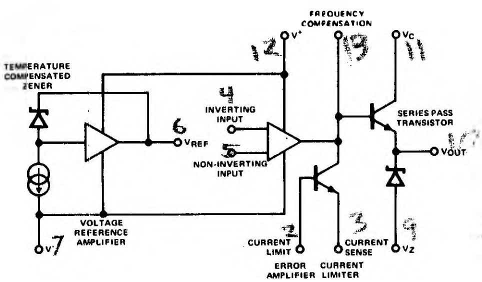
DESCRIPTION

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

FEATURES

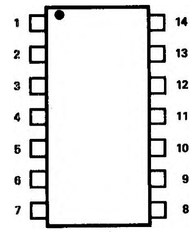
- POSITIVE OR NEGATIVE SUPPLY OPERATION
- SERIES, SHUNT, SWITCHING OR FLOATING OPERATION
- .01% LINE AND LOAD REGULATION
- OUTPUT VOLTAGE ADJUSTABLE FROM 2 TO 37 VOLTS
- OUTPUT CURRENT TO 150mA WITHOUT EXTERNAL PASS TRANSISTOR

EQUIVALENT CIRCUIT



PIN CONFIGURATION

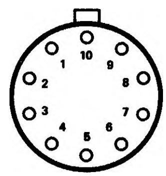
A PACKAGE (Top View)



1. NC
2. Current Limit
3. Current Sense
4. Inverting Input
5. Noninverting Input
6. V_{REF}
7. V^-
8. NC
9. V_z
10. V_{out}
11. V_c
12. V^+
13. Frequency Compensation
14. NC

ORDER PART NOS. μA723A/μA723CA

L PACKAGE



1. Current Sense
2. Inverting Input
3. Noninverting Input
4. V_{REF}
5. V^-
6. V_{out}
7. V_c
8. V^+
9. Frequency Compensation
10. Current Limit

ORDER PART NOS. μA723L/μA723CL

ABSOLUTE MAXIMUM RATINGS

	μA723	μA723C
Pulse Voltage from V^+ to V^- (50ms)	50V	
Continuous Voltage from V^+ to V^-	40V	40V
Input-Output Voltage Differential	40V	40V
Maximum Output Current	150mA	150mA
Current from V_{REF}	15mA	
Current from V_z		25mA
Internal Power Dissipation (Note 1)	800mW	800mW
Operating Temperature Range	-55 to +125°C	0 to 70°C
Storage Temperature Range	-65°C to +150°C	-65°C to +150°C
Lead Temperature	300°C	300°C

ELECTRICAL CHARACTERISTICS ($T_A = 25°C$ unless otherwise specified — Note 1)

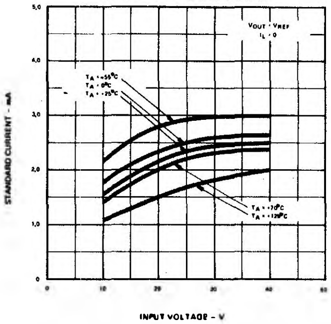
PARAMETER (See definitions)	MIN	TYP	MAX	UNITS	CONDITIONS
μA723C					
Line Regulation (Note 2)		0.01	0.1	% V_{out}	V_{in} = 12V to V_{in} = 15V
		0.1	0.5	% V_{out}	V_{in} = 12V to V_{in} = 40V
Load Regulation (Note 2)		0.03	0.2	% V_{out}	I_L = 1mA to I_L = 50mA
Ripple Rejection		74		dB	f = 50 Hz to 10 kHz, C_{REF} = 0
		86		dB	f = 50 Hz to 10 kHz, C_{REF} = 5μF
Short Circuit Current Limit		65		mA	R_{sc} = 10Ω, V_{out} = 0
Reference Voltage	6.80	7.15	7.50	V	
Output Noise Voltage		20		μV rms	BW = 100 Hz to 10 kHz, C_{REF} = 0
		2.5		μV rms	BW = 100 Hz to 10 kHz, C_{REF} = 5μF
Long Term Stability		0.1	0.1	%/1000 hrs.	
Standby Current Drain		2.3	4.0	mA	I_L = 0, V_{in} = 30V
Input Voltage Range	9.5		40	V	
Output Voltage Range	2.0		37	V	
Input-Output Voltage Differential	3.0		38	V	
The Following Specifications Apply Over the Operating Temperature Ranges					
Line Regulation			0.3	% V_{out}	
Load Regulation			0.6	% V_{out}	
Average Temperature Coefficient					V_{in} = 12V to V_{in} = 15V
of Output Voltage		0.003	0.015	%/°C	I_L = 1mA to I_L = 50mA
μA723					
Line Regulation (Note 2)		0.01	0.1	%V_{out}	V_{in} = 12V to V_{in} = 15V
		0.02	0.2	%V_{out}	V_{in} = 12V to V_{in} =40V
Load Regulation (Note 2)		0.03	0.15	%V_{out}	I_L = 1mA to I_L = 50mA
Ripple Rejection		74		dB	f = 50 Hz to 10 kHz, C_{REF} = 0
		86		dB	f = 50 Hz to 10 kHz, C_{REF} = 5μF
Short Circuit Current Limit		65		mA	R_{SC} = 10Ω, V_{out} = 0
Reference Voltage	6.95	7.15	7.35	V	
Output Noise Voltage		20		μV rms	BW = 100 Hz to 10 kHz, C_{REF} = 0
		2.5		μV rms	BW = 100 Hz to 10 kHz, C_{REF} = 5μF
Long Term Stability		0.1		%/1000 hrs	
Standby Current Drain		2.3	3.5	mA	I_L = 0, V_{in} = 30V
Input Voltage Range	9.5		40	V	
Output Voltage Range	2.0		37	V	
Input-Output Voltage Differential	3.0		38	V	
The Following Specifications Apply Over the Operating Temperature Ranges					
Line Regulation			0.3	% V_{out}	
Load Regulation			0.6	% V_{out}	
Average Temperature Coefficient					V_{in} = 12V to V_{in} = 15V
of Output Voltage		0.002	0.015	%/°C	I_L = 1mA to I_L = 50mA

NOTES

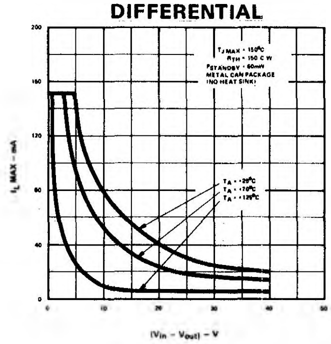
1. Unless otherwise specified, T_A = 25°C, V_{in} = V+ = V_c = 12V, V− = 0V, V_{out} = 5V, I_L = 1mA, R_{sc} = 0, C_1 = 100pF, C_{REF} = 0 and divider impedance as seen by error amplifier $\leq$ 10kΩ when connected as shown in Figure 3.
2. The load and line regulation specifications are for constant junction temperature. Temperature drift effects must be taken into account separately when the unit is operating under conditions of high dissipation.

TYPICAL CHARACTERISTIC CURVES

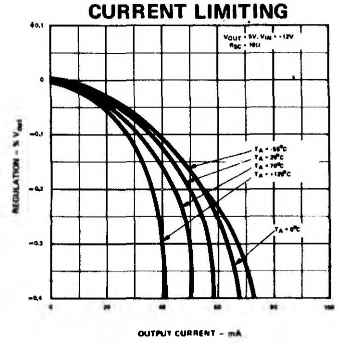
STANDBY CURRENT DRAIN AS A FUNCTION OF INPUT VOLTAGE



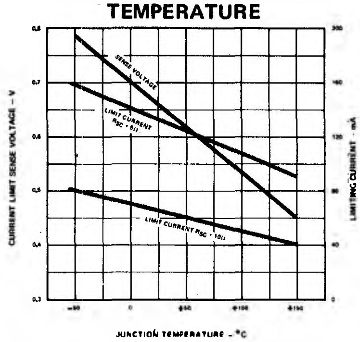
MAXIMUM LOAD CURRENT AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL



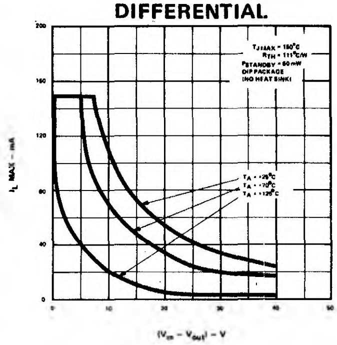
LOAD REGULATION CHARACTERISTICS WITH CURRENT LIMITING



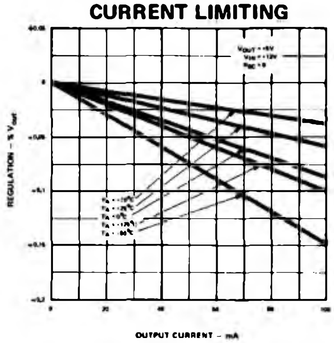
CURRENT LIMITING CHARACTERISTICS AS A FUNCTION OF JUNCTION TEMPERATURE



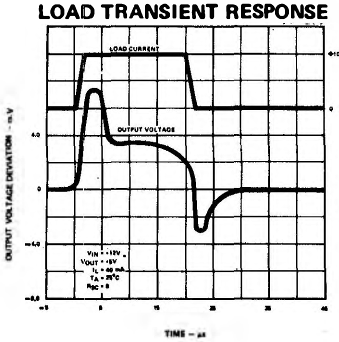
MAXIMUM LOAD CURRENT AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL



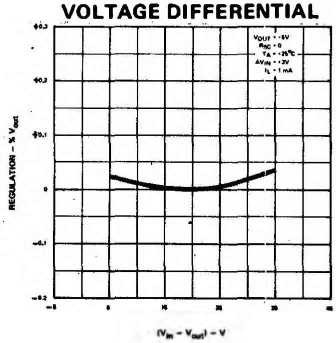
LOAD REGULATION CHARACTERISTICS WITHOUT CURRENT LIMITING



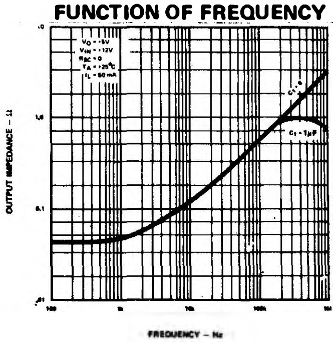
LOAD TRANSIENT RESPONSE



LINE REGULATION AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL

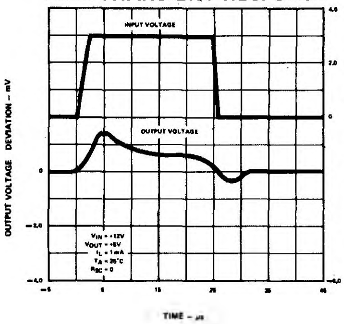


OUTPUT IMPEDANCE AS A FUNCTION OF FREQUENCY

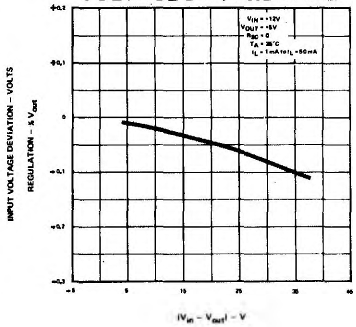


TYPICAL CHARACTERISTIC CURVES (Cont'd.)

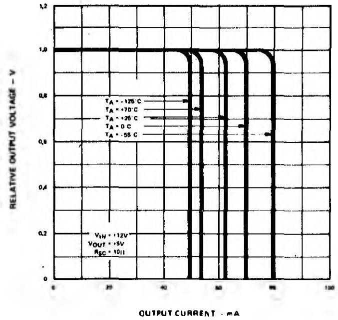
LINE TRANSIENT RESPONSE



LOAD REGULATION AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL

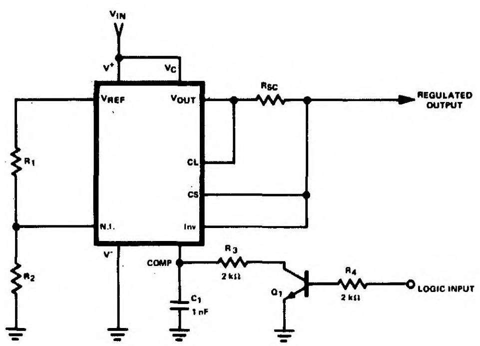


CURRENT LIMITING CHARACTERISTICS



BASIC µA723 REGULATOR APPLICATIONS

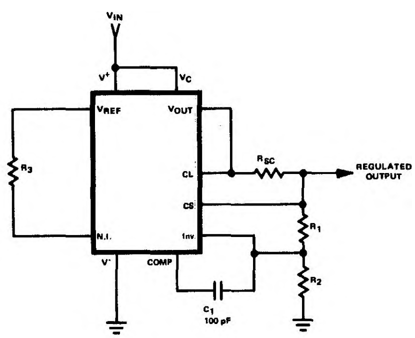
REMOTE SHUTDOWN REGULATOR WITH CURRENT LIMITING (V_{out} = 2 to 7 Volts)



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

FIGURE 1

HIGH VOLTAGE REGULATOR (V_{out} = 7 to 37 Volts)



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

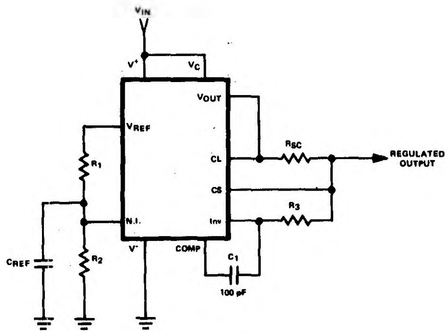
$R_3 = \frac{R_1 R_2}{R_1 + R_2}$ for minimum temperature drift

R_3 may be eliminated for minimum component count

FIGURE 2

BASIC µA723 REGULATOR APPLICATIONS (Cont'd.)

LOW VOLTAGE REGULATOR
(V_{out} = 2 to 7 Volts)

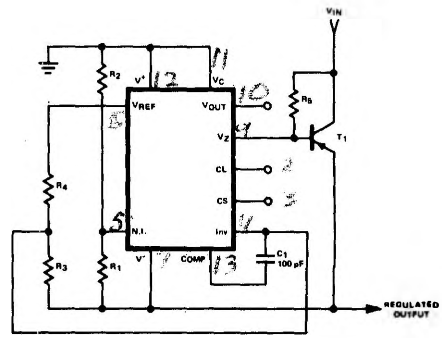


$$V_{out} = \left[V_{REF} \times \frac{R_2}{R_1 + R_2}\right]$$

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

FIGURE 3

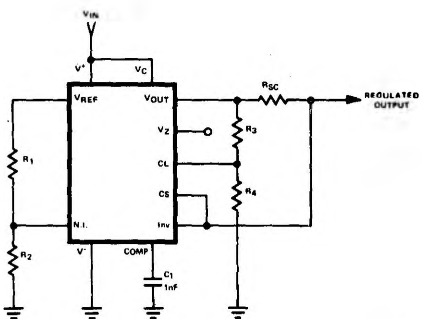
NEGATIVE VOLTAGE REGULATOR

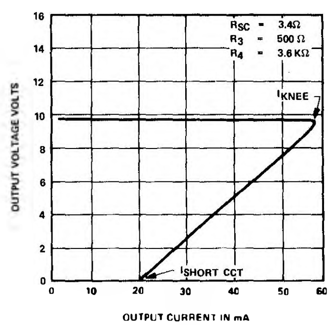


$$V_{out} = \left[\frac{V_{REF}}{2} \times \frac{R_1 + R_2}{R_1}\right] \quad ; R_3 = R_4$$

FIGURE 4

FOLDBACK CURRENT LIMITING REGULATOR
(V_{out} = 2 to 7 Volts)





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

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

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

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

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

FIGURE 5