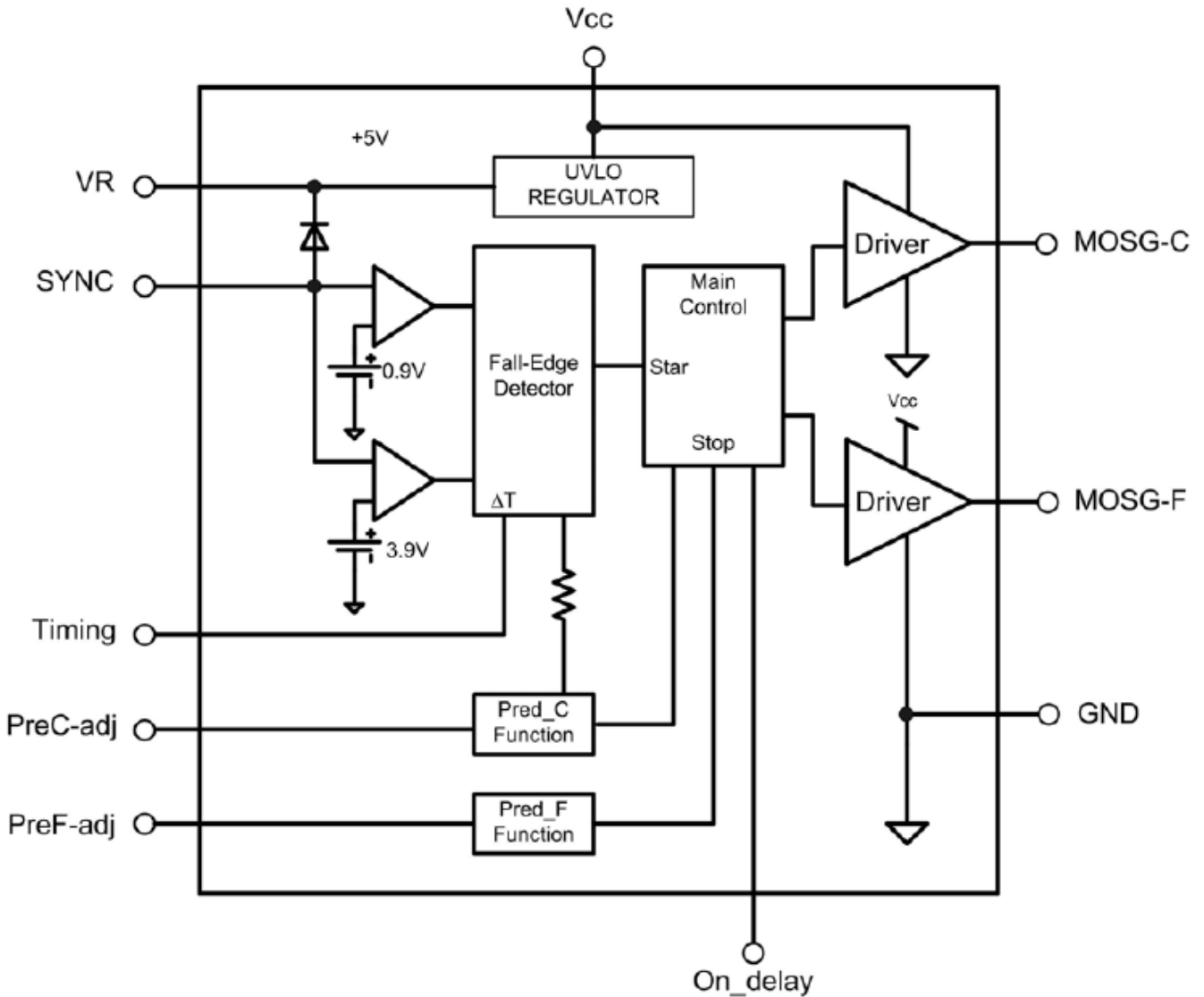
Pin	Symbol	Description
1	Timing	Discontinuous current filter timing adjustment resistor connection.
2	On Delay	Imposed delay between Catch gate turn OFF and Forward gate turn ON.
3	PreC Adj	Capacitor to store previous cycle timing for Catch MOSFET
4	PreF Adj	Capacitor to store previous cycle timing for Forward MOSFET
5	MOSG-F	Forward MOSFET gate drive.
6	VR	Voltage Regulator
7	GND	Ground connection.
8	MOSG-C	Catch MOSFET gate drive.
9	Vdd	DC supply voltage.
10	SYNC	Synchronized signal from transformer's output.



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### BLOCK DIAGRAM



### ORDERING INFORMATION

Part Number	Package	Part Marking
SP6012S10RG	SOP-10P	SP6012I
SP6012S10RGB	SOP-10P	SP6012I

※ SP6012S10RG : 7" Tape Reel ; Pb – Free

※ SP6012S10RGB : 7" Tape Reel ; Pb – Free ; Halogen - Free



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### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C, unless otherwise specified.)

The following ratings designate persistent limits beyond which damage to the device may occur.

Symbol	Parameter	Value	Unit
V <sub>dd</sub>	DC Supply Voltage	17	V
SYNC	SYNC Voltage	7	V
I <sub>OUT</sub>	Peak Source Current (Pulsed)	3	A
	Peak Sink Current (Pulsed)	3	A
P <sub>D</sub>	Power Dissipation @ T <sub>A</sub> =85°C (*)	0.25	W
T <sub>J</sub>	Operating Junction Temperature Range	-40 to 125	°C
T <sub>STG</sub>	Storage Temperature Range	-40 to 150	°C
T <sub>LEAD</sub>	Lead Soldering Temperature for 5 sec.	260	°C

### THERMAL RESISTANCE

Symbol	Parameter	Value	Unit
R <sub>θJC</sub>	Thermal Resistance Junction – Case (*)	45	°C/W

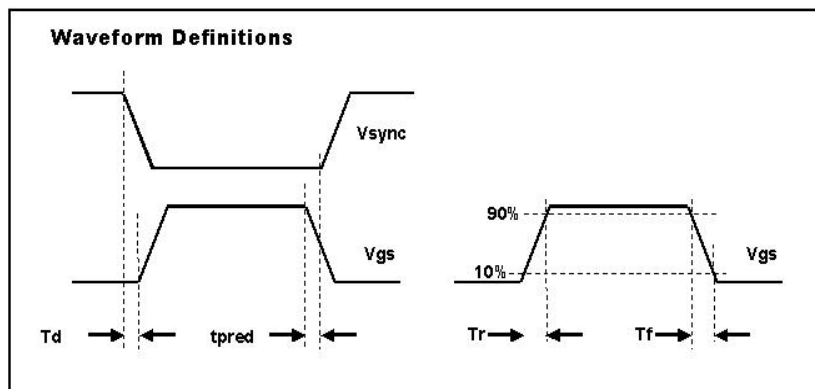
(\*) The power dissipation and thermal resistance are evaluated under copper board mounted with free air conditions.

### ELECTRICAL CHARACTERISTICS

(T<sub>A</sub>=25°C, V<sub>dd</sub>=12V, Freq. =300 KHz, Duty Cycle=50%, unless otherwise specified.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>SUPPLY INPUT</b>						
I <sub>DD</sub>	Supply current	No load		10		mA
		V <sub>SYNC</sub> =0V, No load		10	15	mA
V <sub>onth</sub>	V <sub>dd</sub> turn on threshold			9.5	10	V
V <sub>offth</sub>	V <sub>dd</sub> turn off threshold		8	8.5		V
<b>SYNC REFERENCE (SYNC)</b>						
V <sub>shth</sub>	SYNC high threshold		3.9	5.0		V
V <sub>slth</sub>	SYNC low threshold			0.9	1.2	V
<b>MOSFET GATE DRIVER (MOSG-C)</b>						
V <sub>oh</sub>	Output high voltage	I <sub>o</sub> = -200mA	11.5	11.8		V
V <sub>ol</sub>	Output low voltage	I <sub>o</sub> = 200mA		0.1	0.2	V
T <sub>d</sub>	Propagation delay	No load		50		ns
T <sub>pred</sub>		No load		120		ns
T <sub>r</sub>	Rise time	Load = 1nF (*)		50	100	ns
T <sub>f</sub>	Fall time	Load = 1nF (*)		35	60	ns

(\*) T<sub>r</sub> & T<sub>f</sub> are measured among 10% and 90% of starting and final voltage.





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### PERFORMANCE CHARACTERISTICS ( $T_A=25^\circ\text{C}$ , unless otherwise specified.)

Figure 1 : Supply Current vs Supply Voltage

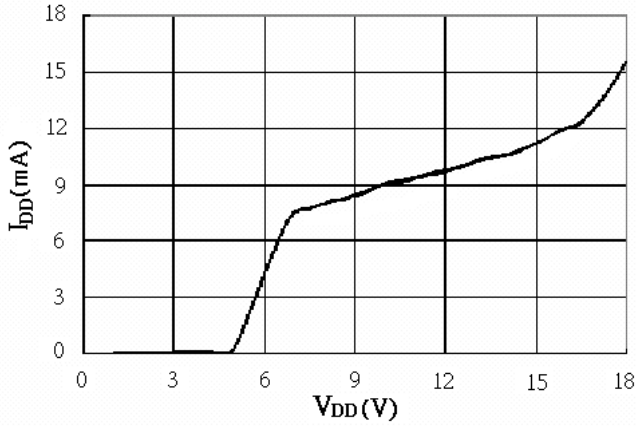


Figure 2 : Supply Current vs Freq. @No Load

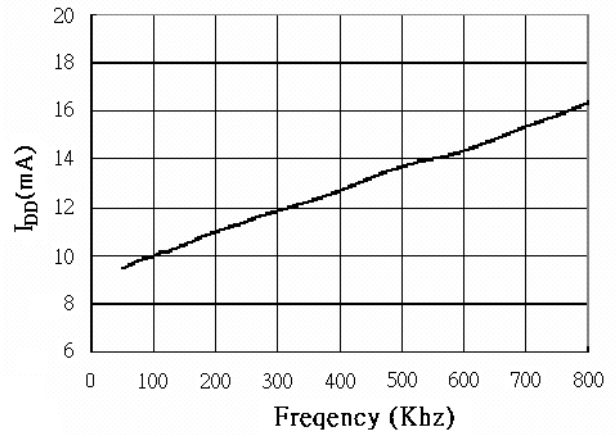


Figure 3 :  $T_{pred}$  vs  $C_{pred}$  @ Freq = 70 KHz ;  $V_{DD}=10V$

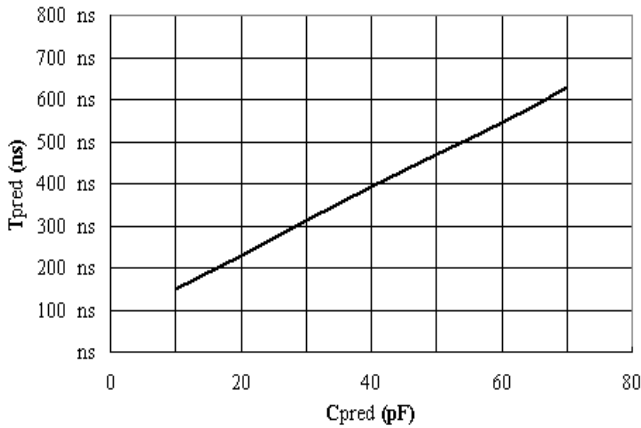


Figure 4 : Output Rise Time vs Load Capacitor

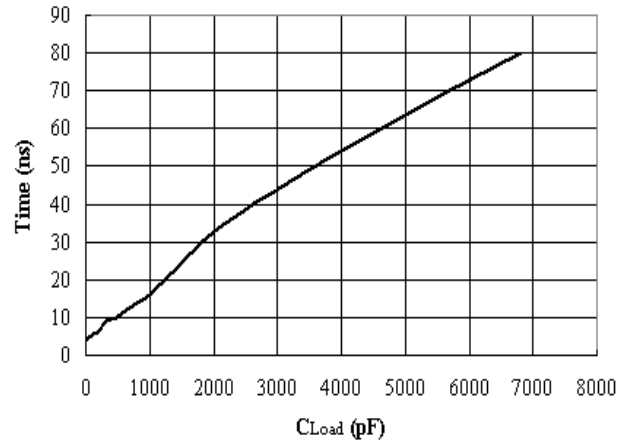


Figure 5 : Output Fall Time vs Load Capacitor

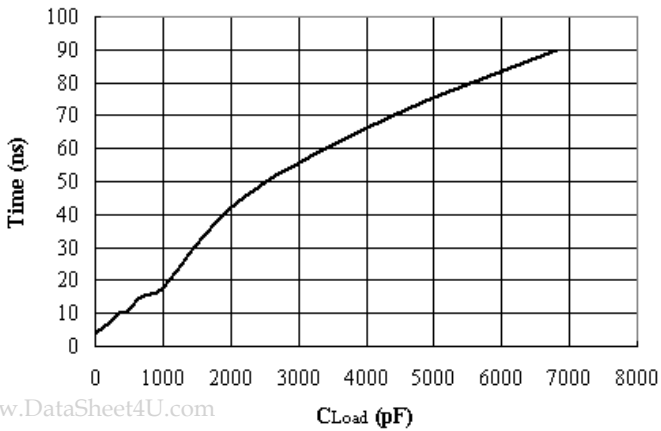
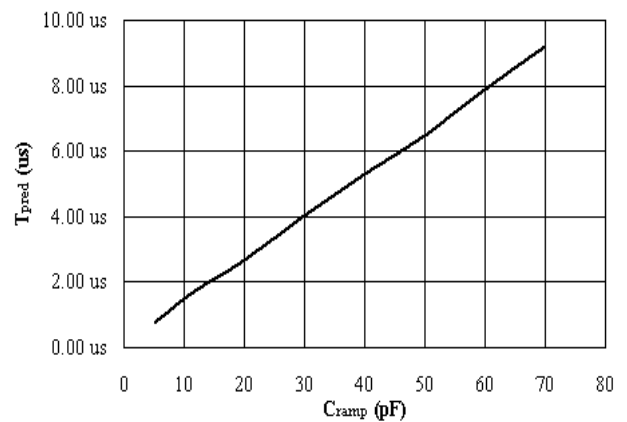


Figure 6 :  $T_{pred}$  vs  $C_{ramp}$  @ Freq = 20 KHz



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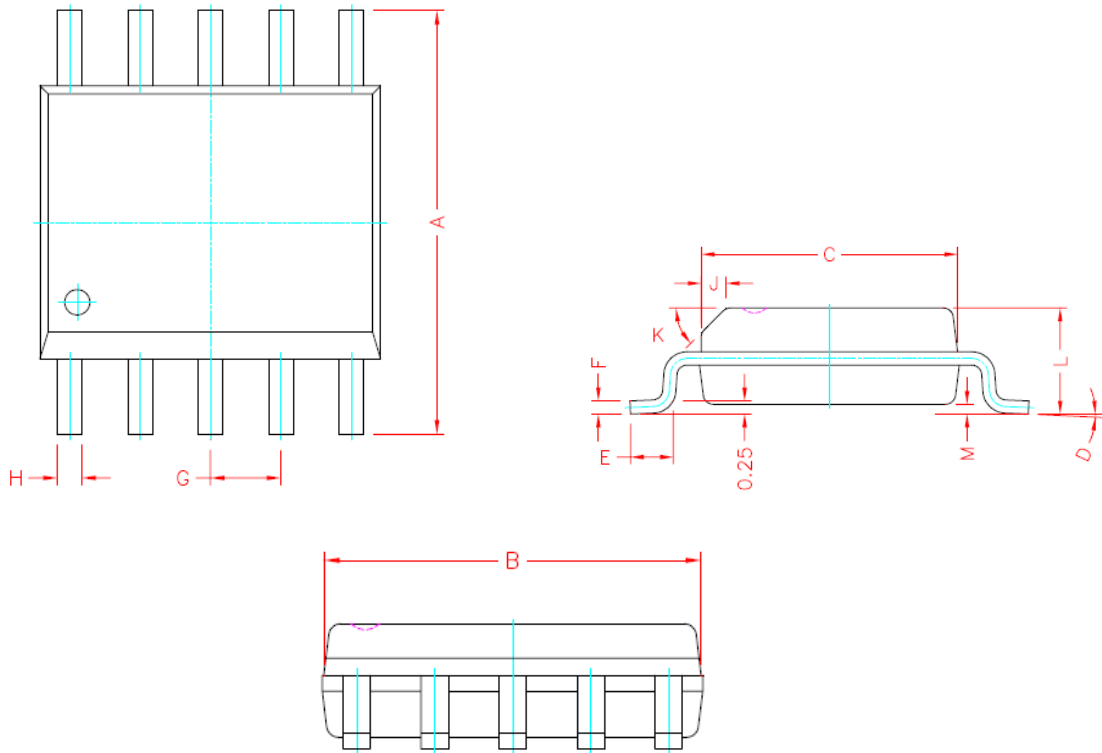
\*Fig. 1 : No Load ; No SYNC  
\*Fig. 4~5 : Frequency = 65 kHz.

### SOP- 10P PACKAGE OUTLINE



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REF.	DIMENSIONS	
	Millimeters	
	Min.	Max.
A	5.80	6.20
B	4.80	5.00
C	3.80	4.00
D	0°	8°
E	0.40	0.90
F	0.19	0.25
M	0.10	0.25
H	0.30	0.44
L	1.35	1.75
J	0.375 REF.	
K	45°	
G	1.00 TYP.	

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