

Features

Patent Number: 64097, 86474, 113235(R.O.C.), 5424740(U.S.A.)

- French specification
- Operating voltage: 2.0V~5.5V
- Low standby current
- Low memory retention current: 0.1μA (Typ.)
- Tone/pulse switchable
- Interface with LCD driver
- 32 digits for redialing
- 18 digits for each memory
- One-key redialing
- Pause and P→T key for PBX
- 3.58MHz crystal or ceramic resonator
- Flash as control key only
- Hand-free control
- Hold-line control
- Pause can be saved for redialing
- Keytone function
- Resistor options:
 - M/B ratio
 - Pause duration
 - Pulse number
 - Keyboard form
- Memory number: 14 memories

General Description

The HT9315F series, originally designed to meet the French standard, are CMOS LSIs for telecommunication systems. Through resistor option matrix, the HT9315F series can be revised to meet other dialing specifications like, M/B ratio, Pause duration, Pulse number and Keyboard form.

The HT9315F series tone/pulse dialers are offered in two different versions. They are HT9315Fx normal version series and HT9315FxT keytone version series. The normal

version series supply versatile functions which can be selected from the table below, such as: Hold-line, Hand-free and LCD dialing number display interface, all of which are suitable for feature phone applications. The keytone version series are the same as the normal version series except that keytone function is included.

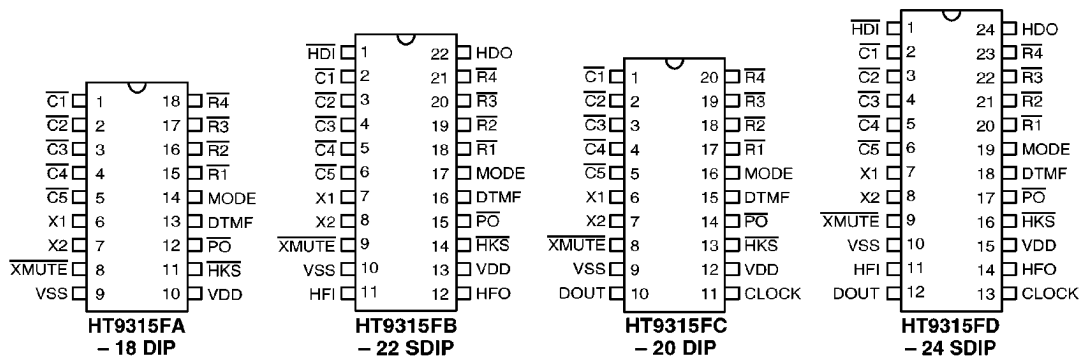
The HT9315F series also provide Redial, 3 one-touch and 10 two-touch memory dials for speed dialing in either pulse or tone mode.

Selection Table

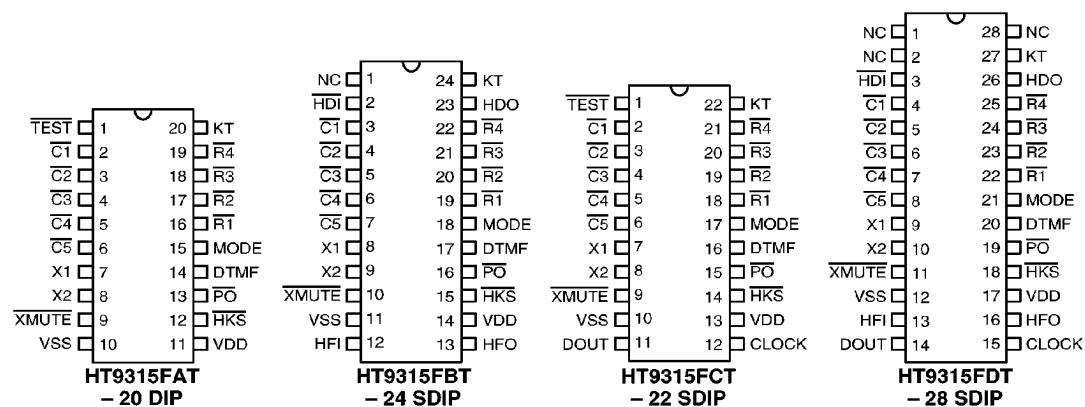
Function Item	Keytone	Lock Function	Hold- Line	Hand- Free	LCD Interface	Package
HT9315Fx	(Normal version)					
HT9315FA	—	—	—	—	—	18 DIP
HT9315FB	—	—	√	√	—	22 SDIP
HT9315FC	—	—	—	—	√	20 DIP
HT9315FD	—	—	√	√	√	24 SDIP
HT9315FxT	(Keytone version)					
HT9315FAT	√	—	—	—	—	20 DIP
HT9315FBT	√	—	√	√	—	24 SDIP
HT9315FCT	√	—	—	—	√	22 SDIP
HT9315FDT	√	—	√	√	√	28 SDIP

Pin Assignment

HT9315Fx version

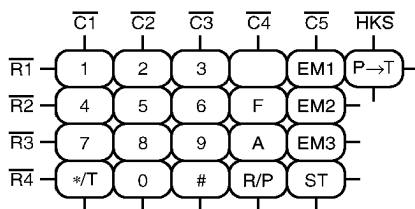


HT9315FxT versions

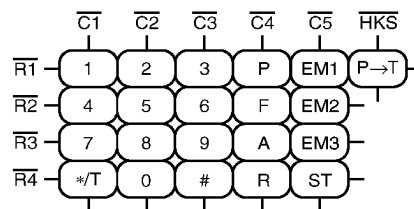


Keyboard Information

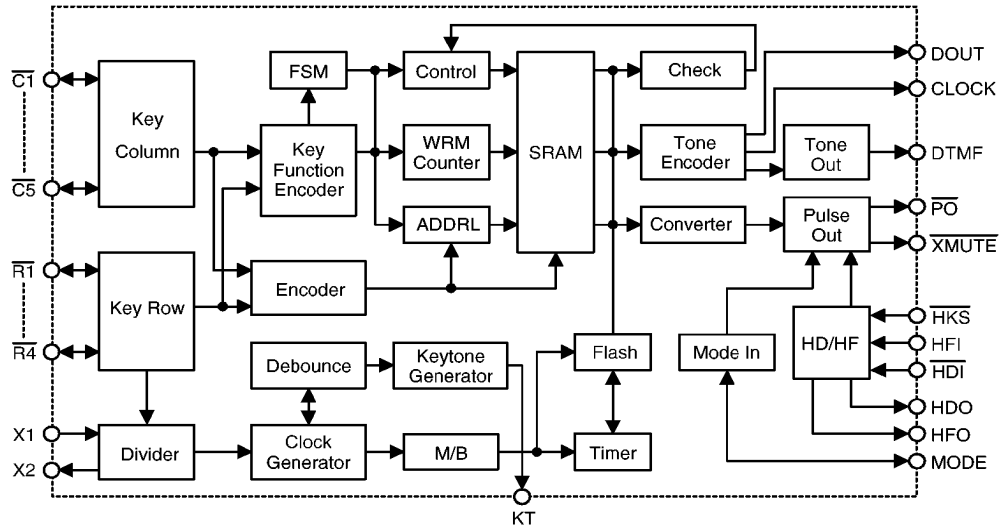
Form A



Form B



Block Diagram



Pin Description

Pin Name	I/O	Internal Connection	Description
$\overline{C1}\sim\overline{C5}$ $\overline{R1}\sim\overline{R4}$	I/O	CMOS IN/OUT	These pins form a standard keyboard matrix which can perform keyboard input detection and dialing specification setting functions. When on-hook ($\overline{HKS}$ =high) all the pins are set high. While off-hook the column group ($\overline{C1}\sim\overline{C5}$) remains low and the row group ($\overline{R1}\sim\overline{R4}$) is set high for key input detection. An inexpensive single contact standard keyboard can be used as an input device. Pressing a key connects a single column to a single row, and actuates the system oscillator that results in a dialing signal output. If more than two keys are pressed at the same time, no response occurs. The key-in debounce time is 20ms. Refer to the keyboard information for keyboard arrangement and to the functional description for dialing specification selection.
X1	I	OSCILLATOR	The system oscillator consists of an inverter, a bias resistor and the necessary load capacitor on chip. Connecting a standard 3.579545MHz crystal or ceramic resonator to the X1 and X2 terminals can implement the oscillator function. The oscillator is turned off in the standby mode, and is actuated whenever a keyboard entry is detected.
X2	O		

Pin Name	I/O	Internal Connection	Description
$\overline{\text{XMUTE}}$	O	NMOS OUT	$\overline{\text{XMUTE}}$ is an NMOS open drain structure pulled to VSS during dialing signal transmission. Otherwise, it is an open circuit. $\overline{\text{XMUTE}}$ is used to mute the speech circuit when transmitting the dial signal.
$\overline{\text{HKS}}$	I	CMOS IN	This pin is used to monitor the status of the hook-switch and its combination with HFI can control the $\overline{\text{PO}}$ pin output to make or break the line. $\overline{\text{HKS}}=\text{VDD}$: On-hook state ($\overline{\text{PO}}=\text{low}$). Except for HFI/ $\overline{\text{HDI}}$ (hand-free/hold-line control input), other functions are all disabled. $\overline{\text{HKS}}=\text{VSS}$: Off-hook state ($\overline{\text{PO}}=\text{high}$). The chip is in the standby mode and is ready to receive the key input.
$\overline{\text{PO}}$	O	CMOS OUT	This pin is a CMOS output structure which by receiving the $\overline{\text{HKS}}$ and HFO signals, control the dialer to connect or disconnect the telephone line. $\overline{\text{PO}}$ outputs a low to break line when $\overline{\text{HKS}}$ is high (on-hook) and HFO is low (hand-free inactive). $\overline{\text{PO}}$ outputs a high to make line when $\overline{\text{HKS}}$ is low (off-hook) or HFO is high or HDO is high. During the off-hook state, this pin also outputs the dialing pulse train in pulse mode dialing. While in the tone mode, this pin is always high.
MODE	I/O	CMOS IN/OUT	This is a three-state input/output pin, used for dialing mode selection, either Tone mode or Pulse mode, 10pps/20pps $\text{MODE}=\text{VDD}$: Pulse mode, 10pps $\text{MODE}=\text{OPEN}$: Pulse mode, 20pps $\text{MODE}=\text{VSS}$: Tone mode During the pulse mode dialing, switching this pin to the tone mode changes the subsequent digit entry to tone mode. When the chips are in tone mode, switching to pulse mode will also be recognized.
DTMF	O	CMOS OUT	This pin is active only when the chip transmits tone dialing signals. Otherwise, it always outputs a low. The pin outputs tone signals to drive the external transmitter amplifier circuit. The load resistor should not be less than 5k Ω .
$\overline{\text{HDI}}$	I	CMOS IN Pull-High	This pin is a schmitt trigger input structure. Active low. Applying a negative going pulse to this pin can toggle the HDO output once. An external RC network is recommended for input debouncing. The pull-high resistance is 200k Ω typ.

Pin Name	I/O	Internal Connection	Description
HDO	O	CMOS OUT	The HDO is a CMOS output structure. Its output is toggle-controlled by a negative transition on $\overline{\text{HDI}}$. When HDO is toggled to high, $\overline{\text{PO}}$ keeps high to hold the line. The hold function can be released by setting HFO high or by an on-off hook operation or by another HDI input. The HDO pin can directly drive the HT3810 series melody generator to produce hold-line back ground melody. Refer to the functional description for the hold-line function.
HFI	I	CMOS IN Pull-Low	This pin is a schmitt trigger input structure. Active high. Applying a positive going pulse to HFI can toggle the HFO once and hence control the hand-free function. The pull-low resistance of HFI is 200k Ω typically. An external RC network is recommended for the input debouncing.
KT	O	CMOS OUT	Keytone output pin. Outputs a 1.2kHz tone carrier when any key is pressed in the pulse mode or when the function keys are pressed in the tone mode.
HFO	O	CMOS OUT	The HFO is a CMOS output structure. Its output is toggle-controlled by a positive transition on the HFI pin. When HFO is high, the hand-free function is enabled and $\overline{\text{PO}}$ outputs high to connect the line. The hand-free function can be released by an on-off-hook operation or by another HFI input or by setting HDO high. Refer to the functional description for the hand-free function operation.
DOUT	O	NMOS OUT	NMOS open drain output pin. It outputs the BCD code of the dialing digits to the LCD driver chip (HT16XX series) or μC for dialing number display. Refer to the functional description for the detailed timing.
CLOCK	O	NMOS OUT	NMOS open drain output. When dialing, it outputs a series of pulse trains for DOUT data synchronization. DOUT data is valid at the falling edge of clock.
VDD	I	—	Positive power supply, 2.0V~5.5V for normal operation
VSS	I	—	Negative power supply

CMOS IN/OUT	NMOS OUT	CMOS IN	CMOS OUT	CMOS IN Pull-High
CMOS IN Pull-Low	OSCILLATOR			

Supply Voltage	-0.3V to 6V	Input Voltage	V _{SS} -0.3 to V _{DD} +0.3V
Storage Temperature	-50°C to 125°C	Operating Temperature	-20°C to 75°C

Electrical Characteristics

(F_{OSC}=3.5795MHz, T_a=25°C)

Symbol	Parameter	Test Conditions			Min.	Typ.	Max.	Units
		V _{DD}	Conditions					
V _{DD}	Operating Voltage	—	—		2	—	5.5	V
I _{DD}	Operating Current	2.5V	Pulse	Off-hook	—	0.2	1	mA
			Tone	Keypad entry No load	—	0.6	2	mA
I _{STB}	Standby Current	1V	On-hook, no load No entry		—	—	1	μA
V _R	Memory Retention Voltage	—	—		1	—	5.5	V
I _R	Memory Retention Current	1V	On-hook		—	0.1	0.2	μA
V _{IL}	Input Low Voltage	—	—		V _{SS}	—	0.2V _{DD}	V
V _{IH}	Input High Voltage	—	—		0.8V _{DD}	—	V _{DD}	V

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{DD}	Conditions				
I _{XMO}	$\overline{\text{XMUTE}}$ Leakage Current	—	V $\overline{\text{XMUTE}}$ =12V No entry	—	—	1	μA
I _{OLXM}	$\overline{\text{XMUTE}}$ Sink Current	2.5V	V $\overline{\text{XMUTE}}$ =0.5V	1	—	—	mA
I _{HKS}	$\overline{\text{HKS}}$ Pin Input Current	2.5V	V $\overline{\text{HKS}}$ =2.5V	—	—	0.1	μA
R _{HFI}	HFI Pull-Low Resistance	2.5V	V $\overline{\text{HFI}}$ =2.5V	—	200	—	kΩ
R _{HDI}	$\overline{\text{HDI}}$ Pull-High Resistance	2.5V	V $\overline{\text{HDI}}$ =0V	—	200	—	kΩ
I _{OH1}	Keypad Pin Source Current	2.5V	V _{OH} =0V	−4	—	−40	μA
I _{OL1}	Keypad Pin Sink Current	2.5V	V _{OL} =2.5V	200	400	—	μA
I _{OH2}	HFO Pin Source Current	2.5V	V _{OH} =2V	−1	—	—	mA
I _{OL2}	HFO Pin Sink Current	2.5V	V _{OL} =0.5V	1	—	—	mA
I _{OH3}	HDO Pin Source Current	2.5V	V _{OH} =2V	−1	—	—	mA
I _{OL3}	HDO Pin Sink Current	2.5V	V _{OL} =0.5V	1	—	—	mA
T _{FP}	Pause Time After Flash	—	—	—	0.2	—	s
T _F	Flash Time	—	—	—	0.3	—	s
T _{RP}	Pause Time for One-key Redialing	—	One-key redialing	—	1	—	s
T _{DB}	Key-in Debounce Time	—	—	—	20	—	ms
T _{BRK}	Break Time for One-key Redialing	—	One-key redialing	—	2	—	s
T _{KT}	Keytone Duration	—	—	—	34	—	ms
F _{KTC}	Keytone Frequency	—	—	—	1.2	—	kHz
F _{OSC}	System Frequency	—	Crystal=3.5795MHz	3.5759	3.5795	3.5831	MHz

Pulse Mode Electrical Characteristics

(F_{OSC}=3.5795MHz, T_a=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{DD}	Conditions				
I _{POH}	$\overline{\text{PO}}$ Output Source Current	2.5V	V _{OH} =2V	−0.2	—	—	mA
I _{POL}	$\overline{\text{PO}}$ Output Sink Current	2.5V	V _{OL} =0.5V	0.2	0.6	—	mA
PR	Pulse Rate	—	MODE pin is connected to V _{DD}	—	10	—	pps
			MODE pin is opened	—	20	—	

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{DD}	Conditions				
M/B	Make/Break Ratio	—	A resistor is linked between $\overline{R2}$ and $\overline{C1}$	—	33:66	—	%
			No resistor is linked between $\overline{R2}$ and $\overline{C1}$	—	40:60	—	
T _{PDP}	Pre-digit-pause Time	—	M/B ratio=40:60	—	40 (10pps) 20 (20pps)	—	ms
			M/B ratio=33:66	—	33 (10pps) 17 (20pps)	—	
T _{IDP}	Inter-digit-pause Time	—	Pulse rate=10pps	—	800	—	ms
			Pulse rate=20pps	—	500	—	
T _M	Pulse Make Duration	—	A resistor is linked between $\overline{R2}$ and $\overline{C1}$	—	33 (10pps) 17 (20pps)	—	ms
			No resistor is linked between $\overline{R2}$ and $\overline{C1}$	—	40 (10pps) 20 (20pps)	—	
T _B	Pulse Break Duration	—	A resistor is linked between $\overline{R2}$ and $\overline{C1}$	—	66 (10pps) 33 (20pps)	—	ms
			No resistor is linked between $\overline{R2}$ and $\overline{C1}$	—	60 (10pps) 30 (20pps)	—	

Tone Mode Electrical Characteristics

(F_{OSC}=3.5795MHz, T_a=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{DD}	Conditions				
V _{TDC}	DTMF Output DC Level	—	—	0.45V _{DD}	—	0.7V _{DD}	V
I _{TOL}	DTMF Sink Current	2.5V	V _{DTMF} =0.5V	0.1	—	—	mA
V _{TAC}	DTMF Output AC Level	—	Row group, R _L =5kΩ	0.12	0.155	0.18	V _{rms}
R _L	DTMF Output Load	2.5V	THD≤-23dB	5	—	—	kΩ
ACR	Column Pre-emphasis	2.5V	Row group=0dB	1	2	3	dB
THD	Tone Signal Distortion	2.5V	R _L =5kΩ	—	-30	-23	dB
T _{TMIN}	Minimum Tone Duration	—	Auto-redial	—	82.5	—	ms
T _{ITPM}	Minimum Inter-tone Pause	—	Auto-redial	—	85.5	—	ms

$$THD \text{ (Distortion) (dB)} = 20 \log \left(\frac{\sqrt{V_1^2 + V_2^2 + \dots + V_n^2}}{\sqrt{V_i^2 + V_h^2}} \right)$$

V_i, V_h: Row group and column group signals

V₁, V₂, ... V_n: Harmonic signals (BW=300Hz~3500Hz)

Functional Description

Keyboard matrix

$\overline{C1}\sim\overline{C5}$ and $\overline{R1}\sim\overline{R4}$ form a keyboard matrix. Together with a 4×5+1 keyboard, the keyboard matrix is used for dialing entries. In addition, the keyboard matrix also provides resistor option for different dialing specification selections. The keyboard arrangement for the HT9315FA/FB/FC/FD are shown in the **Keyboard Information**.

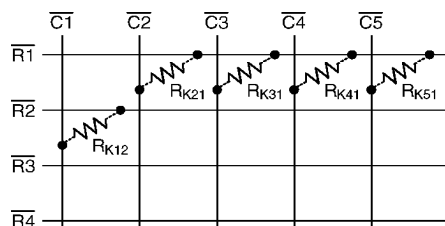
Tone frequency

Tone Name	Output Frequency (Hz)		% Error
	Specified	Actual	
$\overline{R1}$	697	699	+0.29%
$\overline{R2}$	770	766	-0.52%
$\overline{R3}$	852	847	-0.59%
$\overline{R4}$	941	948	+0.74%
$\overline{C1}$	1209	1215	+0.50%
$\overline{C2}$	1336	1332	-0.30%
$\overline{C3}$	1477	1472	-0.34%

Note: % Error does not contain the crystal frequency drift

Dialing specification selection

Various dialing specifications can be selected by adding resistors across keyboard matrix pins. The allowable option resistor connections are shown below.



All the resistors are 330kΩ. The resistor option functions and the default specifications (without option resistors) are listed on the table.

Option Resistor	Option Function	Default (No Resistor)
R _{K12}	Make/Break Ratio Selection	40:60
R _{K21}	Pause Duration Selection	T _P =2s
R _{K31} R _{K41}	Pulse Number Selection	N
R _{K51}	Keypad Form Selection	Form A

M/B ratio selection table

R _{K12}	M/B Ratio (%)
No	40:60
Yes	33.3:66.6

Pause duration selection table

R _{K21}	T _P (sec)
No	2
Yes	3.6

Pulse number selection table

R _{K31}	R _{K41}	Pulse Number
No	No	N
No	Yes	N+1
Yes	No	10-N
Yes	Yes	—

Keypad form selection table

R _{K51}	Keypad Form
No	Form A (see keyboard information)
Yes	Form B (see keyboard information)

Pulse number table

Keypad	Output Pulse Number		
Digit Key	N	10-N	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
*/T	P→T	P→T	P→T
#	Ignored	Ignored	Ignored

Tone duration and pause in redial function

Parameter	Symbol	Typ.	Unit
Minimum Tone Duration	T _{TMIN}	82.5	ms
Minimum Inter-tone Pause	T _{ITPM}	85.5	ms
Cycle Time	T _C	168	ms

Hand-free function operation

- Hand-free function execution
When HFO is low, a rising edge triggers the HFI, enabling the Hand-free function (HFO becomes high).
- Reset Hand-free function
When HFO is high, the Hand-free function is enabled and can be reset by:
 - ♦ Off-hook
 - ♦ Applying a rising edge to HFI
 - ♦ Changing the HDO pin from low to high

Hand-free function table

Current State			Input		Next State		
HKS	HFO	HDO	HDI	HFI	HKS	HFO	HDO
H	L	X	H	L	An	L	An
H	L	X	H	↑	An	H	L
H	H	X	H	↑	An	L	An
H	X	L	H	L	L	L	L
L	L	X	H	L	An	L	An
L	L	X	H	↑	An	H	L
L	H	L	H	↑	An	L	An
L	X	X	H	L	H	An	An
X	X	L	↓	L	An	L	H

H: Logic HIGH X: Don't care ↑: Rising edge
L: Logic LOW An: Unchanged ↓: Falling edge

Hold-line function operation

- Hold-line function execution
When HDO is low, a falling edge triggers the HDI, enabling the Hold-line function (HDO becomes high). The XMUTE remains low when HDO is high.
- Reset Hold-line function
When HDO is high, the Hold-line function is enabled and can be reset by:
 - ♦ Off-hook
 - ♦ Applying a falling edge to HDI
 - ♦ Changing the HFO pin from low to high

• Hold-line function table

Current State			Input			Next State	
HKS	HDO	HFO	HFI	HDI	HKS	HDO	HFO
H	L	X	L	H	An	L	An
H	L	X	L	↓	An	H	L
H	H	L	L	↓	An	L	An
H	X	X	L	H	L	L	L
L	L	X	L	H	An	L	An
L	L	X	L	↓	An	H	L
L	H	L	L	↓	An	L	An
L	X	X	L	H	H	An	An
X	X	L	↑	H	An	L	H

H: Logic HIGH X: Don't care ↑: Rising edge
L: Logic LOW An: Unchanged ↓: Falling edge

DOUT BCD code

When dialing, the corresponding 4-bit BCD codes are serially presented on DOUT from MSB to LSB. The data of DOUT is valid at the falling edge of the CLOCK pin. The following table lists the BCD codes corresponding to the keyboard input.

Key-in	BCD Code	Key-in	BCD Code
1	0001	8	1000
2	0010	9	1001
3	0011	0	1010
4	0100	*/T	1101
5	0101	#	1100
6	0110	F	1011
7	0111	P	1110

Key definition

- 0,1,2,3,4,5,6,7,8,9 keys
These are dialing number input keys for both the pulse mode and the tone mode operations.
- */T
This key executes the P→T function and * tone output functions in the pulse mode. On

the other hand, the */T key executes the * function in the tone mode.

- P→T
The key executes the P→T function in the pulse mode. No response in the tone mode.
- #
This is a dialing signal key for the tone mode only, no response in the pulse mode.
- F
The flash key is a control key. Pressing the F key will force the $\overline{PO}$ pin to be "low" for the T_F (0.3 sec) duration and is then followed by T_{FP} (0.2 sec). During the dialing signal transmission, the F key is inhibited.
- P
Pause key. The execution of this key pauses the output for the T_P duration. T_P can be selected by R_{K21} .
- R
Redial key. Executes redialing as well as one-key redial function.
- R/P
Redial and pause function key. If it is pressed as the first key after off-hook, this key executes the redial function. Otherwise, it works as the pause key.
- ST
Store key. The execution of this key actuates the store memory function with (or without) dialing output. During the dialing signal transmission, the ST key is inhibited.
- EM1~EM3
One-touch memory dialing key. For speed-calling convenience, they provide memory dialing in either pulse or tone mode.
- A
Auto key. When this key is pressed before pressing any one of the digital keys (0~9) it executes the two-touch memory dialing function.

Keyboard operation

The following operations are described under an off-hook or on-hook condition with the hand-free active condition.

• Normal dialing

– Pulse mode

(a) without */T, P→T

Keyboard input: D1 D2 ... Dn

Dialing output: D1 D2 ... Dn

RM: D1 D2 ... Dn

(b) with */T

Keyboard input: D1 D2 ... Dn */T Dn+1 ... Dm

Dialing output: D1 D2 ... Dn * Dn+1 ... Dm
Pulse Tone

RM: D1 D2 ... Dn */T Dn+1 ... Dm

(c) with P→T

Keyboard input: D1 D2 ... Dn P→T Dn+1 ... Dm

Dialing output: D1 D2 ... Dn Dn+1 ... Dm
Pulse Tone

RM: D1 D2 ... Dn P→T Dn+1 ... Dm

– Tone mode

(a) without */T, P→T

Keyboard input: D1 D2 ... Dn

Dialing output: D1 D2 ... Dn

RM: D1 D2 ... Dn

(b) with */T

Keyboard input: D1 D2 ... Dn */T Dn+1 ... Dm

Dialing output: D1 D2 ... Dn * Dn+1 ... Dm

RM: D1 D2 ... Dn * Dn+1 ... Dm

(c) with P→T

Keyboard input: D1 D2 ... Dn P→T Dn+1 ... Dm

Dialing output: D1 D2 ... Dn Dn+1 ... Dm

RM: D1 D2 ... Dn Dn+1 ... Dm

Note: The maximum capacity of the RM memory is 32 digits. When more than 32 digits are entered, the signal is transmitted but the redial function is inhibited.

• Redial

– Pulse mode

(a) without */T, P→T

RM content: D1 D2 ... Dn

Keyboard input: R

Dialing output: D1 D2 ... Dn

RM: Unchanged

(b) with */T

RM content: D1 D2 ... Dn */T Dn+1 ... Dm

Keyboard input: R

Dialing output: D1 D2 ... Dn
Pulse

RM: Unchanged

(c) with P→T

RM content: D1 D2 ... Dn P→T Dn+1 ... Dm

Keyboard input: R

Dialing output: D1 D2 ... Dn
Pulse

RM: Unchanged

– Tone mode

(a) without */T, P→T

RM content: D1 D2 ... Dn

Keyboard input: R

Dialing output: D1 D2 ... Dn

RM: Unchanged

(b) with */T

RM content: D1 D2 ... Dn */T Dn+1 ... Dm

Keyboard input: R

Dialing output: D1 D2 ... Dn * Dn+1 ... Dm

RM: Unchanged

(c) with P→T

RM content: D1 D2 ... Dn P→T Dn+1 ... Dm

Keyboard input: R

Dialing output: D1 D2 ... Dn Dn+1 ... Dm

RM: Unchanged

Note: If the dialing number exceeds 32 digits, redialing is inhibited and $\overline{PO}=VDD$

• One-key redial

– Pulse mode

(a) without */T, P→T

Keyboard input: D1 D2 ... Dn R
Dialing output: D1 D2 ... Dn TBRK TRP D1 D2 ... Dn
RM: D1 D2 ... Dn

(b) with */T

Keyboard input: D1 D2 ... Dn */T Dn+1 ... Dm R
Dialing output: D1 D2 ... Dn * Dn+1 ... Dm
TBRK TRP D1 D2 ... Dn
RM: D1 D2 ... Dn */T Dn+1 ... Dm

(c) with P→T

Keyboard input: D1 D2 ... Dn P→T Dn+1 ... Dm R
Dialing output: D1 D2 ... Dn Dn+1 ... Dm TBRK TRP
D1 D2 ... Dn
RM: D1 D2 ... Dn P→T Dn+1 ... Dm

– Tone mode

(a) without */T

Keyboard input: D1 D2 ... Dn R
Dialing output: D1 D2 ... Dn TBRK TRP D1 D2 ... Dn
RM: D1 D2 ... Dn

(b) with */T

Keyboard input: D1 D2 ... Dn */T Dn+1 ... Dm R
Dialing output: D1 D2 ... Dn * Dn+1 ... Dm
TBRK TRP D1 D2 ... Dn * Dn+1 ... Dm
RM: D1 D2 ... Dn * Dn+1 ... Dm

(c) with P→T

Keyboard input: D1 D2 ... Dn P→T Dn+1 ... Dm R
Dialing output: D1 D2 ... Dn Dn+1 ... Dm
TBRK TRP D1 D2 ... Dn Dn+1 ... Dm
RM: D1 D2 ... Dn Dn+1 ... Dm

Note: If the dialing number exceeds 32 digits, redialing is inhibited and $\overline{PO}=VDD$

• Memory store

– One-touch memory store

(a) without dialing output

Keyboard input: ST D1 D2 ... Dn ST EMa
Dialing output:
EMa: D1 D2 ... Dn
RM: D1 D2 ... Dn

(b) with dialing output

Keyboard input: D1 D2 ... Dn ST ST EMa
Dialing output: D1 D2 ... Dn
EMa: D1 D2 ... Dn
RM: D1 D2 ... Dn

– Two-touch memory store

(a) without dialing output

Keyboard input: ST D1 D2 ... Dn ST a
Dialing output:
Ma: D1 D2 ... Dn
RM: D1 D2 ... Dn

(b) with dialing output

Keyboard input: D1 D2 ... Dn ST ST a
Dialing output: D1 D2 ... Dn
Ma: D1 D2 ... Dn
RM: D1 D2 ... Dn

Note: If the dialing number exceeds 32 digits, the memory store is inhibited.

However, if the dialing number is not more than 32 digits the memory will store a max. of 18 digits.
EMa=EM1~EM3, Ma=M0~M9, a=0~9

- Memory dialing

EMa content: D1 D2 ... Dn
 Keyboard input: **EMa**
 Dialing output: D1 D2 ... Dn
 EMa: Unchanged
 RM: D1 D2 ... Dn

Ma content: D1 D2 ... Dn
 Keyboard input: **A a**
 Dialing output: D1 D2 ... Dn
 Ma: Unchanged
 RM: D1 D2 ... Dn

Note: EMa=EM1~EM3. Ma=M0~M9, a=0~9

- Chain dialing

EM1 content: D1 D2 ... Dn
 EM2 content: Dn+1 ... Dm
 M1 content: Dm+1 ... DI
 M2 content: DI+1 ... Dk
 Keyboard input: **D1 D2 D3 A 1 A 2 EM1 EM2**
 Dialing output: D1 D2 D3 Dm+1 ... DI DI+1 ... Dk D1 D2 ... Dn Dn+1 ... Dm
 EM1/EM2/M1/M2: Unchanged
 RM: D1 D2 D3 Dm+1 ... DI DI+1 ... Dk D1 D2 ... Dn Dn+1 ... Dm

Note: The maximum capacity of the RM memory is 32 digits. When the dialing number exceeds 32 digits, redialing is inhibited and $\overline{PO}=VDD$

- Flash

- Flash as a control key

Keyboard input: **D1 D2 ... Dn F Dn+1 ... Dm**
 Dialing output: D1 D2 ... Dn T_F (break a flash time) T_{FP} Dn+1 ... Dm
 RM: Dn+1 ... Dm

- Pause

Keyboard input: **D1 D2 ... Dn [P or R/P] Dn+1 ... Dm**
 Dialing output: D1 D2 ... Dn T_P Dn+1 ... Dm
 RM: D1 D2 ... Dn P Dn+1 ... Dm

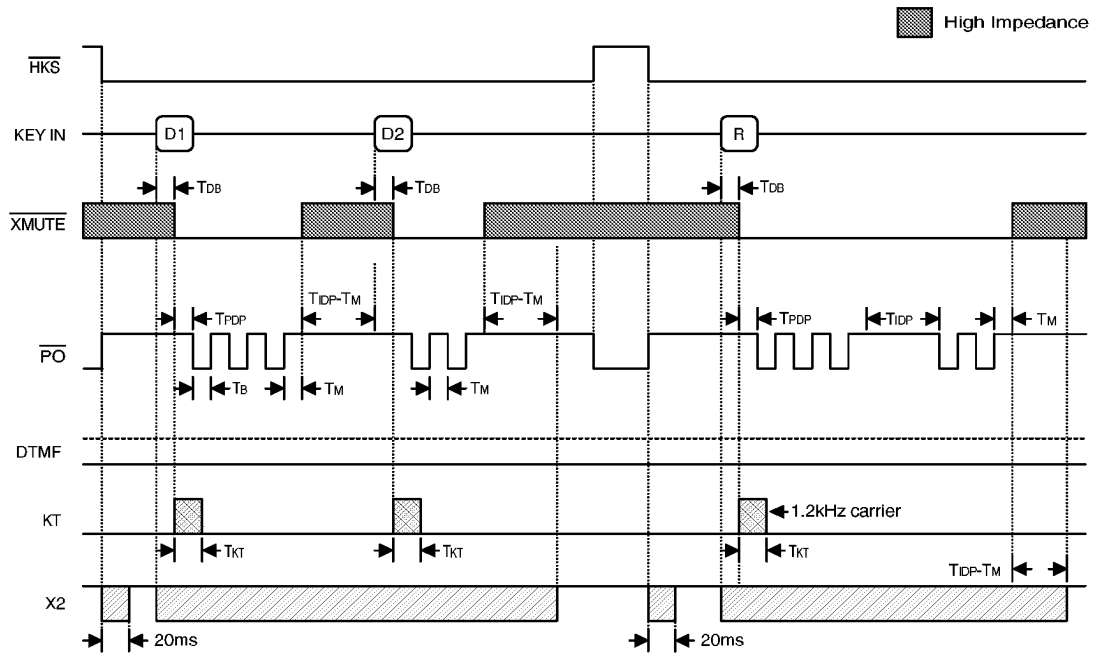
- Note:

RM: Redial memory
 D1 D2 ... Dn: 0~9
 Dn+1 ... Dm: 0~9, *, #
 Dm+1 ... DI: 0~9, *, #
 DI+1 ... Dk: 0~9, *, #

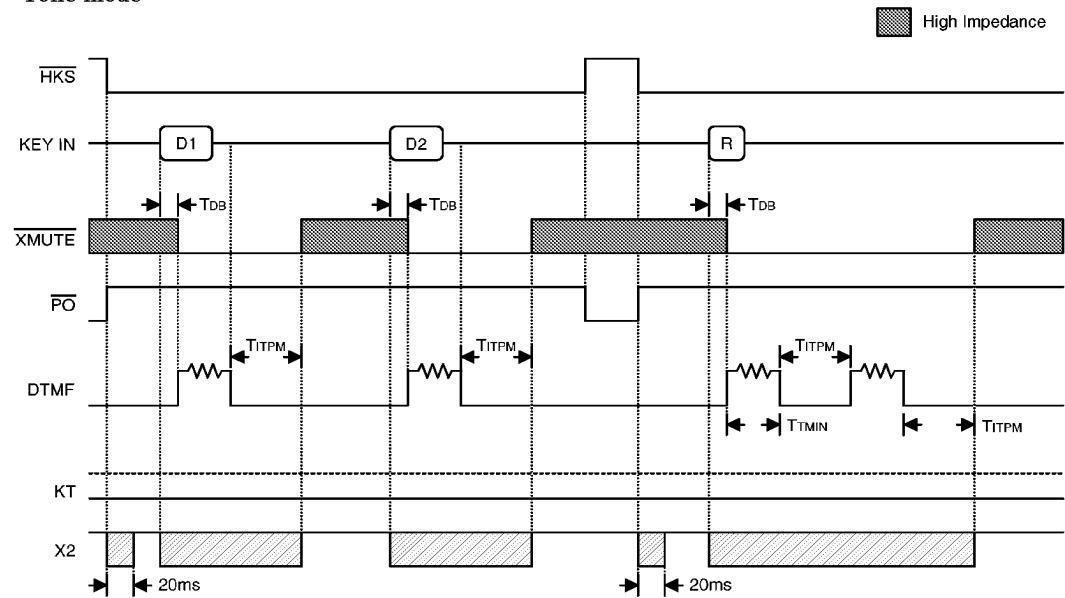
Timing Diagrams

Normal dialing

- Pulse mode

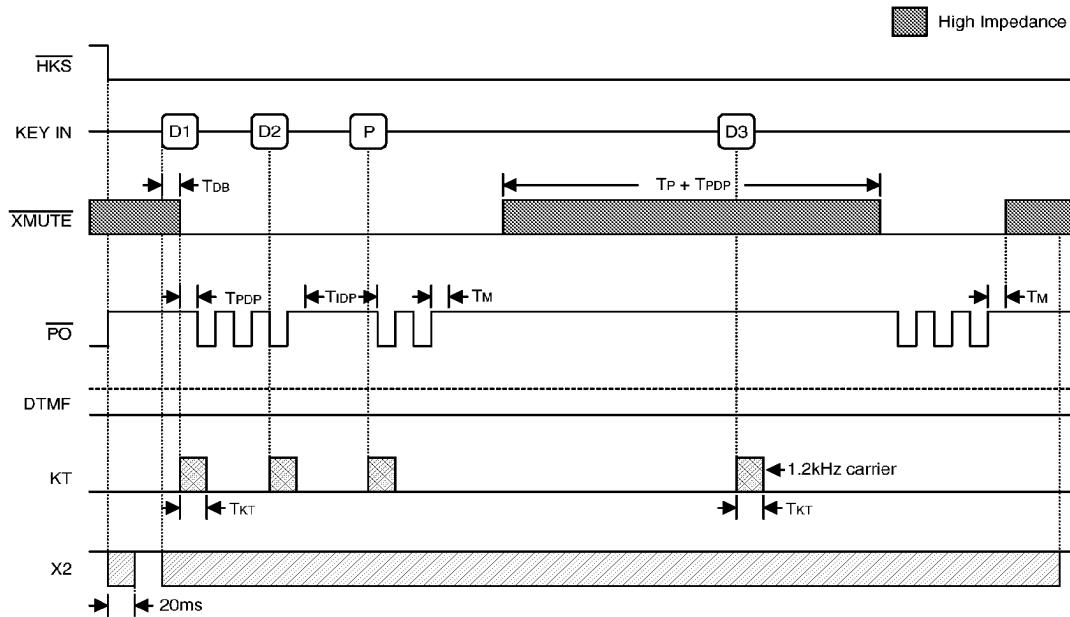


- Tone mode

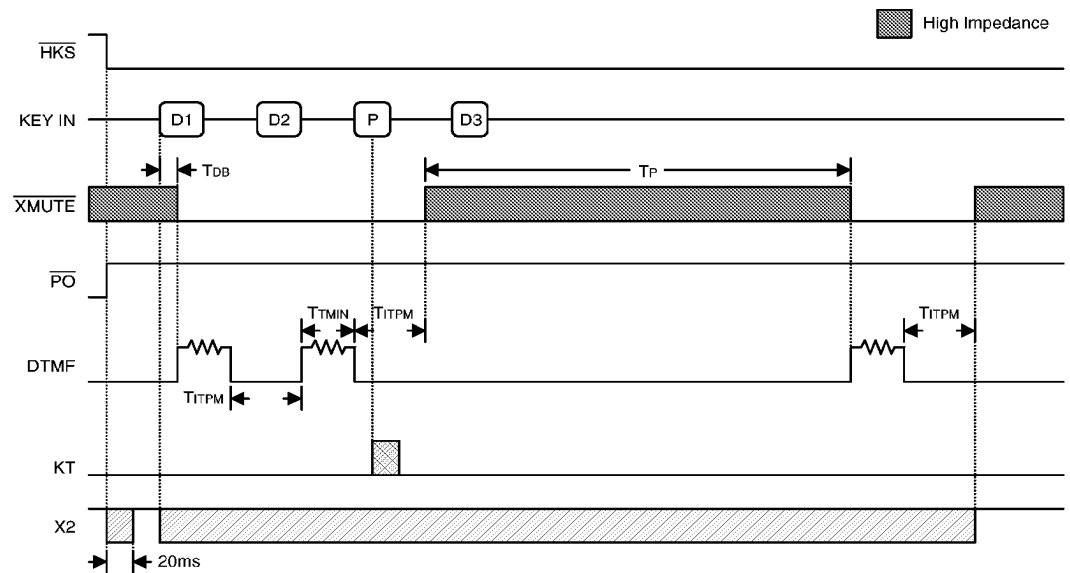


Dialing with pause key

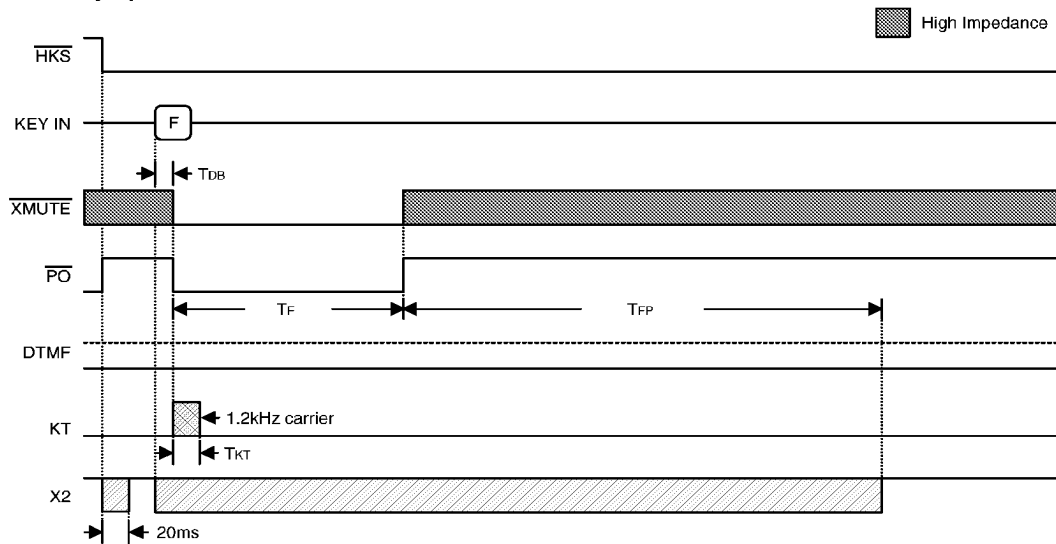
- Pulse mode



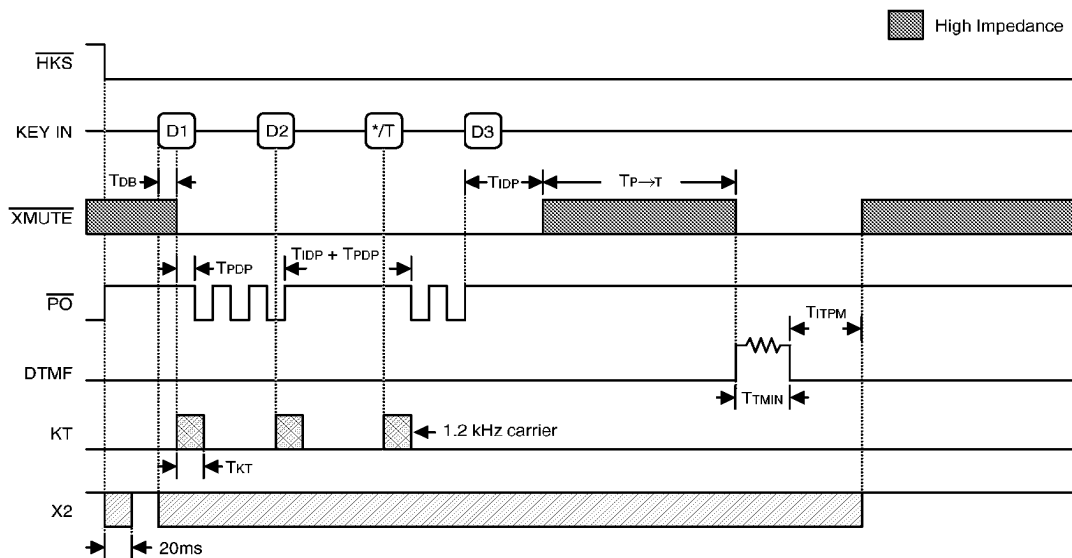
- Tone mode



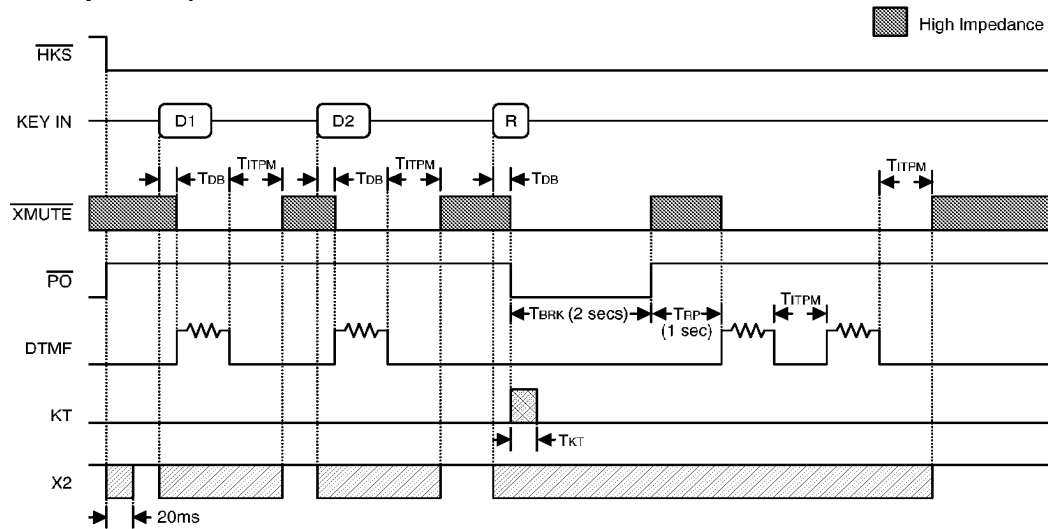
Flash key operation



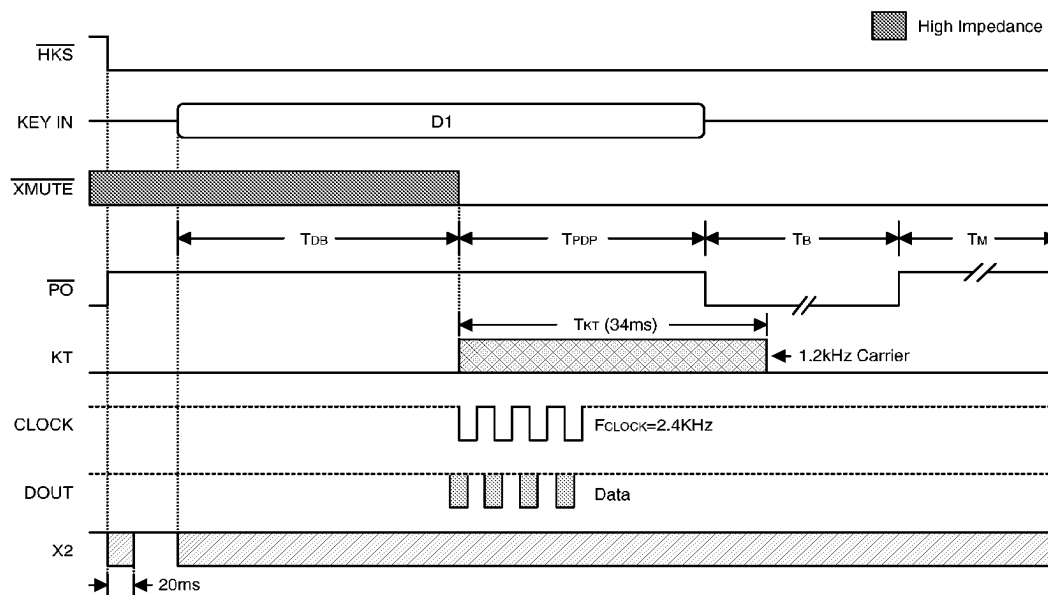
Pulse→Tone operation



One key redial operation



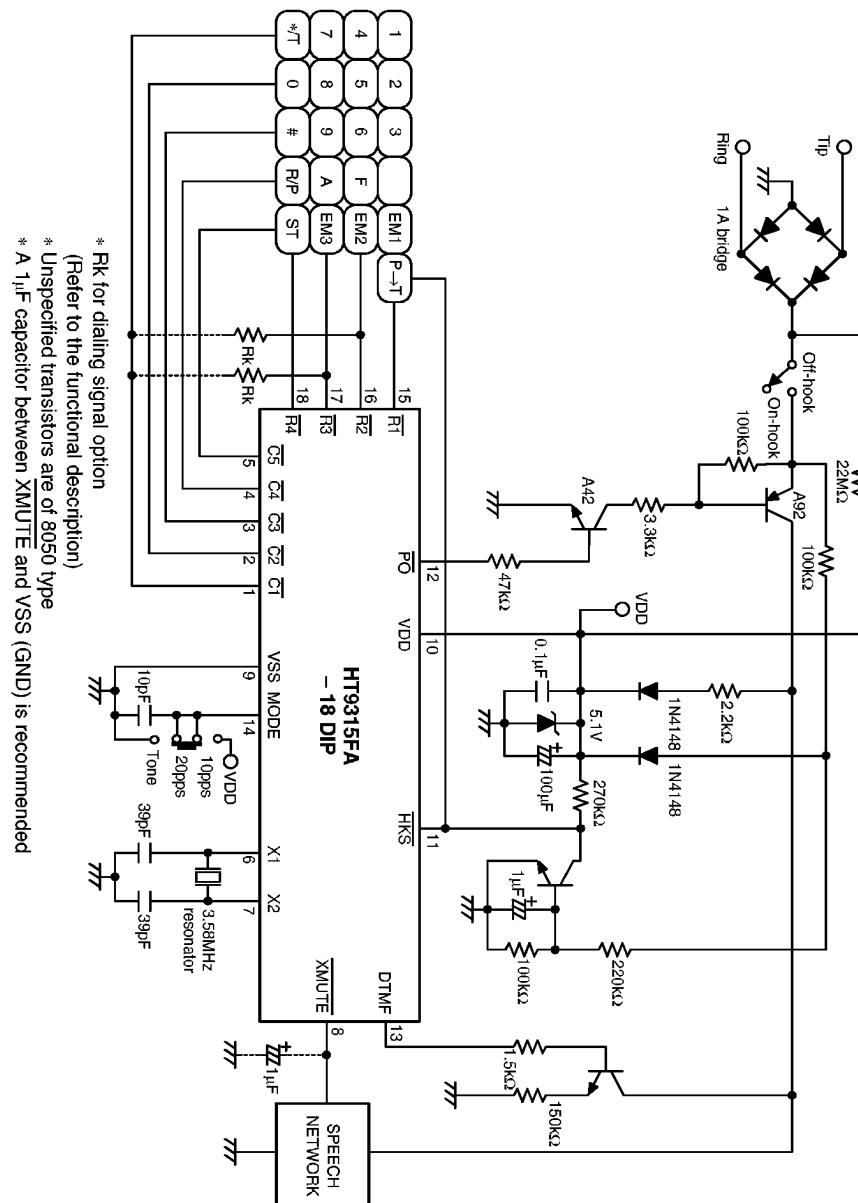
CLOCK & DOUT operation



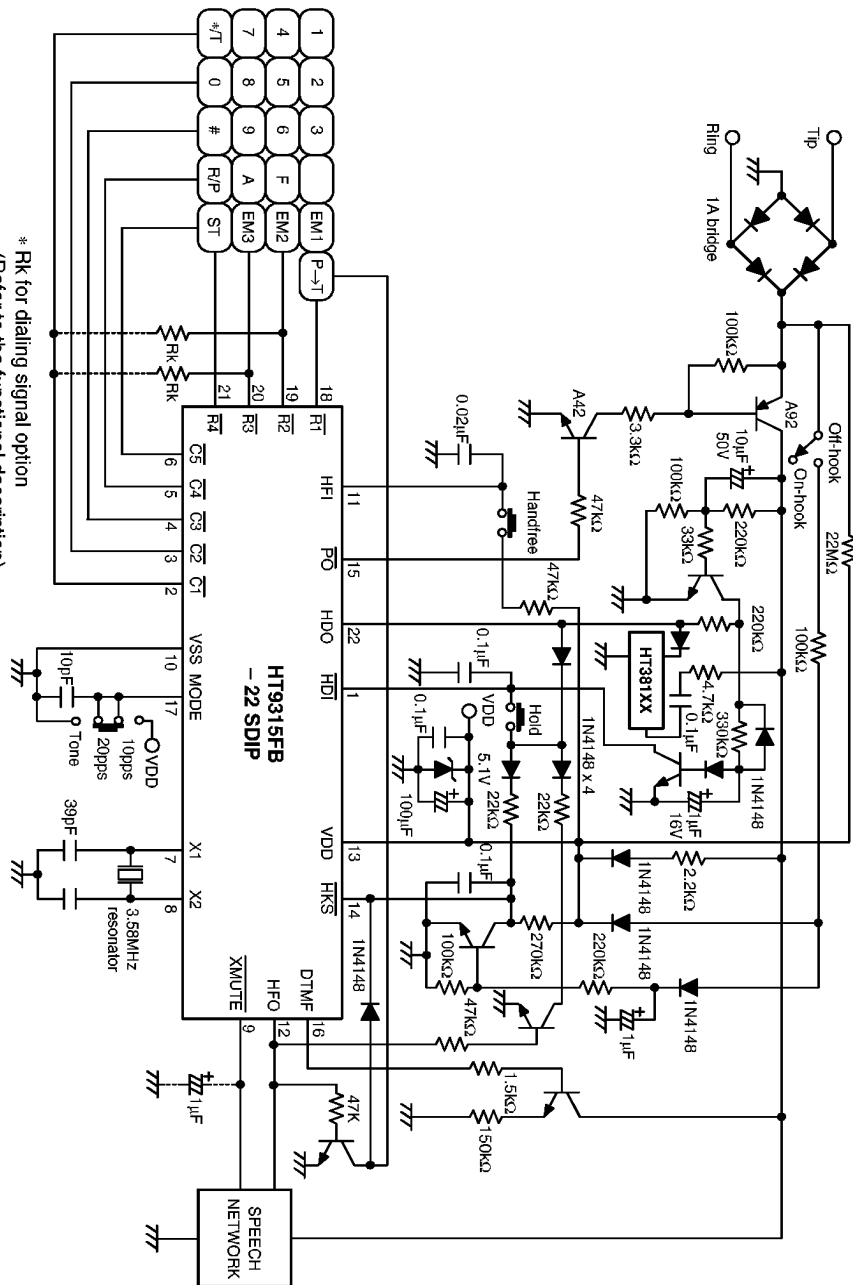
Note: D1=D3=3
D2=2

Application Circuits

Application circuit 1

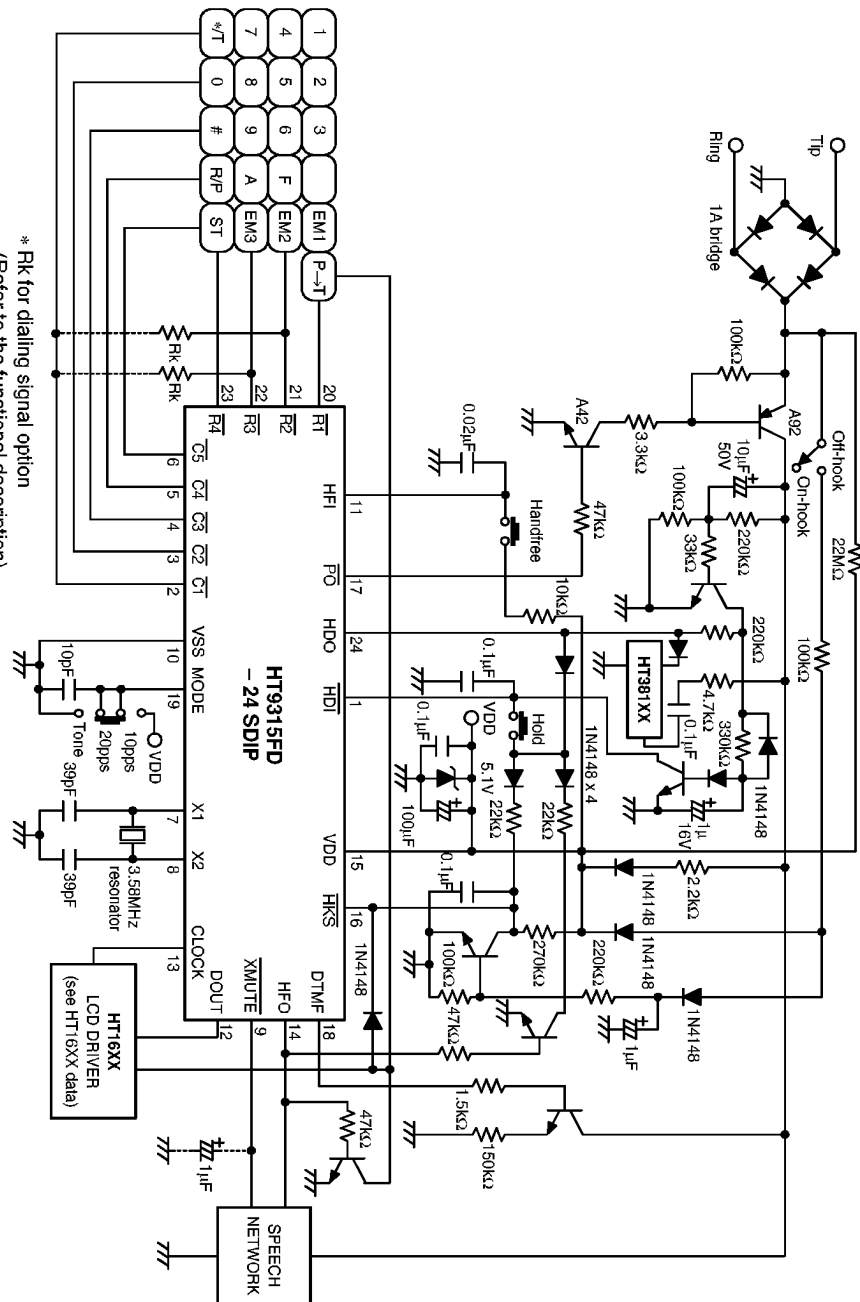


- * Rk for dialing signal option (Refer to the functional description)
- * Unspecified transistors are of 8050 type
- * A 1 μ F capacitor between XMUTE and VSS (GND) is recommended
- * The HT381XX (HT3810 series) provides a melody during the hold period



[illegible]

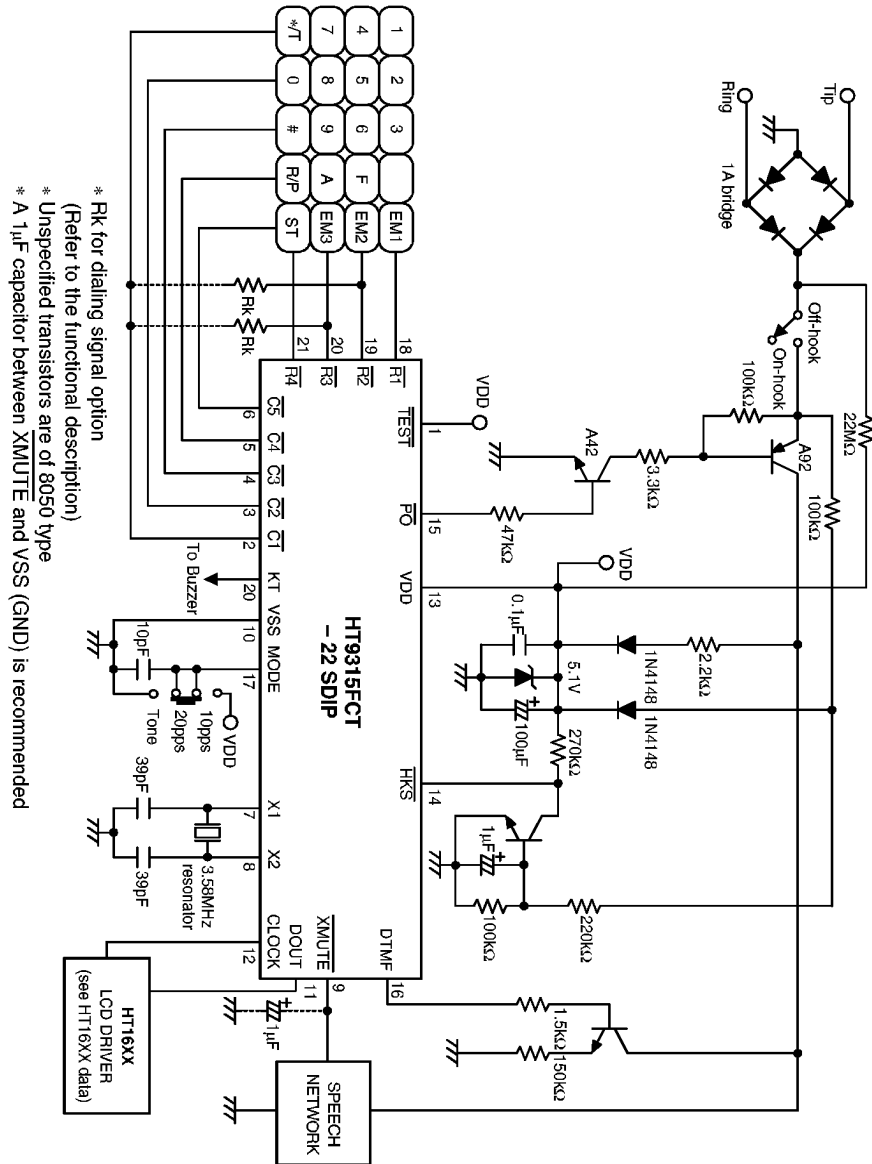
- * Rk for dialing signal option
- (Refer to the functional description)
- * Unspecified transistors are of 8050 type
- * A $1\mu\text{F}$ capacitor between XMUTE and VSS (GND) is recommended
- * The HT1381XX (HT13810 series) provides a melody during the hold period



[illegible]

[illegible]

Application circuit 7



- * Rk for dialing signal option
- (Refer to the functional description)
- * Unspecified transistors are of 8050 type
- * A 1 μ F capacitor between XMUTE and VSS (GND) is recommended
- * The HT1381XX (HT13810 series) provides a melody during the hold period

