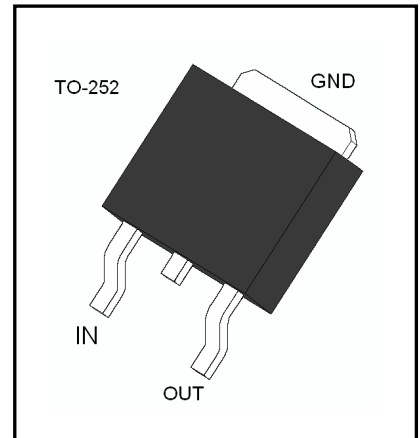


## Features

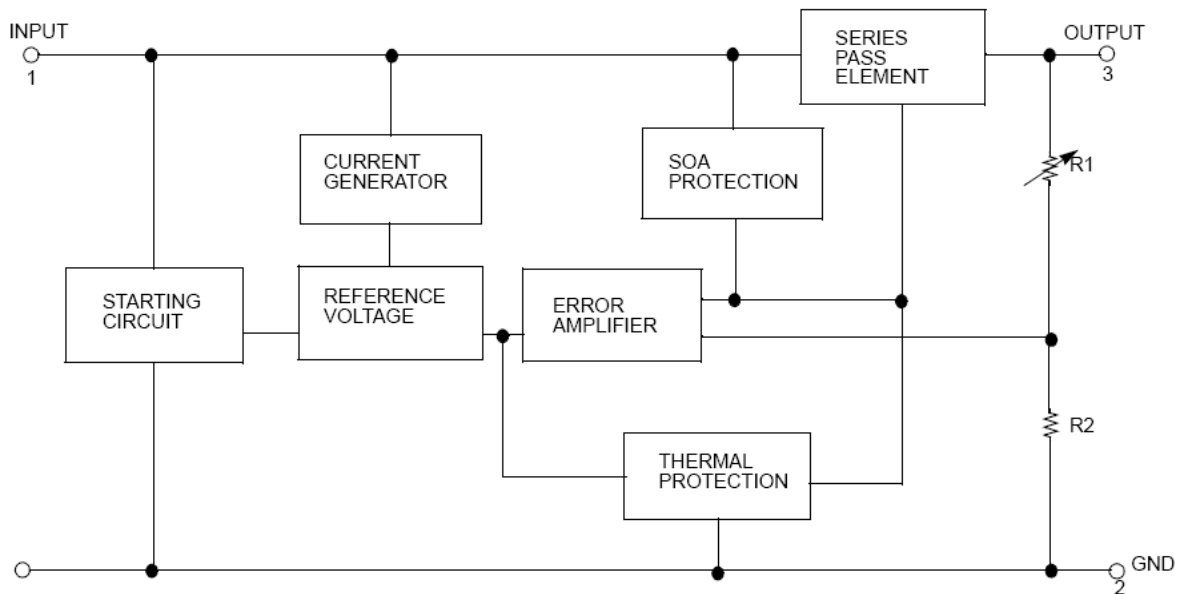
Output Current up to 0.5A  
Output Voltages of 5, 6, 8, 9, 12, 15, 18, 24V  
Thermal Overload Protection Short Circuit Protection  
Output Transistor Safe Operating area (SOA)Protection

## 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.



## 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)	$\Delta V_O$	$I_O = 200\text{mA}$ $T_J = 25^{\circ}\text{C}$	$V_I = 7\text{V} \sim 25\text{V}$			100	mV
			$V_I = 8\text{V} \sim 25\text{V}$			50	
Load Regulation(Note)	$\Delta V_O$	$T_J = 25^{\circ}\text{C}$	$I_O = 5\text{mA} \sim 500\text{mA}$			100	mV
			$I_O = 5\text{mA} \sim 200\text{mA}$			50	
Quiescent Current	$I_Q$	$T_J = 25^{\circ}\text{C}$			8.0	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA} \sim 350\text{mA}$			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		$\mu\text{V}$	
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	$I_{SC}$	$T_J = 25^{\circ}\text{C}$ , $V_I = 35\text{V}$		300		mA	
Peak Current	$I_{PK}$	$T_J = 25^{\circ}\text{C}$		700		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)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^\circ\text{C}$	$V_i = 8\text{V} \sim 25\text{V}$			100	mV
			$V_i = 9\text{V} \sim 25\text{V}$			50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^\circ\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$			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	$\Delta I_Q$	$I_o = 5\text{mA} \sim 350\text{mA}$				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			$\mu\text{V}$
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	$I_{SC}$	$T_j = 25^\circ\text{C}$ , $V_i = 35\text{V}$		300			mA
Peak Current	$I_{PK}$	$T_j = 25^\circ\text{C}$		700			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)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^{\circ}\text{C}$	$V_i = 10.5\text{V} \sim 25\text{V}$		100	mV
			$V_i = 11\text{V} \sim 25\text{V}$		50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^{\circ}\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$		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	$\Delta I_q$	$I_o = 5\text{mA} \sim 350\text{mA}$			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		$\mu\text{V}$
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	$I_{SC}$	$T_j = 25$ , $V_i = 35\text{V}$		300		mA
Peak Current	$I_{PK}$	$T_j = 25^{\circ}\text{C}$		700		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)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^\circ\text{C}$	$V_i = 11.5\text{V} \sim 25\text{V}$		100	mV
			$V_i = 12\text{V} \sim 25\text{V}$		50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^\circ\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$		180	mV
			$I_o = 5\text{mA} \sim 200\text{mA}$		90	
Quiescent Current	$I_q$	$T_j = 25^\circ\text{C}$			8.0	mA
Quiescent Current Change	$\Delta I_q$	$I_o = 5\text{mA} \sim 350\text{mA}$			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/°C
Output Noise Voltage	$V_N$	$f = 10\text{Hz} \sim 100\text{KHz}$		52		$\mu\text{V}$
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	$I_{SC}$	$T_j = 25^\circ\text{C}$ , $V_i = 35\text{V}$		300		mA
Peak Current	$I_{PK}$	$T_j = 25^\circ\text{C}$		700		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)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^{\circ}\text{C}$	$V_i = 14.5\text{V} \sim 30\text{V}$		100	mV
			$V_i = 16\text{V} \sim 30\text{V}$		50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^{\circ}\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$		240	mV
			$I_o = 5\text{mA} \sim 200\text{mA}$		120	
Quiescent Current	$I_Q$	$T_j = 25^{\circ}\text{C}$			8.0	mA
Quiescent Current Change	$\Delta I_Q$	$I_o = 5\text{mA} \sim 350\text{mA}$			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		$\mu\text{V}$
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	$I_{SC}$	$T_j = 25$ , $V_i = 35\text{V}$		300		mA
Peak Current	$I_{PK}$	$T_j = 25^{\circ}\text{C}$		700		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)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^{\circ}\text{C}$	$V_i = 17.5\text{V} \sim 30\text{V}$		100	mV
			$V_i = 20\text{V} \sim 30\text{V}$		50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^{\circ}\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$		300	mV
			$I_o = 5\text{mA} \sim 200\text{mA}$		150	
Quiescent Current	$I_q$	$T_j = 25^{\circ}\text{C}$			8.0	mA
Quiescent Current Change	$\Delta I_q$	$I_o = 5\text{mA} \sim 350\text{mA}$			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		$\mu\text{V}$
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	$I_{SC}$	$T_j = 25^{\circ}\text{C}$ , $V_i = 35\text{V}$		300		mA
Peak Current	$I_{PK}$	$T_j = 25^{\circ}\text{C}$		700		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,  $C_1 = 0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ )

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)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^{\circ}\text{C}$	$V_i = 21\text{V} \sim 33\text{V}$		100	mV
			$V_i = 24\text{V} \sim 33\text{V}$		50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^{\circ}\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$		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	$\Delta I_q$	$I_o = 5\text{mA} \sim 350\text{mA}$			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		$\mu\text{V}$
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	$I_{SC}$	$T_j = 25$ , $V_i = 35\text{V}$		300		mA
Peak Current	$I_{PK}$	$T_j = 25^{\circ}\text{C}$		700		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)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^{\circ}\text{C}$	$V_i = 27\text{V} \sim 38\text{V}$		100	mV
			$V_i = 28\text{V} \sim 38\text{V}$		50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^{\circ}\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$		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	$\Delta I_q$	$I_o = 5\text{mA} \sim 350\text{mA}$			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		$\mu\text{V}$
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	$I_{SC}$	$T_j = 25$ , $V_i = 35\text{V}$		300		mA
Peak Current	$I_{PK}$	$T_j = 25^{\circ}\text{C}$		700		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.