# SECOS

**Elektronische Bauelemente**

# SSC2139

**1.55A CMOS**
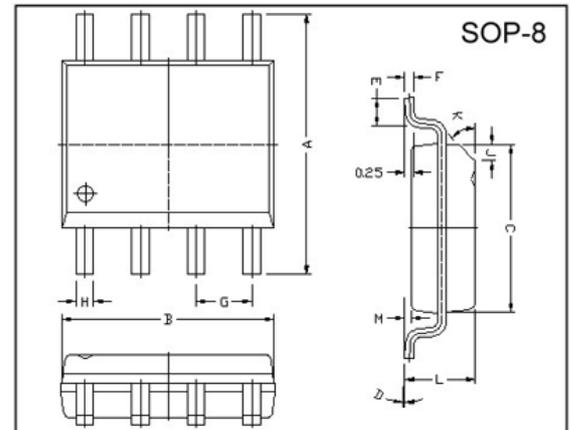
**Low Dropout Voltage Regulator**

RoHS Compliant Product

## Description

The SSC2139 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.The SSC2139 is stable with an output capacitance of 4.7μF or greater.

## Features

* Low Temperature Coefficient
* Over-Temperature Shutdown
* Adjustable Version
* Very Low Dropout Voltage
* High Accurate ±1.5%
* Guaranteed 1.55A output
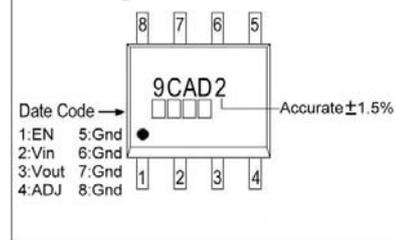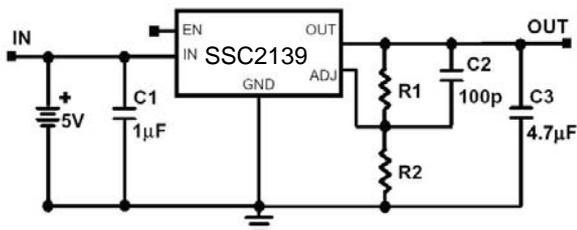* Current Limiting
* Power-Saving Shutdown Mode

## Applications

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



SOP-8

| REF. | Millimeter | | REF. | Millimeter | |
|------|------|------|------|------|------|
| | Min. | Max. | | Min. | Max. |
| A | 5.80 | 6.20 | M | 0.10 | 0.25 |
| B | 4.80 | 5.00 | H | 0.35 | 0.49 |
| C | 3.80 | 4.00 | L | 1.35 | 1.75 |
| D | 0° | 8° | J | 0.375 REF. | |
| E | 0.40 | 0.90 | K | 45° | |
| F | 0.19 | 0.25 | G | 1.27 TYP. | |

Marking :



9CAD2

Accurate±1.5%

Date Code
1:EN    5:Gnd
2:Vin   6:Gnd
3:Vout  7:Gnd
4:ADJ   8:Gnd

## Functional Block Diagram
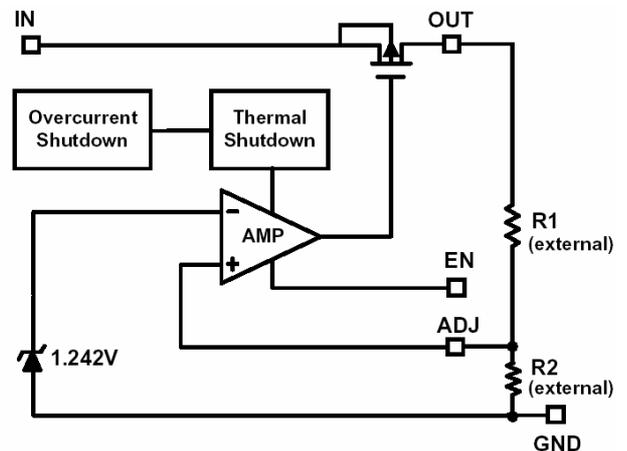


## Typical Application Circuit

# SSC2139

**1.55A CMOS**

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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 | $V_{OUT}$ | Gnd-0.3 to $V_{IN}$+0.3 | V |
| Operating Ambient Temperature | Topr | -40~+85 | $^{\circ}$C |
| Junction Temperature | Tj | -40~+125 | $^{\circ}$C |
| Max. Junction Temperature | Tj Max. | 150 | $^{\circ}$C |
| Power Dissipation ($\triangle$ T=100$^{\circ}$C) | $P_D$ | 810 | mW |
| EDS Classification | | B | |

## Electrical Characteristics  Ta=25$^{\circ}$C  unless otherwise noted ($V_{IN}=V_{OUT}(T)+2V, V_{EN}=V_{IN}$)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Condition | |
|---|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}(E)^1$ | -1.5% | $V_{OUT}(T)^2$ | 1.5% | V | $I_O$=1mA | |
| Output Current | $I_O$ | 1.55 | – | – | A | $V_O$>1.2V | |
| Current Limit | $I_{LIM}$ | 1.55 | 2.0 | – | A | $V_O$>1.2V | |
| Load Regulation | $REG_{LOAD}$ | -1 | 0.2 | 1 | % | $I_O$=1mA~1.5A | |
| Dropout Voltage | $V_{DROPOUT}$ | – | – | 1000 | mV | 1.5V<$V_{OUT}(T)\leq$2.0V | $I_O$=1.55A $V_O=V_{OUT}(E)$-2% |
| | | – | – | 800 | | 2.0V<$V_{OUT}(T)\leq$2.8V | |
| | | – | – | 600 | | 2.8V<$V_{OUT}(T)$ | |
| Ground Pin Current | $I_{GND}$ | – | 45 | – | uA | $I_O$=1mA~1.5A | |
| Line Regulation | $REG_{LINE}$ | – | – | 0.15 | % | $V_{OUT}(T)$< 2.0V | $I_O$=1mA $V_{IN}=V_{OUT}(T)+1$ to $V_{OUT}(T)+2$ |
| | | – | 0.02 | 0.1 | | 2.0V$\leq V_{OUT}(T)$ | |
| Input Voltage | $V_{IN}$ | Note$^3$ | – | 7 | V | | |
| Over Temperature Shutdown | $O_{TS}$ | – | 150 | – | $^{\circ}$C | | |
| Over Temperature Hystersis | $O_{TH}$ | – | 30 | – | $^{\circ}$C | | |
| Output Voltage Temperature Coefficient | $T_C$ | – | 30 | – | ppm/$^{\circ}$C | | |
| Power Supply Rejection | PSRR | – | 50 | – | dB | f=1kHz | $I_O$=100mA $C_O$=4.7uF (ceramic) |
| | | – | 20 | – | | f=10kHz | |
| | | – | 15 | – | | f=100kHz | |
| Output Voltage Noise | eN | – | 30 | – | uVrms | f=10Hz~100kHz, $I_O$=10mA $C_O$=4.7uF | |
| EN Input Threshold | $V_{EH}$ | 2 | – | $V_{IN}$ | V | $V_{IN}$=2.7V to 7V | |
| | $V_{EL}$ | 0 | – | 0.4 | | | |
| EN Input Bias Current | $I_{EH}$ | – | – | 0.1 | uA | $V_{EN}=V_{IN}, V_{IN}$=2.7V~7V | |
| | $I_{EL}$ | – | – | 0.5 | | $V_{EN}$=0V, $V_{IN}$=2.7V~7V | |
| Shutdown Supply Current | $I_{SD}$ | – | 30 | – | uA | $V_{IN}$=5V, $V_O$=0, $V_{EN}<V_{EL}$ | |
| | | – | 0.5 | 2 | | $V_{IN}$=2.5V, $V_O$=0, $V_{EN}<V_{EL}$ | |
| ADJ Input Bias Current | $I_{ADJ}$ | – | 1 | – | uA | $V_{IN}$=5V, $V_{ADJ}$=1.242V | |
| ADJ Reference Voltage | $V_{REF}$ | 1.223 | 1.242 | 1.261 | V | | |

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

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

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

Any changing of specification will not be informed individual

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# SSC2139

### 1.55A CMOS

### Low Dropout Voltage Regulator

## Ordering Information(contd.)

| Part Number | Marking | Output Voltage | Part Number | Marking | Output Voltage |
|---|---|---|---|---|---|
| SSC2139-AD | 9CAD2 XXXX | Adjustable | | | |

## Detailed Description

The SSC2139 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 exceeds$140^o$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.

## External Capacitors

The SSC2139 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.
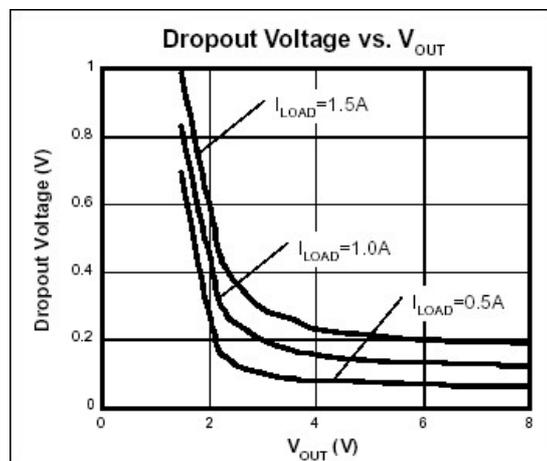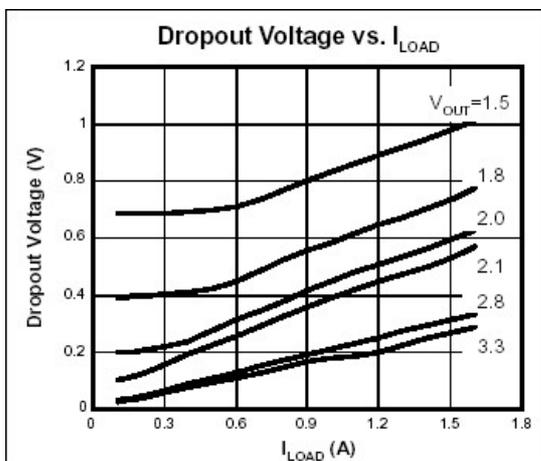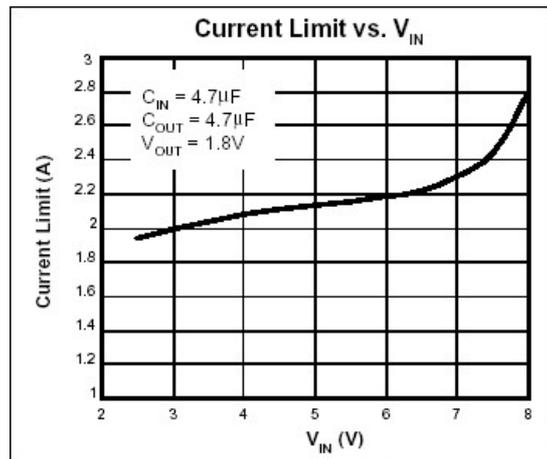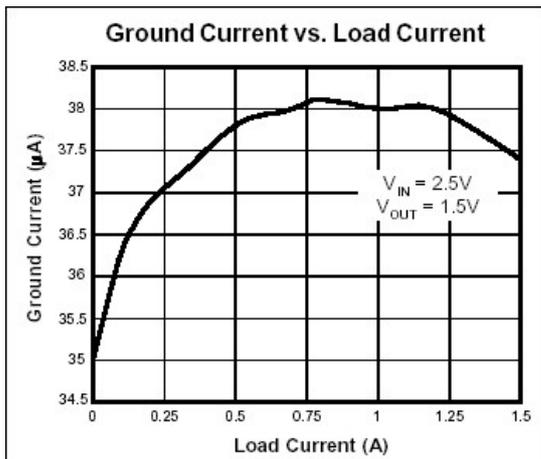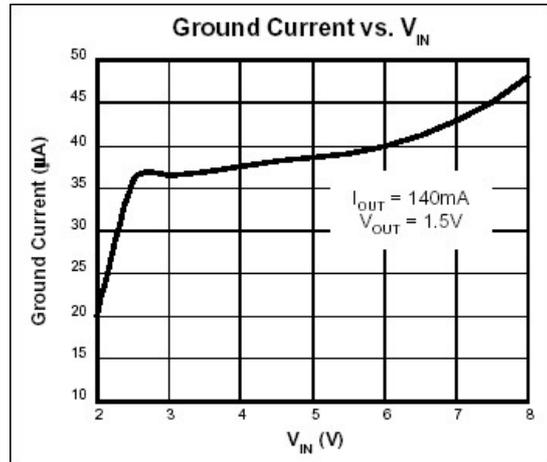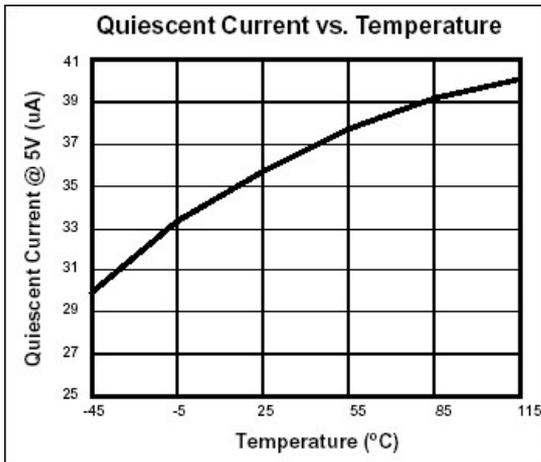
## Adjustable Version

The adjustable version uses external feedback resistors to generate an output voltage anywhere from 1.5V to 5.0V. Vadj is trimmed to 1.242V and Vout is given by the equation:

$$V_{OUT}=Vadj*(1+R1/R2)$$

Feedback resistors R1 and R2 should be high enough to keep quiescent current low, but increasing R1+R2 will reduce stability. In general, R1 and R2 in the 10's of k$\Omega$ will produce adequate stability, given reasonable layout precautions. To improve stability characteristics, keep parasitic on the ADJ pin to min., and lower R1 and R2 values.

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## Characteristics Curve



Quiescent Current vs. Temperature



Ground Current vs. $V_{IN}$

$I_{OUT} = 140mA$
$V_{OUT} = 1.5V$



Ground Current vs. Load Current

$V_{IN} = 2.5V$
$V_{OUT} = 1.5V$



Current Limit vs. $V_{IN}$

$C_{IN} = 4.7\mu F$
$C_{OUT} = 4.7\mu F$
$V_{OUT} = 1.8V$



Dropout Voltage vs. $I_{LOAD}$

$V_{OUT}$=1.5, 1.8, 2.0, 2.1, 2.8, 3.3



Dropout Voltage vs. $V_{OUT}$

$I_{LOAD}$=1.5A
$I_{LOAD}$=1.0A
$I_{LOAD}$=0.5A

Load Regulation vs. Temperature



Dropout Voltage vs. Load Current(2.5V)



Line Transient Response

$C_{IN} = 4.7\mu F$
$C_{OUT} = 4.7\mu F$
$T_R = T_F = 1\mu S$
$V_{OUT} = 1.5V$



Load Step 40mA to 1.5A

$C_{IN} = 4.7\mu F$
$C_{OUT} = 4.7\mu F$
$V_{IN} = 4.0V$
$V_{OUT} = 1.8V$



Current Limit Response

$V_{IN} = 5V$
$C_{IN} = 4.7\mu F$
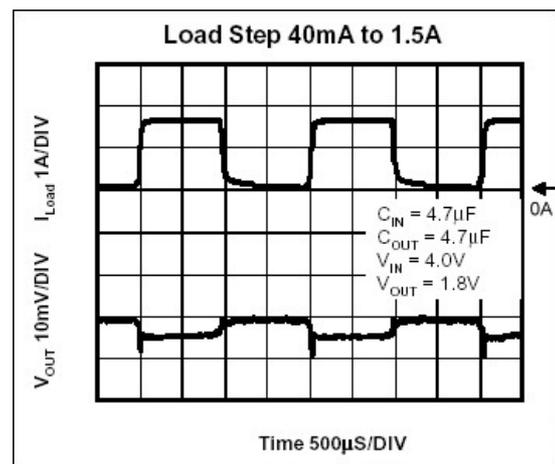$C_{OUT} = 4.7\mu F$



Overtemperature Shutdown

$V_{IN} = 4V$
$C_{IN} = 4.7\mu F$
$C_{OUT} = 4.7\mu F$

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Stability vs. ESR vs. $I_{LOAD}$ — $C_L = 2\mu F$



Stability vs. ESR vs. $I_{Load}$ — $C_L = 5\mu F$



Stability vs. ESR vs. $I_{Load}$ — $C_L = 10\mu F$



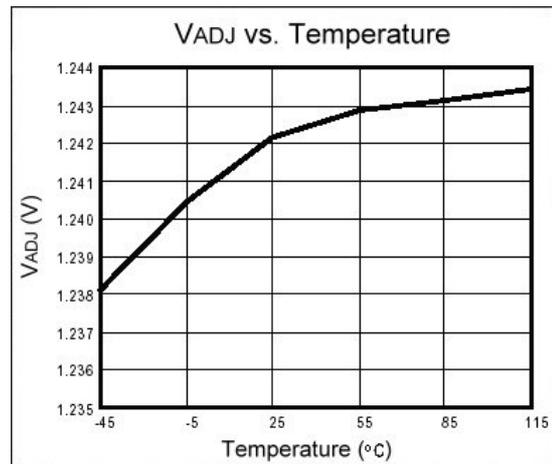$V_{ADJ}$ vs. Temperature

# SSC2139

**1.55A CMOS**

**Low Dropout Voltage Regulator**

**SeCoS**
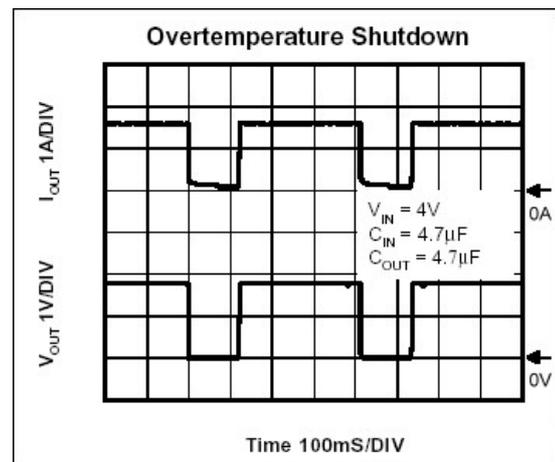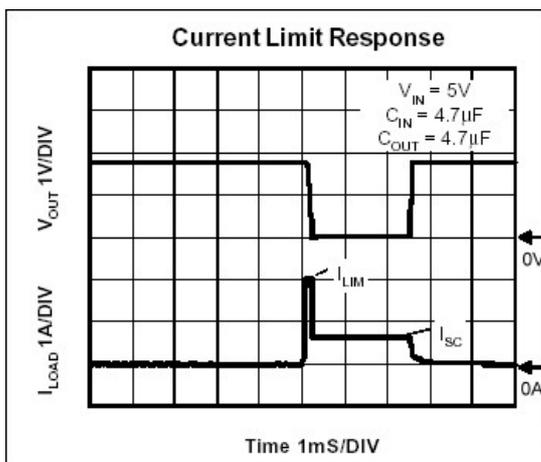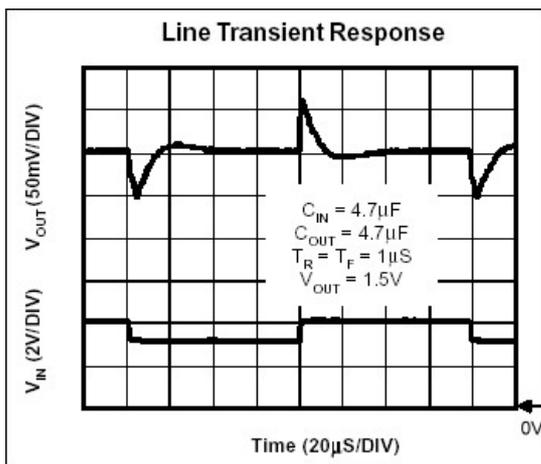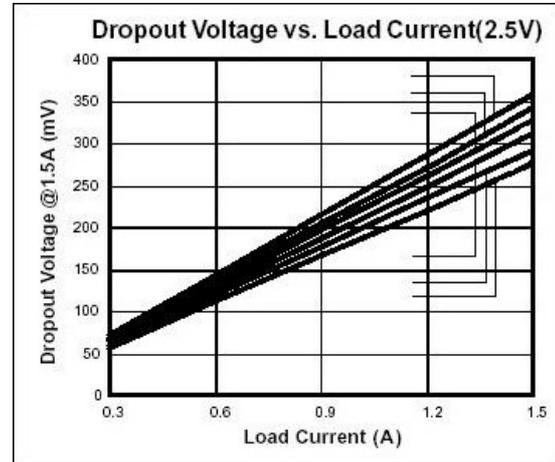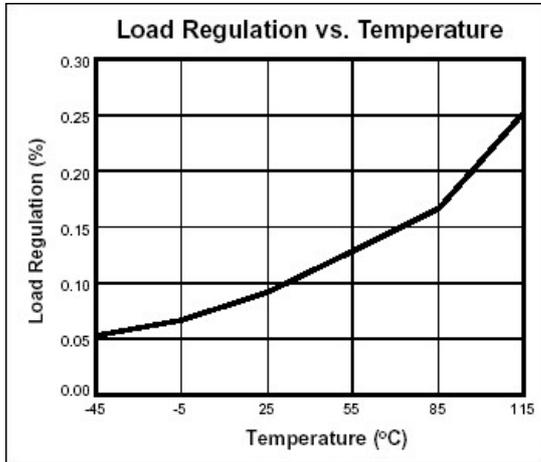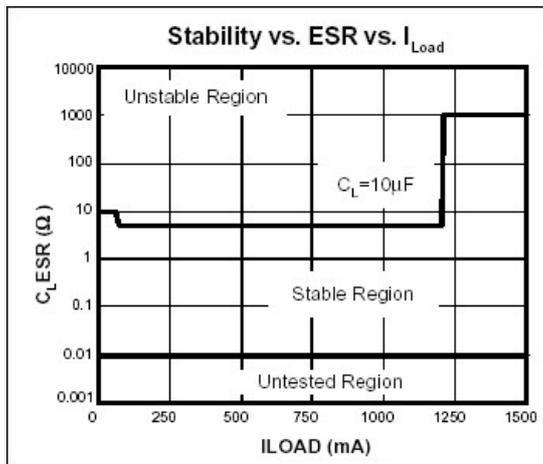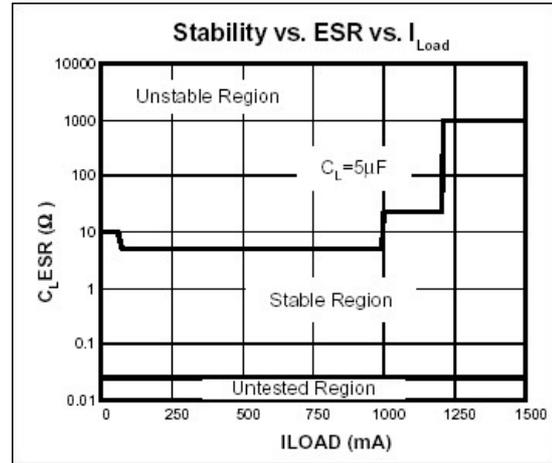
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## External Resistor Divider Table

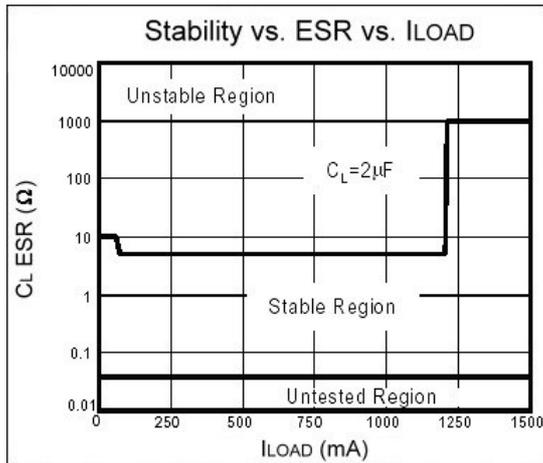| R1(kΩ) | 1 | 2 | 5 | 10 | 20 | 50 | R1(kΩ) | 1 | 2 | 5 | 10 | 20 | 50 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VOUT | R2(kΩ)=(1.242*R1(kΩ))/(VOUT-1.242) | | | | | | VOUT | R2(kΩ)=(1.242*R1(kΩ))/(VOUT-1.242) | | | | | |
| 1.30 | 21.41 | 42.83 | 107.07 | 214.14 | 428.28 | 1070.7 | 3.20 | 0.63 | 1.27 | 3.17 | 6.34 | 12.69 | 31.72 |
| 1.35 | 11.50 | 23.00 | 57.50 | 115.00 | 230.00 | 575.00 | 3.25 | 0.62 | 1.24 | 3.09 | 6.19 | 12.37 | 30.93 |
| 1.40 | 7.86 | 15.72 | 39.30 | 78.61 | 157.22 | 393.04 | 3.30 | 0.60 | 1.21 | 3.02 | 6.03 | 12.07 | 30.17 |
| 1.45 | 5.97 | 11.94 | 29.86 | 59.71 | 119.42 | 298.56 | 3.35 | 0.59 | 1.18 | 2.95 | 5.89 | 11.78 | 29.46 |
| 1.50 | 4.81 | 9.63 | 24.07 | 48.14 | 96.28 | 240.70 | 3.40 | 0.58 | 1.15 | 2.88 | 5.76 | 11.51 | 28.78 |
| 1.55 | 4.03 | 8.06 | 20.16 | 40.32 | 80.65 | 201.62 | 3.45 | 0.56 | 1.13 | 2.81 | 5.63 | 11.25 | 28.13 |
| 1.60 | 3.47 | 6.94 | 17.35 | 34.69 | 68.39 | 173.46 | 3.50 | 0.55 | 1.10 | 2.75 | 5.50 | 11.00 | 27.50 |
| 1.65 | 3.04 | 6.09 | 15.22 | 30.44 | 60.88 | 152.21 | 3.55 | 0.54 | 1.08 | 2.69 | 5.38 | 10.76 | 26.91 |
| 1.70 | 2.71 | 5.42 | 13.56 | 27.12 | 54.24 | 135.59 | 3.60 | 0.53 | 1.05 | 2.63 | 5.27 | 10.53 | 26.34 |
| 1.75 | 2.44 | 4.89 | 12.22 | 24.45 | 48.90 | 122.24 | 3.65 | 0.52 | 1.03 | 2.58 | 5.16 | 10.32 | 25.79 |
| 1.80 | 2.23 | 4.45 | 11.13 | 22.26 | 44.52 | 111.29 | 3.70 | 0.51 | 1.01 | 2.53 | 5.05 | 10.11 | 25.26 |
| 1.85 | 2.04 | 4.09 | 10.21 | 20.43 | 40.86 | 102.14 | 3.75 | 0.50 | 0.99 | 2.48 | 4.95 | 9.90 | 24.76 |
| 1.90 | 1.89 | 3.78 | 9.44 | 18.88 | 37.75 | 94.38 | 3.80 | 0.49 | 0.97 | 2.43 | 4.86 | 9.71 | 24.28 |
| 1.95 | 1.75 | 3.51 | 8.77 | 17.54 | 35.08 | 87.71 | 3.85 | 0.48 | 0.95 | 2.38 | 4.76 | 9.52 | 23.81 |
| 2.00 | 1.64 | 3.28 | 8.19 | 16.39 | 32.77 | 81.93 | 3.90 | 0.47 | 0.93 | 2.34 | 4.67 | 9.35 | 23.36 |
| 2.05 | 1.54 | 3.07 | 7.69 | 15.37 | 30.74 | 76.86 | 3.95 | 0.46 | 0.92 | 2.29 | 4.59 | 9.17 | 22.93 |
| 2.10 | 1.45 | 2.90 | 7.24 | 14.48 | 28.95 | 72.38 | 4.00 | 0.45 | 0.90 | 2.25 | 4.50 | 9.01 | 22.52 |
| 2.15 | 1.37 | 2.74 | 6.84 | 13.68 | 27.36 | 68.39 | 4.05 | 0.44 | 0.88 | 2.21 | 4.42 | 8.85 | 22.12 |
| 2.20 | 1.30 | 2.59 | 6.48 | 12.96 | 25.93 | 64.82 | 4.10 | 0.43 | 0.87 | 2.17 | 4.35 | 8.69 | 21.73 |
| 2.25 | 1.23 | 2.46 | 6.16 | 12.32 | 24.65 | 61.61 | 4.15 | 0.43 | 0.85 | 2.14 | 4.27 | 8.54 | 21.35 |
| 2.30 | 1.17 | 2.35 | 5.87 | 11.74 | 23.48 | 58.70 | 4.20 | 0.42 | 0.84 | 2.10 | 4.20 | 8.40 | 20.99 |
| 2.35 | 1.12 | 2.24 | 5.60 | 11.21 | 22.42 | 56.05 | 4.25 | 0.41 | 0.83 | 2.06 | 4.13 | 8.26 | 20.64 |
| 2.40 | 1.07 | 2.15 | 5.36 | 10.73 | 21.45 | 53.63 | 4.30 | 0.41 | 0.81 | 2.03 | 4.06 | 8.12 | 20.31 |
| 2.45 | 1.03 | 2.06 | 5.14 | 10.28 | 20.56 | 51.41 | 4.35 | 0.40 | 0.80 | 2.00 | 4.00 | 7.99 | 19.98 |
| 2.50 | 0.99 | 1.97 | 4.94 | 9.87 | 19.75 | 49.36 | 4.40 | 0.39 | 0.79 | 1.97 | 3.93 | 7.87 | 19.66 |
| 2.55 | 0.95 | 1.90 | 4.75 | 9.50 | 18.99 | 47.48 | 4.45 | 0.39 | 0.77 | 1.94 | 3.87 | 7.74 | 19.36 |
| 2.60 | 0.91 | 1.83 | 4.57 | 9.15 | 18.29 | 45.73 | 4.50 | 0.38 | 0.76 | 1.91 | 3.81 | 7.62 | 19.06 |
| 2.65 | 0.88 | 1.76 | 4.41 | 8.82 | 17.64 | 44.11 | 4.55 | 0.38 | 0.75 | 1.88 | 3.75 | 7.51 | 18.77 |
| 2.70 | 0.85 | 1.70 | 4.26 | 8.52 | 17.04 | 42.59 | 4.60 | 0.37 | 0.74 | 1.85 | 3.70 | 7.40 | 18.49 |
| 2.75 | 0.82 | 1.65 | 4.12 | 8.24 | 16.47 | 41.18 | 4.65 | 0.36 | 0.73 | 1.82 | 3.64 | 7.29 | 18.22 |
| 2.80 | 0.80 | 1.59 | 3.99 | 7.97 | 15.94 | 39.86 | 4.70 | 0.36 | 0.72 | 1.80 | 3.59 | 7.18 | 17.96 |
| 2.85 | 0.77 | 1.54 | 3.86 | 7.72 | 15.45 | 38.62 | 4.75 | 0.35 | 0.71 | 1.77 | 3.54 | 7.08 | 17.70 |
| 2.90 | 0.75 | 1.50 | 3.75 | 7.49 | 14.98 | 37.45 | 4.80 | 0.35 | 0.70 | 1.75 | 3.49 | 6.98 | 17.45 |
| 2.95 | 0.73 | 1.45 | 3.64 | 7.27 | 14.54 | 36.36 | 4.85 | 0.34 | 0.69 | 1.72 | 3.44 | 6.88 | 17.21 |
| 3.00 | 0.71 | 1.41 | 3.53 | 7.06 | 14.13 | 35.32 | 4.90 | 0.34 | 0.68 | 1.70 | 3.40 | 6.79 | 16.98 |
| 3.05 | 0.69 | 1.37 | 3.43 | 6.87 | 13.74 | 34.35 | 4.95 | 0.33 | 0.67 | 1.67 | 3.35 | 6.70 | 16.75 |
| 3.10 | 0.67 | 1.34 | 3.34 | 6.68 | 13.37 | 33.42 | 5.00 | 0.33 | 0.66 | 1.65 | 3.30 | 6.61 | 16.52 |
| 3.15 | 0.65 | 1.30 | 3.25 | 6.51 | 13.02 | 32.55 | | | | | | | |

Note: Small load (greater than 2mA) is necessary as R1 or R2 is larger than 50kΩ. Otherwise, output voltage probably can not be pulled down to 0V on disable mode.