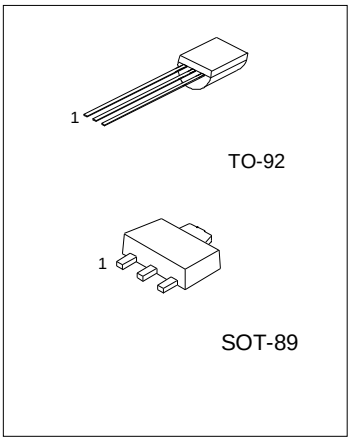
3-TERMINAL 0.15A POSITIVE VOLTAGE REGULATORS



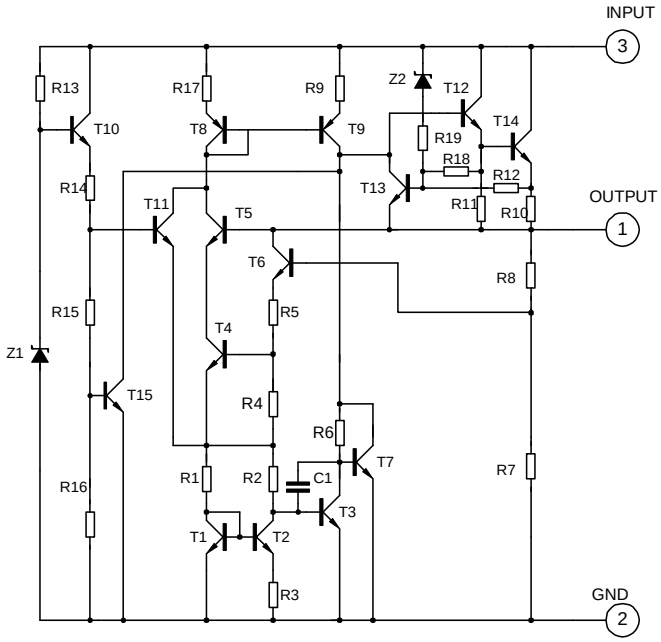
DESCRIPTION

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 3.3V,5V,6V,8V,9V,10V,12V,15V and 24V
*Thermal overload protection
*Short circuit current limiting
*Output voltage accuracy：1%

BLOCK DIAGRAM



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

CHARACTERISTICS	SYMBOL	VALUE	UNITS
Input voltage(for Vo=5,8V) (for Vo=12,15V)	V_I V_I	30 35	V V
High power dissipation	Pd	700	mW
Operating Junction Temperature Range	TOPR	-20~+120	°C
Storage Temperature Range	TSTG	-55~+150	°C

78L33 ELECTRICAL CHARACTERISTICS

(VI=8.3V,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	3.267	3.3	3.33	V
Output Voltage(note 2)	VO	Tj=25°C	3.267		3.33	V
Load Regulation	ΔVo	Tj=25 °C,I O=1mA~200mA		10	60	mV
		Tj=25 °C,I O=1mA~80mA		7	30	mV
Line regulation	ΔVo	5.3V ≤VI≤20V,Tj=25 °C		7	150	mV
		6.3V ≤VI≤20V,Tj=25 °C		4	100	mV
Quiescent Current	Iq	Tj=25 °C		2.0	5.5	mA
Quiescent Current Change	ΔIq	6.3V ≤VI≤20 V			1.5	mA
	ΔIq	1mA ≤IO≤80mA			0.1	mA
Output Noise Voltage	VN	10Hz ≤f≤100kHz, Tj=25 °C		40		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.45		mV/°C
Ripple Rejection	RR	6.3V ≤VI≤16.3V,f=120Hz,Tj=25 °C	40	49		dB
Dropout Voltage	Vd	Tj=25°C		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	4.95	5.0	5.05	V
Output Voltage(note 2)	Vo	Tj=25°C	4.95	5.0	5.05	V
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	V_O	Tj=25°C	5.94	6.0	6.06	V
Output Voltage(note 2)	V_O	Tj=25°C	5.94	6.0	6.06	V
Load Regulation	ΔVo	Tj=25°C,I_O=1mA~130mA		12.8	80	mV
		Tj=25°C,I_O=1mA~70mA		5.8	40	mV
Line regulation	ΔVo	8.5V≤V_I≤20V,Tj=25°C		64	175	mV
		9V≤V_I≤20V,Tj=25°C		54	125	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	9V≤V_I≤20V			1.5	mA
	ΔIq	1mA≤V_I≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100kHz		49		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.75		mV/°C
Ripple Rejection	RR	10V≤V_I≤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	V_O	Tj=25°C	7.92	8.0	8.08	V
Output Voltage(note 2)	V_O	Tj=25°C	7.92	8.0	8.08	V
Load Regulation	ΔVo	Tj=25°C, I_O=1mA~130mA		15	80	mV
		Tj=25°C, I_O=1mA~70mA		8.0	40	mV
Line regulation	ΔVo	10.5V≤V_I≤23V,Tj=25°C		10	175	mV
		11V≤V_I≤23V,Tj=25°C		8	125	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	11V≤V_I≤23V			1.5	mA
	ΔIq	1mA≤V_I≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100kHz		49		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.75		mV/°C
Ripple Rejection	RR	11V≤V_I≤23V,f=120Hz, Tj=25°C	36	45		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

78L09 ELECTRICAL CHARACTERISTICS

(VI=15V,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	V_O	Tj=25°C	8.91	9.0	9.09	V
Output Voltage(note 2)	V_O	Tj=25°C	8.91	9.0	9.09	V
Load Regulation	ΔVo	Tj=25°C, I_O=1mA~130mA		20	90	mV
		Tj=25°C, I_O=1mA~40mA		10	45	mV
Line regulation	ΔVo	11.5V≤V_I≤24V,Tj=25°C		90	200	mV
		13V≤V_I≤24V,Tj=25°C		100	150	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	13V≤V_I≤24V			1.5	mA
	ΔIq	1mA≤V_I≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100kHz		49		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.75		mV/°C
Ripple Rejection	RR	12V≤V_I≤23V,f=120Hz, Tj=25°C	36	44		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

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	V_O	Tj=25°C	11.88	12	12.12	V
Output Voltage(note 2)	V_O	Tj=25°C	11.88	12.0	12.12	V
Load Regulation	ΔVo	Tj=25°C, I_O=1mA~130mA		25	150	mV
		Tj=25°C, I_O=1mA~40mA		12	75	mV
Line regulation	ΔVo	14.5V≤V_I≤27V,Tj=25°C		25	300	mV
		16V≤V_I≤27V,Tj=25°C		20	250	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	16V≤V_I≤27V			1.5	mA
	ΔIq	1mA≤V_I≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100kHz		80		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		1.0		mV/°C
Ripple Rejection	RR	15V≤V_I≤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	V_O	Tj=25°C	14.85	15	15.15	V
Output Voltage(note 2)	V_O	Tj=25°C	14.85	15.0	15.15	V
Load Regulation	ΔVo	Tj=25°C,I_O=1mA~130mA		20	150	mV
		Tj=25°C,I_O=1mA~70mA		25	150	mV
Line regulation	ΔVo	17.5V≤V_I≤30V,Tj=25°C		25	150	mV
		20V≤V_I≤30V,Tj=25°C		15	75	mV
Quiescent Current	Iq			2.2	6.0	mA
Quiescent Current Change	ΔIq	20V≤V_I≤30V			1.5	mA
	ΔIq	1mA≤V_I≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100kHz		90		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		1.3		mV/°C
Ripple Rejection	RR	18.5V≤V_I≤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	V_O	Tj=25°C	17.82	18	18.18	V
Output Voltage(note2)	V_O	Tj=25°C	17.82	18	18.18	V
Load Regulation	ΔVo	Tj=25°C, I_O=1mA~130mA		30	170	mV
		Tj=25°C, I_O=1mA~40mA		15	85	mV
Line regulation	ΔVo	21V≤V_I≤33V,Tj=25°C		145	300	mV
		22V≤V_I≤33V,Tj=25°C		135	250	mV
Quiescent Current	Iq			2.2	6.0	mA
Quiescent Current Change	ΔIq	21V≤V_I≤33V			1.5	mA
	ΔIq	1mA≤V_I≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100kHz		150		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		1.8		mV/°C
Ripple Rejection	RR	23V≤V_I≤33V,f=120Hz, Tj=25°C	32	38		dB
Dropout Voltage	Vd	Tj=250°C		1.7		V

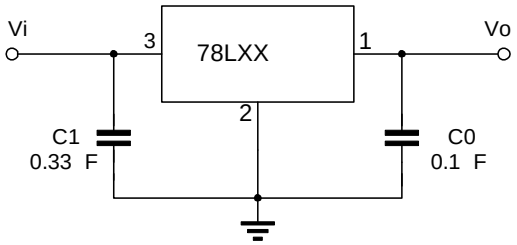
78L24 ELECTRICAL CHARACTERISTICS

(VI=33V,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	V_O	Tj=25°C	23.76	24	24.24	V
Output Voltage(note 3)	V_O	Tj=25°C	23.76	24	24.24	V
Load Regulation	ΔVo	Tj=25°C, I_O=1mA~130mA		40	200	mV
		Tj=25°C, I_O=1mA~40mA		20	100	mV
Line regulation	ΔVo	27V≤V_I≤38V,Tj=25°C		160	300	mV
		28V≤V_I≤38V,Tj=25°C		150	250	mV
Quiescent Current	Iq			2.2	6.0	mA
Quiescent Current Change	ΔIq	27V≤V_I≤38V			1.5	mA
	ΔIq	1mA≤V_I≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100kHz		200		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		2.0		mV/°C
Ripple Rejection	RR	27V≤V_I≤38V,f=120Hz,Tj=25°C	30	37		dB
Dropout Voltage	Vd	Tj=25°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 date above respresent 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,substitue 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

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

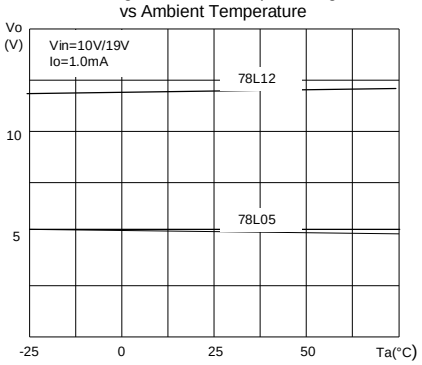


Fig 2 78L05/12 Quiescent Current vs Output Current

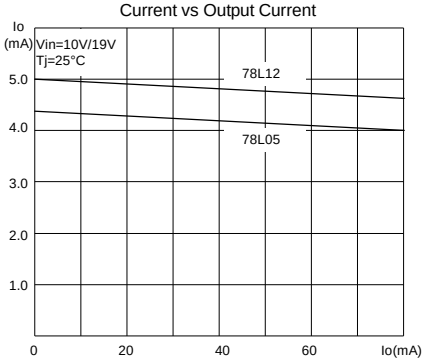


Fig.3 78L05 Quiescent Current vs Input

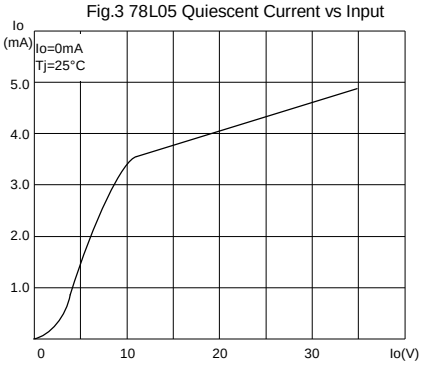


Fig.4 78L05/12/24 Thermal Shutdown

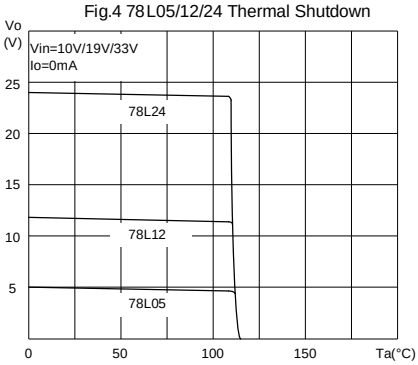


Fig.5 78 L05/12/24 Output Characteristics

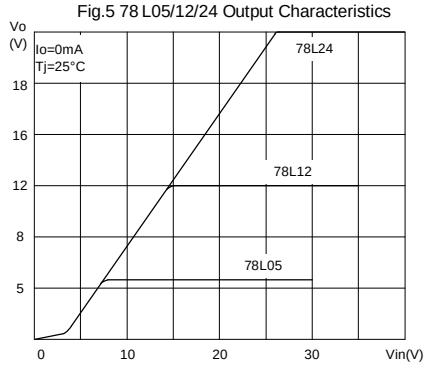
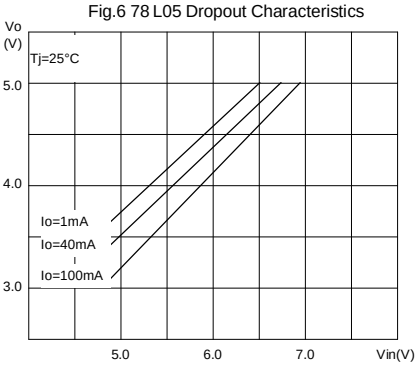
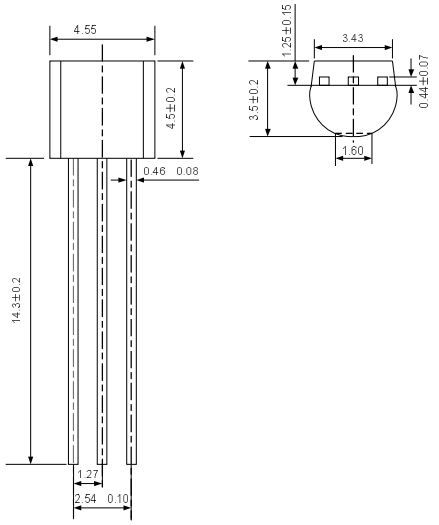


Fig.6 78 L05 Dropout Characteristics

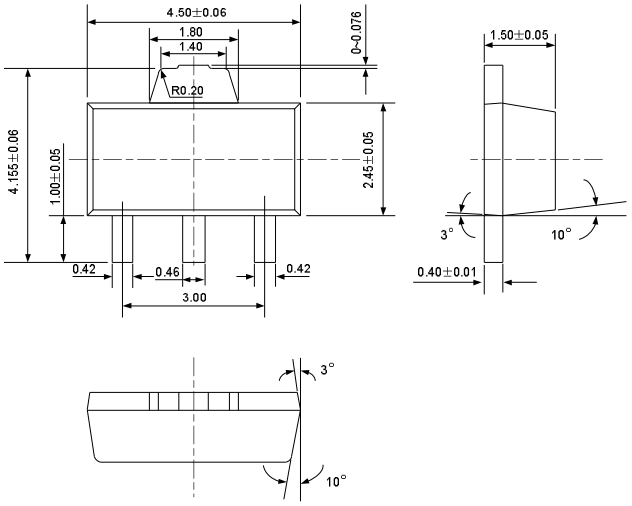


PACKAGE OUTLINE

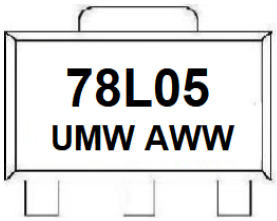
TO-92 UNIT mm



SOT-89 UNIT mm



Marking



- In the second line, "A" represents the product code
- In the second line, "WW" represents week code

Ordering information

Order code	Package	Baseqty	Deliverymode	Marking
UMW 78L33-150	SOT-89	1000	Tape and reel	78L33
UMW 78L05-150	SOT-89	1000	Tape and reel	78L05
UMW 78L06-150	SOT-89	1000	Tape and reel	78L06
UMW 78L08-150	SOT-89	1000	Tape and reel	78L08
UMW 78L09-150	SOT-89	1000	Tape and reel	78L09
UMW 78L12-150	SOT-89	1000	Tape and reel	78L12
UMW 78L15-150	SOT-89	1000	Tape and reel	78L15
UMW 78L18-150	SOT-89	1000	Tape and reel	78L18
UMW 78L24-150	SOT-89	1000	Tape and reel	78L24