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

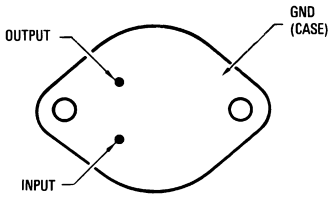
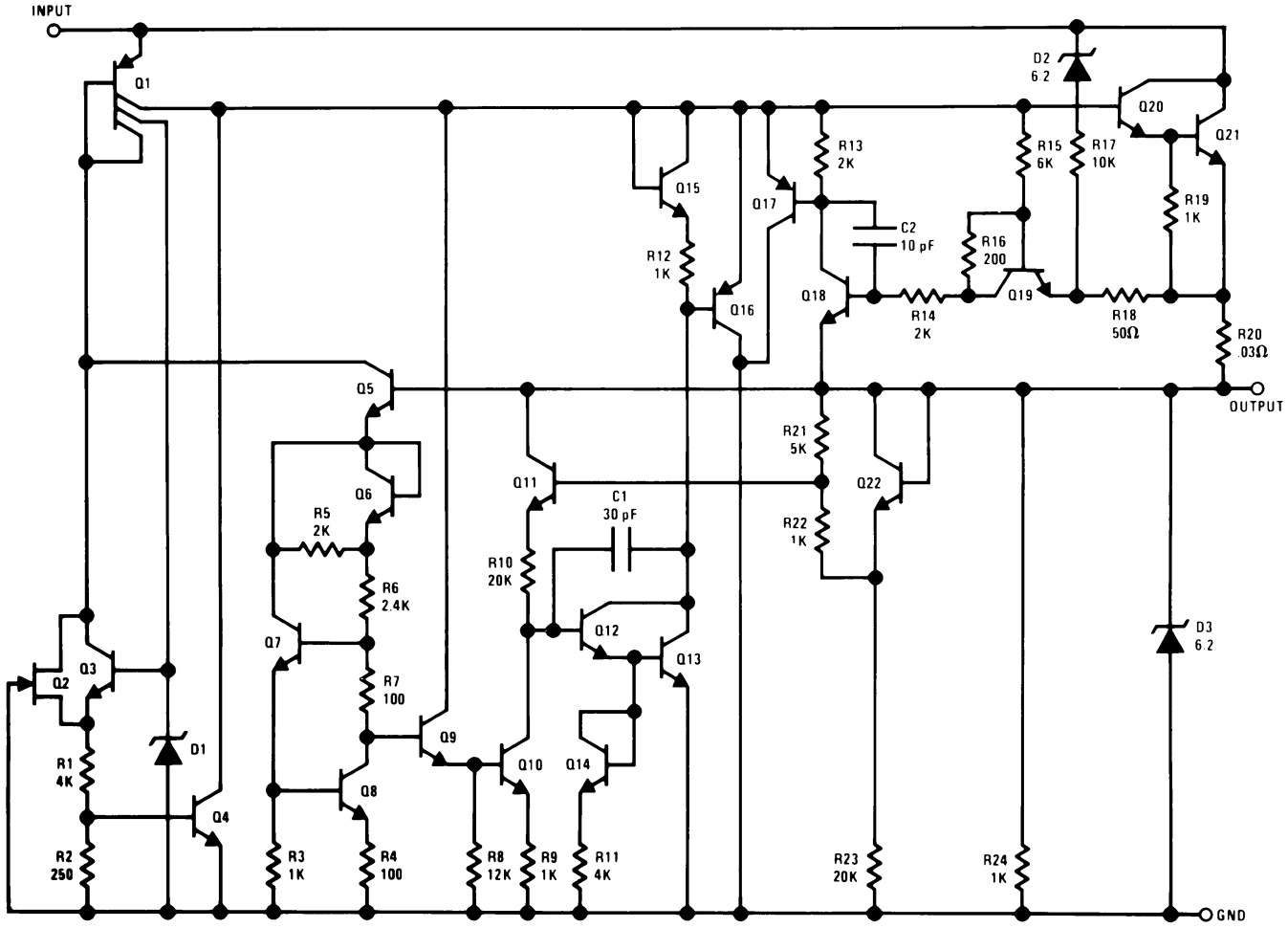


Figure 1. TO Package
See Package Number K0002C

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 $P_{Dmax} = (T_{Jmax} - T_A)/\theta_{JA}$ 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
$\Delta V_O / \Delta T$	Long Term Stability		See (1)		35	mV	1

(1) Specified parameter not tested.

Typical Performance Characteristics

Maximum Average Power Dissipation for LM123

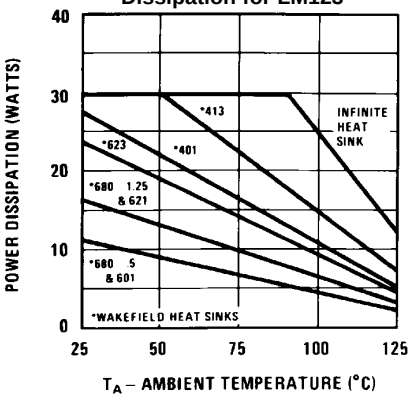


Figure 2.

Output Impedance

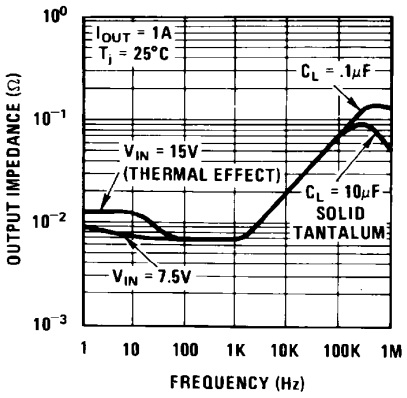


Figure 3.

Peak Available Output Current

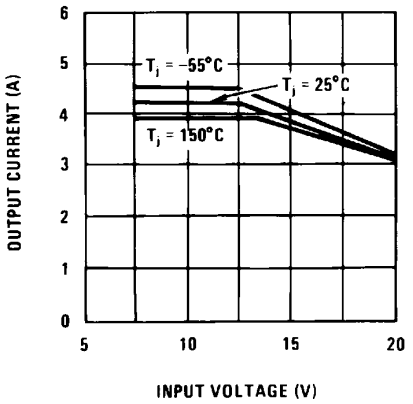


Figure 4.

Short Circuit Current

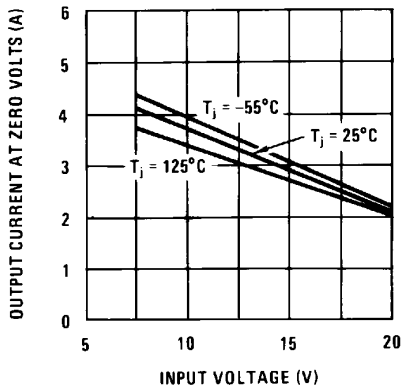


Figure 5.

Ripple Rejection

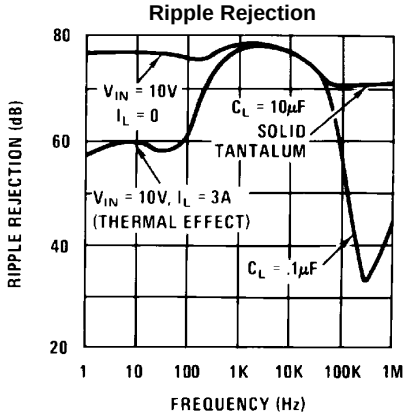


Figure 6.

Dropout Voltage

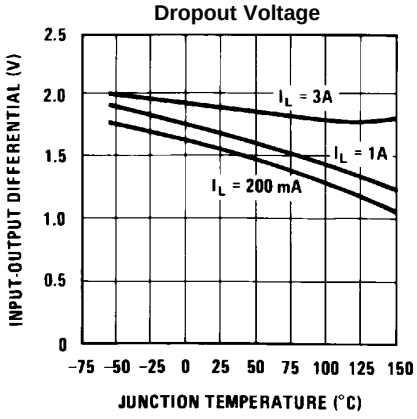


Figure 7.

Typical Performance Characteristics (continued)

Line Transient Response

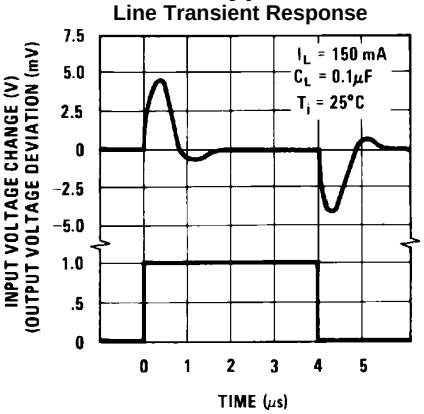


Figure 8.

Output Voltage

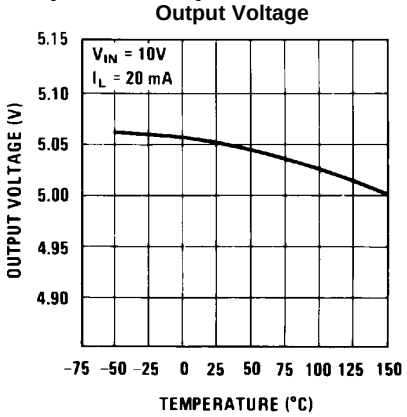


Figure 9.

Quiescent Current

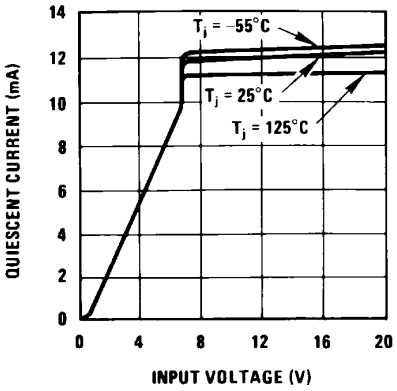


Figure 10.

Load Transient Response

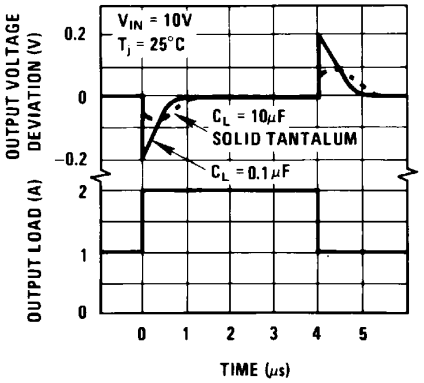


Figure 11.

Output Noise Voltage

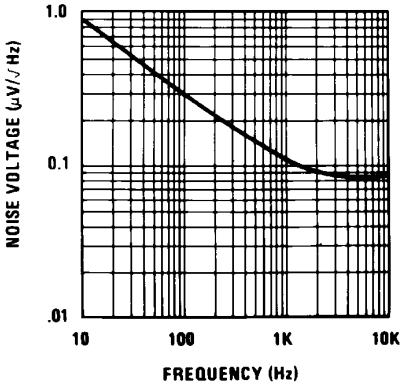
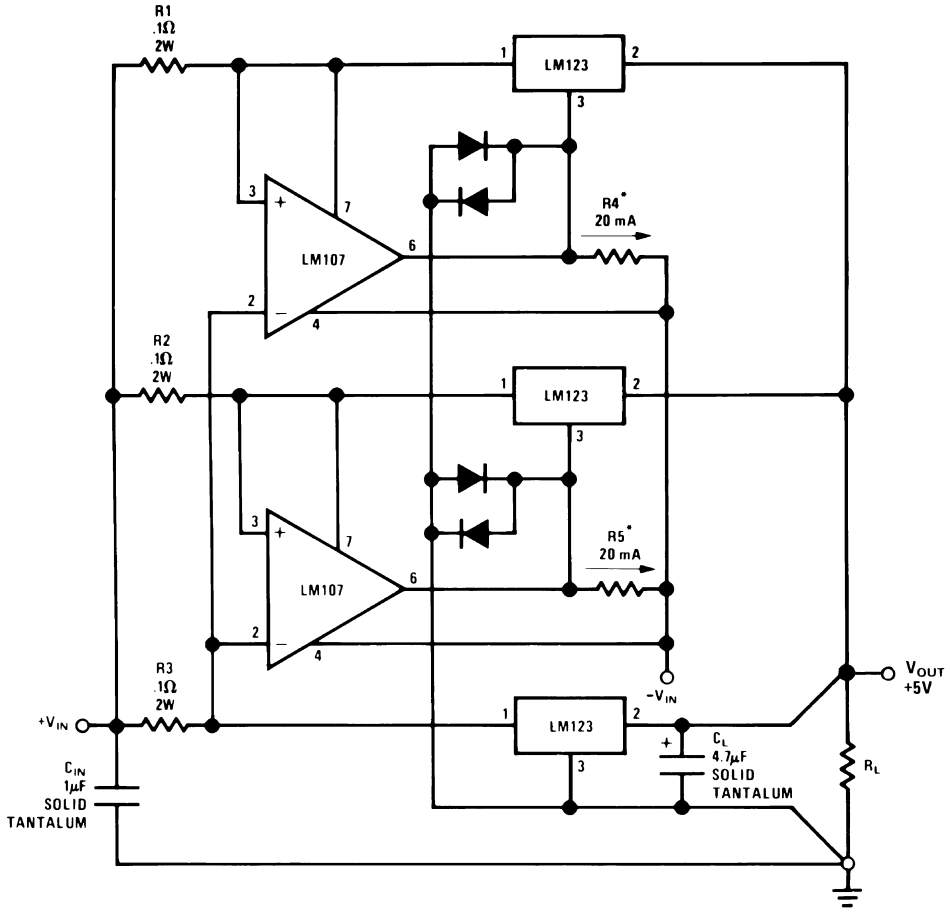


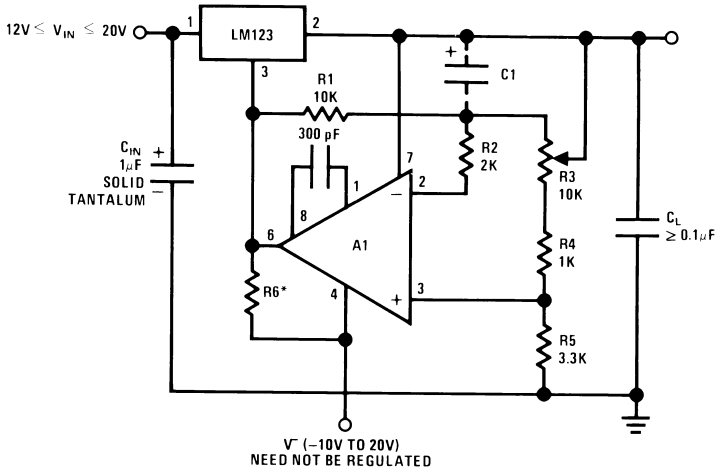
Figure 12.

TYPICAL APPLICATIONS



*Select for 20 mA Current from Unregulated Negative Supply

Figure 13. 10 Amp Regulator with Complete Overload Protection



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

A_1—LM101A

C_1—2 µF Optional—Improves Ripple Rejection, Noise, and Transient Response

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

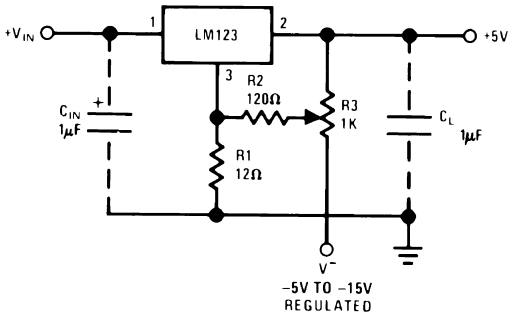
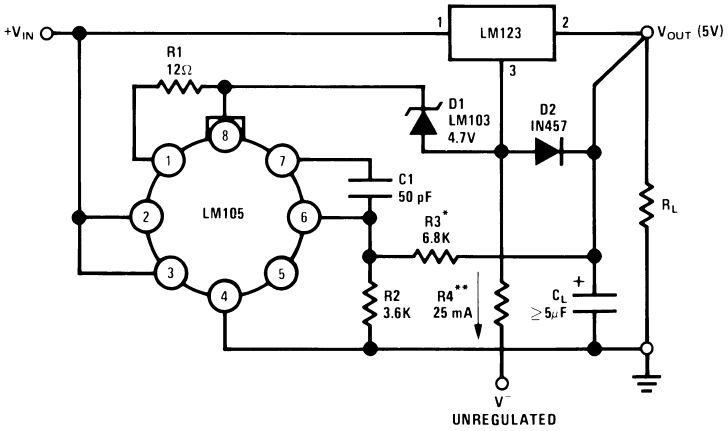
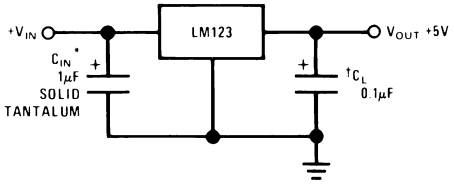


Figure 15. Trimming Output to 5V



*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 part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
LM123K/883	Obsolete	Production	TO (K) | 2	-	-	Call TI	Call TI	-	LM123K /883 Q ACO /883 Q >T

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

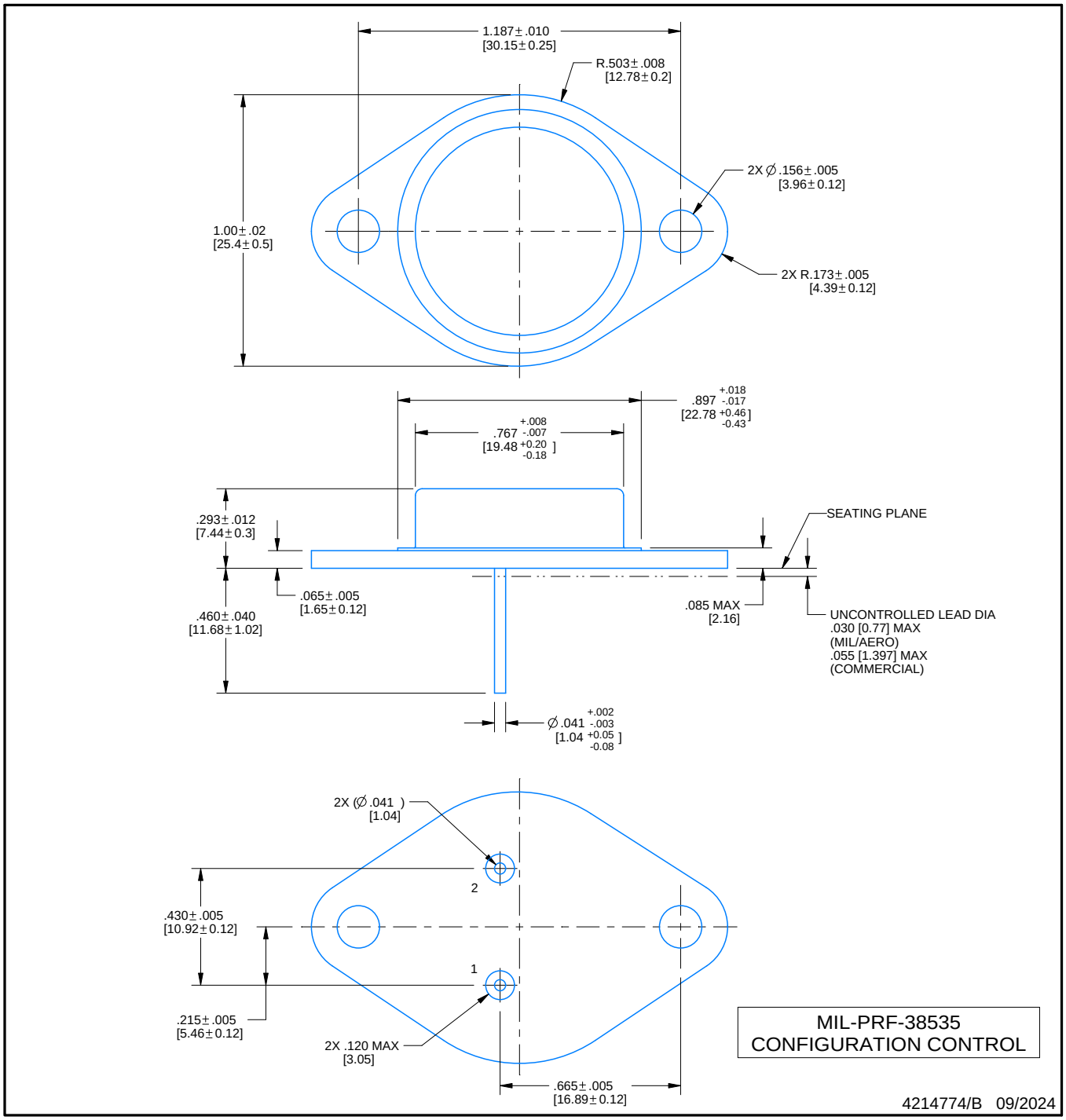
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

K0002A

PACKAGE OUTLINE

TO-CAN - 7.747 mm max height

TRANSISTOR OUTLINE



NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. 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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