PRECISION VOLTAGE REGULATOR

μA723/723C/SA723C

DESCRIPTION

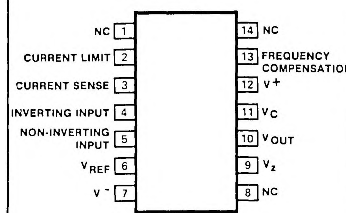
The μA723/SA723C is a Monolithic Precision Voltage Regulator capable of operation in positive or negative supplies as a series, shunt, switching or floating regulator. The 723 contains a temperature compensated reference amplifier, error amplifier, series pass transistor, and current limiter, with access 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**
- **μA723 MIL STD 88 3A, B, C available**

PIN CONFIGURATIONS

D,F,N PACKAGE

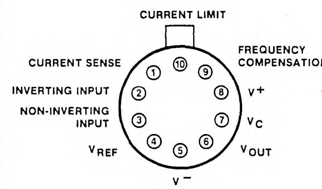


TOP VIEW

ORDER NUMBERS

μA723F,N μA723CF,CN
SA723CN μA723CD

H PACKAGE*



ORDER NUMBERS

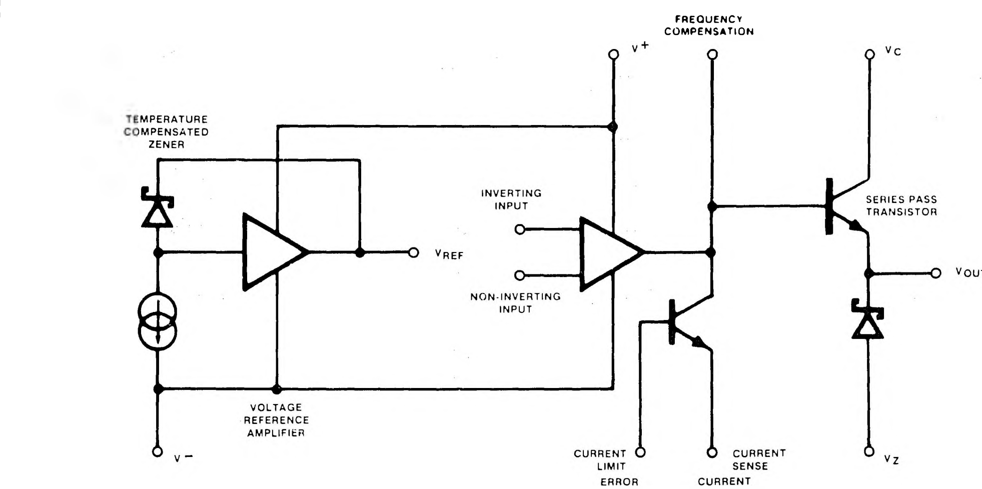
μA723H μA723CH

*Metal cans (H) not recommended for new designs

ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
Pulse voltage from V+ to V- (50 ms)	50	V
Continous 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		
μA723	-55 to +125	°C
μA723C	0 to 70	°C
SA723C	-40 to +85	°C
Storage temperature range	-65 to +150	°C
Lead temperature	300	°C

EQUIVALENT CIRCUIT



PRECISION VOLTAGE REGULATOR — μA723/723C/SA723C

DC ELECTRICAL CHARACTERISTICS $T_A = 25°C$ unless otherwise specified.[1]

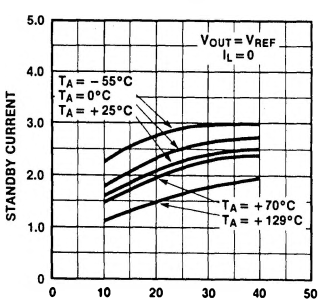
PARAMETER	TEST CONDITIONS	μA723 Min	μA723 Typ	μA723 Max	μA723C/SA723C Min	μA723C/SA723C Typ	μA723C/SA723C Max	UNIT
Line regulation[2]	$V_{IN} = 12V$ to $V_{IN} = 15V$ $V_{IN} = 12V$ to $V_{IN} = 40V$		0.01 0.02	0.1 0.2		0.01 0.1	0.1 0.5	$\%V_{OUT}$ $\%V_{OUT}$
Load regulation[2]	$I_L = 1mA$ to $I_L = 50mA$ f = 50Hz to 10kHz, $C_{REF} = 0$ f = 50Hz to 10kHz, $C_{REF} = 5\mu F$		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 = 100Hz to 10kHz, $C_{REF} = 0$ BW = 100Hz to 10kHz, $C_{REF} = 5\mu F$		20 2.5			20 2.5		μVrms μVrms
Long term stability			0.1			1	0.1	%/1000hrs.
Standby current drain	$I_L = 0$, $V_{IN} = 30V$		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	$V_{IN} = 12V$ to $V_{IN} = 15V$ $I_L = 1mA$ to $I_L = 50mA$		0.002	0.015		0.003	0.015	%/°C

NOTES

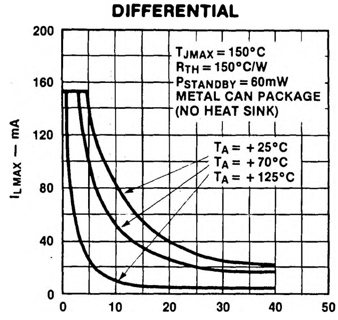
1. $V_{IN} = V+ = V_C = 12V$, $V- = 0V$, $V_{OUT} = 5V$, $I_L = 1mA$, $R_{SC} = 0$, $C_1 = 100pF$, $C_{REF} = 0$ and divider impedance as seen by error amplifier ≤ 10kΩ when connected as shown in Figure 3.
2. The load and line regulation specifications are for constant junction temperature. Temperature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

TYPICAL PERFORMANCE CHARACTERISTICS

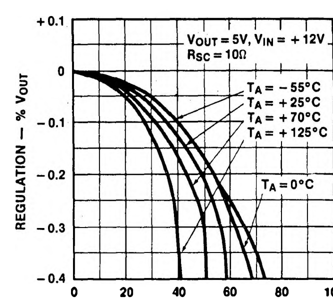
STANDBY CURRENT DRAIN AS A FUNCTION OF INPUT VOLTAGE



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



LOAD REGULATION CHARACTERISTICS WITH CURRENT LIMITING

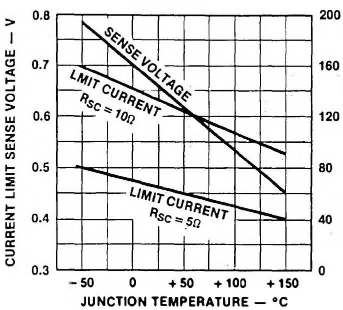


PRECISION VOLTAGE REGULATOR

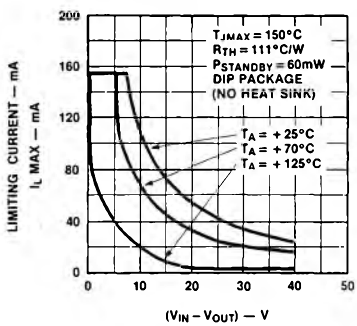
μA723/723C/SA723C

TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

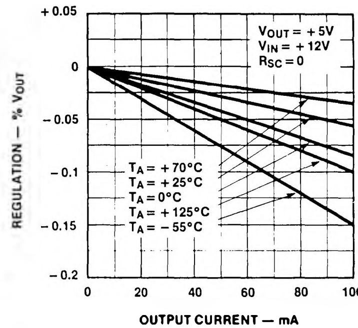
CURRENT LIMITING CHARACTERISTICS AS A FUNCTION OF JUNCTION TEMPERATURE



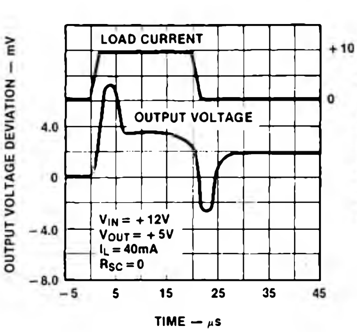
MAXIMUM LOAD CURRENT AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL



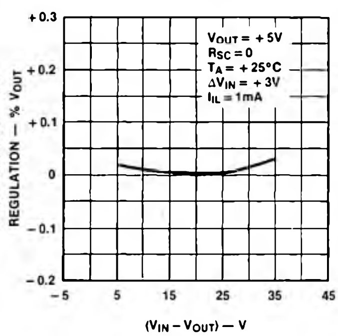
LOAD REGULATION CHARACTERISTICS WITHOUT CURRENT LIMITING



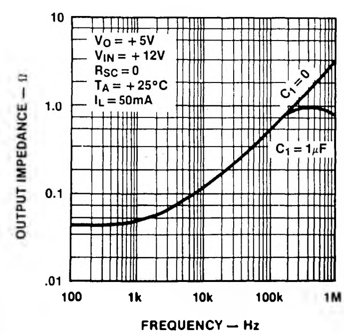
LOAD TRANSIENT RESPONSE



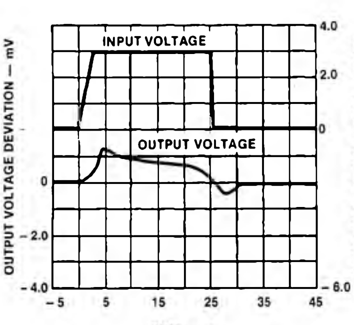
LINE REGULATION AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL



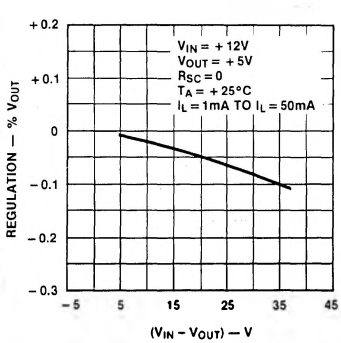
OUTPUT IMPEDANCE AS A FUNCTION OF FREQUENCY



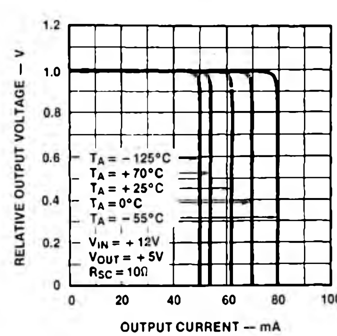
LINE TRANSIENT RESPONSE



LOAD REGULATION AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL

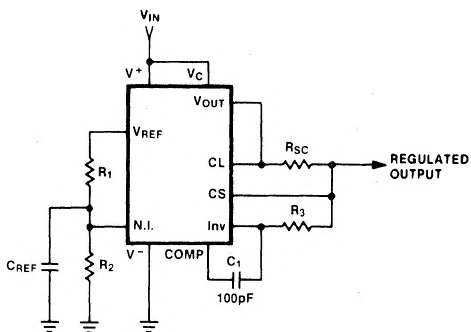


CURRENT LIMITING CHARACTERISTICS



TYPICAL APPLICATIONS

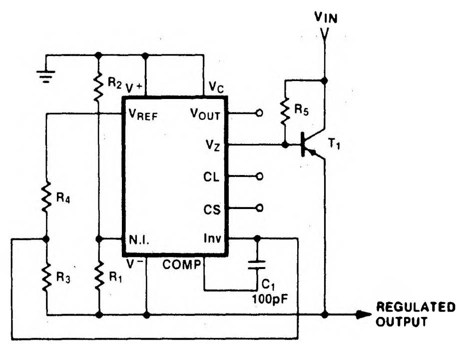
LOW VOLTAGE REGULATOR (V_{OUT} = 2 TO 7 VOLTS)



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

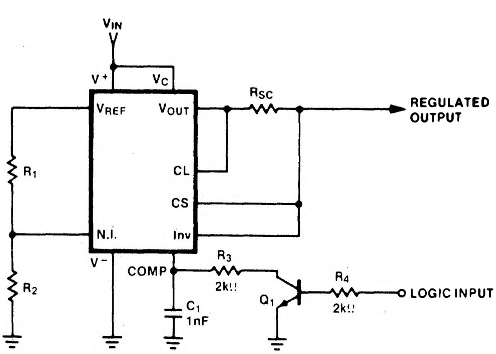
$R_3 = \frac{R_1 R_2}{R_1 + R_2}$ for minimum temperature drift

NEGATIVE VOLTAGE REGULATOR



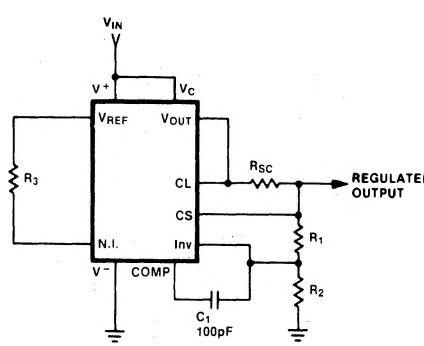
$$V_{OUT} = \left[\frac{V_{REF}}{2} \times \frac{R_1 + R_2}{R_1}\right]; R_3 = R_4$$

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)



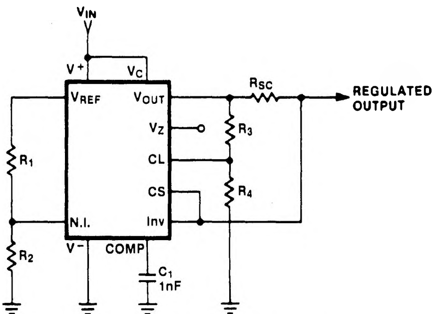
$$V_{OUT} = \left[V_{REF} \times \frac{R_1 + R_2}{R_2}\right]$$

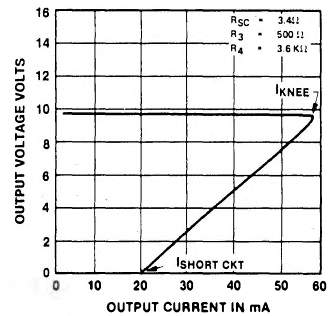
$R_3 = \frac{R_1 R_2}{R_1 + R_2}$ for minimum temperature drift

R3 may be eliminated for minimum component count

TYPICAL APPLICATIONS (Cont'd)

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





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

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

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

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

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