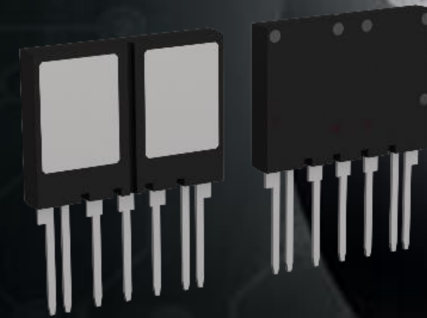
Electronics for the Future

DOT247 Built-in 4th Gen SiC MOSFET Technology



March 2023

ATSC
ROHM Semiconductor

Context

- Introduction of DOT-247
- Line-up and development schedule
- Thermic advantages
- Power cycle capability
- Assembling method
- PCB size reduction application example

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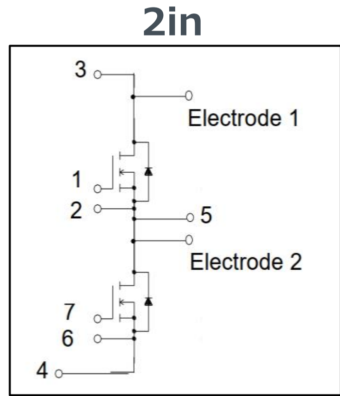
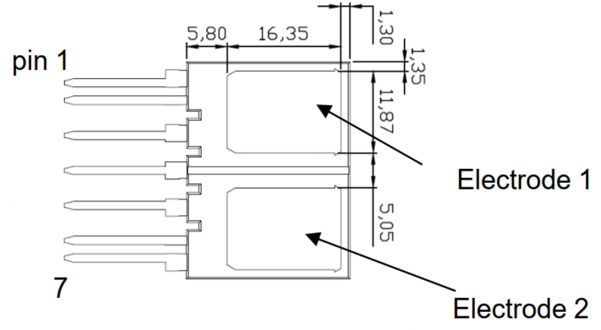
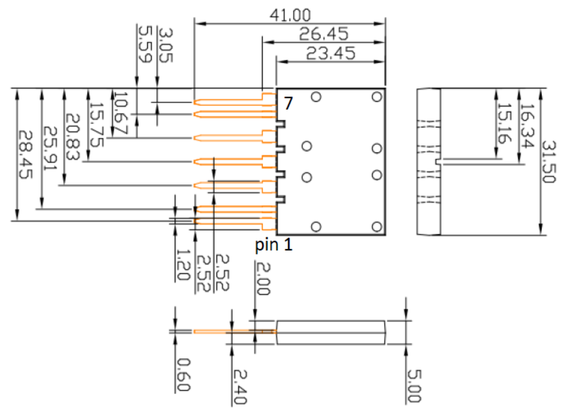
DOT247 Introduction

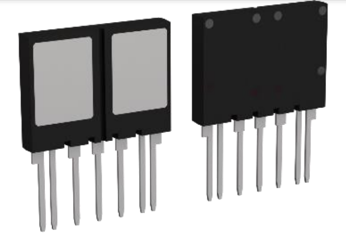
Schematic





Dimensions





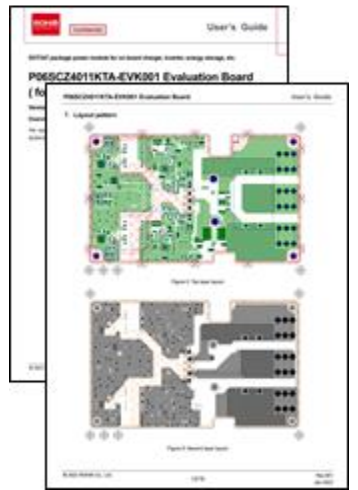
This item does NOT have isolation function inside the package

Benefits DOT247

- Improved package for thermal dissipation
- Improved realibility
- Higher power density
- Low Ls realizes high frequency drive
- Wide Line-up
- Automative-grade with lower Rds_on

Evaluation Kit

Evaluation Kit on Request



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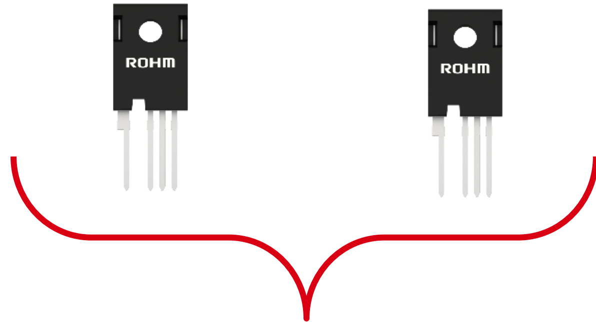
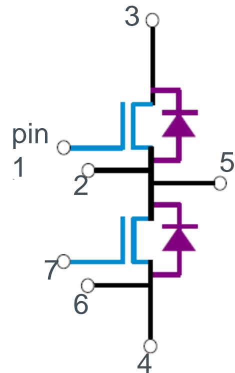
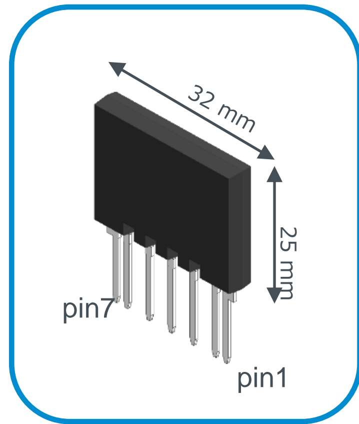
DOT247 Lineup and development schedule information

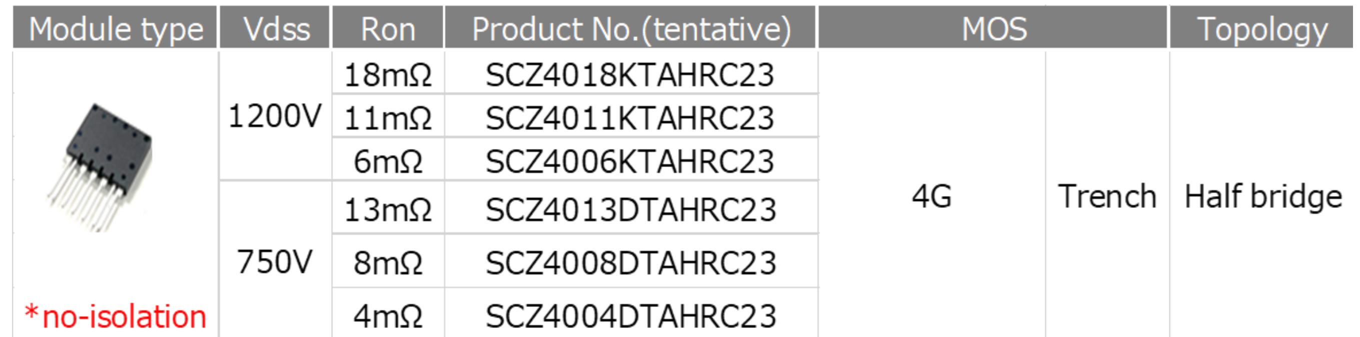


- Sample Available
- MP: Middle of 2023





Product lineup



Module type	Vdss	Ron	Product No.(tentative)	MOS		Topology
*no-isolation	1200V	18mΩ	SCZ4018KTAHRC23	4G	Trench	Half bridge
		11mΩ	SCZ4011KTAHRC23			
		6mΩ	SCZ4006KTAHRC23			
	750V	13mΩ	SCZ4013DTAHRC23			
		8mΩ	SCZ4008DTAHRC23			
		4mΩ	SCZ4004DTAHRC23			

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Thermal resistance comparing with TO247 package

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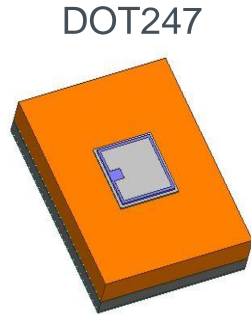
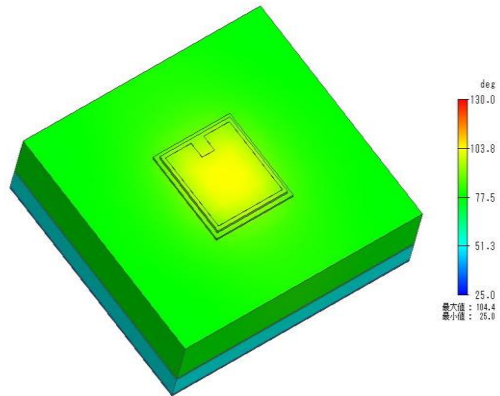
DOT247

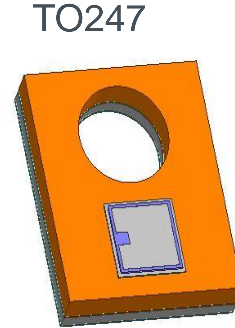
Layer	Thermal conductivity (W/m/K)	Thickness (mm)
SiC	370	-
Solder	**64**	**-**
Cu Frame	364	-
Grease	1	0.1
AlN	170	1
Grease	1	0.1

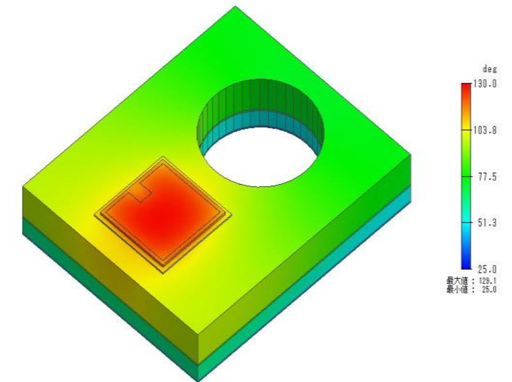




TO247

Layer	Thermal conductivity (W/m/K)	Thickness (mm)
SiC	370	-
Solder	**24**	**-**
Cu frame	364	-
Grease	1	0.1
AlN	170	1
Grease	1	0.1





- The same thickness of each layer
- Input power (one chip) : 63.6W
- Heat sink temp Ta＝25℃
- Heat transfer coefficient 5000W/m2/K

	Rthj-c[K/W] Ta=25℃	Rthj-a[K/W] Ta=25℃
TO247-4L	0.34	1.04
DOT247	0.22	0.80

35% Down (Rthj-c) **23%** Down (Rthj-a)

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Power cycle capability

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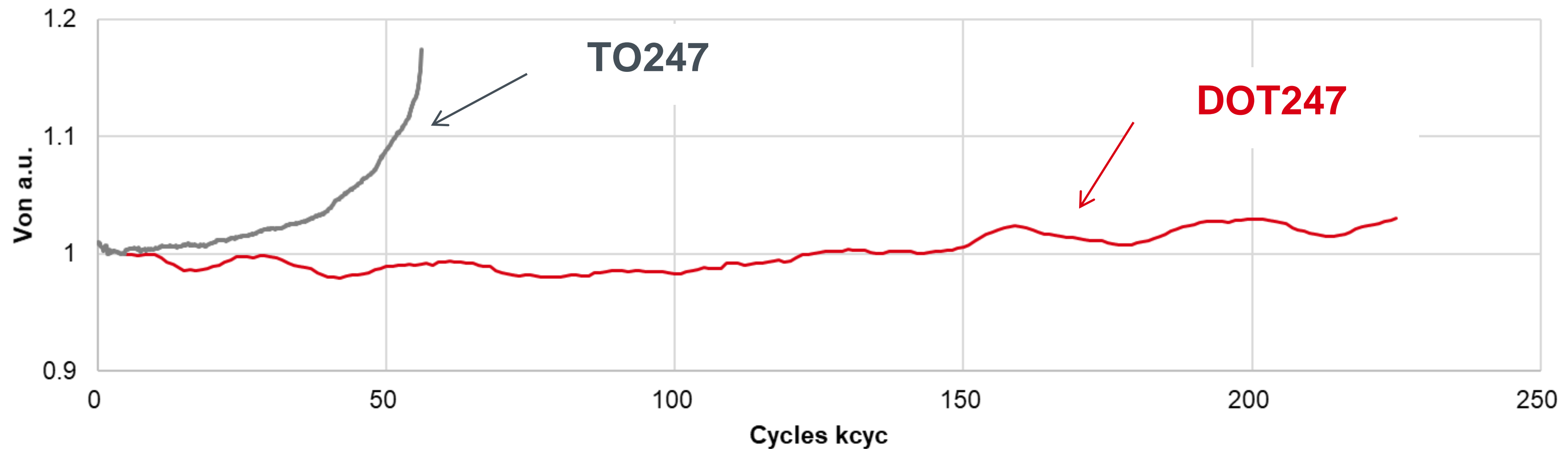
Durability of power cycling test comparing with TO247

Parameter	Value
Testing equipment	Siemens T3STER PWT900A
t_on/t_off	2s/18s
Temperature swing	Tj=50℃~150℃
D.U.T cooling method	water



✓Longer (~x4) PC lifetime compared to TO247 achieved by use of copper clips.

a.u = Arbitrary unit

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Assembling w/o screw hole

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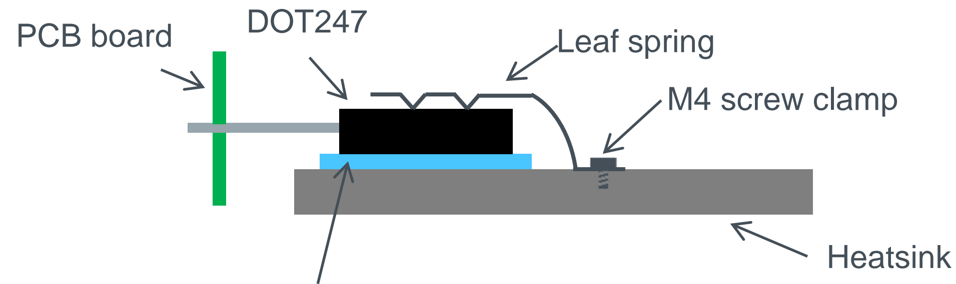
Mounting method (example)

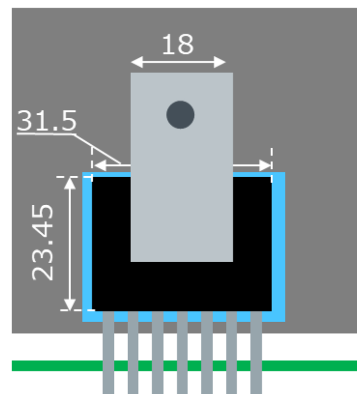
Side view



Ex.) Thermal sheet with insulation function

Top view

- Hold center of DOT247 by single leaf spring.



Reference; mounting of TO247

Leads are mounted on the board

✓ **Insulation between DOT247 and heatsink is needed**
✓ **DOT247 is not compatible with reflow soldering**

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Application example: DC-Wallbox

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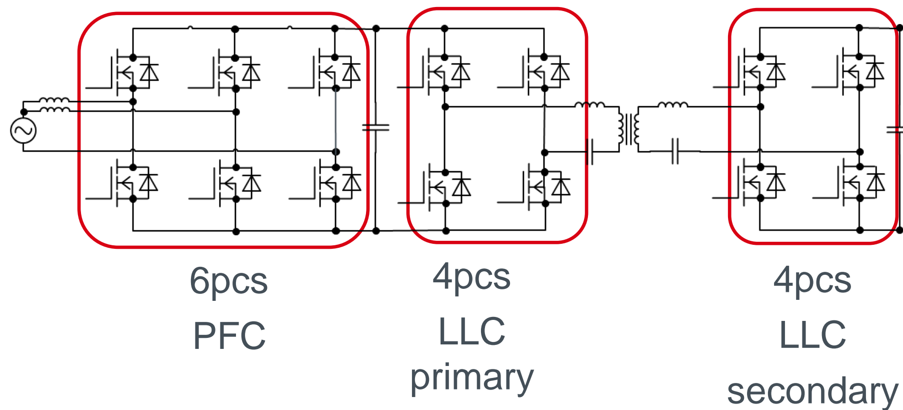
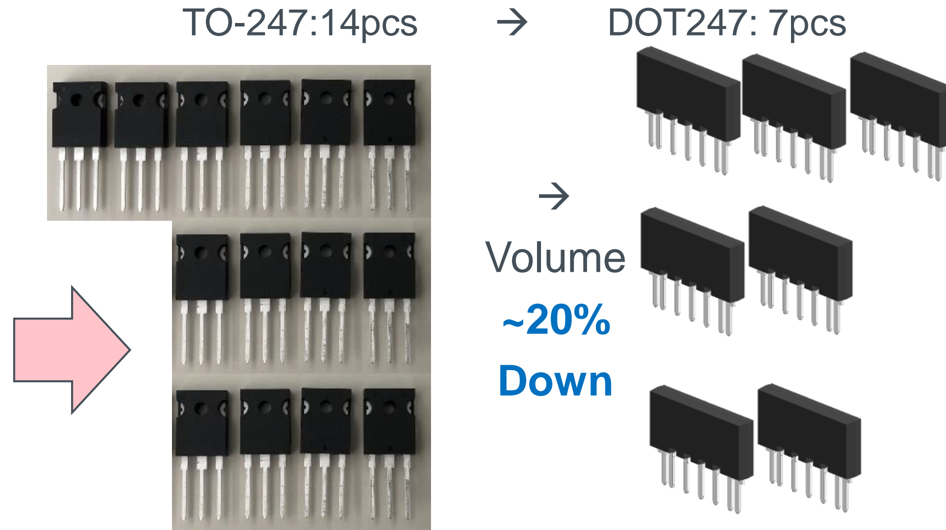
Contribution to Miniaturization

Bidirectional Charger topology





By using DOT247 package versus TO247-4L could help to reduce overall Inverter size up to ~20%
Example design at ~22KW bidirectional DC-Wallbox

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Worldwide distributed high level support

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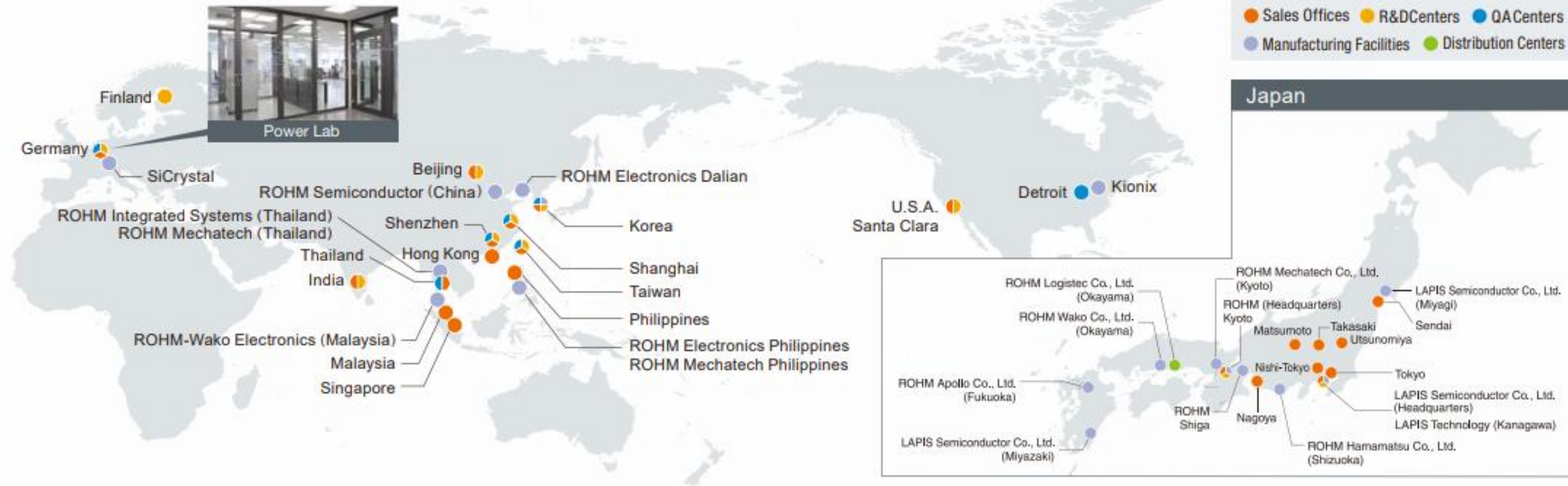
Application-Level Support

ROHM's Support System

We provide global support for the integrated design of high-speed switching SiC devices and gate drivers that combine high accuracy with fast switching control.



SiC MOSFET Evaluation Board

PCB005P Rev.C

An evaluation board is offered that allows for easy evaluation of SiC devices

ROHM Solution Simulator

ROHM's web simulation tool enables complete circuit verification of power devices and driver ICs

ROHM Solution Simulator

Simulates SiC devices in environments closer to real-world applications, including gate drivers and peripheral circuits.

Electricity Cost Testing of EVs Based on the International WLTC Standard

Test Conditions
Driving Pattern: WLTC Class 3b
Assumed Vehicle: C-Segment EV

Test Motor: Permanent magnet synchronous motor (100kW, 800V)
Device: SiC vs IGBT (1,200V)

Inverter Efficiency Comparison: 4th Gen SiC MOSFET vs IGBT

Inverter Efficiency Map

IGBT | 4th Gen SiC MOSFET

Significantly improved efficiency in the high torque and low rotational speed range

Expanded high efficiency area

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