NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC7073

μPC7073 ANALOG SUBSCRIBER LINE LSI (BS-SLIC)

The μPC7073 is a BS-SLIC that can be used in analog subscriber circuits such as private branch exchangers (PBXs) and switching equipment for central offices. It features two of the functions required for analog subscriber circuits: subscriber line feed control and subscriber line supervision.

Use of the μPC7073 in combination with a digital CODEC (μPD9903) can reduce the number of components required in analog subscriber circuits.

FEATURES

- Single-chip, monolithic LSI (bipolar)
- Constant-resistance feed or semi constant-current feed **Note**
- 200-Ω feed, 400-Ω feed, or Tip-to-Ring pin feedout status (HIGH and WET)
- On-chip metering signal superposing circuit
- On-hook sending and receiving
- Loop detection **Note**
- Ground detection and ground-fault/power contact protection **Note**
- Three on-chip relay drivers (flyback prevention diode must be externally provided)
- Two power supply voltages (–48 V and +5 V)
- Low power consumption: 110 mW (TYP., when on hook)

Note Requires μPD9903.

ORDERING INFORMATION

Part Number	Package
μPC7073GT	48-pin plastic shrink SOP (375 mil)

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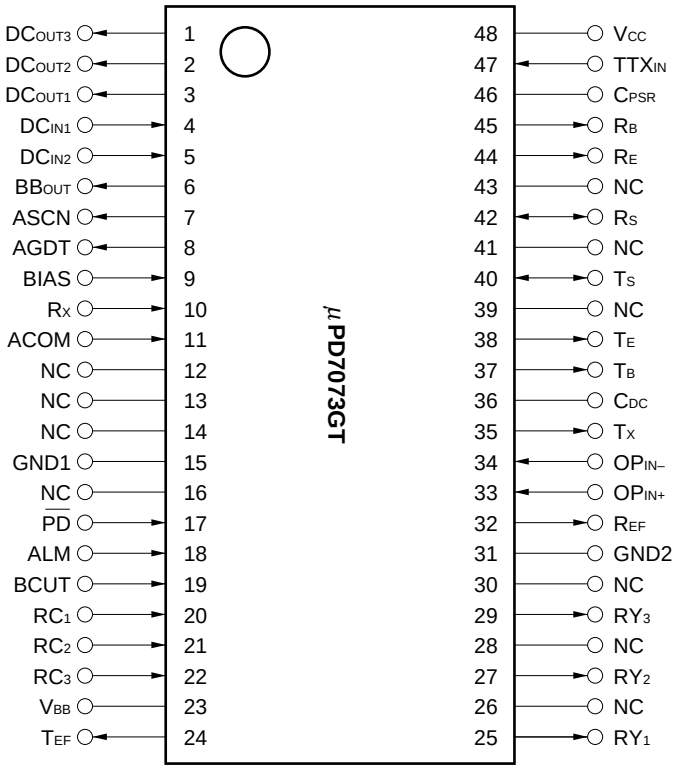
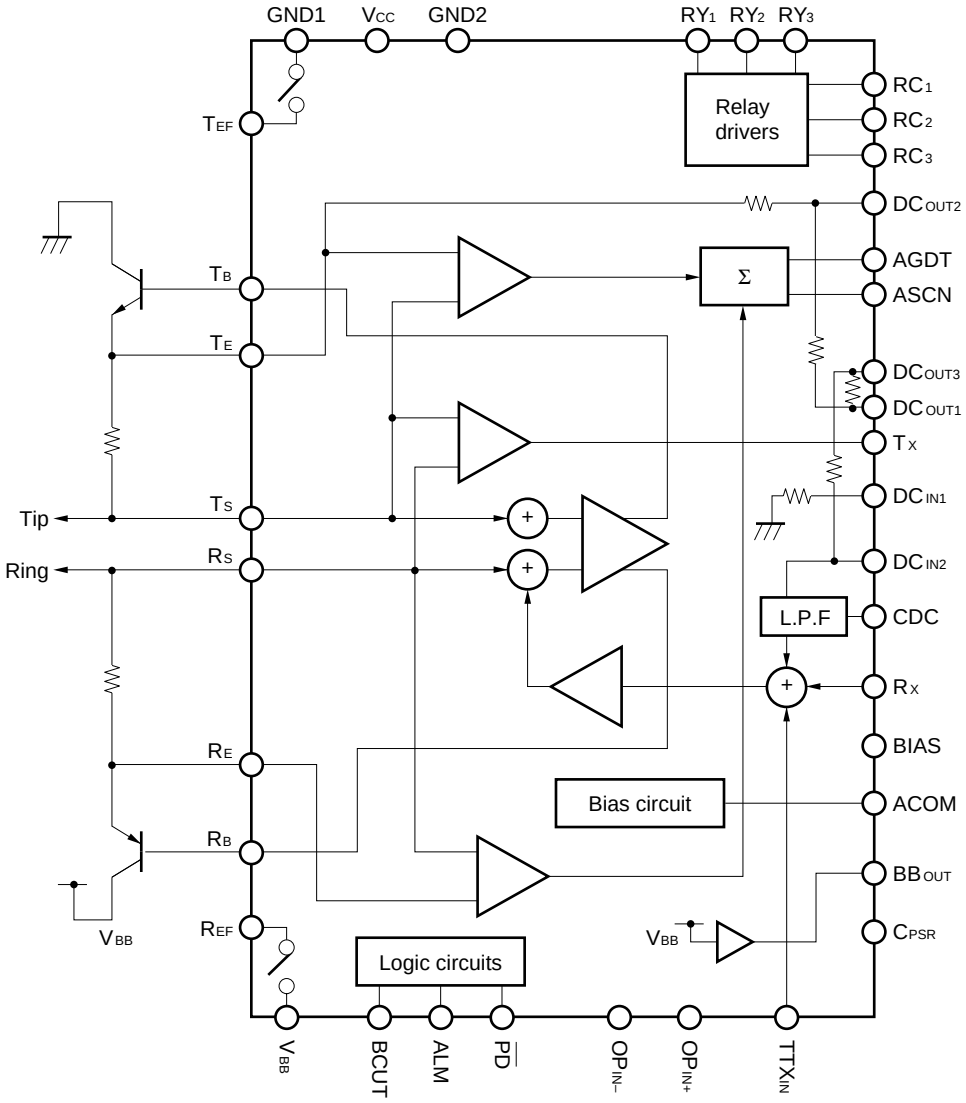
PIN CONFIGURATION

48-pin plastic shrink SOP (375 mil)



ACOM	:	ANALOG COMMON VOLTAGE
AGDT	:	ANALOG GROUND DETECTION SIGNAL OUT
ALM	:	ALARM IN
ASCN	:	ANALOG LOOP DETECTION SIGNAL OUT
BB_{OUT}	:	V_{BB} VOLTAGE INFORMATION OUT
BCUT	:	BATTERY FEED CUT SIGNAL IN
BIAS	:	BIAS LEVEL
CDC	:	DC FEEDBACK CAPACITOR
CPSR	:	POWER SUPPLY REJECTION CAPACITOR
DC_{IN1}, DC_{IN2}	:	DC FEEDBACK CONTROL IN
DC_{OUT1}-DC_{OUT3}	:	DC FEEDBACK CONTROL OUT
GND1, GND2	:	GROUND
NC	:	NO CONNECTION
OP_{IN+}	:	TELETAX SIGNAL CANCEL IN (+)
OP_{IN-}	:	TELETAX SINGAL CANCEL IN (–)
$\overline{PD}$	:	POWER DOWN CONTROL IN
R_B	:	RING BASE
RC_1-RC_3	:	RELAY CONTROL IN
R_E	:	RING EMITTER
R_{EF}	:	RING EMITTER PROTECT FEED
RS	:	RING SENSE
R_X	:	SIGNAL RECEPTION IN
RY_1-RY_3	:	RELAY DRIVER OUT
T_B	:	TIP BASE
T_E	:	TIP EMITTER
T_{EF}	:	TIP EMITTER PROJECT FEED
T_S	:	TIP SENSE
TTX_{IN}	:	TELETAX SIGNAL IN
T_X	:	TRANSSMISSION OUTPUT
V_{BB}	:	NEGATIVE POWER SUPPLY (–48 V)
V_{CC}	:	POSITIVE POWER SUPPLY (+5 V)

BLOCK DIAGRAM



CONTENTS

1. PIN FUNCTIONS

Number	Pin Name	I/O	Function
1-3	DC_{OUT1}-DC_{OUT3}	O	DC feedback control output [to the μPD9903's pin 48-46]
4, 5	DC_{IN1}, DC_{IN2}	I	DC feedback control input [to the μPD9903's pin 45, 44]
6	BB_{OUT}	O	V_{BB} voltage information output [to the μPD9903's pin 43]
7	ASCN	O	Tip-Ring difference current detection signal output [to the μPD9903's pin 42]
8	AGDT	O	Tip-Ring sum current detection signal output [to the μPD9903's pin 41]
9	BIAS	I	Bias level input. Connect to μPD9903's A_{IN} pin [to the μPD9903's pin 40]
10	R_X	I	Receiving input for 4W side [to the μPD9903's pin 39]
11	ACOM	I	Signal reference voltage (2.4 V TYP) input for 4W side [to the μPD9903's pin 37, 38]
12-14, 16, 26, 28, 30, 39, 41, 43	NC	–	No-connection pins. Leave these pins unconnected.
15	GND1	–	Ground pin 1, for circuit grounding
17	$\overline{PD}$	I	Power-down control H: Power-up L: Power-down TTL level [to the μPD9903's pin 32]
18	ALM	I	Ground-fault/power line contact protection mode select input H: Protect mode L: Normal feed TTL level [to the μPD9903's pin 31]
19	BCUT	I	Feed-out select input H: Feed-out L: Normal feed TTL level [to the μPD9903's pin 30]
20	RC_1	I	Relay control for ringer transmission, high active [to the μPD9903's pin 29]
21	RC_2	I	Relay control for line test, high active [to the μPD9903's pin 28]
22	RC_3	I	Relay control for network test, high active [to the μPD9903's pin 27]
23	V_{BB}	–	Negative power supply (–48 V)
24	T_{EF}	O	Feed resistor pin connection for Tip side during ground-fault/power line contact detection
25	RY_1	O	Relay control for ringer transmission, open collector
27	RY_2	O	Relay control for line testing, open collector
29	RY_3	O	Relay control for network testing, open collector
31	GND2	–	Ground pin 2, relay driver
32	R_{EF}	O	Ring feed resistor pin connection for ground-fault/power line contact detection
33	OP_{IN+}	I	TTX (Teletax) signal cancel circuit input pin (+)
34	OP_{IN-}	I	TTX signal cancel circuit input pin (–)
35	T_X	O	Transmission output for 4W side. Connect with BIAS pin via C_{AC} capacitor.
36	C_{DC}	–	Connect to DC feedback capacitor Connect C_{DC} capacitor to this pin
37	T_B	O	Tip-side auxiliary power transistor base connection pin
38	T_E	O	Tip-side feed amplifier output pin. Connect with T_S pin via R_{FT} resistor.
40	T_S	I/O	Tip pin for 2W side
42	R_S	I/O	Ring pin for 2W side

Number	Pin Name	I/O	Function
44	R_E	O	Ring-side feed amplifier output pin. Connect with R_S pin via R_{FR} resistor.
45	R_B	O	Ring-side auxiliary power transistor base connection pin
46	C_{PSR}	–	Connect a capacitor for power supply noise eliminator
47	TTX_{IN}	I	TTX signal input pin
48	V_{CC}	–	Positive power supply (+5 V)

2. USE CAUTIONS

(1) Combined characteristics of μPC7073 and μPD9903

- The μPC7073 is designed to be used in combination with the μPD9903. Therefore, first half of the electrical characteristics described below are ratings for the μPC7073 as a discrete unit while the second half are combined ratings that include the μPD9903.

- Subscriber circuit constants that are determined by factors such as termination impedance are configured to enable setting by external order parameters. Consequently, input of an order that is not suitable for the target impedance may result in failure to obtain the required characteristics.

(2) Absolute maximum ratings

Application of voltage or current in excess of the absolute maximum ratings may result in damage. Be especially cautious about surges, etc.

(3) Load of by-pass capacitor

Because the μPC7073 and μPD9903 use several internal high-frequency operational amplifiers, high power supply impedance can cause instability (such as oscillation) in these internal operational amplifiers. To suppress such instability and eliminate power supply noise, connect by-pass capacitors (C_{ACOM} = approx. 0.1 μF) having superior high frequency characteristics as close as possible to the μPC7073's power supply pins (V_{BB} and V_{CC}) and the μPD9903's power supply pins (AV_{DD} and DV_{DD}).

(4) Addition of ACOM pin connection capacitor

The voltage of the ACOM pin between the μPC7073 and μPD9903 is the signal source reference voltage for the μPC7073. Superposition of noise on this pin may have adverse effects on transmission characteristics. Therefore, make the wires between the ACOM pin and the two LSIs as short as possible, and connect capacitors (C_{ACOM} = approx. 0.1 μF) having superior high frequency characteristics as close as possible to the pins.

(5) Overcurrent prevention measures

Due to its structure, power to the μPC7073 must first be supplied to a low-voltage potential (V_{BB}). Accordingly, if power is supplied first to a power supply pin other than V_{BB}, an overcurrent will flow within the μPC7073 (an overcurrent will not flow if power is input to all power supply pins).
Therefore, if feeding to a power supply pin other than V_{BB} first, connect an external diode and limiting resistor (rated at several Ω) in the directions described below.

- Reverse-bias direction between V_{BB} pin and V_{CC} pin.
- Reverse-bias direction between V_{BB} pin and GND.
- Reverse-bias direction between V_{CC} pin and GND.

3. ELECTRICAL SPECIFICATIONS

3.1 Discrete unit ratings

Absolute maximum ratings (T_A = +25 °C)

Parameter	Symbol	Conditions	Rating	Units
Power supply voltage	V_{BB}	Including spike voltage	–63 to +0.3	V
	V_{CC}	Including spike voltage	–0.3 to +7.0	
	V_{ACOM}	ACOM pin	–0.3 to V_{CC} + 0.3	
Input voltage	V_{IN0}	R_X pin	–0.3 to V_{CC} + 0.3	
	V_{IN1}	T_S, R_S, T_E, and R_E pins	V_{BB} – 0.3 to V_{CC} + 0.3	
	V_{IN2}	TTX_{IN} pin	To be defined	
Logic input voltage	V_{IN3}	BCUT, ALM, $\overline{PD}$, RC_1, RC_2, and RC_3 pins	–0.3 to V_{CC} + 0.3	
Relay driver output current	I_{OL}	RY_1, RY_2, and RY_3 pins	40	mA
Power consumption	P_T	Thermal resistance: 160 °C/W, T_A = 70 °C	1	W
Ambient operating temperature	T_A		0 to 70	˚C
Storage temperature	T_{stg}		–65 to +150	

Caution If the absolute maximum rating for any of the above parameters is exceeded even momentarily, it may adversely affect the quality of this product. In other words, these absolute maximum ratings have been set to prevent physical damage to the product. Do not use the product in such a way as to exceed any of these ratings.

Recommended operating conditions

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Units
Power supply voltage	V_{BB}		–58	–48	–42	V
	V_{CC}		4.75	5.0	5.25	
	V_{ACOM}	ACOM pin	2.38	2.4	2.42	
Ambient operating temperature	T_A		0	25	70	˚C
High level input voltage	V_{IH}	BCUT, ALM, $\overline{PD}$, RC_1, RC_2, and RC_3 pins	2.0		V_{CC}	V
Low level input voltage	V_{IL}		0		0.8	
Digital input rise and fall times	t_R	BCUT, ALM, $\overline{PD}$, RC_1, RC_2, and RC_3 pins			200	ns
	t_F				200	
R_X drive impedance			0		50	Ω
R_X-ACOM offset voltage			–0.1		+0.1	V
Loop resistance (line resistance + termination resistance)	R_L	V_{BB} = –51 V, 200 Ω × 2 feeding modes			1900	Ω
		V_{BB} = –51 V, 400 Ω × 2 feeding modes			1500	
Terminal leakage current during on-hook transmission	$I_{ON-LEAK}$		0		8	mA
AC inductive current	I_{long}	f = 60 Hz, 2Pw-Tr [Note] During loop detection (one line), during ground detection (one line)			5.0	mA_{rms}

Note Pw-Tr is a power transistor for feeding.

DC Characteristics

(V_{BB} = –42 to –58 V, V_{CC} = 5 V ± 0.25 V, T_A = 0 to 70 °C, combined characteristics with μPD9903)

Parameter	Symbol	Conditions		MIN.	TYP.	MAX.	Units
On-hook supply current 1	I_{BB1}	On-hook, including $I_{Pw\text{-}Tr}$ **Note** I_{long} = 0 mA,	I_L = 0 mA V_{BB} = –48 V V_{CC} = +5 V		1.9		mA
	I_{CC1}				1		
Off-hook supply current 1	I_{BB2}	Off-hook, not including $I_{Pw\text{-}Tr}$ **Note** I_{long} = 0 mA,	I_L = 20 mA V_{BB} = –48 V V_{CC} = +5 V		4.3		
	I_{CC2}				2.0		
On-hook supply current 2	I_{BB3}	On-hook, including $I_{Pw\text{-}Tr}$ **Note** I_{long} = 0 mA,	I_L = 0 mA V_{BB} = –58 V V_{CC} = +5.25 V		2.3	2.9	
	I_{CC3}				1.3	1.7	
Off-hook supply current 2	I_{BB4}	Off-hook, not including $I_{Pw\text{-}Tr}$ **Note** I_{long} = 0 mA,	I_L = 20 mA V_{BB} = –58 V V_{CC} = +5.25 V		4.4	5.5	
	I_{CC4}				2.2	2.8	
Power current during on-hook transmission	I_{BB6}	On-hook, including $I_{Pw\text{-}Tr}$ **Note** I_{long} = 0 mA,	I_L = 0 mA V_{BB} = –58 V V_{CC} = +5.25 V		3	3.9	
	I_{CC6}				2.1	2.7	
ACOM input current	I_{ACOM}	ACOM pin	On-hook	–100	–16	+100	μA
			Off-hook	–100	0	+100	
R_X input current	I_{RX}	R_X, V_{RX} = 2.4 V		8	12	16	
Relay driver input current	I_{IH}	V_I = 5.0 V For each RC_1, RC_2, and RC_3 pins			1.0	1.5	mA
Relay driver output voltage	V_{OL}	I_{OL} = 35 mA For each RY_1, RY_2, and RY_3 pins				+1.1	V
Digital pin high level input current	I_{IH}	V_I = 2.0 V For each BCUT, ALM, $\overline{PD}$, RC_1, RC_2, and RC_3 pins				0.5	mA
Digital pin low level input current	I_{IL}	V_I = 0.0 V For each BCUT, ALM, $\overline{PD}$, RC_1, RC_2, and RC_3 pins			50		μA
Control input voltage		BCUT : I_L = 50 mA → | I_L | ≤ 1 mA : I_L = 50 mA → – I_L × 90 % : I_L = 50 mA → | I_L | ≤ 20 mA		2.0			V
		BCUT, I_L = 50 mA → – I_L × 90 %				0.8	
DC feed resistance	R_{BF}	200 Ω feed 400 Ω feed		180 360	200 400	220 440	Ω
High and wet impedance	$R_{H\&W}$	R_L = 1900 Ω AC/DC		100			kΩ
Ground-fault/power contact drooping current		V_{BB} = –48 V R_{TE5K}/R_{RE5K} = 3.6 kΩ		12.1	13.1	14.1	mA

Note $I_{Pw\text{-}Tr}$ is the current to the power transistor for feeding.

3.2 Combined specifications with μPD9903

DC characteristics

μPC7073 (V_{BB} = –42 to –58 V, V_{CC} = 5 V ± 0.25 V, T_A = 0 to 70 °C, 18 ≤ I_L ≤ I_{LMAX} (mA))

μPD9903 (T_A = 0 to 70 °C, V_{DD} = 5 V ± 0.25 V, V_{DD} = V_{AG} = 0 V, f_{DCLK} = 2048 kHz)

Parameter	Symbol	Conditions		MIN.	TYP.	MAX.	Units
DC feed resistance	R_{BF}	200 Ω feed		180	200	220	Ω
		400 Ω feed		360	400	440	
Minimum loop unit	I_{LMIN}	V_{BB} = –51 V	200 Ω feed	21.7	22.2	22.6	mA
		R_L = 1900 Ω	400 Ω feed	18.2	18.8	19.3	
Maximum current setting	I_{LMAX}	I_{LMAX} = 76 mA setting	200 Ω feed	70	76	82	mA
			400 Ω feed	50	55	60	
		I_{LMAX} = 45 mA setting		40	45	50	
		I_{LMAX} = 35 mA setting		31	35	39	
Pin voltage during on-hook	V_{TS}	Normally on-hook, between Tip and GND, V_{BB} = –48 V		2.25	2.55	2.85	V
	V_{RS}	Normally on-hook, between Ring and V_{BB}, V_{BB} = –48 V		3.05	3.35	3.65	
	V_{TS}	On-hook transmission, between Tip and GND, V_{BB} = –48 V		2.25	2.55	2.85	
	V_{RS}	On-hook transmission, between Ring and V_{BB}, V_{BB} = –48 V		3.05	3.35	3.65	
Voltage between lines during on-hook	V_{TS}	V_{BB} = –48 V		V_{BB} – 7.0	V_{BB} – 5.9	V_{BB} – 5.0	V
Supervisory control – V_{BB} fault voltage	V_{BBF}			32	35	38	V

Parameter	Symbol	Conditions		MIN.	TYP.	MAX.	Units
Loop detection operating resistance (during normal transmission)	R_{ON1}	Includes termination resistance	200 Ω feed 400 Ω feed			2500 2100	Ω
Loop detection non-operating resistance (during normal transmission)			200 Ω feed 400 Ω feed	3900 3500			
Loop detection operating resistance (during on-hook transmission)	R_{ON2}	Includes termination resistance	200 Ω feed 400 Ω feed			1900 1500	Ω
Loop detection non-operating resistance (during on-hook transmission)			200 Ω feed 400 Ω feed	2840 2440			
Loop release non-operating resistance	R_{ON3}	Includes termination resistance	200 Ω feed 400 Ω feed			2960 2560	Ω
Loop release operating resistance			200 Ω feed 400 Ω feed	4540 4140			
Ground detection 1 (C/O) operating resistance	R_{ON4}	Includes termination resistance				5.2	kΩ
Ground detection 1 (C/O) non-operating resistance				20			
Ground-fault/power line contact detection operating resistance	R_{ON6}	Includes termination resistance Off-hook stage	I_{LMAX} = 45/76 mA			340	Ω
			I_{LMAX} = 35 mA			480	
Ground-fault/power line contact detection non-operating resistance		Includes termination resistance	I_{LMAX} = 45/76 mA	870			Ω
			I_{LMAX} = 35 mA	1130			
Ground-fault/power line contact release non-operating resistance	R_{ON7}	Includes termination resistance				1.4	kΩ
Ground-fault/power line contact release operating resistance				10			

Note The above values are resistance-converted values.

Transmission Characteristics

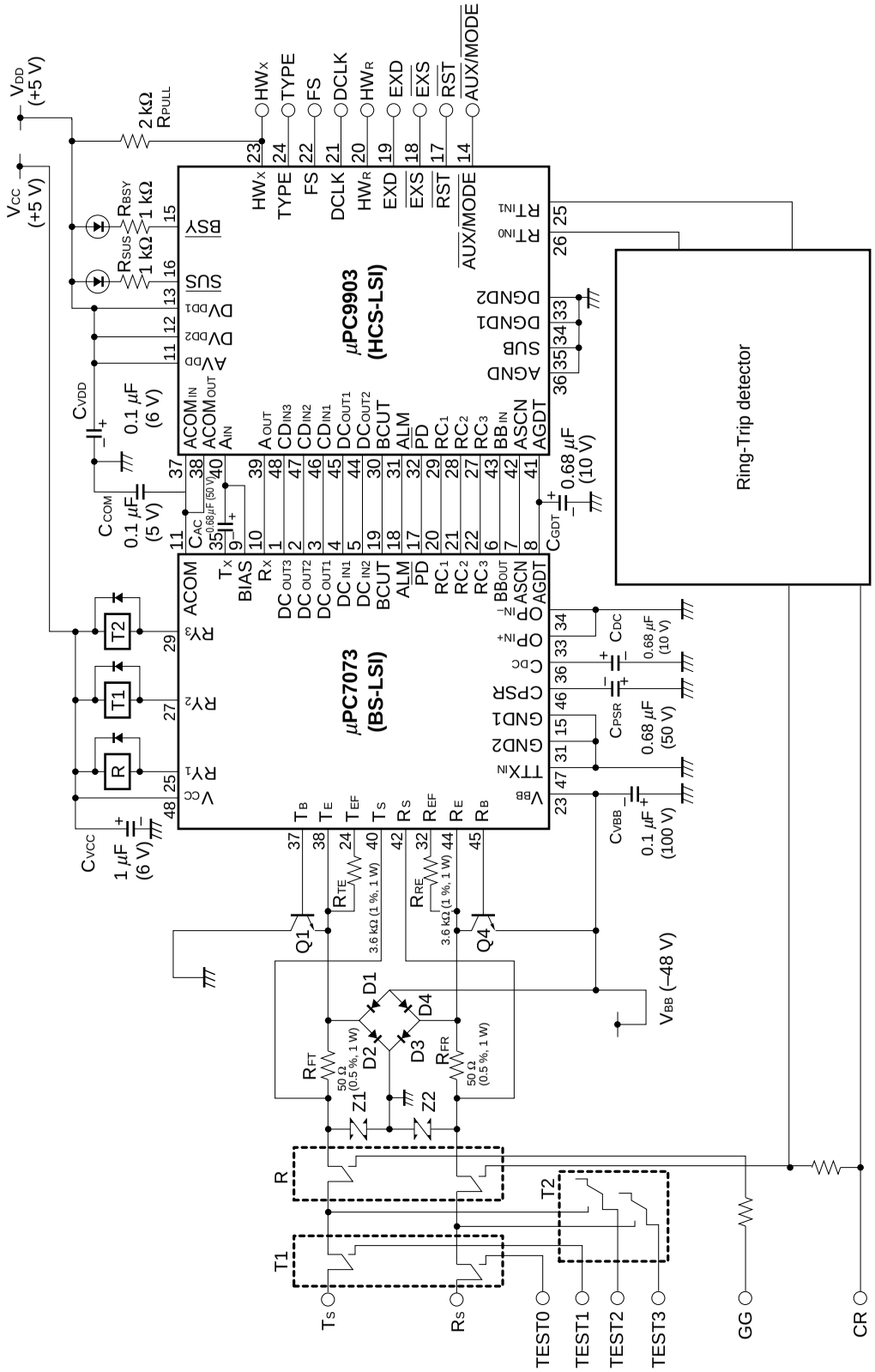
μPC7073 (V_{BB} = –42 to –58 V, V_{CC} = 5 V ± 0.25 V, T_A = 0 to 70 °C, 18 ≤ I_L ≤ I_{LMAX} (mA))

μPD9903 (T_A = 0 to 70 °C, V_{DD} = 5 V ± 0.25 V, V_{DG}= V_{AG} = 0 V, f_{DCLK} = 2048 kHz)

Parameter	Symbol	Conditions		MIN.	TYP.	MAX.	Units
Insertion loss	IL	A-D input signal 0 dBm0 1 kHz		–0.45	0.0	+0.45	dB
		D-A input signal 0 dBm0 1 kHz		–0.45	0.0	+0.45	
Transfer loss frequency characteristics	F_{RX}	A-D Reference input signal 1015 Hz 0 dBm0	60 Hz 200 Hz 300 Hz 400 to 3000 Hz 3200 Hz 3400 Hz	24.0 0.6 –0.15 –0.15 –0.15 0.2		– 2.0 +0.21 +0.15 +0.65 0.8	dB
	F_{RR}	D-A Reference input signal 1015 Hz 0 dBm0	60 Hz 200 Hz 300 Hz 400 to 3000 Hz 3200 Hz 3400 Hz	0.2 0.1 –0.15 –0.15 –0.15 0.2		4.0 1.0 +0.25 +0.15 +0.65 0.8	
Gain tracking (tone method)	GT_X	A-D Reference input signal –10 dBm0 f = 700 to 1100 Hz	+3 to –40 dBm0 –50 dBm0 –55 dBm0	–0.2 –0.5 –1.0		+0.2 +0.5 +1.0	dB
	GT_R	D-A Reference input signal –10 dBm0 f = 700 to 1100 Hz	+3 to –40 dBm0 –50 dBm0 –55 dBm0	–0.2 –0.4 –0.8		+0.2 +0.4 +0.8	
Return loss	RL	Input signal 0 dBm0 Z_T = 600 Ω + 2.16 μF	300 Hz 500 to 2000 Hz 2000 to 3400 Hz	16 20 16			dB
Echo attenuation	TBRL	Input signal 0 dBm0 Z_T = 600 Ω + 2.16 μF	300 Hz 500 to 2500 Hz 3400 Hz	18 22 18			dB
Transmit channel total power distortion ratio (tone method)	SD_X	A-D Input signal f = 700 to 1100 Hz	+3 to –30 dBm0 –40 dBm0 –45 dBm0	36 30 25			dB
	SD_R	D-A Input signal f = 700 to 1100 Hz	+3 to –30 dBm0 –40 dBm0 –45 dBm0	36 30 25			

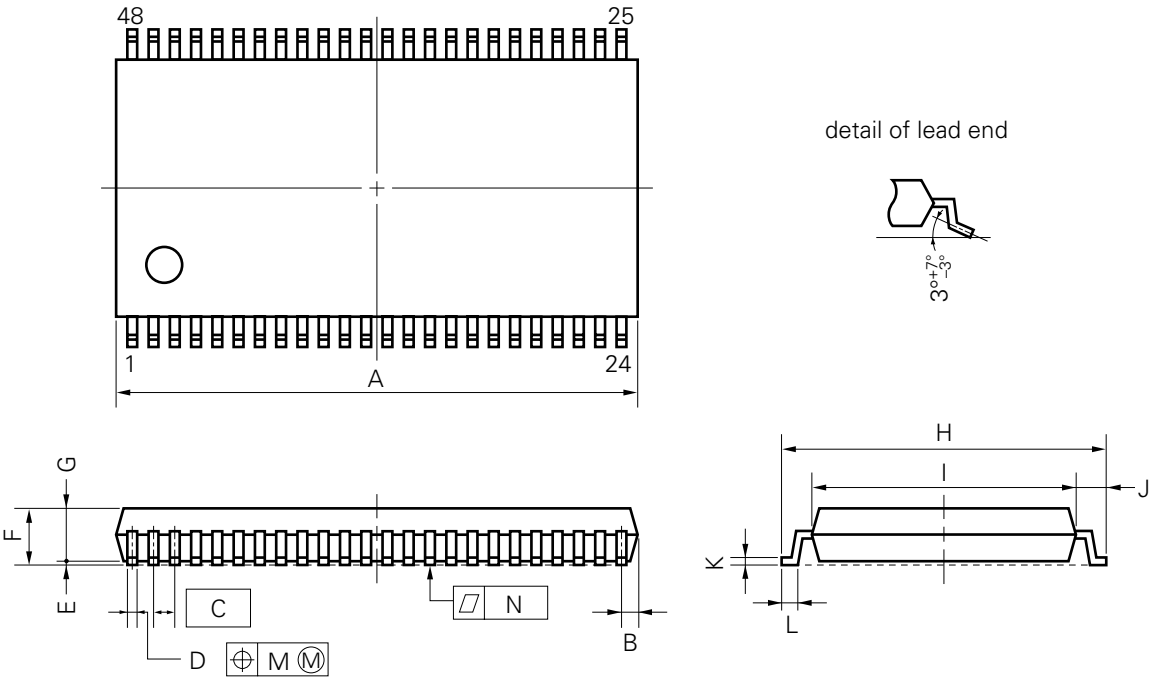
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Units
Absolute delay characteristics	D_A	A-A input signal 0 dBm0			540	μs
Absolute delay distortion frequency characteristics	D_O	A-A 500 Hz 600 HZ 1000 to 2600 Hz 2800 Hz			1400 700 200 1400	
Intermodulation (2 Tone)	IMD	A-D input signal f1, f2: 300 to 3400 Hz –4 to –21 dBm0 Measured signal: 2 × f1 – f2 level (2 × f1 – f2) vs level (f1, f2)	44.0			dB
		D-A input signal f1, f2: 300 to 3400 Hz –4 to –21 dBm0 Measured signal: 2 × f1 – f2 level (2 × f1 – f2) vs level (f1, f2)	44.0			
Single frequency noise	N_{SF}	D-A PAD level set at 0 dB Measured signal up to f = 256 kHz			–54	dBm0
Deviation in gain setting for transmit channel	ΔDGS_X	Difference from A-D reference set value Setting value: +7.5 to +3.0 dB +3.0 to –3.5 dB	 –0.2 –0.1		 +0.2 +0.1	dB
Gain setting deviation for receive chanel	ΔDGS_R	Difference from D-A reference set value Setting value: 0.0 to –5.0 dB –5.0 to –8.5 dB	 –0.1 –0.2		 +0.1 +0.2	
Idle circuit noise	ICN_{24}	2W-4W, A-law, Psophometric weighted			–67	dBm0p
		2W-4W, μ-law, C message weighted			23	dBrnc0
	ICN_{42}	4W-2W, A-law, Psophometric weighted			–76	dBm0p
		4W-2W, μ-law, C message weighted			14	dBrnc0
Line to ground balance attenuation	LB	R_F = 50 Ω, Relative accuracy = 0.5 % f = 300 to 600 Hz f = 600 to 3400 Hz	42 48			dB
V_{BB}-PSRR (tone method)	$PSRR_B$	I_L = 20 mA f = 60 to 3400 Hz f = 100 kHz	30 –5			dB
V_{CC}-PSRR (tone method)	$PSRR_C$	I_L = 20 mA f = 60 to 3400 Hz f = 100 kHz	25 5			
AC induction noise resistance	LFI	I_L = 0 mA, V_{IN} = 6 V_{rms}			43	dBrnc
		I_L = 20 mA, V_{IN} = 15 V_{rms}			20	

4. SYSTEM APPLICATION EXAMPLE USING μPC7073 AND μPD9903



5. PACKAGE DRAWING

48 PIN PLASTIC SHRINK SOP (375 mil)



P48GT-65-375B-1

NOTE

Each lead centerline is located within 0.10 mm (0.004 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	16.21 MAX.	0.639 MAX.
B	0.63 MAX.	0.025 MAX.
C	0.65 (T.P.)	0.026 (T.P.)
D	0.30 ± 0.10	$0.012^{+0.004}_{-0.005}$
E	0.125 ± 0.075	0.005 ± 0.003
F	2.0 MAX.	0.079 MAX.
G	1.7 ± 0.1	0.067 ± 0.004
H	10.0 ± 0.3	$0.394^{+0.012}_{-0.013}$
I	8.0 ± 0.2	0.315 ± 0.008
J	1.0 ± 0.2	$0.039^{+0.009}_{-0.008}$
K	$0.15^{+0.10}_{-0.05}$	$0.006^{+0.004}_{-0.002}$
L	0.5 ± 0.2	$0.020^{+0.008}_{-0.009}$
M	0.10	0.004
N	0.10	0.004

6. RECOMMENDED SOLDERING CONDITIONS

This product should be soldered and mounted under the conditions recommended below.

For details of recommended soldering conditions, refer to the information document **Semiconductor Device Mounting Technology Manual (C10535E)**.

For soldering methods and conditions other than those recommended, please contact your NEC sales representative.

SURFACE MOUNT TYPE

μPC7073GT: 48-pin plastic shrink SOP (375 mil)

Soldering Method	Soldering Conditions	Recommended Condition Symbol
Infrared reflow	Package peak temperature: 235 ˚C Duration: 30 sec. max. (210 ˚C or above) Number of times: 1	IR35-00-1
Pin heating	Pin temperature: 300 ˚C max. Duration: 3 sec. max. (per side of device)	–

Note For the storage period after unpacking from the dry-pack, storage conditions are max. 25 ˚C, 65 % RH.

Notes on Handling Devices against Electrostatic Discharge

Caution **When handling this device, special care against electrostatic discharge (ESD) must be taken. If a strong ESD is applied to this device, the junction parts of the internal transistors may be destroyed. Therefore, when transporting or storing this device, be sure to use the conductive tray or magazine case in the packing provided by NEC, or use a conductive buffer material or metal case. Also be sure to ground the operator's body and any tools that may enter in contact with the device during assembly processes. Never put or leave the device on a plastic board or table, and do not touch the device pins directly by hand.**

[MEMO]

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The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

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