QUICKSWITCH® PRODUCTS HIGH-SPEED CMOS QUADRUPLE BUS SWITCH WITH INDIVIDUAL ACTIVE LOW ENABLES

QS3125

FEATURES:

- **Enhanced N channel FET with no inherent diode to Vcc**
- **Pin compatible with the 74'125 function**
- **Zero propagation delay, zero added ground bounce**
- **Undershoot clamp diodes on all switch and control inputs**
- **Available in QSOP and SOIC packages**

APPLICATIONS:

- **Hot-swapping, hot-docking**
- **Voltage translation (5V to 3.3V)**
- **Power conservation**
- **Capacitance reduction and isolation (mass storage, work stations)**
- **Logic replacement (data processing)**
- **Clock gating**
- **Bus isolation**

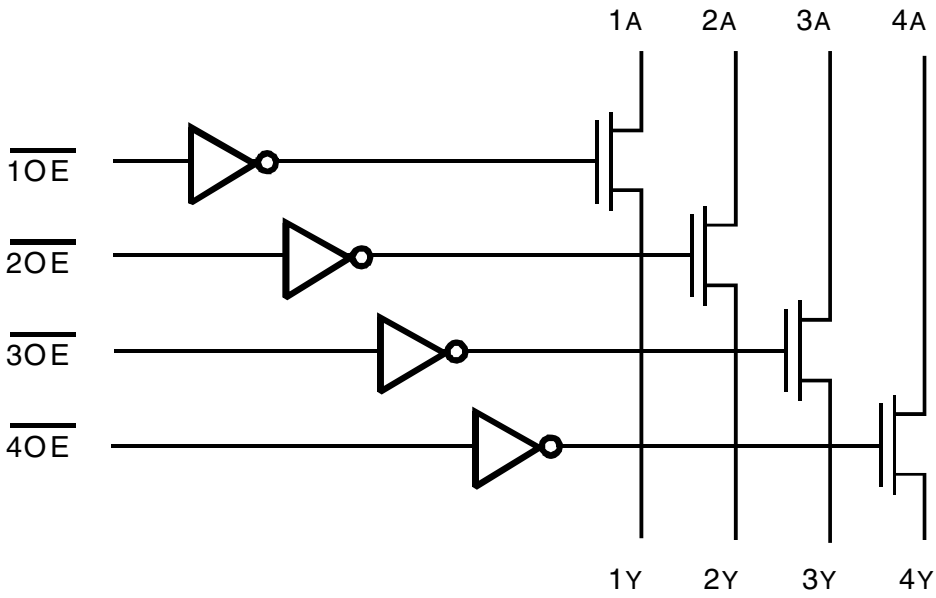
DESCRIPTION:

The QS3125 provides a set of four high-speed low resistance CMOS switches connecting inputs to outputs without propagation delay and without generating additional ground bounce noise. Individual enables ($\overline{OE}$) are used to turn on the switches. The QS3125 is ideal for signal and control switching since the device adds no noise, ground bounce, propagation delay, or significant power consumption to the system. The QS3125 can also be used for analog switching applications such as video.

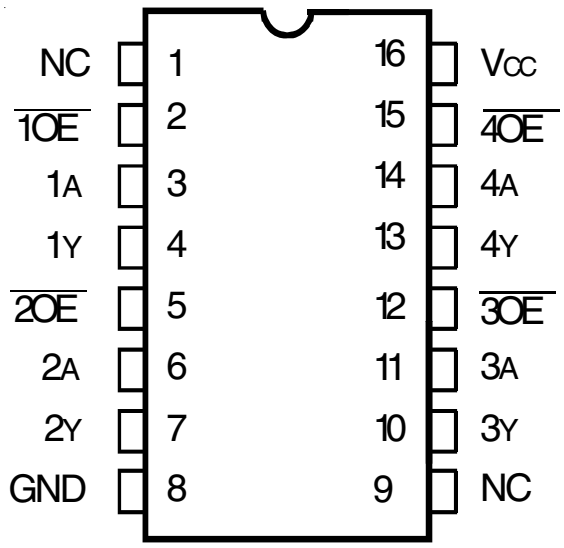
QuickSwitch devices provide an order of magnitude faster speed than conventional logic devices.

The QS3125 is characterized for operation at -40°C to +85°C.

FUNCTIONAL BLOCK DIAGRAM

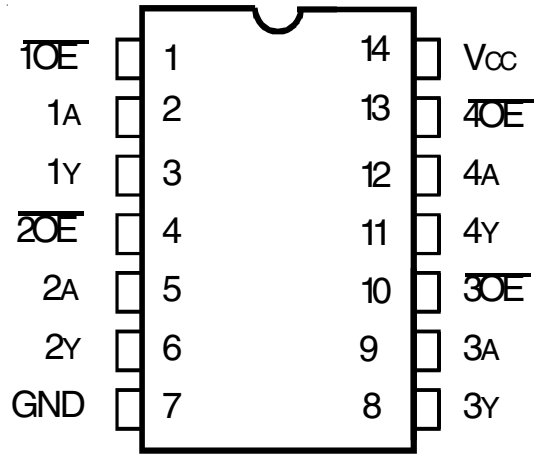


PIN CONFIGURATION



TOP VIEW

Package Type	Package Code	Order Code
QSOP	PCG16	QG



TOP VIEW

Package Type	Package Code	Order Code
SOIC	DCG14	S1G

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Description	Max	Unit
V_{TERM}(2)	Supply Voltage to Ground	–0.5 to +7	V
V_{TERM}(3)	DC Switch Voltage V_S	–0.5 to +7	V
V_{TERM}(3)	DC Input Voltage V_{IN}	–0.5 to +7	V
V_{AC}	AC Input Voltage (pulse width ≤20ns)	–3	V
I_{OUT}	DC Output Current	120	mA
P_{MAX}	Maximum Power Dissipation (T_A = 85°C)	0.5	W
T_{STG}	Storage Temperature	–65 to +150	°C

NOTES:
1. Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
2. V_{CC} terminals.
3. All terminals except V_{CC} .

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

Pins	Typ.	Max.(1)	Unit
$\overline{OE}$ (Inputs)	3	5	pF
Quickswitch Channels (Switch OFF)	5	7	pF

NOTE:
1. This parameter is guaranteed but not production tested.

PIN DESCRIPTION

Pin Names	I/O	Description
$1A$ - $4A$	I/O	Bus A
$1Y$ - $4Y$	I/O	Bus Y
$\overline{1OE}$ - $\overline{4OE}$	I	Bus Switch Enable

FUNCTION TABLE(1)

$\overline{xOE}$	xA	xY	Function
L	H	H	Connect
L	L	L	Connect
H	X	X	Disconnect

NOTE:
1. H = HIGH Voltage Level
   L = LOW Voltage Level
   X = Don't Care

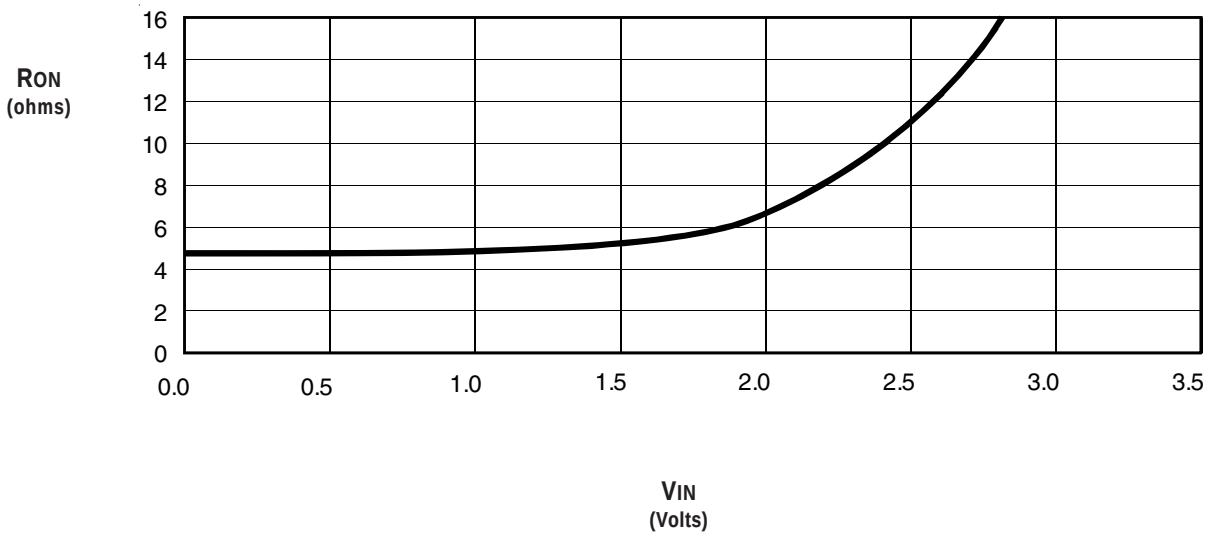
DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:
Industrial: T_A = –40°C to +85°C, V_{CC} = 5V ± 5%

Symbol	Parameter	Test Conditions	Min.	Typ.(1)	Max.	Unit
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH for Control Inputs	2	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for Control Inputs	—	—	0.8	V
I_{IN}	Input Leakage Current (Control Inputs)	0V ≤ V_{IN} ≤ V_{CC}	—	—	±1	µA
I_{OZ}	Off-State Current (Hi-Z)	0V ≤ V_{OUT} ≤ V_{CC}, Switches OFF	—	—	±1	µA
R_{ON}	Switch ON Resistance(2)	V_{CC} = Min., V_{IN} = 0V, I_{ON} = 30mA	—	5	7	Ω
		V_{CC} = Min., V_{IN} = 2.4V, I_{ON} = 15mA	—	10	15	
V_P	Pass Voltage(3)	V_{IN} = V_{CC} = 5V, I_{OUT} = -5µA	3.7	4	4.2	V

NOTES:
1. Typical values are at V_{CC} = 5V and T_A = 25°C.
2. R_{ON} is guaranteed but not production tested.
3. Pass voltage is guaranteed but not production tested.

TYPICAL ON RESISTANCE vs V_{IN} AT V_{CC} = 5V



POWER SUPPLY CHARACTERISTICS

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	µA
ΔI_{CC}	Power Supply Current per Input HIGH[2]	V_{CC} = Max., V_{IN} = 3.4V, f = 0	2.5	mA
I_{CCD}	Dynamic Power Supply Current per MHz [3]	V_{CC} = Max., A 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 Electrical Characteristics.
2. Per TTL-driven input (V_{IN} = 3.4V, control inputs only). A and Y 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 Y inputs generate no significant AC or DC currents as they transition. This parameter is guaranteed but not production tested.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

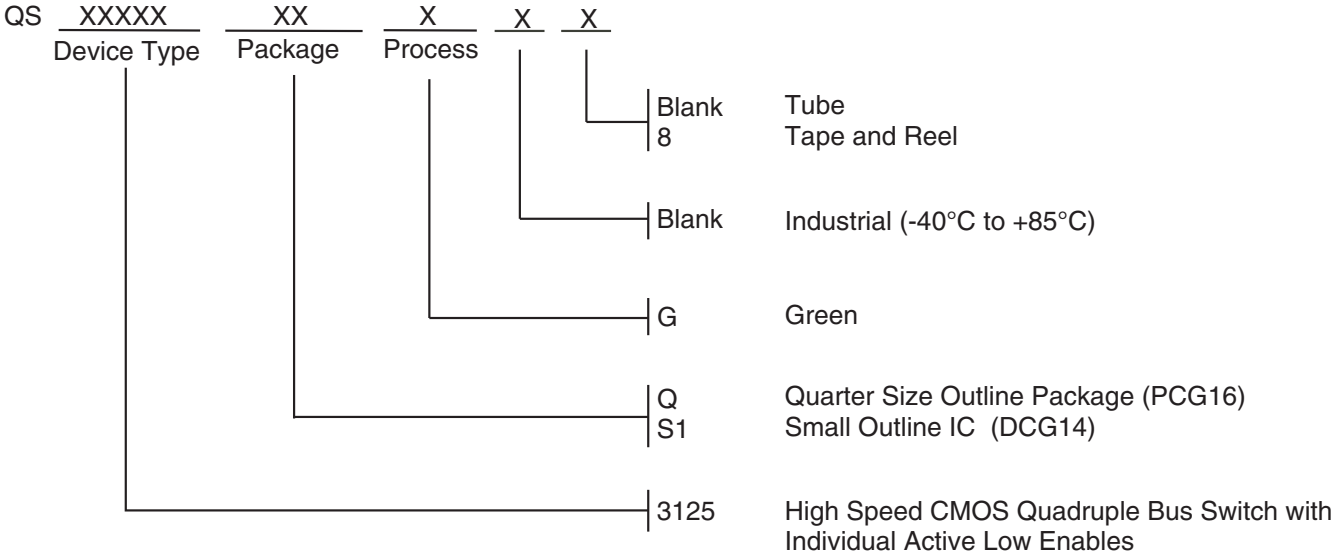
T_A = -40°C to +85°C, V_{CC} = 5V ± 5%

C_{LOAD} = 50pF, R_{LOAD} = 500Ω unless otherwise noted.

Symbol	Parameter	Min.[1]	Typ.	Max.	Unit
t_{PLH} t_{PHL}	Data Propagation Delay[2] A to Y	—	—	0.25[3]	ns
t_{PZL} t_{PZH}	Switch Turn-On Delay $\overline{OE}$ to xA/xY	1.5	—	6.5	ns
t_{PLZ} t_{PHZ}	Switch Turn-Off Delay[2] $\overline{OE}$ to xA/xY	1.5	—	5.5	ns

NOTES:
1. Minimums are 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 at C_L = 50pF. Since this time constant is much smaller than the rise and 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.

ORDERING INFORMATION



Orderable Part Information

Speed (ns)	Orderable Part ID	Pkg. Code	Pkg. Type	Temp. Grade
	QS3125QG	PCG16	QSOP	I
	QS3125QG8	PCG16	QSOP	I
	QS3125S1G	DCG14	SOIC	I
	QS3125S1G8	DCG14	SOIC	I

Datasheet Document History

02/08/2011	Pg. 5	Updated the ordering information by removing the "IDT" notation, non RoHS part and by adding Tape and Reel information.
05/06/2019	Pg. 2,6	Added table under pin configuration diagram with detailed package information and orderable part information table. Updated the ordering information diagram in clearer detail.

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