CW78X X Series

3 TERMINAL 1.0A POSITIVE VOLTAGE REGULATORS

DESCRIPTION

The 78XX series of three-terminal positive regulators are available in TO-220 packages.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 1.0A output current, Although designed as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.

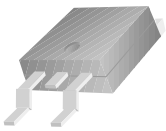
1.IN

2.GND

3.OUT

1 2 3

TO-220



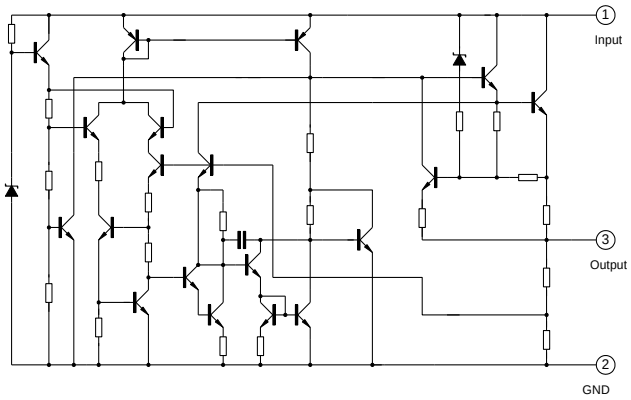
1 2 3

TO-252

FEATURES

*Output current up to 1.0A
*Thermal overload protection
*Short circuit protection
*Output transistor SOA protection

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Characteristic	Symbol	Value	Unit
Input voltage	Vi	35	V
Thermal resistance junction-air	R(JA)	65	°C/W
Thermal resistance junction-cases	RθJC	5	°C/W
Operating Temperature	Topr	-20~+125	°C
Storage Temperature	Tstg	-65~+150	°C

7805 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125℃,Io=500mA,Vi=10V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	4.8	5.0	5.2	V
		5.0mA<Io<1.0A,Po<15W Vi=8V to 20V	4.75	5.00	5.25	V
Line regulation	ΔVo	Tj=25°C,Vi=7.5V to 20V		4	100	mV
		Tj=25°C,Vi=8V to 12V		2	50	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mA to 1.0A		9	100	mV
		Tj=25°C,Io=250mA to 750mA		4	50	mV
Quiescent current	I_Q	Tj=25°C		4.2	8	mA
Quiescent current change	ΔI_Q	Io=5mA to 1.0A		0.03	0.5	mA
		Vi=8V to 25V, Io=500mA		0.3	0.8	mA
Output voltage drift	ΔVo/ΔT	Io=5mA		0.8		mV/°C
Output noise voltage	V_N	f=10Hz to 100kHz,Ta=25°C		42		μV/Vo
Ripple rejection	RR	f=120Hz, Vi=8V to 18V	62	73		dB
Dropout voltage	Vo	Io=1.0A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		15		mΩ
Short circuit current	Isc	Vi=35V,Ta=25°C		200		mA

7806 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125℃,Io=500mA,Vi=11V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	5.75	6	6.25	V
		5.0mA<Io<1.0A,Po<15W Vi=9V to 21V	5.65	6	6.25	V
Line regulation	ΔVo	Tj=25°C,Vi=8.5V to 25V			120	mV
		Tj=25°C,Vi=9V to 13V			60	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mA to 1.0A			120	mV
		Tj=25°C,Io=250mA to 750mA			60	mV
Quiescent current	I_Q	Tj=25°C		4.3	8	mA
Quiescent current change	ΔI_Q	Io=5mA to 1.0A			0.5	mA
		Vi=9V to 25V, Io=500mA			0.8	mA
Output voltage drift	ΔVo/ΔT	Io=5mA		0.8		mV/°C
Output noise voltage	V_N	f=10Hz to 100kHz,Ta=25°C		42		μV/Vo
Ripple rejection	RR	f=120Hz, Vi=9V to 19V		68		dB
Dropout voltage	Vo	Io=1.0A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		17		mΩ
Short circuit current	Isc	Vi=35V,Ta=25°C		200		mA

3 TERMINAL 1.0A POSITIVE VOLTAGE REGULATORS

7808 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125℃,Io=500mA,Vi=14V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	7.84	8	8.16	V
		5.0mA<Io<1.0A,Po<15W Vi=11.5V to 23V	7.7	8	8.3	V
Line regulation	ΔVo	Tj=25°C,Vi=10.5V to 25V			160	mV
		Tj=25°C,Vi=11V to 17V			80	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mA to 1.0A			160	mV
		Tj=25°C,Io=250mA to 750mA			80	mV
Quiescent current	IQ	Tj=25°C		4.3	8	mA
Quiescent current change	ΔIQ	Io=5mA to 1.0A			0.5	mA
		Vi=11.5V to 25V, Io=500mA			0.8	mA
Output voltage drift	ΔVo/ΔT	Io=5mA		1.0		mV/°C
Output noise voltage	VN	f=10Hz to 100kHz,Ta=25°C		42		μV/Vo
Ripple rejection	RR	f=120Hz, Vi=11.5V to 21.5V		62		dB
Dropout voltage	Vo	Io=1.0A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		18		mΩ
Short circuit current	Isc	Vi=35V,Ta=25°C		200		mA

7809 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125℃,Io=500mA,Vi=15V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	8.82	9	9.18	V
		5.0mA<Io<1.0A,Po<15W Vi=12.5V to 24V	8.65	9	9.35	V
Line regulation	ΔVo	Tj=25°C,Vi=11.5V to 26V			180	mV
		Tj=25°C,Vi=12V to 18V			90	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mA to 1.0A			180	mV
		Tj=25°C,Io=250mA to 750mA			90	mV
Quiescent current	IQ	Tj=25°C		4.3	8	mA
Quiescent current change	ΔIQ	Io=5mA to 1.0A			0.5	mA
		Vi=12.5V to 25V, Io=500mA			0.8	mA
Output voltage drift	ΔVo/ΔT	Io=5mA		1.2		mV/°C
Output noise voltage	VN	f=10Hz to 100kHz,Ta=25°C		42		μV/Vo
Ripple rejection	RR	f=120Hz, Vi=12.5V to 22.5V		61		dB
Dropout voltage	Vo	Io=1.0A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		18		mΩ
Short circuit current	Isc	Vi=35V,Ta=25°C		200		mA

7810 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125℃,Io=500mA,Vi=16V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	9.7	10	10.3	V
		5.0mA<Io<1.0A,Po<15W Vi=13.5V to 25V	9.6	10	10.4	V
Line regulation	ΔVo	Tj=25°C,Vi=12.5V to 28V		8	200	mV
		Tj=25°C,Vi=14V to 20V		4	100	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mA to 1.0A		18	200	mV
		Tj=25°C,Io=250mA to 750mA		8	100	mV
Quiescent current	IQ	Tj=25°C		4.3	8	mA
Quiescent current change	ΔIQ	Io=5mA to 1.0A			0.5	mA
		Vi=13V to 28V, Io=500mA			0.8	mA
Output voltage drift	ΔVo/ΔT	Io=5mA		1.3		mV/°C
Output noise voltage	VN	f=10Hz to 100kHz,Ta=25°C		42		μV/Vo
Ripple rejection	RR	f=120Hz, Vi=13V to 23V		61		dB
Dropout voltage	Vo	Io=1.0A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		18		mΩ
Short circuit current	Isc	Vi=35V,Ta=25°C		200		mA

7812 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125℃,Io=500mA,Vi=19V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	11.5	12	12.5	V
		5.0mA<Io<1.0A,Po<15W Vi=15.5V to 27V	11.4	12	12.6	V
Line regulation	ΔVo	Tj=25°C,Vi=14.5V to 30V			240	mV
		Tj=25°C,Vi=16V to 22V			120	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mA to 1.0A			240	mV
		Tj=25°C,Io=250mA to 750mA			120	mV
Quiescent current	I_Q	Tj=25°C		4.4	8	mA
Quiescent current change	ΔI_Q	Io=5mA to 1.0A			0.5	mA
		Vi=15V to 30V, Io=500mA			0.8	mA
Output voltage drift	ΔVo/ΔT	Io=5mA		1.5		mV/°C
Output noise voltage	V_N	f=10Hz to 100kHz,Ta=25°C		42		μV/Vo
Ripple rejection	RR	f=120Hz, Vi=15V to 25V		60		dB
Dropout voltage	Vo	Io=1.0A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		18		mΩ
Short circuit current	Isc	Vi=35V,Ta=25°C		200		mA

7815 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125℃,Io=500mA,Vi=21V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	14.4	15	15.6	V
		5.0mA<Io<1.0A,Po<15W Vi=17.5V to 30V	14.25	15	15.75	V
Line regulation	ΔVo	Tj=25°C,Vi=17.5V to 30V		15	300	mV
		Tj=25°C,Vi=20V to 26V		7	150	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mA to 1.0A		25	300	mV
		Tj=25°C,Io=250mA to 750mA		10	150	mV
Quiescent current	I_Q	Tj=25°C		5	8	mA
Quiescent current change	ΔI_Q	Io=5mA to 1.0A			0.5	mA
		Vi=18V to 30V, Io=500mA			0.8	mA
Output voltage drift	ΔVo/ΔT	Io=5mA		1.8		mV/°C
Output noise voltage	V_N	f=10Hz to 100kHz,Ta=25°C		42		μV/Vo
Ripple rejection	RR	f=120Hz, Vi=18V to 28V		60		dB
Dropout voltage	Vo	Io=1.0A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		18		mΩ
Short circuit current	Isc	Vi=35V,Ta=25°C		200		mA

TEST CIRCUITS

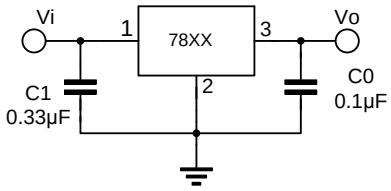


FIG.1 DC PARAMETERS

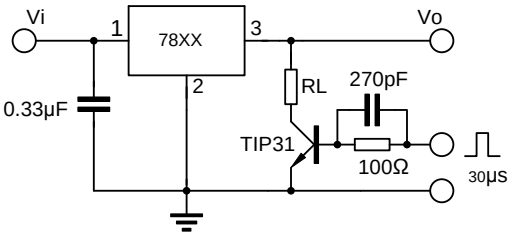


FIG.2 LOAD REGULATION

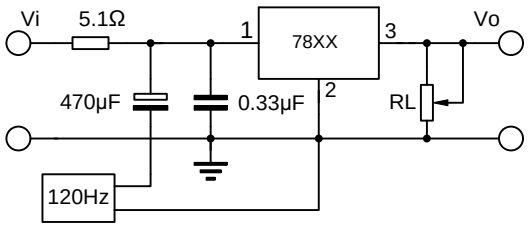


FIG.3 RIPPLE REJECTION

APPLICATION CIRCUITS

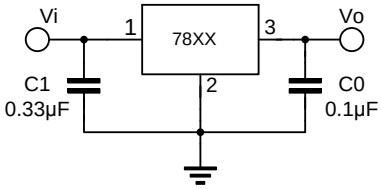


Fig.4 Fixed output regulator

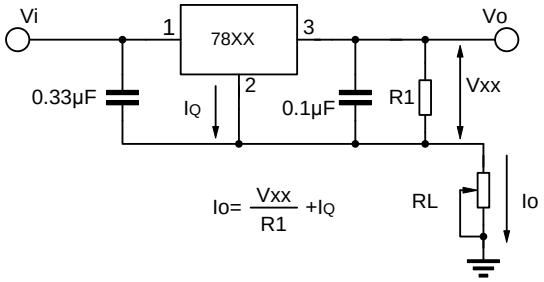


Fig.5 Constant current regulator

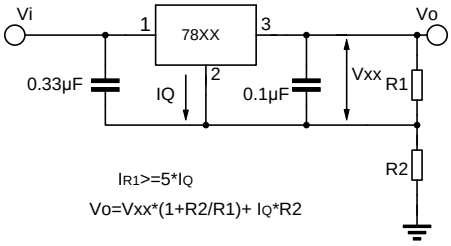


Fig.6 Circuit for increasing Regulator output voltage

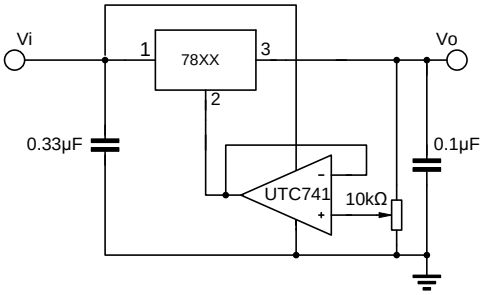


Fig.7 Adjustable output

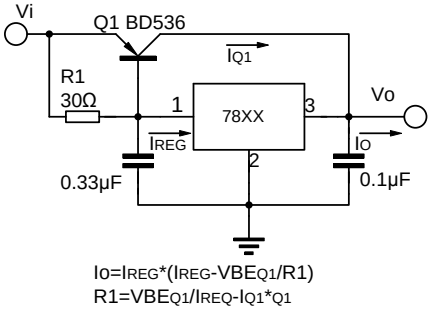


Fig.8 High current with voltage regulator

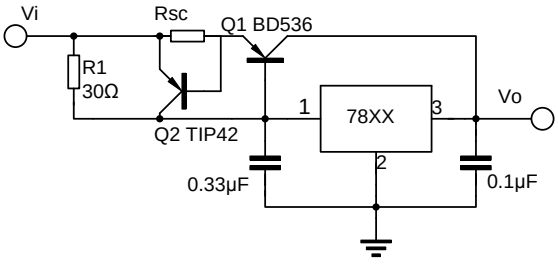


Fig.9 High output curent short circuit protection

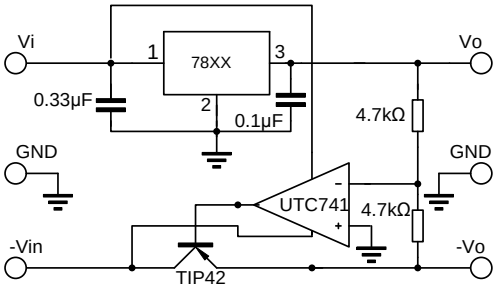


Fig.10 Tracking voltage regulator

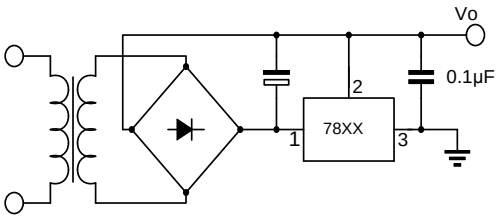


Fig.11 Negative output voltage ciruit

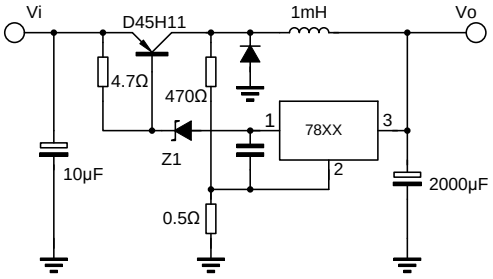


Fig.12 Switching regulator