

FUJITSU

SUBSCRIBER LINE INTERFACE IC

The Fujitsu MB4752A is designed for PBX (Private Branch Exchange), it has battery feed, supervision and 4-wire to 2-wire conversion functions. Battery Feed mode can be established to $200\Omega \times 2$, $440\Omega \times 2$ constant feeding resistor, just changing the terminal connection. It is used the subscriber line interface circuit for digital PBX and CO. We can get much high longitudinal balance and 4W to 2W-gain and characteristics just adjusting external resistor. So it can use not only domestic use but also overseas use.

- $440\Omega \times 2 / 200\Omega \times 2$ feeding resistance
- Loop detection function
- Line fault protection
- Hybrid function (4-wire to 2-wire conversion function)
- Ring trip comparator
Balancing impedance is selected by an external parts
- Digital output terminal has open-collector output with a pull up resistor
- 28-pad LCC package: (Suffix:-TV)

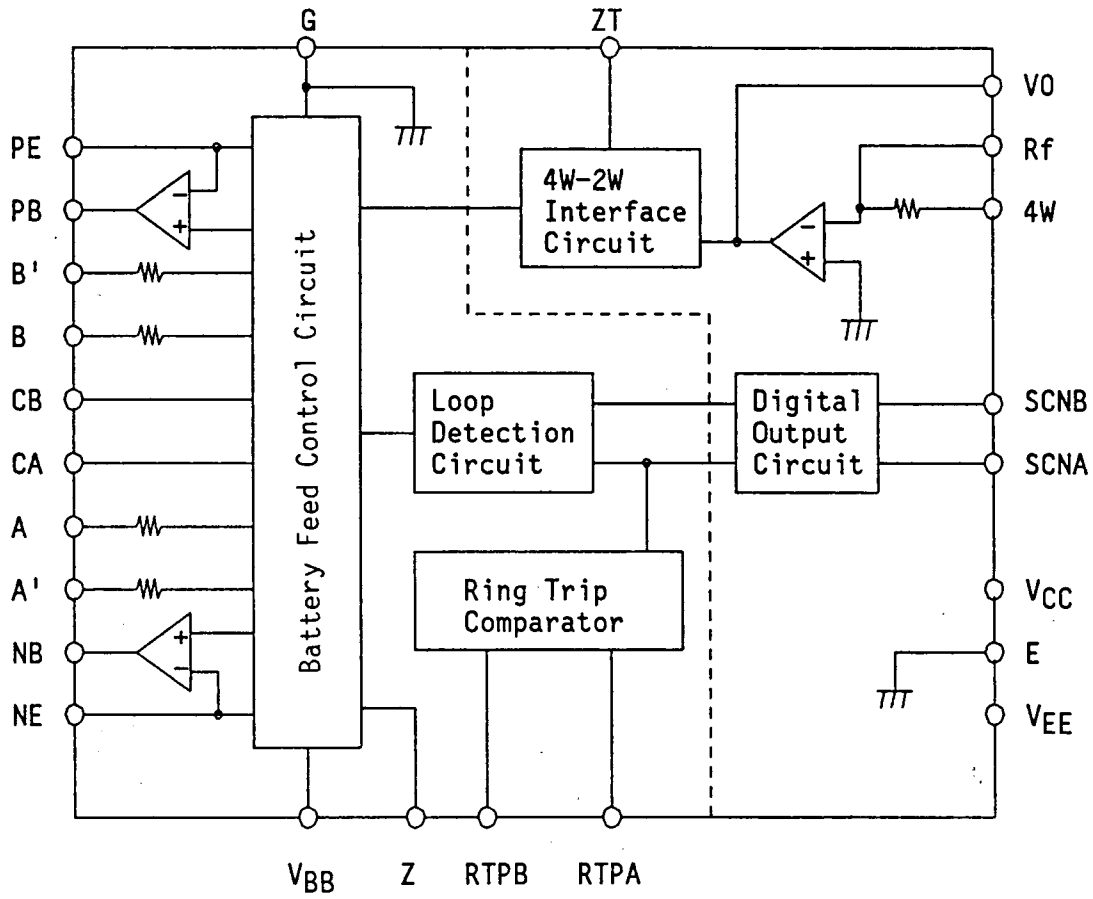
Absolute Maximum Rating (See Note)

Rating	Symbol	Value	Unit	Note
Power Supply Voltage	V_{BB}	-60 to +0.5	V	Referenced to GND
	V_{CC}	-0.5 to +7	V	Referenced to E
	V_{EE}	-7 to +0.5	V	
	V_{EG}	-7.5 to +0.5	V	Referenced to GND
Input Voltage	V_A	$V_{BB}-0.5$ to +0.5	V	Referenced to GND
	V_B	$V_{BB}-0.5$ to +0.5	V	
	RTPA	$V_{BB}-0.5$ to $V_{BB}+30$	V	
	RTPB	-30 to +0.5	V	
	V_{4W}	$V_{EE}-0.5$ to $V_{CC}+0.5$	V	Referenced to E
Storage Temperature	T_{STG}	-55 to +150	$^{\circ}\text{C}$	

NOTE: Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

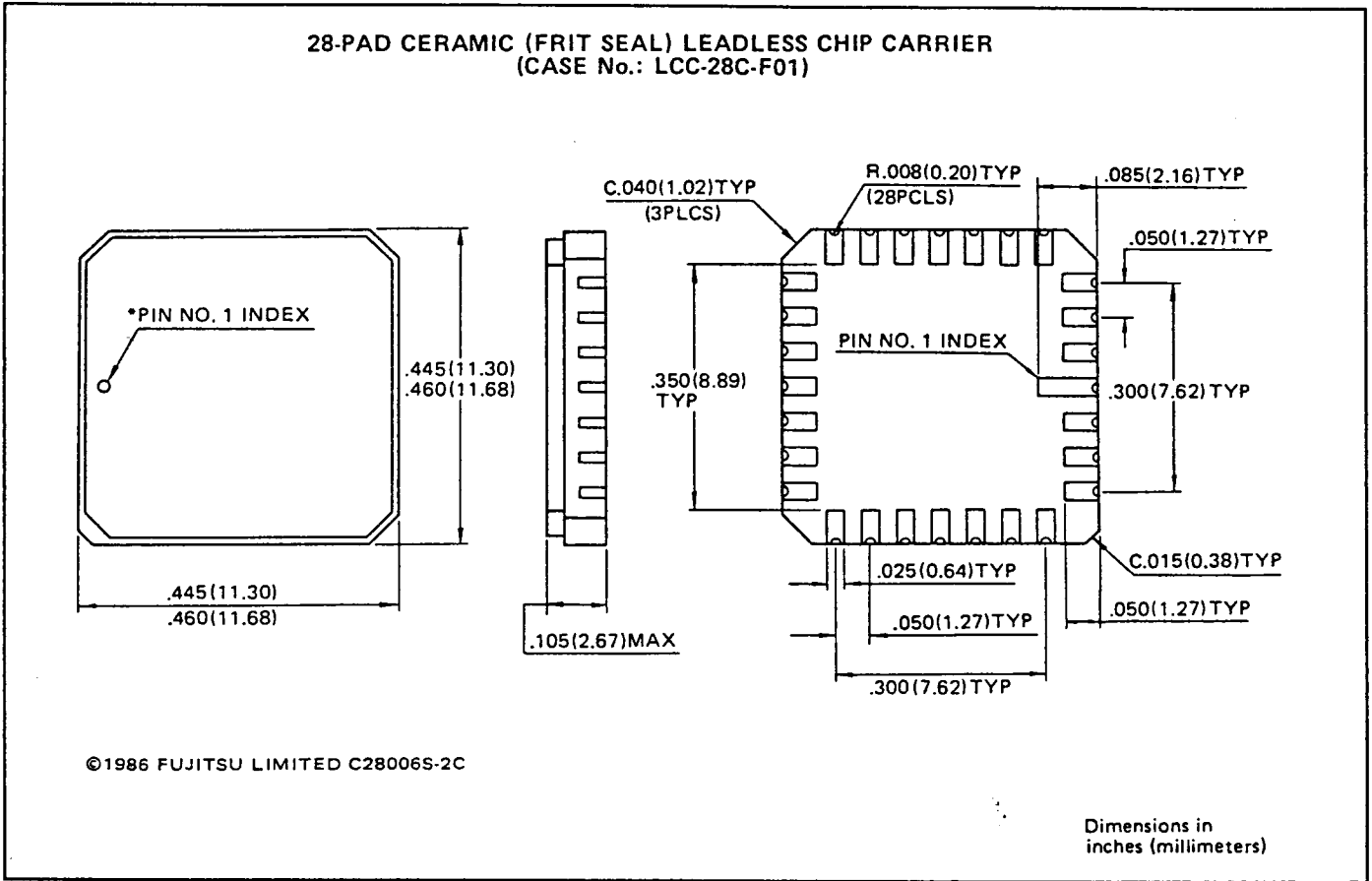
This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

Figure-1 MB4752A Block Diagram

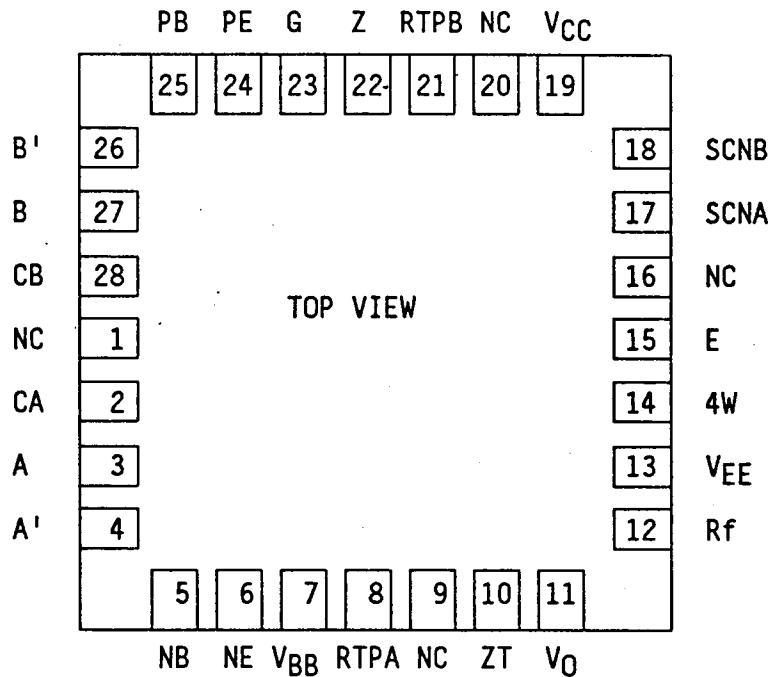


Package Dimensions

(Suffix:-TV)



Pin Assignment



Pin Description

Pin No.	Symbol	Function
1	NC	No connection
2	CA	High-impedance capacitor pin. A capacitor is connected between this terminal and CB terminal. AC impedance of Battery Feed circuit is made up to high impedance by this external capacitor.
3	A	440Ω battery feed for line A
4	A'	200Ω battery feed for line A
5	NB	Base drive output for the NPN power transistor
6	NE	Emitter current sensing input for the NPN power transistor
7	V _{BB}	Most Negative Voltage Supply, -48V
8	RTPA	Ring-trip input for line A
9	NC	No connection
10	ZT	4W to 2W Transformation impedance
11	V _O	4W to 2W Gain setting resistor input
12	R _f	4W to 2W Gain setting resistor input
13	V _{EE}	Negative Voltage Supply, -5V
14	4W	4-wire input
15	E	Ground
16	NC	No connection
17	SCNA	SCN detecting output for line A
18	SCNB	SCN detecting output for line B
19	V _{CC}	Positive Voltage Supply, +5V
20	NC	No connection

Pin Description (Continued)

Pin No.	Symbol	Function
21	RTPB	Ring trip input for line B
22	Z	Compensation capacitor input
23	G	Ground
24	PE	Emitter current sensing input for the PNP power transistor
25	PB	Base drive output for the PNP power transistor
26	B'	200 Ω battery feed for line B
27	B	440 Ω battery feed for line B
28	CB	High-impedance capacitor pin. A capacitor is connected between this terminal and CB terminal. AC impedance of Battery Feed circuit is made up to high impedance by this external capacitor.

Functional Description

Battery feed

By selecting connection A,B or A',B', ballanced feeding resistance of 440Ω for PBX or 200Ω for CO application is selected.

Loop detection

The digital signal outputs indicate the condition of handset being hung on, both terminals of SCNA and SCNB simultaneously, detecting the current which is generated when the handset is hung on.

Line fault protection

It outputs the signals when line A or B is short circuited to SCNA, SCNB respectively.
When excess current flow, arrester provides system protection, DC feeding resistance becomes six times as large as normal value. As a result, current would decrease.

Hybrid (Four-to-two wire conversion)

As for the communication channel, telephone switching system has four-wire-line internally, telephone set system has two-wire-line. This device have also a built-in four-wire to two-wire converter. Two-wire to four-wire converter is comprised by external common industrial operational amplifier.

Ring trip comparator

It is necessary for electrical telephone switching system to detect receiver is hung up during a calling signal. Ring trip detection is performed by connecting external low pass filter to input terminal RTPA or RTPB. Output signal is superimposed on trip supervise output SCA, when the handset is hung up.

Recommended Operating Conditions

Parameter		Symbol	Condition	Unit	Note
Power Supply Voltage		V_{BB}	-48 ± 5	V	Referenced to GND
		V_{CC}	5.0 ± 0.25	V	Referenced to E
		V_{EE}	-5.0 ± 0.25	V	
		V_{EG}	-0.5 to $+0.5$	V	Referenced to GND
2W	440 Ω Feeding Loop Resistor	R_L	0 to 1200	Ω	Line resistor + terminal resistor
	200 Ω Feeding Loop Resistor	R_L	0 to 1900	Ω	
	Low Frequency Inductive Current	I_{AC}	0 to 6.4	mArms	Single line current $f=50/60\text{Hz}$
4W	Input Offset Voltage	V_{RCS}	-0.2 to 0.2	V	
	Input Voltage	S_{4W}	~ 7.0	dBm	
Operating Temperature		T_{OP}	5 to 70	$^{\circ}\text{C}$	

DC Characteristics

(Recommended operating condition unless otherwise noted.)

Parameter		Symbol	Condition	Min	Typ	Max	Unit
Power Supply Current	On-Hook	I_{BB1}	$V_B=0V$ $V_A=V_{BB}$	-6.4	-3.8		mA
		I_{CC1}			2.5	6.6	mA
		I_{EE1}		-2.2	-1.1		mA
440 Ω Feeding Mode	Off-Hook $R_L=0\Omega$	I_{BB2}	$V_B=-26.5V$ $V_A=V_{BB}$ $+26.5V$	-13	-8		mA
		I_{CC2}			2.5	6.4	mA
		I_{EE2}		-2.2	-1.2		mA
Power Supply Current	On-Hook	I_{BB3}	$V_B=0V$ $V_A=V_{BB}$	-7.5	-4		mA
		I_{CC3}			2.5	6.6	mA
		I_{EE3}		-2.2	-1.1		mA
200 Ω Feeding Mode	Off-Hook $R_L=0\Omega$	I_{BB4}	$V_B=-26.5V$ $V_A=V_{BB}$ $+26.5V$	-15.6	-9.5		mA
		I_{CC4}			2.5	6.4	mA
		I_{EE4}		-2.2	-1.2		mA

DC Characteristics (Continued)
 (Recommended operating condition unless otherwise noted)

Parameter		Symbol	Condition	Min	Typ	Max	Unit					
Loop Supply Current 440Ω Feeding Mode		I _{A1}	V _B =-24V	V _{BB} =-48V V _{CC} =5.0V V _{EE} =-5.0V V _{EG} =0V	47.5	54	65	mA				
		I _{B1}	V _A =V _{BB} +24V						-65	-54	-47.5	mA
		I _{A2}	V _B =-10V						16.8	21	26.5	mA
		I _{B2}	V _A =V _{BB} +10V						-26.5	-21	-16.8	mA
Loop Supply Current 200Ω Feeding Mode		I _{A3}	V _B =-24V	V _{BB} =-48V V _{CC} =5.0V V _{EE} =-5.0V V _{EG} =0V	72.5	83	91.4	mA				
		I _{B3}	V _A =V _{BB} +24V						-91.4	-83	-72.5	mA
		I _{A4}	V _B =-10V						35.7	45	58	mA
		I _{B4}	V _A =V _{BB} +10V						-58	-45	-35.7	mA
Line-Fault Drooping Current 440Ω Feeding Mode		I _{PG1}	V _A =GND	V _{BB} =-53V V _{CC} =5.0V V _{EE} =-5.0V V _{EG} =0V		22	28	mA				
		I _{PB1}	V _B =V _{BB}						-28	-22		mA
Line-Fault Drooping Current 200Ω Feeding Mode		I _{PG2}	V _A =GND	V _{BB} =-53V V _{CC} =5.0V V _{EE} =-5.0V V _{EG} =0V		29	36	mA				
		I _{PB2}	V _B =V _{BB}						-36	-29		mA
Loop Detection Current	Detection	I _{ON1}	V _{BB} =-43V	V _{CC} =5.0V V _{EE} =-5.0V V _{EG} =0V	11.1	12.4	14.2	mA				
	Release	I _{OFF1}							10.4	11.5	13.4	mA
	Detection	I _{ON2}	V _{BB} =-53V						14.4	16.0	18.1	mA
	Release	I _{OFF2}							13.4	14.8	16.6	mA
Ring Trip Detection Voltage	RTPA	V _{RD1}	On-Hook	V _{BB} =-48V V _{CC} =5.0V V _{EE} =-5.0V V _{EG} =0V	-44	-43.3	-42.5	V				
	RTPB	V _{RD2}	On-Hook						-5	-4.4	-4	V
Line-Fault Detection Volt. 200Ω Feeding Mode	Line A to GND	V _{GD1}	V _B =OPEN	V _{BB} =-48V V _{CC} =5.0V V _{EE} =-5.0V V _{EG} =0V	24	26.5	30	V				
	Line B to V _{BB}		V _A =OPEN						24	26.5	30	V
Line Fault Detection Volt. 400Ω Feeding Mode	Line A to GND	V _{GD2}	V _B =OPEN	V _{BB} =-48V V _{CC} =5.0V V _{EE} =-5.0V V _{EG} =0V	11	15.5	21	V				
	Line B to V _{BB}		V _A =OPEN						11	15.5	21	V
Line-Fault SCN Mask Current	SCNA	I _{MA}	V _B =V _{BB}	V _{BB} =-48V V _{CC} =5.0V V _{EE} =-5.0V V _{EG} =0V	3.3	4.4	5.9	mA				
	SCNB	I _{MB}	V _A =0V						-5.9	-4.4	-3.3	mA
SCN Output Low Voltage	SCNA	V _{OLA}	I=1.2mA V _{CC} =5.25V On-Hook	V _{BB} =-48V V _{EE} =-5.0V V _{EG} =0V Reference to E		0.02	0.4	V				
	SCNB	V _{OLB}							0.02	0.4	V	
SCN Output High Voltage	SCNA	V _{OHA}	I=-50μA V _{CC} =4.75V Off-Hook	V _{BB} =-48V V _{EE} =-5.0V V _{EG} =0V Reference to E	2.4	3.8		V				
	SCNB	V _{OHB}							2.4	3.8	V	

Note : Unless RTPA terminal is in use, it must be connected to V_{DD}.

AC Characteristics

(Recommended operating condition unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	
4W to 2W Gain	G ₄₂	L=+4dBm, f=1kHz	-5.4	-4.4	-3.4	dB	
4W to 2W Gain Frequency Response	G _{f42}	f=0.2kHz	Referenced to output at f=1kHz L=-10dB	-0.1	+0.07		dB
		f=0.3kHz		-0.1	+0.04	+0.2	dB
		f=0.4kHz		-0.1	+0.02	+0.2	dB
		f=0.6kHz		-0.1	0	+0.2	dB
		f=2.4kHz		-0.1	-0.01	+0.2	dB
		f=3.0kHz		-0.1	-0.01	+0.2	dB
		f=3.4kHz		-0.1	-0.01	+0.2	dB
4W to 2W Gain Level Linearity	G _{L42}	L=+3dB	Referenced to output at L=-10dB f=1kHz	-0.1	0	+0.1	dB
		L=-40dB		-0.1	0	+0.1	dB
		L=-50dB		-0.2	0	+0.2	dB
Idle Channel Noise	N _{I2}			-94	-76	dBmp	
4W to 2W Signal / Noise Ratio	SN ₄₂	L=0dB	f=1KHz	50	57		dB
		L=-30dB		46	61		dB
		L=-40dB		36	52		dB
		L=-45dB		31	47		dB
Longitudinal Balance	LB _{2W}	f=0.3kHz	Adjust REA 48 to 53Ω	43	60		dB
		f=1.0kHz		43	60		dB
		f=3.4kHz		43	60		dB
Power Supply Noise Rejection	VBB to 2W	PSRB	L=0.245Vrms, f=1kHz	20	39		dB
	VCC to 2W	PSRC		20	41		dB
	VEE to 2W	PSRE		20	55		dB
	VEG to 2W	PSRR		20	43		dB

Note : Unless RTPA terminal is in use, it must be connected to VBB.

SCN Logical Table

Input Condition		SCNA	SCNB	Note	
Loop Detection	Loop Detection (OFF-Hook to ON-Hook)	$I_L < I_{ON}$	L	L	I_L : Loop Current I_{ON} : I_{ON1}, I_{ON2} I_{OFF} : I_{OFF1}, I_{OFF2} See DC Char.
		$I_L > I_{ON}$	H	H	
	Loop Release (ON-Hook to OFF-Hook)	$I_L > I_{OFF}$	H	H	
		$I_L < I_{OFF}$	L	L	
Ring Trip Detection	RTPA input	$V_{RTPA} < V_{RD1}$	L	L	V_{RTPA} : RTPA Input Voltage V_{RTPB} : RTPB input Voltage V_{RD1} : See DC Char. V_{RD2} :
		$V_{RTPA} > V_{RD1}$	H	L	
	RTPB input	$V_{RTPB} > V_{RD2}$	L	L	
		$V_{RTPB} < V_{RD2}$	H	L	
Line-Fault Detection	Line A to Ground	$I_A + I_B < I_{ON} * 2$	L	L	I_A : Line A Current I_B : Line B Current I_{MA} I_{MB} See DC Char.
		$I_A + I_B > I_{ON} * 2$ and $I_B < I_{MB}$	H	L	
		$I_A + I_B > I_{ON} * 2$ and $I_B > I_{MB}$	H	H	
	Line B to Ground	$I_A + I_B < I_{ON} * 2$	L	L	
		$I_A + I_B > I_{ON} * 2$ and $I_A < I_{MA}$	L	H	
		$I_A + I_B > I_{ON} * 2$ and $I_A > I_{MA}$	H	H	

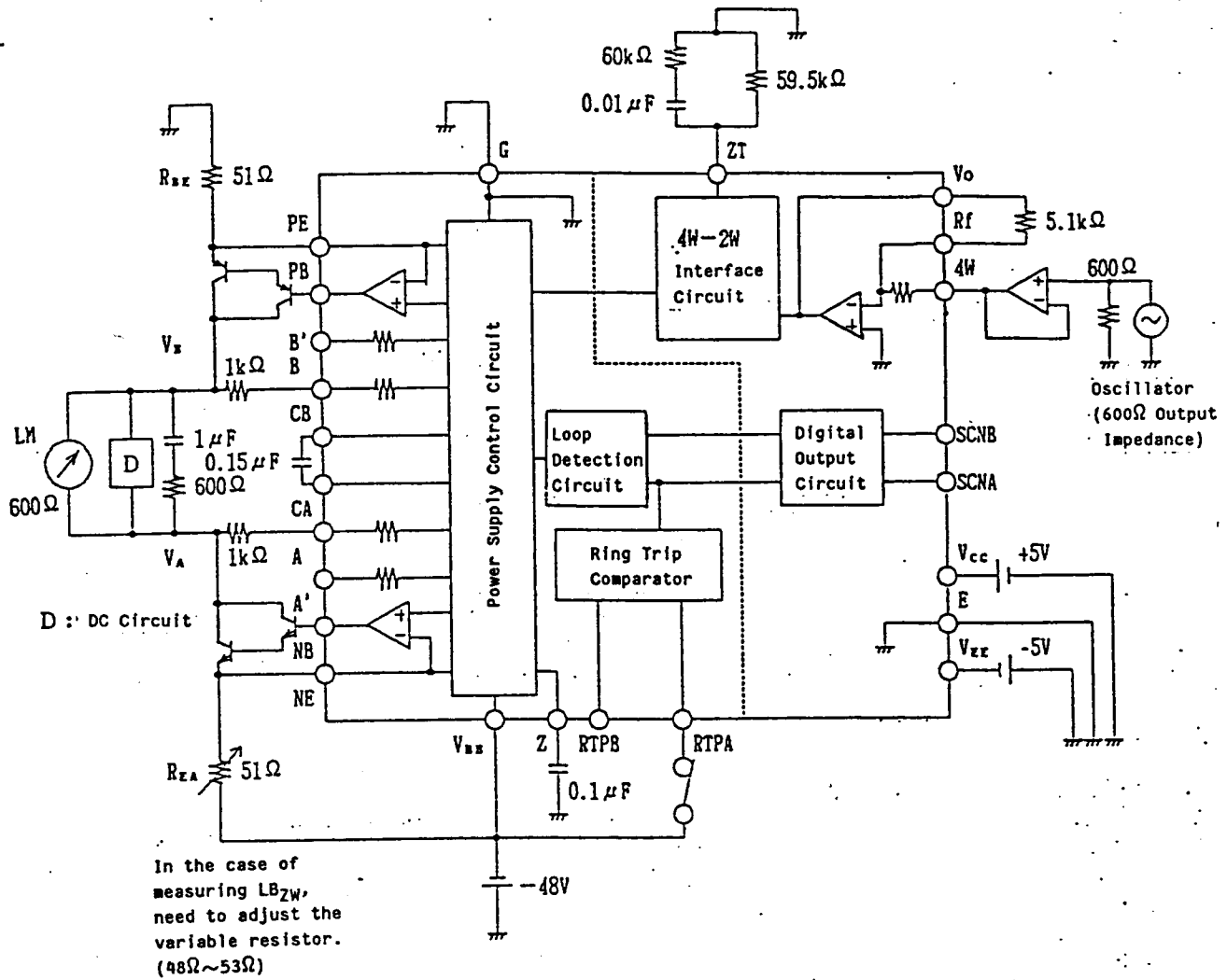
Note : Unless RTPA terminal is in use, it terminal must be connected to V_{BB} .

Line Fault Protection

2W State		Feed Mode	Note
Line to Ground/ V_{BB}	$ V_B + (V_A - V_{BB}) < V_{GD}$	Normal Feeding (No Protection)	V_A : Line A Voltage V_B : Line B Voltage V_{GD}, V_{GD1}, V_{GD2} : See DC Char.
	$ V_B + (V_A - V_{BB}) > V_{GD}$	Feeding resistor (6 times of normal value)	

◇ Measurement Circuit

◆ Power Supply Mode (440Ω)



◆ Power Supply Mode (200Ω)

Change A→A' and B→B' with connecting C_A and C_B , as shown in the below diagram.

