

## THREE-TERMINAL LOW POWER VOLTAGE REGULATORS

### DESCRIPTION

The UTC UT10XX 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. The advantage of CMOS technology is low voltage dropout and low quiescent current.

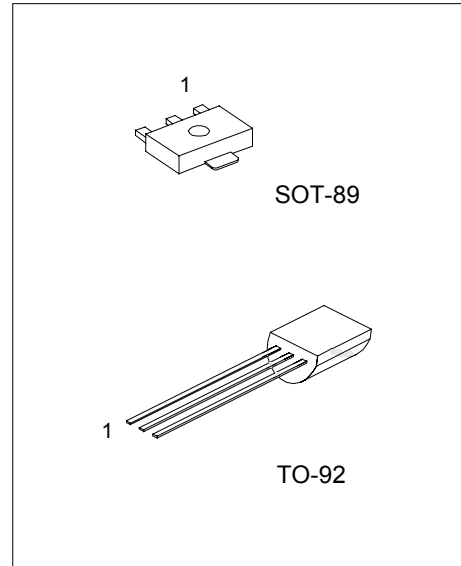
Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain variable voltages and currents.

### FEATURES

- \* Low power consumption
- \*Low voltage dropout
- \*Low temperature coefficient
- \*Wide operating voltage (12V Max.)

### APPLICATIONS

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

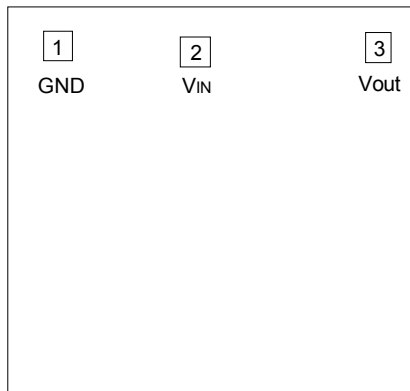


TO-92 : UT10XX-B : 1: VOUT 2: GND 3: VIN

TO-92 : UT10XX-C : 1: GND 2:VIN 3:VOUT

SOT-89 : 1: GND 2:VIN 3:VOUT

### PAD ASSIGNMENT



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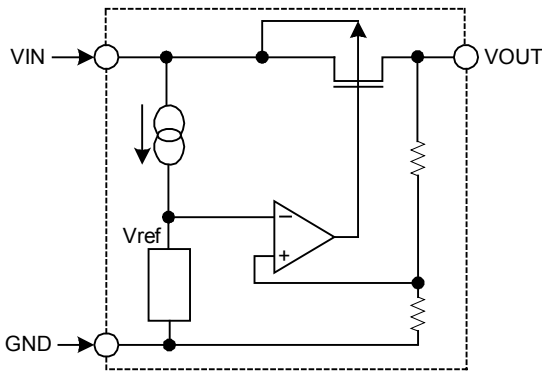
Chip size: 1.34 × 1.30 mm<sup>2</sup>

\*The IC substrate should be connected to VDD in the PCB layout artwork.

PAD NO.	X	Y
1	184	1137
2	615	1121
3	1194	1132

Unit: μ m

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	Vcc	-0.3 ~ +13	V
Power Dissipation	Pd	250	mW
Storage Temperature	Tstg	-50 ~ +125	°C
Operating Temperature	Topr	0 ~ +70	°C

UTC UT1018 (+1.8V output type) ELECTRICAL CHARACTERISTICS (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	VOUT	N=3.8V, IOUT=10mA ±2.4% ±5%	1.757 1.71	1.8 1.8	1.843 1.89	V
Output Current	IOUT	VIN=3.8V	20	30		mA
Load Regulation	ΔVOUT	VIN=3.8V, 1mA ≤ IOUT ≤ 20mA		60	100	mV
Voltage Dropout	Vd	IOUT=1mA		60		mV
Current Consumption	ISS	VIN=3.8V, No load		2.2	6.0	μA
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	2.8V ≤ VIN ≤ 12V, IOUT=0.5mA		0.2		%/V
Input Voltage	VIN				12	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_a}$	VIN=3.8V, IOUT=10mA 0°C < Ta < 70°C		±0.25		mV/°C

## UTC UT1020 ( +2.0V output type) ELECTRICAL CHARACTERISTICS (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>OUT</sub>	V <sub>IN</sub> =4V, I <sub>OUT</sub> =10mA ±2.4% ±5%	1.952 1.9	2.0 2.0	2.048 2.1	V
Output Current	I <sub>OUT</sub>	V <sub>IN</sub> =4V	20	30		mA
Load Regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> =4V, 1mA ≤ I <sub>OUT</sub> ≤ 20mA		60	100	mV
Voltage Dropout	V <sub>d</sub>	I <sub>OUT</sub> =1mA		60		mV
Current Consumption	I <sub>SS</sub>	V <sub>IN</sub> =4V, No load		2.2	6.0	μA
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	3V ≤ V <sub>IN</sub> ≤ 12V, I <sub>OUT</sub> =0.5mA		0.2		%/V
Input Voltage	V <sub>IN</sub>				12	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_a}$	V <sub>IN</sub> =4V, I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.3		mV/°C

## UTC UT1025 ( +2.5V output type) ELECTRICAL CHARACTERISTICS (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>OUT</sub>	V <sub>IN</sub> =4.5V, I <sub>OUT</sub> =10mA ±2.4% ±5%	2.440 2.375	2.5 2.5	2.560 2.625	V
Output Current	I <sub>OUT</sub>	V <sub>IN</sub> =4.5V	20	30		mA
Load Regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> =4.5V, 1mA ≤ I <sub>OUT</sub> ≤ 20mA		60	100	mV
Voltage Dropout	V <sub>d</sub>	I <sub>OUT</sub> =1mA		60		mV
Current Consumption	I <sub>SS</sub>	V <sub>IN</sub> =4.5V, No load		2.2	6.0	μA
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	3.5V ≤ V <sub>IN</sub> ≤ 12V, I <sub>OUT</sub> =0.5mA		0.2		%/V
Input Voltage	V <sub>IN</sub>				12	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_a}$	V <sub>IN</sub> =4.5V, I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.35		mV/°C

## UTC UT1027 ( +2.7V output type) ELECTRICAL CHARACTERISTICS (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>OUT</sub>	V <sub>IN</sub> =4.7V, I <sub>OUT</sub> =10mA ±2.4% ±5%	2.635 2.565	2.7 2.7	2.765 2.835	V
Output Current	I <sub>OUT</sub>	V <sub>IN</sub> =4.7V	20	30		mA
Load Regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> =4.7V, 1mA ≤ I <sub>OUT</sub> ≤ 20mA		60	100	mV
Voltage Dropout	V <sub>d</sub>	I <sub>OUT</sub> =1mA		60		mV
Current Consumption	I <sub>SS</sub>	V <sub>IN</sub> =4.7V, No load		2.5	6.0	μA
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	3.7V ≤ V <sub>IN</sub> ≤ 12V, I <sub>OUT</sub> =0.5mA		0.2		%/V
Input Voltage	V <sub>IN</sub>				12	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_a}$	V <sub>IN</sub> =4.7V, I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.4		mV/°C

## UTC UT1028 ( +2.8V output type) ELECTRICAL CHARACTERISTICS (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>OUT</sub>	V <sub>IN</sub> =4.8V, I <sub>OUT</sub> =10mA ±2.4% ±5%	2.732 2.660	2.8 2.8	2.867 2.940	V
Output Current	I <sub>OUT</sub>	V <sub>IN</sub> =4.8V	20	30	-	mA
Load Regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> =4.8V, 1mA ≤ I <sub>OUT</sub> ≤ 20mA		60	100	mV
Voltage Dropout	V <sub>d</sub>	I <sub>OUT</sub> =1mA		60		mV
Current Consumption	I <sub>SS</sub>	V <sub>IN</sub> =4.8V, No load		2.5	6.0	μA
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	3.8V ≤ V <sub>IN</sub> ≤ 12V, I <sub>OUT</sub> =1mA		0.2		%/V
Input Voltage	V <sub>IN</sub>				12	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_a}$	V <sub>IN</sub> =4.8V, I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.4		mV/°C

## UTC UT1030 ( +3.0V output type) ELECTRICAL CHARACTERISTICS (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>OUT</sub>	V <sub>IN</sub> =5V, I <sub>OUT</sub> =10mA ±2.4% ±5%	2.928 2.850	3.0 3.0	3.072 3.150	V
Output Current	I <sub>OUT</sub>	V <sub>IN</sub> =5V	20	30	-	mA
Load Regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> =5V, 1mA ≤ I <sub>OUT</sub> ≤ 20mA		60	100	mV
Voltage Dropout	V <sub>d</sub>	I <sub>OUT</sub> =1mA		60		mV
Current Consumption	I <sub>SS</sub>	V <sub>IN</sub> =5V, No load		2.5	6.0	μA
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	4V ≤ V <sub>IN</sub> ≤ 12V, I <sub>OUT</sub> =1mA		0.2		%/V
Input Voltage	V <sub>IN</sub>				12	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_a}$	V <sub>IN</sub> =5V, I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.45		mV/°C

## UTC UT1033 ( +3.3V output type) ELECTRICAL CHARACTERISTICS (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>OUT</sub>	V <sub>IN</sub> =5.5V, I <sub>OUT</sub> =10mA ±2.4% ±5%	3.220 3.135	3.3 3.3	3.379 3.465	V
Output Current	I <sub>OUT</sub>	V <sub>IN</sub> =5.5V	20	30		mA
Load Regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> =5.5V, 1mA ≤ I <sub>OUT</sub> ≤ 30mA		60	100	mV
Voltage Dropout	V <sub>d</sub>	I <sub>OUT</sub> =1mA		60		mV
Current Consumption	I <sub>SS</sub>	V <sub>IN</sub> =5.5V, No load		2.5	6.0	μA
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	4.5V ≤ V <sub>IN</sub> ≤ 12V, I <sub>OUT</sub> =1mA		0.2		%/V
Input Voltage	V <sub>IN</sub>				12	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_a}$	V <sub>IN</sub> =5.5V, I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.5		mV/°C

## UTC UT1036 ( +3.6V output type) ELECTRICAL CHARACTERISTICS (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>OUT</sub>	V <sub>IN</sub> =5.6V, I <sub>OUT</sub> =10mA ±2.4% ±5%	3.513 3.420	3.6 3.6	3.686 3.780	V
Output Current	I <sub>OUT</sub>	V <sub>IN</sub> =5.6V	20	30		mA
Load Regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> =5.6V, 1mA ≤ I <sub>OUT</sub> ≤ 30mA		60	100	mV
Voltage Dropout	V <sub>d</sub>	I <sub>OUT</sub> =1mA		60		mV
Current Consumption	I <sub>SS</sub>	V <sub>IN</sub> =5.6V, No load		3.0	7.0	μA
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	4.6V ≤ V <sub>IN</sub> ≤ 12V, I <sub>OUT</sub> =1mA		0.2		%/V
Input Voltage	V <sub>IN</sub>				12	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_a}$	V <sub>IN</sub> =5.6V, I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.6		mV/°C

## UTC UT1044 ( +4.4V output type) ELECTRICAL CHARACTERISTICS (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>OUT</sub>	V <sub>IN</sub> =6.4V, I <sub>OUT</sub> =10mA ±2.4% ±5%	4.294 4.180	4.4 4.4	4.505 4.620	V
Output Current	I <sub>OUT</sub>	V <sub>IN</sub> =6.4V	20	30		mA
Load Regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> =6.4V, 1mA ≤ I <sub>OUT</sub> ≤ 30mA		60	100	mV
Voltage Dropout	V <sub>d</sub>	I <sub>OUT</sub> =1mA		60		mV
Current Consumption	I <sub>SS</sub>	V <sub>IN</sub> =6.4V, No load		3.0	7.5	μA
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	5.4V ≤ V <sub>IN</sub> ≤ 12V, I <sub>OUT</sub> =1mA		0.2		%/V
Input Voltage	V <sub>IN</sub>				12	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_a}$	V <sub>IN</sub> =6.4V, I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.7		mV/°C

## UTC UT1050 ( +5.0V output type) ELECTRICAL CHARACTERISTICS (Ta=25°C)

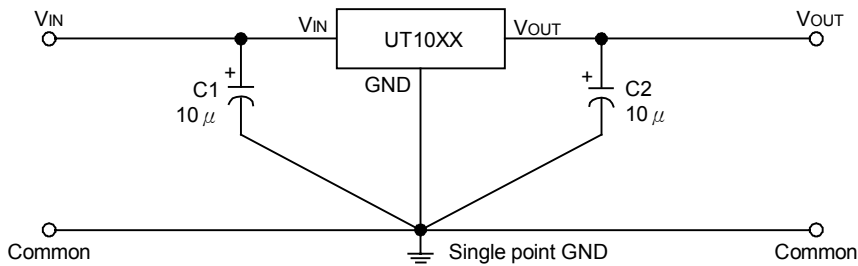
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V <sub>OUT</sub>	V <sub>IN</sub> =7V, I <sub>OUT</sub> =10mA ±2.4% ±5%	4.88 4.75	5.0 5.0	5.12 5.25	V
Output Current	I <sub>OUT</sub>	V <sub>IN</sub> =7V	20	30		mA
Load Regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> =7V, 1mA ≤ I <sub>OUT</sub> ≤ 30mA		60	100	mV
Voltage Dropout	V <sub>d</sub>	I <sub>OUT</sub> =1mA		60		mV
Current Consumption	I <sub>SS</sub>	V <sub>IN</sub> =7V, No load		3.5	9.0	μA
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	6V ≤ V <sub>IN</sub> ≤ 12V, I <sub>OUT</sub> =1mA		0.2		%/V
Input Voltage	V <sub>IN</sub>				12	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_a}$	V <sub>IN</sub> =7V, I <sub>OUT</sub> =10mA 0°C < T <sub>a</sub> < 70°C		±0.75		mV/°C

## UTC UT1070 (+7.0V output type) ELECTRICAL CHARACTERISTICS (Ta=25°C)

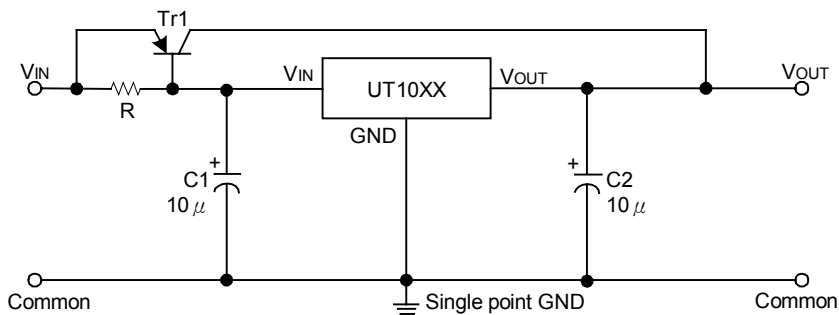
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_{OUT}$	$V_{IN}=9V, I_{OUT}=10mA$ $\pm 2.4\%$ $\pm 5\%$	6.832 6.65	7.0 7.0	7.168 7.35	V
Output Current	$I_{OUT}$	$V_{IN}=9V$	20	30		mA
Load Regulation	$\Delta V_{OUT}$	$V_{IN}=9V, 1mA \leq I_{OUT} \leq 30mA$		60	100	mV
Voltage Dropout	$V_d$	$I_{OUT}=1mA$		60		mV
Current Consumption	$I_{SS}$	$V_{IN}=9V, \text{No load}$		5.0	12.5	$\mu A$
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	$8V \leq V_{IN} \leq 12V, I_{OUT}=1mA$		0.2		%/V
Input Voltage	$V_{IN}$				12	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_a}$	$V_{IN}=9V, I_{OUT}=10mA$ $0^\circ C < T_a < 70^\circ C$		$\pm 1.05$		mV/°C

### APPLICATION CIRCUIT

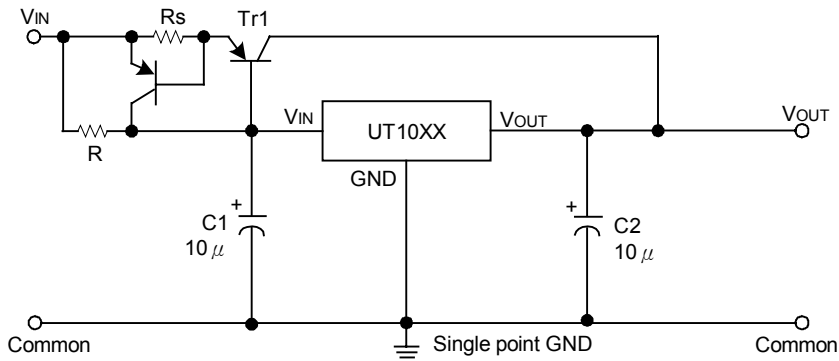
The basic circuits using the UT10XX series



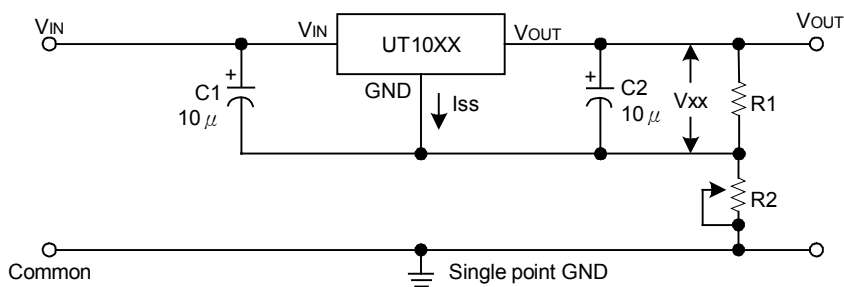
High output current positive voltage regulator



Short-circuit protection for Tr1



Circuit for increasing output voltage

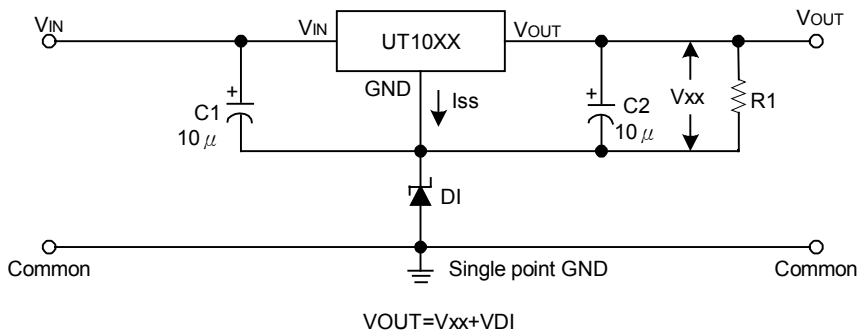


$$V_{OUT} = V_{xx} \left( 1 + \frac{R_2}{R_1} \right) + I_{SS} R_2$$

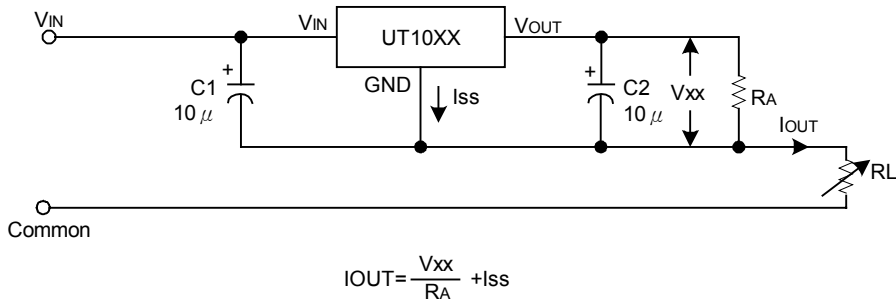
$$\approx V_{xx} \left( 1 + \frac{R_2}{R_1} \right)$$

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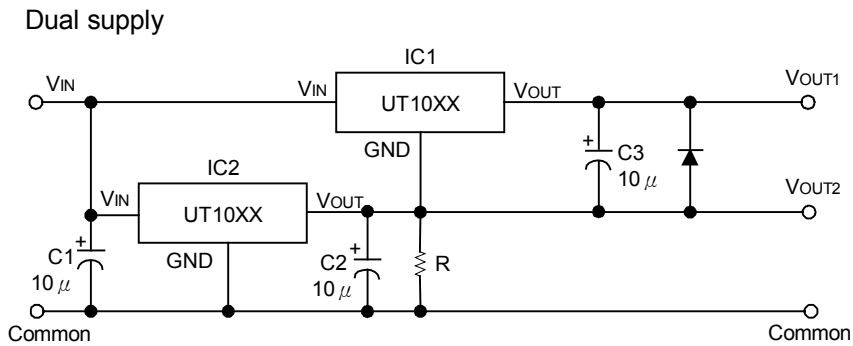
Circuit for increasing output voltage



Constant current regulator







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