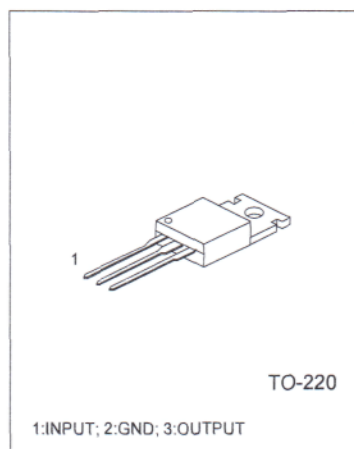


3 TERMINAL 1A POSITIVE VOLTAGE REGULATORS

DESCRIPTION

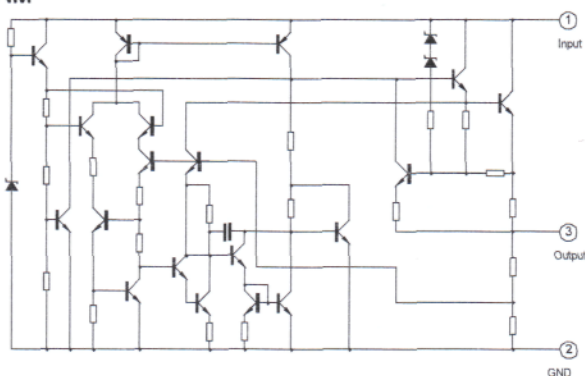
The UTC78XX series of three-terminal positive regulators are available in TO-220 package and with several fixed output voltage, making them useful in a wide range of application. Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.



FEATURES

- *Output current up to 1A
- *5V;6V;8V;9V;10V;12V;15V;18V;24V output voltage available
- *Thermal overload protection
- *Short circuit protection
- *Output transistor SOA protection

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Characteristic	Symbol	Value	Unit
Input voltage (for Vo=5V to 18V)	Vi	35	V
(for Vo=24V)		40	V
Thermal resistance junction-air	RθJA	65	°C/W
Thermal resistance junction-cases	RθJC	5	°C/W
Operating Temperature	Topr	0 ~ +125	°C
Storage Temperature	Tstg	-65 ~ +150	°C

UTC7805 ELECTRICAL CHARACTERISTICS(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 10\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	V_o	$T_j = 25^\circ\text{C}$	4.8	5.0	5.2	V
		$5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$ $V_i = 7\text{V}$ to 20V	4.75	5.00	5.25	V
Line regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $V_i = 7\text{V}$ to 25V		4.0	100	mV
		$T_j = 25^\circ\text{C}$, $V_i = 8\text{V}$ to 12V		1.6	50	mV
Load regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.5A		9	100	mV
		$T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA		4	50	mV
Quiescent current	I_Q	$T_j = 25^\circ\text{C}$		5.0	8	mA
Quiescent current change	ΔI_Q	$I_o = 5\text{mA}$ to 1.0A		0.03	0.5	mA
		$V_i = 7\text{V}$ to 25V		0.3	1.3	mA
Output voltage drift	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		-0.8		mV/ $^\circ\text{C}$
Output noise voltage	V_N	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$		42		μV
Ripple rejection	RR	$f = 120\text{Hz}$, $V_i = 8\text{V}$ to 18V	62	73		dB
Dropout voltage	V_o	$I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$		2		V
Output resistance	R_o	$f = 1\text{kHz}$		15		$\text{m}\Omega$
Short circuit current	I_{sc}	$V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$		230		mA
peak current	I_{pk}	$T_j = 25^\circ\text{C}$		2.2		A

UTC7806 ELECTRICAL CHARACTERISTICS(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 11\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	V_o	$T_j = 25^\circ\text{C}$	5.75	6.00	6.25	V
		$5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$ $V_i = 8\text{V}$ to 21V	5.7	6.0	6.3	V
Line regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $V_i = 8\text{V}$ to 25V		5	120	mV
		$T_j = 25^\circ\text{C}$, $V_i = 9\text{V}$ to 13V		1.5	60	mV
Load regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.5A		9	130	mV
		$T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA		3	60	mV
Quiescent current	I_Q	$T_j = 25^\circ\text{C}$		5.0	8	mA
Quiescent current change	ΔI_Q	$I_o = 5\text{mA}$ to 1.0A			0.5	mA
		$V_i = 8\text{V}$ to 25V			1.3	mA
Output voltage drift	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		-0.8		mV/ $^\circ\text{C}$
Output noise voltage	V_N	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$		45		μV
Ripple rejection	RR	$f = 120\text{Hz}$, $V_i = 9\text{V}$ to 19V	59	75		dB
Dropout voltage	V_o	$I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$		2		V
Output resistance	R_o	$f = 1\text{kHz}$		19		$\text{m}\Omega$
Short circuit current	I_{sc}	$V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$		250		mA
peak current	I_{pk}	$T_j = 25^\circ\text{C}$		2.2		A

UTC7808 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 14\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	V_o	$T_j = 25^\circ\text{C}$	7.7	8.0	8.3	V
		$5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$ $V_i = 10.5\text{V}$ to 23V	7.6	8.0	8.4	V
Line regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $V_i = 10.5\text{V}$ to 25V		5.0	160	mV
		$T_j = 25^\circ\text{C}$, $V_i = 11.5\text{V}$ to 17V		2.0	80	mV
Load regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.5A		10	160	mV
		$T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA		5.0	80	mV
Quiescent current	I_q	$T_j = 25^\circ\text{C}$		5.0	8	mA
Quiescent current change	ΔI_q	$I_o = 5\text{mA}$ to 1.0A		0.05	0.5	mA
		$V_i = 11.5\text{V}$ to 25V		0.5	1.0	mA
Output voltage drift	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		-0.8		mV/ $^\circ\text{C}$
Output noise voltage	V_N	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$		52		μV
Ripple rejection	RR	$f = 120\text{Hz}$, $V_i = 11.5\text{V}$ to 21.5V	56	73		dB
Dropout voltage	V_o	$I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$		2		V
Output resistance	R_o	$f = 1\text{kHz}$		17		$\text{m}\Omega$
Short circuit current	Isc	$V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$		230		mA
peak current	Ipk	$T_j = 25^\circ\text{C}$		2.2		A

UTC7809 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 15\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	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 24V	8.6	9.0	9.4	V
Line regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $V_i = 11.5\text{V}$ to 25V		6	180	mV
		$T_j = 25^\circ\text{C}$, $V_i = 12\text{V}$ to 25V		2	90	mV
Load regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.5A		12	180	mV
		$T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA		4	90	mV
Quiescent current	I_q	$T_j = 25^\circ\text{C}$		5.0	8	mA
Quiescent current change	ΔI_q	$I_o = 5\text{mA}$ to 1.0A			0.5	mA
		$V_i = 11.5\text{V}$ to 26V			1.3	mA
Output voltage drift	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		-1		mV/ $^\circ\text{C}$
Output noise voltage	V_N	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$		58		μV
Ripple rejection	RR	$f = 120\text{Hz}$, $V_i = 13\text{V}$ to 23V	56	71		dB
Dropout voltage	V_o	$I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$		2		V
Output resistance	R_o	$f = 1\text{kHz}$		15		$\text{m}\Omega$
Short circuit current	Isc	$V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$		250		mA
peak current	Ipk	$T_j = 25^\circ\text{C}$		2.2		A

UTC7810 ELECTRICAL CHARACTERISTICS(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 16\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	V_o	$T_j = 25^\circ\text{C}$ $5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$ $V_i = 12.5\text{V}$ to 25V	9.6	10	10.4	V
		$T_j = 25^\circ\text{C}$, $V_i = 12.5\text{V}$ to 25V	9.5	10	10.5	V
Line regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $V_i = 12.5\text{V}$ to 25V		10	200	mV
		$T_j = 25^\circ\text{C}$, $V_i = 13\text{V}$ to 20V		3	100	mV
Load regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.5A		12	200	mV
		$T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA		4	100	mV
Quiescent current	I_Q	$T_j = 25^\circ\text{C}$		5.0	8	mA
Quiescent current change	ΔI_Q	$I_o = 5\text{mA}$ to 1.0A			0.5	mA
		$V_i = 12.5\text{V}$ to 29V			1.0	mA
Output voltage drift	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		-1		mV/ $^\circ\text{C}$
Output noise voltage	V_N	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$		58		μV
Ripple rejection	RR	$f = 120\text{Hz}$, $V_i = 14\text{V}$ to 24V	56	71		dB
Dropout voltage	V_o	$I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$		2		V
Output resistance	R_o	$f = 1\text{kHz}$		17		$\text{m}\Omega$
Short circuit current	I_{sc}	$V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$		250		mA
peak current	I_{pk}	$T_j = 25^\circ\text{C}$		2.2		A

UTC7812 ELECTRICAL CHARACTERISTICS(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 16\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	V_o	$T_j = 25^\circ\text{C}$ $5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$ $V_i = 14.5\text{V}$ to 27V	11.5	12.0	12.5	V
		$T_j = 25^\circ\text{C}$, $V_i = 14.5\text{V}$ to 27V	11.4	12	12.6	V
Line regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $V_i = 14.5\text{V}$ to 30V		10	240	mV
		$T_j = 25^\circ\text{C}$, $V_i = 16\text{V}$ to 22V		3	120	mV
Load regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.5A		11	240	mV
		$T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA		5.0	120	mV
Quiescent current	I_Q	$T_j = 25^\circ\text{C}$		5.1	8	mA
Quiescent current change	ΔI_Q	$I_o = 5\text{mA}$ to 1.0A			0.5	mA
		$V_i = 14.5\text{V}$ to 30V			1.0	mA
Output voltage drift	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		-1		mV/ $^\circ\text{C}$
Output noise voltage	V_N	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$		76		μV
Ripple rejection	RR	$f = 120\text{Hz}$, $V_i = 15\text{V}$ to 25V	55	71		dB
Dropout voltage	V_o	$I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$		2		V
Output resistance	R_o	$f = 1\text{kHz}$		18		$\text{m}\Omega$
Short circuit current	I_{sc}	$V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$		230		mA
peak current	I_{pk}	$T_j = 25^\circ\text{C}$		2.2		A

UTC7815 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 23\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	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 30V	14.25	15	15.75	V
Line regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $V_i = 17.5\text{V}$ to 30V		11	300	mV
		$T_j = 25^\circ\text{C}$, $V_i = 20\text{V}$ to 26V		3	150	mV
Load regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.5A		12	300	mV
		$T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA		4	150	mV
Quiescent current	I_Q	$T_j = 25^\circ\text{C}$		5.2	8	mA
Quiescent current change	ΔI_Q	$I_o = 5\text{mA}$ to 1.0A			0.5	mA
		$V_i = 17.5\text{V}$ to 305V			1.0	mA
Output voltage drift	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		-1		mV/ $^\circ\text{C}$
Output noise voltage	V_N	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$		90		μV
Ripple rejection	RR	$f = 120\text{Hz}$, $V_i = 18.5\text{V}$ to 28.5V	54	70		dB
Dropout voltage	V_o	$I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$		2		V
Output resistance	R_o	$f = 1\text{kHz}$		19		$\text{m}\Omega$
Short circuit current	I_{sc}	$V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$		250		mA
peak current	I_{pk}	$T_j = 25^\circ\text{C}$		2.2		A

UTC7818 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 23\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	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 33V	17.1	18	18.9	V
Line regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $V_i = 21\text{V}$ to 33V		15	360	mV
		$T_j = 25^\circ\text{C}$, $V_i = 24\text{V}$ to 30V		5	180	mV
Load regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.5A		15	360	mV
		$T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA		5.0	180	mV
Quiescent current	I_Q	$T_j = 25^\circ\text{C}$		5.2	8	mA
Quiescent current change	ΔI_Q	$I_o = 5\text{mA}$ to 1.0A			0.5	mA
		$V_i = 21\text{V}$ to 32V			1.0	mA
Output voltage drift	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		-1		mV/ $^\circ\text{C}$
Output noise voltage	V_N	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$		110		μV
Ripple rejection	RR	$f = 120\text{Hz}$, $V_i = 22\text{V}$ to 32V	53	69		dB
Dropout voltage	V_o	$I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$		2		V
Output resistance	R_o	$f = 1\text{kHz}$		22		$\text{m}\Omega$
Short circuit current	I_{sc}	$V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$		250		mA
peak current	I_{pk}	$T_j = 25^\circ\text{C}$		2.2		A

UTC7824 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 33\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	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 38V	22.8	24	25.2	V
Line regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $V_i = 27\text{V}$ to 38V		17	480	mV
		$T_j = 25^\circ\text{C}$, $V_i = 30\text{V}$ to 36V		6	240	mV
Load regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.5A		15	480	mV
		$T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA		5.0	240	mV
Quiescent current	I_q	$T_j = 25^\circ\text{C}$		5.2	8	mA
Quiescent current change	ΔI_q	$I_o = 5\text{mA}$ to 1.0A			0.5	mA
		$V_i = 27\text{V}$ to 38V			1.0	mA
Output voltage drift	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		-1.5		mV/ $^\circ\text{C}$
Output noise voltage	V_N	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$		160		μV
Ripple rejection	RR	$f = 120\text{Hz}$, $V_i = 28\text{V}$ to 38V	50	67		dB
Dropout voltage	V_o	$I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$		2		V
Output resistance	R_o	$f = 1\text{kHz}$		28		$\text{m}\Omega$
Short circuit current	I_{sc}	$V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$		230		mA
peak current	I_{pk}	$T_j = 25^\circ\text{C}$		2.2		A

TEST CIRCUITS

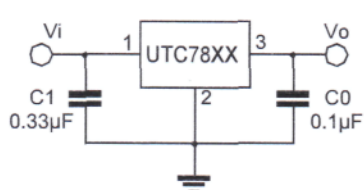


FIG.1 DC PARAMETERS

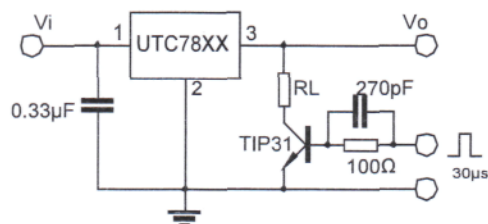


FIG.2 LOAD REGULATION

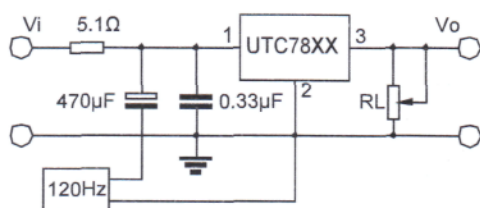


FIG.3 RIPPLE REJECTION

APPLICATION CIRCUITS

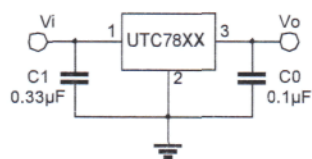


Fig.4 Fixed output regulator

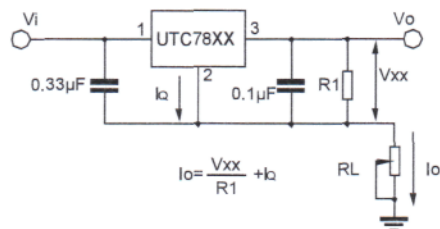


Fig.5 Constant current regulator

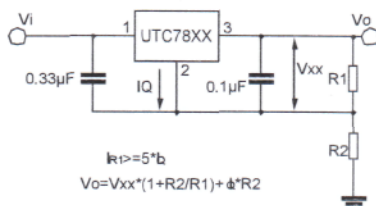


Fig.6 Circuit for increasing Regulator output voltage

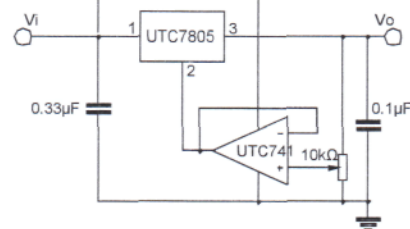


Fig.7 Adjustable output

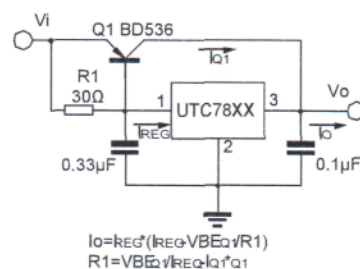


Fig.8 High current with voltage regulator

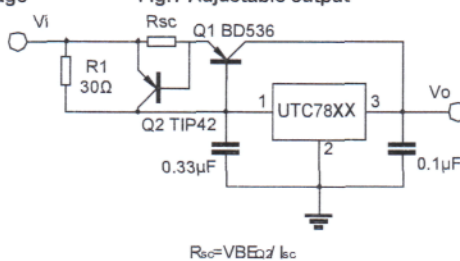


Fig.9 High output current short circuit protection

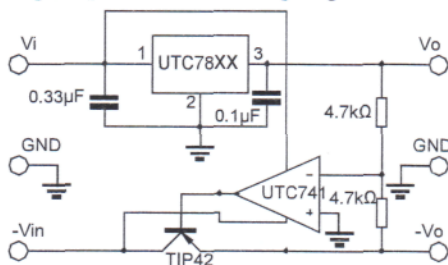


Fig.10 Tracking voltage regulator

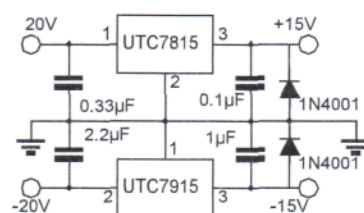


Fig.11 Split power supply (±15V, 1A)

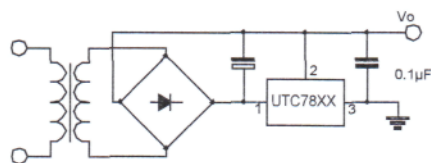


Fig.12 Negative output voltage circuit

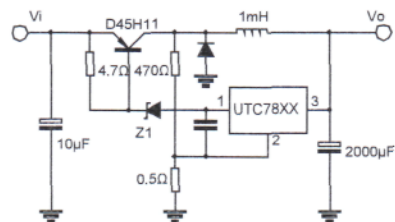


Fig.13 switching regulator

TYPICAL PERFORMANCE CHARACTERISTICS

Fig.14 Quiescent current

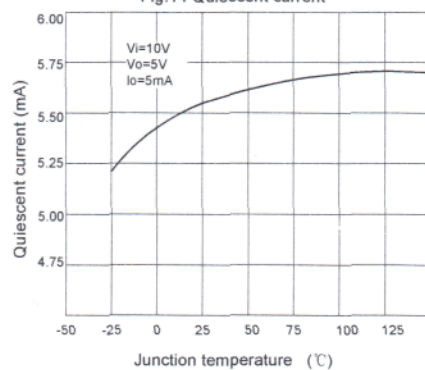


Fig.15 Output voltage

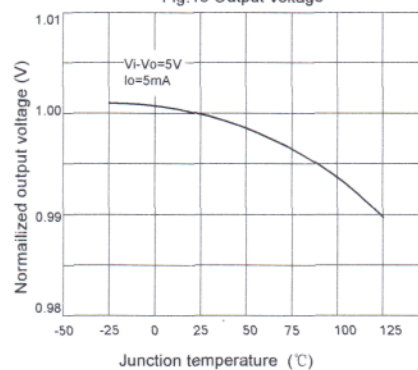


Fig.16 Peak output current

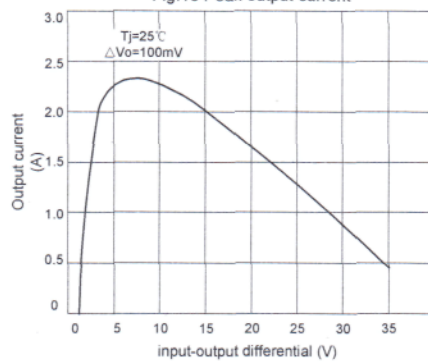


Fig.17 Quiescent current

