

CMOS Operational Amplifier (Single) Monolithic IC MM3002

Outline

This IC is a CMOS (Single) operating amp for which input/output voltage both can be used up to the power supply voltage. Further, low offset voltage, low drift and low consumption current have been achieved. The package is the ultra-small SOT-25.

Features

- | | |
|--|---------------------------------|
| (1) Input voltage range ($V_{DD}=3V$) | $-0.1V \sim V_{DD} + 0.1V$ typ. |
| (2) Output voltage range ($V_{DD}=3V$) | $0.03V \sim 2.97V$ typ. |
| (3) Input offset voltage | 1mV typ. |
| (4) Input offset voltage temperature drift | $5\mu V/^\circ C$ typ. |
| (5) Input bias current | 5pA typ. |
| (6) Consumption current | $120\mu A$ typ. |
| (7) Output current | $\pm 5mA$ typ. |
| (8) Through rate | $0.6V/\mu S$ |

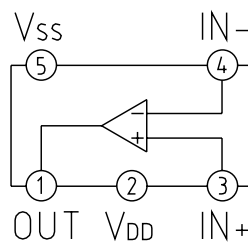
Package

SOT-25 (Mini mold)

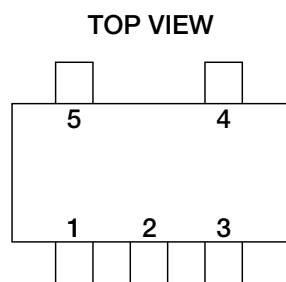
Applications

- (1) Communication equipment (mobile telephones, cordless telephones, etc.)
- (2) Computers and computer peripherals (notebook PCs, mini PCs, PDA, digital cameras, printers, scanners, etc.)
- (3) AV equipment (movies, CD players, MD players, etc.)
- (4) Other (navigation equipment, measurement equipment, handy terminals, etc.)

Block Diagram



Pin Assignment



SOT-25

1	OUT
2	V_{DD}
3	IN+
4	IN-
5	V_{SS}

Pin Description

Pin No.	Pin name	Functions	Internal Equivaalent Circuit
1	OUT	Output pin	
2	V _{DD}	Power supply input pin	
3	IN+	Non - inverting input pin	
4	IN-	Inverting input pin	
5	V _{SS}	V _{SS} PIN	

Absolute Maximum Ratings (Except where noted otherwise, Ta=25°C)

Item	Symbol	Ratings	Units
Storage temperature	T _{STG}	-40~+125	°C
Operating temperature	T _{OPR}	-30~+85	°C
Power supply voltage	V _{DD} max.	10	V
Input voltage	V _I	-0.3~V _{DD} +0.3	V

Recommended Operating Conditions

Item	Symbol	Ratings	Units
Operating temperature	T _{OPR}	-30~+85	°C
Power supply voltage	V _{OPR}	+2.7~+9	V
Input voltage	V _I	0~V _{DD}	V

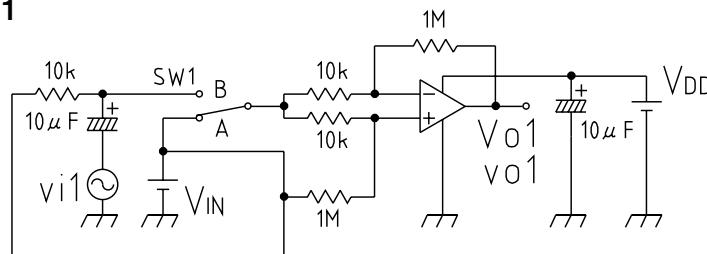
Electrical Characteristics (Except where noted otherwise, Ta=25°C, V_{DD}=3V, V_{IN}=1.5V)

Item	Symbol	Measurement conditions	Measurement circuit	Min.	Typ.	Max.	Units
Input offset voltage	V _{OS}	R _S ≤ 10kΩ	1		1	3	mV
Input offset voltage temperature Drift	ΔV _{OS} /ΔTa	Ta=-30°C~+85°C	1		5		μV/°C
Input bias current	I _B		2		5		pA
Common - mode signal rejection ratio	CMRR		1	60	70		dB
Power supply voltage rejection ratio	PSRR	V _{DD} =3V~5V	1	70	90		dB
Current consumption	I _{DD}		3	50	120	240	μA
Input voltage L	V _{IL}		4		-0.1	0	V
Input voltage H	V _{IH}		5	V _{DD}	V _{DD} +0.1		V
Voltage gain	A _V	R _L ≥ 100kΩ	6	80	95		dB
Gain band area	GBW	A _V =0dB	6		800		kHz
Output voltage L	V _{OL}	R _L =10kΩ	7		0.03	0.05	V
Output voltage H	V _{OH}	R _L =10kΩ	8	2.95	2.97		V
Output flow current	I _{SO}		9	2.5	5		mA
Output inflow current	I _{SI}		10	2.5	5		mA
Through rate	SR		11		0.6		V/μs

NOTE1 Put capacitors of number μF between V_{DD}-V_{SS} when using.

Measuring Circuit (Except where noted otherwise, Ta=25°C, V_{DD}=3V, V_{IN}=V_{DD}/2, SW1;A)

Measuring circuit 1

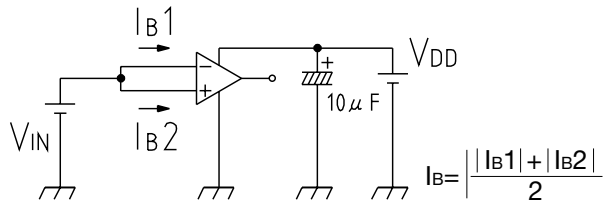


$$V_{OS} = \left| \frac{V_{O1} - V_{IN}}{100} \right|$$

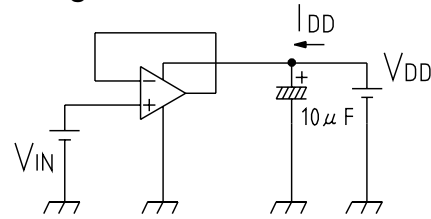
$$CMRR = 20 \log \left| \frac{100 \times v_{i1}}{V_{O1}} \right| \quad \text{SW1 ; B } v_{i1} = 1V_{(P-P)}$$

$$PSRR = 20 \log \left| \frac{(5-3) \times 100}{(V_{O1} - V_{IN1}) - (V_{O2} - V_{IN2})} \right| \quad V_{IN2}, V_{O2} ; V_{DD} = 5V$$

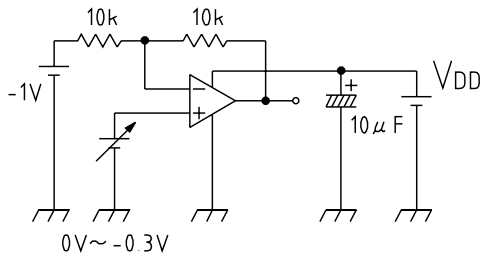
■ Measuring circuit 2



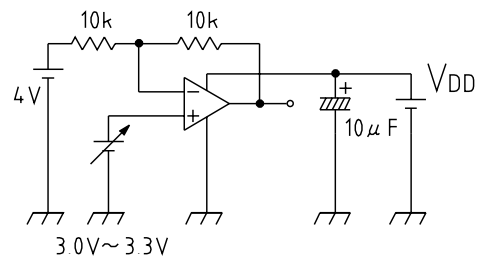
■ Measuring circuit 3



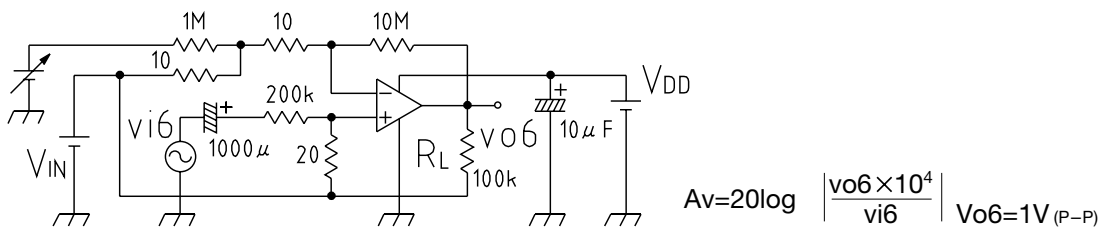
■ Measuring circuit 4



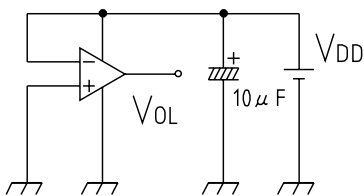
■ Measuring circuit 5



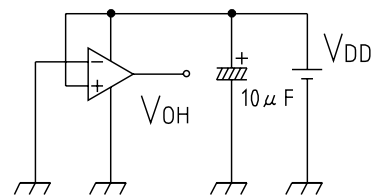
■ Measuring circuit 6



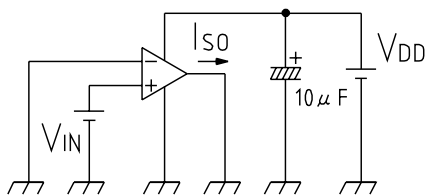
■ Measuring circuit 7



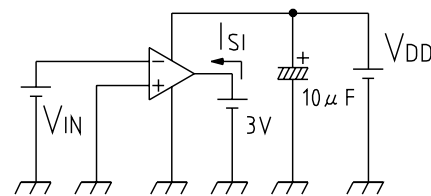
■ Measuring circuit 8



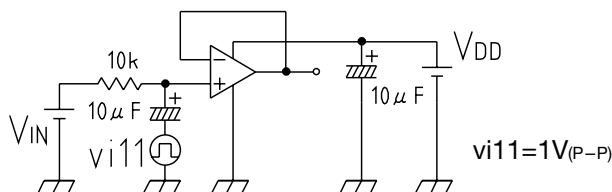
■ Measuring circuit 9



■ Measuring circuit 10

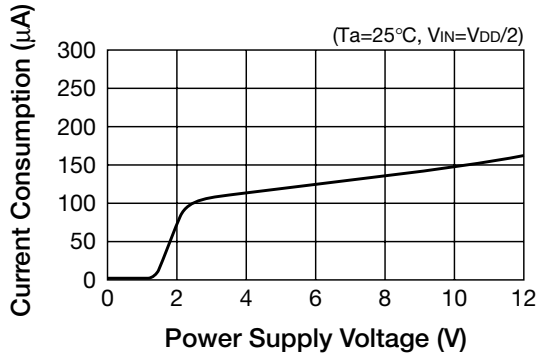


■ Measuring circuit 11

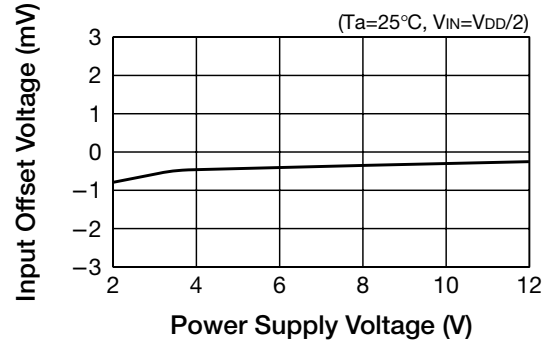


Characteristics

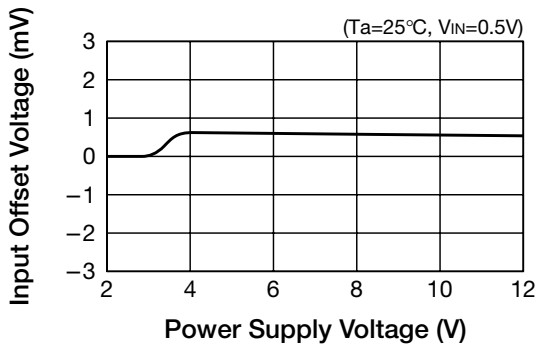
■ Current consumption vs power supply voltage



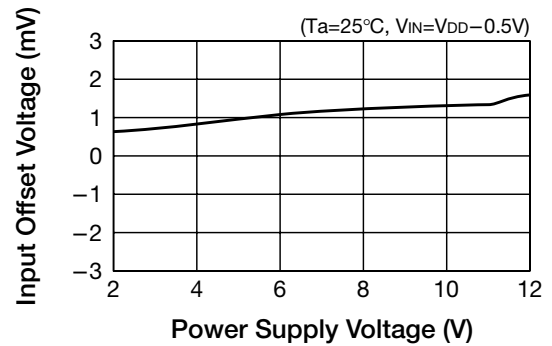
■ Input offset voltage vs power supply voltage



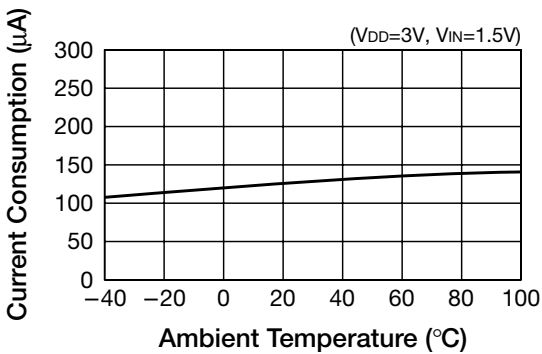
■ Input offset voltage vs power supply voltage



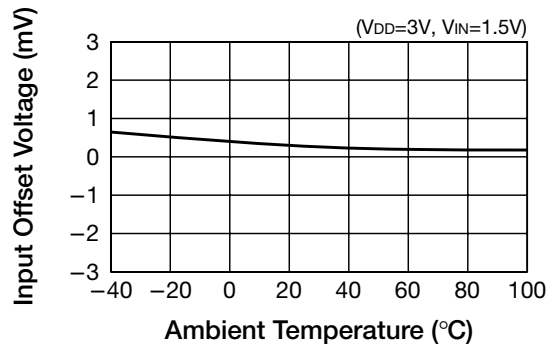
■ Input offset voltage vs power supply voltage



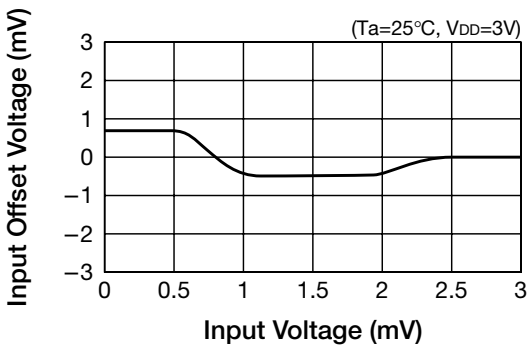
■ Current consumption vs ambient temperature



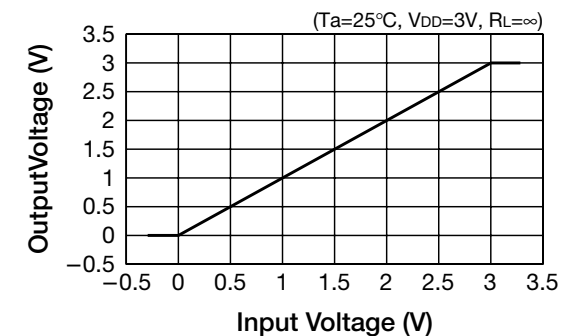
■ Input offset voltage vs ambient temperature



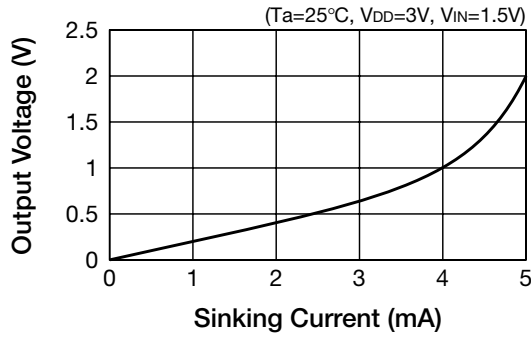
■ Input offset voltage vs input voltage



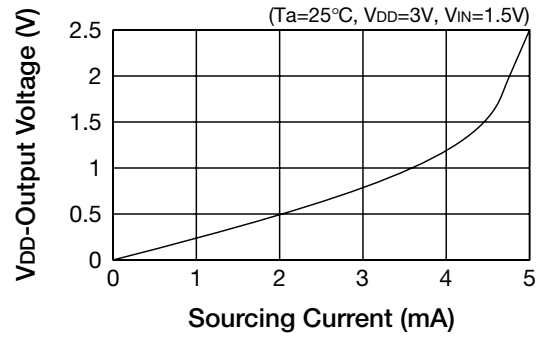
■ Output voltage vs input voltage



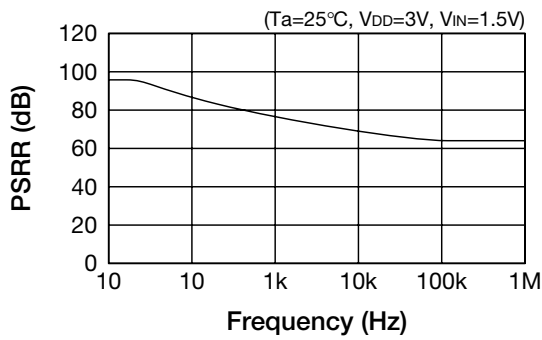
■ Output voltage vs sinking current



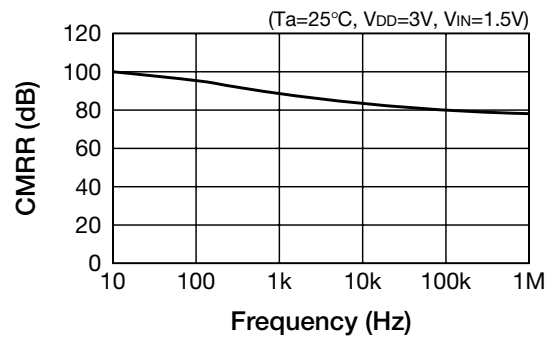
■ Output voltage vs sourcing current



■ PSRR vs frequency



■ CMRR vs frequency



■ Voltage gain vs frequency

