T-45-19-13

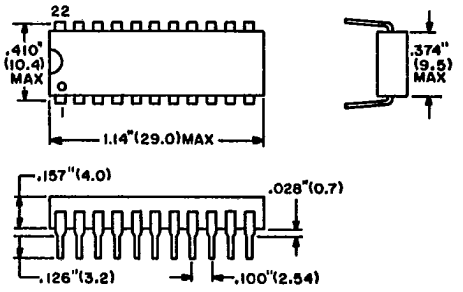
ECG® Semiconductors

ECG1253

CMOS - PLL Frequency Synthesizer for CB

Features

- High speed operation with low power consumption
- Open drain (NMOS) included for the lowpass filter — the dynamic range of the VCO is increased using a HV supply separate from the logic section
- Buffer terminal provided for the reference (10.24 MHz) oscillator
- Detection circuit for misprogramming and the unlock period (stopping the Tx output)
- Programmable input, (PI), and ½-divider input, (T), have AC amplifiers, and will operate at 100 mV, 4 mW input
- Program input terminals, P1...P6, have pull down resistors and pull-up resistors provided at the Tx/Rx terminals
- Reference oscillator circuit: 10.24 MHz w/external crystal
- 11 bit divider, 10 bit and 11 bit w/changeover switch
- Programmable divider: BCD channel code
- Phase detector, CP
- Code converter for Tx/Rx changeover
- ½-divider for SSB



The ECG1253 is a CMOS LSI, PLL frequency synthesizer that has been designed for use in 40 channel CB transceivers.

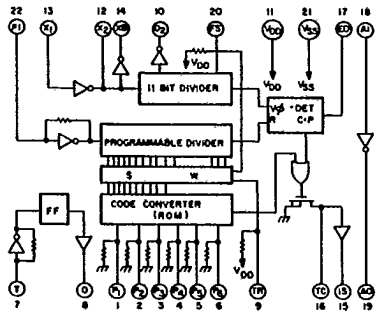
Absolute Maximum Ratings

Characteristic	Symbol	Rating	Unit
Supply Voltage	V_{DD1}	−0.3 to +6.0	V
Input Voltage	V_I	−0.3 to V_{DD}+0.3	V
Output Voltage	V_O	−0.3 to V_{DD}+0.3	V
Output Current	I_O	±10	mA
Filter Amplifiter Drain withstanding Voltage	V_{DD2}	−0.3 to +16	V
Operating Temperature	T_{opg}	−30 to +75	°C
Storage Temperature	T_{stg}	−40 to +125	°C

Electrical Characteristics ($T_A = -30$ to $+60°C$)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Supply Voltage	V_{DD1}		4.5	5.0	5.5	V
Supply Voltage	V_{DD2}		4.5	--	9.0	V
Operating Current	I_{DD}	PI: 3.3 MHz; T: 4.0 MHz; f_O: 11.0 MHz; other terminals open	--	5.0	--	mA
Input Voltage High Level	V_{IH}		80% V_{DD1}	--	--	V
Low Level	V_{IL}		--	--	20% V_{DD1}	V
Output Current High Level	I_{OH}	XB,IS,Q,EO; V_{DD1} = 4.5 V, V_O = 4.0 V	--	--	−0.5	mA
	I_{OFF}	AO; V_{DD1} = 5.5 V, V_O = 12 V	--	10	--	nA
	I_{OFF}	TC; V_{DD1} = 5.5 V, V_O = 1.0 V	--	10	--	nA
Low Level	I_{OL}	D_2, AO; V_{DD1} = 4.5 V, V_O = 0.5 V	1.6	--	--	mA
	I_{OL}	XB,IS,Q,EO; V_{DD1} = 4.5 V	0.5	--	--	mA
Leakage Current	I_L	EO (Floating), V_{DD1} = 5.5 V, T_A = 25°C	--	1.0	--	nA
Input Resistance High Level	R_{IH}	P1 - P6; V_{DD1} = 5.0 V, V_I = 5.0 V	--	20	--	kΩ
Low Level	R_{IL}	FS, TR; V_{DD1} = 5.0 V, V_I = 0 V	--	30	--	kΩ
Operating Frequency	f_D	X, Divider; V_{DD1} = 4.5 V	11	17.0	--	MHz
	f_P	PI; V_{DD1} = 4.5 V, V_I = 0.1 mVrms	3.3	--	--	MHz
	f_T	T; V_{DD1} = 4.5 V, V_I = 0.1 mVrms	4.0	10.0	--	MHz

Functional Diagram



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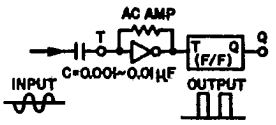
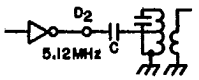
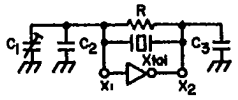
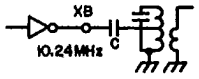
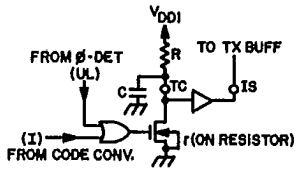
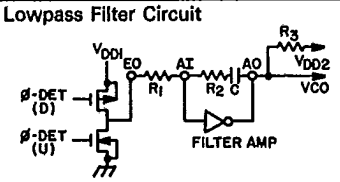
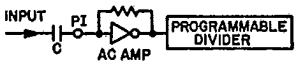
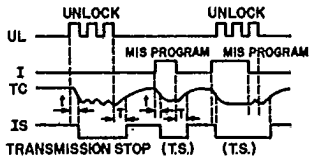
Pin Function Table

Pin No.	Symbol	Function								Remarks
		Program Input (BCD)								
1	P1	CH	P1	P2	P3	P4	P5	P6	Tx/Rx Frequency MHz	a. Pull-down resistor included; typ. 20 kΩ.
		1	0						26.965	b. At Channel 40 with program code at "0"; others at BCD input.
		2		0					.975	
		3	0	0					.985	
		4			0				27.005	c. To prevent misoperation due to noise with long program input leads, use an input capacitor, 0.001-0.01 μF.
		5	0		0				.015	
∫	∫	6		0	0				.025	
		7	0	0	0				.035	
		8				0			.055	
		9	0			0			.065	
		10					0		.075	
6	P6	11	0				0		.085	Markings used:
		12		0			0		.105	0 = High level, V_{DD1}
		13	0	0			0		.115	None = Low level, open
		14			0		0		.125	
		15	0		0		0		.135	
		16		0	0		0		.155	
		17	0	0	0		0		.165	
		18				0	0		.175	
		19	0			0	0		.185	
		20						0	.205	
		21	0					0	.215	
		22		0				0	.225	
		23	0	0				0	.255	
		24			0			0	.235	
		25	0		0			0	.245	
		26		0	0			0	.265	
		27	0	0	0			0	.275	
		28				0		0	.285	
		29	0			0		0	.295	
		30					0	0	.305	
		31	0				0	0	.315	
		32		0			0	0	.325	
		33	0	0			0	0	.335	
		34			0		0	0	.345	
		35	0		0		0	0	.355	
		36		0	0		0	0	.365	
		37	0	0	0		0	0	.375	
		38				0	0	0	.385	
		39	0			0	0	0	.395	
		40							.405	
7	T	SSB Input and ½-Divider								F/F
8	Q									a. Use a DC blocking capacitor at input of the AC amplifier
										b. Input level > 0.1 Vrms, sine wave

Pin No.	Symbol	Function	Remarks
9 20	TR FS	5 kHz/10 kHz Changeover and Tx/Rx Changeover FS: Channel Division Ratio (N) TR | FS | | 1 | 2 | 3 | 4 | – | 38 | 39 | 40 H | H | 10 kHz | 91 | 92 | 93 | 95 | – | 133 | 134 | 135 Tx | L | 5 kHz | 182 | 184 | 186 | 190 | – | 266 | 268 | 270 L | H | 10 kHz | 91 | 92 | 93 | 95 | – | 133 | 134 | 135 Rx | L | 5 kHz | 273 | 276 | 277 | 281 | – | 357 | 359 | 361	a. 10.695 MHz frequency: b. At FS, TR: Comparison frequency and division ratio, N, are changed and relation between channels and N automatically corresponds to the C-B channel.
10	D_2	5.12 MHz Input 	Use a DC blocking capacitor at the output.
11 21	V_{DD} V_{SS}	Power Supply V_{DD} (+) V_{SS} (Ground)	$V_{DD1} - V_{SS}$: 5±0.5 V
12 13	X_2 X_1	Crystal Oscillator  Xtal f_O = 10.24 MHz C_L = 32 pF R_O < 30 Ω	R = 330 kΩ C_1 = 30 pF (Trimmer) C_2 = 20 pF C_3 = 43 pF
14	XB	Output Buffer for 10.24 MHz 	Use a DC blocking capacitor at the output.
15 16	IS TC	Unlock Detector Circuit  $t = C\frac{R_r}{R+r}\ell n\ \frac{V_{DD}}{Vx}$ $= 0.8\ C\ \frac{R_r}{R+r}$ $T = CR\ \ell n\ \frac{V_{DD}}{V_{DD}-Vx}$ $= 0.6\ CR$	$\frac{V_{pp}}{Vx} \fallingdotseq 2.2$ r (ON resistor) = 200 Ω – 1 kΩ a. V_{DD} to R at TC must be the same as voltage, V_{DD1}, for the logic. b. Use a protective resistor, > 1 kΩ, at the IS input.

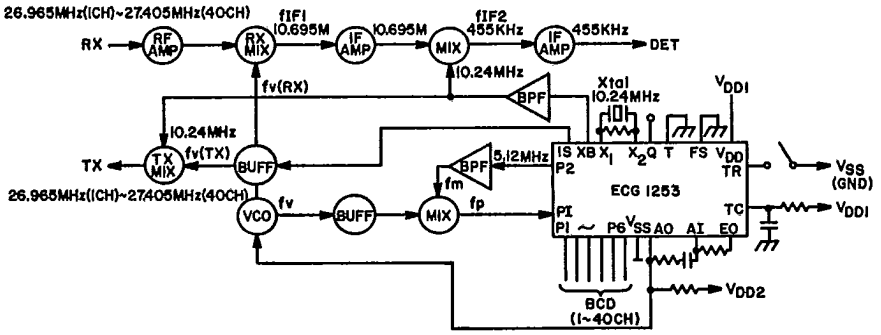
Pin No.	Symbol	Function	Remarks
17	EO	Lowpass Filter Circuit 	a. Phase detector, EO, output modes: $f_D > f_p$: Sync. $f_D = f_p$: Floating $f_D < f_p$: Drive
18	AI		
19	AO	Filter Amp Mutual Conductance Typ. 2 mΩ V_{DD2} = 8.0 V V_D = 2.0 V R_3 = 10 kΩ V_D ... Drain Voltage	b. For the filter circuit, a high voltage supply, V_{DD2}, separate from the logic supply can be used.
22	PI	Programmable Divider Circuit 	a. Use a DC blocking capacitor at input of the AC amplifier. b. Input conditions: > 0.1 Vrms, sine wave

Characteristic Voltage Waveforms



Typical Applications

1-Crystal Synthesizer System for AM C-B VCO at 16.270 to 17.165 MHz



IF MHz	TR	f_v MHz	f_p kHz	f_m MHz
10.695	H (R_X)	16.27 to 16.71	910 to 1350	15.36 (5.12 x 3)
	L (T_X)	16.725 to 17.165	1365 to 1805	