



QUICKSWITCH® PRODUCTS HIGH-SPEED CMOS QUICKSWITCH MULTIWIDTH™ 24:6 MUX/DEMUX

IDTQS33X2253

FEATURES:

- Enhanced N channel FET with no inherent diode to Vcc
- Bidirectional switches connect inputs to outputs
- 24:6 Mux/Demux switches
- Zero propagation delay, zero ground bounce
- Individual controls for each bank
- Undershoot clamp diodes on all switch and control pins
- TTL-compatible control inputs
- Available in 48-pin QVSOP Package

APPLICATIONS

- Logic replacment
- Video, audio, graphics switching, muxing
- Hot-swapping, hot-docking
- Voltage translation (5V to 3.3V)

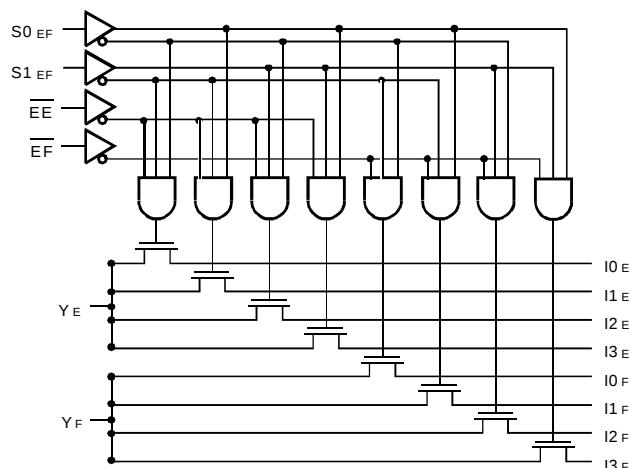
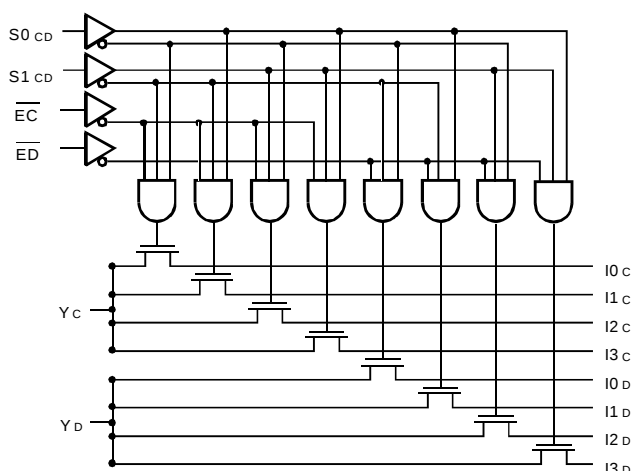
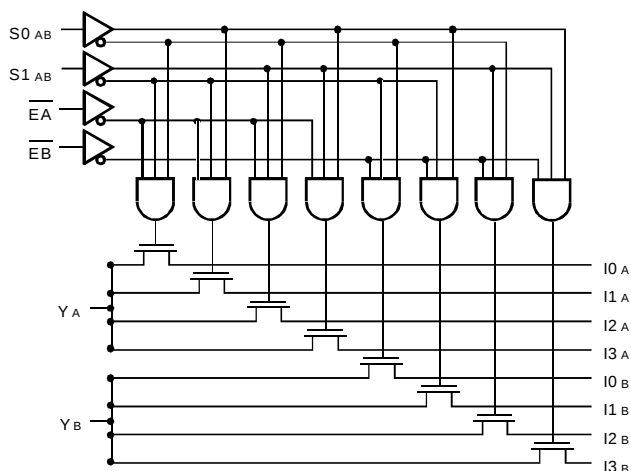
DESCRIPTION:

The QS33X2253 is a high-speed CMOS 24:6 (3, dual 4:1) multiplexer/demultiplexer. The QS33X2253 is a member of the MultiWidth™ family and is functionally compatible to three of the QuickSwitch version of the 74F253, 74FCT253, and the 74ALS/AS/LS253 Dual 4:1 multiplexers. The low ON resistance of the QS33X2253 allows inputs to be connected to outputs without adding propagation delay and without generating additional ground bounce noise. TTL-compatible control circuitry with "Break-before-make" feature avoids bus contention on the demux side. This part is ideal for video switching and four way memory bank interleaving applications. The QS33X2253 has 25Ω series resistors to reduce ground bounce noise.

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

The QS33X2253 is characterized for operation at -40°C to +85°C.

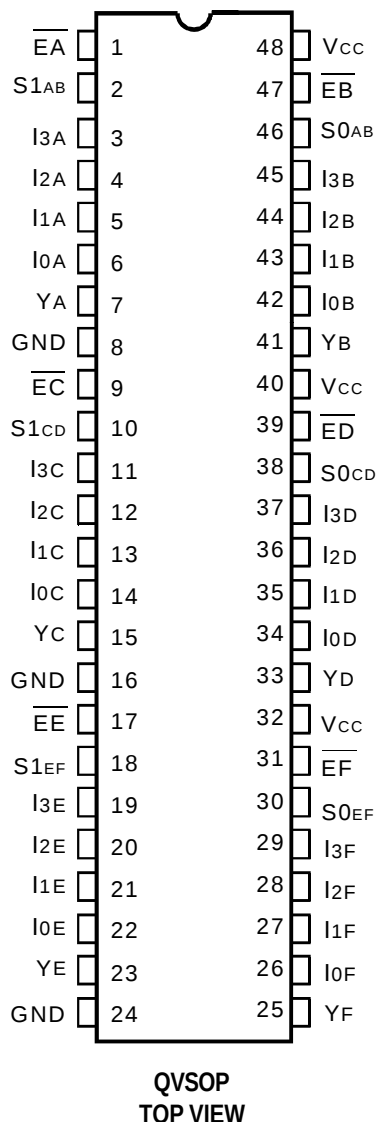
FUNCTIONAL BLOCK DIAGRAM



INDUSTRIAL TEMPERATURE RANGE

JANUARY 2000

PIN CONFIGURATION



PIN DESCRIPTION

Pin Names	I/O	Description
Ixx	I	Data Inputs
S0xx, S1xx	I	Select Inputs
$\overline{E}x$	I	Enable Inputs
Yx	O	Data Outputs

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 Vs	- 0.5 to +7	V
$V_{TERM}^{(3)}$	DC Input Voltage VIN	- 0.5 to +7	V
VAC	AC Input Voltage (pulse width $\leq 20ns$)	-3	V
IOUT	DC Output Current	120	mA
P _{MAX}	Maximum Power Dissipation (TA = 85°C)	.5	W
T _{STG}	Storage Temperature	- 65 to +150	°C

NOTES:

- 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.
- Vcc Terminals.
- All terminals except Vcc.

CAPACITANCE

(TA = +25°C, f = 1.0MHz, VIN = 0V, VOUT = 0V)

Pins		Typ.	Max. ⁽¹⁾	Unit
Control Inputs		4	5	pF
Quickswitch Channels	Demux	5	7	pF
(Switch OFF)	Mux	14	16	pF

NOTE:

- This parameter is guaranteed at characterization but not tested.

FUNCTION TABLE ^(1, 2)

Enable		Select		Outputs		Function
$\overline{E}A$	$\overline{E}B$	S1AB	S0AB	YA	YB	
H	X	X	X	Hi-Z	X	Disable A
X	H	X	X	X	Hi-Z	Disable B
L	L	L	L	I0A	I0B	S1 - 0 = 0
L	L	L	H	I1A	I1B	S1 - 0 = 1
L	L	H	L	I2A	I2B	S1 - 0 = 2
L	L	H	H	I3A	I3B	S1 - 0 = 3

NOTES:

- H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care
Z = High-Impedence
- This table represents the function for block "AB".
The "CD" block nomenclature substitutes "A" for "C" and "B" for "D".
The "EF" block nomenclature substitutes "A" for "E" and "B" for "F".

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

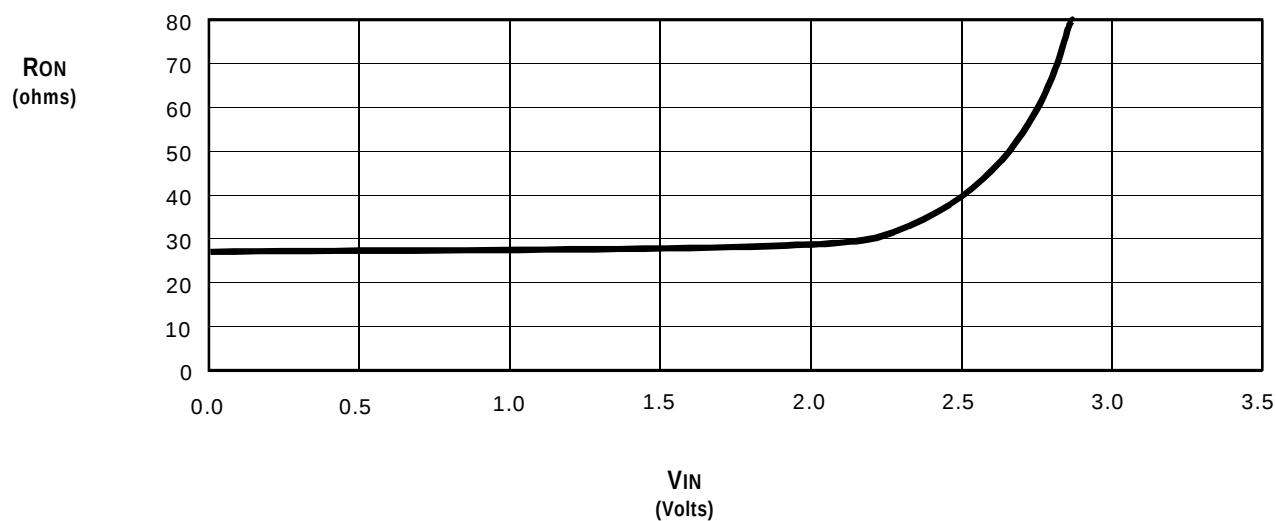
Industrial: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{CC} = 5.0\text{V} \pm 5\%$

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)	$0\text{V} \leq V_{IN} \leq V_{CC}$	—	—	± 1	μA
I_{OZ}	Off-State Current (Hi-Z)	$0\text{V} \leq V_{OUT} \leq V_{CC}$	—	—	± 1	μA
R_{ON}	Switch ON Resistance	$V_{CC} = \text{Min.}, V_{IN} = 0\text{V}, I_{ON} = 30\text{mA}$	20	28	40	Ω
R_{ON}	Switch ON Resistance	$V_{CC} = \text{Min.}, V_{IN} = 2.4\text{V}, I_{ON} = 15\text{mA}$	20	35	48	Ω
V_P	Pass Voltage ⁽²⁾	$V_{IN} = V_{CC} = 5\text{V}, I_{OUT} = -5\mu\text{A}$	3.7	4	4.2	V

NOTES:

1. Typical values are at $V_{CC} = 5.0\text{V}$, $T_A = 25^{\circ}\text{C}$.
2. Pass voltage is guaranteed but not production tested.

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



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	9	μA
ΔI _{cc}	Power Supply Current per Control Input HIGH ⁽²⁾	V _{CC} = Max., V _{IN} = 3.4V, f = 0	1.5	mA
I _{ccD}	Dynamic Power Supply Current per MHz ⁽³⁾	V _{CC} = Max., I and Y pins open Control Input Toggling at 50% Duty Cycle	0.25	mA/MHz

NOTES:

- For conditions shown as Min. or Max., use the appropriate values specified under DC Electrical Characteristics.
- Per TTL driven input (V_{IN} = 3.4V, control inputs only). I and Y pins do not contribute to ΔI_{cc}.
- This current 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.

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.

Symbol	Parameter	Min. ⁽¹⁾	Typ.	Max.	Unit
t _{PLH} t _{PHL}	Data Propagation Delay ^(2, 3) In to Y	—	—	1.25	ns
t _{PZL} t _{PZH}	Switch Turn-On Delay Sn to Y	0.5	—	7	ns
t _{PZL} t _{PZH}	Switch Turn-Off Delay $\overline{\text{En}}$ to Y	0.5	—	7	ns
t _{PLZ} t _{PHZ}	Switch Turn-Off Delay ⁽²⁾ $\overline{\text{En}}$ to Y, Sn to Y	0.5	—	6	ns

NOTES:

- Minimums guaranteed but not tested.
- This parameter is guaranteed but not tested
- 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 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

IDTQS	XXXXX	XX	X		
Device Type	Package	Process			
			Blank		Industrial (-40°C to +85°C)
			Q1		QVSOP
			33X2253		High Speed CMOS Quickswitch Multiwidth 24:6 Mux/Demux



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