HIGH SPEED SINGLE SUPPLY OPERATIONAL AMPLIFIER

■FEATURES

- ●Low Input Offset Voltage 3.5mV max.
- ●Low Input Offset Voltage Drift
  - NJM842 3.5µV/°C
  - NJM844 5µV/°C
- ●High Slew Rate 8.5V/µs
- ●High Unity Gain Frequency 3.5MHz
- ●Single Supply 3V to 36V
- ●Operating Temperature Range -40°C to +125°C
- ●Low input voltage around GND level
- ●Unity-Gain Stable (C_L=1000pF)
- ●No Phase Reversal
- ●High EMI Immunity
- ●Output Short-Circuit Protection
- ●Operating Current (All amplifiers)
  - NJM842 4.3mA
  - NJM844 8.8mA
- ●Package
  - NJM842 SOP8, SSOP8, MSOP8(VSP8)
  - NJM844 SOP14, SSOP14

■GENERAL DESCRIPTION

The NJM842/NJM844 are high speed single supply operational amplifier.

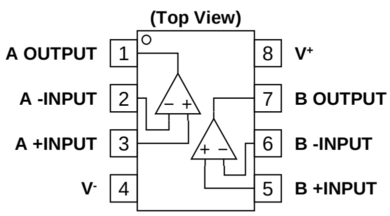
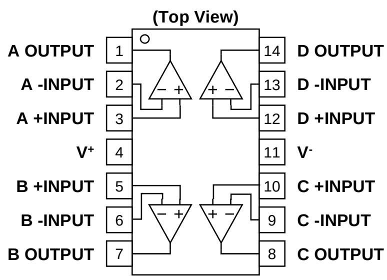
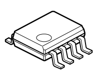
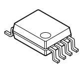
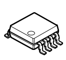
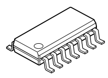
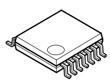
These amplifiers feature is low-offset voltage, low-offset voltage drift, 8.5V/µs slew rate, 3.5MHz gain bandwidth and unity-gain stable (C_L=1000pF).

As a further feature, wide operation voltage range and wide operation temperature range are suitable for power supply unit, general-purpose inverters and high performance industrial equipment.

■APPLICATIONS

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

■PIN CONFIGURATION / PRODUCT INFORMATION

<table>
<tr><td>PIN FUNCTION</td><td colspan="3">
</td><td colspan="2">
</td></tr>
<tr><td>PACKAGE</td><td>
SOP8</td><td>
SSOP8</td><td>
MSOP8(VSP8)</td><td>
SOP14</td><td>
SSOP14</td></tr>
<tr><td>PART NUMBER</td><td>NJM842G</td><td>NJM842V</td><td>NJM842R</td><td>NJM844G</td><td>NJM844V</td></tr>
</table>

■ABSOLUTE MAXIMUM RATINGS (Ta=25ºC, unless otherwise noted.)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	$V^+ - V^-$	38 (5)	V
Differential Input Voltage (1)	V_{ID}	±36 (2)	V
Input Voltage (2)	V_{IN}	V^- - 0.3 to V^- +36	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	
MSOP8(VSP8)		600 / 810	
SOP14		1200 / 1900	
SSOP14		600 / 770	
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

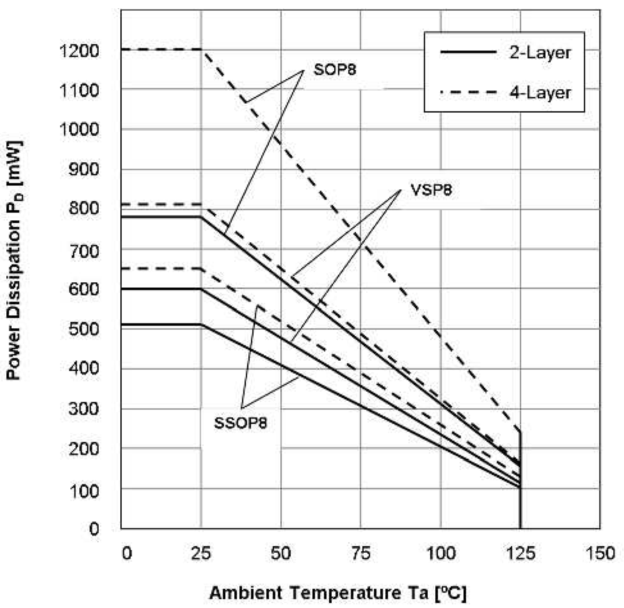
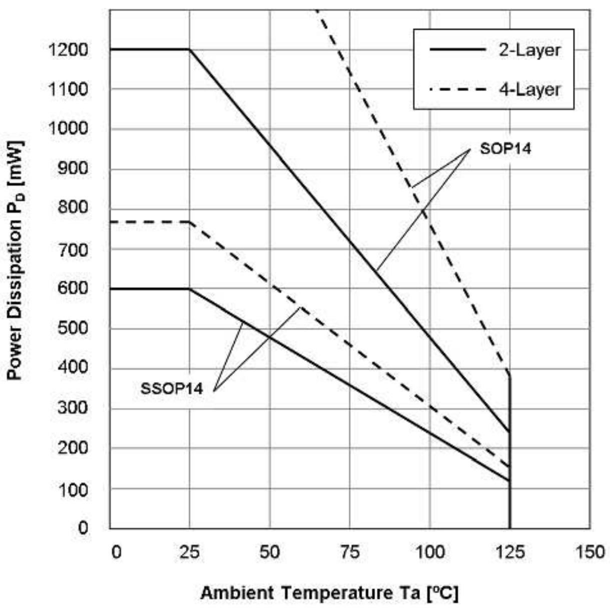


Figure1B. Power Dissipation vs. Temperature



■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)

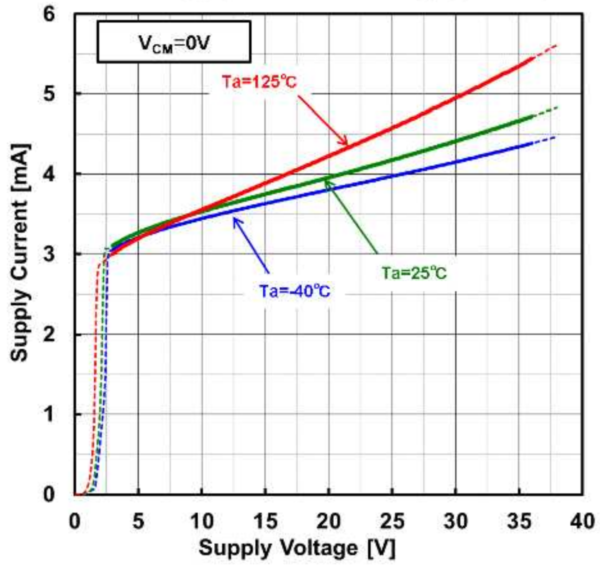
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
INPUT CHARACTERISTICS						
Input Offset Voltage	V_{IO}	R_S=50Ω, V_{CM}=0V	-	0.8	3.5	mV
Input Offset Voltage Drift NJM842 NJM844	$\Delta V_{IO}/\Delta T$	Ta=-40°C~+125°C	 - -	 3.5 5	 - -	 µV/ºC µV/ºC
Input Bias Current	I_B		-	120	500	nA
Input Offset Current	I_{IO}		-	6	75	nA
Open-Loop Voltage Gain	A_V	V_O=±10V, R_L=2kΩ to 0V	88	110	-	dB
Common Mode Rejection Ratio	CMR	V_{ICM}=-15V to 13.2V	70	86	-	dB
Common Mode Input Voltage Range	V_{ICM}	CMR≥70dB	V^-	-	V^+-1.8	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	14	-	
Low-level Output Voltage	V_{OL}	R_L=10kΩ to 0V	-	-14.3	-13.7	V
		R_L=2kΩ to 0V	-	-13.8	-13.5	
Output Source Current	I_{SOURCE}	Vo=0V, +Input=+1V, -Input=0V	10	40	-	mA
Output Sink Current	I_{SINK}	Vo=0V, +Input=0V, -Input=+1V	10	45	-	mA
POWER SUPPLY						
Supply Current (All amplifiers) NJM842 NJM844	I_{SUPPLY}	No Signal, R_L=∞	 - -	 4.3 8.8	 5.5 12	 mA mA
Supply Voltage Rejection Ratio	SVR	V^+/V^-=±1.5V to ±18V, V_{ICM}=0V	70	93	-	dB
AC CHARACTERISTICS						
Gain Bandwidth Product	GBW	R_L=2kΩ to 0V, f=100kHz	-	3.5	-	MHz
Slew Rate	SR	G_V=0dB, Vin=-10V to +10V, R_L=2kΩ to 0V, C_L=20pF	-	8.5	-	V/µs
Phase Margin	φ_M	R_L=2kΩ to 0V, C_L=20pF	-	90	-	deg
		R_L=2kΩ to 0V, C_L=330pF	-	70	-	
Gain Margin	G_M	R_L=2kΩ to 0V, C_L=20pF	-	9	-	dB
		R_L=2kΩ to 0V, C_L=330pF	-	8	-	
NOISE, THD						
Equivalent Input Noise Voltage	e_n	f=1kHz	-	32	-	nV/√Hz
Total Harmonic Distortion + Noise	THD+N	G_V=20dB, f=1kHz, V_O=15V_{PP}, R_L=2kΩ to 0V, C_L=20pF	-	0.003	-	%
Channel Separation	CS	f=10kHz, Equivalent Input value	-	120	-	dB

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

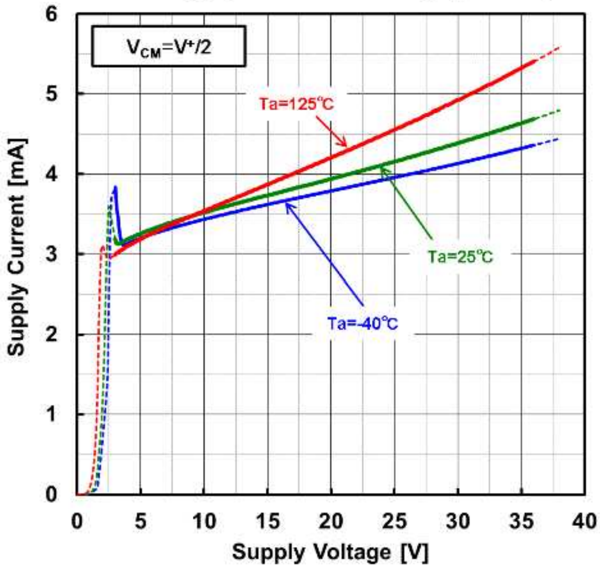
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
INPUT CHARACTERISTICS						
Input Offset Voltage	V_{IO}	R_S=50Ω, $V_{CM}=V^+/2$, $Vo=V^+/2$	-	0.5	3.5	mV
Input Offset Voltage Drift NJM842 NJM844	$\Delta V_{IO}/\Delta T$	Ta=-40°C~+125°C	 - -	 2.5 4	 - -	 µV/ºC µV/ºC
Input Bias Current	I_B	$V_{CM}=V^+/2$, $V_O=V^+/2$	-	140	500	nA
Input Offset Current	I_{IO}	$V_{CM}=V^+/2$, $V_O=V^+/2$	-	6	75	nA
Open-Loop Voltage Gain	A_V	V_O=1.5V to 3.5V, R_L=2kΩ to 0V	88	110	-	dB
Common Mode Rejection Ratio	CMR	V_{CM}=0V to 3.2V	70	80	-	dB
Common Mode Input Voltage Range	V_{ICM}	CMR≥70dB	V^-	-	V^+-1.8	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	0	V
Output Source Current	I_{SOURCE}	Vo=0V, +Input=+1V, -Input=0V	10	30	-	mA
Output Sink Current	I_{SINK}	Vo=5V, +Input=0V, -Input=+1V	10	30	-	mA
POWER SUPPLY						
Supply Current (All amplifiers) NJM842 NJM844	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	-	3.5	-	MHz
Slew Rate	SR	G_V=0dB, Vin=+0.5V to +3V, R_L=2kΩ to 0V, C_L=20pF	-	7	-	V/µs
Phase Margin	φ_M	R_L=2kΩ to 0V, C_L=20pF	-	80	-	deg
		R_L=2kΩ to 0V, C_L=330pF	-	55	-	
Gain Margin	G_M	R_L=2kΩ to 0V, C_L=20pF	-	9	-	dB
		R_L=2kΩ to 0V, C_L=330pF	-	7	-	
NOISE, THD						
Equivalent Input Noise Voltage	e_n	f=1kHz	-	30	-	nV/√Hz

■ELECTRICAL CHARACTERISTICS

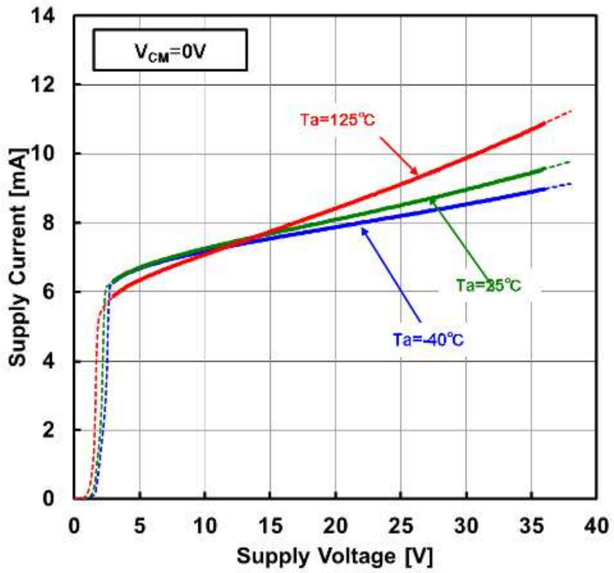
NJM842 : Supply Current vs. Supply Voltage



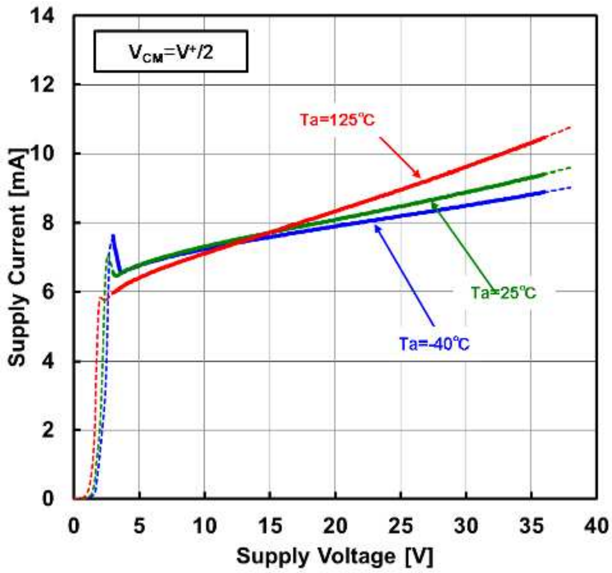
NJM842 : Supply Current vs. Supply Voltage



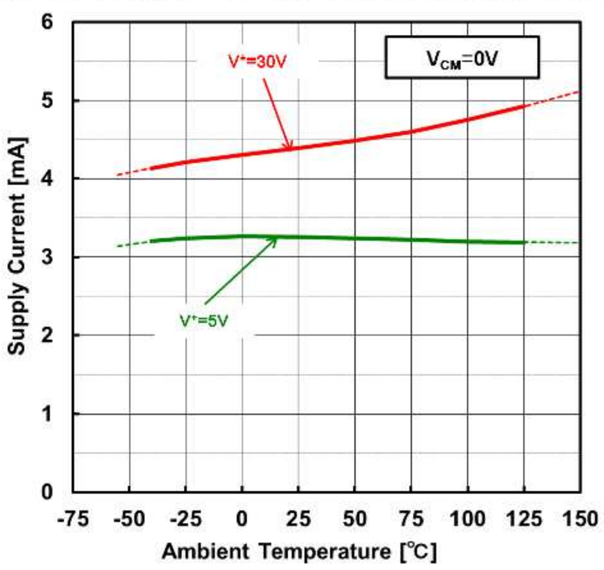
NJM844 : Supply Current vs. Supply Voltage



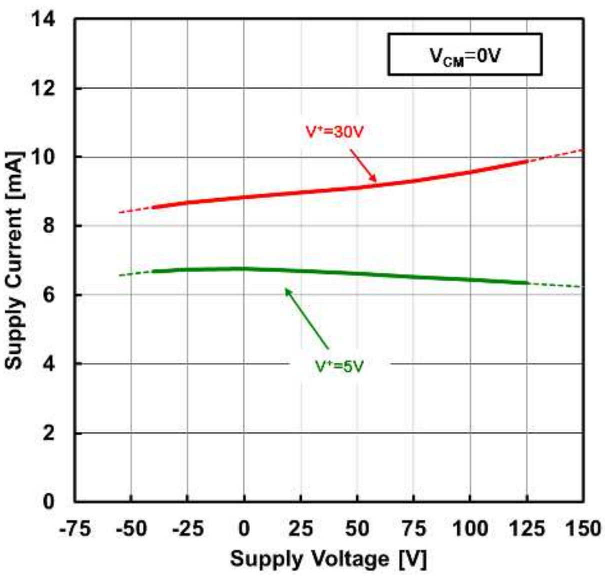
NJM844 : Supply Current vs. Supply Voltage



NJM842 : Supply Current vs. Ambient Temperature

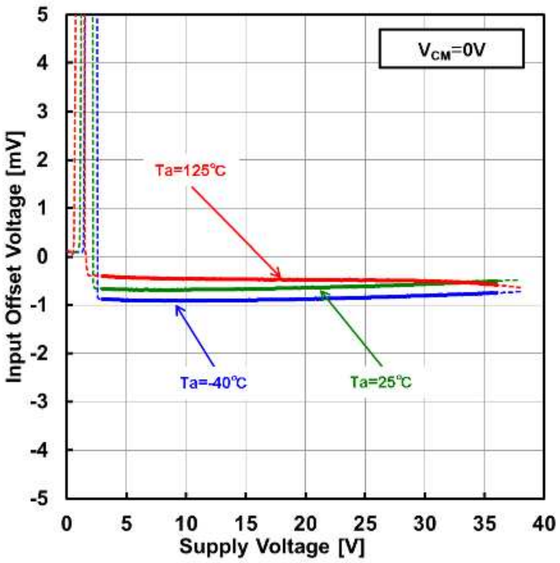


NJM844 : Supply Current vs. Ambient Temperature

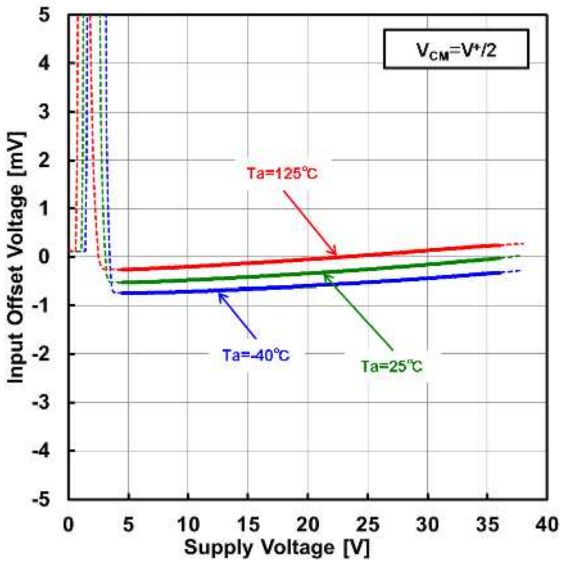


■ELECTRICAL CHARACTERISTICS

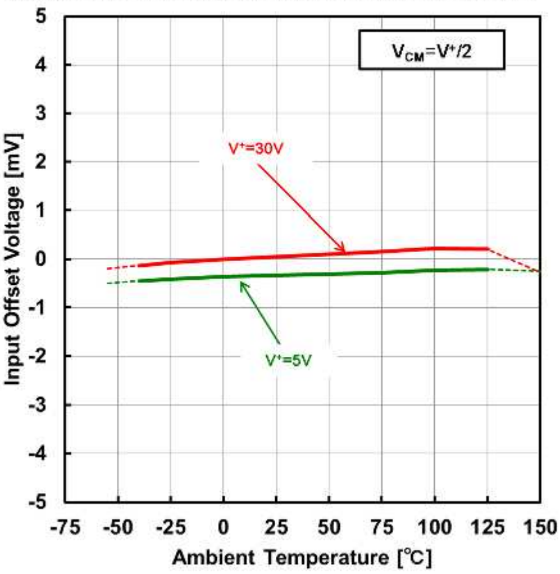
Input Offset Voltage vs. Supply Voltage



Input Offset Voltage vs. Supply Voltage

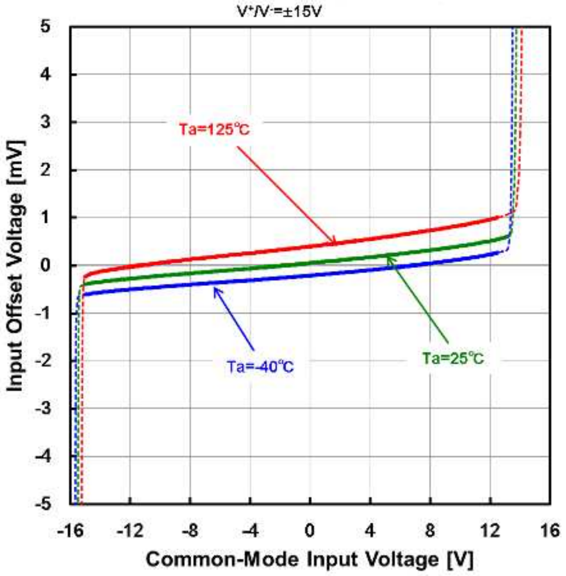


Input Offset Voltage vs. Ambient Temperature



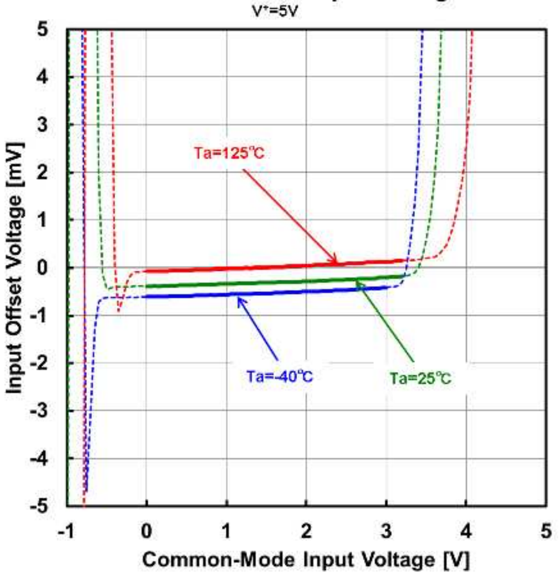
Input Offset Voltage
vs. Common-Mode Input Voltage

V+/V-=±15V



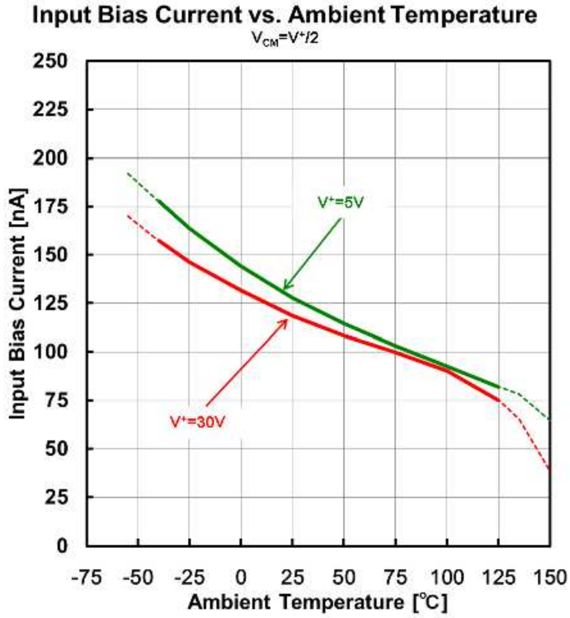
Input Offset Voltage
vs. Common-Mode Input Voltage

V+=5V

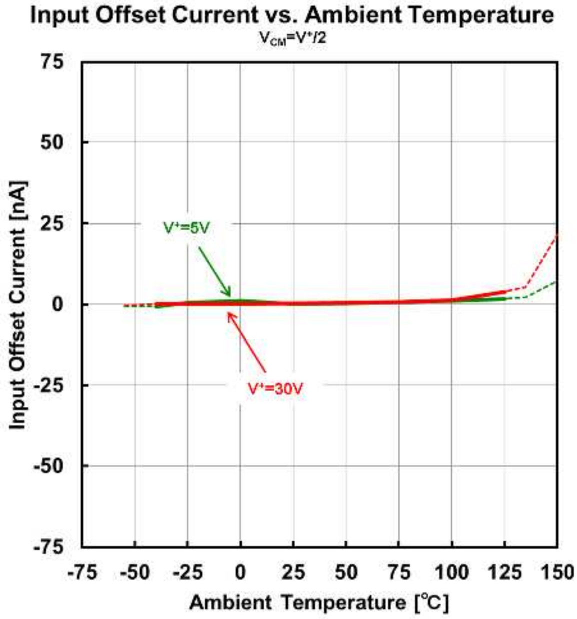


■ELECTRICAL CHARACTERISTICS

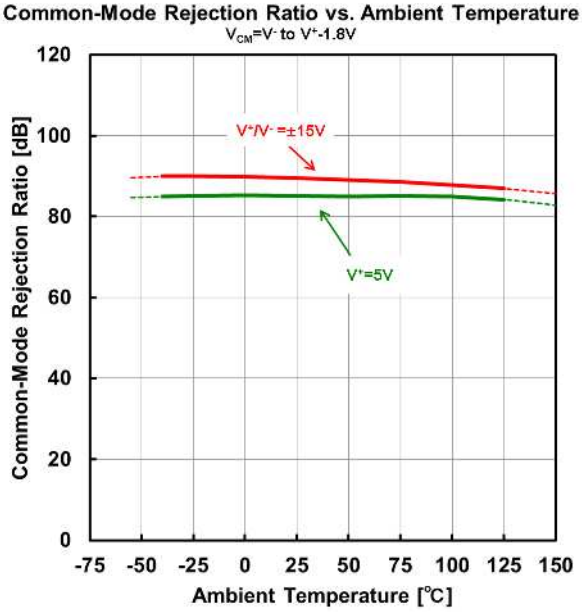
Input Bias Current vs. Ambient Temperature



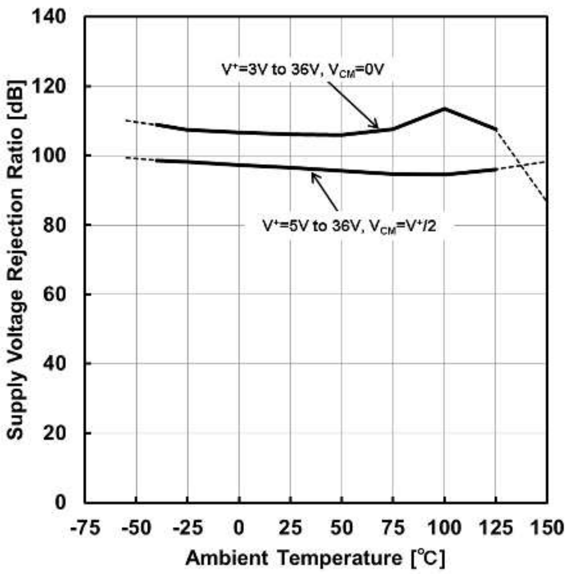
Input Offset Current vs. Ambient Temperature



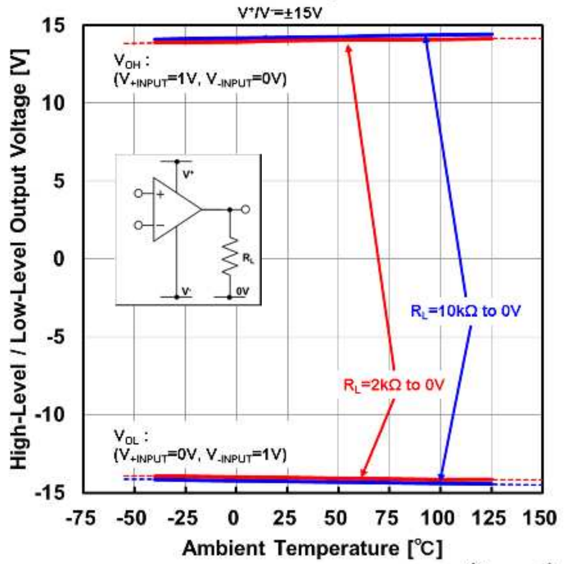
Common-Mode Rejection Ratio vs. Ambient Temperature



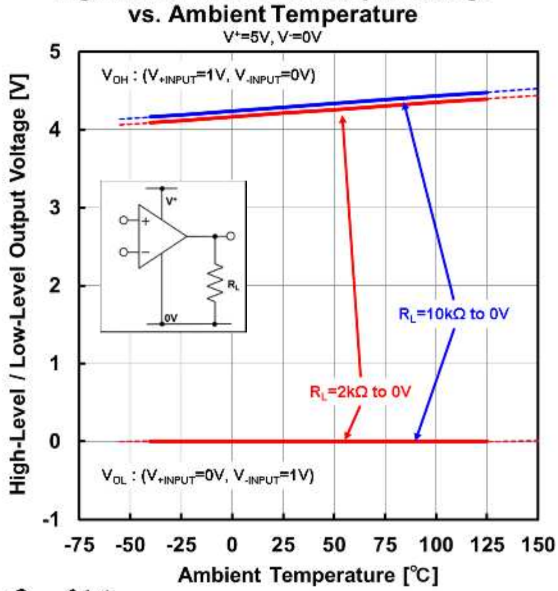
Supply Voltage Rejection Ratio vs. Ambient Temperature



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

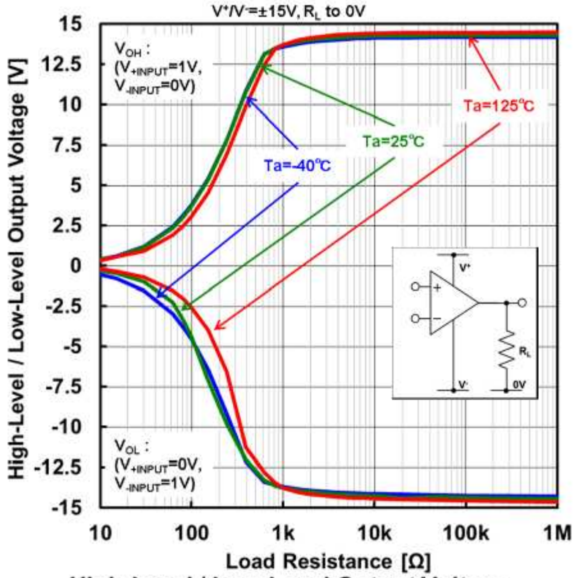


High-Level / Low-Level Output Voltage vs. Ambient Temperature

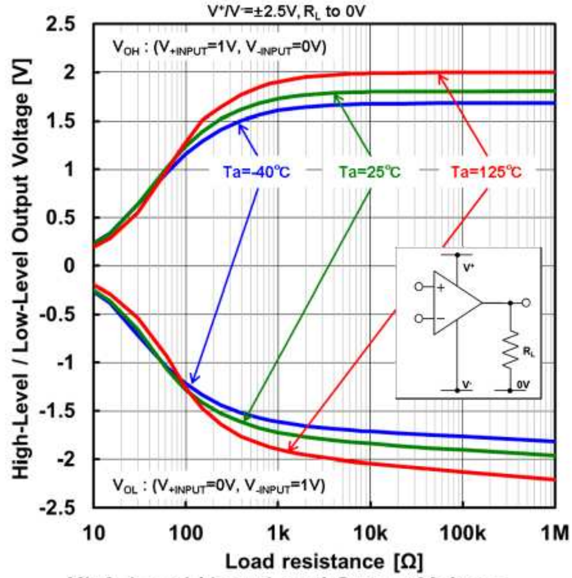


■ELECTRICAL CHARACTERISTICS

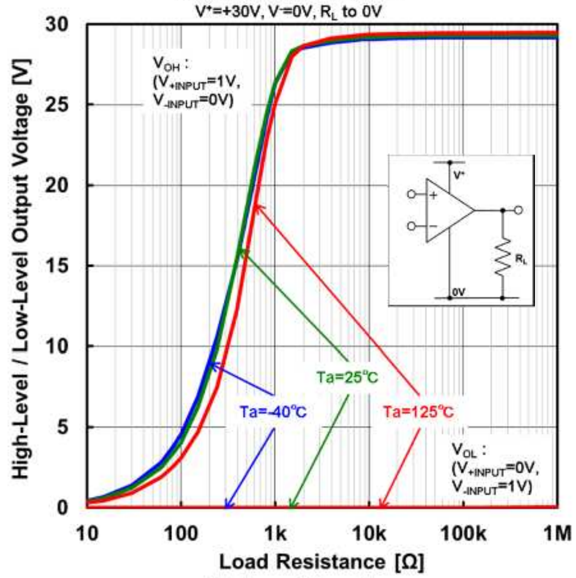
High-Level / Low-Level Output Voltage vs. Load Resistance



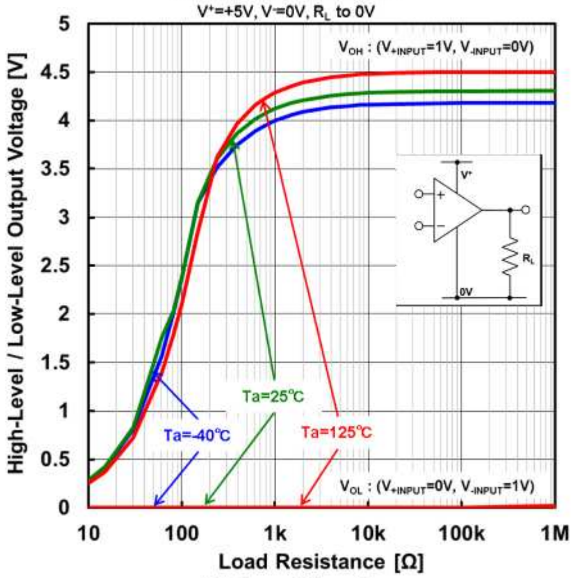
High-Level / Low-Level Output Voltage vs. Load Resistance



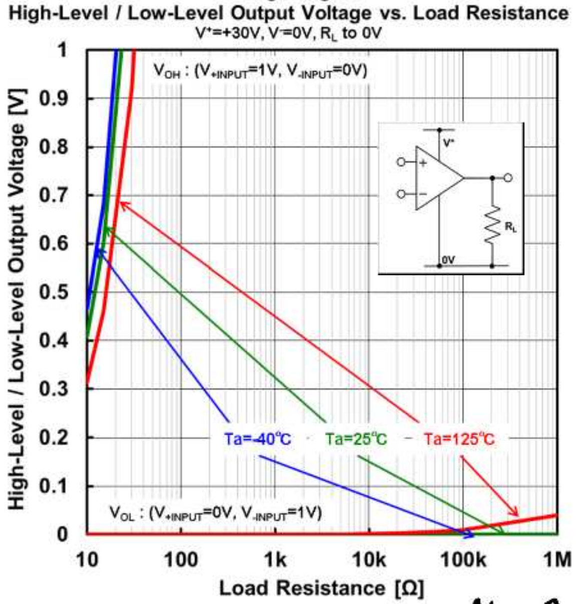
High-Level / Low-Level Output Voltage vs. Load Resistance



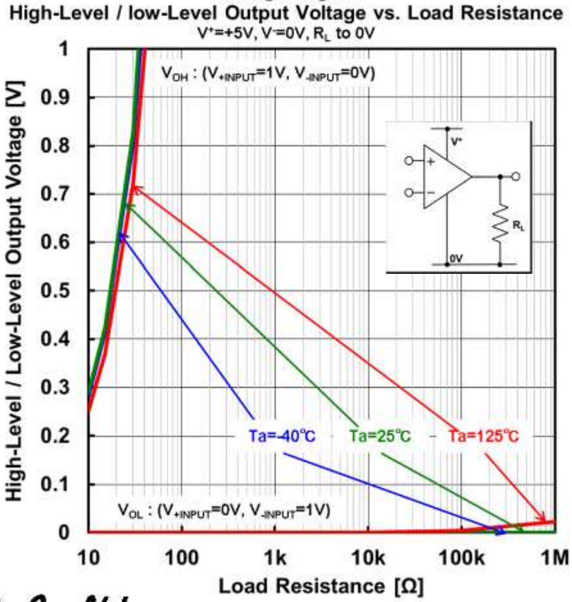
High-Level / Low-Level Output Voltage vs. Load Resistance



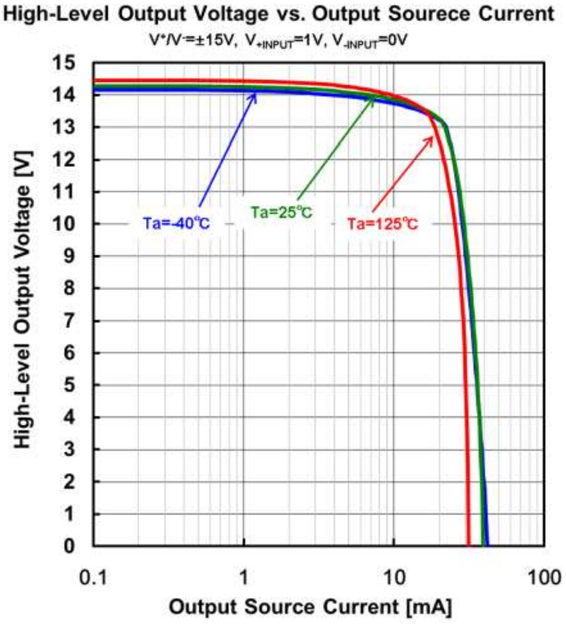
"Enlarged figure"
High-Level / Low-Level Output Voltage vs. Load Resistance

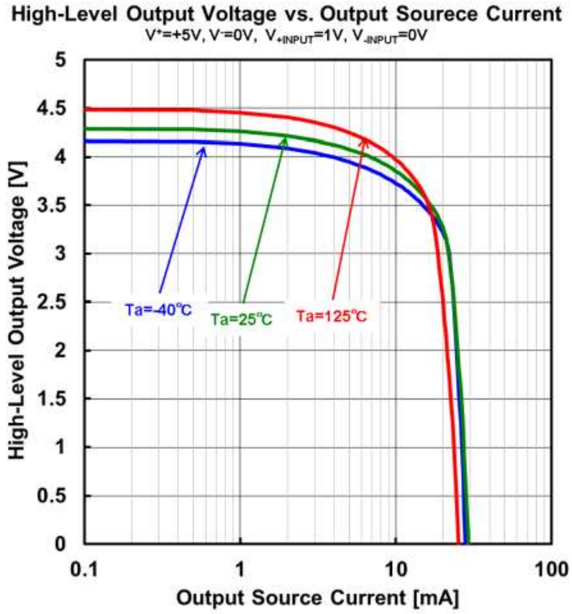


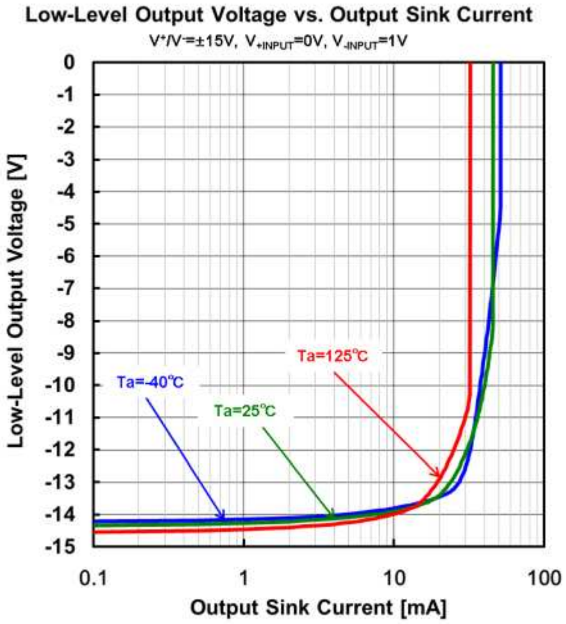
"Enlarged figure"
High-Level / low-Level Output Voltage vs. Load Resistance

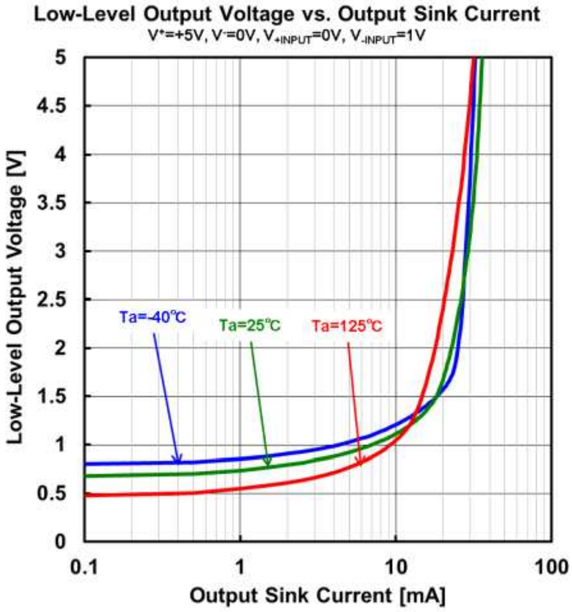


■ELECTRICAL CHARACTERISTICS





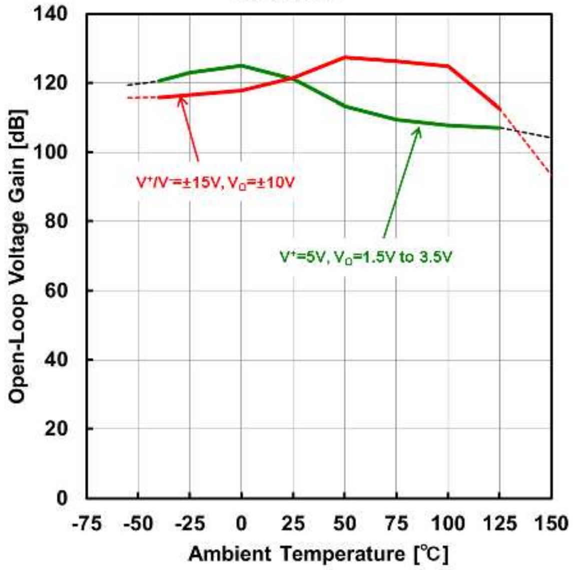




■ELECTRICAL CHARACTERISTICS

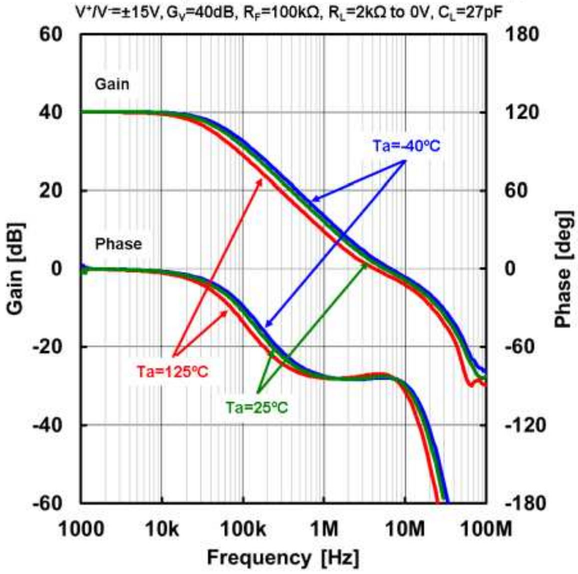
Open-Loop Voltage gain vs. Ambient Temperature

R_L=2kΩ to 0V



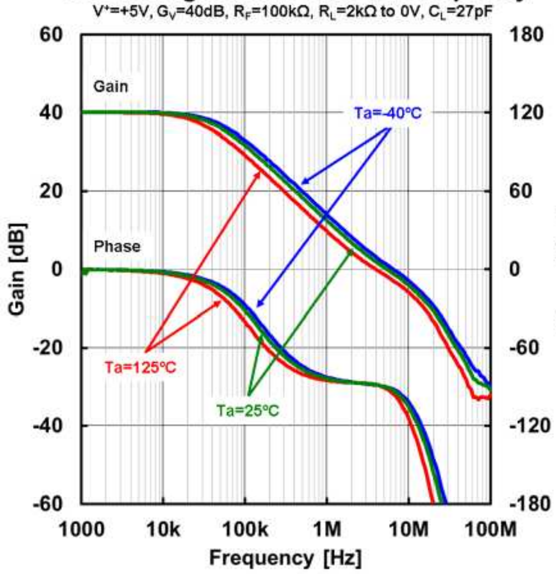
40dB Voltage Gain / Phase vs. Frequency

V^+/V^-=±15V, G_V=40dB, R_F=100kΩ, R_L=2kΩ to 0V, C_L=27pF



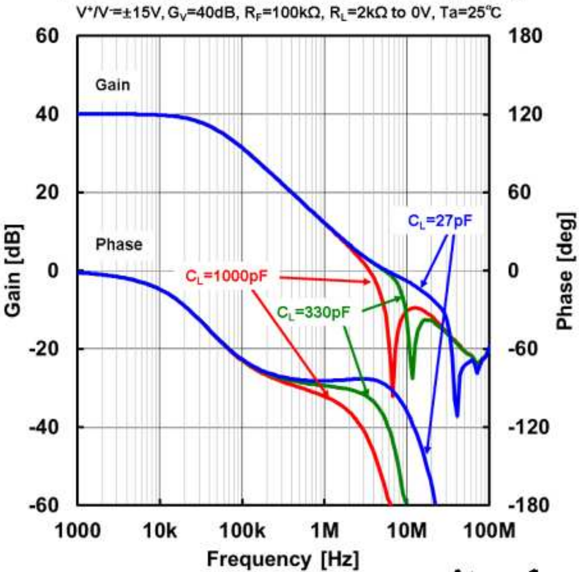
40dB Voltage Gain / Phase vs. Frequency

V^+=+5V, G_V=40dB, R_F=100kΩ, R_L=2kΩ to 0V, C_L=27pF



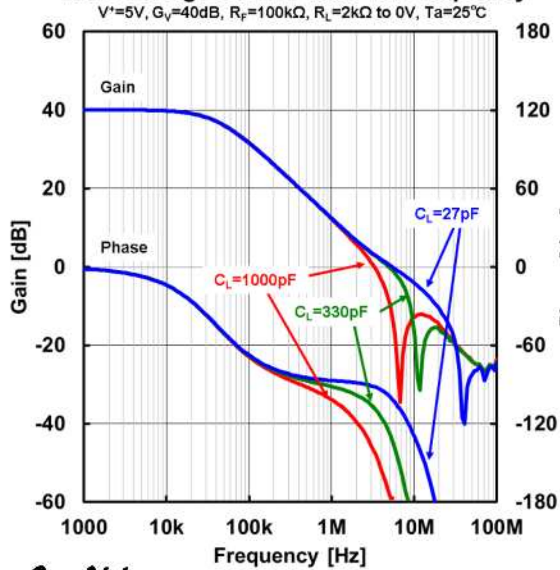
40dB Voltage Gain / Phase vs. Frequency

V^+/V^-=±15V, G_V=40dB, R_F=100kΩ, R_L=2kΩ to 0V, Ta=25℃

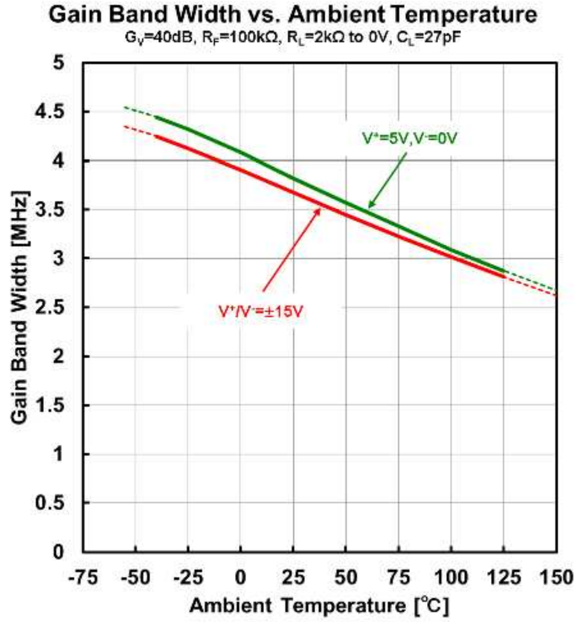


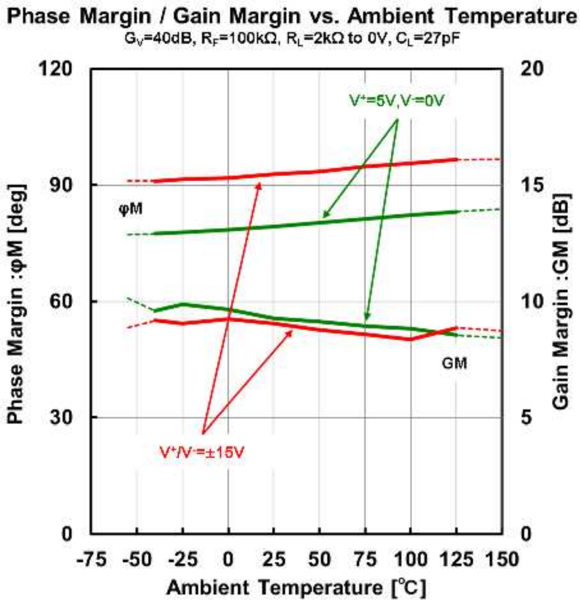
40dB Voltage Gain / Phase vs. Frequency

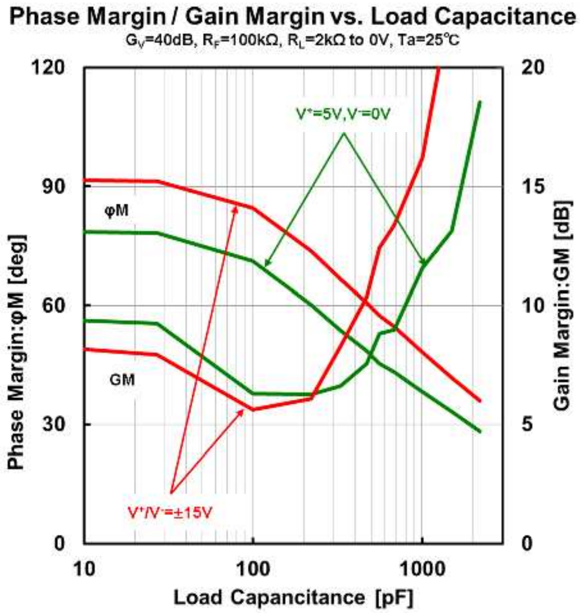
V^+=5V, G_V=40dB, R_F=100kΩ, R_L=2kΩ to 0V, Ta=25℃

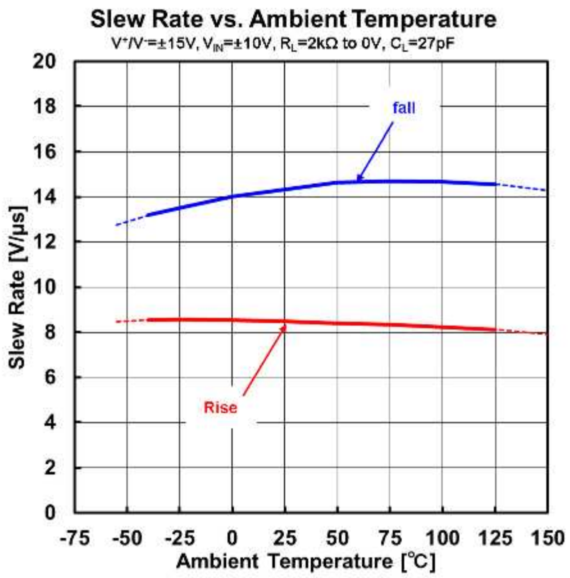


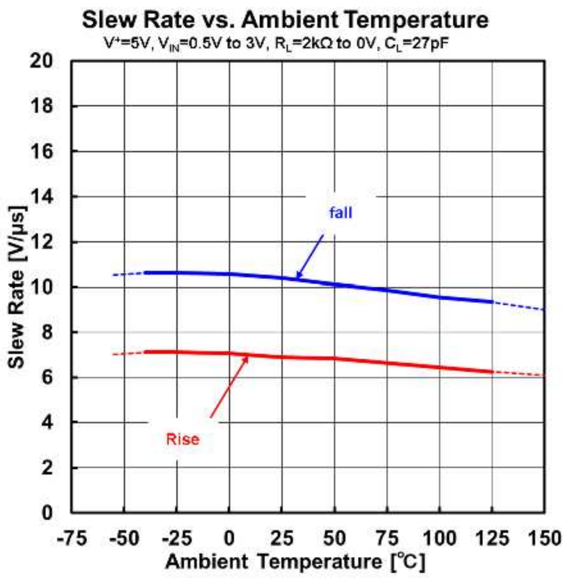
■ELECTRICAL CHARACTERISTICS



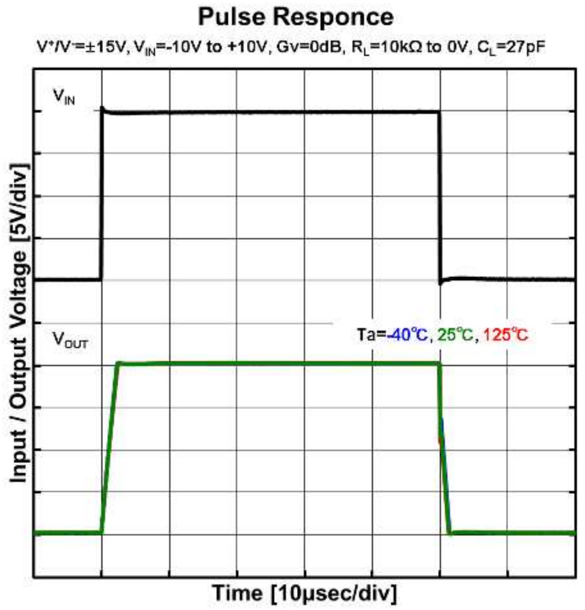


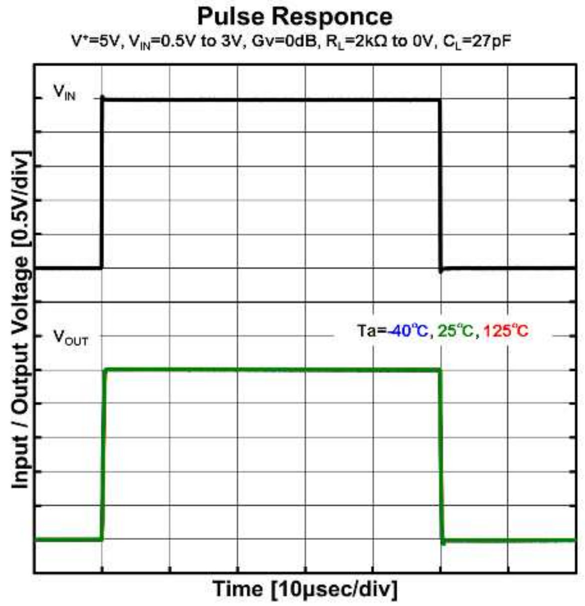


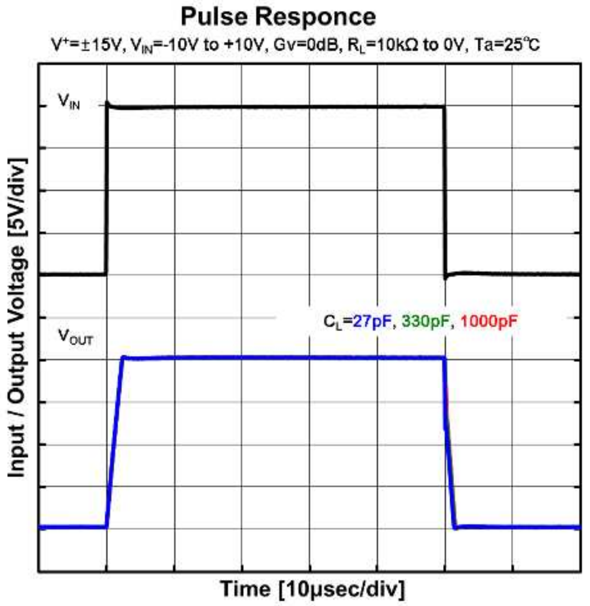


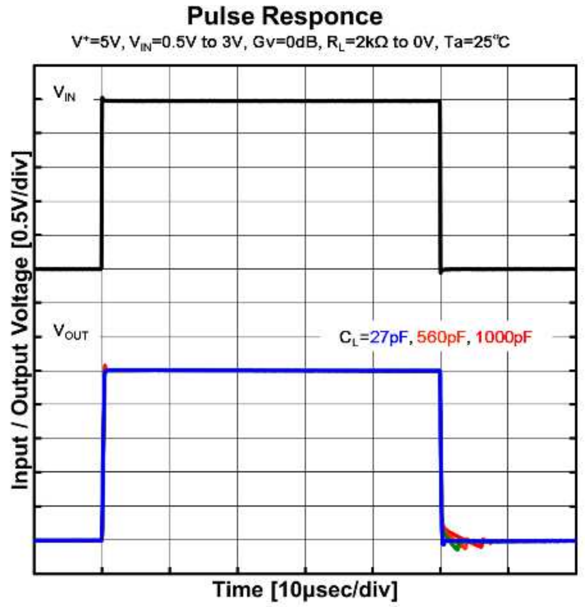


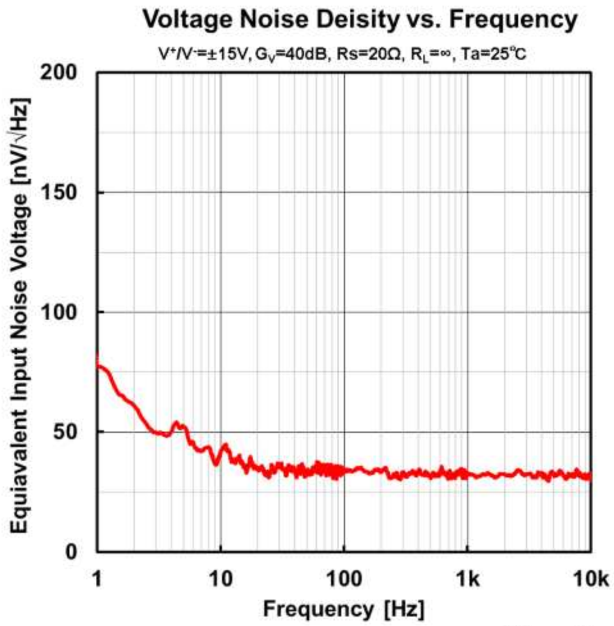
■ELECTRICAL CHARACTERISTICS

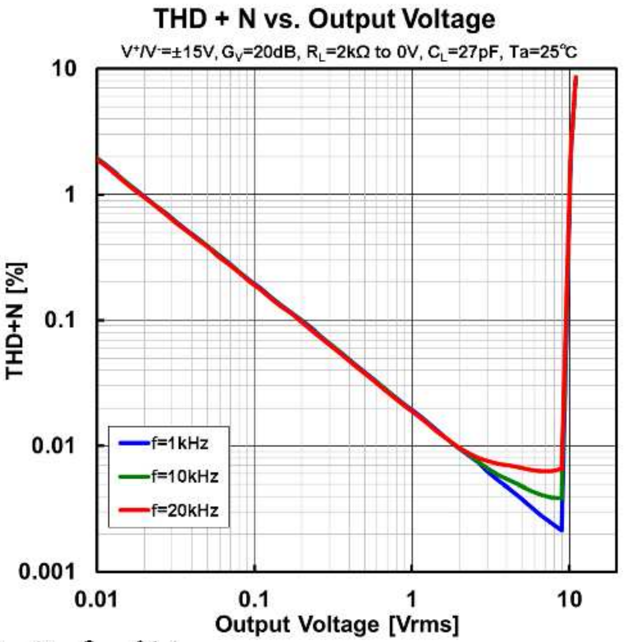




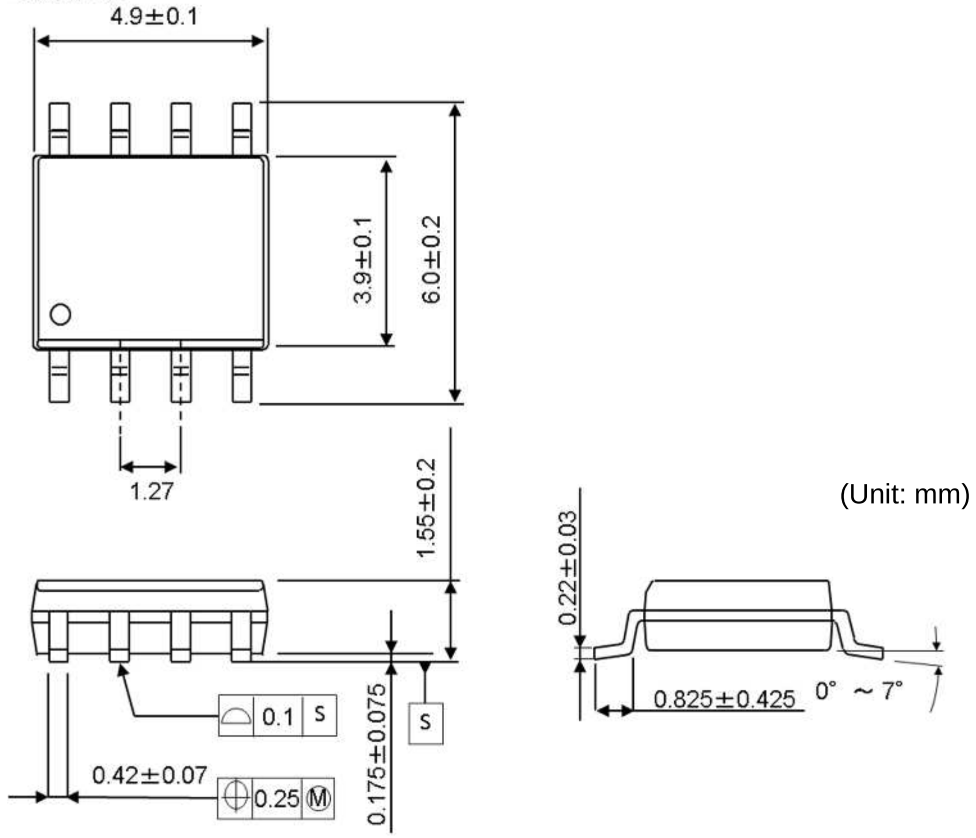




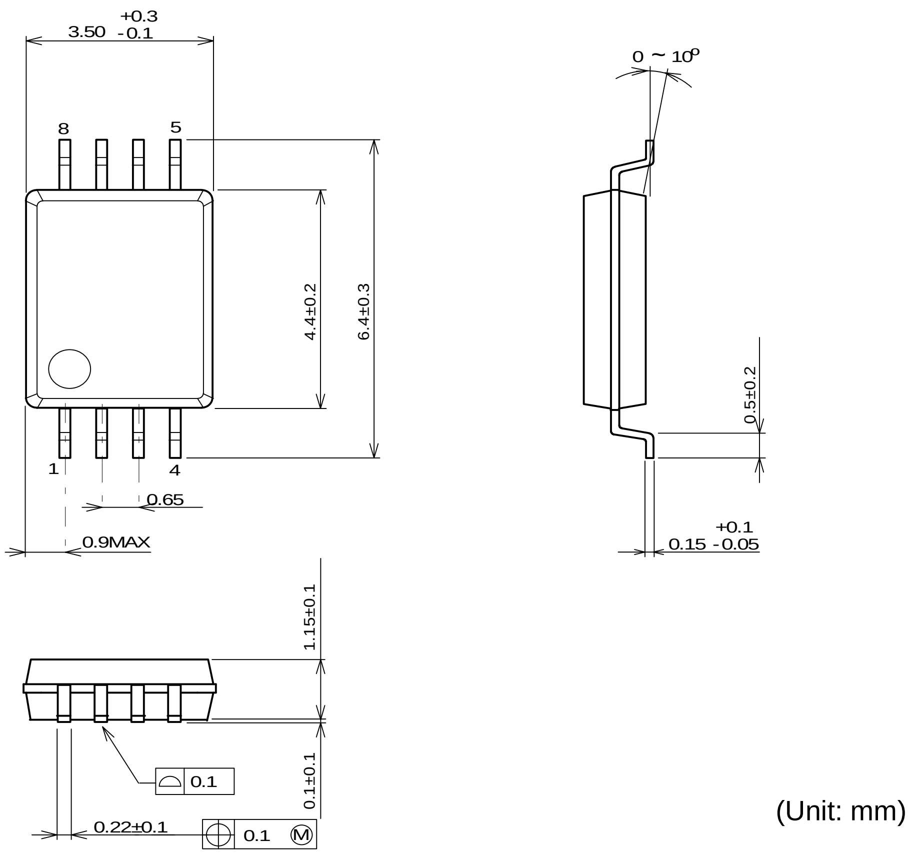




■PACKAGE DIMENSIONS

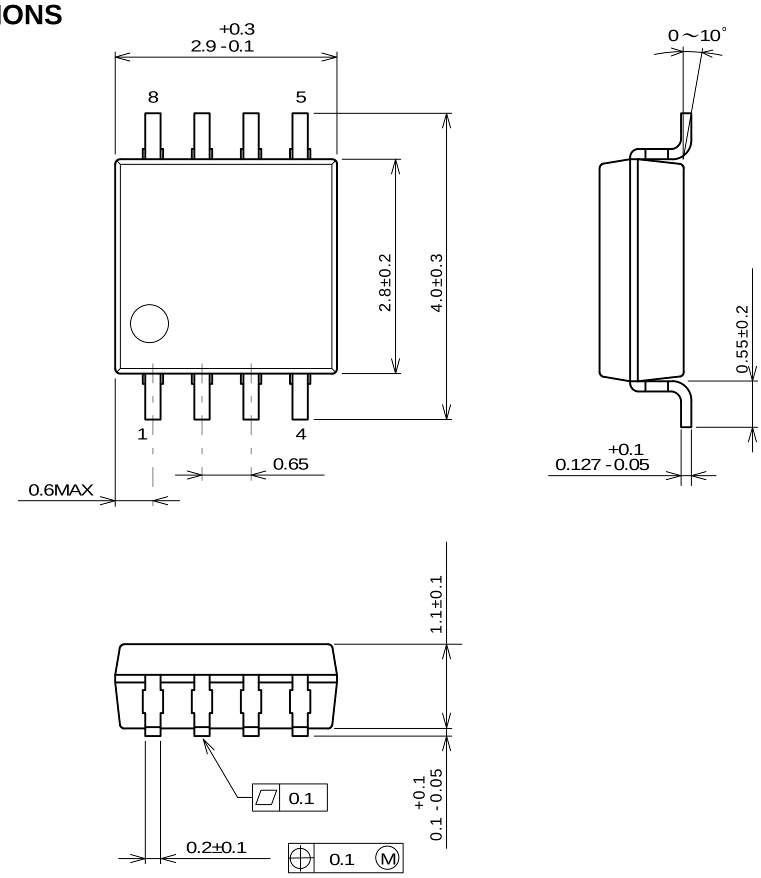


SOP8 Package



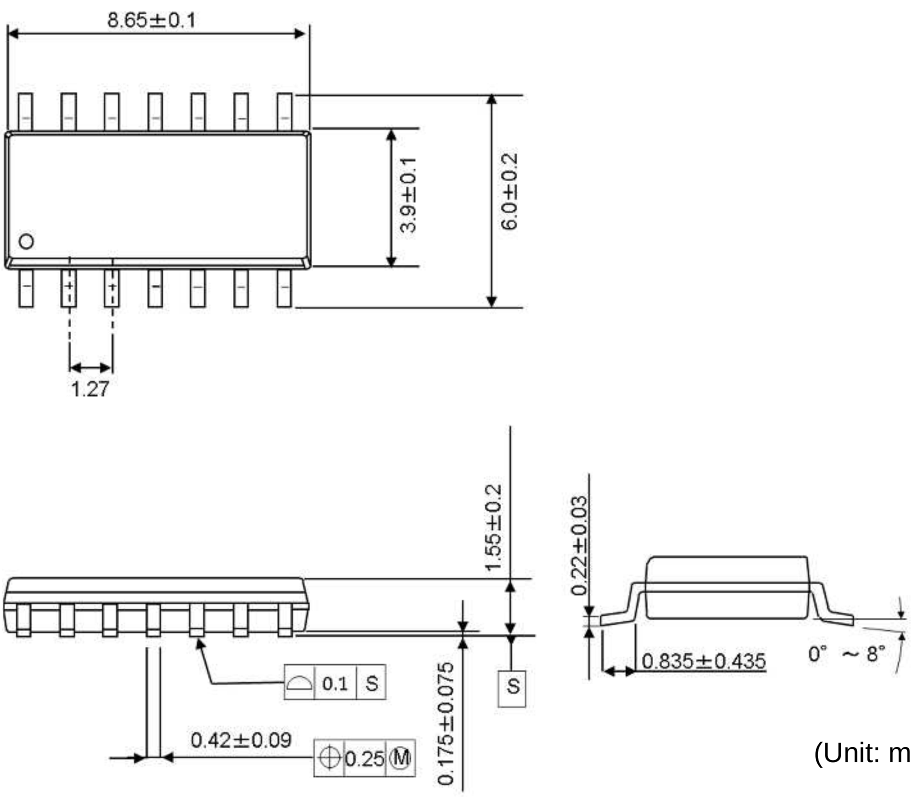
SSOP8 Package

■**PACKAGE DIMENSIONS**



(Unit: mm)

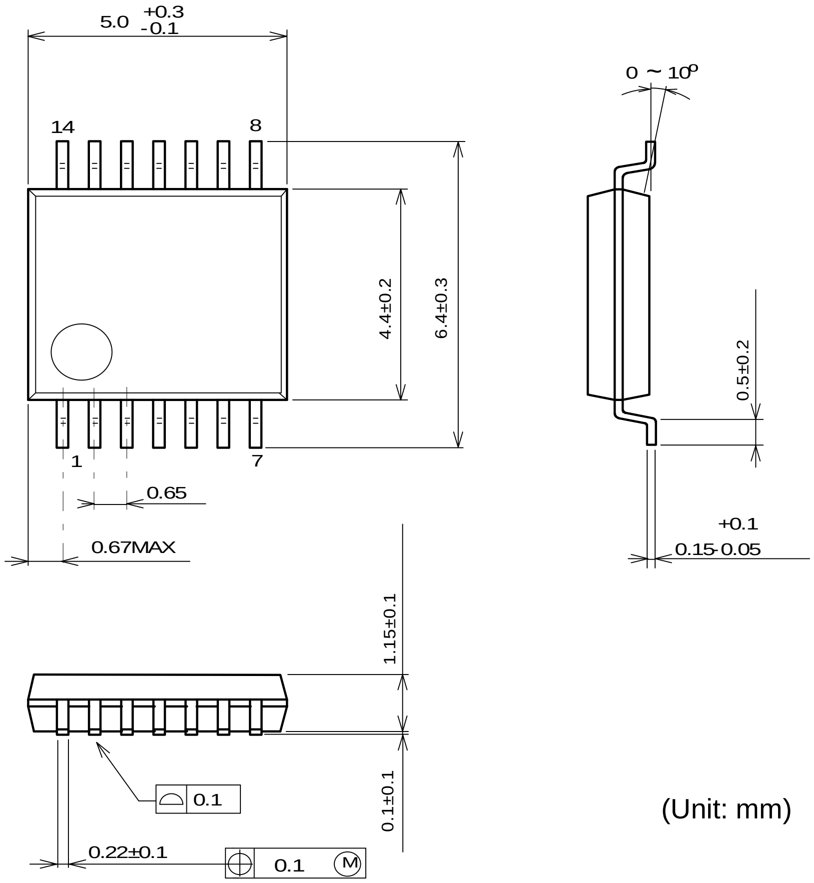
MSOP8 (VSP8) **JEDEC MO-187-DA / thin type** **Package**



(Unit: mm)

SOP14 Package

■**PACKAGE DIMENSIONS**



(Unit: mm)

SSOP14 Package

[CAUTION]
The specifications on this data book are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this data book are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.