

# Positive-Voltage Regulators



Rev.3 June 2013

	78LXXnd3
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- **3-Terminal Regulators**
- **Output Current Up to 100mA**
- **No External Components**
- **Internal Thermal Overload Protection**
- **Internal Short-Circuit Limiting**
- **Direct Replacement for Fairchild  $\mu$ A78L00 Series**

### DESCRIPTION

This series of fixed-voltage monolithic integrated circuit voltage regulators is designed for a wide range of applications. These applications include 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. Each of these regulators can deliver up to 100mA of output current. The internal limiting and thermal shutdown features of these regulators make them essentially immune to overload. When used as a replacement for a Zener diode-resistor combination, an effective improvement in output impedance can be obtained together with lower-bias current.

Nominal output voltage	Regulator
3V	78L03nd3
3,3V	78L33nd3
5V	78L05nd3
6V	78L06nd3
8V	78L08nd3
9V	78L09nd3
10V	78L10nd3
12V	78L12nd3
15V	78L15nd3
18V	78L18nd3
24V	78L24nd3

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### Absolute maximum ratings over operating temperature range (unless otherwise noted)

	78L03nd3 thru 78L10nd3	78L12nd3 thru 78L18nd3	78L24nd3	UNIT
Input voltage	30	35	40	V
Operating free-air, case, or virtual junction temperature range	-40 to 125	-40 to 125	-40 to 125	$^{\circ}$ C
Storage temperature range	-65 to 150	-65 to 150	-65 to 150	
Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds	260	260	260	

### Recommended operating conditions

Parameter	MIN	MAX	UNIT	
Input voltage, $V_I$	78L03nd3	5.5	18	V
	78L33nd3	5.5	18	
	78L05nd3	7	20	
	78L06nd3	8	20	
	78L08nd3	10.5	23	
	78L09nd3	11.5	24	
	78L10nd3	12.5	25	
	78L12nd3	14.5	27	
	78L15nd3	17.5	30	
	78L18nd3	20.5	33	
	78L24nd3	26.5	39	
Output current, $I_o$		100	mA	
Operating virtual junction temperature, $T_j$	0	125	$^{\circ}$ C	

## Positive-Voltage Regulators



**VSP MIKRON**

**78LXXnd3**

**78L03nd3 electrical characteristics at specified virtual junction temperature,  $V_I=8V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L03nd3			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	2.88	3	3.12	V
	$I_O=1mA$ to 40mA $V_I=5.5V$ to 18V	0 to 125 °C	2.85	3	3.15	
	$I_O=1mA$ to 70mA		2.85	3	3.15	
Input regulation	$V_I=5.5V$ to 18V	25°C		28	120	mV
	$V_I=6V$ to 18V			23	80	
Ripple rejection	$V_I=6V$ to 16V, $f=120Hz$	25°C	43	51		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		13	50	mV
	$I_O=1mA$ to 40mA			7	35	
Output noise voltage	$f=10Hz-100Hz$	25°C		40		µV
Dropout voltage		25°C		1.7		V
Bias current		25°C		2.4	6	mA
		125°C			5.5	
Bias current change	$V_I=6V$ to 18V	0 to 125 °C			1.5	
	$I_O=1mA$ to 40mA				0.1	

**78L33nd3 electrical characteristics at specified virtual junction temperature,  $V_I=8.5V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L33nd3			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	3.168	3.3	3.432	V
	$I_O=1mA$ to 40mA $V_I=5.5V$ to 18V	0 to 125 °C	3.135	3.3	3.465	
	$I_O=1mA$ to 70mA		3.135	3.3	3.465	
Input regulation	$V_I=5.5V$ to 18V	25°C		30	130	mV
	$V_I=7V$ to 18V			25	90	
Ripple rejection	$V_I=7V$ to 16V, $f=120Hz$	25°C	42	50		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		14	55	mV
	$I_O=1mA$ to 40mA			7	35	
Output noise voltage	$f=10Hz-100Hz$	25°C		41		µV
Dropout voltage		25°C		1.7		V
Bias current		25°C		2.5	6	mA
		125°C			5.5	
Bias current change	$V_I=7V$ to 18V	0 to 125 °C			1.5	
	$I_O=1mA$ to 40mA				0.1	

\*Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible.

Thermal effects must be taken into account separately. All characteristics are measured with a 0.33µF capacitor across the input and a 0.1µF capacitor across the output.

\*\*This specification applies only for dc power dissipation permitted by absolute maximum ratings.

## Positive-Voltage Regulators



**VSP MIKRON**

**78LXXnd3**

**78L05nd3 electrical characteristics at specified virtual junction temperature,  $V_I=10V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L05nd3			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	4.8	5	5.2	V
	$I_O=1mA$ to 40mA	0 to 125 °C	4.75	5	5.25	
	$V_I=7V$ to 20V		4.75	5	5.25	
Input regulation	$V_I=7V$ to 20V	25°C		32	150	mV
	$V_I=8V$ to 20V			26	100	
Ripple rejection	$V_I=8V$ to 18V, $f=120Hz$	25°C	41	49		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		15	60	mV
	$I_O=1mA$ to 40mA			8	30	
Output noise voltage	$f=10Hz-100Hz$	25°C		42		µV
Dropout voltage		25°C		1.7		V
Bias current		25°C		2.6	6	mA
		125°C			5.5	
Bias current change	$V_I=8V$ to 20V	0 to 125 °C			1.5	
	$I_O=1mA$ to 40mA				0.1	

**78L06nd3 electrical characteristics at specified virtual junction temperature,  $V_I=11V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L06nd3			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	5.75	6	6.25	V
	$I_O=1mA$ to 40mA	0 to 125 °C	5.7	6	6.3	
	$V_I=8V$ to 20V		5.7	6	6.3	
Input regulation	$V_I=8V$ to 20V	25°C		35	175	mV
	$V_I=9V$ to 20V			29	125	
Ripple rejection	$V_I=9V$ to 19V, $f=120Hz$	25°C	40	48		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		16	80	mV
	$I_O=1mA$ to 40mA			9	40	
Output noise voltage	$f=10Hz-100Hz$	25°C		46		µV
Dropout voltage		25°C		1.7		V
Bias current		25°C		2.7	6	mA
		125°C			5.5	
Bias current change	$V_I=9V$ to 20V	0 to 125 °C			1.5	
	$I_O=1mA$ to 40mA				0.1	

\*Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible.

Thermal effects must be taken into account separately. All characteristics are measured with a 0.33µF capacitor across the input and a 0.1µF capacitor across the output.

\*\*This specification applies only for dc power dissipation permitted by absolute maximum ratings.

## Positive-Voltage Regulators



**VSP MIKRON**

**78LXXnd3**

**78L08nd3 electrical characteristics at specified virtual junction temperature,  $V_I=14V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L08nd3			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	7.7	8	8.3	V
	$I_O=1mA$ to 40mA $V_I=10.5V$ to 23V	0 to 125 °C	7.6	8	8.4	
	$I_O=1mA$ to 70mA		7.6	8	8.4	
Input regulation	$V_I=10.5V$ to 23V	25°C		42	175	mV
	$V_I=11V$ to 23V			36	125	
Ripple rejection	$V_I=13V$ to 23V, $f=120Hz$	25°C	37	46		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		18	80	mV
	$I_O=1mA$ to 40mA			10	40	
Output noise voltage	$f=10Hz-100Hz$	25°C		54		µV
Dropout voltage		25°C		1.7		V
Bias current		25°C		2.8	6	mA
		125°C			5.5	
Bias current change	$V_I=11V$ to 23V	0 to 125 °C			1.5	
	$I_O=1mA$ to 40mA				0.1	

**78L09nd3 electrical characteristics at specified virtual junction temperature,  $V_I=16V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L09nd3			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	8.6	9	9.4	V
	$I_O=1mA$ to 40mA $V_I=12V$ to 24V	0 to 125 °C	8.55	9	9.45	
	$I_O=1mA$ to 70mA		8.55	9	9.45	
Input regulation	$V_I=12V$ to 24V	25°C		45	175	mV
	$V_I=13V$ to 24V			40	125	
Ripple rejection	$V_I=15V$ to 25V, $f=120Hz$	25°C	38	45		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		19	90	mV
	$I_O=1mA$ to 40mA			11	40	
Output noise voltage	$f=10Hz-100Hz$	25°C		58		µV
Dropout voltage		25°C		1.7		V
Bias current		25°C		2.9	6	mA
		125°C			5.5	
Bias current change	$V_I=13V$ to 24V	0 to 125 °C			1.5	
	$I_O=1mA$ to 40mA				0.1	

\*Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible.

Thermal effects must be taken into account separately. All characteristics are measured with a 0.33µF capacitor across the input and a 0.1µF capacitor across the output.

\*\*This specification applies only for dc power dissipation permitted by absolute maximum ratings.

## Positive-Voltage Regulators



**VSP MIKRON**

**78LXXnd3**

**78L10nd3 electrical characteristics at specified virtual junction temperature,  $V_I=17V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L10nd3			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	9.6	10	10.4	V
	$I_O=1mA$ to 40mA $V_I=13V$ to 25V	0 to 125 °C	9.5	10	10.5	
	$I_O=1mA$ to 70mA		9.5	10	10.5	
Input regulation	$V_I=13V$ to 25V	25°C		51	175	mV
	$V_I=14V$ to 25V			42	125	
Ripple rejection	$V_I=15V$ to 25V, $f=120Hz$	25°C	37	44		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		20	90	mV
	$I_O=1mA$ to 40mA			11	40	
Output noise voltage	$f=10Hz-100Hz$	25°C		62		µV
Dropout voltage		25°C		1.7		V
Bias current		25°C		3.0	6	mA
		125°C			5.5	
Bias current change	$V_I=14V$ to 25V	0 to 125 °C			1.5	
	$I_O=1mA$ to 40mA				0.1	

**78L12nd3 electrical characteristics at specified virtual junction temperature,  $V_I=19V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L12nd3			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	11.5	12	12.5	V
	$I_O=1mA$ to 40mA $V_I=14V$ to 27V	0 to 125 °C	11.4	12	12.6	
	$I_O=1mA$ to 70mA		11.4	12	12.6	
Input regulation	$V_I=14V$ to 27V	25°C		55	250	mV
	$V_I=16V$ to 27V			49	200	
Ripple rejection	$V_I=15V$ to 25V, $f=120Hz$	25°C	37	42		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		22	100	mV
	$I_O=1mA$ to 40mA			13	50	
Output noise voltage	$f=10Hz-100Hz$	25°C		70		µV
Dropout voltage		25°C		1.7		V
Bias current		25°C		3.1	6.5	mA
		125°C			6	
Bias current change	$V_I=16V$ to 27V	0 to 125 °C			1.5	
	$I_O=1mA$ to 40mA				0.1	

\*Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible.

Thermal effects must be taken into account separately. All characteristics are measured with a 0.33µF capacitor across the input and a 0.1µF capacitor across the output.

\*\*This specification applies only for dc power dissipation permitted by absolute maximum ratings.

## Positive-Voltage Regulators



**VSP MIKRON**

**78LXXnd3**

**78L15nd3 electrical characteristics at specified virtual junction temperature,  $V_I=23V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L15nd3			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	14.4	15	15.6	V
	$I_O=1mA$ to 40mA $V_I=17.5V$ to 30V	0 to 125 °C	14.25	15	15.75	
	$I_O=1mA$ to 70mA		14.25	15	15.75	
Input regulation	$V_I=17.5V$ to 30V	25°C		65	300	mV
	$V_I=19V$ to 30V			58	250	
Ripple rejection	$V_I=18.5V$ to 28.5V, $f=120Hz$	25°C	34	39		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		25	150	mV
	$I_O=1mA$ to 40mA			15	75	
Output noise voltage	$f=10Hz-100Hz$	25°C		82		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		3.4	6.5	mA
		125°C			6	
Bias current change	$V_I=19V$ to 30V	0 to 125 °C			1.5	
	$I_O=1mA$ to 40mA				0.1	

**78L18nd3 electrical characteristics at specified virtual junction temperature,  $V_I=26V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L18nd3			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	17.3	18	18.7	V
	$I_O=1mA$ to 40mA $V_I=20.5V$ to 33V	0 to 125 °C	17.1	18	18.9	
	$I_O=1mA$ to 70mA		17.1	18	18.9	
Input regulation	$V_I=20.5V$ to 33V	25°C		70	360	mV
	$V_I=22V$ to 33V			64	300	
Ripple rejection	$V_I=21.5V$ to 31.5V, $f=120Hz$	25°C	32	36		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		27	180	mV
	$I_O=1mA$ to 40mA			19	90	
Output noise voltage	$f=10Hz-100Hz$	25°C		89		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		3.5	6.5	mA
		125°C			6	
Bias current change	$V_I=22V$ to 33V	0 to 125 °C			1.5	
	$I_O=1mA$ to 40mA				0.1	

\*Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible.

Thermal effects must be taken into account separately. All characteristics are measured with a 0.33μF capacitor across the input and a 0.1μF capacitor across the output.

\*\*This specification applies only for dc power dissipation permitted by absolute maximum ratings.

## Positive-Voltage Regulators



**VSP MIKRON**

**78LXXnd3**

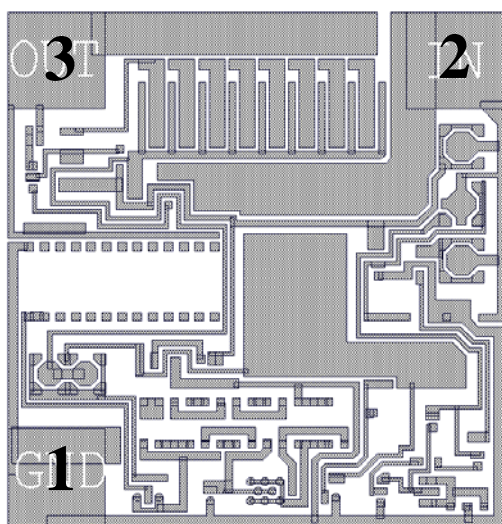
**78L24nd3 electrical characteristics at specified virtual junction temperature,  $V_I=32V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L24nd3			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	23	24	25	V
	$I_O=1mA$ to 40mA $V_I=26.5V$ to 39V	0 to 125 °C	22.8	24	25.2	
	$I_O=1mA$ to 70mA		22.8	24	25.2	
Input regulation	$V_I=26.5V$ to 39V	25°C		95	480	mV
	$V_I=29V$ to 39V			78	400	
Ripple rejection	$V_I=27.5V$ to 37.5V, $f=120Hz$	25°C	30	33		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		41	240	mV
	$I_O=1mA$ to 40mA			28	120	
Output noise voltage	$f=10Hz-100Hz$	25°C		97		µV
Dropout voltage		25°C		1.7		V
Bias current		25°C		3.6	6.5	mA
		125°C			6	
Bias current change	$V_I=28V$ to 39V	0 to 125 °C			1.5	
	$I_O=1mA$ to 40mA				0.1	

\*Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33µF capacitor across the input and a 0.1µF capacitor across the output.

\*\*This specification applies only for dc power dissipation permitted by absolute maximum rating

Pad location 78LXXnd3



Wafer Thickness: 460±30µm (280±30µm)  
 Top metal: AlSi  
 Backside metal: - (or Ti-Ni (V)-Ag)  
 Wafer size: 100,150mm

Chip size : 0,64 x 0,65 mm

Pad №	Pad Name	X(um)	Y(um)	Pad size (um)
1	GROUND	105	105	90 x 90
2	INPUT	537	545	90 x 90
3	OUTPUT	105	545	90 x 90