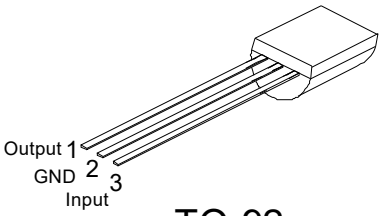
1.Description

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

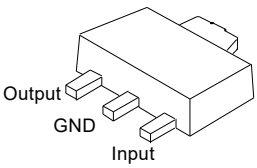
2.Features

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

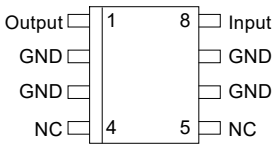
3.Pinning information



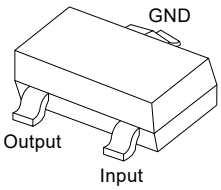
TO-92



SOT-89

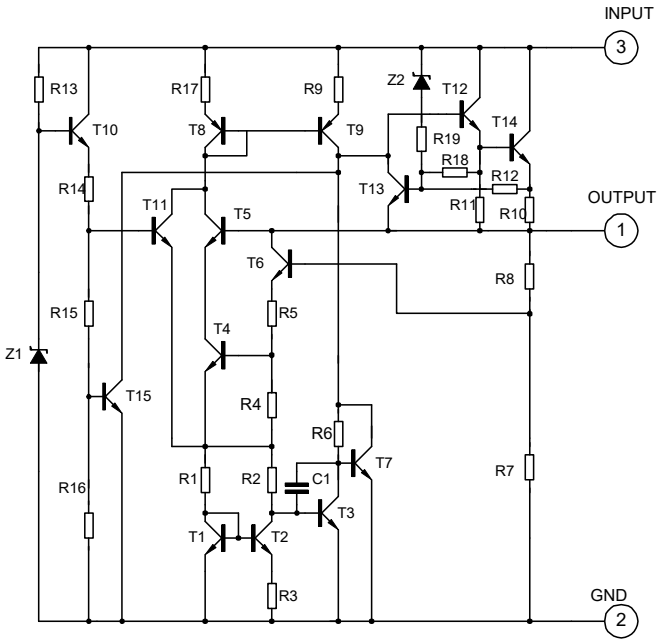


SOP-8



SOT-23

4.Block Diagram



5.Absolute Maximum Ratings

Characteristics	Symbol	Value		Units
Input voltage (for V_O=3.3 to 18V)	V_I	35		V
(for V_O=24V)		40		V
Power Dissipation	P_d	TO-92	700	mW
		SOT-23	300	mW
		SOT-89	400	mW
		SOP-8	400	mW
Junction Temperature Range	T_{OPR}	-20 to 120		°C
Storage Temperature Range	T_{STG}	-55 to 150		°C

6.1Electrical Characteristics (78L33)

(V_I=8.3V, I_O=40mA, 0<T_J<25°C, C1=0.33μF, C_O=0.1μF, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_O	T_J=25°C	3.168	3.3	3.432	V
		5.3V≤V_I≤20V,I_O=1mA~40mA	3.135		3.465	V
		I_O=1mA~70mA	3.135		3.465	V (note 2)
Load Regulation	ΔV_O	T_J=25°C, I_O=1mA~100mA		10	60	mV
		T_J=25°C, I_O=1mA~40mA		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	5.5	mA
Quiescent Current Change	ΔI_q	6.3V ≤V_I≤20V			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	$\Delta V_O/\Delta T$	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

6.2Electrical Characteristics (78L05)

(V_I=10V, I_O=40mA, 0<T_J<25°C, C1=0.33μF, C_O=0.1μF, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_O	T_J=25°C	4.8	5	5.2	V
		7.5V≤V_I≤20V,I_O=1mA~40mA	4.75		5.25	V
		7.5V≤V_I≤V_{MAX},I_O=1mA~70mA	4.75		5.25	V (note 2)
Output Voltage(note 3)	V_O	T_J=25°C	4.9	5	5.1	V
		7.5V≤V_I≤20V,I_O=1mA~40mA	4.85		5.15	V
		7.5V≤V_I≤V_{MAX},I_O=1mA~70mA	4.85		5.15	V (note 2)
Load Regulation	ΔV_O	T_J=25°C, I_O=1mA~100mA		11	60	mV
		T_J=25°C, I_O=1mA~40mA		5	30	mV
Line regulation	ΔV_O	7V ≤V_I≤20V,T_J=25°C		8	150	mV
		8V ≤V_I≤20V,T_J=25°C		6	100	mV
Quiescent Current	I_q			2	5.5	mA
Quiescent Current Change	ΔI_q	8V ≤V_I≤20V			1.5	mA
	ΔI_q	1mA ≤I_O≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz ≤f≤100kHz		40		μV
Temperature coefficient of V_O	ΔV_O/ ΔT	I_O=5mA		0.65		mV/°C
Ripple Rejection	RR	8V≤V_I≤20V,f=120Hz,T_J=25°C	40	49		dB
Dropout Voltage	V_d	T_J=25°C		1.7		V

6.3Electrical Characteristics (78L06)

(V_I=12V, I_O=40mA, 0<T_J<25°C, C1=0.33μF, C_O=0.1μF, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_O	T_J=25°C	5.76	6	6.24	V
		8.5V≤V_I≤20V,I_O=1mA~40mA	5.7		6.3	V
		8.5V≤V_I≤V_{MAX},I_O=1mA~70mA	5.7		6.3	V (note 2)
Output Voltage(note 3)	V_O	T_J=25°C	5.88	6	6.12	V
		8.5V≤V_I≤20V,I_O=1mA~40mA	5.82		6.18	V
		8.5V≤V_I≤V_{MAX},I_O=1mA~70mA	5.82		6.18	V (note 2)
Load Regulation	ΔV_O	T_J=25°C, I_O=1mA~100mA		12.8	80	mV
		T_J=25°C, I_O=1mA~70mA		5.8	40	mV
Line regulation	ΔV_O	8.5V ≤V_I≤20V,T_J=25°C		64	175	mV
		9V ≤V_I≤20V,T_J=25°C		54	125	mV
Quiescent Current	I_q			2	5.5	mA
Quiescent Current Change	ΔI_q	9V ≤V_I≤20V			1.5	mA
	ΔI_q	1mA ≤I_O≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz ≤f≤100kHz		49		μV
Temperature coefficient of V_O	ΔV_O/ ΔT	I_O=5mA		0.75		mV/°C
Ripple Rejection	RR	10V≤V_I≤20V,f=120Hz,T_J=25°C	38	46		dB
Dropout Voltage	V_d	T_J=25°C		1.7		V

6.4Electrical Characteristics (78L08)

(V_I=14V, I_O=40mA, 0<T_J<25°C, C1=0.33μF, C_O=0.1μF, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_O	T_J=25°C	7.68	8	8.32	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)	V_O	T_J=25°C	7.84	8	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	ΔV_O	T_J=25°C, I_O=1mA~100mA		15	80	mV
		T_J=25°C, I_O=1mA~70mA		8	40	mV
Line regulation	ΔV_O	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	5.5	mA
Quiescent Current Change	ΔI_q	11V ≤V_I≤23V			1.5	mA
	ΔI_q	1mA ≤I_O≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz ≤f≤100kHz		49		μV
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	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

6.5Electrical Characteristics (78L09)

(V_I=15V, I_O=40mA, 0<T_J<25°C, C1=0.33μF, C_O=0.1μF, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_O	T_J=25°C	8.64	9	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)	V_O	T_J=25°C	8.82	9	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	ΔV_O	T_J=25°C, I_O=1mA~100mA		20	90	mV
		T_J=25°C, I_O=1mA~40mA		10	45	mV
Line regulation	ΔV_O	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	5.5	mA
Quiescent Current Change	ΔI_q	13V ≤V_I≤24V			1.5	mA
	ΔI_q	1mA ≤I_O≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz ≤f≤100kHz		49		μV
Temperature coefficient of V_O	ΔV_O/ 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

6.6Electrical Characteristics (78L10)

(V_I=15V, I_O=40mA, 0<T_J<25°C, C1=0.33μF, C_O=0.1μF, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_O	T_J=25°C	9.6	10	10.4	V
		12.5V≤V_I≤24V,I_O=1mA~40mA	9.55	10	10.45	V
		12.5V≤V_I≤V_{MAX},I_O=1mA~70mA	9.55		10.45	V (note 2)
Output Voltage(note 3)	V_O	T_J=25°C	9.8	10	10.2	V
		12.5V≤V_I≤24V,I_O=1mA~40mA	9.7		10.3	V
		12.5V≤V_I≤V_{MAX},I_O=1mA~70mA	9.7		10.3	V (note 2)
Load Regulation	ΔV_O	T_J=25°C, I_O=1mA~100mA		20	90	mV
		T_J=25°C, I_O=1mA~40mA		10	45	mV
Line regulation	ΔV_O	12.5V ≤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	5.5	mA
Quiescent Current Change	ΔI_q	13V ≤V_I≤24V			0.1	mA
	ΔI_q	1mA ≤I_O≤40mA				mA
Output Noise Voltage	V_N	10Hz ≤f≤100kHz		49		μV
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	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

6.7Electrical Characteristics (78L12)

(V_I=19V, I_O=40mA, 0<T_J<25°C, C1=0.33μF, C_O=0.1μF, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_O	T_J=25°C	11.52	12	12.48	V
		14.5V≤V_I≤27V,I_O=1mA~40mA	11.4		12.6	V
		14.5V≤V_I≤V_{MAX},I_O=1mA~70mA	11.4		12.6	V (note 2)
Output Voltage(note 3)	V_O	T_J=25°C	11.76	12	12.24	V
		14.5V≤V_I≤27V,I_O=1mA~40mA	11.64		12.36	V
		14.5V≤V_I≤V_{MAX},I_O=1mA~70mA	11.64		12.36	V (note 2)
Load Regulation	ΔV_O	T_J=25°C, I_O=1mA~100mA		25	150	mV
		T_J=25°C, I_O=1mA~40mA		12	75	mV
Line regulation	ΔV_O	14.5V ≤V_I≤27V,T_J=25°C		25	300	mV
		16V ≤V_I≤27V,T_J=25°C		20	250	mV
Quiescent Current	I_q			2	5.5	mA
Quiescent Current Change	ΔI_q	16V ≤V_I≤27V			15	mA
	ΔI_q	1mA ≤I_O≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz ≤f≤100kHz		80		μV
Temperature coefficient of V_O	ΔV_O/ ΔT	I_O=5mA		1		mV/°C
Ripple Rejection	RR	15V≤V_I≤25V,f=120Hz,T_J=25°C	36	42		dB
Dropout Voltage	V_d	T_J=25°C		1.7		V

6.8Electrical Characteristics (78L15)

(V_I=23V, I_O=40mA, 0<T_J<25°C, C1=0.33μF, C_O=0.1μF, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_O	T_J=25°C	14.4	15	15.6	V
		17.5V≤V_I≤30V,I_O=1mA~40mA	14.25		15.75	V
		17.5V≤V_I≤V_{MAX},I_O=1mA~70mA	14.25		15.75	V (note 2)
Output Voltage(note 3)	V_O	T_J=25°C	14.7	15	15.3	V
		17.5V≤V_I≤30V,I_O=1mA~40mA	14.55		15.45	V
		17.5V≤V_I≤V_{MAX},I_O=1mA~70mA	14.55		15.45	V (note 2)
Load Regulation	ΔV_O	T_J=25°C, I_O=1mA~100mA		20	150	mV
		T_J=25°C, I_O=1mA~70mA		25	150	mV
Line regulation	ΔV_O	17.5V ≤V_I≤30V,T_J=25°C		25	150	mV
		20V ≤V_I≤30V,T_J=25°C		15	75	mV
Quiescent Current	I_q			2.2	6	mA
Quiescent Current Change	ΔI_q	20V ≤V_I≤30V			1.5	mA
	ΔI_q	1mA ≤I_O≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz ≤f≤100kHz		90		μV
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	I_O=5mA		1.3		mV/°C
Ripple Rejection	RR	18.5V≤V_I≤28.5V,f=120Hz,T_J=25°C	33	39		dB
Dropout Voltage	V_d	T_J=25°C		1.7		V

6.9Electrical Characteristics (78L18)

(V_I=27V, I_O=40mA, 0<T_J<25°C, C1=0.33μF, C_O=0.1μF, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_O	T_J=25°C	17.28	18	18.72	V
		21V≤V_I≤33V,I_O=1mA~40mA	17.1		18.9	V
		21V≤V_I≤V_{MAX},I_O=1mA~70mA	17.1		18.9	V (note 2)
Output Voltage(note 3)	V_O	T_J=25°C	17.64	18	18.36	V
		21V≤V_I≤33V,I_O=1mA~40mA	17.46		18.54	V
		21V≤V_I≤V_{MAX},I_O=1mA~70mA	17.46		18.54	V (note 2)
Load Regulation	ΔV_O	T_J=25°C, I_O=1mA~100mA		30	170	mV
		T_J=25°C, I_O=1mA~40mA		15	85	mV
Line regulation	ΔV_O	21V ≤V_I≤33V,T_J=25°C		145	300	mV
		22V ≤V_I≤33V,T_J=25°C		135	250	mV
Quiescent Current	I_q			2.2	6	mA
Quiescent Current Change	ΔI_q	21V ≤V_I≤33V			1.5	mA
	ΔI_q	1mA ≤I_O≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz ≤f≤100kHz		150		μV
Temperature coefficient of V_O	ΔV_O/ ΔT	I_O=5mA		1.8		mV/°C
Ripple Rejection	RR	23V≤V_I≤33V,f=120Hz,T_J=25°C	32	38		dB
Dropout Voltage	V_d	T_J=25°C		1.7		V

6.10Electrical Characteristics (78L24)

(V_I=33V, I_O=40mA, 0<T_J<25°C, C1=0.33μF, C_O=0.1μF, unless otherwise specified) (Note 1)

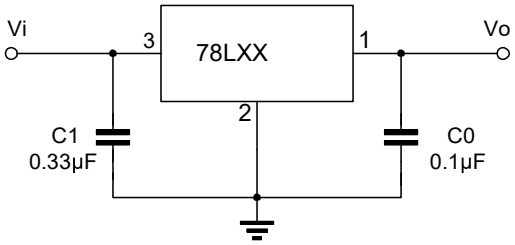
Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_O	T_J=25°C	23.04	24	24.96	V
		27V≤V_I≤38V,I_O=1mA~40mA	22.8		25.2	V
		27V≤V_I≤V_{MAX},I_O=1mA~70mA	22.8		25.2	V (note 2)
Output Voltage(note 3)	V_O	T_J=25°C	23.52	24	24.48	V
		27V≤V_I≤38V,I_O=1mA~40mA	23.22		24.72	V
		27V≤V_I≤V_{MAX},I_O=1mA~70mA	23.22		24.72	V (note 2)
Load Regulation	ΔV_O	T_J=25°C, I_O=1mA~100mA		40	200	mV
		T_J=25°C, I_O=1mA~40mA		20	100	mV
Line regulation	ΔV_O	27V ≤V_I≤38V,T_J=25°C		160	300	mV
		28V ≤V_I≤38V,T_J=25°C		150	250	mV
Quiescent Current	I_q			2.2	6.0	mA
Quiescent Current Change	ΔI_q	27V ≤V_I≤38V			1.5	mA
	ΔI_q	1mA ≤I_O≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz ≤f≤100kHz		200		μV
Temperature coefficient of V_O	ΔV_O/ ΔT	I_O=5mA		2		mV/°C
Ripple Rejection	RR	27V≤V_I≤38V,f=120Hz,T_J=25°C	30	37		dB
Dropout Voltage	V_d	T_J=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 78LXXA

7.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

8.1 Typical characteristic

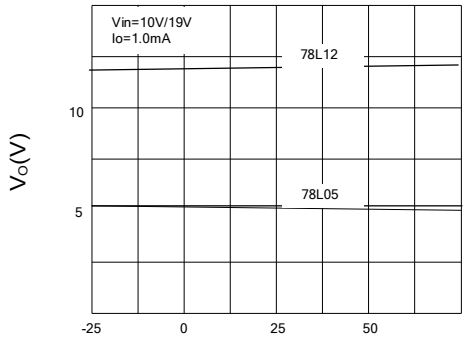


Figure 1: 78L05/12 Output Voltage vs Ambient Temperature

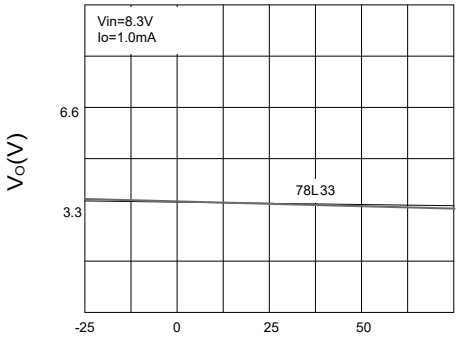


Figure 2: 78L33 Output Voltage vs Ambient Temperature

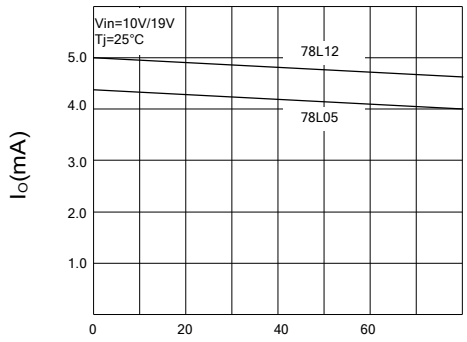


Figure 3: 78L05/12 Quiescent Curent vs Output Current

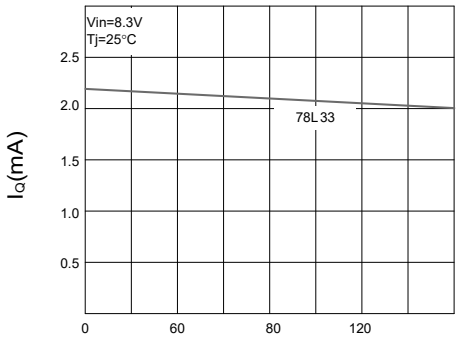


Figure 4: 78L33 Quiescent Current vs Output Current

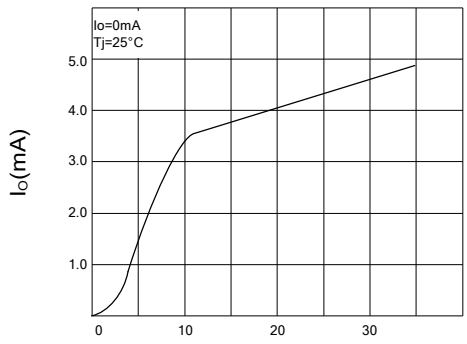


Figure 5: 78L05 Quiescent Current vs Input

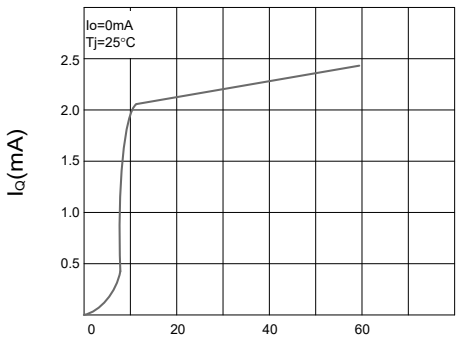


Figure 6: 78L33 Quiescent Current vs Input

8.2 Typical characteristic

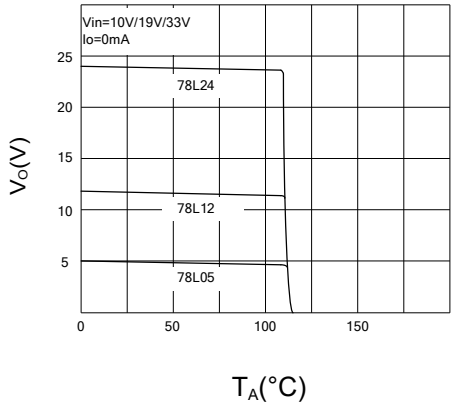


Figure 7: 78L05/12/24 Thermal Shutdown

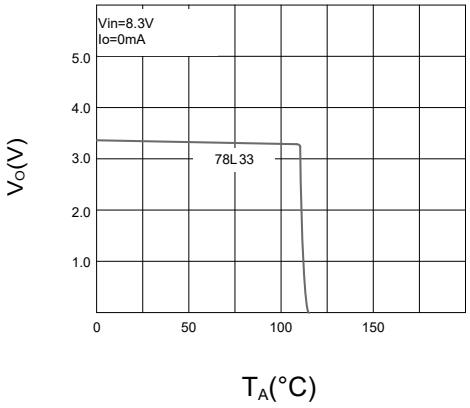


Figure 8: 78L33 Thermal Shutdown

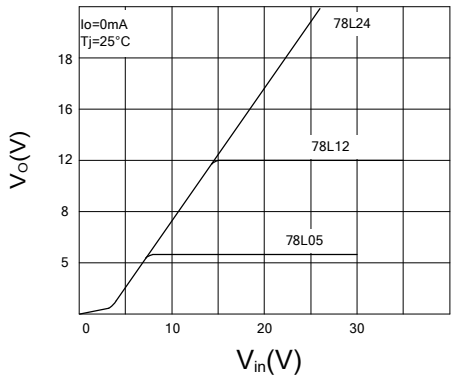


Figure 9: 78 L05/12/24 Output Characteristics

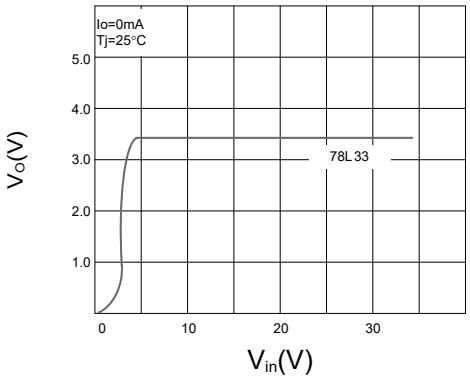


Figure 10: 78L33 Output Characteristics

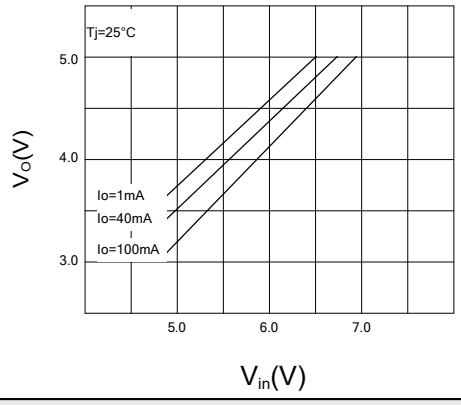


Figure 11: 78L05 Dropout Characteristics

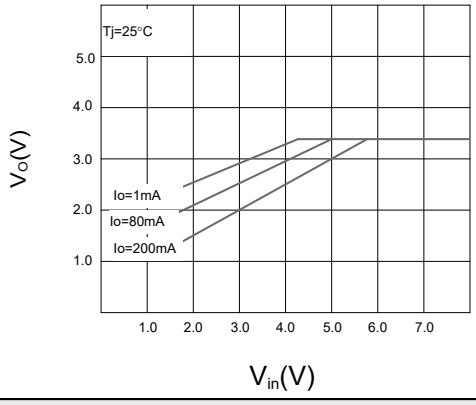
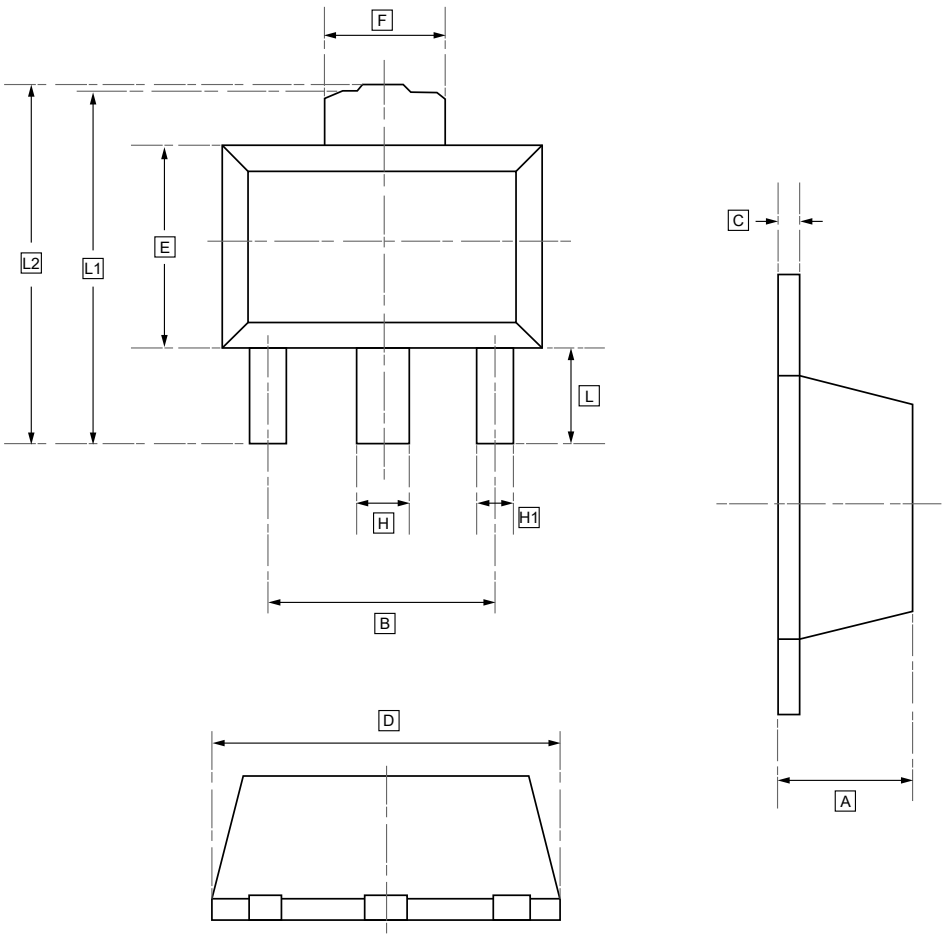


Figure 12: 78L33 Dropout Characteristics

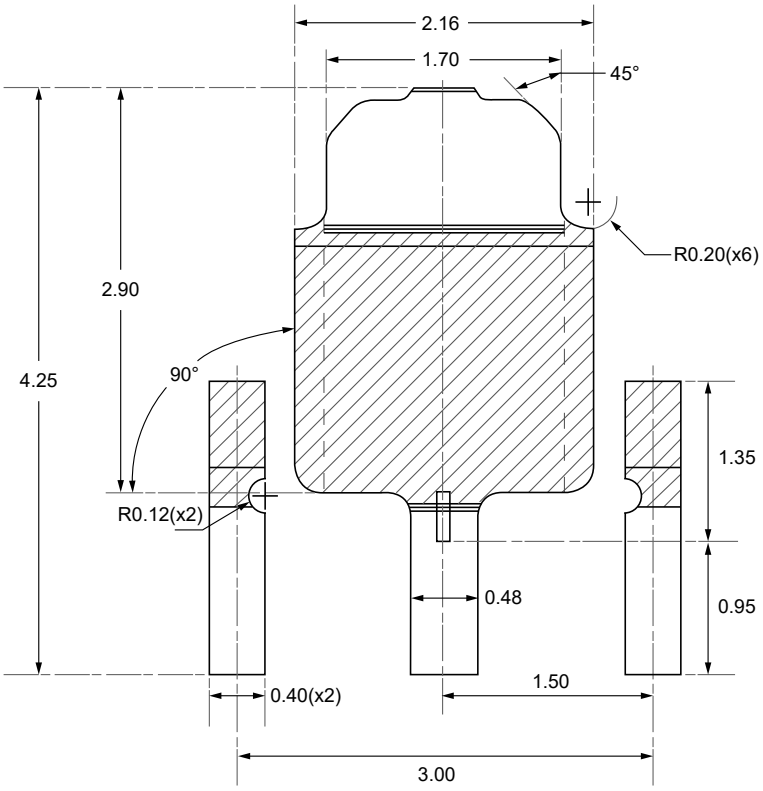
9.1 SOT-89 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	B	C	D	E	F	H	H1	L	L1	L2
Min	1.40	2.90	0.330	4.40	2.30	1.60	0.40	0.320	0.900	3.900	4.100
Max	1.60	3.10	0.430	4.60	2.60	1.80	0.580	0.520	1.200	4.300	4.350

9.2 SOT-89-3L Suggested Pad Layout



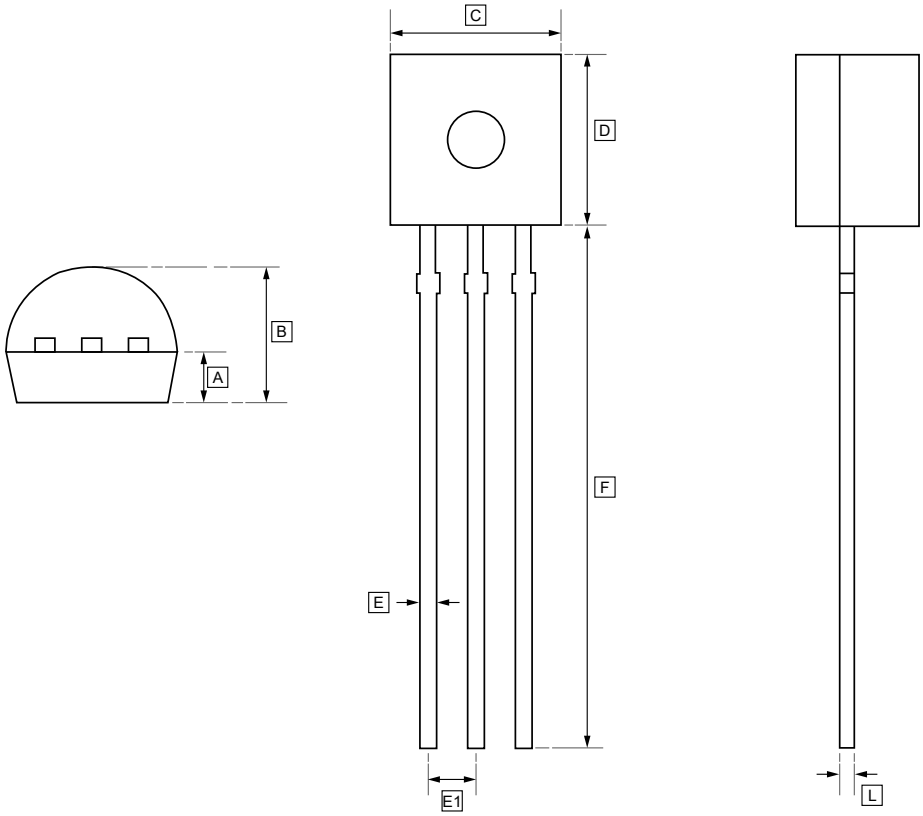
Note:

1.Controlling dimension: in milimeters.

2.General tolerance: +0.05mm.

3.The pad layout is for reference purposes only.

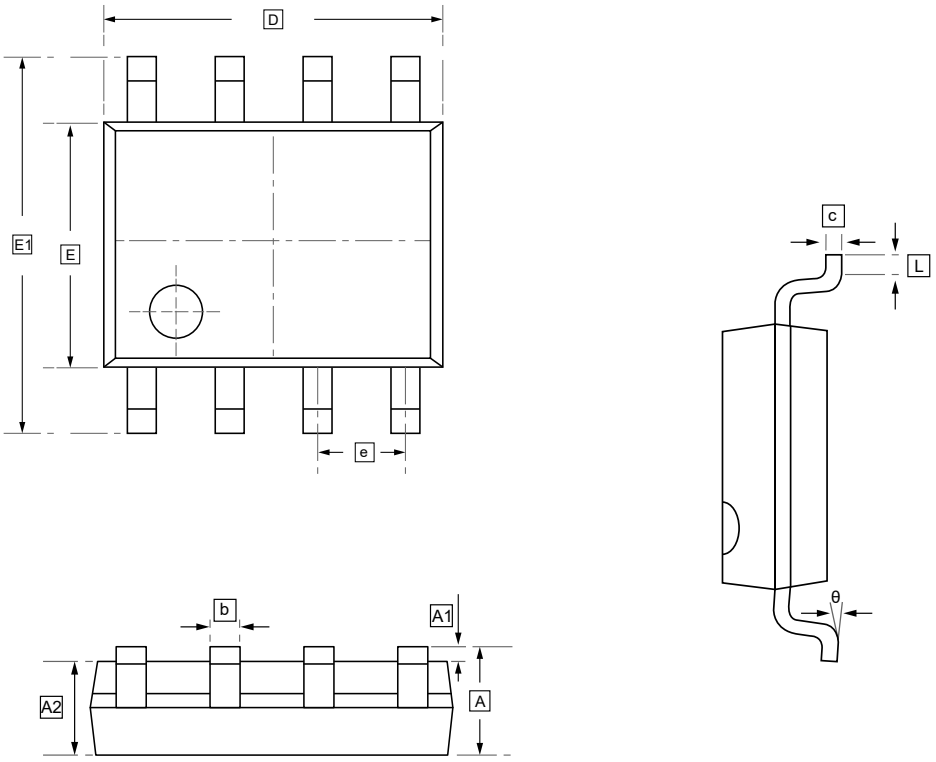
9.3 TO-92 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	B	C	D	E	E1	F	L
Min	1.10	3.50	4.50	4.40	0.35	1.27	13.50	0.35
Max	1.30	3.90	4.90	4.90	0.45	TYP	14.50	0.40

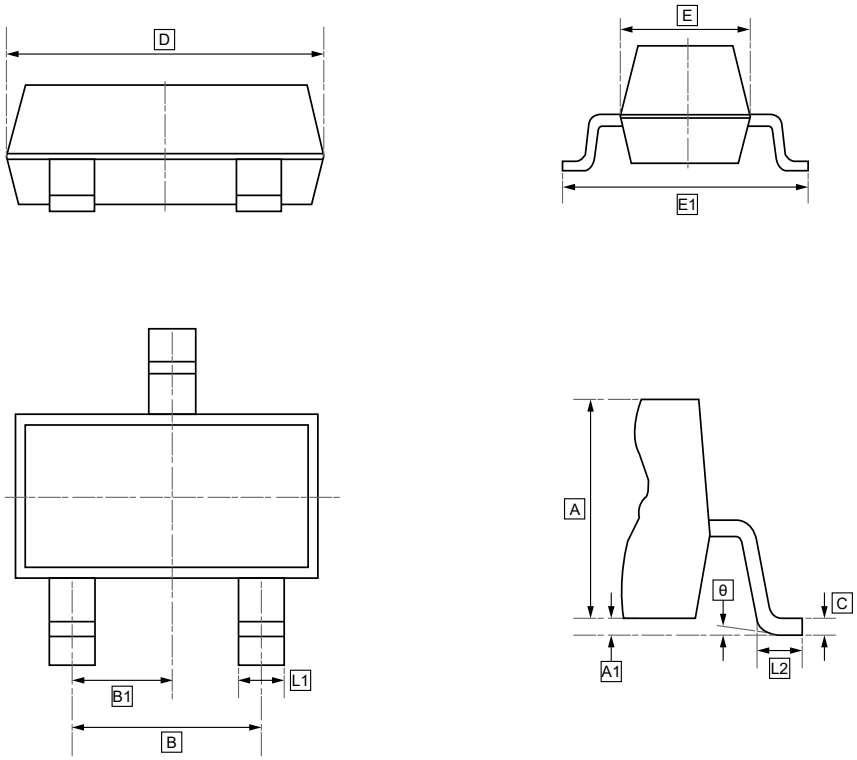
9.4 SOP-8 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	c	D	E	E1	e	L	θ
Min	1.350	0.000	1.350	0.330	0.170	4.700	3.800	5.800	1.270	0.400	0°
Max	1.750	0.100	1.550	0.510	0.250	5.100	4.000	6.200	BSC	1.270	8°

9.5 SOT-23 Package Outline Dimensions

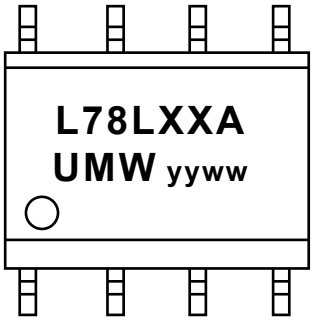


DIMENSIONS (mm are the original dimensions)

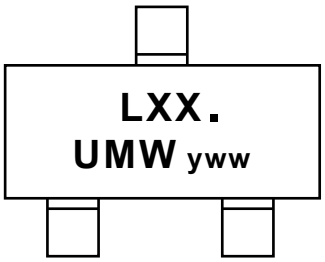
Symbol	A	A1	L1	L2	C	D	E	E1	B	B1	θ
Min	0.900	0.020	0.300	0.300	0.100	2.800	1.200	2.300	1.800	0.950	0°
Max	1.100	0.100	0.500	0.500	0.120	3.000	1.400	2.500	2.000	TYP	8°

10.Ordering Information

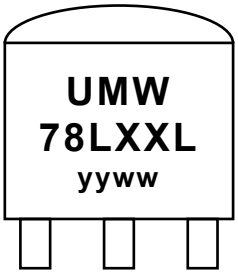
SOP-8



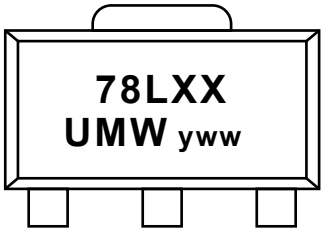
SOT-23



TO-92



SOT-89



Order Code	Marking	Package	Base QTY	Delivery Mode
UMW L78LxxA	L78LxxA	SOP-8	2500	Tape and reel
UMW 78LxxS	LxX.	SOT-23	3000	Tape and reel
UMW 78LxxL	78LxxL	TO-92	1000	Bulk Bag
UMW 78Lxx	78Lxx	SOT-89	1000	Tape and reel

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