

C-016. DC-DC Quasi-Resonant Converter $V_{in}=800V$, $V_o=25V$, $I_o=10A$

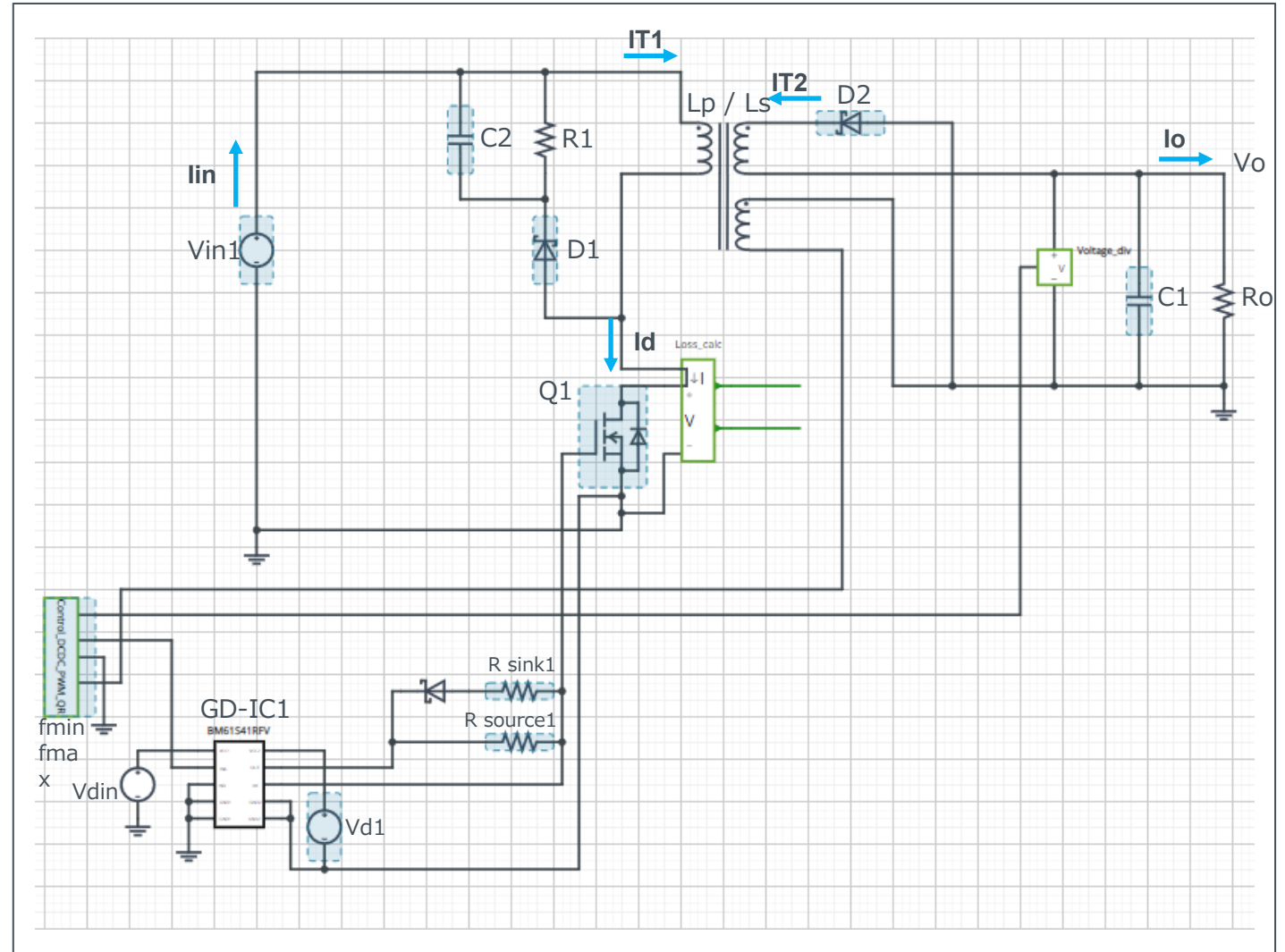
Simulation Parameters

Component name	Component	Default	Simulation Setting Range
Vin1	Input voltage	800Vdc	
Vo	Output voltage	25Vdc	
Io	Output current	10Adc	
fmin	Switching frequency	50kHz	10k – 300kHz
fmax	Switching frequency	150kHz	100k – 500kHz
Tj	Temperature	100°C	
Vd1-4	Gate Drive voltage H	18V	10 – 20V
Vdin	Signal voltage level	5V	
Lp / Ls	Transformer	500μ/11.25μ/50nH K=0.999	

Devices

Component Name	Component	Default	Simulation Setting Range
Q1	SiC MOSFET SJ MOSFET	Selectable	
D1,2	SiC SBD	Selectable	
GD-IC1	Gate Driver	Selectable	
R sink1	Resistor for sink	ESR18 2Ω	0.1 -
R source1	Resistor for source	ESR18 5Ω	0.1 -
C1	Capacitor	100μF	1μF - 2mF
C2	Capacitor	10nF	1pF - 1mF
R1	Resistor	100kΩ	
Ro	Output Resistor	{Vo/Io}	

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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ROHM Solution Simulator Schematic Information



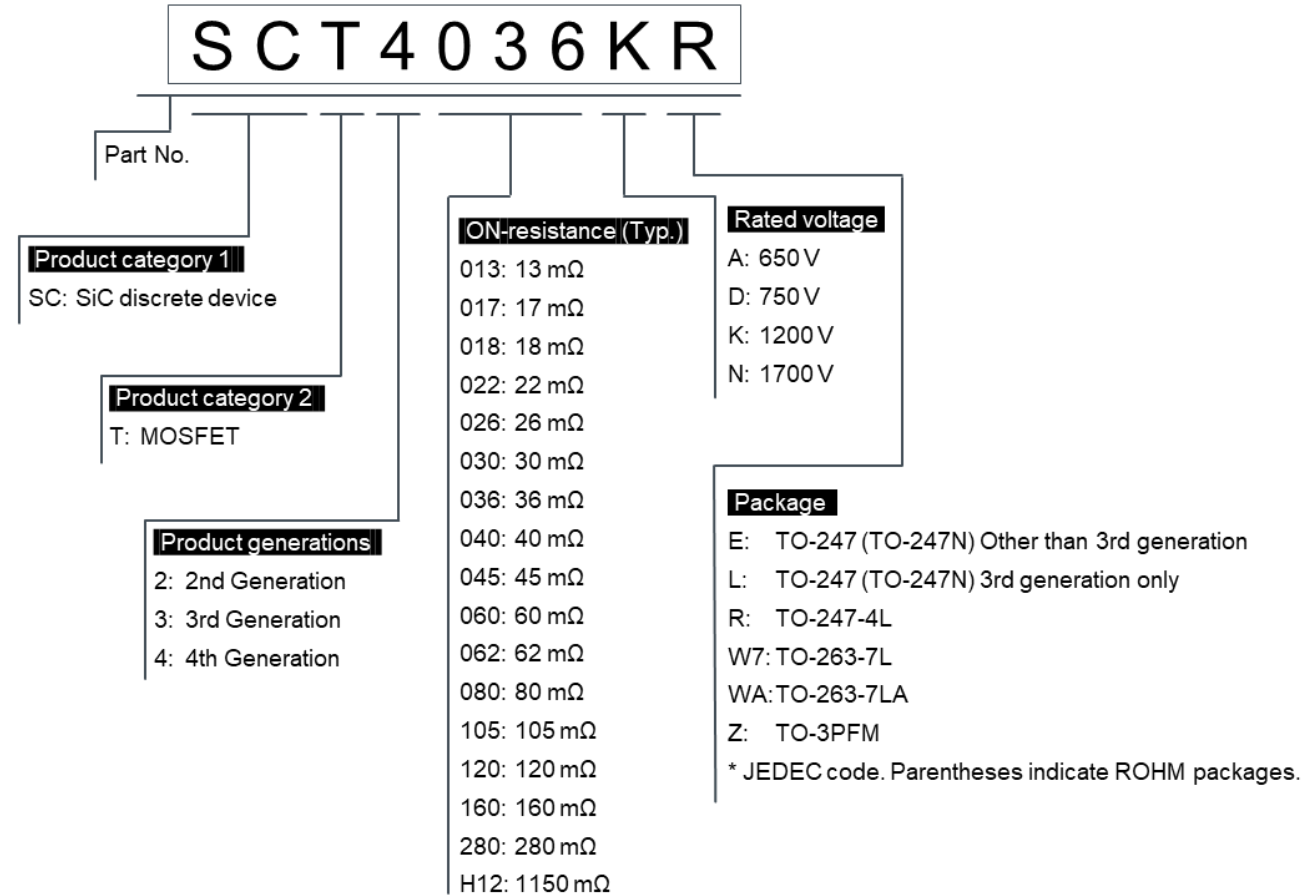
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Selectable Devices

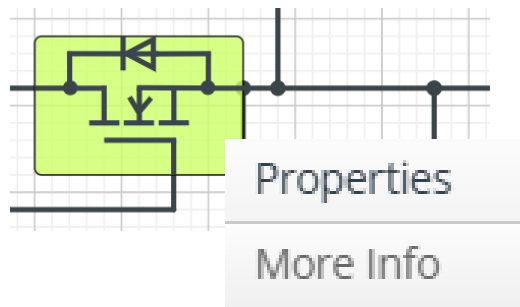
Component name	Component
Q1	SiC MOSFET

SiC MOSFET part number information

SCT4036KR



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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Product Lineup: [SiC MOSFETs](#)

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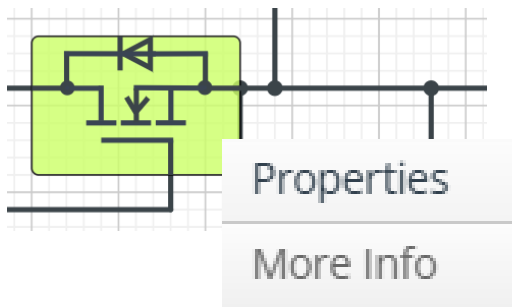


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Selectable Devices

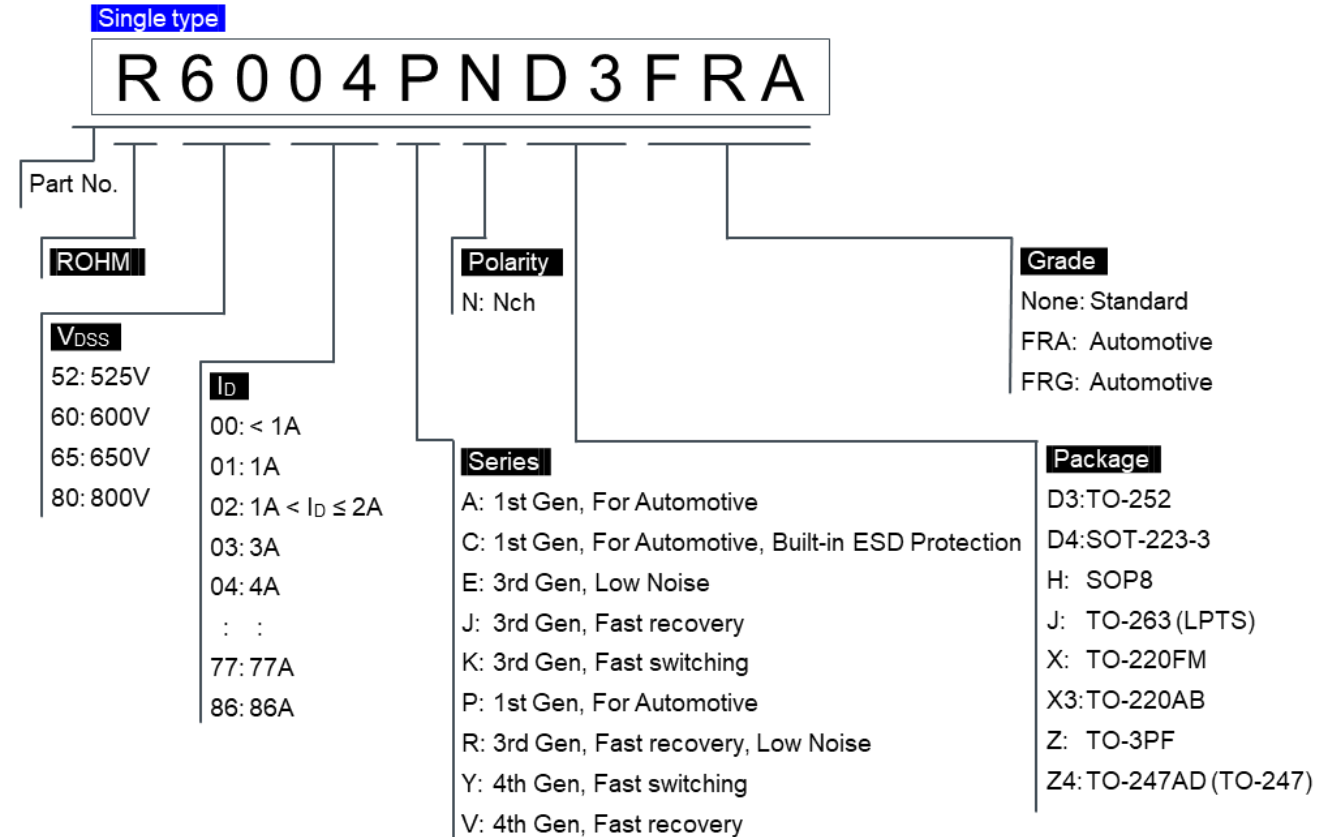
Component name	Component	Product
Q1	SJ MOSFET	RxxxxJN series RxxxxVN series

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



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



Product Lineup: [Super Junction MOSFETs](#)

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ROHM Solution Simulator Schematic Information



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Selectable Devices

Component name	Component	Product
Q1	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 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

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

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

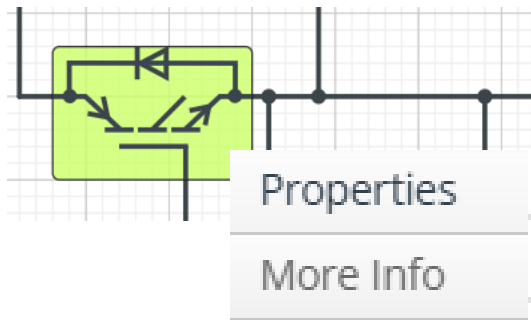
Package
BM: TO-252, TO-252GE
NS: TO-263S, TO-262
NL: TO-263L
TM: TO-220NFM
TS: TO-247N, TO-247GE
TK: TO-3PFM

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

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ROHM Solution Simulator Schematic Information

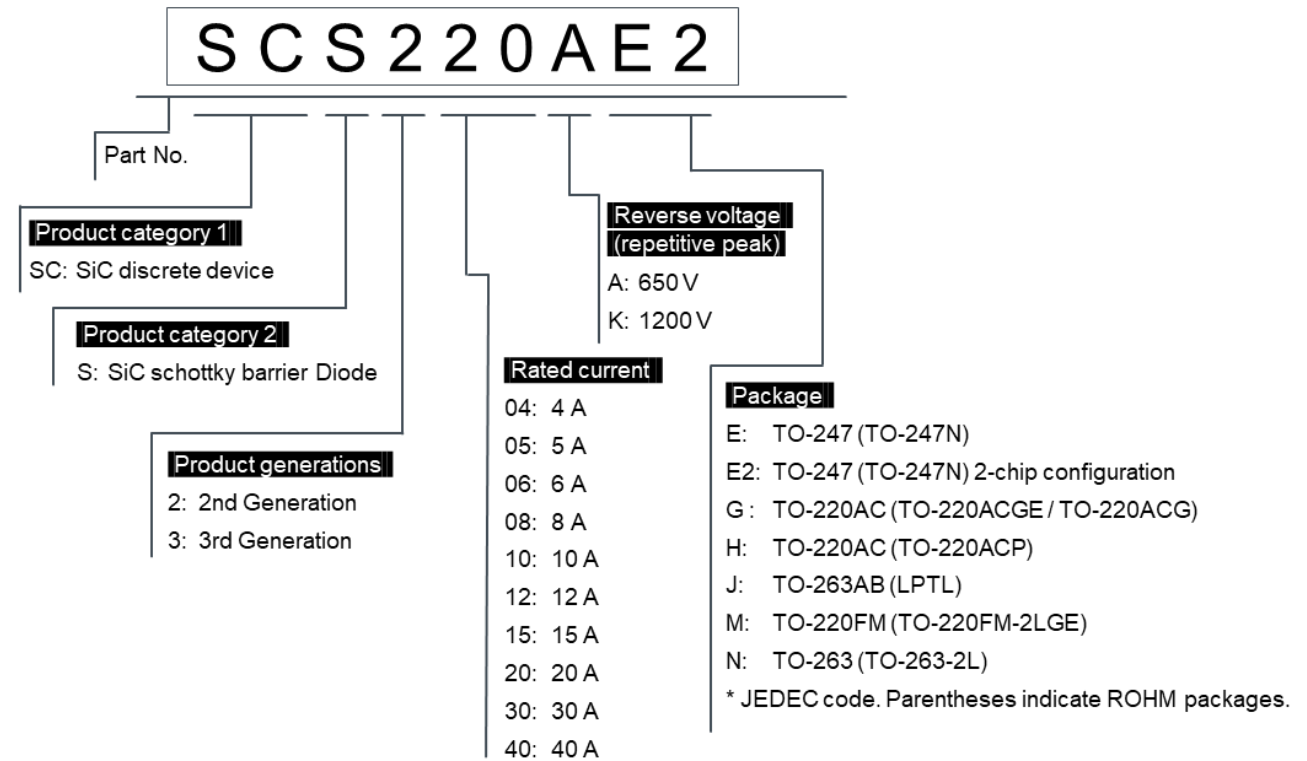


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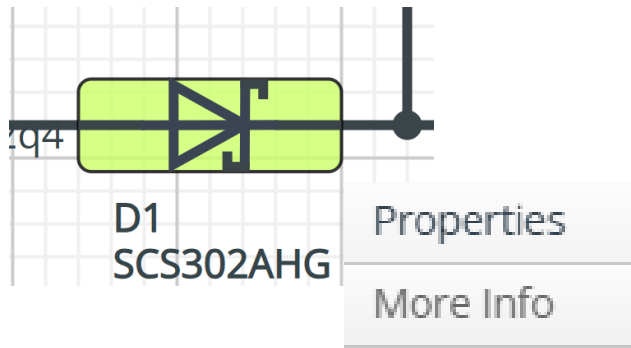
Selectable Devices

Component name	Component
D1,2	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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- [Link To Datasheet](#)
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Product Lineup: [SiC Schottky Barrier Diodes](#)

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ROHM Solution Simulator Schematic Information



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Selectable Devices

Component name	Component	Product No.	feature
GD-IC1	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

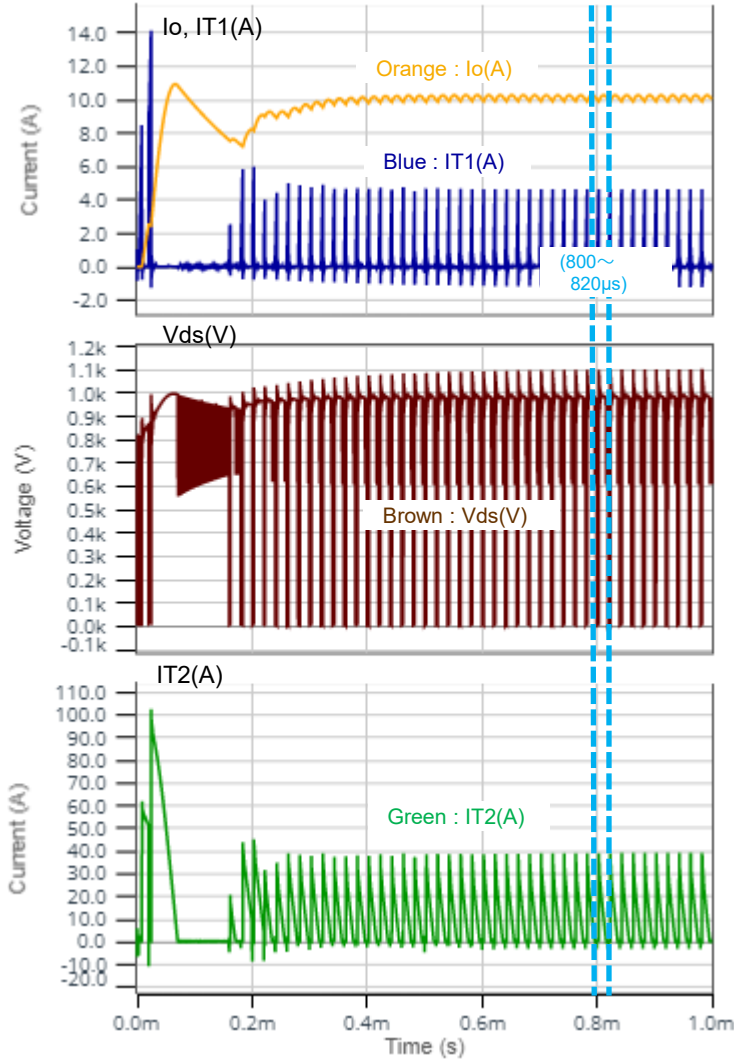
* Default device

Simulation Waveform

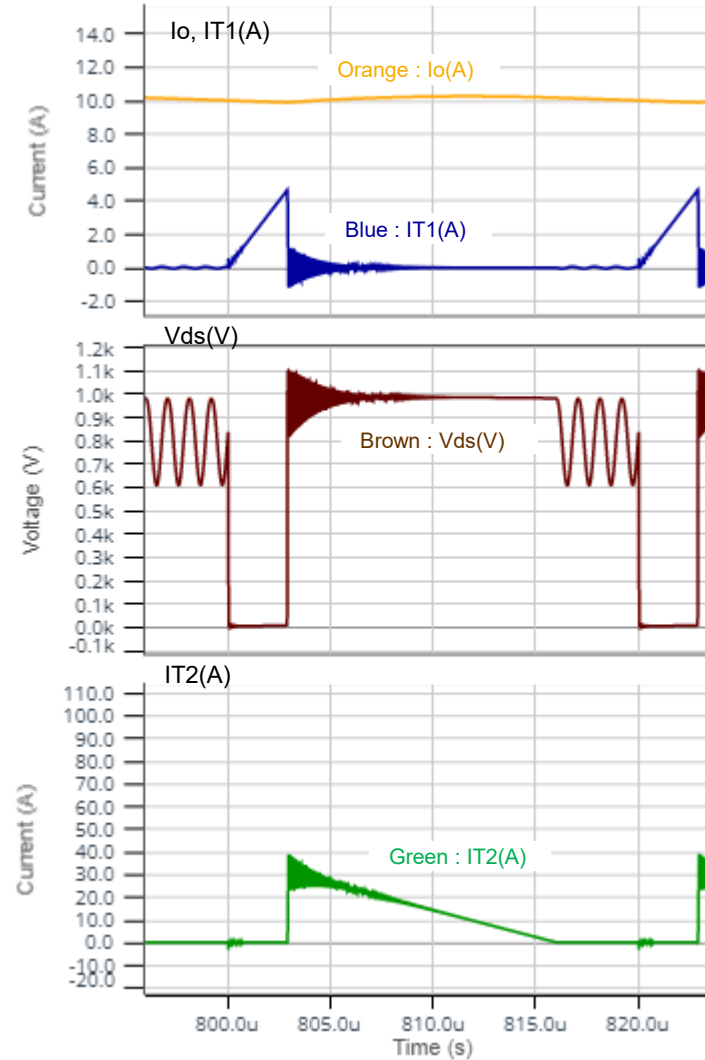


- Q1 : SiC MOSFET
SCT2450KE
- D1 : SiC SBD
SCS205KG
- D2 : SiC SBD
SCS302AHG

$I_o, I_{T1}, V_{ds}, I_{T2}$ (0~2.00ms) $V_{in}=800V$ $V_o=25V$
 $I_o=10A$ $T_j=100^\circ C$



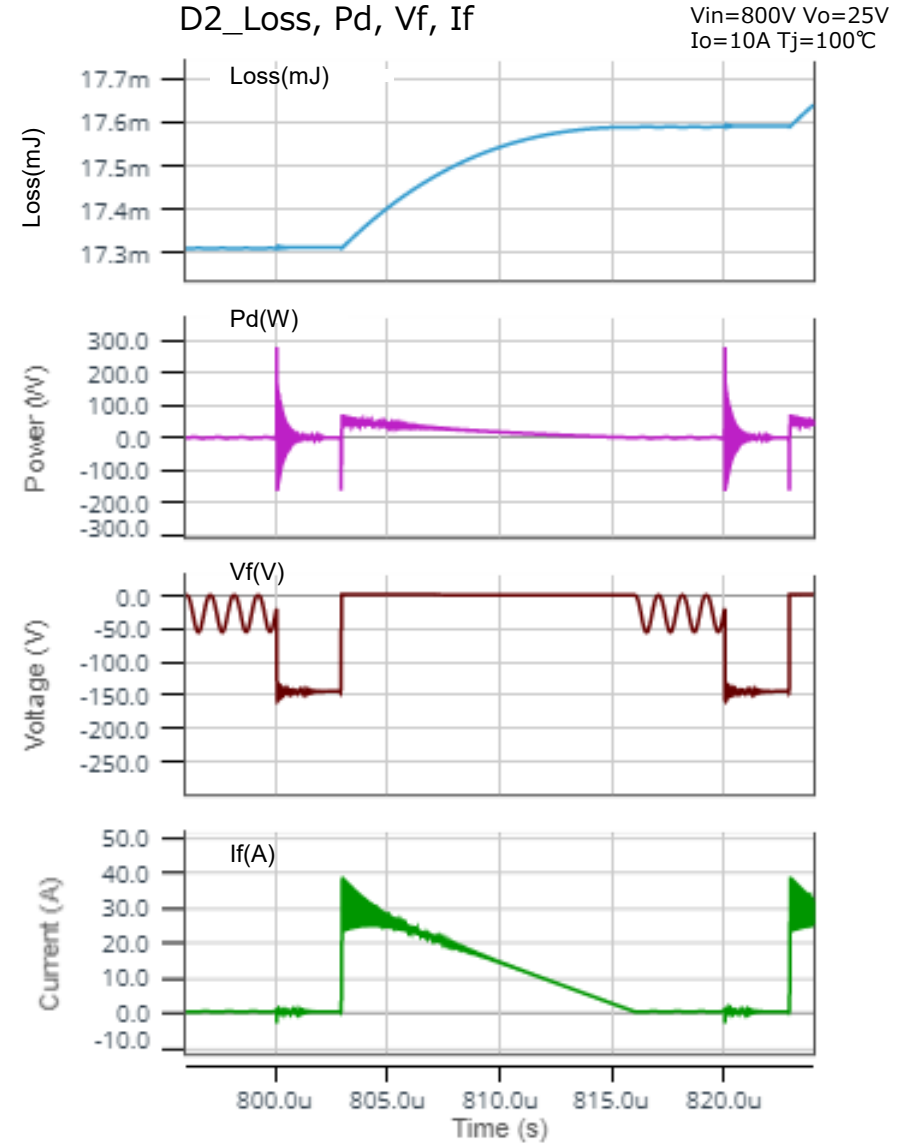
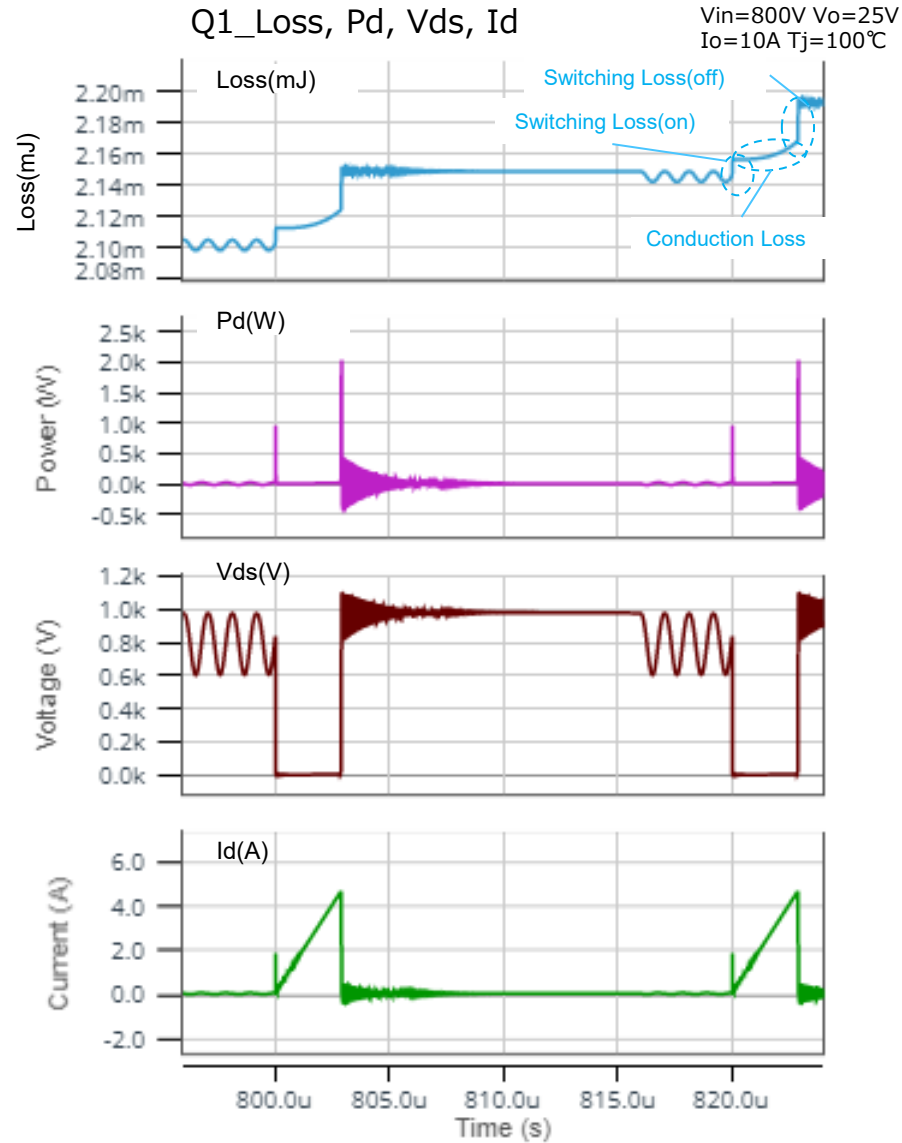
Expansion (800µs~820µs)



Simulation Waveform2



Q1 : SiC MOSFET
SCT2450KE
D1 : SiC SBD
SCS205KG
D2 : SiC SBD
SCS302AHG



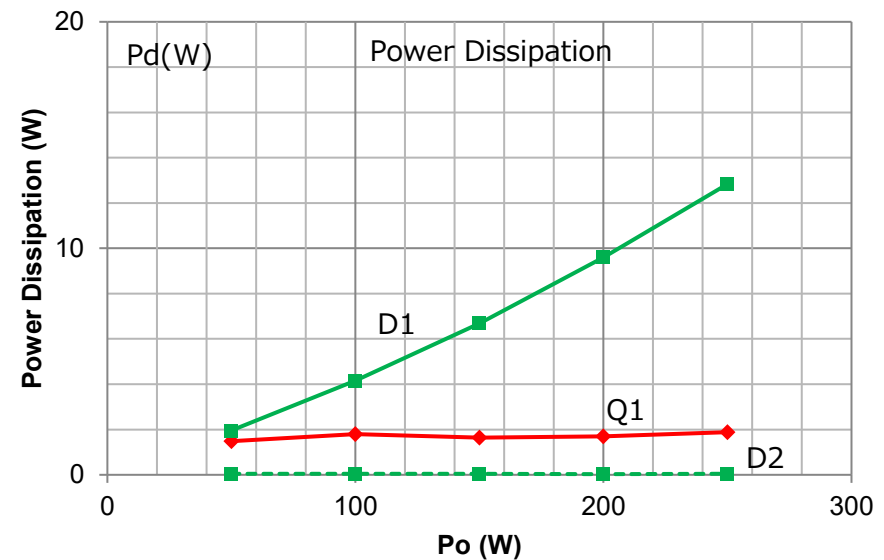
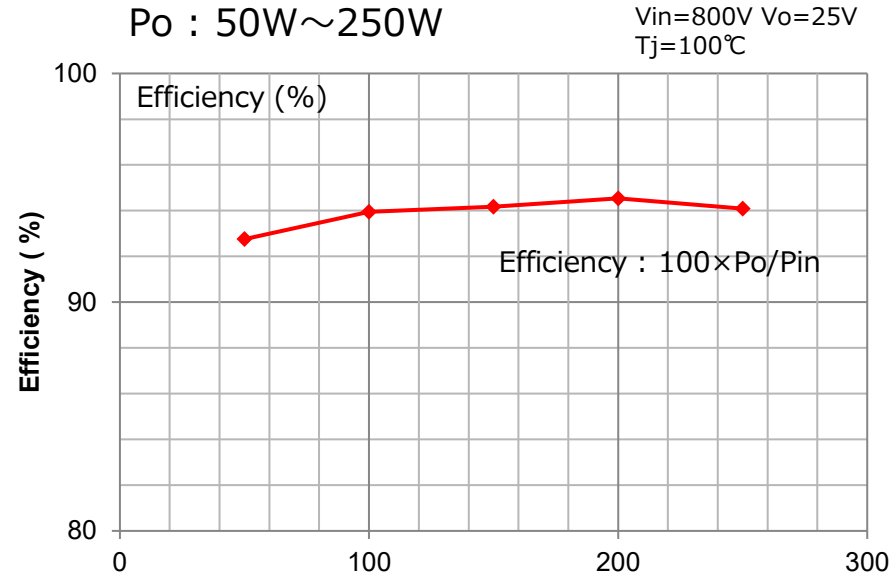
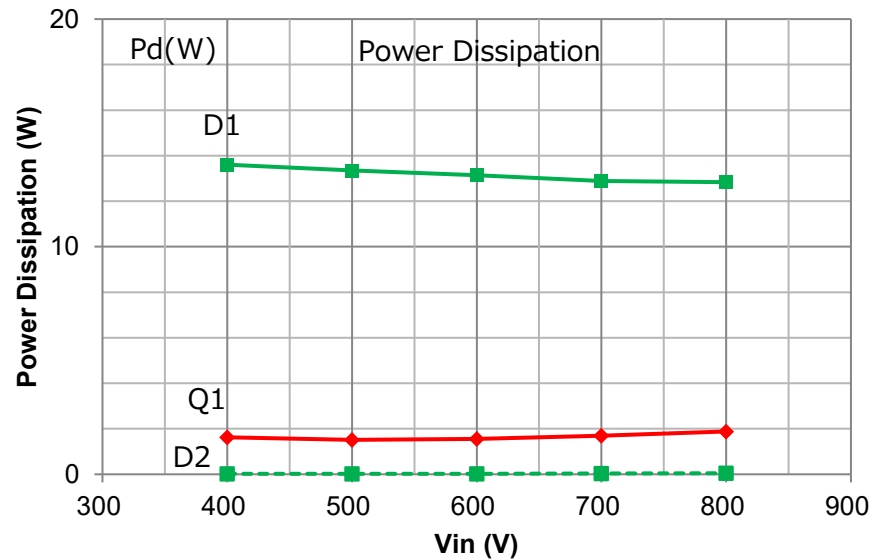
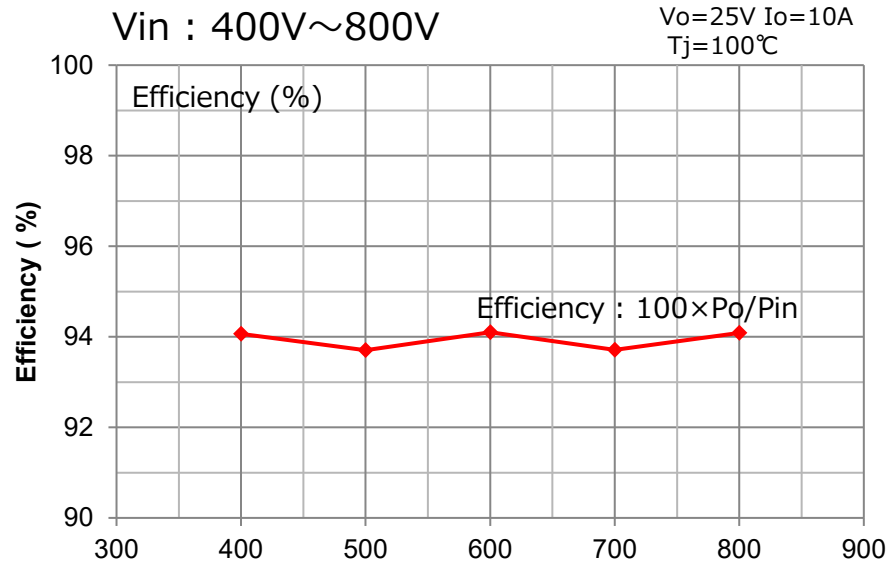
Efficiency, Power Dissipation 1



ROHM Solution Simulator Schematic Information

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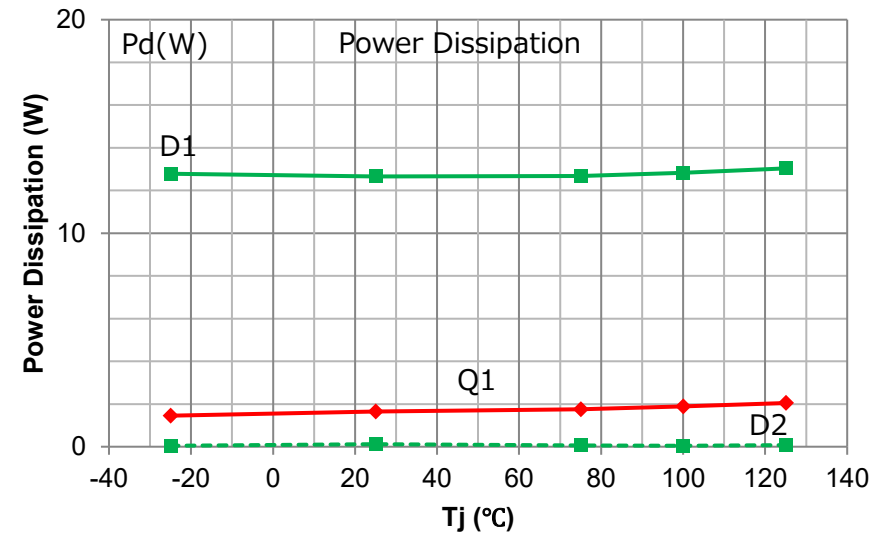
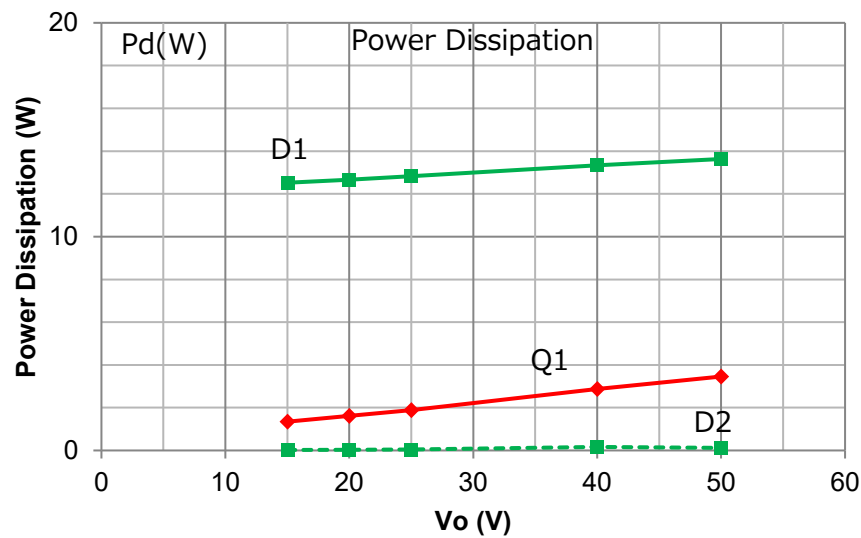
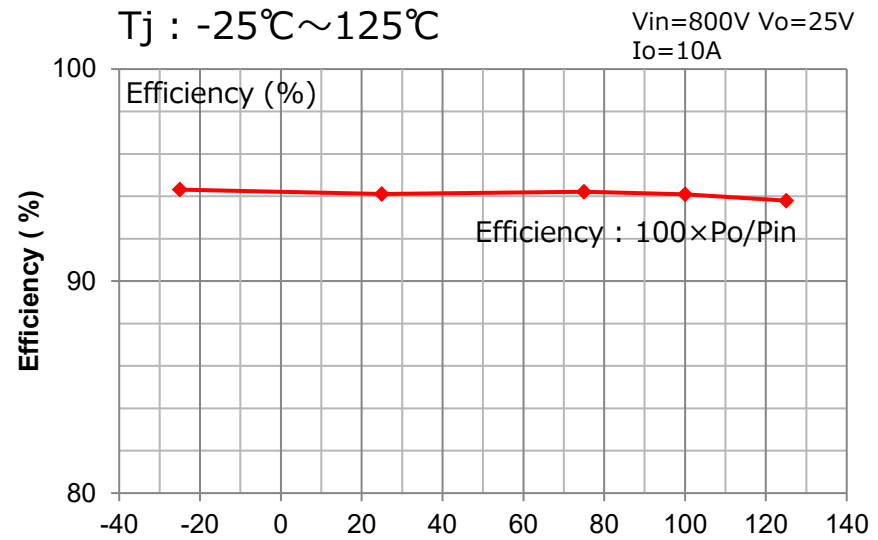
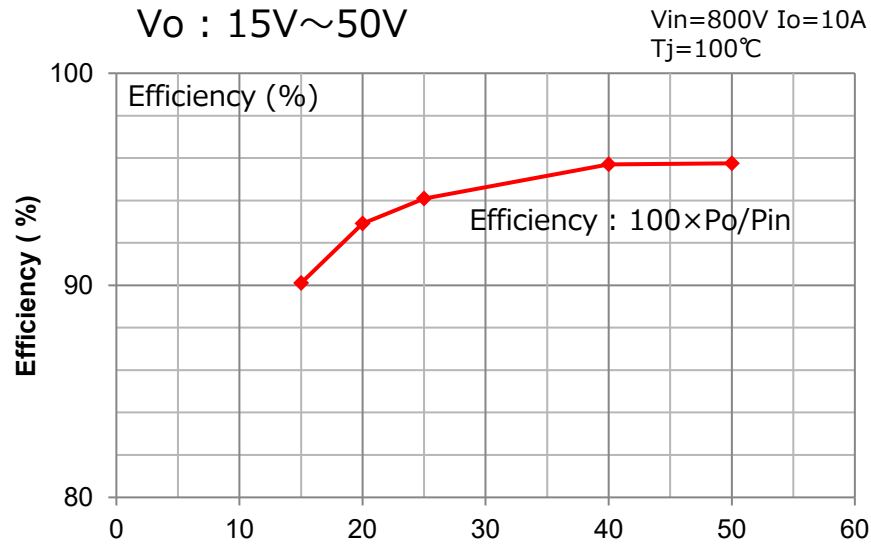
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SCT2450KE
- D1 : SiC SBD
SCS205KG
- D2 : SiC SBD
SCS302AHG



Efficiency, Power Dissipation 2

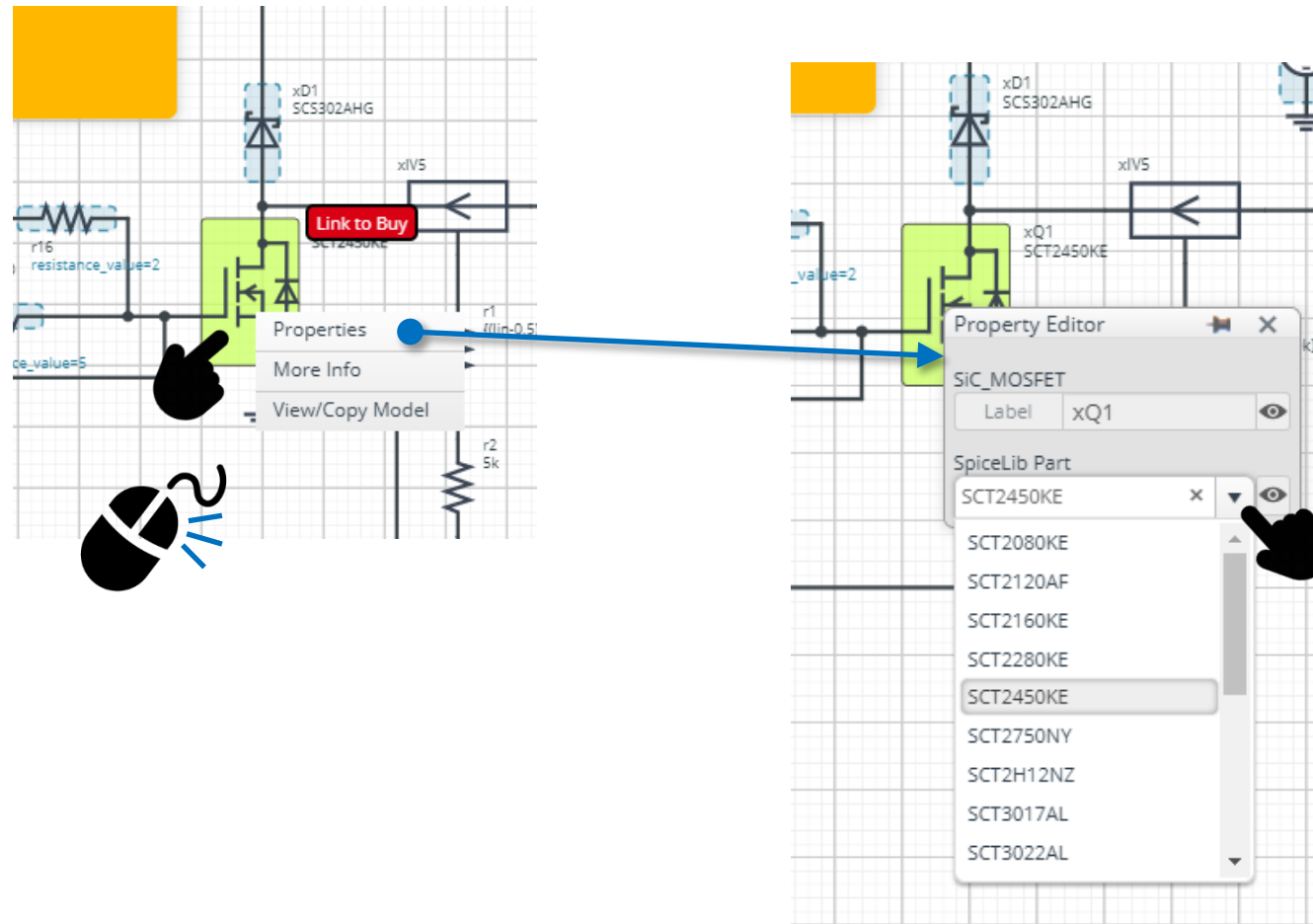


- Q1 : SiC MOSFET
SCT2450KE
- D1 : SiC SBD
SCS205KG
- D2 : SiC SBD
SCS302AHG



How to change the devices

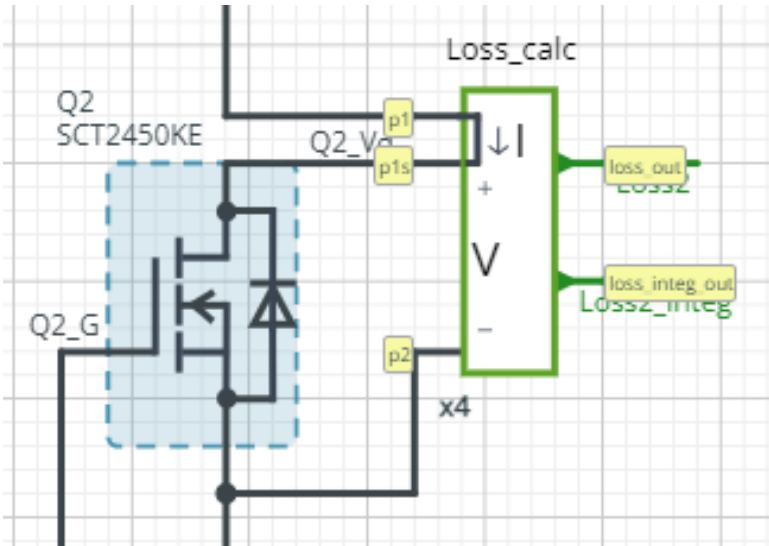
Right-click on the device → Select Properties → Pull down “SpiceLib Part” → Select the product



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

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Loss calculation model 'Loss_calc'



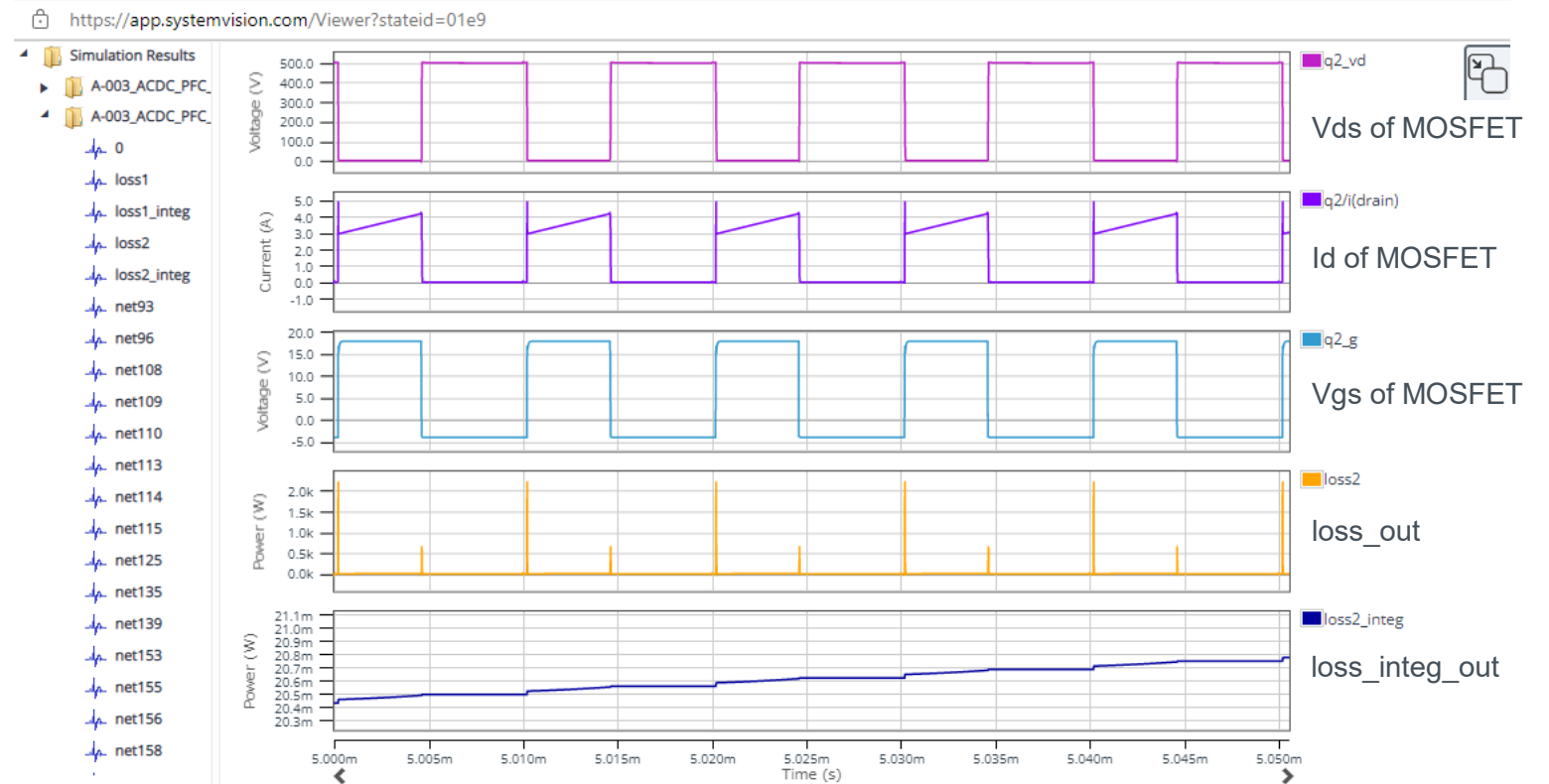
$$loss_out(t) = I(t) \times V(t)$$

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

I : Current through p1 to p1s

V : Voltage between p1s and p2

Waveform example



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