Ordering number: EN 3325

Monolithic Linear IC

No.3325

# LA8510

## Telephonic Speech Network

### Overview

The Sanyo LA8510 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 LA8510's low operating current reduces line load. Switching between the DTMF/keytone and voice circuits is controlled directly from a single MUTE input.

The LA8510 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.

**Maximum Ratings** at Ta = 25°C

| | | | unit |
|---|---|---|---|
| Line Voltage | $V_L$ max | 15 | V |
| Line Current | $I_L$ max | 150 | mA |
| Allowable Power Dissipation | Pd max | 1200 | mW |
| Operating Temperature | Topr | −30 to +75 | °C |
| Storage Temperature | Tstg | −55 to +150 | °C |

**Operating Characteristics** at Ta = 25°C, f = 1kHz, See specified Test Circuit.

| | | | min | typ | max | unit |
|---|---|---|---|---|---|---|
| Line Voltage | $V_L$ | $I_L$ = 20mA | | 3.2 | | V |
| | | $I_L$ = 50mA | | 5.3 | | V |
| | | $I_L$ = 120mA | | 10.6 | | V |
| Supply Voltage | $V_{CC}$ | $I_L$ = 20mA | | 2.3 | | V |
| | | $I_L$ = 50mA | | 4.0 | | V |
| | | $I_L$ = 120mA | | 7.9 | | V |

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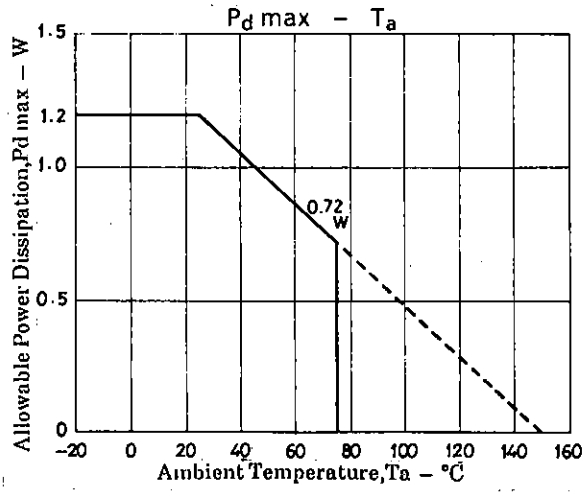
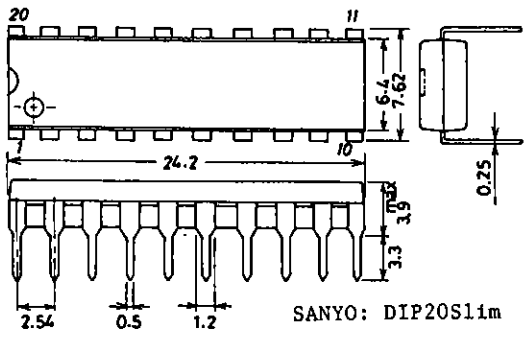



**Package Dimensions**
**( unit: mm )**
**3021B**

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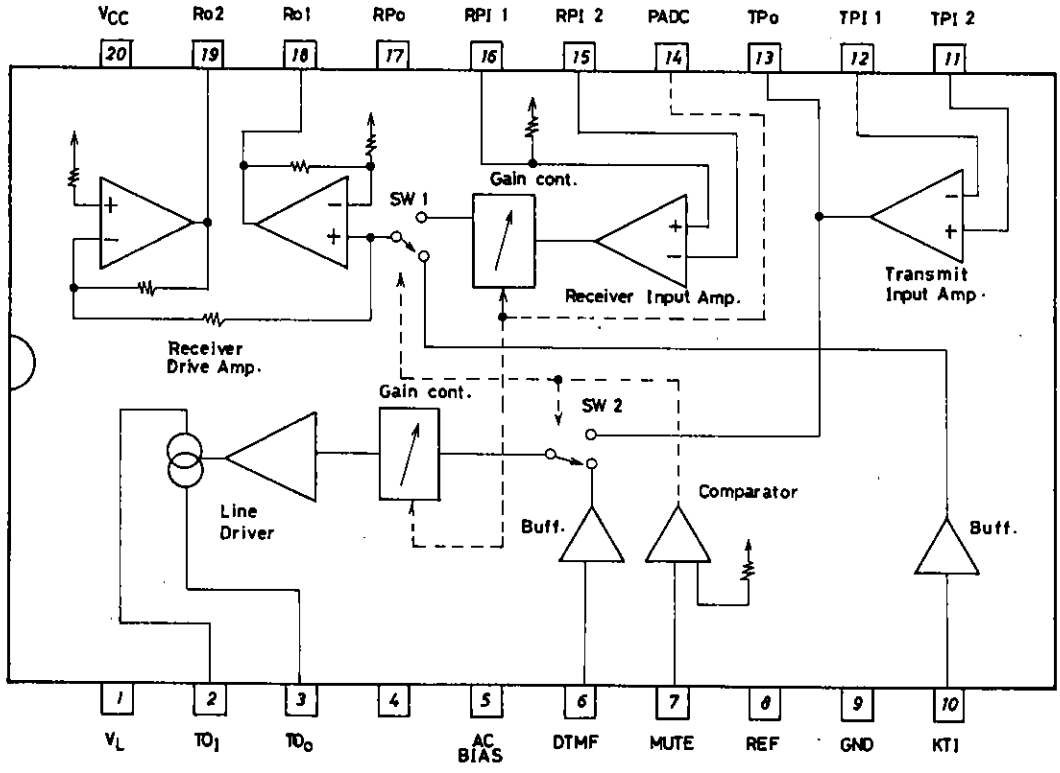
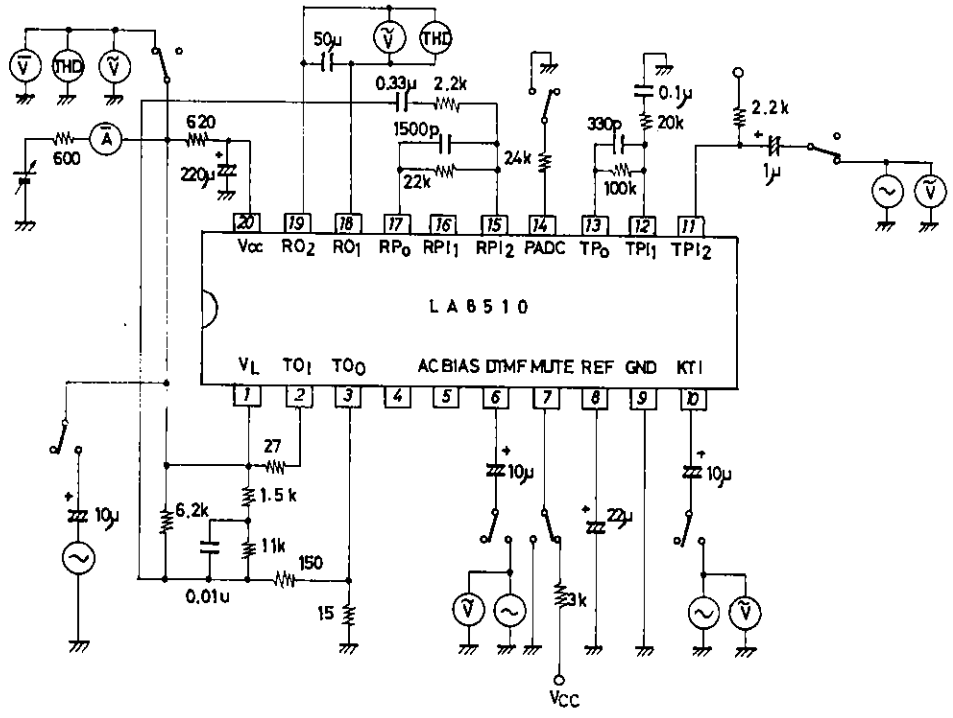
| | | | min | typ | max | unit |
|---|---|---|---|---|---|---|
| Transmit Gain | $G_T$ | $I_L$=20mA,$V_{IN}$=−55dBV | 38 | 40 | 42 | dB |
| | | $I_L$=120mA,$V_{IN}$=−55dBV | 35 | 37 | | dB |
| Receive Gain | $G_R$ | $I_L$=20mA,$V_{IN}$=−20dBV | 7.5 | 10 | 12.5 | dB |
| | | $I_L$=120mA,$V_{IN}$=−20dBV | 1.5 | 4 | 6.5 | dB |
| DTMF Gain | $G_{MF}$ | $I_L$=20mA,$V_{IN}$=−30dBV | 23 | 25 | 27 | dB |
| | | $I_L$=120mA,$V_{IN}$=−30dBV | 20 | 22 | | dB |
| Transmit Dynamic Range | $DR_T$ | $I_L$=20mA,THD=4% | 2.5 | | | Vpp |
| | | $I_L$=120mA,THD=4% | 4.6 | | | Vpp |
| Receive Dynamic Range | $DR_R$ | $I_L$=20mA,THD=10% | 2.0 | | | Vpp |
| | | $I_L$=120mA,THD=10% | 6.0 | | | Vpp |
| DTMF Input Impedance | $Z_{IMF}$ | $I_L$=50mA | 24 | | | kΩ |
| KTI Input Impedance | $Z_{KTI}$ | $I_L$=50mA | 17 | | | kΩ |
| MUTE "H"-Level Input Voltage | $V_{IH}$ | $I_L$=20mA to 120mA | 1.5 | | $V_{CC}$ | V |
| MUTE "L"-Level Input Voltage | $V_{IL}$ | $I_L$=20mA to 120mA | 0 | | 0.2 | V |
| Transmit Attenuation | $\Delta G_T$ | $I_L$=30mA,PADC grounded via 24kΩ | | 3 | | dB |
| Receive Attenuation | $\Delta G_R$ | $I_L$=30mA,PADC grounded via 24kΩ | | 6 | | dB |
| Reference Voltage | $V_{REF}$ | $I_L$=20mA | | 0.7 | | V |
| | | $I_L$=50mA | | 1.3 | | V |
| | | $I_L$=120mA | | 2.4 | | V |

Note) Be careful of dielectric breakdown.

## Equivalent Circuit Block Diagram

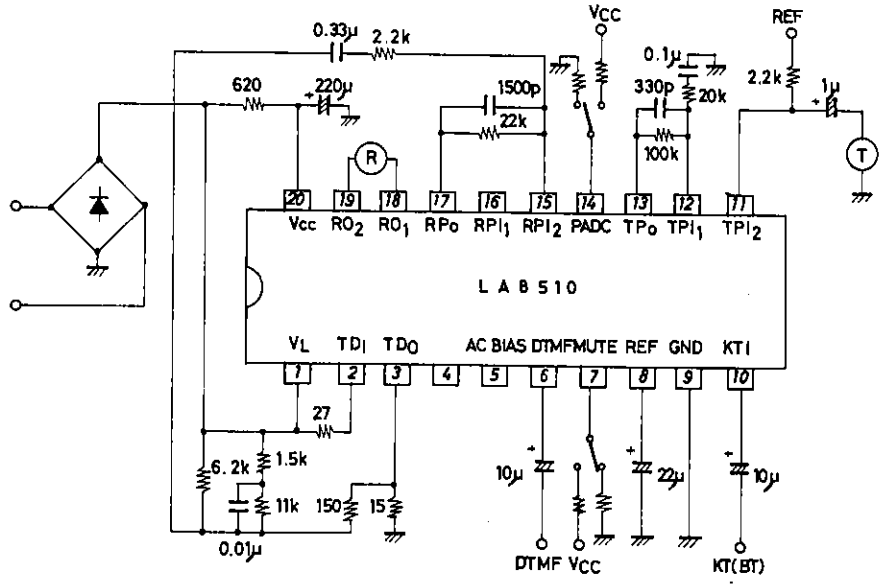


## Test Circuit




Unit (resistance: Ω, capacitance: F)

## Sample Application Circuit

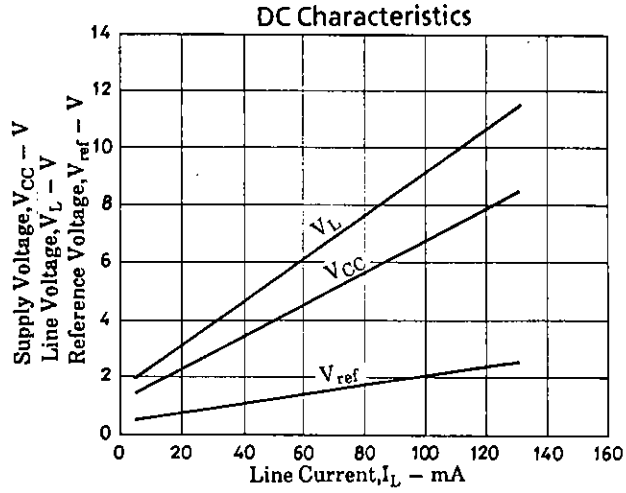



Unit (resistance: Ω, capacitance: F)

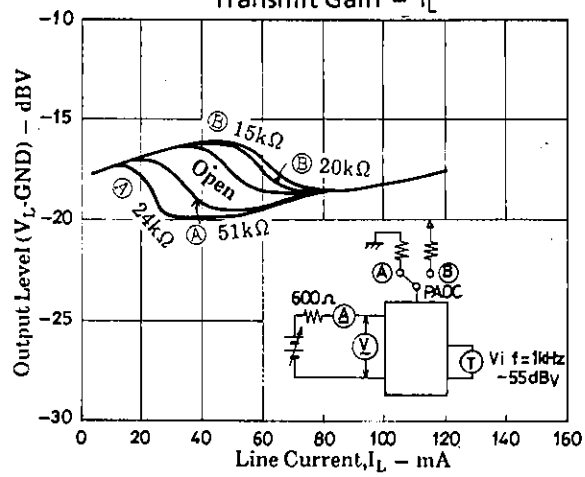
## Pin Descriptions

| Pin Number | Pin Name | Description |
|---|---|---|
| 1 | $V_L$ | Line voltage<br>Connected to the positive side of the line diode bridge. See the application circuit. |
| 2 | $TO_I$ | Transmit output current source, input side<br>Connected to $V_L$ through a 27Ω resistor. Select the value of this resistor after considering the maximum expected line current. |
| 3 | $TO_O$ | Transmit output current source, output side<br>As above, but to ground through a 15Ω resistor |
| 4 | | Not used.<br>This pin has a DC bias and should not be connected. |
| 5 | AC BIAS | AC signal reference voltage<br>An internally-generated reference voltage. |
| 6 | DTMF | DTMF input<br>The signal on this pin is output on $V_L$ (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<br>Switches between the transmit side DTMF or receive side keytone, and voice circuits.<br>LOW : DEMF output, keytone receive output<br>HIGH : Voice circuits |
| 8 | REF | Reference voltage<br>Internal amplifier bias voltage. Requires an external capacitor. This voltage should not be used by external circuitry. |
| 9 | GND | Ground<br>Connected to the negative side of the line diode bridge. |
| 10 | KTI | Key tone input<br>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 | $TPI_2$ | Transmit input amp non-inverting input<br>Transmit voice circuit input. Requires a DC bias from REF (pin 8) through a resistor. |
| 12 | $TPI_1$ | Transmit input amp inverting input<br>Negative feedback input. Amplifier gain and frequency response are controlled by the feedback network. |
| 13 | $TP_O$ | Transmit input amp output |
| 14 | PADC | Pad control input<br>The value of the resistor between this pin and either $V_{CC}$ or ground determines the shape of the line-current vs. gain characteristics. See Electrical Characteristics. |
| 15 | $RPI_2$ | Receive input amp inverting input<br>Negative feedback is applied from the amplifier output to control amplifier gain and frequency response. |
| 16 | $RPI_1$ | Receive input amp non-inverting input<br>This pin is internally biased through a resistor using REF. |
| 17 | $RP_O$ | Receive input amp output |
| 18 | $R_{O1}$ | Receive circuit output<br>BTL output. Connect a ceramic receiver between $R_{O1}$ and $R_{O2}$. |
| 19 | $R_{O2}$ | |
| 20 | $V_{CC}$ | Supply voltage<br>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. |

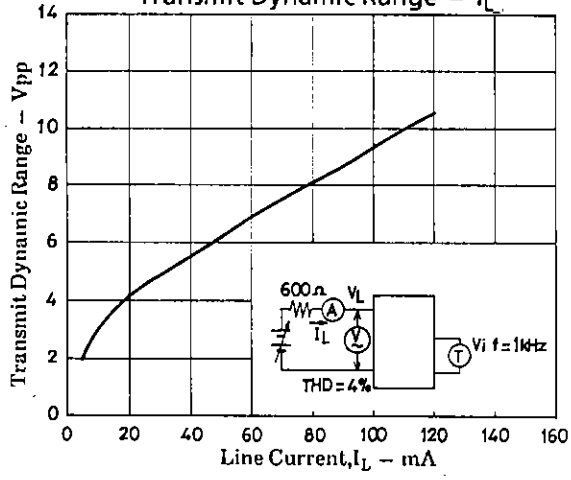
DC Characteristics



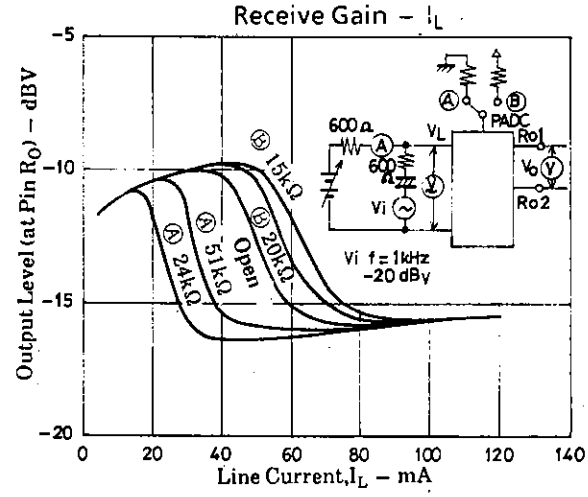

Transmit Gain – $I_L$



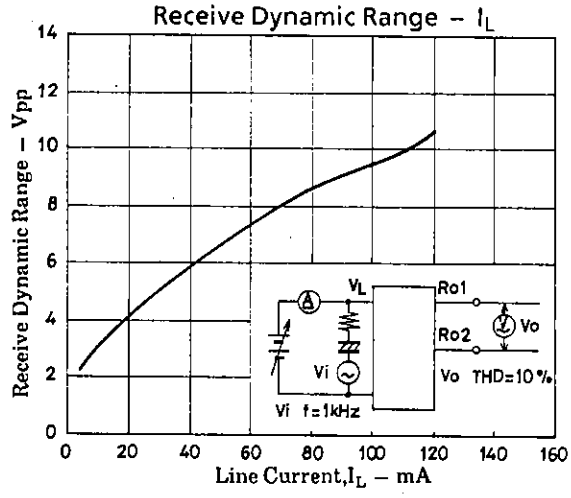

Transmit Dynamic Range – $I_L$



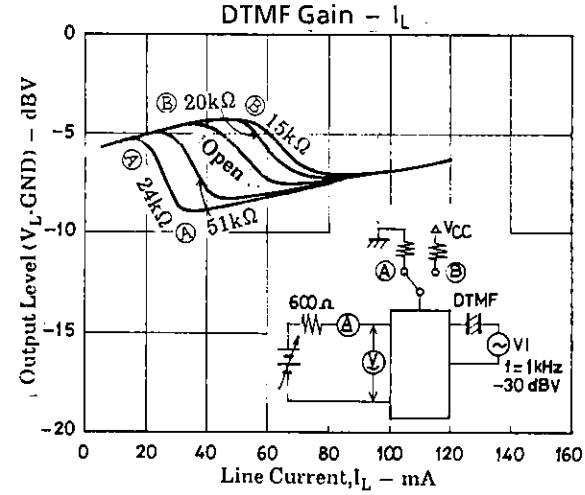

Receive Gain – $I_L$




Receive Dynamic Range – $I_L$




DTMF Gain – $I_L$




DTMF Transmit Dynamic Range – $I_L$