

## Single Channel Rail-to-Rail Operational Amplifier

### Description

The FP8103 is single channel rail-to-rail input and output operational amplifier optimized for LCD module applications. The rail-to-rail input and output capability maximizes system flexibility.

The LCD operational amplifier has high slew rate, 250mA peak output current to provide high capacitive load drive capability. The wide supply range from 4.5V to 16V and offset voltage below 20mV. The FP8103 is ideal for LCD grayscale reference buffer and  $V_{COM}$  applications.

The FP8103 is a single OP amp which is available in space-saving 5-lead TSOT-23 and SOP-8 packages.

### Features

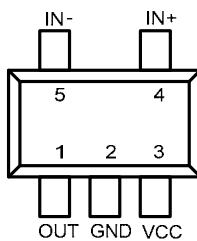
- 250mA Peak Output Current
- 35mA Continuous Output Current
- 12V/us Slew Rate
- Wide Input Range: 4.5V to 16V
- Rail-to-Rail Inputs/Outputs
- 700uA Supply Current
- Low Input Bias Current
- High Input Impedance
- Thermal-Overload Protection
- Available in TSOT-23-5 and SOP-8 Packages
- RoHS Compliant

### Applications

- LCD Reference Drivers
- Portable Electronics
- Communication Equipments

### Pin Assignments

#### S8 Package (TSOT-23-5)



#### S0 Package (SOP-8)

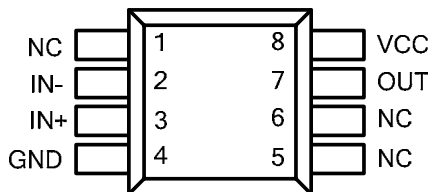
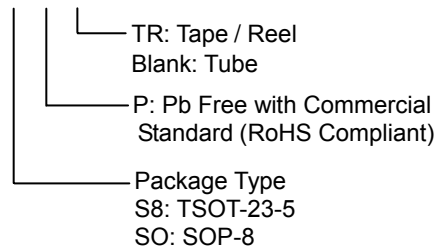


Figure 1. Pin Assignment of FP8103

### Ordering Information

FP8103



#### TSOT-23-5 Marking

Part Number	Product Code
FP8103S8P	E3

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## Typical Application Circuit

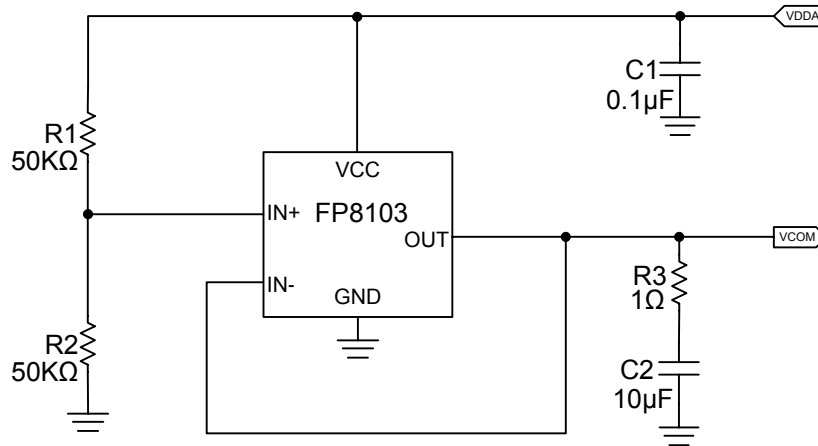


Figure 2. Typical Application Circuit of FP8103

## Functional Pin Description

Pin Name	Pin Number	Pin Function
	TSOT-23-5	
OUT	1	Operational Amplifier Output
GND	2	IC Ground
VCC	3	Supply Voltage. VCC can range from 4.5V to 16V
IN+	4	Operational Amplifier Non-Inverting Input
IN-	5	Operational Amplifier Inverting Input

## Absolute Maximum Ratings

- Supply Voltage ( $V_{CC}$ )----- - 0.3V to + 18V
- Supply Voltage ( $V_{SUP}$ )----- - 0.3V to  $V_{CC}$
- Input Pins ( $V_{IN+}$ ,  $V_{IN-}$ )----- - 0.3V to  $V_{CC} + 0.3V$
- Package Thermal Resistance, TSOT-23-5 ( $\theta_{JA}$ )----- 250°C/W
- Power Dissipation @ 25°C, TSOT-23-5 ( $P_D$ )----- + 0.4W
- Package Thermal Resistance, SOP-8 ( $\theta_{JA}$ )----- 160°C/W
- Power Dissipation @ 25°C, SOP-8 ( $P_D$ )----- + 0.63W
- OUT Maximum Output Current ----- Internal Limit

Note : Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device.

## Recommended Operating Conditions

- Supply Voltage ( $V_{CC}$ )----- + 4.5V to + 16V
- Operation Temperature Range----- - 40°C to + 85°C

## Electrical Characteristics

( $V_{IN}=12V$ ,  $T_A=25^{\circ}C$ , unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage Range	$V_{CC}$		4.5		16	V
Supply Current	$I_{CC}$			0.7		mA
Input Offset Voltage	$V_{OS}$	$(V_{IN+}, V_{IN-}, OUT) \sim V_{CC}/2$			20	mV
Input Bias Current	$I_{BIAS}$	$(V_{IN+}, V_{IN-}, OUT) \sim V_{CC}/2$		1	50	nA
Common-Mode Rejection Ratio	CMRR	$0 \leq (V_{IN+}, V_{IN-}) \leq V_{CC}$	45			dB
Input Common-Mode Range	$V_{CM}$		0		$V_{CC}$	V
Output Voltage Swing, High	$V_{OH}$	$I_{OUT} = 100\mu A$	$V_{CC} - 15$	$V_{CC} - 3$		mV
		$I_{OUT} = 5mA$	$V_{CC} - 150$	$V_{CC} - 80$		mV
Output Voltage Swing, Low	$V_{OL}$	$I_{OUT} = -100\mu A$		3	15	mV
		$I_{OUT} = -5mA$		80	150	mV
Peak Output Current				250		mA
Continuous Output Current				35		mA
Slew Rate	SR			12		V/us
Power-Supply Rejection Ratio	PSRR	DC, $6V \leq V_{CC} \leq 16V$	60			dB
Open-Loop Gain				95		dB
Gain-Bandwidth Product	GBW	Buffer Configuration		8		MHz
Thermal Shutdown		Temperature Rising		150		$^{\circ}C$
		Hysteresis		15		

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### Typical Performance Curves

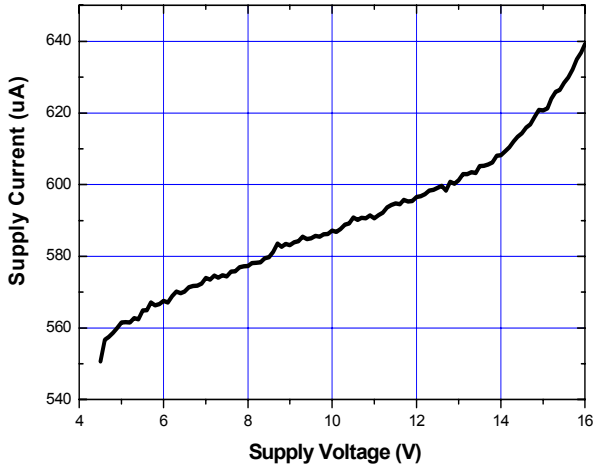


Figure 3. Supply Voltage vs. Supply Current

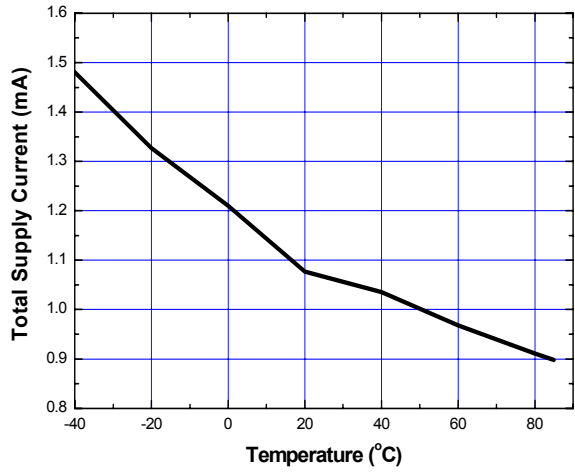


Figure 4. Total Supply Current vs. Temperature

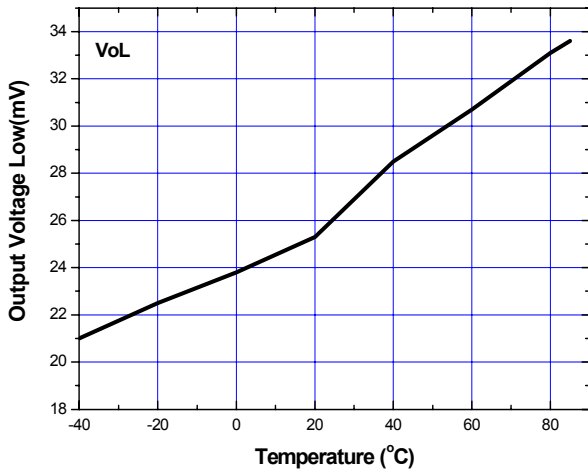


Figure 5. Output Voltage Low vs. Temperature

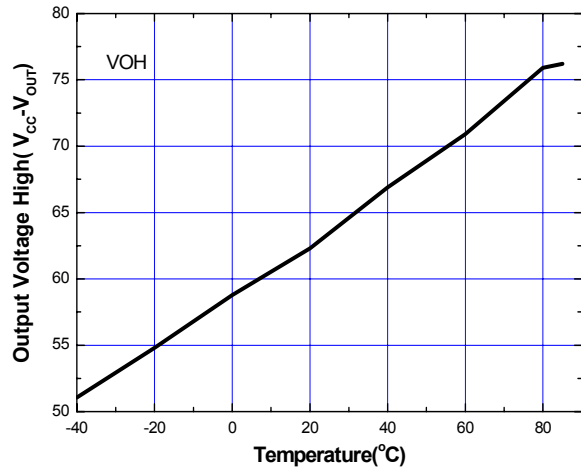


Figure 6. Output Voltage High vs. Temperature

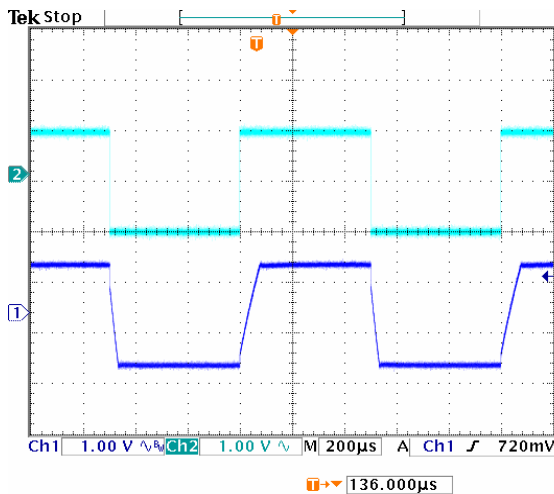


Figure 7. Large-Signal Step Response with 10uF Output Capacitor

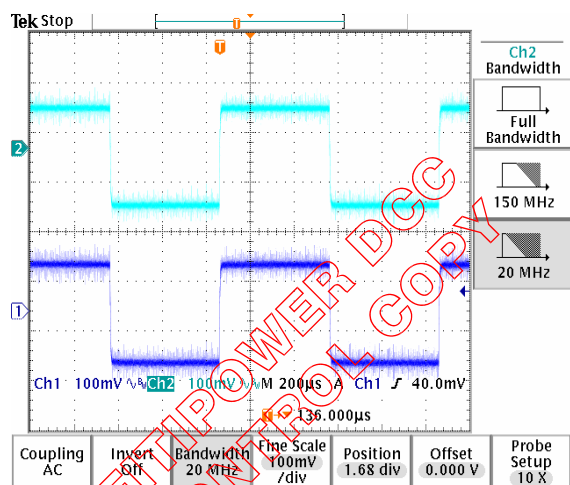


Figure 8. Small-Signal Step Response with 10uF Output Capacitor

## Typical Performance Curves (Continued)

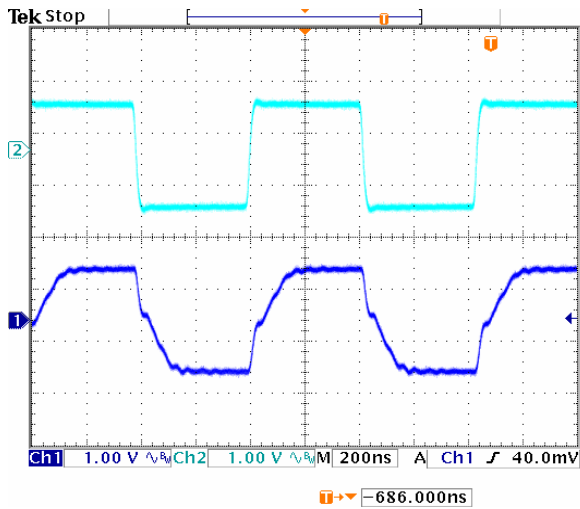


Figure 9. Large-Signal Step Response without Output Capacitor

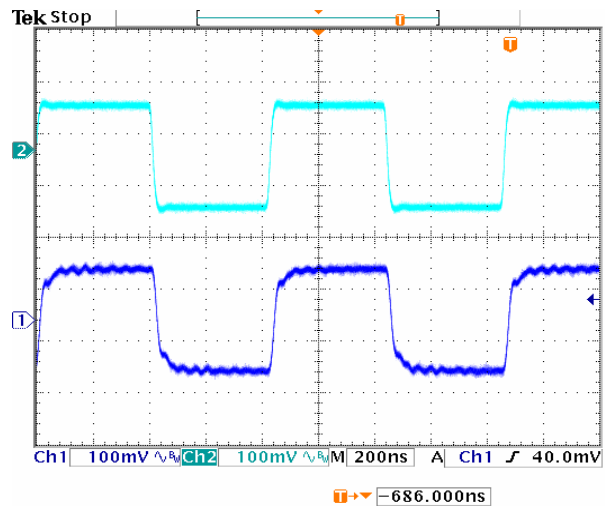


Figure 10. Small-Signal Step Response without Output Capacitor

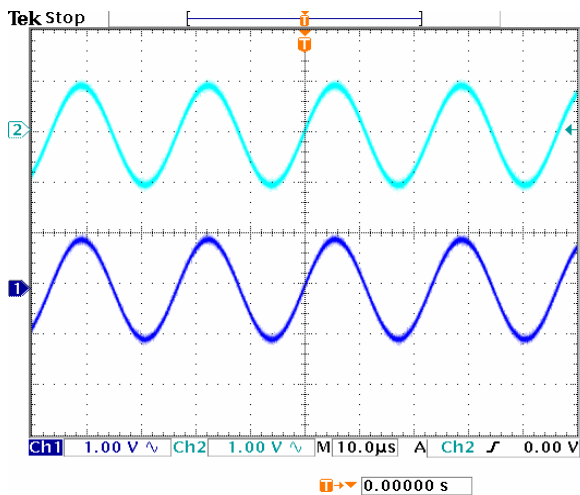


Figure 11. Large Signal Sin Wave Response

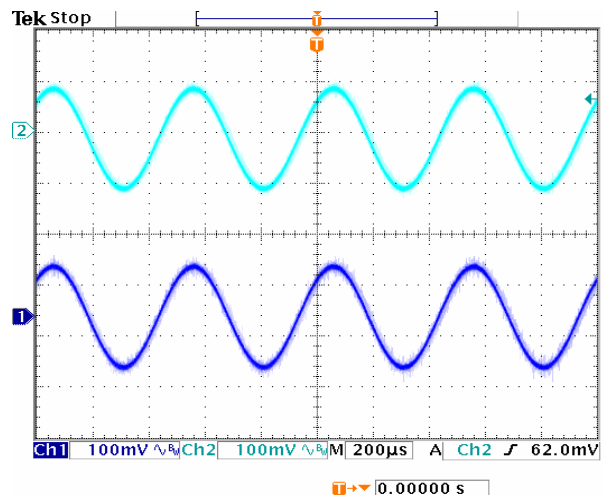


Figure 12. Small Signal Sin Wave Response

## Application Information

The FP8103 is a rail-to-rail operational amplifier that could provide 35mA continuous output current. Besides, on chip thermal shutdown feature provide protection against overload or ambient temperature that could exceed junction temperature.

### 1. Input Capacitor and output capacitor

A high-speed, high-current amp like the FP8103 must have generous decoupling capacitors. They should be as close to the power pins as possible.

The FP8103 could work without output capacitor. If a large output capacitor is needed. Enlarge the ESR of the output capacitor to insure stability.

### 2. Protection Features

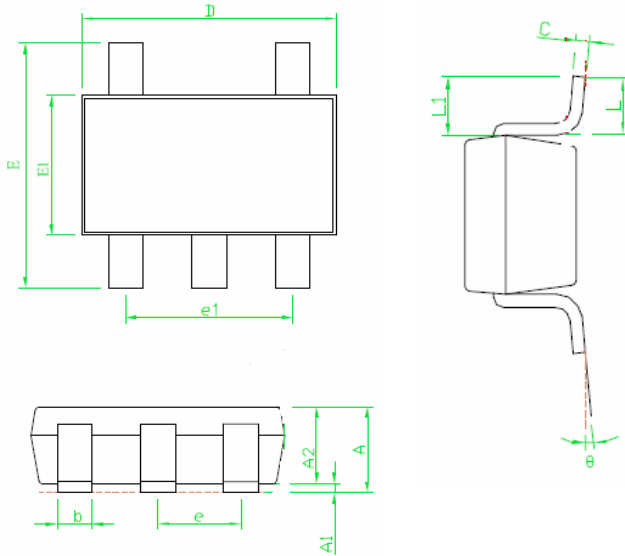
In order to prevent overloading or thermal condition from damaging device, FP8103 has internal thermal shutdown function designed to protect the device. It will rapidly shut off output element during over temperature condition.

### 3. Thermal Consideration

The power handling capability of the device will be limited by maximum operation junction temperature (150°C). The power dissipated by the device will be estimated by  $PD = I_{OUT} \times (V_{IN} - V_{OUT})$ . The power dissipation should be lower than the maximum power dissipation listed in "Absolute Maximum Ratings" section.

## Outline Information

TSOT-23-5 Package (Unit: mm)

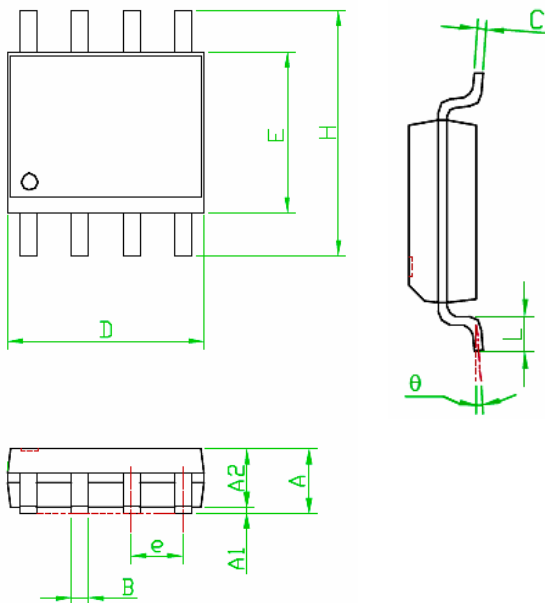


SYMBOLS UNIT	DIMENSION IN MILLIMETER		
	MIN	NOM	MAX
A	---	---	1.10
A1	0.00	---	0.10
A2	0.70	0.90	1.00
b	0.30	---	0.50
c	0.08	---	0.20
D	---	2.90	---
E	---	2.80	---
E1	---	1.60	---
e	0.95		
e1	1.90		
L	0.3	0.45	0.6
L1	0.60		
$\theta$	0°	4°	8°

Note 1 : Followed From JEDEC MO-193-C.

## Outline Information (Continued)

SOP- 8 Package (Unit: mm)



SYMBOLS UNIT	DIMENSION IN MILLIMETER		
	MIN	NOM	MAX
A	---	---	1.75
A1	0.10	---	0.25
A2	1.25	---	---
B	0.31	---	0.51
C	0.17	---	0.25
D	---	4.9	---
E	---	3.9	---
e	---	1.27	---
H	---	6.0	---
L	0.40	---	1.27
$\theta$	0°	4°	8°

Note 1 : Followed From JEDEC MO-012-E

### Life Support Policy

Fitipower's products are not authorized for use as critical components in life support devices or other medical systems.