

LM123QML 3-Amp, 5-Volt Positive Regulator

 Check for Samples: [LM123QML](#)

FEATURES

- 3 Amp Output Current
- Internal Current and Thermal Limiting
- 0.01Ω Typical Output Impedance
- 7.5V Minimum Input Voltage
- 30W Power Dissipation

DESCRIPTION

The LM123 is a three-terminal positive regulator with a preset 5V output and a load driving capability of 3 amps. New circuit design and processing techniques are used to provide the high output current without sacrificing the regulation characteristics of lower current devices.

The 3 amp regulator is virtually blowout proof. Current limiting, power limiting, and thermal shutdown provide the same high level of reliability obtained with these techniques in the LM109 1 amp regulator.

No external components are required for operation of the LM123. If the device is more than 4 inches from the filter capacitor, however, a 1 μF solid tantalum capacitor should be used on the input. A 0.1 μF or larger capacitor may be used on the output to reduce load transient spikes created by fast switching digital logic, or to swamp out stray load capacitance.

An overall worst case specification for the combined effects of input voltage, load currents, ambient temperature, and power dissipation ensure that the LM123 will perform satisfactorily as a system element.

For applications requiring other voltages, see LM150 series adjustable regulator data sheet.

Connection Diagram

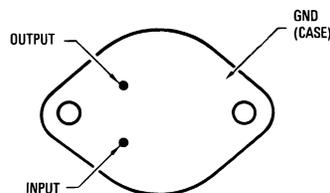


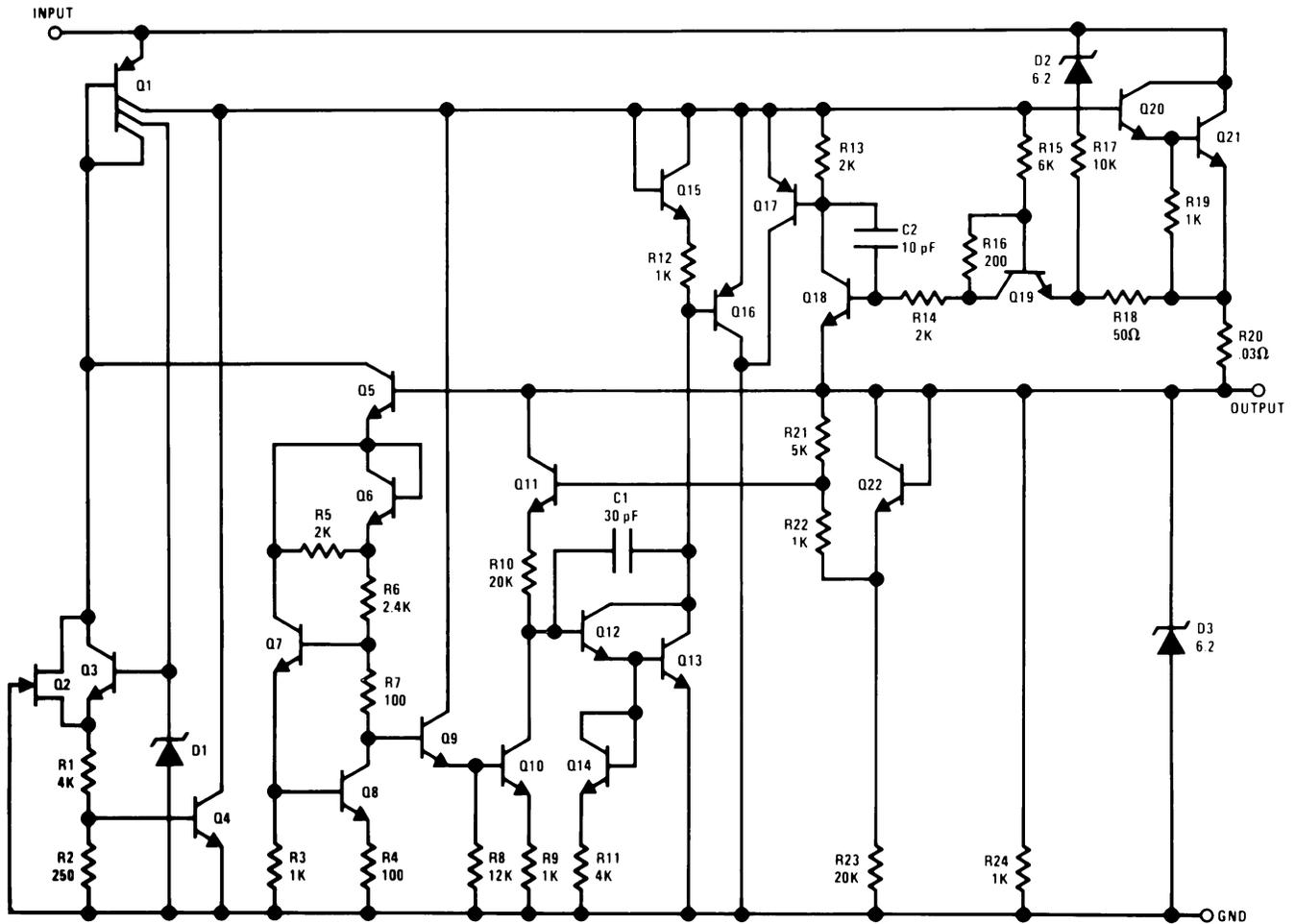
Figure 1. TO Package
See Package Number K0002C



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Schematic Diagram



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Absolute Maximum Ratings⁽¹⁾

| | |
|---------------------------------------|---------------------------------|
| Input Voltage | 20V |
| Power Dissipation ⁽²⁾ | Internally Limited |
| Operating Junction Temperature Range | -55°C ≤ T _J ≤ +150°C |
| Storage Temperature Range | -65°C ≤ T _J ≤ +150°C |
| Lead Temperature (Soldering, 10 sec.) | 300°C |
| ESD Tolerance ⁽³⁾ | 2000V |

- (1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not ensure specific performance limits. For ensured specifications and test conditions, see the Electrical Characteristics. The specified specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.
- (2) The maximum power dissipation must be derated at elevated temperatures and is dictated by T_{Jmax} (maximum junction temperature), θ_{JA} (package junction to ambient thermal resistance), and T_A (ambient temperature). The maximum allowable power dissipation at any temperature is P_{Dmax} = (T_{Jmax} - T_A)/θ_{JA} or the number given in the Absolute Maximum Ratings, whichever is lower.
- (3) Human body model, 1.5 kΩ in series with 100 pF.

Quality Conformance Inspection
Table 1. Mil-Std-883, Method 5005 - Group A

| Subgroup | Description | Temp (°C) |
|----------|---------------------|-----------|
| 1 | Static tests at | +25 |
| 2 | Static tests at | +125 |
| 3 | Static tests at | -55 |
| 4 | Dynamic tests at | +25 |
| 5 | Dynamic tests at | +125 |
| 6 | Dynamic tests at | -55 |
| 7 | Functional tests at | +25 |
| 8A | Functional tests at | +125 |
| 8B | Functional tests at | -55 |
| 9 | Switching tests at | +25 |
| 10 | Switching tests at | +125 |
| 11 | Switching tests at | -55 |
| 12 | Settling time at | +25 |
| 13 | Settling time at | +125 |
| 14 | Settling time at | -55 |

DC Parameters

| Parameter | | Test Conditions | Notes | Min | Max | Units | Sub-groups |
|----------------------|-----------------------|---|--------------------|------|-----|-------|------------|
| V _{OUT} | Output Voltage | V _{IN} = 7.5V, I _O = 0A | | 4.7 | 5.3 | V | 1 |
| | | 7.5V ≤ V _{IN} ≤ 15V, 0 ≤ I _O ≤ 3A, P ≤ 30W | | 4.6 | 5.4 | V | 1, 2, 3 |
| V _{RLine} | Line Regulation | 7.5V ≤ V _{IN} ≤ 15V, I _O = 0A | | -25 | 25 | mV | 1 |
| V _{RLoad} | Load Regulation | V _{IN} = 7.5V, 0 ≤ I _O ≤ 3A | | -100 | 100 | mV | 1 |
| I _Q | Quiescent Current | V _{IN} = 15V, 0 ≤ I _O ≤ 3A | | | 20 | mA | 1, 2, 3 |
| | | V _{IN} = 7.5V, 0 ≤ I _O ≤ 3A | | | 20 | mA | 1, 2, 3 |
| I _{SC} | Short Circuit Current | V _{IN} = 15V | | | 4.5 | A | 1 |
| | | V _{IN} = 7.5V | | | 5.0 | A | 1 |
| ΔV _O / ΔT | Long Term Stability | | See ⁽¹⁾ | | 35 | mV | 1 |

(1) Specified parameter not tested.

Typical Performance Characteristics

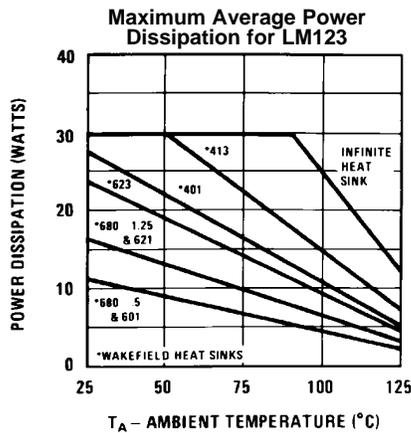


Figure 2.

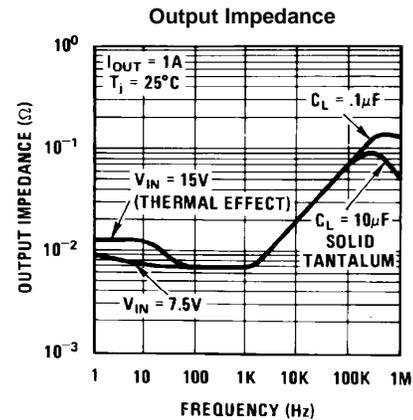


Figure 3.

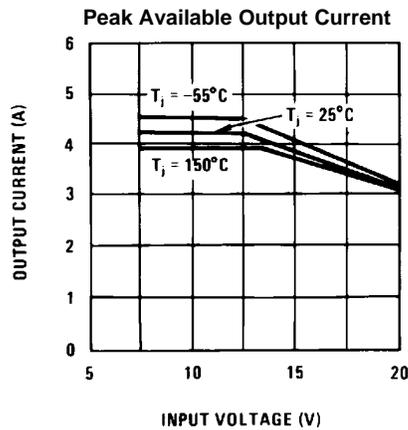


Figure 4.

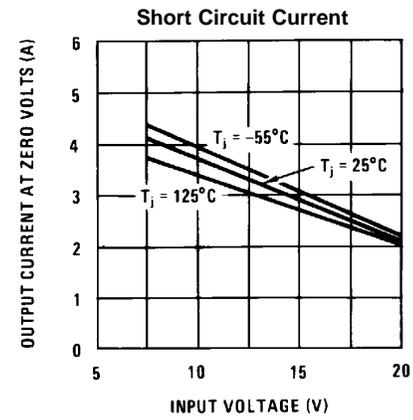


Figure 5.

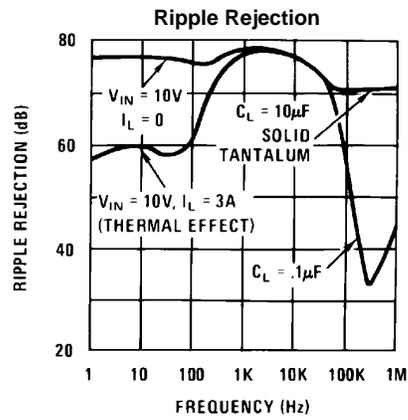


Figure 6.

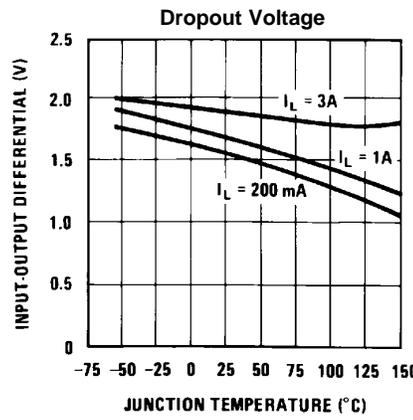


Figure 7.

Typical Performance Characteristics (continued)

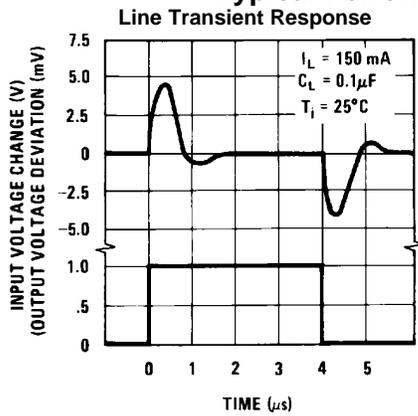


Figure 8.

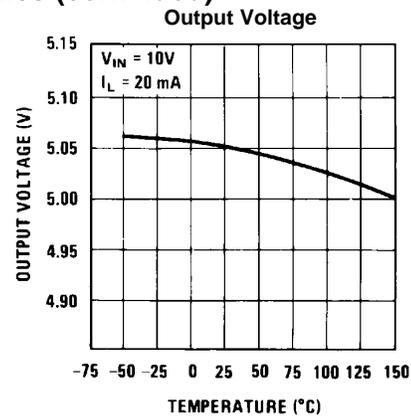


Figure 9.

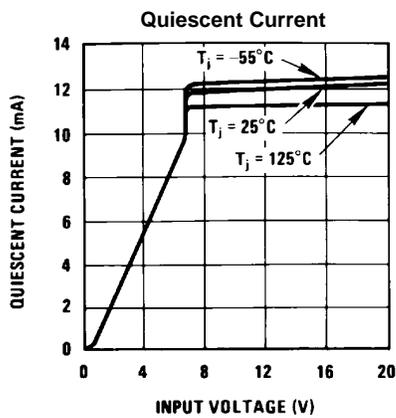


Figure 10.

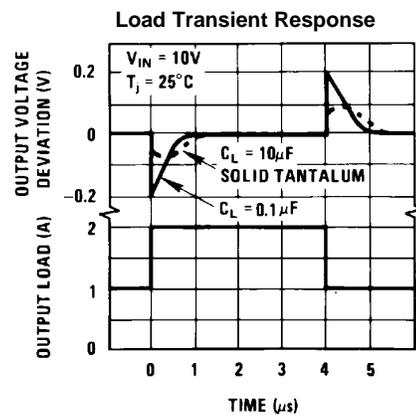


Figure 11.

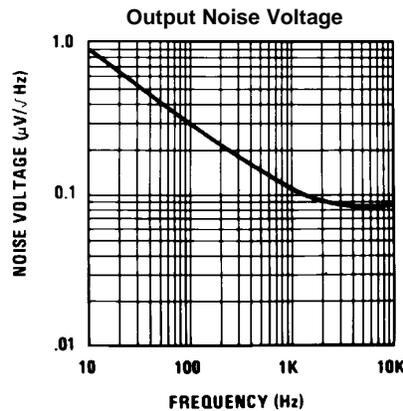
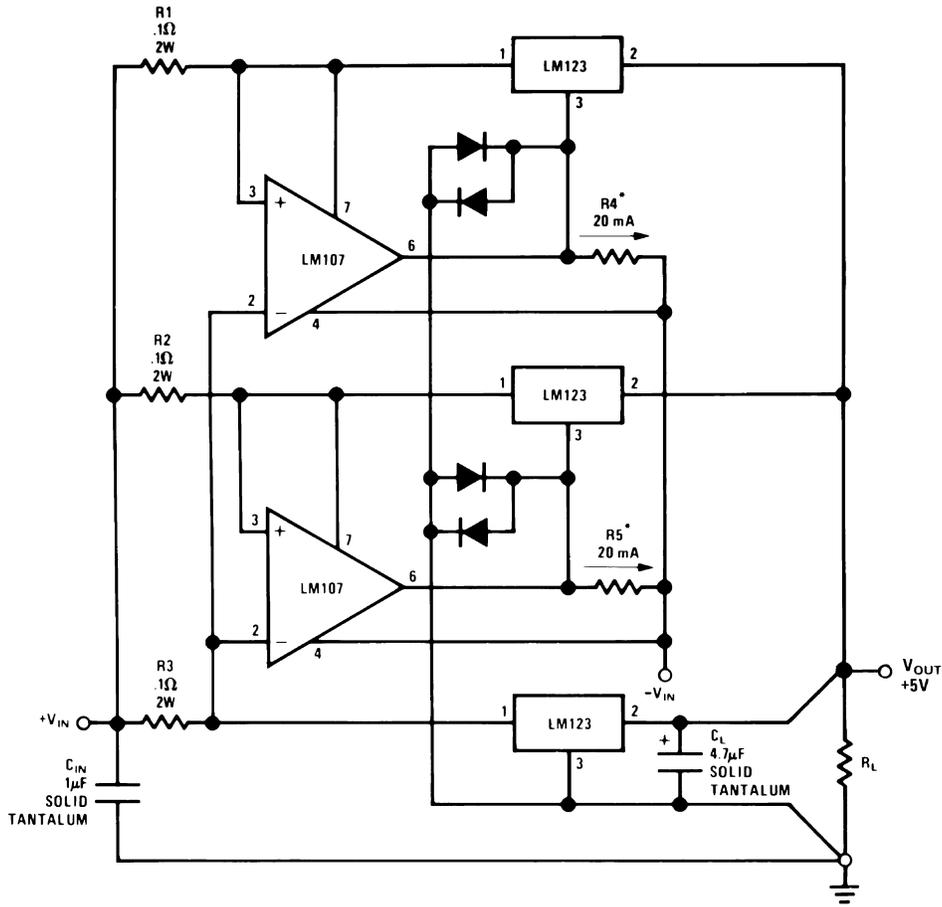


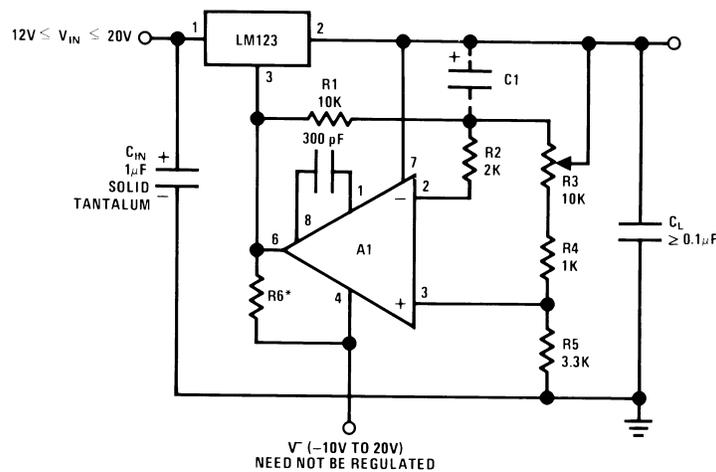
Figure 12.

TYPICAL APPLICATIONS



*Select for 20 mA Current from Unregulated Negative Supply

Figure 13. 10 Amp Regulator with Complete Overload Protection



$$*R6 = \frac{V^-}{12 \text{ mA}}$$

A₁—LM101A

C₁—2 μF Optional—Improves Ripple Rejection, Noise, and Transient Response

Figure 14. Adjustable Regulator 0V–10V at 3A

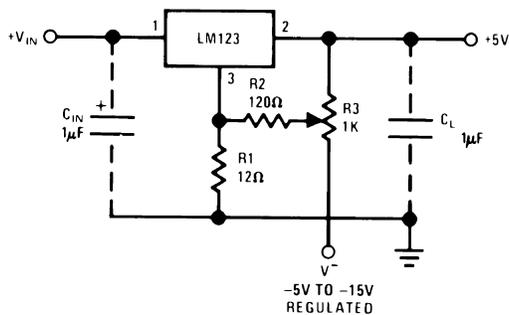
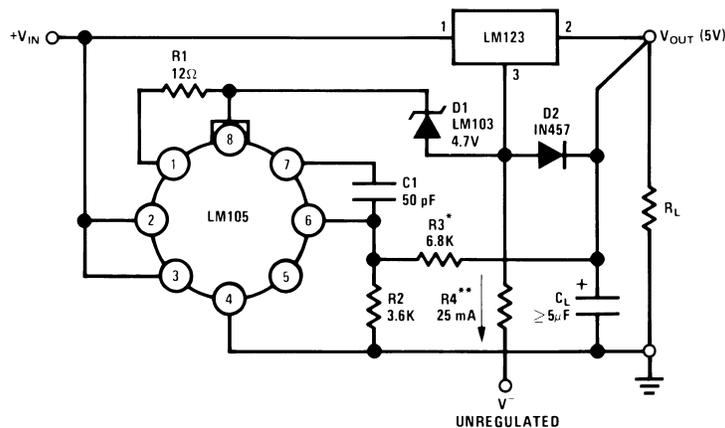
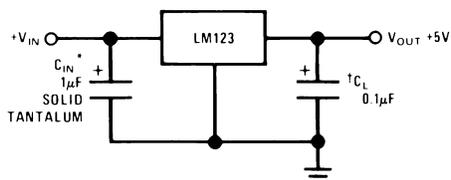


Figure 15. Trimming Output to 5V



*Select to Set Output Voltage
 **Select to Draw 25 mA from V⁻

Figure 16. Adjustable Output 5V-10V 0.1% Regulation



*Required if LM123 is more than 4" from filter capacitor.
 †Regulator is stable with no load capacitor into resistive loads.

Figure 17. Basic 3 Amp Regulator

REVISION HISTORY SECTION

| Released | Revision | Section | Changes |
|------------|----------|-------------------------------|--|
| 12/16/2010 | A | New Release, Corporate format | 1 MDS data sheet converted into one Corp. data sheet format. The drift table was eliminated from the 883 section since it did not apply; MNLM123-X Rev 0BL will be archived. |
| 04/22/2013 | A | All | Changed layout of National Data Sheet to TI format. |

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-----------------------------------|---------|
| LM123K/883 | OBSOLETE | TO | K | 2 | | TBD | Call TI | Call TI | | LM123K /883 Q ACO /883 Q >T | |

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

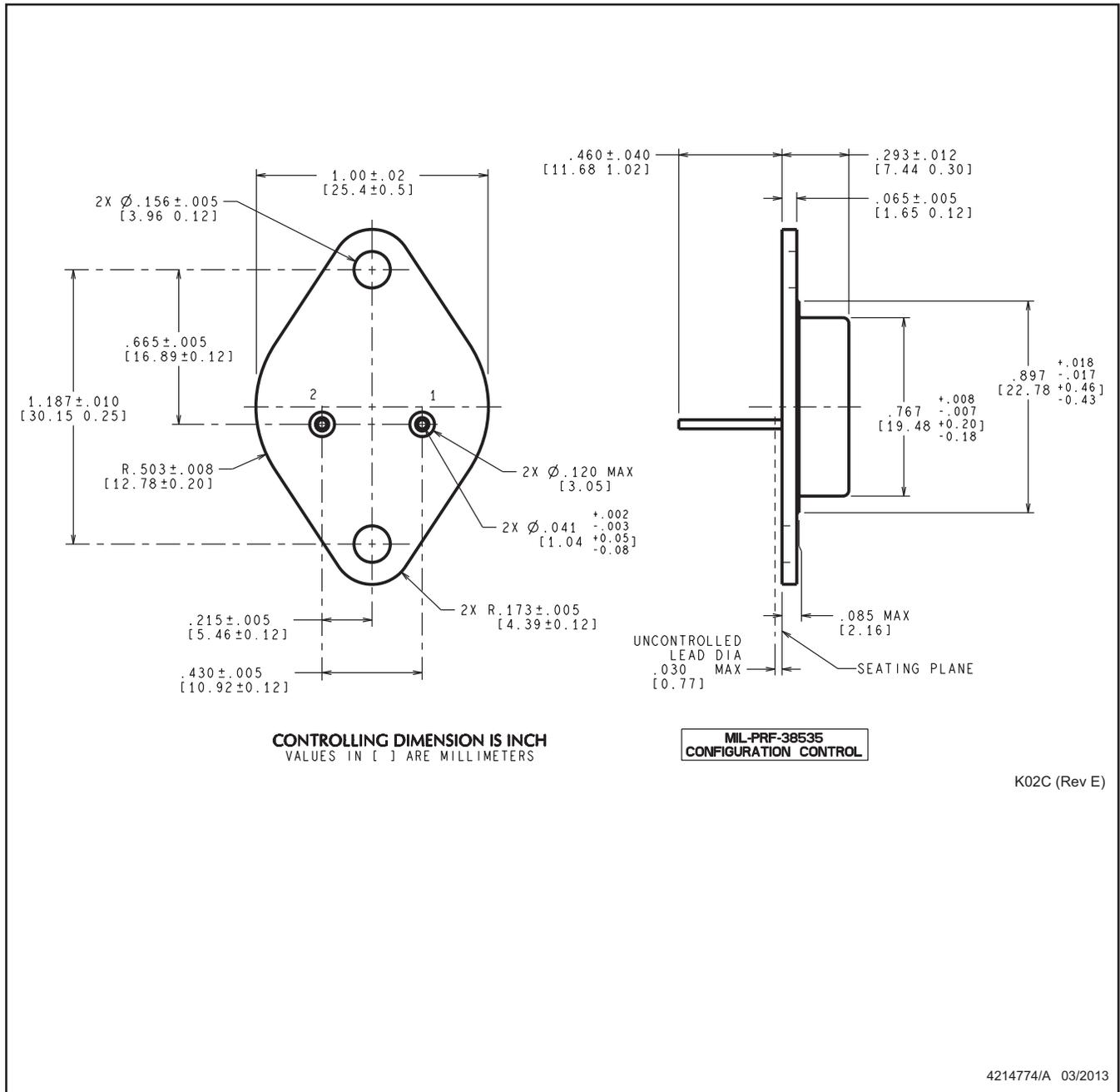
(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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K0002C



NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Leads not to be bent greater than 15°

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