Hide and seek – Meet the demand for more aesthetic PV Modules with Ulbrich's newest product

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HIDE AND SEEK

Meet the demand for more aesthetic PV Modules with Ulbrich’s newest product

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ULBRICH‘s BLACK READY RIBBON BRR™
TOPICS

• Introduction Ulbrich and its cooperation with Alpha
• Black Ready Ribbon – BRR™
• Product characteristics
• Production Tests / Performance
• Reliability and tests performed
• Availability
Alpha

- **Electronics Assembly & Semiconductor Packaging**
- **Automotive**
- **Metals Reclamation**
- **Power & LED Devices**
- **Solar Photovoltaic**
- **Water Treatment**

- Solder Bar and Wire
- Flux Cored Wire
- Solder Paste
- Liquid Soldering Flux
- Electronics Cleaners
- SMD Adhesives
- Solder Preforms
- Stencils
- Advanced Die Attach Materials
- Solder Spheres
- Conductive Polymers
- Thermoplastic Adhesives
- Underfills
- Getters
- Misc. Other Products
- Boiler System Treatment Chemicals

*Image: Solar Technologies*
Ulbrich

- Ulbrich Solar Technologies is one of the branches of Ulbrich Stainless Steel and Special Metals.
- Ulbrich is a fourth-generation family owned and operated business with 11 locations in five countries.
- CEO Chris Ulbrich leads a global workforce of over 700 employees who still hold true the values in which the company was founded on in 1924: a never-ending commitment to quality, innovation and customer service.
Ulbrich Solar Technologies

• Ulbrich Solar Technologies supplies the solar industry for over 28 years
• In the early days Ulbrich was the global market leader
• In recent years the company focus has changed into an innovation leader in connection technology
Ulbrich Solar Technologies

• Early involvement in power enhancing technologies
• Products for thin film, heterojunction technologies, space photovoltaics, and special applications
• R&D focus on production performance, power enhancement, reliability, adhesive technologies and lately also optical performances
BLACK READY RIBBON

• 3 years ago Ulbrich started its cooperation with Alpha.
• BRR™ is a co-development of Alpha and Ulbrich Solar Technologies and based on Alpha’s Ready Ribbon Technology.
• BRR™ is Ulbrich’s high quality standard PV ribbon coated with Alpha CRR-BK colored flux.
BLACK READY RIBBON

• **BRR™** is specially designed for building and rooftop integrated photovoltaic applications
• Black Modules are already common for better aesthetics in rooftop applications
• Remaining “non black” parts are PV Ribbons
BLACK READY RIBBON

• By using BRR™ instead of standard silver colored PV Ribbon the optical appearance is significantly improved and modules blend perfectly with dark colors of roof tiles.

• The optics can vary based on the light angle. BRR™ will be seen from dark blue to black color shades.

• Perfectly blending in with solar cell colors.

Full Black Module from Kioto Photovoltaics with Ulbrich’s BRR™
BLACK READY RIBBON

- Ulbrich’s BRR™ is simply the high quality Ulbrich Ribbon that has been coated with a thin (<2µm) homogenous layer of unique halogen and halide free black flux cured in a highly specialized process.

- Final Ribbon characteristics are unaffected.
BLACK READY RIBBON

- Ulbrich’s BRR™ eliminates:
  - The need to apply liquid flux by either dipping or spraying methods in stringers
  - All efforts and costs associated with buying, storing and using flux
  - A potential work place hazard if the liquid flux being used is flammable
PRODUCTION TESTS

• Largest Test performed: More than 1000 modules have been produced at Kioto PV in Austria with BRR™

• Equipment used: Teamtechnik 2100/1800/1200

• No color degradation after IR soldering

• Process modifications:
  • Sensor adjustment
  • Cleaning intervals
BLACK READY RIBBON

- Imperfections after soldering
- Ribbon color varies with different light angles

Optical improvement is significant with Ulbrich's BRR™
BLACK READY RIBBON

Stringer holding devices & Angle Dependence
PRODUCTION TESTS

• Alpha performed a peel strength test on BRR™
• Imada Pull Tester used / pull angle 180°
• Front and Back side pull test >1N/mm per DIN 50461
RELIABILITY / TESTS PERFORMED

• Color intensity tests show no change after IR reflow soldering
• Color retention analysis by simulating sun exposure for 25 years in order to guarantee UV stability during use – no color degradation after those test
• Color hot spot test – no change in color after exposing BRR™ to 200°C for 10 seconds.
RELIABILITY TESTS

• Gel-Content Test & EVA compatibility test performed by Alpha
• Gel content measurement on cured samples according to ASTM D2765-01 (2006) method

- Sandwichted in between two EVA sheets (no cells)
- EVA curing (135°C / 18min)
- Gel-content (per ASTM standard)
- Observation: Yellowing, bubbling, etc...

• No yellowing or bubbling
• Data indicates BRR™ compatibility with EVA
• Gel content within specified 60%-95%
RELIABILITY TESTS

• Damp Heat Test and TC in progress at Kioto PV
• UV-DH on mini modules will be performed for further color retention analysis at Fraunhofer ISE in Germany
• Tack Test (Rheska Tack Tester) performed by Alpha
  • **BRR™** is non-tacky at 55°C (tested according to JIS standard)
SUMMARY

• **BRR™** brings aesthetically pleasing optics / based on the light angle black to dark blue metallic shading of the wires.

• **BRR™** eliminates costs related to qualifying, purchasing, storing and using flux.

• Final Ribbon characteristics are unaffected.

• Drop-in solution with minimal process adaption.
AVAILABILITY

• 5BB Starter Packages of BRR™ available from stock
  • 5 spools: 1,00mm x 0,20mm SnPb Ulbrich standard specifications
  • 1 spool: 5,00mm x 0,30mm SnPb Ulbrich standard specifications

Orders only per email: austria@ulbrich.com
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