

WAS4731Q

**3:1 High speed (-3dB bandwidth 1.8GHz)
Switch with Mobile High-Definition Link
(MHL)**

[Http://www.sh-willsemi.com](http://www.sh-willsemi.com)

Descriptions

The WAS4731Q is a bi-directional, low power, high-speed 3:1 switch that operates from a single +2.3V to +5.5V power supply.

The WAS4731Q is designed for switching of high-speed (-3dB bandwidth 1.8GHz) signals in handset and consumer applications, such as cell phones, digital cameras, and notebooks with hubs or controllers with limited USB I/Os.

The WAS4731Q has low bit-to-bit skew and high channel-to-channel noise isolation, and is compatible with various standards, such as high-speed USB 2.0 (480Mbps), MHL 1080p/60fps. Each switch is bi-directional and offers little attenuation of the high-speed signals at the outputs. Its bandwidth is quite marginal to pass high-speed differential signals (3.6Gbps) with good signal integrity.

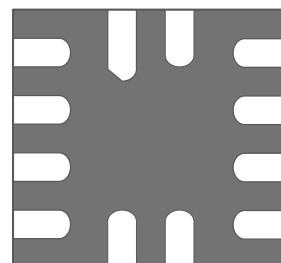
The WAS4731Q is available in QFN1818-12L package. Standard products are Pb-Free and halogen-Free.

Features

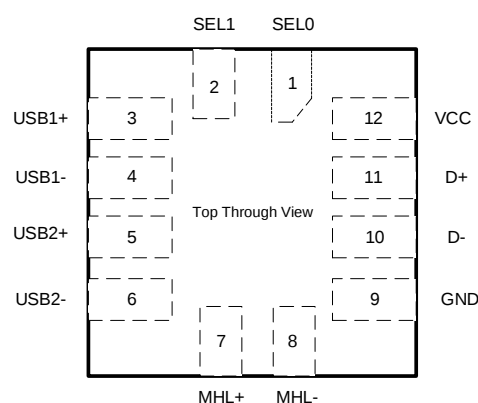
- Supply voltage : 2.3 ~ 5.5V
- -3dB Bandwidth : 1.8GHz @ $C_L=0pF$
- Off isolation : -57dB @ 50MHz
- Crosstalk : -57dB @ 50MHz
- Low quiescent current : 60uA Typ.

Applications

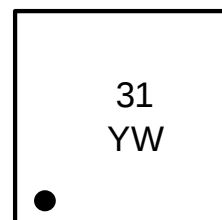
- Cell phones
- MID
- Router
- Other electronics equipments



QFN1818-12L



Pin configuration (Top view)



Marking

31 = Device code

YW= Month (A~Z)

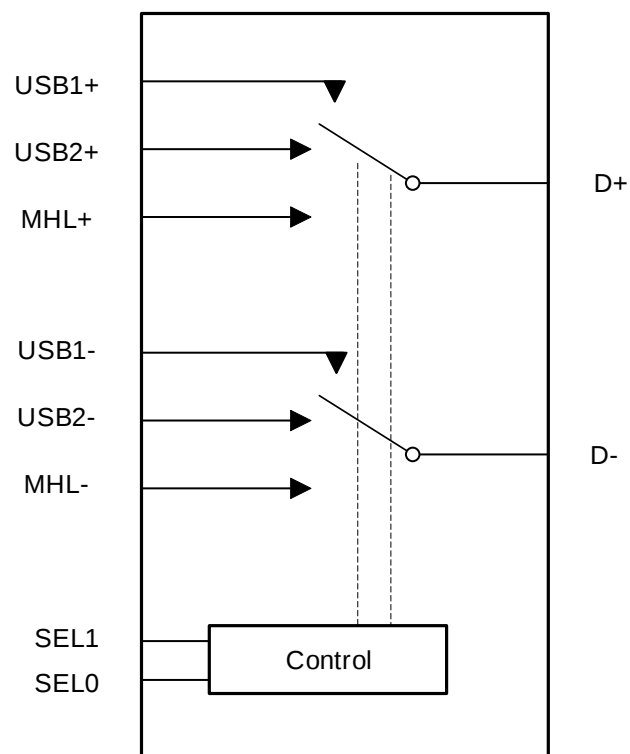
Order information

Device	Package	Shipping
WAS4731Q-12/TR	QFN1818-12L	3000/Reel&Tape

Pin Descriptions

Pin Number	Symbol	Descriptions
1	SEL0	Path Selection Control Input (See Table Below)
2	SEL1	Path Selection Control Input (See Table Below)
3	USB1+	USB Differential Data (Positive) ---Source 1
4	USB1-	USB Differential Data (Negative) ---Source 1
5	USB2+	USB Differential Data (Positive) ---Source 2
6	USB2-	USB Differential Data (Negative) ---Source 2
7	MHL+	MHL Differential Data (Positive) ---Source 3
8	MHL-	MHL Differential Data (Negative) ---Source 3
9	GND	Device Ground
10	D+	Data Switch Output (Positive)
11	D-	Data Switch Output (Negative)
12	VCC	Device Supply

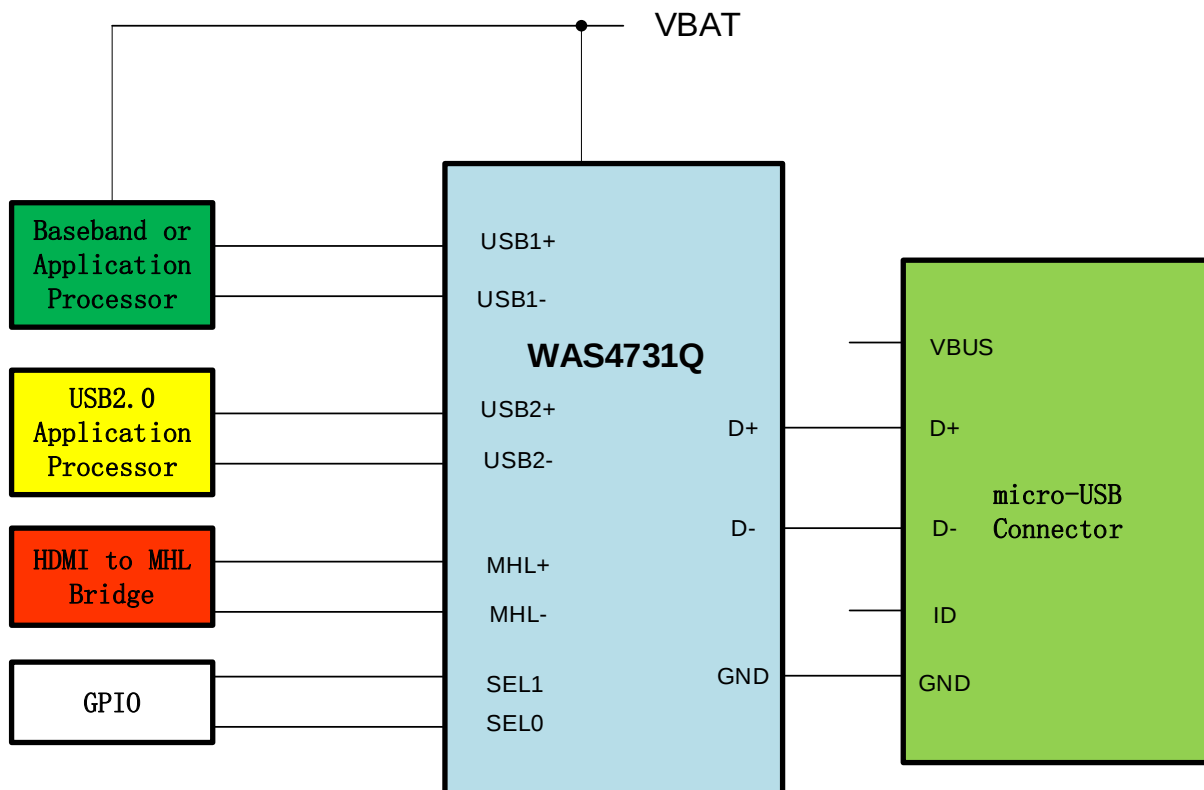
Analog Symbol



Function Descriptions

SEL1	SEL0	Function
0	0	D+ = USB1+, D- = USB1-
0	1	D+ = USB2+, D- = USB2-
1	0	D+ = MHL+, D- = MHL-
1	1	D+,D- high impedance, Device power-down

Typical Applications (Mobile Phone Example)



Absolute maximum ratings

Parameter	Symbol	Value	Unit
Supply voltage range	VCC	-0.5 ~ 6.5	V
Data input/output voltage range	V _{DATA}	-0.5 ~ 6.5	V
Select input voltage range	V _{SEL}	-0.5 ~ 6.5	V
Continues output current	I _{OUT}	±60	mA
Junction temperature range	T _J	150	°C
Lead temperature range	T _L	260	°C
Storage temperature range	T _{STG}	-65 ~ 150	°C
Thermal resistance	R _{θJA}	250	°C/W
ESD protection (HBM)	I/O to GND	6	kV
MIL-STD-883H Method 3015.8	I/O to I/O	3	kV

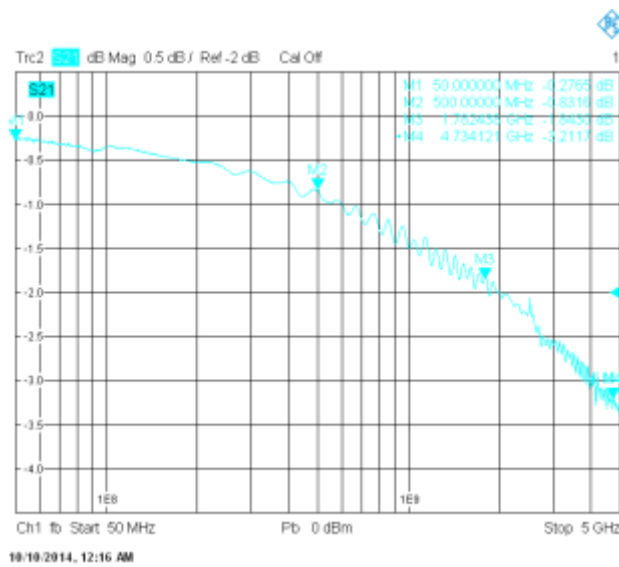
Recommend operating ratings

Parameter	Symbol	Value	Unit
Supply voltage range	VCC	2.3 ~ 5.5	V
Data input/output voltage range	V _{DATA}	0.0 ~ 3.6	V
Select input voltage range	V _{SEL}	0.0 ~ VCC	V
Operating temperature range	T _A	-40 ~ 85	°C

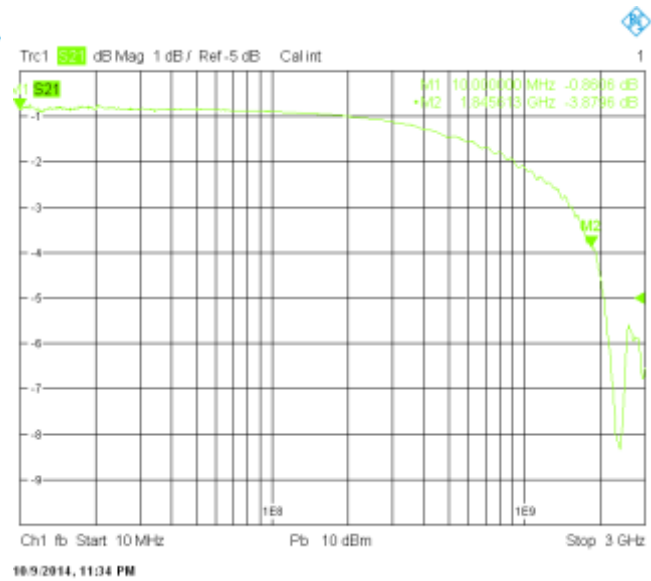
Electronics Characteristics (Ta=25°C, VCC=3.6V, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Select logic high level	V_{IH}	VCC=3.0~4.5	1.6			V
		VCC=2.3~3.0	1.4			V
Select logic low level	V_{IL}	VCC=3.0~4.5			0.6	V
		VCC=2.3~3.0			0.4	V
Supply quiescent current	I_{CC}	$I_{OUT}=0$, $V_{SEL} > 1.5V$ or $V_{SEL} < 0.7V$		60	75	uA
Select input leakage current	I_{SEL}	$V_{SEL}=VCC$			±1.0	uA
Off state switch leakage current	I_{OFF}				±1.0	uA
On state switch leakage current	I_{ON}				±1.0	uA
On-Resistance	R_{ON}	VCC=3.0V, $V_{DATA}=0\sim0.4V, I_{OUT}=8mA$,		9	11	Ω
On-Resistance match	ΔR_{ON}	VCC=3.0V, $V_{DATA}=0\sim0.4V, I_{OUT}=8mA$,		0.18	0.3	Ω
On-Resistance flatness	$R_{FLAT(ON)}$	VCC=3.0V, $V_{DATA}=0\sim1.0V, I_{OUT}=8mA$,		1.8	2.5	Ω
Propagation delay time	T_{PLH} / T_{PHL}	$C_L=10pF, R_L=50\Omega$		0.25		us
Select input to switch on time	T_{ON}	$C_L=10pF, R_L=50\Omega$		200		us
Select input to switch off time	T_{OFF}	$C_L=10pF, R_L=50\Omega$			100	ns
Break-Before-Make time	T_{BBM}	Generated by design		100		ns
-3dB Bandwidth	BW	$R_L=50\Omega, C_L=0pF$		1.8		GHz
Off isolation	OIRR	$R_L=50\Omega, F=50MHz$		-57		dB
Crosstalk	Xtalk	$R_L=50\Omega, F=50MHz$		-57		dB
Charge injection (Select input to common I/O)	Q	$C_L=0.1nF, VCC=3.3V$ $R_G=0\Omega, V_G=GND$		5		pC
Select pin input capacitance	C_{IN}	VCC=0V		5		pF
D+/- Off capacitance	C_{OFF}	VCC=3.6V		3.5		pF
D+/- On capacitance	C_{ON}	VCC=3.6V		4.5		pF

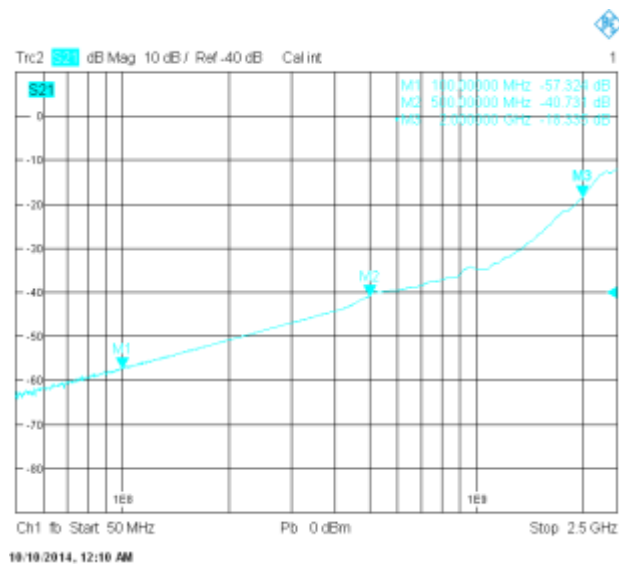
Typical Characteristics (Ta=25°C, VCC=3.6V, 10dBm, unless otherwise noted)



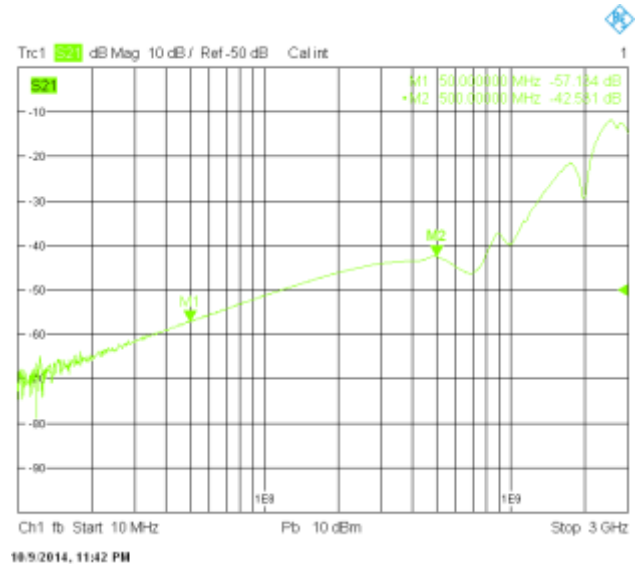
Insertion loss without WAS4731Q



Insertion loss with WAS4731Q



Channel-to-Channel Cross-Talk



Off-Isolation

Test Circuit

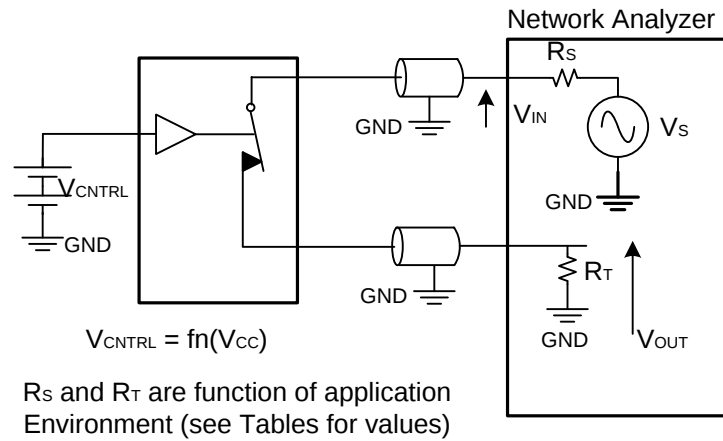


Figure 1. USB Bandwidth

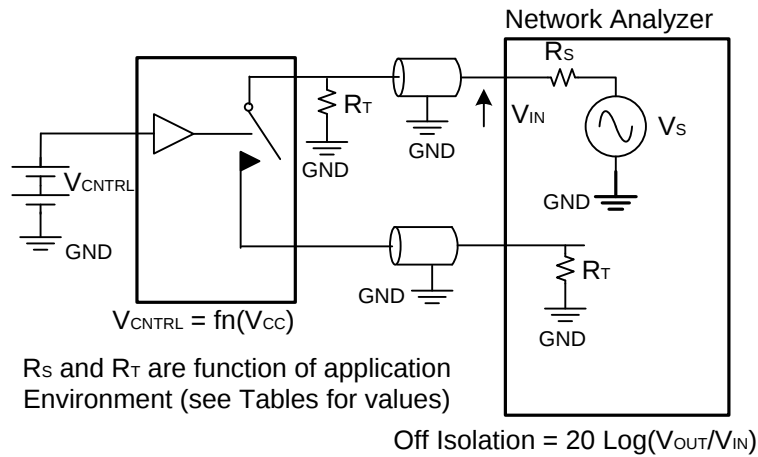


Figure 2. Channel Off Isolation

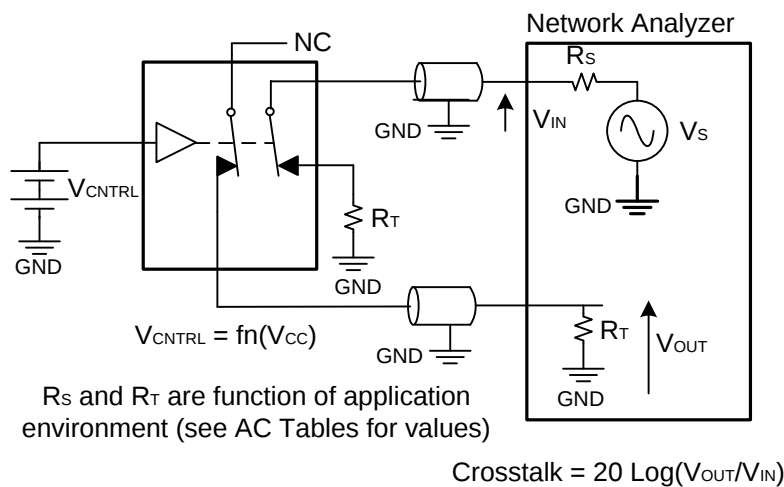
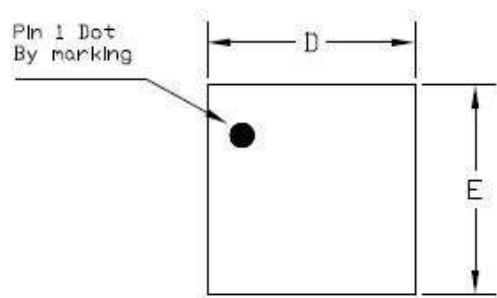
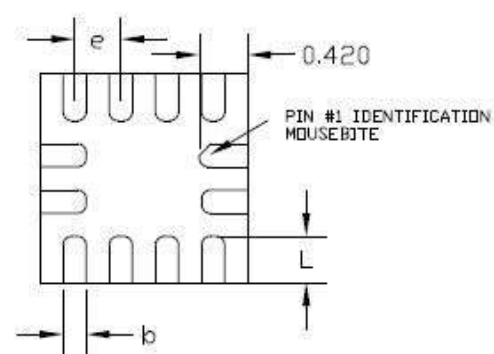


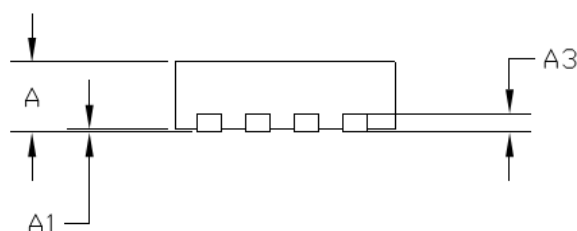
Figure 3. Non-Adjacent Channel-to-Channel Crosstalk

Package outline dimensions
QFN1818-12L


TOP VIEW



BOTTOM VIEW



SIDE VIEW

Symbol	Dimension in Millimeters		
	Min.	Typ.	Max.
A	0.50	0.55	0.60
A1	0.00	-	0.05
A3	0.15 Typ.		
D	1.75	1.80	1.85
E	1.75	1.80	1.85
L	0.35	0.40	0.45
b	0.15	0.20	0.25
e	0.40 Typ.		

制 修 订 记 录					
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应用部	品质部、封装组		市场部	生产管理部	