

UTC78XX

双极型线性集成电路

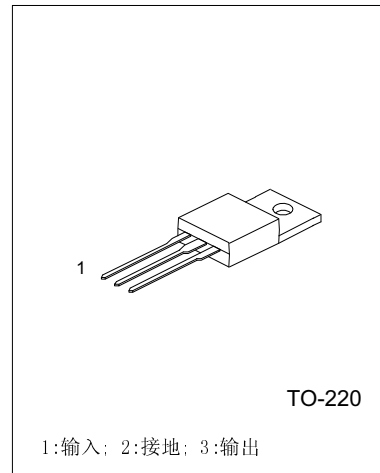
三端1.5A正电源稳压电路

概述

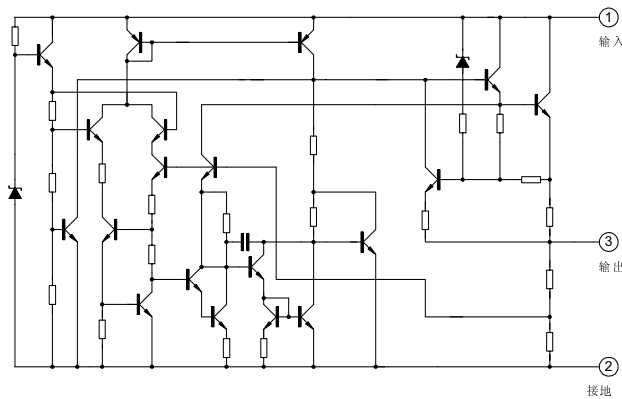
* UTC78XX系列是三端正电源稳压电路，它的封装形式为TO-220。它有一系列固定的电压输出，应用非常的广泛。每种类型由于内部电流的限制，以及过热保护和安全工作区的保护，使它基本上不会损坏。如果能够提供足够的散热片，它们就能够提供大于1.5A的输出电流。虽然是按照固定电压值来设计的，但是当接入适当的外部器件后，就能获得各种不同的电压和电流。

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)	Vi	35	V
		40	V
结到空气热阻	RθJA	65	°C/W
结到壳热阻	RθJC	5	°C/W
工作温度	Topr	0~+125	°C
贮存温度	Tstg	-65~+150	°C

UTC7805 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	ΔV_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	ΔV_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	ΔI_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		$\text{mV}/^\circ\text{C}$
输出噪声电压	V_N	$f = 10\text{Hz to } 100\text{kHz}$, $T_a = 25^\circ\text{C}$		42		μV
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

UTC7806 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	ΔV_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	ΔV_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	ΔI_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		$\text{mV}/^\circ\text{C}$
输出噪声电压	V_N	$f = 10\text{Hz to } 100\text{kHz}$, $T_a = 25^\circ\text{C}$		45		μV
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

UTC7808 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	ΔV_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	ΔV_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	ΔI_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		μV
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

UTC7809 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	ΔV_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	ΔV_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	ΔI_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		μV
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

UTC7810 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	ΔV_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	ΔV_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	ΔI_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/ $^\circ\text{C}$
输出噪音电压	V_N	$f = 10\text{Hz to } 100\text{kHz}$, $T_a = 25^\circ\text{C}$		58		μV
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

UTC7812 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	ΔV_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	ΔV_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	ΔI_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/ $^\circ\text{C}$
输出噪音电压	V_N	$f = 10\text{Hz to } 100\text{kHz}$, $T_a = 25^\circ\text{C}$		76		μV
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

UTC7815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	ΔV_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	ΔV_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	ΔI_Q	$I_o = 5\text{mA to } 1.0\text{A}$			0.5	mA
		$V_i = 18\text{V to } 30\text{V}$			0.8	mA
输出电压温漂	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		-1		mV/ $^\circ\text{C}$
输出噪音电压	V_N	$f = 10\text{Hz to } 100\text{kHz}$, $T_a = 25^\circ\text{C}$		90		μV
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

UTC7818 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	ΔV_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	ΔV_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	ΔI_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		μV
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

UTC7824 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	ΔV_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	ΔV_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	ΔI_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/°C
输出噪音电压	V_N	$f = 10\text{Hz to } 100\text{kHz}$, $T_a = 25^\circ\text{C}$		160		μV
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

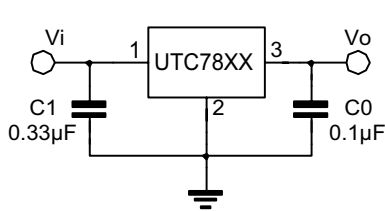


图1 测直流电参数电路图

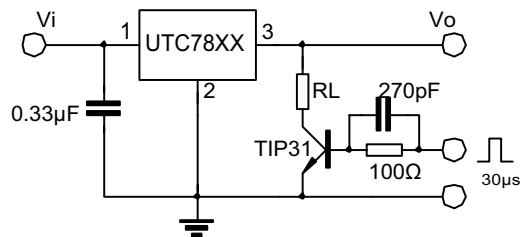


图2 测负载调整率电路图

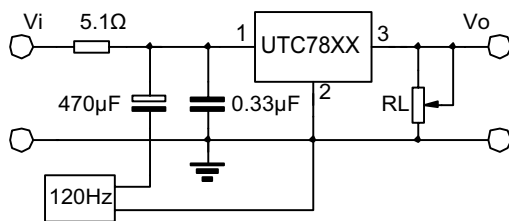


图3 测纹波抑制比电路图

应用电路图

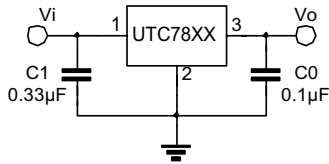
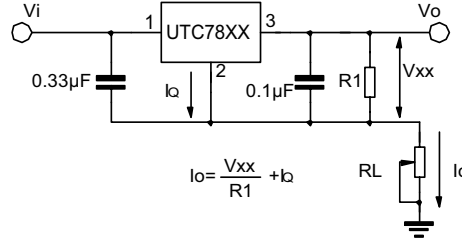
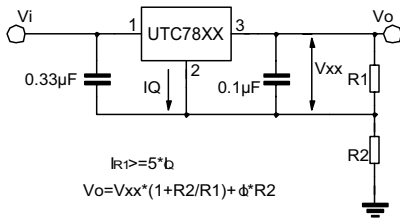


图4 固定输出稳压电路



$$I_o = \frac{V_{xx}}{R_1} + I_Q$$

图5 恒流稳压电路



$$I_{R1} >= 5 \cdot I_Q$$

$$V_o = V_{xx} \cdot (1 + R_2/R_1) + \phi \cdot R_2$$

图6 增强型稳压输出电路

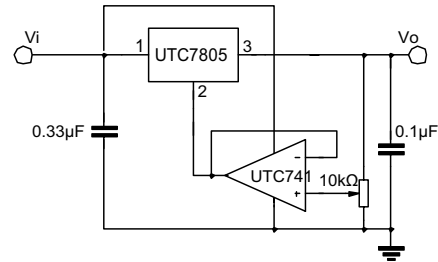
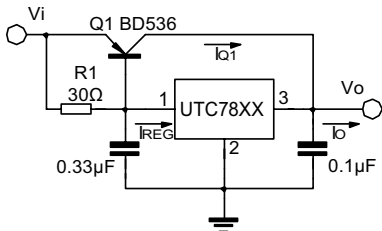


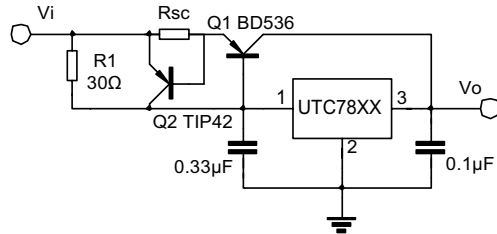
图7 可调型输出电路



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

$$R_1 = V_{BEQ1} / I_{REG} \cdot I_o \cdot \alpha_1$$

图8 高电流电压稳压电路



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

图9 高输出电流短路保护电路

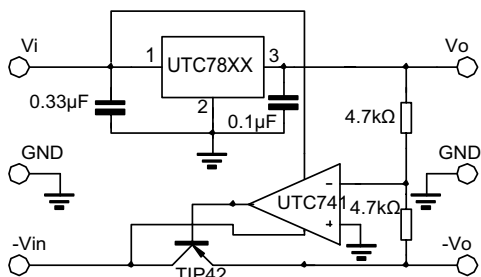


图10 跟踪电压稳压电路

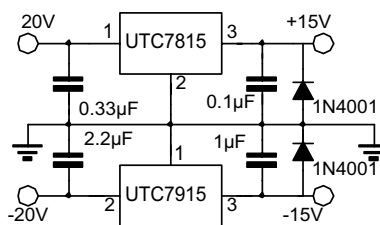


图11 分电源电路(±15V, 1A)

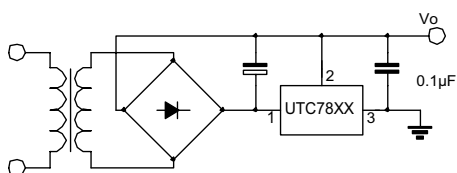


图12 负电源电压输出电路

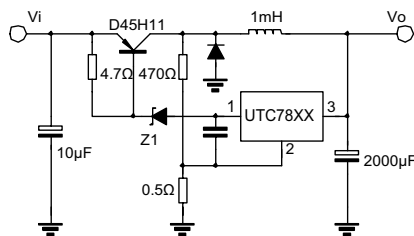


图13 开关稳压电路

典型特性曲线图

图14 静态电流与结点温度的关系曲线图

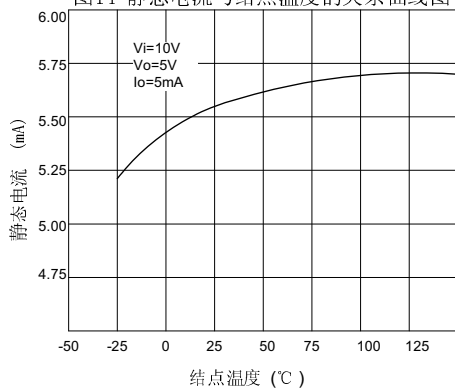


图15 输出电压与结点温度的关系曲线图

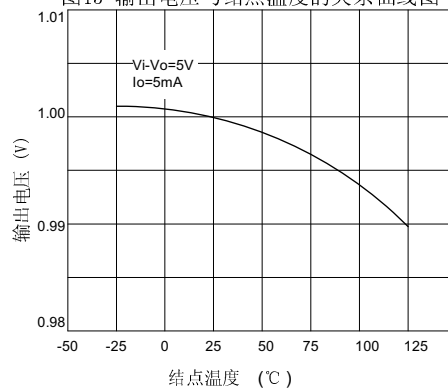


图16 峰值输出电流

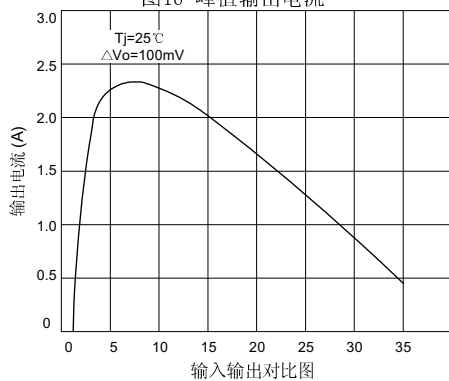
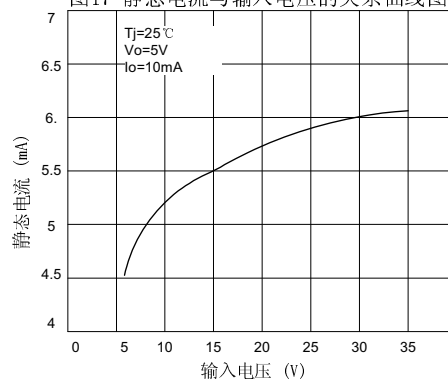
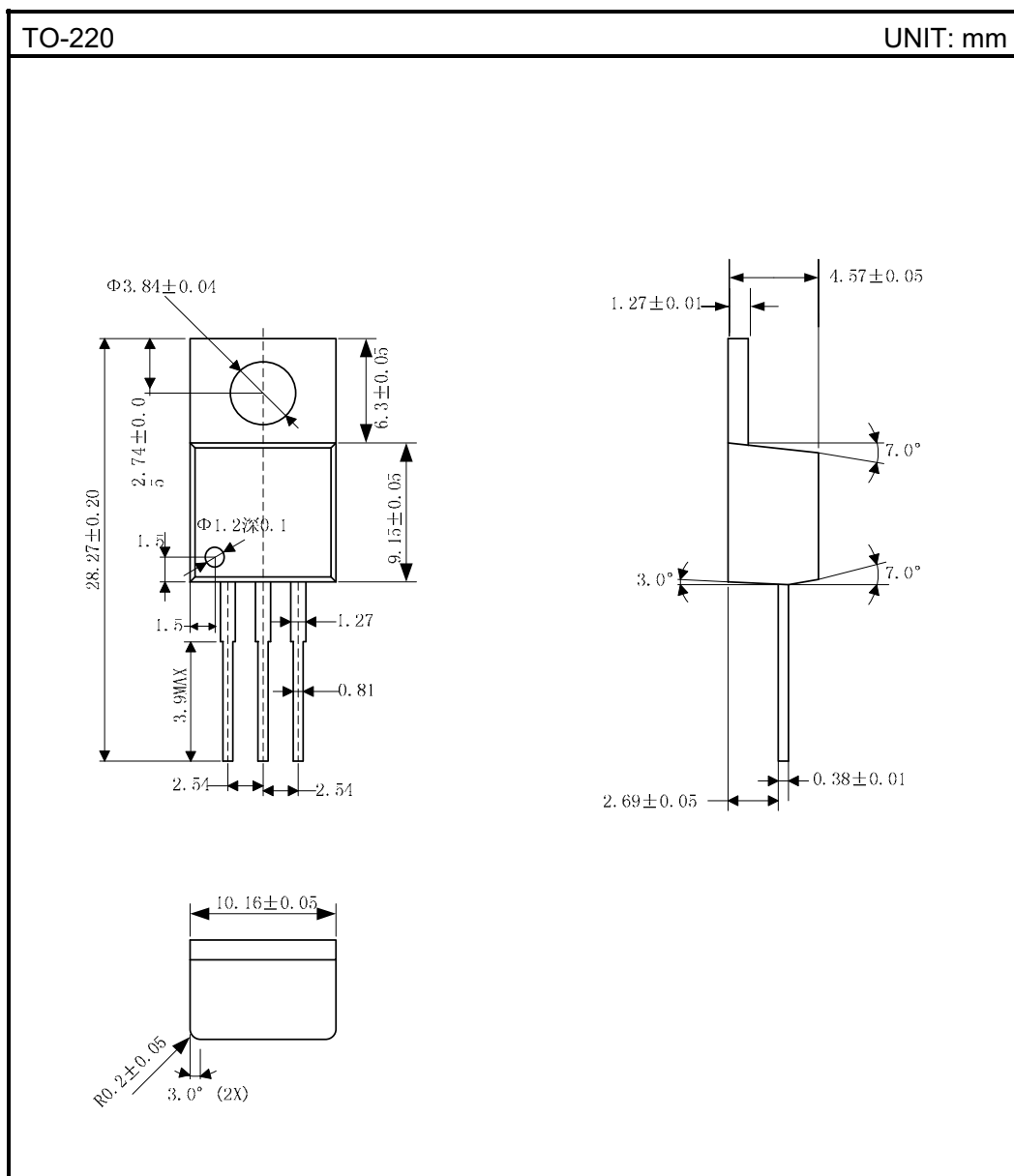


图17 静态电流与输入电压的关系曲线图



封装外形图



修改记录:

日期	版本号	描述	页码
	原版		
05.06.30	V1.1	修改“立体图” 增加“封装外形图”	1 10