



# SP6039

## High Performance Synchronous Rectifier Driver

### DESCRIPTION

SP6039 is a high performance and tightly integrated secondary side synchronous rectifier for switching mode power supply system. It combines a much lower voltage drop N-channel MOSFET to emulate the traditional diode rectifier at the secondary side of Flyback converter, The fundamental of SP6039 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. The SP6039 is capable to adapt in almost all existing 5V Resonance converters with few adjustments considered necessary.

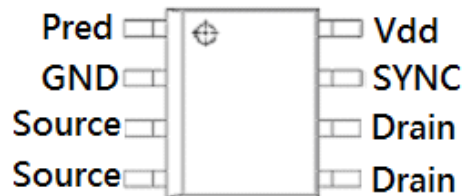
### FEATURES

- Offers efficiency improvement over Schottky Diode (depends on drive configuration of the SR).
- Low Standby Power to meet DOE Lot 6 requirement.
- Secondary-side synchronous rectifier optimized for 5V output system.
- Build-in 45V SR MOSFET with low Rdson
- Operating frequency up to 300 KHz.
- Synchronize to transformer secondary voltage waveform.
- Internal over voltage protection

### APPLICATIONS

- Switching Mode Power Supply (CCM&DCM&QR)
- 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

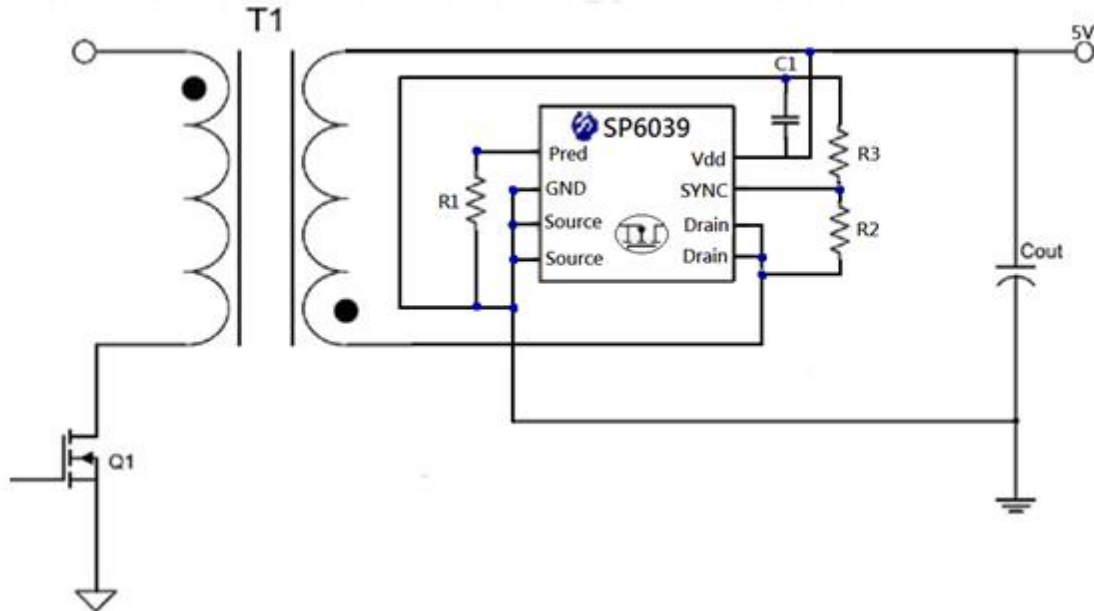




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### TYPICAL APPLICATION CIRCUIT



### PIN DESCRIPTION

Pin	Symbol	Description
1	Pred	By connecting a resistor to ground to set the dead time.
2	GND	Ground connection.
3	Source	Internal MOSFET Source
4	Source	Internal MOSFET Source
5	Drain	Internal MOSFET drain
6	Drain	Internal MOSFET drain
7	SYNC	Synchronized signal from Vds of SR MOSFET
8	Vdd	DC supply voltage.

### ORDERING INFORMATION

Part Number	Package	Part Marking
SP6039S8RGB	SOP-8	SP6039

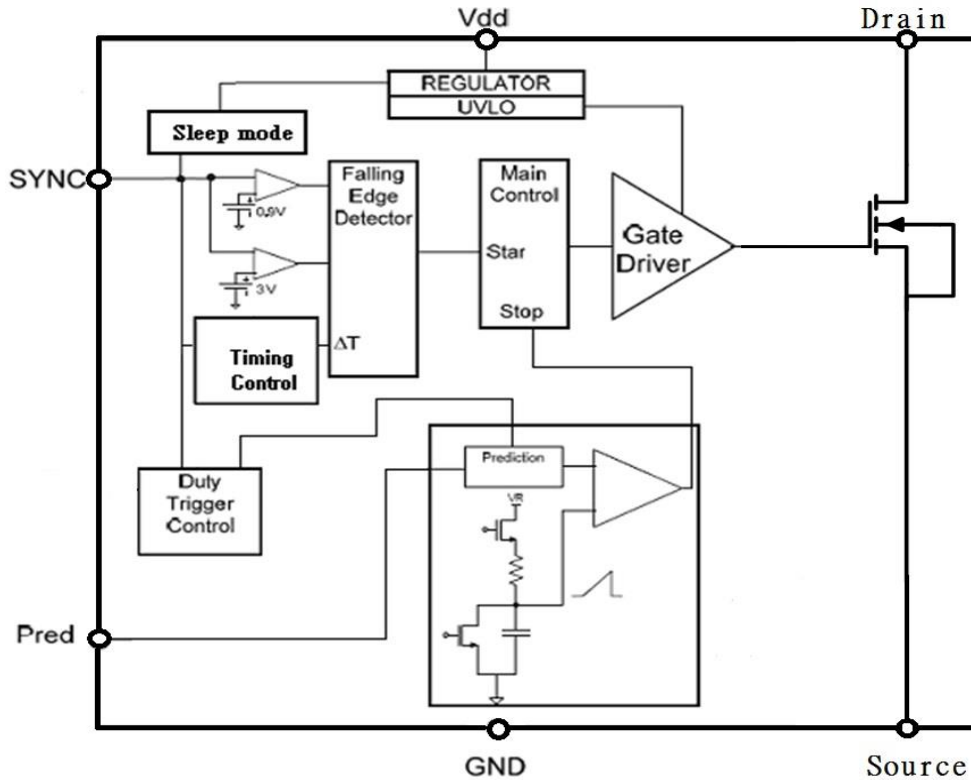
※ SP6039S8RGB : Tape Reel ; Pb – Free ; Halogen - Free



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### BLOCK DIAGRAM



### 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	13	V
I <sub>DRAIN</sub>	Continuous Drain Current (T <sub>c</sub> = 25°C)	4	A
	Continuous Drain Current (T <sub>c</sub> = 100°C)	3.5	A
V <sub>d</sub> to V <sub>s</sub>	Drain to Source	45	V
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>θJA</sub>	Thermal Resistance-Junction to Ambient (*)	110	°C/W

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



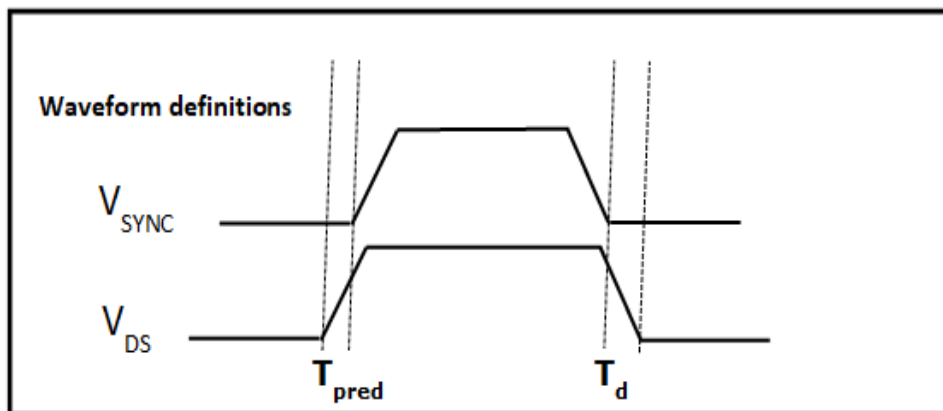
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### ELECTRICAL CHARACTERISTICS

( $T_A=25^{\circ}\text{C}$ ,  $V_{dd}=5\text{V}$ , Freq. =50 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 & Sleep mode		0.2	0.35	mA
		$V_{\text{SYNC}}=V_{\text{dd}}$ , No load	2.0	3.0	4.0	mA
V <sub>dd</sub>	Supply voltage	I <sub>dd peak</sub> < 1A	4.5		13	V
V <sub>dd on</sub>	Enable voltage		3.4	3.7	4.1	V
V <sub>dd hysteresis</sub>	Enable voltage		0.1	0.3	0.5	V
<b>SYNC REFERENCE (SYNC)</b>						
V <sub>shth</sub>	SYNC high threshold			3.0		V
V <sub>slth</sub>	SYNC low threshold			0.9		V
V <sub>sync</sub>	SYNC clamp voltage	I <sub>sync</sub> =3mA	V <sub>dd</sub> +1.5			V
V <sub>sync WK</sub>	SYNC wake-up voltage	Pulse width >1uS for V <sub>dd</sub> =5V	6			V
I <sub>sync</sub>	SYNC input current				3	mA
<b>PREDICTION SECTION</b>						
V <sub>pred</sub>		Pin1=15K $\Omega$		1.25		V
T <sub>d</sub>	Propagation delay	Pin1=15K $\Omega$		120		ns
T <sub>pred</sub>	Dead time	Pin1=15K $\Omega$		450		ns
T <sub>r</sub>	Rise time			11		ns
T <sub>f</sub>	Fall time			8		ns
<b>SR MOSFET SECTION</b>						
BV <sub>dss</sub>	MOSFET Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	45			V
R <sub>ds(on)</sub>	On Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =8A		10	14	m $\Omega$
C <sub>iss</sub>	Input Capacitance	V <sub>ds</sub> =20V, V <sub>gs</sub> =0V, f=1MHz		942		
C <sub>oss</sub>	Output Capacitance			309		
C <sub>rss</sub>	Reverse Transfer Capacitance			29		
T <sub>d(on)</sub>	Turn On Time		V <sub>ds</sub> =20V, I <sub>d</sub> =10A, V <sub>gs</sub> =10V,		6	
T <sub>d(off)</sub>	Turn Off Time	R <sub>g</sub> =10 $\Omega$		21		

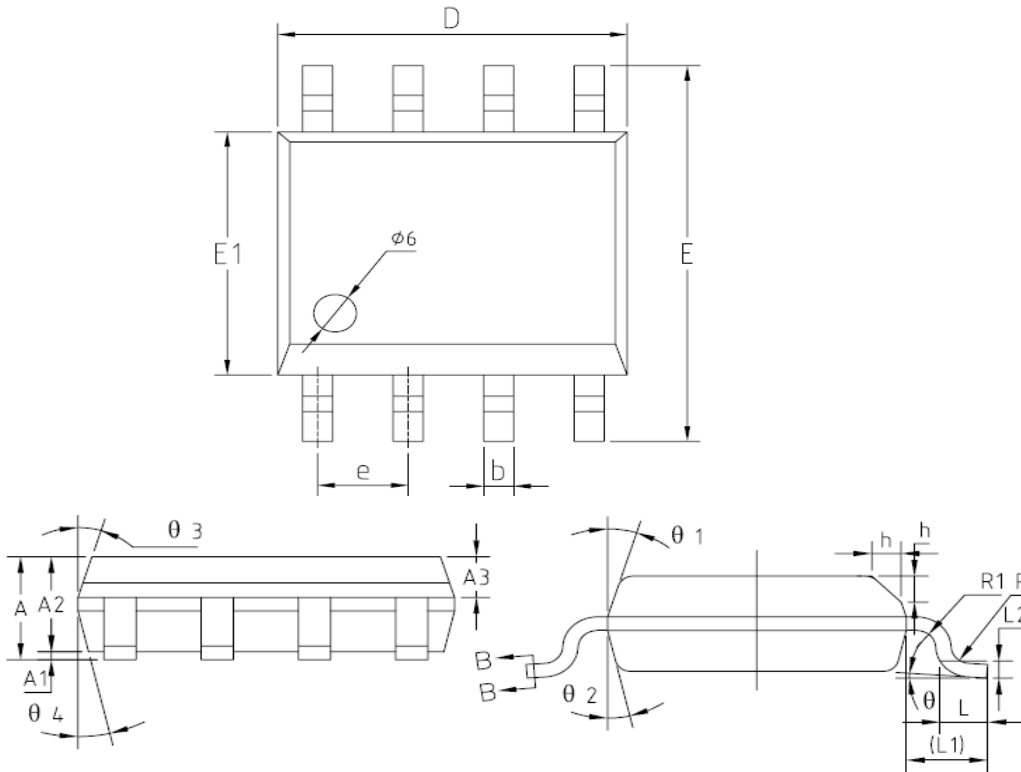




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### SOP-8 PACKAGE OUTLINE



SYMBOL	MIN	NOM	MAX
A	1.35	--	1.75
A1	0.10	--	0.25
A2	1.25	1.40	1.65
A3	0.50	0.60	0.70
b	0.33	-	0.51
c	0.17	--	0.25
D	4.80	4.93	5.05
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.17	1.27	1.37
L	0.45	0.60	0.80
L1	1.04 REF		
L2	0.25BSC		
R	0.07	--	--
R1	0.07	--	0.20
h	0.25	--	0.50
θ	0°	--	8°
θ 1	15°	17°	19°
θ 2	11°	13°	15°
θ 3	15°	17°	19°
θ 4	11°	13°	15°



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