

# MC78LXXA/LM78LXXA/MC78L05AA

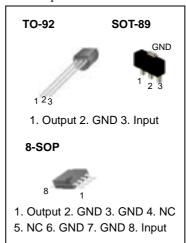
# 3-Terminal 0.1A Positive Voltage Regulator

### **Features**

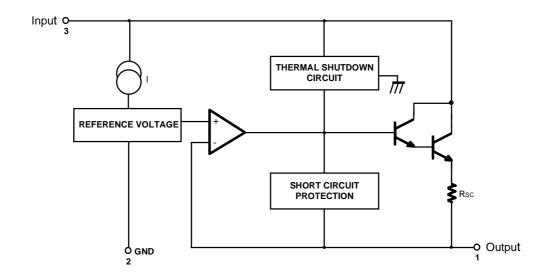
- Maximum Output Current of 100mA
- Output Voltage of 5V, 8V, 12V, 15V, 18V and 24V
- Thermal Overload Protection
- · Short Circuit Current Limiting
- Output Voltage Offered in ±5% Tolerance

### **Description**

The MC78LXXA/LM78LXXA/MC78L05AA series of fixed voltage monolithic integrated circuit voltage regulators are suitable for application that required supply current up to 100mA.



### **Internal Block Diagram**



## **Absolute Maximum Ratings**

Parameter	Symbol	Value	Unit
Input Voltage (for Vo = 5V, 8V)		30	V
(for Vo = 12V to 18V)	Vı	35	V
$(for V_O = 24V)$		40	V
Operating Junction Temperature Range	TJ	0 ~ +150	°C
Storage Temperature Range	TSTG	-65 ~ +150	°C

## Electrical Characteristics(MC78L05A/LM78L05A)

(VI = 10V, IO = 40mA,  $0^{\circ}$ C  $\leq$  TJ  $\leq$  125 $^{\circ}$ C, CI =  $0.33\mu$ F, CO =  $0.1\mu$ F, unless otherwise specified. (Note 1)

Parameter		Symbol	Cor	nditions	Min.	Тур.	Max.	Unit
Output Voltage		Vo	T <sub>J</sub> = 25°C		4.8	5.0	5.2	V
Line Regulation (Not	te1)	ΔVο	T.J = 25°C	7V ≤ V <sub>I</sub> ≤ 20V	-	8	150	mV
3, 3, 4, 4	,	ΔνΟ	1J = 25°C	$8V \le V_I \le 20V$	-	6	100	mV
Load Population (No	sto1)	ΔVο	T 25°C	$1mA \le IO \le 100mA$	-	11	60	mV
Load Regulation (No	ne i)		TJ = 25°C	$1mA \le IO \le 40mA$	-	5.0	30	mV
			7V ≤ V <sub>I</sub> ≤ 20V	$1mA \le IO \le 40mA$	-	-	5.25	V
Output Voltage		Vo	$7V \le V_I \le V_{MAX}$ (Note2)	1mA ≤ I <sub>O</sub> ≤ 70mA	4.75	-	5.25	V
Quiescent Current		IQ	T <sub>J</sub> = 25°C		-	2.0	5.5	mA
Quiescent Current	With Line	ΔlQ	8V ≤V <sub>I</sub> ≤ 20V		-	-	1.5	mA
Change	With Load	ΔlQ	1mA ≤ I <sub>O</sub> ≤ 40 m	nA	-	-	0.1	mA
Output Noise Voltag	е	VN	T <sub>A</sub> = 25°C, 10Hz	z ≤ f ≤ 100kHz	-	40	-	μV/Vo
Temperature Coefficient of VO		ΔV0/ΔΤ	IO = 5mA		-	-0.65	-	mV/°C
Ripple Rejection		RR	f = 120Hz, 8V ≤ V <sub>I</sub> ≤ 18V, T <sub>J</sub> = 25°C		41	80	-	dB
Dropout Voltage		VD	TJ = 25°C		-	1.7	-	V

<sup>1.</sup> The maximum steady state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represent pulse test conditions with junction temperature as indicated at the initiation of tests.

<sup>2.</sup> Power dissipation  $PD \le 0.75W$ .

## Electrical Characteristics(MC78L08A) (Continued)

(VI = 14V, IO = 40mA,  $0^{\circ}$ C  $\leq$  TJ  $\leq$  125 $^{\circ}$ C, CI = 0.33 $\mu$ F, CO = 0.1 $\mu$ F, unless otherwise specified. (Note 1)

Parameter		Symbol	Cor	nditions	Min.	Тур.	Max.	Unit
Output Voltage		Vo	T <sub>J</sub> = 25°C		7.7	8.0	8.3	V
Line Regulation (Note	<b>51</b> )	ΔVΩ	T <sub>J</sub> = 25°C	$10.5 \text{V} \leq \text{V}_{\text{I}} \leq 23 \text{V}$	-	10	175	mV
Line Regulation (Note	<i>=1)</i>	ΔνΟ	1J = 25 C	11V ≤ V <sub>I</sub> ≤ 23V	-	8	125	mV
Load Population (Not	:01)	4)/0	TJ = 25°C	1mA ≤ I <sub>O</sub> ≤ 100mA	-	15	80	mV
Load Regulation (Not	.e i )	ΔVο		$1mA \le I_O \le 40mA$	-	8.0	40	mV
			10.5V ≤ V <sub>I</sub> ≤ 23V	$1mA \le IO \le 40mA$	7.6	-	8.4	V
Output Voltage		Vo	10.5V ≤ V <sub>I</sub> ≤ VMAX (Note2)	1mA ≤ I <sub>O</sub> ≤ 70mA	7.6	-	8.4	V
Quiescent Current		lQ	T <sub>J</sub> = 25°C		-	2.0	5.5	mA
Quiescent Current	With Line	ΔlQ	11V ≤ V <sub>I</sub> ≤ 23V		-	-	1.5	mA
Change	With Load	ΔlQ	1mA ≤ I <sub>O</sub> ≤ 40m	A	-	-	0.1	mA
Output Noise Voltage	;	VN	T <sub>A</sub> = 25°C, 10Hz	z ≤ f ≤100kHz	-	60	-	μV/Vo
Temperature Coefficient of VO		ΔV0/ΔΤ	I <sub>O</sub> = 5mA		-	-0.8	-	mV/°C
Ripple Rejection		RR	f = 120Hz, 11V ≤ V <sub>I</sub> ≤ 21V, T <sub>J</sub> = 25°C		39	70	-	dB
Dropout Voltage		VD	T <sub>J</sub> = 25°C		-	1.7	-	V

<sup>1.</sup> The maximum steady state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represent pulse test conditions with junction temperature as indicated at the initiation of tests.

<sup>2.</sup> Power dissipation  $PD \le 0.75W$ .

## Electrical Characteristics(MC78L12A/LM78L12A) (Continued)

 $(V_I = 19V, I_O = 40mA, 0^{\circ}C \le T_J \le 125^{\circ}C, C_I = 0.33 \,\mu\text{F}, C_O = 0.1 \mu\text{F}, unless otherwise specified. (Note1))$ 

Parameter		Symbol	Cor	nditions	Min.	Тур.	Max.	Unit
Output Voltage		Vo	TJ = 25°C		11.5	12	12.5	V
Line Regulation (Note	01)	ΔVΩ	T <sub>J</sub> = 25°C	$14.5 \text{V} \leq \text{V}_{\text{I}} \leq 27 \text{V}$	-	20	250	mV
Line Regulation (Not	<del>5</del> 1)	ΔνΟ	11 = 23 C	16V ≤ V <sub>I</sub> ≤ 27V	-	15	200	mV
Load Regulation (No	to1)	ΔVΩ	T1 = 25°C	$1mA \le IO \le 100mA$	-	20	100	mV
Load Negulation (No	le i )	ΔνΟ	TJ = 25°C	$1mA \le IO \le 40mA$	-	10	50	mV
			14.5V ≤ V <sub>I</sub> ≤ 27V	$1mA \le IO \le 40mA$	11.4	-	12.6	V
Output Voltage		Vo	14.5V ≤ V <sub>I</sub> ≤ V <sub>MAX</sub> (Note2)	1mA ≤ I <sub>O</sub> ≤ 70mA	11.4	-	12.6	V
Quiescent Current		lQ	TJ = 25°C		-	2.1	6.0	mA
Quiescent Current	With Line	ΔlQ	16V ≤ V <sub>I</sub> ≤ 27V		-	-	1.5	mA
Change	With Load	ΔlQ	1mA ≤ I <sub>O</sub> ≤ 40m	A	-	-	0.1	mA
Output Noise Voltage	)	VN	TA = 25°C, 10Hz	z ≤ f ≤ 100kHz	-	80	-	μV/Vo
Temperature Coefficient of VO		ΔV0/ΔΤ	IO = 5mA		-	-1.0	-	mV/°C
Ripple Rejection		RR	f = 120Hz, 15V ≤ V <sub>I</sub> ≤ 25V, T <sub>J</sub> = 25°C		37	65	-	dB
Dropout Voltage		VD	T <sub>J</sub> = 25°C		-	1.7	-	V

<sup>1.</sup> The maximum steady state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represent pulse test conditions with junction temperature as indicated at the initiation of tests.

<sup>2.</sup> Power dissipation  $PD \le 0.75W$ .

## Electrical Characteristics(MC78L15A) (Continued)

(VI = 23V, IO = 40mA,  $0^{\circ}$ C  $\leq$  TJ  $\leq$  125 $^{\circ}$ C, CI = 0.33  $\mu$ F, CO = 0.1 $\mu$ F, unless otherwise specified. (Note1))

Parameter		Symbol	Coi	nditions	Min.	Тур.	Max.	Unit
Output Voltage		Vo	T <sub>J</sub> = 25°C		14.4	15	15.6	V
Line Regulation (Note	<b>51</b> )	ΔVΩ	T 25°C	17.5V ≤ V <sub>I</sub> ≤ 30V	-	25	300	mV
Line Regulation (Note	<i>=1)</i>	ΔνΟ	T <sub>J</sub> = 25°C	$20V \le V_I \le 30V$	-	20	250	mV
Load Degulation (Not	·o1)	۸۱/۵	T. 25°C	$1mA \le IO \le 100mA$	-	25	150	mV
Load Regulation (Not	.e i )	ΔVΟ	T <sub>J</sub> = 25°C	$1mA \le IO \le 40mA$	-	12	75	mV
			17.5V ≤ V <sub>I</sub> ≤ 30V	$1mA \le IO \le 40mA$	14.25	-	15.75	V
Output Voltage		Vo	17.5V ≤ V <sub>I</sub> ≤ VMAX (Note2)	1mA ≤ I <sub>O</sub> ≤ 70mA	14.25	-	15.75	V
Quiescent Current		IQ	T <sub>J</sub> = 25°C		-	2.1	6.0	mA
Quiescent Current	With Line	ΔlQ	20V ≤ V <sub>I</sub> ≤ 30V		-	-	1.5	mA
Change	With Load	ΔlQ	1mA ≤ I <sub>O</sub> ≤ 40m/	4	-	-	0.1	mA
Output Noise Voltage	<b>;</b>	VN	T <sub>A</sub> = 25°C, 10Hz	z ≤ f ≤ 100kHz	-	90	-	μV/Vo
Temperature Coefficient of VO		ΔV0/ΔΤ	I <sub>O</sub> = 5mA		-	-1.3	-	mV/°C
Ripple Rejection		RR	f = 120Hz, 18.5V≤V <sub>I</sub> ≤28.5V, T <sub>J</sub> = 25°C		34	60	-	dB
Dropout Voltage		VD	T <sub>J</sub> = 25°C		-	1.7	-	V

<sup>1.</sup> The maximum steady state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represent pulse test conditions with junction temperature as indicated at the initiation of tests.

<sup>2.</sup> Power dissipation  $PD \le 0.75W$ .

## Electrical Characteristics(MC78L18A) (Continued)

(VI = 27V, IO = 40mA,  $0^{\circ}$ C  $\leq$  TJ  $\leq$  125 $^{\circ}$ C, CI = 0.33 $\mu$ F, CO = 0.1 $\mu$ F, unless otherwise specified. (Note1))

Parameter		Symbol	Coi	nditions	Min.	Тур.	Max.	Unit
Output Voltage		Vo	T <sub>J</sub> = 25°C		17.3	18	18.7	V
Line Regulation (Note	21)	ΔVΩ	T 25°C	21V ≤ V <sub>I</sub> ≤ 33V	-	145	300	mV
Line Regulation (Note	<del>5</del> 1)	ΔνΟ	T <sub>J</sub> = 25°C	22V ≤ V <sub>I</sub> ≤ 33V	-	135	250	mV
Load Degulation (Not	101)	۸۱/۵	T. 25°C	1mA ≤ Io≤100mA	-	30	170	mV
Load Regulation (Not	le i)	ΔVΟ	T <sub>J</sub> = 25°C	$1mA \le IO \le 40mA$	-	15	85	mV
			21V ≤ V <sub>I</sub> ≤ 33V	$1mA \le IO \le 40mA$	17.1	-	18.9	V
Output Voltage		Vo	21V ≤ V <sub>I</sub> ≤ VMAX (Note2)	1mA ≤ I <sub>O</sub> ≤ 70mA	17.1	-	18.9	V
Quiescent Current		IQ	T <sub>J</sub> = 25°C		-	2.2	6.0	mA
Quiescent Current	With Line	ΔlQ	21V ≤ V <sub>I</sub> ≤ 33V		-	-	1.5	mA
Change	With Load	ΔlQ	1mA ≤ I <sub>O</sub> ≤ 40m	A	-	-	0.1	mA
Output Noise Voltage	)	VN	T <sub>A</sub> = 25°C, 10H;	z ≤ f ≤ 100kHz	-	150	-	μV/Vo
Temperature Coefficient of VO		ΔV0/ΔΤ	I <sub>O</sub> = 5mA		-	-1.8	-	mV/°C
Ripple Rejection		RR	f = 120Hz, 23V ≤ V <sub>I</sub> ≤ 33V, T <sub>J</sub> = 25°C		34	48	-	dB
Dropout Voltage		VD	T <sub>J</sub> = 25°C		-	1.7	-	V

<sup>1.</sup> The maximum steady state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represent pulse test conditions with junction temperature as indicated at the initiation of tests.

<sup>2.</sup> Power dissipation PD  $\leq$  0.75W.

## Electrical Characteristics(MC78L24A) (Continued)

(VI = 33V, IO = 40mA,  $0^{\circ}$ C  $\leq$  TJ  $\leq$  125 $^{\circ}$ C, CI = 0.33 $\mu$ F, CO = 0.1 $\mu$ F, unless otherwise specified. (Note1))

Parameter		Symbol	Conditions		Min.	Тур.	Max.	Unit
Output Voltage		Vo	T <sub>J</sub> = 25°C		23	24	25	V
Line Regulation (Note	e1)	ΔVΩ	T <sub>J</sub> = 25°C	27V ≤ V <sub>I</sub> ≤ 38V	-	160	300	mV
,	,	ΔνΟ	1J = 25 C	28V ≤ V <sub>I</sub> ≤ 38V	-	150	250	mV
Load Population (Not	:01)	ΔVΩ	T <sub>J</sub> = 25°C	1mA ≤ IO ≤ 100mA	-	40	200	mV
Load Regulation (Not	. <del>e</del> 1)	ΔνΟ	1J = 25 C	$1mA \le IO \le 40mA$	-	20	100	mV
			27V ≤ V <sub>I</sub> ≤ 38V	$1mA \le IO \le 40mA$	22.8	-	25.2	V
Output Voltage		Vo	27V ≤ V <sub>I</sub> ≤ VMAX (Note2)	1mA ≤ I <sub>O</sub> ≤ 70mA	22.8	-	25.2	V
Quiescent Current		lQ	T <sub>J</sub> = 25°C		-	2.2	6.0	mA
Quiescent Current	With Line	ΔlQ	28V ≤ V <sub>I</sub> ≤ 38V		-	-	1.5	mA
Change	With Load	ΔlQ	1mA ≤ I <sub>O</sub> ≤ 40m	A	-	-	0.1	mA
Output Noise Voltage	;	VN	T <sub>A</sub> = 25°C, 10H;	z ≤ f ≤ 100kHz	-	200	-	μV/Vo
Temperature Coefficient of VO		ΔV0/ΔΤ	I <sub>O</sub> = 5mA		-	-2.0	-	mV/°C
Ripple Rejection		RR	f = 120Hz, 28V ≤ V <sub>I</sub> ≤ 38V, T <sub>J</sub> = 25°C		34	45	-	dB
Dropout Voltage		VD	T <sub>J</sub> = 25°C		-	1.7	-	V

<sup>1.</sup> The maximum steady state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represent pulse test conditions with junction temperature as indicated at the initiation of tests.

<sup>2.</sup> Power dissipation  $PD \le 0.75W$ .

## **Absolute Maximum Ratings**

Parameter	Symbol	Value	Unit
Input Voltage (for Vo = 5V, 8V)		30	V
(for Vo = 12V to 18V)	Vı	35	V
$(for V_O = 24V)$		40	V
Operating Junction Temperature Range	TJ	0 ~ +150	°C
Storage Temperature Range	TSTG	-65 ~ +150	°C

## Electrical Characteristics(MC78L05AA) (Continued)

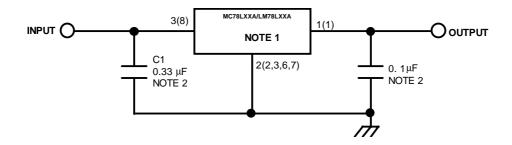
(VI = 10V, IO = 40mA,  $0^{\circ}$ C  $\leq$  TJ  $\leq$  125 $^{\circ}$ C, CI = 0.33 $\mu$ F, CO = 0.1 $\mu$ F, unless otherwise specified. (Note))

Parameter		Symbol	Coi	nditions	Min.	Тур.	Max.	Unit
Output Voltage		Vo	T <sub>J</sub> = 25°C		4.9	5.0	5.1	V
Line Regulation (Not	te1)	ΔVο	T.J = 25°C	7V ≤ V <sub>I</sub> ≤ 20V	-	8	150	mV
	,	ΔνΟ	1J = 25 C	8V ≤ V <sub>I</sub> ≤ 20V	-	6	100	mV
Load Population (No	sto1)	ΔVο	T 25°C	1mA ≤ I <sub>O</sub> ≤ 100mA	-	11	50	mV
Load Regulation (No	ne i)		T <sub>J</sub> = 25°C	$1mA \le IO \le 40mA$	-	5.0	25	mV
			7V ≤V <sub>I</sub> ≤20V	$1mA \le IO \le 40mA$	-	-	5.15	V
Output Voltage		Vo	7V ≤V <sub>I</sub> ≤ V <sub>MAX</sub> (Note2)	1mA ≤ I <sub>O</sub> ≤ 70mA	4.75	-	5.15	V
Quiescent Current		lQ	T <sub>J</sub> = 25°C		-	2.0	5.5	mA
Quiescent Current	With Line	ΔlQ	8V ≤V <sub>I</sub> ≤ 20V		-	-	1.5	mA
Change	With Load	ΔlQ	1mA ≤ I <sub>O</sub> ≤ 40 m	nA	-	-	0.1	mA
Output Noise Voltag	е	٧N	T <sub>A</sub> = 25°C, 10H;	z ≤ f ≤ 100kHz	-	40	-	μV/Vo
Temperature Coefficient of VO Δ\		ΔV0/ΔΤ	IO = 5mA		-	-0.65	-	mV/°C
Ripple Rejection		RR	f = 120Hz, 8V ≤ V <sub>I</sub> ≤ 18V, T <sub>J</sub> = 25°C		41	80	-	dB
Dropout Voltage		VD	TJ = 25°C		-	1.7	-	V

<sup>1.</sup> The maximum steady state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represent pulse test conditions with junction temperature as indicated at the initiation of tests.

<sup>2.</sup> Power dissipation PD  $\leq$  0.75W.

# **Typical Application**



'()': 8SOP Type

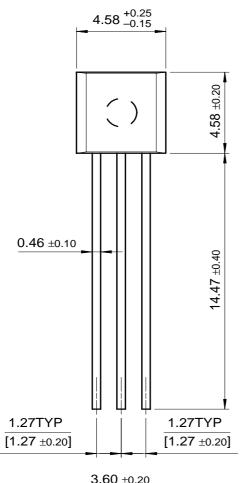
- 1. To specify an output voltage, substitute voltage value for "XX".
- 2. Bypass Capacitors are recommend for optimum stability and transient response and should be located as close as possible to the regulator

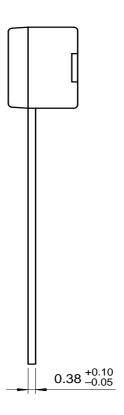
## **Mechanical Dimensions**

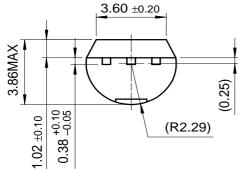
### Package

### **Dimensions in millimeters**

**TO-92** 





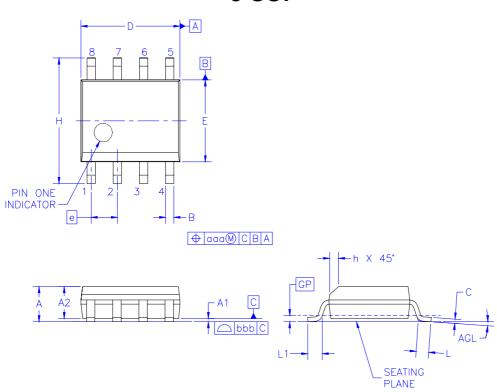


# **Mechanical Dimensions** (Continued)

## Package

### **Dimensions in millimeters**





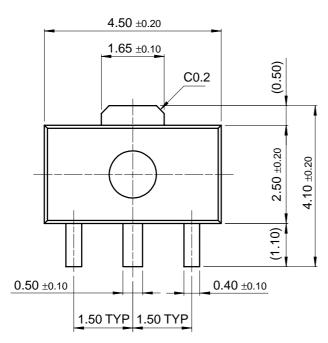
Symbol	Min	Nom	Max
А	-	-	1.75
A1	0.10	0.15	0.25
A2	1.25	1.45	1.50
В	0.35	0.37	0.51
С	0.19	0.20	0.25
D	4.80	4.90	5.00
E	3.80	3.90	4.00
е		1.27BSC	
Н	5.79	5.99	6.20
h	0.25	-	0.50
L	0.50	0.70	0.90
GP		0.36 BSC	
q	0	-	8
aaa	-	-	0.25
bbb	-	-	0.10

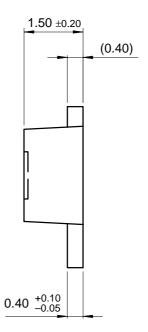
# **Mechanical Dimensions** (Continued)

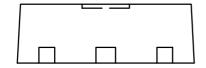
### Package

### **Dimensions in millimeters**

**SOT-89** 







# **Ordering Information**

Product Number	Package	Output Voltage Tolerance	Operating Temperature	Shipping	
LM78L05ACZ				Bulk	
LM78L12ACZ				Buik	
LM78L05ABZX				Tape & Reel	
LM78L05ABZXA	TO-92	5%	0 ~ +125°C	Ammo Pack	
LM78L05ACZX	10-92			2 070 0 71125 0	Tape & Reel
LM78L05ACZXA				Ammo Pack	
LM78L12ACZX				Tape & Reel	
LM78L12ACZXA				Ammo Pack	
Product Number	Package	Output Voltage Tolerance	Operating Temperature	Shipping	
MC78L05ACP					
MC78L08ACP					
MC78L12ACP	TO-92				
MC78L15ACP	10-92				
MC78L18ACP					
MC78L24ACP		5%			
MC78L05ACD		5%		Bulk	
MC78L08ACD	8-SOP				
MC78L12ACD					
MC78L05ACH	SOT-89				
MC78L08ACH					
MC78L12ACH					
MC78L05AACP		2%			
MC78L05AACPXA				Ammo Pack	
MC78L05ABPX				Tape & Reel	
MC78L05ABPXA			0 ~ +125°C	Ammo Pack	
MC78L05ACPX			0 * 1120 0	Tape & Reel	
MC78L05ACPXA				America Da ale	
MC78L06ACPXA				Ammo Pack	
MC78L08ACPX				Tape & Reel	
MC78L08ACPXA					
MC78L09ACPXA	TO-92	F0/		Ammo Pack	
MC78L10ACPXA		5%			
MC78L12ACPX				Tape & Reel	
MC78L12ACPXA				Ammo Pack	
MC78L15ACPX				Tape & Reel	
MC78L15ACPXA				Ammo Pack	
MC78L18ACPX				Tape & Reel	
MC78L18ACPXA				Ammo Pack	
MC78L24ACPX				Tape & Reel	
MC78L24ACPXA				Ammo Pack	

<sup>•</sup> For information on tape & reel and ammo pack specifications, including part orientation and tape sizes, please refer to our tape and reel data, www.fairchildsemi.com/products/discrete/pdf/to92\_tr.pdf.

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- A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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