



Information Brief



Unique Family of Dual PLL Frequency Synthesizers with DACs and Voltage Multipliers

– Provides low voltage operation with high frequency performance

The MC145181, MC145225, and MC145230 family of Dual PLL Frequency Synthesizers with DACs and Voltage Multipliers are truly unique in the industry. These ICs provide an unmatched combination of low voltage and high frequency performance, with an extended operating temperature range. All three devices operate with a single 1.8 V power supply, making them compatible with 1.8 V microcontrollers in applications powered by smaller two cell battery packs.

These devices each support two independent loops with a single input reference, and phase noise reduction circuitry has been integrated into each IC. The MC145181 operates at frequencies up to 550 MHz on the main loop and up to 60 MHz on the secondary loop. The MC145225 is capable of direct usage up to 1.2 GHz on the main and up to 550 MHz on the secondary loop; while the MC145230 operates to 2.2 GHz and 550 MHz on the main and secondary loops, respectively.

All three products have two 8-bit DACs that can be powered from a supply different than the main power supply for the chip. An on-chip voltage multiplier provides power to the phase/frequency detectors. In addition, the current source/sink phase/frequency detector for the main loop is designed to achieve faster lock times than conventional detectors. Both high and low current outputs are available, along with a timer, double buffers, and a MOSFET switch to adjust the external low-pass filter response.

**For More Information On This Product,
Go to: www.freescale.com**

FEATURES

COMMON FEATURES/SPECIFICATIONS

- Dual PLL frequency synthesizers support two independent loops with a single input reference
- Two on-chip 8-bit DACs can be powered from a supply different than the main power supply for the IC
- On-chip voltage multiplier provides power to phase/frequency detectors
- Current source/sink phase/frequency detector for the main loop is designed to achieve faster lock times than conventional detectors
- Integrated phase noise reduction circuitry
- Lock detection circuitry for both loops is multiplexed to a single output
- Supply voltage from 1.8 to 3.6 V
- Several levels of standby controlled with 1-byte through a serial port
- Either DAC can be placed in standby with a 4-byte serial port transfer
- Maximum standby current of 10 μ A with all systems shut down
- Direct interface to Motorola SPI data port at up to 10 Mbps
- Three general purpose outputs
- Extended operating temperature range of -40 to $+85$ $^{\circ}$ C
- Very small 5 x 5 mm body, low-profile 32-pin QFP surface mount package

SPECIFICATION DIFFERENCES	MC145181	MC145225	MC145230
• Operating Frequency			
Main Loop	100 to 550 MHz	100 to 1200 MHz	500 to 2200 MHz
Secondary Loop	10 to 60 MHz	50 to 550 MHz	50 to 550 MHz
• On-Chip Prescalers			
Main Loop	32/33	32/33	32/33
Secondary Loop	-	8/9	8/9
• Divider Range			
Main Loop	992 to 262,143	992 to 262,143	992 to 262,143
Secondary Loop	7 to 8,191	56 to 65,535	56 to 65,535
• Fractional Reference Counters			
Divider Range	20 to 32,767.5	20 to 32,767.5	20 to 32,767.5
• Nominal Supply Current	3 mA	4 mA	5 mA
• Phase Detector Output Current			
1.8 V Supply	0.7 or 2.8 mA	0.7 or 2.8 mA	0.7 or 2.8 mA
2.5 V Supply	1.1 or 4.4 mA	1.1 or 4.4 mA	1.1 or 4.4 mA

TYPES OF APPLICATIONS

The MC145181, MC145225, and MC145230 Dual PLL Frequency Synthesizers with DACs and Voltage Multipliers all operate with a single 1.8 V power supply, making them compatible with 1.8 V microcontrollers in applications powered by smaller two cell battery packs.

- Use of the MC145181 greatly simplifies the design of the first and second local oscillators for receivers in ReFLEX™ protocol two-way pagers.
- The MC145225, and MC145230 will find application in a wide variety of products including: wireless data terminals, remote meter reading transponders, PDAs, two-way pagers, PHS and dual-band cellular phones, wireless local loops, sonobuoys, and cable modems.

BENEFITS TO YOU

- Reduced cost due to higher level integration of dual PLL frequency synthesizers with related key support functions.
- Faster manufacturing times and reduced product costs with on-chip dual DACs to automate trimming of the oscillator frequencies, or to adjust RF PA output.
- Lower product cost due to elimination of a second power supply to provide elevated VCO control line voltage with integrated voltage multiplier.
- End product can frequency hop faster because the main loop phase/frequency detector locks faster than conventional detectors.
- Lower noise and less interference with improved signal to noise ratio and adjacent channel rejection due to on-chip phase noise reduction circuitry.
- Can be used in two-cell battery-powered applications with a power supply voltage as low as 1.8 V.
- Improved system performance due to extended operating temperature range of -40 to +85°C.
- Smaller battery for portable applications with 1.8 V operation and several levels of standby to reduce power consumption.
- Improved reliability due to lower power dissipation.
- Simplified “locked” display/signal when both loops are locked due to the two lock detection circuits being multiplexed to a single output.
- Provides higher circuit and system density with the very-small 5 x 5 mm body, low-profile 32-pin QFP surface mount package.
- Simplified MCU control of multiple frequency synthesis functions through a Motorola Serial Peripheral Interface (SPI) data port.

A SOLUTION FOR THESE QUESTIONS

- Do you want to reduce the parts count and lower your manufacturing costs by using highly integrated dual PLL frequency synthesizer with related key support functions?
- Does your design require an operating voltage below 2.0 V, with PLL loop frequencies from 100 MHz to 2.2 GHz?
- Do you need to design a cellular phone that can frequency hop faster?
- Would you like to reduce the parts count and lower your manufacturing costs with on-chip DACs and a voltage multiplier?
- Do you want to eliminate an additional power supply in your system by using a voltage multiplier to generate the elevated VCO control line voltage?
- Does your design require that the battery size be reduced with a supply voltage as low as 1.8 V, low current drain, and other power-saving features?
- Do you have to increase the signal to noise ratio and adjacent channel rejection of your system to lower the noise and reduce interference?
- Do you need to design a system with an operating temperature range as wide as -40 to +85°C?
- Do you want to reduce the pc board area for your handheld wireless product by using space-efficient surface mount packages?
- Would you like to use an MCU to control a variety of frequency synthesis functions in your wireless system through a serial bus?

DEVELOPMENT SYSTEM

The MC145230EVK is strongly recommended to simplify the system development process. This complete development system contains hardware and software supporting all features and operational modes of the MC145181, MC145225, and MC145230. Up to four boards or devices can be controlled, and the user is alerted to all error conditions. The control program may be used with any board based on any of the three devices. The user must, however, provide the VCOs for evaluating the MC145181.


LITERATURE

Complete data sheets containing full specifications, characteristic curves, and application circuit configurations are available through Motorola's LDC as MC145181/D and MC145225/D (for the MC145225 and MC145230). Alternately, call Mfax at 602/244-6609 and key-in MC145181, and/or MC145225.

ORDERING INFORMATION

Device	Main/Secondary Loop Operating Frequencies	Package in Tape & Reel
MC145181FTAR2	550MHz/60 MHz	LQFP-32*
MC145225FTAR2	1.2 GHz/550MHz	
MC145230FTAR2	2.2 GHz/550MHz	

*(1,800 units per 16mm, 13 inch reel)

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