



Hittite has developed an industry-leading line of high performance clock distribution and clock generation products that enable the system designer to maximize the performance from data converters and physical layer (PHY) components.





Analog, Digital & Mixed-Signal ICs, Modules, Subsystems & Instrumentation, DC - 110 GHz

Hittite Core Competencies in Clock & Timing ICs:

Clock Generation

- Programmable Output Frequencies for Flexible Frequency Planning
- Industry Leading Phase Jitter of <80 fs RMS
- Advanced Phase Noise Spur Reduction Technique to Reduce Noise Sensitivity

Clock Management

- Jitter Attenuation of Backplane Clocks Up to 3 GHz
- Fractional-N Frequency Generation Using Proprietary Delta-Sigma Modulation Technique
- Exact Frequency Mode to Generate Clocks with 0 Hz Error

Clock Distribution

- Clock Trees with Negligible Additive Jitter & Low Propagation Delays
- Best-in-Class Phase Noise Floor of <-165 dBc/Hz
- Clock De-Skew & Delay Management

Across All Markets:

Our SMT packaged clock generators operate up to 3 GHz, and are ideal for a wide range of high performance cellular/4G infrastructure, fiber optic and networking applications, and deliver best-in-class jitter and industry-leading phase noise floor. Hittite's configurable Clock & Timing ICs offer flexibility in frequency planning and system design. In communications applications, low jitter clock ICs improve link Bit Error Rate (BER) and eye diagram performance for higher bandwidth communication interfaces. In control applications, Hittite's proprietary Fractional-N clock generation architecture allows for configurable frequencies. Similarly, in sensors and entertainment applications, clock generation and distribution devices facilitate clock trees that support multiple frequencies to address system-wide synchronization challenges.

Hittite Heritage:

Hittite has broad engineering expertise in high frequency PLL, VCO and signal amplifiers. As bandwidth requirements increase, the clock speeds that are required to synchronize data converters and PHY components increase as well. Hittite's focus on innovation in high frequency building blocks enable the industry leading Clock & Timing IC products that meet the demands of next generation designs.

CLOCK & TIMING ICs

	Clock Distribution												
	Max. Rate	Clock (GHz)	Function	Input	Output	Phase Jitt (12 k to 20 M	ter Rise/Fall /IHz) Time (ps)	Channel Skew (ps)	Disable Mode	Power Supply (V)	Package	ECCN Code	Part Number
NEV	v ! -	4	Clock Divider & L Delay Management	VPECL, LVDS, CML, CMOS	LVPECL	13 fs RM	S 90	300 to 1500	Yes	5 or 3.3	LP3	3A001.a.11.b	HMC988LP3E
		8	1:9 Fanout Buffer	VPECL, LVDS, CML, CMOS	LVPECL	8 fs RMS	65	3.1	Yes	3.3	LP5	3A001.a.11.b	HMC987LP5E
	Clock	k Gene	erators										
	M Freq (M	ax. uency Hz)	Function	Typical Pha Jitter (fsRM	se Pha S) Floo	ise Noise r (dBc/Hz)	Maximum Reference Freq. (MHz)	Typical Pov Consumpti (W)	ver Figu on (F (c	re of Merit Frac/Int) Bc/Hz)	Package	ECCN Code	Part Number
NEV	V! 5	00	Integer Mode PLL (x1, x5, x10)	Defined by VCXO	Define	ed by VCXO	140	0.0064		-208	MS8	EAR99	HMC1031MS8E
	3	50	Clock Generator wit Fractional-N PLL+VC	h 116 / 75		-165	350	0.86	-2	27 / -230	LP6G	3A001.a.11.b	HMC1032LP6GE
NEV	V! 5	50	High Performance +3.3 V Clock Genera	tor 99		-163	350	0.64	-2	26 / -227	LP6G	3A001.a.11.b	HMC1033LP6GE
NEV	V! 25	500	High Performance +3.3 V Clock Genera	tor 97		-163	350	0.57	-2:	26 / -227	LP6G	3A001.a.11.b	HMC1035LP6GE
	30	000	Clock Generator wit Fractional-N PLL+VC	h 118 / 78		-165	350	0.86	-2	27 / -230	LP6G	3A001.a.11.b	HMC1034LP6GE

Hittite Clock & Timing ICs

Hittite Clock & Timing ICs offer excellent Power Supply Rejection Ratios (PSRR) and spur reduction. For demanding applications where additional supply noise filtering and regulation is required, low noise linear voltage regulators from Hittite reduce system complexity and offer excellent power supply noise immunity. These industry leading regulators are assembled in space saving LP3 (3 mm x 3 mm) packages and offer noise spectral densities of <7 nv/sqrt (Hz) at 1 kHz offsets.

DC POWER CONDITIONING - Linear Voltage Regulators

Input	Function	Output Voltage (V)	Output Current (mA)	Power Supply Rejection Ratio (PSRR) (dB)		Output Noise Spectral Density (nV/√Hz)		Regulated	Package	ECCN	Part
voltage (v)				1 kHz	1 MHz	1 kHz	10 kHz	Outputs		Code	Number
3.35 - 5.6	Quad High PSRR	2.5 - 5.2	15 - 100	80	60	7	3	4	LP3	EAR99	HMC860LP3E
3.35 - 5.6	Low Noise, High PSRR	1.8 - 5.2	500	80	60	7	3	4	LP3	EAR99	HMC1060LP3E
4.8 to 5.6	Low Noise, High PSRR	1.8 to 5.1	400	60	30	6	3	1	LP3	EAR99	HMC976LP3E



Hittite's website contains full datasheets, application notes, as well as ordering information for our complete product offering of over 1075 products across 36 product lines.

HMC1033LP6GE & HMC1035LP6GE

3.3V High Performance Programmable Clock Generator, 25 to 2500 MHz



- Integer & Fractional-N Mode Frequency Translation from 25 MHz to 2.5 GHz
- Configurable Outputs: LVDS-Compatible or LVPECL with 12 Settings to Adjust the Signal Amplitude
- "Phase Noise on Demand" feature to switch between "Power Priority" and "Performance Priority" Modes
- Adjustable PLL Loop Bandwidth via External Loop Filter to Control Setting Time & Noise Profile
- Output Disable/Mute Control
- Lock Detect Signal
- Exact Frequency Mode to Achieve Reference Frequency Tuning for DDS Replacement Applications



CLOCK GENERATION

HMC1032LP6GE & HMC1034LP6GE

Clock Generator with Fractional-N PLL & Integrated VCO, 125 to 3000 MHz



HMC1031MS8E

Clock Generator with Integer-N PLL, 0.1 to 500 MHz

 Integer-N PLL Clock Generator with External VCO/VCXO • Ultra-Low Power Consumption: <2 mA Typical in Normal Operation</p> Hardware Pin Programmable Reference Clock Multiplication Ratios of x1, x5, x10 • Phase Noise Floor (Figure of Merit): -208 dBc/Hz (Typical) 8-Lead, 4.8 x 3.0 mm SMT Package Very Low Power Consumption Typical Closed Loop Phase Noise, as Jitter Attenuator 3 -20 DIV 1. REF/VCXO = 122.88MH 2.5 (dBc/Hz) -6 (W) -80 NOISE (CURRENT 2 100 U 354 HA -140 1.5 -160 DIV 5, REF =10 MHz, VCXO = DIV 10, REF =10 MHz. VCXO = 100 MH; -180 2.6 2.8 3 3.2 3.4 3.6 10 102 10³ 104 10 10⁶ 107 10⁸ OFFSET (Hz) SUPPLY VOLTAGE (V) -40 C 27 C 85 C

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32-Lead, 5 x 5 mm SMT Package: 25 mm²

H987

HMC987LP5E

3.3V Low Noise, 1:9 Fanout Buffer, DC to 8 GHz

- 8 LVPECL Outputs (800 mVp-p into 50 Ohm Single-Ended Load)
- 1 Adjustable Power RF Output (-3 to 6 dBm)
- Flexible Input Buffer: LVPECL or AC-Coupled Input Compatible
- Serial or Parallel Control & Pin-Controlled Chip Enable
- Single-Ended or Differential-to-Differential Conversion
- Optimized for Very Low Output-to-Output Skew



HMC988LP3E

3.3V Programmable Digital Delay & Divider IC, DC to 4 GHz





Data Converter Clocking with Hittite Clock Generators

Selecting the right components for clock generation and data conversion enables a designer to extract the best performance from a given architecture. Data converter dynamic range and linearity performance can be improved by careful consideration of clock generator characteristics.

Important criteria to consider when choosing a clock generator are phase jitter and phase noise floor, which impact the SNR of the data converter being clocked. As the graph below indicates, the low phase noise floor of the chosen clock generator as well as its low integrated phase jitter helps to minimize the SNR degradation at higher ADC/DAC frequencies in multi-acquisition applications. The HMC1034LP6GE with integer-mode configuration offers the lowest clock jitter and offers significant improvements over clock generators with higher jitter.

Hittite's Clock & Timing ICs are designed with data converter applications in mind, and work well with Hittite's high speed ADC devices. Our clock generators with industry's best close-in and far-from-carrier phase noise are ideally suited to extract the best performance from data converters.



10G/40G/100G Networking & Storage Line Cards



Frequency Translation with HMC1031MS8E

Together with an external loop filter and a VCXO, the HMC1031MS8E forms a complete clock generator solution targeted at low frequency jitter-cleaner and reference clock generation applications. Quite often, the reference clock in a test & measurement or a communications system is a high accuracy Oven Controlled Crystal Oscillator (OCXO) with excellent long-term stability.

The HMC1031MS8E may find applications when the OCXO frequency needs to be multiplied up to a higher rate to drive the primary clock inputs in a system. The device offers a very low power, small package and high performance method to multiply its incoming frequency in x1, x5 and x10 rates. Such multiplication is needed because the higher reference clocks improve phase noise, ADC/DAC SNR, clock generator jitter and PHY BERs. In this scheme, the HMC1031MS8E may be connected to an external low cost VCXO (e.g. at 50 MHz or 100 MHz), and lock this external VCXO to the excellent long-term stability of the OCXO.



Clock Generation

Our Clock & Timing solutions are ideal for communications, control, sensing & entertainment electronic systems across all markets. Hittite Clock Generation ICs enable deterministic system design with low noise clock signals that have very low jitter and fast rise and fall times.



Clock Distribution

Hittite Clock Distribution ICs with the industry's best phase noise floor performance are used to distribute Data Converter Sample Clocks with negligible additive jitter.



Hittite's Clock & Timing Evaluation Software enables users to communicate with, and control, Hittite Clock & Timing ICs with their PCs via the provided USB connection board. The software features a simple GUI to set reference and output frequencies, program registers, and select operation modes.



Synthesizer Block Diagr

HITT-PLL: Hittite's Clock Design & Analysis Tool

- Accurately Simulate Your Design
- Easily Optimize Performance by Varying Loop Filter Components and Noise Profiles
- Reduce Design Time by Generating Phase Noise Plots and Jitter Measurements
- Model Transient Behavior to Estimate Loop Settling Times and Frequency Changes



Programmed Noise Sources Can be Modified by Individual Sources

CLOCK & TIMING IC SOLUTIONS

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