

# MC78L00A Series, NCV78L00A

## 100 mA Positive Voltage Regulators

The MC78L00A Series of positive voltage regulators are inexpensive, easy-to-use devices suitable for a multitude of applications that require a regulated supply of up to 100 mA. Like their higher powered MC7800 and MC78M00 Series cousins, these regulators feature internal current limiting and thermal shutdown making them remarkably rugged. No external components are required with the MC78L00 devices in many applications.

These devices offer a substantial performance advantage over the traditional zener diode-resistor combination, as output impedance and quiescent current are substantially reduced.

### Features

- Wide Range of Available, Fixed Output Voltages
- Low Cost
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- No External Components Required
- Complementary Negative Regulators Offered (MC79L00A Series)
- Pb-Free Packages are Available
- NCV Prefix for Automotive and Other Applications Requiring Site and Control Changes

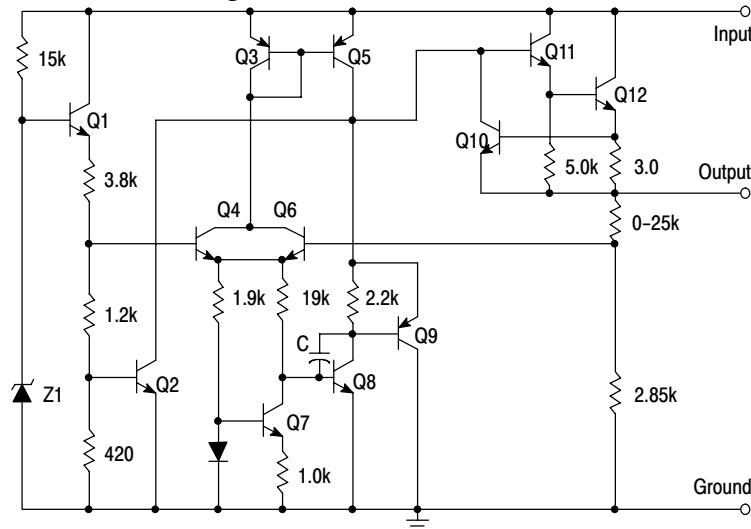


Figure 1. Representative Schematic Diagram

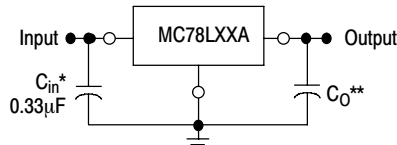


Figure 2. Standard Application

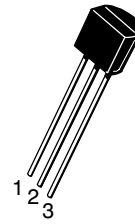
A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.

\*  $C_{in}$  is required if regulator is located an appreciable distance from power supply filter.

\*\*  $C_O$  is not needed for stability; however, it does improve transient response.

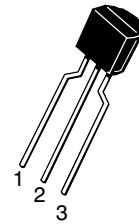


ON Semiconductor®



STRAIGHT LEAD  
BULK PACK

TO-92  
P SUFFIX  
CASE 029



BENT LEAD  
TAPE & REEL  
AMMO PACK

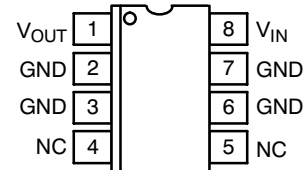
Pin: 1. Output  
2. Ground  
3. Input



SOIC-8\*  
D SUFFIX  
CASE 751

\*SOIC-8 is an internally modified SO-8 package. Pins 2, 3, 6, and 7 are electrically common to the die attach flag. This internal lead frame modification decreases package thermal resistance and increases power dissipation capability when appropriately mounted on a printed circuit board. SOIC-8 conforms to all external dimensions of the standard SO-8 package.

### PIN CONNECTIONS



(Top View)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 9 of this data sheet.

### DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 15 of this data sheet.

## MC78L00A Series, NCV78L00A

### MAXIMUM RATINGS (T<sub>A</sub> = +125°C, unless otherwise noted.)

Rating	Symbol	Value	Unit
Input Voltage (2.6 V–8.0 V) (12 V–18 V) (24 V)	V <sub>I</sub>	30 35 40	Vdc
Storage Temperature Range	T <sub>stg</sub>	-65 to +150	°C
Operating Junction Temperature Range	T <sub>J</sub>	-40 to +150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

\*This device series contains ESD protection and exceeds the following tests:  
Human Body Model 2000 V per MIL-STD-883, Method 3015  
Machine Model Method 200 V

### ELECTRICAL CHARACTERISTICS (V<sub>I</sub> = 10 V, I<sub>O</sub> = 40 mA, C<sub>I</sub> = 0.33 μF, C<sub>O</sub> = 0.1 μF, -40°C < T<sub>J</sub> < +125°C (for MC78LXXAB, NCV78L05A), 0°C < T<sub>J</sub> < +125°C (for MC78LXXAC), unless otherwise noted.)

Characteristics	Symbol	MC78L05AC, AB, NCV78L05A			Unit
		Min	Typ	Max	
Output Voltage (T <sub>J</sub> = +25°C)	V <sub>O</sub>	4.8	5.0	5.2	Vdc
Line Regulation (T <sub>J</sub> = +25°C, I <sub>O</sub> = 40 mA) 7.0 Vdc ≤ V <sub>I</sub> ≤ 20 Vdc 8.0 Vdc ≤ V <sub>I</sub> ≤ 20 Vdc	Reg <sub>line</sub>	- -	55 45	150 100	mV
Load Regulation (T <sub>J</sub> = +25°C, 1.0 mA ≤ I <sub>O</sub> ≤ 100 mA) (T <sub>J</sub> = +25°C, 1.0 mA ≤ I <sub>O</sub> ≤ 40 mA)	Reg <sub>load</sub>	- -	11 5.0	60 30	mV
Output Voltage (7.0 Vdc ≤ V <sub>I</sub> ≤ 20 Vdc, 1.0 mA ≤ I <sub>O</sub> ≤ 40 mA) (V <sub>I</sub> = 10 V, 1.0 mA ≤ I <sub>O</sub> ≤ 70 mA)	V <sub>O</sub>	4.75 4.75	- -	5.25 5.25	Vdc
Input Bias Current (T <sub>J</sub> = +25°C) (T <sub>J</sub> = +125°C)	I <sub>IB</sub>	- -	3.8 -	6.0 5.5	mA
Input Bias Current Change (8.0 Vdc ≤ V <sub>I</sub> ≤ 20 Vdc) (1.0 mA ≤ I <sub>O</sub> ≤ 40 mA)	ΔI <sub>IB</sub>	- -	- -	1.5 0.1	mA
Output Noise Voltage (T <sub>A</sub> = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V <sub>n</sub>	-	40	-	μV
Ripple Rejection (I <sub>O</sub> = 40 mA, f = 120 Hz, 8.0 Vdc ≤ V <sub>I</sub> ≤ 18 V, T <sub>J</sub> = +25°C)	RR	41	49	-	dB
Dropout Voltage (T <sub>J</sub> = +25°C)	V <sub>I</sub> - V <sub>O</sub>	-	1.7	-	Vdc

NOTE: NCV78L05A: T<sub>low</sub> = -40°C, T<sub>high</sub> = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

## MC78L00A Series, NCV78L00A

**ELECTRICAL CHARACTERISTICS** ( $V_I = 19\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $-40^\circ\text{C} < T_J < +125^\circ\text{C}$  (for MC78LXXAB),  $0^\circ\text{C} < T_J < +125^\circ\text{C}$  (for MC78LXXAC), unless otherwise noted.)

Characteristics	Symbol	MC78L12AC, AB			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = +25^\circ\text{C}$ )	$V_O$	11.5	12	12.5	Vdc
Line Regulation ( $T_J = +25^\circ\text{C}$ , $I_O = 40\text{ mA}$ ) $14.5\text{ Vdc} \leq V_I \leq 27\text{ Vdc}$ $16\text{ Vdc} \leq V_I \leq 27\text{ Vdc}$	$\text{Reg}_{\text{line}}$	- -	120 100	250 200	mV
Load Regulation ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 100\text{ mA}$ ) ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\text{Reg}_{\text{load}}$	- -	20 10	100 50	mV
Output Voltage ( $14.5\text{ Vdc} \leq V_I \leq 27\text{ Vdc}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ ) ( $V_I = 19\text{ V}$ , $1.0\text{ mA} \leq I_O \leq 70\text{ mA}$ )	$V_O$	11.4 11.4	- -	12.6 12.6	Vdc
Input Bias Current ( $T_J = +25^\circ\text{C}$ ) ( $T_J = +125^\circ\text{C}$ )	$I_{\text{IB}}$	- -	4.2 -	6.5 6.0	mA
Input Bias Current Change ( $16\text{ Vdc} \leq V_I \leq 27\text{ Vdc}$ ) ( $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\Delta I_{\text{IB}}$	- -	- -	1.5 0.1	mA
Output Noise Voltage ( $T_A = +25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$ )	$V_n$	-	80	-	$\mu\text{V}$
Ripple Rejection ( $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $15\text{ V} \leq V_I \leq 25\text{ V}$ , $T_J = +25^\circ\text{C}$ )	RR	37	42	-	dB
Dropout Voltage ( $T_J = +25^\circ\text{C}$ )	$V_I - V_O$	-	1.7	-	Vdc

**ELECTRICAL CHARACTERISTICS** ( $V_I = 23\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $-40^\circ\text{C} < T_J < +125^\circ\text{C}$  (for MC78LXXAB),  $0^\circ\text{C} < T_J < +125^\circ\text{C}$  (for MC78LXXAC), unless otherwise noted.)

Characteristics	Symbol	MC78L15AC, AB / NCV78L15A			Unit
		Min	Typ	Max	
Output Voltage ( $T_J = +25^\circ\text{C}$ )	$V_O$	14.4	15	15.6	Vdc
Line Regulation ( $T_J = +25^\circ\text{C}$ , $I_O = 40\text{ mA}$ ) $17.5\text{ Vdc} \leq V_I \leq 30\text{ Vdc}$ $20\text{ Vdc} \leq V_I \leq 30\text{ Vdc}$	$\text{Reg}_{\text{line}}$	- -	130 110	300 250	mV
Load Regulation ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 100\text{ mA}$ ) ( $T_J = +25^\circ\text{C}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\text{Reg}_{\text{load}}$	- -	25 12	150 75	mV
Output Voltage ( $17.5\text{ Vdc} \leq V_I \leq 30\text{ Vdc}$ , $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ ) ( $V_I = 23\text{ V}$ , $1.0\text{ mA} \leq I_O \leq 70\text{ mA}$ )	$V_O$	14.25 14.25	- -	15.75 15.75	Vdc
Input Bias Current ( $T_J = +25^\circ\text{C}$ ) ( $T_J = +125^\circ\text{C}$ )	$I_{\text{IB}}$	- -	4.4 -	6.5 6.0	mA
Input Bias Current Change ( $20\text{ Vdc} \leq V_I \leq 30\text{ Vdc}$ ) ( $1.0\text{ mA} \leq I_O \leq 40\text{ mA}$ )	$\Delta I_{\text{IB}}$	- -	- -	1.5 0.1	mA
Output Noise Voltage ( $T_A = +25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$ )	$V_n$	-	90	-	$\mu\text{V}$
Ripple Rejection ( $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $18.5\text{ V} \leq V_I \leq 28.5\text{ V}$ , $T_J = +25^\circ\text{C}$ )	RR	34	39	-	dB
Dropout Voltage ( $T_J = +25^\circ\text{C}$ )	$V_I - V_O$	-	1.7	-	Vdc

## MC78L00A Series, NCV78L00A

### ORDERING INFORMATION (continued)

Device	Output Voltage	Operating Temperature Range	Package	Shipping <sup>†</sup>
MC78L12ABD	12 V	$T_J = -40^\circ \text{ to } +125^\circ \text{C}$	SOIC-8	98 Units/Rail
MC78L12ABDG			SOIC-8 (Pb-Free)	98 Units/Rail
MC78L12ABDR2			SOIC-8	2500 Tape & Reel
MC78L12ABDR2G			SOIC-8 (Pb-Free)	2500 Tape & Reel
NCV78L12ABDG*			SOIC-8 (Pb-Free)	98 Units/Rail
NCV78L12ABDR2*			SOIC-8	2500 Tape & Reel
NCV78L12ABDR2G*			SOIC-8 (Pb-Free)	2500 Tape & Reel
MC78L12ABP			TO-92	2000 Units/Bag
MC78L12ABPG			TO-92 (Pb-Free)	2000 Units/Bag
MC78L12ABPRP			TO-92	2000 Ammo Pack
MC78L12ABPRPG			TO-92 (Pb-Free)	2000 Ammo Pack
NCV78L12ABPG*			TO-92 (Pb-Free)	2000 Units/Bag
MC78L12ACD			$T_J = 0^\circ \text{ to } +125^\circ \text{C}$	SOIC-8
MC78L12ACDG		SOIC-8 (Pb-Free)		98 Units/Rail
MC78L12ACDR2		SOIC-8		2500 Tape & Reel
MC78L12ACDR2G		SOIC-8 (Pb-Free)		2500 Tape & Reel
MC78L12ACP		TO-92		2000 Units/Bag
MC78L12ACPG		TO-92 (Pb-Free)		2000 Units/Bag
MC78L12ACPRA		TO-92		2000 Tape & Reel
MC78L12ACPRA G		TO-92 (Pb-Free)		2000 Tape & Reel
MC78L12ACPRE		TO-92		2000 Tape & Reel
MC78L12ACPRE G	TO-92 (Pb-Free)	2000 Tape & Reel		
MC78L12ACPRM	TO-92	2000 Ammo Pack		
MC78L12ACPRMG	TO-92 (Pb-Free)	2000 Ammo Pack		
MC78L12ACPRP	TO-92	2000 Ammo Pack		
MC78L12ACPRPG	TO-92 (Pb-Free)	2000 Ammo Pack		

\*NCV78L12A:  $T_{low} = -40^\circ \text{C}$ ,  $T_{high} = +125^\circ \text{C}$ . Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.  
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

## MC78L00A Series, NCV78L00A

### ORDERING INFORMATION (continued)

Device	Output Voltage	Operating Temperature Range	Package	Shipping <sup>†</sup>	
MC78L15ABD	15 V	$T_J = -40^\circ \text{ to } +125^\circ \text{C}$	SOIC-8	98 Units/Rail	
MC78L15ABDG			SOIC-8 (Pb-Free)	98 Units/Rail	
MC78L15ABDR2			SOIC-8	2500 Tape & Reel	
MC78L15ABDR2G			SOIC-8 (Pb-Free)	2500 Tape & Reel	
NCV78L15ABDR2G*			SOIC-8 (Pb-Free)	2500 Tape & Reel	
MC78L15ABP			TO-92	2000 Units/Bag	
MC78L15ABPG			TO-92 (Pb-Free)	2000 Units/Bag	
MC78L15ABPRA			TO-92	2000 Tape & Reel	
MC78L15ABPRAG			TO-92 (Pb-Free)	2000 Tape & Reel	
MC78L15ABPRP			TO-92	2000 Ammo Pack	
MC78L15ABPRPG			TO-92 (Pb-Free)	2000 Ammo Pack	
MC78L15ACD			SOIC-8	98 Units/Rail	
MC78L15ACDG		SOIC-8 (Pb-Free)	98 Units/Rail		
MC78L15ACDR2		SOIC-8	2500 Tape & Reel		
MC78L15ACDR2G		SOIC-8 (Pb-Free)	2500 Tape & Reel		
MC78L15ACP		TO-92	2000 Units/Bag		
MC78L15ACPG		TO-92 (Pb-Free)	2000 Units/Bag		
MC78L15ACPRA		TO-92	2000 Tape & Reel		
MC78L15ACPRAG		TO-92 (Pb-Free)	2000 Tape & Reel		
MC78L15ACPRP		TO-92	2000 Ammo Pack		
MC78L15ACPRPG		TO-92 (Pb-Free)	2000 Ammo Pack		
			$T_J = 0^\circ \text{ to } +125^\circ \text{C}$		

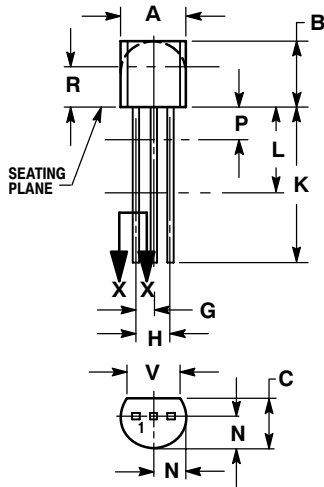
\*NCV78L15A:  $T_{low} = -40^\circ \text{C}$ ,  $T_{high} = +125^\circ \text{C}$ . Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

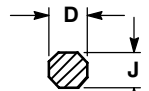
# MC78L00A Series, NCV78L00A

## PACKAGE DIMENSIONS

TO-92 (TO-226)  
P SUFFIX  
CASE 29-11  
ISSUE AM



STRAIGHT LEAD  
BULK PACK

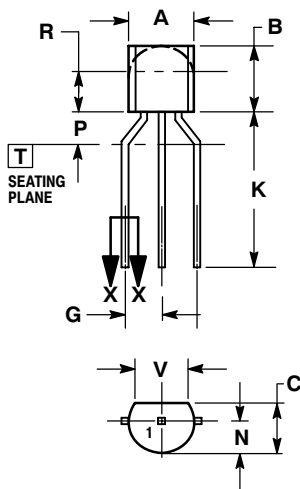


SECTION X-X

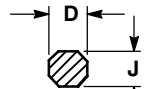
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---



BENT LEAD  
TAPE & REEL  
AMMO PACK



SECTION X-X

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	MILLIMETERS	
	MIN	MAX
A	4.45	5.20
B	4.32	5.33
C	3.18	4.19
D	0.40	0.54
G	2.40	2.80
J	0.39	0.50
K	12.70	---
N	2.04	2.66
P	1.50	4.00
R	2.93	---
V	3.43	---