

## 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 MTP-5.

### ■ PACKAGE OUTLINE

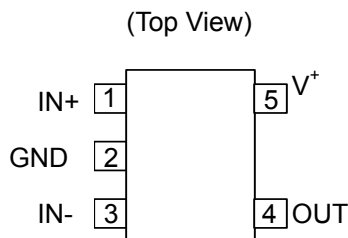


NJM2730F

### ■ FEATURES

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

### ■ PIN CONFIGURATION



# NJM2730

## ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V^+$	7.0	V
Differential Input Voltage	$V_{ID}$	$\pm 1.0$	V
Input Common Mode Voltage Range	$V_{ICM}$	0 to 7.0	V
Power Dissipation	$P_D$	200	mW
Operating Temperature Range	$T_{opr}$	-40 to +85	°C
Storage Temperature Range	$T_{stg}$	-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

( $V^+=5V, Ta=25^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Operating Current	$I_{CC}$	No Signal	-	320	550	$\mu A$
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	$A_V$	$R_L=2k\Omega$	60	85	-	dB
Common Mode Rejection Ratio	CMR	CMR+: $2.5V \leq V_{CM} \leq 5.0V$ , CMR-: $0 \leq V_{CM} \leq 2.5V$ (Note2)	55	70	-	dB
Supply Voltage Rejection Ratio	SVR		70	85	-	dB
Maximum Output Voltage 1	$V_{OH1}$	$R_L=20k\Omega$	4.9	4.95	-	V
	$V_{OL1}$	$R_L=20k\Omega$	-	0.05	0.1	
Maximum Output Voltage 2	$V_{OH2}$	$R_L=2k\Omega$	4.75	4.85	-	V
	$V_{OL2}$	$R_L=2k\Omega$	-	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  $2.5V \leq V_{CM} \leq 5V$  and CMR- is measured with  $0V \leq V_{CM} \leq 2.5V$ .

### ● AC CHARACTERISTICS

( $V^+=5V, Ta=25^\circ C$ )

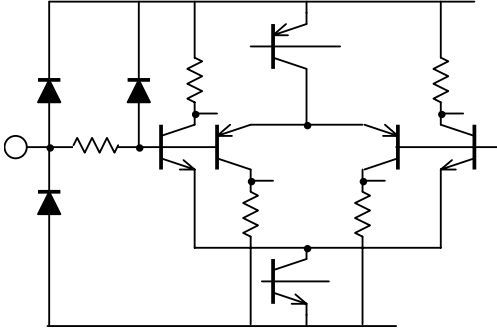
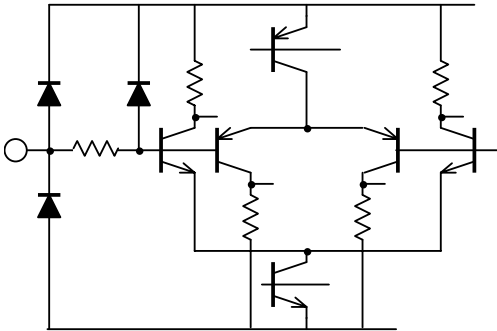
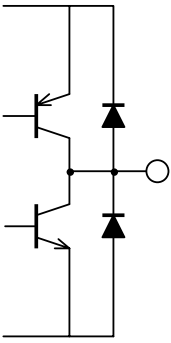
PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Unity Gain Bandwidth	$f_T$	$R_L=2k\Omega$	-	1	-	MHz
Phase Margin	$\Phi_M$	$R_L=2k\Omega$	-	75	-	Deg
Equivalent Input Noise Voltage	$V_N$	$f=1kHz$	-	10	-	$nV/\sqrt{Hz}$

### ● TRANSIENT CHARACTERISTICS

( $V^+=5V, Ta=25^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Slew Rate	SR	$R_L=2k\Omega$	-	0.4	-	V/ $\mu s$

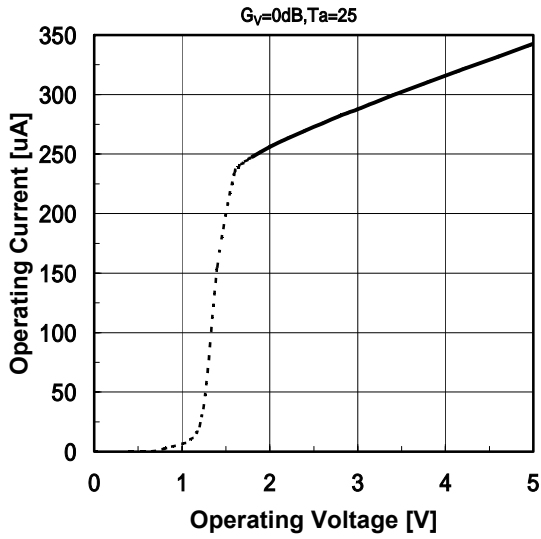
## ■ TERMINAL CHARACTERISTICS

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

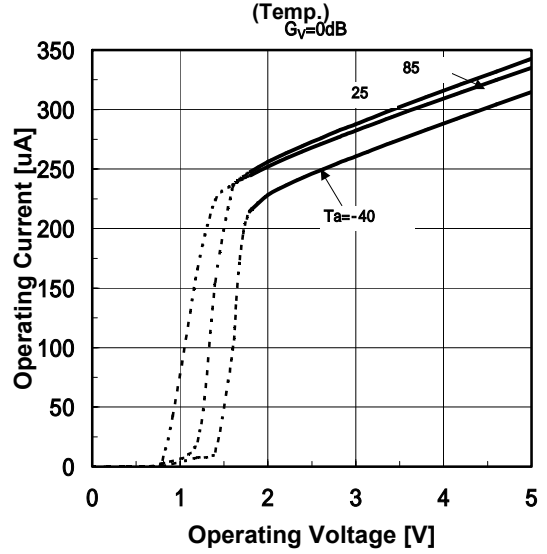
## ■ TYPICAL CHARACTERISTICS

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

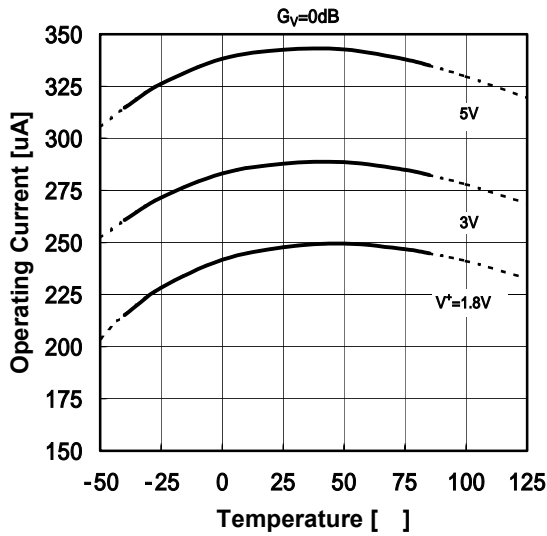
Operating Current vs. Operating Voltage



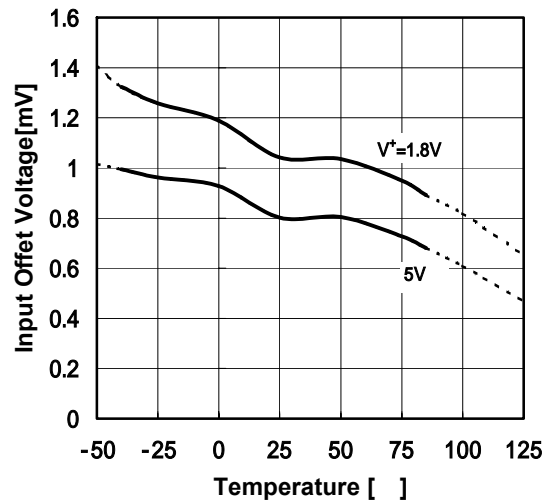
Operating Current vs. Operating Voltage



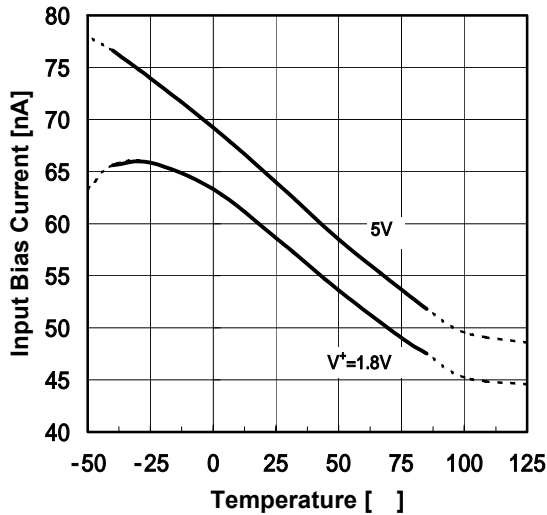
Operating Current vs. Temperature



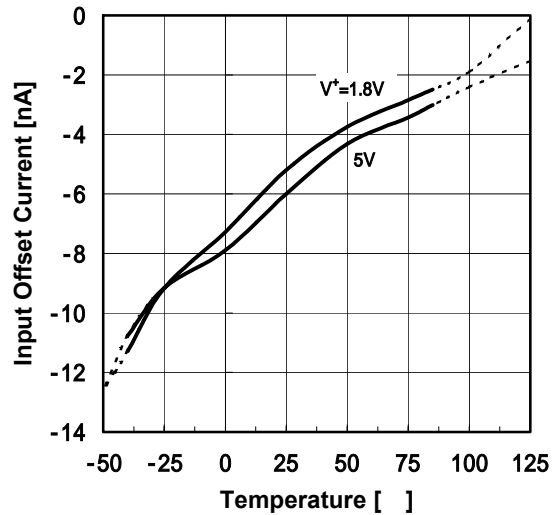
Input Offset Voltage vs. Temperature

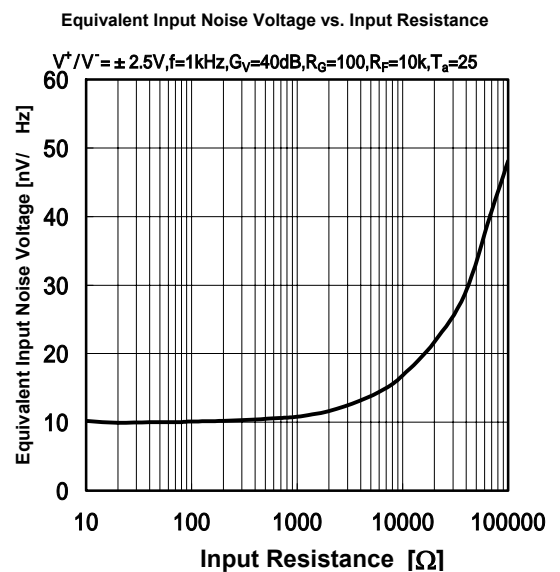
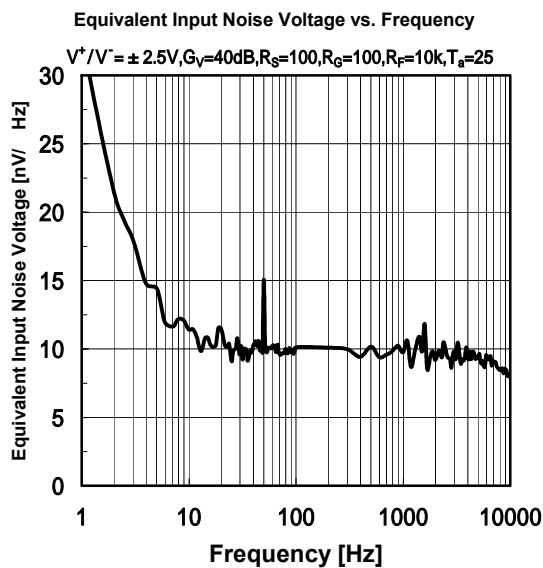
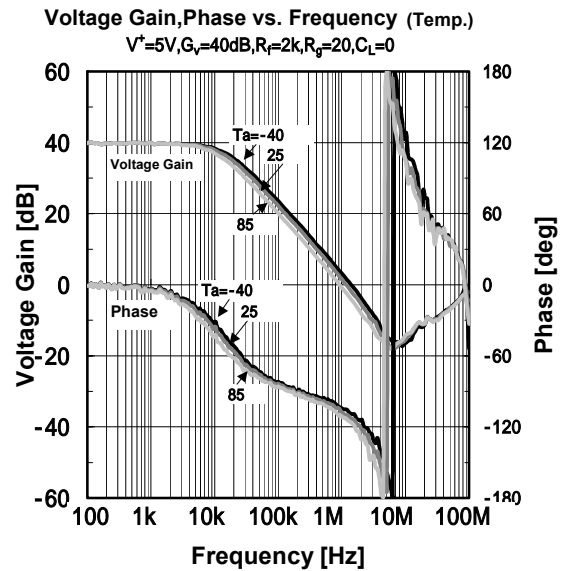
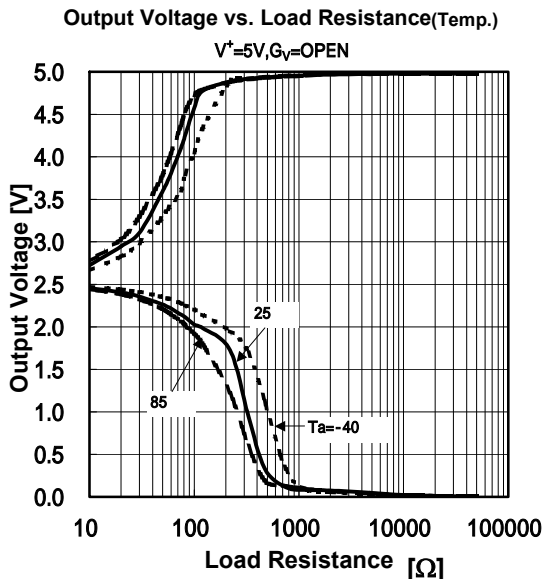
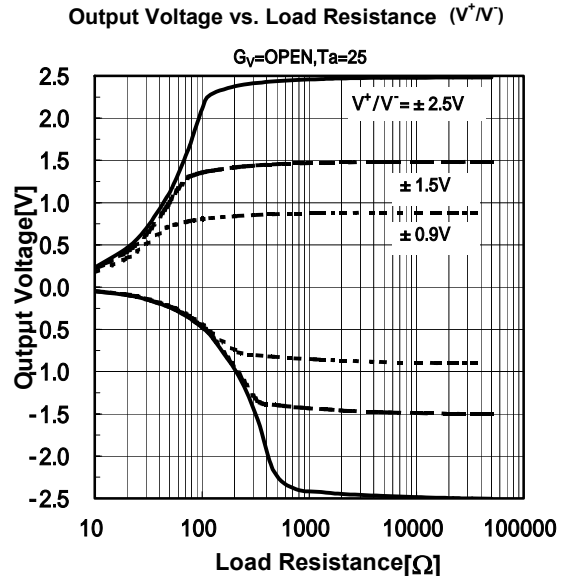
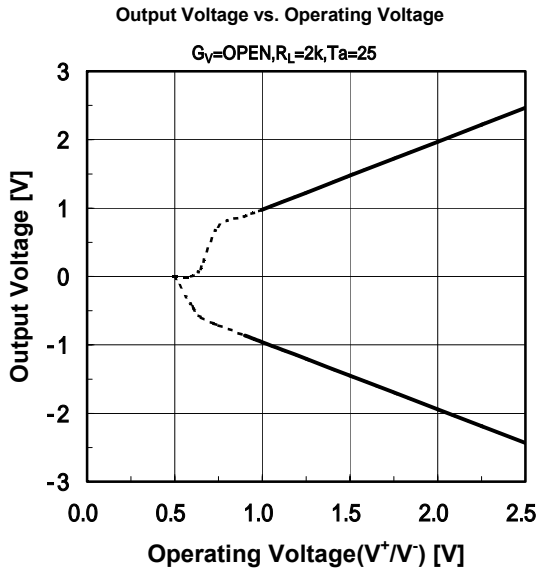


Input Bias Current vs. Temperature

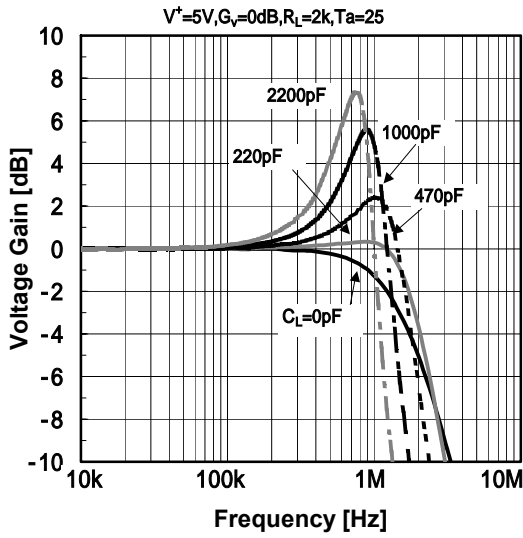


Input Offset Current vs. Temperature

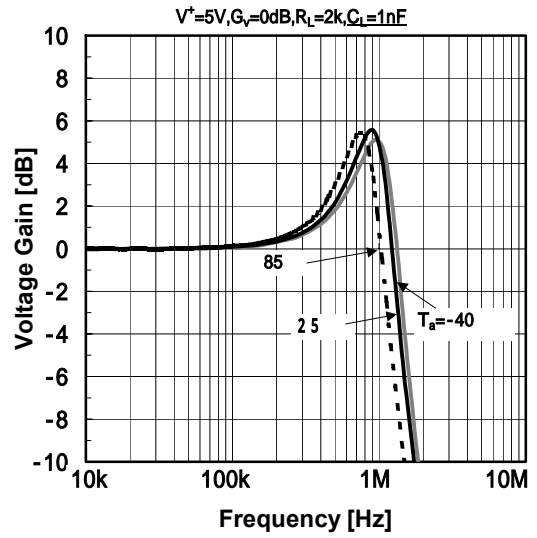




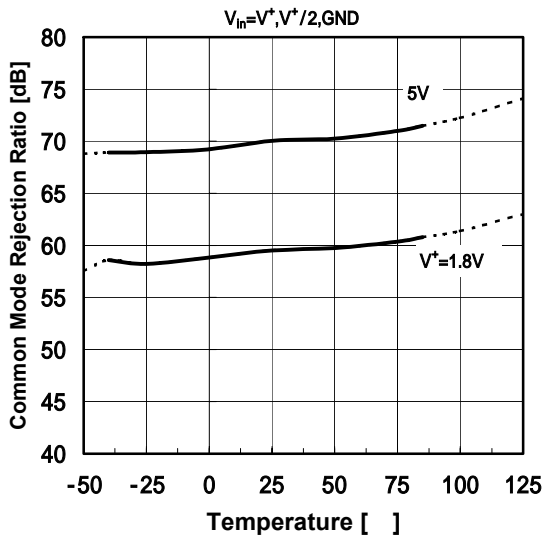
V.F.Peak vs.Frequency (Load C.)



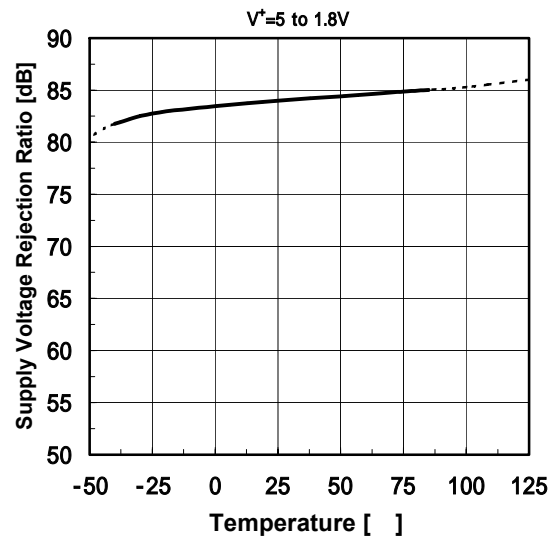
V.F.Peak vs.Frequency (Temp.)



Common Mode Rejection Ratio vs. Temperature

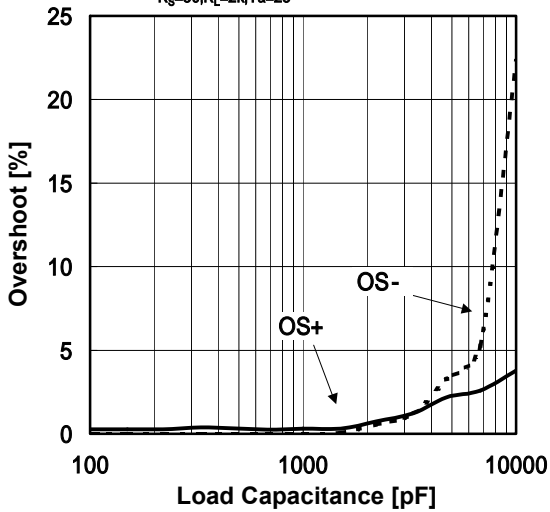


Supply Voltage Rejection Ratio vs. Temperature



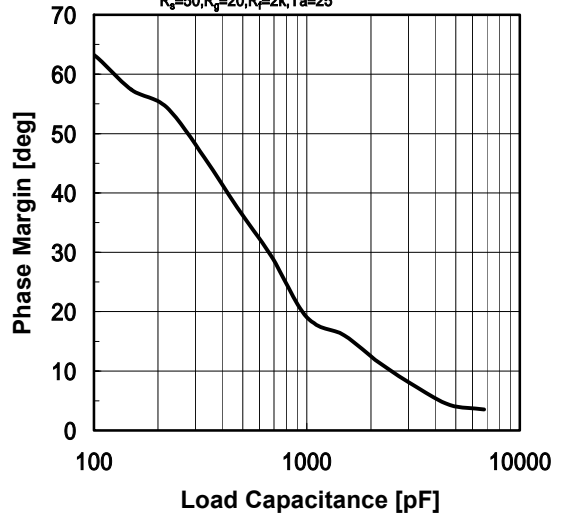
**Overshoot vs. Load Capacitance**

$V^+=5V, V_{in}=1V_{p-p}, f=10kHz, G_v=0dB$   
 $R_s=50, R_l=2k, T_a=25$



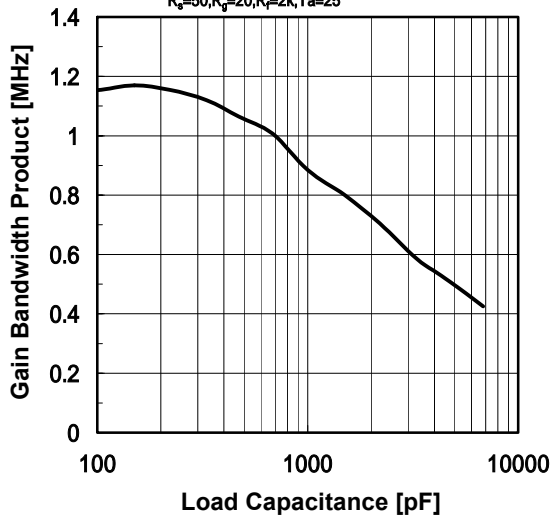
**Phase Margin vs. Load Capacitance**

$V^+=5V, G_v=40dB, V_{in}=-30dBm$ ,  
 $R_s=50, R_g=20, R_l=2k, T_a=25$



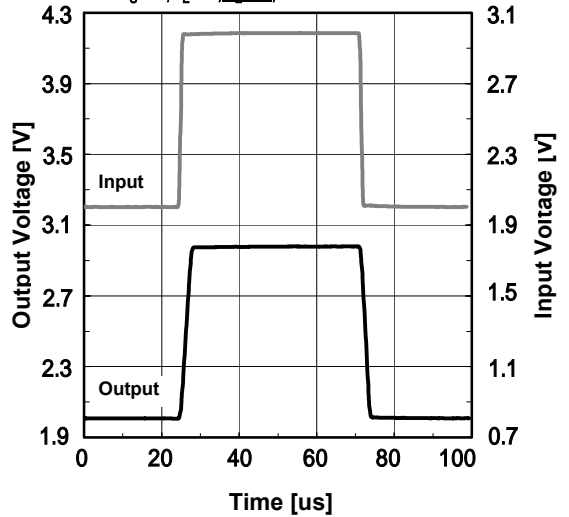
**Gain Bandwidth Product vs. Load Capacitance**

$V^+=5V, G_v=40dB, V_{in}=-30dBm$ ,  
 $R_s=50, R_g=20, R_l=2k, T_a=25$



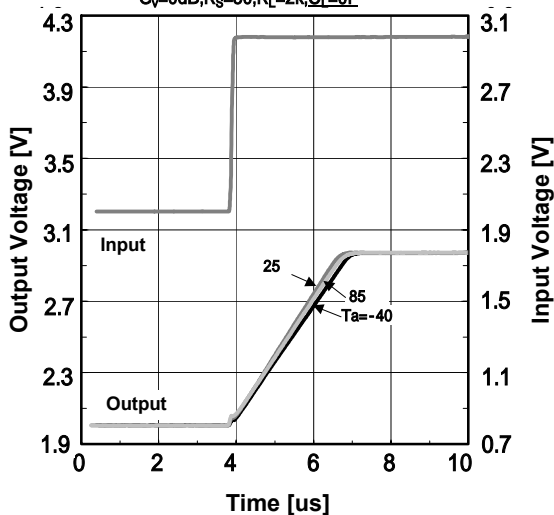
**Pulse Response**

$V^+=5V, V_{in}=1V_{p-p}, f=10kHz, G_v=0dB$   
 $R_s=50, R_l=2k, C_l=0F, T_a=25$



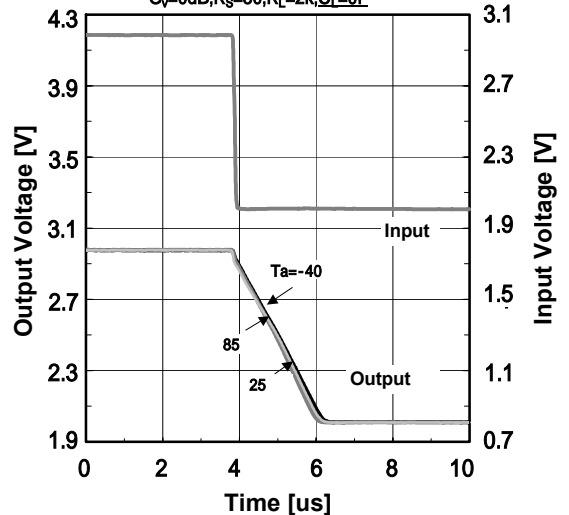
**Pulse Response(Rise) (Temp.)**

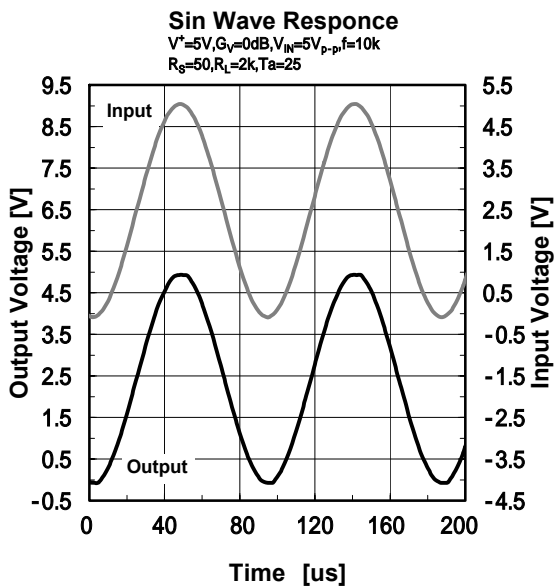
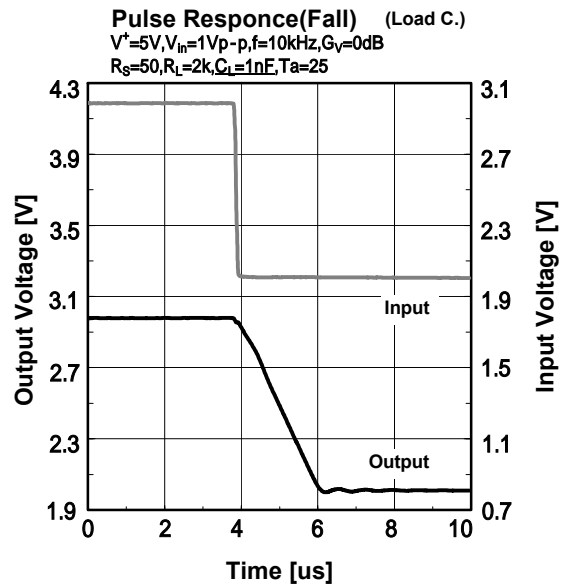
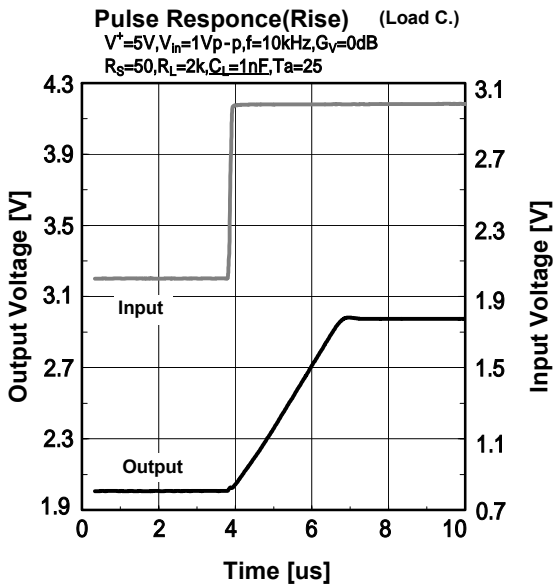
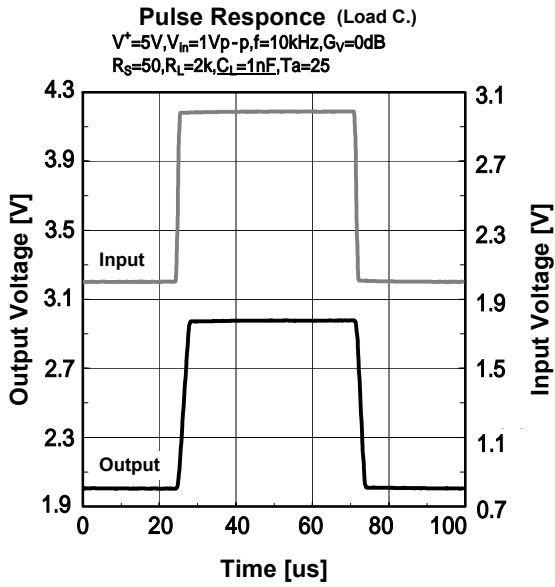
$V^+=5V, V_{in}=1V_{p-p}, f=10kHz$ ,  
 $G_v=0dB, R_s=50, R_l=2k, C_l=0F$



**Pulse Response(Fall) (Temp.)**

$V^+=5V, V_{in}=1V_{p-p}, f=10kHz$ ,  
 $G_v=0dB, R_s=50, R_l=2k, C_l=0F$







■ MEMO

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