

## X78XX

## 双极型线性集成电路

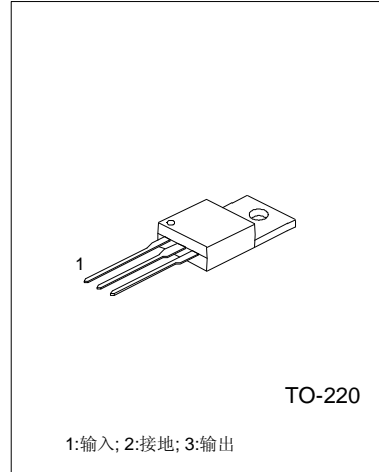
### 三端1.5A正电源稳压电路

#### 概述

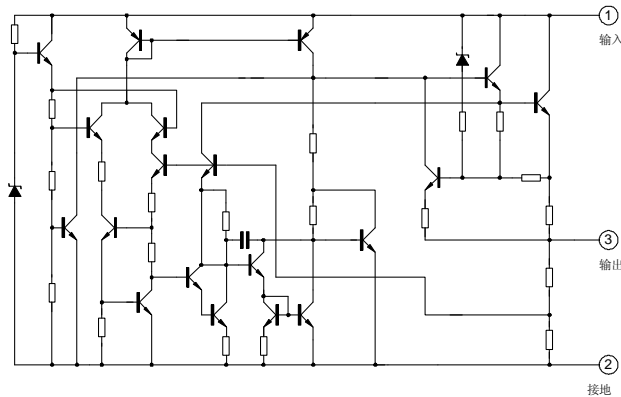
\* X78XX 系列是三端正电源稳压电路，它的封装形式为 TO-220。它有一系列固定的电压输出，应用非常的广泛。每种类型由于内部电流的限制，以及过热保护和安全工作区的保护，使它基本上不会损坏。如果能够提供足够的散热片，它们就能够提供大于1.5A的输出电流。虽然是按照固定电压值来设计的，但是当接入适当的外部器件后，就能获得各种不同的电压和电流。

#### 特点

- \*最大输出电流为1.5A
- \*输出电压为5V;6V;8V;9V;10V;12V;15V;18V;24V
- \*热过载保护
- \*短路保护
- \*输出晶体管安全工作区保护



#### 内部框图



#### 极限参数 (Ta=25°C)

参数	符号	数值	单位
输入电压 (Vo=5V to 18V) (Vo=24V)	Vi	35	V
		40	V
结到空气热阻	Rθ JA	65	°C/W
结到壳热阻	Rθ JC	5	°C/W
工作温度	Topr	0~ +125	°C
贮存温度	Tstg	-65 ~ +150	°C

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### X7805 电参数

(除特别说明,  $0 < T_j < 125^\circ\text{C}$ ,  $I_o = 500\text{mA}$ ,  $V_i = 10\text{V}$ ,  $C_i = 0.33\mu\text{F}$ ,  $C_o = 0.1\mu\text{F}$ )

参数	符号	测试条件	最小值	典型值	最大值	单位
输出电压	$V_o$	$T_j = 25^\circ\text{C}$	4.8	5.0	5.2	V
		$5.0\text{mA} < I_o < 1.0\text{A}$ , $P_o < 15\text{W}$ $V_i = 7.5\text{V to } 20\text{V}$	4.75	5.00	5.25	V
线性调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $V_i = 7.5\text{V to } 25\text{V}$		4.0	100	mV
		$T_j = 25^\circ\text{C}$ , $V_i = 8\text{V to } 12\text{V}$		1.6	50	mV
负载调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $I_o = 5.0\text{mA to } 1.5\text{A}$		9	100	mV
		$T_j = 25^\circ\text{C}$ , $I_o = 250\text{mA to } 750\text{mA}$		4	50	mV
静态电流	$I_Q$	$T_j = 25^\circ\text{C}$		5.0	8	mA
静态电流变化率	$\Delta I_Q$	$I_o = 5\text{mA to } 1.0\text{A}$		0.03	0.5	mA
		$V_i = 8\text{V to } 25\text{V}$		0.3	0.8	mA
输出电压温漂	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		0.8		$\text{mV}/^\circ\text{C}$
输出噪音电压	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_a = 25^\circ\text{C}$		42		$\mu\text{V}$
纹波抑制比	$RR$	$f = 120\text{Hz}$ , $V_i = 8\text{V to } 18\text{V}$	62	73		dB
输入输出电压差	$V_o$	$I_o = 1.0\text{A}$ , $T_j = 25^\circ\text{C}$		2		V
输出阻抗	$R_o$	$f = 1\text{kHz}$		15		$\text{m}\Omega$
短路电流	$I_{sc}$	$V_i = 35\text{V}$ , $T_a = 25^\circ\text{C}$		230		mA
峰值电流	$I_{pk}$	$T_j = 25^\circ\text{C}$		2.2		A

### X7806 电参数

(除特别说明,  $0 < T_j < 125^\circ\text{C}$ ,  $I_o = 500\text{mA}$ ,  $V_i = 11\text{V}$ ,  $C_i = 0.33\mu\text{F}$ ,  $C_o = 0.1\mu\text{F}$ )

参数	符号	测试参数	最小值	典型值	最大值	单位
输出电压	$V_o$	$T_j = 25^\circ\text{C}$	5.75	6.00	6.25	V
		$5.0\text{mA} < I_o < 1.0\text{A}$ , $P_o < 15\text{W}$ $V_i = 8.5\text{V to } 21\text{V}$	5.7	6.0	6.3	V
线性调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $V_i = 8.5\text{V to } 25\text{V}$		5	120	mV
		$T_j = 25^\circ\text{C}$ , $V_i = 9\text{V to } 13\text{V}$		1.5	60	mV
负载调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $I_o = 5.0\text{mA to } 1.5\text{A}$		9	130	mV
		$T_j = 25^\circ\text{C}$ , $I_o = 250\text{mA to } 750\text{mA}$		3	60	mV
静态电流	$I_Q$	$T_j = 25^\circ\text{C}$		5.0	8	mA
静态电流变化率	$\Delta I_Q$	$I_o = 5\text{mA to } 1.0\text{A}$			0.5	mA
		$V_i = 9\text{V to } 25\text{V}$			0.8	mA
输出电压温漂	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		0.8		$\text{mV}/^\circ\text{C}$
输出噪音电压	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_a = 25^\circ\text{C}$		45		$\mu\text{V}$
纹波抑制比	$RR$	$f = 120\text{Hz}$ , $V_i = 9\text{V to } 19\text{V}$	59	75		dB
输入输出电压差	$V_o$	$I_o = 1.0\text{A}$ , $T_j = 25^\circ\text{C}$		2		V
输出阻抗	$R_o$	$f = 1\text{kHz}$		19		$\text{m}\Omega$
短路电流	$I_{sc}$	$V_i = 35\text{V}$ , $T_a = 25^\circ\text{C}$		250		mA
峰值电流	$I_{pk}$	$T_j = 25^\circ\text{C}$		2.2		A

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## X7808 电参数

(除特别说明,  $0 < T_j < 125^\circ\text{C}$ ,  $I_o = 500\text{mA}$ ,  $V_i = 14\text{V}$ ,  $C_i = 0.33\mu\text{F}$ ,  $C_o = 0.1\mu\text{F}$ )

参数	符号	测试条件	最小值	典型值	最大值	单位
输出电压	$V_o$	$T_j = 25^\circ\text{C}$	7.7	8.0	8.3	V
		$5.0\text{mA} < I_o < 1.0\text{A}$ , $P_o < 15\text{W}$ $V_i = 11\text{V to } 23\text{V}$	7.6	8.0	8.4	V
线性调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $V_i = 10.5\text{V to } 25\text{V}$		5.0	160	mV
		$T_j = 25^\circ\text{C}$ , $V_i = 11\text{V to } 17\text{V}$		2.0	80	mV
负载调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $I_o = 5.0\text{mA to } 1.5\text{A}$		10	160	mV
		$T_j = 25^\circ\text{C}$ , $I_o = 250\text{mA to } 750\text{mA}$		5.0	80	mV
静态电流	$I_Q$	$T_j = 25^\circ\text{C}$		5.0	8	mA
静态电流变化率	$\Delta I_Q$	$I_o = 5\text{mA to } 1.0\text{A}$		0.05	0.5	mA
		$V_i = 11\text{V to } 25\text{V}$		0.5	1.0	mA
输出电压温漂	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		0.8		mV/ $^\circ\text{C}$
输出噪音电压	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_a = 25^\circ\text{C}$		52		$\mu\text{V}$
纹波抑制比	RR	$f = 120\text{Hz}$ , $V_i = 11.5\text{V to } 21.5\text{V}$	56	73		dB
输入输出电压差	$V_o$	$I_o = 1.0\text{A}$ , $T_j = 25^\circ\text{C}$		2		V
输出阻抗	$R_o$	$f = 1\text{kHz}$		17		$\text{m}\Omega$
短路电流	$I_{sc}$	$V_i = 35\text{V}$ , $T_a = 25^\circ\text{C}$		230		mA
峰值电流	$I_{pk}$	$T_j = 25^\circ\text{C}$		2.2		A

## X7809 电参数

(除特别说明,  $0 < T_j < 125^\circ\text{C}$ ,  $I_o = 500\text{mA}$ ,  $V_i = 15\text{V}$ ,  $C_i = 0.33\mu\text{F}$ ,  $C_o = 0.1\mu\text{F}$ )

参数	符号	测试条件	最小值	典型值	最大值	单位
输出电压	$V_o$	$T_j = 25^\circ\text{C}$	8.65	9.00	9.35	V
		$5.0\text{mA} < I_o < 1.0\text{A}$ , $P_o < 15\text{W}$ $V_i = 11.5\text{V to } 24\text{V}$	8.6	9.0	9.4	V
线性调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $V_i = 11.5\text{V to } 25\text{V}$		6	180	mV
		$T_j = 25^\circ\text{C}$ , $V_i = 12\text{V to } 25\text{V}$		2	90	mV
负载调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $I_o = 5.0\text{mA to } 1.5\text{A}$		12	180	mV
		$T_j = 25^\circ\text{C}$ , $I_o = 250\text{mA to } 750\text{mA}$		4	90	mV
静态电流	$I_Q$	$T_j = 25^\circ\text{C}$		5.0	8	mA
静态电流变化率	$\Delta I_Q$	$I_o = 5\text{mA to } 1.0\text{A}$			0.5	mA
		$V_i = 12\text{V to } 26\text{V}$			0.8	mA
输出电压温漂	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		1		mV/ $^\circ\text{C}$
输出噪音电压	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_a = 25^\circ\text{C}$		58		$\mu\text{V}$
纹波抑制比	RR	$f = 120\text{Hz}$ , $V_i = 13\text{V to } 23\text{V}$	56	71		dB
输入输出电压差	$V_o$	$I_o = 1.0\text{A}$ , $T_j = 25^\circ\text{C}$		2		V
输出阻抗	$R_o$	$f = 1\text{kHz}$		15		$\text{m}\Omega$
短路电流	$I_{sc}$	$V_i = 35\text{V}$ , $T_a = 25^\circ\text{C}$		250		mA
峰值电流	$I_{pk}$	$T_j = 25^\circ\text{C}$		2.2		A

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## X7810电参数

(除特别说明,  $0 < T_j < 125^\circ\text{C}$ ,  $I_o = 500\text{mA}$ ,  $V_i = 16\text{V}$ ,  $C_i = 0.33\mu\text{F}$ ,  $C_o = 0.1\mu\text{F}$ )

参数	符号	测试条件	最小值	典型值	最大值	单位
输出电压	$V_o$	$T_j = 25^\circ\text{C}$	9.6	10	10.4	V
		$5.0\text{mA} < I_o < 1.0\text{A}$ , $P_o < 15\text{W}$ $V_i = 12.5\text{V to } 25\text{V}$	9.5	10	10.5	V
线性调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $V_i = 12.5\text{V to } 25\text{V}$		10	200	mV
		$T_j = 25^\circ\text{C}$ , $V_i = 13\text{V to } 20\text{V}$		3	100	mV
负载调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $I_o = 5.0\text{mA to } 1.5\text{A}$		12	200	mV
		$T_j = 25^\circ\text{C}$ , $I_o = 250\text{mA to } 750\text{mA}$		4	100	mV
静态电流	$I_Q$	$T_j = 25^\circ\text{C}$		5.0	8	mA
静态电流变化率	$\Delta I_Q$	$I_o = 5\text{mA to } 1.0\text{A}$			0.5	mA
		$V_i = 13\text{V to } 29\text{V}$			0.8	mA
输出电压温漂	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		1		mV/ $^\circ\text{C}$
输出噪声电压	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_a = 25^\circ\text{C}$		58		$\mu\text{V}$
纹波抑制比	RR	$f = 120\text{Hz}$ , $V_i = 14\text{V to } 24\text{V}$	56	71		dB
输入输出电压差	$V_o$	$I_o = 1.0\text{A}$ , $T_j = 25^\circ\text{C}$		2		V
输出阻抗	$R_o$	$f = 1\text{kHz}$		17		$\text{m}\Omega$
短路电流	$I_{sc}$	$V_i = 35\text{V}$ , $T_a = 25^\circ\text{C}$		250		mA
峰值电流	$I_{pk}$	$T_j = 25^\circ\text{C}$		2.2		A

## X7812电参数

(除特别说明,  $0 < T_j < 125^\circ\text{C}$ ,  $I_o = 500\text{mA}$ ,  $V_i = 16\text{V}$ ,  $C_i = 0.33\mu\text{F}$ ,  $C_o = 0.1\mu\text{F}$ )

参数	符号	测试条件	最小值	典型值	最大值	单位
输出电压	$V_o$	$T_j = 25^\circ\text{C}$	11.5	12.0	12.5	V
		$5.0\text{mA} < I_o < 1.0\text{A}$ , $P_o < 15\text{W}$ $V_i = 14.5\text{V to } 27\text{V}$	11.4	12	12.6	V
线性调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $V_i = 14.5\text{V to } 30\text{V}$		10	240	mV
		$T_j = 25^\circ\text{C}$ , $V_i = 16\text{V to } 22\text{V}$		3	120	mV
负载调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $I_o = 5.0\text{mA to } 1.5\text{A}$		11	240	mV
		$T_j = 25^\circ\text{C}$ , $I_o = 250\text{mA to } 750\text{mA}$		5.0	120	mV
静态电流	$I_Q$	$T_j = 25^\circ\text{C}$		5.1	8	mA
静态电流变化率	$\Delta I_Q$	$I_o = 5\text{mA to } 1.0\text{A}$			0.5	mA
		$V_i = 15\text{V to } 30\text{V}$			0.8	mA
输出电压温漂	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		1		mV/ $^\circ\text{C}$
输出噪声电压	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_a = 25^\circ\text{C}$		76		$\mu\text{V}$
纹波抑制比	RR	$f = 120\text{Hz}$ , $V_i = 15\text{V to } 25\text{V}$	55	71		dB
输入输出电压差	$V_o$	$I_o = 1.0\text{A}$ , $T_j = 25^\circ\text{C}$		2		V
输出阻抗	$R_o$	$f = 1\text{kHz}$		18		$\text{m}\Omega$
短路电流	$I_{sc}$	$V_i = 35\text{V}$ , $T_a = 25^\circ\text{C}$		230		mA
峰值电流	$I_{pk}$	$T_j = 25^\circ\text{C}$		2.2		A

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### X7815电参数

(除特别说明,  $0 < T_j < 125^\circ\text{C}$ ,  $I_o = 500\text{mA}$ ,  $V_i = 23\text{V}$ ,  $C_i = 0.33\mu\text{F}$ ,  $C_o = 0.1\mu\text{F}$ )

参数	符号	测试条件	最小值	典型值	最大值	单位
输出电压	$V_o$	$T_j = 25^\circ\text{C}$	14.4	15.0	15.6	V
		$5.0\text{mA} < I_o < 1.0\text{A}$ , $P_o < 15\text{W}$ $V_i = 17.5\text{V to } 30\text{V}$	14.25	15	15.75	V
线性调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $V_i = 17.5\text{V to } 30\text{V}$		11	300	mV
		$T_j = 25^\circ\text{C}$ , $V_i = 20\text{V to } 26\text{V}$		3	150	mV
负载调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $I_o = 5.0\text{mA to } 1.5\text{A}$		12	300	mV
		$T_j = 25^\circ\text{C}$ , $I_o = 250\text{mA to } 750\text{mA}$		4	150	mV
静态电流	$I_Q$	$T_j = 25^\circ\text{C}$		5.2	8	mA
静态电流变化率	$\Delta I_Q$	$I_o = 5\text{mA to } 1.0\text{A}$			0.5	mA
		$V_i = 18\text{V to } 305\text{V}$			0.8	mA
输出电压温漂	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		1		mV/ $^\circ\text{C}$
输出噪音电压	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_a = 25^\circ\text{C}$		90		$\mu\text{V}$
纹波抑制比	RR	$f = 120\text{Hz}$ , $V_i = 18.5\text{V to } 28.5\text{V}$	54	70		dB
输入输出电压差	$V_o$	$I_o = 1.0\text{A}$ , $T_j = 25^\circ\text{C}$		2		V
输出阻抗	$R_o$	$f = 1\text{kHz}$		19		$\text{m}\Omega$
短路电流	$I_{sc}$	$V_i = 35\text{V}$ , $T_a = 25^\circ\text{C}$		250		mA
峰值电流	$I_{pk}$	$T_j = 25^\circ\text{C}$		2.2		A

### X7818电参数

(除特别说明,  $0 < T_j < 125^\circ\text{C}$ ,  $I_o = 500\text{mA}$ ,  $V_i = 23\text{V}$ ,  $C_i = 0.33\mu\text{F}$ ,  $C_o = 0.1\mu\text{F}$ )

参数	符号	测试条件	最小值	典型值	最大值	单位
输出电压	$V_o$	$T_j = 25^\circ\text{C}$	17.3	18.0	18.7	V
		$5.0\text{mA} < I_o < 1.0\text{A}$ , $P_o < 15\text{W}$ $V_i = 21\text{V to } 33\text{V}$	17.1	18	18.9	V
线性调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $V_i = 21\text{V to } 33\text{V}$		15	360	mV
		$T_j = 25^\circ\text{C}$ , $V_i = 24\text{V to } 30\text{V}$		5	180	mV
负载调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $I_o = 5.0\text{mA to } 1.5\text{A}$		15	360	mV
		$T_j = 25^\circ\text{C}$ , $I_o = 250\text{mA to } 750\text{mA}$		5.0	180	mV
静态电流	$I_Q$	$T_j = 25^\circ\text{C}$		5.2	8	mA
静态电流变化率	$\Delta I_Q$	$I_o = 5\text{mA to } 1.0\text{A}$			0.5	mA
		$V_i = 21\text{V to } 32\text{V}$			0.8	mA
输出电压温漂	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		1		mV/ $^\circ\text{C}$
输出噪音电压	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_a = 25^\circ\text{C}$		110		$\mu\text{V}$
纹波抑制比	RR	$f = 120\text{Hz}$ , $V_i = 22\text{V to } 32\text{V}$	53	69		dB
输入输出电压差	$V_o$	$I_o = 1.0\text{A}$ , $T_j = 25^\circ\text{C}$		2		V
输出阻抗	$R_o$	$f = 1\text{kHz}$		22		$\text{m}\Omega$
短路电流	$I_{sc}$	$V_i = 35\text{V}$ , $T_a = 25^\circ\text{C}$		250		mA
峰值电流	$I_{pk}$	$T_j = 25^\circ\text{C}$		2.2		A

## X78XX

## X7824电参数

(除特别说明,  $0 < T_j < 125^\circ\text{C}$ ,  $I_o = 500\text{mA}$ ,  $V_i = 33\text{V}$ ,  $C_i = 0.33\mu\text{F}$ ,  $C_o = 0.1\mu\text{F}$ )

参数	符号	测试条件	最小值	典型值	最大值	单位
输出电压	$V_o$	$T_j = 25^\circ\text{C}$	23	24	25	V
		$5.0\text{mA} < I_o < 1.0\text{A}$ , $P_o < 15\text{W}$ $V_i = 27\text{V to } 38\text{V}$	22.8	24	25.2	V
线性调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $V_i = 27\text{V to } 38\text{V}$		17	480	mV
		$T_j = 25^\circ\text{C}$ , $V_i = 30\text{V to } 36\text{V}$		6	240	mV
负载调整率	$\Delta V_o$	$T_j = 25^\circ\text{C}$ , $I_o = 5.0\text{mA to } 1.5\text{A}$		15	480	mV
		$T_j = 25^\circ\text{C}$ , $I_o = 250\text{mA to } 750\text{mA}$		5.0	240	mV
静态电流	$I_Q$	$T_j = 25^\circ\text{C}$		5.2	8	mA
静态电流变化率	$\Delta I_Q$	$I_o = 5\text{mA to } 1.0\text{A}$			0.5	mA
		$V_i = 27\text{V to } 38\text{V}$			0.8	mA
输出电压温漂	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		1.5		mV/ $^\circ\text{C}$
输出噪音电压	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_a = 25^\circ\text{C}$		160		$\mu\text{V}$
纹波抑制比	RR	$f = 120\text{Hz}$ , $V_i = 28\text{V to } 38\text{V}$	50	67		dB
输入输出电压差	$V_o$	$I_o = 1.0\text{A}$ , $T_j = 25^\circ\text{C}$		2		V
输出阻抗	$R_o$	$f = 1\text{kHz}$		28		$\text{m}\Omega$
短路电流	$I_{sc}$	$V_i = 35\text{V}$ , $T_a = 25^\circ\text{C}$		230		mA
峰值电流	$I_{pk}$	$T_j = 25^\circ\text{C}$		2.2		A

### 测试电路图

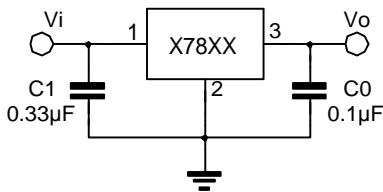


图1 测直流电参数电路图

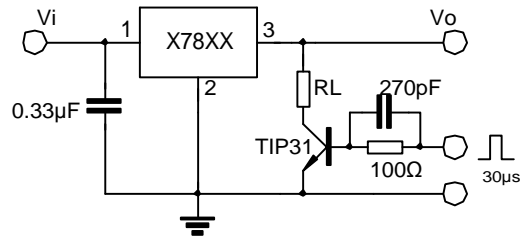


图2 测负载调整率电路图

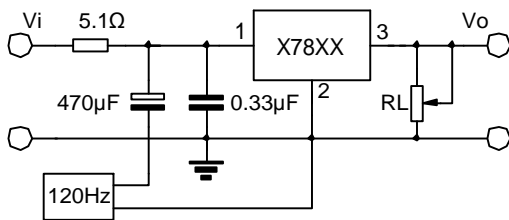


图3 测纹波抑制比电路图

## 应用电路图

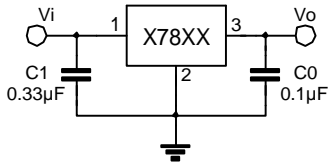


图4 固定输出稳压电路

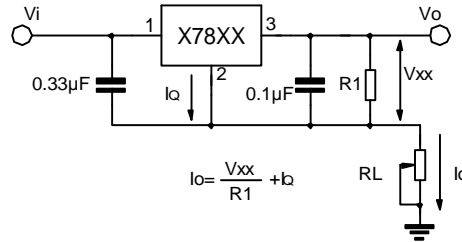


图5 恒流稳压电路

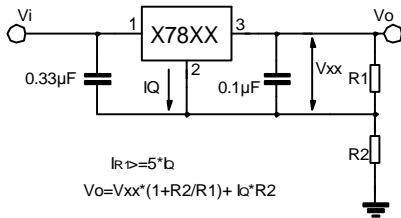


图6 增强型稳压输出电路

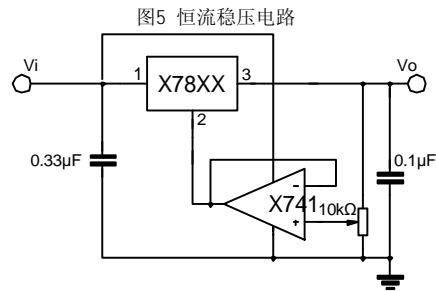


图7 可调型输出电路

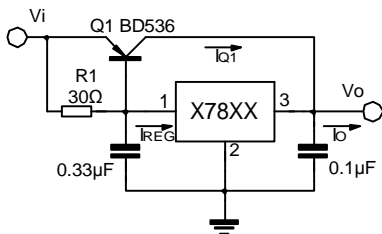


图8 高电流电压稳压电路

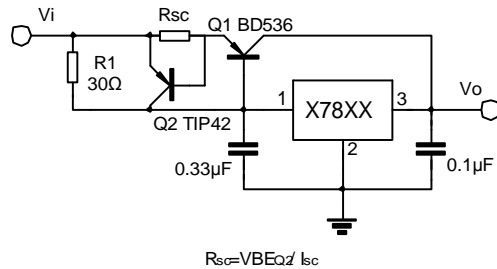


图9 高输出电流短路保护电路

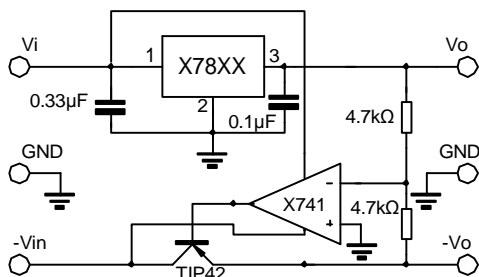


图10 跟踪电压稳压电路

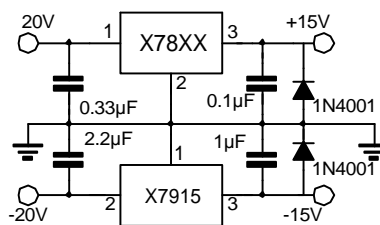


图11 分电源电路(±15V, 1A)

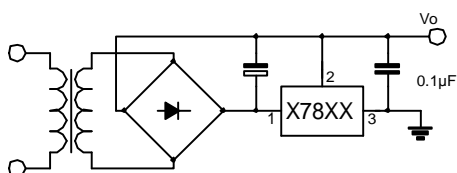


图12 负电源电压输出电路

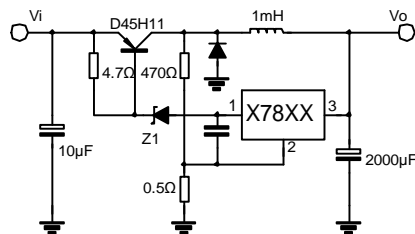


图13 开关稳压电路



典型特性曲线图

图14 静态电流与结点温度的关系曲线图

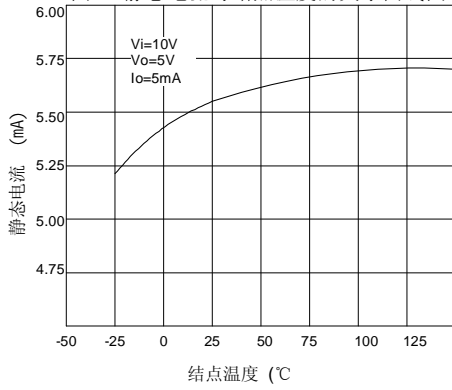


图15 输出电压与结点温度的关系曲线图

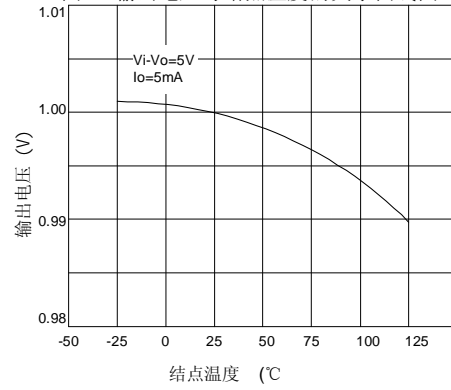


图16 峰值输出电流

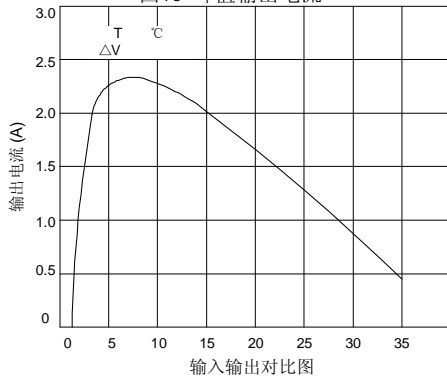
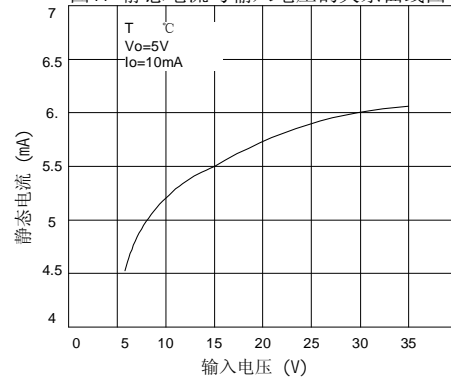


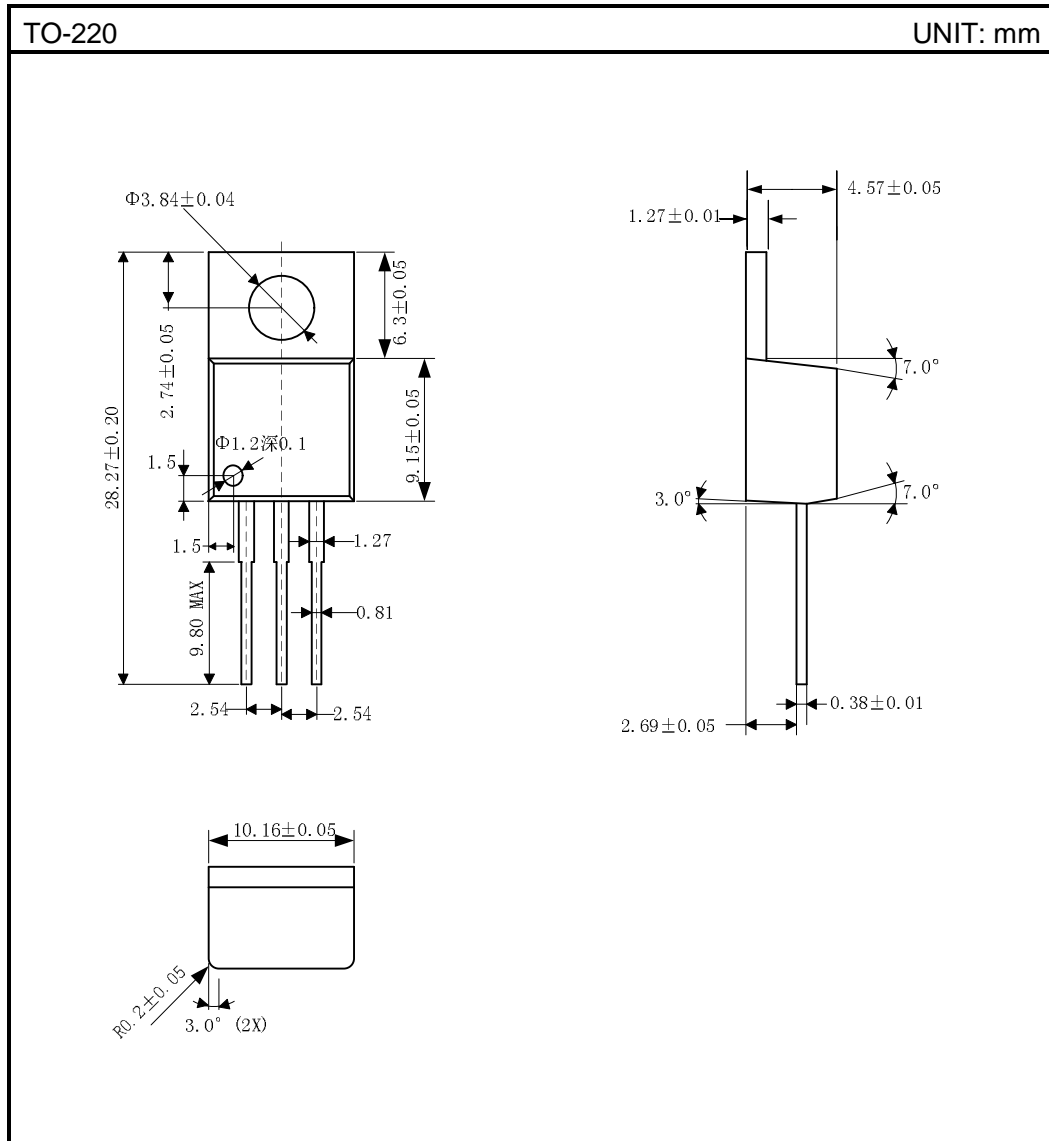
图17 静态电流与输入电压的关系曲线图



# X78XX

# 双极型线性集成电路

## 封装外形图



# X78XX