OSPREY CE ALLOYS
FOR THERMAL MANAGEMENT

Lightweight Controlled Expansion
Silicon Aluminium Alloys
Sandvik Osprey offers a family of lightweight, controlled expansion, Si/Al alloys in the form of machined carriers and housings. Package manufacture, including feedthroughs, can be arranged via partner companies.

Typical uses include high performance device, circuit and system level packages for applications in defence, aerospace, space, communications, radar and other leading-edge industries.

The materials are produced using Sandvik Osprey’s patented rapid solidification spray forming technology, which has been used for the manufacture of many advanced materials over the past 25 years.

PROPERTIES

LOW EXPANSION
CTE from 7ppm/°C to 17ppm/°C

LIGHTWEIGHT
Up to 10% lighter than pure aluminium

HIGH THERMAL CONDUCTIVITY
Up to 180W/mK

ELECTRICALLY CONDUCTIVE
Excellent EMI/RFI shielding characteristics

HIGH STIFFNESS VALUES
Specific stiffness up to 54GPa.cm³/g

EXCELLENT THERMO-MECHANICAL STABILITY
Up to 500°C

FULLY DENSE, HERMETIC
Leak rates of less than 1x10⁻⁹ atm-cm³/sec of He

MANUFACTURING

READYLY MACHINABLE
Carbide or diamond tools

LOW COST, PROTOTYPE COMPONENTS
No dies required

SHORT LEAD TIMES
Typically 1-5 weeks depending on complexity

ENVIRONMENTALLY FRIENDLY
Non-toxic materials

READYLY PLATEABLE
Nickel, gold, silver, tin, etc.

STANDARD MICROELECTRONIC ASSEMBLY
Adhesives, solders, wire and ribbon bonding, laser welding

LOW COST, LIGHTWEIGHT ALTERNATIVES TO Cu/W, Cu/Mo, AlSiC, Ti or KOVAR
Typical Applications

**MICROWAVE/RF HOUSINGS**
- HERMETIC PACKAGES
- POWER BASEPLATES
- CARRIERS

**METAL-CLAD PCBS**
- PCB GUIDE BARS
- ASSEMBLY FIXTURES FOR SOLDERING
- STRUCTURAL COMPONENTS

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**CE11 Prototype Housing**
replacing Ti/Mo-Cu in hermetic aerospace product
(Raytheon/Pacific Aerospace)

**CE17M Guide Bars**
replacing W-Cu in PCBs
(Radstone Technology)

**CE7 Carrier**
replacing W-Cu in lightweight gas sensor
(Proengin)

**CE7 Optical Housing**
for aerospace application

**CE7 Hermetic Ka Band Amplifier**
for satellite application
(Tyco M/A-COM)

**CE11 Hermetic Ka Band Amplifier**
for satellite application
(Tyco M/A-COM)

**CE7 replacing W-Cu for low-cost 40GBit/s transmit module**
(C-MAC)

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**CE7 Clad PCB for base-station application**

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**CE13 Housing**
replacing Kovar for radar application
(Ericsson Microwave)
Mechanical/Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>CE7</th>
<th>CE9</th>
<th>CE11</th>
<th>CE13</th>
<th>CE17</th>
<th>CE17M</th>
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</thead>
<tbody>
<tr>
<td>% Si CONTENT</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>42</td>
<td>27</td>
<td>27</td>
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<tr>
<td>DENSITY g/cm³</td>
<td>2.40</td>
<td>2.45</td>
<td>2.50</td>
<td>2.55</td>
<td>2.60</td>
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<tr>
<td>TENSILE STRENGTH MPa</td>
<td>100</td>
<td>134</td>
<td>138</td>
<td>176</td>
<td>236</td>
<td>380</td>
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<tr>
<td>YIELD STRENGTH MPa</td>
<td>100</td>
<td>134</td>
<td>125</td>
<td>155</td>
<td>183</td>
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<tr>
<td>BEND STRENGTH MPa</td>
<td>143</td>
<td>140</td>
<td>172</td>
<td>213</td>
<td>210</td>
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<tr>
<td>ELASTIC MODULUS GPa</td>
<td>129</td>
<td>124</td>
<td>121</td>
<td>107</td>
<td>92</td>
<td>92</td>
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<tr>
<td>RIGIDITY MODULUS GPa</td>
<td>51</td>
<td>49</td>
<td>49</td>
<td>42</td>
<td>36</td>
<td>36</td>
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<tr>
<td>POISSON'S RATIO</td>
<td>0.26</td>
<td>0.25</td>
<td>0.25</td>
<td>0.27</td>
<td>0.28</td>
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</table>

Coefficient of Thermal Expansion ppm/°C

<table>
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<tr>
<th>TEMPERATURE RANGE °C</th>
<th>CE7</th>
<th>CE9</th>
<th>CE11</th>
<th>CE13</th>
<th>CE17</th>
<th>CE17M</th>
</tr>
</thead>
<tbody>
<tr>
<td>-60 to 200</td>
<td>7.6</td>
<td>-</td>
<td>11.6</td>
<td>-</td>
<td>-</td>
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<tr>
<td>25 to 100</td>
<td>7.4</td>
<td>9.0</td>
<td>11.0</td>
<td>12.8</td>
<td>16.0</td>
<td>16.0</td>
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<tr>
<td>25 to 200</td>
<td>8.3</td>
<td>9.9</td>
<td>12.7</td>
<td>13.6</td>
<td>17.0</td>
<td>17.0</td>
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<tr>
<td>25 to 300</td>
<td>8.5</td>
<td>10.5</td>
<td>13.1</td>
<td>14.4</td>
<td>17.7</td>
<td>17.7</td>
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<tr>
<td>25 to 400</td>
<td>8.2</td>
<td>10.8</td>
<td>13.7</td>
<td>15.0</td>
<td>17.5</td>
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<tr>
<td>25 to 500</td>
<td>7.7</td>
<td>10.1</td>
<td>14.4</td>
<td>16.2</td>
<td>16.8</td>
<td>16.8</td>
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</table>

Thermal Conductivity W/ mK

<table>
<thead>
<tr>
<th>TEMPERATURE °C</th>
<th>CE7</th>
<th>CE9</th>
<th>CE11</th>
<th>CE13</th>
<th>CE17</th>
<th>CE17M</th>
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</thead>
<tbody>
<tr>
<td>-100</td>
<td>180</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>-50</td>
<td>140</td>
<td>-</td>
<td>-</td>
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<td>0</td>
<td>125</td>
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<tr>
<td>25</td>
<td>120</td>
<td>129</td>
<td>149</td>
<td>160</td>
<td>177</td>
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<tr>
<td>100</td>
<td>110</td>
<td>125</td>
<td>132</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>200</td>
<td>100</td>
<td>108</td>
<td>122</td>
<td>-</td>
<td>151</td>
<td>147</td>
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</table>

Values above are for guidance only and the suitability of a material for a specific application can be confirmed only when we know the actual service conditions. Continuous development may necessitate changes in technical data without notice.

Sandvik Osprey is a part of Sandvik Materials Technology, one of three business areas within the Sandvik Group - a high technology engineering organisation with 40,000 employees in 130 countries and annual sales of approximately $10B.

Sandvik offers advanced products and world-leading positions in selected areas such as special alloys, tools for metalworking, and machinery and tools for rock excavation.

SMT has a global presence and is a leading multi-national high technology manufacturer, offering speciality stainless steels, medical alloys and other advanced alloys and products.

For more details about CE Alloys:
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