

SOP-8



Pin assignment:

- | | |
|----------------------|----------------|
| 1. Output A | 8. Vcc |
| 2. Input A (-) | 7. Output B |
| 3. Input A (+) / Vka | 6. Input B (-) |
| 4. Gnd | 5. Input B (+) |

General Description

The TS103 is a monolithic IC specifically designed to control the output current and voltage levels of switch mode battery chargers and power supplies.

The device contains two operational amplifiers and a precision shunt regulator. Op Amp 1 is designed for voltage control, whose non-inverting input internally connects to the output of the shunt regulator. Op Amp 2 is for current control with both inputs uncommitted. The IC offers the power converter designer a control solution that features increased precision with a corresponding reduction in system complexity and cost.

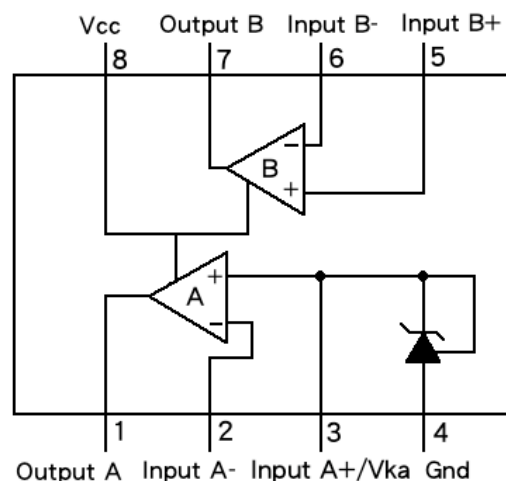
Features

- Input Offset Voltage: 0.5mV
- Supply Current: 250uA per OP AMP @ 5V
- Unity Gain Bandwidth: 1MHz
- Output Voltage Swing: 0~(Vcc – 1.5) V
- Power Supply Voltage: 3~18V
- Fixed Output Voltage Reference: 2.5V±1%
- Sink Current Capability from 0.2~80mA
- Package types: SOP-8

Ordering Information

Part No.	Package	Packing
TS103CS RL	SOP-8	2.5Kpcs / 13" Reel
TS103ACS RL	SOP-8	2.5Kpcs / 13" Reel

Block Diagram



Absolute Maximum Rating

Parameter	Symbol	Value	Unit
Power Supply Voltage (V _{CC} to GND)	V _{CC}	20	V
Op Amp 1 and 2 Input Voltage Range (Pins 2,5,6)	V _{IN}	-0.3 to V _{CC} +0.3	V
Op Amp 2 Input Differential Voltage (Pins 5,6)	V _{ID}	20	V
Voltage Reference Cathode Current (Pin 3)	I _K	100	mA
Power Dissipation	P _D	500	mW
Storage Temperature Range	T _{STG}	-65 to 150	°C
ESD Protection Voltage (Machine Model)	--	≥200	V

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings " may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings " for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Min.	Max.	Unit
Supply Voltage	3	18	V
Ambient Temperature	-40	85	°C

Electrical Characteristics (Operating Conditions: $V_{CC} = +5V$, $T_A = 25^\circ C$ unless otherwise specified)

Parameters	Conditions	Min.	Typ.	Max.	Unit
Total Supply Current, excluding Current in Voltage Reference	$V_{CC} = 5V$, no load, $-40^\circ C \leq T_A \leq 85^\circ C$	--	0.5	0.8	mA
	$V_{CC} = 18V$, no load, $-40^\circ C \leq T_A \leq 85^\circ C$	--	0.6	1.2	

Voltage Reference Section

Reference Voltage	$I_{KA} = 10mA$, (TS103)	2.475	2.500	2.525	V
	$I_{KA} = 10mA$, (TS103A)	2.490	2.500	2.510	
Reference Voltage Deviation Over Full Temperature Range	$I_{KA} = 10mA$, $T_A = -40$ to $85^\circ C$	--	5 5	24 17	mV
Minimum Cathode Current for Regulation		--	0.2	1.0	mA
Dynamic Impedance	$V_{CC} = 1.0$ to $80mA$, $f < 1kHz$		0.3	0.5	Ω

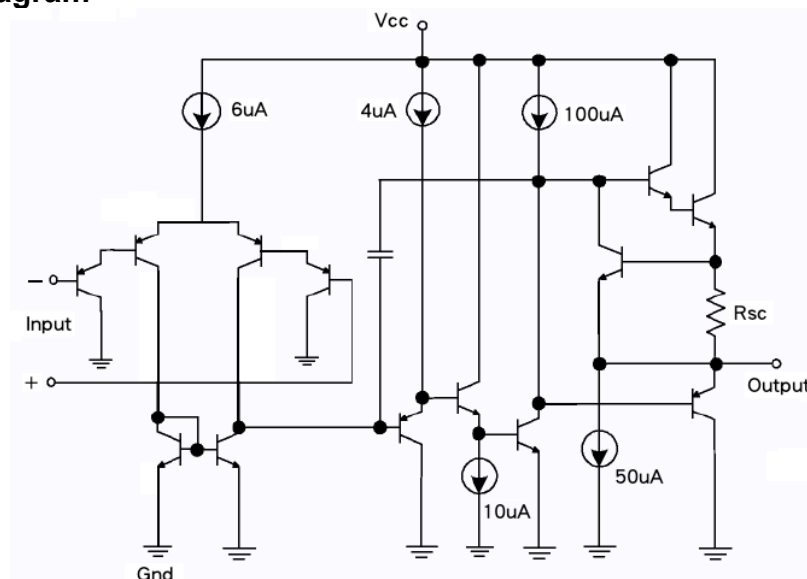
OP AMP 1 Section ($V_{CC} = 5V$, $V_O = 1.4V$, $T_A = 25^\circ C$, unless otherwise noted)

Input Offset Voltage	$T_A = 25^\circ C$ (TS103)	--	0.5	3	mV
	$T_A = 25^\circ C$ (TS103A)	--	0.5	2	
	$T_A = -40$ to $85^\circ C$	--	--	5	
Input Offset Voltage Temperature Drift	$T_A = -40$ to $85^\circ C$	--	7	--	$\mu V/^\circ C$
Input Bias Current (Inverting Input Only)	$T_A = 25^\circ C$	--	20	150	nA
Large Signal Voltage Gain	$V_{CC} = 15V$, $R_L = 2k\Omega$, $V_O = 1.4$ to $11.4V$	85	100	--	dB
Power Supply Rejection Ratio	$V_{CC} = 5$ to $18V$	70	90	--	dB
Output Current	Source $V_{CC} = 15V$, $V_{ID} = 1V$, $V_O = 2V$	20	40	--	mA
	Sink $V_{CC} = 15V$, $V_{ID} = -1V$, $V_O = 2V$	10	20	--	mA
Output Voltage Swing (High)	$V_{CC} = 18V$, $R_L = 10k\Omega$, $V_{ID} = 1V$	16	16.5	--	V
Output Voltage Swing (Low)	$V_{CC} = 18V$, $R_L = 10k\Omega$, $V_{ID} = -1V$	--	17	100	mV
Slew Rate	$V_{CC} = 18V$, $R_L = 2k\Omega$, $A_V = 1$, $V_{IN} = 0.5$ to $2V$, $C_L = 100pF$	0.2	0.5	--	V/ μs
Gain Bandwidth Product	$V_{CC} = 18V$, $R_L = 2k\Omega$, $C_L = 100pF$ $V_{IN} = 10mV$, $f = 100kHz$	0.5	1	--	MHz

Electrical Characteristics (Operating Conditions: $V_{CC} = +5V$, $T_A = 25^\circ C$ unless otherwise specified)

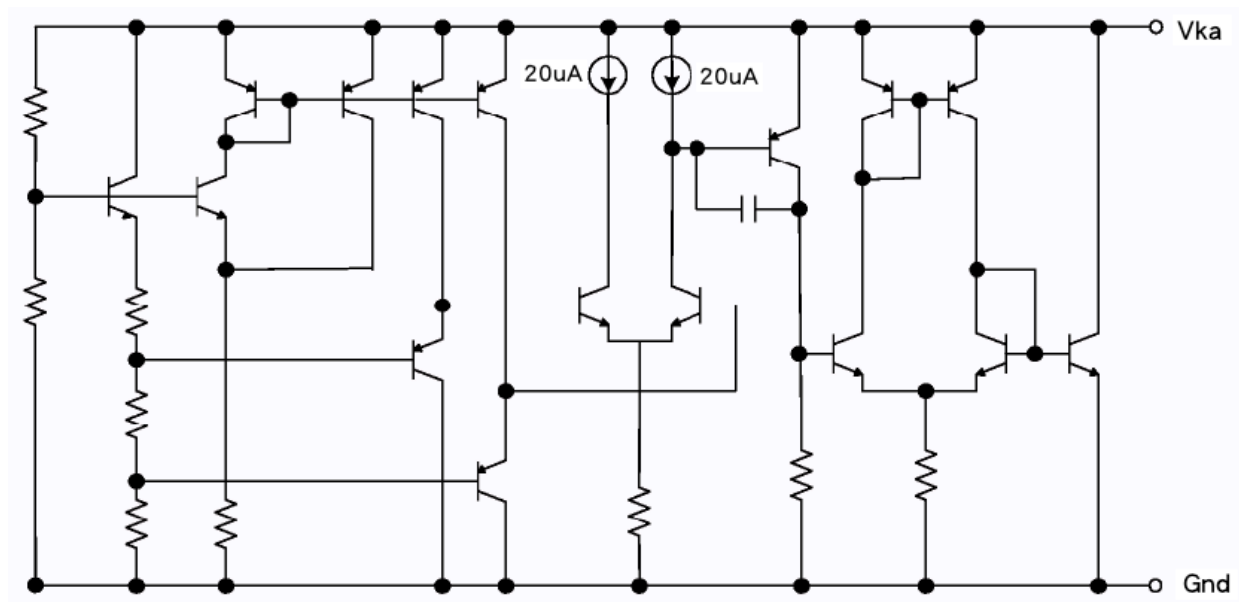
Parameters		Conditions	Min.	Typ.	Max.	Unit
OP AMP 2 Section (V _{CC} = 5V, V _O = 1.4V, T _A = 25°C, unless otherwise noted)						
Input Offset Voltage		T _A = 25°C (TS103)	--	0.5	3	mV
		T _A = 25°C (TS103A)	--	0.5	2	
		T _A = -40 to 85°C	--	--	5	
Input Offset Voltage Temperature Drift		T _A = -40 to 85°C	--	7	--	µV/°C
Input Bias Current		T _A = 25°C	--	20	150	nA
Input Voltage Range		V _{CC} = 0~18V	0	00	V _{CC} -1.5	V
Large Signal Voltage Gain		V _{CC} = 15V, R _L = 2kΩ, V _O = 1.4 to 11.4V	85	100	--	dB
Power Supply Rejection Ratio		V _{CC} = 5 to 18V	70	90	--	dB
Output Current	Source	V _{CC} = 15V, V _{ID} = 1V, V _O = 2V	20	40	--	mA
	Sink	V _{CC} = 15V, V _{ID} = -1V, V _O = 2V	10	20	--	mA
Output Voltage Swing (High)		V _{CC} = 18V, R _L = 10kΩ, V _{ID} = 1V	16	16.5	--	V
Output Voltage Swing (Low)		V _{CC} = 18V, R _L = 10kΩ, V _{ID} = -1V	--	17	100	mV
Slew Rate		V _{CC} = 18V, R _L = 2kΩ, A _V = 1, V _{IN} = 0.5 to 2V, C _L = 100pF	0.2	0.5	--	V/µs
Gain Bandwidth Product		V _{CC} = 18V, R _L = 2kΩ, C _L = 100pF V _{IN} = 10mV, f = 100kHz	0.5	1	--	MHz

Function Block Diagram



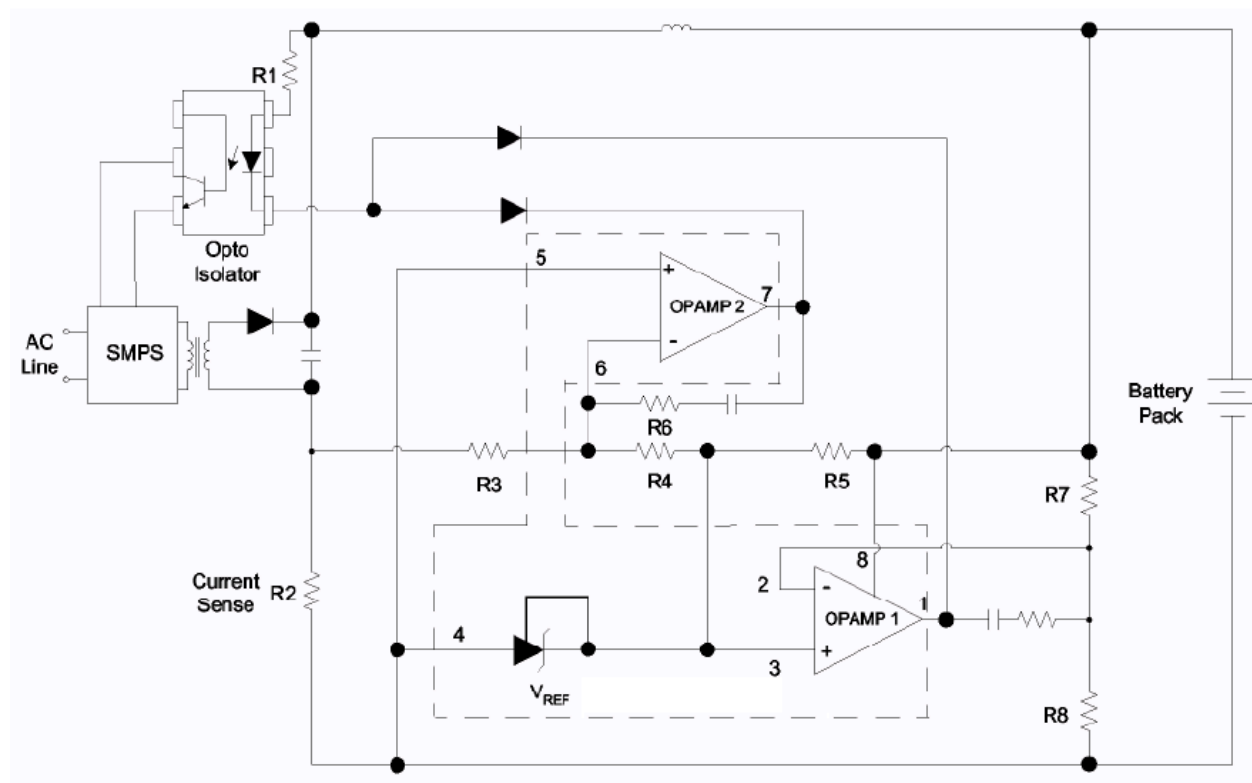
OP AMP Function Block Diagram (Each Amplifier)

Function Block Diagram (Continue)

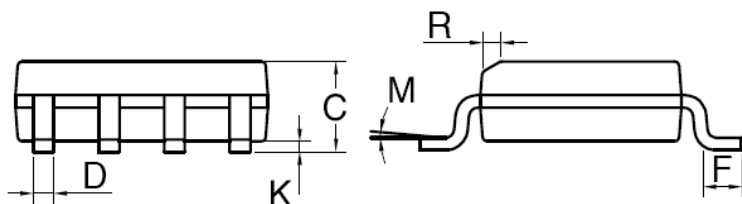
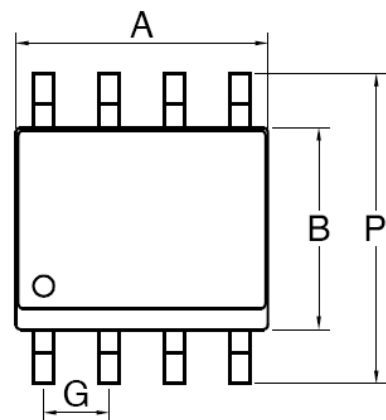


Voltage Reference Function Block Diagram

Typical Application Circuit

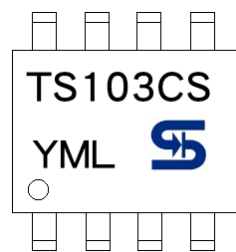


SOP-8 Mechanical Drawing



DIM	SOP-8 DIMENSION			
	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX.
A	4.80	5.00	0.189	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27BSC		0.05BSC	
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

Marking Diagram



- Y** = Year Code
- M** = Month Code
(**A**=Jan, **B**=Feb, **C**=Mar, **D**=Apr, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug, **I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)
- L** = Lot Code

TS103/A

Dual Operational Amplifiers And Voltage Reference

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