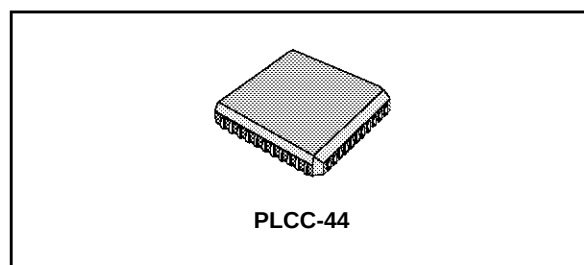


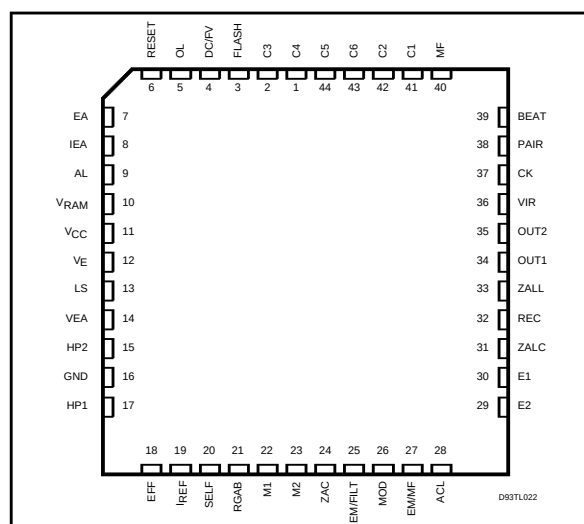
MONOCHIP TELEPHONE

ADVANCE DATA

- ADJUSTABLE SLOPE OF DC CHARACTERISTIC
- ADJUSTABLE AUTOMATIC LINE LENGTH RECEIVING AND SENDING GAIN CONTROL (NOT USED IN DTMF), WITH POSSIBILITY OF FIXED GAIN (PABX).
- ADJUSTABLE AUTOMATIC LINE LENGTH TRACKING ANTISIDETONE SYSTEM
- ADJUSTABLE DYNAMIC IMPEDANCE
- STABILIZED POWER SUPPLY FOR PERIPHERALS
- CONFIDENCE LEVEL DURING PULSE AND DTMF DIALLING
- RECEIVING AMPLIFIER FOR DYNAMIC OR PIEZO-ELECTRIC EARPIECES
- HIGH IMPEDANCE MICROPHONE INPUTS (80K Ω MIN. IN SYMMETRICAL AND 40K Ω MIN. IN ASYMMETRICAL) SUITABLE FOR DYNAMIC, MAGNETIC, PIEZO-ELECTRIC OR ELECTRET MICROPHONE
- DYNAMIC LIMITING IN SENDING (ANTICLIPPING) PREVENTS DISTORTION OF LINE SIGNAL AND SIDETONE
- ANTISQUELCH SYSTEM IN SENDING PREVENTS "ROOM NOISE" TO BE TRANSMITTED, AND IMPROVES THE ANTI-LARSEN EFFICIENCY
- LOUDHEARING PROGRAMMABLE GAIN IN 8 STEPS OF 3 dB USING THE SERIAL BUS, OR LINEARLY USING A POTENTIOMETER
- ANTILARSEN SYSTEM WHICH DOESN'T CUT THE RECEIVING VOICE
- ANTIDISTORTION SYSTEM BY AUTOMATIC GAIN CONTROL VERSUS AVAILABLE LOUDHEARING CURRENT
- RINGING BALANCED OUTPUT IN DMOS FOR HIGHER POWER CAPABILITY
- 4 RINGING TONES ADJUSTABLE WITHOUT EXTERNAL COMPONENTS
- INTERNAL SPEED UP CIRCUIT PERMITS A FASTER CHARGE OF V_{CC} AND V_{RAM} CAPACITORS
- LOGIC BOUNCE ELIMINATION
- PULSE DIALLING 66/33 OR 60/40 OR DTMF DIALLING SELECTABLE BY PROGRAMMING PIN
- ADJUSTABLE FLASHING DURATION (90ms or 265ms)



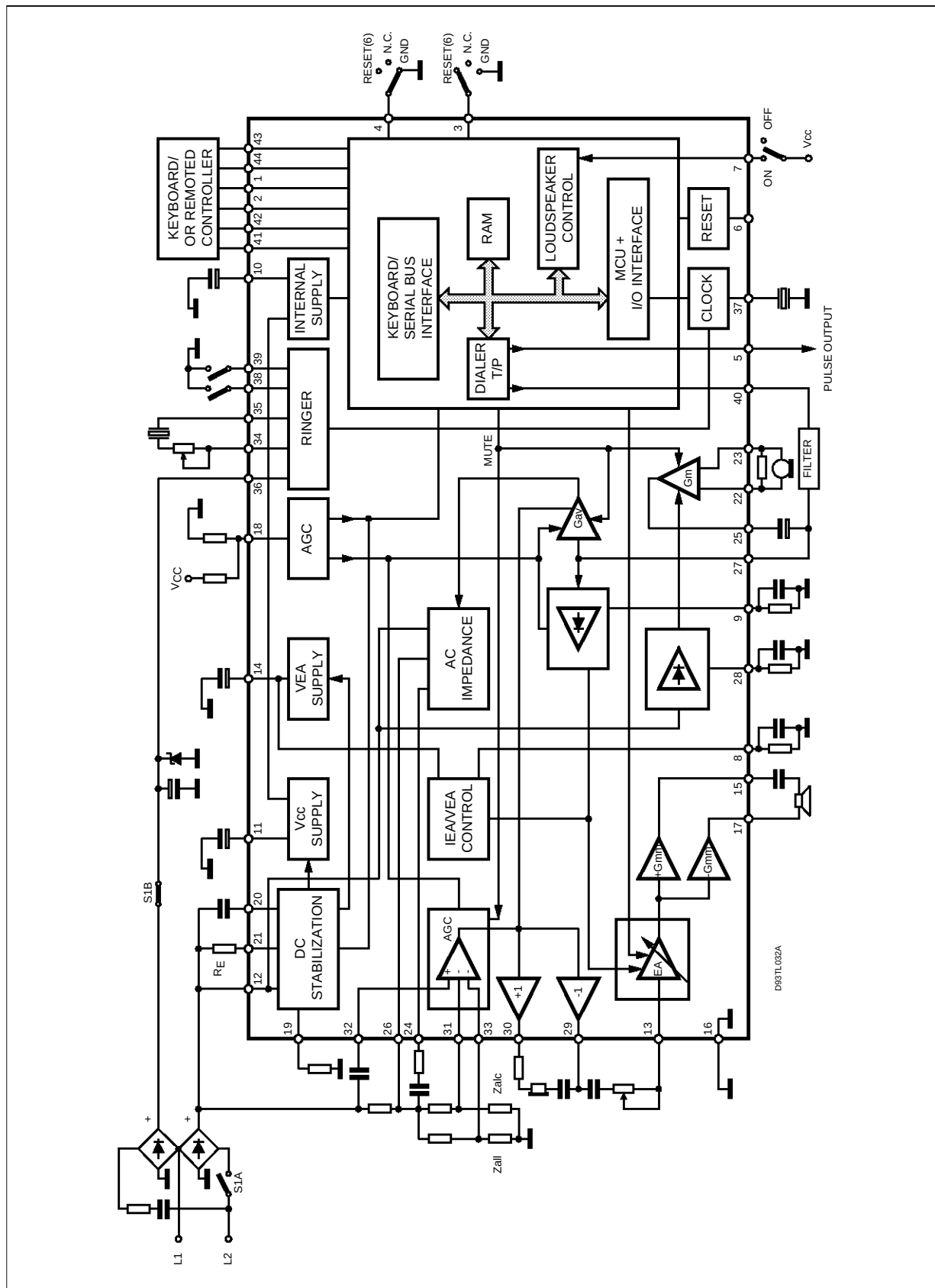
PIN CONNECTION (top view)



- INTERDIGITAL PAUSE
- CONFIDENCE TONE (440Hz)
- LAST NUMBER RADIAL UP TO 23 DIGITS
- STANDARD LOW COST CERAMIC 455KHz
- BINARY DATA INPUT IN SERIAL MODE
- TEST MODE CAPABILITY

DESCRIPTION

The L3913 monochip is a BIPOLAR CMOS-DMOS (BCD) integrated circuit that performs all the speech and line interface functions required in an electronic telephone set, the ringing function with 4 melodies, the pulse and DTMF dialling with radial, the loudhearing with antilarlsen and antidistortion systems, a keyboard interface with the possibility to interface with an external microcontroller using the internal serial bus, and a power supply for peripheral.



PIN FUNCTIONS

N°	Name	Description
1	C4	Keyboards inputs
2	C3	Keyboard inputs
3	FLASH	Flashing selection (80 or 265ms)
4	DC/FV	Dialling selection (33/66 pulse, 40/60 pulse or DTMF)
5	OL	Open line output
6	RESET	Output reset in normal case, input reset in test mode
7	EA	Loudhearing ON/OFF
8	IEA	Antidistortion time constant adjustment in loudhearing
9	AL	Antilarsen time constant adjustment in loudhearing
10	V _{RAM}	RAM and internal logic supply
11	V _{CC}	Power supply for peripherals
12	V _E	Line voltage
13	LS	Loudhearing input
14	VEA	Loudhearing supply
15	HP2	Loudspeaker output
16	GND	Ground
17	HP1	Loudspeaker output
18	EFF	line lenght AGC adjustment
19	I _{REF}	Bias adjustment
20	SELF	Electronic self input
21	RGAB	DC characteristic slope adjustment
22	M1	Microphone input
23	M2	Microphone input
24	ZAC	Dynamic impedance adjustment
25	EM/FILT	First sending stage output
26	MOD	Modulator output
27	EM/MF	NSecond sending stage input and DTMF input
28	ACL	Anticlippping time constant adjustment
29	E2	Receiver output
30	E1	Receiver output
31	ZALC	Short line sidetone network
32	REC	Receiver input
33	ZALL	Long line sidetone network
34	OUT1	Buzzer output
35	OUT2	Buzzer output
36	VIR	Ringing supply
37	CK	Ceramic input (455KHz)
38	PAIR	Ajustment between 2 pairs of ringing frequencies
39	BEAT	Beat ajustment of each pair
40	MF	DTMF output
41	C1	Keyboard inputs
42	C2	Keyboard Inputs
43	C6	Keyboard inputs
44	C5	Keyboard inputs

L3913

ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$; $f = 1\text{kHz}$; $R_E = 20\text{k}\Omega$; all resistance are specified at 1%, all capacitance at 2%)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit	Fig.
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DC CHARACTERISTICS

V_L	Line Voltage	$I_L = 15\text{mA}$	-	4.4	4.9	V	1
		$I_L = 25\text{mA}$	5.75	6.15	6.55	V	1
		$I_L = 60\text{mA}$	12.75	13.15	13.55	V	1
V_{CC}	Stabilized Voltage Supply	$I_{CC} = 0.6\text{mA}$ $I_L = 8.3\text{mA}$	2	2.5	-	V	1
		$I_{CC} = 2.1\text{mA}$ $I_L = 25\text{mA}$	3.15	3.4	3.65	V	1
I_{RAM}	Operative	VRAM = 3.5V	-	-	500	μA	
I_{RAM}	STAND-BY	VRAM = 3.5V	-	-	300	nA	

RECEPTION

GR1	Receiving Gain	$I_L = 25\text{mA}$ $V_L = 0.3\text{Vrms}$	10	11	12	dB	2
GR2	Receiving Gain	$I_L = 60\text{mA}$ (see AGCR)	2.5	4	5.5	dB	2
AGCR	Delta Gain Receive	$I_L = 60\text{mA}$ (to be applied only if GR2 is not respected)	6.3	7	7.7	dB	2
R_X	Distortion	$I_L = 30\text{mA}$; $V_{out} = 5\text{Vpp}$	-	0.6	3	%	2
		$I_L = 60\text{mA}$; $V_{out} = 5\text{Vpp}$	-	0.6	3	%	2
Z_{out}	Receiver	$I_L = 25\text{mA}$; $V_{out} = 50\text{mVrms}$	45	65	85	Ω	2
R_X	Offset	$I_L = 25\text{mA} / 60\text{mA}$	-500	-	500	mV	2
	Sidetone	$I_L = 25\text{mA}$ $V_{MI} = 2\text{mVrms}$	-	30	-	dB	1
		$I_L = 60\text{mA}$	-	16	-	dB	1

TRANSMISSION

GS1	Sending GAIN	$I_L = 25\text{mA}$ $V_{mic} = 2\text{mVrms}$	47.5	48.5	49.5	dB	1
GS2	Sending GAIN	$I_L = 60\text{mA}$ (see SGCS)	40.4	41.9	43.4	dB	1
AGCS	Delta GAIN sending	$I_L = 60\text{mA}$ (to be applied only if GS2 is not respected)	5.9	6.6	7.3	dB	1
CMRR	Common Mode Rejection	$I_L = 25\text{mA}$; $V_{cm} = 50\text{mVrms}$	-	75	-	dB	1
T_X	Distortion	$I_L = 36\text{mA}$ $V_{mi} = 5\text{mVrms}$	-	-	3	%	1
		$V_{mi} = 5\text{mVrms} + 10\text{dB}$	-	-	5	%	1
		$V_{mi} = 5\text{mVrms} + 20\text{dB}$	-	-	7	%	1
AS	GAIN Attenuation	$I_L = 25\text{mA}$ $V_{mi} = 2\text{mVrms}$	65	-	-	dB	1
Z_{in}	Microphone Impedance	$I_L = 30\text{mA}$	85	120	-	$\text{K}\Omega$	1
T_X	Offset Pin 25 (DTMF - T_X)	$I_L = 25\text{mA} / 60\text{mA}$	- 100		+ 100	mV	1
T_X swing	Tx Output Voltage Swing	$I_L = 36\text{mA}$ $V_{mi} = 5\text{mVrms} + 10\text{dB}$	3.2	3.8	4.4	Vpp	1
T_X squelch	Dynamic Range	$I_L = 25\text{mA}$ $V_{mic} = 1\text{mVrms} / 0.15\text{mVrms}$	7.5	9	10.5	dB	1
Z_{LINE}	Matching	$I_L = 25\text{mA}$ $I_L = 60\text{mA}$	580	630	680	Ω	2

NOISE

T_X	Noise	$I_L = 25\text{mA}$ (psophometric)	-	- 78	-	dBmp	1
R_X	Noise	$I_L = 25\text{mA}$ (psophometric)	-	200	-	μVp	2

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit	Fig.
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LOUDHEARING

V_{ea}	Loudhearing Supply	$I_L = 25mA$ $I_L = 60mA$	3.5 7.8	3.8 8.2	4.1 8.9	V V	3 3
G_{ea}	Loudhearing Gain	$I_L = 30 / 50mA$ $V_{LS} = 20mVrms$	19.7	20.7	21.7	dB	3
ΔG_{ea}	8 Steps Programmable Gain Using Serial Bus	$I_L = 25 / 60mA$ $V_{LS} = 20mVrms$	-	3	-	dB	3
Z_{ih}	Input Impedance	$I_L = 30mA$	24	34	44	K Ω	3
LH	Distortion LOAD = 100 Ω	$I_L = 50mA$ $V_{LINE} = 200mVrms$ $V_{LINE} = 350mVrms$	- -	1 4.5	3 7	% %	3 3
LH	Offset	$I_L = 25mA$	-120	-	+120	mV	3
I_{LEAK}	Leakage Pin I_{EA}	$I_L = 25mA$	-	-	100	nA	3
LH	Offset Pin AL	$I_L = 25mA$	-	-	150	mV	3
LH	Antilarsen Attenuation	$I_L = 30mA$ Pin 9 to V_{CC}	5.75	6.25	6.75	dB	3

RINGER

$V_{turn-on}$	Threshold on	Measured at Pin V_{IR}	14	15	17	V	4
$V_{turn-off}$	Threshold off		10.5	12	14	V	4
I_S	Supply Current	$V_S = 17V$ no load	-	1.2	1.6	mA	4
F_{out}	Frequencies	Pin 38 = GND $V_{IR} = 32V$	1450 1160	1458 1166	1465 1172	Hz Hz	4 4
		Pin 38 = Open $V_{IR} = 32V$	544 435	547 438	550 441	Hz Hz	4 4
		Pin 39 = GND Pin 39 = Open $V_{IR} = 32V$	3.9 9	4 9.1	4.1 9.2	Hz Hz	4 4
V_{out}	Output Voltage Swing	$V_{IR} = 32V$	30	-	-	V	4
I_{IL}	Input Low	$V_{IR} = 32V$ BEAT, PAIR (Pins 38, 39) $V_{IL} = 1V$	- 12	- 7	- 1.5	μA	4

DTMF GENERATION

	DTMF Frequency Tolerances	$I_L = 25mA$	-0.4	-	+0.25	%	1
	DTMF Level	$I_L = 25 / 60mA$ Low group High group Preemphasis	-10	-8	-6	dBm	1
			-8	-6	-4	dBm	1
			1	2	3	dB	1
	DTMF Distortion	$I_L = 25mA$ BW = 20kHz	see MASK fig. 6				
	DTMF Feedback	$I_L = 60mA$ referred to the line voltage RX LH	-	- 19	-	dB	5
			-	- 2.5	-	dB	5
	Flash Operating Current		8.3	-	-	mA	1
TMF	Transmission Time		80.1	81.7	83.3	ms	1
T_{IDMF}	Interdigit Time		87.4	89.2	91.5	ms	1
T_{mMF}	Transmission Mute		167.5	170.9	174.3	ms	1
	Confidence Tone	Only by Serial Bus	-	440.9		Hz	1
	Confidence Tone Level	$I_L = 25mA$	-	- 9	-	dBm	1

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit	Fig.
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LEAKAGE ($V_{RAM} = 3.5V$)

I_{KL}	Input Low (Keyboard current)	C1 % C6 (pins 1, 2, 41 % 44) $V_{IL} = 0.5V$	1.5	-	5	μA	
I_{il}	Input Low	C1 % C6 (pins 1, 2, 41 % 44) $V_{IL} = 0.4V$	150	450	1300	μA	
		CK (pin 37) $V_{IL} = 0.5V$	-	-	1	μA	
I_{ih}	Input High	EA (pin 7) $V_{IH} = 3.5V$	5	11.5	16	μA	
		DCFV (pin 4), Flash (3) $V_{IL} = 0V$	- 10	- 6	- 1.5	μA	
		C1 % C6 (pins 1, 2, 41 % 44) $V_{IH} = 3.1V$	- 1300	- 450	- 150	μA	
		DCFV (pin 4), Flash (3), CK(37) $V_{IH} = 3.5V$	- -	- -	1 1	μA μA	
I_{ol}	Output Low	Reset (pin 6) $V_{OL} = 0.4V$	0.2	-	1.3	mA	
		OL (pin 5)	0.7	-	3.7	mA	
I_{oh}	Output High	Reset (pin 6) $V_{OH} = 2.85V$	- 1.8	- 0.6	- 0.2	mA	
		OL (pin 5) $V_{OH} = 0.7V$	- 30	-	- 8	μA	

TIMING AND FREQUENCY

t_r	Reset Time	In mode DTMF	-	34.3	-	ms	7
		In mode 60/40	-	30	-	ms	7
		In mode 66/33	-	33	-	ms	7
t_{on}	Clock Start-up Time		-	5	-	ms	
t_{lb}	Time line Break generating a Reset	In mode 60/40	290	-	300	ms	7
		In mode 66/33	319	-	330	ms	7
		In mode DTMF	341	-	343	ms	7
t_e	Debounce Time	In mode 60/40	14	24	34	ms	
		In mode 66/33	15.4	26.4	37.4	ms	
		In mode DTMF	16	27.4	38.9	ms	

SERIAL BUS

t_{wl}, t_{wh}	Pulse Width Clock		2	-	-	μs	8
t_{el}, t_{eh}	Pulse Width Enable Signal		2	-	-	μs	8
$t_{set up}$	Set-up Time Data to Clock		0	-	-	ns	8
	Hold Time Data Drom Clock		100	-	-	ns	8
t_e	Enable Time		0	-	-	ns	8
t_{RRN}	Time Between two Transmissions		900	-	-	μs	8

PULSE DIALLING (OL)

	Dialling Pulse Frequency	In mode 60/40 (pin 4 tied to RESET)	-	10	-	Hz	
		In mode 66/33 (pin 4 not Connected)	-	10.11	-	Hz	
T_{OL}	Dialling Pulse Period	pin 4 tied to RESET	-	100	-	ms	
		pin 4 n.c.	-	98.9	-	ms	
t_b	Break Time	pin 4 tied to RESET	-	60	-	ms	
		pin 4 n.c.	-	66	-	ms	
t_m	Make Time	pin 4 tied to RESET	-	40	-	ms	
		pin 4 n.c.	-	33	-	ms	

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit	Fig.
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PULSE DIALLING (OL) continued.

t_{IDOL}	Interdigit		830 813	- -	833 816.5	ms ms	
t_{mol}	Transmission Mute n Pulses Dialling	See note below					
t_{FI}	Flash Pulse Duration	Pin 3 to GND, Pin 4 n.c.	99	-	101.2	ms	
		Pin 3 n.c., Pin 4 n.c.	264	-	266.2	ms	
		Pin 3 to GND, Pin 4 to Reset	90	-	92	ms	
		Pin 3 to GND, Pin 4 to GND	92	-	94	ms	
		Pin 3 n.c., Pin 4 to Reset	240	-	242.2	ms	
		Pin 3 n.c., Pin 4 to GND	264	-	266	ms	
		Pin 3 to Reset, Pin 4 to Reset	110	-	112.2	ms	
		Pin 3 to Reset, Pin 4 to GND	115	-	117	ms	
		Pin 3 to Reset, Pin 4 n.c.	121	-	123.2	ms	
t_{mtl}	Transmission Mute	In mode 60/40	830	-	832	ms	
		In mode 66/33	813	-	815.5	ms	
		In mode DTMF	860	-	880	ms	
t_p	Pause Time	In mode 60/40	3034	-	3038	ms	
		In mode 66/33	2994	-	2998	ms	
		In mode DTMF	3028	-	3032	ms	
	Clock Keyboard: Minimum time to respect, in order to take the pressed pushbutton into account	Pin 4 to pin 6	14	24	34	ms	
		Pin 4 n.c.	15.4	26.4	37.4	ms	
		Pin 4 to GND	16	27.4	38.9	ms	
	Clock Keyboard: Minimum time to respect, in order to take the released pushbutton into account	Pin 4 to pin 6	24	24	34	ms	
		Pin 4 n.c.	26.4	26.4	37.4	ms	
		Pin 4 to GND	27.4	27.4	38.9	ms	

Note:

Min.	Max.	Unit
$n \times 100 + 30$	$n \times 100 + 32$	ms
$n \times 98.9 + 22$	$n \times 100 + 24.2$	ms

Figure 1.



Figure 3.

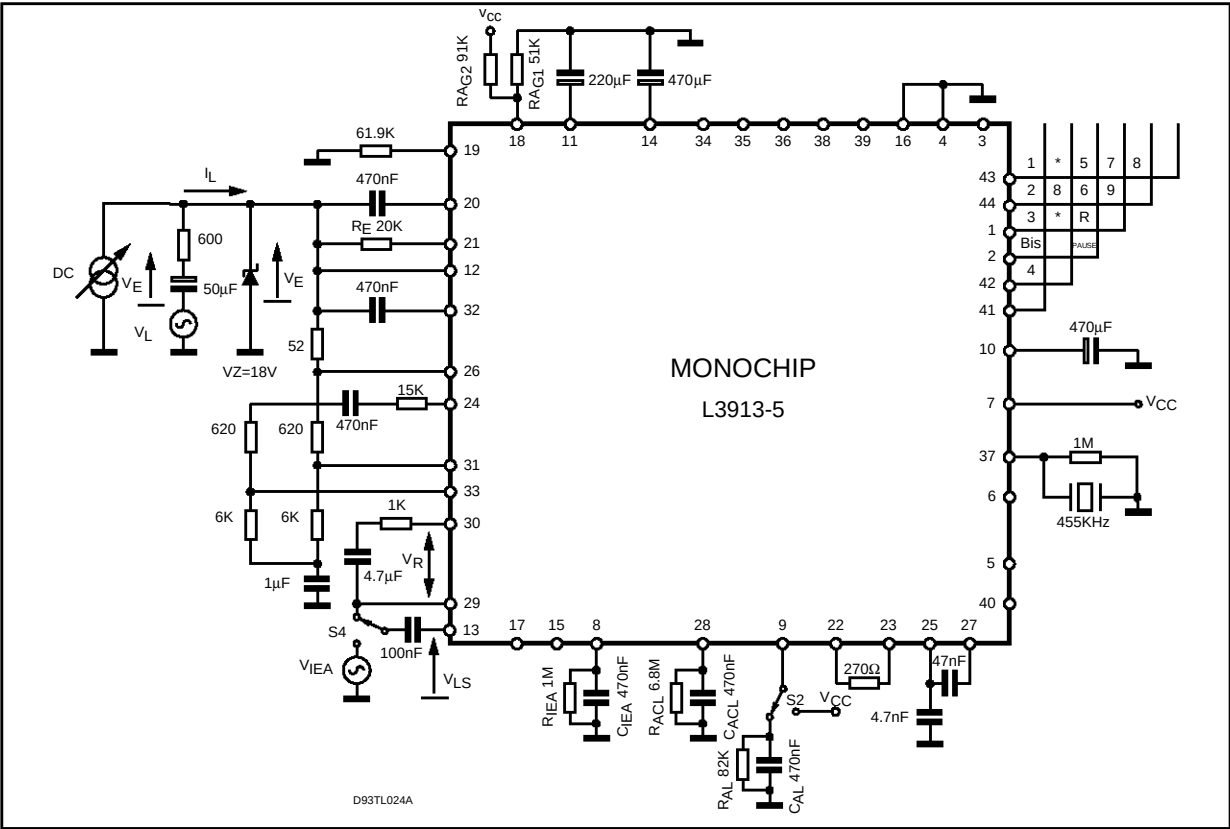


Figure 4.

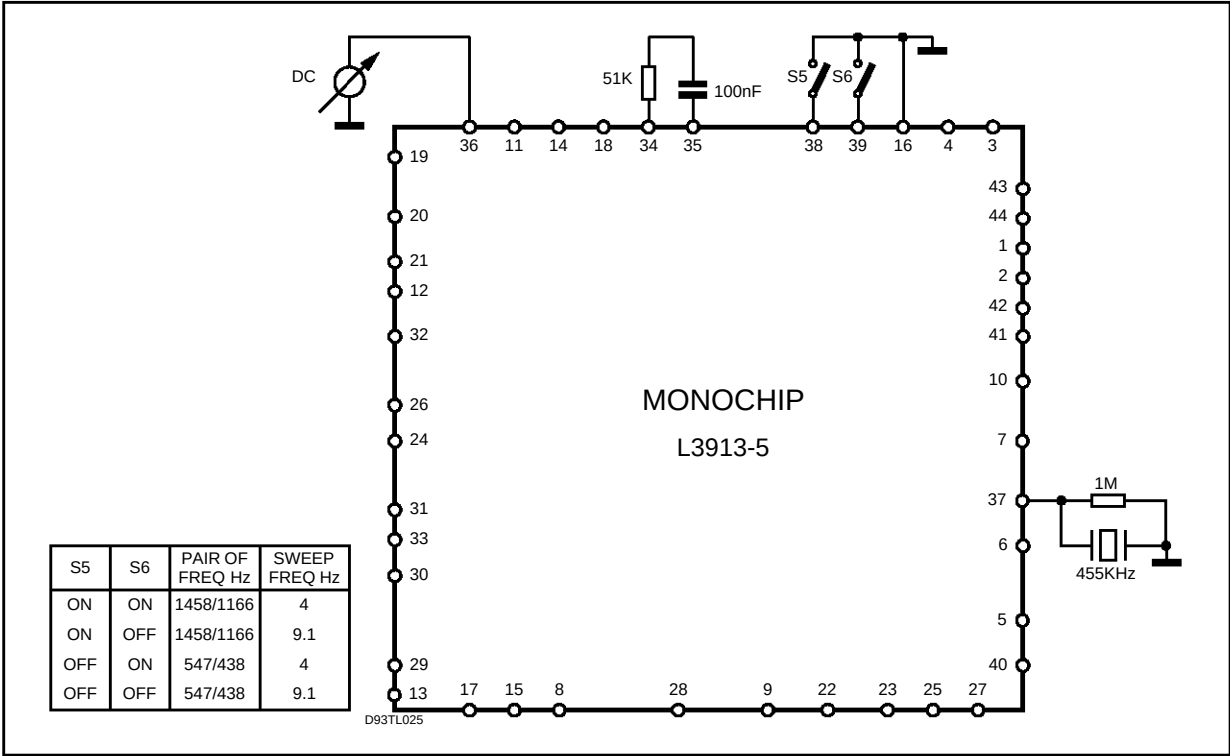


Figure 5.

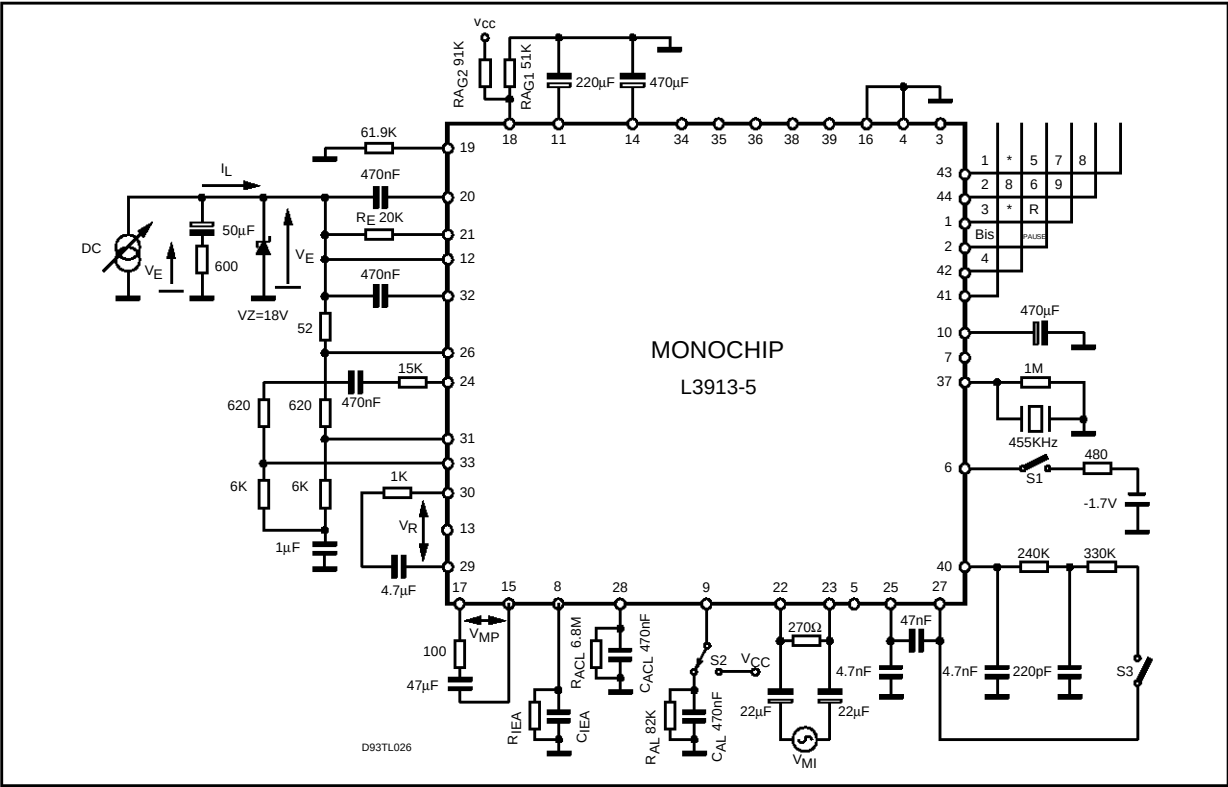
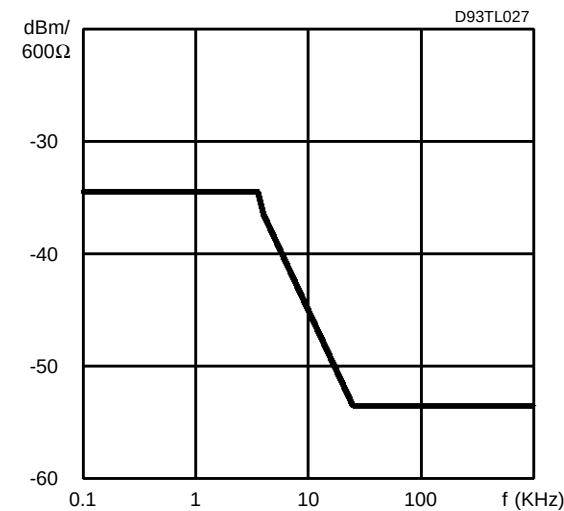


Figure 6: DTMF Distortion French Specification.



LINE BREAK DESCRIPTION

After a line break longer than a Time Line Break (tlb) an internal reset is generated. A short line break < tlb does not affect the reset.

POWER ON RESET TIMINGS (After Line Break)

Figure 7a: $V_{RAM} > V_{Son}$ at $t = 0$

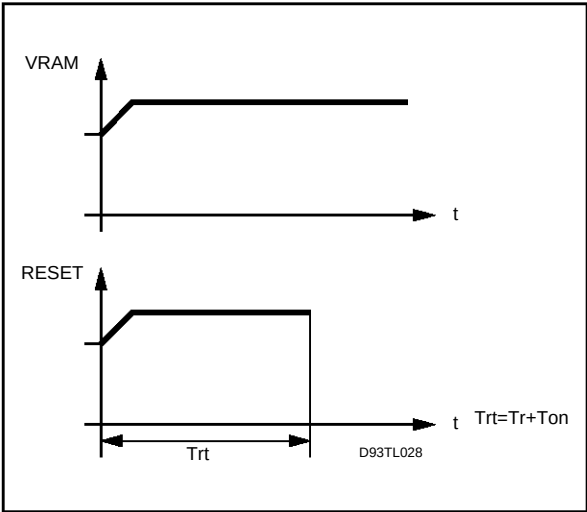
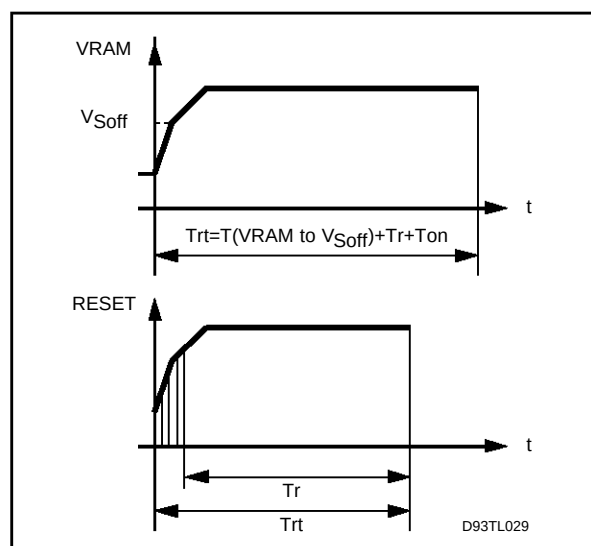
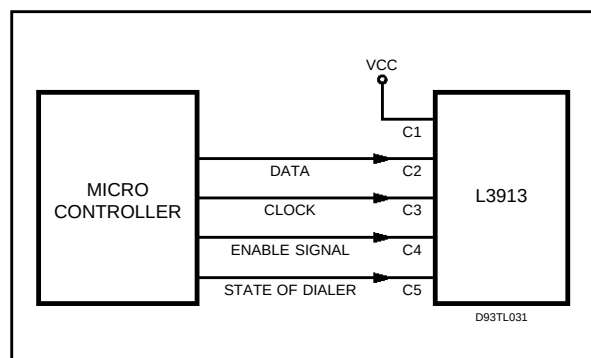
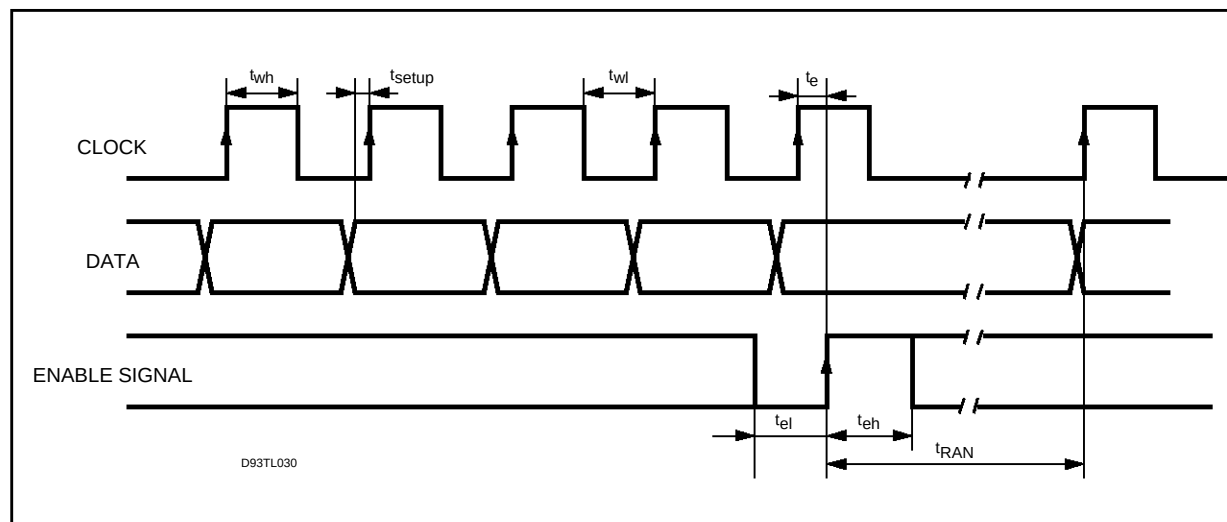


Figure 7b: $V_{RAM} < V_{Son}$ at $t = 0$ 

Pin reset: It is the power on reset output.

Figure 8.**Figure 9:** Timing serial bus.

DIALER FUNCTIONAL DESCRIPTION

The monochip includes a dialling circuit for either pulse dialling or dual tone multifrequency dialling. The dialler transmits the codes decoded by the logic keyboard on the outputs 0L and DTMF.

DIALING MODE SELECTION

The default dialling mode is selected by the tri-level pin DC/FV (pin 4):

- DC/FV open: pulse dialling in 66/33ms
- DC/FV to pin Reset: pulse dialling in 60/40ms
- DC/FV to pin GND: DTMF dialling calibrated
- mixed mode

When the circuit is in pulse mode, it is possible to change to DTMF dialling with the " * " key. The circuit returns in pulse mode after a reset condition or after a flash pulse.

DIALLING CODES

These are the numeric keys 0 to 9, and the non numeric keys A, B, C, D, *, #. All of them are stored in RAM.

The codes A, B, C, D can be only transmitted by the serial bus, not by standard key board.

In pulse dialling, the code #, B, C, D have no effect on the dialling. The code A (in pulse mode) corresponds to 11 pulses.

SERIAL BUS DESCRIPTION

A microcontroller can be connected to the monochip by 4 pins C2, C3, C4, C5 (see fig. 8)

C1 must be connected to V_{CC} to select the serial mode operation.

C2 sends the data, C3 the clock, C4 the enable

L3913

signal, C5 indicates the state of the dialler (if C5 = 0 the dialler is busy, if C5 = 1 the dialler is free).

Data is a 5 bits serial word shifted in a 5 bits register during the positive transition of the clock pulse. The positive transition of the enable signal

validates the acquisition of the last 5 bits.

Timings diagram in fig. 9 shows the details of serial bus synchronization.

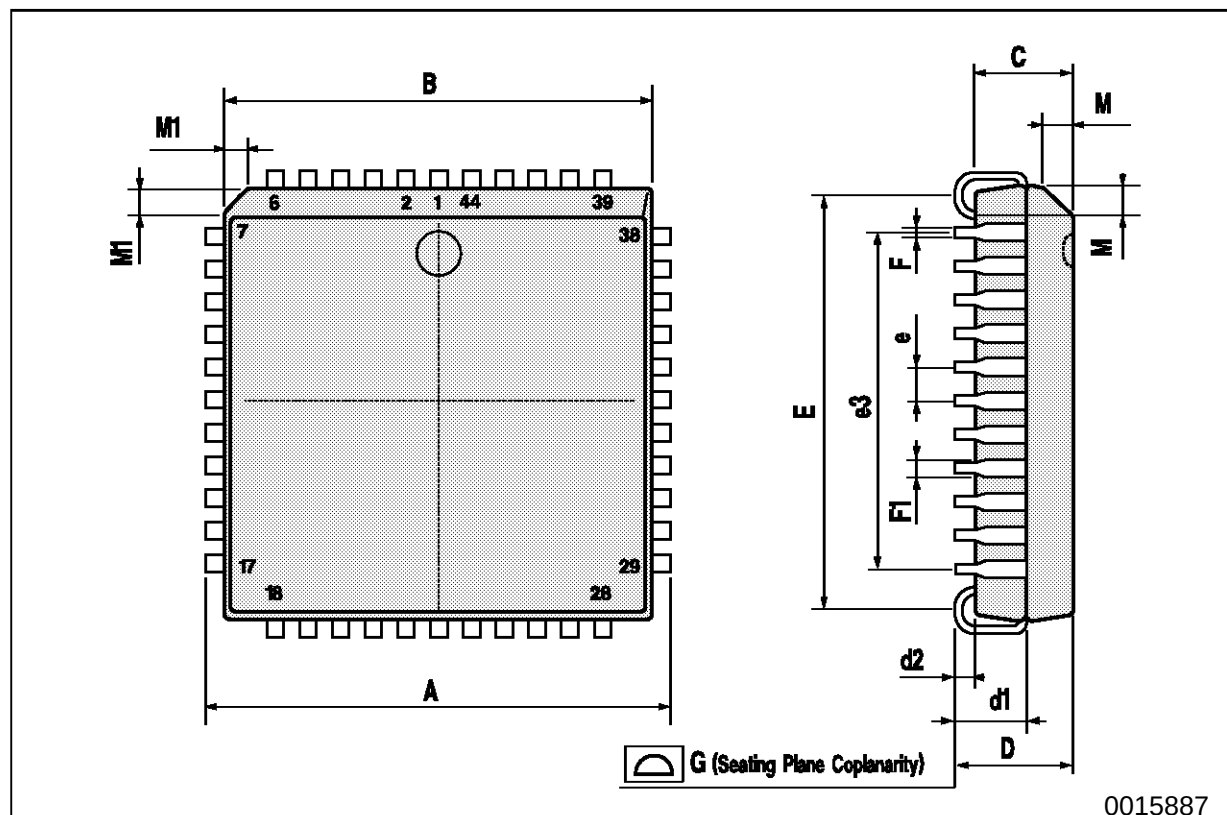
Table 1 explains the "CODE ENTRY" in serial bus mode.

Table 1: Code Entries.

0	0	0	0	0	*
0	0	0	0	1	1
0	0	0	1	0	2
0	0	0	1	1	3
0	0	1	0	0	4
0	0	1	0	1	5
0	0	1	1	0	6
0	0	1	1	1	7
0	1	0	0	0	8
0	1	0	0	1	9
0	1	0	1	0	0
0	1	0	1	1	A
0	1	1	0	0	B
0	1	1	0	1	C
0	1	1	1	0	D
0	1	1	1	1	*
1	0	0	0	0	RESERVED
1	0	0	0	1	R: FLASH
1	0	0	1	0	REDIAL
1	0	0	1	1	LOUDSPEAKER ON
1	0	1	0	0	CONFIDENCE TONE
1	0	1	0	1	MICROPHONE MUTE
1	0	1	1	0	PAUSE
1	0	1	1	1	RESERVED
1	1	0	0	0	LOUDSPEAKER LEVEL 0dB
1	1	0	0	1	LOUDSPEAKER LEVEL 3dB
1	1	0	1	0	LOUDSPEAKER LEVEL 6dB
1	1	0	1	1	LOUDSPEAKER LEVEL 9dB
1	1	1	0	0	LOUDSPEAKER LEVEL 12dB
1	1	1	0	1	LOUDSPEAKER LEVEL 15dB
1	1	1	1	0	LOUDSPEAKER LEVEL 18dB
1	1	1	1	1	LOUDSPEAKER LEVEL 21dB

PLCC44 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	17.4		17.65	0.685		0.695
B	16.51		16.65	0.650		0.656
C	3.65		3.7	0.144		0.146
D	4.2		4.57	0.165		0.180
d1	2.59		2.74	0.102		0.108
d2		0.68			0.027	
E	14.99		16	0.590		0.630
e		1.27			0.050	
e3		12.7			0.500	
F		0.46			0.018	
F1		0.71			0.028	
G			0.101			0.004
M		1.16			0.046	
M1		1.14			0.045	



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