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July 2015

MC78LXXA / LM78LXXA
3-Terminal 0.1 A Positive Voltage Regulator

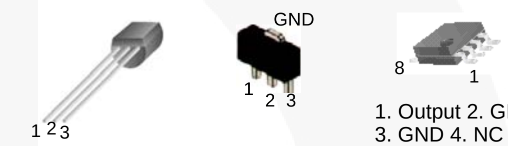
Features

- 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.

TO-92 **SOT-89** **8-SOIC**



1. Output 2. GND 3. Input

1. Output 2. GND
3. GND 4. NC
5. NC 6. GND
7. GND 8. Input

Ordering Information

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

Block Diagram

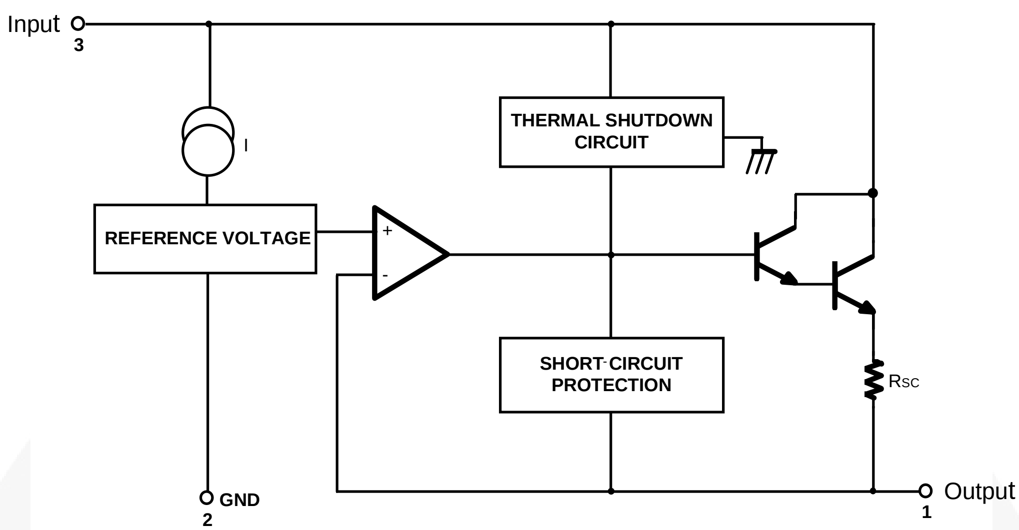


Figure 1. Block Diagram

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°C unless otherwise noted.

Symbol	Parameter		Value	Unit
V_I	Input Voltage	V_O = 5 V to 8 V	30	V
		V_O = 12 V to 15 V	35	V
T_{OPR}	Operating Temperature Range		-40 to +125°C	°C
$T_{J(MAX)}$	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-65 to +150	°C
$R_{\theta JC}$	Thermal Resistance, Junction-Case	TO-92	50	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-Air	TO-92	150	°C/W
		SOT-89	225	°C/W
		8-SOIC	160	°C/W

Electrical Characteristics (MC78L05A / LM78L05A)

V_I = 10 V, I_O = 40 mA, -40°C ≤ T_J ≤ 125°C, C_I = 0.33 µF, C_O = 0.1 µF, unless otherwise specified.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = 25°C		4.8	5.0	5.2	V
ΔV_O	Line Regulation[1]	T_J = 25°C	7 V ≤ V_I ≤ 20 V		8	150	mV
			8 V ≤ V_I ≤ 20 V		6	100	mV
ΔV_O	Load Regulation[1]	T_J = 25°C	1 mA ≤ I_O ≤ 100 mA		11	60	mV
			1 mA ≤ I_O ≤ 40 mA		5.0	30.0	mV
V_O	Output Voltage	7 V ≤ V_I ≤ 20 V	1 mA ≤ I_O ≤ 40 mA			5.25	V
		7 V ≤ V_I ≤ V_{MAX}[2]	1 mA ≤ I_O ≤ 70 mA	4.75		5.25	V
I_Q	Quiescent Current	T_J = 25°C			2.0	5.5	mA
ΔI_Q	Quiescent Current Change — With Line	8 V ≤ V_I ≤ 20 V				1.5	mA
ΔI_Q	Quiescent Current Change — With Load	1 mA ≤ I_O ≤ 40 mA				0.1	mA
V_N	Output Noise Voltage	T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz			40		µV/Vo
$\Delta V_O/\Delta T$	Temperature Coefficient of V_O	I_O = 5 mA			-0.65		mV/°C
RR	Ripple Rejection	f = 120 Hz, 8 V ≤ V_I ≤ 18 V, T_J = 25°C		41	80		dB
V_D	Dropout Voltage	T_J = 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 ≤ 0.75 W.

Electrical Characteristics (MC78L06A)

V_I = 12 V, I_O = 40 mA, -40°C ≤ T_J ≤ 125°C, C_I = 0.33 µF, C_O = 0.1 µF, unless otherwise specified.

Symbol	Parameter		Conditions		Min.	Typ.	Max.	Unit
V_O	Output Voltage		T_J = 25°C		5.75	6.0	6.25	V
ΔV_O	Line Regulation(3)		T_J = 25°C	8.5 V ≤ V_I ≤ 20 V		64	175	mV
				9 V ≤ V_I ≤ 20 V		54	125	mV
ΔV_O	Load Regulation(3)		T_J = 25°C	1 mA ≤ I_O ≤ 100 mA		12.8	80.0	mV
				1 mA ≤ I_O ≤ 70 mA		5.8	40.0	mV
V_O	Output Voltage		8.5 V ≤ V_I ≤ 20 V, 1 mA ≤ I_O ≤ 40 mA		5.7		6.3	V
			8.5 V ≤ V_I ≤ V_{MAX}(4), 1 mA ≤ I_O ≤ 70 mA		5.7		6.3	V
I_Q	Quiescent Current		T_J = 25°C				5.5	mA
			T_J = 125°C			3.9	6.0	mA
ΔI_Q	Quiescent Current Change	With Line	9 V ≤ V_I ≤ 20 V				1.5	mA
ΔI_Q		With Load	1 mA ≤ I_O ≤ 40 mA				0.1	mA
V_N	Output Noise Voltage		T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz			40		µV/Vo
$\Delta V_O/\Delta T$	Temperature Coefficient of V_O		I_O = 5 mA			0.75		mV/°C
RR	Ripple Rejection		f = 120 Hz, 10 V ≤ V_I ≤ 20 V, T_J = 25°C		40	46		dB
V_D	Dropout Voltage		T_J = 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 ≤ 0.75 W.

Electrical Characteristics (MC78L08A)

V_I = 14 V, I_O = 40 mA, -40°C ≤ T_J ≤ 125°C, C_I = 0.33 µF, C_O = 0.1 µF, unless otherwise specified.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = 25°C		7.7	8.0	8.3	V
ΔV_O	Line Regulation(5)	T_J = 25°C	10.5 V ≤ V_I ≤ 23 V		10	175	mV
ΔV_O	Line Regulation(5)	T_J = 25°C	11 V ≤ V_I ≤ 23 V		8	125	mV
ΔV_O	Load Regulation(5)	T_J = 25°C	1 mA ≤ I_O ≤ 100 mA		15	80	mV
ΔV_O	Load Regulation(5)	T_J = 25°C	1 mA ≤ I_O ≤ 40 mA		8	40	mV
V_O	Output Voltage	10.5V ≤ V_I ≤ 23V	1 mA ≤ I_O ≤ 40 mA	7.6		8.4	V
V_O	Output Voltage	10.5V ≤ V_I ≤ V_{MAX}(6)	1 mA ≤ I_O ≤ 70 mA	7.6		8.4	V
I_Q	Quiescent Current	T_J = 25°C			2.0	5.5	mA
ΔI_Q	Quiescent Current Change — With Line	11 V ≤ V_I ≤ 23 V				1.5	mA
ΔI_Q	Quiescent Current Change — With Load	1 mA ≤ I_O ≤ 40 mA				0.1	mA
V_N	Output Noise Voltage	T_A = 25°C, 10 Hz ≤ f ≤100 kHz			60		µV/Vo
$\Delta V_O/\Delta T$	Temperature Coefficient of V_O	I_O = 5 mA			-0.8		mV/°C
RR	Ripple Rejection	f = 120 Hz, 11 V ≤ V_I ≤ 21 V, T_J = 25°C		39	70		dB
V_D	Dropout Voltage	T_J = 25°C			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 ≤ 0.75 W.

Electrical Characteristics (MC78L12A / LM78L12A)

V_I = 19 V, I_O = 40 mA, -40°C ≤ T_J ≤ 125°C, C_I = 0.33 µF, C_O = 0.1 µF, unless otherwise specified.

Symbol	Parameter		Conditions		Min.	Typ.	Max.	Unit
V_O	Output Voltage		T_J = 25°C		11.5	12.0	12.5	V
ΔV_O	Line Regulation (7)		T_J = 25°C	14.5 V ≤ V_I ≤ 27 V		20	250	mV
				16 V ≤ V_I ≤ 27 V		15	200	mV
ΔV_O	Load Regulation (7)		T_J = 25°C	1 mA ≤ I_O ≤ 100 mA		20	100	mV
				1 mA ≤ I_O ≤ 40 mA		10	50	mV
V_O	Output Voltage		14.5 V ≤ V_I ≤ 27 V	1 mA ≤ I_O ≤ 40 mA	11.4		12.6	V
			14.5 V ≤ V_I ≤ V_{MAX} (8)	1 mA ≤ I_O ≤ 70 mA	11.4		12.6	V
I_Q	Quiescent Current		T_J = 25°C			2.1	6.0	mA
ΔI_Q	Quiescent Current Change	With Line	16 V ≤ V_I ≤ 27 V				1.5	mA
ΔI_Q		With Load	1 mA ≤ I_O ≤ 40 mA				0.1	mA
V_N	Output Noise Voltage		T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz			80		µV/Vo
$\Delta V_O/\Delta T$	Temperature Coefficient of V_O		I_O = 5 mA			-1.0		mV/°C
RR	Ripple Rejection		f = 120 Hz, 15 V ≤ V_I ≤ 25 V, T_J = 25°C		37	65		dB
V_D	Dropout Voltage		T_J = 25°C			1.7		V

Notes:
7. 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 ≤ 0.75 W.

Electrical Characteristics (MC78L15A)

V_I = 23 V, I_O = 40 mA, -40°C ≤ T_J ≤ 125°C, C_I = 0.33 µF, C_O = 0.1 µF, unless otherwise specified.

Symbol	Parameter		Conditions		Min.	Typ.	Max.	Unit
V_O	Output Voltage		T_J = 25°C		14.4	15.0	15.6	V
ΔV_O	Line Regulation[9]		T_J = 25°C	17.5 V ≤ V_I ≤ 30 V		25	300	mV
				20 V ≤ V_I ≤ 30 V		20	250	mV
ΔV_O	Load Regulation[9]		T_J = 25°C	1 mA ≤ I_O ≤ 100 mA		25	150	mV
				1 mA ≤ I_O ≤ 40 mA		12	75	mV
V_O	Output Voltage		17.5 V ≤ V_I ≤ 30 V	1 mA ≤ I_O ≤ 40 mA	14.25		15.75	V
			17.5 V ≤ V_I ≤ V_{MAX}[10]	1 mA ≤ I_O ≤ 70 mA	14.25		15.75	V
I_Q	Quiescent Current		T_J = 25°C			2.1	6.0	mA
ΔI_Q	Quiescent Current Change	With Line	20 V ≤ V_I ≤ 30 V				1.5	mA
ΔI_Q		With Load	1 mA ≤ I_O ≤ 40 mA				0.1	mA
V_N	Output Noise Voltage		T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz			90		µV/Vo
$\Delta V_O/\Delta T$	Temperature Coefficient of V_O		I_O = 5 mA			-1.3		mV/°C
RR	Ripple Rejection		f = 120 Hz, 18.5 V ≤ V_I ≤28.5 V, T_J = 25°C		34	60		dB
V_D	Dropout Voltage		T_J = 25°C			1.7		V

Notes:

9. 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.
10. Power dissipation P_D ≤ 0.75 W.

Typical Application

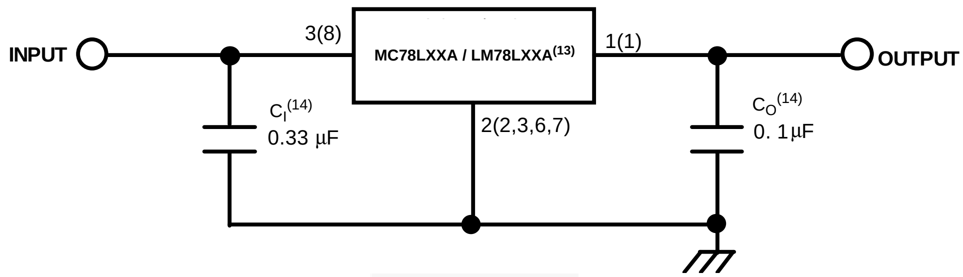
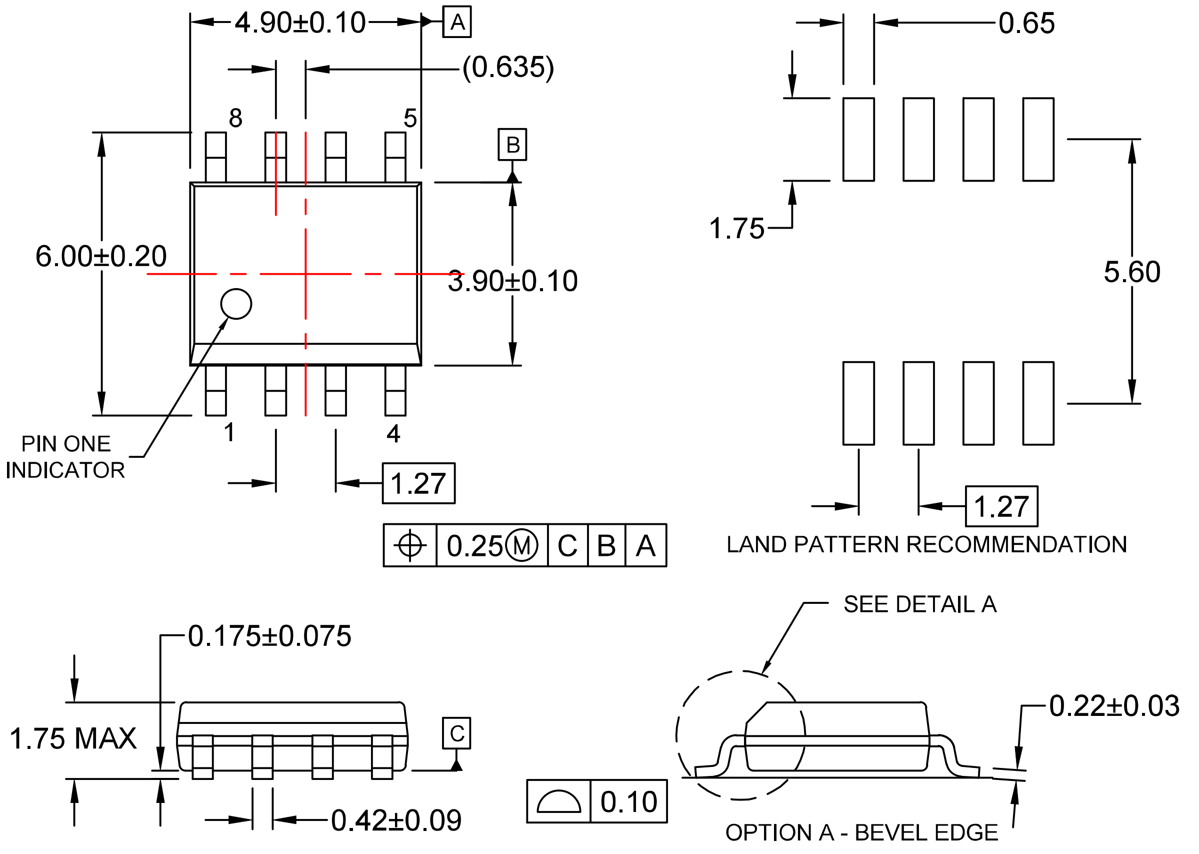
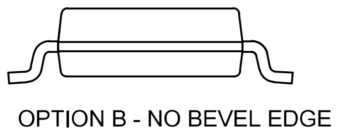


Figure 2. Typical Application

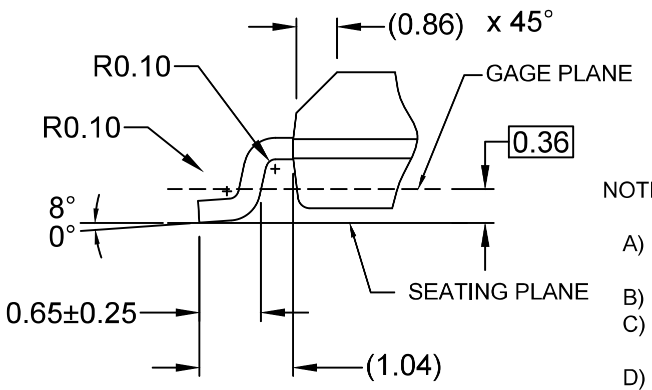
Notes:

13. To specify an output voltage, substitute voltage value for “XX”.
14. C_I is required if the regulator is located an appreciable distance from the power supply filter. Though C_O is not needed for stability, it improves transient response. Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulator.





OPTION B - NO BEVEL EDGE



DETAIL A
SCALE: 2:1

NOTES:

A) THIS PACKAGE CONFORMS TO JEDEC MS-012, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
D) LANDPATTERN STANDARD: SOIC127P600X175-8M
E) DRAWING FILENAME: M08Arev16

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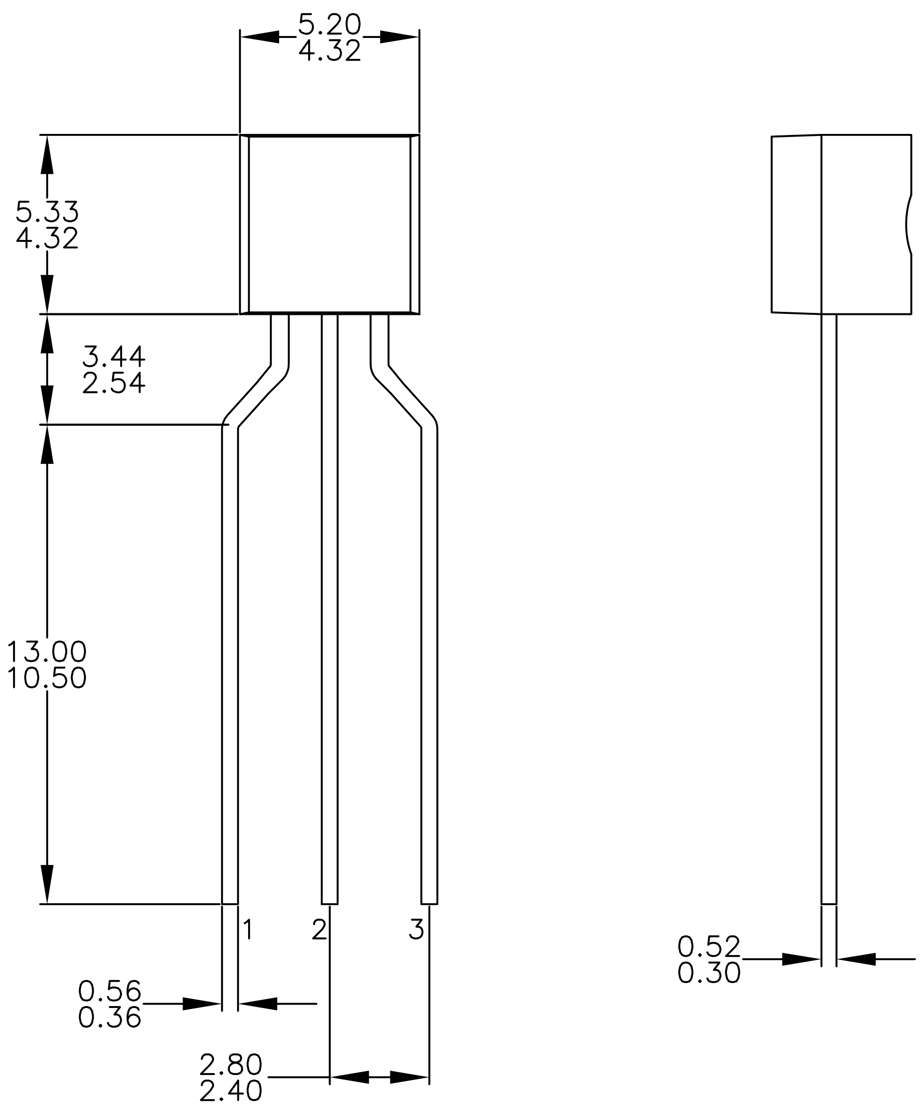
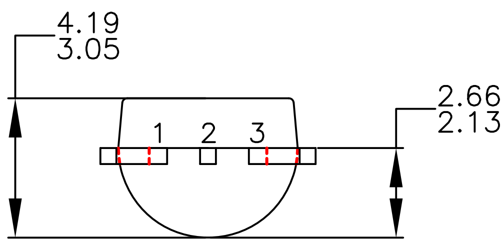
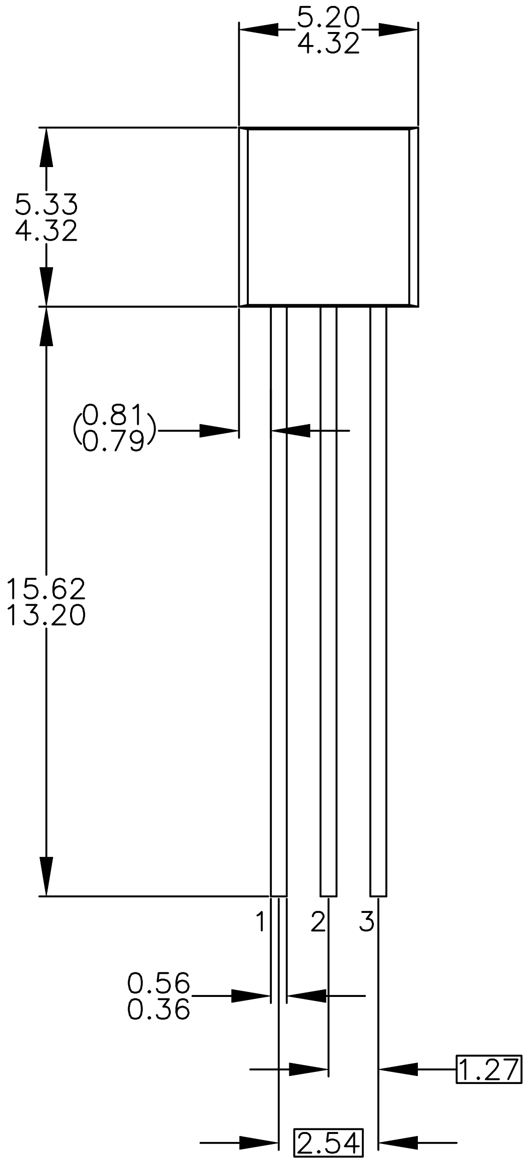
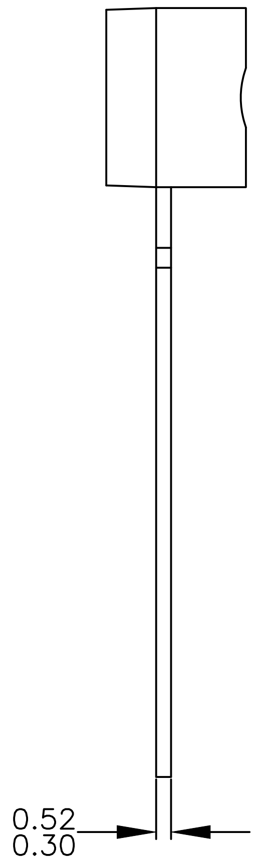


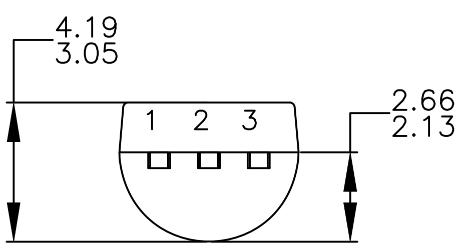


NOTES: UNLESS OTHERWISE SPECIFIED

A. DRAWING CONFORMS TO JEDEC MS-013, VARIATION AC.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. DRAWING CONFORMS TO ASME Y14.5M-2009.
D. DRAWING FILENAME: MKT-ZA03FREV3.
E. FAIRCHILD SEMICONDUCTOR.







NOTES: UNLESS OTHERWISE SPECIFIED

A) DRAWING WITH REFERENCE TO JEDEC TO-92 RECOMMENDATIONS.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DRAWING CONFORMS TO ASME Y14.5M-2009.
D) DRAWING FILENAME: MKT-ZA03DREV4.

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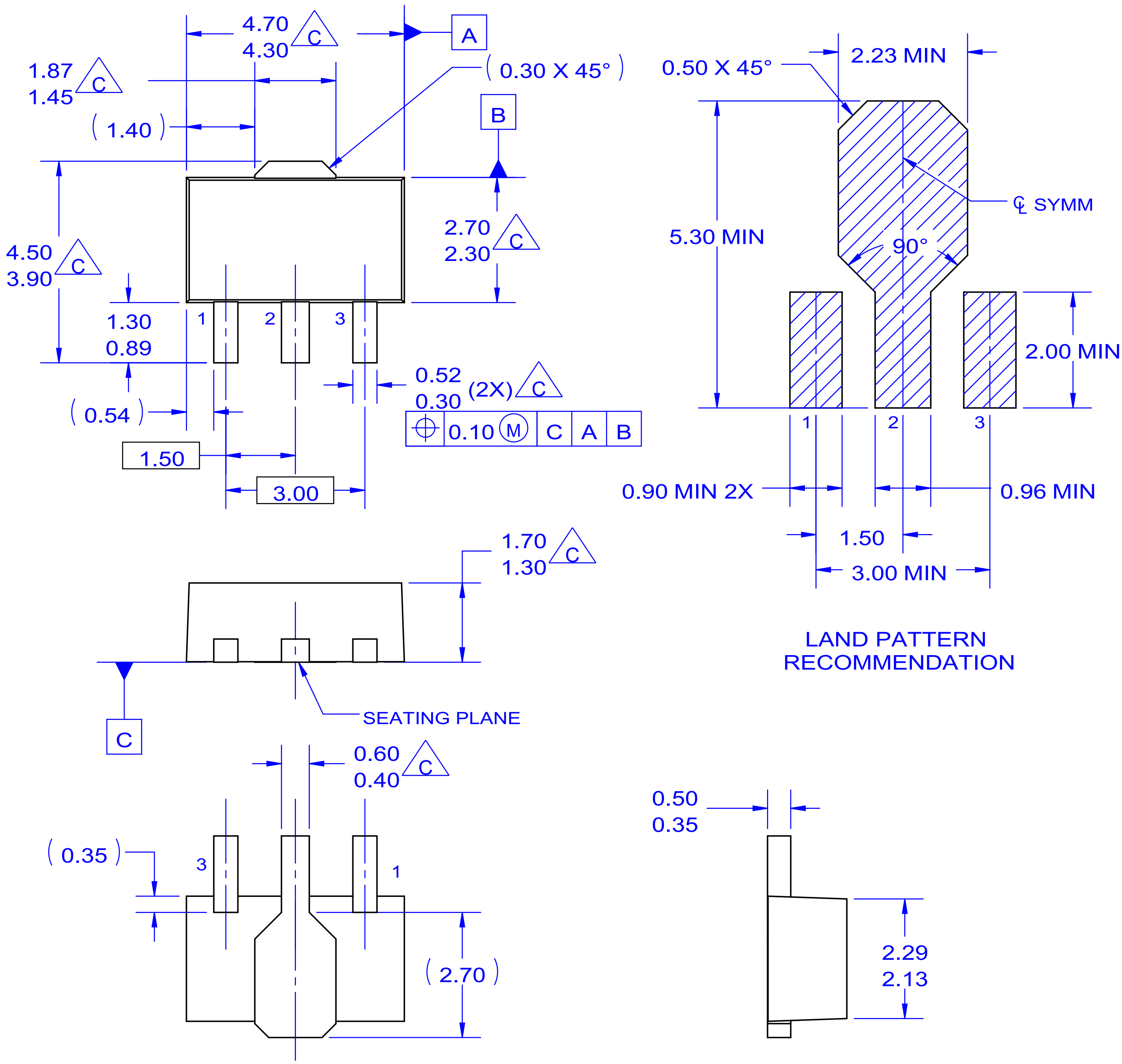

NOTES: UNLESS OTHERWISE SPECIFIED.

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.
E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
F. DRAWING FILE NAME: MA03CREV3

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