THREE-TERMINAL POSITIVE REGULATOR

LM78LXX Series

TO-92

TO-92
Plastic Package
RoHS compliant

GENERAL DESCRIPTIONS:

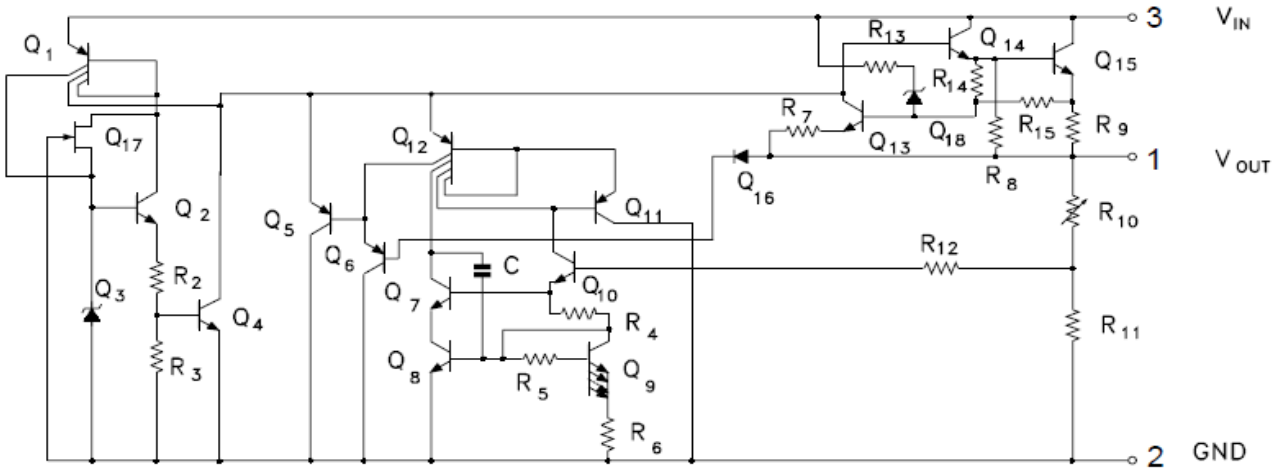
The LM78LXX series of three-terminal positive regulators employ internal current limiting and thermal shutdown, making them essentially indestructible. If adequate heat-sink is provided, they can deliver up to 100 mA output current. They are intended as fixed voltage regulators in a wide range of applications including local or on-card regulation for elimination of noise and distribution problems associated with single-point regulation.In addition, they can be used with power pass elements to make high-current voltage regulators.The LM78LXX series used as Zener diode/resistor combination replacement, offers an effective output impedance improvement of typically two orders of magnitude, along with lower quiescent current and lower noise.

FEATURES:

1. Output current upto 100 mA
2. Output Voltage 3.3; 5; 6; 8; 9; 10; 12; 15; 18; 20; 24V
3. Thermal overload protection.
4. Short circuit protection.
5. No external components required.
6. This product is available in AEC-Q101 Compliant and PPAP Capable also.

Note: For AEC-Q101 compliant products, please use suffix -AQ in the part number while ordering.

SCHEMATIC DIAGRAM



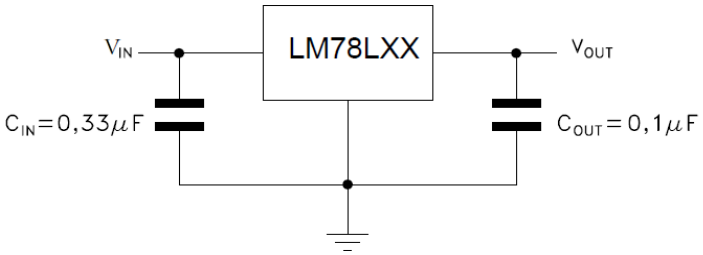
ABSOLUTE MAXIMUM RATINGS (Ta = 25 ℃ Unless otherwise specified)

PARAMETER		SYMBOL	VALUE	UNIT
DC Input Voltage	V_O = 3.3 to 9 V	V_I	30	V
	V_O = 12 to 15 V		35	
	V_O = 18 to 24 V		40	
Output Current		I_O	100	mA
Lead Temperature 1.6mm (1/16inch) from		T_{stg}	-40 to +150	°C
Operating Junction Temperature Range		T_{op}	-40 to +125	°C

Thermal Resistance

Thermal Resistance Junction to Ambient	$R_{th\ (j-a)}$	200	°C/W

TEST CIRCUIT



ELECTRICAL CHARACTERISTICS OF LM78L33 (refer to the test circuit, V_I= 8.3V, I_O =40mA, C_I=0.33µF, C_O= 0.1µF, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_O	25ºC	3.168	3.3	3.432	V
		I_O=1mA to 40mA, V_I=5.3V to 20V,	3.135	--	3.465	V
		I_O=1mA to 70mA, V_I=8.3V,	3.135	--	3.465	V
Line Regulation	ΔV_O	V_I=5.3V to 20V, T_j=25°C	--	--	150	mV
		V_I=6.3V to 20V, T_j=25°C	--	--	100	mV
Load Regulation	ΔV_O	I_O=1mA to100mA, Tj=25°C	--	--	60	mV
		I_O=1mA to 40mA, Tj=25°C	--	--	30	mV
Quiescent Current	I_Q	Tj=25°C	--	--	6.0	mA
		Tj=125°C	--	--	5.5	mA
Quiescent Current Change	ΔI_d	I_O=1mA to 40mA	--	--	0.1	mA
		V_I=6.3V to 20V	--	--	1.5	mA
Output Noise Voltage	eN	B =10Hz to 100KHz, Tj=25°C	--	40	--	µV
Supply Voltage Rejection	SVR	V_I = 6.3 to 16.3V, $_f$=120Hz, I_O = 40mA, Tj=25°C	41	49	--	dB
Dropout Voltage	V_d		--	1.7	--	V

ELECTRICAL CHARACTERISTICS OF LM78L05 (refer to the test circuit, V_I= 10V, I_O =40mA, C_I=0.33µF, C_O= 0.1µF, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_O	25ºC	4.80	5.0	5.20	V
		I_O=1mA to 40mA, V_I=7V to 20V,	4.75	--	5.25	V
		I_O=1mA to 70mA, V_I=10V,	4.75	--	5.25	V
Line Regulation	ΔV_O	V_I=7V to 20V, T_j=25°C	--	--	150	mV
		V_I=8V to 20V, T_j=25°C	--	--	100	mV
Load Regulation	ΔV_O	I_O=1mA to100mA, Tj=25°C	--	--	60	mV
		I_O=1mA to 40mA, Tj=25°C	--	--	30	mV
Quiescent Current	I_Q	Tj=25°C	--	--	6.0	mA
		Tj=125°C	--	--	5.5	mA
Quiescent Current Change	ΔI_d	I_O=1mA to 40mA	--	--	0.1	mA
		V_I=8V to 20V	--	--	1.5	mA
Output Noise Voltage	eN	B =10Hz to 100KHz, Tj=25°C	--	40	--	µV
Supply Voltage Rejection	SVR	V_I = 8 to 18V, V_f=120Hz, I_O = 40mA, Tj=25°C	41	49	--	dB
Dropout Voltage	V_d		--	1.7	--	V

ELECTRICAL CHARACTERISTICS OF LM78L06 (refer to the test circuit, V_I= 10V, I_O =40mA, C_I=0.33µF, C_O= 0.1µF, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_O	25ºC	5.76	6.0	6.24	V
		I_O=1mA to 40mA, V_I=8.5V to 20V,	5.70	--	6.30	V
		I_O=1mA to 70mA, V_I=12V,	5.70	--	6.30	V
Line Regulation	ΔV_O	V_I=8.5V to 20V, T_j=25°C	--	--	150	mV
		V_I=9V to 20V, T_j=25°C	--	--	100	mV
Load Regulation	ΔV_O	I_O=1mA to100mA, Tj=25°C	--	--	60	mV
		I_O=1mA to 40mA, Tj=25°C	--	--	30	mV
Quiescent Current	I_Q	Tj=25°C	--	--	6.0	mA
		Tj=125°C	--	--	5.5	mA
Quiescent Current Change	ΔI_d	I_O=1mA to 40mA	--	--	0.1	mA
		V_I=9V to 20V	--	--	1.5	mA
Output Noise Voltage	eN	B =10Hz to 100KHz, Tj=25°C	--	50	--	µV
Supply Voltage Rejection	SVR	V_I = 9 to 20V, V_f=120Hz, I_O = 40mA, Tj=25°C	39	46	--	dB
Dropout Voltage	V_d		--	1.7	--	V

ELECTRICAL CHARACTERISTICS OF LM78L08 (refer to the test circuit, V_I= 14V, I_O =40mA, C_I=0.33µF, C_O= 0.1µF, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_O	25ºC	7.68	8.0	8.32	V
		I_O=1mA to 40mA, V_I=10.5V to 23V,	7.60	--	8.40	V
		I_O=1mA to 70mA, V_I=14V,	7.60	--	8.40	V
Line Regulation	ΔV_O	V_I=10.5V to 23V, T_j=25°C	--	--	175	mV
		V_I=11V to 23V, T_j=25°C	--	--	125	mV
Load Regulation	ΔV_O	I_O=1mA to100mA, Tj=25°C	--	--	80	mV
		I_O=1mA to 40mA, Tj=25°C	--	--	40	mV
Quiescent Current	I_Q	Tj=25°C	--	--	6.0	mA
		Tj=125°C	--	--	5.5	mA
Quiescent Current Change	ΔI_d	I_O=1mA to 40mA	--	--	0.1	mA
		V_I=11V to 23V	--	--	1.5	mA
Output Noise Voltage	eN	B =10Hz to 100KHz, Tj=25°C	--	60	--	µV
Supply Voltage Rejection	SVR	V_I = 12 to 23V, V_f=120Hz, I_O = 40mA, Tj=25°C	37	45	--	dB
Dropout Voltage	V_d		--	1.7	--	V

ELECTRICAL CHARACTERISTICS OF LM78L09 (refer to the test circuit, V_I= 15V, I_O =40mA, C_I=0.33µF, C_O= 0.1µF, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_O	25ºC	8.68	9.0	9.36	V
		I_O=1mA to 40mA, V_I=11.5V to 23V,	8.55	--	9.45	V
		I_O=1mA to 70mA, V_I=15V,	8.55	--	9.45	V
Line Regulation	ΔV_O	V_I=11.5V to 23V, T_j=25°C	--	--	225	mV
		V_I=12V to 23V, T_j=25°C	--	--	150	mV
Load Regulation	ΔV_O	I_O=1mA to100mA, Tj=25°C	--	--	80	mV
		I_O=1mA to 40mA, Tj=25°C	--	--	40	mV
Quiescent Current	I_Q	Tj=25°C	--	--	6.0	mA
		Tj=125°C	--	--	5.5	mA
Quiescent Current Change	ΔI_d	I_O=1mA to 40mA	--	--	0.1	mA
		V_I=12V to 23V	--	--	1.5	mA
Output Noise Voltage	eN	B =10Hz to 100KHz, Tj=25°C	--	70	--	µV
Supply Voltage Rejection	SVR	V_I = 12 to 23V, V_f=120Hz, I_O = 40mA, Tj=25°C	37	44	--	dB
Dropout Voltage	V_d		--	1.7	--	V

ELECTRICAL CHARACTERISTICS OF LM78L10 (refer to the test circuit, V_I= 16V, I_O =40mA, C_I=0.33µF, C_O= 0.1µF, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_O	25ºC	9.6	10	10.4	V
		I_O=1mA to 40mA, V_I=12.5V to 23V,	9.5	--	10.5	V
		I_O=1mA to 70mA, V_I=16V,	9.5	--	10.5	V
Line Regulation	ΔV_O	V_I=12.5V to 23V, T_j=25°C	--	--	230	mV
		V_I=13V to 23V, T_j=25°C	--	--	170	mV
Load Regulation	ΔV_O	I_O=1mA to100mA, Tj=25°C	--	--	80	mV
		I_O=1mA to 40mA, Tj=25°C	--	--	40	mV
Quiescent Current	I_Q	Tj=25°C	--	--	6	mA
		Tj=125°C	--	--	5.5	mA
Quiescent Current Change	ΔI_d	I_O=1mA to 40mA	--	--	0.1	mA
		V_I=13V to 23V	--	--	1.5	mA
Output Noise Voltage	eN	B =10Hz to 100KHz, Tj=25°C	--	60	--	µV
Supply Voltage Rejection	SVR	V_I = 14 to 23V, V_f=120Hz, I_O = 40mA, Tj=25°C	37	45	--	dB
Dropout Voltage	V_d		--	1.7	--	V

ELECTRICAL CHARACTERISTICS OF LM78L12 (refer to the test circuit, V_I= 15V, I_O =40mA, C_I=0.33µF, C_O= 0.1µF, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_O	25ºC			12.5	V
		I_O=1mA to 40mA, V_I=14.5V to 23V,		--	12.6	V
		I_O=1mA to 70mA, V_I=19V,		--	12.6	V
Line Regulation	ΔV_O	V_I=14.5V to 27V, T_j=25°C	--	--	250	mV
		V_I=16V to 27V, T_j=25°C	--	--	200	mV
Load Regulation	ΔV_O	I_O=1mA to100mA, Tj=25°C	--	--	100	mV
		I_O=1mA to 40mA, Tj=25°C	--	--	50	mV
Quiescent Current	I_Q	Tj=25°C	--	--	6.5	mA
		Tj=125°C	--	--	6	mA
Quiescent Current Change	ΔI_d	I_O=1mA to 40mA	--	--	0.1	mA
		V_I=16V to 27V	--	--	1.5	mA
Output Noise Voltage	eN	B =10Hz to 100KHz, Tj=25°C	--	80	--	µV
Supply Voltage Rejection	SVR	V_I = 15 to 25V, V_f=120Hz, I_O = 40mA, Tj=25°C	37	42	--	dB
Dropout Voltage	V_d		--	1.7	--	V

ELECTRICAL CHARACTERISTICS OF LM78L15 (refer to the test circuit, V_I= 19V, I_O =40mA, C_I=0.33µF, C_O= 0.1µF, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_O	25ºC	14.4	15	15.6	V
		I_O=1mA to 40mA, V_I=17V to 30V,	14.25	--	15.75	V
		I_O=1mA to 70mA, V_I=23V,	14.25	--	15.75	V
Line Regulation	ΔV_O	V_I=17.5V to 30V, T_j=25°C	--	--	300	mV
		V_I=20V to 30V, T_j=25°C	--	--	250	mV
Load Regulation	ΔV_O	I_O=1mA to100mA, Tj=25°C	--	--	150	mV
		I_O=1mA to 40mA, Tj=25°C	--	--	75	mV
Quiescent Current	I_Q	Tj=25°C	--	--	6.5	mA
		Tj=125°C	--	--	6	mA
Quiescent Current Change	ΔI_d	I_O=1mA to 40mA	--	--	0.1	mA
		V_I=20V to 30V	--	--	1.5	mA
Output Noise Voltage	eN	B =10Hz to 100KHz, Tj=25°C	--	90	--	µV
Supply Voltage Rejection	SVR	V_I = 18.5 to 228.5V, V_f=120Hz, I_O = 40mA, Tj=25°C	34	39	--	dB
Dropout Voltage	V_d		--	1.7	--	V

ELECTRICAL CHARACTERISTICS OF LM78L18 (refer to the test circuit, V_I= 27V, I_O =40mA, C_I=0.33µF, C_O= 0.1µF, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_O	25ºC	17.3	18	18.7	V
		I_O=1mA to 40mA, V_I=22V to 33V,	17.1	--	18.9	V
		I_O=1mA to 70mA, V_I=27V,	17.1	--	18.9	V
Line Regulation	ΔV_O	V_I=22V to 33V, T_j=25°C	--	--	320	mV
		V_I=22V to 33V, T_j=25°C	--	--	270	mV
Load Regulation	ΔV_O	I_O=1mA to100mA, Tj=25°C	--	--	170	mV
		I_O=1mA to 40mA, Tj=25°C	--	--	85	mV
Quiescent Current	I_Q	Tj=25°C	--	--	6.5	mA
		Tj=125°C	--	--	6	mA
Quiescent Current Change	ΔI_d	I_O=1mA to 40mA	--	--	0.1	mA
		V_I=23V to 33V	--	--	1.5	mA
Output Noise Voltage	eN	B =10Hz to 100KHz, Tj=25°C	--	120	--	µV
Supply Voltage Rejection	SVR	V_I = 23V to 33V, V_f=120Hz, I_O = 40mA, Tj=25°C	33	38	--	dB
Dropout Voltage	V_d		--	1.7	--	V

ELECTRICAL CHARACTERISTICS OF LM78L20 (refer to the test circuit, V_I= 29V, I_O =40mA, C_I=0.33µF, C_O= 0.1µF, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_O	25ºC	19.2	20	20.8	V
		I_O=1mA to 40mA, V_I=24V to 33V,	19	--	21	V
		I_O=1mA to 70mA, V_I=29V,	19	--	21	V
Line Regulation	ΔV_O	V_I=22.5 to 34 V, T_j=25°C	--	--	330	mV
		V_I=24V to 34V, T_j=25°C	--	--	280	mV
Load Regulation	ΔV_O	I_O=1mA to100mA, Tj=25°C	--	--	180	mV
		I_O=1mA to 40mA, Tj=25°C	--	--	90	mV
Quiescent Current	I_Q	Tj=25°C	--	--	6.5	mA
		Tj=125°C	--	--	6	mA
Quiescent Current Change	ΔI_d	I_O=1mA to 40mA	--	--	0.1	mA
		V_I=25V to 33V	--	--	1.5	mA
Output Noise Voltage	eN	B =10Hz to 100KHz, Tj=25°C	--	120	--	µV
Supply Voltage Rejection	SVR	V_I = 25 to 35V, V_f=120Hz, I_O = 40mA, Tj=25°C	32	38	--	dB
Dropout Voltage	V_d		--	1.7	--	V

ELECTRICAL CHARACTERISTICS OF LM78L24 (refer to the test circuit, V_I= 27V, I_O =40mA, C_I=0.33µF, C_O= 0.1µF, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_O	25ºC	23	24	25	V
		I_O=1mA to 40mA, V_I=27 to 38 V,	22.8	--	25.2	V
		I_O=1mA to 70mA, V_I=33V,	22.8	--	25.2	V
Line Regulation	ΔV_O	V_I=27 to 38 V, T_j=25°C	--	--	350	mV
		V_I=28 to 38 V, T_j=25°C	--	--	300	mV
Load Regulation	ΔV_O	I_O=1mA to100mA, Tj=25°C	--	--	200	mV
		I_O=1mA to 40mA, Tj=25°C	--	--	100	mV
Quiescent Current	I_Q	Tj=25°C	--	--	6.5	mA
		Tj=125°C	--	--	6	mA
Quiescent Current Change	ΔI_d	I_O=1mA to 40mA	--	--	0.1	mA
		VI=28 to 38 V, Tj=25°C	--	--	1.5	mA
Output Noise Voltage	eN	B =10Hz to 100KHz, Tj=25°C	--	200	--	µV
Supply Voltage Rejection	SVR	V_I = 23 to 33V, V_f=120Hz, I_O = 40mA, Tj=25°C	31	37	--	dB
Dropout Voltage	V_d		--	1.7	--	V

Typical Characteristics Curves

Fig. 1. LM78L05/12 Output Voltage vs Ambient Temperature

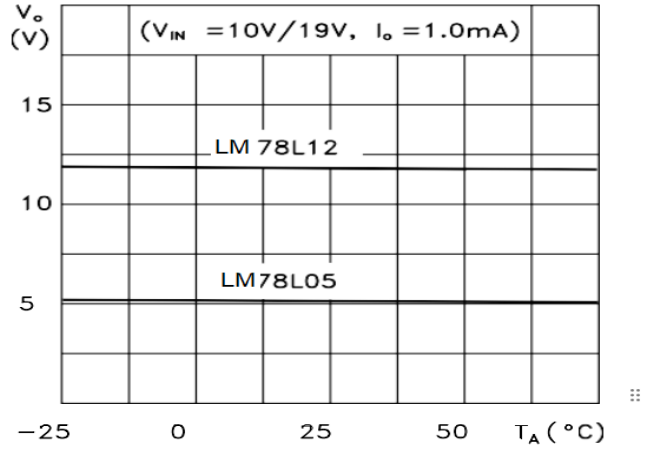


Fig. 2. LM78L05/12/24 Load Characteristics

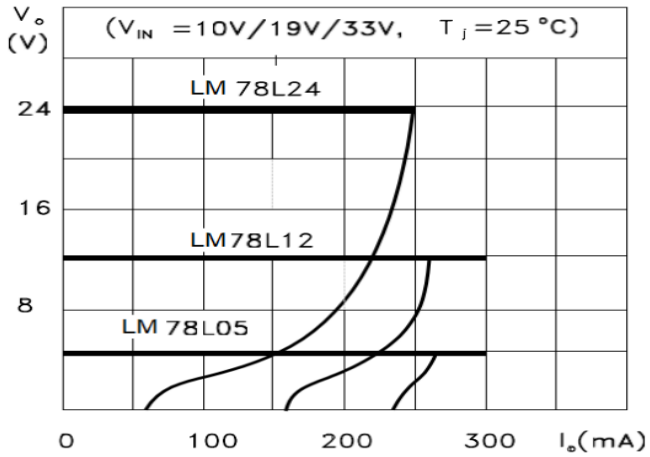


Fig. 3. LM78L05/12/24 Thermal Shutdown

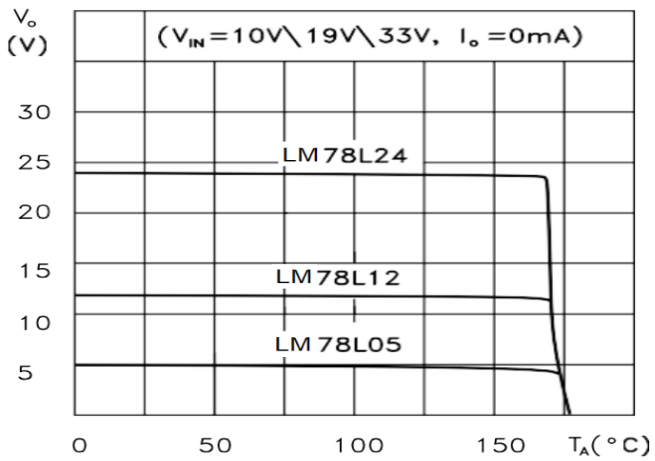


Fig. 4. LM78L05/12 Quiescent Current vs Output Current

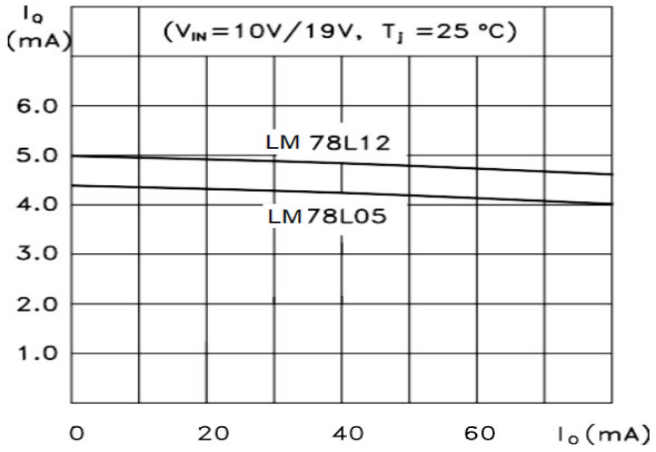


Fig. 5. LM78L05 Quiescent Current vs Input Voltage

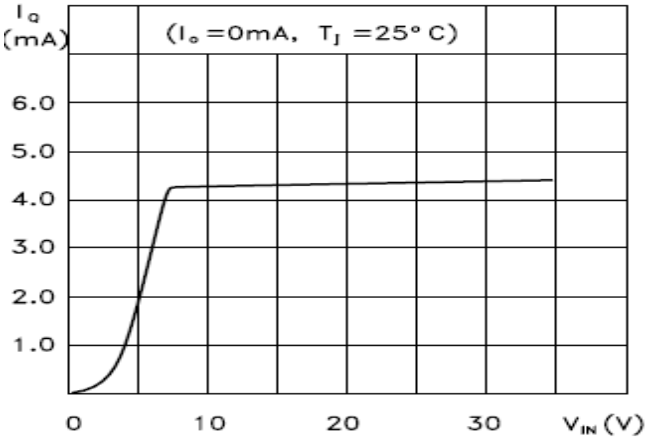
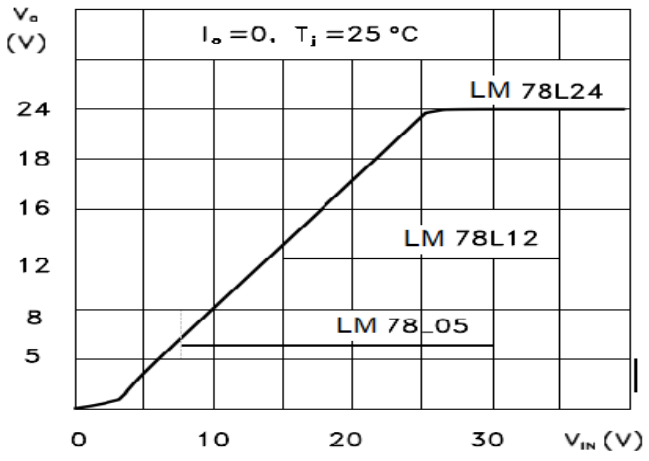


Fig. 6. LM78L05/12/24 Output Characteristics



Typical Characteristics Curves

Fig. 7. LM78L05/12/24 Ripple Rejection

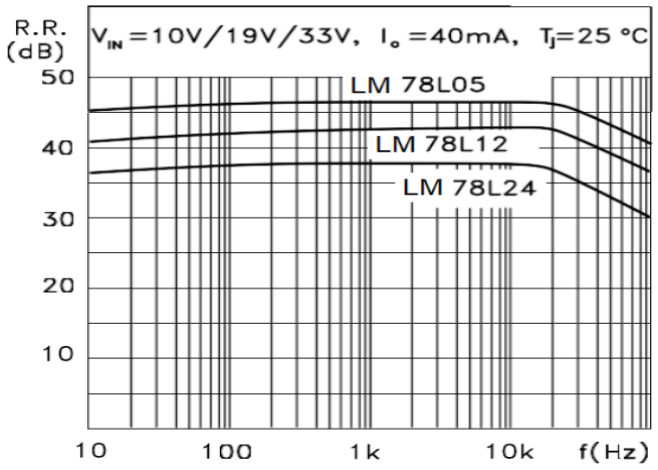


Fig. 8. LM78L05 Dropout Characteristics

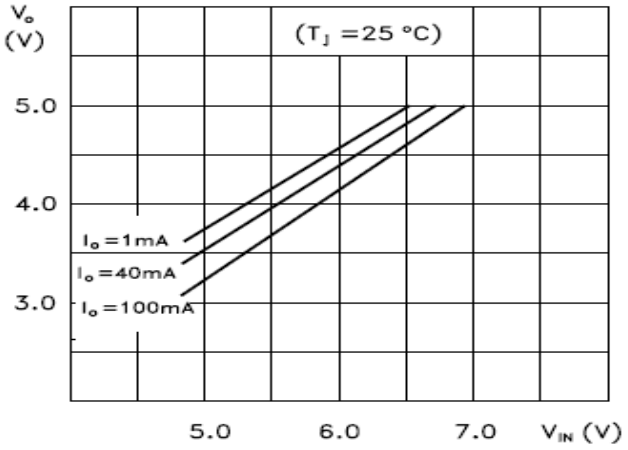
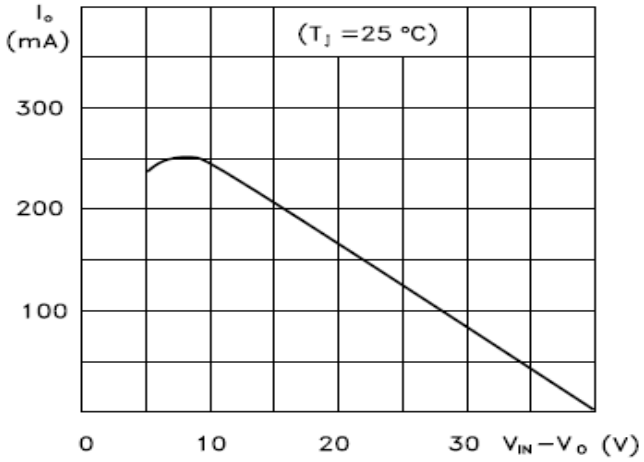


Fig. 9. LM78LXX Series Short Circuit Output Current



TYPICAL APPLICATIONS

Fig. 10. High Output Current Short Circuit Protected

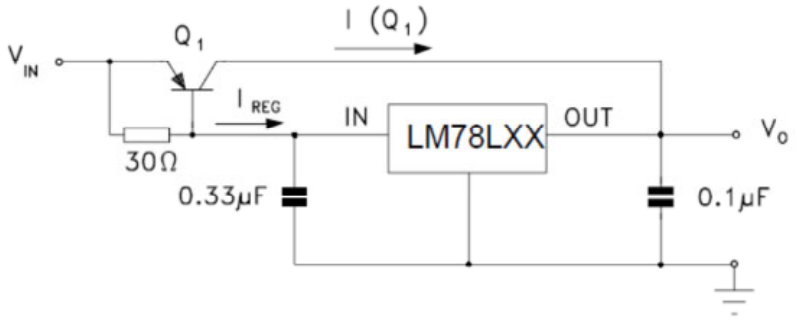


Fig. 11. Edit Boost Circuit

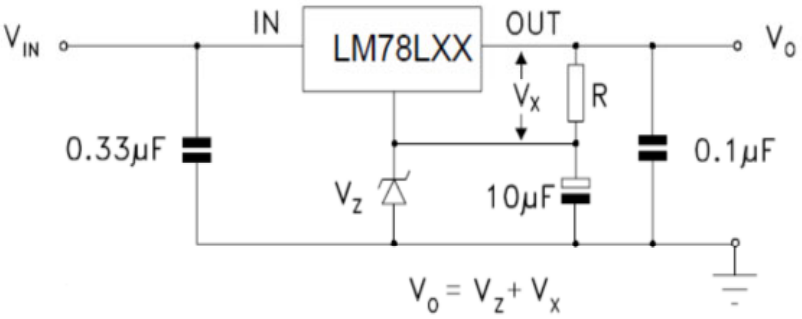


Fig. 12. Current Regulator

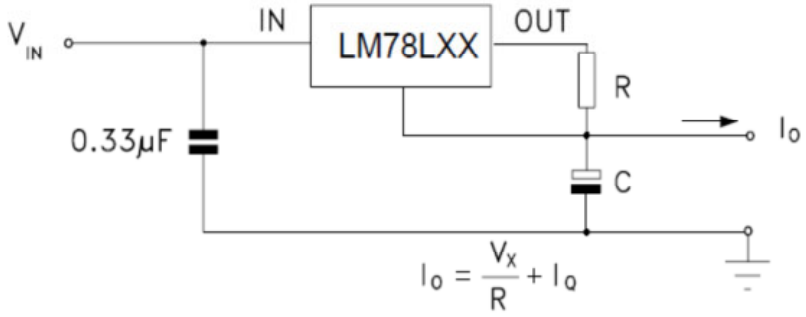
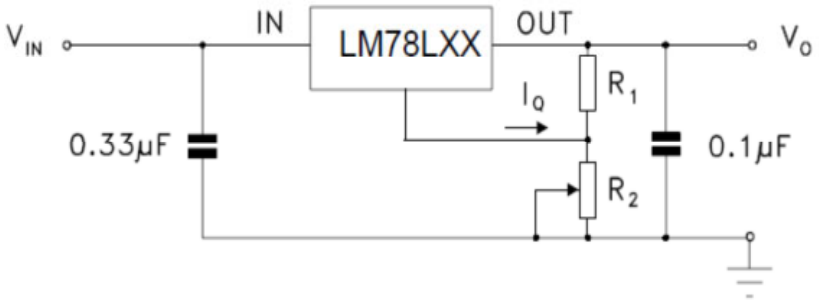
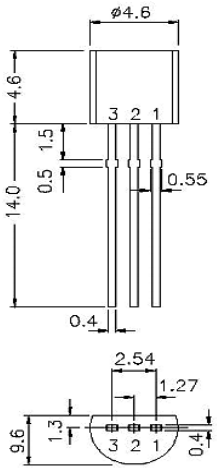


Fig. 13. Adjustable Output Regulator



Package Details

TO-92 Plastic Package



All Dimensions are in mm

Pin Configuration

1. Input
2. Ground
3. Output

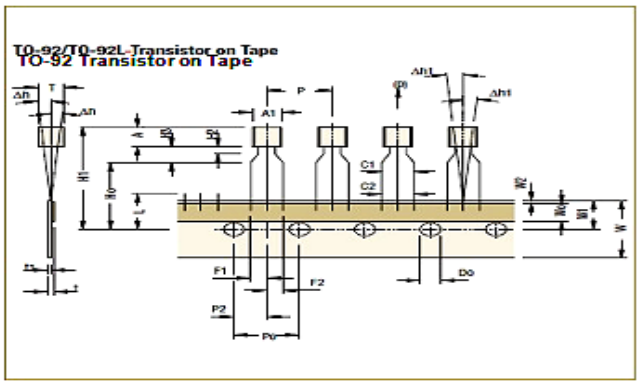
Packing details of TO-92

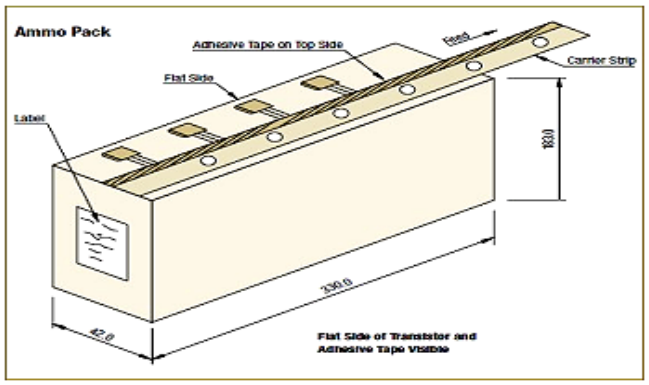
Packaging Specifications . . .

T & A: Tape and Ammo Pack; **T & R:** Tape and Reel; **Bulk:** Loose in Poly Bags; **Tube:** Tube and Carton; **K:** 1,000

Package / Case Type	Packaging Type	Std. Packing	Inner Carton			Outer Carton		
		Qty	Qty	Size L x W x H	Gross Weight	Qty	Size L x W x H	Gross Weight
				(cm)	(Kg)		(cm)	(Kg)
TO-92	Bulk	1,000	5K	19 x 19 x 8	1.1	80K	43 x 40 x 35	20.0
	T & A	2,000	2K	32 x 4.5 x 20	0.7	40K	43 x 40 x 35	15.2

TO-92 and Tape and Ammo Packaging





Tape Specifications

		TO-92			
Item description	**Symbol**	**Min**	**Nom**	**Max**	**Tol**
Body width	A1	4.45		5.20	
Body height	A	4.32		5.33	
Body thickness	T	3.18		4.19	
Pitch of component[Cr]	P		12.7		±1.0
Feed hole pitch[§1]	Po		12.7		±0.3
Feed hole center to component centre[§2]	P2		6.35		±0.4
Comp. alignment, Side view[§3]	Dh		0	1.0	
Comp. alignment, Front view[§3]	Dh1		0	1.3	
Tape width[Cr]	W		18		±0.5
Hold down tape width[Cr]	Wo		6		±0.2
Hole position	W1		9		+0.7 -0.5
Hold-down tape position	W2	0.0		0.7	
Lead wire clinch height	Ho		16		±0.5
Component height	H1			24.0	
Length of snipped leads	L			11.0	
Feed hole diameter[Cr]	Do		4		±0.2
Total tape thickness[§4]	t			1.2	
Lead-to-lead distance[Cr]	F1, F2	2.4		2.7	
Stand off	H2	0.45		1.45	
Clinch height	H3			3.0	
Lead parallelismCr	C1-C2			0.22	
Pull-out force	(p)	6N			

Taping Specification

- Maximum alignment deviation between leads not to be greater than 0.20 mm.
- Maximum non-cumulative variation between tape feed holes shall not exceed 1 mm in 20 pitches.
- Hold down tape not to exceed beyond the edge(s) carrier tape and there shall be no exposure of adhesive.
- No more than 3 consecutive missing components is permitted.
- A tape trailer, having at least three feed holes is required after the last component.
- Splices shall not interfere with the sprocket feed holes.

§1 Cumulative pitch error 1.0 mm/20 pitch.
§2 To be measured at bottom of clinch.
§3 At top of body.
§4 t1 = 0.3 – 0.6 mm
Cr Critical Dimension.

Recommended Reflow Solder Profiles

The recommended reflow solder profiles for Pb and Pb-free devices are shown below.

Figure 1 shows the recommended solder profile for devices that have Pb-free terminal plating, and where a Pb-free solder is used.

Figure 2 shows the recommended solder profile for devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with a leaded solder.

Figure 1

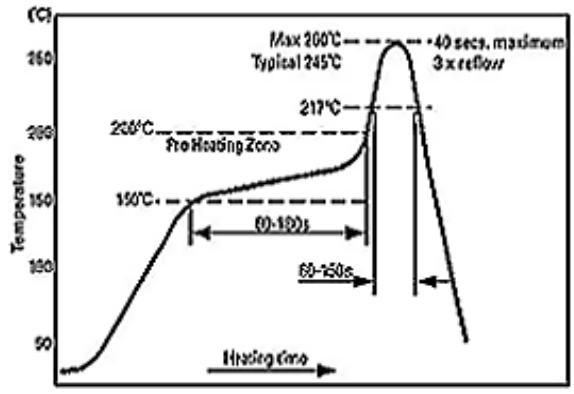
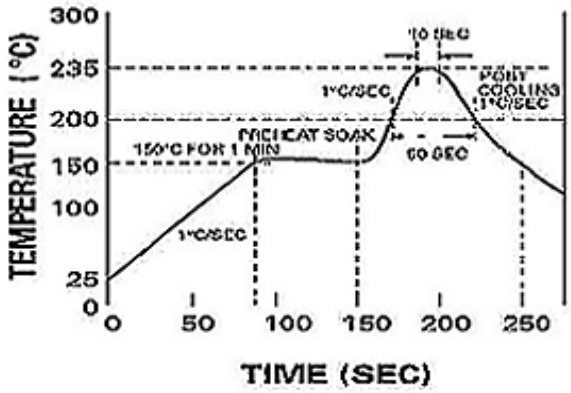


Figure 2

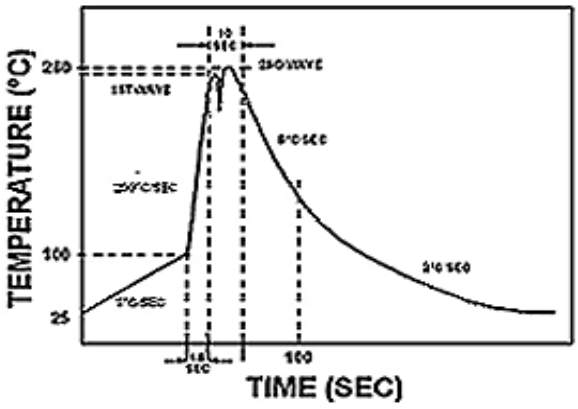


Reflow profiles in tabular form

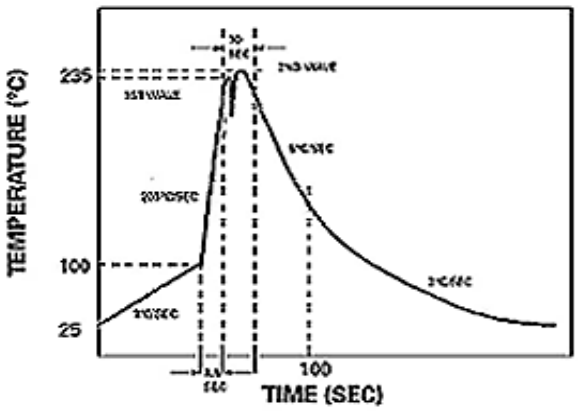
Profile Feature	Sn-Pb System	Pb-Free System
Average Ramp-Up Rate	~3°C/second	~3°C/second
Preheat – Temperature Range – Time	 150-170°C 60-180 seconds	 150-200°C 60-180 seconds
Time maintained above: – Temperature – Time	 200°C 30-50 seconds	 217°C 60-150 seconds
Peak Temperature	235°C	260°C max.
Time within +0 -5°C of actual Peak	10 seconds	40 seconds
Ramp-Down Rate	3°C/second max.	6°C/second max.

Recommended Wave Solder Profiles

The Recommended solder Profile For Devices with Pb-free terminal plating where a Pb-free solder is used



The Recommended solder Profile For Devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with leaded solder



Wave Profiles in Tabular Form

Profile Feature	Sn-Pb System	Pb-Free System
Average Ramp-Up Rate	~200°C/second	~200°C/second
Heating rate during preheat	Typical 1-2, Max 4°C/sec	Typical 1-2, Max 4°C/Sec
Final preheat Temperature	Within 125°C of Solder Temp	Within 125°C of Solder Temp
Peak Temperature	235°C	260°C max.
Time within +0 -5°C of actual Peak	10 seconds	10 seconds
Ramp-Down Rate	5°C/second max.	5°C/second max

Recommended Product Storage Environment for Discrete Semiconductor Devices

This storage environment assumes that the Diodes and transistors are packed properly inside the original packing supplied by CDIL.

- Temperature 5 °C to 30 °C
- Humidity between 40 to 70 %RH
- Air should be clean.
- Avoid harmful gas or dust.
- Avoid outdoor exposure or storage in areas subject to rain or water spraying .
- Avoid storage in areas subject to corrosive gas or dust. Product shall not be stored in areas exposed to direct sunlight.
- Avoid rapid change of temperature.
- Avoid condensation.
- Mechanical stress such as vibration and impact shall be avoided.
- The product shall not be placed directly on the floor.
- The product shall be stored on a plane area. They should not be turned upside down. They should not be placed against the wall.

Shelf Life of CDIL Products

The shelf life of products is the period from product manufacture to shipment to customers. The product can be unconditionally shipped within this period. The period is defined as 2 years.
If products are stored longer than the shelf life of 2 years the products shall be subjected to quality check as per CDIL quality procedure.
The products are further warranted for another one year after the date of shipment subject to the above conditions in CDIL original packing.

Floor Life of CDIL Products and MSL Level

When the products are opened from the original packing, the floor life will start.
For this, the following JEDEC table may be referred:

JEDEC MSL Level		
Level	**Time**	**Condition**
1	Unlimited	≤30 °C / 85% RH
2	1 Year	≤30 °C / 60% RH
2a	4 Weeks	≤30 °C / 60% RH
3	168 Hours	≤30 °C / 60% RH
4	72 Hours	≤30 °C / 60% RH
5	48 Hours	≤30 °C / 60% RH
5a	24 Hours	≤30 °C / 60% RH
6	Time on Label(TOL)	≤30 °C / 60% RH

Component Disposal Instructions

1. CDIL Semiconductor Devices are RoHS compliant, customers are requested to please dispose as per prevailing Environmental Legislation of their Country.
2. In Europe, please dispose as per EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).

Disclaimer

The product information and the selection guides facilitate selection of the CDIL's Semiconductor Device(s) best suited for application in your product(s) as per your requirement. It is recommended that you completely review our Data Sheet(s) so as to confirm that the Device(s) meet functionality parameters for your application. The information furnished in the Data Sheet and on the CDIL Web Site/CD are believed to be accurate and reliable. CDIL however, does not assume responsibility for inaccuracies or incomplete information. Furthermore, CDIL does not assume liability whatsoever, arising out of the application or use of any CDIL product; neither does it convey any license under its patent rights nor rights of others. These products are not designed for use in life saving/support appliances or systems. CDIL customers selling these products (either as individual Semiconductor Devices or incorporated in their end products), in any life saving/support appliances or systems or applications do so at their own risk and CDIL will not be responsible for any damages resulting from such sale(s).

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