LM723

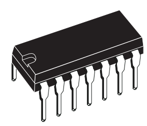
High precision voltage regulator

Features

- Input voltage up to 40 V
- Output voltage adjustable from 2 to 37 V
- Positive or negative supply operation
- Series, shunt, switching or floating operation
- Output current to 150 mA without external pass transistor
- Adjustable current limiting

Description

The LM723 is a monolithic integrated programmable voltage regulator, assembled in 14-lead dual in-line plastic package. The circuit provides internal current limiting. When the output current exceeds 150 mA an external NPN or PNP pass element may be used. Provisions are made for adjustable current limiting and remote shut-down.



DIP-14

Table 1. Device summary

Order code	Package
LM723N	DIP-14
LM723CN	DIP-14

3 Maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		LM723	LM723C	
V_I	DC input voltage	40	40	V
ΔV_{I-O}	Dropout voltage	40	40	V
I_O	Output current	150	150	mA
I_{REF}	Current from V_{REF}	15	25	mA
T_{OP}	Operating Temperature	-55 to 125	0 to 70	°C
T_{STG}	Storage Temperature	-65 to 150	-65 to 150	°C
T_J	Junction Temperature	150	125	°C

Table 3. Thermal data

Symbol	Parameter	DIP14	Unit
R_{thJA}	Thermal resistance junction-ambient Max	200	°C/W

Table 5. Electrical characteristics for LM723C (refer to the test circuits, T_A = 25 °C, unless otherwise specified.)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$\Delta V_O/\Delta V_I$	Line regulation	V_I = 12 to 15 V			0.01	0.1	%
		V_I = 12 to 40 V			0.1	0.5	
		V_I = 12 to 15 V, T_A = 0 to 70°C				0.3	
$\Delta V_O/V_O$	Load regulation	I_O = 1 to 50 mA			0.03	0.2	%
		I_O = 1 to 10 mA, T_A = 0 to 70°C				0.6	
V_{REF}	Reference voltage	I_{REF} = 160 µA		6.8	7.15	7.5	V
SVR	Supply voltage rejection	f = 100 Hz to 10kHz	C_{REF} = 0		74		dB
			C_{REF} = 5µF		86		
$\Delta V_O/\Delta T$	Output voltage drift					150	ppm/°C
I_{SC}	Output current limit	R_{SC} = 10Ω, V_O = 0 V			65		mA
V_I	Input voltage range			9.5		40	V
V_O	Output voltage range			2		37	V
V_O-V_I				3		38	V
I_d	Quiescent current	V_I = 30V, I_O = 0 mA			2.3	4	mA
K_{VH}	Long term stability				0.1		%/1000 hrs
eN	Output noise voltage	BW = 100 Hz to 10 kHz	C_{REF} = 0		20		µV
			C_{REF} = 5µF		2.5		

Table 6. Resistor values (kΩ) for standard output voltages

Output Voltage	Applicable figures	Fixed output ± 5%		Output adjustable ± 10% (1)		
		R1	R2	R1	P1	R2
+3	*16, 18, 20, 21, 24, 26*	4.12	3.01	1.8	0.5	1.2
+5	*16, 18, 20, 21, 24, 26*	2.15	4.99	0.75	0.5	2.2
+6	*16, 18, 20, 21, 24, 26*	1.15	6.04	0.5	0.5	2.7
+9	*17, 18, 20, 21, 24, 26*	1.87	7.15	0.75	1	2.7
+12	*17, 18, 20, 21, 24, 26*	4.87	7.15	2	1	3
+15	*17, 18, 20, 21, 24, 26*	7.87	7.15	3.3	1	3
+28	*17, 18, 20, 21, 24, 26*	21	7.15	5.6	1	2
+45	*22*	3.57	48.7	2.2	10	39
+75	*22*	3.57	78.7	2.2	10	68
+100	*22*	3.57	102	2.2	10	91
+250	*22*	3.57	255	2.2	10	240
-6 (2)	*18*	3.57	2.43	1.2	0.5	0.75
-9	*18*	3.48	5.36	1.2	0.5	2
-12	*18*	3.57	8.45	1.2	0.5	3.3
-15	*18*	3.65	11.5	1.2	0.5	4.3
-28	*18*	3.57	24.3	1.2	0.5	10
-45	*23*	3.57	21.2	2.2	10	33
-100	*23*	3.57	97.6	2.2	10	91
-250	*23*	3.57	249	2.2	10	240

1. Replace R1/R2 divider with the circuit of *Figure 27*.
2. V+ must be connected to a +3 V or greater supply.

Table 7. Formula for intermediate output voltages

Conditions		
Outputs from 2 to 7V *Figure 16, 19, 20, 21, 24, 26* $V_O=(V_{REF} x R_2)/(R_1+R_2)$	Outputs from 4 to 250V *Figure 22* $V_O=(V_{REF}/2) x [(R_2-R_1)/R_1]$; $R_3=R_4$	Current Limit $I_{LIMIT}=V_{SENSE}/R_{SC}$
Outputs from 7 to 37V *Figure 17, 19, 20, 21, 24, 26* $V_O=V_{REF} x [(R_1+R_2)/R_2]$	Outputs from -6 to -250V *Figure 18, Figure 23* $V_O=(V_{REF}/2) x [(R_1+R_2)/R_1]$; $R_3=R_4$	Foldback Current Limiting $I_{KNEE}=[(V_O x R_3)/(R_{SC} x R_4)] x [V_{SENSE} x (R_3+R_4)] / (R_{SC} x R_4)$ $I_{SHORTCKT}=(V_{SENSE}/R_{SC}) x [(R_3+R_4)/R_4]$

Plastic DIP-14 mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100