

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 | $0.6V/\mu S$ |

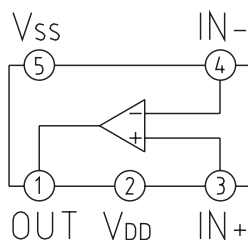
Package

SOT-25

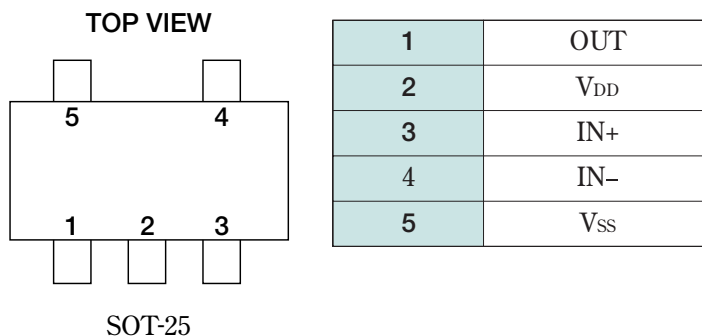
Applications

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

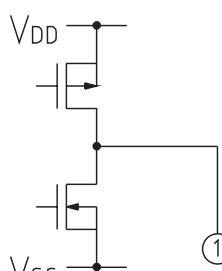
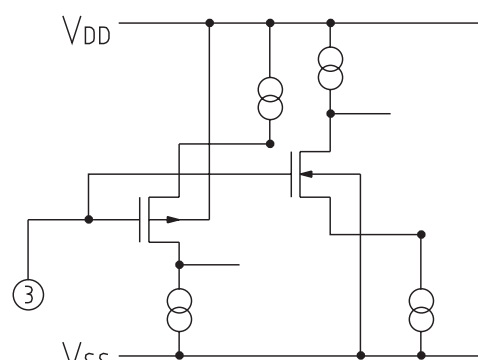
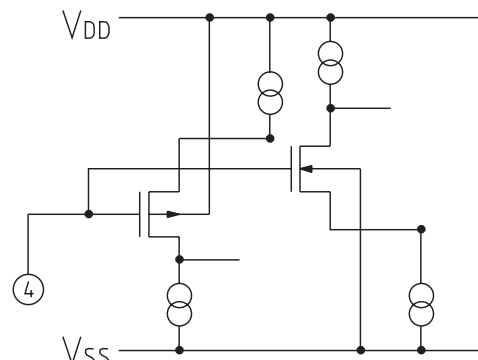
Block Diagram



Pin Assignment



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

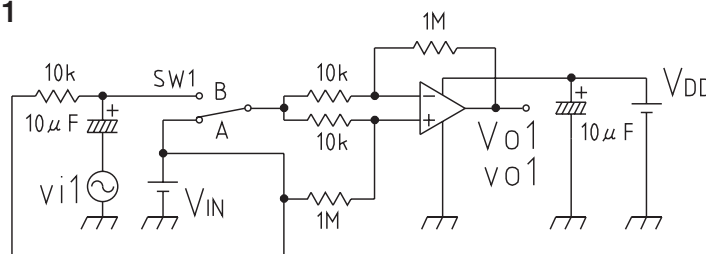
Electrical Characteristics (Except where noted otherwise, Ta=25°C, V_{DD}=3V, V_{IN}=1.5V)

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}		7		0.03	0.05	V
Output voltage H	V _{OH}		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

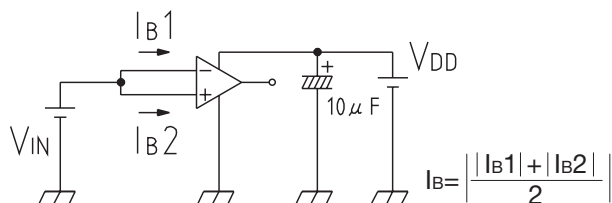


$$V_{OS} = \left| \frac{V_{O1} - V_{IN}}{100} \right|$$

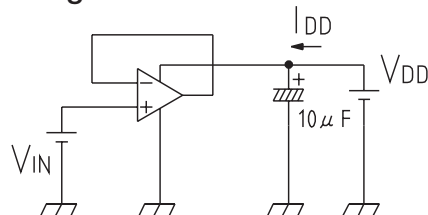
$$CMRR = 20 \log \left| \frac{100 \times v_{i1}}{v_{o1}} \right| \quad \text{SW1 ; B } v_{i1} = 1V_{(P-P)}$$

$$PSRR = 20 \log \left| \frac{(5-3) \times 100}{(v_{o1} - V_{IN1}) - (v_{o2} - V_{IN2})} \right| \quad V_{IN2}, V_{O2} ; V_{DD} = 5V$$

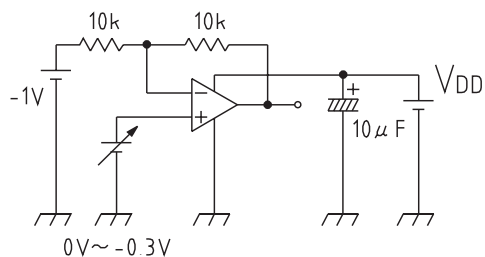
■ Measuring circuit 2



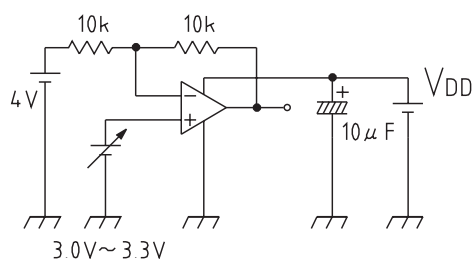
■ Measuring circuit 3



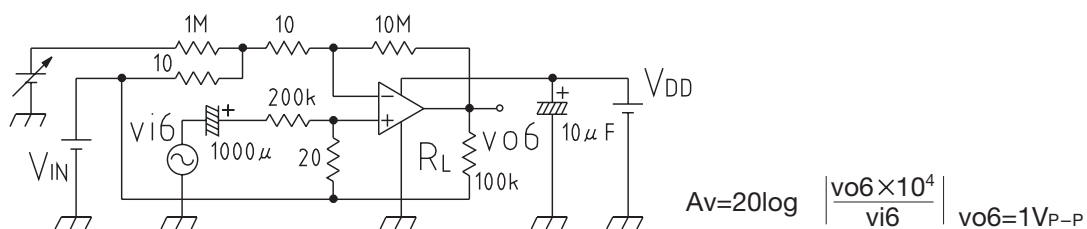
■ Measuring circuit 4



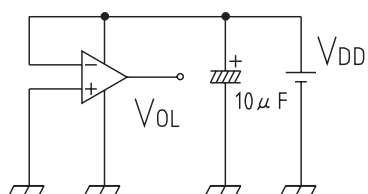
■ Measuring circuit 5



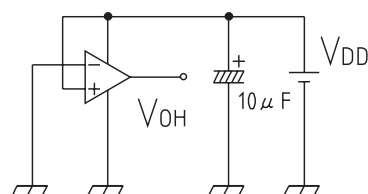
■ Measuring circuit 6



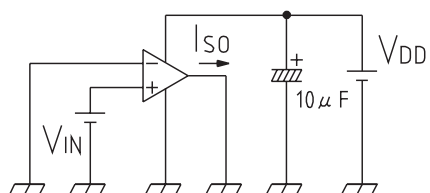
■ Measuring circuit 7



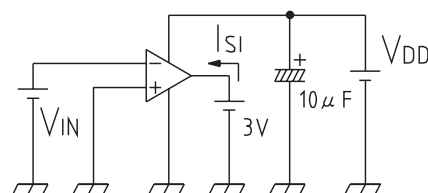
■ Measuring circuit 8



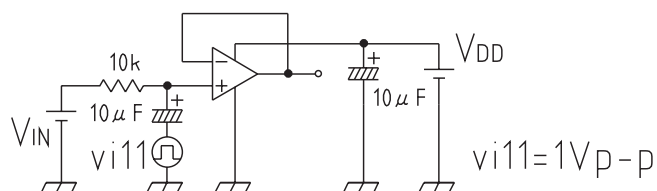
■ Measuring circuit 9



■ Measuring circuit 10

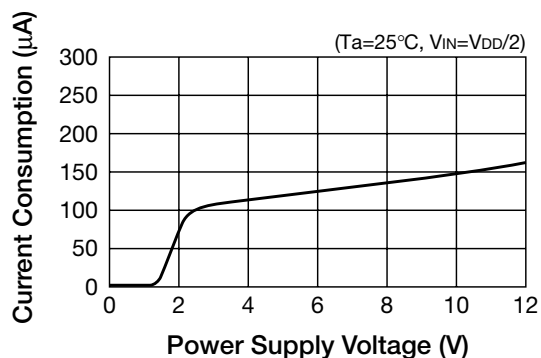


■ Measuring circuit 11

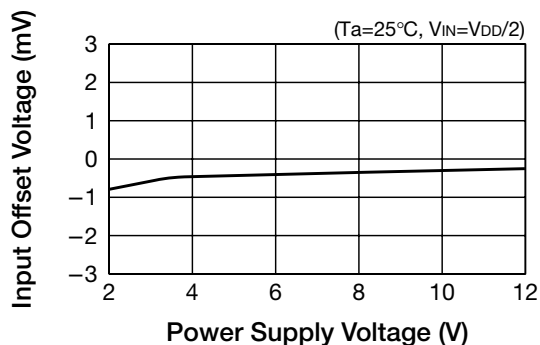


Characteristics

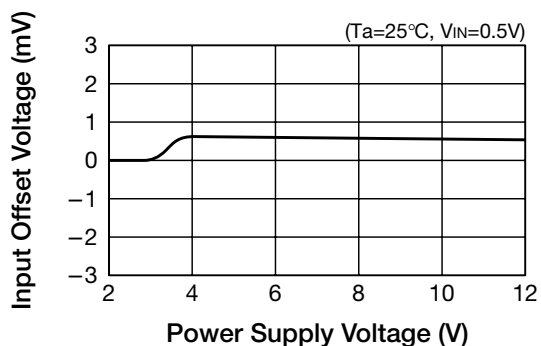
Current consumption vs power supply voltage



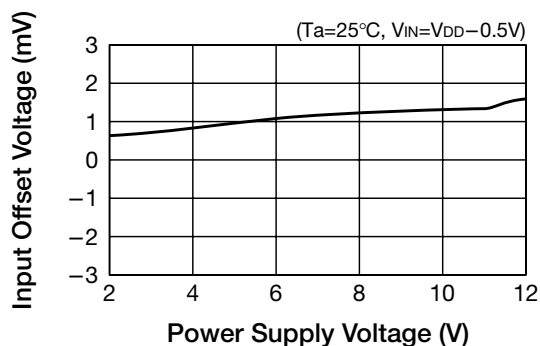
Input offset voltage vs power supply voltage



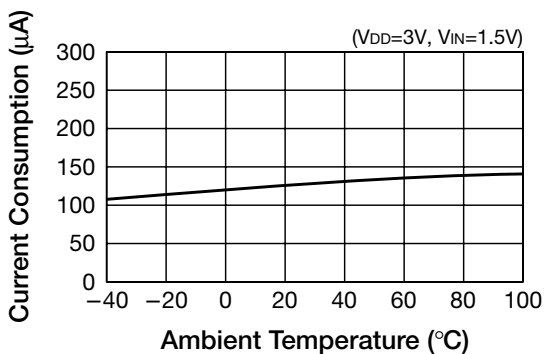
Input offset voltage vs power supply voltage



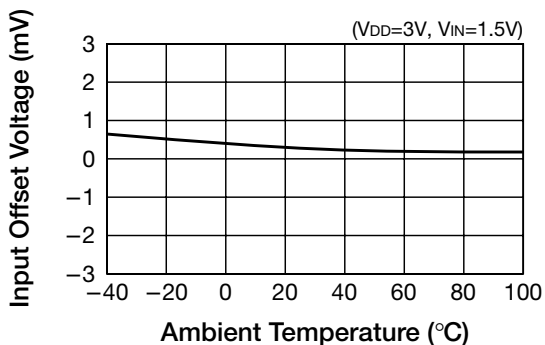
Input offset voltage vs power supply voltage



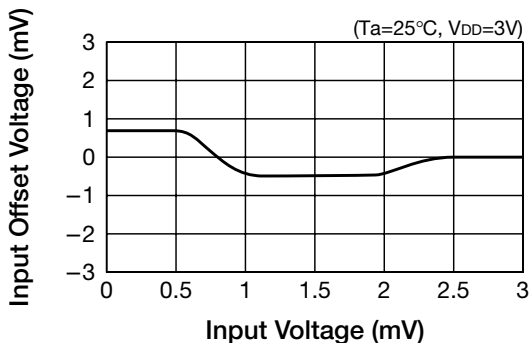
Current consumption vs ambient temperature



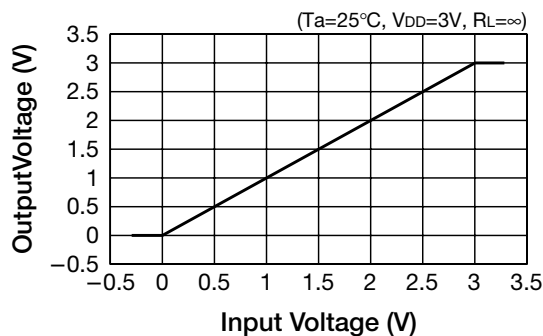
Input offset voltage vs ambient temperature



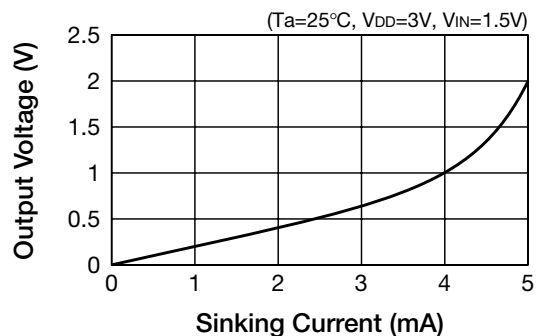
Input offset voltage vs input voltage



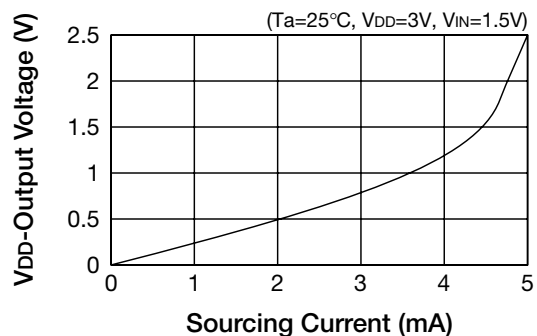
Output voltage vs input voltage



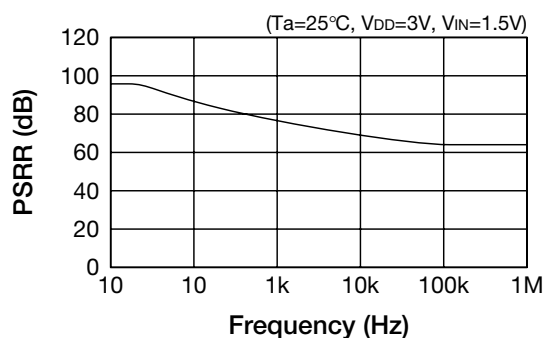
■ Output voltage vs sinking current



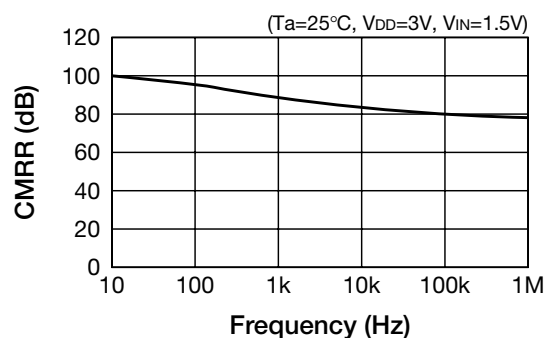
■ Output voltage vs sourcing current



■ PSRR vs frequency



■ CMRR vs frequency



■ Voltage gain vs frequency

