

3-terminal positive voltage regulator

General Description

The 78LXX series of fixed-voltage monolithic integrated circuit voltage regulators is designed for a wide range of applications.

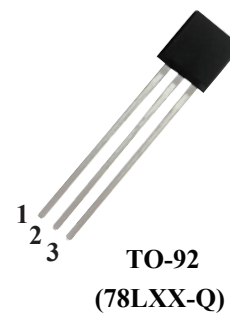
Features

- Maximum output current of 100mA
- Output voltage of 5V,6V,8V,9V,12V,15V, 18V and 24V
- Thermal overload protection
- Short circuit current limiting

SOT-89 / TO-92 Pin Configuration

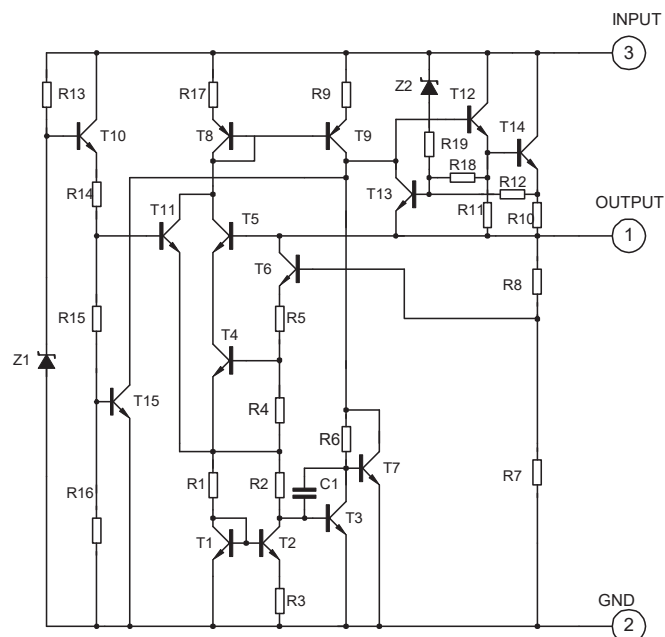


1. VOUT
2. GND
3. VIN



1. VOUT
2. GND
3. VIN

Block Diagram



3-terminal positive voltage regulator

Absolute Maximum Ratings(Operating temperature range applies unless otherwise specified)

Characteristics	Symbol	Rating	Unit
Input voltage(for $V_o=5,8V$)	V_I	30	V
(for $V_o=12,15V$)	V_I	35	V
High power dissipation	P_d	700	mW
Operating Junction Temperature Range	T_{OPR}	-20~+120	°C
Storage Temperature Range	T_{STG}	-55~+150	°C

78L05 Electrical Characteristics

($V_I=10V, I_o=40mA, 0<T_j<125^{\circ}C, C_1=0.33\mu F, C_o=0.1\mu F$, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	V_o	$T_j=25^{\circ}C$	4.8	5.0	5.2	V
		$7V \leq V_I \leq 20V, I_o=1mA \sim 40mA$	4.75		5.25	V
		$7V \leq V_I \leq V_{MAX}, I_o=1mA \sim 70mA$	4.75		5.25	V (note 2)
Output Voltage(note 3)	V_o	$T_j=25^{\circ}C$	4.9	5.0	5.1	V
		$7V \leq V_I \leq 20V, I_o=1mA \sim 40mA$	4.85		5.15	V
		$7V \leq V_I \leq V_{MAX}, I_o=1mA \sim 70mA$	4.85		5.15	V (note 2)
Load Regulation	ΔV_o	$T_j=25^{\circ}C, I_o=1mA \sim 100mA$		11	60	mV
		$T_j=25^{\circ}C, I_o=1mA \sim 40mA$		5.0	30	mV
Line regulation	ΔV_o	$7V \leq V_I \leq 20V, T_j=25^{\circ}C$		8	150	mV
		$8V \leq V_I \leq 20V, T_j=25^{\circ}C$		6	100	mV
Quiescent Current	I_q			2.0	5.5	mA
Quiescent Current Change	ΔI_q	$8V \leq V_I \leq 20V$			1.5	mA
	ΔI_q	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$		40		μV
Temperature coefficient of V_o	$\Delta V_o / \Delta T$	$I_o=5mA$		0.65		mV/°C
Ripple Rejection	RR	$8V \leq V_I \leq 20V, f=120Hz, T_j=25^{\circ}C$	40	49		dB
Dropout Voltage	V_d	$T_j=25^{\circ}C$		1.7		V

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78L06 ELECTRICAL CHARACTERISTICS

(VI=12V, IO=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	5.75	6.0	6.25	V
		8.5V≤Vi≤20V, IO=1mA~40mA	5.7		6.3	V
		8.5V≤Vi≤VMAX, IO=1mA~70mA	5.7		6.3	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	5.88	6.0	6.12	V
		8.5V≤Vi≤20V, IO=1mA~40mA	5.82		6.18	V
		8.5V≤Vi≤VMAX, IO=1mA~70mA	5.82		6.18	V (note 2)
Load Regulation	ΔVo	Tj=25°C, IO=1mA~100mA		12.8	80	mV
		Tj=25°C, IO=1mA~70mA		5.8	40	mV
Line regulation	ΔVo	8.5V≤Vi≤20V, Tj=25°C		64	175	mV
		9V≤Vi≤20V, Tj=25°C		54	125	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	9V≤Vi≤20V			1.5	mA
	ΔIq	1mA≤Vi≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		49		μV
Temperature coefficient of Vo	ΔVo/ΔT	IO=5mA		0.75		mV/°C
Ripple Rejection	RR	10V≤Vi≤20V, f=120Hz, Tj=25°C	38	46		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

78L08 ELECTRICAL CHARACTERISTICS

(VI=14V, IO=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	7.7	8.0	8.3	V
		10.5V≤Vi≤23V, IO=1mA~40mA	7.6		8.4	V
		10.5V≤Vi≤VMAX, IO=1mA~70mA	7.6		8.4	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	7.84	8.0	8.16	V
		10.5V≤Vi≤23V, IO=1mA~40mA	7.76		8.24	V
		10.5V≤Vi≤VMAX, IO=1mA~70mA	7.76		8.24	V (note 2)
Load Regulation	ΔVo	Tj=25°C, IO=1mA~100mA		15	80	mV
		Tj=25°C, IO=1mA~70mA		8.0	40	mV
Line regulation	ΔVo	10.5V≤Vi≤23V, Tj=25°C		10	175	mV
		11V≤Vi≤23V, Tj=25°C		8	125	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	11V≤Vi≤23V			1.5	mA
	ΔIq	1mA≤Vi≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		49		μV
Temperature coefficient of Vo	ΔVo/ΔT	IO=5mA		0.75		mV/°C
Ripple Rejection	RR	11V≤Vi≤23V, f=120Hz, Tj=25°C	36	45		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

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78L09 ELECTRICAL CHARACTERISTICS

(($V_I=15V$, $I_O=40mA$, $0<T_J<125^{\circ}C$, $C_1=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified))(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	V_O	$T_J=25^{\circ}C$	8.64	9.0	9.36	V
		$11.5V \leq V_I \leq 24V$, $I_O=1mA \sim 40mA$	8.55		9.45	V
		$11.5V \leq V_I \leq V_{MAX}$, $I_O=1mA \sim 70mA$	8.55		9.45	V (note 2)
Output Voltage(note 3)	V_O	$T_J=25^{\circ}C$	8.82	9.0	9.18	V
		$11.5V \leq V_I \leq 24V$, $I_O=1mA \sim 40mA$	8.73		9.27	V
		$11.5V \leq V_I \leq V_{MAX}$, $I_O=1mA \sim 70mA$	8.73		9.27	V (note 2)
Load Regulation	ΔV_O	$T_J=25^{\circ}C$, $I_O=1mA \sim 100mA$		20	90	mV
		$T_J=25^{\circ}C$, $I_O=1mA \sim 40mA$		10	45	mV
Line regulation	ΔV_O	$11.5V \leq V_I \leq 24V$, $T_J=25^{\circ}C$		90	200	mV
		$13V \leq V_I \leq 24V$, $T_J=25^{\circ}C$		100	150	mV
Quiescent Current	I_q			2.0	5.5	mA
Quiescent Current Change	ΔI_q	$13V \leq V_I \leq 24V$			1.5	mA
	ΔI_q	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$		49		μV
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	$I_O=5mA$		0.75		mV/ $^{\circ}C$
Ripple Rejection	RR	$12V \leq V_I \leq 23V$, $f=120Hz$, $T_J=25^{\circ}C$	36	44		dB
Dropout Voltage	V_d	$T_J=25^{\circ}C$		1.7		V

78L12 ELECTRICAL CHARACTERISTICS

(($V_I=19V$, $I_O=40mA$, $0<T_J<125^{\circ}C$, $C_1=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified))(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	V_O	$T_J=25^{\circ}C$	11.5	12	12.6	V
		$14.5V \leq V_I \leq 27V$, $I_O=1mA \sim 40mA$	11.4		12.6	V
		$14.5V \leq V_I \leq V_{MAX}$, $I_O=1mA \sim 70mA$	11.4		12.6	V (note 2)
Output Voltage(note 3)	V_O	$T_J=25^{\circ}C$	11.76	12.0	12.24	V
		$14.5V \leq V_I \leq 27V$, $I_O=1mA \sim 40mA$	11.64		12.36	V
		$14.5V \leq V_I \leq V_{MAX}$, $I_O=1mA \sim 70mA$	11.64		12.36	V (note 2)
Load Regulation	ΔV_O	$T_J=25^{\circ}C$, $I_O=1mA \sim 100mA$		25	150	mV
		$T_J=25^{\circ}C$, $I_O=1mA \sim 40mA$		12	75	mV
Line regulation	ΔV_O	$14.5V \leq V_I \leq 27V$, $T_J=25^{\circ}C$		25	300	mV
		$16V \leq V_I \leq 27V$, $T_J=25^{\circ}C$		20	250	mV
Quiescent Current	I_q			2.0	5.5	mA
Quiescent Current Change	ΔI_q	$16V \leq V_I \leq 27V$			1.5	mA
	ΔI_q	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$		80		μV
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	$I_O=5mA$		1.0		mV/ $^{\circ}C$
Ripple Rejection	RR	$15V \leq V_I \leq 25V$, $f=120Hz$, $T_J=25^{\circ}C$	36	42		dB
Dropout Voltage	V_d	$T_J=25^{\circ}C$		1.7		V

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78L15 ELECTRICAL CHARACTERISTICS

(VI=23V, Io=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	14.4	15	15.6	V
		17.5V≤Vi≤30V, Io=1mA~40mA	14.25		15.75	V
		17.5V≤Vi≤VMAX, Io=1mA~70mA	14.25		15.75	V (Note 2)
Output Voltage(note 3)	Vo	Tj=25°C	14.7	15.0	15.3	V
		17.5V≤Vi≤30V, Io=1mA~40mA	14.55		15.45	V
		17.5V≤Vi≤VMAX, Io=1mA~70mA	14.55		15.45	V (Note 2)
Load Regulation	ΔVo	Tj=25°C, Io=1mA~100mA		20	150	mV
		Tj=25°C, Io=1mA~70mA		25	150	mV
Line regulation	ΔVo	17.5V≤Vi≤30V, Tj=25°C		25	150	mV
		20V≤Vi≤30V, Tj=25°C		15	75	mV
Quiescent Current	Iq			2.2	6.0	mA
Quiescent Current Change	ΔIq	20V≤Vi≤30V			1.5	mA
	ΔIq	1mA≤Vi≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		90		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		1.3		mV/°C
Ripple Rejection	RR	18.5V≤Vi≤28.5V, f=120Hz, Tj=25°C	33	39		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

78L18 ELECTRICAL CHARACTERISTICS

(VI=27V, Io=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	17.3	18	18.7	V
		21V≤Vi≤33V, Io=1mA~40mA	17.1		18.9	V
		21V≤Vi≤VMAX, Io=1mA~70mA	17.1		18.9	V (Note 2)
Output Voltage(note 3)	Vo	Tj=25°C	17.64	18.0	18.36	V
		21V≤Vi≤33V, Io=1mA~40mA	17.46		18.54	V
		21V≤Vi≤VMAX, Io=1mA~70mA	17.46		18.54	V (Note 2)
Load Regulation	ΔVo	Tj=25°C, Io=1mA~100mA		30	170	mV
		Tj=25°C, Io=1mA~40mA		15	85	mV
Line regulation	ΔVo	21V≤Vi≤33V, Tj=25°C		145	300	mV
		22V≤Vi≤33V, Tj=25°C		135	250	mV
Quiescent Current	Iq			2.2	6.0	mA
Quiescent Current Change	ΔIq	21V≤Vi≤33V			1.5	mA
	ΔIq	1mA≤Vi≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		150		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		1.8		mV/°C
Ripple Rejection	RR	23V≤Vi≤33V, f=120Hz, Tj=25°C	32	38		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

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78L24 ELECTRICAL CHARACTERISTICS

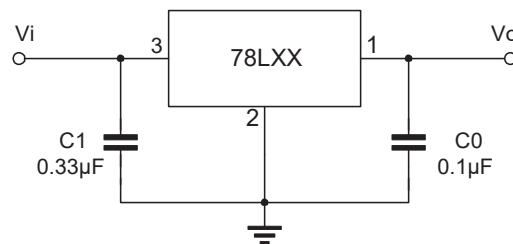
($V_I=33V, I_o=40mA, 0<T_j<125^{\circ}C, C_1=0.33\mu F, C_o=0.1\mu F$, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	V_o	$T_j=25^{\circ}C$	23	24	25	V
		$27V \leq V_I \leq 38V, I_o=1mA \sim 40mA$	22.8		25.2	V
		$27V \leq V_I \leq V_{MAX}, I_o=1mA \sim 70mA$	22.8		25.2	V (Note 2)
Output Voltage(note 3)	V_o	$T_j=25^{\circ}C$	23.5	24	24.5	V
		$27V \leq V_I \leq 38V, I_o=1mA \sim 40mA$	23.25		24.75	V
		$27V \leq V_I \leq V_{MAX}, I_o=1mA \sim 70mA$	23.25		24.75	V (Note 2)
Load Regulation	ΔV_o	$T_j=25^{\circ}C, I_o=1mA \sim 100mA$		40	200	mV
		$T_j=25^{\circ}C, I_o=1mA \sim 40mA$		20	100	mV
Line regulation	ΔV_o	$27V \leq V_I \leq 38V, T_j=25^{\circ}C$		160	300	mV
		$28V \leq V_I \leq 38V, T_j=25^{\circ}C$		150	250	mV
Quiescent Current	I_q			2.2	6.0	mA
Quiescent Current Change	ΔI_q	$27V \leq V_I \leq 38V$			1.5	mA
	ΔI_q	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$		200		μV
Temperature coefficient of V_o	$\Delta V_o / \Delta T$	$I_o=5mA$		2.0		mV/ $^{\circ}C$
Ripple Rejection	RR	$27V \leq V_I \leq 38V, f=120Hz, T_j=25^{\circ}C$	30	37		dB
Dropout Voltage	V_d	$T_j=25^{\circ}C$		1.7		V

Note:

1. The Maximum steady state usable output current and input voltage are very dependent on the heating sinking and/or lead temperature length of the package. The data above represent pulse test conditions with junction temperatures as indicated at the initiation of test.
2. Power dissipation $< 0.75W$.
3. Output voltage of 78LXX.

TYPICAL APPLICATION



Note:

1. To specify an output voltage, substitute voltage value for "XX".
2. Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.