

1.Description

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.

3.Applications

- Simple High-Efficiency Step-Down (Buck) Regulator
- Efficient Preregulator for Linear Regulators

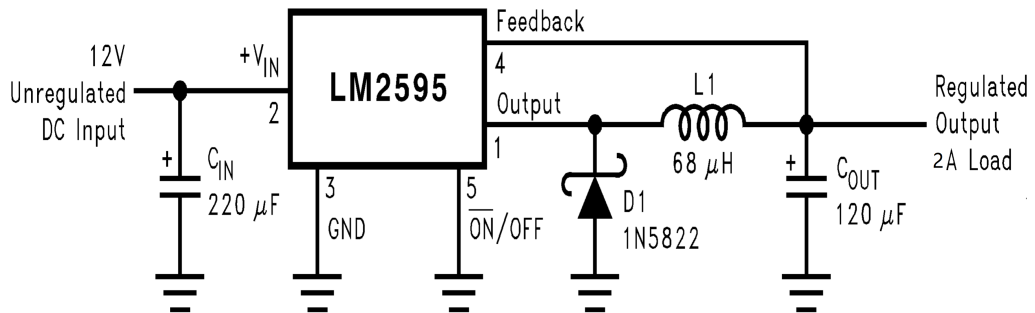
2.Features

- 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

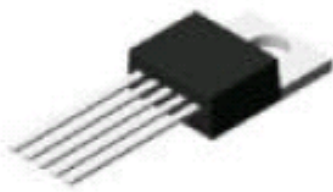
- On-Card Switching Regulators
- Positive-to-Negative Converter



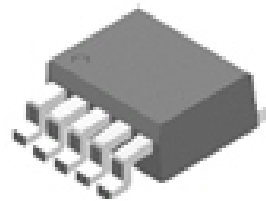
4. Typical Application (Fixed Output Voltage Versions)



5. Package Types



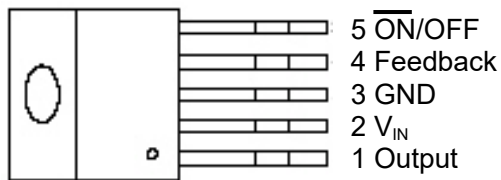
TO-220



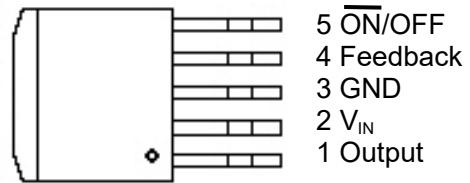
TO-263



6. Pinning information



TO-220



TO-263

Pin Descriptions

Name	Description
V_{IN}	Input supply voltage
Output	Switching output
GND	Ground
Feedback	Output voltage feedback
ON/OFF	ON/OFF shutdown Active is "Low" or floating

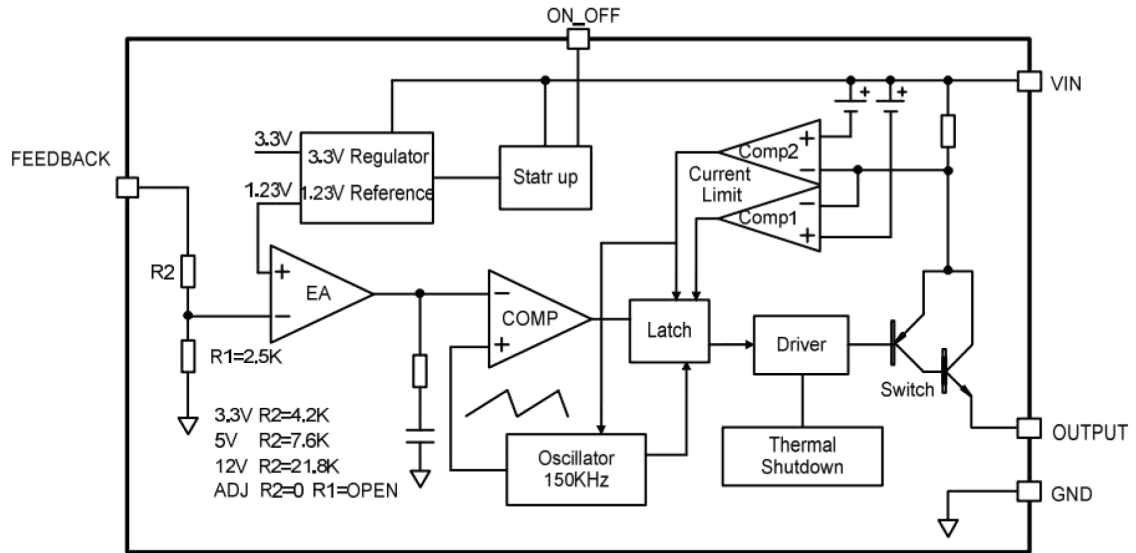


Pin Descriptions

Pin Number	Pin Name	I/O	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	V _{IN}	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.
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.



7. Internal Block Diagram





8.Limit Parameter

Parameter	Symbol	Value	Value
Input power supply voltage LM2595	V_{IN}	45	V
Voltage feedback terminal voltage	V_{FB}	-0.3 to 25	V
Switching terminal voltage	V_{ON-OFF}	-0.3 to 25	V
Output voltage to ground (steady-state)		-1	V
power consumption	P_D	Internally limited	mW
Working temperature saving	T_J	-40 to 125	°C
Storage temperature	T_{STG}	-65 to 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.

9.Recommended Working Conditions

Parameter	Symbol	Value	Value
Input voltage LM2595	V_{IN}	5~40	V
Operating junction temperature range	T_J	-40 to 125	°C



10. Electrical Characteristics

T_{amb}=25°C, normal working junction temperature range -40°C~125°C)Electrical characteristics LM2595 -3.3,
T_A=25°C; Unless otherwise specified.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
System Parameters Figure 5 (LM2595-3.3)						
Output regulated value	V _{OUT}	V _{IN} =4.75V to 40V, I _{LOAD} =0.2A to 2A	3.168	3.3	3.432	V
Efficiency	η	V _{IN} =12V, V _{OUT} =5V, I _{LOAD} =2A		73		%
System Parameters Figure 5 (LM2595 - 5.0)						
Output regulated value	V _{OUT}	V _{IN} =7V to 40V, I _{LOAD} =0.2A to 2A	4.8	5	5.2	V
Efficiency	η	V _{IN} =12V, V _{OUT} =5V, I _{LOAD} =2A		80		%
System Parameters Figure 5 (LM2595 -12)						
Output regulated value	V _{OUT}	V _{IN} =15V to 40V, I _{LOAD} =0.2A to 2A	11.52	12	12.48	V
Efficiency	η	V _{IN} =25V, V _{OUT} =5V, I _{LOAD} =2A		90		%
System Parameters Figure 5 (LM2595 -ADJ)						
Output regulated value	V _{OUT}	V _{IN} =4.5V to 40V, I _{LOAD} =0.2A to 2A	1.193	1.23	1.267	V
Efficiency	η	V _{IN} =12V, V _{OUT} =3V, I _{LOAD} =2A		73		%



11.DC Parameters of All Electrical Appliances

3.3V, 5V, ADJ version, $V_{IN}=12V$; 12V version, $V_{IN}=24V$. $GND=0$, and a 220uF/50V capacitor is connected in parallel between vin and GND, $I_{OUT}=500mA$, $T_A=25^{\circ}C$, Unless otherwise specified.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
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}		117	150	183	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)		1.4		V
		low(control on)		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}	$V_{FB}=0$, $L_{OUT}=3A$		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		$^{\circ}C/W$

12.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



13.Series Step- Down Regulator Design Program (Fixed Output)

Conditions			Inductor (L1)	Output Capacitance (COUT)			
				Through Hole Electrolysis		Surface Mount Tantalum	
Output Voltage (V)	Load Current (A)	Max Input Voltage (V)	Inductance (uh)	Panasonic HFQ Series (uf/V)	Nichicon PL 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
		40	33	560/35	470/35	330/6.3	390/6.3
	1	6	22	470/25	470/35	330/6.3	390/6.3
		10	33	330/35	330/35	330/6.3	390/6.3
		40	47	330/35	270/50	220/10	330/10
5	2		22	470/25	560/16	220/10	330/10
		10	22	560/25	560/25	220/10	330/10
		15	33	330/35	330/35	220/10	330/10
		40	47	330/35	270/35	220/10	330/10
	1	9	22	470/25	560/16	220/10	330/10
		20	68	180/35	180/35	100/10	270/10
		40	68	180/35	180/35	100/10	270/10
12	2	15	22	470/25	470/25	100/16	180/16
		18	33	330/25	330/25	100/16	180/16
		30	68	180/25	180/25	100/16	120/20
		40	68	180/35	180/25	100/16	120/20
	1	15	33	330/25	330/25	100/16	180/16
		20	68	180/25	180/25	100/16	120/20
		40	150	82/25	82/25	68/20	68/25



14.Series Step- Down Regulator Design Program (Adjustable Output)

Output Voltage (V)	Through Hole Output Electrolysis			Surface Mount Output Capacitor		
	Panasonic HFQ Series ($\mu\text{F/V}$)	Nichicon PL Series ($\mu\text{F/V}$)	Feedforward Capacitance	AVX TPS Series ($\mu\text{F/V}$)	Sprague 595D Series ($\mu\text{F/V}$)	Feedforward Capacitor
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	470/25	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	220/35	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

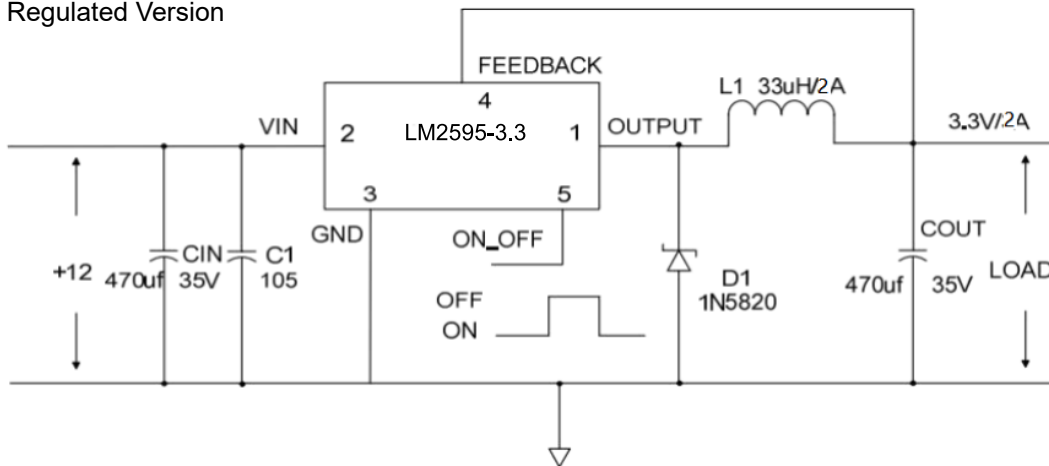
15.Schottky Diode Selection Table

Current	Surface Mount	Through Hole	VR (The same as system maximum input voltage)				
			20V	30V	40V	50V	60V
1A		√	1N5817	1N5818	1N5819		
		√	1N5820	1N5821	1N5822		
3A		√	MBR320	MBR330	MBR340	MBR350	MBR360
	√		SK32	SK33	SK34	SK35	SK36
	√			30WQ03	30WQ04	30WQ05	
		√		31DQ03	31DQ04	31DQ05	
		√	SR302	SR303	SR304	SR305	SR306

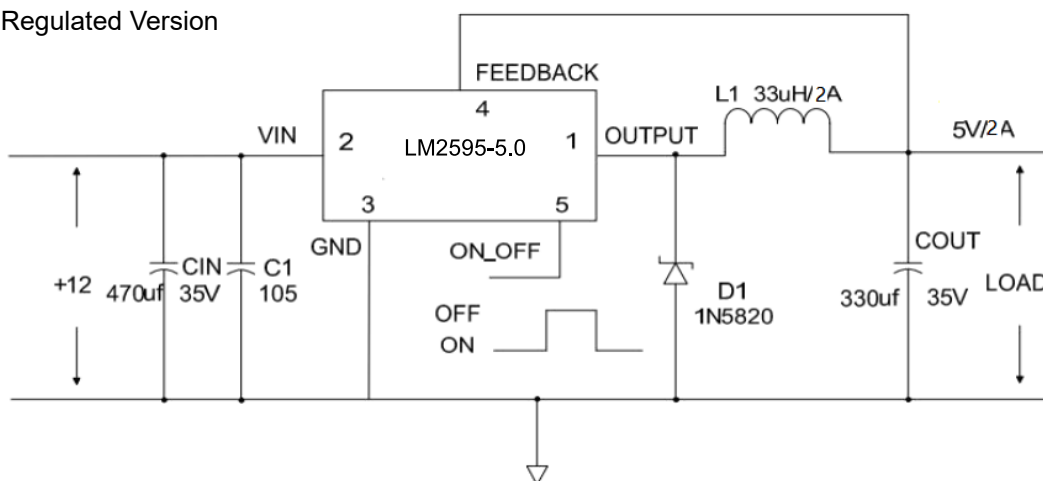


16. Typical Application Circuit Diagram

3.3V Output Regulated Version

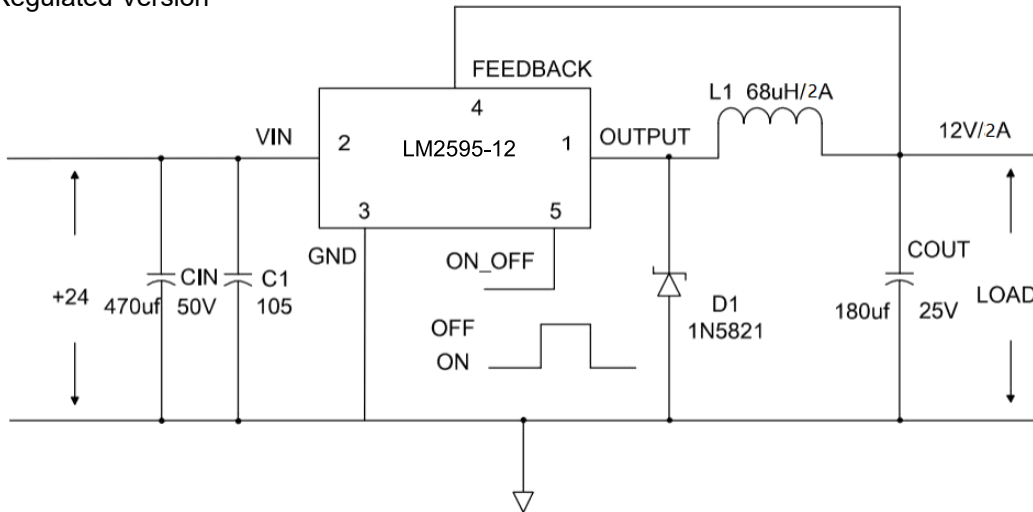


5.0V Output Regulated Version

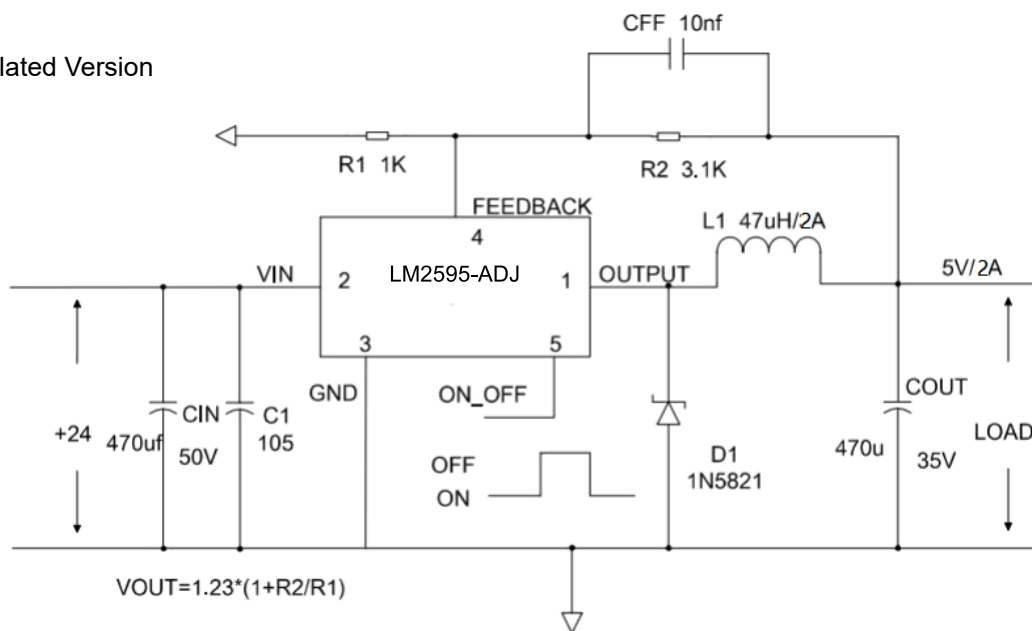




12V Output Regulated Version



Output Regulated Version





17.1 Typical Characteristic

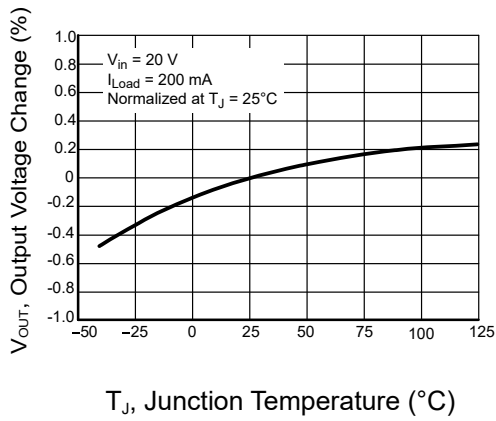


Figure 1: Normalized Output Voltage

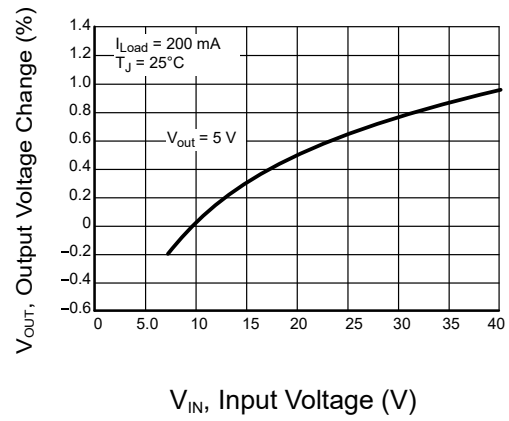


Figure 2: Line Regulation

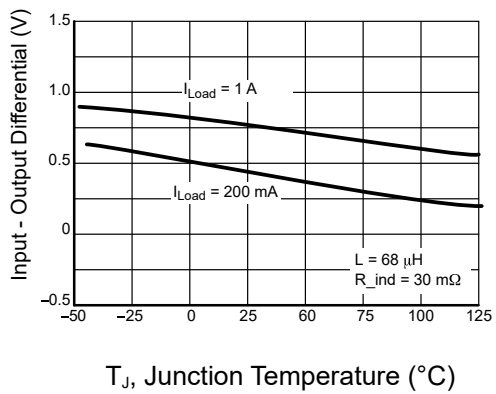


Figure 3: Dropout Voltage

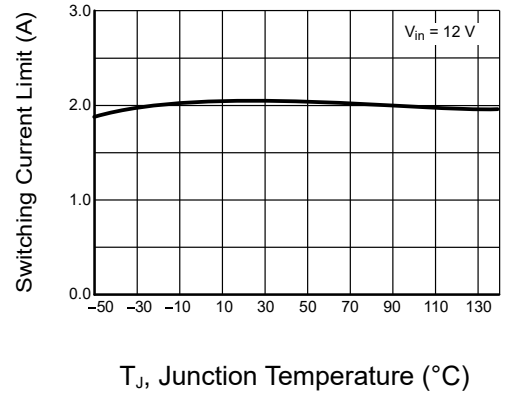


Figure 4: Current Limit

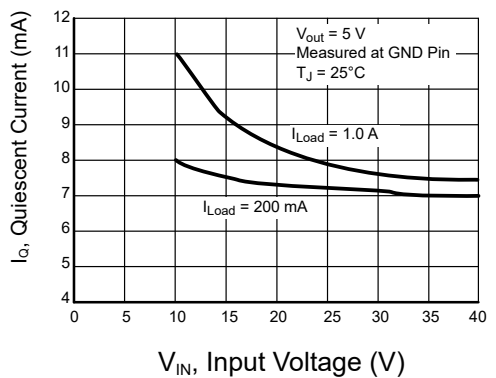


Figure 5: Quiescent Current

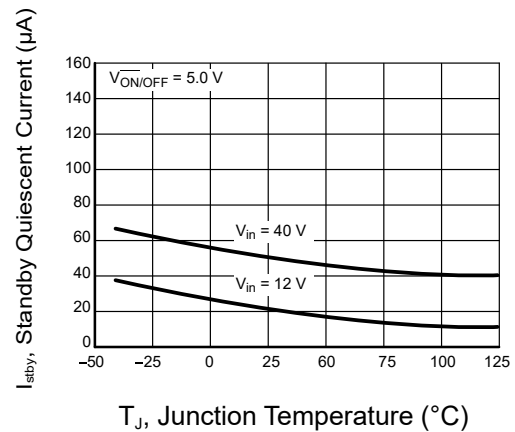


Figure 6: Standby Quiescent Current



17.2 Typical Characteristic

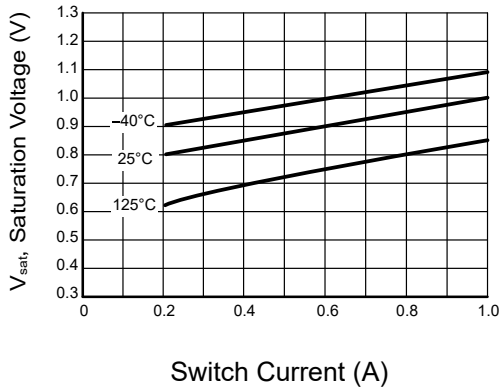


Figure 7: Switch Saturation Voltage

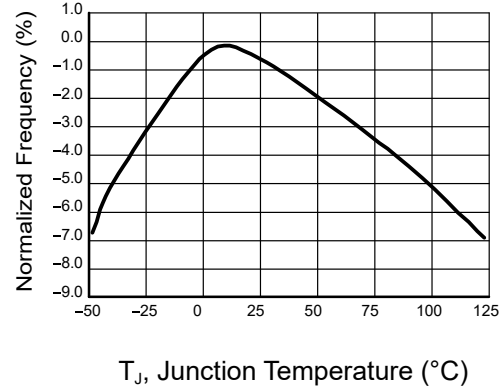


Figure 8: Switching Frequency

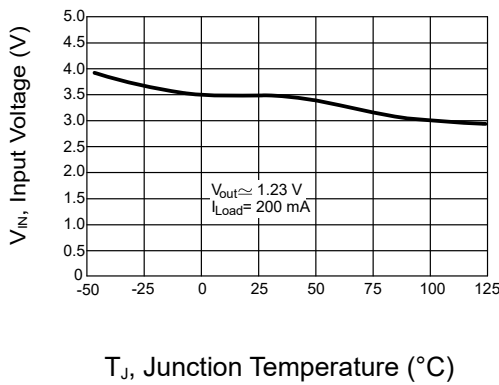


Figure 9: Minimum Supply Operating Voltage

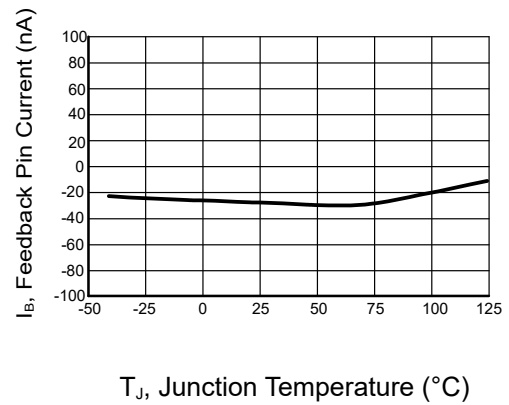


Figure 10: Feedback Pin Current

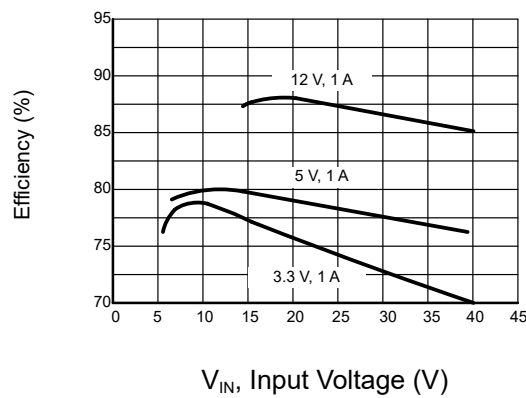
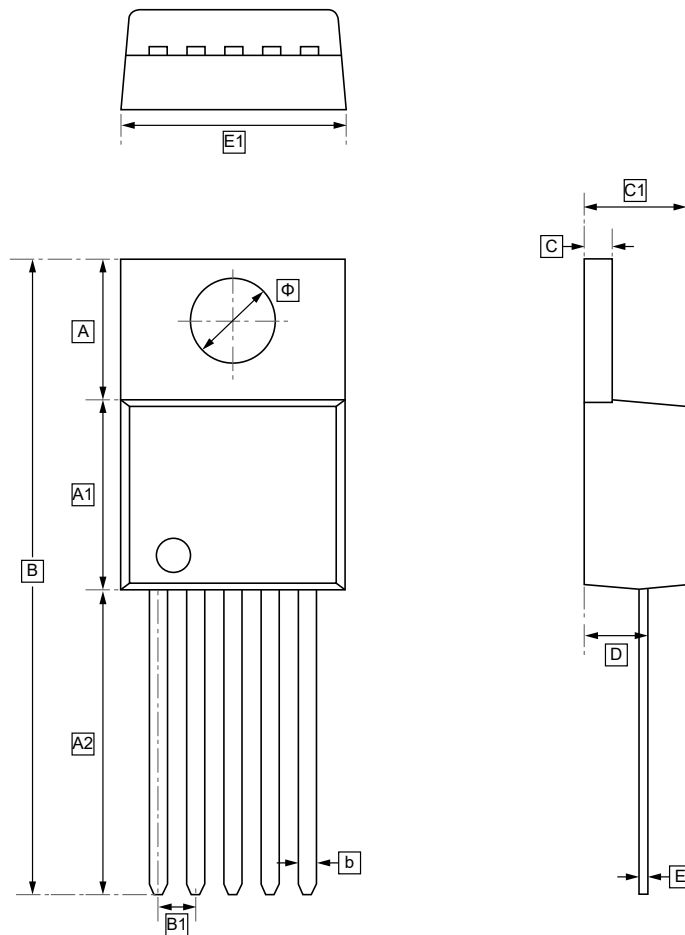


Figure 11: Efficiency



18.1 TO-220 Package Outline Dimensions

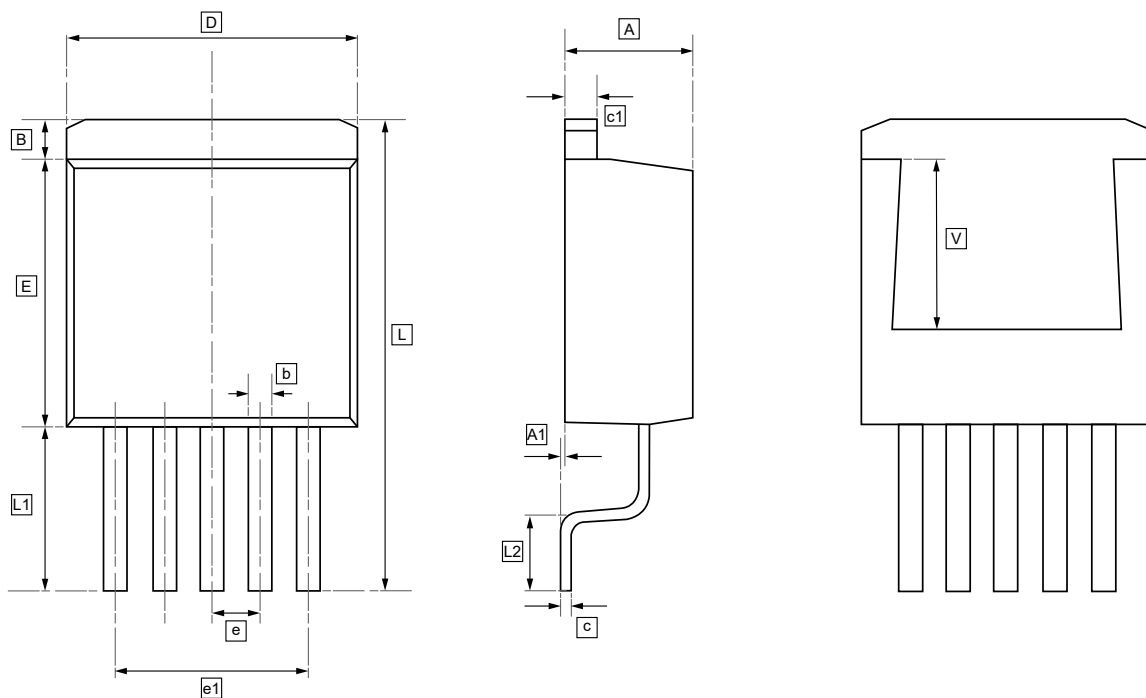


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	B	B1	b	C	C1	D	E	E1	Φ
Min	6.3	8.48	13.67	28.55	1.70	0.75	1.20	0.45	2.38	0.33	10.00	3.80
Max	6.4	8.68	13.97	28.95		0.85	1.30	0.65	2.58	0.43	10.20	3.90



18.2 TO-263 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	B	b	c	c1	D	E	e	e1	L	L1
Min	4.470	0.000	1.560	0.710	0.310	1.170	9.880	8.200	1.700	6.700	15.140	5.080
Max	4.670	0.150	1.760	0.910	0.530	1.370	10.180	8.600	TYP	6.900	15.540	5.480

Symbol	L2	V
Min	2.340	5.600
Max	2.740	REF



19. Ordering Information

UMW yyww
LM2595S
xx P+

yy: Year Code
ww: Week Code
xx: Voltage

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW LM2595S-12	LM2595S	TO-263	800	Tape and reel
UMW LM2595S-3.3	LM2595S	TO-263	800	Tape and reel
UMW LM2595S-5.0	LM2595S	TO-263	800	Tape and reel
UMW LM2595S-ADJ	LM2595S	TO-263	800	Tape and reel



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