

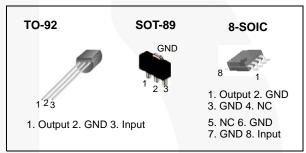
# MC78LXXA / LM78LXXA 3-Terminal 0.1 A Positive Voltage Regulator

#### Features

- Maximum Output Current of 100 mA
- Output Voltage of 5 V, 6 V, 8 V, 12 V, and 15 V
- Thermal Overload Protection
- Short-Circuit Current Limiting
- Output Voltage Offered in ±5% Tolerance

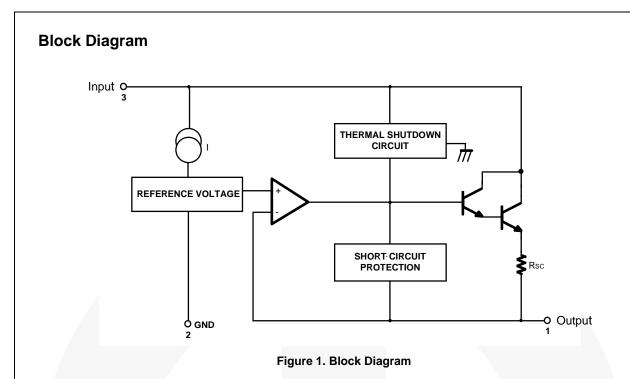
### Description

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



Product Number	Package	Packing Method	Output Voltage Tolerance	<b>Operating Temperature</b>
LM78L05ACZ		Bulk		
LM78L05ACZX		Tape & Reel		
LM78L05ACZXA		Ammo		
LM78L12ACZ		Bulk		
LM78L12ACZX		Tape & Reel		
MC78L05ACP	TO-92	Bulk		
MC78L05ACPXA		Ammo		
MC78L06ACP		Bulk	±5%	-40 to +125°C
MC78L08ACP		Bulk		
MC78L15ACP		Bulk		
MC78L15ACPXA		Ammo		
MC78L05ACD	0.000	Rail		
MC78L05ACDX	8-SOIC	Tape & Reel		
MC78L05ACHX	SOT-89	Tape & Reel	1	
MC78L08ACHX	301-09	Tape & Reel	1	

#### **Ordering Information**



## **Absolute Maximum Ratings**

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at  $T_A = 25^{\circ}$ C unless otherwise noted.

Symbol	Paramete	r	Value	Unit	
V		$V_0 = 5 V \text{ to } 8 V$	30	V	
VI	Input Voltage	V <sub>O</sub> = 12 V to 15 V	35	V	
T <sub>OPR</sub>	Operating Temperature Range	-40 to +125°C	°C		
T <sub>J(MAX)</sub>	Maximum Junction Temperature	150	°C		
T <sub>STG</sub>	Storage Temperature Range		-65 to +150	°C	
$R_{ extsf{ heta}JC}$	Thermal Resistance, Junction-Case	TO-92	50	°C/W	
		TO-92	150	°C/W	
$R_{ extsf{ heta}JA}$	Thermal Resistance, Junction-Air	SOT-89	225	°C/W	
		8-SOIC	160	°C/W	

# Electrical Characteristics (MC78L05A / LM78L05A)

 $V_I = 10 \text{ V}, \text{ } I_O = 40 \text{ mA}, \text{ } -40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}, \text{ } C_I = 0.33 \text{ } \mu\text{F}, \text{ } C_O = 0.1 \text{ } \mu\text{F}, \text{ } \text{unless otherwise specified}.$ 

Symbol	Parameter		Conditions		Min.	Тур.	Max.	Unit
Vo	Output Voltage		$T_J = 25^{\circ}C$		4.8	5.0	5.2	V
A\/	V <sub>O</sub> Line Regulation <sup>(1)</sup>		T <sub>.1</sub> = 25°C	$7 \text{ V} \leq \text{V}_{I} \leq 20 \text{ V}$		8	150	mV
Δvo			1 <sub>J</sub> = 25 C	$8~V \le V_I \le 20~V$		6	100	mV
ΔV <sub>O</sub>	Load Regulation <sup>(1)</sup>		T <sub>.1</sub> = 25°C	$1 \text{ mA} \le I_O \le 100 \text{ mA}$		11	60	mV
7v0			$1_{\rm J} = 25.0$	$1 \text{ mA} \le I_O \le 40 \text{ mA}$		5.0	30.0	mV
V	Output Voltage		$7 \text{ V} \leq \text{V}_{I} \leq 20 \text{ V}$	$1 \text{ mA} \le I_O \le 40 \text{ mA}$			5.25	V
Vo			$7 \text{ V} \leq \text{V}_{\text{I}} \leq \text{V}_{\text{MAX}}^{(2)}$	$1 \text{ mA} \le I_O \le 70 \text{ mA}$	4.75		5.25	V
Ι <sub>Q</sub>	Quiescent Current		$T_J = 25^{\circ}C$			2.0	5.5	mA
$\Delta I_Q$	Quiescent Current	With Line	$8 \text{ V} \leq \text{V}_{I} \leq 20 \text{ V}$				1.5	mA
$\Delta I_Q$	Change	With Load	1 mA $\leq$ I <sub>O</sub> $\leq$ 40 mA	N			0.1	mA
V <sub>N</sub>	Output Noise Voltage		T <sub>A</sub> = 25°C, 10 Hz	≤ f ≤ 100 kHz		40		μV/Vo
$\Delta V_O / \Delta T$	Temperature Coefficient of VO		l <sub>O</sub> = 5 mA			-0.65		mV/°C
RR	Ripple Rejection		f = 120 Hz, 8 V ≤ V	$V_{\rm I} \le 18  {\rm V},  {\rm T}_{\rm J} = 25^{\circ}{\rm C}$	41	80		dB
V <sub>D</sub>	Dropout Voltage		T <sub>J</sub> = 25°C			1.7		V

Notes:

1. 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 represents pulse test conditions with junction temperature as indicated at the initiation of tests.

2. Power dissipation  $P_D \leq 0.75$  W.

### **Electrical Characteristics (MC78L06A)**

 $V_I = 12 \text{ V}, I_O = 40 \text{ mA}, -40^{\circ}C \leq T_J \leq 125^{\circ}C, C_I = 0.33 \text{ }\mu\text{F}, C_O = 0.1 \text{ }\mu\text{F}, \text{ unless otherwise specified}.$ 

Symbol	Paramete	er		Conditions		Тур.	Max.	Unit
Vo	Output Voltage		T <sub>J</sub> = 25°C		5.75	6.0	6.25	V
A \ /	Line Regulation <sup>(3)</sup>		т огоо	$8.5 \text{ V} \le \text{V}_{I} \le 20 \text{ V}$		64	175	mV
$\Delta V_O$			T <sub>J</sub> = 25°C	$9 \text{ V} \le \text{V}_{\text{I}} \le 20 \text{ V}$		54	125	mV
A) /	Lood Degulation <sup>(3)</sup>		T 05%C	1 mA ≤ I <sub>O</sub> ≤ 100 mA		12.8	80.0	mV
$\Delta V_O$	Load Regulation <sup>(3)</sup>		$T_J = 25^{\circ}C$	$1 \text{ mA} \le I_O \le 70 \text{ mA}$		5.8	40.0	mV
M	Output Voltage		$8.5 \text{ V} \leq \text{V}_{\text{I}} \leq$	≤ 20 V, 1 mA ≤ I <sub>O</sub> ≤ 40 mA	5.7		6.3	V
Vo			$8.5 \text{ V} \leq \text{V}_{\text{I}} \leq$	$\leq V_{MAX}^{(4)}$ , 1 mA $\leq I_{O} \leq$ 70 mA	5.7		6.3	V
			T <sub>J</sub> = 25°C				5.5	mA
Ι <sub>Q</sub>	Quiescent Current		T <sub>J</sub> = 125°C	;		3.9	6.0	mA
$\Delta I_Q$	Quiescent Current	With Line	$9 V \le V_{I} \le 2$	20 V			1.5	mA
$\Delta I_Q$	Change	With Load	1 mA ≤ I <sub>O</sub> ≤	≤ 40 mA			0.1	mA
V <sub>N</sub>	Output Noise Voltage		T <sub>A</sub> = 25°C,	10 Hz $\leq$ f $\leq$ 100 kHz		40		μV/Vo
$\Delta V_O / \Delta T$	Temperature Coefficient of VO		l <sub>O</sub> = 5 mA			0.75		mV/°C
RR	Ripple Rejection		f = 120 Hz,	$10 \text{ V} \le \text{V}_{\text{I}} \le 20 \text{ V}, \text{ T}_{\text{J}} = 25^{\circ}\text{C}$	40	46		dB
VD	Dropout Voltage		T <sub>J</sub> = 25°C			1.7		V

#### Notes:

3. 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 represents pulse test conditions with junction temperature as indicated at the initiation of tests. 4. Power dissipation  $P_D \le 0.75$  W.

# **Electrical Characteristics (MC78L08A)**

 $V_I = 14 \text{ V}, I_O = 40 \text{ mA}, -40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}, \text{ } C_I = 0.33 \text{ } \mu\text{F}, \text{ } C_O = 0.1 \text{ } \mu\text{F}, \text{ } \text{unless otherwise specified}.$ 

Symbol	Parameter		Conditions			Тур.	Max.	Unit
V <sub>O</sub>	Output Voltage		T <sub>J</sub> = 25°C		7.7	8.0	8.3	V
A) /	Line Regulation <sup>(5)</sup>		T 25%C	$10.5~V \leq V_{I} \leq 23~V$		10	175	mV
$\Delta V_{O}$	Line Regulation.		T <sub>J</sub> = 25°C	$11~V \le V_I \le 23~V$		8	125	mV
41/	O Load Regulation <sup>(5)</sup>		T - 25°C	$1 \text{ mA} \le I_O \le 100 \text{ mA}$		15	80	mV
$\Delta V_O$			T <sub>J</sub> = 25°C	$1 \text{ mA} \le I_O \le 40 \text{ mA}$		8	40	mV
	Output Voltage		$10.5V \le V_1 \le 23V$	$1 \text{ mA} \le I_O \le 40 \text{ mA}$	7.6		8.4	V
Vo			$10.5V \le V_I \le V_{MAX}^{(6)}$	$1 \text{ mA} \le I_O \le 70 \text{ mA}$	7.6		8.4	V
Ι <sub>Q</sub>	Quiescent Current		T <sub>J</sub> = 25°C			2.0	5.5	mA
$\Delta I_Q$	Quiescent Current	With Line	$11 \text{ V} \leq \text{V}_{\text{I}} \leq 23 \text{ V}$				1.5	mA
$\Delta I_Q$	Change	With Load	$1 \text{ mA} \le I_O \le 40 \text{ mA}$				0.1	mA
V <sub>N</sub>	Output Noise Voltage		$T_A = 25^{\circ}C$ , 10 Hz $\leq$ f	≤100 kHz		60		μV/Vo
$\Delta V_O / \Delta T$	Temperature Coefficient of V <sub>O</sub>		l <sub>O</sub> = 5 mA			-0.8		mV/°C
RR	Ripple Rejection		f = 120 Hz, 11 V $\leq$ V <sub>I</sub>	$\leq$ 21 V, T <sub>J</sub> = 25°C	39	70		dB
V <sub>D</sub>	Dropout Voltage		Т <sub>Ј</sub> = 25°С			1.7		V

Notes:

5. 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 represents pulse test conditions with junction temperature as indicated at the initiation of tests.

6. Power dissipation  $P_D \le 0.75$  W.

### Electrical Characteristics (MC78L12A / LM78L12A)

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

Symbol	Parameter		Conditions			Тур.	Max.	Unit
Vo	Output Voltage		T <sub>J</sub> = 25°C		11.5	12.0	12.5	V
A) /	Line Regulation <sup>(7)</sup>		T 25%C	$14.5~V \leq V_{I} \leq 27~V$		20	250	mV
$\Delta V_O$			T <sub>J</sub> = 25°C	$16 \text{ V} \le \text{V}_{I} \le 27 \text{ V}$		15	200	mV
A) /	Load Regulation <sup>(7)</sup>		T - 25°C	$1 \text{ mA} \le I_O \le 100 \text{ mA}$		20	100	mV
$\Delta V_O$			T <sub>J</sub> = 25°C	$1 \text{ mA} \le I_O \le 40 \text{ mA}$		10	50	mV
V	Output Voltage		$14.5 \text{ V} \le \text{V}_{\text{I}} \le 27 \text{ V}$	$1 \text{ mA} \le I_O \le 40 \text{ mA}$	11.4		12.6	V
Vo			$14.5 V \le V_I \le V_{MAX}^{(8)}$	$1 \text{ mA} \le I_O \le 70 \text{ mA}$	11.4		12.6	V
Ι <sub>Q</sub>	Quiescent Curren	t	$T_J = 25^{\circ}C$			2.1	6.0	mA
$\Delta I_Q$	Quiescent	With Line	$16 \text{ V} \leq \text{V}_{\text{I}} \leq 27 \text{ V}$				1.5	mA
$\Delta I_Q$	Current Change	With Load	$1 \text{ mA} \le I_O \le 40 \text{ mA}$				0.1	mA
V <sub>N</sub>	Output Noise Voltage		$T_A = 25^{\circ}C$ , 10 Hz $\leq f$ :	≤ 100 kHz		80		μV/Vo
$\Delta V_O / \Delta T$	Temperature Coefficient of V <sub>O</sub>		l <sub>O</sub> = 5 mA			-1.0		mV/°C
RR	Ripple Rejection	Ripple Rejection		≤ 25 V, T <sub>J</sub> = 25°C	37	65		dB
VD	Dropout Voltage		T <sub>J</sub> = 25°C			1.7		V

Notes:

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 represents pulse test conditions with junction temperature as indicated at the initiation of tests.

8. Power dissipation  $P_D \le 0.75$  W.

### **Electrical Characteristics (MC78L15A)**

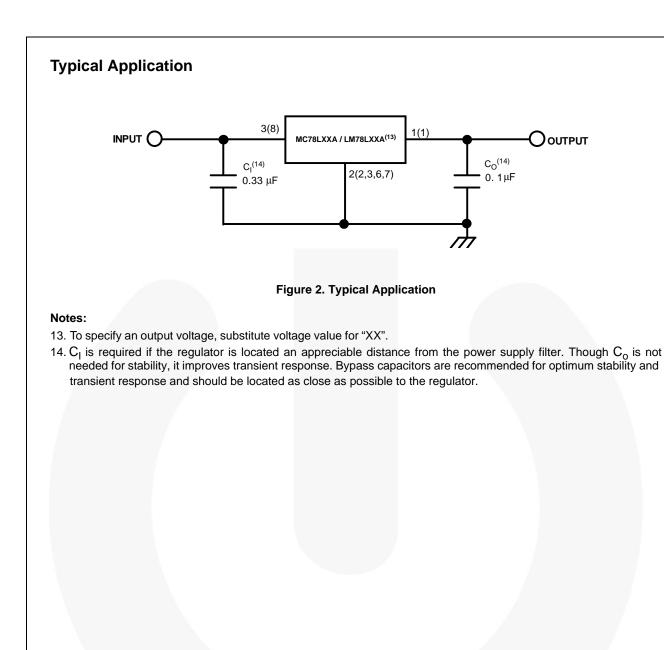
 $V_I = 23 \text{ V}, \text{ I}_O = 40 \text{ mA}, \text{ -}40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}, \text{ C}_I = 0.33 \text{ }\mu\text{F}, \text{ C}_O = 0.1 \text{ }\mu\text{F}, \text{ unless otherwise specified}.$ 

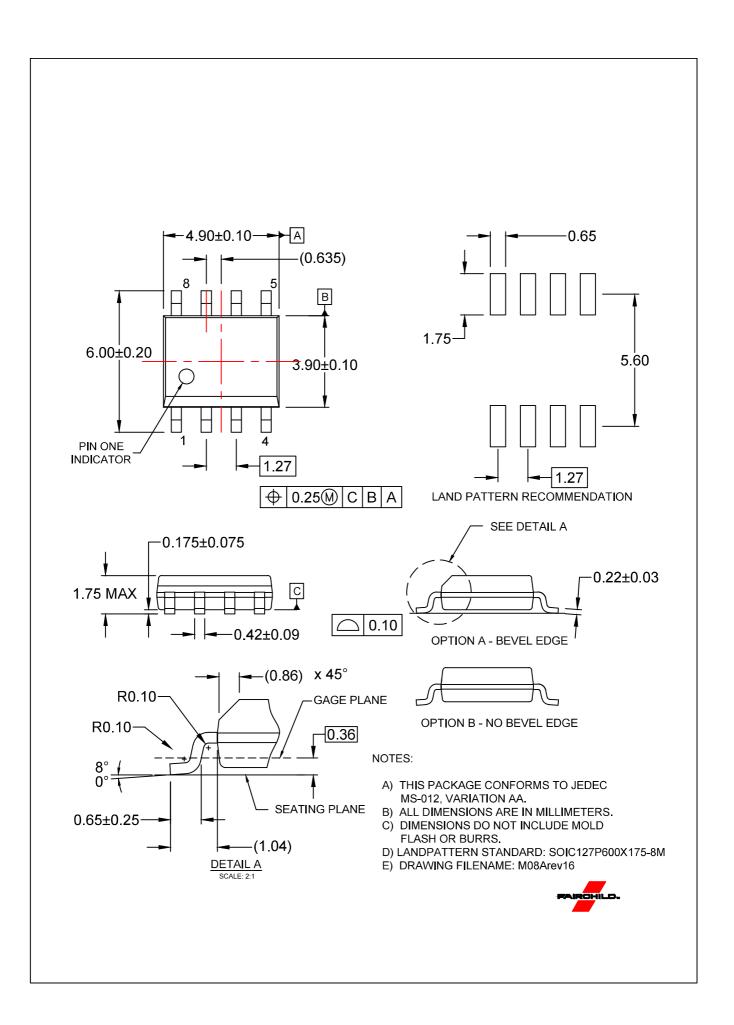
Symbol	Parame	ter	Condit	Conditions			Тур.	Max.	Unit
Vo	Output Voltage	Output Voltage		T <sub>J</sub> = 25°C			15.0	15.6	V
41/	Line Regulation <sup>(9)</sup>		T <sub>.1</sub> = 25°C	17.5 V ≤ V <sub>I</sub> ≤	30 V		25	300	mV
$\Delta V_{O}$			$1_{\rm J} = 25 {\rm C}$	$20 \text{ V} \le \text{V}_1 \le 3$	0 V		20	250	mV
ΔV <sub>O</sub>	Load Regulation <sup>(9)</sup>		T <sub>.1</sub> = 25°C	$1 \text{ mA} \le I_0 \le 1$	00 mA		25	150	mV
ΔvO			1 <sub>J</sub> = 25 C	$1 \text{ mA} \le I_0 \le 4$	40 mA		12	75	mV
V	Output Voltage		$17.5 \text{ V} \le \text{V}_{\text{I}} \le 30 \text{ V}$	$1 \text{ mA} \le I_O \le 40 \text{ mA}$		14.25		15.75	V
Vo			$17.5 \text{ V} \le \text{V}_{\text{I}} \le \text{V}_{\text{MAX}}^{(10)}$	$1 \text{ mA} \le I_0 \le 7$	70 mA	14.25		15.75	V
Ι <sub>Q</sub>	Quiescent Curren	t	$T_J = 25^{\circ}C$				2.1	6.0	mA
$\Delta I_Q$	Quiescent	With Line	$20 \text{ V} \leq \text{V}_{\text{I}} \leq 30 \text{ V}$					1.5	mA
$\Delta I_Q$	Current Change	With Load	$1 \text{ mA} \le I_O \le 40 \text{ mA}$					0.1	mA
V <sub>N</sub>	Output Noise Voltage		$T_A = 25^{\circ}C$ , 10 Hz $\leq$ f $\leq$	100 kHz			90		μV/Vo
$\Delta V_O / \Delta T$	Temperature Coefficient of VO		I <sub>O</sub> = 5 mA				-1.3		mV/°C
RR	Ripple Rejection		f = 120 Hz, 18.5 V $\leq$ V <sub>I</sub>	$\leq$ 28.5 V, T <sub>J</sub> =	25°C	34	60		dB
V <sub>D</sub>	Dropout Voltage		T <sub>J</sub> = 25°C				1.7		V

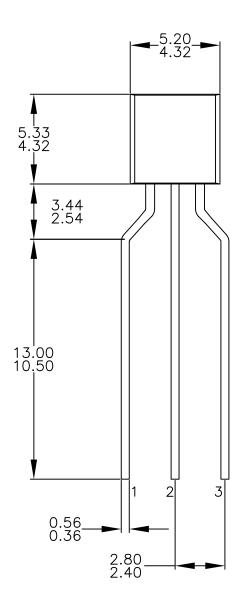
#### Notes:

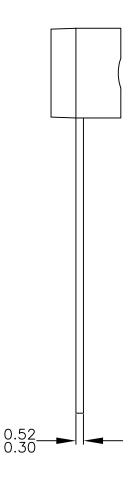
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10. Power dissipation  $P_D \le 0.75$  W.





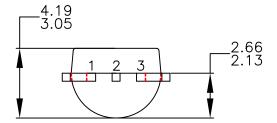


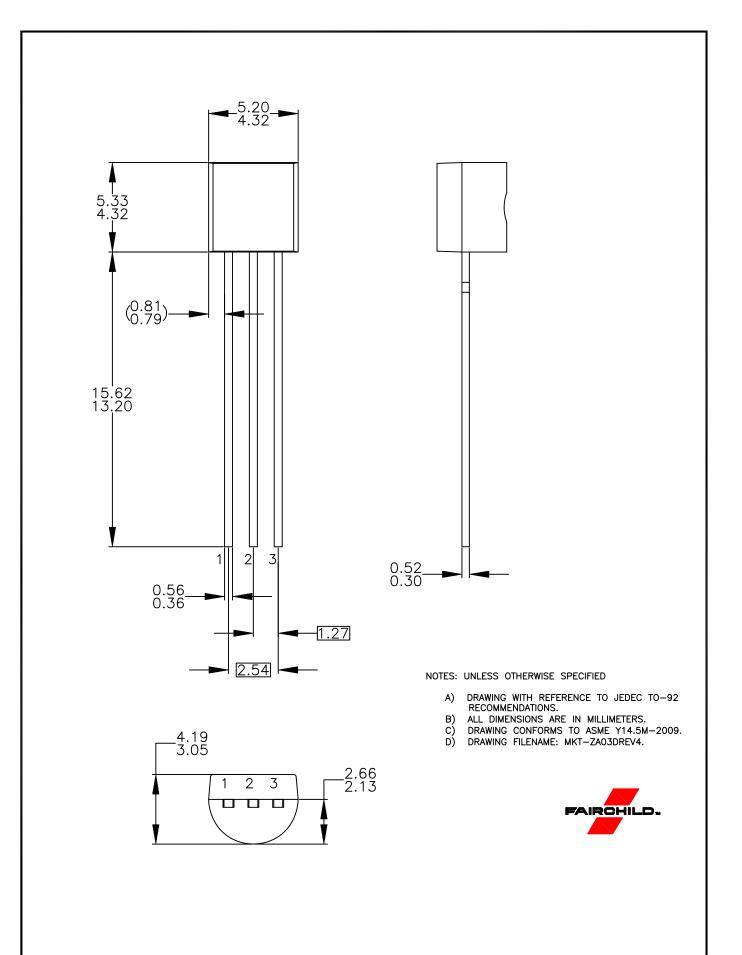


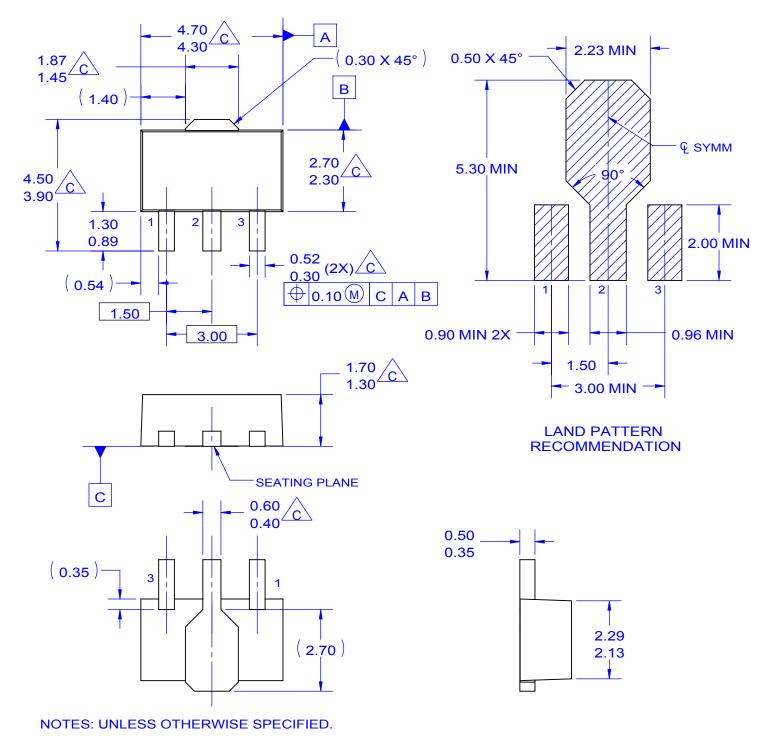
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- В. С. D. Е.







A. REFERENCE TO JEDEC TO-243 VARIATION AA.

B. ALL DIMENSIONS ARE IN MILLIMETERS.

 C DOES NOT COMPLY JEDEC STANDARD VALUE.
D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSION.
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No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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