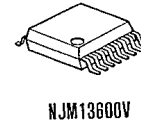
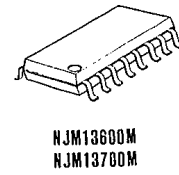
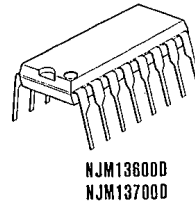


DUAL OPERATIONAL TRANSCONDUCTANCE AMPLIFIER

■ GENERAL DESCRIPTION

The NJM13600/13700 consist of two current controlled transconductance amplifiers each with differential inputs and a push pull output. The two amplifiers share common supplies but otherwise operate independently. Linearizing diodes are provided at the inputs to reduce distortion and allow higher input levels. The results is a 10 dB signal-to-noise improvement referenced to 0.5 percent THD. Controlled impedance buffers are provided which are especially designed to complement the dynamic range of the amplifiers.

■ PACKAGE OUTLINE

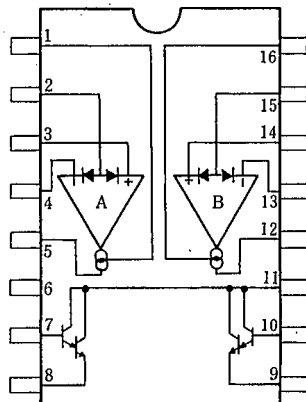


■ FEATURES

- Package Outline
- Bipolar Technology

DIP16, DMP16, (SSOP16)

■ PIN CONFIGURATION



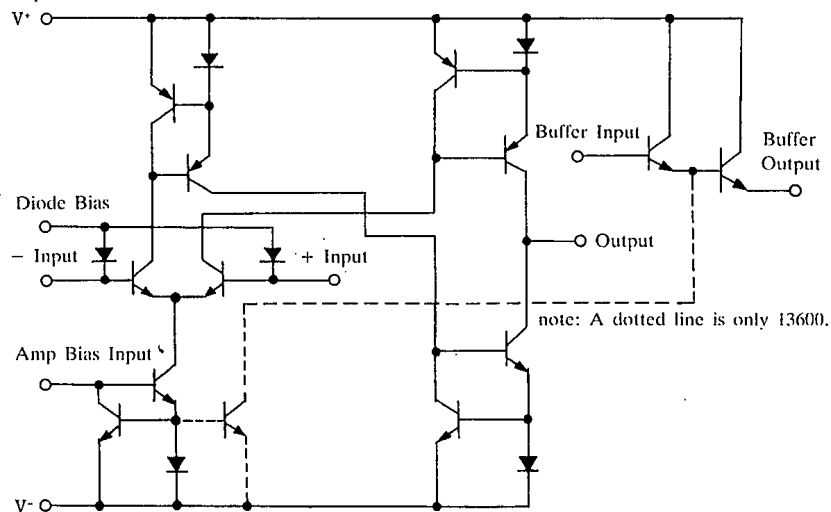
NJM13600D, NJM13600M, NJM13600V
NJM13700D, NJM13700M

PIN FUNCTION

- | | |
|---------------------|----------------------|
| 1. Amp Bias Input A | 9. Buffer Output B |
| 2. Diode Bias A | 10. Buffer Input B |
| 3. + Input | 11. V ⁺ |
| 4. - Input | 12. Output B |
| 5. Output A | 13. - Input B |
| 6. V ⁻ | 14. + Input B |
| 7. Buffer Input A | 15. Diode Bias B |
| 8. Buffer Output A | 16. Amp Bias Input B |

4

■ EQUIVALENT CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+/V^-	36 or ± 18	V
Differential Input Voltage	V_{ID}	± 5	V
Diode Bias Current	I_D	2	mA
Amp Bias Current	I_{ABC}	2	mA
Buffer Output Current	I_O	20	mA
Power Dissipation	P_D	(DIP16) 570	mW
		(DMP16) 700	mW
DC Input Voltage	V_{IN}	$V^+ \sim V^-$	
Operating Temperature Range	T_{opr}	$-40 \sim +85$	°C
Storage Temperature Range	T_{sig}	$-40 \sim +125$	°C

(note) At on a ceramic PCB (10×20×0.635mm)

■ ELECTRICAL CHARACTERISTICS

($V^+/V^- = \pm 15V$, Ta=25°C, $I_{ABC}=500\mu A$)

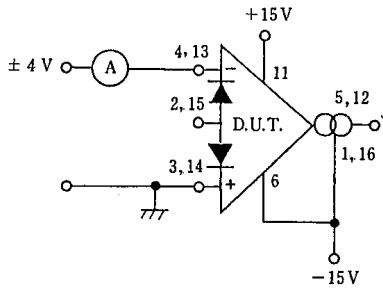
PARAMETER	SYMBOL	TEST CONDITION	13600			13700			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Input Offset Voltage (Vos)	V_{IO}		—	0.4	5	—	0.4	4	mV
Input Offset Voltage		$I_{ABC}=5\mu A$	—	0.3	5	—	0.3	4	mV
Vos Including Diodes		Diode Bias Current, $I_D=500\mu A$	—	0.5	5	—	0.5	5	mV
Input Offset Change		$5\mu A \leq I_{ABC} \leq 500\mu A$	—	0.1	—	—	0.1	3	mV
Input Bias Current	I_B		—	0.4	5	—	0.4	5	μA
Input Bias Current		($-20 \sim +75^\circ C$)	—	1	8	—	1	8	μA
Forward Transconductance(gm)	gm		6,700	9,600	13,000	6,700	9,600	13,000	$\mu\Omega$
		($-20 \sim +75^\circ C$)	5,400	—	—	5,400	—	—	$\mu\Omega$
gm Tracking		$R_L=0, I_{ABC}=5\mu A$	—	0.3	—	—	0.3	—	dB
Peak Output Current	I_{OP}	$R_L=0, I_{ABC}=5\mu A$	—	5	—	—	0	—	μA
Peak Output Current		$R_L=0, I_{ABC}=500\mu A$	350	500	650	350	500	650	μA
Peak Output Current		$R_L=0, -20 \sim +75^\circ C$	300	—	—	300	—	—	μA
Peak Output Voltage Positive	V_{OP}	$R_L=\infty, 5\mu A \leq I_{ABC} \leq 500\mu A$	+12	+14.2	—	+12	+14.2	—	V
Peak Output Voltage Negative		$R_L=\infty, 5\mu A \leq I_{ABC} \leq 500\mu A$	-12	-14.4	—	-12	-14.4	—	V
Operating Current	I_{CC}	$I_{ABC}=500\mu A$, two circuit	—	2.6	—	—	2.6	—	mA
Vos Sensitivity Positive	SVR	$\Delta V_{OS}/\Delta V^+$	76.5	94	—	76.5	94	—	dB
Vos Sensitivity Negative		$\Delta V_{OS}/\Delta V^-$	76.5	94	—	76.5	94	—	dB
Input Offset Current	I_{IO}		—	0.1	0.6	—	0.1	0.6	μA
CMRR	CMR		80	110	—	80	110	—	dB
Common Mode Range	V_{ICM}		± 12	± 13.5	—	± 12	± 13.5	—	V
Cross talk	CT	$20Hz < f < 20kHz$ (note 2)	—	-100	—	—	-100	—	dB
Differential Input Current	I_{ID}	$I_{ABC}=0$, Input = $\pm 4V$	—	0.02	100	—	0.02	100	nA
Leakage Current	I_{LEAK}	$I_{ABC}=0$ (Refer to Test Circuit)	—	0.2	100	—	0.2	100	nA
Input Resistance	R_{IN}		10	26	—	10	26	—	k Ω
Open Loop Bandwidth			—	2	—	—	2	—	MHz
Slew Rate	SR		—	50	—	—	50	—	V/ μS
Buffer Input Current		(note 2)	—	0.4	5	—	0.4	5	μA
Peak Buffer Output Voltage		(note 2)	10	—	—	10	—	—	V

(note 1) Open unless otherwise specified. The inputs to the buffers are grounded and outputs are open.

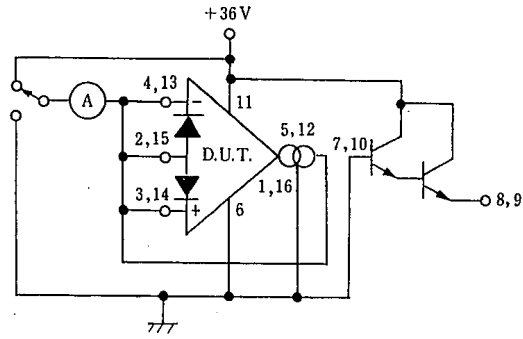
(note 2) $R_{OUT}=5k\Omega$ connected from the buffer output to V^- and the input of buffer is connected to the transconductance amplifier output.
 $I_{ABC}=500\mu A$

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■ TEST CIRCUIT



Differential Input Current

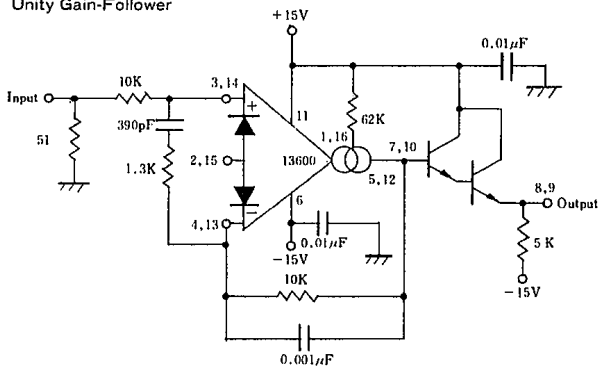


Leakage Current

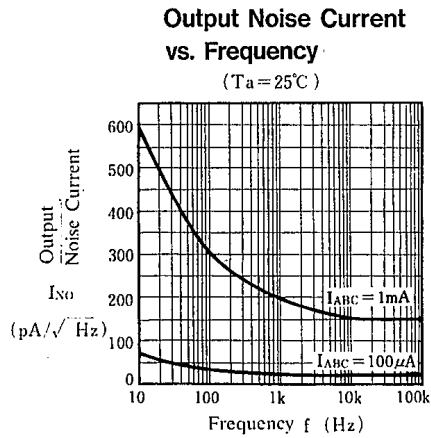
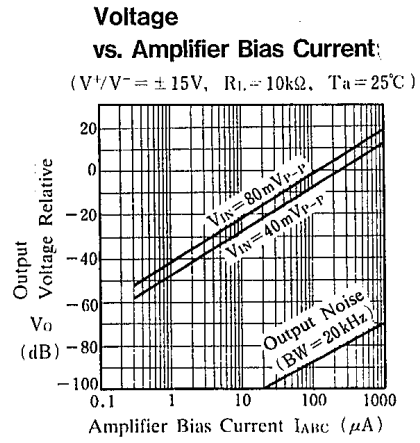
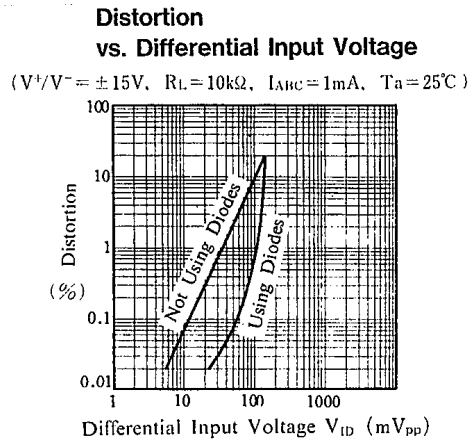
■ TYPICAL APPLICATIONS

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Unity Gain-Follower

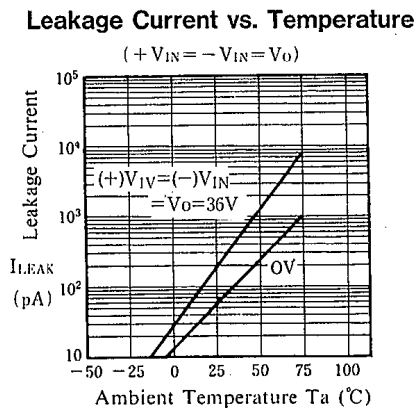
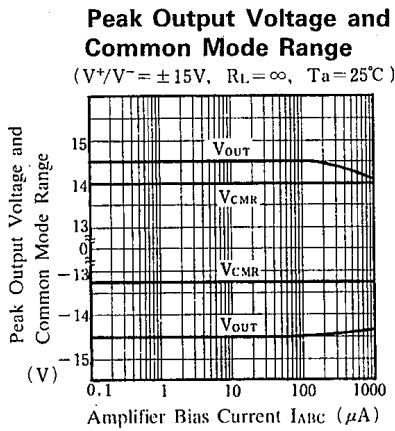
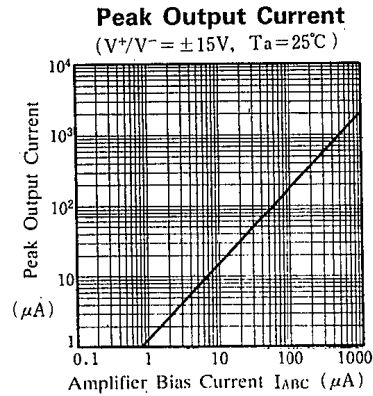
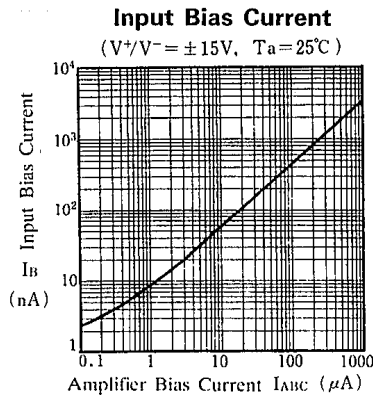
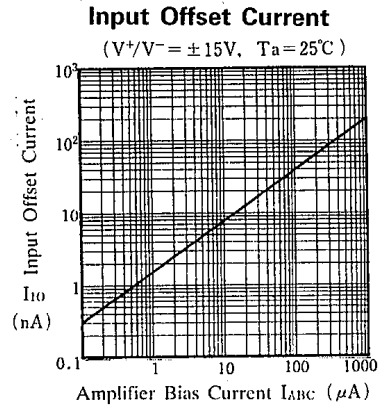
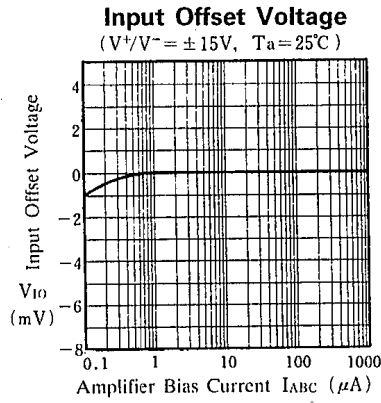


■ TYPICAL CHARACTERISTICS



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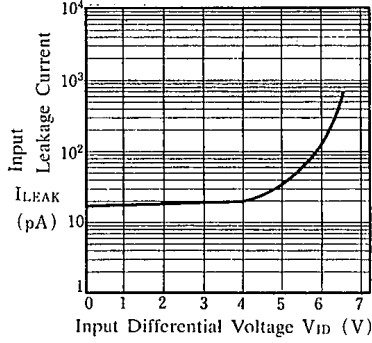
■ TYPICAL CHARACTERISTICS



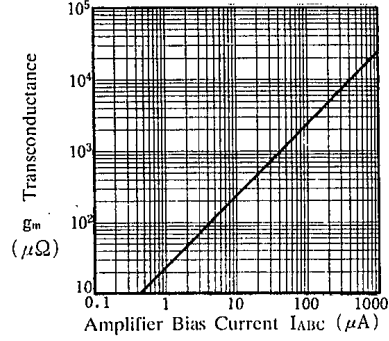
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■ TYPICAL CHARACTERISTICS

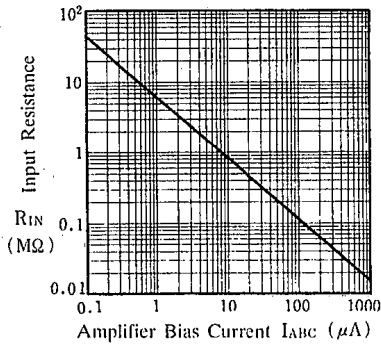
Input Leakage Current
($T_a=25^\circ\text{C}$)



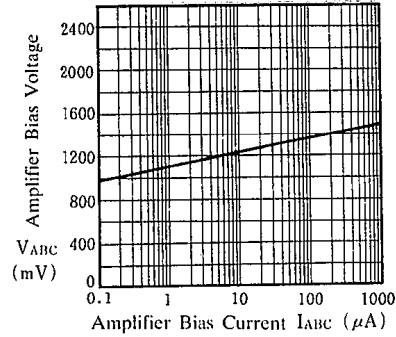
Transconductance
($V^+/V^- = \pm 15\text{V}$, Pin2.15 Open, $T_a=25^\circ\text{C}$)



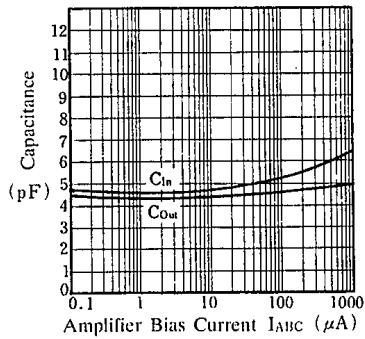
Input Resistance
(Pin2.15 Open, $T_a=25^\circ\text{C}$)



Amplifier Bias Voltage vs. Amplifier Bias Current
($T_a=25^\circ\text{C}$)



Input and Output Capacitance
($V^+/V^- = \pm 15\text{V}$, $T_a=25^\circ\text{C}$)



Output Resistance
($T_a=25^\circ\text{C}$)

