The new Mitsubishi Electric 7th Generation Standard-Type IGBTs for 650V, 1200V and 1700V have been developed for the purpose of highest power density inverters and best-in-class thermal behavior. The new 7th Generation CSTBT and diode chip set provides high efficiency by reducing both dynamic and static losses. The innovative TMS packaging technology provides very low thermal impedance, low package inductance and high thermal cycling capacity. The new Mitsubishi Standard-Type modules facilitate a high performance and reliability and compact inverter design.

The well established 34mm and 62mm package styles greatly simplify the design of medium power inverters for various applications like industrial drives, wind power, solar power and UPS. The newly introduced 48mm package for 300A and 400A rated currents enables a more compact inverter size than with comparable modules in 62mm outline.

The 62mm package is a defacto standard in the market since many years. The 7th Generation extends the rated current range of this 62mm standard package, pushing its limits from previously 450A/1200V to 600A/1200V. This gives advantages in terms of operational inverter power, efficiency, reliability and even switching frequency.

### Product Advantages
- Low-loss 7th generation CSTBT™
- Low package inductance
- Low internal electrical resistance
- High thermal conductivity
- Compact size
- Wide power range
- Light weight

### User benefits

<table>
<thead>
<tr>
<th>Achieved by</th>
<th>User benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>High thermal cycling capability by new TMS-Technology</td>
<td>Extended module life time</td>
</tr>
<tr>
<td>Reduced &quot;pump-out&quot;-effect by symmetric TMS construction</td>
<td></td>
</tr>
<tr>
<td>PC-TIM (pre-applied Phase Change Thermal Interface Material)</td>
<td>Reduction of assembly costs</td>
</tr>
<tr>
<td>Production lot-independent paralleling capability</td>
<td></td>
</tr>
<tr>
<td>Low loss 7th gen. Chipset</td>
<td>Increased power density for</td>
</tr>
<tr>
<td>Increased active area by common substrate layer</td>
<td>- less cooling effort</td>
</tr>
<tr>
<td>Low thermal resistance $R_{th(j-c)}$</td>
<td>- higher load conditions</td>
</tr>
<tr>
<td>Low losses by reduced package inductance due to laminated main terminals</td>
<td></td>
</tr>
<tr>
<td>Full power rating line-up of 650V and 1200V modules up to 600A</td>
<td>Scalable platform concepts</td>
</tr>
</tbody>
</table>

### Circuit Topology

<table>
<thead>
<tr>
<th>2in1 IGBT</th>
<th>2in1 AC switch</th>
<th>2in1 Diode</th>
</tr>
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<tbody>
<tr>
<td><strong>D</strong></td>
<td><strong>C1</strong></td>
<td><strong>D</strong></td>
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</table>

### Package outline

<table>
<thead>
<tr>
<th>Package size</th>
<th>650V</th>
<th>1200V</th>
<th>1700V</th>
</tr>
</thead>
<tbody>
<tr>
<td>34mm x 94mm</td>
<td>100A</td>
<td>100A</td>
<td>75A</td>
</tr>
<tr>
<td></td>
<td>150A</td>
<td>150A</td>
<td>100A</td>
</tr>
<tr>
<td>48mm x 94mm</td>
<td>200A</td>
<td>200A</td>
<td>150A</td>
</tr>
<tr>
<td></td>
<td>300A</td>
<td>300A</td>
<td>200A</td>
</tr>
<tr>
<td>62mm x 108mm</td>
<td>400A</td>
<td>450A</td>
<td>300A</td>
</tr>
<tr>
<td></td>
<td>600A</td>
<td>600A</td>
<td>400A</td>
</tr>
<tr>
<td></td>
<td>600A</td>
<td>600A</td>
<td>800A</td>
</tr>
</tbody>
</table>
TMS (Thick-Metal-Substrate)-Technology

The newly introduced TMS-Technology is a packaging technology developed for realizing low inductance and very high thermal conductivity. Instead of the conventional package structure with several ceramic substrates soldered to a copper baseplate, the Thick-Metal-Substrate contains a high thermal conductive silicon nitride ceramic with thick copper layers brazed directly to the top and bottom sides. The thick copper layer underneath the IGBT chip provides low lead resistance and thus allows a higher current density. At the same time, it enables a better heat spreading directly next to the chip. This, in combination with the elimination of the substrate solder, means that both the thermal resistance and temperature cycling capacity are improved. The symmetrically stacked structure of the TMS-Technology prevents the typical bending of baseplates in operation. This improves the thermal interface between the module and the heatsink. Finally the total thermal resistance from junction to heatsink is reduced by more than half compared to conventional modules.

The TMS contains one common substrate instead of multi substrate arrangements as used in conventional modules. This expands the effective mounting area for chips and by eliminating wire bond interconnections - the internal stray inductance and lead resistance are reduced.

The main terminals are connected to the TMS by laminated internal bus bar with increased laminated area and ultrasonic bonding. This reduces the package inductance by 30% and contributes to low lead resistance.

User-friendly by PC-TIM

The Standard-Type of 7th Generation IGBT modules is also available with Pre-applied Phase Change Thermal Interface Material (PC-TIM). The structure and consistency of Mitsubishi PC-TIM compliments the advantages of TMS-technology and removes the need for applying thermal grease. By PC-TIM a very low thermal contact resistance is achieved. This feature enables a highly reliable mounting process even in harsh environments and easy maintenance in the field.

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