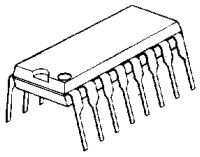
DUAL OPERATIONAL TRANSCONDUCTANCE AMPLIFIER

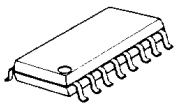
■ GENERAL DESCRIPTION

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.

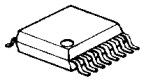
■ PACKAGE OUTLINE



NJM13600D
NJM13700D



NJM13600M
NJM13700M

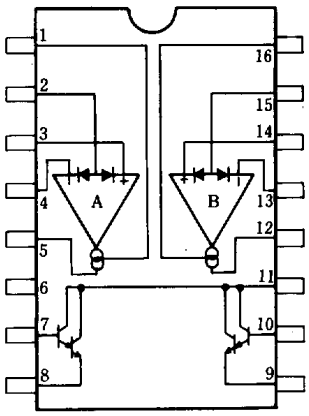


NJM13600V

■ FEATURES

- Package Outline — DIP16, DMP16, (SSOP16)
- Bipolar Technology

■ PIN CONFIGURATION

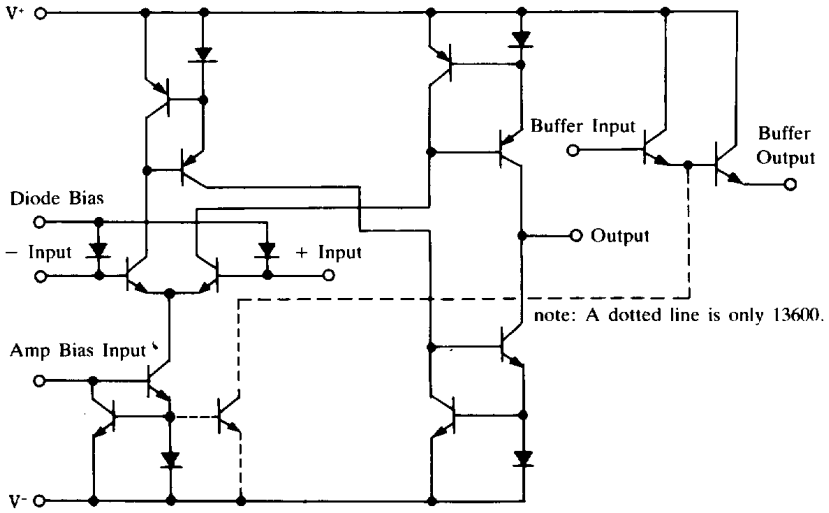


NJM13600D, NJM13600M, NJM13600V
NJM13700D, NJM13700M,

PIN FUNCTION

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

■ EQUIVALENT CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25℃)

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}	−20～+75	℃
Storage Temperature Range	T_{stg}	−40～+125	℃

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

■ ELECTRICAL CHARACTERISTICS

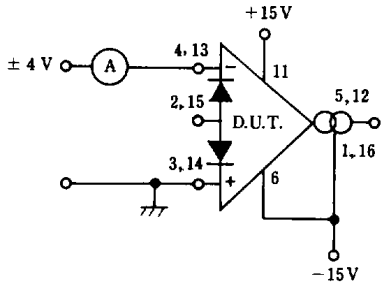
(V^+/V^-=±15V, Ta=25℃, I_{ABC}=500 μA)

PARAMETER	SYMBOL	TEST CONDITION	13600			13700			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Input Offset Voltage (V_{OS})	V_{IO}		—	0.4	5	—	0.4	4	mV
Input Offset Voltage		I_{ABC}=5μA	—	0.3	5	—	0.3	4	mV
V_{OS} Including Diodes		Diode Bias Current, I_D=500μA	—	0.5	5	—	0.5	5	mV
Input Offset Change		5μA≦I_{ABC}≦500μA	—	0.1	—	—	0.1	3	mV
Input Bias Current	I_B		—	0.4	5	—	0.4	5	μA
Input Bias Current		(−20～+75℃)	—	1	8	—	1	8	μA
Forward Transconductance(gm)	gm		6,700	9,600	13,000	6,700	9,600	13,000	μΩ
		(−20～+75℃)	5,400	—	—	5,400	—	—	μΩ
gm Tracking		R_L=0,I_{ABC}=5μA	—	0.3	—	—	0.3	—	dB
Peak Output Current	I_{OP}	R_L=0,I_{ABC}5μA	—	5	—	—	0	—	μA
Peak Output Current		R_L=0,I_{ABC}=500μA	350	500	650	350	500	650	μA
Peak Oputput Current		R_L=0, −20～+75℃	300	—	—	300	—	—	μA
Peak Output Voltage Positive	V_{OP}	R_L=∞, 5μA≦I_{ABC}≦500μA	+12	+14.2	—	+12	+14.2	—	V
Peak Output Voltage Negative		R_l =∞, 5μA≦$_{ABC}$≦500μA	−12	−14.4	—	−12	−14.4	—	V
Operating Current	I_{CC}	I_{ABC}=500μA, two circuit	—	2.6	—	—	2.6	—	mA
V_{OS} Sensitivity Positive	SVR	$\Delta V_{OS}/\Delta V^+$	76.5	94	—	76.5	94	—	dB
V_{OS} Sensitivity Negative		$\Delta V_{OS}/\Delta V^-$	76.5	94	—	76.5	94	—	dB
Input Offset Curent	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=±4V	—	0.02	100	—	0.02	100	nA
Leakage Curent	I_{LEAK}	I_{ABC}=0 (Refer to Test Circuit)	—	0.2	100	—	0.2	100	nA
Input Resistance	R_{IN}		10	26	—	10	26	—	kΩ
Open Loop Bandwidh			—	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

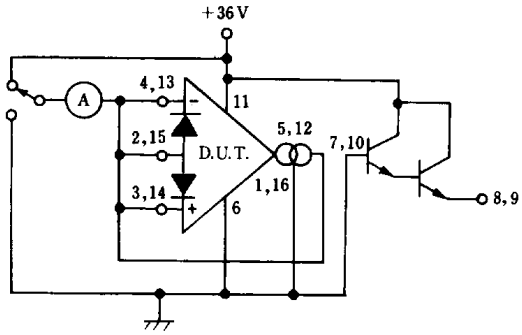
(note 1) Open unless otherwise specified. The inputs to the buffers are grounded and outputs are open.

(note 2) R_{OUT}=5kΩ connected from the buffer output to V^- and the input of buffer is connected to the transconductance amplifier output. I_{ABC}=500μA

■ TEST CIRCUIT



Differential Input Current



Leakage Current

■ TYPICAL APPLICATIONS

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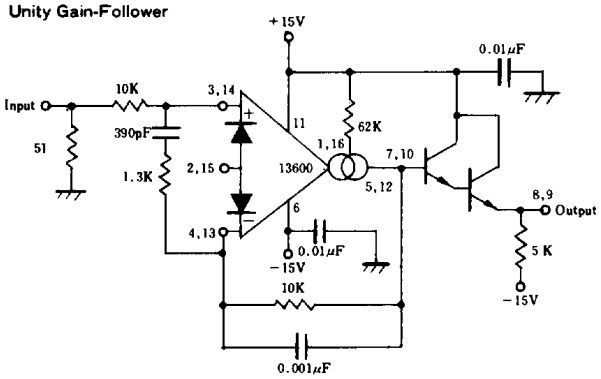
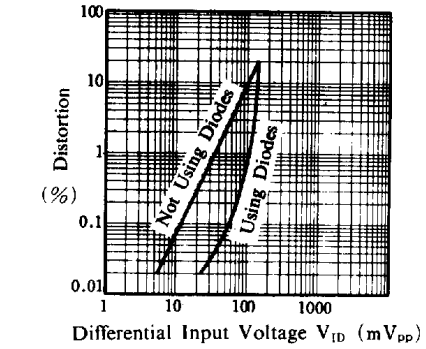
Unity Gain-Follower



■ TYPICAL CHARACTERISTICS

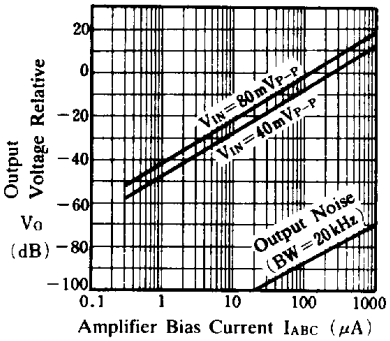
Distortion vs. Differential Input Voltage

($V^+/V^-=\pm15V$, $R_L=10k\Omega$, $I_{ABC}=1mA$, $Ta=25°C$)



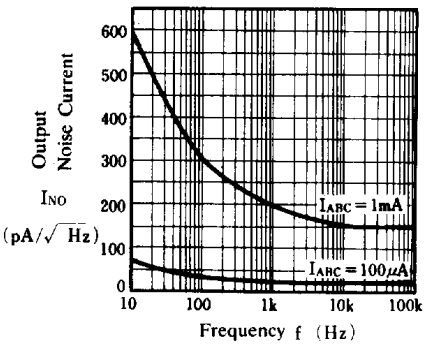
Voltage vs. Amplifier Bias Current

($V^+/V^-=\pm15V$, $R_L=10k\Omega$, $Ta=25°C$)



Output Noise Current vs. Frequency

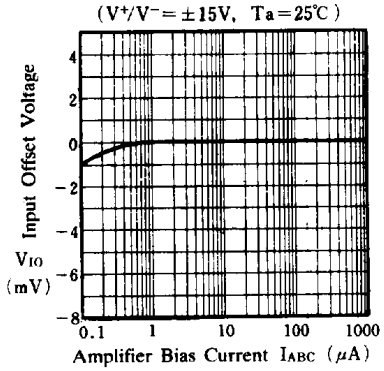
($Ta=25°C$)



■ TYPICAL CHARACTERISTICS

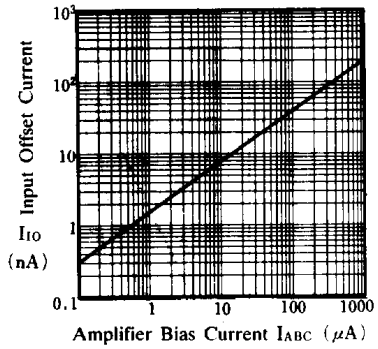
Input Offset Voltage

($V^+/V^-=\pm15V$, Ta=25℃)



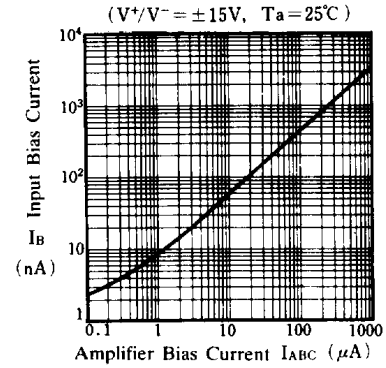
Input Offset Current

($V^+/V^-=\pm15V$, Ta=25℃)



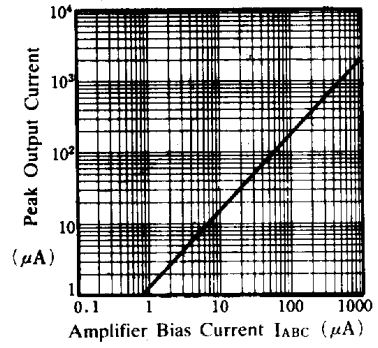
Input Bias Current

($V^+/V^-=\pm15V$, Ta=25℃)



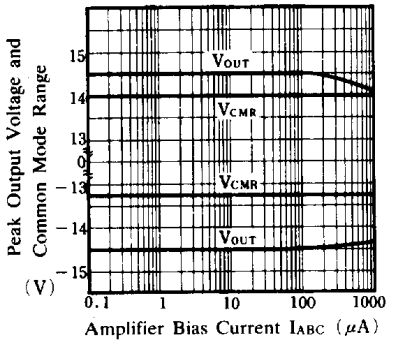
Peak Output Current

($V^+/V^-=\pm15V$, Ta=25℃)



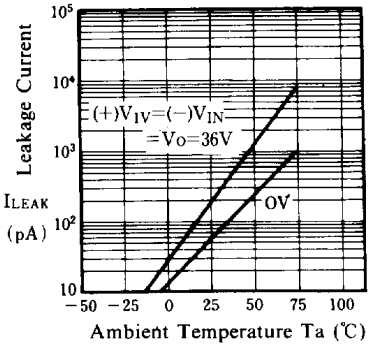
Peak Output Voltage and Common Mode Range

($V^+/V^-=\pm15V$, $R_L=\infty$, Ta=25℃)



Leakage Current vs. Temperature

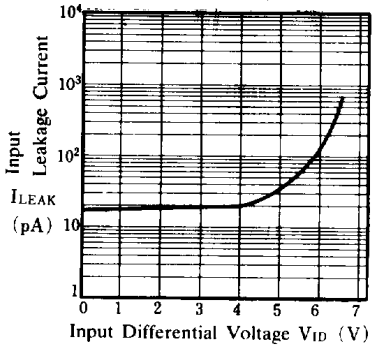
($+V_{IN}=-V_{IN}=V_O$)



■ TYPICAL CHARACTERISTICS

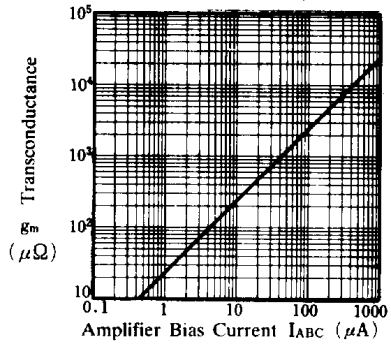
Input Leakage Current

(Ta=25℃)



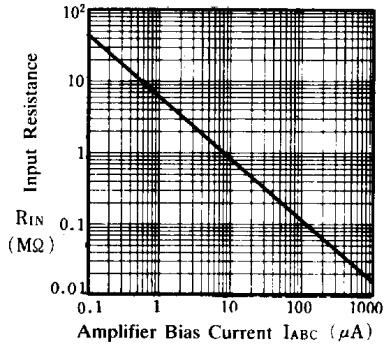
Transconductance

($V^+/V^-=\pm15V$, Pin2.15 Open, Ta=25℃)



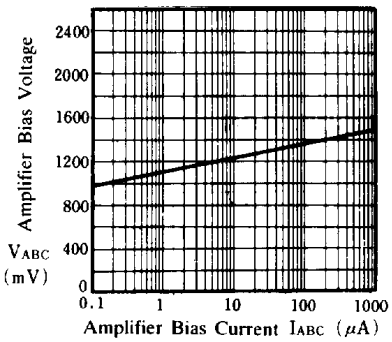
Input Resistance

(Pin2.15 Open, Ta=25℃)



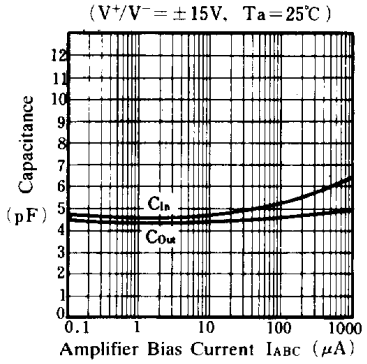
Amplifier Bias Voltage vs. Amplifier Bias Current

(Ta=25℃)



Input and Output Capacitance

($V^+/V^-=\pm15V$, Ta=25℃)



Output Resistance

(Ta=25℃)