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

1. Output 2. GND 3. Input

SOT-89

8-SOIC

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

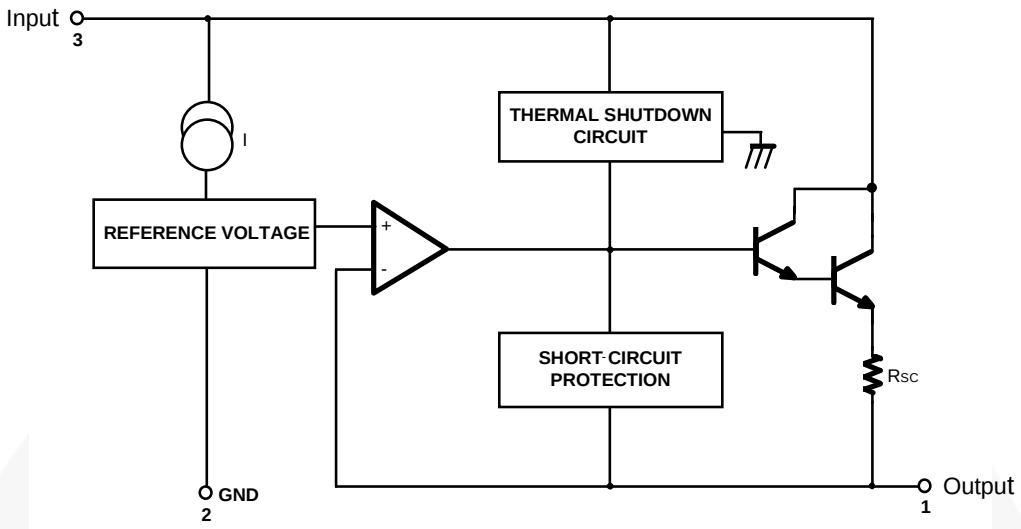


Figure 1. Block Diagram

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		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
				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
				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
			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		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

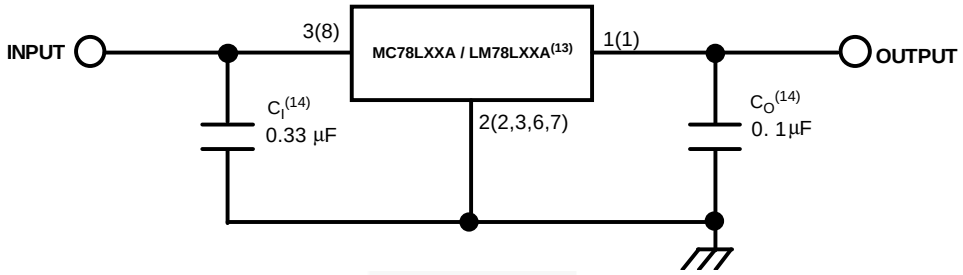
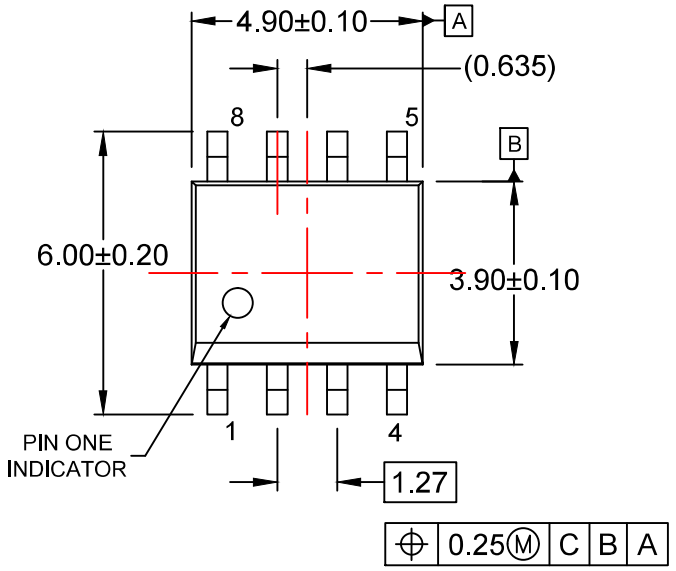
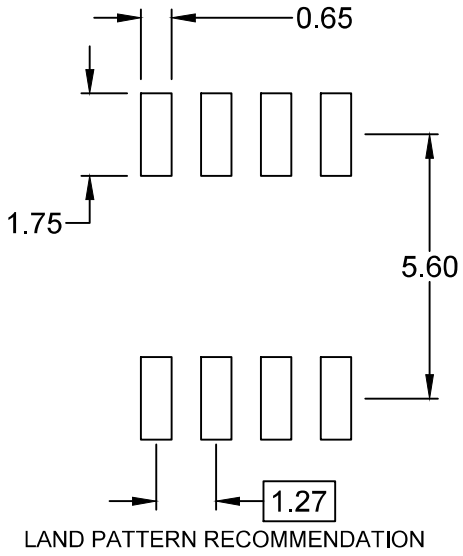


Figure 2. Typical Application

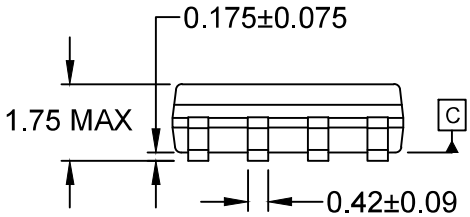
Notes:

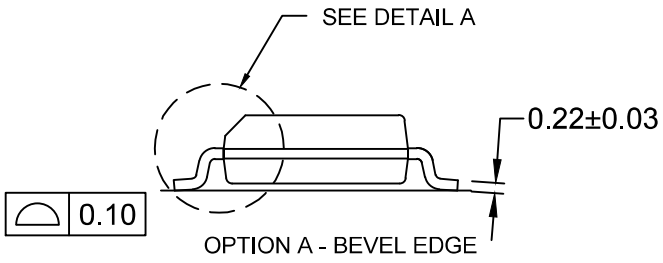
13. To specify an output voltage, substitute voltage value for “XX”.
14. C_I is required if the regulator is located an appreciable distance from the power supply filter. Though C_O is not needed for stability, it improves transient response. Bypass capacitors are recommended for optimum stability and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



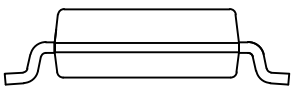


LAND PATTERN RECOMMENDATION

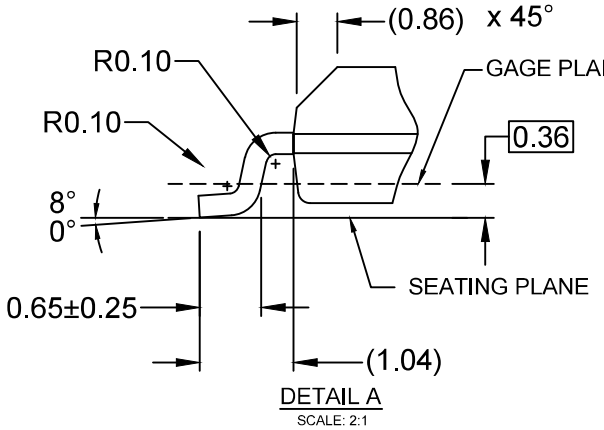




OPTION A - BEVEL EDGE



OPTION B - NO BEVEL EDGE

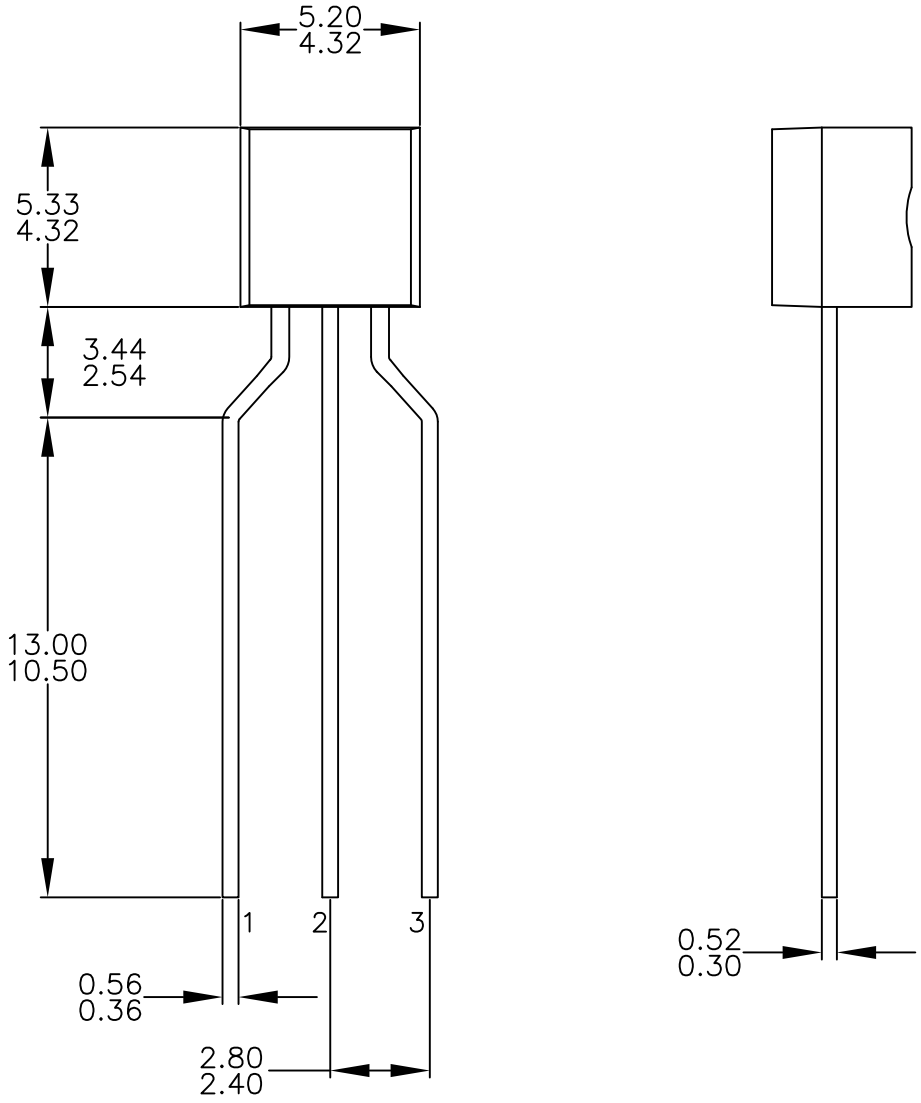


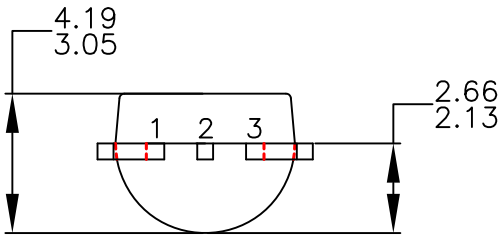
DETAIL A
SCALE: 2:1

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

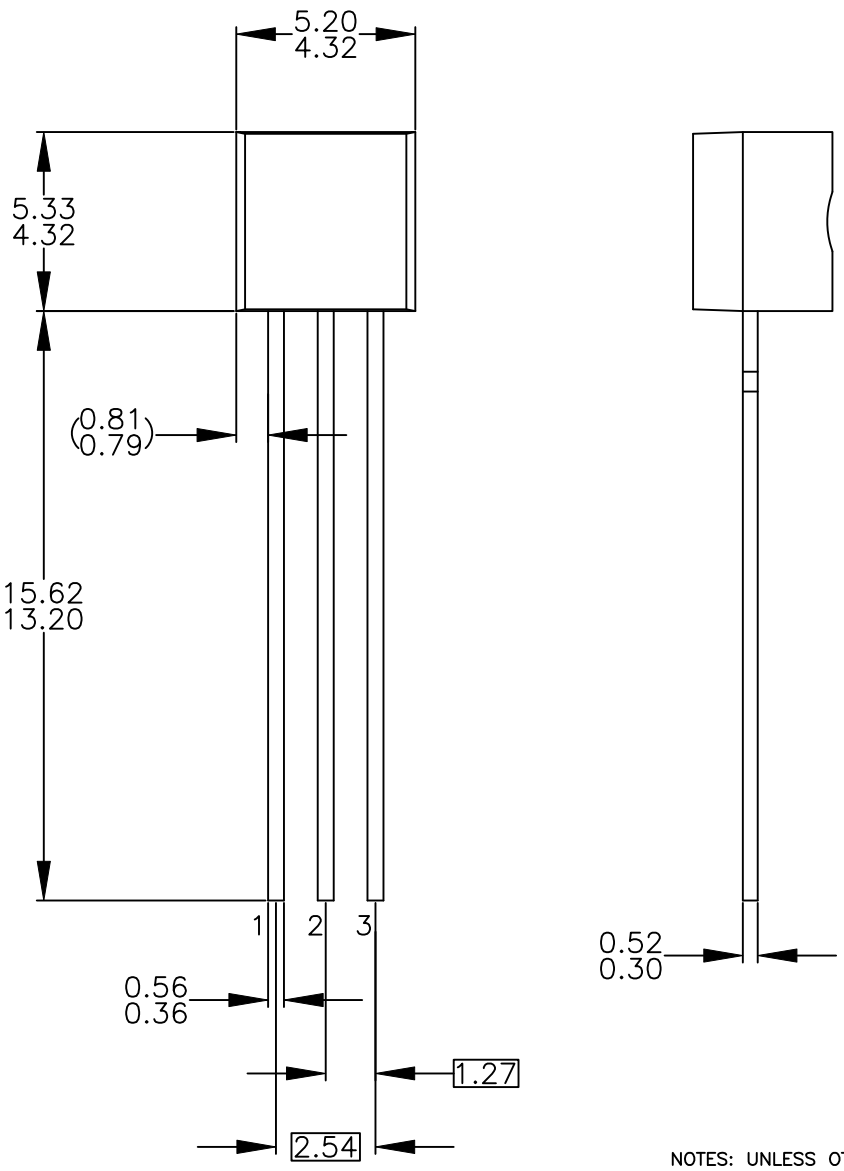
FAIRCHILD.

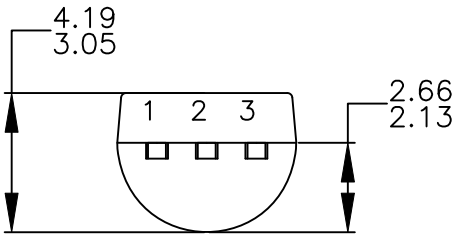




NOTES: UNLESS OTHERWISE SPECIFIED

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.

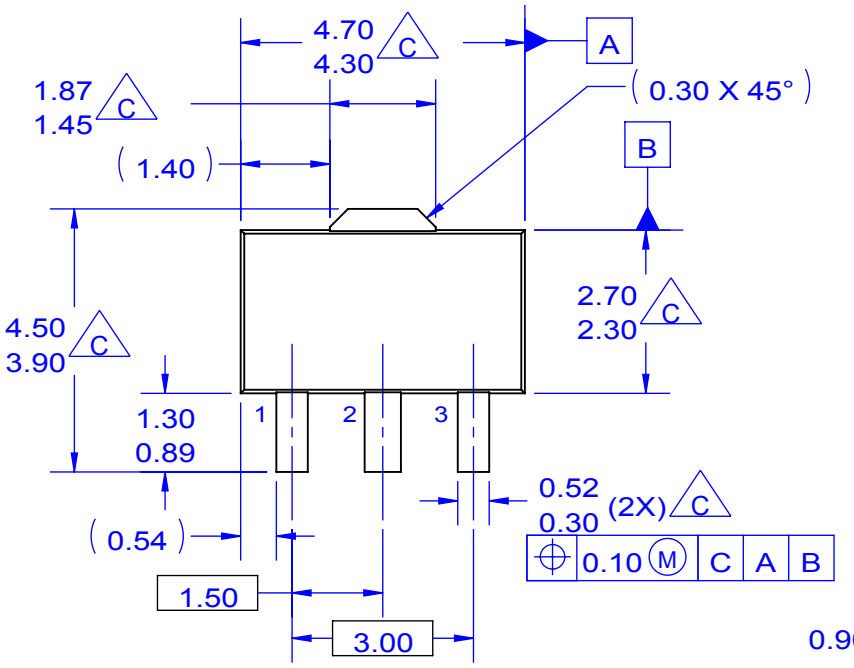


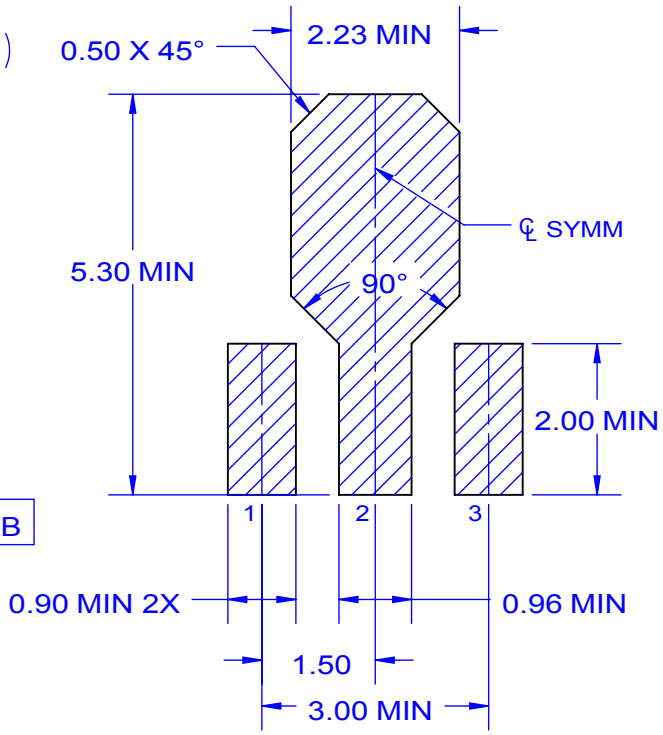


NOTES: UNLESS OTHERWISE SPECIFIED

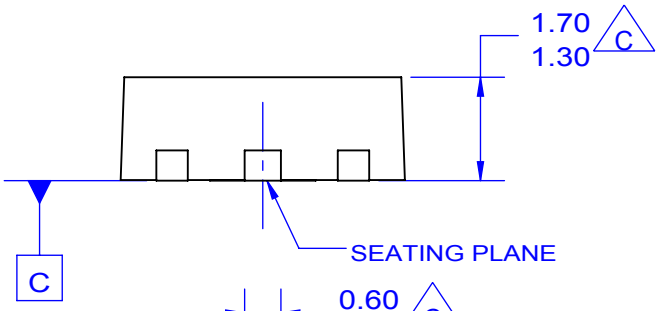
A) DRAWING WITH REFERENCE TO JEDEC TO-92 RECOMMENDATIONS.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DRAWING CONFORMS TO ASME Y14.5M-2009.
D) DRAWING FILENAME: MKT-ZA03DREV4.

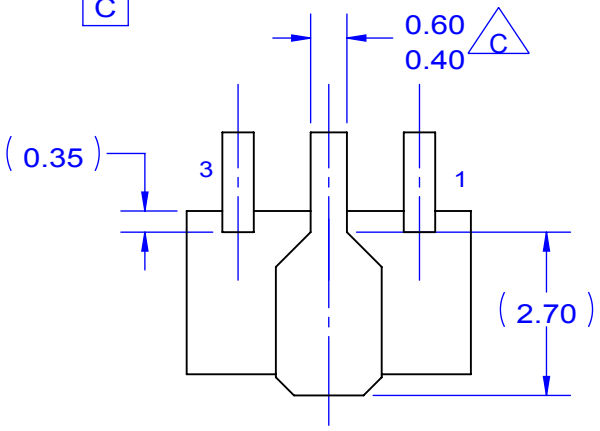
FAIRCHILD

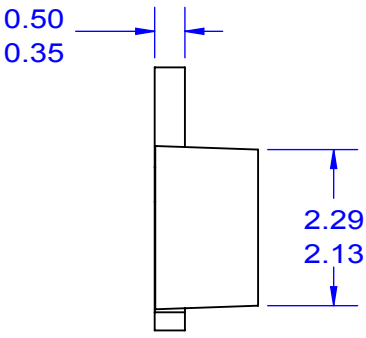




LAND PATTERN
RECOMMENDATION







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

TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™
AttitudeEngine™
Awinda®
AX-CAP®*
BitSiC™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficientMax™
ESBC™
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FastvCore™
FETBench™
FPS™
F-PFS™
FRFET®
Global Power Resource SM
GreenBridge™
Green FPS™
Green FPS™ e-Series™
G*max*™
GTO™
IntelliMAX™
ISOPLANAR™
Making Small Speakers Sound Louder and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
MotionGrid®
MTi®
MTx®
MVN®
mWSaver®
OptoHiT™
OPTOLOGIC®
OPTOPLANAR®
®
Power Supply WebDesigner™
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
Solutions for Your Success™
SPM®
STEALTH™
SuperFET®
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS®
SyncFET™
Sync-Lock™
SYSTEM GENERAL®*
TinyBoost®
TinyBuck®
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC™
TriFault Detect™
TRUECURRENT®*
µSerDes™
SerDes™
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
VoltagePlus™
XS™
Xsens™
仙童®

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT HTTP://WWW.FAIRCHILDSEMI.COM. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

AUTHORIZED USE

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Terms of Use

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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.

Rev. I77

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Fairchild Semiconductor:
MC78L06ACPXA MC78L06ACP