C-016. DC-DC Quasi-Resonant Converter Vin=800V, Vo=25V, Io=10A

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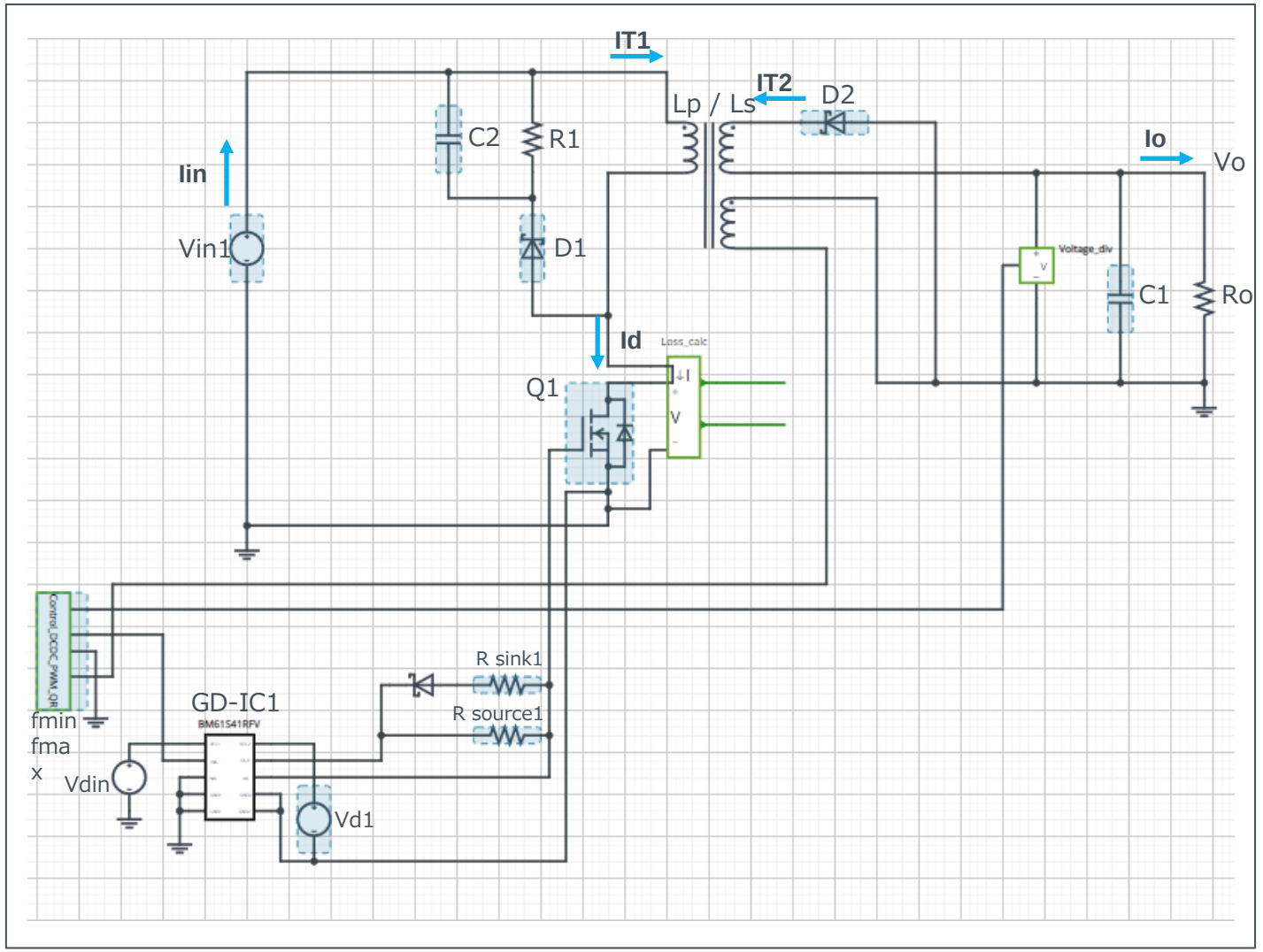
Simulation Parameters

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	Selectable	
D1,2	SiC SBD	Selectable	
GD-IC1	Gate Driver	BM61S41RFV-C	
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.

C-016. DC-DC Quasi-Resonant Converter Vin=800V, Vo=25V, Io=10A

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Selectable Devices

Component name	Component	Product No.	feature
Q1	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
D1, D2	SiC SBD	SCS205KG (*)	1200V, 5A
		SCS206AG	650V, 6A
		SCS208AG	650V, 8A
		SCS210AG	650V, 10A
		SCS210KG	1200V, 10A
		SCS212AG	650V, 12A
		SCS215AG	650V, 15A
		SCS215KG	1200V, 15A
		SCS220AG	650V, 20A
		SCS220KG	1200V, 20A
		SCS302AHG	650V, 2A, High surge resistance
		SCS304AHG	650V, 4A, High surge resistance
		SCS306AHG	650V, 6A, High surge resistance
		SCS308AHG	650V, 8A, High surge resistance
		SCS310AHG	650V, 10A, High surge resistance
		SCS312AHG	650V, 12A, High surge resistance
		SCS315AHG	650V, 15A, High surge resistance
		SCS320AHG	650V, 20A, High surge resistance

* Default device

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

C-016. DC-DC Quasi-Resonant Converter Vin=800V, Vo=25V, Io=10A

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Selectable Devices

Component name	Component	Product No.	feature
D2	SiC SBD	SCS205KG	1200V, 5A
		SCS206AG	650V, 6A
		SCS208AG	650V, 8A
		SCS210AG	650V, 10A
		SCS210KG	1200V, 10A
		SCS212AG	650V, 12A
		SCS215AG	650V, 15A
		SCS215KG	1200V, 15A
		SCS220AG	650V, 20A
		SCS220KG	1200V, 20A
		SCS302AHG	650V, 2A, High surge resistance
		SCS304AHG	650V, 4A, High surge resistance
		SCS306AHG	650V, 6A, High surge resistance
		SCS308AHG	650V, 8A, High surge resistance
		SCS310AHG	650V, 10A, High surge resistance
		SCS312AHG	650V, 12A, High surge resistance
		SCS315AHG	650V, 15A, High surge resistance
		SCS320AHG (*)	650V, 20A, High surge resistance

* Default device

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

Simulation Waveform

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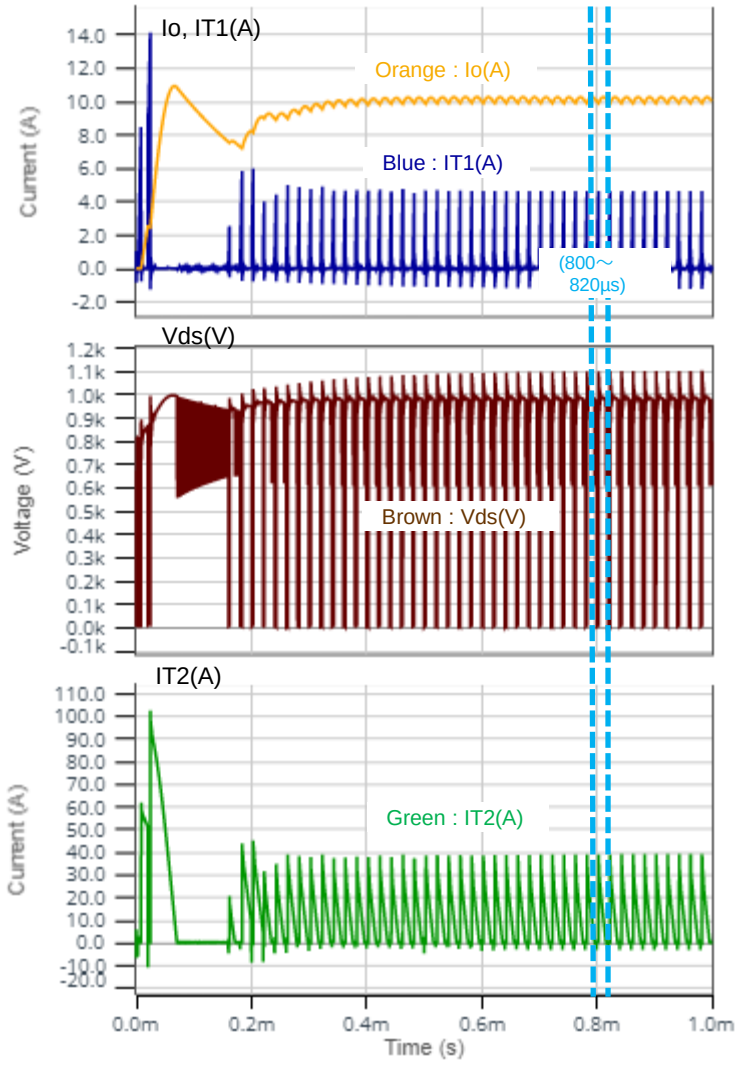
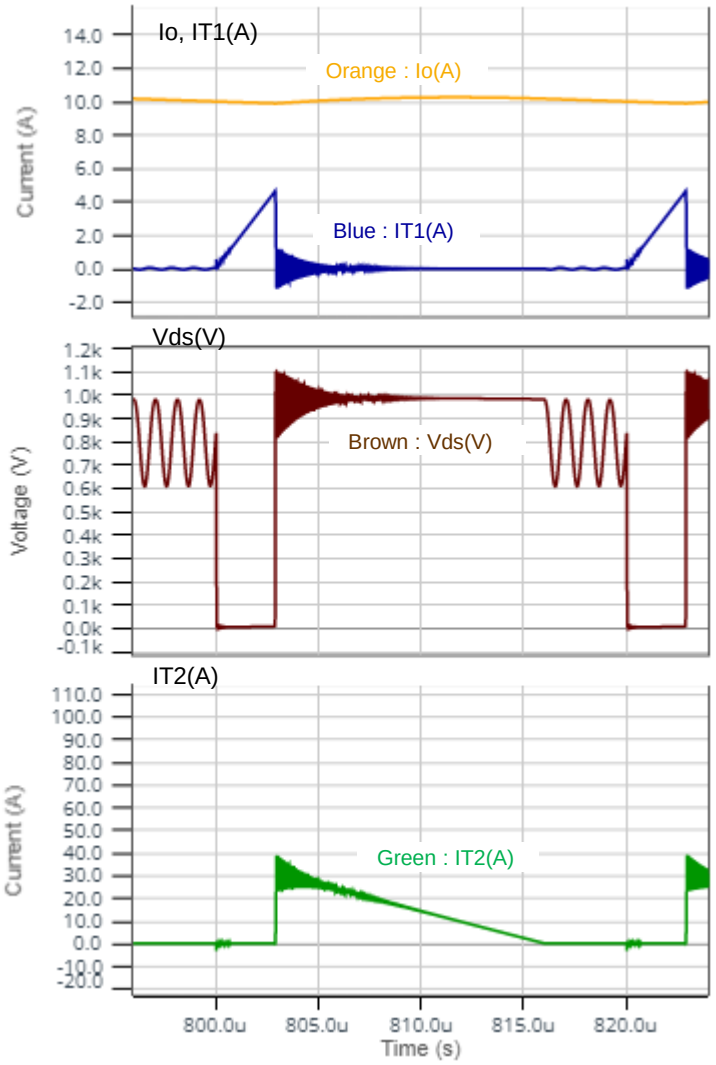
Io, IT1, Vds, IT2 (0～2.00ms) Vin=800V Vo=25V Io=10A Tj=100℃



Expansion （800µs～820µs）



Simulation Waveform2

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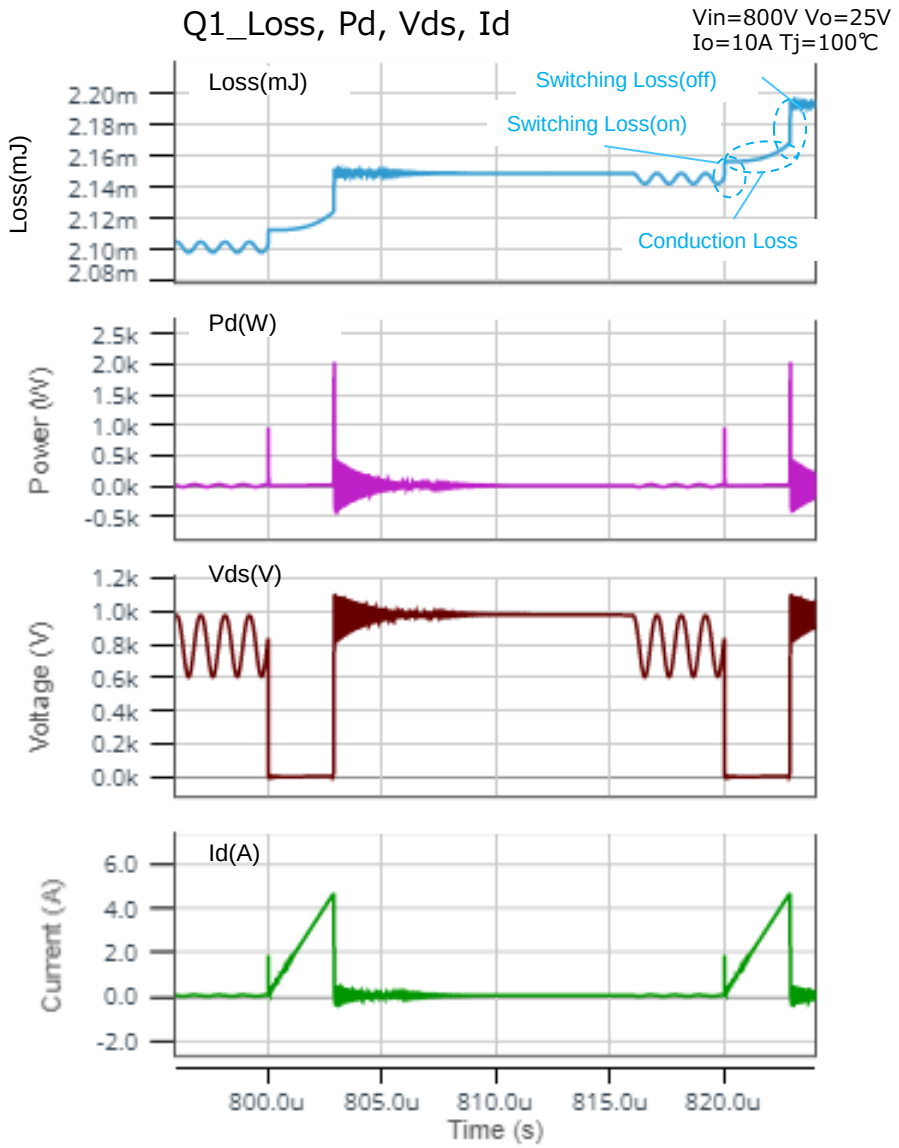

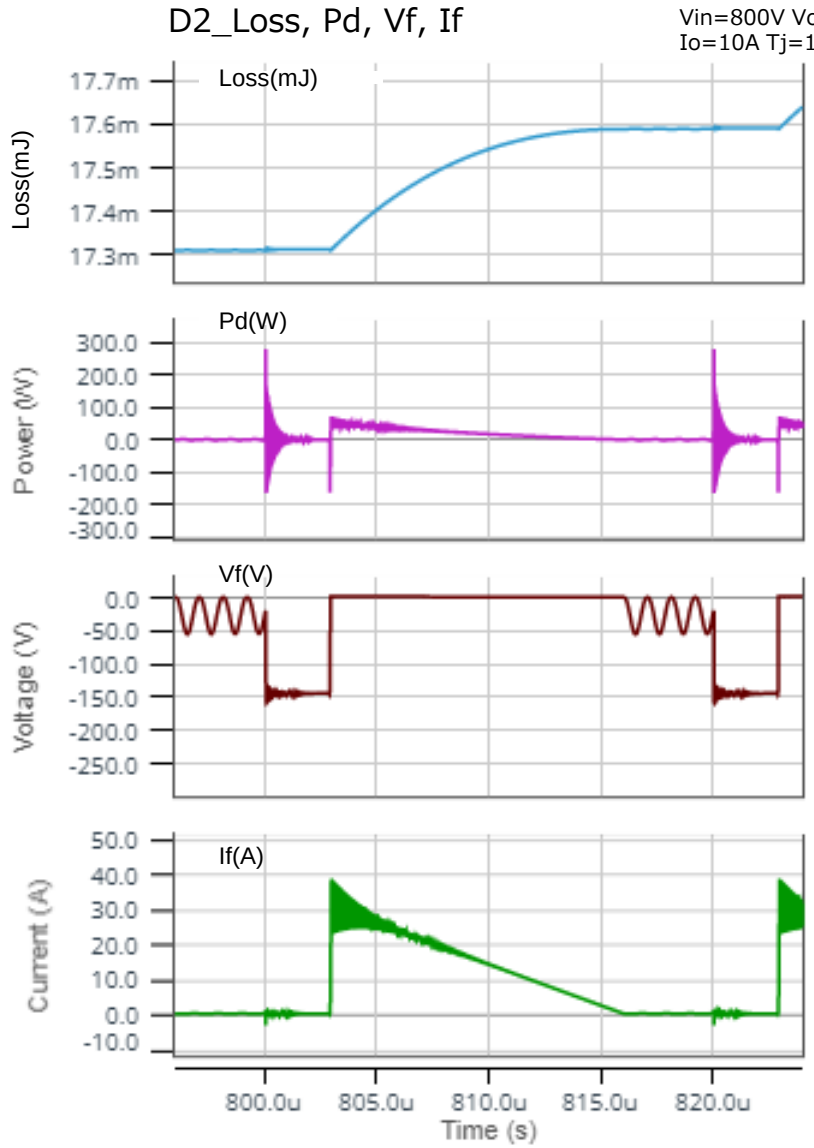

Efficiency, Power Dissipation 1

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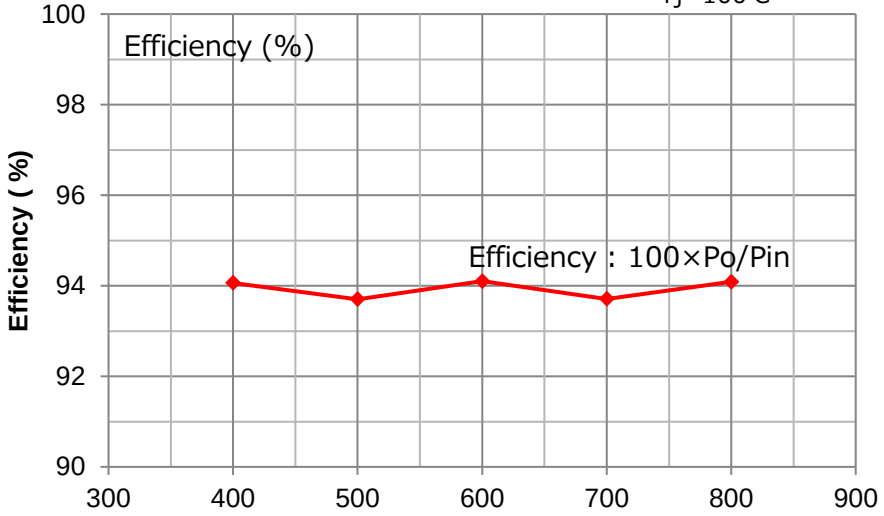
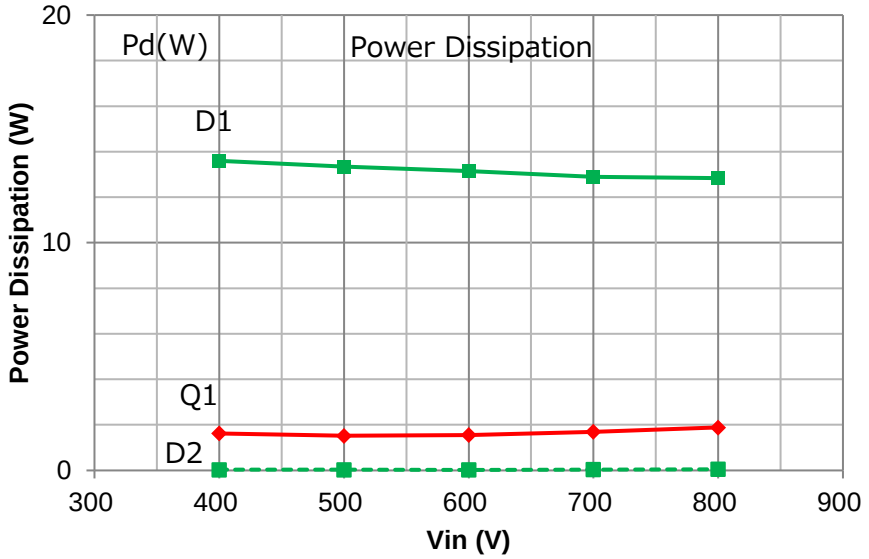
Vin：400V～800V

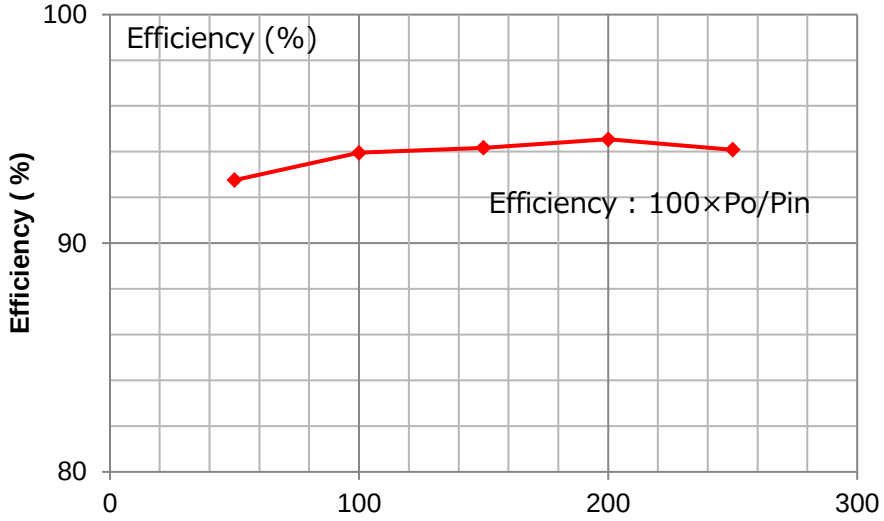
Vo=25V Io=10A
Tj=100℃

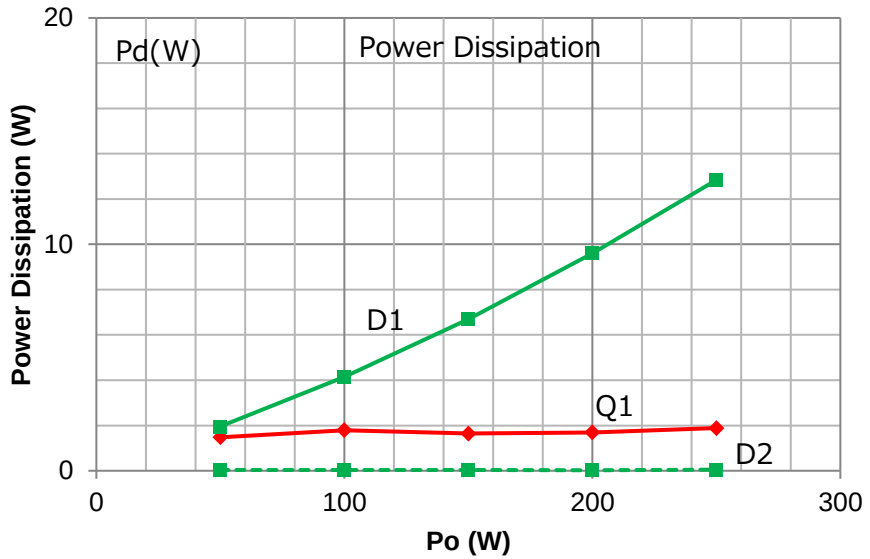




Po：50W～250W

Vin=800V Vo=25V
Tj=100℃





Efficiency, Power Dissipation 2

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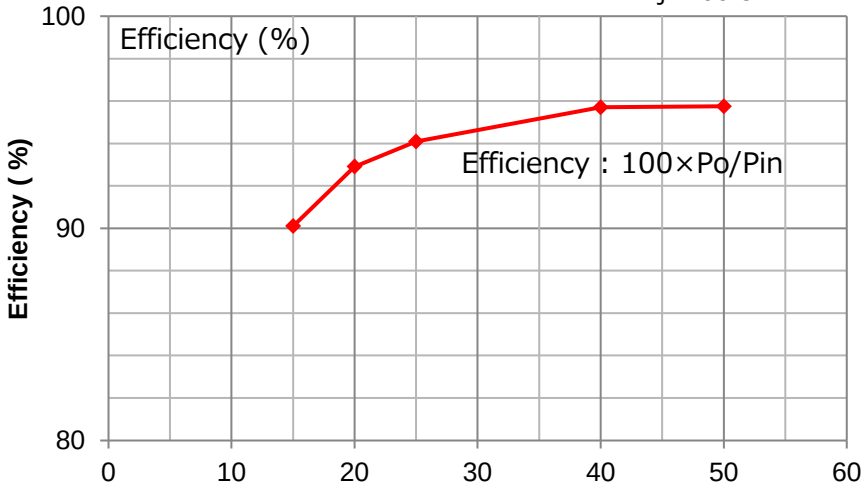
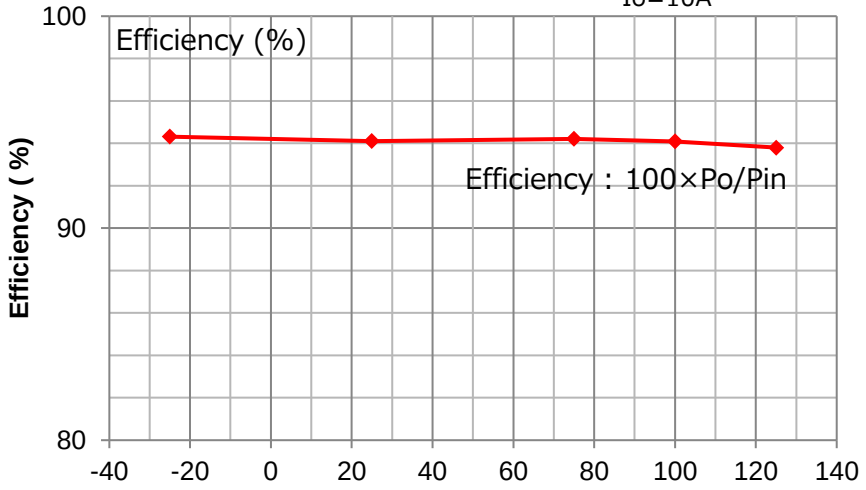
Vo：15V～50V

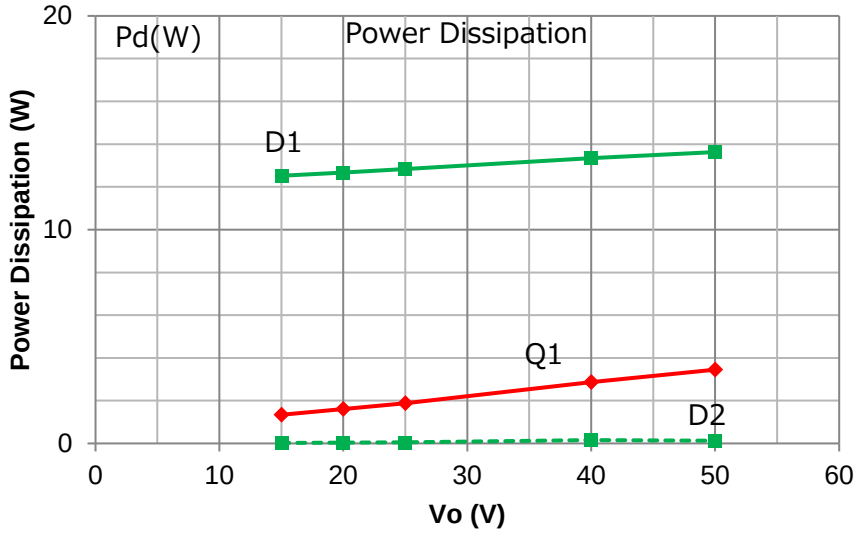
Vin=800V Io=10A
Tj=100℃

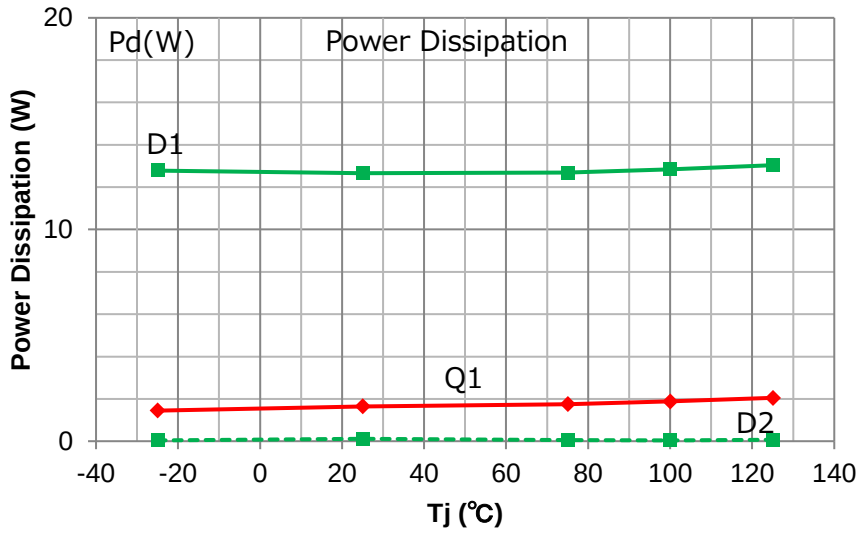


Tj：-25℃～125℃

Vin=800V Vo=25V
Io=10A







How to change the devices

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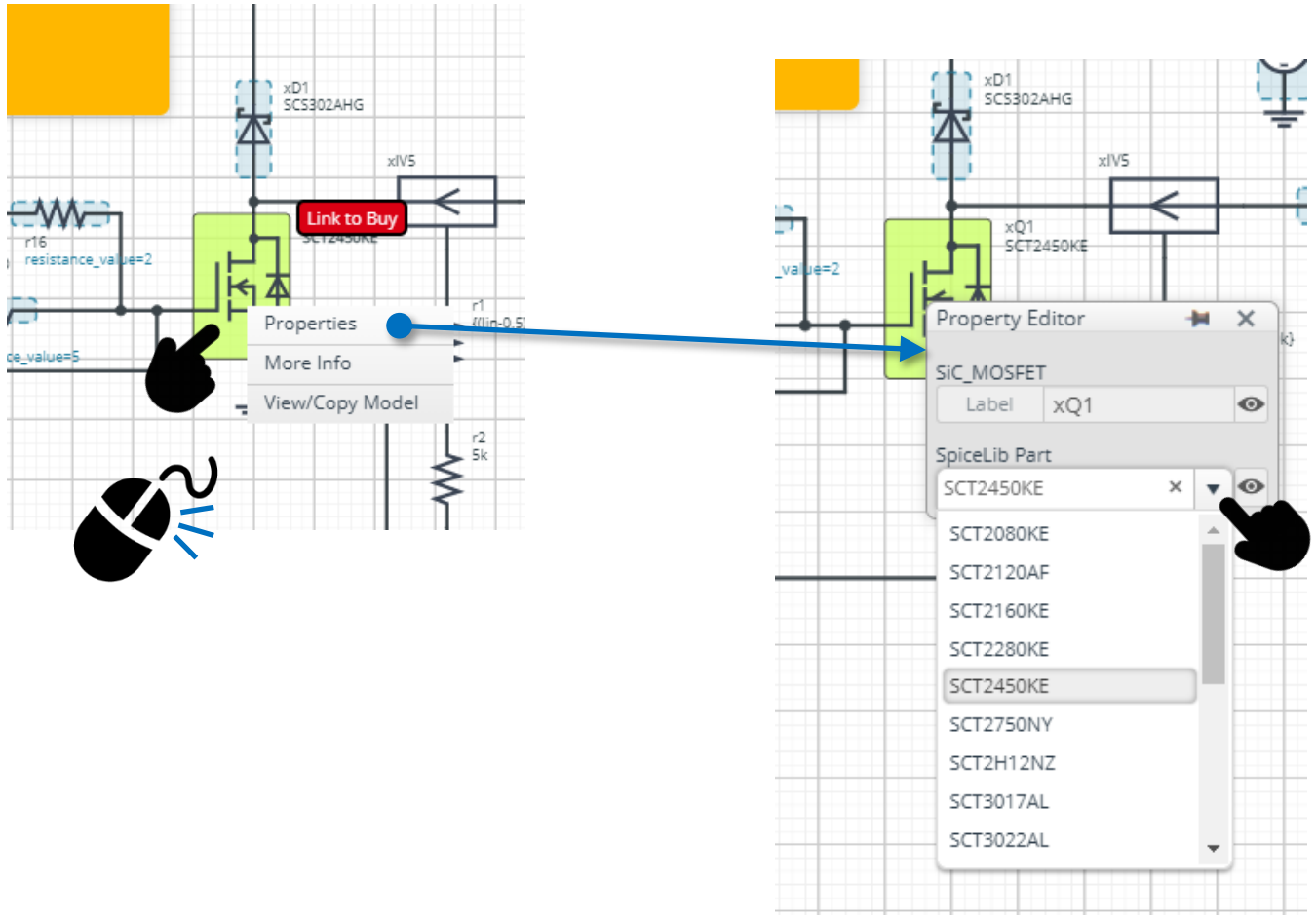
Right-click on the device ⇨ Select Properties ⇨ Pull down “SpiceLib Part” ⇨ Select the product



Loss Calculation Model

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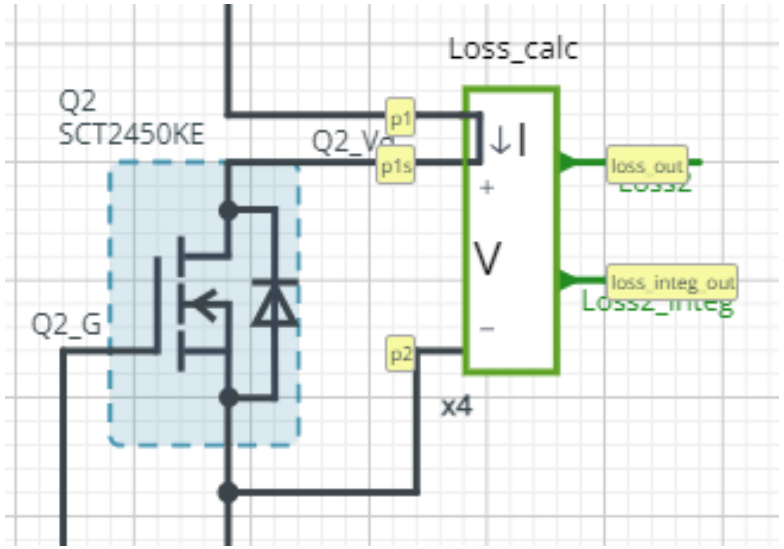
Loss Calculation Model outputs the instantaneous value of power loss and its integration.

Loss calculation model ‘Loss_calc’



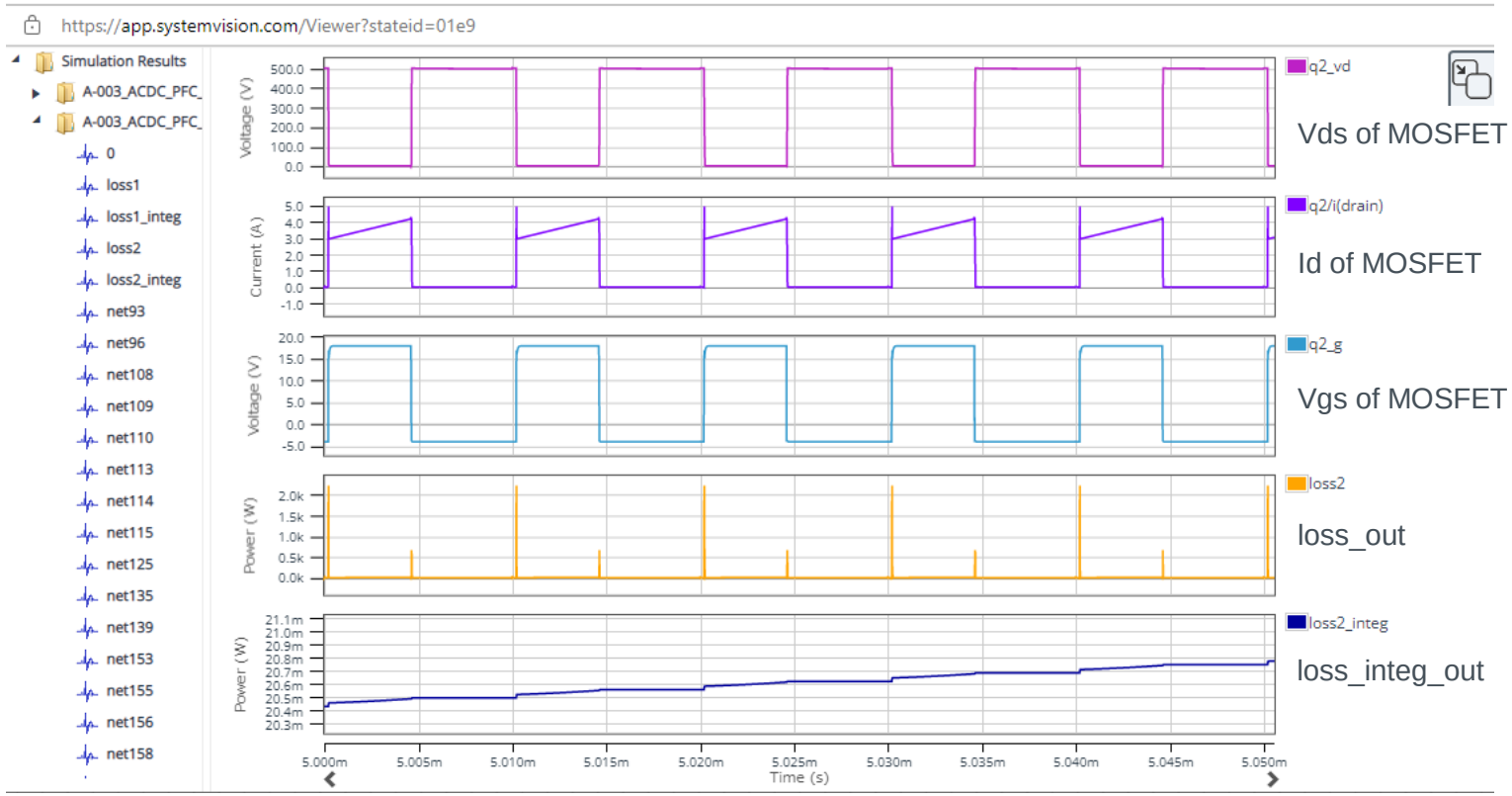
$$loss\_out(t) = I(t) \times V(t)$$

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

I : Current through p1 to p1s

V : Voltage between p1s and p2

Waveform example



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