Rail-to-Rail Input/Output Single Operational Amplifier

■ GENERAL DESCRIPTION

NJM2730 is a Rail-to-Rail Input/Output single operational amplifier featuring Low power, low noise and operation from 1.8V.

Rail-to-Rail Input/Output 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 SOT−23−5

■ PACKAGE OUTLINE

NJM2730F

■ FEATURES

- Single Supply
- Operating Voltage   1.8 to 5.0V
- Rail-to-Rail Input V_{ICM}= 0 to 5.0V at V^+=5V
- Rail-to-Rail Output $V_{OH} \geq 4.9V$/ $V_{OL} \leq 0.1V$ 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   SOT−23−5

■ PIN CONFIGURATION

(Top View)

IN+ 1	5 V^+
GND 2	
IN- 3	4 OUT
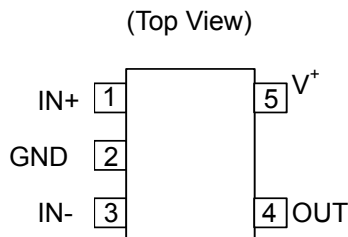
NJM2730

■ 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_{NI}	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**

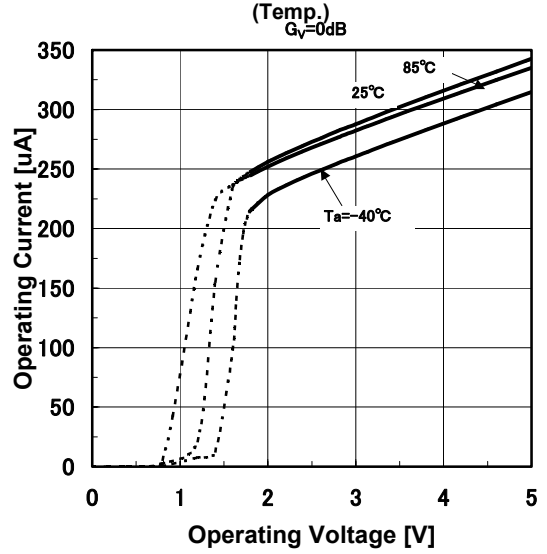| No.	Symbol	Equivalent Circuit	Typ.DC Voltage(V)	Function
1	+INPUT			non-inverting input
3	-INPUT			inverting input
4	VOUT			output

NJM2730

■ TYPICAL CHARACTERISTICS

(Note: Rs,Rg,R$_L$ and C$_L$ are connected to V$^+$/2 when single supply.)
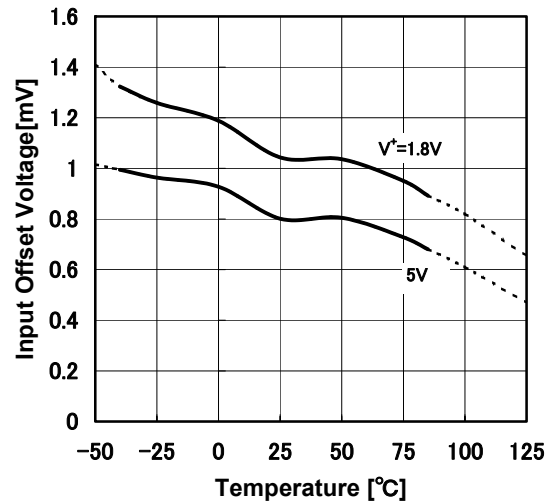
Operating Current vs. Operating Voltage

G$_V$=0dB,Ta=25℃

Operating Current vs. Operating Voltage (Temp.)

G$_V$=0dB
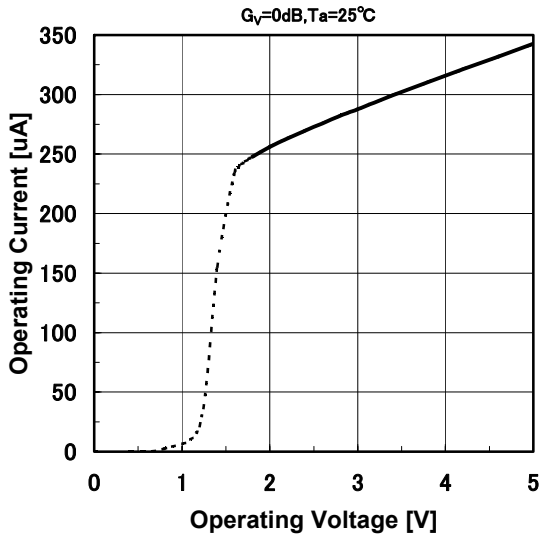
Operating Current vs. Temperature

G$_V$=0dB
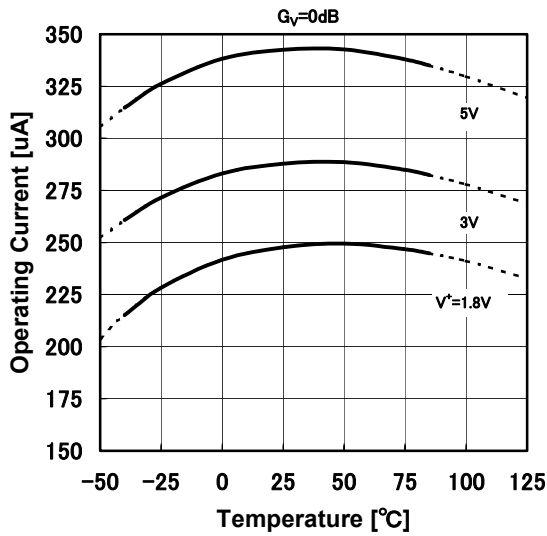
Input Offset Voltage vs. Temperature

Input Bias Current vs. Temperature
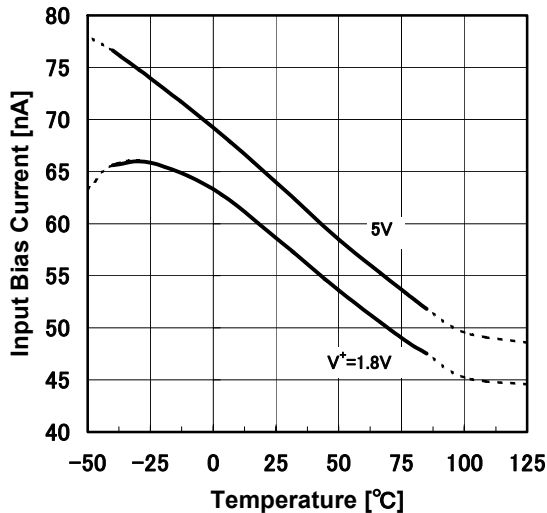
Input Offset Current vs. Temperature
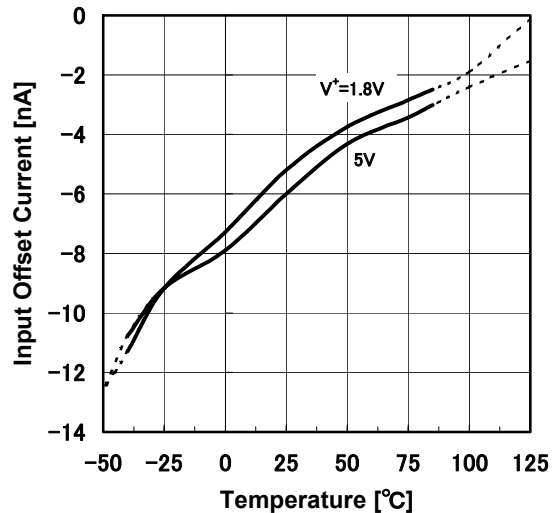
Output Voltage vs. Operating Voltage
G_V=OPEN, R_L=2k, Ta=25ºC
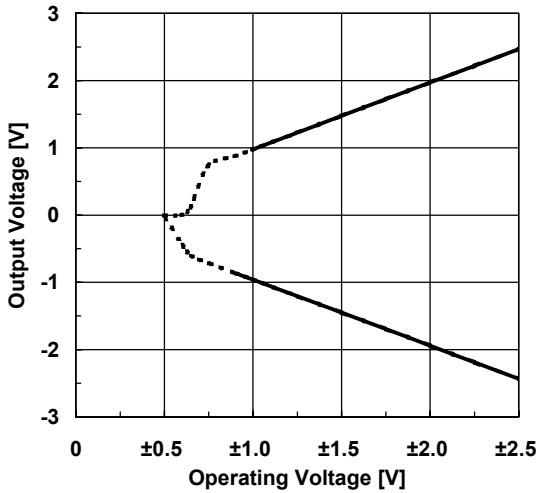
Output Voltage vs. Load Resistance (V^+/V^-)
G_V=OPEN,Ta=25℃
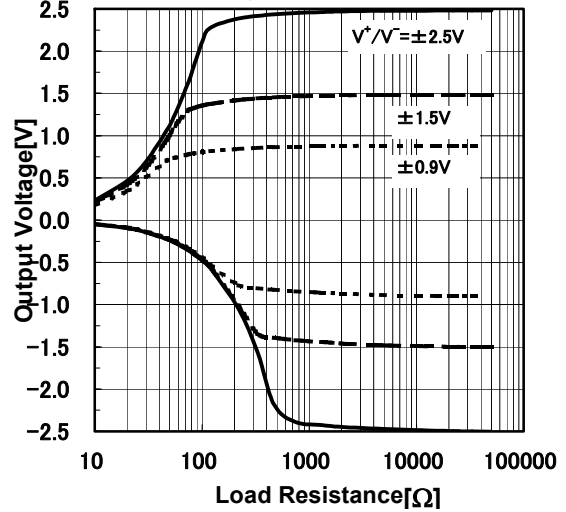
V^+/V^-=±2.5V
±1.5V
±0.9V

Output Voltage vs. Load Resistance(Temp.)
V^+=5V,G_V=OPEN

25℃
85℃
Ta=−40℃
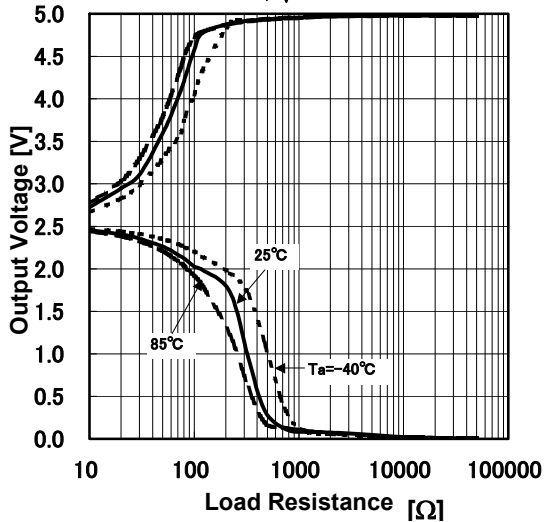
Voltage Gain,Phase vs. Frequency (Temp.)
V^+=5V,G_V=40dB,R_F=2k,R_g=20,C_L=0

Ta=−40℃
25℃
85℃
Voltage Gain
Ta=−40℃
25℃
85℃
Phase
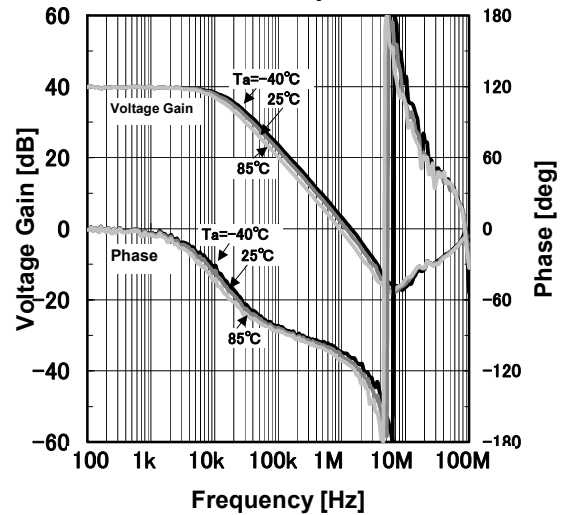
Equivalent Input Noise Voltage vs. Frequency
V^+/V^-=±2.5V,G_V=40dB,R_S=100,R_G=100,R_F=10k,T_a=25℃
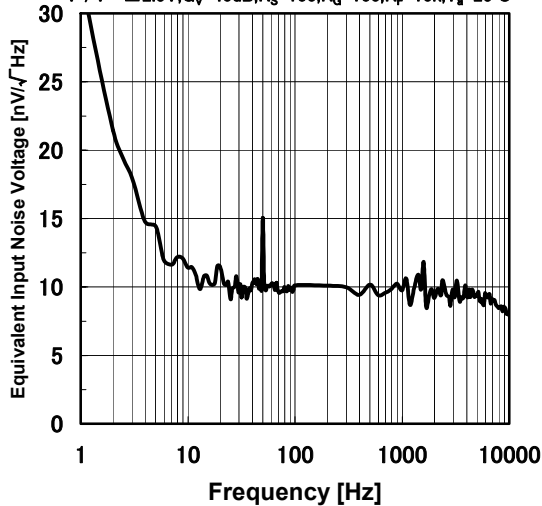
Equivalent Input Noise Voltage vs. Input Resistance
V^+/V^-=±2.5V,f=1kHz,G_V=40dB,R_G=100,R_F=10k,T_a=25℃

NJM2730
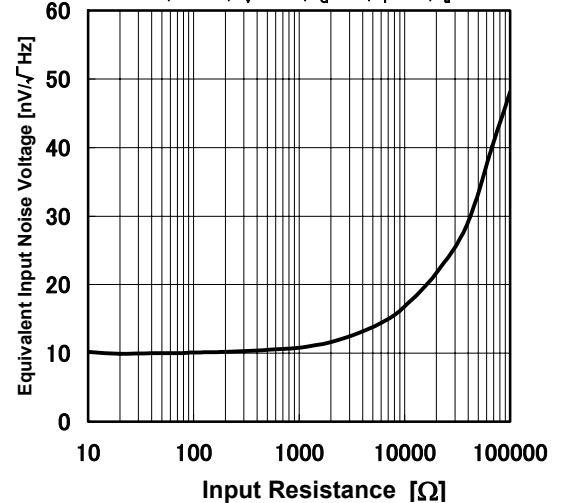
V.F.Peak vs.Frequency (Load C.)
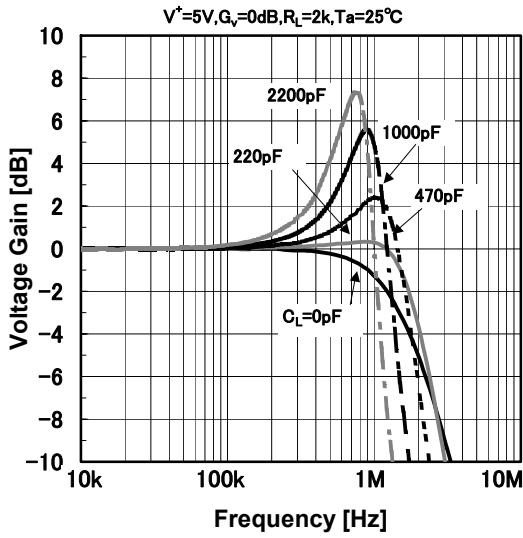
V$^+$=5V,G$_v$=0dB,R$_L$=2k,Ta=25°C

V.F.Peak vs.Frequency (Temp.)
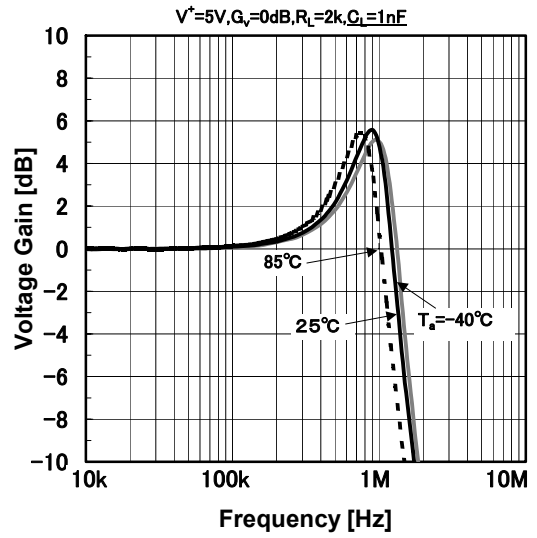
V$^+$=5V,G$_v$=0dB,R$_L$=2k,C$_L$=1nF

Common Mode Rejection Ratio vs. Temperature

V$_{in}$=V$^+$,V$^+$/2,GND

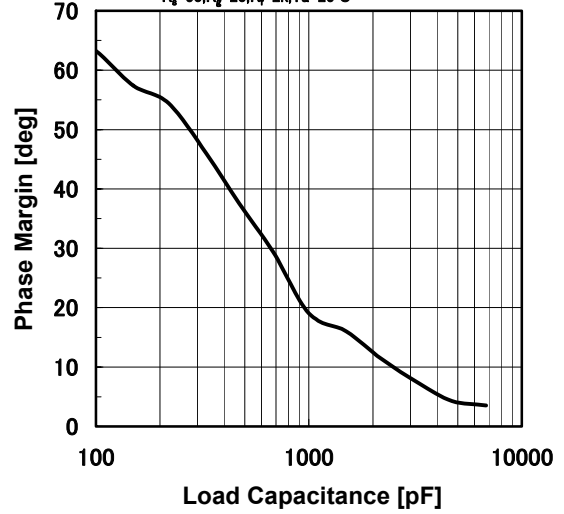## Supply Voltage Rejection Ratio vs. Temperature

V$^+$=5 to 1.8V
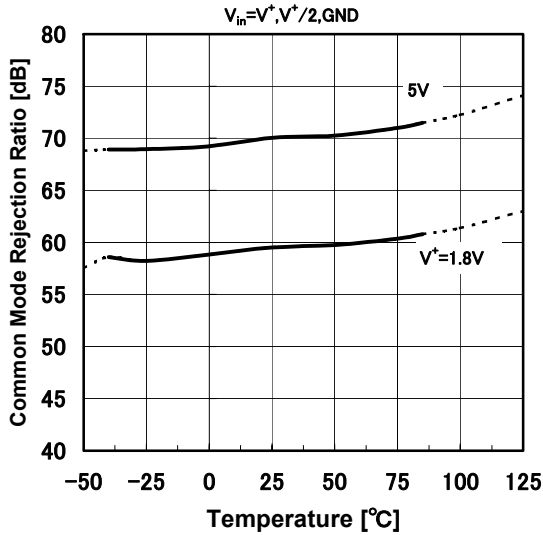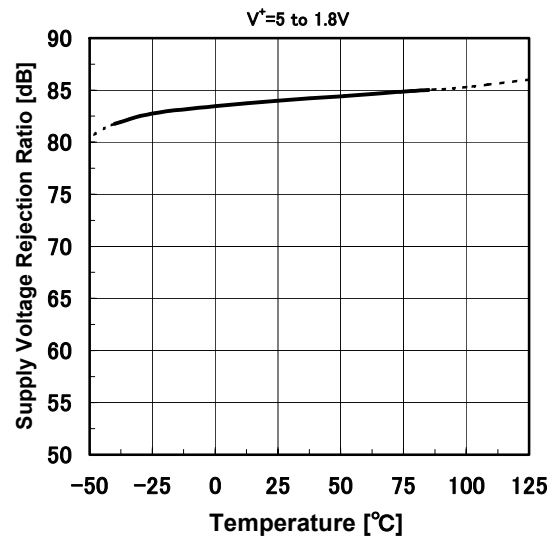
Overshoot vs. Load Capacitance
V$^+$=5V,V$_{IN}$=1V$_{p-p}$,f=10kHz,G$_V$=0dB
R$_S$=50,R$_L$=2k,Ta=25℃
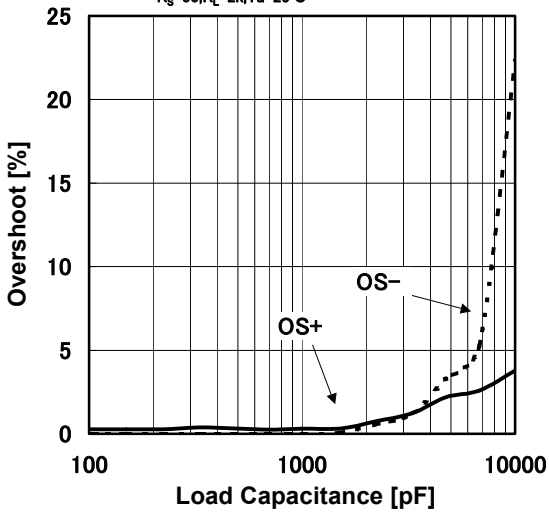
Phase Margin vs. Load Capacitance
V$^+$=5V,G$_V$=40dB,V$_{IN}$=−30dBm,
R$_s$=50,R$_g$=20,R$_f$=2k,Ta=25℃

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℃
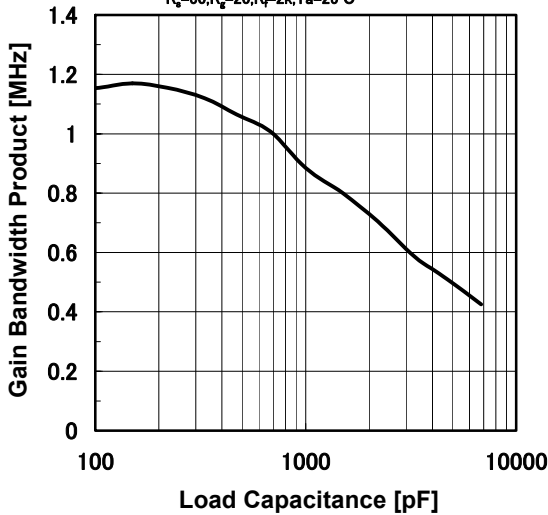
Pulse Responce
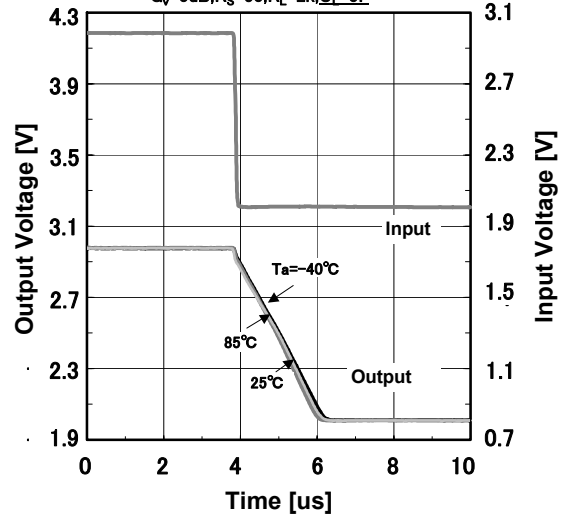V$^+$=5V,V$_{in}$=1Vp−p,f=10kHz,G$_V$=0dB
R$_S$=50,R$_L$=2k,C$_L$=0F,Ta=25℃
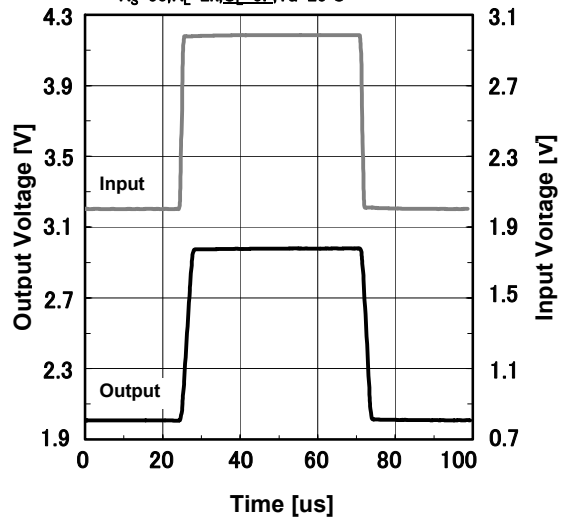
Pulse Responce(Rise) (Temp.)
V$^+$=5V,V$_{in}$=1Vp−p,f=10kHz,
G$_V$=0dB,R$_S$=50,R$_L$=2k,C$_L$=0F

Pulse Responce(Fall) (Temp.)
V$^+$=5V,V$_{in}$=1Vp−p,f=10kHz,
G$_V$=0dB,R$_S$=50,R$_L$=2k,C$_L$=0F

NJM2730

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

New Japan Radio Co., Ltd.