

SiC MOSFETs(1200V) : Chinese-made SiC MOSFETs Benchmark Report (2025 Edition)

Introduction

Due to the improved quality, yield and lower cost of SiC wafer produced in China, worldwide leading SiC MOSFET manufacturers have begun adopting wafers from Chinese companies. The number of SiC power device manufacturers in China has expanded, reaching close to 100 companies. It is anticipated that the adoption of Chinese-made power devices in various products will rapidly increase in the near future.

In recent years, we have observed that some of these products exhibit performance on par with those of leading global manufacturers. Therefore, we believe it is essential to regularly assess the technical level of Chinese SiC MOSFETs, just as we do for the major manufacturers.

Report abstract

LTEC has conducted structural/material and electrical characteristic analyses on approximately 60 SiC power devices from 2014 to 2025, as well as on 9 Chinese-made SiC power devices since 2021. In this report, the technology trends of Chinese manufacturers are summarized and compared with that of major global SiC manufacturers. (See P.3)

Product features

Manufacturer	Gen	Product	Vds[V]	Id[A]	Ron[mΩ]
BASIC	Gen2	B2M065120Z	1200	47	65
INVENTCHIP	Gen2	IV2Q12040T4Z ※1	1200	65	40
INVENTCHIP	Gen3	IV3Q12013T4Z	1200	147	13.5
Hestia	Gen2	H2M120F080	1200	33	80
Sanan	Gen2	SMS1200075M2	1200	35	72

※1 Only simple structural analysis performed

Report contents (61 pages) and Summary of results

- Some Chinese manufacturers have emerged with FOM RONxAA that is comparable to or exceeds third-generation products from leading global manufacturers.
- The thickness of the epitaxial and buffer layers in all evaluated SiC MOSFETs is very similar, indicating possible commonality in SiC substrates, epitaxial layers, and buffer layers.
- Although the impact on reliability wasn't evaluated, based on structural shape abnormalities some manufacturing concerns are observed in several products.
- Cost analysis results suggest that the cost of Chinese-made devices is expected to be significantly lower than that of global manufacturers.

Report price

Delivered one week after order placement.

Please contact us for report pricing.

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3. Benchmarking electrical characteristics

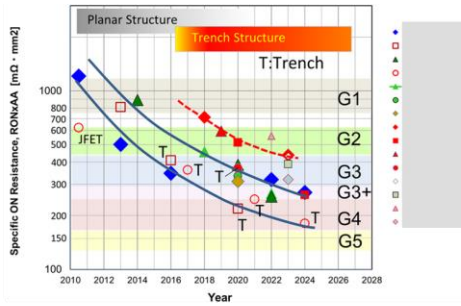


Fig. 1-6-1 Trend of ON resistance per area (RON x A)

★ This graph shows the analysis data we conducted from 2015 to 2024.

- 1) The bottom line represents the major SiC device manufacturers (I → RON x A is the lowest)
- 2) The middle line is a trend that includes minor manufacturers (I → RON x A is the lowest)
- 3) The red dashed line shows the trend of Chinese manufacturers → Before 2023, it was clear that Chinese manufacturers were lagging behind in technology, but after 2023, some manufacturers such as [redacted] and [redacted] are catching up with major manufacturers.

Parameter	Unit	Chinese Manufacturers									
		BASIC	Inventchip	SASTC	Hestia	Sanan	WOLFSPEED				
Part number		B1M080120HC	B2M065120Z	IV1Q12013T4Z	SA1M1200065D	H2M120F080	SMS1200075M2	E4M0013120K			
Technology Generation		1st	2nd	3rd	1st	2nd	2nd	4th			
Model Year		2019	2020	2023	2024	2023	2023	2024			
Package		TO-247-3L	TO-247-4	TO-247-3	TO-247-4	TO-247-3L	TO-247-4L	TO-247-4L			
Vds	V	1200	1200	1200	1200	1200	1200	1200			
ISD Drain Current, Id @ Tj=120°C	A	40	40	40	40	40	40	40			
ISD Drain Current, Id @ Tj=150°C	A	28	28	28	28	28	28	28			
Pulsed Drain Current, IdPulse	A	80	80	80	80	80	80	80			
Max Junction Temperature, Tjmax	°C	150	150	150	150	150	150	150			
Max Power Dissipation, Pd	W	250	250	250	250	250	250	250			
Thermal Impedance, RθJA (Typ)	°C/W	2.5	2.5	2.5	2.5	2.5	2.5	2.5			
Thermal Resistance, RθJA (Max)	°C/W	0.425	0.425	0.425	0.425	0.425	0.425	0.425			
Recommended Operating Vgs	V	20	20	20	20	20	20	20			
On Resistance, RON (Typ) @ Tj=120°C	mΩ	80	80	80	80	80	80	80			
On Resistance, RON (Max) @ Tj=120°C	mΩ	40	40	40	40	40	40	40			
On Resistance, RON (Typ) @ Tj=150°C	mΩ	110	110	110	110	110	110	110			
On Resistance, RON (Typ) @ Tj=175°C	mΩ	—	—	—	—	—	—	—			
Gate Input Resistance, Rg	Ω	1.48	1.48	1.48	1.48	1.48	1.48	1.48			
Transconductance, gm	S	6.5	6.5	6.5	6.5	6.5	6.5	6.5			
Class: Vgs=0V, Vds=800V	μF	2224	2224	2224	2224	2224	2224	2224			
Capacitance	pF	155	155	155	155	155	155	155			
Capacitance	pF	100	100	100	100	100	100	100			
Capacitance	pF	15.1	15.1	15.1	15.1	15.1	15.1	15.1			
Capacitance	pF	25	25	25	25	25	25	25			
Capacitance	pF	3.3	3.3	3.3	3.3	3.3	3.3	3.3			
Turn-on delay time, tdi	ns	129	129	129	129	129	129	129			
Qrr	nC	37	37	37	37	37	37	37			
Qrr	nC	54	54	54	54	54	54	54			
Turn-off delay time, tdf	ns	25	25	25	25	25	25	25			
Reverse recovery time, trr @ Vds=1200V, IAS=10A	ns	68	68	68	68	68	68	68			
Turn-off delay time, tdf	ns	27	27	27	27	27	27	27			
Full time, tf	ns	27	27	27	27	27	27	27			
Turn-on switching loss, Eon @ Vds=800V	μJ	254	254	254	254	254	254	254			
Turn-off switching loss, Eoff	μJ	180	180	180	180	180	180	180			
Body Diode Forward Voltage, Vsd	V	6.7	6.7	6.7	6.7	6.7	6.7	6.7			
Reverse Recovery time, trr @ Vd=800V, Pk=12A	ns	—	—	—	—	—	—	—			
Reverse Recovery charge, Qrr	nC	102	102	102	102	102	102	102			
Peak Reverse Recovery Current, Irm	A	25	25	25	25	25	25	25			
Thermal Impedance, RθJA @ tp=1s, Single Pulse	°C/W	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012			
Thermal Impedance, RθJA @ tp=1s, Single Pulse	°C/W	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			
Thermal Impedance, RθJA @ tp=100s, Single Pulse	°C/W	0.02	0.02	0.02	0.02	0.02	0.02	0.02			

Device Structure	Part number	Unit	Chinese Manufacturers							
			BASIC	Inventchip	SASTC	Hestia	Sanan	WOLFSPEED		
	Technology Generation		1st	2nd	3rd	1st	2nd	2nd	4th	
47	Chip Size, X x Y	mm x mm	3							
48	Chip Size, A x X x Y	mm ²								
49	Transistor Active Area, AA	mm ²								
50	Chip Edge (Uneffective) width, We	mm								
51	FOM 1 : 単位面積当たりのON抵抗, RON x A	mΩ · mm ²								
52	FOM 2 : RON x Qg	Ω · nC								
53	MOSFET Total Channel width, W	mm								
54	Transistor cell structure									
55	Transistor cell array configuration									
56	Transistor cell Pitch, P	μm								
57	Tox	nm								
58	N-Epi thickness	μm								
59	Chip Thickness, dsc	μm								

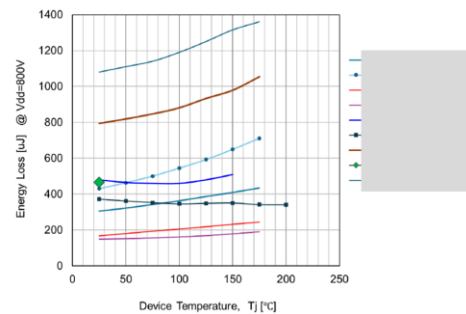
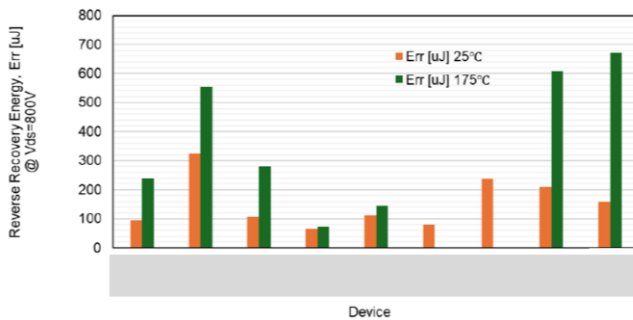



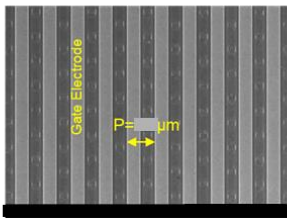
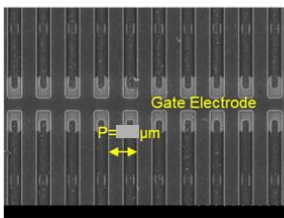
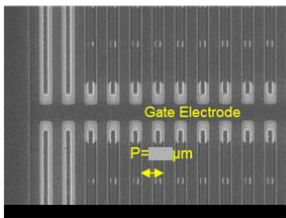
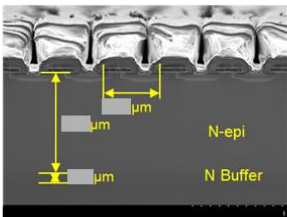
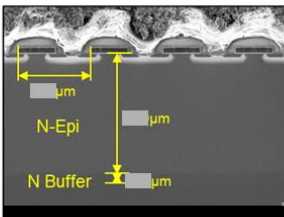
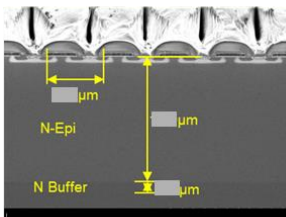


Fig.X-1 Body diode reverse recovery energy losses (Err @ 25°C, 800V), and (b) total switching energy loss in 1200V, Ron~32-40mΩ SiC MOSFETs.

	BASIC	Inventchip	Inventchip
Product	B2M065120Z	IV2Q12040T4Z	IV3Q12013T4Z
Die photograph	 A=10.0mm ²	 A=12.8mm ²	 A=25.1mm ²
Transistor cell Plane SEM: Array configuration	 Gate Electrode P=1μm	 Gate Electrode P=1μm	 Gate Electrode P=1μm
Transistor cell Cross-sectional SEM: Epi layer	 N-epi N Buffer 1μm	 N-Epi N Buffer 1μm	 N-Epi N Buffer 1μm

Manufacturing Concerns (3) (Sanan : SMS1200075M2)

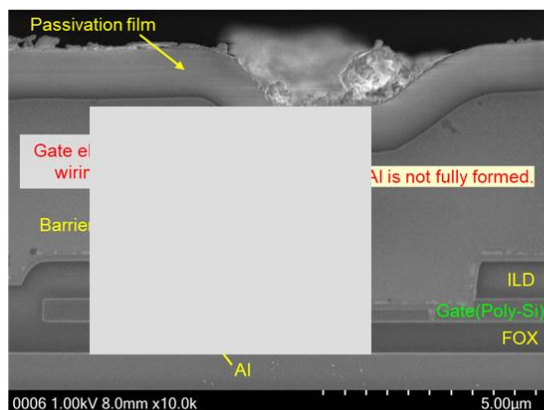
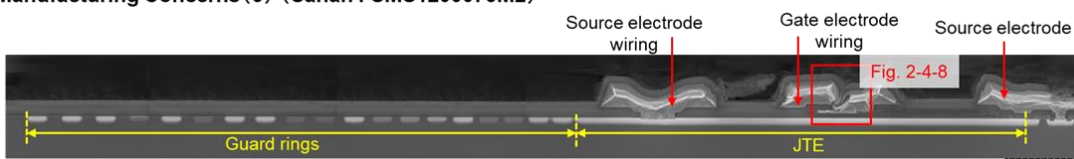


Fig. 2-4-8 Outer periphery: Cross-sectional SEM image

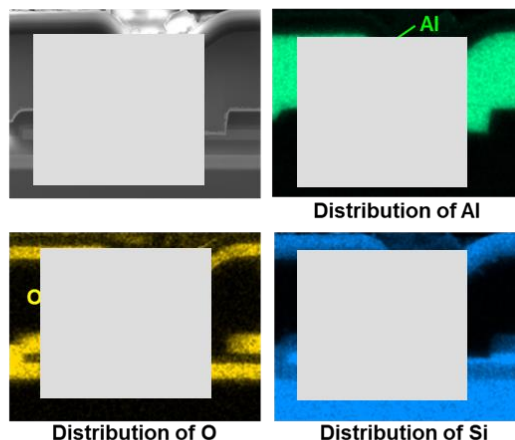


Fig. 2-4-9 SEM-EDX mapping