

DUAL HIGH SPEED SINGLE SUPPLY OPERATIONAL AMPLIFIER

■FEATURES

- High Slew Rate 10V/ μ s
- High Bandwidth 3MHz
- High Unity Gain Frequency 3.6MHz
- Input Offset Voltage 5.5mV max.
- Single Supply 3V~36V
- Operating Temperature Range -40°C~+125°C
- Low input voltage around GND level
- Unity-Gain Stable
- Operating Current (All amplifiers) 4mA
- No Phase Reversal
- High EMI Immunity
- Output Short-Circuit Protection
- Package

NJM3472	SOP8, SSOP8, VSP8
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■GENERAL DESCRIPTION

The NJM3472 is a dual high speed single supply operational amplifier with operation voltage range from 3V to 36V and operation temperature range from -40 to 125°C.

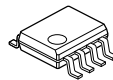
10V/ μ s slew rate and 3MHz gain bandwidth is suitable for inverter and active filter.

Compared with the TL3472, the characteristics of low-power are improved.

■APPLICATIONS

- Current Sensor
- Buffer Application Amplifier
- Active filter
- Battery Application

■PACKAGE OUTLINE



**NJM3472G
(SOP8)**

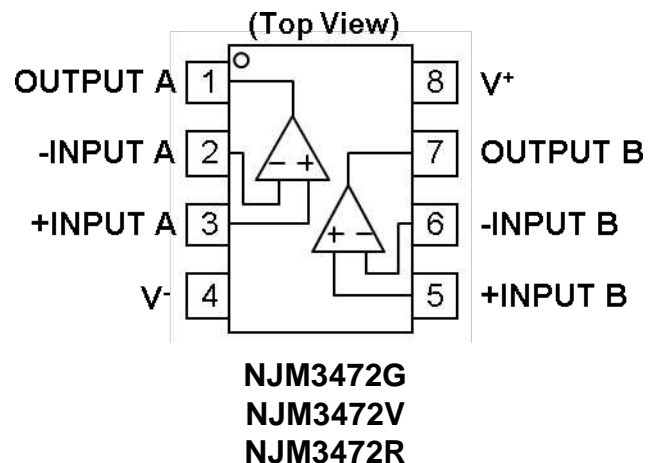


**NJM3472V
(SSOP8)**



**NJM3472R
(VSP8)**

■PIN CONFIGURATION

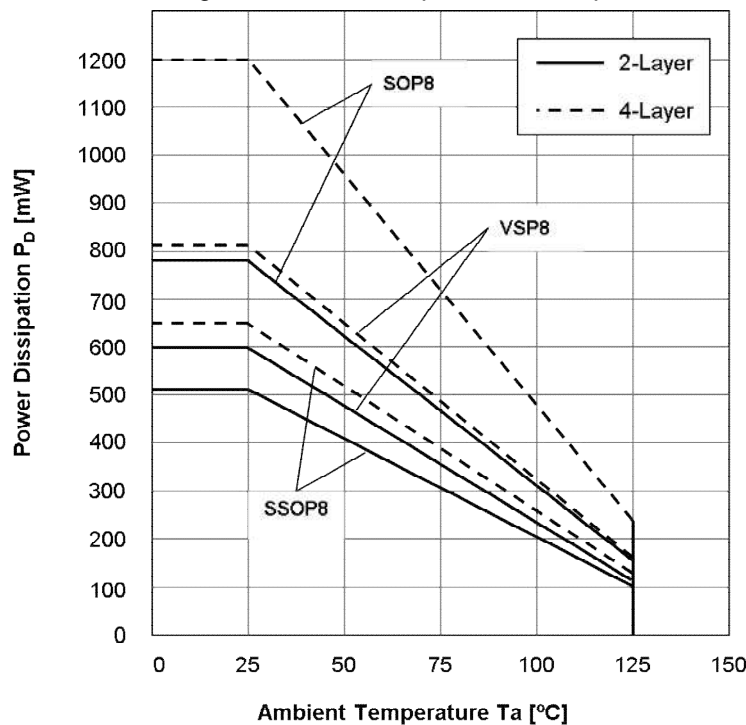


■ **ABSOLUTE MAXIMUM RATINGS** (Ta=25°C, unless otherwise noted.)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	$V^+ - V^-$	40 ⁽⁵⁾	V
Differential Input Voltage ⁽¹⁾	V_{ID}	± 40 ⁽²⁾	V
Input Voltage ⁽²⁾	V_{IN}	$V^- - 0.3$ to $V^+ + 40$	V
Output Terminal Input Voltage	V_O	$V^- - 0.3$ to $V^+ + 0.3V$	V
Power Dissipation ⁽³⁾	P_D	(2-layer / 4-layer)	mW
SOP8		780 / 1200	
SSOP8		510 / 650	
VSP8		600 / 810	
Output Short-Circuit Duration ⁽⁴⁾		infinite	
Operating Temperature Range	T_{opr}	-40 to +125	°C
Storage Temperature Range	T_{stg}	-55 to +150	°C

- (1) Differential voltage is the voltage difference between +INPUT and -INPUT.
- (2) Input voltage should be allowed to apply to the input terminal independent of the magnitude of V^+ . The normal operation will establish when any input is within the Common Mode Voltage Range of electrical characteristics.
- (3) Power dissipation is the power that can be consumed by the IC at Ta=25°C, and is the typical measured value based on JEDEC condition. When using the IC over Ta=25°C subtract the value [mW/°C]=PD/(Tstg(MAX)-25) per temperature.
 2-layer: EIA/JEDEC STANDARD Test board (76.2x114.3x1.6mm, 2layers, FR-4) mounting
 4-layer: EIA/JEDEC STANDARD Test board (76.2x114.3x1.6mm, 4layers, FR-4) mounting
- (4) Temperature and/or supply voltages must be limited to ensure the maximum dissipation rating is not exceeded.
- (5) Supply Voltage is the voltage difference between V^+ and V^- .

Figure1. Power Dissipation vs. Temperature



■ **RECOMMENDED OPERATING CONDITIONS** (Ta=25°C)

PARAMETER	Supply Voltage	UNIT
Supply Voltage	+3 to +36 (± 1.5 to ± 18)	V

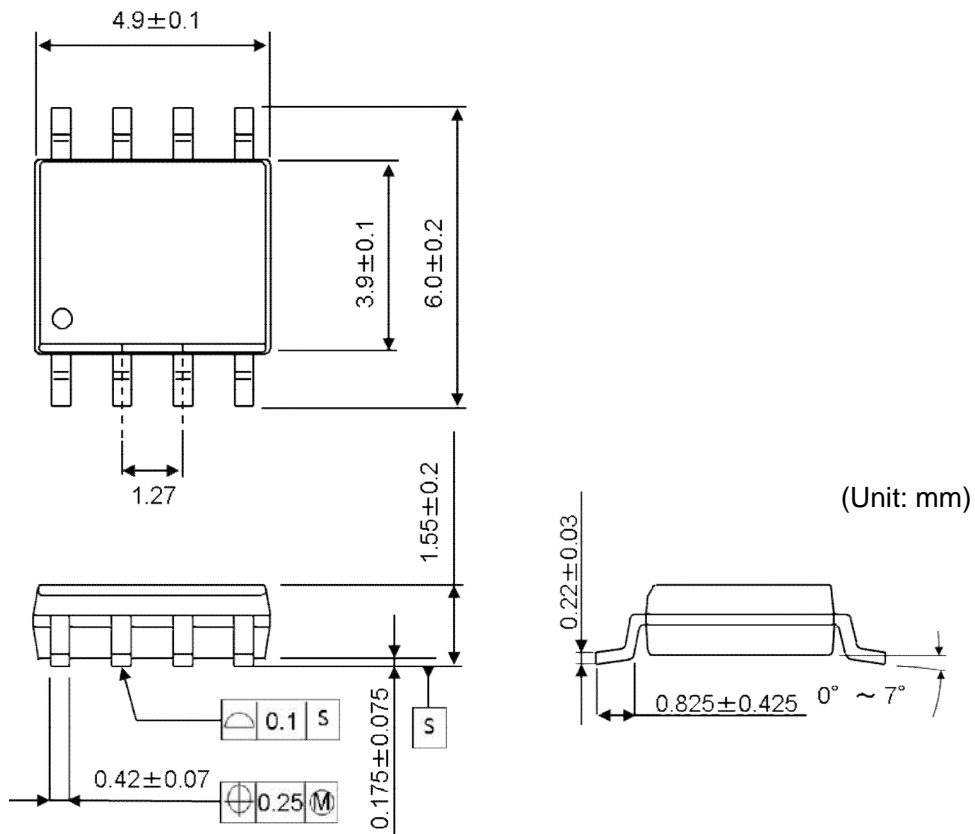
■ELECTRICAL CHARACTERISTICS ($V^+=+15V$, $V^-=-15V$, $V_{CM}=0V$, $T_a=25^\circ C$ unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
INPUT CHARACTERISTICS						
Input Offset Voltage	V_{IO}	$R_S=50\Omega$, $V_{CM}=0V$	-	1	5.5	mV
Input Offset Voltage Drift	$\Delta V_{IO}/\Delta T$	$T_a=-40^\circ C \sim +125^\circ C$	-	10	-	$\mu V/^\circ C$
Input Bias Current	I_B		-	80	150	nA
Input Offset Current	I_{IO}		-	5	75	nA
Open-Loop Voltage Gain	A_V	$V_O=\pm 10V$, $R_L=2k\Omega$ to $0V$	80	95	-	dB
Common Mode Rejection Ratio	CMR	$V_{ICM}=-15V$ to $13.0V$	60	100	-	dB
Common Mode Input Voltage Range	V_{ICM}	CMR ≥ 60 dB	V^-	-	$V^+-2.0$	V
OUTPUT CHARACTERISTICS						
High-level Output Voltage	V_{OH}	$R_L=10k\Omega$ to $0V$	13.7	14	-	V
		$R_L=2k\Omega$ to $0V$	13.5	13.8	-	
Low-level Output Voltage	V_{OL}	$R_L=10k\Omega$ to $0V$	-	-14.8	-14.3	V
		$R_L=2k\Omega$ to $0V$	-	-13.8	-13.5	
Output Source Current	I_{SOURCE}	$V_O=0V$, +Input= $+1V$, -Input= $0V$	10	35	-	mA
Output Sink Current	I_{SINK}	$V_O=0V$, +Input= $0V$, -Input= $+1V$	20	60	-	mA
POWER SUPPLY						
Supply Current (All amplifiers)	I_{SUPPLY}	No Signal, $R_L=\infty$	-	4	5	mA
Supply Voltage Rejection Ratio	SVR	$V^+/V^-=\pm 2V$ to $\pm 18V$, $V_{ICM}=0V$	60	95	-	dB
AC CHARACTERISTICS						
Gain Bandwidth Product	GBW	$R_L=2k\Omega$ to $0V$, $f=100kHz$	-	3	-	MHz
Unity Gain Frequency	f_T	$R_L=2k\Omega$ to $0V$	-	3.6	-	MHz
Slew Rate	SR	$G_V=0dB$, $R_L=2k\Omega$ to $0V$, $C_L=20pF$, $V_{in}=-10V$ to $+10V$	7.5	10	-	V/ μs
Full Power Bandwidth	FPBW	$G_V=0dB$, $R_L=2k\Omega$ to $0V$, $C_L=20pF$, $V_O=20V_{pp}$, THD=5.0%	-	190	-	kHz
Settling Time	t_s	$G_V=0dB$, 10V step To 0.1%	-	1.8	-	μs
		$G_V=0dB$, 10V step To 0.01%	-	12	-	
Phase Margin	ϕ_M	$R_L=2k\Omega$ to $0V$, $C_L=20pF$	-	78	-	deg
		$R_L=2k\Omega$ to $0V$, $C_L=220pF$	-	68	-	
Gain Margin	GM	$R_L=2k\Omega$ to $0V$, $C_L=20pF$	-	12	-	dB
		$R_L=2k\Omega$ to $0V$, $C_L=220pF$	-	6	-	
NOISE, THD						
Equivalent Input Noise Voltage	e_n	$f=1kHz$	-	48	-	nV/ \sqrt{Hz}
Total Harmonic Distortion + Noise	THD+N	$G_V=20dB$, $R_L=2k\Omega$ to $0V$, $C_L=20pF$, $f=10kHz$, $V_O=20V_{pp}$	-	0.02	-	%
Channel Separation	CS	$f=1kHz$, Equivalent Input value	-	120	-	dB

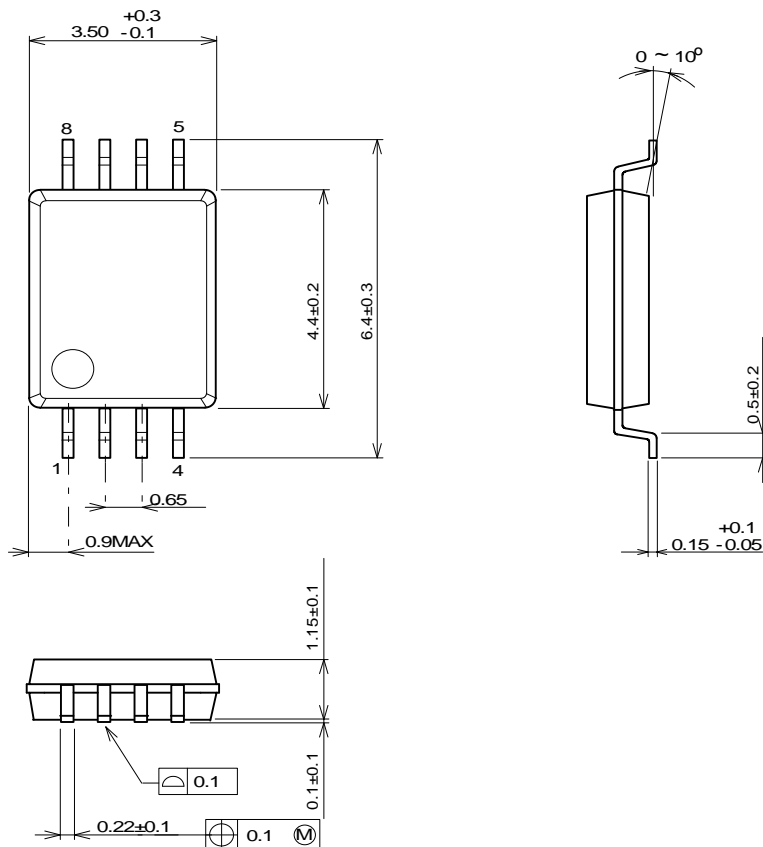
■ELECTRICAL CHARACTERISTICS ($V^+=+5V$, $V^-=0V$, $V_{CM}=2.5V$, $T_a=25^\circ C$ unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
INPUT CHARACTERISTICS						
Input Offset Voltage	V_{IO}	$R_S=50\Omega$, $V_{CM}=0V$, $V_o=V^+/2$	-	1	5.5	mV
Input Offset Voltage Drift	$\Delta V_{IO}/\Delta T$	$T_a=-40^\circ C \sim +125^\circ C$	-	10	-	$\mu V/^\circ C$
Input Bias Current	I_B	$V_{CM}=V^+/2$, $V_o=V^+/2$	-	80	150	nA
Input Offset Current	I_{IO}	$V_{CM}=V^+/2$, $V_o=V^+/2$	-	5	75	nA
Open-Loop Voltage Gain	A_v	$V_o=1.5V$ to $3.5V$, $R_L=2k\Omega$ to $V^+/2$	80	95	-	dB
Common Mode Rejection Ratio	CMR	$V_{CM}=0V$ to $3V$	60	90	-	dB
Common Mode Input Voltage Range	V_{ICM}	CMR ≥ 60 dB	V^-	-	$V^+-2.0$	V
OUTPUT CHARACTERISTICS						
High-level Output Voltage	V_{OH}	$R_L=2k\Omega$ to $0V$	3.7	4	-	V
Low-level Output Voltage	V_{OL}	$R_L=2k\Omega$ to $0V$	-	0.1	0.3	V
Output Source Current	I_{SOURCE}	$V_o=0V$	10	28	-	mA
Output Sink Current	I_{SINK}	$V_o=5V$	20	60	-	mA
POWER SUPPLY						
Supply Current (All amplifier)	I_{SUPPLY}	No Signal, $R_L=\infty$	-	3.3	4.5	mA
AC CHARACTERISTICS						
Gain Bandwidth Product	GBW	$R_L=2k\Omega$ to $0V$, $f=100kHz$	-	3	-	MHz
Unity Gain Frequency	f_T	$R_L=2k\Omega$ to $0V$	-	3.2	-	MHz
Slew Rate	SR	$G_v=0dB$, $R_L=2k\Omega$ to $0V$, $C_L=20pF$, $V_{in}=+2V$ to $+3V$	5	7	-	V/ μs
Phase Margin	ϕ_M	$R_L=2k\Omega$ to $0V$, $C_L=20pF$	-	64	-	deg
Gain Margin	GM	$R_L=2k\Omega$ to $0V$, $C_L=20pF$	-	13	-	dB
NOISE, THD						
Equivalent Input Noise Voltage	e_n	$f=1kHz$	-	48	-	nV/\sqrt{Hz}
Total Harmonic Distortion + Noise	THD+N	$G_v=6dB$, $R_L=2k\Omega$ to $0V$, $C_L=20pF$, $f=1kHz$, $V_o=2V_{pp}$	-	0.01	-	%
Channel Separation	CS	$f=1kHz$, Equivalent Input value	-	120	-	dB

■ PACKAGE DIMENSIONS

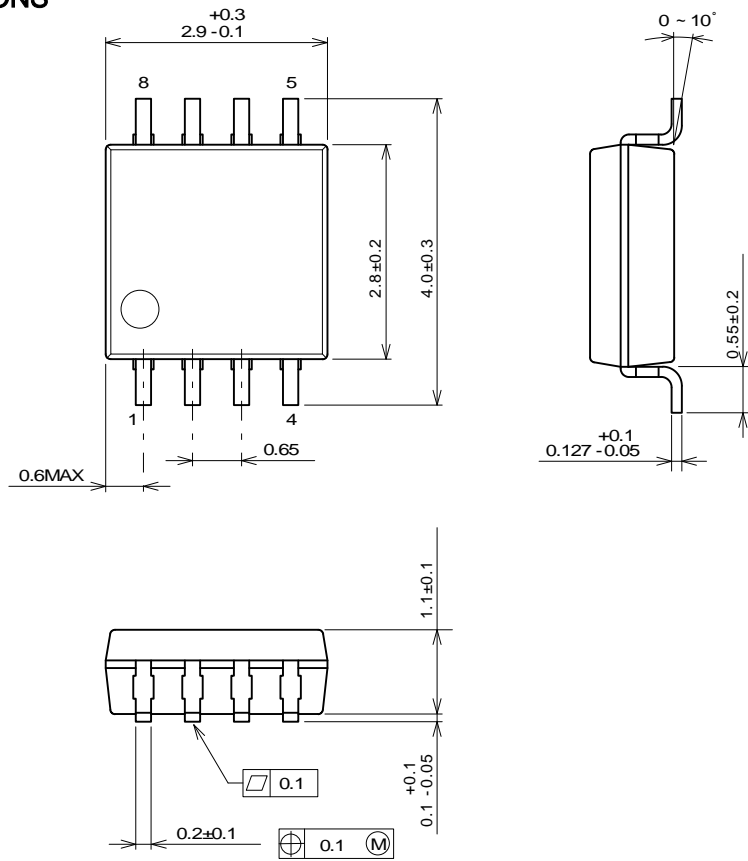


SOP8 Package



SSOP8 Package

■ PACKAGE DIMENSIONS



(Unit: mm)

MSOP8 (TVSP8) JEDEC MO-187-DA / thin type Package

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