

78MXXA

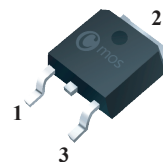
General Description

The 78MXXA three-terminal positive regulators are available in the TO-252 package with several fixed output voltages making it useful in a wide range of applications.

Features

- Output Current up to 1A
- Thermal overload protection
- Short circuit protection
- Output Transistor Safe Operating area (SOA) Protection

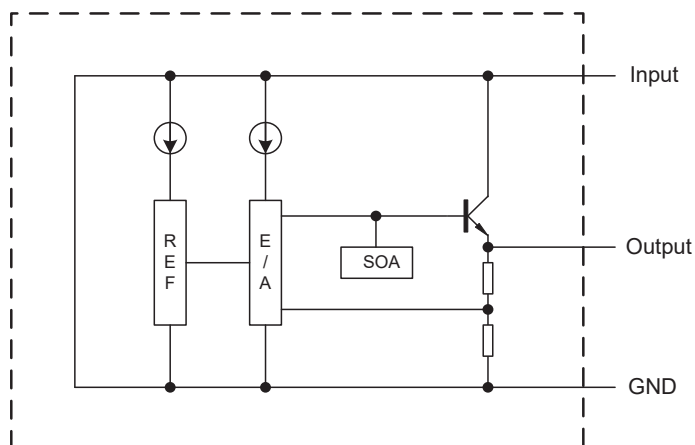
TO-252 Pin Configuration



TO-252
(78MXXA)

- 1. IN
- 2. GND
- 3. OUT

Internal Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	35	V
Thermal Resistance Junction - Case	$R_{\theta JC}$	5	°C/W
Thermal Resistance Junction - Air	$R_{\theta JA}$	65	°C/W
Operating Junction Temperature Range	T_{OPR}	-40~+125	°C
Storage Temperature Range	T_{STG}	-65~+150	°C

Electrical Characteristics (78M05A)

(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)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_o	$I_o = 5\text{mA} \sim 1\text{A}$, $P_o < 15\text{W}$ $V_i = 7.5\text{V} \sim 20\text{V}$	4.8	5	5.2	V
Line Regulation(Note)	ΔV_o	$T_j = 25^\circ\text{C}$ $V_i = 7.5\text{V} \sim 20\text{V}$			100	mV
		$V_i = 8\text{V} \sim 12\text{V}$			50	
Load Regulation(Note)	ΔV_o	$T_j = 25^\circ\text{C}$ $I_o = 5\text{mA} \sim 1\text{A}$			100	mV
		$I_o = 250\text{mA} \sim 750\text{mA}$			50	
Quiescent Current	I_Q	$T_j = 25^\circ\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_o = 5\text{mA} \sim 1\text{A}$			0.5	mA
		$I_o = 500\text{mA}$, $V_i = 8\text{V} \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$		0.8		mV/ $^\circ\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$, $T_A = 25^\circ\text{C}$		42		$\mu\text{V}/V_o$
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_i = 8\text{V} \sim 18\text{V}$		70		dB
Dropout Voltage	V_D	$T_j = 25^\circ\text{C}$, $I_o = 1\text{A}$		2		V
Short Circuit Current	I_{SC}	$T_A = 25^\circ\text{C}$, $V_i = 35\text{V}$		200		mA
Output resistance	R_o	$f = 1\text{KHz}$		15		m Ω

Notes:

Load and line regulation are specified at constant junction temperature. Change in V_o due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (78M06A)

(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)

Parameter	Symbol	Conditions		Value			Unit
				Min	Typ	Max	
Output Voltage	V_o	$I_o = 5\text{mA} \sim 1\text{A}$, $P_o < 15\text{W}$ $V_i = 8.5\text{V} \sim 21\text{V}$		5.75	6	6.25	V
Line Regulation(Note)	ΔV_o	$T_j = 25^\circ\text{C}$	$V_i = 8.5\text{V} \sim 25\text{V}$			120	mV
			$V_i = 9\text{V} \sim 13\text{V}$			60	
Load Regulation(Note)	ΔV_o	$T_j = 25^\circ\text{C}$	$I_o = 5\text{mA} \sim 1\text{A}$			120	mV
			$I_o = 250\text{mA} \sim 750\text{mA}$			60	
Quiescent Current	I_Q	$T_j = 25^\circ\text{C}$				8.0	mA
Quiescent Current Change	ΔI_Q	$I_o = 5\text{mA} \sim 1\text{A}$				0.5	mA
		$I_o = 500\text{mA}$, $V_i = 9\text{V} \sim 25\text{V}$				0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$			0.8		mV/ $^\circ\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$, $T_A = 25^\circ\text{C}$			42		$\mu\text{V}/V_o$
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_i = 9\text{V} \sim 19\text{V}$			65		dB
Dropout Voltage	V_D	$T_j = 25^\circ\text{C}$, $I_o = 1\text{A}$			2		V
Short Circuit Current	I_{SC}	$T_A = 25^\circ\text{C}$, $V_i = 35\text{V}$			200		mA
Output resistance	R_o	$f = 1\text{KHz}$			17		m Ω

Notes:

Load and line regulation are specified at constant junction temperature. Change in V_o due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (78M08A)

(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)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_o	$I_o = 5\text{mA} \sim 1\text{A}$, $P_o < 15\text{W}$ $V_i = 10.5\text{V} \sim 23\text{V}$	7.84	8	8.16	V
Line Regulation(Note)	ΔV_o	$T_j = 25^\circ\text{C}$ $V_i = 10.5\text{V} \sim 25\text{V}$			160	mV
		$V_i = 11\text{V} \sim 17\text{V}$			80	
Load Regulation(Note)	ΔV_o	$T_j = 25^\circ\text{C}$ $I_o = 5\text{mA} \sim 1\text{A}$			160	mV
		$I_o = 250\text{mA} \sim 750\text{mA}$			80	
Quiescent Current	I_Q	$T_j = 25^\circ\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_o = 5\text{mA} \sim 1\text{A}$			0.5	mA
		$I_o = 500\text{mA}$, $V_i = 11.5\text{V} \sim 21.5\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$		1.0		mV/ $^\circ\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$, $T_A = 25^\circ\text{C}$		42		$\mu\text{V}/V_o$
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_i = 11.5\text{V} \sim 21.5\text{V}$		59		dB
Dropout Voltage	V_D	$T_j = 25^\circ\text{C}$, $I_o = 1\text{A}$		2		V
Short Circuit Current	I_{sc}	$T_A = 25^\circ\text{C}$, $V_i = 35\text{V}$		200		mA
Output resistance	R_o	$f = 1\text{KHz}$		18		m Ω

Notes:

Load and line regulation are specified at constant junction temperature. Change in V_o due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (78M09A)

(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)

Parameter	Symbol	Conditions		Value			Unit
				Min	Typ	Max	
Output Voltage	V_o	$I_o = 5\text{mA} \sim 1\text{A}$, $P_o < 15\text{W}$ $V_i = 11.5\text{V} \sim 24\text{V}$		8.82	9	9.18	V
Line Regulation(Note)	ΔV_o	$T_j = 25^\circ\text{C}$	$V_i = 11.5\text{V} \sim 26\text{V}$			180	mV
			$V_i = 12\text{V} \sim 18\text{V}$			90	
Load Regulation(Note)	ΔV_o	$T_j = 25^\circ\text{C}$	$I_o = 5\text{mA} \sim 1\text{A}$			180	mV
			$I_o = 250\text{mA} \sim 750\text{mA}$			90	
Quiescent Current	I_Q	$T_j = 25^\circ\text{C}$				8.0	mA
Quiescent Current Change	ΔI_Q	$I_o = 5\text{mA} \sim 1\text{A}$				0.5	mA
		$I_o = 500\text{mA}$, $V_i = 12.5\text{V} \sim 25\text{V}$				0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$			1.2		mV/ $^\circ\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$, $T_A = 25^\circ\text{C}$			42		$\mu\text{V}/V_o$
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_i = 12.5\text{V} \sim 22.5\text{V}$			58		dB
Dropout Voltage	V_D	$T_j = 25^\circ\text{C}$, $I_o = 1\text{A}$			2		V
Short Circuit Current	I_{SC}	$T_A = 25^\circ\text{C}$, $V_i = 35\text{V}$			200		mA
Output resistance	R_o	$f = 1\text{KHz}$			18		m Ω

Notes:

Load and line regulation are specified at constant junction temperature. Change in V_o due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (78M12A)

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

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_o	$I_o = 5\text{mA} \sim 1\text{A}$, $P_o < 15\text{W}$ $V_i = 14.5\text{V} \sim 27\text{V}$	11.5	12	12.5	V
Line Regulation(Note)	ΔV_o	$T_j = 25^\circ\text{C}$ $V_i = 14.5\text{V} \sim 30\text{V}$			240	mV
		$V_i = 16\text{V} \sim 22\text{V}$			120	
Load Regulation(Note)	ΔV_o	$T_j = 25^\circ\text{C}$ $I_o = 5\text{mA} \sim 1\text{A}$			240	mV
		$I_o = 250\text{mA} \sim 750\text{mA}$			120	
Quiescent Current	I_Q	$T_j = 25^\circ\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_o = 5\text{mA} \sim 1\text{A}$			0.5	mA
		$I_o = 500\text{mA}$, $V_i = 15\text{V} \sim 30\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$		1.5		mV/ $^\circ\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$, $T_A = 25^\circ\text{C}$		42		$\mu\text{V}/V_o$
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_i = 15\text{V} \sim 25\text{V}$		57		dB
Dropout Voltage	V_D	$T_j = 25^\circ\text{C}$, $I_o = 1\text{A}$		2		V
Short Circuit Current	I_{sc}	$T_A = 25^\circ\text{C}$, $V_i = 35\text{V}$		200		mA
Output resistance	R_o	$f = 1\text{KHz}$		18		m Ω

Notes:

Load and line regulation are specified at constant junction temperature. Change in V_o due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (78M15A)

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

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_o	$I_o = 5\text{mA} \sim 1\text{A}$, $P_o < 15\text{W}$ $V_i = 17.5\text{V} \sim 30\text{V}$	14.4	15	15.6	V
Line Regulation(Note)	ΔV_o	$T_j = 25^\circ\text{C}$ $V_i = 17.5\text{V} \sim 30\text{V}$			300	mV
		$V_i = 20\text{V} \sim 26\text{V}$			150	
Load Regulation(Note)	ΔV_o	$T_j = 25^\circ\text{C}$ $I_o = 5\text{mA} \sim 1\text{A}$			300	mV
		$I_o = 250\text{mA} \sim 750\text{mA}$			150	
Quiescent Current	I_Q	$T_j = 25^\circ\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_o = 5\text{mA} \sim 1\text{A}$			0.5	mA
		$I_o = 500\text{mA}$, $V_i = 18\text{V} \sim 30\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$		1.8		mV/ $^\circ\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$, $T_A = 25^\circ\text{C}$		42		$\mu\text{V}/V_o$
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_i = 18\text{V} \sim 28\text{V}$		56		dB
Dropout Voltage	V_D	$T_j = 25^\circ\text{C}$, $I_o = 1\text{A}$		2		V
Short Circuit Current	I_{SC}	$T_A = 25^\circ\text{C}$, $V_i = 35\text{V}$		200		mA
Output resistance	R_o	$f = 1\text{KHz}$		18		m Ω

Notes:

Load and line regulation are specified at constant junction temperature. Change in V_o due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Test circuits

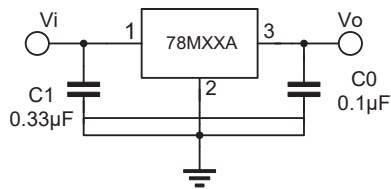


Fig1 DC parameters

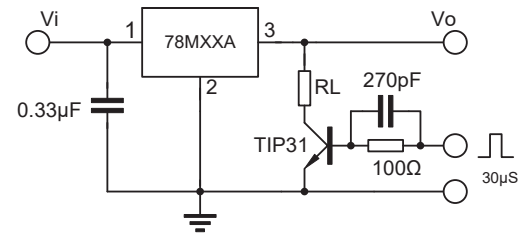


Fig.2 Load regulation

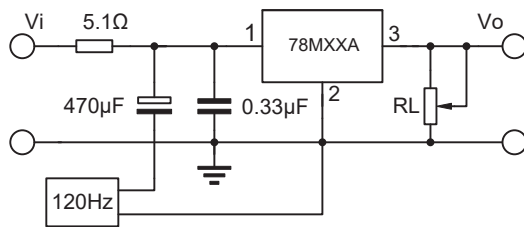


Fig.3 Ripple rejection

Application circuits

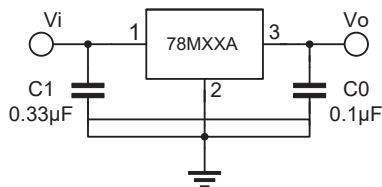


Fig.4 Fixed output regulator

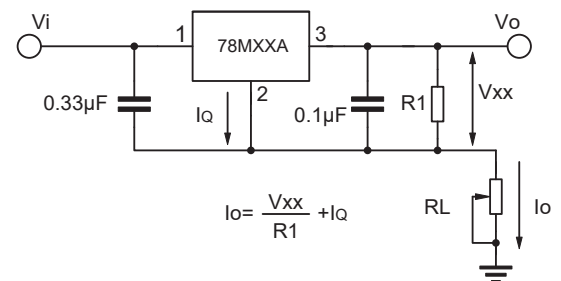


Fig.5 Constant current regulator

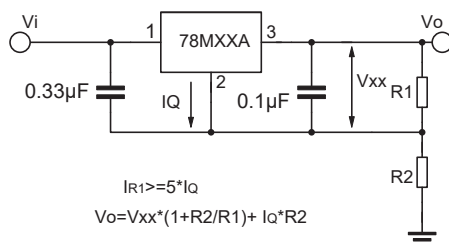


Fig.6 Circuit for increasing Regulator output voltage

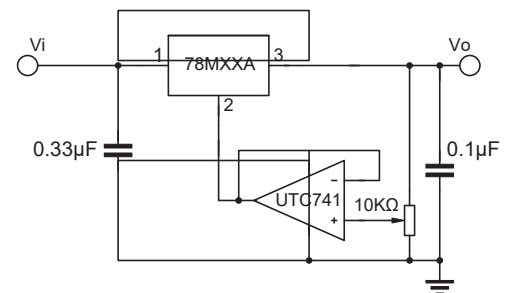


Fig.7 Adjustable output

Application circuits

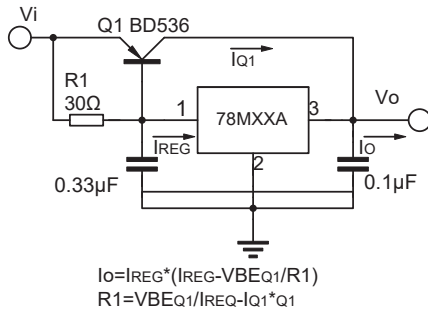


Fig.8 High current with voltage regulator

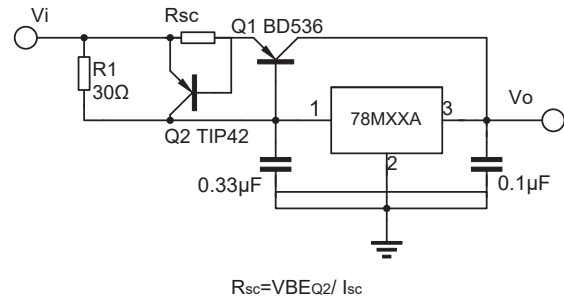


Fig.9 High output current short circuit protection

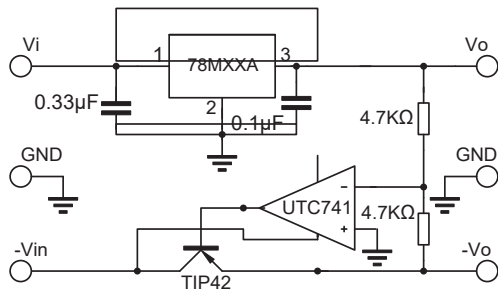


Fig.10 Tracking voltage regulator

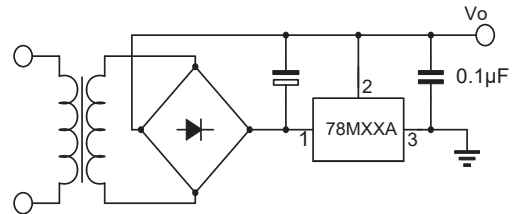


Fig.11 Negative output voltage circuit

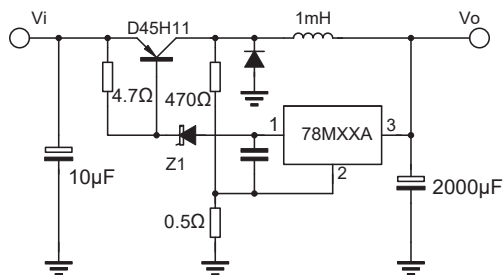


Fig.12 Switching regulator

Typical Characteristics

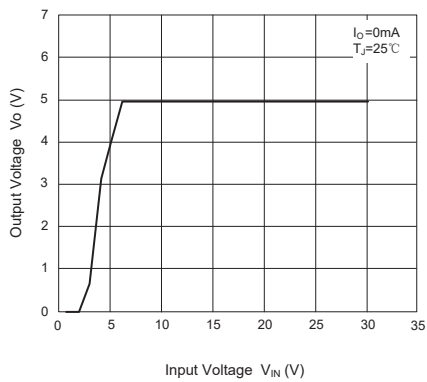


Fig.13 Output Characteristics

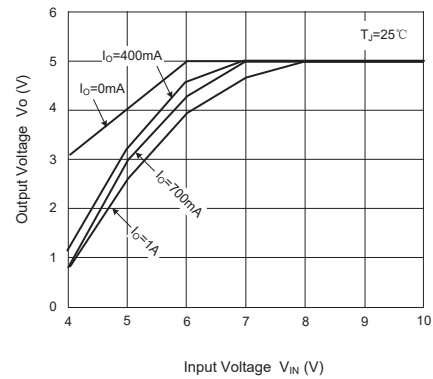


Fig.14 Dropout Characteristics

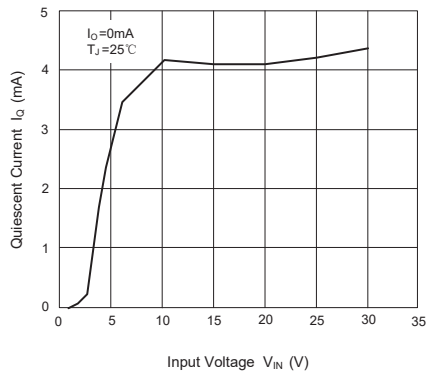


Fig.15 Quiescent Current vs Input Voltage

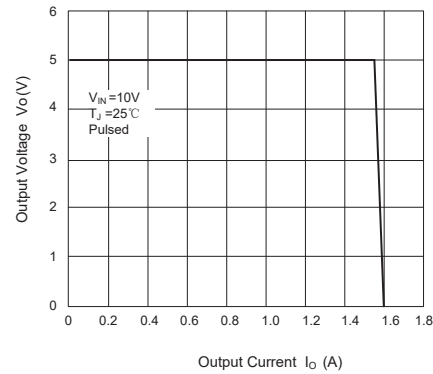


Fig.16 Current Cut-off Grid Voltage

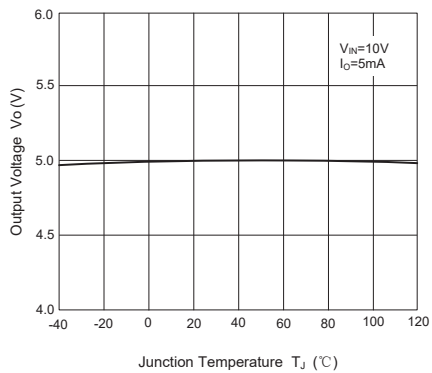


Fig.17 Output Voltage vs Junction Temperature

Package Dimension

TO-252

Unit :mm

