

# A-015. Bridgeless PFC $V_{in}=200V$ , $I_{in}=20A$ , CCM (Full-Bridge)

ROHM Solution Simulator Schematic Information



2025. Nov.  
64UG109E Rev.005

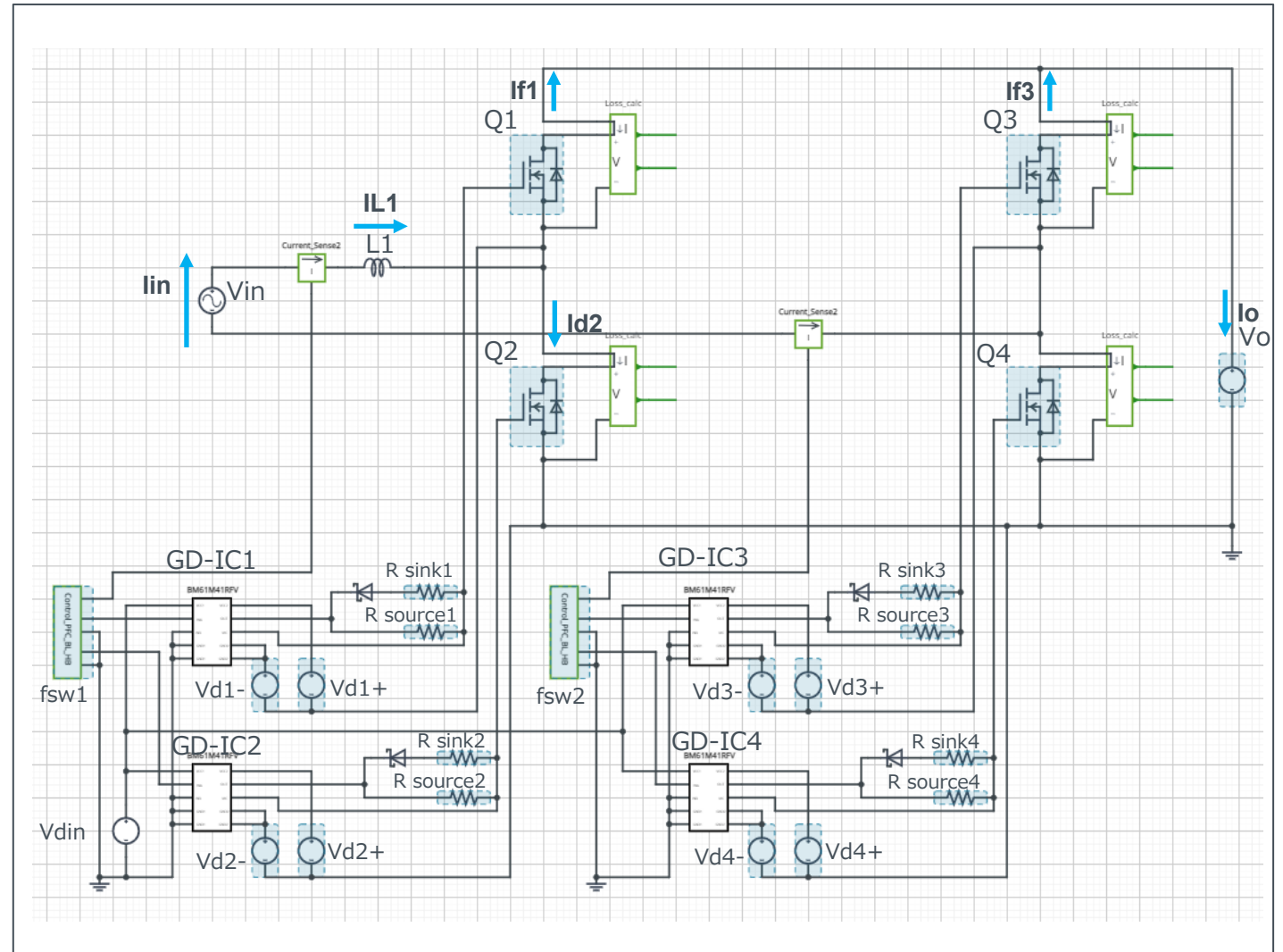
## Simulation Parameters

Parameters	Descriptions	Default	Simulation Setting Range
$V_{in}$	Input voltage	200Vac 50Hz	
$I_{in}$	Input current	20Aac	
$V_o$	Output voltage	500Vdc	300 – 500Vdc
fsw1,2	Switching frequency	50kHz	10k – 300kHz
$T_j$	Temperature	100°C	
Vd1-4+	Gate Drive voltage H	18V	10 – 20V
Vd1-4-	Gate Drive voltage L	0V	-4 – 0V
Vdin	Signal voltage level	5V	

## Devices

Component Name	Component	Default	Simulation Setting Range
Q1 – Q4	SiC MOSFET SJ-MOSFET	Selectable	
GD-IC1-4	Gate Driver	Selectable	
R sink1-4	Resistor for sink	ESR18 1Ω	0.1 -
R source1-4	Resistor for source	ESR18 2Ω	0.1 -
L1	Inductor	200μH	10μH - 2mH

## 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.

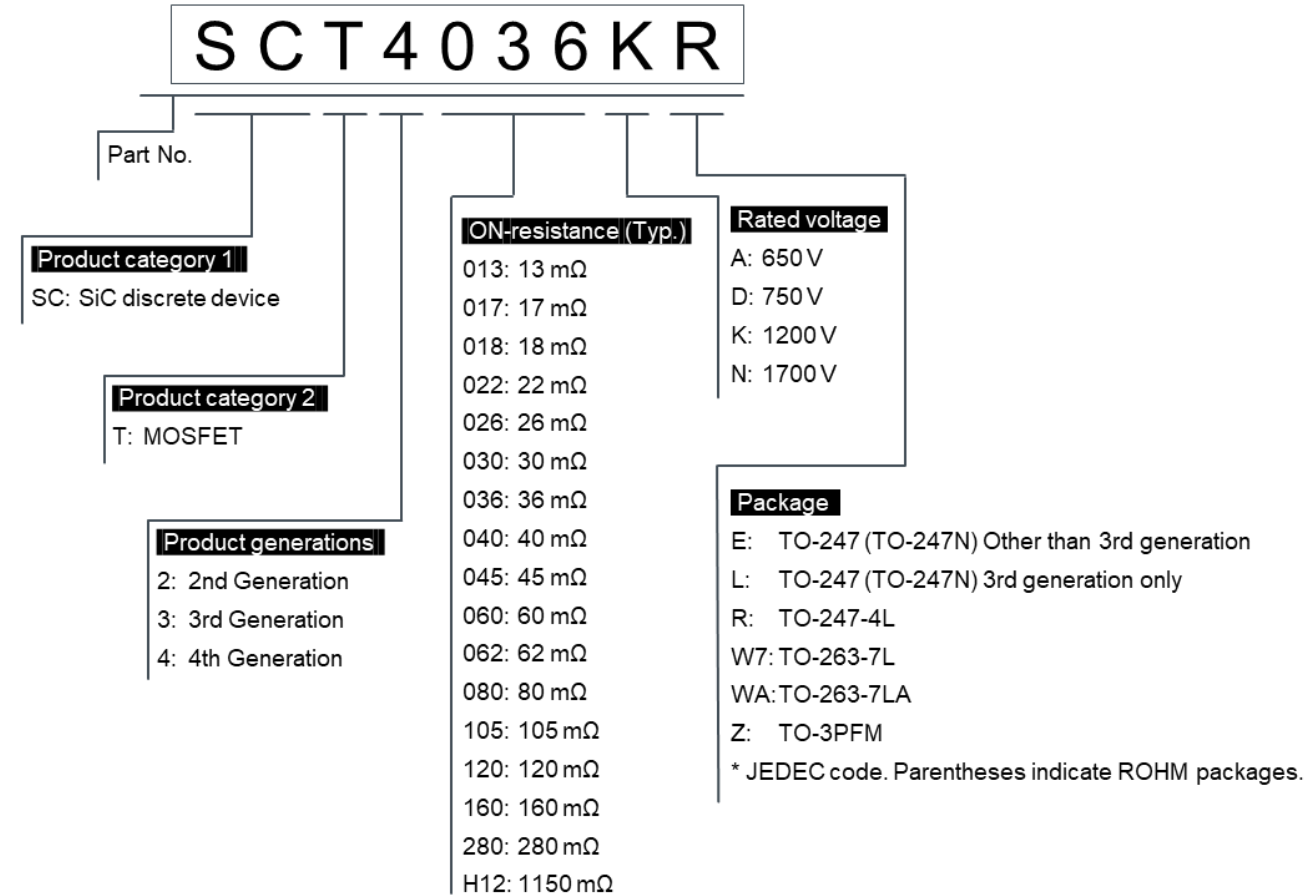
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## Selectable Devices

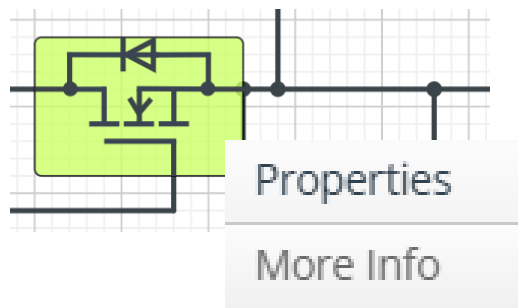
Component name	Component
Q1 - 4	SiC MOSFET

## SiC MOSFET part number information

**SCT4036KR**



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



**Model Links:**  
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Product Lineup: [SiC MOSFETs](#)

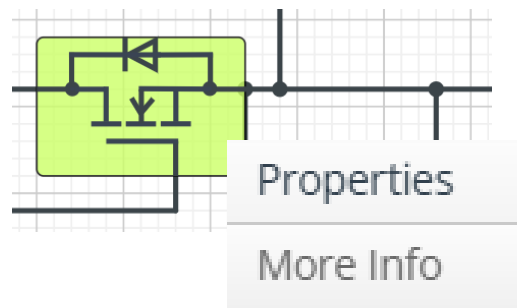
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## Selectable Devices

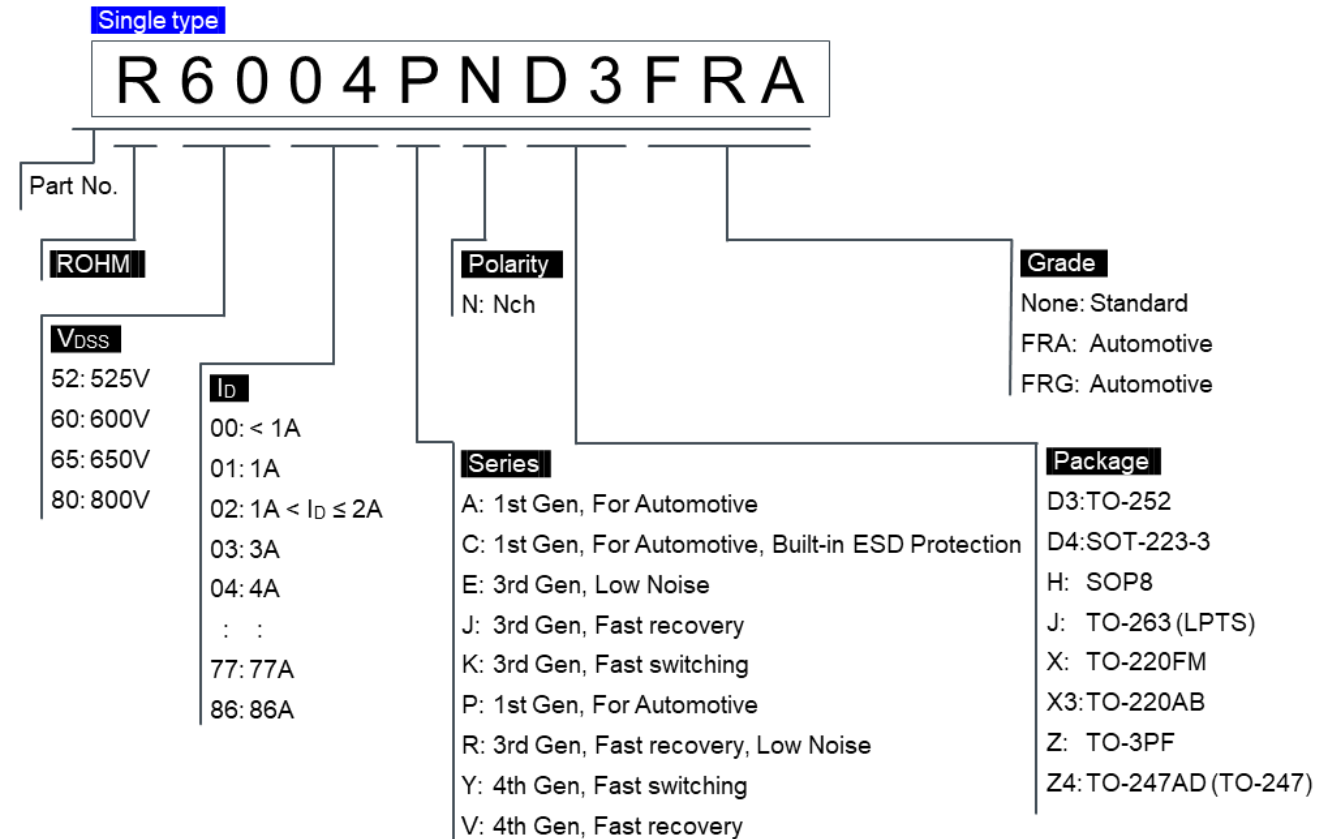
Component name	Component	Product
Q1 - 4	SJ MOSFET	RxxxxKN series RxxxxYN series

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](#)

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## Selectable Devices

Component name	Component	Product
Q1 - 4	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 $\mu$ s  
 T: For inverter, Short circuit capability guaranteed 5 $\mu$ s  
 TV: For converter / inverter, High speed switching, Short circuit capability guaranteed 2 $\mu$ 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

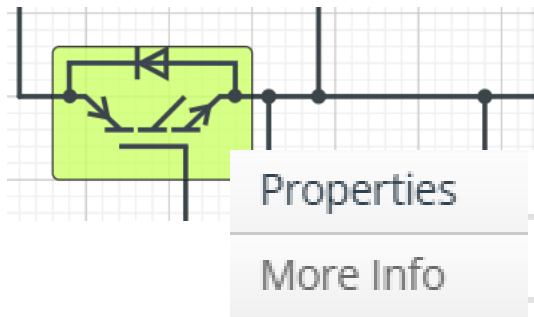
None: Without diode  
 C: SiC Schottky barrier diode  
 D: Fast recovery diode  
 E: Larger size Fast recovery diode  
 R: Body diode with reverse conducting (RC) structure

### 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

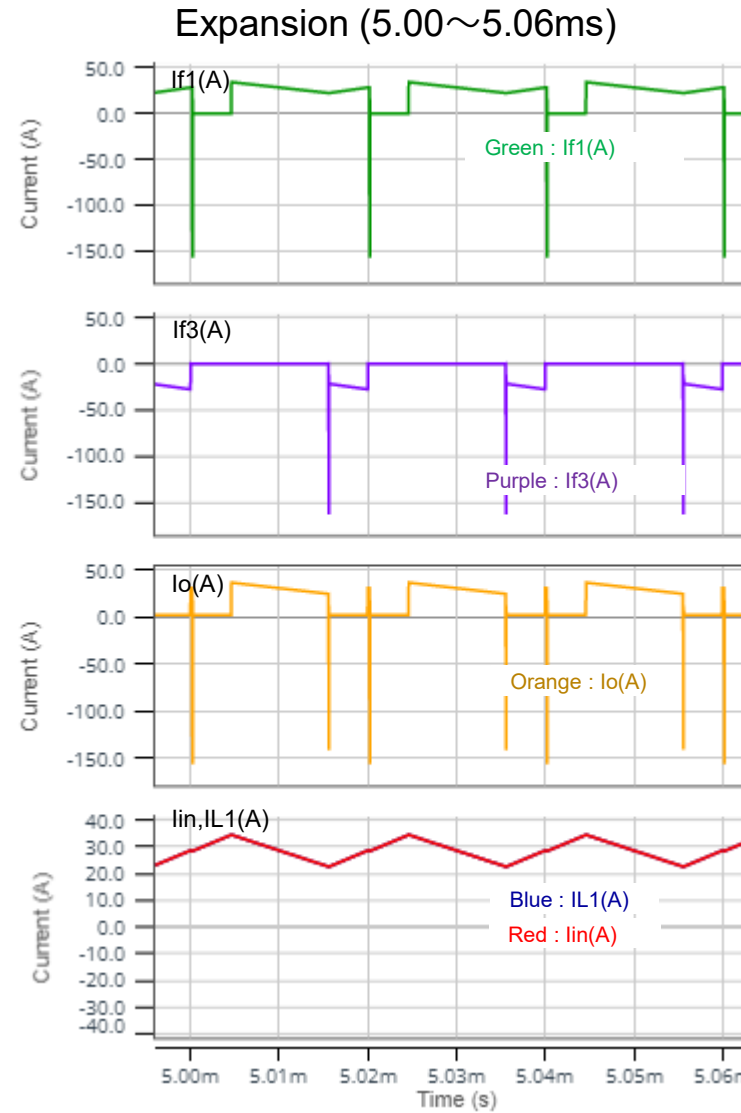
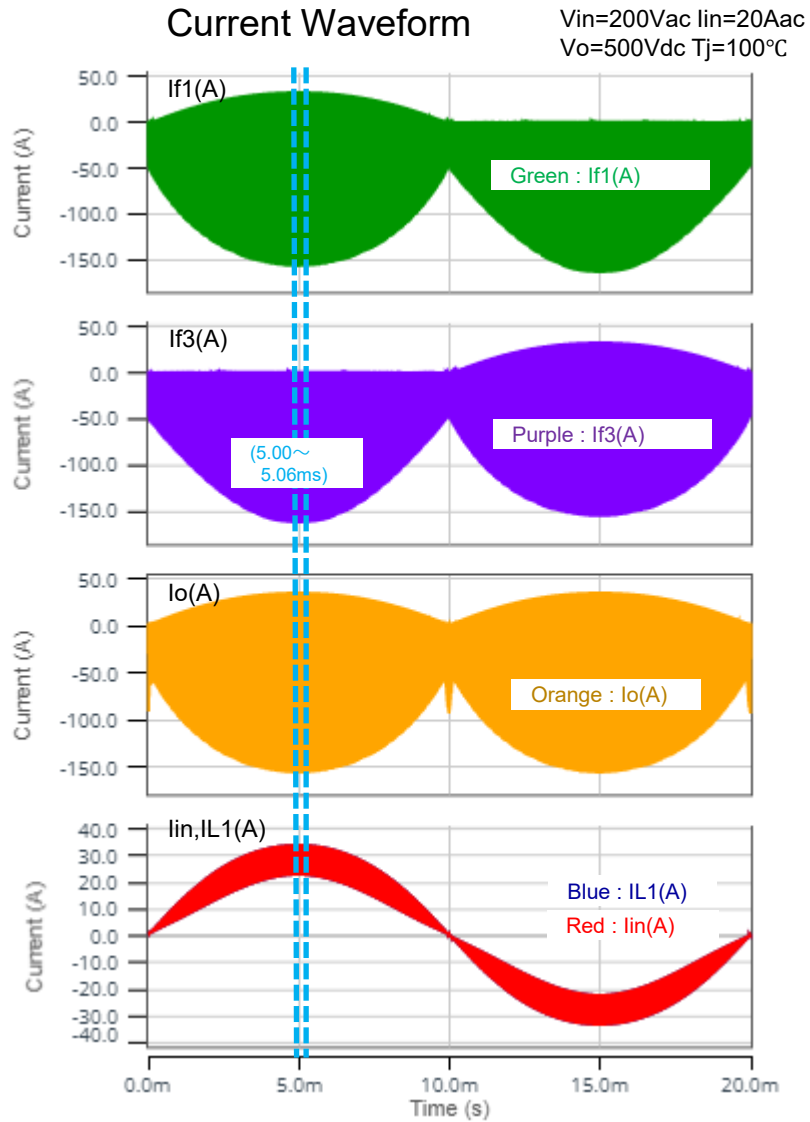
Component name	Component	Product No.	feature
GD-IC 1-4	Gate Driver	BM61S41RFV-C (*)	<b>for SiC MOSFET</b> Isolation Voltage : 3750 Vrms I/O Delay Time (max) : 65ns Miller Clamp : Built-in UVLO : 14.5V
		BM61M41RFV-C	<b>for SJ-MOS / IGBT</b> Isolation Voltage : 3750 Vrms I/O Delay Time (max) : 65ns Miller Clamp : Built-in UVLO : 7.4V

\* Default device

# Simulation Waveform1



Q1 - 4: SJ MOSFET  
R6050JNZ4



# Simulation Waveform2



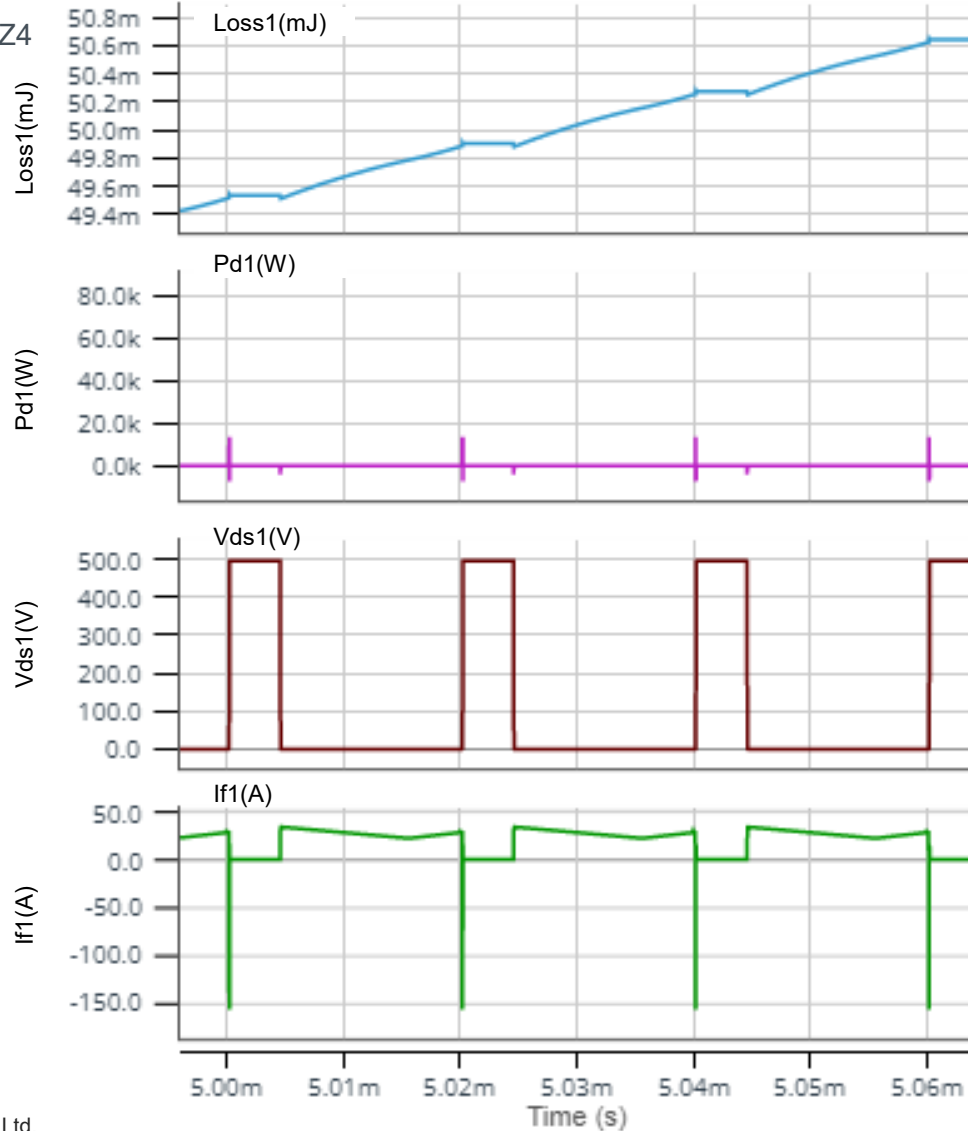
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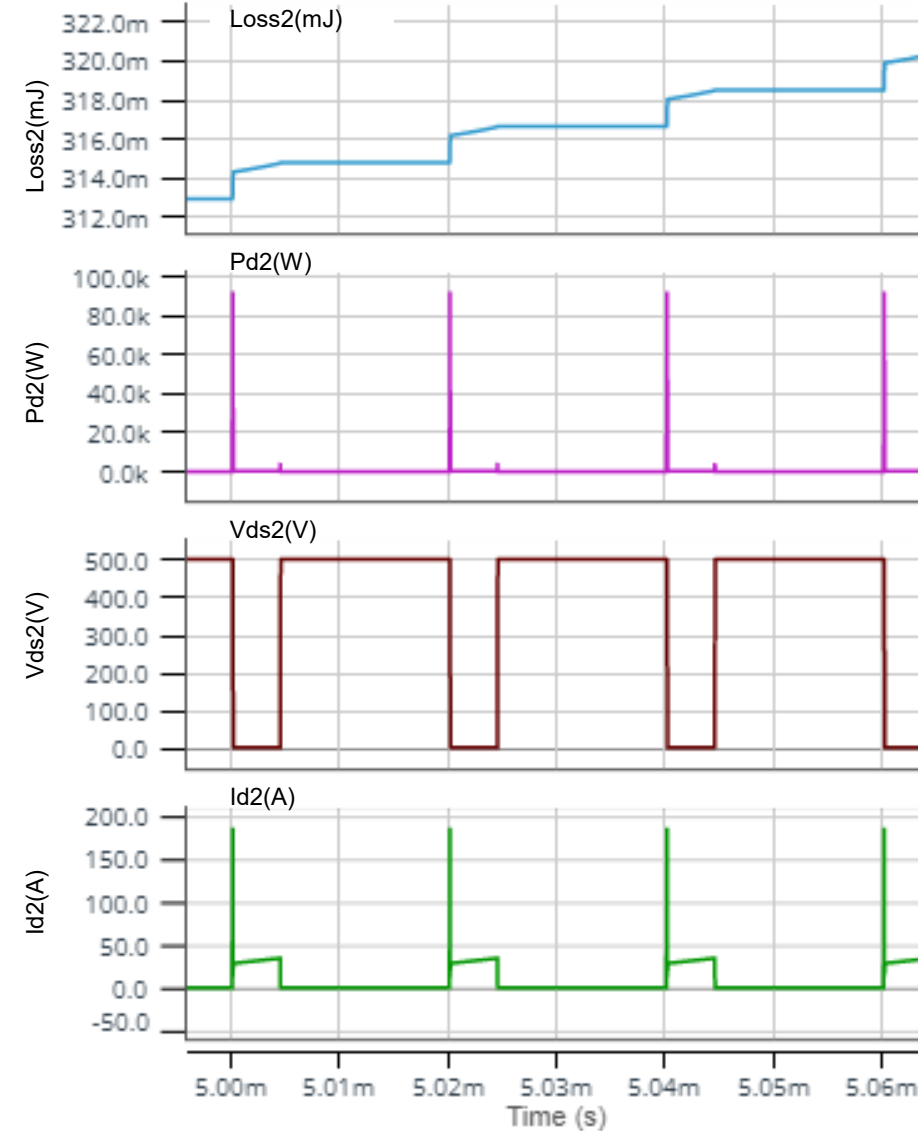
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Q1 - 4: SJ MOSFET  
R6050JNZ4

Q1\_Loss1, Pd1, Vds1, If1  
Vin=200Vac Iin=20Aac  
Vo=500Vdc Tj=100°C



Q2\_Loss2, Pd2, Vds2, Id2  
Vin=200Vac Iin=20Aac  
Vo=500Vdc Tj=100°C

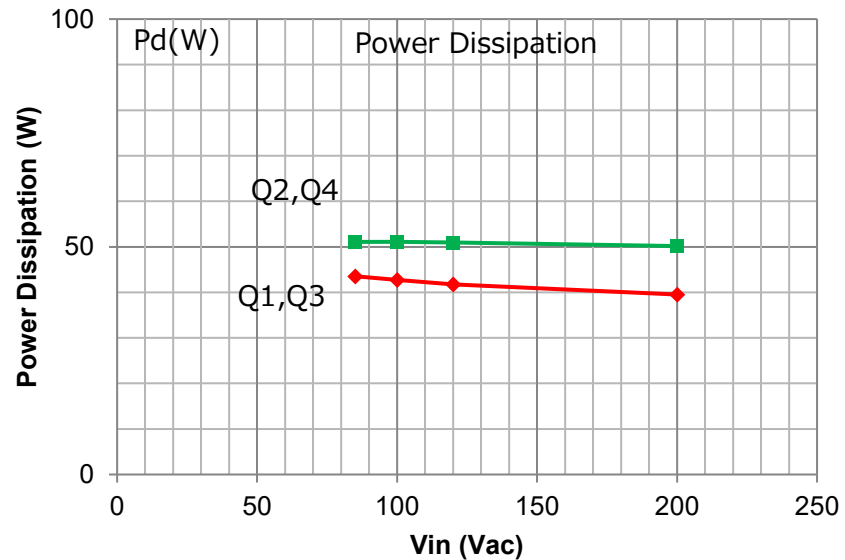
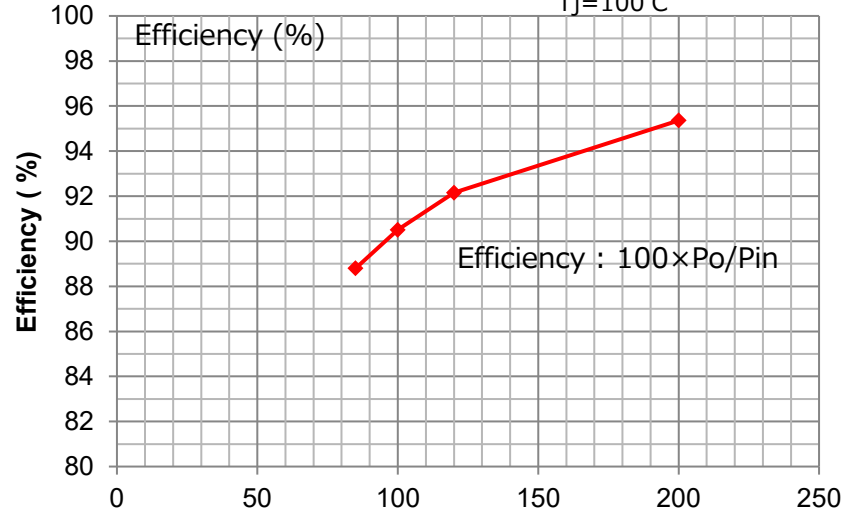


# Efficiency, Power Dissipation



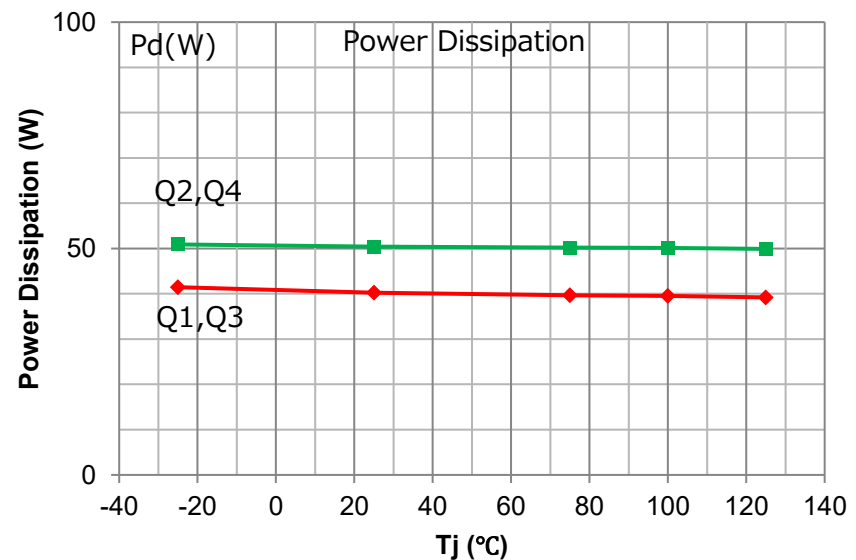
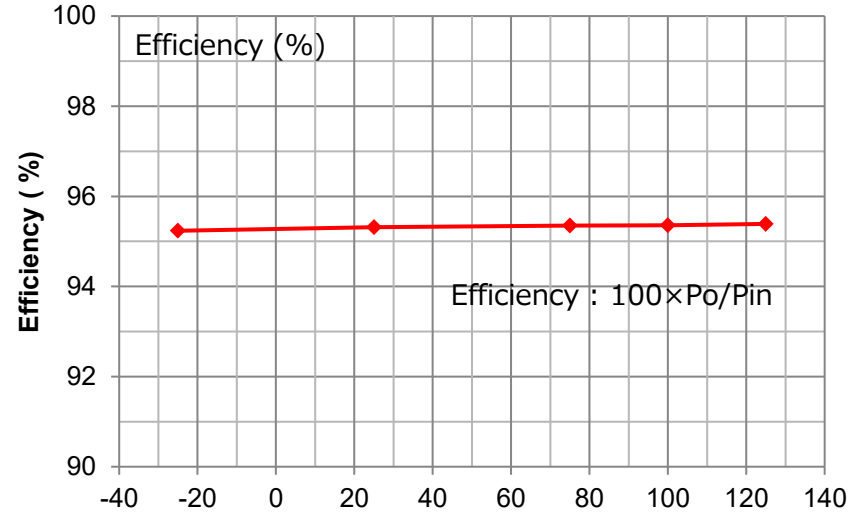
Q1 - 4: SJ MOSFET  
R6050JNZ4

Vin : 85Vac~200Vac Iin=20Aac Vo=500Vdc  
Tj=100°C



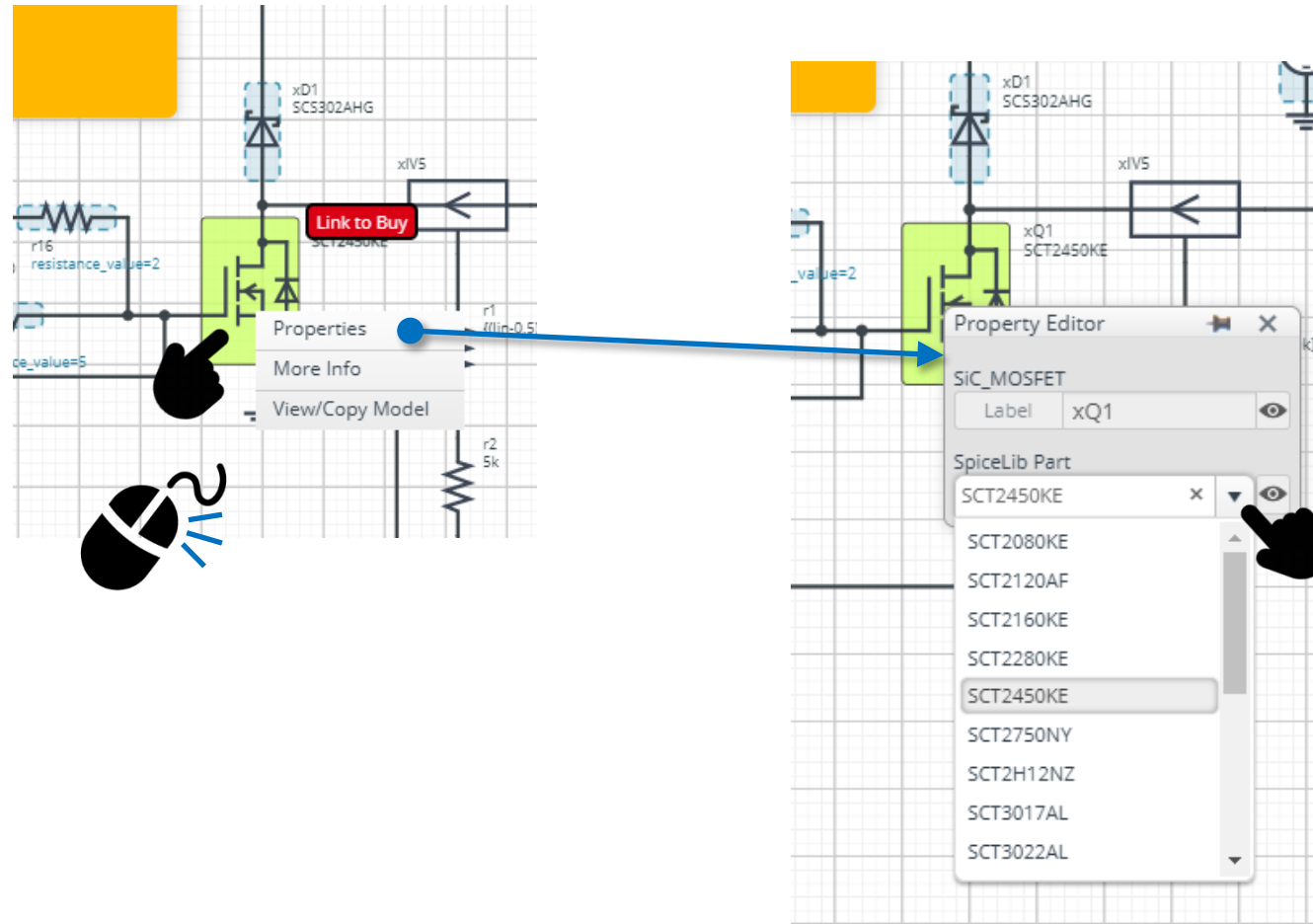
Tj : -25°C~125°C

Vin=200Vac Iin=20Aac  
Vo=500Vdc



# How to change the devices

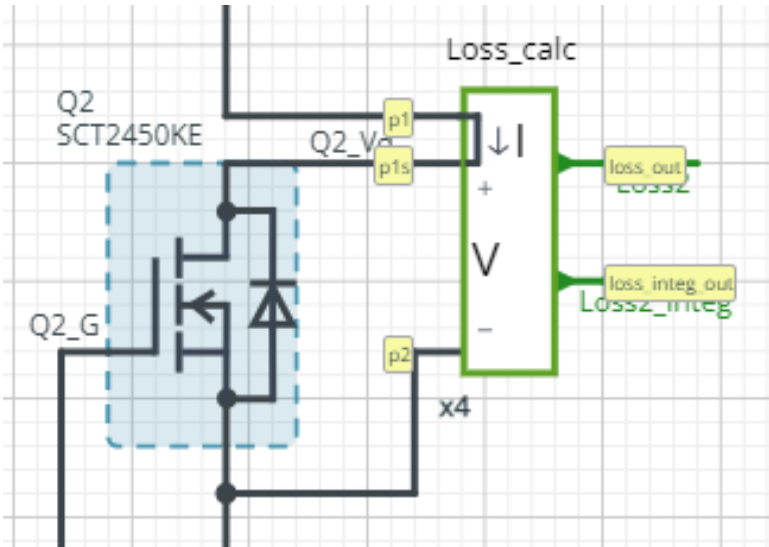
Right-click on the device → Select Properties → Pull down “SpiceLib Part” → Select the product



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

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## Loss calculation model 'Loss\_calc'



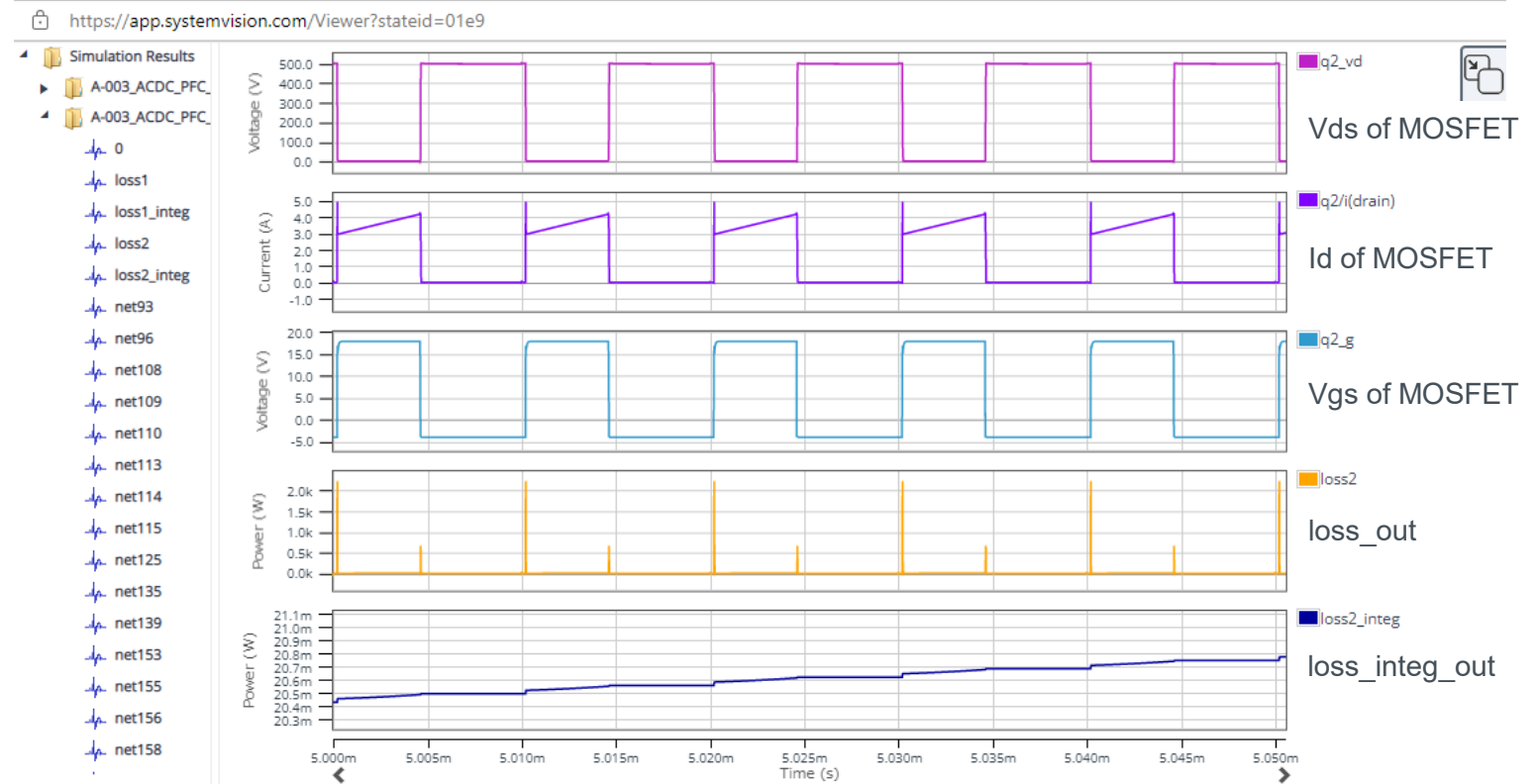
$$loss\_out(t) = I(t) \times V(t)$$

$$loss\_integ\_out = \int_0^t loss\_out(t) dt$$

I : Current through p1 to p1s

V : Voltage between p1s and p2

## Waveform example



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