A-010. Totem-Pole Bridgeless PFC Vin=200V, Iin=100A, Synchronous FETs on low frequency leg

ROHM Solution Simulator Schematic Information

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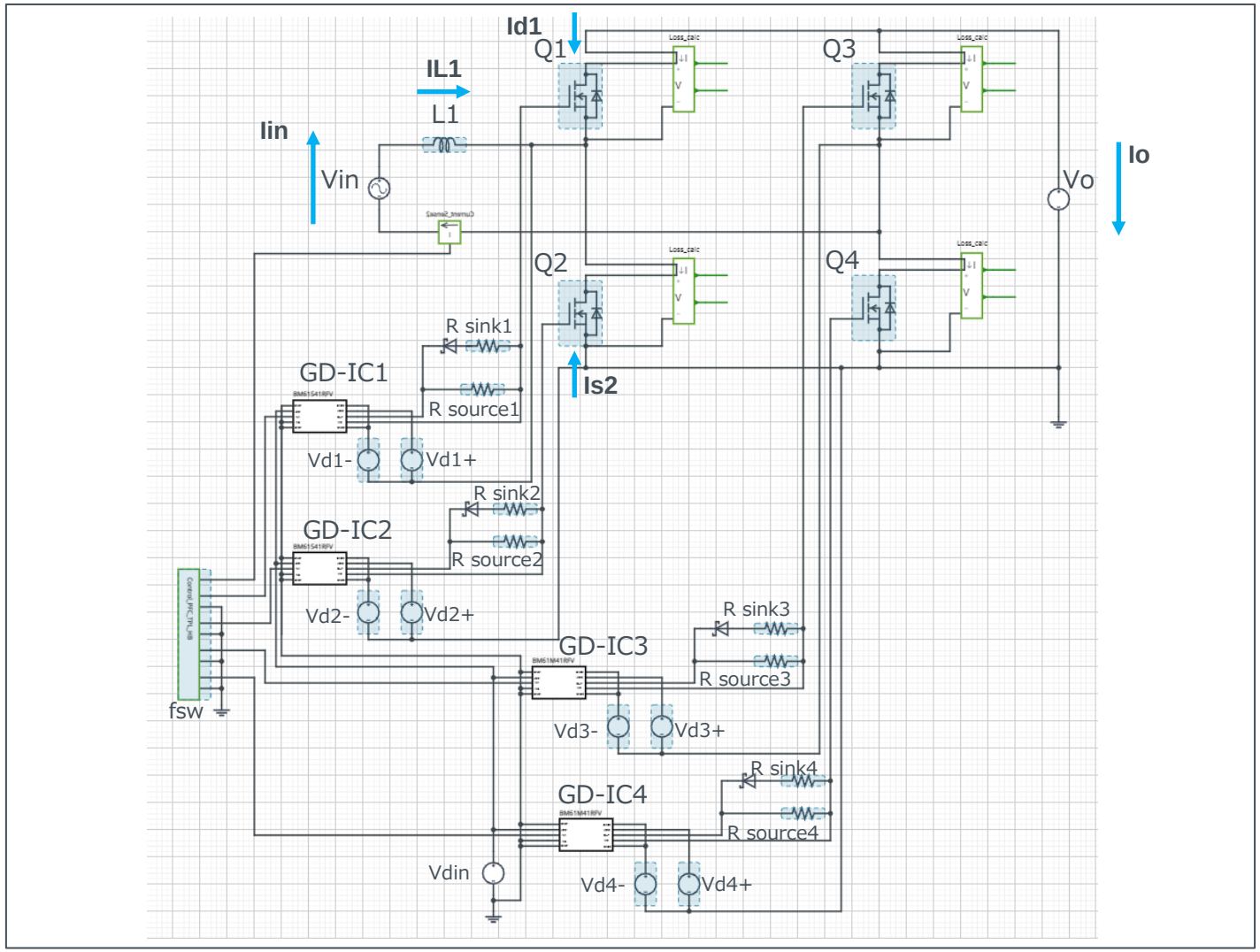
Simulation Parameters

Component name	Component	Default	Simulation Setting Range
Vin	Input voltage	200Vac 50Hz	
Iin	Input current	100Aac	
Vo	Output voltage	400Vdc	300 – 500Vdc
fsw	Switching frequency	50kHz	10k – 300kHz
Tj	Temperature	100°C	
Vd1,2,3,4+	Gate Drive voltage H	18V	10 – 20V
Vd1,2,3,4-	Gate Drive voltage L	-4V	-4 – 0V
Vdin	Signal voltage level	5V	

Devices

Component name	Component	Default	Simulation Setting Range
Q1, Q2	SiC MOSFET	Selectable	
Q3,Q4	SJ-MOSFET	Selectable	
GD-IC1,2	Gate Driver	BM61S41RFV-C	
GD-IC3,4	Gate Driver	BM61M41RFV-C	
R sink1,2	Resistor for sink	ESR18 1Ω	0.1 -
R sink3,4	Resistor for sink	ESR18 1Ω	0.1 -
R source1,2	Resistor for source	ESR18 2Ω	0.1 -
R source3,4	Resistor for source	ESR18 2Ω	0.1 -
L1	Inductor	100µH	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.

A-010. Totem-Pole Bridgeless PFC (Synchronous FETs)

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Selectable Devices

Component name	Component	Product No.	feature
Q1, Q2	SiC MOSFET	SCT2080KE	1200V, 80mΩ, 40A
		SCT2120AF	650V, 120mΩ, 29A
		SCT2160KE	1200V, 160mΩ, 22A
		SCT2280KE	1200V, 280mΩ, 14A
		SCT2450KE	1200V, 450mΩ, 10A
		SCT2750NY	1700V, 750mΩ, 6A
		SCT2H12NZ	1700V, 1150mΩ, 3.7A
		SCT3017AL (*)	650V, 17mΩ, 118A
		SCT3022AL	650V, 22mΩ, 93A
		SCT3022KL	1200V, 22mΩ, 95A
		SCT3030AL	650V, 30mΩ, 70A
		SCT3030KL	1200V, 30mΩ, 72A
		SCT3040KL	1200V, 40mΩ, 55A
		SCT3060AL	650V, 60mΩ, 39A
		SCT3080AL	650V, 80mΩ, 30A
		SCT3080KL	1200V, 80mΩ, 31A
		SCT3105KL	1200V, 105mΩ, 24A
		SCT3120AL	650V, 120mΩ, 21A
		SCT3160KL	1200V, 160mΩ, 17A

* Default device

Selectable Devices

Component name	Component	Product No.	feature
Q3, Q4	SJ-MOSFET	R6004JNX	600V, 4A
		R6006JNX	600V, 6A
		R6009JNX	600V, 9A
		R6018JNX	600V, 18A
		R6020JNX	600V, 20A
		R6025JNX	600V, 25A
		R6030JNZ4	600V, 30A
		R6050JNZ4 (*)	600V, 50A

* Default device

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

Simulation Waveform1

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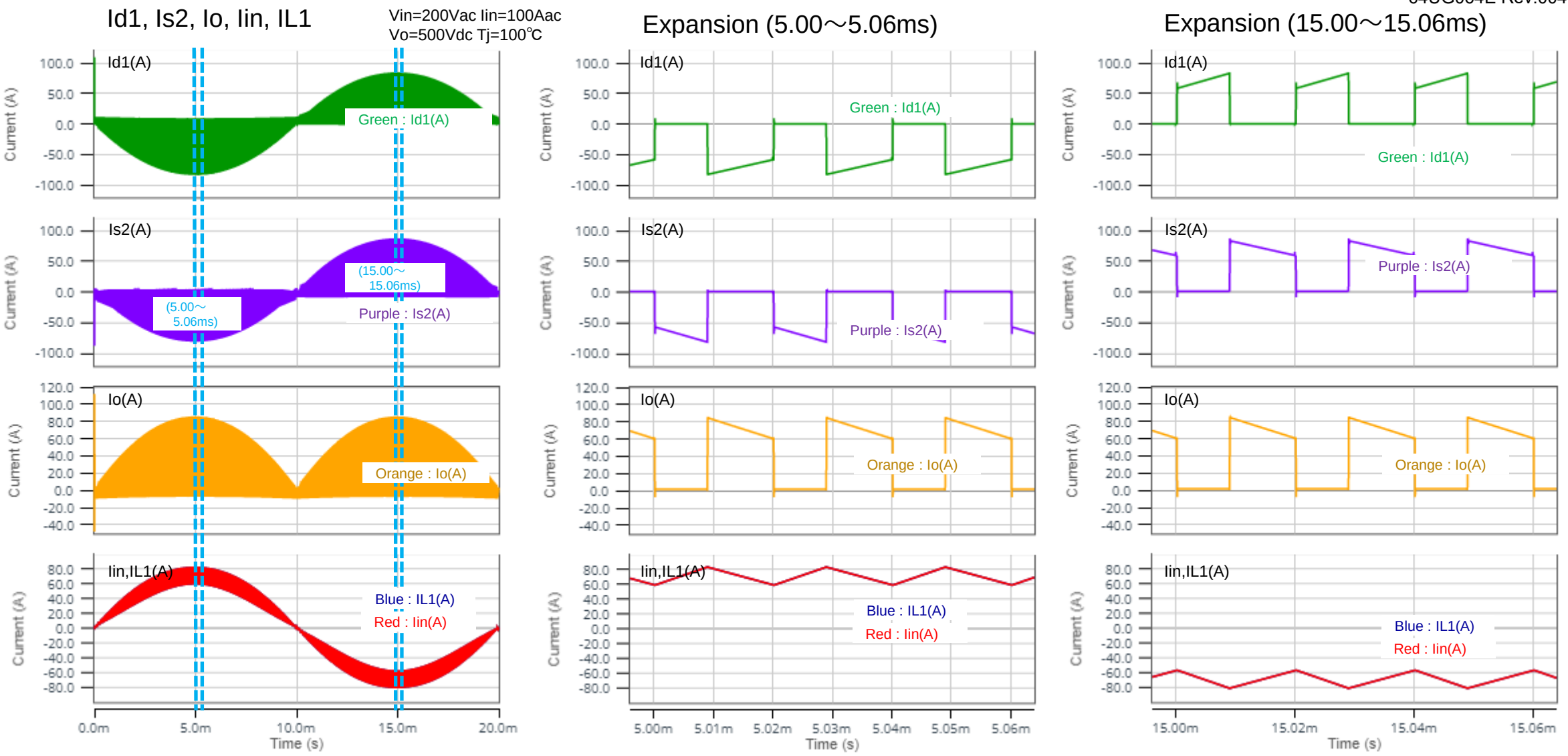

Efficiency, Power Dissipation 1

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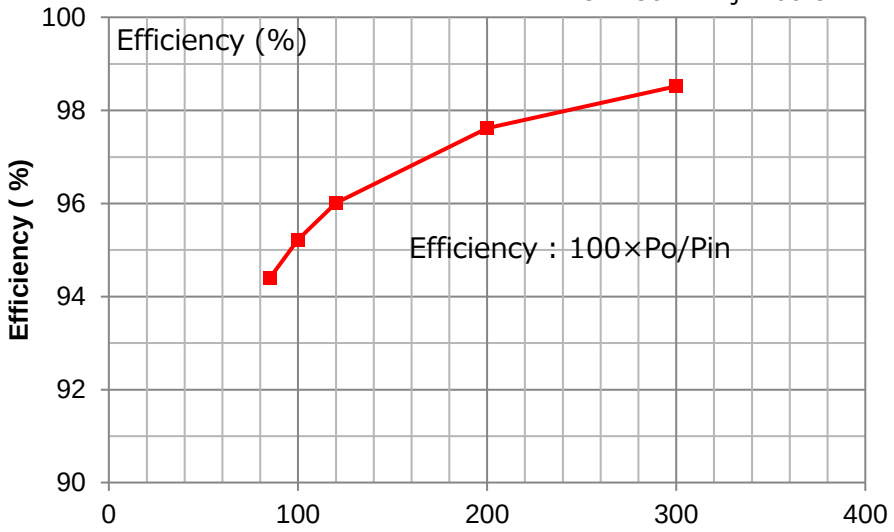
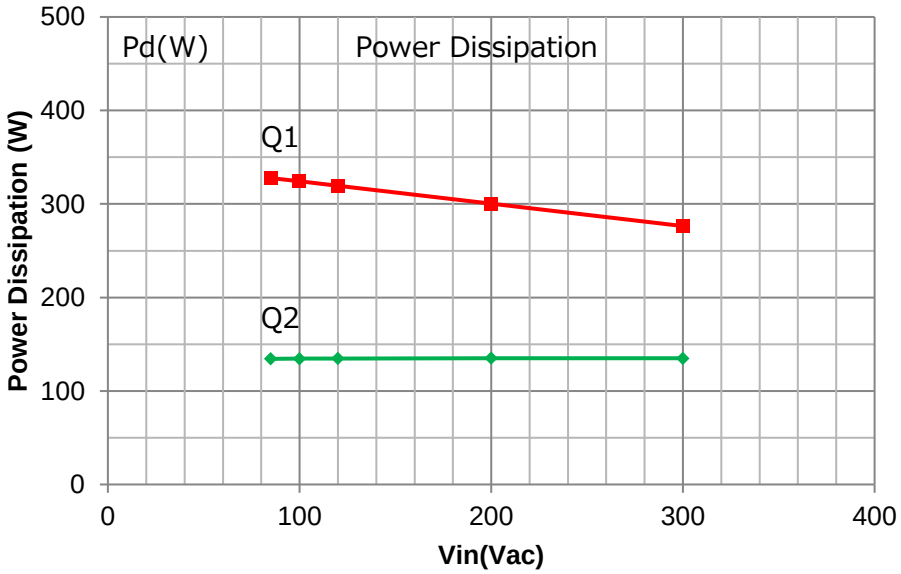
Vin : 85Vac～300Vac

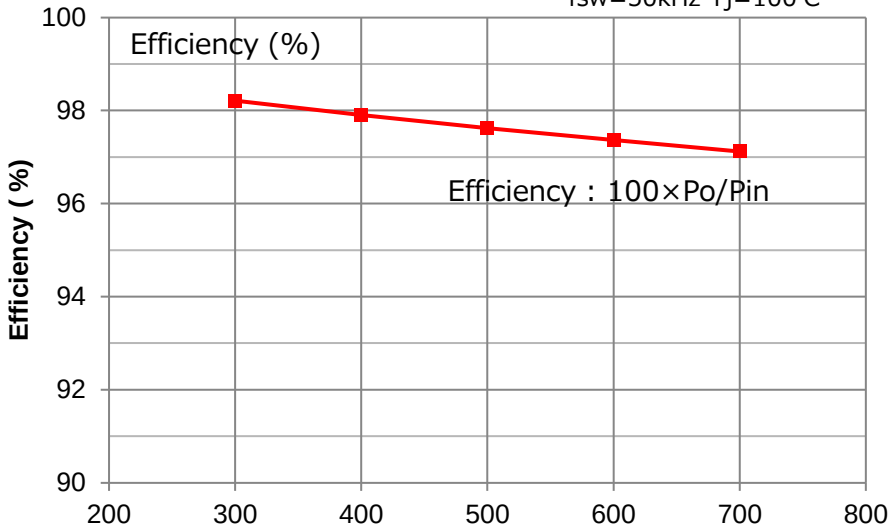
Iin=100Aac Vo=500Vdc
fsw=50kHz Tj=100℃

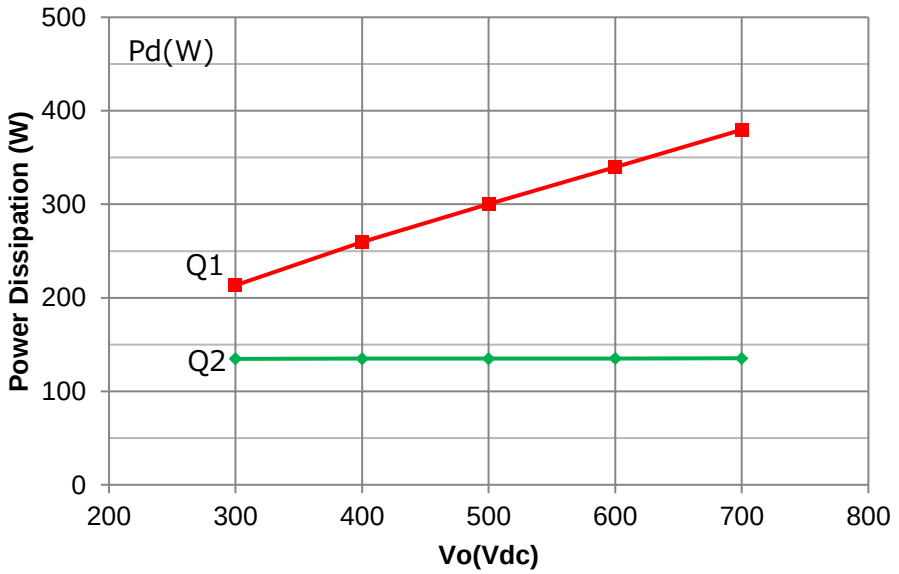




Vo : 300Vdc～700Vdc

Vin=200Vac Iin=100Aac
fsw=50kHz Tj=100℃





Efficiency, Power Dissipation 2

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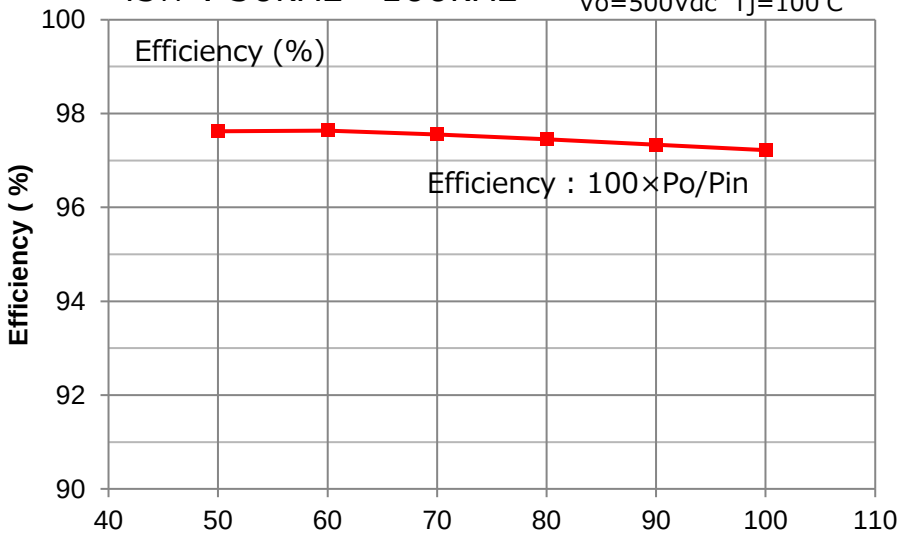
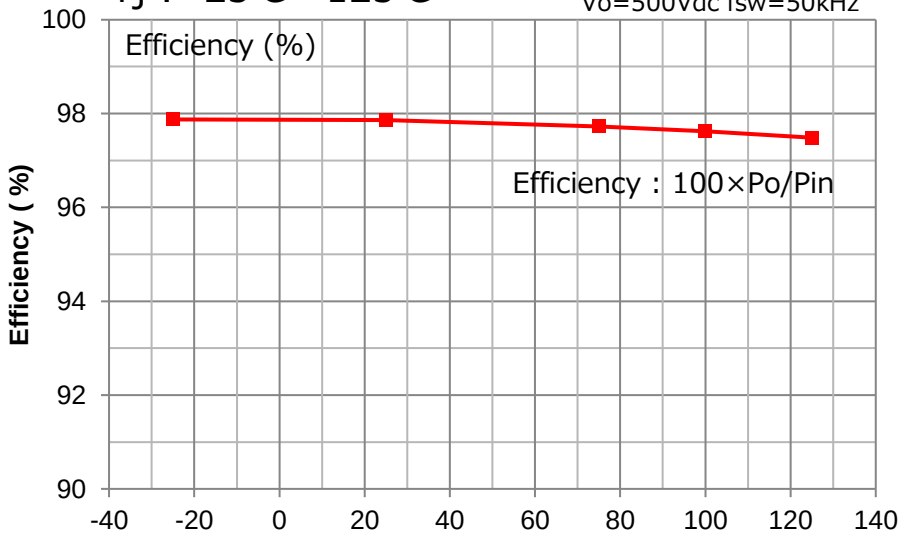
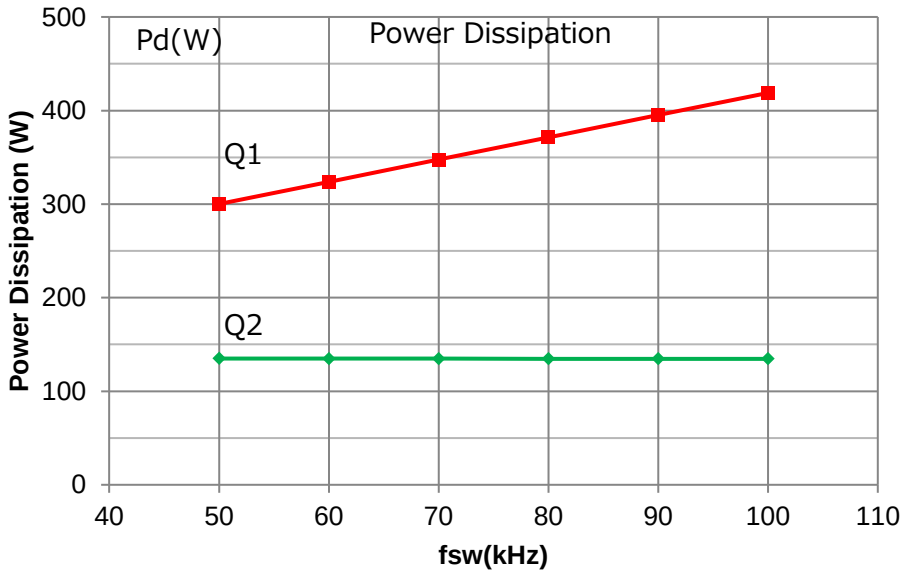
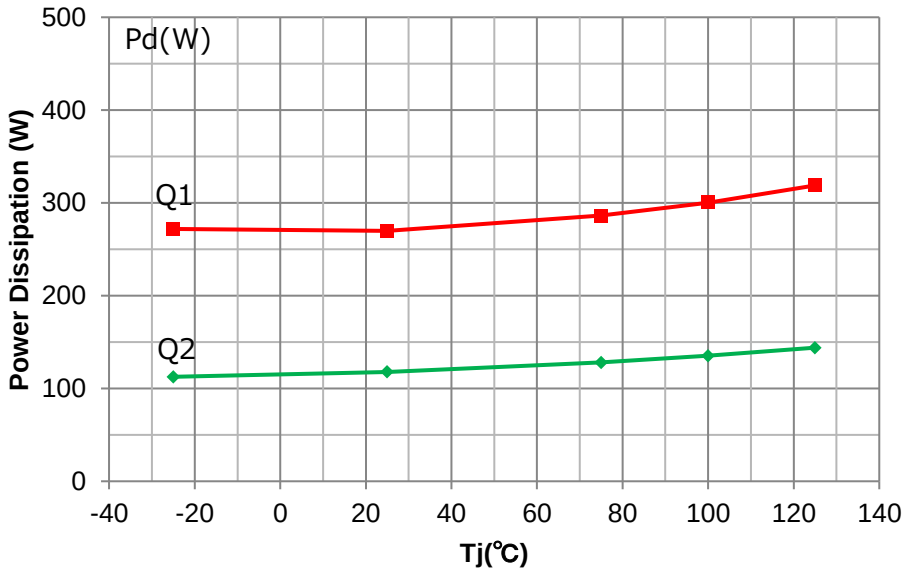
fsw：50kHz～100kHz
Vin=200Vac Iin=100Aac
Vo=500Vdc Tj=100℃



Tj：-25℃～125℃
Vin=200Vac Iin=100Aac
Vo=500Vdc fsw=50kHz







How to change the devices

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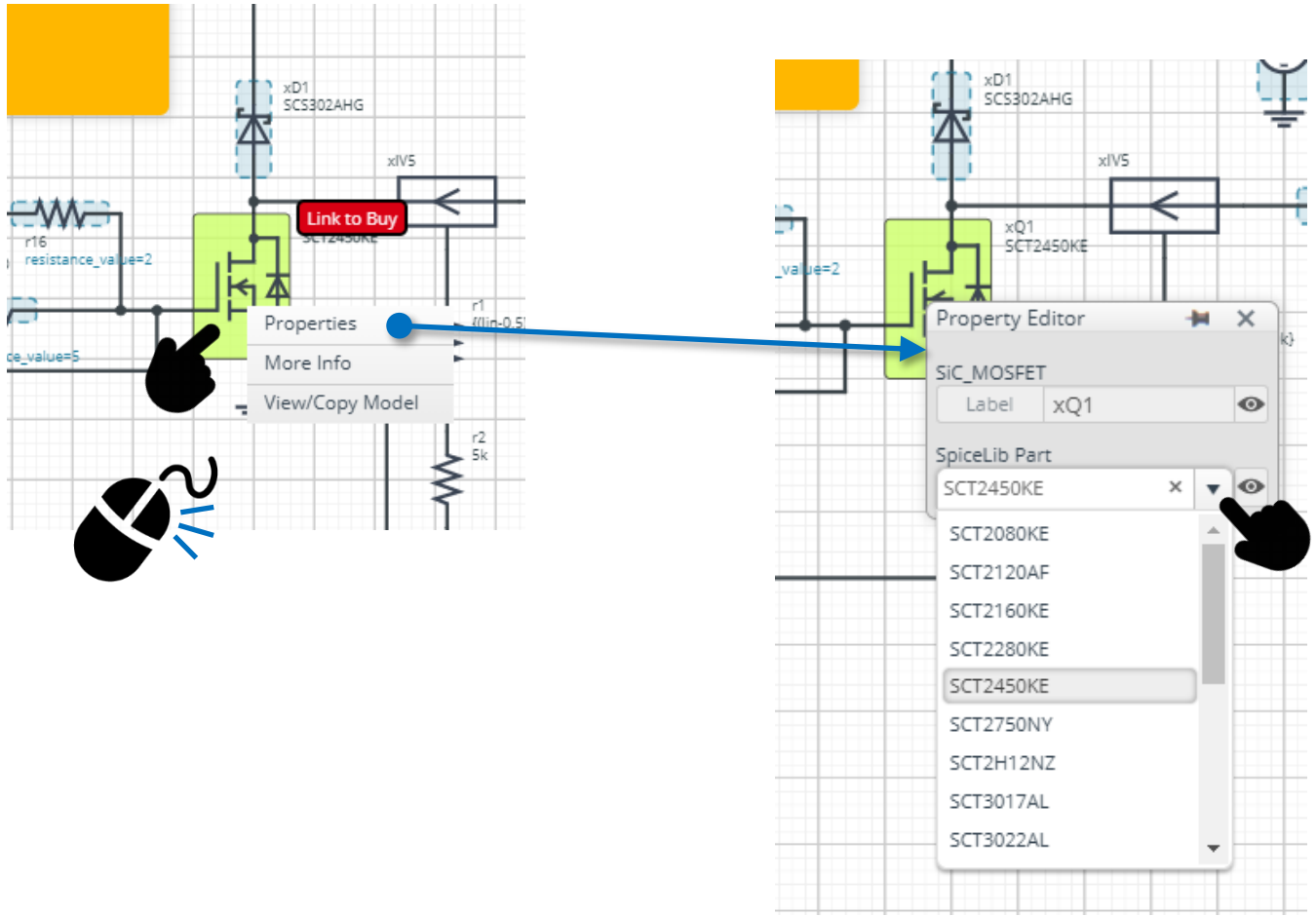
Right-click on the device ⇨ Select Properties ⇨ Pull down “SpiceLib Part” ⇨ Select the product



Loss Calculation Model

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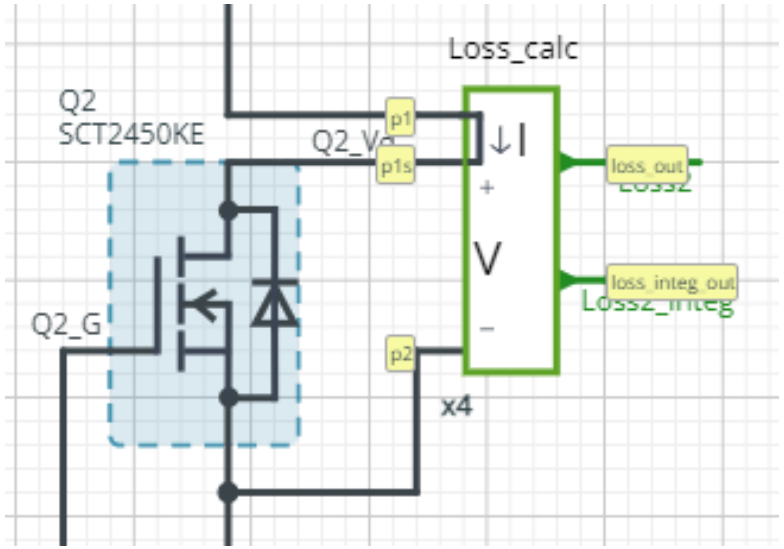
Loss Calculation Model outputs the instantaneous value of power loss and its integration.

Loss calculation model ‘Loss_calc’



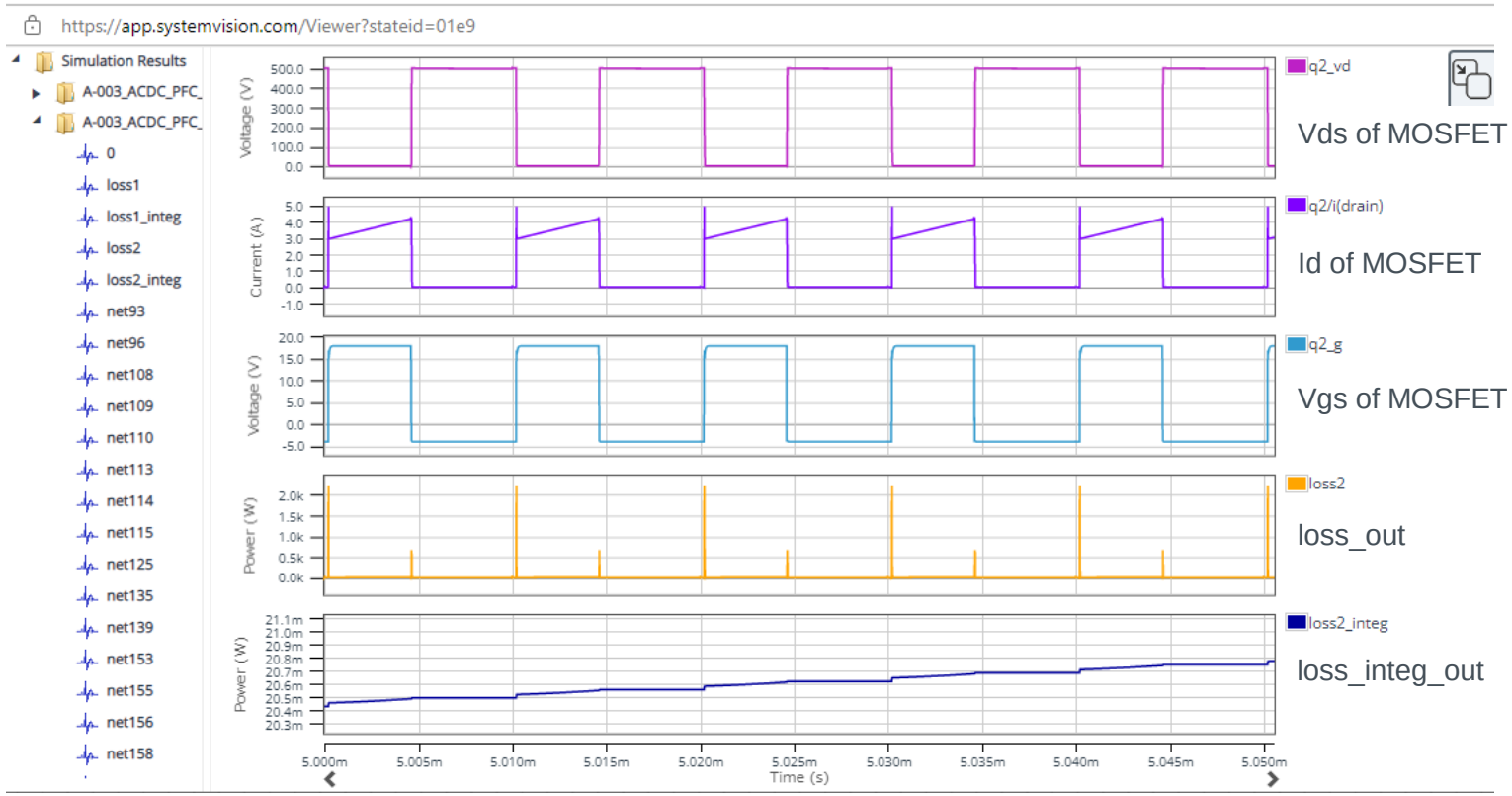
$$loss\_out(t) = I(t) \times V(t)$$

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

I : Current through p1 to p1s

V : Voltage between p1s and p2

Waveform example



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