



APPENDIX A

SPECIFICATIONS OF SEMICONDUCTOR DEVICES

INTRODUCTION

Data sheets published by the semiconductor device manufacturer specify the electrical characteristics of each type of device. The data sheet establishes the communication link between the manufacturer and the user. The information provided by the manufacturer must be recognized and correctly interpreted by the user. It can avoid device failures and give optimum performance.

Here, the specification sheets of some of the commonly used PN Junction Diode, Zener Diode, Varactor Diode, Tunnel Diode, Photo Diode, BJT–NPN Small Signal Transistor, BJT–PNP Small Signal Transistor, N-Channel JFET, P-Channel JFET, Power MOSFET, Small Signal MOSFET and UJT are given in the following Tables.

Table A.1 PN Junction Diode

Parameters <i>Type</i>	V_R (max) (V)	I_R (max) (mA)	Continuous		Peak		Reverse recovery (ns)	Capacitance (10 V) (pF)	Class	Comments
			V_F (V)	I_F (mA)	V_F (V)	I_F (A)				
IN4002	100	50	0.9	1000	2.3	25	3500	15	1-amp rect	Indus std; 7-member family Silicon
IN4007	1000	50	0.9	1000	2.3	25	5000	10		Silicon
OA79	30	1.5 to 150	1.2 to 3.8	35	1.4 to 4.0	100	—	—	Detector Circuits	Germanium
BY126	650	10	—	—	1.5	5	—	—	Television receivers	Silicon
BY127	1250	10	—	—	1.5	5	—	—	Television receivers	Silicon
DR-25	25	200	—	—	1000 (mV)	250	—	—	Low power rectifier	Germanium
DS-10	10	500	—	—	22.5	20	—	—	Stabilizing element	Germanium
IN4148	75	0.025	1	10	1	200	4	4	Small Signal	Silicon
IN5404	400	5	—	—	1.1	3	—	—	GP rectifier	Silicon
IN5408	1000	5	—	3	1.1	3	—	—	GP rectifier	Silicon

Table A.2 Zener Diode

<div>Parameter</div> <div>Type</div>	<div>Volt V_Z @</div> <div>IZT (Volt)</div>	<div>Watts</div>	<div>Test Current IZT (mA)</div>
IN4728	3.3	1	—
IN4732	4.7	1	53
IN4734	5.6	1	45
IN4736	6.8	1	37
IN4740	10	1	25
IN4742	12	1	21
IN4744	15	1	17
IN4747	20	1	12.5
IN4749	24	1	10.5
IN4751	30	1	8.5
IN750	4.7	0.4	20
IN752	5.6	0.4	20
IN754	6.8	0.4	18.5
IN755	7.5	0.4	16.5
IN758	10	0.4	14.0
IN759	12	0.4	11.5
IN965	15	0.4	9.5
IN968	20	0.4	7.0
IN970	24	0.4	5.6
IN972	30	0.4	5.3

Table A.3 Varactor Diode

<div>Parameter</div> <div>Type</div>	<div>Reverse</div> <div>breakdown</div> <div>voltage</div> <div>(min)</div> <div>(Volts)</div>	<div>Reverse</div> <div>leakage</div> <div>current</div> <div>(max)</div> <div>(nA)</div>	<div>Operating</div> <div>temperature</div> <div>range</div> <div>°C</div>	<div>Nominal</div> <div>capacitance</div> <div>pF</div>	<div>Minimum</div> <div>Q (figure</div> <div>of merit)</div>	<div>Tuning ratio</div> <div>Min. Max.</div>	
ZC830B (SMT)	25	20	−55°C to +150°C	10	300	4.5	60
SOD 323 (SMT)	30	20 at $T_A = 25^\circ\text{C}$	−55°C to +125°C	—	—	—	—
SOD 123 (SMT)	30	10 at $T_A = 25^\circ\text{C}$	−55°C to +125°C	19.5	—	—	—
BB139	30	50	−55°C to +150°C	6.3	150	—	—

Table A.4 Tunnel Diode

Parameter Type	Maximum reverse voltage (Volts)	Maximum forward current (mA)	Maximum dissipation at 25°C (mW)	Maximum reverse leakage current at 10 V (nA)	Series inductance (nH)	Q at 2V dc	Applications
MV1403	12	250	400	10	6	200	AM broadcast band, general A.F.C. and tuning applications in lower RF frequencies AFC applications in Radio, TV and general electronic tuning.
MV1600	20	250	400	100	4	—	

Table A.5 Photo Diode

Parameter Type	Light Current		$V_{(BR)}$		Dark Current		Response Time
	μA typ	@ V_R Volts	H W/cm ²	Volts (min)	nA (max)	@ Volts	ns Typ
MRD 500	9.0	20	5.0	100	2.0	20	1.0
MRD 510	2.0	20	5.0	100	2.0	20	1.0
MRD 721	4.0	20	5.0	100	10	20	1.0

Table A.6(a) BJT-NPN Small Signal Transistor

Parameter Type	I_C (max) (mA)	P_D (max) (mW)	V_{CEO} (max) (Volts)	V_{CBO} (max) (Volts)	H_{fe} (min-max) @ I_C (mA)	V_{CE}	F_T @ MHz	Complement	Applications
BC107	100	300	45	50	110-450@2	5	300	BC177	Audio driver
BC108	100	300	20	30	110-800@2	5	300	BC178	General purpose
BC109	100	300	20	30	200-800@2	5	300	BC179	Low noise audio
BC547	100	625	45	50	110-800@2	5	300	BC557	Amplifier
BC548	100	625	30	30	110-800@2	5	300	BC558	Amplifier
BC549	100	625	30	30	110-800@2	5	250	BC559	Low noise audio
2N2369A	200	360	15	40	20(min)@100	1	500(min)	—	High speed switch
2N3904	200	350	40	60	100-300@10	1	300(min)	2N3906	Low level amp.
2N4401	600	350	40	60	100-300@150	2	250(max)	2N4403	General purpose
2N3053	700	5.0W	40	60	50-250@150	10	100	—	General purpose
2N2222A	800	500	40	75	100-300@150	10	300	—	High speed switch
BFY50	1000	2800	35	80	30(min)@150	10	60(min)	—	General Purpose
BUY82	10000	30W	60	150	40(min)@1.5A	5	60	—	High power switch
2N3055	15A	115W	60	70	20-70@4A	1.1	0.8	BDY 20	O/P - SW
2N916		360	25	45	50-200@10	0.5	300	2N2222A	

(Contd.)

Table A.6(a) (Contd.)

<div>Parameter</div> <div>Type</div>	I_C (max) (mA)	P_D (max) (mW)	V_{CEO} (max) (Volts)	V_{CBO} (max) (Volts)	H_{fe} (min-max) @ I_C (mA)	V_{CE}	F_T @ MHz	Complement	Applications
2N2369		360		40	40-120@10	0.35	500	—	
2N3040		360	30	40	40-160@150	0.20	50	2N3040	For IF amplifier
BF184	30	145	20	30	75 to 750	10 V	300	—	Low noise AM and FM applications
BF185	30	145	20	30	67	10 V	220	—	
BF195	30	250	20	30	67	10 V	200	—	
SL100	500	800	50	60	50-280	7 V	—	SK100	AM for receivers Class B push pull stage
PT4	2 Amps	4W	20	32	80-320	10 V	3	PT6	Amplifier and Radio receivers
AC176	1 Amp	155 mW	32	32	83	—	Mc/S	AC128	Radio receivers, Tape recording
BF115	30	145 mW	30	50	45-165	—	230	—	Gen. Broadcast and television

Table A.6(b) BJT–PNP Small Signal Transistor

Parameter Type	V_{CE} (Volts)	V_{CB} (Volts)	I_C (mA)	$V_{ces}@I_C$	$H_{fe}@I_C$	$F_T@I_{Mhz}$	P to t (mW)	Use	Comparable Types
BC157	-45	-50	-100	-0.25 10	75-260	2 150	300	S.S. Amp	BC177, BC212, BC307
BC158	-25	-30	-100	0.25 10	75-500	2 150	300	S.S. Amp	BC175, BC308
BC159	-20	-25	-100	-0.25 10	125-500	2 150	300	S.S. Amp	BC179 BC309
BC557	-45	-50	-100	—	110-300	2 150	500	4p. small sig.	BC157 DS557
BC558	-30	-30	-100	—	75	2 150	500	4p. small sig.	BC158 DS558
AF115	-32	-32	-10	—	150	75	75	RF. Amp, mixer oscillator in S.W. receivers	AF125 AF200
2N2904	-40	-60	-0.6 A	—	20-40	200	0.6 W	Switching & driving applications	—
AD162	-20	-32	-2 A	-1 v	50-300	1.5	6 W	Audio matched pair	—
BC177	-45	-50	-100	-5 v	175-500	200	300 mW	Audio driver	BC 107

Table A.7(a) N-Channel JFET (Absolute Maximum Rating at 25°C)

Parameter	Gate Source voltage V_{GS} (Volts)	Drain- Gate voltage V_{DG} (Volts)	Drain- Source voltage V_{DS} (Volts)	Forward Gate current I_{GF} (mA)	Device Dissipation P_D (mW)	Storage Temperature Range (°C)	Common uses	Features
Type								
BFW10	-30	-30	±30	10	300	-65° to 200°C	UHF amplifiers	Low Capacitance High Transconductor
BFW11	-30	-30	±30	10	300	-65° to 200°C	UHF amplifiers	Low Capacitance High Transconductor

Table A.7(b) P-Channel JFET (Absolute Maximum Rating at 25°C)

Parameter	Gate Source voltage V_{GS} (Volts)	Drain- Gate voltage V_{DG} (Volts)	Drain- Source voltage V_{DS} (Volts)	Forward Gate current I_{GF} (mA)	Device Dissipation P_D (mW)	Storage Temperature Range (°C)	Common uses	Features
Type								
E174	30	30	±30	10	350	-55°C to +150°C	Analog switches choppers commutators	Low cost Low on resistance Fast switching speed
2N5018	30	30	±30	10	300	-65°C to +200°C	Digital switch, sample and hold multiplexers	Low on resistance, High speed switch

Table A.8(a) Power MOSFET

Parameter Type	$V_{(BR)}$ Volts mini.	DSS max.	V_{DS} (ohms) max.	I_D (Amps)	I_D Continuous (Amps) max.	P_D $T_C = 25^\circ\text{C}$ watts
MTM6N55	550		1.2	3	6.0	150
2N6762	500		1.5	3	4.5	75
2N6760	400		1	3.5	5.5	75
2N6758	200		0.4	6	9	75
2N6757	150		0.6	5	8	75

Table A.8(b) Small Signal MOSFET

Parameter Type	$V_{(BR)}$ Volts mini.	DSS Volts mini.	V_{DS} (ohms) max.	I_D (Amps)	I_D Continuous (Amps) max.	P_D $T_C = 25^\circ\text{C}$ watts
BS107	200		14	0.2	0.25	0.6
BS170	200		5	0.2	0.50	0.6
2N6661	90		4	1	2	6.25

Table A.9 Uni Junction Transistor (Absolute Maximum Rating at 25°C)

Parameter	Emitter-Base two reverse voltage V_{EB2} (v)	Inter-base voltage V_{BB} (v)	Continuous emitter current I_E (mA)	Peak-emitter current I_P (A)	Continuous device dissipation at (or below) 25°C (mW)	Storage temperature range	Lead temperature 1/16 inch from the case for 10 seconds
2N2646	-30	35	50	2	300	-65 to 150°C	260°C
2N2647	-30	35	50	2	300	-65 to 150°C	260°C
MU10	30	35	50	1.0	300	-65 to 150°C	—

Table A.10 SCR

Parameter Type	Repetitive Reverse Voltage (Max.) V_{RRM} in Volts	Forward Current (RMS) I_T (RMS) in Amp.	Forward Current (Average) I_T (AV) in Amp.	Non-Repetitive Surge Current (Max.) I_{TSM} in Amp.	Gate Power (Max.) P_{GM} in Watts	Forward Gate Current (Max.) I_{GM} in Amp.	Reverse Gate Voltage (Max.) V_{RGM} in Volts	Operating Junction Temp. T_j in °C
MCR 106	30	4.0	2.55	25	0.5	0.2	6.0	-40 to +110
MCR 115	150	0.8	—	—	0.1	1.0	5.0	-40 to +110
C 106A	100	4.0	2.55	20	0.5	0.2	6.0	-40 to +110
TY 6004	50	8.0	—	—	5.0	2.0	—	-40 to +125

Table A.11 TRIAC

Parameter Type	Repetitive off state Voltage (Max.) V_{DRM} in Volts	On state Current (RMS) I_T (RMS) in Amp.	Surge Current (Max.) I_T (SM) in Amp.	Gate Power (Max.) P_{GM} in Watts	Gate Power (Average) P_G (AV) in Watts	Gate Voltage (Max.) V_{GM} in Volts	Operating Junction Temp. T_j in °C	Storage Temp. T_{sig} in °C
Q4004	25	4.0	30	10	0.5	5.0	-40 to +110	-40 to +150
2N6157	200	30	250	20	0.5	—	-65 to +125	-65 to +150
MAC228-2	50	8.0	80	20	0.5	±10	-40 to +110	-40 to +150
BT136	600	4.0	—	—	—	1.5	-40 to +110	-40 to +150

Table A.12 DIAC

<i>Parameter</i>	<i>Switching Voltage</i>	<i>Switching Current</i>
<i>Type</i>	<i>V_s in Volts</i>	<i>I_S in μA</i>
IN 5758	20 \pm 4.0	100
IN 5760	28 \pm 4.0	100
IN 5761	32 \pm 4.0	100
IN 5762	36 \pm 4.0	100
IN 5758A	20 \pm 2.0	25

Table A.13 Photo Transistor

<i>Parameter</i>	<i>Light Current in mA at</i> <i>V_{CE} = 5 V</i>		<i>Dark Current</i> <i>(Max.) at</i> <i>V_{CE} = 30 V</i>	<i>Power</i> <i>Dissipation</i> <i>in milli Watts</i>
<i>Type</i>	<i>Min.</i>	<i>Max.</i>		
IN 5722	0.5	3.0	25 nA	50
IN 5723	2.0	5.0	25 nA	50
IN 5724	4.0	8.0	25 nA	50
TIL 601	0.5	3.0	25 nA	50
TIL 602	2.0	5.0	25 nA	50
TIL 603	4.0	8.0	25 nA	50