LOG AMPLIFIER

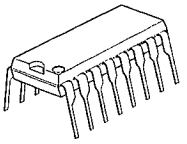
■ GENERAL DESCRIPTION

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

Its voltage gain is 58dB and linearity is ±1dB 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

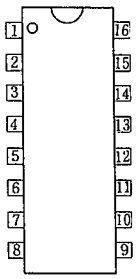
■ FEATURES

- Wide log dynamic range (50dB)
- Wide linearity range (±1dB)
- Large Voltage Gain (60dB)
- Wide stable operating supply voltage range (8~12V)
- Wide stable operating temperature range (−20~85℃)
- Package Outline DIP16
- Bipolar Technology

■ APPLICATION

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

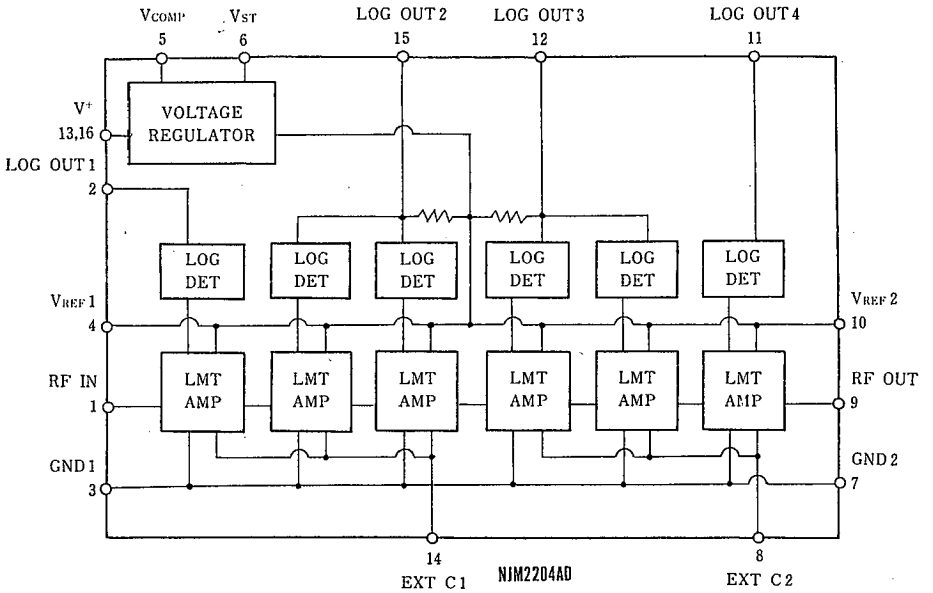
■ PIN CONFIGURATION



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	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	Limitted 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



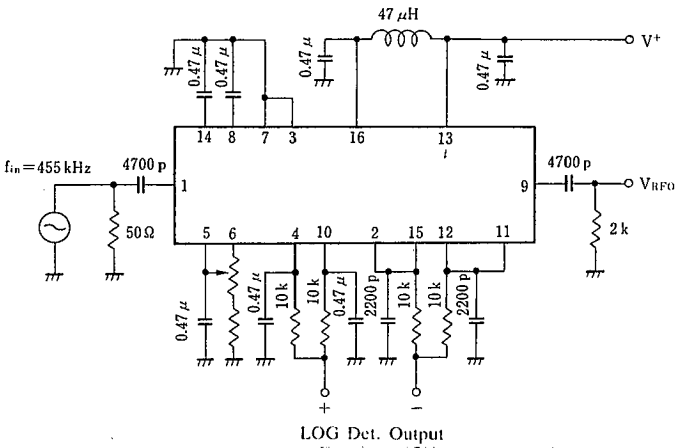
■ LOG DETECTOR OUTPUT CHARACTERISTICS (EXAMPLE)

(Ta=25℃, V+=9V, V_{REF}=6.0V)

PARAMETER	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Log Detector Output	f_{in}=455kHz, V_{in}=8dB (50Ω termination)	0.976	1.004	1.032	V
	f_{in}=455kHz, V_{in}=−2dB (50Ω termination)	0.868	0.896	0.924	V
	f_{in}=455kHz, V_{in}=−12dB (50Ω termination)	0.727	0.755	0.783	V
	f_{in}=455kHz, V_{in}=−22dB (50Ω termination)	0.586	0.614	0.642	V
	f_{in}=455kHz, V_{in}=−32dB (50Ω termination)	0.446	0.474	0.502	V
	f_{in}=455kHz, V_{in}=−42dB (50Ω termination)	0.305	0.333	0.361	V
	f_{in}=455kHz, V_{in}=−52dB (50Ω termination)	0.164	0.192	0.202	V
	f_{in}=455kHz, V_{in}=−62dB (50Ω termination)	0.057	0.085	0.113	V
Log Detector Linearity	Ta=−20°C~85°C, V_{in}=−2~−52dBm	—	—	±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 90μV/°C Typ. (−20~+85°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

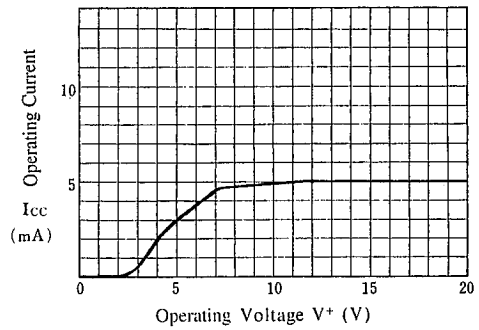
(Ta=25°C, V^+=9V, V_{REF}=6.0V)

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_{in}=−2dBm~−52dBm (50Ω termination)	—	—	±1	dB
Limitter Amp Gain	G_V		60	—	—	dB

■ TYPICAL CHARACTERISTICS

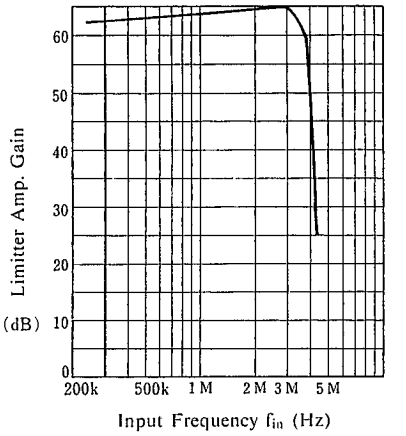
Operating Current vs. Operating Voltage

(Ta=25℃)



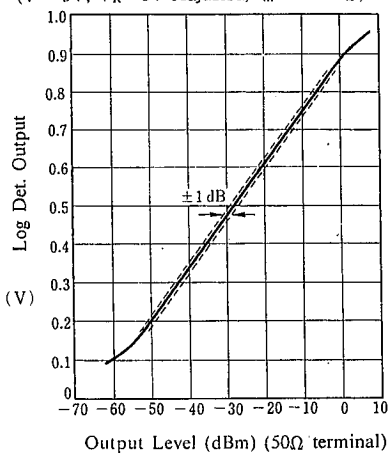
Limitter Amp Gain

(V_{in}=−52dBm, V_R=6V Adjusted, Ta=25°C)



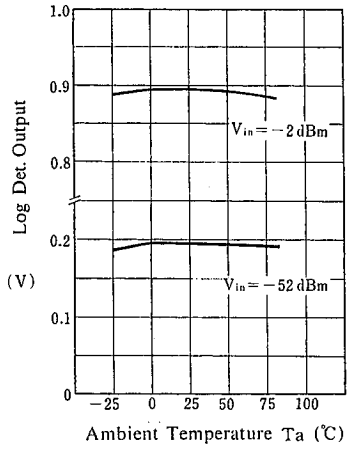
Log Detector Output

(V^+=9V, V_R=6V Adjusted, f_{in}=455kHz, Ta=25℃)



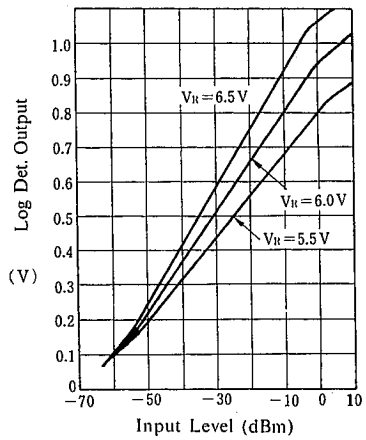
Log Detector Output

(V_{in}=−52dBm, V_R=6V Adjusted, Ta=25°C)

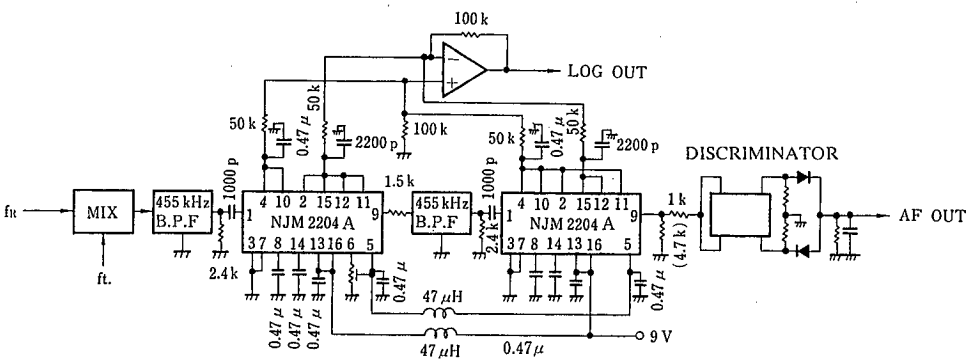


Log Detector Output V_R

(f_{in}=455kHz, Ta=25°C, 50Ω Terminal)



■ TYPICAL APPLICATION & CHARACTERISTICS (10 synthesized stage)



Log Det Output Voltage

(50Ω terminate)