Dual Operational Amplifiers and Voltage Reference

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: 250μA per OP AMP @ 5V
- Unity Gain Bandwidth: 1MHz
- Output Voltage Swing: 0~(V_{CC} – 1.5) V
- Power Supply Voltage: 3~18V
- Fixed Output Voltage Reference: 2.5V±1%
- Sink Current Capability from 0.2~80mA
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC.
- Halogen-free according to IEC 61249-2-21

APPLICATION

- Battery chargers
- Switch-Mode Power Supplies
- Linear voltage regulation

Pb-Free RoHS COMPLIANT HALOGEN FREE

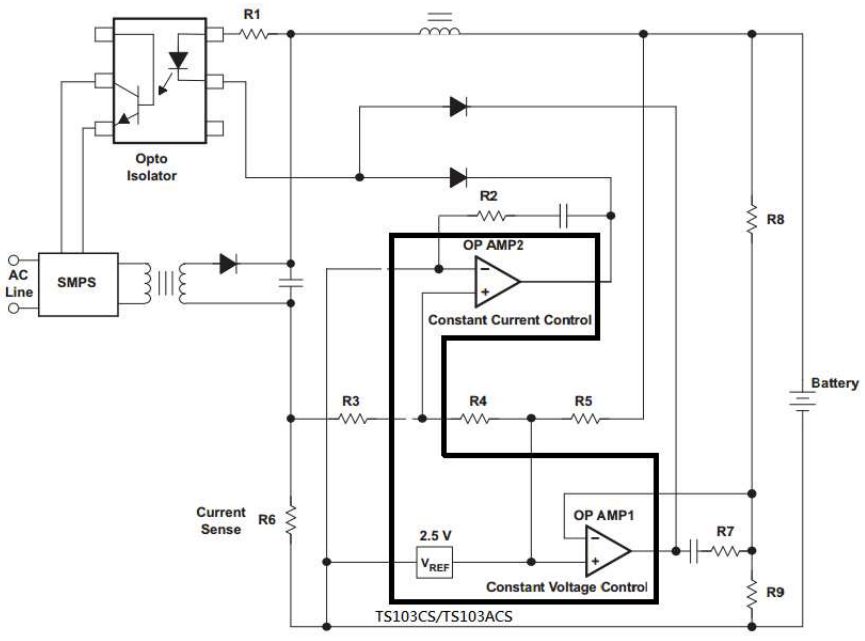
SOP-8

Pin Definition:

1. Output A	8. V_{CC}
2. Input A (-)	7. Output B
3. Input A (+) / V_{KA}	6. Input B (-)
4. GND	5. Input B (+)

Note: MSL 3 (Moisture Sensitivity Level) per J-STD-020

TYPICAL APPLICATION CIRCUIT



ABSOLUTE MAXIMUM RATINGS (Note 1)			
PARAMETER	**SYMBOL**	**LIMIT**	**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

RECOMMENDED OPERATING CONDITIONS (Note 3)			
PARAMETER	**SYMBOL**	**CONDITIONS**	**UNIT**
Supply Voltage	V_{CC}	3 ~ 18	V
Operating Ambient Temperature Range	T_{OPA}	-40 to +85	°C

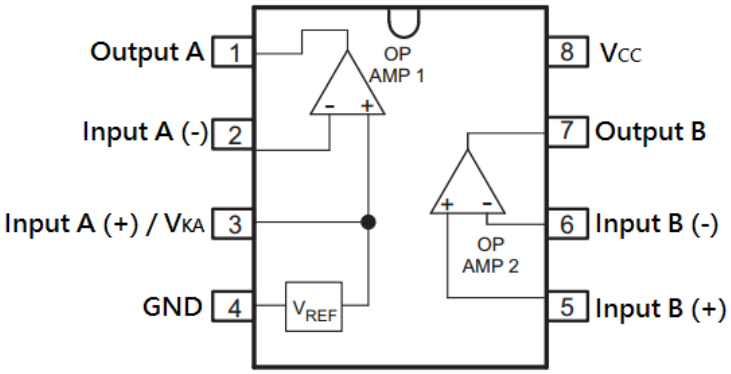
ELECTRICAL SPECIFICATIONS (V_{CC} = 18V, T_A = 25°C unless otherwise noted)						
PARAMETER		**CONDITIONS**	**MIN**	**TYP**	**MAX**	**UNIT**
Total Supply Current, excluding Current in Voltage Reference		V_{CC} = 5V, no load, -40°C ≤T_A ≤85°C	--	0.5	0.8	mA
		V_{CC} = 18V, no load, -40°C≤ T_A ≤85°C	--	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

ELECTRICAL SPECIFICATIONS (V_{CC} = 18V, T_A = 25°C unless otherwise noted)						
PARAMETER		**CONDITIONS**	**MIN**	**TYP**	**MAX**	**UNIT**
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
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

ORDERING INFORMATION

PART NO.	PACKAGE	PACKING
TS103CS RLG	SOP-8	2,500pcs / 13”Reel
TS103ACS RLG	SOP-8	2,500pcs / 13”Reel

BLOCK DIAGRAM



PIN DESCRIPTION

PIN NO.	NAME	FUNCTION
1	Output A	OP AMP 1 output
2	Input A (-)	OP AMP 1 inverting input
3	Input A (+) / V_{KA}	OP AMP 1 non-inverting input and shunt reference cathode terminal
4	GND	Negative supply voltage
5	Input B (+)	OP AMP 2 output
6	Input B (-)	OP AMP 2 non-inverting input
7	Output B	OP AMP 2 output
8	V_{CC}	Positive supply voltage

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

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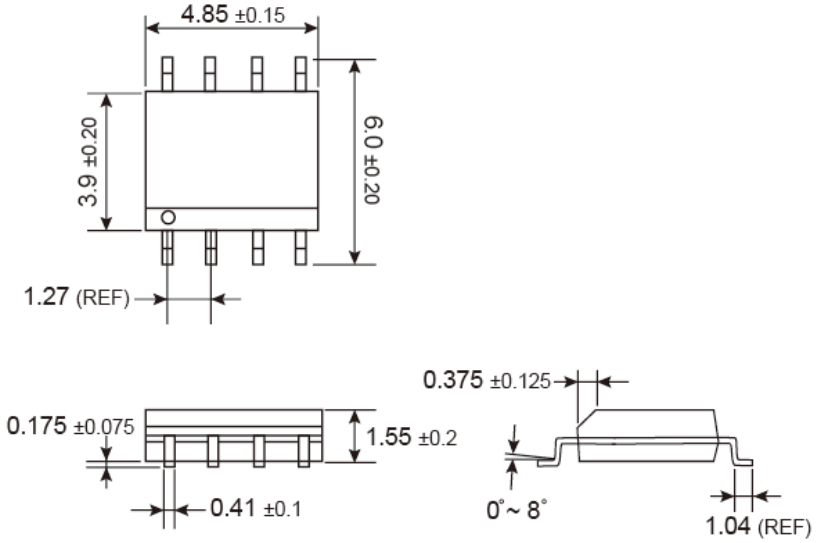
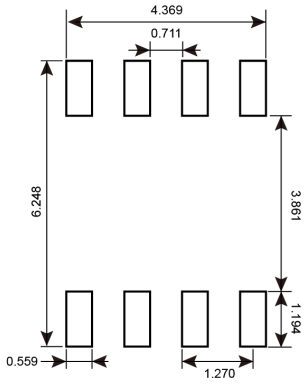
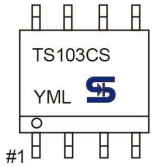


SUGGESTED PAD LAYOUT (Unit: Millimeters)



MARKING DIAGRAM



Y = Year Code

M = Month Code for Halogen Free Product

O	=Jan	**P**	=Feb	**Q**	=Mar	**R**	=Apr
S	=May	**T**	=Jun	**U**	=Jul	**V**	=Aug
W	=Sep	**X**	=Oct	**Y**	=Nov	**Z**	=Dec

L = Lot Code (1~9, A~Z)

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