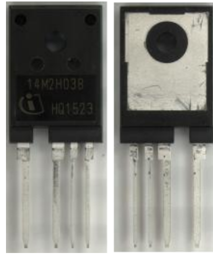
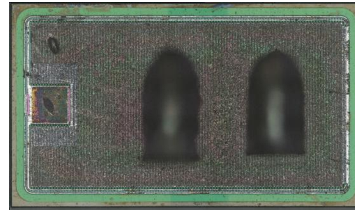
SiC MOSFET (1400V): Infineon IMZC140R038M2H Overview, Structure, Electrical Characteristics, SCM Analysis Reports



Package



SiC MOSFET die

Report Overview

Infineon began production of 1400V SiC MOSFETs in June 2025.

This product is developed based on the 2nd Generation 1200V CoolSiC™ technology and represents the first commercially available 1400V-class SiC MOSFET.

The newly adopted high-voltage structure ensures a sufficient voltage margin compared to conventional 1200V products. This characteristic allows for an optimal balance between gate resistance (Rg) and switching loss, contributing to improved overall system efficiency and greater design flexibility. These applications target a wide range of fields requiring high voltage and high reliability, including commercial vehicles, construction machinery, xEV charging infrastructure, and battery energy storage systems (BESS).

This report clarifies the features of this 1400V SiC MOSFET and also includes a comparison with existing 1200V devices.

Product Features

Product type:	IMZC140R038M2H Vdss=1400V, RON=38mΩ, Id=37A mΩ
Released data:	June 2025

Datasheet：IMZC140R038M2H

Report No：25R-0584-1, 25G-0584-2,3,4 Release day：2026.3.19

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Analysis result summary

①SiC MOSFET Overview Analysis Report (13pages)

・Confirmation of die photos, size, and cell array structure, and a simple structural comparison with existing 1200V products.
Comparative Evaluation of Electrical Characteristics from Datasheet.

②SiC MOSFET Structure Analysis Report (52pages)

・This analysis clarifies the modifications in the cross-sectional structure associated with the transition to 1400V.
(e.g., Epi layer, JTE, Pwell)
・RONxAA(FOM) of this product is approximately 10% lower than that of state-of-the-art 4th generation devices.

③Electrical characteristics Analysis Report (29pages)

・ Electrical Characteristics Evaluation. ($R_{G,int}$※, BVdss, C-Vds, Idss-Vds-T, Igss-Vgs)
・ Discussion on the correlation between characteristics and structure.
・ Identification of specific structural changes from the conventional 1200V G2 process.
※The evaluation and modeling of the transistor's internal resistance (RG, int) is used to extract information such as the resistivity of trench-gate polysilicon.

④SCM Analysis Report (9pages)

Report price

Delivered one week after order placement. Please contact us for report pricing.

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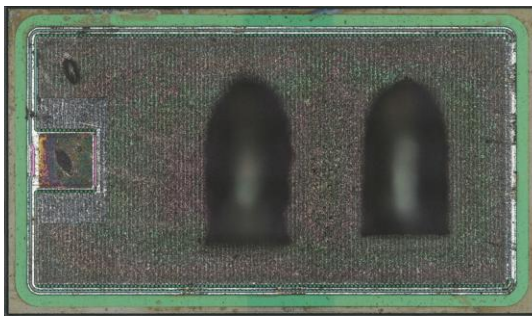
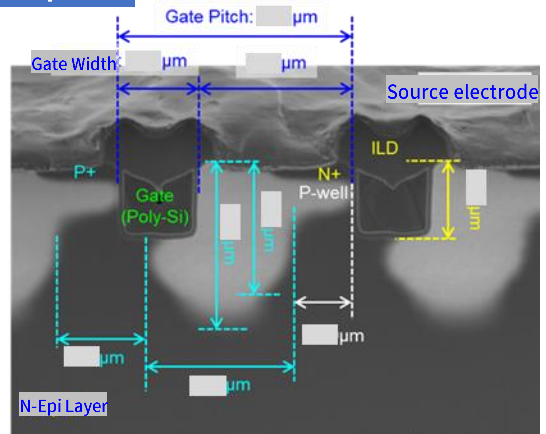
①Excerpt from SiC MOSFET Overview Analysis Report



SiC MOSFET (Top metal layer)



Cell array Cross-section SEM Image

		IMZC120R040M2H	IMZC140R038M2H	
Package		TO-247-4	TO-247-4	
Vdss	V	1200	1400	
DC Id @ Tc=25°C	A			
100°C	A			
Transient Max Vgs	V			
Avalanche Energy (Single)	mJ			
Max Tj	°C			
Thermal Resistance, Rthjc(max)	°C/W			
Power Dissipation, Pd @Tc=25°C	W			
100°C	W			
ON Resistance, Ron @ Id	A			
@ Vgs	V			
Ron (typ) 25°C	mΩ			
Ron (typ) 150°C	mΩ			
Ron (max) 150°C	mΩ			
Ron (typ) 175°C	mΩ			
Threshold Voltage, Vth	V			
Transconductance, gm	S			
Internal gate resistance, Rgi	Ω			
Input gate capacitance, Ciss	pF			
Output Capacitance, Coss	pF			
Reverse transfer Capacitance, Crss	pF			
Coss stored energy, Eoss	uJ			
Total gate charge, Qg	nC			
Plateau gate charge, Qgs(pl)	nC			
Gate-drain charge, Qgd	nC			
Energy losses at Vds=800V				
Turn-on Energy, Eon @ 175°C	uJ			
Turn-off Energy, Eoff @ 175°C	uJ			
Reverse Recovery, Efr @ 175°C	uJ			
Total Esw = Eon+Eoff+Efr @175°C	uJ			

Comparison of Main Electrical Characteristics (from Datasheet)

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②Excerpt from SiC MOSFET Structure Analysis Report

Planar Structure Analysis (OM)

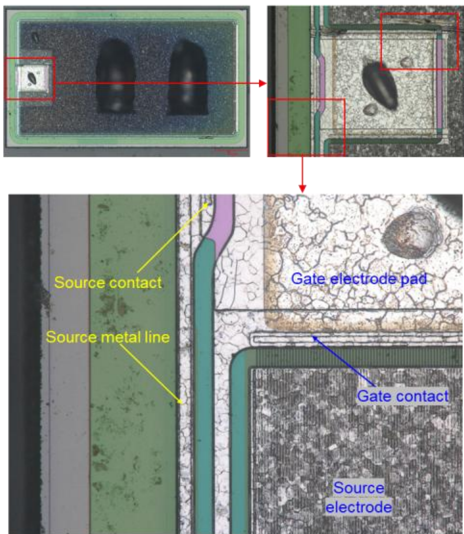

Fig. 3-1-10 Gate pad corner (Top Metal layer)

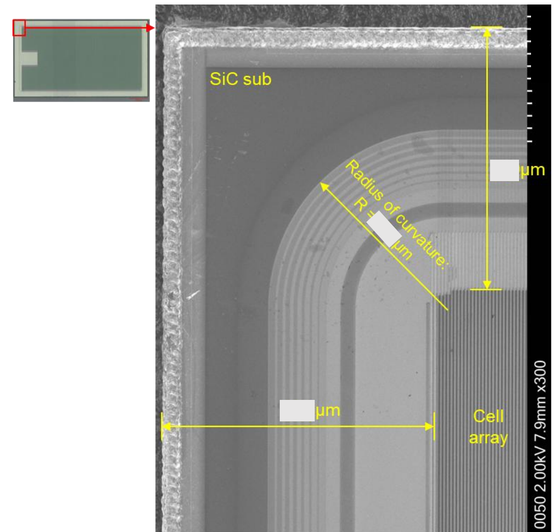

Fig. 3-2-2 Plane SEM image of die corner (SiC sub layer)

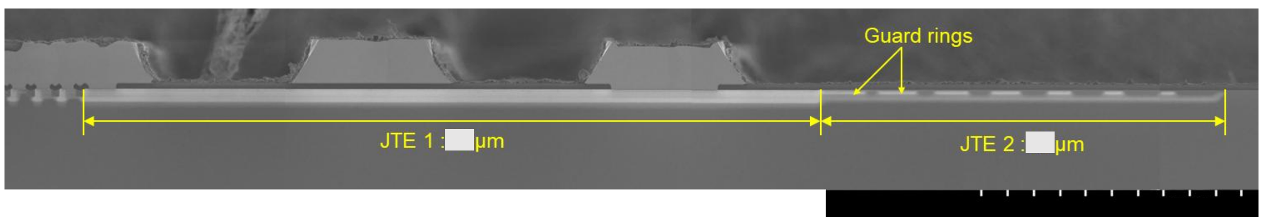

Fig. 3-4-2 Cross-sectional SEM image of die outer periphery

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③Excerpt from Electrical characteristics Analysis Report (1)

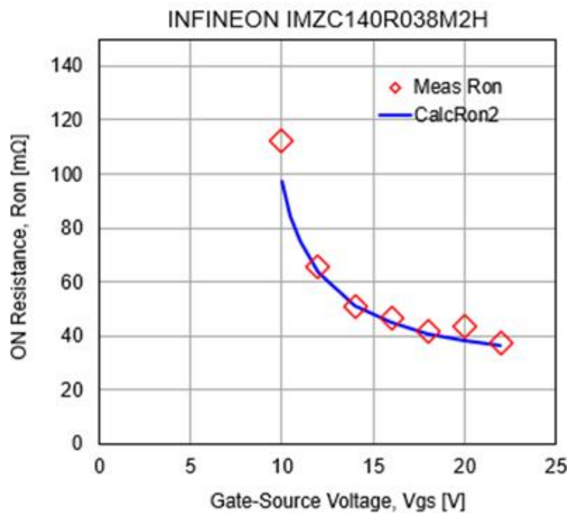

Fig. 2-8-2 Comparison of measured RON (circle) and model calculated RON (blue line)

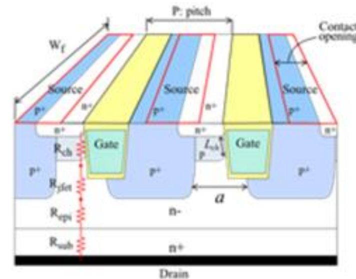

Fig. 2-8-3 Asymmetric trench SiC MOSFET Schematic

Based on numerical analysis and fitting to the measured characteristics, the effective carrier mobility of the MOSFET channel is μch～　　cm^2/V・sec

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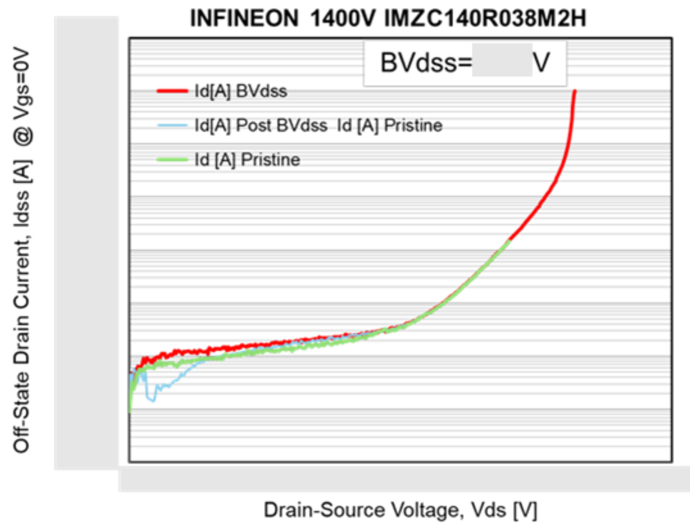
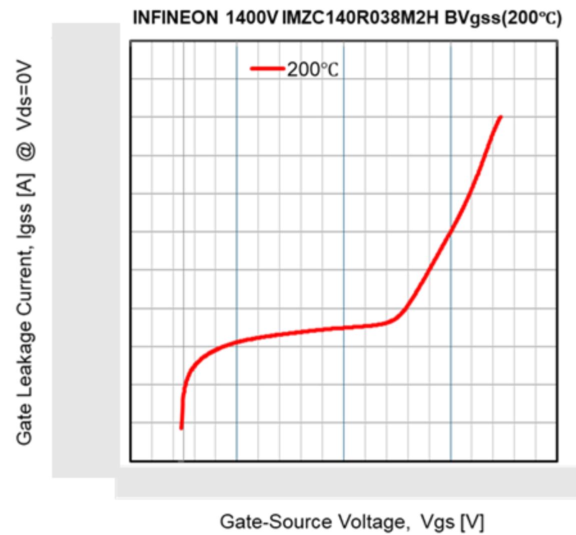
③Excerpt from Electrical characteristics Analysis Report (2)

2-4. Off-State Breakdown Voltage (BVdss)

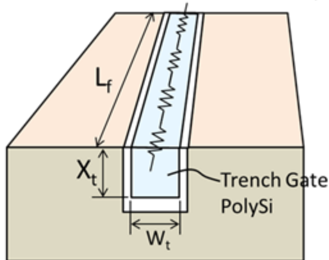


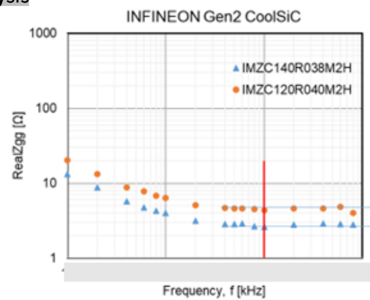
2-5. Gate Leakage Current (Igss)



New evaluated item

2-9. Transistor Internal Gate Resistance (RG, int) Analysis





	Datasheet Rgint [Ω]	Measured Rgint [Ω]	Model Rgint [Ω]
IMZC140R038M2H	2.75	2.62	2.5
IMZC120R040M2H	6.5	4.34	6.2

Fig. 2-9-X Measured frequency dependency of gate internal resistance Rgint (=Re(Zgg)) for the 1200V and the 1400V CoolSiC MOSFETs.

※The evaluation and modeling of the transistor's internal resistance (RG, int) is used to extract information such as the resistivity of trench-gate polysilicon.

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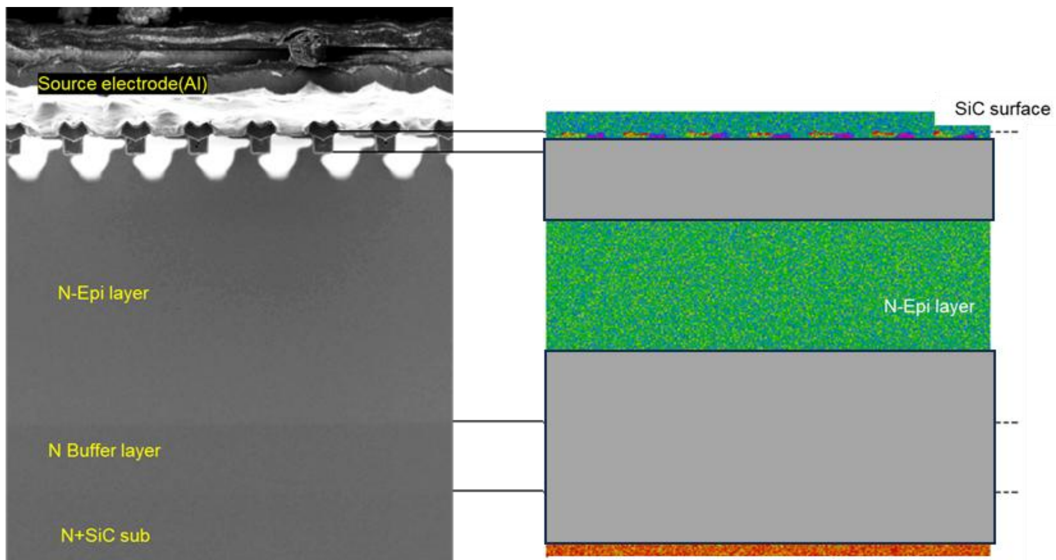
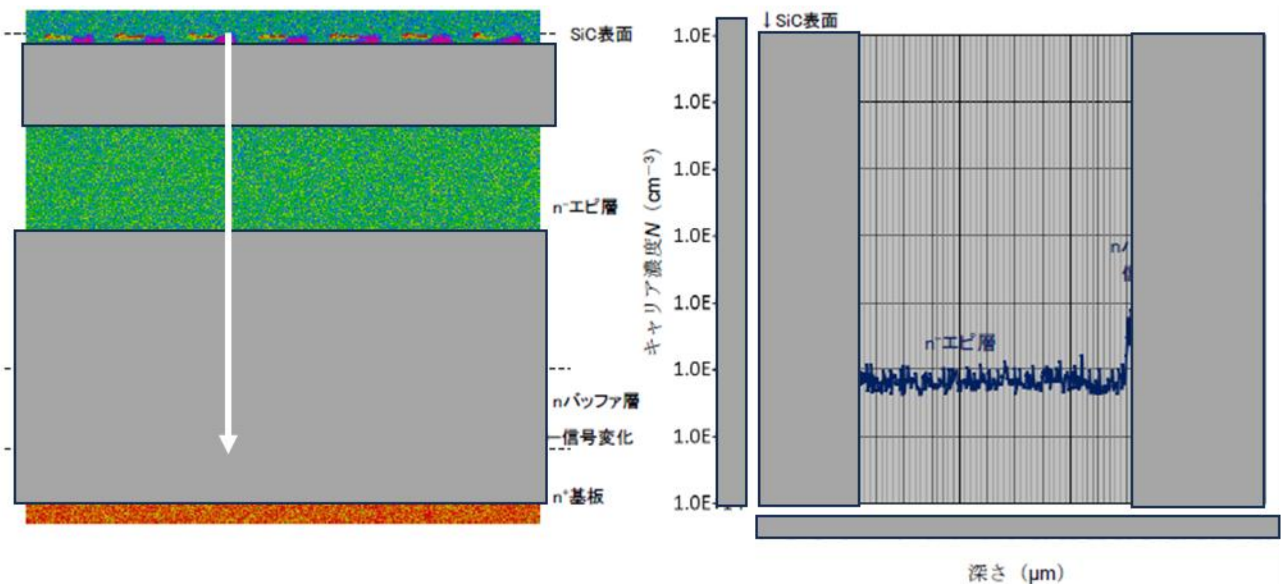
④Excerpt from SCM Analysis Report



Cell array　SCM image



SCM Line Profile

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