

Precision voltage regulator

 μ A723/723C

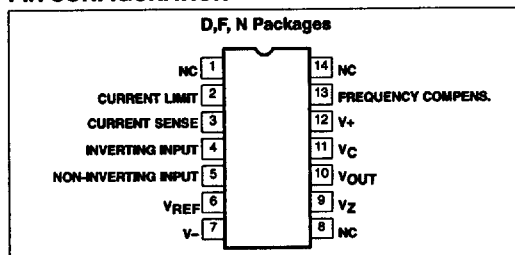
DESCRIPTION

The μ A723/ μ A723C 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
- μ A723 MIL-STD-883A, B, C available

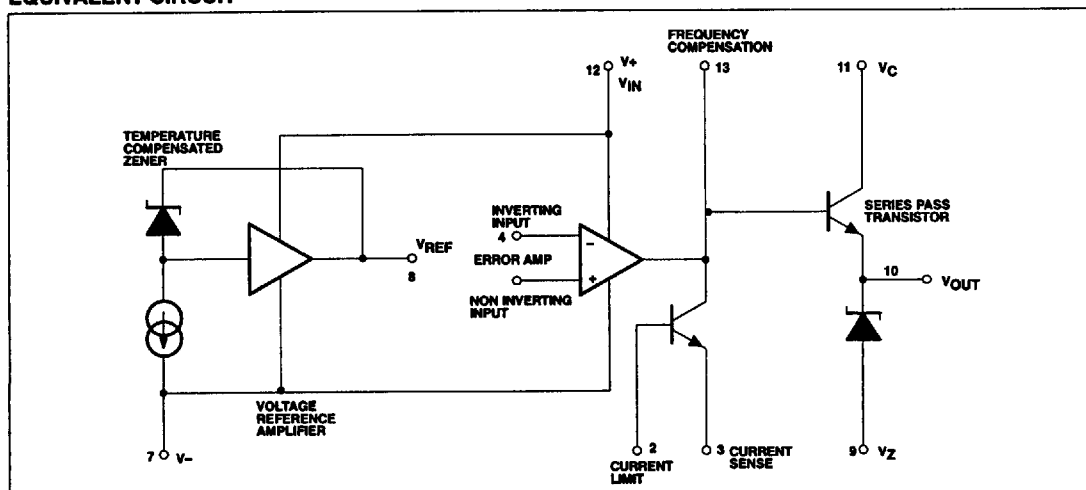
PIN CONFIGURATION



ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
14-Pin Ceramic Dual In-Line Package (CERDIP)	-55°C to 125°C	μ A723F	0581B
14-Pin Plastic Dual In-Line Package (DIP)	0 to 70°C	μ A723CN	0405B
14-Pin Plastic Small Outline (SO) Package	0 to 70°C	μ A723CD	0175D

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 $T_A=25^\circ\text{C}$ (still-air) ¹		
	F package	1190	mW
	N package	1420	mW
	D package	1040	mW
T_A	Operating ambient temperature range		
	μ A723	-55 to +125	$^\circ\text{C}$
	μ A723C	0 to 70	$^\circ\text{C}$
T_{STG}	Storage temperature range	-65 to +150	$^\circ\text{C}$
T_{SOLD}	Lead soldering temperature (10sec max)	300	$^\circ\text{C}$

NOTES:

1. The following derating factors should be applied above 25°C F package at $9.5\text{mW}/^\circ\text{C}$ N package at $11.4\text{mW}/^\circ\text{C}$ D package at $8.3\text{mW}/^\circ\text{C}$

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DC ELECTRICAL CHARACTERISTICS

 $T_A = 25^\circ\text{C}$, unless otherwise specified.¹

SYMBOL	PARAMETER	TEST CONDITIONS	$\mu A723$			$\mu A723C$			UNITS
			Min	Typ	Max	Min	Typ	Max	
$V_{R\text{ LINE}}$	Line regulation ²	$V_{IN}=12\text{V to } V_{IN}=15\text{V}$ $V_{IN}=12\text{V to } V_{IN}=40\text{V}$		0.01 0.02	0.1 0.2		0.01 0.1	0.1 0.5	% V_{OUT}
$V_{R\text{ LOAD}}$	Load regulation ²	$I_L=1\text{mA to } I_L=50\text{mA}$		0.03	0.15		0.03	0.2	% V_{OUT}
$\Delta V_{IN}/\Delta V_O$	Ripple Rejection	$f=50\text{Hz to } 10\text{kHz}, C_{REF}=0$		74			74		dB
		$f=50\text{Hz to } 10\text{kHz}, C_{REF}=5\mu\text{F}$		86			86		
I_{OS}	Short-circuit current	$R_{SC}=10\Omega, V_{OUT}=0$		65			65		mA
V_{REF}	Reference voltage	$I_{REF}=0.1\text{mA}$	6.95	7.15	7.35	6.80	7.15	7.50	V
$V_{REF\text{ (LOAD)}}$	Reference voltage change with load	$I_{REF}=0.1\text{mA to } 5\text{mA}$			20			20	mV
V_{NOISE}	Output noise voltage	$BW=100\text{Hz to } 10\text{kHz}, C_{REF}=0$		20			20		μV_{RMS}
		$BW=100\text{Hz to } 10\text{kHz}, C_{REF}=5\mu\text{F}$		2.5			2.5		
S	Long-term stability	$T_J=T_{Jmax}$, $T_A=25^\circ\text{C}$ for end point measurement		0.1			0.1		%1000 hrs.
I_{SCD}	Standby current drain	$I_L=0, V_{IN}=30\text{V}$		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.									
$V_{R\text{ LINE}}$	Line regulation	$V_{IN}=12\text{V to } V_{IN}=15\text{V}$			0.3			0.3	% V_{OUT}
$V_{R\text{ LOAD}}$	Load regulation	$I_L=1\text{mA to } I_L=50\text{mA}$			0.6			0.6	% V_{OUT}
TC	Average temperature coefficient of output voltage			0.002	0.015		0.003	0.015	% $^\circ\text{C}$

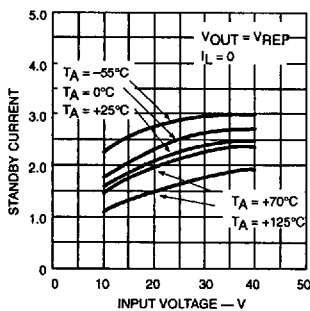
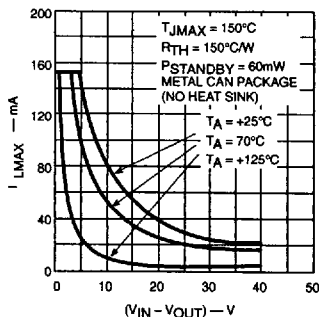
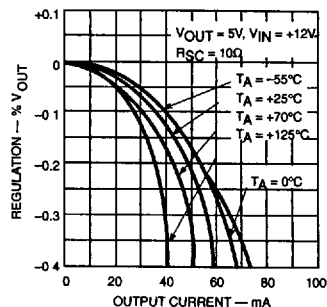
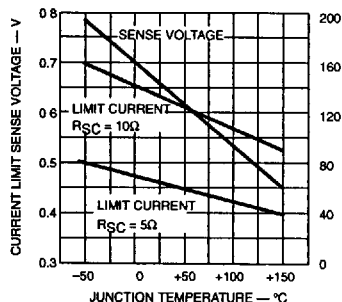
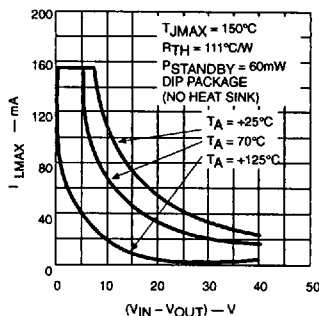
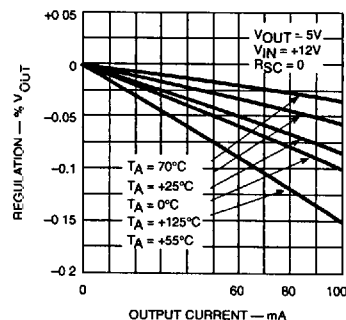
NOTES:

- $V_{IN}=V_+=V_-=12\text{V}$, $V_-=0\text{V}$, $V_{OUT}=5\text{V}$, $I_L=1\text{mA}$, $R_{SC}=0$, $C_1=100\text{pF}$, $C_{REF}=0$ and divider impedance as seen by error amplifiers $\leq 10\text{k}\Omega$.
- 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.

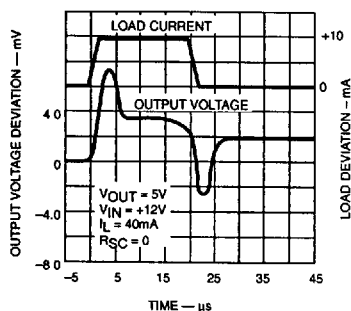
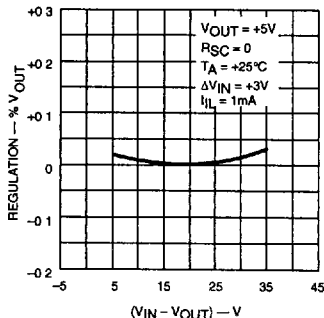
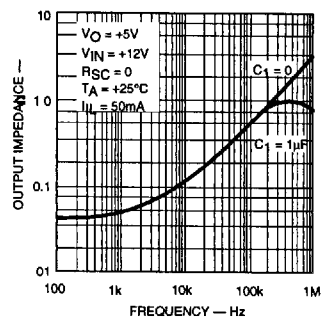
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TYPICAL PERFORMANCE CHARACTERISTICS

Standby Current Drain
as a Function of Input VoltageMaximum Load Current
as a Function of
Input-Output Voltage
DifferentialLoad Regulation
Characteristics with
Current LimitingCurrent Limiting
Characteristics as a
Function of Junction
TemperatureMaximum Load Current
as a Function of
Input-Output Voltage
DifferentialLoad Regulation
Characteristics Without
Current Limiting

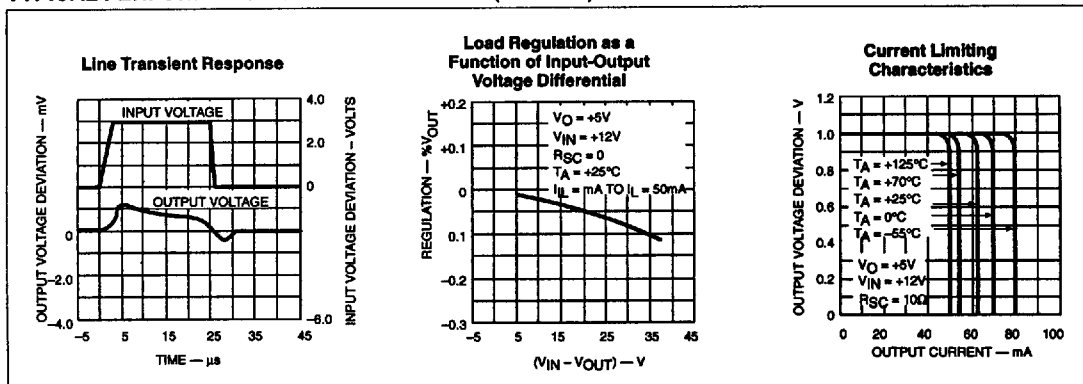
Load Transient Response

Line Regulation as a
Function of Input-Output
Voltage DifferentialOutput Impedance as
a Function of Frequency

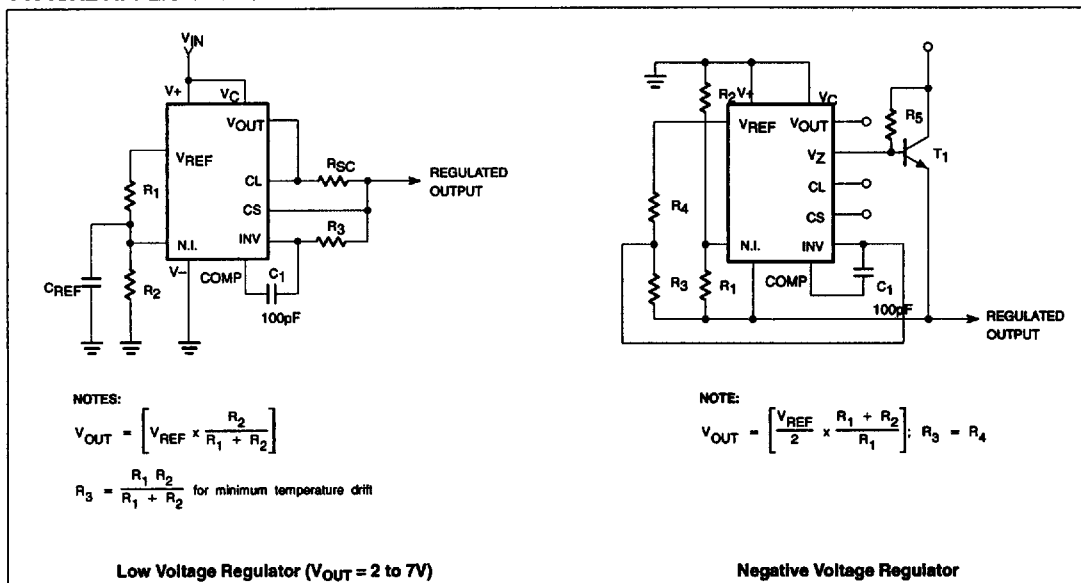
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TYPICAL PERFORMANCE CHARACTERISTICS (Continued)



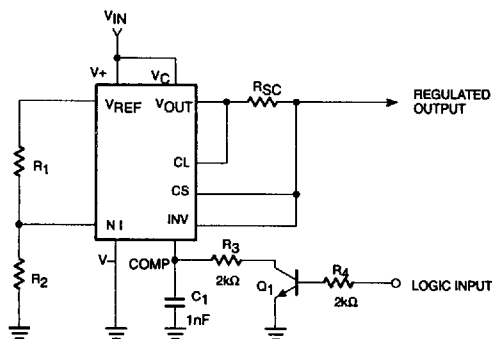
TYPICAL APPLICATIONS



Precision voltage regulator

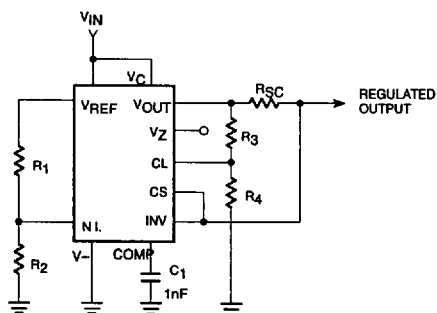
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TYPICAL APPLICATIONS (Continued)



NOTE:

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

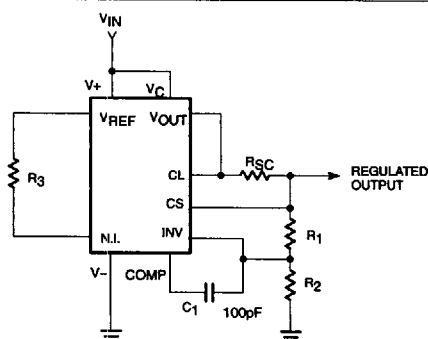
Remote Shutdown Regulator With Current Limiting ($V_{OUT} = 2$ to $7V$)

NOTES:

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

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

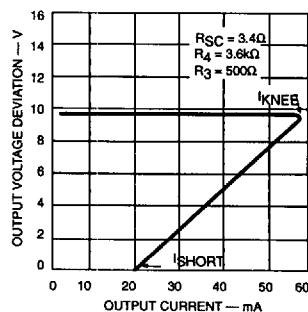
$$I_{SHORT\ CKT} = \left[\frac{V_{SENSE}}{R_{SC}} \times \frac{R_3 + R_4}{R_4} \right]$$

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

NOTE:

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

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

 R_3 may be eliminated for minimum component countHigh Voltage Regulator ($V_{OUT} = 7$ to $37V$)

NOTES:

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

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