

## LOG AMPLIFIER

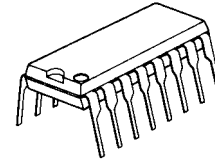
### ■ GENERAL DESCRIPTION

The **NJM2204A** is an integrated IF limiting amplifier which contains temperature compensated reference power supply, 6 stage differential limiting amplifier and 6 stage logarithmic suppression circuit.

Its voltage gain is 58dB and linearity is  $\pm 1$ dB within 50dB log dynamic range. The voltage gain and log dynamic range are enlarged by connecting multiple stages.

The **NJM2204A** is suitable to telecommunication equipment.

### ■ PACKAGE OUTLINE



**NJM2204AD**

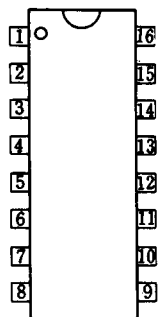
### ■ FEATURES

- Wide log dynamic range (50dB)
- Wide linearity range ( $\pm 1$ dB)
- Large Voltage Gain (60dB)
- Wide stable operating supply voltage range (8 to 12V)
- Wide stable operating temperature range (-20 to 85°C)
- Package Outline DIP16
- Bipolar Technology

### ■ APPLICATION

- Cellular
- Personal wireless Radio
- Business wireless Radio
- Handy talky

### ■ PIN CONFIGURATION

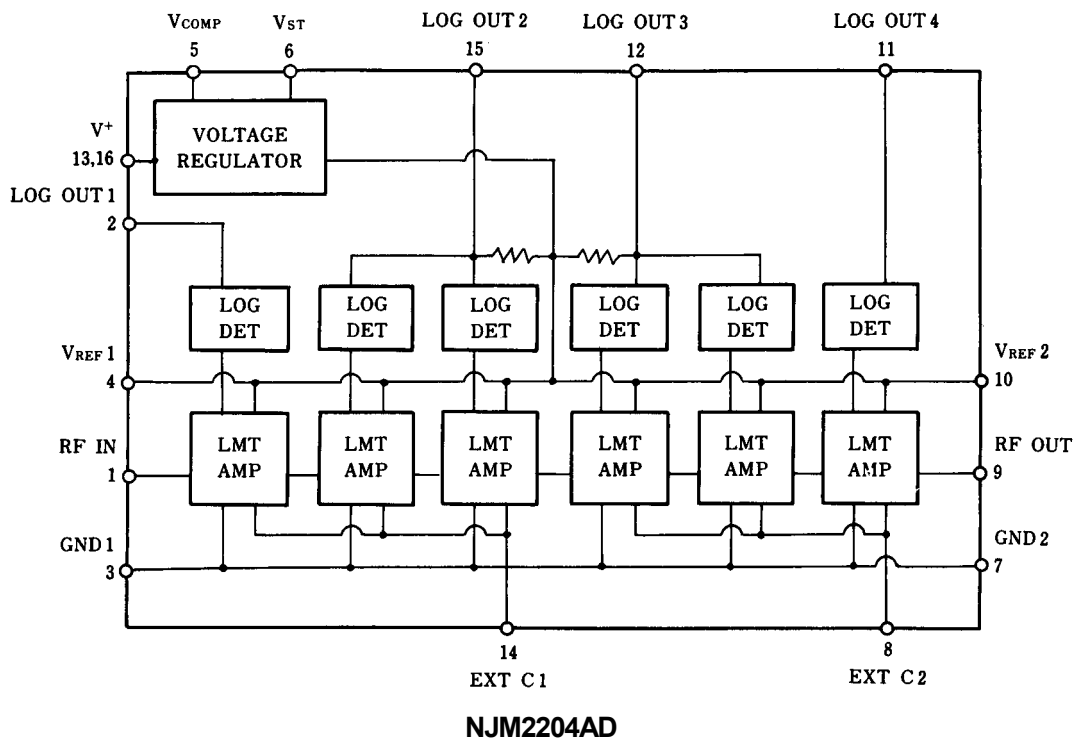


**NJM2204AD**

Pin No.	Pin Name	Function
1	RF IN	AC Signal Input (C-coupling)
2	LOG OUT 1	LOG Detector Output (from 1st stage)
3	GND1	Ground 1
4	V <sub>REF1</sub>	Internal Reference Voltage 1
5	V <sub>COMP</sub>	Compensation Input to Reference Voltage
6	V <sub>st</sub>	Compensated Output of Reference Voltage
7	GND2	Ground 2
8	EXT C2	Terminate with C
9	RF OUT	Limited AC Output
10	V <sub>REF2</sub>	Internal Reference Voltage2
11	LOG OUT 4	LOG Detector Output (from 6th stage)
12	LOG OUT 3	LOG Detector Output (from 4th and 5th stage)
13	V <sup>+</sup> 2	Supply Voltage Input 2
14	EXT C1	Terminate with C
15	LOG OUT 2	LOG Detector Output (from 2nd and 3rd stage)
16	V <sup>+</sup> 1	Supply Voltage Input 1

# NJM2204A

## ■ BLOCK DIAGRAM



## ■ LOG DETECTOR OUTPUT CHARACTERISTICS (EXAMPLE)

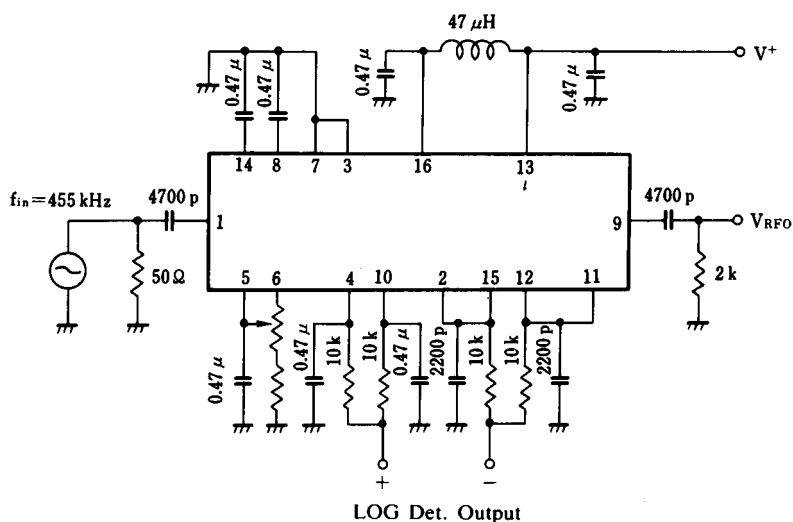
( $T_a=25^\circ\text{C}$ ,  $V^+=9\text{V}$ ,  $V_{\text{REF}}=6.0\text{V}$ )

PARAMETER	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Log Detector Output	$f_{\text{IN}}=455\text{kHz}$ , $V_{\text{IN}}=8\text{dB}$ (50 $\Omega$ termination)	0.976	1.004	1.032	V
	$f_{\text{IN}}=455\text{kHz}$ , $V_{\text{IN}}=-2\text{dB}$ (50 $\Omega$ termination)	0.868	0.896	0.924	V
	$f_{\text{IN}}=455\text{kHz}$ , $V_{\text{IN}}=-12\text{dB}$ (50 $\Omega$ termination)	0.727	0.755	0.783	V
	$f_{\text{IN}}=455\text{kHz}$ , $V_{\text{IN}}=-22\text{dB}$ (50 $\Omega$ termination)	0.586	0.614	0.642	V
	$f_{\text{IN}}=455\text{kHz}$ , $V_{\text{IN}}=-32\text{dB}$ (50 $\Omega$ termination)	0.446	0.474	0.502	V
	$f_{\text{IN}}=455\text{kHz}$ , $V_{\text{IN}}=-42\text{dB}$ (50 $\Omega$ termination)	0.305	0.333	0.361	V
	$f_{\text{IN}}=455\text{kHz}$ , $V_{\text{IN}}=-52\text{dB}$ (50 $\Omega$ termination)	0.164	0.192	0.202	V
Log Detector Linearity	$T_a=-20^\circ\text{C}$ to $85^\circ\text{C}$ , $V_{\text{IN}}=-2$ to $-52\text{dBm}$	-	-	$\pm 1$	dB

\* Log Detection Linearity : It is error between RF input level and ideal input level to straight line connected two detection output points of two input level (-2dBm, -52dBm).

\* Temperature coefficient of Log detection output voltage : approximately  $90\mu\text{V}/^\circ\text{C}$  Typ. (-20 to +85 $^\circ\text{C}$ ).

## ■ TEST CIRCUIT



## ■ RECOMMENDED OPERATING CONDITION

(T<sub>a</sub>=-20 to 85°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V <sup>+</sup>	8.0	9.0	16.0	V
Output Load Impedance	B <sub>RFO</sub>	1	2	-	kΩ
	B <sub>LOGO</sub>	100	-	-	kΩ
Stabilized Voltage	V <sub>VR</sub>	-	6.0	-	V

## ■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V <sup>+</sup>	-0.5 to 16.0	V
Input Voltage	V <sub>IN</sub>	-0.5 to V <sup>+</sup>	V
Output Current	I <sub>LR</sub>	5	mA
	I <sub>RFO</sub>	2	mA
Operating Temperature	T <sub>opr</sub>	-20 to 85	°C
Storage Temperature	T <sub>stg</sub>	-55 to 125	°C

(note):The **NJM2204A** is produced by high frequency wafer process and so destrutive voltage against surge pulse is lower than low frequency product.

## ■ ELECTRICAL CHARACTERISTICS

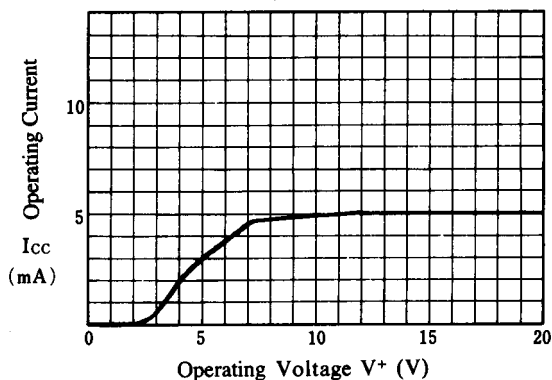
(T<sub>a</sub>=25°C, V<sup>+</sup>=9V, V<sub>REF</sub>=6.0V)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I <sub>CC</sub>		-	6	10.0	mA
Maximum Operating Frequency	f <sub>max</sub>		0.5	3	-	MHz
Output Voltage Swing	V <sub>RFO</sub>	Input : +8dBm (50Ω termination)	-	2.0	-	V <sub>P-P</sub>
Log Detection Output	V <sub>LOG</sub>	Input : +8dBm (50Ω termination)	-	1.0	-	V
Log Detection Linearity	L <sub>IN</sub>	V <sub>IN</sub> =-2dBm to -52dBm (50Ω termination)	-	-	±1	dB
Limiter Amp Gain	G <sub>V</sub>		60	-	-	dB

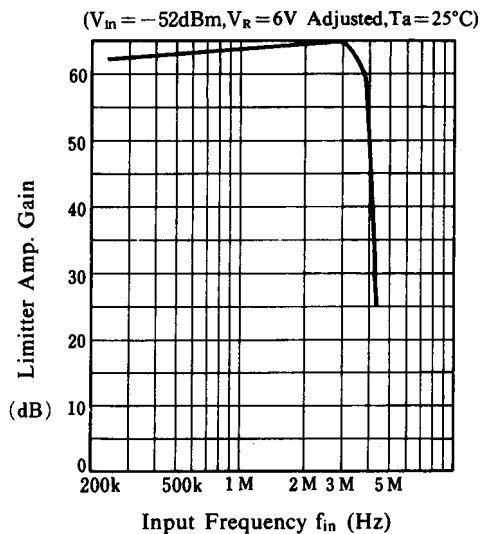
# NJM2204A

## ■ TYPICAL CHARACTERISTICS

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

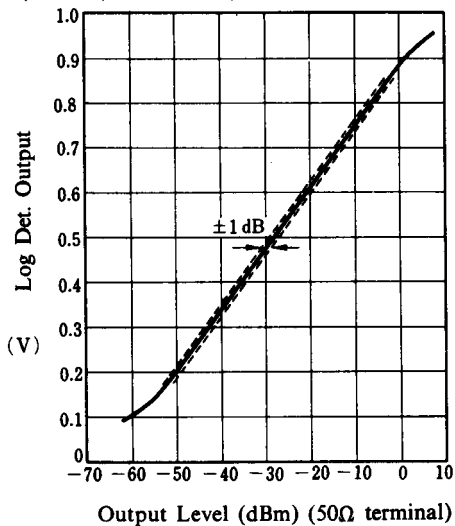


**Limiter Amp Gain**



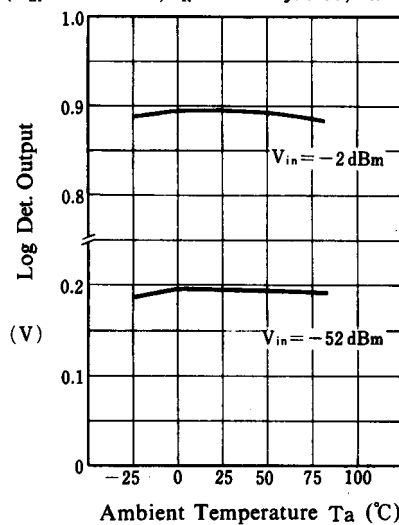
**Log Detector Output**

( $V^+ = 9\text{V}, V_R = 6\text{V Adjusted}, f_{in} = 455\text{kHz}, T_a = 25^\circ\text{C}$ )



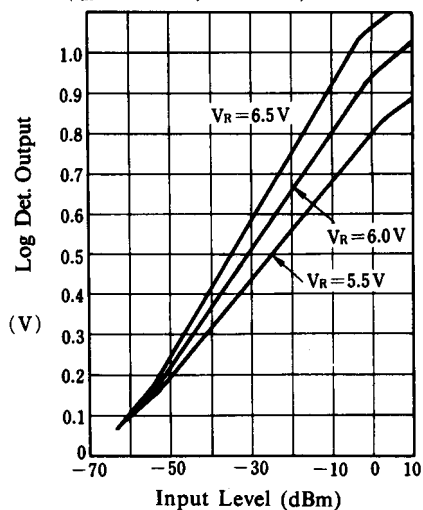
**Log Detector Output**

( $V_{in} = -52\text{dBm}, V_R = 6\text{V Adjusted}, T_a = 25^\circ\text{C}$ )

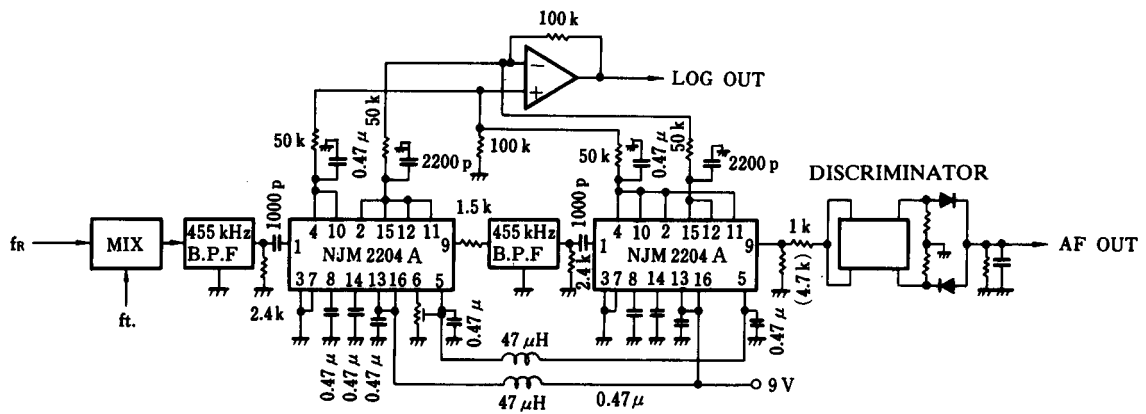


**Log Detector Output  $V_R$**

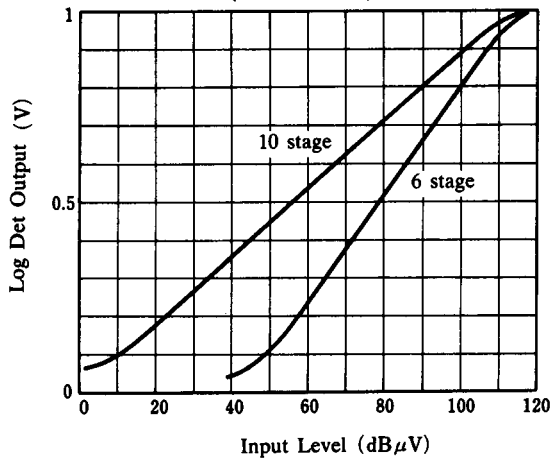
( $f_{in} = 455\text{kHz}, T_a = 25^\circ\text{C}, 50\Omega$  Terminal)



## ■ TYPICAL APPLICATION & CHARACTERISTICS (10 synthesized stage)



**Log Det Output Voltage**  
(50Ω terminate)



**[CAUTION]**

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