B-006. 3-Phase 3-Wire Inverter P_{OUT}=5kW

ROHM Solution Simulator Schematic Information

2025. Nov.

64UG102E Rev.007

Simulation Parameters

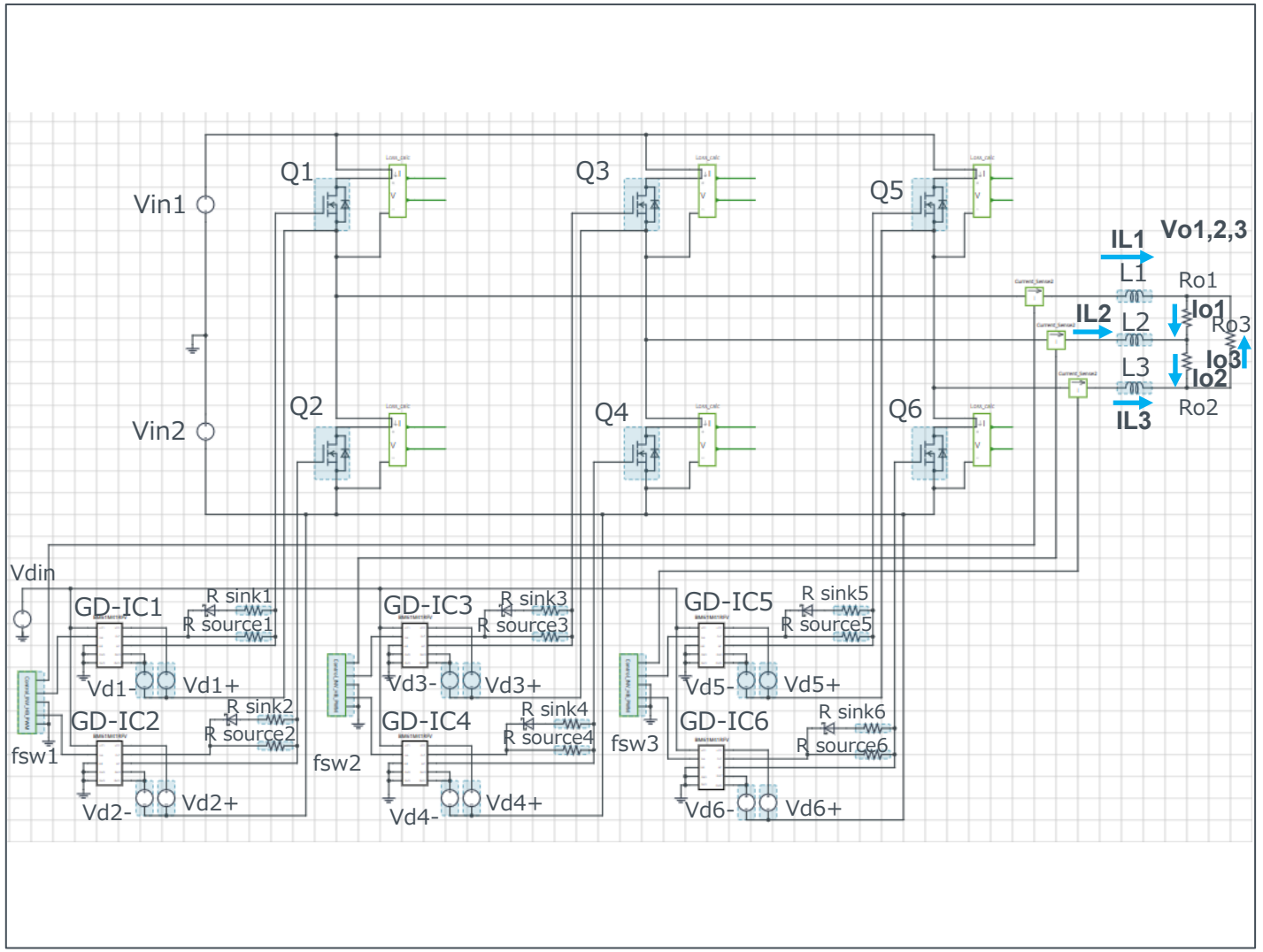
Component name	Component	Default	Simulation Setting Range
Vin1,2	Input voltage	200Vdc	
Vo1-3	Output voltage	200Vac	
fsw1-3	Switching frequency	20kHz	10k – 300kHz
Tj	Temperature	100°C	
Vd1-6+	Gate Drive voltage H	15V	10 – 20V
Vd1-6-	Gate Drive voltage L	-4V	-4 – 0V
Vdin	Signal voltage level	5V	

Devices

Component Name	Component	Default	Simulation Setting Range
Q1-6	SiC MOSFET SJ MOSFET IGBT	Selectable	
GD-IC1-6	Gate Driver	BM61M41RFV-C	
R sink1-6	Resistor for sink	ESR18 2Ω	0.1 -
R source1-6	Resistor for source	ESR18 5Ω	0.1 -
L1-3	Inductor	500μH	10μH - 2mH
Ro1-3	Output Resistor	{3*Vo*Vo/Po}	

Simulation Circuit

Run simulation [DC-AC Inverter / 3-Phase Inverter]



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.

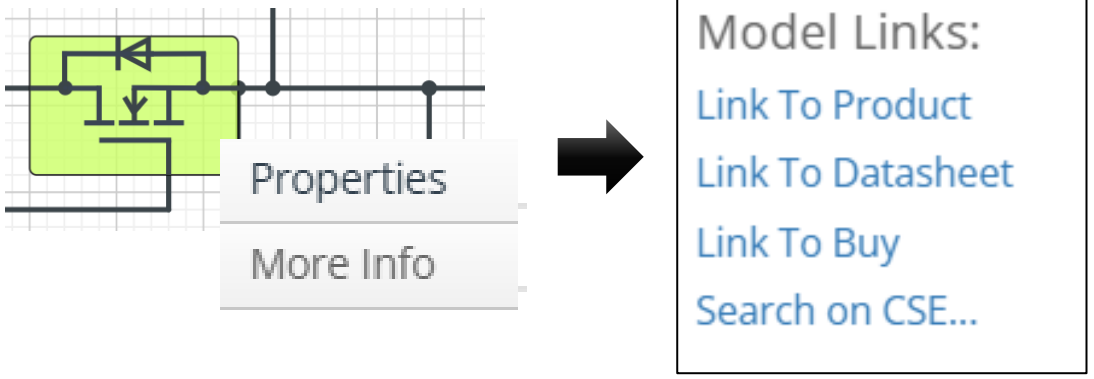
B-006. 3-Phase 3-Wire Inverter P_{OUT}=5kW

2025. Nov.
64UG102E Rev.007

Selectable Devices

Component name	Component
Q1 - 6	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.

B-006. 3-Phase 3-Wire Inverter P_{OUT}=5kW

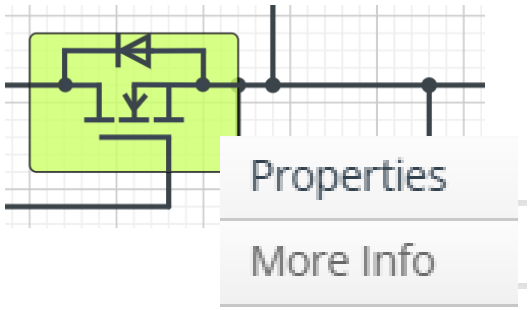
2025. Nov.
64UG102E Rev.007

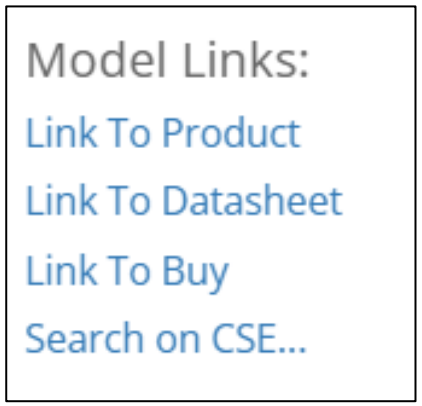
Selectable Devices

Component name	Component	Product
Q1 - 6	SJ MOSFET	RxxxxJN series

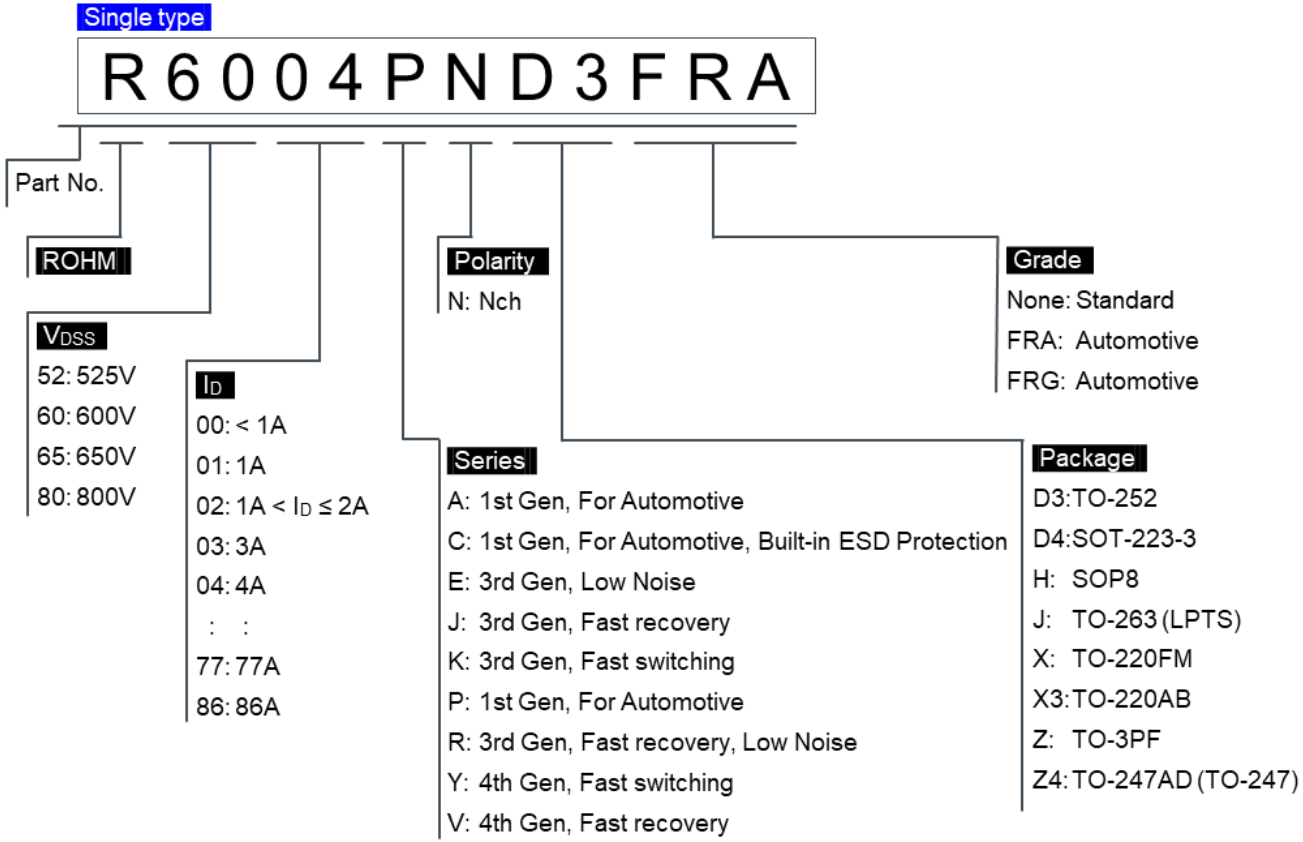
* Default device : R6050JNZ4

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





SJ MOSFET part number information



➧ Product Lineup: Super Junction MOSFETs

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

B-006. 3-Phase 3-Wire Inverter P_{OUT}=5kW

2025. Nov.
64UG102E Rev.007

Selectable Devices

Component name	Component	Product
Q1 - 6	IGBT	RGA series RGS 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 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

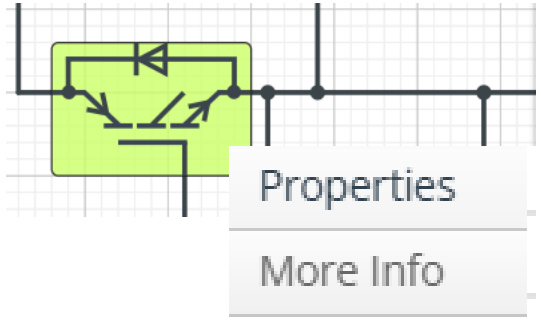
Rated voltage V_{CES}
60: 600 V
65: 650 V
X2: 1200 V
X8: 1800 V

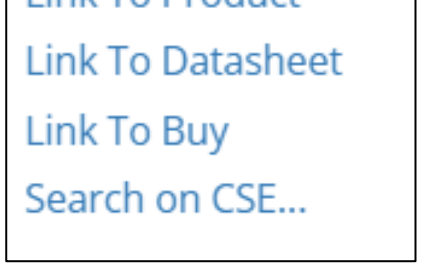
Built-in diode configuration
None: Without diode
C: SiC Schottky barrier diode
D: Fast recovery diode
E: Larger size Fast recovery diode
R: Body diode with reverse conducting (RC) structure

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

➧ Product Lineup: Field Stop Trench IGBT

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





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

B-006. 3-Phase 3-Wire Inverter P_{OUT}=5kW

2025. Nov.
64UG102E Rev.007

Selectable Devices

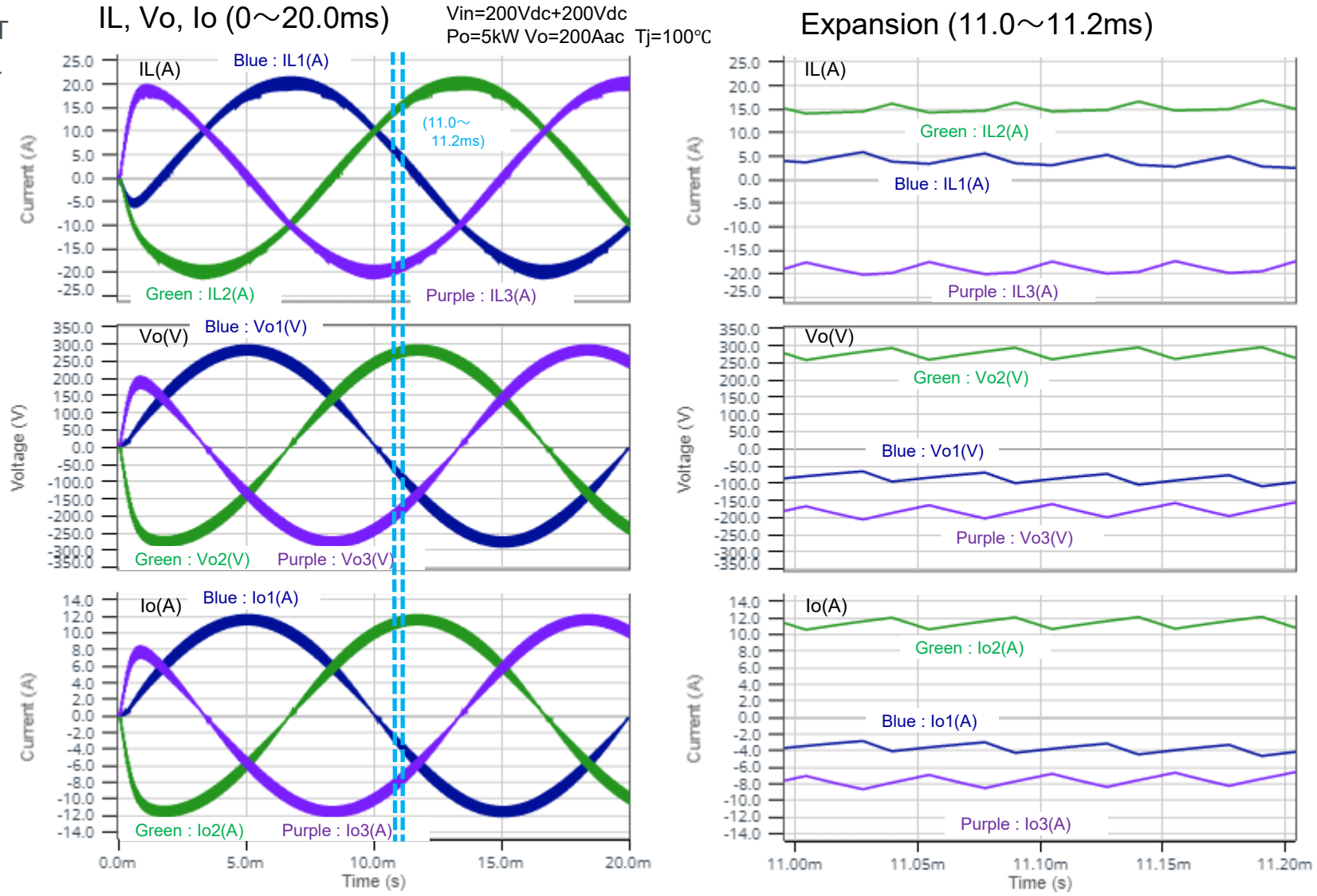
Component name	Component	Product No.	feature
GD-IC1-6	Gate Driver	BM61S41RFV-C (*)	**for SiC MOSFET** Isolation Voltage : 3750 Vrms I/O Delay Time (max) : 65ns Miller Clamp : Built-in UVLO : 14.5V
		BM61M41RFV-C	**for SJ-MOS / IGBT** Isolation Voltage : 3750 Vrms I/O Delay Time (max) : 65ns Miller Clamp : Built-in UVLO : 7.4V

* Default device

Simulation Waveform1

2025. Nov.
64UG102E Rev.007

Q1 - 6: SJ MOSFET
R6050JNZ4



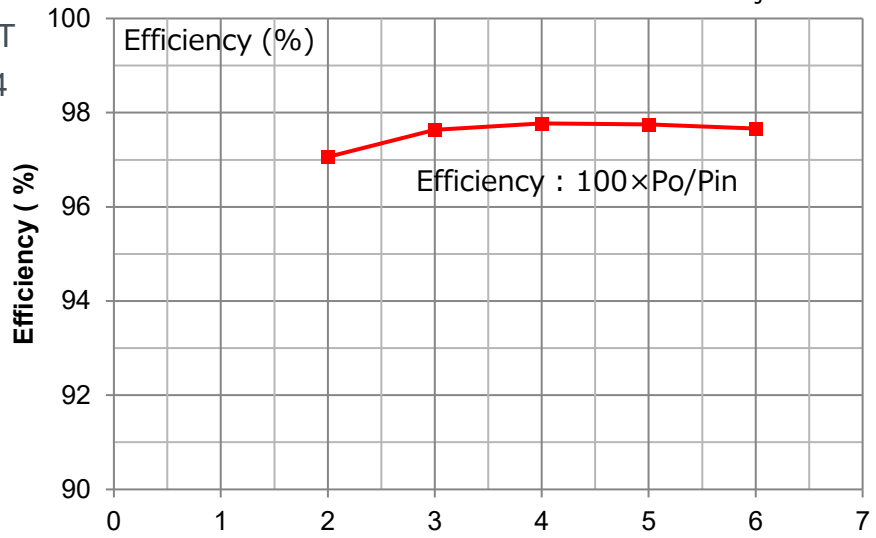
Efficiency, Power Dissipation 1

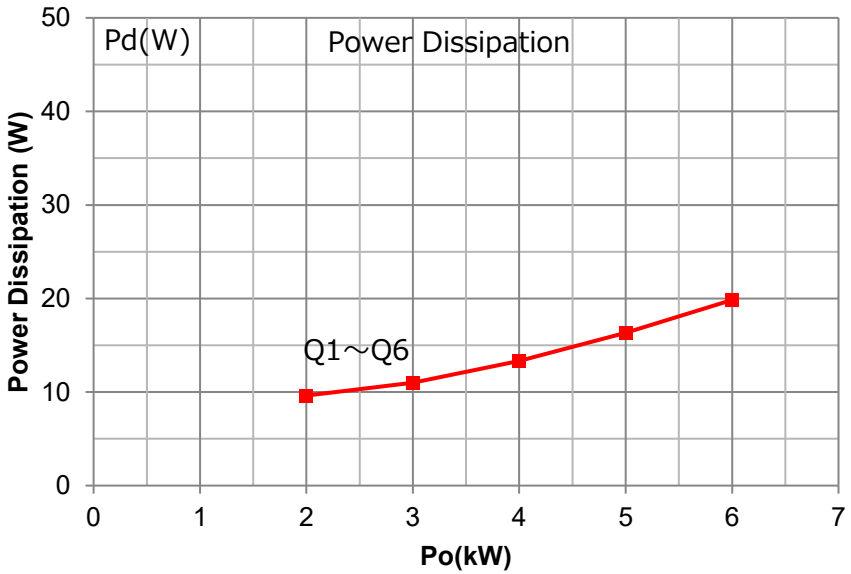
2025. Nov.
64UG102E Rev.007

Q1 - 6: SJ MOSFET
R6050JNZ4

Po : 2kW～6kW

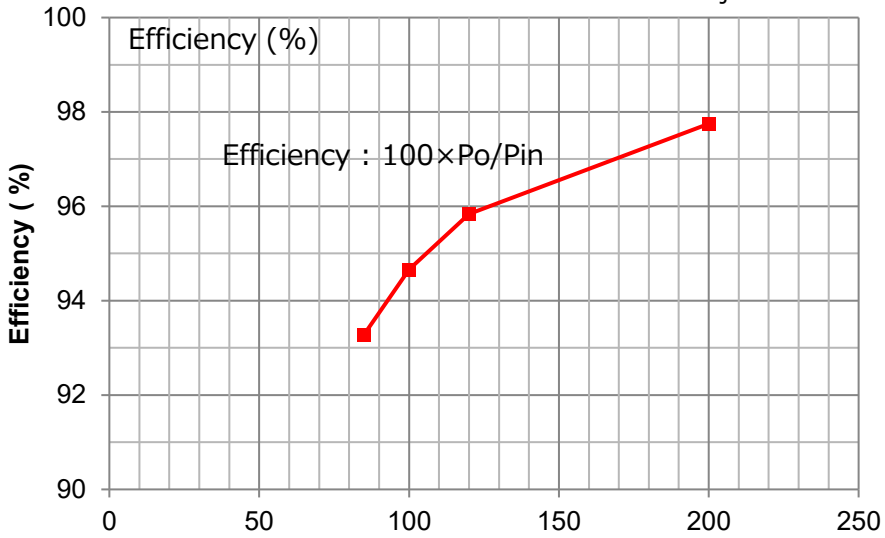
Vin=200Vdc+200Vdc
Vo=200Vac Tj=100℃

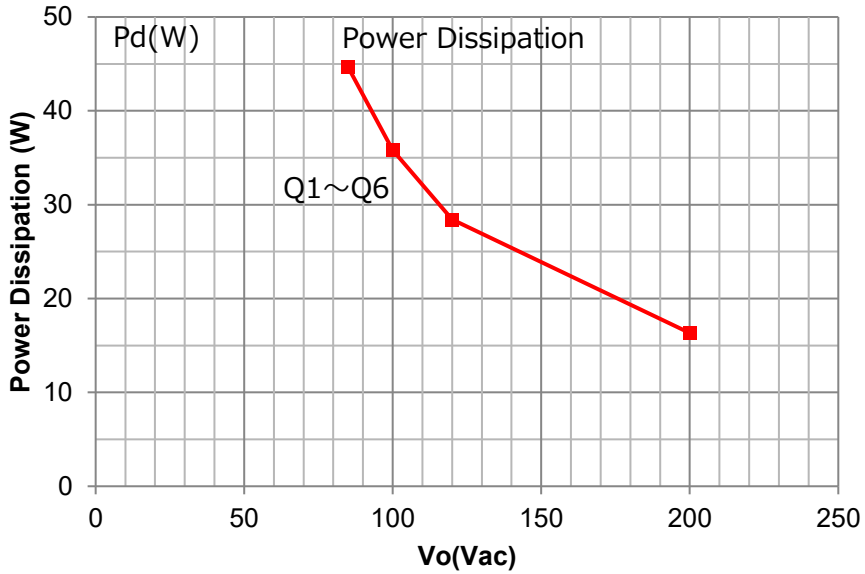




Vo : 85Vac～200Vac

Vin=200Vdc+200Vdc
Po=5kW Tj=100℃

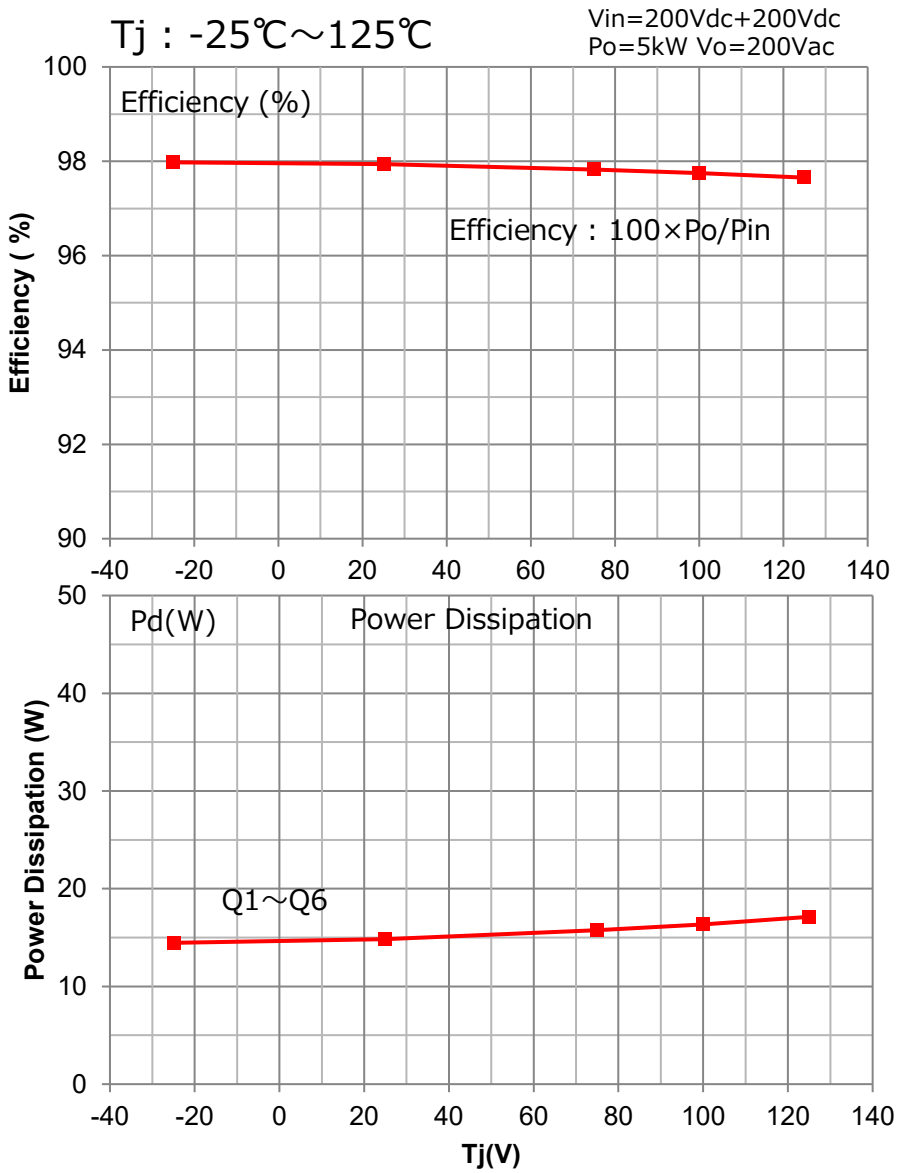




Efficiency, Power Dissipation 2

2025. Nov.
64UG102E Rev.007

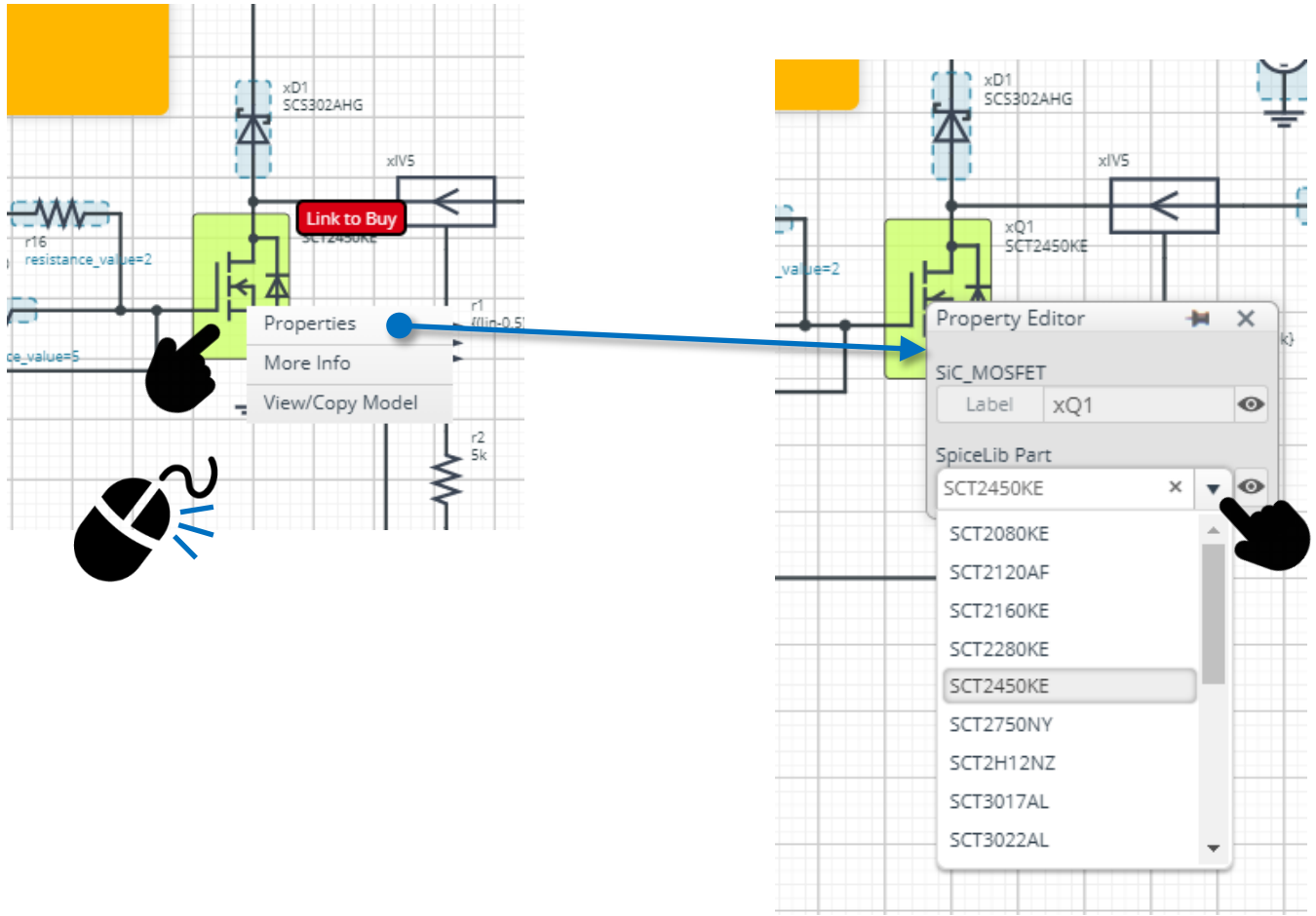
Q1 - 6: SJ MOSFET
R6050JNZ4



How to change the devices

2025. Nov.
64UG102E Rev.007

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

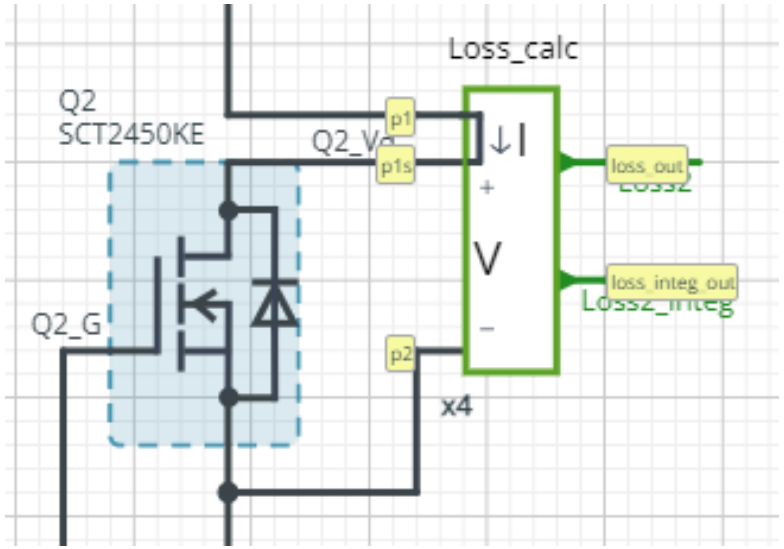


Loss Calculation Model

2025. Nov.
64UG102E Rev.007

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

Loss calculation model 'Loss_calc'



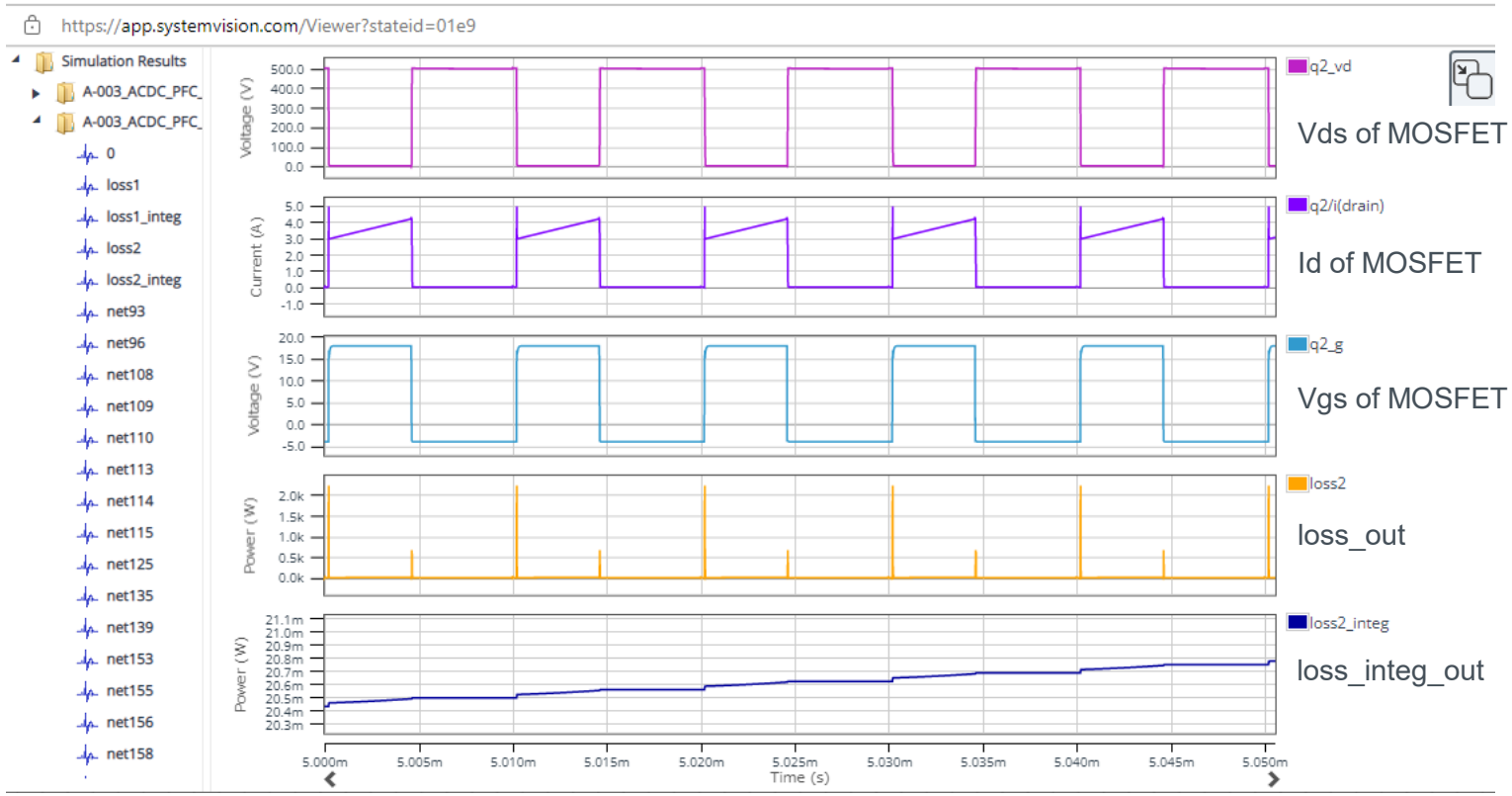
$$loss\_out(t) = I(t) \times V(t)$$

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

I : Current through p1 to p1s

V : Voltage between p1s and p2

Waveform example



Notice

1) The information contained in this document is intended to introduce ROHM Group (hereafter referred to asROHM) products. When using ROHM products, please verify the latest specifications or datasheets before use.

2) ROHM products are designed and manufactured for use in general electronic equipment and applications (such as Audio Visual equipment, Office Automation equipment, telecommunication equipment, home appliances, amusement devices, etc.) or specified in the datasheets. Therefore, please contact the ROHM sales representative before using ROHM products in equipment or devices requiring extremely high reliability and whose failure or malfunction may cause danger or injury to human life or body or other serious damage (such as medical equipment, transportation, traffic, aircraft, spacecraft, nuclear power controllers, fuel control, automotive equipment including car accessories, etc. hereafter referred to as Specific Applications). Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses, or losses incurred by you or third parties arising from the use of ROHM Products for Specific Applications.

3) Electronic components, including semiconductors, can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against physical injury, and damage to any property, which a failure or malfunction of products may cause.

4) The information contained in this document, including application circuit examples and their constants, is intended to explain the standard operation and usage of ROHM products, and is not intended to guarantee, either explicitly or implicitly, the operation of the product in the actual equipment it will be used. As a result, you are solely responsible for it, and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses, or losses incurred by you or third parties arising from the use of such information.

5) When exporting ROHM products or technologies described in this document to other countries, you must abide by the procedures and provisions stipulated in all applicable export laws and regulations, such as the Foreign Exchange and Foreign Trade Act and the US Export Administration Regulations, and follow the necessary procedures in accordance with these provisions.

6) The technical information and data described in this document, including typical application circuits, are examples only and are not intended to guarantee to be free from infringement of third parties intellectual property or other rights. ROHM does not grant any license, express or implied, to implement, use, or exploit any intellectual property or other rights owned or controlled by ROHM or any third parties with respect to the information contained herein.

7) No part of this document may be reprinted or reproduced in any form by any means without the prior written consent of ROHM.

8) All information contained in this document is current as of the date of publication and subject to change without notice. Before purchasing or using ROHM products, please confirm the latest information with the ROHM sales representative.

9) ROHM does not warrant that the information contained herein is error-free. ROHM shall not be in any way responsible or liable for any damages, expenses, or losses incurred by you or third parties resulting from errors contained in this document.

ROHM SEMICONDUCTOR

Thank you for your accessing to ROHM product informations.
More detail product informations and catalogs are available, please contact us.

ROHM Customer Support System

https://www.rohm.com/contactus