

## Series3-Terminal 0.15A Positive Voltage Regulators

# LR78LXX

### DESCRIPTION

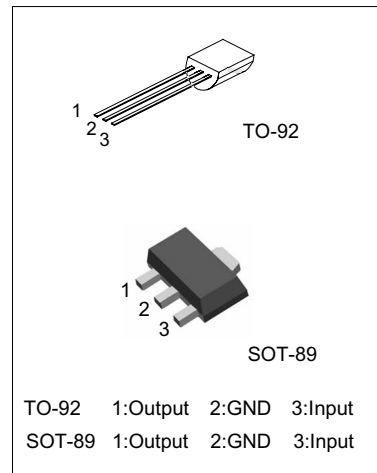
The LRC LR78LXX family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 150mA.

### FEATURES

- \*Output current up to 150mA
- \*Fixed output voltage of 5V, 6V, 8V, 9V, 12V, 15V, 18V and 24V available
- \*Thermal overload shutdown protection
- \*Short circuit current limiting
- \*We declare that material of product compliance with ROHS requirements.

### ORDERING INFORMATION

- \*LR78Lxx: TO-92
- \*LR78LxxU: SOT89



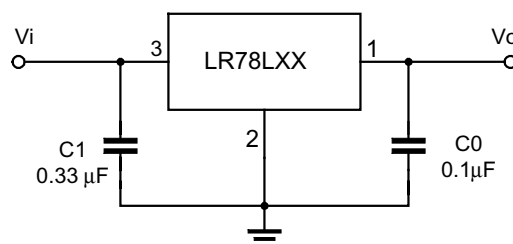
### ABSOLUTE MAXIMUM RATINGS

(Operating temperature range applies unless otherwise specified)

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Input voltage (for $V_o=5\sim 15V$ )	$V_i$		35	V
(for $V_o=18\sim 24V$ )	$V_i$		40	V
Output Current	$I_o$		150	mA
Power Dissipation	PD			mW
TO-92			625	
SOT-89			500	
Operating Junction Temperature	$T_J$		+150	°C
Operating Ambient Temperature	$T_{OPR}$	-55	+125	°C
Storage Temperature Range	$T_{STG}$	-55	+150	°C

ESD: HBM 2000V

### APPLICATION CIRCUIT



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.

## LR78L00 Series 3-Terminal 0.15A Positive Voltage Regulators

### LR78L05 ELECTRICAL CHARACTERISTICS

( $V_I=10V$ ,  $I_o=40mA$ ,  $-55^{\circ}C < T_j < 125^{\circ}C$ ,  $C_1=0.33\mu F$ ,  $C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Output Voltage	$V_o$	$T_j=25^{\circ}C$	4.80	5.0	5.20	V
		$7V \leq V_I \leq 20V, I_o=1mA-40mA$	4.75		5.25	V
		$7V \leq V_I \leq V_{MAX}, I_o=1mA-70mA$	4.75		5.25	V (note 2)
Load Regulation	$V_o$	$T_j=25^{\circ}C, I_o=1mA-100mA$		11	60	mV
		$T_j=25^{\circ}C, I_o=1mA-40mA$		5.0	30	mV
Line regulation	$V_o$	$7V \leq V_I \leq 20V, T_j=25^{\circ}C$		32	150	mV
		$8V \leq V_I \leq 20V, T_j=25^{\circ}C$		26	100	mV
Quiescent Current	$I_q$	$V_I=10V, I_o=0mA, T_j=25^{\circ}C$		3.8	6.1	mA
Quiescent Current Change	$\Delta I_q$	$8V \leq V_I \leq 20V$			1.5	mA
	$\Delta I_q$	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		42		$\mu V$
Ripple Rejection	RR	$8V \leq V_I \leq 20V, f=120Hz, T_j=25^{\circ}C$	41	49		dB
Dropout Voltage	$V_d$	$T_j=25^{\circ}C$		1.7		V

### LR78L06 ELECTRICAL CHARACTERISTICS

( $V_I=12V$ ,  $I_o=40mA$ ,  $-55^{\circ}C < T_j < 125^{\circ}C$ ,  $C_1=0.33\mu F$ ,  $C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Output Voltage	$V_o$	$T_j=25^{\circ}C$	5.76	6.0	6.24	V
		$8.5V \leq V_I \leq 20V, I_o=1mA-40mA$	5.70		6.30	V
		$8.5V \leq V_I \leq V_{MAX}, I_o=1mA-70mA$	5.70		6.30	V (note 2)
Load Regulation	$V_o$	$T_j=25^{\circ}C, I_o=1mA-100mA$		12.8	80	mV
		$T_j=25^{\circ}C, I_o=1mA-70mA$		5.8	40	mV
Line regulation	$V_o$	$8.5V \leq V_I \leq 20V, T_j=25^{\circ}C$		64	175	mV
		$9V \leq V_I \leq 20V, T_j=25^{\circ}C$		54	125	mV
Quiescent Current	$I_q$	$V_I=12V, I_o=0mA, T_j=25^{\circ}C$		3.9	6.0	mA
Quiescent Current Change	$\Delta I_q$	$9V \leq V_I \leq 20V$			1.5	mA
	$\Delta I_q$	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		49		$\mu V$
Ripple Rejection	RR	$10V \leq V_I \leq 20V, f=120Hz, T_j=25^{\circ}C$	40	46		dB
Dropout Voltage	$V_d$	$T_j=25^{\circ}C$		1.7		V

## LR78L00 Series 3-Terminal 0.15A Positive Voltage Regulators

### LR78L08 ELECTRICAL CHARACTERISTICS

( $V_I=14V, I_O=40mA, -55^{\circ}C < T_J < 125^{\circ}C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_O$	$T_J=25^{\circ}C$	7.68	8.0	8.32	V
		$10.5V \leq V_I \leq 23V, I_O=1mA-40mA$	7.60		8.40	V
		$10.5V \leq V_I \leq V_{MAX}, I_O=1mA-70mA$	7.60		8.40	V (note 2)
Load Regulation	$V_O$	$T_J=25^{\circ}C, I_O=1mA-100mA$		18	80	mV
		$T_J=25^{\circ}C, I_O=1mA-70mA$		10	40	mV
Line regulation	$V_O$	$10.5V \leq V_I \leq 23V, T_J=25^{\circ}C$		42	175	mV
		$11V \leq V_I \leq 23V, T_J=25^{\circ}$		36	125	mV
Quiescent Current	$I_q$	$V_{IN}=14V, I_O=0mA, T_J=25^{\circ}C$		4.0	6.0	mA
Quiescent Current Change	$\Delta I_q$	$11V \leq V_I \leq 23V$			1.5	mA
	$\Delta I_q$	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		54		$\mu V$
Ripple Rejection	RR	$11V \leq V_I \leq 23V, f=120Hz, T_J=25^{\circ}C$	39	46		dB
Dropout Voltage	$V_d$	$T_J=25^{\circ}C$		1.7		V

### LR78L09 ELECTRICAL CHARACTERISTICS

( $V_I=15V, I_O=40mA, -55^{\circ}C < T_J < 125^{\circ}C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_O$	$T_J=25^{\circ}C$	8.64	9.0	9.36	V
		$11.5V \leq V_I \leq 24V, I_O=1mA-40mA$	8.55		9.45	V
		$11.5V \leq V_I \leq V_{MAX}, I_O=1mA-70mA$	8.55		9.45	V (note 2)
Load Regulation	$V_O$	$T_J=25^{\circ}C, I_O=1mA-100mA$		20	90	mV
		$T_J=25^{\circ}C, I_O=1mA-40mA$		11	45	mV
Line regulation	$V_O$	$11.5V \leq V_I \leq 24V, T_J=25^{\circ}C$		90	200	mV
		$13V \leq V_I \leq 24V, T_J=25^{\circ}C$		100	150	mV
Quiescent Current	$I_q$	$V_{IN}=15V, I_O=0mA, T_J=25^{\circ}C$		4.1	6.0	mA
Quiescent Current Change	$\Delta I_q$	$13V \leq V_I \leq 24V$			1.5	mA
	$\Delta I_q$	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		58		$\mu V$
Ripple Rejection	RR	$12V \leq V_I \leq 23V, f=120Hz, T_J=25^{\circ}C$	38	44		dB
Dropout Voltage	$V_d$	$T_J=25^{\circ}C$		1.7		V

## LR78L00 Series3-Terminal 0.15A Positive Voltage Regulators

### LR78L12 ELECTRICAL CHARACTERISTICS

( $V_I=19V, I_o=40mA, -55^{\circ}C < T_j < 125^{\circ}C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_o$	$T_j=25^{\circ}C$	11.5	12.0	12.5	V
		$14.5V \leq V_I \leq 27V, I_o=1mA-40mA$	11.40		12.60	V
		$14.5V \leq V_I \leq V_{MAX}, I_o=1mA-70mA$	11.40		12.60	V (note 2)
Load Regulation	$V_o$	$T_j=25^{\circ}C, I_o=1mA-100mA$		25	150	mV
		$T_j=25^{\circ}C, I_o=1mA-40mA$		12	75	mV
Line regulation	$V_o$	$14.5V \leq V_I \leq 27V, T_j=25^{\circ}C$		55	250	mV
		$16V \leq V_I \leq 27V, T_j=25^{\circ}C$		49	200	mV
Quiescent Current	$I_q$	$V_{IN}=19V, I_o=0mA, T_j=25^{\circ}C$		4.3	6.5	mA
Quiescent Current Change	$\Delta I_q$	$16V \leq V_I \leq 27V$			1.5	mA
	$\Delta I_q$	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		70		$\mu V$
Ripple Rejection	RR	$15V \leq V_I \leq 25V, f=120Hz, T_j=25^{\circ}C$	37	42		dB
Dropout Voltage	$V_d$	$T_j=25^{\circ}C$		1.7		V

### LR78L15 ELECTRICAL CHARACTERISTICS

( $V_I=23V, I_o=40mA, -55^{\circ}C < T_j < 125^{\circ}C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	$V_o$	$T_j=25^{\circ}C$	14.40	15.0	15.60	V
		$17.5V \leq V_I \leq 30V, I_o=1mA-40mA$	14.25		15.75	V
		$17.5V \leq V_I \leq V_{MAX}, I_o=1mA-70mA$	14.25		15.75	V (note 2)
Load Regulation	$V_o$	$T_j=25^{\circ}C, I_o=1mA-100mA$		20	150	mV
		$T_j=25^{\circ}C, I_o=1mA-70mA$		25	150	mV
Line regulation	$V_o$	$17.5V \leq V_I \leq 30V, T_j=25^{\circ}C$		25	150	mV
		$20V \leq V_I \leq 30V, T_j=25^{\circ}C$		15	75	mV
Quiescent Current	$I_q$	$V_{IN}=23V, I_o=0mA, T_j=25^{\circ}C$		4.6	6.5	mA
Quiescent Current Change	$\Delta I_q$	$20V \leq V_I \leq 30V$			1.5	mA
	$\Delta I_q$	$1mA \leq V_I \leq 40mA$			0.1	mA
Output Noise Voltage	$V_N$	$10Hz \leq f \leq 100kHz$		82		$\mu V$
Ripple Rejection	RR	$18.5V \leq V_I \leq 28.5V, f=120Hz, T_j=25^{\circ}C$	34	39		dB
Dropout Voltage	$V_d$	$T_j=25^{\circ}C$		1.7		V

## LR78L00 Series3-Terminal 0.15A Positive Voltage Regulators

### LR78L18 ELECTRICAL CHARACTERISTICS

( $V_I=27V, I_o=40mA, -55^{\circ}C < T_j < 125^{\circ}C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	17.30	18.0	18.70	V
		21V<=Vi<=33V, Io=1mA-40mA	17.10		18.90	V
		21V<=Vi<=VMAX, Io=1mA-70mA	17.10		18.90	V (note 2)
Load Regulation	Vo	Tj=25°C, Io=1mA-100mA		30	180	mV
		Tj=25°C, Io=1mA-40mA		19	90	mV
Line regulation	Vo	21V<=Vi<=33V, Tj=25°C		70	360	mV
		22V<=Vi<=33V, Tj=25°C		60	300	mV
Quiescent Current	Iq	VIN=27V, Io=0mA, Tj=25°C		4.7	6.5	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		uV
Ripple Rejection	RR	23V<=Vi<=33V, f=120Hz, Tj=25°C	32	36		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

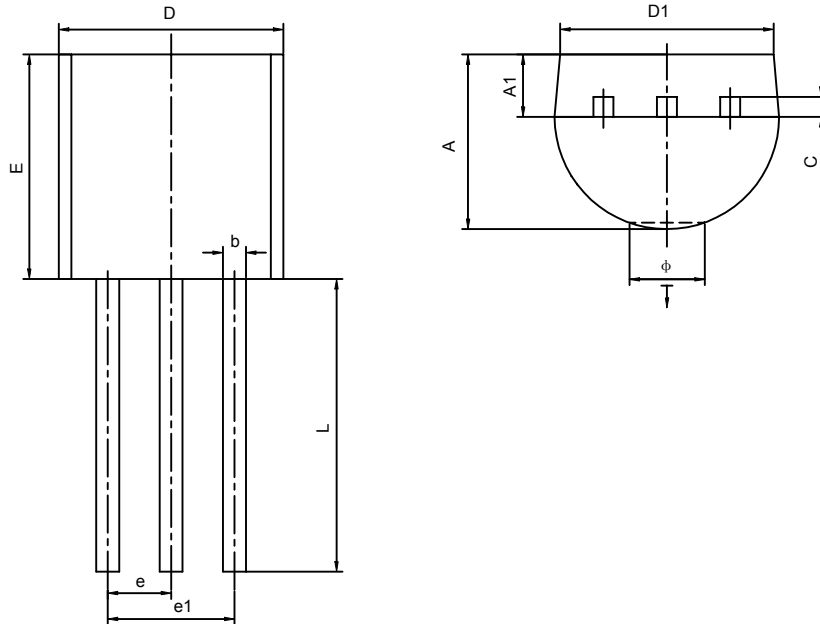
### LR78L24 ELECTRICAL CHARACTERISTICS

( $V_I=33V, I_o=40mA, -55^{\circ}C < T_j < 125^{\circ}C, C_1=0.33\mu F, C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	23.04	24.0	24.96	V
		27V<=Vi<=38V, Io=1mA-40mA	22.8		25.2	V
		27V<=Vi<=VMAX, Io=1mA-70mA	22.8		25.2	V (note 2)
Load Regulation	Vo	Tj=25°C, Io=1mA-100mA		40	200	mV
		Tj=25°C, Io=1mA-40mA		20	100	mV
Line regulation	Vo	27V<=Vi<=38V, Tj=25°C		160	360	mV
		28V<=Vi<=38V, Tj=25°C		150	300	mV
Quiescent Current	Iq	VIN=33V, Io=0mA, Tj=25°C		4.7	6.5	mA
Quiescent Current Change	ΔIq	27V<=Vi<=38V			1.5	mA
	ΔIq	1mA<=Vi<=40mA			0.1	mA
Output Noise Voltage	VN	10Hz<=f<=100kHz		200		uV
Ripple Rejection	RR	27V<=Vi<=38V, f=120Hz, Tj=25°C	34	45		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

Note 1: The Maximum steady state usable output current is dependent on input voltage, heat sinking, lead length of the package and copper pattern of PCB. The data above represent pulse test conditions with junction temperatures specified at the initiation of test.

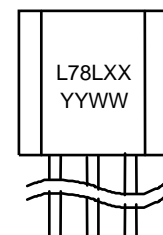
Note 2: Power dissipation<0.5W

**TO-92 PACKAGE OUTLINE DIMENSIONS**


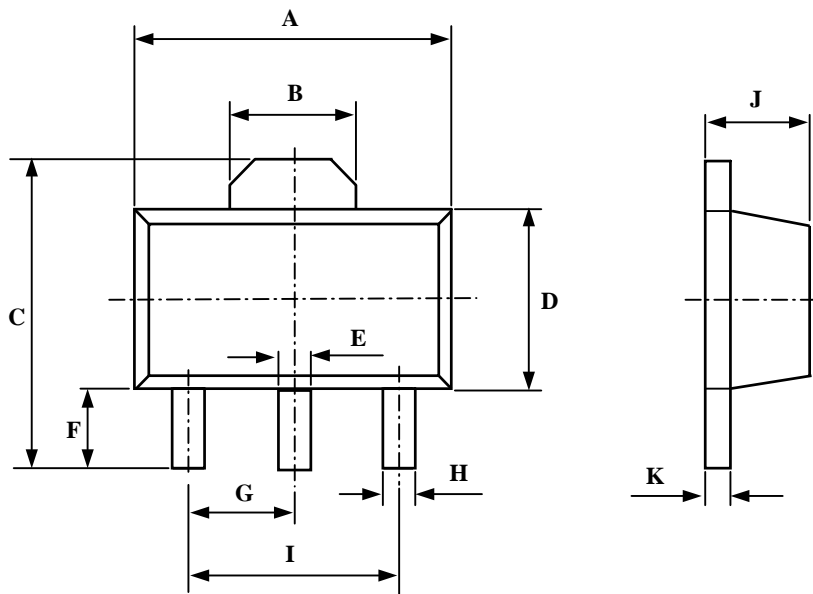
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270TYP		0.050TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Ö		1.600		0.063
↓	0.000	0.380	0.000	0.015

**SHIPPING INFORMATION**

1. Bag: 1000 Units/ Bag 10 Bag/ Box(240mm\*170mm\*96mm)  
4 Box/ Chest(365mm\*270mm\*210mm)
2. Tape: 2000 Units/ Box 10 Box/ Chest

**MARKING**


## SOT-89-3L PACKAGE OUTLINE DIMENSIONS



SYMBOL	Dimensions In Mmillimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.000	4.600	0.173	0.181
B	1.550 REF		0.061 REF	
C	3.940	4.250	0.155	0.167
D	2.300	2.600	0.091	0.102
E	0.400	0.580	0.016	0.023
F	0.900	1.200	0.035	0.047
G	1.5 TYP		0.06 TYP	
H	0.320	0.520	0.013	0.020
I	3 TYP		0.118 TYP	
J	1.400	1.600	0.055	0.063
K	0.350	0.440	0.014	0.017

### SHIPPING INFORMATION

Tape: 2500 Units/ Reel(13 inch)  
 2 Reel/ Box(340mm\*340mm\*50mm)  
 6 Box/ Chest(360mm\*360mm\*315mm)

### MARKING

