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AFNL-TR-76-108, Adden

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D180-19491-1

ADDENDUM TO

SEMICONDUCTOR FAILURE MODEL STUDY

Final Report

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Research & Engineering Division
Boeing Aerospace Company

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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) SUPERSAP2 EIP Semiconductor Damage Constant		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report presents the results of a limited preliminary study to obtain methodology for failure modeling of transistors and diodes for use in electromagnetic pulse vulnerability studies on aerospace electronic systems. The report describes the methodology and presents data and analysis to document the model.		

ADDENDUM TO
SEMICONDUCTOR FAILURE MODEL STUDY

This document presents the supplemental data for the Semiconductor Failure Model Study (D180-19491-1).

Table 1 presents a computer listing of the SUPERSAP2 transistor experimental data used for the study.

Table 2 presents a computer listing of the SUPERSAP2 diode experimental data.

Tables 3, 4, 5, and 6 present original copies of the four HP 9820 Calculator programs used to prepare the data plots. The programs are identified as "TR-K/V," "TR-LEG," "DI-K/V," and "DI-LEG." The operation of the programs is described in Section 2 of the basic report.

Table 1
SUPERSAP2 TRANSISTOR EXPERIMENTAL DATA

NUMBER	1N1015S	1N1039	2N1699	2N1115	2N1115A
VENDOR	WFSY	TIT	DEL	ETC	TEC
FUNCTION	BJT6N	BJT6P	BJT6P	BJT6P	BJT6N
STRUCTURE	F.	AL.		AL.	
PACKAGE	THREAD	CASE1	T036	CASE1	T05
POWER	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RISETIME	0.	0.	0.	0.	0.
WUNSC	1.600E+00	1.400E+00	1.000E+00	3.800E-01	9.800E-01
CURRENT	0.	0.	0.	0.	0.
GAIN	0.	0.	0.	0.	0.
DATA	M-01	M-01	M-01	M-01	M-01
REFERENCE	BASE	BASE	BASE	BASE	BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	6.000E+00	2.000E+01	4.000E+01	1.000E+01	6.000E+00
INZ	0.	0.	0.	0.	0.
INZPLK5	0.	0.	0.	0.	0.
INZPLK50	0.	0.	0.	0.	0.
INCASETR	0.	0.	0.	0.	0.
INAMRTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	0.	0.
INMODEL					
INKE1	0.	0.	0.	0.	0.
INKE2	0.	0.	0.	0.	0.
INMODEL2	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
INKR1	1.600E+00	1.400E+00	1.000E+00	3.800E-01	9.800E-01
INKR2	0.	0.	0.	0.	0.
OUTPUT	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
OUTVOLT	1.200E+02	6.000E+01	8.000E+01	2.000E+01	6.000E+01
OUTZPLK5	0.	0.	0.	0.	0.
OUTZPLK50	0.	0.	0.	0.	0.
OUTCASETR	0.	0.	0.	0.	0.
OUTAMRTR	0.	0.	0.	0.	0.
OUTJUNCAP	0.	0.	0.	2.000E+01	0.
OUTMODEL					
OUTKE1	0.	0.	0.	0.	0.
OUTKE2	0.	0.	0.	0.	0.
OUTMODEL2					
OUTKR1	0.	0.	0.	0.	0.
OUTKR2	0.	0.	0.	0.	0.

Table 1 (Continued)

2N1118	2N1132	2N1459	2N1485	2N1486
SPR	FSC	SOD	SEN	SEN
BJTSP	BJTSP	BJTSP	BJTSN	BJTSN
AL.PL	D.	AL.	PL.D	PL.D
T05	T039	T05	T08	T08
0.	0.	2.500E-01	2.500E+01	2.500E+01
0.	0.	0.	1.200E+00	1.200E+00
0.	0.	0.	0.	0.
1.900E-01	2.300E-01	6.500E-01	2.380E+00	1.560E+00
0.	0.	0.	3.000E+00	3.000E+00
0.	0.	0.	0.	0.
M-04	M-01	M-01	M-12	M-12
BASE	BASE	BASE	BASE	BASE
EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
1.000E+01	5.000E+00	4.000E+00	1.200E+01	1.200E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	5.700E+01	0.	0.	0.
0.	WUNSCH	0.	0.	0.
0.	2.000E+00	0.	0.	0.
0.	0.	0.	0.	0.
WUNSCH	WUNSCH	WUNSCH	EXPO	EXPO
1.900E-01	2.300E-01	6.500E-01	1.560E-04	1.850E-01
0.	0.	0.	1.170E+00	6.520E-01
COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
2.500E+01	5.000E+01	4.000E+01	6.000E+01	1.000E+02
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	7.040E+00	7.040E+00
0.	0.	0.	0.	0.
6.000E+00	3.100E+01	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	WUNSCH	EXPO
0.	0.	0.	1.010E+00	2.860E+02
0.	0.	0.	0.	1.060E-01

Table 1 (Continued)

NUMBER	2N1596	2N1502	2N1642	2N176	2N177A
VENDOR	TII	TEC	CRY	MOTA	GE.SY
FUNCTION	SCR	SCR	BJTSP	BJTGP	SCR
STRUCTURE	PL.			ME.	
PACKAGE	T05	T064	T05	T03	T064
POWER	0.	0.	0.	9.000E+01	0.
FREQUENCY	0.	0.	0.	7.000E+00	0.
RISETIME	0.	0.	0.	0.	0.
WUNSCH	9.400E-01	+.000E-01	1.300E-01	1.010E+00	4.000E+00
CURRENT	0.	0.	0.	3.000E+00	0.
GAIN	0.	0.	0.	0.	0.
DATA	M-01	M-01	M-01	M-03	M-02
REFERENCE	BASE	BASE	BASE	BASE	BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	1.000E+02	0.	0.	0.	0.
INZ	0.	0.	0.	0.	0.
INZBLK5	0.	0.	0.	0.	0.
INZBLK50	0.	0.	0.	0.	0.
INCASETR	3.130E+01	0.	0.	0.	0.
INAMTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	0.	0.
INMODELF				WUNSCH	
INKF1	0.	0.	0.	3.000E+00	0.
INKF2	0.	0.	0.	0.	0.
INMODELR	WUNSCH	WUNSCH	WUNSCH	EXPO	WUNSCH
INKR1	9.400E-01	4.000E-01	1.300E-01	3.330E+00	4.000E+00
INKR2	0.	0.	0.	4.200E-01	0.
OUTPUT	COLLECTOR		COLLECTOR	COLLECTOR	
OUTVOLT	1.000E+01	0.	3.000E+01	4.000E+01	0.
OUTZBLK5	0.	0.	0.	0.	0.
OUTZBLK50	0.	0.	0.	0.	0.
OUTCASETR	0.	0.	0.	8.330E-01	0.
OUTAMTR	0.	0.	0.	0.	0.
OUTJUNCAP	0.	0.	0.	0.	0.
OUTMODELF				WUNSCH	
OUTKF1	0.	0.	0.	1.110E+01	0.
OUTKF2	0.	0.	0.	0.	0.
OUTMODELR				WUNSCH	
OUTKR1	0.	0.	0.	9.580E-01	0.
OUTKR2	0.	0.	0.	0.	0.

Table 1 (Continued)

2N1893	2N190	2N2102	2N2222	2N2222
FSC	ETC	NSC	FSC	FSC
RJTSN	RJTGP	RJTSN	RJTSN	RJTSN
D.PL	AL.	D.	PL.E	PL.E
T05	CASE1	T05	T018	T018
0.	0.	1.000E+00	0.	0.
0.	0.	0.	2.500E+02	2.500E+02
0.	0.	0.	0.	0.
4.000E-01	5.800E-01	4.590E-01	8.000E-02	1.100E-01
0.	0.	1.000E+00	8.000E-01	8.000E-01
0.	0.	0.	0.	0.
M-02	M-04	M-12	M-01	M-02
BASE	BASE	BASE	BASE	BASE
EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
7.000E+00	0.	7.000E+00	5.000E+00	5.000E+00
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	8.330E+01	8.330E+01
0.	0.	0.	3.000E+02	3.000E+02
0.	0.	0.	0.	0.
0.	0.	0.	WUNSCH	0.
0.	0.	0.	6.000E-01	0.
0.	0.	0.	0.	0.
WUNSCH	WUNSCH	EXPO	0.	WUNSCH
4.000E-01	5.800E-01	1.970E-02	0.	8.200E-02
0.	0.	7.210E-01	0.	0.
COLLECTOR		COLLECTOR	COLLECTOR	COLLECTOR
1.200E+02	0.	1.200E+02	6.000E+01	6.000E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	1.750E+02	0.	0.
0.	0.	0.	8.000E+00	8.000E+00
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	WUNSCH	0.	0.
0.	0.	4.710E-01	0.	0.
0.	0.	0.	0.	0.

Table 1 (Continued)

NUMBER	2N2346	2N24P3	2N2857	2N2894	2N2906
VENDOR	GE SY	FSC	MOTA	RAYN	MOTA
FUNCTION	SCR	BJTSM	BJTSM	BJTSP	BJTSP
STRUCTURE		NB	PL.D	PL.D	
PACKAGE	T05	T018	T072	T018	T018
POWER	0.	3.600E-01	2.000E-01	3.600E-01	0.
FREQUENCY	0.	6.000E+01	1.400E+03	4.000E+02	0.
RISETIME	0.	0.	0.	6.000E+01	0.
WUNSCH	3.800E+00	3.400E-02	8.500E-03	3.500E-02	4.400E-02
CURRENT	0.	5.000E-02	4.000E-02	2.000E-01	0.
GAIN	0.	8.000E+01	5.000E+01	0.	0.
DATA	M-01	M-12	M-12	M-12	M-01
REFERENCE	BASE	BASE	BASE	BASE	BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	0.	6.000E+00	2.500E+00	4.000E+00	5.000E+00
INZ	0.	0.	0.	0.	0.
INZBLK5	0.	0.	0.	0.	0.
INZBLK50	0.	0.	0.	0.	0.
INCASETR	0.	0.	0.	0.	0.
INAMBTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	0.	3.000E+01
INMODEL					
INKF1	0.	0.	0.	0.	0.
INKF2	0.	0.	0.	0.	0.
INMODEL	WUNSCH	EXPO	EXPO	EXPO	WUNSCH
INKR1	3.800E+00	4.250E-01	2.450E-01	2.370E-02	4.400E-02
INKR2	0.	3.280E-01	2.670E-01	5.280E-01	0.
OUTPUT		COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
OUTVOLT	0.	6.000E+01	3.000E+01	1.200E+01	6.000E+01
OUTZBLK5	0.	0.	0.	0.	0.
OUTZBLK50	0.	0.	0.	0.	0.
OUTCASETR	0.	0.	0.	1.460E+02	0.
OUTAMBTR	0.	5.000E+02	8.750E+02	4.860E+02	0.
OUTJUNCAP	0.	6.000E+00	1.000E+00	6.000E+00	8.000E+00
OUTMODEL					
OUTKF1	0.	0.	0.	0.	0.
OUTKF2	0.	0.	0.	0.	0.
OUTMODEL			WUNSCH		
OUTKR1	0.	0.	1.730E-02	0.	0.
OUTKR2	0.	0.	0.	0.	0.

Table 1 (Continued)

2N2907	2N2907A	2N2920	2N3251	2N329
MOTA	MOTA	FSC	RAYN	RAYN
RJTSP	RJTSP	RJTSP	RJTSP	RJTSP
PL.D		D	PL.D	F.A
T018	T018	CASE1	T018	T05
4.000E-01	0.	0.	3.600E-01	0.
2.000E+02	0.	0.	3.000E+02	0.
4.000E+01	0.	0.	3.500E+01	0.
1.400E-01	1.000E-01	4.000E-02	6.400E-02	2.200E-01
6.000E-01	0.	0.	2.000E-01	0.
0.	0.	0.	1.000E+02	0.
M-12	M-02	M-02	M-12	M-01
BASE	BASE	BASE	BASE	BASE
EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
5.000E+00	5.000E+00	6.000E+00	5.000E+00	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	3.000E+01	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
WUNSCH	WUNSCH	WUNSCH	EXPO	WUNSCH
1.400E-01	1.000E-01	4.000E-02	3.020E-04	2.200E-01
0.	0.	0.	8.550E-01	0.
COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	
6.000E+01	6.000E+01	6.000E+01	5.000E+01	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
9.710E+01	0.	0.	1.450E+02	0.
4.390E+02	0.	0.	4.860E+02	0.
8.000E+00	8.000E+00	6.000E+00	6.000E+00	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
WUNSCH			EXPO	
4.450E-02	0.	0.	6.150E-04	0.
0.	0.	0.	8.810E-01	0.

Table 1 (Continued)

NUMREF	2N335	2N336	2N336A	2N338	2N343
VENDOR	TII	TII	ETC	TEC	TII
FUNCTION	BJT5N	BJT5N	BJT5N	BJT5N	BJT5N
STRUCTURE	G	G	D.G	PL.D	G
PACKAGE	T05	T05	T05	T05	T011
POWER	0.	0.	0.	1.250E-01	0.
FREQUENCY	0.	0.	0.	0.	0.
RISE TIME	0.	0.	0.	0.000E+01	0.
WUNSCN	5.500E-01	5.500E-01	3.400E-01	4.600E-02	4.700E-02
CURRENT	0.	0.	0.	2.000E-02	0.
GAIN	0.	0.	0.	0.	0.
DATA REFERENCE	M-01 BASE	M-01 BASE	M-01 BASE	M-12 BASE	M-01 BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	1.000E+00	1.000E+00	4.000E+00	1.000E+00	1.000E+00
INZ	0.	0.	0.	0.	0.
INZPLK5	0.	0.	0.	0.	0.
INZPLK50	0.	0.	0.	0.	0.
INCASET	0.	0.	0.	0.	0.
INAMBTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	0.	0.
INMODELF					
INKF1	0.	0.	0.	0.	0.
INKF2	0.	0.	0.	0.	0.
INMODEL	WUNSCN	WUNSCN	WUNSCN	EXPO	WUNSCN
INKR1	5.500E-01	5.500E-01	3.400E-01	7.640E+00	4.700E-02
INKR2	0.	0.	0.	1.400E-01	0.
OUTPUT	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
OUTVOLT	4.500E+01	4.500E+01	4.500E+01	4.500E+01	6.000E+01
OUTZPLK5	0.	0.	0.	0.	0.
OUTZPLK50	0.	0.	0.	0.	0.
OUTCASET	0.	0.	0.	0.	0.
OUTAMBTR	0.	0.	0.	1.000E+03	0.
OUTJUNCAP	7.000E+00	7.000E+00	7.000E+00	1.200E+00	0.
OUTMODELF					
OUTKF1	0.	0.	0.	0.	0.
OUTKF2	0.	0.	0.	0.	0.
OUTMODEL				EXPO	
OUTKR1	0.	0.	0.	1.160E+01	0.
OUTKR2	0.	0.	0.	2.400E-01	0.

Table 1 (Continued)

2N3585	2N375	2N389	2N4044	2N4393
MOTA	MOTA	TII	SODI	SOD
HJTSN	HJIGP	HJTSN	HJTSN	FETN
PL.D	Sw.	D		CH.
T066	T03	T053	T070	T018
3.500E+01	0.	0.	7.500E+01	0.
1.000E+01	0.	0.	0.	0.
3.000E+03	0.	0.	0.	5.000E+00
3.430E+00	1.020E+00	2.140E+00	0.	1.500E+01
5.000E+00	0.	0.	0.	0.
0.	0.	0.	0.	0.
M-12	M-01	M-04	M-07	M-07
BASE	BASE	BASE	BASE	DRAIN
EMITTER	EMITTER	EMITTER	EMITTER	SOURCE
6.000E+00	4.000E+01	1.000E+01	3.000E-03	4.000E+01
0.	0.	0.	0.	1.000E+02
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	1.400E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
EXPO	WUNSCH	WUNSCH	EXPO	EXPO
9.820E-01	1.020E+00	2.140E+00	2.730E-03	1.240E-02
5.860E-01	0.	0.	3.230E-01	6.140E-01
COLLECTOR	COLLECTOR		COLLECTOR	GATE
5.000E+02	6.000E+01	0.	6.000E+01	4.000E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
5.000E+00	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	1.400E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
WUNSCH				
1.140E+00	0.	0.	0.	0.
0.	0.	0.	0.	0.

Table 1 (Continued)

NUMBER	2N463	2N491	2N475A	2N498	2N5117
VENDOR	KSC	GFSY	CNS	111	SODI
FUNCTION	BJTGP	BJT	BJTSP	BJTSP	BJTSP
STRUCTURE	AL			D.PL	PL.
PACKAGE	T032	T013	T01	T05	T07K
POWER	0.	4.500E+01	0.	0.	7.500E+01
FREQUENCY	0.	0.	0.	0.	0.
RISE TIME	0.	0.	0.	0.	0.
WUNSCH	5.700E+00	0.	5.500E-01	8.000E-01	0.
CURRENT	0.	0.	0.	0.	1.000E-02
GAIN	0.	0.	0.	0.	0.
DATA	M-04	M-07	M-01	M-01	M-07
REFERENCE	BASE	BASE	BASE	BASE	BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	5.000E+01	0.	0.	8.000E+00	7.000E+00
INZ	0.	0.	0.	0.	0.
INZBLK5	0.	0.	0.	0.	0.
INZBLK50	0.	0.	0.	0.	0.
INCASET	0.	0.	0.	0.	0.
INAMTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	6.000E+01	0.
INMODELF					
INKF1	0.	0.	7.000E-01	0.	0.
INKF2	0.	0.	0.	0.	0.
INMODELR	WUNSCH	EXPO		WUNSCH	EXPO
INKR1	5.700E+00	4.970E+00	8.000E-01	8.000E-01	3.290E-03
INKR2	0.	5.330E-01	0.	0.	3.900E-01
OUTPUT		COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
OUTVOLT	6.000E+01	0.	2.500E+01	1.000E+02	4.500E+01
OUTZBLK5	0.	0.	0.	0.	0.
OUTZBLK50	0.	0.	0.	0.	0.
OUTCSETR	0.	0.	0.	0.	0.
OUTAMTR	0.	0.	0.	0.	0.
OUTJUNCAP	3.100E+02	0.	0.	1.300E+01	8.000E-01
OUTMODELF					
OUTKF1	0.	0.	0.	0.	0.
OUTKF2	0.	0.	0.	0.	0.
OUTMODELR					
OUTKR1	0.	0.	0.	0.	0.
OUTKR2	0.	0.	0.	0.	0.

Table 1 (Continued)

2N526	2N576A	2N618	2N656	2N657
GFSY	ETC	MOTA	TII	TII
HJTGP	HJTGN	HJTGP	HJTSN	HJTSN
AL.	AL.	SW.	D.PL	D.PL
T05	T05	T03	T05	T05
0.	0.	0.	0.	4.000E+00
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
3.900E-01	2.300E-02	8.800E-01	2.000E-01	6.200E-01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
M-01	M-01	M-01	M-04	M-01
BASE	BASE	BASE	BASE	BASE
EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
1.500E+01	1.500E+01	4.000E+01	8.000E+00	8.000E+00
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	4.380E+01
0.	0.	0.	0.	2.190E+02
0.	0.	0.	6.000E+01	6.000E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
3.900E-01	2.300E-02	8.800E-01	2.000E-01	6.200E-01
0.	0.	0.	0.	0.
COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
4.500E+01	4.000E+01	8.000E+01	6.000E+01	1.000E+02
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
4.000E+01	1.500E+01	0.	1.300E+01	1.300E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.

Table 1 (Continued)

NUMBER	2N657A	2N685	2N687	2N697	2N699
VENDOR	GESY	GFSY	GFSY	GFSY	MOTA
FUNCTION	HJTSN	SCR	SCR	SCR	HJTSN
STRUCTURE	ME.				D.ME.
PACKAGE	T05	T018	T048	T05	T05
POWER	0.	0.	0.	6.000E-01	0.
FREQUENCY	0.	0.	0.	1.000E+02	0.
RISETIME	0.	0.	0.	0.	0.
WUNSCH	1.070E+00	1.400E+00	1.170E+01	1.140E+00	2.500E-01
CURRENT	0.	0.	0.	0.	0.
GAIN	0.	0.	0.	0.	0.
DATA REFERENCE	M-01 BASE	M-01 BASE	M-04 BASE	M-12 BASE	M-01 BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	1.000E+02	2.000E+02	3.000E+02	5.000E+00	5.000E+00
INZ	0.	0.	0.	0.	0.
INZBLK5	0.	0.	0.	0.	0.
INZBLK50	0.	0.	0.	0.	0.
INCASETR	0.	0.	0.	0.	0.
INAMRTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	0.	0.
INMODELF					
INKF1	0.	0.	0.	0.	0.
INKF2	0.	0.	0.	0.	0.
INMODELR	WUNSCH	WUNSCH	WUNSCH	EXPO	WUNSCH
INKR1	1.070E+00	1.400E+00	1.170E+01	4.340E+00	2.500E-01
INKR2	0.	0.	0.	2.460E-01	0.
OUTPUT				COLLECTOR	COLLECTOR
OUTVOLT	1.000E+02	0.	0.	6.000E+01	1.200E+02
OUTZBLK5	0.	0.	0.	0.	0.
OUTZBLK50	0.	0.	0.	0.	0.
OUTCASETR	0.	0.	0.	8.750E+01	0.
OUTAMRTR	0.	0.	0.	2.920E+02	0.
OUTJUNCAP	0.	0.	0.	2.000E+01	1.200E+01
OUTMODELF					
OUTKF1	0.	0.	0.	0.	0.
OUTKF2	0.	0.	0.	0.	0.
OUTMODELR				EXPO	
OUTKR1	0.	0.	0.	3.900E+01	0.
OUTKR2	0.	0.	0.	1.260E-01	0.

Table 1 (Continued)

2N706	2N708	2N736	2N760	2N834
TII BJTSN D.ME T018	FSC BJTSN PL. T018	MOTA BJTSN PL. T018	NSC BJTSN ME. T018	RAYN BJTSN PL.D T018
0.	0.	0.	0.	3.000E-01
0.	0.	0.	0.	5.000E+09
0.	0.	0.	0.	0.
7.500E-03	3.000E-02	1.000E-01	3.400E-02	1.500E-02
0.	0.	0.	0.	2.000E-01
0.	0.	0.	0.	0.
M-04 BASE EMITTER	M-04 BASE EMITTER	M-01 BASE EMITTER	M-01 BASE EMITTER	M-0A BASE EMITTER
3.000E+00	5.000E+00	5.000E+00	8.000E+00	5.000E+00
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	WUNSCH
0.	0.	0.	0.	5.000E-02
0.	0.	0.	0.	0.
WUNSCH	WUNSCH	WUNSCH	WUNSCH	EXPO
7.500E-03	3.000E-02	1.000E-01	3.400E-02	6.200E-02
0.	0.	0.	0.	4.000E-01
COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
2.500E+01	4.000E+01	8.000E+01	6.000E+01	4.000E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	5.000E+02
5.000E+00	6.000E+00	1.000E+01	5.000E+00	2.800E+00
0.	0.	0.	0.	WUNSCH
0.	0.	0.	0.	5.000E-02
0.	0.	0.	0.	0.
0.	0.	0.	0.	WUNSCH
0.	0.	0.	0.	2.500E-02
0.	0.	0.	0.	0.

Table 1 (Continued)

NUMBER	2N859	2N869A	2N915	2N918	2N927
VENDOR	CRY	FSC	KAYN	CRY	CRY
FUNCTION	HJTSP	HJTSM	HJTSM	HJTSM	HJTSP
STRUCTURE		PL.D	PL.D	PL.D	AL.
PACKAGE	T018	T018	T018	T072	T01b
POWER	0.	3.600E-01	3.600E-01	2.000E-01	0.
FREQUENCY	0.	0.	3.000E+02	6.000E+02	0.
RISE TIME	0.	0.	0.	0.	0.
WUNSCH	1.800E-01	1.700E-02	5.100E-02	8.600E-03	9.600E-02
CURRENT	0.	2.000E-01	0.	5.000E-02	0.
GAIN	0.	0.	5.000E+01	0.	0.
DATA	M-04	M-08	M-12	M-12	M-01
REFERENCE	BASE	BASE	BASE	BASE	BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	2.500E+01	5.000E+00	5.000E+00	3.000E+00	7.000E+01
INZ	0.	0.	0.	0.	0.
INZRLK5	0.	0.	0.	0.	0.
INZRLK50	0.	0.	0.	0.	0.
INCASETR	0.	0.	0.	0.	0.
INAMRTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	0.	0.
INMODEL		WUNSCH			
INKF1	0.	5.000E-02	0.	0.	0.
INKF2	0.	0.	0.	0.	0.
INMODELK	WUNSCH	EXPO	EXPO	EXPO	WUNSCH
INKR1	1.800E-01	3.100E-01	4.900E-02	2.090E+00	9.600E-02
INKR2	0.	3.000E-01	5.030E-01	7.920E-02	0.
OUTPUT	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
OUTVOLT	4.000E+01	2.500E+01	4.500E+01	3.000E+01	7.000E+01
OUTZRLK5	0.	0.	0.	0.	0.
OUTZRLK50	0.	0.	0.	0.	0.
OUTCASETR	0.	1.460E+02	1.450E+02	5.840E+02	0.
OUTAMRTR	0.	5.000E+02	4.860E+02	8.750E+02	0.
OUTJUNCAP	5.000E+00	6.000E+00	6.000E+00	2.000E+00	2.000E+01
OUTMODEL		WUNSCH			
OUTKF1	0.	1.000E+00	0.	0.	0.
OUTKF2	0.	0.	0.	0.	0.
OUTMODELK		WUNSCH	WUNSCH		
OUTKR1	0.	2.000E-02	9.750E-02	0.	0.
OUTKR2	0.	0.	0.	0.	0.

Table 1 (Continued)

2N930	2N930	2N930A
FSC	FSC	SOD
HJTSN	HJTSN	HJTSN
PL.D	PL.D	
T018	T018	T018
3.000E-01	3.000E-01	0.
3.000E+01	3.000E+01	0.
0.	0.	0.
4.600E-02	5.400E-02	2.000E-02
3.000E-02	3.000E-02	0.
1.500E+02	1.500E+02	0.
M-01	M-12	M-01
BASE	BASE	BASE
EMITTER	EMITTER	6.000E00
5.000E+00	5.000E+00	0.
0.	0.	0.
0.	0.	0.
0.	0.	0.
2.500E+02	0.	0.
5.000E+02	0.	0.
0.	0.	0.
0.	0.	0.
0.	0.	0.
WUNSCH	EXPO	WUNSCH
4.600E-02	8.300E-03	2.000E-02
0.	6.290E-01	0.
COLLECTOR	COLLECTOR	
4.500E+01	4.500E+01	6.000E+01
0.	0.	0.
0.	0.	0.
0.	1.700E+02	0.
0.	4.000E+02	0.
8.000E+00	8.000E+00	0.
0.	0.	0.
0.	0.	0.
0.	EXPO	
0.	3.820E-03	0.
0.	7.560E-01	0.

Table 2

SUPERSAP2 DIODE EXPERIMENTAL DATA

NUMBER	1NA351	LV451A	LV491A	1N1095	1N1124A
NUMBER					
VENDOR	CUDI	TRW	TRW	TII	SYN
FUNCTION	DIODREF	DIODREF	DIODREF	DIODGP	DIODGP
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE		AL.	AL.		0
PACKAGE	007	D014	D014	D03	D04
POWERA	6.000E-01	6.000E-01	6.000E-01	0.	0.
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	0.	0.
CURRENT	0.	0.	0.	7.500E-01	3.300E+00
DATA	M-12	.GT.M-12	M-12	M-01	.GT.M-08
VOLT	4.250E+00	5.100E+00	9.100E+00	5.000E+02	2.500E+02
ZBLK5	0.	0.	0.	0.	0.
ZBLK50	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMRTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	1.200E+01	1.200E+01	1.000E+01	8.800E-01	5.750E+00
MODEL F	WUNSCH	WUNSCH	WUNSCH		WUNSCH
KF1	3.000E+01	1.400E+01	2.200E+01	0.	4.040E+00
KF2	0.	0.	0.	0.	0.
MODEL P	WUNSCH	EXPO	WUNSCH	WUNSCH	EXPO
KR1	1.800E+01	1.090E+00	1.000E+01	8.800E-01	7.750E-05
KR2	0.	6.970E-01	0.	0.	1.220E+00

	1N1126A	1N1202A	1N1206	1N1614	1N1615
	SYN	UNK	SYN	UNK	SYN
	DIODGP	DIODGP	DIODGP	DIODGP	DIODGP
	SI	SI	SI	SI	SI
		0			
	D04	D04	THREAD	D04	D04
	0.	0.	1.800E+01	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	3.300E+00	1.200E+01	1.200E+01	5.000E+00	5.000E+00
	.GT.M-08	.GT.M-08	.GT.M-08	.GT.M-08	.GT.M-08
	5.000E+02	2.000E+02	6.000E+02	2.000E+02	4.000E+02
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	9.200E+00	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	1.510E+01	4.670E+00	1.590E+01	4.880E+00	1.280E+01
	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
	1.330E+01	6.600E+00	2.250E+01	7.290E+00	1.330E+01
	0.	0.	0.	0.	0.
	WUNSCH	EXPO	WUNSCH	EXPO	WUNSCH
	1.510E+01	1.210E+02	1.590E+01	2.600E+03	1.280E+01
	0.	2.700E-01	0.	8.200E-02	0.

Table 2 (Continued)

NUMBER	1N1733A	1N2158	1N23RF	1N23WE	1N25
NUMBER					
VENDOR	TRW	SYN	ALP	ALP	ALP
FUNCTION	DIODGP	DIODGP	DIODMM	DIODMM	DIODMM
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE		D			
PACKAGE	A1	D05	MISC	MISC	MISC
POWERA	0.	0.	0.	0.	7.500E+02
POWERB	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	0.	0.
CURRENT	1.500E-01	2.500E+01	0.	0.	0.
DATA	M-04	.GT.M-04	M-04	M-04	M-04
VOLT	3.000E+03	4.000E+02	0.	0.	0.
ZPLK5	0.	0.	0.	0.	0.
ZPLK50	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMRTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	1.000E+00	0.
WUNSCH	1.130E+01	3.060E+01	9.400E-04	2.900E-04	2.600E-02
MODEL1		WUNSCH			
KF1	0.	1.380E+01	0.	0.	0.
KF2	0.	0.	0.	0.	0.
MODEL2	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
KR1	1.130E+01	3.060E+01	9.400E-04	2.900E-04	2.600E-02
KR2	0.	0.	0.	0.	0.
	1N253	1N277	1N2929A	1N2970B	1N2984B
	TEC	TEC	CRL	CRL	CRL
	DIODGP	DIODGP	DIODTUN	DIODREF	DIODREF
	SI	GE	GE	SI	SI
				D	
	THRFD	D07	T018	D04	D04
	0.	8.000E-02	5.000E-03	0.	1.000E+01
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	1.000E+00	0.	0.	0.	0.
	M-01	M-04	M-01	.GT.M-04	.GT.M-04
	9.500E+01	1.250E+02	0.	0.	2.000E+01
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	9.000E+01	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	8.600E-01	2.700E-02	7.300E-02	2.340E+01	1.690E+01
	0.	0.	0.	WUNSCH	WUNSCH
	0.	0.	0.	1.180E+01	8.250E+00
	0.	0.	0.	0.	0.
	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
	8.600E-01	2.700E-02	7.300E-02	2.340E+01	1.690E+01
	0.	0.	0.	0.	0.

Table 2 (Continued)

NUMBER	1N2985B	1N2985B	1N2988B	1N2989B	1N2991B
NUMBER					
VENDOR	CRL	ROTA	CRL	UNK	CRL
FUNCTION	DIODREF	DIODREF	DIODREF	DIODREF	DIODREF
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE	D	PL.D	D	D	D
PACKAGE	D04	D04	D04	D04	D04
POWER	1.000E+01	0.	1.000E+01	1.000E+01	1.000E+01
POWER RC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	0.	0.
CURRENT	0.	0.	0.	0.	0.
DATA	.GT.M-08	.GT.M-08	.GT.M-08	.GT.M-08	.GT.M-08
VOLT	2.200E+01	0.	2.700E+01	3.000E+01	3.600E+01
ZRLK5	0.	0.	0.	0.	0.
ZRLK50	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMRTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	1.670E+01	2.620E+01	2.770E+01	2.970E+01	3.510E+01
MODELF	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
KF1	4.990E+00	2.000E+01	9.790E+00	1.280E+01	1.000E+01
KF2	0.	0.	0.	0.	0.
MODEL R	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
KP1	1.670E+01	2.620E+01	2.770E+01	2.970E+01	3.570E+01
KP2	0.	0.	0.	0.	0.
	1N3015B	1N3017B	1N3019B	1N3022B	1N3031B
	CRL	CRL	CRL	DIC	HAUF
	DIODREF	DIODREF	DIODREF	DIODREF	DIODREF
	SI	SI	SI	SI	SI
	D				
	D04	AXIAL	AXIAL	AXIAL	AXIAL
	1.000E+01	1.000E+00	1.000E+00	1.000E+00	1.000E+00
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	.GT.M-08	.GT.M-08	.GT.M-08	.GT.M-08	.GT.M-08
	2.000E+02	7.500E+00	9.100E+00	1.200E+01	3.000E+01
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	8.790E+01	1.060E+01	2.680E+01	1.380E+01	2.840E+01
	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
	1.160E+01	6.640E+00	1.480E+01	9.960E+00	6.650E+00
	0.	0.	0.	0.	0.
	EXPO	WUNSCH	WUNSCH	WUNSCH	WUNSCH
	6.310E+03	1.060E+01	2.680E+01	1.380E+01	2.840E+01
	1.500E-01	0.	0.	0.	0.

Table 2 (Continued)

NUMBER	1N3035B	1N3037B	1N3040B	1N3064	1N3157
VENDOR	CRL	CRL	CRL	UNK	DIC
FUNCTION	DIODREF	DIODREF	DIODREF	DIODSW	DIODREF
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE	D	D	D	PL.D	D
PACKAGE	AXIAL	AXIAL	AXIAL	D07	D07
POWER	1.000E+00	1.000E+00	1.000E+00	0.	4.000E-01
POVRC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	4.000E+00	0.
CURRENT	0.	0.	0.	0.	0.
DATA	.GT.M-08	.GT.M-08	.GT.M-08	M-08	M-08
VOLT	4.300E+01	5.100E+01	6.800E+01	7.500E+01	8.400E+00
ZBLK5	0.	0.	0.	0.	0.
ZBLK50	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMRTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	2.000E+00	0.
CAPVOLT	0.	0.	0.	7.500E+01	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	3.940E+01	5.170E+01	7.050E+01	1.700E-01	2.793E+01
MODEL	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
KF1	1.050E+01	7.390E+00	1.110E+01	1.590E-01	1.120E+02
KF2	0.	0.	0.	0.	0.
MODEL	EXPO	WUNSCH	WUNSCH	EXPO	EXPO
KR1	1.280E+02	5.170E+01	7.050E+01	6.000E-02	1.000E+00
KR2	2.600E-01	0.	0.	5.700E-01	7.600E-01
	1N3189	1N34A	1N3600	1N3600	1N3821A
	GESY		FSC	UNK	DIC
	DIODGP	DIODGP	DIODSW	DIODSW	DIODREF
	SI	GE	SI	SI	SI
	D	PC	PL.	PL.D	AL.
	AXIAL	A1	D07	D07	AXIAL
	0.	5.000E-02	0.	0.	1.000E+00
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	4.000E+00	4.000E+00	0.
	1.000E+00	0.	0.	0.	0.
	.GT.M-08	M-02	M-02	M-08	.GT.M-08
	2.000E+02	6.000E+01	7.500E+01	5.000E+01	3.300E+00
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	3.000E+02	0.	0.
	0.	0.	0.	2.500E+00	0.
	0.	0.	2.500E+00	5.000E+01	0.
	0.	0.	0.	0.	0.
W	7.430E+00	1.400E-02	1.800E-01	1.900E-01	1.200E+01
	WUNSCH			WUNSCH	WUNSCH
	1.080E+01	0.	0.	3.000E-01	3.900E+00
	0.	0.	0.	0.	0.
	WUNSCH	WUNSCH	WUNSCH	EXPO	WUNSCH
	7.430E+00	1.400E-02	1.800E-01	1.300E-03	1.200E+01
	0.	0.	0.	8.400E-01	0.

Table 2 (Continued)

NUMBER	1N3828A	1N4003	1N4006	1N4122	1N4148
VENDOR	DIC	MOTA	MOTA	MOTA	FSC
FUNCTION	DIODREF	DIODGP	DIODGP	DIODREF	DIODSW
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE					
PACKAGE	AXIAL	D041	D041	D07	D035
POWERA	1.000E+00	0.	0.	2.500E-01	0.
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIVE	0.	0.	0.	0.	0.
CURRENT	0.	1.000E+00	1.000E+00	0.	4.000E+00
DATA	.GT.M-08	M-06	.GT.M-12	UN	M-12
VOLT	6.200E+00	2.000E+02	8.000E+02	3.600E+01	7.500E+01
ZPLKE	0.	0.	0.	0.	0.
ZPLK50	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMTR	0.	0.	0.	7.000E+02	0.
JUNCAP	0.	1.400E+01	0.	1.340E+02	0.
CAPVOLT	0.	0.	0.	0.	4.000E+00
ENERGY	0.	0.	0.	0.	0.
WUNSCH	1.960E+01	2.200E+00	5.310E-01	8.000E+00	1.130E-02
MODEL	WUNSCH		WUNSCH	WUNSCH	
KF1	7.180E+00	0.	1.800E+01	1.500E-01	0.
KF2	0.	0.	0.	0.	0.
MODEL	WUNSCH	WUNSCH	EXPO	WUNSCH	EXPO
KR1	9.600E+00	2.200E+00	2.040E-03	8.000E+00	5.540E-04
KR2	0.	0.	8.820E-01	0.	7.120E-01

	1N429	1N4370	1N4385JAN	1N457	1N459
VENDOR	CRL	TEC	ITT	FSC	TII
FUNCTION	DIODREF	DIODREF	DIODGP	DIODGP	DIODGP
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE					
PACKAGE	C1	D07	D029	A1	A1
POWERA	2.000E-01	4.000E+01	0.	2.000E-01	0.
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIVE	0.	0.	0.	0.	0.
CURRENT	0.	0.	1.000E+00	7.500E-02	0.
DATA	M-01	.GT.M-08	.GT.M-12	M-04	M-01
VOLT	6.200E+00	2.400E+00	0.	7.000E+01	2.000E+02
ZPLKE	0.	0.	0.	0.	0.
ZPLK50	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMTR	0.	0.	0.	3.750E+02	0.
JUNCAP	0.	0.	0.	8.000E+00	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	6.000E-01	1.190E+01	2.980E-01	1.200E-01	5.900E-01
MODEL	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
KF1	0.	2.500E-01	1.800E+01	0.	0.
KF2	0.	0.	0.	0.	0.
MODEL	WUNSCH	EXPO	EXPO	WUNSCH	WUNSCH
KR1	6.000E-01	1.190E+00	4.630E-01	1.200E-01	5.900E-01
KR2	0.	6.700E-01	4.720E-01	0.	0.

Table 2 (Continued)

NUMBER NUMBER	1N489A	1N482A	1N483B	1N484A	1N485
VENDOR	TRW	TEC	TEC	TEC	TEC
FUNCTION	DIODGP	DIODGP	DIODGP	DIODGP	DIODGP
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE	D		D.ME		D.
PACKAGE	A1	D07	AXIAL	D07	D07
POWERA	2.000E-01	2.500E-01	2.500E-01	2.500E-01	2.500E-01
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	0.	0.
CURRENT	4.000E-02	1.000E-01	0.	1.000E-01	0.
DATA	M-01	M-01	M-08	M-04	M-08
VOLT	2.000E+02	3.500E+01	8.000E+01	1.300E+02	2.250E+02
ZBLK5	0.	0.	0.	0.	0.
ZBLK50	0.	0.	0.	0.	0.
CASETP	0.	0.	0.	0.	0.
AMTR	0.	0.	0.	0.	0.
JUNCAP	4.000E+00	0.	0.	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	9.600E-01	9.600E-01	1.020E+00	4.500E-01	2.100E-01
MODEL			WUNSCH		WUNSCH
KF1	0.	0.	1.480E+00	0.	1.890E+00
KF2	0.	0.	0.	0.	0.
MODEL	WUNSCH	WUNSCH	EXPO	WUNSCH	EXPO
KR1	9.600E-01	9.600E-01	4.790E+00	4.500E-01	1.910E+01
KR2	0.	0.	4.000E-01	0.	1.900E-01

	1N4937	1N5233	1N5253A	1N5287	1N5356
	MOTA	MOTA	MOTA	MOTA	MOTA
	DIODSW	DIODZEN	DIODREF	MISC	DIODZEN
	SI	SI	SI	SI	SI
	A1	D07	D07	D07	A1
	0.	5.000E-01	5.000E-01	6.000E-01	5.000E+00
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	2.000E+02	0.	0.	0.	0.
	1.000E+00	0.	0.	0.	0.
	M-02	M-06	M-07	M-07	M-06
	6.000E+02	6.000E+00	2.500E+01	1.000E+02	3.600E+01
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	2.500E+02	0.	0.	2.500E+01
	6.580E+01	0.	3.500E+02	0.	0.
	0.	4.400E+02	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	7.500E-01	8.000E+00	0.	0.	2.800E+01
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	WUNSCH	WUNSCH	EXPO	EXPO	WUNSCH
	7.500E-01	8.000E+00	2.160E+01	3.550E+00	2.800E+01
	0.	0.	9.130E-01	5.950E-01	0.

Table 2 (Continued)

NUMBER	1N537	1N537A	1N538B	1N540	1N547
NUMBER					
VENDOR	TII	MOTA	GIC	TII	TII
FUNCTION	DIODGP	DIODZEN	DIODGP	DIODGP	DIODGP
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE	D		D	D	
PACKAGE	D03	A1	D03	D03	D03
POWERA	0.	5.000E+00	0.	0.	0.
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	0.	0.
CURRENT	7.500E-01	0.	7.500E-01	7.500E-01	7.500E-01
DATA	M-01	M-04	.GT.M-04	M-01	M-04
VOLT	1.000E+02	1.000E+02	0.	4.000E+02	6.000E+02
ZFLK5	0.	0.	0.	0.	0.
ZFLK50	0.	0.	0.	0.	0.
CASFR	0.	2.500E+01	0.	0.	0.
AMRTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	5.100E-01	5.800E+01	8.530E+00	9.300E-01	1.210E+01
MODEL			WUNSCH		
KF1	0.	0.	1.780E+01	0.	0.
KF2	0.	0.	0.	0.	0.
MODEL	WUNSCH	WUNSCH	EXPO	WUNSCH	WUNSCH
KP1	5.100E-01	3.800E+01	2.340E+02	9.300E-01	1.210E+01
KP2	0.	0.	2.500E-01	0.	0.
	1N5556	1N64	1N643A	1N645	1N645
	GSE	APRX	TRW	TII	ITT
	MISC	DIODGP	DIODSW	DIODGP	DIODGP
		GE	SI	SI	SI
		PC		D	D
	D013	D07	A1	A1	AXIAL
	0.	0.	0.	6.000E-01	6.000E-01
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	3.000E+02	0.	0.
	0.	5.000E-02	0.	4.000E-01	4.000E-01
	.GT.M-04	M-04	M-04	M-04	.GT.M-12
	0.	2.500E+01	2.000E+02	2.250E+02	2.250E+02
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	2.040E+02	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	4.130E+01	4.100E-02	1.000E-01	5.600E-01	7.130E-01
	WUNSCH			WUNSCH	
	8.770E+00	0.	0.	0.	2.700E+01
	0.	0.	0.	0.	0.
	WUNSCH	WUNSCH	WUNSCH	WUNSCH	EXPO
	4.130E+01	4.100E-02	1.000E-01	5.600E-01	3.200E+00
	0.	0.	0.	0.	3.960E-01

Table 2 (Continued)

NUMBER	1N646	1N647	1N658	1N661	1N702A
NUMBER					
VENDOR	TII	TII	FSC	TII	TII
FUNCTION	DIODGE	DIODGE	DIODSW	DIODSW	DIODZEN
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE	D	D	PL	D	D
PACKAGE	A1	A1	D07	A1	A1
POWER A	6.000E-01	6.000E-01	0.	0.	2.500E-01
POWER C	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	3.000E+02	3.000E+02	0.
CURRENT	4.000E-01	4.000E-01	2.000E-01	1.000E-01	0.
DATA	V-04	M-04	M-04	.6I.M-04	M-01
VOLT	3.000E+02	4.000E+02	1.200E+02	2.000E+02	2.600E+00
ZBLK5	0.	0.	0.	0.	0.
ZBLK50	0.	0.	0.	0.	0.
CASE TR	0.	0.	0.	0.	0.
AMBT	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	2.700E+00	0.
CAPVOLT	0.	0.	0.	9.000E+00	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	2.290E+00	3.900E+00	9.200E-01	4.600E-01	1.000E+00
MODEL F					
KF1	0.	0.	0.	0.	0.
KF2	0.	0.	0.	0.	0.
MODEL R	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
KP1	2.290E+00	3.900E+00	9.200E-01	4.600E-01	1.000E+00
KP2	0.	0.	0.	0.	0.

	1N711A	1N746A	1N750A	1N751A	1N751A
	CRL	NPC	TII	TII	TII
	DIODZEN	DIODREF	DIODREF	DIODZEN	DIODZEN
	SI		SI	SI	SI
		PL.D	PL.D	D	D
	D07	AXIAL	AXIAL	A1	A1
	2.500E-01	4.000E-01	4.000E-01	4.000E-01	4.000E-01
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	M-01	M-04	M-04	M-04	M-04
	7.500E+00	3.300E+00	4.700E+00	5.100E+00	5.100E+00
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	2.100E+00	1.600E+00	2.840E+00	6.300E+00	1.200E+00
		WUNSCH	WUNSCH		
	0.	3.000E+00	2.420E+00	0.	0.
	0.	0.	0.	0.	0.
	WUNSCH	EXPO	EXPO	WUNSCH	WUNSCH
	2.100E+00	3.470E+00	5.000E-02	6.300E+00	1.200E+00
	0.	4.400E-01	7.900E-01	0.	0.

Table 2 (Continued)

NUMBER	IN752A	IN753A	IN754A	IN755A	IN755
NUMBER					
VENDOR	TEC	TEC	NPC	TEC	TRA
FUNCTION	DIODREF	DIODREF	DIODREF	DIODREF	DIODREF
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE	A	AL.	PL.D	AL.	AL.
PACKAGE	AXIAL	AXIAL	AXIAL	AXIAL	AXIAL
POWERA	4.000E-01	4.000E-01	4.000E-01	4.000E-01	4.000E-01
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIVE	0.	0.	0.	0.	0.
CURRENT	0.	0.	0.	0.	0.
DATA	M-08	M-08	M-08	.GT.M-08	M-08
VOLT	5.600E+00	6.200E+00	6.800E+00	7.500E+00	8.200E+00
ZBLK5	0.	0.	0.	0.	0.
ZBLK6	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMRTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	1.054E+01	1.479E+01	1.120E+00	1.334E+01	2.042E+01
MODEL1	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
KF1	2.640E+01	2.210E+01	8.610E-01	2.890E+01	6.870E+01
KF2	0.	0.	0.	0.	0.
MODEL2	EXPO	EXPO	EXPO	EXPO	EXPO
KR1	3.200E-01	4.300E-01	2.000E-02	3.000E-02	9.200E-01
KR2	7.700E-01	7.500E-01	7.900E-01	9.600E-01	7.400E-01

	IN757A	IN758A	IN763-2	IN816	IN82A
	TEC	TEC	DIC	TEC	NPC
	DIODREF	DIODREF	DIODZEN	DIODGP	DIODMM
	SI	SI	SI	SI	SI
	AL.	AL.			
	AXIAL	AXIAL	D07	D07	D07
	4.000E-01	4.000E-01	2.500E-01	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	M-08	M-08	M-01	M-01	M-01
	9.100E+00	1.000E+01	7.000E+00	6.000E+00	5.000E+00
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	7.670E+00	6.170E+00	3.000E+00	1.500E+00	7.000E-04
	WUNSCH	WUNSCH			
	1.630E+01	2.450E+01	0.	0.	0.
	0.	0.	0.	0.	0.
	EXPO	EXPO	WUNSCH	WUNSCH	WUNSCH
	1.000E-01	2.630E-01	3.000E+00	1.500E+00	7.000E-04
	8.000E-01	7.300E-01	0.	0.	0.

Table 2 (Continued)

NUMBER	1N921	1N923	1N914	1N933J	1N963B
NUMBER					
VENDOR	TEC	TEC	TII	TEC	DIC
FUNCTION	DIODREF	DIODZEN	DIODSW	DIODGP	DIODREF
MATERIAL	SI	SI	SI	GE	SI
STRUCTURE	AL.	AL.	PL	PC	PL.D
PACKAGE	D07	D07	D07	D07	D07
POWERA	2.500E-01	2.500E-01	0.	0.	4.000E-01
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	4.000E+00	4.000E+02	0.
CURRENT	0.	0.	0.	0.	0.
DATA	.GT.M-08	M-01	M-04	M-01	.GT.M-08
VOLT	6.200E+00	6.200E+00	7.500E+01	1.000E+02	1.200E+01
ZRLK5	0.	0.	0.	0.	0.
ZRLK50	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMBTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	4.000E+00	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	1.910E+01	1.800E+00	9.600E-02	1.000E-01	6.170E+00
MODEL	WUNSCH				WUNSCH
KF1	4.440E+01	0.	0.	0.	1.220E+01
KF2	0.	0.	0.	0.	0.
MODEL	EXPO	WUNSCH	WUNSCH	WUNSCH	EXPO
KR1	2.950E-01	1.800E+00	9.600E-02	1.000E-01	1.200E-01
KR2	8.300E-01	0.	0.	0.	8.000E-01
	1N964B	1N965B	1N967	1N970B	1N972B
	FSC	DIC	MOTA	DIC	DIC
	DIODREF	DIODREF	DIODZEN	DIODREF	DIODREF
	SI	SI	SI	SI	SI
	PL.D	PL.D	PL.D	PL.D	PL.D
	D07	D07	D07	D07	D07
	4.000E-01	4.000E-01	4.000E-01	4.000E-01	4.000E-01
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	M-08	.GT.M-08	M-01	.GT.M-08	.GT.M-08
	1.300E+01	1.500E+01	1.800E+01	2.400E+01	3.000E+01
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	3.130E+02	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	1.800E+00	7.590E+00	7.300E-01	6.460E+00	2.400E+01
	WUNSCH	WUNSCH		WUNSCH	WUNSCH
	2.250E+00	1.360E+01	0.	1.990E+01	4.400E+01
	0.	0.	0.	0.	0.
	EXPO	EXPO	WUNSCH	EXPO	EXPO
	1.000E-04	4.200E-02	7.300E-01	2.800E-01	7.590E-01
	1.170E+00	6.600E-01	0.	7.400E-01	7.200E-01

Table 2 (Continued)

NUMBER	1N973R	1N974R	1N981R
NUMBER			
VENDOR	BAUF	MOTA	MOTA
FUNCTION	DIODREF	DIODREF	DIODZEN
MATERIAL	SI	SI	SI
STRUCTURE	AL.	D	
PACKAGE	D07	D07	D07
POWERA	4.000E-01	4.000E-01	4.000E-01
POWERC	0.	0.	0.
FREQUENCY	0.	0.	0.
RECTIME	0.	0.	0.
CURRENT	0.	0.	0.
DATA	.GT.M-0M	.GT.M-0P	M-01
VOLT	3.300E+01	3.600E+01	6.800E+01
ZFLK5	0.	0.	0.
ZFLK50	0.	0.	0.
CASETR	0.	0.	0.
AMBTR	0.	0.	0.
JUNCAP	0.	0.	0.
CAPVOLT	0.	0.	0.
ENERGY	0.	0.	0.
WUNSCH	4.270E+01	7.910E+00	1.400E+00
MODEL F	WUNSCH	WUNSCH	
KF1	3.200E+01	5.540E+01	0.
KF2	0.	0.	0.
MODEL R	EXPO	EXPO	WUNSCH
KR1	9.120E-12	2.570E-03	1.400E+00
KR2	2.760E+00	1.060E+00	0.

Table 3 HP9820 PROGRAM - TRANSISTOR, K VS. V_{BD}

```

0:
DSP "TR-K/V";
STP F
1:
ENT "V1,V0,VM",R
26;"NODE";R28;"C
ODE";R25;"PLT";R
17;.1+R1;.001+R2
F
2:
IF R26=2;1+R1F
3:
4+R7;5+R8;R1*
TN+ R7+R3;R2*
TN+ R8+R4F
4:
ENT "START";R29;
"STOP";R22;1-
LOG R1+R6;ABS
INT LOG R4+1+R5F
5:
SCL 0;.9;.8;.0;.6;.2;
PLT 1;.1;PLT 1;.5;
PLT 6;.5;PLT 6;.1;
PLT 1;.1;PEN F
6:
LTR .2;.4;.122;
PLT "T-";IFXD 0;
PLT R28;PLT "-";
PLT R25;PLT "+";
PLT R17F
7:
"P";LOG R4+R4;
LOG R2+R2;LOG R3
+R3;LOG R1+R1;5E
3+R7;10+R8F
8:
0+C;0+R18;0+R19;
0+R20;0+R21;0+A;
0+B;0+R30F
9:
"K";LDF R29;R31F
10:
IF R26=1;R34+ZF
11:
IF R26=2;R35+ZF
12:
IF R26=3;R36+ZF
13:
IF Z=0;GTO "S" F
14:
LOG Z+Y;LOG R33+
XF
15:
INT (R31/1E5)1E5
+R10;(INT (R31/1
E4)-INT (R10/1E4
))1E4+R12F
16:
(INT (R31/100)-
INT (R31/1E4))*10
0;100+R14;(R31/1
00-INT (R31/100
))100+R16F
17:
JMP R28F
18:
IF R25=R10;GTO "
R" F
19:
IF R25=R12;GTO "
R" F
20:
IF R25=R14;GTO "
R" F
21:
IF R25=R16;GTO "
R" F
22:
IF R25=R10+R12;
GTO "R" F
23:
IF R25=R10+R14;
GTO "R" F
24:
IF R25=R10+R16;
GTO "R" F
25:
IF R25=R12+R14;
GTO "R" F
26:
IF R25=R12+R16;
GTO "R" F
27:
IF R25=R14+R16;
GTO "R" F

```

Table 3 (Continued)

```

28:
IF R25=R10+R12+R
14:GTO "R" F
29:
IF R25=R10+R12+R
16:GTO "R" F
30:
IF R25=R10+R14+R
16:GTO "R" F
31:
IF R25=R12+R14+R
16:GTO "R" F
32:
IF R25=R31:GTO "
R" F
33:
IF R25=0:GTO "R"
F
34:
"S":R29+1+R29:
IF R29<R22:GTO "
K" F
35:
C+R27:GTO "X" F
36:
"R":LTR R5-X+.03
,Y+R6-.05,122:
IF R7>Y:Y+R7 F
37:
IF Y>R8:Y+R8 F
38:
JMP R17 F
39:
PLT R10/1E5:GTO
"V" F
40:
PLT R12/1E4:GTO
"V" F
41:
R14/100+Z:JMP 3F
42:
R16+Z:JMP 2F
43:
PLT "0":GTO "V" F
44:
IF Z<9:PLT Z:
GTO "V" F
45:
IF Z>9:Z-9+Z:
JMP 2F
46:
PLT "A":JMP 9F
47:
PLT "C":JMP 8F
48:
PLT "D":JMP 7F
49:
PLT "E":JMP 6F
50:
PLT "F":JMP 5F
51:
PLT "H":JMP 4F
52:
PLT "J":JMP 3F
53:
PLT "K":JMP 2F
54:
PLT "L":JMP 1F
55:
"V":IF C<39:C*2+
Z:Y+R(40+Z):Y+R(
41+Z) F
56:
Y+R18+R18:Y+R19+
R19:Y+Y+R20+R20:
Y+X+R21+R21:X+X+
R30+R30 F
57:
1+C+C:IF C=35:0+
A:1.35+B F
58:
.15+A+A:LTR .9+A
,5.05+B,122:FXD
0:PLT R29:GTO "S
" F
59:
"X":0+C F
60:
R27*R20-R18*R18+
A:(R19*R20-R18*R
21)/A+R23 F
61:
(R27*R21-R18*R19
)/A+R24:1.200S
ATH ABS R24+Y F
62:
(R20-R18*R18/R27
)/((R27-1)+R25:(R
30-R19+R19/R27)/
(R27-1)+R17 F

```

Table 3 (Continued)

```

63:      (R27-1)(R17-R24*
R24+R25)/(R27-2)
→R11;1+1/R27→R15
;R18/R27→R9F
64:      0→R39;IF R27>40;
GTO "T" F
65:      R23+R24+R(41+C)+
A/R(40+C)+B;A-B→
Z;IF ABS Z>R39;
ABS Z→R39F
66:      C+2→C;IF R27>C/2
;GTO -1F
67:      0→CF
68:      "T";1+C→C;R1→A;
IF C=1;1+X;JMP 5
F
69:      IF C=2;2+X;R11→
R11;JMP 5F
70:      IF C=3;R11*-1→R1
1;JMP 4F
71:      IF C=4;GTO "D" F
72:      "E";JMP XF
73:      A+Y→A;R23+R24*A→
B;JMP 2F
74:      A+2Y→A;R23+R24*A
+1→R11→BF
75:      IF A>R3;GTO "T" F
76:      IF B>R2;GTO "E" F
77:      IF B>R4;GTO "E" F
78:      PLT R5-B,A+R6;
PEN ;GTO "E" F
79:      "D";LTR 7.35,4.4
,122;PLT "A, ";
FXD 3;PLT R23F
80:      LTR 7.5,4.4,122;
PLT "B, ";PLT R2
4F
81:      R24R(P25/R17)→R2
6;LTR 7.65,4.4,1
22;PLT "R, ";
FXD 4;PLT R26F
82:      LTR 7.8,4.4,122;
PLT "S, ";FXD 1;
PLT 20ABS R11;
PLT "DB" F
83:      LTR 7.95,4.4,122
;PLT "D, ";PLT 2
0→R39;PLT "DB" F
84:      LTR 8.1,4.4,122;
FXD 0;PLT "N, ";
PLT R27F
85:      LTR 8.25,4.4,122
;FXD 1;PLT "VL,
";PLT TN↑ R7;
PLT "V" F
86:      LTR 8.4,4.4,122;
PLT "VH, ";PLT
TN↑ R8;PLT "V" F
87:      END F
R1137

```

Table 4 HP9820 PROGRAM - TRANSISTOR, LEGEND

```

0:
DSP "TR - LEG";
STP F
1:
ENT "VI,VO,VN",R
2:"MODE",R2,"COD
E";R1;.1+R5;.001
+R6;IF R7=2;1+R5
F
2:
ENT "PLT";R3F
3:
R5+TNT 4+R8;R6*
TNT 5+R4;SCL 0,9
.3,0,6.2F
4:
LTR .35,4,122;
FXD 0;PLT "T-";
PLT R2;PLT "-";
PLT R1;PLT "-";
PLT R3F
5:
1.05+X;.3+Y;1+C;
R4+R;FXD 0F
6:
LTR X,Y,122;PLT
R4F
7:
"M";A/10+R;1+X+X
;1+C+C;IF C>6;
GTO "L" F
8:
IF 1>A;FXD 4F
9:
LTR X,Y,122;PLT
R;GTO "M" F
10:
"L";LTR 4.1,.15,
213;PLT "K (MEAS
URED)" F
11:
6.2+X;.9+Y;1+C;R
5+R;FXD 0;IF 1>R
5;FXD 4F
12:
LTR X,Y,122;PLT
R5F
13:
"O";A+10+R;1+Y+Y
;1+C+C;FXD 0;IF
C>5;GTO "N" F
14:
.03+C+R;IF 1>R;
FXD 4F
15:
LTR X,Y,122;PLT
R;GTO "O" F
16:
"H";6.4+X;2.3+Y;
LTR X,Y,122;PLT
"VBD ";JMP R7F
17:
PLT "(INVOLT)";
JMP 3F
18:
PLT "(OUTVOLT)";
JMP 2F
19:
PLT "(MEAS)" F
20:
1+X;2+Y;0+C;
21:
LTR X,Y,104;PLT
"1";1+Y+Y;1+C+C;
IF C<2;GTO -0F
22:
0+C;1+X+X;
23:
LTR X,Y,203;PLT
"1";1+C+C;1+X+X;
IF C<3;GTO -0F
24:
0+C;6+X;4+Y;
25:
LTR X,Y,102;PLT
"1";1+C+C;Y-1+Y;
IF C<2;GTO -0F
26:
0+C;1+Y;5+X;
27:
LTR X,Y,201;PLT
"1";1+C+C;X-1+X;
IF C<3;GTO -0F
28:
LTR 6,7,2.3,122;
FXD 0;PLT "--TRAN
SISTORS" F
29:
LTR 6,9,.8,122F
30:
INT (R1/1E5)+R2;
INT (R1/1E4)-R2+

```

Table 4 (Continued)

10→R4F	48:
31:	IF A=3;PLT " M
INT (R1/100)-100	ESA "F
INT (R1/1E4)+R8:	49:
(R1/100-INT (R1/	IF A=4;PLT "UNDE
100))100+R6F	FINED "F
32:	50:
R2→A;PLT "(F	IF A=5;PLT " AL
33:	LOY "F
IF A=0;PLT "	51:
"F	IF A=6;PLT "FUSE
34:	D AL. "F
IF A=1;PLT " SIL	52:
ICON "F	IF A=7;PLT "AL.
35:	PLAN. "F
IF A=2;PLT "GERM	53:
ANIUM"F	IF A=8;PLT " DIF
36:	FUSED "F
IF A=3;PLT " F	54:
ET "F	IF A=9;PLT " PL
37:	ANAR "F
R4→A;PLT ")-(F	55:
38:	IF A=10;PLT "DIF
IF A=0;PLT "	F. MESA"F
"F	56:
39:	IF A=11;PLT "PLA
IF A=1;PLT "NPN	N. EP."F
"F	57:
40:	IF A=12;PLT "
IF A=2;PLT "PNP	N8 "F
"F	58:
41:	IF A=13;PLT "DIF
IF A=3;PLT "N-CH	F. GR."F
"F	59:
42:	IF A=14;PLT " F
IF A=4;PLT "P-CH	USED "F
"F	60:
43:	IF A=15;PLT "PLA
IF A=5;PLT "SCR	N.DIFF."F
"F	61:
44:	IF A=16;PLT " G
R8→A;PLT ")-(F	ROWN "F
45:	62:
IF A=0;PLT "	IF A=17;PLT "DIF
"F	F.PLAN."F
46:	63:
IF A=1;PLT " CHO	R6→A;PLT ")-(F
PPER "F	64:
47:	IF A=0;PLT "
IF A=2;PLT " SW	"F
ITCH "F	

Table 4 (Continued)

65:	"E";IF A=1;PLT "	82:	IF A=18;PLT " TO
	T03 "F		1 "F
66:	IF A=2;PLT " T05	83:	PLT "1" F
	"F	84:	0→X;0→Y;0→CF
67:	IF A=3;PLT " T01	85:	"K";LTR 7.2,4.6,
	8 "F		122;PLT "--DATA-"
68:	IF A=4;PLT " T03		F
	6 "F	86:	LTR 7.2,1.1,122;
69:	IF A=5;PLT " T03		PLT "--LEGEND-" F
	9 "F	87:	IF R3=1;PLT "(MA
70:	IF A=6;PLT " T06		TERIAL)-" F
	4 "F	88:	IF R3=2;PLT "(FU
71:	IF A=7;PLT " T07		NCTION)-" F
	8 "F	89:	IF R3=3;PLT "(ST
72:	IF A=8;PLT "THRE		RUCTURE)-" F
	AD" F	90:	IF R3=4;PLT "(PA
73:	IF A=9;PLT " T04		CKAGE)-" F
	8 "F	91:	0→A;.15→X;.8→B;
74:	IF A=10;PLT " TO		IF R3=5;STP F
	72 "F	92:	IF R3=1;GTO "G" F
75:	IF A=11;PLT " TO	93:	IF R3=2;GTO "H" F
	8 "F	94:	IF R3=3;GTO "I" F
76:	IF A=12;PLT " TO	95:	IF R3=4;GTO "J" F
	68 "F	96:	"G";LTR 7.2+X;B;
77:	IF A=13;PLT " TO		122;X+.15→X;A+1→
	11 "F		A;JMP AF
78:	IF A=14;PLT " TO		97:
	70 "F		PLT "1, SILICON"
79:	IF A=15;PLT " TO		;GTO "G" F
	53 "F	98:	PLT "2, GERMANIU
80:	IF A=16;PLT "CAS		M";GTO "G" F
	E 1" F	99:	PLT "3, FET";
81:	IF A=17;PLT " TO		STP F
	32 "F		

Table 4 (Continued)

100:	"H";LTR 7.2+X;B;	116:	PLT "A; DIFF.MES
122;X+.15+X;A+1+		A";GTO "I" F	
A;JMP AF		117:	PLT "C; PLAN. EP
101:	PLT "1; NPN";	.;GTO "I" F	
GTO "H" F		118:	PLT "D; N8";GTO
102:	PLT "2; PNP";	"I" F	
GTO "H" F		119:	PLT "E; DIFF. GR
103:	PLT "3; N-CH";	.;GTO "I" F	
GTO "H" F		120:	PLT "F; FUSED";
104:	PLT "4; P-CH";	GTO "I" F	
GTO "H" F		121:	PLT "H; PLAN. DI
105:	PLT "5; SCR";	FF.";GTO "I" F	
STP F		122:	PLT "J; GROWN";
106:	"I";LTR 7.2+X;B;	GTO "I" F	
122;X+.15+X;A+1+		123:	PLT "K; DIFF. PL
A;JMP AF		AN.";STP F	
107:	PLT "1; CHOPPER"	124:	"J";LTR 7.2+X;B;
;GTO "I" F		122;X+.15+X;A+1+	
108:	PLT "2; SWITCH";	A;JMP AF	
GTO "I" F		125:	PLT "1; T03";
109:	PLT "3; MESA";	GTO "J" F	
GTO "I" F		126:	PLT "2; T05";
110:	PLT "4; UNDEFINE	GTO "J" F	
D";GTO "I" F		127:	PLT "3; T018";
111:	PLT "5; ALLOY";	GTO "J" F	
GTO "I" F		128:	PLT "4; T036";
112:	PLT "6; FUSED AL	GTO "J" F	
LOY";GTO "I" F		129:	PLT "5; T039";
113:	PLT "7; AL.PLAN";	GTO "J" F	
;GTO "I" F		130:	PLT "6; T064";
114:	PLT "8; DIFFUSED	GTO "J" F	
"GTO "I" F		131:	PLT "7; T078";
115:	PLT "9; PLANAR";	GTO "J" F	
2.6+B;.15+X;GTO			
"I" F			

Table 4 (Continued)

132:
PLT "8, THREAD";
GTO "J" F
133:
PLT "9, T048";
6*B; .15*X; GTO "J"
" F
134:
2.6*B; PLT "A, T0
72"; GTO "J" F
135:
PLT "C, T08";
GTO "J" F
136:
PLT "D, T066";
GTO "J" F
137:
PLT "E, T011";
GTO "J" F
138:
PLT "F, T070";
GTO "J" F
139:
PLT "H, T053";
GTO "J" F
140:
PLT "J, CASE 1";
GTO "J" F
141:
PLT "K, T032";
GTO "J" F
142:
PLT "L, T01";
STP F
143:
END F
R1036

Table 5 HP9820 PROGRAM - DIODE, K VS. V_{BD}

```

0:
DSP "DI-K/V";
STP F
1:
ENT "VI,VM":R26,
"MODE":R28,"CODE
":R25,"PLT":R17;
1→R1;01→R2F
2:
4→R7;5→R8;R1*
TH↑ R7→R3;R2*
TH↑ R8→R4F
3:
ENT "START":R29,
"STOP":R22;1-
LOG R1→R6;ABS
INT LOG R4+1→R5F
4:
SCL 0,9,8,0,6,2;
PLT 1,1;PLT 1,5;
PLT 6,5;PLT 6,1;
PLT 1,1;PEN F
5:
LTR .2,4,122;
PLT "D-":FXD 0;
PLT R28;PLT "-";
PLT R25;PLT "-";
PLT R17F
6:
"P":LOG R4→R4;
LOG R2→R2;LOG R3
→R3;LOG R1→R1;5E
3→R7;0→R8F
7:
0→C;0→R18;0→R19;
0→R20;0→R21;0→A;
0→B;0→R30F
8:
"K":LDF R29,R31F
9:
IF R26=1;R34→ZF
10:
IF R26=2;R36→ZF
11:
IF Z=0;GTO "S"F
12:
IF R33>1000;GTO
"S"F
13:
LOG Z→Y;LOG R33→
XF
14:
INT (R31/1E4)1E4
→R10;(INT (R31/1
E3)-R10/1E3)1E3→
R12F
15:
INT (R31/100)100
-(R10+R12)→R14;R
31-INT (R31/100)
100→R16F
16:
JMP R28F
17:
IF R25=R10;GTO "
R"F
18:
IF R25=R12;GTO "
R"F
19:
IF R25=R14;GTO "
R"F
20:
IF R25=R16;GTO "
R"F
21:
IF R25=R10+R12;
GTO "R"F
22:
IF R25=R10+R14;
GTO "R"F
23:
IF R25=R10+R16;
GTO "R"F
24:
IF R25=R12+R14;
GTO "R"F
25:
IF R25=R12+R16;
GTO "R"F
26:
IF R25=R14+R16;
GTO "R"F
27:
IF R25=R10+R12+R
14;GTO "R"F
28:
IF R25=R10+R12+R
16;GTO "R"F
29:
IF R25=R10+R14+R
16;GTO "R"F

```

Table 5 (Continued)

```

30:
IF R25=R12+R14+R
16:GTO "R" F
31:
IF R25=R31:GTO "
R" F
32:
IF R25=0:GTO "R"
F
33:
"8":R29+1+R29:
IF R29<R22:GTO "
K" F
34:
C>R27:GTO "X" F
35:
"R":LTR R5-X+.03
,Y+R6-.05,122F
36:
IF R7>Y:Y+R7F
37:
IF Y>R8:Y+R8F
39:
JMP R17F
39:
PLT R10/1E4:GTO
"V" F
40:
PLT R12/1E3:GTO
"V" F
41:
R14/100+Z:JMP 3F
42:
R16+Z:JMP 2F
43:
PLT "0":GTO "V" F
44:
IF Z<9:PLT Z:
GTO "V" F
45:
IF Z>9:Z-9+Z:
JMP 2F
46:
PLT "A":GTO "V" F
47:
PLT "C":GTO "V" F
48:
PLT "D":GTO "V" F
49:
PLT "E":GTO "V" F

```

```

50:
PLT "F":GTO "V" F
51:
PLT "H":GTO "V" F
52:
"V":IF C<39:C+2+
Z:Y+R(40+Z):Y+R(
41+Z)F
53:
Y+R19+R18:Y+R19+
R19:Y+Y+R20+R20:
Y+X+R21+R21:Y+X+
R30+R30F
54:
1+C+C:IF C=35:0+
A+.35+B F
55:
IF C=69:0+A+.7+B
F
56:
.15+A+A:LTR .9+A
,5.05+B,122:FxD
0:PLT R29:GTO "S
" F
57:
"X":0+C:R27*R20-
R18*R18+A:(R19+R
20-R18*R21)/A+R2
3F
58:
(R27*R21-R18*R19
)/A+R24+.200S
ATN ABS R24+YF
59:
(R20-R18*R18/R27
)/(R27-1)+R25:(R
30-R19*R19/R27)/
(R27-1)+R17F
60:
(R27-1)(R17-R24*
R24*R25)/(R27-2)
+R11:(1+1/R27+R15
)/R18/R27+R9F
61:
0+R39:IF R27>40:
GTO "T" F
62:
R23+R24+R(41+C)+
A:R(40+C)+B:A-B+
Z:IF ABS Z>R39:
ABS Z+R39F

```

Table 5 (Continued)

63:	C+2+C; IF R27>C/2	PLT " DB" F
	;GTO -1F	80:
64:	0+CF	LTR 7.95,4.4,122
65:	"I";1+C>C;R1+A;	;PLT "D, ";PLT 2
	IF C=1;1+X;JMP 5	0*ABS R39;PLT "
	F	DB" F
66:	IF C=2;2+X;R11+	81:
	R11;JMP 5F	LTR 8.1,4.4,122;
67:	IF C=3;R11*-1+R1	FXD 0;PLT "H, ";
	1;JMP 4F	PLT R27F
68:	IF C=4;GTO "D" F	82:
69:	"E";JMP XF	LTR 8.25,4.4,122
70:	A+Y+A;R23+R24*A+	;FXD 1;PLT "VL,
	B;JMP 2F	"PLT TN+ R7;
71:	A+2Y+A;R23+R24*A	PLT " V" F
	+R11+B F	83:
72:	IF A>R3;GTO "T" F	LTR 8.4,4.4,122;
73:	IF B<R2;GTO "E" F	PLT "VH, ";PLT
74:	IF B>R4;GTO "E" F	TN+ R8;PLT " V" F
75:	PLT R5-B, A+R6;	84:
	PEN ;GTO "E" F	END F
76:	"D";LTR 7.35,4.4	R1139
	,122;PLT "A, ";	
	FXD 3;PLT R23F	
77:	LTR 7.5,4.4,122;	
	PLT "B, ";PLT R2	
	4F	
78:	R24F(R25/R17)+R2	
	6;LTR 7.65,4.4,1	
	22;PLT "R, ";	
	FXD 4;PLT R26F	
79:	LTR 7.8,4.4,122;	
	PLT "S, ";FXD 1;	
	PLT 2*ABS R11;	

Table 6 HP9820 PROGRAM - DIODE, LEGEND

```

0:
DSP "DI - LEG";
STP F
1:
ENT "V1,VH",R7+
MODE",R2;"CODE";
N1:1+R5; 0:1+R6F
2:
ENT "PLT";R3F
3:
R5+TNT 4+R8;R6+
TNT 5+R4;SCL 0;9
.8;0:6.2F
4:
LTR .35,4,122;
FXD 0;PLT "D-";
PLT R2;PLT "-";
PLT R1;PLT "-";
PLT R3F
5:
1.05+X;.3+Y;1+C;
R4+A;FXD 0F
6:
LTR X,Y,122;PLT
R4F
7:
"N";A/10+A;1+X+X
;1+C+C;IF C>6;
GTO "L" F
8:
IF 1>A;FXD 4F
9:
LTR X,Y,122;PLT
A;GTO "M" F
10:
"L";LTR 4.1,.15,
213;PLT "K (MEAS
URED)" F
11:
6.2+X;.9+Y;1+C;R
5+A;FXD 0;IF 1>R
5;FXD 4F
12:
LTR X,Y,122;PLT
R5F
13:
"0";A*10+A;1+Y+Y
;1+C+C;FXD 0;IF
C>5;GTO "N" F
14:
.03*C>B;IF 1>A;
FXD 4F
15:
LTR X,Y,122;PLT
A;GTO "O" F
16:
"N";6.4+X;2.5+Y;
LTR X,Y,122;PLT
"VBD ";JMP R7F
17:
PLT "(VOLT)";
JMP 3F
18:
PLT "(MEAS)";
JMP 2F
19:
PLT "(MEAS)" F
20:
1+X;2+Y;0+C;
21:
LTR X,Y,104;PLT
"1";1+Y+Y;1+C+C;
IF C<2;GTO -0F
22:
0+C;1+X+XF
23:
LTR X,Y,203;PLT
"1";1+C+C;1+X+X;
IF C<3;GTO -0F
24:
0+C;6+X;4+YF
25:
LTR X,Y,102;PLT
"1";1+C+C;Y-1+Y;
IF C<2;GTO -0F
26:
0+C;1+Y;5+XF
27:
LTR X,Y,201;PLT
"1";1+C+C;X-1+X;
IF C<3;GTO -0F
28:
LTR 6.7,2.8,122;
FXD 0;PLT "--DIOD
ES-" F
29:
LTR 6.9,.6,122F
30:
INT (R1/1E4)+R2;
INT (R1/1E3)-R2*
10+R4F

```

Table 6 (Continued)

31:	INT (R1/100)-10	48:	IF A=3:PLT "DIFF
	INT (R1/1E3)+R8;		USED"F
	(R1/100-INT (R1/	49:	IF A=4:PLT "PLAN
	100))100+R6F		. DIFF."F
32:	R2+A:PLT "(F	50:	IF A=5:PLT "PT.
33:	IF A=0:PLT "		CONT."F
	"F	51:	IF A=6:PLT " ALL
34:	IF A=1:PLT " SIL		07 "F
	ICON "F	52:	IF A=7:PLT "DIFF
35:	IF A=2:PLT "GERM		. MESA"F
	ANIUM"F	53:	R6+A:PLT ")-(F
36:	IF A=3:PLT "UNDE	54:	IF A=0:PLT "
	FINED"F		"F
37:	R4+A:PLT ")-(F	55:	"E";IF A=1:PLT "
38:	IF A=0:PLT "		D03 "F
	"F	56:	IF A=2:PLT " D04
39:	IF A=1:PLT "GEN.		"F
	PURP."F	57:	IF A=3:PLT " D05
40:	IF A=2:PLT "REFE		"F
	RENCE"F	58:	IF A=4:PLT " D07
41:	IF A=0:PLT:"SULT		"F
	CH"F	59:	IF A=5:PLT " D01
42:	IF A=4:PLT "ZENE		3 "F
	R"F	60:	IF A=6:PLT " D01
43:	IF A=5:PLT "MICR		4 "F
	O MIXER"F	61:	IF A=7:PLT " D02
44:	R8+A:PLT ")-(F		9 "F
45:	IF A=0:PLT "	62:	IF A=8:PLT " D03
	"F		5 "F
46:	IF A=1:PLT "UNDE	63:	IF A=9:PLT " D04
	FINED"F		1 "F
47:	IF A=2:PLT "PLAN	64:	IF A=10:PLT "AXI
	AK"F		AL "F

Table 6 (Continued)

```

65:      122;X+.15;A+1;
IF A=11;PLT "
A;JMP AF
84:      PLT "1, SILICON"
81:      "F
;GTO "G"
66:      IF A=12;PLT " TO
85:      "F
;GTO "G"
18:      IF A=13;PLT "THR
86:      "F
EAD"
PLT "2, GERMANIU
67:      "F
M";GTO "G"
68:      IF A=14;PLT " MI
87:      "F
SC "
PLT "3, UNDEFINE
69:      IF A=15;PLT "CAS
D";STP F
E 1"
70:      "F
PLT "1, GENERAL
71:      "F
PURPOSE";GTO "H"
0+X;0+Y;0+C
72:      "F
"K";LTR 7.2;4.6;
88:      "F
122;PLT "--DATA-"
PLT "1, GENERAL
73:      "F
LTR 7.2;1.1;122;
PURPOSE";GTO "H"
PLT "--LEGEND-"
74:      "F
IF R3=1;PLT "(MA
89:      "F
TERIAL)-"
PLT "2, REFERENC
75:      IF R3=2;PLT "(FU
E";GTO "H"
NCTION)-"
76:      IF R3=3;PLT "(ST
90:      "F
RUCTURE)-"
PLT "3, SWITCH";
77:      IF R3=4;PLT "(PA
GTO "H"
CKAGE)-"
91:      IF R3=4;PLT "(PA
92:      "F
CKAGE)-"
PLT "4, ZENER";
78:      0;A;.15;X;.8;B;
GTO "H"
IF R3=5;STP F
93:      IF R3=5;STP F
94:      "F
IF R3=1;GTO "G"
95:      "F
80:      IF R3=2;GTO "H"
PLT "5, MICRO MI
81:      IF R3=3;GTO "I"
XER";STP F
96:      IF R3=4;GTO "J"
97:      "F
82:      "F
98:      IF R3=4;GTO "J"
99:      "F
83:      "G";LTR 7.2+X;B;
122;X+.15;A+1;
A;JMP AF
84:      PLT "1, SILICON"
;GTO "G"
85:      PLT "2, GERMANIU
M";GTO "G"
86:      PLT "3, UNDEFINE
D";STP F
87:      "H";LTR 7.2+X;B;
122;X+.15;A+1;
A;JMP AF
88:      PLT "1, GENERAL
PURPOSE";GTO "H"
F
89:      PLT "2, REFERENC
E";GTO "H"
90:      PLT "3, SWITCH";
GTO "H"
91:      PLT "4, ZENER";
GTO "H"
92:      PLT "5, MICRO MI
XER";STP F
93:      "I";LTR 7.2+X;B;
122;X+.15;A+1;
A;JMP AF
94:      PLT "1, UNDEFINE
D";GTO "I"
95:      PLT "2, PLANAR";
GTO "I"
96:      PLT "3, DIFFUSED
";GTO "I"
97:      PLT "4, PLANAR D
IFFUSED";GTO "I"
F
98:      PLT "5, POINT CO
NTACT";GTO "I"

```

Table 6 (Continued)

```

99:
PLT "6, ALLOY";
GTO "I" F
100:
PLT "7, DIFFUSED
MESA"; STP F
101:
"J"; LTR 7.2+X; B;
122; X+.15+X; A+1+
A; JUMP AF
102:
PLT "1, D03";
GTO "J" F
103:
PLT "2, D04";
GTO "J" F
104:
PLT "3, D05";
GTO "J" F
105:
PLT "4, D07";
GTO "J" F
106:
PLT "5, D013";
GTO "J" F
107:
PLT "6, D014";
GTO "J" F
108:
PLT "7, D029";
GTO "J" F
109:
PLT "8, D035"; 2.
6+8; .15+X; GTO "J
" F
110:
PLT "9, D041";
GTO "J" F
111:
2.6+8; PLT "A, AX
IAL"; GTO "J" F
112:
PLT "C, A1"; GTO
"J" F
113:
PLT "D, T018";
GTO "J" F
114:
PLT "E, THREAD";
GTO "J" F
115:
PLT "F, MISC.";
GTO "J" F
116:
PLT "H, CASE 1";
GTO "J" F
117:
F
118:
END F
R1102

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