



SP6038

High Performance Synchronous Rectifying Converter

DESCRIPTION

SP6038 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 SP6038 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 SP6038 is capable to adapt in almost all existing Resonance converters with few adjustments considered necessary.

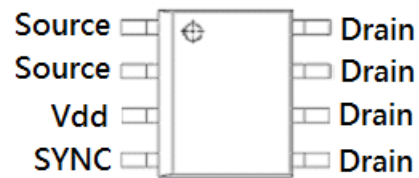
APPLICATIONS

- 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

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 output system.
- Build-in 100V SR MOSFET with low Rdson
- Operating frequency up to 300 KHz.
- Synchronize to transformer secondary voltage waveform.
- Internal over voltage protection

PIN CONFIGURATION (SOP-8)



PART MARKING



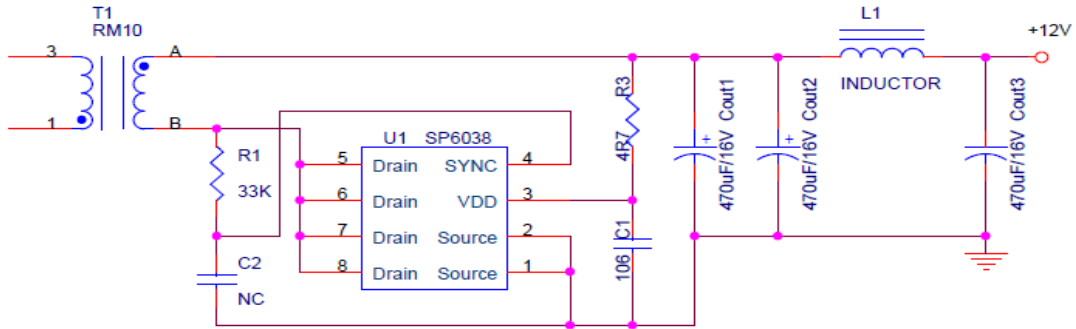


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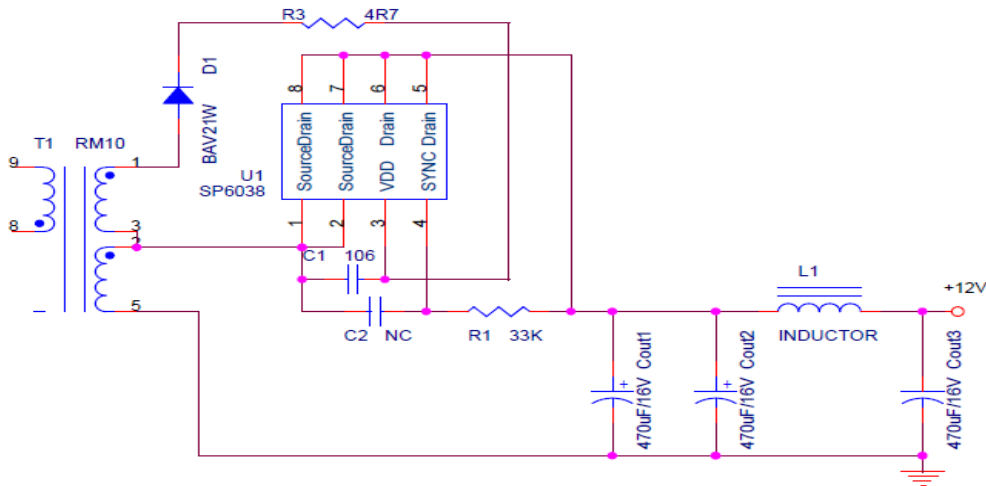
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TYPICAL APPLICATION CIRCUIT

SP6038_application_circuit_L/S



SP6038_application_circuit_H/S with AUX winding



PIN DESCRIPTION

| Pin | Symbol | Description |
|-----|--------|---|
| 1 | Source | Internal MOSFET Source |
| 2 | Source | Internal MOSFET Source |
| 3 | Vdd | DC supply voltage. |
| 4 | SYNC | Synchronized signal from Vds of SR MOSFET |
| 5 | Drain | Internal MOSFET drain |
| 6 | Drain | Internal MOSFET drain |
| 7 | Drain | Internal MOSFET drain |
| 8 | Drain | Internal MOSFET drain |

ORDERING INFORMATION

| Part Number | Package | Part Marking |
|-------------|---------|--------------|
| SP6038S8RGB | SOP-8 | SP6038 |

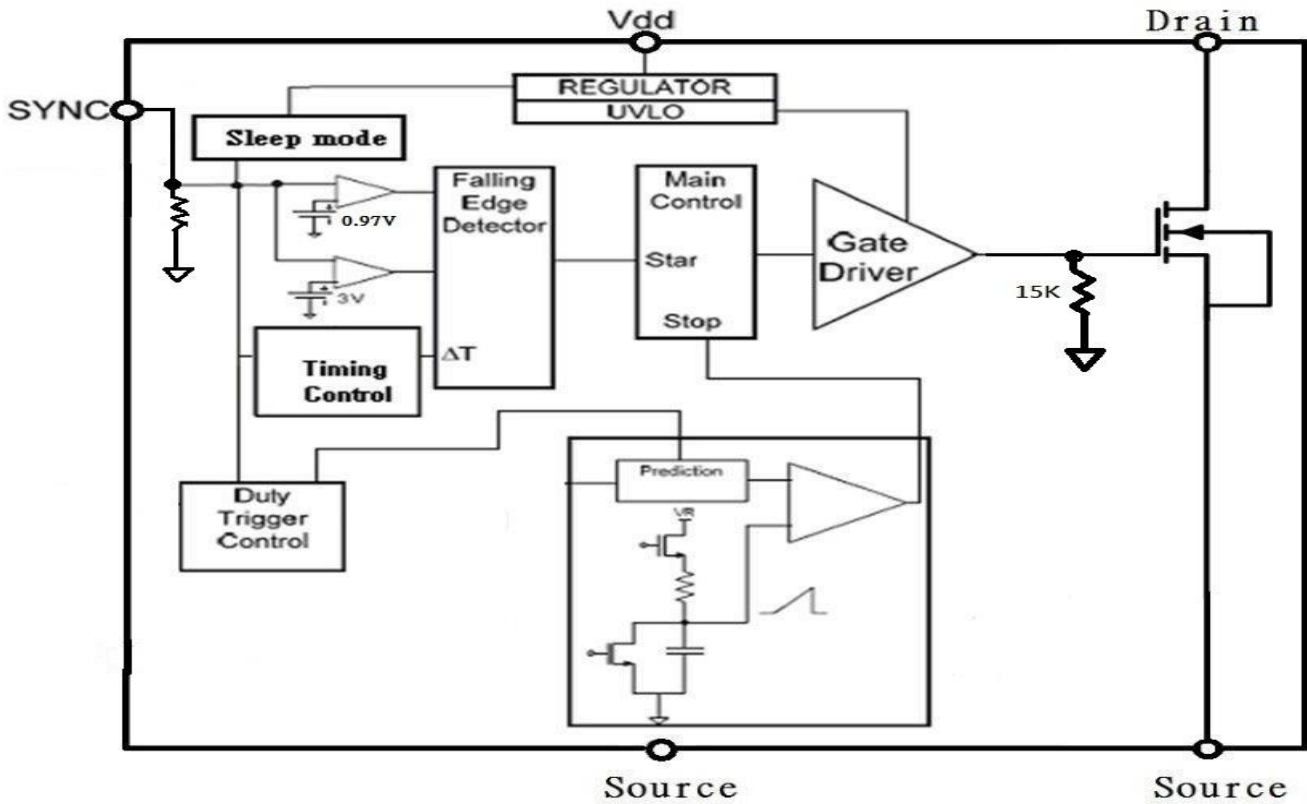
※ SP6038S8RGB : Tape Reel ; Pb – Free ; Halogen - Free



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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 _{dd} | DC Supply Voltage | 16 | V |
| V _d to V _s | Drain to Source | 100 | V |
| P _D | Power Dissipation @ T _A =85°C (*) | 0.3 | W |
| T _J | Operating Junction Temperature Range | -40 to 125 | °C |
| T _{STG} | Storage Temperature Range | -40 to 150 | °C |
| T _{LEAD} | Lead Soldering Temperature for 5 sec. | 260 | °C |

THERMAL RESISTANCE

| Symbol | Parameter | Value | Unit |
|------------------|--|-------|------|
| R _{θJA} | 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°C, V_{dd}=5V, Freq. =50 KHz, Duty Cycle=50%, unless otherwise specified.)

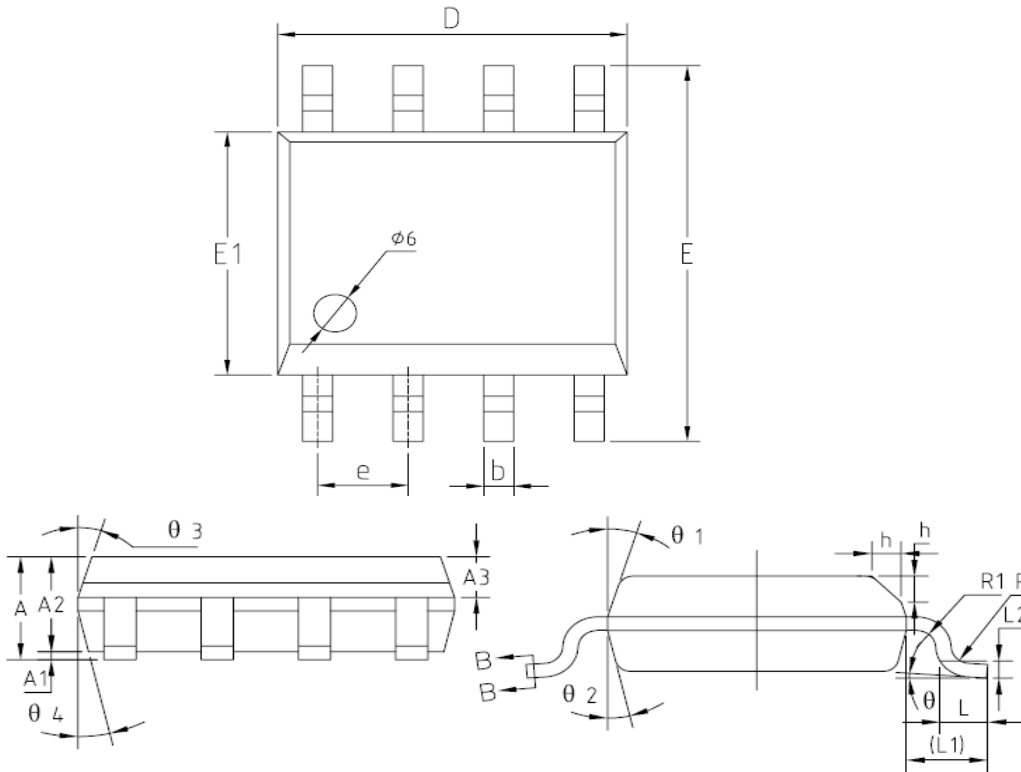
| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|------------------------------|---------------------------------------|---|----------------------|------|------|------|
| SUPPLY INPUT | | | | | | |
| I _{dd} | Supply current | No load & Sleep mode | | 0.2 | 0.35 | mA |
| | | V _{SYNC} =V _{dd} , No load | 2.0 | 3.0 | 4.0 | mA |
| V _{dd} | Supply voltage | I _{dd peak} < 1A | 4.3 | | 16 | V |
| V _{dd on} | Enable voltage | | 3.35 | 3.7 | 4.1 | V |
| V _{dd hysteresis} | Enable voltage | | | 0.2 | | V |
| V _{ovp} | Over voltage protection | | 17 | 17.5 | 18.5 | V |
| V _{OVp hysteresis} | Enable voltage | | | 0.67 | | V |
| SYNC REFERENCE (SYNC) | | | | | | |
| V _{shth} | SYNC high threshold | | | 3.0 | | V |
| V _{slth} | SYNC low threshold | | | 0.9 | | V |
| V _{sync} | SYNC clamp voltage | I _{sync} =3mA | V _{dd} +1.5 | | | V |
| V _{sync WK} | SYNC wake-up voltage | Pulse width >1uS for V _{dd} =5V | 6 | | | V |
| I _{sync} | SYNC input current | | | | 3 | mA |
| Dynamic Protect | | | | | | |
| D _t | Dynamic variable | | | 5.1 | | uS |
| T _{on-min} | MOSG-C on time | PWM adjusts time > D _t | 0.4 | | 0.7 | uS |
| SR MOSFET SECTION | | | | | | |
| B _{Vdss} | MOSFET Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =250uA | 100 | | | V |
| R _{ds(on)} | Drain-Source On-Resistance | V _{GS} =10V, I _D =20A | | 6.5 | 8.0 | mΩ |
| C _{iss} | Input Capacitance | V _{ds} =50V, V _{gs} =0V, f=1MHz | | 1876 | | pF |
| C _{oss} | Output Capacitance | | | 348 | | |
| C _{rss} | Reverse Transfer Capacitance | | | 5.6 | | |
| T _{d(on)} | Turn On Time | V _{DD} =50V, I _D =14A, V _{GS} =10V | | 7 | | nS |
| T _{d(off)} | Turn Off Time | R _G =6Ω | | 20 | | |



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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° |
| $\theta 1$ | 15° | 17° | 19° |
| $\theta 2$ | 11° | 13° | 15° |
| $\theta 3$ | 15° | 17° | 19° |
| $\theta 4$ | 11° | 13° | 15° |



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