

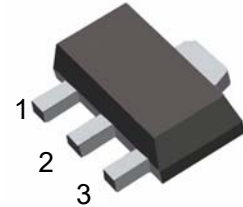
3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

DESCRIPTION

The 78LXX series of fixed voltage monolithic integrated circuit voltage regulators are suitable for applications that required supply up to 100mA.

SOT-89

1. OUT
2. GND
3. IN



FEATURE

- *Maximum output current of 100mA
- *Output voltage of 3V, 3.3V, 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V and 24V
- *Thermal overload protection
- *Short circuit current limiting

ABSOLUTE MAXIMUM RATINGS

(Operating temperature range applies unless otherwise specified)

CHARACTERISTICS		SYMBOL	VALUE	UNITS
Input voltage	$V_{OUT}=3\sim 10V$	V_{IN}	30	V
	$V_{OUT}=12\sim 18V$		35	
	$V_{OUT}=24V$		40	
Output Current		I_{OUT}	100	mA
Junction Temperature		T_J	+125	°C
Operating Temperature		T_{OPR}	-40~+120	°C
Storage Temperature Range		T_{STG}	-40~+150	°C
Lead temperature 1.6mm (1/16inch) from case for 10 seconds		T_{LEAD}	260	°C

Recommended operating conditions

Parameter		MIN	MAX	UNITS
Input voltage, V_I	78L03nd3	5.5	18	V
	78L33nd3	5.5	18	
	78L05nd3	7	20	
	78L06nd3	8	20	
	78L08nd3	10.5	23	
	78L09nd3	11.5	24	
	78L10nd3	12.5	25	
	78L12nd3	14.5	27	
	78L15nd3	15.5	30	
	78L18nd3	20.5	33	
	78L24nd3	26.5	39	
Output current, I_O			100	mA
Operating virtual junction temperature, T_J		0	125	°C

3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

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~100mA		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≤Io≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		40		μV/Vo
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~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≤Io≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		49		μV/Vo
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

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78L08 ELECTRICAL CHARACTERISTICS

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

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

78L09 ELECTRICAL CHARACTERISTICS

(VI=15V, I_o=40mA, 0<T_j<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	T _j =25°C	8.64	9.0	9.36	V
		11.5V≤V _i ≤24V, I _o =1mA~40mA	8.55		9.45	V
		11.5V≤V _i ≤V _{MAX} , I _o =1mA~70mA	8.55		9.45	V (note 2)
Output Voltage(note 3)	Vo	T _j =25°C	8.82	9.0	9.18	V
		11.5V≤V _i ≤24V, I _o =1mA~40mA	8.73		9.27	V
		11.5V≤V _i ≤V _{MAX} , I _o =1mA~70mA	8.73		9.27	V (note 2)
Load Regulation	ΔVo	T _j =25°C, I _o =1mA~100mA		20	90	mV
		T _j =25°C, I _o =1mA~40mA		10	45	mV
Line regulation	ΔVo	11.5V≤V _i ≤24V, T _j =25°C		90	200	mV
		13V≤V _i ≤24V, T _j =25°C		100	150	mV
Quiescent Current	I _q			2.0	5.5	mA
Quiescent Current Change	ΔI _q	13V≤V _i ≤24V			1.5	mA
		1mA≤I _o ≤40mA			0.1	mA
Output Noise Voltage	V _N	10Hz≤f≤100kHz		49		μV/V _o
Temperature coefficient of Vo	ΔVo/ΔT	I _o =5mA		0.75		mV/°C
Ripple Rejection	RR	12V≤V _i ≤23V, f=120Hz, T _j =25°C	36	44		dB
Dropout Voltage	V _d	T _j =25°C		1.7		V

3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

78L12 ELECTRICAL CHARACTERISTICS

(VI=19V, 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	11.5	12	12.6	V
		14.5V≤Vi≤27V, Io=1mA~40mA	11.4		12.6	V
		14.5V≤Vi≤VMAX, Io=1mA~70mA	11.4		12.6	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	11.76	12.0	12.24	V
		14.5V≤Vi≤27V, Io=1mA~40mA	11.64		12.36	V
		14.5V≤Vi≤VMAX, Io=1mA~70mA	11.64		12.36	V (note 2)
Load Regulation	ΔVo	Tj=25°C, Io=1mA~100mA		25	150	mV
		Tj=25°C, Io=1mA~40mA		12	75	mV
Line regulation	ΔVo	14.5V≤Vi≤27V, Tj=25°C		25	300	mV
		16V≤Vi≤27V, Tj=25°C		20	250	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	16V≤Vi≤27V			1.5	mA
	ΔIq	1mA≤Io≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		80		μV/Vo
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		1.0		mV/°C
Ripple Rejection	RR	15V≤Vi≤25V, f=120Hz, Tj=25°C	36	42		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

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≤Io≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		90		μV/Vo
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

3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

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)

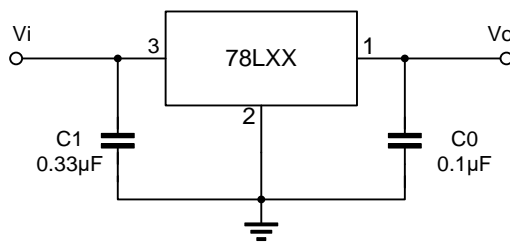
Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	V_o	$T_j=25^\circ C$	17.3	18	18.7	V
		$21V \leq V_i \leq 33V, I_o=1mA \sim 40mA$	17.1		18.9	V
		$21V \leq V_i \leq V_{MAX}, I_o=1mA \sim 70mA$	17.1		18.9	V (note 2)
Output Voltage(note 3)	V_o	$T_j=25^\circ C$	17.64	18.0	18.36	V
		$21V \leq V_i \leq 33V, I_o=1mA \sim 40mA$	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	$T_j=25^\circ C, I_o=1mA \sim 100mA$		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	$1mA \leq I_o \leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$		150		$\mu V/V_o$
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

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 78LXXA.

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.

3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

TYPICAL PERFORMANCE CHARACTERISTICS

Fig.1 78L05/12 Output Voltage vs Ambient Temperature

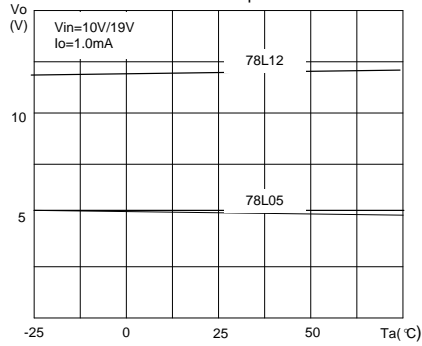


Fig.2 78L05/12 Quiescent Current vs Output Current

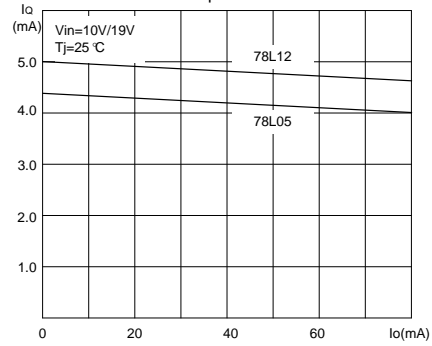


Fig.3 78L05 Quiescent Current vs Input

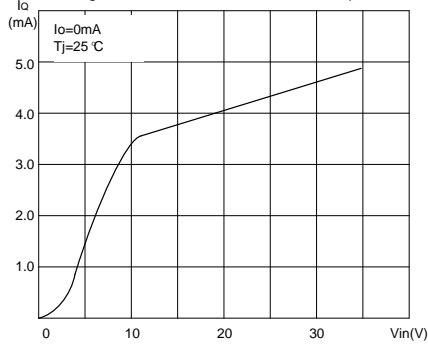


Fig.4 78L05/12 Thermal Shutdown

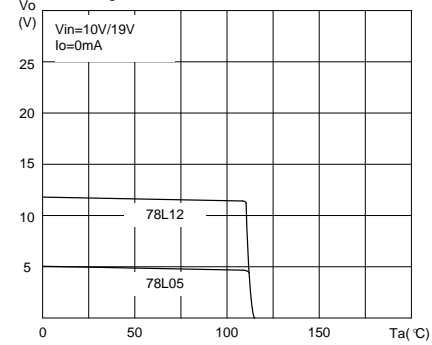


Fig.5 78L05/12 Output Characteristics

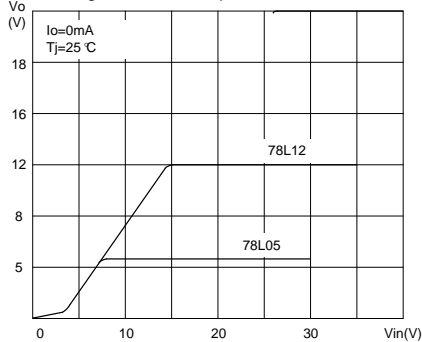


Fig.6 78L05 Dropout Characteristics

