

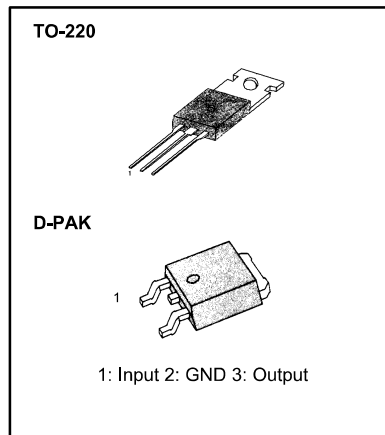
LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

3-TERMINAL 1A POSITIVE VOLTAGE REGULATORS

The LM78XX 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 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.

FEATURES

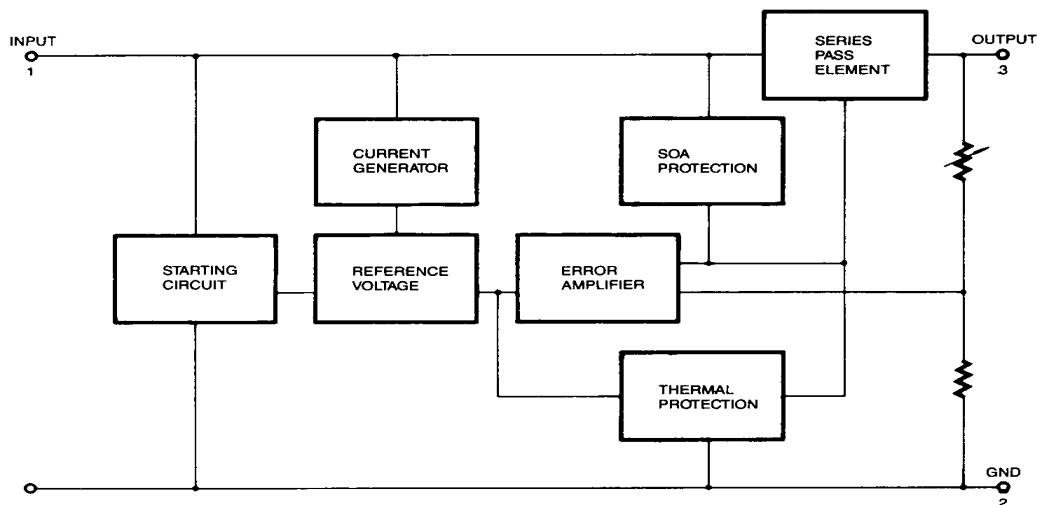
- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 11, 12, 15, 18, 24V
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor SOA Protection



ORDERING INFORMATION

Device	Output Voltage Tolerance	Packag	Operating Temperature
KA78XXCT	± 4%	TO-220	0 ~ +125 °C
KA78XXAT	± 2%		-40 ~ +125 °C
KA78XXIT	± 4%		
KA78XXR	± 2%	D-PAK	0 ~ +125 °C
KA78XXAR	± 2%		-40 ~ +125 °C
KA78XXIR	± 4%		

BLOCK DIAGRAM



LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C, unless otherwise specified)

Characteristic	Symbol	Value	Unit
Input Voltage (for V _O = 5V to 18V) (for V _O = 24V)	V _I	35	V
	V _I	40	V
Thermal Resistance Junction-Cases	R _{θJC}	5	°C/W
Thermal Resistance Junction-Air	R _{θJA}	65	°C/W
Operating Temperature Range KA78XX/A/R/RA KA78XXI/RI	T _{OPR}	0 ~ +125	°C
		-40 ~ +125	°C
Storage Temperature Range	T _{STG}	-65 ~ +150	°C

LM7805/I/R/RI ELECTRICAL CHARACTERISTICS

(Refer to test circuit, T_{MIN} < T_J < T_{MAX}, I_O = 500mA, V_I = 10V, C_I = 0.33μF, C_O = 0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions		LM7805I			LM7805			Unit
				Min	Typ	Max	Min	Typ	Max	
Output Voltage	V _O	T _J =+25 °C		4.8	5.0	5.2	4.8	5.0	5.2	V
		5.0mA ≤ I _O ≤1.0A, P _O ≤ 15W					4.75	5.0	5.25	
		V _I = 7V to 20V								
		V _I = 8V to 20V		4.75	5.0	5.25				
Line Regulation	ΔV _O	T _J =+25°C	V _O = 7V to 25V		4.0	100		4.0	100	mV
			V _I = 8V to 12V		1.6	50		1.6	50	
Load Regulation	ΔV _O	T _J =+25°C	I _O = 5.0mA to 1.5A		9	100		9	100	mV
			I _O =250mA to 750mA		4	50		4	50	
Quiescent Current	I _Q	T _J =+25 °C			5.0	8		5.0	8	mA
Quiescent Current Change	ΔI _Q	I _O = 5mA to 1.0A			0.03	0.5		0.03	0.5	mA
		V _I = 7V to 25V						0.3	1.3	
		V _I = 8V to 25V			0.3	1.3				
Output Voltage Drift	ΔV _O /ΔT	I _O = 5mA			-0.8			-0.8		mV/°C
Output Noise Voltage	V _N	f = 10Hz to 100Khz, T _A =+25 °C			42			42		μV/V _O
Ripple Rejection	RR	f = 120Hz V _O = 8 to 18V		62	73		62	73		dB
Dropout Voltage	V _O	I _O = 1A, T _J =+25 °C			2			2		V
Output Resistance	R _O	f = 1KHz			15			15		mΩ
Short Circuit Current	I _{SC}	V _I = 35V, T _A =+25 °C			230			230		mA
Peak Current	I _{PK}	T _J =+25 °C			2.2			2.2		A

* T_{MIN} < T_J < T_{MAX}

LM78XXI/RI: T_{MIN} = -40°C, T_{MAX} = +125°C

LM78XX/R: T_{MIN} = 0°C, T_{MAX} = +125°C

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7806I/R/RI ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN} < T_J < T_{MAX}$, $I_O = 500mA$, $V_I = 11V$ $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	LM7806I			LM7806			Unit
			Min	Typ	Max	Min	Typ	Max	
Output Voltage	V_O	$T_J = +25^\circ C$	5.75	6.0	6.25	5.75	6.0	6.25	V
		$5.0mA \leq I_O \leq 1.0A$, $P_D \leq 15W$							
		$V_I = 8.0V$ to $21V$ $V_I = 9.0V$ to $21V$	5.7	6.0	6.3	5.7	6.0	6.3	
Line Regulation	ΔV_O	$T_J = +25^\circ C$		5	120		5	120	mV
Load Regulation	ΔV_O	$T_J = +25^\circ C$		9	120		9	120	mV
Quiescent Current	I_Q	$T_J = +25^\circ C$		5.0	8		5.0	8	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA$ to $1A$			0.5			0.5	mA
		$V_I = 8V$ to $25V$						1.3	
		$V_I = 9V$ to $25V$			1.3				
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5mA$		-0.8			-0.8		mV/ $^\circ C$
Output Noise Voltage	V_N	$f = 10Hz$ to $100KHz$, $T_A = +25^\circ C$		45			45		$\mu V/V_O$
Ripple Rejection	RR	$f = 120Hz$ $V_I = 9V$ to $19V$	59	75		59	75		dB
Dropout Voltage	V_D	$I_O = 1A$, $T_J = +25^\circ C$		2			2		V
Output Resistance	R_D	$f = 1KHz$		19			19		$m\Omega$
Short Circuit Current	I_{SC}	$V_I = 35V$, $T_A = +25^\circ C$		250			250		mA
Peak Current	I_{PK}	$T_J = +25^\circ C$		2.2			2.2		A

* $T_{MIN} < T_J < T_{MAX}$

LM78XXI/RI: $T_{MIN} = -40^\circ C$, $T_{MAX} = +125^\circ C$

LM78XX/R: $T_{MIN} = 0^\circ C$, $T_{MAX} = +125^\circ C$

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7808/I/R/RI ELECTRICAL CHARACTERISTICS

(Refer to test Circuit, $T_{MIN} < T_J < T_{MAX}$, $I_O = 500mA$, $V_I = 14V$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	LM7808I			LM7808			Unit
			Min	Typ	Max	Min	Typ	Max	
Output Voltage	V_O	$T_J = +25^\circ C$	7.7	8.0	8.3	7.7	8.0	8.3	V
		$5.0mA \leq I_O \leq 1.0A$, $P_O \leq 15W$							
		$V_I = 10.5V$ to $23V$ $V_I = 11.5V$ to $23V$	7.6	8.0	8.4	7.6	8.0	8.4	
Line Regulation	ΔV_O	$T_J = +25^\circ C$							mV
		$V_I = 10.5V$ to $25V$ $V_I = 11.5V$ to $17V$		5.0	160		5.0	160	
Load Regulation	ΔV_O	$T_J = +25^\circ C$							mV
		$I_O = 5.0mA$ to $1.5A$ $I_O = 250mA$ to $750mA$		10	160		10	160	
Quiescent Current	I_Q	$T_J = +25^\circ C$		5.0	8		5.0	8	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA$ to $1.0A$		0.05	0.5		0.05	0.5	mA
		$V_I = 10.5A$ to $25V$					0.5	1.0	
		$V_I = 11.5V$ to $25V$		0.5	1.0				
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5mA$		-0.8			-0.8		mV/°C
Output Noise Voltage	V_N	$f = 10Hz$ to $100KHz$, $T_A = +25^\circ C$		52			52		$\mu V/V_O$
Ripple Rejection	RR	$f = 120Hz$, $V_I = 11.5V$ to 21.5	56	73		56	73		dB
Dropout Voltage	V_D	$I_O = 1A$, $T_J = +25^\circ C$		2			2		V
Output Resistance	R_O	$f = 1KHz$		17			17		m Ω
Short Circuit Current	I_{SC}	$V_I = 35V$, $T_A = +25^\circ C$		230			230		mA
Peak Current	I_{PK}	$T_J = +25^\circ C$		2.2			2.2		A

* $T_{MIN} < T_J < T_{MAX}$

LM78XXI/RI: $T_{MIN} = -40^\circ C$, $T_{MAX} = +125^\circ C$

LM78XX/R: $T_{MIN} = 0^\circ C$, $T_{MAX} = +125^\circ C$

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7809I/R/RI ELECTRICAL CHARACTERISTICS

(Refer to test circuit. $T_{MIN} < T_J < T_{MAX}$, $I_O = 500mA$, $V_I = 15V$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	LM7809I			LM7809			Unit
			Min	Typ	Max	Min	Typ	Max	
Output Voltage	V_O	$T_J = +25^\circ C$	8.65	9	9.35	8.65	9	9.35	V
		$5.0mA \leq I_O \leq 1.0A$, $P_D \leq 15W$							
		$V_I = 11.5V$ to $24V$ $V_I = 12.5V$ to $24V$	8.6	9	9.4	8.6	9	9.4	
Line Regulation	ΔV_O	$T_J = +25^\circ C$							mV
		$V_I = 11.5V$ to $25V$ $V_I = 12V$ to $25V$		6	180		6	180	
Load Regulation	ΔV_O	$T_J = +25^\circ C$		2	90		2	90	mV
		$I_O = 5mA$ to $1.5A$ $I_O = 250mA$ to $750mA$		12	180		12	180	
Quiescent Current	I_Q	$T_J = +25^\circ C$		5.0	8		5.0	8	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA$ to $1.0A$			0.5			0.5	mA
		$V_I = 11.5V$ to $26V$						1.3	
		$V_I = 12.5V$ to $26V$			1.3				
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5mA$		-1			-1		mV/ $^\circ C$
Output Noise Voltage	V_N	$f = 10Hz$ to $100KHz$, $T_A = +25^\circ C$		58			58		$\mu V/V_O$
Ripple Rejection	RR	$f = 120Hz$ $V_I = 13V$ to $23V$	56	71		56	71		dB
Dropout Voltage	V_D	$I_O = 1A$, $T_J = +25^\circ C$		2			2		V
Output Resistance	R_O	$f = 1KHz$		17			17		$m\Omega$
Short Circuit Current	I_{SC}	$V_I = 35V$, $T_A = +25^\circ C$		250			250		mA
Peak Current	I_{PK}	$T_J = +25^\circ C$		2.2			2.2		A

* $T_{MIN} < T_J < T_{MAX}$

LM78XXI/RI: $T_{MIN} = -40^\circ C$, $T_{MAX} = +125^\circ C$

LM78XX/R: $T_{MIN} = 0^\circ C$, $T_{MAX} = +125^\circ C$

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7810I/R/RI ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN} < T_J < T_{MAX}$, $I_O = 500\text{mA}$, $V_I = 16\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	LM7810I			LM7810			Unit
			Min	Typ	Max	Min	Typ	Max	
Output Voltage	V_O	$T_J = +25^\circ\text{C}$	9.6	10	10.4	9.6	10	10.4	V
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$, $P_D \leq 15\text{W}$							
		$V_I = 12.5\text{V to } 25\text{V}$ $V_I = 13.5\text{V to } 25\text{V}$	9.5	10	10.5	9.5	10	10.5	
Line Regulation	ΔV_O	$T_J = +25^\circ\text{C}$							mV
		$V_I = 12.5\text{V to } 25\text{V}$ $V_I = 13\text{V to } 25\text{V}$		10 3	200 100		10 3	200 100	
Load Regulation	ΔV_O	$T_J = +25^\circ\text{C}$							mV
		$I_O = 5\text{mA to } 1.5\text{A}$ $I_O = 250\text{mA to } 750\text{mA}$		12 4	200 400		12 4	200 400	
Quiescent Current	I_Q	$T_J = +25^\circ\text{C}$		5.1	8		5.1	8	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA to } 1.0\text{A}$			0.5			0.5	mA
		$V_I = 12.5\text{V to } 29\text{V}$						1.0	
		$V_I = 13.5\text{V to } 29\text{V}$			1.0				
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$		-1			-1		mV/°C
Output Noise Voltage	V_N	$f = 10\text{Hz to } 100\text{KHz}$, $T_A = +25^\circ\text{C}$		58			58		$\mu\text{V}/V_O$
Ripple Rejection	RR	$f = 120\text{Hz}$ $V_I = 13\text{V to } 23\text{V}$	56	71		56	71		dB
Dropout Voltage	V_D	$I_O = 1\text{A}$, $T_J = +25^\circ\text{C}$		2			2		V
Output Resistance	R_O	$f = 1\text{KHz}$		17			17		$\text{m}\Omega$
Short Circuit Current	I_{SC}	$V_I = 35\text{V}$, $T_A = +25^\circ\text{C}$		250			250		mA
Peak Current	I_{PK}	$T_J = +25^\circ\text{C}$		2.2			2.2		A

* $T_{MIN} < T_J < T_{MAX}$

LM78XXI/RI: $T_{MIN} = -40^\circ\text{C}$, $T_{MAX} = +125^\circ\text{C}$

LM78XX/R: $T_{MIN} = 0^\circ\text{C}$, $T_{MAX} = +125^\circ\text{C}$

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7811/I/R/RI ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN} < T_J < T_{MAX}$, $I_O = 500mA$, $V_I = 18V$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	LM7811I			LM7811			Unit
			Min	Typ	Max	Min	Typ	Max	
Output Voltage	V_O	$T_J = +25^\circ C$	10.6	11	11.4	10.6	11	11.4	V
		$5.0mA \leq I_O \leq 1.0A$, $P_D \leq 15W$							
		$V_I = 13.5V$ to $26V$ $V_I = 14.5V$ to $26V$	10.5	11	11.5	10.5	11	11.5	
Line Regulation	ΔV_O	$T_J = +25^\circ C$							mV
		$V_I = 13.5V$ to $25V$ $V_I = 14V$ to $21V$		10 3.0	220 110		10 3	220 110	
Load Regulation	ΔV_O	$T_J = +25^\circ C$							mV
		$I_O = 5.0mA$ to $1.5A$ $I_O = 250mA$ to $750mA$		12 4	220 110		12 4	220 110	
Quiescent Current	I_Q	$T_J = +25^\circ C$		5.1	8		5.1	8	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA$ to $1.0A$			0.5			0.5	mA
		$V_I = 13.5V$ to $29V$						1.0	
		$V_I = 14.5V$ to $29V$			1.0				
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5mA$		-1			-1		mV/°C
Output Noise Voltage	V_N	$f = 10Hz$ to $100KHz$, $T_A = +25^\circ C$		70			70		$\mu V/V_O$
Ripple Rejection	RR	$f = 120Hz$ $V_I = 14V$ to $24V$	55	71		55	71		dB
Dropout Voltage	V_D	$I_O = 1A$, $T_J = +25^\circ C$		2			2		V
Output Resistance	R_O	$f = 1KHz$		18			18		m Ω
Short Circuit Current	I_{SC}	$V_I = 35V$, $T_A = +25^\circ C$		250			250		mA
Peak Current	I_{PK}	$T_J = +25^\circ C$		2.2			2.2		A

* $T_{MIN} < T_J < T_{MAX}$

LM78XXI/RI: $T_{MIN} = -40^\circ C$, $T_{MAX} = +125^\circ C$

LM78XX/R: $T_{MIN} = 0^\circ C$, $T_{MAX} = +125^\circ C$

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7812I/R/RI ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN} < T_J < T_{MAX}$, $I_O = 500mA$, $V_I = 19V$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	LM7812I			LM7812			Unit
			Min	Typ	Max	Min	Typ	Max	
Output Voltage	V_O	$T_J = +25^\circ C$	11.5	12	12.5	11.5	12	12.5	V
		$5.0mA \leq I_O \leq 1.0A$, $P_D \leq 15W$							
		$V_I = 14.5V$ to $27V$ $V_I = 15.5V$ to $27V$	11.4	12	12.6	11.4	12	12.6	
Line Regulation	ΔV_O	$T_J = +25^\circ C$							mV
		$V_I = 14.5V$ to $30V$ $V_I = 16V$ to $22V$		10	240		10	240	
Load Regulation	ΔV_O	$T_J = +25^\circ C$							mV
		$I_O = 5mA$ to $1.5A$ $I_O = 250mA$ to $750mA$		11	240		11	240	
Quiescent Current	I_Q	$T_J = +25^\circ C$		5.1	8		5.1	8	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA$ to $1.0A$		0.1	0.5		0.1	0.5	mA
		$V_I = 14.5V$ to $30V$					0.5	1.0	
		$V_I = 15V$ to $30V$			1.0				
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5mA$	0.5	-1			-1		mV/°C
Output Noise Voltage	V_N	$f = 10Hz$ to $100KHz$, $T_A = +25^\circ C$		76			76		mV/ V_O
Ripple Rejection	RR	$f = 120Hz$ $V_I = 15V$ to $25V$	55	71		55	71		dB
Dropout Voltage	V_D	$I_O = 1A$, $T_J = +25^\circ C$		2			2		V
Output Resistance	R_O	$f = 1KHz$		18			18		mΩ
Short Circuit Current	I_{SC}	$V_I = 35V$, $T_A = +25^\circ C$		230			230		mA
Peak Current	I_{PK}	$T_J = +25^\circ C$		2.2			2.2		A

[□] $T_{MIN} < T_J < T_{MAX}$

LM78XXI/RI: $T_{MIN} = -40^\circ C$, $T_{MAX} = +125^\circ C$

LM78XX/R: $T_{MIN} = 0^\circ C$, $T_{MAX} = +125^\circ C$

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7815/I/R/RI ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN} < T_J < T_{MAX}$, $I_O = 500mA$, $V_I = 23V$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	LM7815I			LM7815			Unit
			Min	Typ	Max	Min	Typ	Max	
Output Voltage	V _O	T _J =+25 °C	14.4	15	15.6	14.4	15	15.6	V
		5.0mA ≤ I _O ≤1.0A, P _D ≤15W	14.2 5	15	15.75	14.25	15	15.75	
		V _I = 17.5V to 30V V _I = 18.5V to 30V							
Line Regulation	ΔV _O	T _J =+25°C		11	300		11	300	mV
				3	150		3	150	
Load Regulation	ΔV _O	I _O = 5mA to 1.5A		12	300		12	300	mV
		T _J =+25°C I _O = 250mA to 750mA		4	150		4	150	
Quiescent Current	I _O	T _J =+25 °C		5.2	8		5.2	8	mA
Quiescent Current Change	ΔI _Q	I _O = 5mA to 1.0A			0.5			0.5	mA
		V _I = 17.5V to 30V					1.0		
					1.0				
		V _I = 18.5V to 30V							
Output Voltage Drift	ΔV _O /ΔT	I _O = 5mA		-1			-1		mV/ °C
Output Noise Voltage	V _N	f = 10Hz to 100Khz, T _A =+25 °C		90			90		μV/V _O
Ripple Rejection	RR	f = 120Hz V _I = 18.5V to 28.5V	54	70		54	70		dB
Dropout Voltage	V _D	I _O = 1A, T _J =+25 °C		2			2		V
Output Resistance	R _O	f = 1KHz		19			19		mΩ
Short Circuit Current	I _{SC}	V _I = 35V, T _A =+25 °C		250			250		mA
Peak Current	I _{PK}	T _J =+25 °C		2.2			2.2		A

* $T_{MIN} < T_J < T_{MAX}$

LM78XXI/RI: $T_{MIN} = -40^\circ C$, $T_{MAX} = +125^\circ C$

LM78XX/R: $T_{MIN} = 0^\circ C$, $T_{MAX} = +125^\circ C$

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7818/I/R/RI ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN} < T_J < T_{MAX}$, $I_O = 500mA$, $V_I = 27V$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	LM7818I			LM7818			Unit
			Min	Typ	Max	Min	Typ	Max	
Output Voltage	V_O	$T_J = +25^\circ C$	17.3	18	18.7	17.3	18	18.7	V
		$5.0mA \leq I_O \leq 1.0A$, $P_D \leq 15W$ $V_I = 21V$ to $33V$ $V_I = 22V$ to $33V$	17.1	18	18.9	17.1	18	18.9	
Line Regulation	ΔV_O	$T_J = +25^\circ C$							mV
		$V_I = 21V$ to $33V$ $V_I = 24V$ to $30V$		15 5	360 180		15 5	360 180	
Load Regulation	ΔV_O	$T_J = +25^\circ C$							mV
		$I_O = 5mA$ to $1.5A$ $I_O = 250mA$ to $750mA$		15 5.0	360 180		15 5.0	360 180	
Quiescent Current	I_Q	$T_J = +25^\circ C$		5.2	8		5.2	8	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA$ to $1.0A$			0.5			0.5	mA
		$V_I = 21V$ to $33V$						1	
		$V_I = 22V$ to $33V$			1.0				
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5mA$		-1			-1		mV/°C
Output Noise Voltage	V_N	$f = 10Hz$ to $100KHz$, $T_A = +25^\circ C$		110			110		$\mu V / V_O$
Ripple Rejection	RR	$f = 120Hz$ $V_I = 22V$ to $32V$	53	69		53	69		dB
Dropout Voltage	V_D	$I_O = 1A$, $T_J = +25^\circ C$		2			2		V
Output Resistance	R_O	$f = 1KHz$		22			22		m Ω
Short Circuit Current	I_{SC}	$V_I = 35V$, $T_A = +25^\circ C$		250			250		mA
Peak Current	I_{PK}	$T_J = +25^\circ C$		2.2			2.2		A

* $T_{MIN} < T_J < T_{MAX}$

LM78XXI/RI: $T_{MIN} = -40^\circ C$, $T_{MAX} = +125^\circ C$

LM78XX/R: $T_{MIN} = 0^\circ C$, $T_{MAX} = +125^\circ C$

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7824I/R/RI ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN} < T_J < T_{MAX}$, $I_O = 500mA$, $V_I = 33V$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	LM7824I			LM7824			Unit
			Min	Typ	Max	Min	Typ	Max	
Output Voltage	V_O	$T_J = +25^\circ C$	23	24	25	23	24	25	V
		$5.0mA \leq I_O \leq 1.0A$, $P_D \leq 15W$ $V_I = 27V$ to $38V$ $V_I = 28V$ to $38V$	22.8	24	25.2	22.8	24	25.25	
Line Regulation	ΔV_O	$T_J = +25^\circ C$							mV
		$V_I = 27V$ to $38V$ $V_I = 30V$ to $36V$		17 6	480 240		17 6	480 240	
Load Regulation	ΔV_O	$T_J = +25^\circ C$							mV
		$I_O = 5mA$ to $1.5A$ $I_O = 250mA$ to $750mA$		15 5.0	480 240		15 5.0	480 240	
Quiescent Current	I_Q	$T_J = +25^\circ C$		5.2	8		5.2	8	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA$ to $1.0A$		0.1	0.5		0.1	0.5	mA
		$V_I = 27V$ to $38V$					0.5	1	
		$V_I = 28V$ to $38V$		0.5	1				
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5mA$		-1.5			-1.5		mV/°C
Output Noise Voltage	V_N	$f = 10Hz$ to $100KHz$, $T_A = +25^\circ C$		160			60		$\mu V/V_O$
Ripple Rejection	RR	$f = 120Hz$ $V_I = 28V$ to $38V$	50	67		50	67		dB
Dropout Voltage	V_D	$I_O = 1A$, $T_J = +25^\circ C$		2			2		V
Output Resistance	R_O	$f = 1KHz$		28			28		m Ω
Short Circuit Current	I_{SC}	$V_I = 35V$, $T_A = +25^\circ C$		230			230		mA
Peak Current	I_{PK}	$T_J = +25^\circ C$		2.2			2.2		A

* $T_{MIN} < T_J < T_{MAX}$

LM78XXI/RI: $T_{MIN} = -40^\circ C$, $T_{MAX} = +125^\circ C$

LM78XX/R: $T_{MIN} = 0^\circ C$, $T_{MAX} = +125^\circ C$

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7805A/RA ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_O	$T_J = +25^\circ\text{C}$	4.9	5	5.1	V
		$I_O = 5\text{mA to } 1\text{A}$, $P_D \leq 5\text{W}$ $V_I = 7.5$ to 20V	4.8	5	5.2	
□Line Regulation	ΔV_O	$V_I = 7.5$ to 25V $I_O = 500\text{mA}$		5	50	V
		$V_I = 8\text{V to } 12\text{V}$		3	50	
		$T_J = +25^\circ\text{C}$ $V_I = 7.3\text{V to } 25\text{V}$		5	50	
		$V_I = 8\text{V to } 12\text{V}$		1.5	25	
□Load Regulation	ΔV_O	$T_J = +25^\circ\text{C}$ $I_O = 5\text{mA to } 1.5\text{A}$		9	100	V
		$I_O = 5\text{mA to } 1\text{A}$		9	100	
		$I_O = 250$ to 750mA		4	50	
Quiescent Current	I_Q	$T_J = +25^\circ\text{C}$		5.0	6	mA
Quiescent Current Change	ΔI_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_D	$I_O = 1\text{A}$, $T_J = +25^\circ\text{C}$		2		V
Output Resistance	R_O	$f = 1\text{KHz}$		17		$\text{m}\Omega$
Short Circuit Current	I_{SC}	$V_I = 35\text{V}$, $T_A = +25^\circ\text{C}$		250		mA
Peak Current	I_{PK}	$T_J = +25^\circ\text{C}$		2.2		A

*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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7806A/RA ELECTRICAL CHARACTERISTICS

(Refer to the test circuits. $T_J = 0$ to $+150^\circ\text{C}$, $I_O = 1\text{A}$, $V_I = 11\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test 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 1A , $P_D \leq 15\text{W}$ $V_I = 8.6$ to 21V	5.76	6	6.24	
□ Line Regulation	ΔV_O	$V_I = 8.6$ to 25V $I_O = 500\text{mA}$		5	60	mV
		$V_I = 9\text{V}$ to 13V		3	60	
		$T_J = +25^\circ\text{C}$	$V_I = 8.3\text{V}$ to 21V	5	60	
			$V_I = 9\text{V}$ to 13V	1.5	30	
□ Load Regulation	ΔV_O	$T_J = +25^\circ\text{C}$ $I_O = 5\text{mA}$ to 1.5A		9	100	mV
		$I_O = 5\text{mA}$ to 1A		4	100	
		$I_O = 250$ to 750mA		5.0	50	
Quiescent Current	I_Q	$T_J = +25^\circ\text{C}$		4.3	6	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA}$ to 1A			0.5	mA
		$V_I = 9\text{V}$ to 25V , $I_O = 500\text{mA}$			0.8	
		$V_I = 8.5\text{V}$ to 21V , $T_J = +25^\circ\text{C}$			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 100KHz $T_A = +25^\circ\text{C}$		10		$\mu\text{V}/V_O$
Ripple Rejection	RR	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 9\text{V}$ to 19V		65		dB
Dropout Voltage	V_D	$I_O = 1\text{A}$, $T_J = +25^\circ\text{C}$		2		V
Output Resistance	R_O	$f = 1\text{KHz}$		17		$\text{m}\Omega$
Short Circuit Current	I_{SC}	$V_I = 35\text{V}$, $T_A = +25^\circ\text{C}$		250		mA
Peak Current	I_{PK}	$T_J = +25^\circ\text{C}$		2.2		A

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7808A/RA ELECTRICAL CHARACTERISTICS

(Refer to the test circuits. $T_J = 0$ to $+150^\circ\text{C}$, $I_O = 1\text{A}$, $V_I = 14\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test 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 1A , $P_D \leq 15\text{W}$ $V_I = 8.6$ to 21V	7.7	8	8.3	
□ Line Regulation	ΔV_O	$V_I = 10.6$ to 25V $I_O = 500\text{mA}$		6	80	mV
		$V_I = 11$ to 17V		3	80	
		$T_J = +25^\circ\text{C}$ $V_I = 10.4\text{V}$ to 23V		6	80	
		$V_I = 11\text{V}$ to 17V		2	40	
□ Load Regulation	ΔV_O	$T_J = +25^\circ\text{C}$ $I_O = 5\text{mA}$ to 1.5A		12	100	mV
		$I_O = 5\text{mA}$ to 1A		12	100	
		$I_O = 250$ to 750mA		5	50	
Quiescent Current	I_Q	$T_J = +25^\circ\text{C}$		5.0	6	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA}$ to 1A			0.5	mA
		$V_I = 11\text{V}$ to 25V , $I_O = 500\text{mA}$			0.8	
		$V_I = 10.6\text{V}$ to 23V , $T_J = +25^\circ\text{C}$			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 100KHz $T_A = +25^\circ\text{C}$		10		$\mu\text{V}/V_O$
Ripple Rejection	RR	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 11.5\text{V}$ to 21.5V		62		dB
Dropout Voltage	V_D	$I_O = 1\text{A}$, $T_J = +25^\circ\text{C}$		2		V
Output Resistance	R_O	$f = 1\text{KHz}$		18		$\text{m}\Omega$
Short Circuit Current	I_{SC}	$V_I = 35\text{V}$, $T_A = +25^\circ\text{C}$		250		mA
Peak Current	I_{PK}	$T_J = +25^\circ\text{C}$		2.2		A

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7809A/RA ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	Test 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 1A , $P_D \leq 15\text{W}$ $V_I = 11.2$ to 24V	8.65	9.0	9.35	
□ Line Regulation	ΔV_O	$V_I = 11.7$ to 25V $I_O = 500\text{mA}$		6	90	mV
		$V_I = 12.5$ to 19V		4	45	
		$T_J = +25^\circ\text{C}$	$V_I = 11.5\text{V}$ to 24V	6	90	
			$V_I = 12.5\text{V}$ to 19V	2	45	
□ Load Regulation	ΔV_O	$T_J = +25^\circ\text{C}$ $I_O = 5\text{mA}$ to 1.0A		12	100	mV
		$I_O = 5\text{mA}$ to 1.0A		12	100	
		$I_O = 250$ to 750mA		5	50	
		$T_J = +25^\circ\text{C}$		5.0	6.0	
Quiescent Current	I_Q	$T_J = +25^\circ\text{C}$		5.0	6.0	mA
Quiescent Current Change	ΔI_Q	$V_I = 11.7\text{V}$ to 25V , $T_J = +25^\circ\text{C}$			0.8	mA
		$V_I = 12\text{V}$ to 25V , $I_O = 500\text{mA}$			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	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 12\text{V}$ to 22V		62		dB
Dropout Voltage	V_D	$I_O = 1\text{A}$, $T_J = +25^\circ\text{C}$		2.0		V
Output Resistance	R_O	$f = 1\text{KHz}$		17		$\text{m}\Omega$
Short Circuit Current	I_{SC}	$V_I = 35\text{V}$, $T_A = +25^\circ\text{C}$		250		mA
Peak Current	I_{PK}	$T_J = +25^\circ\text{C}$		2.2		A

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7810A/RA ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	Test 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 1A , $P_D \leq 15\text{W}$ $V_I = 12.8$ to 25V	9.6	10	10.4	
□ Line Regulation	ΔV_O	$V_I = 12.8$ to 26V $I_O = 500\text{mA}$		8	100	mV
		$V_I = 13$ to 20V		4	50	
		$T_J = +25^\circ\text{C}$ $V_I = 12.5\text{V}$ to 25V		8	100	
		$V_I = 13\text{V}$ to 20V		3	50	
□ Load Regulation	ΔV_O	$T_J = +25^\circ\text{C}$ $I_O = 5\text{mA}$ to 1.5A		12	100	mV
		$I_O = 5\text{mA}$ to 1.0A		12	100	
		$I_O = 250$ to 750mA		5	50	
Quiescent Current	I_Q	$T_J = +25^\circ\text{C}$		5.0	6.0	mA
Quiescent Current Change	ΔI_Q	$V_I = 13\text{V}$ to 26V , $T_J = +25^\circ\text{C}$			0.5	mA
		$V_I = 12.8\text{V}$ to 25V , $I_O = 500\text{mA}$			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/°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	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 14\text{V}$ to 24V		62		dB
Dropout Voltage	V_D	$I_O = 1\text{A}$, $T_J = +25^\circ\text{C}$		2.0		V
Output Resistance	R_O	$f = 1\text{KHz}$		17		m Ω
Short Circuit Current	I_{SC}	$V_I = 35\text{V}$, $T_A = +25^\circ\text{C}$		250		mA
Peak Current	I_{PK}	$T_J = +25^\circ\text{C}$		2.2		A

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7811A/RA ELECTRICAL CHARACTERISTICS

(Refer to the test circuits. $T_J = 0$ to $+125^\circ\text{C}$, $I_O = 1\text{A}$, $V_I = 18\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_O	$T_J = +25^\circ\text{C}$	10.8	11.0	11.2	V
		$I_O = 5\text{mA}$ to 1A , $P_D \leq 15\text{W}$ $V_I = 13.8$ to 26V	10.6	11.0	11.4	
□ Line Regulation	ΔV_O	$V_I = 12.8$ to 26V $I_O = 500\text{mA}$		10	110	mV
		$V_I = 15$ to 21V		4	55	
		$T_J = +25^\circ\text{C}$ $V_I = 13.5\text{V}$ to 26V		10	110	
		$V_I = 15\text{V}$ to 21V		3	55	
□ Load Regulation	ΔV_O	$T_J = +25^\circ\text{C}$ $I_O = 5\text{mA}$ to 1.5A		12	100	mV
		$I_O = 5\text{mA}$ to 1.0A		12	100	
		$I_O = 250$ to 750mA		5	50	
Quiescent Current	I_Q	$T_J = +25^\circ\text{C}$		5.1	6.0	mA
Quiescent Current Change	ΔI_Q	$V_I = 13.8\text{V}$ to 26V , $T_J = +25^\circ\text{C}$			0.8	mA
		$V_I = 14\text{V}$ to 27V , $I_O = 500\text{mA}$			0.8	
		$I_O = 5\text{mA}$ to 1.0A			0.5	
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$		-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	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 14\text{V}$ to 24V		61		dB
Dropout Voltage	V_D	$I_O = 1\text{A}$, $T_J = +25^\circ\text{C}$		2.0		V
Output Resistance	R_O	$f = 1\text{KHz}$		18		$\text{m}\Omega$
Short Circuit Current	I_{SC}	$V_I = 35\text{V}$, $T_A = +25^\circ\text{C}$		250		mA
Peak Current	I_{PK}	$T_J = +25^\circ\text{C}$		2.2		A

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7812A/RA ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	Test 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 1A , $P_D \leq 15\text{W}$ $V_I = 14.8$ to 27V	11.5	12	12.5	
□Line Regulation	ΔV_O	$V_I = 14.8$ to 30V $I_O = 500\text{mA}$		10	120	mV
		$V_I = 16$ to 22V		4	120	
		$T_J = +25^\circ\text{C}$ $V_I = 14.5\text{V}$ to 27V		10	120	
		$V_I = 16\text{V}$ to 22V		3	60	
□Load Regulation	ΔV_O	$T_J = +25^\circ\text{C}$ $I_O = 5\text{mA}$ to 1.5A		12	100	mV
		$I_O = 5\text{mA}$ to 1.0A		12	100	
		$I_O = 250$ to 750mA		5	50	
Quiescent Current	I_Q	$T_J = +25^\circ\text{C}$		5.1	6.0	mA
Quiescent Current Change	ΔI_Q	$V_I = 15\text{V}$ to 30V , $T_J = +25^\circ\text{C}$			0.5	mA
		$V_I = 14\text{V}$ to 27V , $I_O = 500\text{mA}$			0.8	
		$I_O = 5\text{mA}$ to 1.0A			0.8	
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$		-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	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 14\text{V}$ to 24V		60		dB
Dropout Voltage	V_D	$I_O = 1\text{A}$, $T_J = +25^\circ\text{C}$		2.0		V
Output Resistance	R_O	$f = 1\text{KHz}$		18		$\text{m}\Omega$
Short Circuit Current	I_{SC}	$V_I = 35\text{V}$, $T_A = +25^\circ\text{C}$		250		mA
Peak Current	I_{PK}	$T_J = +25^\circ\text{C}$		2.2		A

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7815A/RA ELECTRICAL CHARACTERISTICS

(Refer to the test circuits. $T_J = 0$ to $+150^\circ\text{C}$, $I_O = 1\text{A}$, $V_I = 23\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test 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 , $P_D \leq 15\text{W}$ $V_I = 17.7$ to 30V	14.4	15	15.6	
□ Line Regulation	ΔV_O	$V_I = 17.9$ to 30V $I_O = 500\text{mA}$		10	150	mV
		$V_I = 20$ 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	ΔV_O	$T_J = +25^\circ\text{C}$ $I_O = 5\text{mA}$ to 1.5A		12	100	mV
		$I_O = 5\text{mA}$ to 1.0A		12	100	
		$I_O = 250$ to 750mA		5	50	
Quiescent Current	I_Q	$T_J = +25^\circ\text{C}$		5.2	6.0	mA
Quiescent Current Change	ΔI_Q	$V_I = 17.5\text{V}$ to 30V , $T_J = +25^\circ\text{C}$			0.5	mA
		$V_I = 17.5\text{V}$ to 30V , $I_O = 500\text{mA}$			0.8	
		$I_O = 5\text{mA}$ to 1.0A			0.8	
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$		-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	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 18.5\text{V}$ to 28.5V		58		dB
Dropout Voltage	V_D	$I_O = 1\text{A}$, $T_J = +25^\circ\text{C}$		2.0		V
Output Resistance	R_O	$f = 1\text{KHz}$		19		$\text{m}\Omega$
Short Circuit Current	I_{SC}	$V_I = 35\text{V}$, $T_A = +25^\circ\text{C}$		250		mA
Peak Current	I_{PK}	$T_J = +25^\circ\text{C}$		2.2		A

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7818A/RA ELECTRICAL CHARACTERISTICS

(Refer to the test circuits. $T_J = 0$ to $+150^\circ\text{C}$, $I_O = 1\text{A}$, $V_I = 27\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test 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 , $P_D \leq 15\text{W}$ $V_I = 21$ to 33V	17.3	18	18.7	
□ Line Regulation	ΔV_O	$V_I = 21$ to 33V $I_O = 500\text{mA}$		15	180	mV
		$V_I = 21$ 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	ΔV_O	$T_J = +25^\circ\text{C}$ $I_O = 5\text{mA}$ to 1.5A		15	100	mV
		$I_O = 5\text{mA}$ to 1.0A		15	100	
		$I_O = 250$ to 750mA		7	50	
Quiescent Current	I_Q	$T_J = +25^\circ\text{C}$		5.2	6.0	mA
Quiescent Current Change	ΔI_Q	$V_I = 21\text{V}$ to 33V , $T_J = +25^\circ\text{C}$			0.5	mA
		$V_I = 21\text{V}$ to 33V , $I_O = 500\text{mA}$			0.8	
		$I_O = 5\text{mA}$ to 1.0A			0.8	
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_O = 5\text{mA}$		-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	$f = 120\text{Hz}$, $I_O = 500\text{mA}$ $V_I = 18.5\text{V}$ to 28.5V		57		dB
Dropout Voltage	V_D	$I_O = 1\text{A}$, $T_J = +25^\circ\text{C}$		2.0		V
Output Resistance	R_O	$f = 1\text{KHz}$		19		$\text{m}\Omega$
Short Circuit Current	I_{SC}	$V_I = 35\text{V}$, $T_A = +25^\circ\text{C}$		250		mA
Peak Current	I_{PK}	$T_J = +25^\circ\text{C}$		2.2		A

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM7824A/RA ELECTRICAL CHARACTERISTICS

(Refer to the test circuits. $T_J = 0$ to $+150^\circ\text{C}$, $I_O = 1\text{A}$, $V_I = 33\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test 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 1A , $P_D \leq 15\text{W}$ $V_I = 27.3$ to 38V	23	24	25	
□ Line Regulation	ΔV_O	$V_I = 27$ to 38V $I_O = 500\text{mA}$		18	240	mV
		$V_I = 21$ to 33V		6	240	
		$T_J = +25^\circ\text{C}$ $V_I = 26.7\text{V}$ to 38V $V_I = 30\text{V}$ to 36V		18	240	
				6	120	
□ Load Regulation	ΔV_O	$T_J = +25^\circ\text{C}$ $I_O = 5\text{mA}$ to 1.5A		15	100	mV
		$I_O = 5\text{mA}$ to 1.0A		15	100	
		$I_O = 250$ to 750mA		7	50	
Quiescent Current	I_Q	$T_J = +25^\circ\text{C}$		5.2	6.0	mA
Quiescent Current Change	ΔI_Q	$V_I = 27.3\text{V}$ to 38V , $T_J = +25^\circ\text{C}$			0.5	mA
		$V_I = 27.3\text{V}$ to 38V , $I_O = 500\text{mA}$			0.8	
		$I_O = 5\text{mA}$ to 1.0A			0.8	
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 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		54		dB
Dropout Voltage	V_D	$I_O = 1\text{A}$, $T_J = +25^\circ\text{C}$		2.0		V
Output Resistance	R_O	$f = 1\text{KHz}$		20		$\text{m}\Omega$
Short Circuit Current	I_{SC}	$V_I = 35\text{V}$, $T_A = +25^\circ\text{C}$		250		mA
Peak Current	I_{PK}	$T_J = +25^\circ\text{C}$		2.2		A

* 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.

LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

TYPICAL PERFORMANCE CHARACTERISTICS

Fig. 1 Quiescent Current

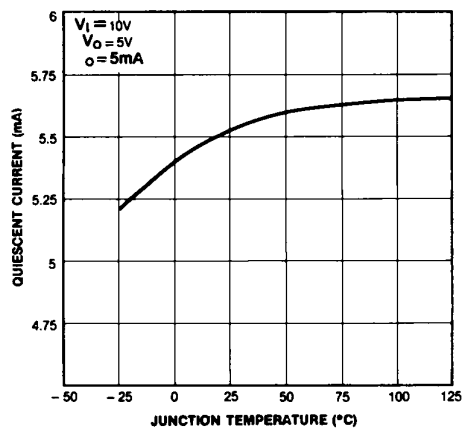


Fig. 2 Peak Output Current

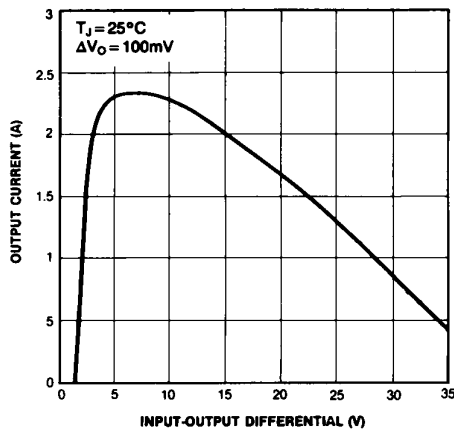


Fig. 3 Output Voltage

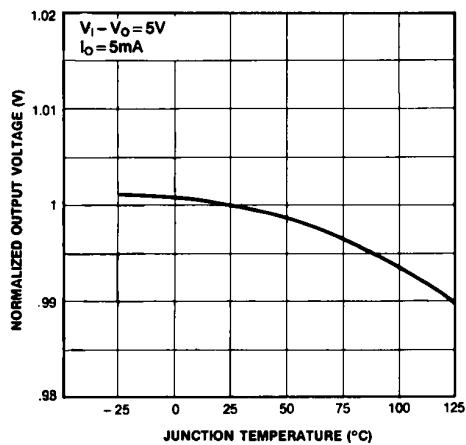
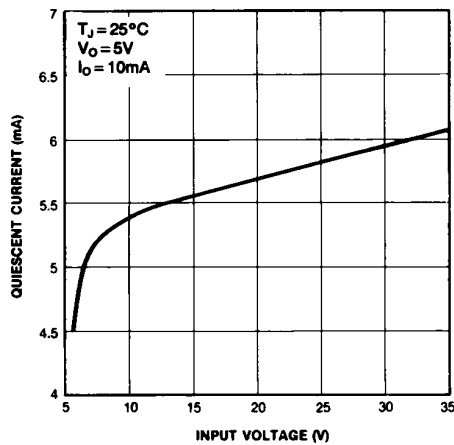


Fig. 4 Quiescent Current



LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

TYPICAL APPLICATIONS

Fig. 5 DC Parameters

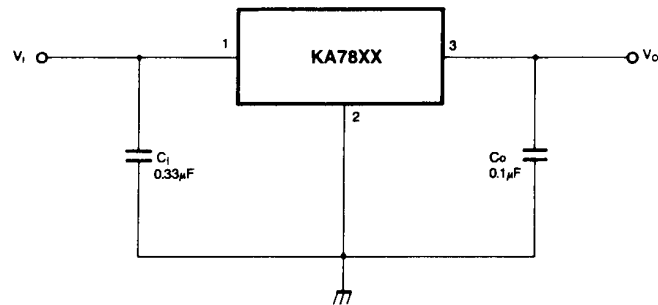


Fig. 6 Load Regulation

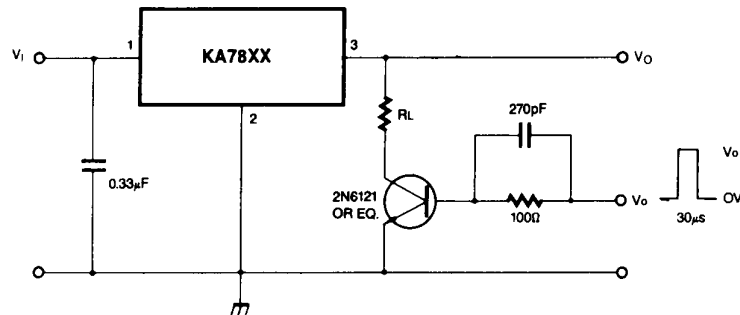
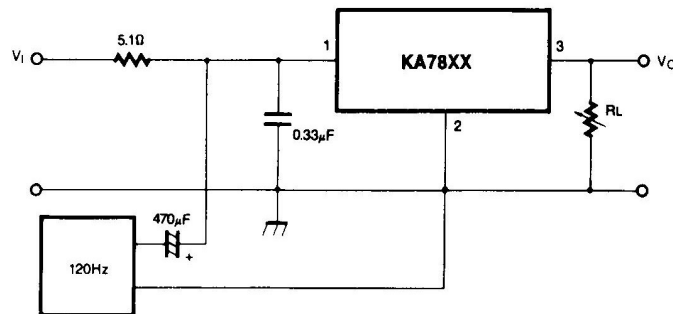


Fig. 7 Ripple Rejection



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Fig. 8 Fixed Output Regulator

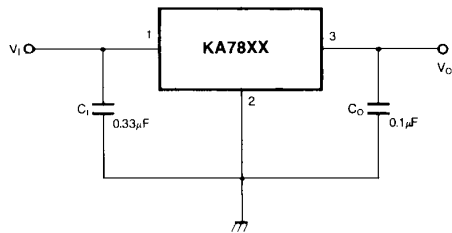
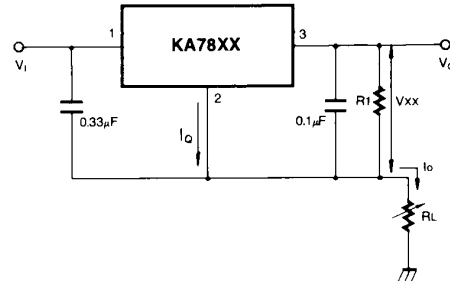


Fig. 9 Constant Current Regulator

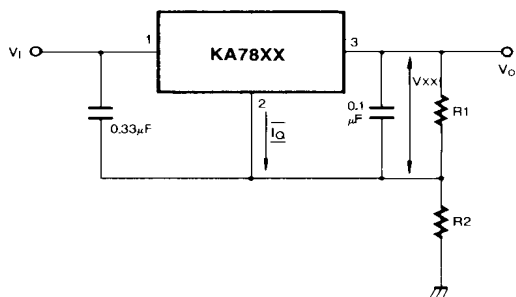


$$I_O = \frac{V_{XX}}{R_1} + I_Q$$

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_I is required if regulator is located an appreciable distance from power supply filter.
- (3) C_O improves stability and transient response.

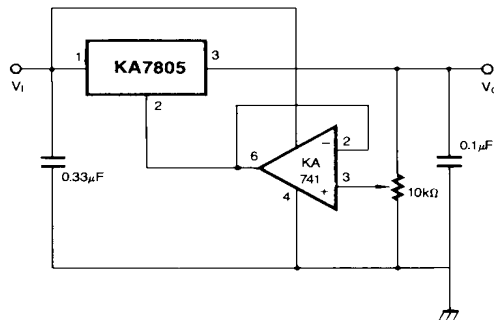
Fig. 10 Circuit for Increasing Output Voltage



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

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

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



LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

TYPICAL APPLICATIONS (Continued)

Fig. 12 High Current Voltage Regulator

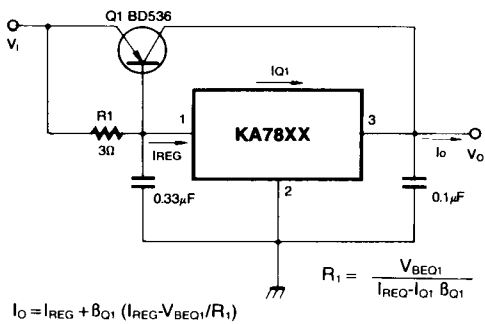


Fig. 13 High Output Current with Short Circuit Protection

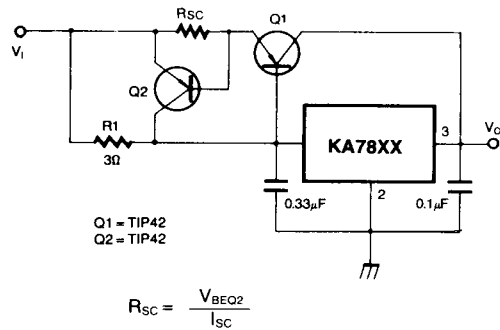


Fig. 14 Tracking Voltage Regulator

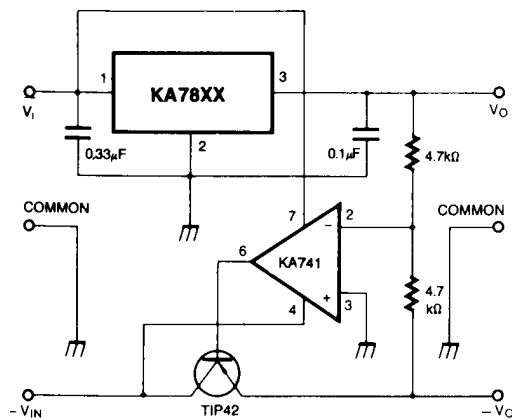
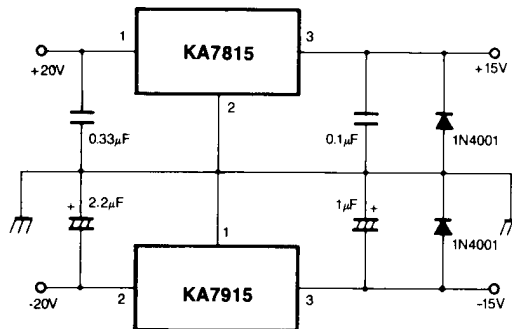


Fig. 15 Split Power Supply (±15V-1A)



LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

TYPICAL APPLICATIONS (Continued)

Fig. 16 Negative Output Voltage Circuit

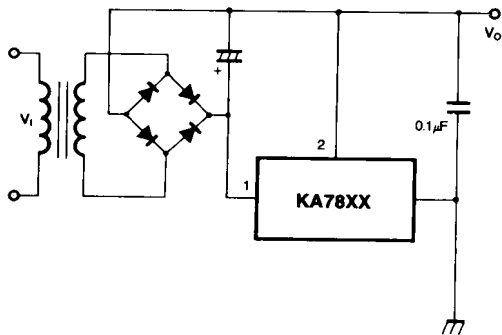
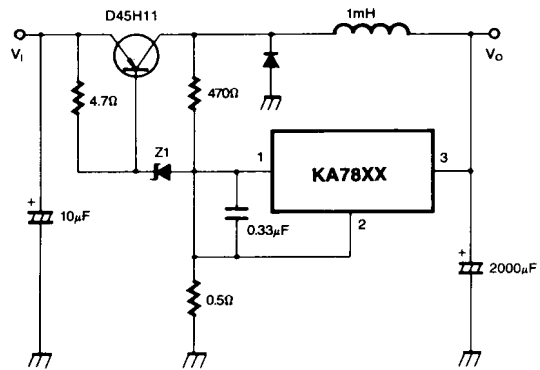


Fig. 17 switching Regulator



LM78XX (KA78XX, MC78XX) FIXED VOLTAGE REGULATOR (POSITIVE)

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