Low Supply Voltage Single Operational Amplifier with Full Swing Input and Output

■ GENERAL DESCRIPTION

NJM2730 is a single supply single operational amplifier with full swing input and output, operates from 1.8V.

Input and Output Full Swing provides wide dynamic range, is from ground to power supply level. In addition to ground sensing applications, NJM2730 enable to be applied to Hi-side sensing applications.

The features are low noise and high phase margin for battery management, portable audio applications, and others. Furthermore NJM2730 is packaged with small size package MTP-5.

■ PACKAGE OUTLINE

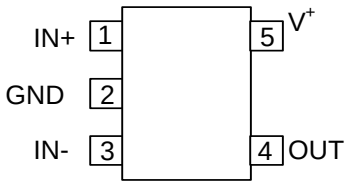
NJM2730F

■ FEATURES

- Single Supply
- Operating Voltage 1.8 to 5.0V
- Input Full-Swing V_{ICM}= 0 to 5.0V at V^+=5V
- Output Full-Swing $V_{OH} \geq 4.9V$/ $V_{OL} \leq 0.1V$ at V^+=5V,R_L=20kΩ
- Load Drivability $V_{OH} \geq 4.75V$/ $V_{OL} \leq 0.25V$ at V^+=5V,R_L=2kΩ
- Offset Voltage 5mV max
- Slew Rate 0.4V/μs typ.
- Low Input Voltage Noise 10nV/√Hz typ.
- Adequate phase margin Φ_M=75deg. typ. at R_L=2kΩ, voltage follower
- Bipolar Technology
- Package Outline MTP5

■ PIN CONFIGURATION

(Top View)



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+	7.0	V
Differential Input Voltage	V_{ID}	±1.0	V
Input Common Mode Voltage Range	V_{ICM}	0 to 7.0	V
Power Dissipation	P_D	200	mW
Operating Temperature Range	Topr	-40 to +85	°C
Storage Temperature Range	Tstg	-40 to +125	°C

(Note1)
If the supply voltage (V^+) is less than 7V, the input voltage must not over the V^+ level through 7V is limit specified.

■ RECOMMENDED OPERATING CONDITION

(Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V^+	1.8 to 5.0	V

■ ELECTRICAL CHARACTERISTICS

● DC CHARACTERISTICS (V^+=5V,Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Operating Current	I_{CC}	No Signal	-	320	550	µA
Input Offset Voltage	V_{IO}		-	1	5	mV
Input Bias Current	I_B		-	50	250	nA
Input Offset Current	I_{IO}		-	5	100	nA
Voltage Gain	A_V	R_L=2kΩ	60	85	-	dB
Common Mode Rejection Ratio	CMR	CMR+:2.5V≤V_{CM}≤5.0V, CMR-: 0≤V_{CM}≤2.5V(Note2)	55	70	-	dB
Supply Voltage Rejection Ratio	SVR		70	85	-	dB
Maximum Output Voltage1	V_{OH1}	R_L=20kΩ	4.9	4.95	-	V
	V_{OL1}	R_L=20kΩ	-	0.05	0.1	
Maximum Output Voltage 2	V_{OH2}	R_L=2kΩ	4.75	4.85	-	V
	V_{OL2}	R_L=2kΩ	-	0.15	0.25	
Input Common Mode Voltage Range	V_{ICM}	CMR>55dB	0	-	5	V

(Note2) CMR is represented by either CMR+ or CMR- which has lower value.
CMR+ is measured with 2.5V≤V_{CM}≤5V and CMR- is measured with 0V≤ V_{CM} ≤ 2.5V .

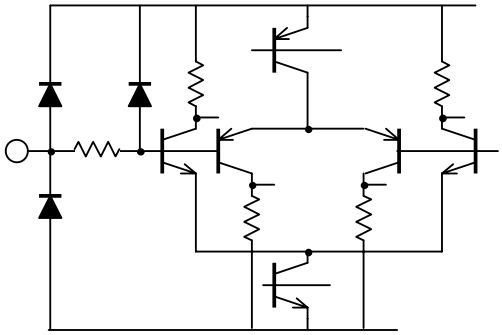
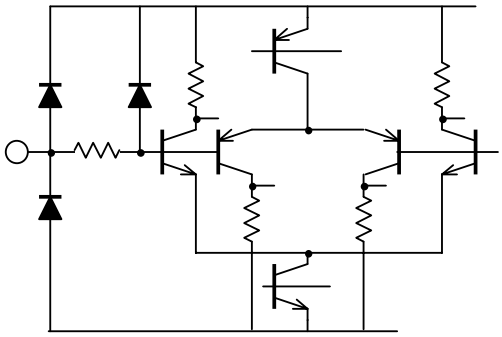
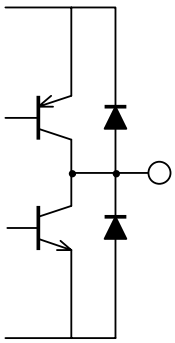
● AC CHARACTERISTICS (V^+=5V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Unity Gain Bandwidth	f_T	R_L=2kΩ	-	1	-	MHz
Phase Margin	Φ_M	R_L=2kΩ	-	75	-	Deg
Equivalent Input Noise Voltage	V_N	f=1kHz	-	10	-	nV/√Hz

● TRANSIENT CHARACTERISTICS (V^+=5V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Slew Rate	SR	R_L=2kΩ	-	0.4	-	V/µs

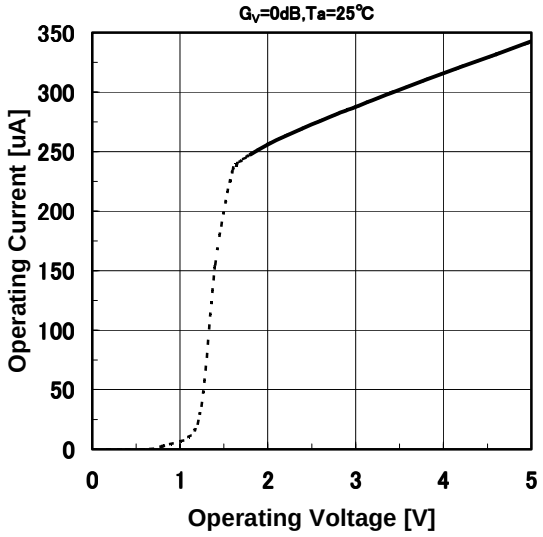
■ TERMINAL CHARACTERISTICS

No.	Symbol	Equivalent Circuit	Typ.DC Voltage(V)	Function
1	+INPUT			non-inverting input
3	-INPUT			inverting input
4	VOUT			output

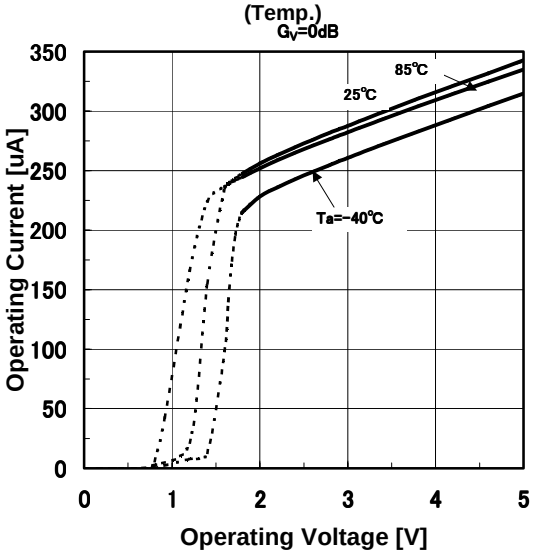
■ TYPICAL CHARACTERISTICS

(Note: Rs,Rg,R_L and C_L are connected to $V^+/2$ when single supply.)

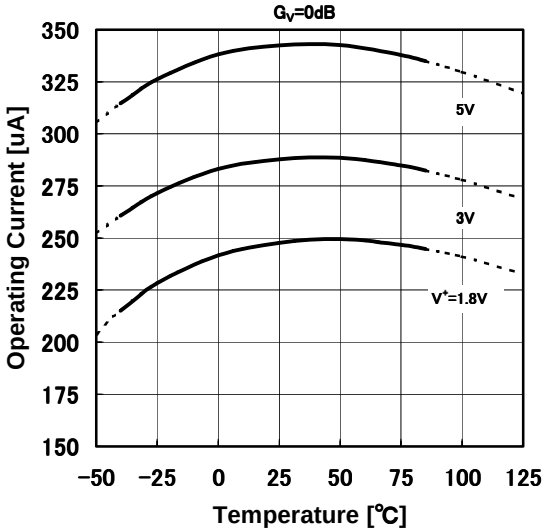
Operating Current vs. Operating Voltage



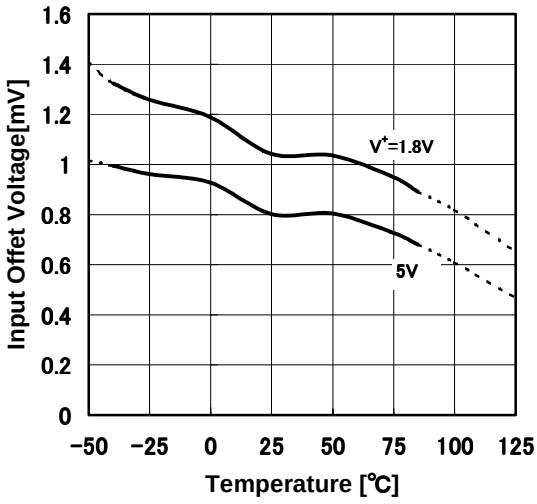
Operating Current vs. Operating Voltage (Temp.)



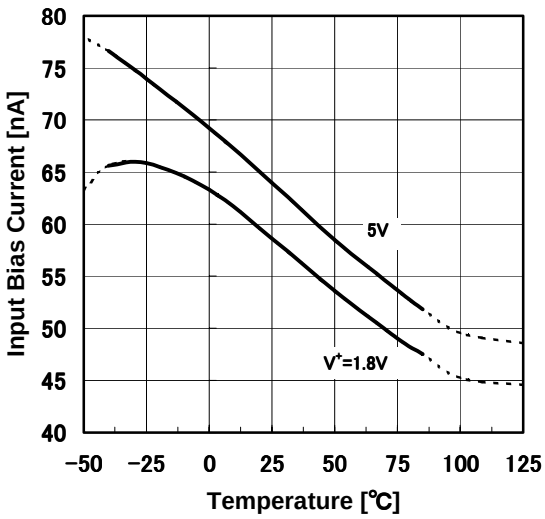
Operating Current vs. Temperature



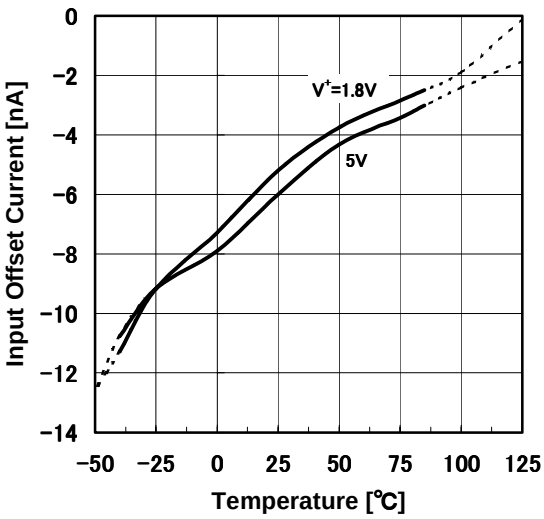
Input Offset Voltage vs. Temperature



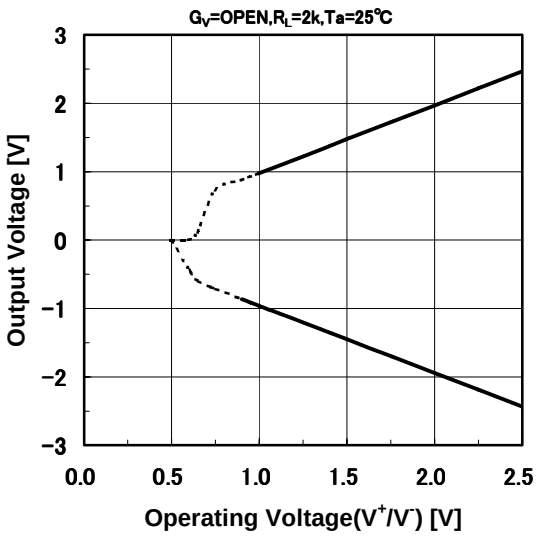
Input Bias Current vs. Temperature



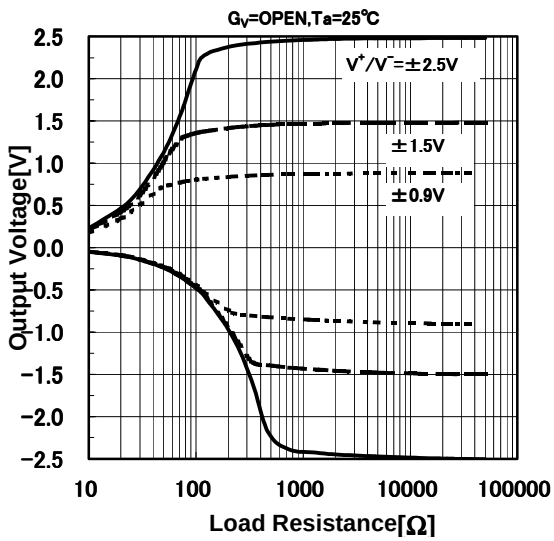
Input Offset Current vs. Temperature



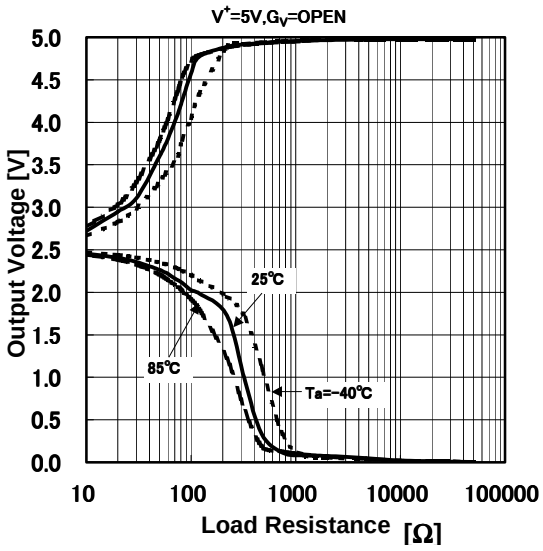
Output Voltage vs. Operating Voltage



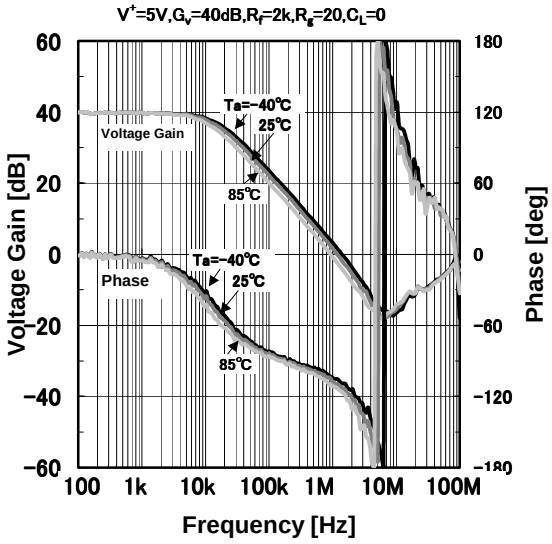
Output Voltage vs. Load Resistance (V^+/V^-)



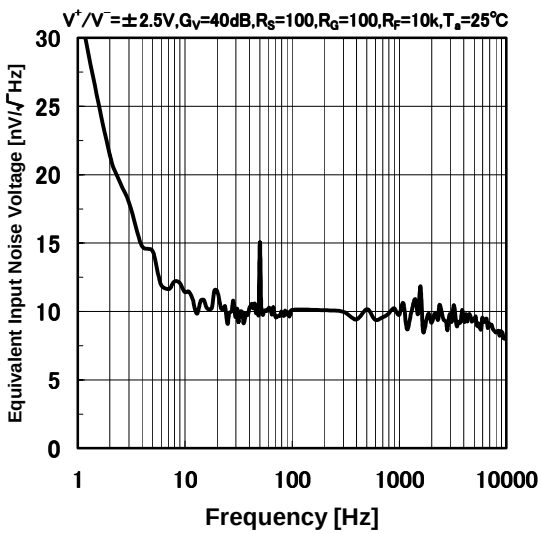
Output Voltage vs. Load Resistance(Temp.)



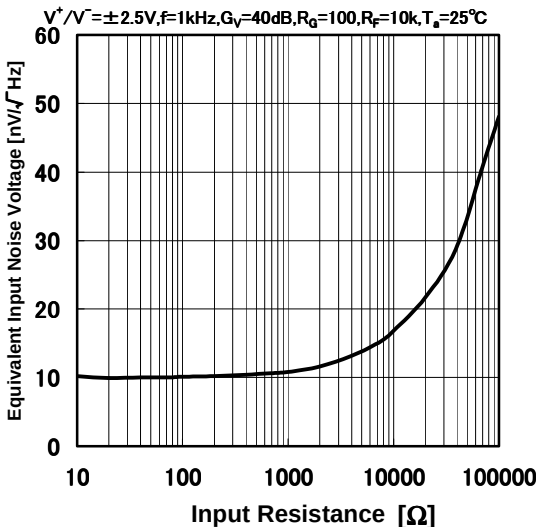
Voltage Gain,Phase vs. Frequency (Temp.)



Equivalent Input Noise Voltage vs. Frequency

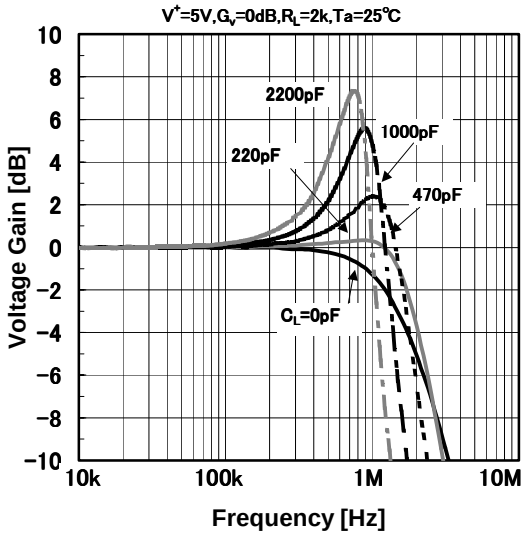


Equivalent Input Noise Voltage vs. Input Resistance



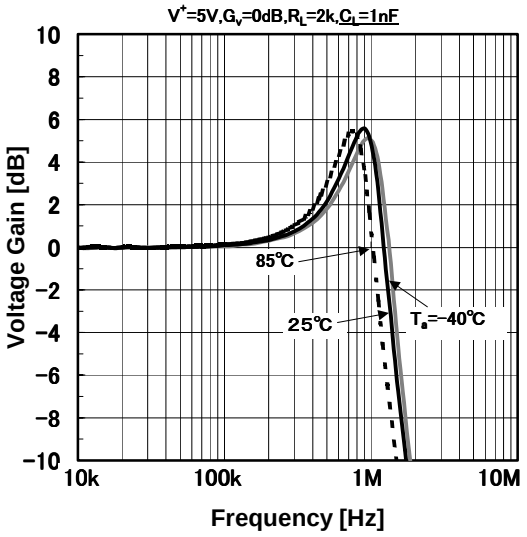
V.F.Peak vs.Frequency (Load C.)

V^+=5V,G_v=0dB,R_L=2k,Ta=25℃



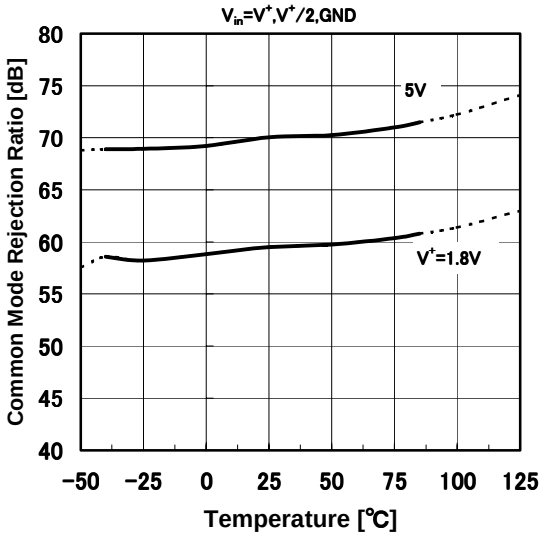
V.F.Peak vs.Frequency (Temp.)

V^+=5V,G_v=0dB,R_L=2k,C_L=1nF



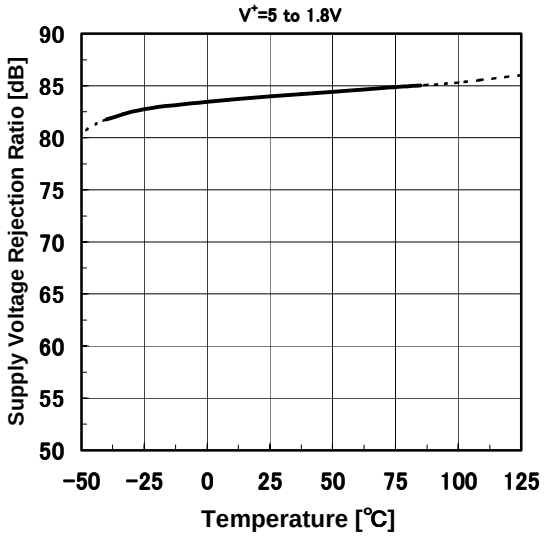
Common Mode Rejection Ratio vs. Temperature

V_{in}=V^+,V^+/2,GND



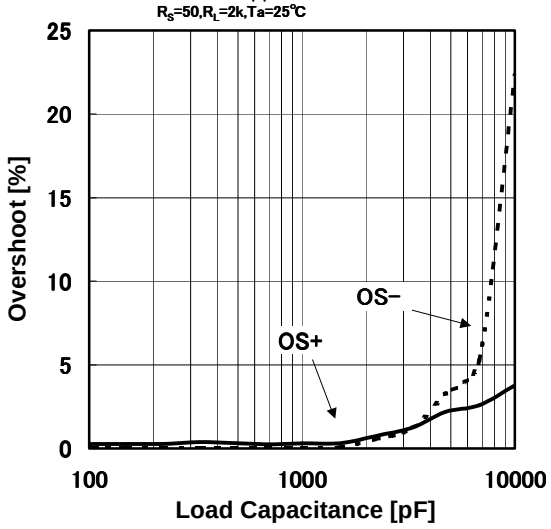
Supply Voltage Rejection Ratio vs. Temperature

V^+=5 to 1.8V



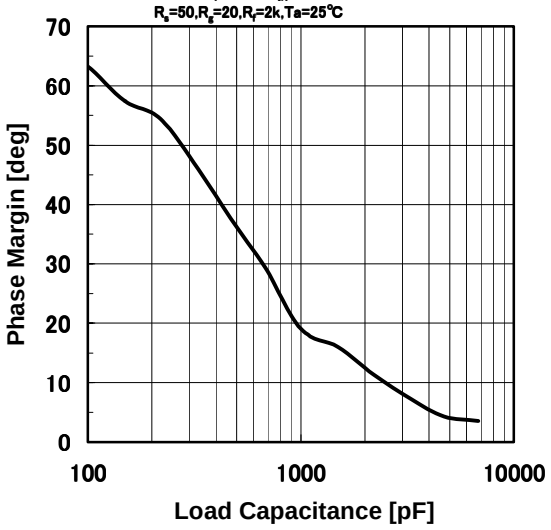
Overshoot vs. Load Capacitance

V^+=5V,V_{IN}=1V_{p-p},f=10kHz,G_V=0dB
R_S=50,R_L=2k,Ta=25℃



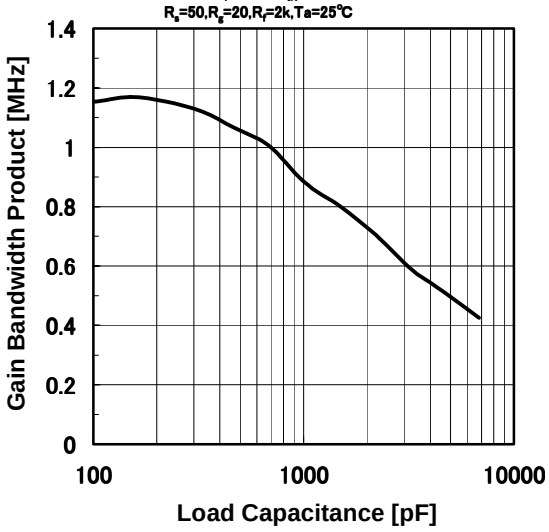
Phase Margin vs. Load Capacitance

V^+=5V,G_V=40dB,V_{IN}=−30dBm,
R_s=50,R_g=20,R_f=2k,Ta=25℃



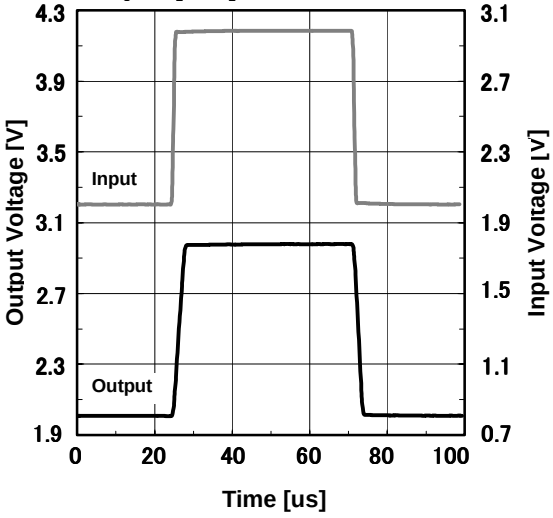
Gain Bandwidth Product vs. Load Capacitance

V^+=5V,G_V=40dB,V_{IN}=−30dBm,
R_s=50,R_g=20,R_f=2k,Ta=25℃



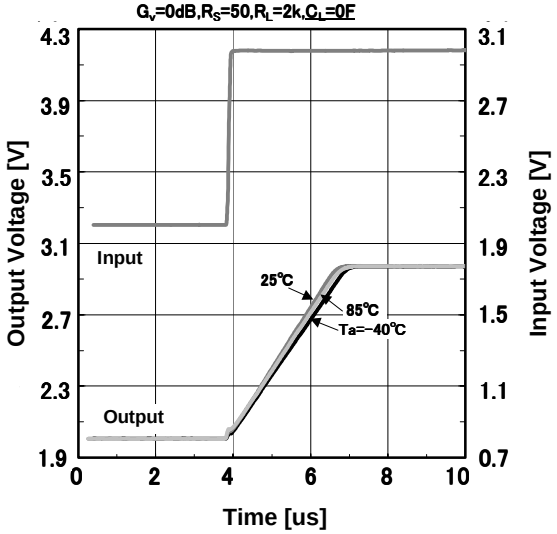
Pulse Responce

V^+=5V,V_{in}=1Vp−p,f=10kHz,G_V=0dB
R_S=50,R_L=2k,C_L=0F,Ta=25℃



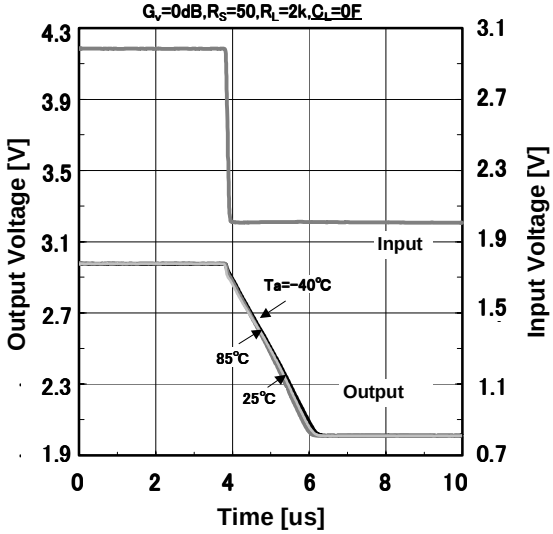
Pulse Responce(Rise) (Temp.)

V^+=5V,V_{in}=1Vp−p,f=10kHz,
G_V=0dB,R_S=50,R_L=2k,C_L=0F



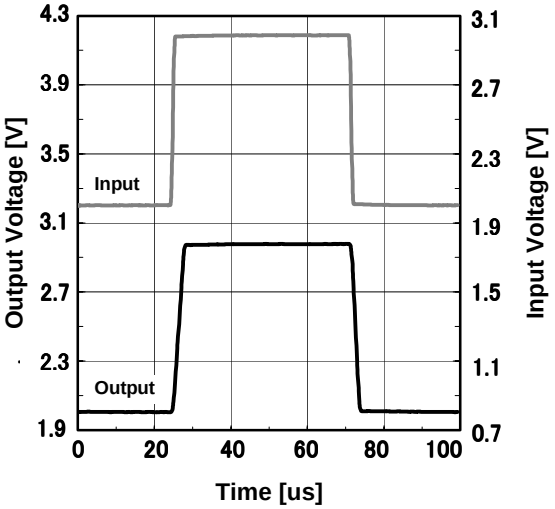
Pulse Responce(Fall) (Temp.)

V^+=5V,V_{in}=1Vp−p,f=10kHz,
G_V=0dB,R_S=50,R_L=2k,C_L=0F



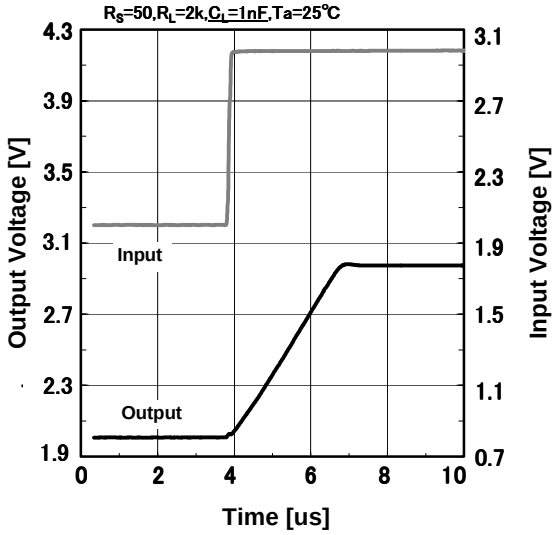
Pulse Responce (Load C.)

V^+=5V,V_{in}=1Vp-p,f=10kHz,G_V=0dB
R_S=50,R_L=2k,C_L=1nF,Ta=25℃



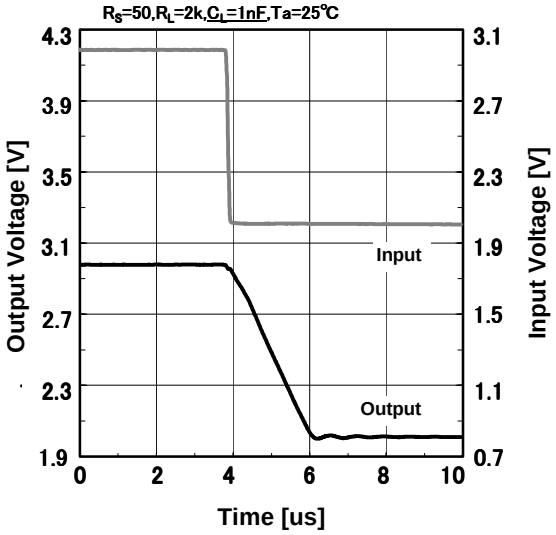
Pulse Responce(Rise) (Load C.)

V^+=5V,V_{in}=1Vp-p,f=10kHz,G_V=0dB
R_S=50,R_L=2k,C_L=1nF,Ta=25℃



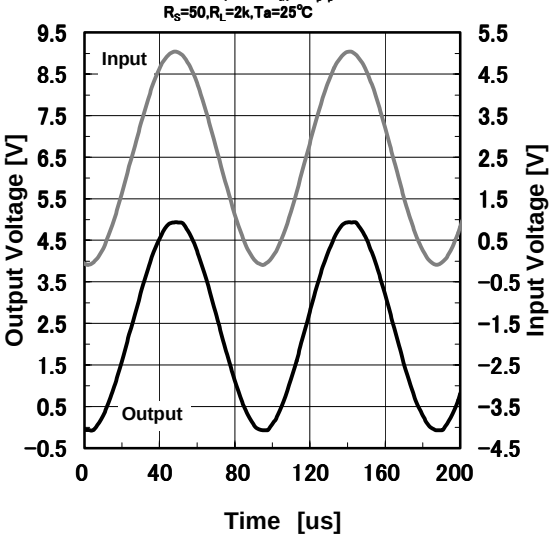
Pulse Responce(Fall) (Load C.)

V^+=5V,V_{in}=1Vp-p,f=10kHz,G_V=0dB
R_S=50,R_L=2k,C_L=1nF,Ta=25℃



Sin Wave Responce

V^+=5V,G_V=0dB,V_{IN}=5V_{p-p},f=10k
R_S=50,R_L=2k,Ta=25℃



■ MEMO

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