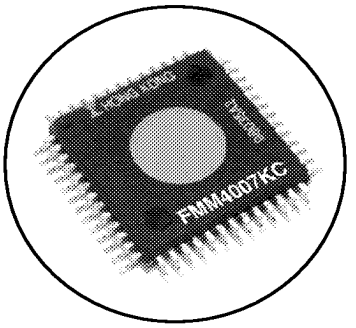
2.5Gb/s GaAs 1:16 Demultiplexer IC

FMM4007KC-1

FEATURES



- High Speed Operation up to 2.5Gbps
- Low Power Dissipation: 1.4W (Typ)
- Single Power Supply: VEE = -5.2V
- High Speed Differential I/O: 2.5GHz clock inputs
- ECL100K Compatible Parallel data I/O: Single-Ended 155Mbps parallel data outputs and 155MHz divided clock outputs
- Thermally Enhanced, 52-pin **Plastic** Mold Package: KC (14mm), Pin pitch: 1.0mm

DESCRIPTION

The FMM4007 is a STM-16/STS-48 compatible high speed 1:16 demultiplexer IC for optical transmission systems and high speed test equipment. The FMM4007 converts 2.485 Gbps high speed serial data to 16-bit 155.5Mbps parallel data. The FMM4007 is designed with 0.5µm GaAs MESFET technology, and has high speed performance with low power consumption. The FMM4007 is packaged in an industrial standard thermally enhanced plastic mold package.

ABSOLUTE MAXIMUM RATINGS (Ambient Temperature Ta = 25°C)

Parameter	Symbol	Values	Unit
Supply Voltage	V_{EE}	-7.0 ~ V_{TT}+0.5	V
Output Current	I_{OUT}	-50 ~ +50	mA
Input Voltage	V_{IN}	V_{EE}~+0.5	V
Maximum Input ESD (MIL-STD-883C)	V_{ESD}	1500*1	V
Case Temperature	T_C	-50 ~ +120	°C
Storage Temperature	T_{STG}	-50 ~ +150	°C

*Note: (1) Human body model

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RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Values	Unit
Supply Voltage	V_{EE}	-5.2 ±5%	V
Output Termination Voltage	V_{TT}	-2.0	V
Output Termination Resistor	R_T	50	W
Ambient Temperature	T_A	0 ~ +70	°C
Junction Temperature	T_J	0 ~ +100	°C

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS FOR ECL I/O

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Output HIGH Voltage	V_{OHE}	50Ω to -2.0V V_{IH} = V_{IH}(max) or V_{IL}(min)	-1020	-850	-700	mV
Output LOW Voltage	V_{OLE}	50Ω to -2.0V V_{IH} = V_{IH}(max) or V_{IL}(min)	-2000	-	-1620	mV
Input HIGH Voltage	V_{IHE}	–	-1140	-	-650	mV
Input LOW Voltage	V_{ILE}	–	-2050	-	-1520	mV
Input HIGH Current	I_{IHE}	V_{IN}=V_{IH} (max)	-	-	200	µA
Input LOW Current	I_{ILE}	V_{IN}=V_{IL} (max)	-50	-	-	µA

DC CHARACTERISTICS FOR HIGH SPEED INPUT and OUTPUT

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
CLK/CLKN, DI/DIN Input Voltage Swing	V_{ISH}	AC-coupled and 2.48832Gbps	600	700	1200	mVpp

POWER DISSIPATION

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Power Dissipation	PD	V_{EE} = -5.46V, Output open	690	1380	2060	mW
		Output: 50Ω to -2.0V Typical Condition	910	1600	2280	mW

AC CHARACTERISTICS (V_{DD}=3.3V, T_A=25°C)

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Max.	Max.	
Maximum Operating Clock Frequency	f_{CLK}	–	2500	-	-	MHz
Phase margin of serial data input	P_{SDI}	$(1-(t_S+t_H)*f_{CLK})*360$	180	-	-	degree
Delay time of parallel data	t_{BD}	–	1000	-	3000	psec
Divided Clock Duty Cycle	t_{DC}	–	40	-	60	%
Rise Time of Parallel Data	$t_{r\ PDO}$	10% - 90%	-	-	1500	psec
Fall Time of Parallel Data	$t_{f\ PDO}$	10% - 90%	-	-	1500	psec
Rise Time of Divided Data	$t_{r\ CKO}$	10% - 90%	-	500	1000	psec
Fall Time of Divided Data	$t_{f\ CKO}$	10% - 90%	-	-	1000	psec

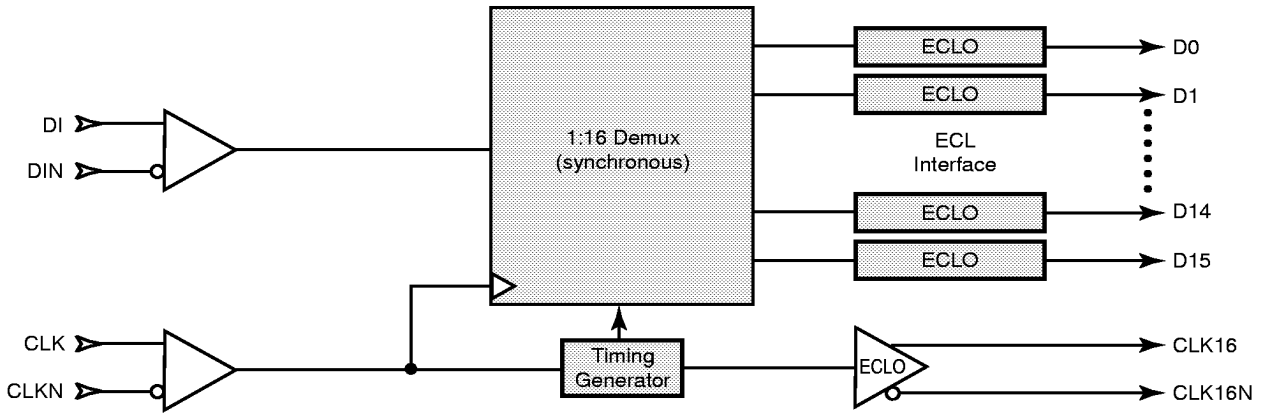


Figure 1: Functional Block Diagram of FMM4007KC

1:16 Demultiplexer

The 2.5Gbps serial data (DI/DIN) is converted into 16-bit 155Mbps parallel data (D0-D15). The parallel data are output through ECL output buffer. The internal synchronous circuits of the FMM4007 are triggered by the negative edge of high speed clock (CLK).

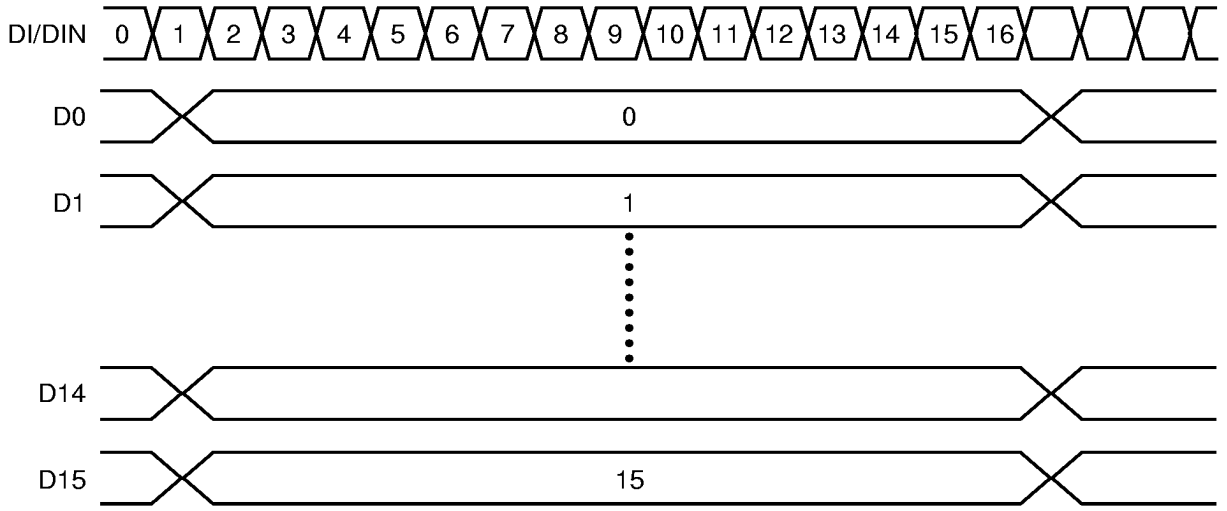


Figure 2: Timing Chart

Timing Generator

The timing generator circuit generates a divide-by-16 clock (CLK16/CLK16N) from the 2.5 GHz high speed clock to synchronize the parallel data and the divided clock.
The CLK16/CLK16N are output through ECL output buffers. The delay times of parallel data (D0-D15) are defined from the falling edge of CLK16 output as shown below.

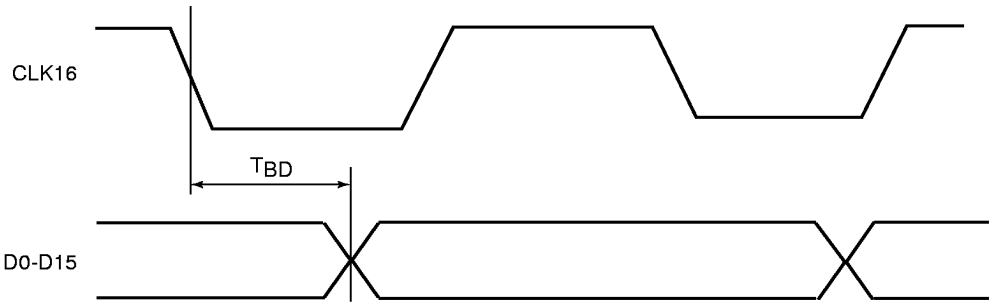
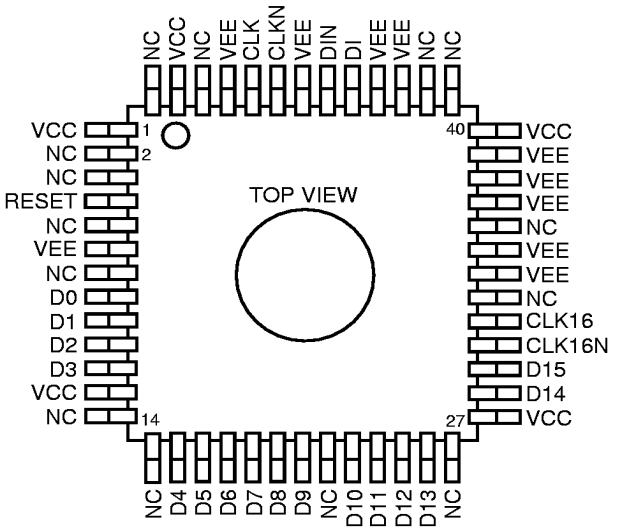


Figure 3: Delay Time Definition for Parallel Data

Package Information

The FMM4007 is packaged in a thermally enhanced plastic mold QFP-52 pin package. The package body size is 14x14mm, and the pin pitch is 1mm.

Figure 4: Package Pin Assignment



NC: No Connection, leave open

Table 1: Pin Description

Pin Name	Pin No.	Type	Description	Pin Name	Pin No.	Type	Description
VCC	1	-	GND (0V)	VCC	27	-	GND (0V)
NC	2	-	Open	D14	28	ECL:O	Parallel data output
NC	3	-	Open	D15	29	ECL:O	Parallel data output
RESET	4	ECL:I	Open or 100K to V_{TT}	CLK16N	30	ECL:O	Divided clock output (n)
NC	5	-	Open	CLK16	31	ECL:O	Divided clock output (p)
VEE	6	-	Power (-5.2V)	NC	32	-	Open
NC	7	-	Open	VEE	33	-	Power (-5.2V)
D0	8	ECL:O	Parallel data output	VEE	34	-	Power (-5.2V)
D1	9	ECL:O	Parallel data output	NC	35	-	Open
D2	10	ECL:O	Parallel data output	VEE	36	-	Power (-5.2V)
D3	11	ECL:O	Parallel data output	VEE	37	-	Power (-5.2V)
VCC	12	-	GND (0V)	VEE	38	-	Power (-5.2V)
NC	13	-	Open	VCC	39	-	GND (0V)
NC	14	-	Open	NC	40	-	Open
D4	15	ECL:O	Parallel data output	NC	41	-	Open
D5	16	ECL:O	Parallel data output	VEE	42	-	Power (-5.2V)
D6	17	ECL:O	Parallel data output	VEE	43	-	Power (-5.2V)
D7	18	ECL:O	Parallel data output	DI	44	HS:I	Serial data input (n)
D8	19	ECL:O	Parallel data output	DIN	45	HS:I	Serial data input (p)
D9	20	ECL:O	Parallel data output	VEE	46	-	Power (-5.2V)
NC	21	-	Open	CLKN	47	HS:I	Clock input (n)
D10	22	ECL:O	Parallel data output	CLK	48	HS:I	Clock input (p)
D11	23	ECL:O	Parallel data output	VEE	49	-	Power (-5.2V)
D12	24	ECL:O	Parallel data output	NC	50	-	Open
D13	25	ECL:O	Parallel data output	VCC	51	-	GND (0V)
NC	26	-	Open	NC	52	-	Open

AC coupling for high speed inputs

The FMM4007 has four high speed inputs (DI, DIN, CLK, CLKN). AC coupling is recommended for the high speed inputs. Figure 5 shows a typical configuration for AC coupled differential inputs. Figure 6 shows a example for singled-ended AC coupled inputs.

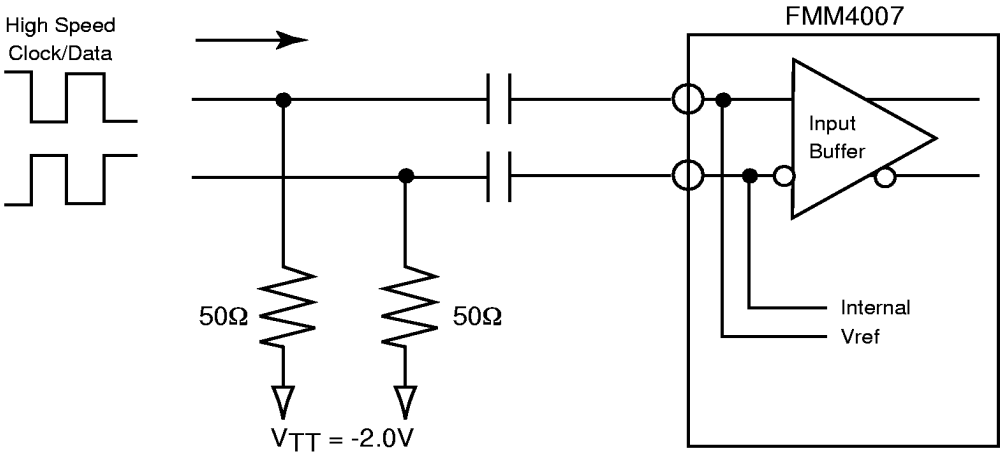


Figure 5: AC coupling for differential high speed inputs

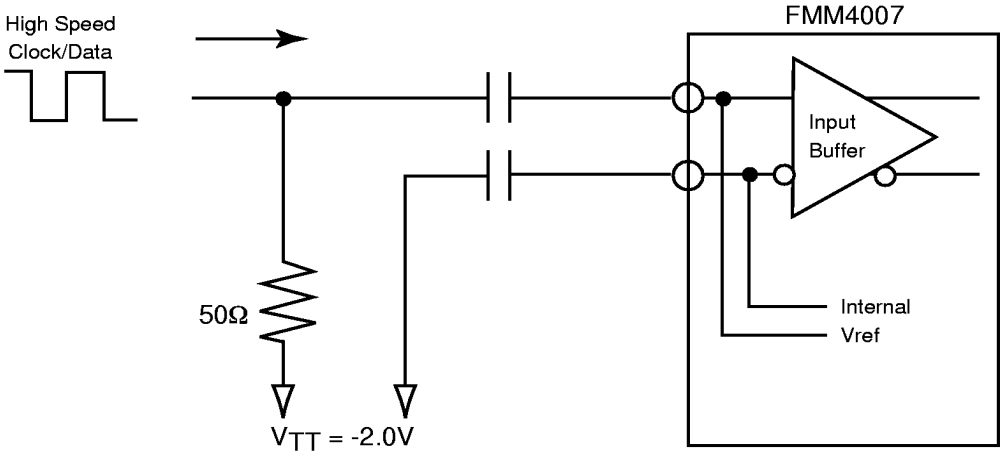
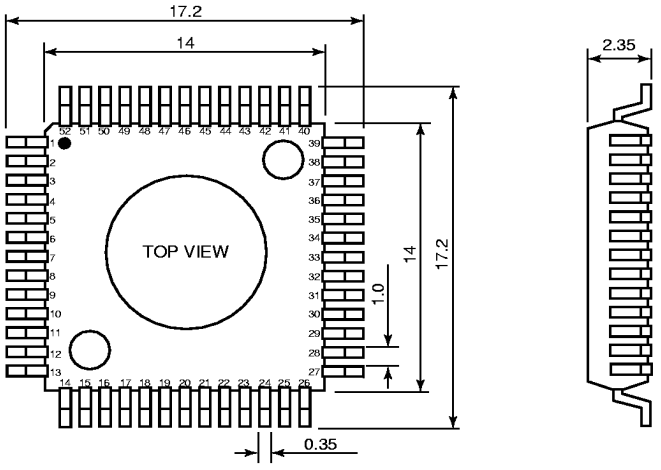


Figure 6: AC coupling for single-ended high speed inputs

Power Supply Circuit

To reduce power supply noise, the bypass capacitors should be used as close as possible to each power supply pin. Ferrite beads are recommended for reducing power supply noise. All bypass capacitors are 0.1µF ceramic chip capacitor.

"KC" PACKAGE **UNIT: mm**



Thermal Resistance of HQFP-52 pin package

	Air flow	0m/s	1m/s	2m/s
Thermal Resistance (Junction to ambient):	θja:	35	26	22°C/W
(Junction to case):	θjc:	2.1°C/W		

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