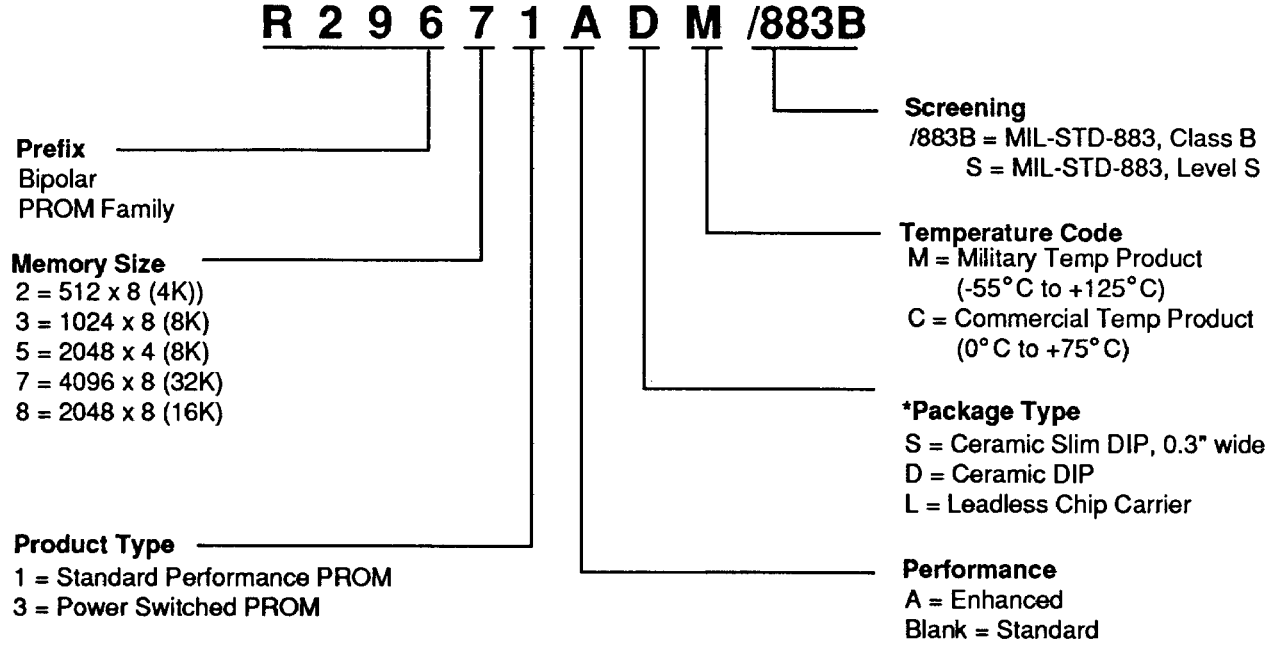
fuses and low power Schottky technology. The devices are shipped with all bits in the HIGH (logical ONE) state. To achieve a LOW state in a given bit location the nichrome link is fused open by passing a short, high current pulse through the link. All R29000 Series devices are programmed using the same programming technique.

Standard performance PROMs are enabled when $\overline{CS}$ is low and CS is high. Power-switched SPROMs are enabled when $\overline{PS}$ is low and PS is high. See individual data sheets for device enabling schemes.

Standard Product Ordering Information



Country of Origin Designator - Prefixes Date Code
O = U.S.A
T = Mexico

*Contact factory regarding flatpack and 20-terminal leadless chip carrier packages.

65-4058

JAN Ordering Information

Mil-M-38510 Slash Sheet Part Number	Raytheon Part Number
Mil-M-38510/20902BVA	R29651DM (2K x 4, 18-pin ceramic DIP)
Mil-M-38510/20904BJA	R29631DM (1K x 8, 24-pin ceramic DIP)
Mil-M-38510/21002BJA	R29681DM (2K x 8, 24-pin ceramic DIP)

*Standard Military Drawing (DESC Print) Ordering Information

SMD Part Number	Raytheon Part Number
8200801JX	R29671DM/883B (4K x 8, 24-pin ceramic DIP)
8200801LX	R29671SM/883B (4K x 8, 24-pin ceramic 0.3" DIP)
82008013X	R29671LM/883B (4K x 8, 28-terminal leadless chip carrier)

*Standard military drawings are being generated for all PROMs that are not JAN qualified.

Absolute Maximum Ratings (above which the useful life may be impaired)

Supply Voltage to Ground Potential (continuous), V_{CC} ..... -0.5V to +7.0V
DC Input Current ..... -30 mA to +5.0 mA
DC Input Voltage (address inputs) ..... -0.5V to +5.5V
DC Input Voltage (chip/power select input pin) ..... -0.5V to +33V
DC Voltage Applied to Outputs (except during programming) ..... -0.5V to +V_{CC} max.
Output Current into Outputs During Programming ..... 240 mA
DC Voltage Applied to Outputs During Programming 26V
Junction Temperature ..... +175°C
Storage Temperature ..... -65°C to +150°C
Programming Temperature ..... 25 ±5°C
Current Density ..... < 5 x 10^5A/cm^2
Lead Temperature (soldering, 10 seconds) ..... 300°C
Thermal Resistance, Junction-to-Case θ_{JC}
Dual-In-Line ..... ≤ 11°C/W
Leadless Chip Carrier ..... ≤ 10°C/W

Operating Conditions

Symbol	Parameter	Commercial		Military		Unit
		Min.	Max.	Min.	Max.	
V_{CC}	Supply Voltage	4.75	5.25	4.5	5.5	V
T_C	Case Operating Temperature			-55	+125	°C
T_A	Ambient Operating Temperature	0	+75			°C
V_{IL}*	DC/Functional Low Level Input Voltage		0.8		0.8	V
V_{IH}*	DC/Functional High Level Input Voltage	2.0		2.0		V
V_{IL}	AC Low Level Input Voltage		0		0	V
V_{IH}	AC High Level Input Voltage	3.0		3.0		V

*Functional tests shall be conducted at input test conditions as follows: $V_{IH} = V_{IH}$(min) +20%, -0%; $V_{IL} = V_{IL}$(max) +0%, -50%. Devices may be tested using any input voltage within this input voltage range but shall be guaranteed to V_{IH}(min) and V_{IL}(max). CAUTION: To avoid test correlation problems, the test system noise (e.g., testers, handlers, etc.) should be verified to assure that V_{IH}(min) and V_{IL}(max) requirements are not violated at the device terminals.

Electrical Characteristics

Over Operating Range

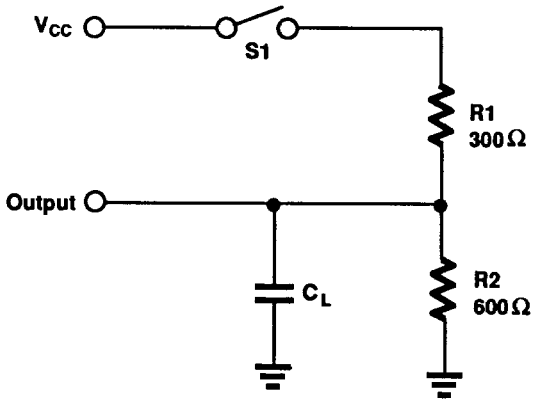
Military devices conform to Mil-Std-883, GroupA, Subgroups 1, 2 and 3

Parameter	Description	Test Conditions		Min	Max	Units
V_{OH}	Output High Voltage	V_{CC} = Min, I_{OH} = -2 mA V_{IN} = V_{IH} or V_{IL}		2.4		V
V_{OL}*	Output Low Voltage	V_{CC} = Min	I_{OL} = 8 mA		0.4	V
		V_{IN} = V_{IH} or V_{IL}	I_{OL} = 16 mA		0.5	
I_{IL}	Input Low Current	V_{CC} = Max, V_{IN} = 0.4V			-250	µA
I_{IH}	Input High Current	V_{CC} = Max, V_{IN} = 2.7V			10	µA
		V_{CC} = Max, V_{IN} = 5.5V			40	
I_{OS}**	Output Short Circuit Current	V_{CC} = Max, V_{OUT} = 0.2V		-12	-85	mA
V_{IC}	Input Clamp Voltage	V_{CC} = Min, I_{IN} = -18 mA			-1.2	V
I_{CEX}	Output Leakage Current	V_{CC} = Max	V_{OUT} = 5.5V		+40	µA
		Chip Disabled	V_{OUT} = 0.4V		-40	

*This characteristic cannot be tested prior to programming; it is guaranteed by factory testing.
**Not more than one output should be shorted at a time. Duration of the short circuit should not exceed 1 second.

Pin Names

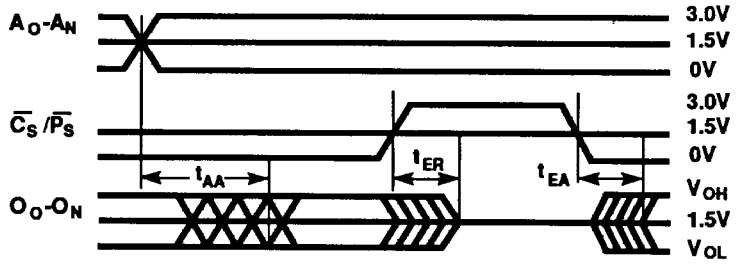
Symbol	Description
A^0—A^n	Address Inputs
$\overline{CS}$	Chip Select Active Low
CS	Chip Select Active High
$\overline{PS}$	Power Select Active Low
PS	Power Select Active High
O^1—O^n	Data Outputs



65-4059

Notes:
1. t_{AA} is tested with switch S_1 closed and C_L = 30 pF.
2. t_{EA} is tested with C_L = 30 pF; S_1 is open for high impedance to "1" test and closed for high impedance to "0" test.
3. t_{ER} is tested with C_L = 5 pF; S_1 is open for "1" to high impedance test and measured at V_{OH} -0.5V output level and is closed for "0" to high impedance test and measured at V_{OL} +0.5V output level.

Figure 1. AC Test Load Circuit



Keys to Timing Diagram

Waveforms	Inputs	Outputs
———	Must be Steady	Will be Steady
———		
	May Change From H to L	Will be Changing From H to L
	May Change From L to H	Will be Changing From L to H
	Don't Care. Any Change Permitted	Changing State Unknown
	Does Not Apply	Center Line is High Impedance Off State

65-4060

Figure 2. Switching Waveforms

512 x 8 PROM — R29621/R29621A

Power and AC Characteristics Over Operating Range

Military ICC conforms to Mil-Std-883, Group A, Subgroups 1, 2 and 3
Military ac parameters conform to Mil-Std-883, Group A, Subgroups 9, 10 and 11

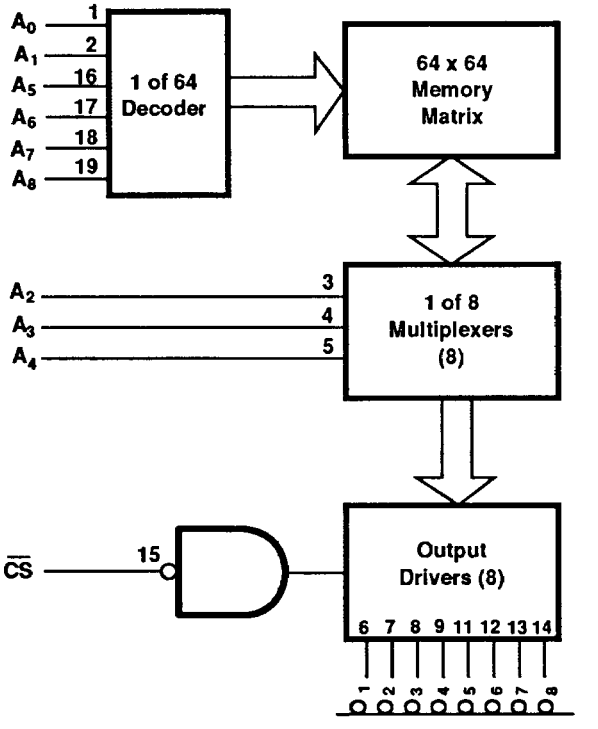
Parameter	Description	Test Conditions	Maximum Limits				Units
			R29621AC	R29621C	R29621AM	R29621M	
I_{CC}	Power Supply Current	V_{CC} = Max All Inputs GND	155	155	155	155	mA
t_{AA}	Address Access Time	C_L = 30 pF *	50	65	60	80	nS
t_{EA}	Enable Access Time	R1 = 300Ω to V_{CC}	30	30	40	40	nS
t_{ER}	Enable Recovery Time	R2 = 600Ω to GND	30	30	40	40	nS
P_D	Power Dissipation	16 mA Load	814	814	853	853	mW

*See AC Test Load Circuit and Switching Waveforms

Raytheon Package Designator	Conforms to Mil-M-38510, Appendix C Case Outline
D	D-8

Contact factory for flatpack/leadless chip carrier packages.

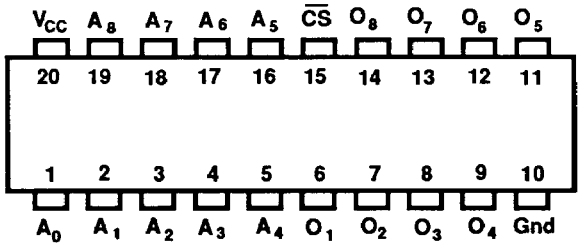
Block Diagram



65-0112

Pin-Out Information

Dual In-Line Package



Pin 15 is also the programming pin (pp)

65-1314

512 x 8 SPROM — R29623/R29623A

Power and AC Characteristics Over Operating Range

Military ICC conforms to Mil-Std-883, Group A, Subgroups 1, 2 and 3
Military ac parameters conform to Mil-Std-883, Group A, Subgroups 9, 10 and 11

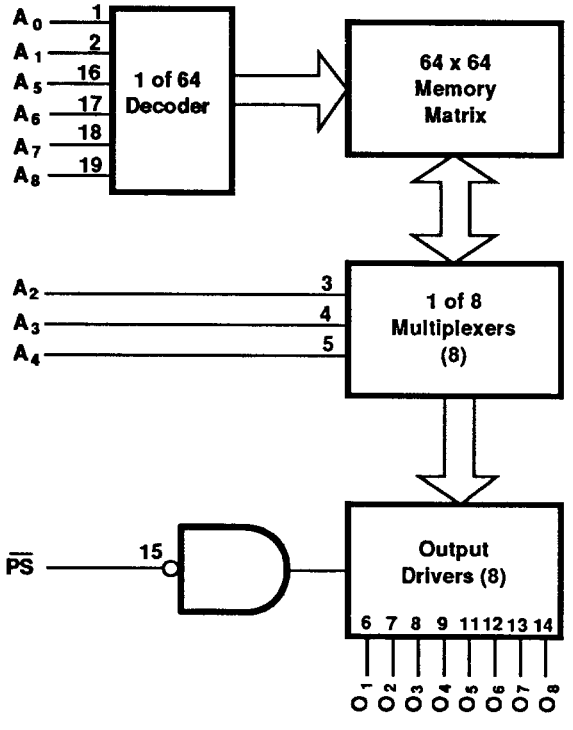
Parameter	Description	Test Conditions	Maximum Limits				Units
			R29623AC	R29623C	R29623AM	R29623M	
I_{CCD}	Power Down, Supply Current (disabled)	V_{CC} = Max $\overline{PS}$ = V_{IH}, All other inputs = GND	45	45	45	45	mA
I_{CC}	Supply Current (enabled)	V_{CC} = Max All inputs = Gnd	155	155	155	155	mA
t_{AA}	Address Access Time	C_L = 30 pF *	50	70	60	85	nS
t_{EA}	Enable Access Time	R1 = 300Ω to V_{CC}	55	70	65	85	nS
t_{ER}	Enable Recovery Time	R2 = 600Ω to GND	30	30	40	40	nS
P_D	Power Dissipation (Disabled)	16 mA Load	236	236	248	248	mW
P_D	Power Dissipation (Enabled)		814	814	853	853	mW

*See AC Test Load Circuit and Switching Waveforms

Raytheon Package Designator	Conforms to Mil-M-38510, Appendix C Case Outline
D	D-8

Contact factory for flatpack/leadless chip carrier packages.

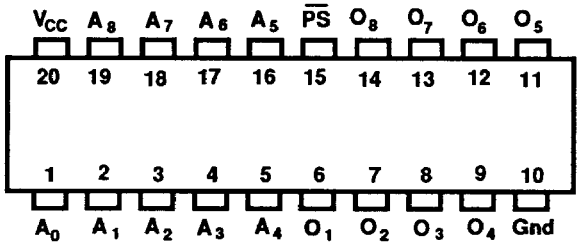
Block Diagram



65-0113

Pin Out Information

Dual In-Line Package



Pin 15 is also the programming pin (pp)

65-1316

1024 x 8 PROM — R29631/R29631A

Power and AC Characteristics Over Operating Range

Military ICC conforms to Mil-Std-883, Group A, Subgroups 1, 2 and 3
Military ac parameters conform to Mil-Std-883, Group A, Subgroups 9, 10 and 11

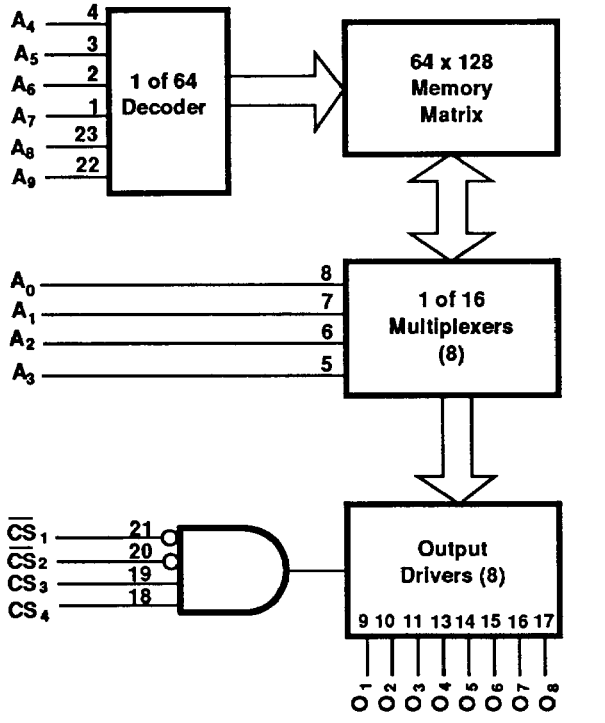
Parameter	Description	Test Conditions	Maximum Limits				Units
			R29631AC	R29631C	R29631AM	R29631M	
I_{CC}	Power Supply Current	V_{CC} = Max All inputs = Gnd	170	170	170	170	mA
t_{AA}	Address Access Time	C_L = 30 pF *	50	70	60	90	nS
t_{EA}	Enable Access Time	R1 = 300Ω to V_{CC}	30	35	40	40	nS
t_{ER}	Enable Recovery Time	R2 = 600Ω to GND	30	30	40	40	nS
P_D	Power Dissipation	16 mA Load	893	893	935	935	mW

*See AC Test Load Circuit and Switching Waveforms

Raytheon Package Designator	Conforms to Mil-M-38510, Appendix C Case Outlines
D	D-3
L	C-4

Contact factory for flatpack package.

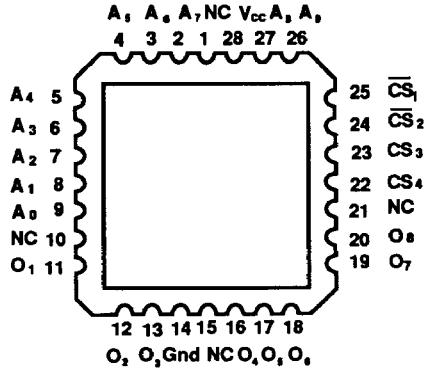
Block Diagram



65-0116

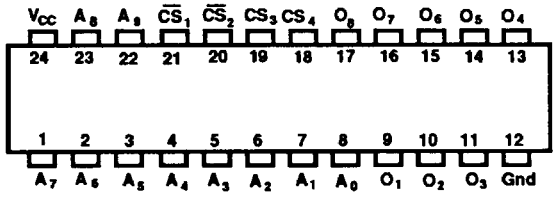
Pin Out Information

Leadless Chip Carrier (28-Terminal)



Pin 24 is also the programming pin (pp)

Dual-In-Line Package



Pin 20 is also the programming pin (pp)

65-4069

1024 x 8 SPROM — R29633/R29633A

Power and AC Characteristics Over Operating Range

Military ICC conforms to Mil-Std-883, Group A, Subgroups 1, 2 and 3
Military ac parameters conform to Mil-Std-883, Group A, Subgroups 9, 10 and 11

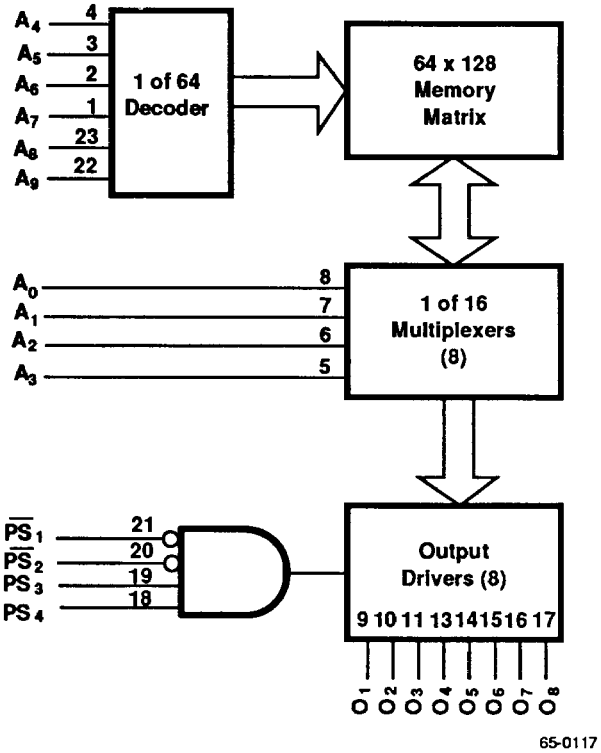
Parameter	Description	Test Conditions	Maximum Limits				Units
			R29633AC	R29633C	R29633AM	R29633M	
I_{CCD}	Power Down, Supply Current (disabled)	V_{CC} = Max $\overline{PS}$ = V_{IH}, All other Inputs = GND	45	45	45	45	mA
I_{CC}	Supply Current (enabled)	V_{CC} = Max All inputs = Gnd	170	170	170	170	mA
t_{AA}	Address Access Time	C_L = 30 pF *	50	70	70	90	nS
t_{EA}	Enable Access Time	R1 = 300Ω to V_{CC}	50	75	70	115	nS
t_{ER}	Enable Recovery Time	R2 = 600Ω to GND	30	30	40	40	nS
P_D	Power Dissipation (Disabled)	16 mA Load	236	236	248	248	mW
P_D	Power Dissipation (Enabled)		893	893	935	935	mW

*See AC Test Load Circuit and Switching Waveforms

Raytheon Package Designator	Conforms to Mil-M-38510, Appendix C Case Outline
D	D-3
L	C-4

Contact factory for flatpack package.

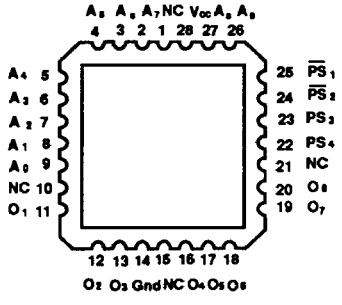
Block Diagram



65-0117

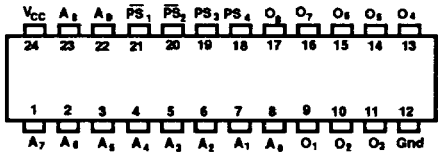
Pin Out Information

Leadless Chip Carrier (28-Terminal)



Pin 24 is also the programming pin (pp)

Dual In-Line Package



Pin 20 is also the programming pin (pp) 65-4071

2048 x 4 PROM — R29651/R29651A

Power and AC Characteristics Over Operating Range

Military ICC conforms to Mil-Std-883, Group A, Subgroups 1, 2 and 3
Military ac parameters conform to Mil-Std-883, Group A, Subgroups 9, 10 and 11

Parameter	Description	Test Conditions	Maximum Limits				Units
			R29651AC	R29651C	R29651AM	R29651M	
I_{CC}	Power Supply Current	V_{CC} = Max All inputs = Gnd	170	170	170	170	mA
t_{AA}	Address Access Time	C_L = 30 pF *	60	70	70	90	nS
t_{EA}	Enable Access Time	R1 = 300Ω to V_{CC}	35	40	45	50	nS
t_{ER}	Enable Recovery Time	R2 = 600Ω to GND	35	35	45	45	nS
P_D	Power Dissipation	16 mA Load	893	893	935	935	mW

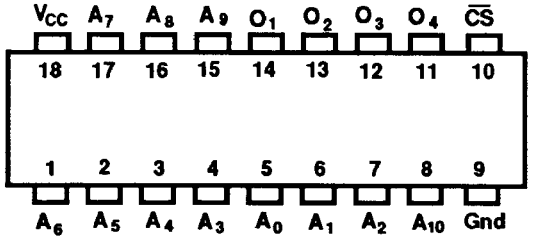
*See AC Test Load Circuit and Switching Waveforms

Raytheon Package Designator	Conforms to Mil-M-38510, Appendix C Case Outline
D	D-6

Contact factory for flatpack/20-terminal leadless chip carrier packages.

Pin Out Information

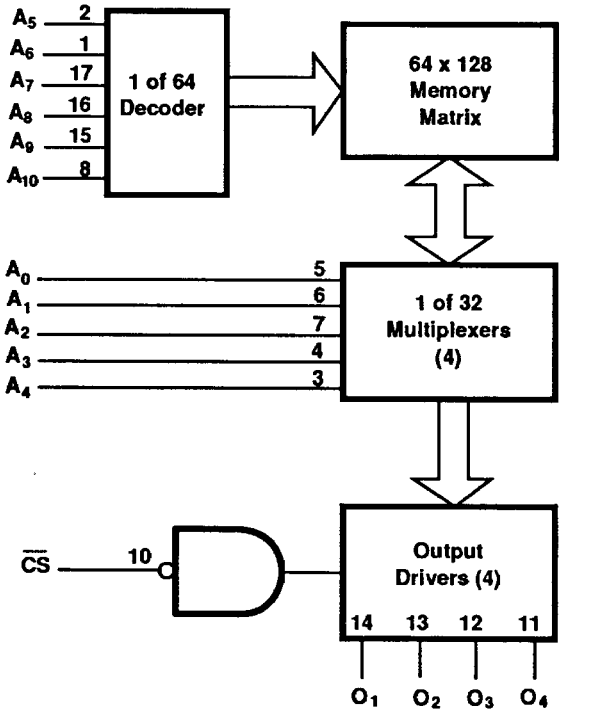
Dual In-Line Package



Pin 10 is also the programming pin (pp)

65-1324

Block Diagram



65-0122

2048 x 4 SPROM — R29653/R29653A

Power and AC Characteristics Over Operating Range

Military ICC conforms to Mil-Std-883, Group A, Subgroups 1, 2 and 3

Military ac parameters conform to Mil-Std-883, Group A, Subgroups 9, 10 and 11

Parameter	Description	Test Conditions	Maximum Limits				Units
			R29653AC	R29653C	R29653AM	R29653M	
I_{CCD}	Power Down, Supply Current (disabled)	V_{CC} = Max $\overline{PS}$ = V_{IH}, All other inputs = GND	45	45	45	45	mA
I_{CC}	Supply Current (enabled)	V_{CC} = Max All inputs = Gnd	170	170	170	170	mA
t_{AA}	Address Access Time	C_L = 30 pF *	65	75	75	90	nS
t_{EA}	Enable Access Time	R1 = 300Ω to V_{CC}	70	80	80	95	nS
t_{ER}	Enable Recovery Time	R2 = 600Ω to GND	35	35	45	45	nS
P_D	Power Dissipation (Disabled)	16 mA Load	236	236	248	248	mW
P_D	Power Dissipation (Enabled)		893	893	935	935	mW

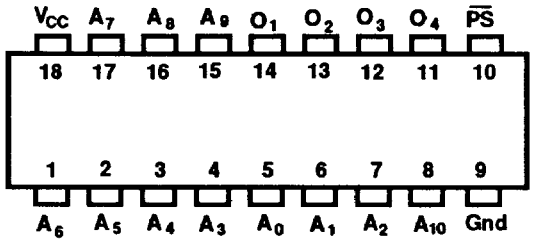
*See AC Test Load Circuit and Switching Waveforms

Raytheon Package Designator	Conforms to Mil-M-38510, Appendix C Case Outline
D	D-6

Contact factory for flatpack/20-terminal leadless chip carrier packages.

Pin Out Information

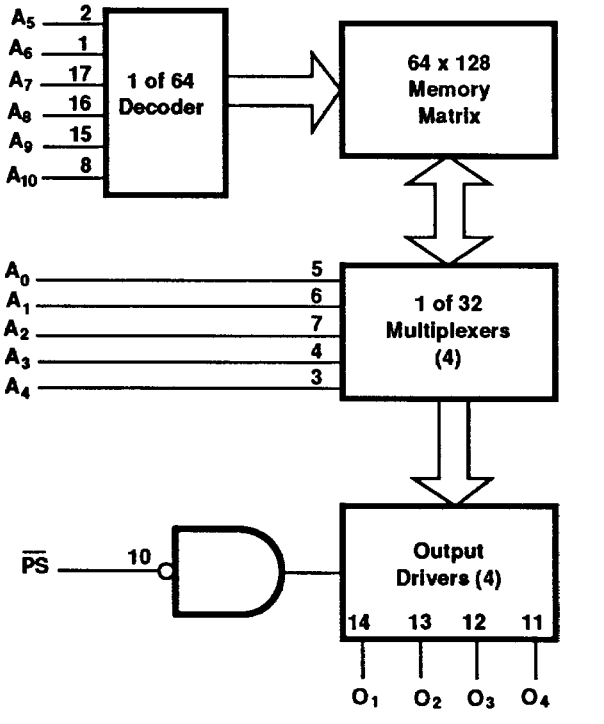
Dual In-Line Package



Pin 10 is also the programming pin (pp)

65-1326

Block Diagram



65-0123

4096 x 8 PROM — R29671/R29671A

Power and AC Characteristics Over Operating Range

Military ICC conforms to Mil-Std-883, Group A, Subgroups 1, 2 and 3. Military ac parameters conform to Mil-Std-883, Group A, Subgroups 9, 10 and 11. Availability per Standard Military Drawing (DESC Print) 82008

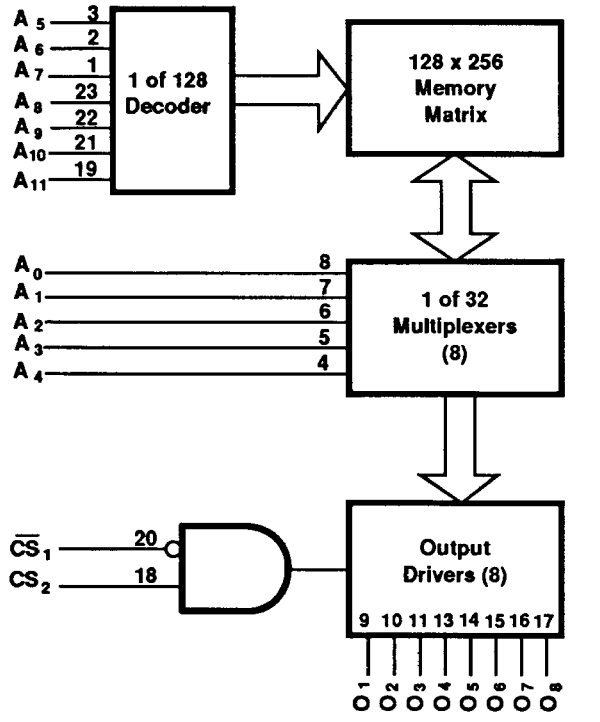
Parameter	Description	Test Conditions	Maximum				Units
			R29671AC	R29671C	R29671AM	R29671M	
I_{CC}	Power Supply Current	V_{CC} = Max All inputs = Gnd	195	195	195	195	mA
t_{AA}	Address Access Time	C_L = 30 pF *	70	80	70	95	nS
t_{EA}	Enable Access Time	R1 = 300Ω to V_{CC}	40	40	45	50	nS
t_{ER}	Enable Recovery Time	R2 = 600Ω to GND	35	40	35	45	nS
P_D	Power Dissipation	16 mA Load	1.02	1.02	1.07	1.07	W

*See AC Test Load Circuit and Switching Waveforms

Raytheon Package Designator	Conforms to Mil-M-38510, Appendix C Case Outlines
S	D-9
D	D-3
L	C-4

Contact factory for flatpack package.

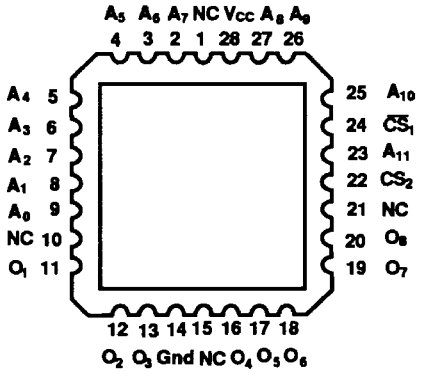
Block Diagram



65-0126

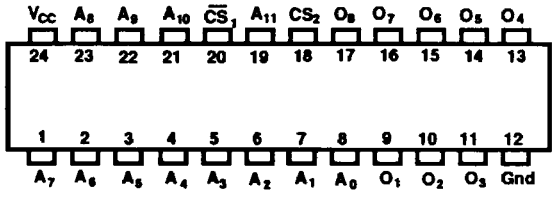
Pin Out Information

Leadless Chip Carrier (28-Terminal)



Pin 24 is also the programming pin (pp)

Dual-In-Line Package
Available in 0.3" and 0.6" Wide Packages



Pin 20 is also the programming pin (pp)

65-4062

4096 x 8 SPROM — R29673

Power and AC Characteristics Over Operating Range

Military ICC conforms to Mil-Std-883, Group A, Subgroups 1, 2 and 3
Military ac parameters conform to Mil-Std-883, Group A, Subgroups 9, 10 and 11

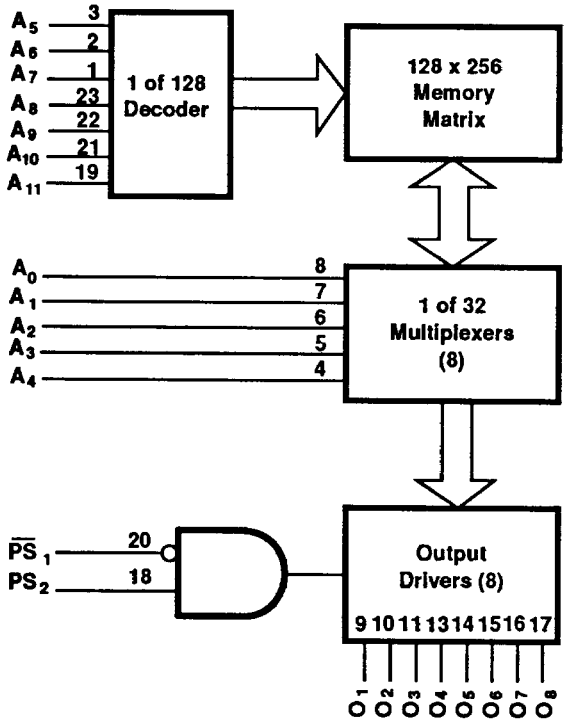
Parameter	Description	Test Conditions	Maximum Limits		Units
			R29673C	R29673M	
I_{CCD}	Power Down, Supply Current (disabled)	V_{CC} = Max, $\overline{PS}$ = VIH, All other inputs = GND	55	55	mA
I_{CC}	Supply Current (enabled)	V_{CC} = Max, All inputs = Gnd	195	195	mA
t_{AA}	Address Access Time	C_L = 30 pF *	85	105	nS
t_{EA}	Enable Access Time	R1 = 300Ω to V_{CC}	95	125	nS
t_{ER}	Enable Recovery Time	R2 = 600Ω to GND	45	50	nS
P_D	Power Dissipation (Disabled)	16 mA Load	289	303	mW
P_D	Power Dissipation (Enabled)		1.02	1.07	W

*See AC Test Load Circuit and Switching Waveforms

Raytheon Package Designator	Conforms to Mil-M-38510, Appendix C Case Outlines
S	D-9
D	D-3
L	C-4

Contact factory for flatpack package.

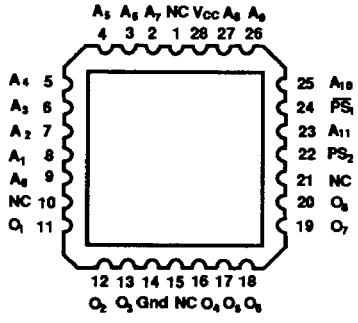
Block Diagram



65-0127

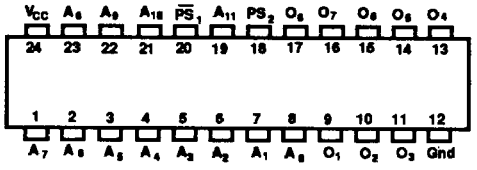
Pin Out Information

Leadless Chip Carrier (28-Terminal)



Pin 24 is also the programming pin (pp)

Dual-In-Line Package
Available in 0.3" and 0.6" Wide Packages



Pin 20 is also the programming pin (pp) 65-4072

2048 x 8 PROM — R29681/R29681A

Power and AC Characteristics Over Operating Range

Military ICC conforms to Mil-Std-883, Group A, Subgroups 1, 2 and 3
Military ac parameters conform to Mil-Std-883, Group A, Subgrpoups 9, 10 and 11

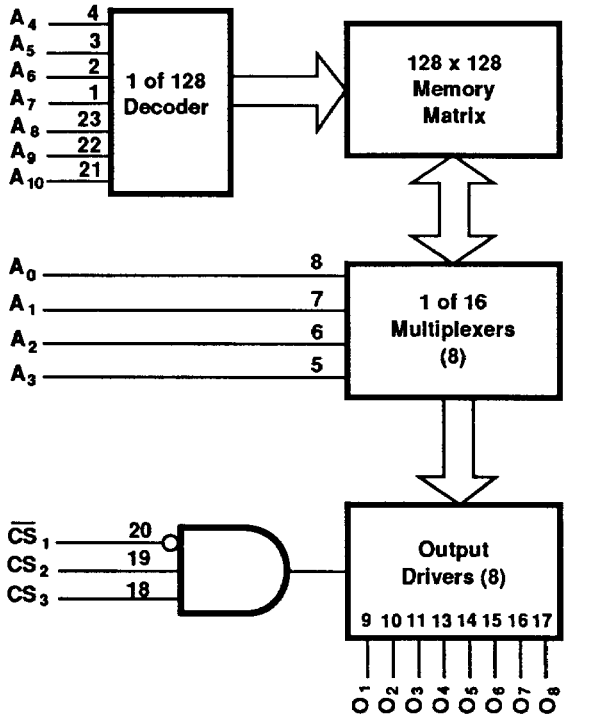
Parameter	Description	Test Conditions	Maximum Limits				Units
			R29681AC	R29681C	R29681AM	R29681M	
I_{CC}	Power Supply Current	V_{CC} = Max All inputs = Gnd	180	180	180	180	mA
t_{AA}	Address Access Time	C_L = 30 pF *	50	80	70	100	nS
t_{EA}	Enable Access Time	R1 = 300Ω to V_{CC}	35	40	45	50	nS
t_{ER}	Enable Recovery Time	R2 = 600Ω to GND	30	40	35	45	nS
P_D	Power Dissipation	16 mA Load	945	945	990	990	mW

*See AC Test Load Circuit and Switching Waveforms

Raytheon Package Designator	Conforms to Mil-M-38510, Appendix C Case Outlines
S	D-9
D	D-3
L	C-4

Contact factory for flatpack package.

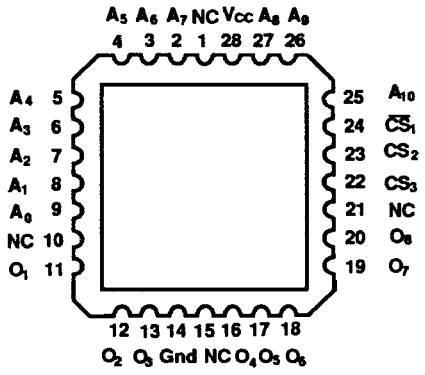
Block Diagram



65-0128

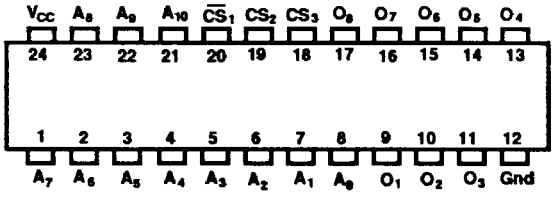
Pin Out Information

Leadless Chip Carrier (28-Terminal)



Pin 24 is also the programming pin (pp)

Dual-In-Line Package
Available in 0.3" and 0.6" Wide Packages



Pin 20 is also the programming pin (pp)

65-4073

2048 x 8 SPROM — R29683/R29683A

Power and AC Characteristics Over Operating Range

Military ICC conforms to Mil-Std-883, Group A, Subgroups 1, 2 and 3
Military ac parameters conform to Mil-Std-883, Group A, Subgroups 9, 10 and 11

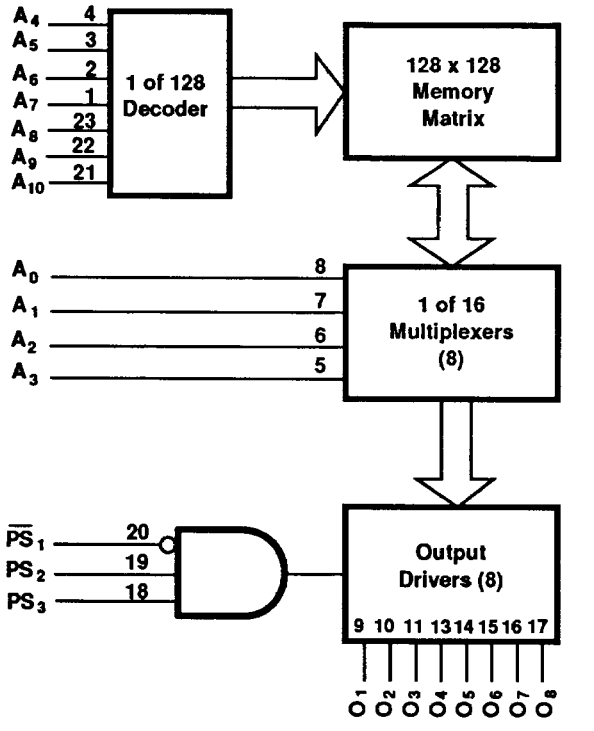
Parameter	Description	Test Conditions	Maximum Limits				Units
			R29683AC	R29683C	R29683AM	R29683M	
I_{CCD}	Power Down, Supply Current (disabled)	V_{CC} = Max $\overline{PS}$ = V_{IH}, All other inputs = GND	50	50	50	50	mA
I_{CC}	Supply Current (enabled)	V_{CC} = Max All inputs = Gnd	180	180	180	180	mA
t_{AA}	Address Access Time	C_L = 30 pF *	50	85	70	105	nS
t_{EA}	Enable Access Time	R1 = 300Ω to V_{CC}	65	85	85	105	nS
t_{ER}	Enable Recovery Time	R2 = 600Ω to GND	35	45	45	50	nS
P_D	Power Dissipation (Disabled)	16 mA Load	263	263	275	275	mW
P_D	Power Dissipation (Enabled)		945	945	990	990	mW

*See AC Test Load Circuit and Switching Waveforms

Raytheon Package Designator	Conforms to Mil-M-38510, Appendix C Case Outlines
S	D-9
D	D-3
L	C-4

Contact factory for flatpack package.

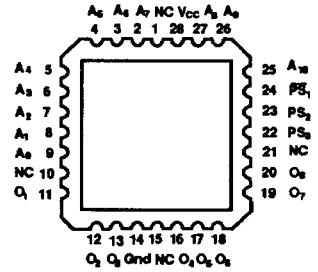
Block Diagram



65-0129

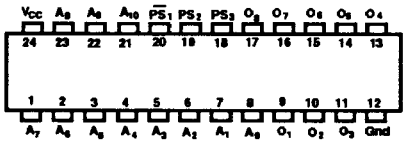
Pin Out Information

Leadless Chip Carrier (28-Terminal)



Pin 24 is also the programming pin (pp)

Dual-In-Line Package
Available in 0.3" and 0.6" Wide Packages



Pin 20 is also the programming pin (pp)

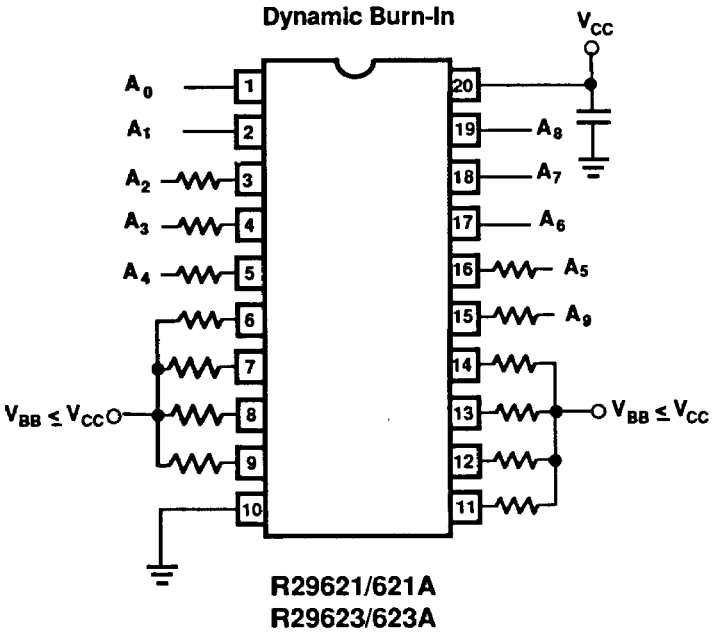
65-4074

Dynamic Life Test/Burn-In Circuits

In accordance with Mil-Std-883, Methods 1005/1015, Condition D

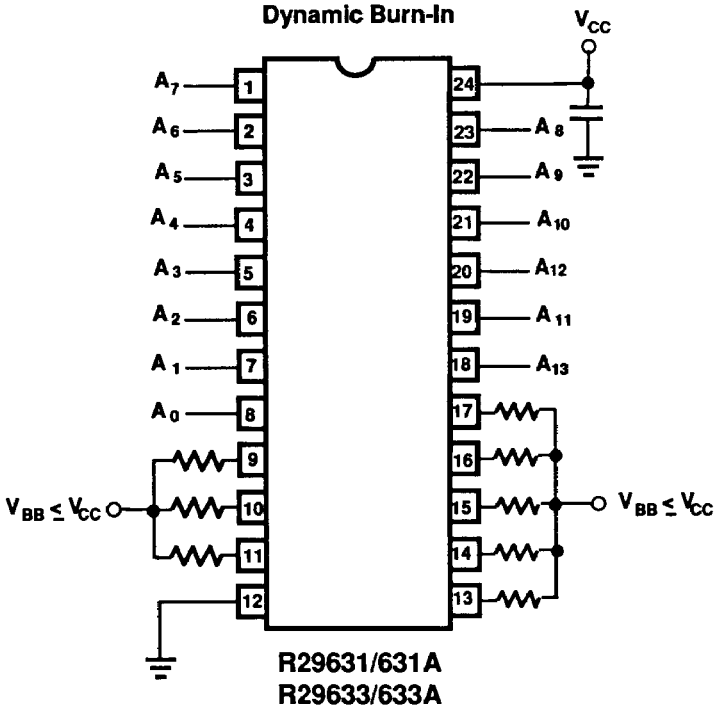
$T_A = 125\ ^{+10}_{-0}\ ^{\circ}C$
$V_{CC} = 5.25 \pm 0.25V$
Square Wave Pulses on A^0 to A^n are:
50% ±10% duty cycle
Frequency of each address is to be
1/2 of each preceding input,
with A^0 beginning at 100 kHz
(e.g., A^0 = 100 kHz ±10%,
A^1 = 50 kHz ±10%,
A^2 = 25 kHz ±10%,
An = 1/2 An-1 ±10%, etc.)

Resistors are optional on input pins



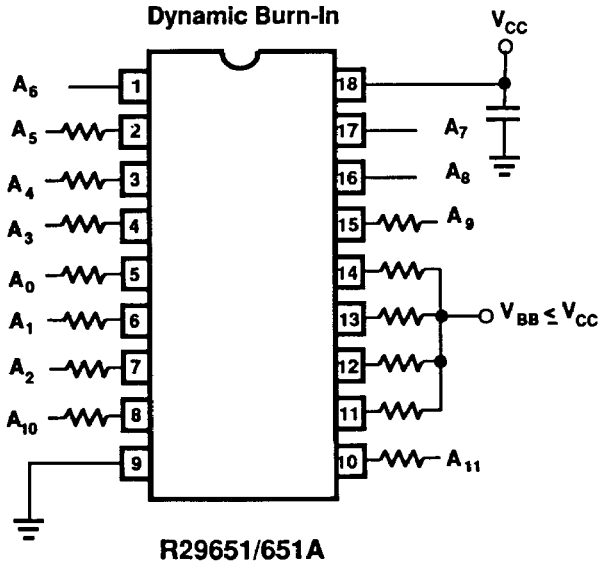
R29621/621A
R29623/623A

65-4065



R29631/631A
R29633/633A
R29671/671A
R29673
R29681/681A
R29683/683A

65-4063



R29651/651A
R29653/653A

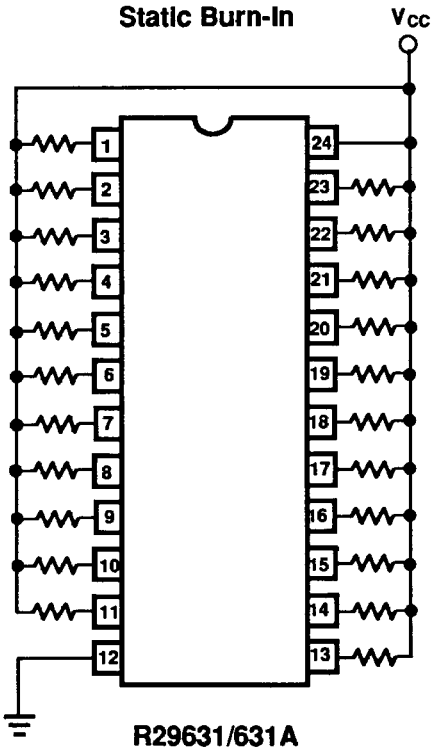
65-4064

Static Life Test/Burn-In Circuits

In accordance with Mil-Std-883, Methods 1005/1015, Condition C

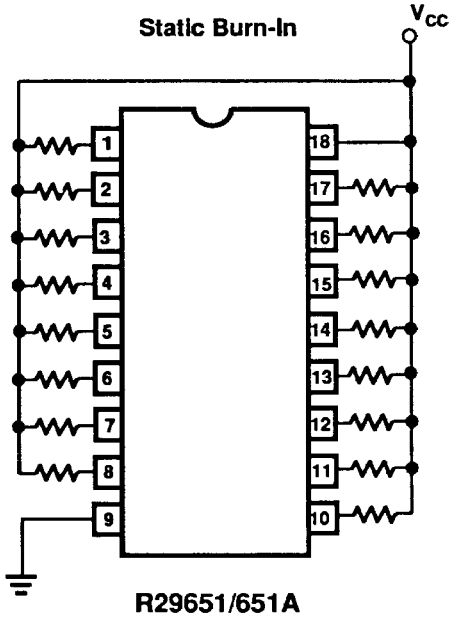
$T_A = 125^{+10}_{-0}$ °C
$V_{CC} = 5.0V \pm 0.25V$

Resistors are optional on input pins



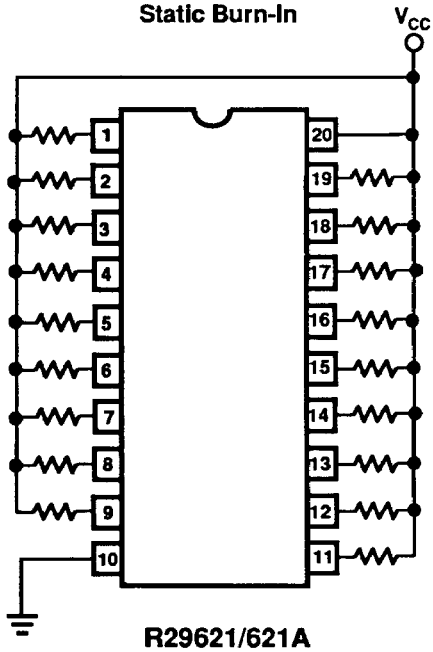
R29631/631A
R29633/633A
R29671/671A
R29673
R29681/681A
R29683/683A

65-4066



R29651/651A
R29653/653A

65-4067



R29621/621A
R29623/623A

65-4068

Programming Instructions

General

The device is manufactured with all outputs high in all storage locations. To make an output low at a particular bit location a nichrome fusible link must be opened. This procedure is called programming.

Programming Description

To select a particular link for programming the word address is presented with TTL levels on A_0 through A_N, a V_{CC} of 5.5V is applied or left applied. The program pin and the output to be programmed are taken to an elevated voltage to supply the required current to the fuse. The outputs must be programmed one at a time, since internal decoding circuitry is capable of sinking only one unit of programming current.

Additional Chip Select Inputs

Additional Chip Select Inputs are present on some devices. These may be high, low or open during programming. When checking that an output is programmed (which is called verification), these inputs must be enabled to activate the device. Since they must be enabled during verification and the state is irrelevant during programming, the simplest procedure is to activate them during the entire procedure.

Timing

The programming procedure involves the use of the program pin (a chip/power select) and the output pin. In order to guarantee that the output transistor is off before increasing the voltage on the output pin, the program pin's voltage pulse must come before the output pin's programming pulse and leave after the output pin's programming pulse. The programming pulse applied to the output pin and program pin must have a 0.4 V/µS rise time (see Figure 3).

Verification

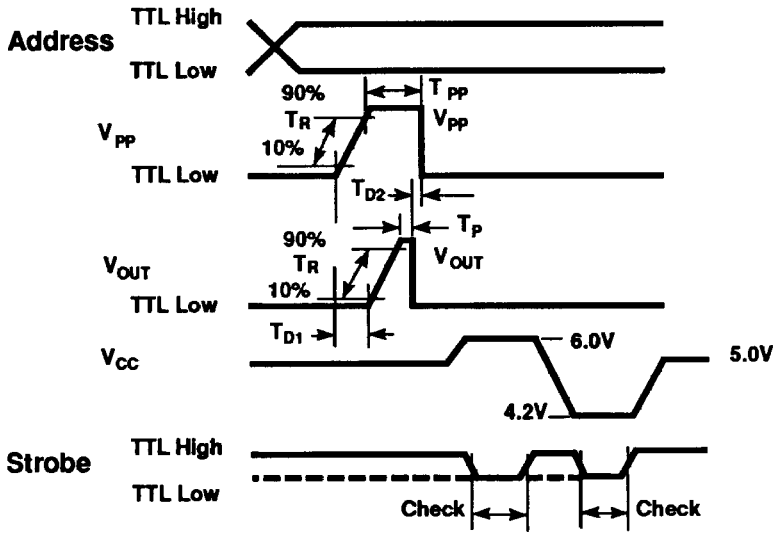
Once a device is programmed, it can be checked for the desired output logic states by enabling it. To guarantee operation at minimum and maximum V_{CC}, and current at temperature the device must sink 12 mA at V_{CC} = 4.2V when low and 0.2 mA at V_{CC} = 6.0V when high at room temperature.

Unprogrammable Units

Visual inspection, test fuse and decoding circuitry tests are performed in order to ensure optimum field programming yields. Because of random defects, it is impossible to guarantee that any given bit will program correctly. *Units returned to Raytheon as unprogrammable must be accompanied by a complete description of the programming method used and a contact phone number for clarification of any engineering or purchasing questions.*

Programming Parameters (Do not test these limits or you may program the device)

Parameter	Description	Test Conditions (T_A = 25°C)	Min	Recommended	Max	Units
V_{CCP}	V_{CC} required during programming		5.4	5.5	5.6	V
T_R	Rise time of program pulse applied to the data out or program pin		0.34	0.4	0.46	V/µS
T_{PP}	Programming pulse width		80	95	110	µS
T_P	Required coincidence among the program pin, output, address and V_{CC} for programming		1.0		40	µS
T_{D1}	Required time delay between disabling the memory output and application of the output programming pulse	Measure at 10% levels	70	80	90	µS
T_{D2}	Required time delay between removal of programming pulse and enabling the memory output	Measure at 10% levels	100			nS
V_{PP}	Required programming voltage on program pin		27	33	33	V
V_{OUT}	Required programming voltage on output pin		20	26	26	V
I_{OLV1}	Output current required during verification	Chip enabled V_{CC} = 4.2V	11	12	13	mA
I_{OLV2}	Output current required during verification	Chip enabled V_{CC} = 6V	0.1	0.2	0.3	mA
I_L	Required current limit of the power supply feeding the program pin and the output during programming	V_{PP} = 33V V_{OUT} = 26V V_{CC} = 5.5V	240			mA
MDC	Maximum duty cycle during automatic programming of program pin	$\frac{T_{PP}}{T}$			50	%



T_R = 0.4V/ µS ±15%
T_{PP} = 95 ±15 µS
T_P = 1 µS min./ 40 µS max.
T_{D1} = 80 ±10 µS
T_{D2} = 100 nS min.
V_{PP} = 27V min./33V max.
V_{OUT} = 20V min./26V max.

Note: Output Load = 0.2 mA During 6.0V Check
Output Load = 12 mA During 4.2V Check

65-4075

Figure 3. Programming Timing

Device Programming Inputs

If you would like to have Raytheon program your devices, please submit one of the following:

- Two masters and truth table
- Two standalone masters and checksum

In either case, we require customer approval prior to programming the devices.

If you need blank devices in order to supply programming masters, please do not hesitate to contact Raytheon for unprogrammed samples.

Commercial Programmers (subject to change)

Equipment must be calibrated at regular intervals. Each time a new board or a new programming module is inserted, the whole system should be checked. Both timing and voltages must meet published specifications for the device.

Please contact the following programmer manufacturers for equipment information:

Data I/O Corp.
10525 Willows Road, N.E.
P.O. Box 97046
Redmond, WA 98073-9746
(800) 247-5700

Digelec Inc.
1602 Lawrence Avenue, Suite 113
Ocean, NJ 07712
(201) 493-2420

Stag Microsystems Inc.
1600 Wyatt Drive, Suite 3
Santa Clara, CA 95054
(408) 988-1118

Commercial Surface Mount Programming Adapter Manufacturer
(subject to change)

Please contact the following adapter manufacturer for equipment information:

Little Machines
11010 Roselle Street
San Diego, CA 92121-1299
(619) 452-6400

The above lists are not intended to be complete listings of all programmer or surface mount programming adapter manufacturers nor does Raytheon endorse any specific company.

Revisions

Rev. No.	Date	Description
A		Complete update R29671M: Changed t_{AA} from 100 nS to 95 nS max. R29671AM: Changed t_{AA} from 80 nS to 70 nS max. R29671AC: Changed t_{ER} from 40 nS to 35 nS max. R29631AC: Changed t_{EA} from 35 nS to 30 nS max. R29631C: Changed t_{EA} from 30 nS to 35 nS max. I_{IH}: Changed from 0.1 mA to 40 µA max. V_{IC}: Changed from -1.5V to -1.2V max. I_{CEX}: Changed from ±100 µA to ±40 µA max. Changed commercial temperature range from 75°C max. to 70°C max. I_L (programming parameter): Changed from 250 mA to 240 mA min. Removed R29613/R29613A data sheet.

Raytheon Company — Code Identification No. 07933

1.0 INTRODUCTION TO OTI-053 DMA AND MEMORY CONTROLLER

OTI-053 integrates all the functions of a DMA controller and memory controller.

A summary of the special features provided by OTI-053 is listed below:

Memory Control:
- page mode and interleave mode for zero wait state cycles
- supports 60ns up to 120ns DRAMs
- system speed up to 20 MHz
- programmable wait states for slower speed DRAMs
- zero wait state ROM cycle with shadow RAM
- EMS 4.0
- supports 640 KB of system memory up to 8MB of total on-board memory including extended/expanded memory.
- supports 256K and 1M type DRAMs
- supports pseudo-SRAM for laptop model
- cartridge ROM support

DMA Control:
- supports fast and normal DMA mode with embedded 8237 at up to 10 MHz

Laptop Support:
- power saving scheme

System Block Diagram