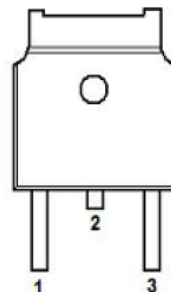


## DESCRIPTION

The WD78MXX series of three-terminal positive regulators are available in TO-252 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 0.5A output current. Although designed as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.

## TO-252



- 1. Input
- 2. GND
- 3. Output

1:Input      2:GND      3:Output

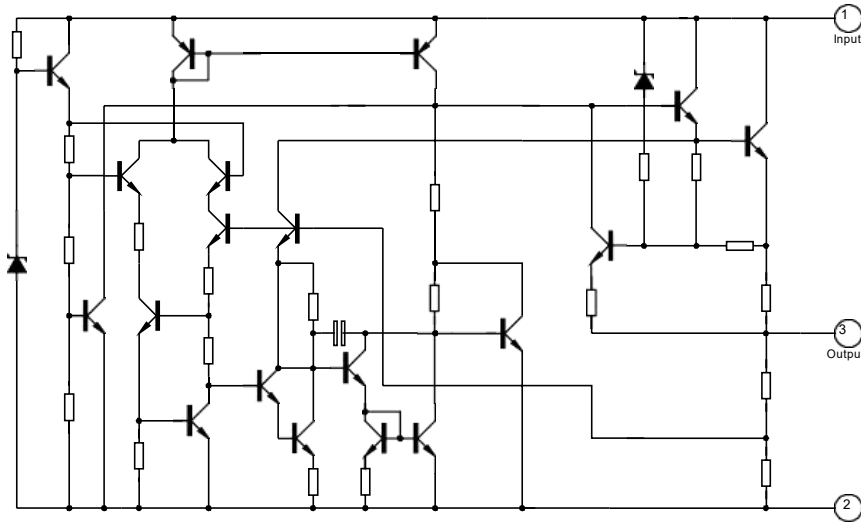
## FEATURES

- Output current up to 0.5A
- Short circuit protection
- Thermal overload protection
- Output transistor SOA protection

## ORDERING INFORMATION

Device	Marking	PARAMETERS
WD78M05	WD78M05 *****	Vin(max)=35V, Vout=5V, 0.5A, TO-252
WD78M06	WD78M06 *****	Vin(max)=35V, Vout=6V, 0.5A, TO-252
WD78M08	WD78M08*****	Vin(max)=35V, Vout=8V, 0.5A, TO-252
WD78M09	WD78M09 *****	Vin(max)=35V, Vout=9V, 0.5A, TO-252
WD78M12	WD78M12 *****	Vin(max)=35V, Vout=12V, 0.5A, TO-252
WD78M15	WD78M15 *****	Vin(max)=35V, Vout=15V, 0.5A, TO-252

## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS (T<sub>c</sub>=25°C unless otherwise noted)

Characteristic	Symbol	Value	Unit
Input voltage	V <sub>i</sub>	35	V
Output current	I <sub>o</sub>	Internally Limited	mA
Power dissipation	P <sub>d</sub>	Internally Limited	mW
Operating Temperature	T <sub>opr</sub>	-40~+125	°C
Storage Temperature	T <sub>stg</sub>	-65~+150	°C

### WD78M05 ELECTRICAL CHARACTERISTIC

(Refer to test circuits,  $T_j=25^{\circ}\text{C}$ ,  $I_o=300\text{mA}$ ,  $V_i=10\text{V}$ ,  $C_i=0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ , unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			4.8	5.0	5.2	V
Output voltage	$V_o$	$I_o=5$ to $350\text{mA}$ , $V_i=7$ to $20\text{V}$	4.75	5.0	5.25	V
Line regulation	$\Delta V_o$	$V_i=7$ to $25\text{V}$ , $I_o=200\text{mA}$			100	mV
		$V_i=8$ to $25\text{V}$ , $I_o=200\text{mA}$			50	
Load regulation	$\Delta V_o$	$I_o=5$ to $500\text{mA}$ , $T_j=25^{\circ}\text{C}$			100	mV
		$I_o=5$ to $200\text{mA}$ , $T_j=25^{\circ}\text{C}$			50	mV
Quiescent current	$I_Q$				6	mA
Quiescent current change	$\Delta I_Q$	$I_o=5$ to $350\text{mA}$			0.5	mA
		$V_i=8\text{V}$ to $25\text{V}$ , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$ , $T_j=0$ to $125^{\circ}\text{C}$		-0.5		mV/ $^{\circ}\text{C}$
Supply voltage rejection	SVR	$V_i=8$ to $18\text{V}$ , $f=120\text{Hz}$ , $I_o=300\text{mA}$	62			dB
Output noise voltage	$V_N$	$f=10\text{Hz}$ to $100\text{kHz}$		40		$\mu\text{V}$
Dropout voltage	$V_D$			2		V
Short circuit current	$I_{sc}$	$V_i=35\text{V}$		50		mA

### WD78M06 ELECTRICAL CHARACTERISTIC

(Refer to test circuits,  $T_j=25^{\circ}\text{C}$ ,  $I_o=350\text{mA}$ ,  $V_i=11\text{V}$ ,  $C_i=0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ , unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			5.75	6	6.25	V
Output voltage	$V_o$	$I_o=5$ to $350\text{mA}$ , $V_i=8$ to $21\text{V}$	5.7	6	6.3	V
Line regulation	$\Delta V_o$	$V_i=8$ to $25\text{V}$ , $I_o=200\text{mA}$			120	mV
		$V_i=9$ to $25\text{V}$ , $I_o=200\text{mA}$			60	
Load regulation	$\Delta V_o$	$I_o=5$ to $500\text{mA}$ , $T_j=25^{\circ}\text{C}$			120	mV
		$I_o=5$ to $200\text{mA}$ , $T_j=25^{\circ}\text{C}$			60	mV
Quiescent current	$I_Q$				6	mA
Quiescent current change	$\Delta I_Q$	$I_o=5$ to $350\text{mA}$			0.5	mA
		$V_i=9\text{V}$ to $25\text{V}$ , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$ , $T_j=0$ to $125^{\circ}\text{C}$		-0.6		mV/ $^{\circ}\text{C}$
Supply voltage rejection	SVR	$V_i=9$ to $19\text{V}$ , $f=120\text{Hz}$ , $I_o=300\text{mA}$	59			dB
Output noise voltage	$V_N$	$f=10\text{Hz}$ to $100\text{kHz}$		45		$\mu\text{V}$
Dropout voltage	$V_D$			2		V
Short circuit current	$I_{sc}$	$V_i=35\text{V}$		50		mA

### WD78M08 ELECTRICAL CHARACTERISTIC

(Refer to test circuits,  $T_j=25^{\circ}\text{C}$ ,  $I_o=300\text{mA}$ ,  $V_i=14\text{V}$ ,  $C_i=0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ , unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			7.7	8.0	8.3	V
Output voltage	$V_o$	$I_o=5$ to $350\text{mA}$ , $V_i=10.5$ to $23\text{V}$	7.6	8.0	8.4	V
Line regulation	$\Delta V_o$	$V_i=10.5$ to $25\text{V}$ , $I_o=200\text{mA}$			160	mV
		$V_i=11$ to $25\text{V}$ , $I_o=200\text{mA}$			80	mV
Load regulation	$\Delta V_o$	$I_o=5$ to $500\text{mA}$ , $T_j=25^{\circ}\text{C}$			160	mV
		$I_o=5$ to $200\text{mA}$ , $T_j=25^{\circ}\text{C}$			80	mV
Quiescent current	$I_q$				6	mA
Quiescent current change	$\Delta I_q$	$I_o=5$ to $350\text{mA}$			0.5	mA
		$V_i=10.5\text{V}$ to $25\text{V}$ , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$ , $T_j=0$ to $125^{\circ}\text{C}$		-0.8		mV/ $^{\circ}\text{C}$
Supply voltage rejection	SVR	$V_i=11.5$ to $21.5\text{V}$ , $f=120\text{Hz}$ , $I_o=300\text{mA}$	56			dB
Output noise voltage	$V_N$	$f=10\text{Hz}$ to $100\text{kHz}$		52		$\mu\text{V}$
Dropout voltage	$V_D$			2		V
Short circuit current	$I_{sc}$	$V_i=35\text{V}$		50		mA

### WD78M08 ELECTRICAL CHARACTERISTIC

(Refer to test circuits,  $T_j=25^{\circ}\text{C}$ ,  $I_o=300\text{mA}$ ,  $V_i=14\text{V}$ ,  $C_i=0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ , unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			7.7	8.0	8.3	V
Output voltage	$V_o$	$I_o=5$ to $350\text{mA}$ , $V_i=10.5$ to $23\text{V}$	7.6	8.0	8.4	V
Line regulation	$\Delta V_o$	$V_i=10.5$ to $25\text{V}$ , $I_o=200\text{mA}$			160	mV
		$V_i=11$ to $25\text{V}$ , $I_o=200\text{mA}$			80	mV
Load regulation	$\Delta V_o$	$I_o=5$ to $500\text{mA}$ , $T_j=25^{\circ}\text{C}$			160	mV
		$I_o=5$ to $200\text{mA}$ , $T_j=25^{\circ}\text{C}$			80	mV
Quiescent current	$I_q$				6	mA
Quiescent current change	$\Delta I_q$	$I_o=5$ to $350\text{mA}$			0.5	mA
		$V_i=10.5\text{V}$ to $25\text{V}$ , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$ , $T_j=0$ to $125^{\circ}\text{C}$		-0.8		mV/ $^{\circ}\text{C}$
Supply voltage rejection	SVR	$V_i=11.5$ to $21.5\text{V}$ , $f=120\text{Hz}$ , $I_o=300\text{mA}$	56			dB
Output noise voltage	$V_N$	$f=10\text{Hz}$ to $100\text{kHz}$		52		$\mu\text{V}$
Dropout voltage	$V_D$			2		V
Short circuit current	$I_{sc}$	$V_i=35\text{V}$		50		mA

### WD78M12 ELECTRICAL CHARACTERISTIC

Refer to test circuits T =25°C I<sub>o</sub>=350mA V<sub>i</sub>=19V C<sub>i</sub>=0.33 F Co=0.1 F unless otherwise specified

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			11.5	12	12.5	V
Output voltage	V <sub>o</sub>	I <sub>o</sub> =5 to 350mA, V <sub>i</sub> =14.5 to 27V	11.4	12	12.6	V
Line regulation	ΔV <sub>o</sub>	V <sub>i</sub> =14.5 to 30V, I <sub>o</sub> =200mA			240	mV
		V <sub>i</sub> =16 to 30V, I <sub>o</sub> =200mA			120	mV
Load regulation	ΔV <sub>o</sub>	I <sub>o</sub> =5 to 500mA, T <sub>j</sub> =25°C			240	mV
		I <sub>o</sub> =5 to 200mA, T <sub>j</sub> =25°C			120	mV
Quiescent current	I <sub>Q</sub>				6	mA
Quiescent current change	ΔI <sub>Q</sub>	I <sub>o</sub> =5 to 350mA			0.5	mA
		V <sub>i</sub> =14.5V to 30V, I <sub>o</sub> =200mA			0.8	mA
Output voltage drift	ΔV <sub>o</sub> /ΔT	I <sub>o</sub> =5mA, T <sub>j</sub> =0 to 125°C		-1		mV/°C
Supply voltage rejection	SVR	V <sub>i</sub> =15 to 25V, f=120Hz, I <sub>o</sub> =300mA	55			dB
Output noise voltage	V <sub>N</sub>	f=10Hz to 100kHz		75		μV
Dropout voltage	V <sub>D</sub>			2		V
Short circuit current	I <sub>sc</sub>	V <sub>i</sub> =35V		50		mA

### WD78M15 ELECTRICAL CHARACTERISTIC

(Refer to test circuits, T<sub>j</sub>=25°C, I<sub>o</sub>=350mA, V<sub>i</sub>=23V, C<sub>i</sub>=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			14.4	15	15.6	V
Output voltage	V <sub>o</sub>	I <sub>o</sub> =5 to 350mA, V <sub>i</sub> =17.5V to 30V	14.25	15	15.75	V
Line regulation	ΔV <sub>o</sub>	V <sub>i</sub> =17.5 V to 30V, I <sub>o</sub> =200mA			300	mV
		V <sub>i</sub> =20V to 30V, I <sub>o</sub> =200mA			150	mV
Load regulation	ΔV <sub>o</sub>	I <sub>o</sub> =5 to 500mA, T <sub>j</sub> =25°C			300	mV
		I <sub>o</sub> =5 to 200mA, T <sub>j</sub> =25°C			150	mV
Quiescent current	I <sub>Q</sub>				6	mA
Quiescent current change	ΔI <sub>Q</sub>	I <sub>o</sub> =5 to 350mA			0.5	mA
		V <sub>i</sub> =17.5V to 30V, I <sub>o</sub> =200mA			0.8	mA
Output voltage drift	ΔV <sub>o</sub> /ΔT	I <sub>o</sub> =5mA, T <sub>j</sub> =0 to 125°C		-1.1		mV/°C
Supply voltage rejection	SVR	V <sub>i</sub> =18.5V to 28.5V, f=120Hz, I <sub>o</sub> =300mA	53			dB
Output noise voltage	V <sub>N</sub>	f=10Hz to 100kHz		100		μV
Dropout voltage	V <sub>D</sub>			2		V
Short circuit current	I <sub>sc</sub>	V <sub>i</sub> =35V		50		mA

## TEST CIRCUITS

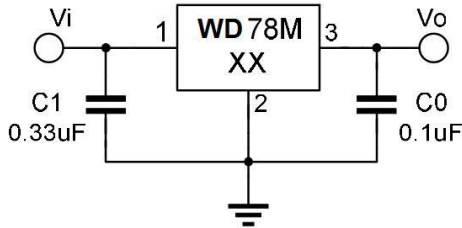


Fig.1 DC PARAMETERS

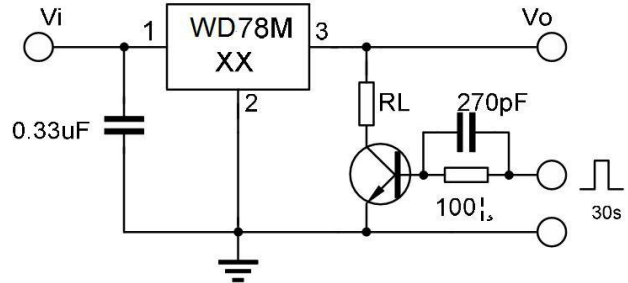


Fig.2 LOAD REGULATION

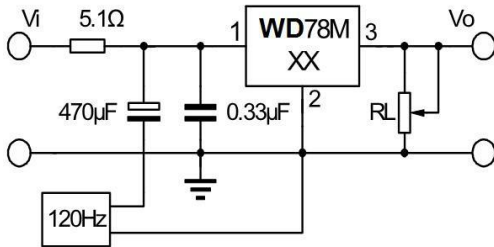


Fig.3 RIPPLE REJECTION

## APPLICATION CIRCUIT

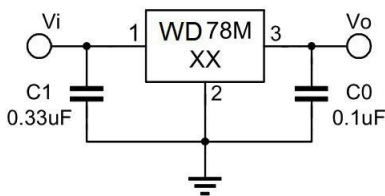


Fig.4 Fixed output regulator

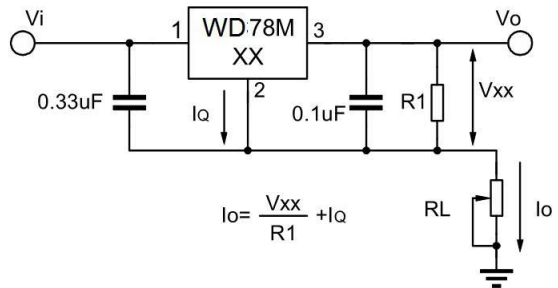


Fig.5 Constant current regulator

## APPLICATION CIRCUIT

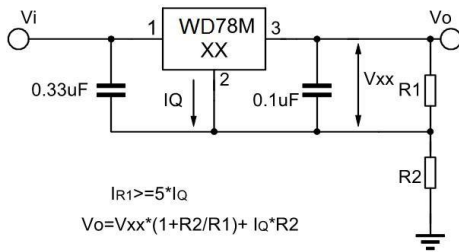


Fig.6 Circuit for increasing Regulator output voltage

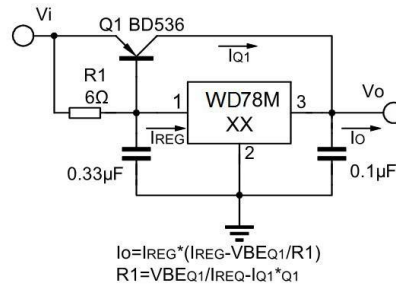


Fig.7 High current with voltage regulator

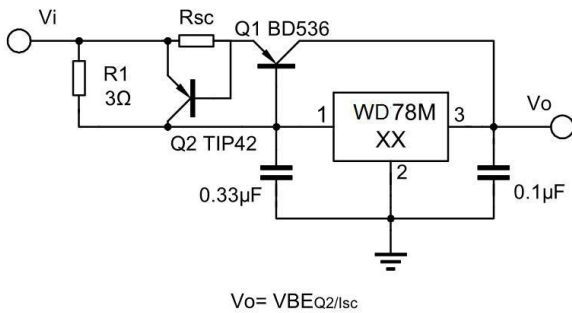


Fig.8 High output current short circuit protection

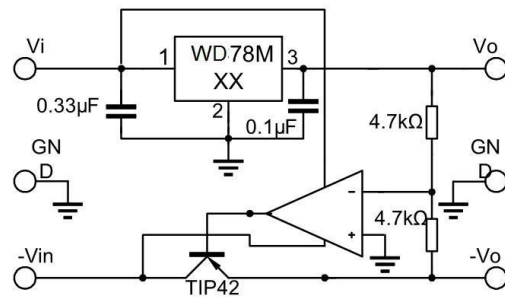


Fig.9 Tracking voltage regulator

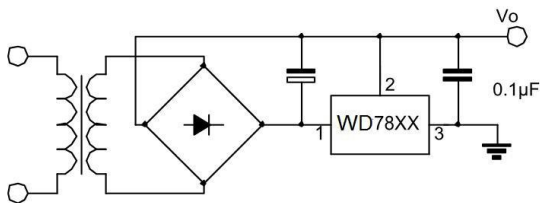


Fig.10 Negative output voltage circuit

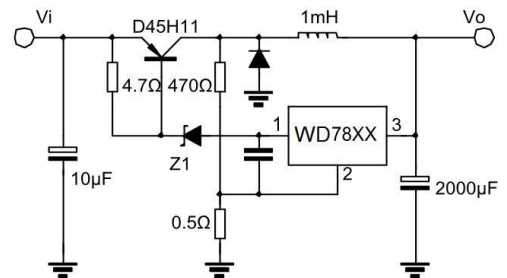
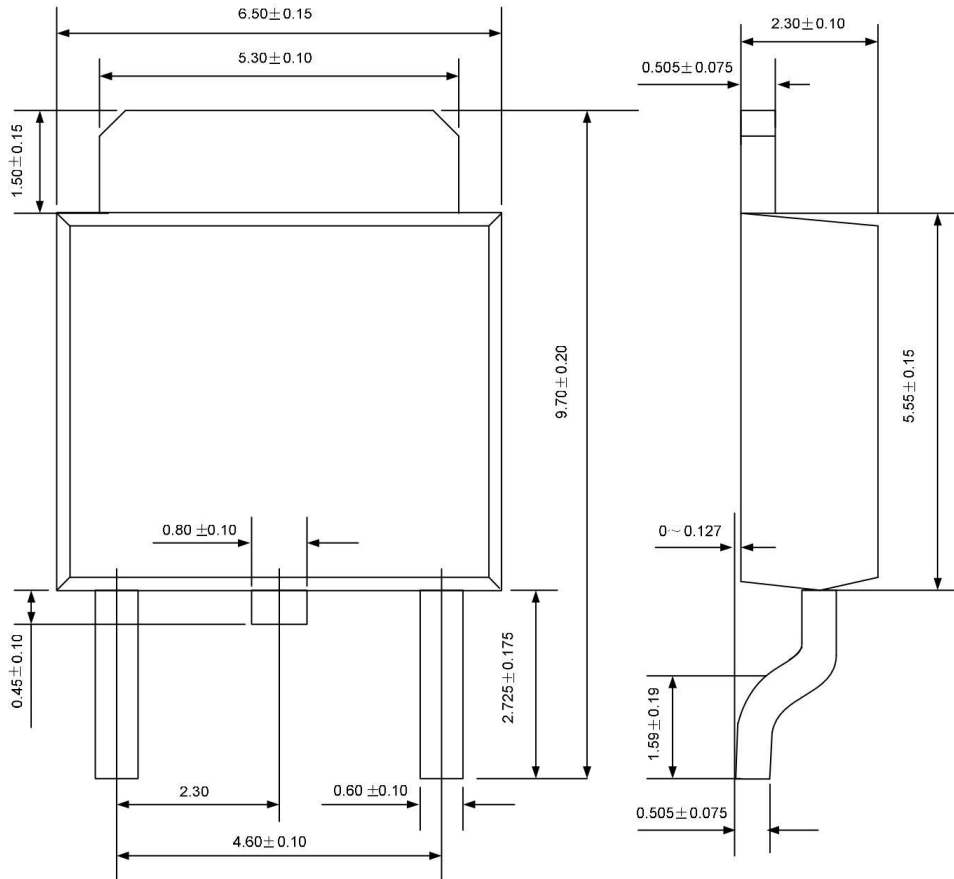


Fig.11 switching regulator

## PACKAGE DIMENSIONS

### TO-252





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