A-009. Interleaved PFC Vin=200V, Iin=5A, DCM (Synchronous FETs)

ROHM Solution Simulator Schematic Information

2025. Nov.
64UG105E Rev.005

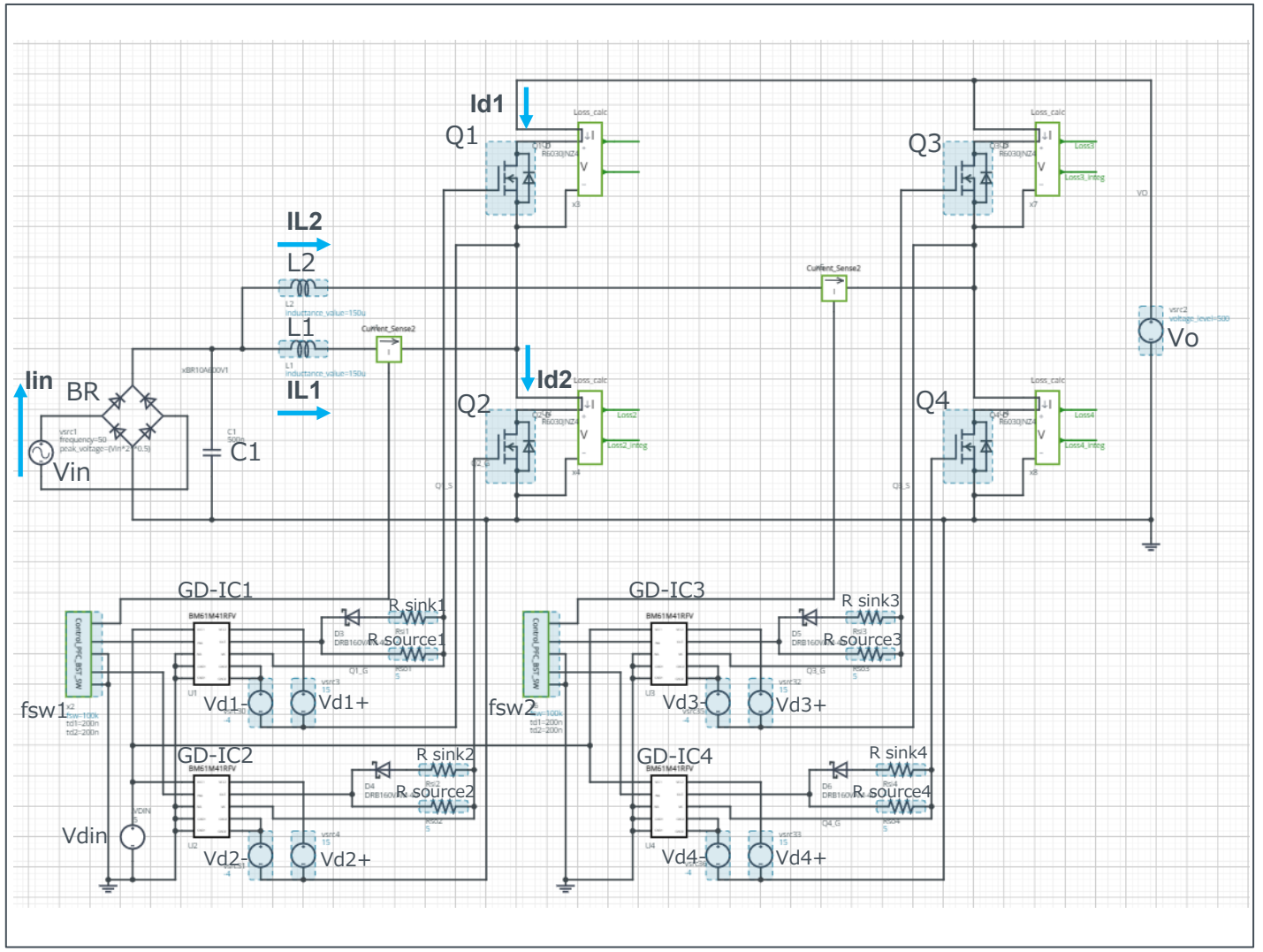
Simulation Parameters

Parameters	Descriptions	Default	Simulation Setting Range
Vin	Input voltage	200Vac 50Hz	
Iin	Input current	5Aac	
Vo	Output voltage	500Vdc	300 – 500Vdc
fsw1,2	Switching frequency	100kHz	10k – 300kHz
Tj	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 IGBT	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 -
L1,2	Inductor	150μH	10μH - 2mH
C1	Capacitor	500nF	
BR	Bridge Diode	600V 10A ideal diode	

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.

A-009. Interleaved PFC Vin=200V, Iin=5A, DCM (Synchronous FETs)

ROHM Solution Simulator Schematic Information

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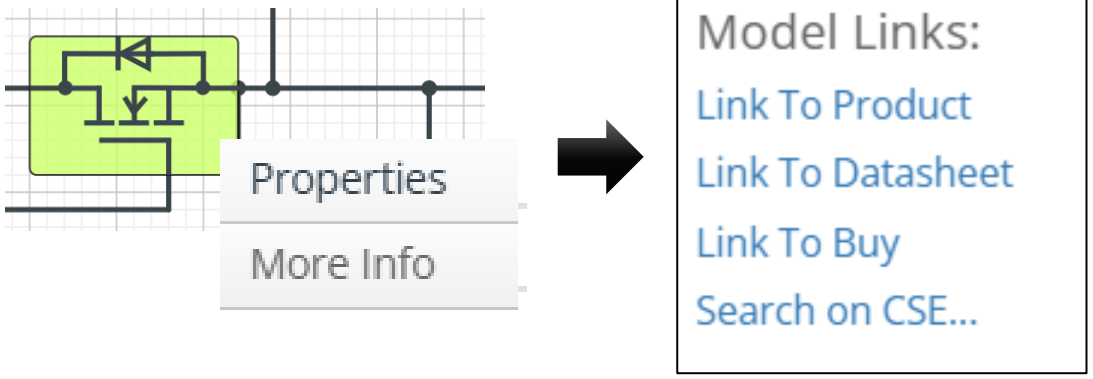
Selectable Devices

Component name	Component
Q1 – Q4	SiC MOSFET

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



SiC MOSFET part number information

S C T 4 0 3 6 K R

Part No.

Product category 1
SC: SiC discrete device

Product category 2
T: MOSFET

Product generations
2: 2nd Generation
3: 3rd Generation
4: 4th Generation

ON-resistance (Typ.)
013: 13 mΩ
017: 17 mΩ
018: 18 mΩ
022: 22 mΩ
026: 26 mΩ
030: 30 mΩ
036: 36 mΩ
040: 40 mΩ
045: 45 mΩ
060: 60 mΩ
062: 62 mΩ
080: 80 mΩ
105: 105 mΩ
120: 120 mΩ
160: 160 mΩ
280: 280 mΩ
H12: 1150 mΩ

Rated voltage
A: 650 V
D: 750 V
K: 1200 V
N: 1700 V

Package
E: TO-247 (TO-247N) Other than 3rd generation
L: TO-247 (TO-247N) 3rd generation only
R: TO-247-4L
W7: TO-263-7L
WA: TO-263-7LA
Z: TO-3PFM
* JEDEC code. Parentheses indicate ROHM packages.

Product Lineup: SiC MOSFETs

Note) We have not been able to confirm operation with all combinations. Please read the disclaimer carefully.

A-009. Interleaved PFC Vin=200V, Iin=5A, DCM (Synchronous FETs)

ROHM Solution Simulator Schematic Information

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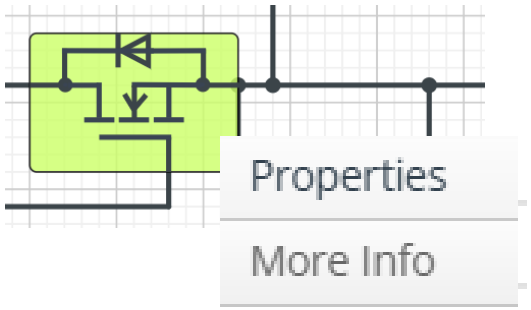
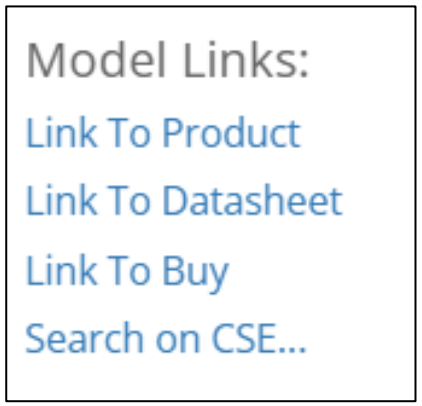
Selectable Devices

Component name	Component	Product
Q1 – Q4	SJ MOSFET	RxxxxKN series RxxxxYN series RxxxxJN series

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





SJ MOSFET part number information

Single type

R 6 0 0 4 P N D 3 F R A

Part No.

ROHM

V_{DSS}
52: 525V
60: 600V
65: 650V
80: 800V

I_D
00: < 1A
01: 1A
02: 1A < I_D ≤ 2A
03: 3A
04: 4A
: :
77: 77A
86: 86A

Polarity
N: Nch

Series
A: 1st Gen, For Automotive
C: 1st Gen, For Automotive, Built-in ESD Protection
E: 3rd Gen, Low Noise
J: 3rd Gen, Fast recovery
K: 3rd Gen, Fast switching
P: 1st Gen, For Automotive
R: 3rd Gen, Fast recovery, Low Noise
Y: 4th Gen, Fast switching
V: 4th Gen, Fast recovery

Grade
None: Standard
FRA: Automotive
FRG: Automotive

Package
D3: TO-252
D4: SOT-223-3
H: SOP8
J: TO-263 (LPTS)
X: TO-220FM
X3: TO-220AB
Z: TO-3PF
Z4: TO-247AD (TO-247)

➧ Product Lineup: Super Junction MOSFETs

Note) We have not been able to confirm operation with all combinations. Please read the disclaimer carefully.

A-009. Interleaved PFC Vin=200V, Iin=5A, DCM (Synchronous FETs)

ROHM Solution Simulator Schematic Information

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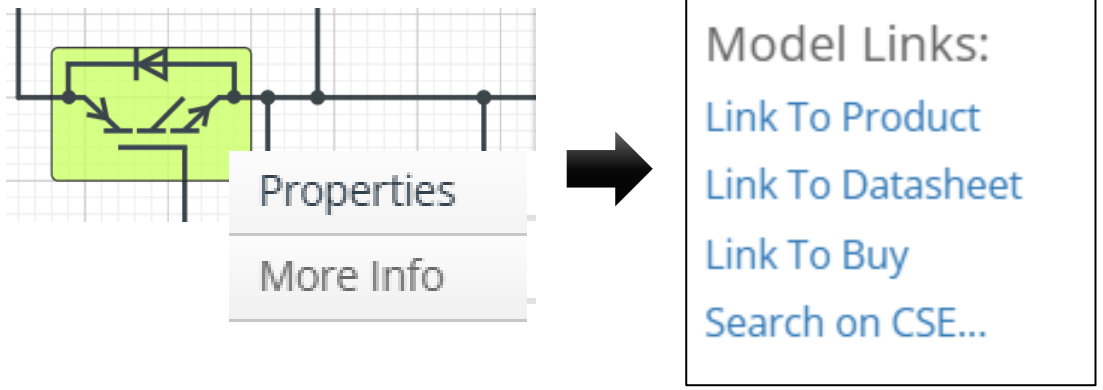
Selectable Devices

Component name	Component	Product
Q1 – Q4	IGBT	RGW series

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



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 10µs
T: For inverter, Short circuit capability guaranteed 5µs
TV: For converter / inverter, High speed switching, Short circuit capability guaranteed 2µs
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°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

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

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

➧ Product Lineup: Field Stop Trench IGBT

Note) We have not been able to confirm operation with all combinations. Please read the disclaimer carefully.

A-009. Interleaved PFC Vin=200V, Iin=5A, DCM (Synchronous FETs)

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Selectable Devices

Component name	Component	Product No.	feature
GD-IC1-4	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

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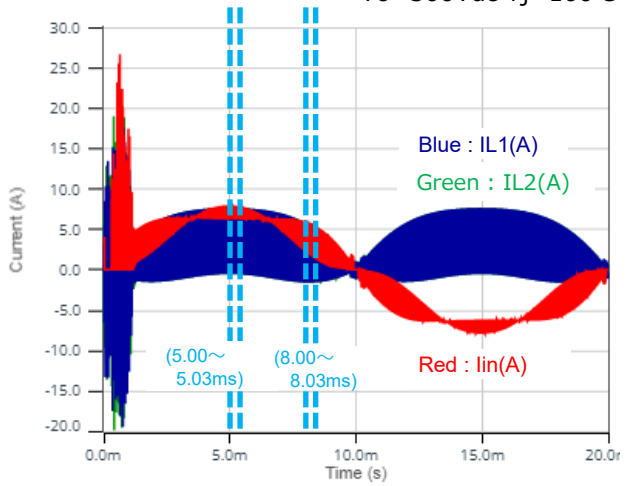
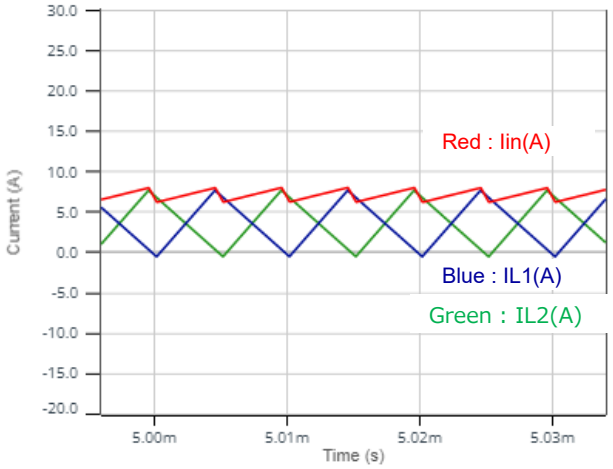
Q1 - Q4
SJ MOSFET
R6030JNZ4

IL1, IL2, Iin

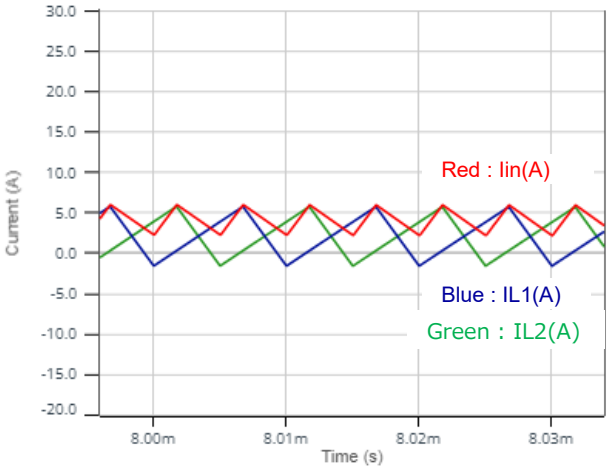
Vin=200Vac Iin=5Aac
Vo=500Vdc Tj=100℃



Expansion (5.00～5.03ms)



Expansion (8.00～8.03ms)



Simulation Waveform2

2025. Nov.
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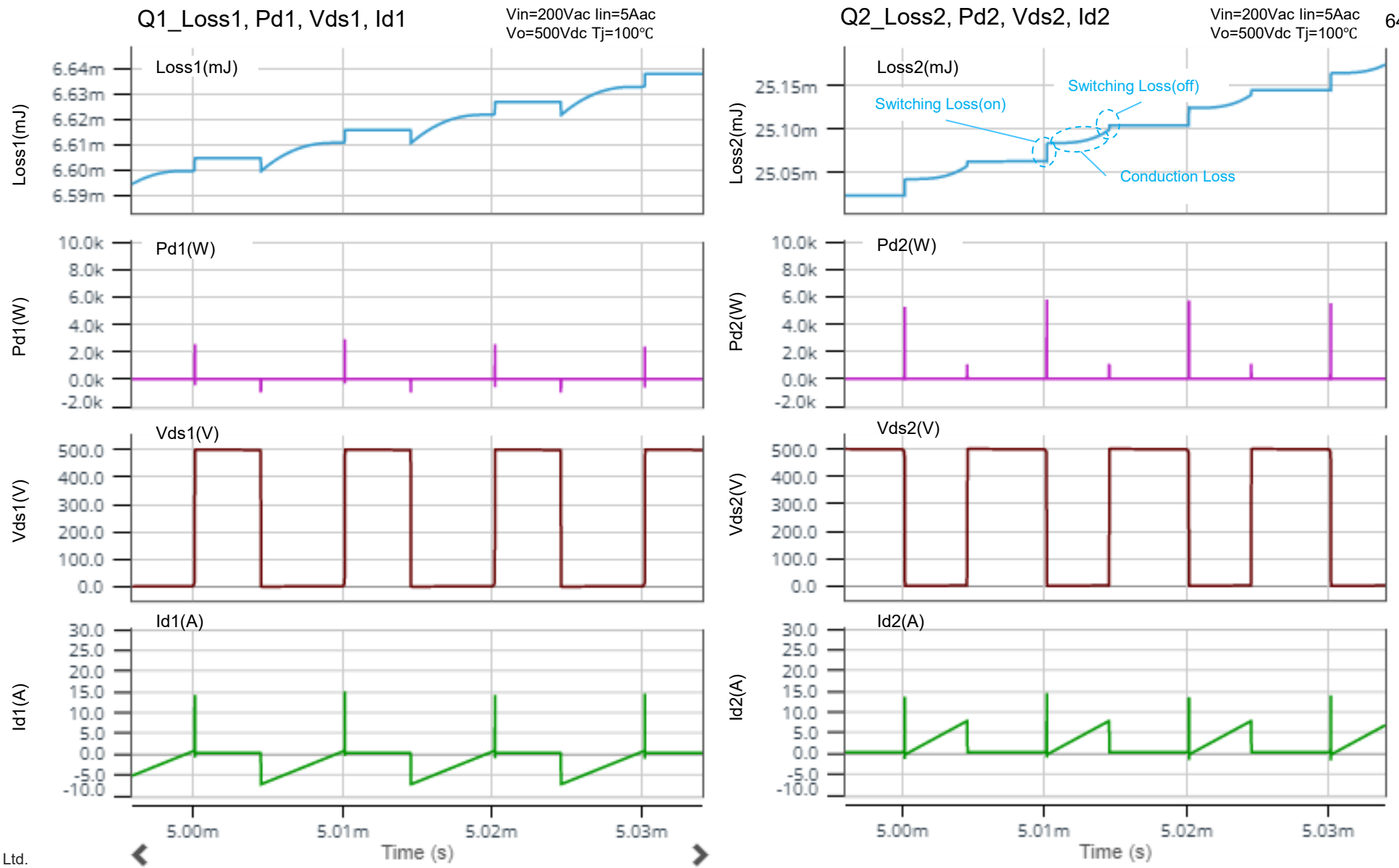
Q1 - Q4
SJ MOSFET
R6030JNZ4



Efficiency, Power Dissipation

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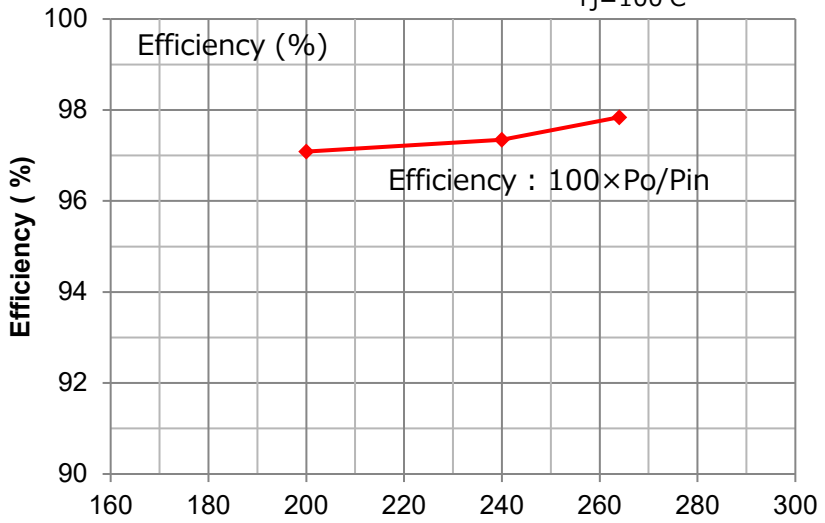
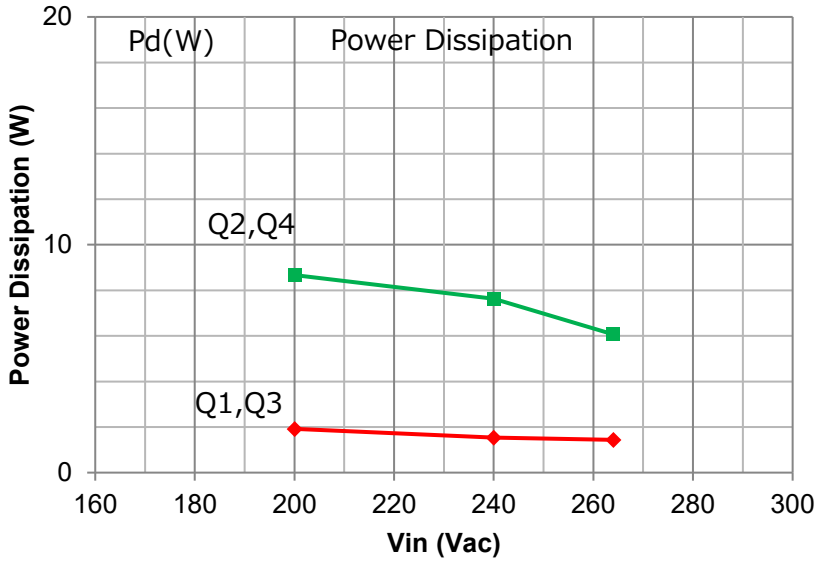
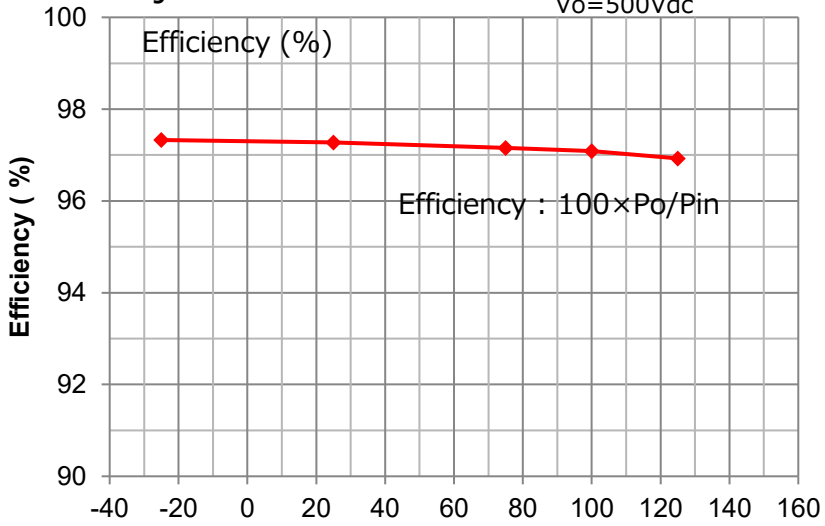
Q1 - Q4
SJ MOSFET
R6030JNZ4

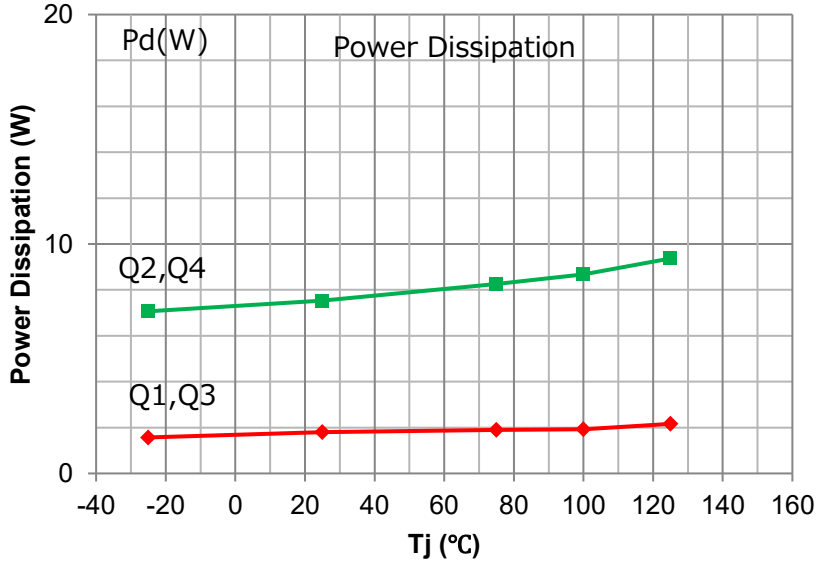
Vin：200Vac～264Vac
Pin=1kW Vo=500Vdc
Tj=100℃





Tj：-25℃～125℃
Vin=200Vac Iin=5Aac
Vo=500Vdc





How to change the devices

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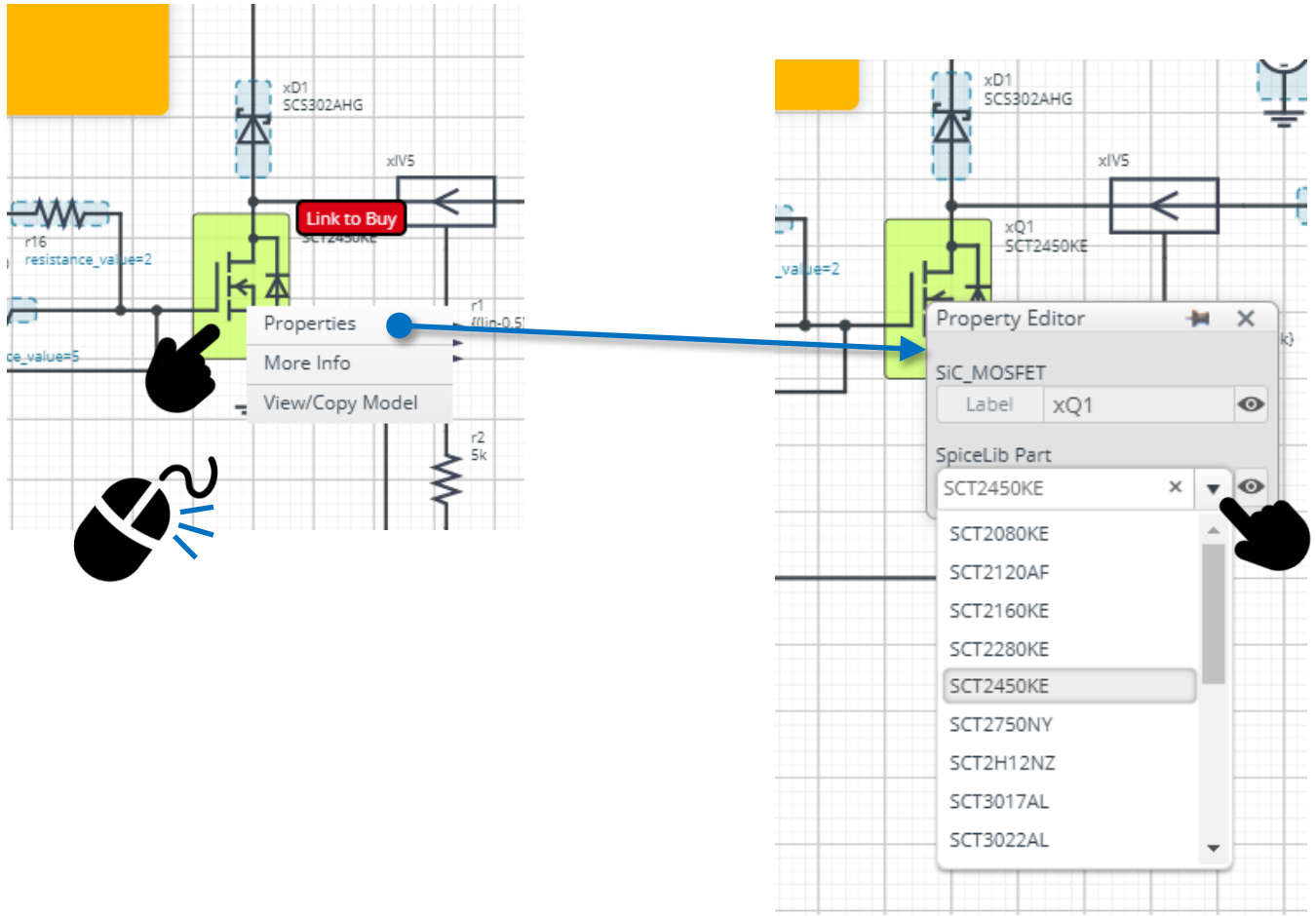
Right-click on the device ⇨ Select Properties ⇨ Pull down “SpiceLib Part” ⇨ Select the product



Loss Calculation Model

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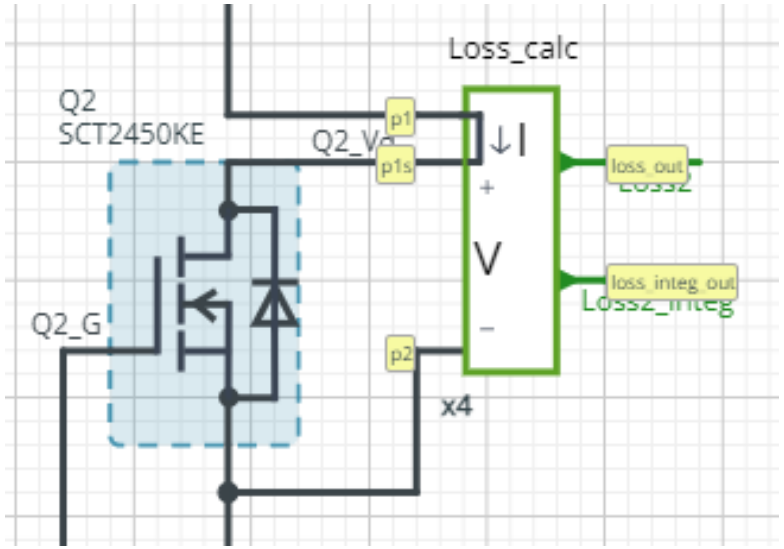
Loss Calculation Model outputs the instantaneous value of power loss and its integration.

Loss calculation model ‘Loss_calc’



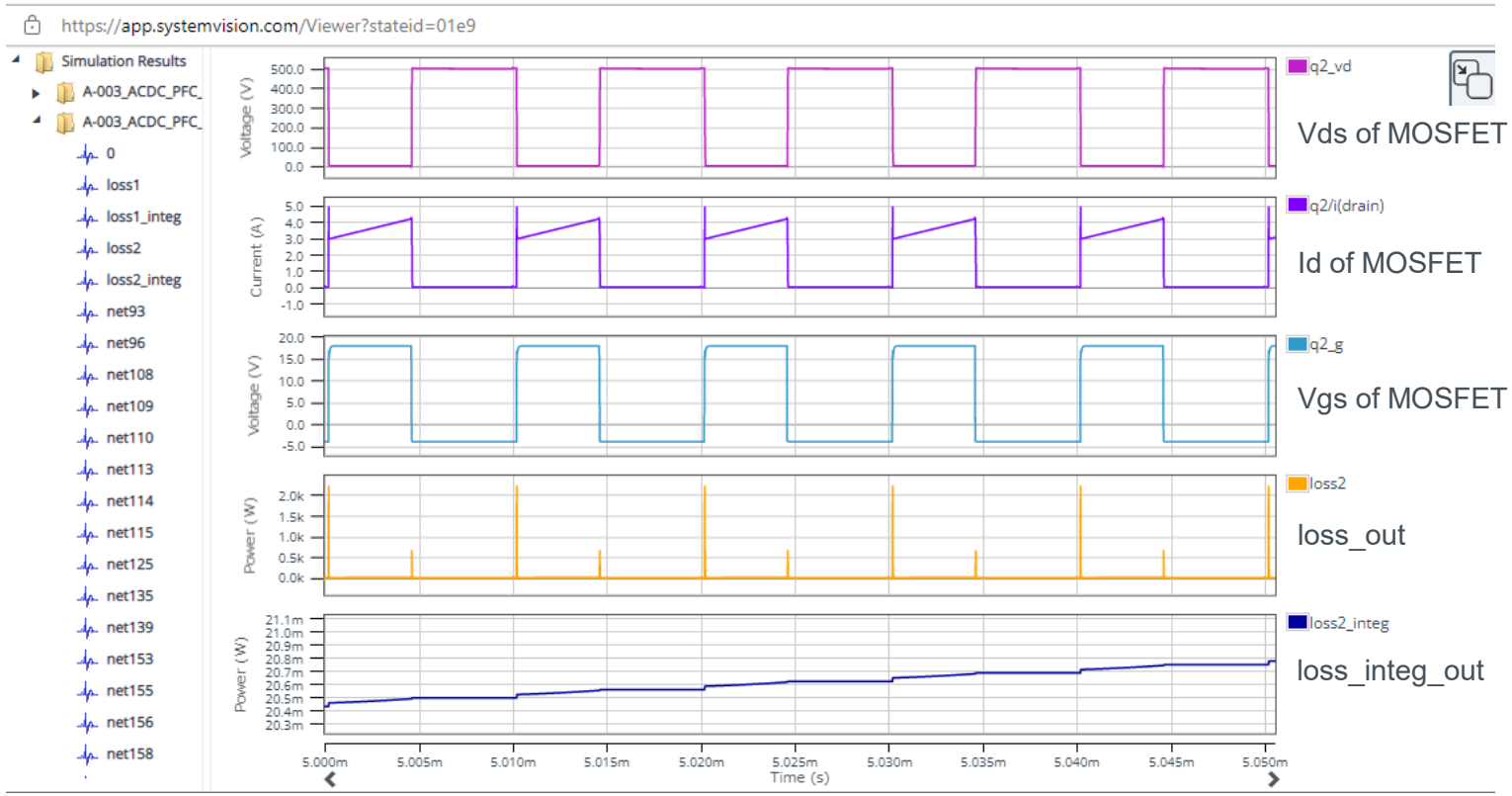
$$loss\_out(t) = I(t) \times V(t)$$

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

I : Current through p1 to p1s

V : Voltage between p1s and p2

Waveform example



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