



Integrated Device Technology, Inc.

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

PRELIMINARY
IDT10474, IDT10A474
IDT100474, IDT100A474
IDT101474, IDT101A474

FEATURES:

- 1024-words x 4-bit organization
- Address access time: 2.7/3/3.5/4/4.5/5/7/8/10/15 ns
- Low power dissipation: 1000mW (typ.)
- Guaranteed Output Hold time
- Fully compatible with ECL logic levels
- Separate data input and output
- Corner and Center power pin pinouts
- Standard through-hole and surface mount packages
- Guaranteed-performance die available for MCMs/hybrids
- MIL-STD-883, Class B product available

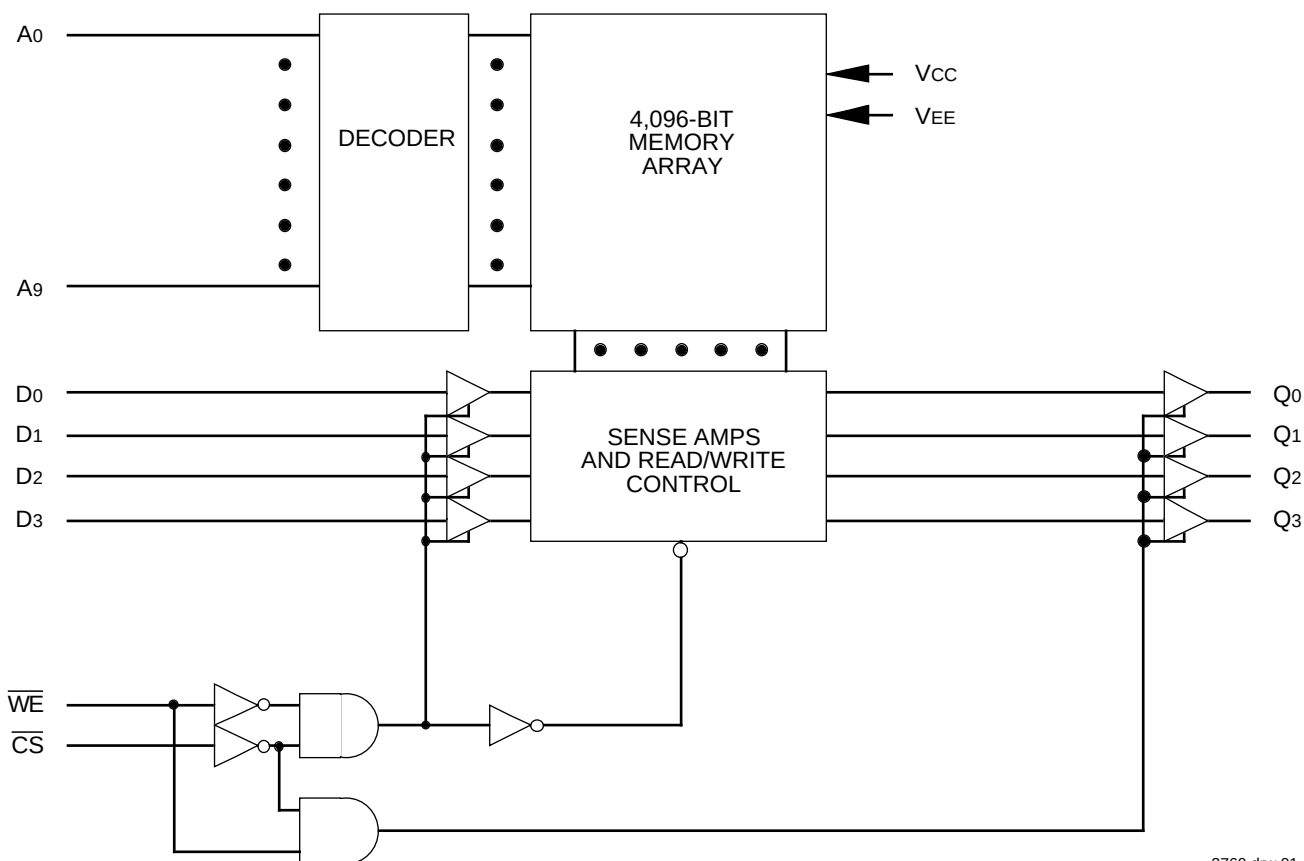
DESCRIPTION:

The IDT10474(10A474), IDT100474(100A474) and IDT101474(101A474) are 4,096-bit high-speed BiCMOS 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 is available in both the traditional corner-power pinout, and "revolutionary" center-power pin configurations. Because they are manufactured in BiCMOS technology, power dissipation is greatly reduced over equivalent bipolar devices. Low power operation provides higher system reliability and makes possible the use of the plastic SOJ package for high-density surface mount assembly.

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.

FUNCTIONAL BLOCK DIAGRAM



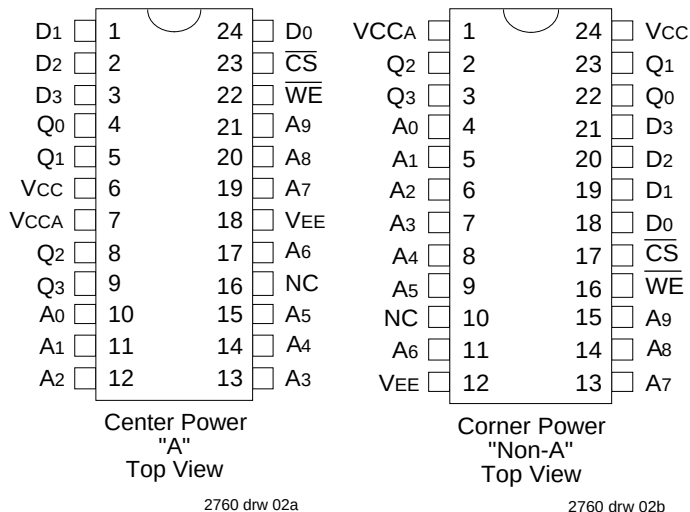
2760 drw 01

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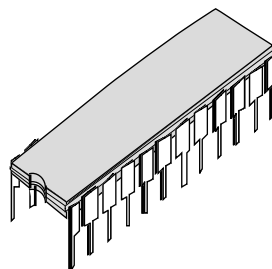
COMMERCIAL TEMPERATURE RANGE

OCTOBER 1992

PIN CONFIGURATIONS

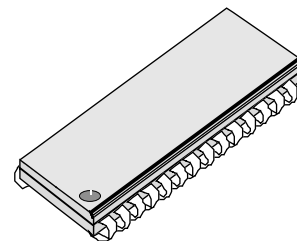


PACKAGES



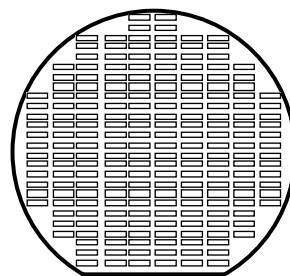
400-Mil-Wide
CERDIP PACKAGE
D24-3

2760 drw 03



300-Mil-Wide
PLASTIC SOJ PACKAGE
SO24-4

2760 drw 04



Hi-Rel Die
For Hybrid and MCM
Applications

2760 drw 05

PIN DESCRIPTIONS

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

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LOGIC SYMBOL

CAPACITANCE ($T_A = +25^\circ\text{C}$, $f = 1.0\text{MHz}$)

Symbol	Parameter	DIP		SOJ		Unit
		Typ.	Max.	Typ.	Max.	
C_{IN}	Input Capacitance	4	—	3	—	pF
C_{OUT}	Output Capacitance	6	—	3	—	pF

2760 tbl 02

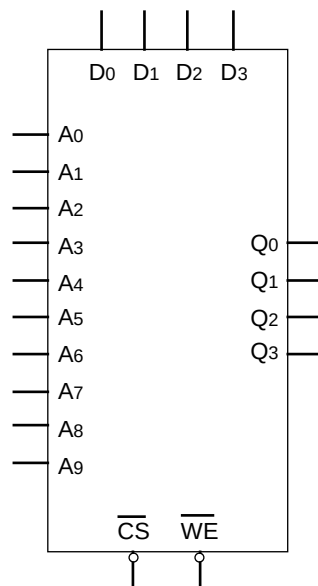
TRUTH TABLE⁽¹⁾

$\overline{CS}$	$\overline{WE}$	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

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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	10K	0 to +75	°C
		100K	0 to +85	
		101K	0 to +75	
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

NOTE:

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- 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.

AC/DC ELECTRICAL OPERATING RANGES

I/O	V _{EE}	T _A
10K	-5.2V ± 5%	0 to +75°C, air flow exceeding 2 m/sec
100K	-4.5V ± 5%	0 to +85°C, air flow exceeding 2 m/sec
101K	-4.75V to -5.46V	0 to +75°C, air flow exceeding 2 m/sec

2760 tbl 05

DC ELECTRICAL CHARACTERISTICS (1)

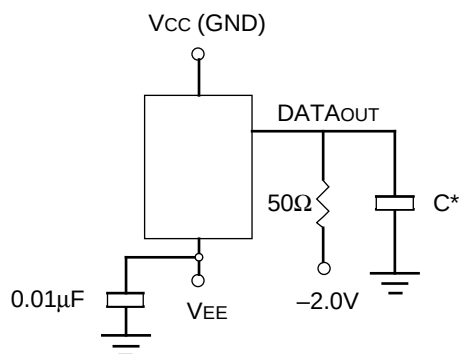
Symbol	Parameter	10K			100K/101K		Unit
		Min.	Max.	T _A	Min.	Max.	
V _{OH}	Output HIGH Voltage (V _{IN} = V _{IH} (Max) or V _{IL} (Min))	-1000 -960 -900	-840 -810 -720	0°C 25°C 75°C	-1025	-880	mV
V _{OL}	Output LOW Voltage (V _{IN} = V _{IH} (Max) or V _{IL} (Min))	-1870 -1850 -1830	-1665 -1650 -1625	0°C 25°C 75°C	-1810	-1620	mV
V _{OHC}	Output Threshold HIGH Voltage (V _{IN} = V _{IH} (Min) or V _{IL} (Max))	-1020 -980 -920	— — —	0°C 25°C 75°C	-1035	—	mV
V _{OLC}	Output Threshold LOW Voltage (V _{IN} = V _{IH} (Min) or V _{IL} (Max))	— — —	-1645 -1630 -1605	0°C 25°C 75°C	—	-1610	mV
V _{IH}	Input HIGH Voltage (Guaranteed Input Voltage High for All Inputs)	-1145 -1105 -1045	-840 -810 -720	0°C 25°C 75°C	-1165	-880	mV
V _{IL}	Input LOW Voltage (Guaranteed Input Voltage Low for All Inputs)	-1870 -1850 -1830	-1490 -1475 -1450	0°C 25°C 75°C	-1810	-1475	mV
I _{IH}	Input HIGH Current						
	V _{IN} = V _{IH} (Max) <u>CS</u> Others	— —	220 110	— —	— —	220 110	μA μA
I _{IL}	Input LOW Current						
	V _{IN} = V _{IL} (Min) <u>CS</u> Others	0.5 -50	170 90	— —	0.5 -50	170 90	μA μA
I _{EE}	Supply Current	-210	—	—	-190 (100K) -210 (101K)	— —	mA

NOTE:

- RL = 50Ω to -2V, air flow exceeding 2 m/sec.

2760 tbl 05

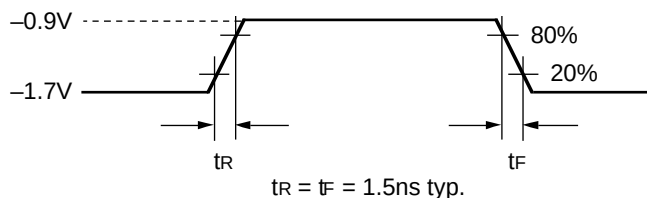
AC TEST LOAD CONDITION



*Includes probe and jig capacitance.
C < 5pF (2.7,3.0, 3.5nS speed grades)
C < 30pF (all other speed grades)

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AC TEST INPUT PULSE



Note: All timing measurements are referenced to 50% input levels.

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RISE/FALL TIME

Symbol	Parameter	Min.	Typ.	Max.	Unit
tR	Output Rise Time	—	1.5	—	ns
tF	Output Fall Time	—	1.5	—	ns

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FUNCTIONAL DESCRIPTION

The IDT10474(10A474), IDT100474(100A474), and IDT101474(101A474) BiCMOS ECL static RAMs provide high speed with low power dissipation typical of BiCMOS ECL. These devices are available in both the traditional corner-power pinout and the "revolutionary" center-power pinout for reduced noise and improved system performance.

READ TIMING

The read timing on these asynchronous devices is straightforward. DataOUT is held LOW until the device is selected by Chip Select (CS). The Address (ADDR) settles and data appears on the output after time tAA. Note that DataOUT is held for a short time (toH) after the address begins to change for the next access, then ambiguous data is on the bus until a new time tAA.

WRITE TIMING

To write data to the device, a Write Pulse need be formed on the Write Enable input (WE) to control the write to the SRAM array. While CS and ADDR must be set-up when WE goes low, DataIN can settle after the falling edge of 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 CS is held LOW (active) and addresses remain unchanged, the Data OUT pins will output the written data after "Write Recovery time" (twr).

Because of the very short Write Pulse requirement, these devices can be cycled as quickly for Writes as for Reads.

AC ELECTRICAL CHARACTERISTICS (Over the AC Operating Range)

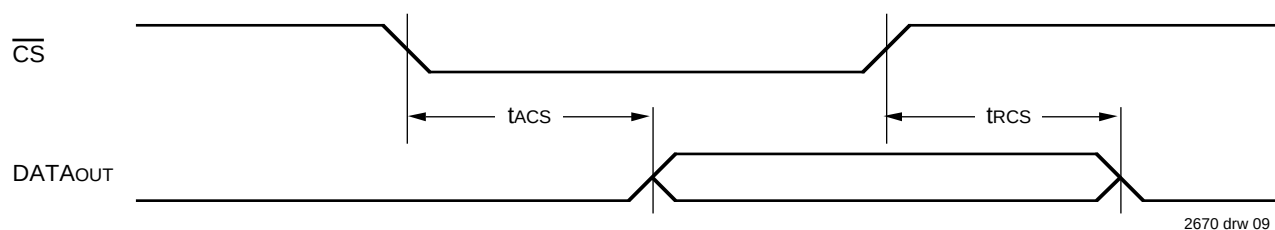
Symbol	Parameter ⁽¹⁾	S2.7		S3		S3.5		S4		S4.5		S5		S7,8,10,15		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle																
tACS	Chip Select Access Time	—	2.0	—	2.0	—	2.5	—	2.5	—	2.5	—	3.0	—	3.5	ns
trCS	Chip Select Recovery Time	—	2.0	—	2.0	—	2.5	—	2.5	—	2.5	—	3.0	—	3.5	ns
tAA	Address Access Time	—	2.7	—	3.0	—	3.5	—	4.0	—	4.5	—	5.0	—	7.0	ns
toH	Data Hold from Address Change	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—	ns

NOTE:

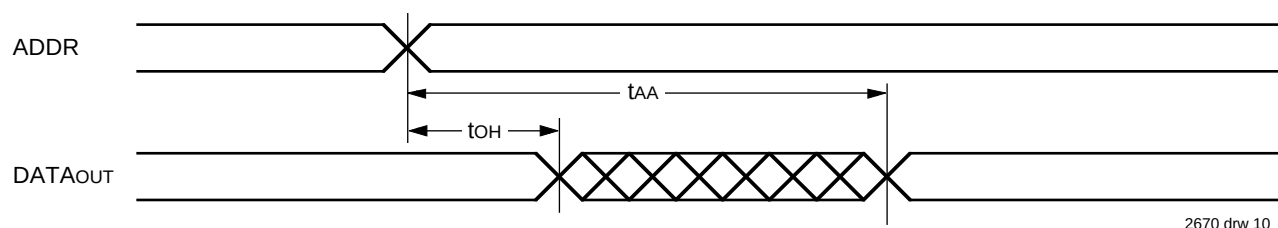
2760 tbl 07

- Input and Output reference level is 50% point of waveform.
- Output load capacitance, C < 5pF (2.7, 3.0, 3.5ns speed grades only), see "AC Test Load Condition" on previous page.

READ CYCLE GATED BY CHIP SELECT (1, 2)



READ CYCLE GATED BY ADDRESS (1, 3)



NOTE:

- WE is HIGH for read cycle.
- Address valid prior to or minimum tAA-tACS before CS active.
- CS active prior to or minimum tAA-tACS after address valid.

AC ELECTRICAL CHARACTERISTICS (Over the AC Operating Range)

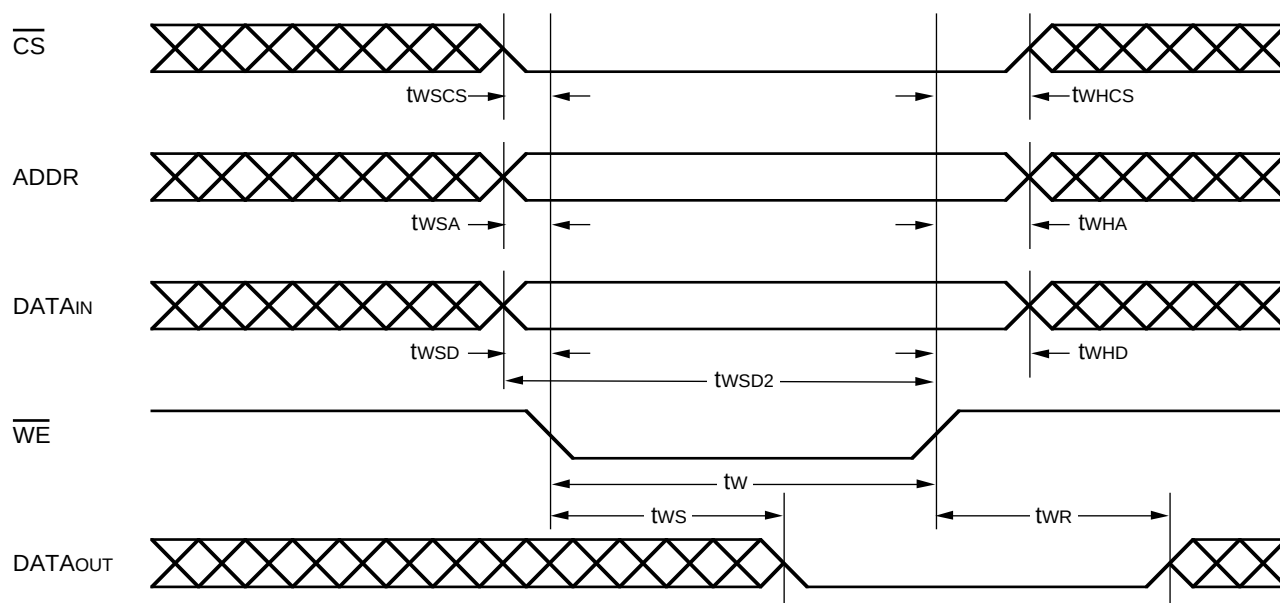
Symbol	Parameter ⁽¹⁾	S2.7		S3.0		S3.5		S4		S4.5		S5		S7,8,10,15		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Write Cycle																
tw	Write Pulse Width (twSA = minimum)	2.5	—	2.5	—	3.0	—	3.0	—	3.5	—	4.0	—	6.0	—	ns
twSD	Data Set-up Time	0	—	0	—	0	—	0	—	0	—	0	—	0	—	ns
twSD ₂ ⁽²⁾	Data Set-up Time to <u>WE</u> HIGH	2.0	—	2.0	—	2.0	—	2.0	—	2.0	—	3.0	—	5.0	—	ns
twSA	Address Set-up Time (tw = minimum)	0	—	0	—	0	—	0	—	0	—	0	—	0	—	ns
twSCS	Chip Select Set-up Time	0	—	0	—	0	—	0	—	0	—	0	—	0	—	ns
twHD	Data Hold Time	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—	ns
twHA	Address Hold Time	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—	ns
twHCS	Chip Select Hold Time	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—	ns
tws	Write Disable Time	—	2.7	—	3.0	—	3.0	—	3.0	—	3.0	—	3.0	—	5.0	ns
tWR ⁽³⁾	Write Recovery Time	—	2.7	—	3.0	—	3.0	—	3.0	—	3.0	—	3.0	—	5.0	ns

NOTE:

2760 tbl 08

- Input and Output reference level is 50% point of waveform.
- twSD is specified with respect to the falling edge of WE for compatibility with bipolar part specifications, but this device actually only requires twSD2 with respect to rising edge of WE.
- tWR is defined as the time to reflect the newly written data on the Data Outputs (Q0 to Q3) when no new Address Transition occurs.

WRITE CYCLE TIMING DIAGRAM



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ORDERING INFORMATION

IDT	nnnnn Device Type	aa Architecture	nn Speed	a Package	a Process/ Temp. Range	
						Blank B(1) Commercial Military (–55°C to +125°C) Compliant to MIL-STD-883, Class B
					DF U(1) Y	CERDIP Hi-Rel Die for MCMs and/or Hybrids Plastic SOJ
					2.7 3 3.5 4 4.5 5 7 8 10 15	Speed in Nanoseconds
					S	Standard Architecture
					10474	4K (1K x 4-bits) BiCMOS ECL-10K Corner-Power Pin Static RAM
					10A474	4K (1K x 4-bits) BiCMOS ECL-10K Center-Power Pin Static RAM
					100474	4K (1K x 4-bits) BiCMOS ECL-100K Corner-Power Pin Static RAM
					100A474	4K (1K x 4-bits) BiCMOS ECL-100K Center-Power Pin Static RAM
					101474	4K (1K x 4-bits) BiCMOS ECL-101K Corner-Power Pin Static RAM
					101A474	4K (1K x 4-bits) BiCMOS ECL-101K Center-Power Pin Static RAM

NOTE:
1. Please contact your IDT Sales Representative for more information on specifications and availability of Military and Die products.

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