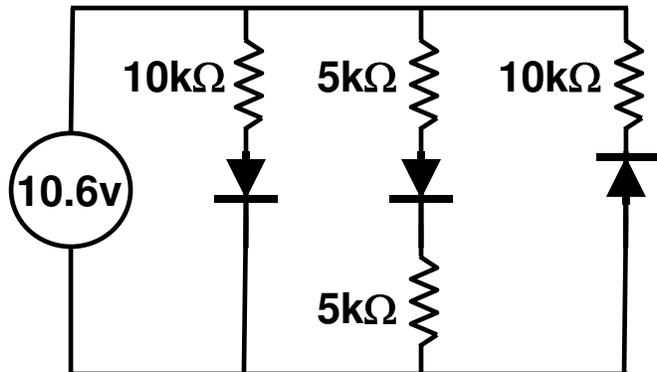


## HW4, PHYSICS 127A

Most problems are embedded in text of Horowitz and Hill textbook.  
 Additional Exercises are at end of chapter.

1. Compute the voltages and currents for the diode circuit on the right.

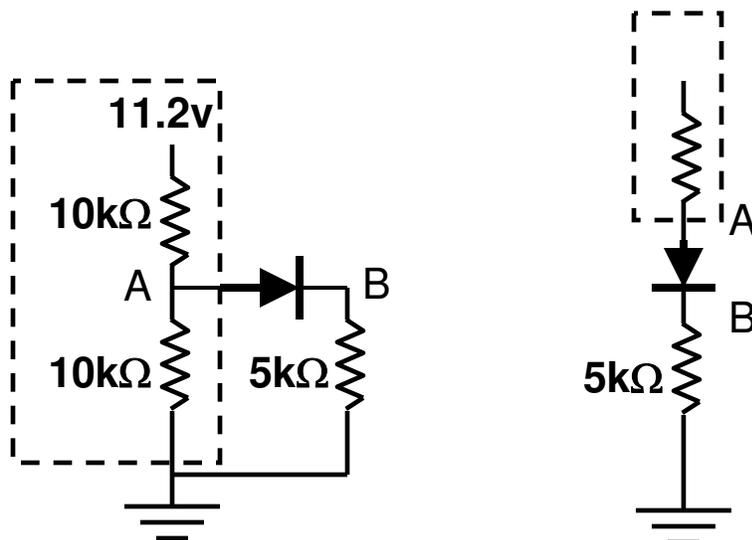


2. HH Ad. Ex. Ch. 1, pblm. (7). (Diode limiter).

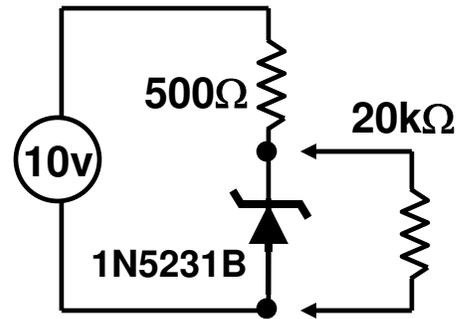
3. HH 1.29 (Battery Charger)

4. HH 1.27 (Full wave rectifier supply).

5. Solve the currents and voltages for the diode circuit below, which we will use later to understand transistors. Note: The symbol 11.2v refers to a 11.2 volt supply connected with respect to ground (0 volts), which is the bottom symbols with 3 horizontal lines. (Hint: Transform the circuit in the dotted box into its Thevenin equivalent at the right.)



6. (a) Find the output voltage of this zener diode source. From the table in the data sheet attached to the end of this file, find the zener voltage specifications for the 1N5231B part.
- (b) What is the current flowing through the zener diode?
- (c) Using Figs. 8 and 10 of the data sheet, estimate the output resistance of the source.
- (d) Calculate the drop in the output voltage if a  $20\text{ k}\Omega$  resistor is placed across the output.



## Small Signal Zener Diodes

### Features

- Silicon Planar Power Zener Diodes
- Standard Zener voltage tolerance is  $\pm 5\%$
- These diodes are also available in Mini-MELF case with the type designation TZM5221 ...TZM5267, SOT-23 case with the type designation MMBZ5225 ...MMBZ5267 and SOD-123 case with the types designation MMSZ5225 ...MMSZ5267
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



94 9367

### Applications

- Voltage stabilization

### Mechanical Data

**Case:** DO-35 Glass case

**Weight:** approx. 125 mg

**Packaging codes/options:**

TAP / 10 k per Ammopack (52 mm tape), 30 k/box

TR / 10 k per 13" reel, 30 k/box

### Absolute Maximum Ratings

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

Parameter	Test condition	Symbol	Value	Unit
Power dissipation	$T_L \leq 25\text{ }^{\circ}\text{C}$	$P_V$	500	mW
Z-current		$I_Z$	$P_V/V_Z$	mA

### Thermal Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

Parameter	Test condition	Symbol	Value	Unit
Thermal resistance junction to ambient air	$l = 4\text{ mm}$ , $T_L = \text{constant}$	$R_{thJA}$	300	K/W
Junction temperature		$T_j$	175	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	- 65 to + 175	$^{\circ}\text{C}$

### Electrical Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	$I_F = 200\text{ mA}$	$V_F$			1.1	V

# 1N5221B to 1N5267B



Vishay Semiconductors

## Electrical Characteristics

1N5221B...1N5267B

Partnumber	Nominal Zener Voltage <sup>1)</sup>	Test Current $I_{ZT}$	Maximum Dynamic Impedance <sup>1)</sup> $Z_{ZT}$ at $I_{ZT}$	Maximum Dynamic Impedance $Z_{ZK}$ at $I_{ZK} = 0.25$ mA	Typical Temperature of Coefficient at $I_{ZT}$	Maximum Reverse Leakage Current	
	at $I_{ZT}$ , $V_Z$					$I_R$	$V_R$
	V					$\mu$ A	V
1N5221B	2.4	20	30	1200	- 0.085	100	1
1N5222B	2.5	20	30	1250	- 0.085	100	1
1N5223B	2.7	20	30	1300	- 0.080	75	1
1N5224B	2.8	20	30	1400	- 0.080	75	1
1N5225B	3	20	29	1600	- 0.075	50	1
1N5226B	3.3	20	28	1600	- 0.070	25	1
1N5227B	3.6	20	24	1700	- 0.065	15	1
1N5228B	3.9	20	23	1900	- 0.060	10	1
1N5229B	4.3	20	22	2000	+ 0.055	5	1
1N5230B	4.7	20	19	1900	+ 0.030	5	2
1N5231B	5.1	20	17	1600	+ 0.030	5	2
1N5232B	5.6	20	11	1600	+ 0.038	5	3
1N5233B	6	20	7	1600	+ 0.038	5	3.5
1N5234B	6.2	20	7	1000	+ 0.045	5	4
1N5235B	6.8	20	5	750	+ 0.050	3	5
1N5236B	7.5	20	6	500	+ 0.058	3	6
1N5237B	8.2	20	8	500	+ 0.062	3	6.5
1N5238B	8.7	20	8	600	+ 0.065	3	6.5
1N5239B	9.1	20	10	600	+ 0.068	3	7
1N5240B	10	20	17	600	+ 0.075	3	8
1N5241B	11	20	22	600	+ 0.076	2	8.4
1N5242B	12	20	30	600	+ 0.077	1	9.1
1N5243B	13	9.5	13	600	+ 0.079	0.5	9.9
1N5244B	14	9	15	600	+ 0.082	0.1	10
1N5245B	15	8.5	16	600	+ 0.082	0.1	11
1N5246B	16	7.8	17	600	+ 0.083	0.1	12
1N5247B	17	7.4	19	600	+ 0.084	0.1	13
1N5248B	18	7	21	600	+ 0.085	0.1	14
1N5249B	19	6.6	23	600	+ 0.086	0.1	14
1N5250B	20	6.2	25	600	+ 0.086	0.1	15
1N5251B	22	5.6	29	600	+ 0.087	0.1	17
1N5252B	24	5.2	33	600	+ 0.088	0.1	18
1N5253B	25	5	35	600	+ 0.089	0.1	19
1N5254B	27	4.6	41	600	+ 0.090	0.1	21
1N5255B	28	4.5	44	600	+ 0.091	0.1	21
1N5256B	30	4.2	49	600	+ 0.091	0.1	23
1N5257B	33	3.8	58	700	+ 0.092	0.1	25
1N5258B	36	3.4	70	700	+ 0.093	0.1	27
1N5259B	39	3.2	80	800	+ 0.094	0.1	30
1N5260B	43	3	93	900	+ 0.095	0.1	33
1N5261B	47	2.7	105	1000	+ 0.095	0.1	36
1N5262B	51	2.5	125	1100	+ 0.096	0.1	39
1N5263B	56	2.2	150	1300	+ 0.096	0.1	43
1N5264B	60	2.1	170	1400	+ 0.097	0.1	46

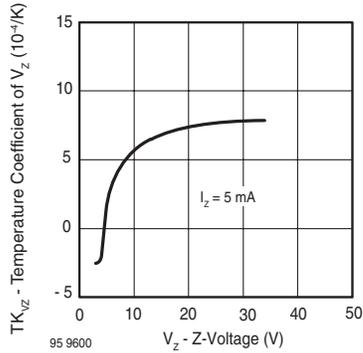


Figure 5. Temperature Coefficient of Vz vs. Z-Voltage

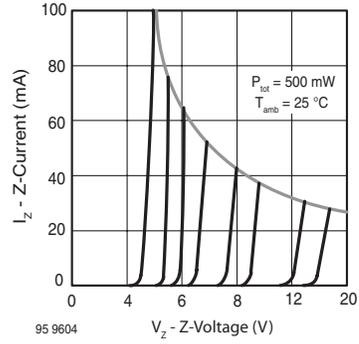


Figure 8. Z-Current vs. Z-Voltage

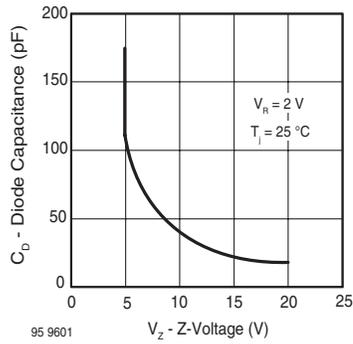


Figure 6. Diode Capacitance vs. Z-Voltage

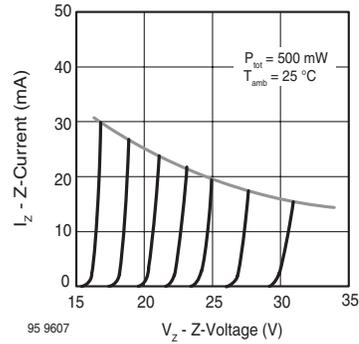


Figure 9. Z-Current vs. Z-Voltage

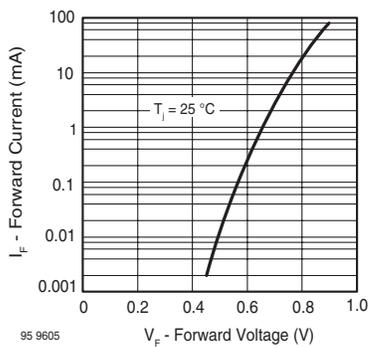


Figure 7. Forward Current vs. Forward Voltage

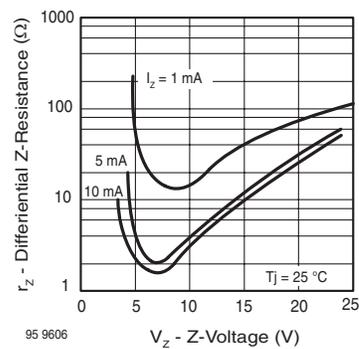


Figure 10. Differential Z-Resistance vs. Z-Voltage