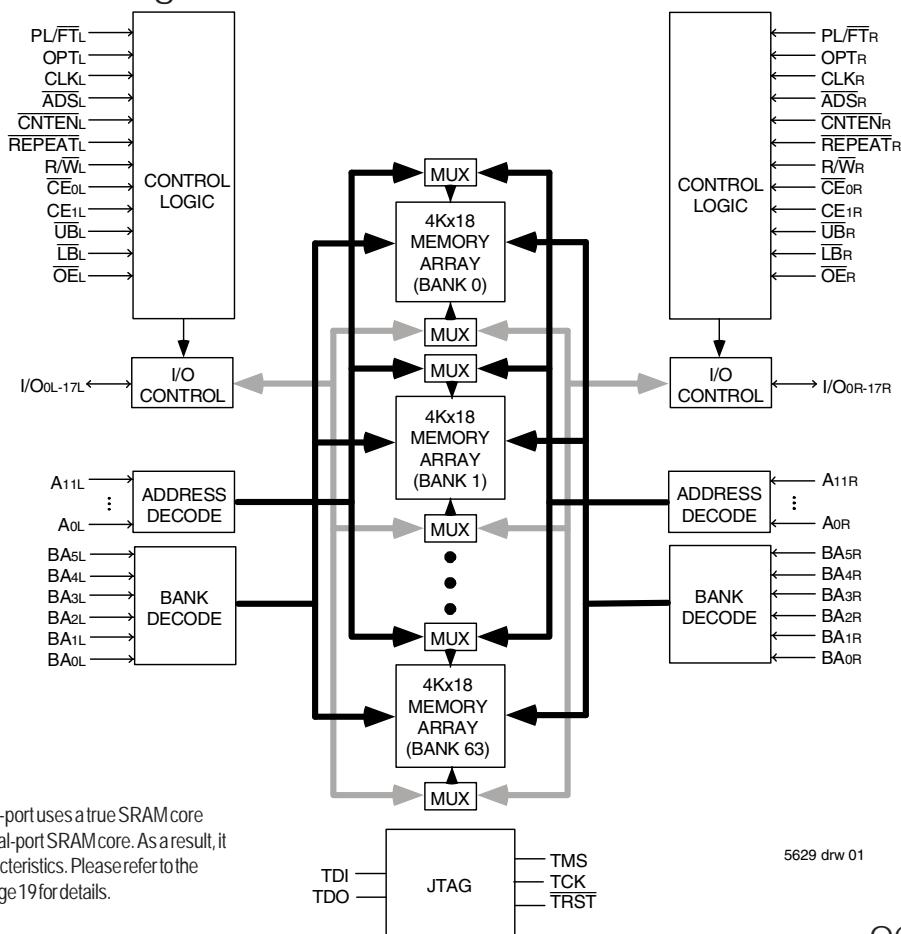


## Features:

- ◆ 256K x 18 Synchronous Bank-Switchable Dual-ported SRAM Architecture
  - 64 independent 4K x 18 banks
  - 4 megabits of memory on chip
- ◆ Bank access controlled via bank address pins
- ◆ High-speed data access
  - Commercial: 3.4ns (200MHz)/3.6ns (166MHz)/4.2ns (133MHz) (max.)
  - Industrial: 4.2ns (133MHz) (max.)
- ◆ Selectable Pipelined or Flow-Through output mode
- ◆ Counter enable and repeat features
- ◆ Dual chip enables allow for depth expansion without additional logic
- ◆ Full synchronous operation on both ports
  - 5ns cycle time, 200MHz operation (14Gbps bandwidth)
  - Fast 3.4ns clock to data out
- ◆ 1.5ns setup to clock and 0.5ns hold on all control, data, and address inputs @ 200MHz
- ◆ Data input, address, byte enable and control registers
- ◆ Self-timed write allows fast cycle time
- ◆ Separate byte controls for multiplexed bus and bus matching compatibility
- ◆ LVTTL-compatible, 3.3V ( $\pm 150$ mV) power supply for core
- ◆ LVTTL compatible, selectable 3.3V ( $\pm 150$ mV) or 2.5V ( $\pm 100$ mV) power supply for I/Os and control signals on each port
- ◆ Industrial temperature range (-40°C to +85°C) is available at 133MHz
- ◆ Available in a 208-pin fine pitch Ball Grid Array (fpBGA) and 256-pin Ball Grid Array (BGA)
- ◆ Supports JTAG features compliant with IEEE 1149.1
- ◆ Green parts available, see ordering information

## Functional Block Diagram



### NOTE:

1. The Bank-Switchable dual-port uses a true SRAM core instead of the traditional dual-port SRAM core. As a result, it has unique operating characteristics. Please refer to the functional description on page 19 for details.

5629 drw 01

OCTOBER 2019

**Description:**

The IDT70V7319 is a high-speed 256Kx18 (4Mbit) synchronous Bank-Switchable Dual-Ported SRAM organized into 64 independent 4Kx18 banks. The device has two independent ports with separate control, address, and I/O pins for each port, allowing each port to access any 4Kx18 memory block not already accessed by the other port. Accesses by the ports into specific banks are controlled via the bank address pins under the user's direct control.

Registers on control, data, and address inputs provide minimal setup and hold times. The timing latitude provided by this approach allows systems to be designed with very short cycle times. With an input data

register, the IDT70V7319 has been optimized for applications having unidirectional or bidirectional data flow in bursts. An automatic power down feature, controlled by CE0 and CE1, permits the on-chip circuitry of each port to enter a very low standby power mode. The dual chip enables also facilitate depth expansion.

The 70V7319 can support an operating voltage of either 3.3V or 2.5V on one or both ports, controllable by the OPT pins. The power supply for the core of the device(VDD) remains at 3.3V. Please refer also to the functional description on page 18.

**Pin Configuration<sup>(1,2,3,4)</sup>**

A1 IO <sub>9L</sub>	A2 NC	A3 Vss	A4 TDO	A5 NC	A6 BA <sub>4L</sub>	A7 BA <sub>0L</sub>	A8 A <sub>8L</sub>	A9 NC	A10 VDD	A11 CLK <sub>L</sub>	A12 CNTE <sub>NL</sub>	A13 A <sub>4L</sub>	A14 A <sub>0L</sub>	A15 OPT <sub>L</sub>	A16 NC	A17 Vss	
B1 NC	B2 Vss	B3 NC	B4 TDI	B5 BA <sub>5L</sub>	B6 BA <sub>1L</sub>	B7 A <sub>9L</sub>	B8 NC	B9 CE <sub>0L</sub>	B10 Vss	B11 ADS <sub>L</sub>	B12 A <sub>5L</sub>	B13 A <sub>1L</sub>	B14 Vss	B15 VDDQR	B16 I/O <sub>8L</sub>	B17 NC	
C1 VDDQL	C2 I/O <sub>9R</sub>	C3 VDDQR	C4 PL/FT <sub>L</sub>	C5 NC	C6 BA <sub>2L</sub>	C7 A <sub>10L</sub>	C8 UB <sub>L</sub>	C9 CE <sub>1L</sub>	C10 Vss	C11 R/W <sub>L</sub>	C12 A <sub>6L</sub>	C13 A <sub>2L</sub>	C14 Vdd	C15 I/O <sub>8R</sub>	C16 NC	C17 Vss	
D1 NC	D2 Vss	D3 I/O <sub>10L</sub>	D4 NC	D5 BA <sub>3L</sub>	D6 A <sub>11L</sub>	D7 A <sub>7L</sub>	D8 LB <sub>L</sub>	D9 VDD	D10 OE <sub>L</sub>	D11 REPEAT <sub>L</sub>	D12 A <sub>3L</sub>	D13 Vdd	D14 NC	D15 VDDQL	D16 I/O <sub>7L</sub>	D17 I/O <sub>7R</sub>	
E1 I/O <sub>11L</sub>	E2 NC	E3 VDDQR	E4 I/O <sub>10R</sub>	70V7319 BF208 <sup>(5)</sup>										E14 I/O <sub>6L</sub>	E15 NC	E16 Vss	E17 NC
F1 VDDQL	F2 I/O <sub>11R</sub>	F3 NC	F4 Vss	208-Pin fpBGA Top View <sup>(6)</sup>										F14 Vss	F15 I/O <sub>6R</sub>	F16 NC	F17 VDDQR
G1 NC	G2 Vss	G3 I/O <sub>12L</sub>	G4 NC	208-Pin fpBGA Top View <sup>(6)</sup>										G14 NC	G15 VDDQL	G16 I/O <sub>5L</sub>	G17 NC
H1 VDD	H2 NC	H3 VDDQR	H4 I/O <sub>12R</sub>	208-Pin fpBGA Top View <sup>(6)</sup>										H14 Vdd	H15 NC	H16 Vss	H17 I/O <sub>5R</sub>
J1 VDDQL	J2 VDD	J3 Vss	J4 Vss	208-Pin fpBGA Top View <sup>(6)</sup>										J14 Vss	J15 Vdd	J16 Vss	J17 VDDQR
K1 I/O <sub>14R</sub>	K2 Vss	K3 I/O <sub>13R</sub>	K4 Vss	208-Pin fpBGA Top View <sup>(6)</sup>										K14 I/O <sub>3R</sub>	K15 VDDQL	K16 I/O <sub>4R</sub>	K17 Vss
L1 NC	L2 I/O <sub>14L</sub>	L3 VDDQR	L4 I/O <sub>13L</sub>	208-Pin fpBGA Top View <sup>(6)</sup>										L14 NC	L15 I/O <sub>3L</sub>	L16 Vss	L17 I/O <sub>4L</sub>
M1 VDDQL	M2 NC	M3 I/O <sub>15R</sub>	M4 Vss	208-Pin fpBGA Top View <sup>(6)</sup>										M14 Vss	M15 NC	M16 I/O <sub>2R</sub>	M17 VDDQR
N1 NC	N2 Vss	N3 NC	N4 I/O <sub>15L</sub>	208-Pin fpBGA Top View <sup>(6)</sup>										N14 I/O <sub>1R</sub>	N15 VDDQL	N16 NC	N17 I/O <sub>2L</sub>
P1 I/O <sub>16R</sub>	P2 I/O <sub>16L</sub>	P3 VDDQR	P4 NC	P5 TRST	P6 BA <sub>4R</sub>	P7 BA <sub>0R</sub>	P8 A <sub>8R</sub>	P9 NC	P10 VDD	P11 CLK <sub>R</sub>	P12 CNTE <sub>NR</sub>	P13 A <sub>4R</sub>	P14 NC	P15 I/O <sub>1L</sub>	P16 Vss	P17 NC	
R1 Vss	R2 NC	R3 I/O <sub>17R</sub>	R4 TCK	R5 BA <sub>5R</sub>	R6 BA <sub>1R</sub>	R7 A <sub>9R</sub>	R8 NC	R9 CE <sub>0R</sub>	R10 Vss	R11 ADS <sub>R</sub>	R12 A <sub>5R</sub>	R13 A <sub>1R</sub>	R14 Vss	R15 VDDQL	R16 I/O <sub>0R</sub>	R17 VDDQR	
T1 NC	T2 I/O <sub>17L</sub>	T3 VDDQL	T4 TMS	T5 NC	T6 BA <sub>2R</sub>	T7 A <sub>10R</sub>	T8 UB <sub>R</sub>	T9 CE <sub>1R</sub>	T10 Vss	T11 R/W <sub>R</sub>	T12 A <sub>6R</sub>	T13 A <sub>2R</sub>	T14 Vss	T15 NC	T16 Vss	T17 NC	
U1 Vss	U2 NC	U3 PL/FT <sub>R</sub>	U4 NC	U5 BA <sub>3R</sub>	U6 A <sub>11R</sub>	U7 A <sub>7R</sub>	U8 LB <sub>R</sub>	U9 Vdd	U10 OE <sub>R</sub>	U11 REPEAT <sub>R</sub>	U12 A <sub>3R</sub>	U13 A <sub>0R</sub>	U14 Vdd	U15 OPT <sub>R</sub>	U16 NC	U17 I/O <sub>0L</sub>	

**NOTES:**

- All V<sub>DD</sub> pins must be connected to 3.3V power supply.
- All V<sub>DDO</sub> pins must be connected to appropriate power supply: 3.3V if OPT pin for that port is set to V<sub>IH</sub>(3.3V), and 2.5V if OPT pin for that port is set to V<sub>IL</sub>(0V).
- All V<sub>ss</sub> pins must be connected to ground supply.
- Package body is approximately 15mm x 15mm x 1.4mm with 0.8mm ball pitch.
- This package code is used to reference the package diagram.
- This text does not indicate orientation of the actual part-marking.

5629 drw 02c

Pin Configuration<sup>(1,2,3,4)</sup> (con't.)70V7319  
BC256<sup>(5)</sup>256-Pin BGA  
Top View<sup>(6)</sup>

A1 NC	A2 TDI	A3 NC	A4 BA5L	A5 BA2L	A6 A11L	A7 A8L	A8 NC	A9 CE1L	A10 OE <sub>L</sub>	A11 CNTEN <sub>L</sub>	A12 A5L	A13 A2L	A14 A0L	A15 NC	A16 NC
B1 NC	B2 NC	B3 TDO	B4 NC	B5 BA3L	B6 BA0L	B7 A9L	B8 UB <sub>L</sub>	B9 CE0L	B10 R/W <sub>L</sub>	B11 REPEAT <sub>R</sub>	B12 A4L	B13 A1L	B14 VDD	B15 NC	B16 NC
C1 NC	C2 I/O <sub>9L</sub>	C3 VSS	C4 BA4L	C5 BA1L	C6 A10L	C7 A7L	C8 NC	C9 LB <sub>L</sub>	C10 CLK <sub>L</sub>	C11 ADS <sub>L</sub>	C12 A6L	C13 A3L	C14 OPT <sub>L</sub>	C15 NC	C16 I/O <sub>8L</sub>
D1 NC	D2 I/O <sub>9R</sub>	D3 NC	D4 PL/FT <sub>L</sub>	D5 VDDQL	D6 VDDQL	D7 VDDQR	D8 VDDQR	D9 VDDQL	D10 VDDQL	D11 VDDQR	D12 VDDQR	D13 VDD	D14 NC	D15 NC	D16 I/O <sub>8R</sub>
E1 I/O <sub>10R</sub>	E2 I/O <sub>10L</sub>	E3 NC	E4 VDDQL	E5 VDD	E6 VDD	E7 VSS	E8 VSS	E9 VSS	E10 VSS	E11 VDD	E12 VDD	E13 VDDQR	E14 NC	E15 I/O <sub>7L</sub>	E16 I/O <sub>7R</sub>
F1 I/O <sub>11L</sub>	F2 NC	F3 I/O <sub>11R</sub>	F4 VDDQL	F5 VDD	F6 VSS	F7 VSS	F8 VSS	F9 VSS	F10 VSS	F11 VSS	F12 VDD	F13 VDDQR	F14 I/O <sub>6R</sub>	F15 NC	F16 I/O <sub>6L</sub>
G1 NC	G2 NC	G3 I/O <sub>12L</sub>	G4 VDDQR	G5 VSS	G6 VSS	G7 VSS	G8 VSS	G9 VSS	G10 VSS	G11 VSS	G12 VSS	G13 VDDQL	G14 I/O <sub>5L</sub>	G15 NC	G16 NC
H1 NC	H2 I/O <sub>12R</sub>	H3 NC	H4 VDDQR	H5 VSS	H6 VSS	H7 VSS	H8 VSS	H9 VSS	H10 VSS	H11 VSS	H12 VSS	H13 VDDQL	H14 NC	H15 NC	H16 I/O <sub>5R</sub>
J1 I/O <sub>13L</sub>	J2 I/O <sub>14R</sub>	J3 I/O <sub>13R</sub>	J4 VDDQL	J5 VSS	J6 VSS	J7 VSS	J8 VSS	J9 VSS	J10 VSS	J11 VSS	J12 VSS	J13 VDDQR	J14 I/O <sub>4R</sub>	J15 I/O <sub>3R</sub>	J16 I/O <sub>4L</sub>
K1 NC	K2 NC	K3 I/O <sub>14L</sub>	K4 VDDQL	K5 VSS	K6 VSS	K7 VSS	K8 VSS	K9 VSS	K10 VSS	K11 VSS	K12 VSS	K13 VDDQL	K14 NC	K15 NC	K16 I/O <sub>3L</sub>
L1 I/O <sub>15L</sub>	L2 NC	L3 I/O <sub>15R</sub>	L4 VDDQR	L5 VDD	L6 VSS	L7 VSS	L8 VSS	L9 VSS	L10 VSS	L11 VSS	L12 VDD	L13 VDDQL	L14 I/O <sub>2L</sub>	L15 NC	L16 I/O <sub>2R</sub>
M1 I/O <sub>16R</sub>	M2 I/O <sub>16L</sub>	M3 NC	M4 VDDQR	M5 VDD	M6 VDD	M7 VSS	M8 VSS	M9 VSS	M10 VSS	M11 VDD	M12 VDD	M13 VDDQL	M14 I/O <sub>1R</sub>	M15 I/O <sub>1L</sub>	M16 NC
N1 NC	N2 I/O <sub>17R</sub>	N3 NC	N4 PL/FT <sub>R</sub>	N5 VDDQR	N6 VDDQR	N7 VDDQL	N8 VDDQL	N9 VDDQR	N10 VDDQR	N11 VDDQL	N12 VDDQL	N13 VDD	N14 NC	N15 I/O <sub>0R</sub>	N16 NC
P1 NC	P2 I/O <sub>17L</sub>	P3 TMS	P4 BA4R	P5 BA1R	P6 A10R	P7 A7R	P8 NC	P9 LB <sub>R</sub>	P10 CLK <sub>R</sub>	P11 ADS <sub>R</sub>	P12 A6R	P13 A3R	P14 NC	P15 NC	P16 I/O <sub>0L</sub>
R1 NC	R2 NC	R3 TRST	R4 NC	R5 BA3R	R6 BA0R	R7 A9R	R8 UB <sub>R</sub>	R9 CE0R	R10 R/W <sub>R</sub>	R11 REPEAT <sub>R</sub>	R12 A4R	R13 A1R	R14 OPT <sub>R</sub>	R15 NC	R16 NC
T1 NC	T2 TCK	T3 NC	T4 BA5R	T5 BA2R	T6 A11R	T7 A8R	T8 NC	T9 CE1R	T10 OE <sub>R</sub>	T11 CNTEN <sub>R</sub>	T12 A5R	T13 A2R	T14 A0R	T15 NC	T16 NC

5629 drw 02d

## NOTES:

- All V<sub>DD</sub> pins must be connected to 3.3V power supply.
- All V<sub>DDQ</sub> pins must be connected to appropriate power supply: 3.3V if OPT pin for that port is set to V<sub>IH</sub> (3.3V), and 2.5V if OPT pin for that port is set to V<sub>IL</sub> (0V).
- All V<sub>SS</sub> pins must be connected to ground supply.
- Package body is approximately 17mm x 17mm x 1.4mm, with 1.0mm ball-pitch.
- This package code is used to reference the package diagram.
- This text does not indicate orientation of the actual part-marking.

## Pin Names

Left Port	Right Port	Names
$\overline{CE}_{0L}$ , $CE_{1L}$	$\overline{CE}_{0R}$ , $CE_{1R}$	Chip Enables
$R/\overline{W}_L$	$R/\overline{W}_R$	Read/Write Enable
$\overline{OE}_L$	$\overline{OE}_R$	Output Enable
$BA_{0L}$ - $BA_{5L}$	$BA_{0R}$ - $BA_{5R}$	Bank Address <sup>(4)</sup>
$A_{0L}$ - $A_{11L}$	$A_{0R}$ - $A_{11R}$	Address
$I/O_{0L}$ - $I/O_{17L}$	$I/O_{0R}$ - $I/O_{17R}$	Data Input/Output
$CLK_L$	$CLK_R$	Clock
$PL/\overline{FT}_L$	$PL/\overline{FT}_R$	Pipeline/Flow-Through
$\overline{ADS}_L$	$\overline{ADS}_R$	Address Strobe Enable
$CNTEN_L$	$\overline{CNTEN}_R$	Counter Enable
$\overline{REPEAT}_L$	$\overline{REPEAT}_R$	Counter Repeat <sup>(3)</sup>
$\overline{LB}_L$ , $\overline{UB}_L$	$\overline{LB}_R$ , $\overline{UB}_R$	Byte Enables (9-bit bytes)
$V_{DDQL}$	$V_{DDQR}$	Power (I/O Bus) (3.3V or 2.5V) <sup>(1)</sup>
$OPT_L$	$OPT_R$	Option for selecting $V_{DDQX}$ <sup>(1,2)</sup>
$V_{DD}$		Power (3.3V) <sup>(1)</sup>
$V_{SS}$		Ground (0V)
TDI		Test Data Input
TDO		Test Data Output
TCK		Test Logic Clock (10MHz)
TMS		Test Mode Select
$\overline{TRST}$		Reset (Initialize TAP Controller)

5629 Ibl 01

## NOTES:

1.  $V_{DD}$ ,  $OPT_x$ , and  $V_{DDQX}$  must be set to appropriate operating levels prior to applying inputs on the I/Os and controls for that port.
2.  $OPT_x$  selects the operating voltage levels for the I/Os and controls on that port. If  $OPT_x$  is set to VIH (3.3V), then that port's I/Os and controls will operate at 3.3V levels and  $V_{DDQX}$  must be supplied at 3.3V. If  $OPT_x$  is set to VIL (0V), then that port's I/Os and address controls will operate at 2.5V levels and  $V_{DDQX}$  must be supplied at 2.5V. The  $OPT$  pins are independent of one another—both ports can operate at 3.3V levels, both can operate at 2.5V levels, or either can operate at 3.3V with the other at 2.5V.
3. When  $\overline{REPEAT}_x$  is asserted, the counter will reset to the last valid address loaded via  $\overline{ADS}_x$ .
4. Accesses by the ports into specific banks are controlled by the bank address pins under the user's direct control: each port can access any bank of memory with the shared array that is not currently being accessed by the opposite port (i.e.,  $BA_{0L}$  -  $BA_{5L}$   $\neq$   $BA_{0R}$  -  $BA_{5R}$ ). In the event that both ports try to access the same bank at the same time, neither access will be valid, and data at the two specific addresses targeted by the ports within that bank may be corrupted (in the case that either or both ports are writing) or may result in invalid output (in the case that both ports are trying to read).

Truth Table I—Read/Write and Enable Control<sup>(1,2,3,4)</sup>

<u>OE</u> <sup>3</sup>	CLK	<u>CE</u> <sub>0</sub>	CE1	<u>UB</u>	<u>LB</u>	R/W	Upper Byte I/O <sub>9-17</sub>	Lower Byte I/O <sub>0-8</sub>	MODE
X	↑	H	X	X	X	X	High-Z	High-Z	Deselected—Power Down
X	↑	X	L	X	X	X	High-Z	High-Z	Deselected—Power Down
X	↑	L	H	H	H	X	High-Z	High-Z	All Bytes Deselected
X	↑	L	H	H	L	L	High-Z	DIN	Write to Lower Byte Only
X	↑	L	H	L	H	L	DIN	High-Z	Write to Upper Byte Only
X	↑	L	H	L	L	L	DIN	DIN	Write to both Bytes
L	↑	L	H	H	L	H	High-Z	DOUT	Read Lower Byte Only
L	↑	L	H	L	H	H	DOUT	High-Z	Read UpperByte Only
L	↑	L	H	L	L	H	DOUT	DOUT	Read both Bytes
H	X	X	X	X	X	X	High-Z	High-Z	Outputs Disabled

5629 tbl 02

## NOTES:

1. "H" = V<sub>IH</sub>, "L" = V<sub>IL</sub>, "X" = Don't Care.
2. ADS, CNTEN, REPEAT are set as appropriate for address access. Refer to Truth Table II for details.
3. OE is an asynchronous input signal.
4. It is possible to read or write any combination of bytes during a given access. A few representative samples have been illustrated here.

Truth Table II—Address and Address Counter Control<sup>(1,2,7)</sup>

Address	Previous Address	Addr Used	CLK	<u>ADS</u>	<u>CNTEN</u>	<u>REPEAT</u> <sup>(6)</sup>	I/O <sup>(3)</sup>	MODE
An	X	An	↑	L <sup>(4)</sup>	X	H	D <sub>0</sub> (n)	External Address Used
X	An	An + 1	↑	H	L <sup>(5)</sup>	H	D <sub>0</sub> (n+1)	Counter Enabled—Internal Address generation
X	An + 1	An + 1	↑	H	H	H	D <sub>0</sub> (n+1)	External Address Blocked—Counter disabled (An + 1 reused)
X	X	An	↑	X	X	L <sup>(4)</sup>	D <sub>0</sub> (0)	Counter Set to last valid <u>ADS</u> load

5629 tbl 03

## NOTES:

1. "H" = V<sub>IH</sub>, "L" = V<sub>IL</sub>, "X" = Don't Care.
2. Read and write operations are controlled by the appropriate setting of R/W, CE<sub>0</sub>, CE1, UB/LB and OE.
3. Outputs configured in flow-through output mode: if outputs are in pipelined mode the data out will be delayed by one cycle.
4. ADS and REPEAT are independent of all other memory control signals including CE<sub>0</sub>, CE1 and UB/LB.
5. The address counter advances if CNTEN = V<sub>IL</sub> on the rising edge of CLK, regardless of all other memory control signals including CE<sub>0</sub>, CE1, UB/LB.
6. When REPEAT is asserted, the counter will reset to the last valid address loaded via ADS. This value is not set at power-up: a known location should be loaded via ADS during initialization if desired. Any subsequent ADS access during operations will update the REPEAT address location.
7. The counter includes bank address and internal address. The counter will advance across bank boundaries. For example, if the counter is in Bank 0, at address FFFh, and is advanced one location, it will move to address 0h in Bank 1. By the same token, the counter at FFFh in Bank 63 will advance to 0h in Bank 0. Refer to Timing Waveform of Counter Repeat, page 17. Care should be taken during operation to avoid having both counters point to the same bank (i.e., ensure BA<sub>0L</sub> - BA<sub>5L</sub> ≠ BA<sub>0R</sub> - BA<sub>5R</sub>), as this condition will invalidate the access for both ports. Please refer to the functional description on page 18 for details.

## Recommended Operating Temperature and Supply Voltage<sup>(1)</sup>

Grade	Ambient Temperature	GND	V <sub>DD</sub>
Commercial	0°C to +70°C	0V	3.3V $\pm$ 150mV
Industrial	-40°C to +85°C	0V	3.3V $\pm$ 150mV

5629tbl04

## NOTE:

1. This is the parameter T<sub>A</sub>. This is the "instanton" case temperature.

## Absolute Maximum Ratings<sup>(1)</sup>

Symbol	Rating	Commercial & Industrial	Unit
V <sub>TERM</sub> <sup>(2)</sup>	Terminal Voltage with Respect to GND	-0.5 to +4.6	V
T <sub>BIAS</sub>	Temperature Under Bias	-55 to +125	°C
T <sub>STG</sub>	Storage Temperature	-65 to +150	°C
I <sub>OUT</sub>	DC Output Current	50	mA

5629tbl06

## 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<sub>TERM</sub> must not exceed V<sub>DD</sub> + 150mV for more than 25% of the cycle time or 4ns maximum, and is limited to  $\leq$  20mA for the period of V<sub>TERM</sub>  $\geq$  V<sub>DD</sub> + 150mV.

## Recommended DC Operating Conditions with V<sub>DDQ</sub> at 2.5V

Symbol	Parameter	Min.	Typ.	Max.	Unit
V <sub>DD</sub>	Core Supply Voltage	3.15	3.3	3.45	V
V <sub>DDQ</sub>	I/O Supply Voltage <sup>(3)</sup>	2.4	2.5	2.6	V
V <sub>SS</sub>	Ground	0	0	0	V
V <sub>IH</sub>	Input High Voltage (Address & Control Inputs)	1.7	—	V <sub>DDQ</sub> + 100mV <sup>(2)</sup>	V
V <sub>IH</sub>	Input High Voltage - I/O <sup>(3)</sup>	1.7	—	V <sub>DDQ</sub> + 100mV <sup>(2)</sup>	V
V <sub>IL</sub>	Input Low Voltage	-0.3 <sup>(1)</sup>	—	0.7	V

5629tbl05a

## NOTES:

1. Undershoot of V<sub>IL</sub>  $\geq$  -1.5V for pulse width less than 10ns is allowed.
2. V<sub>TERM</sub> must not exceed V<sub>DDQ</sub> + 100mV.
3. To select operation at 2.5V levels on the I/Os and controls of a given port, the OPT pin for that port must be set to V<sub>IL</sub> (0V), and V<sub>DDQ</sub> for that port must be supplied as indicated above.

## Recommended DC Operating Conditions with V<sub>DDQ</sub> at 3.3V

Symbol	Parameter	Min.	Typ.	Max.	Unit
V <sub>DD</sub>	Core Supply Voltage	3.15	3.3	3.45	V
V <sub>DDQ</sub>	I/O Supply Voltage <sup>(3)</sup>	3.15	3.3	3.45	V
V <sub>SS</sub>	Ground	0	0	0	V
V <sub>IH</sub>	Input High Voltage (Address & Control Inputs) <sup>(3)</sup>	2.0	—	V <sub>DDQ</sub> + 150mV <sup>(2)</sup>	V
V <sub>IH</sub>	Input High Voltage - I/O <sup>(3)</sup>	2.0	—	V <sub>DDQ</sub> + 150mV <sup>(2)</sup>	V
V <sub>IL</sub>	Input Low Voltage	-0.3 <sup>(1)</sup>	—	0.8	V

5629tbl05b

## NOTES:

1. Undershoot of V<sub>IL</sub>  $\geq$  -1.5V for pulse width less than 10ns is allowed.
2. V<sub>TERM</sub> must not exceed V<sub>DDQ</sub> + 150mV.
3. To select operation at 3.3V levels on the I/Os and controls of a given port, the OPT pin for that port must be set to V<sub>IH</sub> (3.3V), and V<sub>DDQ</sub> for that port must be supplied as indicated above.

Capacitance<sup>(1)</sup>

(TA = +25°C, F = 1.0MHz) PQFP ONLY

Symbol	Parameter	Conditions <sup>(2)</sup>	Max.	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>IN</sub> = 3dV	8	pF
C <sub>OUT</sub> <sup>(3)</sup>	Output Capacitance	V <sub>OUT</sub> = 3dV	10.5	pF

5629 tbl 07

## NOTES:

1. These parameters are determined by device characterization, but are not production tested.
2. 3dV references the interpolated capacitance when the input and output switch from 0V to 3V or from 3V to 0V.
3. C<sub>OUT</sub> also references C<sub>IO</sub>.

DC Electrical Characteristics Over the Operating Temperature and Supply Voltage Range (V<sub>DD</sub> = 3.3V ± 150mV)

Symbol	Parameter	Test Conditions	70V7319S		Unit
			Min.	Max.	
I <sub>U</sub>	Input Leakage Current <sup>(1)</sup>	V <sub>DDQ</sub> = Max., V <sub>IN</sub> = 0V to V <sub>DDQ</sub>	—	10	µA
I <sub>LO</sub>	Output Leakage Current <sup>(1)</sup>	CE <sub>0</sub> = V <sub>IH</sub> or CE <sub>1</sub> = V <sub>IL</sub> , V <sub>OUT</sub> = 0V to V <sub>DDQ</sub>	—	10	µA
V <sub>OL</sub> (3.3V)	Output Low Voltage <sup>(2)</sup>	I <sub>OL</sub> = +4mA, V <sub>DDQ</sub> = Min.	—	0.4	V
V <sub>OH</sub> (3.3V)	Output High Voltage <sup>(2)</sup>	I <sub>OH</sub> = -4mA, V <sub>DDQ</sub> = Min.	2.4	—	V
V <sub>OL</sub> (2.5V)	Output Low Voltage <sup>(2)</sup>	I <sub>OL</sub> = +2mA, V <sub>DDQ</sub> = Min.	—	0.4	V
V <sub>OH</sub> (2.5V)	Output High Voltage <sup>(2)</sup>	I <sub>OH</sub> = -2mA, V <sub>DDQ</sub> = Min.	2.0	—	V

5629 tbl 08

## NOTES:

1. At V<sub>DD</sub> ≤ 2.0V leakages are undefined.
2. V<sub>DDQ</sub> is selectable (3.3V/2.5V) via OPT pins. Refer to page 4 for details.

**DC Electrical Characteristics Over the Operating Temperature and Supply Voltage Range<sup>(5)</sup> (V<sub>DD</sub> = 3.3V ± 150mV)**

Symbol	Parameter	Test Condition	Version	70V7319S200 <sup>(7)</sup> Com'l Only		70V7319S166 <sup>(6)</sup> Com'l & Ind		70V7319S133 Com'l & Ind		Unit	
				Typ. <sup>(4)</sup>	Max.	Typ. <sup>(4)</sup>	Max.	Typ. <sup>(4)</sup>	Max.		
I <sub>DD</sub>	Dynamic Operating Current (Both Ports Active)	$\overline{CE}_L = \overline{CE}_R = V_{IL}$ , Outputs Disabled, $f = f_{MAX}^{(1)}$	COM'L	S	815	950	675	790	550	645	mA
			IND	S	—	—	675	830	550	675	
I <sub>SB1</sub>	Standby Current (Both Ports - TTL Level Inputs)	$\overline{CE}_L = \overline{CE}_R = V_{IH}$ $f = f_{MAX}^{(1)}$	COM'L	S	340	410	275	340	250	295	mA
			IND	S	—	—	275	355	250	310	
I <sub>SB2</sub>	Standby Current (One Port - TTL Level Inputs)	$\overline{CE}^A = V_{IL}$ and $\overline{CE}^B = V_{IH}^{(3)}$ Active Port Outputs Disabled, $f=f_{MAX}^{(1)}$	COM'L	S	690	770	515	640	460	520	mA
			IND	S	—	—	515	660	460	545	
I <sub>SB3</sub>	Full Standby Current (Both Ports - CMOS Level Inputs)	Both Ports $\overline{CE}_L$ and $\overline{CE}_R \geq V_{DDQ} - 0.2V$ , $V_{IN} \geq V_{DDQ} - 0.2V$ or $V_{IN} \leq 0.2V$ , $f = 0^{(2)}$	COM'L	S	10	30	10	30	10	30	mA
			IND	S	—	—	10	40	10	40	
I <sub>SB4</sub>	Full Standby Current (One Port - CMOS Level Inputs)	$\overline{CE}^A \leq 0.2V$ and $\overline{CE}^B \geq V_{DDQ} - 0.2V^{(5)}$ $V_{IN} \geq V_{DDQ} - 0.2V$ or $V_{IN} \leq 0.2V$ , Active Port, Outputs Disabled, $f = f_{MAX}^{(1)}$	COM'L	S	690	770	515	640	460	520	mA
			IND	S	—	—	515	660	460	545	

5629 Ibl 09

**NOTES:**

- At  $f=f_{MAX}$ , address and control lines (except Output Enable) are cycling at the maximum frequency clock cycle of 1/t<sub>cyc</sub>, using "AC TEST CONDITIONS" at input levels of GND to 3V.
- $f=0$  means no address, clock, or control lines change. Applies only to input at CMOS level standby.
- Port "A" may be either left or right port. Port "B" is the opposite from port "A".
- $V_{DD} = 3.3V$ ,  $T_A = 25^\circ C$  for Typ, and are not production tested.  $I_{DDC}(f=0) = 120mA$  (Typ).
- $\overline{CE}_X = V_{IL}$  means  $\overline{CE}_{0X} = V_{IL}$  and  $CE_{1X} = V_{IH}$   
 $\overline{CE}_X = V_{IH}$  means  $\overline{CE}_{0X} = V_{IH}$  or  $CE_{1X} = V_{IL}$   
 $\overline{CE}_X \leq 0.2V$  means  $\overline{CE}_{0X} \leq 0.2V$  and  $CE_{1X} \geq V_{DDQ} - 0.2V$   
 $\overline{CE}_X \geq V_{DDQ} - 0.2V$  means  $\overline{CE}_{0X} \geq V_{DDQ} - 0.2V$  or  $CE_{1X} \leq 0.2V$   
"X" represents "L" for left port or "R" for right port.
- 166MHz Industrial Temperature not available in BF-208 package.
- This speed grade available when  $V_{DDQ} = 3.3V$  for a specific port (i.e.,  $OPT_X = V_{IH}$ ). This speed grade available in BC-256 package only.

AC Test Conditions (V<sub>DDQ</sub> - 3.3V/2.5V)

Input Pulse Levels (Address & Controls)	GND to 3.0V/GND to 2.4V
Input Pulse Levels (I/Os)	GND to 3.0V/GND to 2.4V
Input Rise/Fall Times	2ns
Input Timing Reference Levels	1.5V/1.25V
Output Reference Levels	1.5V/1.25V
Output Load	Figures 1 and 2

5629 tbl 10

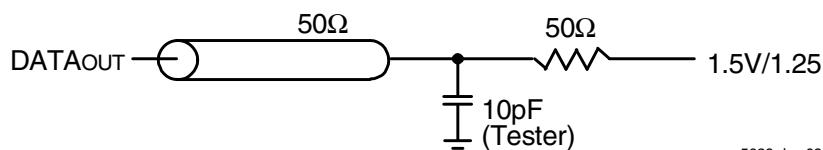
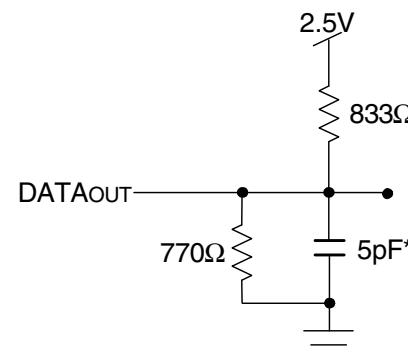
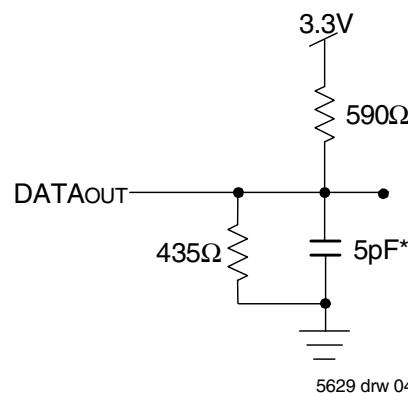


Figure 1. AC Output Test load.

5629 drw 03



5629 drw 04

Figure 2. Output Test Load  
(For t<sub>CKLZ</sub>, t<sub>CKHZ</sub>, t<sub>OLZ</sub>, and t<sub>OHZ</sub>).

\*Including scope and jig.

10.5pF is the I/O capacitance of this device, and 10pF is the AC Test Load Capacitance.

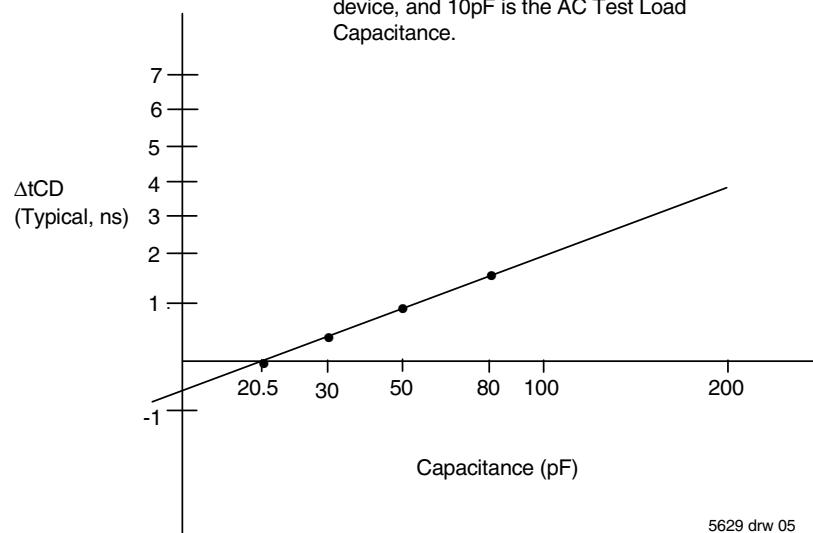


Figure 3. Typical Output Derating (Lumped Capacitive Load).

AC Electrical Characteristics Over the Operating Temperature Range  
(Read and Write Cycle Timing)<sup>(2,3)</sup> (VDD = 3.3V ± 150mV, TA = 0°C to +70°C)

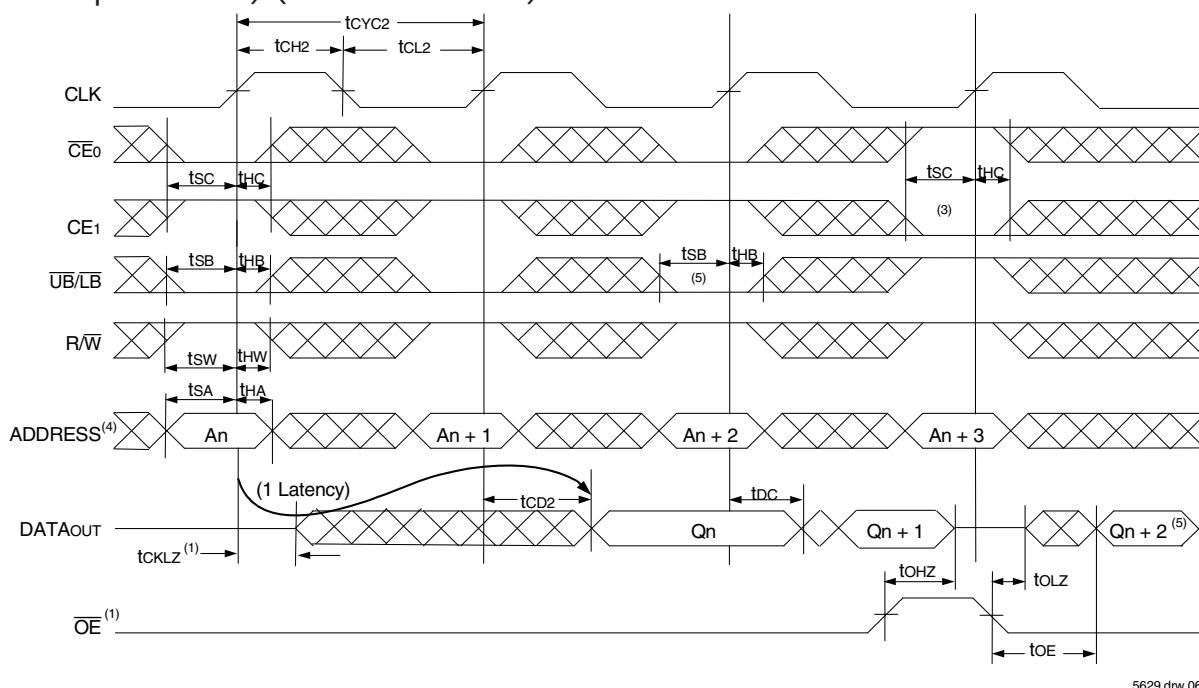
		70V7319S200 <sup>(5)</sup> Com'l Only	70V7319S166 <sup>(3,4)</sup> Com'l & Ind	70V7319S133 <sup>(3)</sup> Com'l & Ind				
Symbol	Parameter	Min.	Max.	Min.	Max.	Min.	Max.	Unit
tCYC1	Clock Cycle Time (Flow-Through) <sup>(1)</sup>	15	—	20	—	25	—	ns
tCYC2	Clock Cycle Time (Pipelined) <sup>(1)</sup>	5	—	6	—	7.5	—	ns
tCH1	Clock High Time (Flow-Through) <sup>(1)</sup>	5	—	6	—	7	—	ns
tCL1	Clock Low Time (Flow-Through) <sup>(1)</sup>	5	—	6	—	7	—	ns
tCH2	Clock High Time (Pipelined) <sup>(2)</sup>	2.0	—	2.1	—	2.6	—	ns
tCL2	Clock Low Time (Pipelined) <sup>(1)</sup>	2.0	—	2.1	—	2.6	—	ns
tR	Clock Rise Time	—	1.5	—	1.5	—	1.5	ns
tF	Clock Fall Time	—	1.5	—	1.5	—	1.5	ns
tSA	Address Setup Time	1.5	—	1.7	—	1.8	—	ns
tHA	Address Hold Time	0.5	—	0.5	—	0.5	—	ns
tSC	Chip Enable Setup Time	1.5	—	1.7	—	1.8	—	ns
tHC	Chip Enable Hold Time	0.5	—	0.5	—	0.5	—	ns
tSB	Byte Enable Setup Time	1.5	—	1.7	—	1.8	—	ns
tHB	Byte Enable Hold Time	0.5	—	0.5	—	0.5	—	ns
tSW	R/W Setup Time	1.5	—	1.7	—	1.8	—	ns
tHW	R/W Hold Time	0.5	—	0.5	—	0.5	—	ns
tSD	Input Data Setup Time	1.5	—	1.7	—	1.8	—	ns
tHD	Input Data Hold Time	0.5	—	0.5	—	0.5	—	ns
tSAD	ADS Setup Time	1.5	—	1.7	—	1.8	—	ns
tHAD	ADS Hold Time	0.5	—	0.5	—	0.5	—	ns
tSCN	CNTEN Setup Time	1.5	—	1.7	—	1.8	—	ns
tHCN	CNTEN Hold Time	0.5	—	0.5	—	0.5	—	ns
tSRPT	REPEAT Setup Time	1.5	—	1.7	—	1.8	—	ns
tHRPT	REPEAT Hold Time	0.5	—	0.5	—	0.5	—	ns
tOE	Output Enable to Data Valid	—	4.0	—	4.0	—	4.2	ns
tOLZ	Output Enable to Output Low-Z	0.5	—	0.5	—	0.5	—	ns
tOHZ	Output Enable to Output High-Z	1	3.4	1	3.6	1	4.2	ns
tCD1	Clock to Data Valid (Flow-Through) <sup>(1)</sup>	—	10	—	12	—	15	ns
tCD2	Clock to Data Valid (Pipelined) <sup>(1)</sup>	—	3.4	—	3.6	—	4.2	ns
tDC	Data Output Hold After Clock High	1	—	1	—	1	—	ns
tCKHZ	Clock High to Output High-Z	1	3.4	1	3.6	1	4.2	ns
tCKLZ	Clock High to Output Low-Z	0.5	—	0.5	—	0.5	—	ns
<b>Port-to-Port Delay</b>								
tCO	Clock-to-Clock Offset	5.0	—	6.0	—	7.5	—	ns

5629tbl11

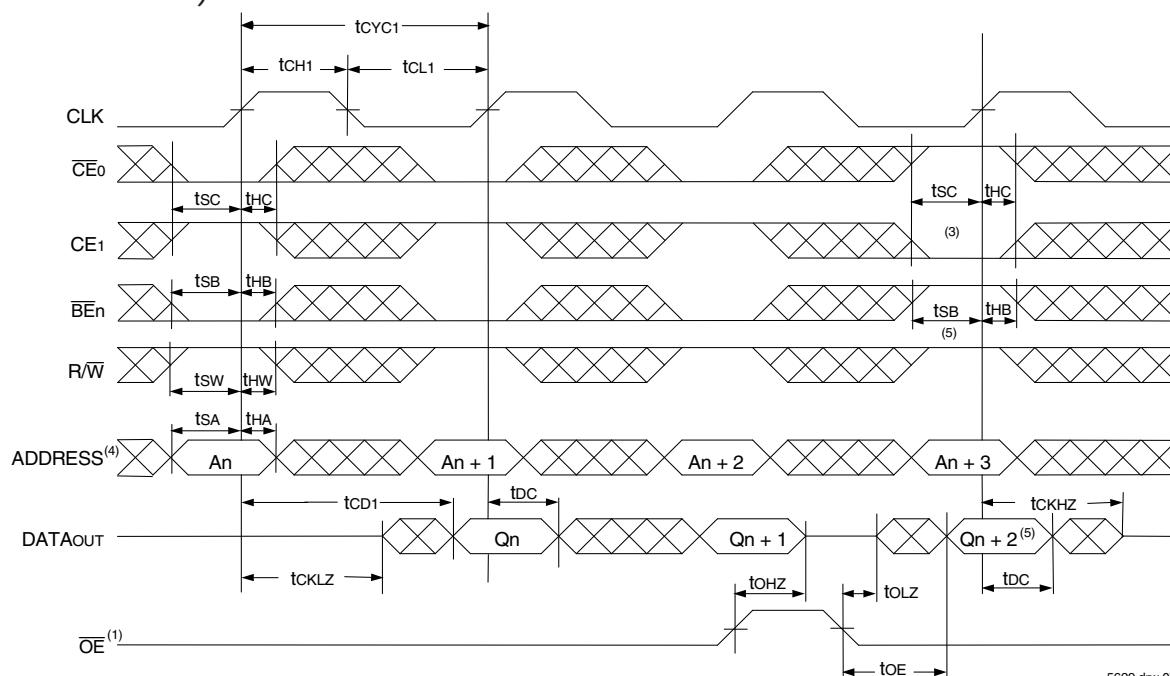
**NOTES:**

1. The Pipelined output parameters (tCYC2, tCD2) apply to either or both left and right ports when  $\overline{FT}/\overline{PIPE}_X = V_{IH}$ . Flow-through parameters (tCYC1, tCD1) apply when  $\overline{FT}/\overline{PIPE}_X = V_{IL}$  for that port.
2. All input signals are synchronous with respect to the clock except for the asynchronous Output Enable ( $\overline{OE}$ ) and  $\overline{FT}/\overline{PIPE}_X$ .  $\overline{FT}/\overline{PIPE}_X$  should be treated as a DC signal, i.e. steady state during operation.
3. These values are valid for either level of VDD (3.3V/2.5V). See page 4 for details on selecting the desired operating voltage levels for each port.
4. 166MHz Industrial Temperature not available in BF-208 package.
5. This speed grade available when VDD = 3.3V for a specific port (i.e., OPTx = V<sub>IL</sub>). This speed grade available in BC-256 package only.

## Timing Waveform of Read Cycle for Pipelined Operation (**ADS** Operation) (PL/**FT**'X' = **VIH**)<sup>(2)</sup>

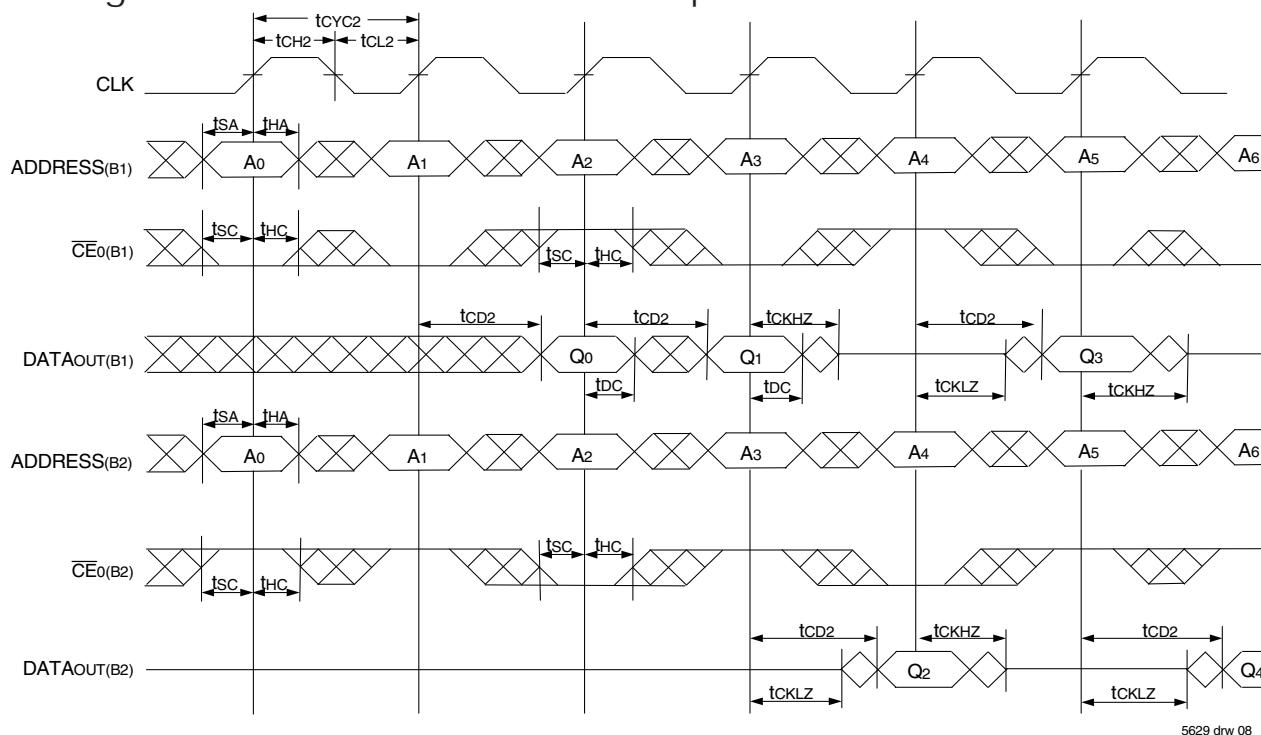
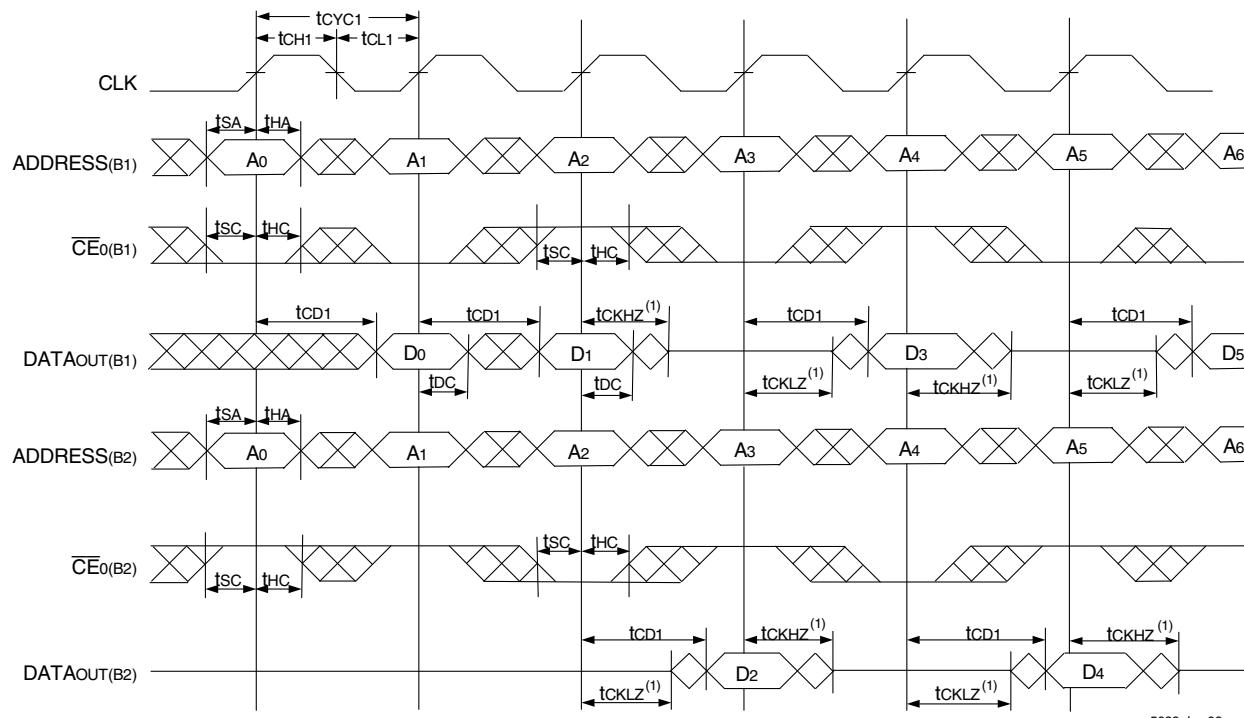


## Timing Waveform of Read Cycle for Flow-through Output (PL/**FT**'X' = **VIL**)<sup>(2,6)</sup>



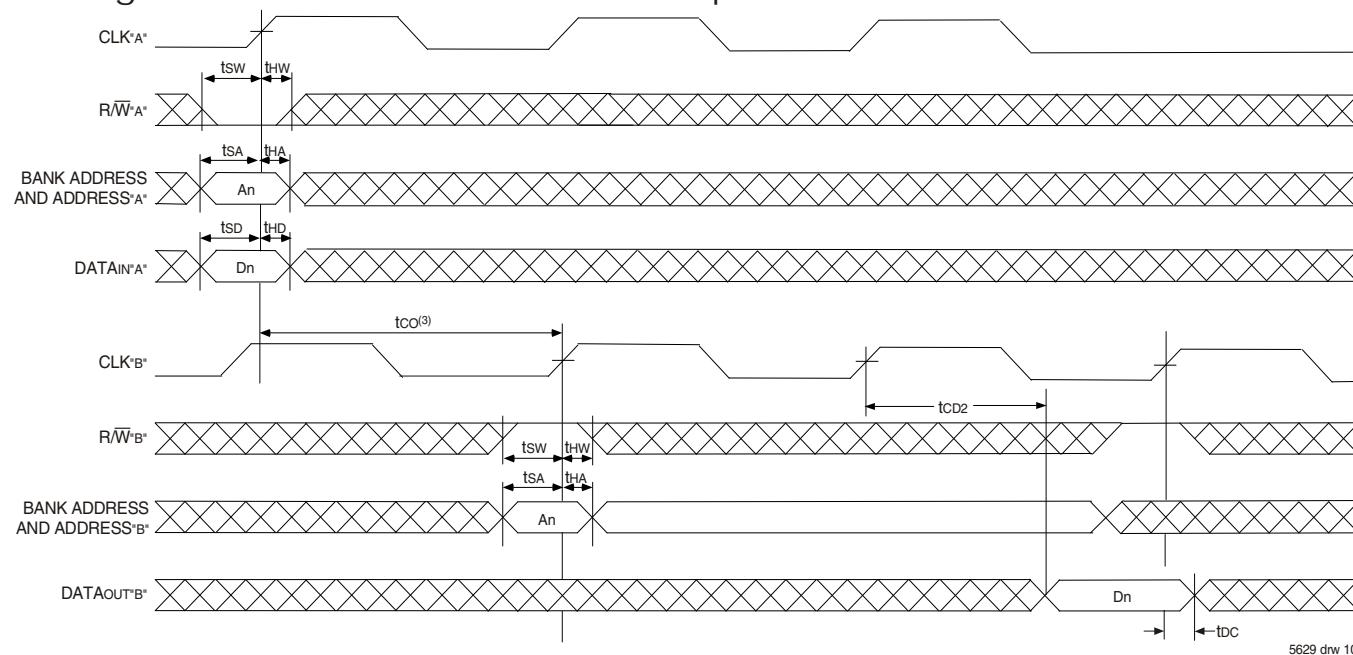
### NOTES:

1.  $\overline{OE}$  is asynchronously controlled; all other inputs are synchronous to the rising clock edge.
2.  $\overline{ADS} = V_{IL}$ ,  $\overline{CNTEN}$  and  $\overline{REPEAT} = V_{IH}$ .
3. The output is disabled (High-Impedance state) by  $\overline{CE0} = V_{IH}$ ,  $CE1 = V_{IL}$ ,  $\overline{UB/LB} = V_{IH}$  following the next rising edge of the clock. Refer to Truth Table 1.
4. Addresses do not have to be accessed sequentially since  $\overline{ADS} = V_{IL}$  constantly loads the address on the rising edge of the CLK; numbers are for reference use only.
5. If  $\overline{UB/LB}$  was HIGH, then the appropriate Byte of DATAout for  $Qn + 2$  would be disabled (High-Impedance state).
6. "x" denotes Left or Right port. The diagram is with respect to that port.

Timing Waveform of a Multi-Device Pipelined Read<sup>(1,2)</sup>Timing Waveform of a Multi-Device Flow-Through Read<sup>(1,2)</sup>

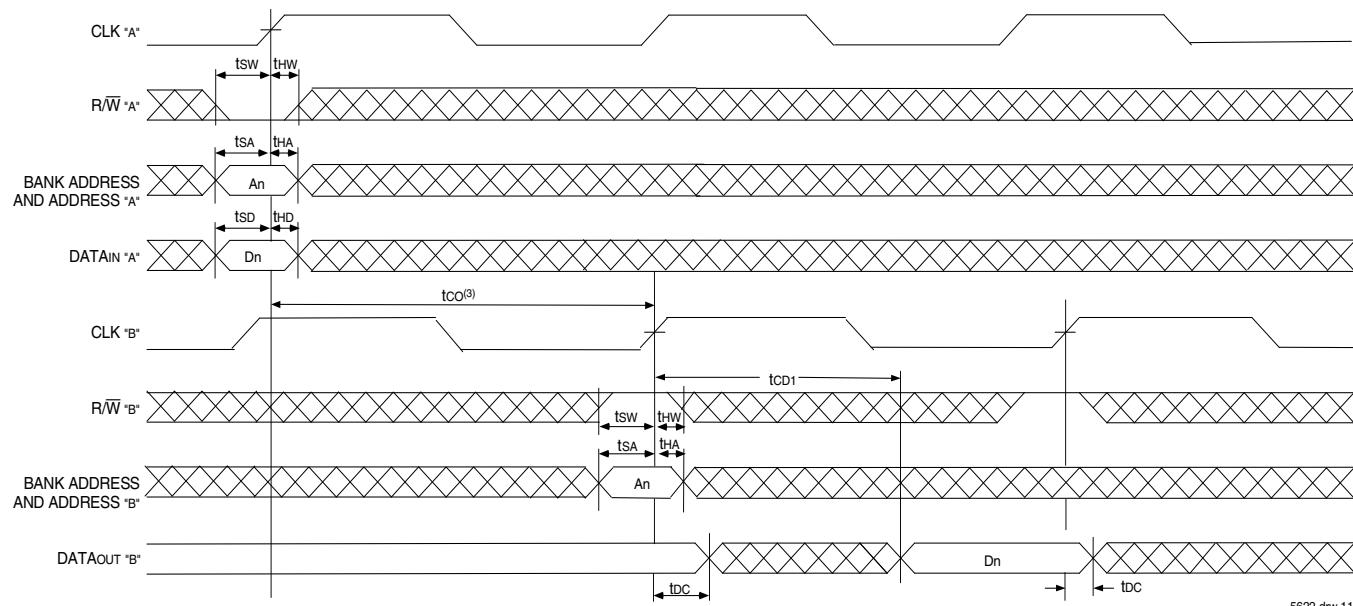
## NOTES:

1. B1 Represents Device #1; B2 Represents Device #2. Each Device consists of one IDT70V7319 for this waveform, and are setup for depth expansion in this example. ADDRESS(B1) = ADDRESS(B2) in this situation.
2.  $\overline{UB}/\overline{LB}$ ,  $\overline{OE}$ , and  $\overline{ADS}$  =  $V_{IL}$ ;  $CE1(B1)$ ,  $CE1(B2)$ ,  $R/W$ ,  $\overline{CNTEN}$ , and  $\overline{REPEAT}$  =  $V_{IH}$ .

Timing Waveform of Port A Write to Pipelined Port B Read<sup>(1,2,4)</sup>

## NOTES:

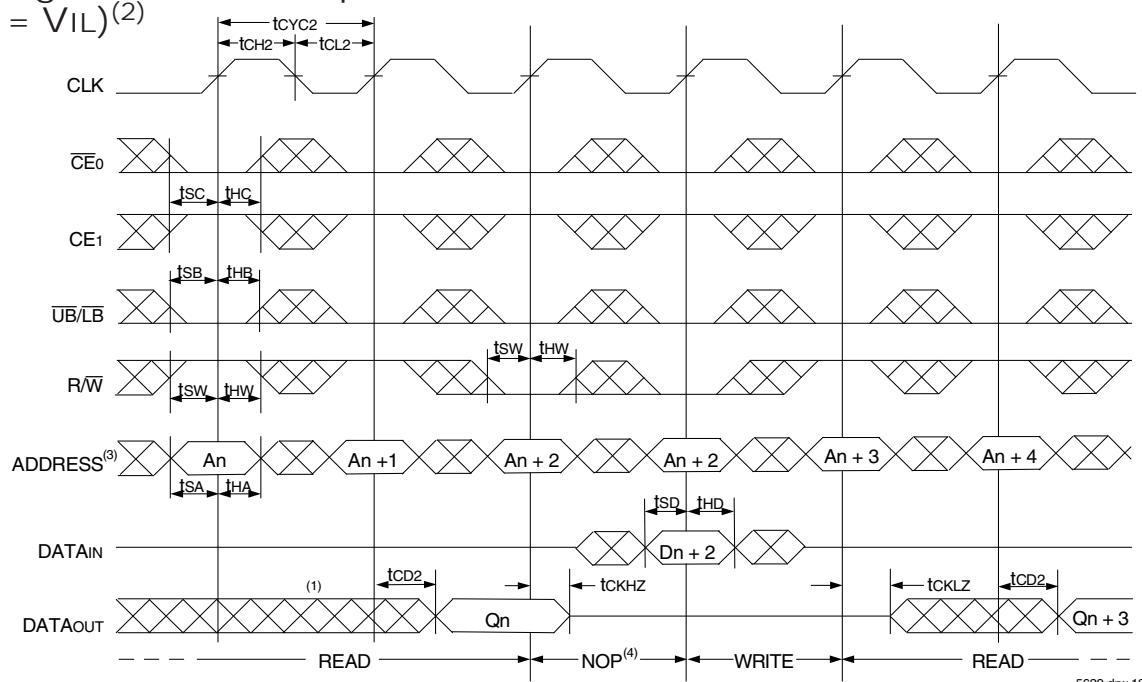
1.  $\overline{CE}_0$ ,  $\overline{BE}_n$ , and  $\overline{ADS} = V_{IL}$ ;  $CE_1$ ,  $\overline{CNTEN}$ , and  $\overline{REPEAT} = V_{IH}$ .
2.  $\overline{OE} = V_{IL}$  for the Right Port, which is being read from.  $\overline{OE} = V_{IH}$  for the Left Port, which is being written to.
3. If  $tco < \text{minimum specified}$ , then operations from both ports are INVALID. If  $tco \geq \text{minimum}$ , then data from Port "B" read is available on first Port "B" clock cycle (i.e., time from write to valid read on opposite port will be  $tco + tCYC + tCD2$ ).
4. All timing is the same for both left and right ports. Port "A" may be either left or right port. Port "B" is the opposite of Port "A".

Timing Waveform with Port-to-Port Flow-Through Read<sup>(1,2,4)</sup>

## NOTES:

1.  $\overline{CE}_0$ ,  $\overline{BE}_n$ , and  $\overline{ADS} = V_{IL}$ ;  $CE_1$ ,  $\overline{CNTEN}$ , and  $\overline{REPEAT} = V_{IH}$ .
2.  $\overline{OE} = V_{IL}$  for the Right Port, which is being read from.  $\overline{OE} = V_{IH}$  for the Left Port, which is being written to.
3. If  $tco < \text{minimum specified}$ , then operations from both ports are INVALID. If  $tco \geq \text{minimum}$ , then data from Port "B" read is available on first Port "B" clock cycle (i.e., time from write to valid read on opposite port will be  $tco + tCD1$ ).
4. All timing is the same for both left and right ports. Port "A" may be either left or right port. Port "B" is the opposite of Port "A".

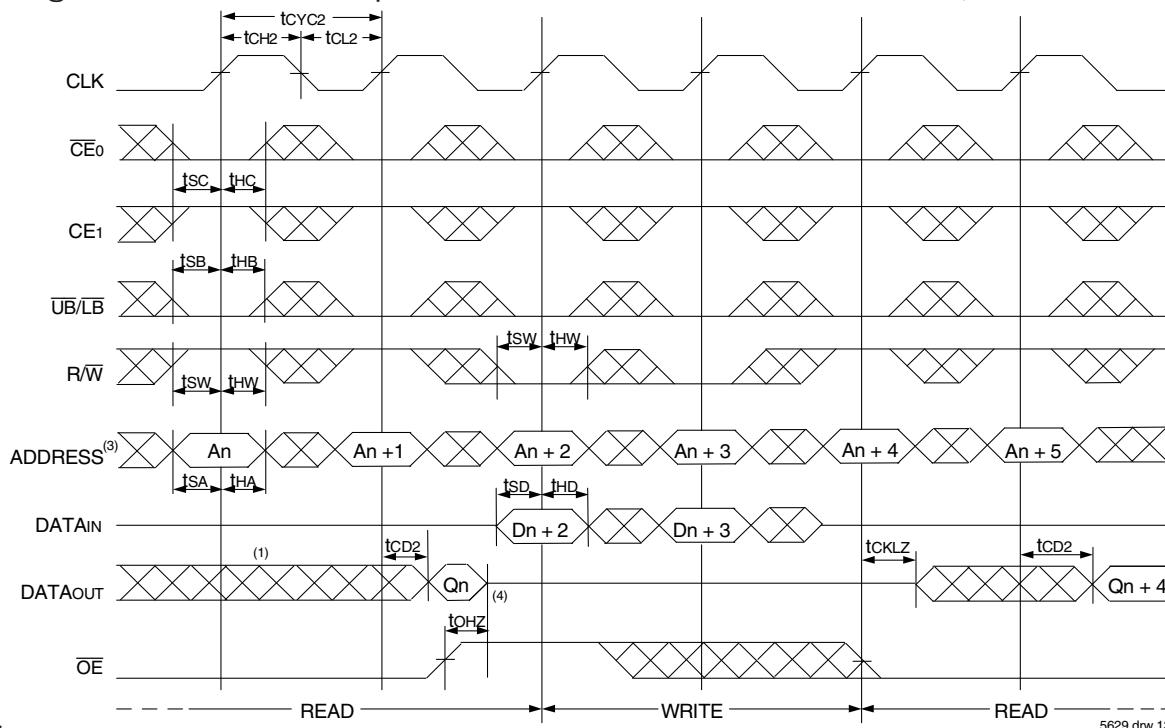
## Timing Waveform of Pipelined Read-to-Write-to-Read ( $\overline{OE} = V_{IL}$ )<sup>(2)</sup>



## NOTES:

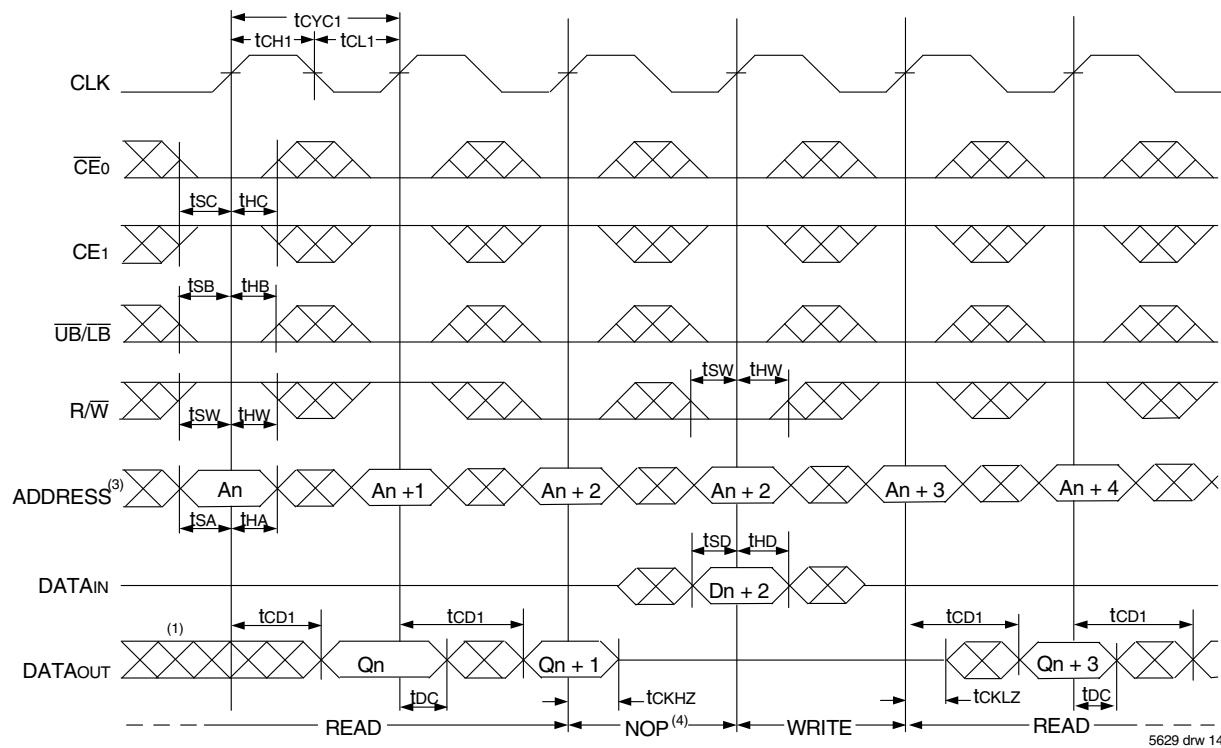
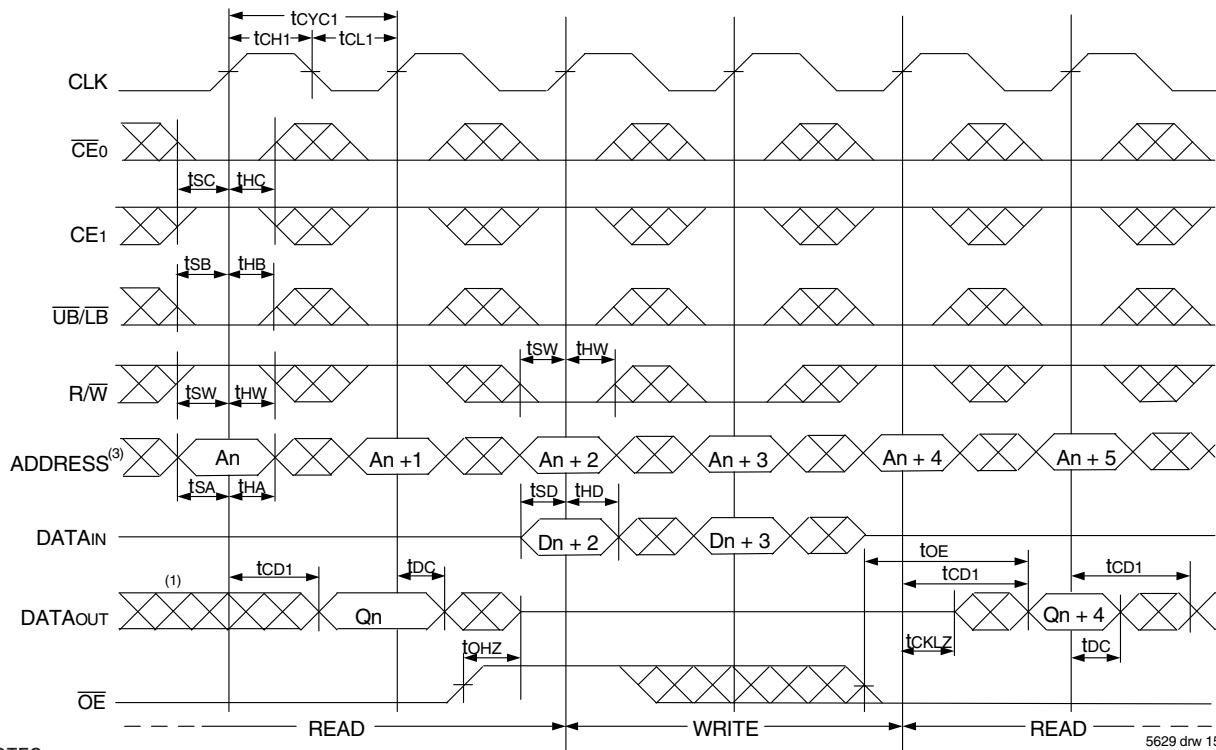
1. Output state (High, Low, or High-impedance) is determined by the previous cycle control signals.
2.  $\overline{CE}_0$ ,  $\overline{UB/LB}$ , and  $\overline{ADS} = V_{IL}$ ;  $\overline{CE}_1$ ,  $\overline{CNTEN}$ , and  $\overline{REPEAT} = V_{IH}$ . "NOP" is "No Operation".
3. Addresses do not have to be accessed sequentially since  $\overline{ADS} = V_{IL}$  constantly loads the address on the rising edge of the CLK; numbers are for reference use only.
4. "NOP" is "No Operation." Data in memory at the selected address may be corrupted and should be rewritten to guarantee data integrity.

## Timing Waveform of Pipelined Read-to-Write-to-Read ( $\overline{OE}$ Controlled)<sup>(2)</sup>



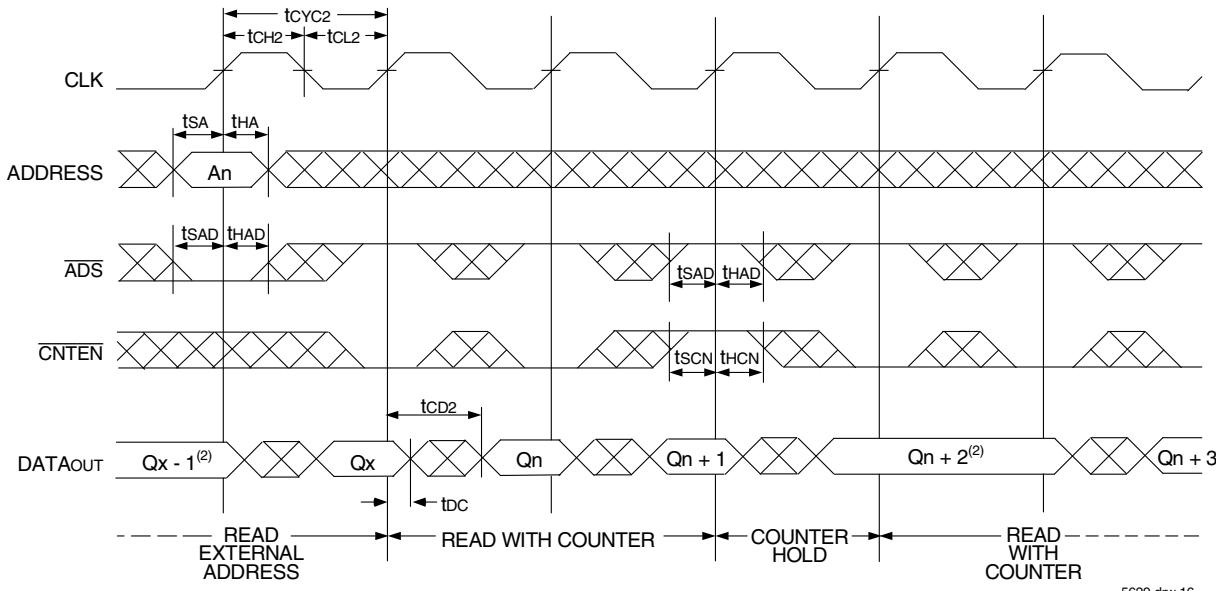
## NOTES:

1. Output state (High, Low, or High-impedance) is determined by the previous cycle control signals.
2.  $\overline{CE}_0$ ,  $\overline{UB/LB}$ , and  $\overline{ADS} = V_{IL}$ ;  $\overline{CE}_1$ ,  $\overline{CNTEN}$ , and  $\overline{REPEAT} = V_{IH}$ .
3. Addresses do not have to be accessed sequentially since  $\overline{ADS} = V_{IL}$  constantly loads the address on the rising edge of the CLK; numbers are for reference use only.
4. This timing does not meet requirements for fastest speed grade. This waveform indicates how logically it could be done if timing so allows.

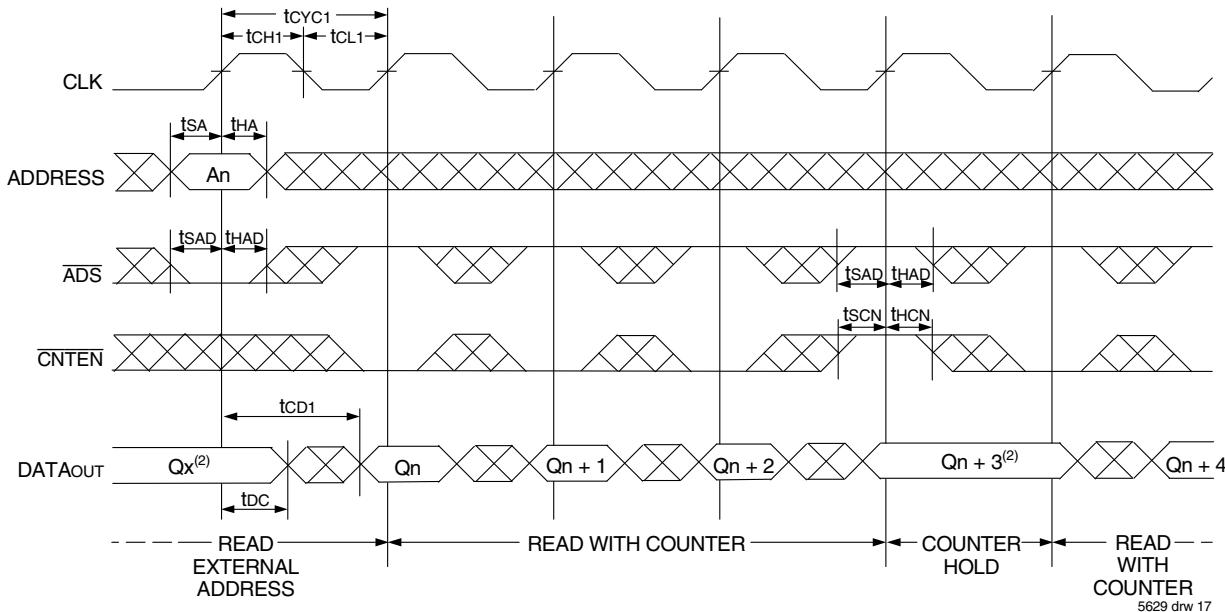
Timing Waveform of Flow-Through Read-to-Write-to-Read ( $\overline{OE} = V_{IL}$ )<sup>(2)</sup>Timing Waveform of Flow-Through Read-to-Write-to-Read ( $\overline{OE}$  Controlled)<sup>(2)</sup>

## NOTES:

1. Output state (High, Low, or High-impedance) is determined by the previous cycle control signals.
2.  $\overline{CE}_0$ ,  $\overline{UB/LB}$ , and  $\overline{ADS} = V_{IL}$ ;  $CE_1$ ,  $CNTEN$ , and  $REPEAT = V_{IH}$ .
3. Addresses do not have to be accessed sequentially since  $\overline{ADS} = V_{IL}$  constantly loads the address on the rising edge of the CLK; numbers are for reference use only.
4. "NOP" is "No Operation." Data in memory at the selected address may be corrupted and should be rewritten to guarantee data integrity.

Timing Waveform of Pipelined Read with Address Counter Advance<sup>(1)</sup>

5629 drw 16

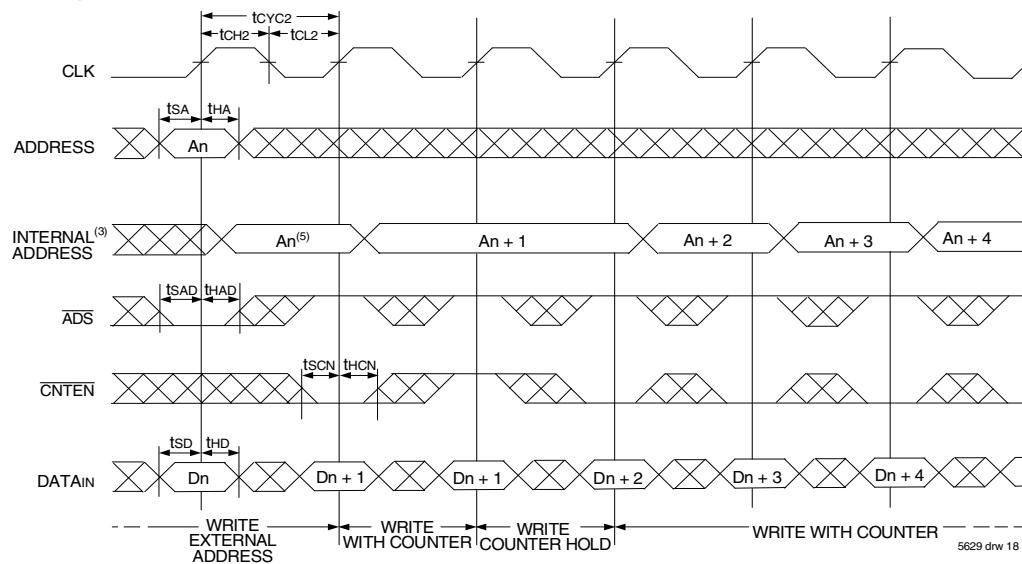
Timing Waveform of Flow-Through Read with Address Counter Advance<sup>(1)</sup>

5629 drw 17

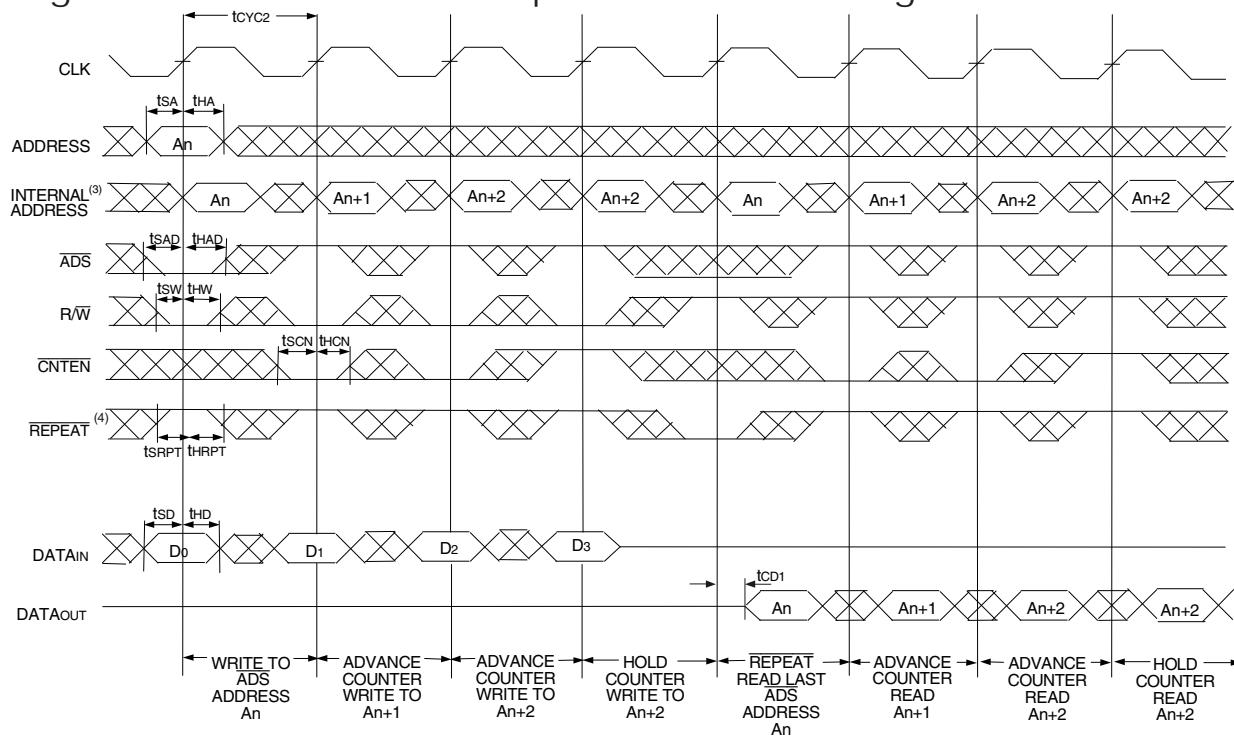
## NOTES:

1.  $\overline{CE}_0$ ,  $\overline{OE}$ ,  $\overline{UB/LB}$  =  $V_{IL}$ ;  $CE_1$ ,  $R/W$ , and  $\overline{REPEAT}$  =  $V_{IH}$ .
2. If there is no address change via  $\overline{ADS} = V_{IL}$  (loading a new address) or  $\overline{CNTEN} = V_{IL}$  (advancing the address), i.e.  $\overline{ADS} = V_{IH}$  and  $\overline{CNTEN} = V_{IH}$ , then the data output remains constant for subsequent clocks.

## Timing Waveform of Write with Address Counter Advance (Flow-through or Pipelined Inputs)<sup>(1,6)</sup>



## Timing Waveform of Counter Repeat for Flow Through Mode<sup>(2,6,7)</sup>



### NOTES:

1.  $\overline{CE}_0$ ,  $\overline{UB/LB}$ , and  $\overline{R/W} = V_{IL}$ ;  $CE_1$  and  $\overline{REPEAT} = V_{IH}$ .
2.  $\overline{CE}_0$ ,  $\overline{UB/LB} = V_{IL}$ ;  $CE_1 = V_{IH}$ .
3. The "Internal Address" is equal to the "External Address" when  $\overline{ADS} = V_{IL}$  and equals the counter output when  $\overline{ADS} = V_{IH}$ .
4. No dead cycle exists during REPEAT operation. A READ or WRITE cycle may be coincidental with the counter REPEAT cycle: Address loaded by last valid ADS load will be accessed. For more information on REPEAT function refer to Truth Table II.
5. CNTEN =  $V_{IL}$  Advances Internal Address from 'An' to 'An+1'. The transition shown indicates the time required for the counter to advance. The 'An+1' Address is written to during this cycle.
6. The counter includes bank address and internal address. The counter will advance across bank boundaries. For example, if the counter is in Bank 0, at address FFFh, and is advanced one location, it will move to address 0h in Bank 1. By the same token, the counter at FFFh in Bank 63 will advance to 0h in Bank 0.
7. For Pipelined Mode user should add 1 cycle latency for outputs as per timing waveform of read cycle for pipelined operations.

## Functional Description

The IDT70V7319 is a high-speed 256Kx18 (4 Mbit) synchronous Bank-Switchable Dual-Ported SRAM organized into 64 independent 4Kx18 banks. Based on a standard SRAM core instead of a traditional true dual-port memory core, this bank-switchable device offers the benefits of increased density and lower cost-per-bit while retaining many of the features of true dual-ports. These features include simultaneous, random access to the shared array, separate clocks per port, 166 MHz operating speed, full-boundary counters, and pinouts compatible with the IDT70V3319 (256Kx18) dual-port family.

The two ports are permitted independent, simultaneous access into separate banks within the shared array. Access by the ports into specific banks are controlled by the bank address pins under the user's direct control: each port can access any bank of memory with the shared array that is not currently being accessed by the opposite port (i.e., BA0L - BA5L  $\neq$  BA0R - BA5R). In the event that both ports try to access the same bank at the same time, neither access will be valid, and data at the two specific addresses targeted by the ports within that bank may be corrupted (in the case that either or both ports are writing) or may result in invalid output (in the case that both ports are trying to read).

The IDT70V7319 provides a true synchronous Dual-Port Static RAM

interface. Registered inputs provide minimal setup and hold times on address, data and all critical control inputs.

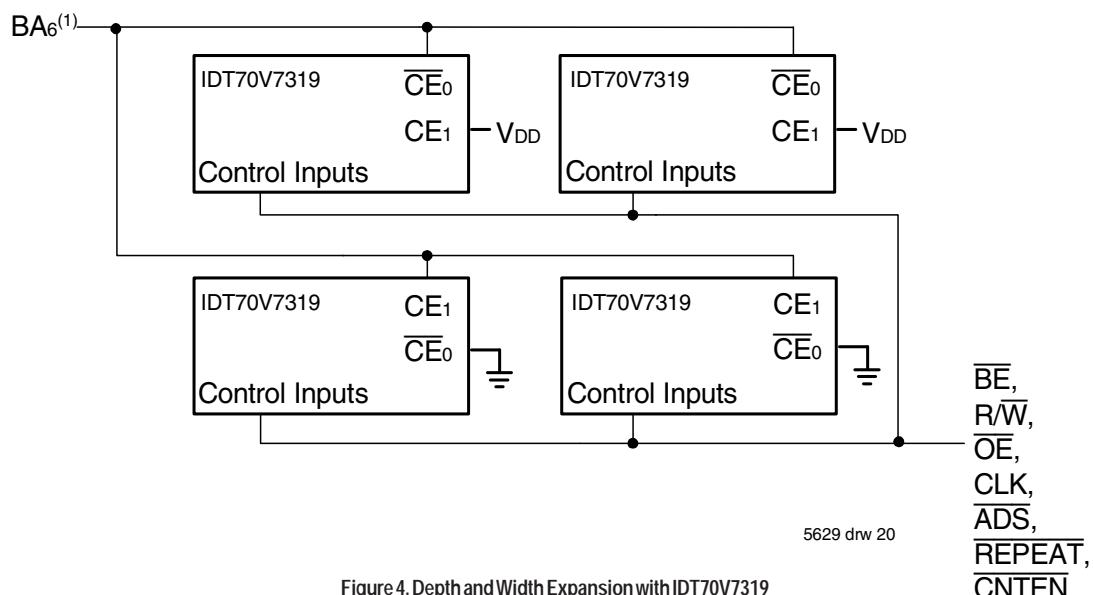
An asynchronous output enable is provided to ease asynchronous bus interfacing. Counter enable inputs are also provided to stall the operation of the address counters for fast interleaved memory applications.

A HIGH on  $\overline{CE}_0$  or a LOW on  $CE_1$  for one clock cycle will power down the internal circuitry on each port (individually controlled) to reduce static power consumption. Dual chip enables allow easier banking of multiple IDT70V7319s for depth expansion configurations. Two cycles are required with  $\overline{CE}_0$  LOW and  $CE_1$  HIGH to read valid data on the outputs.

## Depth and Width Expansion

The IDT70V7319 features dual chip enables (refer to Truth Table I) in order to facilitate rapid and simple depth expansion with no requirements for external logic. Figure 4 illustrates how to control the various chip enables in order to expand two devices in depth.

The IDT70V7319 can also be used in applications requiring expanded width, as indicated in Figure 4. Through combining the control signals, the devices can be grouped as necessary to accommodate applications needing 36-bits or wider.

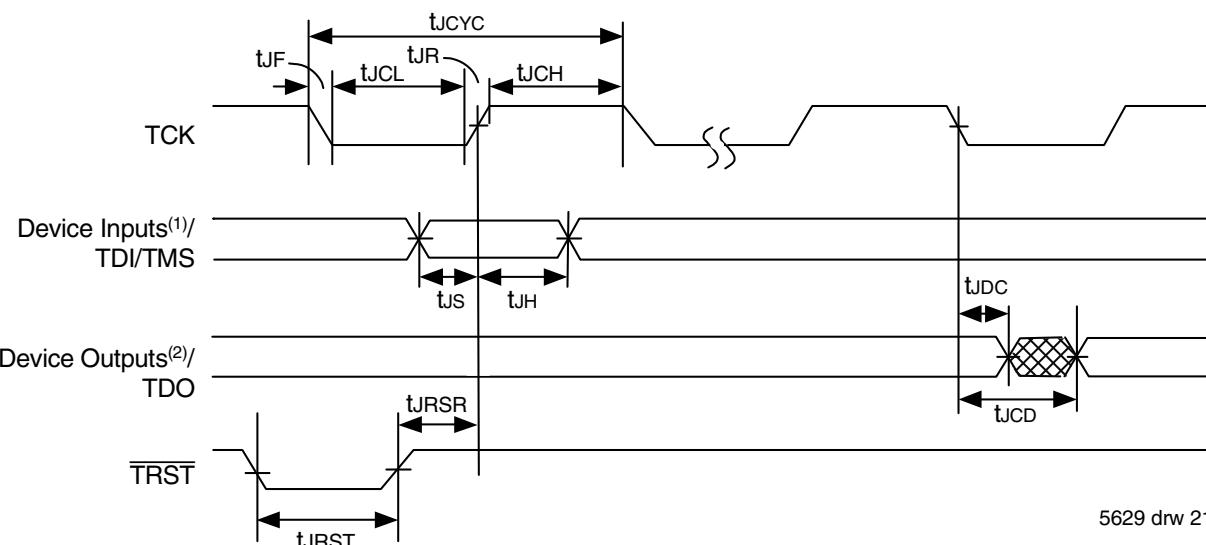


**NOTE:**

NOTE:

1. In the case of depth expansion, the additional address pin logically serves as an extension of the bank address. Accesses by the ports into specific banks are controlled by the bank address pins under the user's direct control: each port can access any bank of memory within the shared array that is not currently being accessed by the opposite port (i.e.,  $BA_{0L} - BA_{6L} \neq BA_{0R} - BA_{6R}$ ). In the event that both ports try to access the same bank at the same time, neither access will be valid, and data at the two specific addresses targeted by the parts within that bank may be corrupted (in the case that either or both parts are writing) or may result in invalid output (in the case that both ports are trying to read).

## JTAG Timing Specifications



## NOTES:

1. Device inputs = All device inputs except TDI, TMS, TRST, and TCK.
2. Device outputs = All device outputs except TDO.

JTAG AC Electrical Characteristics<sup>(1,2,3,4)</sup>

Symbol	Parameter	70V7319		
		Min.	Max.	Units
tJCYC	JTAG Clock Input Period	100	—	ns
tJCH	JTAG Clock HIGH	40	—	ns
tJCL	JTAG Clock Low	40	—	ns
tJR	JTAG Clock Rise Time	—	3 <sup>(1)</sup>	ns
tJF	JTAG Clock Fall Time	—	3 <sup>(1)</sup>	ns
tURST	JTAG Reset	50	—	ns
tURSR	JTAG Reset Recovery	50	—	ns
tJCD	JTAG Data Output	—	25	ns
tJDC	JTAG Data Output Hold	0	—	ns
tJS	JTAG Setup	15	—	ns
tJH	JTAG Hold	15	—	ns

5629 tbl 12

## NOTES:

1. Guaranteed by design.
2. 30pF loading on external output signals.
3. Refer to AC Electrical Test Conditions stated earlier in this document.
4. JTAG operations occur at one speed (10MHz). The base device may run at any speed specified in this datasheet.

## Identification Register Definitions

Instruction Field	Value	Description
Revision Number (31:28)	0x0	Reserved for version number
IDT Device ID (27:12)	0x309	Defines IDT part number
IDT JEDEC ID (11:1)	0x33	Allows unique identification of device vendor as IDT
ID Register Indicator Bit (Bit 0)	1	Indicates the presence of an ID register

5629 tbl 13

## Scan Register Sizes

Register Name	Bit Size
Instruction (IR)	4
Bypass (BYR)	1
Identification (IDR)	32
Boundary Scan (BSR)	Note (3)

5629 tbl 14

## System Interface Parameters

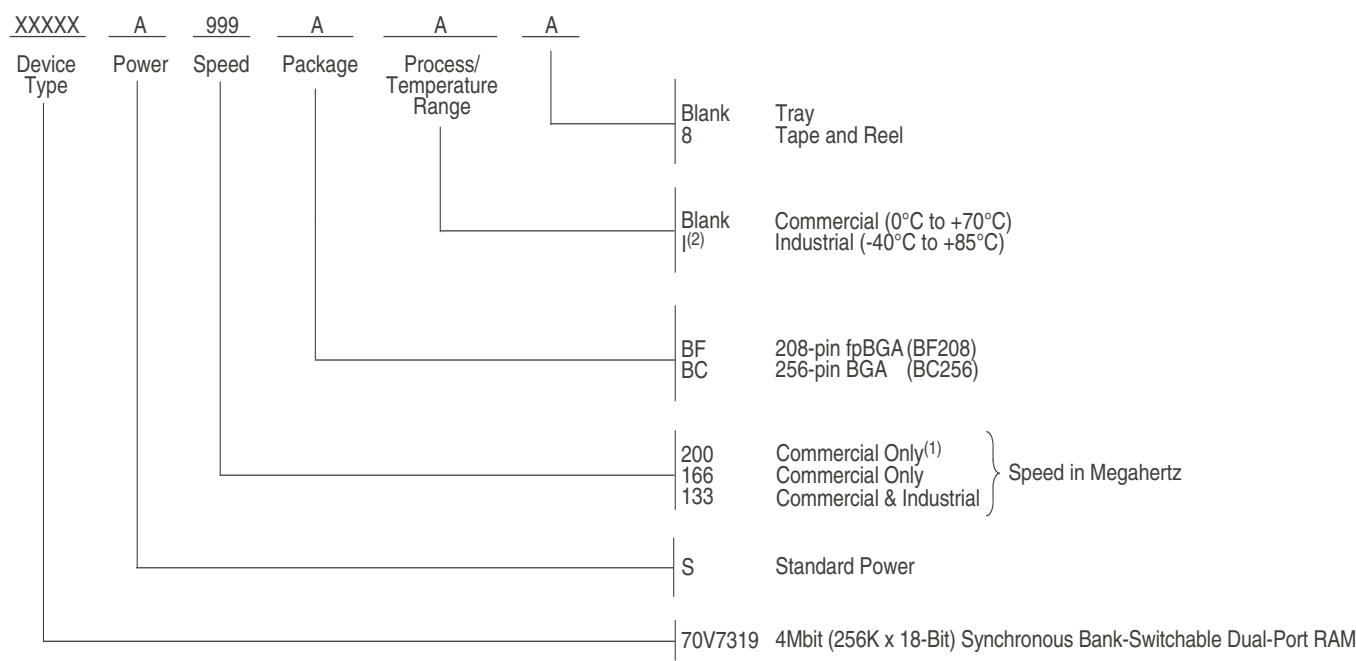
Instruction	Code	Description
EXTEST	0000	Forces contents of the boundary scan cells onto the device outputs <sup>(1)</sup> . Places the boundary scan register (BSR) between TDI and TDO.
BYPASS	1111	Places the bypass register (BYR) between TDI and TDO.
IDCODE	0010	Loads the ID register (IDR) with the vendor ID code and places the register between TDI and TDO.
HIGHZ	0100	Places the bypass register (BYR) between TDI and TDO. Forces all device output drivers to a High-Z state.
CLAMP	0011	Uses BYR. Forces contents of the boundary scan cells onto the device outputs. Places the bypass register (BYR) between TDI and TDO.
SAMPLE/PRELOAD	0001	Places the boundary scan register (BSR) between TDI and TDO. SAMPLE allows data from device inputs <sup>(2)</sup> and outputs <sup>(1)</sup> to be captured in the boundary scan cells and shifted serially through TDO. PRELOAD allows data to be input serially into the boundary scan cells via the TDI.
RESERVED	All other codes	Several combinations are reserved. Do not use codes other than those identified above.

5629 tbl 15

## NOTES:

1. Device outputs = All device outputs except TDO.
2. Device inputs = All device inputs except TDI, TMS, TRST, and TCK.
3. The Boundary Scan Descriptive Language (BSDL) file for this device is available on the IDT website ([www.idt.com](http://www.idt.com)), or by contacting your local IDT sales representative.

## Ordering Information



5629 drw 22

## NOTES:

1. Available in BC-256 package only.
2. Contact your local sales office for industrial temp range for other speeds, packages and powers.

Note that information regarding recently obsoleted parts are included in this datasheet for customer convenience.

## Orderable Part Information

Speed (MHz)	Orderable Part ID	Pkg. Code	Pkg. Type	Temp. Grade
133	70V7319S133BC	BC256	CABGA	C
	70V7319S133BC8	BC256	CABGA	C
	70V7319S133BF	BF208	CABGA	C
	70V7319S133BF8	BF208	CABGA	C
	70V7319S133BF1	BF208	CABGA	I
	70V7319S133BF18	BF208	CABGA	I
166	70V7319S166BC	BC256	CABGA	C
	70V7319S166BC8	BC256	CABGA	C
	70V7319S166BF	BF208	CABGA	C
	70V7319S166BF8	BF208	CABGA	C
200	70V7319S200BC	BC256	CABGA	C
	70V7319S200BC8	BC256	CABGA	C

## Datasheet Document History

01/05/00: Initial Public Offering

06/20/01: Page 1 Added JTAG information for TQFP package  
Page 4 & 22 Changed TQFP package from DA to DD  
Corrected Pin number on TQFP package from 100 to 110  
Page 20 Increased  $t_{CO}$  from 20ns to 25ns

08/06/01: Page 4 Changed body size for DD package from 22mm x 22mm x 1.6mm to 20mm x 20mm x 1.4mm  
Page 9 Changed  $I_{SB3}$  values for commercial and industrial DC Electrical Characteristics

11/20/01: Page 2, 3 & 4 Added date revision for pin configurations  
Page 11 Changed  $t_{OE}$  value in AC Electrical Characteristics, please refer to Errata #SMEN-01-05  
Page 1 & 22 Replaced  $\text{TM}$  logo with  $\text{TM}$  logo

03/18/02: Page 1, 9, 11 & 22 Added 200MHz specification  
Page 9 Tightened power numbers in DC Electrical Characteristics  
Page 14 Changed waveforms to show INVALID operation if  $t_{CO} < \text{minimum specified}$   
Page 1 - 22 Removed "Preliminary" status

12/04/02: Page 9, 11 & 22 Designated 200Mhz speed grade available in BC-256 package only

01/16/04: Page 11 Added byte enable setup time and byte enable hold time parameters and values to all speed grades in the AC Electrical Characteristics Table

07/25/08: Page 9 Corrected a typo in the DC Chars table

01/29/09: Page 22 Removed "IDT" from orderable part number

04/20/10: Page 1 Added green availability to features  
Page 21 Added green indicator to ordering information  
Removed the DD 144-pin TQFP (DD-144) Thin Quad Flatpack per PDN: F-08-01

06/15/15: Page 2, & 21 The package code for BF-208 changed to BF208 to match the standard package codes  
Page 2 & 3 Removed the date from all of the pin configurations BF208 & BC256  
Page 21 Added T&R indicator and updated footnotes to Ordering Information

06/22/18: Product Discontinuation Notice - PDN# SP-17-02  
Last time buy expires June 15, 2018

10/17/19: Page 2 & 3 Updated package codes  
Page 21 Added Orderable Part Information

## Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.
  - "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.
  - "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.

6. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
7. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
9. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
10. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
11. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.4.0-1 November 2017)

## Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

## Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:  
[www.renesas.com/contact/](http://www.renesas.com/contact/)

## Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.