



# LA8515N

## Telephonic Speech Network

### Overview

The SANYO LA8515N telephonic speech network provides amplification, switching and line drive functions for telephone equipment. It can perform 2 to 4 line conversion and impedance matching, and supports both DTMF and keytone signals.

The LA8515N's low operating current reduces line load. Switching between the DTMF/keytone and voice circuits is controlled directly from a single MUTE input.

The LA8515N is available in plastic 20-pin DIPs.

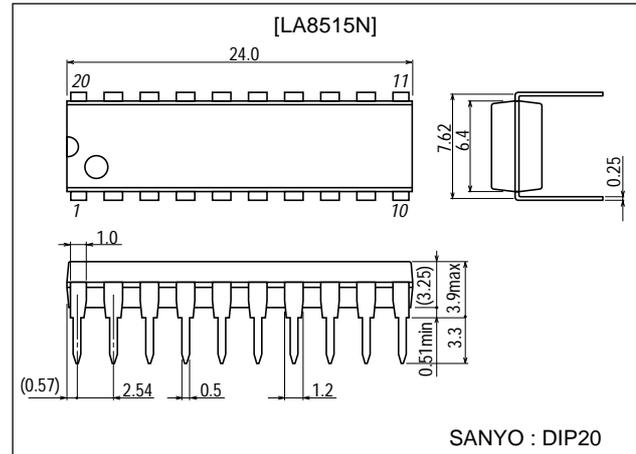
### Features

- Direct connection to low-impedance receiver.
- DTMF/keytone and voice circuit switching controlled by a single MUTE input.
- Receive and transmit gain are adjusted automatically in response to the line current.
- Applicable to a wide variety of transmitters and receivers by selecting external components.

### Package Dimensions

unit:mm

3021C-DIP20



### Specifications

Maximum Ratings at  $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Line voltage	$V_L$ max		15	V
Line current	$I_L$ max		150	mA
Allowable power dissipation	$P_d$ max		1200	mW
Operating temperature	$T_{opr}$		-30 to +75	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

Operating Characteristics at  $T_a = 25^\circ\text{C}$ ,  $f=1\text{kHz}$ , See specified Test Circuit.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Line voltage	$V_L$	$I_L=20\text{mA}$		3.6		V
		$I_L=50\text{mA}$		6.1		V
		$I_L=120\text{mA}$		12.3		V
Supply voltage	$V_{CC}$	$I_L=20\text{mA}$		2.1		V
		$I_L=50\text{mA}$		3.6		V
		$I_L=120\text{mA}$		7.1		V

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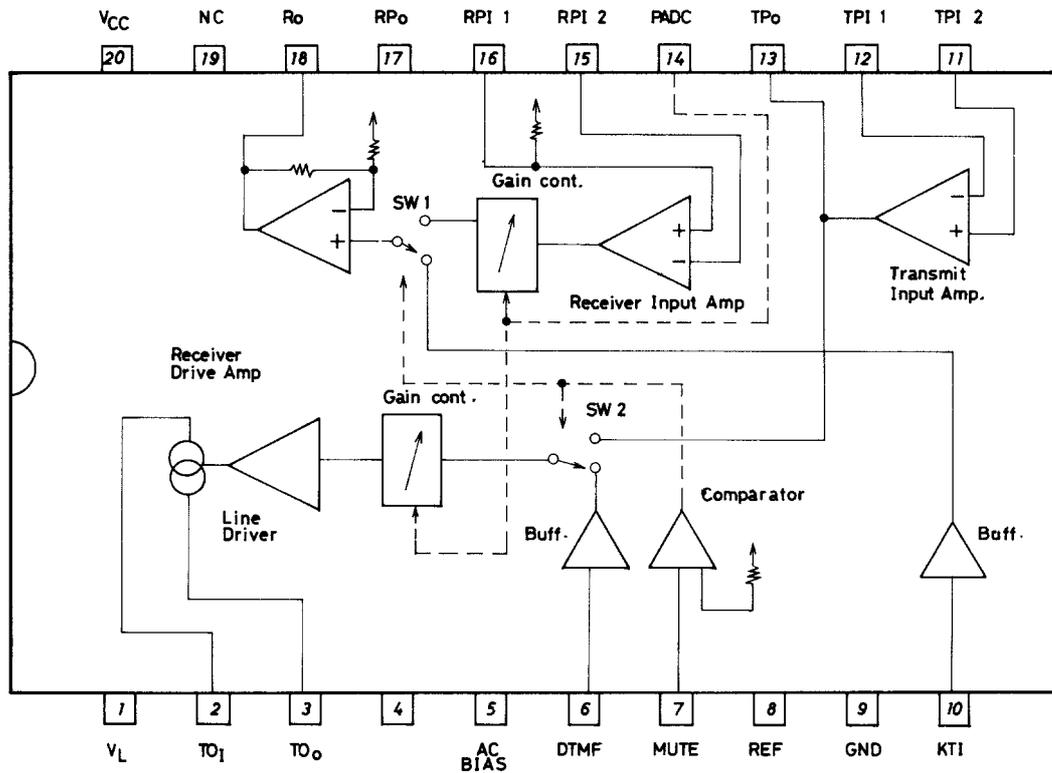
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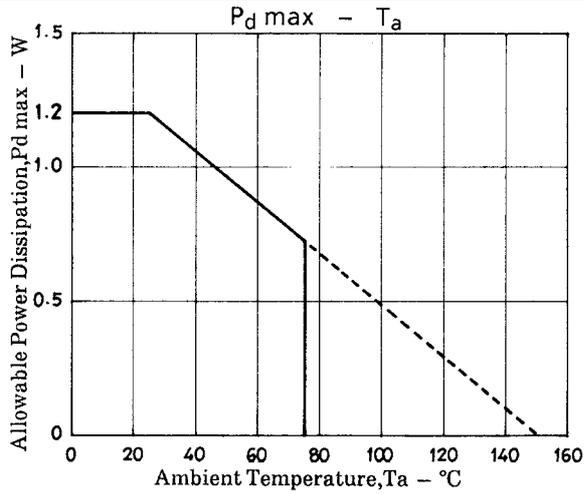
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Transmit gain	$G_T$	$I_L=20\text{mA}, V_{IN}=-55\text{dBV}$	38	40	42	dB
		$I_L=120\text{mA}, V_{IN}=-55\text{dBV}$	35	37		dB
Receive gain	$G_R$	$I_L=20\text{mA}, V_{IN}=-20\text{dBV}$	-4	-2	0	dB
		$I_L=120\text{mA}, V_{IN}=-20\text{dBV}$	-9.5	-7	-5	dB
DTMF gain	$G_{MF}$	$I_L=20\text{mA}, V_{IN}=-30\text{dBV}$	23	25	27	dB
		$I_L=120\text{mA}, V_{IN}=-30\text{dBV}$	20	22		dB
Transmit dynamic range	$DR_T$	$I_L=20\text{mA}, \text{THD}=4\%$	2.5			Vp-p
		$I_L=120\text{mA}, \text{THD}=4\%$	4.6			Vp-p
Receive dynamic range	$DR_R$	$I_L=20\text{mA}, \text{THD}=10\%$	0.3			Vp-p
		$I_L=120\text{mA}, \text{THD}=10\%$	0.5			Vp-p
DTMF input impedance	$Z_{IMF}$	$I_L=50\text{mA}$	24			k $\Omega$
KTI input impedance	$Z_{KTI}$	$I_L=50\text{mA}$	17			k $\Omega$
MUTE high-level input voltage	$V_{IH}$	$I_L=20\text{mA}$ to $120\text{mA}$	1.5		$V_{CC}$	V
MUTE low-level input voltage	$V_{IL}$	$I_L=20\text{mA}$ to $120\text{mA}$	0		0.2	V
Transmit attenuation	$\Delta G_T$	$I_L=30\text{mA}$ , PADC grounded via 24k $\Omega$		3		dB
Receive attenuation	$\Delta G_R$	$I_L=30\text{mA}$ , PADC grounded via 24k $\Omega$		6		dB
Reference voltage	$V_{REF}$	$I_L=20\text{mA}$		0.65		V
		$I_L=50\text{mA}$		1.13		V
		$I_L=120\text{mA}$		2.1		V

Note) Be careful of dielectric breakdown.

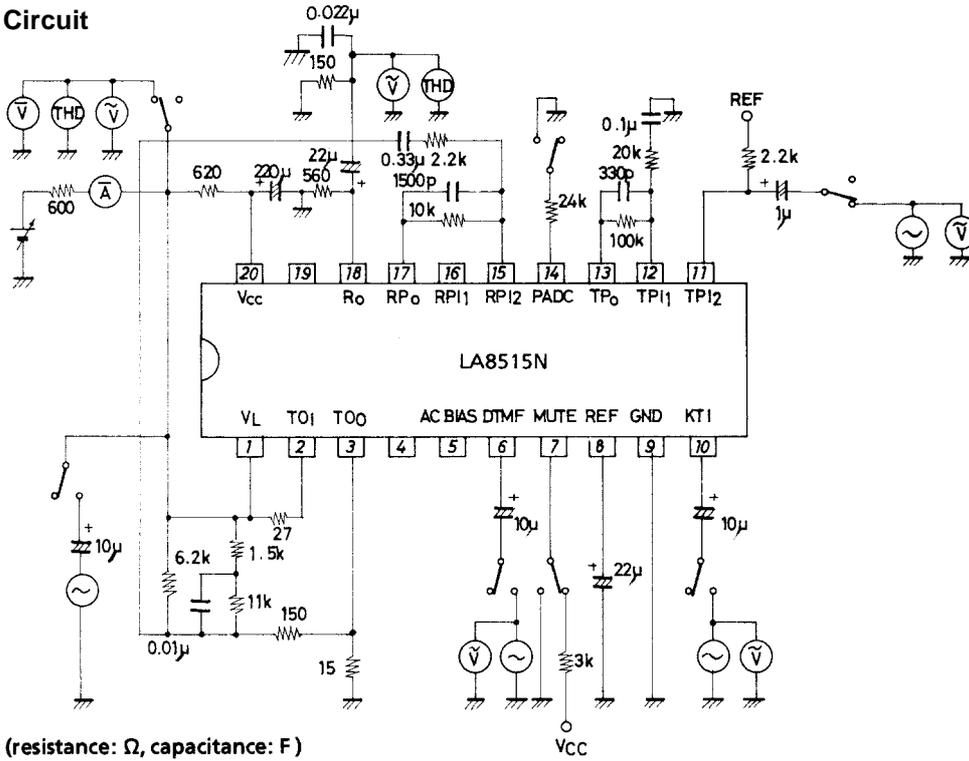
## Equivalent Circuit Block Diagram



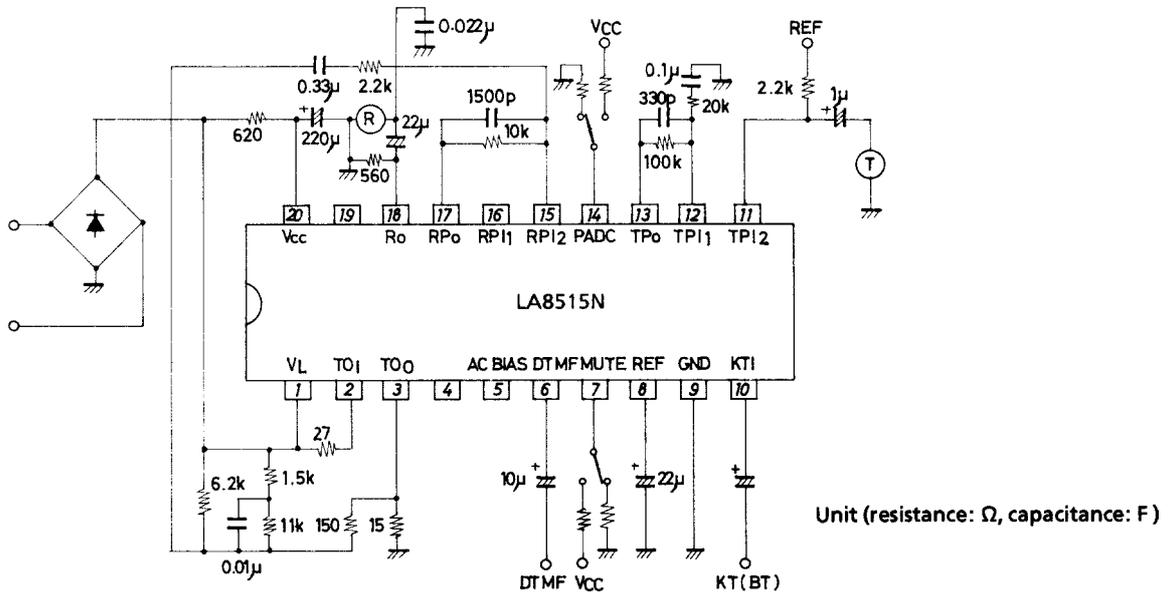
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## Test Circuit



## Sample Application Circuit

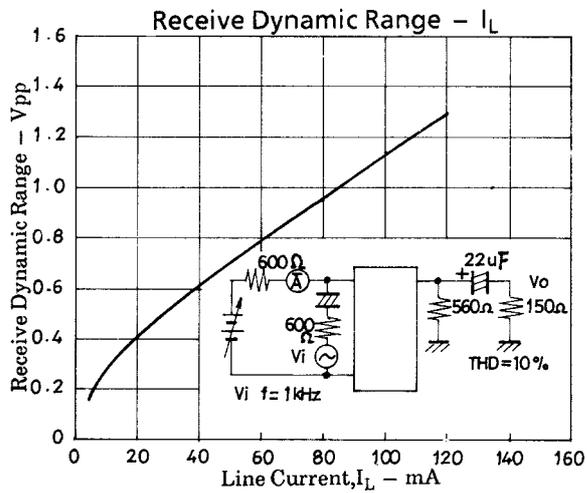
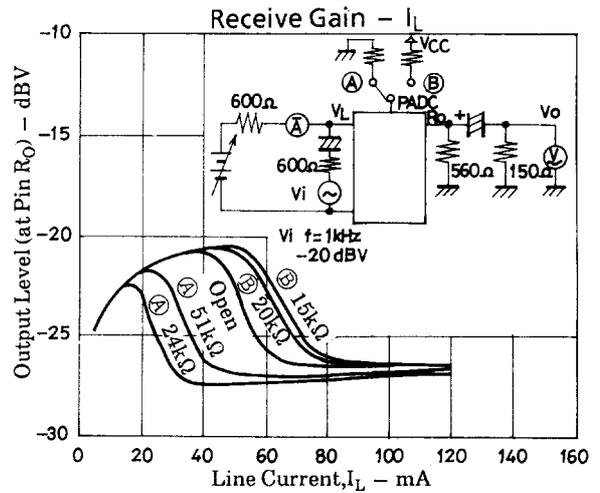
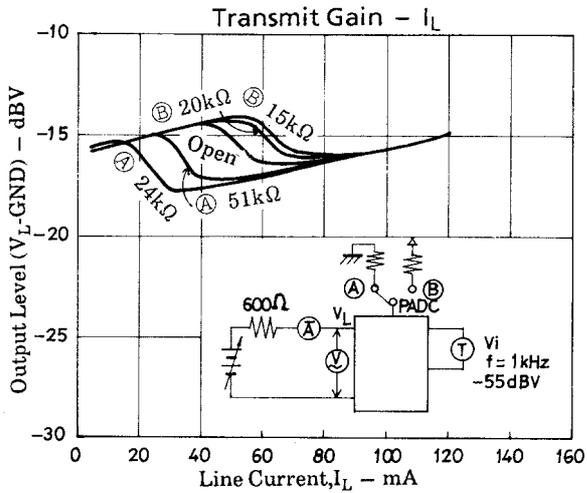
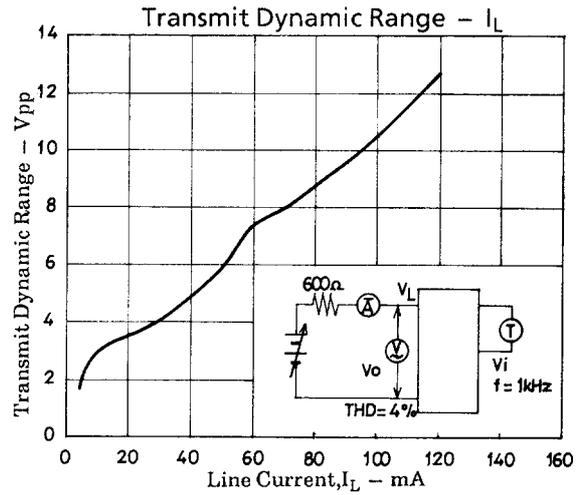
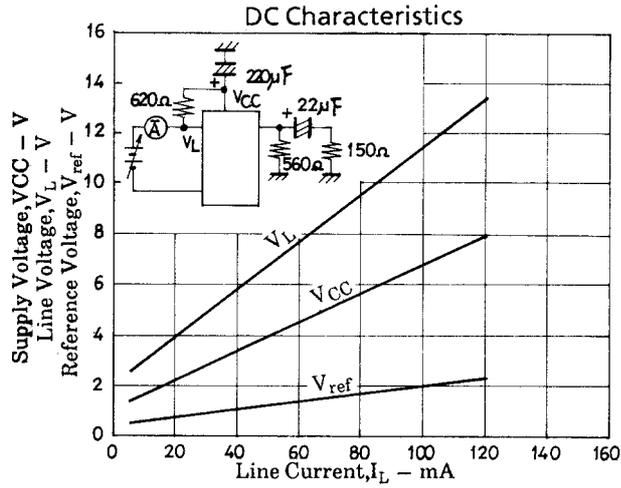


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## Pin Functions

Pin Number	Pin Name	Description
1	V <sub>L</sub>	Line voltage Connected to the positive side of the line diode bridge. See the application circuit.
2	TO <sub>I</sub>	Transmit output current source, input side Connected to V <sub>L</sub> through a 27Ω resistor. Select the value of this resistor after considering the maximum expected line current.
3	TO <sub>O</sub>	Transmit output current source, output side As above, but to ground through a 15Ω resistor.
4		Not used. This pin has a DC bias and should not be connected.
5	AC BIAS	AC signal reference voltage An internally-generated reference voltage.
6	DTMF	DTMF input The signal on this pin is output on V <sub>L</sub> (pin 1) when MUTE (pin 7) is LOW. It should be decoupled using a capacitor since it is biased with the REF voltage.
7	MUTE	Mute control input Switches between the transmit side DTMF or receive side keytone, and voice circuits. LOW : DTMF output, keytone receive output. HIGH : Voice circuits.
8	REF	Reference voltage Internal amplifier bias voltage. Requires an external capacitor. This voltage should not be used by external circuitry.
9	GND	Ground Connected to the negative side of the line diode bridge.
10	KTI	Key tone input Switched through to the receive circuit output when MUTE (pin 7) is LOW. It should be decoupled using a capacitor since it is biased with REF voltage.
11	TPI <sub>2</sub>	Transmit input amplifier non-inverting input Transmit voice circuit input. Requires a DC bias from REF (pin 8) through a resistor.
12	TPI <sub>1</sub>	Transmit input amplifier inverting input Negative feedback input. Amplifier gain and frequency response are controlled by the feedback network.
13	TP <sub>O</sub>	Transmit input amplifier output
14	PADC	Pad control input The value of the resistor between this pin and either V <sub>CC</sub> or ground determines the shape of the line-current vs. gain characteristics. See Electrical Characteristics.
15	RPI <sub>2</sub>	Receive input amplifier inverting input Negative feedback is applied from the amplifier output to control amplifier gain and frequency response.
16	RPI <sub>1</sub>	Receive input amplifier inverting input This pin is internally biased through a resistor using REF.
17	RP <sub>O</sub>	Receive input amplifier output
18	R <sub>O</sub>	Receive circuit output Connect to a low-impedance (approximately 15kΩ) receiver through a decoupling capacitor.
19	NC	No connection
20	V <sub>CC</sub>	Supply voltage Supply voltage for internal circuitry. This supply should not be used as an external circuit supply except as the high-level voltage for the MUTE and PADC inputs.

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