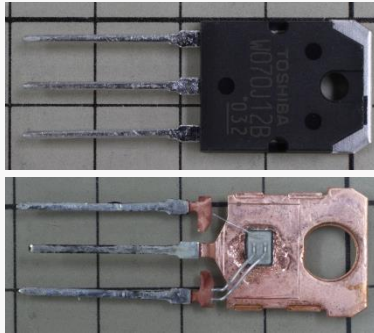
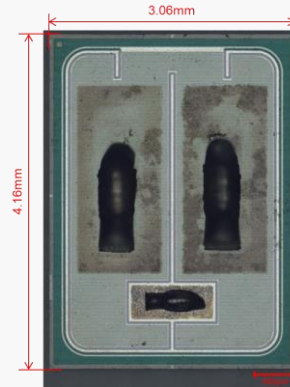


TOSHIBA TW070J120B SiC-MOSFET Die Structure and Process Analysis Reports



Package



Die image

Product overview

- This SiC-MOSFET is a 2nd generation device by Toshiba Electronic Devices & Storage Corporation. Key specifications: $V_{ds}=1200V$, $R_{on}=70m\Omega$, $I_{dmax}=36A$ (@ 25°C), maximum operating temperature =175°C
- The power loss is reduced by a built-in Schottky Barrier Diode (SBD)
- This SiC FET has low the input capacitance, gate input charge (Q_g) and on-resistance. Its high threshold voltage ($V_{th}=5V$) helps prevent malfunction.

Report contents

1. Structural analysis report

Includes cross section of the SiC-MOSFET, plane analysis and layout (transistor unit cell, die edge), SBD cross section and material identification by EDX.

2. Device and process analysis

Estimation of SiC device manufacturing process flow, including doping concentration of the N-epi layer (drift layer), measurement of on-resistance, and breakdown voltage. Measurement of SBD characteristics, and comparison with the built-in body diode characteristics of other companies' SiC MOSFET devices.

Note: The report price may change over time. For current price contact info@ltecusa.com.

20G-0015-1, 2

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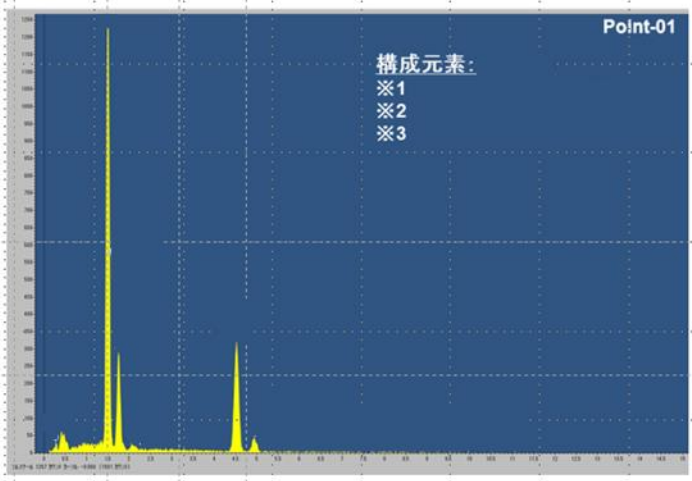
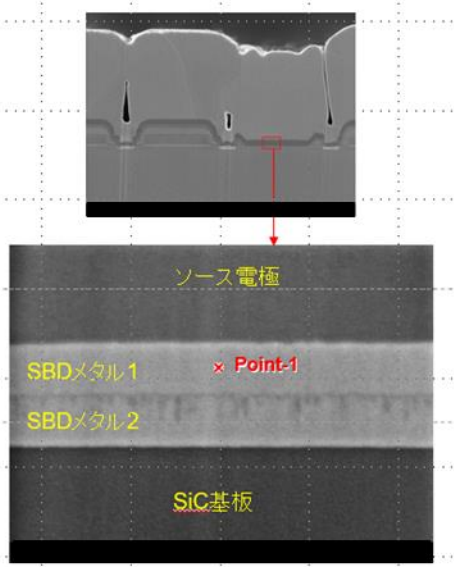
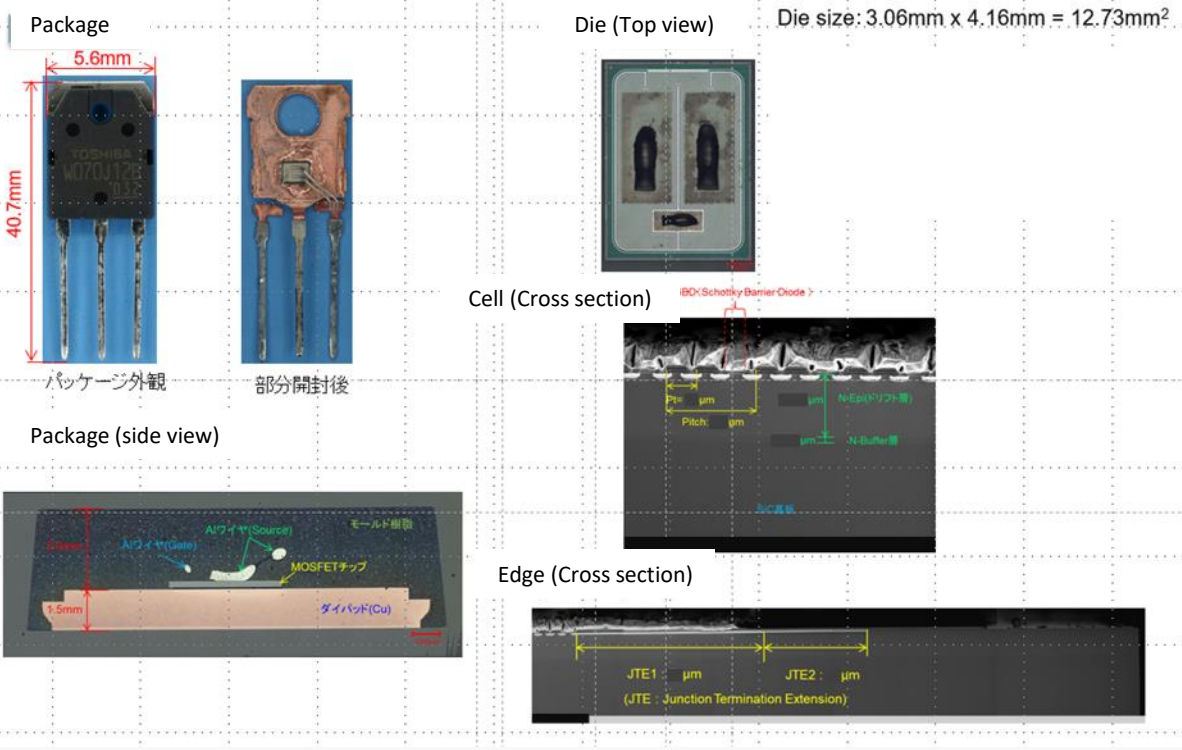







Fig 4-1-1. EDX data

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Table 1: Comparison table of 1200V SiC MOS FET

	Units	TOSHIBA	ROHM	WOLFSPEED	ON-SEMI	INFINEON
		TW070J120B	SCT3080KLHR	C3M0075120K/D	NVHL080N120SC1	IMW120R045M1
Qualification Level		産業用	車載用AEC	産業用	車載用AEC	産業用
Package		3 TO-3P	3 TO-247	3,4 TO-247	3 TO-247	3 TO-247
Technology/Production		2 nd Gen/2020	3 rd Gen/2016	3 rd Gen/2016	1 st Gen/2018	1 st Gen/2017
RON	mΩ	70	80	75	80	45
DC Id	A	36	31	30	44	52
Chip Size	mm ²	12.6	7.3	6.7	8.70	11.6
V _{th}	V	5±0.8 ★	4.1	2.5	2.5	4.5
C _{iss} /A	pF/mm ²	133	107	201	129	164
C _{rss} /A	pF/mm ²	0.63	4.8	0.3	0.74	1.1
C _{oss} /A	pF/mm ²	8.7	10.3	8.7	9.2	9.9
Diode Forward Voltage, V _{DSF} (@ I _s =10A)	V	1.35 ★	3.2	4.5	4	4.1
Specific ON resistance (R _{ON(A)}) _i	mΩ·mm ²	571	440	375	464	369
Structural	Die photograph					

Process flow sequence

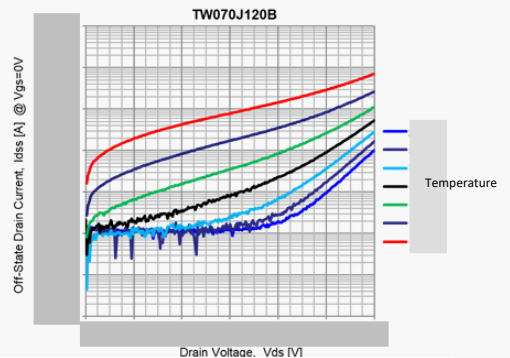
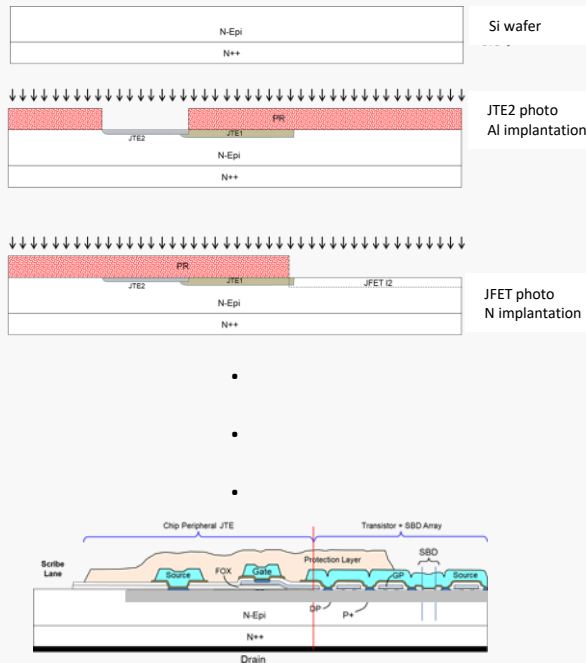


Fig. 4-2-1 Off state Id_{ss}-V_{ds}

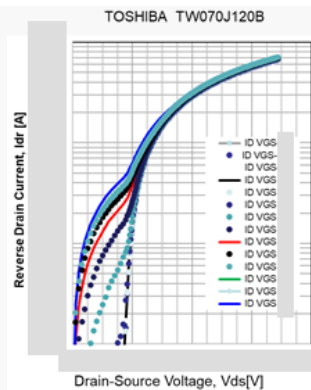


Fig. 4-5-1 Reverse drain current (SBD) vs. V(ds)