Ordering number: EN 3584B

Silicon-gate CMOS LSI

LC7215, 7215F, 7215FM

MW/LW PLL Frequency Synthesizers

Overview

The LC7215, LC7215F and LC7215FM are phase-locked-loop frequency synthesizer LSIs that provide accurate reference frequencies over the MW and LW bands, making them ideally suited for AM tuners.

Features

- PLL frequency synthesizer LSIs for MW and LW bands.
- Reference frequencies of 1, 5, 9 and 10 kHz.
- On-chip transistor for the low-pass filter amplifier.
- Single output pin (CMOS output)
- Controller clock output pin.
- Time-base output pin.
- All devices can be used for double conversion demodulation.
- The LC7215F and 7215FM have expanded input frequency ranges.

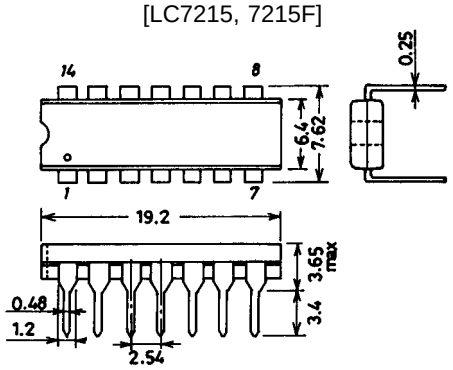
  LC7215 0.5 to 13 MHz : (DIP14)
  LC7215F/FM 0.5 to 20 MHz : (DIP14/MFP14S)

Package Dimensions

unit : mm

3003A-DIP14

[LC7215, 7215F]

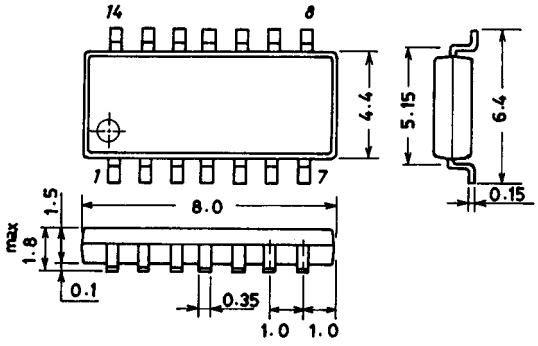


SANYO : DIP14

unit : mm

3111-MFP14S

[LC7215FM]



SANYO : MFP14S

Specifications

Absolute Maximum Ratings at Ta = 25°C, V_{SS} = 0 V

Values in parentheses are for the LC7215F and LC7215FM.

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{DD} max	V_{DD}	–0.3 to +6.5	V
Input voltage	$V_{IN}1$	All input pins	–0.3 to V_{DD} +0.3	V
	$V_{IN}2$	CE, CL, DATA	(Note) –0.3 to +6.5	V
Output current	I_{OUT}	AOUT	0 to 5	mA
Output voltage	$V_{OUT}1$	AOUT	–0.3 to +15	V
	$V_{OUT}2$	$\overline{SYC}$, $\overline{TB}$	–0.3 to +6.5	V
	$V_{OUT}3$	All output pins except $V_{OUT}1$ and $V_{OUT}2$	–0.3 to V_{DD} +0.3	V
Allowable power dissipation	Pd max	Ta ≦ 85°C	150	mW
Operating temperature	Topr		–40 to +85	°C
Storage temperature	Tstg		–55 to +125	°C

Note: Voltage that is applied to the resistors when resistors totaling at least 10 kΩ are connected to a pin in series.

Allowable Operating Conditions at V_{SS} = 0 V

Values in parentheses are for the LC7215F and LC7215FM.

Parameter	Symbol	Conditions	min	typ	max	Unit
Supply voltage	$V_{DD}1$	V_{DD}	(4.5)3.0		(5.5)5.5	V
	$V_{DD}2$	V_{DD} (Crystal OSC oscillation guaranteed)	3.0		5.5	V
High-level input voltage	V_{IH}	CE, CL, DATA	2.0		$V_{DD}1$	V
Low-level input voltage	V_{IL}	CE, CL, DATA	0		0.5	V
Output voltage	$V_{OUT}1$	AOUT			13	V
	$V_{OUT}2$	$\overline{SYC}$, $\overline{TB}$			5.5	V
Input frequency	$f_{IN}1$	PIN: Sine wave, capacitive coupling $V_{DD}1$, *S = 1	(2.3)2.3		(20)13	MHz
	$f_{IN}2$	PIN: Sine wave, capacitive coupling $V_{DD}1$, *S = 0	0.5		2.5	MHz
Oscillation guaranteed crystal oscillator	X'tal	XIN, XOUT: CI ≦ 30 Ω	8.00	11.16	12.00	MHz
Input amplitude	$V_{IN}1$	PIN: Square wave, capacity connection $V_{DD}1$, *S = 1	100		1000	mVrms
	$V_{IN}2$	PIN: Square wave, capacity connection $V_{DD}1$, *S = 0	100		1000	mVrms
Power supply	—	V_{DD}, V_{SS}: A capacitor of at least 1000 pF must be inserted.	1000			pF

Electrical Characteristics within the allowable operating ranges

Values in parentheses are for LC7215F and LC7215FM.

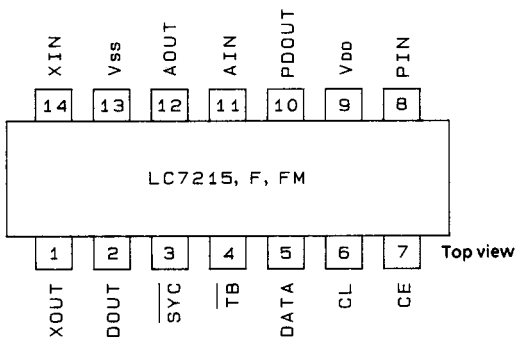
Parameter	Symbol	Conditions	min	typ	max	Unit
High-level input currents	$I_{IH}1$	XIN: $V_I = V_{DD}$			20	µA
	$I_{IH}2$	PIN: $V_I = V_{DD}$			40	µA
	$I_{IH}3$	CE, CL, DATA: $V_I = V_{DD}$			3.0	µA
	$I_{IH}4$	AIN: $V_I = V_{DD}$		0.01	1.0	µA
Low-level input currents	$I_{IL}1$	XIN: $V_I = V_{SS}$			20	µA
	$I_{IL}2$	PIN: $V_I = V_{SS}$			40	µA
	$I_{IL}3$	CE, CL, DATA: $V_I = V_{SS}$			3.0	µA
	$I_{IL}4$	AIN: $V_I = V_{SS}$		0.01	1.0	µA
High-level output voltages	$V_{OH}1$	DOUT: I_O = 1 mA	V_{DD} –1.0			V
	$V_{OH}2$	PDOUT: I_O = 0.5 mA	V_{DD} –1.0			V
Low-level output voltages	$V_{OL}1$	DOUT: I_O = –1 mA			1.0	V
	$V_{OL}2$	PDOUT: I_O = –0.5 mA			1.0	V
	$V_{OL}4$	$\overline{SYC}$, $\overline{TB}$: I_O = 0.5 mA			1.0	V
	$V_{OL}5$	AOUT: I_O = 1 mA			1.0	V
Output off-state leakage currents	$I_{OFF}1$	$\overline{SYC}$, $\overline{TB}$: $V_O = V_{DD}$			3.0	µA
	$I_{OFF}2$	AOUT: V_O = 13 V			5.0	µA
Tristate output High-level off-state leakage current	$I_{OFF}H$	PDOUT: $V_O = V_{DD}$		0.01	1.0	nA
Tristate output Low-level off-state leakage current	$I_{OFF}L$	PDOUT: $V_O = V_{SS}$		0.01	1.0	nA
High-level output voltage	$V_{OH}3$	XOUT: I_O = –0.1 mA	V_{DD} –1.0			V
Low-level output voltage	$V_{OL}3$	XOUT: I_O = 0.1 mA			1.0	V
Supply current	$I_{DD}1$	V_{DD}: $f_{IN}1$ = 13 MHz, *S = 1 (High speed) (Note 1)			10	mA
		$f_{IN}1$ = 20 MHz, *S = 1 (High speed) (Note 1)			(12)	mA
	$I_{DD}2$	V_{DD}: $f_{IN}1$ = 2.5 MHz, *S = 0 (Low speed) (Note 1)			5	mA
	$I_{DD}3$	V_{DD}: V_{DD} = 5.5 V, *O = 0, P = 1 (Note 2)		1.2	2.0	mA
		V_{DD} = 4.5 V, *O = 0, P = 1 (Note 2)		0.7	1.5	mA
		V_{DD} = 3.0 V, *O = 0, P = 1 (Note 2)		0.4	1.0	mA

* S, O and P are serial control bits.

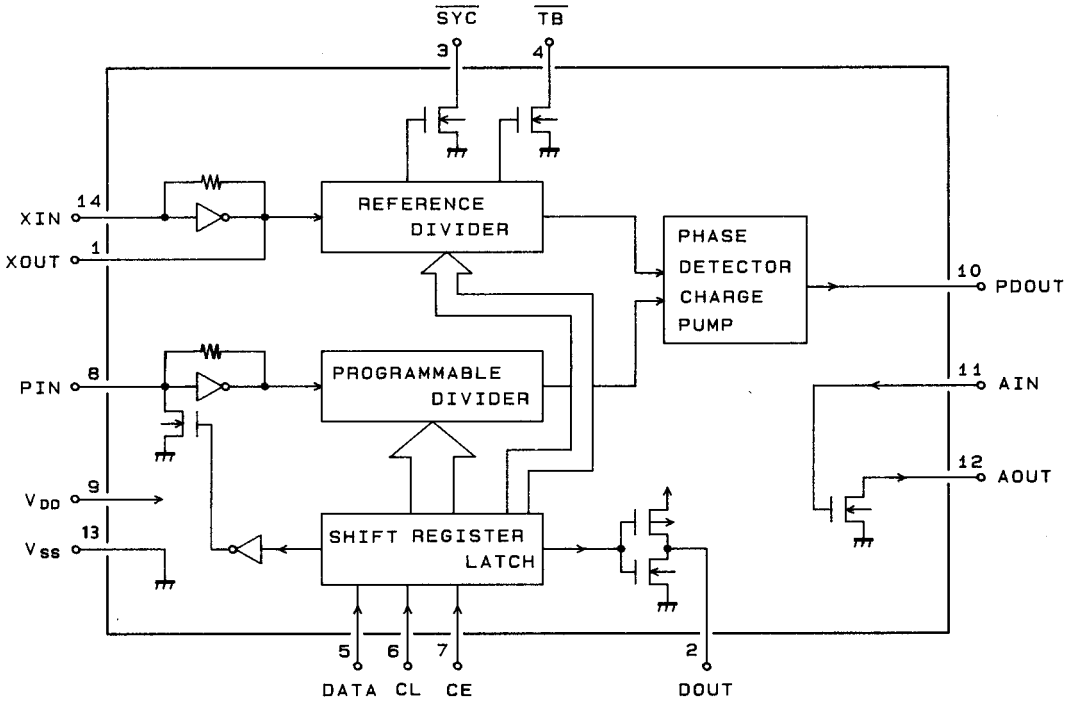
Note 1. $V_{IN}1 = V_{IN}2$ = 100 mVrms. The 11.16 MHz crystal is connected to XIN and XOUT. All other inputs are connected to V_{SS} and all other outputs are open.

2. The 11.16 MHz crystal is connected to XIN and XOUT. All other inputs are connected to V_{DD} and all other outputs are open. (Backup mode when PLL is halted.)

Pin Assignment



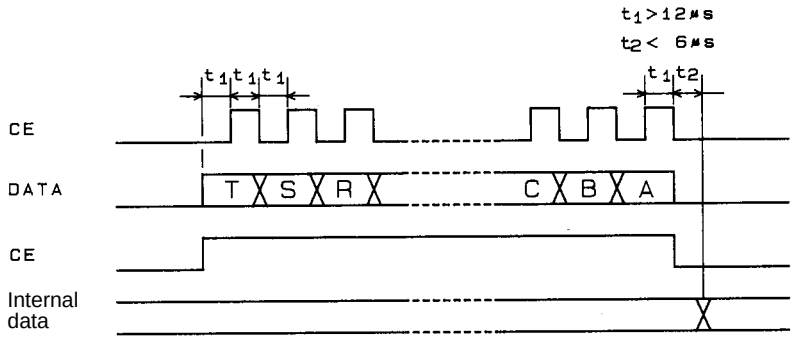
Block Diagram

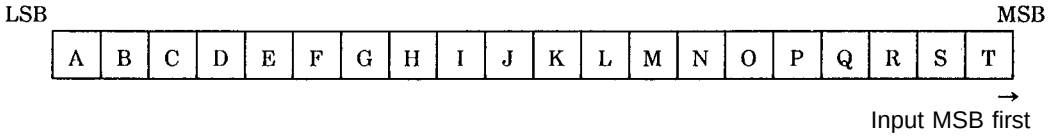


Pin Description

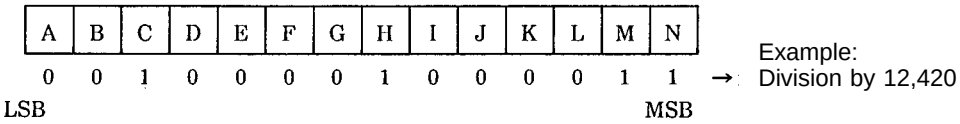
Name	Description
XIN, XOUT	11.16 MHz crystal oscillator connection, feedback resistance built-in
PIN	Local oscillator signal input
V_{DD}, V_{SS}	Power supply
DATA, CL, CE	Data input
DOUT	Single bit data output
AIN, AOUT	Low-pass filter amplifier
PDOUT	Charge pump output
$\overline{TB}$	8 Hz time-base output
$\overline{SYC}$	60 kHz controller clock output

Data Input





(1) A to N: Divider data



(2) O, P: Mode selection

Mode	O	P	DOUT	$\overline{TB}$	Operation
NOR1	0	0	T	8 Hz	Normal operation (with PLL operating)
NOR2	0	1	T	8 Hz	Normal operation (backup when PLL is halted)
TEST1	1	0	(Device test mode)		
TEST2	1	1	(Device test mode)		

(3) Q, R: Reference frequency selection

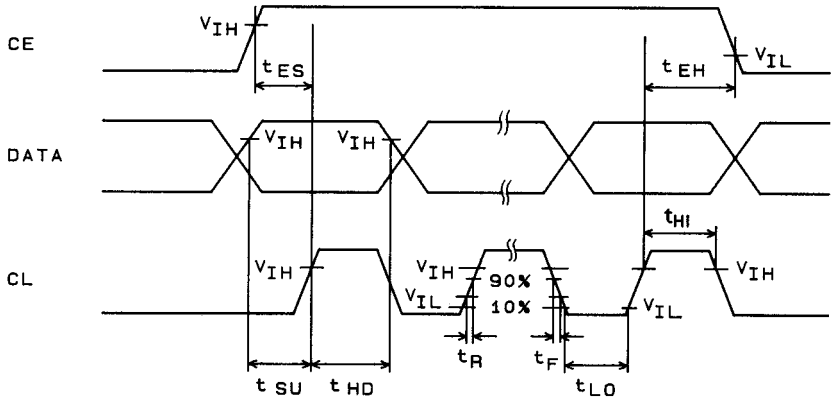
Q	R	Reference frequency
0	0	9 kHz
0	1	10 kHz
1	0	1 kHz
1	1	5 kHz

(4) S: Programmable divider input sensitivity switch
S = 1: for High speed
S = 0: for Low speed

(5) T: Output to DOUT
T = 1: DOUT = 1
T = 0: DOUT = 0

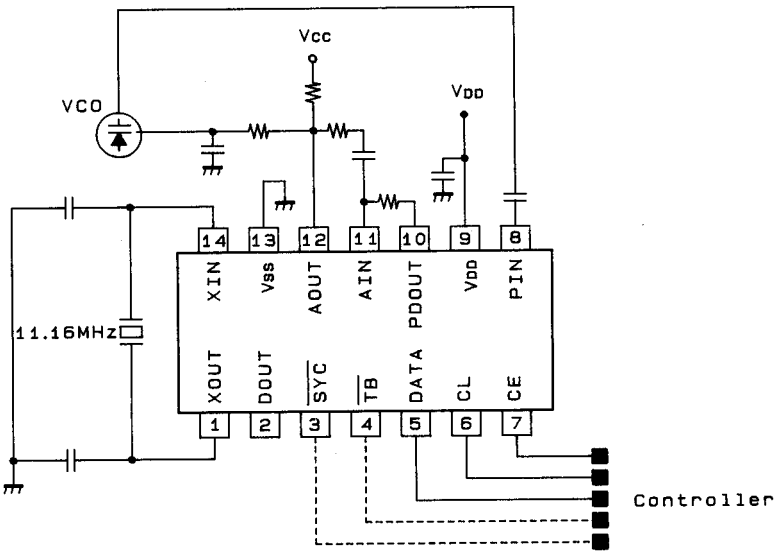
Data Input Timing

V_{IH} = 2.0 to V_{DD}, V_{IL} = 0 to 0.5 V
X'tal = 8.00 to 11.16 (typ) to 12.00 MHz
Data latch: Rising edge of CL ⎍↑⎍



Item	Symbol	11.16 MHz crystal	Other crystal frequencies	Effective value
Enable setup time	t_{ES}	At least 12 µs	At least 2 × (1/fXtal × 62)	1/2 of the value shown at left
Enable hold time	t_{EH}	↑	↑	
Data setup time	t_{SU}	↑	↑	
Data hold time	t_{HD}	↑	↑	
Clock Low-level time	t_{LO}	↑	↑	
Clock High-level time	t_{HI}	↑	↑	
Rise time	t_R	1 µs or less	1 µs or less	
Fall time	t_F	↑	↑	

(1) Sample Application Circuit



(2) Double-conversion Receiver