



Three Terminal Voltage Regulators

三端稳压管

KA78XXA

产品特性 Features

输出电压 Output Voltage	稳压管 Regulators
5V	KA7805A
8V	KA7808A
9V	KA7809A
12V	KA7812A
15V	KA7815A
24V	KA7824A
最大输出电流 Max Output Current	1.5A
过载保护 Internal thermal overload prection	
短路电流限制 Internal short-current limiting	
输出端最大安全工作区域 Output transistor safe-area compensation	
输出电压精度在 4%以内 Output voltage offered in 4% tolerance	

封装形式 Package



1 2 3

1:Input 2:GND 3:Output

功能图 Functional diagram

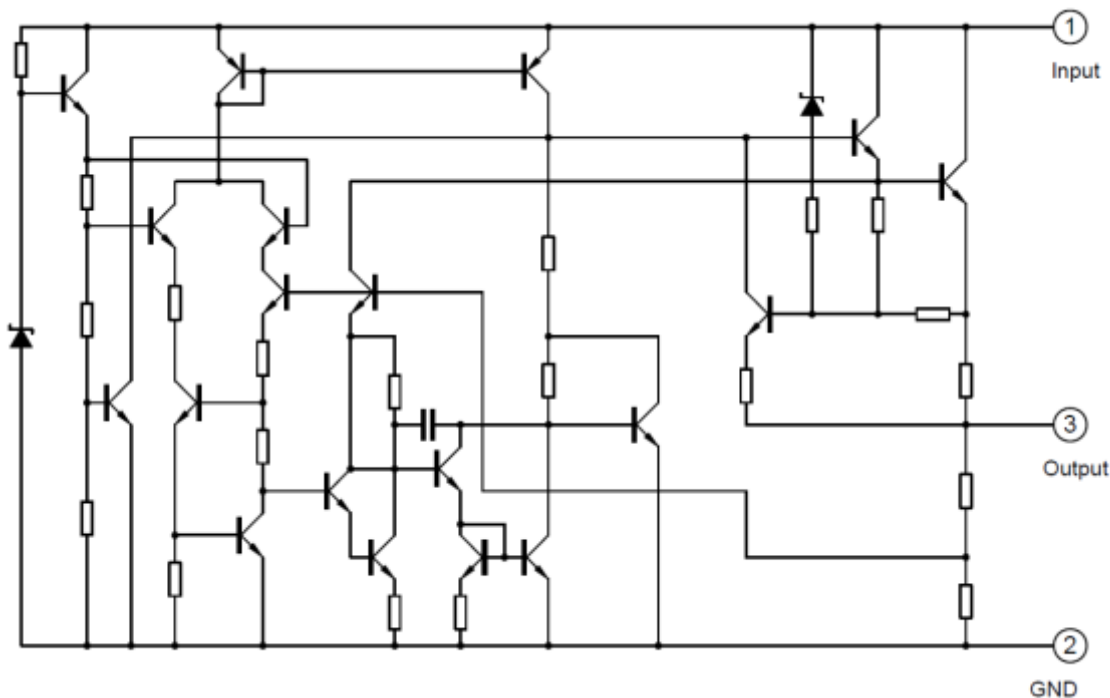


Fig.1

绝对最大额定值 Absolute Maximum Rating ($T_a = 25^\circ\text{C}$ unless otherwise noted)

Parameter 项目	Symbol 符号	Limit 极限值		Unit
输入电压 Input Voltage	V_{in}	for $V_o=5V$ to $V_o=18V$	-35	V
		for $V_o=24V$	-40	
功率损耗 Power Dissipation	P_D	Internal Limited		W
结温 Junction Temperature	T_j	+125		$^\circ\text{C}$
存储温度 Storage Temperature Range	T_{STG}	-65~+150		$^\circ\text{C}$
结-壳的热阻 Thermal Resistance -Junction to Case	$R_{\theta JC}$	5		$^\circ\text{C/W}$
结-环境的热阻 Thermal Resistance -Junction to Ambient	$R_{\theta JA}$	50		$^\circ\text{C/W}$

KA7805A 电参数特性 Electrical Characteristics

($V_{in}=10V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit	
输出电压 Output voltage	Vout	$T_j=25^{\circ}C$	4.80	5	5.20	V	
		$7.5V \leq V_{in} \leq 20V$, $5mA \leq I_{out} \leq 1A$, $PD \leq 15W$	4.75	5	5.25		
线性调节 Line Regulation	REGline	$T_j=25^{\circ}C$	$7.5V \leq V_{in} \leq 25V$	--	4	100	mV
			$8V \leq V_{in} \leq 12V$	--	1.6	50	
负载调节 Load Regulation	REGload	$T_j=25^{\circ}C$	$5mA \leq I_{out} \leq 1.5A$	--	9	100	
			$250mA \leq I_{out} \leq 750mA$	--	4	50	
静态电流 Quiescent Current	Iq	$I_{out}=0$, $T_j=25^{\circ}C$	--	5.0	8	mA	
静态电流变化 Quiescent Current Change	ΔIq	$8.0V \leq V_{in} \leq 25V$	--	--	0.8		
		$5mA \leq I_{out} \leq 1A$	--	--	0.5		
输出电压纹波 Output Noise Voltage	Vn	$10Hz \leq f \leq 100KHz$, $T_j=25^{\circ}C$	--	42	--	μV	
浪涌衰减 Ripple Rejection Ratio	RR	$f=120Hz$, $8V \leq V_{in} \leq 18V$	62	73	--	dB	
衰减电压 Voltage Drop	Vdrop	$I_{out}=1A$, $T_j=25^{\circ}C$	--	2	--	V	
短路电流 Output Short Circuit Current	Ios	$T_j=25^{\circ}C$	--	230	--	mA	
峰值电流 Peak Output Current	I _{o peak}	$T_j=25^{\circ}C$	--	2.2	--	A	
输出电压特性 Temperature Coefficient of Output Voltage	$\Delta V_{out} / \Delta T_j$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	0.8	--	$mV/^{\circ}C$	
输出端电阻 Output resistance	Ro	$f=1KHz$	--	15	--	$m\Omega$	

KA7808A 电参数特性 Electrical Characteristics

($V_{in}=14V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit	
输出电压 Output voltage	Vout	$T_j=25^{\circ}C$	7.7	8.0	8.3	V	
		$11V \leq V_{in} \leq 23V$, $5mA \leq I_{out} \leq 1A$, $PD \leq 15W$	7.6	8.0	8.4		
线性调节 Line Regulation	REGline	$T_j=25^{\circ}C$	$10.5V \leq V_{in} \leq 25V$	--	5.0	160	mV
			$11V \leq V_{in} \leq 17V$	--	2.0	80	
负载调节 Load Regulation	REGload	$T_j=25^{\circ}C$	$5mA \leq I_{out} \leq 1.5A$	--	10	160	
			$250mA \leq I_{out} \leq 750mA$	--	5.0	80	
静态电流 Quiescent Current	Iq	$I_{out}=0$, $T_j=25^{\circ}C$	--	5.0	8	mA	
静态电流变化 Quiescent Current Change	ΔIq	$11V \leq V_{in} \leq 25V$	--	--	0.8		
		$5mA \leq I_{out} \leq 1A$	--	--	0.5		
输出电压纹波 Output Noise Voltage	Vn	$10Hz \leq f \leq 100KHz$, $T_j=25^{\circ}C$	--	52	--	μV	
浪涌衰减 Ripple Rejection Ratio	RR	$f=120Hz$, $11.5V \leq V_{in} \leq 21.5V$	56	73	--	dB	
衰减电压 Voltage Drop	Vdrop	$I_{out}=1A$, $T_j=25^{\circ}C$	--	2	--	V	
短路电流 Output Short Circuit Current	Ios	$T_j=25^{\circ}C$	--	230	--	mA	
峰值电流 Peak Output Current	I _{o peak}	$T_j=25^{\circ}C$	--	2.2	--	A	
输出电压特性 Temperature Coefficient of Output Voltage	$\Delta V_{out} / \Delta T_j$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	0.8	--	$mV/^{\circ}C$	
输出端电阻 Output resistance	Ro	$f=1KHz$	--	17	--	$m\Omega$	

KA7809A 电参数特性 Electrical Characteristics

($V_{in}=15V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit	
输出电压 Output voltage	Vout	$T_j=25^{\circ}C$	8.65	9.0	9.35	V	
		$11.5V \leq V_{in} \leq 24V$, $5mA \leq I_{out} \leq 1A$, $PD \leq 15W$	8.6	9.0	9.4		
线性调节 Line Regulation	REGline	$T_j=25^{\circ}C$	$11.5V \leq V_{in} \leq 25V$	--	6.0	180	mV
			$12V \leq V_{in} \leq 25V$	--	2.0	90	
负载调节 Load Regulation	REGload	$T_j=25^{\circ}C$	$5mA \leq I_{out} \leq 1.5A$	--	12	180	mV
			$250mA \leq I_{out} \leq 750mA$	--	5.0	90	
静态电流 Quiescent Current	Iq	$I_{out}=0$, $T_j=25^{\circ}C$	--	5.0	8	mA	
静态电流变化 Quiescent Current Change	ΔIq	$12V \leq V_{in} \leq 26V$	--	--	0.8		
		$5mA \leq I_{out} \leq 1A$	--	--	0.5		
输出电压纹波 Output Noise Voltage	Vn	$10Hz \leq f \leq 100KHz$, $T_j=25^{\circ}C$	--	58	--	μV	
浪涌衰减 Ripple Rejection Ratio	RR	$f=120Hz$, $11.5V \leq V_{in} \leq 21.5V$	56	73	--	dB	
衰减电压 Voltage Drop	Vdrop	$I_{out}=1A$, $T_j=25^{\circ}C$	--	2	--	V	
短路电流 Output Short Circuit Current	Ios	$T_j=25^{\circ}C$	--	230	--	mA	
峰值电流 Peak Output Current	I _{o peak}	$T_j=25^{\circ}C$	--	2.2	--	A	
输出电压特性 Temperature Coefficient of Output Voltage	$\Delta V_{out} / \Delta T_j$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	1.0	--	mV/ $^{\circ}C$	
输出端电阻 Output resistance	Ro	$f=1KHz$	--	15	--	m Ω	

KA7812A 电参数特性 Electrical Characteristics

($V_{in}=19V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit	
输出电压 Output voltage	Vout	$T_j=25^{\circ}C$	11.5	12.0	12.5	V	
		$14.5V \leq V_{in} \leq 27V$, $5mA \leq I_{out} \leq 1A$, $PD \leq 15W$	11.4	12.0	12.6		
线性调节 Line Regulation	REGline	$T_j=25^{\circ}C$	$14.5V \leq V_{in} \leq 30V$	--	10	240	mV
			$16V \leq V_{in} \leq 22V$	--	3	120	
负载调节 Load Regulation	REGload	$T_j=25^{\circ}C$	$5mA \leq I_{out} \leq 1.5A$	--	12	240	mV
			$250mA \leq I_{out} \leq 750mA$	--	5.0	120	
静态电流 Quiescent Current	Iq	$I_{out}=0$, $T_j=25^{\circ}C$	--	5.1	8	mA	
静态电流变化 Quiescent Current Change	ΔIq	$15V \leq V_{in} \leq 30V$	--	--	0.8		
		$5mA \leq I_{out} \leq 1A$	--	--	0.5		
输出电压纹波 Output Noise Voltage	Vn	$10Hz \leq f \leq 100KHz$, $T_j=25^{\circ}C$	--	76	--	μV	
浪涌衰减 Ripple Rejection Ratio	RR	$f=120Hz$, $15V \leq V_{in} \leq 25V$	55	71	--	dB	
衰减电压 Voltage Drop	Vdrop	$I_{out}=1A$, $T_j=25^{\circ}C$	--	2	--	V	
短路电流 Output Short Circuit Current	Ios	$T_j=25^{\circ}C$	--	230	--	mA	
峰值电流 Peak Output Current	I _{o peak}	$T_j=25^{\circ}C$	--	2.2	--	A	
输出电压特性 Temperature Coefficient of Output Voltage	$\Delta V_{out} / \Delta T_j$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	1.0	--	mV/ $^{\circ}C$	
输出端电阻 Output resistance	Ro	$f=1KHz$	--	18	--	m Ω	

KA7815A 电参数特性 Electrical Characteristics

($V_{in}=23V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
输出电压 Output voltage	V_{out}	$T_j=25^{\circ}C$ $17.5V \leq V_{in} \leq 30V$, $5mA \leq I_{out} \leq 1A$, $PD \leq 15W$	14.4 14.25	15.0 15.0	15.6 15.75	V
线性调节 Line Regulation	REGline	$T_j=25^{\circ}C$	--	11 3	300 150	mV
负载调节 Load Regulation	REGload	$T_j=25^{\circ}C$	--	12 5.0	300 150	
静态电流 Quiescent Current	I_q	$I_{out}=0$, $T_j=25^{\circ}C$	--	5.2	8	mA
静态电流变化 Quiescent Current Change	ΔI_q	$18V \leq V_{in} \leq 30.5V$ $5mA \leq I_{out} \leq 1A$	-- --	-- --	0.8 0.5	
输出电压纹波 Output Noise Voltage	V_n	$10Hz \leq f \leq 100KHz$, $T_j=25^{\circ}C$	--	90	--	μV
浪涌衰减 Ripple Rejection Ratio	RR	$f=120Hz$, $18.5V \leq V_{in} \leq 28.5V$	54	70	--	dB
衰减电压 Voltage Drop	V_{drop}	$I_{out}=1A$, $T_j=25^{\circ}C$	--	2	--	V
短路电流 Output Short Circuit Current	I_{os}	$T_j=25^{\circ}C$	--	230	--	mA
峰值电流 Peak Output Current	$I_{o peak}$	$T_j=25^{\circ}C$	--	2.2	--	A
输出电压特性 Temperature Coefficient of Output Voltage	$\Delta V_{out} / \Delta T_j$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	1.0	--	$mV/^{\circ}C$
输出端电阻 Output resistance	R_o	$f=1KHz$	--	19	--	$m\Omega$

KA7824A 电参数特性 Electrical Characteristics

($V_{in}=33V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
输出电压 Output voltage	V_{out}	$T_j=25^{\circ}C$ $27V \leq V_{in} \leq 38V$, $5mA \leq I_{out} \leq 1A$, $PD \leq 15W$	23 22.8	24 24	25 25.2	V
线性调节 Line Regulation	REGline	$T_j=25^{\circ}C$	--	17 6	480 240	mV
负载调节 Load Regulation	REGload	$T_j=25^{\circ}C$	--	15 5.0	480 240	
静态电流 Quiescent Current	I_q	$I_{out}=0$, $T_j=25^{\circ}C$	--	5.2	8	mA
静态电流变化 Quiescent Current Change	ΔI_q	$27V \leq V_{in} \leq 38V$ $5mA \leq I_{out} \leq 1A$	-- --	-- --	1.0 0.5	
输出电压纹波 Output Noise Voltage	V_n	$10Hz \leq f \leq 100KHz$, $T_j=25^{\circ}C$	--	160	--	μV
浪涌衰减 Ripple Rejection Ratio	RR	$f=120Hz$, $28V \leq V_{in} \leq 38V$	50	67	--	dB
衰减电压 Voltage Drop	V_{drop}	$I_{out}=1A$, $T_j=25^{\circ}C$	--	2	--	V
短路电流 Output Short Circuit Current	I_{os}	$T_j=25^{\circ}C$	--	230	--	mA
峰值电流 Peak Output Current	$I_{o peak}$	$T_j=25^{\circ}C$	--	2.2	--	A
输出电压特性 Temperature Coefficient of Output Voltage	$\Delta V_{out} / \Delta T_j$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	1.0	--	$mV/^{\circ}C$
输出端电阻 Output resistance	R_o	$f=1KHz$	--	28	--	$m\Omega$

测试电路 Test Circuits

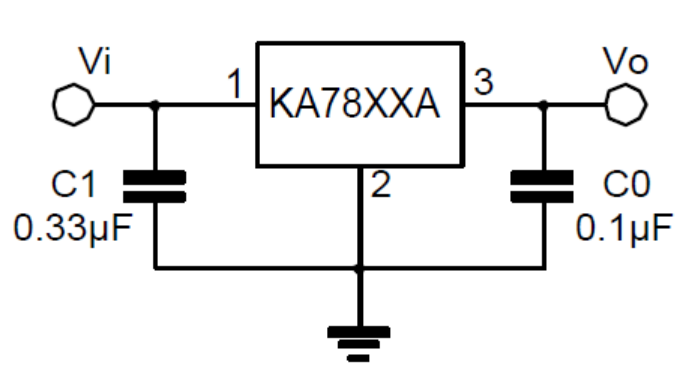


FIG.2 DC PARAMETERS

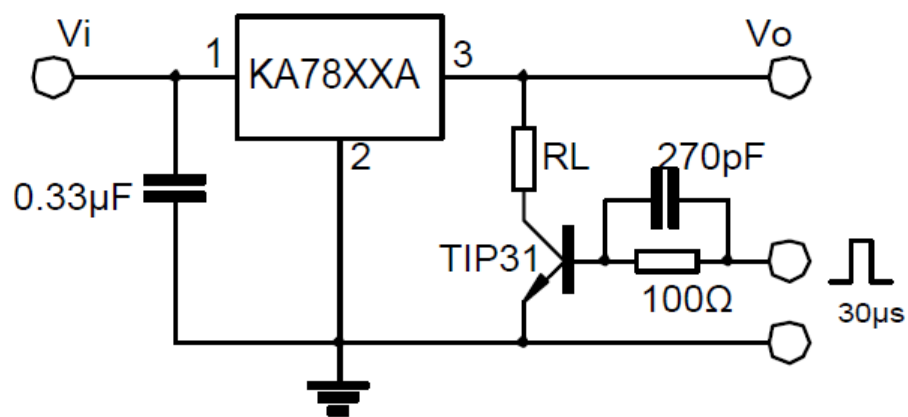


FIG.3 LOAD REGULATION

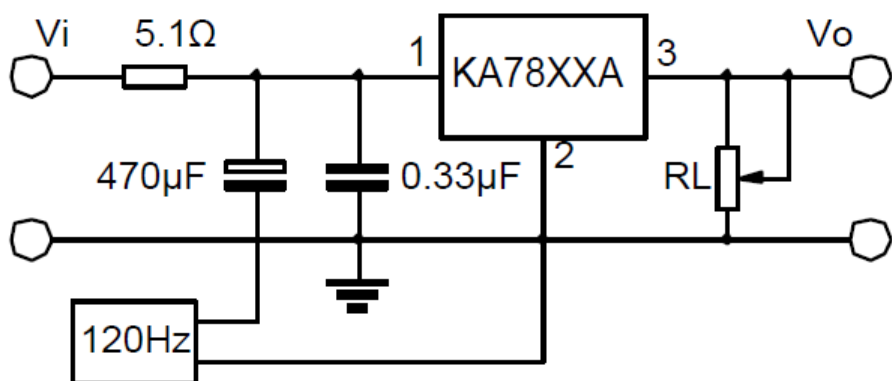


FIG.4 RIPPLE REJECTION

典型应用电路 Typical application circuit

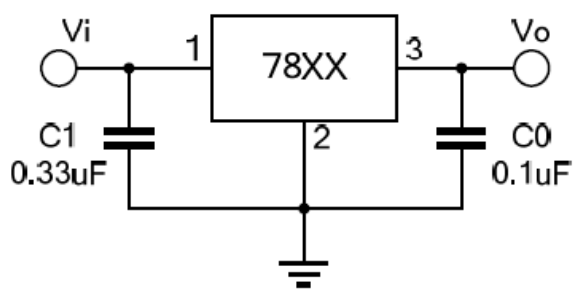


Fig.5 Fixed output regulator

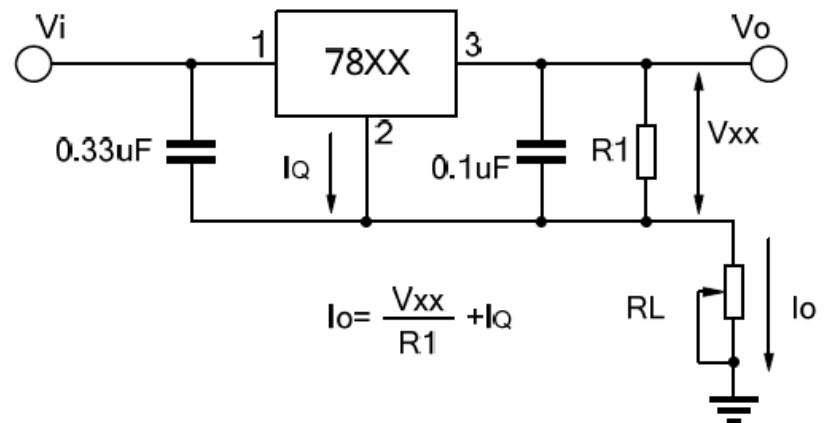


Fig.6 Constant current regulator

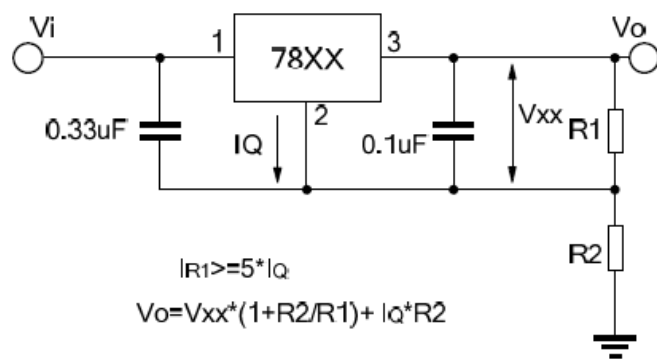


Fig.7 Circuit for increasing Regulator output voltage

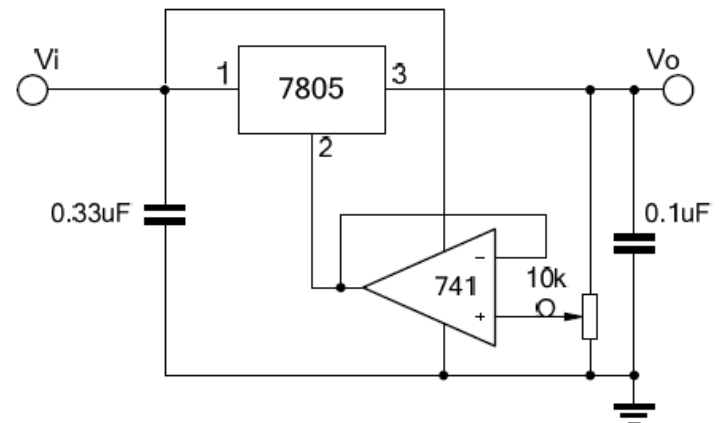
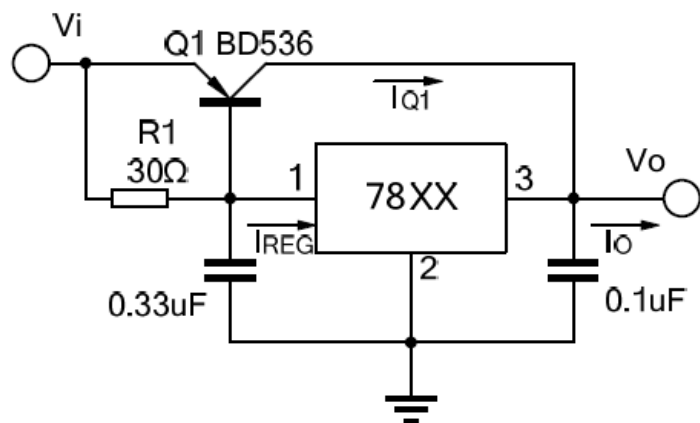


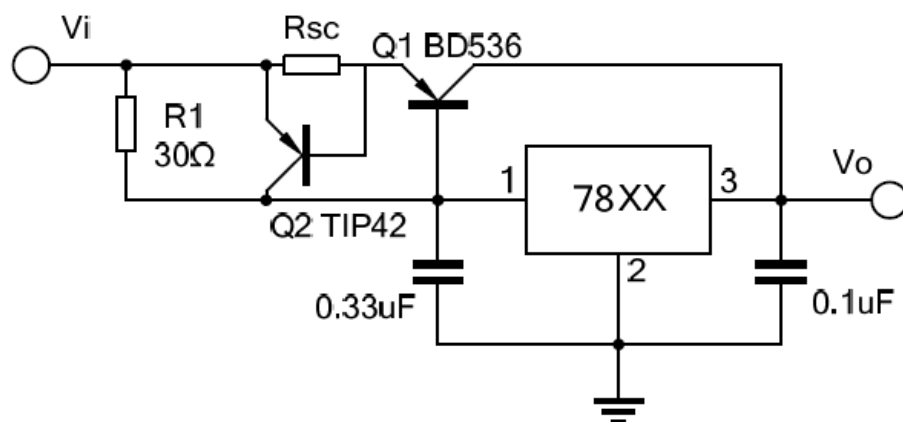
Fig.8 Adjustable output



$$I_o = I_{REG} \cdot (I_{REG} - V_{BEQ1}/R_1)$$

$$R_1 = V_{BEQ1}/(I_{REG} - I_{O1} \cdot Q_1)$$

Fig.9.1 High current with voltage regulator



$$R_{sc} = V_{BEQ2}/I_{sc}$$

Fig.9.2 High output current short circuit protection

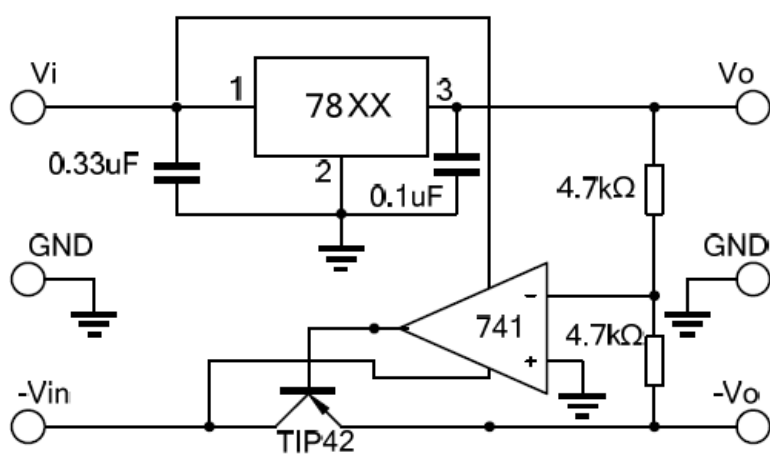


Fig.10 Tracking voltage regulator

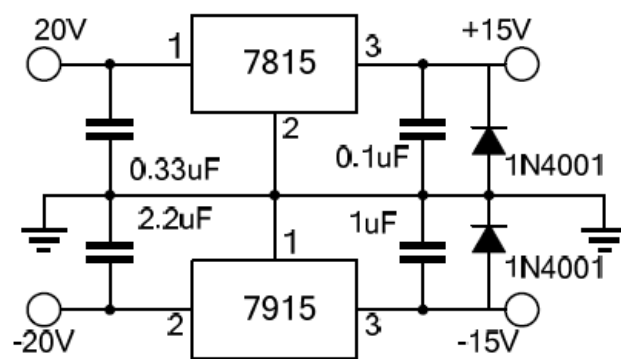


Fig.11 Split power supply(±15V,1A)

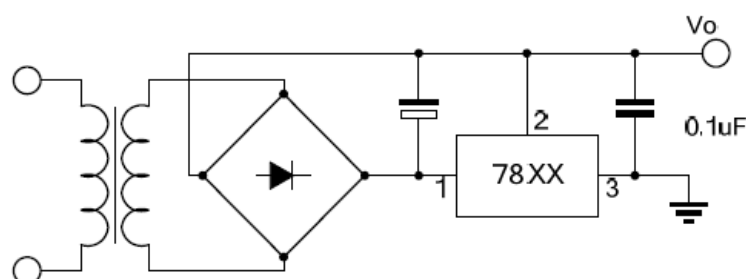


Fig.12 Negative output voltage circuit

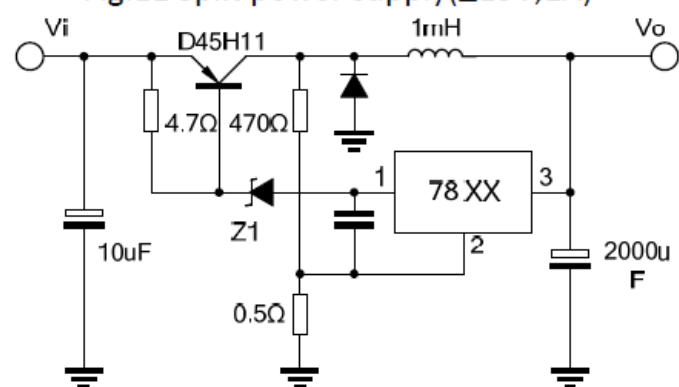


Fig.13 switching regulator

典型特性曲线 Typical performance characteristics

Fig.14 Quiescent current

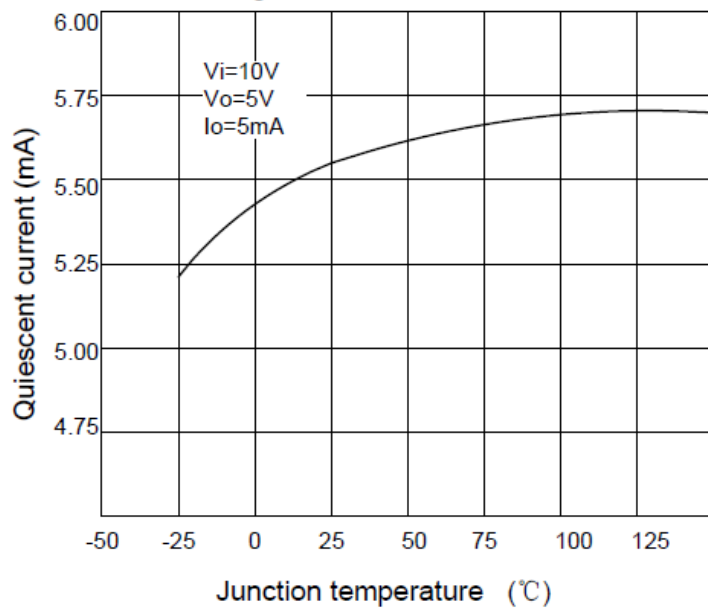


Fig.15 Output voltage

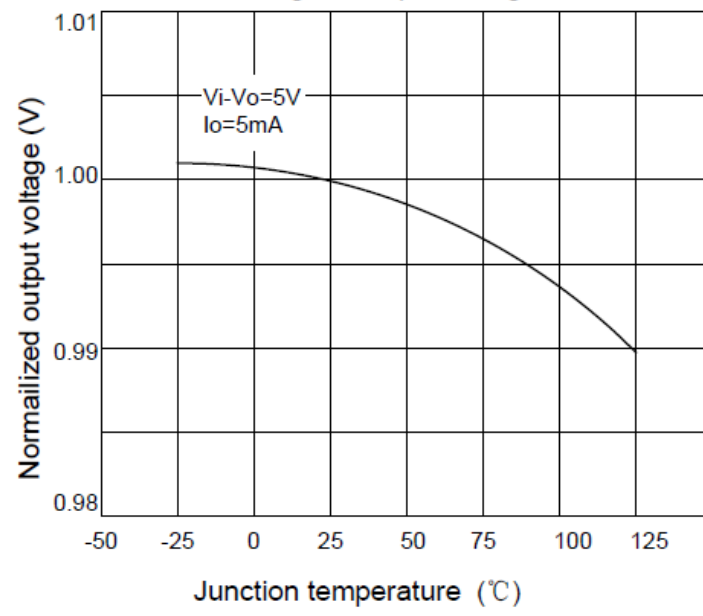


Fig.16 Peak output current

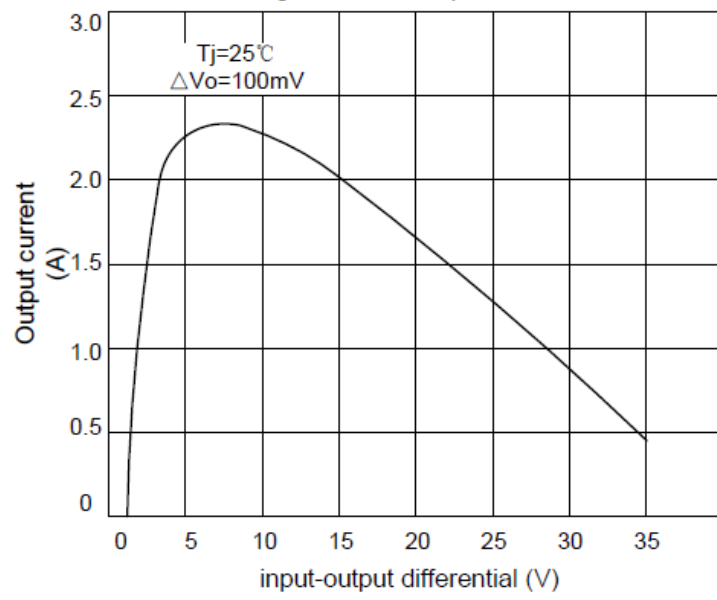
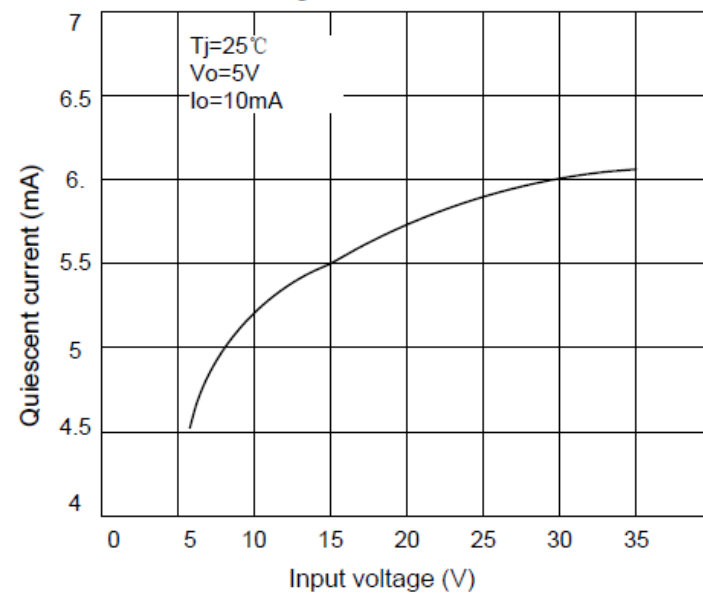
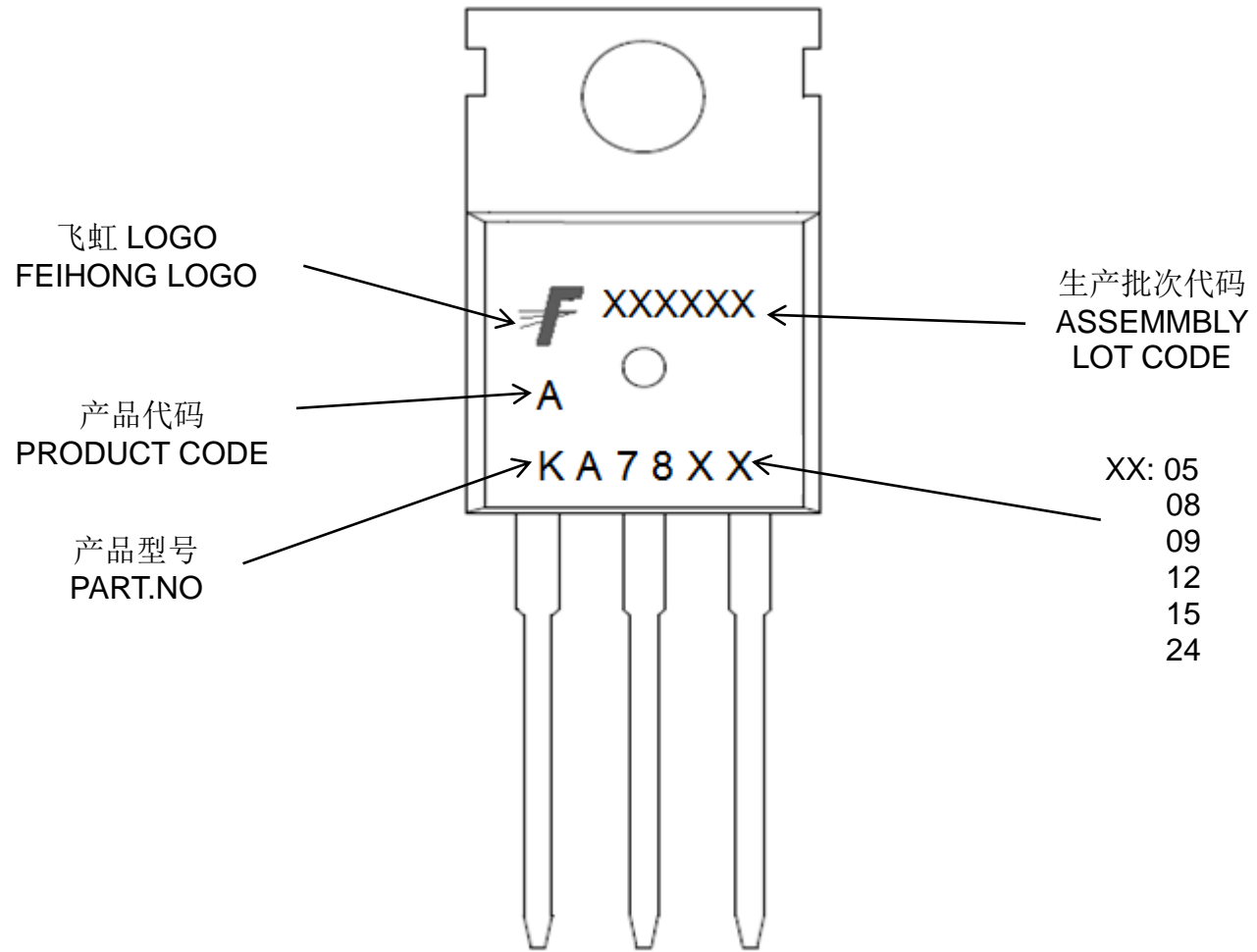


Fig.17 Quiescent current



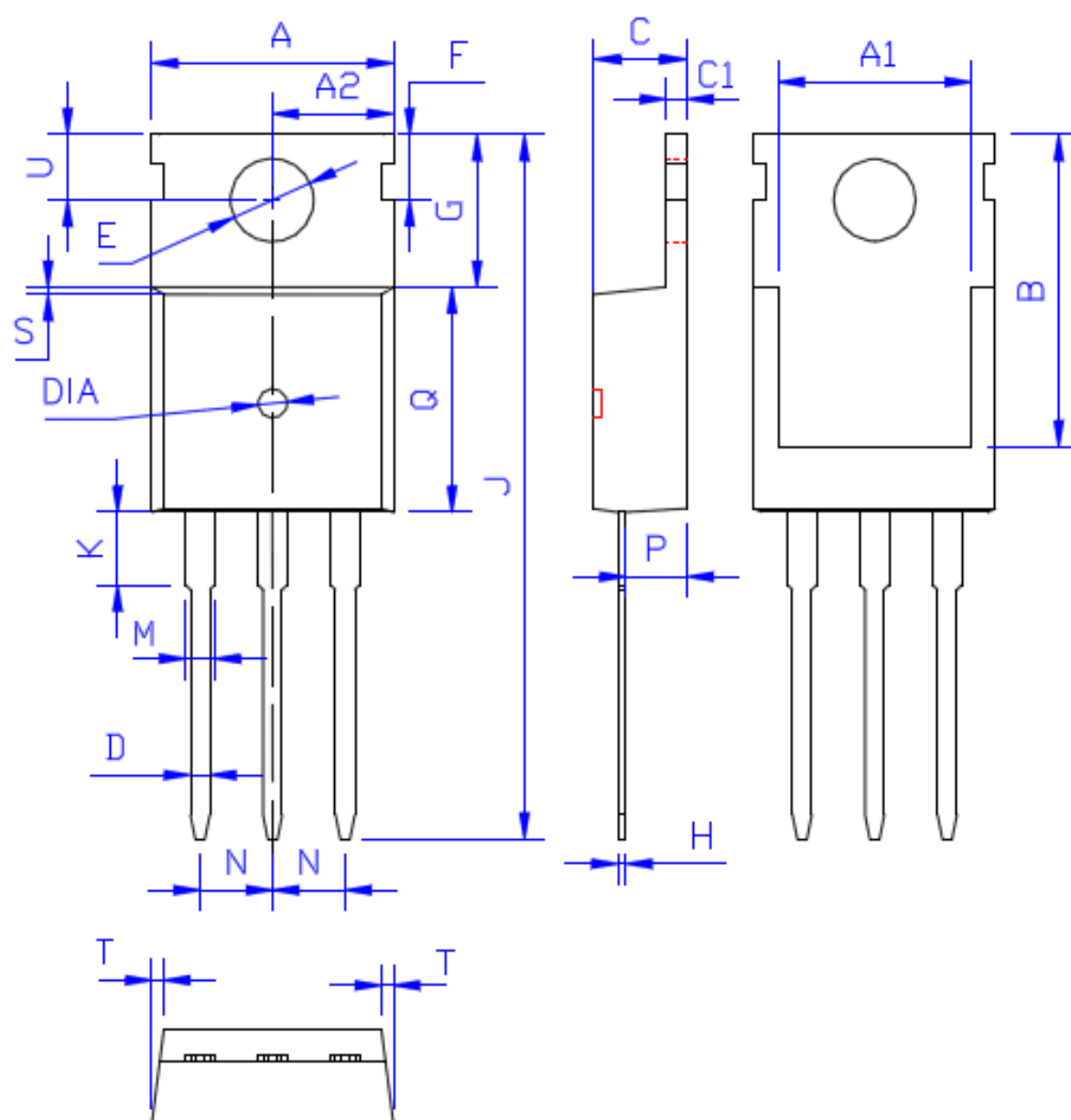
印记 Marking:



外形尺寸:

Package Dimension:

TO-220



DIM	MILLIMETERS
A	10.00 ± 0.30
A1	8.00 ± 0.30
A2	5.00 ± 0.30
B	13.20 ± 0.40
C	4.50 ± 0.20
C1	1.30 ± 0.20
D	0.80 ± 0.20
E	3.60 ± 0.20
F	3.00 ± 0.30
G	6.60 ± 0.40
H	0.50 ± 0.20
J	28.88 ± 0.50
K	3.00 ± 0.30
M	1.30 ± 0.30
N	Typical 2.54
P	2.40 ± 0.40
Q	9.20 ± 0.40
S	0.25 ± 0.15
T	0.25 ± 0.15
U	2.80 ± 0.30
DIA	宽 1.50 ± 0.10 深 0.50 MAX

(Unit: mm)

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