



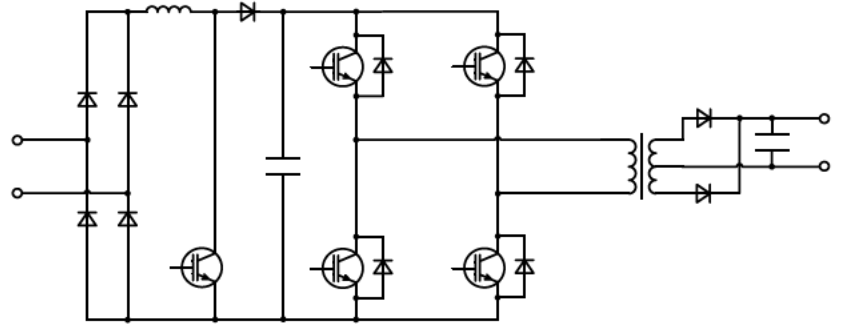
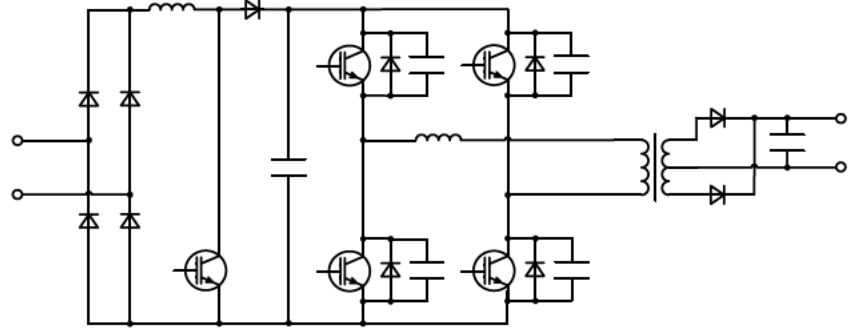
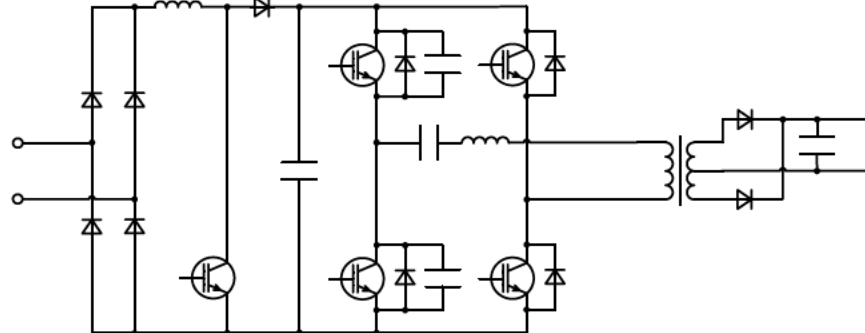
# Fuji IGBT Modules for Welding machine

2021.12

Device Application Technology Dept.  
Sales Division  
Semiconductors Business Group

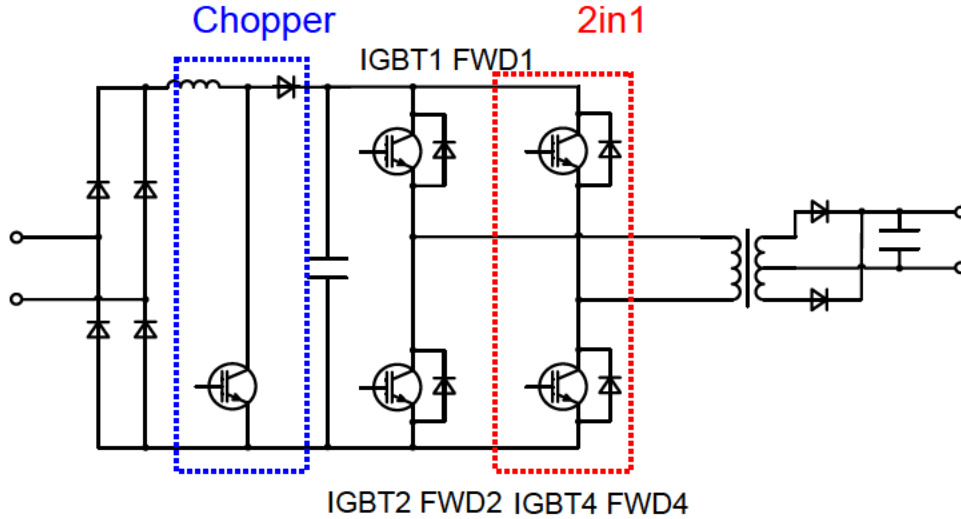
- **Topology in Welding machine**
- Fuji's solutions for Welding machine
- Introduction of Gate Driver Unit (GDU)

# Topology in Welding machine

	Topology (example)	Feature
<p>Hard switching type</p>		<ul style="list-style-type: none"> <li>• Duty control method</li> <li>• IGBT: small turn on and large turn off loss</li> <li>• FWD: small reverse recovery loss</li> </ul>
<p>Soft switching type (ZVS)</p>		<ul style="list-style-type: none"> <li>• IGBT: zero voltage switching at turn on, and hard switching at turn off.</li> <li>• FWD: small reverse recovery loss</li> </ul>
<p>Soft switching Type (ZVZCS)</p>		<ul style="list-style-type: none"> <li>• IGBT: zero voltage zero current switching at turn on, and hard switching at turn off.</li> <li>• FWD: small reverse recovery loss</li> </ul>

# Topology in Welding machine

## ■ Topology (Hard switching type)



### • Chopper Module:

1MBI200HH-120L-50

1MBI300HH-120L-50

1MBI400HH-120L-50

### • H bridge (2in1)

2MBI100HB-120-50

2MBI200HH-120-50

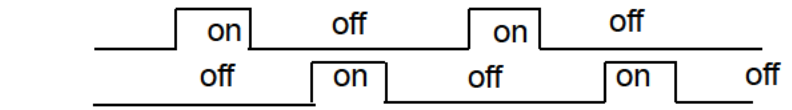
2MBI300HH-120-50

## ■ Feature:

- Duty control method
- IGBT: small turn on and large turn off loss (high speed IGBT is necessary.)
- FWD: small reverse recovery loss (high speed diode in 2in1 module is not necessary.)

IGBT1 gate

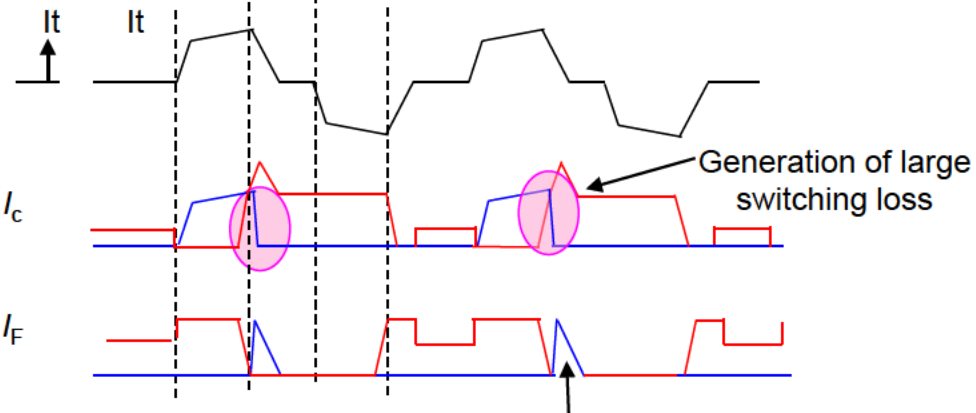
IGBT4 gate



$I_t$

IGBT1  $V_{CE}$ ,  $I_c$

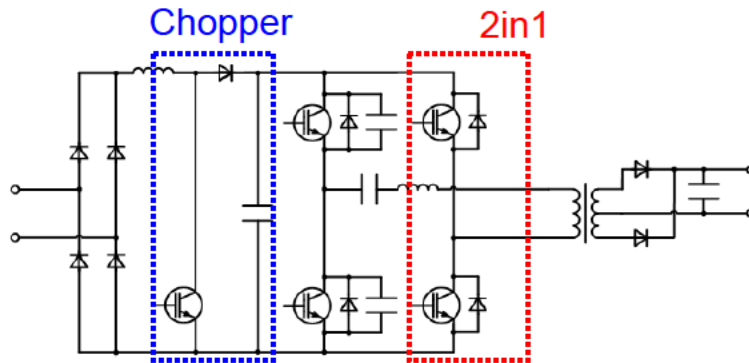
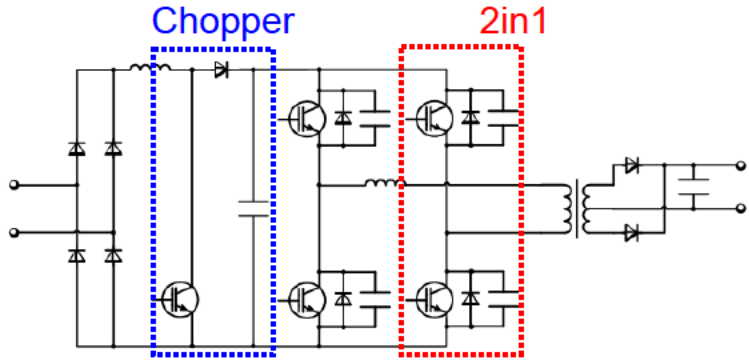
FWD4  $V_{AK}$ ,  $I_F$



FWD current is small and it is only leakage inductance energy.

# Topology in Welding machine

## ■ Topology (Soft switching type)



## ■ Feature:

- IGBT: zero voltage switching at turn on, and hard switching at turn off. (high speed IGBT is necessary.)
- FWD: small reverse recovery loss  
(high speed diode in 2in1 module is not necessary.)

### • Chopper Module:

1MBI200HH-120L-50

1MBI300HH-120L-50

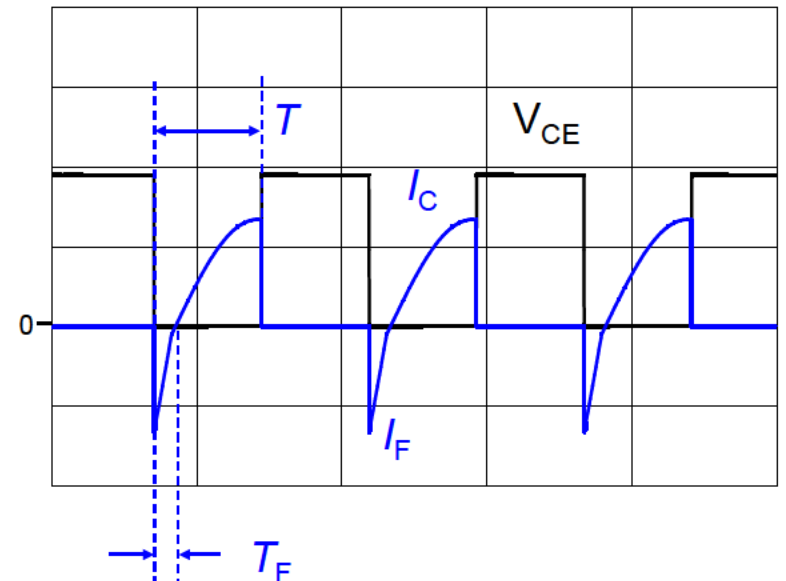
1MBI400HH-120L-50

### • H bridge (2in1)

2MBI100HB-120-50

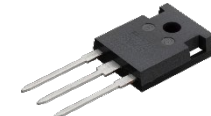
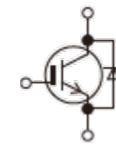


2MBI200HH-120-50

2MBI300HH-120-50




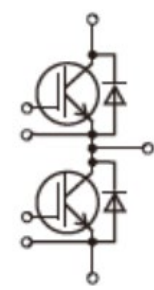


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# Fuji Discrete IGBTs for Welding machine – XS series


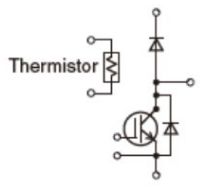
	Device type <sup>※1</sup>	Current	Voltage	Package	Equivalent circuit
XS series	FGW**XS65C	30A 40A 50A 75A	650V	TO-247 	
	FGW**XS65D	50A 75A	650V		
	FGW**XS120C	40A 75A <sup>※2</sup>	1200V		
	FGZ75XS65C	75A	650V	TO-247-4 	

※1 “\*\*” is rated current.    ※2 Under development

# Fuji IGBT modules for Welding machine – 2in1, Chopper

	Device type <sup>※1</sup>	Current	Voltage	Package	Equivalent circuit
2in1	2MBI100HB-120-50	100A	1200V	M233:92 x 45 x 30 	
	2MBI**HH-120-50	150A 200A	1200V	M249:108 x 62 x 30 	
	2MBI**HJ-120-50	100A 150A 200A 300A	1200V	M276:108 x 62 x 30.5 	

※1 “\*\*\*” is rated current.

	Device type <sup>※1</sup>	Current	Voltage	Package	Equivalent circuit
Chopper	1MBI**HH-120L-50	200A 300A 400A	1200V	M249:108 x 62 x 30 	

※1 “\*\*\*” is rated current.



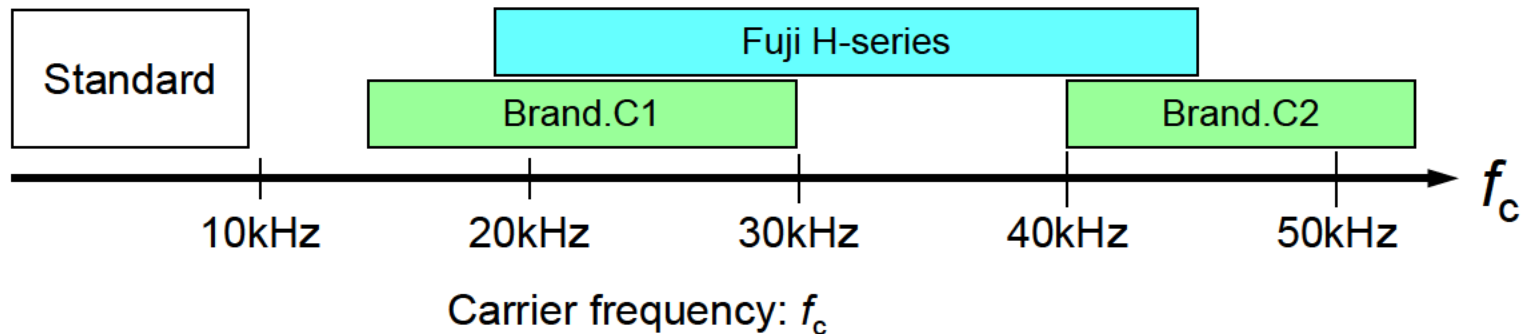
## ● High performance for high carrier frequency application

### ◆ Optimized design for $f_c = 20 \sim 50\text{kHz}$

Lower switching loss, lower surge voltage

### ◆ Low thermal impedance package

New  $\text{Si}_3\text{N}_4$ -DCB substrate, RoHS package



## ● 2in1 module and Chopper module lineup

◆ 2in1 module: 1200V / 100A ~ 200A

◆ Chopper module: 1200V / 200A ~ 400A with NTC

# Fuji IGBT modules for Welding machine

**1/2 half-bridge - 2in1 module** ※only for soft turn on  
High-speed IGBT + Standard, small FWD

2MBI100HB-120-50 (1200V/100A Pkg: M233)

2MBI150HH-120-50 (1200V/150A Pkg: M249)

2MBI200HH-120-50 (1200V/200A Pkg: M249)

**PFC – Chopper module + NTC**

High-speed IGBT + High speed diode + NTC

1MBI200HH-120L-50 (1200V/200A Pkg: M249)

1MBI300HH-120L-50 (1200V/300A Pkg: M249)

1MBI400HH-120L-50 (1200V/400A Pkg: M249)

RoHS, SiN-DBC

M233  
Size:92 x 45 x 30 mm



M249  
Size:108 x 62 x 30 mm



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<http://www.idc-com.co.jp/>

$I_c$ rating (A)	IGBT part No.	Driver part No.
100	2MBI100HB-120-50	VLA513, VLA502
150	2MBI150HH-120-50	
200	2MBI200HH-120-50	
200	1MBI200HH-120L-50	
300	1MBI300HH-120L-50	
400	1MBI400HH-120L-50	



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