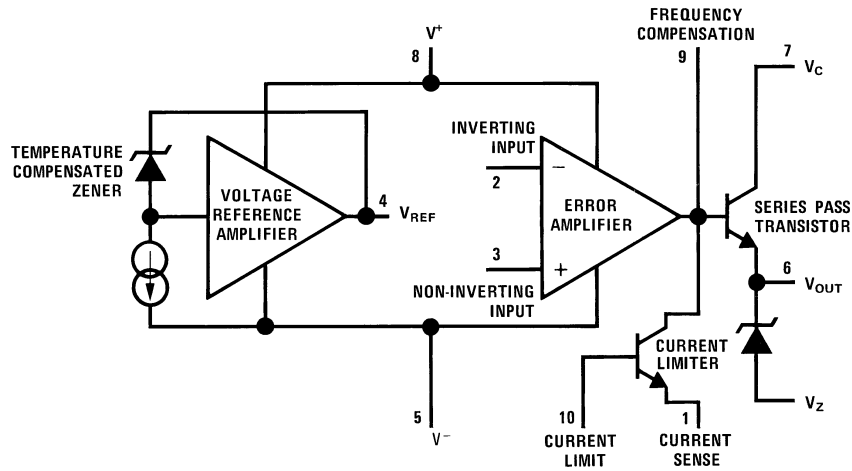
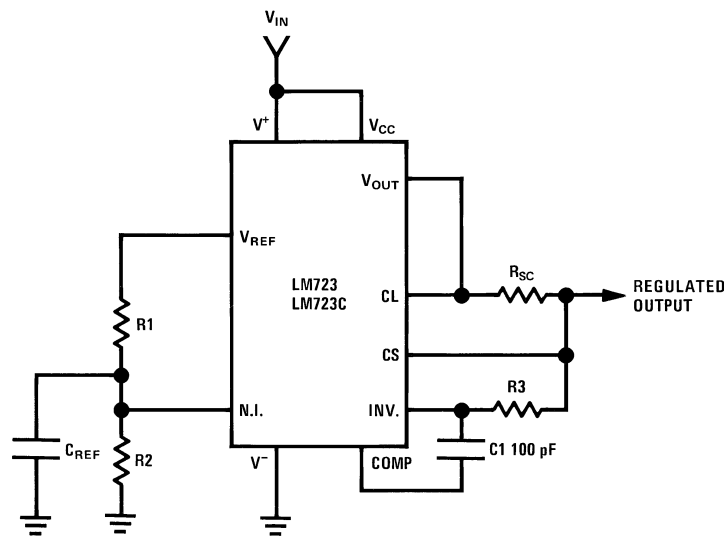


Equivalent Circuit*



*Pin numbers refer to metal can package.

Typical Application



$$\text{Note: } R3 = \frac{R1 R2}{R1 + R2}$$

for minimum temperature drift.

Typical Performance

Regulated Output Voltage	5V
Line Regulation ($\Delta V_{IN} = 3V$)	0.5mV
Load Regulation ($\Delta I_L = 50 \text{ mA}$)	1.5mV

Figure 4. Basic Low Voltage Regulator ($V_{OUT} = 2$ to 7 Volts)



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⁾⁽²⁾

Pulse Voltage from V^+ to V^- (50 ms)	50V
Continuous Voltage from V^+ to V^-	40V
Input-Output Voltage Differential	40V
Maximum Amplifier Input Voltage (Either Input)	8.5V
Maximum Amplifier Input Voltage (Differential)	5V
Current from V_Z	25 mA
Current from V_{REF}	15 mA
Internal Power Dissipation Metal Can ⁽³⁾	800 mW
CDIP ⁽³⁾	900 mW
PDIP ⁽³⁾	660 mW
Operating Temperature Range	
LM723	-55°C to +150°C
LM723C	0°C to +70°C
Storage Temperature Range Metal Can	
	-65°C to +150°C
PDIP	-55°C to +150°C
Lead Temperature (Soldering, 4 sec. max.)	
Hermetic Package	300°C
Plastic Package	260°C
ESD Tolerance	1200V
(Human body model, 1.5 kΩ in series with 100 pF)	

- (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.
- (2) A military RETS specification is available on request. At the time of printing, the LM723 RETS specification complied with the Min and Max limits in this table. The LM723E, H, and J may also be procured as a Standard Military Drawing.
- (3) See derating curves for maximum power rating above 25°C.

ELECTRICAL CHARACTERISTICS⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾

Parameter	Conditions	LM723			LM723C			Units
		Min	Typ	Max	Min	Typ	Max	
Line Regulation	$V_{IN} = 12V$ to $V_{IN} = 15V$		0.01	0.1		0.01	0.1	% V_{OUT}
	$-55^\circ C \leq T_A \leq +125^\circ C$			0.3				% V_{OUT}
	$0^\circ C \leq T_A \leq +70^\circ C$						0.3	% V_{OUT}
	$V_{IN} = 12V$ to $V_{IN} = 40V$		0.02	0.2		0.1	0.5	% V_{OUT}
Load Regulation	$I_L = 1$ mA to $I_L = 50$ mA		0.03	0.15		0.03	0.2	% V_{OUT}
	$-55^\circ C \leq T_A \leq +125^\circ C$			0.6				% V_{OUT}
	$0^\circ C \leq T_A \leq +70^\circ C$						0.6	% V_{OUT}
Ripple Rejection	$f = 50$ Hz to 10 kHz, $C_{REF} = 0$		74			74		dB
	$f = 50$ Hz to 10 kHz, $C_{REF} = 5$ μF		86			86		dB

- (1) Unless otherwise specified, $T_A = 25^\circ C$, $V_{IN} = V^+ = V_C = 12V$, $V^- = 0$, $V_{OUT} = 5V$, $I_L = 1$ mA, $R_{SC} = 0$, $C_1 = 100$ pF, $C_{REF} = 0$ and divider impedance as seen by error amplifier ≤ 10 kΩ connected as shown in Figure 4. Line and load regulation specifications are given for the condition of constant chip temperature. Temperature drifts must be taken into account separately for high dissipation conditions.
- (2) A military RETS specification is available on request. At the time of printing, the LM723 RETS specification complied with the Min and Max limits in this table. The LM723E, H, and J may also be procured as a Standard Military Drawing.
- (3) Specified by correlation to other tests.
- (4) L_1 is 40 turns of No. 20 enameled copper wire wound on Ferroxcube P36/22-3B7 pot core or equivalent with 0.009 in. air gap.

ELECTRICAL CHARACTERISTICS⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾ (continued)

Parameter	Conditions	LM723			LM723C			Units
		Min	Typ	Max	Min	Typ	Max	
Average Temperature Coefficient of Output Voltage ⁽⁵⁾	$-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$		0.002	0.015				%/°C
	$0^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$					0.003	0.015	%/°C
Short Circuit Current Limit	$R_{SC} = 10\Omega, V_{OUT} = 0$		65			65		mA
Reference Voltage		6.95	7.15	7.35	6.80	7.15	7.50	V
Output Noise Voltage	BW = 100 Hz to 10 kHz, $C_{REF} = 0$		86			86		μVrms
	BW = 100 Hz to 10 kHz, $C_{REF} = 5 \mu\text{F}$		2.5			2.5		μVrms
Long Term Stability			0.05			0.05		%/1000 hrs
Standby Current Drain	$I_L = 0, V_{IN} = 30\text{V}$		1.7	3.5		1.7	4.0	mA
Input Voltage Range		9.5		40	9.5		40	V
Output Voltage Range		2.0		37	2.0		37	V
Input-Output Voltage Differential		3.0		38	3.0		38	V
θ_{JA}	PDIP					105		°C/W
θ_{JA}	CDIP		150					°C/W
θ_{JA}	H10C Board Mount in Still Air		165			165		°C/W
θ_{JA}	H10C Board Mount in 400 LF/Min Air Flow		66			66		°C/W
θ_{JC}			22			22		°C/W

(5) For metal can applications where V_Z is required, an external 6.2V zener diode should be connected in series with V_{OUT} .

TYPICAL PERFORMANCE CHARACTERISTICS

Load Regulation Characteristics with Current Limiting

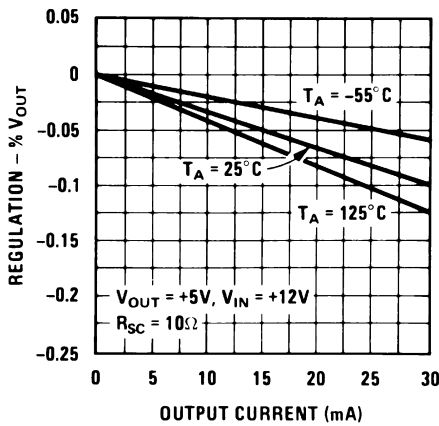


Figure 5.

Load Regulation Characteristics with Current Limiting

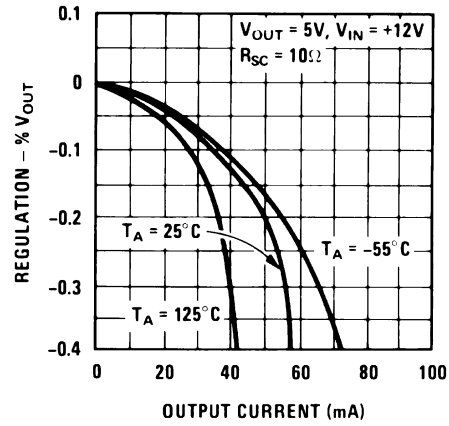


Figure 6.

Load & Line Regulation vs Input-Output Voltage Differential

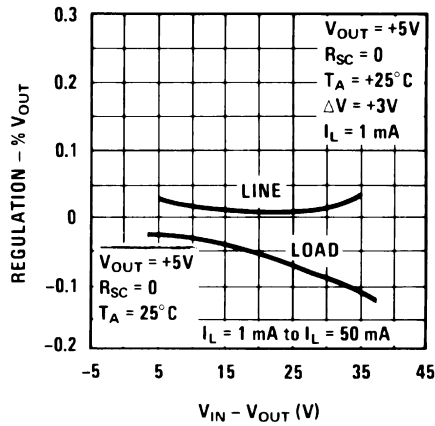


Figure 7.

Current Limiting Characteristics

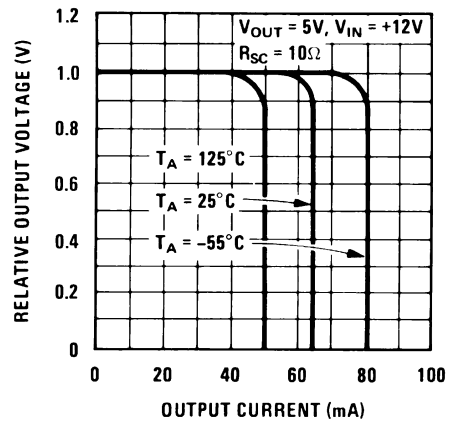


Figure 8.

Current Limiting Characteristics vs Junction Temperature

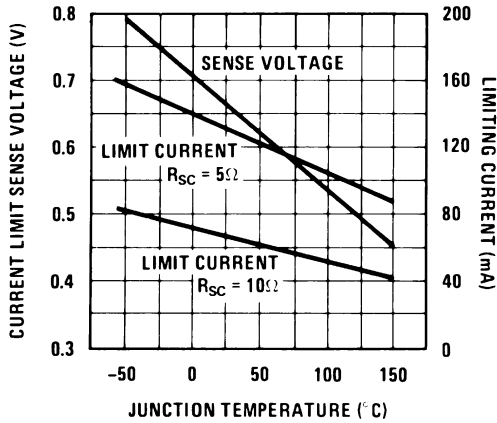


Figure 9.

Standby Current Drain vs Input Voltage

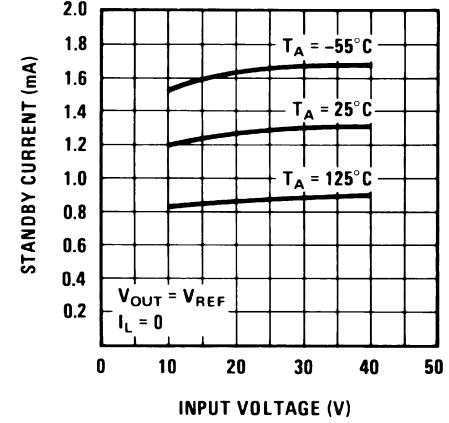


Figure 10.

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

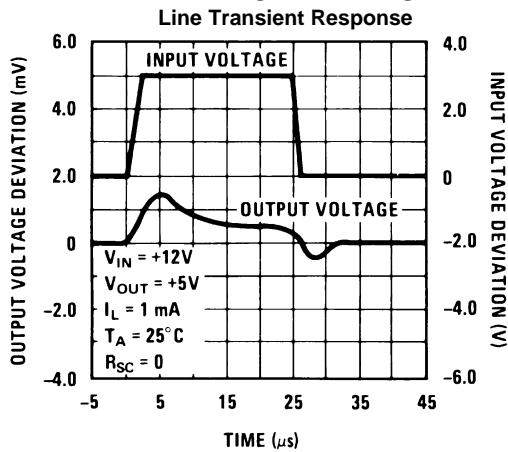


Figure 11.

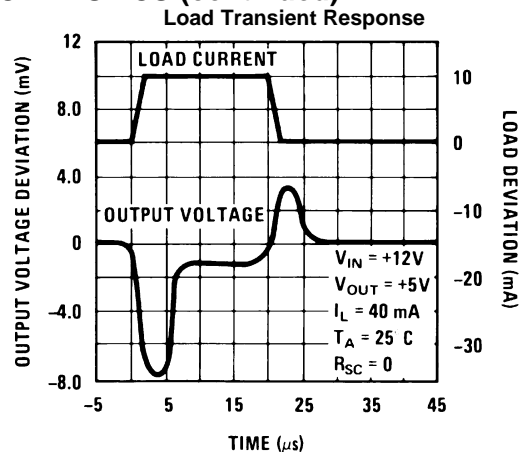


Figure 12.

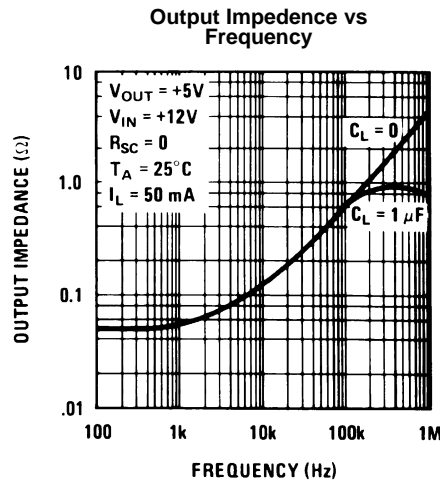


Figure 13.

MAXIMUM POWER RATINGS

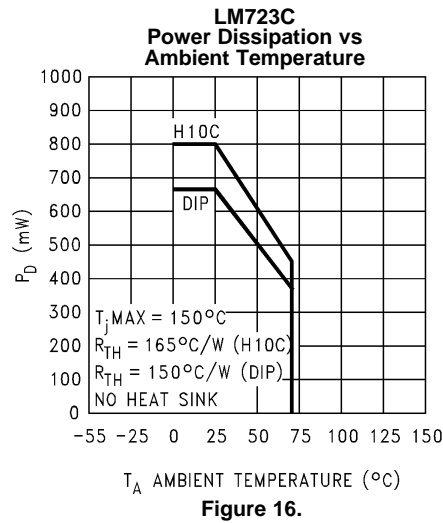
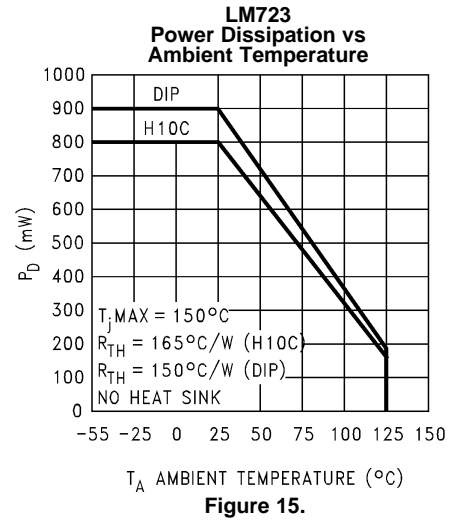
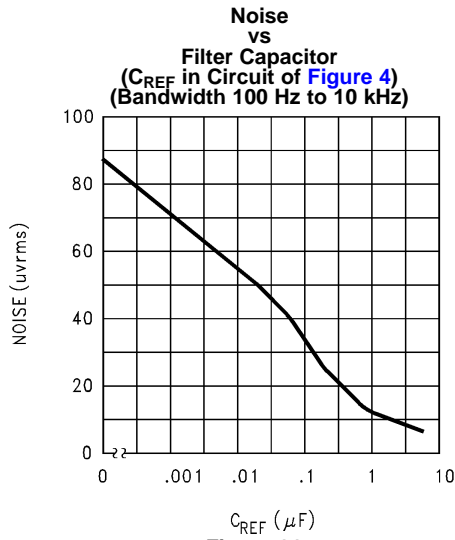


Table 1. Resistor Values (kΩ) for Standard Output Voltage

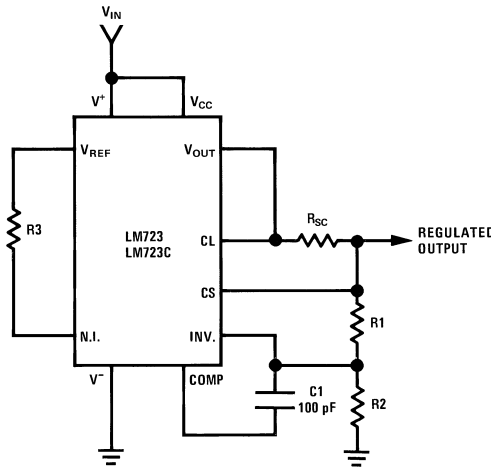
Positive Output Voltage	Applicable Figures See ⁽²⁾	Fixed Output ±5%		Output Adjustable ±10% ⁽¹⁾			Negative Output Voltage	Applicable Figures	Fixed Output ±5%		5% Output Adjustable ±10%		
		R1	R2	R1	P1	R2			R1	R2	R1	P1	R2
+3.0	Figure 4, Figure 19, Figure 21, Figure 24, Figure 27 (Figure 19)	4.12	3.01	1.8	0.5	1.2	+100	Figure 22	3.57	102	2.2	10	91
+3.6	Figure 4, Figure 19, Figure 21, Figure 24, Figure 27 (Figure 19)	3.57	3.65	1.5	0.5	1.5	+250	Figure 22	3.57	255	2.2	10	240
+5.0	Figure 4, Figure 19, Figure 21, Figure 24, Figure 27 (Figure 19)	2.15	4.99	0.75	0.5	2.2	-6 ⁽³⁾	Figure 18, (Figure 25)	3.57	2.43	1.2	0.5	0.75
+6.0	Figure 4, Figure 19, Figure 21, Figure 24, Figure 27 (Figure 19)	1.15	6.04	0.5	0.5	2.7	-9	Figure 18, Figure 25	3.48	5.36	1.2	0.5	2.0
+9.0	Figure 17, Figure 19, (Figure 19, Figure 21, Figure 24, Figure 27)	1.87	7.15	0.75	1.0	2.7	-12	Figure 18, Figure 25	3.57	8.45	1.2	0.5	3.3
+12	Figure 17, Figure 19, (Figure 19, Figure 21, Figure 24, Figure 27)	4.87	7.15	2.0	1.0	3.0	-15	Figure 18, Figure 25	3.65	11.5	1.2	0.5	4.3
+15	Figure 17, Figure 19, (Figure 19, Figure 21, Figure 24, Figure 27)	7.87	7.15	3.3	1.0	3.0	-28	Figure 18, Figure 25	3.57	24.3	1.2	0.5	10
+28	Figure 17, Figure 19, (Figure 19, Figure 21, Figure 24, Figure 27)	21.0	7.15	5.6	1.0	2.0	-45	Figure 23	3.57	41.2	2.2	10	33
+45	Figure 22	3.57	48.7	2.2	10	39	-100	Figure 23	3.57	97.6	2.2	10	91
+75	Figure 22	3.57	78.7	2.2	10	68	-250	Figure 23	3.57	249	2.2	10	240

- (1) Replace R1/R2 in figures with divider shown in Figure 28.
(2) Figures in parentheses may be used if R1/R2 divider is placed on opposite input of error amp.
(3) V⁺ and V_{CC} must be connected to a +3V or greater supply.

Table 2. Formulae for Intermediate Output Voltages

Outputs from +2 to +7 volts (Figure 4 Figure 19 Figure 20 Figure 21 Figure 24 Figure 27) $V_{OUT} = \left(V_{REF} \times \frac{R2}{R1 + R2} \right)$	Outputs from +4 to +250 volts (Figure 22) $V_{OUT} = \left(\frac{V_{REF}}{2} \times \frac{R2 - R1}{R1} \right); R3 = R4$	Current Limiting $I_{LIMIT} = \frac{V_{SENSE}}{R_{SC}}$
Outputs from +7 to +37 volts (Figure 17 Figure 19 Figure 20 Figure 21 Figure 24 Figure 27) $V_{OUT} = \left(V_{REF} \times \frac{R1 + R2}{R2} \right)$	Outputs from -6 to -250 volts (Figure 18 Figure 23 Figure 25) $V_{OUT} = \left(\frac{V_{REF}}{2} \times \frac{R1 + R2}{R1} \right); R3 = R4$	Foldback Current Limiting $I_{KNEE} = \left(\frac{V_{OUT} R3}{R_{SC} R4} + \frac{V_{SENSE} (R3 + R4)}{R_{SC} R4} \right)$ $I_{SHORT\ CKT} = \left(\frac{V_{SENSE}}{R_{SC}} \times \frac{R3 + R4}{R4} \right)$

TYPICAL APPLICATIONS



Note: $R3 = \frac{R1 R2}{R1 + R2}$

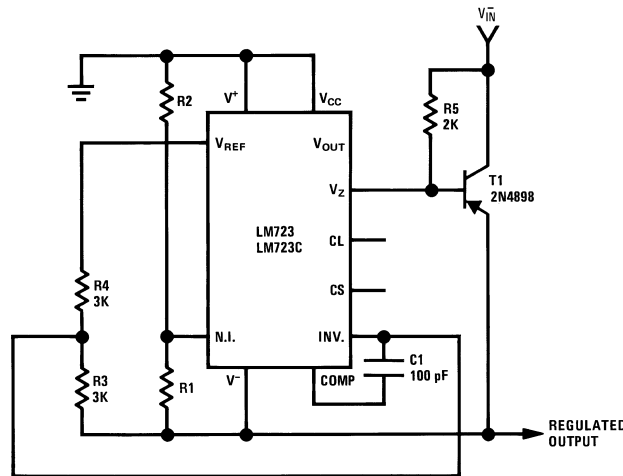
for minimum temperature drift.

R3 may be eliminated for minimum component count.

Typical Performance

Regulated Output Voltage	15V
Line Regulation ($\Delta V_{IN} = 3V$)	1.5 mV
Load Regulation ($\Delta I_L = 50 \text{ mA}$)	4.5 mV

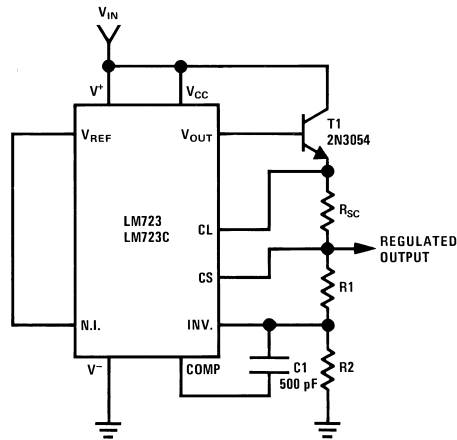
Figure 17. Basic High Voltage Regulator ($V_{OUT} = 7$ to 37 Volts)



Typical Performance

Regulated Output Voltage	-15V
Line Regulation ($\Delta V_{IN} = 3V$)	1 mV
Load Regulation ($\Delta I_L = 100 \text{ mA}$)	2 mV

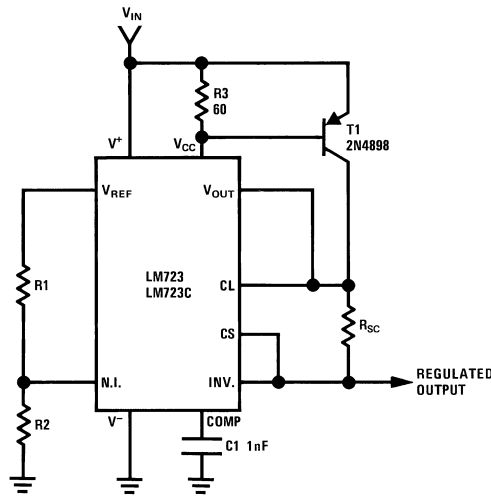
Figure 18. Negative Voltage Regulator



Typical Performance

Regulated Output Voltage	+15V
Line Regulation ($\Delta V_{IN} = 3V$)	1.5 mV
Load Regulation ($\Delta I_L = 1A$)	15 mV

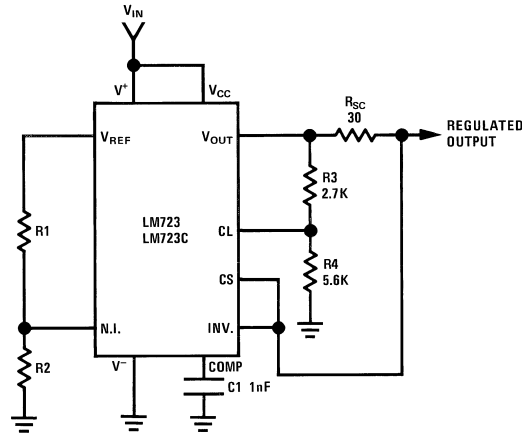
Figure 19. Positive Voltage Regulator (External NPN Pass Transistor)



Typical Performance

Regulated Output Voltage	+5V
Line Regulation ($\Delta V_{IN} = 3V$)	0.5 mV
Load Regulation ($\Delta I_L = 1A$)	5 mV

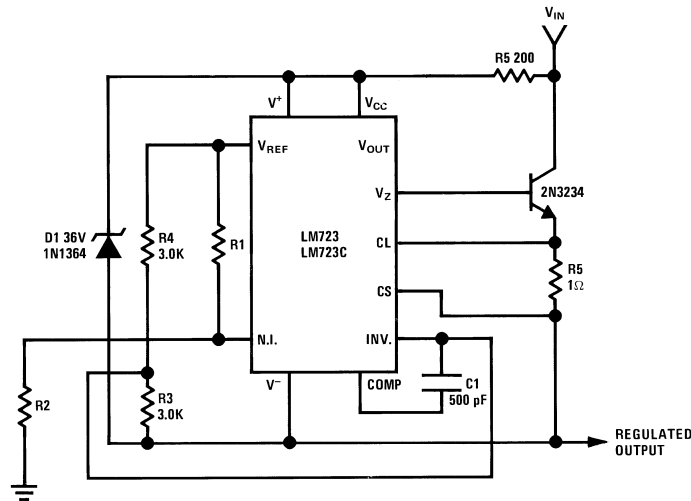
Figure 20. Positive Voltage Regulator (External PNP Pass Transistor)



Typical Performance

Regulated Output Voltage	+5V
Line Regulation ($\Delta V_{IN} = 3V$)	0.5 mV
Load Regulation ($\Delta I_L = 10\text{ mA}$)	1 mV
Short Circuit Current	20 mA

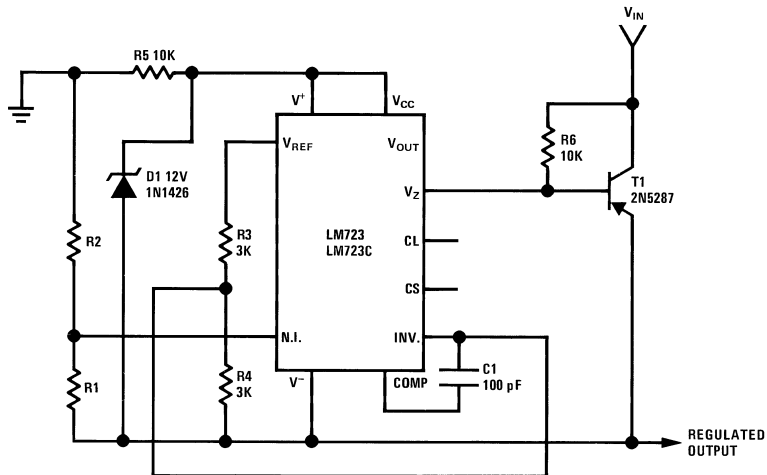
Figure 21. Foldback Current Limiting



Typical Performance

Regulated Output Voltage	+50V
Line Regulation ($\Delta V_{IN} = 20V$)	15 mV
Load Regulation ($\Delta I_L = 50\text{ mA}$)	20 mV

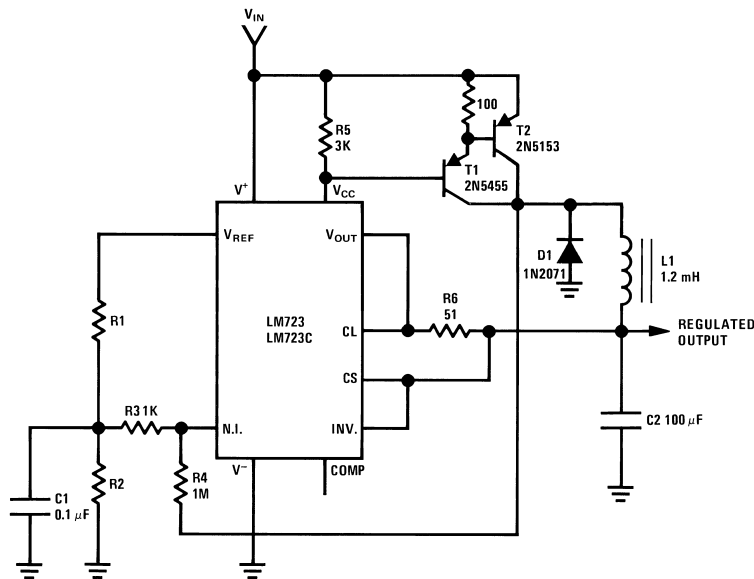
Figure 22. Positive Floating Regulator



Typical Performance

Regulated Output Voltage	-100V
Line Regulation ($\Delta V_{IN} = 20V$)	30 mV
Load Regulation ($\Delta I_L = 100 \text{ mA}$)	20 mV

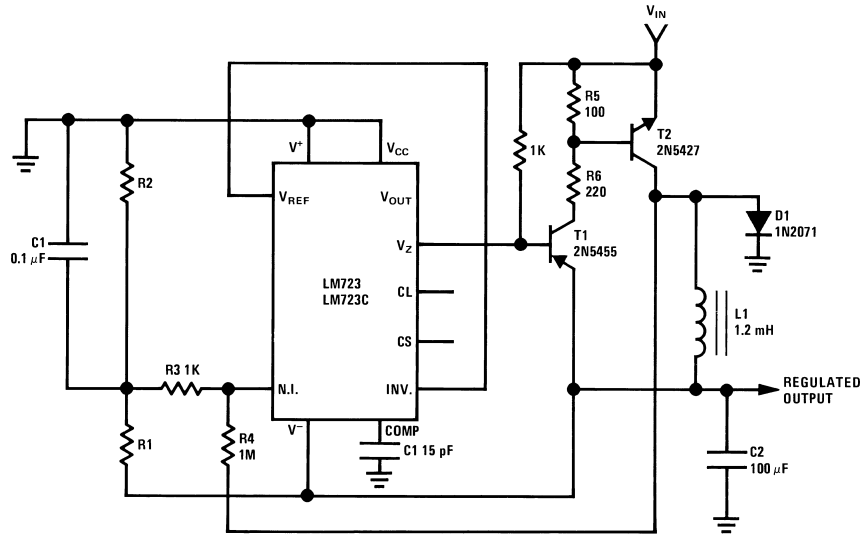
Figure 23. Negative Floating Regulator



Typical Performance

Regulated Output Voltage	+5V
Line Regulation ($\Delta V_{IN} = 30V$)	10 mV
Load Regulation ($\Delta I_L = 2A$)	80 mV

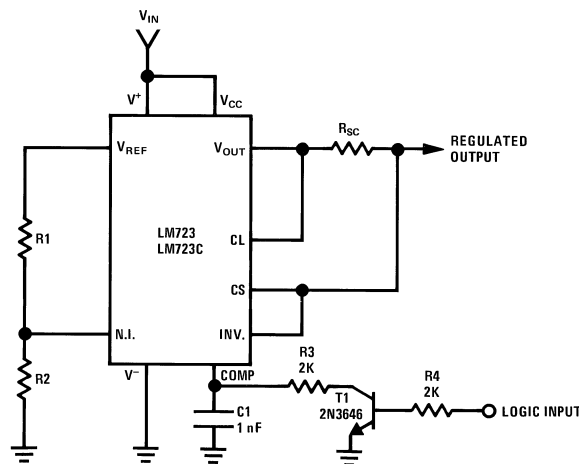
Figure 24. Positive Switching Regulator



Typical Performance

Regulated Output Voltage	-15V
Line Regulation ($\Delta V_{IN} = 20V$)	8 mV
Load Regulation ($\Delta I_L = 2A$)	6 mV

Figure 25. Negative Switching Regulator

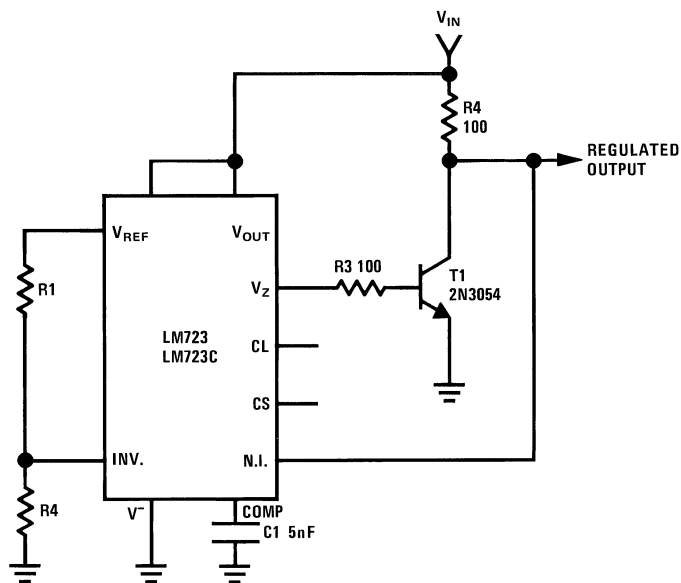


Note: Current limit transistor may be used for shutdown if current limiting is not required.

Typical Performance

Regulated Output Voltage	+5V
Line Regulation ($\Delta V_{IN} = 3V$)	0.5 mV
Load Regulation ($\Delta I_L = 50 \text{ mA}$)	1.5 mV

Figure 26. Remote Shutdown Regulator with Current Limiting



Regulated Output Voltage	+5V
Line Regulation ($\Delta V_{IN} = 10V$)	0.5 mV
Load Regulation ($\Delta I_L = 100 \text{ mA}$)	1.5 mV

Figure 27. Shunt Regulator

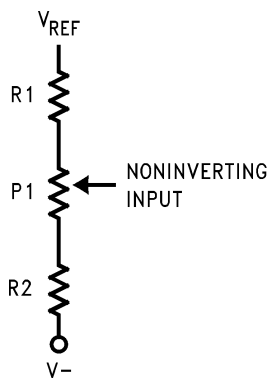
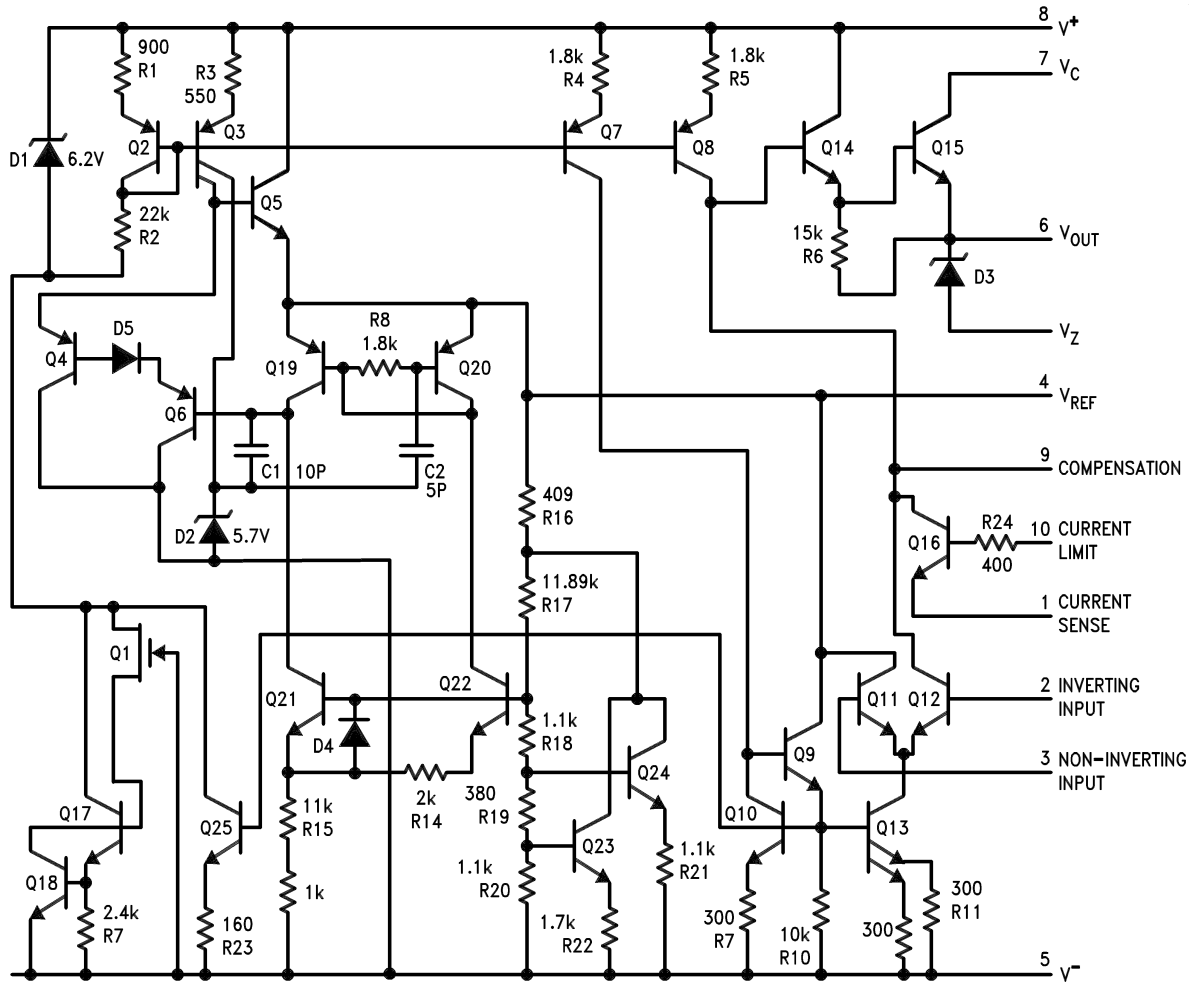


Figure 28. Output Voltage Adjust ⁽¹⁾

(1) Replace R1/R2 in figures with divider shown in [Figure 28](#).

Schematic Diagram



REVISION HISTORY

Changes from Revision B (April 2013) to Revision C	Page
• Changed layout of National Data Sheet to TI format	15

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM723CH	ACTIVE	TO-100	LME	10	500	TBD	Call TI	Call TI	0 to 70	(LM723CH ~ LM723CH)	Samples
LM723CH/NOPB	ACTIVE	TO-100	LME	10	500	Green (RoHS & no Sb/Br)	Call TI	Level-1-NA-UNLIM	0 to 70	(LM723CH ~ LM723CH)	Samples
LM723CN/NOPB	ACTIVE	PDIP	NFF	14	25	Green (RoHS & no Sb/Br)	CU SN	Level-1-NA-UNLIM	0 to 70	LM723CN	Samples
LM723H	ACTIVE	TO-100	LME	10	500	TBD	Call TI	Call TI	-55 to 150	(LM723H ~ LM723H)	Samples
LM723H/NOPB	ACTIVE	TO-100	LME	10	500	Green (RoHS & no Sb/Br)	Call TI	Level-1-NA-UNLIM	-55 to 150	(LM723H ~ LM723H)	Samples

(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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

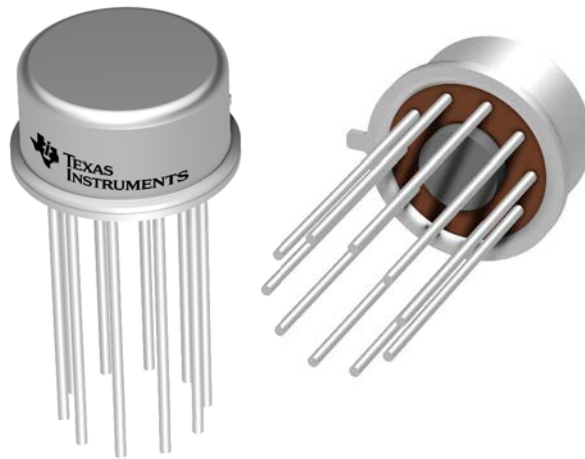
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

GENERIC PACKAGE VIEW

LME 10

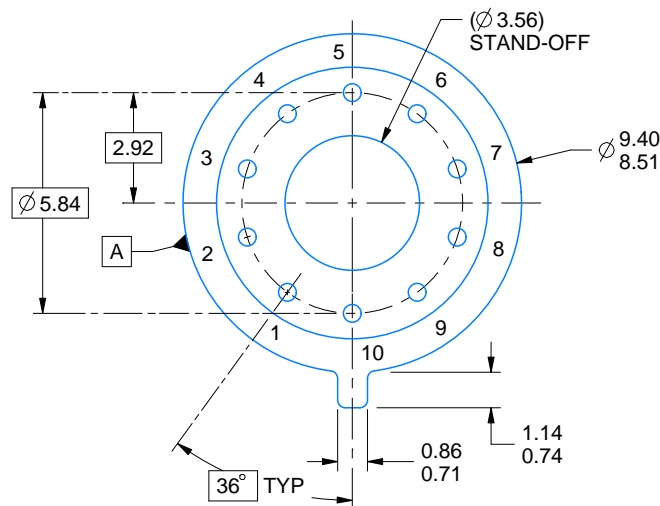
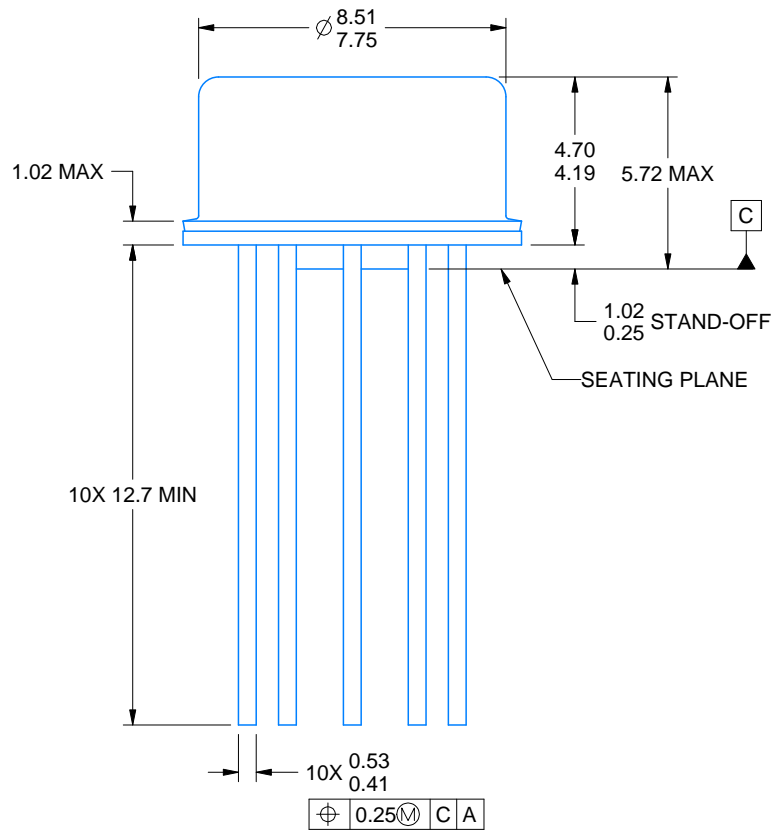
TO-CAN - 5.72 mm max height

METAL CYLINDRICAL PACKAGE



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

4202488/B

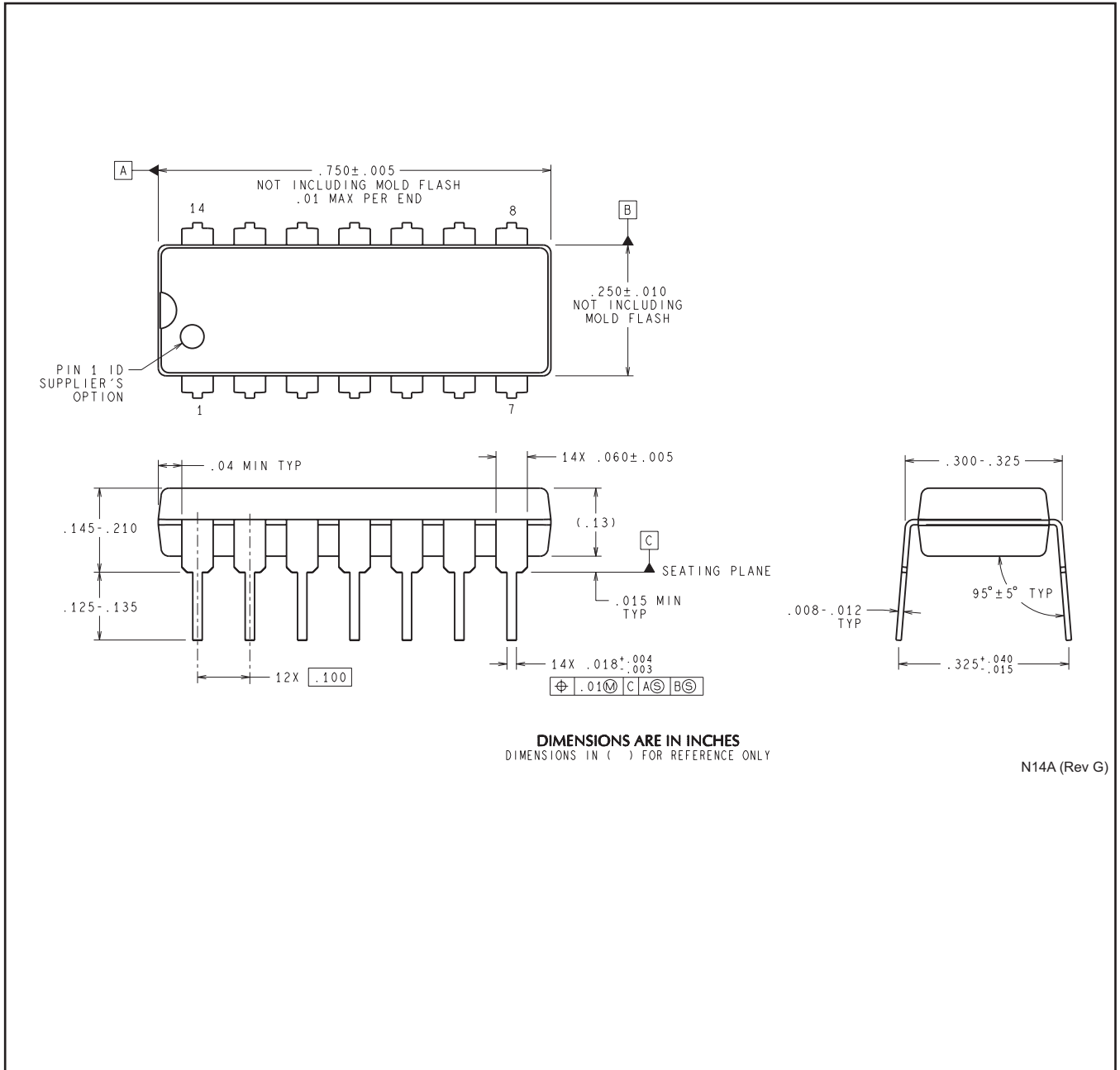


4220604/A 05/2017

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC registration MO-006/TO-100.

NFF0014A



DIMENSIONS ARE IN INCHES
 DIMENSIONS IN () FOR REFERENCE ONLY

N14A (Rev G)

IMPORTANT NOTICE

Texas Instruments Incorporated (TI) reserves the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

TI's published terms of sale for semiconductor products (<http://www.ti.com/sc/docs/stdterms.htm>) apply to the sale of packaged integrated circuit products that TI has qualified and released to market. Additional terms may apply to the use or sale of other types of TI products and services.

Reproduction of significant portions of TI information in TI data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such reproduced documentation. Information of third parties may be subject to additional restrictions. Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyers and others who are developing systems that incorporate TI products (collectively, "Designers") understand and agree that Designers remain responsible for using their independent analysis, evaluation and judgment in designing their applications and that Designers have full and exclusive responsibility to assure the safety of Designers' applications and compliance of their applications (and of all TI products used in or for Designers' applications) with all applicable regulations, laws and other applicable requirements. Designer represents that, with respect to their applications, Designer has all the necessary expertise to create and implement safeguards that (1) anticipate dangerous consequences of failures, (2) monitor failures and their consequences, and (3) lessen the likelihood of failures that might cause harm and take appropriate actions. Designer agrees that prior to using or distributing any applications that include TI products, Designer will thoroughly test such applications and the functionality of such TI products as used in such applications.

TI's provision of technical, application or other design advice, quality characterization, reliability data or other services or information, including, but not limited to, reference designs and materials relating to evaluation modules, (collectively, "TI Resources") are intended to assist designers who are developing applications that incorporate TI products; by downloading, accessing or using TI Resources in any way, Designer (individually or, if Designer is acting on behalf of a company, Designer's company) agrees to use any particular TI Resource solely for this purpose and subject to the terms of this Notice.

TI's provision of TI Resources does not expand or otherwise alter TI's applicable published warranties or warranty disclaimers for TI products, and no additional obligations or liabilities arise from TI providing such TI Resources. TI reserves the right to make corrections, enhancements, improvements and other changes to its TI Resources. TI has not conducted any testing other than that specifically described in the published documentation for a particular TI Resource.

Designer is authorized to use, copy and modify any individual TI Resource only in connection with the development of applications that include the TI product(s) identified in such TI Resource. NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT OF TI OR ANY THIRD PARTY IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information regarding or referencing third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of TI Resources may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

TI RESOURCES ARE PROVIDED "AS IS" AND WITH ALL FAULTS. TI DISCLAIMS ALL OTHER WARRANTIES OR REPRESENTATIONS, EXPRESS OR IMPLIED, REGARDING RESOURCES OR USE THEREOF, INCLUDING BUT NOT LIMITED TO ACCURACY OR COMPLETENESS, TITLE, ANY EPIDEMIC FAILURE WARRANTY AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS. TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY DESIGNER AGAINST ANY CLAIM, INCLUDING BUT NOT LIMITED TO ANY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON ANY COMBINATION OF PRODUCTS EVEN IF DESCRIBED IN TI RESOURCES OR OTHERWISE. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, DIRECT, SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF TI RESOURCES OR USE THEREOF, AND REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Unless TI has explicitly designated an individual product as meeting the requirements of a particular industry standard (e.g., ISO/TS 16949 and ISO 26262), TI is not responsible for any failure to meet such industry standard requirements.

Where TI specifically promotes products as facilitating functional safety or as compliant with industry functional safety standards, such products are intended to help enable customers to design and create their own applications that meet applicable functional safety standards and requirements. Using products in an application does not by itself establish any safety features in the application. Designers must ensure compliance with safety-related requirements and standards applicable to their applications. Designer may not use any TI products in life-critical medical equipment unless authorized officers of the parties have executed a special contract specifically governing such use. Life-critical medical equipment is medical equipment where failure of such equipment would cause serious bodily injury or death (e.g., life support, pacemakers, defibrillators, heart pumps, neurostimulators, and implantables). Such equipment includes, without limitation, all medical devices identified by the U.S. Food and Drug Administration as Class III devices and equivalent classifications outside the U.S.

TI may expressly designate certain products as completing a particular qualification (e.g., Q100, Military Grade, or Enhanced Product). Designers agree that it has the necessary expertise to select the product with the appropriate qualification designation for their applications and that proper product selection is at Designers' own risk. Designers are solely responsible for compliance with all legal and regulatory requirements in connection with such selection.

Designer will fully indemnify TI and its representatives against any damages, costs, losses, and/or liabilities arising out of Designer's non-compliance with the terms and provisions of this Notice.