




# MK1714-02 Spread Spectrum Multiplier Clock

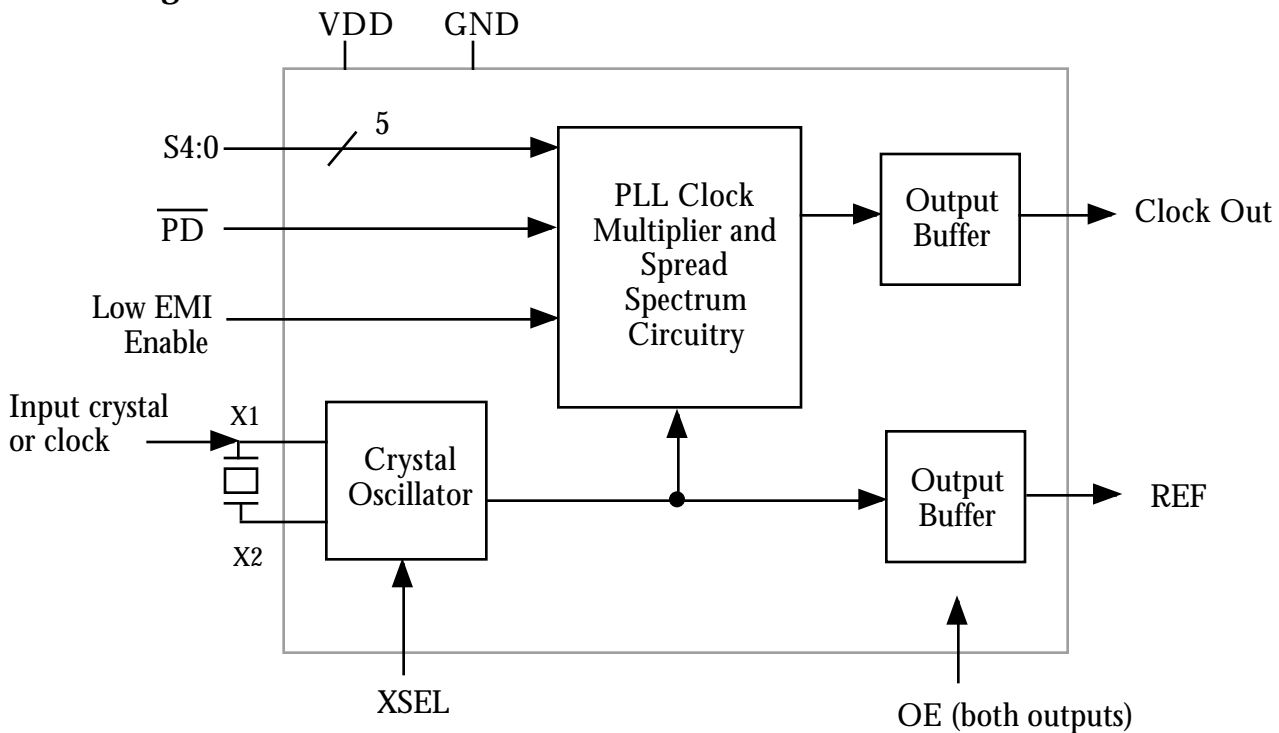
## Description

The MK1714-02 is a low cost, high performance clock synthesizer with selectable multipliers and spread amounts (percentages), designed to generate high frequency clocks with low EMI. Using analog/digital Phase-Locked Loop (PLL) techniques, the device accepts an inexpensive, fundamental mode, parallel resonant crystal, or a clock input to produce a spread, or dithered, output, thereby reducing the frequency amplitude peaks by several dB. The OE pin puts both outputs into a high impedance state for board level testing. The PD# pin powers down the entire chip, and the outputs are held low.

## Features

- Packaged in 20 pin tiny SSOP (QSOP) 
- Operating VDD of 3.3 V or 5 V
- Multiplier modes of x1, x2, x3, x4, x5, and x6
- Inexpensive 10-25 MHz crystal, or clock input
- OE pin tri-states the outputs for testing
- Power down pin stops the outputs low
- Selectable frequency spread
- Spread can be turned on or off
- Duty cycle of 40/60
- Advanced, low power CMOS process
- Industrial temperature range available

## Block Diagram





### Pin Assignment

X2	□	1		20		REF
X1/ICLK	□	2		19	□	OE
VDD	□	3		18	□	$\overline{\text{PD}}$
VDD	□	4		17	□	GND
S4	□	5		16	□	S0
S3	□	6		15	□	NC
GND	□	7		14	□	S1
GND	□	8		13	□	GND
S2	□	9		12	□	LEE
CLK	□	10		11	□	XSEL

20 pin.150 mil SSOP (QSOP)

### Pin Descriptions

Pin #	Name	Type	Description
1	X2	XO	Crystal connection. Connect to parallel mode crystal. Leave open for clock.
2	X1/ICLK	XI	Crystal connection. Connect to parallel mode crystal, or clock.
3	VDD	P	Connect to VDD. Must be same value as other VDD.
4	VDD	P	Connect to VDD. Must be same value as other VDD. Decouple with pin 7.
5	S4	I(D)	Select pin number 4. Determines multiplier and spread amount per table on following page.
6	S3	I	Select pin number 3. Determines multiplier and spread amount per table on following page.
7	GND	P	Connect to ground.
8	GND	P	Connect to ground.
9	S2	I	Select pin number 2. Determines multiplier and spread amount per table on following page.
10	CLK	O	Clock output which depends on the input, multiplier and spread amount per table on page 3.
11	XSEL	I	Connect to VDD for crystal input, or GND for CLK input.
12	LEE	I	Low EMI Enable. Turns on the Spread spectrum when high.
13	GND	P	Connect to ground.
14	S1	I	Select pin number 1. Determines multiplier and spread amount per table on following page.
15	NC	-	No Connect.
16	S0	I	Select pin number 0. Determines multiplier and spread amount per table on following page.
17	GND	P	Connect to ground.
18	$\overline{\text{PD}}$	I	Power Down. Turns off the chip when low. Outputs stop low.
19	OE	I	Output Enable. Tri-states all outputs when low.
20	REF	O	Reference clock output from crystal oscillator.

Key: I = Input with internal pull-up; I(D) = Input with internal pull-down; XO/XI = crystal connections; O = output; P = power supply connection



# MK1714-02

## Spread Spectrum Multiplier Clock

**Clock Output Select Table (in MHz)**

S4	S3	S2	S1	S0	Input Range	Multiplier	Output Range	Direction	Amount (%)	3.3/5V
0	0	0	0	0	40-80	x1	40-80	C	±0.75	Both
0	0	0	0	1	60-120	x1	60-120	DC	+0.25, -0.75	Both
0	0	0	1	0	40-80	x1	40-80	C	±1.25	Both
0	0	0	1	1	80-150	x1	80-150	C	±0.75	Both
0	0	1	0	0	10-30	x2	20-60	C	±0.75	Both
0	0	1	0	1	20-60	x2	40-120	C	±0.5	Both
0	0	1	1	0	10-25	x2	20-50	DC	+0.25, -1.5	Both
0	0	1	1	1	20-60	x2	40-120	DC	+0.5, -1.0	Both
0	1	0	0	0	20-30	x3	60-90	C	±0.5	Both
0	1	0	0	1	40-75	x2	80-150	C	±0.75	Both
0	1	0	1	0	40-100	x1	40-100	DC	+0.25, -1.5	Both
0	1	0	1	1	40-75	x2	80-150	DC	+0.25, -1.5	Both
0	1	1	0	0	20-40	x1	20-40	DC	+0.5, -2.0	3.3 V
0	1	1	0	1	20-60	x1	20-60	DC	+0.25, -1.5	Both
0	1	1	1	0	10-20	x1	10-20	DC	+0.5, -2.0	Both
0	1	1	1	1	10-30	x1	10-30	DC	+0.25, -1.5	Both
1	0	0	0	0	20-37.5	x4	80-150	DC	+0.25, -1.25	Both
1	0	0	0	1	20-40	x3	60-120	DC	+0.25, -1.5	Both
1	0	0	1	0	10-30	x1	10-30	C	±0.75	Both
1	0	0	1	1	20-30	x1	20-30	D	-0.5	Both
1	0	1	0	0	5-20	x2	10-40	DC	+0.25, -2.25	3.3 V
1	0	1	0	1	20-50	x3	60-150	D	-0.25, -2.25	Both
1	0	1	1	0	20-37.5	x4	80-150	C	±0.75	Both
1	0	1	1	1	80-150	x1	80-150	DC	+0.25, -1.25	Both
1	1	0	0	0	10-25	x4	40-100	C	±0.75	Both
1	1	0	0	1	10-20	x5	50-100	C	±0.75	Both
1	1	0	1	0	10-20	x6	60-120	C	±0.75	Both
1	1	0	1	1	20-50	x1	20-50	C	±0.75	Both
1	1	1	0	0	10-25	x4	40-100	DC	+0.25, -1.5	Both
1	1	1	0	1	10-20	x5	50-100	DC	+0.25, -1.25	Both
1	1	1	1	0	10-20	x6	60-120	D	-1.5	Both
1	1	1	1	1	10-30	x1	10-30	C	±0.75	Both

For S4:S0, 0 = connect to GND, 1 = connect to VDD.

Direction: C=Center spread, D=Down spread, DC=Down+Center spread.

Amount equals the spread amount. So for a 40 MHz output clock spread down 1%, the lowest frequency is 39.60 MHz.

Contact ICS with your exact output frequency for details on spread direction and amount.



# MK1714-02

## Spread Spectrum Multiplier Clock

### Electrical Specifications

Parameter	Conditions	Minimum	Typical	Maximum	Units
<b>ABSOLUTE MAXIMUM RATINGS (note 1)</b>					
Supply voltage, VDD	Referenced to GND			7	V
Inputs and Clock Outputs	Referenced to GND	-0.5		VDD+0.5	V
Ambient Operating Temperature		0		70	°C
	MK1714-02RI only	-40		85	°C
Soldering Temperature	Max of 10 seconds			260	°C
Storage temperature		-65		150	°C
<b>DC CHARACTERISTICS (VDD = 3.3V or 5V unless noted)</b>					
Operating Voltage, VDD		3.0		5.5	V
Input High Voltage, VIH, X1/ICLK only	Clock input	VDD/2 + 1	VDD/2		V
Input Low Voltage, VIL, X1/ICLK only	Clock input		VDD/2	VDD/2 - 1	V
Input High Voltage, VIH	Select inputs, OE, $\overline{PD}$	2			V
Input Low Voltage, VIL	Select inputs, OE, $\overline{PD}$			0.8	V
Output High Voltage, VOH	VDD=3.3V, IOH=-8mA	2.4			V
Output Low Voltage, VOL	VDD=3.3V, IOL=8mA			0.4	V
Output High Voltage, VOH, VDD = 3.3 or 5V	IOH=-8mA	VDD-0.4			V
Operating Supply Current, IDD, at 5V	No Load, note 2		40		mA
Operating Supply Current, IDD, at 3.3V	No Load, note 2		26		mA
Short Circuit Current, VDD = 3.3	Each output		±50		mA
Input Capacitance	Except X1, X2		7		pF
Internal Pull-up or Pull-down Resistor	Except X1		500		k
<b>AC CHARACTERISTICS (VDD = 3.3V or 5V unless noted)</b>					
Input Crystal Frequency		10		25	MHz
Input Clock Frequency	See page 3	10		150	MHz
Output Clock Rise Time	0.8 to 2.0V, no load			1.5	ns
Output Clock Fall Time	2.0 to 0.8V, no load			1.5	ns
Output Clock Duty Cycle	At VDD/2	40	50	60	%
One Sigma Jitter, CLK			40		ps
Absolute Jitter, CLK			±160		ps

- Notes: 1. Stresses beyond those listed under Absolute Maximum Ratings could cause permanent damage to the device. Prolonged exposure to levels above the operating limits but below the Absolute Maximums may affect device reliability.  
 2. Multiplier of x1, all clocks at highest frequencies.

### External Components

The MK1714 requires a minimum number of external components for proper operation. Decoupling capacitors of 0.01µF should be connected between VDD and GND (on pins 4 and 7), as close to the chip as possible. A series termination resistor of 33 Ω may be used for each clock output. The crystal must be connected as close to the chip as possible. The crystal should be a fundamental mode and parallel resonant. If accurate tuning is required, crystal capacitors should be connected from pins X1 to ground and X2 to ground. The value of these capacitors is given by the following equation, where  $C_L$  is the crystal load capacitance: Crystal caps (pF) =  $(C_L - 6) \times 2$ . So for a crystal with 20pF load capacitance, two 28 pF caps should be used. If a clock input is used, drive it into X1 and leave X2 unconnected.

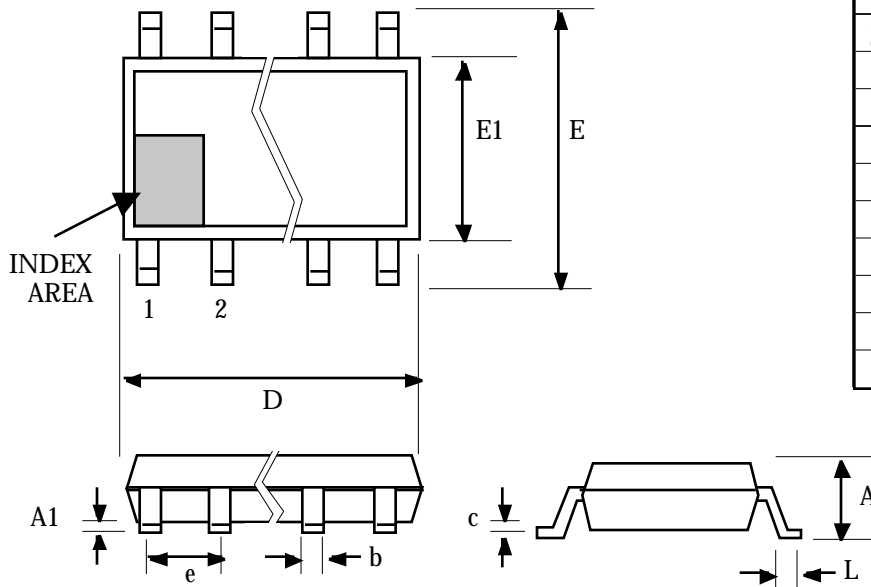


# MK1714-02 Spread Spectrum Multiplier Clock

## Package Outline and Package Dimensions

(For current dimensional specifications, see JEDEC Publication No. 95.)

### 20 pin SSOP



Symbol	Inches		Millimeters	
	Min	Max	Min	Max
A	0.053	0.069	1.35	1.75
A1	0.004	0.010	0.10	0.25
b	0.008	0.012	0.20	0.30
c	0.007	0.010	0.19	0.25
D	0.337	0.344	8.56	8.74
e	.025 BSC		0.65 BSC	
E	0.228	0.244	5.79	6.20
E1	0.150	0.157	3.81	3.99
L	0.016	0.050	0.41	1.27

## Ordering Information

Part/Order Number	Marking	Package	Shipping	Temperature
MK1714-02R	MK1714-02R	20 pin SSOP	Tubes	0 to 70 °C
MK1714-02RTR	MK1714-02R	20 pin SSOP	Tape and Reel	0 to 70 °C
MK1714-02RI	MK1714-02RI	20 pin SSOP	Tubes	-40 to 85 °C
MK1714-02RITR	MK1714-02RI	20 pin SSOP	Tape and Reel	-40 to 85 °C

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