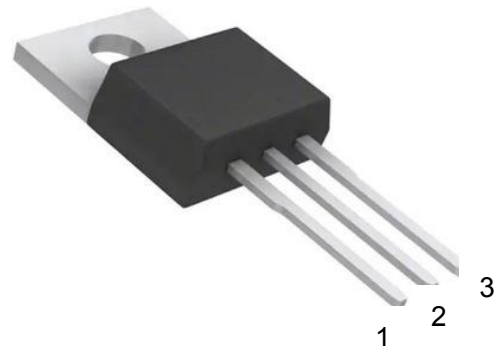


DESCRIPTION

The WD78XX 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.

TO-220



1:INPUT 2:GND 3:OUTPUT

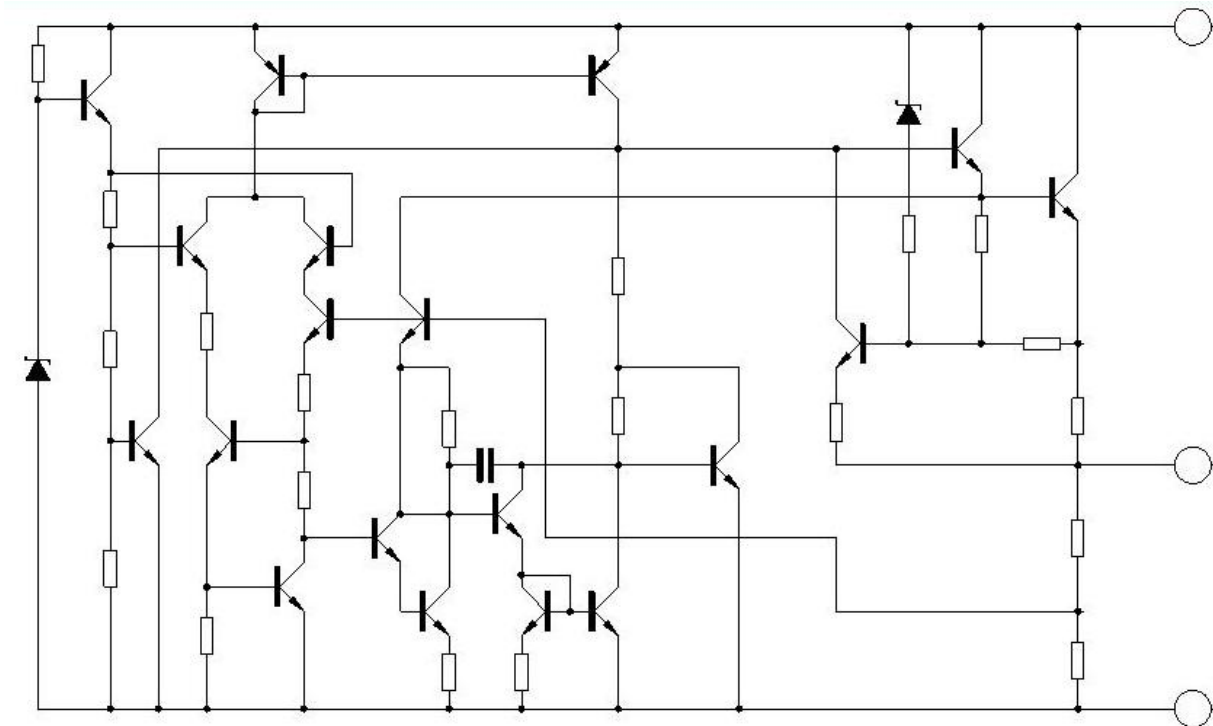
FEATURES

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

ORDERING INFORMATION

Device	Marking	PARAMETERS
WD7805	WD7805 *****	Vin(max)=35V, Vout=5V, 1A, TO-220
WD7806	WD7806 *****	Vin(max)=35V, Vout=6V, 1A, TO-220
WD7808	WD7808*****	Vin(max)=35V, Vout=8V, 1A, TO-220
WD7809	WD7809 *****	Vin(max)=35V, Vout=9V, 1A, TO-220
WD7810	WD7810*****	Vin(max)=35V, Vout=10V, 1A, TO-220
WD7812	WD7812 *****	Vin(max)=35V, Vout=12V, 1A, TO-220
WD7815	WD7815 *****	Vin(max)=35V, Vout=15V, 1A, TO-220

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Tc=25°C unless otherwise noted)

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

ELECTRICAL CHARACTERISTICS (Tc=25°C unless otherwise noted)

(一) WD7805 (Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 10\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	4.80	5.00	5.20	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
Line 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	Iq	Tj=25°C		4.2	8	mA
Quiescent current change	ΔIq	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	VN	f=10Hz to 100kHz, Ta=25°C		42		uV/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

(二) WD7806 (Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 11\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	5.75	6.0	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
Line regulation	ΔVo	Tj=25°C, Io=5.0mA to 1.0A			120	mV
		Tj=25°C, Io=250mA to 750mA			60	mV
Quiescent current	Iq	Tj=25°C		4.3	8	mA
Quiescent current change	ΔIq	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	VN	f=10Hz to 100kHz, Ta=25°C		42		uV/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

(三) WD7808 (Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 14\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	V_o	$T_j = 25^\circ\text{C}$	7.84	8	8.16	V
		$5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$, $V_i = 11.5\text{V}$ to 23V	7.7	8	8.3	V
Line regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $V_i = 10.5\text{V}$ to 25V			160	mV
		$T_j = 25^\circ\text{C}$, $V_i = 11\text{V}$ to 17V			80	mV
Line regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.0A			160	mV
		$T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA			80	mV
Quiescent current	I_Q	$T_j = 25^\circ\text{C}$		4.3	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 25V , $I_o = 500\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		1.0		mV/ $^\circ\text{C}$
Output noise voltage	V_N	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$		42		$\mu\text{V}/V_o$
Ripple rejection	RR	$F = 120\text{Hz}$, $V_i = 11.5\text{V}$ to 21.5V		62		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	Isc	$V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$		200		mA

(四) WD7809 (Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 15\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	V_o	$T_j = 25^\circ\text{C}$	8.82	9	9.18	V
		$5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$, $V_i = 12.5\text{V}$ to 24V	8.65	9	9.35	V
Line regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $V_i = 11.5\text{V}$ to 26V			180	mV
		$T_j = 25^\circ\text{C}$, $V_i = 12\text{V}$ to 18V			90	mV
Line regulation	ΔV_o	$T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.0A			180	mV
		$T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA			90	mV
Quiescent current	I_Q	$T_j = 25^\circ\text{C}$		4.3	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 25V , $I_o = 500\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o / \Delta T$	$I_o = 5\text{mA}$		1.2		mV/ $^\circ\text{C}$
Output noise voltage	V_N	$f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$		42		$\mu\text{V}/V_o$
Ripple rejection	RR	$F = 120\text{Hz}$, $V_i = 12.5\text{V}$ to 22.5V		61		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	Isc	$V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$		200		mA

(五) WD7810 (Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 16\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$)

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
Line 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		uV/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

(六) WD7812 (Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 19\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$)

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
Line regulation	ΔVo	Tj=25°C, Io=5.0mA to 1.0A			240	mV
		Tj=25°C, Io=250mA to 750mA			120	mV
Quiescent current	Iq	Tj=25°C		4.4	8	mA
Quiescent current change	ΔIq	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	VN	f=10Hz to 100kHz, Ta=25°C		42		uV/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

(七) **WD7815** (Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 21\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	14.4	15	15.6	V
		5.0mA<I _o <1.0A,P _o <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
Line regulation	ΔVo	Tj=25°C, I _o =5.0mA to 1.0A		25	300	mV
		Tj=25°C, I _o =250mA to 750mA		10	150	mV
Quiescent current	I _Q	Tj=25°C		5	8	mA
Quiescent current change	ΔI _Q	I _o =5mA to 1.0A			0.5	mA
		Vi=18V to 30V ,I _o =500mA			0.8	mA
Output voltage drift	ΔVo/ΔT	I _o =5mA		1.8		mV/°C
Output noise voltage	V _N	f=10Hz to 100kHz,Ta=25°C		42		uV/Vo
Ripple rejection	RR	F=120Hz,Vi=18V to 28V		60		dB
Dropout voltage	Vo	I _o =1.0A,Tj=25°C		2		V
Output resistance	R _o	f=1KHz		18		mΩ
Short circuit current	I _{sc}	Vi=35V,Ta=25°C		200		mA

TEST CIRCUITS

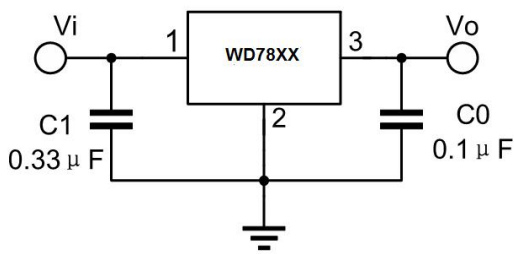


FIG1:DC PARAMETERS

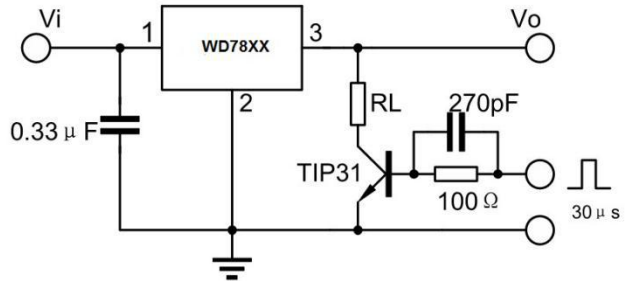


FIG2:LOAD REGULATION

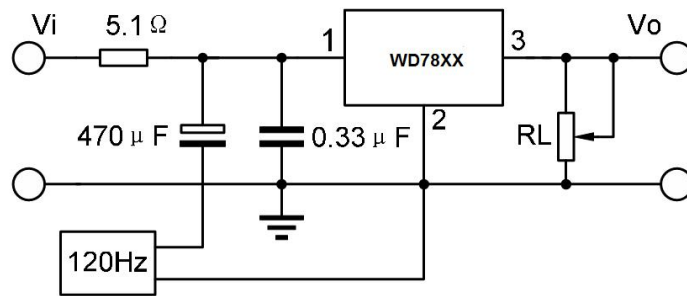


FIG3:RIPPLE REJECTION

APPLICATION CIRCUIT

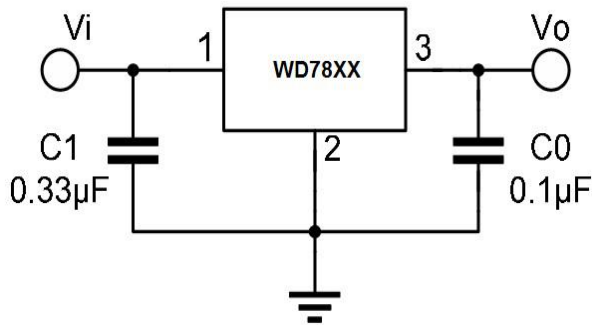


FIG4:Fixed out regulator

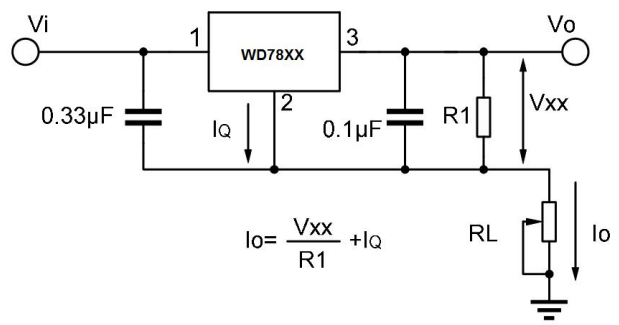


FIG5:Constant current regulator

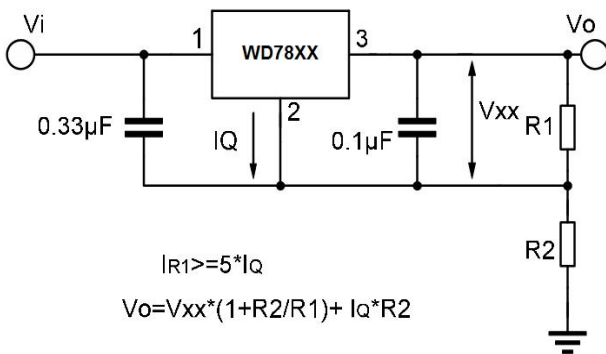


FIG6: For increasing Regulator output voltage

$$I_{R1} \geq 5 \cdot I_q$$

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

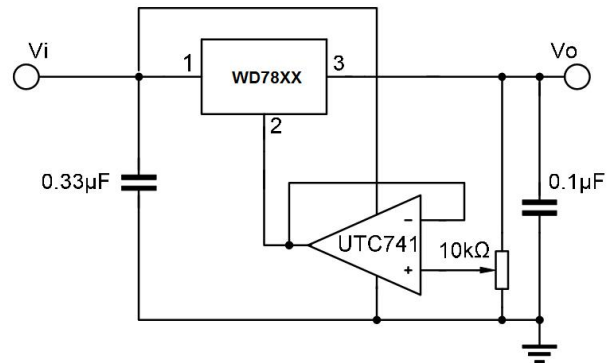


FIG7:Adjustable output

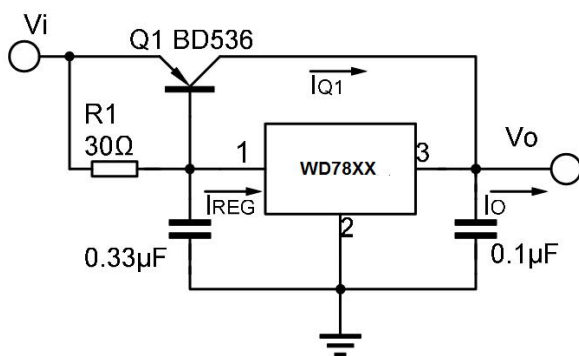


FIG8:High current with voltage regulator

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

$$R_1 = V_{BEQ1}/(I_{REG} - I_{Q1} \cdot Q_1)$$

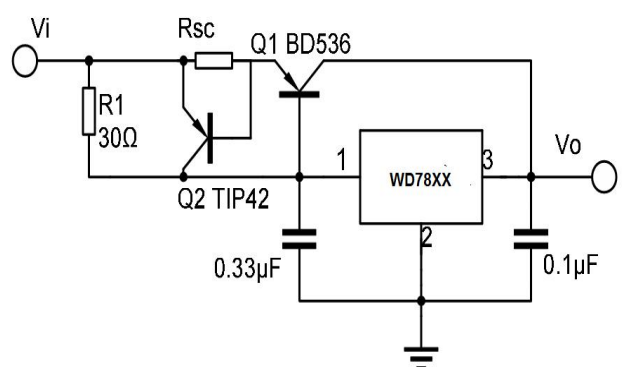


FIG9:High output current short circuit protection

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

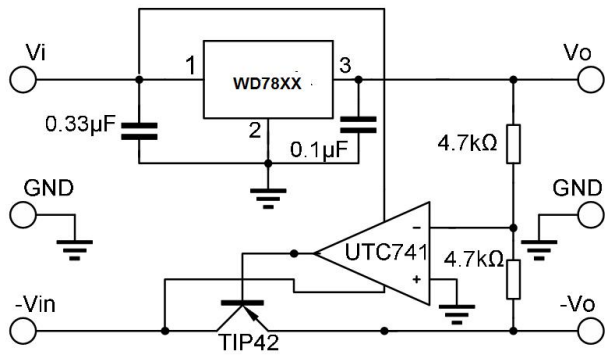


FIG10:Tracking voltage regulator

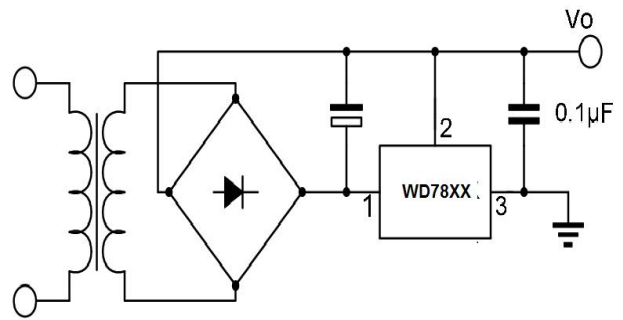


FIG11:Negative output voltage circuit

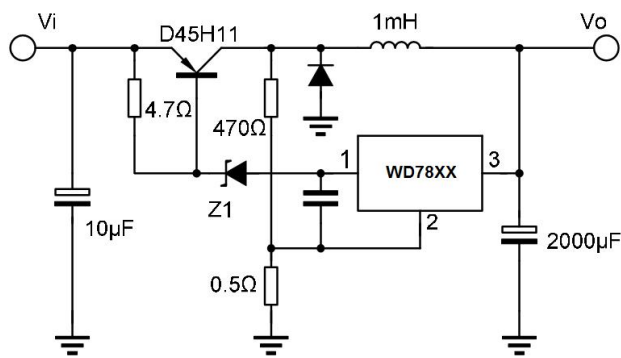


FIG12:Switching regulator

PACKAGE DIMENSIONS

TO-220

