Precision voltage regulator

μA723/723C

DESCRIPTION

The μA723/μA723C 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

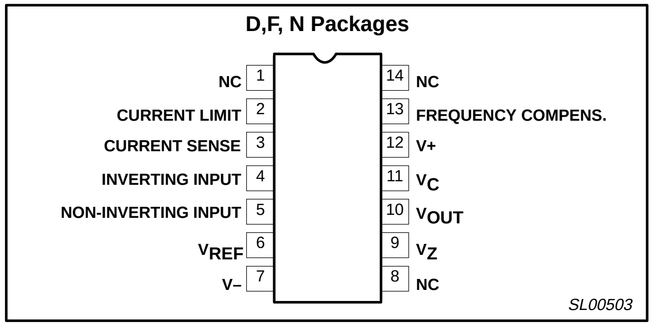


Figure 1. Pin Configuration

ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
14-Pin Ceramic Dual In-Line Package (CERDIP)	-55°C to 125°C	μA723F	0581B
14-Pin Plastic Dual In-Line Package (DIP)	0 to 70°C	μA723CN	SOT27-1
14-Pin Plastic Small Outline (SO) Package	0 to 70°C	μA723CD	SOT108-1

EQUIVALENT CIRCUIT

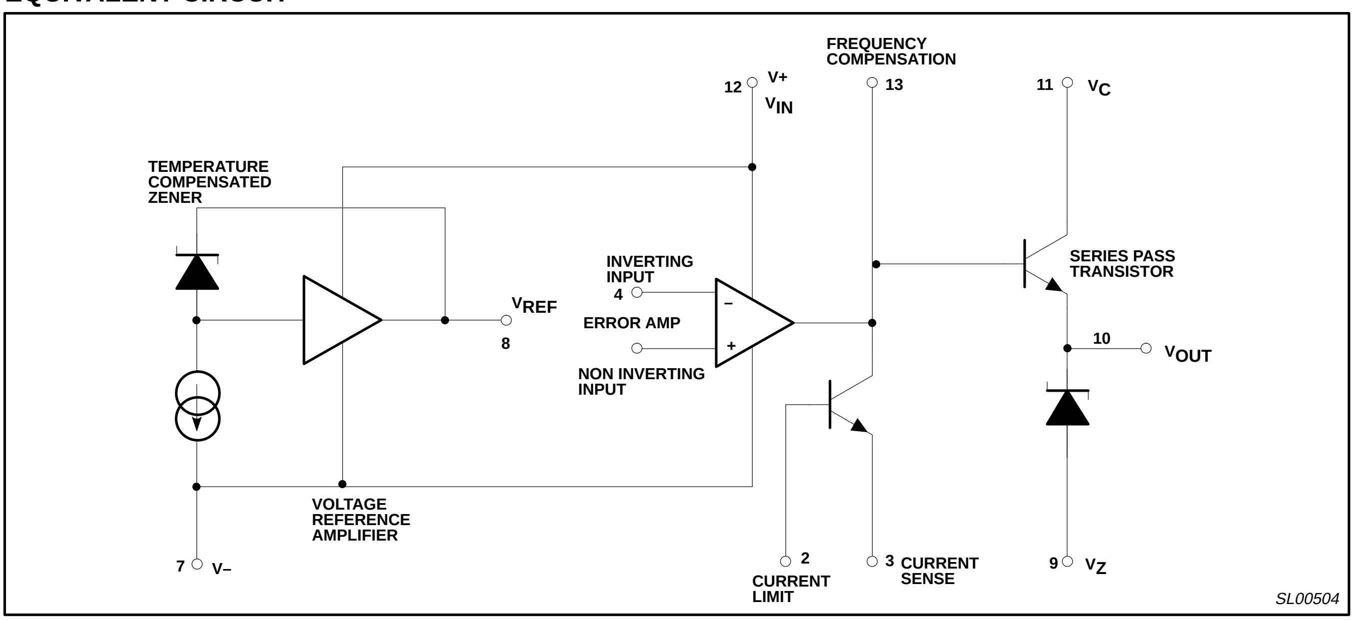


Figure 2. Equivalent Circuit

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	1190	mW
	N package	1420	mW
	D package	1040	mW
T_A	Operating ambient temperature range		
	μA723	-55 to +125	°C
	μA723C	0 to 70	°C
T_{STG}	Storage temperature range	-65 to +150	°C
T_{SOLD}	Lead soldering temperature (10sec max)	300	°C

NOTES:

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

DC ELECTRICAL CHARACTERISTICS

T_A=25°C, unless otherwise specified.[1]

SYMBOL	PARAMETER	TEST CONDITIONS		μA723			μA723C			UNITS
				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	$\%V_{OUT}$
$V_{R\ LOAD}$	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		
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}
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

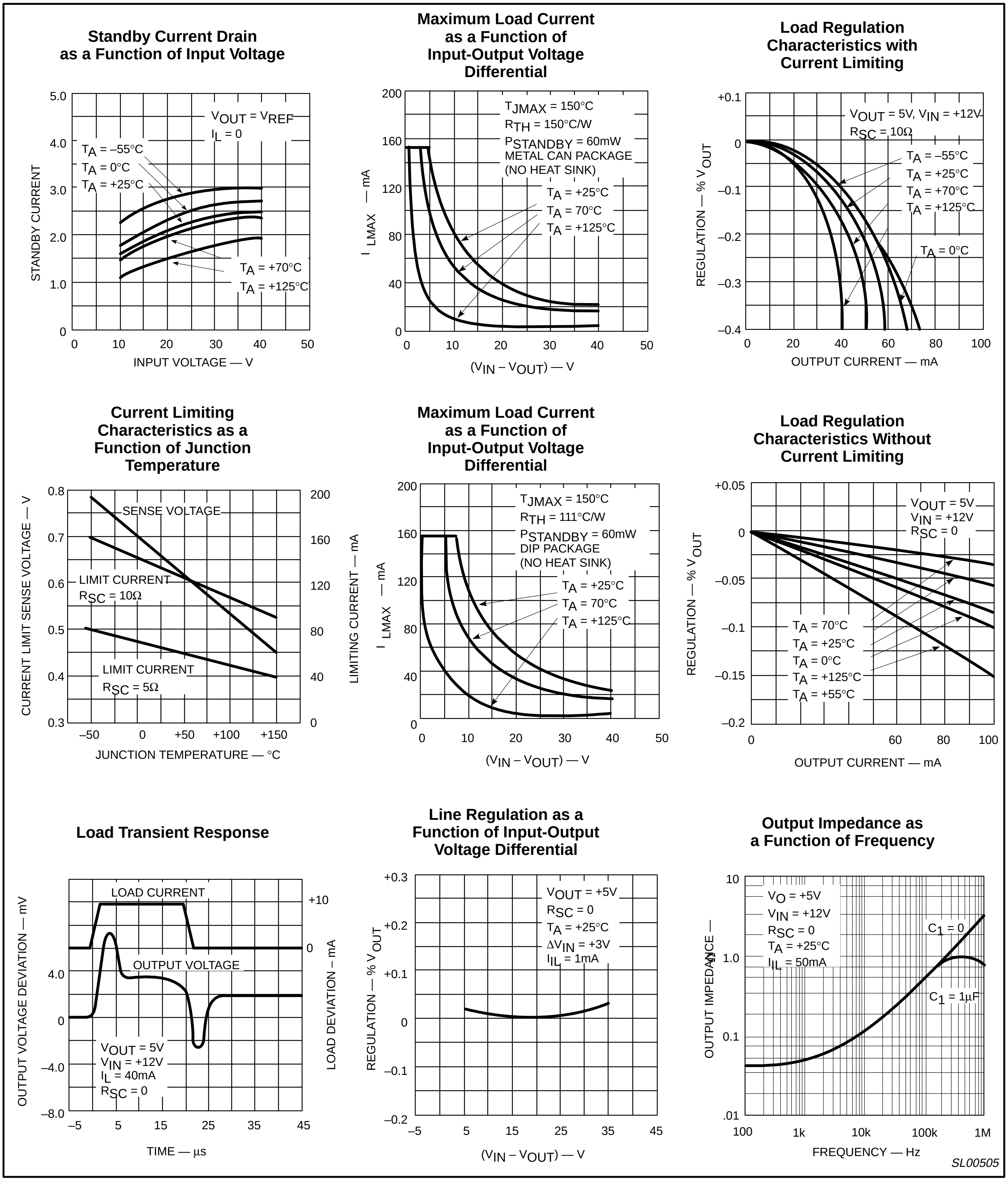


Figure 3. Typical Performance Characteristics

Precision voltage regulator μA723/723C

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

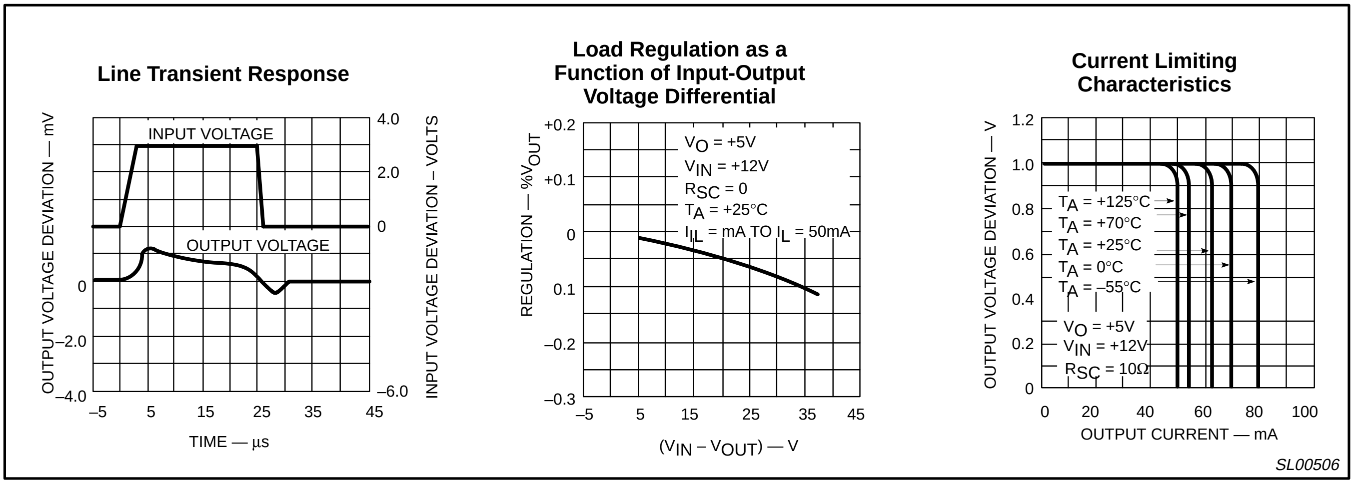
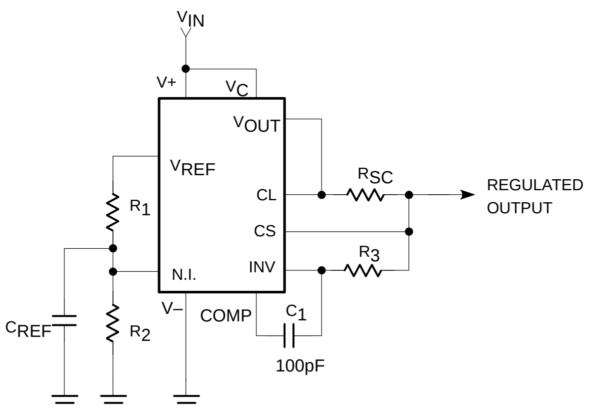


Figure 4. Typical Performance Characteristics (cont.)

TYPICAL APPLICATIONS

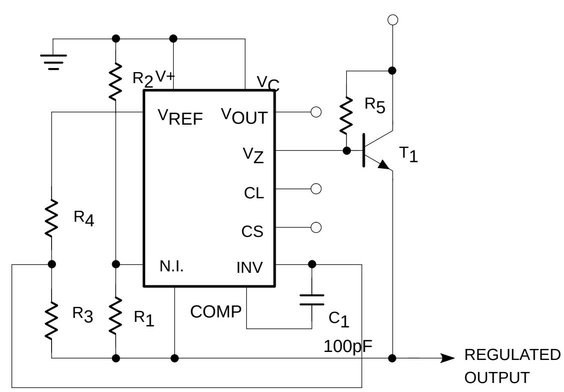


NOTES:

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

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

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



NOTE:

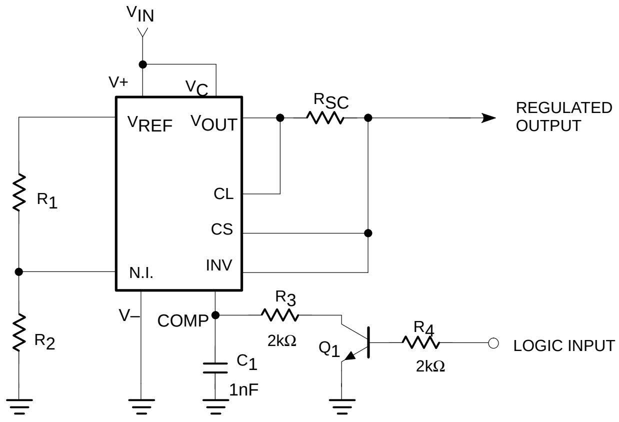
$$V_{OUT} = \left[\frac{V_{REF}}{2} \times \frac{R_1 + R_2}{R_1}\right]; \quad R_3 = R_4$$

Negative Voltage Regulator

SL00507

Figure 5. Typical Applications

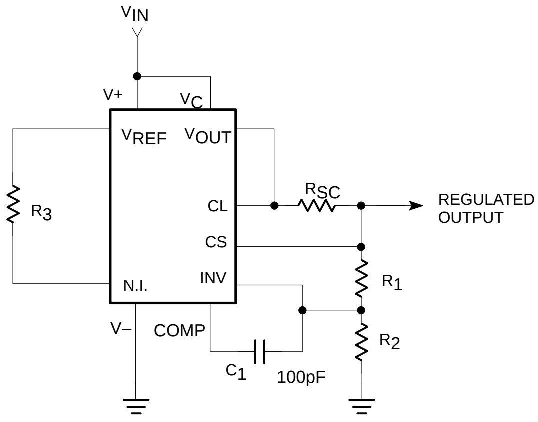
TYPICAL APPLICATIONS (Continued)



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)



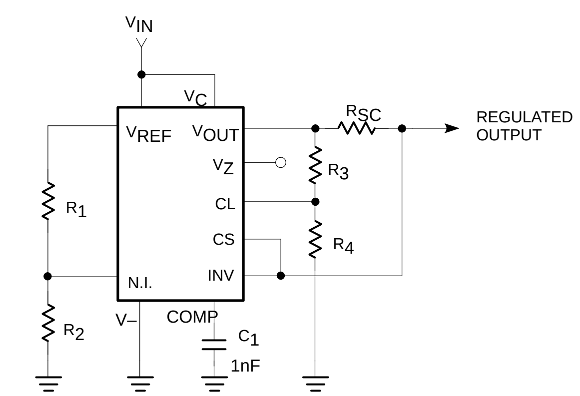
NOTE:

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

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

R3 may be eliminated for minimum component count

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

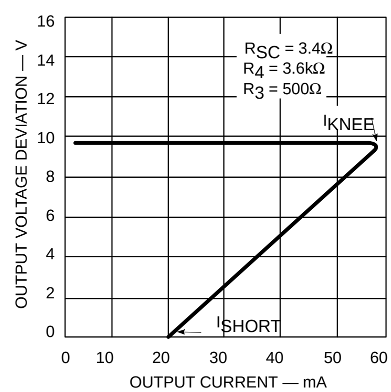


NOTES:

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

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

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



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)

SL00508

Figure 6. Typical Applications (cont.)