



# SP6018E

## Synchronous Rectifier Driver

### DESCRIPTION

The fundamental of SP6018E 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. Specially, SP6018E is designed for Resonance. It also maintains the MOSFET’s body diode conduction at minimum level. The SP6018E is capable to adapt in almost all existing Resonance converters with few adjustments considered necessary.

### FEATURES

- Offers efficiency improvement over Schottky Diode (depends on drive configuration of the SR).
- Low Standby Power to meet DOE Lot 6 requirement.
- Prediction gate timing control.
- Minimum MOSFET body diode conduction.
- Operating frequency up to 400 KHz.
- Synchronize to transformer secondary voltage waveform.
- Internal over voltage protection

### APPLICATIONS

- Switching Mode Power Supply
- Storage area network power supplies
- Telecommunication converters
- Embedded systems
- Industrial & commercial systems using high current processors
- Power converters to meet Lot 6 requirement

### PIN CONFIGURATION (SOP-8)



### PART MARKING

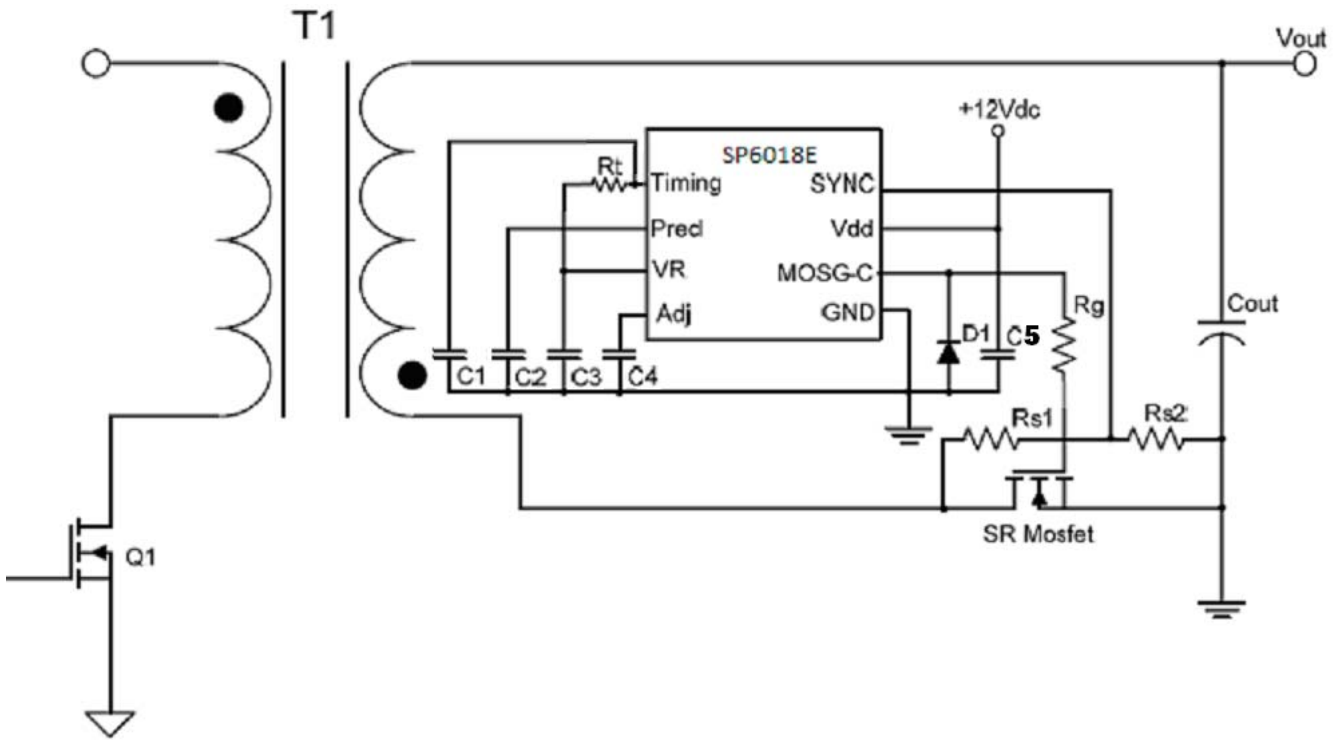




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### TYPICAL APPLICATION CIRCUIT



### PIN DESCRIPTION

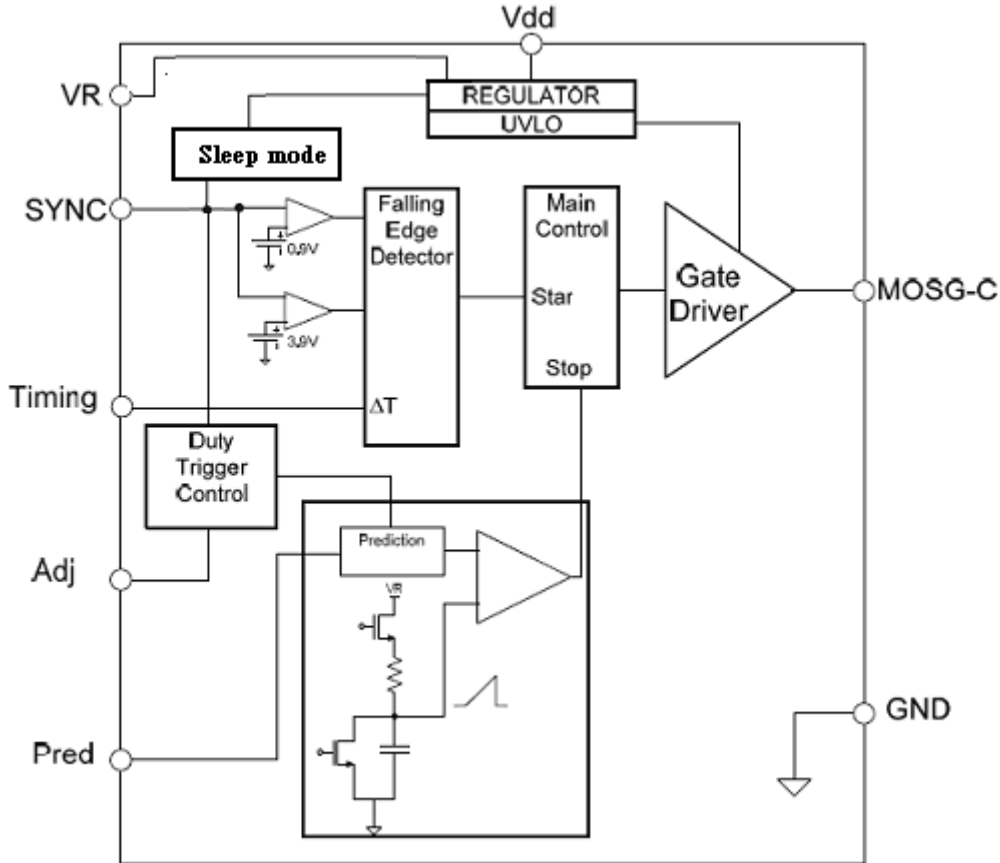
Pin	Symbol	Description
1	Timing	Discontinuous current filter timing adjustment resistor connection.
2	Pred	Capacitor to store previous cycle timing for SR MOSFET.
3	VR	Voltage Regulator.
4	Adj	Trigger point adjustment for Dynamic state.
5	GND	Ground connection.
6	MOSG-C	Catch MOSFET gate drive.
7	Vdd	DC supply voltage.
8	SYNC	Synchronized signal from the $V_{DS}$ of SR MOSFET.



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### BLOCK DIAGRAM



### ORDERING INFORMATION

Part Number	Package	Part Marking
SP6018ES8RGB	SOP-8	SP6018E
SP6018ES8TGB	SOP-8	SP6018E

※ SP6018ES8RGB : Tape Reel ; Pb – Free ; Halogen - Free

※ SP6018ES8TGB : Tube ; Pb – Free ; Halogen - Free

### ABSOLUTE MAXIMUM RATINGS (TA=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	16	V
I <sub>OUT</sub>	Peak Source Current (Pulsed)	2.0	A
	Peak Sink Current (Pulsed)	2.0	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



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### THERMAL RESISTANCE

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance Junction – Case (*)	45	$^{\circ}C/W$

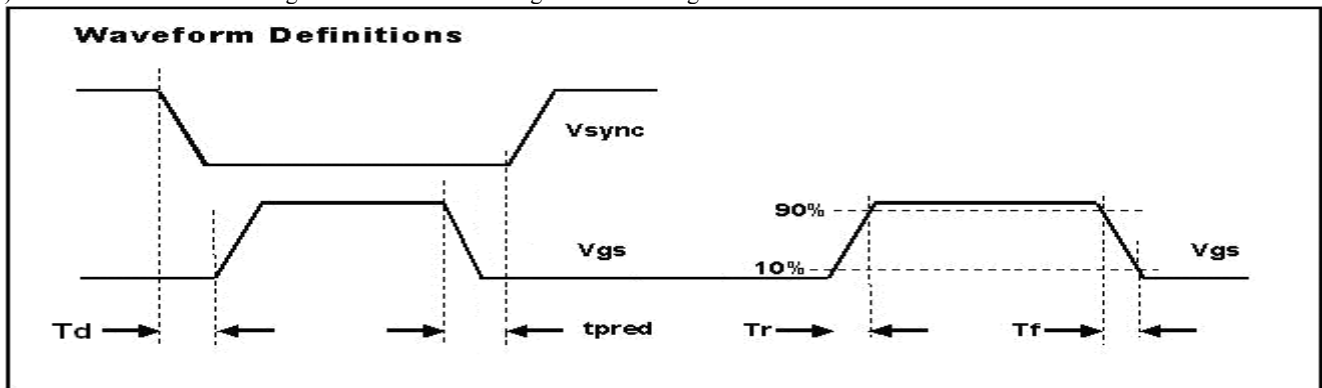
(\*) The power dissipation and thermal resistance are evaluated under copper board mounted with free air conditions.

### ELECTRICAL CHARACTERISTICS

( $T_A=25^{\circ}C$ ,  $V_{dd}=12V$ , Freq. =50 KHZ, Duty Cycle=50%, unless otherwise specified.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>SUPPLY INPUT</b>						
$I_{DD}$	Supply current	Sleep Mode		0.15		mA
		$V_{SYNC}=0V$ , $V_{dd}$ on		3	4	mA
$V_{dd}$	Supply voltage	$I_{dd\ peak} < 2A$			16	V
$V_{dd\ on}$	Enable voltage		9	10	11	V
$V_{dd\ hysteresis}$	Hysteresis Voltage of Supply Voltage			0.7		V
$V_{ovp}$	Over voltage protection		15	16		V
$V_{ovp\ hysteresis}$	Hysteresis Voltage of OVP			1.2		V
<b>SYNC REFERENCE (SYNC)</b>						
$V_{shth}$	SYNC high threshold		3.5	3.9		V
$V_{slth}$	SYNC low threshold			0.9	1.2	V
$V_{sync}$	SYNC clamp voltage	$I_{sync}=3mA$	10		16	V
$I_{sync}$	SYNC input current				3	mA
<b>Voltage Regulator REFERENCE (VR)</b>						
$V_R$	Reference Voltage		5.2		5.4	V
$I_{VR}$	VR Output Current				20	mA
<b>ON TIME DUTY SETUP ( PIN 6 )</b>						
$T_{on-time}$				19	20	us
<b>MOSFET GATE DRIVER (MOSG-C)</b>						
$V_{oh}$	Output high voltage	$I_o = -200mA$	10.5	11.0		V
$V_{ol}$	Output low voltage	$I_o = 200mA$		0.5	0.8	V
$T_d$	Propagation delay	No load	50	80		ns
$T_{pred}$		No load		120		ns
$T_r$	Rise time	Load = 1nF (*)		10	25	ns
$T_f$	Fall time	Load = 1nF (*)		10	25	ns
<b>Dynamic Protect</b>						
$D_t$	Dynamic variable	Pin 4 open		600		ns
$T_{on-min}$	MOSG-C on time	PWM adjusts time > $D_t$		1		us

(\*)  $T_r$  &  $T_f$  are measured among 10% and 90% of starting and final voltage.

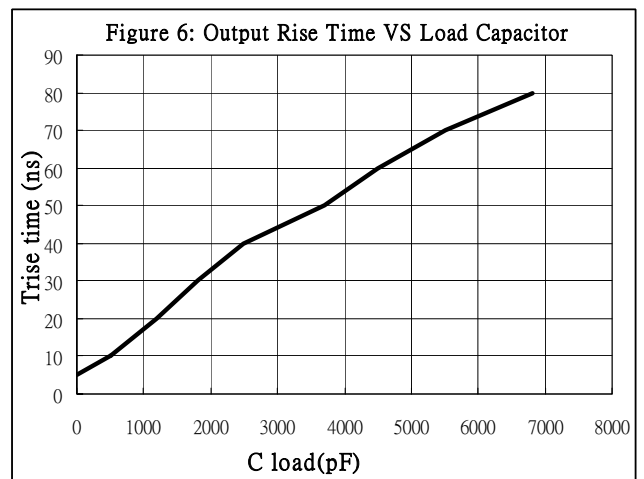
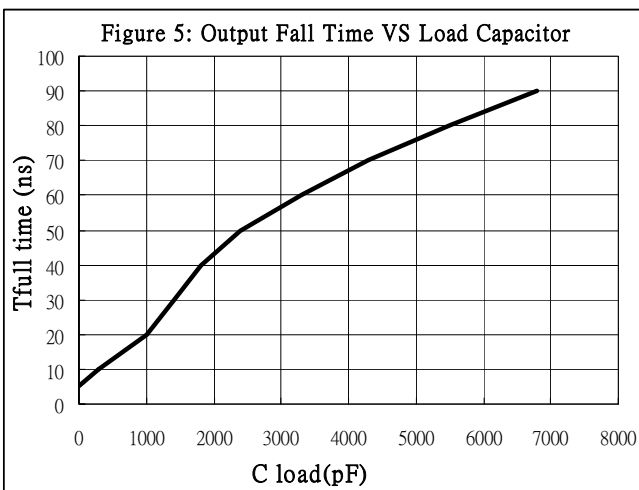
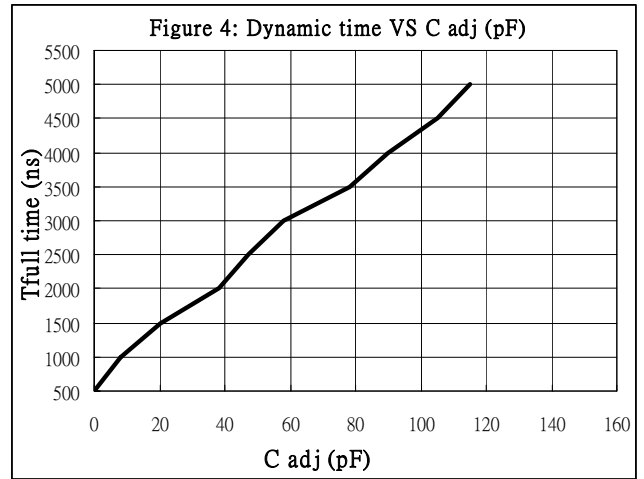
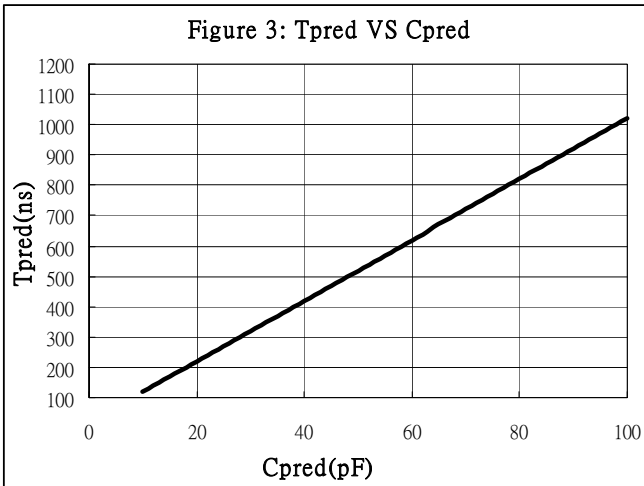
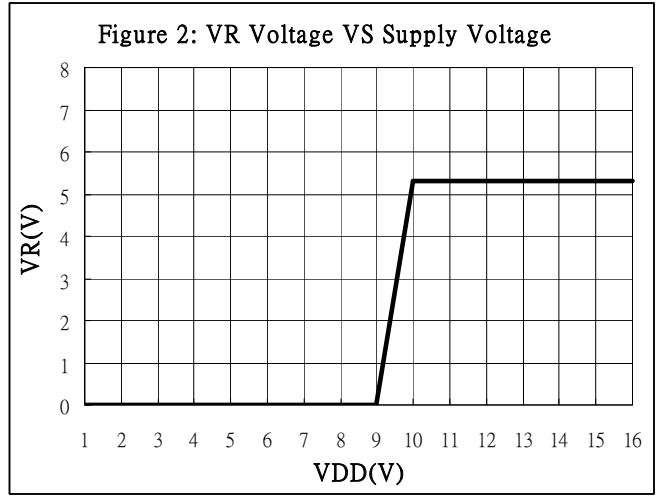
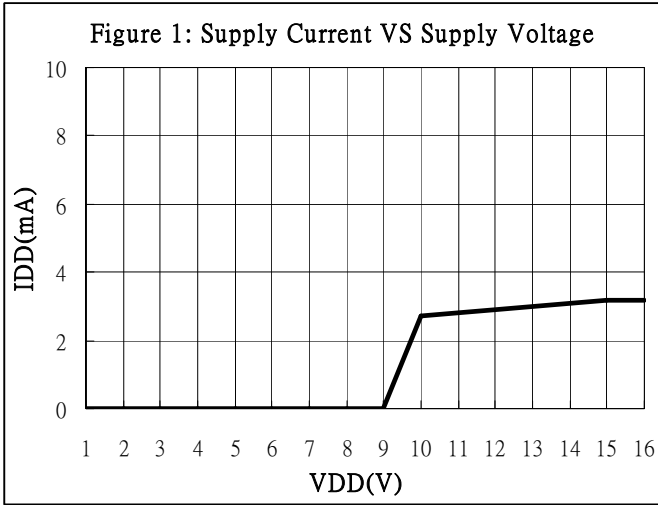




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### PERFORMANCE CHARACTERISTICS ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified.)



\*Fig. 1 : No Load ; No SYNC

\*Fig. 3 : Frequency = 100 kHz

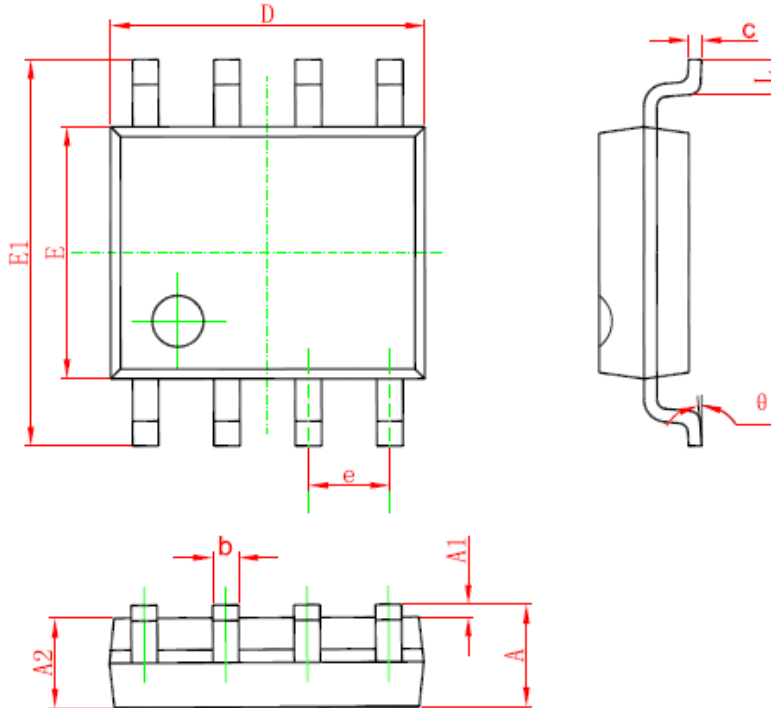
\*Fig. 4-5 : Frequency = 65 kHz.



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### SOP- 8 PACKAGE OUTLINE



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



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