Fuji Electric
Innovating Energy Technology

Fuji IGBT Modules for MV , SVG Inverter

2021.12

Device Application Technology Dept.
Sales Division
Semiconductors Business Group

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Topology in MV , SVG inverter

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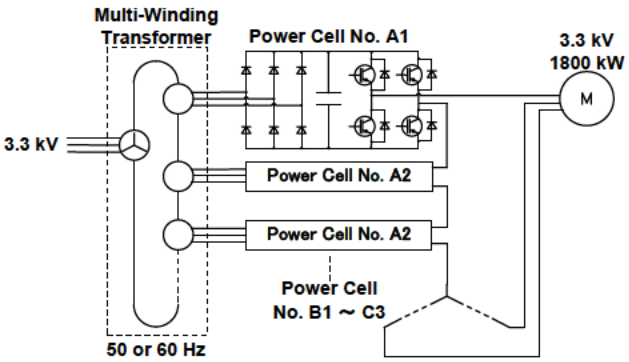
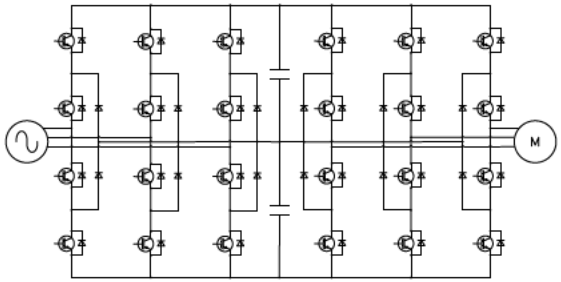
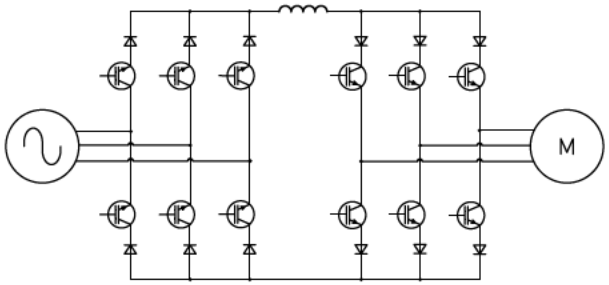
	Topology (example)	Feature	Applicable device	Applicable rate
Unit serial multi-level		・Topology is simple, easy maintenance, any output voltage can be obtained by unit cell serials ・Input-Transformer is necessary (high cost)	1700V/100A～1200A Standard Module	60% Around the world (China etc.)
Direct 3 level Inverter		・Transformer less ・Topology is complicated	3.3kV/800～1500A 4.5kV/ 400A～1500A HPM	30% Europe and America
Current type Inverter		・Reverse-blocking diode is necessary (Large loss)	6.5kV/400A～1500A Press Pack(GCT)	10% Europe and America

Topology in MV , SVG inverter

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Field	Application	Topology			Function
		Unit serial multi-level	Direct 3 level	Current type	
Electric	Dust collecting fan	○	○	○	
	Boiler	○	○	○	
	Circulation pump	○	○	○	
Petroleum	Oil transfer pump	○	○	○	
	Ventilation fan	○	○	○	
	Compressor	-	○	○	Regeneration
Steel	Rolling	○	○	○	
	Ventilation fan	○	○	○	
	Pump	○	○	○	
Cement	Cooler dust collector	○	○	○	
	Material mill	○	○	○	
	Fan	○	○	○	
Paper	Pulp mill	-	○	○	Regeneration
Mining	Exhaust fan	○	○	○	
	Ventilation fan	○	○	○	
Transport	Conveyor	-	○	○	Regeneration
	Crane	-	○	○	Regeneration

Topology - Unit serial multi-level circuit (6.6kV output)

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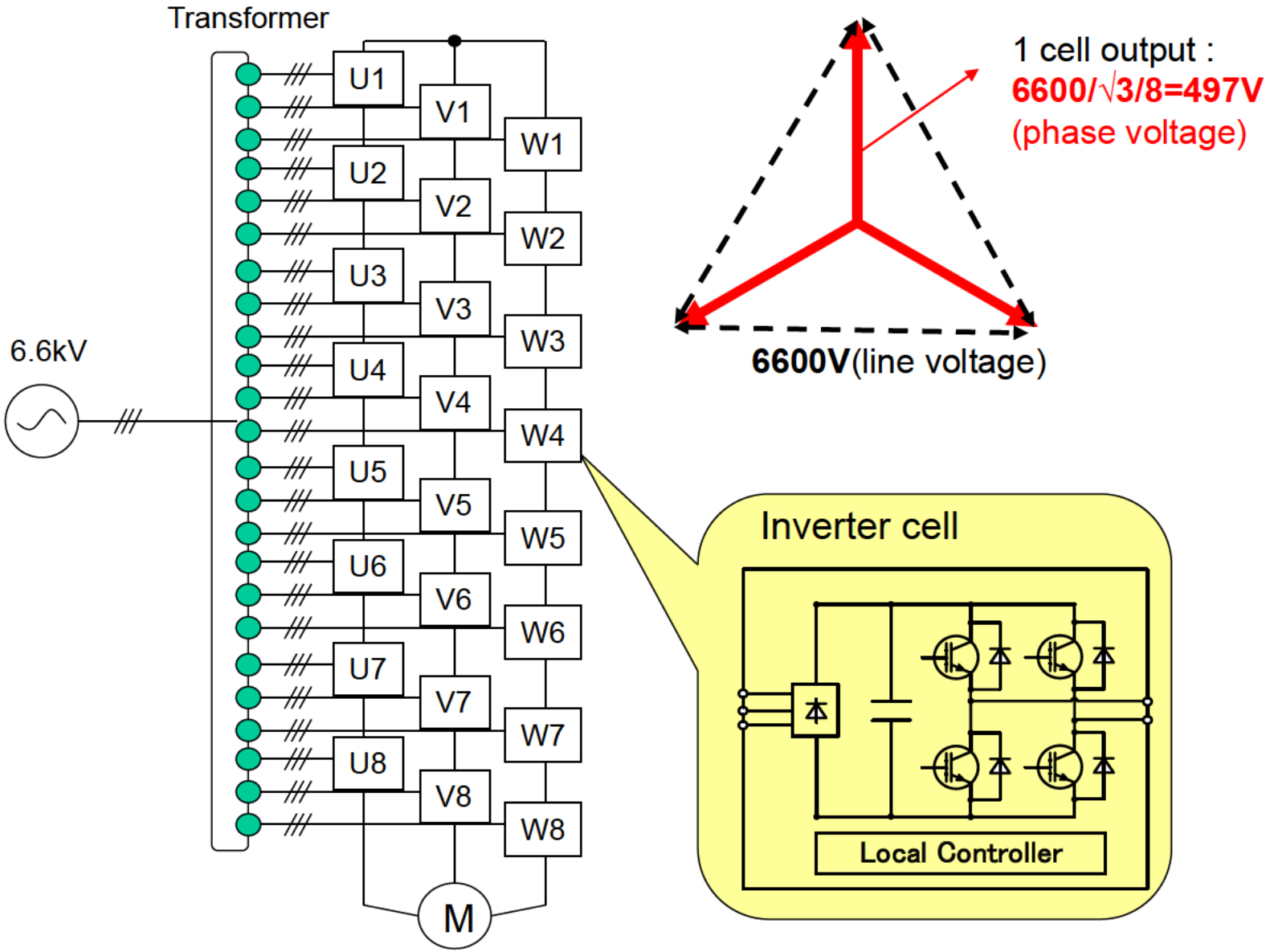

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Fuji IGBT modules for MV , SVG inverter - Standard 2in1

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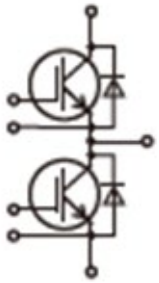
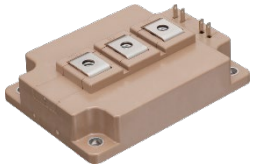
	V series		X series		Voltage	Package	Equivalent circuit
	Device type※1	Current	Device type※1	Current			
Standard 2in1	2MBI**VA-170-50	75A 100A	2MBI**XAA170-50	75A 100A 150A	1700V	M263:94 x 34 x 30mm 	
	2MBI**VH-170-50 2MBI**VH-170-80	150A 200A 300A	2MBI**XHA170-50	150A 200A 300A 400A	1700V	M276:108 x 62 x 30.5mm 	
	2MBI**VE-170-50 2MBI**VE-170-80	300A 400A	2MBI**XEE170-50	300A 400A	1700V	M277:110 x 80 x 30mm 	

※1 “**” is rated current.

Fuji IGBT modules for MV , SVG inverter - Dual XT

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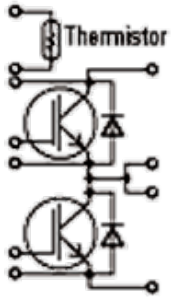
	V series		X series		Voltage	Package	Equivalent circuit
	Device type※1	Current	Device type※1	Current			
Dual XT	2MBI**VN-170-50 2MBI**VN-170-80	300A 450A 550A	2MBI**XNA170-50	225A 300A 450A	1700V	M254:150 x 62 x 17mm Solder pins 	
	–	–	2MBI600XNG170-50	600A	1700V		
	–	–	2MBI600XNE170-50	600A	1700V	M285:150 x 62 x 17mm Press fit pins 	
	2MBI**VX-170-50 2MBI**VX-170-80	225A 300A 450A 550A	2MBI**XNB170-50	225A 300A 450A	1700V	M282:150 x 62 x 17mm Press fit pins 	
	–	–	2MBI600XNH170-50	600A	1700V		
	–	–	2MBI600XNF170-50	600A	1700V	M286:150 x 62 x 17mm Press fit pins 	

※1 “**” is rated current.

Fuji IGBT modules for MV , SVG inverter - PrimePACK™

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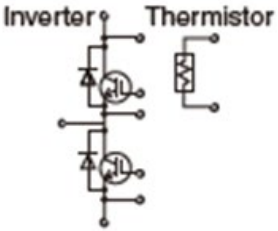
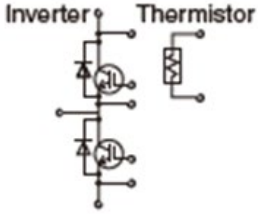
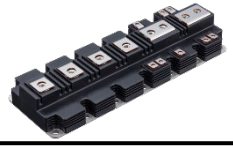
	V series				Voltage	Package	Equivalent circuit
	Low switching loss		Soft turn off				
	Device type※1	Current	Device type	Current			
PrimePACK™	2MBI650VXA-170E-50 2MBI650VXA-170E-80 2MBI650VXA-170E-54 2MBI650VXA-170EA-50 2MBI650VXA-170EA-80 2MBI650VXA-170EA-54	650A	–	–	1700V	M271:172 x 89 x 38mm 	
	2MBI**VXB-170E-50 2MBI**VXB-170E-80 2MBI**VXB-170E-54	1000A 1400A	–	–	1700V	M272:250 x 89 x 38mm 	
	2MBI1000VXB-170EA-50 2MBI1000VXB-170EA-80 2MBI1000VXB-170EA-54	1000A	2MBI1400VXB-170P-50 2MBI1400VXB-170P-80 2MBI1400VXB-170P-54	1400A	1700V		

※1 “**” is rated current.

	X series		Voltage	Package	Equivalent circuit
	Low switching loss				
	Device type※1	Current			
PrimePACK™	2MBI650XXA170-50	650A	1700V	M271:172 x 89 x 38mm 	
	2MBI1200XXE170-50	1200A	1700V		
	2MBI**XXB170-50	1000A 1400A	1700V	M272:250 x 89 x 38mm 	
	2MBI1800XXF170-50	1800A	1700V		
	2MBI1800XXG170-50	1800A	1700V	M291:250 x 89 x 38mm 	

Note: PrimePACK™ is registered trademarks of Infineon Technology AG, Germany.

※1 “**” is rated current.

Fuji IGBT modules for MV , SVG inverter - 1in1, 2in1

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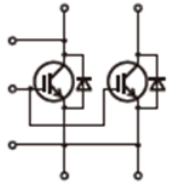
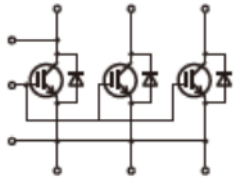
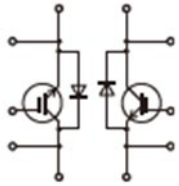
	V series				Voltage	Package	Equivalent circuit
	Cu-base plate		AlSiC-base plate				
	Device type※1	Current	Device type※1	Current			
1in1	1MBI**VC-170E	1200A 1600A 2400A	1MBI**VR-170E	1200A 1600A 2400A	1700V	M151:Cu-baseplate M155:AlSiC-baseplate 130 x 140 x 38mm 	
	1MBI**VD-170E	2400A 3600A	1MBI**VS-170E	2400A 3600A	1700V	M152:Cu-baseplate M156:AlSiC-baseplate 190 x 140 x 38mm 	

※1 “**” is rated current

	V series				Voltage	Package	Equivalent circuit
	Cu-base plate		AlSiC-base plate				
	Device type※1	Current	Device type※1	Current			
2in1	2MBI**VG-170E	600A 800A 1200A	2MBI**VT-170E	600A 800A 1200A	1700V	M256:Cu-baseplate M278:AlSiC-baseplate 130 x 140 x 38mm 	

※1 “**” is rated current

Fuji IGBT modules for MV , SVG inverter - 3.3kV module

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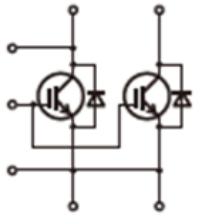
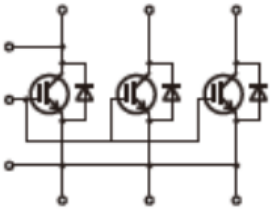
	Device type※1 (U series)	Current	Voltage	Package	Equivalent circuit
3.3kV module	1MBI**UG-330	800A 1000A	3300V	M155:AlSiC-baseplate 130 x 140 x 38mm 	
	1MBI1000UG-330B	1000A	3300V		
	1MBI**UE-330	1200A 1500A	3300V	M156:AlSiC-baseplate 190 x 140 x 38mm 	
	1MBI1500UE-330B	1500A	3300V		

※1 “**” is rated current

Fuji IGBT modules for MV , SVG inverter

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AC output voltage	Inverter capacity (kVA)	Serial	Device rating	Device type	
				V series	X series
3.3 kV	350	4	1700V/100A	2MBI100VA-170-50	2MBI100XAA170-50
	500	4	1700V/150A	2MBI150VH-170-50	2MBI150XAA170-50 2MBI150XHA170-50
	700	4	1700V/200A	2MBI200VH-170-50	2MBI200XHA170-50
	1050	4	1700V/300A	2MBI300VN-170-50 2MBI300VX-170-50	2MBI300XNA170-50 2MBI300XNB170-50
	1350	4	1700V/450A	2MBI450VN-170-50 2MBI450VX-170-50	2MBI450XNA170-50 2MBI450XNB170-50
	1600	4	1700V/300A×2p	2MBI300VN-170-50 2MBI300VX-170-50	2MBI300XNA170-50 2MBI300XNB170-50
6.6 kV	720	8	1700V/100A	2MBI100VA-170-50	2MBI100XAA170-50
	1090	8	1700V/150A	2MBI150VH-170-50	2MBI150XAA170-50 2MBI150XHA170-50
	1450	8	1700V/200A	2MBI200VH-170-50	2MBI200XHA170-50
	2180	8	1700V/300A	2MBI300VN-170-50 2MBI300VX-170-50	2MBI300XNA170-50 2MBI300XNB170-50
	2900	8	1700V/450A	2MBI450VN-170-50 2MBI450VX-170-50	2MBI450XNA170-50 2MBI450XNB170-50
	3490	8	1700V/300A×2p	2MBI300VN-170-50 2MBI300VX-170-50	2MBI300XNA170-50 2MBI300XNB170-50
10 kV	1200	12	1700V/100A	2MBI100VA-170-50	2MBI100XAA170-50
	1800	12	1700V/150A	2MBI150VH-170-50	2MBI150XHA170-50 2MBI150XAA170-50
	2400	12	1700V/200A	2MBI200VH-170-50	2MBI200XHA170-50
	3600	12	1700V/300A	2MBI300VN-170-50 2MBI300VX-170-50	2MBI300XNA170-50 2MBI300XNB170-50
	4800	12	1700V/450A	2MBI450VN-170-50 2MBI450VX-170-50	2MBI450XNA170-50 2MBI450XNB170-50
	5800	12	1700V/300A×2p	2MBI300VN-170-50 2MBI300VX-170-50	2MBI300XNA170-50 2MBI300XNB170-50

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Introduction of GDU for MV , SVG inverter (V_{CES} = 1700V)

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TAMURA
https://www.tamuracorp.com/electronics/en/

I_C rating (A)	IGBT part No.	Driver part No.
75	2MBI75VA-170-50	2DMB51008CC
100	2MBI100VA-170-50	
150	2MBI150VH-170-50	
200	2MBI200VH-170-50	
225	2MBI225XNA170-50	2DUC51008CXE1
300	2MBI300VN-170-50	
	2MBI300XNA170-50	
450	2MBI450VN-170-50	
	2MBI450XNA170-50	
550	2MBI550VN-170-50	

power integrations
http://igbt-driver.com/

I_C rating (A)	IGBT part No.	Driver part No.	"xx" (driver version)
300	2MBI300VN-170-50	2SP0115T2xx -2MBI300VN-170-50	A0, A0C, B0, B0C
450	2MBI450VN-170-50	2SP0115T2xx -2MBI450VN-170-50	
550	2MBI550VN-170-50	2SP0115T2xx -2MBI550VN-170-50	

IDC ISAHAYA ELECTRONICS
http://www.idc-com.co.jp/

I_C rating (A)	IGBT part No.	Driver part No.		
		Hybrid IC type	Mounted unit type	Mounted unit type with clamp circuit
75	2MBI75VA-170-50	VLA546, VLA551K, VLA597	-	-
100	2MBI100VA-170-50	VLA546, VLA551K, VLA597	-	-
150	2MBI150VH-170-50	VLA546, VLA551K, VLA597	-	-
200	2MBI200VH-170-50	VLA546, VLA551K, VLA597	-	-
300	2MBI300VN-170-50	VLA546, VLA551K, VLA597	VLA598-01R	VLA598-11R
450	2MBI450VN-170-50	VLA574, VLA500K, VLA597	VLA598-01R	VLA598-11R

Introduction of Snubber capacitors

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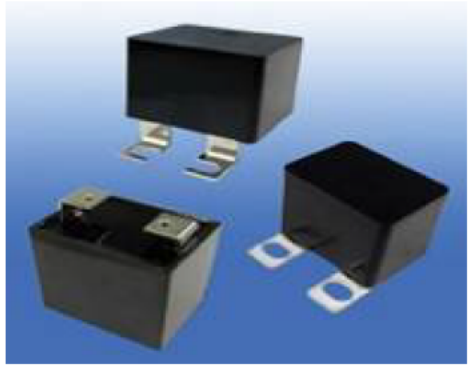
$$C_S = \frac{L * I_o^2}{(V_{CEP} - E_d)^2}$$

L: Main circuit wiring parasitic inductance
I_o: Collector current at IGBT turn-off
V_{CEP}: Snubber capacitor peak voltage
E_d: DC supply voltage



Module rating		DC line inductance	snubber capacitance
V_{CES}	I_c		
1200V/1700V	100A	0.2 μH	0.47 μF
	300A	0.1 μH	3.3 μF
	450A	0.08 μH	4.7 μF
	1000A	0.07 μH	6.8 μF
	1400A	0.06 μH	12 μF