Signetics

μA723/723C/SA723C
Precision Voltage Regulator

Product Specification

Linear Products

DESCRIPTION

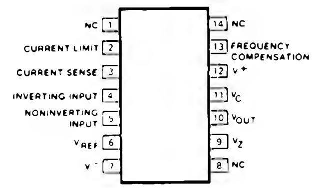
The μA723/SA723C is a monolithic precision voltage regulator capable of operation in positive or negative supplies as a series, shunt, switching, or floating regulator. The 723 contains a temperature-compensated reference amplifier, error amplifier, series pass transistor, and current limiter, with access to remote shutdown.

FEATURES

- **Positive or negative supply operation**
- **Series, shunt, switching, or floating operation**
- **0.01% line and load regulation**
- **Output voltage adjustable from 2V to 37V**
- **Output current to 150mA without external pass transistor**
- **μA723 MIL-STD-883A, B, C available**

PIN CONFIGURATION

D, F, N Packages



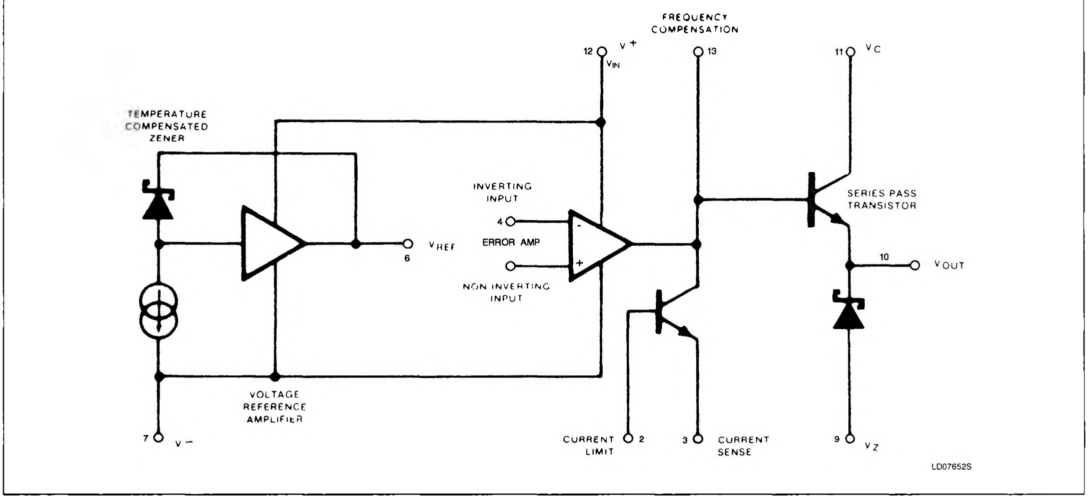
TOP VIEW

CD12281

ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
14-Pin Ceramic DIP	-55°C to +125°C	μA723F
14-Pin Plastic DIP	-55°C to +125°C	μA723N
14-Pin Plastic DIP	-40°C to +85°C	SA723CN
14-Pin Ceramic DIP	0 to 70°C	μA723CF
14-Pin Plastic DIP	0 to 70°C	μA723CN
14-Pin Plastic SO	0 to 70°C	μA723CD

EQUIVALENT CIRCUIT



ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
	Pulse voltage from V+ to V− (50ms)	50	V
	Continuous voltage from V+ to V−	40	V
	Input-output voltage differential	40	V
V_{DIFF}	Error amplifier maximum input differential voltage	±5	V
V_{CM}	Error amplifier non-inverting input (Pin 5) to −V (Pin 7)	8	V
I_{OUT}	Maximum output current	150	mA
	Current from V_{REF}	15	mA
	Current from V_Z	25	mA
P_{MAX}	Maximum power dissipation T_A = 25°C (still-air)[1] F package N package D package	 1190 1420 1040	 mW mW mW
T_A	Operating ambient temperature range μA723 μA723C SA723C	 −55 to +125 0 to 70 −40 to +85	 °C °C °C
T_{STG}	Storage temperature range	−65 to +150	°C
T_{SOLD}	Lead soldering temperature (10sec max)	300	°C

NOTE:
1. The following derating factors should be applied above 25°C:
   F package at 9.5mW/°C
   N package at 11.4mW/°C
   D package at 8.3mW/°C

Precision Voltage Regulator | μA723/723C/SA723C

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

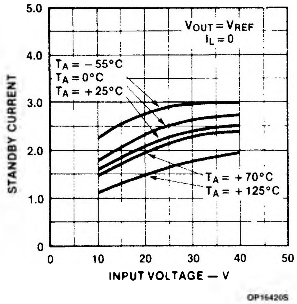
SYMBOL	PARAMETER	TEST CONDITIONS	μA723			μA723C/SA723C			UNIT
			Min	Typ	Max	Min	Typ	Max	
$V_{R\ LINE}$	Line regulation[2]	V_{IN} = 12V to V_{IN} = 15V V_{IN} = 12V to V_{IN} = 40V		0.01 0.02	0.1 0.2		0.01 0.1	0.1 0.5	$\%V_{OUT}$ $\%V_{OUT}$
$V_{R\ LOAD}$	Load regulation[2]	I_L = 1mA to I_L = 50mA		0.03	0.15		0.03	0.2	$\%V_{OUT}$
ΔVIN/Δ VO	Ripple Rejection	f = 50Hz to 10kHz, C_{REF} = 0		74			74		dB
		f = 50Hz to 10kHz, C_{REF} = 5μF		86			86		dB
I_{OS}	Short-circuit current	R_{SC} = 10Ω, V_{OUT} = 0		65			65		mA
V_{REF}	Reference voltage	I_{REF} = 0.1mA	6.95	7.15	7.35	6.80	7.15	7.50	V
$V_{REF\ (LOAD)}$	Reference voltage change with load	I_{REF} = 0.1mA to 5mA			20			20	mV
V_{NOISE}	Output noise voltage	BW = 100Hz to 10kHz, C_{REF} = 0 BW = 100Hz to 10kHz, C_{REF} = 5μF		20 2.5			20 2.5		μV_{RMS} μV_{RMS}
S	Long-term stability	Tj = Tjmax. TA = 25°C for end point measurment		0.1			0.1		%1000 hrs.
I_{SCD}	Standby current drain	I_L = 0, V_{IN} = 30V		2.3	3.5		2.3	4.0	mA
V_{IN}	Input voltage range		9.5		40	9.5		40	V
V_{OUT}	Output voltage range		2.0		37	2.0		37	V
V_{DIFF}	Input-output voltage differential		3.0		38	3.0		38	V
The following specifications apply over the operating temperature ranges.									
$V_{R\ LINE}$	Line regulation	V_{IN} = 12V to V_{IN} = 15V			0.3			0.3	$\%V_{OUT}$
$V_{R\ LOAD}$	Load regulation	I_L = 1mA to I_L = 50mA			0.6			0.6	$\%V_{OUT}$
TC	Average temperature coefficient of output voltage			0.002	0.015		0.003	0.015	%/°C

NOTES:

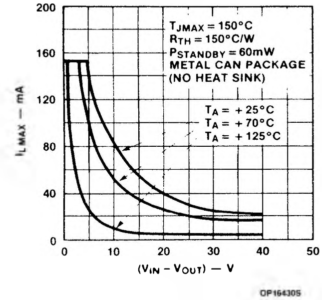
1. $V_{IN} = V+ = V_C = 12V$, $V- = 0V$, $V_{OUT} = 5V$, $I_L = 1mA$, $R_{SC} = 0$, $C_1 = 100pF$, $C_{REF} = 0$ and divider impedance as seen by error amplifier ≤ 10kΩ.
2. The load and line regulation specifications are for constant junction temperature. Temperature drift effects must be taken into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

TYPICAL PERFORMANCE CHARACTERISTICS

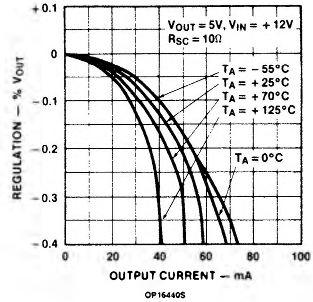
Standby Current Drain as a Function of Input Voltage



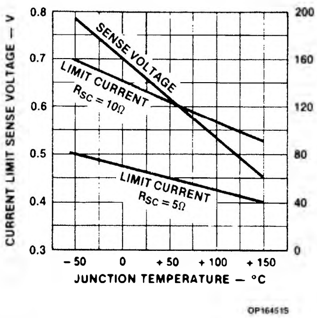
Maximum Load Current as a Function of Input-Output Voltage Differential



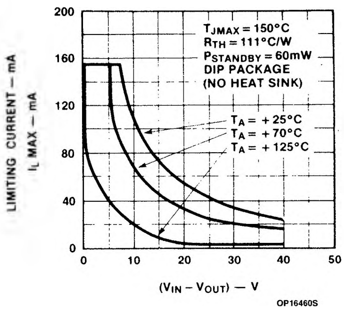
Load Regulation Characteristics with Current Limiting



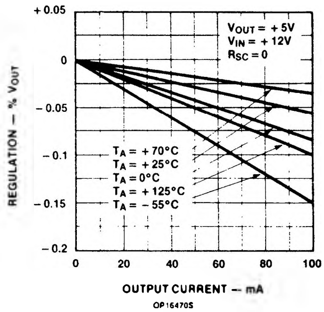
Current Limiting Characteristics as a Function of Junction Temperature



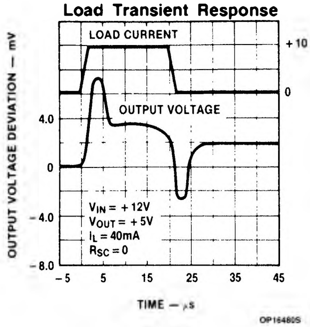
Maximum Load Current as a Function of Input-Output Voltage Differential



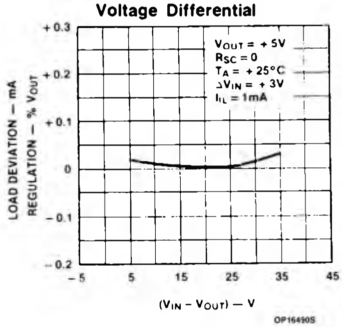
Load Regulation Characteristics Without Current Limiting



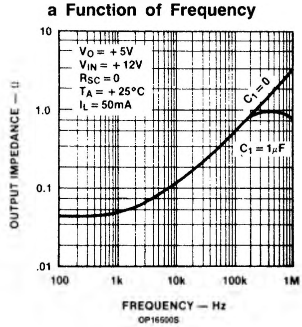
Load Transient Response



Line Regulation as a Function of Input-Output Voltage Differential

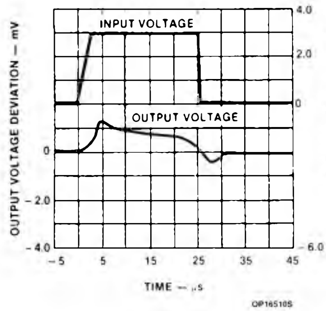


Output Impedance as a Function of Frequency

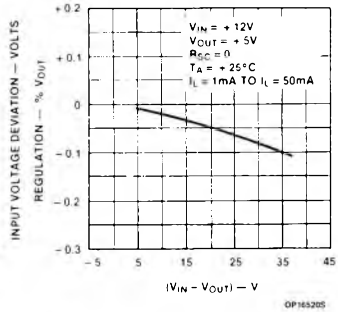


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

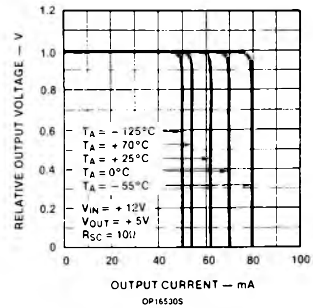
Line Transient Response



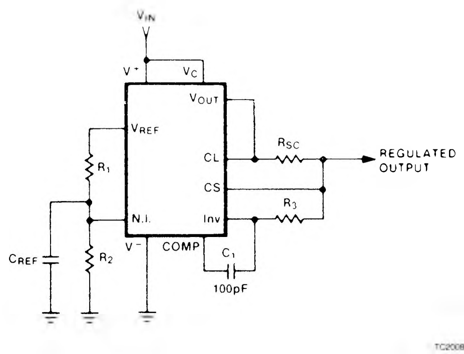
Load Regulation as a Function of Input-Output Voltage Differential



Current Limiting Characteristics



TYPICAL APPLICATIONS

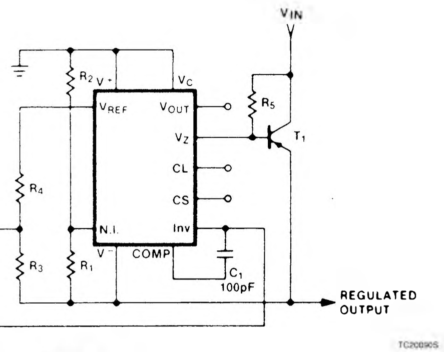


NOTES:

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

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

Low Voltage Regulator (V_{OUT} = 2 to 7V)

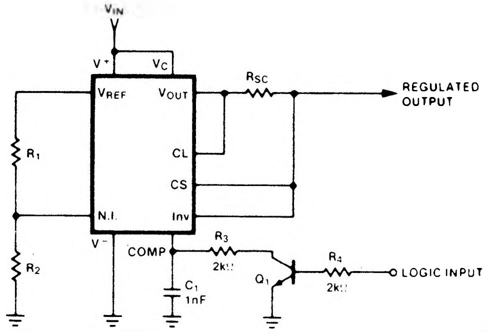


NOTE:

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

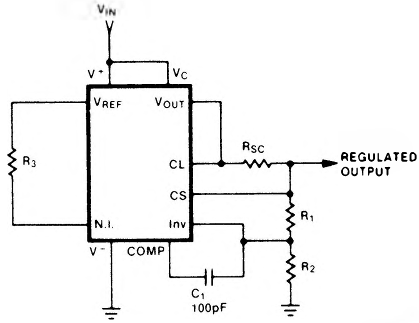
Negative Voltage Regulator

TYPICAL APPLICATIONS (Continued)



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

Remote Shutdown Regulator With Current Limiting (V_{OUT} = 2 to 7V)

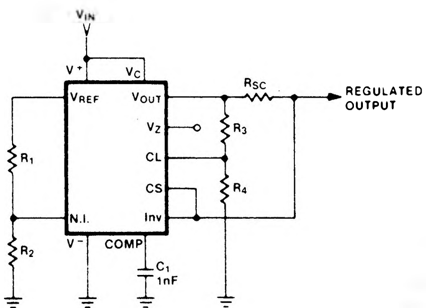


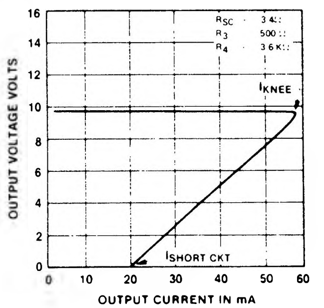
NOTES:
$V_{OUT} = \left[V_{REF} \times \frac{R_1 + R_2}{R_2}\right]$; $R_3 = R_4$

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

R_3 may be eliminated for minimum component count

High Voltage Regulator (V_{OUT} = 7 to 37V)





NOTES:

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

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

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

NOTES:

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

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

Foldback Current Limiting Regulator (V_{OUT} = 2 to 7V)