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

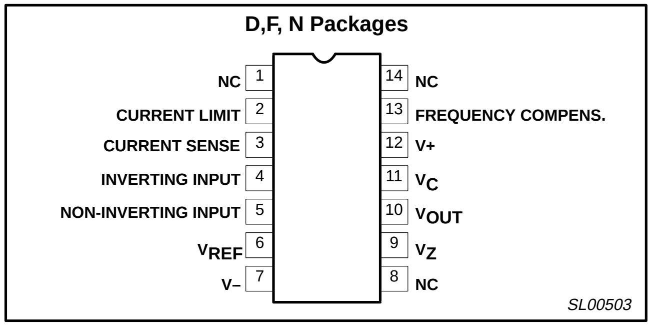

Figure 1. Pin Configuration

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

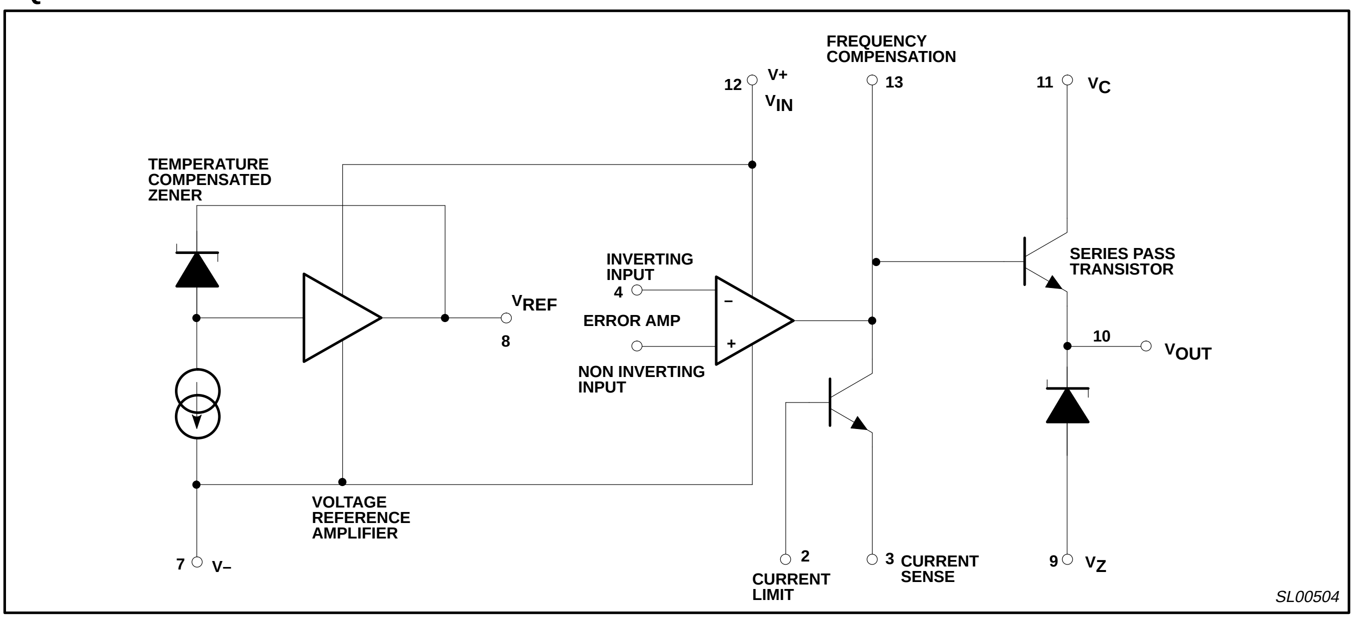

Figure 2. Equivalent Circuit

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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.

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TYPICAL PERFORMANCE CHARACTERISTICS

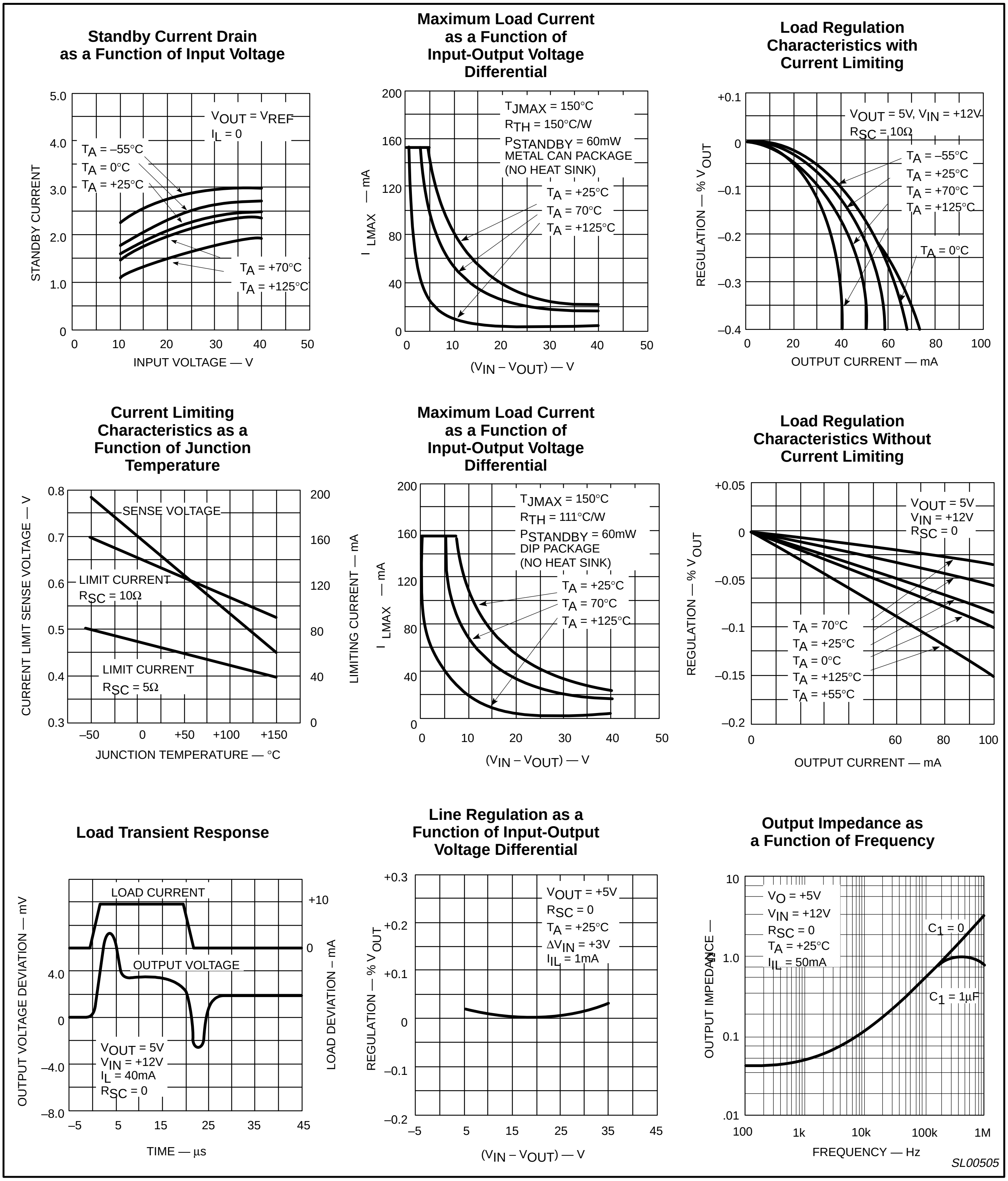

Figure 3. Typical Performance Characteristics

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TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

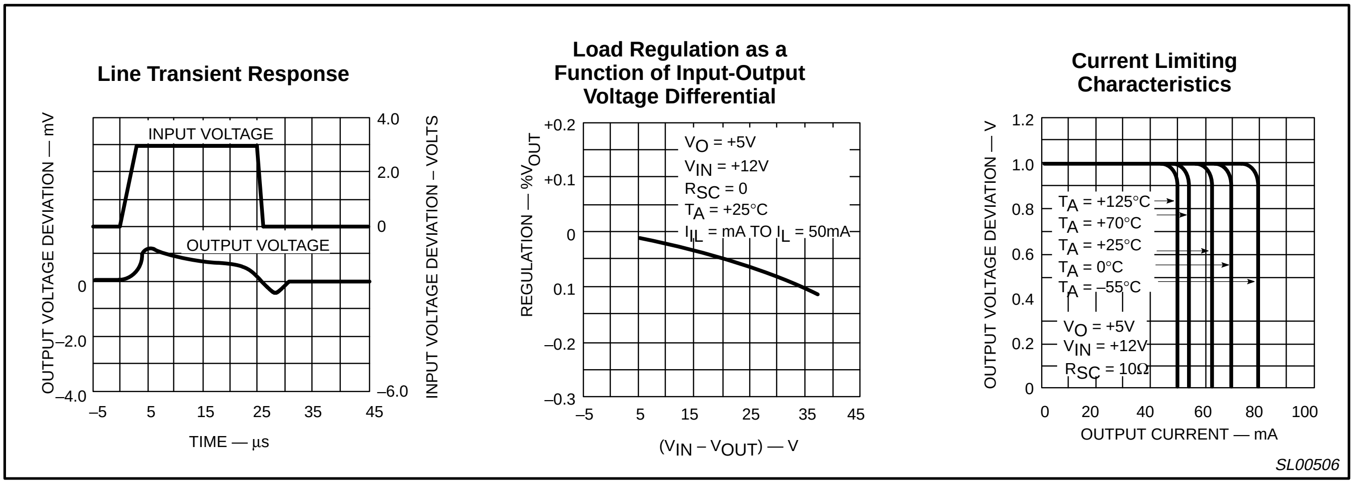
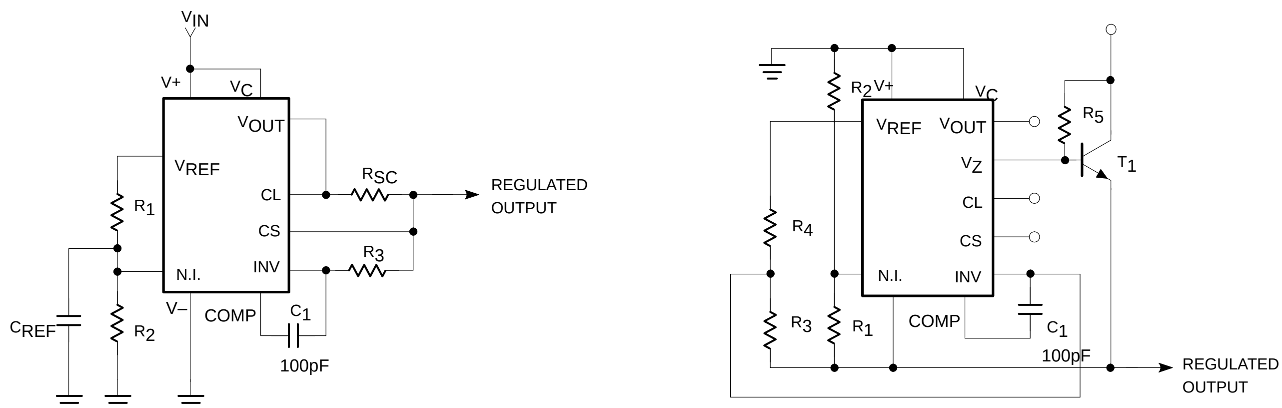


Figure 4. Typical Performance Characteristics (cont.)

TYPICAL APPLICATIONS



NOTES:

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

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

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

NOTE:

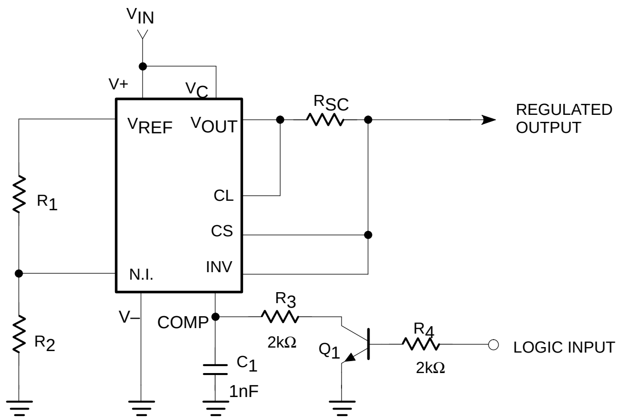
$$V_{OUT} = \left[\frac{V_{REF}}{2} \times \frac{R_1 + R_2}{R_1} \right]; \; R_3 = R_4$$

Negative Voltage Regulator

SL00507

Figure 5. Typical Applications

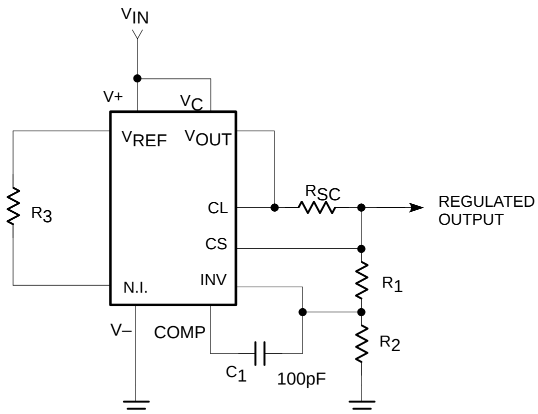
TYPICAL APPLICATIONS (Continued)



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)



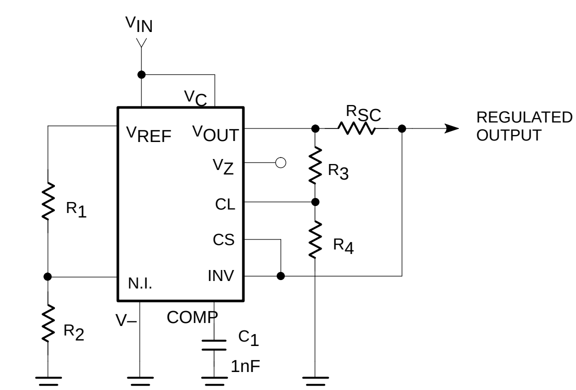
NOTE:

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

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

R3 may be eliminated for minimum component count

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

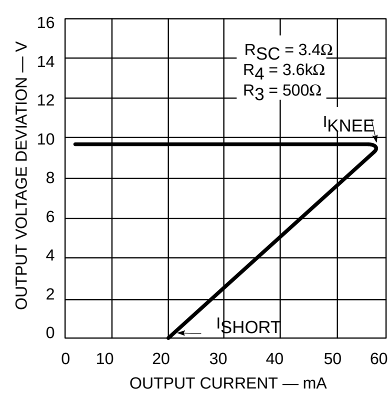


NOTES:

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

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

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



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.)