Claims

1. A method of forming a display comprising:

planarising~~bonding~~ a backplane comprising a plurality of backplane electrical contacts to provide a first planarised surface;

planarising a monolithic light emitting diode structure comprising a ~~corresponding~~ plurality of electrical contacts corresponding to the plurality of electrical contacts of the backplane to provide a second planarised surface;~~,~~

bonding the first planarised surface to the second planarised surface, wherein bonding comprises forming a reversible bond between at least one of the plurality of backplane electrical contacts and a corresponding electrical contact of the monolithic light emitting diode structure; and

subsequently selectively etching~~removing material from~~ the monolithic light emitting diode structure to provide a plurality of physically isolated light emitting diode dies, thereby to enable removal and/or replacement of at least one physically isolated light emitting diode die by reversing the reversible bond between the at least one of the plurality of backplane electrical contacts and the corresponding electrical contact of the monolithic light emitting diode structure.

2. The method according to claim 1, wherein the at least one of the backplane electrical contacts is reversibly bonded to the corresponding electrical contact of the monolithic light emitting diode structure using metal-to-metal bonding and/or eutectic bonding.

3. The method according to any preceding claim, comprising:

removing at least one physically isolated light emitting diode die; and

replacing the at least one physically isolated light emitting diode die with a different one or more light emitting diode dies.

4. The method according to claim 3, wherein removing at least one physically isolated light emitting diode die comprises increasing the temperature of the display thereby to enable removal of the at least one physically isolated light emitting diode die at the reversible bond between the backplane electrical contact and the corresponding electrical contact associated with the monolithic light emitting diode structure, preferably wherein increasing the temperature of the display comprises increasing the temperature at the reversible bond to surpass a eutectic temperature of the reversible bond, preferably wherein the reversible bond comprises at least one of a AuSn eutectic bond, a CuSn eutectic bond and a InSn eutectic bond.

5. The method according to claim 3, wherein removing at least one physically isolated light emitting diode die comprises overcoming an electrostatic force of the reversible bond, preferably wherein the electrostatic force of the reversible bond is the electrostatic force of at least one of a Au-Au metal bond and a Cu-Cu metal bond.

6. The method of any preceding claim comprising:

testing at least one of the plurality of physically isolated light emitting diode dies;

identifying one or more defective light emitting diode dies;

removing defective light emitting diode dies; and

replacing the one or more removed defective light emitting diode dies.

7. The method according to any preceding claim, comprising:

forming a conformal metal layer on at least a portion of the physically isolated light emitting diode dies, thereby to reduce optical cross talk between physically isolated light emitting diode dies.

8. The method according to any preceding claim, comprising:

forming a transparent electrically conductive layer on the plurality of isolated light emitting diode dies, thereby to provide a common electrode.

9. The method according to any preceding claim, comprising:

forming one or more magnetic metal regions associated with at least one of the physically isolated light emitting diode dies, thereby to facilitate removal of physically isolated light emitting diode dies.

10. The method according to any preceding claim, wherein at least one of the reversible bonds is at least partially laterally surrounded by a dielectric layer thereby to separate the backplane and the monolithic light emitting diode structure, preferably wherein the dielectric layer comprises at least one of SiO_2, Si_3N_4, Su-8, SrF_2, PDMS and PMMA.

11. The method according to any preceding claim, wherein the plurality of contacts of the monolithic light emitting structure comprises a high reflectivity metal, preferably wherein the high reflectivity metal is one of Ni and Ag.

12. The method according to any preceding claim, wherein removing material from the monolithic light emitting diode structure comprises forming a discontinuity in at

least one layer of the monolithic light emitting diode structure, preferably wherein the at least one layer of the monolithic light emitting diode structure is an n-type layer, more preferably wherein the n-type layer is an n-doped gallium nitride layer.

~~13. A display comprising:~~

~~a backplane comprising a plurality of backplane electrical contacts bonded to a plurality of physically isolated light emitting diode dies each having an electrical contact, wherein at least one of the plurality of backplane electrical contacts is bonded to a corresponding electrical contact of the plurality of physically isolated light emitting diode dies using a reversible bond, thereby to enable removal and/or replacement of at least one physically isolated light emitting diode die by reversing the reversible bond between the at least one of the plurality of backplane electrical contacts and the corresponding electrical contact of the plurality of physically isolated light emitting diode dies, wherein the plurality of physically isolated light emitting diode dies are formed from a monolithic light emitting diode structure.~~

~~14. The display according to claim 13, wherein the at least one of the backplane electrical contacts is reversibly bonded to the corresponding electrical contact of the monolithic light emitting diode structure using metal-to-metal bonding and/or eutectic bonding preferably wherein the reversible bond comprises at least one of a AuSn eutectic bond, a CuSn eutectic bond, a InSn eutectic bond, a Au-Au metal bond and a Cu-Cu metal bond.~~

~~15. The display according to claim 12, 13 or 14, the reversible bond is temperature dependent.~~

~~16. The display according to any of claims 13 to 15 comprising:~~

~~a conformal metal layer on at least a portion of the physically isolated light emitting diode dies, thereby to reduce optical cross talk between physically isolated light emitting diode dies.~~

~~17. The display according to any of claims 13 to 16, comprising:~~

~~a transparent electrically conductive layer on the plurality of physically isolated light emitting diode dies, thereby to provide a common electrode.~~

~~18. The display according to any of claims 13 to 17, comprising:~~

~~one or more magnetic metal regions associated with at least one of the physically isolated light emitting diode dies, thereby to facilitate removal of physically isolated light emitting diode dies.~~

~~19. The display according to any of claims 13 to 18, comprising a dielectric layer at least partially surrounding one or more of the plurality of reversible bonds, thereby to separate the backplane and the monolithic light emitting diode structure, preferably wherein the dielectric layer comprises at least one of SiO_2, Si_3N_4, Su-8, SrF_2, PDMS and PMMA.~~

~~20. The display according to any of claims 13 to 19, wherein the plurality of contacts of the monolithic light emitting structure comprises a high reflectivity metal, preferably wherein the high reflectivity metal is one of Ni and Ag.~~