Silan Microelectronics

T/P DIALER WITH REDIAL & HANDFREE,HOLD

DESCRIPTION

   The SC91650A/B, SC91651A/B, SC91652A/B are 13-memory Tone/Pulse switchable dialer with Last Number Redial(LNB) and HOLD function, which are fabricated in COMS technology with wide operating voltage for both tone and pulse mode, and consumes very low memory retention current in ON-HOOK state.

DIP-18-300-2.54

DIP-22-400-2.54

FEATURES

 * 13-memory Tone/Puls e switchable dialer
 * Three 16-digit one touch memory and ten 16-digit two touch memory
   One 32-digit last number redial memory
   One 32-digit SAVE function for storing phone number in off hook status
   Note: only 15-digit/31-digit for Tone mode, 1-digit use to identify tone
        mode
 * Pulse-to-tone (P→T) is provided for PBX operation
 * Flash key is available
 * Minimum tone duration is 100ms for SC91650, SC91651 or 91ms for
   SC91652
 * Minimum intertone pause is 106ms for SC91650, SC91651 or 91ms for
   SC91652
 * Uses 3.579545MHz crystal or ceramic resonator
 * Many options can be selected
   Mode (10PPS; 20PPS; Tone)
   M/B ratio (40:60;33:66)
    Pause time (3.6s;2.0s)
    Pulse number (n;n+1;10-n)
   Flash function (RESET;digit)
   (P→T) pause time (3.6s;1.0s)
    Flash time (80ms; 93ms; 100ms; 200ms; 300ms; 600ms)
    Flash pause time (200ms; 1000ms)
 * Redial pause time (1ms)
 * Mixed dialing and cascade dialing is provided
 * Handfree function is provided for speaker phone application
 * Power on reset circuit is provided
 * Hold function is provided
 * Keytone is provided
 * Packaged in 18-DIP or 22-DIP
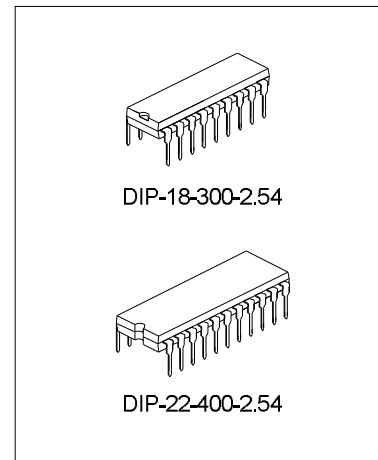
## ORDERING INFORMATION

Device	Package
SC91650A	DIP-18-300-2.54
SC91650B	DIP-22-400-2.54
SC91651A	DIP-18-300-2.54
SC91651B	DIP-22-400-2.54
SC91652A	DIP-18-300-2.54
SC91652B	DIP-22-400-2.54

SELECTION GUIDE

	HDI	HFI	PO	PMUTE	KT	Tone Duration
SC91650A	N	N	Inverter	N	N	100mS
SC91650B	⌐	⌐	Inverter	N	N	100mS
SC91651A	N	N	Open drain	N	N	100mS
SC91651B	⌐	⌐	Open drain	N	N	100mS
SC91652A	N	N	Open drain	N	N	91mS
SC91652B	N	⌐	Open drain	Y	Y	91mS

BLOCK DIAGRAM
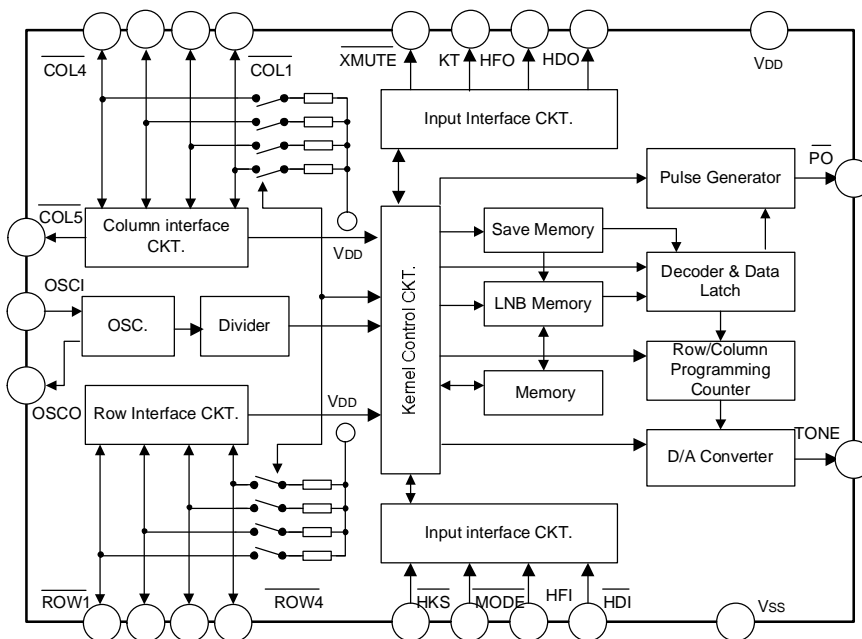
KEYBOARD ASSIGNMENT

	$\overline{C1}$	$\overline{C2}$	$\overline{C3}$	$\overline{C4}$	$\overline{C5}$
$\overline{R1}$	1	2	3	SAVE	EM1
$\overline{R2}$	4	5	6	F	EM2
$\overline{R3}$	7	8	9	A	EM3
$\overline{R4}$	*/T	0	#	RD/P	ST

1) */T: In pulse mode, execute P→T function; In TONE mode, execute * key

2) SAVE: SAVE key.

3) F: Flash key

4) RD/P: Redial key/Pause key

5) ST: Store key

6) EMn: One touch memory key

7) A: Auto key for two touch memory

DIALING SIGNAL OPTION

The resistor connection between selected Row (or Column) and Vss may select most country telecom specifications (refer to Row and Column pin description). Those options include M/B ratio, Flash time, pause time …… , as follows.

a): Make/Break ratio:

$\overline{Row1}$	M/B ratio (%)
NR	40:60
R	33:66

b): Pause time & P→T wait time:

$\overline{Row2}$	tp(sec)	tpT(sec)
NR	3.6	3.6
R	2.0	1.0

c): Flash Key function:

$\overline{Column1}$	Flash key	tFP(sec)
NR	Reset	0.2/0*
R	Digit	1.0

* for flash time = 80ms, 200ms only

d): Flash time:

$\overline{Row3}$	$\overline{Row4}$	Flash time (ms)
NR	NR	600
NR	R	300
R	NR	93 *100
R	R	200 *80

*for SC91652 only

e): Dialing out Pulse number:

$\overline{Column3}$	$\overline{Column4}$	Pulse number
NR	NR	n
NR	R	n+1
R	NR	10-n
R	R	reserved

Note: 1). NR = No resistor connection to Vss.

2). R = A resistor connection to Vss (820k typically).

3). N = Pressed digit key.

4). The following list is the corresponding pulse (break) numbers that are sent out by pressed the number keys.

Digit key	Normal (n)	New Zealand (10-n)	Sweden/Denmark (n+1)
1	1	9	2
2	2	8	3
3	3	7	4
4	4	6	5
5	5	5	6
6	6	4	7
7	7	3	8
8	8	2	9
9	9	1	10
0	10	10	1
*	P→T KEY	P→T KEY	P→T KEY
#	ignored	ignored	ignored

Dialing signal option

ABSOLUTE MAXIMUM RATING (Tamb=25°C, All voltage referenced to Vss, unless otherwise specified)

Characteristics	Symbol	Ratings	Unit
Power Supply Voltage	V_{DD}	6.0	V
Input Voltage	V_{IN}	-0.3~V_{DD}+0.3	V
Power Dissipation	P_D	500	mW
Operating Temperature	T_{opr}	-25~+70	°C
Storage Temperature	T_{stg}	-55~+150	°C

ELECTRICAL CHARACTERISTICS (Tamb=25°C, VDD=2.5V, fosc=3.579545MHz, All voltage referenced to Vss, unless otherwise specified)

Characteristics		Symbol	Conditions		Min.	Typ.	Max.	Unit
DC Characteristics								
Operating Voltage		V_{DD}	Tone		2.0	--	5.5	V
			Pulse		2.0	--	5.5	
			Memory retention		1.0		5.5	
Operating Current		I_{OP}	Tone		--	0.4	1	mA
			Pulse	OFF-HOOK, Keypad entry with pull down resistance	--	0.2	0.5	
				OFF-HOOK, No Keypad entry		20	80	μA
Standby Current		I_S	ON-HOO K,No keypad entry		--	0.1	1.0	μA
Memory Retention Current		I_{mr}	ON-HOO K,VDD=1.0V		--	0.1	1.0	μA
Control Pin Input Low Voltage		V_{il}	--		V_{SS}		0.3V_{DD}	V
Control Pin Input High Voltage		V_{ih}	--		0.7V_{DD}		V_{DD}	
$\overline{XMUTE}$ Pin Leakage Current		I_{mth}	$V_{\overline{XMUTE}}$ =6.0V		--	--	1	μA
$\overline{XMUTE}$ Pin Sink Current		I_{mtl}	$V_{\overline{XMUTE}}$ =0.5V		0.2	--	--	mA
HKS Pin Input Current		I_{hks}	Vhks=2.5V		--	--	0.1	μA
Keyboard Scanning Pin	Drive Current	I_{kbd}	V_n=0V(note1), No resistors connected to Vss		2	10	50	μA
	Sink Current	I_{kbs}	V_n=2.5(note1) No resistors connected to Vss		200	400	800	
Key-in Debounce Time		t_{DB}	--		--	20	--	ms
HFI pin input resistor		R_{hfi}	VDD=2.5V		--	200	--	kΩ
HFO pin drive current		I_{hdoh}	Vhfo=2.0V		0.2	--	--	mA
HFO pin sink current		I_{hdol}	Vhfo=0.5V		0.2	--	--	mA
$\overline{HDI}$ pin pull high resistor		R_{hdi}	VDD=2.5V		--	200	--	kΩ
HDO pin drive current		I_{hdoh}	Vhdo=2.0V		0.2	--	--	mA
HDO pin sink current		I_{hdol}	Vhdo=0.5V		0.2	--	--	mA

(To be continued)

(Continued)

Characteristics		Symbol	Conditions	Min.	Typ.	Max.	Unit
Pulse Mode							
Pulse Output Pin Leakage Current		Ipoh	Vpo=2.0V(SC91650 only)	0.2	--	--	mA
Pulse Output Pin Sink Current		Ipol	Vpo=0.5V	0.2	--	--	mA
Pulse Rate		fpr		--	10	--	pps
				--	20	--	
Make/Break Ratio		tM：tB		--	40:60	--	%
				--	33:66	--	
Pre-digit Pause		tPDP	M/B ratio=40:60	--	40	--	ms
			M/B ratio=33:66	--	33	--	
Inter-digit Pause		tIDP	Pulse rate=10pps	--	800	--	ms
			Pulse rate=20pps	--	500	--	
Tone Mode							
Tone Output Pin	DC Level	Vdc	VDD=2.0V~5.5V	0.5VDD	--	0.7VDD	V
	Sink Current	Itl	Vdtmf=0.5V	0.2	--	--	mA
	AC level	Vdtmf	Row group，RL=5KΩ	130	155	180	mVrms
	Load Resistor	Rl	Dist.≤ -23dB	5	--	--	KΩ
DTMF Signal	Pre-emphasis	twist	VDD=2.0~5.5 V, Column-Row group	1	2	3	dB
	Distortion	Dist.	RL=5KΩ	--	-30	-23	dB
Minimum tone duration Time (note 3)		tTD	Auto redial	--	100	--	ms
				--	91	--	ms
Minimum Intertone Pause Time(note 3)		tITP	Auto redial	--	106	--	ms
				--	91	--	ms

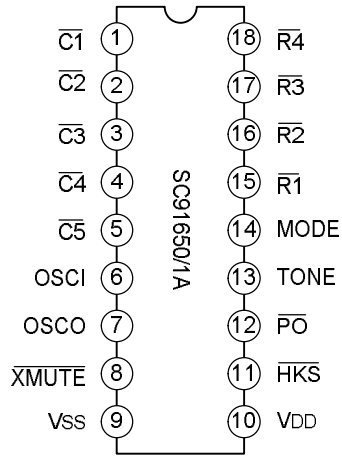Note: 1. Vn: Input voltage of any keyboard scanning pin (Row group, Column group)

2.Distortion (dB) = $20\log\{[V_1^2+V_2^2+V_3^2+\ldots Vn^2)^{1/2}]/[(V_L^2+V_H^2)^{1/2}]\}$

V_L,V_H: Row group and Column group signal , V1,V2…,Vn: Harmonic signal (BW = 300Hz ~ 3500Hz)
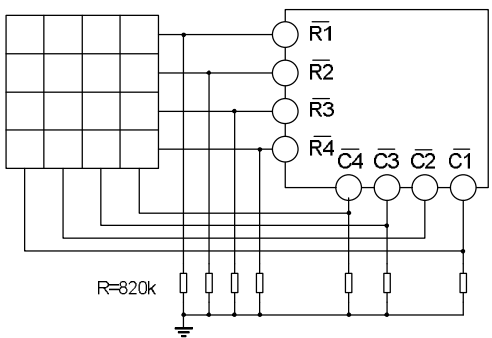
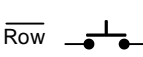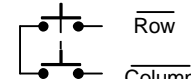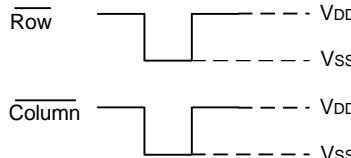**ACTUAL FREQUENCY OUTPUT** (fosc=3.579545MHz)

Keyboard Scanning Pin		Standard(Hz)	Output	Deviation(%)
R1	f1	697	699	+0.28
R2	f2	770	766	-0.52
R3	f3	852	848	-0.47
R4	f4	941	948	+0.74
C1	f5	1209	1216	+0.57
C2	f6	1336	1332	-0.30
C3	f7	1477	1472	-0.34

PIN CONFIGURATIONS

```
         SC91650/1A
 C̄1  (1)        (18)  R̄4
 C̄2  (2)        (17)  R̄3
 C̄3  (3)        (16)  R̄2
 C̄4  (4)        (15)  R̄1
 C̄5  (5)        (14)  MODE
 OSCI (6)       (13)  TONE
 OSCO (7)       (12)  P̄O
 X̄M̄ŪT̄E (8)     (11)  H̄K̄S
 VSS  (9)       (10)  VDD
```

```
         SC91650/1B
 H̄D̄I  (1)       (22)  HDO
 C̄1   (2)       (21)  R̄4
 C̄2   (3)       (20)  R̄3
 C̄3   (4)       (19)  R̄2
 C̄4   (5)       (18)  R̄1
 C̄5   (6)       (17)  MODE
 OSCI (7)       (16)  TONE
 OSCO (8)       (15)  P̄O
 X̄M̄ŪT̄E (9)     (14)  H̄K̄S
 VSS  (10)      (13)  VDD
 HFI  (11)      (12)  HFO
```

```
         SC91652A
 C̄1  (1)        (18)  R̄4
 C̄2  (2)        (17)  R̄3
 C̄3  (3)        (16)  R̄2
 C̄4  (4)        (15)  R̄1
 C̄5  (5)        (14)  MODE
 OSCI (6)       (13)  TONE
 OSCO (7)       (12)  P̄O
 X̄M̄ŪT̄E (8)     (11)  H̄K̄S
 VSS  (9)       (10)  VDD
```

```
         SC91652B
 PMUTE (1)      (22)  KT
 C̄1   (2)       (21)  R̄4
 C̄2   (3)       (20)  R̄3
 C̄3   (4)       (19)  R̄2
 C̄4   (5)       (18)  R̄1
 C̄5   (6)       (17)  MODE
 OSCI (7)       (16)  TONE
 OSCO (8)       (15)  P̄O
 X̄M̄ŪT̄E (9)     (14)  H̄K̄S
 VSS  (10)      (13)  VDD
 H̄F̄I  (11)     (12)  HFO
```

PIN DESCRIPTION

Pin No.						Pin Name	Description
650A/B		651A/B		652A/B			
1	2	1	2	1	2	$\overline{C1}$	*Provides keyboard scanning.
2	3	2	3	2	3	$\overline{C2}$	
3	4	3	4	3	4	$\overline{C3}$	
4	5	4	5	4	5	$\overline{C4}$	
5	6	5	6	5	6	$\overline{C5}$	
15	18	15	18	15	18	$\overline{R1}$	
16	19	16	19	16	19	$\overline{R2}$	
17	20	17	20	17	20	$\overline{R3}$	
18	21	18	21	18	21	$\overline{R4}$	

*Provides keyboard scanning.

a. Dialling option:

*The resistor connection between selected Row (or Column) and Vss may select most countries telecom specification.

R=820k

b. Keyboard scanning:

*While $\overline{HKS}$ pin is HIGH, Both column pin and row pin are in floating state. While $\overline{HKS}$ pin is LOW, the column group stays in "HIGH" state and row group stays in "LOW" state.

*The keypad is compatible with the standard dual contact matrix keyboard (as figure1b), the inexpensive single contact keyboard (as figure 1a), and electronic input (as figur e 1c).

*When $\overline{HKS}$ is "LOW", a valid key entry is defined by related Row & Column connection or by electronic input (as shown in figur e 1c).

*Activation of two or more keys will result in no response, except for single key.

*To avoid keyboard-bouncing error, this chip provides built-in debounce circuit. (Th e debounce time = 20ms)

Figure1a: Single contact form keyboard configuration

Figure1b: Dual contact form keyboard configuration

Figure1c: Electronic signal input keyboard configuration

(To be continued)

(Continued)

Pin No.						Pin Name	Description
650A/B		651A/B		652A/B			
6	7	6	7	6	7	OSCI	*Oscillator input & output pins. *The 3.579545MHz oscillator is formed by a built-in inverter inside of this chip and by connecting a 3.579545MHz crystal or a ceramic resonator across the OSCI and OSCO pins. (built-in feedback resistor and capacitor)
7	8	7	8	7	8	OSCO	*When $\overline{HKS}$ is "LOW", a valid key-in may turn on this oscillator and generates a 3.579545 MHz clock.
8	9	8	9	8	9	$\overline{XMUTE}$	*Mute output pins. *NMOS open drain output structure. *The output is in "LOW" state during dialing sequence (both Pulse and Tone mode) and in Hold status otherwise this pin is "high-impedance". *Long (continue) Mute.
9	10	9	10	9	10	V$_{SS}$	*Negative power supply pin.
10	13	10	13	10	13	V$_{DD}$	*Positive power supply pin.
11	14	11	14	11	14	$\overline{HKS}$	*Hook switch input pin. *When the handset is in ON-HOOK state, this pin must be pulled "high" in order to disable the dialing operation and decrease the power consumption. *When in OFF-HOOK state, th e $\overline{HKS}$ pin must be pulled "low" state for all function operation.
12	15	12	15	12	15	$\overline{PO}$	*Pulse output signal pin. *Inverter output structure (SC91650). *The output is "LOW" during pulse dialing and Flash operation, otherwise this output is "high". *NMOS open drain output structure.
13	16	13	16	13	16	TONE	*Dual Tone Multi-frequency output pin. *In TONE mode, when an entry of digit key (include *, # key), this pin will send out a corresponding DTMF signal. *The TONE pin provides minimum tone duration (tTD) and minimum intertone pause time to support rapid key-in. If key-in time is less than tTD (100ms), DTMF signal will last for tTD (100ms); otherwise the tone duration will last as long as the key is pressed.
14	17	14	17	14	17	MODE	*Mode select pin. *Tri-state input structure. *This pin can select following three modes.

(To be continued)

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Pin No.			Pin Name	Description
650A/B	651A/B	652A/B		
11	11		HFI	*Handfree input control pin. (SC91650, SC91651) *Toggle input structure, rising edge trigger. *It is used to enable and disable Handfree funtion. *With waveshaped by a built-in Schmit trigger, the bounce of input can be eliminated by external R•C debounce circuit. * A built-in pull down resistor is 200kΩ typical.
		11	$\overline{HFI}$	* Toggle input structure with pull up resistance 200kΩ, falling edge trigger. (SC91652)
12	12	12	HFO	* Handfree output pin. * Inverter output structure (normally 'low', active 'high'). * When a HFI pin is active, Handfree function will be enabled (HFO=1) or disable (HFO=0). * When the Handfree function is enable (HFO=1), after OFF-HOOK action, it can reset Handfree function and HFO pin return to 'low' state.
1	1		$\overline{HDI}$	*Hold line input control pin. *Toggle input structure, falling edge trigger. *It is used to enable and disable Hold line function. *With waveshaped by a built-in Schmit trigger, the bounce of input can be eliminated by extenal R.C debounce circuit. *A built-in pull up resistor is 200kΩ typically.
22	22		HDO	*Hold line output pin. *Inverter output structure, falling edge trigger. *When a falling edge signal triggered $\overline{HDI}$ pin, Hold line function will be enable (HDO=1) or disabled(HDO=0). *When the Hold line function is enable (HDO=1), after OFF-HOOK action or HFO pin is from "low" to "high", it can reset Hold line function and HDO pin return to "low" state.
		22	KT	*Keytone output pin for ralid key pad input and memory stored (SC91652 only). *CMOS invertor output structure. *It will issue a 1.2kHz, duty cycle 50% signal with duration 30ms. *To prevent signal interference, while DTMF issue, it will disable Keytone output except function key.
		1	PMUTE	*Pulse mode mute. *CMOS inverter output structure. *The output is high state during dialing sequence (pulse mode only), otherwise this pin is low.

KEYBOARD OPERATION

Symbol definitions:

a)	$\uparrow$	:	OFF-HOOK or enable Hand Free function.
b)	$\downarrow$	:	ON-HOOK or disable Hand Free function.
c)	⌐⌐	:	Input level from low to high.
d)	⌐⌐	:	Input level from high to low.
e)	D1~Dn	:	Digit key：1, 2, 3, 4, 5, 6, 7, 8, 9, 0, *, #, (C1~Cn is same as D1~Dn).
f)	Dp1~Dpn	:	Pulse digit：1, 2, 3, 4, 5, 6, 7, 8, 9, 0, (Cp1~Cpn is same as Dp1~Dpn).
g)	Dt1~Dtn	:	Tone digit：1, 2, 3, 4, 5, 6, 7, 8, 9, 0, *, #, (Ct1~Ctn is same as Dt1~Dtn).
h)	t_F	:	Flash time.
i)	t_P	:	Pause time.
j)	t_{PT}	:	Pulse to Tone wait time.
k)	t_{FP}	:	Pause time for flash.
l)	t_{RP}	:	Pause time for redial.
m)	LNB	:	Last number redial buffer.
n)	M1 … Mm	:	Memory location; 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

A）Normal Dialing

1. Digit Dialing

Procedure	:	$\uparrow$ D1，D2…，Dn$\downarrow$
Dial out	:	Dt1，Dt2…，Dtn (in Tone mode)
Dial out	:	Dp1，Dp2,…，Dpn (in Pulse mode)
LNB	:	D1，D2…，Dn

2. Dialing with flash key

Procedure	:	$\uparrow$ F, D1, D2…, Dn $\downarrow$
Dial out	:	t_F, t_{FP}, Dt1，Dt2…，Dtn (in Tone mode)
Dial out	:	t_F, t_{FP}, Dp1，Dp2, …，Dpn (in Pulse mode)
LNB	:	D1，D2…，Dn (reset function only)
LNB	:	Un change (Digit Function only)

3. Dialing with P→T key

Procedure	:	$\uparrow$ D1，D2 …，P→T , …，Dn $\downarrow$
Dial out	:	Dp1，Dp2, …，t_{PT}, …, Dpn (in Pulse mode)
LNB	:	D1，D2 …，P→T , …，Dn

Note: If key in digit over maximum digit stored in LNB, then RD is inhibit even after on/off hook.

B）Mixed dialing

Procedure	:	$\uparrow$D1, D2…，MODE= ⌐⌐, D9, D10 …，Dn$\downarrow$; or
		$\uparrow$D1, D2…，P→T , D9, D10 …，Dn$\downarrow$
Dial out	:	Dp1, Dp2, …, t_{PT}, Dt9, Dt10…，Dtn
LNB	:	D1, D2…，P→T , D9, D10 …，Dn

C）**Redial**

LNB	:	D1，D2…，Dn
Procedure	:	↑ RD ↓
Dial out	:	t_{RP}，Dt1，Dt2…，Dtn（In Tone mode）
Dial out	:	t_{RP}，Dp1，Dp2,…，Dpn（in Pulse mode）

   Note: If key in digit over maximum digit stored in LNB, then RD is inhibit.

D）**Pause Function**

Procedure	:	↑ D1，D2…，Dn, P, C1 …，Cn ↓
Dial out	:	Dt1，Dt2 ,…，Dtn, t_P, Ct1，Ctn（in Tone mode）
Dial out	:	Dp1，Dp2，… Dpn，t_P, Cp1 …，Cpn（in Pulse mode）
LNB	:	D1, D2…, Dn, P , C1, C2 …, Cn

E）**Flash Function**

1. Reset

Procedure	:	↑ D1，D2…，Dn, F, C1 …，Cn ↓
Dial out	:	Dt1，Dt2,…，Dtn，t_F, t_{FP}, Ct1 …，Ctn（in Tone mode）
Dial out	:	Dp1，Dp2,…，Dpn，t_F, t_{FP}, Cp1 …，Cpn（in Pulse mode）
LNB	:	C1，C2 …，Cn

2 Digit

Procedure	:	↑ D1，D2…，Dn, F, C1 …，Cn ↓
Dial out	:	Dt1，Dt2,…，Dtn，t_F, t_{FP}, Ct1 …，Ctn（in Tone mode）
Dial out	:	Dp1，Dp2,…，Dpn，t_F, t_{FP}, Cp1 …，Cpn（in Pulse mode）
LNB	:	D1，D2 …，Dn

F）**One Touch Memory Function**

1. Store Memory

Procedure	:	↑ ST，D1，D2…，Dn, ST, EMn ↓
Dial out	:	Nothing

   EMn = D1，D2,…… Dn

Procedure	:	↑ ST，D1，D2……,F, …… Dn, ST, EMn ↓
Dial out	:	Nothing

   EMn = D1，D2,……,F, ……Dn

Procedure	:	↑ ST，D1，D2……,P, …… Dn, ST, EMn ↓
Dial out	:	Nothing

   EMn = D1，D2,……,P, ……Dn

Procedure	:	↑ ST，D1，D2……,P→T, …… Dn, ST, EMn ↓
Dial out	:	Nothing

   EMn = D1，D2,……, P→T, ……Dn

2 .Quickly Store

Procedure	:	↑ ST, D1, D2, ST, EM1, ST, D3, D4, D5, St, EM2, ST, EMn ↓
Dial out	:	Nothing

EM1 = D1, D2; EM2 = D3, D4, D5, EMn = D3, D4, D5

LNB	:	D1, D2 …, Dn

3.Redial

EMn = D1 , D2, ……Dn

Procedure	:	↑ EMn ↓
Dial out	:	Dt1, Dt2, …… Dtn (in tone mode)
Dial out	:	Dp1, Dp2, …… Dpn (in pulse mode)
LNB	:	D1, D2,……Dn

G）Two Touch Memory Function

1. Store Memory

Procedure	:	↑ ST, D1, D2…, Dn, ST, EMn ↓
Dial out	:	Nothing

EMn = D1, D2,…… Dn

Procedure	:	↑ ST, D1, D2……,F, …… Dn, ST, EMn ↓
Dial out	:	Nothing

EMn = D1, D2,……,F, ……Dn

Procedure	:	↑ ST, D1, D2……,P, …… Dn, ST, EMn ↓
Dial out	:	Nothing

EMn = D1, D2,……,P, ……Dn

Procedure	:	↑ ST, D1, D2……,P→T, …… Dn, ST, EMn ↓
Dial out	:	Nothing

EMn = D1, D2,……, P→T, ……Dn

2 Quickly Store

Procedure	:	↑ ST, D1, D2, ST, EM1, ST, D3, D4, D5, St, EM2, ST, EMn ↓
Dial out	:	Nothing

EM1 = D1, D2; EM2 = D3, D4, D5, EMn = D3, D4, D5

LNB	:	D1, D2 …, Dn

3 Redial

EMn = D1 , D2, ……Dn

Procedure	:	↑ EMn ↓
Dial out	:	Dt1, Dt2, …… Dtn (in tone mode)
Dial out	:	Dp1, Dp2, …… Dpn (in pulse mode)
LNB	:	D1, D2,……Dn

H）Save Function

1. The Second Redial Memory

Procedure	:	↑ D1, D2 , …… Dn, dialing end, SAVE ↓
Dial out	:	Dt1, Dt2 , …… Dtn (in tone mode)
Dial out	:	Dp1, Dp2, …… Dpn (in pulse mode)
LNB	:	D1, D2, …… Dn

2 Store Phone Number In Conversation

Procedure	:	↑ ST, D1, D2, …… Dn, conversation, ST, C1, C2, …… Cn, ST, SAVE ↓
Dial out	:	Dt1, Dt2 , …… Dtn (in tone mode)
Dial out	:	Dp1, Dp2, …… Dpn (in pulse mode)
SAVE	:	C1, C2, …… Cn
LNB	:	C1, C2, …… Cn

> Note: If key in digit over maximum digit stored in SAVE, then SAVE is ignore.
> The data in SAVE is no change, and can dial out after on/off hook.

3.Redial

SAVE	:	D1, D2, …… Dn
Procedure	:	↑ SAVE ↓
Dial out	:	Dt1, Dt2, …… Dtn (in tone mode)
Dial out	:	Dp1, Dp2, …… Dpn (in pulse mode)
LNB	:	D1, D2,……Dn(SC91652 only)
LNB	:	Un change (SC91650, SC91651)

I）Cascade Dialing

1.Normal Dialing and Memory

Procedure	:	↑ D1, D2, …… Dn, EM1, EMm … EMn, A, Mn ↓

2.One Touch Memory and Memory

Procedure	:	↑ EMm …… Emn, A, Mn ↓

3.LNB and Memory

Procedure	:	↑ RD, EM1, EMm …… EMn, A, Mn ↓

4.SAVE and Memory for SC91652 only

Procedure	:	↑ SAVE, EM1, EMm …… EMn, A, Mn ↓

Handfree Function operation:

A) To execute Handfree function: When HFO = 'low', HFI pin is active, the Handfree function will be enabled (HFO = 'high')

B) Reset Handfree function:

   a. OFF-HOOK action.

   b. When HFO = 'high', a HFI pin is active again, the Handfree function will be reset (HFO='low').

   c. When HDO pin is from "low" to "high", the Handfree function will be reset (HFO="low").

Hold Line Function Operation:

A) To execute Hold Line function: When HFO = 'high' state or HKS is low, HDI pin is active, the Hold line function will be enable (HDO = "high"). The $\overline{\text{XMUTE}}$ pin keep to "low", when HDO stays in "high" state.

B) Reset Hold Line function:

    a. OFF-HOOK action.

    b. HFO pin from "low" to: "HIGH level.

    c. When HDO = "high", HDI pin is active, the Hold line function will be disabled (HDO="low").

Operating flow chart of Handfree
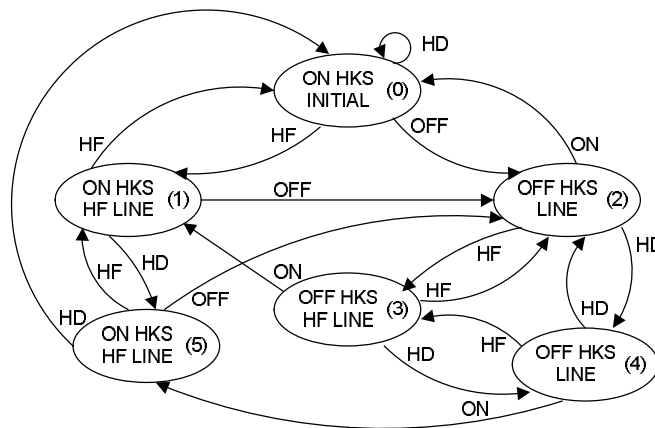
STATE NO.	$\overline{\text{PO}}$	$\overline{\text{XMUTE}}$	HFO	HDO
(0) INITIAL STATE	0/F	F	0	0
(1) ON HKS HF LINE	1/F	F	1	0
(2) OFF HKS LINE	1/F	F	0	0
(3) OFF HKS HF LINE	1/F	F	1	0
(3) OFF HKS HD LINE	1/F	0	0	1
(3) ON HKS HD LINE	1/F	0	0	1

ON/OFF: ON/OFF HKS

HF: Depress HF key

HD: Depress HF key

F: Floating (Hi-impedance)

$\overline{\text{PO}}$ is floating for SC91651/

SC91652 open drain struc-ture.

TEST CIRCUIT

① Operation current

② Standby current

③ Tone output voltage

④ Tone distortion

⑤ Pulse output sink current (open drain structure)

⑥ Pulse output sink current (inverter structure)

⑦ Keypad input current (row group)

⑧ keypad input current (column group)
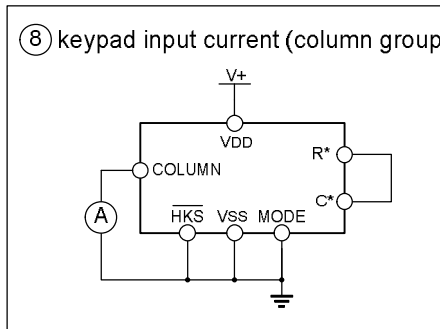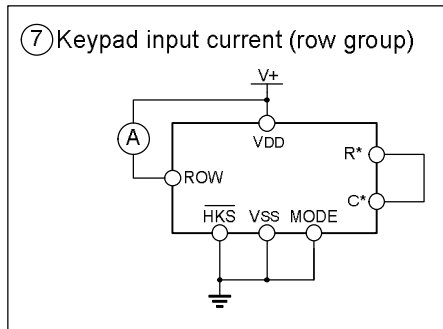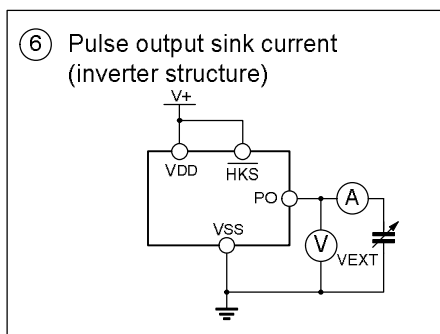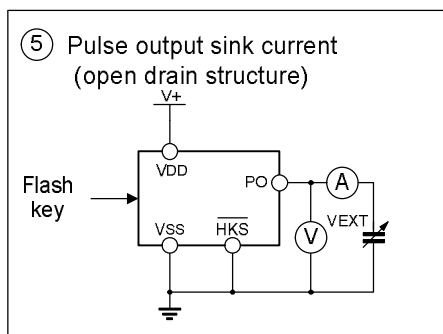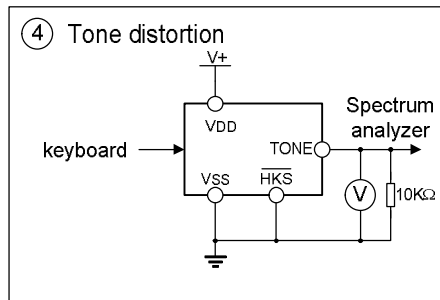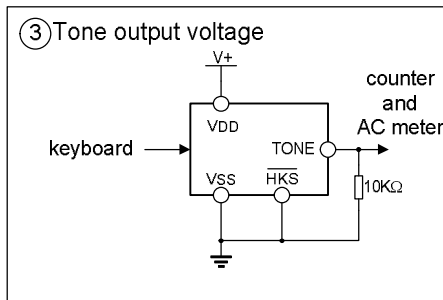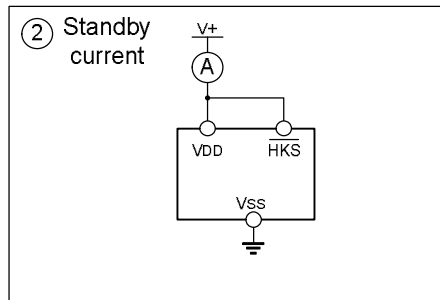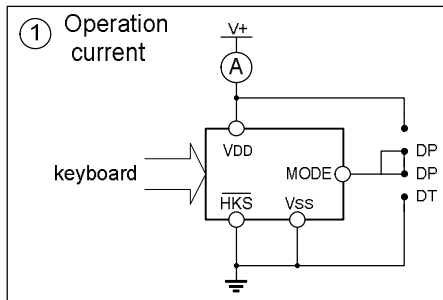
Note: 1. Dist. (dB)=$20\log\{[V_1^2+V_2^2+V_3^2+...V_n^2)^{1/2}]/[(V_L^2+V_H^2)^{1/2}]\}$

      a. V1…Vn are extraneous frequencies (ie, inter modulation and harmonic), components in the 500Hz to 3400Hz band.

      b. V_L, V_H are the individual frequency components of DTMF signal.

      c. Whether keyboard is pushed refer to the TONE mode time diagram.

  2. Sink current Isink=I/(1-Duty Cycle), I is the net DC current measured from ampere meter.

  3. R*, C* mean other column and row.

TIMING DIAGRAMS

Tone Mode Timming Diagram

Pusle Mode Timming Diagram
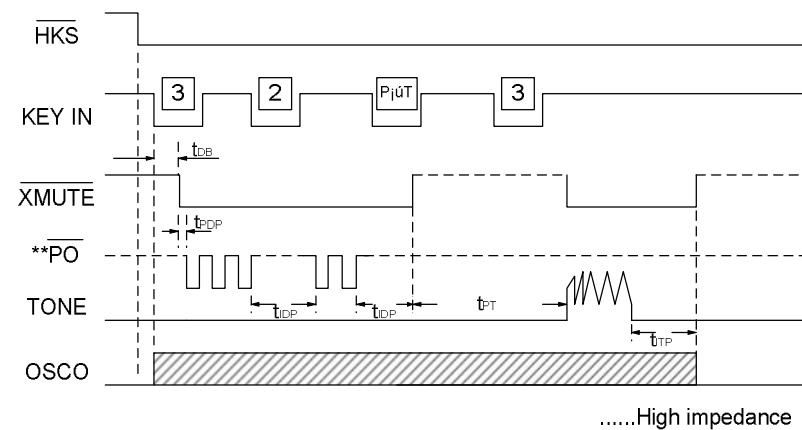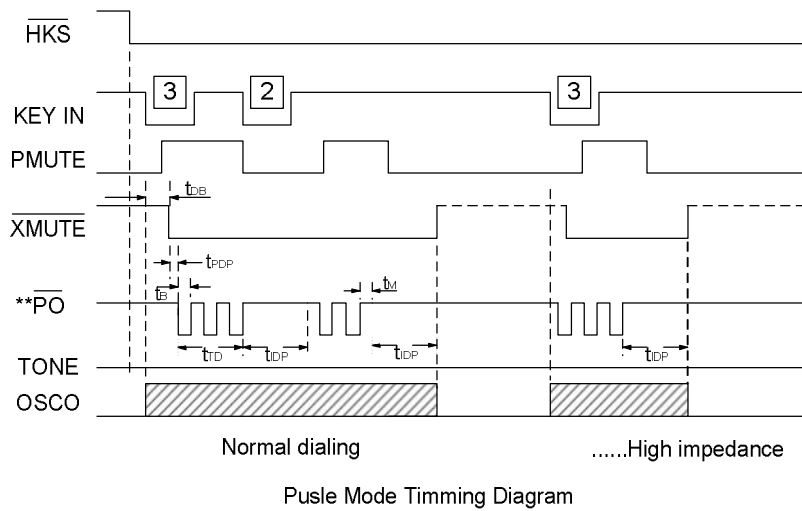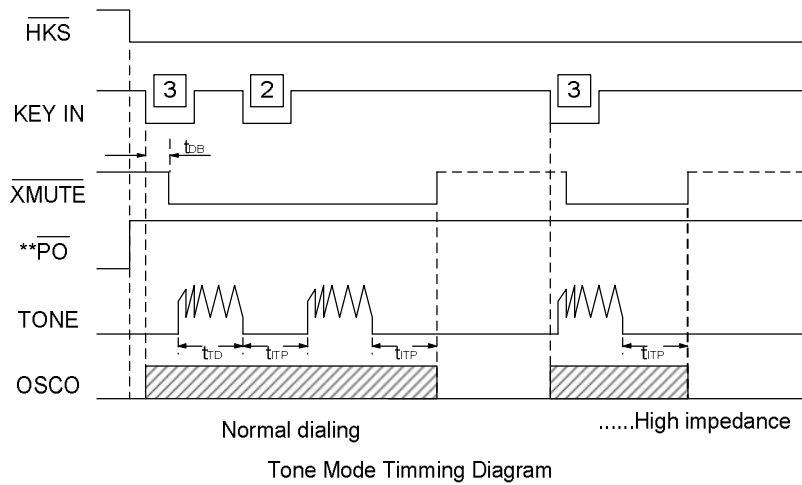
Timming Waveform for mixed dialing Operation (by */T key entry)
for SC91650, SC91651

TIMING DIAGRAMS (continued)
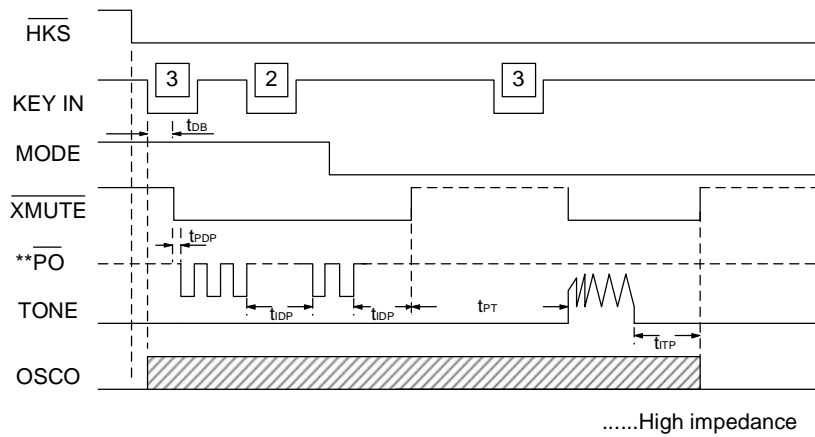
......High impedance

Timming Waveform for mixed dialing Operation (by mode selection pin switches)
for SC91650, SC91651
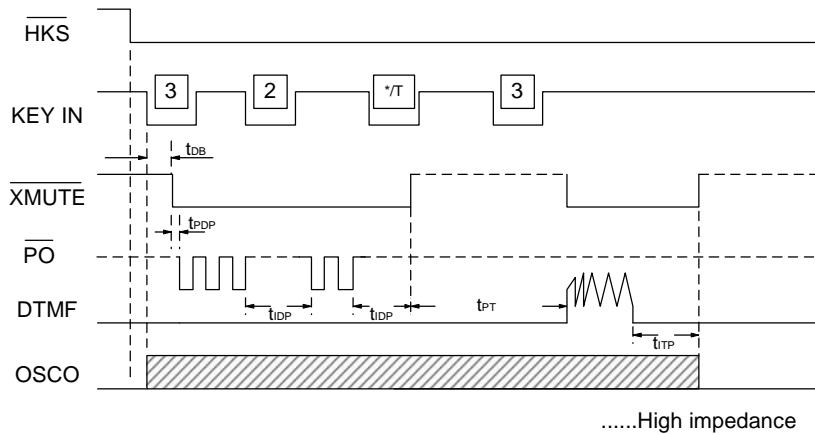
......High impedance

Timming Waveform for mixed dialing Operation (by */T key entry)
for SC91652 only
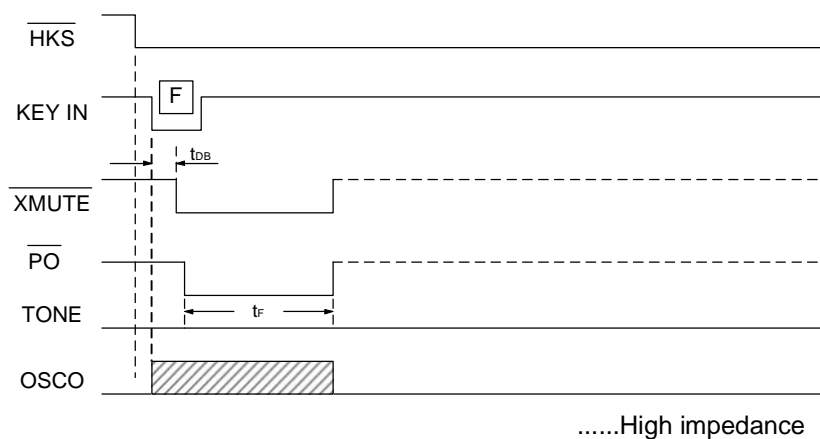
......High impedance

Flash key operating timming
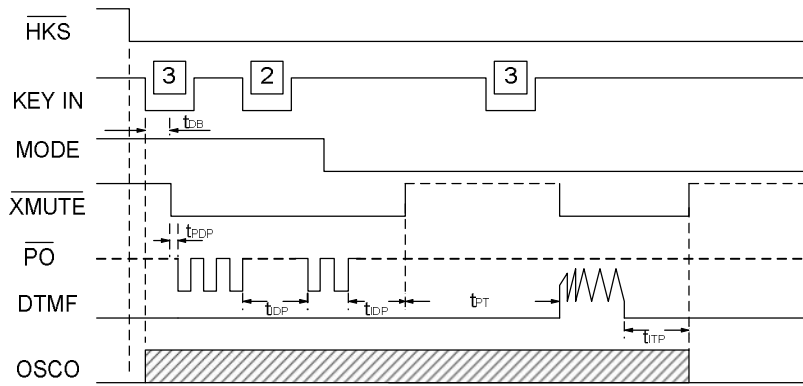
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Microelectronics

TIMING DIAGRAMS (continued)

Timming Waveform for mixed dialing Operation (by mode selection pin switches)
for SC91652 only
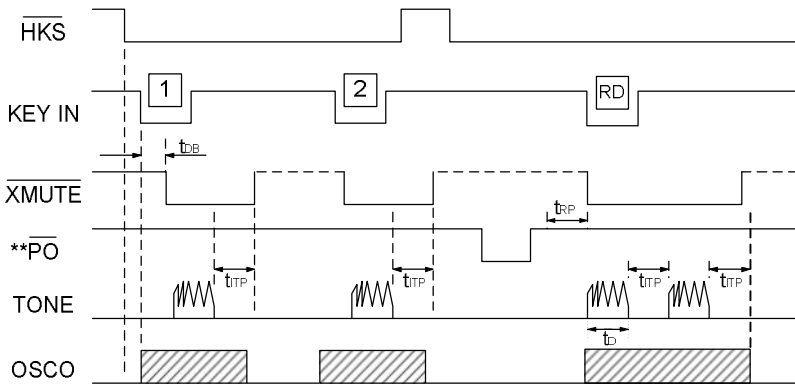
AUTO DIALING

......High impedance

Tone Mode Redial Timming Diagram
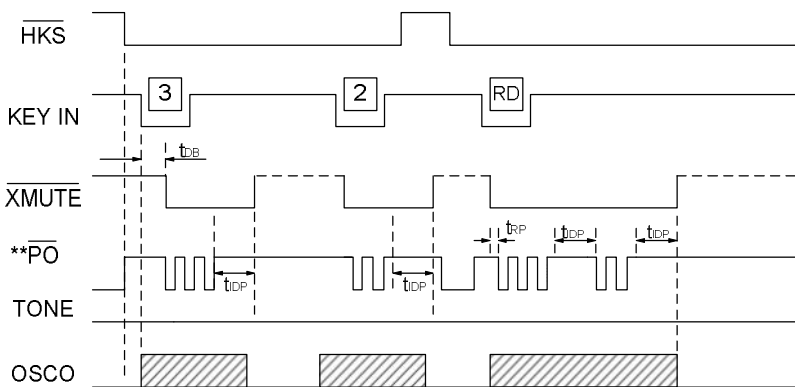
......High impedance

Pulse Mode Redial Timming Diagram

TIMING DIAGRAMS (continued)
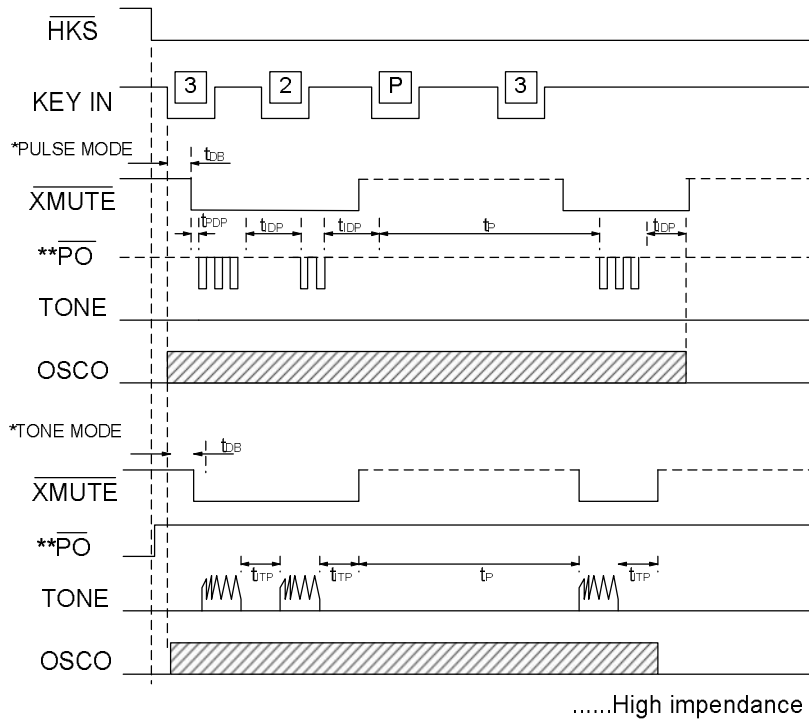
......High impendance

Pause key operating timming (for SC91650, SC91651)
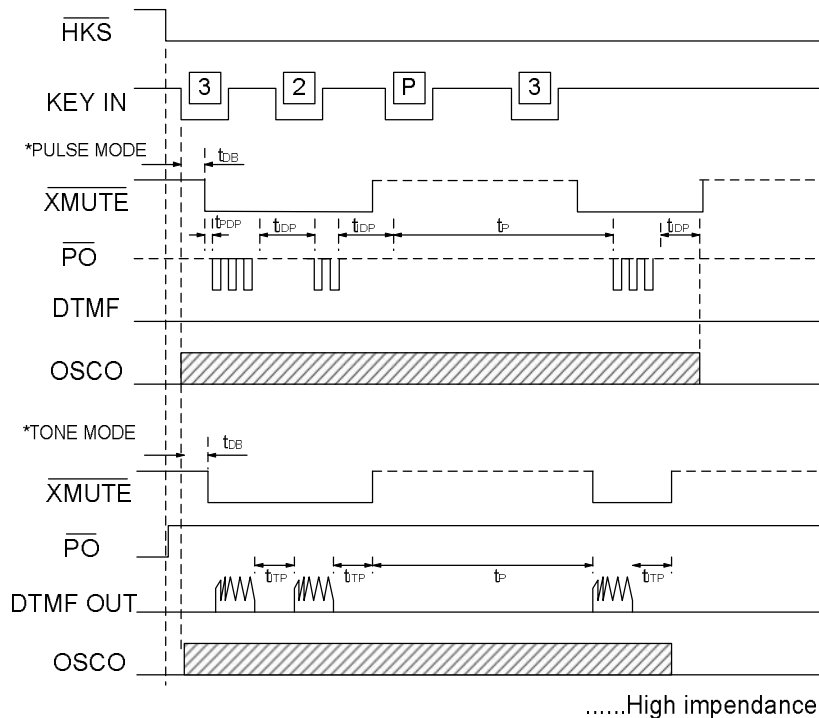
......High impendance

Pause key operating timming(for SC91652 only)

TIMING DIAGRAMS (continued)
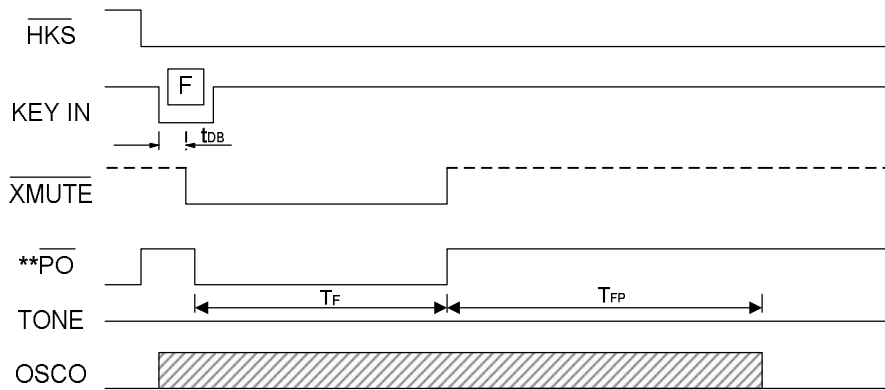
......High impedance

Flash key operation timing

Silan
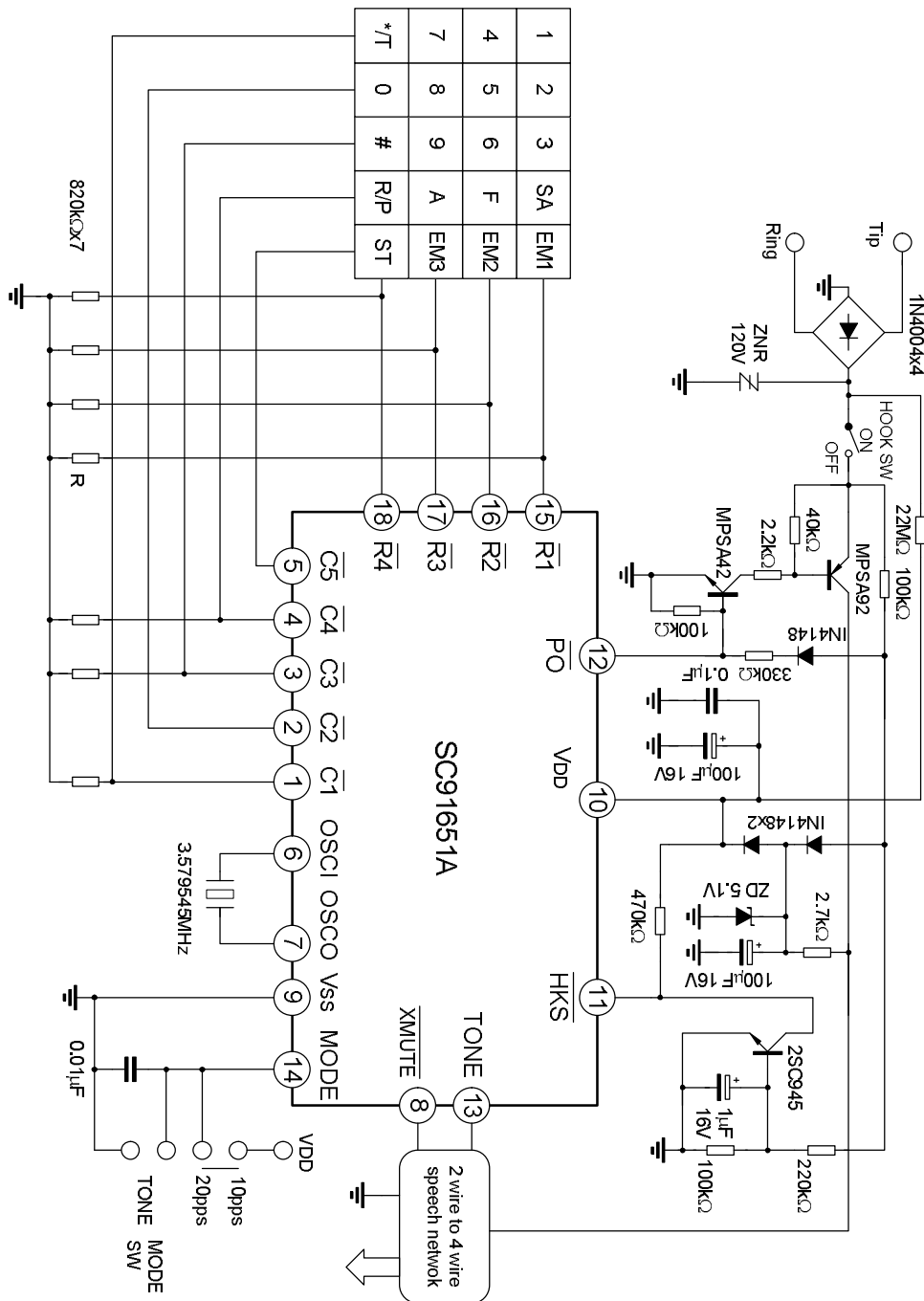Microelectronics

TYPACAL APPLICATION CIRCUIT(for SC91650A)

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TYPACAL APPLICATION CIRCUIT (for SC91650B)

Silan
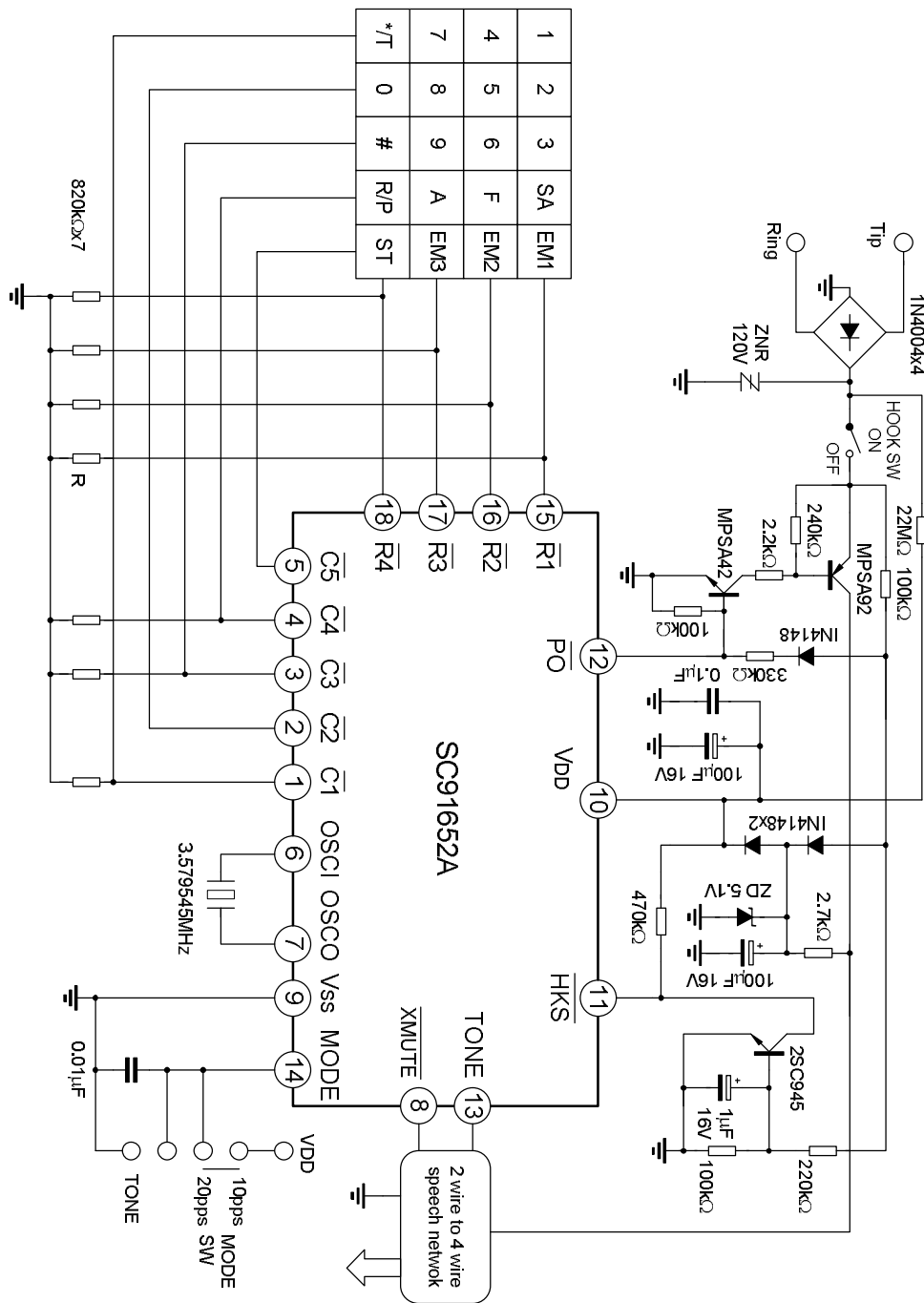Microelectronics
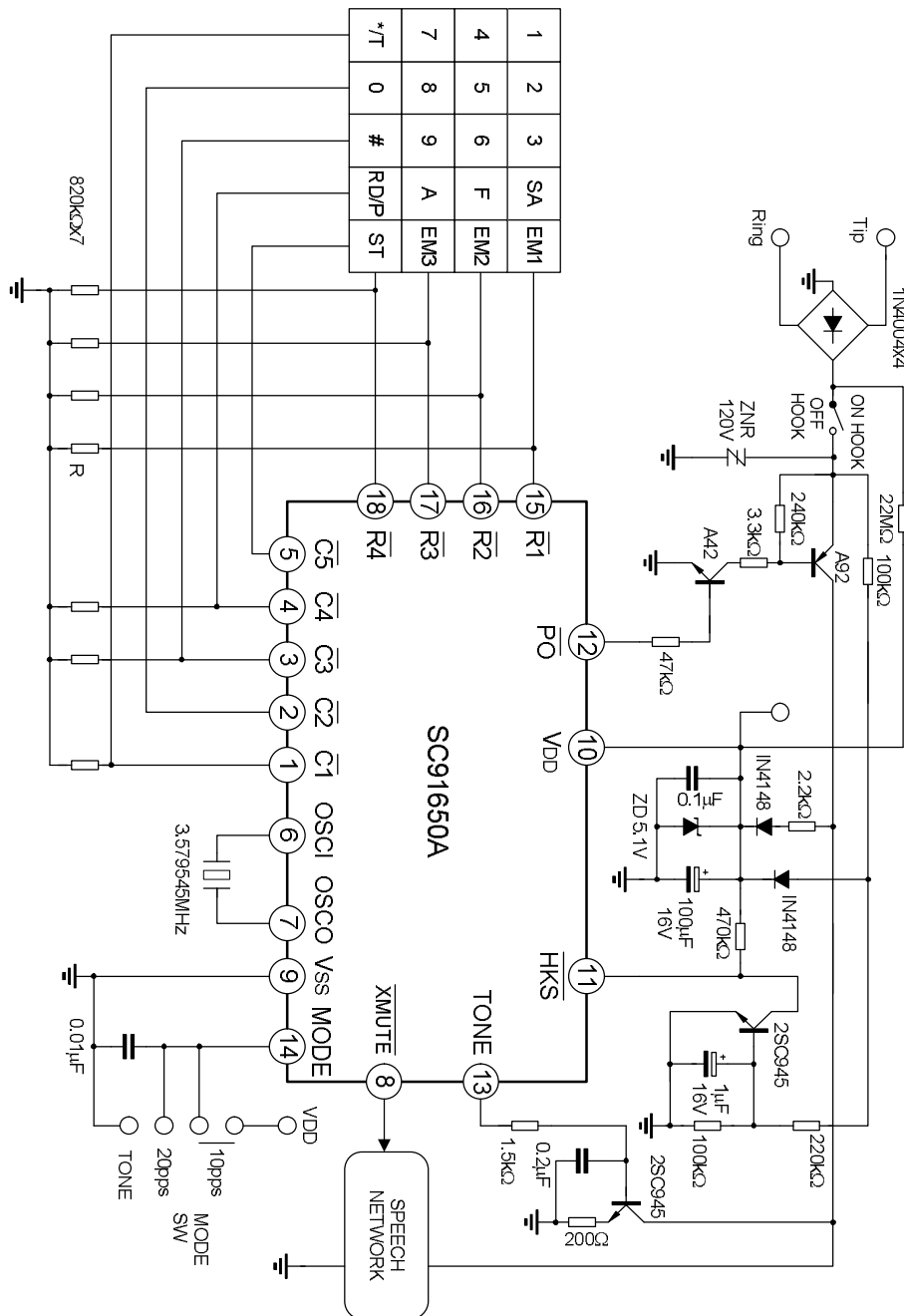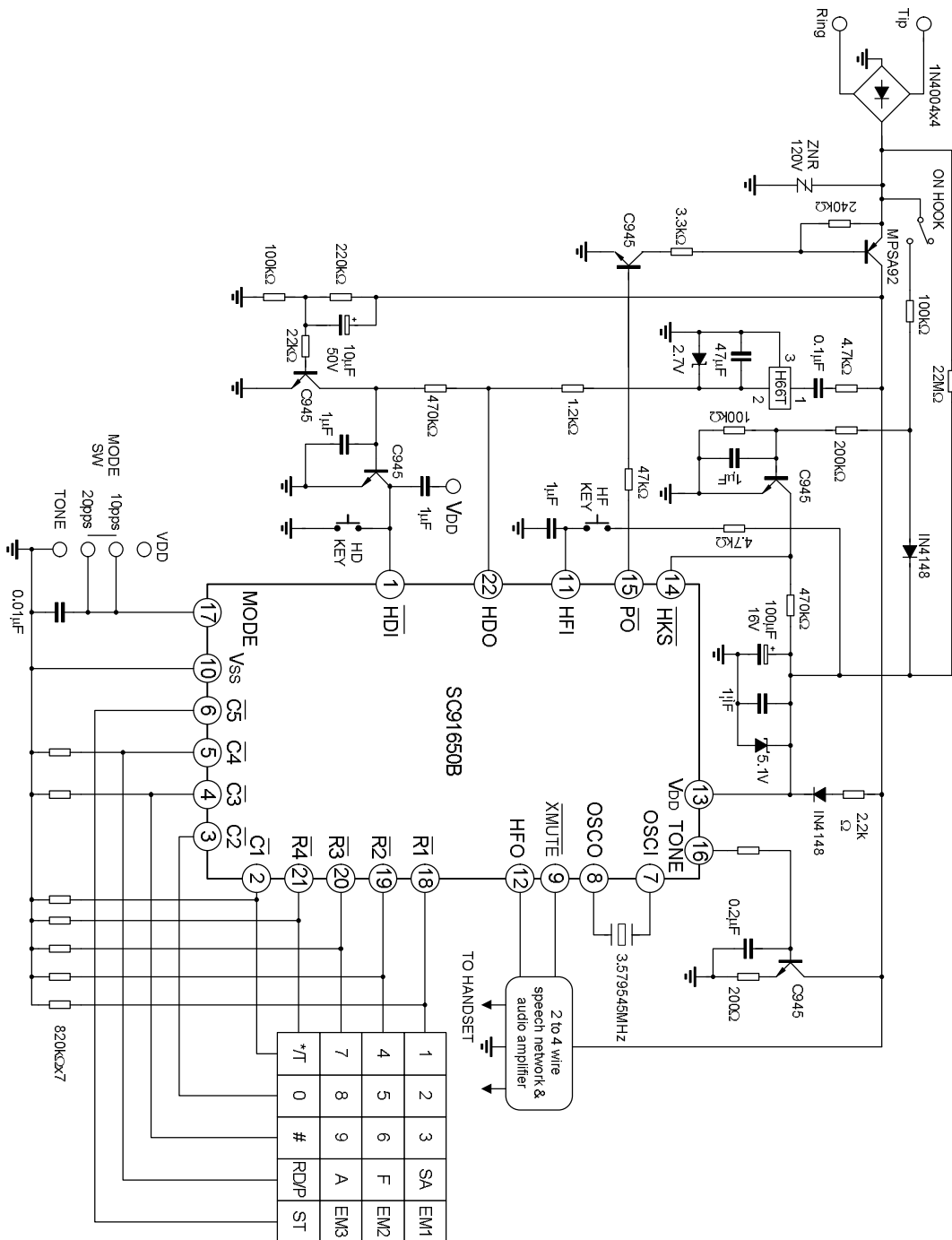
TYPACAL APPLICATION CIRCUIT (for SC91651A)

TYPACAL APPLICATION CIRCUIT (for SC91651B)

TYPACAL APPLICATION CIRCUIT (for SC91652A)
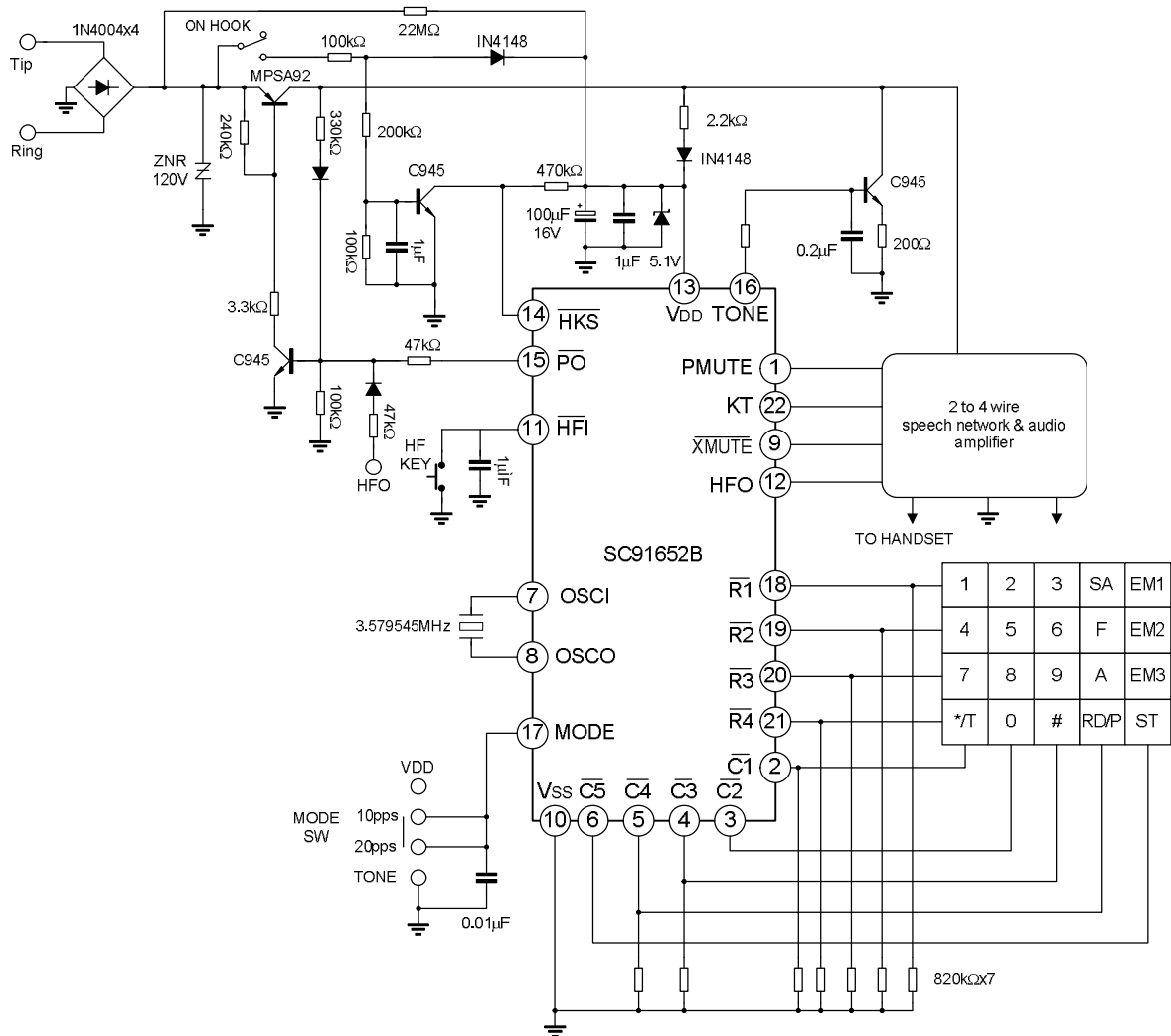
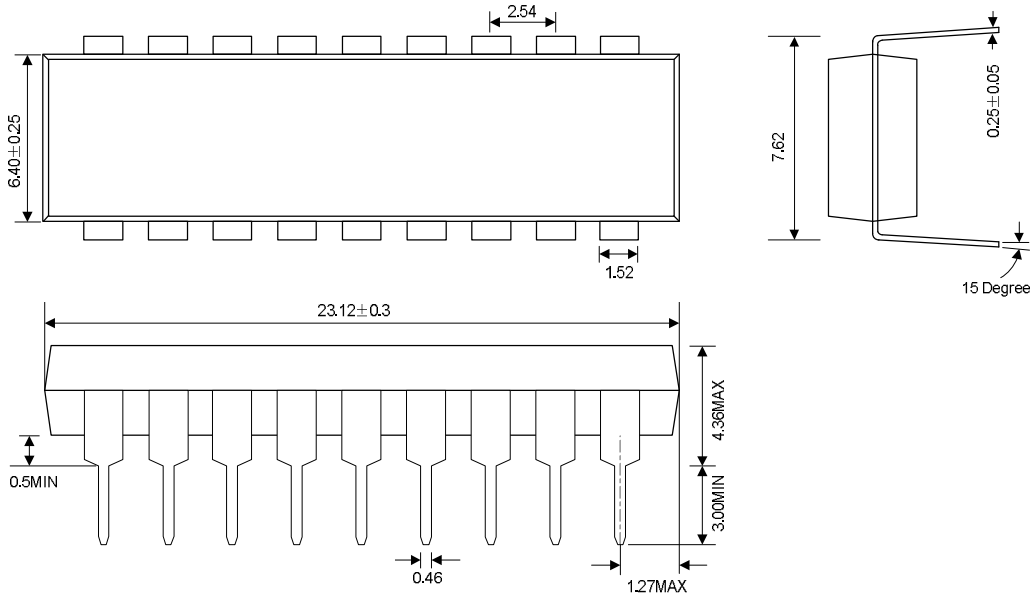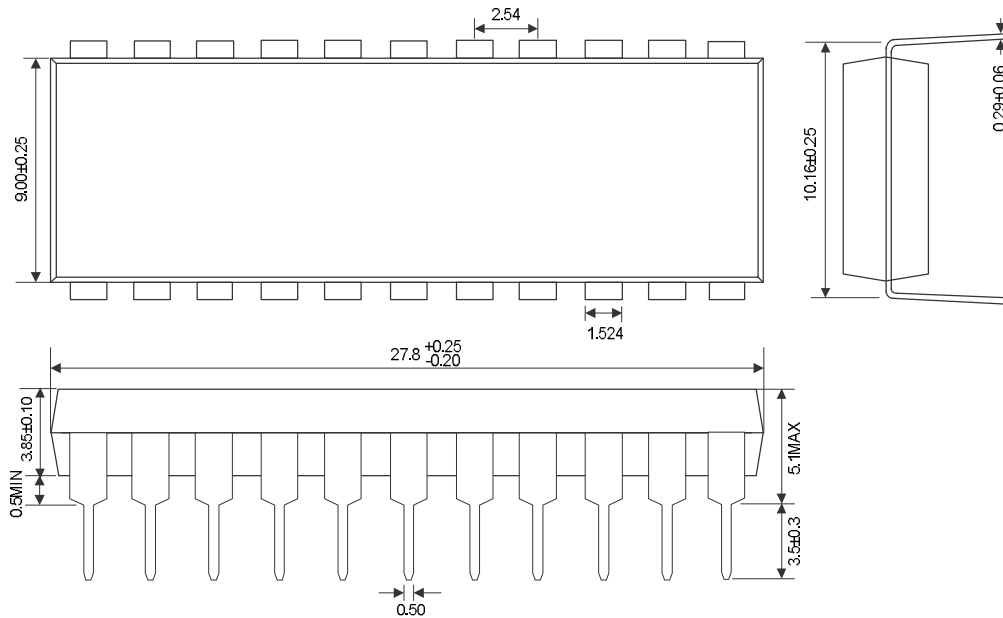## TYPACAL APPLICATION CIRCUIT (for SC91652B)

Silan
Microelectronics
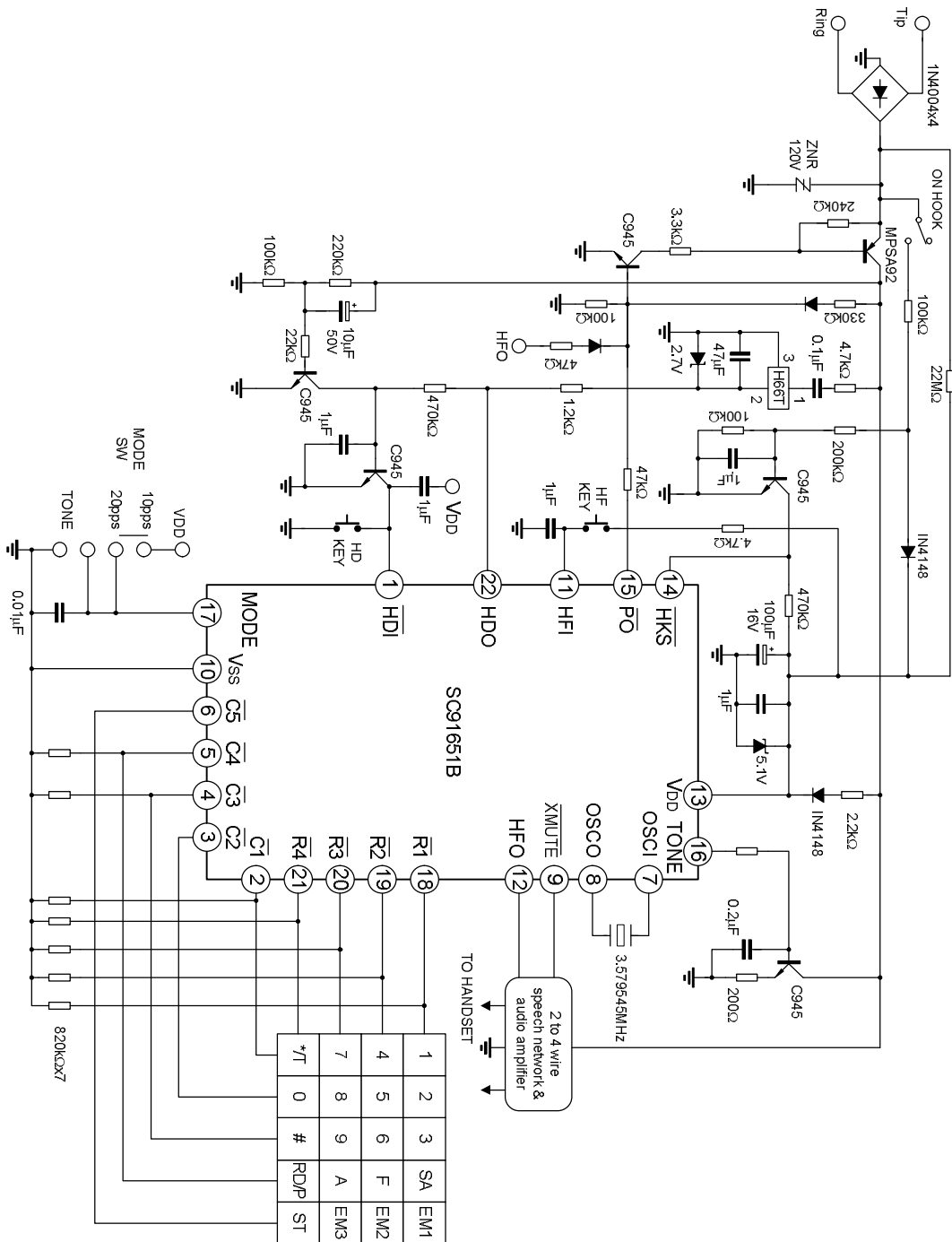
PACKAGE OUTLINE

DIP-18-300-2.54 — UNIT: mm

2.54
6.40±0.25
7.62
0.25±0.05
15 Degree
1.52
23.12±0.3
4.36MAX
3.00MIN
0.5MIN
0.46
1.27MAX

DIP-22-400-2.54 — UNIT: mm

2.54
9.00±0.25
10.16±0.25
0.29±0.06
1.524
27.8 +0.25 -0.20
3.85±0.10
5.1MAX
0.5MIN
3.5±0.3
0.50

CAUTION
ELECTROSTATIC
SENSITIVE DEVICE
DO NOT OPEN OR HANDLE
EXPECT AT A STATIC-FREE
WORKSTATION

HANDLING MOS DEVICES:

Electrostatic charges can exist in many things. All of our MOS devices are internally protected against electrostatic discharge but they can be damaged if the following precautions are not taken:

- Persons at a work bench should be earthed via a wrist strap.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- MOS devices should be packed for dispatch in antistatic/conductive containers.