HIGH SPEED SINGLE SUPPLY OPERATIONAL AMPLIFIER

■FEATURES

●High Slew Rate	10V/µs
●High Bandwidth	3MHz
●High Unity Gain Frequency	3.6MHz
●Input Offset Voltage	5.5mV max.
●Single Supply	3V to 36V
●Operating Temperature Range	-40°C to +125°C

●Low input voltage around GND level
●Unity-Gain Stable
●No Phase Reversal
●High EMI Immunity
●Output Short-Circuit Protection
●Operating Current (All amplifiers)
NJM3472 4mA
NJM3474 8mA
●Package
NJM3472 SOP8, SSOP8, MSOP8(VSP8)
NJM3474 SOP14, SSOP14

■GENERAL DESCRIPTION

The NJM3472/NJM3474 are high speed single supply operational amplifier.

10V/µs slew rate, 3MHz gain bandwidth and 5.5mV max. offset voltage are suitable for inverter current sense application, motor load current sense application and active filter.

As a further feature, operation voltage range from 3V to 36V and operation temperature range from -40 to +125°C are suitable for general-purpose inverters, power supply unit and high performance home appliance. Compared with the TL3472/TL3474, the characteristics of low-power are improved.

■APPLICATIONS

●Motor, Inverter Current Sense Application
●Power Supply Application
●Buffer Application Amplifier
●Active filter

■PIN CONFIGURATION / PRODUCT INFORMATION

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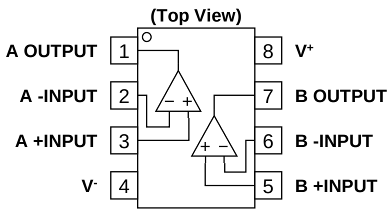
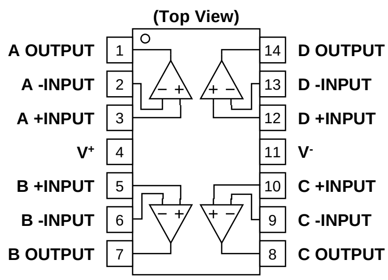
<tr><td>PIN FUNCTION</td><td colspan="3">
</td><td colspan="2">
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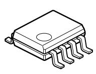
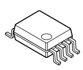
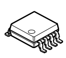
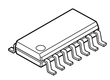
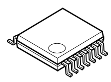
<tr><td>PACKAGE</td><td>
SOP8</td><td>
SSOP8</td><td>
MSOP8(VSP8)</td><td>
SOP14</td><td>
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<tr><td>PART NUMBER</td><td>NJM3472G</td><td>NJM3472V</td><td>NJM3472R</td><td>NJM3474G</td><td>NJM3474V</td></tr>
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■ABSOLUTE MAXIMUM RATINGS (Ta=25ºC, 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) SOP8 SSOP8 MSOP8(VSP8) SOP14 SSOP14	P_D	(2-layer / 4-layer) 780 / 1200 510 / 650 600 / 810 1200 / 1900 600 / 770	mW
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^-.

Figure1A. Power Dissipation vs. Temperature

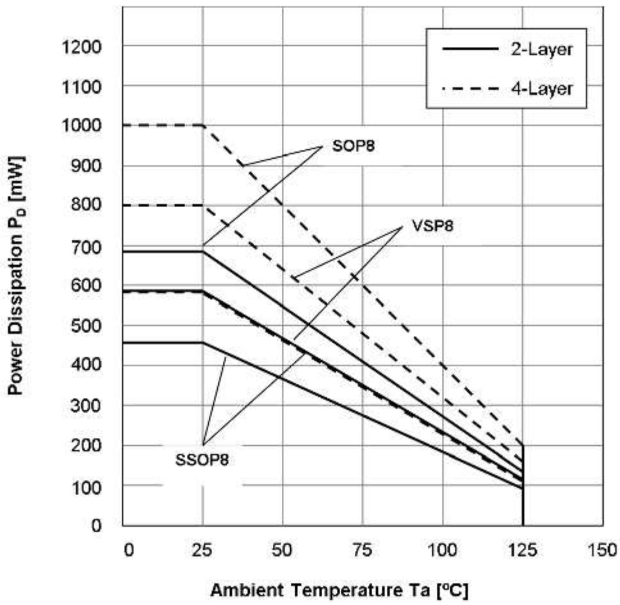
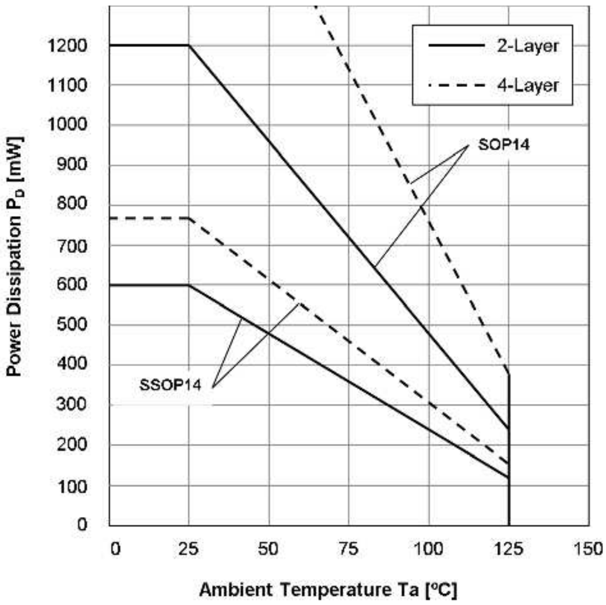


Figure1B. Power Dissipation vs. Temperature



■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, Ta=25°C unless otherwise noted)

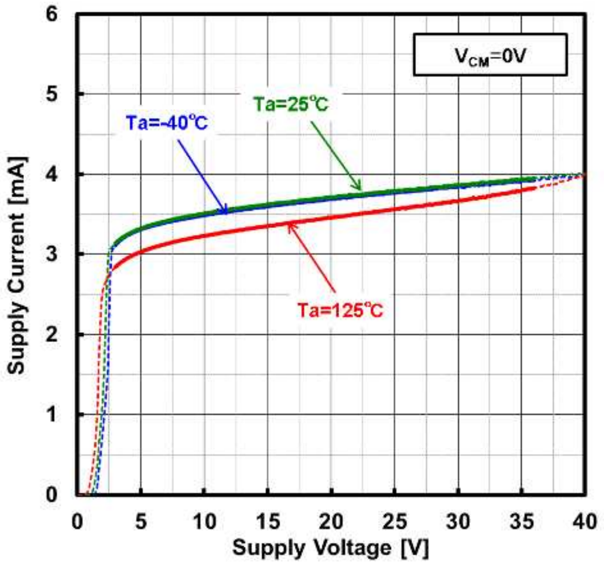
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
INPUT CHARACTERISTICS						
Input Offset Voltage	V_{IO}	R_S=50Ω, V_{CM}=0V	-	1	5.5	mV
Input Offset Voltage Drift	$\Delta V_{IO}/\Delta T$	Ta=-40°C~+125°C	-	10	-	µV/ºC
Input Bias Current	I_B		-	80	150	nA
Input Offset Current	I_{IO}		-	5	75	nA
Open-Loop Voltage Gain	A_V	V_O=±10V, R_L=2kΩ 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≥60dB	V^-	-	V^+-2.0	V
OUTPUT CHARACTERISTICS						
High-level Output Voltage	V_{OH}	R_L=10kΩ to 0V	13.7	14	-	V
		R_L=2kΩ to 0V	13.5	13.8	-	
Low-level Output Voltage	V_{OL}	R_L=10kΩ to 0V	-	-14.8	-14.3	V
		R_L=2kΩ to 0V	-	-13.8	-13.5	
Output Source Current	I_{SOURCE}	Vo=0V, +Input=+1V, -Input=0V	10	35	-	mA
Output Sink Current	I_{SINK}	Vo=0V, +Input=0V, -Input=+1V	20	60	-	mA
POWER SUPPLY						
Supply Current (All amplifiers)	I_{SUPPLY}	No Signal, R_L=∞				
NJM3472			-	4	5	mA
NJM3474			-	8	10	mA
Supply Voltage Rejection Ratio	SVR	V^+/V^-=±2V to ±18V, V_{ICM}=0V	60	95	-	dB
AC CHARACTERISTICS						
Gain Bandwidth Product	GBW	R_L=2kΩ to 0V, f=100kHz	-	3	-	MHz
Unity Gain Frequency	f_T	R_L=2kΩ to 0V	-	3.6	-	MHz
Slew Rate	SR	G_V=0dB, Vin=-10V to +10V, R_L=2kΩ to 0V, C_L=20pF	7.5	10	-	V/µs
Full Power Bandwidth	FPBW	G_V=0dB, Vo=20Vpp, THD=5.0%, R_L=2kΩ to 0V, C_L=20pF	-	190	-	kHz
Settling Time	ts	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=2kΩ to 0V, C_L=20pF	-	78	-	deg
		R_L=2kΩ to 0V, C_L=220pF	-	68	-	
Gain Margin	G_M	R_L=2kΩ to 0V, C_L=20pF	-	12	-	dB
		R_L=2kΩ to 0V, C_L=220pF	-	6	-	
NOISE, THD						
Equivalent Input Noise Voltage	e_n	f=1kHz	-	48	-	nV/√Hz
Total Harmonic Distortion + Noise	THD+N	G_V=0dB, f=10kHz, Vo=20Vpp, R_L=2kΩ to 0V, C_L=20pF	-	0.02	-	%
Channel Separation	CS	f=1kHz, Equivalent Input value	-	120	-	dB

■ELECTRICAL CHARACTERISTICS (V^+=+5V, V^-=0V, V_{CM}=2.5V, Ta=25°C unless otherwise noted)

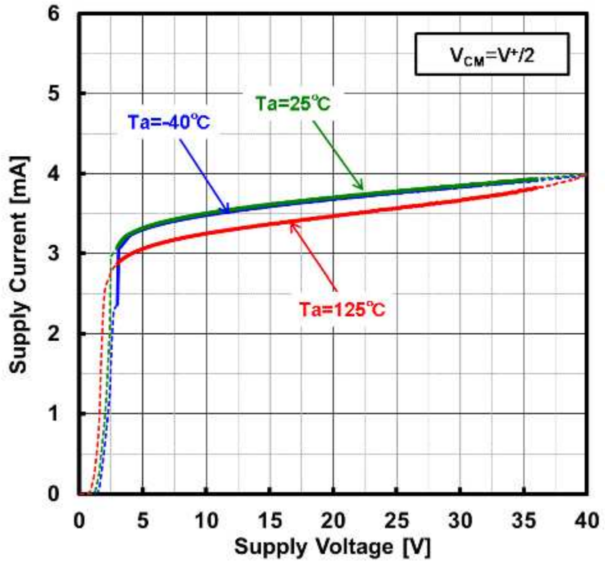
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
INPUT CHARACTERISTICS						
Input Offset Voltage	V_{IO}	R_S=50Ω, V_{CM}=0V, Vo=V^+/2	-	1	5.5	mV
Input Offset Voltage Drift	$\Delta V_{IO}/\Delta T$	Ta=-40°C~+125°C	-	10	-	µV/°C
Input Bias Current	I_B	V_{CM}=V^+/2, Vo=V^+/2	-	80	150	nA
Input Offset Current	I_{IO}	V_{CM}=V^+/2, Vo=V^+/2	-	5	75	nA
Open-Loop Voltage Gain	A_V	V_O=1.5V to 3.5V, R_L=2kΩ 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≥60dB	V^-	-	V^+-2.0	V
OUTPUT CHARACTERISTICS						
High-level Output Voltage	V_{OH}	R_L=2kΩ to 0V	3.7	4	-	V
Low-level Output Voltage	V_{OL}	R_L=2kΩ to 0V	-	0.1	0.3	V
Output Source Current	I_{SOURCE}	Vo=0V	10	28	-	mA
Output Sink Current	I_{SINK}	Vo=5V	20	60	-	mA
POWER SUPPLY						
Supply Current (All amplifiers) NJM3472 NJM3474	I_{SUPPLY}	No Signal, R_L=∞	- -	3.3 6.6	4.5 9	mA mA
AC CHARACTERISTICS						
Gain Bandwidth Product	GBW	R_L=2kΩ to 0V, f=100kHz	-	3	-	MHz
Unity Gain Frequency	f_T	R_L=2kΩ to 0V	-	3.2	-	MHz
Slew Rate	SR	G_V=0dB, Vin=+2V to +3V, R_L=2kΩ to 0V, C_L=20pF,	5	7	-	V/µs
Phase Margin	φ_M	R_L=2kΩ to 0V, C_L=20pF	-	64	-	deg
Gain Margin	G_M	R_L=2kΩ to 0V, C_L=20pF	-	13	-	dB
NOISE, THD						
Equivalent Input Noise Voltage	e_n	f=1kHz	-	48	-	nV/√Hz
Total Harmonic Distortion + Noise	THD+N	G_V=6dB, f=1kHz, Vo=2Vpp, R_L=2kΩ to 0V, C_L=20pF	-	0.01	-	%
Channel Separation	CS	f=1kHz, Equivalent Input value	-	120	-	dB

■ELECTRICAL CHARACTERISTICS

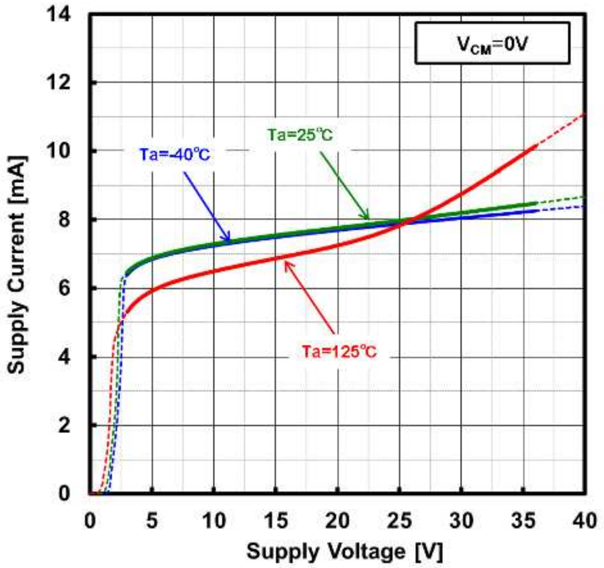
NJM3472 : Supply Current vs. Supply Voltage



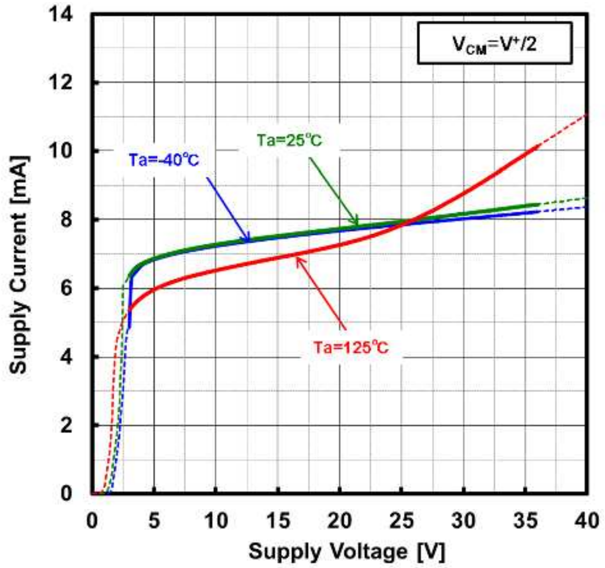
NJM3472 : Supply Current vs. Supply Voltage



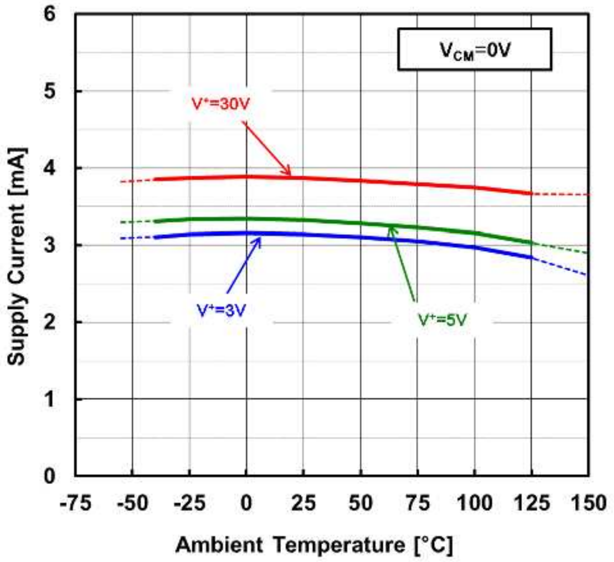
NJM3474 : Supply Current vs. Supply Voltage



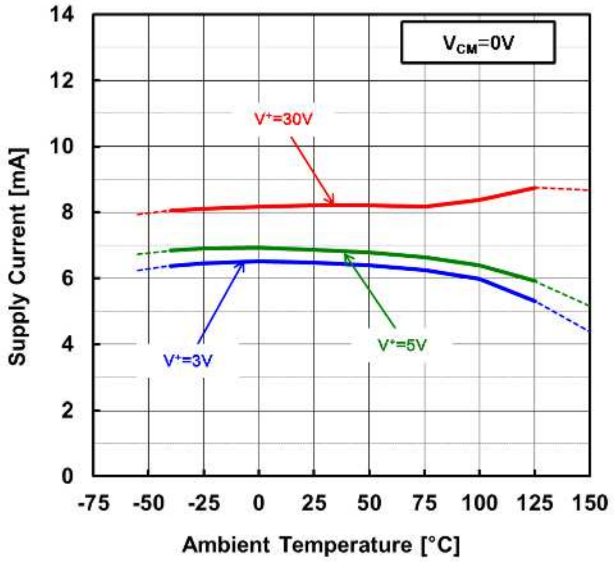
NJM3474 : Supply Current vs. Supply Voltage



NJM3472 : Supply Current vs. Temperature

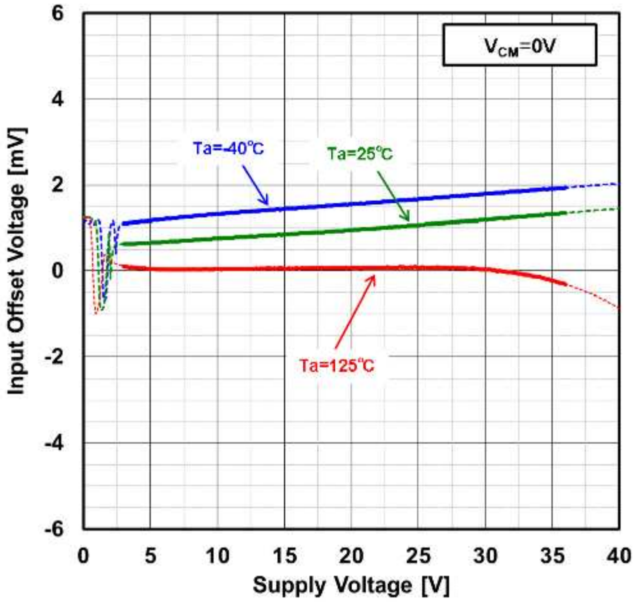


NJM3474 : Supply Current vs. Temperature

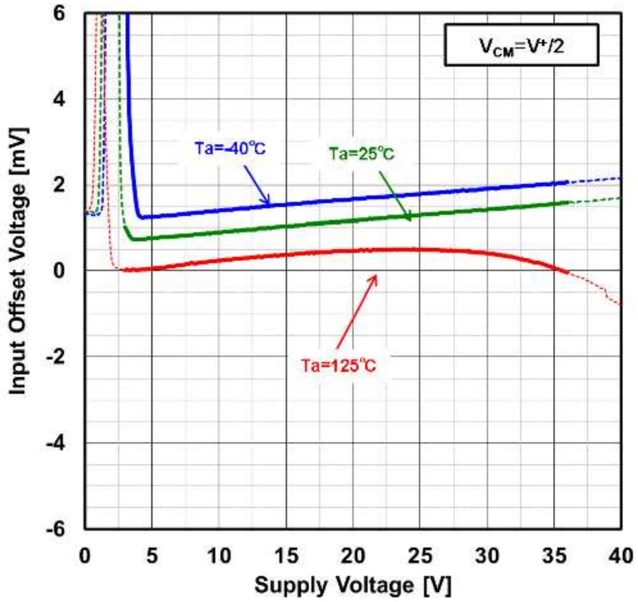


■ELECTRICAL CHARACTERISTICS

Input Offset Voltage vs. Supply Voltage

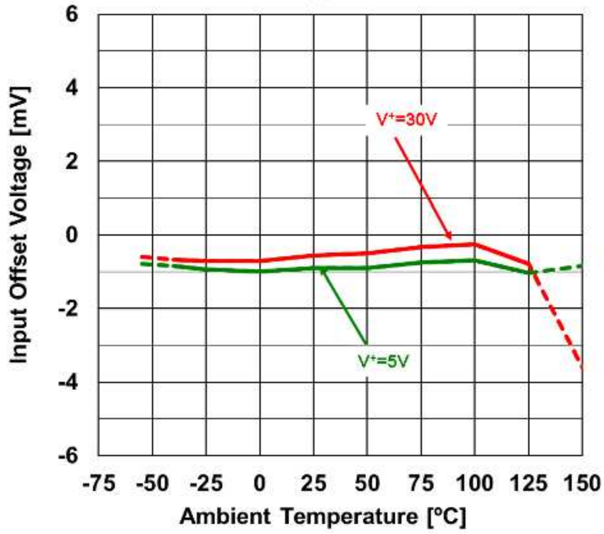


Input Offset Voltage vs. Supply Voltage



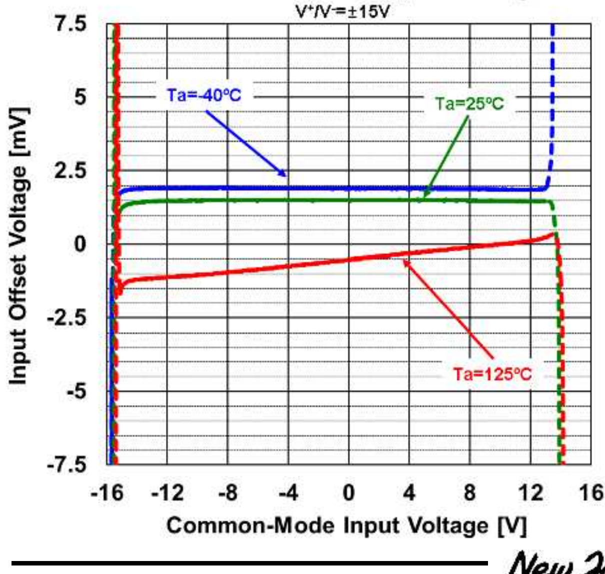
Input Offset Voltage vs. Ambient Temperature

V_{CM}=V^+/2



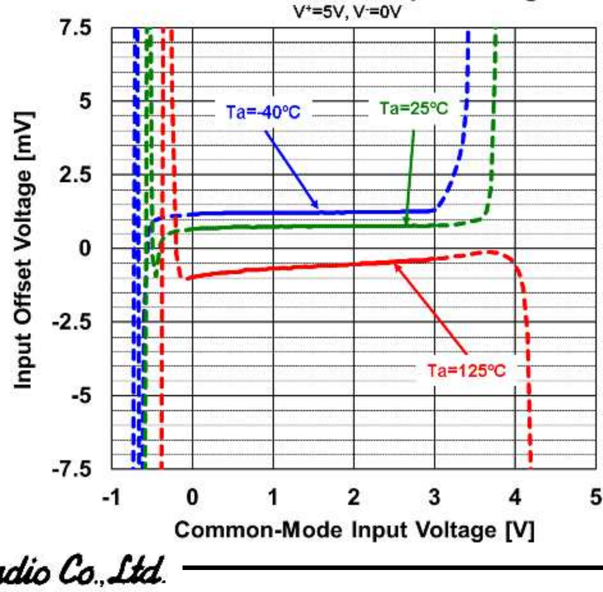
Input Offset Voltage
vs. Common-Mode Input Voltage

V^+/V^-=±15V

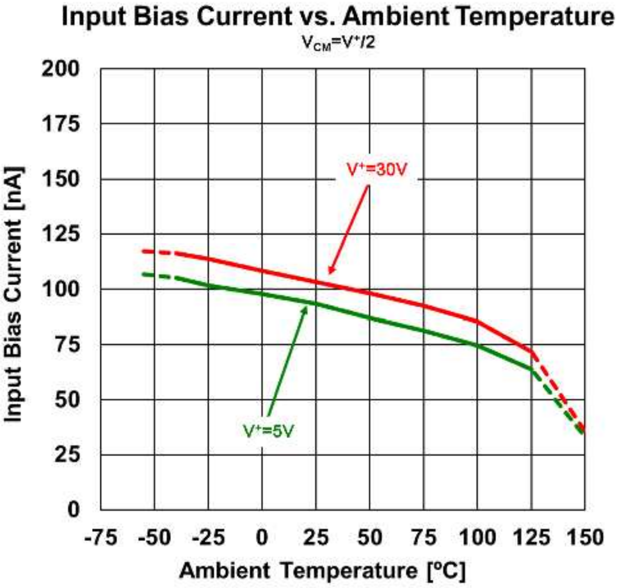


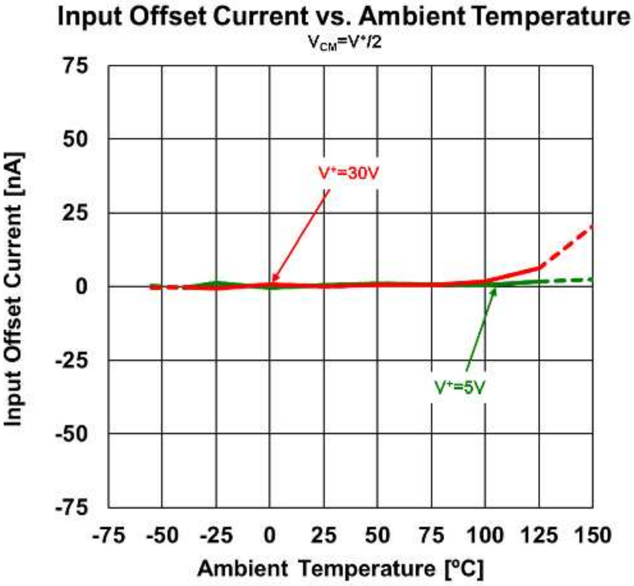
Input Offset Voltage
vs. Common-Mode Input Voltage

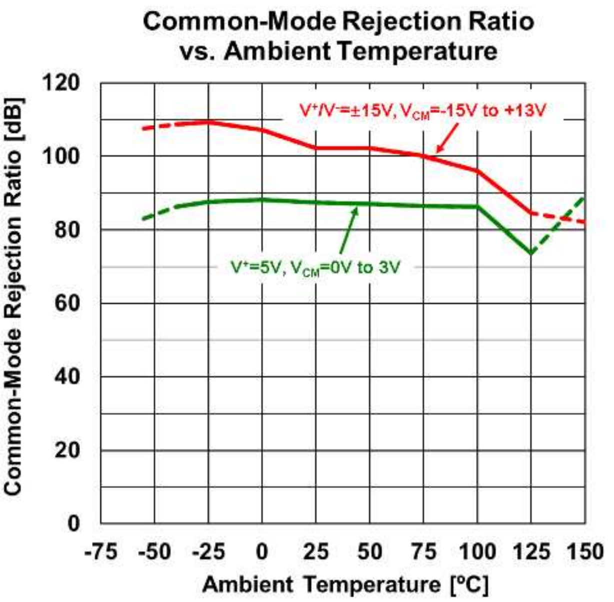
V^+=5V, V^-=0V

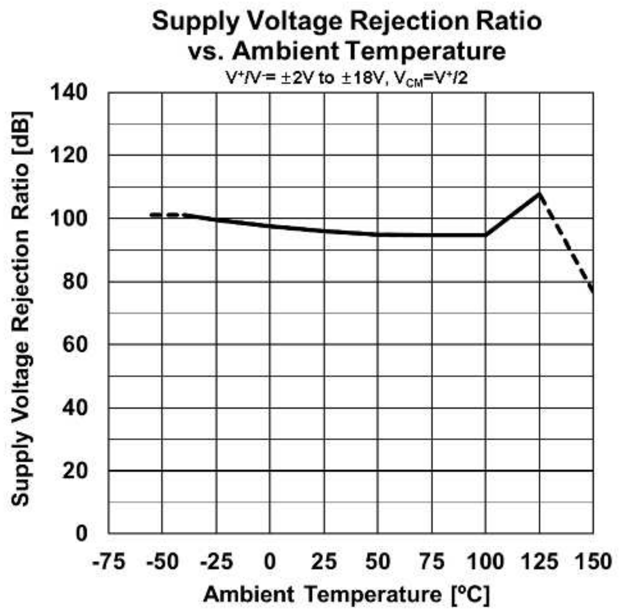


■ELECTRICAL CHARACTERISTICS





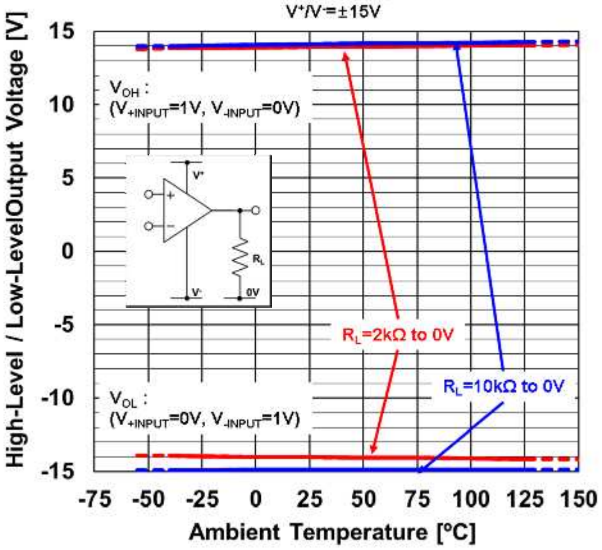




■ELECTRICAL CHARACTERISTICS

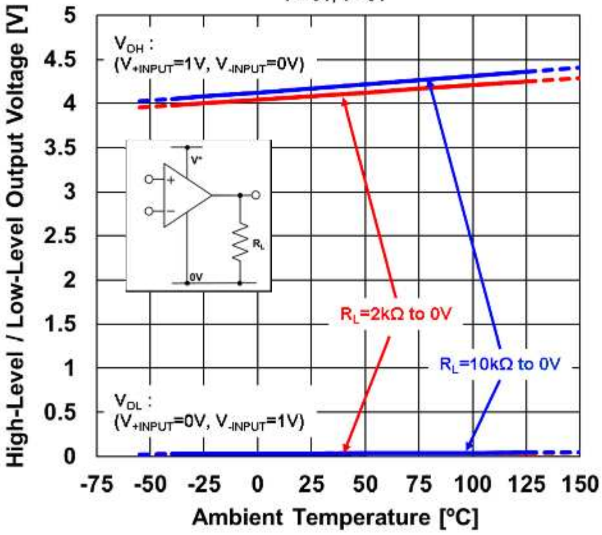
High-Level / Low-Level Output Voltage vs. Ambient Temperature

$V^+/V^-=\pm15V$



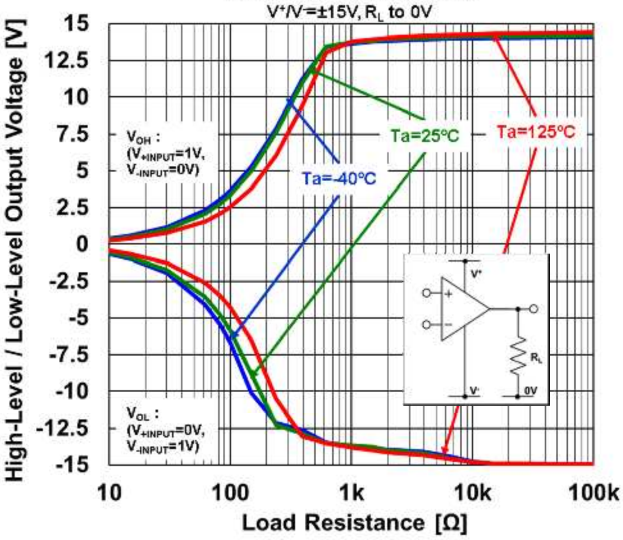
High-Level / Low-Level Output Voltage vs. Ambient Temperature

$V^+=5V,\ V^-=0V$



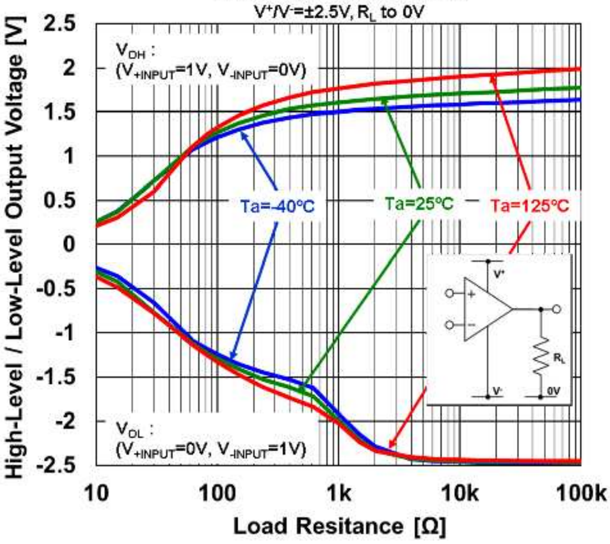
High-Level / Low-Level Output Voltage vs. Load Resistance

$V^+/V^-=\pm15V,\ R_L$ to 0V



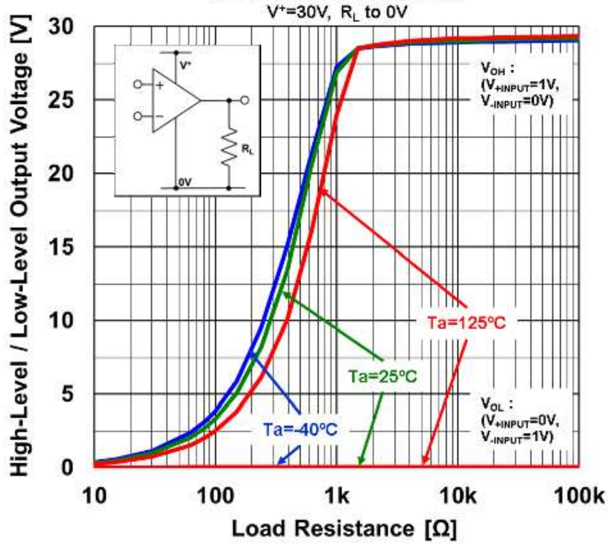
High-Level / Low-Level Output Voltage vs. Load Resistance

$V^+/V^-=\pm2.5V,\ R_L$ to 0V



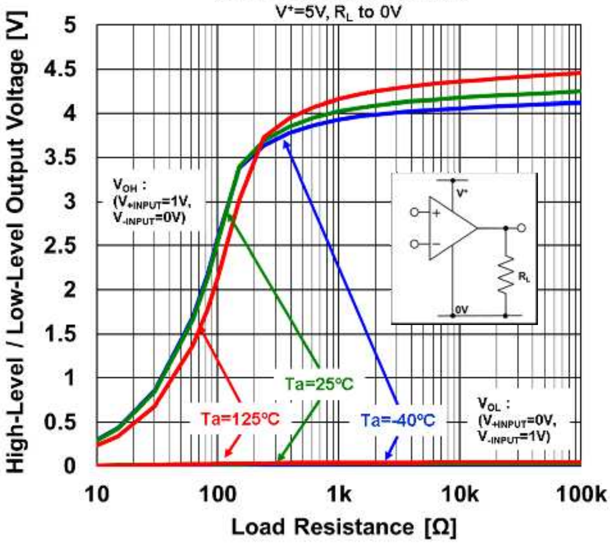
High-Level / Low-Level Output Voltage vs. Load Resistance

$V^+=30V,\ R_L$ to 0V



High-Level / Low-Level Output Voltage vs. Load Resistance

$V^+=5V,\ R_L$ to 0V



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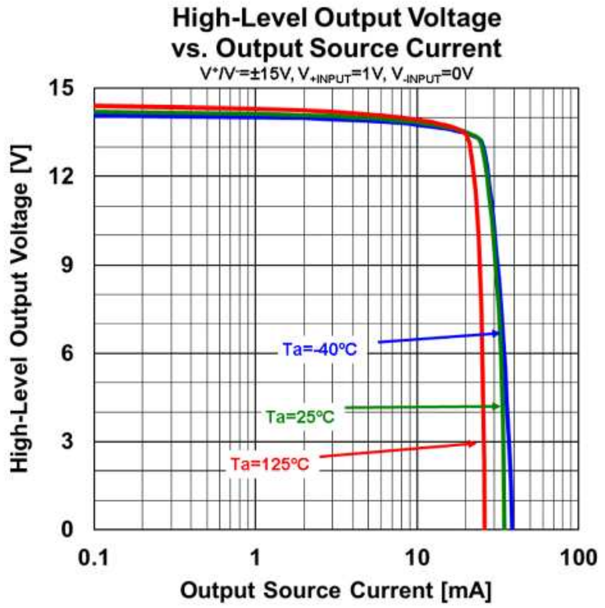
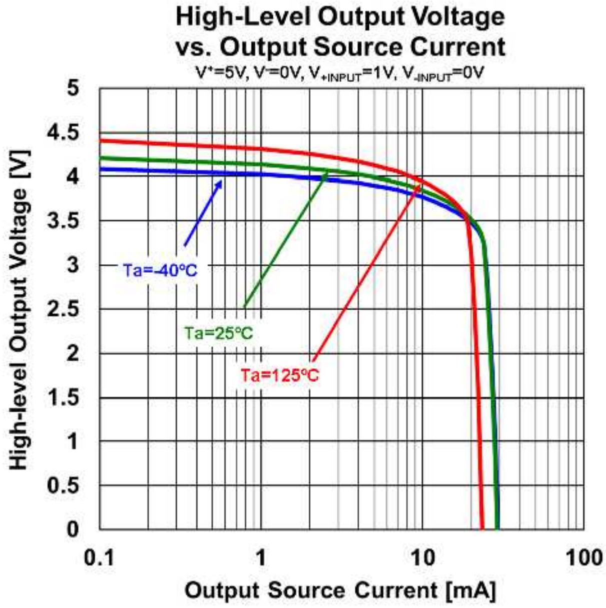
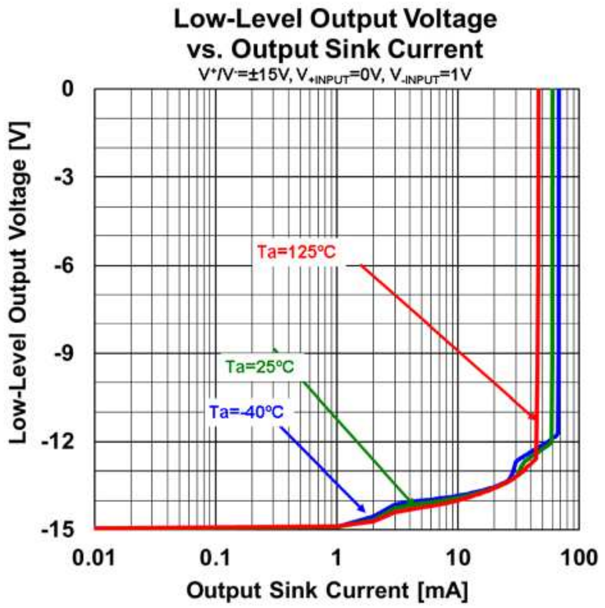
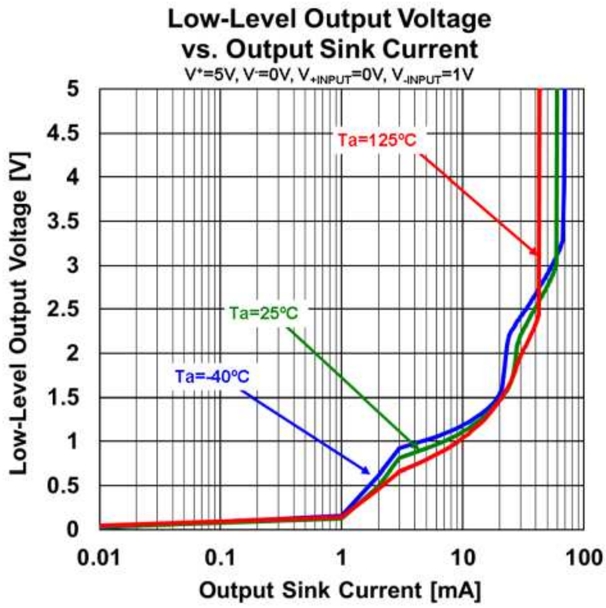
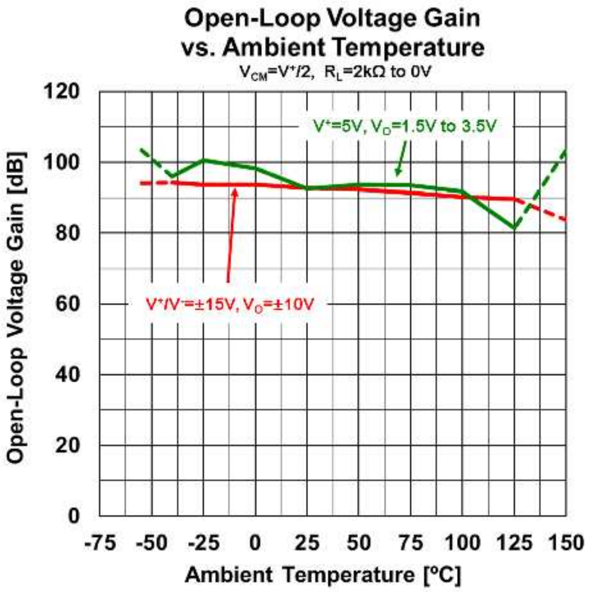


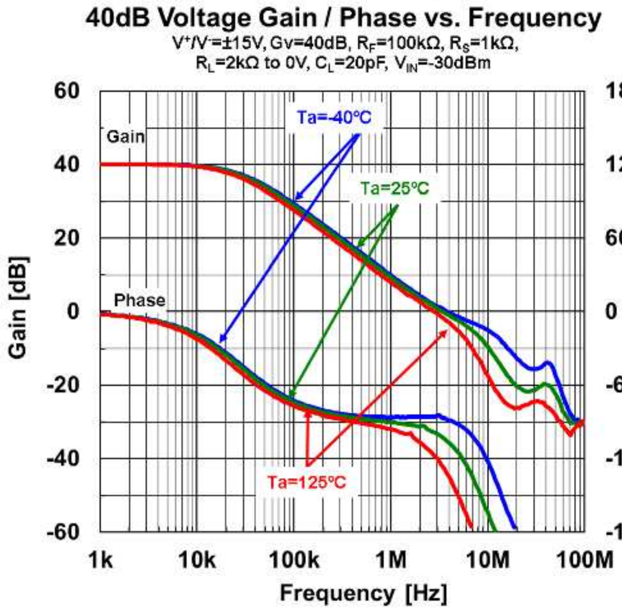


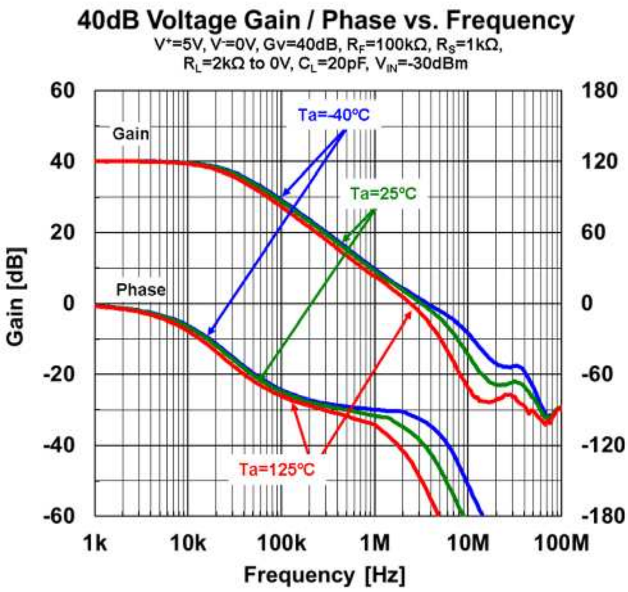


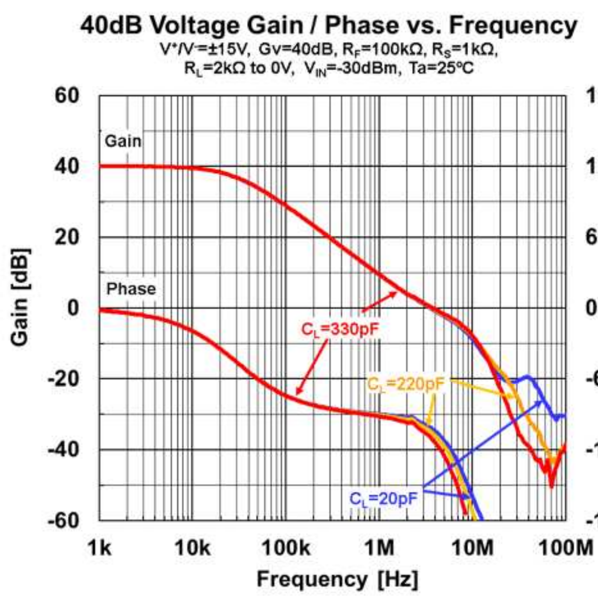


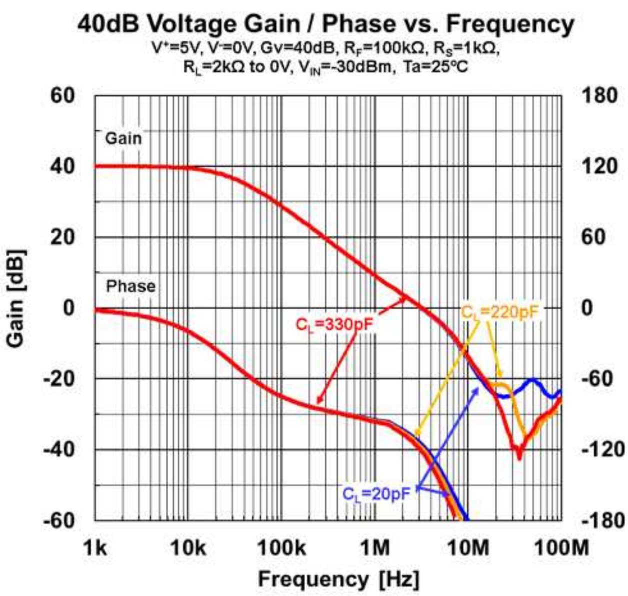
■ELECTRICAL CHARACTERISTICS



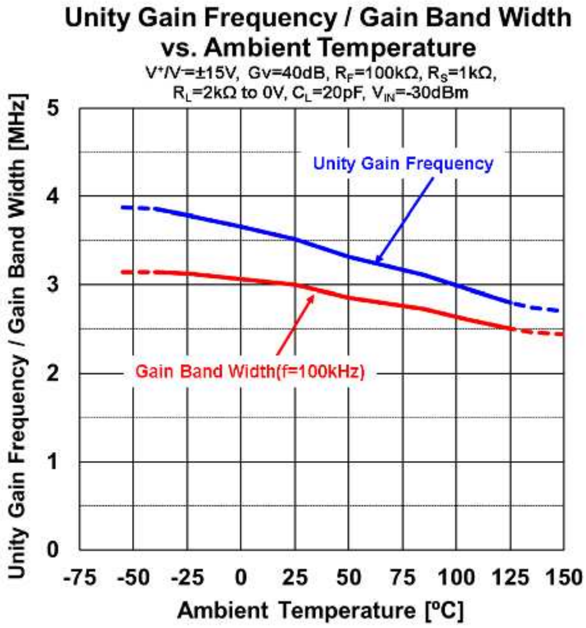


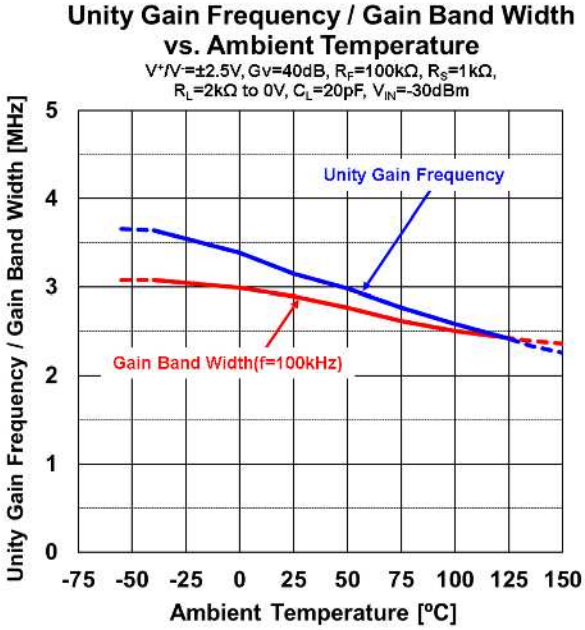


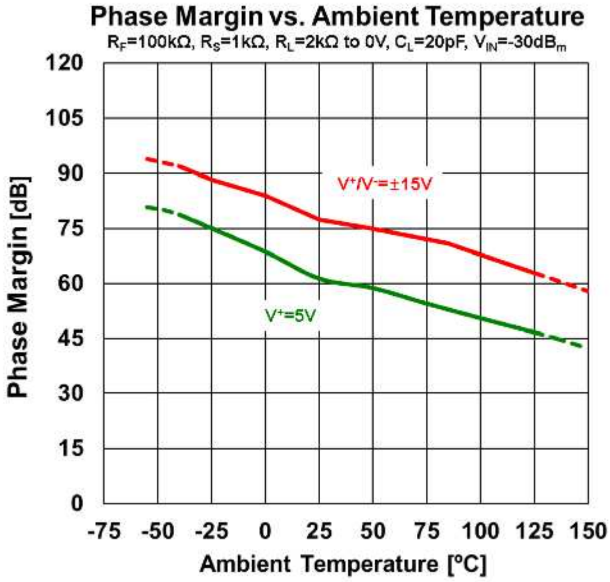


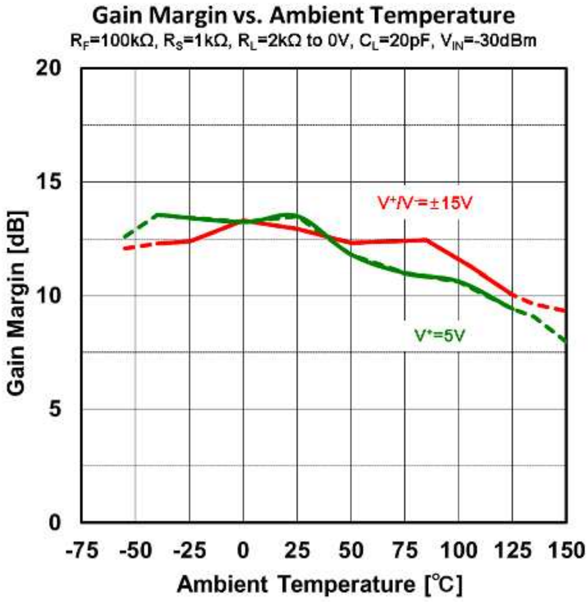


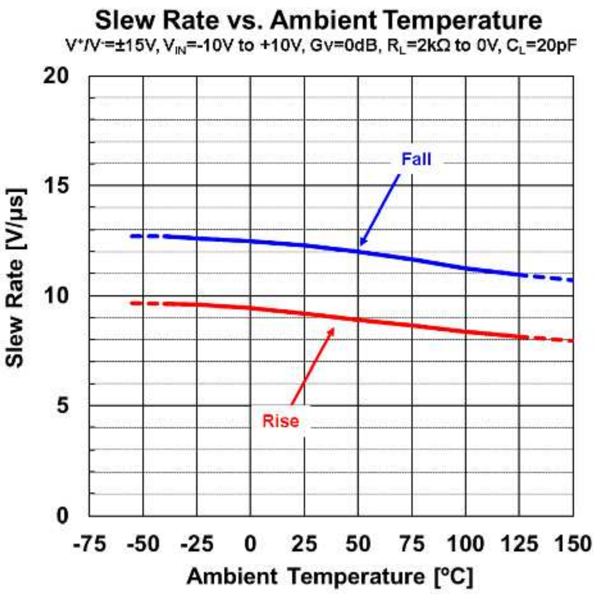
■ELECTRICAL CHARACTERISTICS

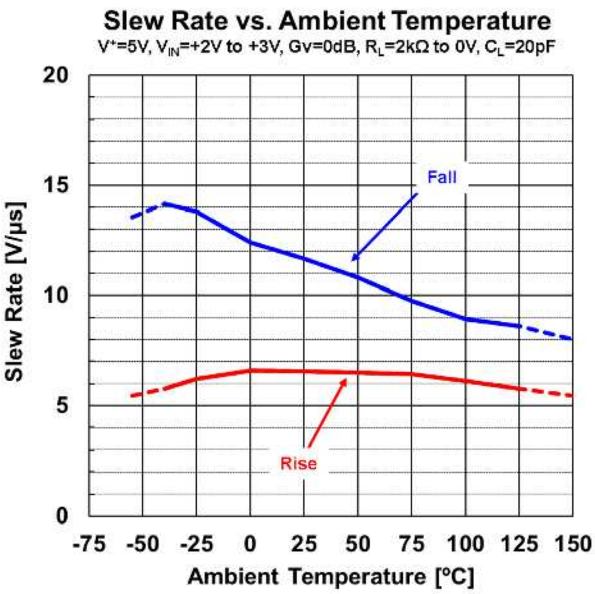




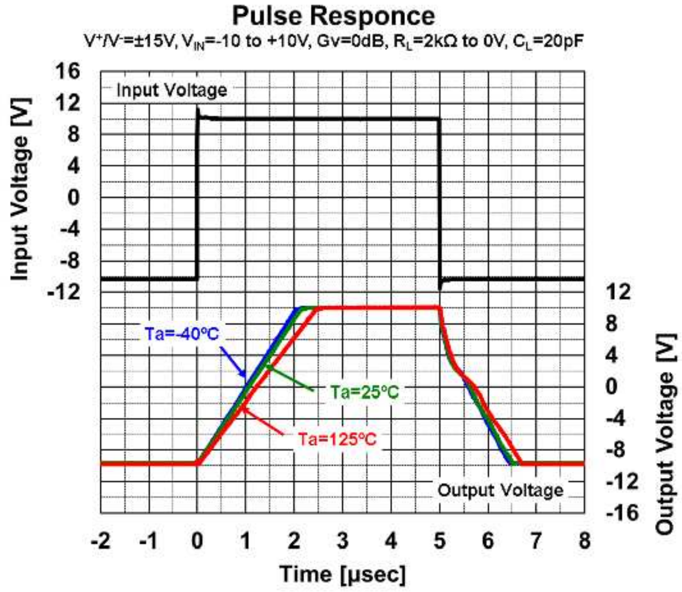


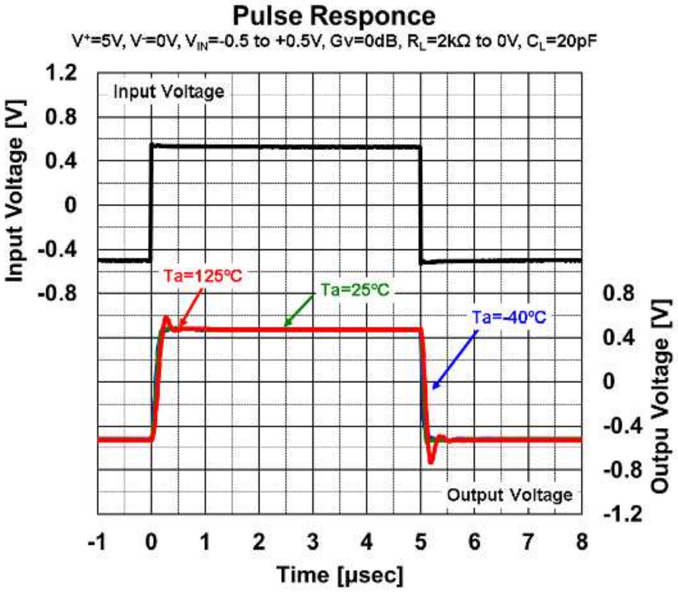


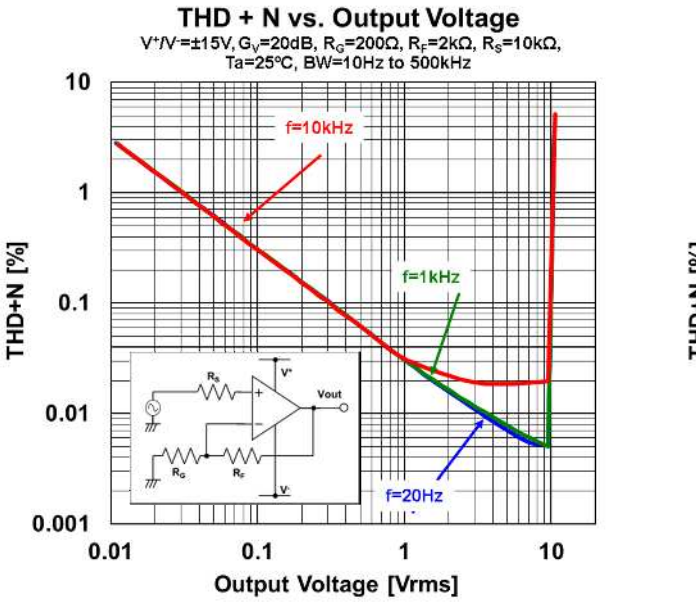


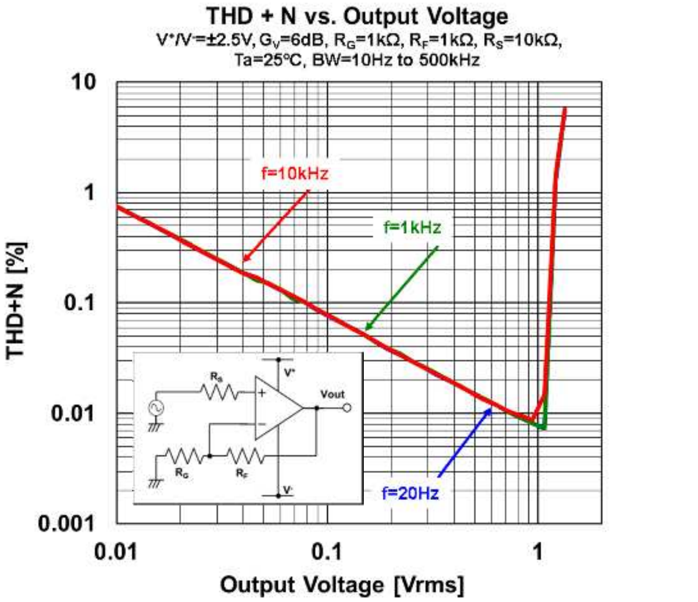


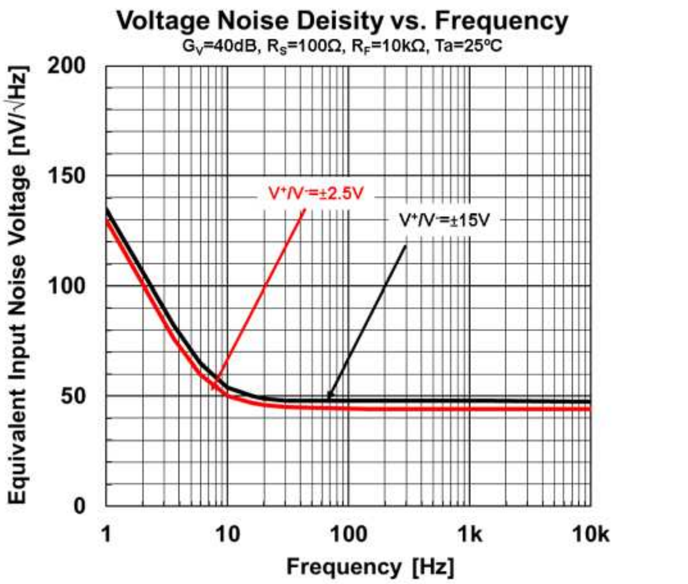
■ELECTRICAL CHARACTERISTICS











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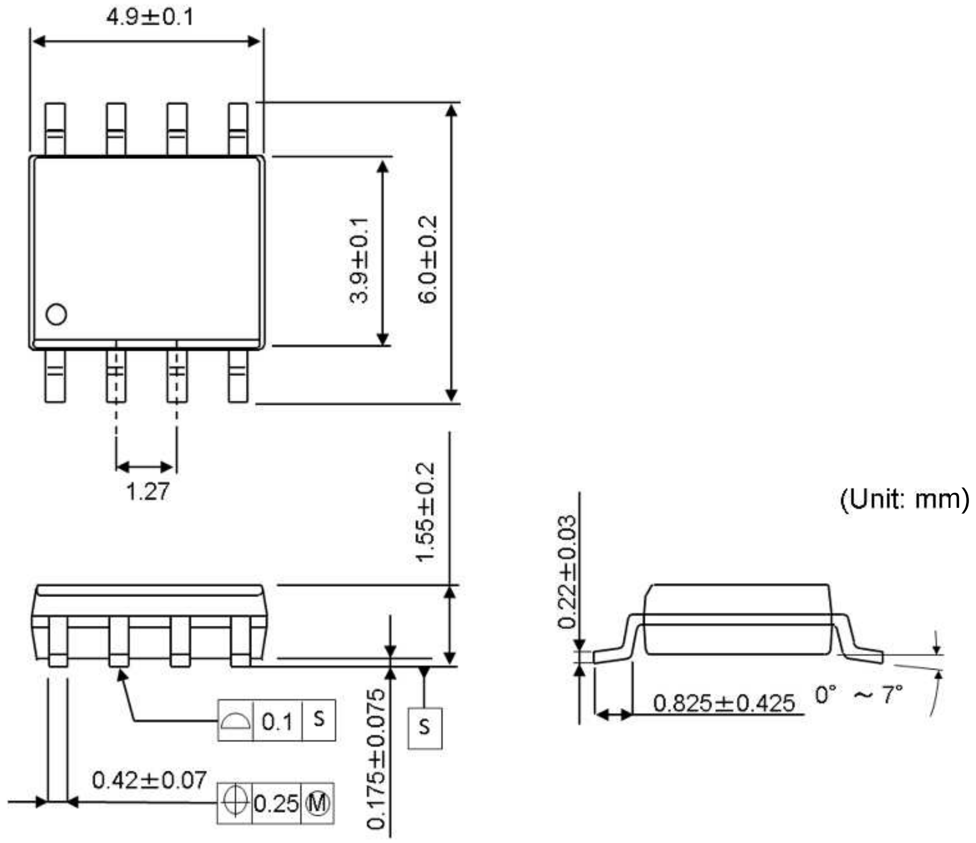
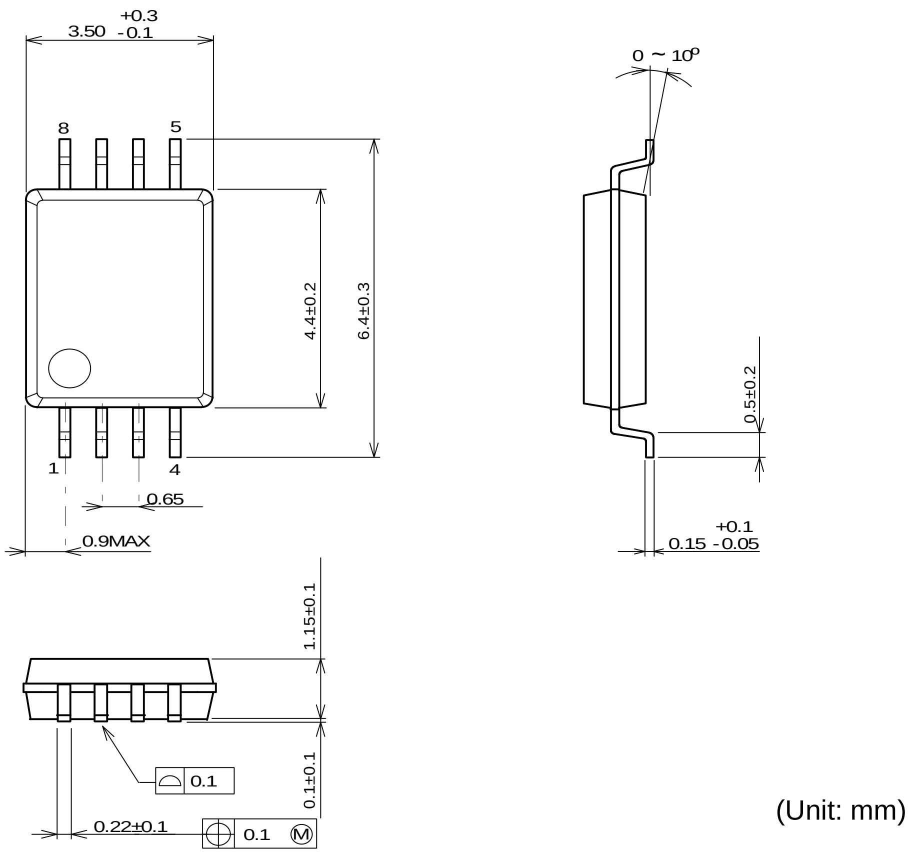


SOP8 Package



SSOP8 Package

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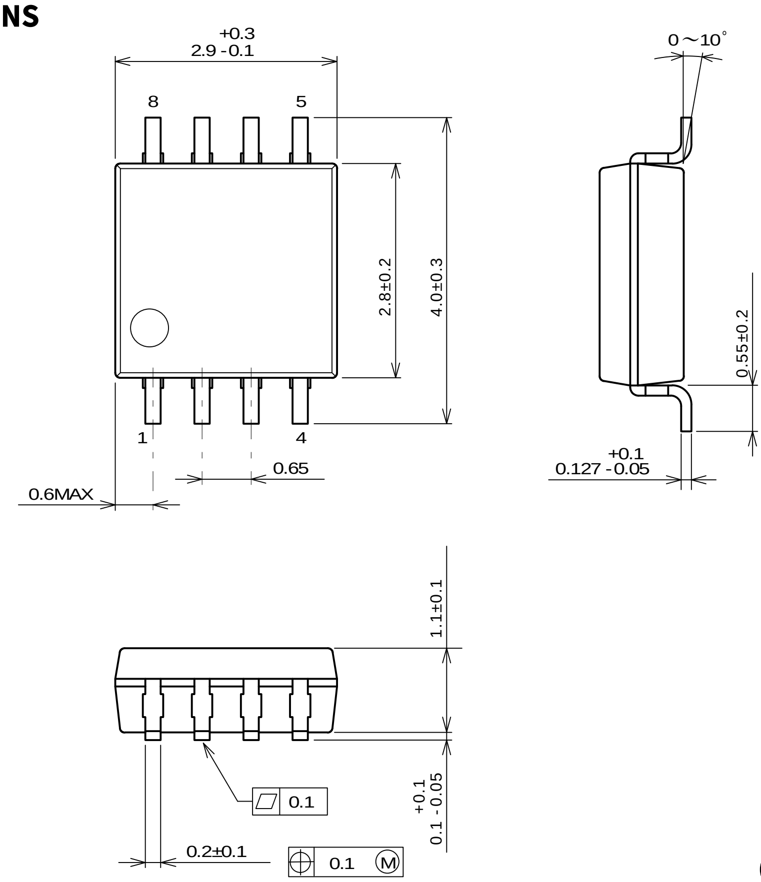
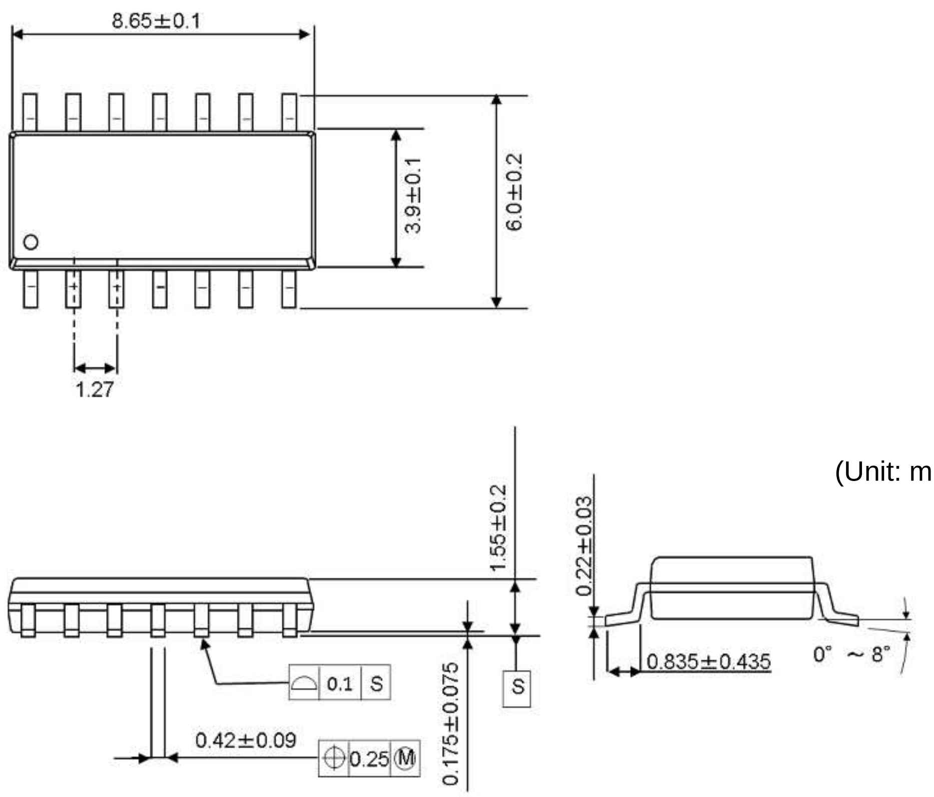


(Unit: mm)

MSOP8 (VSP8) JEDEC MO-187-DA / thin type **Package**



(Unit: mm)

SOP14 Package

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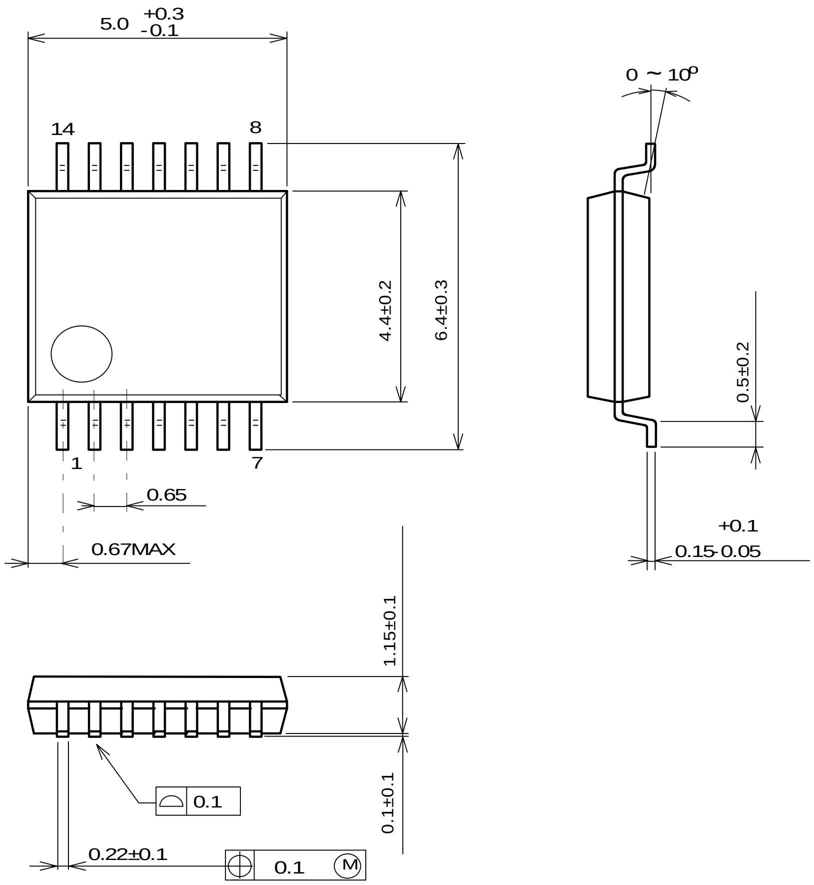

(Unit: mm)

SSOP14 Package

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