

# C-019. DC-DC Phase-Shift Buck Converter $V_o=12V$ , $I_o=250A$

ROHM Solution Simulator Schematic Information



2024. Oct  
64UG133E Rev.005

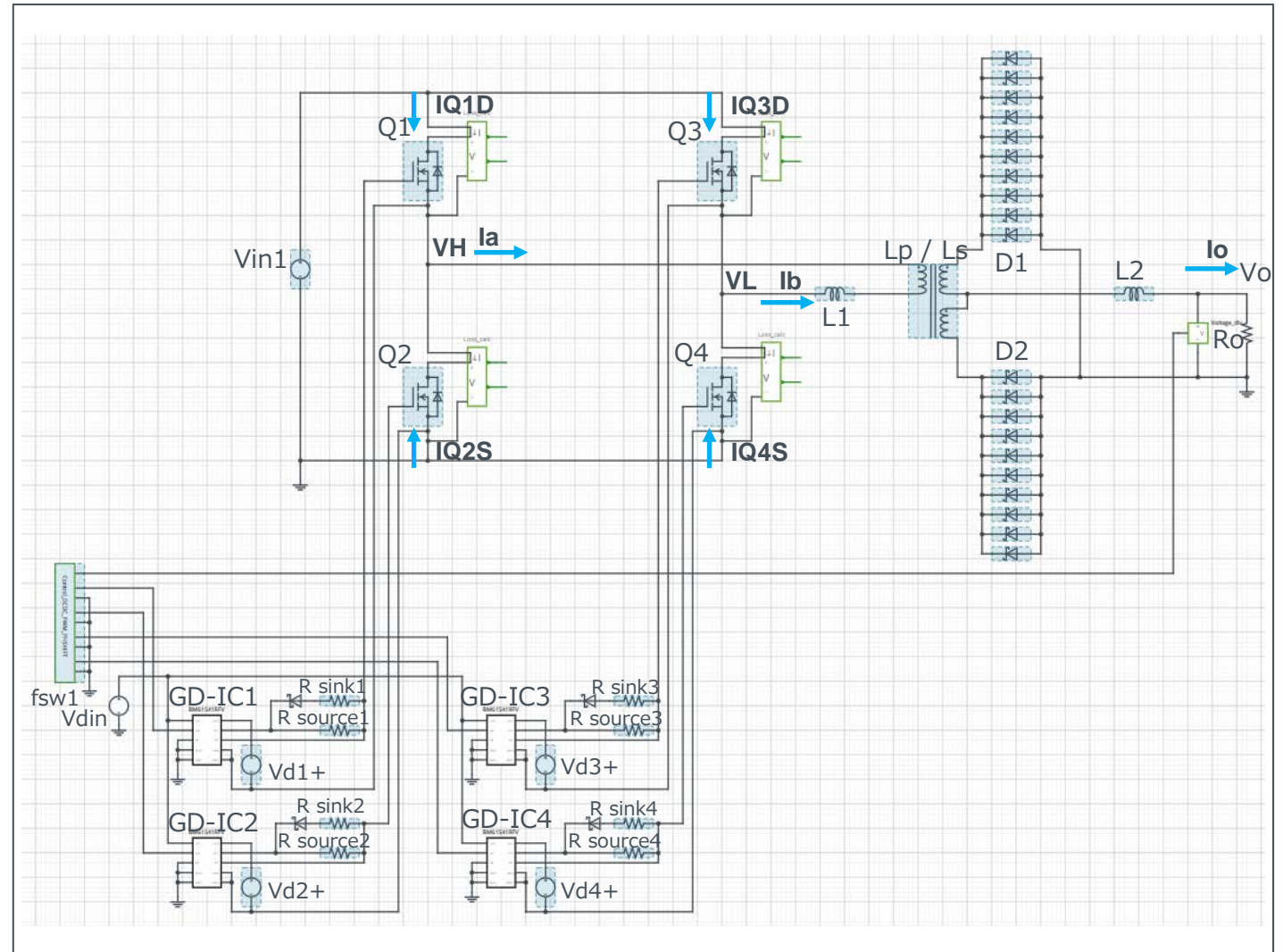
## Simulation Parameters

Component name	Component	Default	Simulation Setting Range
Vin1	Input voltage	800Vdc	10 – 800V
Vo	Output voltage	12Vdc	
Io	Output current	250A dc	
fsw1	Switching frequency	50kHz	10k – 300kHz
Tj	Temperature	100°C	
Vd1-4+	Gate Drive voltage H	18V	10 – 20V
Vdin	Signal voltage level	5V	
Lp / Ls	Transformer	500μ/200n/200nH K=1.0	

## Devices

Component Name	Component	Default	Simulation Setting Range
Q1-4	SIC MOSFET	Selectable	
D1,2_1-10	SBD	Selectable	
GD-IC1-4	Gate Driver	BM61S41RFV-C	
R sink1-4	Resistor for sink	ESR18 2Ω	0.1 -
R source1-4	Resistor for source	ESR18 5Ω	0.1 -
L1	Inductor	20μH	10μH - 2mH
L2	Inductor	10μH	1μH - 1mH
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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## Selectable Devices

Component name	Component	Product No.	feature
Q1-4	SiC MOSFET	SCT4013DE	750V, 13mΩ, 105A
		SCT4018KE (*)	1200V, 18mΩ, 81A
		SCT4026DE	750V, 26mΩ, 56A
		SCT4036KE	1200V, 36mΩ, 43A
		SCT4045DE	750V, 45mΩ, 34A
		SCT4062KE	1200V, 62mΩ, 26A
		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
D1,2_1-10	SBD	RB088T Series	10A, 30V~150V, Low IR
		RB160VAM-40	1A, 40V, Low Vf
		RB218T Series	20A, 30V~150V, Low IR
		RB228T Series	30A, 30V~150V, Low IR
		RB238T Series (*)	40A, 30V~150V, Low IR
		RB298T100NZ	30A, 100V, Low IR
		RBQ10T Series	10A, 45V~100V, Low Vf
		RBQ20T Series	20A, 45V~100V, Low Vf
		RBQ30T Series	30A, 45V~100V, Low Vf
		RBR10T Series	10A, 30V~60V, Low Vf
		RBR20T Series	20A, 30V~60V, Low Vf
		RBR30T Series	30A, 30V~60V, Low Vf

\* Default device

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## Selectable Devices

Component name	Component	Product No.	feature
Q1-4	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

# Simulation Waveform



Q1-4 : SiC MOSFET

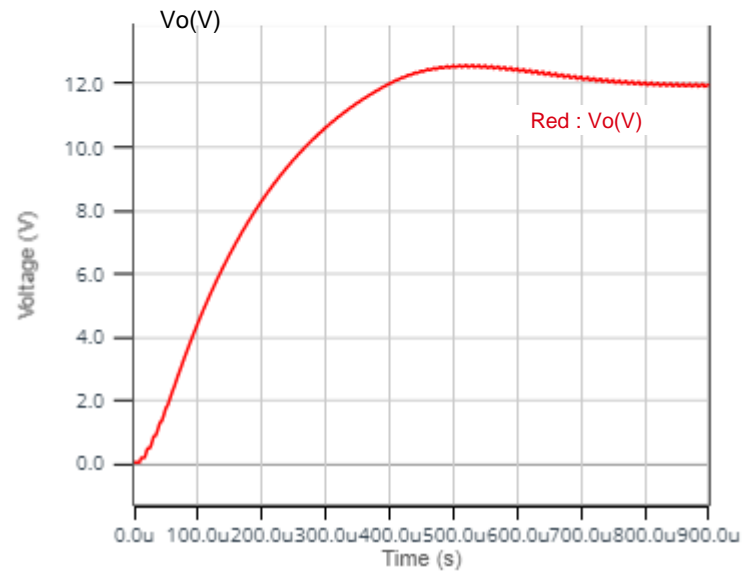
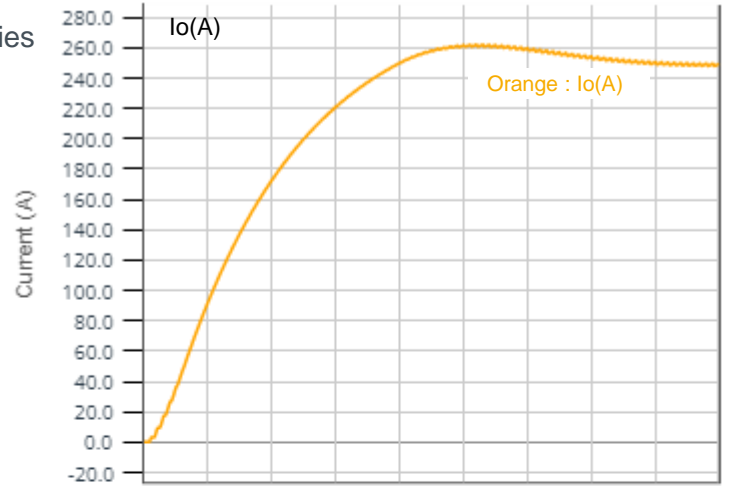
SCT3160AL

D1,2\_1-10 : SBD

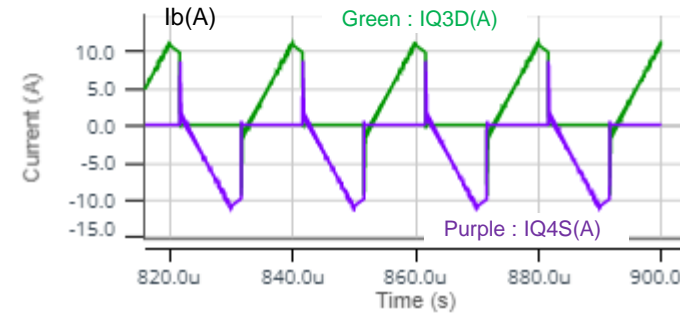
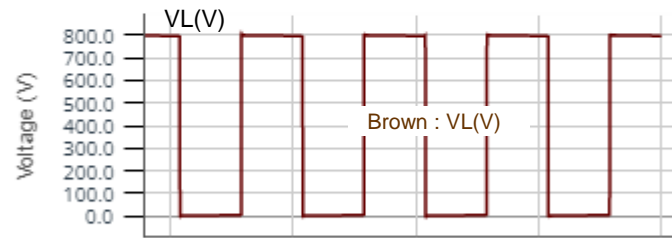
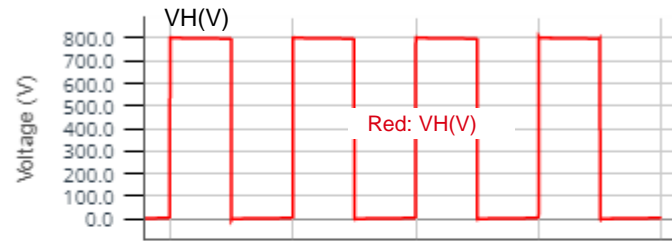
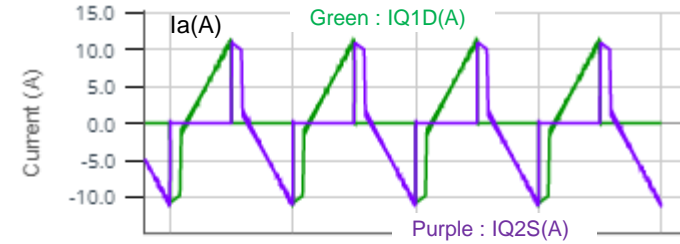
RB238T Series

$I_o, V_o$  (0~0.90ms)

$V_{in}=800V$   $V_o=12V$   
 $I_o=250A$   $T_j=100^\circ C$



$I_a, I_b, V_H, V_L$  (820 $\mu$ s~900 $\mu$ s)



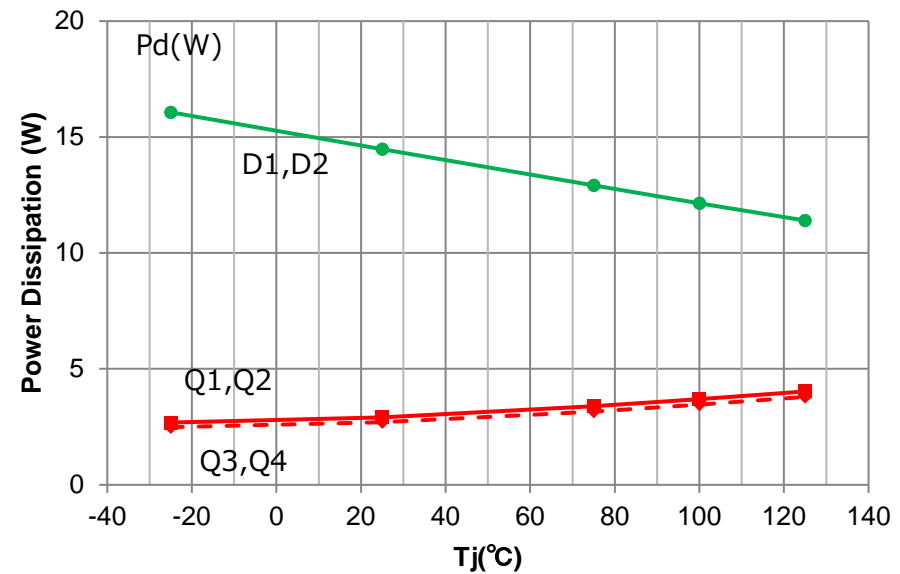
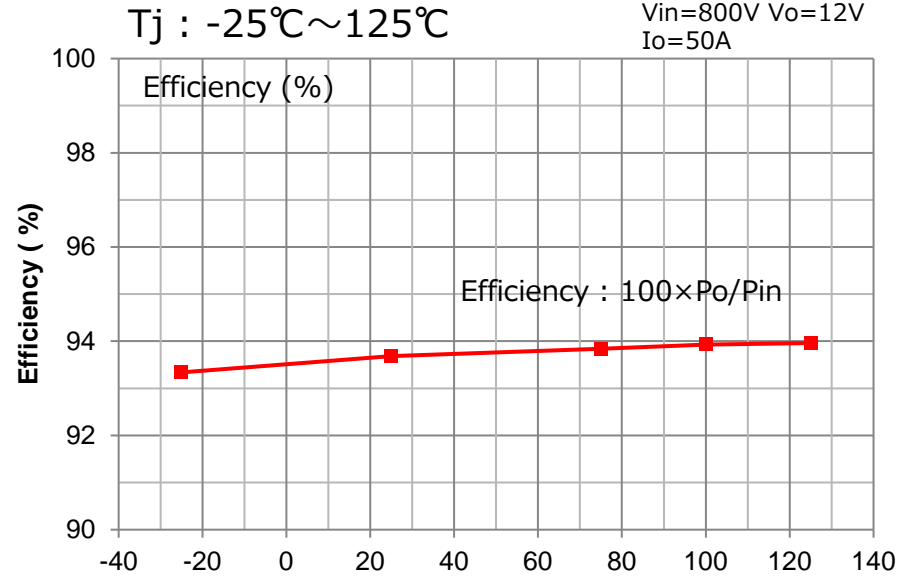
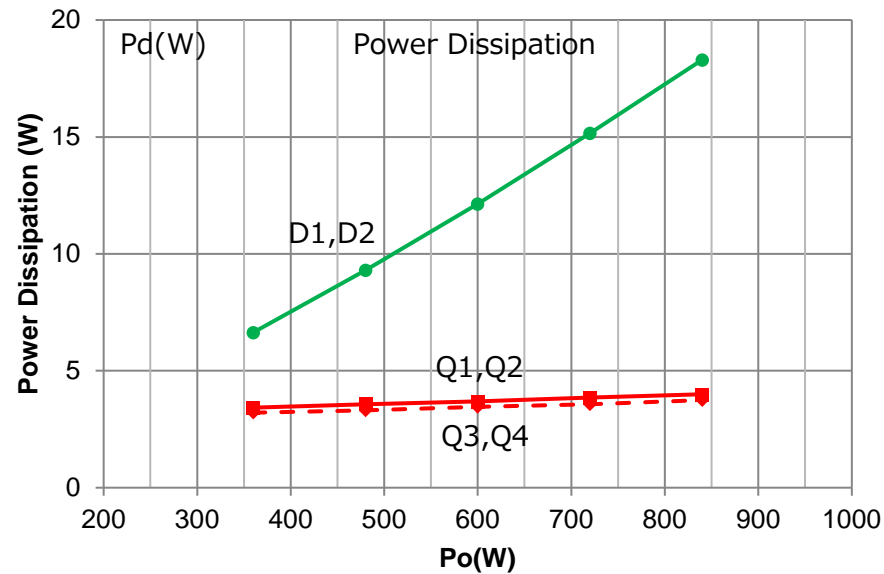
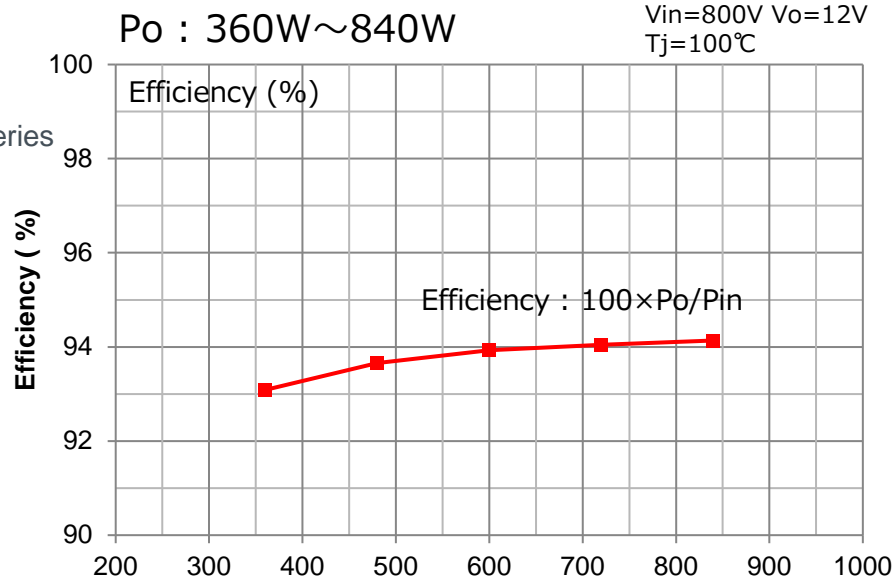
# Efficiency, Power Dissipation



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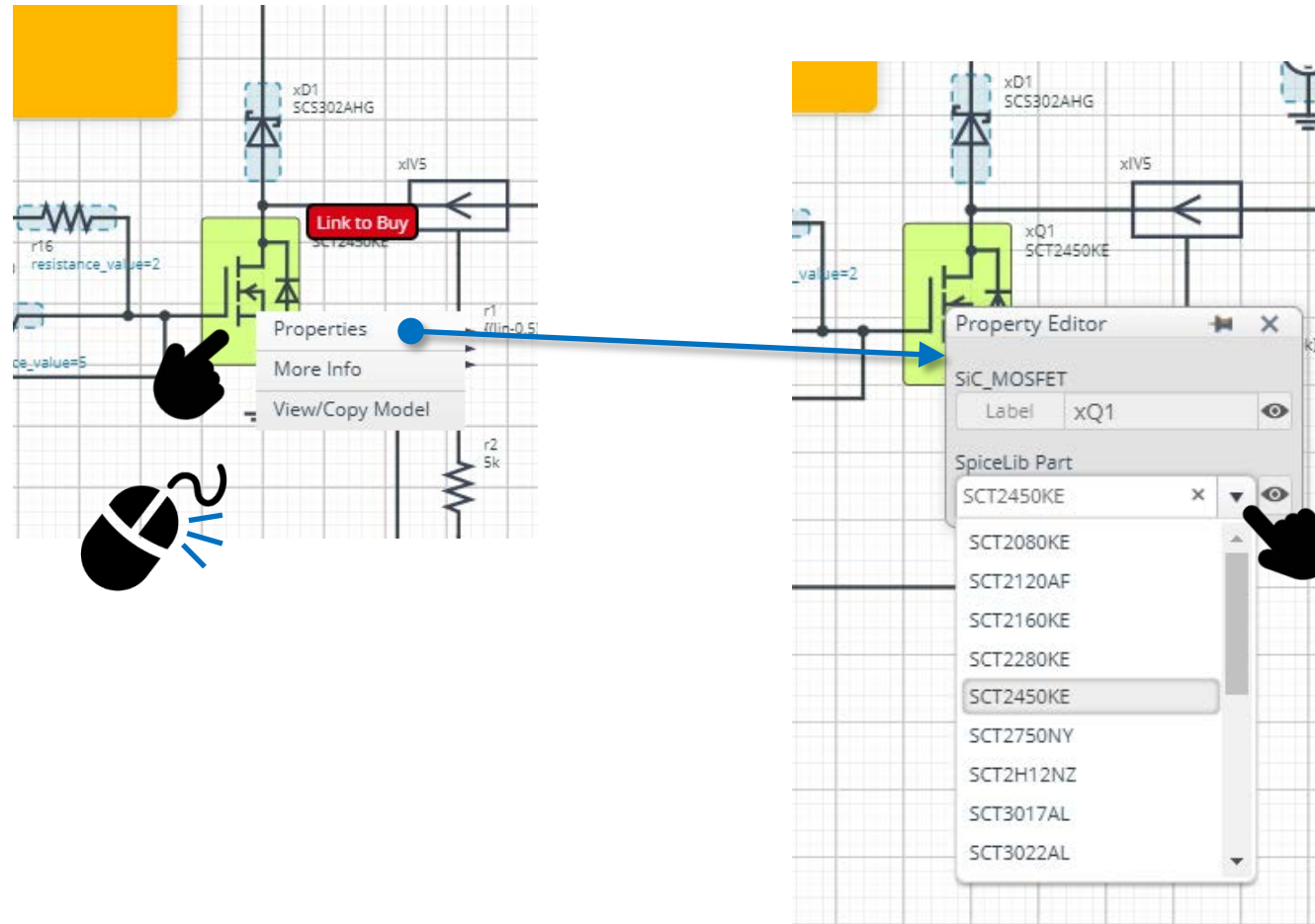
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Q1-4 : SiC MOSFET  
SCT3160AL  
D1,2\_1-10 : SBD  
RB238T Series



# How to change the devices

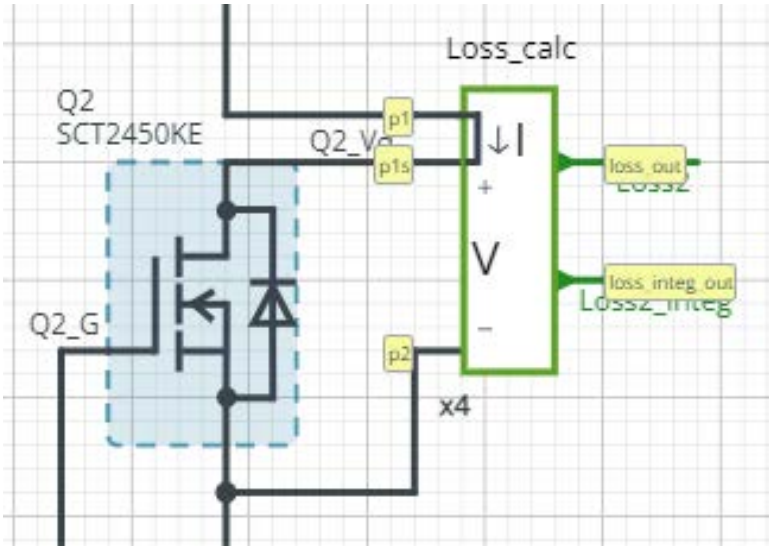
Right-click on the device → Select Properties → Pull down “SpiceLib Part” → Select the product



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

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## Loss calculation model 'Loss\_calc'



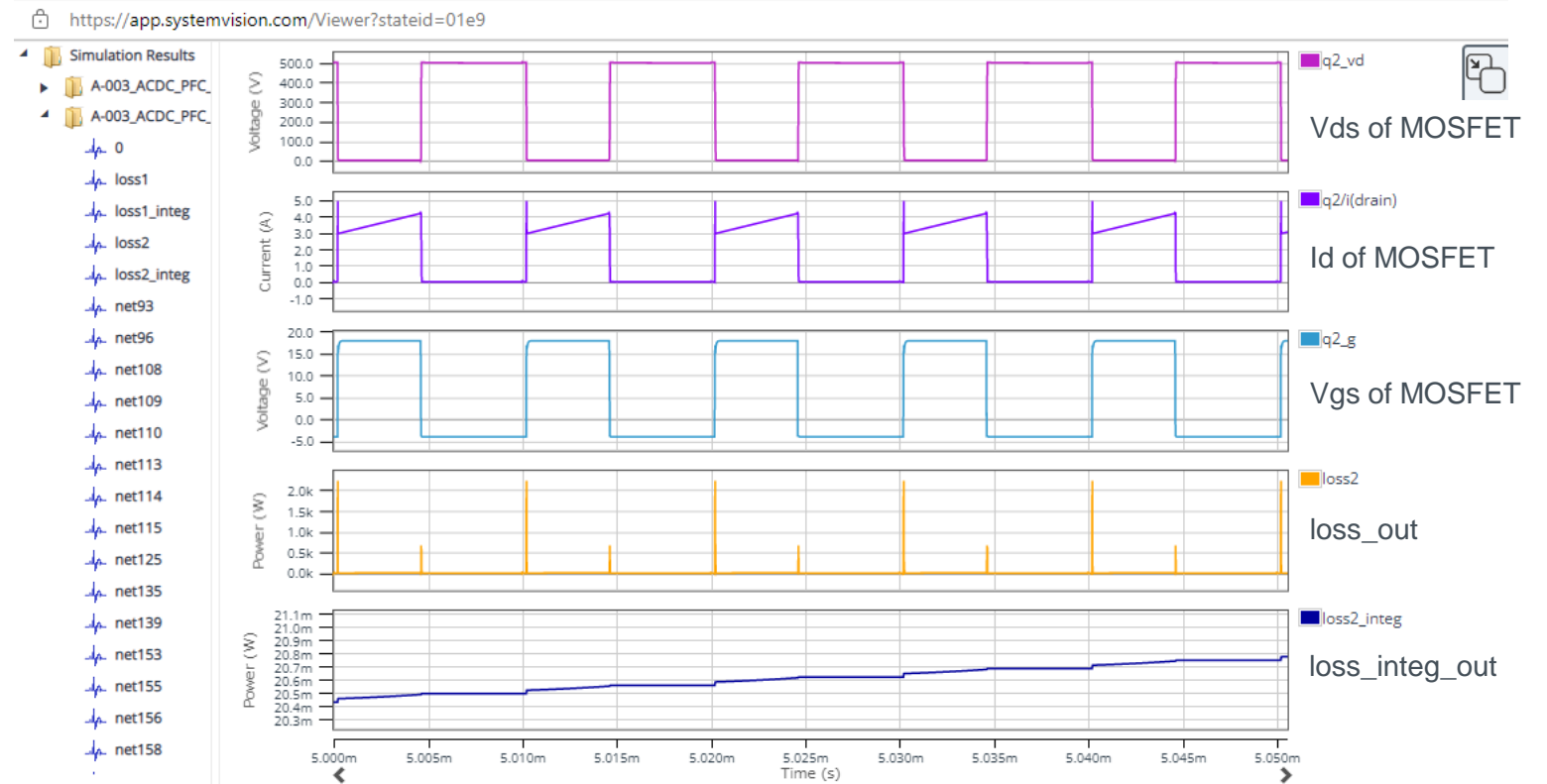
$$loss\_out(t) = I(t) \times V(t)$$

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

I : Current through p1 to p1s

V : Voltage between p1s and p2

## Waveform example



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