

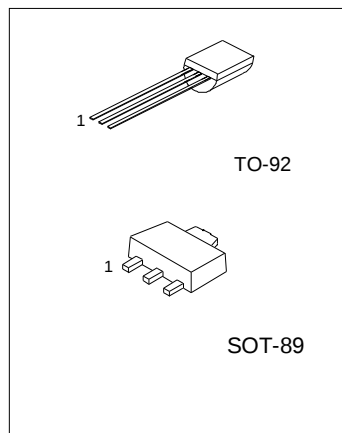
3-TERMINAL 0.15A POSITIVE VOLTAGE REGULATORS

DESCRIPTION

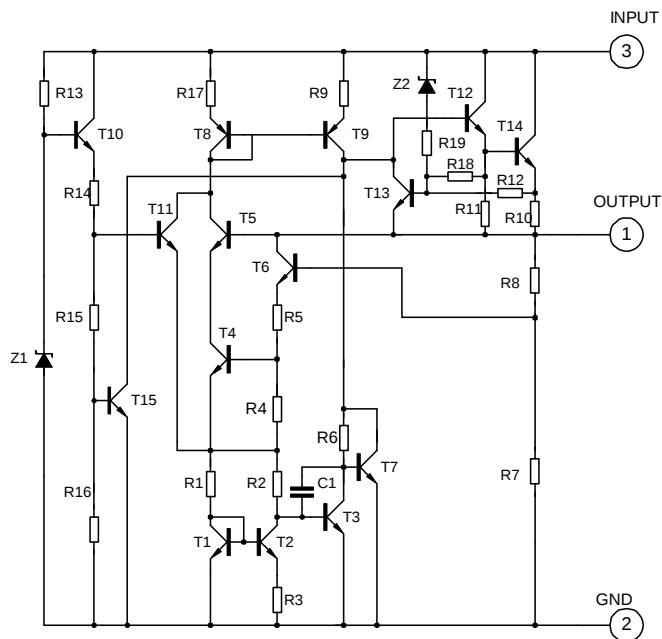
The 78LXX series of fixed voltage monolithic integrated circuit voltage regulators are suitable for applications that required supply up to 150mA.

FEATURE

- *Maximum output current of 150mA
- *Output voltage of 5V,6V,8V,9V,10V,12V,15V and 24V
- *Thermal overload protection
- *Short circuit current limiting



BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Operating temperature range applies unless otherwise specified)

CHARACTERISTICS	SYMBOL	VALUE	UNITS
Input voltage(for Vo=5,8V)	V _I	30	V
(for Vo=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

78L33 ELECTRICAL CHARACTERISTICS

(V_I=8.3V, I_O=80mA, 0<T_j<125 °C, C₁=0.33 μF, C_o=0.1 μF, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	V _O	T _j =25°C	3.168	3.3	3.432	V
		5.3V≤V _I ≤20V,I _O =1mA~80mA	3.135		3.465	V
		I _O =1mA~140mA	3.135		3.465	V (note 2)
Load Regulation	ΔV _O	T _j =25 °C,I _O =1mA~200mA		10	60	mV
		T _j =25 °C,I _O =1mA~80mA		7	30	mV
Line regulation	ΔV _O	5.3V ≤V _I ≤20V,T _j =25 °C		7	150	mV
		6.3V ≤V _I ≤20V,T _j =25 °C		4	100	mV
Quiescent Current	I _q	T _j =25 °C		2.0	5.5	mA
Quiescent Current Change	ΔI _q	6.3V ≤V _I ≤20 V			1.5	mA
	ΔI _q	1mA ≤I _O ≤80mA			0.1	mA
Output Noise Voltage	V _N	10Hz ≤f≤100kHz, T _j =25 °C		40		μV
Temperature coefficient of V _O	ΔV _O /ΔT	I _O =5mA		0.45		mV/ °C
Ripple Rejection	RR	6.3V ≤V _I ≤16.3V,f=120Hz,T _j =25 °C	40	49		dB
Dropout Voltage	V _d			1.7		V

78L05 ELECTRICAL CHARACTERISTICS

(VI=10V, 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	4.8	5.0	5.2	V
		7V≤Vi≤20V, Io=1mA~40mA	4.75		5.25	V
		7V≤Vi≤VMAX, Io=1mA~70mA	4.75		5.25	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	4.9	5.0	5.1	V
		7V≤Vi≤20V, Io=1mA~40mA	4.85		5.15	V
		7V≤Vi≤VMAX, Io=1mA~70mA	4.85		5.15	V (note 2)
Load Regulation	ΔVo	Tj=25°C, Io=1mA~130mA		11	60	mV
		Tj=25°C, Io=1mA~40mA		5.0	30	mV
Line regulation	ΔVo	7V≤Vi≤20V, Tj=25°C		8	150	mV
		8V≤Vi≤20V, Tj=25°C		6	100	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	8V≤Vi≤20V			1.5	mA
	ΔIq	1mA≤Vi≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		40		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.65		mV/°C
Ripple Rejection	RR	8V≤Vi≤20V, f=120Hz, Tj=25°C	40	49		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

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~130mA		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

($V_I=14V$, $I_O=40mA$, $0<T_J<125^{\circ}C$, $C_1=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	V_O	$T_J=25^{\circ}C$	7.7	8.0	8.3	V
		$10.5V \leq V_I \leq 23V, I_O=1mA \sim 40mA$	7.6		8.4	V
		$10.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	7.6		8.4	V (note 2)
Output Voltage(note 3)	V_O	$T_J=25^{\circ}C$	7.84	8.0	8.16	V
		$10.5V \leq V_I \leq 23V, I_O=1mA \sim 40mA$	7.76		8.24	V
		$10.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	7.76		8.24	V (note 2)
Load Regulation	ΔV_O	$T_J=25^{\circ}C, I_O=1mA \sim 130mA$		15	80	mV
Line regulation	ΔV_O	$T_J=25^{\circ}C, I_O=1mA \sim 70mA$		8.0	40	mV
		$10.5V \leq V_I \leq 23V, T_J=25^{\circ}C$		10	175	mV
		$11V \leq V_I \leq 23V, T_J=25^{\circ}C$		8	125	mV
Quiescent Current	I_q			2.0	5.5	mA
Quiescent Current Change	ΔI_q	$11V \leq V_I \leq 23V$			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	$11V \leq V_I \leq 23V, f=120Hz, T_J=25^{\circ}C$	36	45		dB
Dropout Voltage	V_d	$T_J=25^{\circ}C$		1.7		V

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	$T_J=25^{\circ}C, I_O=1mA \sim 130mA$		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	$T_J=25^{\circ}C$, $I_O=1mA \sim 130mA$		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

78L15 ELECTRICAL CHARACTERISTICS

($V_I=23V$, $I_O=40mA$, $0<T_J<125^{\circ}C$, $C_1=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	V_O	$T_J=25^{\circ}C$	14.4	15	15.6	V
		$17.5V \leq V_I \leq 30V, I_O=1mA \sim 40mA$	14.25		15.75	V
		$17.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	14.25		15.75	V (note 2)
Output Voltage(note 3)	V_O	$T_J=25^{\circ}C$	14.7	15.0	15.3	V
		$17.5V \leq V_I \leq 30V, I_O=1mA \sim 40mA$	14.55		15.45	V
		$17.5V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	14.55		15.45	V (note 2)
Load Regulation	ΔV_O	$T_J=25^{\circ}C, I_O=1mA \sim 130mA$		20	150	mV
Line regulation	ΔV_O	$T_J=25^{\circ}C, I_O=1mA \sim 70mA$		25	150	mV
		$17.5V \leq V_I \leq 30V, T_J=25^{\circ}C$		25	150	mV
		$20V \leq V_I \leq 30V, T_J=25^{\circ}C$		15	75	mV
Quiescent Current	I_q			2.2	6.0	mA
Quiescent Current Change	ΔI_q	$20V \leq V_I \leq 30V$			1.5	mA
	ΔI_q	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$		90		μV
Temperature coefficient of V_O	$\Delta V_O / \Delta T$	$I_O=5mA$		1.3		mV/ $^{\circ}C$
Ripple Rejection	RR	$18.5V \leq V_I \leq 28.5V, f=120Hz, T_J=25^{\circ}C$	33	39		dB
Dropout Voltage	V_d	$T_J=25^{\circ}C$		1.7		V

78L18 ELECTRICAL CHARACTERISTICS

($V_I=27V, I_O=40mA, 0<T_J<125^{\circ}C, C_1=0.33\mu F, C_o=0.1\mu F$, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	V_O	$T_J=25^{\circ}C$	17.3	18	18.7	V
		$21V \leq V_I \leq 33V, I_O=1mA \sim 40mA$	17.1		18.9	V
		$21V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	17.1		18.9	V (note 2)
Output Voltage(note 3)	V_O	$T_J=25^{\circ}C$	17.64	18.0	18.36	V
		$21V \leq V_I \leq 33V, I_O=1mA \sim 40mA$	17.46		18.54	V
		$21V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	17.46		18.54	V (note 2)
Load Regulation	ΔV_O	$T_J=25^{\circ}C, I_O=1mA \sim 130mA$		30	170	mV
		$T_J=25^{\circ}C, I_O=1mA \sim 40mA$		15	85	mV
Line regulation	ΔV_O	$21V \leq V_I \leq 33V, T_J=25^{\circ}C$		145	300	mV
		$22V \leq V_I \leq 33V, T_J=25^{\circ}C$		135	250	mV
Quiescent Current	I_Q			2.2	6.0	mA
Quiescent Current Change	ΔI_Q	$21V \leq V_I \leq 33V$			1.5	mA
	ΔI_Q	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$		150		μV
Temperature coefficient of V_O	$\Delta V_O / \Delta T$	$I_O=5mA$		1.8		mV/ $^{\circ}C$
Ripple Rejection	RR	$23V \leq V_I \leq 33V, f=120Hz, T_J=25^{\circ}C$	32	38		dB
Dropout Voltage	V_d	$T_J=250^{\circ}C$		1.7		V

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)

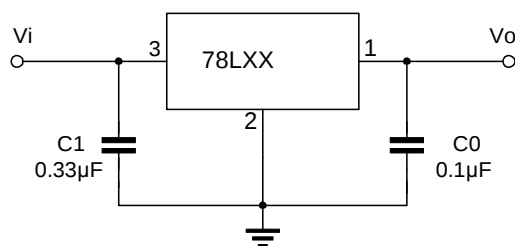
Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	V_O	$T_J=25^{\circ}C$	23	24	25	V
		$27V \leq V_I \leq 38V, I_O=1mA \sim 40mA$	22.8		25.2	V
		$27V \leq V_I \leq V_{MAX}, I_O=1mA \sim 70mA$	22.8		25.2	V (note 2)
Output Voltage(note 3)	V_O	$T_J=25^{\circ}C$	23.5	24	24.5	V
		$27V \leq V_I \leq 38V, I_O=1mA \sim 40mA$	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	$T_J=25^{\circ}C, I_O=1mA \sim 130mA$		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.

Note 2: Power dissipation $< 0.75W$.

Note 3: Output voltage of 78LXX.

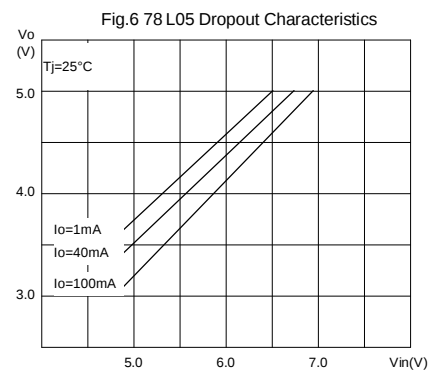
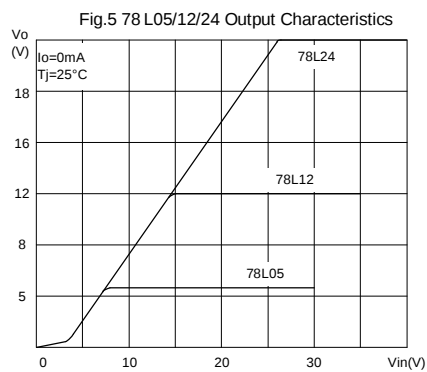
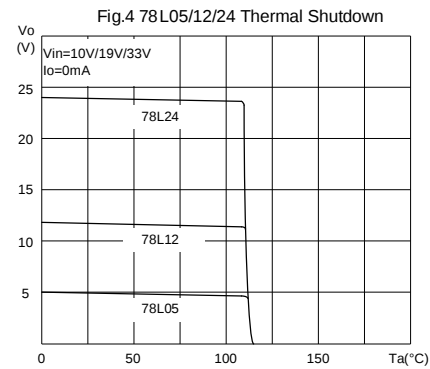
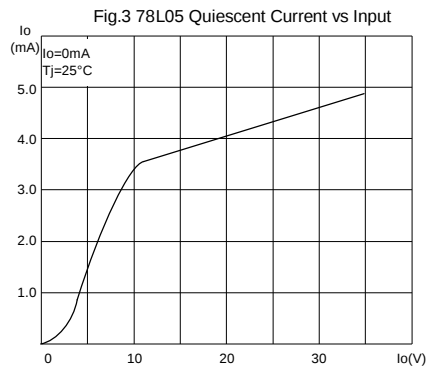
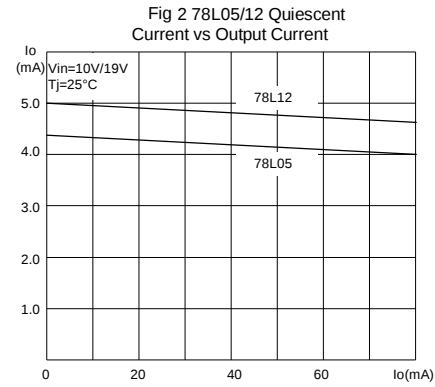
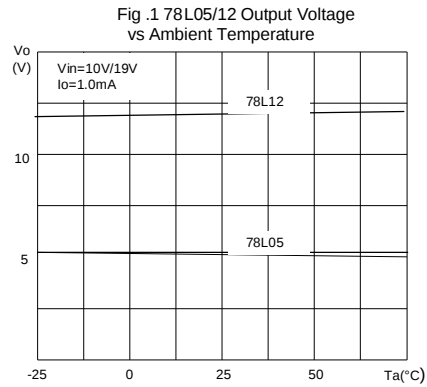
TYPICAL APPLICATION



Note 1: To specify an output voltage, substitute voltage value for "XX".

Note 2: Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.

TYPICAL PERFORMANCE CHARACTERISTICS



PACKAGE OUTLINE

