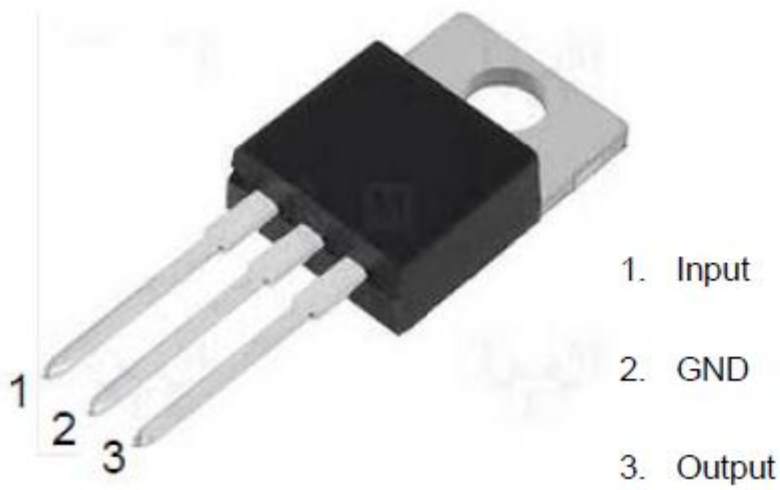
Features

- Output Current of 1.5A
- Thermal Overload Protection
- Short Circuit Protection
- Output transistor safe area protection
- No external components
- Package：TO220
- Output voltage accuracy: tolerance ±2%

General Description

HE78XX is three-terminal positive regulators. One of these regulators can deliver up to 1.5A of output current. The internal limiting and thermal -shutdown features of the regulator make them essentially immune to overload. When used as a replacement for a zener diode-resistor Combination, an effective improvement in output impedance can be obtained, together with lower quiescent current.

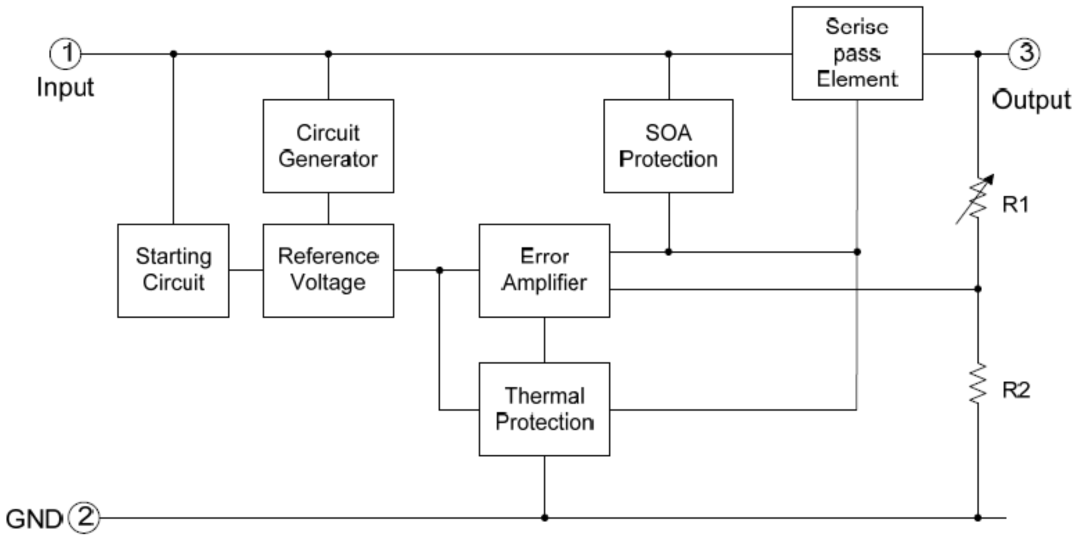
Pin Configuration



Selection Table

Part No.	Output Voltage	Package	Marking
HE7805	5.0V	TO220	
HE7806	6.0V		
HE7808	8.0V		
HE7809	9.0V		
HE7812	12V		

Block Diagram



Absolute Maximum Ratings（Ta=25℃）

Parameter	Rating	Unit
Input supply voltage: VIN	35	V
MAX. Output current:Iout	1500	mA
Maximum junction temperature:Tj	-25~125	℃
Storage temperature:Tstr	-65~125	℃
Soldering temperature and time	+260(Recommended 10S)	℃

Note: The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

Electrical Characteristics

1、HE7805 (refer to the test circuits，TJ = -55 to 150℃ VI = 10V IO = 500 mA，CI = 0.33 μF，CO = 0.1 μF unless otherwise specified)。

Parameter	Symbol	Test Condition		MIN	TYP	MAX	UNIT
Output Voltage	VO	TJ = +25℃		4.9	5	5.1	V
		IO = 5mA to 1A, PO≤15W VI = 8V to 20V		4.9	5	5.1	
Line Regulation (Note1)	ΔVO	TJ = +25℃	VI = 7V to 25V			100	mV
			VI = 8V to 12V			50	
Load Regulation (Note1)	ΔVO	TJ = +25℃，IO = 5mA to 1.5A				100	mV
		TJ=+25℃，IO=250mA to 750mA				50	
Quiescent Current	IQ	TJ = +25℃				6	mA
Quiescent Current Change	ΔIQ	IO = 5mA to 1A				0.5	mA
		VI = 8V to 25V				0.8	
Quiescent Current Change	ΔVo/ΔT	IO = 5mA			0.6		mV/℃
Short Circuit Current	ISC	TJ = +25℃ , VI = 35V			0.75	1.2	A

2、HE7806 (refer to the test circuits，TJ = -55 to 150℃ VI = 11V IO = 500 mA，CI = 0.33 μF，CO = 0.1 μF unless otherwise specified)。

Parameter	Symbol	Test Condition		MIN	TYP	MAX	UNIT
Output Voltage	VO	TJ = +25℃		5.88	6	6.12	V
		IO = 5mA to 1A, PO≤15W VI = 9V to 21V		5.88	6	6.12	
Line Regulation (Note1)	ΔVO	TJ = +25℃	VI = 8V to 25V			100	mV
			VI = 9V to 13V			50	
Load Regulation (Note1)	ΔVO	TJ = +25℃，IO = 5mA to 1.5A				100	mV
		TJ=+25℃，IO=250mA to 750mA				50	
Quiescent Current	IQ	TJ = +25℃				6	mA
Quiescent Current Change	ΔIQ	IO = 5mA to 1A				0.5	mA
		VI = 9V to 25V				0.8	
Quiescent Current Change	ΔVo/ΔT	IO = 5mA			0.7		mV/℃
Short Circuit Current	ISC	TJ = +25℃ , VI = 35V			0.75	1.2	A

3、HE7808 (refer to the test circuits，TJ = -55 to 150℃ VI = 14V IO = 500 mA，CI = 0.33 μF，CO = 0.1 μF unless otherwise specified)。

Parameter	Symbol	Test Condition		MIN	TYP	MAX	UNIT
Output Voltage	VO	TJ = +25℃		7.84	8	8.16	V
		IO = 5mA to 1A, PO≤15W VI =11.5V to 23V		7.84	8	8.16	
Line Regulation (Note1)	ΔVO	TJ = +25℃	VI = 10.5V to 25V			100	mV
			VI = 11V to 17V			50	
Load Regulation (Note1)	ΔVO	TJ = +25℃，IO = 5mA to 1.5A				100	mV
		TJ =+25℃，IO=250mA to 750mA				50	
Quiescent Current	IQ	TJ = +25℃				6	mA
Quiescent Current Change	ΔIQ	IO = 5mA to 1A				0.5	mA
		VI = 11.5V to 25V				1	
Quiescent Current Change	ΔVo/ΔT	IO = 5mA			1		mV/℃
Short Circuit Current	ISC	TJ = +25℃ , VI = 35V			0.75	1.2	A

4、HE7809 (refer to the test circuits，TJ = -55 to 150℃ VI = 15V IO = 500 mA，CI = 0.33 μF，CO = 0.1 μF unless otherwise specified)。

Parameter	Symbol	Test Condition		MIN	TYP	MAX	UNIT
Output Voltage	VO	TJ = +25℃		8.82	9	9.18	V
		IO = 5mA to 1A, PO≤15W VI =11.5V to 26V		8.82	9	9.18	
Line Regulation (Note1)	ΔVO	TJ = +25℃	VI = 11.5V to 26V			100	mV
			VI = 12V to 18V			50	
Load Regulation (Note1)	ΔVO	TJ = +25℃，IO = 5mA to 1.5A				100	mV
		TJ =+25℃，IO=250mA to 750mA				50	
Quiescent Current	IQ	TJ = +25℃				6	mA
Quiescent Current Change	ΔIQ	IO = 5mA to 1A				0.5	mA
		VI = 11.5V to 26V				1	
Quiescent Current Change	ΔVo/ΔT	IO = 5mA			1		mV/℃
Short Circuit Current	ISC	TJ = +25℃ , VI = 35V			0.75	1.2	A

5、HE7812 (refer to the test circuits，TJ = -55 to 150℃ VI = 19V IO = 500 mA，CI = 0.33 μF，CO = 0.1 μF unless otherwise specified)。

Parameter	Symbol	Test Condition		MIN	TYP	MAX	UNIT
Output Voltage	VO	TJ = +25℃		11.76	12	12.24	V
		IO = 5mA to 1A, PO≤15W VI =15.5V to 27V		11.76	12	12.24	
Line Regulation (Note1)	ΔVO	TJ = +25℃	VI = 14.5V to 30V			100	mV
			VI = 16V to 22V			50	
Load Regulation (Note1)	ΔVO	TJ = +25℃，IO = 5mA to 1.5A				100	mV
		TJ =+25℃，IO=250mA to 750mA				50	
Quiescent Current	IQ	TJ = +25℃				6	mA
Quiescent Current Change	ΔIQ	IO = 5mA to 1A				0.5	mA
		VI = 15V to 30V				1	
Quiescent Current Change	ΔVo/ΔT	IO = 5mA			1.5		mV/℃
Short Circuit Current	ISC	TJ = +25℃ , VI = 35V			0.75	1.2	A

LNR: Line Regulation. The change in output voltage for a change in the input voltage. The measurement is made under conditions of low dissipation or by using pulse techniques such that the average chip temperature is not significantly affected.

LDR: Load Regulation.The change in output voltage for a change in load current at constant chip temperature.

Typical Characteristics

Figure 1: Dropout Voltage vs Junction Temperature

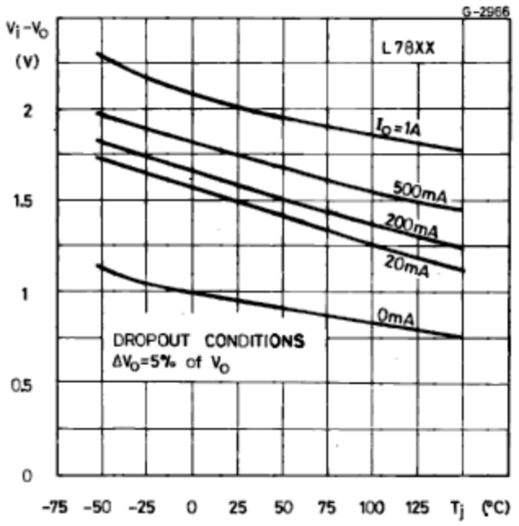


Figure 2: Peak Output Current vs Input/output Differential Voltage

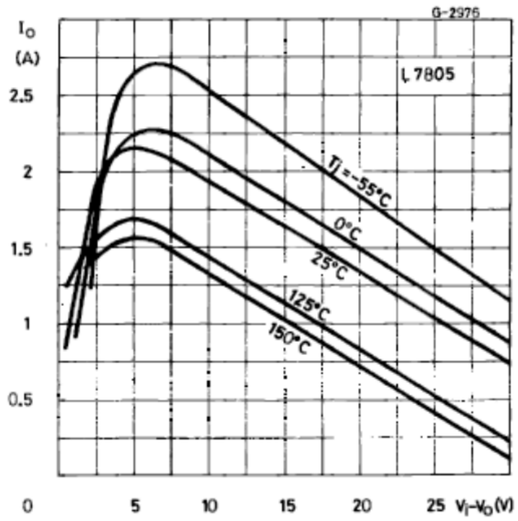


Figure3: Supply Voltage Rejection vs Frequency Temperature

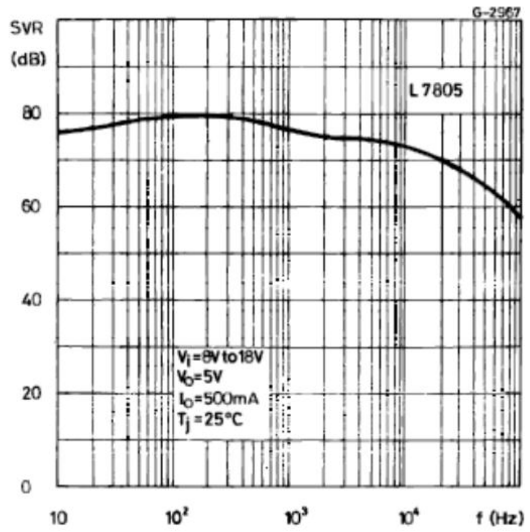
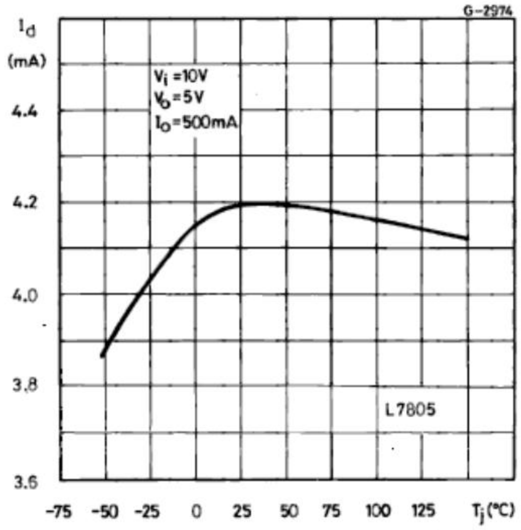


Figure 4: Quiescent Current vs Junction



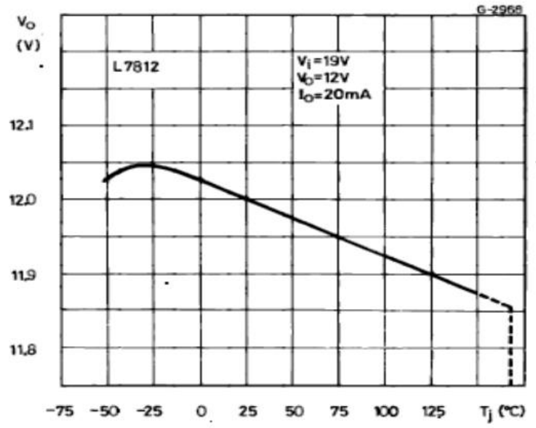


Figure 5: Output Voltage vs Junction Temperature

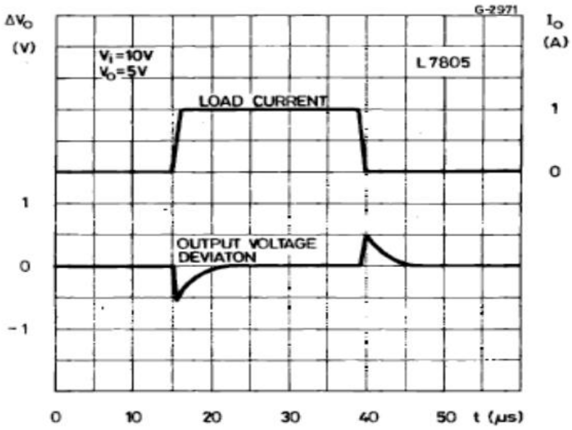


Figure 6: Load Transient Response

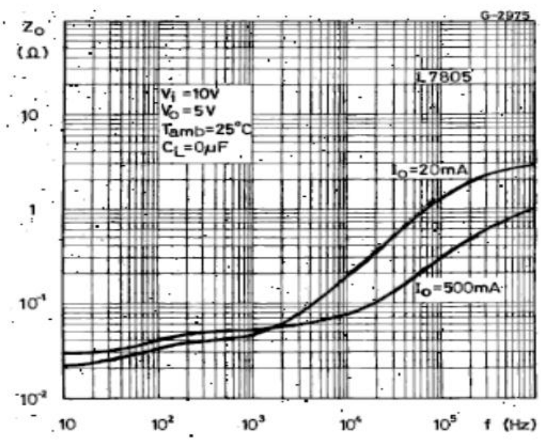


Figure 7: Output Impedance vs Frequency

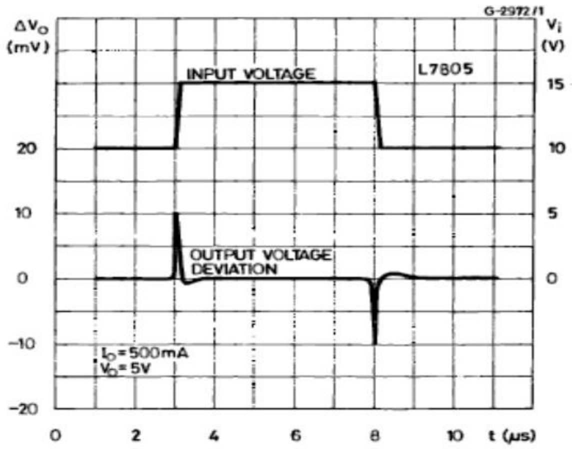


Figure 8: Line Transient Response

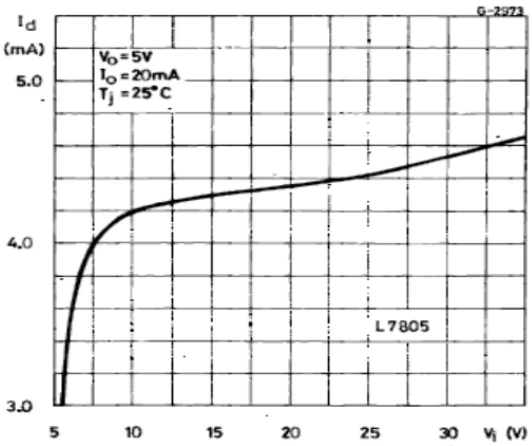


Figure 9: Quiescent Current vs Input Voltage

Operation Description

HE78XX is designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition, Internal Short Circuit Protection that limits the maximum current the circuit will pass, and Output Transistor Safe-Area Compensation that reduces the output short circuit current as the voltage across the pass transistor is increased.

In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long wire lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high frequency characteristics to insure stable operation under all load conditions. A 0.33μFor larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulator's input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.

Typical Application

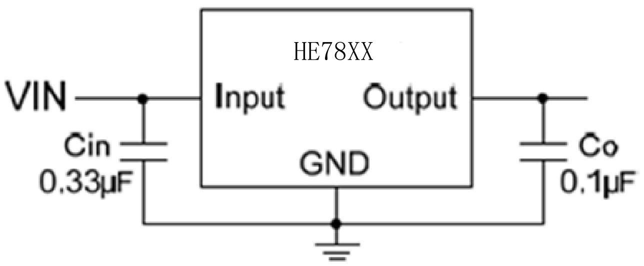


Fig.1 Fixed Output Regulator

A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.

- ●Cin is required if regulator is located an appreciable distance from power supply filter.
- ●Co is not needed for stability; however, it does improve transient response.

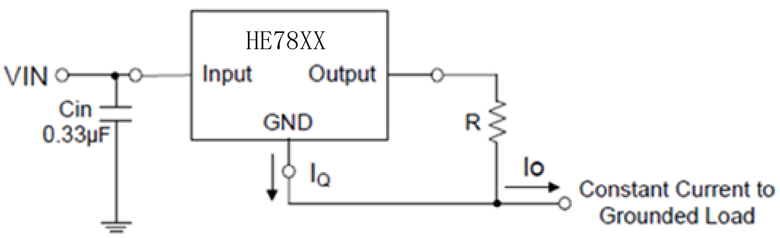


Fig.2 Constant Current Regulator

The HE78XX regulator can also be used as a current source when connected as Fig.2. In order to minimize dissipation the HE78XX is chosen in this application. Resistor R determines the current as follows:

$$I_O = \frac{5V}{R} + I_Q$$

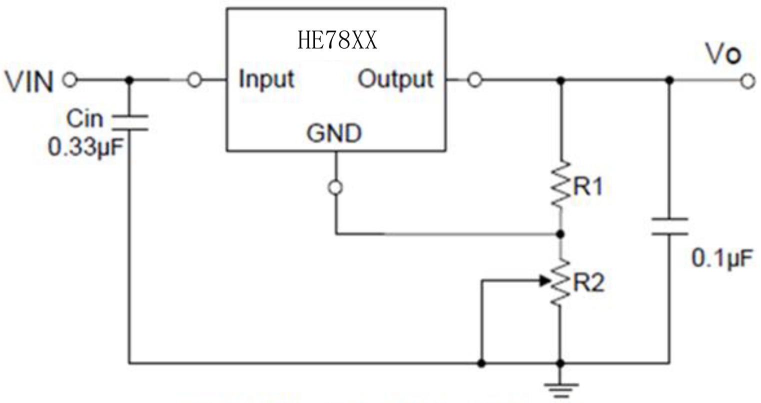


Fig.3 Adjustable Output Regulator

$V_o = 5V + (5V/R1 + I_Q) * R2$

$5V/R1 > 3 * I_Q$

Package Information

TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151