



# SP6016F

## Synchronous Rectifier Driver

### DESCRIPTION

The fundamental of SP6016F 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, SP6016F is designed for Resonance. It also maintains the MOSFET’s body diode conduction at minimum level. The SP6016F is capable to adapt in almost all existing Resonance converters with few adjustments considered necessary.

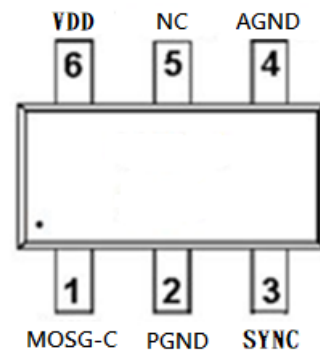
### FEATURES

- Offers efficiency improvement over Schottky Diode.
- Low Standby Power to meet DOE Lot 6 requirement.
- Drives all logic level Power MOSFET.
- Prediction gate timing control.
- Minimum MOSFET body diode conduction.
- Operating frequency up to 300 KHz.
- Synchronize to transformer secondary voltage waveform.
- Minimum on time 0.56uS
- Internal 15K $\Omega$  resistor to GND at MOSG pin
- Internal over voltage protection

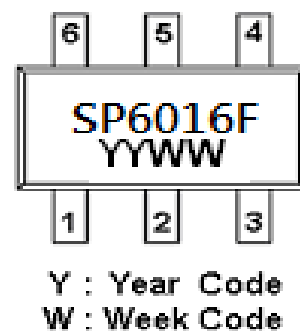
### APPLICATIONS

- 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 (SOT-23-6L)



### PART MARKING

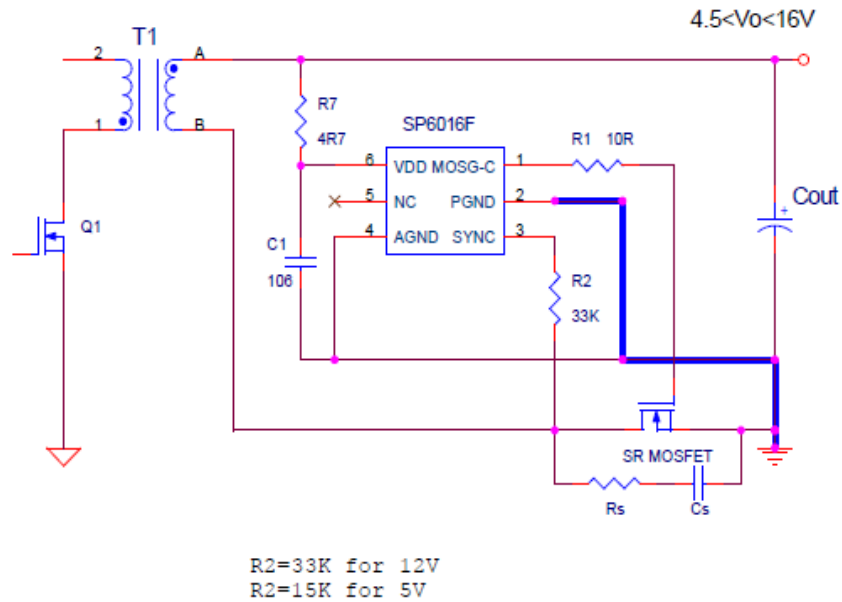




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### TYPICAL APPLICATION CIRCUIT



R2=33K for 12V  
R2=15K for 5V

### PIN DESCRIPTION

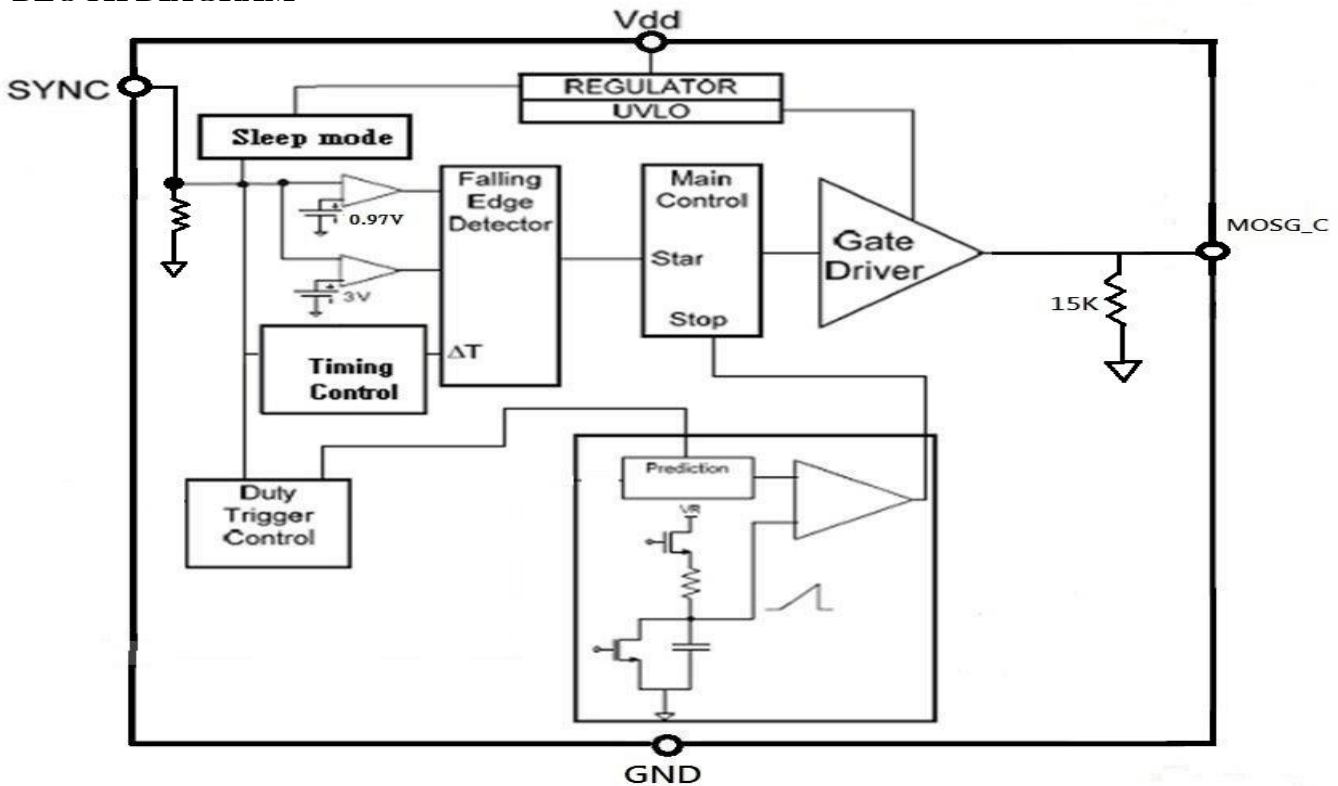
Pin	Symbol	Description
1	MOSG-C	Catch MOSFET gate drive.
2	PGND	Power Ground connection.
3	SYNC	Synchronized signal from the VDS of SR MOSFET.
4	AGND	Ground connection.
5	NC	
6	Vdd	DC supply voltage.



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### BLOCK DIAGRAM



### ORDERING INFORMATION

Part Number	Package	Part Marking
SP6016FS26RGB	SOT-23-6L	6016F

※ SP6016FS26RGB : Tape Reel ; 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	19	V
I <sub>OUT</sub>	Peak Source Current (Pulsed)	1.0	A
	Peak Sink Current (Pulsed)	1.5	A
P <sub>D</sub>	Power Dissipation @ T <sub>A</sub> =85°C (*)	0.3	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 (*)	110	°C/W

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



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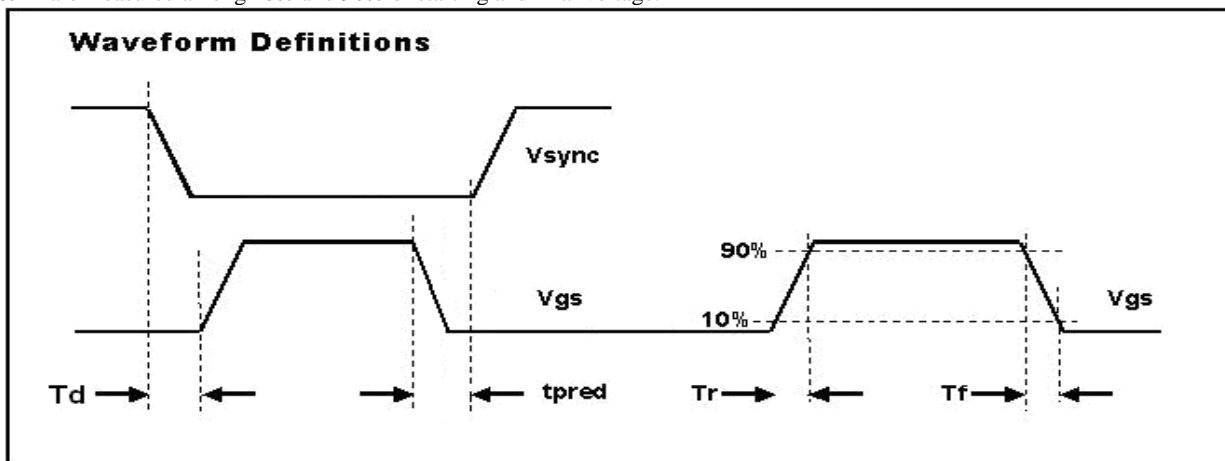
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### ELECTRICAL CHARACTERISTICS

( $T_A=25^\circ\text{C}$ ,  $V_{dd}=5\text{V}$ ,  $\text{Freq.}=50\text{ KHz}$ ,  $\text{Duty Cycle}=50\%$ , unless otherwise specified.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>SUPPLY INPUT</b>						
I <sub>dd</sub>	Supply current	Sleep mode ( $V_{dd}=5\text{V}$ )	0.05	0.11	0.3	mA
		$V_{\text{SYNC}}=15\text{V}$ ( $V_{dd}=5\text{V}$ )		2.65		mA
V <sub>dd</sub>	Supply voltage	I <sub>dd</sub> peak < 1A	4.3		16	V
V <sub>dd on</sub>	Enable voltage		3.3	3.5	4.3	V
V <sub>dd hysteresis</sub>	Enable voltage			0.2		V
V <sub>ovp</sub>	Over voltage protection		17	17.5	18.5	V
V <sub>ovp hysteresis</sub>				0.67		V
<b>SYNC REFERENCE (SYNC)</b>						
V <sub>shth</sub>	SYNC high threshold			3.0		V
V <sub>slth</sub>	SYNC low threshold			0.97		V
V <sub>sync WK</sub>	SYNC wake-up voltage	Pulse width > 1 $\mu\text{s}$ for $V_{dd}=5\text{V}$	6.5			V
I <sub>sync</sub>	SYNC input current				3	mA
<b>ON TIME DUTY SETUP (MOSG-C)</b>						
T <sub>on-time</sub>		Frequency= 10KHz-20KHz, Duty=20%~50%		25		$\mu\text{s}$
<b>MOSFET GATE DRIVER (MOSG-C)</b>						
V <sub>oh</sub>	Output high voltage	I <sub>o</sub> = -200mA, $V_{dd}=12\text{V}$		10.8		V
V <sub>ol</sub>	Output low voltage	I <sub>o</sub> = 200mA, $V_{dd}=12\text{V}$		0.2		V
T <sub>d</sub>	Propagation delay			150		nS
T <sub>pred</sub>	Dead time			1.0		$\mu\text{s}$
T <sub>r</sub>	Rise time	Load = 1nF (*)		13		nS
T <sub>f</sub>	Fall time	Load = 1nF (*)		7		nS
<b>Dynamic Protect</b>						
D <sub>t</sub>	Dynamic variable			5.3		$\mu\text{s}$
T <sub>on-min</sub>	MOSG-C on time	PWM adjusts time > D <sub>t</sub>		0.56	0.6	$\mu\text{s}$

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

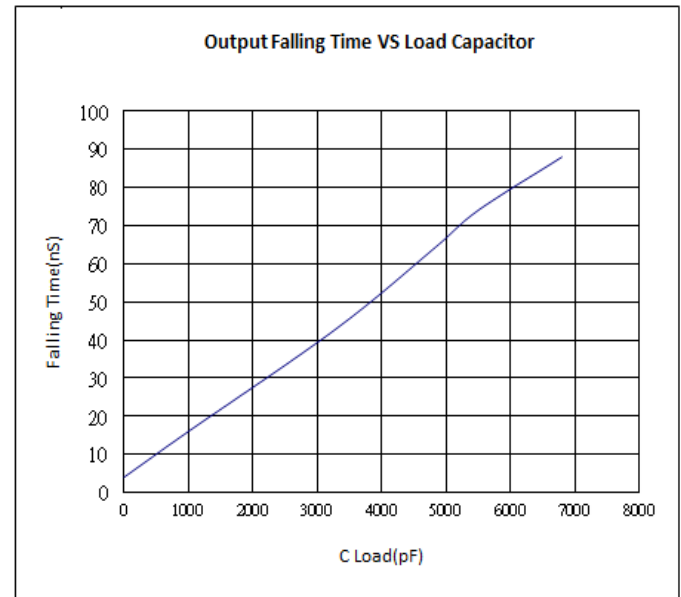
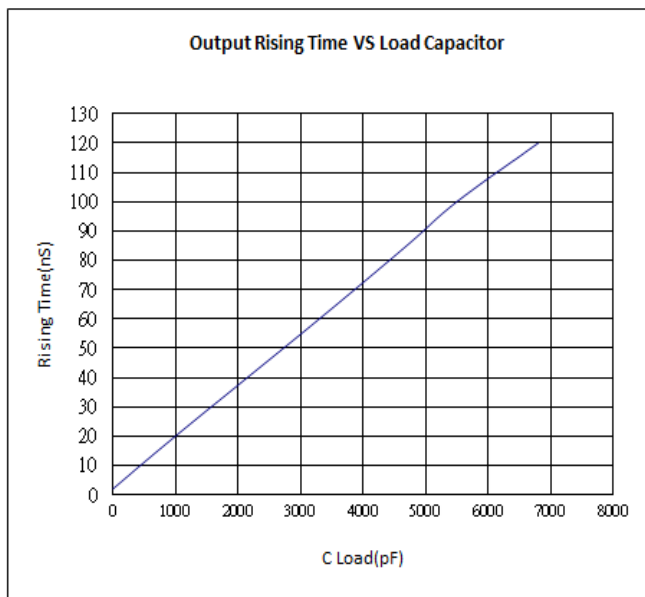
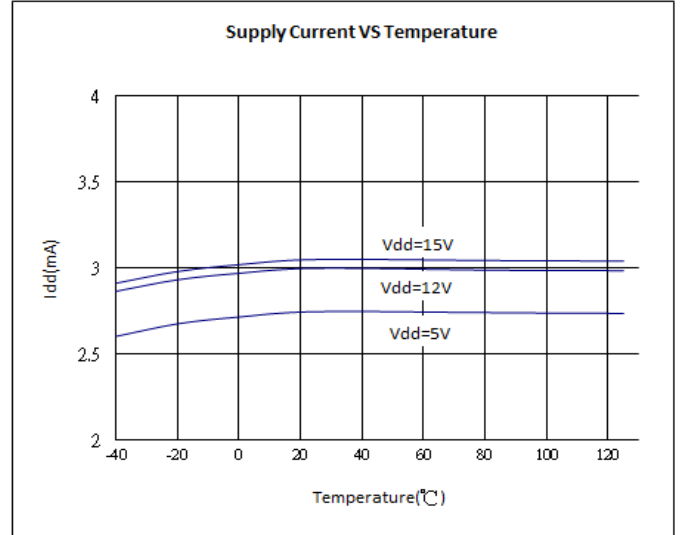
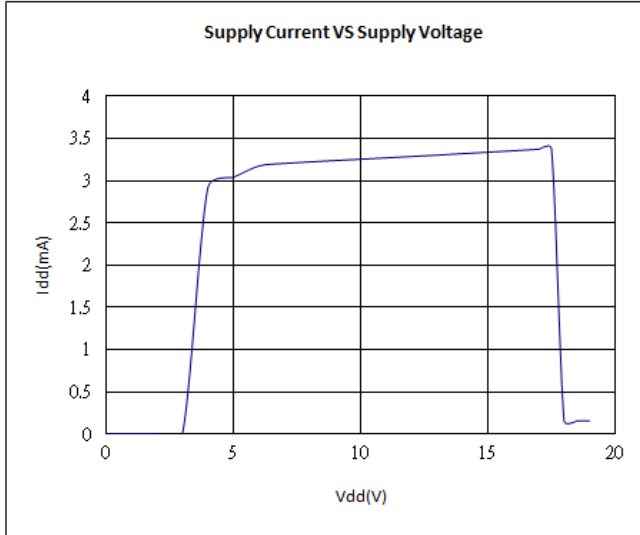




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### TYPICAL CHARACTERISTICS

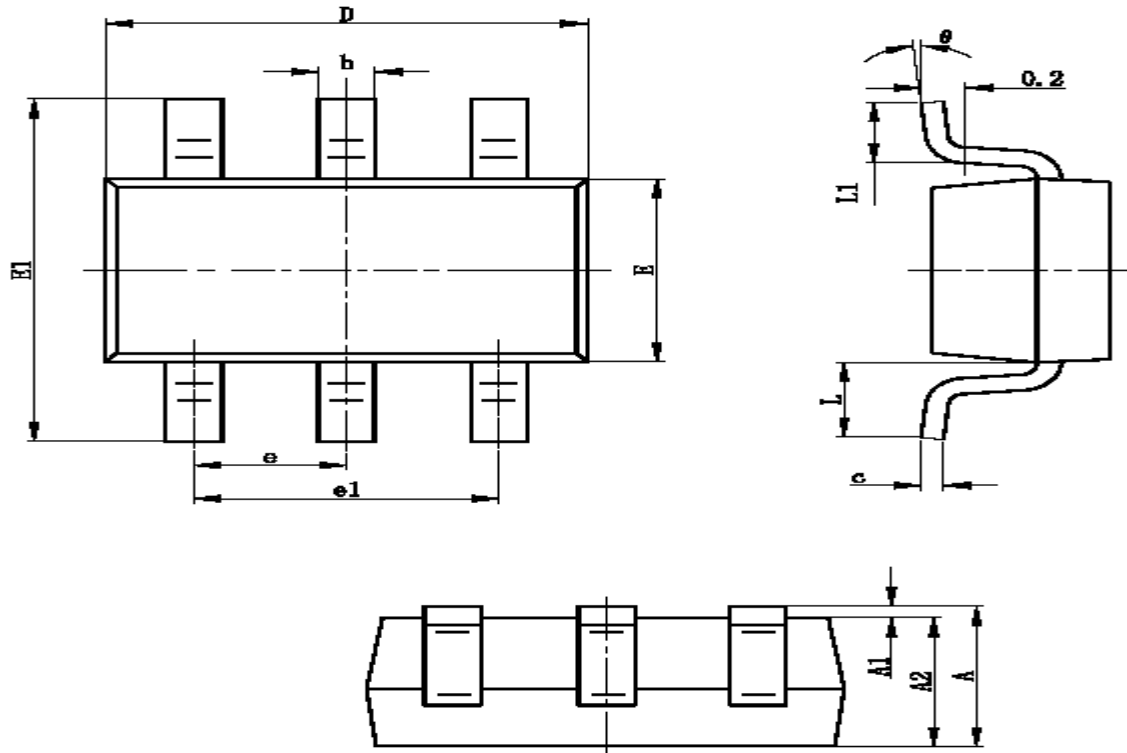




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### SOT-23-6L PACKAGE OUTLINE



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°



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