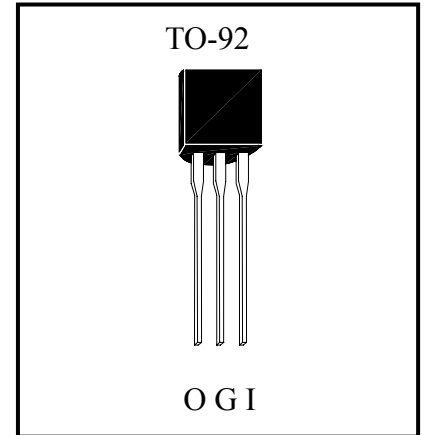**CYStech Electronics Corp.**

Low Current Positive Voltage Regulator
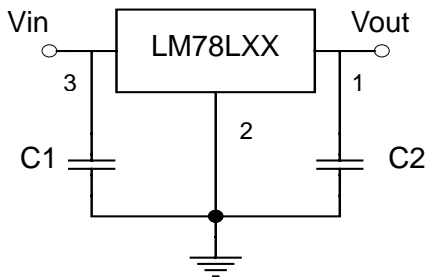
LM78LXXA3

TO-92

O G I

Description

The LM78LXXA3 series of positive regulators are available in the TO-92 package and with 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V and 24V fixed output voltages, making it useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type employs internal current limiting, thermal shut-down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 100mA output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents. LM78LXXA3 is characterized for operation from 0℃ to 125℃.

Features:

• Internal Short-Circuit Current Limiting
• Internal Thermal Overload Protection
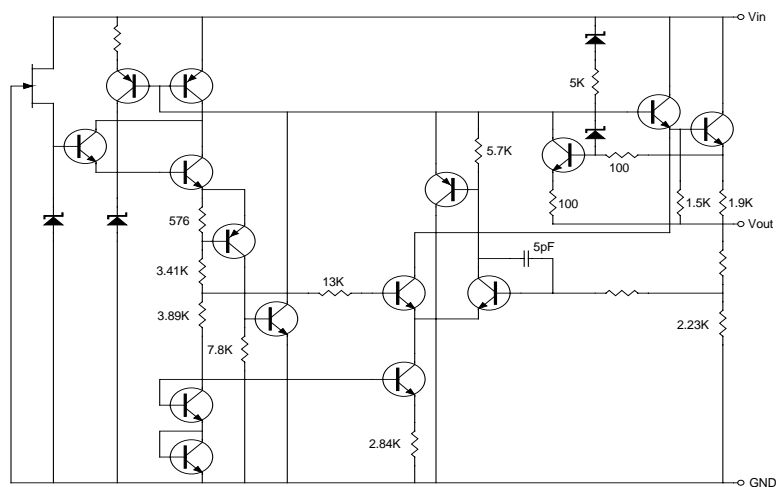• No External Components Required
• Pb-free package

Typical Application

A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0V above the output voltage even during the low point on the input ripple voltage.
Note : C1 and C2 are required if regulator is located far from power supply filter and load, or oscillation may induced on the loop.

Schematic Diagram

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Absolute Maximum Ratings

Parameter		Ratings	Unit
Input Voltage	LM78L05 ~ 10	30	V
	LM78L12 ~18	35	
	LM78L24	40	
Output Current		150	mA
Operating Junction Temperature Range		0 ~ 125	℃
Storage Temperature Range		-55 ~ 150	℃
Power Dissipation		625 (Note)	mW

Note : When tested in free air condition, without heat sinking.

Electrical Characteristics

LM78L05 (Vin=10V, Io=40mA, Tj=0~125°C, Cin=0.33uF, Cout=0.1uF ,unless otherwise noted) (Note 1)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	4.85	5	5.15	Vin=10V, Io=40mA,Tj=25°C 7V≤Vin≤20V, 1mA≤Io≤40mA	V
	B-rank(5%)		4.75	-	5.25	7V≤Vin≤Vmax, 1mA≤Io≤70mA (Note 2)	
ΔVo		Line Regulation	-	18	75	7V≤Vin≤20V	mV
			-	10	54	8V≤Vin≤20V	
ΔVo		Load Regulation	-	20	60	1mA≤Io≤150mA	mV
			-	5	30	1mA≤Io≤40mA	
IQ		Quiescent Current	-	3	5	Tj=25°C, Vin=10V, Io=0mA	mA
ΔIQ		Quiescent Current Change	-	-	1	8V≤Vin≤20V	mA
			-	-	0.1	1mA≤Io≤40mA	
Vn		Output Noise Voltage	-	40	-	10Hz≤f≤100KHz	μV
ΔVin / ΔVout		Ripple Rejection	47	62	-	8V≤Vin≤20V, f=120Hz	dB
ΔVo/ΔTj		Temperature Stability	-	-0.65	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃
VD		Dropout Voltage	-	1.7	-	Io=100mA	V

LM78L06 (Vin=12V, Io=40mA, Tj=0~125°C, Cin=0.33uF, Cout=0.1uF, unless otherwise noted) (Note 1)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	5.82	6	6.18	Vin=12V, Io=40mA,Tj=25°C 8.5V≤Vin≤20V, 1mA≤Io≤40mA	V
	B-rank(5%)		5.70	-	6.30	8.5V≤Vin≤Vmax, 1mA≤Io≤70mA (Note 2)	
ΔVo		Line Regulation	-	64	175	8.5V≤Vin≤20V	mV
			-	54	125	9V≤Vin≤20V	
ΔVo		Load Regulation	-	12.8	80	1mA≤Io≤150mA	mV
			-	5.8	40	1mA≤Io≤70mA	
IQ		Quiescent Current	-	3.9	6	Tj=25°C, Vin=12V, Io=0mA	mA
ΔIQ		Quiescent Current Change	-	-	1.5	9V≤Vin≤20V	mA
			-	-	0.1	1mA≤Io≤40mA	
Vn		Output Noise Voltage	-	49	-	10Hz≤f≤100KHz	μV
ΔVin / ΔVout		Ripple Rejection	40	46	-	10V≤Vin≤20V, f=120Hz	dB
ΔVo/ΔTj		Temperature Stability	-	0.75	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃
VD		Dropout Voltage	-	1.7	-	Io=100mA	V

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LM78L08 (Vin=14V, Io=40mA, Tj=0~125°C, Cin=0.33uF, Cout=0.1uF, unless otherwise noted) (Note 1)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	7.76	8	8.24	Vin=14V, Io=40mA,Tj=25°C 10.5V≤Vin≤23V, 1mA≤Io≤40mA	V
	B-rank(5%)		7.60	-	8.40	10.5V≤Vin≤Vmax,1mA≤Io≤70mA (Note 2)	
ΔVo		Line Regulation	-	10	175	10.5V≤Vin≤23V	mV
			-	8	125	11V≤Vin≤23V	
ΔVo		Load Regulation	-	15	80	1mA≤Io≤150mA	mV
			-	8	40	1mA≤Io≤70mA	
IQ		Quiescent Current	-	2.0	5.5	Tj=25°C, Vin=14V, Io=0mA	mA
ΔIQ		Quiescent Current Change	-	-	1.5	11V≤Vin≤23V	mA
			-	-	0.1	1mA≤Io≤40mA	
Vn		Output Noise Voltage	-	49	-	10Hz≤f≤100KHz	μV
ΔVin / ΔVout		Ripple Rejection	39	45	-	11V≤Vin≤21V, f=120Hz	dB
ΔVo/ΔTj		Temperature Stability	-	0.75	-	Io=5mA, 0°C ≤Tj≤125°C	mV/°C
VD		Dropout Voltage	-	1.7	-	Io=100mA	V

LM78L09 (Vin=15V, Io=40mA, Tj=0~125°C, Cin=0.33uF, Cout=0.1uF, unless otherwise noted) (Note 1)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	8.73	9	9.27	Vin=15V, Io=40mA,Tj=25°C 11.5V≤Vin≤24V, 1mA≤Io≤40mA	V
	B-rank(5%)		8.55	-	9.45	11.5V≤Vin≤Vmax,1mA≤Io≤70mA (Note 2)	
ΔVo		Line Regulation	-	90	200	11.5V≤Vin≤24V	mV
			-	100	150	13V≤Vin≤24V	
ΔVo		Load Regulation	-	20	90	1mA≤Io≤150mA	mV
			-	10	45	1mA≤Io≤40mA	
IQ		Quiescent Current	-	2.0	6.0	Tj=25°C, Vin=15V, Io=0mA	mA
ΔIQ		Quiescent Current Change	-	-	1.5	13V≤Vin≤24V	mA
			-	-	0.1	1mA≤Io≤40mA	
Vn		Output Noise Voltage	-	49	-	10Hz≤f≤100KHz	μV
ΔVin / ΔVout		Ripple Rejection	38	44	-	12V≤Vin≤23V, f=120Hz	dB
ΔVo/ΔTj		Temperature Stability	-	0.75	-	Io=5mA, 0°C ≤Tj≤125°C	mV/°C
VD		Dropout Voltage	-	1.7	-	Io=100mA	V

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Issued Date : 2007.11.28
Revised Date :
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LM78L10 (Vin=17V, Io=40mA, Tj=0~125°C, Cin=0.33uF, Cout=0.1uF, unless otherwise noted) (Note 1)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	9.70	10	10.30	Vin=17V, Io=40mA,Tj=25°C	V
	B-rank(5%)		9.50	-	10.50	13V≤Vin≤25V, 1mA≤Io≤40mA 13V≤Vin≤Vmax,1mA≤Io≤70mA (Note 2)	
ΔVo		Line Regulation	-	51	175	13V≤Vin≤25V	mV
			-	42	125	14V≤Vin≤25V	
ΔVo		Load Regulation	-	20	90	1mA≤Io≤150mA	mV
			-	11	40	1mA≤Io≤40mA	
IQ		Quiescent Current	-	4.2	6.0	Tj=25°C, Vin=17V, Io=0mA	mA
ΔIQ		Quiescent Current Change	-	-	1.5	14V≤Vin≤25V	mA
			-	-	0.1	1mA≤Io≤40mA	
Vn		Output Noise Voltage	-	62	-	10Hz≤f≤100KHz	μV
ΔVin / ΔVout		Ripple Rejection	37	44	-	15V≤Vin≤25V, f=120Hz	dB
ΔVo/ΔTj		Temperature Stability	-	0.75	-	Io=5mA, 0°C ≤Tj≤125°C	mV/°C
VD		Dropout Voltage	-	1.7	-	Io=100mA	V

LM78L12 (Vin=19V, Io=40mA, Tj=0~125°C, Cin=0.33uF, Cout=0.1uF, unless otherwise noted) (Note 1)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	11.64	12	12.36	Vin=19V, Io=40mA,Tj=25°C	V
	B-rank(5%)		11.40	-	12.60	14.5V≤Vin≤27V, 1mA≤Io≤40mA 14.5V≤Vin≤Vmax,1mA≤Io≤70mA (Note 2)	
ΔVo		Line Regulation	-	25	300	14.5V≤Vin≤27V	mV
			-	20	250	16V≤Vin≤27V	
ΔVo		Load Regulation	-	25	150	1mA≤Io≤150mA	mV
			-	12	75	1mA≤Io≤40mA	
IQ		Quiescent Current	-	2.0	6.0	Tj=25°C, Vin=19V, Io=0mA	mA
ΔIQ		Quiescent Current Change	-	-	1.5	16V≤Vin≤27V	mA
			-	-	0.1	1mA≤Io≤40mA	
Vn		Output Noise Voltage	-	80	-	10Hz≤f≤100KHz	μV
ΔVin / ΔVout		Ripple Rejection	37	65	-	15V≤Vin≤25V, f=120Hz	dB
ΔVo/ΔTj		Temperature Stability	-	-1.0	-	Io=5mA, 0°C ≤Tj≤125°C	mV/°C
VD		Dropout Voltage	-	1.7	-	Io=100mA	V

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LM78L15 (Vin=23V, Io=40mA, Tj=0~125°C, Cin=0.33uF, Cout=0.1uF, unless otherwise noted) (Note 1)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	14.55	15	15.45	Vin=23V, Io=40mA,Tj=25°C 17.5V≤Vin≤30V, 1mA≤Io≤40mA 17.5V≤Vin≤Vmax,1mA≤Io≤70mA (Note 2)	V
	B-rank(5%)		14.25	-	15.75		
ΔVo		Line Regulation	-	25	150	17.5V≤Vin≤30V	mV
			-	15	75	20V≤Vin≤30V	
ΔVo		Load Regulation	-	20	150	1mA≤Io≤150mA	mV
			-	25	150	1mA≤Io≤70mA	
IQ		Quiescent Current	-	2.2	6.5	Tj=25°C, Vin=23V, Io=0mA	mA
ΔIQ		Quiescent Current Change	-	-	1.5	20V≤Vin≤30V	mA
			-	-	0.1	1mA≤Io≤40mA	
Vn		Output Noise Voltage	-	90	-	10Hz≤f≤100KHz	μV
ΔVin / ΔVout		Ripple Rejection	34	63	-	18.5V≤Vin≤28.5V, f=120Hz	dB
ΔVo/ΔTj		Temperature Stability	-	-1.3	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃
VD		Dropout Voltage	-	1.7	-	Io=100mA	V

LM78L18 (Vin=27V, Io=40mA, Tj=0~125°C, Cin=0.33uF, Cout=0.1uF, unless otherwise noted) (Note 1)

Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	17.46	18	18.54	Vin=27V, Io=40mA,Tj=25°C 21V≤Vin≤33V, 1mA≤Io≤40mA 21V≤Vin≤Vmax,1mA≤Io≤70mA (Note 2)	V
	B-rank(5%)		17.10	-	18.90		
ΔVo		Line Regulation	-	145	300	21V≤Vin≤33V	mV
			-	135	250	22V≤Vin≤33V	
ΔVo		Load Regulation	-	30	170	1mA≤Io≤150mA	mV
			-	15	85	1mA≤Io≤40mA	
IQ		Quiescent Current	-	2.0	6.0	Tj=25°C, Vin=27V, Io=0mA	mA
ΔIQ		Quiescent Current Change	-	-	1.5	21V≤Vin≤33V	mA
			-	-	0.1	1mA≤Io≤40mA	
Vn		Output Noise Voltage	-	150	-	10Hz≤f≤100KHz	μV
ΔVin / ΔVout		Ripple Rejection	34	48	-	23V≤Vin≤33V, f=120Hz	dB
ΔVo/ΔTj		Temperature Stability	-	-1.8	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃
VD		Dropout Voltage	-	1.7	-	Io=100mA	V

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LM78L24 (Vin=33V, Io=40mA, Tj=0~125°C, Cin=0.33uF, Cout=0.1uF, unless otherwise noted) (Note 1)

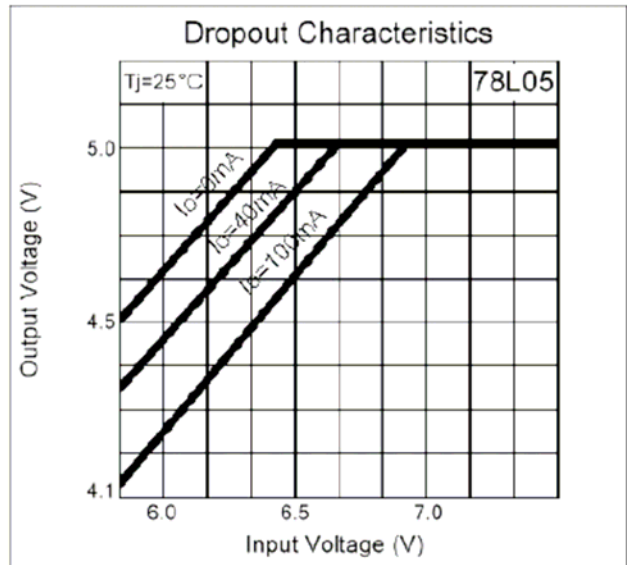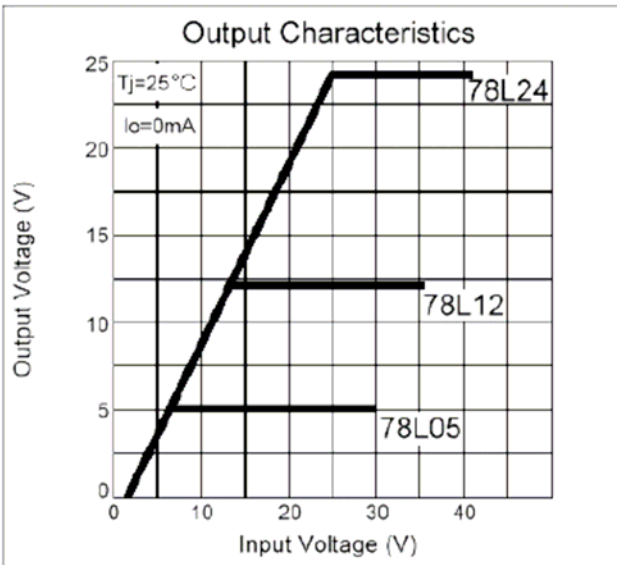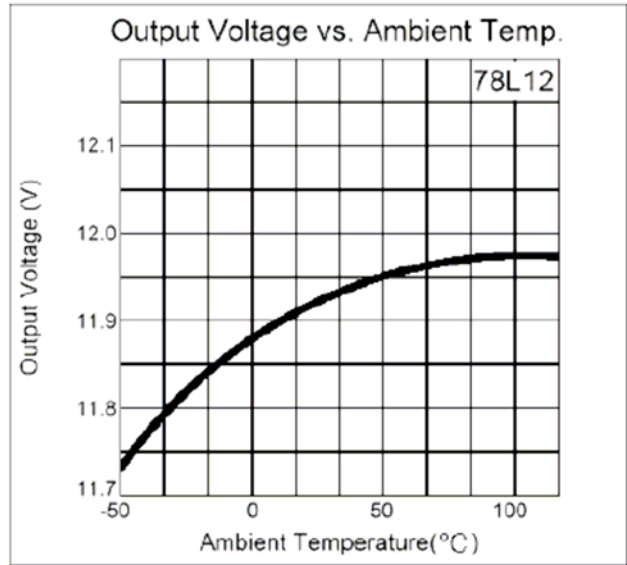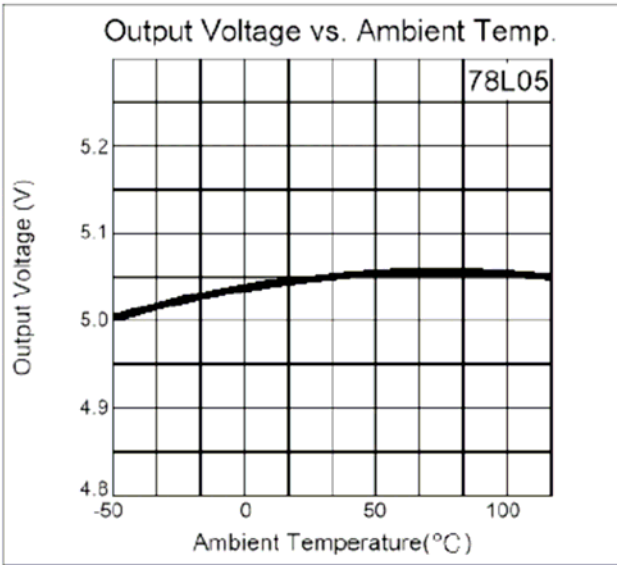| Symbol		Parameter	Min	Typ	Max	Conditions	Units
Vo	A-rank(3%)	Output Voltage	23.28	24	24.72	Vin=33V, Io=40mA,Tj=25°C 27V≤Vin≤38V, 1mA≤Io≤40mA	V
	B-rank(5%)		22.80	24	25.20	27V≤Vin≤Vmax,1mA≤Io≤70mA (Note 2)	
ΔVo		Line Regulation	-	160	300	27V≤Vin≤38V	mV
			-	150	250	28V≤Vin≤38V	
ΔVo		Load Regulation	-	40	200	1mA≤Io≤150mA	mV
			-	20	100	1mA≤Io≤40mA	
IQ		Quiescent Current	-	2.2	6.0	Tj=25°C, Vin=33V, Io=0mA	mA
ΔIQ		Quiescent Current Change	-	-	1.5	27V≤Vin≤38V	mA
			-	-	0.1	1mA≤Io≤40mA	
Vn		Output Noise Voltage	-	200	-	10Hz≤f≤100KHz	μV
ΔVin / ΔVout		Ripple Rejection	34	45	-	27V≤Vin≤38V, f=120Hz	dB
ΔVo/ΔTj		Temperature Stability	-	-2.0	-	Io=5mA, 0°C ≤Tj≤125°C	mV/℃
VD		Dropout Voltage	-	1.7	-	Io=100mA	V

Note : 1. The maximum steady state usable output current is dependent on input voltage, heat sinking, lead length of the package and copper of PCB. The data above represent pulse test conditions with junction temperatures specified at the initial of test.
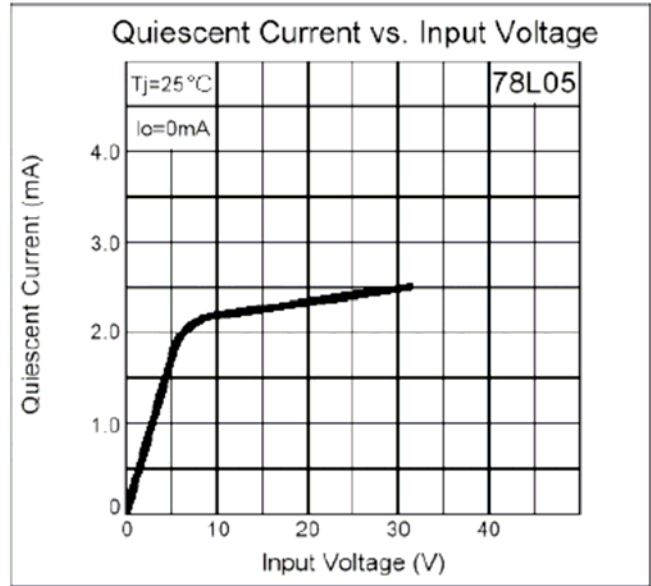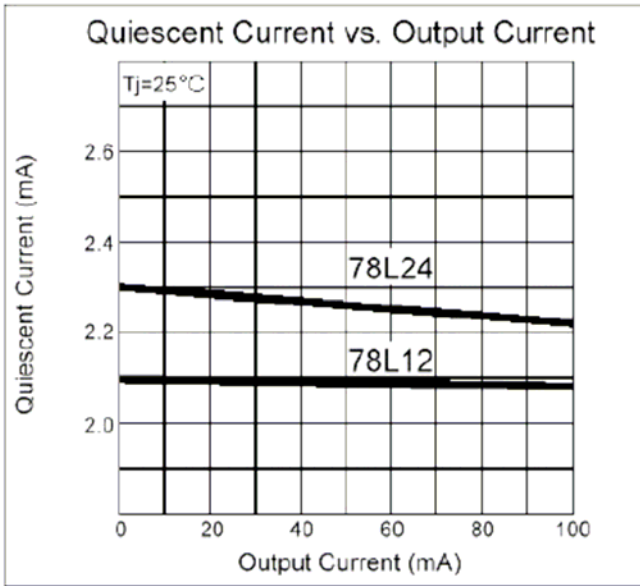2. Power dissipation<0.625W

Ordering Information

Device	Output Voltage Tolerance	Package	Marking
LM78LXXA3 A-rank	±3%	TO-92 (Pb-free)	78LXX
LM78LXXA3 B-rank	±5%	TO-92 (Pb-free)	78LXX

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Characteristic Curves

Output Voltage vs. Ambient Temp. — 78L05

Output Voltage vs. Ambient Temp. — 78L12

Output Characteristics

Dropout Characteristics

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Characteristic Curves(Cont.)

CYStech Electronics Corp.

TO-92 Dimension

Making:

Device Name
Date Code

78L□□
□□   □

Vout:
5V→05
6V→06
8V→08
9V→09
10V→10
12V→12
15V→15
18V→18
24V→24

Rank

Style: Pin 1.Vout 2.GND 3.Vin

3-Lead TO-92 Plastic Package
CYStek Package Code: A3

*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1704	0.1902	4.33	4.83	G	0.0142	0.0220	0.36	0.56
B	0.1704	0.1902	4.33	4.83	H	-	*0.1000	-	*2.54
C	0.5000	-	12.70	-	I	-	*0.0500	-	*1.27
D	0.0142	0.0220	0.36	0.56	α1	-	*5°	-	*5°
E	-	*0.0500	-	*1.27	α2	-	*2°	-	*2°
F	0.1323	0.1480	3.36	3.76	α3	-	*2°	-	*2°

Notes: 1.Controlling dimension: millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material:
• Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0