



# FSHDMI04 Wide-Bandwidth Differential Signaling HDMI Switch

### Features

• 1.65 Gbps throughput

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SEMICONDUCTOR

- 8kV ESD protection
- · -26dB non-adjacent channel crosstalk at 825MHz
- Isolation ground between channels
- · Low skew
  - Inter-pair skew <150ps
  - Intra-pair skew <90ps
- Fast turn on/off time
- Low power consumption (1µA maximun)
- · Control input: TTL compatible

### Applications

UXGA and 1080p DVI and HDMI video source selection

### **Ordering Information**

### **General Description**

The FSHDMI04 is a wide bandwidth switch for routing HDMI Link Data and Clock signals. This device supports data rates up to 1.65Gbps per channel for UXGA resolution. It can also be used to switch TMDS-based DVI digital video streams. Possible applications include LCD TV, DVD, Set-Top Box, notebook computers and other designs with multiple digital video interfaces. The FSHDMI04 switch allows the passage of HDMI link signals with low non-adjacent channel crosstalk and superior OFF-Isolation. This performance is critical to minimize ghost images between active video sources in video applications. The wide bandwidth of this switch allows the high speed differential signal to pass through the switch with minimal additive skew and phase jitter.

Order Number	Package Number	Package Description
FSHDMI04QSPX	MQA48A	48-Lead Quarter Size Very Small Outline Package (QVSOP), JEDEC MO-154, 0.150inches Wide
FSHDMI04MTDX	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide
FSHDMI04BQX (Preliminary)	MLP56	56-Lead Molded Leadless Package (MLP), 5x7mm Wide

# **Applications Diagram**



FSHDMI04 Wide-Bandwidth Differential Signaling HDMI Switch



Function

NC

C3-

GND

C3+

VCC

GND

NC

NC

GND

GND

C0-

GND

C0+

NC

NC

1C0+

### **Absolute Maximum Ratings**

The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table defines the conditions for actual device operation.

Symbol	Parameter	Rating
V <sub>CC</sub>	Supple Voltage	-0.5V to +4.6V
V <sub>S</sub>	DC Switch Voltage	–0.5V to V <sub>CC</sub> +0.05
V <sub>IN</sub>	DC Input Voltage <sup>(1)</sup>	-0.5V to +4.6V
I <sub>IK</sub>	DC Input Diode Current	–50 mA
I <sub>OUT</sub>	DC Output Sink Current	128 mA
T <sub>STG</sub>	Storage Temperature Range	−65°C to +150°C
	ESD, Human Body Model	8,000V

### Recommended Operating Conditions<sup>(2)</sup>

Symbol	Parameter	Rating
V <sub>CC</sub>	Power Supply Operating	3.0V to 3.6V
V <sub>IN</sub>	Control Input Voltage	0V to $V_{CC}$
	Switch Input Voltage	0V to $V_{CC}$
T <sub>A</sub>	Operating Temperature	–40°C to 85°C

# **DC Electrical Characteristics**

All typical values are for V<sub>CC</sub> =  $3.3V @ 25^{\circ}C$  unless otherwise specified.

				T <sub>A</sub> =	40°C to	+85°C	
Symbol	Parameter	Conditions	$V_{CC}(V)$	Min.	Тур.	Max.	Units
V <sub>IK</sub>	Clamp Diode Voltage	I <sub>IN</sub> = -18mA	3.0			-1.2	V
V <sub>IH</sub>	Input Voltage HIGH		3.0–3.6	2.0			V
V <sub>IL</sub>	Input Voltage LOW		3.0–3.6			0.8	V
I <sub>IN</sub>	Control Input Leakage	V <sub>IN</sub> = 0 to V <sub>CC</sub>	3.6			±1.0	μA
I <sub>OZ</sub>	OFF-STATE Leakage	$0 \leq nC_n, \ C_n \leq V_{CC}$	3.6			±1.0	μA
R <sub>ON</sub>	Switch On Resistance <sup>(3)</sup>	$V_{IN} = V_{CC} - 0.6$ to $V_{CC}$ , $I_{ON} = 10$ mA	3.0		12.0	19.0	Ω
R <sub>ON(FLAT)</sub>	Switch On Resistance Flatness <sup>(4)</sup>	$V_{IN} = V_{CC} - 0.6 \text{ to } V_{CC},$ $I_{ON} = 10 \text{mA}$	3.0		1.0		Ω
I <sub>CC</sub>	Quiescent Supply Current	$V_{IN}$ = 0 or $V_{CC}$ , $I_{OUT}$ = 0	3.6			1.0	μA

### Notes:

- 1. The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.
- 2. Unused control inputs must be held HIGH or LOW. They may not float.
- 3. Measured by the voltage drop between A and B pins at the indicated current through the switch. On resistance is determined by the lower of the voltages on the two (A or B) pins.
- 4. Flatness is defined as the difference between the maximum and minimum value on resistance over the specified range of conditions.

### **AC Electrical Characteristics**

All typical values are for V\_{CC} = 3.3V @ 25°C unless otherwise specified.

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> =–40°C to +85°C			Figure	
				Min.	Тур.	Max.	Units	Number
t <sub>ON</sub>	Turn ON Time S, OE-to-Output	$V_{IN} = V_{CC} - 0.5,$ $R_{PU} = 50\Omega, C_L = 5pF$	3.0 to 3.6		4.0	6.0	ns	Figure 7 Figure 8
t <sub>OFF</sub>	Turn OFF Time S, OE-to-Output	$V_{IN} = V_{CC} - 0.5,$ $R_{PU} = 50\Omega, C_L = 5pF$	3.0 to 3.6		2.0	4.0	ns	Figure 7 Figure 8
t <sub>BBM</sub>	Break-Before-Make Time	$V_{IN} = V_{CC} - 0.5,$ $R_{PU} = 20\Omega, C_L = 5pF$	3.0 to 3.6		3.0			Figure 14
t <sub>PD</sub> (t <sub>PLH</sub> , t <sub>PHL</sub> )	Switch Propagation Delay	R <sub>PU</sub> = 50Ω, C <sub>L</sub> = 5pF	3.0 to 3.6			250	ps	Figure 7 Figure 13
T <sub>JITTER</sub>	Total Jitter (DJ + RJ)	f = 165MHz Clock with	3.0 to 3.6		55.0		ps	Figure 7
T <sub>RATIO</sub>	Duty Cycle Ratio	50% Duty Cycle, RPU = 50Ω, C <sub>L</sub> = 5pF			50.0		%	
T <sub>SK1</sub>	Intra-Pair Skew $C_n^+$ to $C_n^-$ <sup>(5)</sup>	f = 1.65Gbps, 2 <sup>23</sup> -1 PRBS R <sub>PU</sub> = 50Ω, C <sub>L</sub> = 5pF	3.0 to 3.6		55.0	90.0	ps	Figure 7 Figure 13
Т <sub>SK2</sub>	Inter-Pair Skew <sup>(5)</sup> (Between any two switch paths)	f = 1.65Gbps, $2^{23}$ -1 PRBS R <sub>PU</sub> = 50Ω, C <sub>L</sub> = 5pF	3.0 to 3.6		90.0	150.0	ps	Figure 7 Figure 13
0 <sub>IRR</sub>	OFF-Isolation	R <sub>T</sub> = 50Ω, f = 370MHz	3.0 to 3.6		-35.0		dB	Figure 9
		R <sub>T</sub> = 50Ω, f = 825MHz	3.0 to 3.6		-25.0			
Xtalk	Non-Adjacent Channel	R <sub>T</sub> = 50Ω, f = 370MHz	3.0 to 3.6		-30.0		dB	Figure 10
	Crosstalk	R <sub>T</sub> = 50Ω, f = 825MHz	3.0 to 3.6		-26.0			
f <sub>MAX</sub>	Maximum Throughput		3.3		1.65		Gbps	

#### Notes:

5. Guaranteed by characteristics and design.

### Capacitance

			T <sub>A</sub> = −40°C to +85°C			
Symbol	Parameter	Conditions	Min.	Тур.	Max.	Units
C <sub>IN</sub>	Control Pin Input Capacitance	V <sub>CC</sub> = 0V		1.1		pF
C <sub>ON</sub>	nC <sub>n</sub> ON Capacitance	V <sub>CC</sub> = 3.3V		6.0		pF
C <sub>OFF</sub>	Port C <sub>n</sub> OFF Capacitance	V <sub>CC</sub> = 3.3V		2.5		pF



# **Typical Characteristics**



VCC = 3.3V

Figure 3. Off- Isolation, V<sub>CC</sub> = 3.3V



Figure 4. Crosstalk, V<sub>CC</sub> =3.3CV









# **Physical Dimensions**

Dimensions are in millimeters unless otherwise noted.





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