QUICKSWITCH® PRODUCTS
2.5V / 3.3V QUAD ACTIVE
HIGH, HIGH BANDWIDTH SWITCH

IDTQS3VH126

FEATURES:

- **N channel FET switches with no parasitic diode to V_{CC}**
  - *Isolation under power-off conditions*
  - *No DC path to V_{CC} or GND*
  - *5V tolerant in OFF and ON state*
- **5V tolerant I/Os**
- **Low R_{ON} - 4Ω typical**
- **Flat R_{ON} characteristics over operating range**
- **Rail-to-rail switching 0 - 5V**
- **Bidirectional dataflow with near-zero delay: no added ground bounce**
- **Excellent R_{ON} matching between channels**
- **V_{CC} operation: 2.3V to 3.6V**
- **High bandwidth - up to 500MHz**
- **LVTTL-compatible control Inputs**
- **Undershoot Clamp Diodes on all switch and control Inputs**
- **Low I/O capacitance, 4pF typical**
- **Available in QSOP and SOIC packages**

APPLICATIONS:

- **Hot-swapping**
- **10/100 Base-T, Ethernet LAN switch**
- **Low distortion analog switch**
- **Replaces mechanical relay**
- **ATM 25/155 switching**

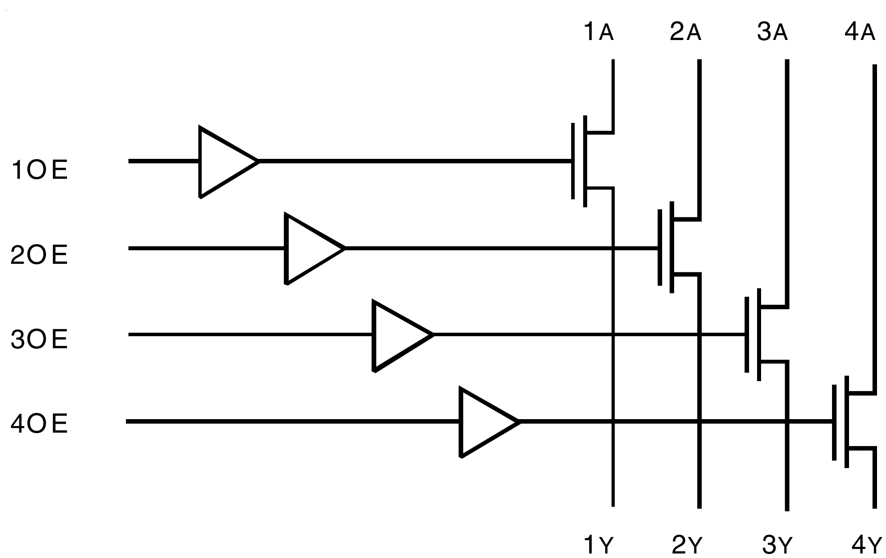
DESCRIPTION:

The QS3VH126 is a high bandwidth bus switch. The QS3VH126 has very low ON resistance, resulting in under 250ps propagation delay through the switch. The switches can be turned ON under the control of individual LVTTL-compatible active high Output Enable signals for bidirectional data flow with no added delay or ground bounce. In the ON state, the switches can pass signals up to 5V. In the OFF state, the switches offer very high impedence at the terminals.

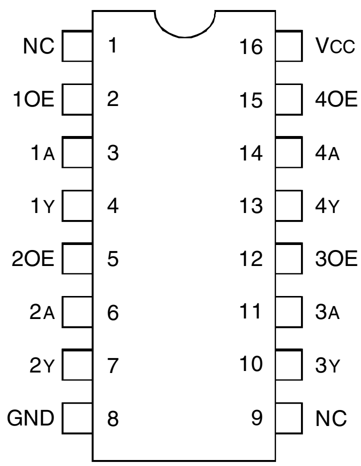
The combination of near-zero propagation delay, high OFF impedance, and over-voltage tolerance makes the QS3VH126 ideal for high performance communications applications.

The QS3VH126 is characterized for operation from -40°C to +85°C.

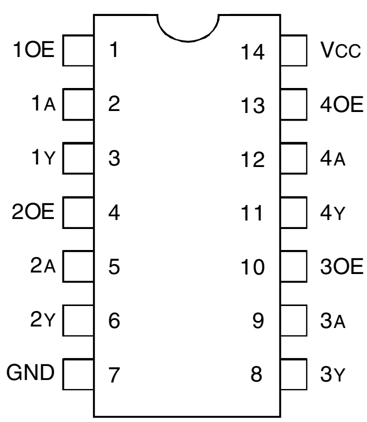
FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



QSOP
TOP VIEW



SOIC
TOP VIEW

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Description	Max	Unit
V_{TERM}(2)	SupplyVoltage to Ground	–0.5 to +4.6	V
V_{TERM}(3)	DC Switch Voltage V_S	–0.5 to +5.5	V
V_{TERM}(3)	DC Input Voltage V_{IN}	–0.5 to +5.5	V
V_{AC}	AC Input Voltage (pulse width ≤20ns)	–3	V
I_{OUT}	DC Output Current (max. sink current/pin)	120	mA
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)

Symbol	Parameter(1)	Typ.	Max.	Unit
C_{IN}	Control Inputs	3	5	pF
$C_{I/O}$	Quickswitch Channels (Switch OFF)	4	6	pF
$C_{I/O}$	Quickswitch Channels (Switch ON)	8	12	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
1OE - 4OE	I	Output Enable

FUNCTION TABLE(1)

OE	A	Y	Function
H	H	H	Connect
H	L	L	Connect
L	X	X	Disconnect

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

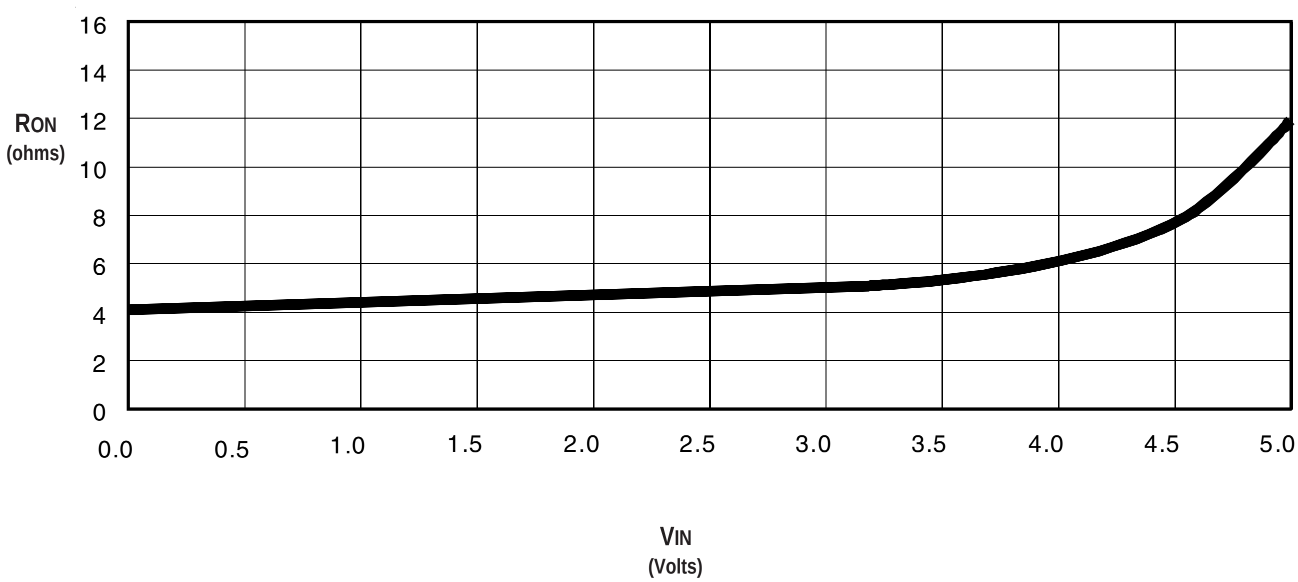
DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:
Industrial: T_A = –40°C to +85°C, V_{CC} = 3.3V ±0.3V

Symbol	Parameter	Test Conditions			Min.	Typ.[1]	Max.	Unit
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH for Control Inputs	V_{CC} = 2.3V to 2.7V		1.7	—	—	V
			V_{CC} = 2.7V to 3.6V		2	—	—	
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for Control Inputs	V_{CC} = 2.3V to 2.7V		—	—	0.7	V
			V_{CC} = 2.7V to 3.6V		—	—	0.8	
I_{IN}	Input Leakage Current (Control Inputs)	0V ≤ V_{IN} ≤ V_{CC}			—	—	±1	µA
I_{OZ}	Off-State Current (Hi-Z)	0V ≤ V_{OUT} ≤ 5V, Switches OFF			—	—	±1	µA
I_{OFF}	Data Input/Output Power Off Leakage	V_{IN} or V_{OUT} 0V to 5V, V_{CC} = 0V			—	—	±1	µA
R_{ON}	Switch ON Resistance	V_{CC} = 2.3V	V_{IN} = 0V	I_{ON} = 30mA	—	6	8	Ω
		Typical at V_{CC} = 2.5V	V_{IN} = 1.7V	I_{ON} = 15mA	—	7	9	
		V_{CC} = 3V	V_{IN} = 0V	I_{ON} = 30mA	—	4	6	
			V_{IN} = 2.4V	I_{ON} = 15mA	—	5	8	

NOTE:
1. Typical values are at V_{CC} = 3.3V and T_A = 25°C.

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

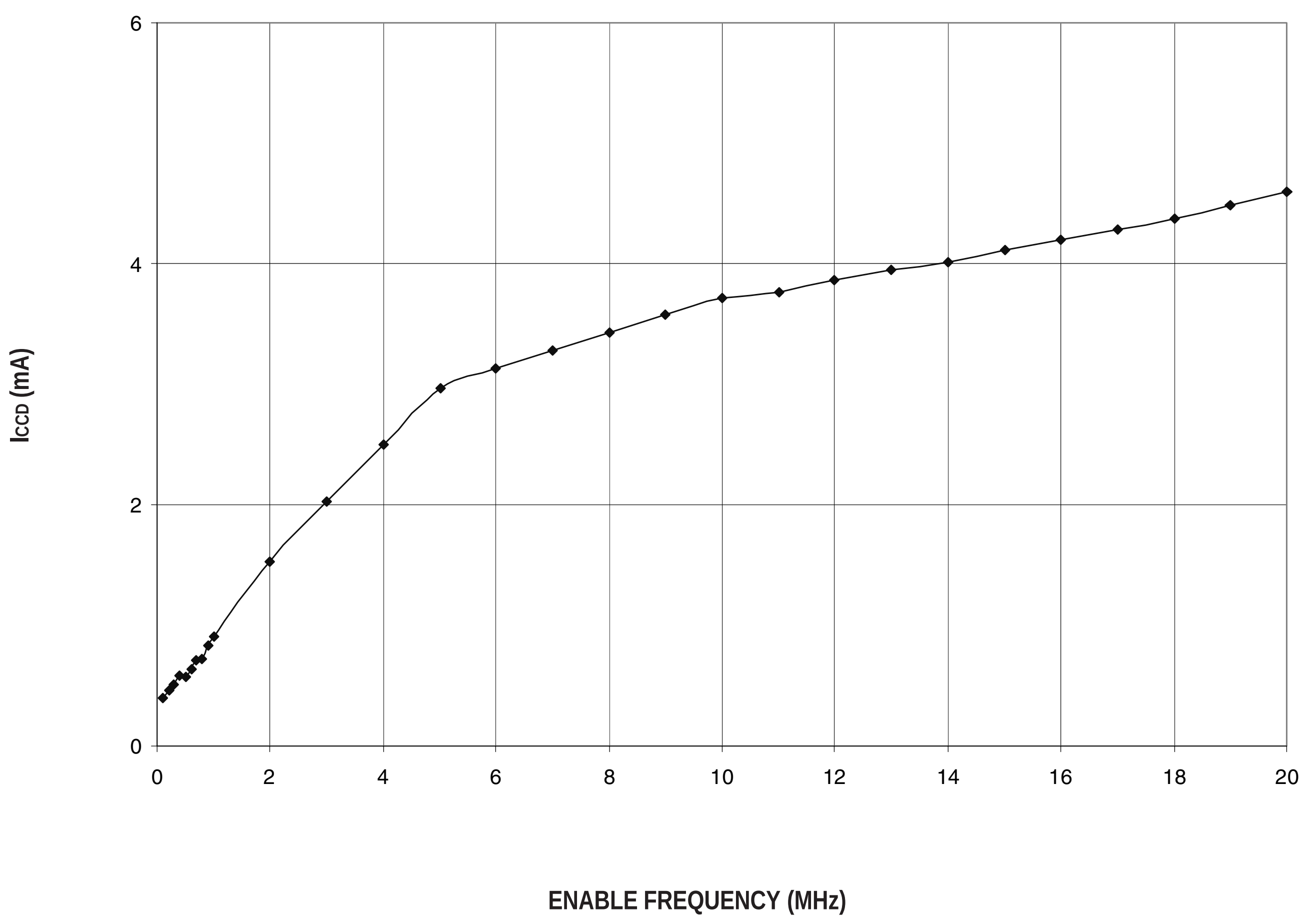


POWER SUPPLY CHARACTERISTICS

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 Y 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 Y pins do not contribute to ΔIcc.
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 Y 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



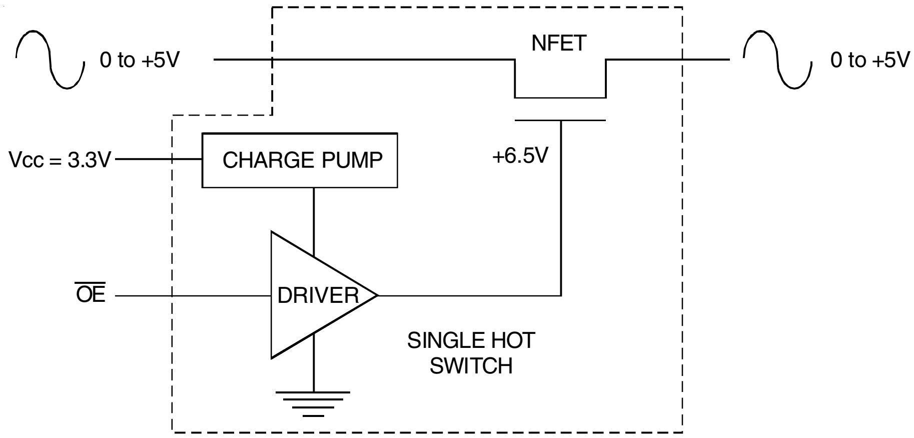
SWITCHING CHARACTERISTICS OVER OPERATING RANGE

T_A = -40°C to +85°C

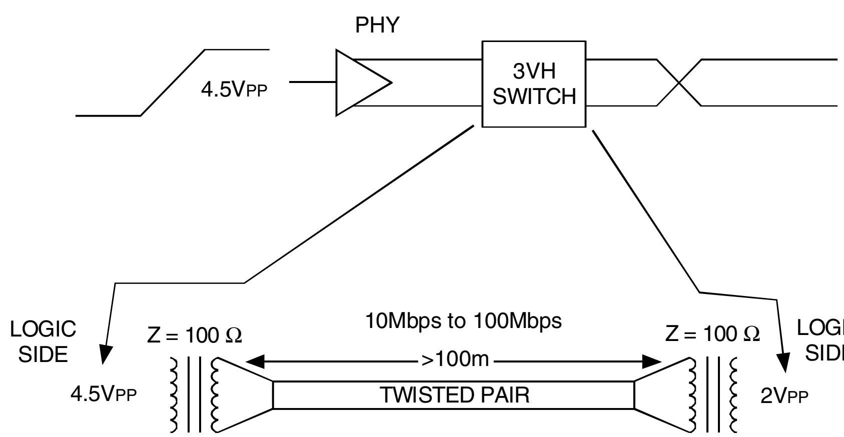
Symbol	Parameter	Vcc = 2.5 ± 0.2V (1)		Vcc = 3.3 ± 0.3V (1)		Unit
		Min. (4)	Max.	Min. (4)	Max.	
t_{PLH} t_{PHL}	Data Propagation Delay(2,3) A to Y	—	0.2	—	0.2	ns
t_{PZL} t_{PZH}	Switch Turn-On Delay xOE to xA/xY	1.5	8	1.5	6.5	ns
t_{PLZ} t_{PHZ}	Switch Turn-Off Delay xOE to xA/xY	1.5	7	1.5	7	ns
f_{xOE}	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 0.2ns 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 xOE control input (pass voltage > V_{CC}, V_{IN} = 5V, $R_{LOAD} \geq 1M\Omega$, no C_{LOAD}).

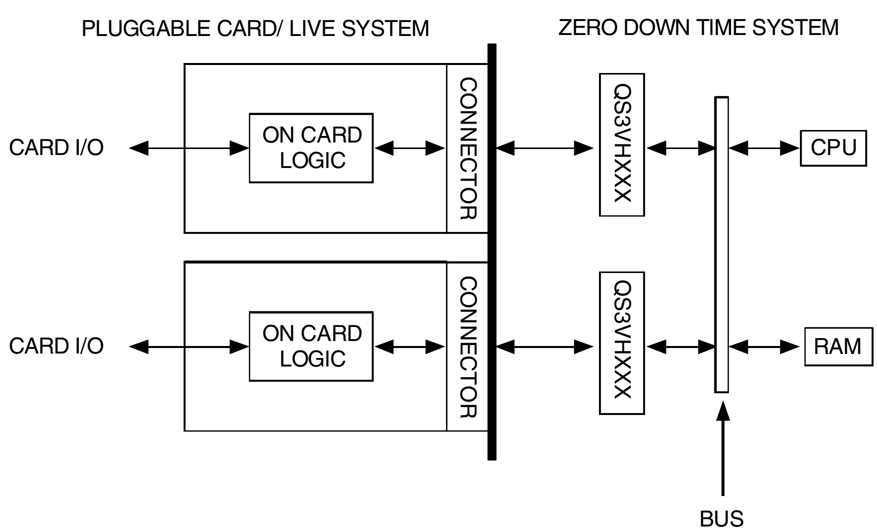
SOME APPLICATIONS FOR HOTSWITCH PRODUCTS



Rail-to-Rail Switching



Fast Ethernet Data Switching (LAN Switch)

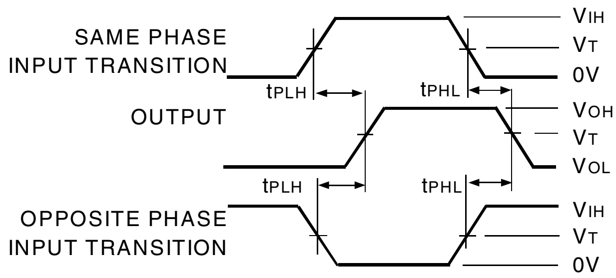


Hot-Swapping

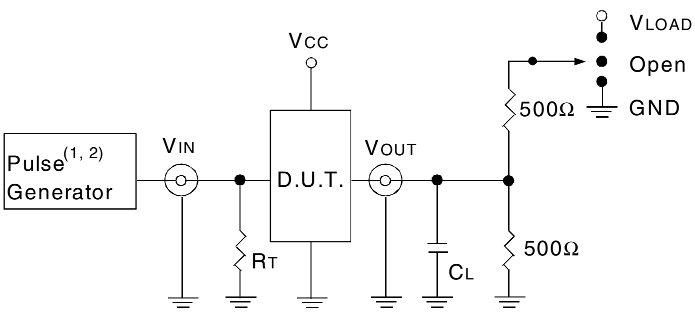
TEST CIRCUITS AND WAVEFORMS

TEST CONDITIONS

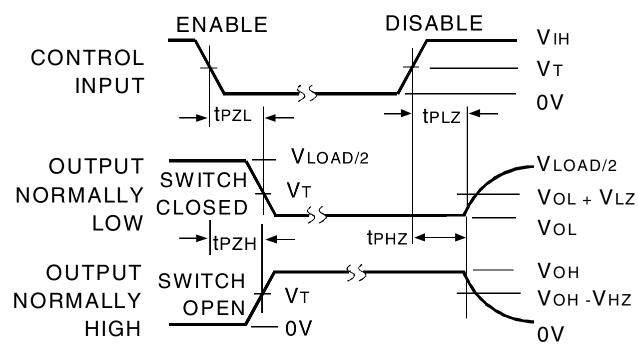
Symbol	Vcc(1)= 3.3V ± 0.3V	Vcc(2)= 2.5V ± 0.2V	Unit
VLOAD	6	2 x Vcc	V
VIH	3	Vcc	V
VT	1.5	Vcc/2	V
VLZ	300	150	mV
VHZ	300	150	mV
CL	50	30	pF



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:
CL = Load capacitance: includes jig and probe capacitance.
RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.

NOTES:
1. Pulse Generator for All Pulses: Rate ≤ 10MHz; tF ≤ 2.5ns; tR ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; tF ≤ 2ns; tR ≤ 2ns.

SWITCH POSITION

Test	Switch
tPLZ/tPZL	VLOAD
tPHZ/tPZH	GND
tPD	Open

ORDERING INFORMATION

QS XXXXX (Device Type) XX (Package)

Package:

QG	QSOP - Green
S1G	SOIC - Green

Device Type:

3VH126	2.5V / 3.3V Quad Active High, High Bandwidth Switch

Datasheet Document History

09/01/08	Pg. 4, 8	Revise ICCQ Typ. and Max. Remove non green package version and updated the ordering information by removing the “IDT” notation.

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