



QUICKSWITCH® PRODUCTS HIGH-PERFORMANCE CMOS ANALOG FOUR-CHANNEL SPDT MUX/DEMUX

IDTQS4A205

FEATURES:

- Low On-resistance: $r_{DS(on)} = 5\Omega$
- Fast Transition Time: $t_{Tran} = 6ns$
- Wide bandwidth: 830MHz (–3dB point)
- Crosstalk: –115dB @ 50KHz, –100dB @ 5MHz, –66dB @ 30MHz
- Off-isolation: –90dB @ 50KHz, –60dB @ 5MHz, –50dB @ 30MHz
- Single 5V supply
- Can be used as a multiplexer or demultiplexer
- TTL compatible control inputs
- Ultra-low quiescent current: 3μA

APPLICATIONS

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

DESCRIPTION:

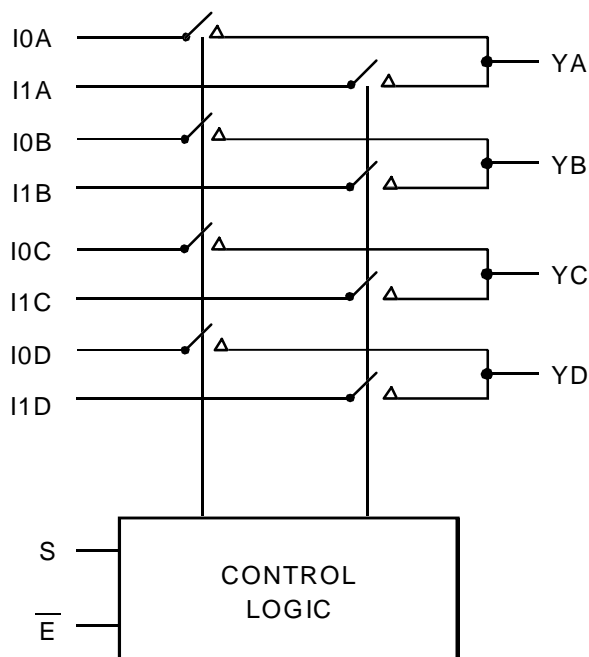
The QS4A205 is a high-performance CMOS analog Four-Channel SPDT multiplexer/demultiplexer with individual enables. The low On-resistance of the QS4A205 allows inputs to be connected to outputs with low insertion loss and high bandwidth. TTL-compatible control circuitry with "Break-Before-Make" feature prevents contention.

The QS4A205 with 830MHz bandwidth makes it ideal for high-performance video signal switching, audio signal switching, and telecomm routing applications. High performance and low power dissipation makes this device ideal for battery operated and remote instrumentation applications.

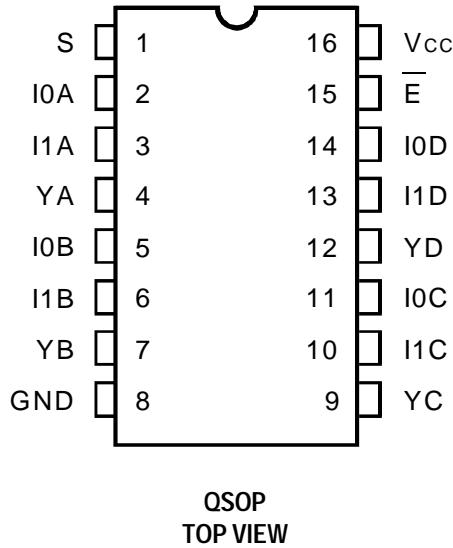
The QS4A205 is offered in the QSOP package and has several advantages over conventional packages such as PDIP and SOIC including:

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

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS (1)

Symbol	Description	Max.	Unit
$V_{TERM}^{(2)}$	Supply Voltage to Ground	- 0.5 to 7	V
$V_{TERM}^{(2)}$	DC Switch Voltage V_S	- 0.5 to 7	V
	Analog Input Voltage	- 0.5 to 7	V
$V_{TERM}^{(2)}$	DC Input Voltage V_{IN}	- 0.5 to 7	V
V_{AC}	AC Input Voltage (for a pulse width $\leq 20ns$)	- 3	V
V_{OUT}	DC Output Current	120	mA
P_{MAX}	Maximum Power Dissipation ($T_A = 85^\circ C$)	0.7	W
T_{STG}	Storage Temperature	-65 to 150	$^\circ C$

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.
- V_{CC} terminals.
- All terminals except V_{CC} .

CAPACITANCE ($T_A = +25^\circ C$, $f = 1MHz$, $V_{IN} = 0V$, $V_{OUT} = 0V$)

Symbol	Parameter(1)	Conditions	Typ.	Max.	Unit
$C_{MUX(OFF)}$	MUX Off Capacitance	$\bar{E} = V_{CC}$, $V_{IN} = V_{OUT} = 0V$	5.6	—	pF
$C_{DEMUX(OFF)}$	DEMUX Off Capacitance	$\bar{E} = V_{CC}$, $V_{IN} = V_{OUT} = 0V$	7.4	—	pF
$C_{MUX(ON)}$	MUX On Capacitance	$\bar{E} = 0V$, $V_{IN} = V_{OUT} = 0V$	12	—	pF
$C_{DEMUX(ON)}$	DEMUX On Capacitance	$\bar{E} = 0V$, $V_{IN} = V_{OUT} = 0V$	15	—	pF

NOTE:

- As applicable to the device type.

PIN DESCRIPTION

Pin Names	I/O	Description
IxA	I/O	Demux Port A
IxB	I/O	Demux Port B
IxC	I/O	Demux Port C
IXD	I/O	Demux Port D
\bar{E}	I	Enable Input
S	I	Select Input
YA-YD	I/O	Mux Port A-D

FUNCTION TABLE (1)

Enable	Select	MUX/DEMUX Ports				Function
\bar{E}	S	YA	YB	YC	YD	
H	X	High-Z	High-Z	High-Z	High-Z	Disable
L	L	I0A	I0B	I0C	I0D	Select 0
L	H	I1A	I1B	I1C	I1D	Select 1

NOTE:

- H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care
Z = High-Impedence

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

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

Symbol	Parameter	Test Conditions	Min.	Typ. ⁽¹⁾	Max.	Unit
Analog Switch						
V_{IN}	Analog Signal Range ⁽²⁾		-0.5	1	$V_{CC}-1$	V
$r_{DS(on)}$	Drain-Source On-Resistance ^(2,3)	$V_{CC} = \text{Min.}, V_{IN} = 0\text{V}, I_{ON} = 30\text{mA}$	—	5	7	Ω
		$V_{CC} = \text{Min.}, V_{IN} = 2.4\text{V}, I_{ON} = 15\text{mA}$	—	13	17	Ω
$I_{C(OFF)}$	Channel Off Leakage Current	$I_N = V_{CC}$ or 0V , $Y_N = 0\text{V}$ or V_{CC} , $\bar{E} = V_{CC}$	—	2	—	nA
$I_{C(ON)}$	Channel On Leakage Current	$I_N = Y_N = 0\text{V}$, Each channel is turned on sequentially	—	2	—	nA
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 S to Y	$R_L = 1\text{K}\Omega$, $C_L = 100\text{pF}$	0.5	—	6.6	ns
$t_{ON}(\bar{E})$	Enable Turn-On Time, \bar{E} to Y	$R_L = 1\text{K}\Omega$, $C_L = 100\text{pF}$	0.5	—	6	ns
$t_{OFF}(\bar{E})$	Enable Turn-Off Time, \bar{E} to Y	$R_L = 1\text{K}\Omega$, $C_L = 100\text{pF}$	0.5	—	6	ns
t_{PD}	Group Delay ^(2, 4)	$R_L = 1\text{K}\Omega$, $C_L = 100\text{pF}$	—	—	250	ps
f_{3dB}	-3dB Bandwidth	$V_{IN} = 1\text{Vp-p}$, $R_L = 75\Omega$	—	830	—	MHz
	Off-Isolation	$V_{IN} = 1\text{Vp-p}$, $R_L = 75\Omega$, $f = 5\text{MHz}$	—	-60	—	dB
X_{TALK}	Crosstalk	$V_{IN} = 1\text{Vp-p}$, $R_L = 75\Omega$, $f = 5\text{MHz}$	—	-100	—	dB
Q_{CI}	Charge Injection		—	1.5	—	pC

NOTES:

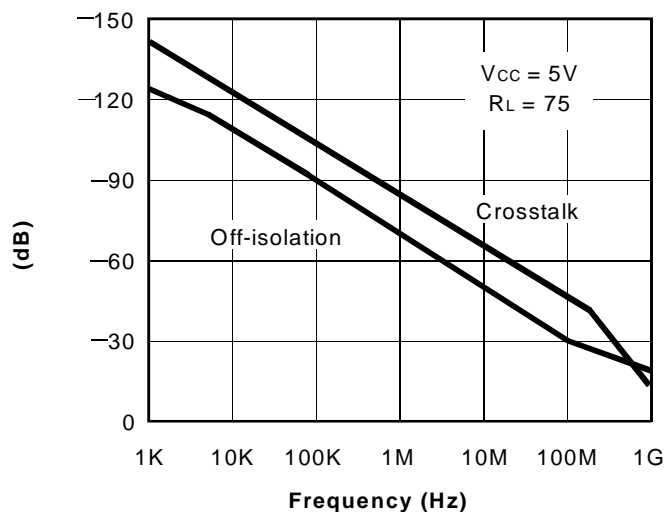
1. Typical values are at $V_{CC} = 5\text{V}$ and $T_A = 25^{\circ}\text{C}$.
2. Guaranteed by design, not subject to production test.
3. Measured by voltage drop between I and Y pins at indicated current through the switch. On-resistance is determined by the lower of the voltages on the two (I, Y) pins.
4. The bus switch contributes no group delay other than the RC Delay of the On-Resistance of the switch and the load capacitance. 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.

POWER SUPPLY CHARACTERISTICS

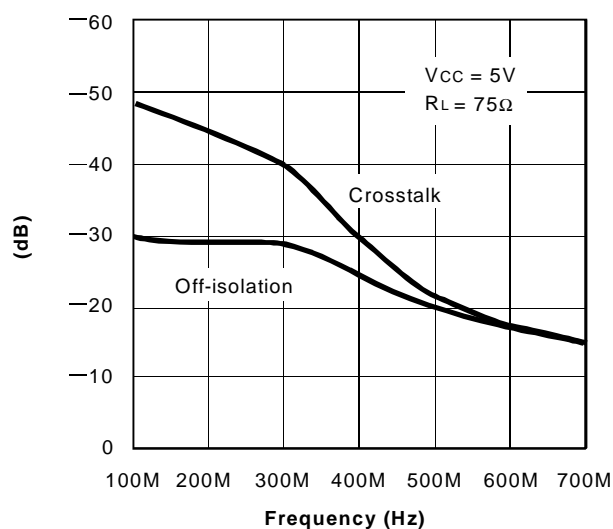
Symbol	Parameter	Test Conditions	Max.	Unit
I_{CCQ}	Quiescent Power	$V_{CC} = \text{Max.}, V_{IN} = \text{GND or } V_{CC}, f = 0$	3	μA

TYPICAL CHARACTERISTICS

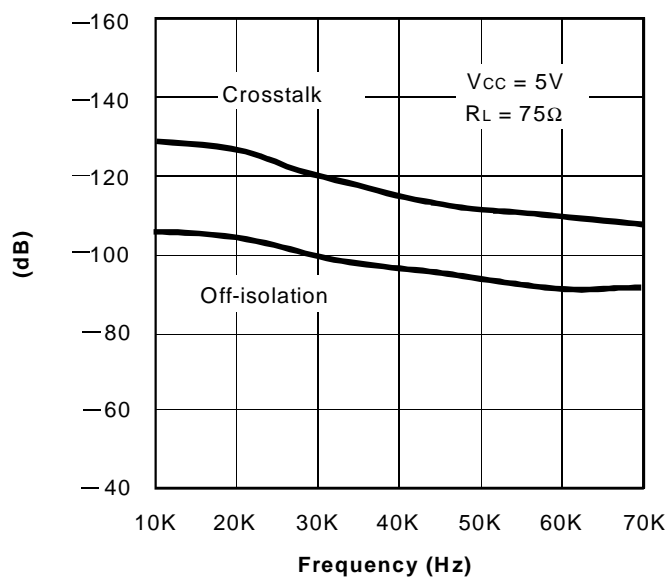
OFF-ISOLATION AND CROSSTALK VS. FREQUENCY



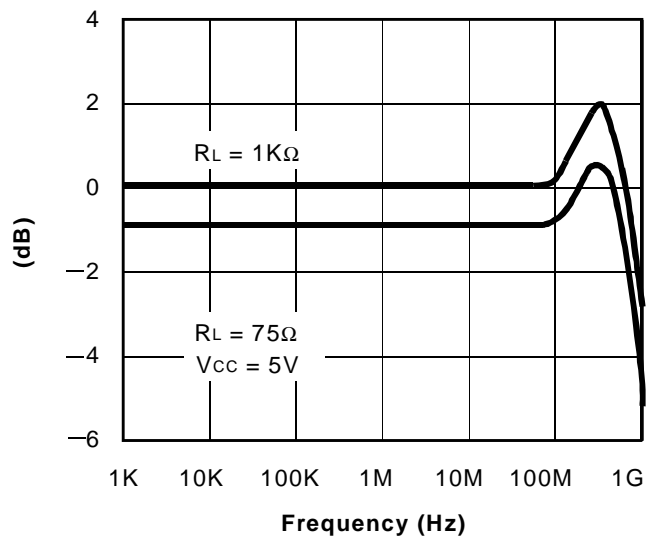
OFF-ISOLATION AND CROSSTALK VS. FREQUENCY



OFF-ISOLATION AND CROSSTALK VS. FREQUENCY

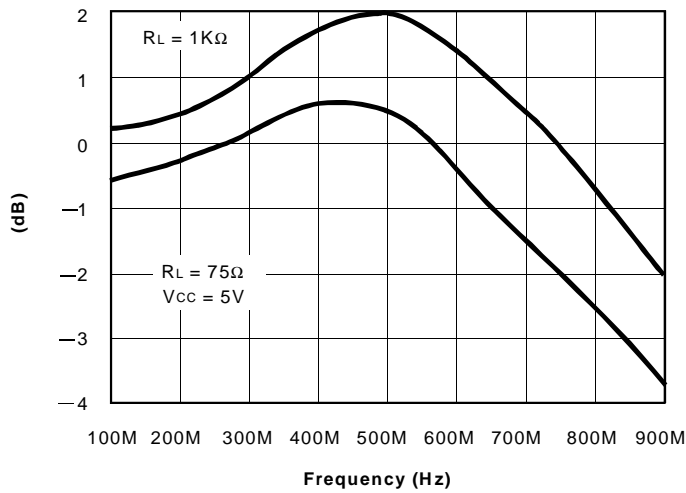


INSERTION LOSS VS. FREQUENCY

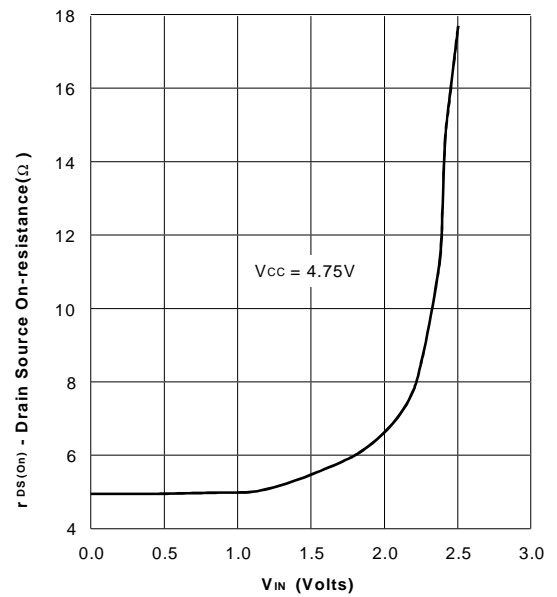


TYPICAL CHARACTERISTICS (CONTINUED)

INSERTION LOSS VS. FREQUENCY



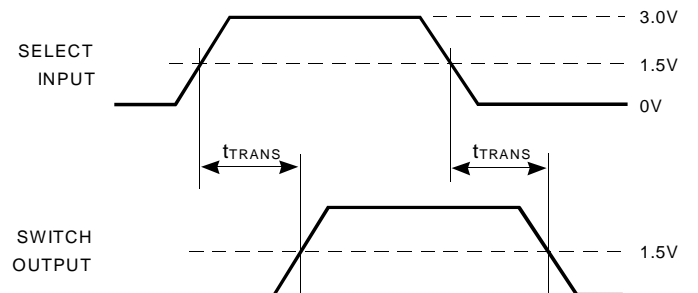
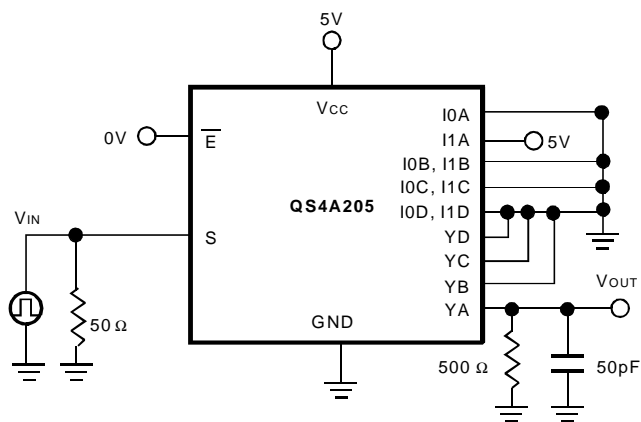
ON-RESISTANCE VS. V_{IN}



RON LINK

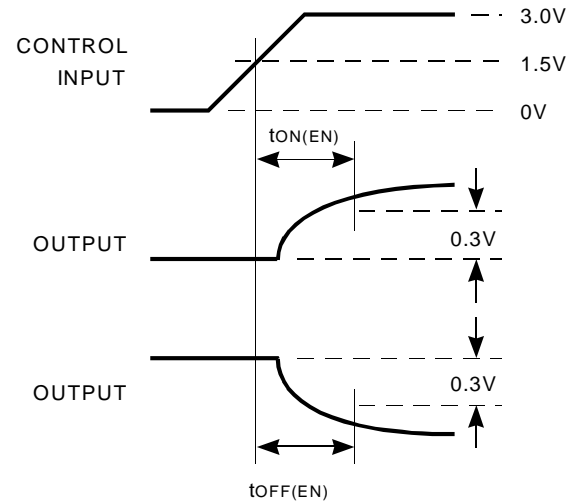
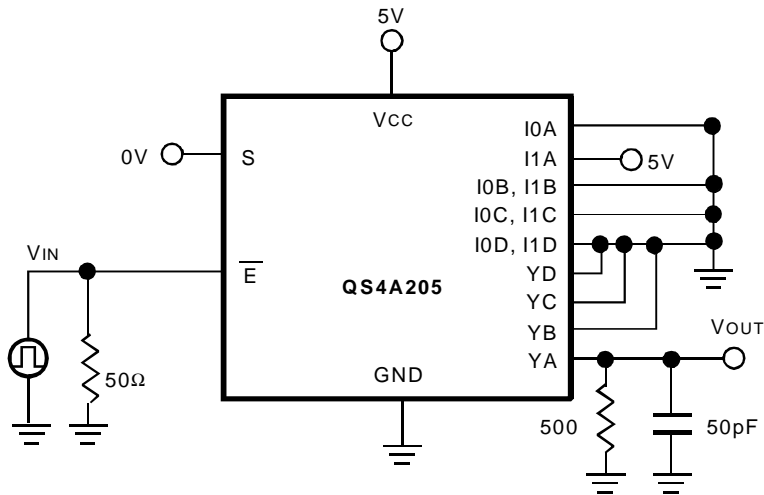
TEST CIRCUITS

TRANSITION TIME

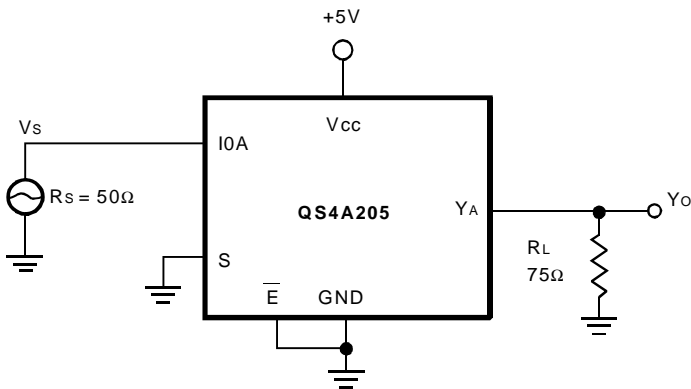


TEST CIRCUITS (CONTINUED)

ENABLE SWITCHING TIME



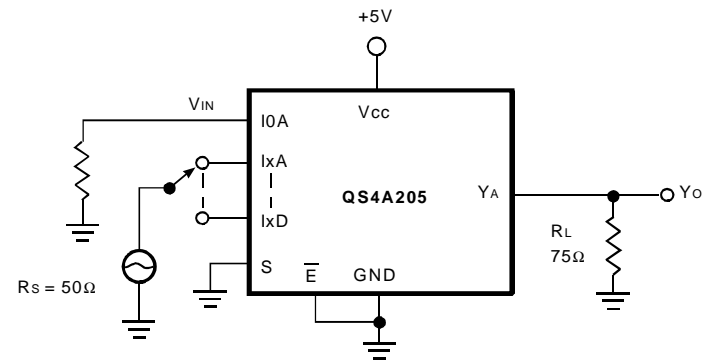
INSERTION LOSS



NOTE:

1. Insertion Loss = $20 \log |V_o/V_s|$

CROSSTALK

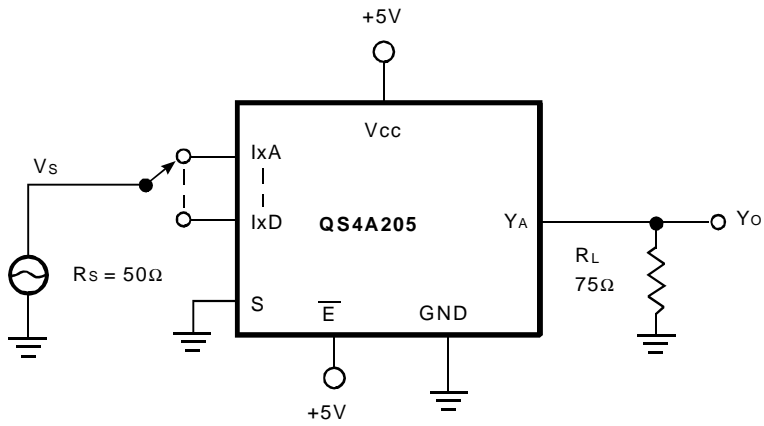


NOTE:

1. Crosstalk = $20 \log |V_o/V_s|$

TEST CIRCUITS (CONTINUED)

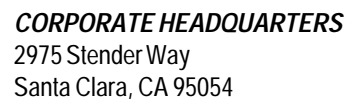
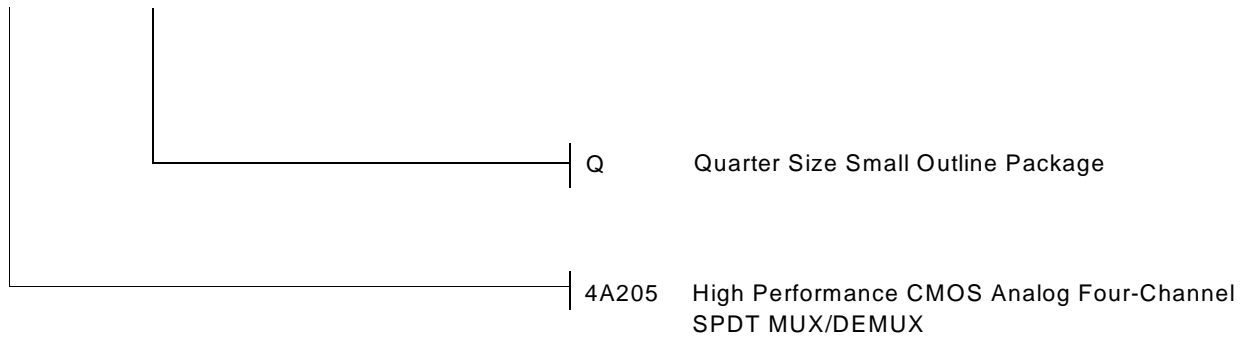
OFF-ISOLATION



NOTE:

1. Off-Isolation = $20 \log |V_o/V_s|$

IDTQS XXXXX XX
Device Type Package



**To search for sales office near you, please click the sales button found on our home page or dial the 800# above and press 2.*
The IDT logo, QuickSwitch, and SynchroSwitch are registered trademarks of Integrated Device Technology, Inc.