

SiC MOSFET(1200V): SiC MOSFET of Chinese makers Survey and Benchmark Report (2025 Edition)

Overview

As SiC wafer production yields has been improving in China, major global SiC MOSFET manufacturers have begun to adopt wafers from Chinese companies, and improvements in wafer quality, yields, and costs have been reported.

In addition to wafers, Chinese companies are also expanding their presence in the SiC power device manufacturing field (estimated 100 companies), and it is predicted that Chinese SiC power devices will be rapidly adopted in a variety of products in the future.

LTEC has been analyzing and evaluating products from major Chinese manufacturers since 2021. Chinese SiC MOSFETs have begun to appear with performance equivalent to that of major manufacturers, so LTEC believes that it is necessary to regularly check the technical level of Chinese SiC MOSFETs, just like major manufacturers.

Report overview

LTEC has conducted structural/material analysis and electrical characteristic analysis of approximately 60 SiC power devices (2014-2025) and nine Chinese SiC power devices since 2021. This report summarizes the trends of Chinese manufacturers, and technical comparison with major global manufacturers (see page 3). **Report Contents/Overview of Results**

Maker	Gen.	Product number	BVds(V)	Io(A)	Ron(mΩ)
BASIC	Gen2	B2M065120Z	1200	47	65
INVENTCHIP	Gen2	IV2Q12040T4Z	1200	65	40
INVENTCHIP	Gen3	IV3Q12040T4Z	1200	147	13.5
HESTIA	Gen2	H2M12DF080	1200	33	80
HUNAN SANAN	Gen2	SMS1200075M2	1200	35	72

Report contents

Chinese manufacturers' FOM RONxAA is beginning to rival the third generation of major manufacturers.

The epitaxial/buffer layer thicknesses of all SiC MOSFETs evaluated are very similar, possibly indicating commonality (SiC substrate, epitaxial layer, and buffer layer).

The impact on reliability is unknown, but shaping abnormalities have been confirmed around the source electrode and contacts in some products.

Cost analysis suggests that the cost price of Chinese manufacturers is significantly lower than that of US manufacturers.

Report price

Delivered one week after order placement

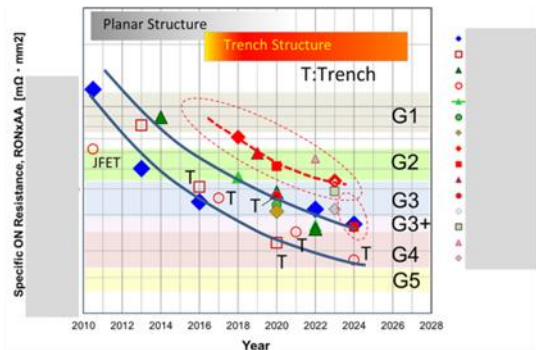
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Excerpt (1) from the report

3. 電気的特性のベンチマーク



- 1) 下の線は、大手 SiC デバイスメーカー (Rohm, Toshiba, Fuji, Infineon, STMicroelectronics, ON Semiconductor) を表している → RON×A が最も低い
2) 中央の線は、マイナーメーカー (Lecap, LSC, LSC2, LSC3, LSC4, LSC5, LSC6, LSC7, LSC8, LSC9, LSC10) を含む傾向である。
3) 赤い破線は、中国メーカーの傾向です → 2023年以前では技術の遅れが明らかとなっていたが、2023年度以降、Lecap や LSC など一部のメーカーは主要メーカーに追いつきつつある。

Parameter	Unit	Chinese Manufacturers									
		BASIC	Inventchip	SASTC	Hestia	Sanan	WOLFSPEED				
1 Parameter		B1M080120HC	B2M065120Z	IV3Q12013T4Z	SA1M120065SD	H2M120F080	SMS1200075M2	E4M0013120K			
2 Technology Generation		1st	2nd	3rd	1st	2nd	2nd	4th			
3 Model Year		2019	2020	2020	2024	2020	2021	2023	2024		
4 Package		TO-247-3L	TO-247-4	TO-247-3	TO-247-4	TO-247-3	TO-247-3L	TO-247-4L	TO-247-4L		
5 Vds	V	1200	1200	1200	1200	1200	1200	1200	1200		
6 IS Drain Current, Id @ Tj=25°C	A	40	40	40	40	40	40	40	40		
7 IS Drain Current, Id @ Tj=150°C	A	28	28	28	28	28	28	28	28		
8 Pulsed Drain Current, Idpuls	A	80	80	80	80	80	80	80	80		
9 Max Junction Temperature, Tjmax	°C	150	150	150	150	150	150	150	150		
10 Max Power Dissipation, Pd	W	235	235	235	235	235	235	235	235		
11 Thermal Impedance, RθJA (Typ)	°C/W	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5		
12 Thermal Resistance, RθJA (Max)	°C/W	0.425	0.425	0.425	0.425	0.425	0.425	0.425	0.425		
13 Recommended Operating Vgs	V	20	20	20	20	20	20	20	20		
14 On Resistance, RDS(on) Typ @ Tj=25°C	mΩ	80	80	80	80	80	80	80	80		
15 On Resistance, RDS(on) Max @ Tj=25°C	mΩ	40	40	40	40	40	40	40	40		
16 On Resistance, RDS(on) Typ @ Tj=150°C	mΩ	110	110	110	110	110	110	110	110		
17 On Resistance, RDS(on) Typ @ Tj=175°C	mΩ	—	—	—	—	—	—	—	—		
18 Gate Input Resistance, Rg	Ω	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48		
19 Transconductance, gm	S	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		
20 Ciss, Vgs=0V, Vds=800V	pF	2224	2224	2224	2224	2224	2224	2224	2224		
21 Coss	pF	100	100	100	100	100	100	100	100		
22 Qrr	μC	25	25	25	25	25	25	25	25		
23 Qrr	μC	25	25	25	25	25	25	25	25		
24 Total Gate Charge, Qg	nC	129	129	129	129	129	129	129	129		
25 Qg1	nC	37	37	37	37	37	37	37	37		
26 Qg2	nC	54	54	54	54	54	54	54	54		
27 Turn-on delay time, tdi(on)	ns	25	25	25	25	25	25	25	25		
28 Raising tr	ns	68	68	68	68	68	68	68	68		
29 Turn-off delay time, tdi(off)	ns	27	27	27	27	27	27	27	27		
30 Fall time, tf	ns	27	27	27	27	27	27	27	27		
31 Turn-on switching loss, Eon	μJ	254	254	254	254	254	254	254	254		
32 Turn-off switching loss, Eoff	μJ	180	180	180	180	180	180	180	180		
33 Body Diode Forward Voltage, Vsd	V	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7		
34 Reverse Recovery time, trr @ Vd=800V, Pk=1A	ns	—	—	—	—	—	—	—	—		
35 Reverse Recovery charge, Qrr	nC	252	252	252	252	252	252	252	252		
36 Peak Reverse Recovery Current, Irm	A	25	25	25	25	25	25	25	25		
37 Thermal Impedance, RθJA @ tp=1us Single Pulse	°C/W	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012	0.00012		
38 Thermal Impedance, RθJA @ tp=10us Single Pulse	°C/W	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001		
39 Thermal Impedance, RθJA @ tp=100us Single Pulse	°C/W	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		

		Unit	Chinese Manufacturers							
			BASIC	Inventchip	SASTC	Hestia	Sanan	WOLFSPEED		
	Part number		B1M080120HC	B2M065120Z	IV3Q12013T4Z	SA1M120065SD	H2M120F080	SMS1200075M2	E4M0013120K	
	Technology Generation		1st	2nd	1st	3rd	1st	2nd	2nd	4th
Device Structure	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ON抵抗, RON×AA	mΩ · mm ²								
	52 FOM 2: RON×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								

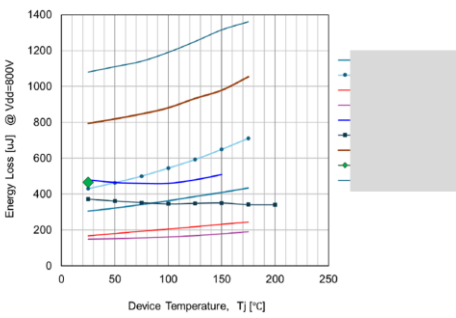
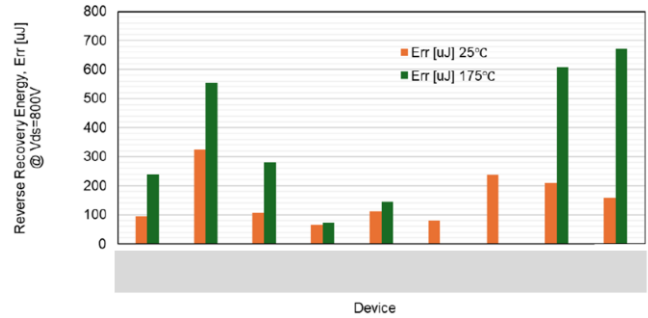


Fig.X-1 1200V, Ron~32-40mΩ SiC MOSFET (a) Reverse recovery energy loss of the body diode (Err @ 25°C, 800V) and (b) total switching energy loss

Excerpt (2) from the report

表2. トランジスタの主な構造的特徴の概要

	BASIC社	Inventchip社	Inventchip社
製品	B2M065120Z	IV2Q12040T4Z	IV3Q12013T4Z
Die image			
Transistor cell Plane view SEM Image			
Transistor cell Cross section SEM Image			
Epi			

製造上の懸念点 (3) ()

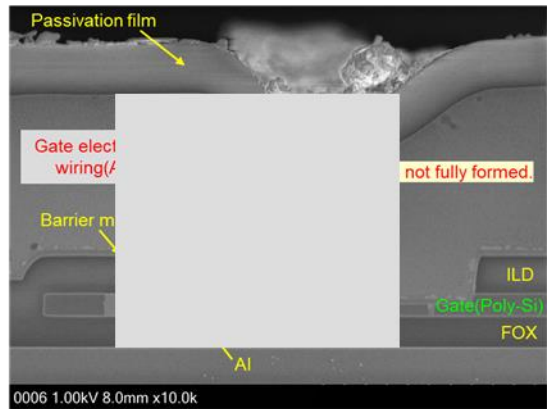
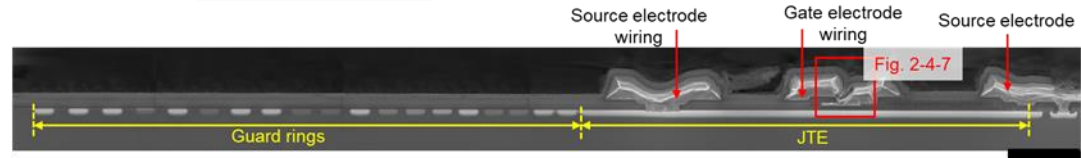


Fig. 2-4-7 外周部 断面SEM像

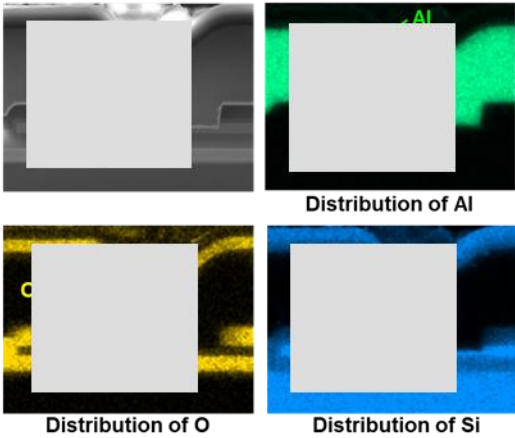


Fig. 2-4-8 SEM-EDXマッピング結果