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September 2016

FSA660—2:1 MIPI C-PHY (5.7 Gbps) 1-Data Lane Switch

Features

- Switch Type: SPDT(3x)
- Signal Types:
  - MIPI, C-PHY
- V_{CC}: 1.5 to 5.0 V
- Input Signals: 0 to 2.1 V
- R_{ON}: 5.4 Ω Typical
- ΔR_{ON}: 0.1 Ω Typical
- R_{ON_FLAT}: 0.9 Ω Typical
- I_{CCZ}:1 µA Maximum
- I_{CC}: 12 µA Typical
- O_{IRR}: -28 dB Typical
- Bandwidth: 5G Hz Typical
- I_L: -1.0 dB Typical
- Xtalk: -44 dB Typical
- C_{ON}: 0.8 pF Typical

Description

The FSA660 is a one-data-lane MIPI, C-PHY switch. This Single-Pole, Double-Throw (SPDT) switch is optimized for switching between two high-speed or low-power MIPI sources. The FSA660 is designed for the MIPI specification and allows connection to a CSI or DSI module.

Applications

- Smart phones
- Tablets
- Laptops
- Displays

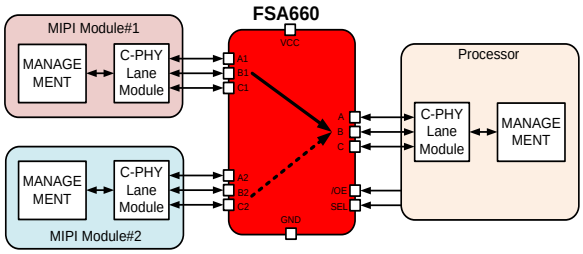


Figure 1. Typical Application

Ordering Information

Part Number	Operating Temperature Range	Package	Top Mark
FSA660TMX	-40 to +85°C	18-Lead, Quad, Ultra-ultrathin Molded Leadless Package (TMLP), 2.0 mm x 2.8 mm x 0.375 mm	LS

Pin Descriptions

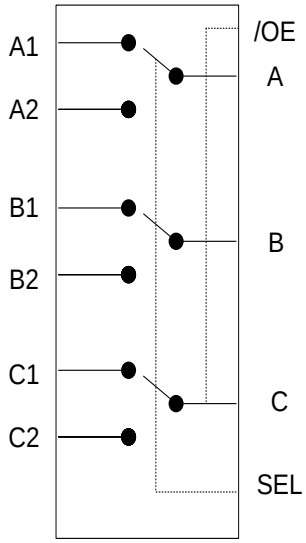


Figure 2. Analog Symbol

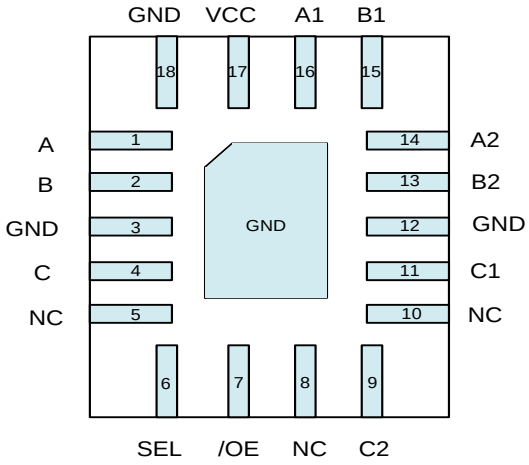


Figure 3. Pin Assignment(Top Through View)

Pin Definitions

Pin Name	Description		
A1	1-Side Data Path A		
B1	1-Side Data Path B		
C1	1-Side Data Path C		
A2	2-Side Data Path A		
B2	2-Side Data Path B		
C2	2-Side Data Path C		
A	Common Data Path A		
B	Common Data Path B		
C	Common Data Path C		
/OE	Output Enable		
SEL	Control Pin	SEL=0	A=A1,B=B1,C=C1
		SEL=1	A=A2,B=B2,C=C2
VCC	Power		
GND	Ground		
NC	No Connect		

Truth Table

SEL	/OE	Function
HIGH	LOW	A=A2,B=B2,C=C2
LOW	LOW	A=A1,B=B1,C=C1
X	HIGH	A,B,C Data Ports High Impedance

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter		Min.	Max.	Unit
V_{CC}	Supply Voltage		-0.5	6.0	V
V_{CNTRL}	DC Input Voltage (SEL, /OE)(1)		-0.5	V_{CC}	V
V_{SW}	DC Switch I/O Voltage(1,2)		-0.3	2.1	V
I_{IK}	DC Input Diode Current		-50		mA
I_{sw}	DC Switch Current			25	mA
T_{STG}	Storage Temperature		-65	+150	°C
MSL	Moisture Sensitivity Level (JEDEC J-STD-020A)			1	
ESD	Human Body Model, JEDEC: JESD22-A114	All Pins	2		kV
	IEC 61000-2-4, Level 4, for Switch Pins	Contact	8		
		Air	15		
	Charged Device Model, JESD22-C101		1		

Notes:
1. The input and output negative ratings may be exceeded if the input and output diode current ratings are observed.
2. V_{SW} refers to analog data switch paths.

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter		Min.	Max.	Unit
V_{CC}	Supply Voltage		1.5	5.0	V
V_{CNTRL}	Control Input Voltage (SEL, /OE)(3)		0	5.0	V
V_{SW}	Switch I/O Voltage	HS Mode	0	0.54	V
		LP Mode	0	1.3	
T_A	Operating Temperature		-40	+85	°C

Note:
3. The control inputs must be held HIGH or LOW; they must not float.

DC and Transient Characteristics

All typical values are at T_A=25°C unless otherwise specified.

Symbol	Parameter	Condition	V_{CC} (V)	T_A= -40ºC to +85ºC			Unit
				Min.	Typ.	Max.	
V_{IK}	Clamp Diode Voltage SEL, /OE	I_{IN}=-18 mA	1.5	-1.2		-0.6	V
I_{IK}	Clamp Diode Current (Switch Pins)	V_{IN}=-0.3 V	0			18	µA
V_{IH}	Control Input Voltage High	SEL, /OE	1.5	1.3			V
		SEL, /OE	3.6	1.4			V
		SEL, /OE	5.0	1.5			V
V_{IL}	Control Input Voltage Low	SEL, /OE	1.5			0.4	V
		SEL, /OE	3.6			0.4	V
		SEL, /OE	5.0			0.4	V
I_{IN}	Control Input Leakage	V_{SW}= 0 to 2.0 V V_{CNTRL}=0 to V_{CC}	5.0	-500		500	nA
I_{OZ}	Off-State Leakage for Open Data Paths	V_{SW}= 0.0 ≤ DATA ≤ 2.0 V	5.0	-500		500	nA
I_{CL}	On-State Leakage for Closed Data Paths(4)	V_{SW}= 0.0 ≤ DATA ≤ 2.0 V	5.0	-500		500	nA
I_{OFF}	Power-Off Leakage Current (All I/O Ports)	V_{SW}= 0.0 V to 2.0 V	0	-500		500	nA
R_{ON}	Switch On Resistance	V_{SW}= 0 V, I_{ON}=-8 mA	1.5		5.4	8.0	Ω
ΔR_{ON}	Difference in R_{ON} Between Positive-Negative	V_{SW}= 0 V, I_{ON}=-8 mA,	1.5		0.1		Ω
R_{ONF_FLAT}	Flatness for R_{ON}	V_{SW}= 0 ≤ DATA ≤ 2.0 V, I_{ON}=-8 mA	1.5		0.9		Ω
I_{CC}	Quiescent Supply Current	$V_{/OE}$=0, V_{SEL}=0 or V_{CC}, I_{OUT}=0	5.0		12	30	µA
I_{CCZ}	Quiescent Supply Current (High Impedance)	V_{SEL}=X, $V_{/OE}$= V_{CC}, I_{OUT}=0	5.0			1	µA
I_{CCT}	Increase in Quiescent Supply Current	V_{SEL}=X, $V_{/OE}$ =1.5 V	5.0		5	15	µA

Note:

4. For this test, the data switch is closed with the respective switch pin floating.

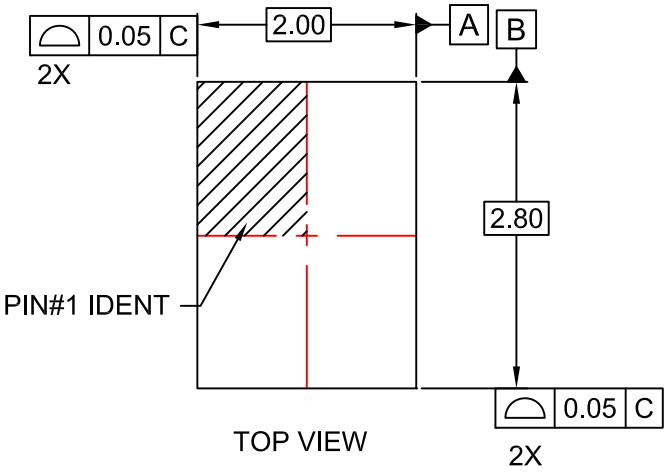
AC Electrical Characteristics

All typical value are for V_{CC} =3.6 V and T_A=25°C unless otherwise specified.

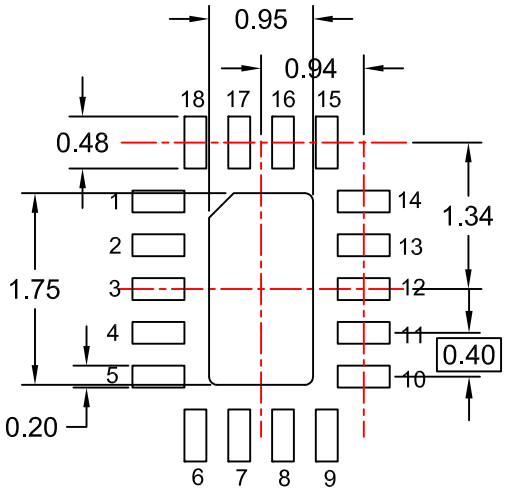
Symbol	Parameter	Condition	V_{CC} (V)	T_A= -40ºC to +85ºC			Unit
				Min.	Typ.	Max.	
t_{ON}	Turn-On Time, SEL to Output	R_L=50 Ω, C_L=0 pF, V_{SW}=0 V, V_{SW}=0.6 V	1.5 to 5.0 V		350	600	ns
t_{OFF}	Turn-Off Time, SEL to Output	R_L=50 Ω, C_L=0 pF, V_{SW}=0 V, V_{SW}=3.3 V	1.5 to 5.0 V		125	300	ns
t_{PD}	Propagation Delay[5]	C_L=, C_L=0 pF, R_L=50 Ω,	1.5 to 5.0 V		0.25		ns
t_{BBM}	Break-Before-Make[5]	R_L=50 Ω, C_L=0 pF, V_{SW1}=0.6 V,V_{SW2}= -0.6 V,	1.5 to 5.0 V	100		350	ns
t_{PEN}	Enable Time, /OE to Output	R_L=50 Ω, C_L=0 pF, V_{SW}=0.6 V	1.5 to 5.0 V		60	150	µs
t_{PDISEN}	Disable Time, /OE to Output	R_L=50 Ω, C_L=0 pF, V_{SW}=0.6 V	1.5 to 5.0 V		35	240	ns
O_{IRR}	Off Isolation[5]	V_S=0 dBm, R=50 Ω, f=2.5 GHz	3.6 V		-28		dB
Xtalk	Channel Crosstalk[5]	V_S=0 dBm, R=50 Ω, f=2.5 GHz	3.6 V		-44		dB
IL	Insertion Loss[5]	V_S=0 dBm, f=2.5 GHz, R_L=50 Ω, C_L=0 pF	3.6V		-1.0		dB
BW	-3 db Bandwidth[5]	V_{IN}=1 V_{pk-pk}, R_L=50 Ω, C_L=0 pF (All Data Paths)	3.6 V		5		GHz
$t_{SK(P)}$	Skew of Transitions of the Output[5]	R_{PU}=50 Ω to V_{CC}, f=2.5 GHz, C_L=0 pF	3.6 V		6		ps
C_{IN}	Control Pin Input Capacitance[5]	V_{CC}=0 V, f=1 MHz			2.7		pF
C_{ON}	On Capacitance[5]	V_{CC}=3.3 V, f=2.5 GHz			0.8		pF
C_{OFF}	Off Capacitance[5]	V_{CC}=3.3 V, f=2.5 GHz			0.6		pF

Note:

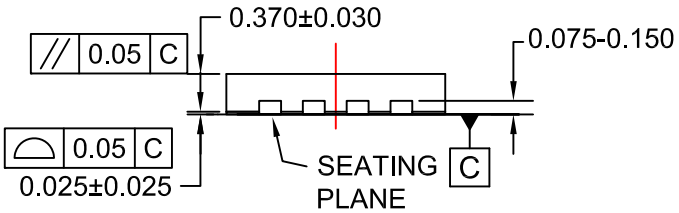
5. Guaranteed by characterization and design. Not production tested.



TOP VIEW



LAND PATTERN RECOMMENDATION



END VIEW

NOTES:

A. NO INDUSTRY STANDARD APPLIES.
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
D. LAND PATTERN RECOMMENDATION IS A FAIRCHILD DESIGN.
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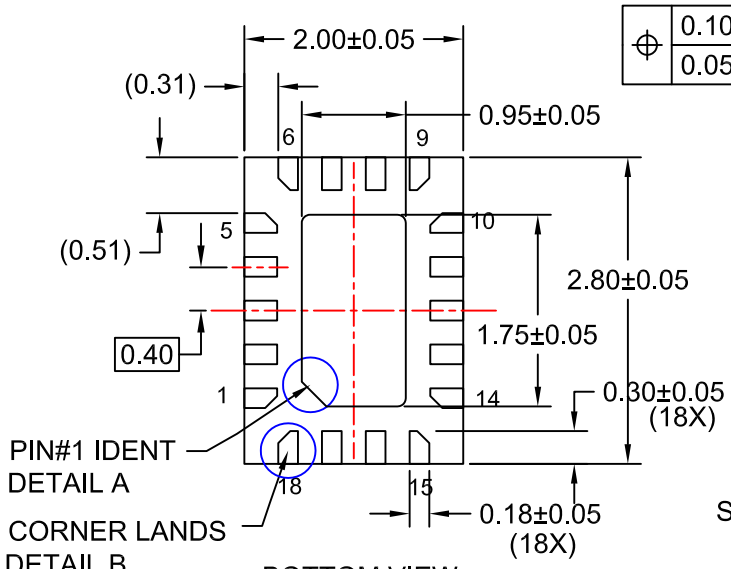
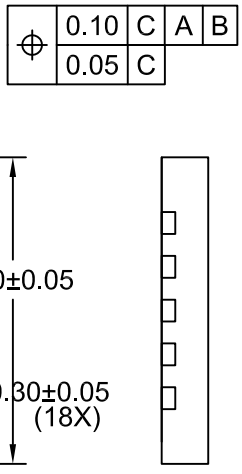
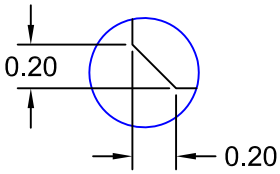


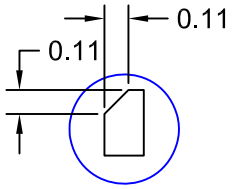
BOTTOM VIEW



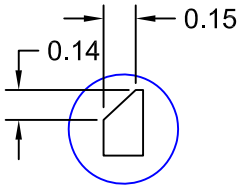
SIDE VIEW



DETAIL A
2X SCALE



DETAIL B - 8X
2X SCALE



DETAIL B - 8X
2X SCALE

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