

## Speech Network Circuit

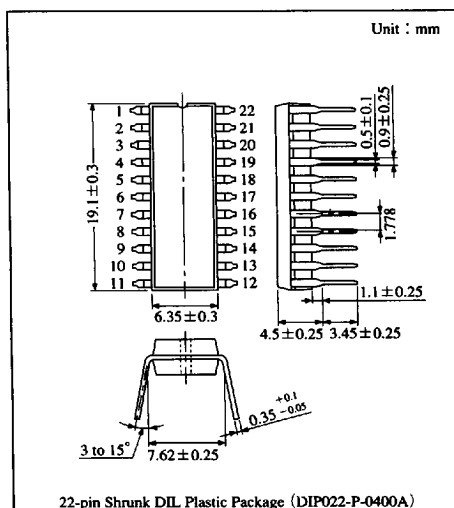
The AN6157NK is a speech network IC with a side tone preventive circuit network switching function. It enables manual/automatic switching and realizes good side-tone characteristics under any line conditions, including communications through the extension.

- Capable of interfacing with the light-weight small ceramic receivers and low-impedance dynamic receivers.
- Capable of interfacing with the ECM transmitters.
- Built-in ECM constant voltage source (2.1V typ.)
- Built-in 2-channel side tone circuit network switching function according to a line current and capable of manual switching in communications through the extension.
- Automatic gain control according to a line current and manual gain control also available.
- Built-in key-in-tone amplifier and DTMF transmission circuit to allow mode setting through a control pin.
- 22-pin DIL (shrink type) plastic package.

The block diagram illustrates the internal architecture of the AD-6P circuit, organized around 22 pins. The top row of pins (12-22) is connected to a common line labeled  $V_L$ . The bottom row of pins (1-11) is connected to a common line labeled GND. Key internal components include:

- V-I Control:** Connected to pins 21 and 22.
- 2V Reg:** Connected to pins 1 and 2.
- BN-SW:** A central switching block connected to pins 17, 18, and 19.
- SEND Main Amp.:** An amplifier connected to pins 17, 18, and 19.
- MIC Amp./ATT:** A microphone amplifier/attenuator connected to pins 14 and 15.
- DTMF Amp./ATT:** A DTMF amplifier/attenuator connected to pins 13 and 14.
- KT Amp.:** A keyboard tone amplifier connected to pins 6 and 7.
- REC Main Amp.:** A recording main amplifier connected to pins 3 and 4.
- REC Amp./ATT:** A recording amplifier/attenuator connected to pins 5 and 6.
- DM Logic:** Digital multiplexer logic connected to pins 8 and 9.
- AP Control:** Address and data control logic connected to pins 9 and 10.
- $V_{REF}$ :** A reference voltage input connected to pin 11.

The diagram shows various signal paths, including feedback loops and control lines, connecting these components to the pins.



### ICs for Telephone

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■ Absolute Maximum Ratings (Ta=25℃)

Parameter	Symbol	Rating	Unit
Supply voltage	V <sub>L</sub>	14.4	V
Supply current	I <sub>L</sub>	120	mA
Power dissipation (Ta=60℃)	P <sub>D</sub>	1440	mW
Operating ambient temperature	T <sub>opr</sub>	-20 to +75	℃
Storage temperature	T <sub>stg</sub>	-55 to +150	℃

■ Recommended Operating Range (Ta=25℃)

Parameter	Symbol	Range
Operating supply voltage range	V <sub>L</sub>	3 to 11.5V

■ Electrical Characteristics (I<sub>L</sub> (Line Current) = 30mA, Input Signal Frequency f<sub>in</sub> = 1kHz, Ta = 25℃)

Parameter	Symbol	Condition	min	typ	max	Unit
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Receiver System

Receiver gain	G <sub>V-R</sub>	Input a signal to the Pin⑫. Connect a resistor (3kΩ) and a capacitor (0.055μF) between the Pins③ and ④, and measure the output between the capacitors.	8.5	11	13.5	dB
Receiver automatic pad	A <sub>P-R</sub>	Input a signal (-26dBV) to the Pin⑫. Measure an output change (both ends of the capacitor) when changing I <sub>L</sub> from 30mA to 80mA.	-4.8	-3.4	-2.3	dB
Maximum receiver level	V <sub>O-R</sub>	Input a signal to the Pin⑫ and measure the output when the output distortion factor is 5%.	-3	0	—	dBV
KEY IN TONE gain	G <sub>V-KT</sub>	Ground the Pin⑧. Measure the receiver output when inputting a signal (-42dBV) to the Pin⑦.	11.5	14	16.5	dB

Transmitter System

Transmitter gain (1)	G <sub>V-T</sub>	Input a signal (-47dBV) to the Pin⑬ and measure a transmission signal at a 600Ω load eed between the Pin② and GND.	37	39	41	dB
Transmitter automatic pad	A <sub>P-T</sub>	Input a signal (-47dBV) to the Pin⑬. Measure a change of transmission signal (600Ω end) when changing I <sub>L</sub> from 30mA to 80mA.	-5.3	-3.7	-2.5	dB
Maximum transmission level	V <sub>O-T</sub>	Input a signal to the Pin⑬ and measure the output when the output distortion factor of a transmission signal (600Ω end) is 5%.	-5	-1.4	—	dBV
DTMF gain	G <sub>V-DT</sub>	Ground the Pin⑧. Input a signal (-37dBV) to the Pin⑬ and measure a transmission signal (600Ω end).	25	27	29	dB
DTMF automatic pad	A <sub>P-DT</sub>	Ground the Pin⑧. Input a signal (-37dBV) to the Pin⑬ and measure an output change when I <sub>L</sub> changes from 30mA to 80mA.	-5	-3.4	-2.2	dB
DTMF maximum transmission level	V <sub>O-DT</sub>	Ground the Pin⑧. Input a signal to the Pin⑬ and measure the output when the output distortion factor of a transmission signal (600Ω end) is 5%.	-5	-1.2	—	dBV

Power Supply

DC line voltage (1)	V <sub>L-1</sub>	Pin⑫ DC voltage when I <sub>L</sub> = 20mA	2.5	3.1	3.7	V
DC line voltage (2)	V <sub>L-2</sub>	Pin⑫ DC voltage when I <sub>L</sub> = 120mA	5.5	7.5	11.5	V
Internal supply voltage (1)	V <sub>CC</sub>	Pin② DC voltage when I <sub>L</sub> = 20mA	1.8	2.08	2.4	V
Internal supply voltage (2)	V <sub>REF</sub>	Pin⑪ DC voltage when I <sub>L</sub> = 20mA	0.88	1.03	1.18	V

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■ Electrical Characteristics (cont.) (I<sub>L</sub> (Line Current)=30mA, Input Signal Frequency f<sub>in</sub>=1kHz, Ta=25℃)

Parameter	Symbol	Condition	min	typ	max	Unit
Dial Mute Input						
Dial mute OFF	V <sub>DM-H</sub>		0.8	—	V <sub>CC</sub>	V
Dial mute ON	V <sub>DM-L</sub>		—	—	0.3	V
Input current (1) *	I <sub>DM-H</sub>	V <sub>DM</sub> =V <sub>CC</sub>	-2	0.1	2	μA
Input current (2) *	I <sub>DM-L</sub>	V <sub>DM</sub> =0V	-2	-0.2	-0.02	μA

BN Control						
BN-1 ON	I <sub>L-BN1</sub>	Increase I <sub>L</sub> from 20mA and measure I <sub>L</sub> when BN1 is turned ON and BN2 is turned OFF.	—	52	59	mA
BN-2 ON	I <sub>L-BN2</sub>	Decrease I <sub>L</sub> from 80mA and measure I <sub>L</sub> when BN1 is turned OFF and BN2 is turned ON.	41	46	—	mA
Manual BN	V <sub>BN-L</sub>	BN1 ON, BN2 OFF, S-BN ON	0.2	—	0.6	V
Input current *	I <sub>BN-L</sub>	BN1 ON, BN2 OFF, V <sub>BN</sub> =0.2V	-1	—	—	mA

Manual Pad						
Manual pad	V <sub>AP-L</sub>		0.2	—	0.6	V
Input current	I <sub>AP-L</sub>	V <sub>AP</sub> =0.2V	-1	—	—	mA

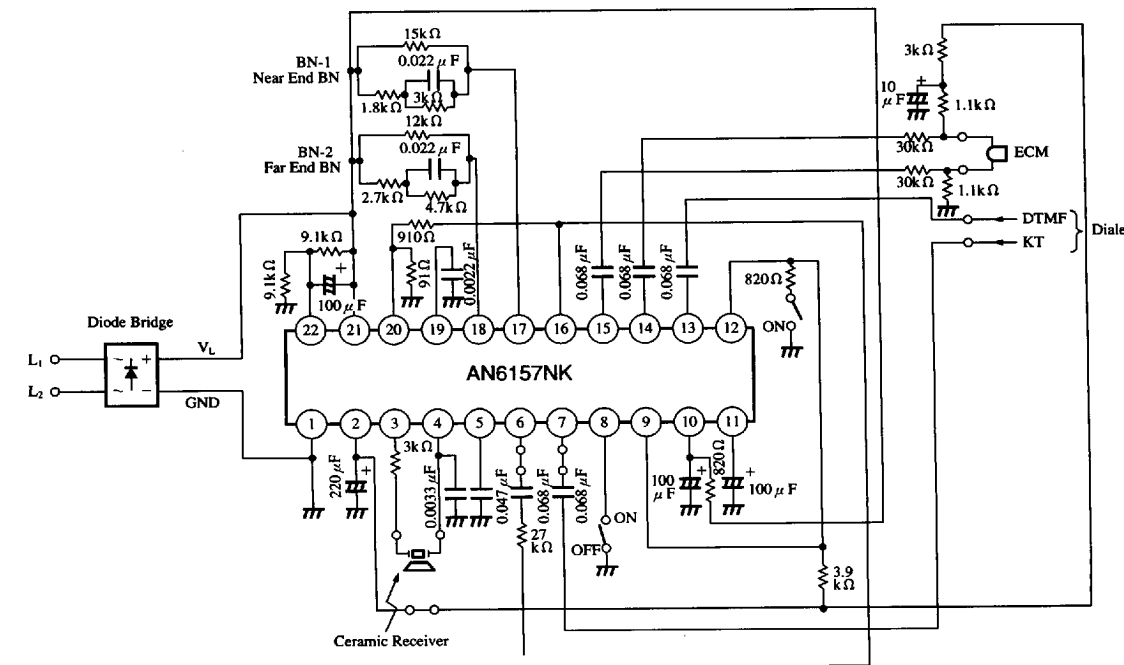
\* For the balancing network constant, BN2 is connected.

■ Electrical Characteristics Design Reference Values (Ta=25℃)

Parameter	Symbol	Condition	min	typ	max	Unit
Supply Voltage						
AC impedance (1)	Z <sub>AC-1</sub>	I <sub>L</sub> =30mA, f <sub>in</sub> =1kHz	400	650	800	Ω
AC impedance (2)	Z <sub>AC-2</sub>	I <sub>L</sub> =80mA, f <sub>in</sub> =1kHz	400	610	800	Ω

Note) The above characteristics are design reference values and not guaranteed values.

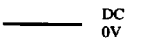
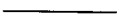
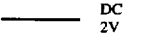
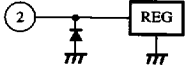
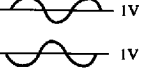
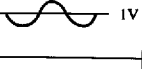
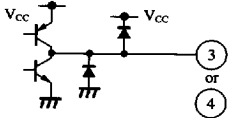
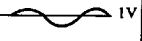
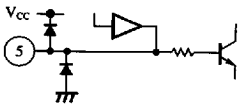

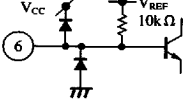

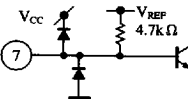
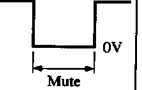
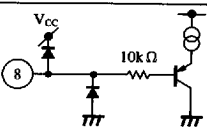
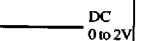
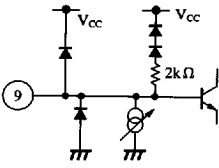
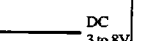
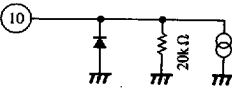
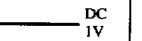
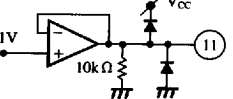
■ Application Circuit



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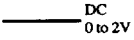
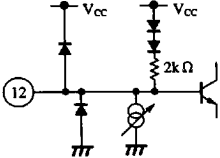
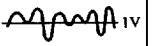
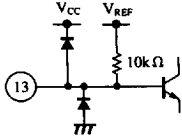
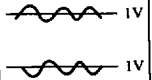
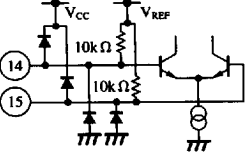



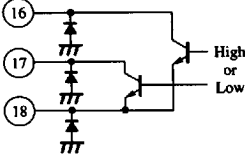

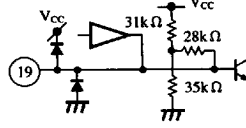

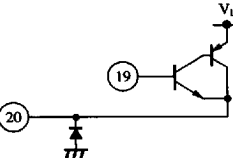
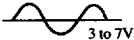
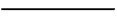
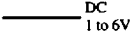
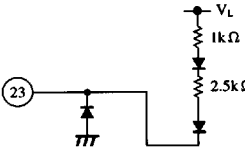
Pin Descriptions

Pin No.	Pin name	Typical waveform	Description	Equivalent circuit
1	GND	 DC 0V	Ground pin. Connect to the — output of the diode bridge.	
2	2V REG	 DC 2V	2V internal stabilized power output pin. Connect to GND via 220 $\mu$ F.	
3 4	REC OUT	 1V  1V	Receiver output pin. The Pins③ and ④ are of BTL output.	
5	REC filter	 1V	Receiver filter pin. Between the receiver pre-amplifier step and output amplifier step. The input impedance is 2k $\Omega$ .	
6	REC IN	 1V	Receiver input pin. A signal is output to the Pins③, ④ and ⑤ when DM (Pin⑧) is at the H level, and not output when at the L level.	
7	Key In tone IN	 1V	KT signal input pin. A signal is output to the Pins③, ④ and ⑤ when DM (Pin⑧) is at the L level, and not output when at the H level.	
8	Dial mute SW	 Mute	Dial mute SW pin. Switches between the transmission signals (MIC, DTMF) and reception signals (REC, KT). MIC and REC are output at the high level, and KT and DTMF are output at the low level.	
9	Auto pad control	 DC 0 to 2V	Automatic pad control pin. Connect a resistor between the Pin② and this pin. Adjust the circuit current characteristic of the pad depending on an external resistance value. Connecting this pin to V <sub>CC</sub> maximizes the gain, and setting it to the Low level minimizes the gain. (manual pad)	
10	BN-SW V <sub>L</sub>	 DC 3 to 8V	BN Circuit power pin. Connect a resistor (typ. 820 $\Omega$ ) between V <sub>L</sub> (Pin⑩) and a capacitor (typ. 220 $\mu$ F) between GND and this pin.	
11	V <sub>REF</sub>	 DC 1V	1V internal stabilized power output pin. Reference voltage to determine the operating point of the internal circuit. No power input/output is allowed to this pin.	

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Pin Descriptions (cont.)

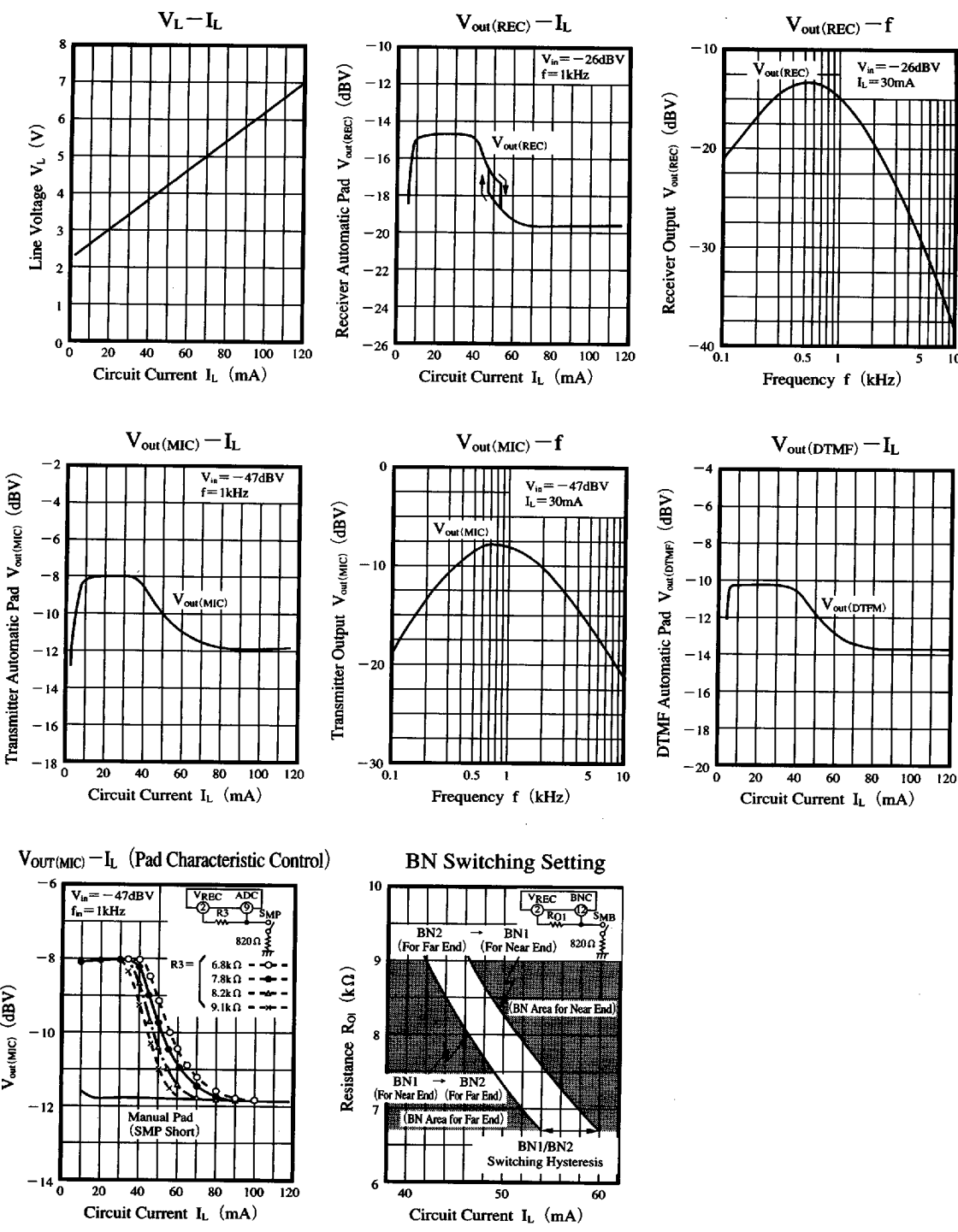
Pin No.	Pin name	Typical waveform	Description	Equivalent circuit
12	BN control		BN control pin. Connect resistor between the Pin② and this pin. Switches BN with the voltage generated at this pin. If this pin is connected to 2V, the BN-2 (for far end) side tone preventive circuit network is connected, and if set to the Low level, the BN-1 (for near end) side tone preventive circuit network is connected.	
13	DTMF IN		DTMF signal input pin. Input a DTMF signal from the dialer, etc. It is sent to the circuit when DM (Pin⑧) is at the L level, and not sent when at the H level.	
14 15	MIC IN		MIC input pin. Microphone input pin. The Pins⑭ and ⑮ are of differential input and sent to the circuit when the DM (Pin⑧) is at the H level, and not sent when at the L level.	
16 17 18	BN OUT BN-1 BN-2	  	BN output pin (Pin⑯). BN connection pins (Pins⑰ and ⑱). Switches the circuit network between the Pin⑯ and Pin⑰ and Pin⑱. Connect the near end BN circuit to the Pin⑰ and the far end BN circuit to the Pin⑱.	
19	SEND filter		Transmission filter pin. A transmission system L.P.F consists of capacitors connected between this pin and GND.	
20	Side tone		Transmitter output pin. Connect a resistor between GND and this pin. The transmitter system gain changes depending on this resistance value. A circuit output inverting signal is output.	
21	V <sub>L</sub>		Circuit input pin. Connect to the + output of the diode bridge.	
22	V <sub>LC</sub>		Circuit voltage control pin. Connect a resistor and a capacitor between this pin and V <sub>L</sub> (Pin②①), and a resistor between this pin and GND. The DC characteristics of V <sub>L</sub> can be adjusted depending on a resistance value.	

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■ Characteristics Curve



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