Chipsmall

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QUICKSWITCH® PRODUCTS
HIGH-PERFORMANCE CMOS
SIX CHANNEL SP4T MUX/DEMUX

IDTQS4A215

FEATURES:

- **Low ON resistance: $r_{DS(ON)}$ = 5Ω**
- **Fast transition time: t_{TRAN} = 6ns**
- **Wide bandwidth: 700MHz (-3dB point)**
- **Crosstalk: -110dB at 50KHz, -68dB at 5MHz, -66dB at 30MHz**
- **Off-isolation: -90dB at 50KHz, -60dB at 5MHz, -50dB at 30MHz**
- **Single 5V supply**
- **Can be used as multiplexer or demultiplexer**
- **TTL-compatible control inputs**
- **Ultra-low quiescent current: 9µA**
- **Available in QVSOP package**

APPLICATIONS:

- **High-speed video signal switching/routing**
- **HDTV-quality video signal multiplexing**
- **Audio signal switching/routing**
- **Data acquisition**
- **ATE systems**
- **Telecomm routing**
- **Switch between multiple video sources**
- **Token Ring transceivers**
- **High-speed networking**

DESCRIPTION:

The QS4A215 is a high-performance CMOS six-channel multiplexer/ demultiplexer with individual enables. The low ON-resistance of the QS4A215 allows inputs to be connected to outputs with low insertion loss and high bandwidth. TTL-compatible control circuitry with "Break-Before-Make" feature prevents contention.
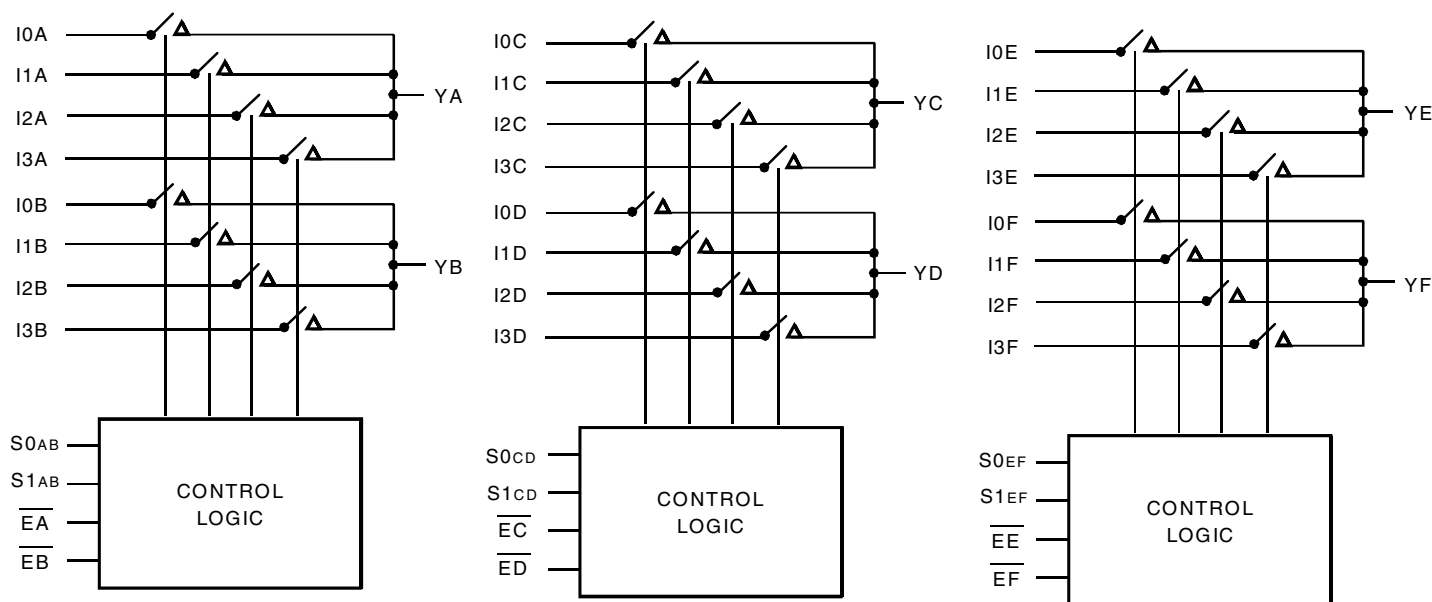
The QS4A215 with 700MHz bandwidth makes it ideal for high-performance video signal switching, audio signal switching, and telecom routing applications. High performance and low power dissipation makes this device ideal for battery operated and remote instrumentation applications.

The QS4A215 is offered in the QVSOP package which has several advantages over conventional packages such as PDIP and SOIC, including:

- Reduced signal delays due to denser component packaging on circuit boards
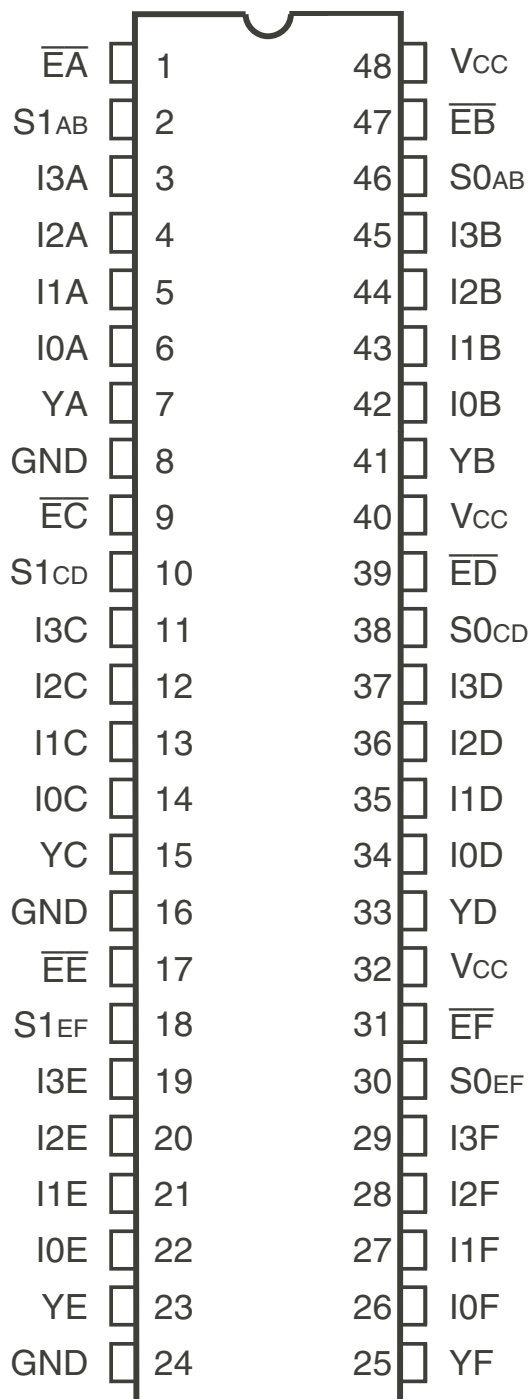- Reduced system noise due to less pin inductance, resulting in lower ground bounce

The QS4A215 is characterized for operation at -40°C to +85°C.

FUNCTIONAL BLOCK DIAGRAM

INDUSTRIAL TEMPERATURE RANGE

JULY 2015

PIN CONFIGURATION

$\overline{EA}$	1		48	Vcc
S1$_{AB}$	2		47	$\overline{EB}$
I3A	3		46	S0$_{AB}$
I2A	4		45	I3B
I1A	5		44	I2B
I0A	6		43	I1B
YA	7		42	I0B
GND	8		41	YB
$\overline{EC}$	9		40	Vcc
S1$_{CD}$	10		39	$\overline{ED}$
I3C	11		38	S0$_{CD}$
I2C	12		37	I3D
I1C	13		36	I2D
I0C	14		35	I1D
YC	15		34	I0D
GND	16		33	YD
$\overline{EE}$	17		32	Vcc
S1$_{EF}$	18		31	$\overline{EF}$
I3E	19		30	S0$_{EF}$
I2E	20		29	I3F
I1E	21		28	I2F
I0E	22		27	I1F
YE	23		26	I0F
GND	24		25	YF

QVSOP
TOP VIEW

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
—	Analog Input Voltage	–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	0.7	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$_{CC}$.

PIN DESCRIPTION

Pin Names	I/O	Description
Ixx	I/O	Demux Ports A-F
S0$_{XX}$, S1$_{XX}$	I	Select Inputs
$\overline{Ex}$	I	Enable Inputs A-F
Yx	I/O	Mux Ports A-F

FUNCTION TABLE[1]

Enable		Select		Mux/Demux Ports		
$\overline{EA}$	$\overline{EB}$	S1	S0	YA	YB	Function
H	X	X	X	Z	X	Disable A
X	H	X	X	X	Z	Disable B
L	L	L	L	I0A	I0B	S1$_{AB}$, S0$_{AB}$ = 0
L	L	L	H	I1A	I1B	S1$_{AB}$, S0$_{AB}$ = 1
L	L	H	L	I2A	I2B	S1$_{AB}$, S0$_{AB}$ = 2
L	L	H	H	I3A	I3B	S1$_{AB}$, S0$_{AB}$ = 3

NOTE:
1. H = HIGH Voltage Level
   L = LOW Voltage Level
   X = Don't Care
   Z = High-Impedance
2. This function 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°C to +85°C, V_{CC} = 5V ± 5%

Symbol	Parameter	Test Conditions	Min.	Typ.[1]	Max.	Unit
Analog Switch						
V_{IN}	Analog Signal Range[2]		–0.5	1	Vcc - 1	V
$r_{DS(ON)}$	Drain-source ON resistance[2,3]	Vcc = Min., V_{IN} = 0V, I_{ON} = 30mA	—	5	7	Ω
		Vcc = Min., V_{IN} = 2.4V, I_{ON} = 15mA	—	13	17	
$I_{C(OFF)}$	Channel Off Leakage Current	I_N = Vcc or 0V; Y_N = 0V or Vcc; $\overline{EX}$ = Vcc	—	10	—	nA
$I_{C(ON)}$	Channel On Leakage Current	I_N = Y_N = 0V	—	10	—	nA
		(each channel is turned on sequentially)				
Digital Control						
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH for Control Pins	2	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for Control Pins	—	—	0.8	V
Dynamic Characteristics						
t_{TRANS}	Switching Time of Mux Sx to Yx	R_L = 1KΩ, C_L = 100pF (See Transition Time)	0.5	—	6.6	ns
$t_{ON(\overline{EN})}$	Enable Turn-On Time $\overline{EX}$ to Yx	R_L = 1KΩ, C_L = 100pF (See Switching Time)	0.5	—	6	ns
$t_{OFF(\overline{EN})}$	Enable Turn-Off Time $\overline{EX}$ to Yx	R_L = 1KΩ, C_L = 100pF (See Switching Time)	0.5	—	6	ns
t_{PD}	Group Delay[2,4]	R_L = 1KΩ, C_L = 100pF	—	—	250	ps
f_{3dB}	-3dB Bandwidth	V_{IN} = 1Vp-p, R_L = 75Ω	—	700	—	MHz
	Off-isolation	V_{IN} = 1Vp-p, R_L = 75Ω, f = 5MHz	—	-60	—	dB
X_{TALK}	Crosstalk	V_{IN} = 1Vp-p, R_L = 75Ω, f = 5MHz	—	-68	—	dB
$C_{MUX(OFF)}$	Mux Off Capacitance	$\overline{EX}$ = Vcc, V_{IN} = V_{OUT} = 0V	—	6	—	pF
$C_{DEMUX(OFF)}$	Demux Off Capacitance	$\overline{EX}$ = Vcc, V_{IN} = V_{OUT} = 0V	—	14	—	pF
$C_{MUX(ON)}$	Mux On Capacitance	$\overline{EX}$ = 0V, V_{IN} = V_{OUT} = 0V	—	20	—	pF
$C_{DEMUX(ON)}$	Demux On Capacitance	$\overline{EX}$ = 0V, V_{IN} = V_{OUT} = 0V	—	20	—	pF
Q_{CI}	Charge Injection	C_L = 1000pF	—	1.5	—	pC

NOTES:

1. Typical values are at V_{CC} = 5.0V, T_A = 25°C.

2. Max value is guaranteed but not production tested.

3. Measured by voltage drop between A and C pins or B and D pins at indicated current through the switch. ON resistance is determined by the lower of the voltages on the two (I, Y) pins.

4. The bus switch contributes no group delay other than the RC delay of the ON resistance of the switch and load capacitance. Group 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.

POWER SUPPLY CHARACTERISTICS

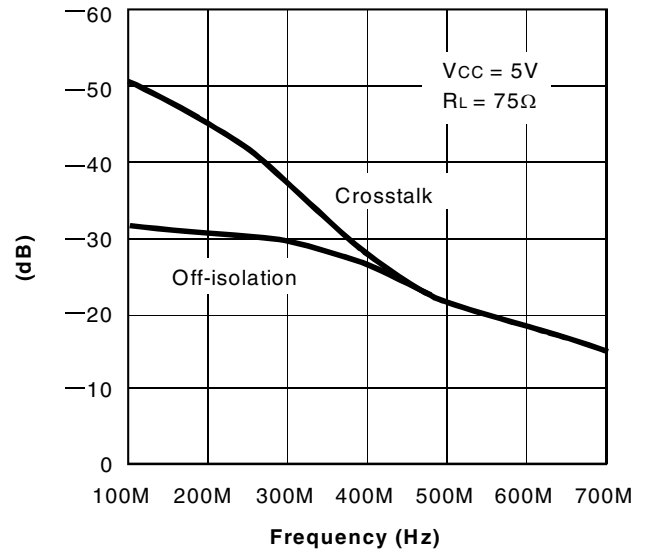| Symbol	Parameter	Test Conditions	Max.	Unit
I_{CCQ}	Quiescent Power	V_{CC} = Max., V_{IN} = GND or Vcc, f = 0	9	µA

TYPICAL CHARACTERISTICS
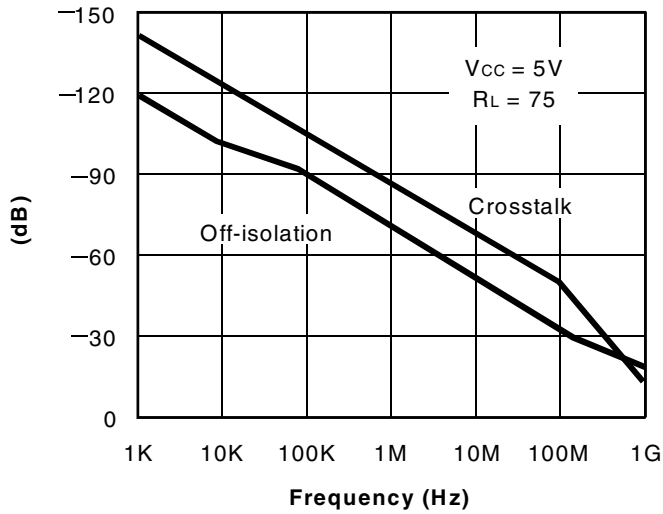
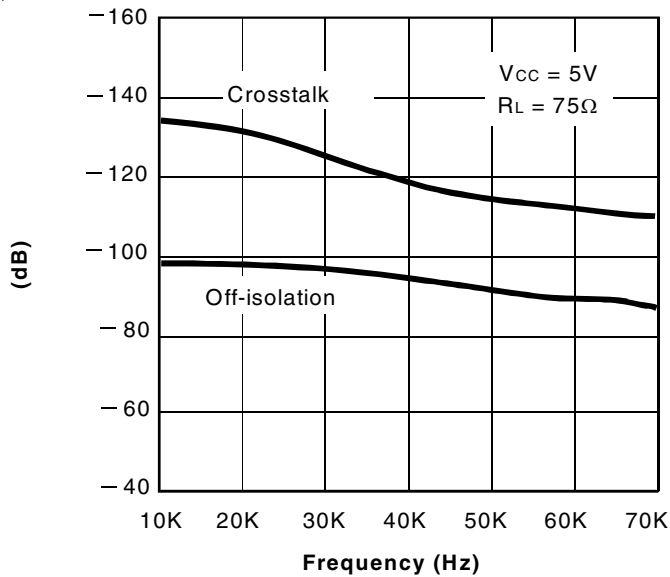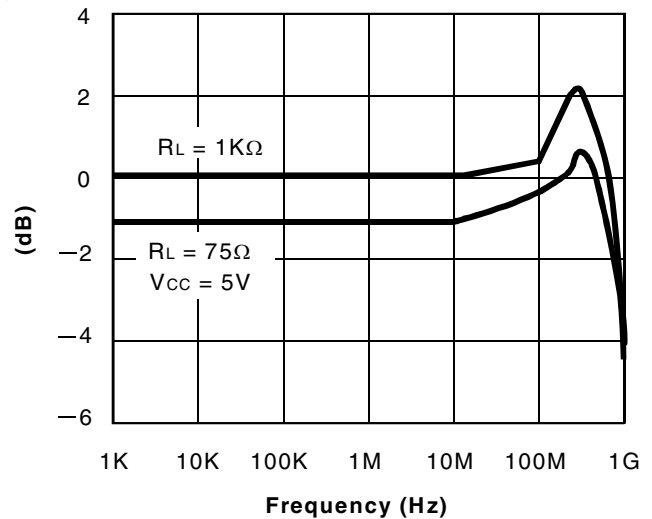*Off-isolation and Crosstalk vs. Frequency*

NOTES:
1. Crosstalk = 20 log |V_O/V_S|
2. Off-isolation = 20 log |V_O/V_S|

Off-isolation and Crosstalk vs. Frequency

NOTES:
1. Crosstalk = 20 log |V_O/V_S|
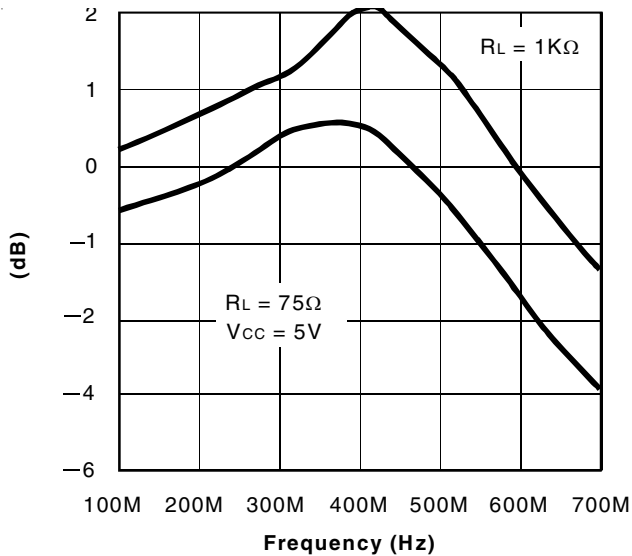2. Off-isolation = 20 log |V_O/V_S|

Off-isolation and Crosstalk vs. Frequency

NOTES:
1. Crosstalk = 20 log |V_O/V_S|
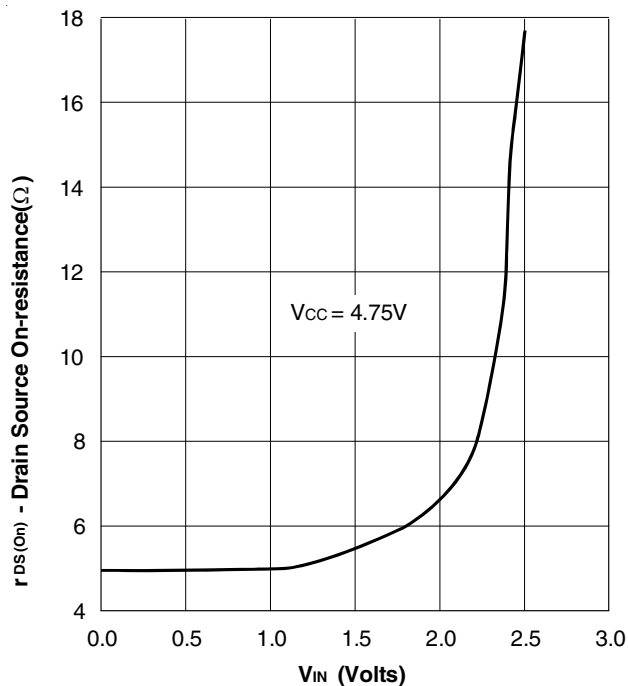2. Off-isolation = 20 log |V_O/V_S|

Insertion Loss vs. Frequency

NOTE:
1. Insertion Loss = 20 log |V_O/V_S|

TYPICAL CHARACTERISTICS (CONTINUED)

Insertion Loss vs. Frequency

NOTE:
1. Insertion Loss = 20 log $|V_O/V_S|$

R$_{ON}$ LINK

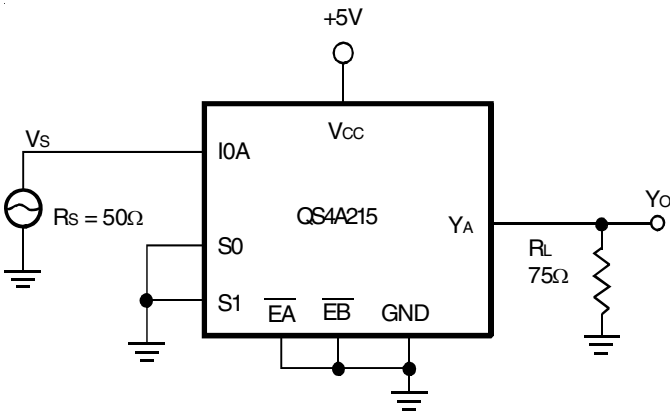*On-Resistance vs. V$_{IN}$*
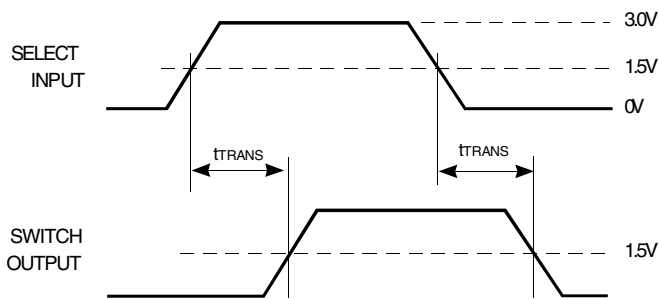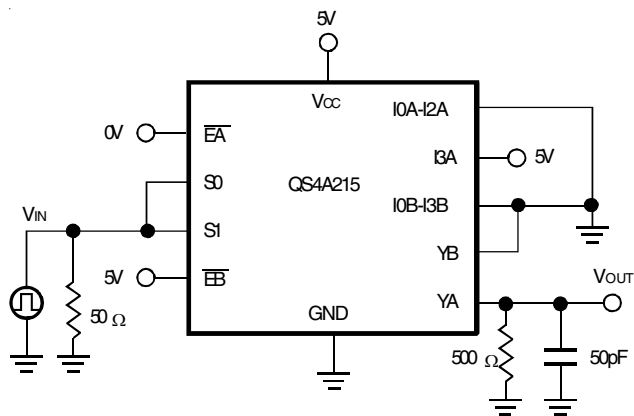
TEST CIRCUITS

Transition Time

TEST CIRCUITS (CONTINUED)
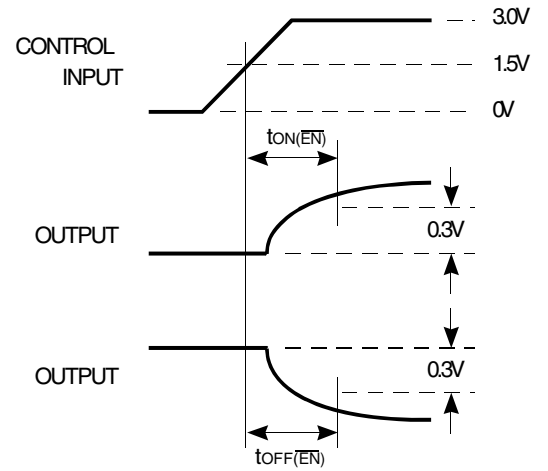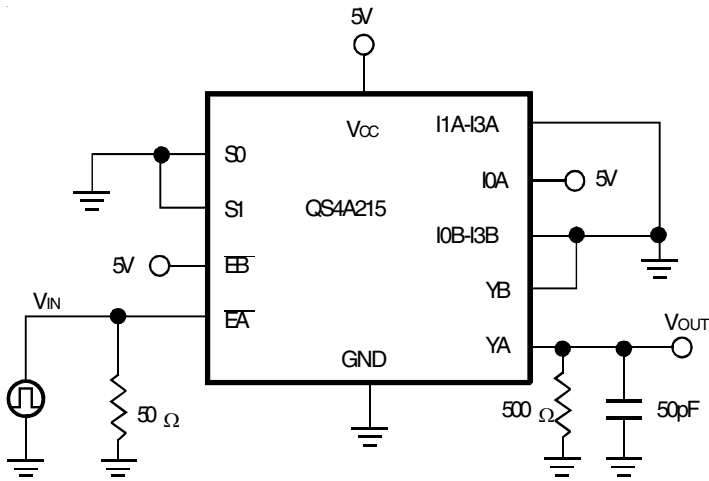
Enable Switching Time

Insertion Loss
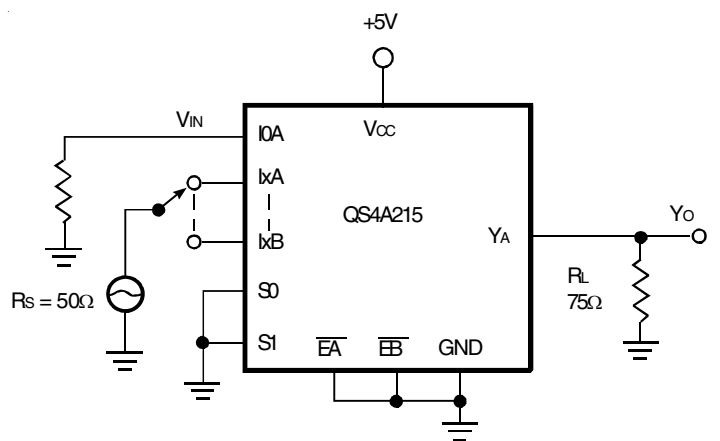
NOTE:
1. Insertion Loss = 20 log |Vo/Vs|

Crosstalk
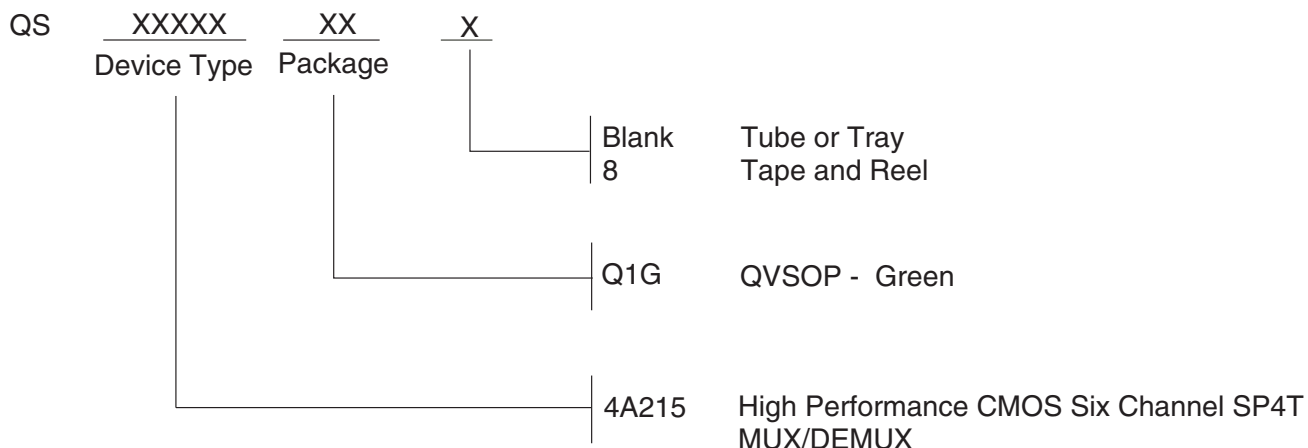
NOTE:
1. Crosstalk = 20 log |Vo/Vs|
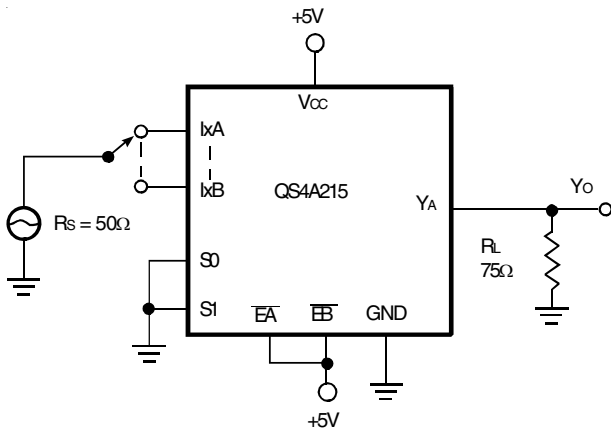
Off-Isolation

NOTE:
1. Off-isolation = 20 log |Vo/Vs|

ORDERING INFORMATION

QS   <u>XXXXX</u>   <u>XX</u>   <u>X</u>
    Device Type   Package

Blank	Tube or Tray
8	Tape and Reel

Q1G	QVSOP - Green

4A215	High Performance CMOS Six Channel SP4T MUX/DEMUX

DATASHEET DOCUMENT HISTORY