

B-009. 3-Phase Modulation Inverter $P_{OUT}=10kW$ for Motor Drive



ROHM Solution Simulator Schematic Information

2025. Nov.
64UG105E Rev.006

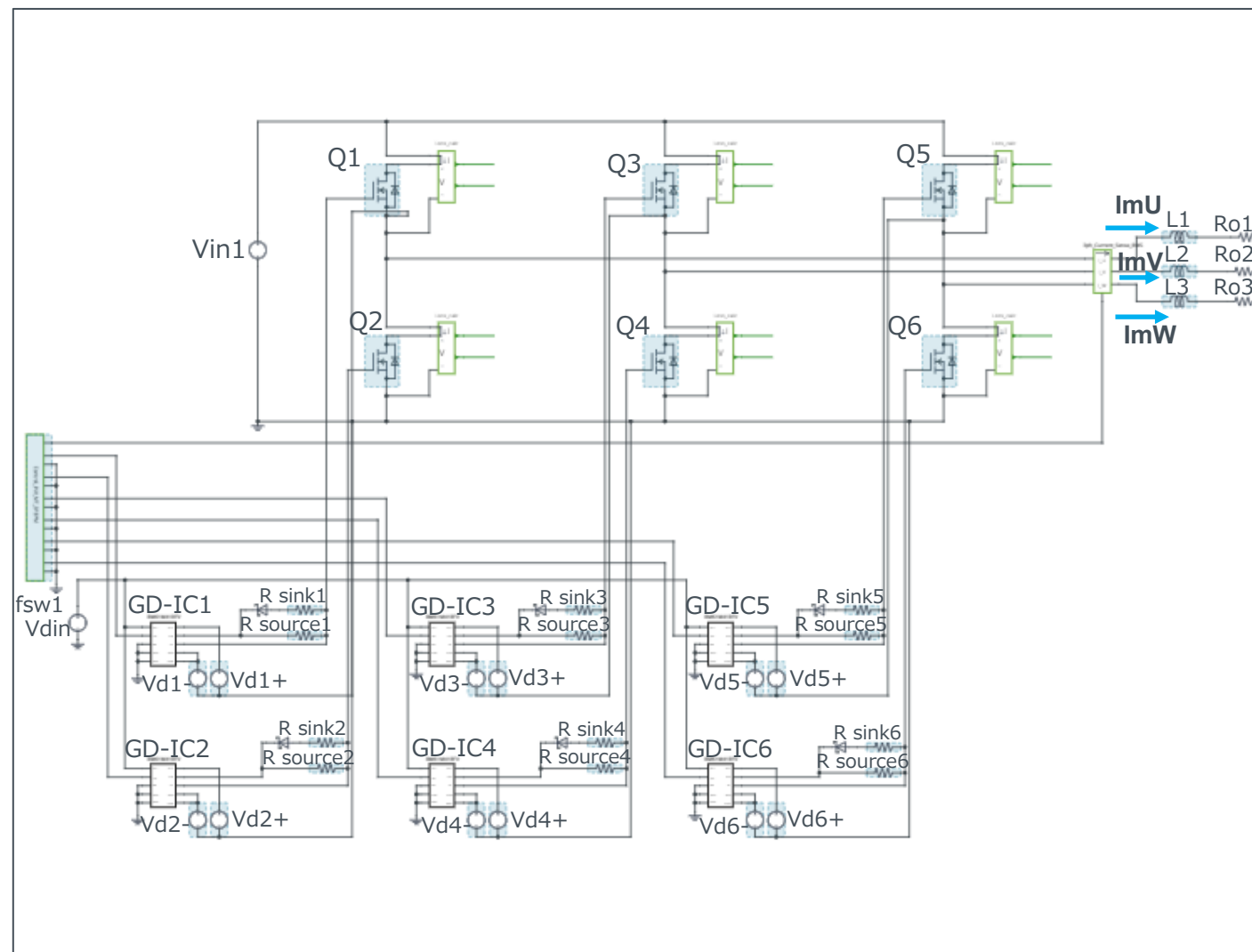
Simulation Parameters

Component name	Component	Default	Simulation Setting Range
Vin1	Input voltage	500Vdc	
fsw1	Switching frequency	20kHz	10k – 300kHz
Tj	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
Q1-6	SiC MOSFET SJ MOSFET IGBT	Selectable	
GD-IC1-6	Gate Driver	BM61M41RFV-C	
R sink1-6	Resistor for sink	ESR18 1Ω	0.1 -
R source1-6	Resistor for source	ESR18 2Ω	0.1 -
L1-3	Inductor	500μH	10μH - 2mH
Ro1-3	Output Resistor	{Po/Im/Im/3}	

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.

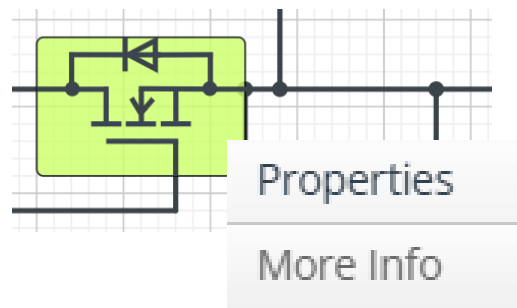
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Selectable Devices

Component name	Component
Q1 - 6	SiC MOSFET

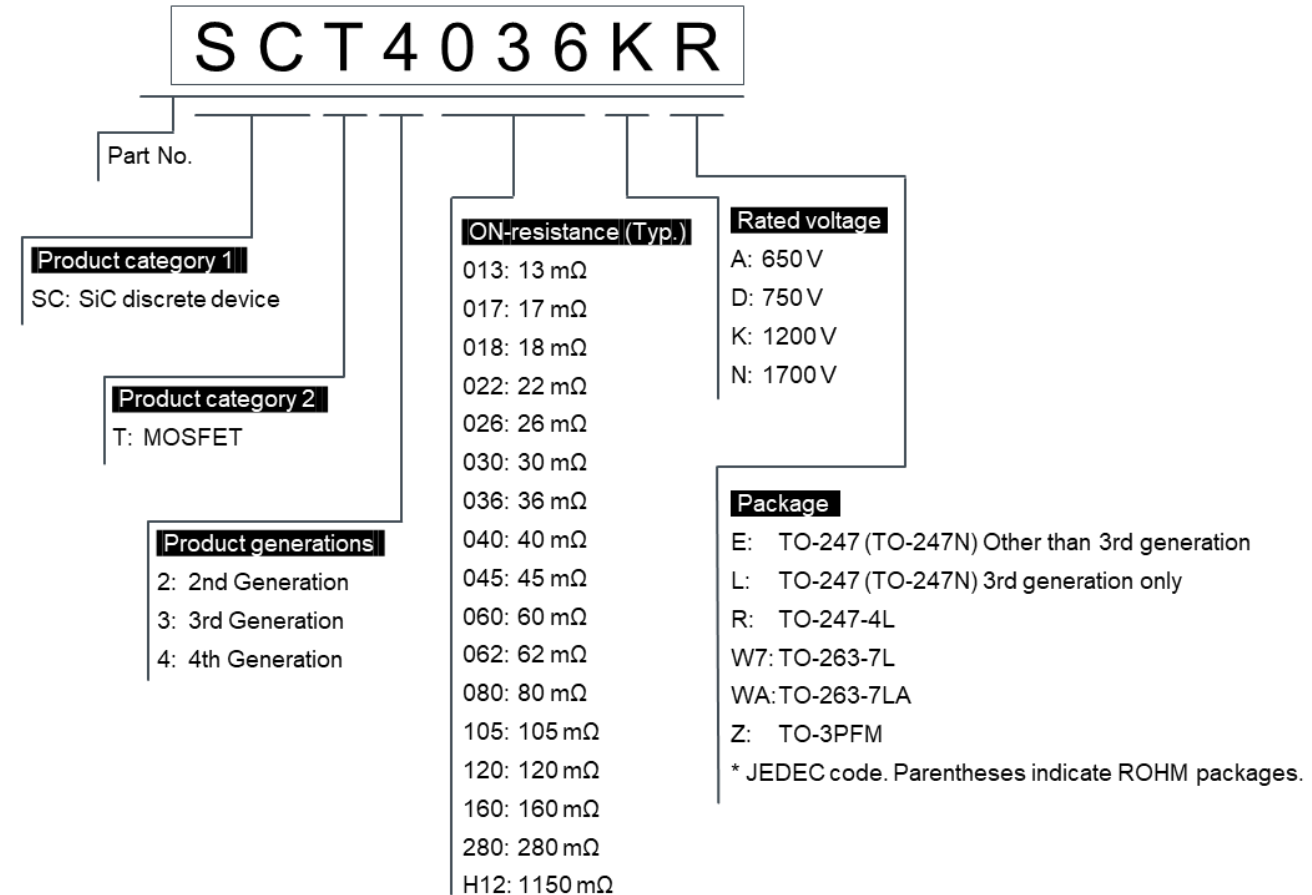
For more information, go to “**More Info**” and click on “**Link to Datasheet**”.



Model Links:
[Link To Product](#)
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SiC MOSFET part number information

SCT4036KR



Product Lineup: [SiC MOSFETs](#)

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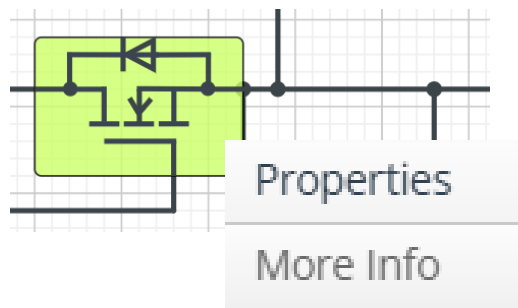


Selectable Devices

Component name	Component	Product
Q1 - 6	SJ MOSFET	RxxxxJN series

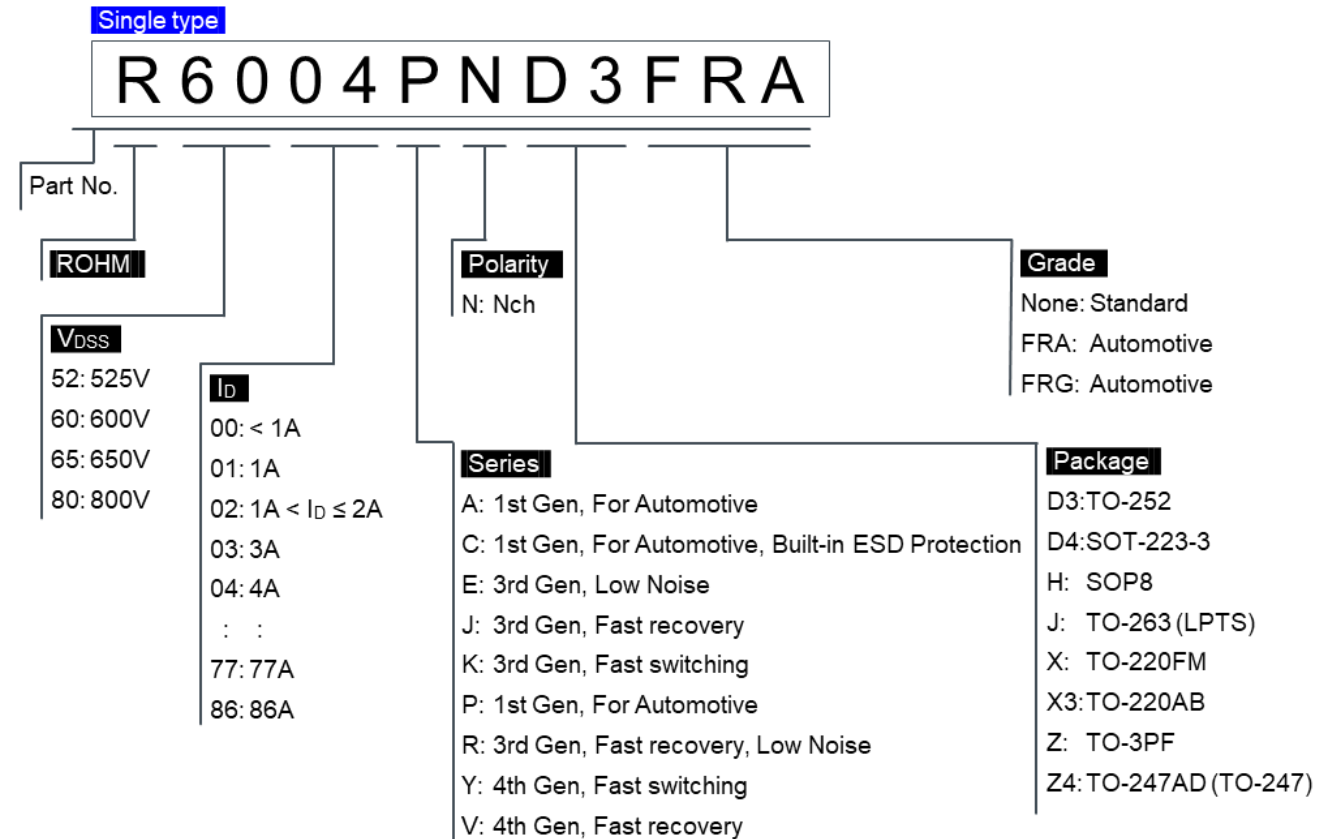
* Default device : R6050JNZ4

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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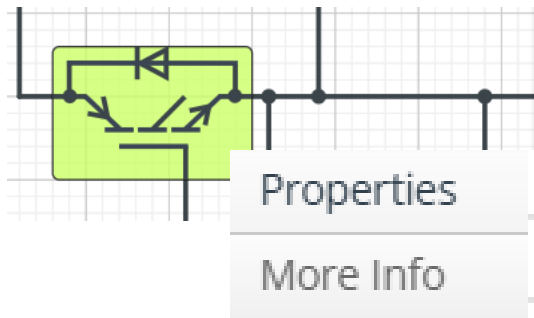
IGBT part number information

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

Selectable Devices

Component name	Component	Product
Q1 - 6	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 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

Rated voltage V_{CES}

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

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

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

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Selectable Devices

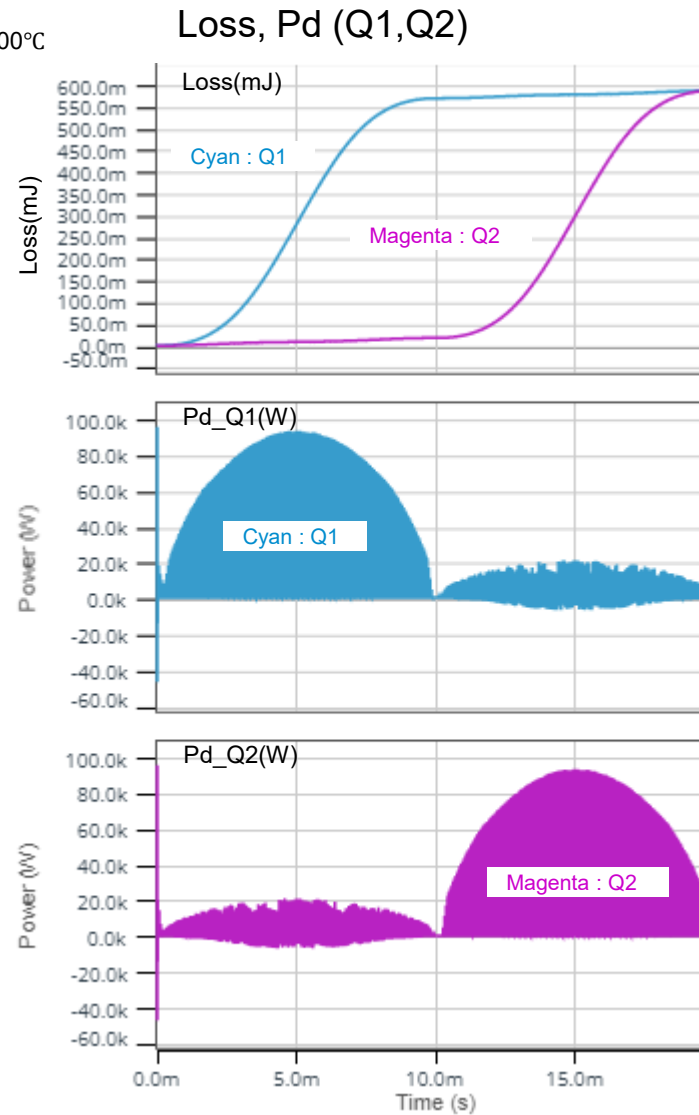
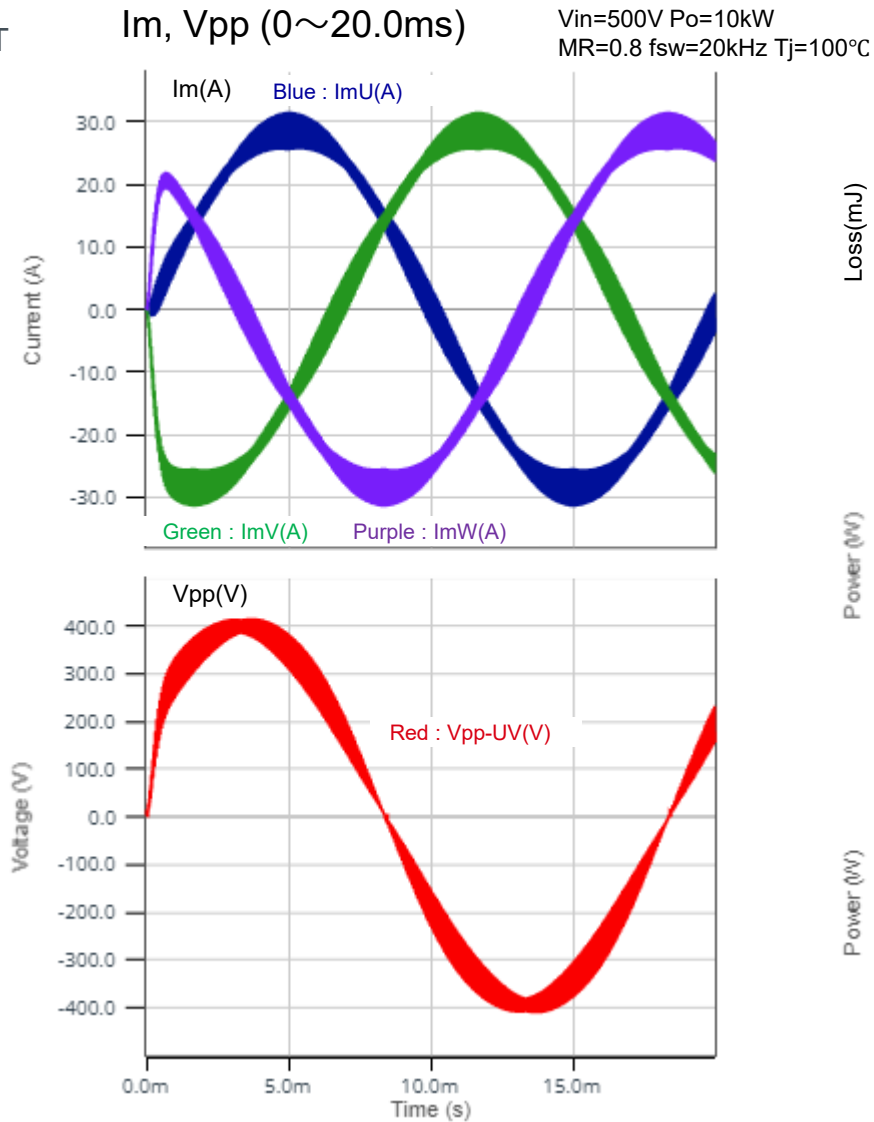
Component name	Component	Product No.	feature
GD-IC1-6	Gate Driver	BM61S41RFV-C (*)	for SiC MOSFET Isolation Voltage : 3750 Vrms I/O Delay Time (max) : 65ns Miller Clamp : Built-in UVLO : 14.5V
		BM61M41RFV-C	for SJ-MOS / IGBT Isolation Voltage : 3750 Vrms I/O Delay Time (max) : 65ns Miller Clamp : Built-in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

* Default device

Simulation Waveform1

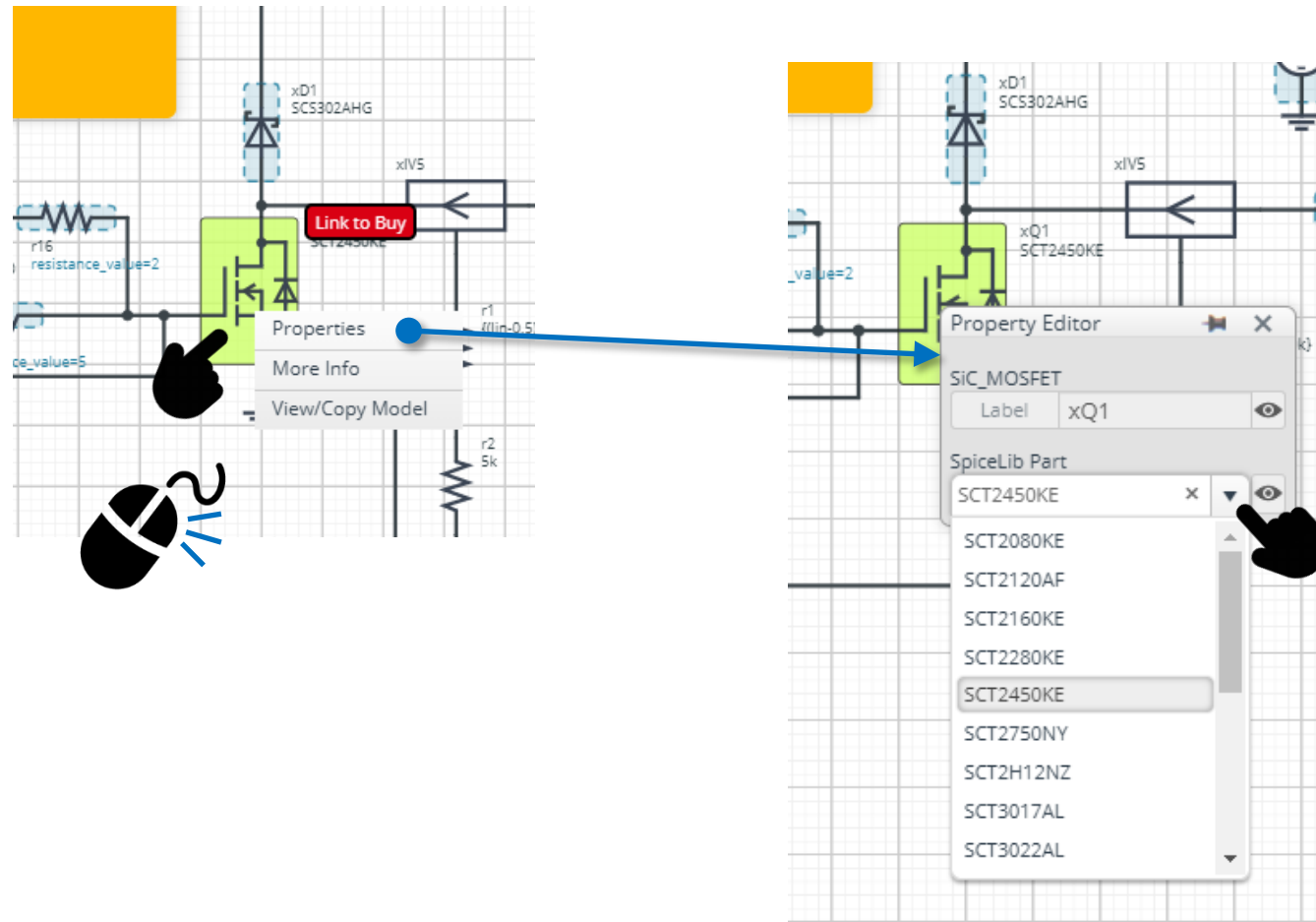


Q1 - 6: SJ MOSFET
R6050JNZ4



How to change the devices

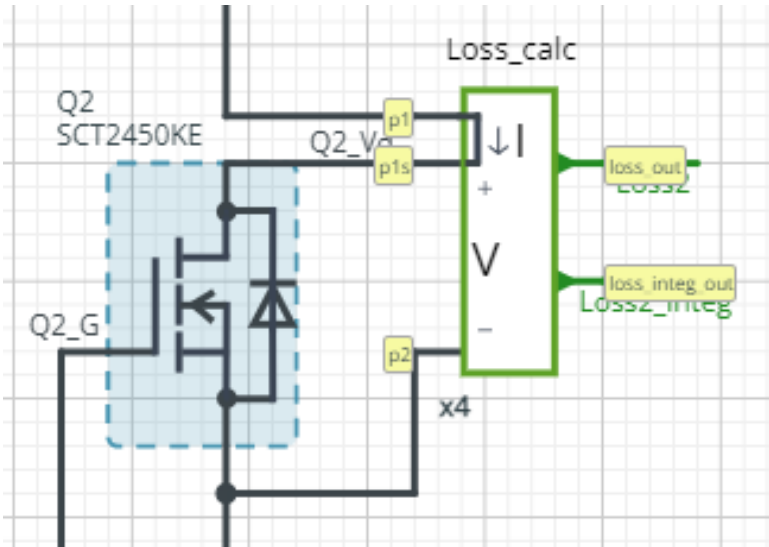
Right-click on the device → Select Properties → Pull down “SpiceLib Part” → Select the product



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

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Loss calculation model 'Loss_calc'



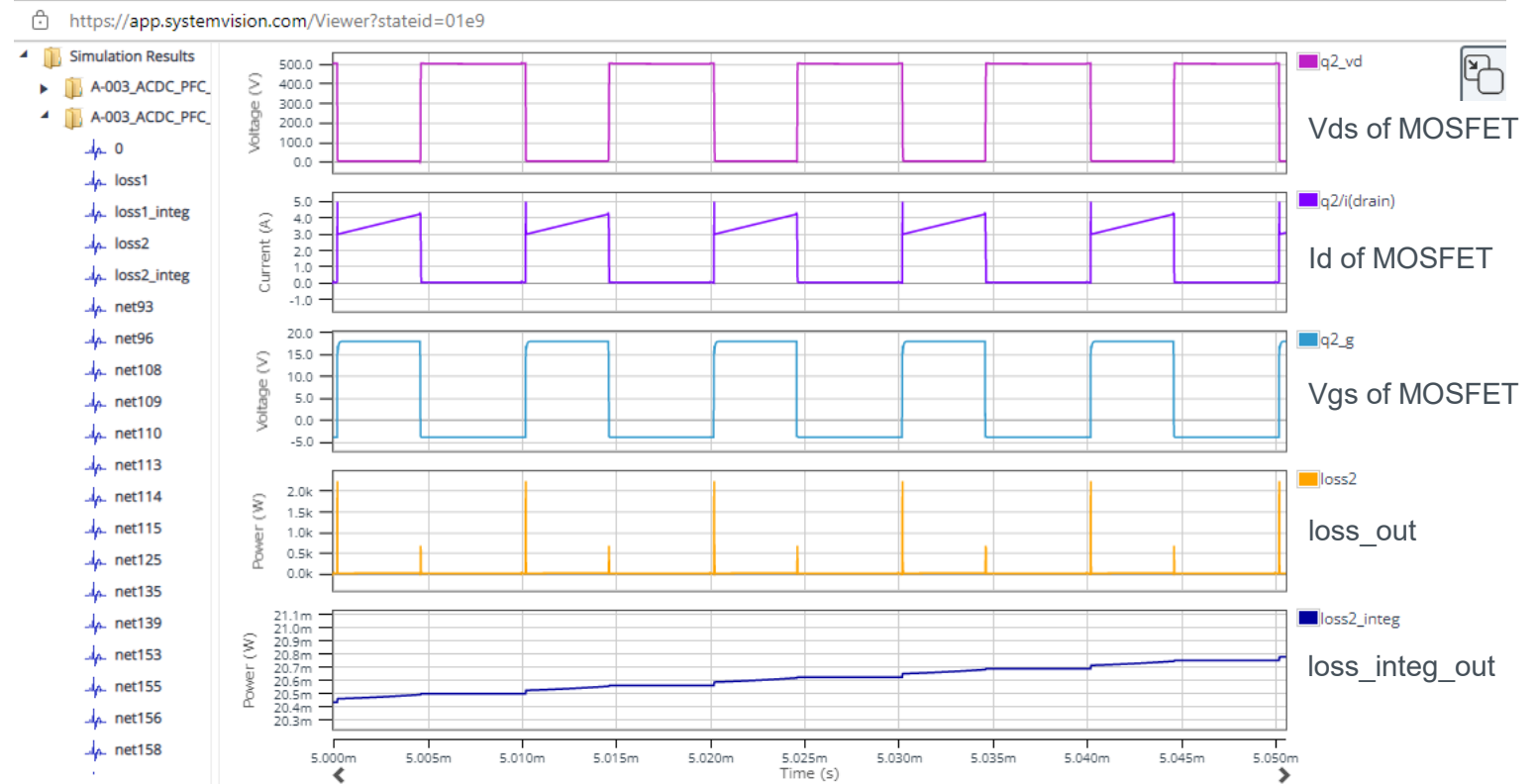
$$loss_out(t) = I(t) \times V(t)$$

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

I : Current through p1 to p1s

V : Voltage between p1s and p2

Waveform example



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