

A-012. Bridgeless PFC $V_{in}=200V$, $I_{in}=2.5A$, BCM

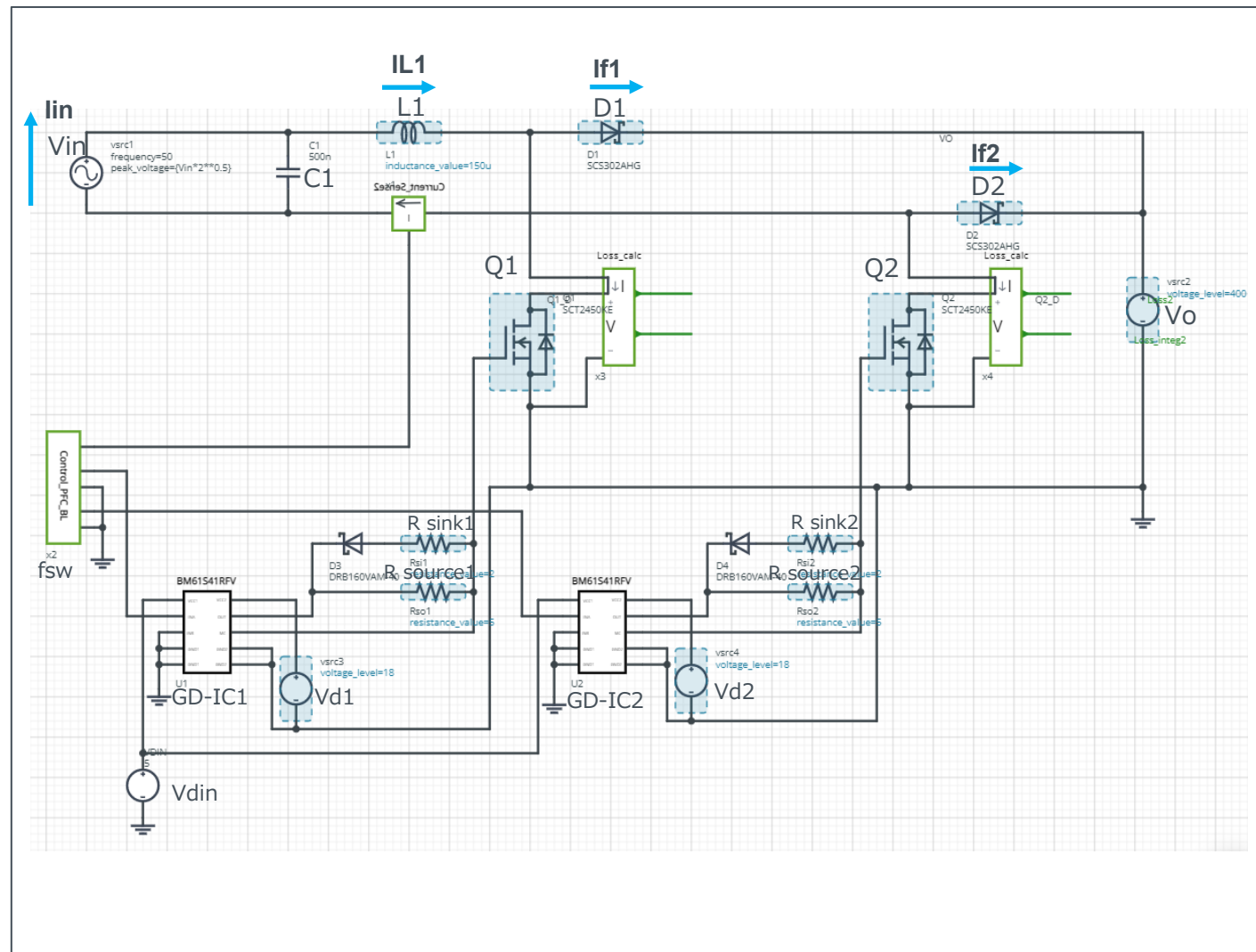
Simulation Parameters

Component name	Component	Default	Simulation Setting Range
V_{in}	Input voltage	200Vac 50Hz	
I_{in}	Input current	2.5Aac	
V_o	Output voltage	500Vdc	300 – 500Vdc
fsw	Switching frequency	100kHz	Fixed 100k
T_j	Temperature	100°C	
$V_{d1,2}$	Gate Drive voltage	18V	10 – 20V
V_{din}	Signal voltage level	5V	

Devices

Component Name	Component	Default	Simulation Setting Range
Q1, Q2	SiC MOSFET SJ MOSFET	Selectable	
D1, D2	SiC SBD	Selectable	
GD-IC1,2	Gate Driver	Selectable	
R sink1,2	Resistor for sink	ESR18 2Ω	0.1 -
R source1,2	Resistor for source	ESR18 5Ω	0.1 -
L1	Inductor	150μH	10μH - 2mH
C1	Capacitor	500nF	

Simulation Circuit



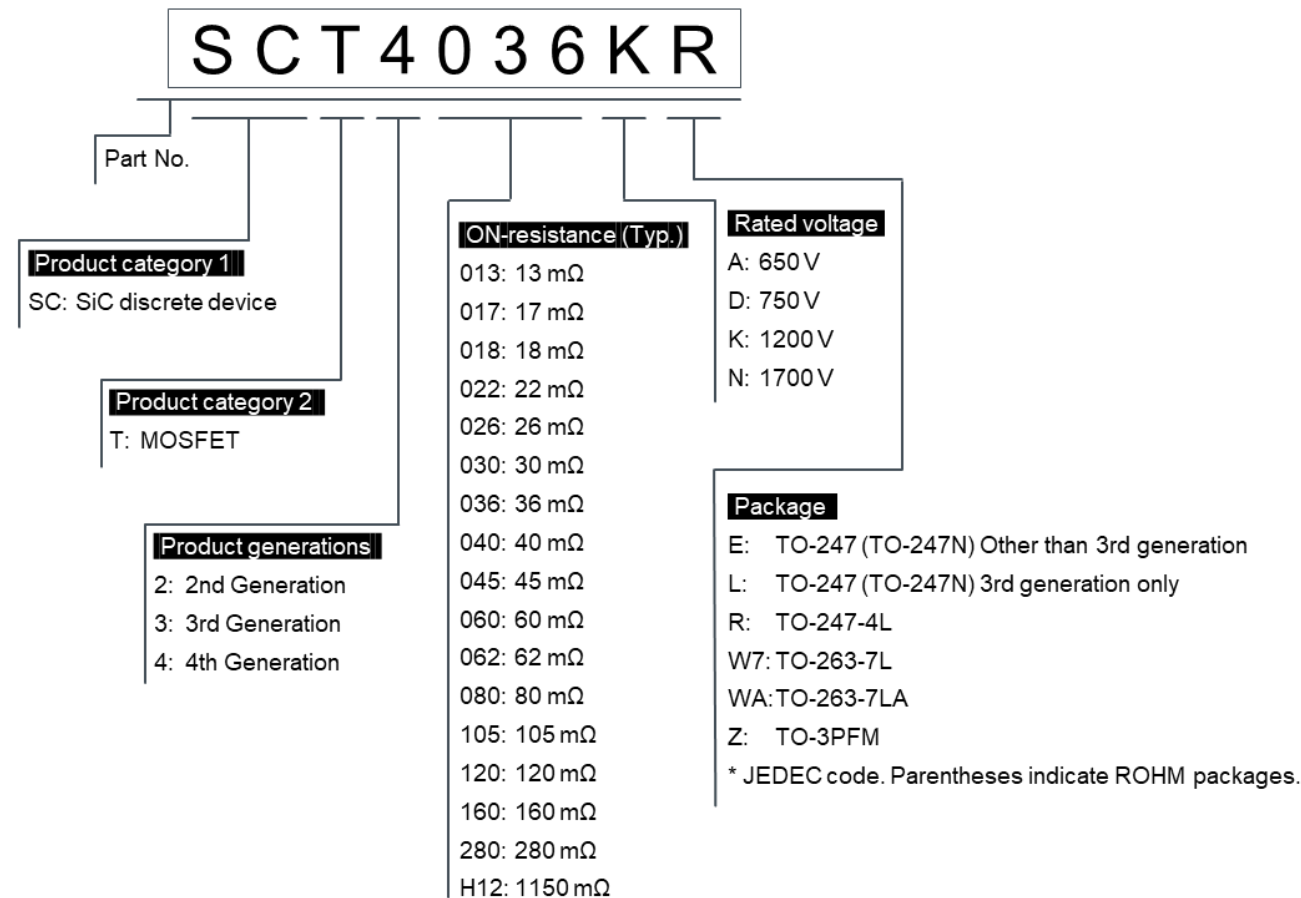
Note: The Loss_calc component is a utility module to support power loss calculation and does not affect the simulation results of circuit operation or performance.

Selectable Devices

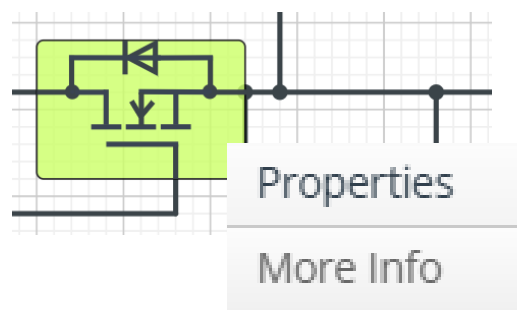
Component name	Component
Q1,2	SiC MOSFET

SiC MOSFET part number information

SCT4036KR



For more information, go to “**More Info**” and click on “**Link to Datasheet**”.



Model Links:

- [Link To Product](#)
- [Link To Datasheet](#)
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Product Lineup: [SiC MOSFETs](#)

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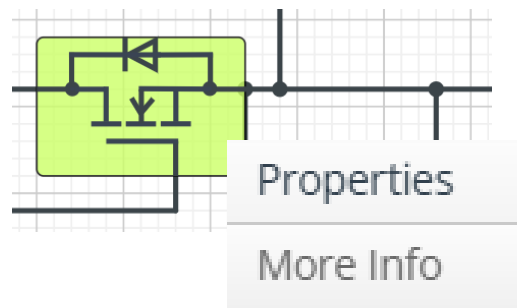


2025. Nov.
64UG106E Rev.006

Selectable Devices

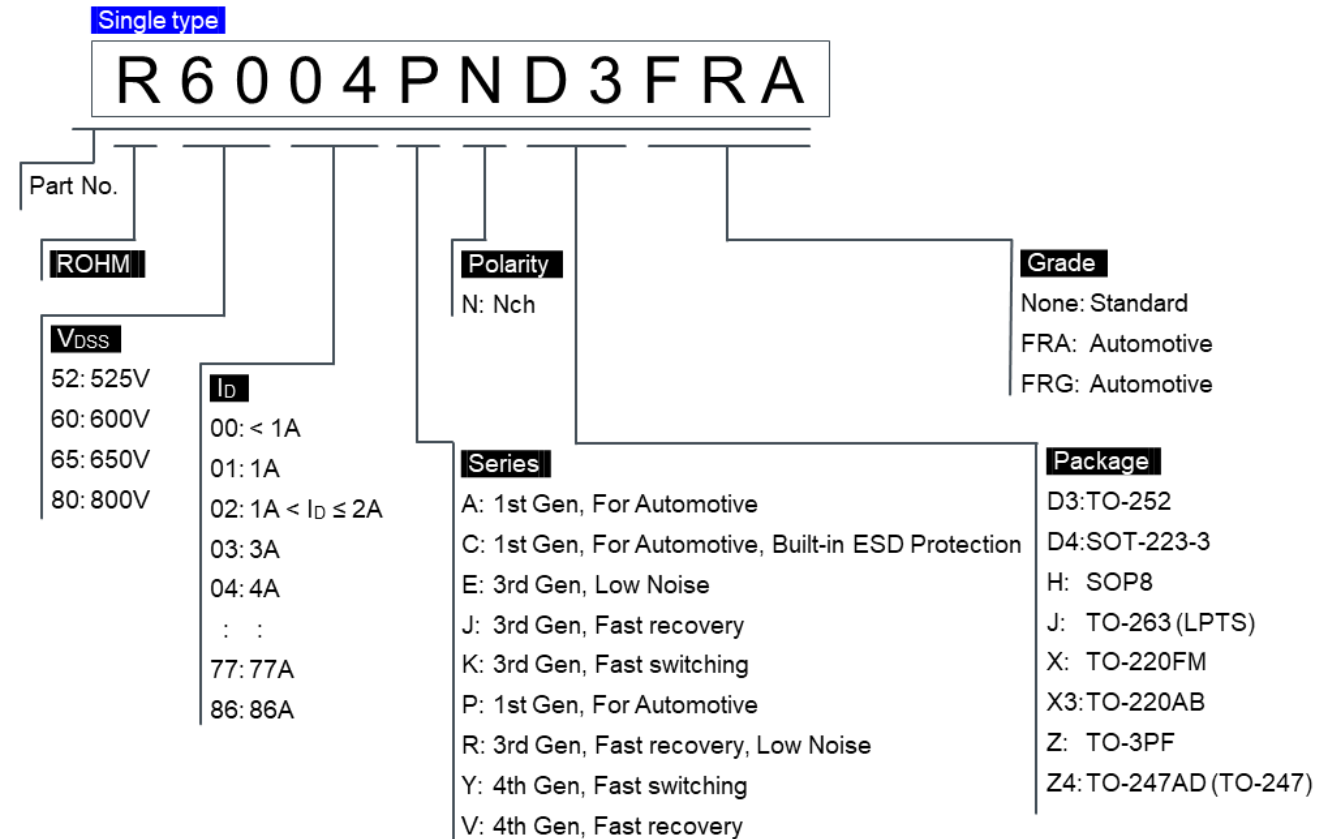
Component name	Component	Product
Q1,2	SJ MOSFET	RxxxxJN series RxxxxVN series

For more information, go to “**More Info**” and click on “**Link to Datasheet**”.



Model Links:
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SJ MOSFET part number information



Product Lineup: [Super Junction MOSFETs](#)

A-012. Bridgeless PFC $V_{in}=200V$, $I_{in}=2.5A$, BCM



Selectable Devices

Component name	Component	Product
Q1,2	IGBT	RGW series

IGBT part number information

R G S 6 0 T S 6 5 D H R

Part No.

Product category

RG: IGBT

Product series

- C: For voltage resonant, Reverse Conducting IGBT (RC-IGBT)
- CL: Low $V_{CE(sat)}$
- S: For Automotive Inverter, Short circuit capability guaranteed 8 to 10 μ s
- T: For inverter, Short circuit capability guaranteed 5 μ s
- TV: For converter / inverter, High speed switching, Short circuit capability guaranteed 2 μ s
- TH: For converter, High speed switching
- W: For converter, Ultra high-speed switching
- WS: For converter, Ultra high-speed switching, Popular edition

Rated collector current $I_C(T_C=100^\circ C)$

- 8: 4 A
- 16: 8 A
- 20: 10 A
- 30: 15 A
- 40: 20 A
- 50: 25 A
- 60: 30 A
- 80: 40 A
- 00: 50 A
- X2: 60 A
- X5: 75 A
- X6: 80 A

* See datasheet for current values that may differ in some cases.

Package

- BM: TO-252, TO-252GE
- NS: TO-263S, TO-262
- NL: TO-263L
- TM: TO-220NFM
- TS: TO-247N, TO-247GE
- TK: TO-3PFM

Grade

- G: Standard
- GV: Standard
- HR: Automotive (AEC-Q101)
- HRB: Automotive (AEC-Q101)

Built-in diode configuration

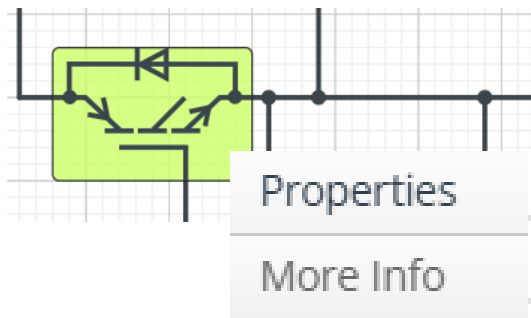
- None: Without diode
- C: SiC Schottky barrier diode
- D: Fast recovery diode
- E: Larger size Fast recovery diode
- R: Body diode with reverse conducting (RC) structure

Rated voltage V_{CES}

- 60: 600 V
- 65: 650 V
- X2: 1200 V
- X8: 1800 V

Product Lineup: [Field Stop Trench IGBT](#)

For more information, go to “More Info” and click on “Link to Datasheet”.

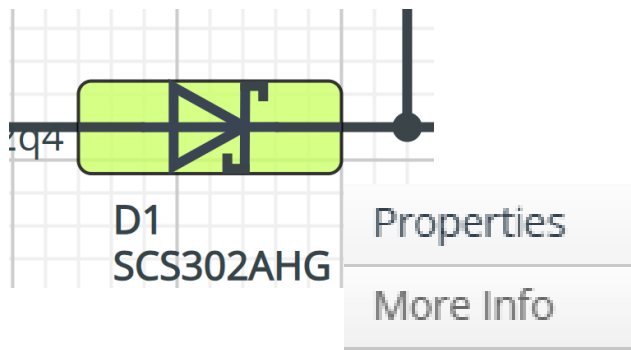


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Selectable Devices

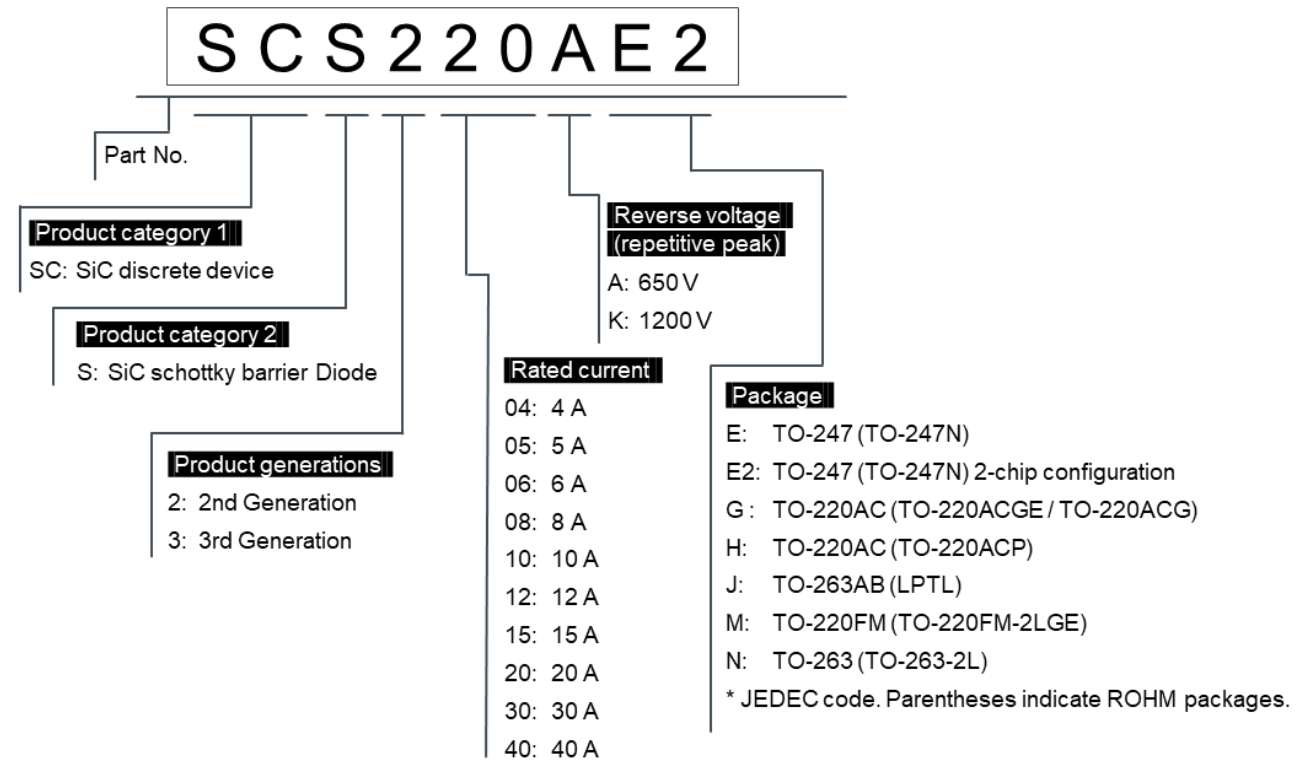
Component name	Component
D1, D2	SiC Schottky Barrier Diode

For more information, go to “**More Info**” and click on “**Link to Datasheet**”.



Model Links:
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SiC Schottky Barrier Diode part number information



Product Lineup: [SiC Schottky Barrier Diodes](#)

Selectable Devices

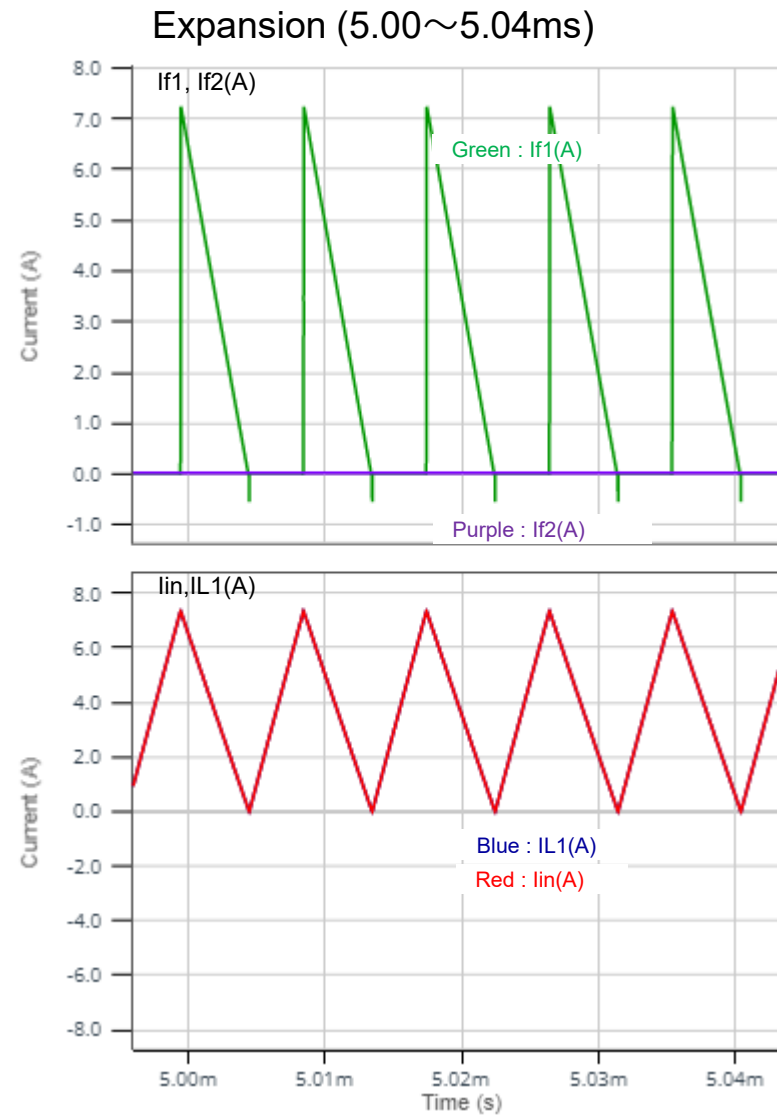
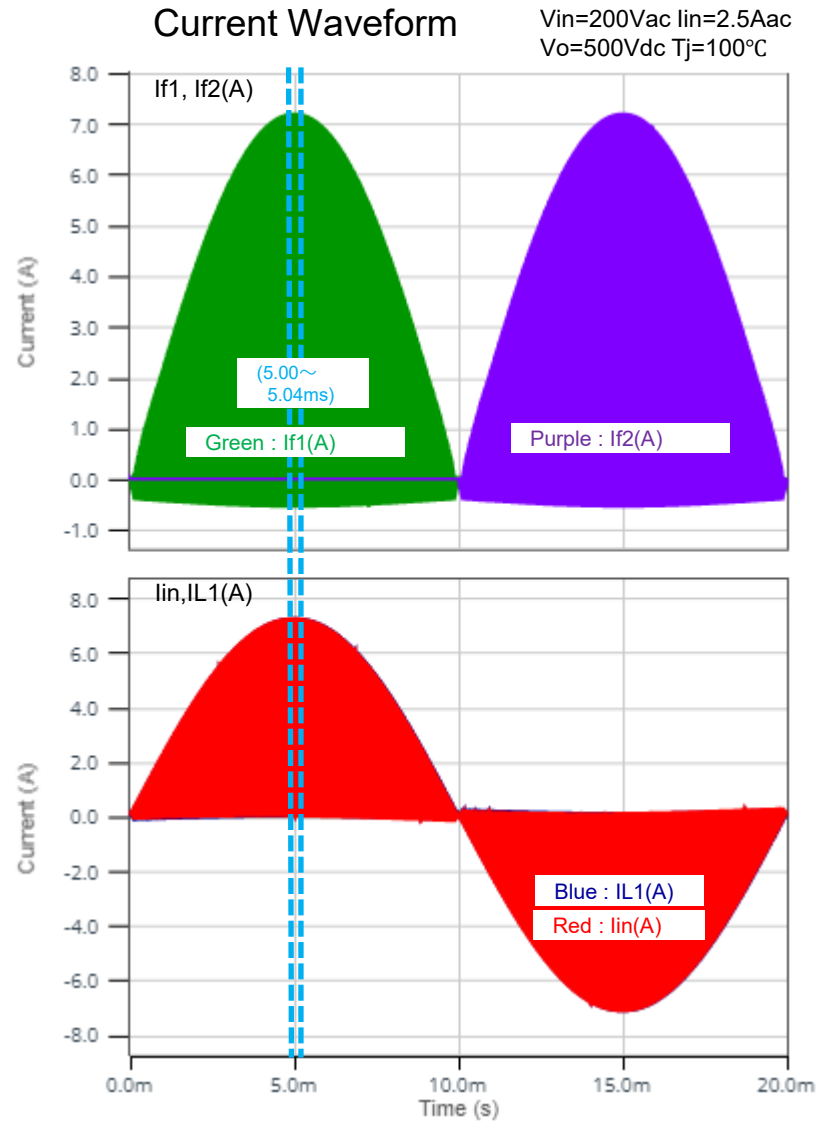
Component name	Component	Product No.	feature
GD-IC1,2	Gate Driver	BM61S41RFV-C (*)	for SiC MOSFET Isolation Voltage : 3750 Vrms I/O Delay Time (max) : 65ns Miller Clamp : Built-in UVLO : 14.5V
		BM61M41RFV-C	for SJ-MOS / IGBT Isolation Voltage : 3750 Vrms I/O Delay Time (max) : 65ns Miller Clamp : Built-in UVLO : 7.4V

* Default device

Simulation Waveform1



Q1,2 : SiC MOSFET
SCT2450KE
D1,2 : SiC SBD
SCS302AHG

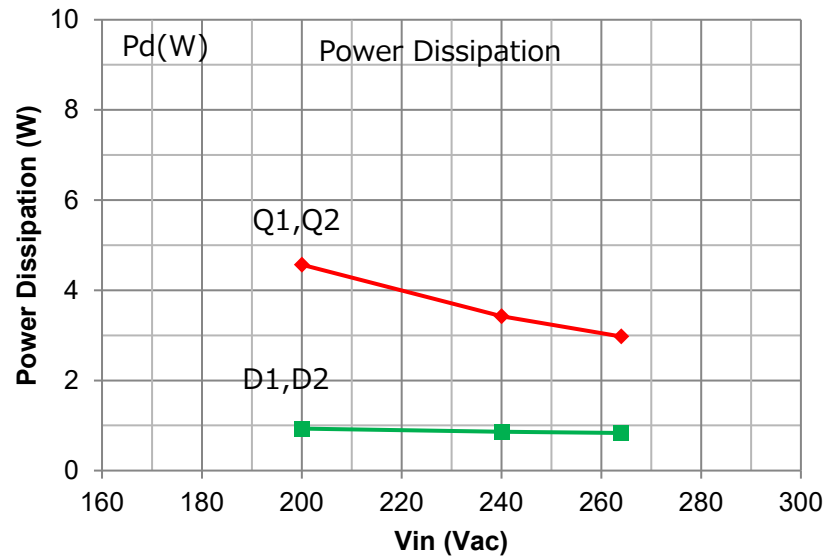
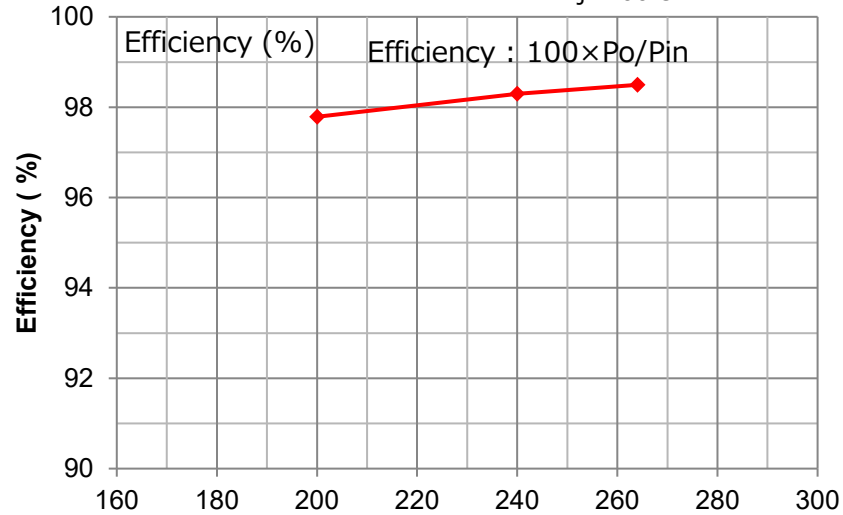


Efficiency, Power Dissipation 1

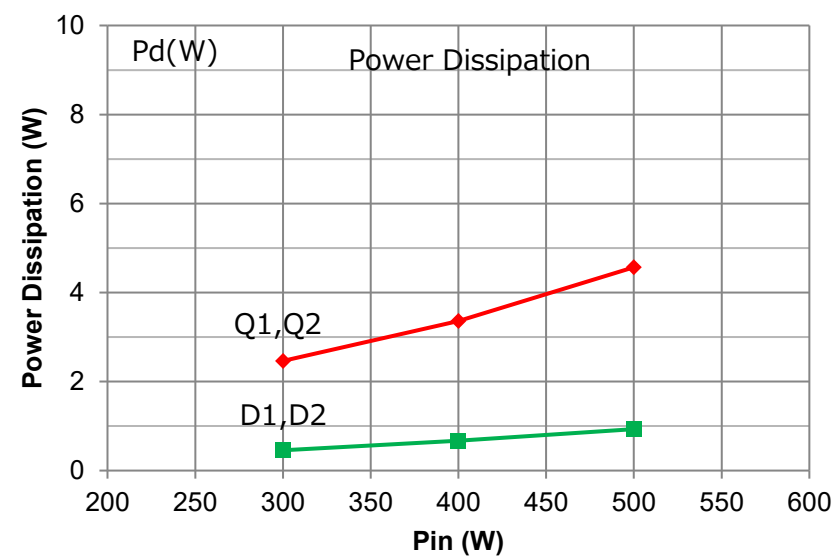
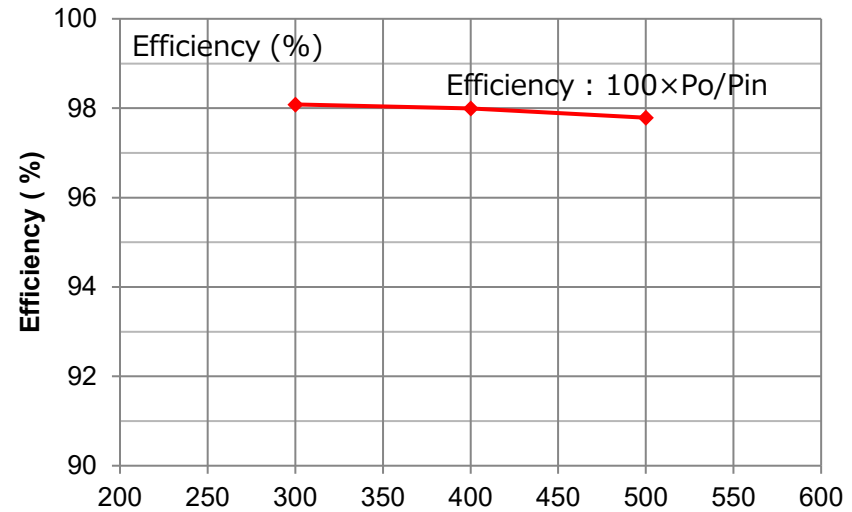


Q1,2 : SiC MOSFET
SCT2450KE
D1,2 : SiC SBD
SCS302AHG

Vin : 200Vac~264Vac Pin=500W Vo=500Vdc
Tj=100°C



Pin : 300W~500W Vin=200Vac Vo=500Vdc
Tj=100°C



Efficiency, Power Dissipation 2

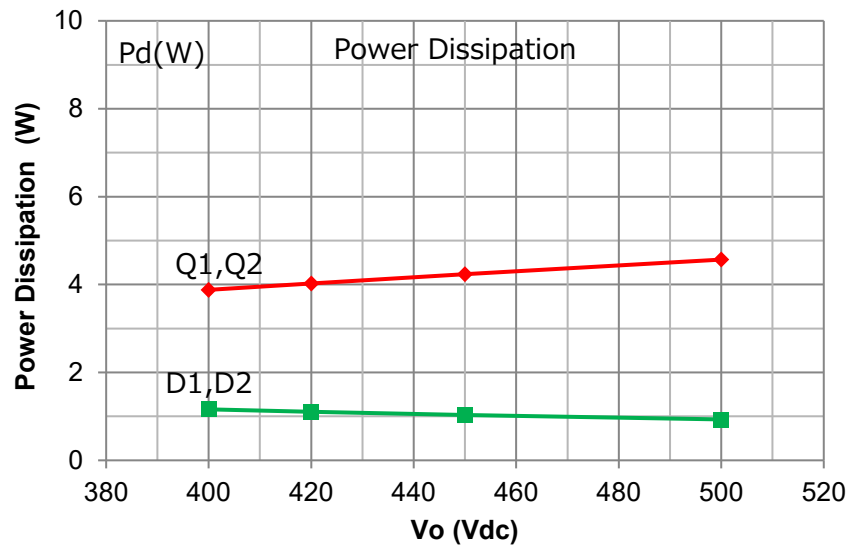
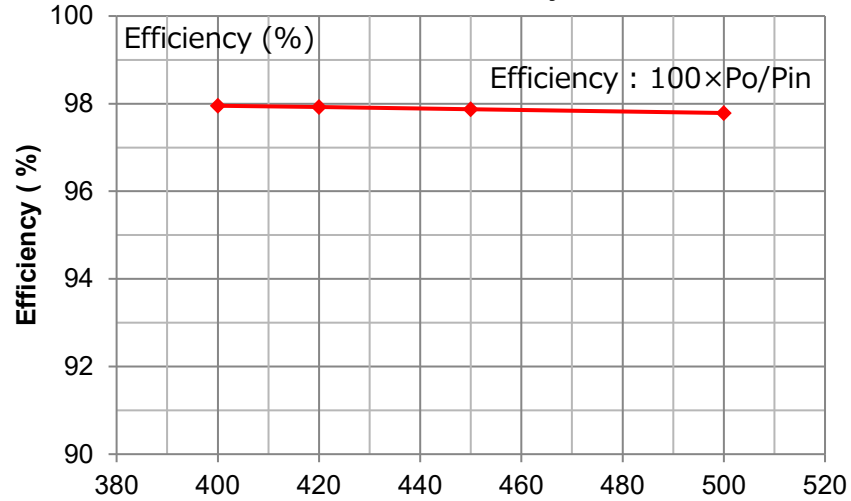


ROHM Solution Simulator Schematic Information

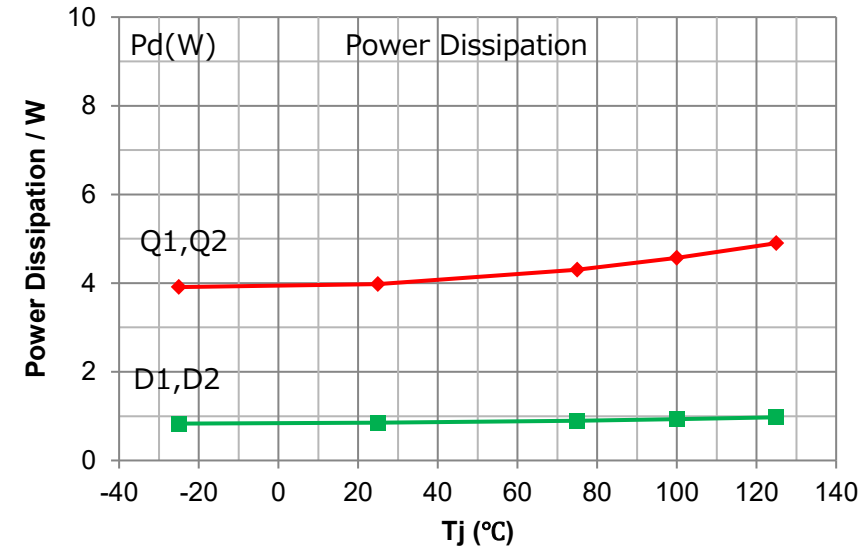
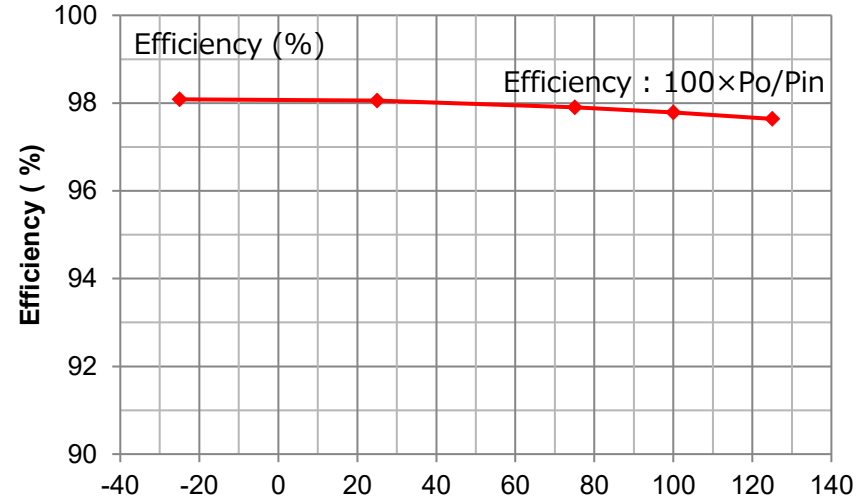
2025. Nov.
64UG106E Rev.006

Q1,2 : SiC MOSFET
SCT2450KE
D1,2 : SiC SBD
SCS302AHG

Vo : 400Vdc~500Vdc Vin=200Vac Iin=2.5Aac
Tj=100°C

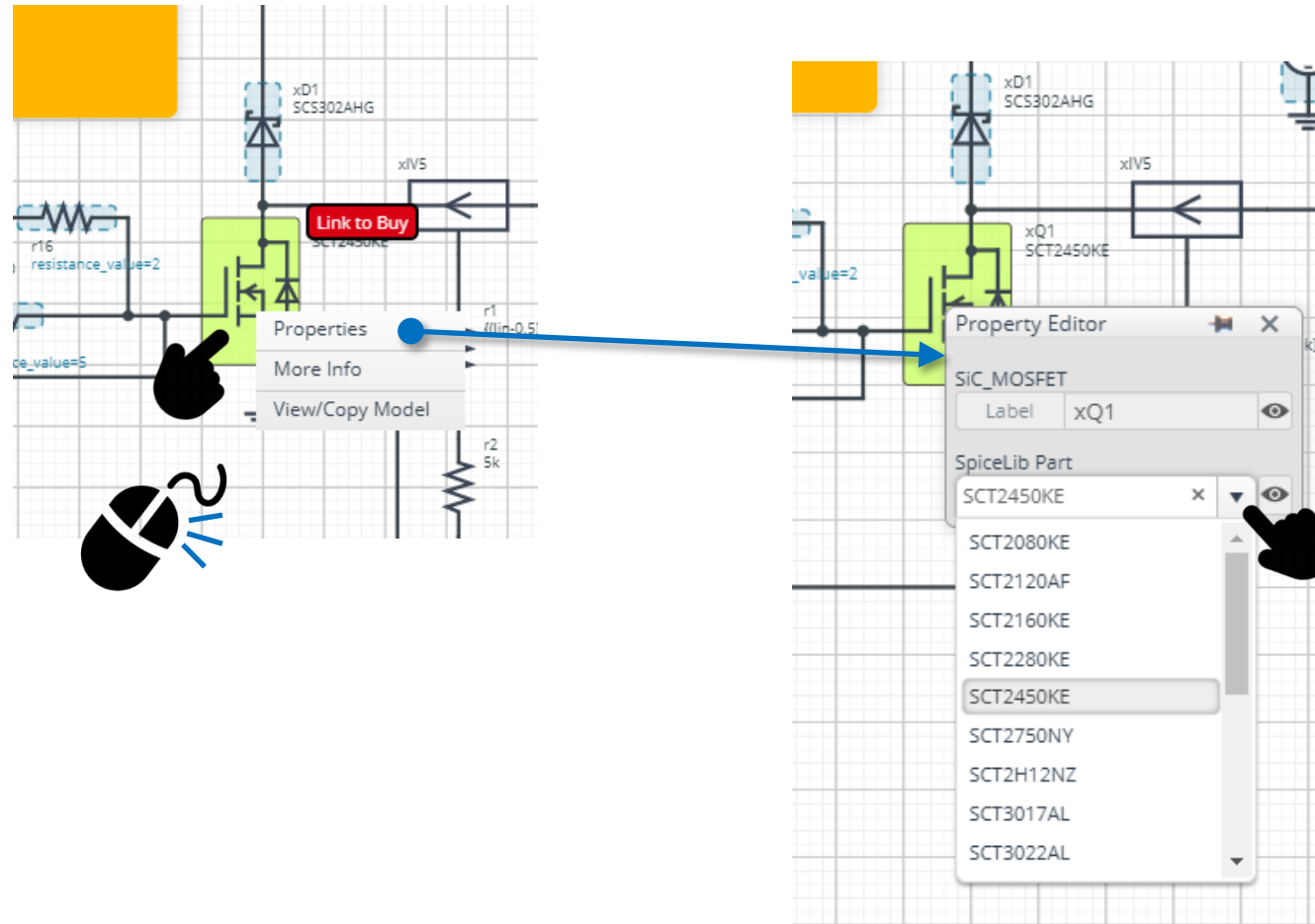


Tj : -25°C~125°C Vin=200Vac Iin=2.5Aac
Vo=500Vdc



How to change the devices

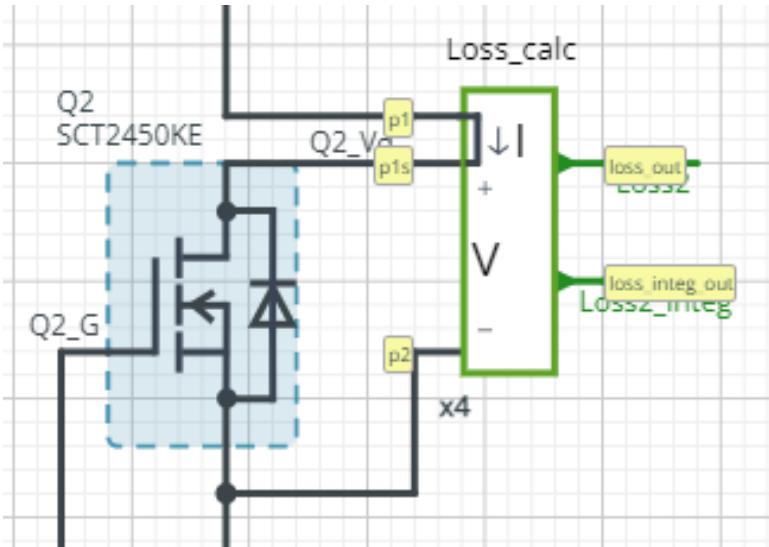
Right-click on the device → Select Properties → Pull down “SpiceLib Part” → Select the product



Loss Calculation Model outputs the instantaneous value of power loss and its integration.

2025. Nov.
64UG106E Rev.006

Loss calculation model 'Loss_calc'



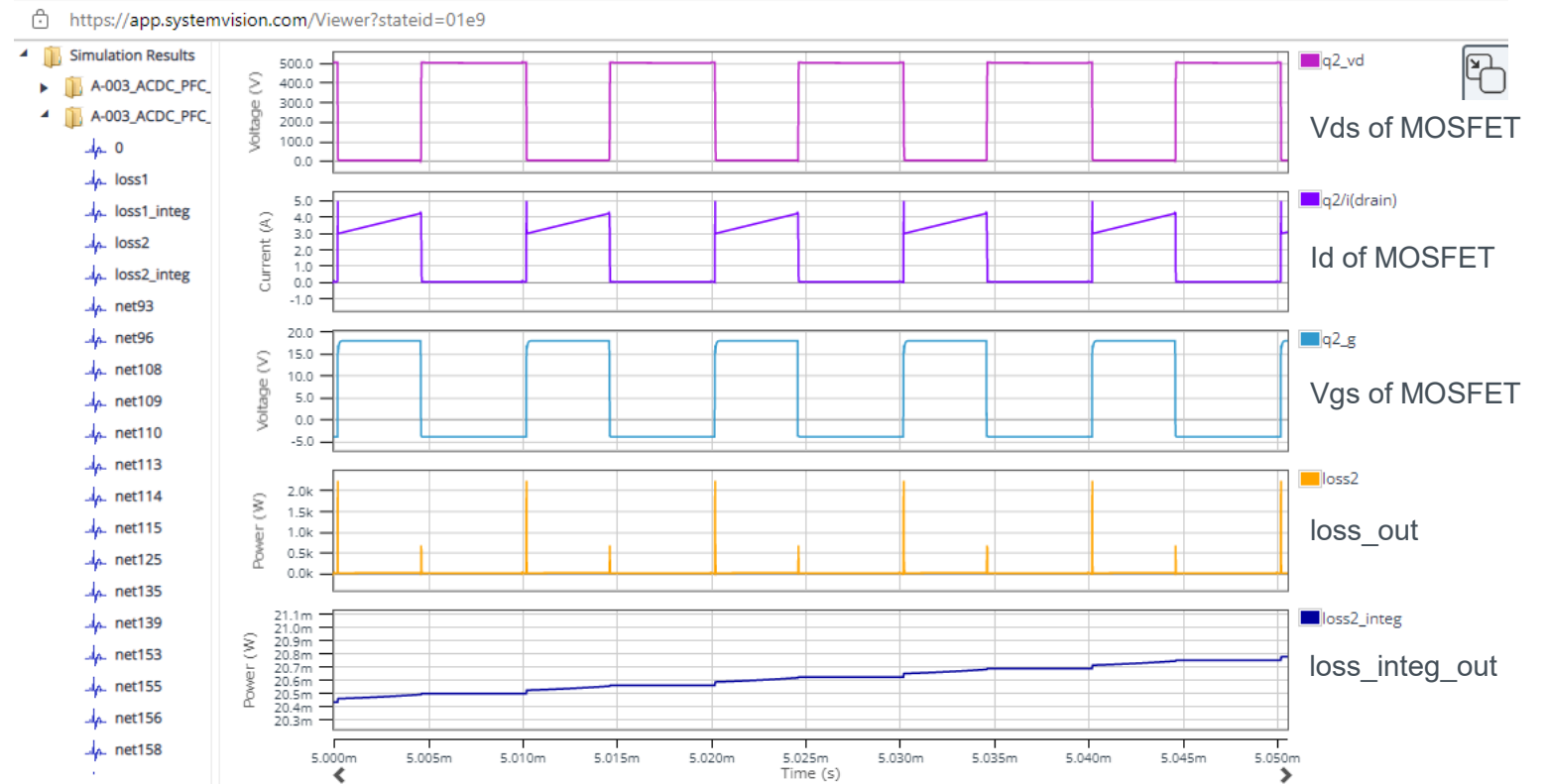
$$loss_out(t) = I(t) \times V(t)$$

$$loss_integ_out = \int_0^t loss_out(t) dt$$

I : Current through p1 to p1s

V : Voltage between p1s and p2

Waveform example



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