QuickSwitch® Products
High-Speed CMOS QuickSwitch Quad 2:1 Mux/Demux

FEATURES/BENEFITS

- Enhanced N channel FET with no inherent diode to V_{CC}
- 5Ω bidirectional switches connect inputs to outputs
- Pin compatible with the 74F257, 74FCT257, and 74FCT257T
- Zero propagation delay, zero ground bounce
- TTL-compatible control inputs
- Undershoot clamp diodes on all switch and control pins
- Available in SOIC (S1), QSOP
- QS32257 is 25Ω version for low noise

APPLICATIONS

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

DESCRIPTION

The QS3257 is a high-speed CMOS LVTTL-compatible Quad 2:1 multiplexer/demultiplexer. The QS3257 is a function and pinout compatible QuickSwitch version of the 74F257, 74FCT257, and the 74ALS/AS/LS257 Quad 2:1 multiplexers. The low ON resistance of the QS3257 allows inputs to be connected to outputs without adding propagation delay and without generating additional ground bounce noise. The QS32257 has 25Ω series resistors to reduce ground bounce noise.

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

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Figure 1. Functional Block Diagram

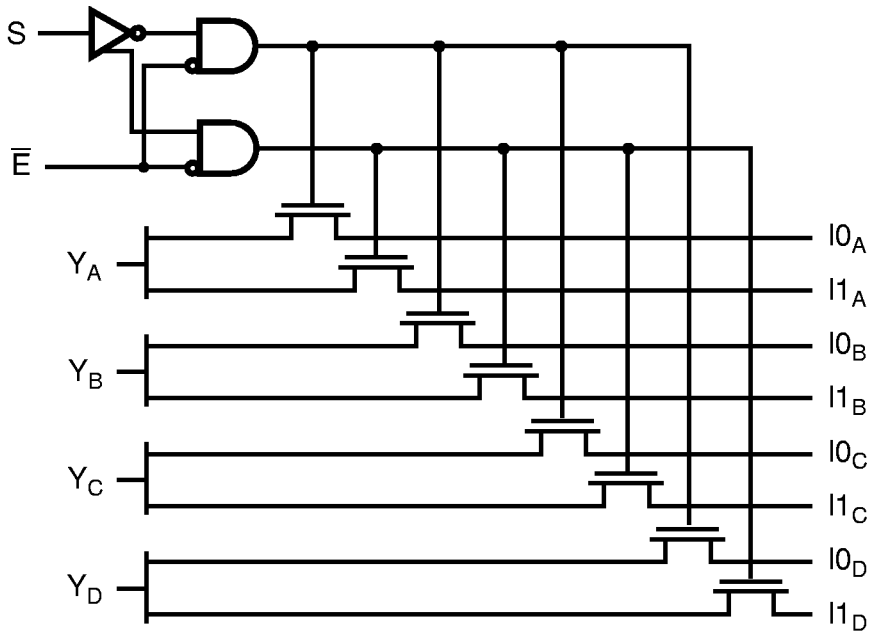

Table 1. Pin Description

Name	I/O	Description
Ixx	I	Data Inputs
S	I	Select Input
$\overline{E}$	I	Enable Input
Y_A-Y_D	O	Data Outputs

Figure 2. Pin Configuration (All Pins Top View)

SOIC (S1), QSOP

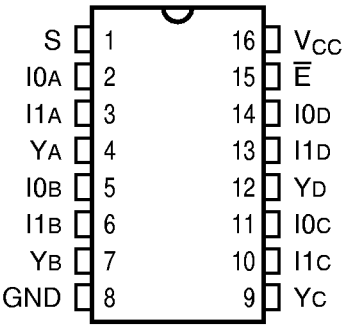

Table 2. Function Table

Inputs		Outputs				
$\overline{E}$	S	Y_A	Y_B	Y_C	Y_D	Function
H	X	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Disable
L	L	I0A	I0B	I0C	I0D	Select 0
L	H	I1A	I1B	I1C	I1D	Select 1

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	0.5 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		SOIC, QSOP Typ	SOIC, QSOP Max	Unit
Control Inputs		4	5	pF
QuickSwitch Channels (Switch OFF)	Demux	5	7	pF
	Mux	8	9	pF

Note: Capacitance is guaranteed, but not production tested and are typical values. 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

Commercial T_A = –40°C to +85°C, V_{CC} = 5.0V ± 5%, Military: T_A = –55°C to 125°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 Pins		2.0	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for Control Pins		—	—	0.8	V
$\| I_{IN} \|$	Input Leakage Current (Control Inputs)	$0V \le V_{IN} \le V_{CC}$		—	—	1	µA
$\| I_{OZ} \|$	Off-State Current (Hi-Z)	$0V \le V_{OUT} \le V_{CC}$		—	—	1	µA
R_{ON}	Switch On Resistance(2)	V_{CC} = Min., V_{IN} = 0.0V	QS3257	—	5	7	Ω
		I_{ON} = 30mA	QS32257	20	28	40	
R_{ON}	Switch On Resistance(2)	V_{CC} = Min., V_{IN} = 2.4V	QS3257	—	10	15	Ω
		I_{ON} = 15mA	QS32257	20	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." R_{ON} guaranteed, but not production tested.
3. Pass voltage is guaranteed, but not production tested.

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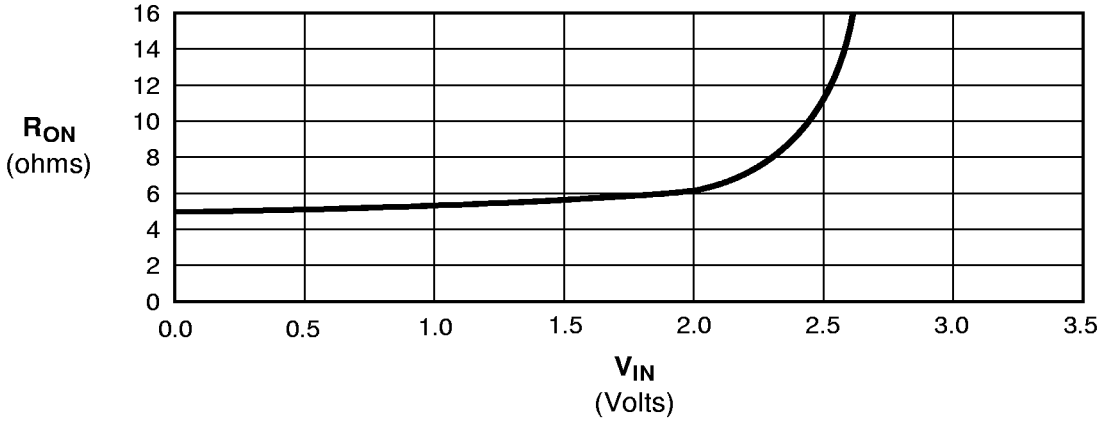
Figure 3. Typical ON Resistance vs. V_{IN} at V_{CC} = 5.0V (QS3257)



Note: For QS32257, add 23Ω to R_{ON} shown.

Table 6. Power Supply Characteristics Over Operating Range

T_A = –40°C to +85°C, V_{CC} = 5.0V ± 5%

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[2] per Input HIGH	V_{CC} = Max, V_{IN} = 3.4V, f = 0 per control input	1.5	mA
Q_{CCD}	Dynamic Power Supply Current per MHz[3]	V_{CC} = Max, I and Y Pins Open, Control Inputs 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, control inputs only). I and Y pins do not contribute to ΔI_{CC}.
3. This parameter applies to the control inputs only and represents the current required to switch internal capacitance at the specified frequency. The I and Y 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 ± 5%
C_{LOAD} = 50pF, R_{LOAD} = 500Ω unless otherwise noted.

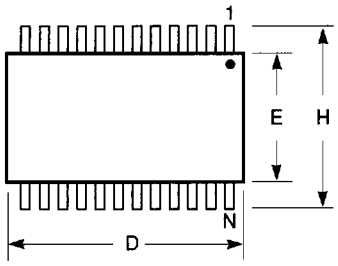
		QS3257			QS32257			
Symbol	Description[1]	Min	Typ	Max	Min	Typ	Max	Unit
t_{PLH} t_{PHL}	Data Propagation Delays[2,3] In to Y	—	—	0.25[3]	—	—	1.25[3]	ns
t_{PZH} t_{PZL}	Switch Turn-on Delay Sn to Y	0.5	—	5.2	0.5	—	6.2	ns
t_{PZH} t_{PZL}	Switch Turn-on Delay $\overline{En}$ to Y	0.5	—	4.8	0.5	—	5.8	ns
t_{PHZ} t_{PLZ}	Switch Turn-off Delay[2] $\overline{En}$ to Y, Sn to Y	0.5	—	5.0	0.5	—	5.0	ns

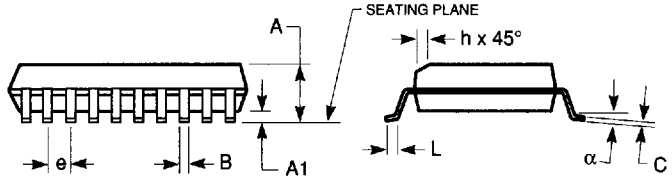
Notes:
1. See Test Circuit and Waveforms. Minimums guaranteed, but not production tested.
2. This parameter is guaranteed, but not production tested.
3. The bus switch contributes no propagation delay other than the RC delay of the ON resistance of the switch and the load capacitance. The time constant for the switch alone is of the order of 0.25ns for QS3257 and 1.25ns for QS32257 for C_L = 50pF. 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 SOIC - Package Code SO

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.

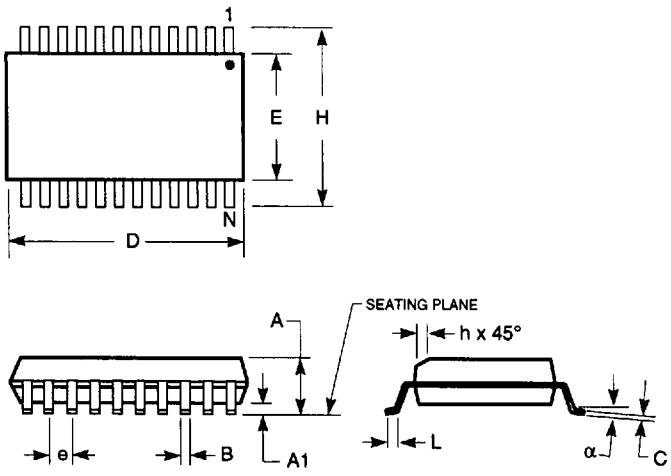




JEDEC#	MS-013AA		MS-013AC		MS-013AD		MS-013AE	
DWG#	PS16A		PS20A		PS24A		PS28A	
Symbol	Min	Max	Min	Max	Min	Max	Min	Max
A	0.096	0.104	0.096	0.104	0.096	0.104	0.096	0.104
A1	0.005	0.011	0.005	0.011	0.005	0.011	0.005	0.011
B	0.014	0.019	0.014	0.019	0.014	0.019	0.014	0.019
C	0.009	0.012	0.009	0.012	0.009	0.012	0.009	0.012
D	0.402	0.412	0.500	0.510	0.602	0.612	0.701	0.711
E	0.292	0.299	0.292	0.299	0.292	0.299	0.292	0.299
e	0.044	0.056	0.044	0.056	0.044	0.056	0.044	0.056
H	0.396	0.416	0.396	0.416	0.396	0.416	0.396	0.416
h	0.010	0.016	0.010	0.016	0.010	0.016	0.010	0.016
L	0.020	0.040	0.020	0.040	0.020	0.040	0.020	0.040
N	16		20		24		28	
α	0°	8°	0°	8°	0°	8°	0°	8°

150-MIL SOIC - Package Code S1

Plastic Small Outline Gull-Wing



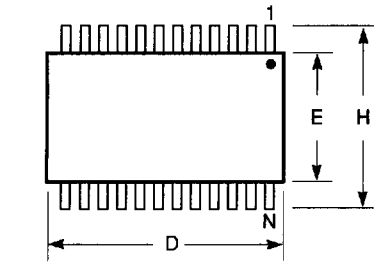
JEDEC#	MS-012AB			MS-012AC		
DWG#	PS-14B			PS-16B		
Symbol	Min	Nom	Max	Min	Nom	Max
A	0.060	0.064	0.068	0.060	0.064	0.068
A1	0.004	0.006	0.008	0.004	0.006	0.008
B	0.014	0.016	0.019	0.014	0.016	0.019
C	0.0075	0.008	0.0098	0.0075	0.008	0.0098
D	0.337	0.341	0.346	0.386	0.390	0.394
E	0.150	0.154	0.157	0.150	0.154	0.157
e	0.050 BSC			0.050 BSC		
H	0.230	0.236	0.244	0.230	0.236	0.244
h	0.010	0.013	0.016	0.010	0.013	0.016
L	0.016	0.025	0.035	0.016	0.025	0.035
N	14			16		
α	0°	5°	8°	0°	5°	8°

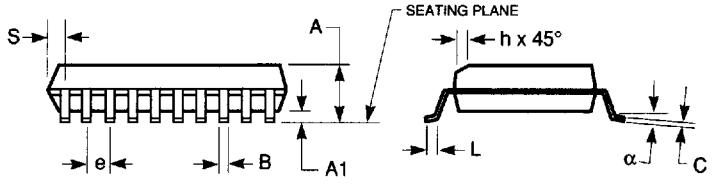
Notes:
1. Refer to applicable symbol list.
2. All dimensions are in inches.
3. N is the number of lead positions.
4. Dimensions D and E are to be measured at maximum material condition but do not include mold flash. Allowable mold flash is 0.006 in. per side.
5. Lead coplanarity is 0.004 in. maximum.

150-MIL QSOP - Package Code Q

Quarter-Size 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-137AB			MO-137AD			MO-137AE			MO-137AF		
DWG#	PSS-16A			PSS-20A			PSS-24A			PSS-28A		
Symbol	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
A	0.060	0.064	0.068	0.060	0.064	0.068	0.060	0.064	0.068	0.060	0.064	0.068
A1	0.004	0.006	0.008	0.004	0.006	0.008	0.004	0.006	0.008	0.004	0.006	0.008
B	0.009	0.010	0.012	0.009	0.010	0.012	0.009	0.010	0.012	0.009	0.010	0.012
C	0.007	0.008	0.010	0.007	0.008	0.010	0.007	0.008	0.010	0.007	0.008	0.010
D	0.189	0.193	0.197	0.337	0.341	0.344	0.337	0.341	0.344	0.386	0.390	0.394
E	0.150	0.154	0.157	0.150	0.154	0.157	0.150	0.154	0.157	0.150	0.154	0.157
e	0.025 BSC			0.025 BSC			0.025 BSC			0.025 BSC		
H	0.230	0.236	0.244	0.230	0.236	0.244	0.230	0.236	0.244	0.230	0.236	0.244
h	0.010	0.013	0.016	0.010	0.013	0.016	0.010	0.013	0.016	0.010	0.013	0.016
L	0.016	0.025	0.035	0.016	0.025	0.035	0.016	0.025	0.035	0.016	0.025	0.035
N	16			20			24			28		
α	0°	5°	8°	0°	5°	8°	0°	5°	8°	0°	5°	8°
S	0.006	0.009	0.010	0.056	0.058	0.060	0.031	0.033	0.035	0.031	0.033	0.035