# SP6033

## High Performance Synchronous Rectifying Converter

### DESCRIPTION

SP6033 is a high performance and tightly integrated secondary side synchronous rectifying converter for switching mode power supply system. It combines a low Rdson N-channel MOSFET to emulate the traditional diode rectifier at the secondary side of Flyback converter, The fundamental of SP6033 synchronous rectifying (SR) converter 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 SP6033 is capable to adapt in almost all existing Resonance converters with no adjustment required.

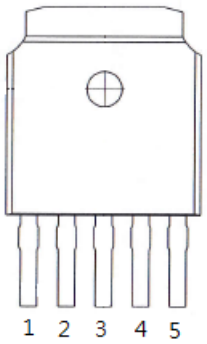
### APPLICATIONS

- 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

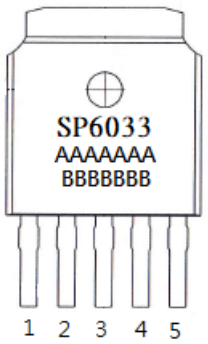
### FEATURES

- Offers efficiency improvement over Schottky Diode.
- Low Standby Power to meet DOE Lot 6 requirement.
- Secondary-side synchronous rectifier optimized for switching power system.
- Build-in 100V SR MOSFET with low Rdson
- Operating frequency up to 300 KHz.
- Synchronize to transformer primary voltage waveform.
- Internal over voltage protection

### PIN CONFIGURATION (TO-252-5L)



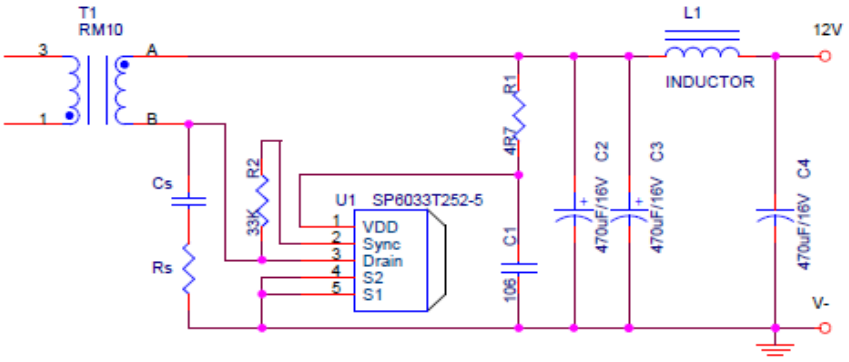

### PART MARKING



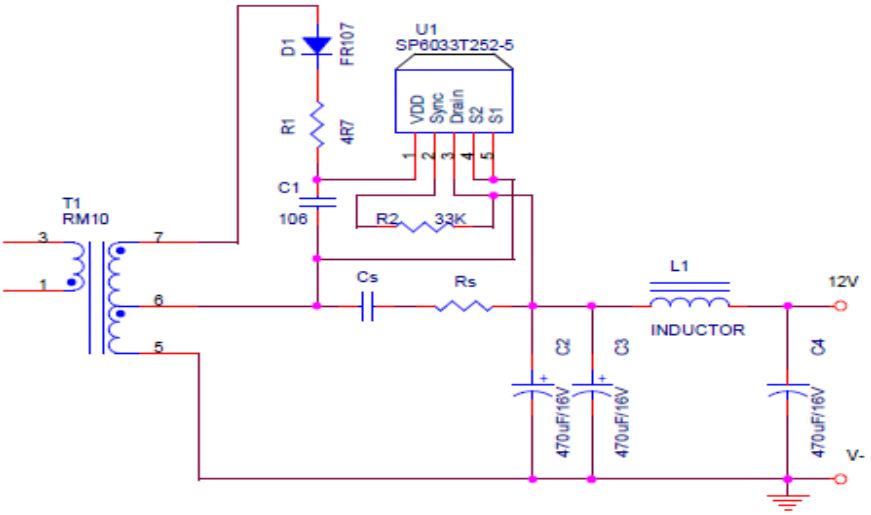

A : Lot Code
B : Date Code

## TYPICAL APPLCATION CIRCUIT

SP6033_application circuit_L/S




SP6033_application circuit_H/S




## PIN DESCRIPTION

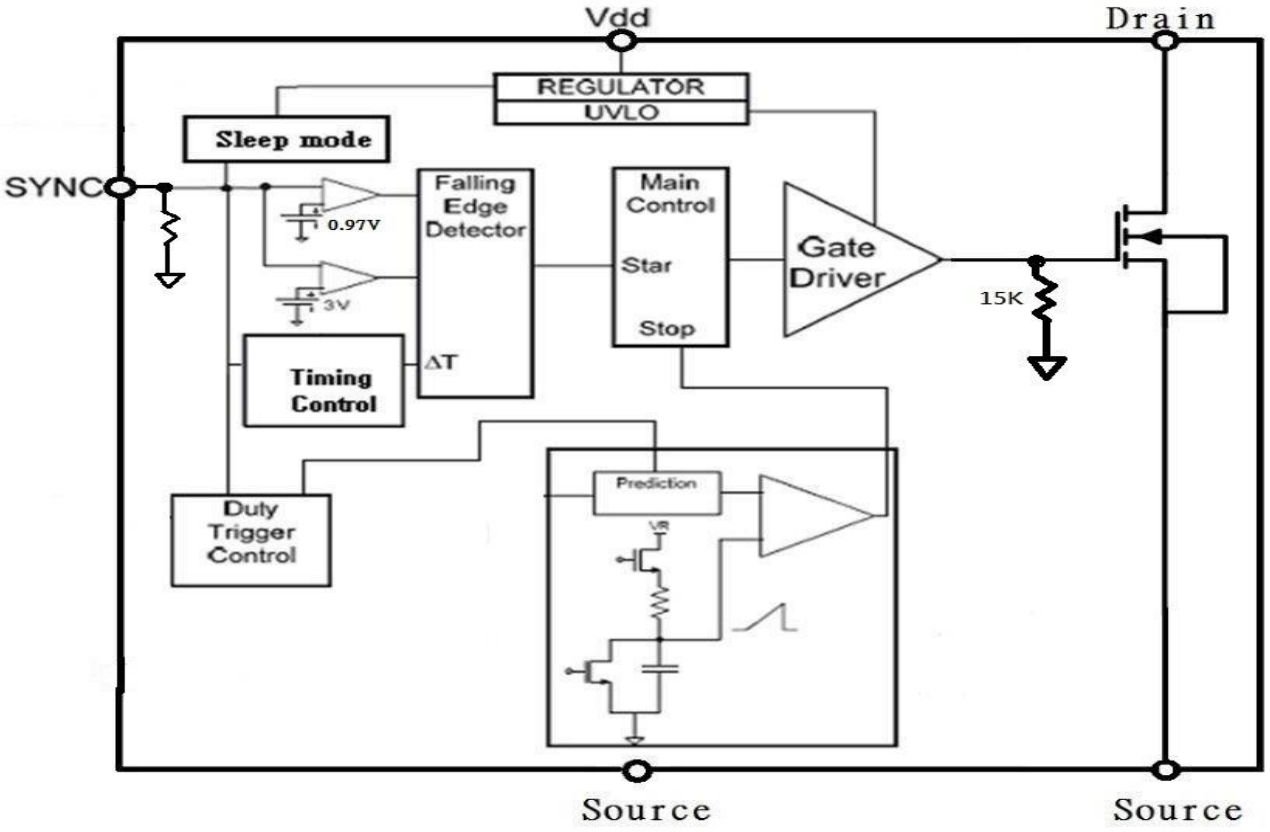
| Pin | Symbol | Description |
|---|---|---|
| 1 | Vdd | DC supply voltage. |
| 2 | SYNC | Synchronized signal from Vds of SR MOSFET |
| 3 | Drain | Internal MOSFET drain |
| 4 | Source | Internal MOSFET Source |
| 5 | Source | Internal MOSFET Source |

## ORDERING INFORMATION

| Part Number | Package | Part Marking |
|---|---|---|
| SP6033T255RGB | TO-252-5L | SP6033 |

※ SP6033T255RGB : Tape Reel ; Pb – Free ; Halogen - Free

## BLOCK DIAGRAM




## ABSOULTE MAXIMUM RATINGS (TA=25℃, 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 |
| Vd to Vs | Drain to Source | 100 | V |
| $P_D$ | Power Dissipation @ $T_C$=25℃ (*) | 1.33 | W |
| $T_J$ | Operating Junction Temperature Range | -40 to125 | ℃ |
| $T_{STG}$ | Storage Temperature Range | -40 to 150 | ℃ |
| $T_{LEAD}$ | Lead Soldering Temperature for 5 sec. | 260 | ℃ |

## THERMAL RESISTANCE

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance-Junction to Ambient (*) | 75 | ℃/W |

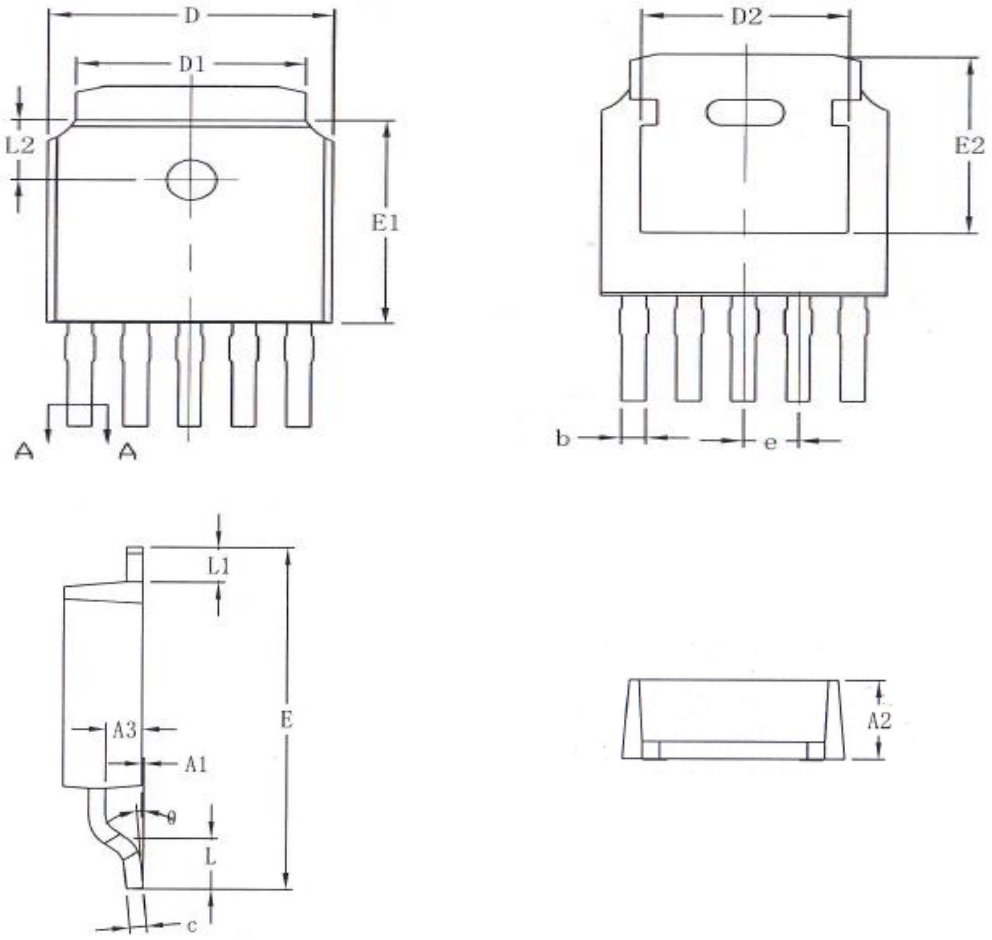
(*) The power dissipation and thermal resistance are evaluated under copper board mounted with free air conditions.

## ELECTRICAL CHARACTERISTICS

($T_A$=25℃, $V_{dd}$=5V, Freq. =50 KHz, Duty Cycle=50%, unless otherwise specified.)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **SUPPLY INPUT** | | | | | | |
| Idd | Supply current | No load & Sleep mode | 0.05 | 0.11 | 0.2 | mA |
| | | $V_{SYNC}$=DC 12V | 2.3 | 2.65 | 3.0 | mA |
| Vdd | Supply voltage | Idd peak < 1A | 4.3 | | 16 | V |
| Vdd on | Enable voltage | | 3.3 | 3.5 | 4.3 | V |
| Vdd hysteresis | Enable voltage | | | 0.2 | | V |
| Vovp | Over voltage protection | | 17 | 17.5 | 18.5 | V |
| Vovp hysteresis | | | | 0.67 | | V |
| **SYNC REFERENCE (SYNC)** | | | | | | |
| Vshth | SYNC high threshold | | | 3.0 | | V |
| Vslth | SYNC low threshold | | | 0.97 | | V |
| Vsync WK | SYNC wake-up voltage | | 12 | | | V |
| Isync | SYNC input current | | | | 3 | mA |
| **PREDICTION SECTION** | | | | | | |
| Td | Propagation delay | | | 150 | | nS |
| Tpred | Dead time | | | 1 | | uS |
| **SR MOSFET SECTION** | | | | | | |
| BVdss | MOSFET Drain-Source Breakdown Voltage | $V_{GS}$=0V,$I_D$=250uA | 100 | | | V |
| Rds(on) | On Resistance | $V_{GS}$=10V,$I_D$=20A | | 9.5 | 12 | mΩ |
| Ciss | Input Capacitance | $V_{DS}$=50V,$V_{GS}$=0V f=1MHz | | 2275 | | pF |
| Coss | Output Capacitance | | | 162 | | |
| Crss | Reverse Transfer Capacitance | | | 7.9 | | |
| Td(on) | Turn On Time | $V_{DD}$=50V, $I_D$=14A $V_{GEN}$=10V, $R_G$=10Ω | | 8 | | nS |
| Td(off) | Turn Off Time | | | 26 | | |
| Tf | Fall time | | | 4 | | |

## TO-252-5L PACKAGE OUTLINE




| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A1 | 0.00 | —— | 0.10 |
| A2 | 2.20 | 2.30 | 2.40 |
| A3 | 1.02 | 1.07 | 1.12 |
| b | 0.54 | —— | 0.62 |
| b1 | 0.53 | 0.56 | 0.59 |
| c | 0.51 | —— | 0.55 |
| c1 | 0.50 | 0.51 | 0.52 |
| D | 6.50 | 6.60 | 6.70 |
| D1 | 5.33 REF. | | |
| D2 | 4.83 REF. | | |
| E | 9.90 | 10.10 | 10.30 |
| E1 | 6.00 | 6.10 | 6.20 |
| E2 | 5.30REF | | |
| e | 1.27BSC | | |
| L | 1.40 | 1.50 | 1.60 |
| L1 | 1.02REF. | | |
| L2 | 1.70 | 1. 80 | 1.90 |
| θ | 0 | —— | 8° |

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