

2A 150KHZ DC switching voltage stabilizing circuit

Summary

LM2595 is a PWM DC-DC stabilized power converter with fixed frequency of 150KHz. It has the characteristics of 2A output current driving capability, high efficiency, low ripple, high linear regulation rate and load regulation rate. The chip adopts PWM modulation mode to adjust the linear range of duty cycle from 0 to 100%.

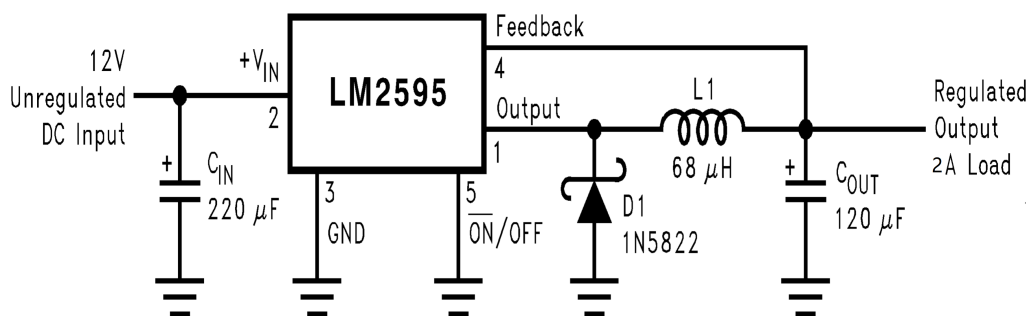
LM2595 has a built-in fixed frequency oscillator and frequency compensation module, which is simple to use and requires only a few external components. In addition, the chip also has built-in functions such as enabling with hysteresis function, over-temperature protection, over-current protection and stimulation over-current protection. When the secondary overcurrent protection occurs, the chip's built-in frequency reduction function reduces the working frequency from 150KHz to 50KHz.

Characteristic

- The input voltage range is 4.5V to 40V.
- The regulated output has 3.3V, 5V, 12V and output adjustable versions, and the adjustable range of the output adjustable version is 1.23V to 37v.
- The duty ratio can be adjusted from 0% to 100%
- The minimum saturation pressure drop is 1.5V
- 150KHz fixed working frequency
- 2A Fixed current output capability
- ON-OFF hysteresis switch function
- Built-in over-temperature protection and over-current protection
- Built-in frequency compensation function
- High working efficiency, linear adjustment rate and load adjustment rate

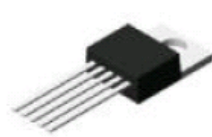
Application

- Simple High-Efficiency Step-Down (Buck) Regulator
- Efficient Preregulator for Linear Regulators
- On-Card Switching Regulators
- Positive-to-Negative Converter

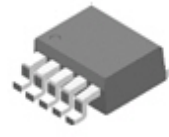


2A 150KHZ DC switching voltage stabilizing circuit

Package Types

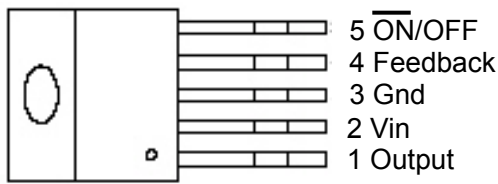


TO220-5L

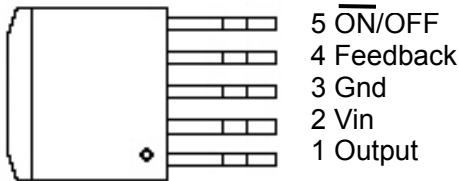


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Pin Assignments



TO220-5L



TO263-5L

Pin Descriptions

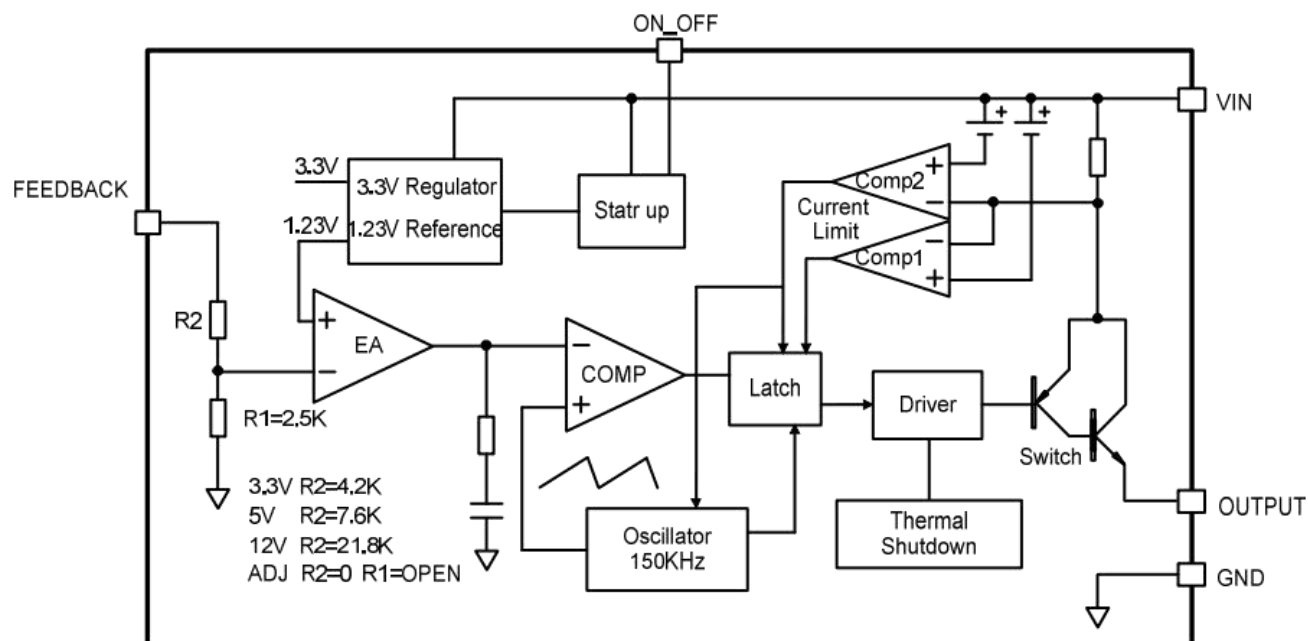
Name	Description
Vin	Input supply voltage
Output	Switching output
Gnd	Ground
Feedback	Output voltage feedback
ON/OFF	ON/OFF shutdown Active is "Low" or floating

Pin description

Pin number	Pin name	I/O	Functional description
1	OUTPUT	O	Output pin of power tube. The output pin of the power tube is a switch node, which supplies power to the output load.
2	VIN	I	Power supply input pin. It is necessary to provide a DC power supply in the range of 4.5V~40V when working. Connect a capacitor with a large capacity in parallel between the power supply pin and the ground to eliminate power supply noise.
3	GND	-/O	Ground pin. It is necessary to pay attention to the layout, and this pin should be placed on the path from the output point outside the Schott diode to the ground to prevent the noise caused by the switching current spike.
4	FEEDBACK	I/O	Voltage feedback pin. The voltage feedback terminal monitors and controls the output voltage through a resistor voltage dividing network of ten thousand units. The threshold voltage of the feedback terminal is 1.23V v.
5	ON_OFF	I	Enable the switch pin. The switch pin makes the chip work by applying a position: applying a high potential to turn off the chip. When it floats, it defaults to low potential.

Internal block diagram

2A 150KHZ DC switching voltage stabilizing circuit



Limit parameter

parameter	symbol	range	unit
Input power supply voltage LM2595	V_{IN}	~40	V
Voltage feedback terminal voltage	V_{FB}	-0.3~ V_{IN}	V
Switching terminal voltage	V_{ON_OFF}	-0.3~ V_{IN}	V
Output terminal voltage of power tube	V_{OUTPUT}	-0.3~ V_{IN}	V
power consumption	P_D	Internal restriction	m/W
Working temperature saving	T_J	-40~125	°C
Storage temperature	T_{STG}	-65~150	°C
Welding wire temperature	T_{LEAD}	260	°C
ESD capability (human discharge mode)	ESD	2000	V

Note 1: If the value applied to the circuit is greater than the maximum value of the parameters in the above table, it may cause permanent damage to the chip. The reliability of the chip may be affected by operating the chip continuously for several cycles under the above - mentioned limit conditions.

Recommended working conditions

parameter	symbol	range	unit
Input voltage LM2595	V_{IN}	5~40	V
Operating junction temperature range	T_J	-40~+125	°C

2A 150KHZ DC switching voltage stabilizing circuit

Electrical characteristics (unless otherwise specified, the parameters shown in black font,

 $T_{amb}=25^{\circ}\text{C}$, normal working junction temperature range $-40^{\circ}\text{C}\sim 125^{\circ}\text{C}$)

Electrical characteristics LM2595 -3.3

 $T_a=25^{\circ}\text{C}$; Unless otherwise specified.

parameter	symbol	test condition	minimum value	typical value	maximum	unit
System parameters Figure 5						
Output regulated value LM2595-3.3	V_{OUT}	$V_{IN}=4.75\text{V} \sim 40\text{V}$ $I_{LOAD}=0.2\text{A} \sim 2\text{A}$	3.168	3.3	3.432	V
efficiency	n	$V_{IN}=12\text{V}, V_{OUT}=5\text{V}$ $I_{LOAD}=2\text{A}$		73		%

Electrical characteristics LM2595 -5.0

 $T_a=25^{\circ}\text{C}$; Unless otherwise specified.

parameter	symbol	test condition	minimum value	typical value	maximum	unit
System parameters Figure 5						
Output regulated value LM2595-5.0	V_{OUT}	$V_{IN}=7\text{V} \sim 40\text{V}$ $I_{LOAD}=0.2\text{A} \sim 2\text{A}$	4.8	5	5.2	V
efficiency	n	$V_{IN}=12\text{V}, V_{OUT}=5\text{V}$ $I_{LOAD}=2\text{A}$		80		%

Electrical characteristics LM2595 -12

 $T_a=25^{\circ}\text{C}$; Unless otherwise specified.

parameter	symbol	test condition	minimum value	typical value	maximum	unit
System parameters Figure 5						
Output regulated value LM2595-12	V_{OUT}	$V_{IN}=15\text{V} \sim 40\text{V}$ $I_{LOAD}=0.2\text{A} \sim 2\text{A}$	11.52	12	12.48	V
efficiency	n	$V_{IN}=25\text{V}, V_{OUT}=5\text{V}$ $I_{LOAD}=2\text{A}$		90		%

Electrical characteristics LM2595 -ADJ

 $T_a=25^{\circ}\text{C}$; Unless otherwise specified.

parameter	symbol	test condition	minimum value	typical value	maximum	unit
System parameters Figure 5						
Output regulated value LM2595-ADJ	V_{OUT}	$V_{IN}=4.5\text{V} \sim 40\text{V}$ $I_{LOAD}=0.2\text{A} \sim 2\text{A}$	1.193	1.23	1.267	V
efficiency	n	$V_{IN}=12\text{V}, V_{OUT}=3\text{V}$ $I_{LOAD}=2\text{A}$		73		%

2A 150KHZ DC switching voltage stabilizing circuit
DC parameters of all electrical appliances

3.3V, 5V, ADJ version, $V_{IN}=12V$; 12V version, $V_{IN}=24V$. $GND = 0$, and a $220\mu F/50V$ capacitor is connected in parallel between vin and gnd .

$I_{OUT}=500mA, T_a=25^\circ C$. Unless otherwise specified.

parameter	symbol	test condition	minimum value	typical value	maximum	unit
Input working voltage	V_{IN}		4.5		40	V
Standby current	I_{STBY}	$V_{ON_OFF}=5V$		80	200	μA
Static working current	I_Q	$V_{ON_OFF}=0V$, $V_{FB}=V_{IN}$		2	10	mA
Working frequency	F_{OSC}		127	150	173	kHz
Limit current	I_L	$V_{FB}=0$	2.2	3	4.5	A
Threshold voltage of switch pin	V_{ON_OFF}	Hight (control off) low(control on)		1.4 0.8		V
Switch pin leakage	I_H	$V_{ON_OFF}=2.5V(ON)$		5	15	μA
	I_L	$V_{ON_OFF}=2.5V(ON)$		0.2	5	μA
saturation voltage	V_{CE}	$V_{FB}=0V$ $L_{OUT}=3A$		1.3	1.5	V
Maximum duty cycle	D_{MAX}	$C_{FB}=0V$		100		%
Thermal resistance coefficient (without fins) TO220, TO263 Encapsulation)	R_{JA}			50		$^\circ C/W$

Functional description

LM2595 is a voltage-drop regulated DC power converter, whose main function is to convert high-voltage DC voltage with large noise and ripple into low-voltage DC regulated output with small ripple and noise. There are four different versions of LM2595. The four versions are divided into different output regulated values, namely 3.3V, 5V, 12V and adjustable output voltage versions. On-chip provides over-temperature protection function and current limiting protection function.

2A 150KHZ DC switching voltage stabilizing circuit

LM2595 series step-down regulator design program (fixed output)

condition			Inductor (L1)	Output capacitance (COUT)			
				Through hole electrolysis		Surface mount tantalum	
Output voltage (V)	load current (A)	Maximum input voltage (V)	inductance (uh)	PanasonicHFQ Series (uf/V)	NichiconPL Series (uf/V)	AVX TPS Series (uf/V)	Sprague 595D Series (uf/V)
3.3	2	5	22	470/25	560/16	330/6.3	390/6.3
		7	22	560/35	560/35	330/6.3	390/6.3
		10	22	680/35	680/35	330/6.3	390/6.3
	1	40	33	560/35	470/35	330/6.3	390/6.3
		6	22	470/25	470/35	330/6.3	390/6.3
		10	33	330/35	330/35	330/6.3	390/6.3
5	2	40	47	330/35	270/50	220/10	330/10
		22	22	470/25	560/16	220/10	330/10
		10	22	560/25	560/25	220/10	330/10
	1	15	33	330/35	330/35	220/10	330/10
		9	22	470/25	560/16	220/10	330/10
		20	68	180/35	180/35	100/10	270/10
12	2	40	68	180/35	180/35	100/10	270/10
		15	22	470/25	470/25	100/16	180/16
		18	33	330/25	330/25	100/16	180/16
	1	30	68	180/25	180/25	100/16	120/20
		40	68	180/35	180/25	100/16	120/20
		15	33	330/25	330/25	100/16	180/16
1	20	68	180/25	180/25	100/16	120/20	
	40	150	82/25	82/25	68/20	68/25	

2A 150KHZ DC switching voltage stabilizing circuit
LM2595 series step-down regulator design program (adjustable output)

Output voltage (V)	Through hole output electrolysis			Surface mount output capacitor		
	Panasonic HFQ Series (uf/V)	NichiconPL Series (uf/V)	Feedforward capacitance	AVX TPS Series (uf/V)	Sprague 595D Series (uf/V)	Feedforward capacitance
2	820/35	820/35	33nf	330/6.3	470/4	33nf
4	560/35	470/35	10nf	330/6.3	390/6.3	10nf
6	470/25	470/35	3.3nf	220/10	330/10	3.3nf
9	330/25	330/25	1.5nf	100/16	180/16	1.5nf
12	330/25	330/25	1nf	100/16	180/16	1nf
15	220/25	220/35	680pf	68/20	120/20	680pf
24	220/35	150/35	560pf	33/25	33/25	220pf
28	100/50	100/50	390pf	10/35	15/50	220pf

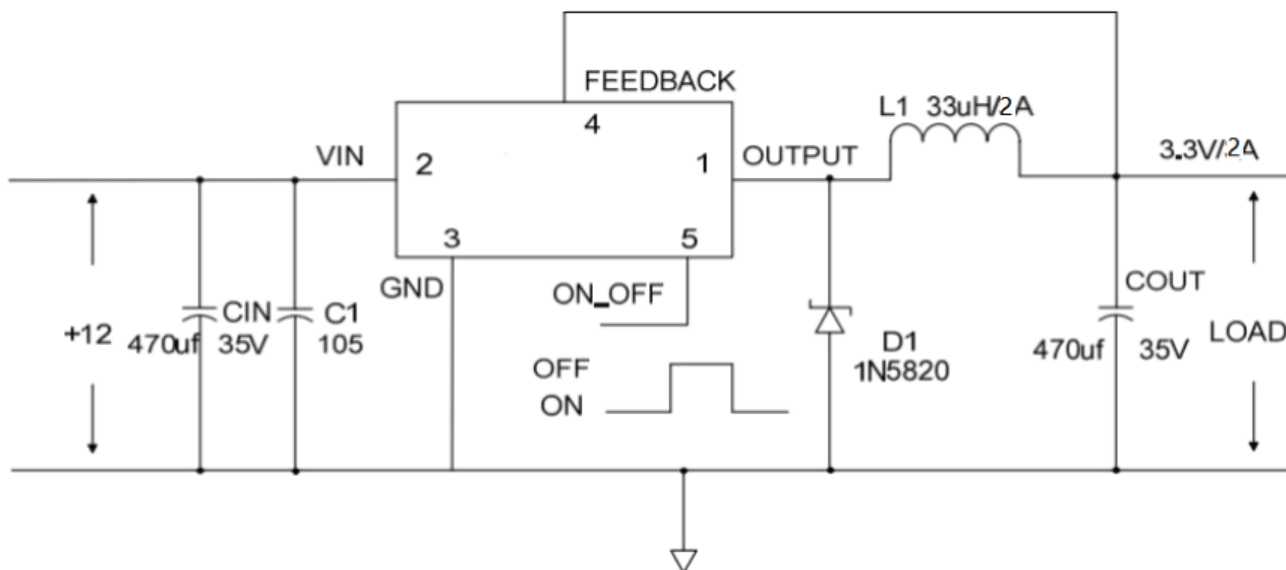
Schottky diode selection table

present	Surface mounting	Through hole installation	VR (same as the maximum input voltage of the system)				
			20V	30V	40V	50V	60V
1A		√	1N5817	1N5818	1N5819		
3A		√	1N5820	1N5821	1N5822		
		√	MBR320	MBR330	MBR340	MBR350	MBR360
	√		SK32	SK33	SK34	SK35	SK36
	√			30WQ03	30WQ04	30WQ05	
		√		31DQ03	31DQ04	31DQ05	
		√		SR302	SR303	SR304	SR305

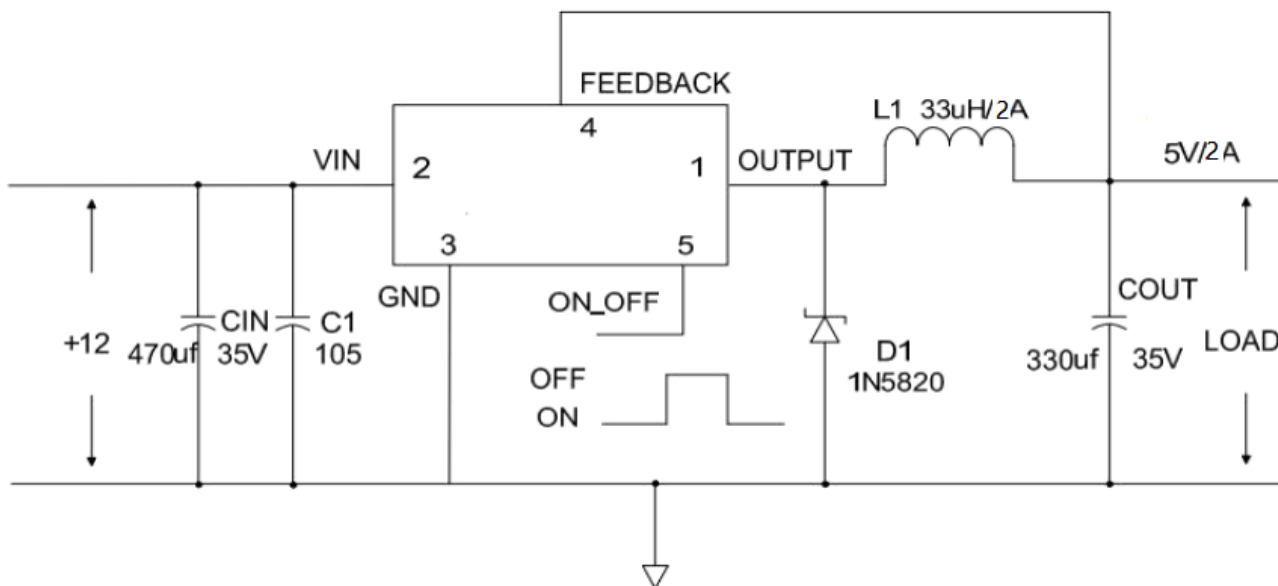
2A 150KHZ DC switching voltage stabilizing circuit

Typical application circuit diagram

3.3V output regulated version

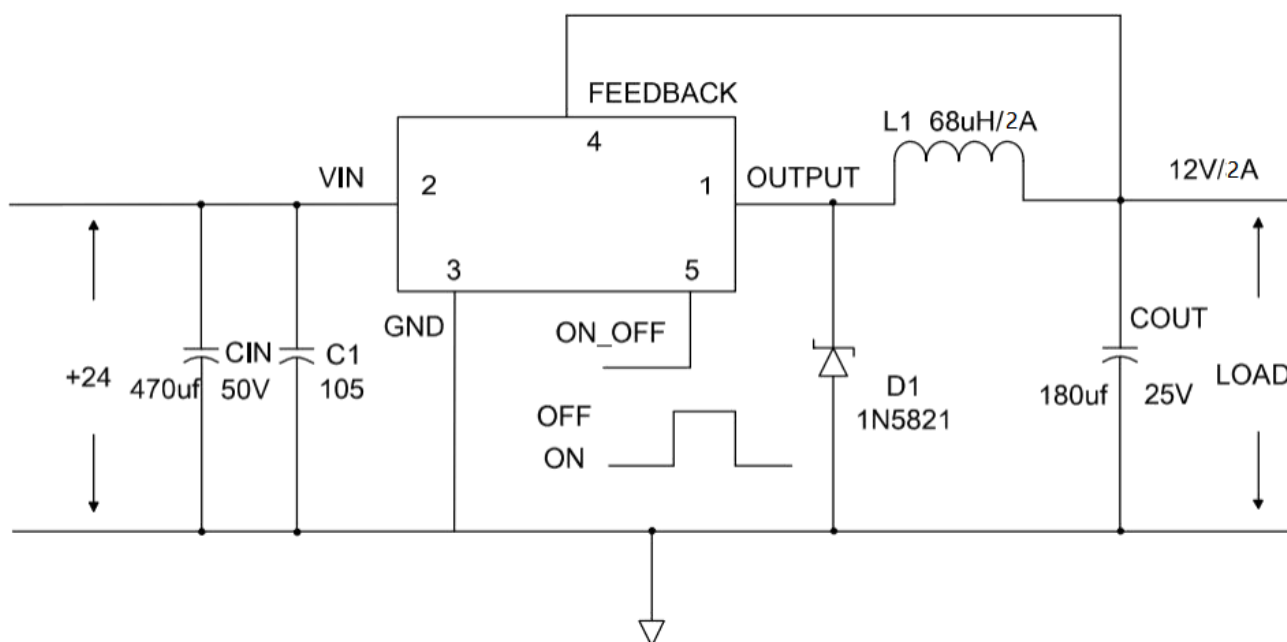


5.0V output regulated version

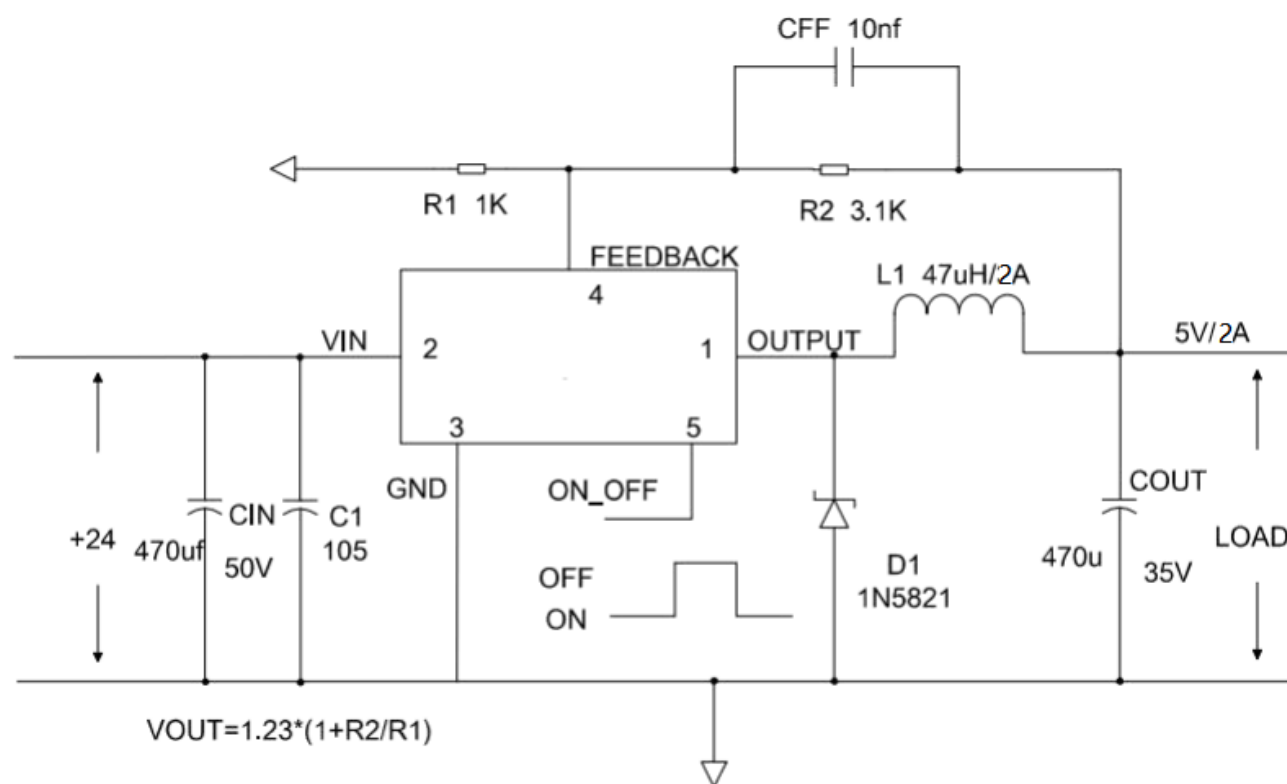


2A 150KHZ DC switching voltage stabilizing circuit

12V output regulated version



Output adjustable version

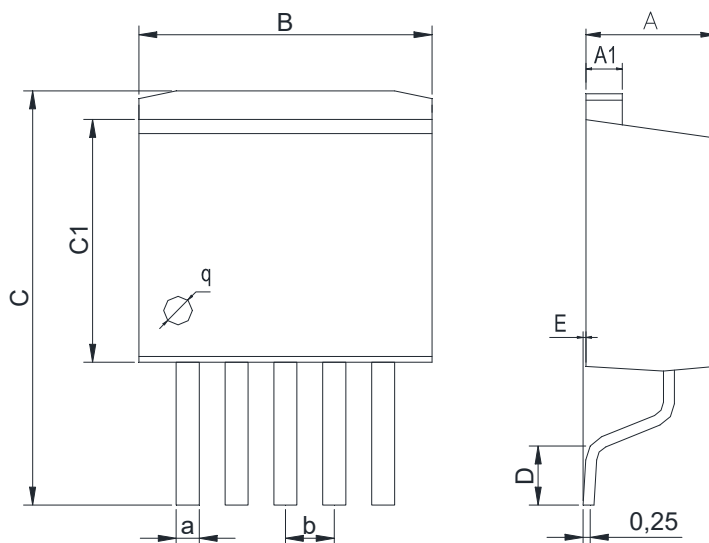


$$V_{OUT} = 1.23 * (1 + R2/R1)$$

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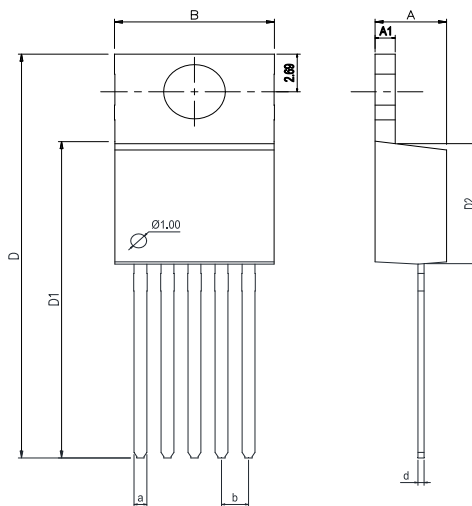
Package external dimension

TO263-5



Dimensions In Millimeters(TO263-5)									
Symbol:	A	A1	B	C	C1	D	E	a	b
Min:	4.45	1.22	10	13.7	8.40	1.90	0	0.71	1.70BSC
Max:	4.62	1.32	10.4	14.6	8.90	2.10	0.20	0.97	

TO220-5



Dimensions In Millimeters(TO220-5)									
Symbol:	A	A1	B	D	D1	D2	a	d	b
Min:	4.52	1.25	10	28.6	22.4	8.69	1.68	0.33	1.70BSC
Max:	4.62	1.29	10.3	28.8	22.6	8.79	1.77	0.42	

Ordering information

Order code	Package	Baseqty	Deliverymode
UMW LM2595S-3.3	TO-263	500	Tape and reel
UMW LM2595S-5.0	TO-263	500	Tape and reel
UMW LM2595S-12	TO-263	500	Tape and reel
UMW LM2595S-ADJ	TO-263	500	Tape and reel
UMW LM2595T-3.3	TO-220	1000	Tube and box
UMW LM2595T-5.0	TO-220	1000	Tube and box
UMW LM2595T-12	TO-220	1000	Tube and box
UMW LM2595T-ADJ	TO-220	1000	Tube and box