

# A-020. 3-Phase 2-Level Full Bridge PFC 4-wire $V_{in}=200V$ , $P_{IN}=25kW$

ROHM Solution Simulator Schematic Information



2025. Nov.  
64UG114E Rev.006

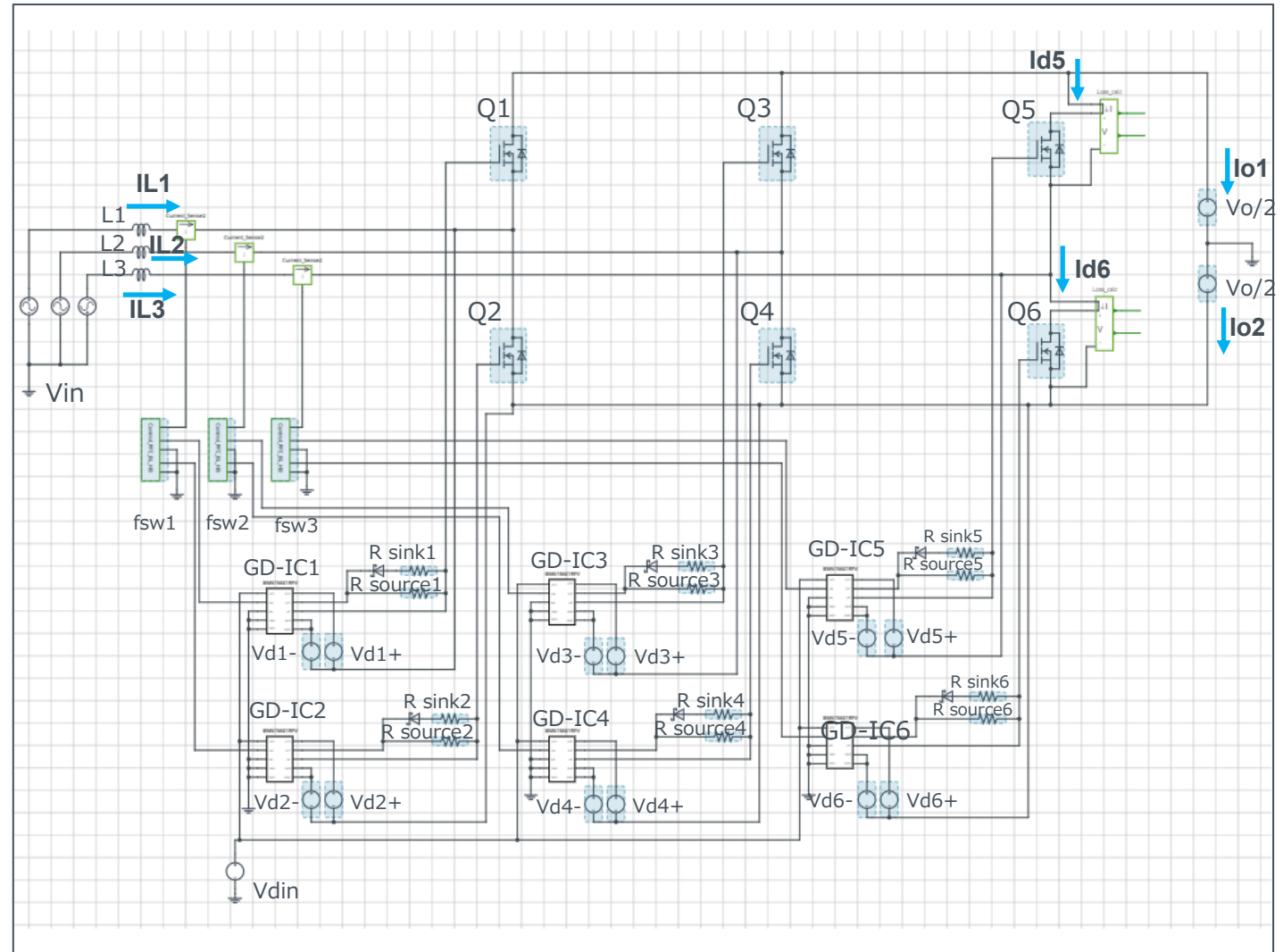
## Simulation Parameters

Parameters	Descriptions	Default	Simulation Setting Range
$V_{in}$	Input voltage	115Vac 50Hz	
$P_o$	Power Output	25kW	
$V_o$	Output voltage	200+200Vdc	300 – 500Vdc
fsw1,2,3	Switching frequency	20kHz	10k – 300k
$T_j$	Temperature	100°C	
Vd1-6+	Gate Drive voltage H	15V	10 – 20V
Vd1-6-	Gate Drive voltage L	-4V	-4 – 0V
Vdin	Signal voltage level	5V	

## Devices

Component Name	Component	Default	Simulation Setting Range
Q1 – Q6	SiC MOSFET SJ MOSFET IGBT	Selectable	
GD-IC1-6	Gate Driver	Selectable	
R sink1-6	Resistor for sink	ESR18 1Ω	0.1 -
R source1-6	Resistor for source	ESR18 2Ω	0.1 -
L1, L2, L3	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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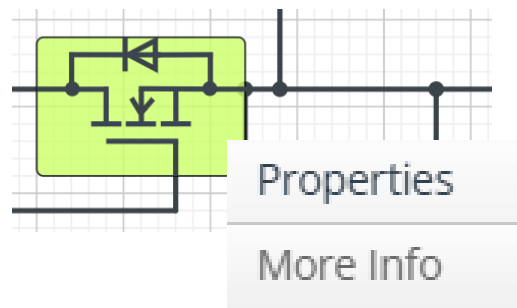


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## Selectable Devices

Component name	Component
Q1 – Q6	SiC MOSFET

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

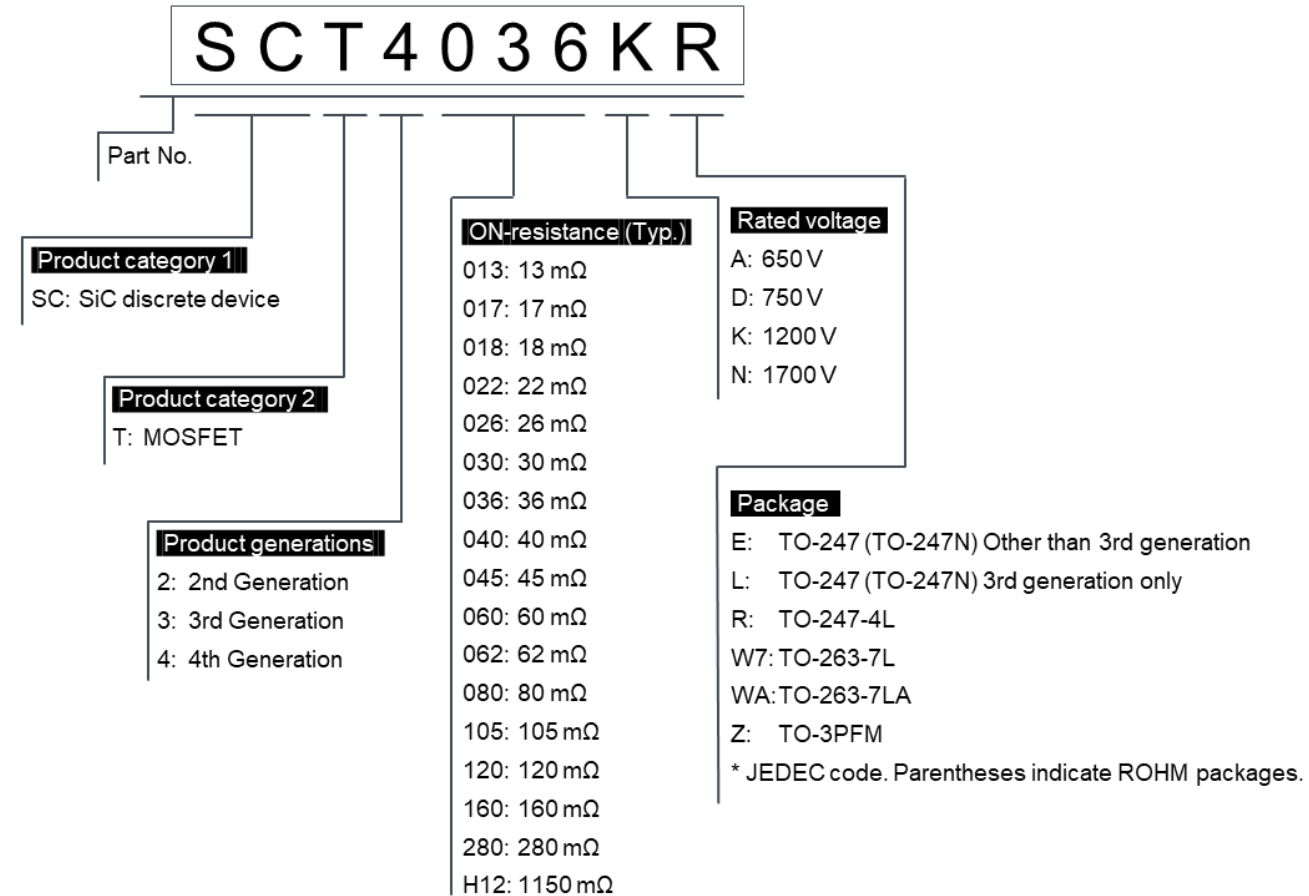


**Model Links:**

- [Link To Product](#)
- [Link To Datasheet](#)
- [Link To Buy](#)
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## SiC MOSFET part number information

**SCT4036KR**



Product Lineup: [SiC MOSFETs](#)

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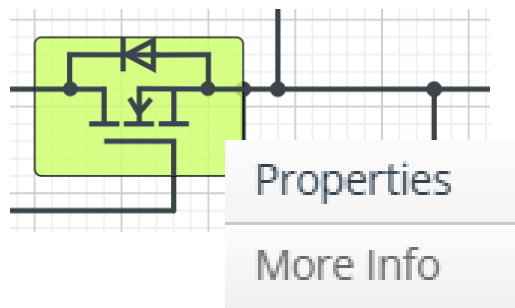
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## Selectable Devices

Component name	Component	Product
Q1 – Q6	SJ MOSFET	RxxxxJN series RxxxxVN series

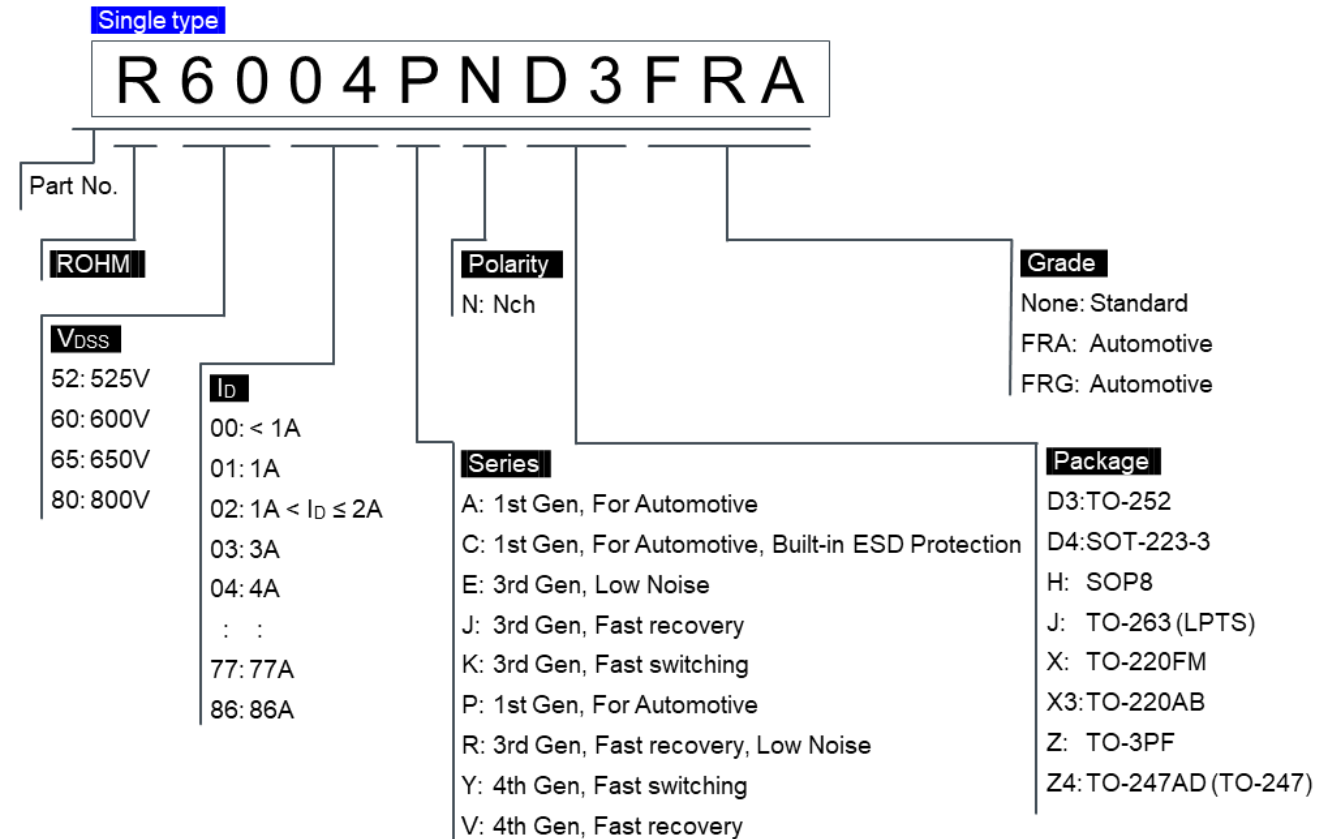
\* Default device : R6077VNZ4

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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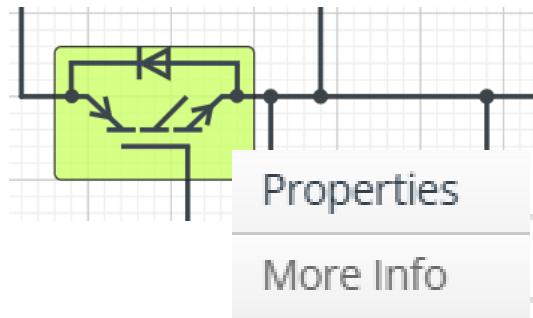
IGBT part number information

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

Selectable Devices

Component name	Component	Product
Q1 – Q6	IGBT	RGA series RGS series

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



Model Links:  
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**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](#)

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## Selectable Devices

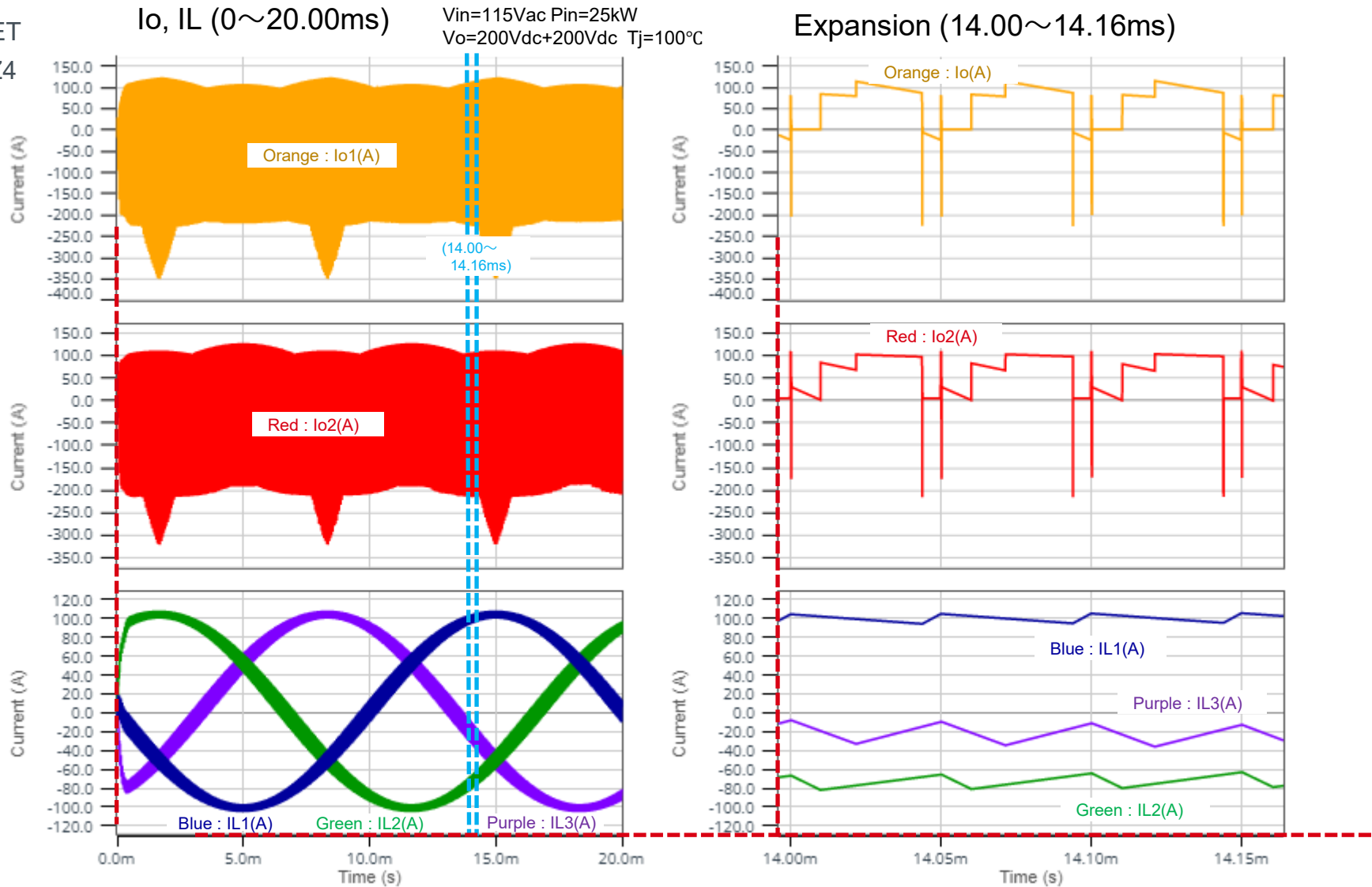
Component name	Component	Product No.	feature
GD-IC1-6	Gate Driver	BM61S41RFV-C (*)	<b>for SiC MOSFET</b> Isolation Voltage : 3750 Vrms I/O Delay Time (max) : 65ns Miller Clamp : Built-in UVLO : 14.5V
		BM61M41RFV-C	<b>for SJ-MOS / IGBT</b> Isolation Voltage : 3750 Vrms I/O Delay Time (max) : 65ns Miller Clamp : Built-in UVLO : 7.4V

\* Default device

# Simulation Waveform1



Q1 - 6 : SJ MOSFET  
R6050JNZ4



# Simulation Waveform2



ROHM Solution Simulator Schematic Information

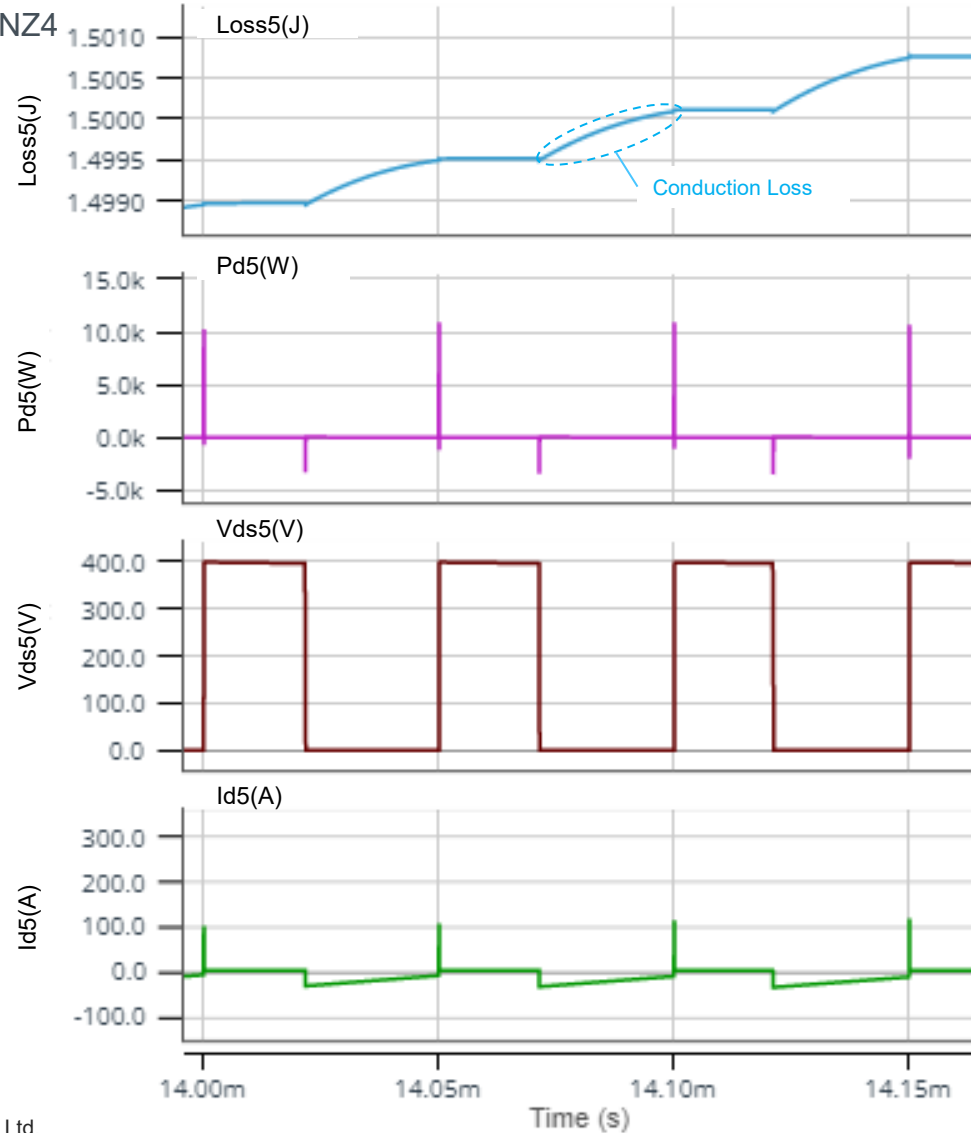
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Q1 - 6 : SJ MOSFET

R6050JNZ4

Q5\_Loss5, Pd5, Vds5, Id5

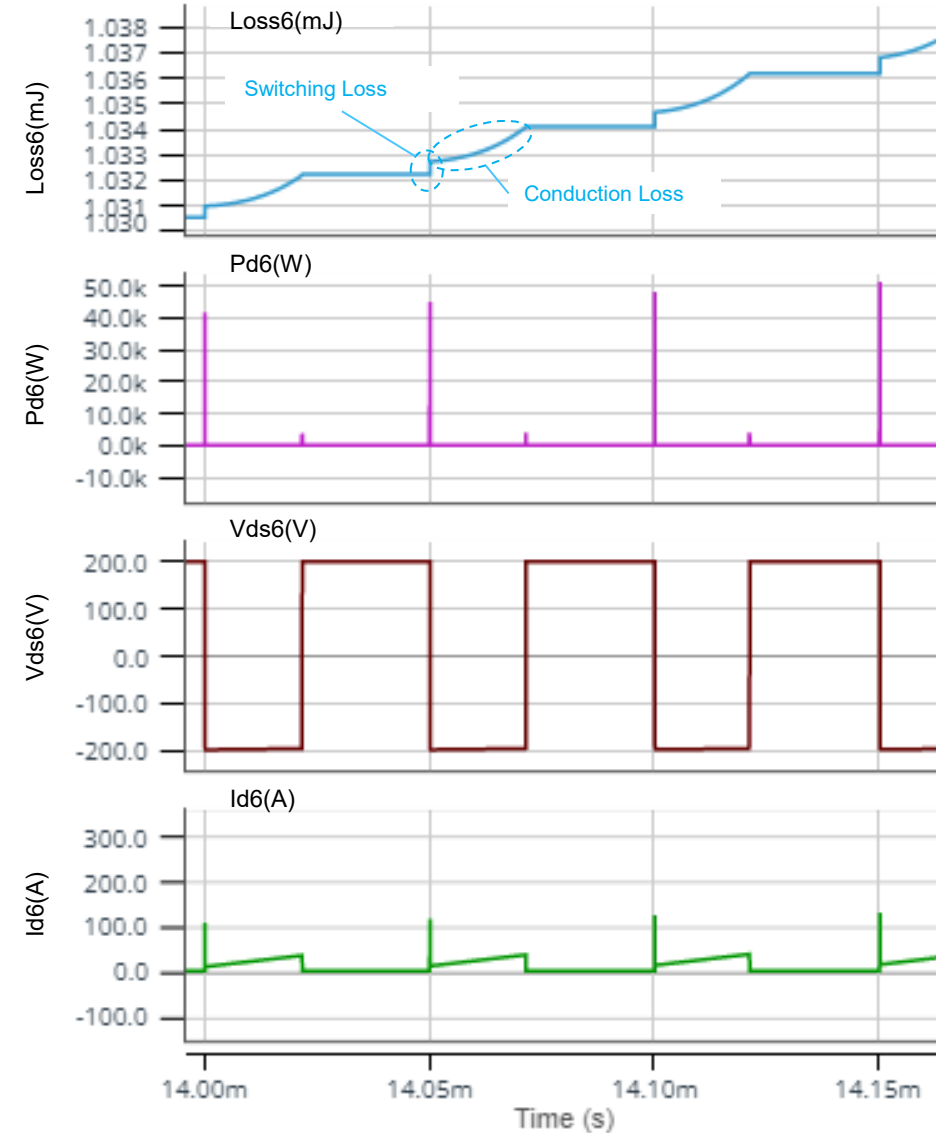
Vin=115Vac Pin=25kW  
Vo=200Vdc+200Vdc Tj=100°C



Q6\_Loss6, Pd6, Vds6, Id6

Vin=115Vac Pin=25kW  
Vo=200Vdc+200Vdc Tj=100°C

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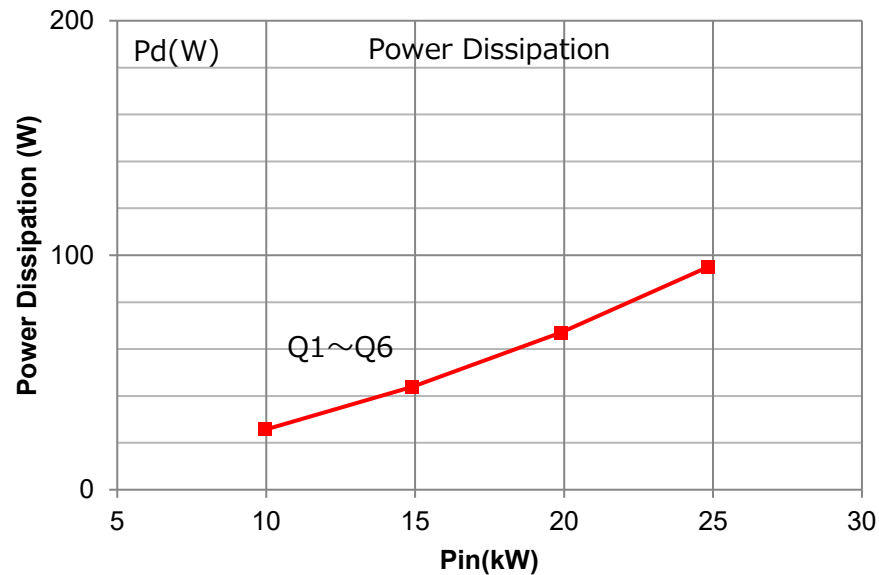
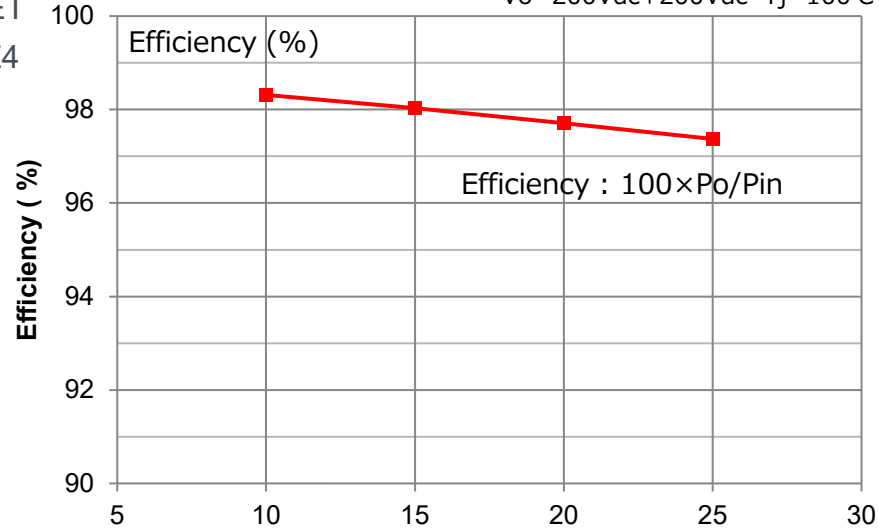
# Efficiency, Power Dissipation



ROHM Solution Simulator Schematic Information

Q1 - 6 : SJ MOSFET  
R6050JNZ4

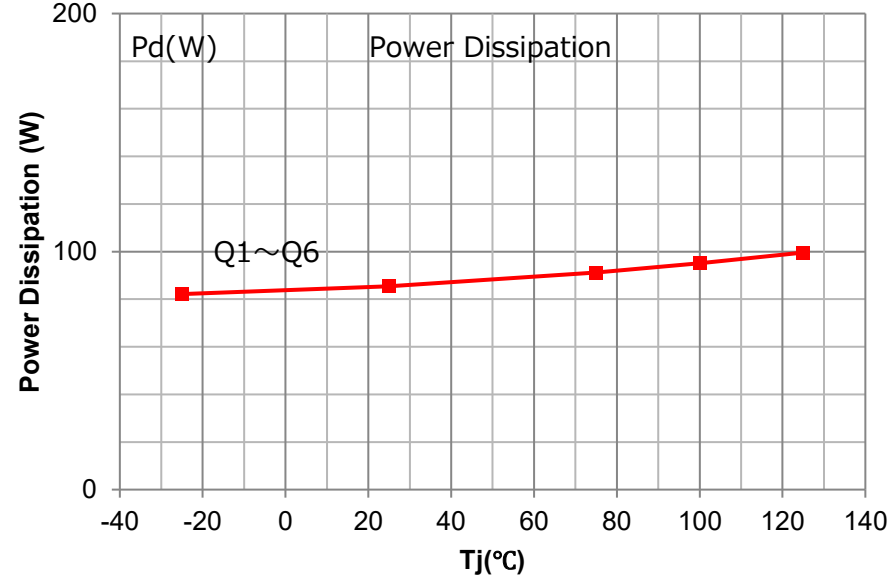
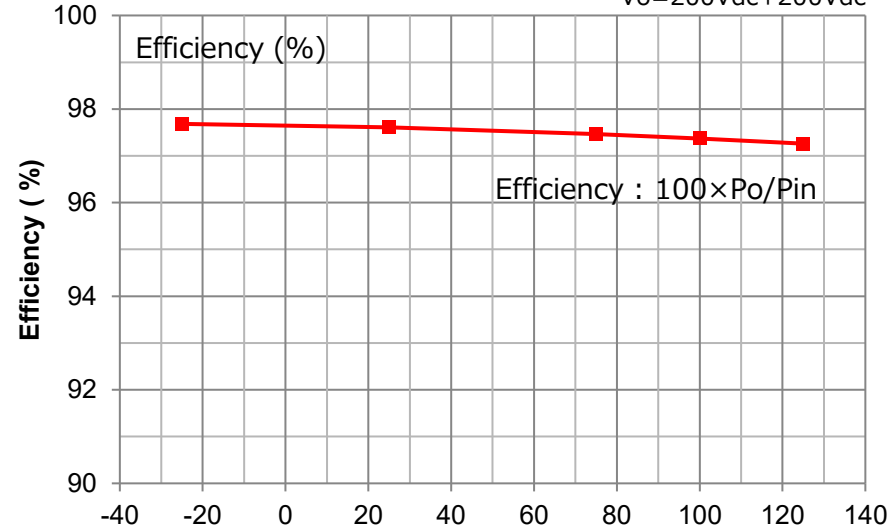
Pin : 10kW~25kW Vin=115Vac  
Vo=200Vdc+200Vdc Tj=100°C



Tj : -25°C~125°C

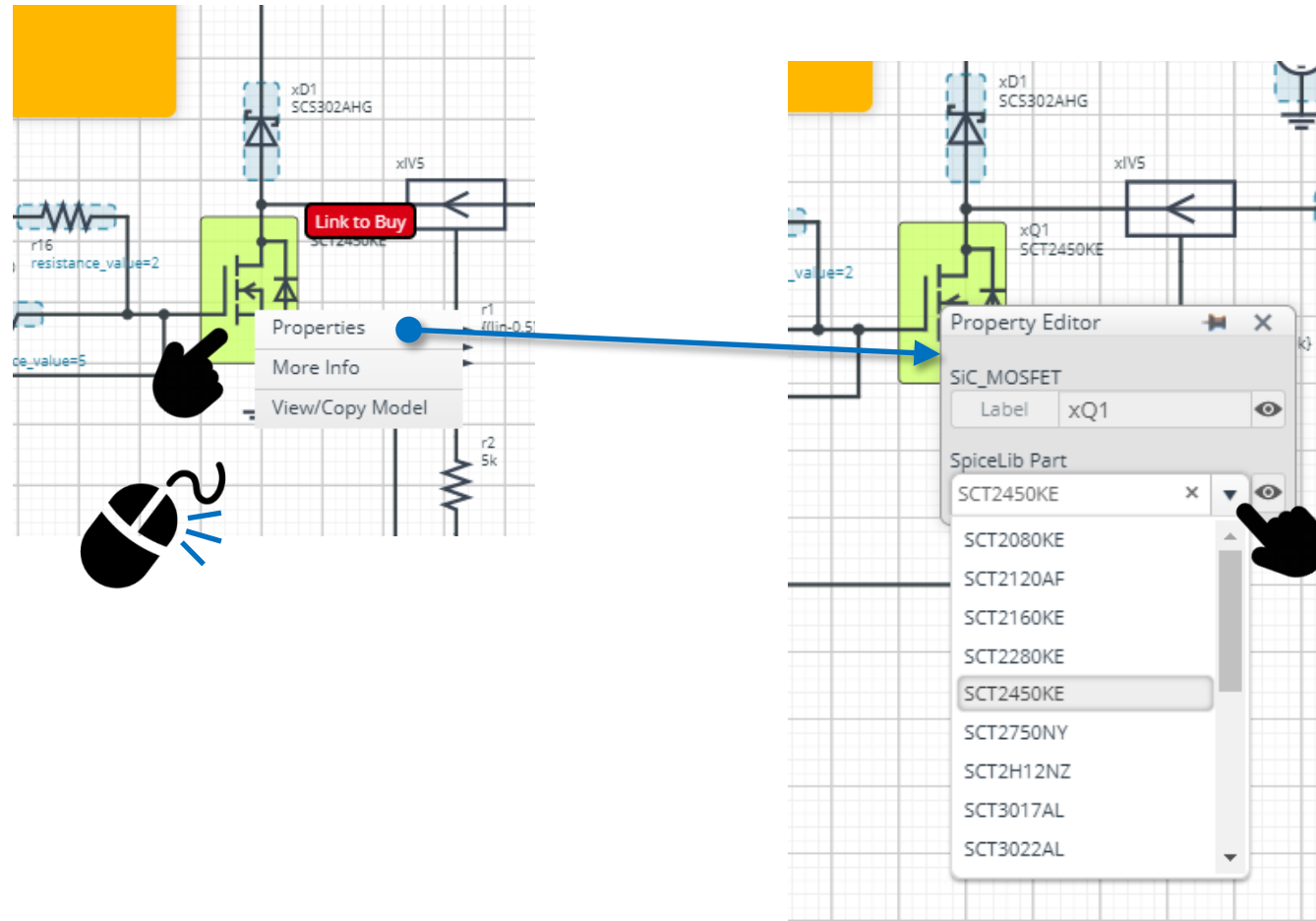
Vin=115Vac Pin=25kW  
Vo=200Vdc+200Vdc

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# How to change the devices

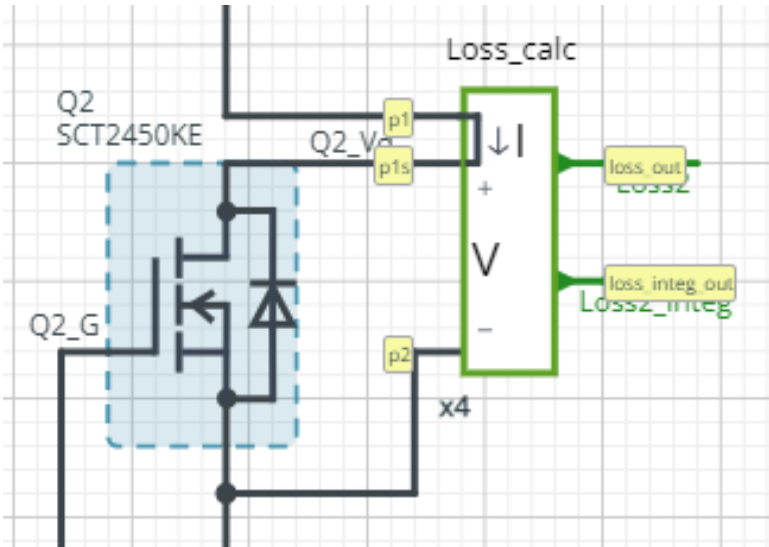
Right-click on the device → Select Properties → Pull down “SpiceLib Part” → Select the product



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

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## Loss calculation model 'Loss\_calc'



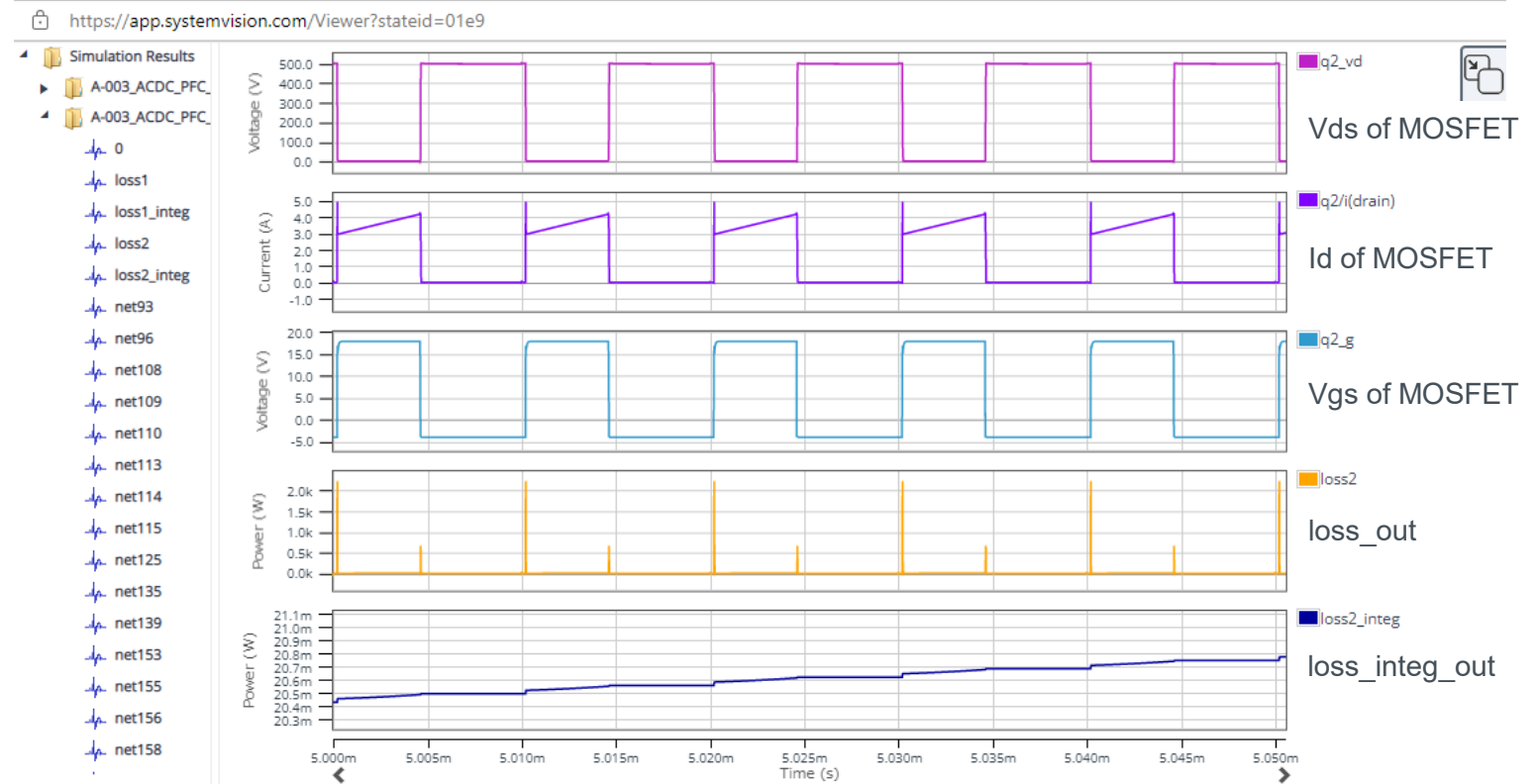
$$loss\_out(t) = I(t) \times V(t)$$

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

I : Current through p1 to p1s

V : Voltage between p1s and p2

## Waveform example



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