

PRECISION VOLTAGE REGULATOR

 μ A723/723C/SA723C

DESCRIPTION

The μ A723/SA723C is a Monolithic Precision Voltage Regulator capable of operation in positive or negative supplies as a series, shunt, switching or floating regulator. The 723 contains a temperature compensated reference amplifier, error amplifier, series pass transistor, and current limiter, with access to remote shutdown.

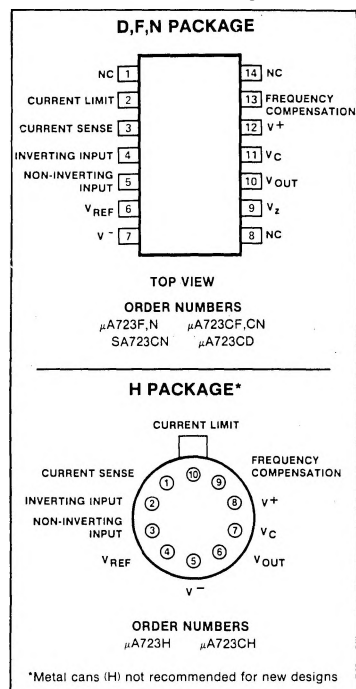
FEATURES

- Positive or negative supply operation
- Series, shunt, switching or floating operation
- .01% line and load regulation
- Output voltage adjustable from 2 to 37 volts
- Output current to 150mA without external pass transistor
- μ A723 MIL STD 88 3A, B, C available

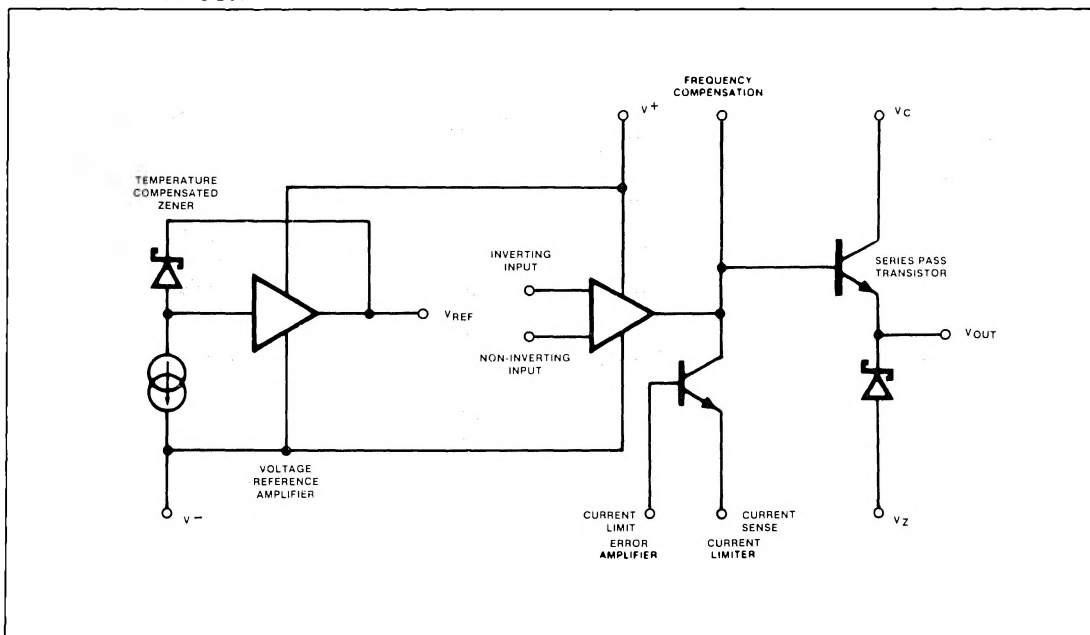
ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
Pulse voltage from $V+$ to $V-$ (50 ms)	50	V
Continuous voltage from $V+$ to $V-$	40	V
Input-output voltage differential	40	V
Maximum output current	150	mA
Current from V_{REF}	15	mA
Current from V_z	25	mA
Internal power dissipation ¹	800	mW
Operating temperature range		
μ A723	-55 to +125	°C
μ A723C	0 to 70	°C
SA723C	-40 to +85	°C
Storage temperature range	-65 to +150	°C
Lead temperature	300	°C

PIN CONFIGURATIONS



EQUIVALENT CIRCUIT



PRECISION VOLTAGE REGULATOR

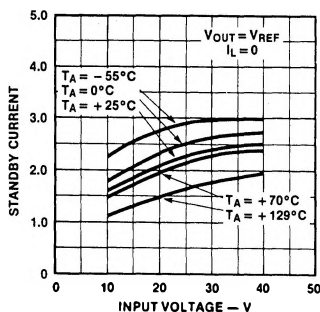
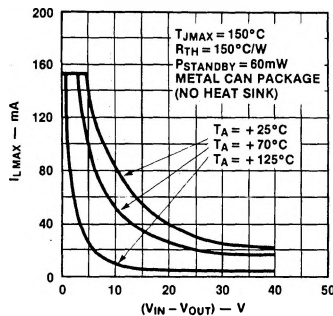
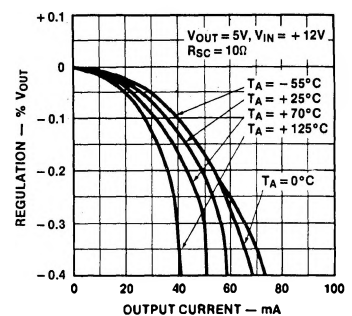
 μ A723/723C/SA723CDC ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$ unless otherwise specified.¹

PARAMETER	TEST CONDITIONS	μ A723			μ A723C/SA723C			UNIT
		Min	Typ	Max	Min	Typ	Max	
Line regulation ²	$V_{IN} = 12\text{V to } V_{IN} = 15\text{V}$ $V_{IN} = 12\text{V to } V_{IN} = 40\text{V}$		0.01 0.02	0.1 0.2		0.01 0.1	0.1 0.5	% V_{OUT} % V_{OUT}
Load regulation ²	$I_L = 1\text{mA to } I_L = 50\text{mA}$ $f = 50\text{Hz to } 10\text{kHz}, C_{REF} = 0$ $f = 50\text{Hz to } 10\text{kHz}, C_{REF} = 5\mu\text{F}$		0.03 74 86	0.15		0.03 74 86	0.2	% V_{OUT} dB dB
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	$BW = 100\text{Hz to } 10\text{kHz}, C_{REF} = 0$ $BW = 100\text{Hz to } 10\text{kHz}, C_{REF} = 5\mu\text{F}$		20 2.5			20 2.5		μVrms μVrms
Long term stability			0.1			1	0.1	%/1000hrs.
Standby current drain	$I_L = 0, V_{IN} = 30\text{V}$		2.3	3.5		2.3	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
The following specifications apply over the operating temperature ranges								
Line regulation				0.3			0.3	% V_{OUT}
Load regulation				0.6			0.6	% V_{OUT}
Average temperature coefficient of output voltage	$V_{IN} = 12\text{V to } V_{IN} = 15\text{V}$ $I_L = 1\text{mA to } I_L = 50\text{mA}$		0.002	0.015		0.003	0.015	%/ $^\circ\text{C}$

NOTES

- $V_{IN} = V^+ = V_C = 12\text{V}$, $V^- = 0\text{V}$, $V_{OUT} = 5\text{V}$, $I_L = 1\text{mA}$, $R_{SC} = 0$, $C_1 = 100\text{pF}$, $C_{REF} = 0$ and divider impedance as seen by error amplifier $\leq 10\text{k}\Omega$ when connected as shown in Figure 3.
- The load and line regulation specifications are for constant junction temperature. Temperature drift effects must be taken into account separately when the unit is operating under conditions of high dissipation.

TYPICAL PERFORMANCE CHARACTERISTICS

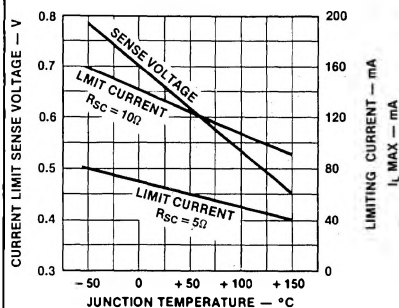
STANDBY CURRENT DRAIN
AS A FUNCTION OF
INPUT VOLTAGEMAXIMUM LOAD CURRENT
AS A FUNCTION OF
INPUT-OUTPUT VOLTAGE
DIFFERENTIALLOAD REGULATION
CHARACTERISTICS WITH
CURRENT LIMITING

PRECISION VOLTAGE REGULATOR

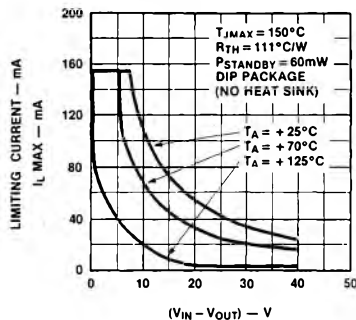
 μ A723/723C/SA723C

TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

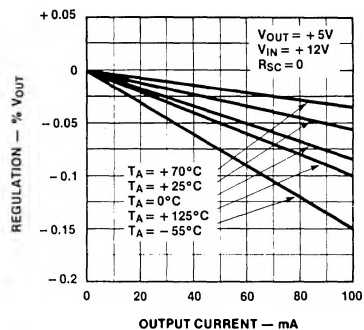
CURRENT LIMITING CHARACTERISTICS AS A FUNCTION OF JUNCTION TEMPERATURE



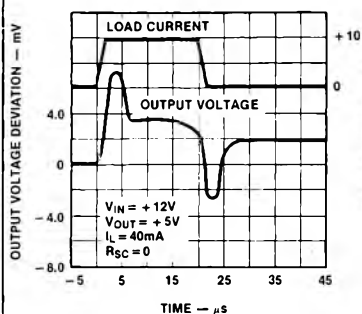
MAXIMUM LOAD CURRENT AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL



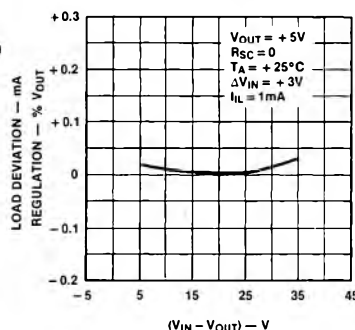
LOAD REGULATION CHARACTERISTICS WITHOUT CURRENT LIMITING



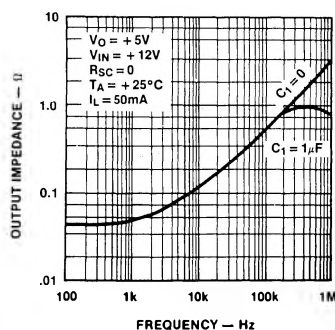
LOAD TRANSIENT RESPONSE



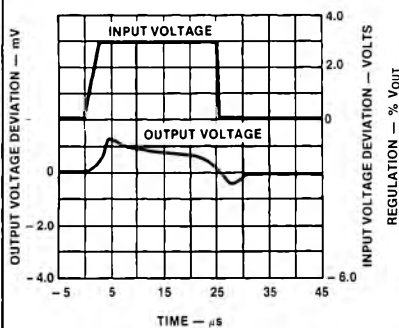
LINE REGULATION AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL



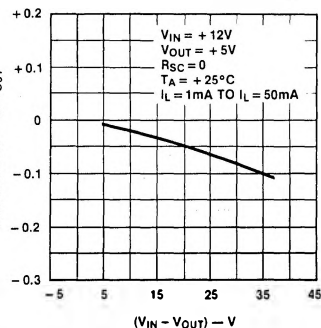
OUTPUT IMPEDANCE AS A FUNCTION OF FREQUENCY



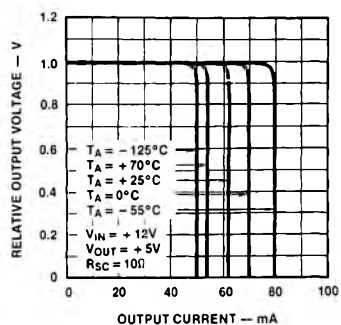
LINE TRANSIENT RESPONSE



LOAD REGULATION AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL



CURRENT LIMITING CHARACTERISTICS

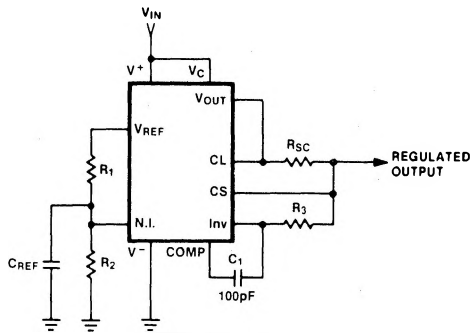


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TYPICAL APPLICATIONS

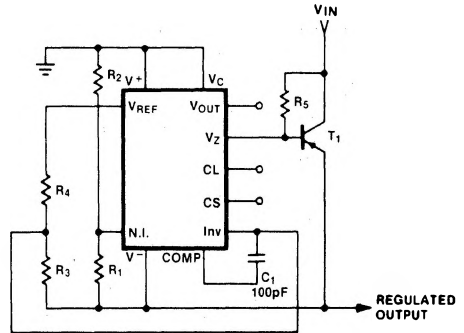
LOW VOLTAGE REGULATOR ($V_{OUT} = 2$ TO 7 VOLTS)



$$V_{OUT} = \left[V_{REF} \times \frac{R_2}{R_1 + R_2} \right]$$

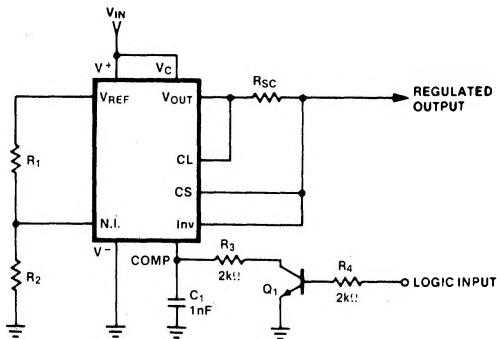
$$R_3 = \frac{R_1 R_2}{R_1 + R_2} \text{ for minimum temperature drift}$$

NEGATIVE VOLTAGE REGULATOR



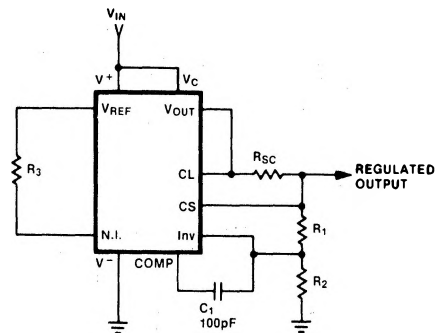
$$V_{OUT} = \left[\frac{V_{REF}}{2} \times \frac{R_1 + R_2}{R_1} \right] R_3 = R_4$$

REMOTE SHUTDOWN REGULATOR WITH CURRENT LIMITING ($V_{OUT} = 2$ TO 7 VOLTS)



$$V_{OUT} = \left[V_{REF} \times \frac{R_2}{R_1 + R_2} \right]$$

HIGH VOLTAGE REGULATOR ($V_{OUT} = 7$ TO 37 VOLTS)



$$V_{OUT} = \left[V_{REF} \times \frac{R_1 + R_2}{R_2} \right]$$

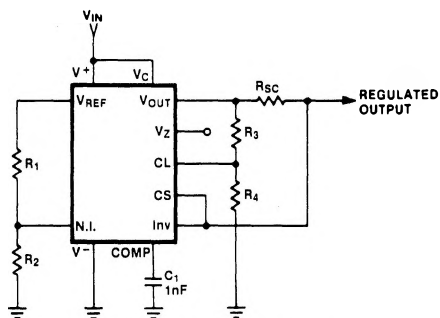
$$R_3 = \frac{R_1 R_2}{R_1 + R_2} \text{ for minimum temperature drift}$$

R_3 may be eliminated for minimum component count

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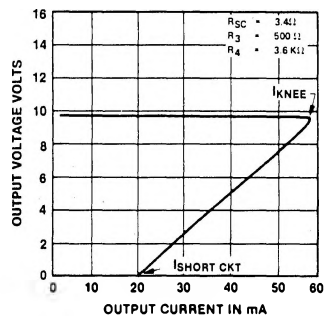
TYPICAL APPLICATIONS (Cont'd)

FOLDBACK CURRENT LIMITING REGULATOR
($V_{OUT} = 2$ TO 7 VOLTS)

$$I_{KNEE} = \left[\frac{V_{OUT} R_3}{R_{SC} R_4} + \frac{V_{SENSE} (R_3 + R_4)}{R_{SC} R_4} \right]$$

$$V_{OUT} = \left[V_{REF} \times \frac{R_1 + R_2}{R_2} \right]$$

$$I_{SHORT\ CKT} = \left[\frac{V_{SENSE}}{R_{SC}} \times \frac{R_3 + R_4}{R_4} \right]$$



$$\frac{R_4}{R_3} = \frac{V_{OUT} I_{SC}}{V_{SENSE} (I_{KNEE} - I_{SHORT\ CKT})} - 1$$

$$R_{SC} = \frac{V_{SENSE}}{I_{SC}} \left[1 + \frac{R_3}{R_4} \right]$$