ITMO University

LABORATORY WORK REPORT №1
«Simple semiconductor device circuits design and simulation»
(Includes Practice 1 Report)
Principles of Circuits

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group №
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2021

1. Work purpose: to study parameters of semiconductor elements and basis of the semiconductor device design

Goals:
1) Design rectifier model on the basis of diode «diode name»
2) Simulate rectifier scheme and analyze dependencies of DC voltage ripple from load and filter capacitor values variation
3) Simulate overvoltage and overcurrent states (optional)

2. Starting data

2.1.1. Parameters of the voltage source:

- One-phase sine voltage source
- Rectifier scheme: Half-Wave Rectifier (HWR) /Central tap rectifier (CTR) /Full -Bridge rectifier (FBR)
- Source voltage amplitude

$$V_s = 50 \qquad \text{(V)}$$

- Source voltage frequency

$$f = 100 \qquad \text{(Hz)}$$

2.1.2. Diode: (copy the 1stand the second line of .lib file of your variant)

2.1.3. Required parameters of DC output:

- Load resistance:

$$R_L = R_{LOAD\_HWR/CTR/FBR} = 180 \qquad \text{(V)}$$

- Desired DC voltage ripple factor:

$$K_p = .035$$

3. Simulation report

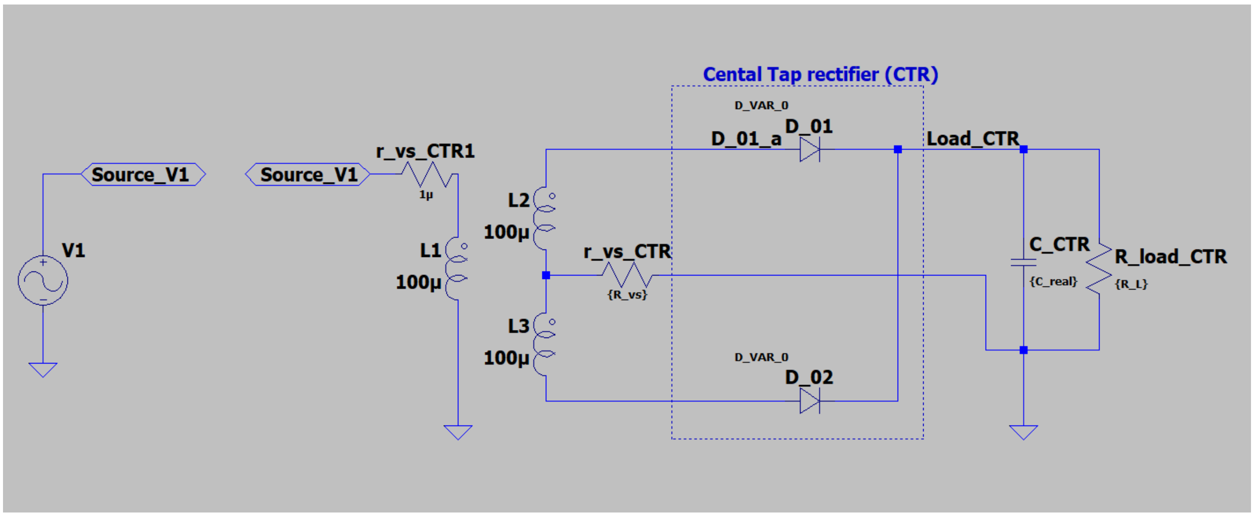


Fig. 3.1 – Rectifier scheme model

3.1.1. Filter parameters:

— C_{real} = ______300______(uF)

3.1.2. Load parameters:

— $R_L = R_{LOAD\_HWR}$ = ______180______(Ω)

— $V_{R_{L AVG}}$ ______46.84______(V)

— $V_{R_{L RMS}}$ ______46.91______(V)

— $K_p = K_p = \dfrac{\Delta V_{R_L}}{2V_{R_{L AVG}}}$ = ______0.035______

— $I_{VD_{ON}}$ = ______28.69______(A)

— $I_{VD_{max}}$ = ______1.81______(A)

— ΔV_{R_L} = ______3.28______(V)

3.2. Simulation results

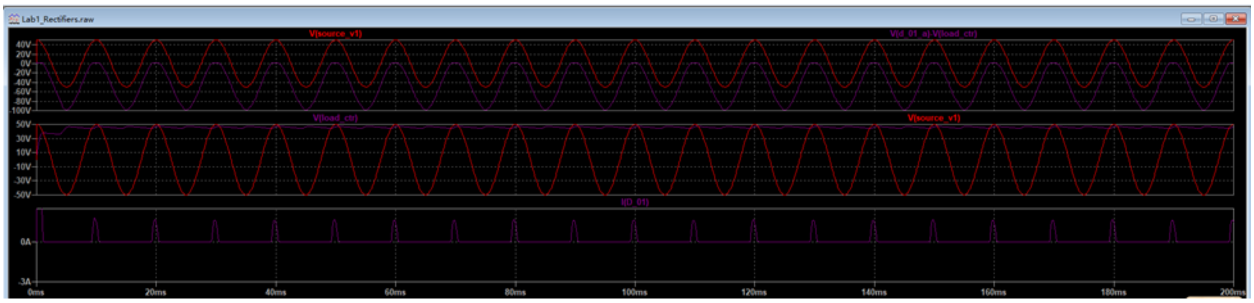


Fig 3.2 – Simulation results

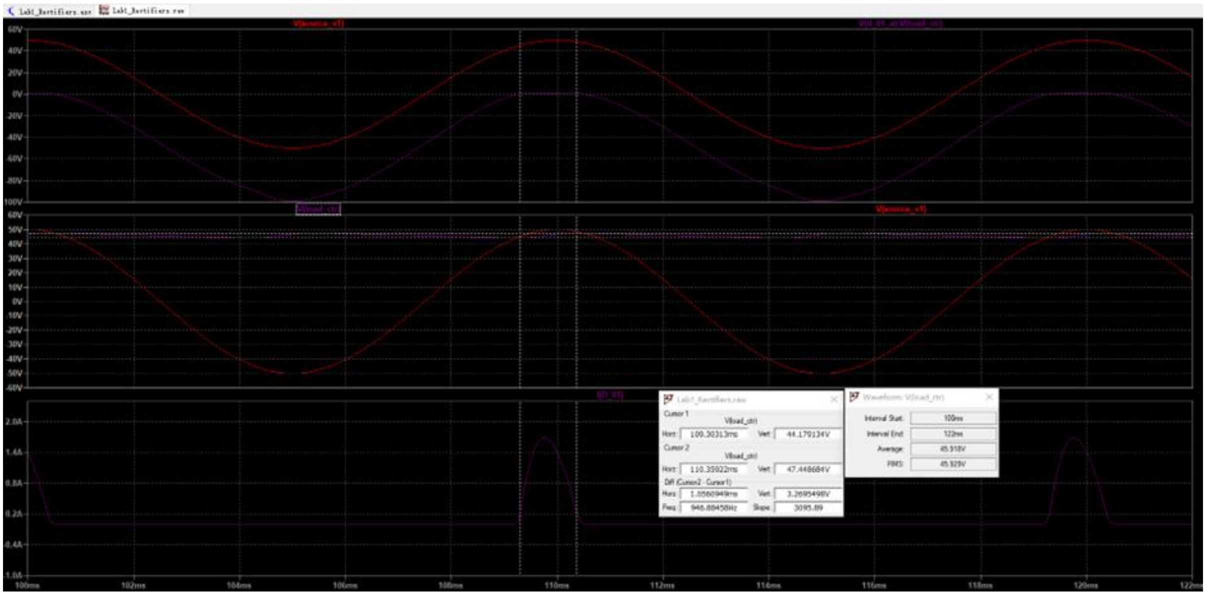
3.2.1. Ripple factor:

Required:

— K_p = 0.035

Simulated with 0.8 C_{real}

— K_{P_EXP}= 0.034



b) Full-bridge rectifier

Fig 3.3 –Voltage ripple analysis

To define Average and RMS values use CTRL+left click mouse button on the signal name. Use 2-3 Voltage periods in the end of simulation interval

Right-click with mouse on the signal name gives access to the signal cursor

3.2.2. Voltage ripple from simulation results

$$V_{R_{L_{AVG}}exp} = 45.918 \quad (V)$$

$$V_{R_{L_{RMS}}exp} = 45.929 \quad (V)$$

$$V_{R_{L_{max}}} = 47.45 \quad (V)$$

$$V_{R_{L_{min}}} = 44.18 \quad (V)$$

$$\Delta V_{R_L exp} = V_{R_{L_{max}}} - V_{R_{L_{min}}} = 3.27 \quad (V)$$

3.2.3. Ripple factor

$$K_{Pexp} = \sqrt{\left(\frac{V_{R_L\_RMS}}{V_{R_{L_{AVG}}}}\right)^2 - 1} = 0.021$$

$$K_{pRMS} \approx \sqrt{\left(\frac{V_{R_{LRMS}}}{V_{R_{LAVG}}}\right)^2 - 1} \approx \frac{\frac{V_{R_{Lmax}} - V_{R_{Lmin}}}{2\sqrt{3}}}{V_{R_{LAVG}exp}} = 0.021$$

3.2.4. Diode opening state angle:

$$\tau_1 = 0.00107 \quad \text{(s)}$$

$$\theta_{exp} = \tau_1 \cdot f \cdot 2\pi = \frac{\tau_1}{T} \cdot 2\pi = 0.672 \quad \text{(rad)}$$

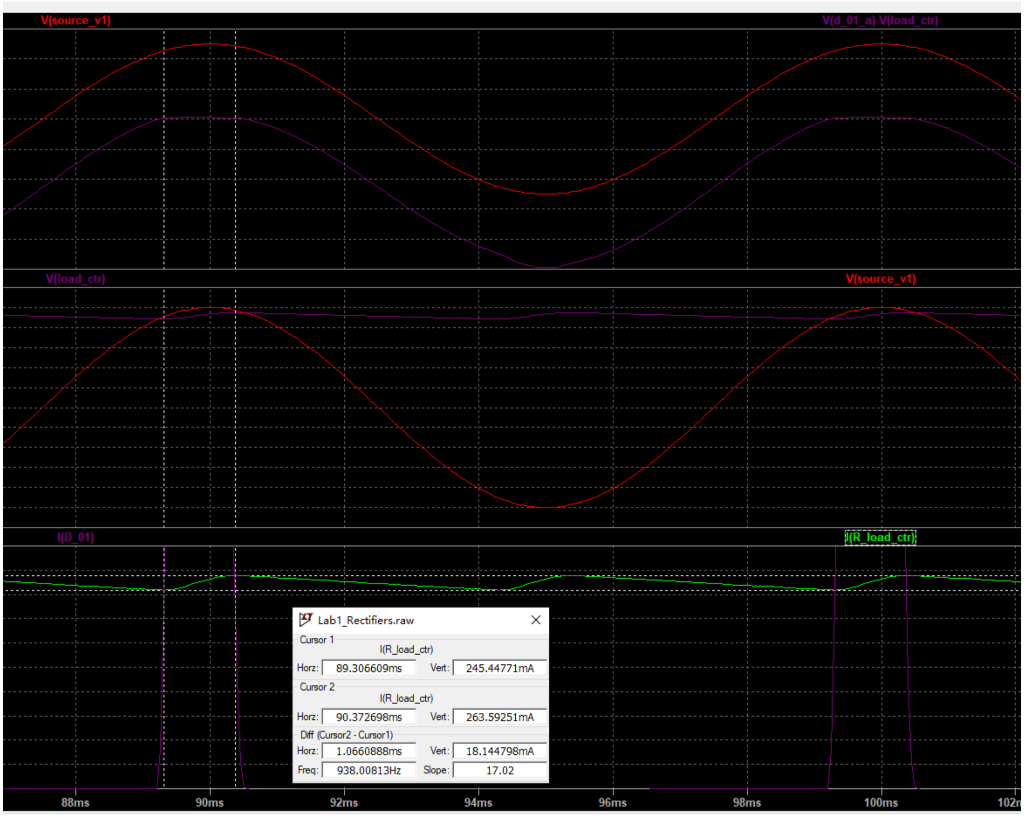


Fig 3.4 – θ_{exp} angle definition from simulation results
(It is recommended to consider diode open state at current level 0.05-0.1A or determine theta on the capacitor charging interval)

3.2.5. Average rectifier scheme diode current (To define Average and RMS values use CTRL+left click mouse button on the signal name. Use 2-3 Voltage periods in the end of simulation interval)

$$I_{VDexp} = 0.133 \quad \text{(A)}$$

3.2.6. Starting (Non-repetitive) maximum peak surge diode current in rectifier scheme

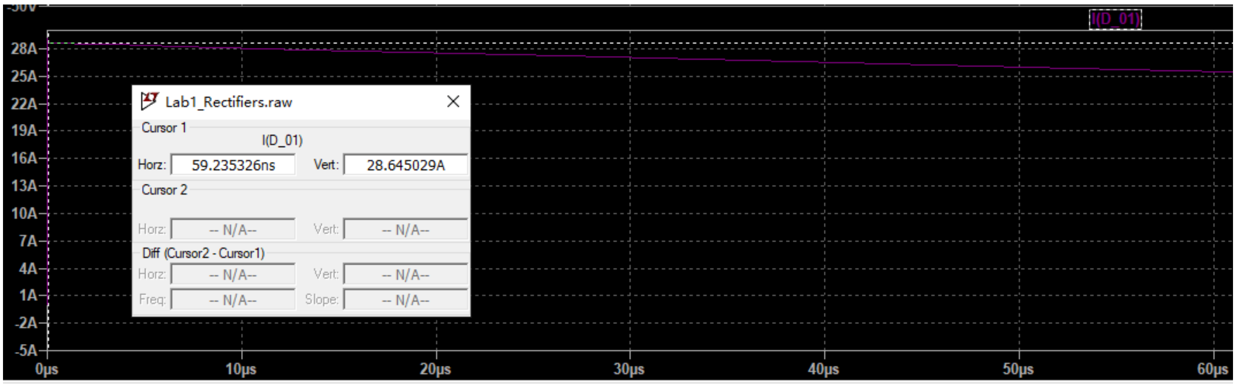


Fig 3.5 –Starting current

$$I_{VD_{ON}exp} = 28.65 \quad \text{(A)}$$

PRACTICE REPORT №1
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4. Rectifier evaluation

4.1. Diode simulation parameters evaluation

4.1.1. Datasheet parameters:

Maximum Ratings (@T_A = +25 ℃, unless otherwise specified.)

Single phase, half wave, 60Hz, resistive or inductive load.
For capacitance load, derate current by 20%.

Characteristic	Symbol	ES1A	ES1B	ES1C	ES1D	ES1G	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage (Note 6)	V_{RRM} V_{RWM} V_R	50	100	150	200	400	V
RMS Reverse Voltage	$V_{R(RMS)}$	35	70	105	140	280	V
Average Rectified Output Current @ T_T = +110°C	I_O			1.0			A
Non-Repetitive Peak Forward Surge Current 8.3ms Single Half Sine-Wave Superimposed on Rated Load	I_{FSM}			30			A

a)

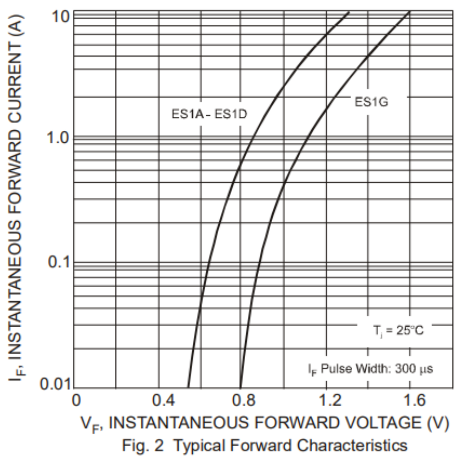

Fig.4.1 – Diode parameters for 25°C

- Maximum average rectified current

$$I_{fwd\_\mathrm{AVG}} = 1.0 \quad \text{(A)}$$

- Maximum peak reverse voltage

$$V_{reverse\_imp} = 100 \quad \text{(V)}$$

- Maximum peak surge current (as known as Maximum forward surge current or Non-repetitive peak surge current)

$$I_{FSM} = 30 \quad \text{(A)}$$

- Maximum repetitive peak surge current

$$I_{fwd\_imp} = 10 \quad \text{(A)}$$

4.1.2. Diode forward bias voltage

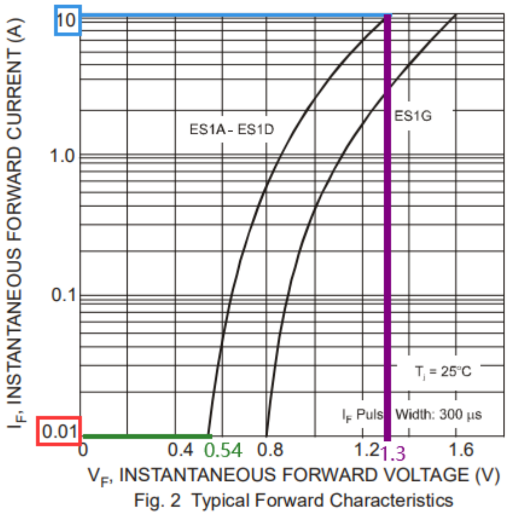

Fig.4.2 – Diode parameters for 25°C

$$V_{fwd\_max}\left(I_{fwd\_imp}\right) = 1.3 \quad \text{(V)}$$

4.1.3. Diode threshold voltage:

$$v_{ON} = 0.54 \quad \text{(V)}$$

4.1.4. Diode active resistance:

$$r_{VD} = \frac{V_{fwd\_max} - v_{ON}}{I_{fwd_{imp}} - I_{fwd}(v_{ON})} = 0.0761 \quad (\Omega)$$

4.2. Diode rectifier without filter (Part 4.3 is optional for LAB 1 report. It is considered as Practice 1 Task)

4.2.1. Average load voltage

$$V_{R_{L_{AVG}}} = \begin{cases} \frac{V_S}{\pi}, \text{ for } \mathbf{HWR} \text{ schemes} \\ \frac{2 \cdot V_S}{\pi}, \text{ for } \mathbf{FBR} \text{ or } \mathbf{CTR} \text{ schemes} \end{cases} = 31.831 \quad \text{(V)}$$

4.2.2. RMS load voltage:

$$V_{R_{L_{RMS}}} = \begin{cases} \frac{V_S}{2}, \text{ for } \mathbf{HWR} \text{ schemes} \\ \frac{V_S}{\sqrt{2}}, \text{ for } \mathbf{FBR} \text{ or } \mathbf{CTR} \text{ schemes} \end{cases} = 35.3553 \quad \text{(V)}$$

4.2.3. Max peak diode reverse voltage:

$$V_{VD_{max}} = V_S = 50 \quad \text{(V)}$$

4.2.4. Average load current:

$$I_{L_{AVG}} = \frac{V_{R_{LAVG}}}{R_L} = \begin{cases} \frac{V_S}{\pi R_L}, \text{ for } \mathbf{HWR} \text{ schemes} \\ \frac{2 \cdot V_S}{\pi R_L}, \text{ for } \mathbf{FBR} \text{ or } \mathbf{CTR} \text{ schemes} \end{cases} = 0.1768 \quad \text{(A)}$$

4.2.5. RMS load current:

$$I_{L_{RMS}} = \frac{V_{R_{LRMS}}}{R_L} = \begin{cases} \frac{V_S}{2R_L}, \text{ for } \mathbf{HWR} \text{ schemes} \\ \frac{V_S}{\sqrt{2}R_L}, \text{ for } \mathbf{FBR} \text{ or } \mathbf{CTR} \text{ schemes} \end{cases} = 0.1964 \quad \text{(A)}$$

4.2.6. Average diode rectified output current:

$$I_{VD} = \begin{cases} I_{L_{AVG}}, \text{ for } \mathbf{HWR} \text{ schemes} \\ \frac{I_{L_{AVG}}}{2}, \text{ for } \mathbf{FBR} \text{ or } \mathbf{CTR} \text{ schemes} \end{cases} = 0.0884 \quad \text{(A)}$$

4.2.7. Peak repetitive forward output current:

$$I_{VD_{max}} \begin{cases} \frac{V_S}{R_L}, \text{ for } \mathbf{HWR} \text{ schemes} \\ \frac{V_S}{2R_L}, \text{ for } \mathbf{FBR} \text{ or } \mathbf{CTR} \text{ schemes} \end{cases} = 0.1389 \quad \text{(A)}$$

4.2.8. Voltage ripple evaluated from desired K_p:

$$\Delta U_{R_L} = 2 \cdot K_p \cdot U_{R_{L_{AVG}}} = 30.7758 \quad \text{(V)}$$

4.2.9. Voltage ripple evaluated:

$$K_p = \sqrt{\left(\frac{V_{R_{LRMS}}}{V_{R_{LAVG}}}\right)^2 - 1} = 0.4834 \quad \text{(V)}$$

4.2.10. Voltage ripple evaluated for the rectifier scheme:

$$\Delta V_{R_L} = 2 \cdot K_p \cdot V_{R_{L_{AVG}}} = 30.5 \quad \text{(V)}$$

Conclusion: to provide required K_p (ΔV_{R_L}) additional C- filter is required

4.3. Diode rectifier with filter (Part 4.3 is optional for LAB 1 report. It is considered as Practice 1 Task)

4.3.1. Source output resistance (overcurrent protection):

$$r_{on} = r_{V_S} = \frac{V_S}{I_{FSM}} = 1.6667 \qquad (\Omega)$$

4.3.2. Input rectifier resistance:

$$r_{IN} = \begin{cases} r_{vd} + r_{V_S}, \text{ for } \mathbf{HWR} \; or \; \mathbf{CTR} \text{ schemes} \\ 2 \cdot r_{vd} + r_{V_S}, \text{ for } \mathbf{FBR} \text{ schemes} \end{cases} = 1.7427 \qquad (\Omega)$$

4.3.3. Starting (Non-repetitive) maximum peak surge diode current in rectifier scheme

$$I_{VD_{ON}} = \frac{V_S}{r_{IN}} = 28.6904$$

Maximum Ratings (@T_A = +25 °C, unless otherwise specified.)

Single phase, half wave, 60Hz, resistive or inductive load.
For capacitance load, derate current by 20%.

Characteristic	Symbol	ES1A	ES1B	ES1C	ES1D	ES1G	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage (Note 6)	V_{RRM} V_{RWM} V_R	50	100	150	200	400	V
RMS Reverse Voltage	$V_{R(RMS)}$	35	70	105	140	280	V
Average Rectified Output Current @ T_T = +110°C	I_O			1.0			A
Non-Repetitive Peak Forward Surge Current 8.3ms Single Half Sine-Wave Superimposed on Rated Load	I_{FSM}			30			A

At this state, if $I_{VD\_ON} > I_{FSM}$ it is necessary to increase $r_{VS} = \frac{V_S}{I_{VD_{ON}}}$ and repeat evaluations 4.3.1-4.3.3.

4.3.4. Diode opening state angle:

$$\theta = \begin{cases} 2 \cdot \sqrt[3]{3 \cdot \pi \cdot \frac{r_{IN}}{R_L}}, \text{ for } \mathbf{HWR} \text{ schemes} \\ 2 \cdot \sqrt[3]{\frac{3}{2} \cdot \pi \cdot \frac{r_{IN}}{R_L}}, \text{ for } \mathbf{FBR} \text{ or } \mathbf{CTR} \text{ schemes} \end{cases} = 0.7147 \qquad (\text{rad})$$

4.3.5. Average load voltage

$$V_{R_{L_{AVG}}} = V_S \cdot \cos\left(\frac{\theta}{2}\right) = 46.8417 \qquad (\text{V})$$

4.3.6. Average load current:

$$I_{L_{AVG}} = \frac{V_{R_{L_{AVG}}}}{\mathrm{R_L}} = \begin{cases} \frac{1}{\pi \cdot r_{IN}} (V_S \cdot \sin\left(\frac{\theta}{2}\right) - V_{R_{L_{AVG}}} \cdot \frac{\theta}{2}), \text{ for } \mathbf{HWR} \text{ schemes} \\ \frac{2}{\pi \cdot r_{IN}} (V_S \cdot \sin\left(\frac{\theta}{2}\right) - V_{R_{L_{AVG}}} \cdot \frac{\theta}{2}), \text{ for } \mathbf{FBR} \text{ or } \mathbf{CTR} \text{ schemes} \end{cases} = 0.2742 \text{ (A)}$$

4.3.7. Average diode current:

$$I_{VD} = \begin{cases} \frac{V_S}{R_L} \cdot \cos\left(\frac{\theta}{2}\right) = \frac{V_S}{R_L} \cdot \cos\left(\sqrt[3]{3 \cdot \pi \cdot \frac{r_{IN}}{R_L}}\right), \text{ for } \mathbf{HWR} \text{ schemes} \\ \frac{V_S}{2 \cdot R_L} \cdot \cos\left(\frac{\theta}{2}\right) = \frac{V_S}{2 \cdot R_L} \cdot \cos\left(\sqrt[3]{\frac{3}{2} \cdot \pi \cdot \frac{r_{IN}}{R_L}}\right), \text{ for } \mathbf{FBR} \text{ or } \mathbf{CTR} \text{ schemes} \end{cases} = 0.1301 \text{ (A)}$$

Compare with:

Maximum Ratings (@T_A = +25 ℃, unless otherwise specified.)

Single phase, half wave, 60Hz, resistive or inductive load.
For capacitance load, derate current by 20%.

Characteristic	Symbol	ES1A	ES1B	ES1C	ES1D	ES1G	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage (Note 6)	V_{RRM} V_{RWM} V_R	50	100	150	200	400	V
RMS Reverse Voltage	$V_{R(RMS)}$	35	70	105	140	280	V
Average Rectified Output Current @ T_T = +110°C	I_O	1.0					A
Non-Repetitive Peak Forward Surge Current 8.3ms Single Half Sine-Wave Superimposed on Rated Load	I_{FSM}	30					A

4.3.8. Maximum repetitive rectifier scheme diode current:

$$I_{VD_{max}} = \frac{V_S - V_{R_{L AVG}}}{r_{IN}} = \begin{cases} \frac{V_S\left(1-\cos\left(\sqrt[3]{3 \cdot \pi \cdot \frac{r_{vd}+r_{V_S}}{R_L}}\right)\right)}{r_{vd}+r_{V_S}}, \text{ for } \mathbf{HWR} \text{ schemes} \\ \frac{V_S\left(1-\cos\left(\sqrt[3]{\frac{3}{2} \cdot \pi \cdot \frac{r_{vd}+r_{V_S}}{R_L}}\right)\right)}{r_{vd}+r_{V_S}}, \text{ for } \mathbf{CTR} \text{ schemes} \\ \frac{V_S\left(1-\cos\left(\sqrt[3]{\frac{3}{2} \cdot \pi \cdot \frac{2 \cdot r_{vd}+r_{V_S}}{R_L}}\right)\right)}{2 \cdot r_{vd}+r_{V_S}}, \text{ for } \mathbf{FBR} \text{ schemes} \end{cases} = 1.8122 \text{ (A)}$$

Electrical Characteristics (@T_A = +25 ℃, unless otherwise specified.)

Characteristic		Symbol	ES1A	ES1B	ES1C	ES1D	ES1G	Unit
Minimum Reverse Breakdown Voltage (Note 6)	I_R = 5μA	$V_{(BR)R}$	50	100	150	200	400	V
Maximum Forward Voltage Drop	I_F = 0.6A I_F = 1.0A	V_{FM}	0.90 0.92				— 1.25	V
Peak Reverse Current at Rated DC Blocking Voltage (Note 6)	T_A = +25°C T_A = +125°C	I_{RM}	5.0 200					μA
Maximum Reverse Recovery Time (Note 7)		t_{RR}	25					ns
Typical Total Capacitance (Note 8)		C_T	20					pF

Notes: 5. Unit mounted on PC board with 5.0 mm^2 (0.013 mm thick) copper pad as heat sink.
6. Short duration pulse test used to minimize self-heating effect.
7. Measured with I_F = 0.5A, I_R = 1.0A, I_{RR} = 0.25A. See figure 5.
8. Measured at 1.0MHz and applied reverse voltage of 4.0V DC.

Compare with capacitor rated current.

4.3.9. Peak repetitive reverse voltage:

$$V_{VD_{max}} = \begin{cases} V_S + V_{R_{L AVG}}, \text{ for } \mathbf{HWR} \text{ schemes or } \mathbf{CTR} \text{ schemes} \\ \frac{V_S + V_{R_{L AVG}}}{2}, \text{ for } \mathbf{FBR} \end{cases} = 96.8417$$

Compare with:

Maximum Ratings (@T_A = +25 ℃, unless otherwise specified.)

Single phase, half wave, 60Hz, resistive or inductive load.
For capacitance load, derate current by 20%.

Characteristic	Symbol	ES1A	ES1B	ES1C	ES1D	ES1G	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage (Note 6)	V_{RRM} V_{RWM} V_R	50	100	150	200	400	V
RMS Reverse Voltage	$V_{R(RMS)}$	35	70	105	140	280	V
Average Rectified Output Current @ T_T = +110°C	I_O	1.0					A
Non-Repetitive Peak Forward Surge Current 8.3ms Single Half Sine-Wave Superimposed on Rated Load	I_{FSM}	30					A

4.3.10. Voltage ripple evaluated for the K_p from given variant data:

	Rectifier scheme	Source voltage amplitude, [V]	Load resistance, [Ω]	Desired DC voltage ripple factor	Source voltage frequency, [Hz]
Variant #	wave rectifier, CTR-	V_s	R_L	K_P	f
72	CTR	120	180	0.035	100

$$\Delta V_{R_L} = \begin{cases} \frac{I_{L_{AVG}}}{2\pi f \cdot C}(2\pi - \theta) = K_p V_{R_{L_{AVG}}} 2\sqrt{3}, \text{ for } \textbf{HWR} \text{ schemes} \\ \frac{I_{L_{AVG}}}{2\pi f \cdot C}(\pi - \theta) = K_p V_{R_{L_{AVG}}} 2\sqrt{3}, \text{ for } \textbf{FBR} \text{ or } \textbf{CTR} \text{ schemes} \end{cases} = 3.2789 \quad \text{(V)}$$

4.4. Capacitor evaluation

4.4.1. Capacitance evaluation:

$$C = \begin{cases} \frac{I_{L_{AVG}}}{2\pi f \cdot \Delta V_{R_L}}(2\pi - \theta), \text{ for } \textbf{HWR} \text{ schemes} \\ \frac{I_{L_{AVG}}}{2\pi f \cdot \Delta V_{R_L}}(\pi - \theta), \text{ for } \textbf{FBR} \text{ or } \textbf{CTR} \text{ schemes} \end{cases} = 0.0003 \quad \text{(F)}$$

Pay attention to maximum tolerance rating: for the example in this case 20%

$$C_{real} = \frac{C}{0{,}8} = 1{,}25C = 0.000375 \quad \text{(F)}$$

$$(100\%\text{-}20\%)C_{real} \geq C = 0.0003 \quad \text{(F)}$$

4.4.2. After the nominal value is chosen:

$$C_{real} = 0.000375 \quad \text{(F)}$$

$$0.8C_{real} = 0.0003 \quad \text{(F)}$$

$$1.2C_{real} = 0.00045 \quad \text{(F)}$$

4.5. Expected parameters of the developed rectifier

4.5.1. Voltage ripple:

$$\Delta V_{R_L} = \begin{cases} \frac{I_{L_{AVG}}}{2\pi f \cdot 0.8C_{real}}(2\pi - \theta), \text{ for } \mathbf{HWR} \text{ schemes} \\ \frac{I_{L_{AVG}}}{2\pi f \cdot 0.8C_{real}}(\pi - \theta), for \text{ FBR or CTR } schemes \end{cases} = 3.2789 \quad \text{(V)}$$

$$\Delta V_{R_L} = \begin{cases} \frac{I_{L_{AVG}}}{2\pi f \cdot C_{real}}(2\pi - \theta), \text{ for } \mathbf{HWR} \text{ schemes} \\ \frac{I_{L_{AVG}}}{2\pi f \cdot C_{real}}(\pi - \theta), for \text{ FBR or CTR } schemes \end{cases} = 2.6231 \quad \text{(V)}$$

$$\Delta V_{R_L} = \begin{cases} \frac{I_{L_{AVG}}}{2\pi f \cdot 1.2C_{real}}(2\pi - \theta), \text{ for } \mathbf{HWR} \text{ schemes} \\ \frac{I_{L_{AVG}}}{2\pi f \cdot 1.2C_{real}}(\pi - \theta), for \text{ FBR or CTR } schemes \end{cases} = 2.1859 \quad \text{(V)}$$

4.5.2. Voltage ripple factor:

$$K_p \approx \frac{\frac{\Delta V_{R_L}}{2\sqrt{3}}}{V_{R_{L_{AVG}}}} = 0.021$$

4.6. Comparing simulation and estimation results

4.6.1. Average load voltage tolerance

$$\Delta_{V_{R_{L_{AVG}}}} = \frac{\left|V_{R_{L_{AVG}}exp} - V_{R_{L_{AVG}}}\right|}{V_{R_{L_{AVG}}}} = 1.97 \quad (\%)$$

4.6.2. Ripple factor tolerance:

$$\Delta_{K_P} = \frac{|K_{Pexp} - K_P|}{K_P} \cdot 100\% = 40 \quad (\%)$$

4.6.3. Voltage ripple tolerance:

$$\Delta_{\Delta V_{R_L}} = 0.27 \quad (\%)$$

4.6.4. Diode opening state angle tolerance:

$$\Delta_{\theta} = 5.97 \quad (\%)$$

4.6.5. Maximum repetitive rectifier scheme diode current tolerance:

$$\Delta_{I_{VD_{max}}} = 1.23 \quad (\%)$$

4.6.6. Average rectifier scheme diode current tolerance:

$$\Delta_{I_{VD}} = 0.077 \quad (\%)$$

4.6.7. Starting (Non-repetitive) maximum peak surge diode current in rectifier scheme tolerance:

$$\Delta_{I_{VD_{ON}}} = 13.9 \quad (\%)$$

Table 4.1 Tolerance report

Parameter	Desired/evaluated value	Simulation result	Tolerance %
$V_{R_{L_{AVG}}}$(V)	46.8417	45.918	1.97
K_P	0.035	0.021	40
ΔV_{R_L}(V)	3.2789	3.27	0.27
θ (rad)	0.7147	0.672	5.97
$I_{VD_{max}}$(A)	1.8122	1.79	1.23
I_{VD} (A)	0.1301	0.13	0.077

Conclusions

Conclusions should contain:
1) Diode check results:

- Is breakdown voltage check passed? /Is voltage source changed because of overvoltage?

  Yes/Yes

- Is starting current check passed? /Is additional resistance r_vs added to prevent overcurrent in diode/capacitor?

  Yes/Yes

2) Capacitor information: nominal value, tolerance, allowed current
.MODEL D_VAR_0 D (IS=123n RS=42.0m BV=100 IBV=5.00u+ CJO=18.5p M=0.333 N=2.12 TT=28.8n)
3) Provided ripple factor value
0.035

Appendix A.

ES1B

Maximum Ratings (@T_A = +25 ℃, unless otherwise specified.)

Single phase, half wave, 60Hz, resistive or inductive load.
For capacitance load, derate current by 20%.

Characteristic	Symbol	ES1A	ES1B	ES1C	ES1D	ES1G	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage (Note 6)	V_{RRM} V_{RWM} V_R	50	100	150	200	400	V
RMS Reverse Voltage	$V_{R(RMS)}$	35	70	105	140	280	V
Average Rectified Output Current @ T_T = +110°C	I_O	1.0					A
Non-Repetitive Peak Forward Surge Current 8.3ms Single Half Sine-Wave Superimposed on Rated Load	I_{FSM}	30					A

a)

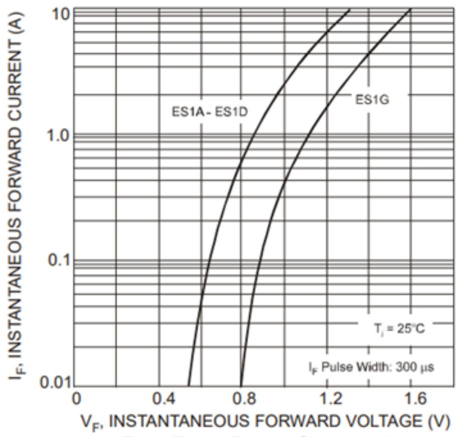

Fig. 2 Typical Forward Characteristics

b)

Fig.1. Diode parameters for 25°C

Appendix B. VariantNo72.lib listing