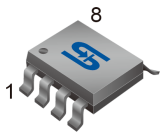
TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

TS103

Dual Operational Amplifiers And Voltage Reference

SOP-8



Pin assignment:

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

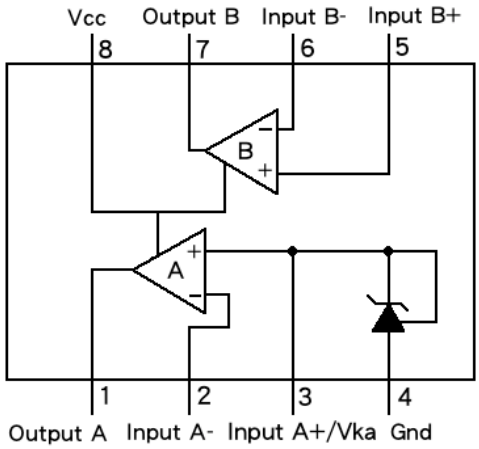
General Description

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

Block Diagram



Ordering Information

Part No.	Package	Packing
TS103CS RLG	SOP-8	2.5Kpcs / 13” Reel
TS103ACS RLG	SOP-8	2.5Kpcs / 13” Reel

Note: “G” denote for Halogen Free Product

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

TS103
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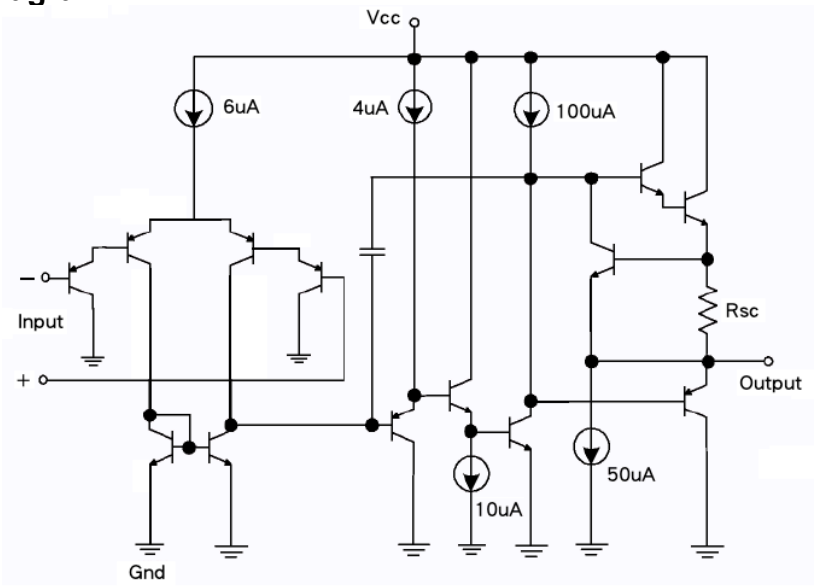
Electrical Characteristics (Operating Conditions: V_{CC} = +5V, TA= 25°C unless otherwise specified)

Parameters		Conditions	Min.	Typ.	Max.	Unit
Total Supply Current, excluding Current in Voltage Reference		V_{CC} = 5V, no load, -40°C ≤T_A ≤85°C	--	0.5	0.8	mA
		V_{CC} = 18V, no load, -40°C≤ T_A ≤85°C	--	0.6	1.2	
Voltage Reference Section						
Reference Voltage	TS103	I_{KA} = 10mA	2.475	2.500	2.525	V
		I_{KA} = 10mA @ -40°C ≤T_A ≤85°C	2.45	2.500	2.55	
	TS103A	I_{KA} = 10mA	2.490	2.500	2.510	
		I_{KA} = 10mA @ -40°C ≤T_A ≤85°C	2.475	2.500	2.525	
Reference Voltage Deviation Over Full Temperature Range		I_{KA} = 10mA, T_A=-40 to 85°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°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 (Inverting Input Only)		T_A = 25°C	--	20	150	nA
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 l8V	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

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

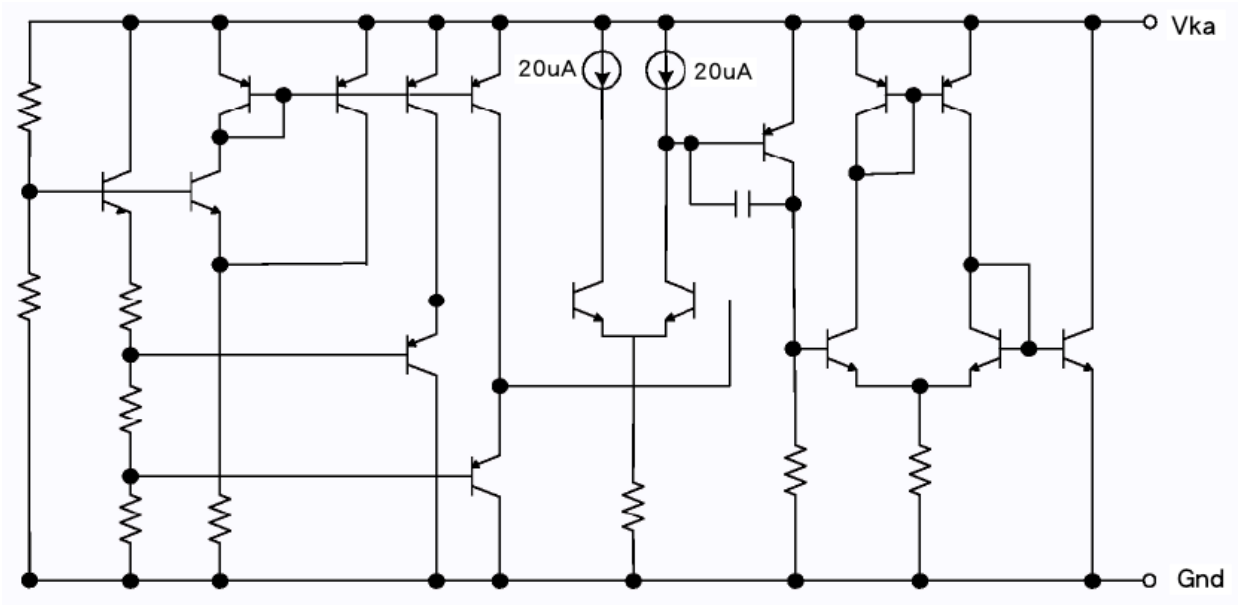
Parameters		Conditions	Min.	Typ.	Max.	Unit
OP AMP 2 Section (V_{CC}= 5V, V_O= 1.4V, T_A= 25°C, unless otherwise noted)						
Input Offset Voltage		T_A = 25°C (TS103)	--	0.5	3	mV
		T_A = 25°C (TS103A)	--	0.5	2	
		T_A = -40 to 85°C	--	--	5	
Input Offset Voltage Temperature Drift		T_A = -40 to 85°C	--	7	--	µV/°C
Input Bias Current		T_A = 25°C	--	20	150	nA
Input Voltage Range		V_{CC} = 0~18V	0	00	Vcc-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 l8V	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



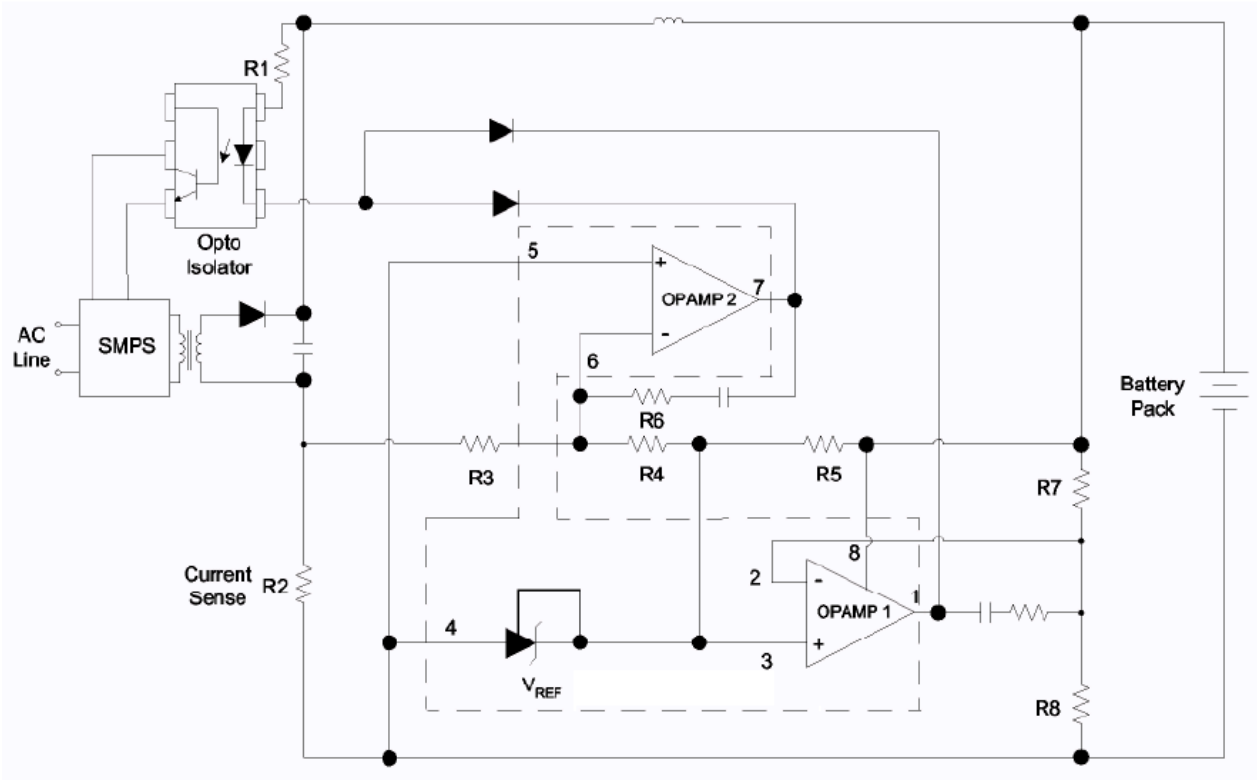
OP AMP Function Block Diagram (Each Amplifier)

Function Block Diagram (Continue)

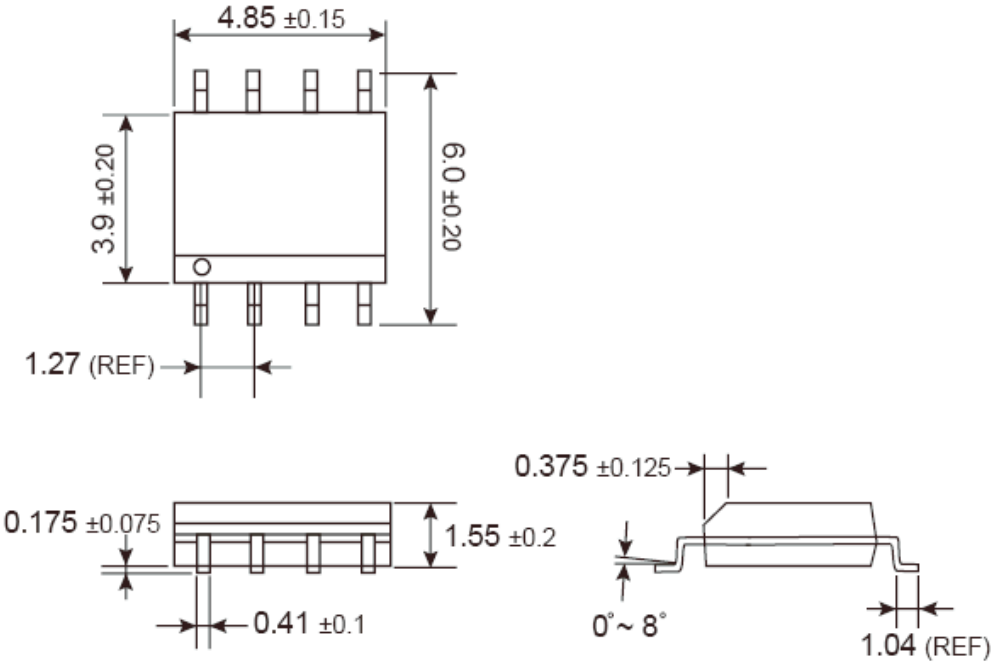


Voltage Reference Function Block Diagram

Typical Application Circuit

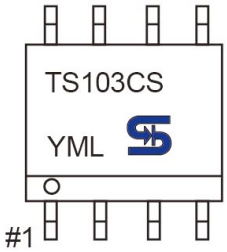


SOP-8 Mechanical Drawing



Unit: Millimeters

Marking Diagram



Y = Year Code
M = Month Code for Halogen Free Product
(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apl, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
L = Lot Code

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