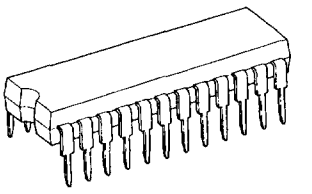
SPEECH NETWORK FOR TELEPHONE

FEATURES

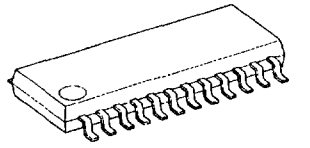
- Possible to use line power supply or external power supply.
- Built-in many kinds of switches.
- Gain is auto matically controlled according to the line current. (Auto pad function)
- Capable of coping with ceramic and dynamic receivers.
- Small package : SDIP 24 Pin, SSOP 24 Pin

TA31066N



SDIP24-P-300

TA31066F

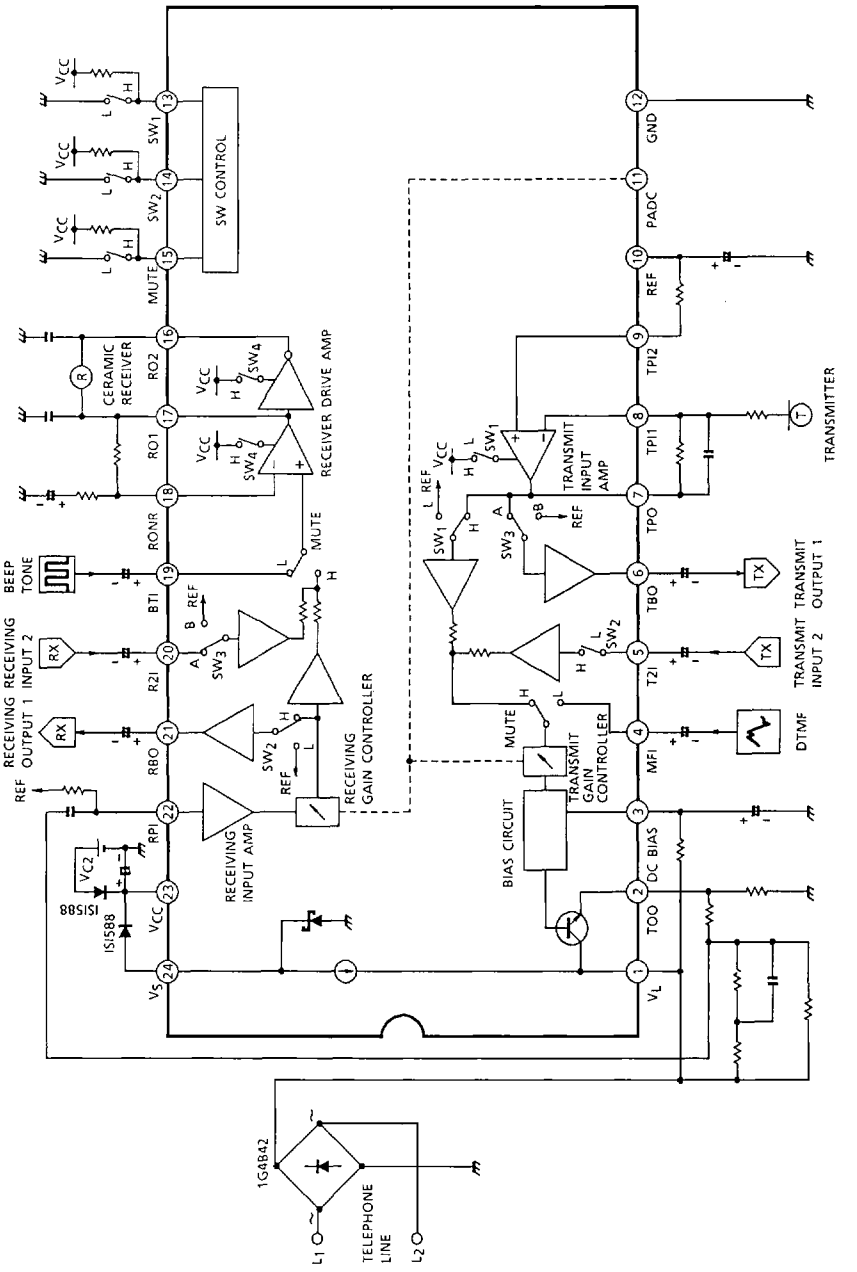


SSOP24-P-300B

Weight SDIP24-P-300 : 1.2g (Typ.)
SSOP24-P-300B : 0.27g (Typ.)

BLOCK DIAGRAM

TA31066N / F



TA31066N/F-2

PIN FUNCTION

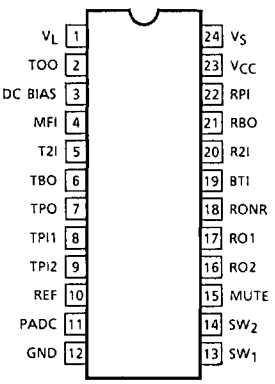
PIN No.	PIN NAME	FUNCTION
1	V_L	[Line current flow-in terminal, line voltage terminal] Connected to positive output of diode bridge circuit. DC potential of this terminal determines line voltage, and if AC signal is not input, the highest DC potential appears.
2	TOO	[Current output terminal of transmit output terminal] Connected to GND terminal (pin 10) through 33Ω. Since almost all the line currents are flowed out from this terminal, set allowable power of resistance 33Ω to be connected to GND terminal from this terminal considering the maximum current of line current expected to be used.
3	DC BIAS	[DC voltage power supply terminal] DC power supply of internal IC. Connected to GND terminal (pin 10) through capacitor.
4	MFI	[Input terminal of DTMF or external input signals] Signal, which is input to this terminal, is output at V_L terminal (pin 1) only when MUTE terminal (pin 15) "L" state and SW_2 terminal (pin 14) "H" state. Since this terminal is biased to almost the same potential as REF terminal (pin 10), avoide direct impress of external DC potential by using capacitor at inputting external signal.
5	T2I	[Input terminal of external input signals] Signal, which is input to this terminal, is output at V_L terminal (pin 1) only when MUTE terminal (pin 15) "H" state and SW_2 terminal (pin 14) "H" state. Since this terminal is biased to almost the some potential as REF terminal (pin 10), avoide direct impress of external DC potential by using capacitor of inputting external signal.
6	TBO	[Output terminal of internal transmit signal] Output terminal to transmit input amplifier only when SW_1 terminal (pin 14) "H" state and SW_2 terminal (pin 15) "H" state. Output from transmit input amplifier is without any relation to gain control (PAD) or MUTE since this input does not pass through gain control circuit or MUTE function.
7	TPO	[Output terminal of transmit input amplifier] Makes negative feedback to TPI terminal (pin 8).
8	TPI1	[Inversion input terminal of transmit input amplifier] Receives negative feedback from TPO terminal (pin 7).
9	TPI2	[Non-inversion input terminal of transmit input amplifier] Apply DC bias to this terminal from REF terminal (pin 10) through resistance.
10	REF	[Internal reference voltage output terminal] Voltage of this terminal is used as reference voltage of internal pre-amplifier. Never use this terminal as an external power supply.

PIN No.	PIN NAME	FUNCTION
11	PADC	[Pad control terminal] When this terminal is connected to GND terminal (pin 12) or V_{CC} terminal (pin 23) through resistance, operation current of gain control (auto-pad) performed by line current can be controlled.
12	GND	[Ground terminal] Connected to negative output of diode bridge circuit.
13	SW_1	[Switch 1 terminal] This terminal is connected to GND terminal (pin 12) or V_{CC} terminal (pin 23) through resistance. (reference switch mode diagram on another sheet)
14	SW_2	[Switch 2 terminal] This terminal is connected to GND terminal (pin 12) or V_{CC} terminal (pin 23) through resistance. (reference switch mode diagram on another sheet)
15	MUTE	[MUTE terminal] This terminal is connected to GND terminal (pin 12) or V_{CC} terminal (pin 23) through resistance. (reference switch mode diagram on another sheet)
16	RO2	[Receiving output terminal, inversion output] Output terminal to receiver. Signal, of which phase is negative of RO1 terminal (pin 17), is output.
17	RO1	[Receiving output terminal, non-inversion output] Output terminal to receiver. Signal, of which phase is negative of RO2 terminal (pin 16), is output.
18	RONR	[Output terminal of receiving input amplifier] Makes negative feedback to RO1 terminal (pin 17).
19	BTI	[Dial confirmation sound (Beep Tone, DTMF), monitor sound input terminal] Signal, which is input to this terminal, is output to terminals RO1 and RO2 (pin 17 and pin 16) only when SW_1 terminal (pin 13), SW_2 terminal (pin 14) is in "H" state, and MUTE terminal (pin 15) is in "L" state. Since this terminal is biased to about the same potential as REF terminal (pin 10), avoide direct impressing of external DC voltage through capacitor at inputting external signal.
20	RI2	[Input terminal of external input signals] Signal, which is input to this terminal, is output at RO1 terminal and RO2 terminal (pin 16 and pin 17) only when SW_1 terminal (pin 13), SW_2 terminal (pin 14) and MUTE terminal (pin 15) is in "H" state. Since this terminal is biased to about the same potential as REF terminal (pin 10), avoide direct impressing of external DC voltage through capacitor at inputting external signal.
21	RBO	[Output terminal of internal Receiving signal] Output terminal to Receive input only when SW_2 terminal (pin 14) is in "H" state.

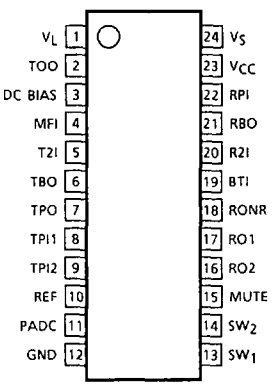
PIN No.	PIN NAME	FUNCTION
22	RPI	[Non-inversion input terminal of receiving input amplifier] Apply DC bias to this terminal from REF terminal (pin 10) through resistance. This terminal avoide direct impressing of external DC voltage through capacitor at inputting external signal.
23	V_{CC}	[Internal power supply voltage terminal] Power supply of internal pre-amplifier. This terminal avoide to add higher voltage than 8V.
24	V_S	[Power supply terminal] Power supply of V_{CC} terminal (pin 23). This terminal is connected to V_{CC} terminal (pin 23) through diode.

PIN CONNECTION (TOP VIEW)

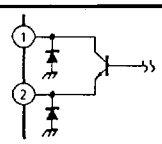
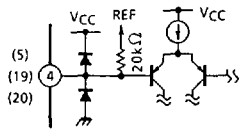
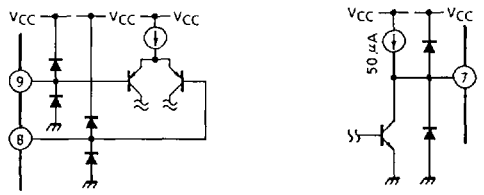
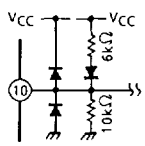
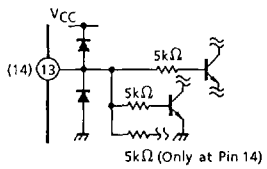
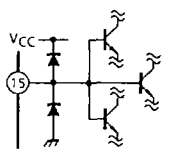
TA31066N

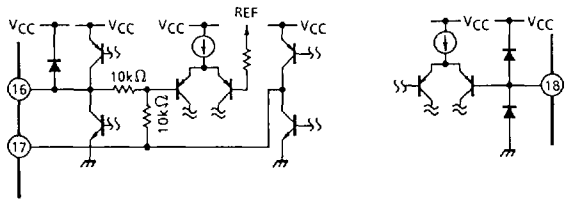
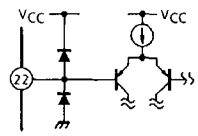
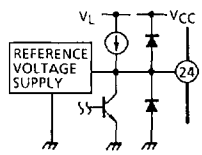


TA31066F



INTERNAL EQUIVALENT CIRCUIT (The values of resistor and current are typical.)

PIN No.	PIN NAME	INTERNAL EQUIVALENT CIRCUIT
1 2	V_L TOO	
4 5 19 20	MFI T2I BTI R2I	
7 8 9	TPO TPI1 TPI2	
10	REF	
13 14	SW_1 SW_2	
15	MUTE	

PIN No.	PIN NAME	INTERNAL EQUIVALENT CIRCUIT
16 17 18	RO2 RO1 RONR	
22	RPI	
24	V_S	

STATUS OF SWITCHES AND SET

SW_1	SW_2	MUTE	SW_3	SW_4	SET No.	EXPECTED SET STATUS
L	L	L	B	H	1	Dial (DTMF, DP)
L	L	H	B	L	2	—
L	H	L	B	H	3	—
L	H	H	B	L	4	Cordless handset
H	L	L	B	H	5	Dial (DTMF, DP)
H	L	H	B	H	6	Base set
H	H	L	A	H	7	—
H	H	H	A	H	8	Call with 3 persons and an extension

STATUS OF SET

1 : Signal, which is input to MFI terminal (pin 4), is output at V_L terminal (pin 1).
Signal, which is input to BTI terminal (pin 19), is output at RO1, RO2 terminal (pin 17, 16).

2 : Suspension of action.

3 : Signal, which is input to MFI terminal (pin 4), is output at V_L terminal (pin 1).
Signal, which is input to BTI terminal (pin 19), is output at RO1, RO2 terminal (pin 17, 16).
Signal, which is input to RPI terminal (pin 22), is output at RBO terminal (pin 21).

4 : Signal, which is input to RPI terminal (pin 22), is output at RBO terminal (pin 21).
Signal, which is input to T2I terminal (pin 5), is output at V_L terminal (pin 1).

5 : Signal, which is input to MFI terminal (pin 4), is output at V_L terminal (pin 1).
Signal, which is input to BTI terminal (pin 19), is output at RBO terminal (pin 21).

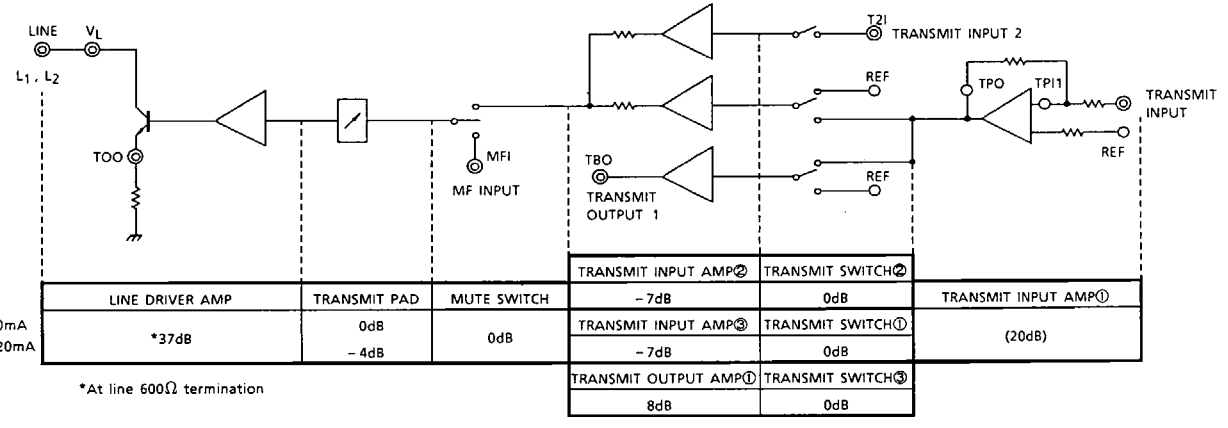
6 : Signal, which is input to TPI1 terminal (pin 8), is output at V_L terminal (pin 1).
Signal, which is input to RPI terminal (pin 22), is output at RO1, RO2 terminal (pin 17, 16).

7 : Signal, which is input to RPI terminal (pin 22), is output at RBO terminal (pin 21).
Signal, which is input to TPI1 terminal (pin 8), is output at TBO terminal (pin 6).
Signal, which is input to MFI terminal (pin 4), is output at V_L terminal (pin 1).
Signal, which is input to BTI terminal (pin 19), is output at RO1, RO2 terminal (pin 17, 16).

8 : Signal, which is input to T2I terminal (pin 5), is output at V_L terminal (pin 1).
Signal, which is input to TPI1 terminal (pin 8), is output at V_L terminal (pin 1) and TBO terminal (pin 6).
Signal, which is input to RPI terminal (pin 22), is output at RO1, RO2 and RBO terminal (pin 17, 16, 21).
Signal, which is input to R2I terminal (pin 20), is output at RO1, RO2 terminal (pin 17, 16).

GAIN DISTRIBUTION

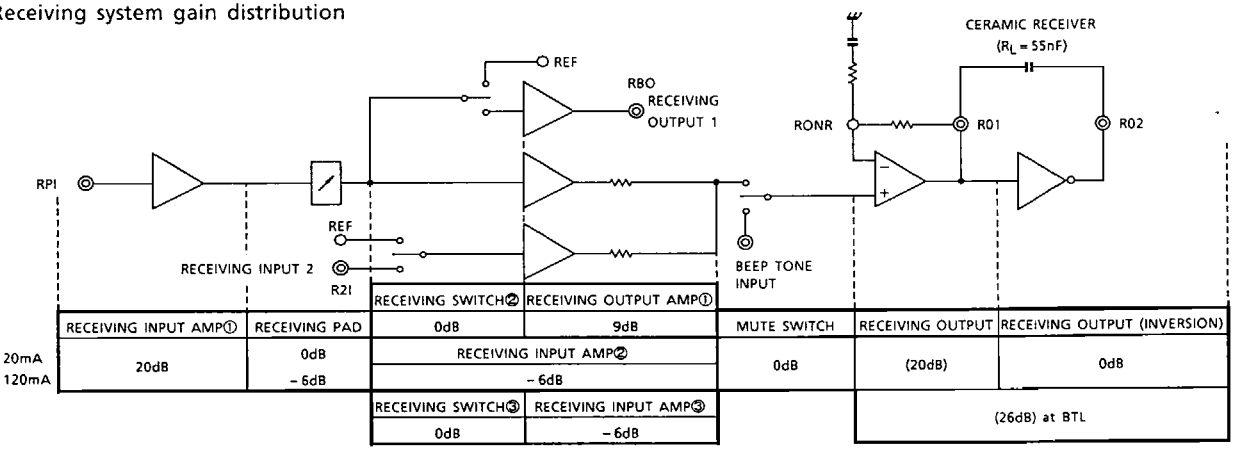
1. Transmit system gain distribution



	LINE DRIVER AMP	TRANSMIT PAD	MUTE SWITCH	TRANSMIT INPUT AMP①
I_L = 20mA I_L = 120mA	*37dB	0dB -4dB	0dB	(20dB)

*At line 600Ω termination

2. Receiving system gain distribution



	RECEIVING INPUT AMP①	RECEIVING PAD		MUTE SWITCH	RECEIVING OUTPUT	RECEIVING OUTPUT (INVERSION)
I_L = 20mA I_L = 120mA	20dB	0dB -6dB		0dB	(20dB)	0dB
					(26dB) at BTL	

(*) Contents in ( ) can externally be varied.
The gain value is the one roughly determined.

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Line Voltage		V_L	18	V
Power Supply Voltage		V_{CC}	8	V
Line Current		I_L	150	mA
Power Dissipation	TA31066N	P_D	1300	mW
	TA31066F		*1) 750	
			*2) 950	
Operating Temperature	TA31066N	T_{opr}	−20~70	°C
	TA31066F		−20~60	
Storage Temperature		T_{stg}	−55~150	°C

*1) NO PCB

*2) This value is detained by 50×50×1.6mm PCB mounting occupied in excess of 10% of copper area.

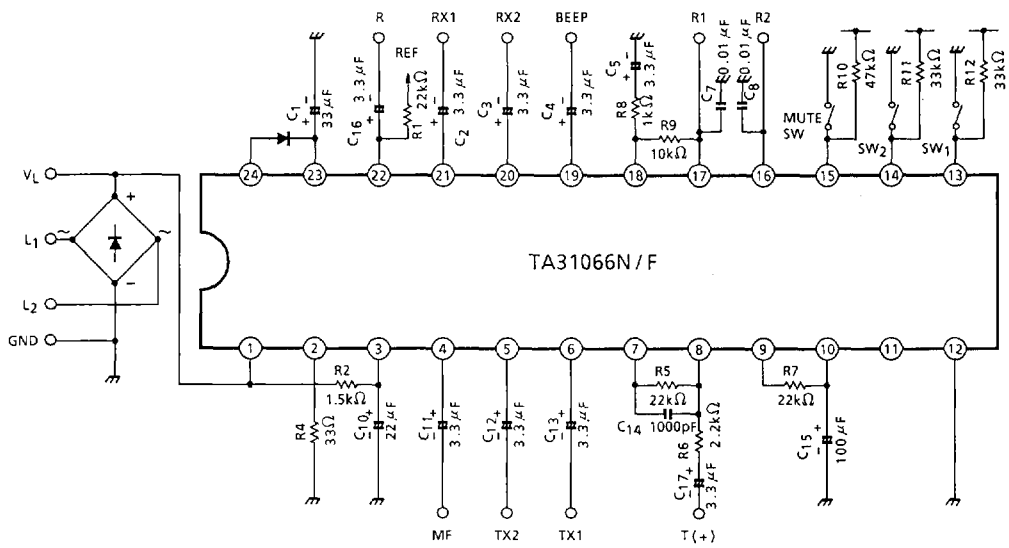
ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, Ta = 25°C, f_{IN} = 1kHz, SW_1 : H, SW_2 : H, MUTE SW : H)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Line Voltage	V_L	1	I_L = 20mA		3.2	3.7	4.2	V
			I_L = 120mA		6.0	7.9	10.0	
Internal Power Supply Voltage	V_{CC}	1	I_L = 20mA		2.1	2.4	2.7	V
			I_L = 120mA		2.15	2.4	2.65	
Transmit Gain	G_T	2	I_L = 20mA	V_{IN} = −55dBV	47	49	51	dB
			I_L = 120mA	SW_2 : L	43	45	47	
Receiving Gain	G_R	4	I_L = 20mA	V_{IN} = −55dBV	32	34	36	dB
			I_L = 120mA	SW_2 : L	26	28	30	
MF Gain	G_{MF}	3	I_L = 20mA	V_{IN} = −50dBV	33	35.5	38	dB
			I_L = 120mA	All SW : L	30	32	34	
Beep Gain	G_{BP}	5	I_L = 20mA	V_{IN} = −50dBV	18	20	22	dB
			I_L = 120mA	All SW : L	18	20	22	
Transmit Dynamic Range	DR_T	2	I_L = 20mA	THD 4%	—	4.6	—	V_{p-p}
			I_L = 120mA	SW_2 : L	—	6.4	—	
Receiving Dynamic Range	DR_R	4	I_L = 20mA	THD 10%	—	2.0	—	V_{p-p}
			I_L = 120mA	SW_2 : L	—	2.1	—	
MFI Input Resistance	$Z_{I(MF)}$	—	All SW : L		14	20	26	kΩ
BTI Input Resistance	$Z_{I(BP)}$	—	All SW : L		14	20	26	kΩ
T2I Input Resistance	$Z_{I(T2I)}$	—	SW_2 : L		14	20	26	kΩ
R2I Input Resistance	$Z_{I(R2I)}$	—	SW_2 : L		14	20	26	kΩ

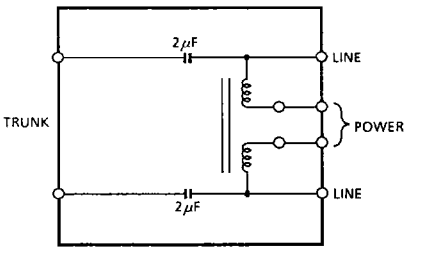
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
SW_1 Terminal Input Voltage	V_{IH} (S1)	—	I_L = 20~120mA		V_{CC} −0.2	—	V_{CC}	V
	V_{IL} (S1)	—			0	—	0.2	
SW_2 Terminal Input Voltage	V_{IH} (S2)	—	I_L = 20~120mA		V_{CC} −0.2	—	V_{CC}	V
	V_{IL} (S2)	—			0	—	0.2	
MUTE Terminal Input Voltage	V_{IH} (MU)	—	I_L = 20~120mA		V_{CC} −0.2	—	V_{CC}	V
	V_{IL} (MU)	—			0	—	0.2	
Transmit Gain 1 (T (+) Input − TX1 Output)	G_{T1O}	—	I_L = 20mA	V_{IN} = −55dBV	26	28	30	dB
			I_L = 120mA		26	28	30	
Transmit Gain 2 (TX2 Input − V_L Output)	G_{T2I}	—	I_L = 20mA	V_{IN} = −55dBV	27.5	30	32.5	dB
			I_L = 120mA		23.5	25.5	27.5	
Receiving Gain 1 (R Input − RX1 Output)	G_{R1O}	—	I_L = 20mA	V_{IN} = −55dBV	27	29	31	dB
			I_L = 120mA		21	23	25	
Receiving Gain 2 (RX2 Input − R1 Output)	G_{R2I}	—	I_L = 20mA	V_{IN} = −50dBV	12	14	16	dB
			I_L = 120mA		12	14	16	

TEST CIRCUIT

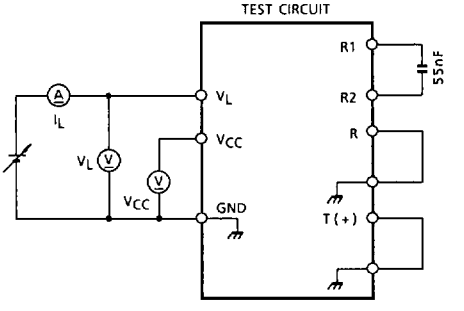


TEST CIRCUIT

TELEPHONE LINE SIMULATION
EQUIVALENT CIRCUIT



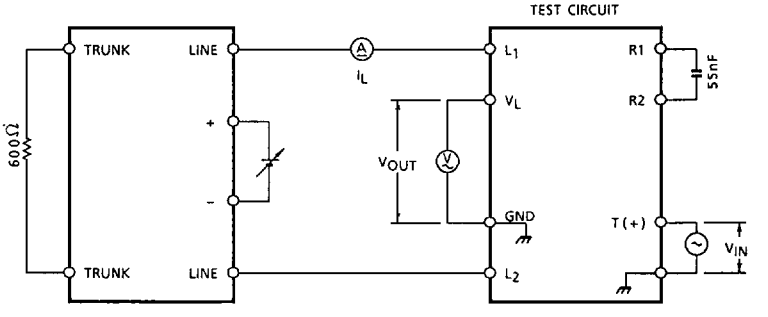
(1) V_L, V_{CC}



SW_1 : H
SW_2 : H
MUTE SW : H

BEEP-GND Short
TX2-GND Short
RX2-GND Short
MF-GND Short

(2) G_T, DR_T



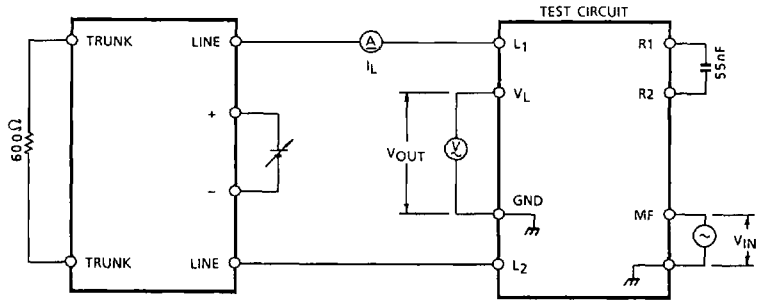
SW_1 : H
SW_2 : L
MUTE SW : H

BEEP-GND Short
TX2-GND Short
R-GND Short
MF-GND Short

TRANSMIT GAIN : $G_T = 20\log|V_{OUT}/V_{IN}|$ (dB)

TRANSMIT DYNAMIC RANGE : $D_{RT} = V_{OUT}(V_{p\text{-}p})$ (at V_{OUT} : DIST = 4%)

(3) G_{MF}

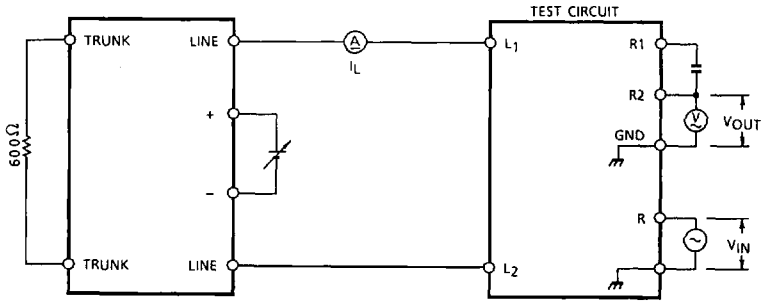


SW_1 : L
SW_2 : L
MUTE SW : L

R-GND Short
T(+)-GND Short
TX2-GND Short
RX2-GND Short

MF GAIN : $G_{MF} = 20\log|V_{OUT}/V_{IN}|$ (dB)

(4) G_R, DR_R



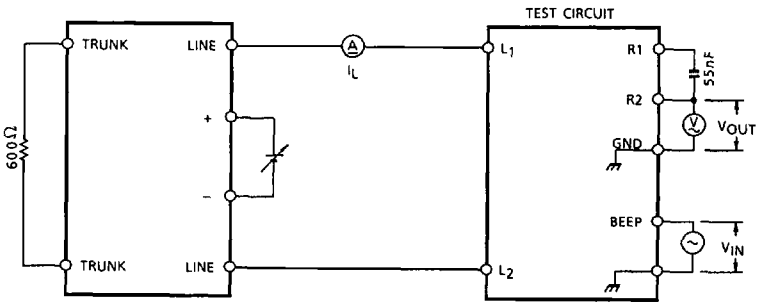
SW_1 : H
SW_2 : L
MUTE SW : H

T(+)-GND Short
TX2-GND Short
RX2-GND Short
MF-GND Short
BEEP-GND Short

RECEIVING GAIN : $G_T = 20\log|V_{OUT}/V_{IN}|$ (dB)

RECEIVING DYNAMIC RANGE : $D_{RR} = V_{OUT}$ (V_{p-p}) (at V_{OUT} : DIST = 10%)

(5) G_{BP}

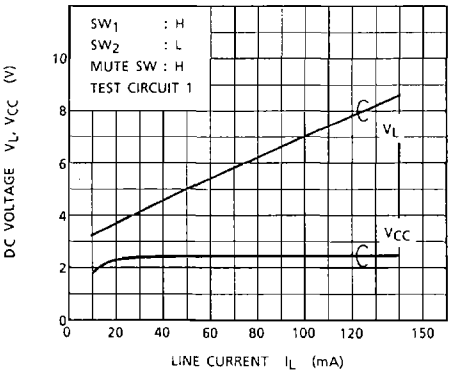


SW_1 : L
SW_2 : L
MUTE SW : L

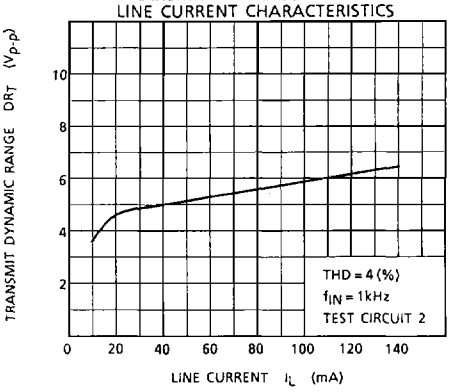
R-GND Short
T(+)-GND Short
TX2-GND Short
RX2-GND Short
MF-GND Short

BEEP GAIN : $G_{BP} = 20\log|V_{OUT}/V_{IN}|$ (dB)

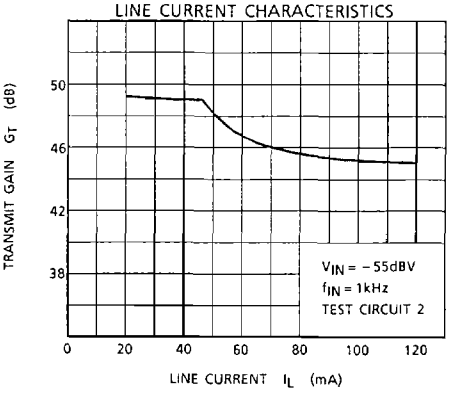
DC CHARACTERISTICS



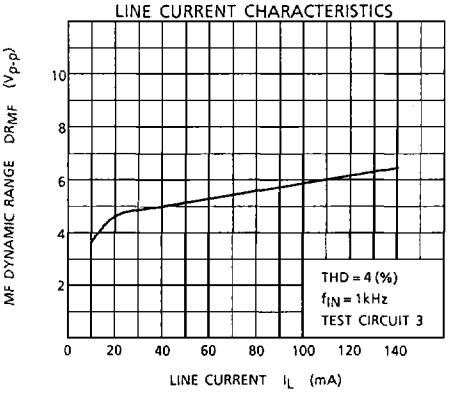
TRANSMIT DYNAMIC RANGE – LINE CURRENT CHARACTERISTICS



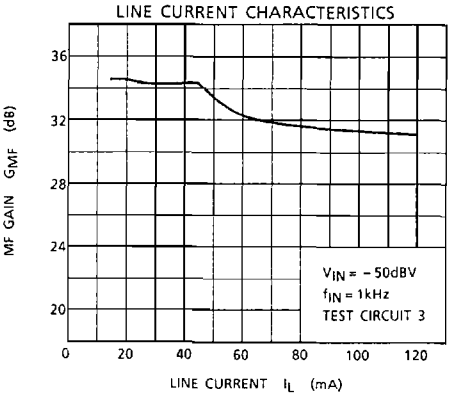
TRANSMIT GAIN – LINE CURRENT CHARACTERISTICS



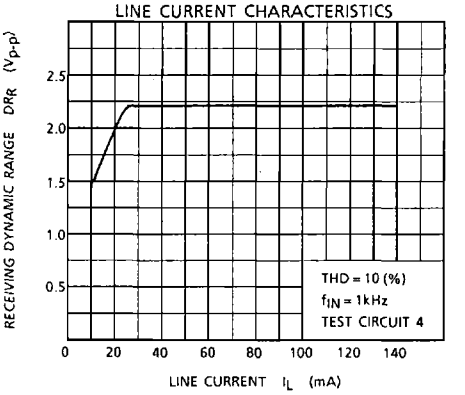
MF DYNAMIC RANGE – LINE CURRENT CHARACTERISTICS



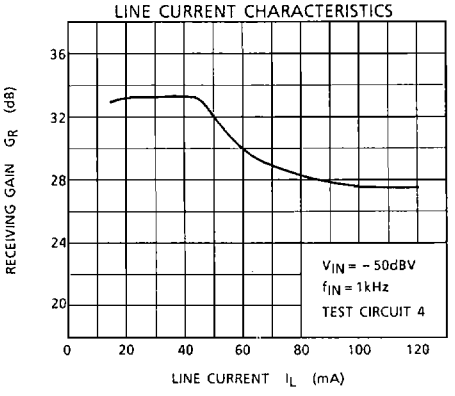
MF GAIN – LINE CURRENT CHARACTERISTICS



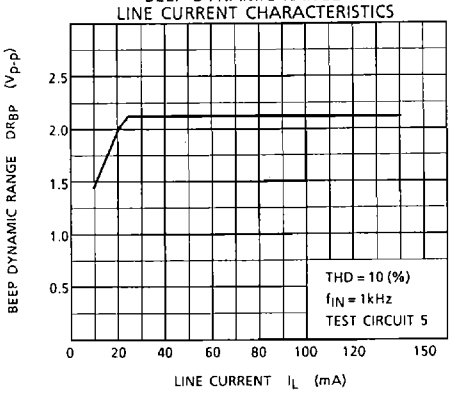
RECEIVING DYNAMIC RANGE – LINE CURRENT CHARACTERISTICS



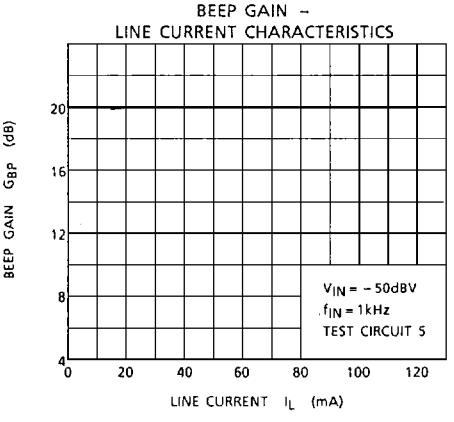
RECEIVING GAIN – LINE CURRENT CHARACTERISTICS



BEEP DYNAMIC RANGE – LINE CURRENT CHARACTERISTICS



BEEP GAIN – LINE CURRENT CHARACTERISTICS



EXAMPLE OF APPLICATION CIRCUIT

TA31066N / F