component news

Dec. 20, 1978 COMPANY CONFIDENTIAL Issue 266

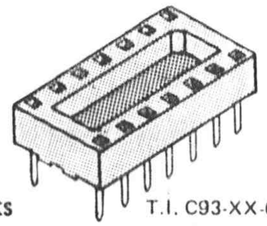
IC sockets: *An* asset or a liability?

Tek uses an extremely large volume of IC sockets each year. In the last few months, however, major reliability problems have caused us to seriously re-evaluate our need for these parts.

advantages in using IC sockets

IC sockets offer easier manufacturability and prevent large ICs from breaking due to board warpage. The possibility of multilayer board damage from careless desoldering of ICs is lessened. Field serviceability is improved using sockets, as well as providing the field and our customers the opportunity to upgrade their instruments.

Unfortunately, there are numerous disadvantages associated with IC sockets which tend to outweigh the benefits gained from their use.



T.I. C93-XX-02

disadvantages of IC sockets

Most of the problems encountered in using IC sockets has been in the area of manufacturability. For example, the JEDEC specification on IC leads is vague and ambiguous. Under the spec the lead thickness is allowed to vary by a factor of two.

The DIP lead frame has an unspecified base material, and plating is likewise not specified. As a result, IC leads have come into Tek with three platings — tin, silver and gold. The same device, if second-sourced, might come in with two different platings.

The size of the burrs left on the IC leads after cutoff from the carrier strips is not specified. One manufacturer's tolerance on the burrs exceeds 50% of the lead thickness. Burrs and sharp edges on the leads remove significant amounts of plating, exposing the base material to corrosion and failure under adverse environmental conditions.

high insertion force required

High insertion force is needed to make good contact between IC and socket. The majority of ICs have tin leads and a high normal force is required to break through the surface oxide films and maintain contact integrity. This high insertion force leads to damaged and bent IC leads in manufacturing areas. Also, many large ICs are broken during removal, due to the high withdrawal force required.

Damage to the IC socket contact occurs when DIP adapters or probes are inserted in the sockets. These devices "pre-size" the contacts, lowering the insertion force and therefore lowering the overall reliability of the instrument. **No device that exceeds the dimensions of the IC lead should ever go into an IC socket.**

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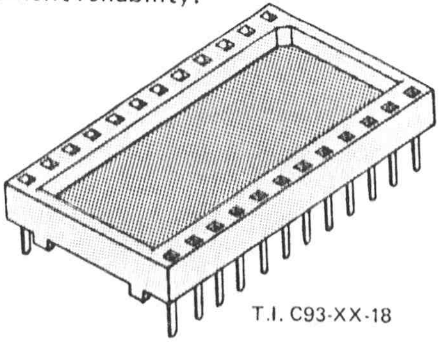
other reliability considerations

IC sockets are susceptible to flow solder and wash procedures. Flux contamination from poor washing reduces the long-term reliability of the connection. The socket housing often hinders or prevents effective washing and hides the contaminants, making inspection for residues very difficult.

Sockets obstruct airflow in densely packed instruments. Also heat conduction to the circuit board is greatly reduced by connections to the IC socket. The resultant higher heat in the IC further lowers instrument reliability.



T.I. C93-XX-18

In serviceability, IC sockets encourage "shotgun" troubleshooting. 40-60% of the failed ICs returned to Beaverton still test good. This either attests to the poor reliability of IC sockets or to poor or incomplete service procedures.

The use of sockets for upgradeability of instruments in the field also brings about the ability for our customers to upgrade their instruments without purchasing the devices from Tek. Field Service has difficulty determining what has been purchased from Tek, and the result is lost revenue!

Finally, there is a higher manufacturing cost incurred because IC sockets are relatively expensive. There is no way to save labor dollars because IC sockets cannot be machine-inserted. At present, Incoming Inspection has no way to test IC sockets for quality or reliability other than a visual inspection.

a solution to the problem

Considerable cost savings and gain in reliability could be achieved by eliminating the use of IC sockets in the majority of applications.

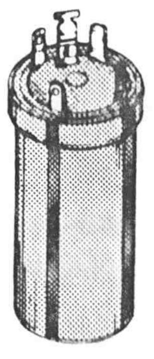
Enhanced manufacturability would result from the use of automated IC insertion directly into the board. The use of tri-state devices (to disable outputs during test) and techniques like "signature analysis" could replace the requirement for removing ICs in manufacturing board test.

I recommend that we eliminate the use of IC sockets wherever possible, and institute plans for soldering-in integrated circuits.

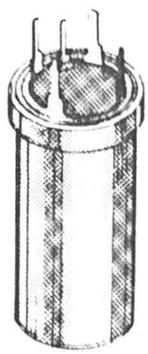
Peter Butler, ext. 5417
Electromechanical Component Engineering

Mallory drops aluminum electrolytic cap line

We currently part-number five 500 WVDC aluminum electrolytic capacitors. Mallory has just announced that they will no longer produce these large, can-type capacitors. This leaves Tek with only one approved supplier. Therefore, the following 500V aluminum electrolytics are **not recommended for new design:**



290-0028-00
290-0143-00
290-0150-00
290-0262-00
290-0668-00



twist-mount — printed circuit mount

We also part-number three 475 WVDC parts and they will probably suffer the same fate in the near future. If there are any questions or problems contact **Don Anderson (58-299), ext. 5415**, or **Harry Tanielian (19-194), ext. 6405.**

64K ROM performance compared

ne advent of more complex memory systems at Tek has generated interest in the 64K ROM to fill ory requirements. To meet the needs of various user groups, Memory Component Engineering has studying these devices as they become available from semiconductor manufacturers.

devices under test

ne first 64K ROM samples investigated were secured under a contract between Tektronix and AMI or number Am4264). These were the first large memory devices to use VMOS (V-groove MOS) tech- y and utilize a fully static design. The parts were later redesigned, and the results of our second sis are presented in this article.

osely following AMI was the introduction of a 64K ROM from Mostek (MK36000). This was also a e design for ROMs because it employed dynamic peripheral circuits around the cell array. Perform- was greatly improved, but the device could not be operated in a mode inherently available in fully devices.

amples were also obtained from Motorola, National and Signetics. The Motorola (MCM68364) design first Motorola ROM to employ the HMOS (high-performance MOS) process. Devices from National 2164) and Signetics (S2664) appear to be based on standard design and process technology.

results

ne table below shows some of the results obtained through testing. The first AMI design appeared to 'brute force" approach which was intended to be refined at a later date. Their redesigned ROMs have oved performance over the original samples.

continued on next page

	Mostek MK36000P-4 (3 samples)	Motorola MCM68364 (4 samples)	AMI Am4264 (3 samples)	Signetics S2664 (3 samples)	National MM52164 (1 sample)
(nS)[1]					
C	132.0	197.4	207.1	313	378.5
C	146.3	233.1	223.8	350.1	556.1
standby[1] \)					
C	3.93	4.7	123.1	114.5	64.3
C	3.30	4.1	109.0	99.1	56.3
dynamic[1] \)					
C	17.5*	47.0	137.3	121.3	79.0
C	15.9*	42.4	123.0	105.5	72.5

$_{CC}$ = 5.0 V * Clock cycle = 500 nS

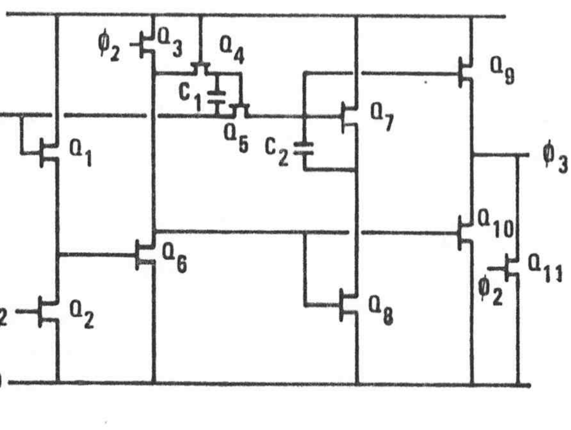
nued from previous page

The Mostek ROM exhibited the best perfor-ce characteristics of all the devices tested. No r source, except perhaps Motorola, could ch Mostek's speed/power characteristics.

In the case of Motorola, HMOS is a new ess and we can expect a certain amount of trial error before it is fully understood. (For a ription of the HMOS process, refer to **Com-ent News 265**, page 5.) As mentioned earlier, onal and Signetics chose to rely on their dard fabrication processes, and the device ormance reflects this decision.

lusions

We feel that the Mostek 64K ROM is being as a vehicle to prove out circuit designs for 64K RAM (which is yet to be released). For reason, we decided to more fully analyze the ce by investigating chip circuitry and modeling e of the basic internal functions. Figure 1 vs a schematic diagram of the clock generator Figure 2 shows the performance obtained from puter simulation.



ure 1 – Clock generator; Mostek MK36000-P4

The results indicate a propagation delay of 3 to S. Considering that the MK4116 (16K RAM) k generator has a 5 nS delay, we may expect e form of this circuit to show up in the 4164 (64K RAM).

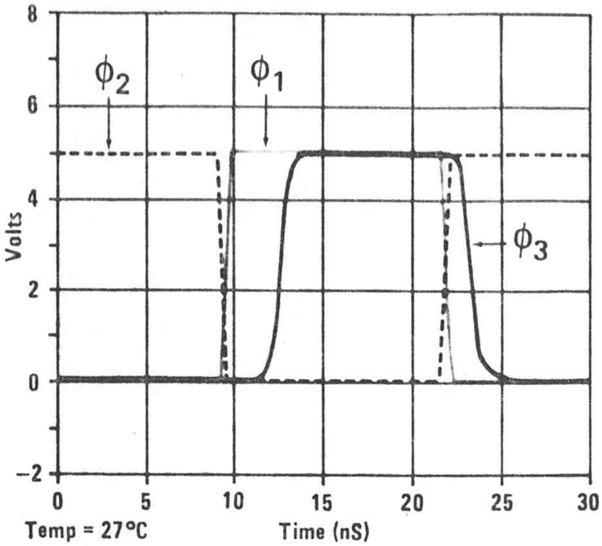


Figure 2 – Simulated performance of Mostek clock generator

In a fully static ROM like the AMI 4264, it is possible to keep chip select low and perform the address sequencing to obtain valid data. The only concern is that a certain amount of delay equal to access time be established to ensure valid data is available on the data bus. Because the Mostek ROM is a clocked part, chip enable must be brought back high to ensure valid data for the next cycle. If this is not done the ROM will not operate properly. The trend toward clocked parts is expected to continue as ROMs become larger and more sophisticated.

The parts tested can be grouped into three general categories: The Mostek-type part, characterized by low power consumption and fast access time; the intermediates, illustrated by the AMI 4264 and Signetics 2664; and the slow performer, characterized by National's 52164.

Fortunately, many ROM manufacturers are designing parts with goals of much lower power consumption and less than 100 nS access times. We expect this type of part to dominate the marketplace very soon.

If you have any questions concerning our evaluation, please contact me at 58-299, ext. 6302.

Bob Goetz

Benefits of incoming inspection on CMOS

by Wilton Hart
Digital Component Engineering

Editor's note: Wilton presented this paper at the "Testing in Electronics Manufacturing" symposium held in San Jose during April of this year. His findings were also featured in the September/October issue of **Evaluation Engineering** magazine.

The interest in CMOS testing has grown in the last few years as usage increases. The question that comes from product assembly areas is, "Why don't these parts work in our circuits?" To prevent this question from arising, some form of testing is needed. Testing can take two forms: the first, and probably the easiest to implement, is incoming testing; the second is characterization.

Tektronix set up an incoming inspection procedure on CMOS to sample or 100% test incoming lots. Over the last year 127,000 CMOS parts were tested with a 1.5% reject rate. This means that 1,851 parts did not meet the parameters specified on the data sheet and probably would not have worked in the production line. If the cost of labor to find and replace a bad part exceeded $4.80 it would be cheaper to test each part first. This conclusion is based on testing cost of seven cents per part. See Figure 1.

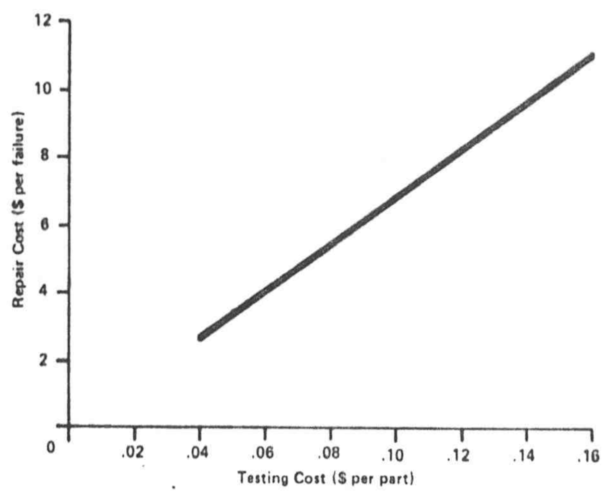


Figure 1 – Repair Cost vs. Testing Cost

What tests need to be performed?

A question which often comes up when discussing incoming inspection is: "What tests need to be performed?" Some think a simple functional test is enough while others also recommend parametric and AC tests.

To help determine what tests are needed, CMOS reject information was saved from incoming inspection tests. The reject data was broken out into three categories: functional, input current, and other. Input current failures accounted for 58% of the total rejects. Functional rejects accounted for 27% and other rejects made up the remaining 15%.

The input current may go out-of-spec for two reasons: one of the protection diodes may become leaky, or the part may have a gate-oxide punch-through. The input current spec is 1μA, but the typical values are several orders of magnitude less.

The input may receive a static discharge which degrades it but the input current may still be only 500 nA. This device will probably fail in the first few months of operation. The ability to measure input current much lower than 1μA is needed.

To be effective, in catching both upper and lower protection diode failures, a tester should measure the input current near ground and at the supply.

The functional failures were truth table errors, so high speed testing was not needed to catch these rejects. (The 27% did not include AC or propagation delay failures.) A simple test fixture could be made to catch the first two types of failures. It would consist of some standard truth table pattern generator which is connected to the part through a set of large value resistors. (The large value resistors are used to detect input current problems.) The output would then be compared to a known good device. The pattern would be a slow but complete truth table test. If the input is not high impedance, the signal will be loaded and the part will not have the correct output. See Figure 2.

continued on page 6

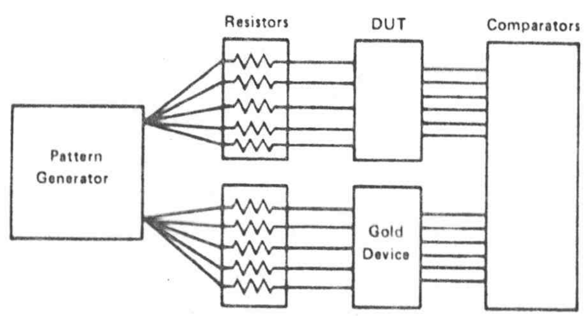


Figure 2 – Functional and Input Current Test Fixture

Even though this test fixture requires a known good device, it is simple and much less expensive than one capable of measuring exact values of input current as well as performing a functional test.

The category "other" contained two types of rejects. The largest portion of the parts failed to meet power supply current limits. These rejects were interesting because they probably reveal a contaminated process. The remaining parts were rejected for speed problems.

The test we use for quiescent current and for leakage paths caused by process contamination is slightly different from the way most vendors specify it. At Tektronix the part is powered up and all inputs are forced to zero. A current meter is inserted in the ground lead. The inputs are forced to the supply one at a time and a current measurement is taken. This type of test not only checks the quiescent current but also checks for leakage to ground from any input. The vendors leave the inputs at ground. This quiescent current test requires current measuring capability and programmable power supplies so the simple tester would not be adequate.

Characterization

The second area of interest is characterization. A benefit of characterization is the ability to determine why one part works in a particular circuit and another doesn't. For example, Tektronix used a two gate oscillator circuit made up of "A Series" type parts. See Figure 3. The circuit did not always start up properly and with some parts it oscillated at a different frequency.

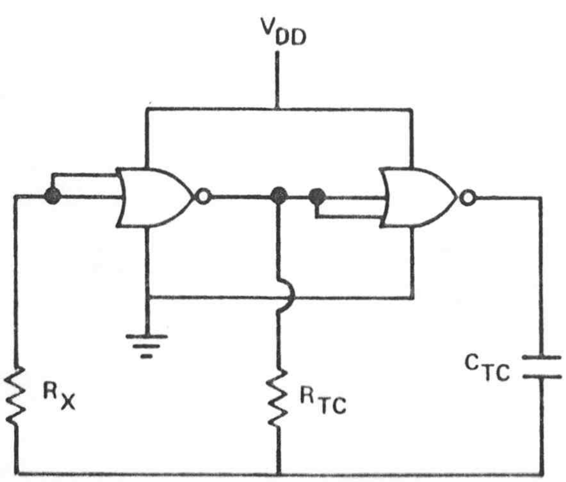


Figure 3

To solve this problem we characterized both parts that worked and those that did not. The transfer curve seemed to be the key. Figure 4 shows the transfer curve of the parts which worked.

Figure 5 shows the transfer curve of those that did not work. The DIP or lower gain point caused the circuit not to work correctly.

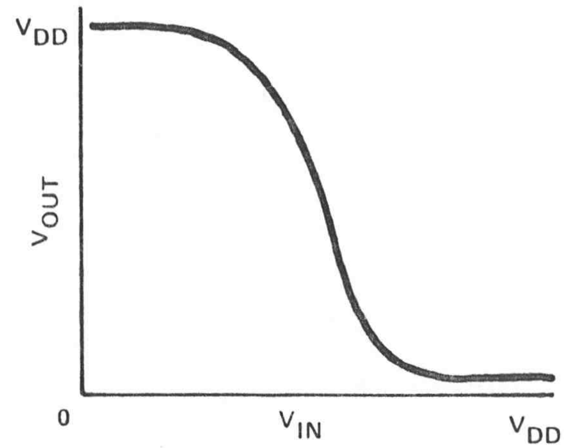


Figure 4 – "A Series" Transfer Curve

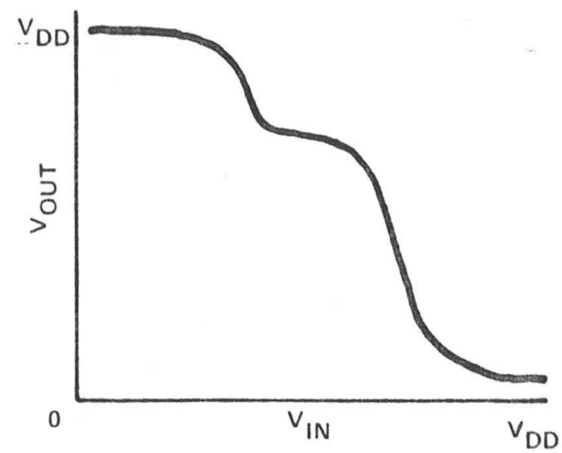


Figure 5 – "Problem Parts" Transfer Curve

This circuit has caused other problems. "B Series" parts will not reliably work. The transfer curve of "B Series" parts is shown in Figure 6.

At some power supply voltages the circuit will not oscillate. At this point, the first gate is sitting with its input voltage equal to its output voltage because there is negative feedback provided by RTC. This point is either below or above the threshold point of the second gate so the circuit is stable. This could not happen with "A Series" parts because the threshold portion of the curve is much wider.

continued on page 7

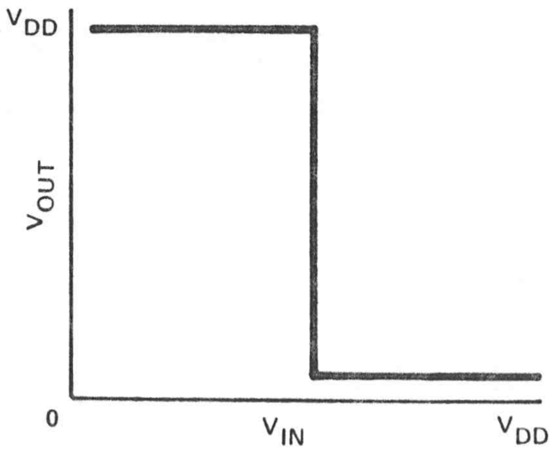


Figure 6 – "B Series" Transfer Curve

A better circuit is shown in Figure 7. This circuit uses a Schmidt Trigger which has specified threshold points so the percentage of frequency change due to part differences can be calculated.

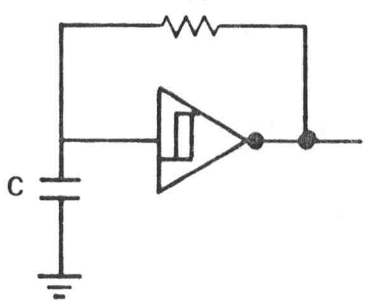


Figure 7

Characterization can also be used effectively in choosing the right analog switch. The data sheets on these parts don't tell the whole story. For example, the data sheets on the CD4016 and CD4066 are quite similar yet the CD4066 will not work correctly in some sample-and-hold circuits. The test circuit is shown in Figure 8.

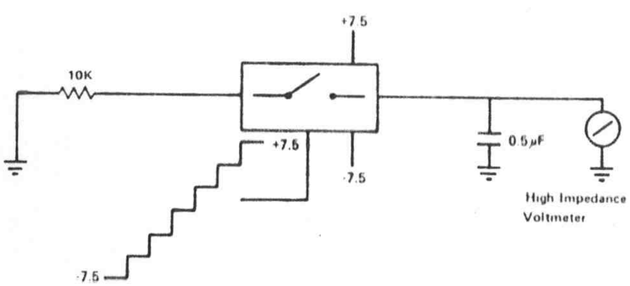


Figure 8 – Sample and Hold Test Jig

Using this circuit, it would seem that the voltmeter would read zero no matter what the control voltage was. This is not true. See Figure 9 and 10.

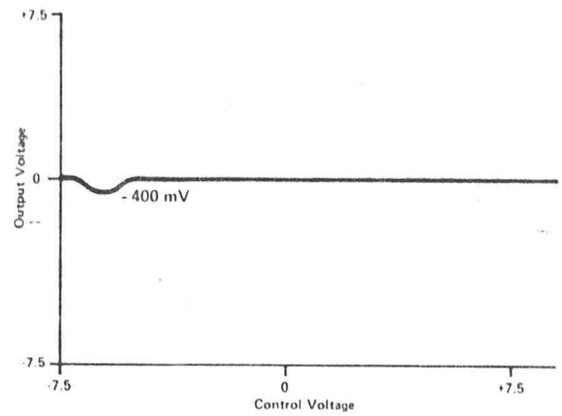


Figure 9 – CD4016; Sample and Hold

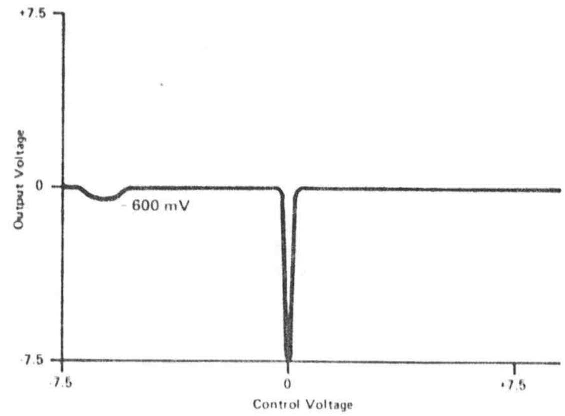


Figure 10 – CD4066; Sample and Hold

The CD4016 has a 400 mV DIP in the output near the -7.5 control voltage point. The CD4066 has the same problem but in addition the output goes to the negative rail at the point where the control equals zero.

In a sample-and-hold application this output glitch discharges the storage capacitor and ruins the stored voltage level. The cause of the glitch is a pair of FETs which were added to help with a latch-up problem. Using a fast risetime control signal reduces this problem.

Characterization can also be used to compare different vendors parts. This type of information can be used for qualifying new vendors or second sourcing.

continued on page 8

An interesting comparison which I recently completed was a characterization of CD4011B (RCA) and MM74C00 (National). These two parts are quad two-input NAND gates. They have the same function but their pinout is different. Figures 11 and 12 show the comparison.

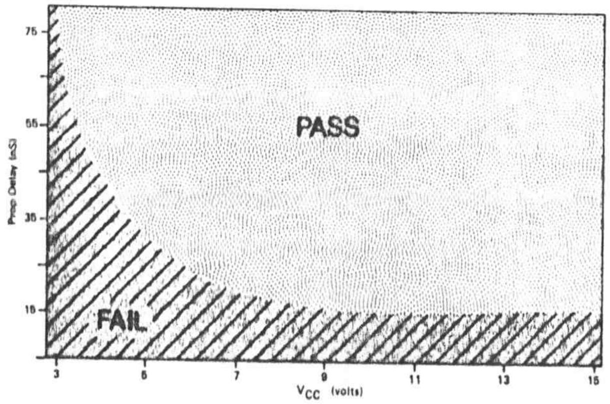


Figure 11– National 74C00; Prop Delay vs. V_{CC}

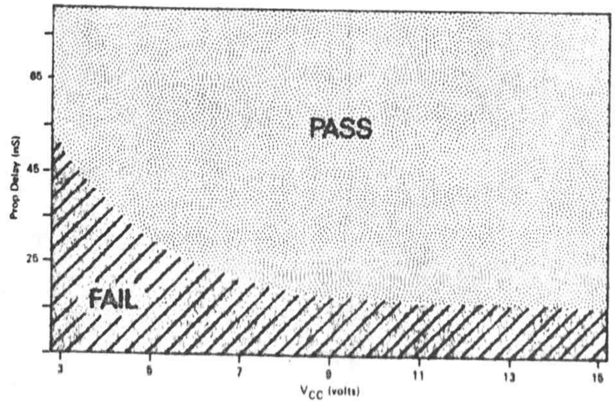


Figure 12 – RCA CD4011; Prop Delay vs. V_{CC}

The two parts were characterized for propagation delay versus power supply voltage. Both parts have a minimum propagation delay of 17 nanoseconds at the higher power supply voltages. The interesting area is below 5 volts. The National part has a 77 nanosecond prop delay at 3 volts where the RCA part has 47 nanosecond propagation delay. The data sheets for these parts do not list specs at 3 volts yet the RCA part is almost 1/3 faster at this power supply level. As illustrated, characterization yields actual boundaries of device operation.

Conclusion

In conclusion; a simple, inexpensive test fixture can catch 85% of the CMOS rejects at Incoming Inspection. The remainder require somewhat more complex equipment. Characterization is very helpful in revealing performance characteristics not evident from data sheets and can explain a device's failure to perform as expected.

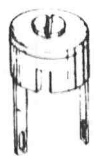
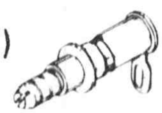
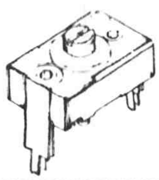
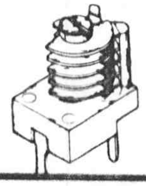
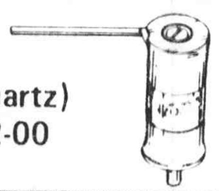
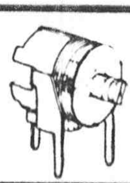
New manager in Optoelectronic/ Passive Components group

Paul Curley is the new Optoelectronic and Passive Components manager within Component Engineering. Paul has a BSEE from the University of Cincinnati, and has been working for Tek since 1971. His most recent position was Applications Support Manager at Walker Road.

Paul can be reached at 58-299, ext. 6389.

Would whoever borrowed the black loose-leaf notebook on aluminum electrolytic capacitors from the Component Engineering area please return it immediately.

VARIABLE CAPACITO

↓ Style / Parameter →	Q	Price	Size (approx.)
Ceramic (disc – single turn) 	Moderate Q most >500 at 1 MHz some>3000 at 100 MHz	Medium 35 - 75¢	Small to medium 0.1x0.15" to 0.4x0.3"
Ceramic (tubular – multi-turn) 	Moderate Q most>500 at 1 MHz	Low 25 - 45¢	Medium 0.2x0.7"
Compression Mica 	Generally the lowest Q of all variable capacitors	Low to medium 30-60¢	Large typically 0.4x0.8x0.5'
Air (plates - single turn) 	Very High Q	Medium 50 - 80¢	Small - medium - larg 0.25x0.38" and up
Piston (air - glass - quartz) e.g., 281-0152-00 	Very High Q typically 2000 - 5000 some >10,000 at 100 MHz	High $1.50 - $12.00 typically $3.50	Small - medium - larg 0.075x0.2" 0.15x0.5" 0.30x 1.0"
Film 	Varies greatly from 200 at 1 MHz to 5000 at 1 MHz	Low 15 - 40¢	Medium to large 0.2x0.4" to 0.4x0.4x0.5"
Teflon e.g., 281-0064-00 	High Q rarely less than 2000 at 1 MHz	Low 25 - 35¢	Medium 0.15x0.7"

SELECTION GUIDE

If you have an application for a variable capacitor and several different types are being considered, this chart might help you make a decision. Much of this information is based on manufacturer's data and on parts purchased in large quantities. For example, the price of an air variable capacitor could be $15 each (18 - 1000 pF), but most of the air variable caps we use (in quantity) are approximately $0.50 - 0.80 each. For questions concerning these parts contact **Alan LaValle (58-299), ext. 5415.**

Temperature Coefficient	Resolution	C-Range (Size / Range)	Voltage
Good to poor 50±50 to – 1500±800 PPM/°C	Single turn	High or low depending on K of dielectric	Most from 100 - 350 VDC
Good to medium/poor 0±100 to 100±400 PPM/°C	Multi-turn	Low	400 VDC
Very poor 0±1500 to 0±2500 PPM/°C	Multi-turn; but comparatively poor resolution for a multi-turn part.	Generally the highest	Most at 175 VDC Some at 500 VDC
Very good typically 45±45 PPM/°C some 0±15 PPM/°C	Single turn (multi-turn air variable caps have a gear reduction)	Very low (k≈1)	150 V and up
Excellent 0±15 PPM/°C	Multi-turn very good resolution	Low	500 VDC to 1250 VDC
Good to poor 0±150 to 100±500 PPM/°C	Single turn High C films have poor resolution	Very High	Most from 100 - 300 WVDC
Good 50±50 PPM/°C	Multi-turn, grasshopper style good resolution	Very low	600 VDC

Invalid low from Signetics hex buffer

We have received many inquiries lately about Signetics' 8T97 hex buffer. It is possible to get an invalid low when the input stays high and the enable pin is toggled.

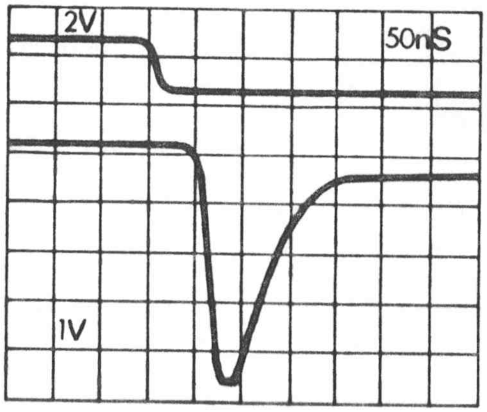


Figure 1 – Signetics hex buffer

In Figure 1, the top trace is the enable pin and the bottom trace is the output. When this test was performed there was a 10KΩ resistor used to pull the output high while it was in the tri-state condition. The magnitude of the pulse is frequency-dependent. Figure 1 shows the maximum voltage swing for this particular IC. The testing was conducted at 10 KHz. However, there was a 4.2 volt dip at 800 KHz which decreased abruptly as the frequency increased.

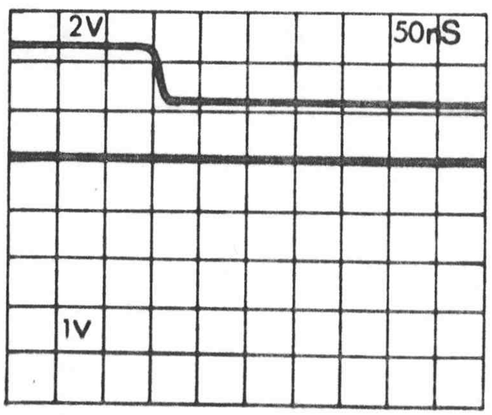


Figure 2 – Motorola hex buffer

The Motorola IC depicted in Figure 2 does not exhibit these characteristics. Therefore, we strongly recommend that the Motorola parts be used in all new designs. Also, be aware that many of the other devices in Signetics' 8T series exhibit the same characteristics.

A more detailed evaluation of this device is underway. For details, contact **Don VanBeek (58-125), ext. 5414.**

EUROPEAN PRODUCT SAFETY POST FILLED

Bob Randall has been named the Tektronix European Product Safety Manager. He will be coordinating our efforts in meeting the various regulations in Europe, the Mid-East and Africa.

Bob has a great deal of product safety experience. He has represented Tek on numerous national and international product safety committees, and has a high degree of success with other projects at Tek. He will be moving to Amsterdam by mid-January.

If you have a question relating to international product safety, you can either work through Product Safety Engineering (58-123), or contact Bob directly.

TECHNICAL STANDARDS

The function of Technical Standards is to identify, describe, and document standard processes, procedures, and practices within the Tektronix complex, and to insure these standards are consistent with established national and international standards. Technical Standards also provides a central repository for standards and specifications required at Tektronix. *Chuck Sullivan, manager (58-187)*

new and revised 062- part numbers available from Reprographics, ext. 5577

062-1780-01 Interface Standards General Purpose Interface Bus. GPIB Codes and Format. This standard was incorrectly referenced in an earlier issue as 062-1780-00. It is completely revised; twenty additional pages have been added.

new publications

Product Durability and Life, papers presented at the 17th meeting of the Mechanical Failures Prevention Group (MFPG). National Bureau of Standards Special Publication 514. Contains questions and answers on product durability including analysis of the consumer.

NASA Tech Briefs are available for anyone to stop by and look at or check out at 58-187.

ASTM Annual Book of Standards, Vol. 43, Electronics, 1978 edition is now available for perusal.

JIS C6361-1971 (Reaffirmed 1974) The Interface Between Modern and Data Terminal Equipment. We now have the English version of this Japanese Industrial Standard, which is apparently equivalent to EIA STD RS 232 and may be of interest to someone involved with the EIA Standard. Copies can be obtained from Technical Standards.

UL Supplement to Recognized Component Directory, September 1978, just received.

National Bureau of Standards Special Publication 487, Engineering Design, Mechanical Failures Prevention Group, August 1977. Includes papers on Design Techniques, Materials, Testing, Hazards and Product Liability, Reliability, and Coating Materials and Techniques. A 355-page compilation of design information and considerations. Available for perusal or copying of selected articles.

ISO Directory of International Standardizing Bodies provides names, addresses and functions of 68 committees on subjects of international interest. These include BIPM (International Bureau of Weights and Measures), CEE (International Commission on Rules for the Approval of Electrical Equipment), OIML (International Organization for Legal Metrology), and WMO (World Metrological Organization). Not available for loan. Stop by 58-187 to see.

National Fluid Power Association Directory and Product Guide 1978. 25th Anniversary Edition. Can be loaned out.

USDC Handbook, Metric Laws and Practices in International Trade is available in limited numbers.

cancelled military documents

MIL-S-22710/4A	**These items all pertain to the main document:**
MIL-S-22710/5A	MIL-S-22710 – Switch, Rotary, (Printed Circuit),
MIL-S-22710/10A	(Thumbwheel, Nonsealed, Nonilluminated),
MIL-S-22710/21	Style SRPC10.

new and revised standards that can be ordered through Technical Standards, ext. 7976

ANSI/EIA RS-310-C, revised Racks and Panels. This provides information on metric dimensions and 24- and 30-inch racks. Tektronix Standard 062-1733-00 is usable but will be updated.

for information on the above publications, please call Carol Whitmore, Technical Standards, ext. 7976.

PART-NUMBERED TEKTRONIX STANDARDS

Whether your job requires all issues of part-numbered Tektronix Standards, or only selected copies, please check the following list to ensure you have the latest available. Call Reprographics, ext. 5577, to obtain new or revised standards, unless otherwise noted.

Tek P/N	Standard	Latest Issue
062-1699-00	Introduction to the Directory (contained in Directory, obtain from Technical Standards)	26Jun78
062-1700-00	Subject Index, Directory	12Aug77
062-1701-00	Trademarks, Copyrights, and Related Proprietary Matters	12Jun78
062-1702-00	Fabrication Standards, Welding, Soldering, and Brazing	15Mar77
062-1703-00	Finish Standards, Glossary of Terms	2Sep77
062-1704-00	Drafting Standards, Decimal Inch Dimensioning	22Jun78
062-1705-00	Metric Standard, Drawings (revision pending)	5Aug77
062-1706-00	Converting Fractions to Decimals	18Nov74
062-1707-00	Rounding off Decimal Numbers	18Nov74
062-1708-00	Drafting Standards, Drawing Format	1Jun78
062-1710-00	Test Procedures for Panels and Tags	8Nov78
062-1714-00	Tooling Standard, Wiedeman Dies and Punches	25Jul78
062-1716-00	Drafting Standard, Symbols for Tolerances of Position and Form	29Nov77
062-1718-00	Finish Standard, Cosmetic	8Nov77
062-1720-00	Finish Standard, Mold Surface Finishes for Plastics	12Jan77
062-1721-00	Circuit Board Standards, Drafting (absorbs and replaces G-102, now invalid)	10Nov78
062-1723-00	Circuit Board Standard, Manufacturing, One and Two Layers	2Jun78
062-1725-00	Circuit Board Standard, "EC 200B"	4Feb77
062-1727-00	Circuit Board Standard, Multi-Layer, Manufacturing	12Sep78
062-1731-00	Hardware Standard, Weld Studs and Posts	12Jan77
062-1732-00	Component Mounting Standards	10Jul78
062-1732-01	Component Mounting Standards, A Series Details	14Apr78
062-1732-02	Component Mounting Standards, B Series Details	14Apr78
062-1732-03	Component Mounting Standards, C Series Details	14Apr78
062-1732-04	Component Mounting Standards, D Series Details	14Apr78
062-1732-05	Component Mounting Standards, E Series Details	12Oct78
062-1732-06	Component Mounting Standards, F Series Details	8Sep77
062-1732-07	Component Mounting Standards, H Series Details	12Oct76
062-1732-08	Component Mounting Standards, M Series Details	12Oct76
062-1733-00	Rackmount Standards	1Feb77
062-1736-00	Communications Standard, Glossary of Technical Terms	7Jan77
062-1737-00	Communications Standard, Abbreviations, Acronyms, and Symbols	20Jul78
062-1738-00	Available Part-Numbered Standards (Directory, Technical Standards)	26Jun78
062-1778-00	Circuit Board Standards, UL Recognition and Flammability Classification	24Jan77
062-1780-00	Interface Language Standard, High Level Format (replaced by 062-1780-01)	
062-1780-01	Interface Standard, General Purpose Interface Bus (GPIB) Codes and Formats	6Jul78
062-1860-00	Product Safety Standard for X-Radiation	19May75
062-1874-00	Drafting Standards, Line Conventions and Lettering	15May78
062-1875-00	Drafting Standards, Projections, Views and Sections/Details	13Jun77
062-1879-00	Cable Standard, Product Wiring, Internal	17Mar78
062-1880-00	Cable Standard, External Interconnecting and Power Cables, Drafting (revision pending)	4Apr77
062-2318-00	Circuit Board Standard, Marking Adherence and Solder Flux Cleaning	1Apr76
062-2319-00	Switch Standard, Cylindrical Cam Switch	30Jun76
062-2463-00	Index, Letter Series Standards, (Directory, Technical Standards)	26Jun78
062-2476-00	Drafting Standard, Symbols, Schematic Diagrams, Electronic Circuits	31Jul78

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Tek P/N	Standard	Latest Issue
062-2801-00	Occupational Safety Standards, Distribution Procedures (from Corporate Safety and Health)	25Jun76
062-2801-01	Occupational Safety Standards, Warning Alarms	28Jun77
062-2801-02	Occupational Safety Standards, Exhaust Hood Classification	20Sep76
062-2801-03	Occupational Safety Standards, Handling Flammable Liquids Under Pressure	22Feb77
062-2801-04	Occupational Safety Standards, Forming and Shaping of Asbestos Materials	16Sep76
062-2801-05	Occupational Safety Standards, Open Tank Classification	8Aug77
062-2843-00	Drafting Standard, Drawing Scale	5Oct76
062-2846-00	Drafting Standard, Glossary of Terms, Dimensioning and Tolerancing	14Oct76
062-2847-00	Product Design Standard, Environmental Test, Atmospheric	15Jun77
062-2848-00	Fabricating Standard, Bend Allowance and Deduction	10Nov77
062-2851-00	Cable Standard, Glossary of Terms	2Nov76
062-2853-00	Product Design Standard, Environmental Test, Product Classification	13Jun77
062-2858-00	Product Design Standard, Environmental Test, Dynamics; Vibration, Shock and Transit	17Jun77
062-2862-00	Product Design Standard, Environmental Test, Electrostatic Discharge	20Oct77
062-2866-00	Product Design Standard, Environmental Test, Electromagnetic Compatibility	31Mar77
062-2877-00	Cable Standard, Wire and Cable Color Coding System	21Oct76
062-3083-00	Documentation Standard, Assignment of Item Names	8Mar77
062-3099-00	Drafting Standards, Engineering Change Order (ECO)	28Apr78
062-3108-00	Circuit Board Standards, Electrodeposited Gold Plate, Contact Areas	20Oct77
062-3109-00	Documentation Standards, Technical Standards, Procedures and Format	4Jan78
062-3134-00	Color Standard, Color Description, Selection, and Testing	…ov77
062-3159-00	Drafting Standard, Marking, Heat and Roll Stamps, Die Cast and Molded [illegible]	…n77
062-3500-00	Test Method Standard, Time Delay of 50µ RF Coaxial Cable and Ca[illegible]	…77
062-3539-00	Test Method Standard, Cables, Spark Test	…7
062-3546-00	Drafting Standard, Draft Considerations, Molded Plastic Par[illegible]	…78
062-3716-00	Component I.D. Marking Standard, Transistors and Dio[illegible]	…Mar78
062-3744-00	Occupational Safety Standard, Illumination, Minim[illegible]	[illegible]
062-3748-00	Microfiche Requirements for Documents	2Jun78
062-3752-00	Communication Standard, Product Markin[illegible]	6Sep78
062-3797-00	Software Standard, BASIC Language St[illegible]	7Aug78
062-3901-00	Drafting Standard, Temporary I.D. of En[illegible] Prior to Part Number Assignment	16Aug78
062-3923-00	Test Method Standard, Cables, Jacket Remo[illegible]	8Nov78

To receive a copy of any of these part-numbered technical standards, contact Reprographics, ext. 5577. Direct any other questions concerning Tek standards to Technical Standards, ext. 7976.

Archiving ROMs and PROMs

In an effort to eliminate errors in archiving, we are requesting that you follow a standard format for all data tapes sent to Documentation Coordination (58-299).

By convention, a hole in the tape equals a "1" state (i.e., V_{OH}). This is irrespective of whether the component programs to a high or low state. The format is based on the majority of tapes received. *Tapes which do not adhere to the format will be returned to the initiator.*

For more information on the archiving system see **Component News 256**, page 6.

Bob Goetz

ComponentNews NewComponents

This column is designed to provide timely information regarding new components, vendors, availability and price. "New Components" can also be used as an informal update to the Common Design Parts Catalogs. Samples may or may not be available in Engineering Stock.

Vendor	No.	Description	When available	Tek P/N	Approx. cost	Engineer to contact
		analog devices				
Ferranti	ZN459C	Pre-amp, low noise, wide bandwidth	now	no P/N	$ 2.15	John Hereford, 6700
Matsushita	--	Pre-amp, Bi-FET using N-channel FETs, 1.8nV/$\sqrt{Hz}$ noise	--	no P/N	---	John Hereford, 6700
National	LM359	Op-amp, Norton, dual, high speed	1st qtr.'79	no P/N	0.50	John Hereford, 6700
Analog Devices	AD542	Op-amp, low offset voltage BiFET, low supply current, low bias current	now	no P/N	2.50	John Hereford, 6700
Analog Devices	AD544	Op-amp, wider G.B.W. than AD542	1st qtr.'79	no P/N	3.00	John Hereford, 6700
Analog Devices	AD545	Op-amp, precision, low drift, FET input (2 pA bias)	now	no P/N	5.95	John Hereford, 6700
Harris	HA5105	Op-amp, wide bandwidth (18 MHz), BiFET, low offset		no P/N	2.60	John Hereford, 6700
Harris	HA5195	Op-amp, wide band (150 MHz G.B.W.), fast settling (70 nS)	now	no P/N	6.50	John Hereford, 6700
T.I.	TL326	Op-amp, HEX 741 characteristics	2nd qtr.'79	no P/N	--	John Hereford, 6700
EXAR	XR-094/095	Op-amp, quad, power programmable BiFET	--	no P/N	--	John Hereford, 6700
Harris	HA4295	Comparator, quad, 40 nS response, 2.0 mV offset	now	no P/N	4.75	John Hereford, 6700
T.I.	TL336	Comparator, HEX, LM339 characteristics	--	no P/N	0.85	John Hereford, 6700
T.I.	TL490/TL491	Comparator, 10-step analog level detector, thresholds adjustable from 200 MV to 50 mV	--	no P/N	1.00/ 1.10	John Hereford, 6700
T.I.	TL487	Comparator, 5-step level detector, 3 dB thresholds	--	no P/N	0.60	John Hereford, 6700
		electromechanical devices				
--	--	Wire, stranded 10 AWG, Black, UL style 1015	now	175-5090-00	--	Rod Christiansen, 5953
--	--	Wire, stranded 10 AWG, White, UL style 1015	now	175-5091-00	--	Rod Christiansen, 5953
Zepher/3M	--	Cable assembly, 34 conductor, 28 AWG, 2" long, 3M#3414-0000 connectors	1/79	175-2456-00	5.00	Rod Christiansen, 5953
Zepher/3M	--	Cable assembly, 25 conductor, 26 AWG, 6.5" long, 3482-1000 connectors (male/male)	now	012-0882-00	11.00	Rod Christiansen, 5953
Zepher/3M	--	Cable assembly, 25 conductor, 26 AWG, 6.5" long, 3483-1000 connectors (female/female)	now	012-0883-00	12.50	Rod Christiansen, 5953
Zepher/3M	--	Cable assembly, 50 conductor, 28 AWG w/grnd. plane, 14' long. Connectors: 131-1781-00, 131-2172-00	now	012-0853-00	48.00	Rod Christiansen, 5953
		memory and I/O devices				
Intel	2732	EPROM, 4K x 8	now	no P/N	91.65	Bob Goetz, 6302

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optoelectronic devices

Mallory	VPR	Capacitor, 5600μF, 6.3 WVDC, single ended, high ripple current	now	290-0853-00	--	Don Anderson, 5415
Mallory	VPR	Capacitor, 1200 μF, 6.3 WVDC, single ended, high ripple current	now	290-0877-00	--	Don Anderson, 5415
Nichicon	35ELA3300	Capacitor, 3500μF, 35 WVDC, axial lead	now	290-0873-00	--	Don Anderson, 5415
Mallory	PFP	Capacitor, 1100 μF, 200 WVDC, printed circuit mount	now	290-0878-00	--	Don Anderson, 5415
Kemet	--	Capacitor, 15μF, 25 WVDC, molded tantalum capacitor, P.C. mount	now	290-0876-00	--	Don Anderson, 5415
RIFA	PME 265	Capacitor, 2200 pF, 250 VAC, plastic, UL, IEC-65 approved for across-the-line use	1/79	285-1192-00	--	Don Anderson, 5415
TRW	--	Capacitor, .012 μF, 1000 WVDC, plastic, high current	now	285-1191-00	--	Don Anderson, 5415
Monsanto	MV57124	LED, rectangular, red	--	150-1070-00	0.50	Betty Anderson, 6389

component news

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