

FEATURES:

- N channel FET switches with no parasitic diode to Vcc
 - Isolation under power-off conditions
 - No DC path to Vcc or GND
 - 5V tolerant in OFF and ON state
- 5V tolerant I/Os
- Flat Ron characteristics over operating range
- Rail-to-rail switching 0 - 5V
- Bidirectional dataflow with near-zero delay: no added ground bounce
- Excellent Ron matching between channels
- Vcc operation: 2.3V to 3.6V
- High bandwidth
- LVTTL-compatible control Inputs
- Undershoot Clamp Diodes on all switch and control Inputs
- Low I/O capacitance, 4pF typical
- 25Ω resistors for low noise and line matching
- Available in QSOP package

DESCRIPTION:

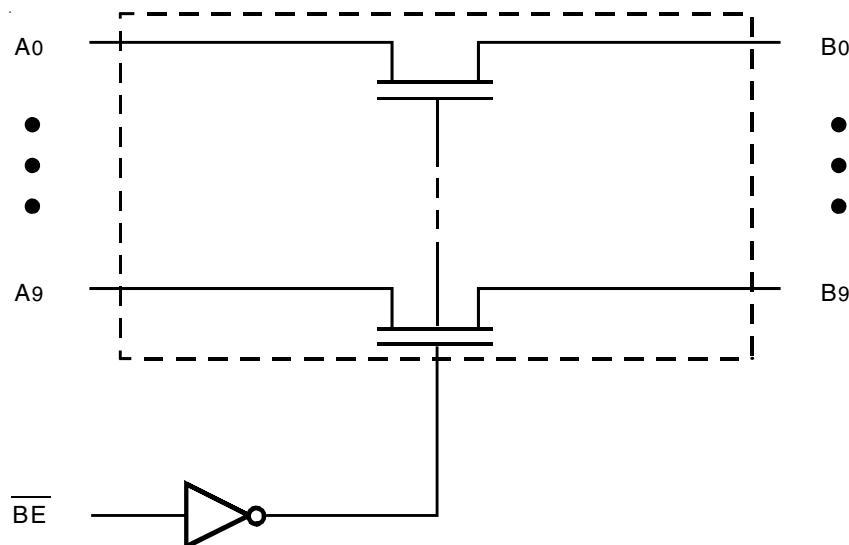
The QS3VH2861 HotSwitch is a high bandwidth bus switch with 10-bit flow-through pin out. The QS3VH2861, with 25Ω ON resistance and 1.35ns propagation delay, is ideal for line matching and low noise environments. The switches are controlled by active low enable (\overline{BE}) control. In the ON state, the switches can pass signals up to 5V. In the OFF state, the switches offer very high impedance at the terminals.

The combination of small propagation delay, high OFF impedance, and over-voltage tolerance makes the QS3VH2861 ideal for high performance communications applications.

The QS3VH2861 is characterized for operation from -40°C to +85°C.

APPLICATIONS:

- Hot-swapping
- Low distortion analog switch
- Replaces mechanical relay
- ATM 25/155 switching

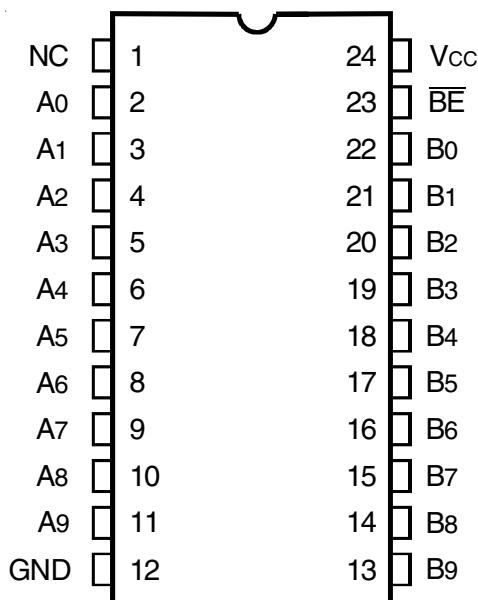
FUNCTIONAL BLOCK DIAGRAM

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INDUSTRIAL TEMPERATURE RANGE

FEBRUARY 2014

PIN CONFIGURATION

QSOP
TOP VIEWABSOLUTE MAXIMUM RATINGS⁽¹⁾

Symbol	Description	Max	Unit
VTERM ⁽²⁾	Supply Voltage to Ground	-0.5 to +4.6	V
VTERM ⁽³⁾	DC Switch Voltage Vs	-0.5 to +5.5	V
VTERM ⁽³⁾	DC Input Voltage Vin	-0.5 to +5.5	V
VAC	AC Input Voltage (pulse width \leq 20ns)	-3	V
IOUT	DC Output Current (max. sink current/pin)	120	mA
TSTG	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. Vcc terminals.
3. All terminals except Vcc .

CAPACITANCE (TA = +25°C, F = 1MHz, VIN = 0V, VOUT = 0V)

Symbol	Parameter ⁽¹⁾	Typ.	Max.	Unit
CIN	Control Inputs	3	5	pF
Cl/O	Quickswitch Channels (Switch OFF)	4	6	pF
Cl/O	Quickswitch Channels (Switch ON)	8	12	pF

NOTE:

1. This parameter is guaranteed but not production tested.

PIN DESCRIPTION

Pin Names	Description
BE	Active LOW Bus Enable
A0 - A9	Bus A
B0 - B9	Bus B

FUNCTION TABLE⁽¹⁾

BE	A0 - A9	Function
H	Z	Disconnect
L	B0 - B9	Connect

NOTE:

1. H = HIGH Voltage Level
L = LOW Voltage Level
Z = High-Impedance

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

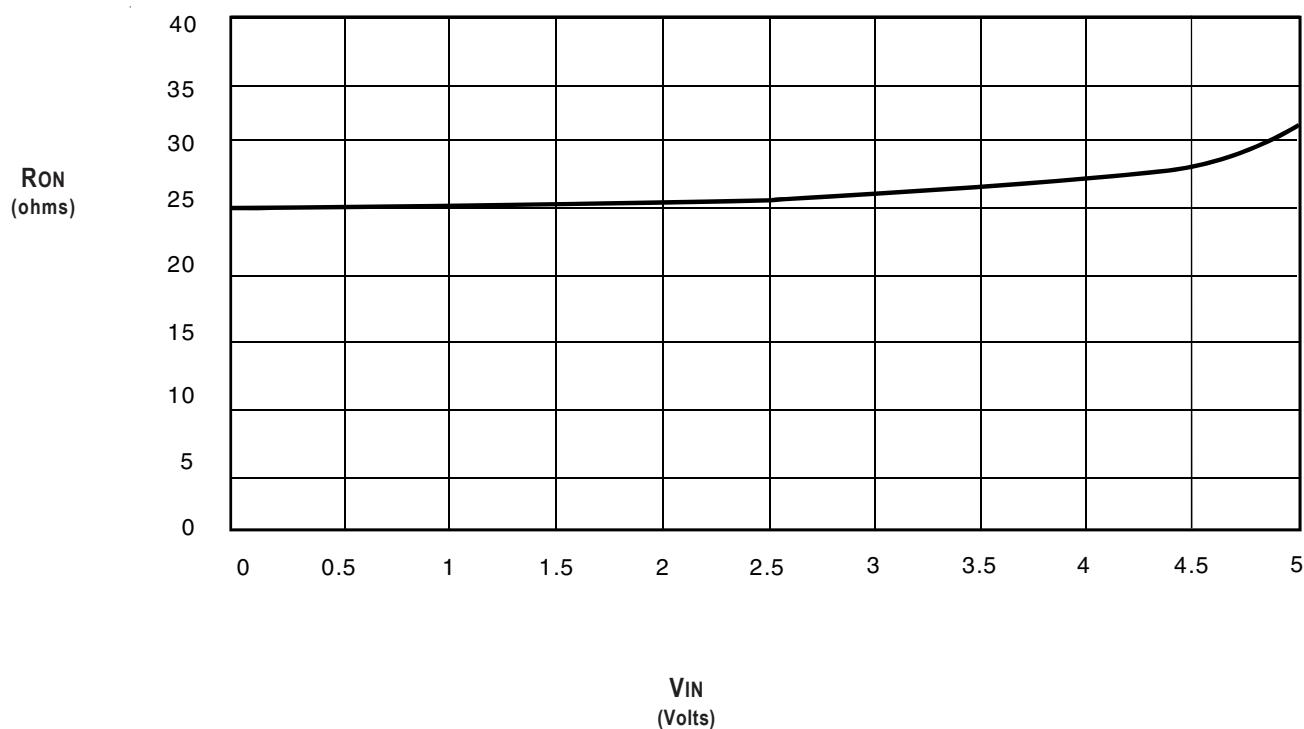
Industrial: $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC} = 3.3\text{V} \pm 0.3\text{V}$

Symbol	Parameter	Test Conditions			Min.	Typ. ⁽¹⁾	Max.	Unit
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH for Control Inputs	$V_{CC} = 2.3\text{V}$ to 2.7V		1.7	—	—	V
			$V_{CC} = 2.7\text{V}$ to 3.6V		2	—	—	
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for Control Inputs	$V_{CC} = 2.3\text{V}$ to 2.7V		—	—	0.7	V
			$V_{CC} = 2.7\text{V}$ to 3.6V		—	—	0.8	
I_{IN}	Input Leakage Current (Control Inputs)	$0\text{V} \leq V_{IN} \leq V_{CC}$			—	—	± 1	μA
I_{OZ}	Off-State Current (Hi-Z)	$0\text{V} \leq V_{OUT} \leq 5\text{V}$, Switches OFF			—	—	± 1	μA
I_{OFF}	Data Input/Output Power Off Leakage	V_{IN} or V_{OUT} 0V to 5V , $V_{CC} = 0\text{V}$			—	—	± 1	μA
R_{ON}	Switch ON Resistance	$V_{CC} = 2.3\text{V}$ Typical at $V_{CC} = 2.5\text{V}$	$V_{IN} = 0\text{V}$	$I_{ON} = 30\text{mA}$	18	27	39	Ω
			$V_{IN} = 1.7\text{V}$	$I_{ON} = 15\text{mA}$	18	28	41	
		$V_{CC} = 3\text{V}$	$V_{IN} = 0\text{V}$	$I_{ON} = 30\text{mA}$	18	25	38	
			$V_{IN} = 2.4\text{V}$	$I_{ON} = 15\text{mA}$	18	26	40	

NOTE:

1. Typical values are at $V_{CC} = 3.3\text{V}$ and $T_A = 25^\circ\text{C}$.

TYPICAL ON RESISTANCE vs V_{IN} AT $V_{CC} = 3.3\text{V}$



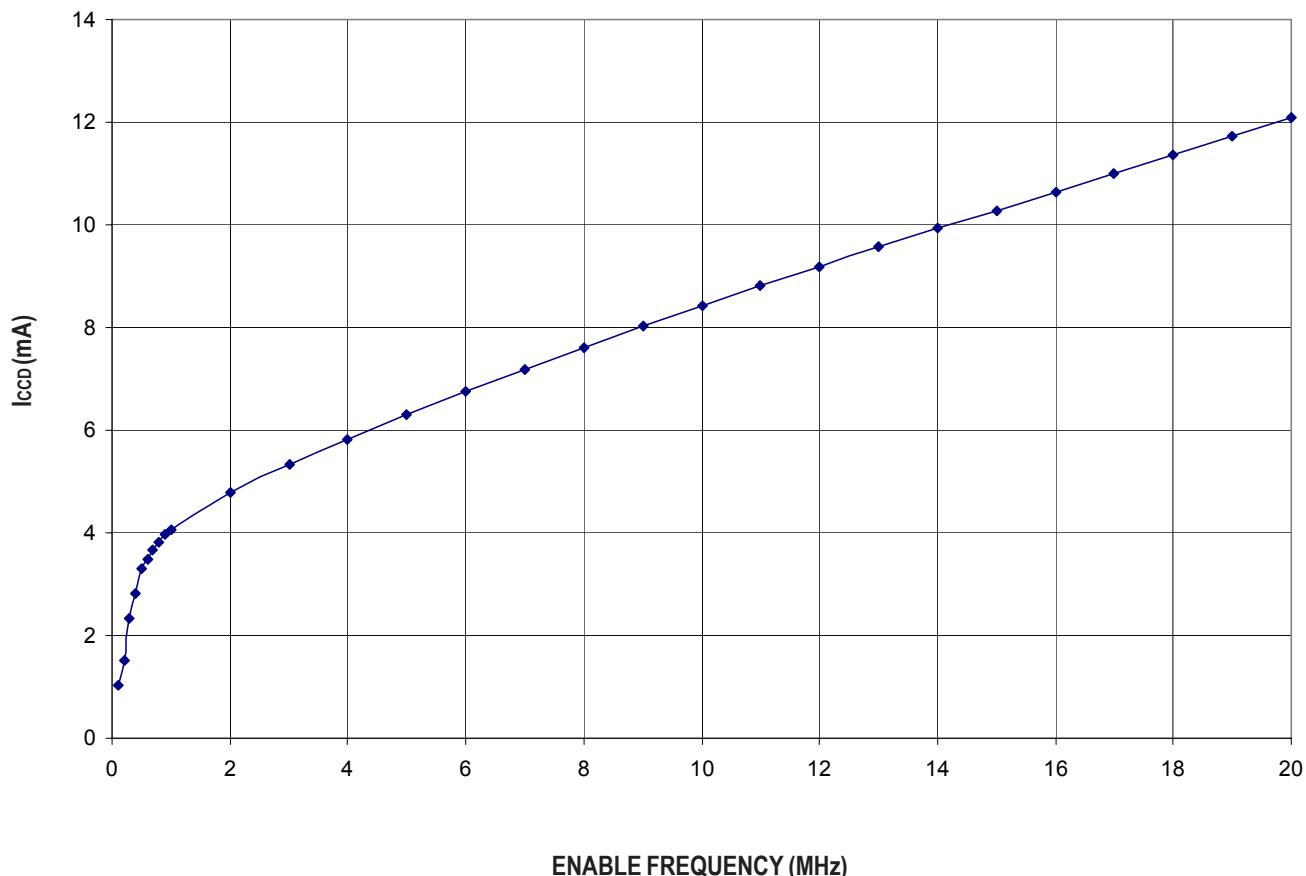
POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾	Min.	Typ.	Max.	Unit
I _{CCQ}	Quiescent Power Supply Current	V _{CC} = Max., V _{IN} = GND or V _{CC} , f = 0	—	2	4	mA
ΔI _{CC}	Power Supply Current ^(2,3) per Input HIGH	V _{CC} = Max., V _{IN} = 3V, f = 0 per Control Input	—	—	30	μA
I _{CCD}	Dynamic Power Supply Current ⁽⁴⁾	V _{CC} = 3.3V, A and B Pins Open, Control Inputs Toggling @ 50% Duty Cycle	See Typical I _{CCD} vs Enable Frequency graph below			

NOTES:

1. For conditions shown as Min. or Max., use the appropriate values specified under DC Electrical Characteristics.
2. Per input driven at the specified level. A and B pins do not contribute to ΔI_{CC}.
3. This parameter is guaranteed but not tested.
4. This parameter represents the current required to switch internal capacitance at the specified frequency. The A and B inputs do not contribute to the Dynamic Power Supply Current. This parameter is guaranteed but not production tested.

TYPICAL I_{CCD} VS ENABLE FREQUENCY CURVE AT V_{CC} = 3.3V



SWITCHING CHARACTERISTICS OVER OPERATING RANGE

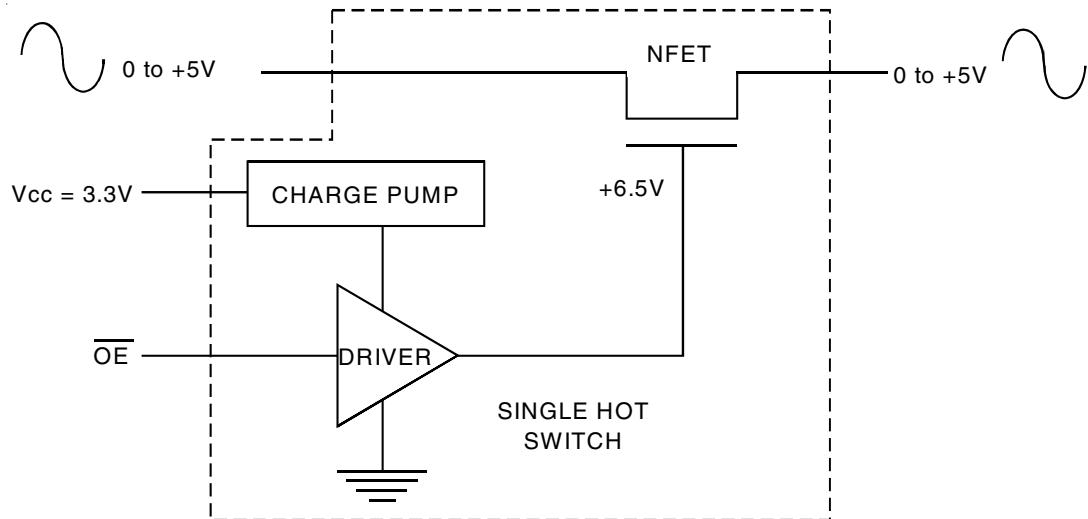
TA = -40°C to +85°C

Symbol	Parameter	Vcc = 2.5 ± 0.2V ⁽¹⁾		Vcc = 3.3 ± 0.3V ⁽¹⁾		Unit
		Min. ⁽⁴⁾	Max.	Min. ⁽⁴⁾	Max.	
t _{PLH}	Data Propagation Delay ^(2,3) Ax to Bx or Bx to Ax	—	0.9	—	1.35	ns
t _{PHL}	Switch Turn-On Delay B̄E to Ax or Bx	1.5	9	1.5	8	ns
t _{PZH}	Switch Turn-Off Delay B̄E to Ax or Bx	1.5	7.5	1.5	7.5	ns
t _{PLZ}	Operating Frequency-Enable ^(2,5)	—	10	—	20	MHz

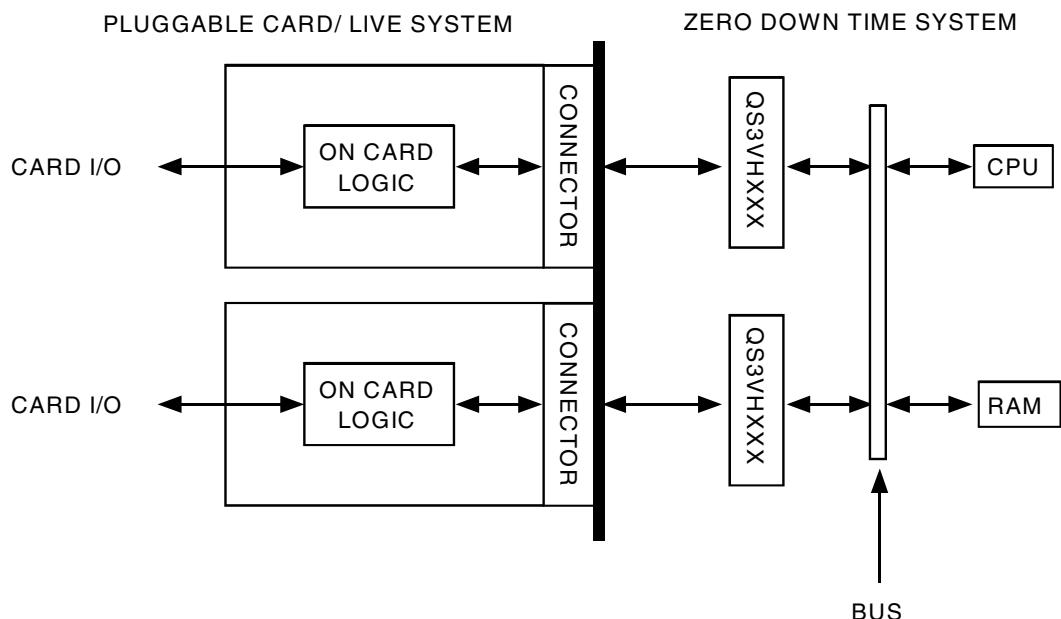
NOTES:

1. See Test Conditions under TEST CIRCUITS AND WAVEFORMS.
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 1.35ns 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.
4. Minimums are guaranteed but not production tested.
5. Maximum toggle frequency for B̄E control input (pass voltage > Vcc, V_{IN} = 5V, R_{LOAD} ≥ 1MΩ, no C_{LOAD}).

SOME APPLICATIONS FOR HOTSWITCH PRODUCTS



Rail-to-Rail Switching

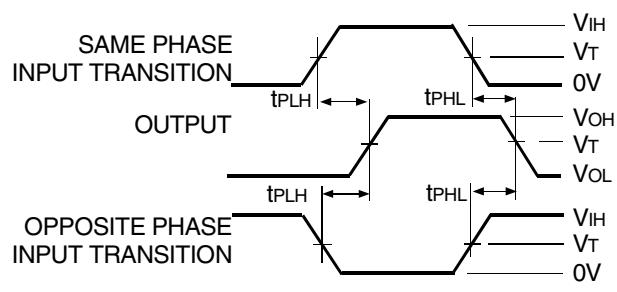


Hot-Swapping

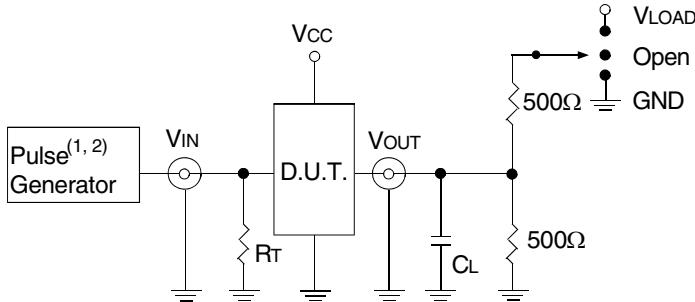
TEST CIRCUITS AND WAVEFORMS

TEST CONDITIONS

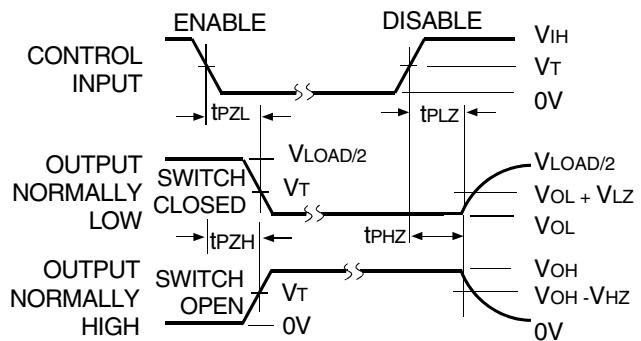
Symbol	$V_{CC}^{(1)} = 3.3V \pm 0.3V$	$V_{CC}^{(2)} = 2.5V \pm 0.2V$	Unit
V_{LOAD}	6	$2 \times V_{CC}$	V
V_{IH}	3	V_{CC}	V
V_T	1.5	$V_{CC}/2$	V
V_{LZ}	300	150	mV
V_{HZ}	300	150	mV
C_L	50	30	pF



Propagation Delay



Test Circuits for All Outputs



NOTE:

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

Enable and Disable Times

DEFINITIONS:

C_L = Load capacitance: includes jig and probe capacitance.

R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

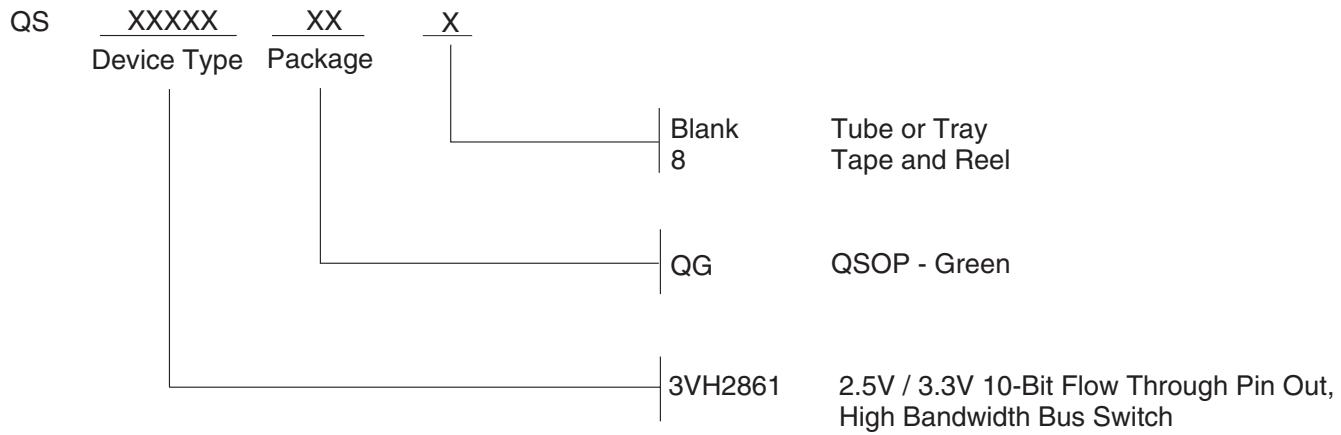
NOTES:

1. Pulse Generator for All Pulses: Rate $\leq 10\text{MHz}$; $t_f \leq 2.5\text{ns}$; $t_r \leq 2.5\text{ns}$.
2. Pulse Generator for All Pulses: Rate $\leq 10\text{MHz}$; $t_f \leq 2\text{ns}$; $t_r \leq 2\text{ns}$.

SWITCH POSITION

Test	Switch
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND
t_{PD}	Open

ORDERING INFORMATION



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