

Series3-Terminal 0.1A Positive Voltage Regulators

LR78LXXA/B

DESCRIPTION

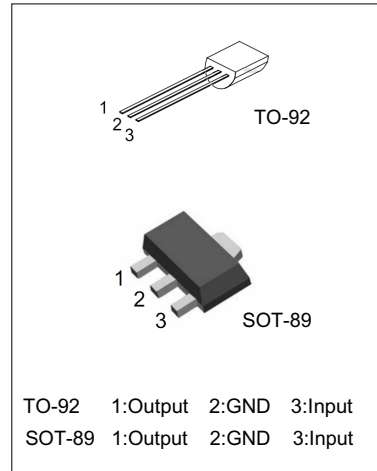
The LRC LR78LXX series is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 100mA.

FEATURES

- *Output current up to 100mA
- *Fixed output voltage of 5V ,9V,12V,15V available
- *Thermal overload shutdown protection
- *Short circuit current limiting
- *We declare that material of product compliance with ROHS requirements.

ORDERING INFORMATION

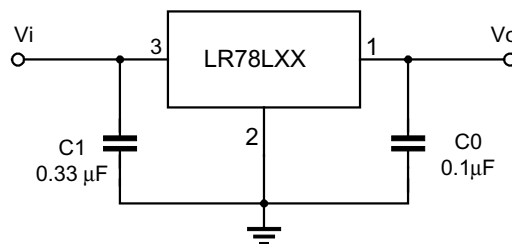
- *LR78LXXA: SOT89
- *LR78LXXB: TO-92


ABSOLUTE MAXIMUM RATINGS

(Operating temperature range applies unless otherwise specified)

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Input voltage (for $V_o=5\sim 9V$)	V_i		30	V
(for $V_o=12\sim 24V$)	V_i		35	V
Output Current	I_o		100	mA
Power Dissipation	PD			mW
TO-92			625	
SOT-89			500	
Operating Junction Temperature	T_J	-40	+150	°C
Operating Ambient Temperature	T_{OPR}	-40	+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.

LR78L05 ELECTRICAL CHARACTERISTICS
(VI=10V, Io=40mA, -55°C <Tj<125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)(Note 3)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Output Voltage	Vo	Tj=25°C	4.80	5.0	5.20	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)
Load Regulation	Vo	Tj=25°C,Io=1mA-100mA		11	60	mV
		Tj=25°C,Io=1mA-40mA		5.0	30	mV
Line regulation	Vo	7V<=Vi<=20V,Tj=25°C		8	150	mV
		8V<=Vi<=20V,Tj=25°C		6	100	mV
Quiescent Current	Iq	VIN=10V,Io=0mA,Tj=25°C		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		uV
Ripple Rejection	RR	8V<=Vi<=20V,f=120Hz,Tj=25°C	40	49		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

LR78L06 ELECTRICAL CHARACTERISTICS
(VI=12V,Io=40mA, -55°C <Tj<125°C,C1=0.33uF,Co=0.1uF,unless otherwise specified)(Note 3)

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
		Io=1mA~70mA	5.7		6.3	V (note 2)
Load Regulation	ΔVo	Tj=25°C,Io=1mA~100mA		18	60	mV
		Tj=25°C,Io=1mA~40mA		12	30	mV
Line regulation	ΔVo	8.5V<=Vi<=20V,Tj=25°C		12	150	mV
		9V<=Vi<=20V,Tj=25°C		6	100	mV
Quiescent Current	Iq	VIN=12V,Io=0mA,Tj=25°C		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, Tj=25°		50		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.75		mV/°C
Ripple Rejection	RR	9V<=Vi<=20V,f=120Hz,Tj=25°	38	46		dB
Dropout Voltage	Vd	C		1.7		V

Note 3: 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 4: Power dissipation<0.5W

LR78L08 ELECTRICAL CHARACTERISTICS

(VI=14V, Io=40mA, -55°C < Tj < 125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)(Note 3)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	7.7	8.0	8.3	V
		10.5V≤Vi≤23V, Io=1mA~40mA	7.6		8.4	V
		Io=1mA~70mA	7.6		8.4	V (note2)
Load Regulation	ΔVo	Tj=25°C, Io=1mA~100mA		24	80	mV
		Tj=25°C, Io=1mA~40mA		16	40	mV
Line regulation	ΔVo	10.5V≤Vi≤23V, Tj=25°C		16	175	mV
		11V≤Vi≤23V, Tj=25°C		8	125	mV
Quiescent Current	Iq	VIN=14V, IO=0mA, Tj=25°C		2.0	5.5	mA
Quiescent Current Change	ΔIq	11V≤Vi≤23V			1.5	mA
	ΔIq	1mA≤Io≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz, Tj=25°C		60		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.8		mV/°C
Ripple Rejection	RR	12V≤Vi≤23V, f=120Hz, Tj=25°C	36	45		dB
Dropout Voltage	Vd			1.7		V

LR78L09 ELECTRICAL CHARACTERISTICS

(VI=15V, Io=40mA, -55°C < Tj < 125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)(Note 3)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	AX	UNIT
Output Voltage	Vo	Tj=25°C	8.64	9.0	36	V
		11.5V≤Vi≤24V, Io=1mA~40mA	8.55		9.45	V
		11.5V≤Vi≤VMAX, Io=1mA~70mA	8.55		9.45	V (Note 2)
Load Regulation	Vo	Tj=25°C, Io=1mA~100mA		20	90	mV
		Tj=25°C, Io=1mA~40mA		10	45	mV
Line regulation	Vo	11.5V≤Vi≤24V, Tj=25°C		90	200	mV
		13V≤Vi≤24V, Tj=25°C		100	150	mV
Quiescent Current	Iq	VIN=15V, Io=0mA, Tj=25°C		2.0	5.5	mA
Quiescent Current Change	ΔIq	13V≤Vi≤24V			1.5	mA
	ΔIq	1mA≤Io≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		49		UV
Ripple Rejection	RR	12V≤Vi≤23V, f=120Hz, Tj=25°C	36	44		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

LR78L12 ELECTRICAL CHARACTERISTICS

(VI=19V, Io=40mA, -55°C <Tj<125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)(Note 3)

Characteristic	Symbol	Test conditions		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
		Io=1mA~70mA	11.4		12.6	V (note 2)
Load Regulation	ΔVo	Tj=25°C, Io=1mA~100mA		36	100	mV
		Tj=25°C, Io=1mA~40mA		24	50	mV
Line regulation	ΔVo	14.5V≤Vi≤27V, Tj=25°C		24	250	mV
		16V≤Vi≤27V, Tj=25°C		12	200	mV
Quiescent Current	Iq	VI=19V, IO=0mA, Tj=25°C		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, Tj=25°C		80		μV
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			1.7		V

LR78L15 ELECTRICAL CHARACTERISTICS

(VI=23V, Io=40mA, -55°C <Tj<125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)(Note 3)

Characteristic	Symbol	Test conditions		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
		Io=1mA~70mA	14.25		15.75	V (note 2)
Load Regulation	ΔVo	Tj=25°C, Io=1mA~100mA		45	150	mV
		Tj=25°C, Io=1mA~40mA		30	75	mV
Line regulation	ΔVo	17.5V≤Vi≤30V, Tj=25°C		30	300	mV
		20V≤Vi≤30V, Tj=25°C		15	250	mV
Quiescent Current	Iq	VI=23V, IO=0mA, Tj=25°C		2.2	6.0	mA
Quiescent Current Change	ΔIq	20V≤Vi≤30V Δ			1.5	mA
	Iq	1mA≤Io≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz, Tj=25°C		90		μV
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			1.7		V

ELECTRICAL CHARACTERISTICS CURVES

Fig.1 LR78L05 Output Voltage vs Ambient Temperature

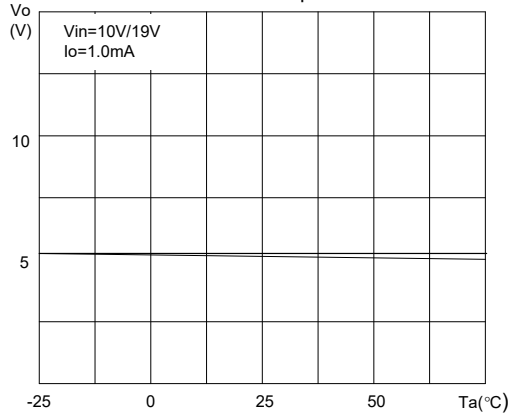


Fig.2 LR78L05 Quiescent Current vs Output Current

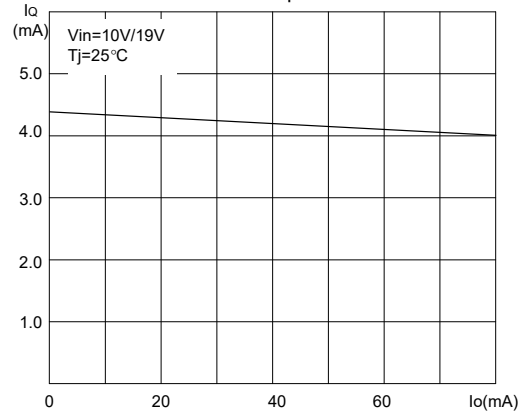


Fig.3 LR78L05 Quiescent Current vs Input

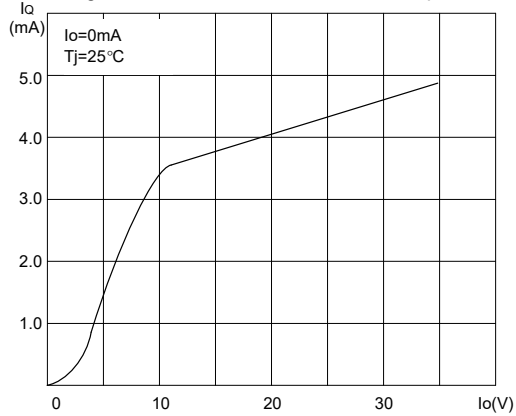


Fig.4 LR78L05 Thermal Shutdown

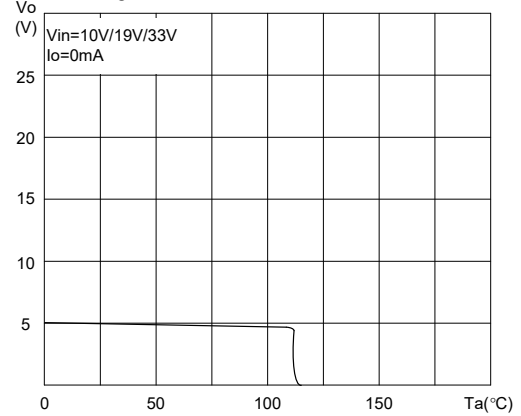


Fig.5 LR78L05 Output Characteristics

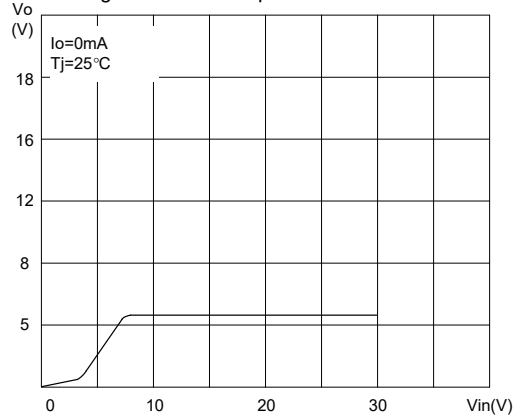
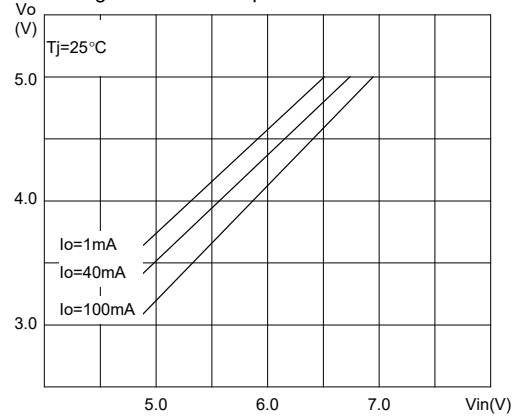
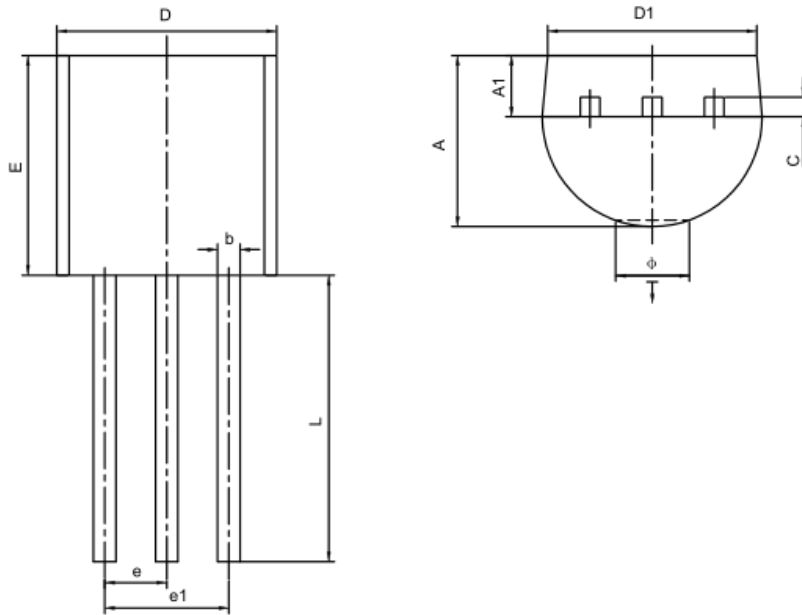


Fig.6 LR78L05 Dropout Characteristics

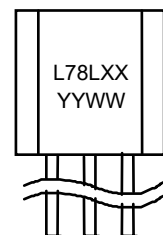


TO-92 PACKAGE OUTLINE DIMENSIONS


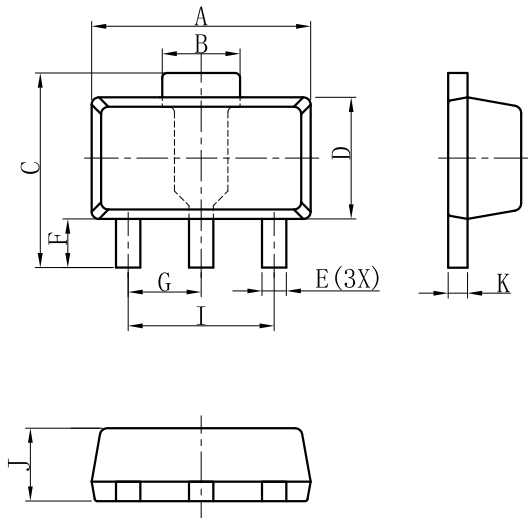
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270TYP		0.050TYP	
e1	2.440	2.640	0.096	0.104
L	14.100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


Package Outline Dimension

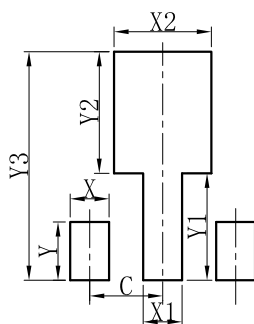
SOT89-3


SOT89-3			
DIM	MIN	NOR	MAX
A	4.30	4.50	4.70
B	1.40	1.60	1.80
C	3.90	4.00	4.25
D	2.30	2.50	2.70
E	0.40	0.50	0.58
F	0.90	1.00	1.20
G	1.50 BSC		
I	3.00 BSC		
J	1.40	1.50	1.60
K	0.34	0.40	0.50
All Dimensions in mm			

GENERAL NOTES

1. Top package surface finish $Ra0.4 \pm 0.2\mu m$
2. Bottom package surface finish $Ra0.7 \pm 0.2\mu m$
3. Side package surface finish $Ra0.4 \pm 0.2\mu m$
4. Protrusion or Gate Burrs shall not exceed 0.10mm per side.

Suggested Pad layout

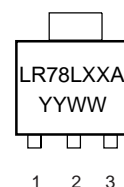
SOT89-3


SOT89-3	
DIM	(mm)
X	0.80
Y	1.20
X1	0.80
Y1	2.20
X2	2.00
Y2	2.50
C	1.50
Y3	4.70

SHIPPING INFORMATION

Tape: 1000 Units/ Reel(7 inch)
 7 Reel/ Box(226mm*206mm*230mm)
 2 Box/Chest(435mm*235mm*247mm)

MARKING



DISCLAIMER

- Curve guarantee in the specification. The curve of test items with electric parameter is used as quality guarantee. The curve of test items without electric parameter is used as reference only.
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