

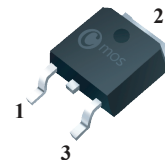
General Description

The 78MXX 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
- Output Voltages of 5,6,8,9,12,15,18,24V
- Thermal Overload Protection Short Circuit Protection
- Output Transistor Safe Operating area (SOA)Protection

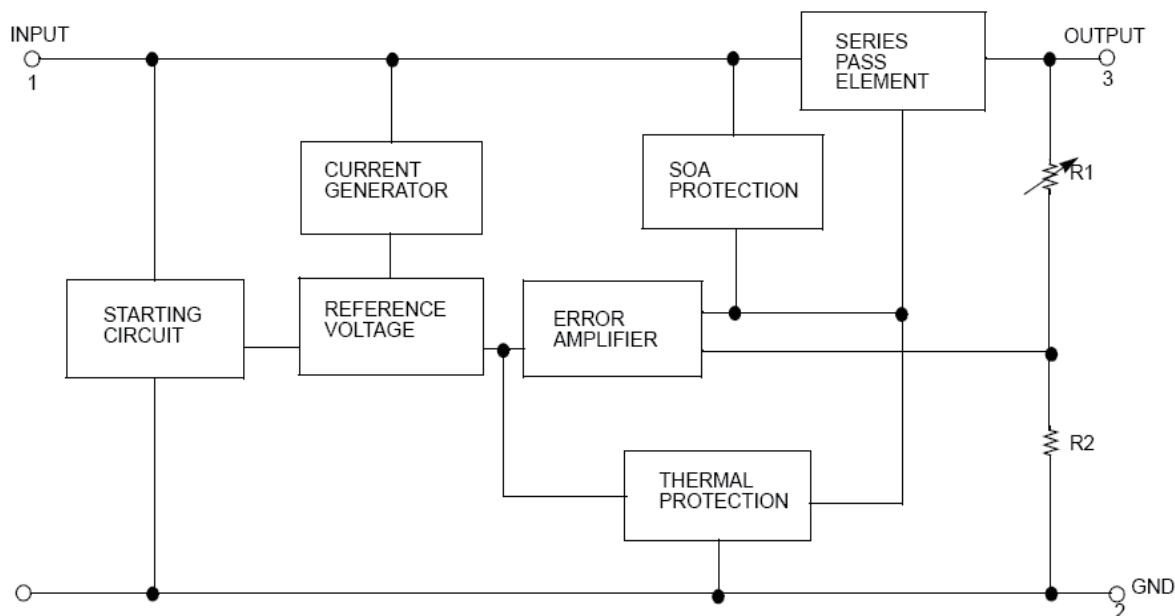
TO-252 Pin Configuration



TO-252
(78MXX)

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

Internal Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage (for $V_O = 5V$ to $18V$) (for $V_O = 24V$)	V_{IN}	35 40	V
Thermal Resistance Junction - Case	$R_{\theta JC}$	2.5	$^{\circ}C/W$
Thermal Resistance Junction - Air ($T_a = +25^{\circ}C$)	$R_{\theta JA}$	92	$^{\circ}C/W$
Operating Junction Temperature Range	T_{OPR}	0 ~ 150	$^{\circ}C$
Storage Temperature Range	T_{STG}	-55 ~ + 150	$^{\circ}C$

Electrical Characteristics (78M05)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=350\text{mA}$, $V_I=10\text{V}$, unless otherwise specified,
 $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 350\text{mA}$ $V_I = 7 \sim 20\text{V}$	4.75	5	5.25	V
Line Regulation(Note)	ΔV_O	$I_O = 200\text{mA}$ $T_J = 25^{\circ}\text{C}$			100	mV
		$V_I = 7\text{V} \sim 25\text{V}$ $V_I = 8\text{V} \sim 25\text{V}$			50	
Load Regulation(Note)	ΔV_O	$T_J = 25^{\circ}\text{C}$			100	mV
		$I_O = 5\text{mA} \sim 500\text{mA}$ $I_O = 5\text{mA} \sim 200\text{mA}$			50	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_O = 200\text{mA}$, $V_I = 8 \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$, $T_J = 0 \sim 125^{\circ}\text{C}$		-0.5		mV/ $^{\circ}\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		40		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 8 \sim 18\text{V}$		80		dB
Dropout Voltage	V_D	$T_J = 25^{\circ}\text{C}$, $I_O = 500\text{mA}$		2		V
Short Circuit Current	I_{SC}	$T_J = 25^{\circ}\text{C}$, $V_I = 35\text{V}$		800		mA
Peak Current	I_{PK}	$T_J = 25^{\circ}\text{C}$		900		mA

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 (78M06)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=350\text{mA}$, $V_I=11\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 350\text{mA}$ $V_I = 8 \sim 21\text{V}$	5.7	6	6.3	V
Line Regulation(Note)	ΔV_O	$I_O = 200\text{mA}$ $T_J = 25^{\circ}\text{C}$			100	mV
		$V_I = 9\text{V} \sim 25\text{V}$			50	
Load Regulation(Note)	ΔV_O	$T_J = 25^{\circ}\text{C}$			120	mV
		$I_O = 5\text{mA} \sim 200\text{mA}$			60	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_O = 200\text{mA}$, $V_I = 9 \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$, $T_J = 0 \sim 125^{\circ}\text{C}$		-0.5		mV/ $^{\circ}\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		45		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 9 \sim 19\text{V}$		80		dB
Dropout Voltage	V_D	$T_J = 25^{\circ}\text{C}$, $I_O = 500\text{mA}$		2		V
Short Circuit Current	I_{SC}	$T_J = 25^{\circ}\text{C}$, $V_I = 35\text{V}$		800		mA
Peak Current	I_{PK}	$T_J = 25^{\circ}\text{C}$		900		mA

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 (78M08)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=350\text{mA}$, $V_I=14\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 350\text{mA}$ $V_I = 10.5 \sim 23\text{V}$	7.6	8	8.4	V
Line Regulation(Note)	ΔV_O	$I_O = 200\text{mA}$ $T_J = 25^{\circ}\text{C}$			100	mV
		$V_I = 11\text{V} \sim 25\text{V}$			50	
Load Regulation(Note)	ΔV_O	$T_J = 25^{\circ}\text{C}$			160	mV
		$I_O = 5\text{mA} \sim 200\text{mA}$			80	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_O = 200\text{mA}$, $V_I = 10.5 \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$, $T_J = 0 \sim 125^{\circ}\text{C}$		-0.8		mV/ $^{\circ}\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		52		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 11.5 \sim 21.5\text{V}$		80		dB
Dropout Voltage	V_D	$T_J = 25^{\circ}\text{C}$, $I_O = 500\text{mA}$		2		V
Short Circuit Current	I_{SC}	$T_J = 25^{\circ}\text{C}$, $V_I = 35\text{V}$		800		mA
Peak Current	I_{PK}	$T_J = 25^{\circ}\text{C}$		900		mA

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 (78M09)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=350\text{mA}$, $V_I=15\text{V}$, unless otherwise specified,
 $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 350\text{mA}$ $V_I = 11.5 \sim 24\text{V}$	8.45	9	9.55	V
Line Regulation(Note)	ΔV_O	$I_O = 200\text{mA}$ $T_J = 25^{\circ}\text{C}$			100	mV
		$V_I = 11.5\text{V} \sim 25\text{V}$ $V_I = 12\text{V} \sim 25\text{V}$			50	
Load Regulation(Note)	ΔV_O	$T_J = 25^{\circ}\text{C}$			180	mV
		$I_O = 5\text{mA} \sim 500\text{mA}$ $I_O = 5\text{mA} \sim 200\text{mA}$			90	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_O = 200\text{mA}$, $V_I = 11.5 \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$, $T_J = 0 \sim 125^{\circ}\text{C}$		-0.8		mV/ $^{\circ}\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		52		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 12.5 \sim 22.5\text{V}$		80		dB
Dropout Voltage	V_D	$T_J = 25^{\circ}\text{C}$, $I_O = 500\text{mA}$		2		V
Short Circuit Current	I_{SC}	$T_J = 25^{\circ}\text{C}$, $V_I = 35\text{V}$		800		mA
Peak Current	I_{PK}	$T_J = 25^{\circ}\text{C}$		900		mA

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 (78M12)

(Refer to the test circuits, $0 < T_j < +125^{\circ}\text{C}$, $I_o=350\text{mA}$, $V_i=19\text{V}$, unless otherwise specified, $C_i = 0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_o	$I_o = 5\text{mA} \sim 350\text{mA}$ $V_i = 14.5 \sim 27\text{V}$	11.4	12	12.6	V
Line Regulation(Note)	ΔV_o	$I_o = 200\text{mA}$ $T_j = 25^{\circ}\text{C}$			100	mV
		$V_i = 14.5\text{V} \sim 30\text{V}$ $V_i = 16\text{V} \sim 30\text{V}$			50	
Load Regulation(Note)	ΔV_o	$T_j = 25^{\circ}\text{C}$			240	mV
		$I_o = 5\text{mA} \sim 500\text{mA}$ $I_o = 5\text{mA} \sim 200\text{mA}$			120	
Quiescent Current	I_Q	$T_j = 25^{\circ}\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_o = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_o = 200\text{mA}$, $V_i = 14.5 \sim 30\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$, $T_j = 0 \sim 125^{\circ}\text{C}$		-0.8		mV/ $^{\circ}\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		75		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_i = 15 \sim 25\text{V}$		80		dB
Dropout Voltage	V_D	$T_j = 25^{\circ}\text{C}$, $I_o = 500\text{mA}$		2		V
Short Circuit Current	I_{SC}	$T_j = 25^{\circ}\text{C}$, $V_i = 35\text{V}$		800		mA
Peak Current	I_{PK}	$T_j = 25^{\circ}\text{C}$		900		mA

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 (78M15)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=350\text{mA}$, $V_I=23\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 350\text{mA}$ $V_I = 17.5 \sim 30\text{V}$	14.25	15	15.75	V
Line Regulation(Note)	ΔV_O	$I_O = 200\text{mA}$ $T_J = 25^{\circ}\text{C}$			100	mV
		$V_I = 17.5\text{V} \sim 30\text{V}$ $V_I = 20\text{V} \sim 30\text{V}$			50	
Load Regulation(Note)	ΔV_O	$T_J = 25^{\circ}\text{C}$			300	mV
		$I_O = 5\text{mA} \sim 500\text{mA}$ $I_O = 5\text{mA} \sim 200\text{mA}$			150	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_O = 200\text{mA}$, $V_I = 17.5 \sim 30\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$, $T_J = 0 \sim 125^{\circ}\text{C}$		-1.0		mV/ $^{\circ}\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		100		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 18.5 \sim 28.5\text{V}$		70		dB
Dropout Voltage	V_D	$T_J = 25^{\circ}\text{C}$, $I_O = 500\text{mA}$		2		V
Short Circuit Current	I_{SC}	$T_J = 25^{\circ}\text{C}$, $V_I = 35\text{V}$		800		mA
Peak Current	I_{PK}	$T_J = 25^{\circ}\text{C}$		900		mA

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 (78M18)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=350\text{mA}$, $V_I=26\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 350\text{mA}$ $V_I = 20.5 \sim 33\text{V}$	17.1	18	18.9	V
Line Regulation(Note)	ΔV_O	$I_O = 200\text{mA}$ $T_J = 25^{\circ}\text{C}$	$V_I = 21\text{V} \sim 33\text{V}$		100	mV
			$V_I = 24\text{V} \sim 33\text{V}$		50	
Load Regulation(Note)	ΔV_O	$T_J = 25^{\circ}\text{C}$	$I_O = 5\text{mA} \sim 500\text{mA}$		360	mV
			$I_O = 5\text{mA} \sim 200\text{mA}$		180	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_O = 200\text{mA}$, $V_I = 21 \sim 33\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$, $T_J = 0 \sim 125^{\circ}\text{C}$		-1.2		mV/ $^{\circ}\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		100		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 22 \sim 32\text{V}$		70		dB
Dropout Voltage	V_D	$T_J = 25^{\circ}\text{C}$, $I_O = 500\text{mA}$		2		V
Short Circuit Current	I_{SC}	$T_J = 25^{\circ}\text{C}$, $V_I = 35\text{V}$		800		mA
Peak Current	I_{PK}	$T_J = 25^{\circ}\text{C}$		900		mA

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 (78M24)

(Refer to the test circuits, $0 < T_J < +125^{\circ}\text{C}$, $I_O=350\text{mA}$, $V_I=33\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 350\text{mA}$ $V_I = 27 \sim 38\text{V}$	22.8	24	25.2	V
Line Regulation(Note)	ΔV_O	$I_O = 200\text{mA}$ $T_J = 25^{\circ}\text{C}$ $V_I = 27\text{V} \sim 38\text{V}$			100	mV
		$V_I = 28\text{V} \sim 38\text{V}$			50	
Load Regulation(Note)	ΔV_O	$T_J = 25^{\circ}\text{C}$ $I_O = 5\text{mA} \sim 500\text{mA}$			480	mV
		$I_O = 5\text{mA} \sim 200\text{mA}$			240	
Quiescent Current	I_Q	$T_J = 25^{\circ}\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_O = 200\text{mA}$, $V_I = 27 \sim 38\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$, $T_J = 0 \sim 125^{\circ}\text{C}$		-1.2		mV/ $^{\circ}\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		170		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 28 \sim 38\text{V}$		70		dB
Dropout Voltage	V_D	$T_J = 25^{\circ}\text{C}$, $I_O = 500\text{mA}$		2		V
Short Circuit Current	I_{SC}	$T_J = 25^{\circ}\text{C}$, $V_I = 35\text{V}$		800		mA
Peak Current	I_{PK}	$T_J = 25^{\circ}\text{C}$		900		mA

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.

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