

MC1723C

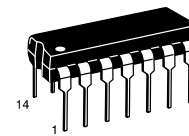
Voltage Regulator

The MC1723C is a positive or negative voltage regulator designed to deliver load current to 150 mAdc. Output current capability can be increased to several amperes through use of one or more external pass transistors. MC1723C is specified for operation over the commercial temperature range (0° to +70°C).

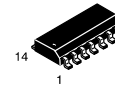
- Output Voltage Adjustable from 2.0 Vdc to 37 Vdc
- Output Current to 150 mAdc Without External Pass Transistors
- 0.01% Line and 0.03% Load Regulation
- Adjustable Short Circuit Protection

VOLTAGE REGULATOR

SEMICONDUCTOR TECHNICAL DATA



P SUFFIX
PLASTIC PACKAGE
CASE 646



D SUFFIX
PLASTIC PACKAGE
CASE 751A
(SO-14)

Figure 1. Representative Schematic Diagram

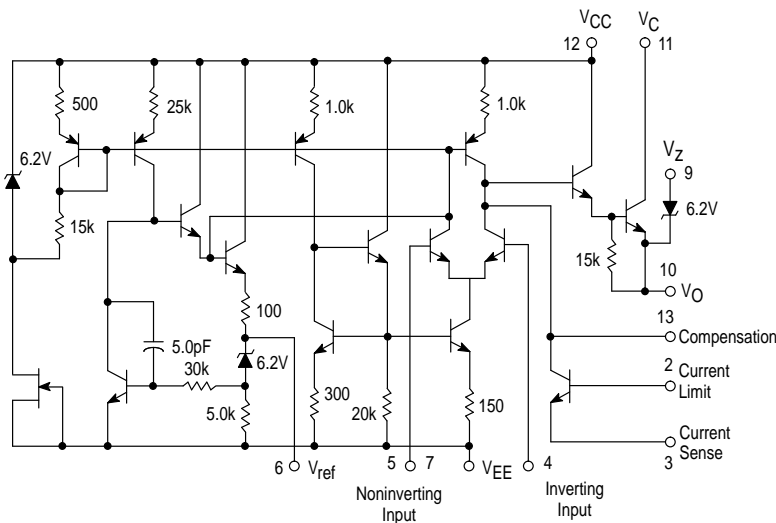


Figure 2. Typical Circuit Connection

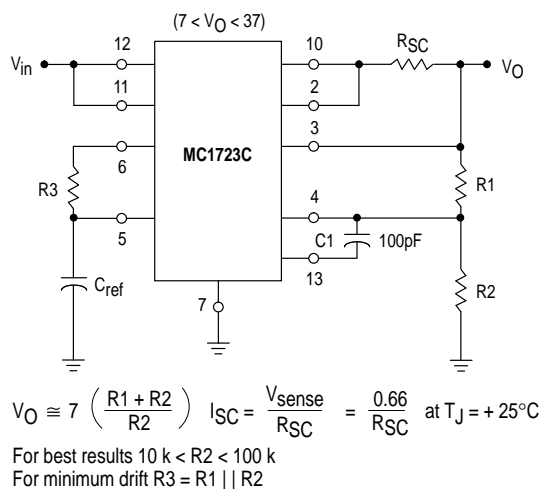
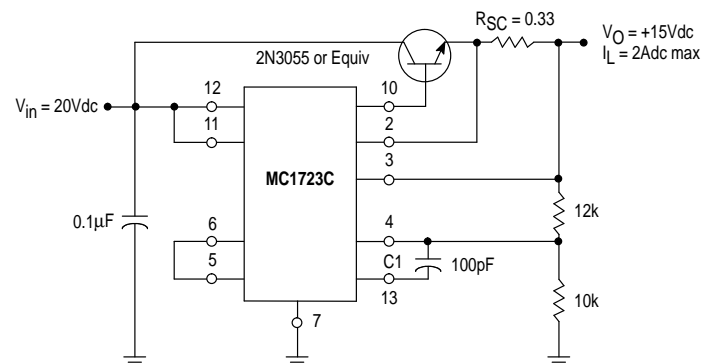


Figure 3. Typical NPN Current Boost Connection



ORDERING INFORMATION

Device	Alternate	Operating Temperature Range	Package
MC1723CD	—	$T_A = 0^\circ \text{ to } +70^\circ\text{C}$	SO-14
MC1723CP	LM723CN $\mu\text{A}723\text{PC}$		Plastic DIP

MC1723C

MAXIMUM RATINGS (T_A = +25°C, unless otherwise noted.)

Rating	Symbol	Value	Unit
Pulse Voltage from V _{CC} to V _{EE} (50 ms)	V _{I(p)}	50	V _{pk}
Continuous Voltage from V _{CC} to V _{EE}	V _I	40	V _{dc}
Input–Output Voltage Differential	V _I –V _O	40	V _{dc}
Maximum Output Current	I _L	150	mAdc
Current from V _{ref}	I _{ref}	15	mAdc
Current from V _Z	I _Z	25	mA
Voltage Between Noninverting Input and V _{EE}	V _{ie}	8.0	V _{dc}
Differential Input Voltage	V _{id}	±5.0	V _{dc}
Power Dissipation and Thermal Characteristics T _A = +25°C Derate above T _A = +25°C Thermal Resistance, Junction–to–Air	P _D 1/θ _{JA} θ _{JA}	1.25 10 100	W mW/°C °C/W
Operating and Storage Junction Temperature Range	T _J , T _{stg}	–65 to +175	°C
Operating Ambient Temperature Range	T _A	0 to +70	°C

ELECTRICAL CHARACTERISTICS (T_A = +25°C, V_{in} 12 Vdc, V_O = 5.0 Vdc, I_L = 1.0 mAdc, R_{SC} = 0, C₁ = 100 pF, C_{ref} = 0 and divider impedance as seen by the error amplifier ≤ 10 kΩ connected as shown in Figure 2, unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Input Voltage Range	V _I	9.5	–	40	V _{dc}
Output Voltage Range	V _O	2.0	–	37	V _{dc}
Input–Output Voltage Differential	V _I –V _O	3.0	–	38	V _{dc}
Reference Voltage	V _{ref}	6.80	7.15	7.50	V _{dc}
Standby Current Drain (I _L = 0, V _{in} = 30 V)	I _{IB}	–	2.3	4.0	mAdc
Output Noise Voltage (f = 100 Hz to 10 kHz) C _{ref} = 0 C _{ref} = 5.0 μF	V _n	– –	20 2.5	– –	μV(RMS)
Average Temperature Coefficient of Output Voltage (T _{low} < T _A < T _{high})	TCV _O	–	0.003	0.015	%/°C
Line Regulation (T _A = 25°C) { 12 V < V _{in} < 15 V 12 V < V _{in} < 40 V (T _{low} < T _A < T _{high}) 12 V < V _{in} < 15 V	Reg _{line}	– – –	0.01 0.1 –	0.1 0.5 0.3	% V _O
Load Regulation (1.0 mA < I _L < 50 mA) T _A = 25°C T _{low} < T _A < T _{high}	Reg _{load}	– –	0.03 –	0.2 0.6	% V _O
Ripple Rejection (f = 50 Hz to 10 kHz) C _{ref} = 0 C _{ref} = 5.0 μF	RR	– –	74 86	– –	dB
Short Circuit Current Limit (R _{SC} = 10 Ω, V _O = 0)	I _{SC}	–	65	–	mAdc
Long Term Stability	ΔV _O /t	–	0.1	–	%/1000 Hr.

NOTE: T_{low} to T_{high} = 0° to +70°C

Figure 4. Maximum Load Current as a Function of Input-Output Voltage Differential

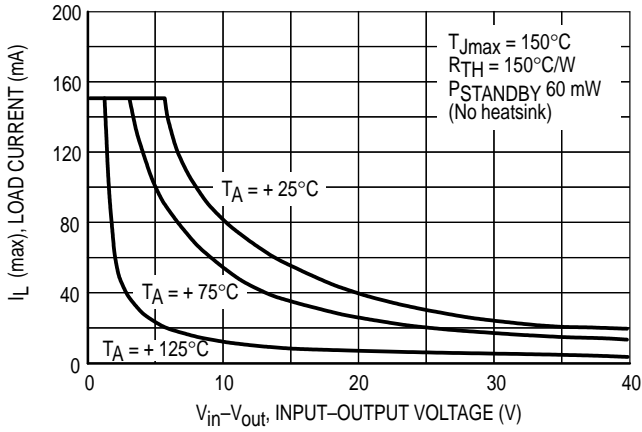


Figure 5. Load Regulation Characteristics Without Current Limiting

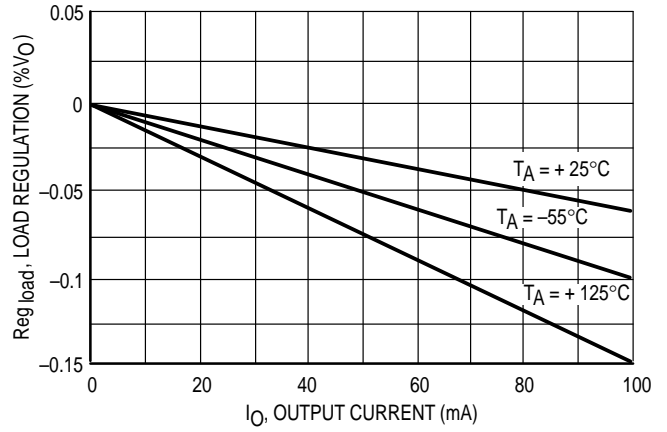


Figure 6. Load Regulation Characteristics With Current Limiting

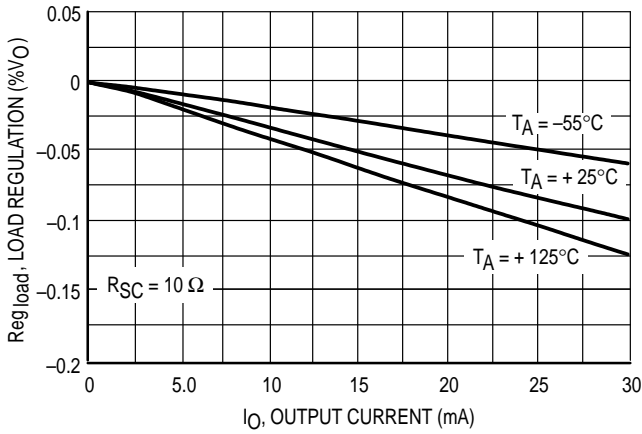


Figure 7. Load Regulation Characteristics With Current Limiting

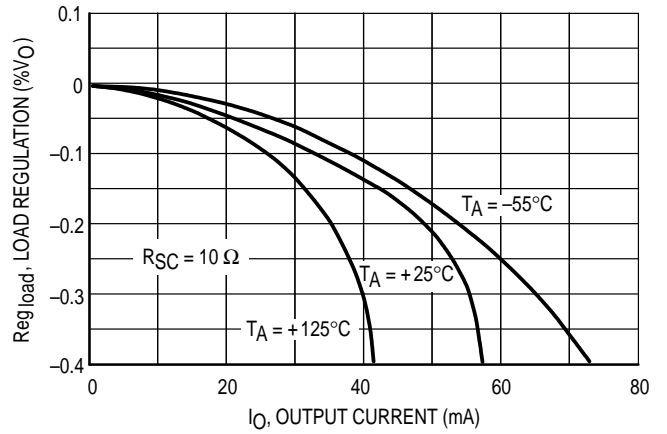


Figure 8. Current Limiting Characteristics

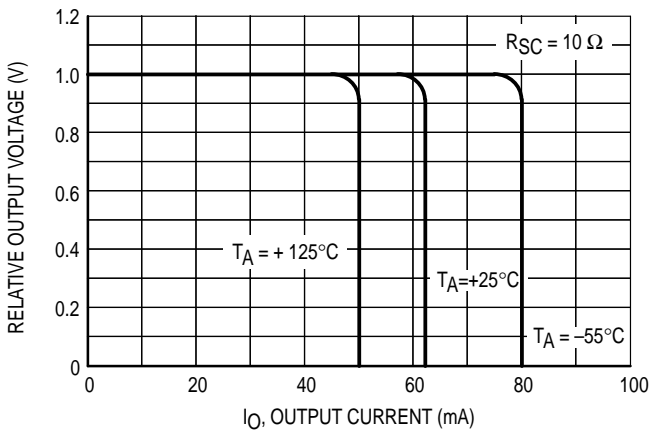


Figure 9. Current Limiting Characteristics as a Function of Junction Temperature

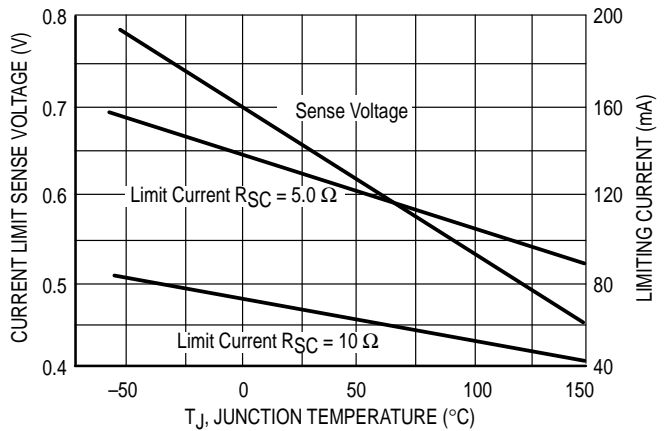


Figure 10. Line Regulation as a Function of Input-Output Voltage Differential

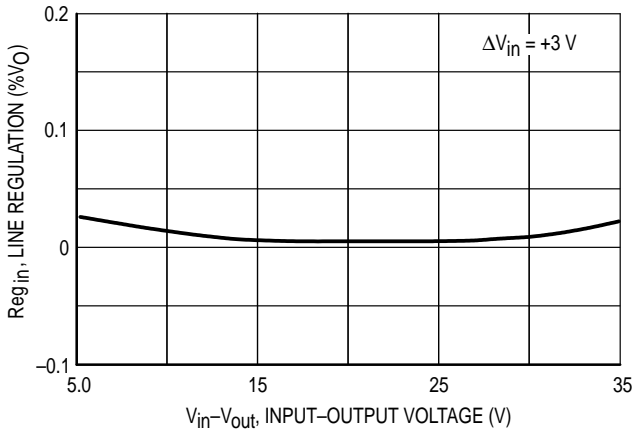


Figure 11. Load Regulation as a Function of Input-Output Voltage Differential

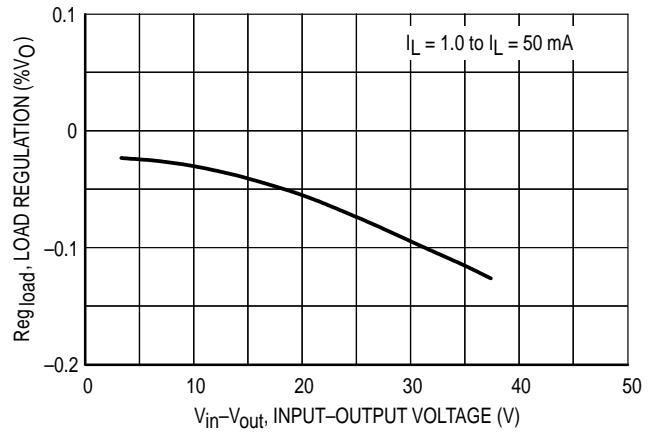


Figure 12. Standby Current Drain as a Function of Input Voltage

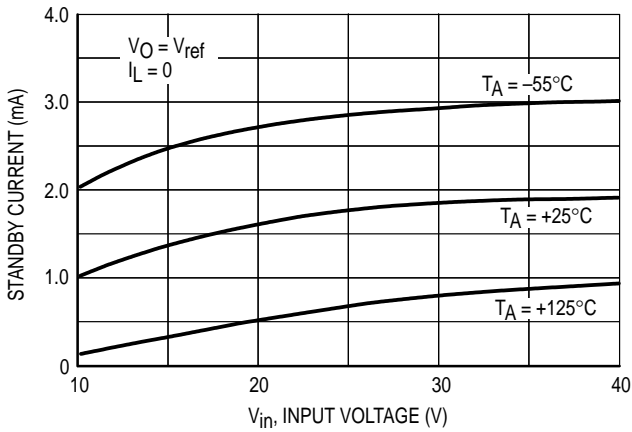


Figure 13. Line Transient Response

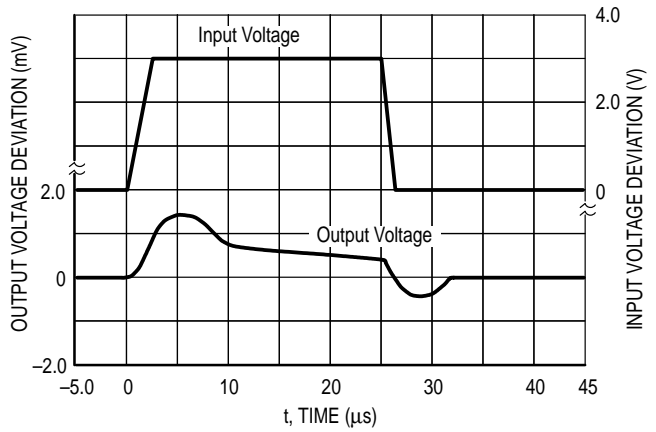


Figure 14. Load Transient Response

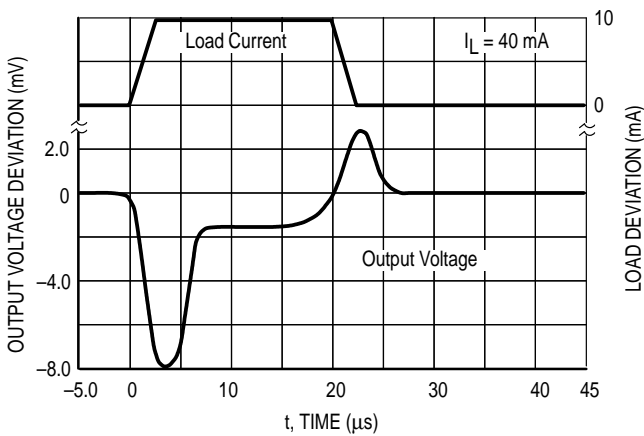
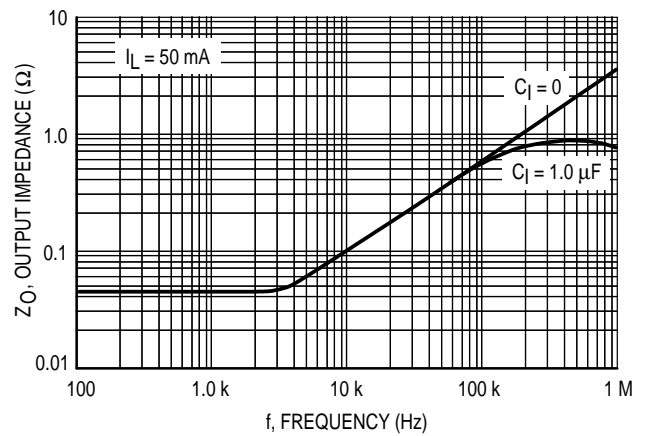
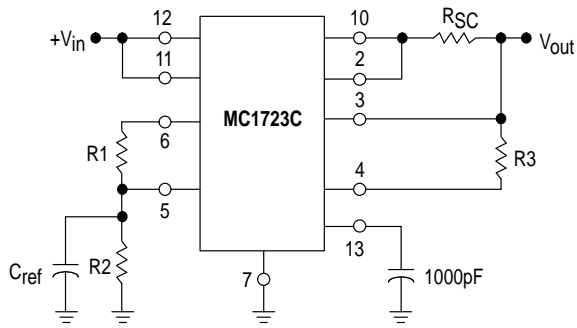


Figure 15. Output Impedance as Function of Frequency



MC1723C

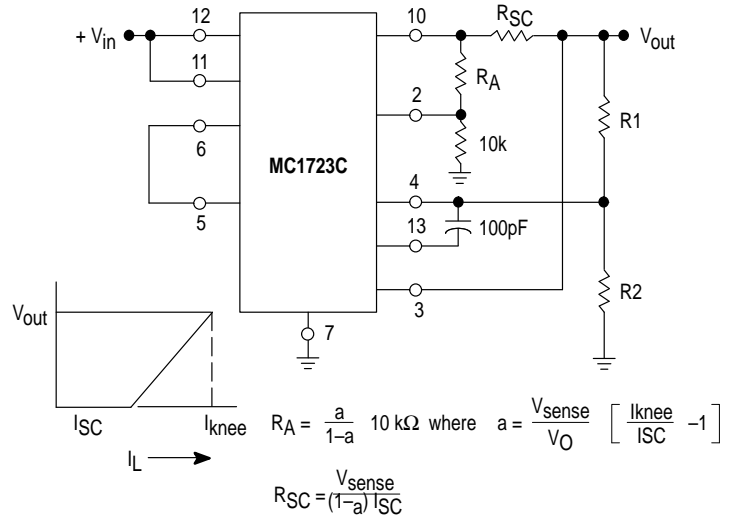
Figure 16. Typical Connection for $2 < V_O < 7$



$$V_O \approx 7 \left[\frac{R_2}{R_1 + R_2} \right] \quad I_{SC} = \frac{V_{sense}}{R_{SC}} \approx \frac{0.66}{R_{SC}} \text{ at } T_J = +25^\circ\text{C}$$

For best results $10 \text{ k} < R_1 + R_2 < 100 \text{ k}$
For minimum drift $R_3 = R_1 R_2$

Figure 17. Foldback Connection



$$R_A = \frac{a}{1-a} 10 \text{ k}\Omega \text{ where } a = \frac{V_{sense}}{V_O} \left[\frac{I_{knee}}{I_{SC}} - 1 \right]$$

$$R_{SC} = \frac{V_{sense}}{(1-a) I_{SC}}$$

Figure 18. +5.0 V, 1.0 A Switching Regulator

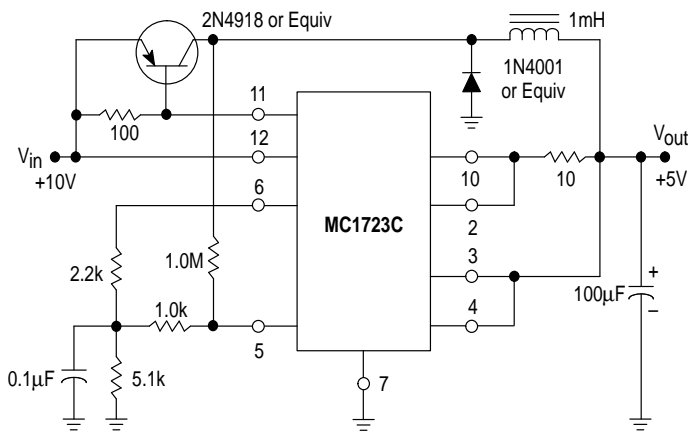


Figure 19. +5.0 V, 1.0 A High Efficiency Regulator

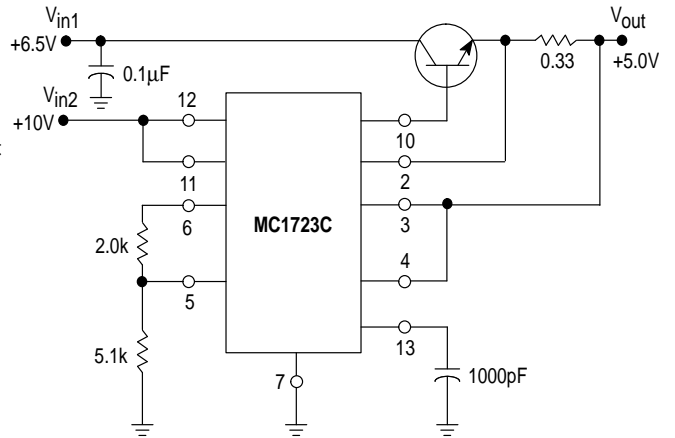


Figure 20. +15 V, 1.0 A Regulator with Remote Sense

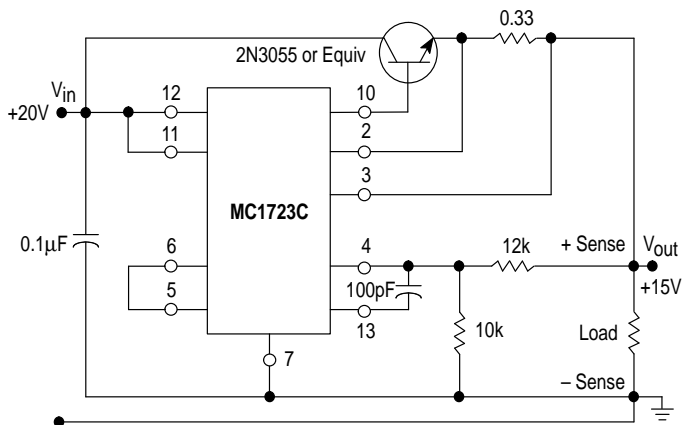
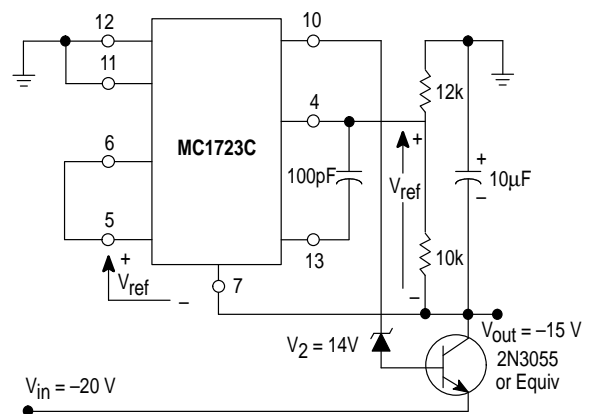
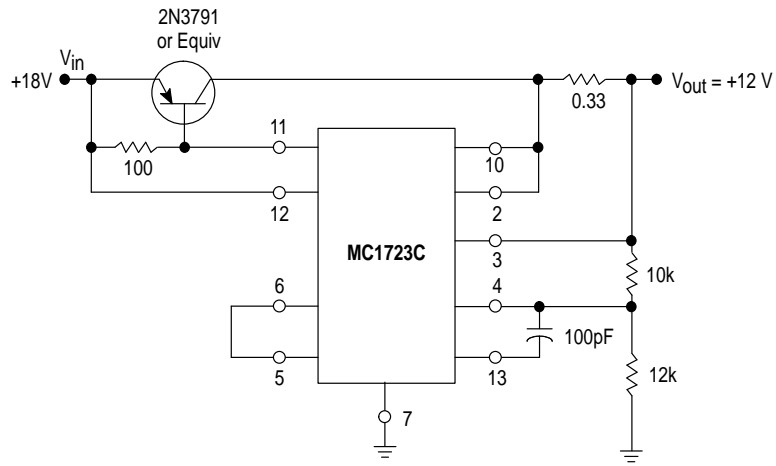


Figure 21. -15 V Negative Regulator



MC1723C

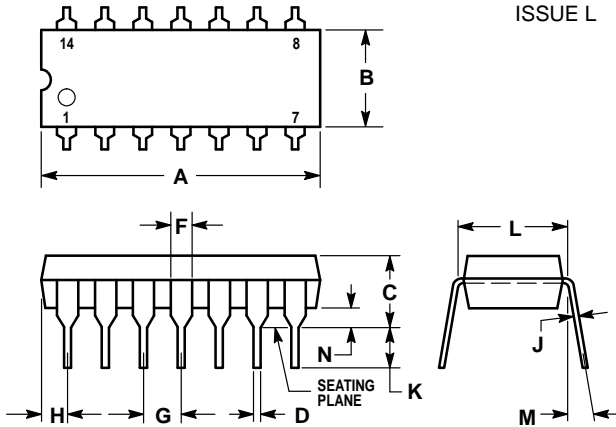
Figure 22. +12V, 1.0 A Regulator
(Using PNP Current Boost)



MC1723C

OUTLINE DIMENSIONS

P SUFFIX PLASTIC PACKAGE CASE 646-06 ISSUE L

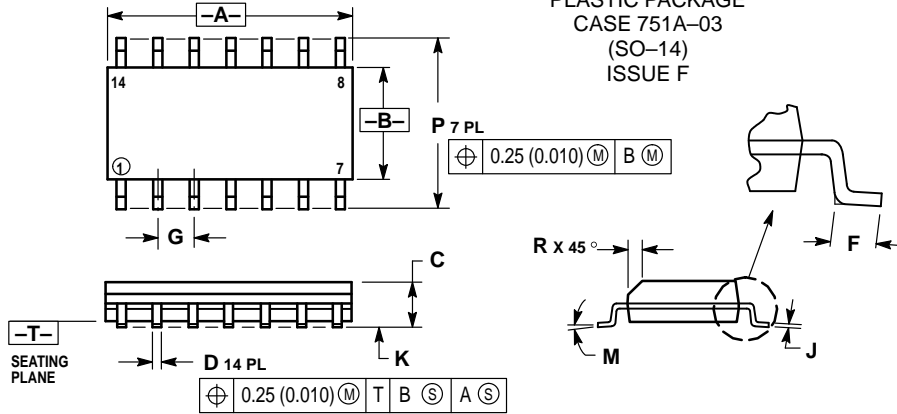


NOTES:

1. LEADS WITHIN 0.13 (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
2. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
3. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
4. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	19.56
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.300 BSC		7.62 BSC	
M	0° - 10°		0° - 10°	
N	0.015	0.039	0.39	1.01


D SUFFIX PLASTIC PACKAGE CASE 751A-03 (SO-14) ISSUE F



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0° - 7°		0° - 7°	
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Mfax is a trademark of Motorola, Inc.

How to reach us:

USA/EUROPE/Locations Not Listed: Motorola Literature Distribution;
P.O. Box 5405, Denver, Colorado 80217. 1-303-675-2140 or 1-800-441-2447

JAPAN: Motorola Japan Ltd.; SPD, Strategic Planning Office, 141,
4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan. 81-3-5487-8488

Customer Focus Center: 1-800-521-6274

Mfax™: RMFAX0@email.sps.mot.com – TOUCHTONE 1-602-244-6609
Motorola Fax Back System – US & Canada ONLY 1-800-774-1848
– http://sps.motorola.com/mfax/

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Centre,
2, Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.
852-26629298

HOME PAGE: <http://motorola.com/sps/>



MOTOROLA

