



7th Generation X series

Very high power density and reliability



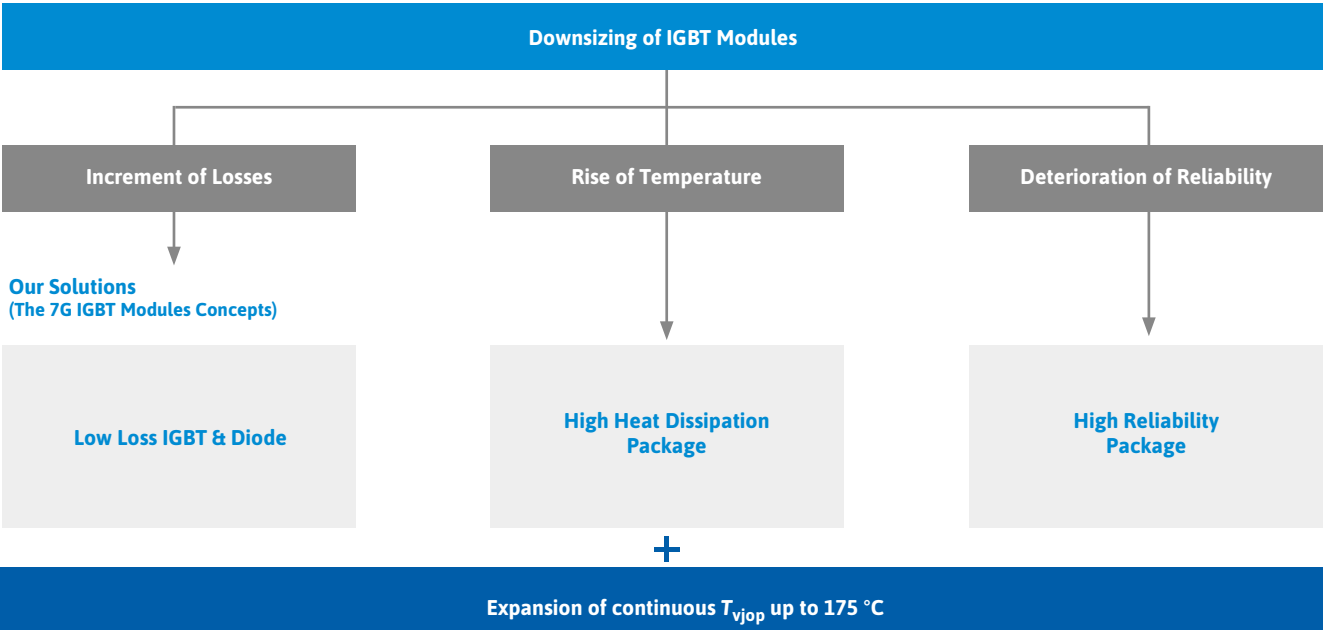
A Power Conversion system has been continuously required to provide compact form factor, better efficiency, lower power dissipation, high reliability.

Fuji Electric introduced the 7th Generation “X series” (7G) IGBT modules which have reduced loss of 10% by improving the semiconductor chips – both IGBT and FWD – characteristics, have enhanced the package capability to carry higher current by a new structure, upgraded the ability to dissipate the power losses by using lower R_{th} materials, improved isolation performance by the use of new silicon gel, while guaranteeing a high reliability / ΔT_{vj} power cycling capability over the entire operating temperature range up to 175 °C.

7G X series More power, lower losses

FEATURES

- ▶ 7G IGBT & FWD
- ▶ New internal layout
- ▶ Higher reliability
- ▶ Improved silicone gel
- ▶ Solder or press fit pins
- ▶ Advanced bond wire design
- ▶ High thermal conductive ceramic substrate
- ▶ Package material with CTI > 600
- ▶ $V_{iso} = 4 \text{ kV}$
- ▶ Lower $V_{CE(sat)}$
- ▶ Lower Voltage Overshoot
- ▶ Less oscillation / Less EMC issues



In 7G “X series” IGBT improvement of $V_{CE(sat)}$ by 0.4 V has been achieved by reducing the thickness of the drift layer as well as to reduce the pitch between trenches. Besides that the field stop layer has been improved to sustain the high breakdown voltage and to reduce the amount of leakage current. On FWD side the reduction of the drift layer thickness leads to a lower forward voltage drop of the diode. By improving the local lifetime control area the diode is now working softer during Reverse Recovery, and by optimizing the backside n+ layer the oscillation has been removed. Compared to previous generation, the 7G modules achieved a loss reduction of about 10% total. The new semiconductors, both IGBT and FWD, are able to work at T_{vjmax} of 175 °C providing a wider operative margin to the final application.

A new package technology has been used in the development and manufacturing of the “7G X series” DualXT modules (M285, M286). The use of a new high thermal conductive AlN substrate permitted to reduce the R_{th} of about 45 % compared to conventional Al_2O_3 material. The new packages are also using copper wiring on the main power circuit that permitted to reduce the heat generation inside the module. The thickness of the output terminal has been increased to 2 mm to sustain the highest current maintaining the temperature at a low level. The more homogeneous crystal structure of the new solder material used in 7G modules is reducing the potential cracking issues. The new silicon gel maintain its elasticity even at very high temperature and guarantee more than 10 years of life expectancy. The combination of 7G new semiconductors and packaging permitted to increase the power density of the module without reducing its long term reliability / power cycling capability at high operative temperatures.

Line-up				
	650V	10A – 150A		
	1200V	10A – 150A		
	650V	100A – 250A* *250A with Xseries RC-IGBT		
	1200V			
	650V	150A – 600A		
	1200V	100A – 2400A *2400A with Xseries RC-IGBT		
	1700V	75A – 2400A *2400A with Xseries RC-IGBT		
	3300V	450A - 600A* * under development		

Note 1: PrimePACK™ is registered trademark of Infineon Technologies AG, Germany.