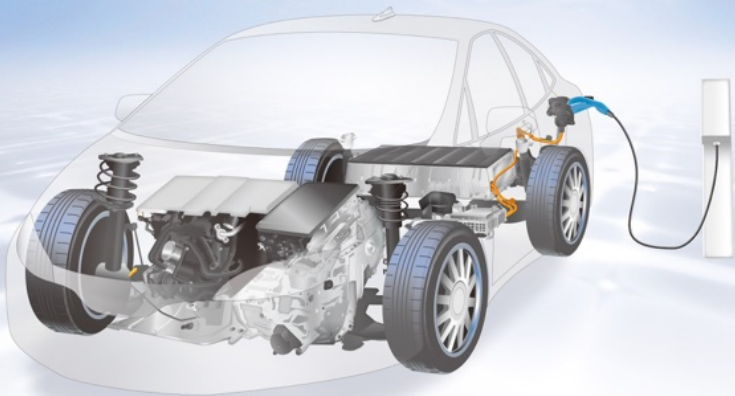
EV

Materials and technologies that respond to vehicle electrification

“熱マネジメントする”
“強電に応える”
“感じとる”
“支える”



つくる *Manufacturing*

よみがえる *Revival*

つかう *Use*

三菱マテリアルグループでは、電気自動車に関連した製品の「つくる」「つかう」「よみがえる」に貢献します。

Mitsubishi Materials Group contributes to the "Manufacturing", "Use", and "Revival" for sustainable EV society.

MITSUBISHI MATERIALS

電動化に応える材料・技術

Materials and technologies that respond to vehicle electrification

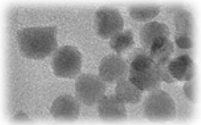
車両の電動化にともなって発生する、省エネ・軽量・低コスト・リサイクルなど、
三菱マテリアルグループではお客様のご要望に対して4つの技術分野でお応えします。

The Mitsubishi Materials Group responds to customer demands such as energy conservation, weight saving, cost reduction, and recycling that arise with the electrification of vehicles in the following four fields:

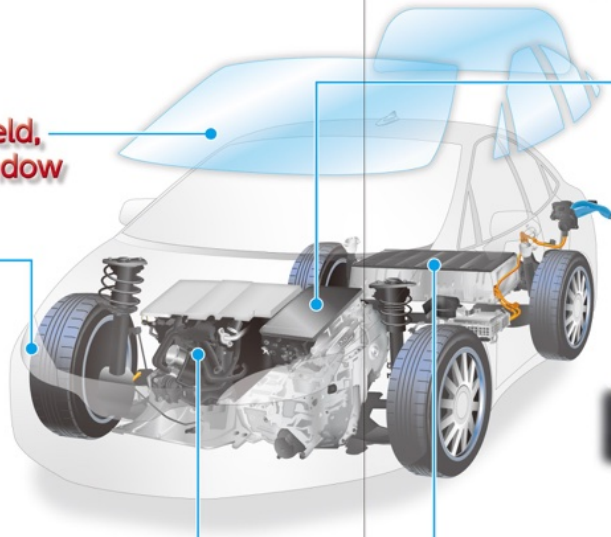
- “熱マネジメントする” *Applying thermal management*
- “強電に応える” *Responding to strong electric power*
- “感じとる” *Sensing with electronic devices*
- “支える” *Supporting EVs by EV key parts and tools for manufacturing.*

太陽光遮熱・通信電波透過・無色透明 ～ナノテクノロジー～

Colorless and transparent solar thermal barrier that doesn't interfere radio waves for today's wireless lifestyle - Nanotechnology utilization



Windshield, Side-Window



P12 LED用メタルベース基板 ～金属・樹脂複合化技術～

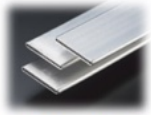
Development

Metal base substrate for LED -Metal / resin composite technology-

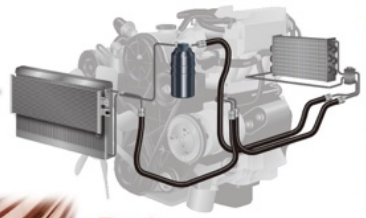
LED Head Light

P15 精密熱交換モジュール ～高精度アルミニウム押出多穴管と高品位モジュール化技術～

High precision Multi-Port Extrusion Aluminum Tube, and high quality module technique



Heat Exchanger



銅ホローコンダクタ冷媒用流路付導体

Copper Hollow Conductors
Electric motor cooling

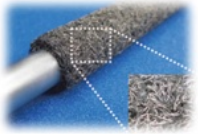
Engine

多孔質アルミニウム

Porous Aluminum

Development

For heat exchanger filtering device



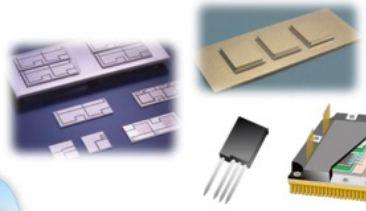
Hybridized Al Tube
Covered with Porous Al Layer

製品・技術取扱会社
Products and technology companies

- 三菱マテリアル(株) Mitsubishi Materials Corporation
- ルバタグループ Luvata Group
- 三菱マテリアル電子化成(株) Mitsubishi Materials Electronic Chemicals Co., Ltd.
- 三菱アルミニウム(株) Mitsubishi Aluminum Co., Ltd.

P11 パワーモジュール用 絶縁放熱部品

Power Electronic Insulating Substrates



P13 SiCパワー半導体/放熱基板接合

Development

Power semiconductor coating/bonding

Power Control Unit

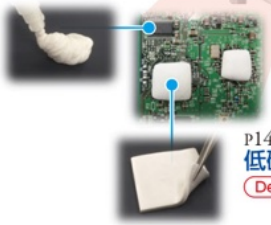
P11 パワーモジュール放熱板用銅材料

Copper plate for heat-sinks and heat-spreaders of power module

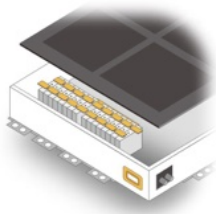
P14 低硬度伝熱材料

Development

Low hardness thermal interface materials (Heat transfer, Insulation, high adhesion, and Siloxane-free)



Battery Pack



絶縁伝熱パテ

Development

Insulated heat transfer putty-like material

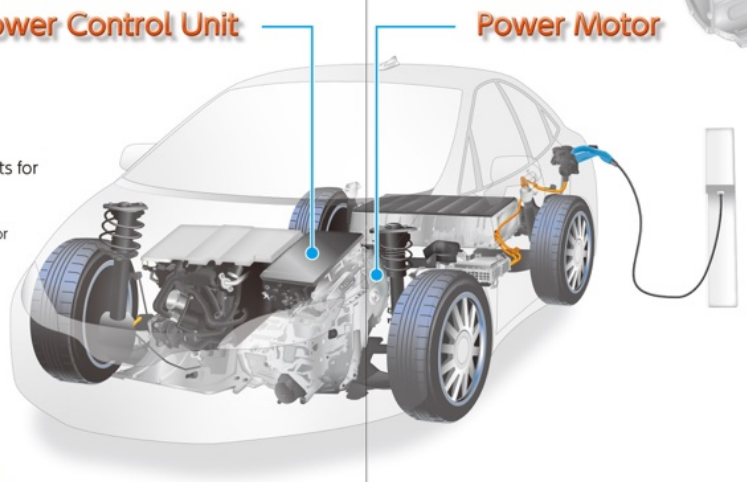
別紙: EV battery solutionに紹介

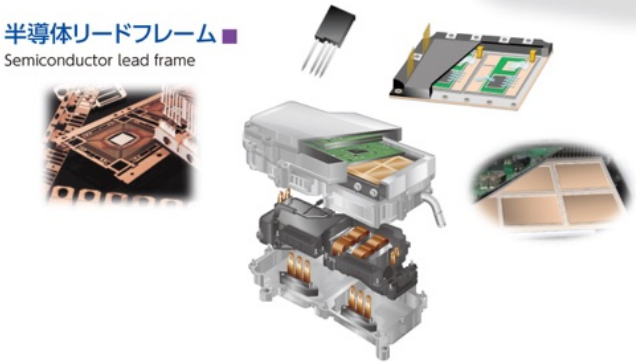
電動化に応える材料・技術

Materials and technologies that respond to vehicle electrification

躍進する車両電動パワー化やAD (Autonomous Driving) /
ADAS (Advanced Driver-Assistance Systems) などの高機能化によって発生する、
強電に応える基幹材料・部品・技術をご提供して行きます。

We will provide the core materials, parts and technologies that respond to the strong electric power generated by the advanced functions such as AD (Autonomous Driving) / ADAS (Advanced Driver-Assistance Systems).





製品・技術取扱会社
Products and technology companies

■ 三菱マテリアル(株) Mitsubishi Materials Corporation
■ (株)後藤製作所 GOTOH MFG Co.,Ltd
■ 三菱アルミニウム(株) Mitsubishi Aluminum Co., Ltd.

P20
電着法による
絶縁皮膜形成技術 ■
Development
Electro-deposited High performance Insulating layer on Conductors

アルミ押出ハウジング ■
Extruded aluminum housing

Aluminum Harness

P21
Cu/Al 複合部 防食めっき技術 ■
Development
Corrosion protective plating for Cu/Al composite parts

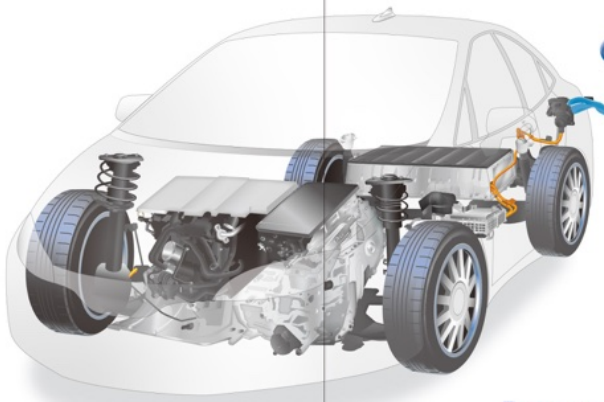
Copper Bus-bar, Connector, and Harness

P17
端子・バスバー
～めっき銅部材 ■
Terminal, bus-bar and plating technology

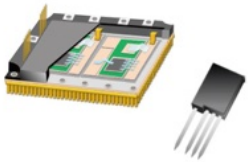
電動化に応える材料・技術
Materials and technologies that respond to vehicle electrification

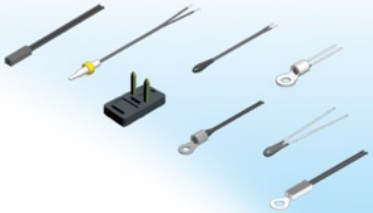
変わりゆく車両の電動駆動化とAD (Autonomous Driving) / ADAS (Advanced Driver-Assistance Systems) の課題に対して、
私たちは "感じとる" 3つの技術セクションで電子デバイスをご提供します。

In response to the changing issues of electric vehicles and the challenges of AD (Autonomous Driving) / ADAS (Advanced Driver-Assistance Systems), we provide electronic devices with three "Sensing" technology sections.



Power Control Unit T





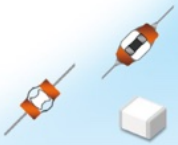
P22
サーミスタ
Thermistor
T

Quick Electric Charger T SA

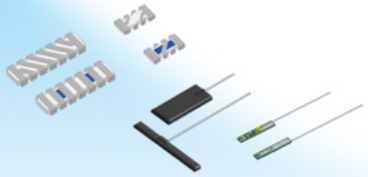
Power Motor T

Battery Pack T

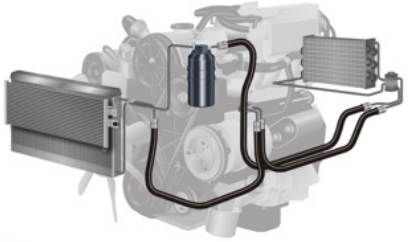
P23
サージ
アブソーバ
Surge Absorber
SA



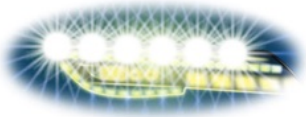
P24
アンテナ
ソリューション
Antenna Solution
AS



Heat Exchanger Units T



LED-Head Light T



製品・技術取扱会社
Products and technology companies

■ 三菱マテリアル(株)
Mitsubishi Materials Corporation

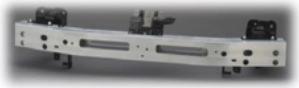
電動化に応える材料・技術

Materials and technologies that respond to vehicle electrification

私たちは常に時代の要請にチャレンジし電動車両の基盤を支える車体マテリアル、加工ツール、
資源の地球的規模の資源循環まで、課題を解決しつつ新たな価値を創造して行きます。

We will constantly challenge to meet the needs of times and create new value while solving problems such as body materials, processing tools and global circulation of resources that support the foundation of electric vehicles.

Aluminum Extruded Materials



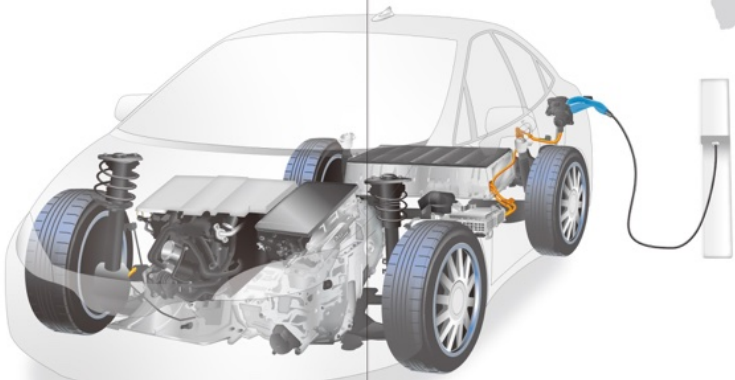
Bumper, suspension

ECO BRASS

Compliant to ELV and RoHS directive due to lead-free copper alloy Alternative to Stainless steel

Chassis, Body, Bonding

Resistance welding electrode



Seal Applications

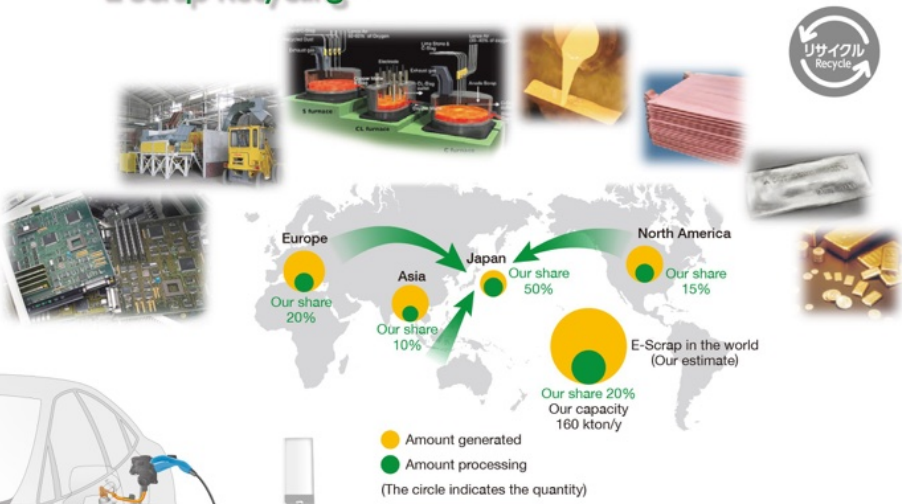
Sealing Parts for Continuously Variable Transmission

Sunflon U Seal: -20℃ to 250℃ in high-pressure gas systems

Sunflon RL Seal: Radial Lip Seal for Compressor shaft for car air conditioner

Cutting Tools

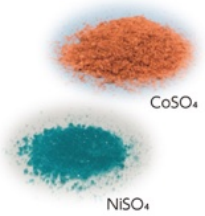
E-Scrap Recycling



Pb-Battery Recycling

Li-ion Battery Recycling

development



製品・技術取扱会社
Products and technology companies

- 三菱マテリアル(株) Mitsubishi Materials Corporation
- ルバタグループ Luvata Group
- 三菱電線工業(株) Mitsubishi Cable Industries, LTD.
- 細倉金属鉱業(株) Hosokura Metal Mining Co., Ltd.
- 三菱アルミニウム(株) Mitsubishi Aluminum Co., Ltd.

三菱マテリアルの無酸素銅と高性能銅合金

High performance oxygen-free copper and copper alloy

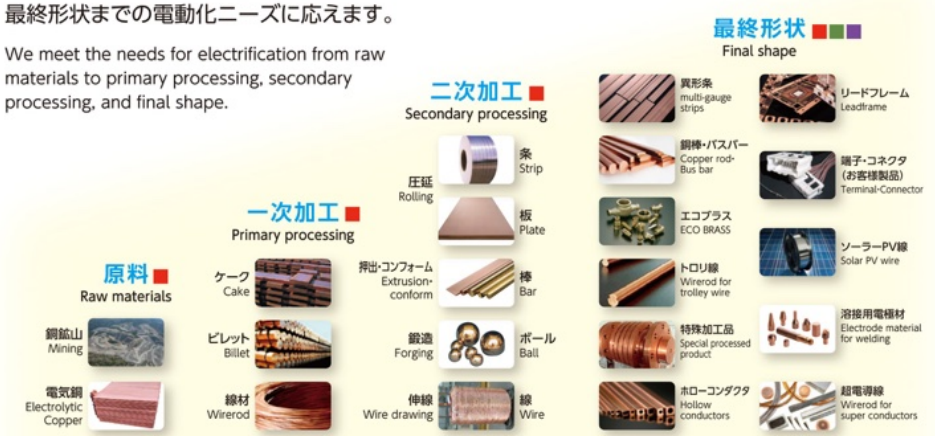
— 原料から製品まで — From raw materials to products

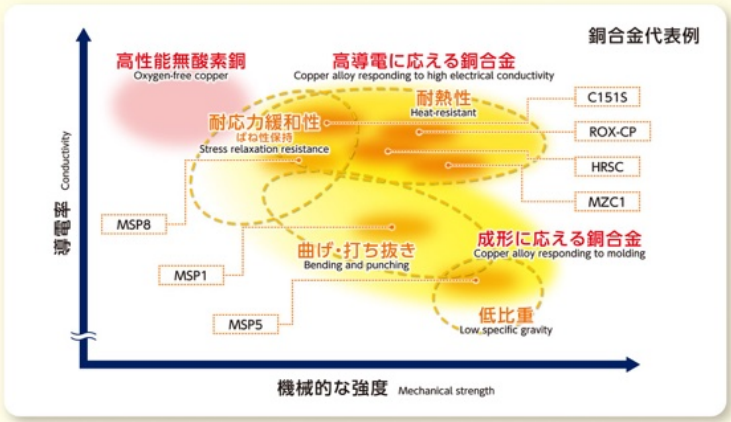
三菱マテリアルは“無酸素銅”ベースに、“高性能銅合金”として、車両電動化のニーズにマッチした、耐熱性、曲げ・打ち抜き、耐応力緩和性、或いは低比重などの様々な“高導電に応える銅合金”や“成形に応える銅合金”を提供しております。

The Mitsubishi Materials Group provides "high-performance copper alloys" based on high-quality "oxygen-free copper" that match the needs of vehicle electrification. These copper alloys are offered as various "copper alloys responding to high electrical conductivity" and "copper alloys responding to molding " with various characteristics such as heat-resistant, bending and punching, stress relaxation resistance, and low specific gravity.

私たちは原料から一次加工、二次加工、そして最終形状までの電動化ニーズに応えます。

We meet the needs for electrification from raw materials to primary processing, secondary processing, and final shape.





製品・技術取扱会社 Products and technology companies

■ 三菱マテリアル(株) Mitsubishi Materials Corporation

■ ルバタグループ Luvata Group

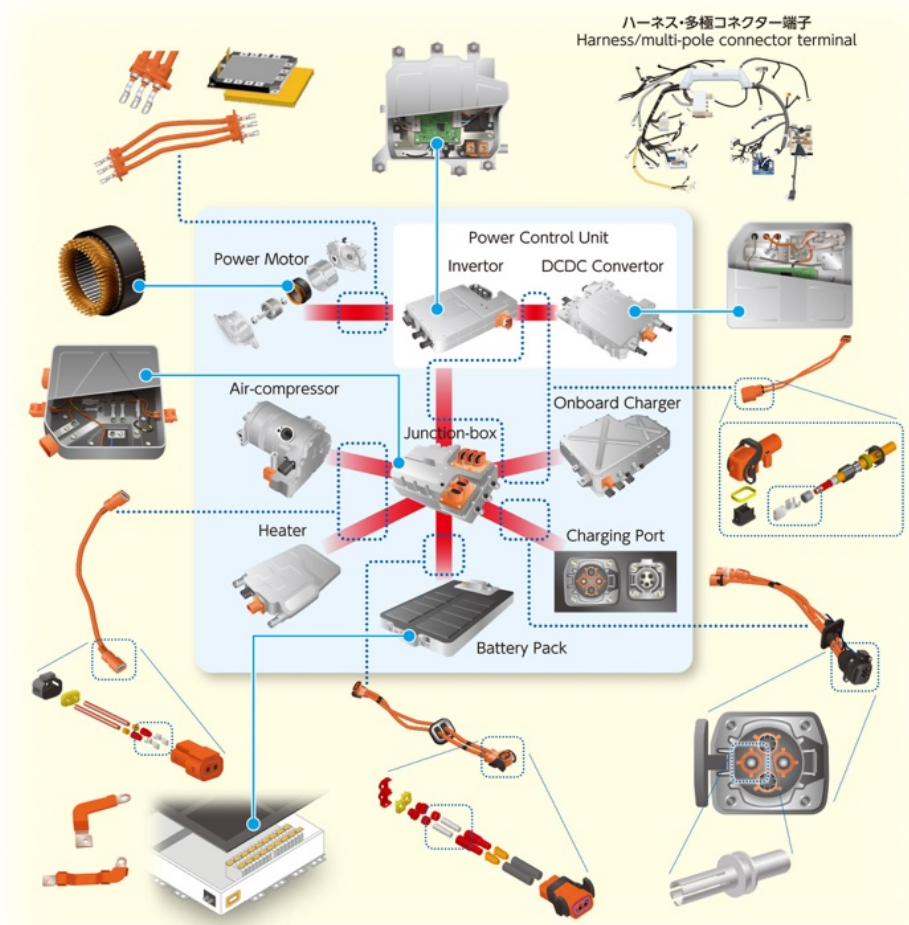
■ (株)後藤製作所 GOTOH MFG Co.,Ltd

— 製品展開例と技術開発 —

Product development examples and technology development

自動車向けハーネス・バスバー・端子材などの形状への銅加工製品をはじめ、めっき技術や様々な異種複合化までの先行ニーズに応える研究開発を進めています。

We are conducting research and development to meet the future needs, including copper processing products such as automotive harnesses, bus bars, and terminal materials, as well as plating technology and compounding.



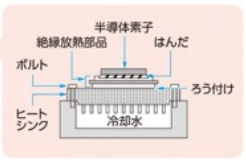
熱マネジメントする
Respond to "Thermal Management"

パワーモジュール用 絶縁放熱部品
Power Electronic Insulating Substrates

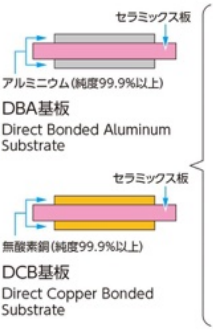
DBA基板は、セラミックスの両面に高純度アルミニウム回路を接合した高信頼性絶縁基板です。この基板のアルミニウムとセラミックスの接合に当社独自技術が用いられており、温度変化が非常に大きい過酷な環境下においても金属層からのセラミックスに対する熱応力の増大が極めて小さく、接合性を確保することを特徴としています。上部へスイッチング素子、下部へ冷却構造を接合してパワー半導体モジュールにご使用いただけます。

The DBA substrate is a highly reliable insulating substrate with high-purity aluminum circuits bonded to both sides of ceramics. The substrate employs Mitsubishi Materials' unique technology in combining aluminum and ceramics. Junction properties remain unchanged under severe temperature swings, maintaining thermal stress to the ceramics from aluminum layers. It is used for power electronic module with the power switching devices bonded to the top and the cooling structure bonded to the bottom.

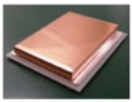
コア技術；接合技術
Core technology; bonding



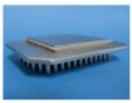
絶縁放熱部品の使用例
Usage example of Power Electronic Insulating Substrates



DBA基板
DBA substrate



DBAC基板
The DBAC substrate is a kind of DBA substrate that is directly bonded thick copper plates to each or both of the Al surfaces.



Pin-Fin
一体型DBA基板
"DBA" Substrate Directly Bonded on the Aluminum Pin-Fin

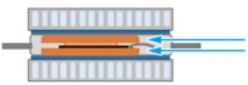
パワーモジュール放熱板用銅材料
Copper plate for heat-sinks and heat-spreaders of power module

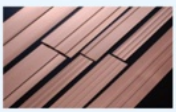
半導体素子冷却用の絶縁放熱部品に、熱伝導性の高い無酸素銅・銅合金を供給。

We supply high-quality oxygen-free copper and copper alloys with high thermal conductivity to insulating heat-radiating components and heat sinks used for cooling semiconductor devices.

■ 無酸素銅(OFC)放熱板
Oxygen-free copper heat spreader

・異形条で提供
Available for multi-gauge strips

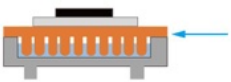




OFC

■ 銅合金(HRSC)放熱板
Copper alloy (HRSC) heat sink

・ロウ付け対応、条で提供
Applicable to brazing, Available for strips



HRSC

LED用メタルベース基板 ～金属・樹脂複合化技術～
Metal base substrate for LED -Metal / resin composite technology-

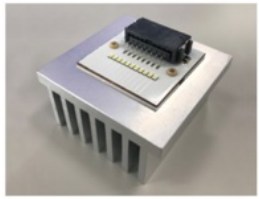
技術開発 Development

ナノコンポジット膜と金属との複合化技術を生かした、高放熱性と信頼性を合わせ持つメタルベース基板開発に取り組んでいます。

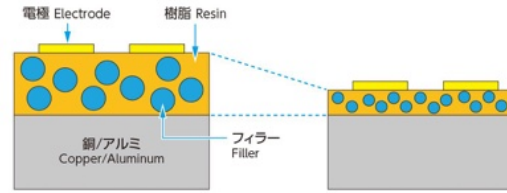
We are working on the development of a metal base substrate that has both high heat dissipation and reliability by utilizing the composite technology of nanocomposite film and metal.

開発取組事例 Example of development initiatives

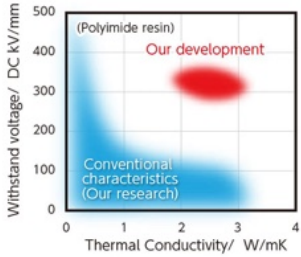
●LED実装済nBoardの写真
Picture of nBoard with LED



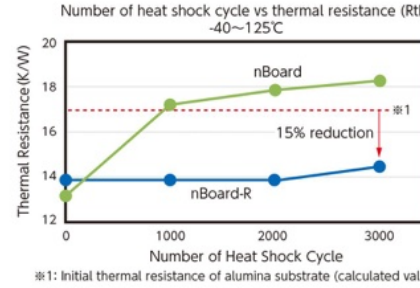
(a) 従来品 Conventional　(b) nBoard



●放熱性と耐電圧
Heat dissipation and withstand voltage



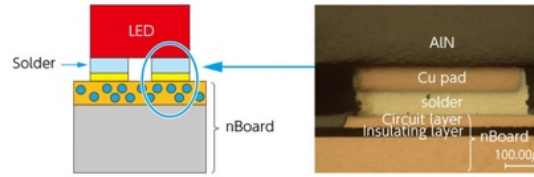
●耐久信頼性 (−40～125℃サイクル)
Endurance reliability(-40～125℃ cycle)



※1: Initial thermal resistance of alumina substrate (calculated value)

●熱衝撃3000回後のはんだ部断面
Cross sectional image of the solder part after heat shock of 3000 times

LED中心部ではんだクラック発生なし
No solder cracks confirmed at the center of LED



nBoard-Rの構成
Configuration of nBoard-R

はんだ部のSEM画像
SEM image of solder part

熱マネジメントする
Respond to "Thermal Management"

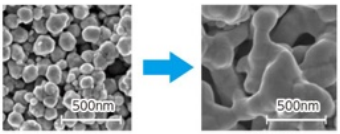
SiCパワー半導体/放熱基板接合ソリューション
Power semiconductor / heat dissipation board bonding

技術開発
Development

ナノテクノロジーを利用した3種類の低温焼結型接合材料から、
お客様の接合用途に応じた接合ソリューションを提供します。

We offer bonding solutions according to the customer's bonding application from three types of low-temperature sintering-type bonding materials that utilize nanotechnology.

焼結型接合材料
Sintered bonding material

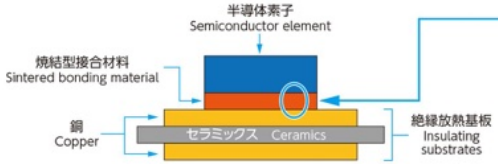


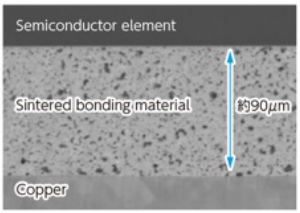
焼結前
Before sintering

焼結後
After sintering

開発取組事例 Example of development initiatives

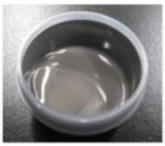
●無加圧、めっきレス接合 (Type1)
Pressure less & no plating(Type1)





接合層断面の走査型電子顕微鏡像
SEM image of cross section of bonding layer

3つの接合ソリューションと特徴 Three bonding solutions and features

	Type1 無加圧・めっきレス Pressure less & no plating	Type2 還元雰囲気不要 No reducing atmosphere	Type3 短時間・均質な接合 Short time/uniform bonding layer
ペースト外観 Appearance of paste			
	Ag Paste	Cu Paste	TLP※(Cu/Sn) Paste
被接合面 Bonding surface	Au, Ag, Cu	Au, Ag, Cu	Au, Ag, Cu, Ni
放熱性(W/mK) Heat resistance	○(>150)	○(>150)	△(<50)
接合雰囲気 Bonding atmosphere	大気、窒素 Air, Nitrogen	窒素 Nitrogen	窒素 Nitrogen
推奨接合温度 Recommend Bonding temperature	250~280℃	250~300℃	280~300℃

※TLP: Transient Liquid Phaseの略

低硬度伝熱材料
Low hardness thermal interface material

技術開発
Development

伝熱性・絶縁性・高密着性・シロキサンフリー Heat transfer, insulation, high adhesion, siloxane-free

■ Development Type1 パテ状伝熱材料

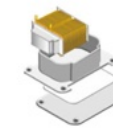
パテ状なので複雑な形状に追従して密着し、効率的に熱を伝えます。
10W/(m･K)グレードも提供可能です。

Since it is a putty, it adheres closely to a complicated shape and transfers heat efficiently.
10W/(m･K)grade is also available.

not specified values

	MMC-STD	PS-X series
Thermal conductivity[W/(m･K)]	1.8	5.2～13.6
Breakdown voltage[kV/mm]	12.8※1	11.7※2
Advantages	Flame retardant oxygen index 65 or more	Easy to deform, high conductivity, etc.

※1: Equivalent to UL94-V0　※2: Typical value



■ Development Type2 耐熱低硬度伝熱シート

耐熱シロキサンフリー、両面粘着性。
高温240℃の質量変化・硬度変化が極めて小さいので、長期にわたり、良好な伝熱特性を維持します。

Heat-resistant siloxane-free, double-sided adhesive sheet.
Since mass change and hardness change at high temperature of 240℃ are extremely small, good heat transfer characteristics are maintained for a long time.

not specified values

	U1	U2
Thermal conductivity [W/(m･K)]	0.8	1.0
Hardness	A36※	A50※
Standard thickness [mm]	0.3 ～2.0	

※国際規格ISO、JISに準拠したデュロメータ硬さで中硬さ(一般ゴム)の「タイプA」を示す。
Indicates "Type A" of medium hardness (general rubber) with durometer hardness in accordance with international standards ISO, JIS.

熱マネジメントする
Respond to "Thermal Management"

高精度アルミニウム押出多穴管と高品位モジュール技術
High precision Multi-Port Extrusion Aluminum Tube, and high quality module technique

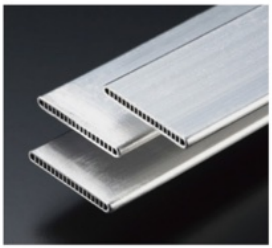
当社のアルミ押出多穴管は、高精度・耐食性の強みを持ち、モジュール用部品として提供出来ます。
複雑かつ微細な自動車の熱交換器に採用され、国内外のお客様から高い評価を頂いてます。

Our multi-port extrusion tube has strengths of "High precision" and "High corrosion resistance".
We can also provide it for module as high quality. It is used in heat exchanger for automobiles.
We have high evaluation from domestic and abroad customers.

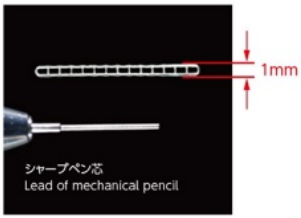
押出多穴管の特徴 Advantage of multi-port extrusion tube

●高精度
High precision

当社は超小型で高精細の多穴管を提供出来ます。
We can provide super small and high precision multi-port extrusion tube.



アルミ押出多穴管
Multi-Port Extrusion Tube



※12mm巾の製作も可能です。 Possible to create 12mm width

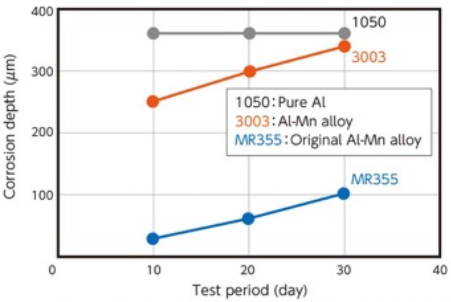
[拡大図] 小形の穴を均一に成形出来ます
[Enlarged view] We can create uniform holes in small parts

●耐食性
High corrosion resistance

当社オリジナルAl-Mn合金は
合金中の添加元素量を最適化したことで、
腐食速度を抑え、製品寿命を伸ばします。

Our original Al-Mn alloy can delay corrosion speed, and extend product life by optimizing additional elements.

熱交換用アルミ合金の腐食促進試験(SWAAT※)結果
SWAAT result of Al alloy for heat exchange



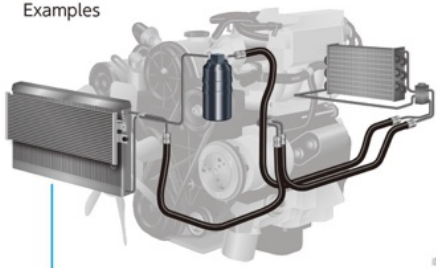
※SWAAT: Sea Water Acetic Acid Test 人工海水を使った腐食促進試験

モジュール技術 Module technique

当社はオリジナルのSBL※工程を採用することで肉薄で軽量且つ、高品質のモジュール用部品を提供出来ます。
We can provide light and thin product for module by adopting original SBL process.

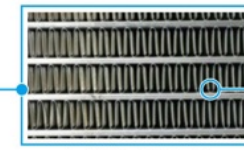
※SBL: Super Braze Liner

●採用例
Examples

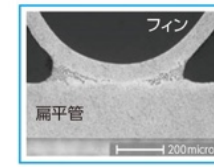


コンデンサ
Condenser

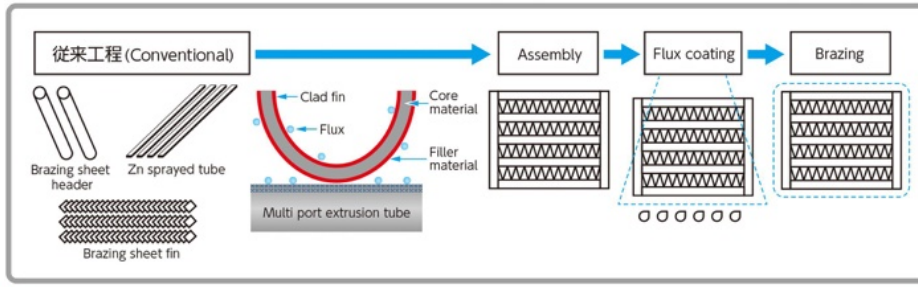
●拡大写真
Close up pictures

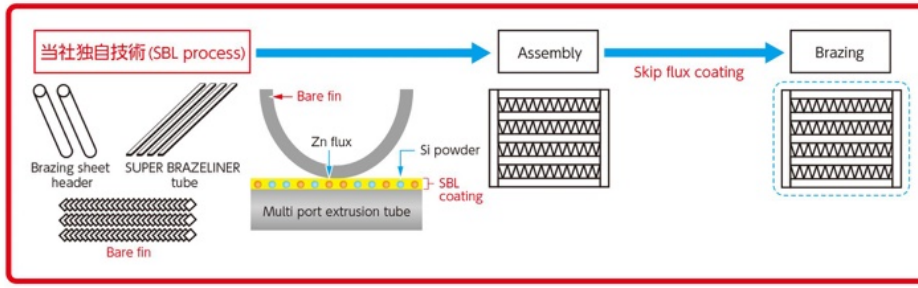


コルゲートフィン
Corrugated fin



フィン/チューブ接合断面図
Fin/Tube joint cross section



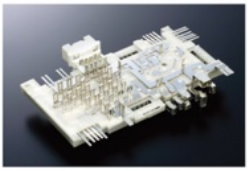


強電に応える
Respond to "Strong Electricity"

次世代車載部品用無酸素銅・銅合金・めっき
OFC, Copper alloys and Plating for EV & HEV

- 大電流に最適な無酸素銅（条厚み～5mm）・銅合金を供給
  OFC and Copper alloys suitable for high current
- 150℃まで対応可能な高耐熱三層めっき
  Enhanced heat-resistant 3-layer plating, applicable up to 150℃

高圧端子・バスバー用銅材料 Copper materials for terminals and bus bars 1



■無酸素銅（OFC）
Oxygen-free copper

最大厚さ5mmの条で提供
Available for strips up to 5mm thickness

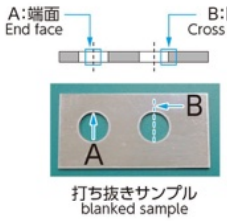
※製品イメージ　Product image

■C151S

耐応力緩和性に優れる
Superior stress relaxation resistance

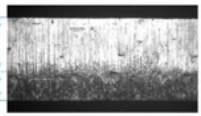
■MSP8

優れた曲げ性と打ち抜き性を有し、
加工時のバリ発生を抑制する
Excellent bendability and blanking properties and prevents burring during processing



打ち抜きサンプル
blanked sample

MSP8　打ち抜き端面（A部）
End face of A



直線的なせん断面（①）/破断面（②）境界
Straight shear(①) / fracture(②) boundary

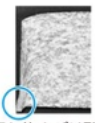
断面（B部）
Cross section of B

▶ 優れた打ち抜き加工性
Excellent blanking workability

既存合金　Existing copper alloy

不均一なせん断面（①）/破断面（②）境界
Non-uniform shear(①) / fracture(②) boundary

▶



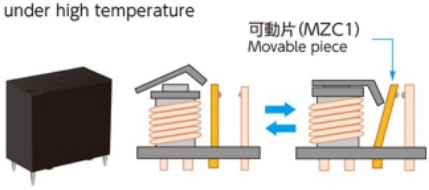
打ち抜きバリ発生
Blanking burrs

リレー可動片・端子用銅合金 Copper alloys for movable terminals and relay terminals 2

■MZC1

高温下の耐疲労性を有する

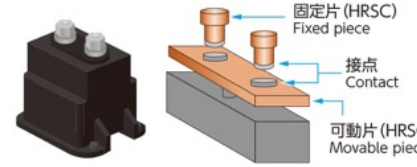
Excellent fatigue resistance
under high temperature



■HRSC

接点ロウ付け後も強度を保持

Maintains high strength
after brazing contacts

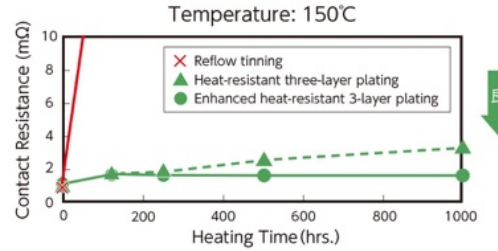


高耐熱三層めっき Enhanced heat-resistant three-layer plating

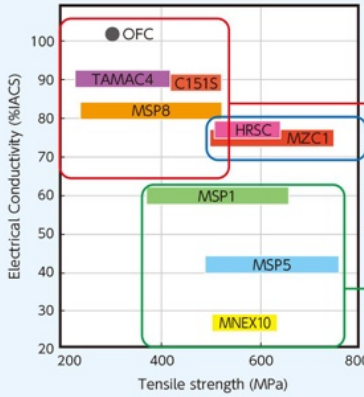
貴金属不使用の150℃耐熱めっき

Precious metal free, applicable up to 150℃

従来 Conventional　　三層めっき three-layer plating



無酸素銅と銅合金の特長 Features of OFC and copper alloys



1 高圧端子・バスバーに最適
Suitable for high-voltage terminals and bus bars

2 リレー可動片・端子に最適
Suitable for movable piece and power relay terminals

3 小型端子・コネクターに最適
Suitable for small terminals and connectors

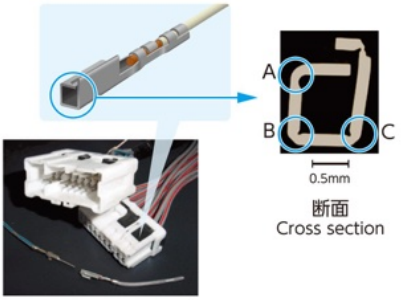
強電に応える
Respond to "Strong Electricity"

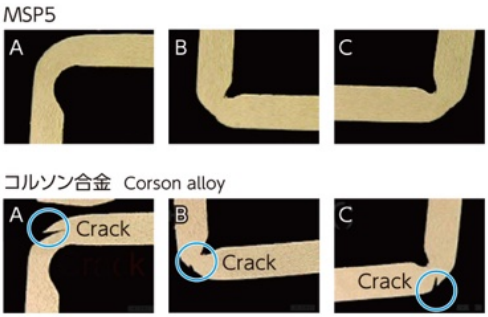
車載端子用銅合金・めっき
Copper alloys and Plating for Automobiles

小型コネクタ端子用銅合金 Copper alloys for small terminals 3

■MSP5

優れた成形性、曲げ加工時にクラックなし
Applicable to small terminals, excellent formability





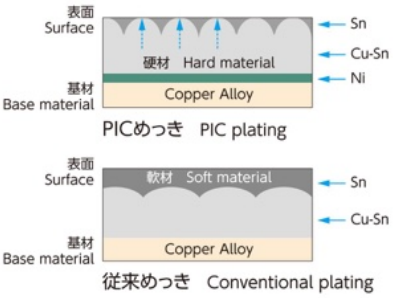
多極コネクタ端子用PICめっき PIC※ plating for terminals of multipole connectors

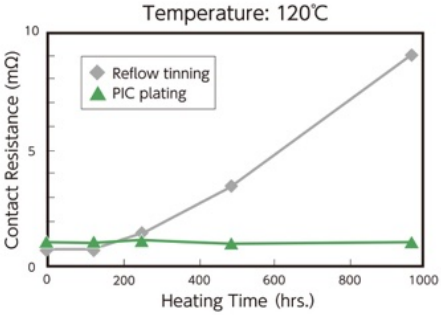
※PIC : Precise Interface Control

銅合金・錫めっき層界面の銅錫化合物形状を柱状に制御し、表面に均一微細に露出させ、
隙間に純錫が存在する複相組織を形成。

The shape of the copper-tin compound at the interface of the copper alloy / tin plating layer is controlled to be columnar, and it is exposed uniformly and finely on the surface, forming a multi-phase structure with pure tin present in the gaps.

- 端子挿入時の摩擦力を、従来めっき比30%低減
  The dynamic friction coefficient is reduced up to 30% compared to conventional plating
- 高温保持環境下で高い電気的信頼性を維持
  Maintaining high electrical reliability under high temperature





電着法による絶縁皮膜形成技術
Electro-deposited High performance Insulating layer on Conductors

技術開発
Development

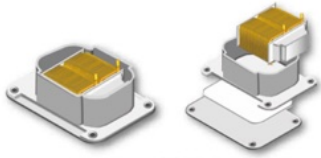
複雑形状の導体ワイヤ、部品表面に均一で高耐熱、高耐圧の絶縁皮膜を形成できます。

Electro-deposition can provide thin & uniform insulating layers with high heat durability, high breakdown strength to complex-shaped conductive wire and parts.

開発取組事例 Examples of development initiatives

●電動車用リアクトル、モータ用コイルの平角銅部材用絶縁皮膜。

Insulation coating for rectangular copper wire and parts of reactors for electric vehicles and motors.

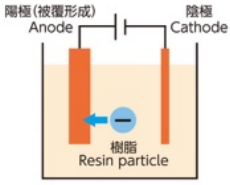


昇圧リアクトル
Boost reactor

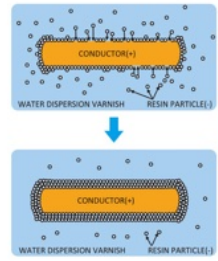
特長 Advantages

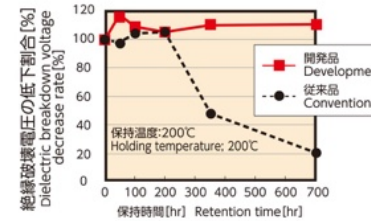
●電着により、様々な形状に対して均一で高耐熱の絶縁皮膜を形成できます。

By electrodeposition, a uniform and highly heat-resistant insulating film can be formed on conductors of various shapes.



電着法の原理
Principle of electrodeposition method





200℃保持時の絶縁皮膜耐久性
Durability of insulating film at 200 ℃

強電に応える
Respond to "Strong Electricity"

Cu/Al 複合部 防食めっき技術
Development of high-performance plating technology

技術開発 Development

私たちは、電動車の燃費・環境性能向上に寄与するめっき技術の開発に取り組んでいます。

We are working on the development of plating technology that contributes to the improvement of fuel efficiency and environmental performance of xEVs.

開発取組事例 Examples of development initiatives

車両アルミハーネスへ対応した、防食性と挿抜性を両立しためっき技術を開発しています。

We are developing plating technology that is compatible with the use of aluminum harnesses for vehicles, which has both corrosion resistance and insertion/removal characteristics.

端子：Cu合金+防食めっき
Terminal : Cu alloy and anticorrosion plating

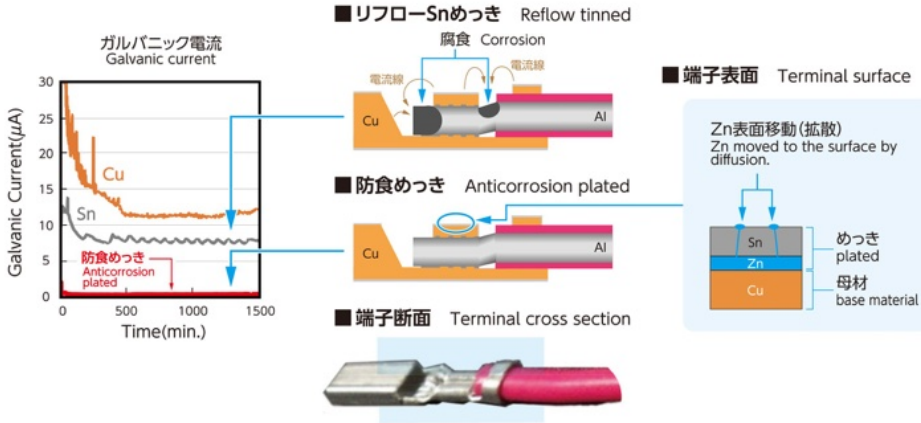
電線：Al合金線
Wire : Al alloy wire

寄与分野 Contributing fields	開発内容 Development contents
軽量化 Weight reduction	異種金属接合 防食めっき Dissimilar metal bonding corrosion protection plating
電動化 Electrical drives	大電流対応（低抵抗・耐摩耗）銀めっき Large current (low resistance and wear resistance) Silver plating
電装化 Electrification	挿抜性に優れたPICめっき Low friction type PIC plating

防食めっき技術の特長 Advantages of plating

三菱マテリアルのめっき技術は、銅材とアルミ線の間に流れるガルバニック電流を大幅に低減し、耐食性を大幅に向上させます。

Galvanic current flowing between Cu plate and aluminum wire is greatly reduced by Corrosion protective plating.



次世代EV 用電子部品
Electronic Components for EV

サーミスタ Thermistor

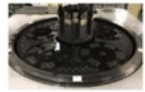
独自の原材料により高精度な温度測定を実現したNTCサーミスタです。
Our NTC thermistors realize highly precise measurement by original materials.

製造・加工
Processing technology

■はんだレス接合
Solderless bonding

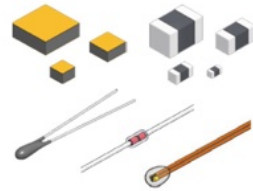
クラックフリー Crack free

■焼成、切断、研磨技術
Firing & Dicing & Lapping technology



素子材料
Element material

■豊富な素子ラインナップ
Abundant element lineup



■高精度、高信頼性化技術
High precision & high reliability technology

ZEROSHIFT※

※ZERO SHIFTは当社オリジナル商標であり、抵抗値が時間に依存しないことを表します。
ZERO SHIFT means to keep the resistance value regardless of time.

構造設計
Structural design

■高耐熱化技術
High heat resistance technology

■解析技術
Computer Aided engineering

熱応力シミュレーション
Thermal stress simulation

■高速応答化技術
Quick response technology

- ご要望に合わせた形状、取付方法などのカスタム対応製品をご提案します
  To proposing customized products such as shapes and mounting methods according to your request
- 豊富な要素技術の組合せにより機能複合化製品のご提案が可能です
  It is possible to propose products with complex functions by combining a wealth of elemental technologies

設計事例 Example

※1 CTH: Chip thermistor　※2 DHT: Double heat sink thermistor

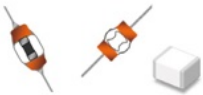
感じとる
Respond with "Electronic Devices"

充電器

サージアブソーバ Surge absorber

サージアブソーバとは、サージ電圧から機器を保護する部品です。
各種サージ対策した製品ラインナップを用意しております。

Surge absorber means to protect equipment from surge voltages.
We prepare a large variety of products for surge countermeasures.



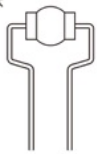
加 工 Processing

■ガラス/金属接合技術
Glass / metal bonding

- 長期信頼性
  Long term reliability
- 高耐湿性
  High humidity resistance

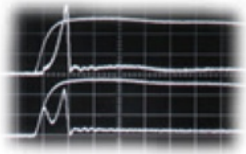
■金属加工技術
Metal processing

- 豊富なフォーミング形状
  Large variety of forming shape



材 料 Material

■放電制御技術
Discharge control



- 高サージ耐量 High surge resistance
- 高応答特性 High response characteristics
- AC耐圧特性 AC withstand voltage characteristics

■素子設計 Element design

- 共振特性(電源用)
  Resonance characteristics(for power supply)
- 高周波特性(通信用)
  High frequency characteristics (for communication)

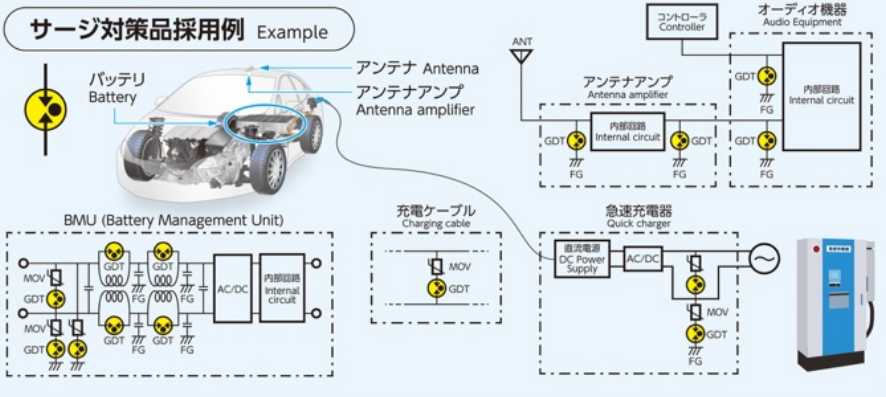
評 価 Evaluation

■放電評価
Discharge evaluation

- 立会試験
  Witness test

- お客様の回路設計に応じた製品をご提案いたします
  We propose the product according to customer's circuit design
- お客様の課題やご要求に合わせた仕様変更が可能です
  We can change the specifications according to the issues or requirements

サージ対策品採用例 Example



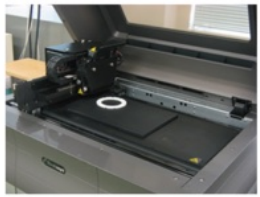
アンテナソリューション Antenna design solution

小型、高性能なチップアンテナと設計・評価技術により、お客様に最適なアンテナソリューションを提案します。次世代自動車用アンテナについても設計相談に応じます。

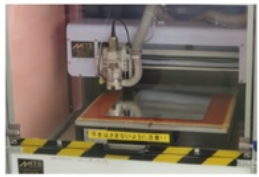
We propose the best antenna solution by design/evaluation techniques and compact/high spec tip antenna.

製造・加工 Processing technology

■プロトタイピング技術
Prototyping



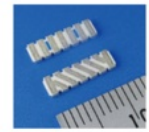
3Dプリンタ造形
3Dprinter modeling



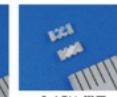
回路基板加工機
Circuit board processing

材料設計 Material design

■誘電体チップアンテナ
Dielectric chip antenna

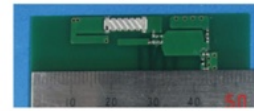


400-1600MHz帯用
For 400-1600MHz frequency range

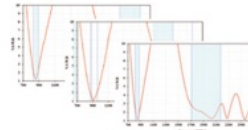


2.4GHz帯用
For 2.4GHz band

■アンテナ設計技術
Antenna design technology



マルチバンドアンテナ設計
Multiband antenna design



入力特性例
Design examples of Input characteristics

分析・評価 Evaluation technology

■充実した技術サポート体制
Engineering support

電波暗室
Anechoic chamber

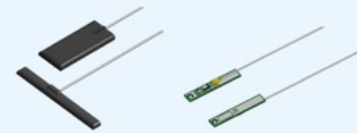
疑似人体
Phantom

■評価/解析技術
Evaluation & Analysis

電磁界シミュレーション
Electro magnetic simulation

- 設計初期から最終段階まで、アンテナ設計をサポートします
  We provide our antenna solution support from a stage of initial design to a stage of final design
- お客様のご要望に応じたマルチバンドアンテナをご提案します
  We can propose multiband-antenna designs according to your request

設計事例 Example

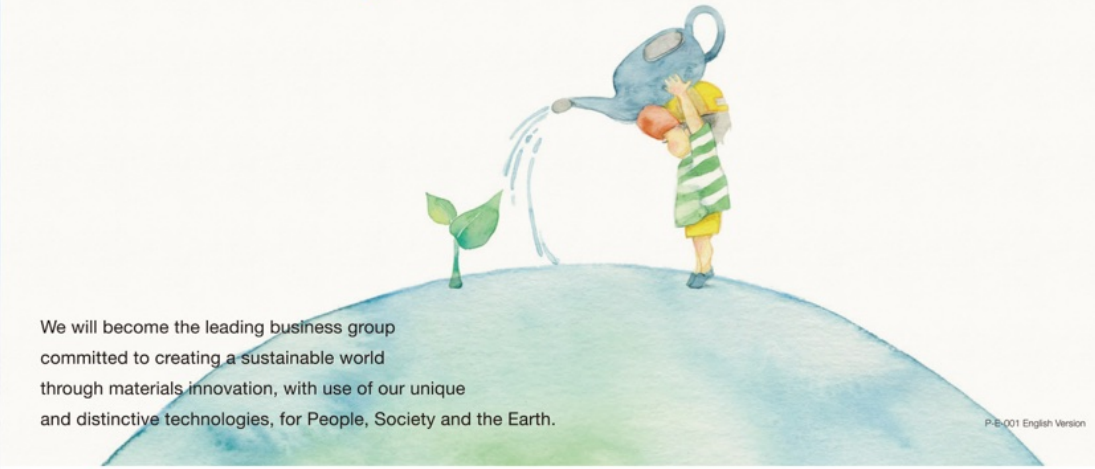


設計例 マルチバンドアンテナ 3G,4G,5G(sub6)対応
example Multiband antenna for 3G,4G,5G(sub6)

MITSUBISHI MATERIALS

Mitsubishi Materials Group

For People, Society and the Earth



We will become the leading business group
committed to creating a sustainable world
through materials innovation, with use of our unique
and distinctive technologies, for People, Society and the Earth.

P-E-001 English Version

三菱マテリアルは、
さまざまな事業活動を通して、
「人と社会と地球のために」貢献することを
企業理念として掲げています。

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