

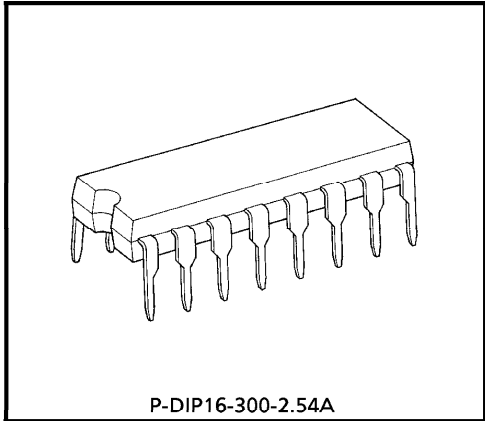
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA31033P, TA31033AP

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.
- Wide operating temperature range :  $T_{opr} = -40 \sim 85^{\circ}\text{C}$ .

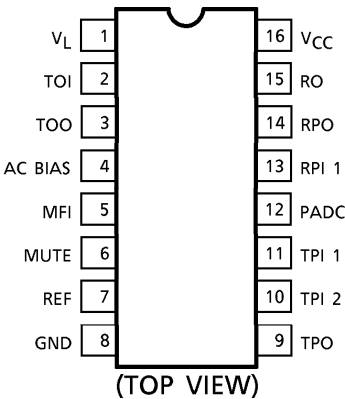


Weight : 1.1 g (Typ.)

DIFFERENCE BETWEEN TA31033P and TA31033AP

NAME OF PRODUCT	TRANSMIT LOSS
TA31033P	- 3dB
TA31033AP	- 5dB

PIN CONNECTION



980910EBA2

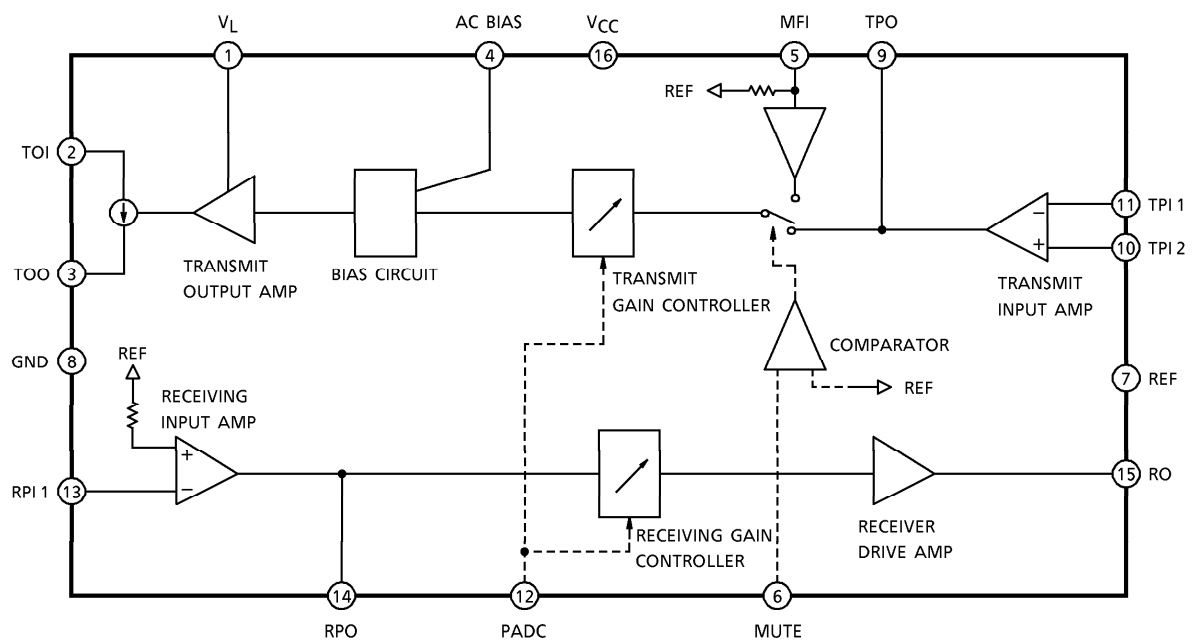
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BLOCK DIAGRAM



## PIN FUNCTION

PIN No.	PIN NAME	FUNCTION
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	TOI	[Current input terminal of transmit output] Connected to V <sub>L</sub> terminal (Pin 1) through 43Ω. Since almost all the line currents are flowed in from this terminal, set allowable power of resistance 43Ω to be connected to V <sub>L</sub> terminal from this terminal considering the maximum current of line current expected to be used.
3	TOO	[Current output terminal of transmit output] Connected to GND terminal (Pin 8) through 15Ω. Since almost all the line currents are flowed out from this terminal, set allowable power of resistance 15Ω to be connected to GND terminal from this terminal considering the maximum current of 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).
4	AC BIAS	[AC signal reference voltage terminal] Output terminal of internal reference electric potential.
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) when MUTE terminal (Pin 6) is connected to V <sub>CC</sub> terminal (Pin 16). Since almost the same electric potential as that of REF terminal (Pin 7) is biased to this terminal avoid direct impress of external DC potential by capacitor at impressing external signal.
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 16), input signal from MFI terminal (Pin 5) is output at V <sub>L</sub> terminal (Pin 1).
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.
8	GND	[Ground terminal] Connected to negative output of diode bridge circuit.
9	TPO	[Output terminal of transmit input amplifier] Makes negative feedback to TPI1 terminal (Pin 11).
10	TPI 2	[Non-inversion input terminal of transmit input amplifier] Apply DC bias to this terminal from REF terminal (Pin 7) through resistance.
11	TPI 1	[Inversion input terminal of transmit input amplifier] Receives negative feedback from TPO terminal (Pin 9).
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 8) or V <sub>CC</sub> terminal (Pin 16) through resistance. At open, gain is controlled at about 45mA. (line current)

PIN No.	PIN NAME	FUNCTION
13	RPI 1	[Inversion input terminal of receiving input amplifier] Receives negative feedback from RPO terminal (Pin 14)
14	RPO	[Output terminal of receiving input amplifier] Makes negative feedback to RPI1 terminal (Pin 13).
15	RO	[Receiving output terminal] Connected to receiver (about 150Ω) of low impedance type through capacitor.
16	V <sub>CC</sub>	[Internal power supply voltage terminal] Power supply voltage of internal pre-amplifier.

### 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 TA31033P, the gain attenuates by about -3dB at transmission and about -6dB at receiving. Further, in the TA31033AP the gain attenuates by about -5dB 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 25kΩ 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 10kΩ or over.

## MAXIMUM RATINGS (Ta = 25°C)

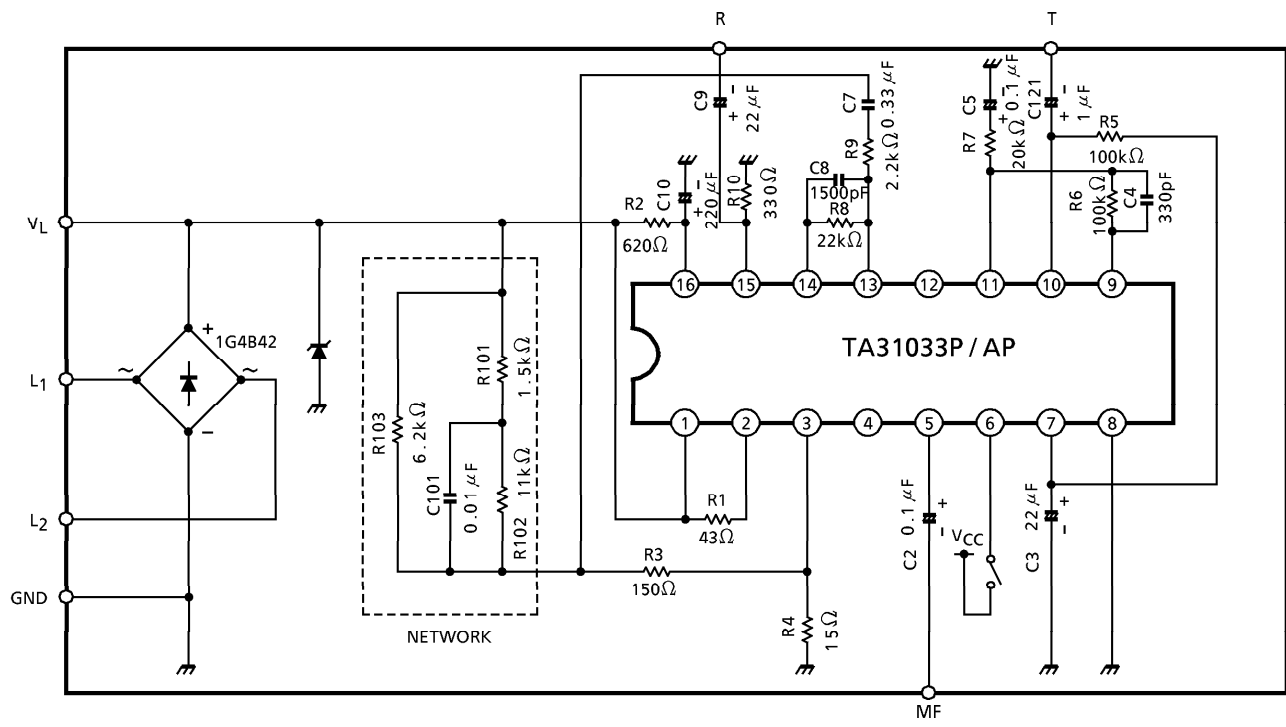
CHARACTERISTIC	SYMBOL	RATING	UNIT
Line Voltage	V <sub>L</sub>	15	V
Line Current	I <sub>L</sub>	150	mA
Peak Line Current ※	I <sub>L peak</sub>	200	mA
Power Dissipation	P <sub>D</sub>	1000	mW
Operating Temperature	T <sub>opr</sub>	− 40 ~ 85	°C
Storage Temperature	T <sub>stg</sub>	− 55 ~ 150	°C

※ : 2s.

## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

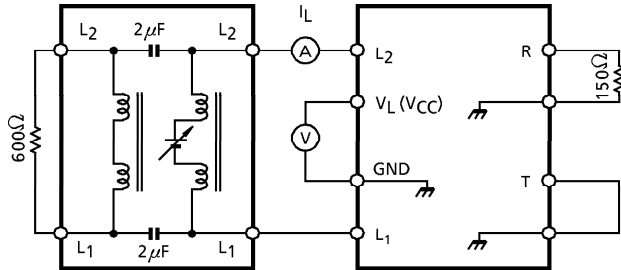
CHARACTERISTIC		SYMBOL	TEST CIR- CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Line Voltage		V <sub>L</sub>	1	I <sub>L</sub> = 20mA	3.1	3.5	3.9	V
				I <sub>L</sub> = 50mA	5.4	6.0	6.4	
				I <sub>L</sub> = 120mA	10.5	11.5	12.5	
Internal Power Supply Voltage		V <sub>CC</sub>	1	I <sub>L</sub> = 20mA	1.7	2.0	2.3	V
				I <sub>L</sub> = 50mA	3.3	3.7	4.1	
				I <sub>L</sub> = 120mA	7.2	7.6	8.0	
Transmit Gain	TA31033P	G <sub>T</sub>	2	I <sub>L</sub> = 120mA	32.0	34.0	36.0	dB
	TA31033AP			I <sub>L</sub> = 20mA	34.0	36.0	38.0	
				I <sub>L</sub> = 120mA	29.0	31.0	33.0	
Receiving Gain		G <sub>R</sub>	4	I <sub>L</sub> = 20mA	− 7.5	− 4.5	− 1.5	dB
				I <sub>L</sub> = 120mA	− 13.5	− 10.5	− 7.5	
MF Gain	TA31033P	G <sub>MF</sub>	3	I <sub>L</sub> = 120mA	17.5	19.5	21.5	dB
	TA31033AP			I <sub>L</sub> = 20mA	19.5	21.5	23.5	
				I <sub>L</sub> = 120mA	14.5	16.5	18.5	
Transmit Dynamic Range		DR <sub>T</sub>	2	I <sub>L</sub> = 20mA Distortion ratio 4%	2.5	—	—	V <sub>p-p</sub>
				I <sub>L</sub> = 120mA Distortion ratio 4%	4.0	—	—	
Receiving Dynamic Range		DR <sub>R</sub>	4	I <sub>L</sub> = 20mA Distortion ratio 10%	0.25	—	—	V <sub>p-p</sub>
				I <sub>L</sub> = 120mA Distortion ratio 10%	0.3	—	—	
MFI Input Impedance		Z <sub>I</sub> (MF)	—	I <sub>L</sub> = 50mA	24	—	—	kΩ
Mute Terminal Input Voltage	“H” Level	V <sub>IH</sub> (MU)	—	I <sub>L</sub> = 20 ~ 120mA	1.5	—	V <sub>CC</sub>	V
	“L” Level	V <sub>IL</sub> (MU)	—	I <sub>L</sub> = 20 ~ 120mA	0	—	0.2	
Receiving Output Current		I <sub>source</sub> (RO)	—	I <sub>L</sub> = 20 ~ 120mA	4.0	—	—	mA

TEST CIRCUIT

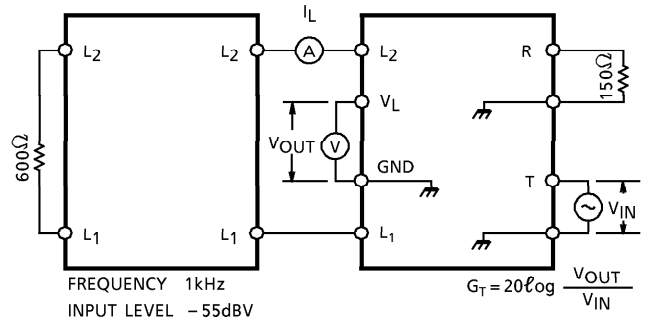


**TEST CIRCUIT**

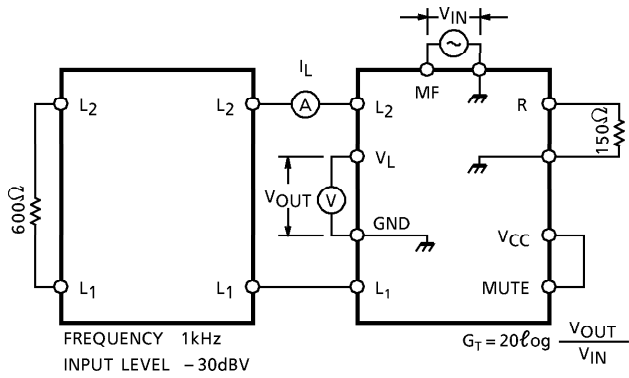
(1)  $V_L$ ,  $V_{CC}$



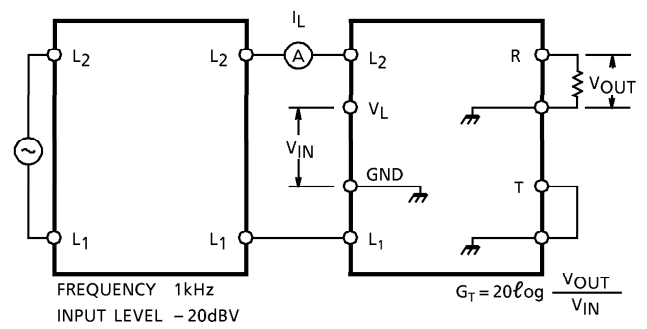
(2)  $G_T$ ,  $DR_T$



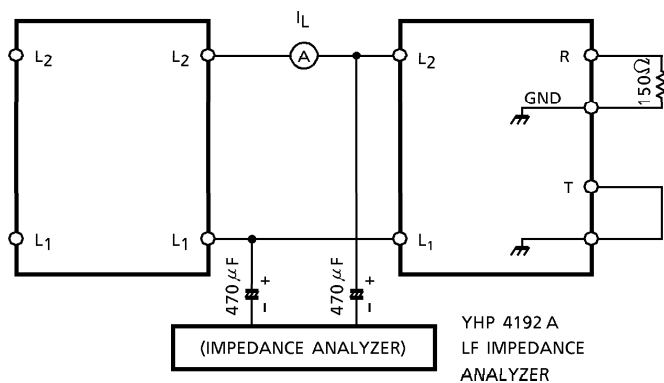
(3)  $G_{MF}$ ,  $DR_{MF}$



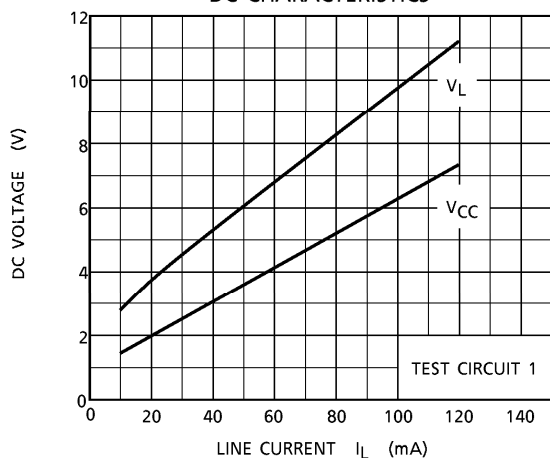
(4)  $G_R$ ,  $DR_R$



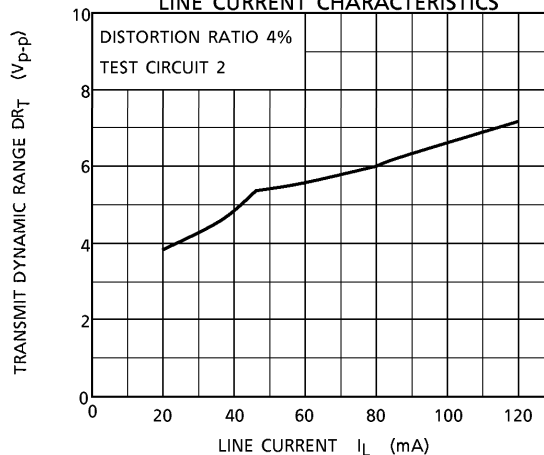
(5)  $Z_{tel}$



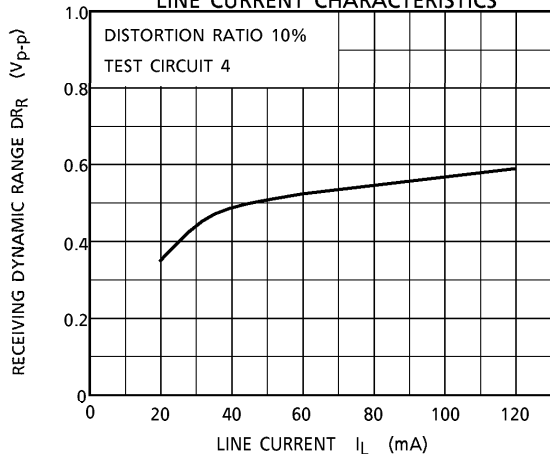
DC CHARACTERISTICS



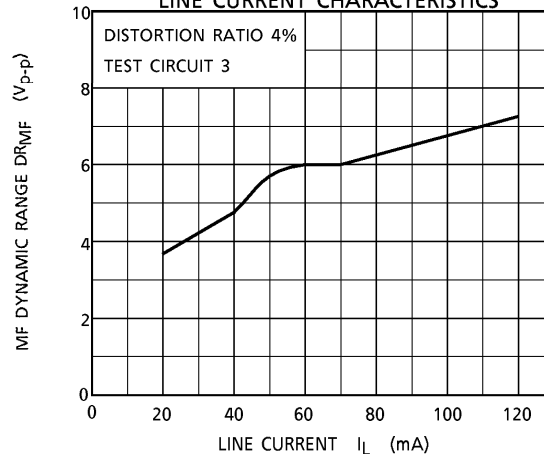
TRANSMIT DYNAMIC RANGE – LINE CURRENT CHARACTERISTICS



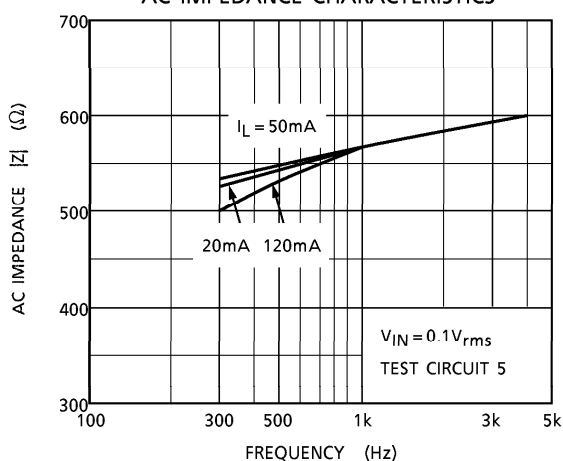
RECEIVING DYNAMIC RANGE – LINE CURRENT CHARACTERISTICS



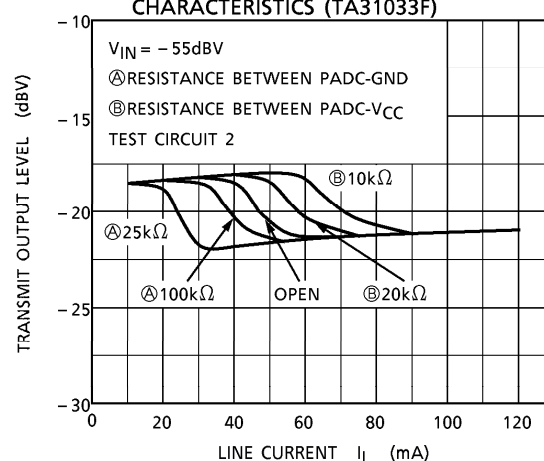
MF DYNAMIC RANGE – LINE CURRENT CHARACTERISTICS



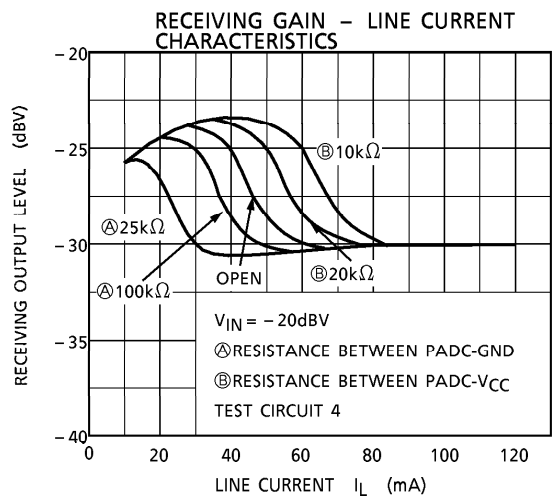
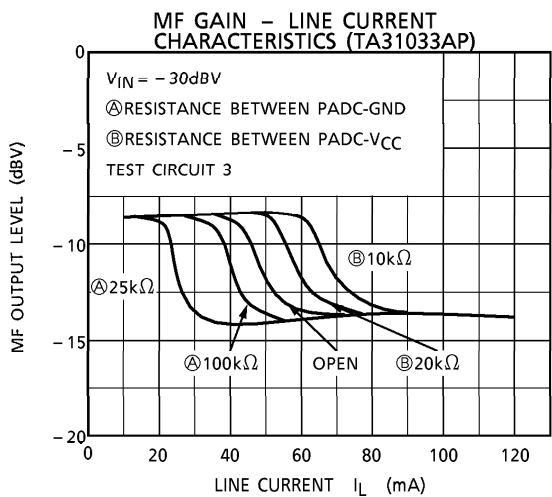
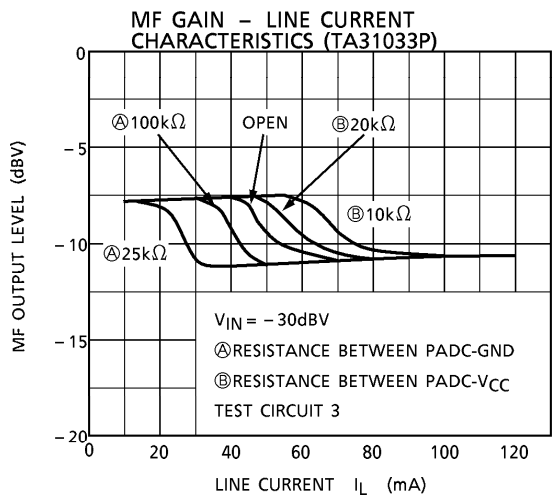
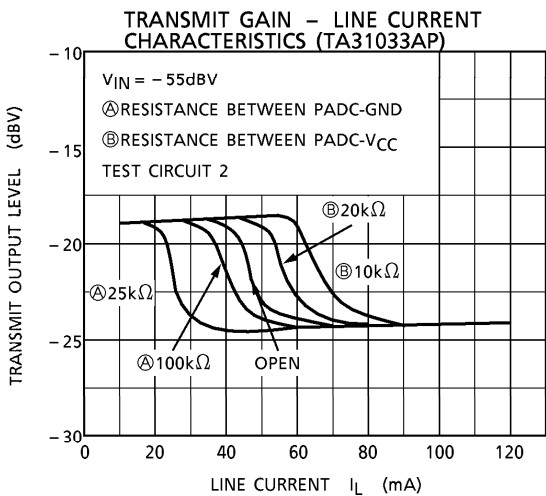
AC IMPEDANCE CHARACTERISTICS



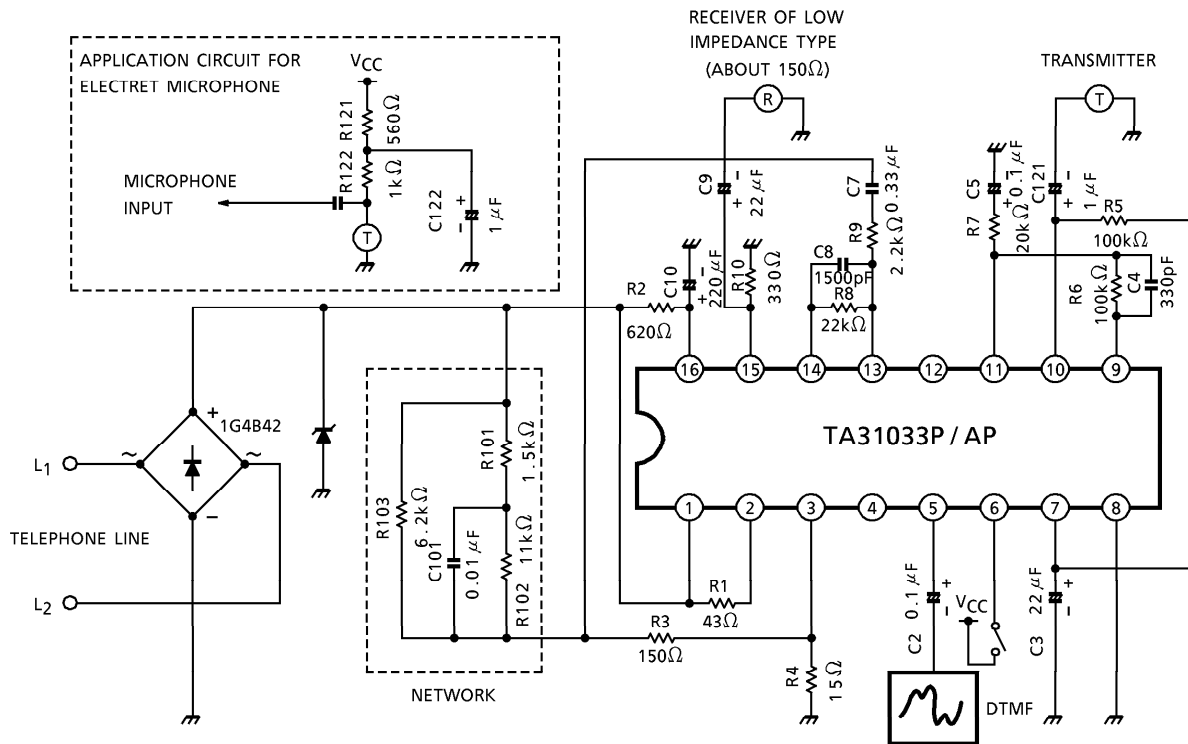
TRANSMIT GAIN – LINE CURRENT CHARACTERISTICS (TA31033F)





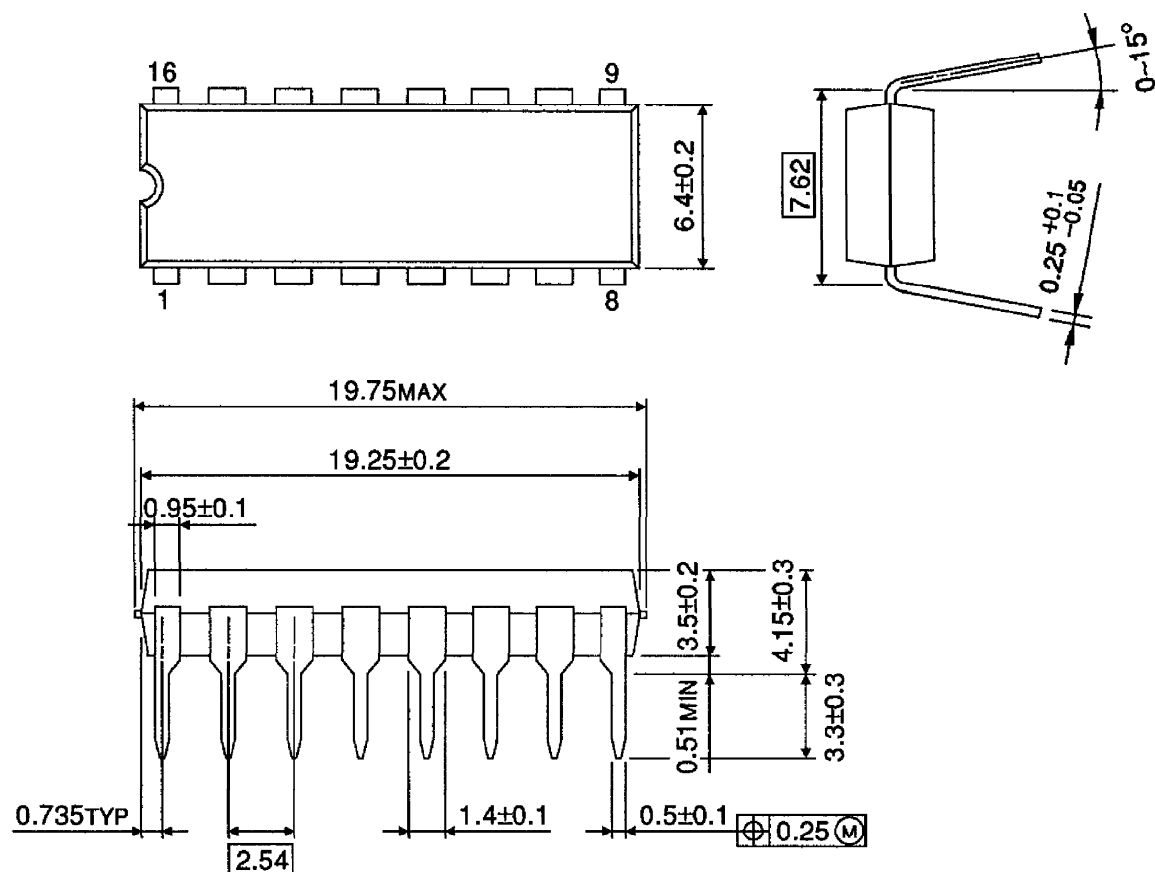


**APPLICATION CIRCUIT**



**PACKAGE DIMENSIONS**  
P-DIP16-300-2.54A

Unit : mm



Weight : 1.1 g (Typ.)