QuickSwitch® Products
High-Speed CMOS 12-Bit 3-to-1 Bus-Select Switch

FEATURES/BENEFITS

- Enhanced N channel FET with no inherent diode to V_{CC}
- 5Ω bidirectional switches connect inputs to outputs
- Zero propagation delay, zero ground bounce
- TTL-compatible input and output levels
- Operating temperature range: –40°C to 85°C
- Undershoot clamp diodes on all switch and control pins
- Available in 56-pin SSOP
- QS3162214 is 25Ω version for low noise

APPLICATIONS

- Video, audio, graphics switching, muxing
- Hot-swapping, hot-docking (Application Note AN-13)
- Voltage translation (5V to 3.3V; Application Note AN-11)

DESCRIPTION

The QS316214 provides a set of twelve high-speed CMOS TTL-compatible buses switching between three separate ports. The low on resistance of the QS316214 allows inputs to be connected to outputs without adding propagation delay and without generating additional ground bounce noise. The device operates as a 12-bit bus-select switch via the data-select (S0-S2) terminals.

The QS3162214 adds an internal 25Ω series termination resistor to reduce reflection noise in high speed applications. When closed, the switch acts as the source (series) termination for the driver connected to it.

Mux/Demux devices provide an order of magnitude faster speed than equivalent logic devices.

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Figure 1. Functional Block Diagram

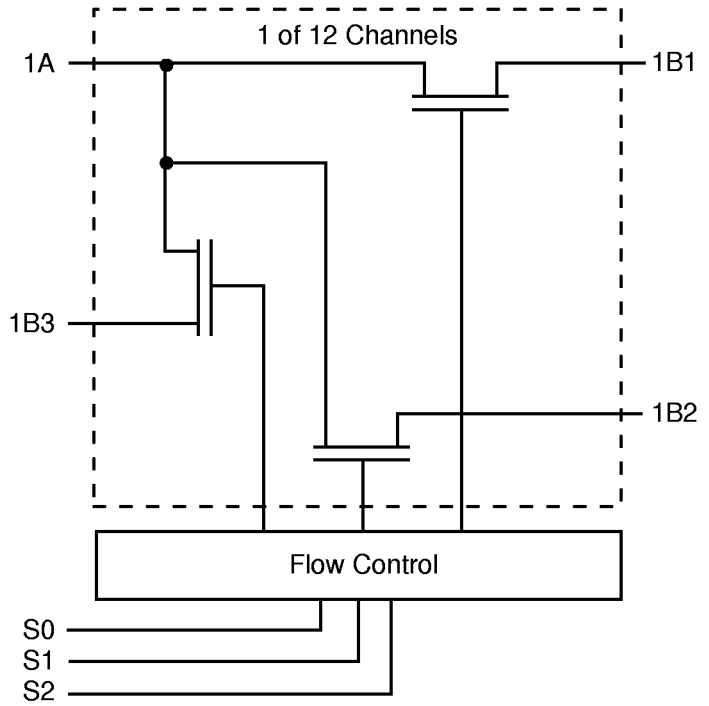

Table 1. Pin Description

Name	I/O	Function
1A-12A	I/O	Bus A
1Bn-12Bn	I/O	Bus B
S0 - S2	I	Data select

Figure 2. Pin Configuration (All Pins Top View)

SSOP (PV)

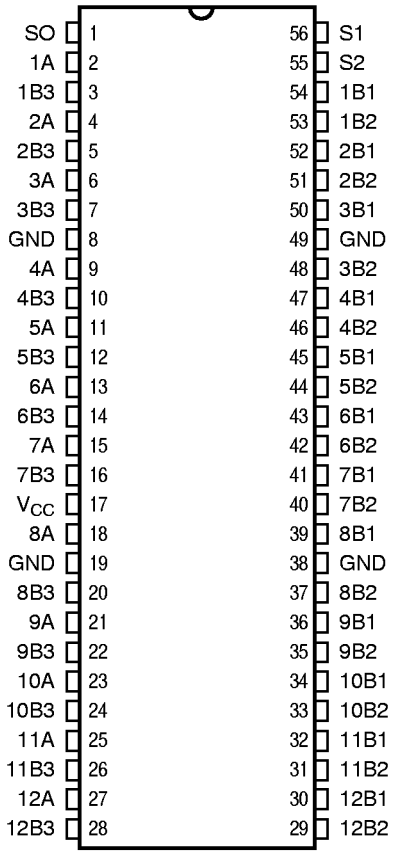

Table 2. Function Table

S2	S1	S0	iA	Function
L	L	L	Z	Disconnect
L	L	H	iB1	iA to iB1
L	H	L	iB2	iA to iB2
L	H	H	Z	Disconnect
H	L	L	Z	Disconnect
H	L	H	iB3	iA to iB3
H	H	L	iB1	iA to iB1
H	H	H	iB2	iA to iB2

Table 3. Absolute Maximum Ratings

Supply Voltage to Ground	–0.5V to +7.0V
DC Switch Voltage V_S	–0.5V to +7.0V
DC Input Voltage V_{IN}	–0.5V to +7.0V
AC Input Voltage (for a pulse width ≤ 20ns)	–3.0V
DC Output Current Max. Sink Current/Pin	120mA
Maximum Power Dissipation at T_A = 85°C	0.93 watts
T_{STG} Storage Temperature	–65° to +150°C

Note: ABSOLUTE MAXIMUM CONTINUOUS RATINGS are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum conditions is not implied.

Table 4. Capacitance

T_A = 25°C, f = 1MHz, V_{IN} = 0V, V_{OUT} = 0V

Pins		SSOP Typ	SSOP Max	Unit
Control Inputs		5	5.5	pF
QuickSwitch Channels (Switch OFF)	Mux	10	12	pF
	Demux	6	7	pF

Note: Capacitance is guaranteed, but not production tested. For total capacitance while the switch is ON, please see Section 1 under "Input and Switch Capacitance."

Table 5. DC Electrical Characteristics Over Operating Range

T_A = –40°C to 85°C, V_{CC} = 5.0V ± 10%

Symbol	Parameter	Test Conditions		Min	Typ(1)	Max	Unit
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH for Control Inputs		2.0	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for Control Inputs		—	—	0.8	V
$\lvert I_{IN} \rvert$	Input Leakage Current (Control Inputs)	$0 \le V_{IN} \le V_{CC}$		—	—	1	µA
$\lvert I_{OZ} \rvert$	Off-State Current (Hi-Z)	$0 \le V_{OUT} \le V_{CC}$		—	—	1	µA
R_{ON}	Switch ON Resistance(2)	V_{CC} = Min., V_{IN} = 0.0V, I_{ON} = 30mA	QS316214	—	4	6	Ω
			QS3162214	20	28	40	
R_{ON}	Switch ON Resistance(2)	V_{CC} = Min., V_{IN} = 2.4V, I_{ON} = 15mA	QS316214	—	8	10	Ω
			QS3162214	24	35	48	
V_P	Pass Voltage(3)	$V_{IN} = V_{CC}$ = 5V, I_{OUT} = –5µA		3.7	4	4.2	V

Notes:
1. Typical values indicate V_{CC} = 5.0V and T_A = 25°C.
2. For a diagram explaining the procedure for R_{ON} measurement, please see Section 1 under "DC Electrical Characteristics." Max. value of R_{ON} guaranteed, but not production tested.
3. Pass voltage is guaranteed, but not production tested.

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Figure 3. Typical ON Resistance vs. V_{IN} at V_{CC} = 5.0V

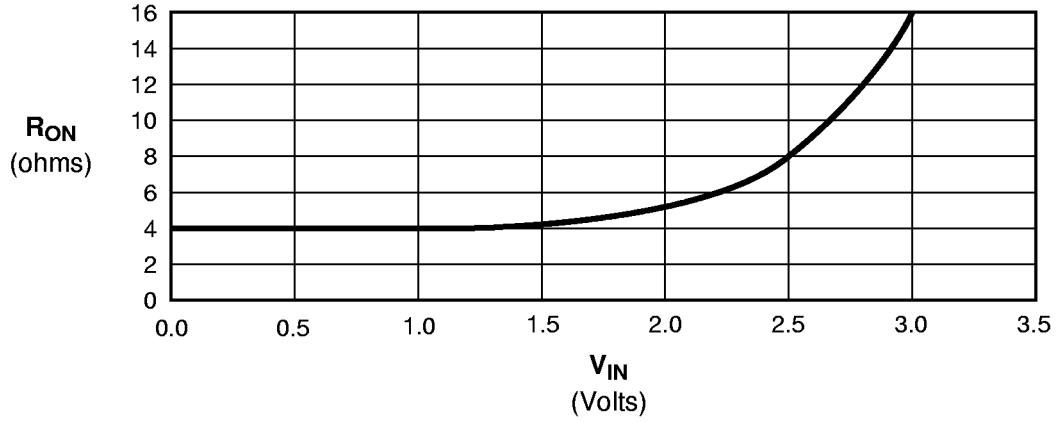


Table 6. Power Supply Characteristics Over Operating Range

T_A = –40°C to 85°C, V_{CC} = 5.0V ± 10%

Symbol	Parameter	Test Conditions[1]	Max	Unit
I_{CCQ}	Quiescent Power Supply Current	V_{CC} = Max., V_{IN} = GND or V_{CC}, f = 0	3.0	µA
ΔI_{CC}	Power Supply Current Per Control Input HIGH[2]	V_{CC} = Max., V_{IN} = 3.4V, f = 0	2.5	mA
Q_{CCD}	Dynamic Power Supply Current per MHz[3]	V_{CC} = Max., A and B Pins Open, Control Input Toggling @ 50% Duty Cycle	0.25	mA/ MHz

Notes:
1. For conditions shown as Min. or Max., use the appropriate values specified under DC specifications.
2. Per TTL driven input (V_{IN} = 3.4V). A and B pins do not contribute to ΔI_{CC}.
3. This current applies to the control inputs only and represents the current required to switch internal capacitance at the specified frequency. The A and B inputs generate no significant AC or DC currents as they transition. This parameter is guaranteed, but not production tested.

Table 7. Switching Characteristics Over Operating Range

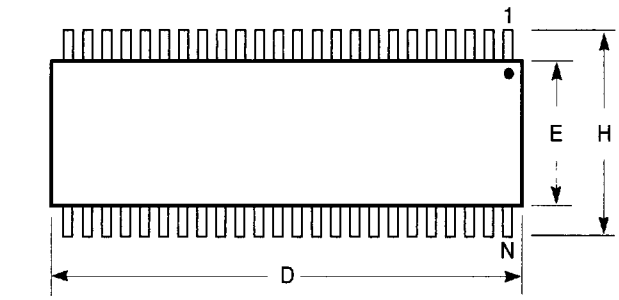
T_A = –40°C to 85°C, V_{CC} = 5.0V ± 10%
C_{LOAD} = 50pF, R_{LOAD} = 500Ω unless otherwise noted.

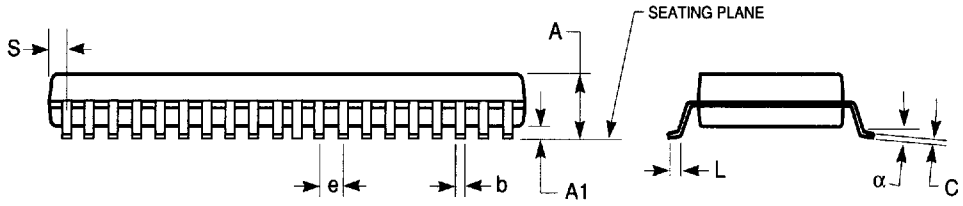
		QS316214			QS3162214			
Symbol	Description[1]	Min	Typ	Max	Min	Typ	Max	Unit
t_{PLH} t_{PHL}	Data Propagation Delay[2,4] iA to iBn, iBn to iA	—	—	0.25[3]	—	—	1.25[3]	ns
t_{PZL} t_{PZH}	Switch Turn-on Delay Sn to iA, iBn	1.5	—	6.5	1.5	—	7.5	ns
t_{PLZ} t_{PHZ}	Switch Turn-off Delay[2] Sn to iA, iBn	1.5	—	5.8	1.5	—	5.8	ns

Notes:
1. See Test Circuit and Waveforms. Minimums guaranteed, but not production tested.
2. This parameter is guaranteed, but not production tested.
3. The time constant for the switch alone is of the order of 0.25ns for QS316214 and 1.25ns for QS3162214 for C_L = 50pF.
4. The bus switch contributes no propagation delay other than the RC delay of the ON resistance of the switch and the load capacitance. Since this time constant is much smaller than the rise/fall times of typical driving signals, it adds very little propagation delay to the system. Propagation delay of the bus switch when used in a system is determined by the driving circuit on the driving side of the switch and its interaction with the load on the driven side.

300-MIL SSOP - Package Code PV

Shrink Small Outline Package
Plastic Small Outline Gull-Wing





Notes:
1. Refer to applicable symbol list.
2. All dimensions are in inches.
3. N is the number of lead positions.
4. Dimensions D and E are to be measured at maximum material condition but do not include mold flash. Allowable mold flash is 0.006in. per side.
5. Lead coplanarity is 0.004in. maximum.

JEDEC#	MO-118AA			MO-118AB		
DWG#	PSS-48B			PSS-56B		
Symbol	Min	Nom	Max	Min	Nom	Max
A	0.095	0.102	0.110	0.095	0.102	0.110
A1	0.008	0.012	0.016	0.008	0.012	0.016
b	0.008	0.010	0.0135	0.008	0.010	0.0135
C	0.005	0.008	0.010	0.005	0.008	0.010
D	0.620	0.625	0.630	0.720	0.725	0.730
E	0.291	0.295	0.299	0.291	0.295	0.299
e	0.025 BSC			0.025 BSC		
H	0.395	0.410	0.420	0.395	0.410	0.420
L	0.020	0.030	0.040	0.020	0.030	0.040
N	48			56		
α	0°	5°	8°	0°	5°	8°
S	0.022	0.025	0.028	0.022	0.025	0.028