Elektronische Bauelemente

# S5U2167

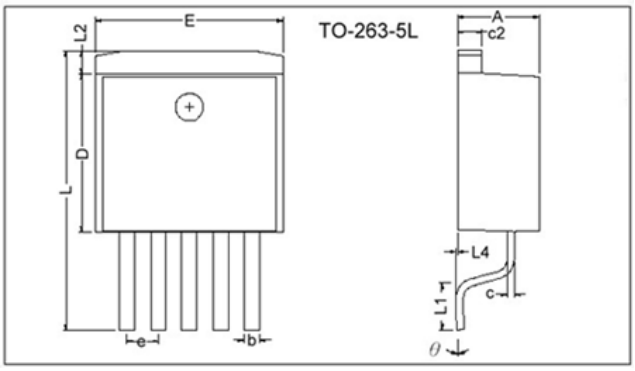
**750mA CMOS**

**Positive Voltage Regulator**

RoHS Compliant Product

## Description

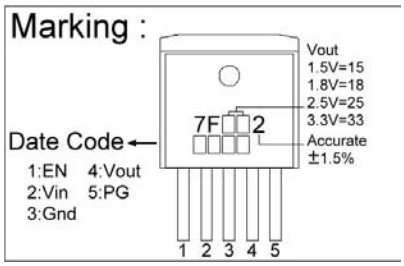
The S5U2167 series positive,linear regulators feature low quiescent current (45μA typ.) with low dropout voltage, making them ideal for battery applications. Output voltage are set at the factory and trimmed to 1.5% accuracy.These rugged devices have both Thermal Shutdown and Current Fold-back to prevent device failure under the "Worst" of operating conditions. An additional feature is a "Power Good" detector, which pulls low when the output is out of regulation.The S5U2167 is stable with an output capacitance of 4.7μF or greater.




| REF. | Millimeter | | REF. | Millimeter | |
|---|---|---|---|---|---|
| | Min. | Max. | | Min. | Max. |
| A | 4.40 | 4.80 | c2 | 1.25 | 1.45 |
| b | 0.66 | 0.91 | L2 | 1.27 REF. | |
| L4 | 0.00 | 0.30 | | 8.6 | 9.0 |
| c | 0.36 | 0.5 | e | 1.70 REF. | |
| L1 | 2.29 | 2.79 | L | 14.6 | 15.8 |
| E | 9.80 | 10.4 | θ | 0˚ | 8˚ |

## Features

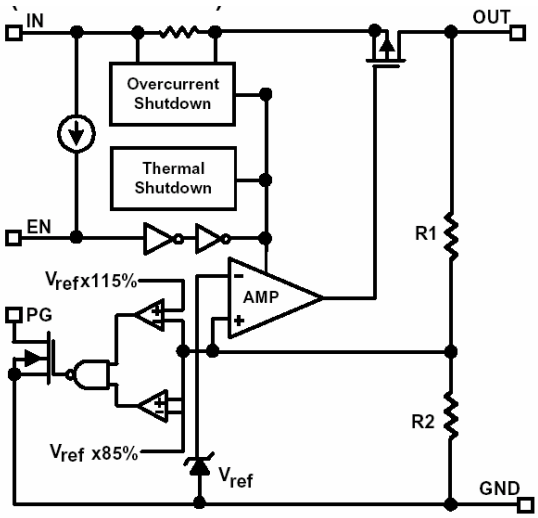
* Low Temperature Coefficient
* Over-Temperature Shutdown
* Power Good Output Function
* Very Low Dropout Voltage
* Noise Reduction Bypass Capacitor
* Short Circuit Current Fold-back
* Guaranteed 750mA output
* Current Limiting
* Power-Saving Shutdown Mode



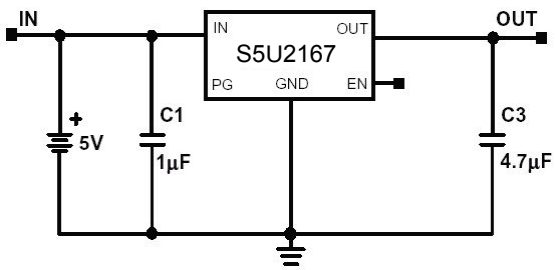

## Applications

* PC Peripherals
* Wireless Devices
* Portable Electronics
* Battery Powered Widgets
* Instrumentation

## Functional Block Diagram




## Typical Application Circuit



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## Absolute Maximum Ratings

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Input Voltage | $V_{IN}$ | 8 | V |
| Output Current | $I_{OUT}$ | $P_D/(V_{IN}-V_O)$ | mA |
| Output Voltage | $V_{OUT}$ | 1.5~3.3 | V |
| Operating Ambient Temperature | Topr | -40~+85 | °C |
| Junction Temperature | Tj | -40~+125 | °C |
| Max. Junction Temperature | Tj Max. | 150 | °C |
| Power Dissipation (△ T=100°C) | $P_D$ | 3.0 | W |
| EDS Classification | | B | |

## Electrical Characteristics $T_A$=25℃ unless otherwise noted

($V_{IN}$=$V_{OUT}$(T) +2V, $V_{EN}$=$V_{IN}$, $C_{IN}$=1uF, $C_{OUT}$=4.7uF)

| Parameter | Symbol | Condition | | Min | TYP | Max | Unit |
|---|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$(E) (Note1) | $I_O$=1mA, $V_{IN}$=$V_{OUT}$(T)+2V | | -1.5 | $V_{OUT}$(T) (Note2) | 1.5 | % |
| Output Current | $I_O$ | $V_O$>1.2V | | 750 | - | - | mA |
| Current Limit | $I_{LIM}$ | $V_O$>1.2V | | 750 | - | - | mA |
| Short Circuit Current | $I_{SC}$ | $V_{IN}$=$V_{OUT}$(T)+1V, $V_O$ < 0.4V | | - | 750 | - | mA |
| Load Regulation | $REG_{LOAD}$ | $V_{IN}$=$V_{OUT}$(T)+2V, $I_O$=1mA to 750mA | | -1 | 0.2 | 1 | % |
| Dropout Voltage | $V_{DROPOUT}$ | $I_O$=750mA $V_O$=$V_{OUT}$(E)-2% | $V_{OUT}$(T)=1.5V | - | - | 1000 | mV |
| | | | $V_{OUT}$(T)=1.8V | - | - | 650 | |
| | | | $V_{OUT}$(T)≥2.0V | - | - | 500 | |
| Quiescent Current | $I_Q$ | $V_{IN}$=$V_{OUT}$(T)+2V, $I_O$=0mA | | - | 45 | 70 | µA |
| Ground Pin Current | $I_{GND}$ | $V_{IN}$=$V_{OUT}$(T)+2V, $I_O$=1mA to 750mA | | - | 45 | - | µA |
| Line Regulation | $REG_{LINE}$ | $I_O$=1mA $V_{IN}$=$V_{OUT}$ $V_{OUT}$(T)+2 | $V_{OUT}$(T)<2.0V | -0.15 | - | 0.15 | % |
| | | | 2.0V≤$V_{OUT}$(T)<4.0V | -0.1 | 0.02 | 0.1 | |
| | | | 4.0V≤$V_{OUT}$(T) | -0.4 | - | 0.4 | |
| Input Voltage | $V_{IN}$ | | | Note3 | - | 7 | V |
| Over Temperature Shutdown | OTS | | | - | 150 | - | ℃ |
| Over Temperature Hysterisis | OTH | | | - | 30 | - | ℃ |
| Output Voltage Temperature Coefficient | TC | | | - | 30 | - | ppm/℃ |
| Power Supply Rejection | PSRR | Io=100mA Co=4.7µF (ceramic) | f=1kHz | - | 75 | - | dB |
| | | | f=10kHz | - | 55 | - | |
| | | | f=100kHz | - | 30 | - | |
| Output Voltage Noise | eN | f=10Hz~100kHz, Io=10mA, Co=4.7µF | | - | 30 | - | µVrms |
| EN Input Threshold | $V_{EH}$ | $V_{IN}$=2.7V to 7V | | 2.0 | - | $V_{IN}$ | V |
| | $V_{EL}$ | $V_{IN}$=2.7V to 7V | | 0 | - | 0.4 | V |
| EN Input Bias Current | $I_{EH}$ | $V_{EN}$=$V_{IN}$, $V_{IN}$=2.7V to 7V | | - | - | 1 | µA |
| | $I_{EL}$ | $V_{EN}$= 0V, $V_{IN}$=2.7V to 7V | | - | - | 1 | µA |
| Shutdown Supply Current | $I_{SD}$ | $V_{IN}$=5V, $V_O$=0V, $V_{EN}$<$V_{EL}$ | | - | 0.5 | 2 | µA |
| Output Under Voltage | $V_{UV}$ | PG goes Low when $V_{OUT}$ too Low | | - | - | 84 | % $V_{OUT}$(T) |
| Output Over Voltage | $V_{OV}$ | PG goes Low when $V_{OUT}$ too High | | 105 | - | - | % $V_{OUT}$(T) |
| PG Leakage Current | $I_{LC}$ | $V_{PG}$=7V | | - | - | 1.0 | µA |
| PG Voltage Low | $V_{OL}$ | $I_{SINK}$=0.25mA | | - | - | 0.4 | V |

Note 1: $V_{OUT}$ (E) =Effective Output Voltage (i.e. the output voltage when "$V_{OUT}$ (T) + 2.0V" is provided at the $V_{IN}$ pin while maintaining a certain $I_{OUT}$ value).

2: $V_{OUT}$ (T) =Specified Output Voltage

3: $V_{IN\ (MIN)}$ =$V_{OUT}$+$V_{DROPOUT}$

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## Ordering Information(contd.)

| Part Number | Marking | Output Voltage | Part Number | Marking | Output Voltage |
|---|---|---|---|---|---|
| S5U 2167-15 | 7F152<br>XXXX | 1.5V | S5U 2167-18 | 7F182<br>XXXX | 1.8V |
| S5U 2167-25 | 7F252<br>XXXX | 2.5V | S5U 2167-33 | 7F332<br>XXXX | 3.3V |

## Detailed Description

The S5U 2167 of COMS regulators contain a PMOS pass transistor,voltage reference, error amplifier,over-current protection and thermal shutdown.The P-channel pass transistor receives data from the error amplifier, over-current shutdown, and thermal protection circuits. During normal operation, the error amplifier compares the output voltage to a precision reference. Over-current and Thermal shutdown circuits become active when the junction temperature exceeds140$^{o}$C, or the current exceeds 2.2A. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 120$^{o}$C.The S5U 2167 behaves like a current source when the load reaches 2.2A. However, if the load impedance drops below 0.3 Ω , the current drops back to 600mA to prevent excessive power dissipation. Normal operation is restored when the load resistance exceeds of 0.75 Ω .

## External Capacitors

The S5U 2167 is stable with an output capacitance to ground of 4.7uF or greater. Ceramic capacitors have the lowest ESR, and will offer the best AC performance. Conversely, Aluminum Electrolytic capacitors exhibit the highest ESR, resulting in the poorest AC response. Unfortunately, large value ceramic capacitors are comparatively expensive. One option is to parallel a 0.1uF ceramic capacitor with a 10uF Aluminum Electrolytic. The benefit is low ESR, high capacitance, and low overall cost. A second capacitor is recommended between the input and ground to stabilize $V_{IN.}$ The input capacitor should be at least 0.1uF to have a beneficial effect. All capacitors should be placed in closed proximity to the pins. A "Quiet" ground termination is desirable. This can be achieved with a "Star" connection.

## Enable

When EN pin is pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In this state, the quiescent current is less than 2uA. This pin behaves much like an electronic switch. 100KΩ resistor is necessary between $V_{EN}$ source and EN pin when $V_{EN}$ is high than $V_{IN}$. (Note: There is no internal pull-up for EN pin. It can not be floating.)

## Power Good

The S5U 2167 includes the Power Good feature. When the output in not within ± 15% of the specified voltage, it pulls low. This can occur under the following conditions:

1. Input voltage too low.
2. During over-temperature.
3. During over-current.
4. If output is pulled up.

( Note: PG pin is an open-drain output.)

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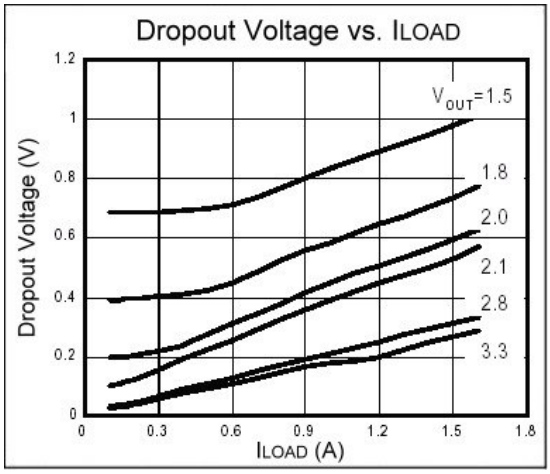
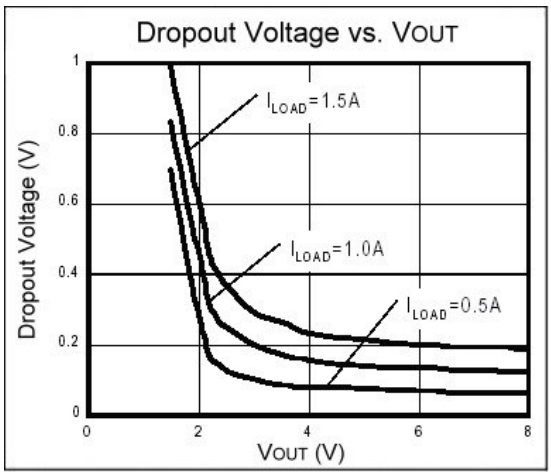
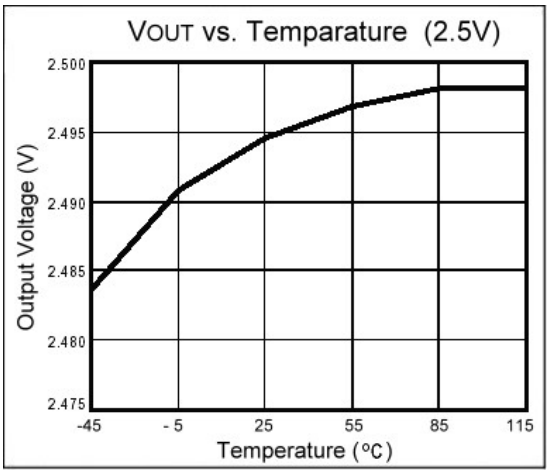
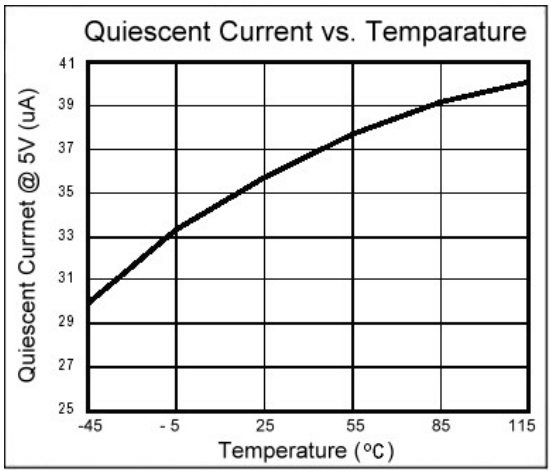
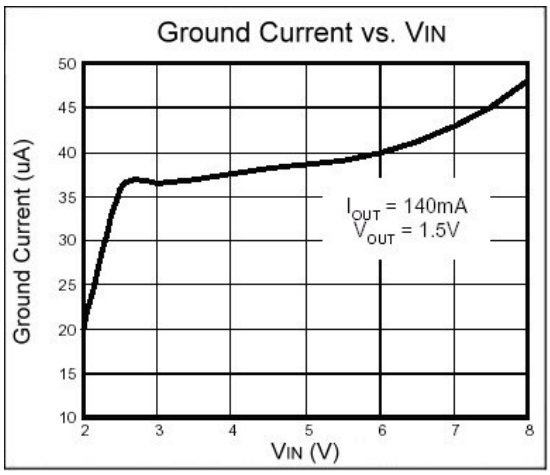
## Characteristics Curve

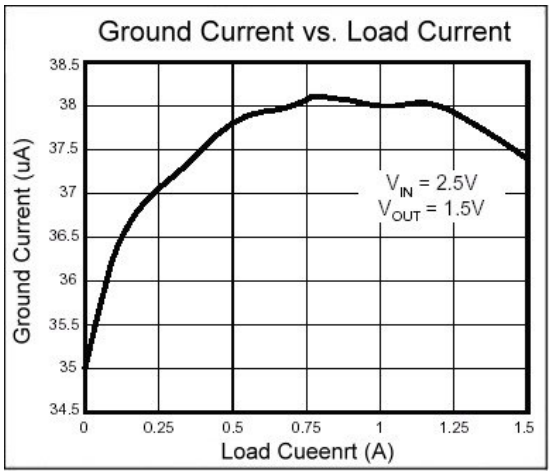


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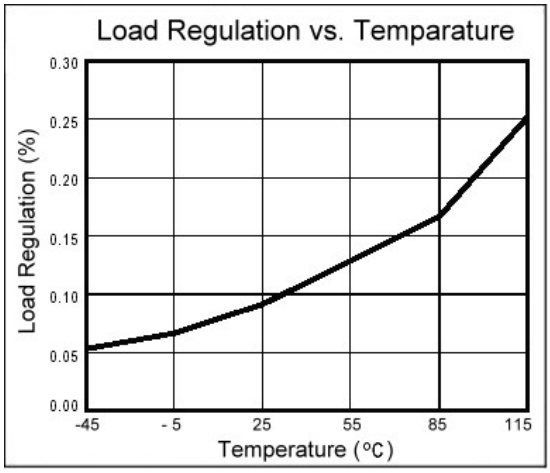


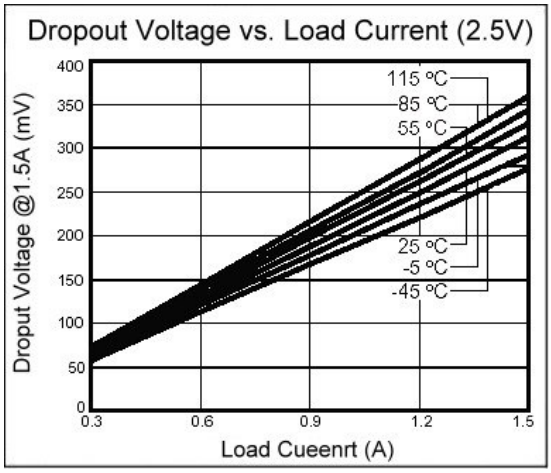


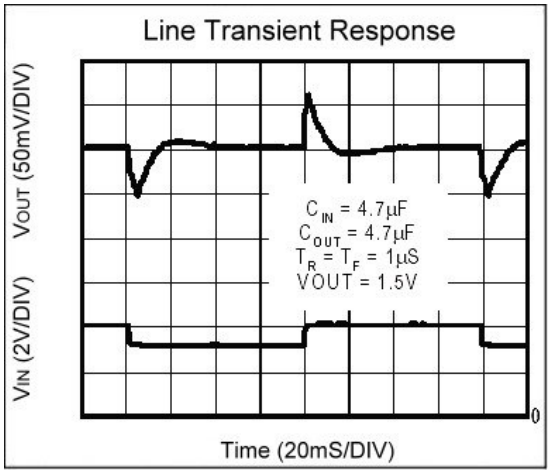


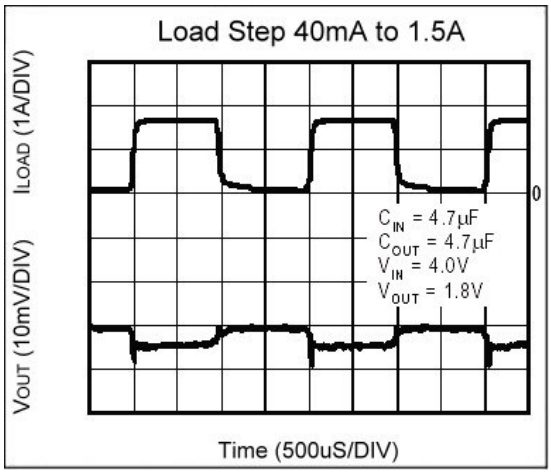


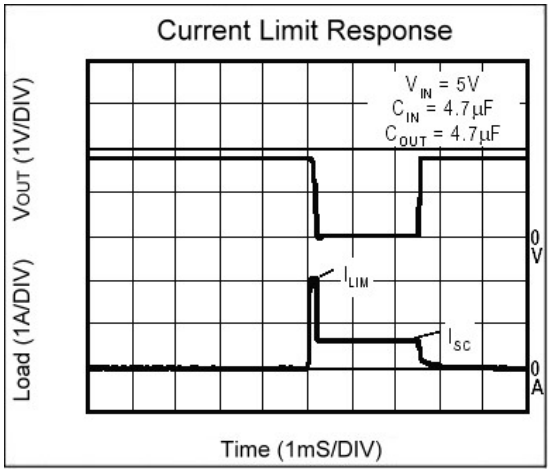


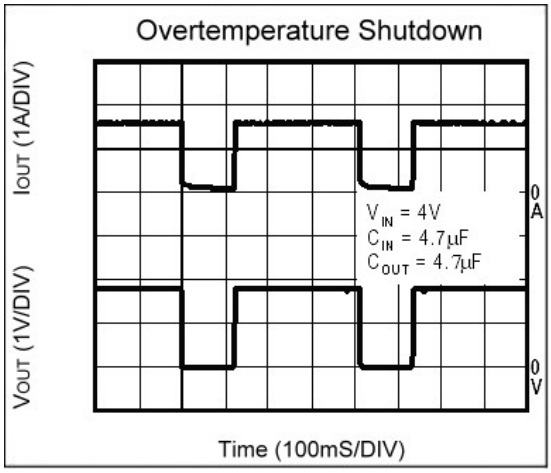

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