



Description

The SE5166 series of fixed output low dropout linear regulators are designed for portable battery powered applications, which require low dropout voltage and low ground current. Each device contains a voltage reference unit, an error amplifier, a PMOS power transistor, and resistors for setting output voltage, and current limit and temperature limit protection circuits.

The SE5166 has been designed to be used with low cost capacitors and requires a minimum output capacitor of 1.0 μ F. Standard voltage versions are 1.5, 1.8, 2.5, 2.8, 3.0, and 3.3V.

Features

- Typical Low Dropout Voltage of 203mV at 75mA.
- Guaranteed 150mA output over the full operating temperature range.
- Excellent Line and Load Regulation.
- High Accuracy Output Voltage of 2%.
- Typical Low Ground Current at 1mA
- Current Limiting and Thermal Protection.
- Standard SOT-23-3L, TO-92, and SOT-323-3L Package.

Applications

- Cellphones.
- Wireless LAN's.
- Hand-Held Instrumentation.
- Portable Video Game Devices.
- Digital Cameras.

Ordering/Marking Information

| Package | Ordering Information | | Marking Information | |
|--|----------------------|-----------|---------------------|---------------------------------|
| <p>TO-92 N-Pinout (Top View)</p> | 3.3V | SE5166AHN | SE5166AHN YYWW | YY: year code WW: week code. |
| | 2.8V | SE5166BHN | SE5166BHN YYWW | |
| | 2.5V | SE5166CHN | SE5166CHN YYWW | |
| | 1.8V | SE5166DHN | SE5166DHN YYWW | |
| | 1.5V | SE5166EHN | SE5166EHN YYWW | |
| | 3.0V | SE5166FHN | SE5166FHN YYWW | |
| <p>TO-92 G-Pinout (Top View)</p> | 3.3V | SE5166AHG | SE5166AHG YYWW | |
| | 2.8V | SE5166BHG | SE5166BHG YYWW | |
| | 2.5V | SE5166CHG | SE5166CHG YYWW | |
| | 1.8V | SE5166DHG | SE5166DHG YYWW | |
| | 1.5V | SE5166EHG | SE5166EHG YYWW | |
| | 3.0V | SE5166FHG | SE5166FHG YYWW | |



Ordering/Marking Information (Continued)

| Package | Ordering Information | | Marking Information | |
|---|----------------------|-----------|---------------------|--|
| <p>SOT-23-3L N-Pinout (Top View)</p> | 3.3V | SE5166ALN | <u>1</u> 66AN_ | <p>Starting with 1, a bar on top of 1 is for production year 2001, and underlined 1 is for year 2002. The next character is marked on top for 2003, and underlined for 2004. The naming pattern continues with consecutive characters for later years.</p> <p>The last character is the week code. (A-Z: 1-26, a-z: 27-52)</p> |
| | 2.8V | SE5166BLN | <u>1</u> 66BN_ | |
| | 2.5V | SE5166CLN | <u>1</u> 66CN_ | |
| | 1.8V | SE5166DLN | <u>1</u> 66DN_ | |
| | 1.5V | SE5166ELN | <u>1</u> 66EN_ | |
| | 3.0V | SE5166FLN | <u>1</u> 66FN_ | |
| <p>SOT-23-3L G-Pinout (Top View)</p> | 3.3V | SE5166ALG | <u>1</u> 66AG_ | |
| | 2.8V | SE5166BLG | <u>1</u> 66BG_ | |
| | 2.5V | SE5166CLG | <u>1</u> 66CG_ | |
| | 1.8V | SE5166DLG | <u>1</u> 66DG_ | |
| | 1.5V | SE5166ELG | <u>1</u> 66EG_ | |
| | 3.0V | SE5166FLG | <u>1</u> 66FG_ | |
| <p>SOT-323-3L N-Pinout (Top View)</p> | 3.3V | SE5166APN | <u>1</u> 66AN_ | |
| | 2.8V | SE5166BPN | <u>1</u> 66BN_ | |
| | 2.5V | SE5166CPN | <u>1</u> 66CN_ | |
| | 1.8V | SE5166DPN | <u>1</u> 66DN_ | |
| | 1.5V | SE5166EPN | <u>1</u> 66EN_ | |
| | 3.0V | SE5166FPN | <u>1</u> 66FN_ | |
| <p>SOT-323-3L G-Pinout (Top View)</p> | 3.3V | SE5166APG | <u>1</u> 66AG_ | |
| | 2.8V | SE5166BPG | <u>1</u> 66BG_ | |
| | 2.5V | SE5166CPG | <u>1</u> 66CG_ | |
| | 1.8V | SE5166DPG | <u>1</u> 66DG_ | |
| | 1.5V | SE5166EPG | <u>1</u> 66EG_ | |
| | 3.0V | SE5166FPG | <u>1</u> 66FG_ | |



Absolute Maximum Ratings⁽¹⁾

Supply Input Voltage (V_{IN}) 0.7V to +6V
 Power Dissipation (P_D) Internally Limited ⁽³⁾
 Junction Temperature (T_J)0°C to +125°C
 Lead Temperature (soldering, 5 sec.) 260°C
 Storage Temperature (T_S) -40°C to +150°C

Operating Ratings⁽²⁾

Supply Input Voltage (V_{IN}) +2.0V to +5.5V
 Junction Temperature (T_J) 0°C to +125°C
 Package Thermal Resistance
 160°C/W (TO-92)
 230°C/W (SOT-23-3L)
 250°C/W (SOT-323-3L)

Electrical Characteristics

$V_{IN} = 5V$; $C_{IN} = 2.2\mu F$; $C_{OUT} = 2.2\mu F$; $I_{OUT} = 10mA$; $T_J = 25^\circ C$; unless otherwise noted

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------------------|--|---|-------|------|-------|-------|
| V_{OUT} | Output Voltage Accuracy | SE5166 – 1.5V | 1.470 | 1.5 | 1.530 | V |
| | | SE5166 – 1.8V | 1.764 | 1.8 | 1.836 | |
| | | SE5166 – 2.5V | 2.450 | 2.5 | 2.550 | V |
| | | SE5166 – 2.8V | 2.744 | 2.8 | 2.856 | V |
| | | SE5166 – 3.0V | 2.940 | 3.0 | 3.060 | V |
| | | SE5166 – 3.3V | 3.234 | 3.3 | 3.366 | V |
| ΔV_{OUT} | Line Regulation | $V_{IN} = V_{OUT} + 1V$ to 5.5V, $I_{OUT} = 10mA$ | -- | 1 | -- | % |
| ΔV_{OUT} | Load Regulation ⁽⁵⁾ | $V_{IN} = 5V$; $I_{OUT} = 10mA$ to 150mA | -- | 1 | -- | % |
| $\Delta V_{OUT}/\Delta T$ | Output Voltage Temperature Coefficient | Note 4 | -- | 0.79 | -- | mV/°C |
| $V_{IN} - V_{OUT}$ | Dropout Voltage ⁽⁶⁾ | $I_{OUT} = 10mA$ | -- | 20 | -- | mV |
| | | $I_{OUT} = 75mA$ | -- | 203 | -- | |
| | | $I_{OUT} = 150mA$ | -- | 500 | -- | |
| $T_{PROTECTION}$ | Thermal Protection | Thermal Protection Temperature | -- | 150 | -- | °C |
| | | Protection Hysteresis | -- | 20 | -- | |
| PSRR | Ripple Rejection | $f = 120$ Hz | -- | 51 | -- | dB |
| I_Q | Quiescent Current | $I_{OUT} = 10mA$ | -- | 1 | 2 | mA |
| I_{LIMIT} | Current Limit | | 300 | -- | -- | mA |



Note 1: Exceeding the absolute maximum rating may damage the device.

Note 2: The device is not guaranteed to function outside its operating rating.

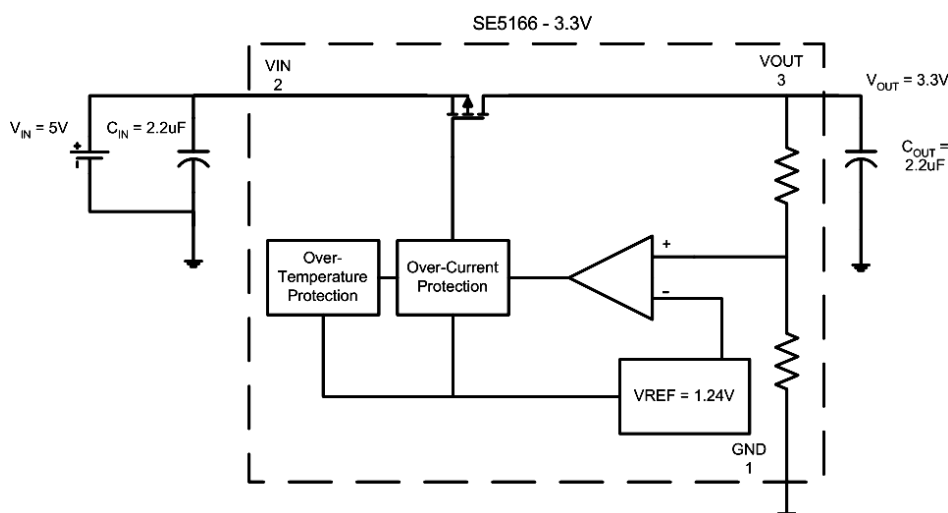
Note 3: The maximum allowable power dissipation at any T_A (ambient temperature) is calculated using: $P_{D(MAX)} = (T_{J(MAX)} - T_A)/\theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown. See "Thermal Consideration" section for details

Note 4: Output voltage temperature coefficient is the worst case voltage change divided by the total temperature range.

Note 5: Regulation is measured at constant junction temperature using low duty cycle pulse testing. Parts are tested for load regulation in the load range from 0.1mA to 150mA. Changes in output voltage due to heating effects are covered by the thermal regulation specification.

Note 6: Dropout voltage is defined as the input to output differential at which the output voltage drops 2% below its nominal value measured at 1V differential.

Typical Application





Application Hints

Like any low dropout regulator, SE5166 requires external capacitors to ensure stability. The external capacitors must be carefully selected to ensure performance.

Input Capacitor

An input capacitor of at least 2.2 μ F is required. Ceramic or Tantalum can be used. The value can be increased without upper limit.

Output Capacitor

An output capacitor is required for stability. It must be placed no more than 1 cm away from the V_{OUT} pin, and connected directly between V_{OUT} and GND pins. The minimum value is 2.2 μ F but may be increased without limit.

Thermal Considerations

It is important that the thermal limit of the package is not exceeded. The SE5166 has built-in thermal protection. When the thermal limit is exceeded, the IC will enter protection, and V_{OUT} will be pulled to ground. The power dissipation for a given application can be calculated as following:

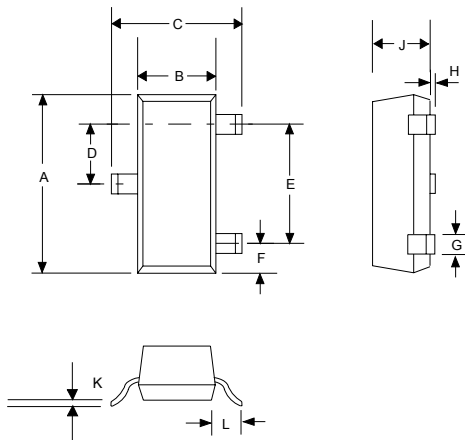
The power dissipation (P_D) is

$$P_D = I_{OUT} * [V_{IN} - V_{OUT}]$$

The thermal limit of the package is then limited to $P_{D(MAX)} = [T_J - T_A]/\Theta_{JA}$ where T_J is the junction temperature, T_A is the ambient temperature, and Θ_{JA} is around 250°C/W for SE5166. SE5166 is designed to enter thermal protection at 150°C. For example, if T_A is 25°C then the maximum P_D is limited to about 0.5W. In other words, if $I_{OUT(MAX)} = 150mA$, then $[V_{IN} - V_{OUT}]$ cannot exceed 3.33V.

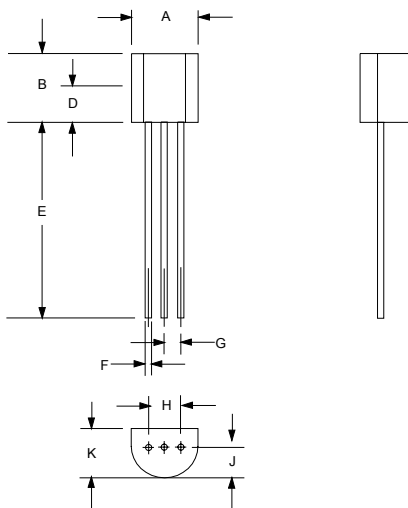


OUTLINE DRAWING SOT-23-3L (SC-59)



| DIM ^N | DIMENSIONS | | | |
|------------------|------------|-------|-------|------|
| | INCHES | | MM | |
| | MIN | MAX | MIN | MAX |
| A | 0.110 | 0.120 | 2.80 | 3.04 |
| B | 0.047 | 0.055 | 1.20 | 1.40 |
| C | 0.083 | 0.104 | 2.10 | 2.64 |
| D | 0.035 | 0.040 | 0.89 | 1.03 |
| E | 0.070 | 0.080 | 1.78 | 2.05 |
| F | 0.018 | 0.024 | 0.45 | 0.60 |
| G | 0.015 | 0.020 | 0.37 | 0.51 |
| H | 0.0005 | 0.004 | 0.013 | 0.10 |
| J | 0.034 | 0.040 | 0.887 | 1.02 |
| K | 0.003 | 0.007 | 0.085 | 0.18 |
| L | - | 0.027 | - | 0.69 |

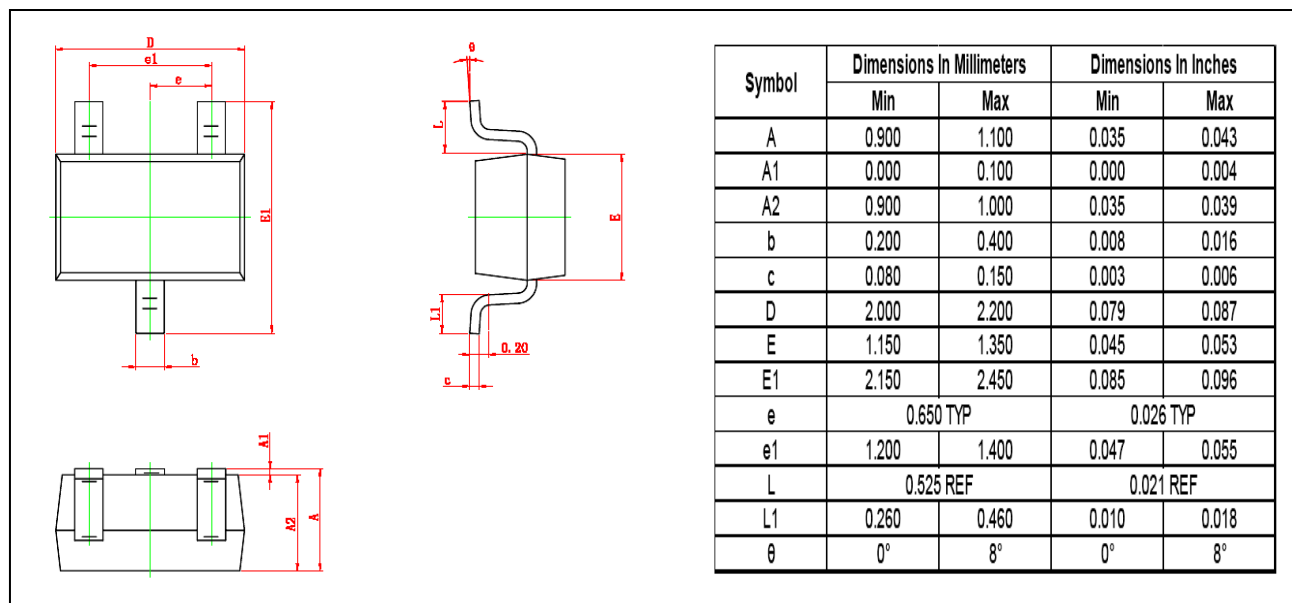
OUTLINE DRAWING TO-92



| DIM ^N | DIMENSIONS | | | |
|------------------|------------|-------|-------|-------|
| | INCHES | | MM | |
| | MIN | MAX | MIN | MAX |
| A | 0.175 | 0.205 | 4.445 | 5.207 |
| B | 0.170 | 0.210 | 4.318 | 5.334 |
| E | 0.500 | 0.610 | 12.70 | 15.50 |
| F | 0.016 | 0.021 | 0.407 | 0.533 |
| G | 0.045 | 0.055 | 1.143 | 1.397 |
| H | 0.095 | 0.105 | 2.413 | 2.667 |
| J | 0.080 | 0.105 | 2.032 | 2.667 |
| K | 0.125 | 0.165 | 3.175 | 4.191 |



OUTLINE DRAWING SOT-323-3L



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