High Speed Single Supply Quad Operational Amplifier

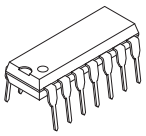
■ GENERAL DESCRIPTION

The **NJM2744** is a high-speed single supply quad operational amplifier. The low V_{OL} enables to treat small output signal on a single supply.

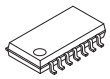
It has wide supply voltage range, +3V to +32V and high slew rate.

The **NJM2744** is suitable for power supply and motor driver units.

■ PACKAGR OUTLINE



NJM2744D



NJM2744M

NJM2744V

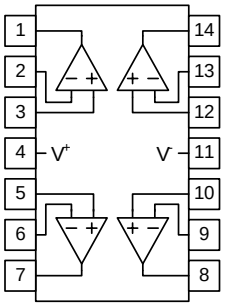
■ FEATURES

●Slew Rate	10V/μs typ.
●Capacitive Load Tolerance	1000pF typ.
●Output Voltage range	0.2V~3.7V at V^+=+5V, R_L=2kΩ
●Operating Voltage	3V~32V
●Single Supply operation	
●Bipolar Technology	
●Package Outline	DIP14, DMP14, SSOP14

■ APPLICATIONS

- Low side current sensing, Inverter motor control
- Power monitor module: UPS, PSU etc.
- Line driver, AD/DA buffer, FET driver

■ PIN CONFIGURATION



Pin Function

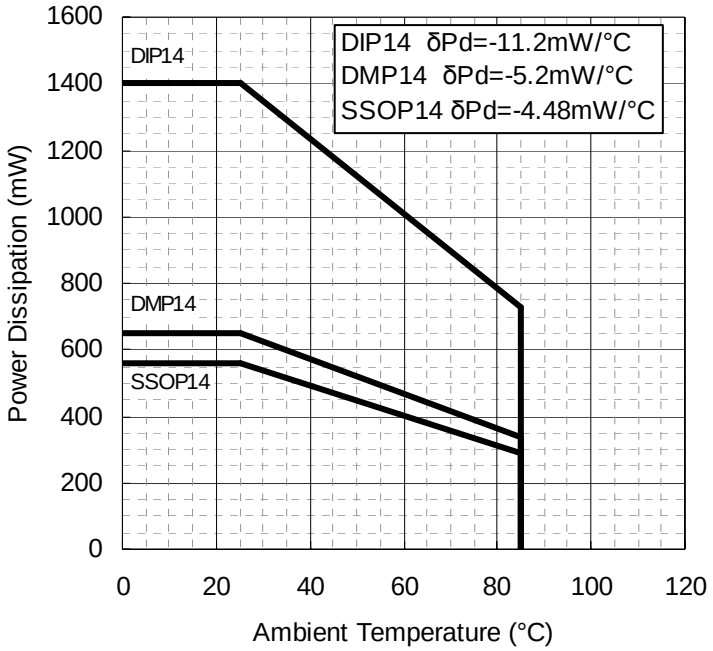
1. A OUTPUT	**8. C OUTPUT**
2. A –INPUT	**9. C –INPUT**
3. A +INPUT	**10. C +INPUT**
4. V^+	**11. V^-**
5. B +INPUT	**12. D +INPUT**
6. B –INPUT	**13. D –INPUT**
7. B OUTPUT	**14. D OUTPUT**

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

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V^+	+36	V
Common Mode Input Voltage Range	V_{ICM}	-0.3 ~ +36(Note1)	V
Differential Input Voltage Range	V_{ID}	±36(Note1)	V
Power Dissipation (Note3)	P_D	1400(DIP14) (Note2) 650(DMP14) (Note2) 560(SSOP14) (Note2)	mW
Operating Temperature Range	Topr	-40~+85	°C
Storage Temperature Range	Tstg	-50~+150	°C

(Note1) For supply voltage less than +36V, the absolute maximum input voltage is equal to supply voltage.
(Note2) On the PCB "EIA/JEDEC (76.2×114.3×1.6mm, 2 layers, FR-4)"
(Note3) See Figure.1"Power Dissipation Derating Curve" when ambient temperature is over 25ºC.

Figure.1 Power Dissipation Derating Curve



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

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V^+		3.0	-	32	V

■ ELECTRICAL CARACTERISTICS

● DC CARACTERISTICS (V^+/V^-=±15V, Ta=25°C, unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	I_{CC}	No Signal, Rs=50Ω	-	7.5	10	mA
Input Offset Voltage	V_{IO}	Rs=50Ω	-	2	12	mV
Input Bias Current	I_B	Rs=50Ω	-	80	400	nA
Input Offset Current	I_{IO}	Rs=50Ω	-	5	75	nA
Voltage Gain	A_V	R_L ≥ 2kΩ, Vo=±10V	80	110	-	dB
Common Mode Rejection Ratio	CMR	-15V ≤ V_{ICM} ≤ 12.5V	55	75	-	dB
Supply Voltage Rejection Ratio	SVR	3V ≤ V^+ ≤ 32V	70	90	-	dB
Maximum Output Voltage1	V_{OM1}	R_L ≥ 10kΩ to GND	13.7 -13.7	14 -14.8	-	V
Maximum Output Voltage2	V_{OM2}	R_L ≥ 2kΩ to GND	13.5 -13.5	-	-	V
Source Output Current	I_{SOURCE}	V_{IN+} = 1V, V_{IN-} = 0V, V_O = 0V	10	30	-	mA
Sink Output Current	I_{SINK}	V_{IN+} = 0V, V_{IN-} = 1V, V_O = 0V	10	30	-	mA
Common Mode Input Voltage Range	V_{ICM}	CMR ≥ 55dB	-15	-	12.5	V

● AC CARACTERISTICS (V^+/V^-=±15V, Ta=25°C, unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gain Bandwidth Product	GB		-	2	-	MHz
Slew Rate	SR		-	10	-	V/μs
Equivalent Input Noise Voltage	V_{NI}	f=1kHz	-	40	-	nV/√Hz
Capacitive Load Tolerance	C_L		-	1000	-	pF

■ ELECTRICAL CARACTERISTICS

● DC CARACTERISTICS (V^+=+5V, V^-=0V, Ta=25°C, unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	I_{CC}	No Signal, Rs=50Ω	-	5.5	9	mA
Input Offset Voltage	V_{IO}	Rs=50Ω	-	2	12	mV
Input Bias Current	I_B	Rs=50Ω	-	80	400	nA
Input Offset Current	I_{IO}	Rs=50Ω	-	5	75	nA
Voltage Gain	A_V	R_L = 2kΩ, Vo=±1V	80	110	-	dB
Common Mode Rejection Ratio	CMR	0V ≤ V_{ICM} ≤ 2.8V	50	60	-	dB
Supply Voltage Rejection Ratio	SVR	3V ≤ V^+ ≤ 32V	70	90	-	dB
Maximum Output Voltage1	V_{OH}	RL = 2kΩ to GND	3.7	4	-	V
Maximum Output Voltage2	V_{OL}	RL = 2kΩ to GND	-	0.1	0.2	V
Source Output Current	I_{SOURCE}	V_{IN+} =1V, V_{IN-} = 0V, V_O = 2.5V	10	30	-	mA
Sink Output Current	I_{SINK}	V_{IN+} =0V, V_{IN-} =1V, V_O = 2.5V	10	30	-	mA
Common Mode Input Voltage Range	V_{ICM}	CMR ≥ 50dB	0	-	2.8	V

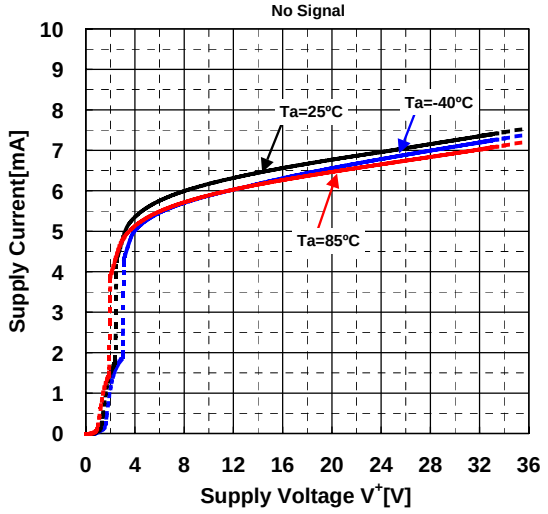
● AC CARACTERISTICS (V^+=+5V, V^-=0V, Ta=25°C, unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gain Bandwidth Product	GB		-	2	-	MHz
Slew Rate	SR		-	7	-	V/μs
Equivalent Input Noise Voltage	V_{NI}	f=1kHz	-	40	-	nV/√Hz
Capacitive Load Tolerance	C_L		-	1000	-	pF

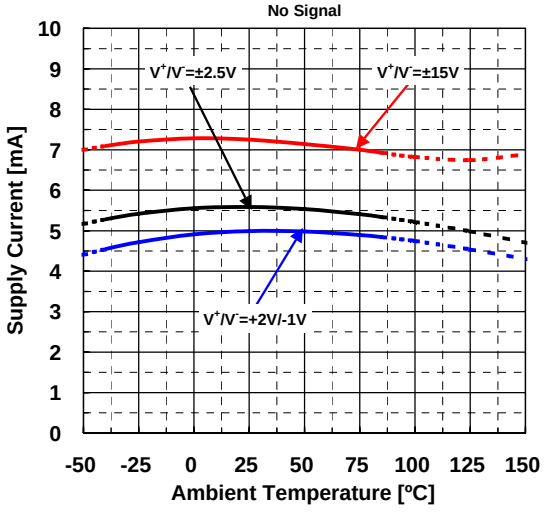
Note: The common mode input voltage range of NJM2744 is shifted toward the V^- for single supply use.
At the low operating voltage, the center potential of the V^+ and V^- may be out of the common mode voltage range.
In this case, shift the common mode input voltage toward the V^-.

■ TYPICAL CARACTERISTICS

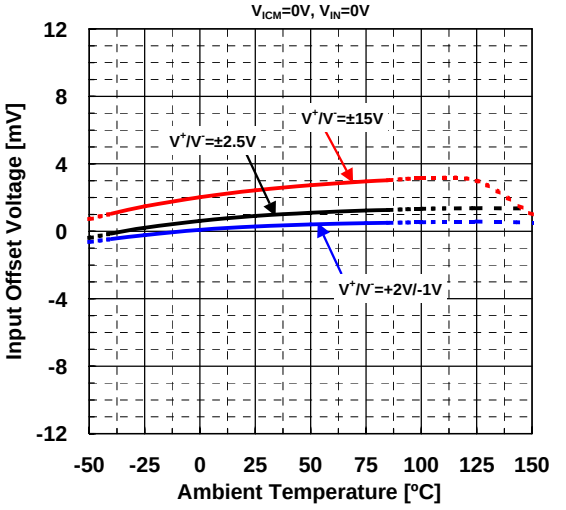
Supply Current vs. Supply Voltage (Temperature)
No Signal



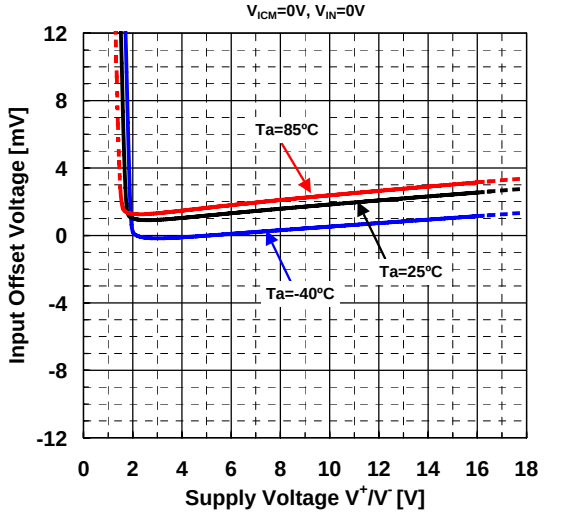
Supply Current vs. Temperature (Supply Voltage)
No Signal



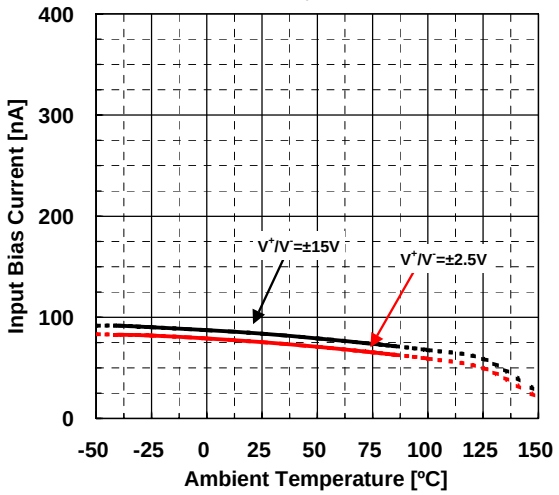
Input Offset Voltage vs. Temperature (Supply Voltage)
VICM=0V, VIN=0V



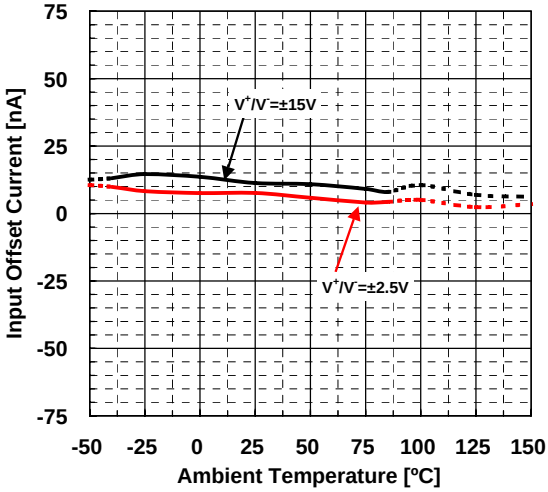
Input Offset Voltage vs. Supply Voltage (Temperature)
VICM=0V, VIN=0V



Input Bias Current vs. Temperature (Supply Voltage)
VICM=0V

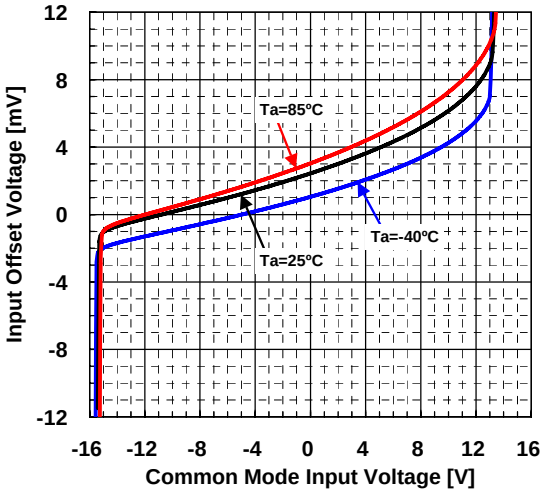


Input Offset Current vs. Temperature (Supply Voltage)
VICM=0V



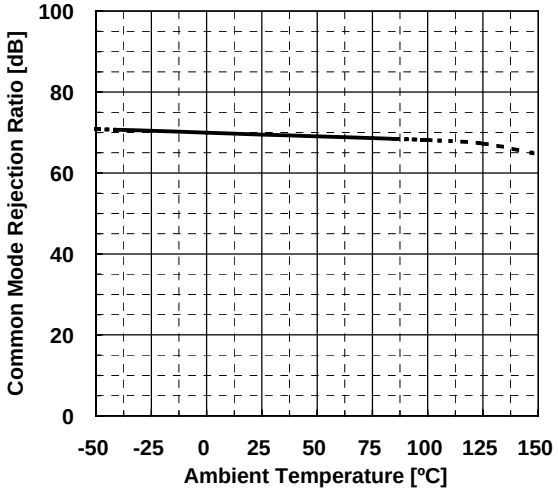
Input Offset Voltage vs. Common Mode Input Voltage (Temperature)

V^+/V^-=±15V



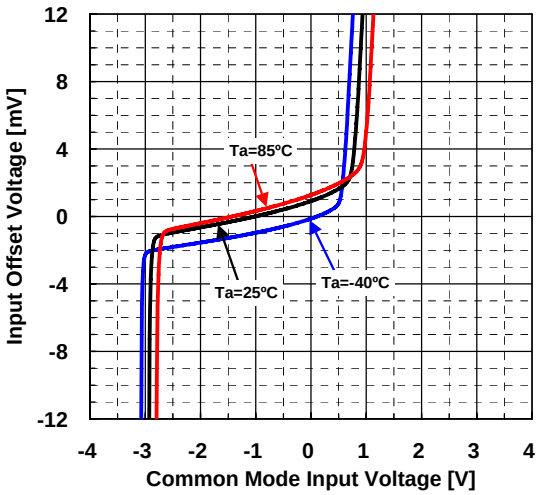
CMR vs. Temperature

V^+/V^-=±15V, V_{ICM}=-15V→+12.5V



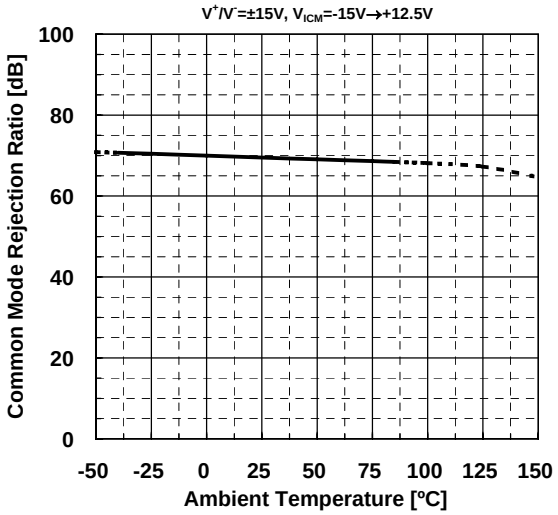
Input Offset Voltage vs. Common Mode Input Voltage (Temperature)

V^+/V^-=±2.5V



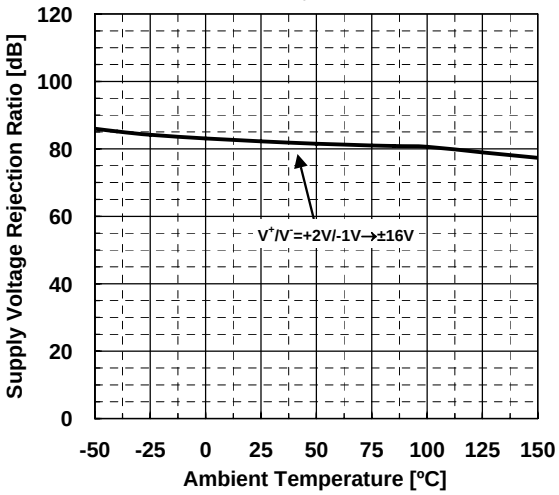
CMR vs. Temperature

V^+/V^-=±15V, V_{ICM}=-15V→+12.5V



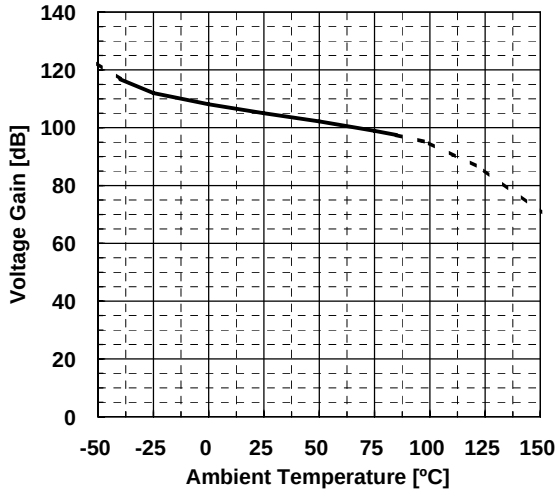
SVR vs. Temperature

V_{ICM}=0V



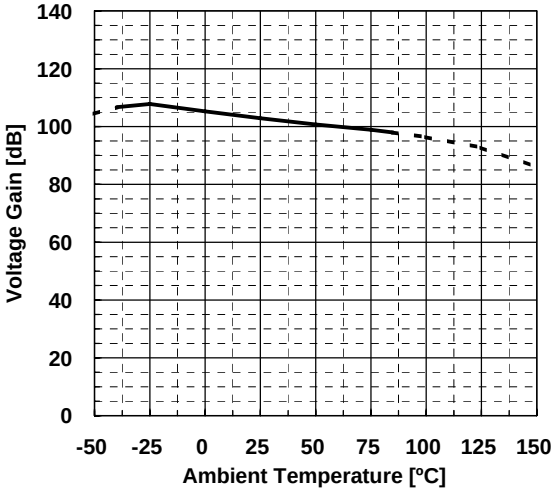
Gain vs. Temperature

V^+/V^-=±15V, R_L=2kΩ to 0V,
C_L=100p to 0V, V_O=-10V→+10V

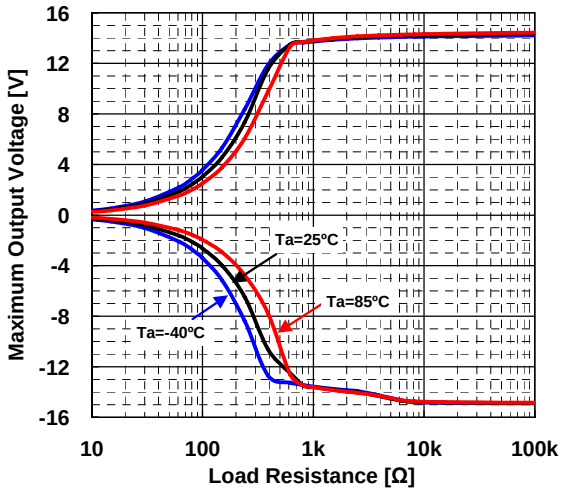


Gain vs. Temperature

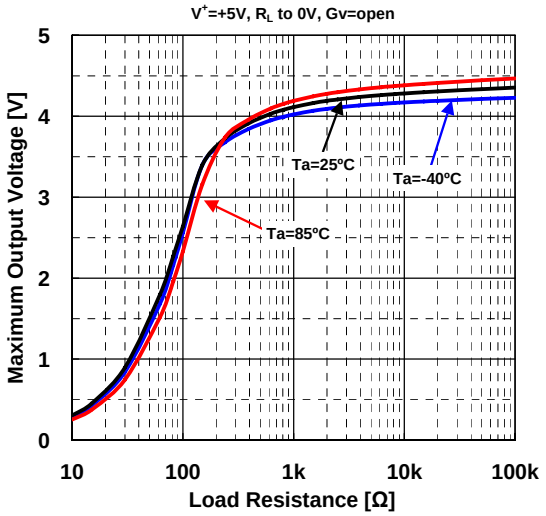
V^+/V^-=±2.5V, R_L=2kΩ to 0V,
C_L=100p to 0V, V_O=-1V→+1V



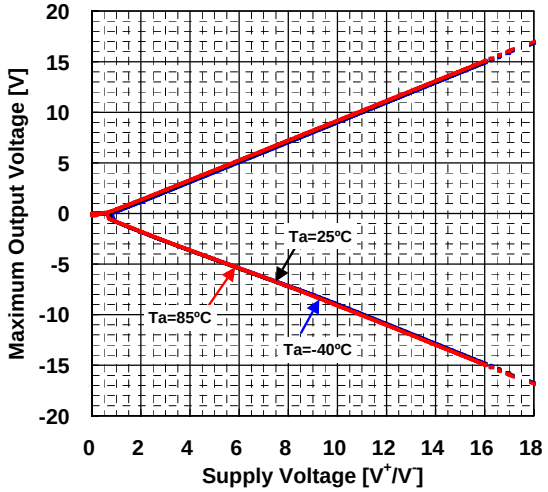
Maximum Output Voltage vs. Load Resistance
(Temperature)
V^+/V^-=±15V, Gv=open, R_L to 0V



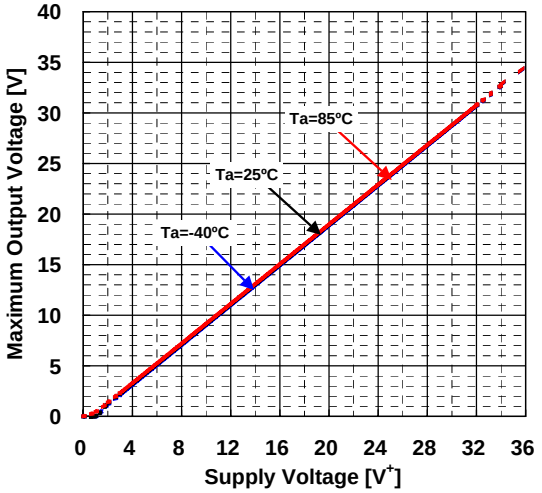
Maximum Output Voltage vs. Load Resistance
(Temperature)
V^+=+5V, R_L to 0V, Gv=open



Maximum Output Voltage vs. Supply Voltage
(Temperature)
R_L=2k to 0V

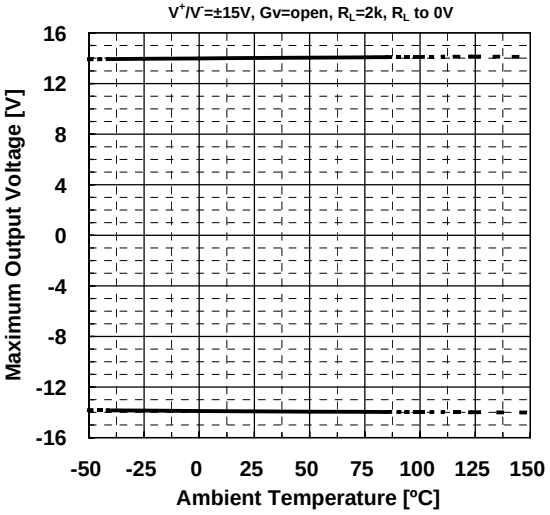


Maximum Output Voltage vs. Supply Voltage
(Temperature)
R_L=2k to 0V



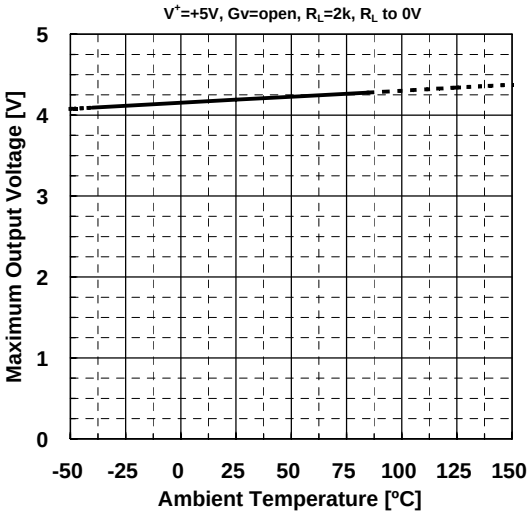
Maximum Output Voltage vs. Temperature

V^+/V^-=±15V, Gv=open, R_L=2k, R_L to 0V



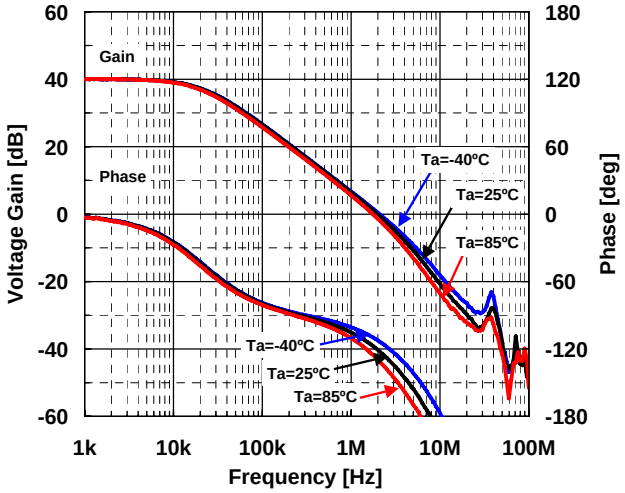
Maximum Output Voltage vs. Temperature

V^+=+5V, Gv=open, R_L=2k, R_L to 0V



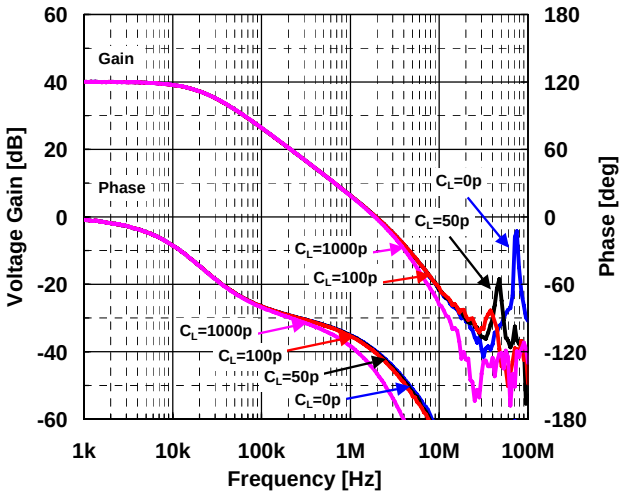
Gain vs. Frequency (Temperature)

V^+/V^-=±15V, G_V=40dB, R_S=20Ω, R_F=2kΩ,
R_T=50Ω, R_L=2kΩ, C_L=100pF, V_{IN}=0.02Vpp



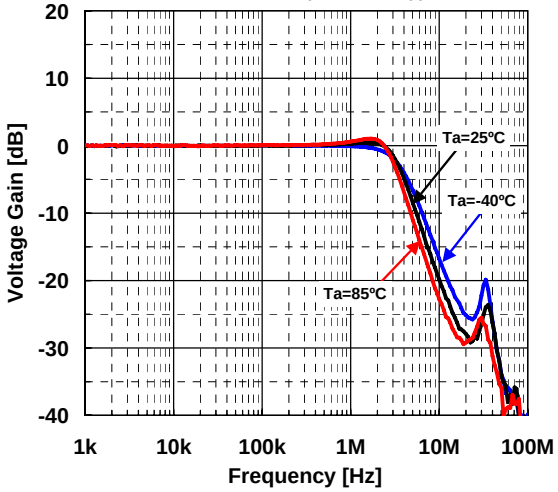
Gain vs. Frequency (Load Capacitance)

V^+/V^-=±15V, G_V=40dB, R_S=20Ω, R_F=2kΩ,
R_T=50Ω, R_L=10kΩ, V_{IN}=0.01Vpp, Ta=25ºC



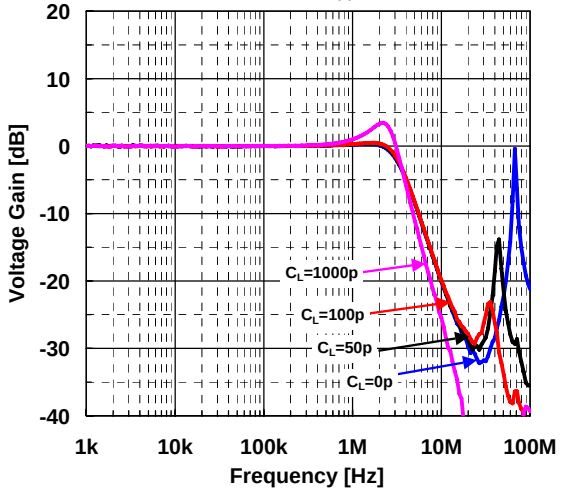
V.F. Peak vs. Frequency (Temperature)

V^+/V^-=±15V, G_V=0dB, R_S=open, R_F=0, R_T=50Ω,
R_L=2kΩ, C_L=100pF, V_{IN}=0.02Vpp



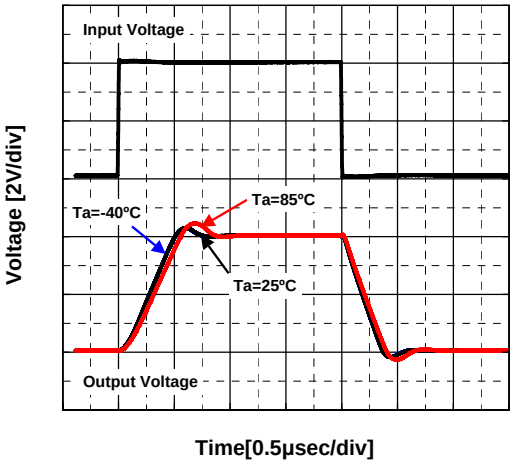
V.F. Peak vs. Frequency (Load Capacitance)

V^+/V^-=±15V, G_V=0dB, R_S=open, R_F=0, R_T=50Ω,
R_L=10kΩ, V_{IN}=0.02Vpp, Ta=25ºC



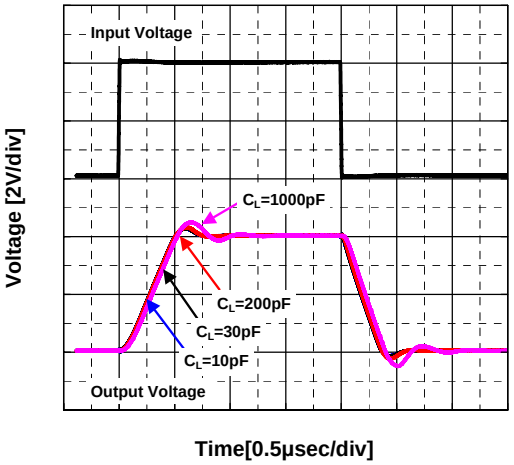
Pulse Response (Temperature)

V^+/V^-=±15V, f=250kHz, V_{IN}=4V_{P-P}, Gv=0dB,
R_T=50Ω, R_F=0Ω, R_G=open, C_L=100pF, R_L=10kΩ



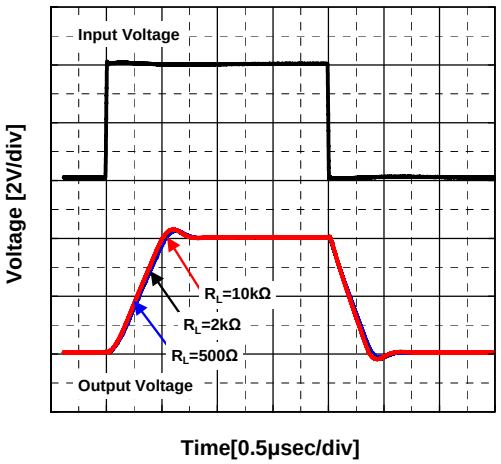
Pulse Response (Load Capacitance)

V^+/V^-=±15V, f=250kHz, V_{IN}=4V_{P-P}, Gv=0dB,
R_T=50Ω, R_F=0Ω, R_G=open, R_L=10kΩ, Ta=25ºC



Pulse Response (Load Resistance)

V^+/V^-=±15V, f=250kHz, V_{IN}=4V_{P-P}, Gv=0dB,
R_T=50Ω, R_F=0Ω, R_G=open, C_L=100pF, Ta=25ºC



■NOTE

[CAUTION]
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