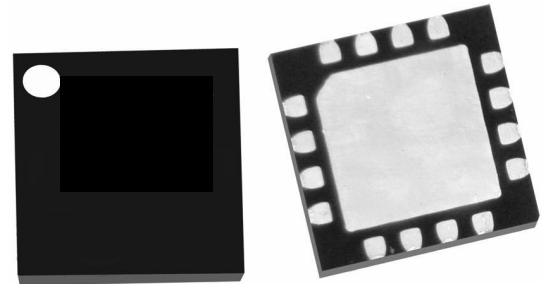


Description

The DM4006 is a high speed D-type flip flop. DM4006 is suitable for very high speed and complex digital applications such as decision circuits, waveform shaping, register implementation, and timing adjustment. The device consists of a master-slave latch designed using an ECL topology to guarantee high speed operation. All differential data and differential clock are on-chip DC coupled and terminated with 50 Ohm resistors to ground. The differential data outputs should DC or AC terminated off chip with 50 Ohm resistors to ground. DM4006 operates from a single -3.3 V power supply.

Features

- ◆ Supports data rate up to 13 Gb/s
- ◆ Fast output rise time (20%-80%) < 22 ps
- ◆ Fast output fall time (20%-80%) < 20 ps
- ◆ 450 mVpp single ended output
- ◆ DC coupled data and clock input
- ◆ AC or DC coupled data output
- ◆ Differential or single ended inputs
- ◆ Low power consumption: 270 mW



Absolute Maximum Ratings

Symbol	Parameters / Conditions	Min.	Max.	Units
VEE	Power Supply Voltage	-3.6	0.5	V
VD	Applied Voltage at input (data)	-1.5	1.5	V
VCLK	Applied Voltage at input (clock)	-1.5	1.5	V
Tstg	Storage Temperature	-65	150	°C

Recommended Operating Conditions

Symbol	Parameters / Conditions	Min.	Typ.	Max.	Units
VEE	Power Supply Voltage	-3.47	-3.3	-3.14	V
IEE	Total Bias Supply Current	74	82	97	mA
PD	Power Consumption	232	271	335	mW
VIH	Input high level (data and clock)	-0.4	0	0.4	V
VIL	Input low level (data and clock)	-0.8	-0.3	0	V
VPP	Input Amplitude Single Ended (data and clock)	0.15	0.3	0.5	V
	Input interface	AC/DC coupled			
	Output interface	AC/DC coupled			



DM4006

13 Gb/s D Flip Flop

(Preliminary Information)

Electrical Characteristics
 (at 25 °C) 50 Ohm system, VEE=-3.3V, Quiescent current (IEE)=82 mA

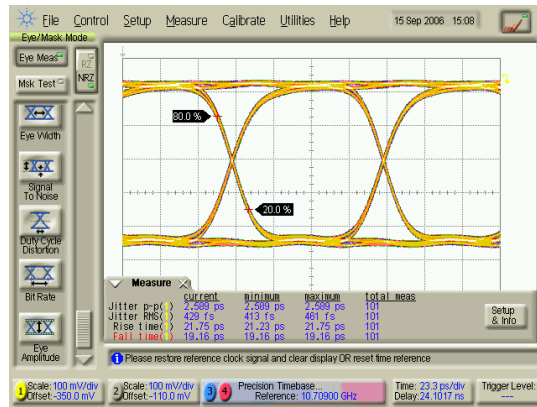
Symbol	Parameters / Conditions	Min.	Typ.	Max.	Units
FCLK	Clock frequency	0		13	GHz
DRATE	Data Rate (NRZ format)	0		13	Gb/s
VDH	Data input voltage level, high level	-0.4	0	0.4	V
VDL	Data input voltage level, low level	-0.8	-0.3	0	V
VCLKH	Clock input voltage level, high level	-0.4	0	0.4	V
VCLKL	Clock input voltage level, low level	-0.8	-0.3	0	V
VQH	Data output amplitude high	-0.05	-0.03	-0.02	V
VQL	Data output amplitude low	-0.49	-0.49	-0.48	
CPM	Clock Phase Margin		260		deg
Jpp	Jitter peak to peak		3.2	3.6	ps
JRMS	Jitter RMS		0.6	0.7	ps
Tr	Output rise time (20% - 80%)		21	22	ps
Tf	Output fall time (20% - 80%)		18	19	ps
RLin	Input Return Loss (Data and Clock) up to 13 GHz		25		dB
RLout	Output Return Loss up to 13 GHz		20		dB

Disclaimer

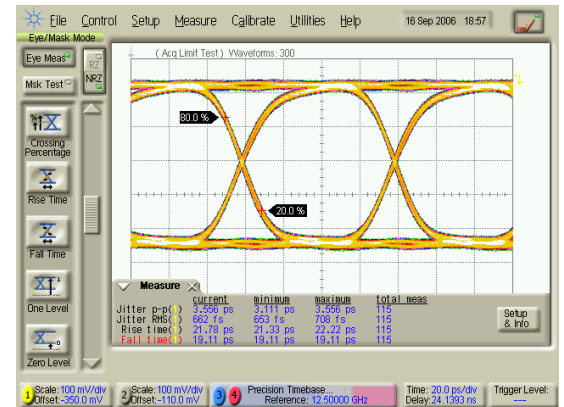
DIGIMIMIC RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. DIGIMIMIC DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

Typical Operating Characteristics

Note: Temperature characteristics are at 12.5 Gb/s

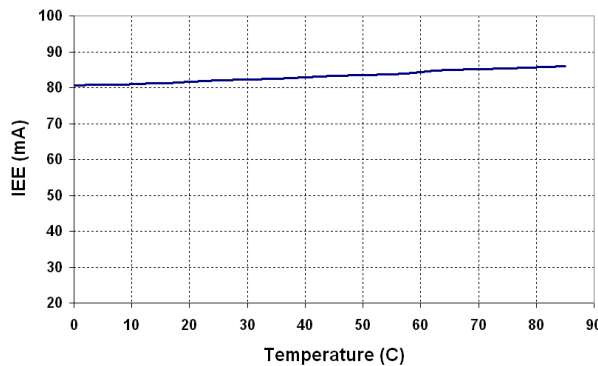


10.709 Gb/s $2^{31}-1$ PRBS data input
Vin = +/-150 mVpp (Data and Clock)

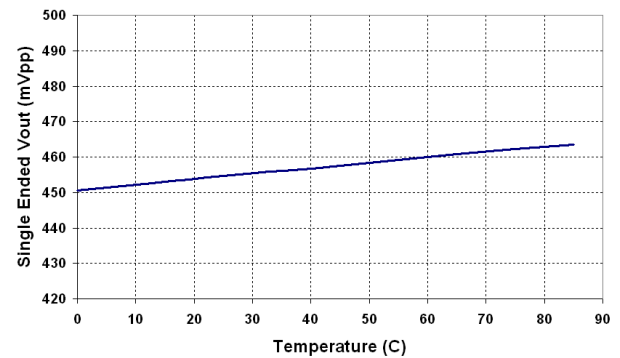


12.5 Gb/s $2^{31}-1$ PRBS data input
Vin = +/-150 mVpp (Data and Clock)

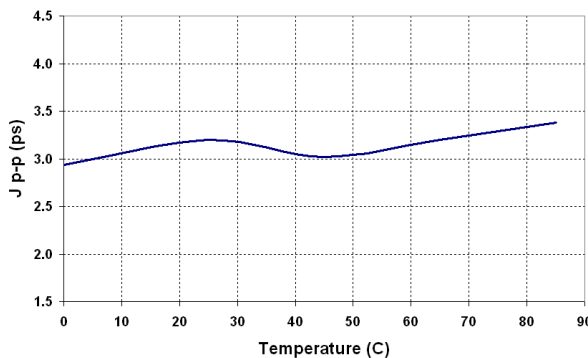
IEE vs. Temperature



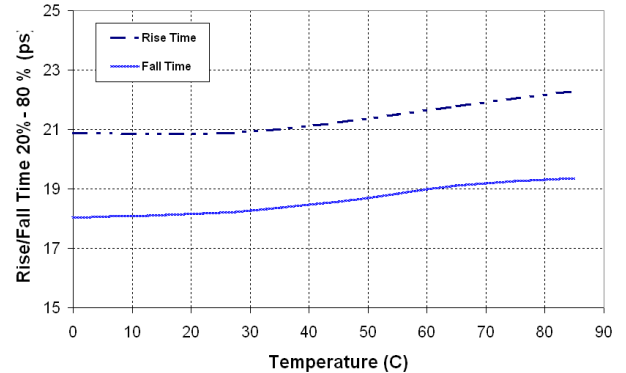
Output Amplitude vs. Temperature



Jitter p-p vs. Temperature



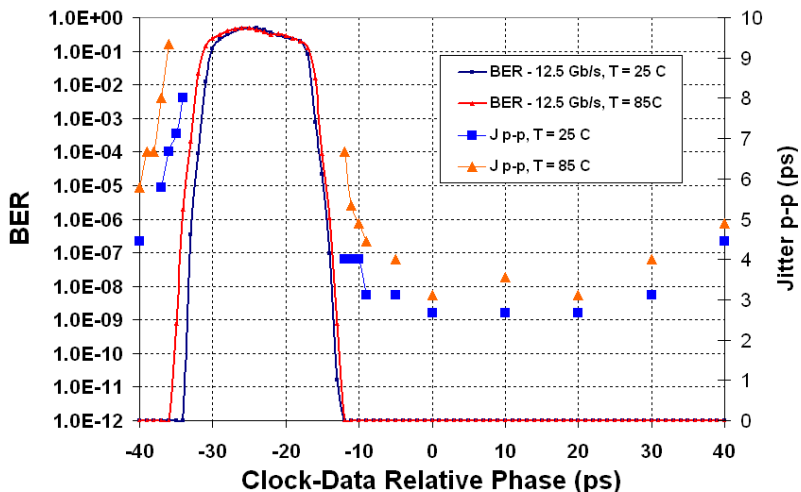
Rise/Fall Time vs. Temperature



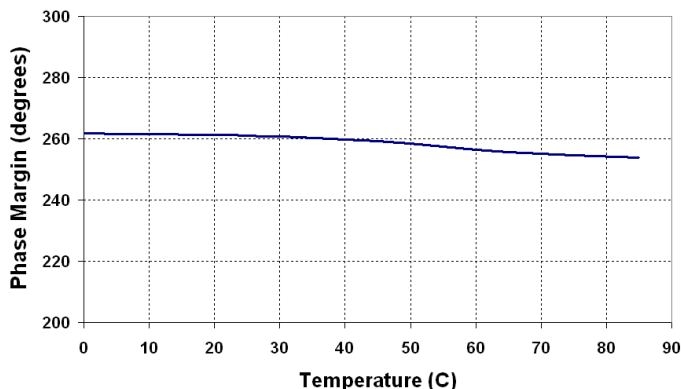
**Phase Margin vs.
Bit Rate and
Temperature**

Typical Operating
Conditions (Data Rate
12.5 Gb/s for the first two
plots)

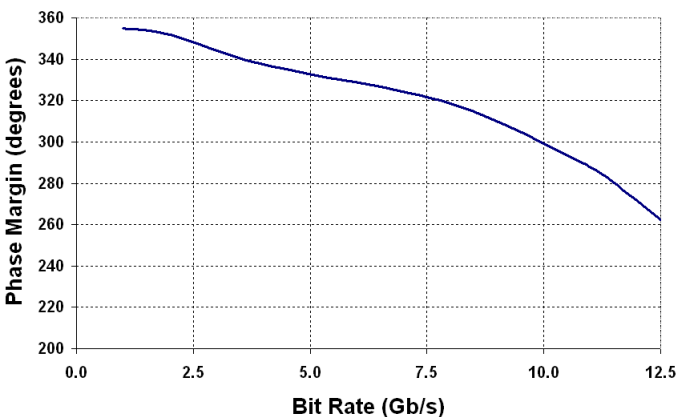
BER and J p-p vs. Clock-Data relative phase



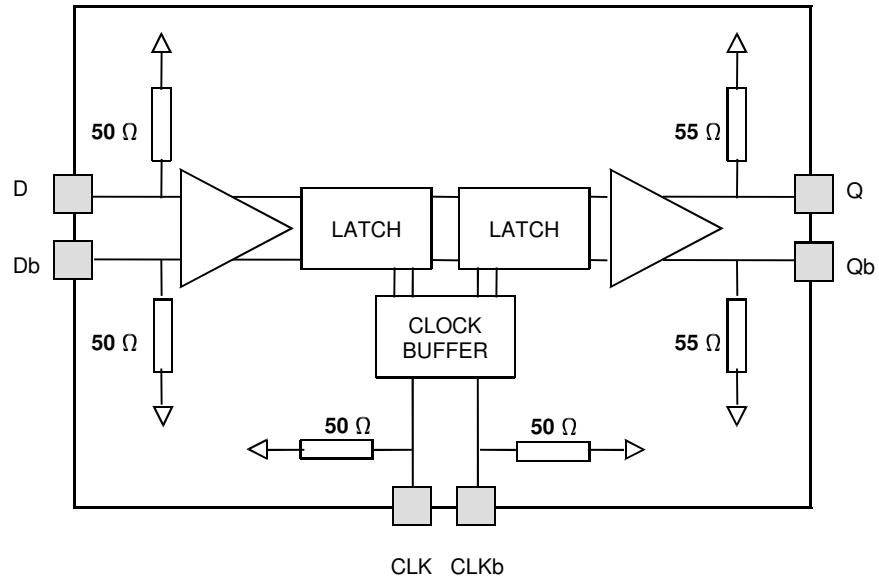
Phase Margin vs. Temperature



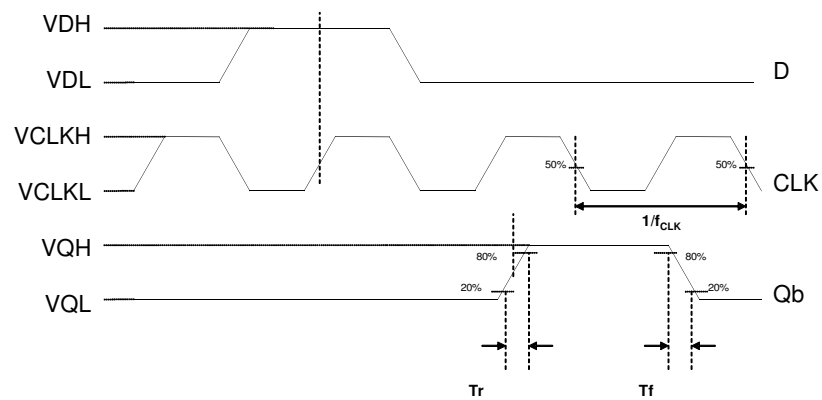
Phase Margin vs. Bit Rate



Block Diagram



Timing Diagram

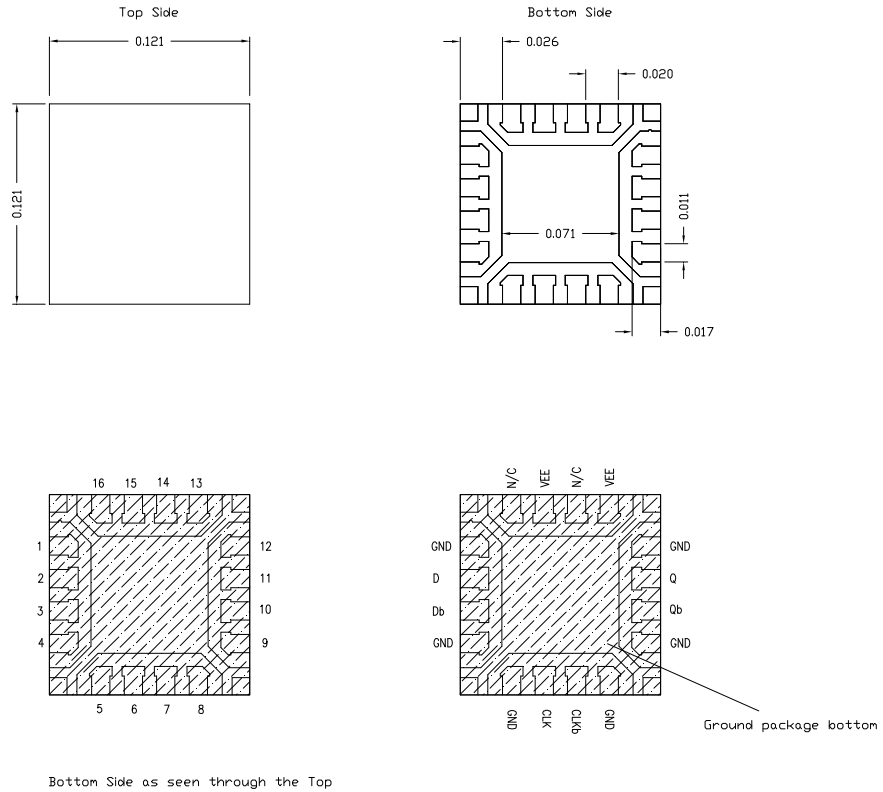


Notes:

- 1) DM4006 D flip flop is positive edge triggered

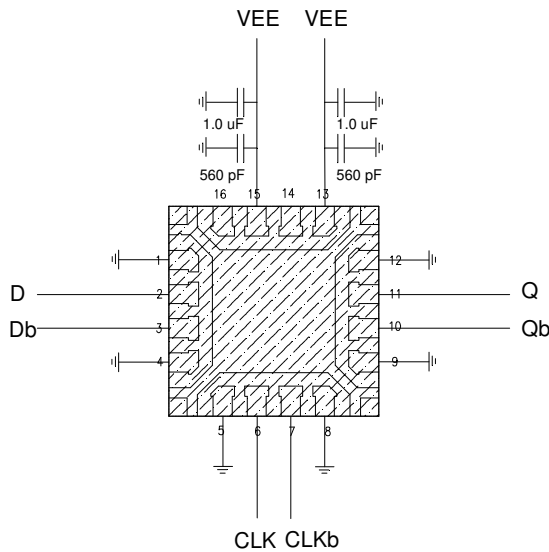
Package Drawing and Pinouts

Dimension: inches

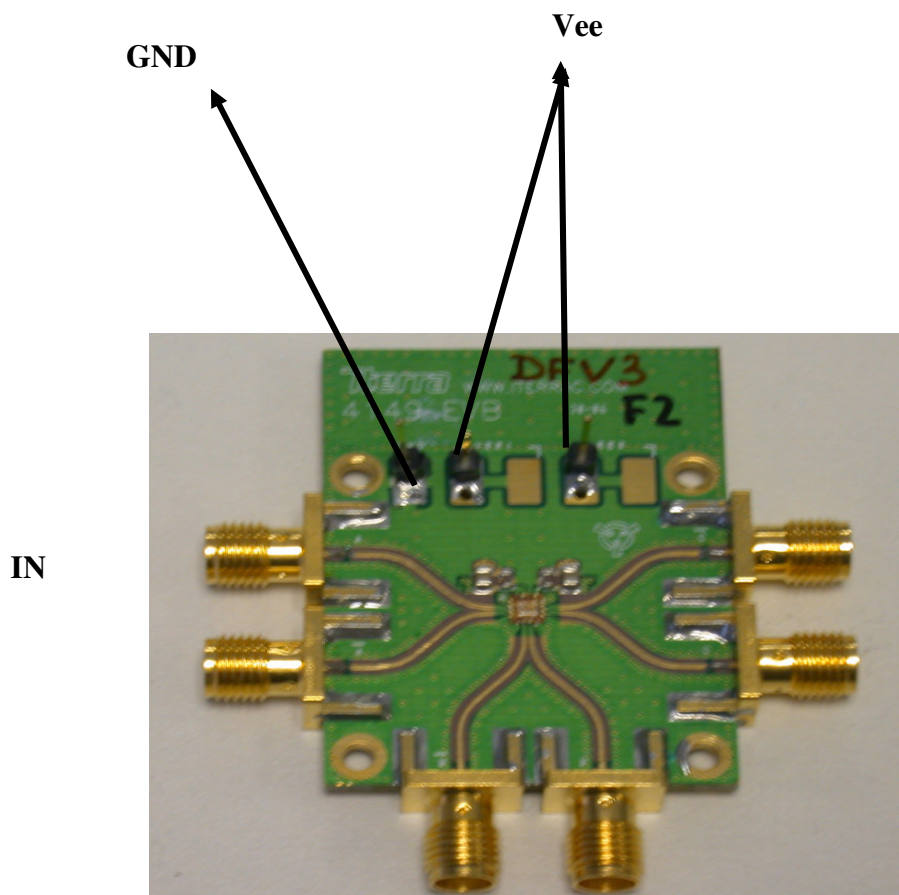


Recommended Operational Setup

Q, Qb can be DC coupled (as shown in the present recommended operational setup) or AC coupled



EVB
Evaluation Board



Power Up Sequence

Apply $-3.3V$ at Vee, $I_{ee} = 85mA$ approx.

Typical Values

	Vee V	I _{ee} mA	P mW
Bias	-3.3	85	270

Application Information

CAUTION: THIS IS AN ESD SENSITIVE DEVICE

Chip carrier material should be selected to have InP 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 InP 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.