

LOG AMPLIFIER

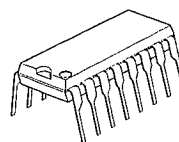
■ GENERAL DESCRIPTION

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 $\pm 1\text{dB}$ 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

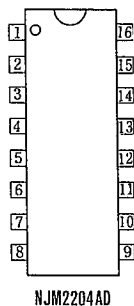
■ FEATURES

- Wide log dynamic range (50dB)
- Wide linearity range ($\pm 1\text{dB}$)
- Large Voltage Gain (60dB)
- Wide stable operating supply voltage range (8 ~ 12V)
- Wide stable operating temperature range ($-20 \sim 85^\circ\text{C}$)
- Package Outline DIP16
- Bipolar Technology

■ APPLICATION

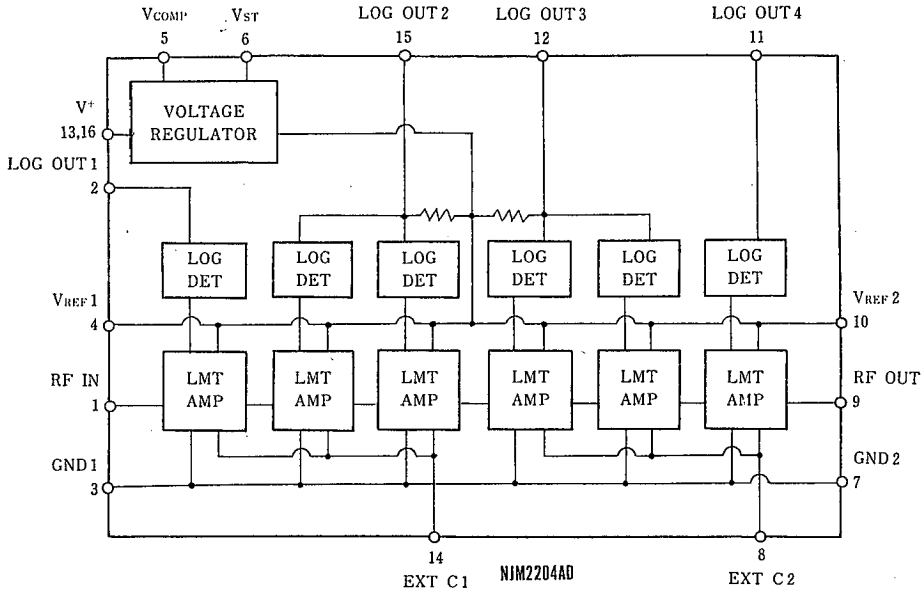
- Cellular
- Personal wireless Radio
- Business wireless Radio
- Handy talky

■ PIN CONFIGURATION



Pin No.	Pin Name	Function
1	RF IN	AC Signal Input (C-coupling)
2	LOG OUT 1	LOG Detector Output (from 1st stage)
3	GND 1	Ground 1
4	V _{REF 1}	Internal Reference Voltage 1
5	V _{COMP}	Compensation Input to Reference Voltage
6	V _{st}	Compensated Output of Reference Voltage
7	GND 2	Ground 2
8	EXT C2	Terminate with C
9	RF OUT	Limited AC Output
10	V _{REF 2}	Internal Reference Voltage 2
11	LOG OUT 4	LOG Detector Output (from 6th stage)
12	LOG OUT 3	LOG Detector Output (from 4th and 5th stage)
13	V ⁺ 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 ⁺ 1	Supply Voltage Input 1

■ BLOCK DIAGRAM



■ LOG DETECTOR OUTPUT CHARACTERISTICS (EXAMPLE)

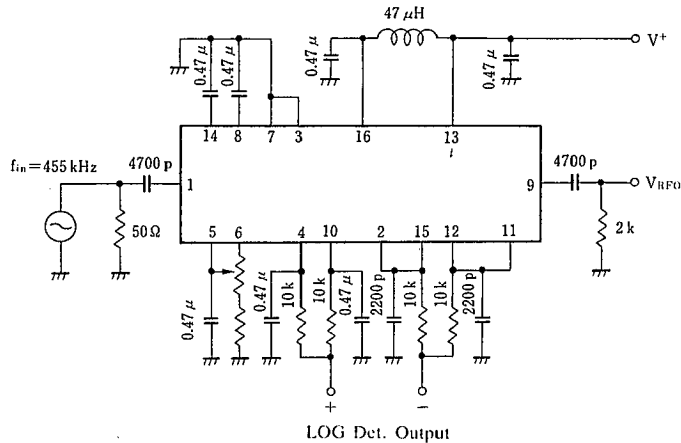
($T_a=25^\circ\text{C}$, $V^+=9\text{V}$, $V_{\text{REF}}=6.0\text{V}$)

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

■ TEST CIRCUIT



RECOMMENDED OPERATING CONDITION

(Ta = -20~85°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V ⁺	8.0	9.0	16.0	V
Output Load Impedance	B _{RFO}	1	2	—	kΩ
	B _{LOGO}	100	—	—	kΩ
Stabilized Voltage	V _{VR}	—	6.0	—	V

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V ⁺	-0.5~16.0	V
Input Voltage	V _{IN}	-0.5~V ⁺	V
Output Current	I _{LR}	5	mA
	I _{RFO}	2	mA
Operating Temperature	T _{opr}	-20~85	°C
Storage Temperature	T _{stg}	-55~125	°C

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

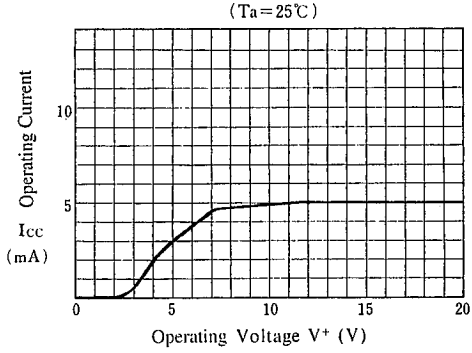
ELECTRICAL CHARACTERISTICS

(Ta = 25°C, V⁺ = 9V, V_{REF} = 6.0V)

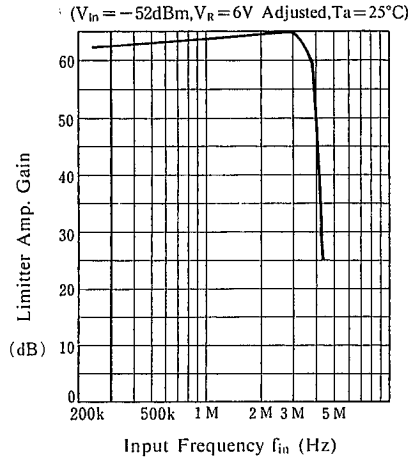
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I _{CC}		—	6	10.0	mA
Maximum Operating Frequency	f _{max}		0.5	3	—	MHz
Output Voltage Swing	V _{RFO}	Input: +8dBm (50Ω termination)	—	2.0	—	V _{P-P}
Log Detection Output	V _{LOG}	Input: +8dBm (50Ω termination)	—	1.0	—	V
Log Detection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

TYPICAL CHARACTERISTICS

Operating Current vs. Operating Voltage

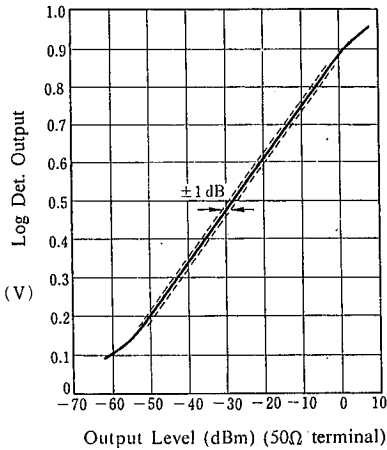


Limiter Amp Gain



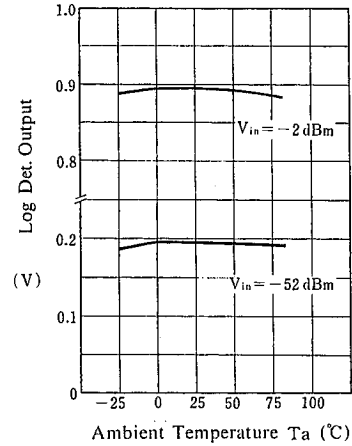
Log Detector Output

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



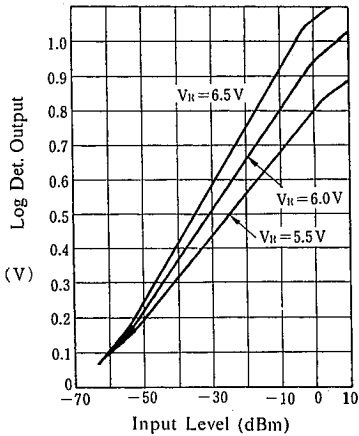
Log Detector Output

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

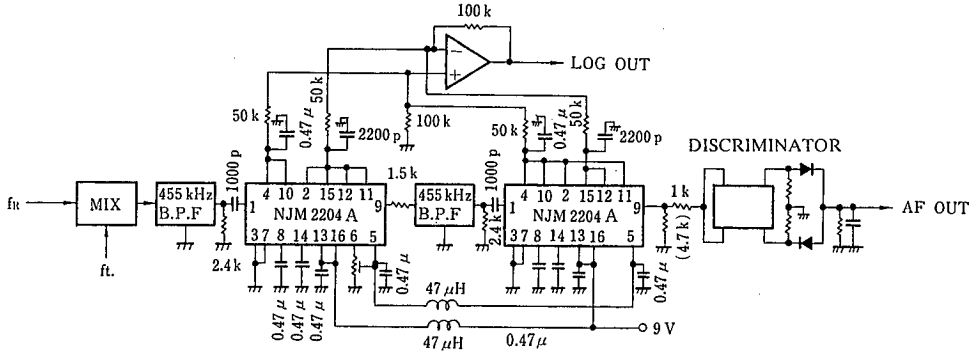


Log Detector Output V_R

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

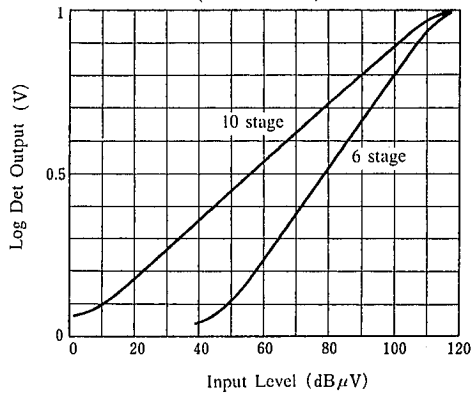


■ **TYPICAL APPLICATION & CHARACTERISTICS** (10 synthesized stage)



Log Det Output Voltage

(50Ω terminate)



MEMO

[CAUTION]

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