PRECISION VOLTAGE REGULATOR — μA723/723C/SA723C

μA723/723C/SA723C-F,L,N

DESCRIPTION

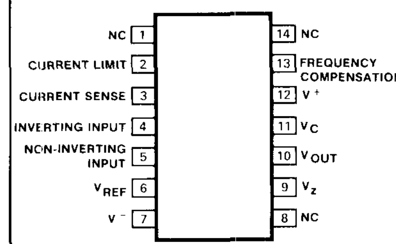
The μA723/SA723C is a Monolithic Precision Voltage Regulator capable of operation in positive or negative supplies as a series, shunt, switching or floating regulator. The 723 contains a temperature compensated reference amplifier, error amplifier, series pass transistor, and current limiter, with access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

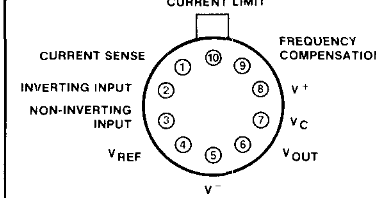
PIN CONFIGURATION

F,N PACKAGE



ORDER PART NOS. μA723N, μA723F, μA723CN, μA723CF, SA723CF, SA723CN

L PACKAGE



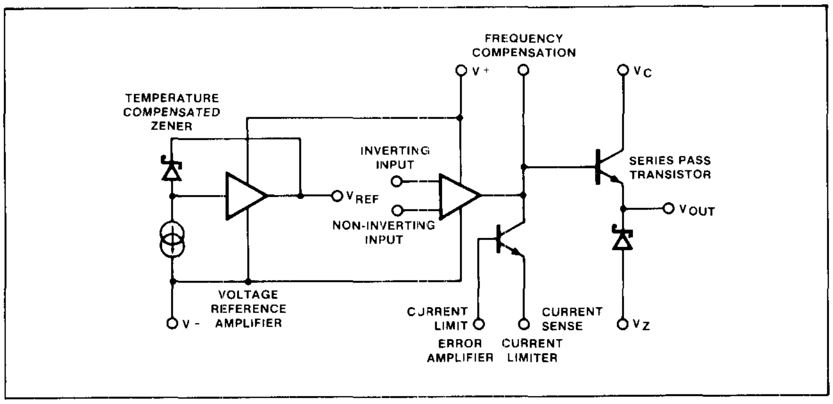
ORDER PART NOS. μA723L/μA723CL

ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
Pulse voltage from V+ to V- (50 ms)		
μA723	50	V
μA723C		
SA723C		
Continous voltage from V+ to V-		
μA723	40	V
μA723C	40	V
SA723C	40	V
Input-output voltage differential	40	V
Maximum output current		
μA723	150	mA
μA723C	150	mA
SA723C	150	mA
Current from V_{REF}		
μA723	15	mA
μA723C		
SA723C		
Current from V_Z		
μA723		
μA723C	25	mA
SA723C	25	mA
Internal power dissipation[1]		
μA723	800	mA
μA723C	800	mA
SA723C	800	mA
Operating temperature range		
μA723	-55 to +125	°C
μA723C	0 to 70	°C
SA723C	-40 to +85	°C
Storage temperature range		
μA723	-65 to +150	°C
μA723C	-65 to +150	°C
SA723C	-65 to +150	°C
Lead temperature		
μA723	300	°C
μA723C	300	°C
SA723C	300	°C

μA723/723C/SA723C-F,L,N

EQUIVALENT CIRCUIT



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

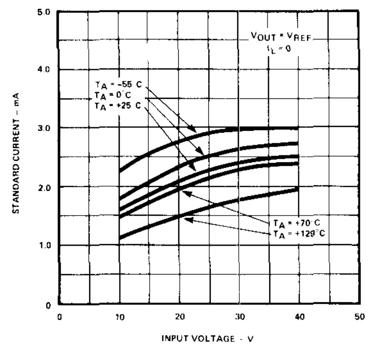
PARAMETER	TEST CONDITIONS	μA723C/SA723C Min	Typ	Max	μA723 Min	Typ	Max	UNIT
Line regulation[2]	$V_{IN} = 12V$ to $V_{IN} = 15V$		0.01	0.1		0.01	0.1	$\%V_{OUT}$
	$V_{IN} = 12V$ to $V_{IN} = 40V$		0.1	0.5		0.02	0.2	$\%V_{OUT}$
Load regulation[2]	$I_L = 1mA$ to $I_L = 50mA$		0.03	0.2		0.03	0.15	$\%V_{OUT}$
	$f = 50Hz$ to $10kHz$, $C_{REF} = 0$		74			74		dB
	$f = 50Hz$ to $10kHz$, $C_{REF} = 5\mu F$		86			86		dB
Short circuit current limit	$R_{SC} = 10\Omega$, $V_{OUT} = 0$		65			65		mA
Reference voltage		6.80	7.15	7.50	6.95	7.15	7.35	V
Output noise voltage	$BW = 100Hz$ to $10kHz$, $C_{REF} = 0$		20			20		μVrms
	$BW = 100Hz$ to $10kHz$, $C_{REF} = 5\mu F$		2.5			2.5		μVrms
Long term stability			0.1	0.1		0.1		%/1000hrs.
Standby current drain	$I_L = 0$, $V_{IN} = 30V$		2.3	4.0	2.3	3.5		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 $I_L = 50mA$		0.003	0.015		0.002	0.015	%/°C

NOTES

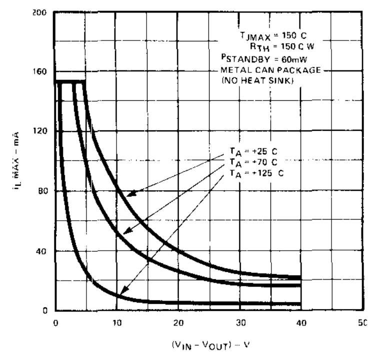
1. $V_{IN} = V+ = V_C = 12V$, $V- = 0V$, $V_{OUT} = 5V$, $I_L = 1mA$, $R_{SC} = 0$, $C_1 = 100pF$, $C_{REF} = 0$ and divider impedance as seen by error amplifier $\leq 10k\Omega$ when connected as shown in Figure 3.
2. The load and line regulation specifications are for constant junction temperature.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

TYPICAL PERFORMANCE CHARACTERISTICS

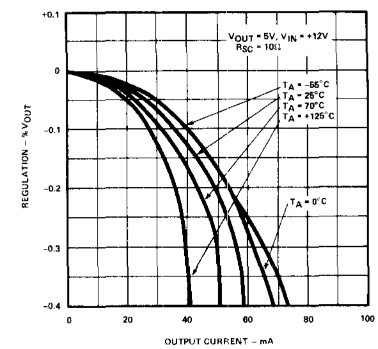
STANDBY CURRENT DRAIN AS A FUNCTION OF INPUT VOLTAGE



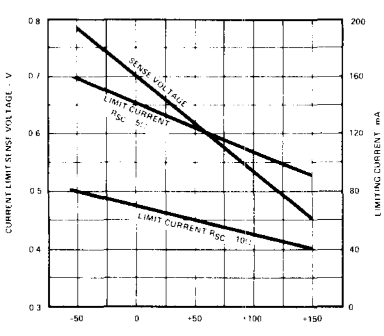
MAXIMUM LOAD CURRENT AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL



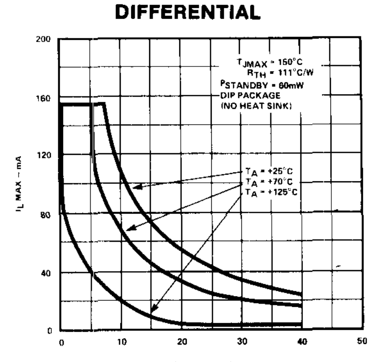
LOAD REGULATION CHARACTERISTICS WITH CURRENT LIMITING



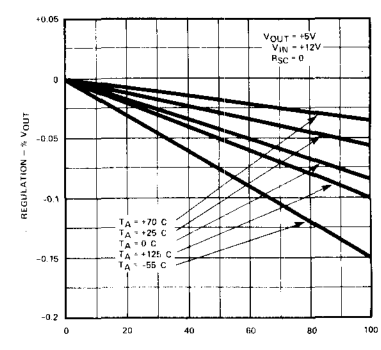
CURRENT LIMITING CHARACTERISTICS AS A FUNCTION OF JUNCTION TEMPERATURE



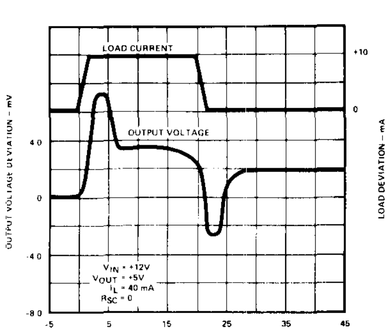
MAXIMUM LOAD CURRENT AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL



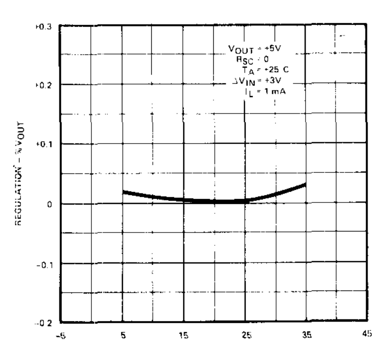
LOAD REGULATION CHARACTERISTICS WITHOUT CURRENT LIMITING



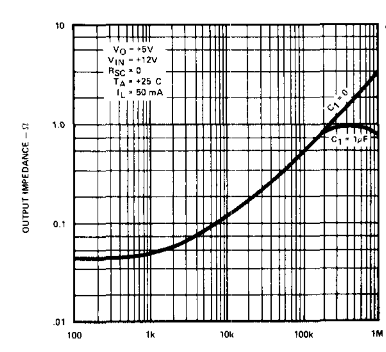
LOAD TRANSIENT RESPONSE



LINE REGULATION AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL

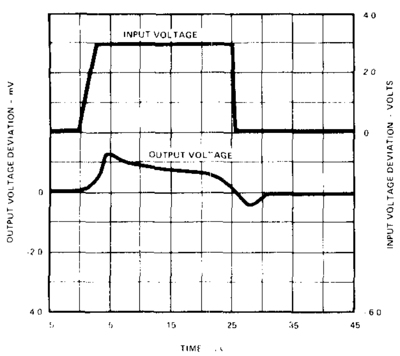


OUTPUT IMPEDANCE AS A FUNCTION OF FREQUENCY

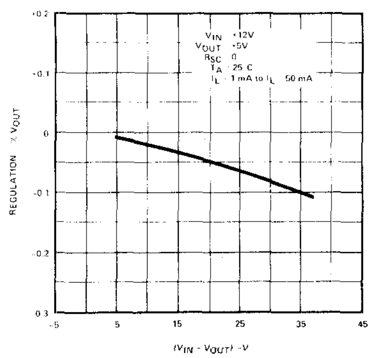


TYPICAL PERFORMANCE CHARACTERISTICS *(Cont'd)*

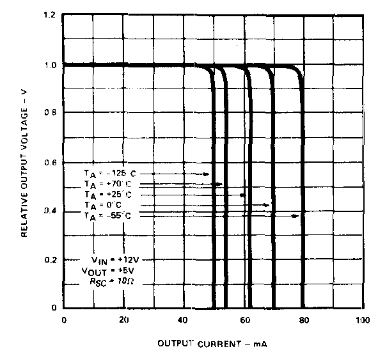
LINE TRANSIENT RESPONSE



LOAD REGULATION AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL

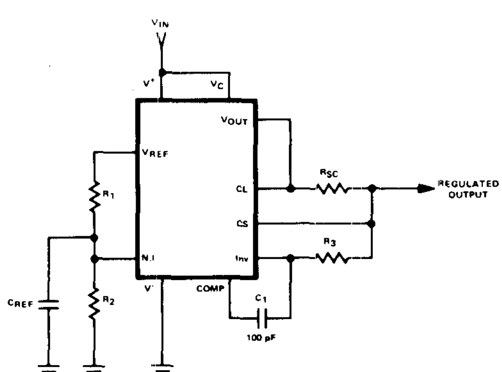


CURRENT LIMITING CHARACTERISTICS



TYPICAL APPLICATIONS

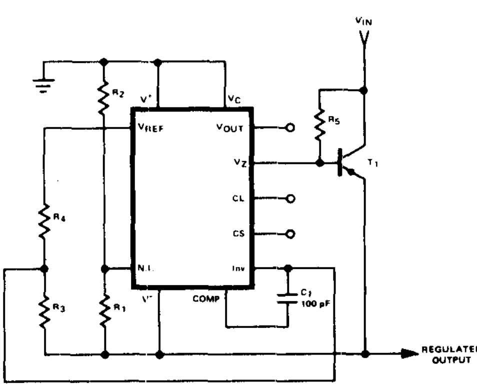
LOW VOLTAGE REGULATOR (V_{OUT} = 2 TO 7 VOLTS)



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

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

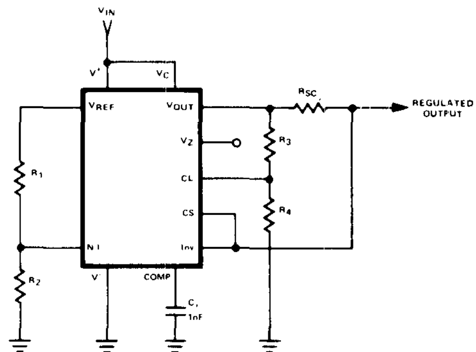
NEGATIVE VOLTAGE REGULATOR

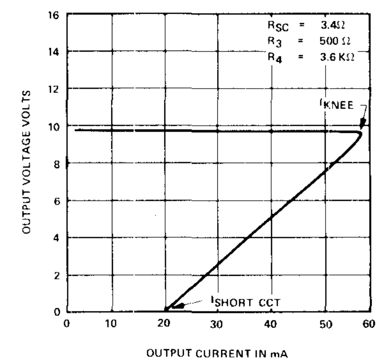


$$V_{out} = \left[\frac{V_{REF}}{2} \times \frac{R_1 + R_2}{R_1}\right]; \quad R_3 = R_4$$

TYPICAL APPLICATIONS (Cont'd)

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





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

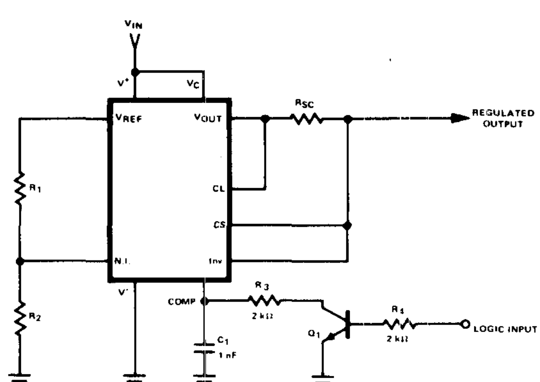
$$V_{out} = \left[V_{REF} \times \frac{R_1 + R_2}{R_2}\right]$$

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

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

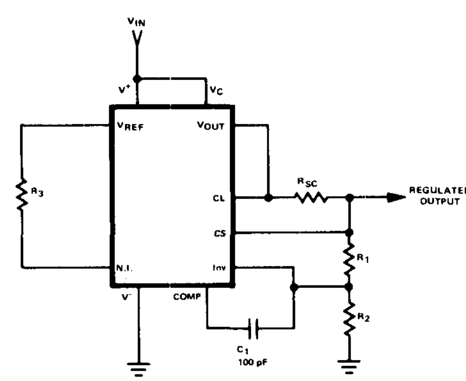
$$R_{SC} = \frac{V_{SENSE}}{I_{SC}}\left[1 + \frac{R_3}{R_4}\right]$$

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

R_3 may be eliminated for minimum component count