

# STC2580C<sub>0C</sub> Series

## CMOS TONE/PULSE DIALER

- DTMF/Pulse Output Switch
- Low Distortion
- Ten 18-digit Repertory Memoies and 24-digit Redial Memory

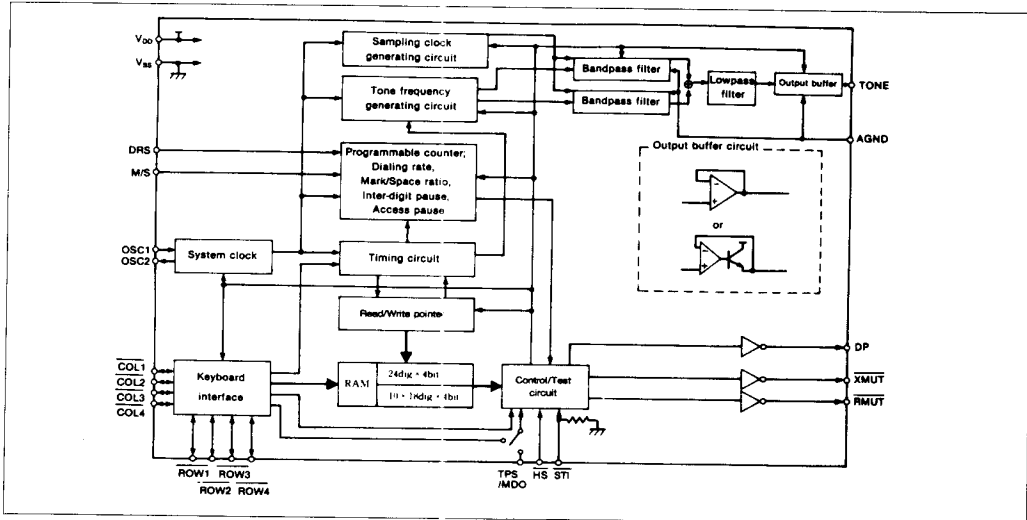
### DESCRIPTION

The STC2580C<sub>0C</sub> series is a CMOS LSI which is provided with a memory for telephone numbers, and can selectively output either dual tone multi-frequency (DTMF) signals or a dialing pulse (DP) train. The LSI contains Band Pass Filters (BPF) and smoothing filter by switched capacitor filter (SCF) technology, so that the DTMF output has less distortion than the DA conversion system used in a conventional tone dialer. It also incorporates an emitter-follower NPN transistor, enabling the DTMF output to directly drive a telephone line. By connecting the minimum necessary interface circuit, the dialing pulse output can also drive a telephone line.

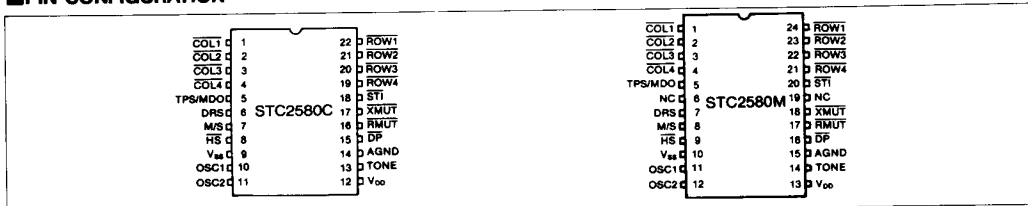
### FEATURES

- Low-voltage operation and low power dissipation due to CMOS process.
- A built-in SCF-type BPF makes possible a DTMF signal with low THD (typically 2.5% at 5 V) without the use of external filters.
- The LSI contains redialing memory for a 24-digit numbers and repertory memory for ten 18-digit numbers which can be used in either the tone or pulse mode.
- DP mode : Permits selection of dialing pulse rate (10/20 pps) and mark/space ratio (40/60, 33.3/66.6). (The inter-digit pause is fixed for each dialing rate .....617.9 ms for 10 pps or 463.4 ms for 20 pps.)
- DTMF mode ..... Make=93.1 ms and inter-digit pause=61.4 ms.
- When sending to an external line, the access pause can be set to auto pause (3.97s) using the pause key. This function can also be canceled during sending.
- This LSI can be connected to a standard 2 of 8 keyboard.
- The built-in reference signal generator requires only an inexpensive and easily-obtainable 3.58 MHz crystal oscillator for the TV color burst signal.
- Package ..... 22-pin DIP (plastic) / 24-pin SOP (plastic)

### BLOCK DIAGRAM



## ■ PIN CONFIGURATION



## ■ PIN DESCRIPTION

Pin name	Pin No.		Functions
	STC2580C	STC2580M	
ROW4-ROW1	19-22	21-24	[Scanning input/output of matrix keyboard] Keys are selected by short-circuiting ROW and COL.
COL1-COL4	1-4	1-4	
TPS*1/MDO	5	5	[TPS : DTMF/DP mode select input] (for STC2585C to STC2588C) In this case, [T/P] on the keypad is an invalid input. [MDO : DTMF/DP mode display output] (for STC2581C to STC2584C) Outputs whether the DTMF or DP mode has been selected using [T/P] key.
DRS*1	6	7	[Pulse rate select input in DP mode] Ignores input switching performed during a pulse output (including auto dialing) as well as inputs made in the DTMF mode. The inter-digit pause is fixed for each pulse rate.
M/S*1	7	8	[Pulse mark/space ratio in DP mode] Like DRS, this pin ignores inputs made during a pulse output or in the DTMF mode. OFF-Hook : V <sub>SS</sub> level
HS*1	8	9	[Hook switch] Determines the ON/OFF status of the hook switch.
V <sub>SS</sub>	9	10	[Power supply terminal (-)]
CSC1	10	11	These pins are connected across the terminals of a 3.579545 MHz crystal oscillator which is used for the reference signal generator.
OSC2	11	12	
V <sub>DD</sub>	12	13	[Power supply terminal (+)]
TONE	13	14	[DTMF signal output] This pin enables either an NPN emitter-follower output or a CMOS OP-Amp output to be selected.
AGND	14	15	[Grounding point output of analog circuit (SCF section)] By connecting a capacitor to this point, the level is stabilized.
DP	15	16	[Dialing pulse output] While the dialing pulse is not output, the output level is V <sub>SS</sub> during ON-Hook and V <sub>DD</sub> during OFF-Hook.
RMUT	16	17	[Receiver mute output] This output is valid in the DP mode. In the DTMF mode, muting is not applied. The level of this pin is: DP mode : During mute or ON-Hook → V <sub>SS</sub> level DTMF mode : During ON-Hook → V <sub>SS</sub> level ; During OFF-Hook → V <sub>DD</sub> level.
X MUT	17	18	[Transmitter mute output] Mute signal for transmitter usable in both the DP mode and the DTMF mode. During mute or ON-Hook status → V <sub>SS</sub> level
STI*2	18	20	[Single tone generating mode select] The single tone generating mode is selected by applying the V <sub>DD</sub> level. To generate a single tone for COL1, COL2, or COL3, press two or three keys in the corresponding column simultaneously, and to generate a single tone for ROW1, ROW2, ROW3, or ROW4, press the two keys of COL1 and COL2 in the corresponding row simultaneously.
NC	6, 19		[No connection]

\*1 Because DRS, M/S, HS, and TPS are open pins, be sure to apply V<sub>DD</sub> or V<sub>SS</sub> from outside the LSI.

\*2 Pin STI is connected to a built-in pull-down resistor which puts the LSI in the single tone inhibit mode during normal use, even when the pin is open. To provide noise immunity, however, it is recommended that this pin be fixed at V<sub>SS</sub> level externally.

## ■ STC2580C<sub>OC</sub> SERIES

Type*1	Write to repertory memory	DTMF output*2	Tone/pulse output selection	Type*1	Write to repertory memory	DTMF output*2	Tone/pulse output selection
STC2581C <sub>OC</sub>	OFF Hook	Bip	Key	STC2585C <sub>OC</sub>	OFF Hook	Bip	External pin
STC2582C <sub>OC</sub>	ON Hook	Bip	Key	STC2586C <sub>OC</sub>	ON Hook	Bip	External pin
STC2583C <sub>OC</sub>	OFF Hook	CMOS	Key	STC2587C <sub>OC</sub>	OFF Hook	CMOS	External pin
STC2584C <sub>OC</sub>	ON Hook	CMOS	Key	STC2588C <sub>OC</sub>	ON Hook	CMOS	External pin

\*1 This LSI can also be provided in a mini-flat package. In this case, C becomes M (e.g. STC2581M). The characteristics are same as those of the DIP type.

\*2 This is the CMOS OP-Amp output or Bipolar emitter-follower output.

## ■ ABSOLUTE MAXIMUM RATINGS

(V<sub>SS</sub>=0V)

Parameter	Symbol	Ratings	Unit
Power supply voltage	V <sub>DD</sub>	-0.3 to 7.5	V
Input voltage	V <sub>I</sub>	-0.3 to V <sub>DD</sub> +0.3	V
Output voltage	V <sub>O</sub>	-0.3 to V <sub>DD</sub> +0.3	V
Operating temperature	T <sub>opr</sub>	-20 to 70	°C
Storage temperature	T <sub>stg</sub>	-65 to 150	°C
Soldering temperature and time	T <sub>sol</sub>	260°C, 10s (at lead)	—

## ■ ELECTRICAL CHARACTERISTICS

### ● DC Characteristics

(V<sub>SS</sub>=0V, T<sub>a</sub> = -20 to 70°C)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
Operating voltage	V <sub>DD</sub>	DP mode	1.5	—	6.0	V	
		DTMF mode	2.5	—	6.0		
Data retention voltage	V <sub>DDR</sub>	HS = V <sub>DD</sub>	1.0	—	6.0	V	
Average operating current	I <sub>DDA</sub>	V <sub>DD</sub> =5.0V HS=V <sub>SS</sub> DP, TONE, RMUT, XMUT and MDO not loaded	Key input stand- by status	—	—	800	μA
		in DP mode dial pulse being output	—	—	1.0	mA	
		in DTMF mode DTMF signal being output	—	—	8.0	mA	
Data retention current	I <sub>DDR</sub>	V <sub>DD</sub> =1.0V, HS=V <sub>DD</sub> , STI=V <sub>SS</sub> , TPS=DRS=M/S= V <sub>DD</sub> or V <sub>SS</sub>	—	—	0.75	μA	
High level input voltage	V <sub>IH</sub>	TPS, DRS, M/S, HS, STI	V <sub>DD</sub> -0.4	—	V <sub>DD</sub>	V	
Low level input voltage	V <sub>IL</sub>	TPS, DRS, M/S, HS, STI	V <sub>SS</sub>	—	V <sub>SS</sub> +0.4	V	
High level input voltage (1)	I <sub>IH1</sub>	TPS, DRS, M/S, HS, V <sub>DD</sub> = 5.0V, V <sub>IH1</sub> =V <sub>DD</sub>	—	—	0.1	μA	
High level input voltage (2)	I <sub>IH2</sub>	STI, V <sub>DD</sub> =5.0V, V <sub>IH2</sub> =V <sub>DD</sub>	—	—	300	μA	
Low level input current	I <sub>IL1</sub>	TPS, DRS, M/S, HS, STI, V <sub>DD</sub> = 5.0V, V <sub>IL1</sub> =V <sub>SS</sub>	—	—	0.1	μA	
Low level input current	I <sub>IL2</sub>	COL1—COL4, ROW1—ROW4, V <sub>DD</sub> =5.0V, V <sub>IL2</sub> =V <sub>SS</sub>	10	23	50	μA	
High level output current (Source)	I <sub>OH1</sub>	DP, XMUT, RMUT, MDO V <sub>DD</sub> =5.0V, V <sub>OH1</sub> =4.0V	4.0	—	—	mA	
Low level output current (Sink)	I <sub>OL2</sub>	DP, XMUT, RMUT, MDO V <sub>DD</sub> =5.0V, V <sub>OL2</sub> =0.5V	4.0	—	—	mA	

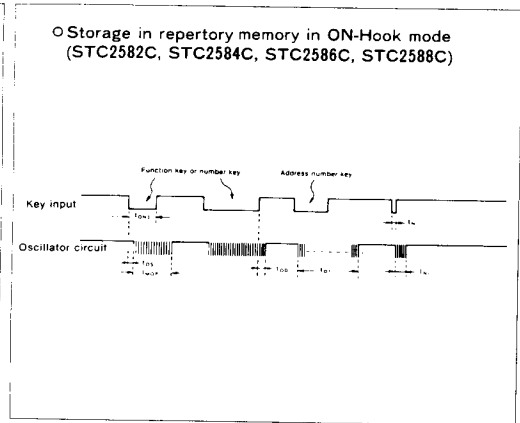
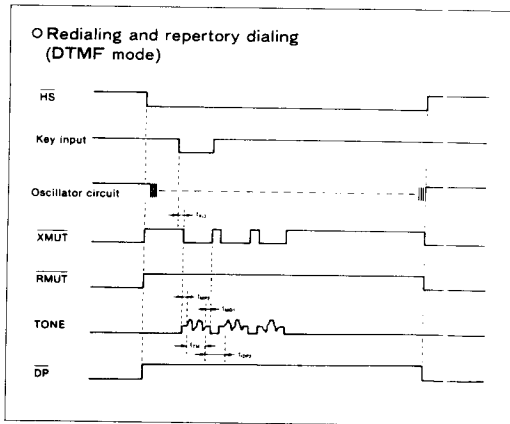
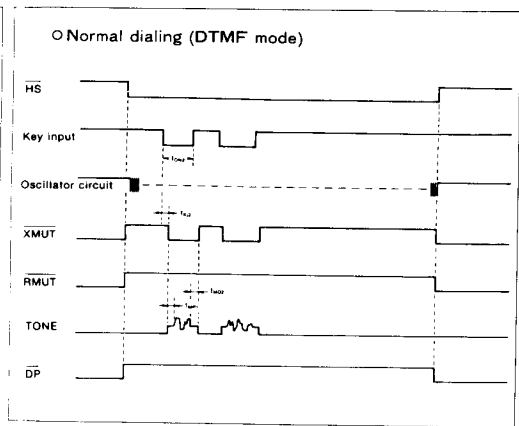
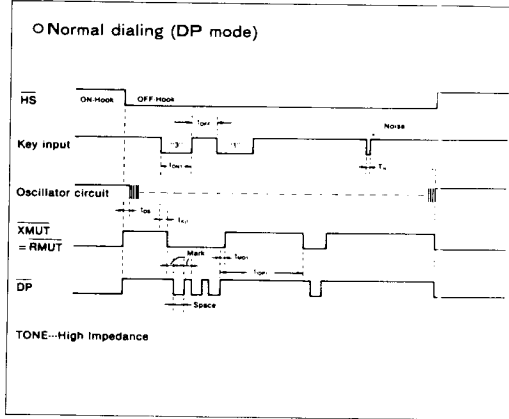
●AC Characteristics

(V<sub>SS</sub>=0V, Ta=25°C, f<sub>osc</sub>=3.579545MHz)

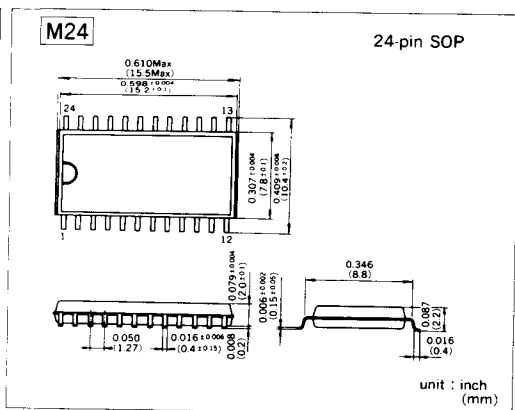
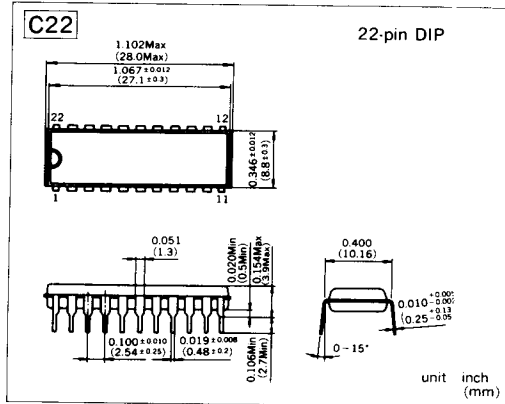
Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
Key input ON effective period	t <sub>ON1</sub> *1	DP and DTMF mode non-normal dialing	Excluding chattering	15.45	—	—	ms
	t <sub>ON2</sub> *2	DTMF mode normal dialing		77.24	—	—	
Key input OFF effective period	t <sub>OFF</sub>	Excluding chattering	1.72	—	—	ms	
Pulse width of allowable noise at input terminal	t <sub>N</sub>		—	—	14.37	ms	
Oscillator start-up time	t <sub>OS</sub>	V <sub>DD</sub> =5.0V CI<100Ω	—	—	2.0	ms	
Key judgement time	t <sub>KJ1</sub>	DP mode normal dialing	30.25	30.90	31.97	ms	
	t <sub>KJ2</sub>	DTMF mode normal dialing	17.37	18.02	19.10		
	t <sub>KJ3</sub>	DP/DTMF mode auto dialing*3	19.95	20.60	21.67		
Pre-mute time	t <sub>MP1</sub>	DTMF mode normal dialing	—	9.01	—	ms	
	t <sub>MP2</sub>	DTMF mode auto dialing	—	9.87	—		
Mute delay time	t <sub>MD1</sub>	DP and DTMF mode auto dialing	—	9.87	—	ms	
	t <sub>MD2</sub>	DTMF mode normal dialing	9.22	9.33	9.44		
Dial pulse mark/space	—	M/S=V <sub>DD</sub>	—	40/60	—	—	
	—	M/S=V <sub>SS</sub>	—	33.3/66.6	—		
Dial pulse rate	—	DRS=V <sub>DD</sub>	—	19.42	—	pps	
	—	DRS=V <sub>SS</sub>	—	9.71	—		
Inter-digit pause	t <sub>IDP1</sub>	DP mode	Dial rate=19.42pps	—	463.4	—	ms
			Dial rate=9.71pps	—	617.9	—	
	t <sub>IDP2</sub>	DTMF mode auto dialing	—	61.36	—		
DTMF make time	t <sub>TM</sub>	DTMF mode auto dialing	—	93.12	—	ms	
Auto access pause	t <sub>AP</sub>		—	3.965	—	s	
Oscillator frequency	f <sub>osc</sub>		—	3.579545	—	MHz	
Oscillator frequency/voltage variance	Δf/f	V <sub>DD</sub> =1.5 to 6.0V	—	—	30	ppm/v	
Tone output voltage (single tone)	V <sub>TONE</sub>	COL	V <sub>DD</sub> =5.0V	—	-10	—	dBm
		ROW	Operational amplifier load=10 Kohms ; Bipolar transistor load=120 ohms	—	-11	—	
COL-ROW tone output voltage ratio*4	d <sub>BCR</sub>	V <sub>DD</sub> =3.0 to 6.0V	—	—	2	dB	
Tone distortion	% <sub>DIS</sub>	V <sub>DD</sub> =2.5V	—	—	7.0	%	
Tone output frequency	f <sub>R1</sub>	ROW1	—	699.13	—	Hz	
	f <sub>R2</sub>	ROW2	—	766.17	—		
	f <sub>R3</sub>	ROW3	—	847.43	—		
	f <sub>R4</sub>	ROW4	—	947.97	—		
	f <sub>C1</sub>	COL1	—	1215.88	—		
	f <sub>C2</sub>	COL2	—	1331.68	—		
	f <sub>C3</sub>	COL3	—	1471.85	—		
Minimum assured key detection time	t <sub>MOP</sub>	t <sub>ON</sub> <t <sub>MOP</sub> Excluding chattering	42.91	44.63	46.35	ms	

- \*1 Key input ON effective time  
When writing data to the repertory memory while in ON-Hook status (STC2582C, STC2584C, STC2586C, and STC2588C), it is necessary to add the oscillator starting time to the effective time t<sub>ON</sub>. t<sub>ON3</sub>=t<sub>ON1</sub>+t<sub>OS</sub> (no key chattering)
- \*2 Key input ON effective time (DTMF mode normal dialing)  
This is the key read time + mute time + NTT engineering reference signal sending time of 50 ms.
- \*3 Auto dialing  
Indicates redialing and repertory dialing.
- \*4 COL-ROW tone output voltage ratio  
The output gain of COL is higher than that of ROW.

● Timing Chart



■ PACKAGE DIMENSIONS



EXAMPLE OF APPLICATIONS

