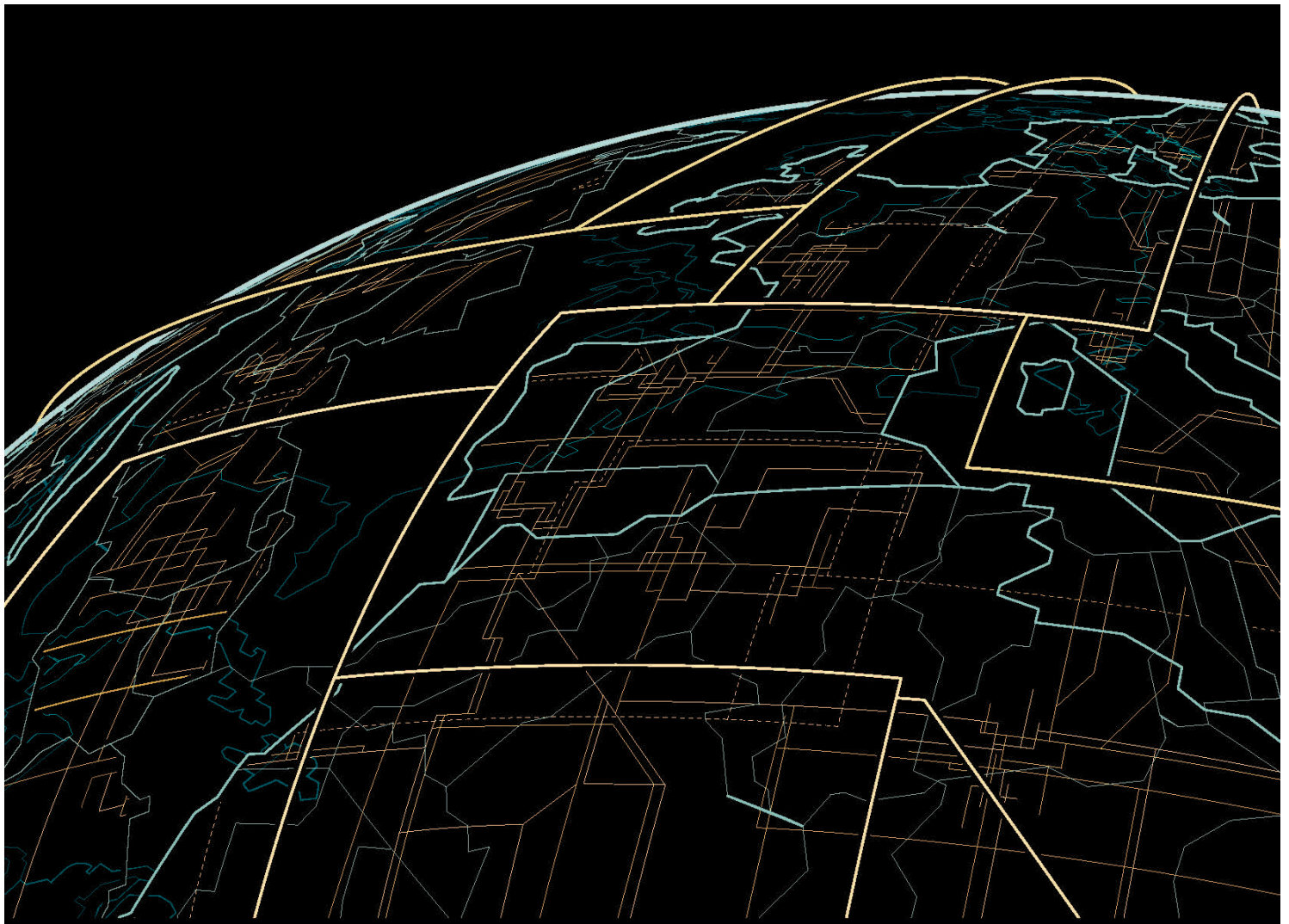




Application Note

Protection for OEM data communications, signal and telephone systems

furse 

Power and productivity
for a better world™ 

Protection for OEM data communications, signal and telephone systems

Circuit board layout and design

All Furse PCB protection products are capable of handling 10 kA of surge current.

The ESP PCB/** Series are electrically the same as the (wire-in) Furse ESP D, SL, E and TN Series protectors (e.g. ESP 06D, ESP SL06, ESP 15E, ESP TN).

All these units offer a high level of protection, however with the PCB mount versions the track layout or choice of connectors may restrict the unit's performance as the line and earth tracks need to be able to handle 10 kA.

If the track fails before 10 kA, the surge protection offered will be limited to what the track can handle before breakdown.

Some guidelines for suitable track layouts are outlined opposite.

The track width connected to the output pins does not affect the surge current capabilities, however care must be taken to ensure the transient is not picked up on the output tracks.

The dirty ('line') tracks should be routed parallel and as close together as possible. This should also be implemented on the clean tracks, however clean (outgoing) tracks should never be routed close and parallel to *line* (incoming) tracks or dirty barrier earth connections as the transient can be re-introduced after the protector due to electromagnetic coupling (*Figures C and D opposite*).

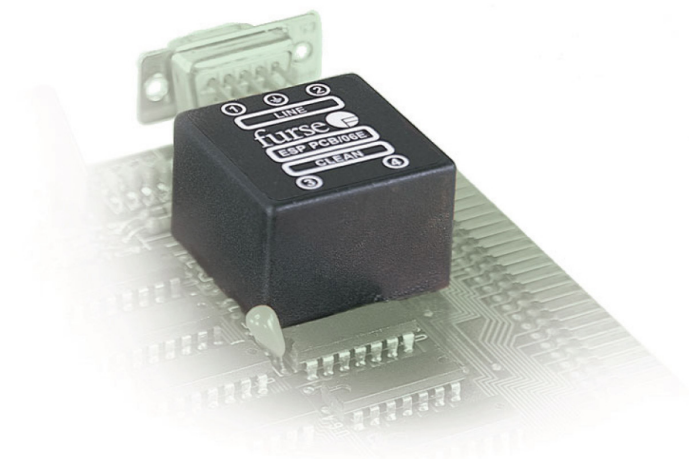
If it is unavoidable the clean tracks can cross the line tracks at 90°.

The use of an earth layer or plane is highly recommended as this reduces the electromagnetic field produced by a transient discharging to earth considerably, and hence the chance of the transient being picked up on the clean tracks.

If multiple lightning barriers are used on a PCB, dirty *line* and clean lines should be kept at least 20 mm apart (*Figure B*).

This separation distance must still be implemented on multi-layer PCBs, as the interference will easily pass through the board. If the PCB layout requirements cannot be met, the wire-in Furse D, SL, E and TN series equivalents can be used.

For further queries regarding suitable track layouts, please contact Furse.



Good layout and design

Do

- Keep the input '*line*' tracks as close together as possible
- Keep the output '*clean*' tracks as close together as possible
- Use the largest track width the board can accommodate for the '*line*' inputs
- Balance out the large track width with good track separation to ensure adequate creepage and clearance
- Use both top and bottom copper layers on the PCB (if possible)
- Use the largest pad size possible, as small solder joints can break down with a transient overvoltage
- Position the unit as close to the *line* input of the PCB as possible, minimising the track distance
- Use a high PCB copper plating level, as thicker plating will considerably increase the current handling
- Connect the earth to the main star point of the earthing system, routing away from all other connections
- Use an earth layer/plane (if possible), as this will greatly minimise inductance and electromagnetic coupling

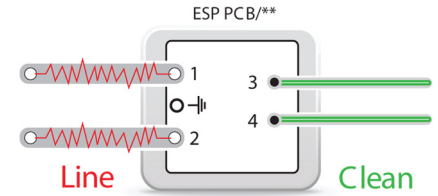


Figure A: Maximum line to clean separation. Large input tracks and pads (using top and bottom copper layers). Earth pin is bonded to an earth layer/plane.

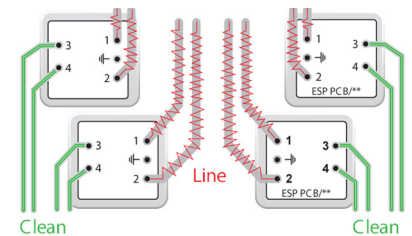


Figure B: All dirty ('line') incoming tracks are separated from the clean output tracks, individual line and clean tracks are routed close together. Earth pins are bonded to an earth layer/plane.

Bad layout and design

Don't

- Route the *line* inputs (including earth) close to the clean outputs
- Create large loops with the *line* or clean tracks as this will increase electromagnetic coupling

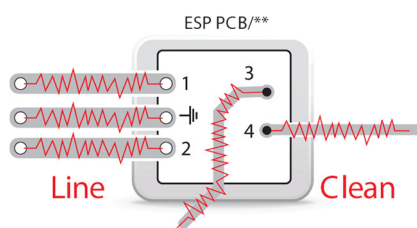


Figure C: Output tracks will create a large induction loop and are too close to input tracks. Input pads could be made larger. Transient will be re-introduced after protector.

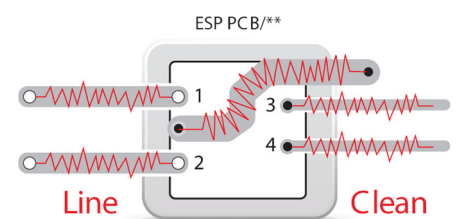


Figure D: Earth track too close and parallel to output tracks. Input pads could be made larger. Transient will be re-introduced after protector.

Contact us

ABB Furse

UK Office

Wilford Road
Nottingham
NG2 1EB

Tel: +44 (0) 115 964 3700
Fax: +44 (0) 115 986 0071
Sales Tel: +44 (0) 333 999 9900
Sales Fax: +44 (0) 333 999 9901
E-Mail: enquiry@furse.com

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Thomas & Betts Ltd. Br.

A Member of the ABB Group

Middle East Sales Office

Office 724 6WA West Wing
Dubai Airport Free Zone
PO Box 54567
Dubai

United Arab Emirates
Tel: +971 (0)4 609 1635
Fax: +971 (0)4 609 1636
E-mail: furseenquiry@tnb.com

Thomas & Betts (Saudi Arabia)

KSA Office

Building 128
Dammam Industrial Area #2
PO Box 514
Al Khobar 31952
Saudi Arabia

Tel: +966 13 812 1222
Fax: +966 13 812 1175
E-mail: furseenquiry@tnb.com

Thomas & Betts Asia (Singapore) Pte Ltd.

A Member of the ABB Group

c/o ABB Pte Ltd
2 Ayer Rajah Crescent
Level 4

Singapore 139935
Tel: +65 6776 5711
Fax: +65 6778 0222
E-mail: asia.inquiry@tnb.com

www.furse.com

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