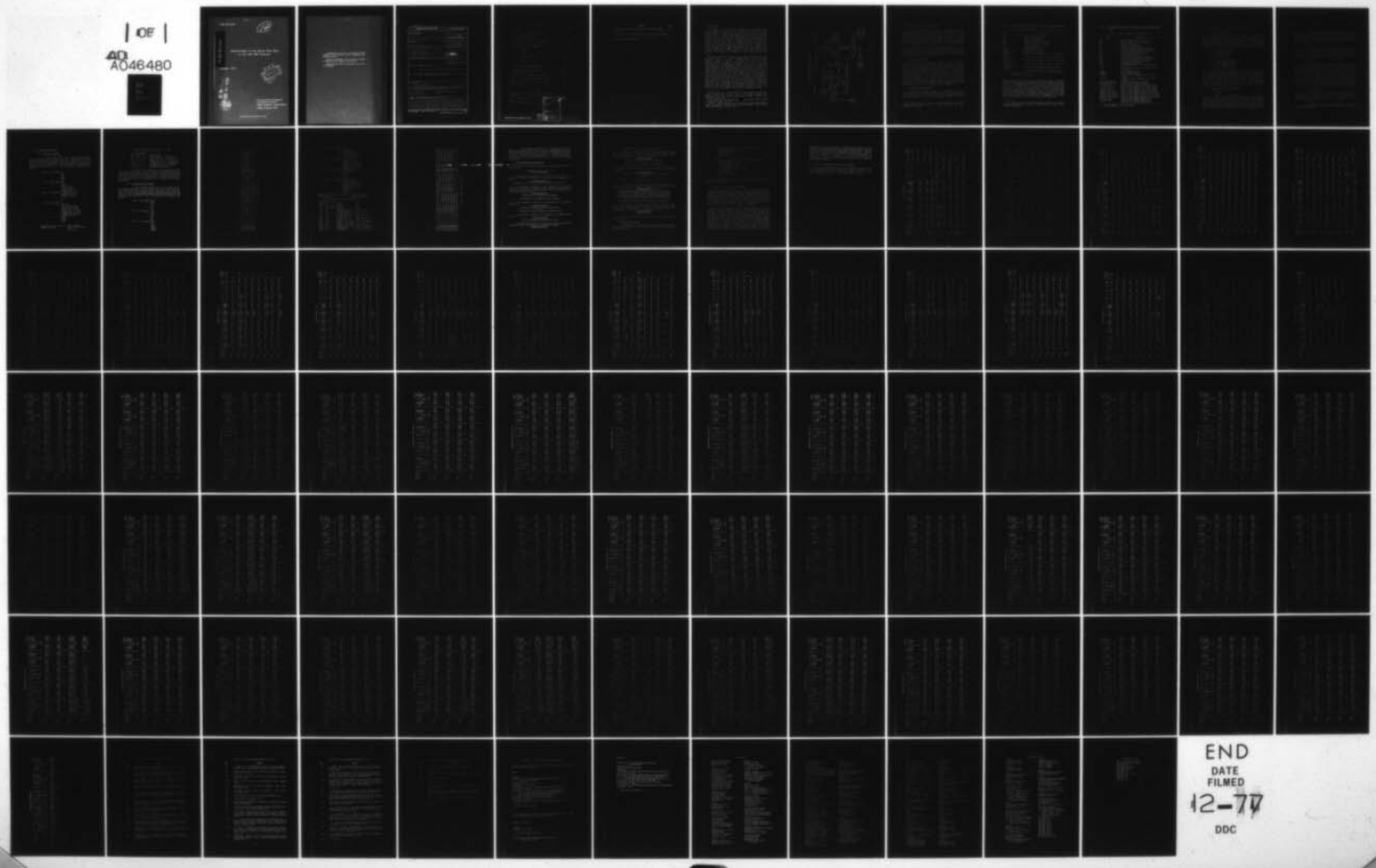
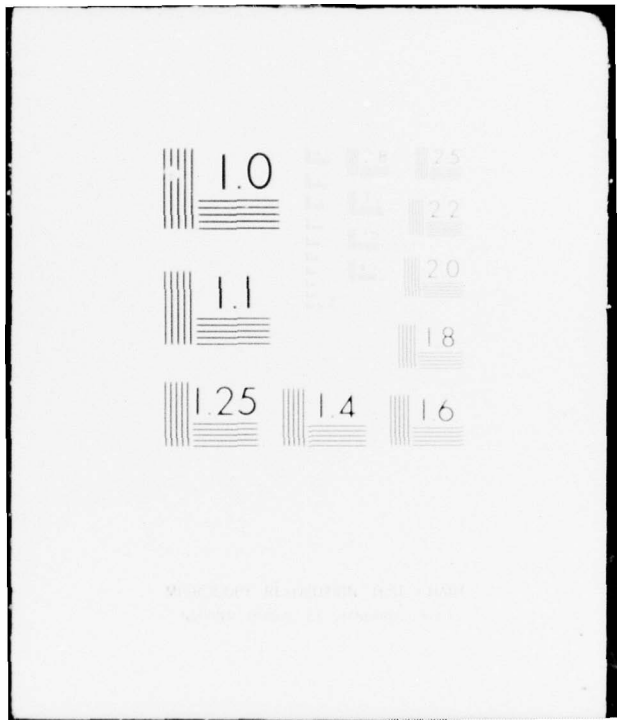
AD-A046 480 HARRY DIAMOND LABS ADELPHI MD F/G 9/5
IMPLEMENTATION OF THE DEVICE DATA BANK ON THE HDL IBM COMPUTER.(U)
OCT 77 T V NOON
UNCLASSIFIED HDL-TR-1819 NL



END
DATE FILMED
12-77
DDC


1.0
1.1
1.25
1.4
1.6
2.2
2.0
1.8

HDL-TR-1819

12
B.S

Implementation of the Device Data Bank on the HDL IBM Computer

October 1977

U.S. Army Materiel Development
and Readiness Command
HARRY DIAMOND LABORATORIES
Adelphi, Maryland 20783

TR-1819—*Implementation of the Device Data Bank on the HDL IBM Computer*, by Thomas V. Noon

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Citation of manufacturers' or trade names does not constitute an official indorsement or approval of the use thereof.

Destroy this report when it is no longer needed. Do not return it to the originator.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER: HDL-TR-1819	2. GOVT ACCESSION NO. / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle): Implementation of the Device Data Bank on the HDL IBM Computer	5. TYPE OF REPORT & PERIOD COVERED: Technical Report / 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Thomas V. Noon	8. CONTRACT OR GRANT NUMBER(s): DA: 1L162118AH75 PRON: A17R000402A1A9
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Harry Diamond Laboratories 2800 Powder Mill Road Adelphi, MD 20783	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: Program Ele: 62118A
11. CONTROLLING OFFICE NAME AND ADDRESS: U.S. Army Materiel Development and Readiness Command Alexandria, VA 22333	12. REPORT DATE: Oct[illegible]977 / 13. NUMBER OF PAGES: 93
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified / 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

HDL Project: X757E2
DRCMS Code: 612118H750011
This work was sponsored by the Department of the Army under project 1W162118AH75/CA, Multiple Systems Evaluation Program.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Device Data Bank
Device library
Semiconductor devices
Semiconductor damage data
DAMTRAC

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Device Data Bank, as used by the DAMTRAC and, in the near future, the NET2 circuit-analysis programs on the Harry Diamond Laboratories' IBM 370/168 computer, is presented. The new file structure of the device libraries, access method for use of the device parameters by DAMTRAC and other computer programs, and a management program to manage and maintain the device data bank are presented in detail. The job control language (JCL) for executing the IBM version of DAMTRAC on the HDL computer is also presented.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

163 050

CONTENTS

FIGURES

TABLES

1. INTRODUCTION

The effects of high-altitude electromagnetic pulses (HEMP) from nuclear weapons deployed at high altitudes can seriously degrade tactical weapon and communication systems vitally needed by the field Army prepared to fight a conventional and nuclear war. The Multiple Systems Evaluation Program (MSEP) was established to determine both the vulnerability of and the means for hardening many of these Army tactical systems to an HEMP environment. An essential step in the program is to develop analytic tools (such as computer programs for predicting transient data and system response) to evaluate system susceptibility to HEMP. These computer programs have been gathered into an applications package titled Generic Assessment Methods for a Priori Hardening of Systems (GAMPHS).[1] The GAMPHS application for the vulnerability and hardness assessment of systems covered by MSEP uses the programs described in this report in addition to other computer programs (see fig. 1).

This report describes one aspect of the effort by the Harry Diamond Laboratories (HDL) to convert DAMTRAC[2] (Damage Analysis Modified Transient Radiation Analysis by Computer) and the Device Data Bank* (consisting of files of diodes and transistors with their equivalent-circuit parameters and damage data) from the Mobility Equipment Research and Development Command CDC computer to the HDL IBM 370/168 computer. The transmutations and modifications required to convert DAMTRAC are basically transparent to users of the CDC version of DAMTRAC except for the control language which directs the job execution (the job control language (JCL) for DAMTRAC is presented in app A). However, the conversion of the Device Data Bank files required the restructuring of the data files and the development of new programs to manage and maintain the data files, and to access and retrieve device data from these files. The file structure, management programs, and access method is discussed in detail in this report. Sufficient information about the software described in this report is provided to allow a programmer experienced in IBM FORTRAN and JCL and in the use of DAMTRAC to use the programs and concepts. Complete listings of the device libraries and parameter references are presented in section 5.

---

[1] *George Gornak et al, EMP Assessment for Army Tactical Communications Systems: Transmission Systems, Series No. 1--Radio Terminal Set AN/TRC-145 (U), Harry Diamond Laboratories TR-1746 (February 1976). (SECRET RESTRICTED DATA)*

[2] *George Baker et al, Damage Analysis Modified TRAC, Harry Diamond Laboratories TM-76-6 (May 1975).*

**Charles P. Ruzic, Extension and Interfacing the MSEP Semiconductor Damage Data Bank for Analysis and Retrieval by DAMTRAC, Harry Diamond Laboratories TR-1821 (December 1977).*

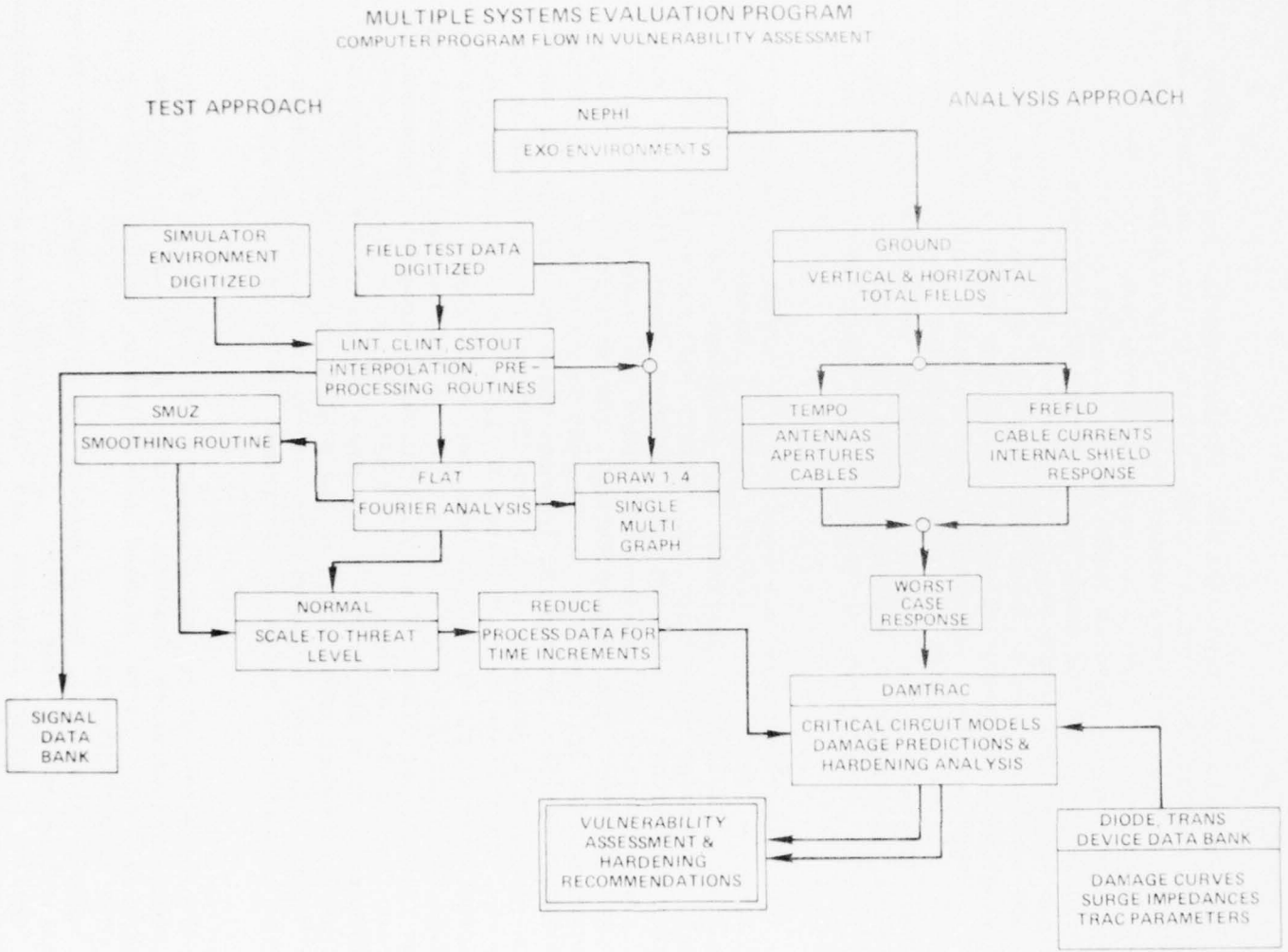


Figure 1. The GAMPHS application in vulnerability and hardness assessment.

2. DESCRIPTION OF THE DEVICE DATA BANK FILES

The Device Data Bank files are a collection of the equivalent-circuit values and damage parameters of different diode and transistor types stored by their device names. The equivalent-circuit and damage parameters are used as input for circuit analysis and for calculations of circuit damage due to EMP (electromagnetic pulse) by programs such as DAMTRAC and NET2. The existence of these files reduces the input data required by the circuit-analysis program by allowing the program users to specify only a device name. The circuit-analysis programs then search the Device Data Bank file for the device parameter.

The Device Data Bank files were created at HDL, using the IBM direct access file structure. The direct access file structure allows for access and modification of multirecord files at random without regard for the records' physical location. This random selection of records is a very desirable attribute for files of data which are retrieved by name keys (such as diode and transistor types).

2.1 Diode Device Library

The Diode Device Library is a direct access file with space reserved for 300 different diode types. Each diode type has space reserved for 19 device parameters, 11 parameter references, and a status flag. The 19 device parameters consist of the 7 TRAC[3] equivalent-circuit values and 12 device-damage values (4 presently unused). The definition of the diode device parameters is given in table I (p 8). The parameter references (see sect. 5) refer to the origin of the TRAC values and the last 10 damage values. The status flag (titled TRAC FLAG on the listings of the device library) indicates whether the proper TRAC equivalent-circuit values are defined for use of the device library entry by the DAMTRAC circuit-analysis program. If the TRAC FLAG is set to 1, all the necessary device parameters have been defined; if the TRAC FLAG is set to 0, all the necessary device parameters have not been defined and therefore cannot be used as input for DAMTRAC runs.

2.2 Transistor Device Library

The Transistor Device Library is a direct access file with space reserved for 300 different transistor types. Each transistor type has space reserved for 40 device parameters, 10 parameter references, and a status flag. The 40 device parameters consist of the 16

---

[3] *E. D. Johnson et al, Transient Radiation Analysis by Computer Program (TRAC), Autonetics Division of North American Rockwell Corp., AD 836683 (June 1968).*

TABLE I. DEFINITION OF DIODE EQUIVALENT-CIRCUIT VALUES AND DAMAGE VALUES

Note: P = power to damage; τ = pulse duration

Symbol	Definition
IS	Reverse saturation current*
MD	Proportionality constant*
RDL	Leakage resistance*
CDO	Junction capacitance constant*
VDBI	Diffusion or built-in voltage*
TD	Diode time constant*
IPPD	Primary photocurrent constant*
VB	Breakdown voltage*
Surge Z	Reverse surge impedance*
R Bulk Forward	Forward bulk resistance
Surge Z Rev 1 μs	Reverse surge impedance for 1-μs square pulse
Surge Z Rev 10 μs	Reverse surge impedance for 10-μs square pulse
K Damage Rev <50 ns	Measured reverse damage constant (τ<50 ns) $K=P\tau$
K Damage Rev >50 ns	Measured reverse damage constant (τ>50 ns) $K=P\tau^{\frac{1}{2}}$
K Damage Forward	Measured forward damage constant using $K=P\tau$
K	Not used, available of other damage constants

**Used by DAMTRAC for diode model.*

TRAC[3] equivalent-circuit values and 24 device-damage values (6 presently unused). The definitions of the transistor device parameters are given in table II. The parameter references (see sect. 5) refer to the origin of the last 20 damage values. The status flag (titled TRAC FLAG on the listings of the device library) indicates whether the proper TRAC equivalent-circuit values are defined for use of the device library entry by the DAMTRAC circuit-analysis program. If the TRAC FLAG is set to 1, all the necessary device parameters have been defined; if the TRAC FLAG is set to 0, all the necessary device parameters have not been defined and therefore cannot be used as input for DAMTRAC runs.

---

[3]*E. D. Johnson et al, Transient Radiation Analysis by Computer Program (TRAC), Autonetics Division of North American Rockwell Corp., AD 836683 (June 1968).*

TABLE II. DEFINITION OF TRANSISTOR EQUIVALENT-CIRCUIT VALUES AND DAMAGE VALUES.

Note: P = power to damage; τ = pulse duration

Symbol	Definition
HFEN	Normal common-emitter current gain*
HFEI	Inverse common-emitter current gain*
TN	Emitter-time constant*
TI	Collector-time constant*
ICS	Collector reverse-saturation current*
MC	C-B proportionality constant in exponent*
CCO	C-B junction capacitance at zero bias*
VCBI	C-B junction-diffusion potential*
RCL	C-B leakage resistance*
IES	Emitter reverse-saturation current*
ME	E-B proportionality constant in exponent*
CEO	E-B junction capacitance at zero bias*
VEBI	E-B junction diffusion potential*
REL	E-B leakage resistance*
IPPC	Primary photocurrent for the collector-base junction*
IPPE	Primary photocurrent for the emmitter-base junction*
C-BBDV	C-B breakdown voltage*
E-BBDV	E-B breakdown voltage*
Surge ZC	C-B reverse surge impedance (0.1-μs pulse width)*
Surge ZE	E-B reverse surge impedance (0.1-μs pulse width)*
Bulk Resistance C-B	Junction forward bulk resistance
Bulk Resistance E-B	Junction forward bulk resistance
Z Surge C-B 1 μs	Reverse surge impedance (1-μs pulse width)
Z Surge C-B 10 μs	Reverse surge impedance (10-μs pulse width)
Z Surge E-B 1 μs	Reverse surge impedance (1-μs pulse width)
Z Surge E-B 10 μs	Reverse surge impedance (10-μs pulse width)
Damage K (<50 ns)C-B	Reverse biased damage constant (τ<50 ns) $K=P\tau$
Damage K (<50 ns)E-B	Reverse biased damage constant (τ<50 ns) $K=P\tau$
Damage K (>50 ns)C-B	Reverse biased damage constant (τ>50 ns) $K=P^{\frac{1}{2}}\tau$
Damage K (>50 ns)E-B	Reverse biased damage constant (τ>50 ns) $K=P^{\frac{1}{2}}\tau$
K Forward C-B	Forward biased damage constant $K=P\tau$
K Forward E-B	Forward biased damage constant $K=P\tau$
K	Available for other damage constants

*Used by DAMTRAC for transistor model.

3. MANAGEMENT PROGRAM FOR THE DEVICE DATA BANK--MPD2B

3.1 Description of MPD2B

To simplify and minimize the effort necessary to manage and maintain the Device Data Bank, only one program, MPD2B, is required to create, update, add to, and list the device libraries. Through the use of action requests and action control cards as part of the required input data to the program, any of the above-mentioned functions can be performed on either or both device libraries in one job. Each action request specifies the action to be taken and the library to which the action refers. The action requests for the device libraries are as follows.

For the Diode Device Library:

(1) CREATE DIODE FILE
(2) UPDATE DIODE FILE
(3) ADD TO DIODE FILE
(4) LIST DIODE FILE

For the Transistor Device Library:

(1) CREATE TRANSISTOR FILE
(2) UPDATE TRANSISTOR FILE
(3) ADD TO TRANSISTOR FILE
(4) LIST TRANSISTOR FILE

The action control cards, END OF ACTION and FINISH, are required to terminate one action request (CREATE, UPDATE, ADD TO) and either prompt the program for another action request or signal the end of the job. For all action requests and action control cards, the command (CREATE, UPDATE, ADD TO, LIST, END OF ACTION, FINISH) must begin in column 1 of the data card, and for action requests specifying a file name (CREATE, UPDATE, ADD TO, LIST), the file name (DIODE FILE, TRANSISTOR FILE) must begin in column 8 of the data card. Improper coding of an action request or action control card causes the job to stop with a user-supplied STOP code of 1.

3.2 Description of the Action Requests

3.2.1 CREATE

The action request CREATE must be the first action request for either device library. The CREATE action request establishes the file definition requirements and writes the supplied device data onto the file beginning at the second record and continuing onto subsequent records for each different device name until an END OF ACTION control card is encountered. After the END OF ACTION control card is read, the record index and the date of the creation run are written onto the first record for use by the LIST action requests.

3.2.2 UPDATE

The UPDATE action request is used for changing parameter values previously defined or for defining new parameter values for devices already in the pertinent device library. Device data are read and the appropriate device record updated until an END OF ACTION control card is encountered. An UPDATE flag and the date of the update run are then written onto the first record for use by the LIST action request to indicate the last action performed on the device library.

3.2.3 ADD TO

The ADD TO action request is used for adding new device entries to a device library. Device data are read with each new device added to the next available record in the file until an END OF ACTION control card is encountered. After the END OF ACTION control card is read, the new record index, an ADD TO flag, and the date of the add run are written onto the first record for use by the LIST action request to indicate the last action performed on the device library.

3.2.4 LIST

The LIST action request is used for listing the devices, device parameters, parameter references, and TRAC flag that are stored in a device library. Each device name is listed along with its associated parameter values. The devices are listed in the IBM collating sequence starting with the first character of the device name. In addition to the list of devices, a title page is printed giving the name of the device library (i.e., Diode Device Library, Transistor Device Library), the current date, the library creation date, and the last action request of the file (if any) and its date. The words "End of Listing" are printed after the last device to signify the end of the listing. The LIST action request should be the last action taken on a file after every run of the MPD2B program. Also, the LIST action request does not need to be followed by an END OF ACTION action request as the LIST action request does not read any data from the input stream.

3.2.5 END OF ACTION

The END OF ACTION action control card is used to terminate the input data to an action request (CREATE, UPDATE, ADD TO). An END OF ACTION card must follow the input data for all the previous action requests. An END OF ACTION card is not required after the LIST action request since there are no input data to this command.

3.2.6 FINISH

The FINISH action control card terminates the input data for the MPD2B program. The FINISH action control card must be the last card of the input data.

3.3 Device Data Entry Format

3.3.1 Diode Device Library

To enter diode device data into the Diode Device Library, four data cards are required for each different device. Each data card contains the device name in columns 1 through 12, with the name left justified; the remainder of each card contains the appropriate values for the parameters and parameter references according to the following order (see table I, sect. 2 for definitions of parameters) and formats:

```
Card 1:  Device Name, IS,
                      MD,
                      RDL,
                      CDO,
                      VDBI,
                      TD
Card 2:  Device Name, IPPD,
                      VB,
                      Surge Z,
                      R Bulk Forward,
                      Surge Z Rev 1 µs,
                      Surge Z Rev 10 µs
Card 3:  Device Name, K Damage Rev <50 ns,
                      K Damage Rev >50 ns,
                      K Damage Forward,
                      K,
                      K,
                      K
Card 4:  Device Name, K,
                      TRAC Ref,
                      R Bulk Forward Ref,
                      Surge Z Rev 1 µs Ref,
                      Surge Z Rev 10 µs Ref,
                      K Damage Rev <50 ns Ref,
                      K Damage Rev >50 ns Ref,
                      K Damage Forward Ref,
                      K Ref,
                      K Ref,
                      K Ref,
                      K Ref

Format for Cards 1, 2, and 3:  (3A4, 3X, 6E10.3)
Format for Card 4:             (3A4, 3X, E10.3, 6X 11
                               (1X, I3))
```

Sample diode data set: (see fig. 2, p 14)

Diode type 1N1202	
IS = 4.25×10^{-10}	Surge Z = 64
MD = 1.62	R Bulk Forward = 1, Ref No. 25
RDL = 4.13×10^{10}	Surge Z Rev 1 μs = 65, Ref No. 25
CDO = 1.3×10^{-11}	Surge Z Rev 10 μs = 65, Ref No. 25
VDBI = 1	K Damage Rev <50 ns = not defined
TD = 1×10^{-7}	K Damage Rev >50 ns = 14, Ref No. 25
IPPD = 1×10^{-4}	K Damage Forward = not defined
VB = 200	TRAC Ref = not defined

For UPDATE action requests, all four data cards for the device being updated must be used as input. All parameter values and parameter reference values which were previously defined must be present on the data cards because the entire record is updated from the input data cards. The reason for this requirement is to make the maintenance of a hard copy of the device library less of a chore for the Device Data Bank manager.

3.3.2 Transistor Device Library

To enter transistor device data into the Transistor Device Library, seven data cards are required for each different device. Each data card contains the device name in columns 1 through 12, with the name left justified; the remainder of each card contains the appropriate values for the parameters and parameter references according to the following order (see table II, sect. 2 for definition of parameters) and formats.

Card 1: Device Name, HFEN,
HFEI,
TN,
TI,
ICS,
MC

Card 2: Device Name, CCO,
VCBI,
RCL,
IES,
ME,
CEO

Card 3: Device Name, VEBI,
REL,
IPPC,
IPPE,
C-BBDV,
E-BBDV

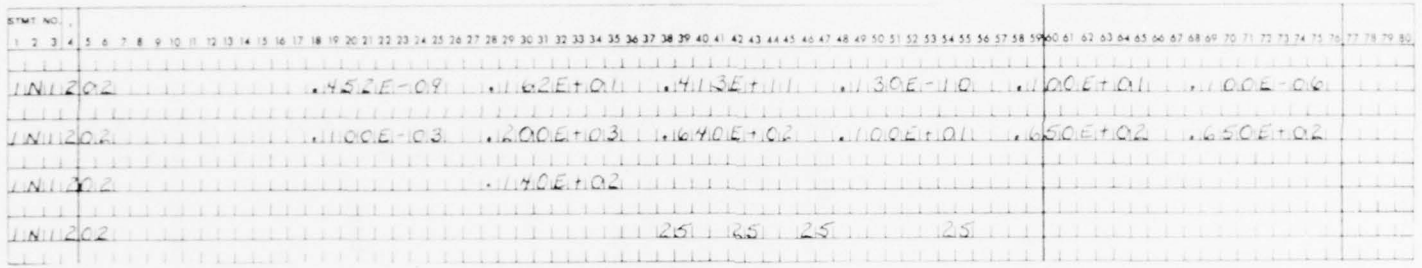


Figure 2. Sample diode data set.

Card 4: Device Name, Surge ZC,
Surge ZE,
Bulk Resistance C-B,
Bulk Resistance E-B,
Z Surge C-B 1 μs,
Z Surge C-B 10 μs

Card 5: Device Name, Z Surge E-B 1 μs,
Z Surge E-B 10 μs,
Damage F (<50 ns) C-B,
Damage K (<50 ns) E-B,
Damage K (>50 ns) C-B,
Damage K (>50 ns) E-B

Card 6: Device Name, K Forward C-B,
K Forward E-B,
K C-B,
K E-B,
K C-B,
K E-B,

Card 7: Device Name, Bulk Resistance Ref,
Z Surge C-B Ref,
Z Surge E-B Ref,
Damage K (<50 ns) Ref,
Damage K (>50 ns) Ref,
K Forward Ref,
K Ref,
K Ref

Format for Cards 1, 2, 3, 4, 5, and 6: (3A4, 3X, 6E10.3)
Format for Card 7: (3A4, 10(1X, I3))

Sample transistor data set: (see fig. 3)

Transistor type 2N705

HFEN = 25	C-BBDV	= 15		
HFEI = not defined	E-BBDV	= 3.5		
TN = 1.06×10^{-9}	Surge ZC	= 72.5		
TI = 5.03×10^{-8}	Surge ZE	= 165		
ICS = 10^{-5}	Bulk Resistance C-B	= 0.95	Ref No. 34	
MC = 1.83	Bulk Resistance E-B	= 2.2		
CCO = 1.37×10^{-11}	Z Surge C-B 1 μs	= 150	Ref No. 34	
VCBI = 0.3	Z Surge C-B 10 μs	= 360		
RCL = 10^{7}	Z Surge E-B 1 μs	= 340	Ref No. 34	
IES = 10^{-5}	Z Surge E-B 10 μs	= 340		
ME = 1.83	Damage K (<50 ns) C-B	= 3.18×10^{-6}	Ref	
CEO = 6.39×10^{-12}	Damage K (<50 ns) E-B	= 1.13×10^{-6}	No. 60	
VEBI = 0.3	Damage K (>50 ns) C-B	= 1.42×10^{-2}		
REL = 10^{7}	Damage K (>50 ns) E-B	= 5.06×10^{-3}	No. 60	
IPPC = 10^{-3}	K Forward C-B	= 7.9×10^{-5}	Ref	
IPPE = 10^{-5}	K Forward E-B	= 3.6×10^{-5}	No. 60	

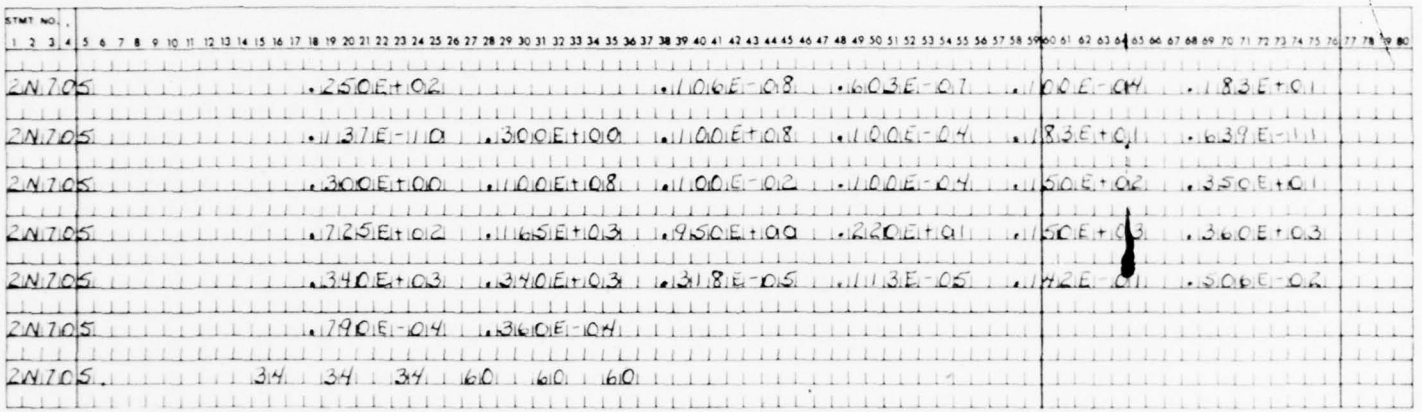


Figure 3. Sample transistor data set.

For UPDATE action requests, all seven data cards for the device being updated must be used as input. All parameter values and parameter reference values which were preciously defined must be present on the data cards because the entire record is updated from the input data cards. The reason for this requirement is to make the maintenance of a hard copy of the device library less of a chore for the Device Data Bank manager.

3.4 Program Messages Issued by MPD2B

The following messages are printed during the execution of the MPD2B program.

*****ERROR ON INPUT CONTROL CARD
*****JOB TERMINATED

This message is printed when an action request card is not recognized. The job is terminated. This message is accompanied by a STOP 1.

*****DATA FOR X DEVICES SUCCESSFULLY WRITTEN ON DEVICE SET Y

This message is printed at the completion of a successful CREATE run. Here, X is the number of devices written on the file and Y is the device set where the data were written (11 for the diode file and 12 for the transistor file).

*****UPDATING OF THE DIODE FILE COMPLETED
or
*****UPDATING OF THE TRANSISTOR FILE COMPLETED

These messages are printed at the completion of a successful UPDATE run.

*****DEVICES SUCCESSFULLY ADDED TO DIODE FILE
or
*****DEVICES SUCCESSFULLY ADDED TO TRANSISTOR FILE

This message is printed at the completion of a successful ADD TO run.

*****END ENCOUNTERED UNEXPECTEDLY ON INPUT

This message is printed if an end of record card is read during the input of data. This message is accompanied by a STOP 1.

*****DEVICES NAMES DO NOT MATCH FOR DEVICE X (Y)

This message is printed if the device names do not match while the input data cards for a particular device are read. Here, X is the device name first read and Y is the device name read which did not match. This message is accompanied by a STOP 1.

*****DEVICE NAME NOT LOCATED IN DIODE FILE
or
*****DEVICE NAME NOT LOCATED IN TRANSISTOR FILE

These messages are printed during an UPDATE run if the device to be updated is not located in the file. This message is accompanied by a STOP 3.

*****DEVICE X IS ALREADY IN THE DIODE DEVICE DATA FILE
(ITEM No. Y)
or
*****DEVICE X IS ALREADY IN THE TRANSISTOR DEVICE DATA FILE
(ITEM No. Y)

These messages are printed during an ADD TO run if device X, to be added to the file, is already in the device file. The item Y is the location of the device on a current listing of the file.

*****INDEXING ERROR WHILE UPDATING DIODE DEVICE DATA FILE
*****INDEXING ERROR WHILE UPDATING TRANSISTOR DEVICE DATA FILE
*****INDEXING ERROR WHILE ADDING TO DIODE DEVICE DATA FILE
*****INDEXING ERROR WHILE ADDING TO TRANSISTOR DEVICE DATA FILE
*****INDEXING ERROR WHILE LISTING DIODE DEVICE DATA FILE
or
*****INDEXING ERROR WHILE LISTING TRANSISTOR DEVICE DATA FILE

These messages are printed if the indexing key stored with the file has been corrupted. The indexing key is checked for the UPDATE, ADD TO, and LIST action requests. A CREATE run for the particular file is recommended. This message is accompanied by a STOP 2.

*****END OF JOB

This message is printed after the FINISH action request has been processed.

3.5 Sample Action Requests

The following are sample action request input data for MPD2B. The last action request to any device file for any run should by the LIST action request.

```
 Sample action request input for a CREATE run
CREATE DIODE FILE
  (enter diode device data)
END OF ACTION
LIST   DIODE FILE
FINISH

Sample action request input for an UPDATE and ADD TO run
UPDATE DIODE FILE
  (enter diode device data)
END OF ACTION
ADD TO TRANSISTOR FILE
  (enter transistor device data)
END OF ACTION
LIST   DIODE FILE
LIST   TRANSISTOR FILE
FINISH
```

It should be noted that the action requests to the diode or transistor data files can be used in any order and do not have to be grouped by file types.

4. INTERFACING DEVICE DATA BANK WITH DAMTRAC

The interfacing of the IBM versions of the Device Data Bank and DAMTRAC was accomplished in much the same manner as was used in the CDC versions. Circuit piece-part data decks constructed for use with the MERADCOM CDC version of DAMTRAC require no changes to be used as input for the HDL IBM version. The manner of requesting the device parameter to be read from the Device Data Bank has remained the same; "device name/R" states that the device parameters do not follow but must be read from the appropriate device library. Only the supporting subroutine which retrieves the appropriate device parameter is different.

The subroutine OPENDA with entry points READDA and WRITDA was written to provide DAMTRAC with the proper access method to the Device Data Bank. Subroutine OPENDA contains the DEFINE FILE statements for the Diode and Transistor Device Libraries and the CALL to OPENDA fills and orders a table of device names for both device libraries. The CALL to READDA locates the device in the appropriate device table for which the parameters have been requested, and reads the requested device parameter into a DAMTRAC supplied array. Before returning to DAMTRAC, the TRAC FLAG for the device is checked. If all the necessary device parameters for the DAMTRAC analysis calculation are not defined (TRAC FLAG set to 0) a message is written on the line printer to notify the user of that fact and the job is terminated. However, if all the necessary device parameters are defined (TRAC FLAG set to 1) the device

parameters are returned to DAMTRAC. To maintain the integrity of the device libraries, the ability to enter device parameters into the device libraries from DAMTRAC was not implemented on the IBM version; however, to maintain compatibility with the DAMTRAC and TRAC manuals, a CALL to WRITDA is executed when a request to enter device parameters is encountered. The CALL to WRITDA writes a message on the line printer notifying the user that data cannot be written in a device library and then returns to DAMTRAC.

5. LISTING OF DIODE AND TRANSISTOR DEVICE LIBRARIES

To aid the EMP damage analyst, this section presents listings of the devices contained in the device libraries. Table III of the section gives parameter references found in the diode device library--for example, code 034 of table III is shown in the library as (34).

DIODE DEVICE LIBRARY

DEVICE NAME (TRAC FLAG)	IS K BULK FORWARD (REF)	ND SURGE Z REV 10US (REF)	RDL SURGE Z REV 100S (REF)	CDD K DAMAGE REV <50NS (REF)	VDBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPD K (REF)	VB K (REF)	SURGE Z K (REF)	(TRAC REF) K (REF)
IRe96735									1.00E+00	(61)
(0)	2.20E-01 (34)	1.00E+00 (34)	1.00E+00 (34)	1.13E-03 (60)	5.06E+00 (60)	8.08E-03 (60)				
MD1054									4.50E+03	(61)
(0)	1.30E-01 (34)	7.11E+03 (34)	1.50E+04 (34)	6.72E-06 (60)	3.01E-02 (60)	6.70E-03 (60)				
MS1040									5.75E+01	(61)
(0)	6.40E+00 (34)	5.75E+01 (34)	3.93E+01 (34)	8.49E-08 (60)	3.80E-04 (60)	2.10E-06 (60)				
PC115	2.36E-12	1.39E+00	1.00E+07	2.59E-11	7.00E-01	1.00E-07	1.00E-04	1.35E+02	4.70E+01	(61)
(1)	1.55E-01 (33)	4.70E+01 (33)	1.20E+02 (33)							
STEP	1.00E-09	2.00E+00	1.00E+09	1.00E-12	7.50E-01	1.00E-08		8.60E+01	1.00E-02	
(0)	1.21E+00									
INCHAP	1.23E+03	1.23E+03	1.23E+03	1.23E+03	1.23E+03	1.23E+03	1.23E+03	1.23E+03	1.23E+03	
(1)										
INDUMMY	1.00E-09	2.00E+00	1.00E+09	1.10E-11	7.50E-01	1.00E-08	1.00E-04	1.44E+02	2.10E+01	
(1)										
INFD100	1.10E-08	2.14E+00	2.00E+06	1.12E-12	8.00E-01	7.46E-07	1.00E-04	5.00E+01	2.10E+01	
(1)										

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME (TRAC FLAG)	IS K BULK FORWARD (REF)	MD SURGE Z REV IOUS (REF)	KDL SURGE Z REV IOUS (REF)	CDO K DAMAGE REV <50NS (REF)	VOBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPO K (REF)	VB K (REF)	SURGE Z K (REF)	(TRAC REF) K (REF)
1VFD600	4.60E-09	1.84E+00	1.60E+09	2.24E-12	8.00E-01	1.00E-06	1.00E-04	7.50E+01	2.10E+01	
(1)										-----
1VFD700	5.15E-11	1.61E+00	5.00E+08	7.18E-13	1.04E+00	7.08E-10	1.00E-04	3.00E+01	2.10E+01	
(1)										-----
1VFS760	2.60E-09	1.55E+00	5.60E+08	2.12E-12	8.00E-01	1.20E-07	1.00E-04	1.50E+02	2.10E+01	
(1)										-----
1VSD400	5.97E-14	1.00E+00	5.70E+05	1.41E-09	5.00E-01	1.59E-05	1.00E-04	4.00E+02	2.10E+01	
(1)										-----
1VSE5250	3.20E-09	1.73E+00	1.70E+09	2.01E-12	8.00E-01	2.05E-07	1.00E-04	5.00E+02	2.10E+01	
(1)										-----
1VUR2054	1.17E-12	1.19E+00	1.15E+10	1.04E-10	8.00E-01	3.26E-07	1.00E-04	5.00E+01	2.10E+01	
(1)										-----
1VUR2055	6.60E-12	1.16E+00	8.50E+09	1.10E-10	8.00E-01	2.36E-07	1.00E-04	5.00E+01	2.10E+01	
(1)										-----
1VUR2056	3.93E-11	1.28E+00	1.90E+09	8.45E-11	8.20E-01	3.00E-07	1.00E-04	5.00E+01	2.10E+01	
(1)										-----

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME (TRAC FLAG)	IS R BULK FORWARD (REF)	MD SURGE Z REV 1US (REF)	RDL SURGE Z REV 10US (REF)	CDO K DAMAGE REV <50NS (REF)	VDBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPD K (REF)	VB K (REF)	SURGE Z K (REF)	(TRAC REF) K (REF)
1NUR205D	5.62E-11	1.41E+00	9.30E+09	1.16E-10	9.00E-01	4.53E-07	1.00E-04	5.00E+01	2.10E+01	-----
(1)										
1NUR205E	2.09E-11	1.24E+00	8.90E+09	1.08E-10	8.50E-01	3.05E-07	1.00E-04	5.00E+01	2.10E+01	-----
(1)										
1NUR205F	7.07E-11	1.34E+00	7.10E+09	1.19E-10	8.50E-01	2.08E-07	1.00E-04	5.00E+01	2.10E+01	-----
(1)										
1NZ1PP	2.10E-15	1.10E+00	1.00E-09	1.00E-12	2.00E+00	2.60E-10	-----	7.50E+01	5.00E+00	-----
(0)										
1N100	2.50E-06	2.63E+00	1.00E+06	7.07E-13	5.00E-01	1.59E-09	1.00E-04	8.00E+01	2.10E+01	-----
(1)										
1N1200	1.78E-09	1.79E+00	1.00E+10	1.00E-12	9.00E-01	1.00E-07	1.00E-04	1.00E+02	9.00E+02	-----
(1)	5.00E-02 (25)		1.10E+02 (25)		6.23E+01 (22)					
1N1202	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	2.00E+02	6.40E+01	-----
(1)	1.00E+00 (25)	6.50E+01 (25)	6.50E+01 (25)		1.40E+01 (25)					
1N1202AR	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	2.00E+02	1.13E+03	(72)
(1)	1.10E-01 (62)	1.13E+03 (34)	2.95E+03 (34)	2.26E-04 (60)	1.01E+00 (60)		4.67E+00 (13)			-----

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME (TRAC FLAG)	IS R BULK FORWARD (REF)	MD SURGE Z REV IDS (REF)	RDL SURGE Z REV IDUS (REF)	CDO K DAMAGE REV <50NS (REF)	VOBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPD K (REF)	VB K (REF)	SURGE Z K (REF)	(TRAC REF) K (REF)
IN1204A (1)	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00 4.61E+01 (22)	1.00E-07	1.00E-04	4.00E+02	1.10E-01	-----
IN1313A (1)	4.26E-14	1.06E+00	1.70E+10	2.60E-10	8.50E-01	2.15E-07	1.00E-04	8.75E+00	2.10E+01	-----
IN1313B (1)	2.09E-14	1.03E+00	1.28E+10	4.12E-10	8.50E-01	1.94E-07	1.00E-04	8.75E+00	2.10E+01	-----
IN1313C (1)	1.05E-14	1.02E+00	2.53E+10	2.49E-10	8.50E-01	2.61E-07	1.00E-04	8.75E+00	2.10E+01	-----
IN1313D (1)	1.00E-13	1.01E+00	1.96E+10	2.91E-10	8.00E-01	2.30E-07	1.00E-04	8.75E+00	2.10E+01	-----
IN1313E (1)	1.00E-13	1.01E+00	1.50E+10	2.49E-10	8.00E-01	2.57E-07	1.00E-04	8.75E+00	2.10E+01	-----
IN1313F (1)	5.00E-13	1.07E+00	8.00E+09	4.02E-10	8.00E-01	2.49E-07	1.00E-04	8.75E+00	2.10E+01	-----
IN1315A (1)	7.08E-14	1.08E+00	2.50E+10	2.00E-10	9.00E-01	2.17E-07	1.00E-04	1.28E+01	2.10E+01	-----

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME (TRAC FLAG)	IS K BULK FORWARD (REF)	MD SURGE Z REV IUS (REF)	RDL SURGE Z REV IOUS (REF)	CDO K DAMAGE REV <50NS (REF)	VDBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPD K (REF)	VB K (REF)	SURGE Z K (REF)	(TRAC REF) K (REF)
IN1315B	3.30E-13	1.12E+00	2.60E+10	2.11E-10	9.00E-01	1.15E-07	1.00E-04	1.28E+01	2.10E+01	
(1)										-----
IN1315C	6.60E-14	1.11E+00	1.40E+09	4.01E-10	9.00E-01	2.63E-07	1.00E-04	1.28E+01	2.10E+01	
(1)										-----
IN1315D	4.36E-13	1.14E+00	7.00E+09	2.42E-10	9.00E-01	1.29E-07	1.00E-04	1.28E+01	2.10E+01	
(1)										-----
IN1315F	7.25E-14	1.06E+00	2.50E+10	2.11E-10	9.00E-01	1.59E-07	1.00E-04	1.28E+01	2.10E+01	
(1)										-----
IN140	2.87E-12	9.90E-01	1.60E+05	2.83E-11	5.00E-01	1.59E-07	1.00E-04	8.00E+01	2.10E+01	
(1)										-----
IN1482	1.00E-13	1.00E+00	1.00E+07	1.00E-09	1.00E+00	1.00E-12	1.00E-04	4.70E+00	7.00E-02	
(1)										-----
IN1614	9.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	2.00E+02	2.10E+01	
(1)					4.88E+00		3.80E-01			-----
					(13)		(17)			
IN1731A									1.45E+03	(61)
(0)	2.65E-01	5.35E+03	5.35E+03	4.03E-04	1.80E+00	1.90E-01	3.20E+00			-----
	(34)	(34)	(34)	(60)	(60)	(60)	(22)			

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME	IS	MD	RDL	CDO	VDBI	TD	IPPD	VB	SURGE Z	(TRAC REF)
(TRAC FLAG)	K BULK FORWARD (REF)	SURGE Z REV IOUS (REF)	SURGE Z REV IOUS (REF)	K DAMAGE REV <5ONS (REF)	K DAMAGE REV >5ONS (REF)	K DAMAGE FORWARD (REF)	K (REF)	K (REF)	K (REF)	K (REF)
1N191	1.25E-15	5.90E-01	4.00E+05	7.00E-13	5.00E-01	1.59E-08	1.00E-04	9.00E+01	2.10E+01	
(1)					5.00E-03 (17)					
1N2199	2.00E-09	1.71E+00	1.00E+09	2.83E-12	5.00E-01	2.27E-08	1.00E-04	1.44E+02	2.10E+01	
(1)										
1N2580										
(0)	1.70E-01 (62)	4.40E+01 (71)	4.25E+01 (71)	1.13E-02 (60)	5.06E+01 (60)					
1N270	1.24E-06	1.67E+00	5.00E+05	1.13E-12	5.00E-01	3.18E-08	1.00E-04	1.00E+02	2.10E+01	
(1)					2.20E-02 (22)					
1N273A	1.95E-06	1.44E+00	2.82E+06	9.26E-13	5.00E-01	1.02E-08	1.00E-04	3.20E+01	2.10E+01	
(1)										
1N273B	2.75E-06	1.59E+00	2.46E+06	7.64E-13	5.00E-01	1.05E-08	1.00E-04	3.20E+01	2.10E+01	
(1)										
1N273C	3.40E-06	1.66E+00	3.00E+06	1.05E-12	5.50E-01	5.41E-09	1.00E-04	3.20E+01	2.10E+01	
(1)										
1N273D	3.57E-06	1.86E+00	4.40E+06	7.78E-13	5.00E-01	7.02E-09	1.00E-04	3.20E+01	2.10E+01	
(1)										

DEVICE NAME / (TRAC FLAG)	IS R BULK FORWARD (REF)	MD SURGE Z REV 10US (REF)	RDL SURGE Z REV 10US (REF)	CDO % DAMAGE REV <50NS (REF)	VDBI % DAMAGE REV >50NS (REF)	TD % DAMAGE FORWARD (REF)	IPPD % (REF)	VB % (REF)	SURGE Z % (REF)	(TRAC REF) % (REF)
1N273E	3.31E-06	1.72E+00	4.50E+06	7.82E-13	5.50E-01	5.78E-09	1.00E-04	3.20E+01	2.10E+01	-----
(1)										
1N273F	2.82E-06	1.54E+00	1.60E+06	9.33E-13	5.00E-01	6.65E-09	1.00E-04	3.20E+01	2.10E+01	-----
(1)										
1N276	5.60E-07	1.94E+00	8.00E+05	5.00E-13	6.00E-01	6.50E-09	1.00E-04	1.00E+02	2.10E+01	-----
(1)					5.50E-03 (22)					
1N277	9.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	1.25E+02	5.10E+03	(61)
(1)	6.90E-01 (34)	7.60E+03 (34)	7.60E+03 (34)	3.95E-06 (60)	1.77E-02 (60)	3.70E-04 (60)	2.70E-02 (20)			
1N279	1.24E-06	1.67E+00	3.80E+06	2.83E-11	5.00E-01	3.18E-08	1.00E-04	3.20E+01	2.10E+02	-----
(1)										
1N2823B	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00 2.49E+02 (22)	1.00E-07	1.00E-04	3.00E+01	2.10E+01	-----
(1)										
1N2846B	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01 1.50E+01 (17)	1.00E-07	1.00E-04	2.00E+02	2.10E+01	-----
(1)										
1N2991B										-----
(0)	1.05E-01 (62)	5.50E-01 (34)	3.60E-01 (34)	7.08E-03 (60)	3.16E+01 (60)		1.50E+01 (17)			

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME	IS	MD	RDL	CDO	VDB1	TD	IPPD	VB	SURGE Z	(TRAC REF)
(TRAC FLAG)	R BULK FORWARD (REF)	SURGE Z REV 1US (REF)	SURGE Z REV 10US (REF)	K DAMAGE REV <50NS (REF)	K DAMAGE REV >50NS (REF)	K DAMAGE FORWARD (REF)	K (REF)	K (REF)	K (REF)	K (REF)
1N3024	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	1.30E+01	2.10E+01	
(1)					1.90E+00 (17)					-----
1N3025B	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	1.60E+01	3.50E-01	(61)
(1)	8.50E-02 (34)	3.50E-01 (62)	6.00E-01 (62)	8.49E-04 (60)	3.80E+00 (60)	4.40E-02 (60)	1.90E+00 (17)			-----
1N3027B	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01	1.00E-07	1.00E-04	2.00E+01	2.10E+01	
(1)					1.90E+00 (17)					-----
1N3033B	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01	1.00E-07	1.00E-04	3.60E+01	2.10E+01	
(1)					1.90E+00 (17)					-----
1N3034	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01	1.00E-07	1.00E-04	3.90E+01	2.10E+01	
(1)										-----
1N3064	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01	4.00E-09	1.00E-04	7.50E+01	5.00E+00	
(1)					1.70E-01 (13)	1.86E-04 (13)	2.00E-02 (17)			-----
1N3071	9.10E-09	1.94E+00	4.50E+09	1.50E-12	1.00E+00	8.00E-07	1.00E-04	2.00E+02	2.10E+01	
(1)										-----
1N338	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	1.00E+02	2.10E+01	
(1)					1.83E+01 (21)		3.24E+00 (2)			-----

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME (TRAC FLAG)	IS R BULK FORWARD (REF)	MD SURGE Z REV 10US (REF)	KDL SURGE Z REV 10US (REF)	CDO K DAMAGE REV <50NS (REF)	VDBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPD K (REF)	VB K (REF)	SURGE Z K (REF)	(TRAC REF) K (REF)
1N3565	9.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	2.60E+01	2.00E+01	-----
(1)										
1N3600	1.58E-09	1.66E+00	1.54E+09	1.20E-12	9.00E-01	1.00E-07	1.00E-04	5.00E+01	5.00E+00	-----
(1)	3.97E-01 (64)	1.70E+01 (65)		1.80E-01 (3)	1.90E-01 (13)	3.04E-04 (13)				
1N3605	3.77E-09	1.96E+00	4.86E+09	8.57E-13	1.28E+00	5.79E-09	1.00E-04	4.00E+01	2.10E+01	-----
(1)										
1N3611	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	2.00E+02	2.10E+01	-----
(1)										
1N3669	1.30E-10	1.38E+00	1.10E+06	2.30E-11	8.00E-01	4.64E-07	1.00E-04	7.00E+01	2.10E+01	-----
(1)										
1N4001	5.00E-09	1.84E+00	6.40E+08	1.30E-11	1.00E+00	1.19E-06	1.00E-04	5.00E+01	2.10E+01	-----
(1)										
1N4003	4.20E-09	1.76E+00	2.00E+10	2.30E-11	1.00E+00	6.82E-06	1.00E-04	1.50E+03	1.60E+02	-----
(1)		1.65E+01 (25)			7.80E-01 (25)					
1N4005	6.20E-09	1.84E+00	1.20E+09	3.60E-11	1.00E+00	1.48E-05	1.00E-04	1.50E+03	1.20E+02	-----
(1)										

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME / (TRAC FLAG)	IS R BULK FORWARD (REF)	MD SURGE Z REV 1US (REF)	RDL SURGE Z REV 10US (REF)	CDO K DAMAGE REV <50NS (REF)	VDBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPD K (REF)	VB K (REF)	SURGE Z K (REF)	(TRAC REF) K (REF)
IN4006	8.00E-09	1.84E+00	8.20E+09	2.50E-11	1.00E+00	6.19E-06	1.00E-04	8.00E+02	1.00E+02	-----
(1)					8.60E-01 (13)					
IN4148	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01	1.00E-07	1.00E-04	7.50E+01	2.10E+01	-----
(1)					1.94E-02 (13)	1.50E-04 (13)				
IN4249	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	1.00E+03	2.10E+01	-----
(1)					2.40E+00 (17)					
IN457	7.40E-12	1.36E+00	2.70E+10	5.60E-12	8.50E-01	4.91E-07	1.00E-04	2.10E+02	2.10E+01	-----
(1)	4.00E-01 (25)	6.00E+01 (25)			1.20E-01 (20)		7.50E-01 (25)			
IN458	9.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	1.50E+02	2.10E+01	-----
(1)					5.00E-01 (17)					
IN459	5.80E-11	1.41E+00	2.00E+12	1.20E-11	8.00E-01	5.84E-07	1.00E-04	2.30E+02	8.30E+01	-----
(1)		8.30E+02 (24)			5.90E-01 (20)					
IN459A	9.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	2.00E+02	3.60E+00	-----
(1)		3.60E+00 (2)			9.60E-01 (21)		9.60E-01 (2)			
IN461	9.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	3.50E+01	2.10E+01	-----
(1)					2.40E-01 (17)					

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME (TRAC FLAG)	IS % BULK FORWARD (REF)	MD SURGE Z REV 10US (REF)	RDL SURGE Z REV 10US (REF)	CDO % DAMAGE REV <50NS (REF)	VDBI % DAMAGE REV >50NS (REF)	TD % DAMAGE FORWARD (REF)	IPPO % (REF)	VB % (REF)	SURGE Z % (REF)	(TRAC REF) % (REF)
1N462	9.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	8.00E+01	2.10E-01	
(1)					5.00E-02 (17)					
1N482A	9.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	3.60E+01	7.60E+02	
(1)		7.60E+02 (24)			9.60E-01 (20)		9.60E-01 (2)			
1N485B									2.50E+01	(61)
(0)	4.63E-01 (34)	9.62E+02 (34)	5.32E+02 (34)	1.13E-04 (60)	5.06E-01 (60)	9.60E-03 (60)	3.00E-01 (22)			
1N537	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.20E-06	1.00E-04	1.00E+02	3.00E+01	
(1)		1.30E+02			5.10E-01 (20)		5.10E-01 (2)			
1N538	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	2.00E+02	2.10E+01	
(1)					8.53E+00 (12)		1.00E+00 (17)			
1N538M	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	2.00E+02	2.10E+01	
(1)					1.00E+00 (17)					
1N540	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	4.00E+02	9.40E+01	
(1)		9.40E+01 (24)			9.30E-01 (20)		9.30E-01 (2)			
1N547	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	1.00E-07	1.00E-04	6.00E+02	2.10E+01	
(1)					1.21E+01 (20)					

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME (TRAC FLAG)	IS R BULK FORWARD (REF)	MD SURGE Z REV 1US (REF)	RDL SURGE Z REV 10US (REF)	CDO K DAMAGE REV <50NS (REF)	VDBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPD K (REF)	VB K (REF)	SURGE Z K (REF)	*(TRAC REF) K (REF)
IN600	1.00E-13	1.00E+00	1.00E+07	1.00E-09	1.00E+00	1.00E-12	1.00E-04	4.70E+00	7.00E-02	
(1)		1.60E-02 (32)		7.00E-02						-----
IN63	2.87E-13	9.90E-01	1.00E+06	1.41E-10	5.00E-01	1.59E-07	1.00E-04	1.00E+02	2.10E+01	
(1)										-----
IN645	4.52E-10	1.62E+00	4.13E+10	1.30E-11	8.00E-01	1.86E-06	1.00E-04	2.25E+02	1.75E+03	(61)
(1)	2.25E-01 (34)	6.90E+03 (66)	6.90E+03 (66)	1.49E-04 (60)	6.65E-01 (60)	6.60E-02 (60)	2.80E+00 (17)	3.63E+00 (2)	7.90E-01 (13)	-----
IN6458	5.20E-10	1.64E+00	8.50E+08	2.46E-08	8.00E-01	1.86E-06	1.00E-04	2.25E+02	2.10E+01	
(1)										-----
IN645Y	5.20E-10	1.64E+00	2.70E+10	2.20E-12	8.00E-01	1.86E-06	1.00E-04	2.25E+02	8.70E+00	
(1)										-----
IN645Z	5.20E-10	1.64E+00	2.70E+10	1.30E-12	8.00E-01	1.86E-06	1.00E-04	2.25E+02	8.70E+00	
(1)										-----
IN646										
(C)					2.29E+00 (20)					-----
IN646M	2.20E-10	1.43E+00	3.10E+10	1.60E-11	1.00E+00	9.63E-07	1.00E-04	1.44E+02	2.10E+01	
(1)										-----

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME (TRAC FLAG)	IS K BULK FORWARD (REF)	MD SURGE Z REV 10US (REF)	RDL SURGE Z REV 10US (REF)	CDO K DAMAGE REV <50NS (REF)	VDBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPD K (REF)	VB K (REF)	SURGE Z K (REF)	(TRAC REF) K (REF)
1N646X	1.00E-08	2.28E+00	3.10E+10	1.60E-11	1.00E+00	1.53E-06	1.00E-04	1.44E+02	2.10E+01	-----
(1)										
1N646Y	2.20E-10	1.43E+00	3.10E+10	1.60E-11	1.00E+00	7.04E-07	1.00E-04	1.44E+02	2.10E+01	-----
(1)										
1N646Z	1.00E-08	2.28E+00	3.10E+10	1.60E-11	1.00E+00	1.12E-06	1.00E-04	1.44E+02	2.10E+01	-----
(1)										
1N647	1.60E-09	1.76E+00	4.20E+10	7.70E-12	1.00E+00	8.64E-07	1.00E-04	4.00E+02	1.72E+01	(61)
(1)	5.20E+00 (25)			4.20E+00 (25)	3.90E+00 (7)					
1N648	2.80E-09	1.64E+00	5.80E+10	6.60E-12	1.00E+00	6.64E-07	1.00E-04	5.00E+02	2.10E+01	-----
(1)					2.80E+00 (17)					
1N649	4.52E-10	1.62E+00	4.13E+10	1.30E-11	1.00E+00	3.00E-06	1.00E-04	6.00E+02	2.10E+01	-----
(1)					2.90E+00 (7)					
1N649W	1.40E-11	1.15E+00	3.60E+10	1.20E-11	9.00E-01	3.26E-06	1.00E-04	1.44E+02	2.10E+01	-----
(1)										
1N649X	7.60E-08	2.58E+00	3.60E+00	1.20E-11	9.00E-01	7.33E-06	1.00E-04	1.44E+02	2.10E+01	-----
(1)										

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME (TRAC FLAG)	IS K BULK FORWARD (REF)	MD SURGE Z REV 1US (REF)	RDL SURGE Z REV 100S (REF)	CDD K DAMAGE REV <50NS (REF)	VDBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPD K (REF)	VB K (REF)	SURGE Z K (REF)	(TRAC REF) K (REF)
1N649Y	1.40E-11	1.15E+00	3.60E+10	8.60E-12	9.00E-01	3.26E-06	1.00E-04	1.44E+02	2.10E+01	
(1)										-----
1N649Z	7.60E-08	2.58E+00	3.60E+10	8.60E-12	9.00E-01	7.33E-06	1.00E-04	1.44E+02	2.10E+01	
(1)										-----
1N658	3.90E-09	1.76E+00	6.10E+09	1.80E-12	1.00E+00	1.50E-07	1.00E-04	1.20E+02	2.10E+01	
(1)					9.20E-01 (7)					-----
1N659	1.40E-11	1.15E+00	5.60E+08	2.12E-11	8.00E-01	8.90E-08	1.00E-04	5.00E+01	2.10E+01	
(1)										-----
1N660	4.80E-09	1.82E+00	9.90E+08	3.40E-12	9.00E-01	3.24E-07	1.00E-04	1.00E+02	2.10E+01	
(1)		1.10E+01 (12)			2.80E+00 (12)		4.40E-01 (17)			-----
1N661	5.24E-17	9.90E-01	2.00E+07	3.82E-12	5.00E-01	3.18E-09	1.00E-04	2.00E+02	2.10E+01	
(1)					4.60E-01 (7)		4.10E-01 (20)			-----
1N665	7.20E-07	1.55E+00	3.20E+05	7.00E-13	6.00E-01	1.44E-08	1.00E-04	2.00E+01	2.10E+01	
(1)										-----
1N706	1.39E-13	1.12E+00	1.00E+18	2.50E-10	9.00E-01	1.00E-07	1.00E-04	5.80E+00	2.10E+01	
(1)					2.88E-01 (22)					-----

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME / (TRAC FLAG)	IS R BULK FORWARD (REF)	MD SURGE Z REV 1US (REF)	RDL SURGE Z REV 100S (REF)	CDD K DAMAGE REV <50NS (REF)	VDBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPD K (REF)	VB K (REF)	SURGE Z K (REF)	(TRAC REF) K (REF)
1N711A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	7.50E+00	1.90E+00	-----
(1)		1.90E+00 (2)			2.10E+00 (2)					
1N746A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	3.30E+00	2.10E+01	-----
(1)					1.60E+00 (13)	3.20E-03 (13)	1.10E+00 (17)			
1N747A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	3.60E+00	2.10E+01	-----
(1)					1.10E+00 (17)					
1N748A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	3.90E+00	2.10E+01	-----
(1)					1.10E+00 (17)					
1N751A									7.00E-01	(61)
(0)	1.85E-01 (34)	7.00E-01 (34)	7.00E-01 (34)	4.46E-04 (60)	1.99E+00 (60)	9.30E-03 (60)	1.10E+00 (17)	3.87E+00 (2)		
1N752	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	5.60E+00	2.10E+01	-----
(1)					1.10E+00 (17)					
1N752A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	5.60E+00	2.10E+01	-----
(1)					1.06E+01 (13)	3.23E-02 (13)	1.10E+00 (17)	1.20E+00 (21)		
1N753	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	6.20E+00	4.00E-01	-----
(1)					1.20E+00 (20)					

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME (TRAC FLAG)	IS R BULK FORWARD (REF)	MD SURGE Z REV 1US (REF)	RDL SURGE Z REV 10US (REF)	CDO K DAMAGE REV <50NS (REF)	VDBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPD K (REF)	VB K (REF)	SURGE Z K (REF)	(TRAC REF) K (REF)
IN753A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	6.20E+00	4.00E-01	
(1)		4.00E-01 (24)			1.48E+01 (13)	2.34E-02 (13)	1.20E+00 (20)			-----
IN754A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	6.80E+00	2.10E+01	
(1)					1.12E+00 (13)	6.43E-04 (13)	6.30E-01 (17)			-----
IN755A	7.26E-10	1.73E+00	1.00E+09	5.00E-12	1.00E+00	1.00E-08	1.00E-03	7.50E+00	5.00E+00	
(1)										-----
IN756	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	8.20E+00	2.10E+01	
(1)					2.04E+01 (13)	6.87E-02 (13)	6.30E-01 (17)			-----
IN756A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	8.20E+00	2.10E+01	
(1)					6.30E-01 (17)					-----
IN758	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	1.00E+01	2.10E+01	
(1)					6.30E-01 (17)					-----
IN758A	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	1.00E+01	2.10E+01	
(1)					6.17E+00 (13)	2.50E-02 (13)	6.30E-01 (17)			-----
IN758A1	4.20E-14	1.10E+00	2.20E+09	5.38E-10	9.00E-01	1.26E-07	1.00E-04	1.00E+01	2.10E+01	
(1)										-----

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME / (TRAC FLAG)	IS K BULK FORWARD (REF)	MD SURGE Z REV IDS (REF)	RDL SURGE Z REV IDUS (REF)	CDO K DAMAGE REV <5ONS (REF)	VDBI K DAMAGE REV >5ONS (REF)	TD K DAMAGE FORWARD (REF)	IPPD K (REF)	VB K (REF)	SURGE Z K (REF)	*(TRAC REF) K (REF)
1N758A2	7.50E-15	1.01E+00	1.00E+10	3.58E-10	9.00E-01	2.66E-07	1.00E-04	1.00E+01	2.10E+01	
(1)										-----
1N758A3	6.30E-15	1.01E+00	9.80E+09	3.95E-10	9.00E-01	1.80E-07	1.00E-04	1.00E+01	2.10E+01	
(1)										-----
1N758A4	1.60E-14	1.03E+00	9.40E+09	3.66E-10	9.00E-01	1.43E-07	1.00E-04	1.00E+01	2.10E+01	
(1)										-----
1N758A5	1.60E-14	1.03E+00	8.90E+09	3.69E-10	9.00E-01	2.49E-07	1.00E-04	1.00E+01	2.10E+01	
(1)										-----
1N758A6	1.80E-14	1.05E+00	6.50E+09	3.37E-10	9.00E-01	2.38E-07	1.00E-04	1.00E+01	2.10E+01	
(1)										-----
1N816M	9.42E-12	1.30E+00	2.40E+11	4.00E-12	8.50E-01	1.00E-07	1.00E-04	2.60E+01	2.00E+01	
(1)					1.50E+00 (20)					-----
1N823	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	6.20E+00	7.90E-01	
(1)		7.90E-01 (24)			1.80E+00 (2)		1.80E+00 (20)			-----
1N903	7.60E-12	1.36E+00	1.20E+10	1.30E-12	8.00E-01	4.23E-08	1.00E-04	2.00E+01	2.10E+01	
(1)										-----

DEVICE NAME (TRAC FLAG)	IS K BULK FORWARD (REF)	MD SURGE Z REV IOUS (REF)	RDL SURGE Z REV IOUS (REF)	CDO K DAMAGE REV <50NS (REF)	VDBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPD K (REF)	VB K (REF)	SURGE Z K (REF)	(TRAC REF) K (REF)
IN908	5.20E-09	1.92E+00	8.90E+06	1.20E-12	8.00E-01	4.95E-08	1.00E-04	4.00E+01	2.10E+01	
(I)										
IN914	1.58E-09	1.68E+00	1.54E+09	1.20E-12	9.00E-01	1.59E-08	1.00E-04	1.00E+02	4.00E+01	
(I)		4.00E+01		5.05E-01 (70)	7.20E-02 (12)	1.91E+00 (67)	9.60E-02 (7)	8.50E-01 (20)		
IN9148	8.70E-10	1.61E+00	1.10E+06	2.40E-12	9.00E-01	1.33E-07	1.00E-04	7.50E+01	8.50E+01	
(I)										
IN91481	8.51E-09	2.02E+00	4.60E+08	1.14E-12	1.00E+00	3.28E-09	1.00E-04	7.50E+01	2.10E+01	
(I)										
IN91482	1.10E-08	2.09E+00	5.50E+08	1.28E-12	8.50E-01	3.41E-09	1.00E-04	7.50E+01	2.10E+01	
(I)										
IN91483	1.10E-08	2.05E+00	5.60E+08	9.60E-13	1.00E+00	3.57E-09	1.00E-04	7.50E+01	2.10E+01	
(I)										
IN91484	1.00E-08	2.03E+00	4.80E+08	1.18E-12	9.50E-01	3.64E-09	1.00E-04	7.50E+01	2.10E+01	
(I)										
IN91485	1.15E-08	2.04E+00	5.70E+08	1.23E-12	9.50E-01	2.63E-09	1.00E-04	7.50E+01	2.10E+01	
(I)										

DEVICE NAME (TRAC FLAG)	IS R BULK FORWARD (REF)	NO SURGE Z REV 1US (REF)	RDL SURGE Z REV 10US (REF)	CDO K DAMAGE REV <50NS (REF)	VDBI K DAMAGE REV >50NS (REF)	TD K DAMAGE FORWARD (REF)	IPPO K (REF)	VB K (REF)	SURGE Z K (REF)	(TRAC REF) K (REF)
1N9148	1.55E-08	2.06E+00	6.30E+08	1.19E-12	9.50E-01	2.87E-09	1.00E-04	7.50E+01	2.10E+01	-----
(1)										
1N963B	1.39E-13	1.12E+00	1.00E+18	3.29E-10	9.00E-01		1.00E-04	1.20E+01	1.03E+02	-----
(0)					6.17E+00 (13)	2.02E-03 (13)	1.00E+00 (17)			
1N965B	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	1.50E+01	2.10E+01	-----
(1)					7.59E+00 (13)		1.00E+00 (17)			
1N967B	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	1.80E+01	1.90E+00	-----
(1)					7.30E-01 (20)					
1N973B	1.39E-13	1.12E+00	1.00E+18	1.00E-18	9.00E-01	1.00E-07	1.00E-04	3.30E+01	2.10E+01	-----
(1)					4.27E+01 (13)		1.00E+00 (17)			
1N995	7.30E-07	1.43E+00	4.00E+06	5.66E-12	5.00E-01	2.53E-08	1.00E-04	1.50E+01	2.10E+01	-----
(1)										

END OF LISTING

TRANSISTOR DEVICE LIBRARY

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCU	VCBI	RCL	IES
(TRAC FLAG)	ME	CEU	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF)	E-B	1US (REF)	10US	1US (REF)	10US	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD		K		K		K		K	
	C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
CA3018 TD	1.53E+02	2.64E-01	1.29E-10	1.17E-08	4.07E-14	1.01E+00	2.95E-12	9.00E-01	1.00E+07	2.97E-15
(1)	9.68E-01	3.48E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	6.00E+00	9.25E+01	1.05E+02
	3.70E+00	8.90E+00	2.40E+02	2.50E+03	1.05E+02	1.83E+02	4.46E-06	1.98E-06	1.99E-02	8.86E-03
	(34)		(34)		(34)		(60)		(60)	
	1.70E-04	4.80E-05								
	(60)									
SME526517										
(0)										3.85E+01
	9.70E-01	1.57E+00	5.85E+02	1.21E+03	3.85E+02	6.70E+01	2.05E-01	1.20E-01	8.54E-02	4.40E-02
	(34)		(34)		(34)		(60)		(60)	
	5.00E-03	4.10E-04								
	(60)									
2NDUMMY	1.00E+02	1.00E+00	1.00E-09	1.00E-07	1.00E-11	1.00E+00	1.00E-11	7.50E-01	1.10E+08	1.00E-13
(1)	1.00E+00	5.00E-11	7.50E-01	1.00E+08	1.00E-03	1.00E-05	6.00E+01	5.00E+01	2.10E+01	2.10E+01
2N1016	9.52E+01	5.00E+00	2.08E-07	1.67E-06	8.76E-10	1.11E+00	1.50E-09	7.00E-01	1.00E+07	2.73E-10
(1)	1.02E+00	4.00E-10	1.00E+00	1.00E+07	1.00E-03	1.00E-05	1.00E+02	2.50E+01	2.10E+01	6.20E+00

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCB	VCBI	RCL	IES
(TRAC FLAG)	ME	CEO	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B	E-B	1US	10US	1US	10US	C-B	E-B	C-B	E-B
	(REF)		(REF)		(REF)		(REF)		(REF)	
	K FORWARD		K		K		K		K	
	C-B	E-B	C-B	E-B	C-B	E-B				
	(REF)		(REF)		(REF)		(REF)		(REF)	
2N1016B	2.87E+01	7.49E+00	2.03E-07	1.76E-06	8.22E-10	1.11E+00	1.75E-09	7.00E-01	1.00E+07	2.78E-10
(1)	1.02E+00	4.00E-10	1.00E+00	1.00E+07	1.00E-03	1.00E-05	1.00E+02	2.50E+01	2.10E+01	6.20E+00
2N1016E	1.60E+01	4.79E+00	3.29E-07	2.40E-06	1.87E-10	1.03E+00	1.85E-09	7.00E-01	1.00E+07	6.70E-11
(1)	9.72E-01	3.91E-10	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+01	2.50E+01	2.10E+01	6.20E+00
2N1037	9.00E+00	9.00E+00	5.31E-07	1.59E-06	1.00E-06	9.94E-01	9.19E-11	5.00E-01	1.00E+07	1.00E-06
(1)	9.94E-01	1.41E-10	5.00E-01	1.00E+07	1.00E-03	1.00E-05	5.00E+01	2.00E+01	2.10E+01	2.10E+01
2N1039	1.00E+01	5.00E+00	1.99E-05	1.59E-04	6.00E-09	9.94E-01	2.12E-10	5.00E-01	1.00E+07	6.00E-09
(1)	9.94E-01	1.41E-09	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	2.00E+01	2.10E+01	2.85E+02

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCO	VCBI	RCL	IES
(TRAC FLAG)	ME	CEO	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE C-B (REF) E-B		Z SURGE C-B IUS (REF) IOUS		Z SURGE E-B IUS (REF) IOUS		DAMAGE K (<50NS) C-B (REF) E-B		DAMAGE K (>50NS) C-B (REF) E-B	
	K FORWARD C-B (REF) E-B		K C-B (REF) E-B		K C-B (REF) E-B		K (REF)		K (REF)	
2N1042RA										
(C)									9.75E+01	1.42E+02
	1.60E-01	2.95E-01	5.92E+02	2.63E+02	2.55E+02	5.00E+02	3.11E-04	2.69E-04	1.39E+00	1.20E+00
	(34)		(34)		(34)		(60)		(60)	
	1.60E-01	1.40E-01								
	(60)									
2N1099	8.40E+00	2.20E+00	6.52E-07	1.03E-06	2.23E-14	1.30E+00	1.20E-09	6.00E-01	1.00E+07	6.60E-14
(I)	1.90E+00	1.50E-09	6.00E-01	1.00E+07	1.00E-03	1.00E-05	8.00E+01	4.00E+01	2.10E+01	1.39E+02
2N1132	5.60E+01		7.96E-09	3.18E-08	4.00E-12	1.39E+00	5.92E-11	9.36E-01	1.00E+07	3.96E-12
(O)	1.42E+00	4.06E-11	1.63E+00	1.00E+07	1.00E-03	1.00E-05	5.00E+01	5.00E+00	2.10E+01	4.30E+00
2N1184	6.80E+01	7.47E+00	7.69E-08	1.50E-07	1.13E-05	9.68E-01	2.40E-10	4.00E-01	1.00E+07	8.12E-06
(I)	8.23E-01	2.00E-10	4.00E-01	1.00E+07	1.00E-03	1.00E-05	4.50E+01	2.00E+01	1.40E+02	2.00E+02

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME / (TRAC FLAG)	HFEN / ME	HFEI / CED	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCD / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE C-B (REF)	E-B	Z SURGE C-B IUS (REF)	IOUS	Z SURGE E-B IUS (REF)	IOUS	DAMAGE K (<50NS) C-B (REF)	E-B	DAMAGE K (>50NS) C-B (REF)	E-B
	K FORWARD C-B (REF)	E-B	K C-B (REF)	E-B	K C-B (REF)	E-B	K (REF)		K (REF)	
2N1184 T	6.80E+01	7.47E+00	7.69E-08	1.50E-07	1.13E-05	9.68E-01	2.40E-10	4.00E-01	1.00E+07	8.12E-06
(1)	8.23E-01	2.00E-10	4.00E-01	1.00E+07	1.00E-03	1.00E-05	4.50E+01	2.00E+01	2.00E+02	1.40E+02
	2.00E-01	3.00E-01		1.40E+02		2.00E+02				
	(32)		(32)		(32)					
2N1225	3.00E+01	3.50E-01	9.62E-09	1.12E-07	5.40E-07	1.11E+00	3.10E-12	4.00E-01	1.00E+07	1.23E-07
(1)	1.05E+00	3.30E-12	5.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	5.00E-01	2.10E+01	2.10E+01
2N1289	2.00E+01	9.00E+00	3.98E-09	1.59E-08	6.00E-09	9.94E-01	1.41E-11	5.00E-01	1.00E+07	6.00E-09
(1)	9.94E-01	1.41E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+01	2.10E+01	2.10E+01
2N1301	1.50E+01	5.00E+00	4.55E-09	1.59E-08	1.02E-10	9.94E-01	1.70E-11	5.00E-01	1.00E+07	1.02E-10
(1)	9.94E-01	1.41E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+01	2.10E+01	2.10E+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCD	VCBI	RCL	IES
(TRAC FLAG)	ME	CED	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE C-B (REF) E-B		Z SURGE C-B 1US (REF) 10US		Z SURGE E-B 1US (REF) 10US		DAMAGE K (<50NS) C-B (REF) E-B		DAMAGE K (>50NS) C-B (REF) E-B	
	K FORWARD C-B (REF) E-B		K C-B (REF) E-B		K C-B (REF) E-B		K (REF)		K (REF)	
2N1304	7.00E+01	5.00E+00	1.99E-08	7.96E-08	3.50E-07	1.49E+00	2.53E-11	1.40E+00	1.00E+07	3.43E-07
(1)	1.51E+00	8.45E-12	1.40E+00	1.00E+07	1.00E-03	1.00E-05	2.50E+01	2.50E+01	2.10E+01	2.10E+01
2N1306	1.00E+02	5.00E+00	1.33E-08	7.96E-08	3.50E-07	1.49E+00	2.53E-11	1.40E+00	1.00E+07	3.43E-07
(1)	1.51E+00	8.45E-12	1.40E+00	1.00E+07	1.00E-03	1.00E-05	2.50E+01	2.50E+01	2.10E+01	2.10E+01
2N1307	1.00E+02	5.00E+00	1.33E-08	7.96E-08	3.50E-07	1.49E+00	2.53E-11	1.40E+00	1.00E+07	3.43E-07
(1)	1.51E+00	5.92E-12	1.40E+00	1.00E+07	1.00E-03	1.00E-05	3.00E+01	2.50E+01	2.10E+01	2.10E+01
2N1308	1.50E+02	5.00E+00	7.96E-09	7.96E-08	3.50E-07	1.49E+00	2.53E-11	1.40E+00	1.00E+07	3.43E-07
(1)	1.51E+00	8.45E-12	1.40E+00	1.00E+07	1.00E-03	1.00E-05	2.50E+01	2.50E+01	2.10E+01	6.20E+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCO	VCBI	RCL	IES
(TRAC FLAG)	ME	CEO	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF) E-B		1US (REF) 10US		1US (REF) 10US		C-B (REF) E-B		C-B (REF) E-B	
	K FORWARD		K		K		K		K	
	C-B (REF) E-B		C-B (REF) E-B		C-B (REF) E-B		(REF)		(REF)	
2N1342	4.31E+01	5.00E-01	1.56E-09	3.33E-07	1.68E-13	1.05E+00	1.70E-11	8.00E-01	1.00E+07	2.05E-14
(1)	9.92E-01	3.70E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+02	5.00E+00	2.10E+01	2.10E+01
2N1401G	1.00E+02	5.00E+01	1.99E-05	1.59E-04	6.00E-09	9.94E-01	2.12E-10	5.00E-01	1.00E+07	6.00E-09
(1)	9.94E-01	1.41E-09	5.00E-01	1.00E+07	1.00E-03	1.00E-04	6.00E-03	2.00E+01	2.10E+01	2.85E+02
2N1483	1.00E+01	9.00E+00	1.27E-07	1.59E-06	6.98E-15	9.94E-01	2.47E-10	5.00E-01	1.00E+07	6.98E-15
(1)	9.94E-01	2.47E-10	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	1.20E+01	2.10E+01	2.10E+01
2N1485	7.96E+01	3.69E+00	5.92E-08	3.70E-07	4.57E-12	9.68E-01	7.80E-10	8.00E-01	1.00E+07	1.62E-11
(1)	1.05E+00	2.30E-10	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	1.20E+01	7.75E+00	1.90E+00
	5.75E-01 (62) 4.05E-01		6.90E+01 (34)	6.90E+01	5.00E-01 (67)	3.30E-01	2.48E-04 (60)	2.05E-03	1.11E+00 (60)	9.18E+00
	4.50E-02 (60)			4.10E+00 (17)						

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME / (TRAC FLAG)	HFEN / ME	HFEI / CED	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCO / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF) E-B		1US (REF) 10US		1US (REF) 10US		C-B (REF) E-B		C-B (REF) E-B	
	K FORWARD		K		K		K		K	
	C-B (REF) E-B		C-B (REF) E-B		C-B (REF) E-B		(REF)		(REF)	
2N1486	7.96E+01	3.69E+00	5.92E-08	3.70E-07	4.57E-12	9.68E-01	7.80E-10	8.00E-01	1.00E+07	1.62E-11
(1)	1.05E+00	2.30E-10	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	1.20E+01	2.10E+01	2.10E+01
2N1490										
(0)										1.65E+00
	3.00E-02	3.00E-02	2.15E+00	1.60E+01	1.65E+00	1.65E+00	4.74E-04	8.49E-04	2.12E+00	3.80E+00
	(34)		(34)		(34)		(60)		(60)	
2N1499	2.00E+01	2.00E+00	7.96E-09	1.59E-08	1.00E-06	1.37E+00	4.24E-12	5.00E-01	1.00E+07	1.00E-06
(1)	1.37E+00	7.07E-12	5.00E-01	1.00E+07	1.00E-03	1.00E-05	2.00E+01	2.00E+00	2.10E+01	2.10E+01
2N1506	2.86E+01	3.50E-01	8.12E-10	3.34E-07	1.17E-13	1.01E+00	4.60E-11	8.00E-01	1.00E+07	3.82E-14
(1)	1.01E+00	1.55E-10	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	4.00E+00	2.10E+01	2.10E+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME / (TRAC FLAG)	HFEN / ME	HFEI / CEQ	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCQ / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF)	E-B	1US (REF)	10US	1US (REF)	10US	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD		K		K		K		K	
	C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
2N158	2.86E+01	3.00E-01	8.12E-10	3.34E-07	1.17E-13	1.01E+00	4.60E-11	8.00E-01	1.00E+07	3.82E-14
(1)	1.01E+00	1.55E-10	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	3.00E+01	2.10E+01	2.10E+01
2N1613	8.00E+01	5.00E+00	1.77E-08	7.96E-09	4.00E-11	1.19E+00	2.59E-11	1.68E+00	1.00E+07	3.88E-11
(1)	1.21E+00	5.44E-11	7.13E-01	1.00E+07	1.00E-03	1.00E-05	7.50E+01	7.00E+00	6.05E+01	7.55E+00
	5.50E-01 (34)	6.75E-01	6.05E+01 (34)	6.05E+01	7.55E+00 (34)	7.55E+00	3.40E-04 (60)	6.30E-05	1.52E+00 (60)	2.82E-01
	1.70E-02 (60)	2.90E-03		2.70E-01 (17)		1.00E+00				
2N1709	2.50E+01	2.50E-01	1.54E-09	1.10E-06	3.15E-12	1.11E+00	1.02E-10	8.00E-01	1.00E+07	2.08E-13
(1)	1.05E+00	4.20E-10	1.00E+00	1.00E+07	1.00E-03	1.00E-05	7.50E+01	4.00E+00	2.10E+01	2.10E+01
2N1711	1.35E+02		2.27E-09	7.96E-09	1.00E-08	2.49E+00	3.54E-11	5.00E-01	1.00E+07	5.00E-09
(0)	2.67E+00	1.13E-10	5.00E-01	1.00E+07	1.00E-03	1.00E-05	7.50E+01	7.00E+00	2.10E+01	4.30E+00

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCO	VCBI	RCL	IES
(TRAC FLAG)	ME	CEO	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B	E-B	IUS	IOUS	IUS	IOUS	C-B	E-B	C-B	E-B
	(REF)		(REF)		(REF)		(REF)		(REF)	
	K FORWARD		K		K		K		K	
	C-B	E-B	C-B	E-B	C-B	E-B				
	(REF)		(REF)		(REF)		(REF)		(REF)	
2N1717	8.00E+01	2.30E+00	6.84E-09	1.37E-07	3.60E-12	1.11E+00	5.81E-11	8.00E-01	1.00E+07	3.20E-13
(1)	1.00E+00	1.96E-10	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+01	6.00E+00	2.10E+01	2.10E+01
2N1722	3.30E+01	4.90E-01	1.22E-07	1.64E-06	9.12E-11	1.14E+00	1.75E-09	1.00E+00	1.00E+07	6.18E-10
(1)	1.08E+00	5.50E-09	1.00E+00	1.00E+07	1.00E-03	1.00E-05	1.75E+02	1.00E+01	2.10E+01	1.60E+00
2N174	5.50E+01	5.00E+00	1.59E-06	1.59E-05	1.00E-04	1.19E+00	1.10E-09	1.00E+00	1.00E+07	9.89E-05
(1)	1.21E+00	1.00E-09	1.00E+00	1.00E+07	1.00E-03	1.00E-05	8.00E+01	6.00E+01	2.10E+00	2.10E+01
2N1893	3.70E+01	9.00E-02	1.95E-09	4.14E-07	3.03E-13	9.68E-01	7.80E-13	9.00E-01	1.00E+07	7.29E-14
(1)	9.92E-01	3.20E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.20E+02	7.00E+00	2.10E+01	1.00E+01

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	NC	CCD	VCBI	RCL	IES
(TRAC FLAG)	ME	CEL	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF)	E-B	1US (REF)	100S	1US (REF)	100S	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD		K		K		K		K	
	C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
2N1900	1.36E+02	1.37E+00	1.69E-09	1.08E-06	2.32E-11	1.02E+00	1.80E-09	7.00E-01	1.00E+07	1.60E-11
(1)	1.02E+00	7.00E-09	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.40E+02	5.00E+00	2.10E+01	2.10E+01
2N2048	2.50E+01	9.00E+00	6.12E-10	1.59E-08	4.00E-09	9.94E-01	2.12E-12	5.00E-01	1.00E+07	4.00E-09
(1)	9.94E-01	7.07E-12	5.00E-01	1.00E+07	1.00E-03	1.00E-05	2.00E+01	2.00E+00	2.10E+01	2.10E+01
2N2060	1.00E+00	2.00E-01	8.00E-10	6.17E-07	1.20E-13	1.08E+00	3.48E-11	9.00E-01	1.00E+07	2.60E-13
(1)	1.01E+00	6.60E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	7.00E+00	2.10E+01	2.10E+01
2N2087	2.00E+01	9.00E+00	1.06E-09	3.18E-09	1.62E-12	9.94E-01	1.70E-11	5.00E-01	1.00E+07	4.86E-14
(1)	9.94E-01	9.90E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	1.20E+02	5.00E+00	2.10E+01	2.10E+01

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCB	VCBI	RCL	IES
(TRAC FLAG)	ME	CED	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF)	E-B	IUS (REF)	IOUS	IUS (REF)	IOUS	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD		K		K		K		K	
	C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
2N2102	4.83E+01	3.20E-01	2.84E-10	4.84E-07	1.16E-12	1.04E+00	1.03E+00	8.00E-01	1.00E+07	2.85E-13
(1)	1.04E+00	4.40E-10	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.20E+02	7.00E+00	2.10E+01	2.10E+01
2N2187	3.30E+01	6.10E-01	1.94E-09	6.83E-09	5.67E-13	1.07E+00	7.80E-12	7.00E-01	1.00E+07	5.67E-14
(1)	9.35E-01	5.40E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	3.00E+01	3.00E+01	2.10E+01	2.10E+01
2N2193	8.00E+01		1.77E-09	3.18E-08	1.00E-05	1.82E+00	2.26E-12	5.00E-01	1.00E+07	1.00E-05
(1)	1.82E+00	1.41E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	2.00E+00	2.10E+01	2.10E+01
2N2192	1.95E+02	7.00E+00	8.16E-10	1.05E-07	9.49E-13	1.02E+00	2.10E-11	8.00E-01	1.00E+07	1.31E-13
(1)	9.21E-01	3.90E-11	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01

DEVICE NAME (TRAC FLAG)	HFEN ME BULK RESISTANCE C-B (REF)	HFEI CED E-B	TN VEBI Z SURGE C-B 1US (REF)	TI REL 10US	ICS IPPC Z SURGE E-B 1US (REF)	MC IPPE 10US	CCD C-BBDV DAMAGE K (<50NS) C-B (REF)	VCBI E-BBDV E-B	RCL SURGE ZC DAMAGE K (>50NS) C-B (REF)	IES SURGE ZE E-B
	K FORWARD C-B (REF)	E-B	K C-B (REF)	E-B	K C-B (REF)	E-B	K (REF)		K (REF)	
2N2219	1.50E+02	2.01E+00	4.84E-10	1.11E-07	4.85E-14	9.92E-01	1.82E-11	1.00E+00	1.00E+07	5.66E-14
(1)	1.01E+00	2.53E-11	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01
2N2219A	1.36E+02	2.30E+00	5.49E-12	2.74E-07	3.70E-14	1.01E+00	1.37E-11	9.00E-01	1.00E+07	9.30E-15
(1)	9.64E-01	2.32E-11	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01
2N2222	1.36E+02	2.30E+00	5.49E-12	2.74E-07	3.70E-14	1.01E+00	1.37E-11	9.00E-01	1.00E+07	9.30E-15
(1)	9.64E-01	2.32E-11	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+01	2.10E+01	7.20E+00
2N2223	7.48E+01	2.00E-01	1.58E-09	6.17E-07	1.78E-12	1.08E+00	3.30E-11	9.00E-01	1.00E+07	1.08E-13
(1)	1.01E+00	5.90E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	7.00E+00	2.10E+01	2.10E+01

DEVICE NAME / (TRAC FLAG)	HFEN / HE	HFEI / CEO	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCO / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF)	E-B	IUS (REF)	IOUS	IUS (REF)	IOUS	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD		K		K		K		K	
	C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
2N2243	8.99E+01	3.14E+00	9.59E-10	2.65E-07	7.53E-14	9.77E-01	3.00E-11	8.00E-01	1.00E+07	5.63E-14
(1)	9.77E-01	6.70E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.20E+02	7.00E+00	2.10E+01	2.10E+01
2N2270	1.00E+01	9.00E+00	1.27E-07	1.59E-06	6.98E-15	9.94E-01	2.47E-10	5.00E-01	1.00E+07	6.98E-15
(1)	9.94E-01	2.47E-10	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	7.00E+00	2.10E+01	2.10E+01
2N2368	4.25E+01	1.00E+00	2.93E-10	2.25E-08	4.00E-12	1.20E+00	8.20E-12	1.00E+00	1.00E+07	5.11E-15
(1)	9.77E-01	4.90E-12	1.00E+00	1.00E+07	1.00E-03	1.00E-05	4.00E+01	4.50E+00	2.10E+01	2.10E+01
2N2369	4.50E+01		3.18E-10	3.18E-09	2.26E-10	1.65E+00	2.63E-12	1.10E+00	1.00E+07	4.99E-15
(0)	1.04E+00	2.58E-12	1.06E+00	1.00E+07	1.00E-03	1.00E-05	4.00E+01	4.50E+00	2.10E+01	2.10E+01

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCD	VCBI	RCL	IES
(TRAC FLAG)	ME	CED	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF)	E-B	1US (REF)	10US	1US (REF)	10US	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD		K		K		K		K	
	C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
2N2411	2.86E+01	4.10E-01	6.76E-10	5.24E-08	1.75E-15	9.82E-01	5.30E-12	8.00E-01	1.00E+07	6.06E-16
(1)	9.82E-01	5.60E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	5.00E+00	2.10E+01	2.10E+01
2N2461	5.78E+01	2.00E-02	4.03E-10	3.36E-09	1.86E-12	1.05E+00	4.00E-12	8.00E-01	1.00E+07	8.95E-15
(1)	9.44E-01	5.50E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	5.00E+00	2.10E+01	2.10E+01
2N2538	1.15E+02	1.50E+00	3.47E-10	2.40E-07	6.00E-13	1.08E+00	6.90E-12	8.00E-01	1.00E+07	1.20E-14
(1)	9.44E-01	1.90E-11	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01
2N2656	9.52E+01	1.00E+00	3.96E-10	3.30E-07	3.00E-14	1.02E+00	5.80E-12	8.00E-01	1.00E+07	4.85E-15
(1)	9.68E-01	4.30E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	5.00E+00	2.10E+01	2.10E+01

DEVICE NAME / (TRAC FLAG)	HFEN MF BULK RESISTANCE C-B (REF) K FORWARD C-B (REF)	HFEI CEQ E-B E-B	TN VEBI Z SURGE C-B IUS (REF) K C-B (REF)	TI REL IOUS E-B	ICS IPPC Z SURGE E-B IUS (REF) K C-B (REF)	MC IPPE IOUS E-B	CCD C-BBDV DAMAGE K (<50NS) C-B (REF)	VCBI E-BBDV E-B	RCL SURGE ZC DAMAGE K (>50NS) C-B (REF)	IES SURGE ZE E-B
2N2695	6.15E+01	8.00E+00	9.05E-10	5.51E-08	3.60E-14	1.02E+00	1.90E-11	9.00E+01	1.00E+07	1.32E-14
(1)	9.92E-01	4.50E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	4.00E+00	2.10E+01	2.10E+01
2N2708	5.00E+01	8.50E-01	1.57E-10	2.66E-08	1.31E-14	1.14E+00	1.50E-12	9.00E-01	1.00E+07	1.60E-16
(1)	9.92E-01	1.20E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	3.50E+01	3.00E+00	2.10E+01	2.10E+01
2N2784	8.10E+01	1.70E-01	1.59E-10	2.99E-08	3.64E-10	1.65E+00	1.47E-12	1.00E+00	1.00E+07	7.94E-15
(1)	1.10E+00	1.24E-12	1.00E+00	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.00E+00	2.10E+01	2.10E+01
2N2501	9.52E+01	7.80E-01	3.86E-10	4.82E-09	1.78E-13	9.92E-01	4.90E-11	8.00E-01	1.00E+07	3.33E-14
(1)	9.92E-01	6.50E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	5.00E+01	5.00E+00	2.10E+01	3.00E+00

DEVICE NAME / (TRAC FLAG)	HFEN / ME	HFEI / CEO	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCO / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE C-B (REF)	BULK RESISTANCE E-B	Z SURGE C-B 1US (REF)	Z SURGE C-B 10US	Z SURGE E-B 1US (REF)	Z SURGE E-B 10US	DAMAGE K (<50NS) C-B (REF)	DAMAGE K (<50NS) E-B	DAMAGE K (>50NS) C-B (REF)	DAMAGE K (>50NS) E-B
	K FORWARD C-B (REF)	K FORWARD E-B	K C-B (REF)	K E-B	K C-B (REF)	K E-B	K (REF)		K (REF)	
2N2808	2.28E+01	1.30E+00	1.34E-10	2.49E-08	9.02E-15	1.11E+00	1.30E-12	1.00E+00	1.00E+07	4.17E-17
(1)	9.44E-01	9.00E-13	1.00E+00	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+01	2.10E+01	2.10E+01
2N2845	5.00E+01	1.50E-01	5.88E-10	1.56E-08	2.45E-11	1.33E+00	9.00E-12	9.00E-01	1.00E+07	2.35E-14
(1)	9.92E-01	4.60E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01
2N2857G	2.15E+00	2.44E+00	1.21E-09	1.24E-07	1.11E-13	1.02E+00	6.88E-11	8.00E-01	1.00E+07	8.00E-15
(1)	1.01E+00	1.36E-10	8.00E-01	1.00E+07	1.00E-03	1.00E-05	3.00E+01	2.50E+00	6.50E+01	1.60E+01
2N2857NET	6.46E+01	5.30E-01	2.64E-10	3.60E-12	5.03E-15	1.08E+00	1.22E-12	2.00E+00	1.00E+07	2.05E-15
(1)	1.07E+00	1.00E-12	2.00E+00	1.00E+07	1.00E-03	1.00E-05	3.00E+01	2.50E+00	6.50E+01	1.65E+01
	2.40E+00 (33)	2.30E+00	6.70E+02 (33)	5.70E+02	1.65E+01 (33)	5.50E+01	5.24E-06 (60)	5.38E-07	2.34E-02 (60)	2.41E-03
	2.90E-05 (60)	1.30E-05								

DEVICE NAME / (TRAC FLAG)	HFEN / ME	HFEI / CED	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCD / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<SONS)		DAMAGE K (>SONS)	
	C-B (REF)	E-E	1US (REF)	10US	1US (REF)	10US	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD		K		K		K		K	
	C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
2N2887	4.83E+01	3.20E-01	2.84E-10	4.84E-07	1.16E-12	1.04E+00	1.03E-10	8.00E-01	1.00E+07	2.85E-13
(1)	1.04E+00	4.40E-10	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	4.00E+05	2.10E+01	2.10E+01
2N2894	7.00E+01		5.31E-10	3.18E-09	2.11E-12	1.49E+00	3.89E-12	1.01E+00	1.00E+07	9.40E-13
(0)	1.50E-02	3.44E-12	1.08E+00	1.00E+07	1.00E-03	1.00E-05	1.20E+01	4.00E+00	4.60E+00	1.60E+00
	1.95E+00 (34)	2.30E+00	4.60E+01 (34)	9.35E+02	1.30E+01 (34)	1.78E+01	7.78E-06 (60)	3.82E-06	3.48E-02 (60)	1.71E-02
	2.30E-05 (60)	2.10E-05								
2N2905	1.33E+02	1.40E+00	4.78E-08	4.64E-08	4.42E-14	1.01E+00	1.45E-11	8.00E-01	1.00E+07	9.82E-15
(1)	9.60E-01	1.80E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01
2N2907	2.16E+02	4.20E+00	4.98E-10	3.55E-08	1.48E-13	1.43E+00	2.60E-11	1.00E+00	1.00E+07	2.21E-14
(1)	9.68E-01	2.10E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	5.00E+00

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCD	VCBI	RCL	IES
(TRAC FLAG)	ME	CEQ	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF)	E-B	1US (REF)	10US	1US (REF)	10US	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD		K		K		K		K	
	C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
2N297 T	1.00E+01	5.00E+00	3.70E-07	1.59E-06	5.00E-09	9.94E-01	1.41E-10	5.00E-01	1.00E+07	5.00E-09
(1)	9.94E-01	1.41E-10	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	4.00E+01	7.30E+01	7.30E+01
2N2696	2.86E+01	4.10E-01	6.76E-10	5.24E-08	1.75E-15	9.82E-01	5.30E-12	8.00E-01	1.00E+07	6.06E-16
(1)	9.62E-01	5.60E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	3.00E+00	2.10E+01	2.10E+01
2N3013	6.30E+01	2.50E-01	1.97E-10	7.60E-09	1.60E-12	1.25E+00	3.48E-12	9.00E-01	1.00E+07	4.27E-15
(1)	9.92E-01	8.01E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	5.00E+00	1.51E+01	9.50E+00
	1.45E+00	1.65E+00	3.85E+02	7.50E+02	9.50E+00	9.50E+00	3.82E-06	5.80E-06	1.71E-02	2.59E-02
	(34)		(34)		(34)		(60)		(60)	
	5.80E-05	8.40E-05								
	(60)									
2N3017	8.03E+01	4.59E+00	1.28E-09	8.97E-06	8.64E-13	9.92E-01	1.70E-10	9.00E-01	1.00E+07	8.00E-13
(1)	1.02E+00	4.80E-10	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	4.00E+00	2.10E+01	2.10E+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME (TRAC FLAG)	HFEN	HFEI	TN	TI	ICS	MC	CCD	VCBI	RCL	IES
	ME	CEO	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B	E-B	10S	100S	10S	100S	C-B	E-B	C-B	E-B
	(REF)		(REF)		(REF)		(REF)		(REF)	
	K FORWARD		K		K		K		K	
	C-B	E-B	C-B	E-B	C-B	E-B				
	(REF)		(REF)		(REF)		(REF)		(REF)	
2N3053	1.00E+01	9.00E+00	1.27E-07	1.59E-06	6.98E-15	9.94E-01	2.47E-10	5.00E-01	1.00E+07	6.98E-15
(1)	9.94E-01	2.47E-10	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01
2N3055	1.08E+02	6.00E-01	5.94E-10	2.25E-07	6.93E-13	1.05E+00	2.40E-11	1.00E+00	1.00E+07	5.35E-14
(1)	9.92E-01	1.60E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	1.00E+02	7.00E+00	2.10E+01	2.10E+01
2N3114	3.03E+01	4.59E+00	1.25E-10	1.36E-08	1.20E-12	1.08E+00	1.40E-11	7.00E-01	1.00E+07	8.18E-14
(1)	9.92E-01	2.20E-11	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	4.00E+00	2.10E+01	2.10E+01
2N315	1.00E+01	5.00E+00	3.11E-09	1.59E-07	4.00E-09	9.94E-01	1.98E-11	5.00E-01	1.00E+07	4.00E-09
(1)	9.94E-01	1.41E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	2.00E+01	2.00E+01	2.10E+01	2.10E+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME / (TRAC FLAG)	HFEN / ME	HFEI / CEO	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCO / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<SONS)		DAMAGE K (>SONS)	
	C-B (REF)	E-B	IUS (REF)	IOUS	IUS (REF)	IOUS	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD		K		K		K		K	
	C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
2N3244	1.15E+02	2.10E+00	4.96E-10	5.01E-08	1.02E-13	9.92E-01	4.30E-11	8.00E-01	1.00E+07	1.71E-13
(1)	1.02E+00	5.50E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	4.00E+01	5.00E+00	2.10E+01	2.10E+01
2N3251	1.66E+02	6.80E-01	2.59E-10	4.86E-08	1.19E-13	1.08E+00	6.50E-12	9.00E-01	1.00E+07	4.02E-15
(1)	9.68E-01	4.80E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	5.00E+01	5.00E+00	2.10E+01	2.10E+01
2N3252	6.23E+01	8.00E-02	4.94E-10	3.70E-09	2.84E-12	1.05E+00	1.40E-11	8.00E-01	1.00E+07	5.16E-14
(1)	9.68E-01	5.50E-11	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01
2N328A	1.00E+01	5.00E+00	1.99E-05	1.59E-04	6.00E-09	9.94E-01	2.12E-10	5.00E-01	1.00E+07	6.00E-09
(1)	9.94E-01	1.41E-09	5.00E-01	1.00E+07	1.00E-03	1.00E-05	5.00E+01	2.00E+01	2.10E+01	1.60E+01

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCO	VCBI	RCL	IES
(TRAC FLAG)	NE	CEO	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF)	E-B	1US (REF)	10US	1US (REF)	10US	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD		K		K		K		K	
	C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
2N3283	1.25E+01	2.60E-01	2.88E-10	2.27E-08	2.00E-08	1.61E+00	1.30E-12	5.00E-01	1.00E+07	4.60E-09
(1)	9.68E-01	6.20E-12	5.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	5.00E-01	2.10E+01	2.10E+01
2N3287	2.40E+01	1.38E+00	6.63E-10	9.93E-07	5.35E-14	1.14E+00	1.80E-12	1.00E+00	1.00E+07	9.48E-16
(1)	9.68E-01	1.90E-12	1.00E+00	1.00E+07	1.00E-03	1.00E-05	4.00E+01	3.00E+00	2.10E+01	2.10E+01
2N329A	4.90E+01	4.10E-01	8.62E-08	4.07E-06	1.90E-12	1.33E+00	9.60E-11	8.00E-01	1.00E+07	2.14E-14
(1)	9.92E-01	2.80E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	5.00E+01	2.00E+01	2.10E+01	2.10E+01
2N3309	3.30E+01	1.60E+00	3.98E-10	8.36E-09	6.53E-14	1.05E+00	1.60E-11	1.00E+00	1.00E+07	8.55E-15
(1)	9.68E-01	2.40E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	5.00E+01	3.00E+00	2.10E+01	2.10E+01

DEVICE NAME (T+AC FLAG)	HFEN / ME / BULK RESISTANCE C-B (REF) / K FORWARD C-B (REF)	HFEI / CEC / BULK RESISTANCE E-B (REF) / K FORWARD E-B (REF)	TN / VEBI / Z SURGE C-B IUS / K C-B (REF)	TI / REL / IOUS / K E-B (REF)	ICS / IPPC / Z SURGE E-B IUS / K C-B (REF)	MC / IPPE / IOUS / K E-B (REF)	CCD / C-BBDV / DAMAGE K C-B	VCBI / E-BBDV / K (<50NS) E-B (REF)	RCL / SURGE ZC / DAMAGE K (>50NS) C-B (REF)	IES / SURGE ZE / K E-B (REF)
2N335	7.71E+01	1.11E+00	2.54E-09	2.42E-07	1.60E-11	1.37E+00	1.00E-11	8.00E-01	1.00E+07	2.92E-12
(1)	1.05E+00	5.70E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	4.50E+01	1.00E+00	2.10E+01	1.30E+01
2N336	7.71E+01	1.11E+00	5.13E-09	2.42E-07	1.60E-11	1.37E+00	1.00E-11	8.00E-01	1.00E+07	6.40E-09
(1)	2.13E+00	5.70E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	4.50E+01	1.00E+00	2.10E+01	1.00E+01
2N336A	7.71E+01	1.11E+00	2.54E-09	2.42E-07	1.60E-11	1.37E+00	1.00E-11	8.00E-01	1.00E+07	2.92E-12
(1)	1.05E+00	5.70E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+01	2.10E+01	2.10E+01
2N336Y	7.71E+01	1.11E+00	5.13E-09	2.42E-07	1.60E-11	1.37E+00	1.00E-11	8.00E-01	1.00E+07	6.40E-09
(1)	2.13E+00	5.70E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+01	2.10E+01	2.10E+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME / (TRAC FLAG)	HFEN / ME	HFEI / CEO	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCO / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE C-B (REF)	E-B	Z SURGE C-B IUS (REF)	IOUS	Z SURGE E-B IUS (REF)	IOUS	DAMAGE K (<50NS) C-B (REF)	E-B	DAMAGE K (>50NS) C-B (REF)	E-B
	K FORWARD (-a (REF)	E-B	K C-B (REF)	E-B	K C-B (REF)	E-B	K (REF)		K (REF)	
2N3375 T	5.00E+01	5.00E+00	1.77E-08	7.96E-09	4.00E-11	1.19E+00	2.59E-11	1.68E+00	1.00E+07	3.88E-11
(1)	1.21E+00	5.64E-11	7.13E-01	1.00E+07	1.00E-03	1.00E-05	6.50E+01	4.00E+00	3.70E+03	9.60E-01
	3.05E-01	4.50E-01	3.70E+01	7.90E+01	6.00E-01	6.00E-01	1.56E-04	1.13E-04	6.97E-01	5.06E-01
	(33)		(33)		(33)		(60)		(60)	
	4.10E-03	1.30E-03								
	(60)									
2N3439										
(C)									4.75E+03	1.85E+00
	2.50E-01	2.95E-01	1.90E+04	8.50E+04	1.85E+00	1.85E+00	5.38E-06	1.27E-04	2.41E-02	5.70E-01
	(34)		(34)		(34)		(60)		(60)	
	3.70E-02	1.30E-02								
	(60)									
2N3440	5.00E+01		1.77E-09	3.18E-06	1.00E-05	1.82E+00	2.26E-12	5.00E-01	1.00E+07	1.00E-05
(C)	1.82E+00	1.41E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	3.00E+02	7.00E+00	2.10E+01	2.10E+01
2N3466	2.60E+02	1.47E+00	1.79E-10	4.34E-08	5.04E-13	1.08E+00	1.48E-11	9.00E-01	1.00E+07	7.83E-15
(1)	9.44E-01	1.90E-11	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01

DEVICE NAME (TRAC FLAG)	HFEN ME	HFEI CEO	TN VEBI	TI REL	ICS IPPC	MC IPPE	CCC C-BBDV	VCBI E-BBDV	RCL SURGE ZC	ZES SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF)	E-B	1US (REF)	10US	1US (REF)	10US	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD		K		K		K		K	
	C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
2N3499	1.08E+02	6.00E-01	5.94E-10	2.25E-07	6.93E-13	1.05E+00	2.40E-11	1.00E+00	1.00E+07	5.35E-14
(1)	9.92E-01	1.60E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	1.00E+02	6.00E+00	2.10E+01	2.10E+01
2N3509	1.53E+02	2.64E-01	1.29E-10	1.17E-08	4.07E-14	1.01E+00	2.95E-12	9.00E-01	1.00E+07	2.97E-15
(1)	9.68E-01	3.48E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	6.00E+00	2.10E+01	2.10E+01
2N3553	3.41E+01	5.34E+00	2.65E-09	3.87E-08	1.97E-14	1.04E+00	2.94E-11	8.00E-01	1.00E+07	1.36E-13
(1)	1.01E+00	1.04E-10	8.00E-01	1.00E+07	1.00E-03	1.00E-05	6.50E+01	4.00E+00	2.10E+01	2.10E+01
2N356	1.50E+01	5.00E+00	5.31E-08	1.99E-07	4.00E-09	9.94E-01	1.98E-11	5.00E-01	1.00E+07	4.00E-09
(1)	9.94E-01	1.41E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	2.00E+01	2.00E+01	2.10E+01	2.10E+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME / (TRAC FLAG)	HFEN / MF	HFEI / CEO	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCO / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE C-B (REF) K FOR WARD C-B (REF)	E-B	Z SURGE C-B 1US (REF) K C-B (REF)	10US E-B	Z SURGE E-B 1US (REF) K C-B (REF)	10US E-B	DAMAGE K (<50NS) C-B (REF) K	E-B	DAMAGE K (>50NS) C-B (REF) K	E-B
2N3584										
(0)									2.15E+03	1.30E+00
	8.00E-02	2.60E-01	2.15E+03	2.15E+03	1.30E+00	4.15E+00			3.60E-01	2.30E+00
	(34)		(34)		(34)				(60)	
	1.50E-02	3.20E-02								
	(60)									
2N3632	1.51E+01	2.54E+00	1.97E-09	9.83E-08	5.38E-13	1.10E+00	6.93E-11	8.00E-01	1.00E+07	7.67E-15
(1)	1.02E+00	1.21E-10	8.00E-01	1.00E+07	1.00E-03	1.00E-05	6.50E+01	4.00E+00	2.10E+01	2.10E+01
2N3633	2.49E+02	1.00E-01	5.58E-11	1.28E-10	7.40E-14	1.08E+00	2.40E-12	1.00E+00	1.00E+07	8.30E-15
(1)	9.68E-01	1.60E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.00E+00	2.10E+01	2.10E+01
2N3723A	1.60E+01	8.05E-01	9.44E+02	4.02E+03	1.12E-11	1.16E+01	2.24E-11	7.30E-01	1.00E+07	1.70E-13
(1)	3.86E-02	7.39E-11	7.50E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	6.00E+00	2.10E+01	2.10E+01

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCO	VCBI	RCL	IES
(TRAC FLAG)	ME	CEO	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF) E-B		1US (REF) 10US		1US (REF) 10US		C-B (REF) E-B		C-B (REF) E-B	
	K FORWARD		K		K		K		K	
	C-B (REF) E-B		C-B (REF) E-B		C-B (REF) E-B		(REF)		(REF)	
2N3723B	1.30E+01	5.00E-02	4.18E-09	3.14E-09	1.01E-10	1.17E+00	1.30E-11	1.00E+00	1.00E+07	1.40E-12
(1)	1.07E+00	6.48E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	6.00E+00	2.10E+01	2.10E+01
2N3723C	1.73E+01	1.07E+00	3.12E-09	3.77E-08	6.96E-12	1.19E+00	1.34E-11	8.00E-01	1.00E+07	5.08E-13
(1)	1.06E+00	7.60E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	6.00E+00	2.10E+01	2.10E+01
2N3723D	1.13E+01	7.61E-01	3.03E-09	3.46E-08	4.17E-14	1.07E+00	7.76E-12	7.80E-01	1.00E+07	4.68E-15
(1)	1.01E+00	1.65E-11	8.50E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	6.00E+00	2.10E+01	2.10E+01
2N3723E	1.08E+01	7.17E-01	5.13E-09	3.17E-08	1.10E-10	1.19E+00	9.84E-12	8.00E-01	1.00E+07	2.51E-12
(1)	1.12E+00	6.26E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	6.00E+00	2.10E+01	2.10E+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME (TRAC FLAG)	HFEN NE BULK RESISTANCE C-B (REF) / E-B K FORWARD C-B (REF) / E-B	HFEI CED	TN VEBI Z SURGE C-B 1US (REF) / 10US K C-B (REF) / E-B	TI REL	ICS IPPC Z SURGE E-B 1US (REF) / 10US K C-B (REF) / E-B	MC IPPE	CCO C-BBDV DAMAGE K (<50NS) C-B (REF) / E-B	VCBI E-BBDV	RCL SURGE ZC DAMAGE K (>50NS) C-B (REF) / E-B	IES SURGE ZE
2N3723F	1.34E+01	7.78E-01	3.24E-09	2.81E-08	5.71E-12	1.14E+00	9.62E-12	8.00E-01	1.00E+07	3.22E-13
(1)	1.01E+00	6.04E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	6.00E+00	2.10E+01	2.10E+01
2N3828	2.40E+01	2.10E+00	2.88E-08	4.06E-08	1.40E-13	1.02E+00	6.80E-12	7.50E-01	1.00E+07	3.10E-14
(1)	1.02E+00	1.80E-11	8.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	3.00E+00	2.10E+01	2.10E+01
2N3866	1.00E+00	1.00E-01	8.10E-10	1.61E-08	1.39E-13	9.80E-01	5.70E-11	8.00E-01	1.00E+07	1.26E-13
(1)	1.05E+00	1.03E-10	8.50E-01	1.00E+07	1.00E-03	1.00E-05	5.50E+01	3.50E+00	2.10E+01	2.10E+01
2N3866A	8.50E+00	2.30E+00	8.86E-10	4.74E-08	1.02E-14	1.06E+00	7.56E-12	8.20E-01	1.00E+07	5.59E-15
(1)	1.04E+00	1.42E-11	8.60E-01	1.00E+07	1.00E-03	1.00E-05	5.50E+01	3.50E+00	2.10E+01	2.10E+01

DEVICE NAME (TRAC FLAG)	HFEN ME BULK RESISTANCE C-B (REF) K FORWARD C-B (REF)	HFEI CEO E-B E-B	TN VEBI Z SURGE C-B 1US (REF) K C-B (REF)	TI REL 10US E-B	ICS IPPC Z SURGE E-B 1US (REF) K C-B (REF)	MC IPPE 10US E-B	CCD C-BBDV DAMAGE K (<50NS) C-B (REF) K (REF)	VCBI E-BBDV E-B	RCL SURGE ZC DAMAGE K (>50NS) C-B (REF) K (REF)	IES SURGE ZE E-B
2N3866B	5.20E+00	2.00E+00	1.31E-09	4.17E-08	1.65E-14	1.08E+00	8.06E-12	8.20E-01	1.00E+07	6.44E-15
(1)	1.05E+00	1.56E-11	8.60E-01	1.00E+07	1.00E-03	1.00E-05	5.50E+01	3.50E+00	2.10E+01	2.10E+01
2N3866C	6.60E+00	2.41E+00	1.22E-09	2.73E-08	6.37E-13	1.31E+00	7.36E-12	7.80E-01	1.00E+07	7.25E-15
(1)	1.04E+00	1.51E-11	8.60E-01	1.00E+07	1.00E-03	1.00E-05	5.50E+01	3.50E+00	2.10E+01	2.10E+01
2N3866D	7.10E+00	3.40E+00	8.77E-10	4.36E-08	2.33E-14	1.07E+00	7.76E-12	7.80E-01	1.00E+07	4.91E-15
(1)	1.01E+00	1.65E-11	8.50E-01	1.00E+07	1.00E-03	1.00E-05	5.50E+01	3.50E+00	2.10E+01	2.10E+01
2N3866E	8.30E+00	5.00E+00	8.70E-10	1.69E-08	9.60E-15	1.06E+00	8.05E-12	8.00E-01	1.00E+07	2.02E-15
(1)	9.90E-01	1.74E-11	8.50E-01	1.00E+07	1.00E-03	1.00E-05	5.50E+01	3.50E+00	2.10E+01	2.10E+01

DEVICE NAME (TRAC FLAG)	HFEN HE	HFEI CED	TN VEBI	TI REL	ICS IPPC	MC IPPE	CCD C-BBDV	VCBI E-BBDV	RCL SURGE ZC	IES SURGE ZE
	BULK RESISTANCE C-B (REF) E-B		Z SURGE C-B 1US (REF) 10US		Z SURGE E-B 1US (REF) 10US		DAMAGE K (<50NS) C-B (REF) E-B		DAMAGE K (>50NS) C-B (REF) E-B	
	K FORWARD C-B (REF) E-B		K C-B (REF) E-B		K C-B (REF) E-B		K (REF)		K (REF)	
2N3866F	1.02E+01	4.30E+00	7.29E-10	2.86E-08	3.20E-13	1.14E+00	7.60E-12	8.00E-01	1.00E+07	2.75E-14
(1)	1.01E+00	1.61E-11	8.70E-01	1.00E+07	1.00E-03	1.00E-05	5.50E+01	3.50E+00	2.10E+01	2.10E+01
2N388	1.50E+02	5.00E+00	7.96E-09	7.96E+08	3.50E-07	1.49E+00	2.53E-11	1.40E+00	1.00E+07	3.43E-07
(1)	1.51E+00	8.45E-12	1.40E+00	1.00E+07	1.00E-03	1.00E-05	2.50E+01	1.50E+01	2.10E+01	2.10E+01
2N393	1.00E+01	9.00E+00	3.18E-09	1.59E-07	1.04E-10	9.94E-01	8.49E-12	5.00E-01	1.00E+07	1.04E-10
(1)	9.94E-01	1.41E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+00	6.00E+00	1.22E+02	2.35E+02
	4.40E+01 (34) 3.80E+01		2.45E+02 (34) 1.47E+02		1.28E+03 (34) 1.28E+03		2.69E-04 (60) 3.11E-05		1.20E+00 (60) 1.39E-01	
	8.40E-04 (60) 6.14E-04									
2N396A										
(0)									1.31E+03	1.10E+03
	4.25E-01 (34) 1.35E+00		1.18E+03 (34) 1.18E+03		1.10E+03 (34) 1.40E+03				1.42E-01 (60) 1.56E-01	
	1.80E-02 (60) 3.20E-03									

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCD	VCBI	RCL	IES
(TRAC FLAG)	ME	CED	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF)	E-B	10S (REF)	10US	10S (REF)	10US	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD		K		K		K		K	
	C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
2N404	6.00E+01	9.00E+00	3.98E-08	1.59E-07	5.00E-07	1.21E+00	2.83E-11	5.00E-01	1.00E+07	5.00E-07
(1)	1.21E+00	2.83E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	1.20E+01	2.10E+01	2.10E+01
2N4209	5.80E+01	8.80E-01	1.47E-10	6.93E-09	5.49E-15	1.04E+00	2.86E-12	8.00E-01	1.00E+07	3.45E-14
(1)	1.13E+00	2.76E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4209A	4.01E+01	1.33E+00	1.37E-10	1.08E-08	5.61E-14	1.15E+00	2.68E-12	8.00E-01	1.00E+07	2.56E-15
(1)	1.03E+00	2.71E-12	8.50E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4209B	4.29E+01	1.32E+00	1.17E+10	7.97E-09	5.62E-14	1.15E+00	2.68E-12	8.00E-01	1.00E+07	2.56E-15
(1)	1.03E+00	2.71E-12	8.50E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCO	VCBI	RCL	IES
(TRAC FLAG)	ME	CEO	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE C-B (REF)	E-B	Z SURGE C-B 1US (REF)	10US	Z SURGE E-B 1US (REF)	10US	DAMAGE K (<50NS) C-B (REF)	E-B	DAMAGE K (>50NS) C-B (REF)	E-B
	K FORWARD C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
2N4209C	4.55E+01	1.55E+00	1.08E-10	7.90E-09	1.65E-14	1.07E+00	3.02E-12	8.00E-01	1.00E+07	1.02E-14
(1)	1.07E+00	2.71E-12	8.50E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4209D	4.41E+01	1.30E+00	1.27E-10	1.02E-08	5.66E-13	1.15E+00	2.68E-12	8.00E-01	1.00E+07	5.11E-13
(1)	1.05E+00	2.64E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4209E	4.30E+01	1.24E+00	1.17E-10	9.41E-09	8.31E-11	1.19E+00	2.80E-12	8.00E-01	1.00E+07	2.35E-12
(1)	1.12E+00	2.56E-12	9.50E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4209F	4.36E+01	1.50E+00	9.78E-11	8.40E-09	4.17E-12	1.14E+00	2.68E-12	8.00E-01	1.00E+07	3.07E-13
(1)	1.01E+00	2.69E-10	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME / (TRAC FLAG)	HFEN / ME / BULK RESISTANCE C-B (REF) / K FORWARD C-B (REF)	HFEI / CEO / E-B / E-B	TN / VEBI / Z SURGE C-B IUS (REF) / K C-B (REF)	TI / REL / IOUS / E-B	ICS / IPPC / Z SURGE E-B IUS (REF) / K C-B (REF)	MC / IPPE / IOUS / E-B	CCO / C-BBDV / DAMAGE K (<50NS) C-B (REF) / K (REF)	VCBI / E-BBDV / E-B	RCL / SURGE ZC / DAMAGE K (>50NS) C-B (REF) / K (REF)	IES / SURGE ZE / E-B
2N4251A	1.83E+02	1.92E+01	4.48E-11	2.85E-09	3.37E-11	1.48E+00	4.04E-12	7.50E-01	1.00E+07	1.01E-12
(1)	1.20E+00	4.99E-12	8.50E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4251B	1.72E+02	1.75E+01	4.57E-11	2.65E-09	3.38E-14	1.06E+00	4.12E-12	8.50E-01	1.00E+07	4.02E-14
(1)	1.06E+00	5.21E-12	8.50E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4251C	1.70E+02	1.84E+01	4.47E-11	2.85E-09	1.48E-14	1.01E+00	3.58E-12	7.50E-01	1.00E+07	2.51E-13
(1)	1.19E+00	4.92E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4251D	1.59E+02	1.60E+01	4.87E-11	3.11E-09	3.93E-14	1.02E+00	3.52E-12	8.00E-01	1.00E+07	3.72E-14
(1)	1.07E+00	4.80E-12	1.00E+00	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01

DEVICE NAME / (TRAC FLAG)	HFEN / ME	HFEI / CEO	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCB / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE C-B (REF) K FORWARD C-B (REF)	E-B	Z SURGE C-B 1US (REF) K C-B (REF)	10US E-B	Z SURGE E-B 1US (REF) K C-B (REF)	10US E-B	DAMAGE K (<50NS) C-B (REF) K (REF)	E-B	DAMAGE K (>50NS) C-B (REF) K (REF)	E-B
2N4251E	1.79E+02	1.90E+01	5.17E-11	3.61E-09	4.53E-14	1.07E+00	3.52E-12	8.00E-01	1.00E+07	3.82E-14
(1)	1.07E+00	4.53E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N4251F	2.12E+02	2.07E+01	4.88E-11	3.43E-09	5.66E-14	1.08E+00	3.58E-12	8.00E-01	1.00E+07	1.61E-14
(1)	1.02E+00	4.80E-12	1.00E+00	1.00E+07	1.00E-03	1.00E-05	1.50E+01	4.50E+00	2.10E+01	2.10E+01
2N428M										
(0)	5.60E-01 (34) 1.30E-02 (60)	1.84E+00 3.20E-03	9.75E+02 (34)	9.75E+02	9.78E+02 (34)	9.78E+02	4.25E-05 (60)	6.51E-05	4.40E+02 1.90E-01 (60)	9.78E+02 2.91E-01
2N457	1.00E-03	1.00E-05	6.00E+01	2.00E+01	2.10E+01	2.10E+01		5.00E-01	1.00E+07	5.00E-09
(0)	9.94E-01	1.41E-10	5.00E-01	1.00E+07	1.00E+01	5.00E+00	3.70E-07	1.59E-06	5.00E-09	9.94E-01

DEVICE NAME / (TRAC FLAG)	HFEN / ME	HFEI / CED	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCB / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF)	E-B	1US (REF)	100S	1US (REF)	100S	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD		K		K		K		K	
	C-B (REF)	E-B	C-B (REF)	E-B	C-B (REF)	E-B	(REF)		(REF)	
2N466M										
(0)									6.80E+02	6.20E+02
	1.30E+00	1.85E+00	6.80E+02	2.41E+02	5.00E+02	2.80E+02	1.42E-04	1.34E-04	6.33E-01	6.01E-01
	(34)		(34)		(34)		(60)		(60)	
	1.40E-02	2.70E-03								
	(60)									
2N501A TO	8.00E+01	2.00E+00	1.77E-10	3.18E-09	1.10E-06	1.22E+00	2.69E-12	6.65E-01	1.00E+07	1.14E-06
(1)	1.22E+00	4.90E-12	8.62E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	2.00E+00	3.15E+01	4.20E+01
	5.10E+00	8.40E+00	3.55E+02	4.70E+02	2.60E+02	1.01E+03	3.40E-06	4.95E-06	1.52E-02	2.22E-02
	(34)		(34)		(34)		(60)		(60)	
	3.90E-04	1.40E-04								
	(60)									
2N526 T	1.00E+01	9.00E+00	1.59E-09	7.96E-09	6.00E-09	9.94E-01	4.24E-12	5.00E-01	1.00E+07	6.00E-09
(1)	9.94E-01	7.07E-12	5.00E-01	1.00E+07	1.00E-03	1.00E-05	4.50E+01	1.50E+01	2.10E+01	2.50E+02
2N5829										
(0)									9.25E+01	1.80E+01
	2.65E+00	1.65E+00	6.25E+02	1.50E+03	1.80E+01	1.80E+01	2.90E-06	2.05E-06	1.30E-02	9.18E-03
	(34)		(34)		(34)		(60)		(60)	
	3.70E-05	1.40E-05								
	(60)									

DEVICE NAME (T-AC FLAG)	HFEN HE BULK RESISTANCE C-B (REF) K FORWARD C-B (REF)	HFEI CEO E-B E-B	TN VEBI Z SURGE C-B IUS (REF) K C-B (REF)	TI REL IOUS E-B	ICS IPPC Z SURGE E-B IUS (REF) K C-B (REF)	MC IPPE IOUS E-B	CCO C-BBDV DAMAGE K (<50NS) C-B (REF) K (REF)	VCBI E-BBDV E-B	RCL SURGE ZC DAMAGE K (>50NS) C-B (REF) K (REF)	IES SURGE ZE E-B
2N598	2.50E+01	1.00E+01	2.84E-08	3.18E-07	1.80E-08	9.94E-01	2.83E-11	5.00E-01	1.00E+07	1.80E-08
(1)	9.94E-01	2.83E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	3.50E+01	3.00E+01	2.10E+01	1.60E+02
2N600										
(0)										
	2.50E-01	1.00E+00		6.00E+02		4.30E+02				
	(32)		(32)		(32)					
2N600 T	1.00E+01	9.00E+00	1.59E-09	7.96E-09	6.00E-09	9.94E-01	4.54E-12	5.00E-01	1.00E+07	6.00E-09
(1)	9.94E-01	7.07E-12	5.00E-01	1.00E+07	1.00E-03	1.00E-05	3.50E+01	3.00E+01	6.00E+02	4.30E+02
2N645	1.00E+01	9.00E+00	2.65E-09	1.59E-08	7.99E-10	9.94E-01	7.07E-12	5.00E-01	1.00E+07	7.99E-10
(1)	9.94E-01	7.07E-12	5.00E-01	1.00E+07	1.00E-03	1.00E-41	6.00E+10	5.00E+10	2.10E+01	2.10E+01

DEVICE NAME	HFEN	HFEI	TN	TI	ICS	MC	CCB	VCBI	RCL	IES
(TRAC FLAG)	ME	CEO	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE C-B (REF) K FORWARD C-B (REF)	E-B	Z SURGE C-B 1US (REF) K C-B (REF)	IOUS E-B	Z SURGE E-B 1US (REF) K C-B (REF)	IOUS E-B	DAMAGE K (<50NS) C-B (REF) K (REF)	E-B	DAMAGE K (>50NS) C-B (REF) K (REF)	E-B
2N657	1.00E+01	9.00E+00	1.27E-07	1.59E-06	6.98E-15	9.94E-01	2.47E-10	5.00E-01	1.00E+07	6.98E-15
(0)	9.94E-01	2.47E-10	5.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+02	8.00E+00		3.20E+00
2N696	2.00E+01	5.00E+00	1.59E-09	1.77E-09	4.00E-17	9.94E-01	4.95E-11	5.00E-01	1.00E+07	4.00E-17
(1)	9.94E-01	7.07E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01
2N697	2.00E+01	5.00E+00	1.59E-09	1.77E-09	4.00E-17	9.94E-01	4.95E-11	5.00E-01	1.00E+07	4.00E-17
(1)	9.94E-01	7.07E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01
2N705	2.50E+01		1.06E-09	6.03E-08	1.00E-05	1.83E+00	1.37E-11	3.00E-01	1.00E+07	1.00E-05
(0)	1.83E+00	6.39E-12	3.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	3.50E+00	7.25E+01	1.65E+02
	9.50E-01	2.20E+00	1.50E+02	3.60E+02	3.40E+02	3.40E+02	3.18E-06	1.13E-06	1.42E-02	5.06E-03
		(34)	(34)		(34)		(60)		(60)	
	7.90E-05	3.60E-05								
	(60)									

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME / (TRAC FLAG)	HFEN / ME	HFEI / CED	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCD / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE C-B (REF) K FORWARD C-B (REF)	E-B	Z SURGE C-B IUS (REF) K C-B (REF)	IOUS E-B	Z SURGE E-B IUS (REF) K C-B (REF)	IOUS E-B	DAMAGE K (<50NS) C-B (REF) K (REF)	E-B	DAMAGE K (>50NS) C-B (REF) K (REF)	E-B
2N706	8.99E+01	1.20E-01	1.88E-10	1.28E-08	7.37E-13	1.11E+00	4.50E-12	1.00E+00	1.00E+07	1.01E-14
(1)	9.92E-01	5.60E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	3.00E+00	1.65E+01	2.50E+01
	2.15E+00	2.45E+00	4.70E+01	7.30E+01	2.50E+01	2.50E+01	4.25E-06	3.96E-06	1.80E-02	1.77E-02
		(34)		(34)		(34)		(60)		(60)
	4.30E-05	6.80E-05								
		(60)								
2N706A	3.00E+01		7.96E-10	1.59E-08	1.00E-08	2.48E+00	4.24E-12	5.00E-01	1.00E+07	5.00E-09
(0)	2.67E+00	8.49E-12	5.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	5.00E+00	2.10E+01	2.10E+01
2N711A	1.25E+01	9.00E+00	1.06E-09	1.59E-08	6.67E-12	9.94E-01	8.49E-12	5.00E-01	1.00E+07	6.67E-12
(1)	9.94E-01	1.41E-11	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+01	2.10E+01	2.10E+01
2N718	6.23E+01	3.26E+00	7.61E-10	1.92E-06	1.30E-13	1.02E+00	2.50E-11	8.00E-01	1.00E+07	3.24E-14
(1)	9.68E-01	3.70E-11	9.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+00	2.10E+01	2.10E+01

DEVICE NAME (T=AC FLAG)	HFEN ME BULK RESISTANCE C-B (REF)	HFEI CEO E-B (REF) K FORWARD C-B (REF)	TN VEBI Z SURGE C-B 1US (REF) K C-B (REF)	TI REL 10US E-B	ICS IPPC Z SURGE E-B 1US (REF) K C-B (REF)	MC IPPE 10US E-B	CCO C-BBDV DAMAGE K (<50NS) C-B (REF)	VCBI E-BBDV E-B	RCL SURGE ZC DAMAGE K (>50NS) C-B (REF)	IES SURGE ZE E-B
2N718A	7.59E+01	2.02E+00	7.60E-10	1.67E-06	1.50E-13	1.03E+00	2.74E-11	8.00E-01	1.00E+07	3.20E-14
(1)	9.80E-01	3.65E-11	9.00E-01	1.00E+07	1.00E-03	1.00E-05	7.50E+01	7.00E+00	2.10E+01	2.10E+01
2N720A	6.99E+01	3.30E+00	1.48E-09	3.23E-06	1.21E-13	9.92E-01	3.20E-13	9.00E-01	1.00E+07	6.59E-14
(1)	9.68E-01	7.80E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	1.20E+02	7.00E+00	2.10E+01	2.10E+01
2N722	6.48E+01	1.00E+00	7.68E-10	1.20E-07	3.60E-13	1.11E+00	1.50E-11	8.00E-01	1.00E+07	4.06E-14
(1)	1.05E+00	2.90E-11	1.00E+00	1.00E+07	1.00E-03	1.00E-05	5.00E+01	5.00E+00	2.10E+01	2.10E+01
2N743	4.90E+01	4.00E+00	4.41E-10	4.32E-08	1.49E-14	1.02E+00	5.30E-12	8.00E-01	1.00E+07	3.26E-14
(1)	1.08E+00	4.60E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	2.00E+01	5.00E+00	2.10E+01	2.10E+01

DEVICE NAME (TRAC FLAG)	XPEN / ME	HFEI / CEO	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCO / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE C-B (REF)	E-B	Z SURGE C-B IUS (REF)	IOUS	Z SURGE E-B IUS (REF)	IOUS	DAMAGE K (<50NS) C-B (REF)	E-B	DAMAGE K (>50NS) C-B (REF)	E-B
	K FORWARD C-B (REF)	E-B	K C-B (REF)	E-B	K C-B (REF)	E-B	K (REF)		K (REF)	
2N760	5.39E+01	1.20E-01	4.46E-10	1.52E-08	3.89E-11	1.29E+00	4.20E-12	7.00E-01	1.00E+07	3.23E-13
(1)	9.80E-01	7.90E-12	1.00E+00	1.00E+07	1.00E-03	1.00E-05	4.50E+01	8.00E+00	2.10E+01	2.10E+01
2N797	2.00E+01	5.00E+00	2.65E-10	1.59E-09	3.37E-10	9.94E-01	5.66E-12	5.00E-01	1.00E+07	3.37E-10
(1)	9.94E-01	5.66E-12	5.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	2.00E+01	2.10E+01	2.10E+01
2N834	6.27E+01	7.20E+00	4.53E-10	4.92E-08	1.14E-14	1.02E+00	7.30E-12	9.00E-01	1.00E+07	1.32E-15
(1)	9.44E-01	8.00E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	5.00E+00	2.10E+01	2.10E+01
2N835	3.40E+01	1.00E-01	9.03E-10	5.00E-08	1.20E-13	1.05E+00	5.00E-12	8.00E-01	1.00E+07	3.60E-15
(1)	9.92E-01	7.20E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	2.50E+01	3.00E+00	2.10E+01	2.10E+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME / (TRAC FLAG)	HFEN / ME	HFEI / CEO	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCO / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE C-B (REF) K FORWARD C-B (REF)	E-B K FORWARD E-B (REF)	Z SURGE C-B 10US (REF) K C-B (REF)	E-B	Z SURGE E-B 10US (REF) K C-B (REF)	E-B	DAMAGE K (<50NS) C-B (REF) K (REF)	E-B	DAMAGE K (>50NS) C-B (REF) K (REF)	E-B
2N914	2.60E+01	1.10E-01	3.66E-10	1.19E-08	2.62E-13	1.05E+00	4.70E-12	9.00E-01	1.00E+07	6.54E-15
(1)	9.92E-01	5.90E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	4.00E+01	5.00E+00	2.10E+01	2.10E+01
2N915	1.07E+02	3.30E-01	5.15E-10	4.46E-07	3.75E-11	1.43E+00	4.60E-12	8.00E-01	1.00E+07	6.66E-15
(1)	9.68E-01	7.10E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	7.00E+01	5.00E+00	2.10E+01	2.10E+01
2N916	9.16E+01	3.50E-01	5.05E-10	3.89E-07	1.93E-13	1.11E+00	6.70E-12	9.00E-01	1.00E+07	4.95E-15
(1)	9.92E-01	7.30E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	4.50E+01	5.00E+00	2.10E+01	2.10E+01
2N918	4.38E+01	1.00E+00	1.76E-11	2.25E-08	3.20E-15	1.02E+00	2.40E-12	1.00E+00	1.00E+07	1.65E-15
(1)	1.02E+00	1.90E-12	1.00E+00	1.00E+07	1.00E-03	1.00E-05	3.00E+01	3.00E+00	2.10E+01	2.10E+01

DEVICE NAME / (TRAC FLAG)	HFEN / ME	HFEI / CEO	TN / VEBI	TI / REL	ICS / IPPC	MC / IPPE	CCO / C-BBDV	VCBI / E-BBDV	RCL / SURGE ZC	IES / SURGE ZE
	BULK RESISTANCE C-B (REF)	E-B	Z SURGE C-B 1US (REF)	10US	Z SURGE E-B 1US (REF)	10US	DAMAGE K (<50NS) C-B (REF)	E-B	DAMAGE K (>50NS) C-B (REF)	E-B
	K FORWARD C-B (REF)	E-B	K C-B (REF)	E-B	K C-B (REF)	E-B	K (REF)		K (REF)	
2N930	3.40E+01	1.00E-01	9.03E-10	5.00E-08	1.20E-13	1.05E+00	5.00E-12	8.00E-01	1.00E+07	3.60E-15
(1)	9.92E-01	7.20E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	4.50E+01	5.00E+00	2.10E+01	3.70E+00
2N955A	1.66E+02	4.00E-01	8.95E-11	4.29E-09	8.05E-06	1.08E+00	6.00E-12	4.00E-01	1.00E+07	1.81E-07
(1)	1.05E+00	4.30E-12	5.00E-01	1.00E+07	1.00E-03	1.00E-05	6.00E+01	5.00E+01	2.10E+01	2.10E+01
2N964	1.04E+02	1.00E+00	4.26E-10	5.50E-09	1.44E-06	1.08E+00	3.20E-12	5.00E-01	1.00E+07	3.50E-07
(1)	1.08E+00	2.50E-12	5.00E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	2.50E+00	2.10E+01	2.10E+01
2N9726A	1.79E+02	1.77E+00	2.19E-10	1.34E-08	1.72E-12	1.22E+00	9.93E-12	7.50E-01	1.00E+07	4.22E-14
(1)	1.03E+00	8.83E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+01	1.00E+01	2.10E+01	2.10E+01

DEVICE NAME / (TRAC FLAG)	HFEN / ME / BULK RESISTANCE C-B (REF) / K FORWARD C-B (REF)	HFEI / CED / E-B	TN / VEBI / Z SURGE C-B IUS (REF) / K C-B (REF)	TI / REL / IOUS (REF) / K E-B (REF)	ICS / IPPC / Z SURGE E-B IUS (REF) / K C-B (REF)	MC / IPPE / IOUS (REF) / K E-B (REF)	CCL / C-BBDV / DAMAGE K (<50NS) C-B (REF) / K	VCBI / E-BBDV / E-B (REF)	RCL / SURGE ZC / DAMAGE K (>50NS) C-B (REF) / K	IES / SURGE ZE / E-B (REF)
2N9726B	1.23E+02	1.37E+00	2.48E-10	1.39E-07	3.63E-12	1.27E+00	9.81E-12	7.50E-01	1.00E+07	8.07E-14
(1)	1.06E+00	8.72E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+01	1.00E+01	2.10E+01	2.10E+01
2N9726C	1.38E+02	2.02E+00	2.48E-10	1.34E-07	8.07E-12	1.33E+00	9.35E-12	7.50E-01	1.00E+07	4.23E-14
(1)	1.21E+00	8.72E-12	8.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+01	1.00E+01	2.10E+01	2.10E+01
2N9726E	1.75E+02	1.50E-02	1.99E-10	2.96E-09	1.69E-11	1.14E+00	1.01E-11	8.00E-01	1.00E+07	2.21E-14
(1)	9.75E-01	8.33E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+01	1.00E+01	2.10E+01	2.10E+01
2N9726F	9.88E+01	1.78E+00	3.86E-10	1.15E-07	3.90E-13	1.14E+00	9.84E-12	8.00E-01	1.00E+07	2.53E-14
(1)	1.01E+00	8.64E-12	9.00E-01	1.00E+07	1.00E-03	1.00E-05	1.00E+01	1.00E+01	2.10E+01	2.10E+01

DEVICE NAME / (TRAC FLAG)	HFEN	HFEI	TN	TI	ICS	MC	CCD	VCBI	RCL	IES
	ME	CEO	VEBI	REL	IPPC	IPPE	C-BBDV	E-BBDV	SURGE ZC	SURGE ZE
	BULK RESISTANCE		Z SURGE C-B		Z SURGE E-B		DAMAGE K (<50NS)		DAMAGE K (>50NS)	
	C-B (REF)	E-B	1US (REF)	10US	1US (REF)	10US	C-B (REF)	E-B	C-B (REF)	E-B
	K FORWARD C-B (REF)	E-B	K C-B (REF)	E-B	K C-B (REF)	E-B	K (REF)		K (REF)	
2N976	8.00E+01	2.00E+00	1.77E-10	3.18E-09	1.10E-06	1.22E+00	2.69E-12	6.65E-01	1.00E+07	1.14E-06
(1)	1.22E+00	4.90E-12	8.62E-01	1.00E+07	1.00E-03	1.00E-05	1.50E+01	2.00E+00	2.10E+01	2.10E+01

END OF LISTING

TABLE III. DEVICE PARAMETER REFERENCES

CODE	REPORT
001	Preliminary Report--Semiconductor Damage Study, Braddock, Dunn, & McDonald (23 December 1968).
002	D. C. Wunsch and L. Marzetelli, BDM Final Report Volume 1, Semiconductor and Non-Semiconductor Damage Study, Braddock, Dunn, & McDonald 375-69-F-0168 (April 1969).
003	J. B. Singletary and D. C. Wunsch, Final Report on Semiconductor Damage Study Phase II, Braddock, Dunn, & McDonald/A-6670-TR (June 1970).
004	Braddock, Dunn, & McDonald, Final Summary Report on Semiconductor Damage Study Phase II, BDM/A-84-70-TR (February 1971).
005	D. C. Wunsch et al, Semiconductor Vulnerability Phase II Report, Theoretical Estimates of Failure Levels of Selected Semiconductor Diodes & Transistors, AFWL-TR-73-119, Vol 1 (July 1973).
006	D. C. Wunsch, R. L. Cline, and G. R. Case, Semiconductor Vulnerability Phase II Report, Braddock, Dunn, & McDonald/A-42-69-R (December 1969).
007	J. B. Singletary, W. O. Collier, and J. A. Meyers, Semiconductor Vulnerability Phase III Report, Braddock, Dunn, & McDonald/A-75-70-TR (August 1970).
010	D. L. Durgin et al, Methods, Devices, and Circuits for the EMP Hardening of Army Electronics, ECOM-0275-F, Braddock, Dunn, & McDonald/A-119-72-TR (July 1972).
011	Boeing Aerospace Company and Braddock, Dunn, & McDonald, EMP Susceptibility of Semiconductor Components, Boeing, Braddock, Dunn, & McDonald/A-110-74-TR (September 1974).
012	Braddock, Dunn, & McDonald and Boeing Co., Addendum to EMP Susceptibility of Semiconductor Components, D224-13042-2 (July 1975).
013	Braddock, Dunn, & McDonald and Boeing Co., Electromagnetic Susceptibility of Semiconductor Components, Final Report (September 1975).

TABLE III. DEVICE PARAMETER REFERENCES (Cont'd)

CODE	REPORT
014	G. Brown et al, Experimental Damage Constant Summary--Braddock, Dunn, & McDonald/A-99-74-TR-Rl (20 September 1974).
015	Diode and SCR--D.A.T.A. Book, Derivation and Tabulation Associates, Inc. (1970).
016	Transistor--D.A.T.A. Book, Derivation and Tabulation Associates, Inc. (1969).
017	SAP-1 Computer Listing. Data as reported in DASA Handbook (1972).
020	Experimental data from DASA EMP Handbook. DASA 2114-1 (September 1968).
021	Estimated data from DASA EMP Handbook. DASA 2114-1 (September 1968).
022	Calculated as per Section III of DNA EMP Handbook (1972).
023	DNA EMP Handbook (September 1975).
024	Joe Miletta, EMP Effects on Components, internal memo, Harry Diamond Laboratories.
025	Joe Miletta, LANCE System Component Damage Characterizations, internal memo, Harry Diamond Laboratories.
026	D. M. Tasca, Submicrosecond Pulse Power Failure Modes in Semiconductor Devices, General Electric Company, Re-Entry & Environmental Systems Division, Document No. 70SD401 (January 1970).
027	D. M. Tasca, Energy-Time Dependence of Second Breakdown in Semiconductors for Submicrosecond Electrical Pulses, General Electric Company, Missile and Space Division, Document No. 67SD7253 (October 1967).
030	D. M. Tasca, J. Peden, and J. Andrews, Theoretical and Experimental Studies of Semiconductor Device Degradation due to high Power Electrical Transients, GE Document No. 73SD4289 (December 1973).
031	Bruno Kalab, Analysis of Failure of Electronic Circuits from EMP-Induced Signals, Harry Diamond Laboratories TR-1615 (August 1973).

TABLE III. DEVICE PARAMETER REFERENCES (Cont'd)

CODE	REPORT
032	G. Baker, EMP Vulnerability Analysis of M-109, M-110 Self-Propelled Howitzers, Harry Diamond Laboratories TR-1797, to be published.
033	G. Baker, EMP Vulnerability Analysis of Radio Sets AN/PRC-77, AN/VRC-64 and AN/GRC-160 (U), Harry Diamond Laboratories TR-1747 (February 1976). (SECRET RESTRICTED DATA)
034	G. Gornak et al, EMP Assessment for Army Tactical Communications Systems: Transmission Systems, Series No. 1, Radio Terminal Set AN/TRC-145 (U), Harry Diamond Laboratories TR-1746 (February 1976). (SECRET RESTRICTED DATA)
035	See Ref 034.
050	J. D. Holder and V. Ruwe--Statistical Component Damage Study, U.S. Army Missile Command Report RG-TR-71-1 (January 1971).
051	Pete Stadler, Failure Threshold and Resistance of the Protected and Unprotected 2N2222 Transistor in the Short Pulse Width Regime, *Philco-Ford Corp*, U-4976 (May 1972).
052	EMP Electronic Design Handbook, Boeing Aerospace Corporation D224-10019-1 (April 1973).
053	C. R. Jenkins and J. A. Meyers, Integrated Circuits Test Program, Final Report, Word Order 2-14, Braddock, Dunn, & McDonald/A-98-73-TR (July 1973).
054	D. R. Alexander, T. J. Zwolinski, and C. R. Jenkins, Integrated Circuits and Discrete Semiconductor Components Test Program, Technical Directive 4-6, BDM Monthly Progress Reports (January, February, and March 1974).
055	J. S. Smith, Pulse Power Testing of Microcircuits, Rome Air Development Center TR-71-59 (October 1971).
056	The Boeing Company, Memorandum No. 2-6731-0000-C/S-102, Subject: Pulse Damage Data from Integrated Circuits and Electronic Parts (26 September 1973).
057	G. J. Rimbert et al, Resistor Modeling Program, BDM Final Report, ASV Work Order 2-14 [n.d.].
060	See Ref 034.

TABLE III. DEVICE PARAMETER REFERENCES (Cont'd)

CODE	REPORT
061	Data value from our previous data base at MERADCOM.
062	See Ref 034.
063	Forward biased damage constant from graph in DNA Handbook (1972).
064	Weighted average from Ref 013.
065	Averaged from Ref 013.
066	These data are from Ref 034, but conflicting values were obtained from Ref 025.
067	D. Tacsa, J. Peden, and D. Nepveux, Pulsed Power Failure Modes: Conference Proceedings, Component Degradation from Transient Inputs (April 1970).
070	Data derived by averaging the means of data in Ref 067.
071	Data from Ref 034 and 062.
777	UNKNOWN

APPENDIX A.--JCL FOR EXECUTING DAMTRAC AT HDL

The following is the JCL (job control language) necessary to execute DAMTRAC on the HDL IBM 370/168.

DAMTRAC

```
//JOBCARD
//stepname  EXEC FORTPLG,PARM.LKED=LET, COND.GO=(8,LT),
//       PRELIB='library name'
//LKED.SYSIN  DD *
 INCLUDE SYSLIB(TRAC,BLKDAT)
 ENTRY MAIN
//GO.FT06F001 DD SYSOUT=A,DCB=(RECFM=VA,LRECL=137,BLKSIZE=137)
//GO.FT07F001 DD DUMMY
//GO.FT01F001 DD UNIT=VIO,SPACE=(TRK,(1,1)),DISP=(NEW),DELETE)
//GO.FT10F001 DD DSN=&&TEMP,UNIT=SYSDA,DISP=(NEW,DELETE),
//       DCB=(RECFM=FB,LRECL=80,BLKSIZE=80),SPACE=(80,(100,50))
//GO.FT11F001 DD DSN='diode library', DISP=SHR
//GO.FT12F001 DD DSN='transistor library',DISP=SHR
//GO.FT17F001 DD DUMMY
//GO.FT50F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=3990)
//GO.SYSIN    DD *

    TRAC piece part data deck

/*
```

The following is the JCL necessary to execute DAMTRAC with a user-written TREAQ subroutine on the HDL IBM 370/168.

DAMTRAC JCL w/TREAQ

```
//JOBCARD
//stepname  EXEC FORTPC

    user written TREAQ subroutine

/*
//stepname EXEC FORTPLG,PARM.LKED=LET,COND.GO=(8,LT),
         PRELIB='library name'
```

APPENDIX A

```
//LKED.SYSLIN DD DSN=&&LOADSET,DISP=(OLD,PASS)
//            DD DDNAME=SYSIN
//LKED.SYSIN  DD *
 INCLUDE SYSLIB(TRAC,BLKDATA)
 ENTRY MAIN
//GO.FT06F001 DD SYSOUT=A,DCB=(RECFM=VA,LRECL=137,BLKSIZE=137)
//GO.FT07F001 DD DUMMY
//GO.FT01F001 DD UNIT=VIO,SPACE=(TRK,(1,1)),DISP=(NEW,DELETE)
//GO.FT10F001 DD DSN=&&TEMP,UNIT=SYSDA,DISP=(NEW,DELETE),
//       DCB=(RECFM=FB,LRECL=80,BLKSIZE=80,SPACE=(80,(100,50))
//GO.FT11F001 DD DSN='diode library',DISP=SHR
//GO.FT12F001 DD DSN='transistor library', DISP=SHR
//GO.FT17F001 DD DUMMY
//GO.FT50F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=3990)
//GO.SYSIN    DD *

    TRAC piece part data deck

/*
```

DISTRIBUTION

DEFENSE DOCUMENTATION CENTER
CAMERON STATION, BUILDING 5
ALEXANDRIA, VA 22314
ATTN DDC-TCA (12 COPIES)

COMMANDER
US ARMY MATERIEL DEVELOPMENT
& READINESS COMMAND
5001 EISENHOWER AVENUE
ALEXANDRIA, VA 22333
ATTN DRXAM-TL, HQ TECH LIBRARY
ATTN DRCRP/MG C. M. MCKEEN, JR.
ATTN DRCRP-M/COL R. W. SPECKER
ATTN DRCPM-SCM-WF
ATTN DRCDE-D/MR. HUNT
ATTN DRCDE-D/COL J. F. BLEECKER
ATTN DRCDE, DIR FOR DEV & ENGR
ATTN DRCDE-DE/H. DARRACOTT
ATTN DRCMS-I/DR. R. P. UHLIG
ATTN DRCMS-I/MR. E. O'DONNEL
ATTN DRCDMD-ST/N. L. KLEIN

COMMANDER
US ARMY ARMAMENT MATERIEL
READINESS COMMAND
ROCK ISLAND ARSENAL
ROCK ISLAND, IL 61201
ATTN DRSAR-ASF, FUZE & MUNITION DIV
ATTN DRSAR-PDM/J. A. BRINKMAN
ATTN DRCPM-VFF

COMMANDER
USA MISSILE & MUNITIONS
CENTER & SCHOOL
REDSTONE ARSENAL, AL 35809
ATTN ATSK-CTD-F

COMMANDING OFFICER
NAVAL TRAINING EQUIPMENT CENTER
ORLANDO, FL 32813
ATTN TECHNICAL LIBRARY

DEFENSE ADVANCED RESEARCH
PROJECTS AGENCY
1400 WILSON BLVD
ARLINGTON, VA 22209
ATTN TECH INFORMATION OFFICE
ATTN DIR, STRATEGIC TECHNOLOGY
ATTN DIR, TACTICAL TECHNOLOGY

DIRECTOR
DEFENSE COMMUNICATION ENG CENTER
1860 WIEHLE AVENUE
RESTON, VA 22090
ATTN R104, M. J. RAFFENSPERGER
ATTN R800, R. E. LYONS
ATTN R320, A. IZZO

DIRECTOR
DEFENSE INTELLIGENCE AGENCY
WASHINGTON, DC 20301
ATTN DI-2, WEAPONS & SYSTEMS DIV

DIRECTOR
DEFENSE NUCLEAR AGENCY
WASHINGTON, DC 20305
ATTN PETER HAAS, DEP DIR,
SCIENTIFIC TECHNOLOGY
ATTN RAEV, MAJ S. O. KENNEDY, SR.
ATTN VLIS, LTC ADAMS

DEPARTMENT OF DEFENSE
DIRECTOR OF DEFENSE RESEARCH & ENGINEERING
WASHINGTON, DC 20301
ATTN DEP DIR (TACTICAL WARFARE PROGRAMS)
ATTN DEP DIR (TEST & EVALUATION)
ATTN DEFENSE SCIENCE BOARD
ATTN ASST DIR SALT SUPPORT
GP/MR. J. BLAYLOCK

CHAIRMAN
JOINT CHIEFS OF STAFF
WASHINGTON, DC 20301
ATTN J-3, NUCLEAR WEAPONS BR
ATTN J-3, EXER PLANS & ANALYSIS DIV
ATTN J-5, NUCLEAR DIR NUCLEAR POLICY BR
ATTN J-5, REQUIREMENT & DEV BR
ATTN J-6, COMMUNICATIONS-ELECTRONICS

DEPARTMENT OF DEFENSE
JOINT CHIEFS OF STAFF
STUDIES ANALYSIS & GAMING AGENCY
WASHINGTON, DC 20301
ATTN STRATEGIC FORCES DIV
ATTN GEN PURPOSE FORCES DIV
ATTN TAC NUC BR
ATTN SYS SUPPORT BR

ASSISTANT SECRETARY OF DEFENSE
PROGRAM ANALYSIS AND EVALUATION
WASHINGTON, DC 20301
ATTN DEP ASST SECY (GEN PURPOSE PROG)
ATTN DEP ASST SECY (REGIONAL PROGRAMS)
ATTN DEP ASST SECY (RESOURCE ANALYSIS)

DEPARTMENT OF THE ARMY
OFFICE, SECRETARY OF THE ARMY
WASHINGTON, DC 20301
ATTN ASST SECRETARY OF THE ARMY (I&L)
ATTN DEP FOR MATERIEL ACQUISITION
ATTN ASST SECRETARY OF THE ARMY (R&D)

DEPARTMENT OF THE ARMY
ASSISTANT CHIEF OF STAFF FOR INTELLIGENCE
WASHINGTON, DC 20301
ATTN DAMI-OC/COL J. A. DODDS
ATTN DAMI-TA/COL F. M. GILBERT

US ARMY SECURITY AGENCY
ARLINGTON HALL STATION
4000 ARLINGTON BLVD
ARLINGTON, VA 22212
ATTN DEP CH OF STAFF RESEARCH
& DEVELOPMENT

DISTRIBUTION (Cont'd)

DEPARTMENT OF THE ARMY
US ARMY CONCEPTS ANALYSIS AGENCY
8120 WOODMONT AVENUE
BETHESDA, MD 20014
ATTN COMPUTER SUPPORT DIV
ATTN WAR GAMING DIRECTORATE
ATTN METHODOLOGY AND RESOURCES DIRECTORATE
ATTN SYS INTEGRATION ANALYSIS DIRECTORATE
ATTN JOINT AND STRATEGIC FORCES DIRECTORATE
ATTN FORCE CONCEPTS AND DESIGN DIRECTORATE
ATTN OPERATIONAL TEST AND EVALUATION AGENCY

DIRECTOR
NATIONAL SECURITY AGENCY
FORT GEORGE G. MEADE, MD 20755

COMMANDER-IN-CHIEF
EUROPEAN COMMAND
APO NEW YORK, NY 09128

HEADQUARTERS
US EUROPEAN COMMAND
APO NEW YORK, NY 09055

DIRECTOR
WEAPONS SYSTEMS EVALUATION GROUP
OFFICE, SECRETARY OF DEFENSE
400 ARMY-NAVY DRIVE
WASHINGTON, DC 20305
ATTN DIR, LT GEN GLENN A. KENT

DEPARTMENT OF THE ARMY
DEPUTY CHIEF OF STAFF FOR OPERATIONS
& PLANS
WASHINGTON, DC 20301
ATTN DAMO-RQD/COL E. W. SHARP
ATTN DAMO-SSP/COL D. K. LYON
ATTN DAMO-SSN/LTC R. E. LEARD
ATTN DAMO-SSN/LTC B. C. ROBINSON
ATTN DAMO-RQZ/COL G. A. POLLIN, JR.
ATTN DAMO-TCZ/MG T. M. RIENZI
ATTN DAMO-ZD/A. GOLUB
ATTN DAMO-RQA/COL M. T. SPEIR

DEPARTMENT OF THE ARMY
CHIEF OF RESEARCH DEVELOPMENT
AND ACQUISITION OFFICE
WASHINGTON, DC 20301
ATTN DAMA-RAZ-A/R. J. TRAINOR
ATTN DAMA-CSM-N/LTC OGDEN
ATTN DAMA-WSA/COL W. E. CROUCH, JR.
ATTN DAMA-WSW/COL L. R. BAUMANN
ATTN DAMA-CSC/COL H. C. JELINEK
ATTN DAMA-CSM/COL H. R. BAILEY
ATTN DAMA-WSZ-A/MG D. R. KEITH
ATTN DAMA-WSM/COL J. B. OBLINGER, JR.
ATTN DAMA-PPR/COL D. E. KENNEY

COMMANDER
BALLISTIC MISSILE DEFENSE SYSTEMS
P.O. BOX 1500
HUNTSVILLE, AL 35807
ATTN BMDSC-TEN/MR. JOHN VEFNEMAN

COMMANDER
US ARMY FOREIGN SCIENCE
AND TECHNOLOGY CENTER
220 SEVENTH ST., NE
CHARLOTTESVILLE, VA 22901

DIRECTOR
US ARMY MATERIEL SYSTEMS ANALYSES ACTIVITY
ABERDEEN PROVING GROUND, MD 21005
ATTN DRXSY-C/DON R. BARTHEL
ATTN DRXSY-T/P. REID

COMMANDER
US ARMY SATELLITE COMMUNICATIONS AGENCY
FT. MONMOUTH, NJ 07703
ATTN LTC HOSMER

DIRECTOR
BALLISTIC RESEARCH LABORATORIES
ABERDEEN PROVING GROUND, MD 21005
ATTN DRXBR-XA/MR. J. MESZAROS

COMMANDER
US ARMY AVIATION SYSTEMS COMMAND
12TH AND SPRUCE STREETS
ST. LOUIS, MO 63160
ATTN DRCPM-AAH/ROBERT HUBBARD

DIRECTOR
EUSTIS DIRECTORATE
US ARMY AIR MOBILITY R&D LABORATORY
FORT EUSTIS, VA 23604
ATTN SAVDL-EU-MOS/MR. S. POCILUYKO
ATTN SAVDL-EU-TAS(TETRACORE)

COMMANDER
2D BDE, 101ST ABN DIV (AASLT)
FORT CAMPBELL, KY 42223
ATTN AFZB-KB-SO
ATTN DIV SIGNAL OFFICER,
AFBZ-SO/MAJ MASON

COMMANDER
US ARMY ELECTRONICS COMMAND
FT. MONMOUTH, NJ 07703
ATTN PM, ATACS/DRCPM-ATC/LTC DOBBINS
ATTN DRCPM-ATC-TM
ATTN PM, ARTADS/DRCPM-TDS/
BG A. CRAWFORD
ATTN DRCPM-TDS-TF/COL D. EMERSON
ATTN DRCPM-TDS-TO
ATTN DRCPM-TDS-FB/LTC A. KIRKPATRICK
ATTN PM, MALOR/DRCPM-MALR/COL W. HARRISON
ATTN PM, NAVCOM/DRCPM-NC/
COL C. MCDOWELL, JR.
ATTN PM, REMBASS/DRCPM-RBS/
COL R. COTTEY, SR.
ATTN DRSEL-TL-IR/MR. R. FREIBERG
ATTN DRSEL-SA/NORMAN MILLSTEIN
ATTN DRSEL-MA-C/J. REAVIS
ATTN DRSEL-CE-ES/J. A. ALLEN

COMMANDER
US ARMY MISSILE MATERIEL
READINESS COMMAND
REDSTONE ARSENAL, AL 35809
ATTN DRSMI-FRR/DR. F. GIPSON
ATTN DRCPM-HA/COL P. RODDY
ATTN DRCPM-LCCX/L. B. SEGGEL (LANCE)
ATTN DRCPM-MD/GENE ASHLEY (SAM-D)
ATTN DRCPM-MP
ATTN DRCPM-PE/COL SKEMP (PERSHING)
ATTN DRCPM-SHO
ATTN DRCPM-TO
ATTN DRSMI-R, RDE + MSL DIRECTORATE

COMMANDER
US ARMY MATERIEL DEV & READINESS COMMAND
PICATINNY ARSENAL
DOVER NJ 07801
ATTN DRDAR-ND-V/DANIEL WAXLER

COMMANDER
US ARMY TANK/AUTOMOTIVE
MATERIEL READINESS COMMAND
WARREN, MI 48090
ATTN DRSI-RHT/MR. P. HASEK
ATTN DRCPM(XM-L)/MR. L. WOOLCOT
ATTN DRCPM-GCM-SW/MR. R. SLAUGHTER

PRESIDENT
DA, HA, US ARMY ARMOR AND ENGINEER BOARD
FORT KNOX, KY 40121
ATTN STEBB-MO/MAJ SANZOTERRA

COMMANDER
WHITE SANDS MISSILE RANGE
WHITE SANDS MISSILE RANGE, NM 88002
ATTN STEWS-TE-NT/MARVIN SQUIRES

COMMANDER
TRASANA
SYSTEM ANALYSIS ACTIVITY
WHITE SANDS, NM 88002
ATTN ATAA-TDO/DR. D. COLLIER

COMMANDER
197TH INFANTRY BRIGADE
FORT BENNING, GA 31905
ATTN COL WASIAK

COMMANDER
US ARMY COMMUNICATIONS COMMAND
FORT HUACHUCA, AZ 85613
ATTN ACC-AD-C/H. LASITTER (EMP STUDY GP)

COMMANDER
USA COMBINED ARMS COMBAT DEVELOPMENTS
ACTIVITY
FT. LEAVENWORTH, KS 66027
ATTN ATCAC
ATTN ATCACO-SD/LTC L. PACHA
ATTN ATCA/COC/COL HUBBERT
ATTN ATCA-CCM-F/LTC BECKER
ATTN ATSW-TD-3 NUCLEAR STUDY
TEAM/LT D. WILKINS

PROJECT MANAGER
MOBILE ELECTRIC POWER
7500 BACKLICK ROAD
SPRINGFIELD, VA 22150
ATTN DRCPM-MEP

DEPUTY COMMANDER
US ARMY NUCLEAR AGENCY
7500 BACKLICK RD
BUILDING 2073
SPRINGFIELD, VA 22150
ATTN MONA-WE/COL A. DEVERILL

COMMANDER
US ARMY SIGNAL SCHOOL
FT. GORDON, GA 30905
ATTN AISO-CID/BILL MANNELL
ATTN ATST-CTD-CS/CAPT G. ALEXANDER (INTACS)
ATTN ATSO-CID-CS/MR. TAYLOR
ATTN ATSN-CD-OR/MAJ CARR

DIRECTOR
JOINT TACTICAL COMMUNICATIONS OFFICE
FT. MONMOUTH, NJ 07703
ATTN TRI-TAC/NORM BECHTOLD

COMMANDER
US ARMY COMMAND AND GENERAL STAFF COLLEGE
FORT LEAVENWORTH, KS 66027

COMMANDER
US ARMY COMBAT DEVELOPMENTS EXPERIMENTATION
COMMAND
FORT ORD, CA 93941

COMMANDER
HQ MASSTER
FORT HOOD, TX 76544

COMMANDER
US ARMY AIR DEFENSE SCHOOL
FORT BLISS, TX 79916
ATTN ATSA-CD

COMMANDER
US ARMY ARMOR SCHOOL
FORT KNOX, KY 40121
ATTN ATSB-CTD (2 COPIES)

COMMANDER
US ARMY AVIATION CENTER
FORT RUCKER, AL 36360
ATTN ATST-D-MS (2 COPIES)

COMMANDER
US ARMY ORDNANCE CENTER AND SCHOOL
ABERDEEN PROVING GROUND, MD 21005
ATTN USAOC&S
ATTN ATSL-CTD

COMMANDER
US ARMY SIGNAL SCHOOL
FORT GORDON, GA 30905
ATTN ATSS-CTD (2 COPIES)

DISTRIBUTION (Cont'd)

COMMANDER
US ARMY ENGINEER SCHOOL
FORT BELVOIR, VA 22060
ATTN ATSE-CTD (2 COPIES)

COMMANDER
US ARMY INFANTRY SCHOOL
FORT BENNING, GA 31905
ATTN ATSH-CTD (2 COPIES)

COMMANDER
US ARMY INTELLIGENCE CENTER AND SCHOOL
FORT HUACHUCA, AZ 85613
ATTN ATSI-CTD (2 COPIES)

COMMANDER
US ARMY FIELD ARTILLERY SCHOOL
FORT SILL, OK 73503
ATTN ATSF-CTD (2 COPIES)

CHIEF OF NAVAL OPERATIONS
NAVY DEPARTMENT
WASHINGTON, DC 20350
ATTN NOP-932, SYS EFFECTIVENESS DIV
CAPT E. V. LANEY
ATTN NOP-9860, COMMUNICATIONS BR
COR L. LAYMAN
ATTN NOP-351, SURFACE WEAPONS BR
CAPT G. A. MITCHELL
ATTN NOP-622C, ASST FOR NUCLEAR
VULNERABILITY, R. PIACESI

COMMANDER
NAVAL ELECTRONICS SYSTEMS COMMAND, HQ
2511 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VA 20360
ATTN PME-117-21, SANGUINE DIV

HEADQUARTERS, NAVAL MATERIEL COMMAND
STRATEGIC SYSTEMS PROJECTS OFFICE
1931 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VA 20390
ATTN NSP2201, LAUNCHING & HANDLING
BRANCH, BR ENGINEER, P. R. FAUROT
ATTN NSP-230, FIRE CONTROL & GUIDANCE
BRANCH, BR ENGINEER, D. GOLD
ATTN NSP-2701, MISSILE BRANCH,
BR ENGINEER, J. W. PITSENBERGER

COMMANDER
NAVAL SURFACE WEAPONS CENTER
WHITE OAK, MD 20910
ATTN CODE 222, ELECTRONICS & ELECTRO-
MAGNETICS DIV
ATTN CODE 431, ADVANCED ENGR DIV

US AIR FORCE, HEADQUARTERS
DCS, RESEARCH & DEVELOPMENT
WASHINGTON, DC 20330
ATTN DIR OF OPERATIONAL REQUIREMENTS
AND DEVELOPMENT PLANS, S/V &
LTC P. T. DUESBERRY

COMMANDER
AF WEAPONS LABORATORY, AFSC
KIRTLAND AFB, NM 87117
ATTN ES, ELECTRONICS DIVISION
ATTN EL, J. DARRAH
ATTN TECHNICAL LIBARY
ATTN D. I. LAWRY

COMMANDER
AERONAUTICAL SYSTEMS DIVISION, AFSC
WRIGHT-PATTERSON AFB, OH 45433
ATTN ASD/YH, DEPUTY FOR B-1

COMMANDER
HQ SPACE AND MISSILE SYSTEMS ORGANIZATION
P.O. 96960 WORLDWAYS POSTAL CENTER
LOS ANGELES, CA 90009
ATTN S7H, DEFENSE SYSTEMS APL SPO
ATTN XRT, STRATEGIC SYSTEMS DIV
ATTN SYS, SURVIVABILITY OFC

SPACE AND MISSILE SYSTEMS ORGANIZATION
NORTON AFB, CA 92409
ATTN MMH, HARD ROCK SILO DEVELOPMENT

COMMANDER
AF SPECIAL WEAPONS CENTER, AFSC
KIRTLAND AFB, NM 87117

ASSISTANT CHIEF OF STAFF
FOR COMMUNICATIONS ELECTRONICS
XVIII AIRBORNE CORPS
FORT BRAGG, NC 28307
ATTN AFZA-CE/LTC K. KILLINGSTEAD

HARRY DIAMOND LABORATORIES
ATTN DANIEL, CHARLES D., JR., MG,
COMMANDING GENERAL (ERADCOM)
ATTN RAMSDEN, JOHN J., LTC, COMMANDER/
FLYER, I.N./LANDIS, P.E./
SOMMER, H./OSWALD, R. B.
ATTN CARTER, W.W., DR., TECHNICAL
DIRECTOR/MARCUS, S.M.
ATTN KIMMEL, S., PAO
ATTN CHIEF, 0021
ATTN CHIEF, 0022
ATTN CHIEF, LAB 100
ATTN CHIEF, LAB 200
ATTN CHIEF, LAB 300
ATTN CHIEF, LAB 400
ATTN CHIEF, LAB 500
ATTN CHIEF, LAB 600
ATTN CHIEF, DIV 700
ATTN CHIEF, DIV 800
ATTN CHIEF, LAB 900
ATTN CHIEF, LAB 1000
ATTN RECORD COPY, BR 041
ATTN HDL LIBRARY (5 COPIES)

DISTRIBUTION (Cont'd)

HARRY DIAMOND LABORATORIES (Cont'd)
ATTN CHAIRMAN, EDITORIAL COMMITTEE
ATTN CHIEF, 047
ATTN TECH REPORTS, 013
ATTN PATENT LAW BRANCH, 071
ATTN GIDEP OFFICE, 741
ATTN LANHAM, C., 0021
ATTN CHIEF, 0024
ATTN CHIEF, 1010
ATTN CHIEF, 1020 (20 COPIES)
ATTN CHIEF, 1030
ATTN CHIEF, 1040
ATTN CHIEF, 1050
ATTN NOON, T. V., 1020