

# C-013. DC-DC LLC Full-Bridge $V_o=400V$ , $I_o=15A$

ROHM Solution Simulator Schematic Information



2025. Nov.

64UG130E Rev.006

## Simulation Parameters

Component name	Component	Default	Simulation Setting Range
Vin1	Input voltage	450Vdc	
Vo	Output voltage	400Vdc	
Io	Output current	15Adc	
fmin	Switching frequency	50kHz	10k – 300kHz
fmax	Switching frequency	300kHz	100k – 500kHz
Tj	Temperature	100°C	
Vd1-4	Gate Drive voltage H	18V	10 – 20V
Vdin	Signal voltage level	5V	
Lp / Ls	Transformer	300μ/300μ/300μH K=1.0	

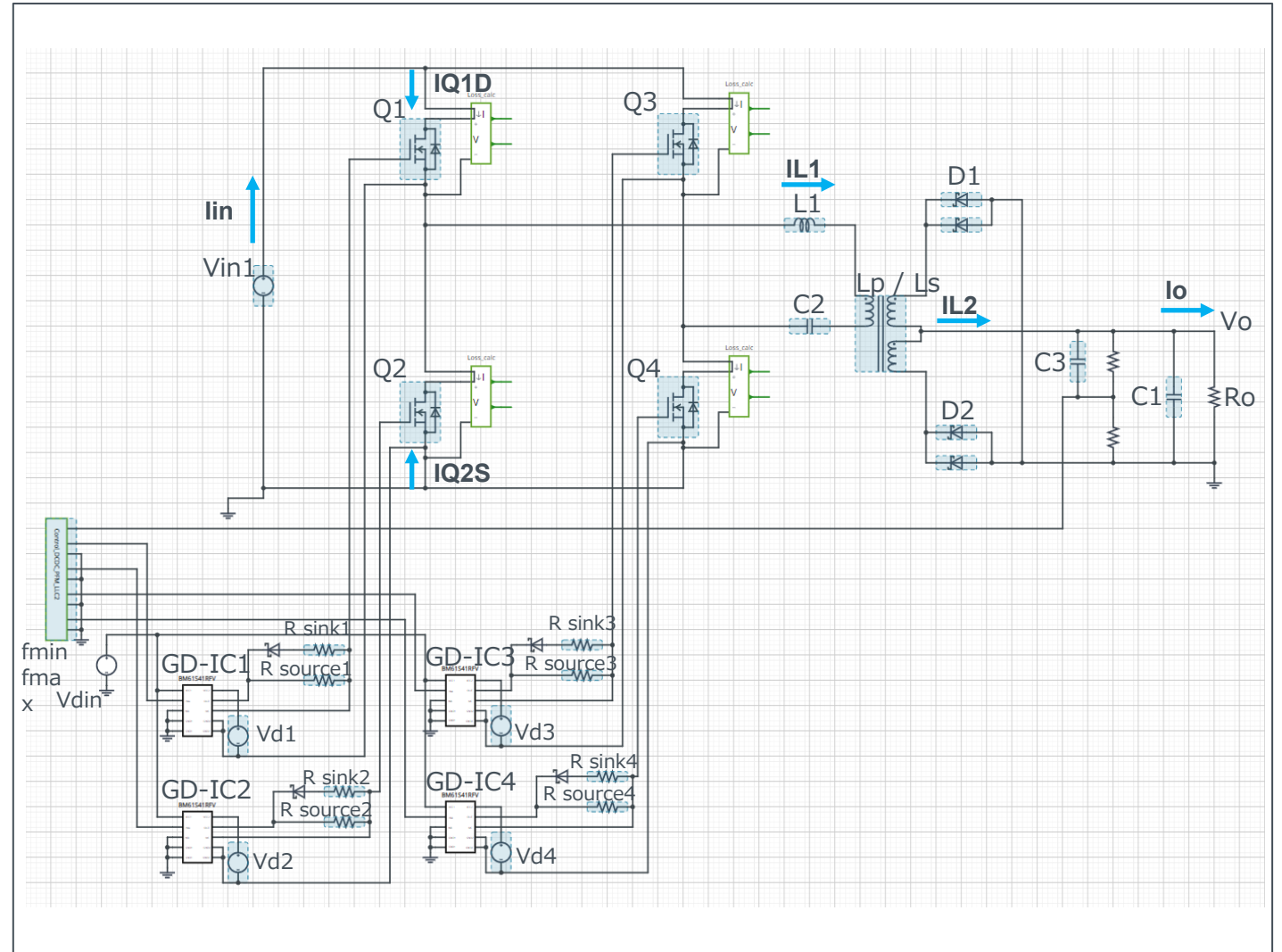
## Devices

Component Name	Component	Default	Simulation Setting Range
Q1-4	SiC MOSFET SJ MOSFET	Selectable	
D1,2_1,2	SiC SBD	Selectable	
GD-IC1-4	Gate Driver	Selectable	
R sink1-4	Resistor for sink	ESR18 2Ω	0.1 -
R source1-4	Resistor for source	ESR18 5Ω	0.1 -
L1	Inductor	30μH	10μH - 2mH
C1	Capacitor	10μF	1μF - 10mF
C2	Capacitor	110nF	1nF - 100μF
C3	Capacitor	10pF	1pF - 1nF
Ro	Output Resistor	{Vo/Io}	

Simulation Circuit



Run simulation [DC-DC Converter / LLC](#)

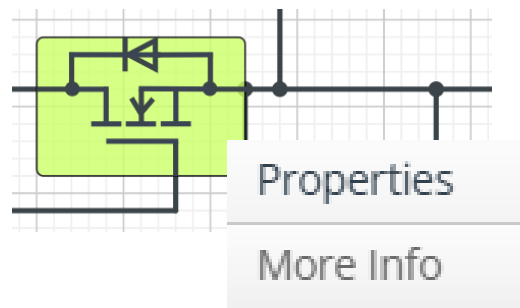


Note: The Loss\_calc component is a utility module to support power loss calculation and does not affect the simulation results of circuit operation or performance.

## Selectable Devices

Component name	Component
Q1-4	SiC MOSFET

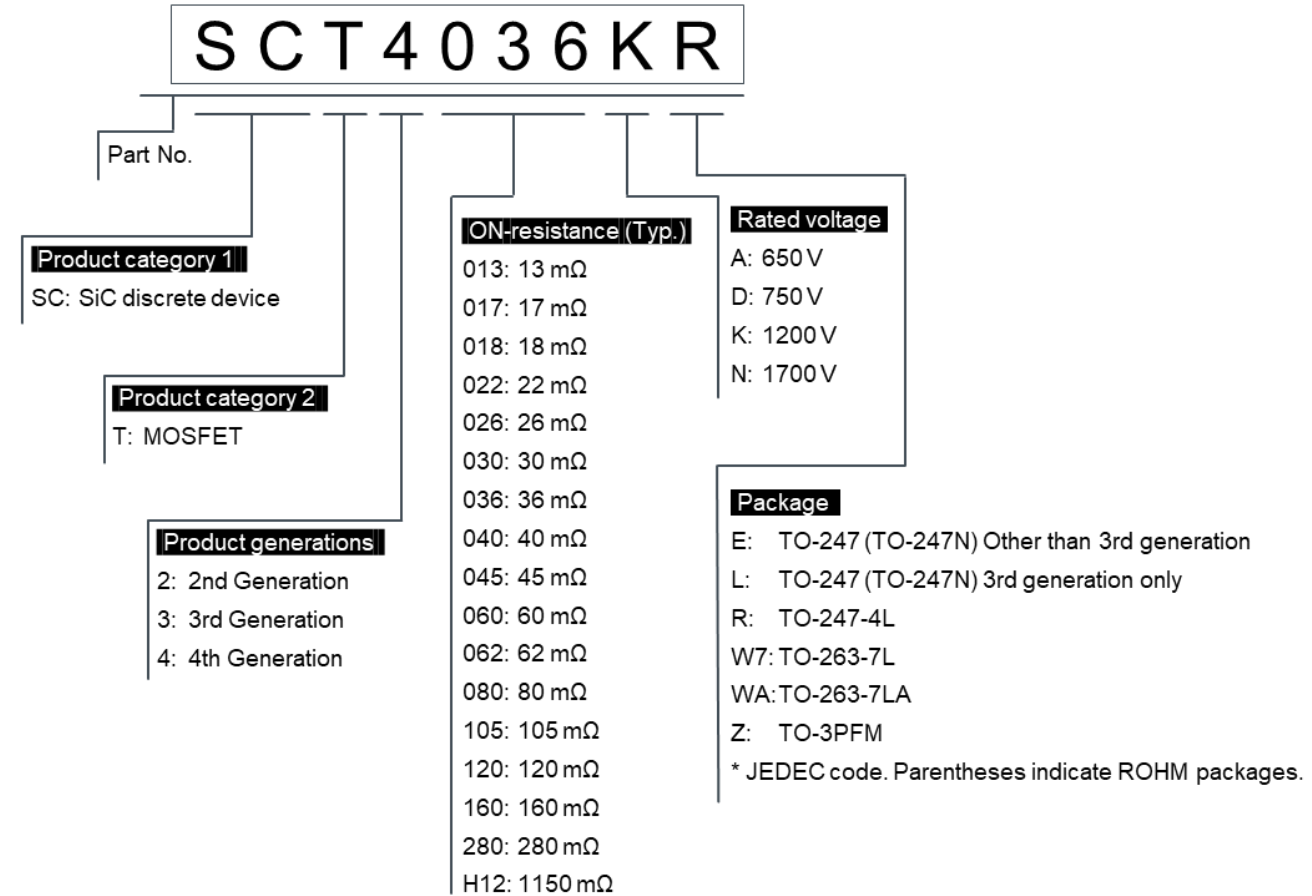
For more information, go to “**More Info**” and click on “**Link to Datasheet**”.



Model Links:  
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## SiC MOSFET part number information

**SCT4036KR**



Product Lineup: [SiC MOSFETs](#)

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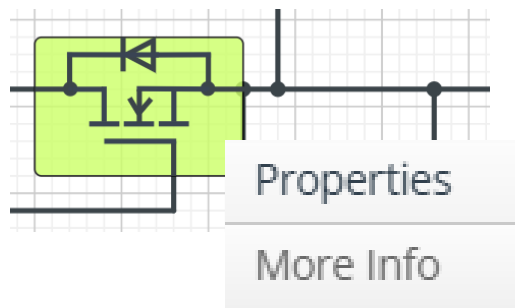


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## Selectable Devices

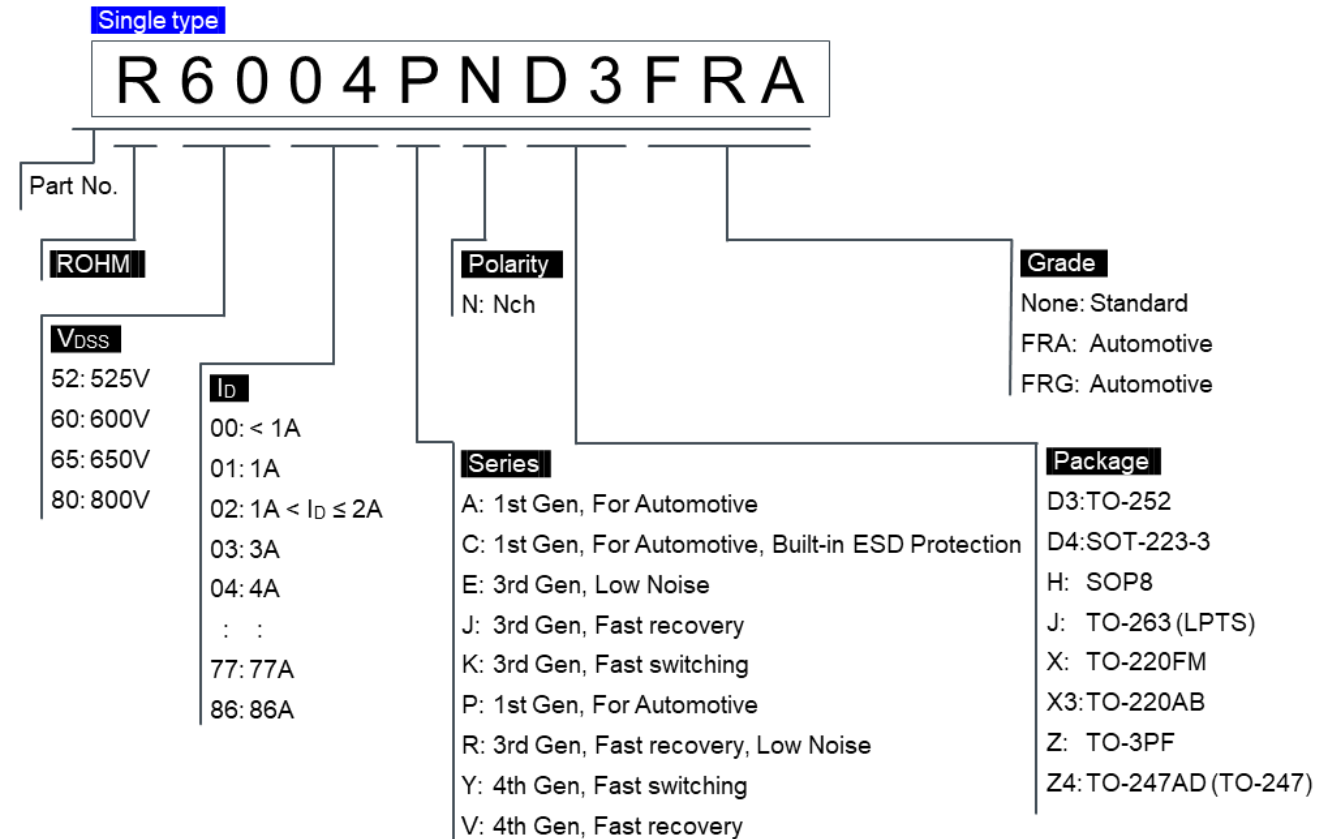
Component name	Component	Product
Q1-4	SJ MOSFET	RxxxxJN series RxxxxVN series

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



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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

### 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 collector current $I_C(T_C=100^\circ\text{C})$

- 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

### 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

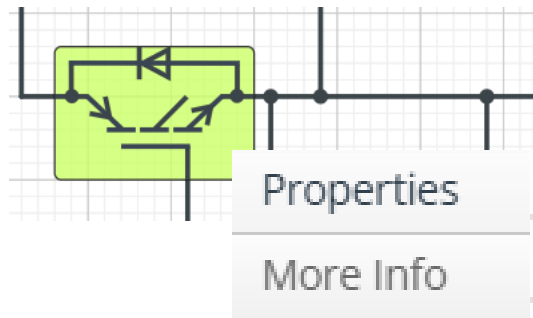
### Rated voltage $V_{CES}$

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

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

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

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

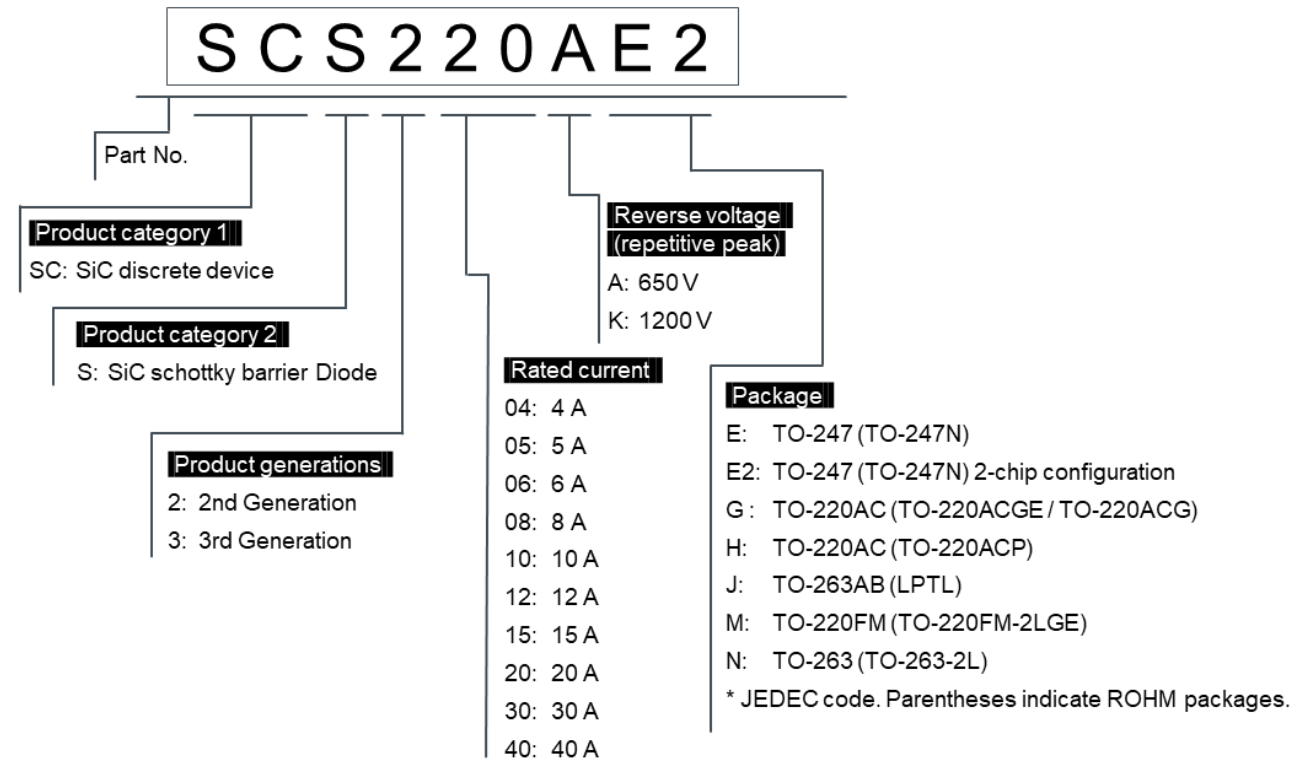


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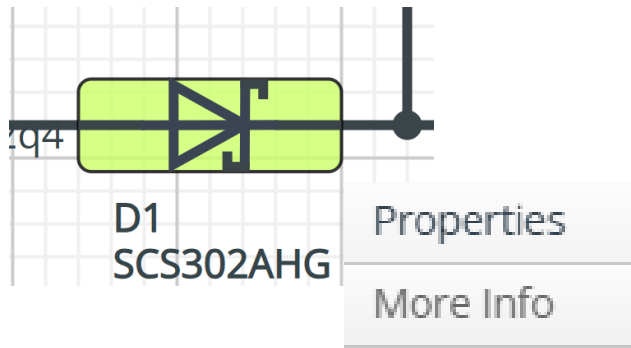
## Selectable Devices

Component name	Component
D1,2_1,2	SiC Schottky Barrier Diode

## SiC Schottky Barrier Diode part number information



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



### Model Links:

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

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## Selectable Devices

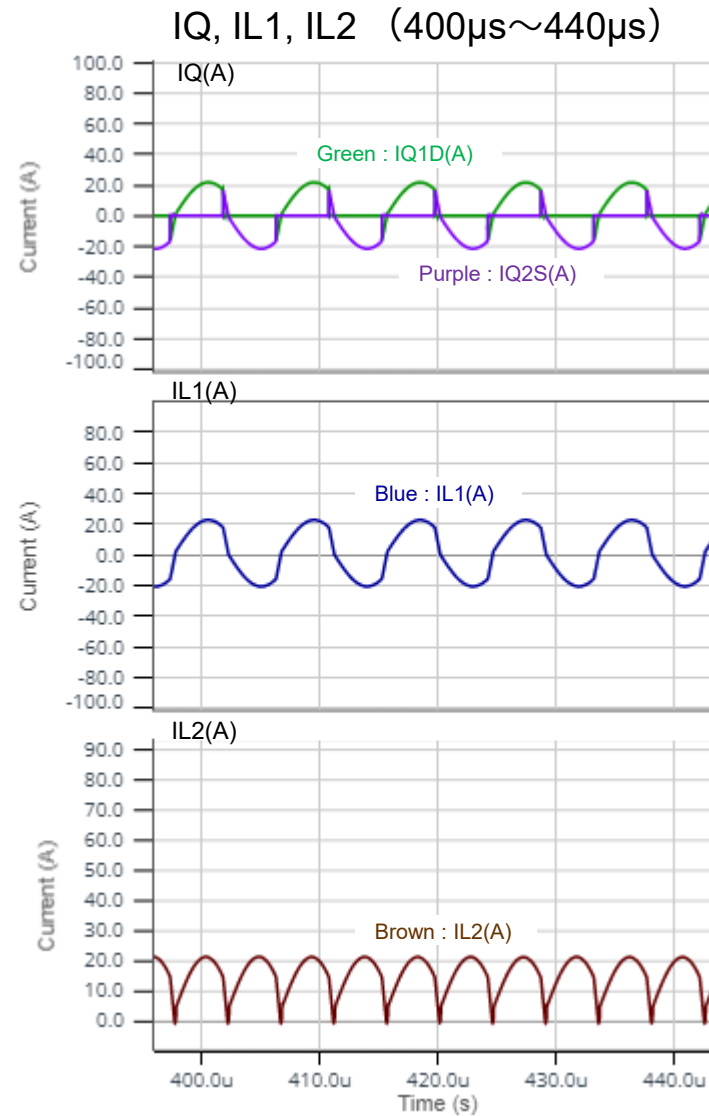
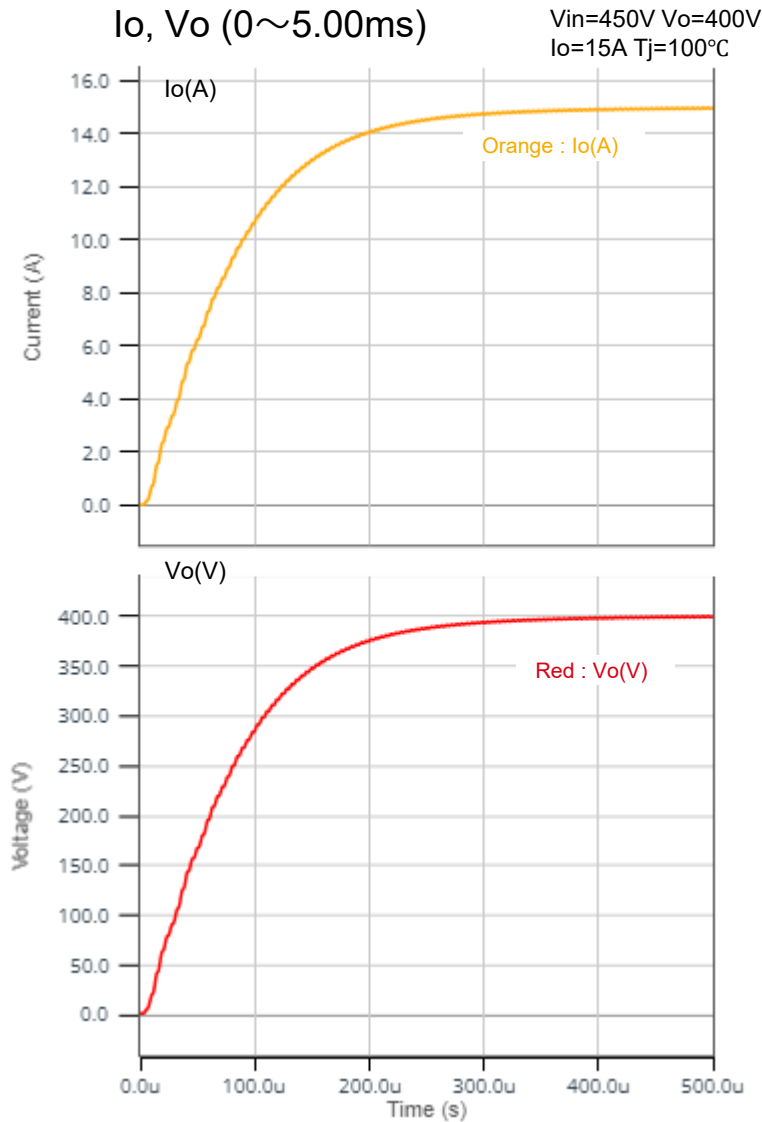
Component name	Component	Product No.	feature
GD-IC1-4	Gate Driver	BM61S41RFV-C (*)	<b>for SiC MOSFET</b> Isolation Voltage : 3750 Vrms I/O Delay Time (max) : 65ns Miller Clamp : Built-in UVLO : 14.5V
		BM61M41RFV-C	<b>for SJ-MOS / IGBT</b> Isolation Voltage : 3750 Vrms I/O Delay Time (max) : 65ns Miller Clamp : Built-in UVLO : 7.4V

\* Default device

# Simulation Waveform

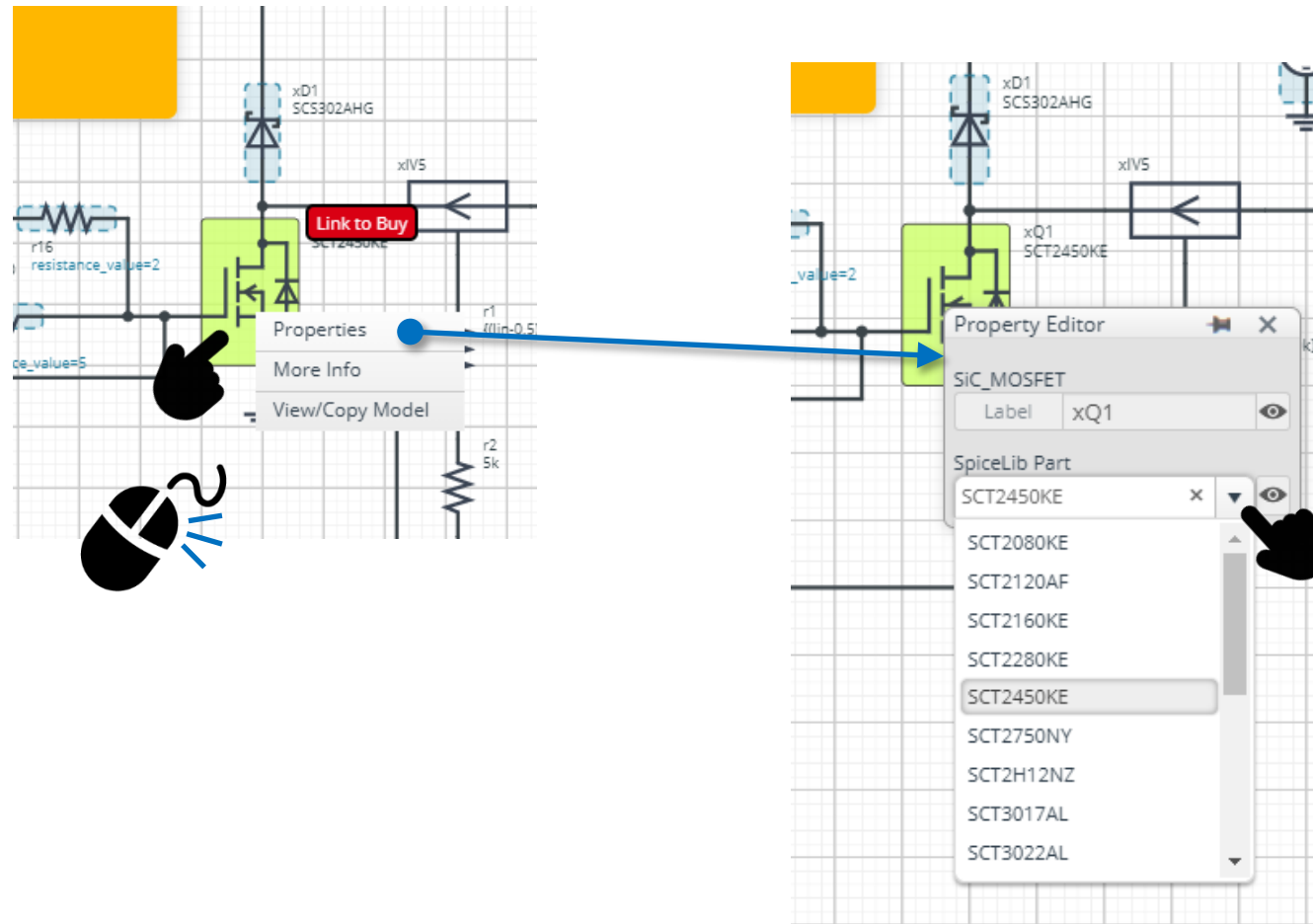


Q1-4 : SiC MOSFET  
SCT3060AL  
D1,2\_1,2 : SiC SBD  
SCS320AHG



# How to change the devices

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

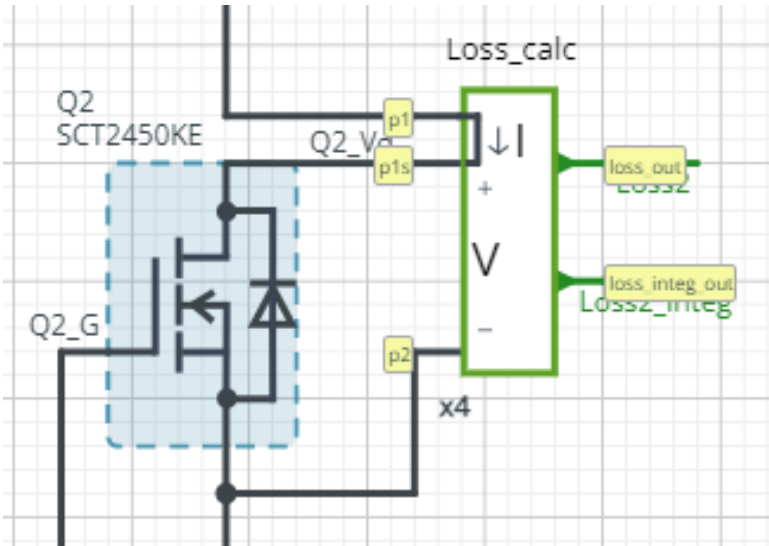


# Loss Calculation Model

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

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## Loss calculation model 'Loss\_calc'



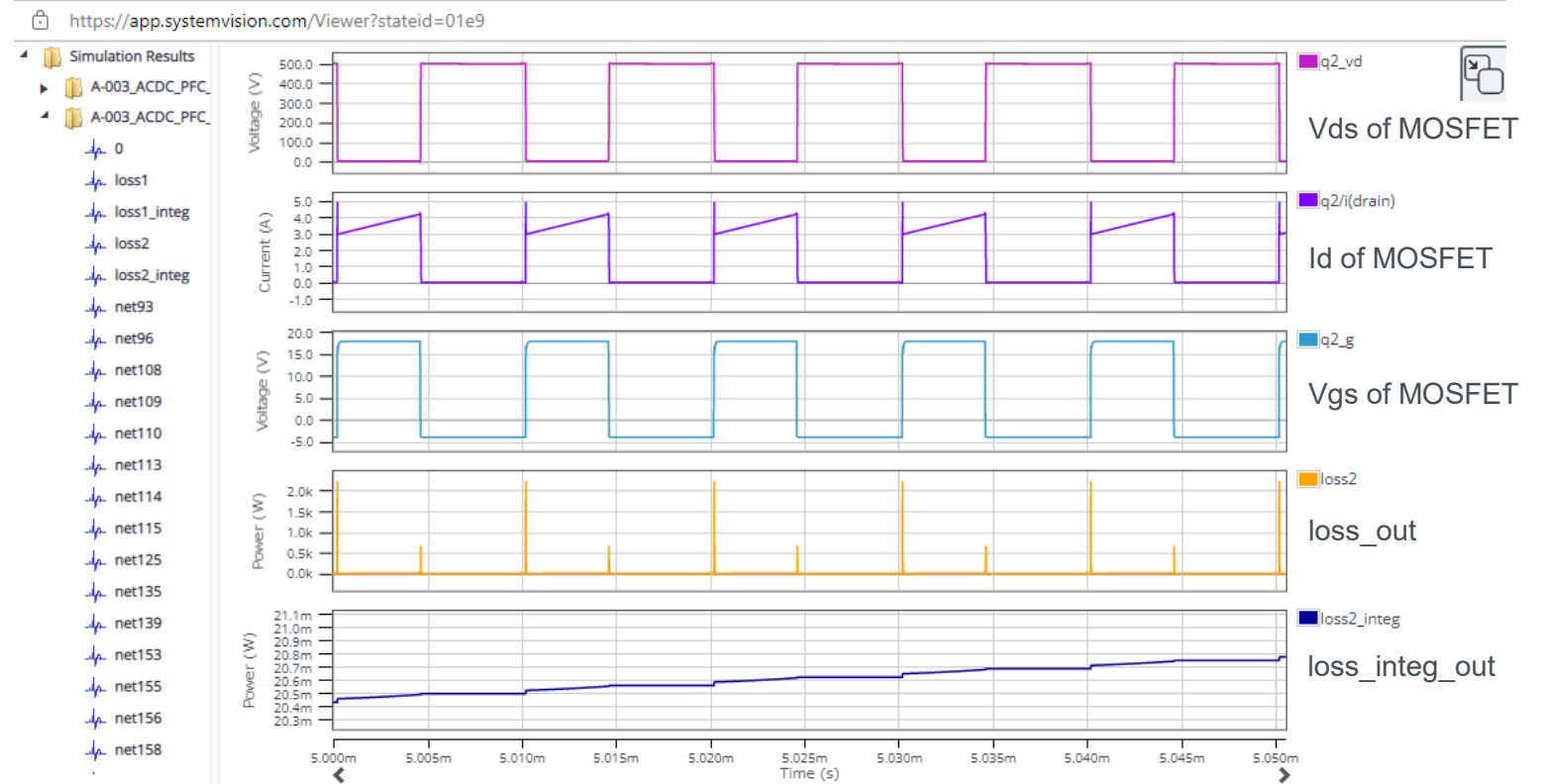
$$loss\_out(t) = I(t) \times V(t)$$

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

I : Current through p1 to p1s

V : Voltage between p1s and p2

## Waveform example



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