TEK COMPANY CONFIDENTIAL

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component news

Low-cost "box" film caps part numbered

Tek has begun part numbering a series of very inexpensive "box" capacitors which are possible replacements for conventional film caps. Box caps were developed in Europe several years ago, and are becoming widely used in the US because of their low price and good environmental protection.

What makes box caps different?

The construction of box caps is what sets them apart from the more traditional wrap-and-fill film caps. Box caps start with a conventional film cap section, however they have radial leads, and are housed in a premolded box and potted in epoxy.

This type of construction lends itself to automation and volume production, thus the reason for the low per-piece cost for these parts (some are only 10¢ each). Box caps are typically less expensive than axial-lead film caps which have a lot of hand labor involved in their manufacture.

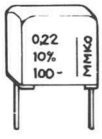
Box capacitors have all the electrical advantages of film capacitors. They are very stable, with low DF, high IR and low dielectric absorption. Another advantage is the precise size of the boxes (±0.005 in.). Short leads (0.25 in.) with accurate spacing (0.1 in. centers, ±0.015 in.) makes them easy to board insert. The short, radial leads also contribute to low inductance.

We currently have at least two sources for all box cap types. They are available in metallized mylar (lowest price), metallized polycarbonate (flat temperature coefficient) and metallized polypropylene (lowest DF and DA, highest IR).

Disadvantages

There are a few disadvantages associated with box caps. They cannot presently be machine-inserted at Tek because of lack of equipment. However, these caps may be machine-inserted in the future.

"Specials" are not available or are very expensive. (Specials in this case are parts with non-catalog C, V, special DF or IR.) Also, because tolerance standards are at ±20%, ±10% and ±5%, anything below 5% is considered a special. Finally, the temperature coefficient of mylar makes a tolerance below ±5% not useful.



Types and construction

"Minibox" or Plessey 160 — This is the original line of box caps, with many manufacturers and widespread use. They use a standard, wound metallized section that is squashed flat; then radial leads are welded on; it is put into a rectangular, premolded plastic box which is then completely potted with epoxy.

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ALSO IN THIS ISSUE

Electrically, these parts are the same as standard wrap-and-fill axial lead caps. They are available from 0.001μF to 10μF; VDC from 63V to 1000V; and standard tolerances of ±20%, ±10% and ±5%.

The tables below are taken from the Plessey catalog and show the various sizes of metallized mylar minibox caps available. These are representative of other manufacturers' parts, except some vendors offer a line of 63V DC (40v ac) caps that are smaller for the same capacitance value.

DIMENSIONS - INCHES

Case Code	L	T	H	S	dd
B	.413	.157	.354	.295	.024
C	.512	.157	.354	.394	.031
D	.512	.197	.433	.394	.031
E	.512	.236	.472	.394	.031
F	.709	.197	.433	.591	.031
G	.709	.236	.472	.591	.031
H	.709	.295	.531	.591	.031
J	1.04	.236	.591	.787	.031
K	1.04	.276	.650	.787	.031
L	1.04	.237	.591	.886	.031
M	1.04	.276	.650	.886	.031
N	1.04	.335	.669	.886	.031
O	1.04	.394	.748	.886	.031
P	1.26	.433	.787	1.08	.031
Q	1.26	.512	.866	1.08	.031
R	1.26	.591	1.18	1.08	.039
S	1.26	.709	1.30	1.08	.039
T	1.26	.866	1.46	1.08	.039

CAP μF	100V D.C./ 63V A.C. Case Code	250V D.C./ 160V A.C. Case Code	400V D.C./ 200 V A.C. Case Code	630V D.C./ 220V A.C. Case Code	1000V D.C./ 250V A.C. Case Code
.001			B/C	B	C
.0012	These Values Are		B/C	B	C
.0015	Available Only At The		B/C	B	C
.0018	Higher Voltages Indicated		B/C	B	C
.0022			B/C	B	C
.0027			B/C	B	C
.0033			B/C	B	C
.0039			B/C	B/C	D
.0047			B/C	B/C	D
.0056			B/C	B/C	D
.0068			B/C	B/C	E
.0082			B/C	C	E
.01		B/C	B/C	C	E
.012		B/C	B/C	D	F
.015		B/C	B/C	D	F
.018		B/C	C	D	G
.022		B/C	C	E	H
.027		B/C	C	F	H
.033		B/C	D	F	L
.039		B/C	D	G	L
.047		B/C	E/F	G	L
.056		B/C	F	G	M
.068	B	C	F	H	M
.082	B	C	F	J/L	O
.1	B/C	D/F	G	J/L	O
.12	C	E/F	G	K/M	P
.15	C	E/F	H/J	K/M	P
.18	C	E/F	J/L	O/P	Q
.22	D	F	J/L	O/P	Q
.27	D	G	K/M	P	
.33	E/F	G	K/M	P	
.39	F	L	N/P	Q	
.47	F	J/L	N/P	Q	
.56	G	K/M	P		
.68	G	K/M	P		
.82	H	N/P	Q		
1.0	H	N/P	Q		
1.5	M	O/P			
2.2	N	P			
3.3	O	Q			
4.7	P	R			
6.8	Q	S			
10.0	R	T			

CAPACITANCE TOLERANCE
J = 5%
K = 10%
M = 20%

Most of these same values are also available with metallized polycarbonate and metallized polypropylene dielectrics. Comparing the part size for the same capacitance and voltage part, the mylar would be smallest, followed by the polycarbonate, and the polypropylene would be the largest.

Typical prices for some metallized mylar minibox capacitors follow.

C	Tol.	V	Case Size	Approx. Cost 10K lots
0.001μF	±10%	400V	B	$0.08
0.01μF	±10%	250V	B	0.07
0.1μF	±20%	100V	B	0.11
0.1μF	±10%	100V	B	0.12
0.1μF	±5%	100V	B	0.14
0.47μF	±10%	100V	F	0.19
1.0μF	±10%	100V	H	0.29
4.7μF	±10%	100V	P	1.05

Following is a list of the minibox caps currently part numbered.

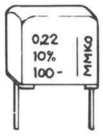
285-1174-00	0.1μF ±10%, 100V	Metallized mylar
285-1175-00	0.22μF ±10%, 100V	Metallized mylar
285-1176-00	0.1μF ±10%, 400V	Metallized mylar
285-1185-00	0.05μF ±5%, 250V	Metallized mylar
285-1186-00	4.7μF ±10%, 100V	Metallized mylar
285-1187-00	0.47μF ±10%, 100V	Metallized mylar
285-1188-00	0.082μF ±5%, 100V	Metallized mylar
285-1189-00	0.1μF ±5%, 100V	Metallized mylar
285-1190-00	0.056μF ±5%, 250V	Metallized mylar
285-1235-00	0.22μF ±10%, 400V	Metallized mylar
285-1241-00	0.22μF ±10%, 100V	Stacked film mylar
285-1242-00	0.033μF ±10%, 250V	Metallized polypropylene
285-1245-00	0.01μF ±10%, 400V	Metallized polypropylene

Micro-minibox — These caps are the same construction as the minibox, only with smaller packages and lead spacing ("S" from the chart above) of 0.2 inch and 0.3 inch.

The micro-minibox has a real potential for replacing multilayer (monolithic) ceramic caps. Multilayer ceramic caps are prone to having low IR and shorting problems, even when operated well below their rated voltage. If the cap should fail (usually shorted) and has a lot of power available, it can easily burn up the board. Boards with a large number of bypass capacitors on the power supply bus can therefore have significant reliability problems.

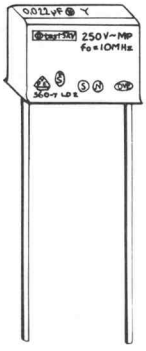
continued on page 3

On the other hand, metallized mylar caps like the micro-minibox are self-healing, and even if severely abused usually fail as an open circuit.



Stacked film — In these parts the cap section is stacked layers of metallized mylar instead of wound in a roll. Thus, each plate of the capacitor is connected directly to the lead wire. This provides very low inductance and low ESR, making them good for high-frequency bypassing.

Here's a comparison between a ceramic film cap and its replacement stacked film box cap — a 4.7μF, 50V Z5U ceramic cap used in 3200 test systems costs over $1.00; it has been replaced by a 0.22μF, 100V metallized mylar stacked film cap (P/N 285-1241-00) which costs under $0.25 (and won't burn up the board).



Rifa capacitors — These metallized paper caps are made by Rifa, a Swedish company, for line-to-line and line-to-ground interference suppression applications. Rifa caps are approved by all European safety agencies, and in some cases by UL and CSA.

These caps are a radial lead, conventionally wound section of metallized paper that is completely encapsulated in flame-retardant epoxy.

These are very tough caps — they'll survive 2000V AC at 50Hz for one minute. Following is a list of Rifa caps currently part numbered.

285-1192-00	0.0022μF, 250V AC
285-1196-00	0.01μF, 250V AC
285-1246-00	0.022μF, 250V AC
285-1222-00	0.068μF, 250V AC, "X" type
285-1242-00	0.10μF, 250V AC

For more information

If you have any questions, or need more information, please contact **Don Anderson at D/S 78-552, ext. 2545**.

Colored component responsibilities defined

The Tektronix Color System is described in the Color Application Standards for Electronic Instruments (Tek Standard #062-5528-00). As explained by Howard Meehan, Corporate Industrial Design Manager, this standard was established as "a means of improving the quality of color match in raw materials and finished parts used in Tektronix products." To this end, one function of the Corporate Color Lab is to see that all our products conform to these standard colors.

The Color Lab is, in fact, the consultant group for all color-related problems from raw materials through finished products. They also provide assistance to manufacturing, Incoming Inspection and the different quality assurance groups by testing and training personnel to handle color-matching in their own areas.

On the other hand, all documentation (PPIFs, PISLs, specifications, etc.) for purchased components is handled by Component Engineering (CE). CE provides the same technical support for all groups on problems concerning components (except those relating to colors). The Color Lab and CE are jointly responsible for setting up the quality acceptance criteria for purchased "colored" components.

For more information, please contact **Bella Geotina, ext. 2315.**

New ESD symbol

The familiar "lightning bolt" symbol used to denote electrostatic discharge hazard has been replaced with a "reaching hand" as the official notice for electrostatic-sensitive devices. The reaching hand symbol represents the danger to ESD-sensitive devices from handling by an unprotected worker. The use of this new symbol is noted in EIA Standard RS-471. The lightning bolt, associated with electrical hazards to life, was not acceptable on an international basis.

Component Problem Notice revised

The Component Problem Notice (CPN) is used to identify component problems (both Tek-made and purchased) in the manufacturing areas. Over the years, this form has been changed to reflect changing needs; the latest being in August 1981. The purpose of this most recent revision is to:

1. Provide better information to both the person working on the problem and the person submitting the problem.
2. Provide the originator with the name and extension of the person who processed the problem.
3. Provide a format for enhancing a tracking/reporting system. EMCM Quality Assurance's computerized system is operational and Plant Quality Support's tracking system is under development.

A CPN is initiated by the business unit's designated representative and can be sent to one of two CPN Centers:

Tek-made components
CPN Center
Y6-511

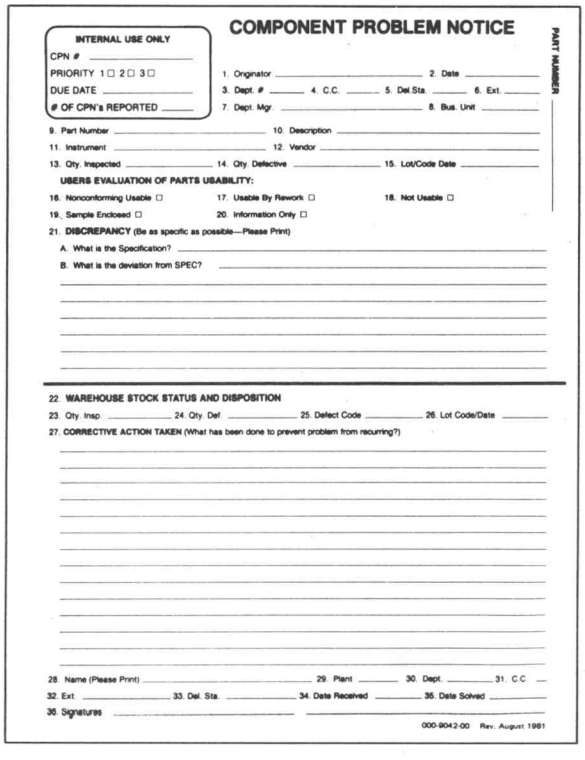
Purchased components
Myron Bidiman
78-532

When a CPN is initiated, a sample of the defective part should be included. Each CPN is then screened for proper information and assigned a priority. Priorities are used to indicate the urgency of the problem.

After the corrective action has been determined and before the CPN is sent back to the originator, it will be reviewed for completeness, clarity and to assure that it is a valid response.

Following are the instructions for filling out the originator's portion of the CPN form. Again, the intent of this revision is to improve the information both for the originator and the people solving the problems. At the same time, we plan an added emphasis on improving responsiveness to the people submitting the problems.

Jim Brammer, manager
Plant Quality Support



COMPONENT PROBLEM NOTICE

INTERNAL USE ONLY
CPN #
PRIORITY 1☐ 2☐ 3☐
DUE DATE
OF CPN's REPORTED

1. Originator 2. Date
3. Dept. # 4. C.C. 5. Del.Sta. 6. Ext.
7. Dept. Mgr. 8. Bus. Unit

PART NUMBER

9. Part Number 10. Description
11. Instrument 12. Vendor
13. Qty. Inspected 14. Qty. Defective 15. Lot/Code Date

USERS EVALUATION OF PARTS USABILITY:
16. Nonconforming Usable ☐ 17. Usable By Rework ☐ 18. Not Usable ☐
19. Sample Enclosed ☐ 20. Information Only ☐
21. DISCREPANCY (Be as specific as possible—Please Print)
A. What is the Specification?
B. What is the deviation from SPEC?

22. WAREHOUSE STOCK STATUS AND DISPOSITION
23. Qty. Insp. 24. Qty. Def. 25. Defect Code 26. Lot Code/Date
27. CORRECTIVE ACTION TAKEN (What has been done to prevent problem from recurring?)

28. Name (Please Print) 29. Plant 30. Dept. 31. C.C.
32. Ext. 33. Del. Sta. 34. Date Received 35. Date Solved
36. Signatures

000-9042-00 Rev. August 1981

When filling out the "CPN" form, please make sure you press hard (to go through all the copies) and that your writing is legible (please print or type).

ORIGINATOR PORTION (upper half of page)

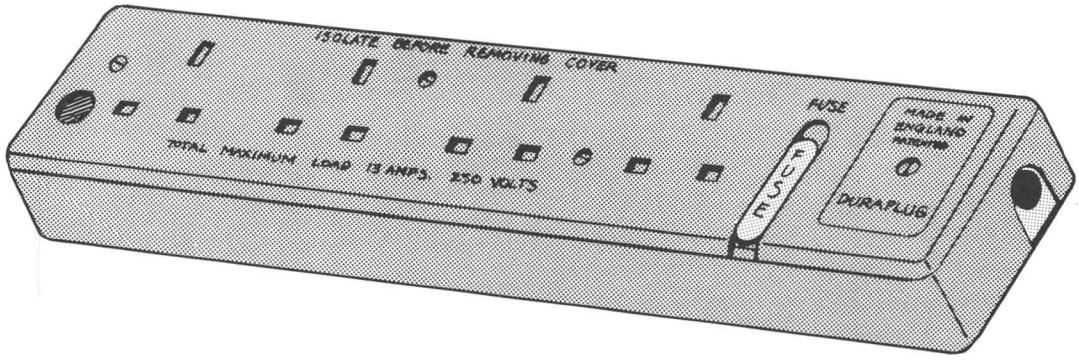
1. Originator's **name**
2. **Date** CPN is initiated by originator
3. Originator's department **responsibility number**
4. Originator's **cost center number** Note: #3 and #4 are for identification only — no charges will be applied to these numbers.
5. Originator's **delivery station**
6. Originator's **telephone number**
7. Originator's **manager** (alternate) and phone number
8. Originator's **business unit** name (e.g. GPI, Portables, 5000 Series, Metals)
9. **Component part number**
10. **Component name**
11. **Instrument** in which the component is used
12. Component **manufacturer's name**, if known
13. **Number of parts inspected** (no percentages, please)
14. Of those inspected, **number of defective** parts (no percentages)
15. Lot or **date code**, if known
16. Check this box if the parts are **usable**
17. If this box is checked, indicate **who will perform the rework** (e.g. user's area, vendor, manufacturing area)
18. Check this box if the parts are **not usable**
19. Check this box if a **sample** is sent (if not, explain why)
20. **Information only**. Check this box to report problems that do not require formal corrective action. You will not receive a written answer to "info only" problems.
21. A) Indicate formal **specifications with tolerances**
    B) Define **problem and its effect** on your production line. Be specific and clear, your description will influence the emphasis applied to correct the problem.

This completes the originator's portion of the CPN form. Remove the goldenrod copy and retain it for your records. Then, determine if your problem pertains to a purchased or a Tek-made component. Send the white (original), yellow, green and pink copies together with your samples to the appropriate CPN center for processing. **Purchased component problems should be sent to 78-532; Tek-made component problems should be addressed to CPN center Y6-511.**

British power plug adapter

An outlet adapter strip for British power plugs (option number A2) is now available for use in our test racks and cycle rooms. The strip has four outlets, but the user must attach a cord and plug. The unit is fused for 13 amps, and a replacement fuse is available in stock under Tek P/N 159-0172-00.

You can order this new outlet from Panel Components Corporation, Santa Rosa, CA. The cost is $32.40 each. For more information, please contact **Dennis Johnson on ext. 2471**.



New technology in cyanoacrylate bonding

Typically, cyanoacrylate adhesives are used for bonding clean, nonporous, closely-mating surfaces. Tek has part numbered several of these adhesives — 006-2712-00 and 006-2848-00, among others. A weak base, such as water, must be present to cure these adhesives. In addition, surfaces must be clean and free from rust inhibitors, mold release agents, grease and oil for cyanoacrylates to effectively bond the adherends.

Dexter Hysol has developed new technologies in cyanoacrylate adhesive bonding. The new formulations improve adhesion to surfaces which were difficult or impossible to bond with first generation cyanoacrylates (such as oily, acidic and mold release surfaces; leather, wood, chromate platings and microscopically porous plastics like Nylon and Delrin). These new adhesives can be applied without any prior surface preparation.

Another set of advanced technology cyanoacrylates has been formulated to withstand various stresses (such as high temperatures, moisture and high impact). Yet another cyanoacrylate is optically clear. All of the above come in a range of viscosities to allow different fixturing times.

For more information, contact **Katherine Dennett, Electromechanical Component Engineering, ext. 2314.**

Reprographics' phone hours change

As of Monday, November 30 (Week 48), the telephone service hours for Reprographics were changed to 9:00 a.m. to 2:30 p.m. daily. This change is due to cutbacks in personnel and an increasingly large workload. If you have any questions, please call Collette on ext. 1659.

Joan Bellinger, manager
Reprographics Operations

Do you need component field failure information?

The Reliability Information Service group provides field failure and reliability information for Tek-made and purchased components. Frequent users throughout Tektronix include product and component design groups, component evaluation and application groups, and reliability and quality groups.

The information in our reliability data base is obtained from service records sent to us directly from Tektronix service centers. To assure continuity and accuracy, information from service records is verified and keyed on a daily basis.

We have several standard component field failure reports available to the user. If certain component field failure information of interest cannot be found in one of our standard reports, we have software engineers available to create special reports to meet most needs.

Merge Report is an example of one of the standard reports that is very useful. This report merges an instrument's bill of materials with its sales and field failure information. By analyzing a particular component's failures and matching circuit locations, it is possible to differentiate between a component reliability problem and a component application problem.

All requests for component field failure reports should be directed to the Reliability Information Service group, ext. MR-8004. Requests can usually be processed in less than 24 hours, depending on the size and number of reports to be generated.

We also maintain a system that allows the user direct access to component field failure information from an on-line computer terminal. This on-line system is only recommended for the user who has a continual need for component field failure information. There are classes available that describe its use.

The reliability data base contains proprietary information such as sales data, instrument failures and field service data. Because of the confidential status of this data base, authorization for access must be obtained from the Reliability Information Services group.

For all of your component field failure information needs, including having reports generated by us or finding out how to use the on-line system to generate your own reports, please contact Brenda Humes, ext. MR-8004.

Jim Hosford
Reliability Information Services

Thermal analysis programs on CYBER

Preliminary editions of four thermal analysis program manuals are now available on CYBER. They are:

VENTBOX — Predicts temperatures for simple sealed and ventilated enclosures.

NATFIN — An interactive thermal design program for vertically-oriented, natural convection/radiation cooled heat sinks.

TAMS — Thermal analyzer for multilayer structures (3-D rectangular plates).

TNETFA — Time-dependent thermal network analyzer.

These programs may be ordered by typing MANUAL after logging on to CYBER, or by calling Georgene on ext. 6863.

ComponentNewsNewComponents

Vendor	Number	Description	When Available	Tek P/N	Engineer to contact, ext.
Nichicon	TLB	Capacitor, 470μF ±20%, 63V axial lead, aluminum electrolytic	Jan.	290-0977-00	Don Anderson, 2545
Sprague	17D	Capacitor, 75μF, 450V, 0.45A RMS ripple current, 1 × 2.6" telephone grade aluminum electrolytic	Jan.	290-0978-00	Don Anderson, 2545
Plessey	171	Capacitor, 0.01μF, ±10%, 400VDC metallized polypropylene, box-type	Jan.	285-1245-00	Don Anderson, 2545
RIFA	PME265	Capacitor, 0.022μF ±20%, 250VAC interference suppressor, safety approved, box-type	Jan.	285-1246-00	Don Anderson, 2545
Judd		Wire, 22AWG; red; 30,000 volts; UL3239	now	175-6287-00	E. Doolittle, 2309
3M		Cable Asembly, 26 conductors, socket connector/PC board connector, 3.25 inches long	now	175-4589-00	E. Doolittle, 2309
3M		Cable assembly, 40 conductors, socket connector/PC board connector, 3.25 inches long	now	175-4590-00	E. Doolittle, 2309
Belden		Cable assembly, two 24AWG wire molded miniature phone plugs, both ends 42.0 inches long	now	175-6385-00	E. Doolittle, 2309

FR-4 laminates with controlled dielectric

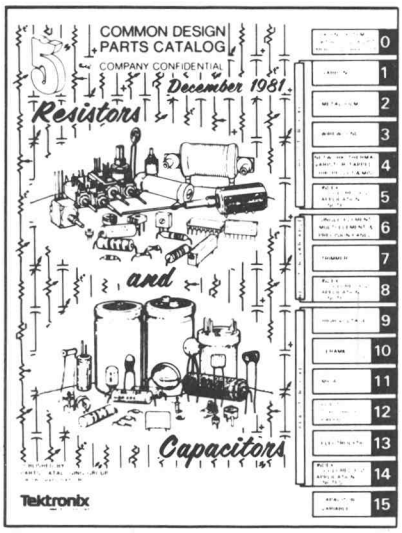
Our specification for copper-clad, woven epoxy glass (FR-4) laminate with controlled dielectric has for its reference MIL-P-13949/4A (now superseded by MIL-P-13949F). This spec calls for a dielectric constant of 5.4 maximum, and a dissipation factor of 0.030 maximum; both values taken at 1MHz.

Tek's requirement at 1MHz is a dielectric constant of 5.0 ±0.10 and a dissipation factor of 0.018 to 0.020.

This may present a problem to users of this raw material because the shipments we receive come with a dielectric constant of 4.7 ±0.20. According to our supplier, this is the best that they can come up with for the dielectric constant value.

CE is in the process of revising all specifications for circuit board laminates and prepregs to conform with the new MIL-P-13949F requirements. Negotiations are under way with the different approved vendors of these materials concerning our new specification requirements.

If you have any recommendations or questions, please call **Bella Geotina, ext. 2315.**



New resistor/capacitor catalog

The *Resistor/Capacitor Common Design Parts Catalog* will be distributed in December. To have your name added or removed from the current distribution list to receive this or other catalogs, please call ext. 2591.

Dorothy Smith, manager
Parts Cataloging

TECHNICAL STANDARDS

The function of Technical Standards is to identify, describe, and document standard processes, procedures, and practices within the Tektronix complex, and to ensure these standards are consistent with established national and international standards. Technical Standards also provides a central repository for standards and specifications required at Tektronix.

New documents (copies may be ordered from Technical Standards)

ASME AMD-Vol. 39 — Solid Contact and Lubrication
DOD-STD-35-16B — Digital Microcircuit Devices
IEEE 587 — Guide for Surge Voltages in Low-Voltage AC Power Circuits
Fed-Test Method STD 101C — Test Procedures for Packaging Materials
MIL-T-1180D — Thermometer Self-Indicating Liquid in Glass
MIL-HDBK-331B — Directory of DOD Engineering Data Repositories
MIL-STD-785B — Reliability Program for Systems and Equipment Development and Production
MIL-HDBK-978 — NASA Parts Application Handbook
NASA — Simple JFET Oscillator (Technical Brief)
NBS-SP-250 — Calibration and Related Measurement Services of the National Bureau of Standards
UL-1417 — Special Fuses for Radio and Television Type Appliances

For information about any of these standards please contact Bonnie Kooken, ext. 1800.

component news

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