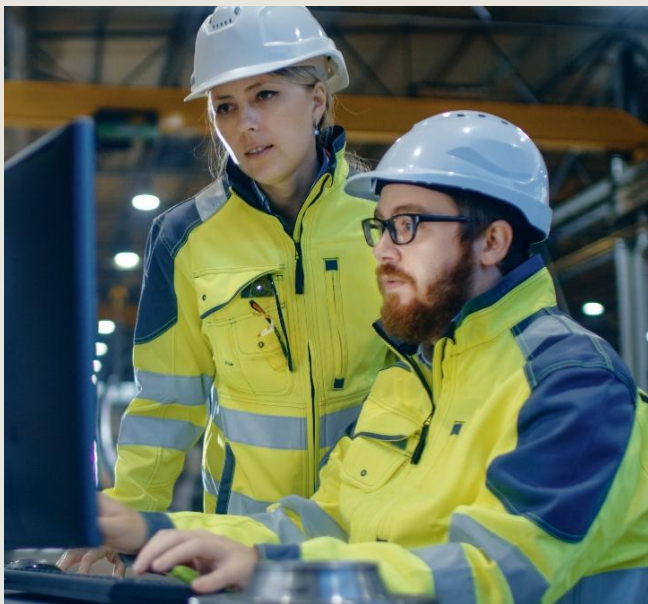


X-Series: High-Voltage IGBT and Diode Modules

Industry-Leading Power and Operating Temperature Range











High-voltage modules are essential for power systems that require large capacity, high reliability and maximum efficiency. Mitsubishi Electric's first HVIGBT module, which was commercialized in 1997, enabled the development of larger capacity and smaller sized high-voltage converter systems. The X Series HVIGBT modules feature 7th-generation Insulated Gate Bipolar Transistors (IGBT) and Relaxed Field of Cathode (RFC) diodes.



Besides state-of-the-art chip technology, the new X Series std. type offers three package footprints. A small 73 mm x 140 mm and a medium 130 mm x 140 mm package allowing compact converter designs while a 190 mm x 140mm package achieves higher output currents up to 2400 A. As key technologies the X Series provides a 1.5-times higher current rating than H Series and, as world's first for the 6.5 kV class, 150°C maximal operational junction temperature.

Product Advantages

- ❑ Power loss reduced by incorporating 7th-generation IGBT and RFC diode
- ❑ Current rating increased by 50 % compared to conventional package
- ❑ Latest package technology enhances power cycle lifetime
- ❑ Package compatible to previous H and R series for simplified design and easy replacement
- ❑ High robustness and 150 °C maximal operation temperature

Circuit Diagram	Package	1700V	3300V	4500V	6500V
 $V_{iso} = 6kV$	 $V_{iso} = 6kV$	CM2400HCB-34X 2400 A	CM1800HC-66X 1800 A CM1500HC-66XB 1500 A CM1200HC-66X 1200 A	CM1500HC-90XA 1500 A CM1350HC-90X 1350 A CM1200HC-90XB 1200 A	
	 $V_{iso} = 6kV$	CM2400HC-34X 2400 A	CM1200HC-66X 1200 A	CM900HC-90X 900 A	
	 $V_{iso} = 10.2kV$		CM1800HG-66X 1800 A	CM1500HG-90X 1500 A CM1350HG-90X 1350 A CM1200HG-90XB 1200 A	CM1000HG-130XA 1000 A CM900HG-130X 900 A CM750HG-130XB 750 A
	 $V_{iso} = 10.2kV$			CM1000HG-90X 1000 A CM900HG-90X 900 A	CM600HG-130X 600 A
	 $V_{iso} = 10.2kV$		CM400HG-66X 400 A		
 $V_{iso} = 6kV$	 $V_{iso} = 6kV$	RM1800HE-34X 1800 A	RM1500HE-66X 1500 A		
	 $V_{iso} = 6kV$		RM600DC-66X 600 A RM1200DC-66X 1200 A	RM750DC-90X 750 A	
	 $V_{iso} = 10.2kV$		RM1200DG-66X 1200 A	RM450DG-90X 450 A RM900DG-90X 900 A RM1500DG-90X 1500 A	RM300DG-130X 300 A RM450DG-130X 450 A RM600DG-130X 600 A RM1000DG-130XA 1000 A

Chip Technology

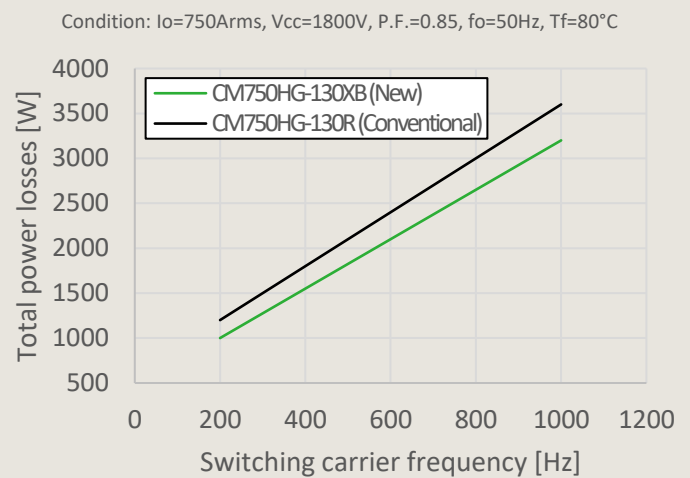
The 7th-generation trench-gate IGBT with carrier-store effect (CSTBT™) and RFC diode reduce the power loss by about 20 %. This leads to either a higher output power or a more compact converter through higher switching frequency. Moreover, the optimized edge termination structure LNFLR (Linearly-Narrowed Field Limiting Ring) allows an increased active chip area of 28 % compared to previous product. Furthermore, as first in the world, Mitsubishi Electric has achieved 150 °C operational junction temperature for the 6.5 kV class.

For applications demanding higher switching speed, the lineup was expanded with XB-Series of HV-IGBT modules. Leveraging the same 7th-generation CSTBT™ and RFC diode chips, the XB-Series achieves about 15 % lower total power losses compared to the previous R-Series, enabling efficient operation at increased switching frequencies. The XB-Series is already in mass production, complementing the existing product line as a readily available solution.



Compared to previous product*, active chip area is increased 28% by optimizing edge termination.

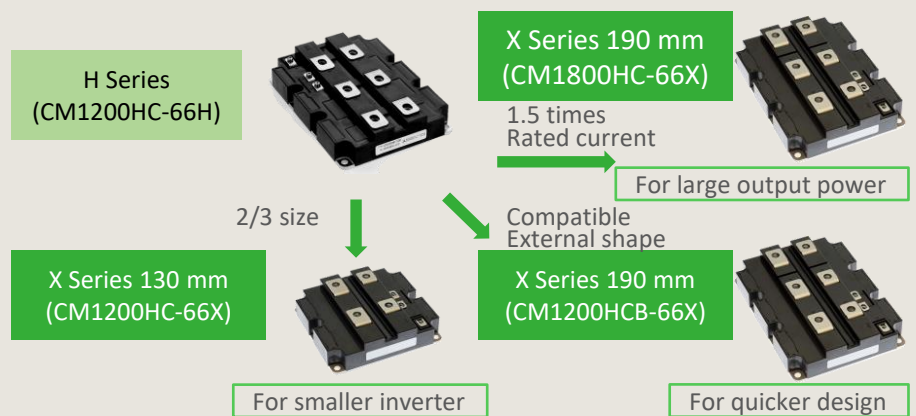
* CM750HG-130R



Package Technology

The X Series delivers 50% higher output current in the same footprint as the H Series, thanks to improved chip design and packaging. Thermal resistance is reduced by 28%, and enhanced materials and wire bonding increase power cycling lifetime.

It comes in two sizes (130×140 mm and 190×140 mm). The larger package provides 50% more current than the H Series, while the smaller package now matches the H Series' large-package current — enabling more compact, cost-effective designs. A compatible large-package version ("X Series 190mm") is also available for easy upgrades.



** CM1000HG-130XA vs. CM600HG-130H

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