# DM4134
X2, 4-to-7 GHz Clock Multiplier
(Preliminary)

Description

The DM4134 is a high-speed X2 clock multiplier fabricated using 1-µm HBT GaAs technology and employs an ECL topology to guarantee high-speed operation. It is an excellent choice for digital clock multiplication, instrumentation, and edge detection. Digital clock multiplication is implemented via XOR operation between the input clock and an internal delayed replica. Several embedded electrically-controlled phase delays are also employed. Suitable regulation of the phase delay voltage controls allows duty cycle control on the clock outputs. Suitable power supply internal distribution provides the ability to disable the echo input which reduces power consumption. The DM4134 can also be stimulated via NRZ data to perform edge detection. A dedicated temperature monitoring pin is also provided.

Features

- Clock input range: 4 to 7 GHz
- 900 mVpp typical single-ended output
- Input sensitivity: Single-ended input >200 mV
- Jitter RMS <1 ps
- 50-ohm matched inputs and outputs (DC)

- Compatible SCFL I/O levels
- Differential or single-ended I/O
- Duty cycle control
- Echo inputs available
- Power consumption: 1.25 W
- 5x5mm Plastic QFN or die

Device Diagram
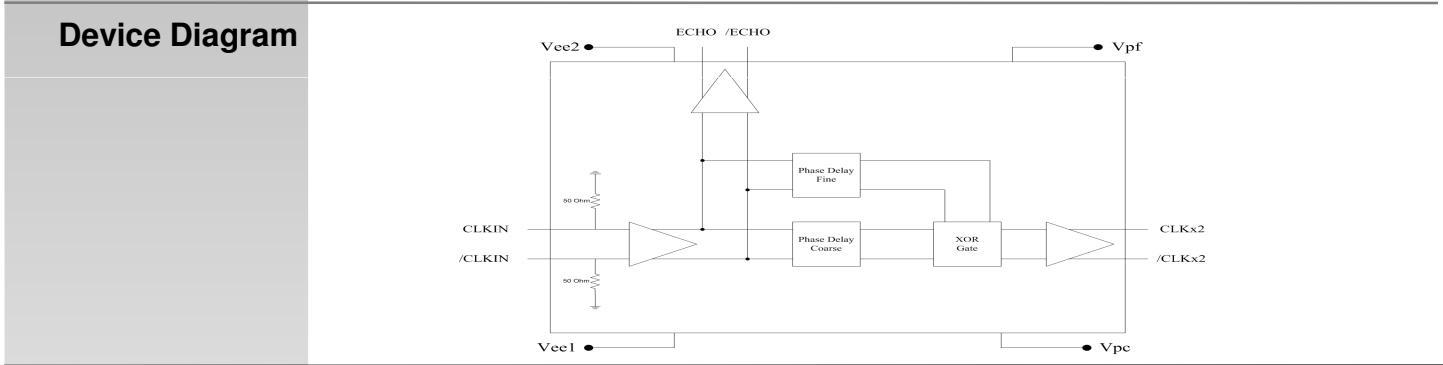
Absolute Maximum Ratings

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this document is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Symbol	Parameters/conditions	Min.	Max.	Units
VEE	Power supply voltage	-5.5	0	V
VPc	Phase delay voltage control (coarse duty cycle adjustment)	-3.5	0	V
VPf	Phase delay voltage control (fine duty cycle adjustment)	-3.5	0	V
VIH	Data/clock input voltage level, high level	-1.2	1.2	V
VIL	Data/clock input voltage level, low level	-1.2	1.2	V
TA	Operating temperature range	-15	125	°C
TSTG	Storage temperature	-65	150	°C

Recommended Operating Conditions

Symbol	Parameters/Conditions	Min.	Typ.	Max	Units
Ta	Operating temperature range	0		85	°C
Vee	Power supply voltage		-5		V
Vih	Data/clock input voltage level, high level (single ended)		0.25		V
Vil	Data/clock input voltage level, low level (single ended)		-0.25		V
Vindc	DC input voltage (with DC-coupled input)		0		V

Electrical Characteristics

1. Electrical characteristics at ambient temperature.
2. In case of single-ended inputs the unused pin has to be tied to VINDC. In case of single-ended output the unused one has to be terminated via 50 ohms to ground.
3. The pin VPmon can be left open or sensed with high-impedance load for temperature monitoring.
4. In case of echo inputs, an extra 65-mA (325-mW) at -5 V must be taken into account

Symbol	Parameters	Min	Typ	Max	Units
Vee	Power supply voltage	-5.25	-5.0	-4.75	V
Vih	Data/clock input voltage level, high level (single ended)	-0.5	0.25	0.5	V
Vil	Data/clock input voltage level, low level (single ended)	-1	-0.25	0	V
Vindc	DC input voltage (with DC-coupled input)	-0.75	0	0.25	V
VPmon	Internally generated reference voltage for 0 ps delay offset of the embedded phase delays (coarse and fine).	-2.8	-2.6	-2.4	V
VPc	Phase delay voltage control (coarse duty cycle adjustment)	VPmon-0.4		VPmon+0.4	V
VPf	Phase delay voltage control (fine duty cycle adjustment)	VPmon-0.4		VPmon+0.4	V
Voh	Data/clock output voltage level, high level (single ended)	-0.1	0	0	V
Vol	Data/clock output voltage level, low level (single ended)	-1.0	-0.9	0.8	V
Tdc	Duty cycle control	40	50	60	%
RLin	Input return loss (up to 25 GHz)		15		dB
RLout	Output return loss (up to 25 GHz)		6		dB
Fclk	Input clock frequency	3.0		7.0	GHz
Jpp	Peak to peak jitter	4	5	6	ps
Jrms	RMS jitter	0.7	0.9	1	ps
SHS	Sub-harmonic suppression	15	20	25	mA
Ic	Power supply current	235	250	280	mA
Pd	Power dissipation	1.1	1.25	1.5	W

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Specifications are based on most current or latest revision.

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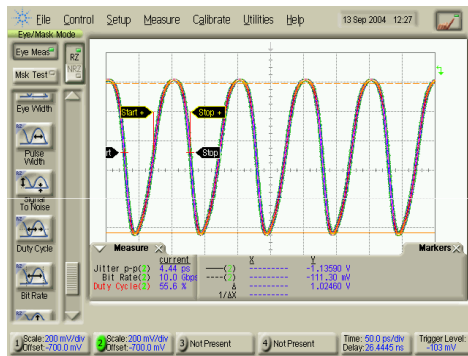+39 (06) 5587394
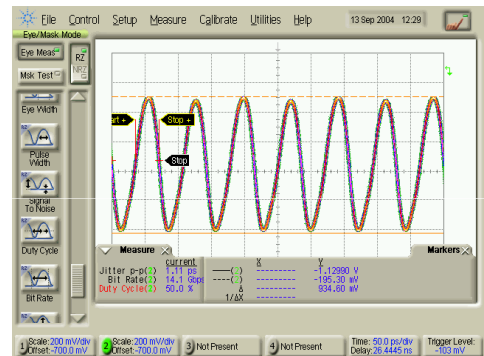
Eye Diagram Performance
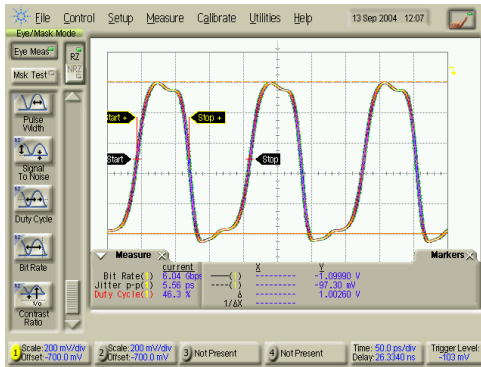
Die measurement
Vee: -5.0 V
Clock input frequency: 3.0 GHz
Single-ended clock input: +/-250 mVpp
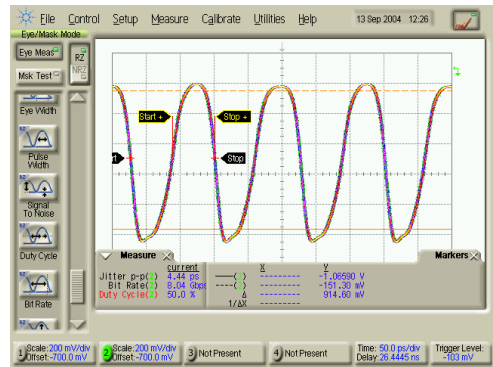
Die measurement
Vee: -5.0 V
Clock input frequency: 4.0 GHz
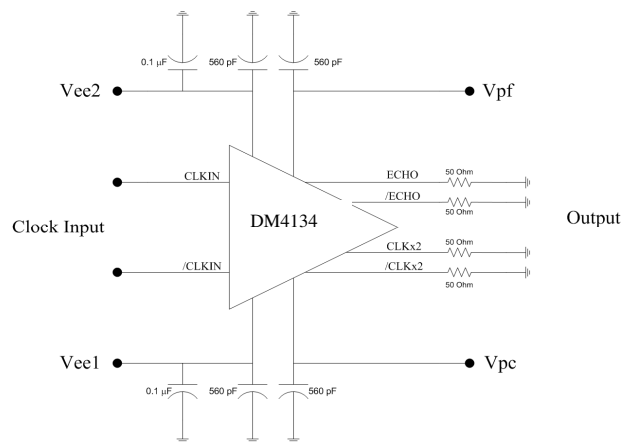Single-ended clock input: +/-250 mVpp

Die measurement
Vee: -5.0 V
Clock input frequency: 5.0 GHz
Single-ended clock input: +/-250 mVpp

Die measurement
Vee: -5.0 V
Clock input frequency: 7.0 GHz
Single-ended clock input: +/-250 mVpp

Recommended Operational Setup

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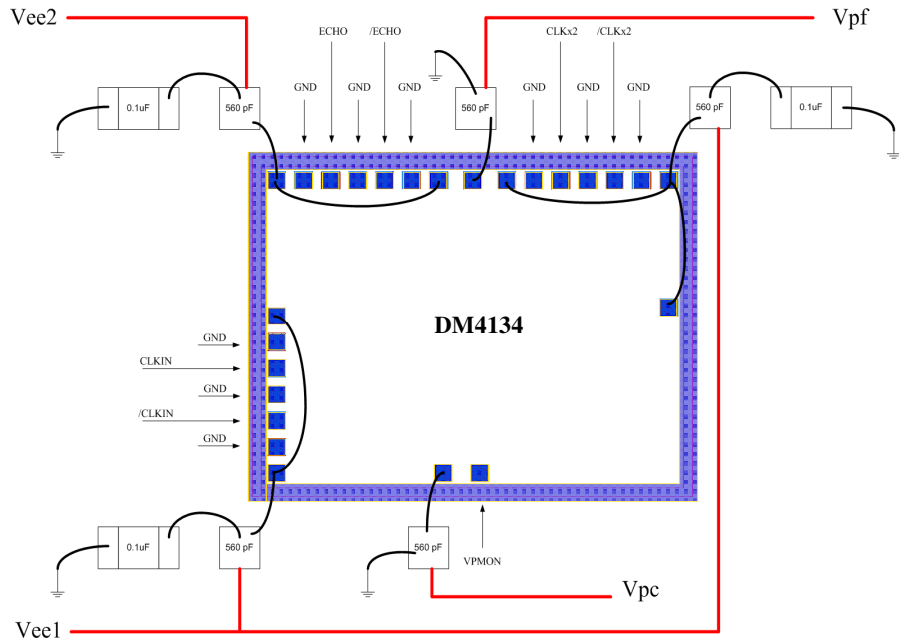**Specifications are based on most current or latest revision.**

Recommended Mounting Assembly

Chip size
1900 μm ±10 mm
x 2400 μm ±10 μm
edge to edge

Chip thickness:
104 μm ±3 μm
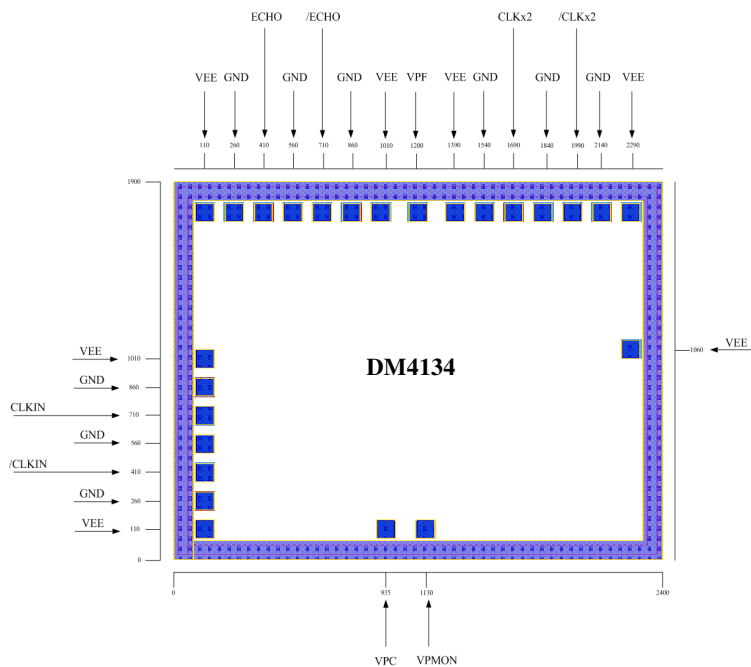
Pad size:
100 μm x 100 μm

RF pad pitch:
150 μm

Pad Position and Chip Dimensions

Chip size
1900 μm ±10 mm
x 2400 μm ±10
μm edge to edge

Chip thickness:
104 μm ±3 μm

Pad size:
100 μm x 100 μm

RF pad pitch:
150 μm

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Application Information

CAUTION: THIS IS AN ESD SENSITIVE DEVICE

Chip carrier material should be selected to have GaAs compatible thermal coefficient of expansion and high thermal conductivity such as copper molybdenum or copper tungsten. The chip carrier should be machined, finished flat, plated with gold over nickel and should be capable of withstanding 325° C for 15 minutes.

Die attachment for power devices should utilize Gold/Tin (80/20) eutectic alloy solder and should avoid hydrogen environment for HBT devices. Note that the backside of the chip is gold plated and it is connected to RF and DC Ground.

These GaAs devices should be handled with care and stored in dry nitrogen environment to prevent contamination of bonding surfaces. These are ESD sensitive devices and should be handled with appropriate precaution including the use of wrist-grounding straps. All die attach and wire/ribbon bond equipment must be well grounded to prevent static discharges through the device.

Recommended wire bonding: for Signal input / output connections, use either 3 mils wide and 0.5 mil thick gold ribbon or a pair of 1mil diameter wires with lengths as short as practical allowing for appropriate stress relief (typically 400 +/- 100 um long). For all other connections, a single 1 mil dia wire of appropriate minimum length may be used.

Product Status Definitions

Datasheet Identification	Product Status	Definition
Advanced Information	Formative or or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. DIGIMIMIC reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. DIGIMIMIC reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not in Production	This datasheet contains specifications on a product that has been discontinued by DIGIMIMIC. The datasheet is printed for reference information only.

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