

# MC78XX/LM78XX/MC78XXA

## 3-Terminal 1A Positive Voltage Regulator

### Features

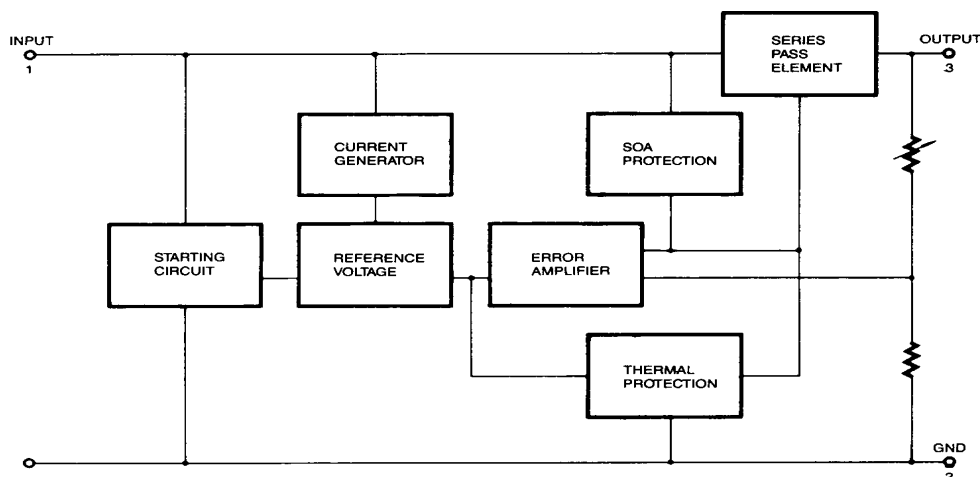
- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Protection

### Description

The MC78XX/LM78XX/MC78XXA series of three terminal positive regulators are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.



### Internal Block Diagram



## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage (for $V_O = 5V$ to $18V$ ) (for $V_O = 24V$ )	$V_I$	35	V
	$V_{I1}$	40	V
Thermal Resistance Junction-Cases (TO-220)	$R_{\theta JC}$	5	$^{\circ}C/W$
Thermal Resistance Junction-Air (TO-220)	$R_{\theta JA}$	65	$^{\circ}C/W$
Operating Temperature Range	$T_{OPR}$	0 ~ +125	$^{\circ}C$
Storage Temperature Range	$T_{STG}$	-65 ~ +150	$^{\circ}C$

## Electrical Characteristics (MC7805/LM7805)

(Refer to test circuit , $0^{\circ}C < T_J < 125^{\circ}C$ ,  $I_O = 500mA$ ,  $V_I = 10V$ ,  $C_I = 0.33\mu F$ ,  $C_O = 0.1\mu F$ , unless otherwise specified)

Parameter	Symbol	Conditions	MC7805/LM7805			Unit	
			Min.	Typ.	Max.		
Output Voltage	$V_O$	$T_J = +25^{\circ}C$	4.8	5.0	5.2	V	
		$5.0mA \leq I_O \leq 1.0A$ , $P_O \leq 15W$ $V_I = 7V$ to $20V$	4.75	5.0	5.25		
Line Regulation (Note1)	Regline	$T_J = +25^{\circ}C$	$V_O = 7V$ to $25V$	-	4.0	100	mV
			$V_I = 8V$ to $12V$	-	1.6	50	
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}C$	$I_O = 5.0mA$ to $1.5A$	-	9	100	mV
			$I_O = 250mA$ to $750mA$	-	4	50	
Quiescent Current	$I_Q$	$T_J = +25^{\circ}C$	-	5.0	8.0	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5mA$ to $1.0A$	-	0.03	0.5	mA	
		$V_I = 7V$ to $25V$	-	0.3	1.3		
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5mA$	-	-0.8	-	$mV / ^{\circ}C$	
Output Noise Voltage	$V_N$	$f = 10Hz$ to $100KHz$ , $T_A = +25^{\circ}C$	-	42	-	$\mu V / V_O$	
Ripple Rejection	RR	$f = 120Hz$ $V_O = 8V$ to $18V$	62	73	-	dB	
Dropout Voltage	$V_{Drop}$	$I_O = 1A$ , $T_J = +25^{\circ}C$	-	2	-	V	
Output Resistance	$r_O$	$f = 1KHz$	-	15	-	$m\Omega$	
Short Circuit Current	$I_{SC}$	$V_I = 35V$ , $T_A = +25^{\circ}C$	-	230	-	mA	
Peak Current	$I_{PK}$	$T_J = +25^{\circ}C$	-	2.2	-	A	

### Note:

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

## Electrical Characteristics (MC7806)

(Refer to test circuit , $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 500\text{mA}$ ,  $V_I = 11\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	MC7806			Unit	
			Min.	Typ.	Max.		
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	5.75	6.0	6.25	V	
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 8.0\text{V to } 21\text{V}$	5.7	6.0	6.3		
Line Regulation (Note1)	Regline	$T_J = +25^{\circ}\text{C}$	$V_I = 8\text{V to } 25\text{V}$	-	5	120	mV
			$V_I = 9\text{V to } 13\text{V}$	-	1.5	60	
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	-	9	120	mV
			$I_O = 250\text{mA to } 750\text{mA}$	-	3	60	
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.0	8.0	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA to } 1\text{A}$	-	-	0.5	mA	
		$V_I = 8\text{V to } 25\text{V}$	-	-	1.3		
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$	-	-0.8	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_A = +25^{\circ}\text{C}$	-	45	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ $V_I = 9\text{V to } 19\text{V}$	59	75	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2	-	V	
Output Resistance	$r_O$	$f = 1\text{kHz}$	-	19	-	$\text{m}\Omega$	
Short Circuit Current	$I_{\text{SC}}$	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	$I_{\text{PK}}$	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

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

## Electrical Characteristics (MC7808)

(Refer to test circuit ,0°C < T<sub>J</sub> < 125°C, I<sub>O</sub> = 500mA, V<sub>I</sub> = 14V, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF, unless otherwise specified)

Parameter	Symbol	Conditions		MC7808			Unit
				Min.	Typ.	Max.	
Output Voltage	V <sub>O</sub>	T <sub>J</sub> = +25 °C		7.7	8.0	8.3	V
		5.0mA ≤ I <sub>O</sub> ≤ 1.0A, P <sub>O</sub> ≤ 15W V <sub>I</sub> = 10.5V to 23V		7.6	8.0	8.4	
Line Regulation (Note1)	Regline	T <sub>J</sub> = +25 °C	V <sub>I</sub> = 10.5V to 25V	-	5.0	160	mV
			V <sub>I</sub> = 11.5V to 17V	-	2.0	80	
Load Regulation (Note1)	Regload	T <sub>J</sub> = +25 °C	I <sub>O</sub> = 5.0mA to 1.5A	-	10	160	mV
			I <sub>O</sub> = 250mA to 750mA	-	5.0	80	
Quiescent Current	I <sub>Q</sub>	T <sub>J</sub> = +25 °C		-	5.0	8.0	mA
Quiescent Current Change	ΔI <sub>Q</sub>	I <sub>O</sub> = 5mA to 1.0A		-	0.05	0.5	mA
		V <sub>I</sub> = 10.5A to 25V		-	0.5	1.0	
Output Voltage Drift	ΔV <sub>O</sub> /ΔT	I <sub>O</sub> = 5mA		-	-0.8	-	mV/°C
Output Noise Voltage	V <sub>N</sub>	f = 10Hz to 100KHz, T <sub>A</sub> = +25 °C		-	52	-	μV/V <sub>O</sub>
Ripple Rejection	RR	f = 120Hz, V <sub>I</sub> = 11.5V to 21.5V		56	73	-	dB
Dropout Voltage	V <sub>Drop</sub>	I <sub>O</sub> = 1A, T <sub>J</sub> = +25 °C		-	2	-	V
Output Resistance	r <sub>O</sub>	f = 1KHz		-	17	-	mΩ
Short Circuit Current	I <sub>SC</sub>	V <sub>I</sub> = 35V, T <sub>A</sub> = +25 °C		-	230	-	mA
Peak Current	I <sub>PK</sub>	T <sub>J</sub> = +25 °C		-	2.2	-	A

### Note:

1. Load and line regulation are specified at constant junction temperature. Changes in V<sub>O</sub> due to heating effects must be taken into account separately. Pulse testing with low duty is used.

## Electrical Characteristics (MC7809)

(Refer to test circuit , $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 500\text{mA}$ ,  $V_I = 15\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	MC7809			Unit	
			Min.	Typ.	Max.		
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	8.65	9	9.35	V	
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 11.5\text{V to } 24\text{V}$	8.6	9	9.4		
Line Regulation (Note1)	Regline	$T_J = +25^{\circ}\text{C}$	$V_I = 11.5\text{V to } 25\text{V}$	-	6	180	mV
			$V_I = 12\text{V to } 17\text{V}$	-	2	90	
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	-	12	180	mV
			$I_O = 250\text{mA to } 750\text{mA}$	-	4	90	
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.0	8.0	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA to } 1.0\text{A}$	-	-	0.5	mA	
		$V_I = 11.5\text{V to } 26\text{V}$	-	-	1.3		
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$	-	-1	-	mV/°C	
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_A = +25^{\circ}\text{C}$	-	58	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ $V_I = 13\text{V to } 23\text{V}$	56	71	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2	-	V	
Output Resistance	$r_O$	$f = 1\text{kHz}$	-	17	-	$\text{m}\Omega$	
Short Circuit Current	$I_{\text{SC}}$	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	$I_{\text{PK}}$	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

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

## Electrical Characteristics (MC7810)

(Refer to test circuit , $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 500\text{mA}$ ,  $V_I = 16\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	MC7810			Unit	
			Min.	Typ.	Max.		
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	9.6	10	10.4	V	
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 12.5\text{V to } 25\text{V}$	9.5	10	10.5		
Line Regulation (Note1)	Regline	$T_J = +25^{\circ}\text{C}$	$V_I = 12.5\text{V to } 25\text{V}$	-	10	200	mV
			$V_I = 13\text{V to } 25\text{V}$	-	3	100	
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	-	12	200	mV
			$I_O = 250\text{mA to } 750\text{mA}$	-	4	400	
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.1	8.0	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA to } 1.0\text{A}$	-	-	0.5	mA	
		$V_I = 12.5\text{V to } 29\text{V}$	-	-	1.0		
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$	-	-1	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_A = +25^{\circ}\text{C}$	-	58	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ $V_I = 13\text{V to } 23\text{V}$	56	71	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2	-	V	
Output Resistance	$r_O$	$f = 1\text{kHz}$	-	17	-	$\text{m}\Omega$	
Short Circuit Current	ISC	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	$I_{PK}$	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

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

## Electrical Characteristics (MC7812)

(Refer to test circuit , $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 500\text{mA}$ ,  $V_I = 19\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	MC7812			Unit	
			Min.	Typ.	Max.		
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	11.5	12	12.5	V	
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 14.5\text{V to } 27\text{V}$	11.4	12	12.6		
Line Regulation (Note1)	Regline	$T_J = +25^{\circ}\text{C}$	$V_I = 14.5\text{V to } 30\text{V}$	-	10	240	mV
			$V_I = 16\text{V to } 22\text{V}$	-	3.0	120	
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	-	11	240	mV
			$I_O = 250\text{mA to } 750\text{mA}$	-	5.0	120	
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.1	8.0	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA to } 1.0\text{A}$	-	0.1	0.5	mA	
		$V_I = 14.5\text{V to } 30\text{V}$	-	0.5	1.0		
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$	-	-1	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_A = +25^{\circ}\text{C}$	-	76	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ $V_I = 15\text{V to } 25\text{V}$	55	71	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2	-	V	
Output Resistance	$r_O$	$f = 1\text{kHz}$	-	18	-	m $\Omega$	
Short Circuit Current	ISC	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	230	-	mA	
Peak Current	$I_{\text{PK}}$	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

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

## Electrical Characteristics (MC7815)

(Refer to test circuit , $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 500\text{mA}$ ,  $V_I = 23\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	MC7815			Unit	
			Min.	Typ.	Max.		
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	14.4	15	15.6	V	
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 17.5\text{V to } 30\text{V}$	14.25	15	15.75		
Line Regulation (Note1)	Regline	$T_J = +25^{\circ}\text{C}$	$V_I = 17.5\text{V to } 30\text{V}$	-	11	300	mV
			$V_I = 20\text{V to } 26\text{V}$	-	3	150	
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	-	12	300	mV
			$I_O = 250\text{mA to } 750\text{mA}$	-	4	150	
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.2	8.0	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA to } 1.0\text{A}$	-	-	0.5	mA	
		$V_I = 17.5\text{V to } 30\text{V}$	-	-	1.0		
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$	-	-1	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_A = +25^{\circ}\text{C}$	-	90	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ $V_I = 18.5\text{V to } 28.5\text{V}$	54	70	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2	-	V	
Output Resistance	$r_O$	$f = 1\text{kHz}$	-	19	-	$\text{m}\Omega$	
Short Circuit Current	$I_{\text{SC}}$	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	$I_{\text{PK}}$	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

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



## Electrical Characteristics (MC7818)

(Refer to test circuit , $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 500\text{mA}$ ,  $V_I = 27\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	MC7818			Unit	
			Min.	Typ.	Max.		
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	17.3	18	18.7	V	
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 21\text{V to } 33\text{V}$	17.1	18	18.9		
Line Regulation (Note1)	Regline	$T_J = +25^{\circ}\text{C}$	$V_I = 21\text{V to } 33\text{V}$	-	15	360	mV
			$V_I = 24\text{V to } 30\text{V}$	-	5	180	
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	-	15	360	mV
			$I_O = 250\text{mA to } 750\text{mA}$	-	5.0	180	
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.2	8.0	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA to } 1.0\text{A}$	-	-	0.5	mA	
		$V_I = 21\text{V to } 33\text{V}$	-	-	1		
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$	-	-1	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_A = +25^{\circ}\text{C}$	-	110	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ $V_I = 22\text{V to } 32\text{V}$	53	69	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2	-	V	
Output Resistance	$r_O$	$f = 1\text{kHz}$	-	22	-	$\text{m}\Omega$	
Short Circuit Current	ISC	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	$I_{\text{PK}}$	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

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

## Electrical Characteristics (MC7824)

(Refer to test circuit , $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 500\text{mA}$ ,  $V_I = 33\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	MC7824			Unit	
			Min.	Typ.	Max.		
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	23	24	25	V	
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 27\text{V to } 38\text{V}$	22.8	24	25.25		
Line Regulation (Note1)	Regline	$T_J = +25^{\circ}\text{C}$	$V_I = 27\text{V to } 38\text{V}$	-	17	480	mV
			$V_I = 30\text{V to } 36\text{V}$	-	6	240	
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{mA to } 1.5\text{A}$	-	15	480	mV
			$I_O = 250\text{mA to } 750\text{mA}$	-	5.0	240	
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.2	8.0	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA to } 1.0\text{A}$	-	0.1	0.5	mA	
		$V_I = 27\text{V to } 38\text{V}$	-	0.5	1		
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$	-	-1.5	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ , $T_A = +25^{\circ}\text{C}$	-	60	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ $V_I = 28\text{V to } 38\text{V}$	50	67	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2	-	V	
Output Resistance	$r_O$	$f = 1\text{kHz}$	-	28	-	$\text{m}\Omega$	
Short Circuit Current	$I_{\text{SC}}$	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	230	-	mA	
Peak Current	$I_{\text{PK}}$	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

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

## Electrical Characteristics (MC7805A)

(Refer to the test circuits.  $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 1\text{A}$ ,  $V_I = 10\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	4.9	5	5.1	V	
		$I_O = 5\text{mA}$ to $1\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 7.5\text{V}$ to $20\text{V}$	4.8	5	5.2		
Line Regulation (Note1)	Regline	$V_I = 7.5\text{V}$ to $25\text{V}$ $I_O = 500\text{mA}$	-	5	50	mV	
		$V_I = 8\text{V}$ to $12\text{V}$	-	3	50		
		$T_J = +25^{\circ}\text{C}$	$V_I = 7.3\text{V}$ to $20\text{V}$	-	5		50
			$V_I = 8\text{V}$ to $12\text{V}$	-	1.5		25
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA}$ to $1.5\text{A}$	-	9	100	mV	
		$I_O = 5\text{mA}$ to $1\text{A}$	-	9	100		
		$I_O = 250\text{mA}$ to $750\text{mA}$	-	4	50		
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.0	6	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA}$ to $1\text{A}$	-	-	0.5	mA	
		$V_I = 8\text{V}$ to $25\text{V}$ , $I_O = 500\text{mA}$	-	-	0.8		
		$V_I = 7.5\text{V}$ to $20\text{V}$ , $T_J = +25^{\circ}\text{C}$	-	-	0.8		
Output Voltage Drift	$\Delta V/\Delta T$	$I_O = 5\text{mA}$	-	-0.8	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz}$ to $100\text{KHz}$ $T_A = +25^{\circ}\text{C}$	-	10	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 8\text{V}$ to $18\text{V}$	-	68	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2	-	V	
Output Resistance	$r_O$	$f = 1\text{KHz}$	-	17	-	$\text{m}\Omega$	
Short Circuit Current	$I_{\text{SC}}$	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	$I_{\text{PK}}$	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

1. 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 (MC7806A)

(Refer to the test circuits.  $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 1\text{A}$ ,  $V_I = 11\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	5.58	6	6.12	V	
		$I_O = 5\text{mA to } 1\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 8.6\text{V to } 21\text{V}$	5.76	6	6.24		
Line Regulation (Note1)	Regline	$V_I = 8.6\text{V to } 25\text{V}$ $I_O = 500\text{mA}$	-	5	60	mV	
		$V_I = 9\text{V to } 13\text{V}$	-	3	60		
		$T_J = +25^{\circ}\text{C}$	$V_I = 8.3\text{V to } 21\text{V}$	-	5		60
			$V_I = 9\text{V to } 13\text{V}$	-	1.5		30
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA to } 1.5\text{A}$	-	9	100	mV	
		$I_O = 5\text{mA to } 1\text{A}$	-	4	100		
		$I_O = 250\text{mA to } 750\text{mA}$	-	5.0	50		
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	4.3	6	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA to } 1\text{A}$	-	-	0.5	mA	
		$V_I = 9\text{V to } 25\text{V}$ , $I_O = 500\text{mA}$	-	-	0.8		
		$V_I = 8.5\text{V to } 21\text{V}$ , $T_J = +25^{\circ}\text{C}$	-	-	0.8		
Output Voltage Drift	$\Delta V/\Delta T$	$I_O = 5\text{mA}$	-	-0.8	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ $T_A = +25^{\circ}\text{C}$	-	10	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 9\text{V to } 19\text{V}$	-	65	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2	-	V	
Output Resistance	$r_O$	$f = 1\text{kHz}$	-	17	-	$\text{m}\Omega$	
Short Circuit Current	ISC	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	IPK	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

1. 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 (MC7808A)**(Refer to the test circuits.  $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 1\text{A}$ ,  $V_I = 14\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	7.84	8	8.16	V	
		$I_O = 5\text{mA}$ to $1\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 10.6\text{V}$ to $23\text{V}$	7.7	8	8.3		
Line Regulation (Note1)	Regline	$V_I = 10.6\text{V}$ to $25\text{V}$ $I_O = 500\text{mA}$	-	6	80	mV	
		$V_I = 11\text{V}$ to $17\text{V}$	-	3	80		
		$T_J = +25^{\circ}\text{C}$	$V_I = 10.4\text{V}$ to $23\text{V}$	-	6		80
			$V_I = 11\text{V}$ to $17\text{V}$	-	2		40
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA}$ to $1.5\text{A}$	-	12	100	mV	
		$I_O = 5\text{mA}$ to $1\text{A}$	-	12	100		
		$I_O = 250\text{mA}$ to $750\text{mA}$	-	5	50		
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.0	6	mA	
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA}$ to $1\text{A}$	-	-	0.5	mA	
		$V_I = 11\text{V}$ to $25\text{V}$ , $I_O = 500\text{mA}$	-	-	0.8		
		$V_I = 10.6\text{V}$ to $23\text{V}$ , $T_J = +25^{\circ}\text{C}$	-	-	0.8		
Output Voltage Drift	$\Delta V/\Delta T$	$I_O = 5\text{mA}$	-	-0.8	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz}$ to $100\text{kHz}$ $T_A = +25^{\circ}\text{C}$	-	10	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 11.5\text{V}$ to $21.5\text{V}$	-	62	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2	-	V	
Output Resistance	$r_O$	$f = 1\text{kHz}$	-	18	-	$\text{m}\Omega$	
Short Circuit Current	$I_{\text{SC}}$	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	$I_{\text{PK}}$	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

**Note:**

1. 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 (MC7809A)

(Refer to the test circuits.  $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 1\text{A}$ ,  $V_I = 15\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	8.82	9.0	9.18	V	
		$I_O = 5\text{mA to } 1\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 11.2\text{V to } 24\text{V}$	8.65	9.0	9.35		
Line Regulation (Note1)	Regline	$V_I = 11.7\text{V to } 25\text{V}$ $I_O = 500\text{mA}$	-	6	90	mV	
		$V_I = 12.5\text{V to } 19\text{V}$	-	4	45		
		$T_J = +25^{\circ}\text{C}$	$V_I = 11.5\text{V to } 24\text{V}$	-	6		90
			$V_I = 12.5\text{V to } 19\text{V}$	-	2		45
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA to } 1.0\text{A}$	-	12	100	mV	
		$I_O = 5\text{mA to } 1.0\text{A}$	-	12	100		
		$I_O = 250\text{mA to } 750\text{mA}$	-	5	50		
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.0	6.0	mA	
Quiescent Current Change	$\Delta I_Q$	$V_I = 11.7\text{V to } 25\text{V}$ , $T_J = +25^{\circ}\text{C}$	-	-	0.8	mA	
		$V_I = 12\text{V to } 25\text{V}$ , $I_O = 500\text{mA}$	-	-	0.8		
		$I_O = 5\text{mA to } 1.0\text{A}$	-	-	0.5		
Output Voltage Drift	$\Delta V/\Delta T$	$I_O = 5\text{mA}$	-	-1.0	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ $T_A = +25^{\circ}\text{C}$	-	10	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 12\text{V to } 22\text{V}$	-	62	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2.0	-	V	
Output Resistance	$r_O$	$f = 1\text{kHz}$	-	17	-	$\text{m}\Omega$	
Short Circuit Current	ISC	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	$I_{\text{PK}}$	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

1. 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 (MC7810A)

(Refer to the test circuits.  $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 1\text{A}$ ,  $V_I = 16\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	9.8	10	10.2	V	
		$I_O = 5\text{mA to } 1\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 12.8\text{V to } 25\text{V}$	9.6	10	10.4		
Line Regulation (Note1)	Regline	$V_I = 12.8\text{V to } 26\text{V}$ $I_O = 500\text{mA}$	-	8	100	mV	
		$V_I = 13\text{V to } 20\text{V}$	-	4	50		
		$T_J = +25^{\circ}\text{C}$	$V_I = 12.5\text{V to } 25\text{V}$	-	8		100
			$V_I = 13\text{V to } 20\text{V}$	-	3		50
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA to } 1.5\text{A}$	-	12	100	mV	
		$I_O = 5\text{mA to } 1.0\text{A}$	-	12	100		
		$I_O = 250\text{mA to } 750\text{mA}$	-	5	50		
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.0	6.0	mA	
Quiescent Current Change	$\Delta I_Q$	$V_I = 13\text{V to } 26\text{V}$ , $T_J = +25^{\circ}\text{C}$	-	-	0.5	mA	
		$V_I = 12.8\text{V to } 25\text{V}$ , $I_O = 500\text{mA}$	-	-	0.8		
		$I_O = 5\text{mA to } 1.0\text{A}$	-	-	0.5		
Output Voltage Drift	$\Delta V/\Delta T$	$I_O = 5\text{mA}$	-	-1.0	-	$\text{mV}/^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ $T_A = +25^{\circ}\text{C}$	-	10	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 14\text{V to } 24\text{V}$	-	62	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2.0	-	V	
Output Resistance	$r_O$	$f = 1\text{kHz}$	-	17	-	$\text{m}\Omega$	
Short Circuit Current	ISC	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	IPK	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

1. 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 (MC7812A)

(Refer to the test circuits.  $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 1\text{A}$ ,  $V_I = 19\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	11.75	12	12.25	V	
		$I_O = 5\text{mA to } 1\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 14.8\text{V to } 27\text{V}$	11.5	12	12.5		
Line Regulation (Note1)	Regline	$V_I = 14.8\text{V to } 30\text{V}$ $I_O = 500\text{mA}$	-	10	120	mV	
		$V_I = 16\text{V to } 22\text{V}$	-	4	120		
		$T_J = +25^{\circ}\text{C}$	$V_I = 14.5\text{V to } 27\text{V}$	-	10		120
			$V_I = 16\text{V to } 22\text{V}$	-	3		60
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA to } 1.5\text{A}$	-	12	100	mV	
		$I_O = 5\text{mA to } 1.0\text{A}$	-	12	100		
		$I_O = 250\text{mA to } 750\text{mA}$	-	5	50		
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.1	6.0	mA	
Quiescent Current Change	$\Delta I_Q$	$V_I = 15\text{V to } 30\text{V}$ , $T_J = +25^{\circ}\text{C}$	-	-	0.8	mA	
		$V_I = 14\text{V to } 27\text{V}$ , $I_O = 500\text{mA}$	-	-	0.8		
		$I_O = 5\text{mA to } 1.0\text{A}$	-	-	0.5		
Output Voltage Drift	$\Delta V/\Delta T$	$I_O = 5\text{mA}$	-	-1.0	-	$\text{mV}/^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz to } 100\text{kHz}$ $T_A = +25^{\circ}\text{C}$	-	10	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 14\text{V to } 24\text{V}$	-	60	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2.0	-	V	
Output Resistance	$r_O$	$f = 1\text{kHz}$	-	18	-	$\text{m}\Omega$	
Short Circuit Current	ISC	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	IPK	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

1. 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 (MC7815A)

(Refer to the test circuits.  $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 1\text{A}$ ,  $V_I = 23\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	14.7	15	15.3	V	
		$I_O = 5\text{mA}$ to 1A, $P_O \leq 15\text{W}$ $V_I = 17.7\text{V}$ to 30V	14.4	15	15.6		
Line Regulation (Note1)	Regline	$V_I = 17.9\text{V}$ to 30V $I_O = 500\text{mA}$	-	10	150	mV	
		$V_I = 20\text{V}$ to 26V	-	5	150		
		$T_J = +25^{\circ}\text{C}$	$V_I = 17.5\text{V}$ to 30V	-	11		150
			$V_I = 20\text{V}$ to 26V	-	3		75
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA}$ to 1.5A	-	12	100	mV	
		$I_O = 5\text{mA}$ to 1.0A	-	12	100		
		$I_O = 250\text{mA}$ to 750mA	-	5	50		
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.2	6.0	mA	
Quiescent Current Change	$\Delta I_Q$	$V_I = 17.5\text{V}$ to 30V, $T_J = +25^{\circ}\text{C}$	-	-	0.8	mA	
		$V_I = 17.5\text{V}$ to 30V, $I_O = 500\text{mA}$	-	-	0.8		
		$I_O = 5\text{mA}$ to 1.0A	-	-	0.5		
Output Voltage Drift	$\Delta V/\Delta T$	$I_O = 5\text{mA}$	-	-1.0	-	$\text{mV}/^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz}$ to 100KHz $T_A = +25^{\circ}\text{C}$	-	10	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 18.5\text{V}$ to 28.5V	-	58	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2.0	-	V	
Output Resistance	$r_O$	$f = 1\text{KHz}$	-	19	-	$\text{m}\Omega$	
Short Circuit Current	ISC	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	$I_{\text{PK}}$	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

1. 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 (MC7818A)

(Refer to the test circuits.  $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 1\text{A}$ ,  $V_I = 27\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	17.64	18	18.36	V	
		$I_O = 5\text{mA}$ to 1A, $P_O \leq 15\text{W}$ $V_I = 21\text{V}$ to 33V	17.3	18	18.7		
Line Regulation (Note1)	Regline	$V_I = 21\text{V}$ to 33V $I_O = 500\text{mA}$	-	15	180	mV	
		$V_I = 21\text{V}$ to 33V	-	5	180		
		$T_J = +25^{\circ}\text{C}$	$V_I = 20.6\text{V}$ to 33V	-	15		180
			$V_I = 24\text{V}$ to 30V	-	5		90
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA}$ to 1.5A	-	15	100	mV	
		$I_O = 5\text{mA}$ to 1.0A	-	15	100		
		$I_O = 250\text{mA}$ to 750mA	-	7	50		
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.2	6.0	mA	
Quiescent Current Change	$\Delta I_Q$	$V_I = 21\text{V}$ to 33V, $T_J = +25^{\circ}\text{C}$	-	-	0.8	mA	
		$V_I = 21\text{V}$ to 33V, $I_O = 500\text{mA}$	-	-	0.8		
		$I_O = 5\text{mA}$ to 1.0A	-	-	0.5		
Output Voltage Drift	$\Delta V/\Delta T$	$I_O = 5\text{mA}$	-	-1.0	-	mV/ $^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz}$ to 100kHz $T_A = +25^{\circ}\text{C}$	-	10	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 22\text{V}$ to 32V	-	57	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2.0	-	V	
Output Resistance	$r_O$	$f = 1\text{KHz}$	-	19	-	m $\Omega$	
Short Circuit Current	ISC	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	IPK	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

1. 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 (MC7824A)

(Refer to the test circuits.  $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 1\text{A}$ ,  $V_I = 33\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	$V_O$	$T_J = +25^{\circ}\text{C}$	23.5	24	24.5	V	
		$I_O = 5\text{mA}$ to $1\text{A}$ , $P_O \leq 15\text{W}$ $V_I = 27.3\text{V}$ to $38\text{V}$	23	24	25		
Line Regulation (Note1)	Regline	$V_I = 27\text{V}$ to $38\text{V}$ $I_O = 500\text{mA}$	-	18	240	mV	
		$V_I = 21\text{V}$ to $33\text{V}$	-	6	240		
		$T_J = +25^{\circ}\text{C}$	$V_I = 26.7\text{V}$ to $38\text{V}$	-	18		240
			$V_I = 30\text{V}$ to $36\text{V}$	-	6		120
Load Regulation (Note1)	Regload	$T_J = +25^{\circ}\text{C}$ $I_O = 5\text{mA}$ to $1.5\text{A}$	-	15	100	mV	
		$I_O = 5\text{mA}$ to $1.0\text{A}$	-	15	100		
		$I_O = 250\text{mA}$ to $750\text{mA}$	-	7	50		
Quiescent Current	$I_Q$	$T_J = +25^{\circ}\text{C}$	-	5.2	6.0	mA	
Quiescent Current Change	$\Delta I_Q$	$V_I = 27.3\text{V}$ to $38\text{V}$ , $T_J = +25^{\circ}\text{C}$	-	-	0.8	mA	
		$V_I = 27.3\text{V}$ to $38\text{V}$ , $I_O = 500\text{mA}$	-	-	0.8		
		$I_O = 5\text{mA}$ to $1.0\text{A}$	-	-	0.5		
Output Voltage Drift	$\Delta V/\Delta T$	$I_O = 5\text{mA}$	-	-1.5	-	$\text{mV}/^{\circ}\text{C}$	
Output Noise Voltage	$V_N$	$f = 10\text{Hz}$ to $100\text{kHz}$ $T_A = 25^{\circ}\text{C}$	-	10	-	$\mu\text{V}/V_O$	
Ripple Rejection	RR	$f = 120\text{Hz}$ , $I_O = 500\text{mA}$ $V_I = 28\text{V}$ to $38\text{V}$	-	54	-	dB	
Dropout Voltage	$V_{\text{Drop}}$	$I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$	-	2.0	-	V	
Output Resistance	$r_O$	$f = 1\text{kHz}$	-	20	-	$\text{m}\Omega$	
Short Circuit Current	ISC	$V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$	-	250	-	mA	
Peak Current	IPK	$T_J = +25^{\circ}\text{C}$	-	2.2	-	A	

### Note:

1. 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.

## Typical Performance Characteristics

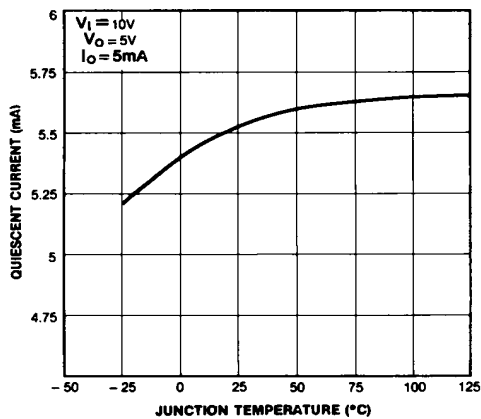


Figure 1. Quiescent Current

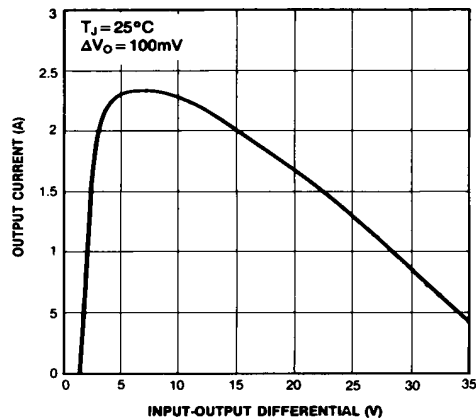


Figure 2. Peak Output Current

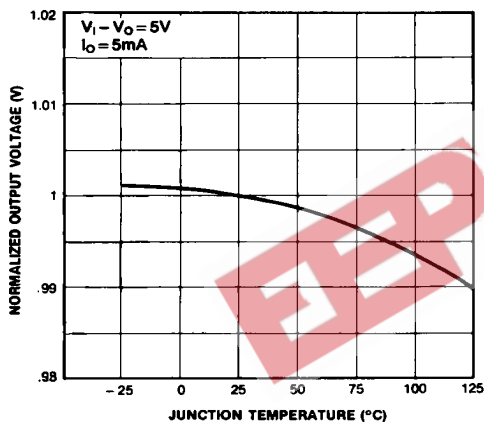


Figure 3. Output Voltage

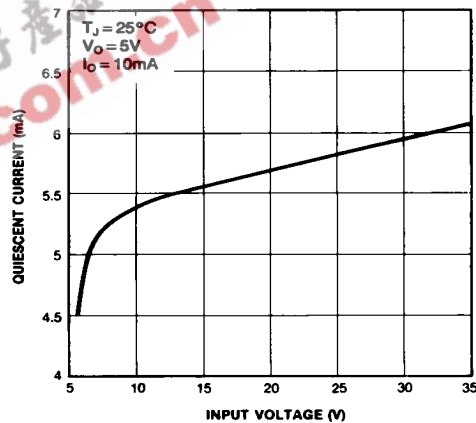


Figure 4. Quiescent Current

## Typical Applications

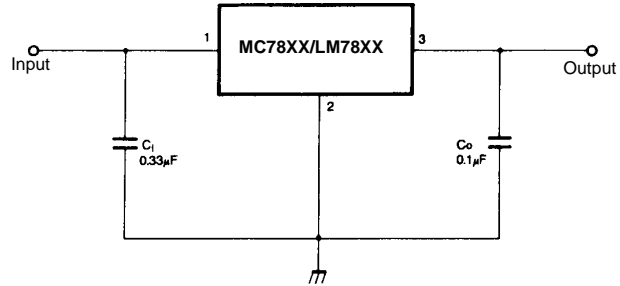


Figure 5. DC Parameters

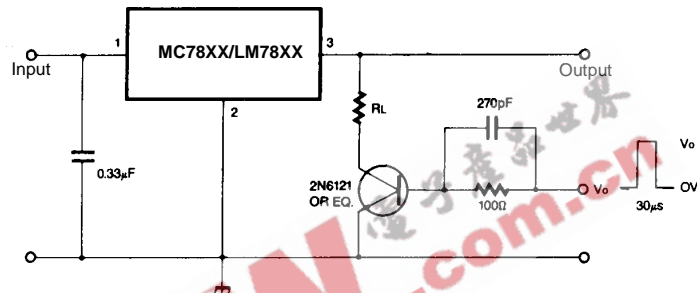


Figure 6. Load Regulation

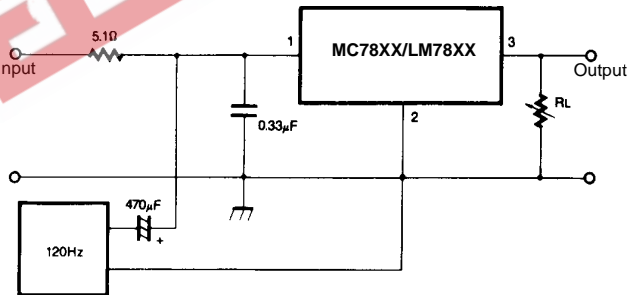


Figure 7. Ripple Rejection

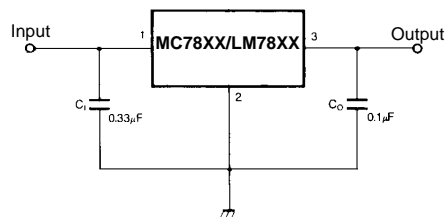


Figure 8. Fixed Output Regulator

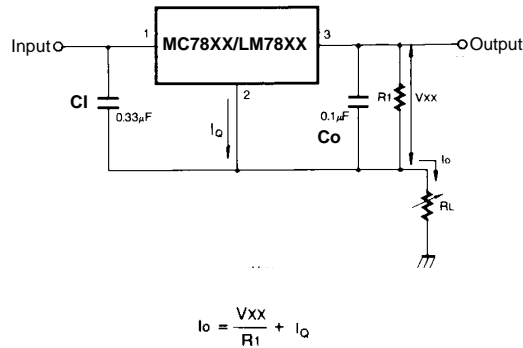
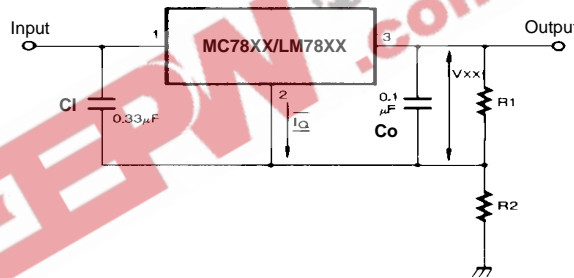


Figure 9. Constant Current Regulator

**Notes:**

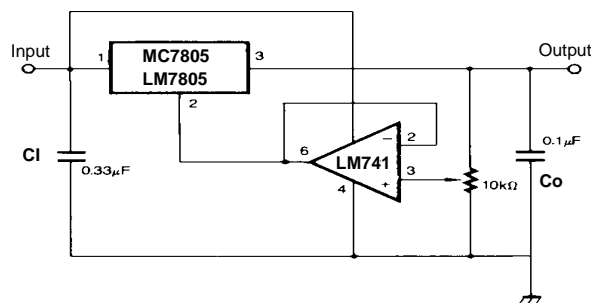
- (1) To specify an output voltage, substitute voltage value for "XX." A common ground is required between the input and the Output voltage. The input voltage must remain typically 2.0V above the output voltage even during the low point on the input ripple voltage.
- (2) C<sub>1</sub> is required if regulator is located an appreciable distance from power Supply filter.
- (3) C<sub>0</sub> improves stability and transient response.



$$I_{R1} \geq 5I_Q$$

$$V_O = V_{XX}(1+R_2/R_1)+I_Q R_2$$

Figure 10. Circuit for Increasing Output Voltage



$$I_{R1} \geq 5 I_Q$$

$$V_O = V_{XX}(1+R_2/R_1)+I_Q R_2$$

Figure 11. Adjustable Output Regulator (7 to 30V)

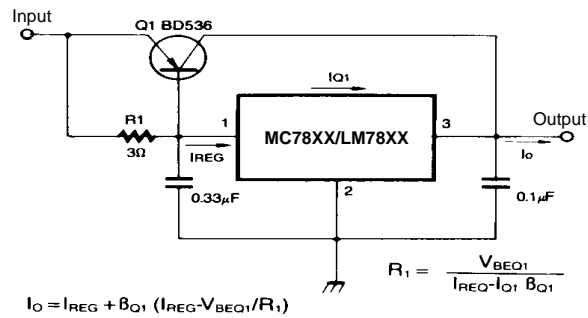


Figure 12. High Current Voltage Regulator

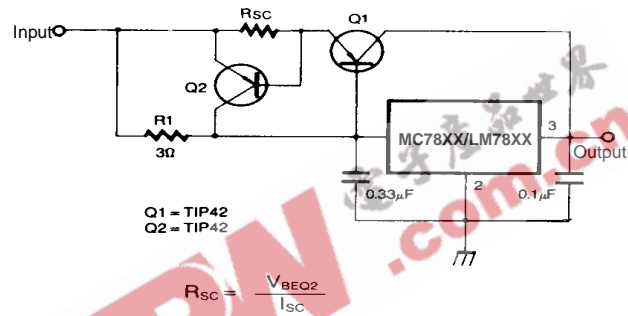


Figure 13. High Output Current with Short Circuit Protection

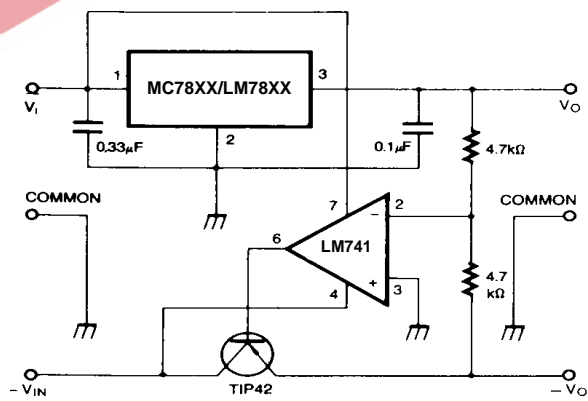


Figure 14. Tracking Voltage Regulator

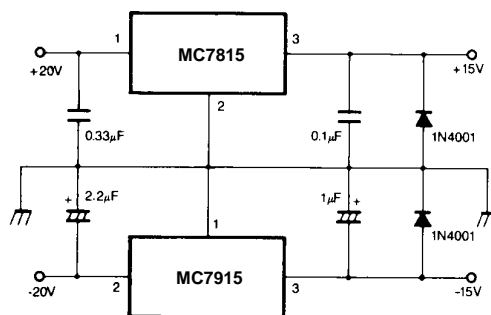


Figure 15. Split Power Supply ( ±15V-1A)

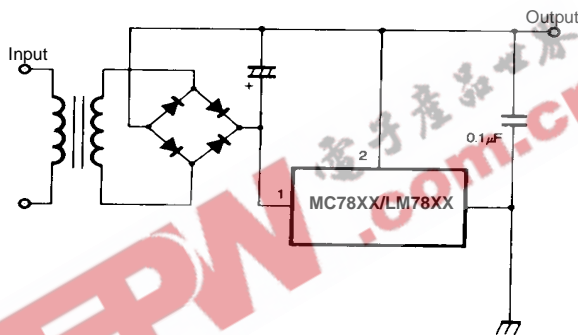


Figure 16. Negative Output Voltage Circuit

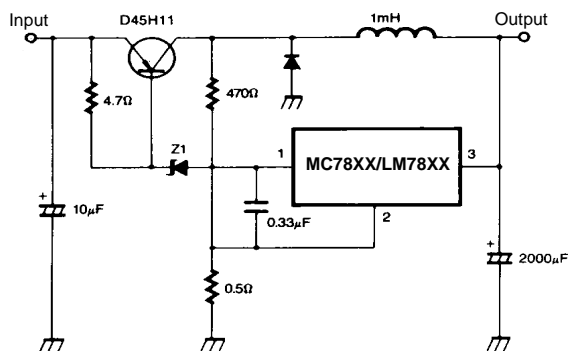


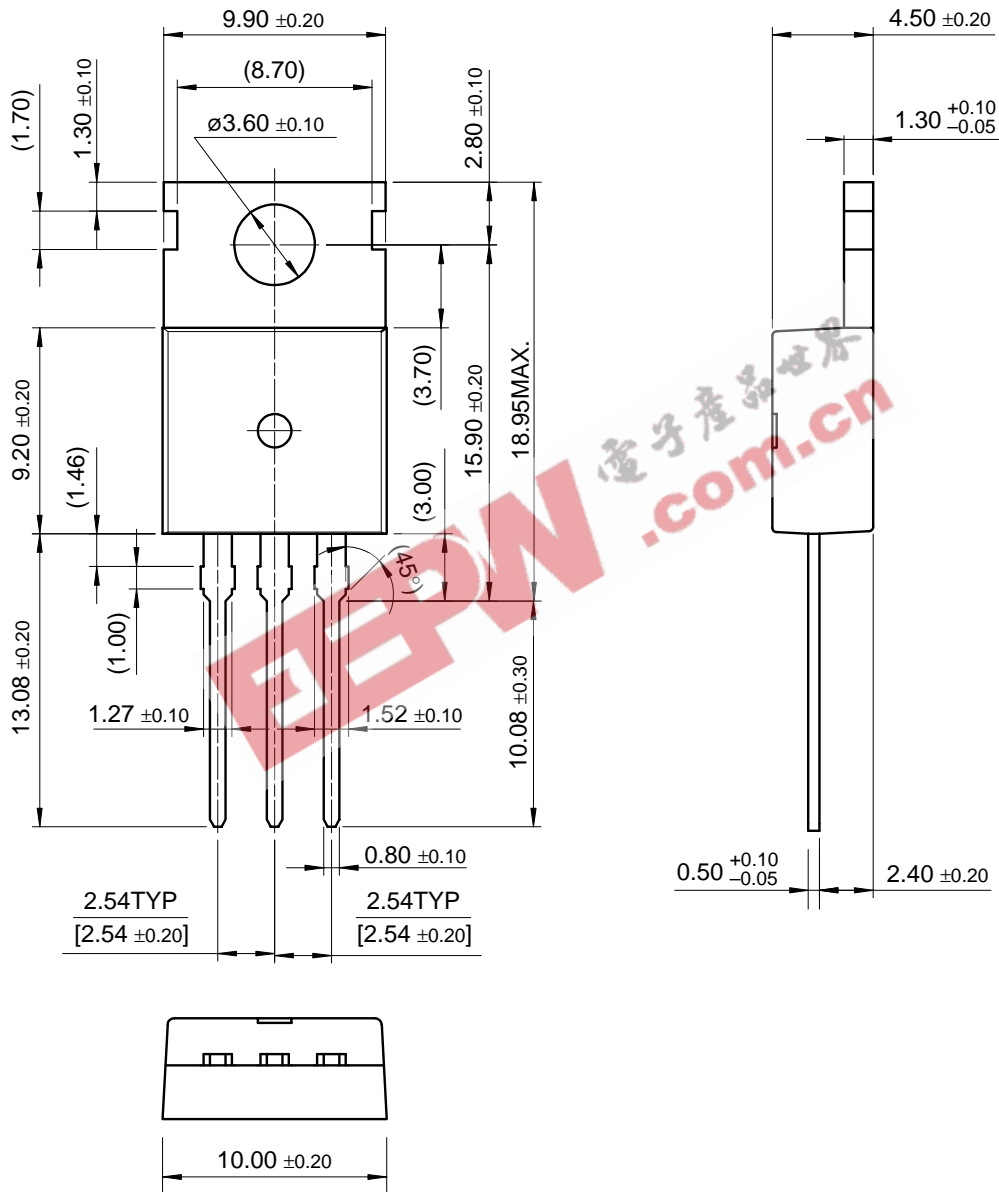
Figure 17. Switching Regulator



## Mechanical Dimensions

### Package

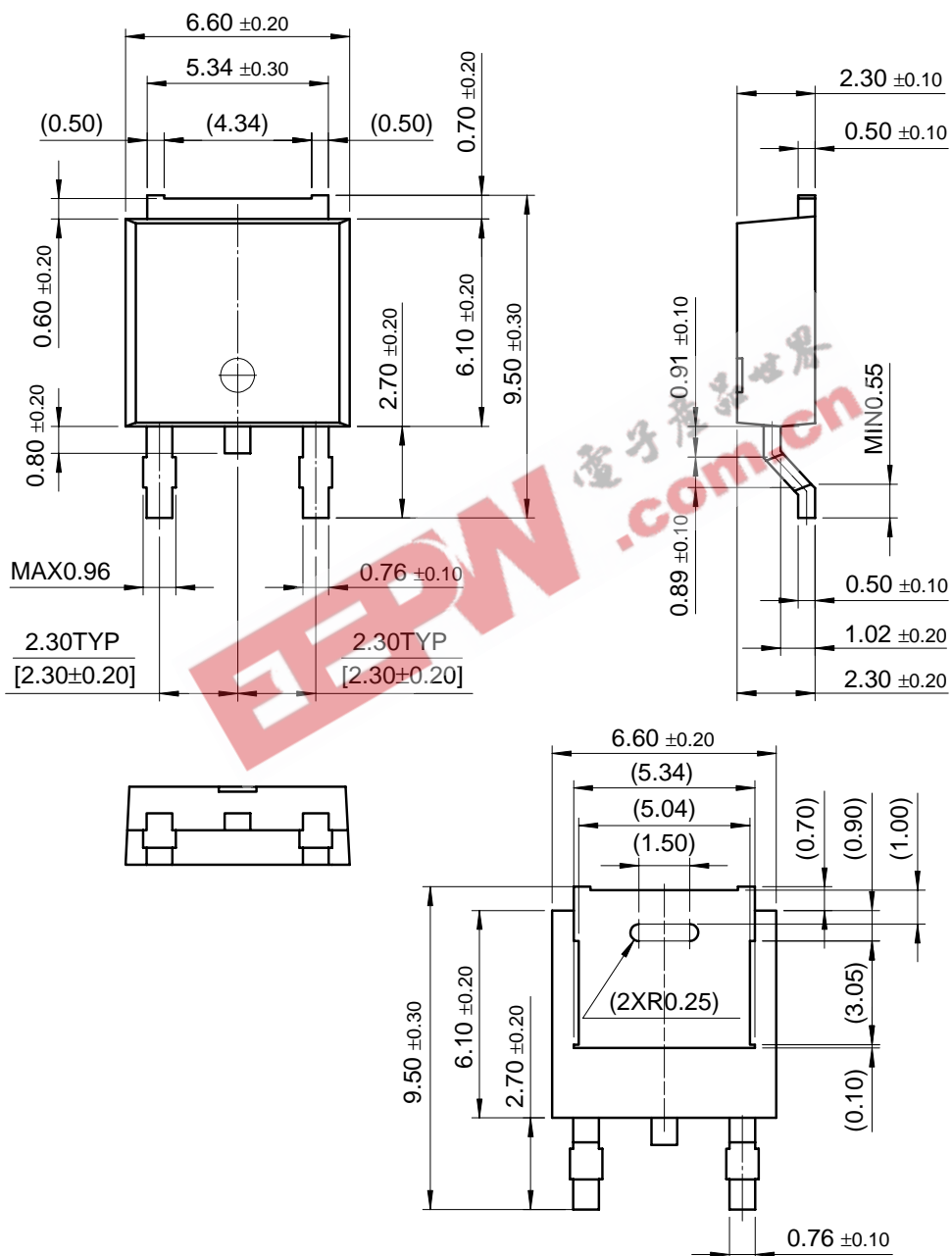
## TO-220



# Mechanical Dimensions (Continued)

## Package

### D-PAK



## Ordering Information

Product Number	Output Voltage Tolerance	Package	Operating Temperature
LM7805CT	±4%	TO-220	0 ~ + 125°C

Product Number	Output Voltage Tolerance	Package	Operating Temperature
MC7805CT	±4%	TO-220	0 ~ + 125°C
MC7806CT			
MC7808CT			
MC7809CT			
MC7810CT			
MC7812CT			
MC7815CT			
MC7818CT			
MC7824CT			
MC7805CDT			
MC7806CDT			
MC7808CDT			
MC7809CDT			
MC7810CDT			
MC7812CDT			
MC7805ACT	±2%	TO-220	
MC7806ACT			
MC7808ACT			
MC7809ACT			
MC7810ACT			
MC7812ACT			
MC7815ACT			
MC7818ACT			
MC7824ACT			



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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.