

MC1723C

Voltage Regulator

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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

Figure 1. Representative Schematic Diagram

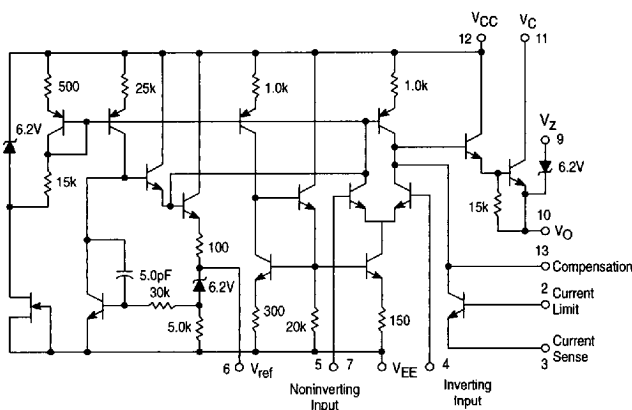


Figure 2. Typical Circuit Connection

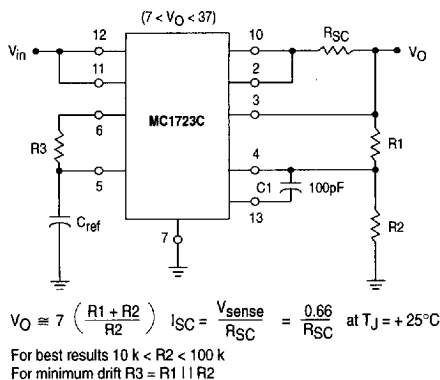
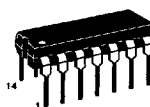
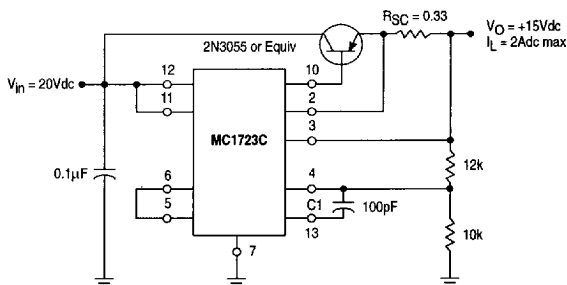


Figure 3. Typical NPN Current Boost Connection



P SUFFIX
PLASTIC PACKAGE
CASE 646



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

ORDERING INFORMATION

Device	Alternate	Operating Temperature Range	Package
MC1723CD	—	$T_A = 0^\circ \text{ to } +70^\circ\text{C}$	SO-14
MC1723CP	LM723CN μA723PC		Plastic DIP

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MAXIMUM RATINGS ($T_A = +25^\circ\text{C}$, 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	Vdc
Input–Output Voltage Differential	$V_I - V_O$	40	Vdc
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	Vdc
Differential Input Voltage	V_{id}	± 5.0	Vdc
Power Dissipation and Thermal Characteristics $T_A = +25^\circ\text{C}$ Derate above $T_A = +25^\circ\text{C}$ Thermal Resistance, Junction-to–Air	P_D $1/\theta_{JA}$ θ_{JA}	1.25 10 100	W mW/ $^\circ\text{C}$ $^\circ\text{C/W}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to $+175$	$^\circ\text{C}$
Operating Ambient Temperature Range	T_A	0 to $+70$	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, V_{in} 12 Vdc, $V_O = 5.0$ Vdc, $I_L = 1.0$ mAdc, $R_{SC} = 0$, $C_1 = 100$ pF, $C_{ref} = 0$ and divider impedance as seen by the error amplifier ≤ 10 k Ω connected as shown in Figure 2, unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Input Voltage Range	V_I	9.5	–	40	Vdc
Output Voltage Range	V_O	2.0	–	37	Vdc
Input–Output Voltage Differential	$V_I - V_O$	3.0	–	38	Vdc
Reference Voltage	V_{ref}	6.80	7.15	7.50	Vdc
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	– –	$\mu\text{V(RMS)}$
Average Temperature Coefficient of Output Voltage ($T_{low} < T_A < T_{high}$)	TCV_O	–	0.003	0.015	%/ $^\circ\text{C}$
Line Regulation ($T_A = 25^\circ\text{C}$) $\left\{ \begin{array}{l} 12 \text{ V} < V_{in} < 15 \text{ V} \\ 12 \text{ V} < V_{in} < 40 \text{ V} \end{array} \right.$ ($T_{low} < T_A < T_{high}$) $12 \text{ V} < V_{in} < 15 \text{ V}$	Reg_{line}	– – –	0.01 0.1 –	0.1 0.5 0.3	% V_O
Load Regulation (1.0 mA $< I_L < 50$ mA) $T_A = 25^\circ\text{C}$ $T_{low} < T_A < T_{high}$	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	$\Delta V_O/t$	–	0.1	–	%/1000 Hr.

NOTE: T_{low} to $T_{high} = 0^\circ$ to $+70^\circ\text{C}$

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

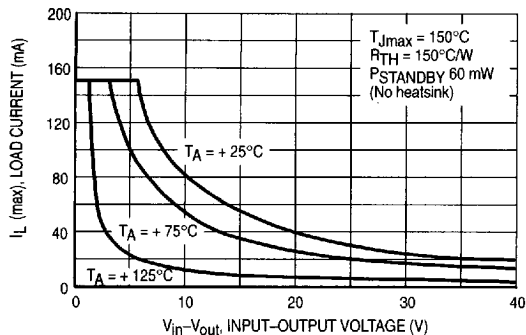


Figure 5. Load Regulation Characteristics Without Current Limiting

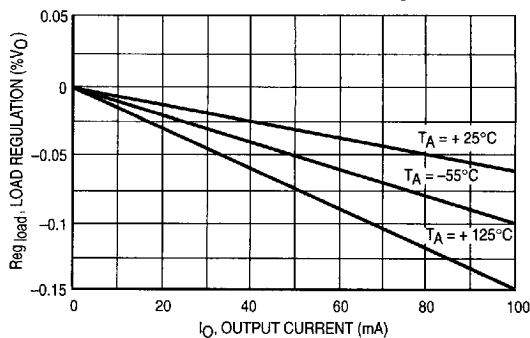


Figure 6. Load Regulation Characteristics With Current Limiting

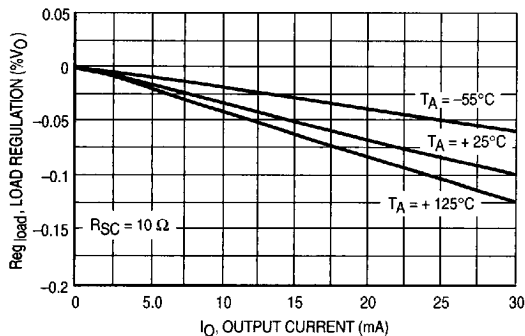


Figure 7. Load Regulation Characteristics With Current Limiting

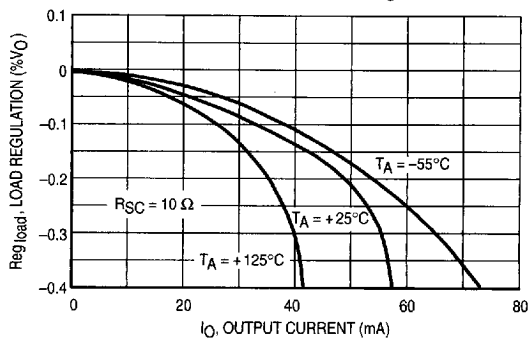


Figure 8. Current Limiting Characteristics

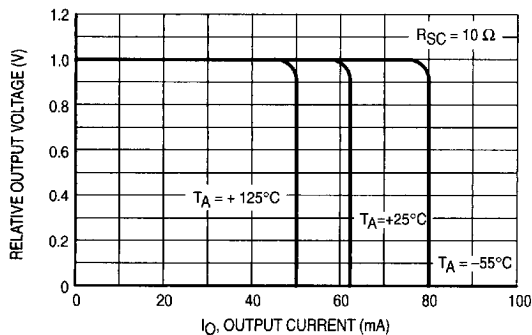


Figure 9. Current Limiting Characteristics as a Function of Junction Temperature

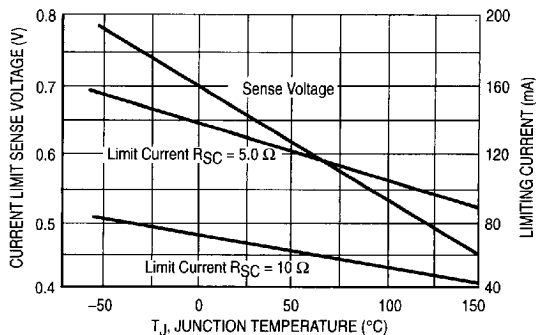


Figure 10. Line Regulation as a Function of Input-Output Voltage Differential

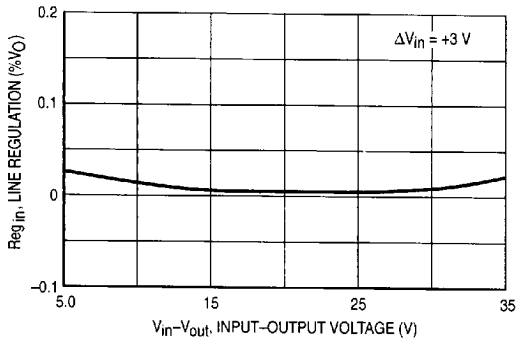


Figure 11. Load Regulation as a Function of Input-Output Voltage Differential

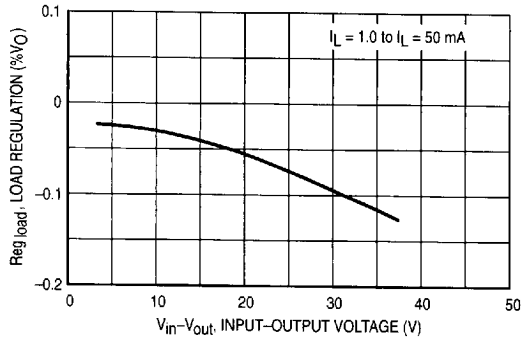


Figure 12. Standby Current Drain as a Function of Input Voltage

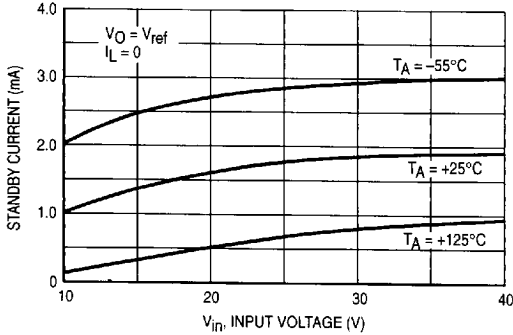


Figure 13. Line Transient Response

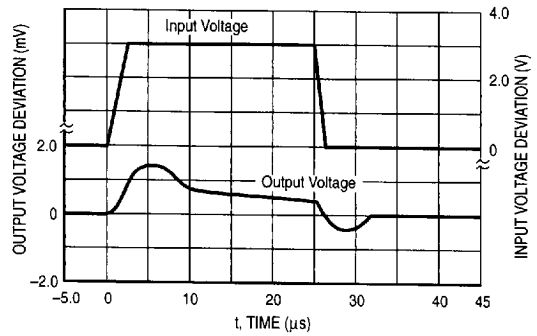


Figure 14. Load Transient Response

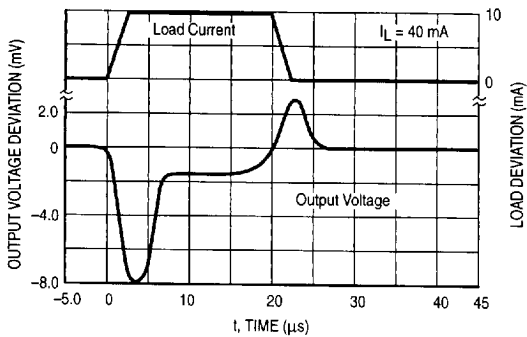
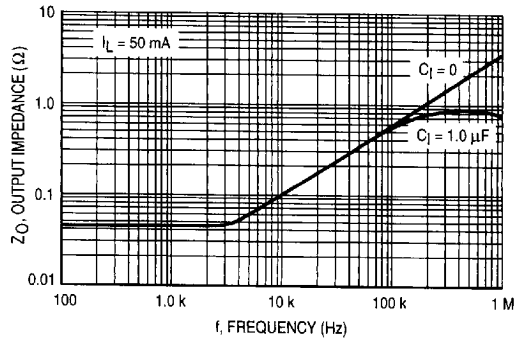
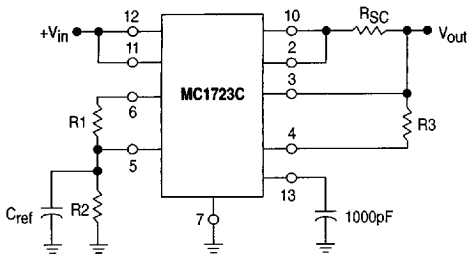


Figure 15. Output Impedance as Function of Frequency



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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

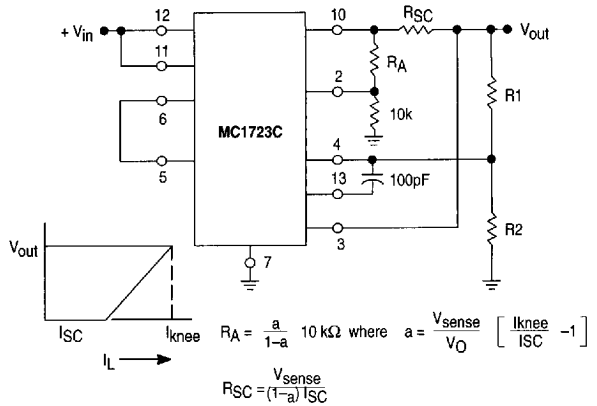


Figure 18. +5.0 V, 1.0 A Switching Regulator

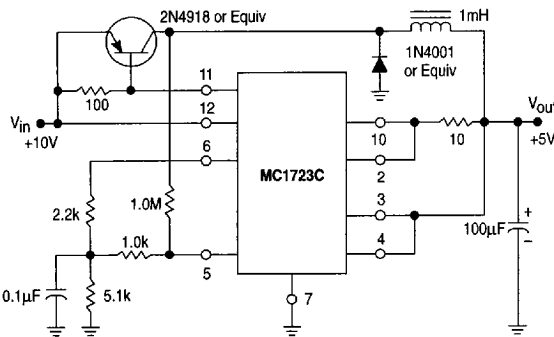


Figure 19. +5.0 V, 1.0 A High Efficiency Regulator

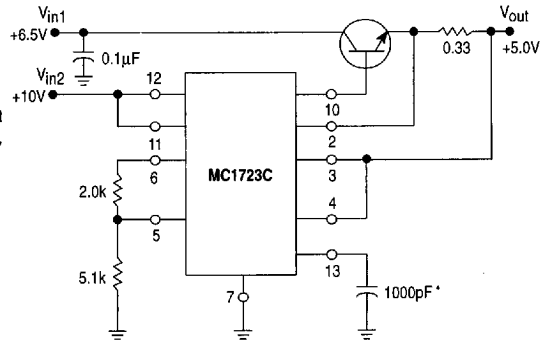


Figure 20. +15 V, 1.0 A Regulator with Remote Sense

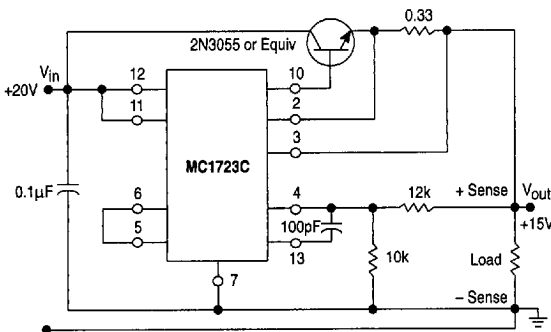
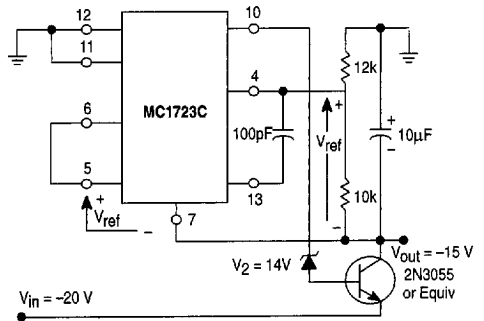
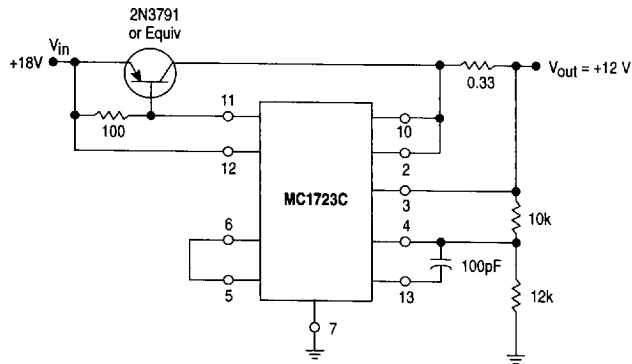


Figure 21. -15 V Negative Regulator



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



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