

## VOLTAGE REGULATOR

### DESCRIPTION

The SC10XX series is a set of three-terminal low power voltage regulators implemented in CMOS technology. They are available with several fixed output voltages ranging from 1.5V--7.0V. CMOS technology ensures low voltage drop and low quiescent current.

Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain variable voltages and currents.

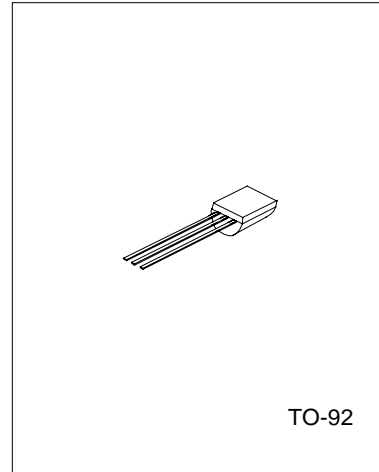
The SC10XX is housed in TO-92 package.

### FEATURES

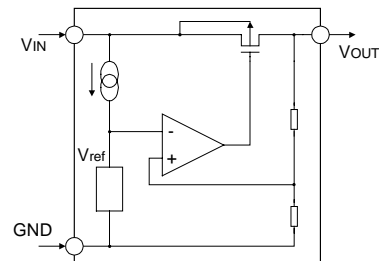
- \* Low power consumption
- \* Low voltage drop
- \* Low temperature coefficient
- \* Wide operating voltage (12V Max.)
- \* TO-92 package

### APPLICATIONS

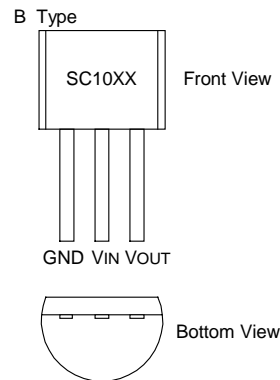
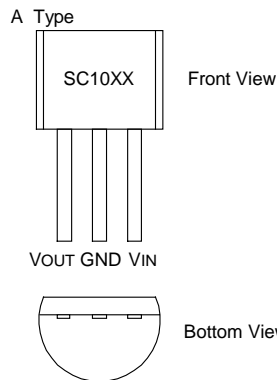
- \* Battery-powered equipment
- \* Communication equipment
- \* Audio/Video equipment



### BLOCK DIAGRAM



### PIN ASSIGNMENT



## SELECTION GUIDE

Part No.	Pin Assignment	Output Voltage	Tolerance
SC1015 SC1016	B Type A Type	1.5V	±2.4%. ±5%
SC1030 SC1031	B Type A Type	3.0V	±2.4%. ±5%
SC1033 SC1034	B Type A Type	3.3V	±2.4%. ±5%
SC1036 SC1037	B Type A Type	3.6V	±2.4%. ±5%
SC1038 SC1039	B Type A Type	3.8V	±2.4%. ±5%
SC1044 SC1045	B Type A Type	4.4V	±2.4%. ±5%
SC1050 SC1051	B Type A Type	5.0V	±2.4%. ±5%
SC1070 SC1071	B Type A Type	7.0V	±2.4%. ±5%

Note: For semi-custom parts, selectable regulated voltage range is from 2.4V to 9V in 0.1V increment.

## ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
Supply Voltage	V <sub>DC</sub>	0.3~15	V
Power Consumption	P <sub>D</sub>	250	m/W
Operating Temperature	T <sub>OPR</sub>	0~70	°C
Storage Temperature	T <sub>stg</sub>	-50~125	°C

Note: These are stress ratings only. Stresses exceeding the range specified under "Absolute Maximum Ratings" may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

## ELECTRICAL CHARACTERISTICS

### SC10XX series (SC1015, SC1016, +1.5V output type) (Ta=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V <sub>IN</sub>	Conditions				
V <sub>OUT</sub>	Output Voltage Tolerance	3.5V	I <sub>OUT</sub> = 0.5mA	1.425	1.5	1.575	V
I <sub>OUT</sub>	Output Current	3.5V	--	7.0	--	--	mA
ΔV <sub>OUT</sub>	Load Regulation	3.5V	1mA ≤ I <sub>OUT</sub> ≤ 7mA	--	80	--	mV
V <sub>DIF</sub>	Voltage Drop	--	I <sub>OUT</sub> = 0.5mA	--	300	--	mV
I <sub>SS</sub>	Current Consumption	3.5V	No load	--	2.2	5.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	--	2.5V ≤ V <sub>IN</sub> ≤ 12V I <sub>OUT</sub> = 0.5mA	--	0.2	--	%/V
V <sub>IN</sub>	Input Voltage	--	--	--	--	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	3.5V	I <sub>OUT</sub> =0.5mA 0°C < T <sub>a</sub> < 70°C		±0.25		mV/°C

### SC10XX series (SC1030, SC1031, +3.0V output type) (Ta=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V <sub>IN</sub>	Conditions				
V <sub>OUT</sub>	Output Voltage Tolerance	5V	I <sub>OUT</sub> = 10mA	2.85	3.0	3.15	V
I <sub>OUT</sub>	Output Current	5V	--	20	30	--	mA
ΔV <sub>OUT</sub>	Load Regulation	5V	1mA ≤ I <sub>OUT</sub> ≤ 20mA	--	60	100	mV
V <sub>DIF</sub>	Voltage Drop	--	I <sub>OUT</sub> = 1mA	--	60	--	mV
I <sub>SS</sub>	Current Consumption	5V	No load	--	2.5	6.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	--	4V ≤ V <sub>IN</sub> ≤ 12V I <sub>OUT</sub> = 1mA	--	0.2	--	%/V
V <sub>IN</sub>	Input Voltage	--	--	--	--	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5V	I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.45	--	mV/°C

**SC10XX series (SC1033, SC1034, +3.3V output type) (Ta=25°C)**

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V <sub>IN</sub>	Conditions				
V <sub>OUT</sub>	Output Voltage Tolerance	5.5V	I <sub>OUT</sub> = 10mA	3.135	3.3	3.465	V
I <sub>OUT</sub>	Output Current	5.5V	--	20	30	--	mA
ΔV <sub>OUT</sub>	Load Regulation	5.5V	1mA ≤ I <sub>OUT</sub> ≤ 30mA	--	60	100	mV
V <sub>DIF</sub>	Voltage Drop	--	I <sub>OUT</sub> = 1mA	--	60	--	mV
I <sub>SS</sub>	Current Consumption	5.5V	No load	--	2.5	6.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	--	4.5V ≤ V <sub>IN</sub> ≤ 12V I <sub>OUT</sub> = 1mA	--	0.2	--	%/V
V <sub>IN</sub>	Input Voltage	--	--	--	--	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5.5V	I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.5	--	mV/°C

**SC10XX series (SC1036, SC1037, +3.6V output type) (Ta=25°C)**

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V <sub>IN</sub>	Conditions				
V <sub>OUT</sub>	Output Voltage Tolerance	5.6V	I <sub>OUT</sub> = 10mA	3.42	3.6	3.78	V
I <sub>OUT</sub>	Output Current	5.6V	--	20	30	--	mA
ΔV <sub>OUT</sub>	Load Regulation	5.6V	1mA ≤ I <sub>OUT</sub> ≤ 30mA	--	60	100	mV
V <sub>DIF</sub>	Voltage Drop	--	I <sub>OUT</sub> = 1mA	--	60	--	mV
I <sub>SS</sub>	Current Consumption	5.6V	No load	--	3.0	7.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	--	4.6V ≤ V <sub>IN</sub> ≤ 12V I <sub>OUT</sub> = 1mA	--	0.2	--	%/V
V <sub>IN</sub>	Input Voltage	--	--	--	--	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5.6V	I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.6	--	mV/°C

**SC10XX series (SC1038, SC1039, +3.8V output type) (Ta=25°C)**

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V <sub>IN</sub>	Conditions				
V <sub>OUT</sub>	Output Voltage Tolerance	5.8V	I <sub>OUT</sub> = 10mA	3.61	3.8	3.99	V
I <sub>OUT</sub>	Output Current	5.8V	--	20	30	--	mA
ΔV <sub>OUT</sub>	Load Regulation	5.8V	1mA ≤ I <sub>OUT</sub> ≤ 30mA	--	60	150	mV
V <sub>DIF</sub>	Voltage Drop	--	I <sub>OUT</sub> = 1mA	--	60	--	mV
I <sub>SS</sub>	Current Consumption	5.8V	No load	--	3.0	8.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	--	4.8V ≤ V <sub>IN</sub> ≤ 12V I <sub>OUT</sub> = 1mA	--	0.2	--	%/V
V <sub>IN</sub>	Input Voltage	--	--	--	--	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	5.8V	I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.7	--	mV/°C

**SC10XX series (SC1044, SC1045, +4.4V output type) (Ta=25°C)**

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V <sub>IN</sub>	Conditions				
V <sub>OUT</sub>	Output Voltage Tolerance	6.4V	I <sub>OUT</sub> = 10mA	4.18	4.4	4.62	V
I <sub>OUT</sub>	Output Current	6.4V	--	20	30	--	mA
ΔV <sub>OUT</sub>	Load Regulation	6.4V	1mA ≤ I <sub>OUT</sub> ≤ 30mA	--	60	100	mV
V <sub>DIF</sub>	Voltage Drop	--	I <sub>OUT</sub> = 1mA	--	60	--	mV
I <sub>SS</sub>	Current Consumption	6.4V	No load	--	3.0	7.5	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	--	5.4V ≤ V <sub>IN</sub> ≤ 12V I <sub>OUT</sub> = 1mA	--	0.2	--	%/V
V <sub>IN</sub>	Input Voltage	--	--	--	--	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	6.4V	I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.7	--	mV/°C

**SC10XX series (SC1050, SC1051, +5.0V output type) (Ta=25°C)**

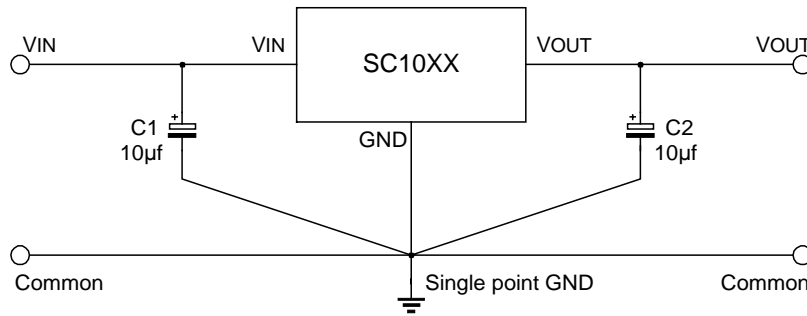
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V <sub>IN</sub>	Conditions				
V <sub>OUT</sub>	Output Voltage Tolerance	7V	I <sub>OUT</sub> = 10mA	4.75	5.0	5.25	V
I <sub>OUT</sub>	Output Current	7V	--	20	30	--	mA
ΔV <sub>OUT</sub>	Load Regulation	7V	1mA ≤ I <sub>OUT</sub> ≤ 30mA	--	60	100	mV
V <sub>DIF</sub>	Voltage Drop	--	I <sub>OUT</sub> = 1mA	--	60	--	mV
I <sub>SS</sub>	Current Consumption	7V	No load	--	3.5	9.0	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	--	6V ≤ V <sub>IN</sub> ≤ 12V I <sub>OUT</sub> = 1mA	--	0.2	--	%/V
V <sub>IN</sub>	Input Voltage	--	--	--	--	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	7V	I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.75	--	mV/°C

**SC10XX series (SC1070, SC1071, +7.0V output type) (Ta=25°C)**

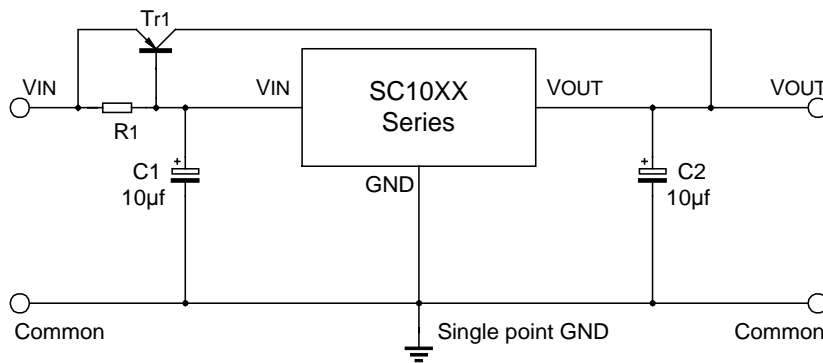
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V <sub>IN</sub>	Conditions				
V <sub>OUT</sub>	Output Voltage Tolerance	9V	I <sub>OUT</sub> = 10mA	6.65	7.0	7.35	V
I <sub>OUT</sub>	Output Current	9V	--	20	30	--	mA
ΔV <sub>OUT</sub>	Load Regulation	9V	1mA ≤ I <sub>OUT</sub> ≤ 30mA	--	60	100	mV
V <sub>DIF</sub>	Voltage Drop	--	I <sub>OUT</sub> = 1mA	--	60	--	mV
I <sub>SS</sub>	Current Consumption	9V	No load	--	5.0	12.5	μA
$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	Line Regulation	--	8V ≤ V <sub>IN</sub> ≤ 12V I <sub>OUT</sub> = 1mA	--	0.2	--	%/V
V <sub>IN</sub>	Input Voltage	--	--	--	--	12	V
$\frac{\Delta V_{OUT}}{\Delta T_a}$	Temperature Coefficient	9V	I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±1.05	--	mV/°C

**TYPICAL APPLICATION CIRCUIT**

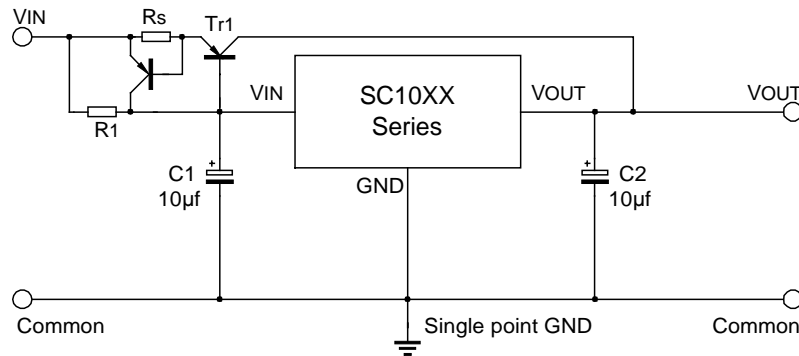
The basic circuits of the SC10XX series



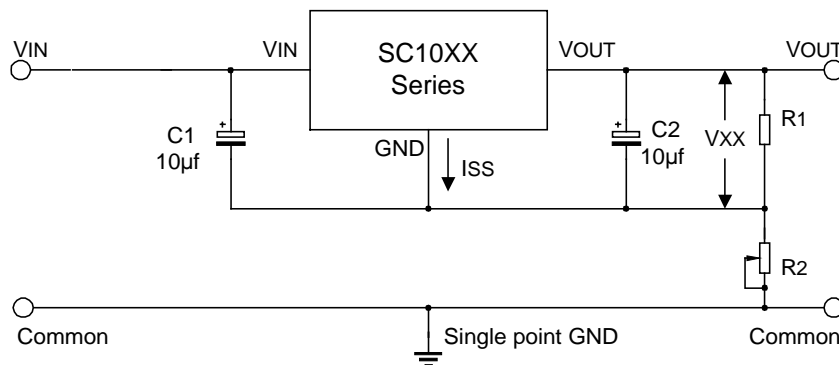
**High output current positive voltage regulator**



**Short-Circuit protection for Tr1**



**Circuit for increasing output voltage**

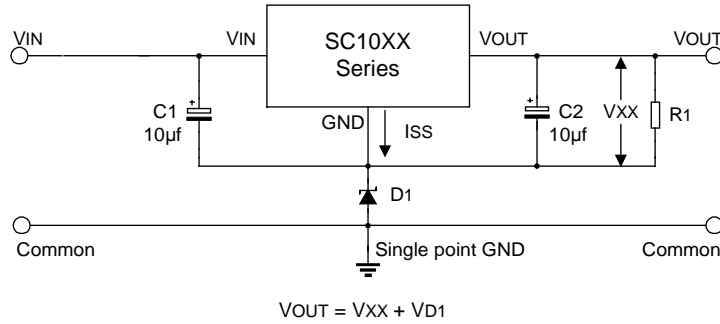


$$V_{OUT} = V_{XX} \cdot \left(1 + \frac{R_2}{R_1}\right) + I_{SS} \cdot R_2$$

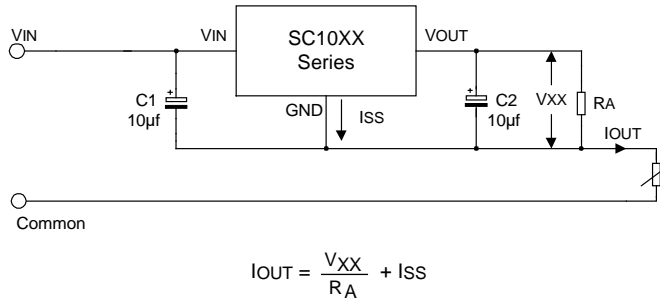
$$\approx V_{XX} \cdot \left(1 + \frac{R_2}{R_1}\right)$$



**Circuit for increasing output voltage**



**Constant current regulator**



**Dual supply**

