Integrated Device Technology, Inc.

HIGH-SPEED BiCMOS ECL STATIC RAM 4K (1K x 4-BIT) SRAM

PRELIMINARY
IDT10474
IDT100474
IDT101474

FEATURES:

- 1024-words x 4-bit organization
- Address access time: 7/8/10/15 ns
- Low power dissipation: 600mW (typ.)
- Guaranteed Output Hold time
- Fully compatible with ECL logic levels
- Separate data input and output
- Traditional corner-power pinout
- Standard through-hole and surface mount packages

DESCRIPTION:

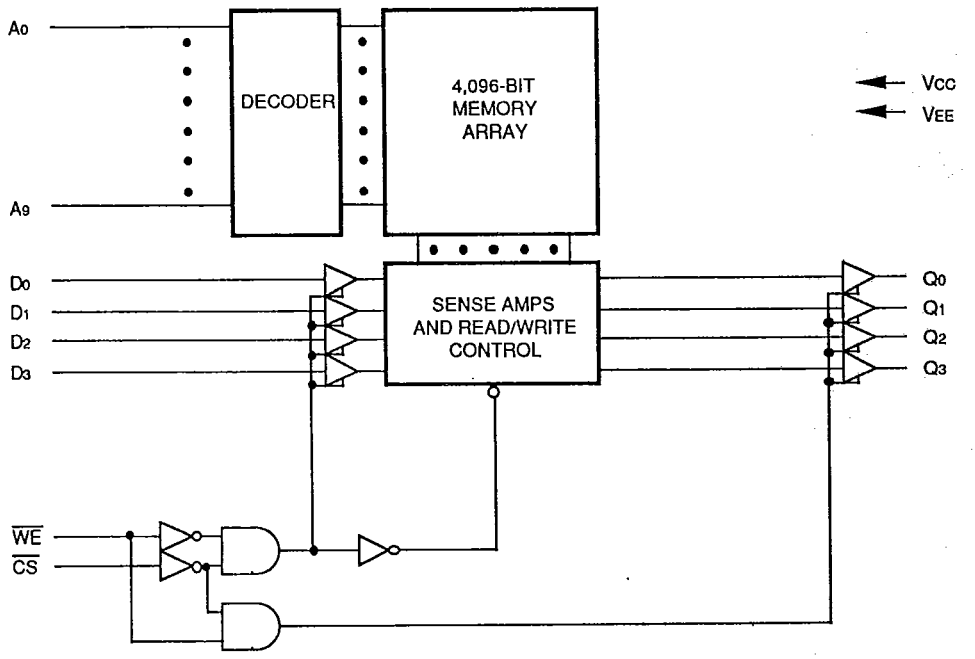
The IDT10474, IDT100474 and 101474 are 4,096-bit high-speed BiCEMOS™ ECL static random access memories organized as 1Kx4, with separate data inputs and outputs. All I/Os are fully compatible with ECL levels.

These devices are part of a family of asynchronous four-bit-wide ECL SRAMs. This device have been configured to follow the traditional corner-power pinout. Because they are manufactured in BiCEMOS™ technology, however, power dissipation is greatly reduced over equivalent bipolar devices.

The asynchronous SRAMs are the most straightforward to use because no additional clocks or controls are required: DataOUT is available an access time after the last change of address. To write data into the device requires the creation of a Write Pulse, and the write cycle disables the output pins in conventional fashion.

The fast access time and guaranteed Output Hold time allow greater margin for system timing variation. DataIN setup time specified with respect to the trailing edge of Write Pulse eases write timing allowing balanced Read and Write cycle times.

FUCNTIONAL BLOCK DIAGRAM



2758 drw 01

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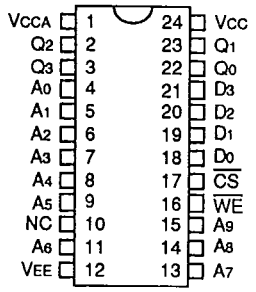
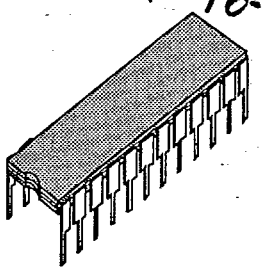
PIN CONFIGURATION



2758 drw 02

TOP VIEW



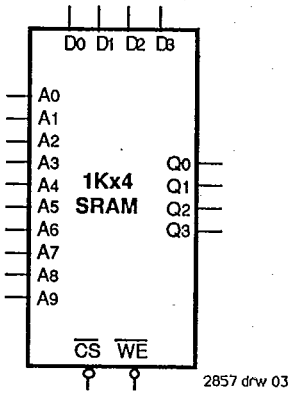
400-Mil-Wide
CERDIP PACKAGE
D24

PIN DESCRIPTIONS

Symbol	Pin Name
A0 through A9	Address Inputs
D0 through D3	Data Inputs
Q0 through Q3	Data Outputs
$\overline{WE}$	Write Enable
$\overline{CS}$	Chip Select Input (Internal pull down)
VEE	More Negative Supply Voltage
VCC	Less Negative Supply Voltage

2758 tbl 01

LOGIC SYMBOL



2857 drw 03

B

AC OPERATING RANGES(1)

I/O	VEE	Temperature
10K	-5.2V ± 5%	0 to 75°C, air flow exceeding 2 m/sed
100K	-4.5V ± 5%	0 to 85°C, air flow exceeding 2 m/sed
101K	-4.75V ± -5.46V	0 to 75°C, air flow exceeding 2 m/sed

NOTE:
1. Referenced to Vcc.

2758 tbl 02

CAPACITANCE (TA=+25°C, f=1.0MHz)

Symbol	Parameter	DIP Typ.	DIP Max.	Unit
CIN	Input Capacitance	4	—	pF
COUT	Output Capacitance	6	—	pF

2758 tbl 03

TRUTH TABLE(1)

$\overline{CS}$	$\overline{WE}$	DATAOUT	FUNCTION
H	X	L	Deselected
L	H	RAM Data	Read
L	L	L	Write

NOTE:
1. H=High, L=Low, X=Don't Care

2758 tbl 04

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ECL-10K ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Rating		Value	Unit
V_{TERM}	Terminal Voltage With Respect to GND		+0.5 to -7.0	V
T_A	Operating Temperature		0 to +75	°C
T_{BIAS}	Temperature Under Bias		-55 to +125	°C
T_{STG}	Storage Temperature	Ceramic	-65 to +150	°C
		Plastic	-55 to +125	
P_T	Power Dissipation		1.5	W
I_{OUT}	DC Output Current (Output High)		-50	mA

2758 tbl 05

NOTE:
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.

ECL-10K DC ELECTRICAL CHARACTERISTICS

(V_{EE} = -5.2V, R_L=50Ω to -2.0V, T_A = 0 to +75°C, air flow exceeding 2 m/sec)

Symbol	Parameter	Test Conditions		Min. (B)	Typ.(1)	Max. (A)	Unit	T_A
V_{OH}	Output HIGH Voltage	$V_{IN} = V_{IHA}$ or V_{ILB}		-1000 -960 -900	-885	-840 -810 -720	mV	0°C 25°C 75°C
V_{OL}	Output LOW Voltage	$V_{IN} = V_{IHA}$ or V_{ILB}		-1870 -1850 -1830	–	-1665 -1650 -1625	mV	0°C 25°C 75°C
V_{OHC}	Output Threshold HIGH Voltage	$V_{IN} = V_{IHB}$ or V_{ILA}		-1020 -980 -920	–	–	mV	0°C 25°C 75°C
V_{OLC}	Output Threshold LOW Voltage	$V_{IN} = V_{IHB}$ or V_{ILA}		–	–	-1645 -1630 -1605	mV	0°C 25°C 75°C
V_{IH}	Input HIGH Voltage	Guaranteed Input Voltage High for All Inputs		-1145 -1105 -1045	–	-840 -810 -720	mV	0°C 25°C 75°C
V_{IL}	Input LOW Voltage	Guaranteed Input Voltage Low for All Inputs		-1870 -1850 -1830	–	-1490 -1475 -1450	mV	0°C 25°C 75°C
I_{IH}	Input HIGH Current	$V_{IN} = V_{IHA}$	$\overline{CS}$	–	–	220	µA	–
			Others	–	–	110	µA	–
I_{IL}	Input LOW Current	$V_{IN} = V_{ILB}$	$\overline{CS}$	0.5	–	170	µA	–
			Others	-50	–	90	µA	–
I_{EE}	Supply Current	All Inputs and Outputs Open		-190	-130	–	mA	–

2758 tbl 06

NOTE:
1. Typical parameters are specified at V_{EE} = -5.2V, T_A = +25°C and maximum loading.

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ECL-100K ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Rating		Value	Unit
V_{TERM}	Terminal Voltage With Respect to GND		+0.5 to -7.0	V
T_A	Operating Temperature		0 to +85	°C
T_{BIAS}	Temperature Under Bias		-55 to +125	°C
T_{STG}	Storage Temperature	Ceramic	-65 to +150	°C
		Plastic	-55 to +125	
P_T	Power Dissipation		1.5	W
I_{OUT}	DC Output Current (Output High)		-50	mA

2758 tbl 07

NOTE:
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.

ECL-100K DC ELECTRICAL CHARACTERISTICS

(V_{EE} = -4.5V, R_L = 50Ω to -2.0V, T_A = 0 to +85°C, air flow exceeding 2 m/sec)

Symbol	Parameter	Test Conditions		Min. (B)	Typ.(1)	Max. (A)	Unit
V_{OH}	Output HIGH Voltage	$V_{IN} = V_{IHA}$ or V_{ILB}		-1025	-955	-880	mV
V_{OL}	Output LOW Voltage	$V_{IN} = V_{IHA}$ or V_{ILB}		-1810	-1715	-1620	mV
V_{OHC}	Output Threshold HIGH Voltage	$V_{IN} = V_{IHB}$ or V_{ILA}		-1035	–	–	mV
V_{OLC}	Output Threshold LOW Voltage	$V_{IN} = V_{IHB}$ or V_{ILA}		–	–	-1610	mV
V_{IH}	Input HIGH Voltage	Guaranteed Input Voltage High for All Inputs		-1165	–	-880	mV
V_{IL}	Input LOW Voltage	Guaranteed Input Voltage Low for All Inputs		-1810	–	-1475	mV
I_{IH}	Input HIGH Current	$V_{IN} = V_{IHA}$	$\overline{CS}$	–	–	220	µA
			Others	–	–	110	
I_{IL}	Input LOW Current	$V_{IN} = V_{ILB}$	$\overline{CS}$	0.5	–	170	µA
			Others	-50	–	90	
I_{EE}	Supply Current	All Inputs and Outputs Open		-170	-110	–	mA

2758 tbl 08

NOTE:
1. Typical parameters are specified at V_{EE} = -4.5V, T_A = +25°C and maximum loading.

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ECL-101K ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Rating		Value	Unit
V_{TERM}	Terminal Voltage With Respect to GND		+0.5 to -7.0	V
T_A	Operating Temperature		0 to +75	°C
T_{BIAS}	Temperature Under Bias		-55 to +125	°C
T_{STG}	Storage Temperature	Ceramic	-65 to +150	°C
		Plastic	-55 to +125	
P_T	Power Dissipation		1.5	W
I_{OUT}	DC Output Current (Output High)		-50	mA

2758 tbl 09

NOTE:
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.

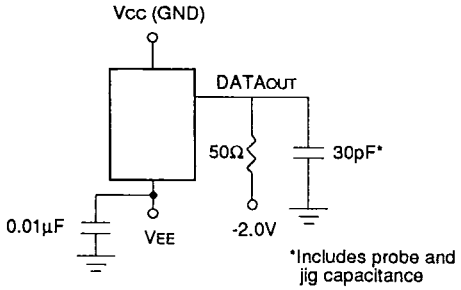
ECL-101K DC ELECTRICAL CHARACTERISTICS

(V_{EE} = -5.2V, R_L = 50Ω to -2.0V, T_A = 0 to +75°C, air flow exceeding 2 m/sec)

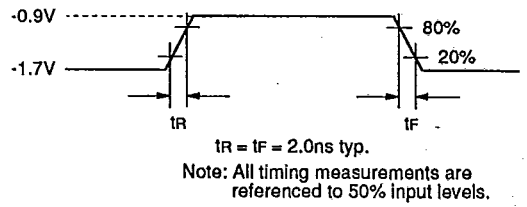
Symbol	Parameter	Test Condition		Min. (B)	Typ.(1)	Max. (A)	Unit
V_{OH}	Output HIGH Voltage	$V_{IN} = V_{IHA}$ or V_{ILB}		-1025	-955	-880	mV
V_{OL}	Output LOW Voltage	$V_{IN} = V_{IHA}$ or V_{ILB}		-1810	-1715	-1620	mV
V_{OHC}	Output Threshold HIGH Voltage	$V_{IN} = V_{IHB}$ or V_{ILA}		-1035	–	–	mV
V_{OLC}	Output Threshold LOW Voltage	$V_{IN} = V_{IHB}$ or V_{ILA}		–	–	-1610	mV
V_{IH}	Input HIGH Voltage	Guaranteed Input Voltage High for All Inputs		-1165	–	-880	mV
V_{IL}	Input LOW Voltage	Guaranteed Input Voltage Low for All Inputs		-1810	–	-1475	mV
I_{IH}	Input HIGH Current	$V_{IN} = V_{IHA}$	$\overline{CS}$	–	–	220	µA
			Others	–	–	110	
I_{IL}	Input LOW Current	$V_{IN} = V_{ILB}$	$\overline{CS}$	0.5	–	170	µA
			Others	-50	–	90	
I_{EE}	Supply Current	All Inputs and Outputs Open		-190	-130	–	mA

2758 tbl 10

AC TEST LOAD CONDITION



AC TEST INPUT PULSE



RISE/FALL TIME

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
tR	Output Rise Time	–	–	2	–	ns
tF	Output Fall Time	–	–	2	–	ns

2758 tbl 11

FUNCTIONAL DESCRIPTION

The IDT10474, IDT100474, and IDT101474 BiCMOS ECL static RAMs (SRAM) provide high speed with low power dissipation typical of BiCMOS ECL. These devices follow the traditional corner-power pinout and functionality for 1Kx4 ECL SRAMs. (For center-power pinouts, please see the IDT10A474, IDT100A474, and IDT101A474, respectively.)

READ TIMING

The read timing on these asynchronous devices is straightforward. DataOUT is held low until the device is selected by Chip Select ($\overline{CS}$). Then Address (ADDR) settles and data appears on the output after time t_{AA}. Note that DataOUT is held for a short time (t_{OH}) after the address begins to change for the next access, then ambiguous data is on the bus until a new time t_{AA}.

WRITE TIMING

To write data to the device, a Write Pulse need be formed on the Write Enable input ($\overline{WE}$) to control the write to the SRAM array. While $\overline{CS}$ and ADDR must be set-up when $\overline{WE}$ goes low, DataIN can settle after the falling edge of $\overline{WE}$, giving the data path extra margin. Data is written to the memory cell at the end of the Write Pulse, and addresses and Chip Select must be held after the rising edge of the Write Pulse to ensure satisfactory completion of the cycle.

DataOUT is disabled (held low) during the Write Cycle. If $\overline{CS}$ is held low (active) and addresses remain unchanged, the DataOUT pins will output the written data after "Write Recovery Time" (t_{WR}).

Because of the very short Write Pulse requirement, these devices can be cycled as quickly for Writes as for Reads. Balanced cycles mean simpler timing in cache applications.

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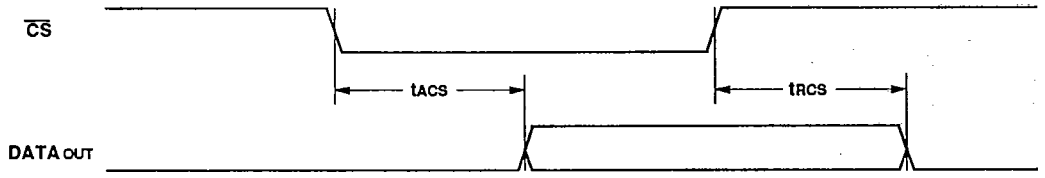
AC ELECTRICAL CHARACTERISTICS (Over the AC Operating Range)

Symbol	Parameter[1]	Test Condition	10474S7 100474S7 101474S7		10474S8 100474S8 101474S8		10474S10 100474S10 101474S10		10474S15 100474S15 101474S15		Unit
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle											
t_{ACS}	Chip Select Access Time	–	–	3	–	5	–	5	–	5	ns
t_{RCS}	Chip Select Recovery Time	–	–	3	–	5	–	5	–	5	ns
t_{AA}	Address Access Time	–	–	7	–	8	–	10	–	15	ns
t_{OH}	Data Hold from Address Change	–	3	–	3	–	3	–	3	–	ns

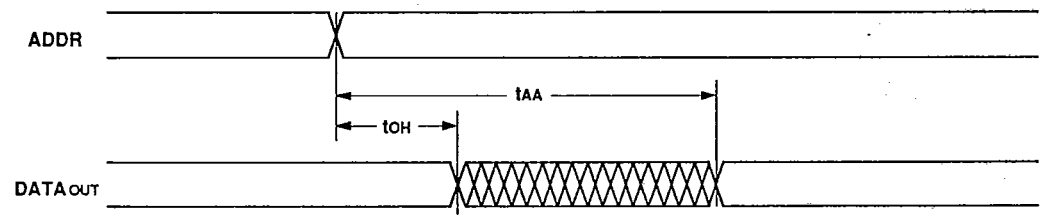
2758 tbl 12

NOTE:
1. Input and Output reference level is 50% point of waveform.

READ CYCLE GATED BY CHIP SELECT



READ CYCLE GATED BY ADDRESS



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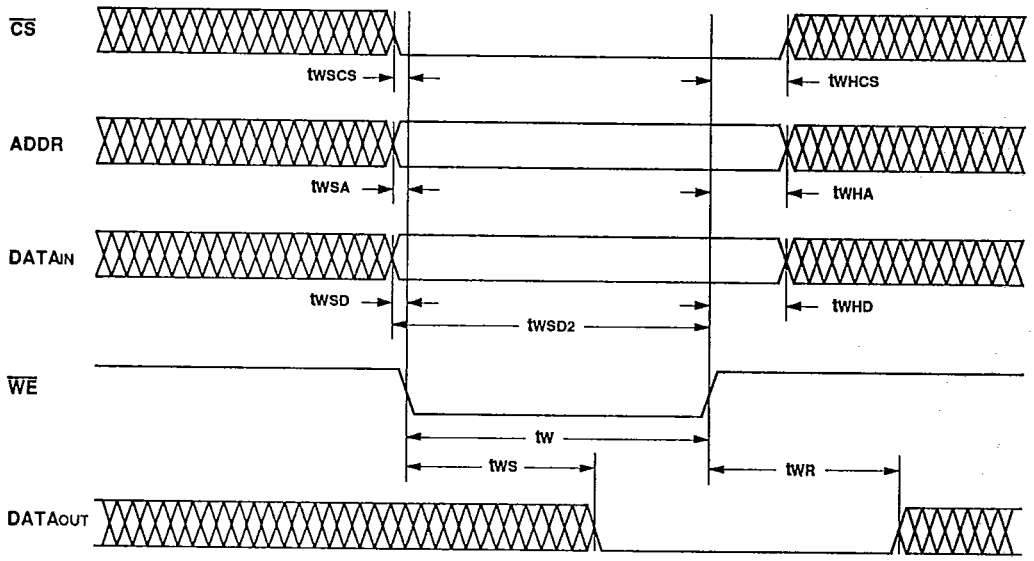
AC ELECTRICAL CHARACTERISTICS (Over the AC Operating Range)

Symbol	Parameter[1]	Test Condition	10474S7 100474S7 101474S7		10474S8 100474S8 101474S8		10474S10 100474S10 101474S10		10474S15 100474S15 101474S15		Unit
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Write Cycle											
tW	Write Pulse Width	tWSA= minimum	6	–	7	–	8	–	10	–	ns
tWSD	Data Set-up Time	–	0	–	0	–	0	–	2	–	ns
tWSD2[2]	Data Set-up Time to $\overline{WE}$ High	–	5	–	5	–	5	–	5	–	ns
tWSA	Address Set-up Time	tWSA= minimum	0	–	0	–	0	–	2	–	ns
tWSCS	Chip Select Set-up Time	–	0	–	0	–	0	–	2	–	ns
tWHD	Data Hold Time	–	1	–	1	–	1	–	2	–	ns
tWHA	Address Hold Time	–	1	–	1	–	1	–	2	–	ns
tWHCS	Chip Select Hold Time	–	1	–	1	–	1	–	2	–	ns
tWS	Write Disable Time	–	–	5	–	5	–	5	–	5	ns
tWR[3]	Write Recovery Time	–	–	5	–	5	–	5	–	5	ns

2758 tbl 13

NOTES:
1. Input and Output reference level is 50% point of waveform.
2. tWSD is specified with respect to the falling edge of $\overline{WE}$ for compatibility with bipolar part specifications, but this device actually only requires tWSD2 with respect to rising edge of $\overline{WE}$.
3. tWR is defined as the time to reflect the newly written data on the Data Outputs (Q_0 to Q_3) when no new Address Transition occurs.

WRITE CYCLE TIMING DIAGRAM



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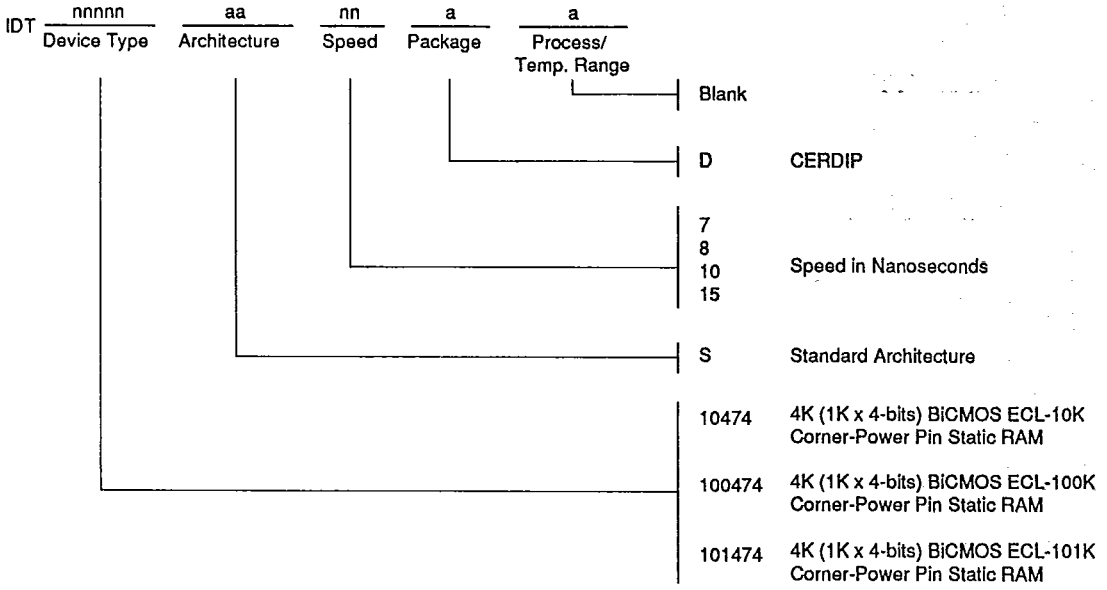
ORDERING INFORMATION



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