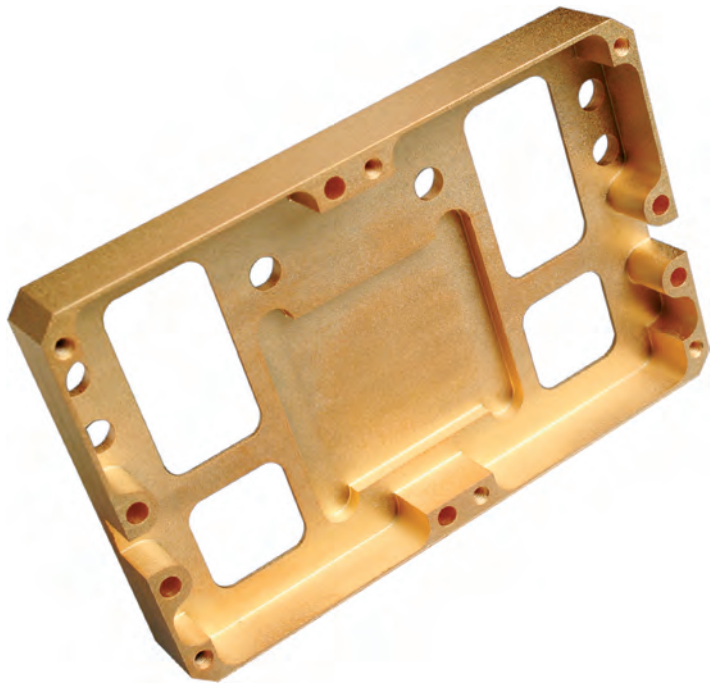




# **OSPREY **CE** ALLOYS FOR THERMAL MANAGEMENT**



***Lightweight **CE** Expansion  
Silicon Aluminium Alloys***

# Osprey CE Alloys

**Sandvik Osprey** offers a family of lightweight, controlled expansion, Si/Al alloys in the form of blocks, plates, 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.cm<sup>3</sup>/g

### EXCELLENT THERMO-MECHANICAL STABILITY

Up to 500°C

### FULLY DENSE, HERMETIC

Leak rates of less than 1x10<sup>-9</sup> atm-cm<sup>3</sup>/sec of He

## MANUFACTURING

### READILY MACHINABLE

Carbide or diamond tools

### LOW COST, PROTOTYPE COMPONENTS

No dies required

### SHORT LEAD TIMES

Typically 1-5 weeks depending on complexity

### ENVIRONMENTALLY FRIENDLY

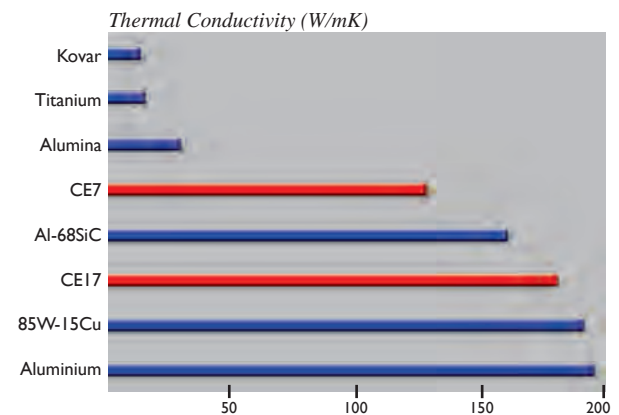
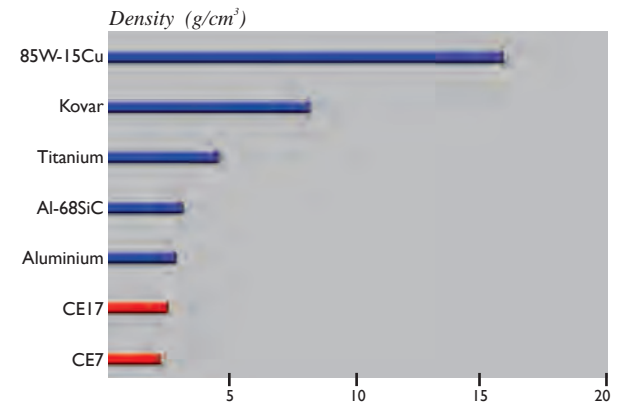
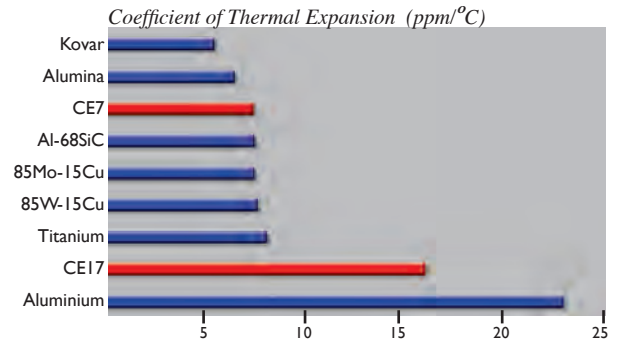
Non-toxic materials

### READILY PLATEABLE

Nickel, gold, silver, tin, etc.

### STANDARD MICROELECTRONIC ASSEMBLY

Adhesives, solders, wire and ribbon bonding, laser welding



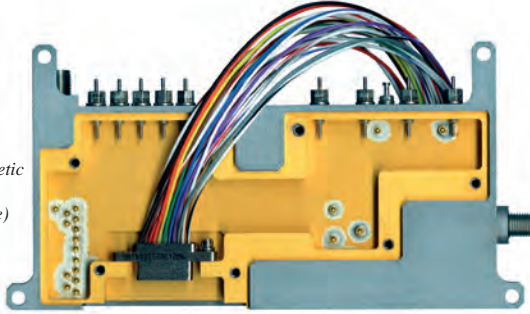
LOW COST, LIGHTWEIGHT ALTERNATIVES TO Cu/W, Cu/Mo, AlSiC, Ti or KOVAR

# Typical Applications

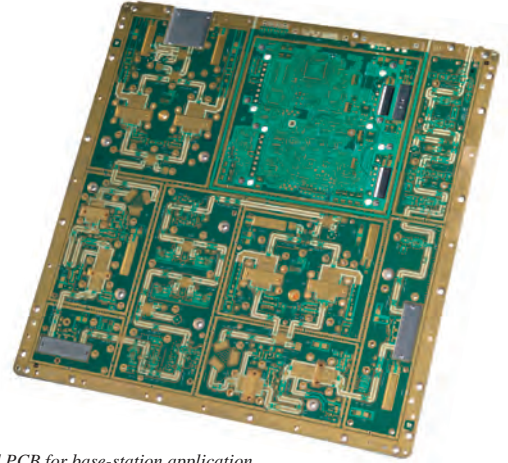
MICROWAVE/RF HOUSINGS  
HERMETIC PACKAGES  
POWER BASEPLATES  
CARRIERS

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

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



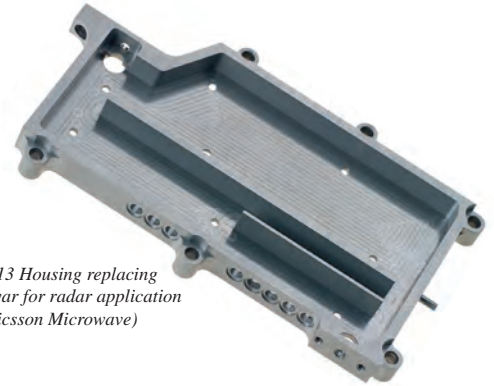
*CE17-clad PCB for base-station application*



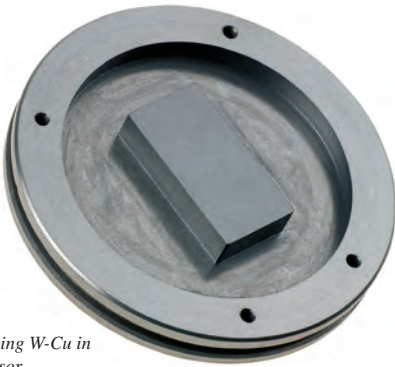
*CE17M Guide Bars replacing W-Cu in PCBs (Radstone Technology)*



*CE13 Housing replacing Kovar for radar application (Ericsson Microwave)*



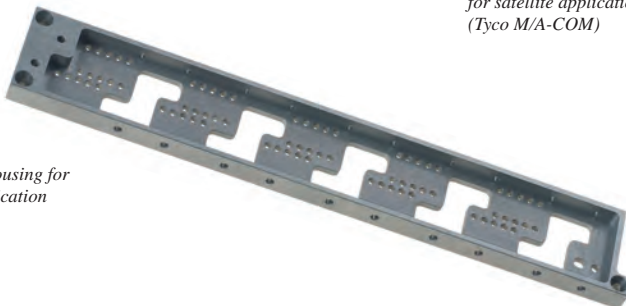
*CE7 Carrier replacing W-Cu in lightweight gas sensor (Proengin)*



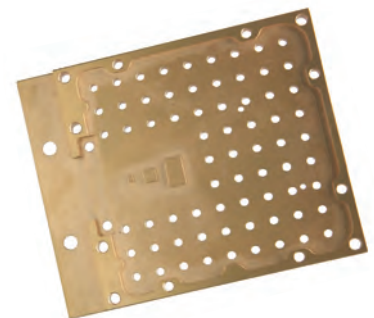
*CE11 Hermetic Ka Band Amplifier for satellite application (Tyco M/A-COM)*



*CE7 Optical Housing for aerospace application*



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



Mechanical/Physical Properties

	CE6F	CE7F	CE9F	CE11F	CE13F	CE17F	CE17M
SI CONTENT %	80	70	60	50	42	27	27
DENSITY g/cm <sup>3</sup>	2.36	2.42	2.45	2.51	2.55	2.60	2.60
TENSILE STRENGTH MPa	-	100	181	193	205	236	380
YIELD STRENGTH MPa	-	-	-	189	147	183	-
BEND STRENGTH MPa	319	271	300	-	300	-	337
ELASTIC MODULUS GPa	142	129	124	121	102	92	92
RIGIDITY MODULUS GPa	-	51	49	48.6	42.4	35.8	35.8
POISSON'S RATIO	-	0.26	0.25	0.25	0.27	0.28	0.28

Coefficient of Thermal Expansion ppm/°C

TEMPERATURE RANGE °C	CE6F	CE7F	CE9F	CE11F	CE13F	CE17F	CE17M
-60 to 200	-	7.6	-	11.6	-	-	-
ROOM TEMPERATURE	6.1	7.2	9.1	11.4	12.2	15.3	15.3
25 to 200	6.7	8.3	10.2	12.3	13.7	17.1	17.1
25 to 300	7.0	8.8	10.9	12.9	14.6	18.1	18.1
24 to 400	7.1	9.2	11.3	13.4	15.2	18.7	18.7
25 to 500	6.7	9.4	11.4	13.7	15.5	19.0	19.0

Thermal Conductivity W/mK

TEMPERATURE °C	CE6F	CE7F	CE9F	CE11F	CE13F	CE17F	CE17M
-100	-	180	-	-	-	-	-
-50	-	140	-	-	-	-	-
0	-	125	-	-	-	-	-
25	100	120	129	149	160	177	147
100	-	110	125	132	-	-	-
200	-	100	108	122	-	151	147

*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 47,000 employees in 130 countries and annual sales of approximately \$13B.

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:*

**[www.smt.sandvik.com/osprey](http://www.smt.sandvik.com/osprey)**

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*For web sales of standard CE Alloy plates:*

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