

Dual OP-Amp and 2.5V±0.7% Voltage Reference

General Description

The LD8103 consists of 2 low-offset voltage amplifiers and a high-accuracy 2.5V voltage reference in a SOP-8 package. The LD8103 provides a low cost and space saving solution for the applications such as power supplies and switching adapters.

The LD8103 is available in a SOP-8 package. It can operate over the ambient temperature range from -40°C to 105°C.

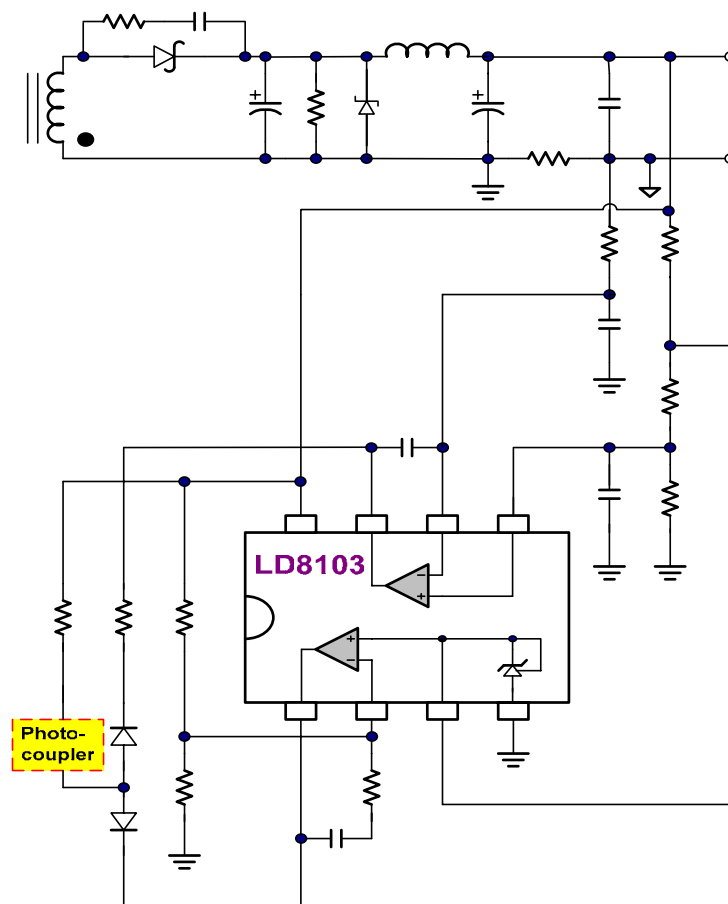
Features

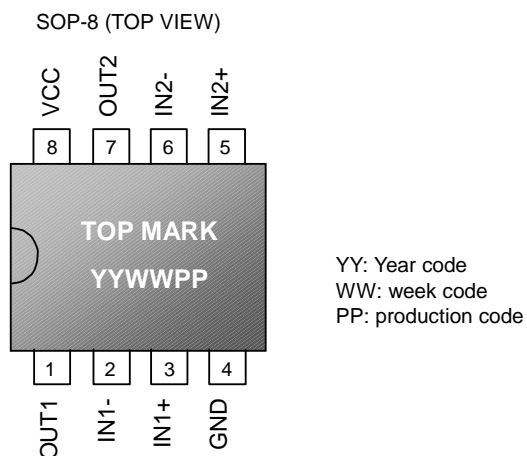
- Precision $\pm 0.7\%$ Voltage Reference
- VREF Sinking Current Capability: 1mA to 100mA
- Low Input Offset Voltage
- Max. 27V Voltage Rating
- SOP-8 Package

Applications

- Switching Power Supply and Adapter
- Portable Device
- Motherboard (Controller of Linear Power)

Typical Application --- CC/CV Control for Switching Adapters

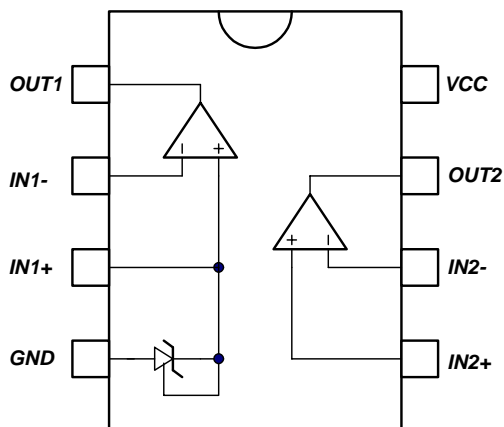


Pin Configuration

Ordering Information

Part number	Package	TOP MARK	Shipping
LD8103 CS	SOP-8	LD8103CS	2500 /tape & reel
LD8103 PS	SOP-8(PBFree)	LD8103PS	2500 /tape & reel

Pin Descriptions

PIN	NAME	FUNCTION
1	OUT1	Output of OP-amp 1
2	IN1-	Negative terminal of OP-amp 1
3	IN1+	Positive terminal of OP-amp 1, connected to internal reference voltage
4	GND	Ground
5	IN2+	Positive terminal of OP-amp 2
6	IN2-	Negative terminal of OP-amp 2
7	OUT2	Output of OP-amp 2
8	VCC	Supply voltage

Block Diagram

Absolute Maximum Ratings

Supply Voltage V_{CC}	27V
Differential Input Voltage (IN1+ to IN1-, IN2+ to IN2-).....	27V
Input Voltage.....	-0.3V to $V_{CC}+0.3V$
Maximum Junction Temperature.....	150°C
Operating Ambient Temperature Range.....	-40°C to 105°C
Storage Temperature Range.....	-65°C to 150°C
Lead Temperature (LD8103CS, 10 sec.).....	230°C
Lead Temperature (LD8103PS, 10 sec.).....	260°C
Junction-to-Ambient Thermal Resistance.....	160°C/W
ESD Level (Human Body Model)	2KV

Caution:

Stresses beyond the ratings specified in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not limited.

Electrical Characteristics

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Total Supply Current (No Load)	$V_{CC} = 5V, -40^{\circ}C \sim 105^{\circ}C$		0.7	1.2	mA
	$V_{CC} = 27V, -40^{\circ}C \sim 105^{\circ}C$			2	

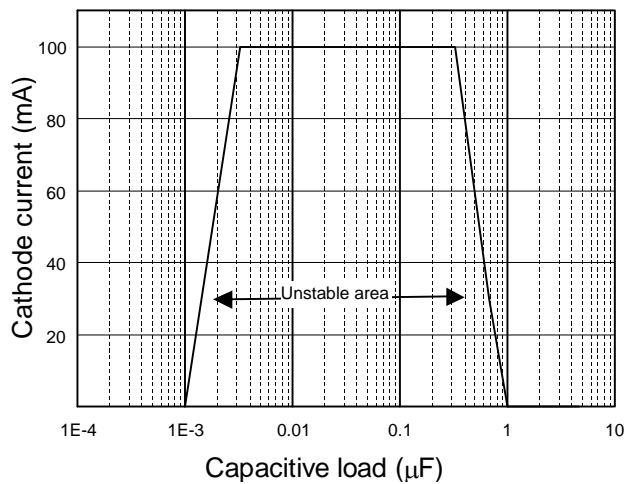
($V_{CC} = +5V, T_A = +25^{\circ}C$ unless otherwise stated)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
OP-Amp1 & OP-Amp2					
Input Offset voltage (Common mode Voltage = 0V)	$25^{\circ}C$		1	4	mV
	$-40^{\circ}C \sim 105^{\circ}C$			5	mV
Input Offset Voltage Drift			7		$\mu V/^{\circ}C$
Input Bias Current (OP1)	$25^{\circ}C$		20		nA
Input Bias Current (OP2)	$25^{\circ}C$		20	150	nA
	$-40^{\circ}C \sim 105^{\circ}C$			200	nA
Output Source Current	$V_{CC} = 15V, V_O = 2V$ Differential Input Voltage = 1V	20	40		mA
Output Sink Current	$V_{CC} = 15V, V_O = 2V$ Differential Input Voltage = -1V	10			mA
	$V_{CC} = 15V, V_O = 0.2V$ Differential Input Voltage = -1V	12	50		μA
Output Short Current	$V_{CC} = 15V$		40	60	mA
Output Voltage --- High Level	$V_{CC} = 27V, R_L = 2K, 25^{\circ}C$	23	24		V
	$V_{CC} = 27V, R_L = 2K, -40^{\circ}C \sim 105^{\circ}C$	23			V
	$V_{CC} = 27V, R_L = 10K, 25^{\circ}C$	24	25		V
	$V_{CC} = 27V, R_L = 10K, -40^{\circ}C \sim 105^{\circ}C$	24			V
Output Voltage --- Low Level	$R_L = 10K, 25^{\circ}C$		5	20	mV
	$R_L = 10K, -40^{\circ}C \sim 105^{\circ}C$			20	
Large Signal Voltage Gain (OP1)	$V_{CC} = 15V, R_L = 2K$ $V_O = 1.4V \sim 11.4V, -40^{\circ}C \sim 105^{\circ}C$		100		V/mV
Large Signal Voltage Gain (OP2)	$V_{CC} = 15V, R_L = 2K,$ $V_O = 1.4V \sim 11.4V, 25^{\circ}C$	50	100		V/mV
	$V_{CC} = 15V, R_L = 2K,$ $V_O = 1.4V \sim 11.4V, -40^{\circ}C \sim 105^{\circ}C$	25		V/mV	
Slew Rate at Unity Gain	$V_{IN} = 0.5V \sim 2V, V_{CC} = 15V$ $R_L = 2K, C_L = 100pF, \text{Unity Gain}$	0.2	0.4		$V/\mu S$
Supply Voltage Rejection Ratio	Common Mode Voltage = 0V $V_{CC} = 5 \sim 27V$	65	100		dB
Gain Bandwidth Product	$V_{CC} = 27V, R_L = 2K, C_L = 100pF$ $F = 100KHz, V_{IN} = 10mV$	0.5	0.9		MHz
Total Harmonic Distortion	$V_{CC} = 27V, R_L = 2K, C_L = 100pF$ $V_O = 2V_{pp}, f = 1KHz, A_V = 20dB$		0.02		%

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
OP-Amp2					
Input Offset Current	25°C		2	75	nA
	-40°C~105°C			150	nA
Input Common Mode Voltage Range	V _{CC} =27V, 25°C	0		V _{CC} -1.5	V
	V _{CC} =27V, -40°C~105°C	0		V _{CC} -2	V
Common Mode Rejection Ratio	25°C	70	85		dB
	-40°C~105°C	60			dB
Equivalent Input Noise Voltage	F=1KHz, R _s =100Ω, V _{CC} =27V		50		nV/√Hz

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Reference Voltage					
Cathode Current		1		100	mA
Reference Voltage (I _K =10mA)	25°C	2.482	2.500	2.518	V
	-40°C~105°C	2.465	2.500	2.535	V
Reference Input Voltage Deviation over Temperature Range (I _K =10mA)	-40°C~105°C		7	30	mV
Minimum Cathode Current for Regulation			0.5	1	mA
Dynamic Impedance	ΔI _K =1~100mA, f<1KHz		0.2	0.5	Ω

Typical Performance Characteristics



Stability behavior with capacitor loads

Fig. 1 Stability Boundary Conditions

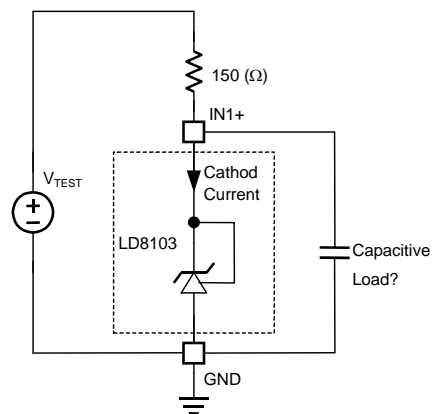
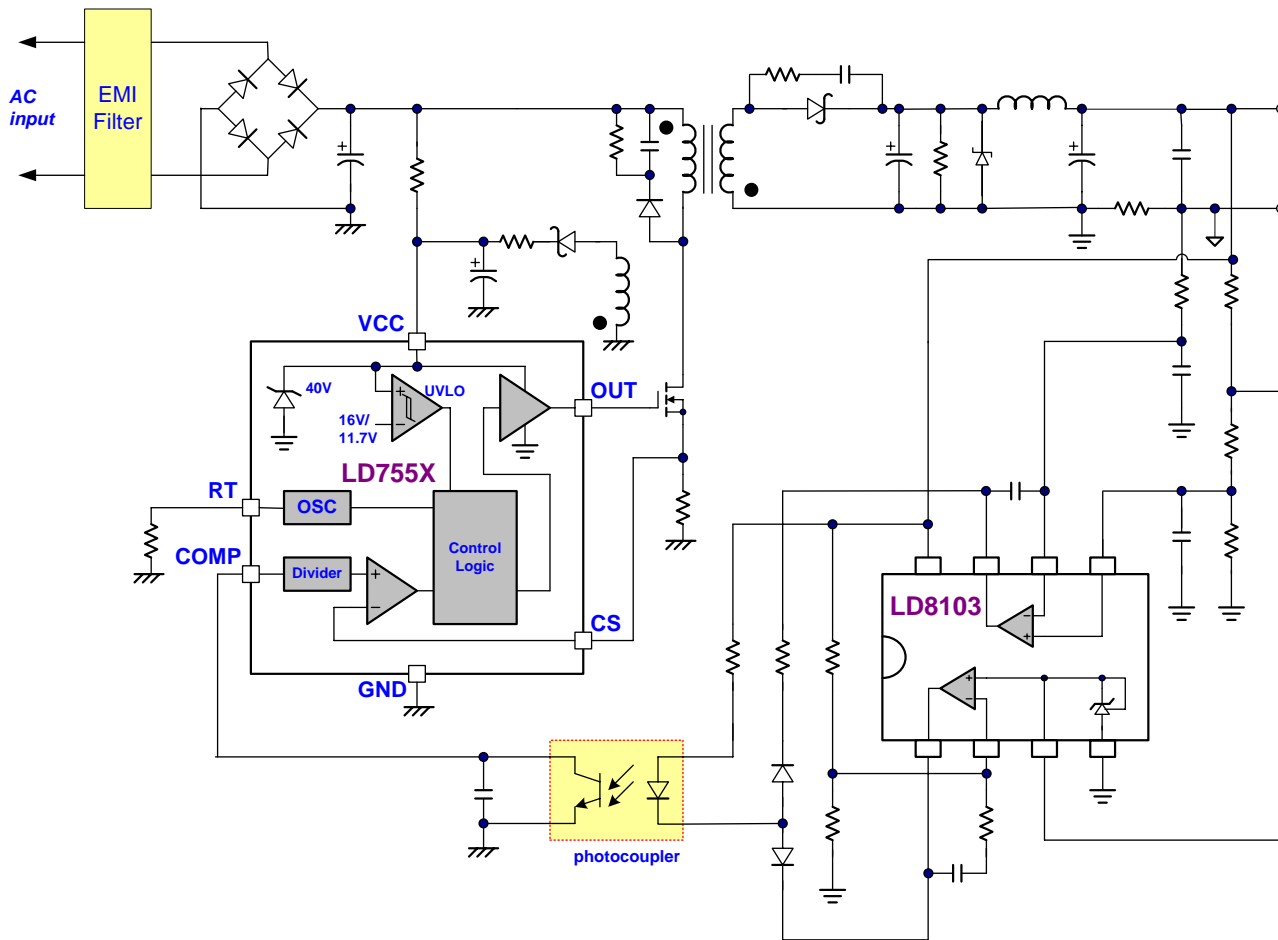


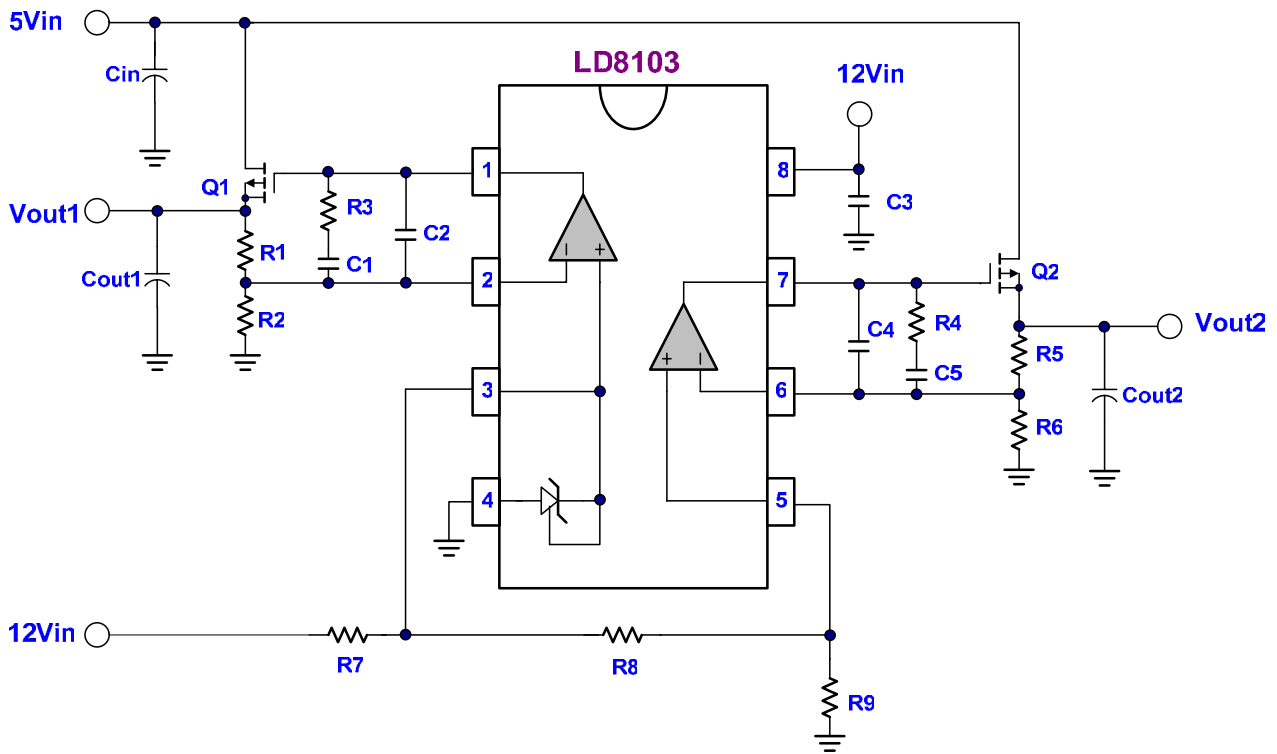
Fig. 2 Test Circuit of Stability Boundary Conditions

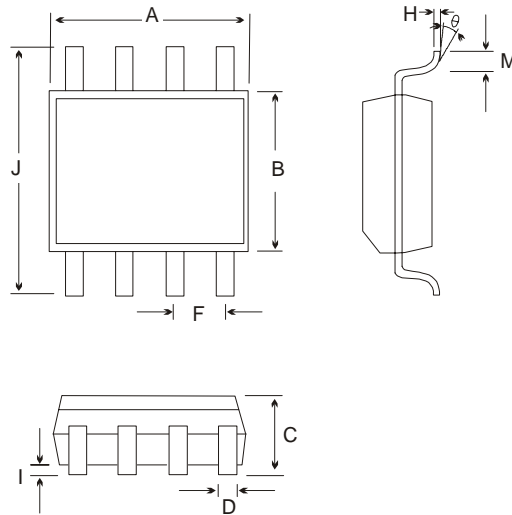
Note: For the shunt regulators like TL431, the stability of capacitive load should be taken into account carefully. As shown in figure1, the areas within the curves represent the conditions that may cause the VREF to oscillate.

Reference Application Circuit #1 --- CC/CV Control for Switching Adapters



Reference Application Circuit #2 --- Motherboard (Controller of Linear Power)



Package Information
SOP-8


Symbols	Dimensions in Millimeters		Dimensions in Inch	
	MIN	MAX	MIN	MAX
A	4.801	5.004	0.189	0.197
B	3.810	3.988	0.150	0.157
C	1.346	1.753	0.053	0.069
D	0.330	0.508	0.013	0.020
F	1.194	1.346	0.047	0.053
H	0.178	0.229	0.007	0.009
I	0.102	0.254	0.004	0.010
J	5.791	6.198	0.228	0.244
M	0.406	1.270	0.016	0.050
θ	0	8°	0	8°

Important Notice

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