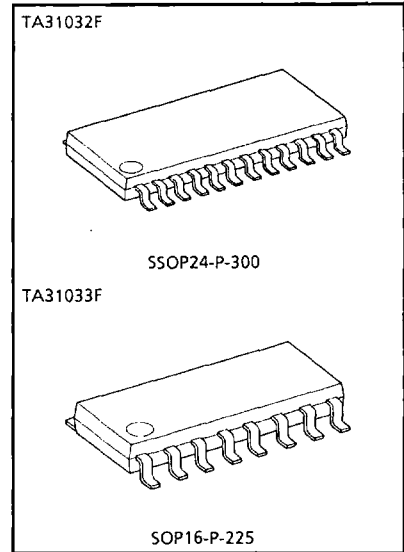


# SPEECH NETWORK ICs

## SPEECH NETWORK FOR TELEPHONE SET

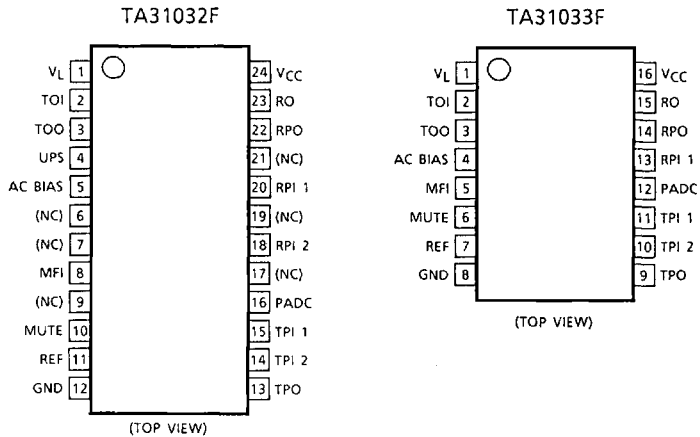
### FEATURES

- Direct interface with receiver (dynamic type, electromagnetic type) of low impedance type is possible.
- This IC is able to change over an input from transmitter to an input of dial signal (DTMF signal) and output to the line.
- Gain is automatically controlled according to the line current. (Auto pad function)
- Gain control terminal (function) in extension usage is provided.
- Low operating voltage provides an excellent branch performance.
- Package is small. (Flat package for surface mount)  
 TA31032F (MFP24PIN)  
 TA31033F (FLP16PIN)



Weight SSOP24-P-300 : 0.31g (Typ.)  
 SOP16-P-225 : 0.2g (Typ.)

### PIN CONNECTION

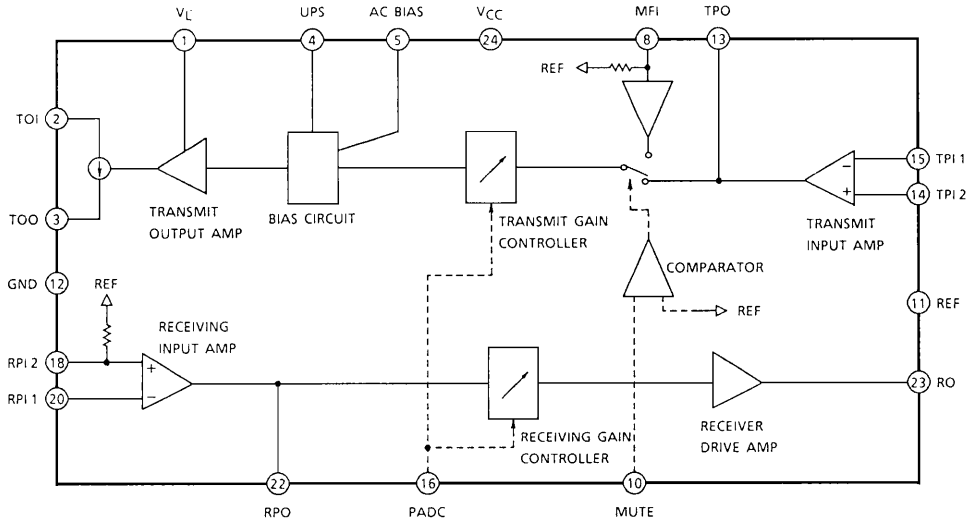


TA31032F, TA31033F-1

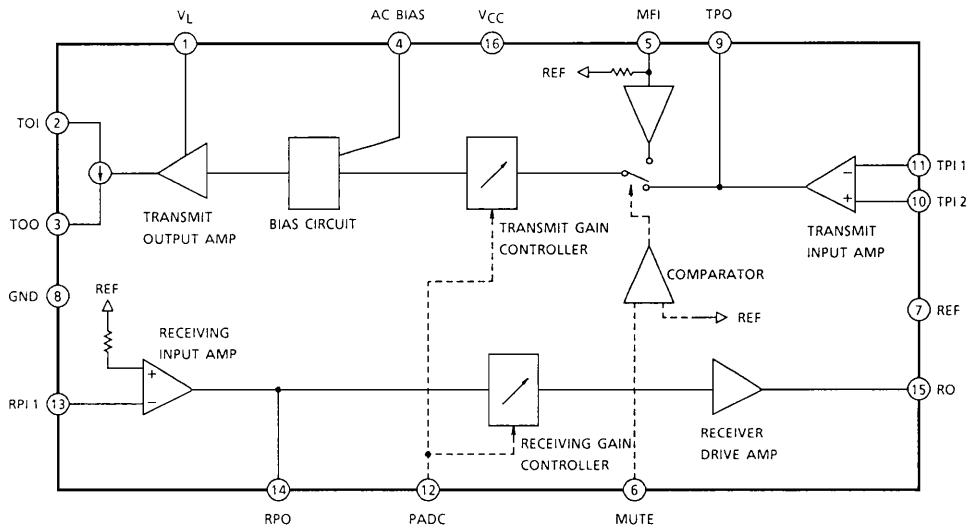
# SPEECH NETWORK ICs

## BLOCK DIAGRAM

TA31032F



TA31033F



TA31032F, TA31033F-2

# SPEECH NETWORK ICs

## PIN FUNCTION

PIN No.	PIN NAME	FUNCTION
1 (1)	V <sub>L</sub>	[Line current flow-in terminal] Connected to positive output of diode bridge circuit. The DC potential of this terminal determines line voltage, and if AC signal is not input, the highest DC potential appears. Transmit output signal and output signal of opposite transfer side are intermingled and output at this terminal in actual usage.
2 (2)	TOI	[Current input terminal of transmit output] Connected to V <sub>L</sub> terminal (Pin 1, Pin (1)) through the transistor for heatradiation and 100Ω, and connected to TOO terminal (Pin 3, Pin (3)) through the transistor and 82Ω. Since almost all the line currents flow through the transistor, set allowable power of resistance of 82Ω which is connected to the collector of the transistor through taking into consideration the maximum current of the line current expected to be used.
3 (3)	TOO	[Current output terminal of transmit output] Connected to GND terminal (Pin 12, Pin (8)) through 15Ω. Since almost all the line currents flow from this terminal to the resistance of 15Ω which is connected to GND terminal, set the allowable power of the resistance through taking into consideration the maximum current of the line current expected to be used. Transmit signal is sent from this terminal. Signal of this terminal varies current which is input from line through connected resistance 15Ω, and makes it be output at V <sub>L</sub> terminal (Pin 1, Pin (1)).
4 (-)	UPS	[Selecting terminal of DC impedance control] Connect this terminal to GND terminal (Pin 12) and set MUTE signal at "H", DC potentials of V <sub>L</sub> terminal (Pin 1) and V <sub>CC</sub> terminal (Pin 24) can be raised in the same line current. Turn it OPEN at non-use.
5 (4)	AC BIAS	[AC signal reference voltage terminal] Output terminal of internal reference electric potential.
8 (5)	MFI	[Input terminal of DTMF or external signals] Signal, which is input at this terminal, is output at V <sub>L</sub> terminal (Pin 1, Pin (1)) when MUTE terminal (Pin 10, Pin (6)) is connected to V <sub>CC</sub> terminal (Pin 24, Pin (16)). Since almost the same electric potential as that of REF terminal (Pin 11, Pin (7)) is biased to this terminal, avoid direct impress of external DC potential by capacitor at impressing external signal.
10 (6)	MUTE	[Mute terminal] (DTMF signal and transmit signal switching terminal in transmit system) When this terminal is connected to V <sub>CC</sub> terminal (Pin 24, Pin (16)), input signal from MFI terminal (Pin 8, Pin (5)), is output at V <sub>L</sub> terminal (Pin 1, Pin (1)).
11 (7)	REF	[Internal reference voltage output terminal] Voltage of this terminal is used for reference voltage of internal pre-amplifier. Never use this terminal as an external power supply.

TA31032F, TA31033F-3

# SPEECH NETWORK ICs



PIN No.	PIN NAME	FUNCTION
12 (8)	GND	[Ground terminal] Connected to negative output of diode bridge circuit.
13 (9)	TPO	[Output terminal of transmit input amplifier] Makes negative feedback to TPI1 terminal (Pin 15, Pin (11)).
14 (10)	TPI 2	[Non-inversion input terminal of transmit input amplifier] Apply DC bias to this terminal from REF terminal (Pin 11, Pin (7)) through resistance.
15 (11)	TPI 1	[Inversion input terminal of transmit input amplifier] Receives negative feedback from TPO terminal (Pin 13, Pin (9)).
16 (12)	PADC	[Pad control terminal] Can control operating current of gain control (auto-pad) which is performed by line current, by means of connecting to GND terminal (Pin 12, Pin (8)) or V <sub>CC</sub> terminal (Pin 24, Pin (16)) through resistance. At open, gain is controlled at about 45mA. (line current)
18 (-)	RPI 2	[Non-inversion input terminal of receiving input amplifier] Biased internally with resistance of about 20k $\Omega$ from REF terminal (Pin 11).
20 (13)	RPI 1	[Inversion input terminal of receiving input amplifier] Receives negative feedback from RPO terminal (Pin 22, Pin (14))
22 (14)	RPO	[Output terminal of receiving input amplifier] Makes negative feedback to RPI1 terminal (Pin 20, Pin (13)).
23 (15)	RO	[Receiving output terminal] Connected to receiver (about 150 $\Omega$ ) of low impedance type through capacitor.
24 (16)	V <sub>CC</sub>	[Internal power supply voltage terminal] Power supply voltage of internal pre-amplifier.

Terminal No. in ( ) is that of TA31033P, TA31033AP.

## TRANSMIT GAIN ADJUSTING CIRCUIT

1. In case PADC terminal is open.

Transmit and receiving gains vary according to line current amount. With the increase of each line current amount, in the TA31032F and TA31033F the gain attenuates by about -3dB at transmission and about -6dB at receiving.

2. In case PADC terminal is connected to GND with resistance.

The gain begins to attenuate with the line current amount fewer than that when PADC terminal is open.

Set the value of resistance to be connected at 25k $\Omega$  or over.

3. In case PADC terminal is connected to V<sub>CC</sub> with resistance.

The gain begins to attenuate with the line current amount more than that when PADC terminal is open.

Set the value of resistance to be connected at 10 $\Omega$  or over.

TA31032F, TA31033F-4

# SPEECH NETWORK ICs

## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Line Voltage	$V_L$	15	V
Line Current	$I_L$	150	mA
Power Dissipation	$P_D$	450	mW
		400	
Operating Temperature	$T_{opr}$	-30 ~ 60	°C
Storage Temperature	$T_{stg}$	-55 ~ 150	°C

## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

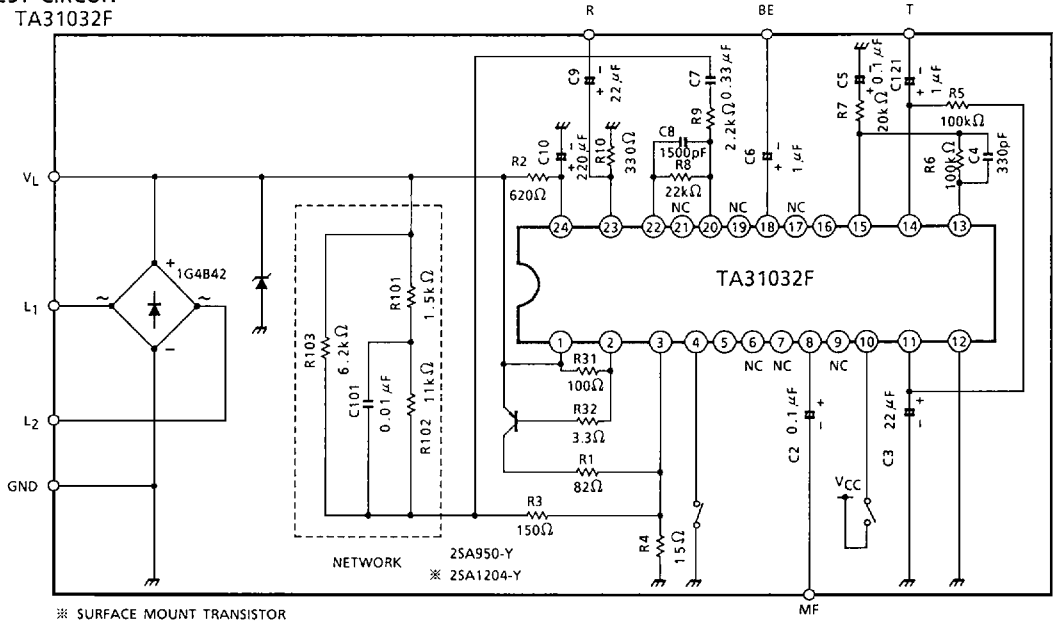
CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Line Voltage	$V_L$	1	$I_L = 20\text{mA}$	3.1	3.5	3.9	V	
			$I_L = 50\text{mA}$	5.4	6.0	6.4		
			$I_L = 120\text{mA}$	10.5	11.5	12.5		
Internal Power Supply Voltage	$V_{CC}$	1	$I_L = 20\text{mA}$	1.7	2.0	2.3	V	
			$I_L = 50\text{mA}$	3.3	3.7	4.1		
			$I_L = 120\text{mA}$	7.2	7.6	8.0		
Transmit Gain	$G_T$	2	$I_L = 20\text{mA}$	35.0	37.0	39.0	dB	
			$I_L = 120\text{mA}$	32.0	34.0	36.0		
Receiving Gain	$G_R$	4	$I_L = 20\text{mA}$	-7.5	-4.5	-1.5	dB	
			$I_L = 120\text{mA}$	-13.5	-10.5	-7.5		
MF Gain	$G_{MF}$	3	$I_L = 20\text{mA}$	20.5	22.5	24.5	dB	
			$I_L = 120\text{mA}$	17.5	19.5	21.5		
Transmit Dynamic Range	$DR_T$	2	$I_L = 20\text{mA}$ Distortion ratio 4%	2.5	—	—	$V_{p-p}$	
			$I_L = 120\text{mA}$ Distortion ratio 4%	4.0	—	—		
Receiving Dynamic Range	$DR_R$	4	$I_L = 20\text{mA}$ Distortion ratio 10%	0.25	—	—	$V_{p-p}$	
			$I_L = 120\text{mA}$ Distortion ratio 10%	0.3	—	—		
MFI Input Impedance	$Z_I$ (MF)	—	$I_L = 50\text{mA}$	24	—	—	$k\Omega$	
RPI2 Input Impedance ※	$Z_I$ (RPI 2)	—	$I_L = 50\text{mA}$	16	20	28	$k\Omega$	
MUTE Terminal Input Voltage	"H" Level	$V_{IH}$ (MU)	—	$I_L = 20 \sim 120\text{mA}$	1.5	—	$V_{CC}$	V
	"L" Level	$V_{IL}$ (MU)	—	$I_L = 20 \sim 120\text{mA}$	0	—	0.2	
Receiving Output Current	$I_{source}$ (RO)	—	$I_L = 20 \sim 120\text{mA}$	4.0	—	—	mA	

※ TA31032F only.

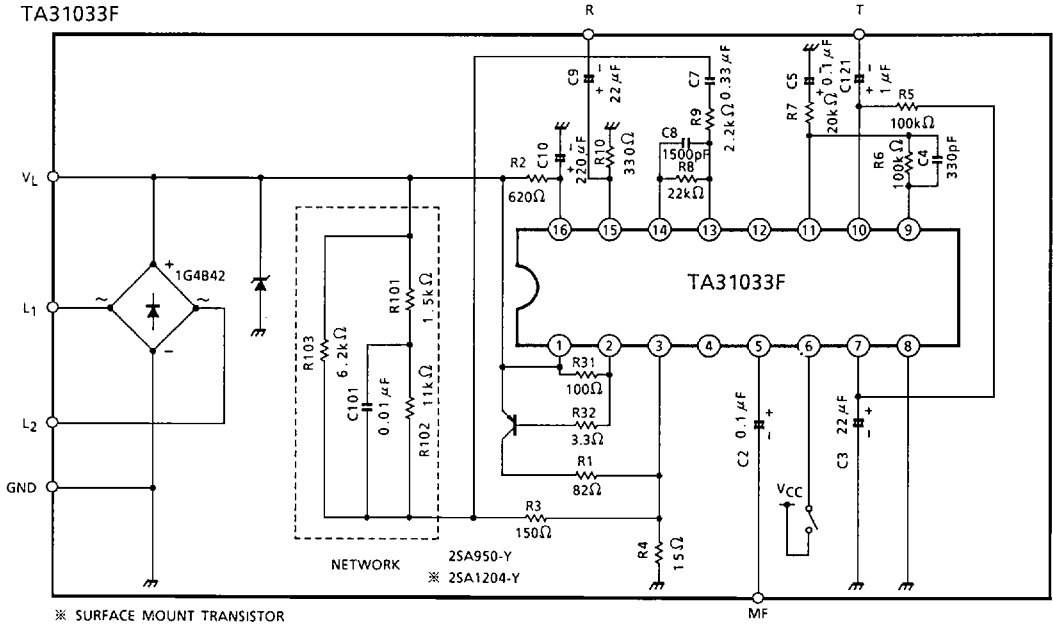
TA31032F, TA31033F-5

# SPEECH NETWORK ICs

TEST CIRCUIT  
TA31032F



TA31033F



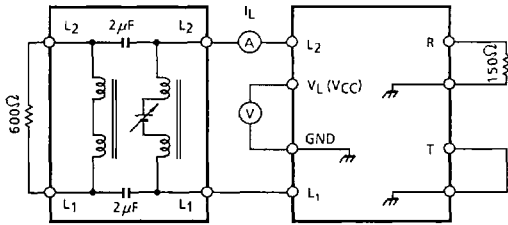
TA31032F, TA31033F-6



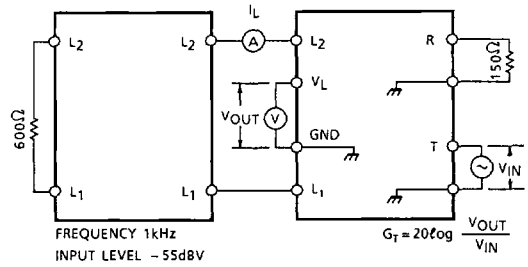
# SPEECH NETWORK ICs

## TEST CIRCUIT

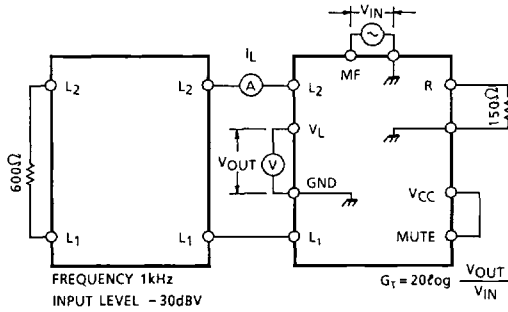
(1)  $V_L, V_{CC}$



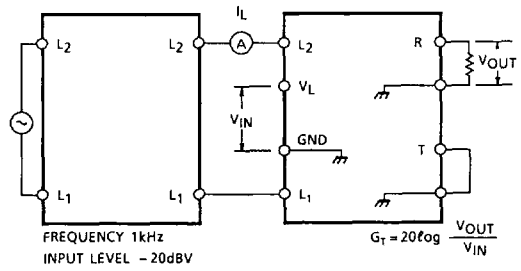
(2)  $G_T, DR_T$



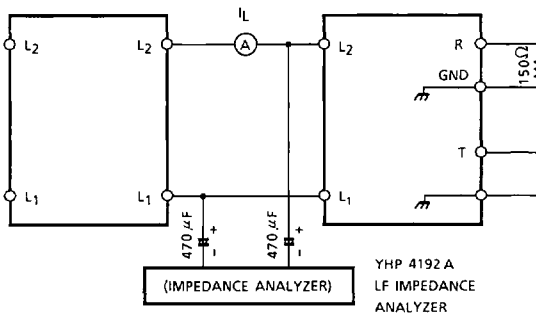
(3)  $G_{MF}, DR_{MF}$



(4)  $G_R, DR_R$



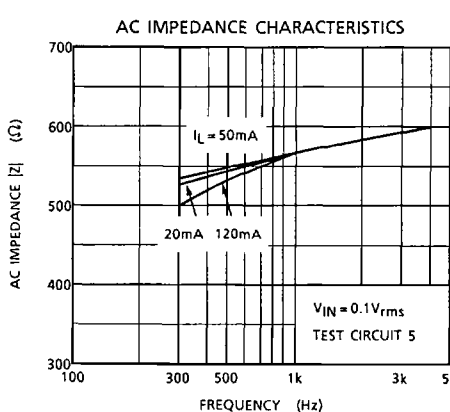
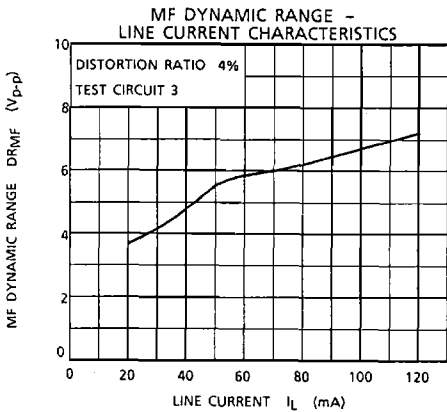
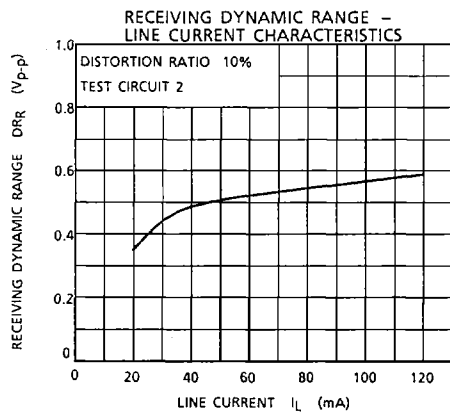
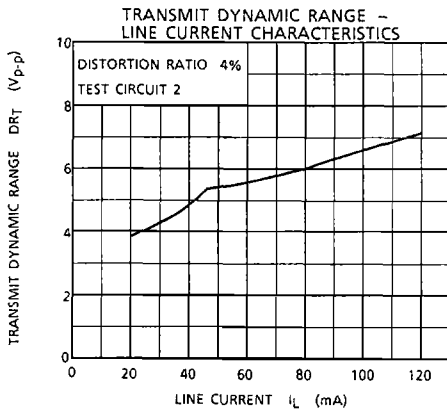
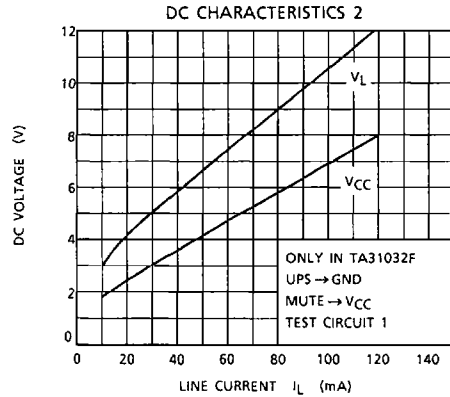
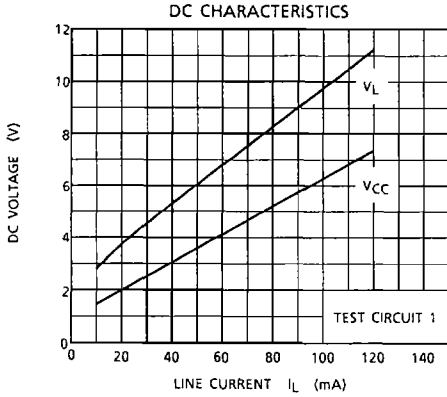
(5)  $Z_{tel}$



TA31032F, TA31033F-7

# SPEECH NETWORK ICs

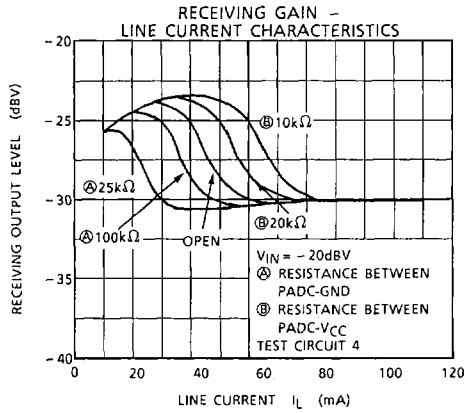
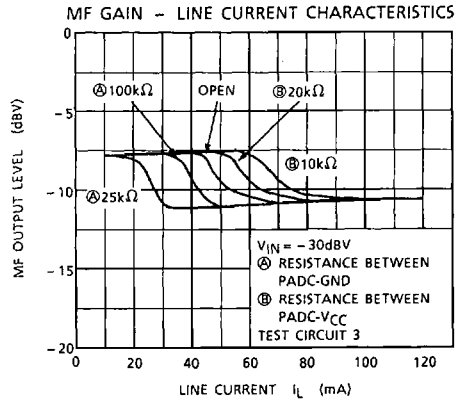
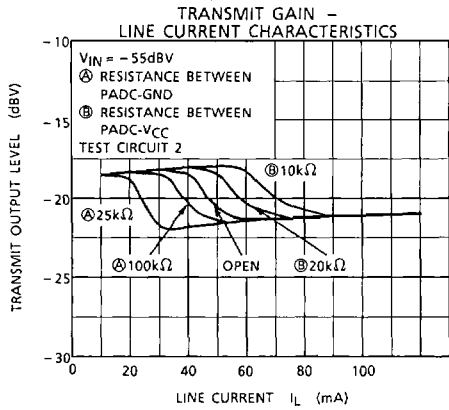
2



TA31032F, TA31033F-8



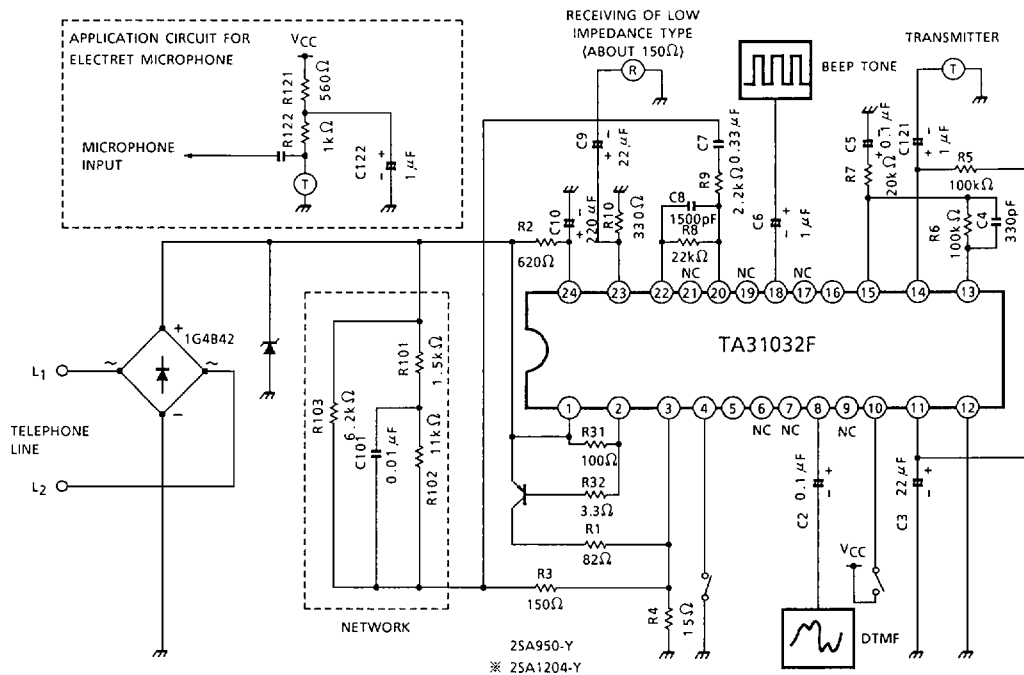
# SPEECH NETWORK ICs



TA31032F, TA31033F-9

# SPEECH NETWORK ICs

## APPLICATION CIRCUIT TA31032F

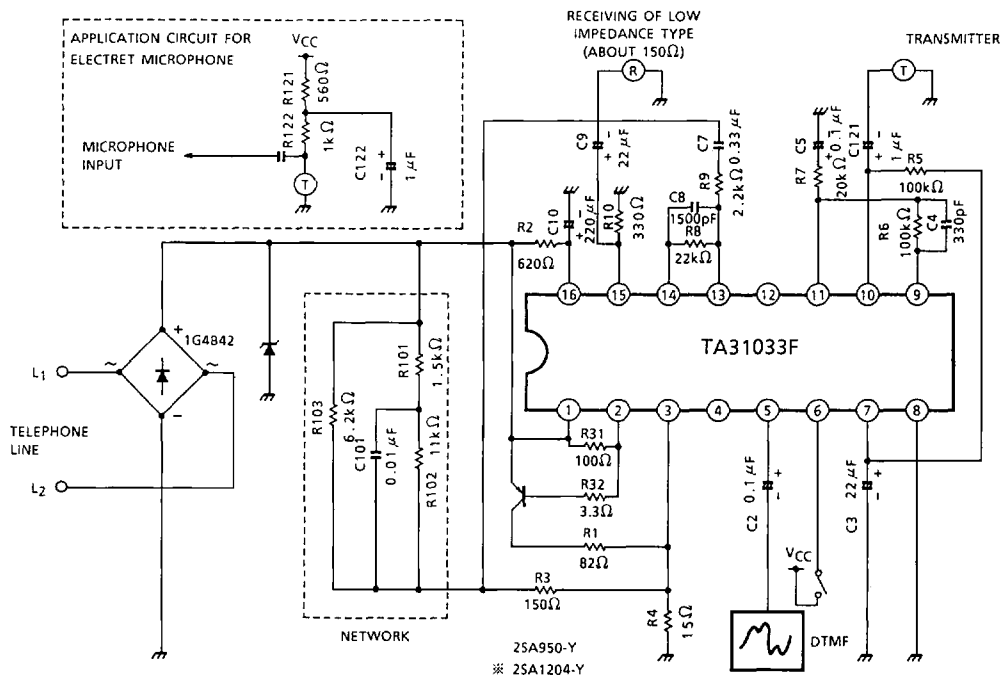


TA31032F, TA31033F-10



# SPEECH NETWORK ICs

TA31033F



※ SURFACE MOUNT TRANSISTOR

TA31032F, TA31033F-11