



1a 1e  
 2a 2b 1a 1e  
 3a 3f  
 4a 4c  
 5 4a 4c  
 6  
 7a 7h

(Printed Circuit Board; PCB) , (Printed Circuit Board; PCB)  
 Paste) , (Polymer Capacitor Paste)  
 (PCB) (Discrete Chip Resistor)  
 (Discrete Chip Capacitor) ,  
 ( )  
 가 , 가  
 가 (Embedded Capacitor PCB)  
 가 가  
 3가 ,  
 (Polymer Thick Film Type)  
 (Copper paste)  
 (Ceramic filled photo-dielectric resin) (coating)  
 (embedded discrete type capacitor) (Motorola) 가  
 (Ceramic powder)  
 (copper foil)  
 (Decoupling capacitor)  
 가 (Sanmin  
 (Power distributed decoupling capacitor)  
 3가 가

1a 1e ( ) 가

1 FR-4 PCB (42) (dry film) (44a, 44b) (-) (43a, 43b) (Clearanc

e) ( 1a ). (+) (45a, 45b) (43a, 43b) (Screen Printing) (stencil)

2 ( 1b ). (-) (45a, 45b) (+) (44a, 44b) (-) (43a, 43b)

3 (Silver) (Copper) (Conductive Paste) ( 1c ).

4 PCB (41) 1 3 (47a, 47b) (Lamination) ( 1d ). , 48a 48b (47a, 47b)

5 (Through Hole; TH) (Laser Blinded V (IC

ia Hole; LBVH)(49a, 49b) (+) (51a, 51b) (-) (50a, 50b) (

Chip; 52a, 2b) (+) (51a, 51b) (-) (50a, 50b) (+) (46a, 46b)

1e ). (45a, 45b) (Crack) 2a 2b 1a 1e (-) (43a, 43b) (45a, 45b)

1b , 2a 2 (C) (Crack) (-) (45a, 45b)

PCB 1/2oz(18 $\mu$ m) 1oz(36 $\mu$ m)

가 10 $\mu$ m (-) (44a, 44b) (45a, 45b) (-) +

(+)

1e 1 2

1a 1e (45a, 45b) , 4 (47a, 47b) (A ) 2 3 (B )

가 2b , 80 $\mu$ m , B 1 2 A 1 (42), 2

(46a, 46b) 20 30 $\mu$ m , 2 (46a, 46b) 가 1

60 70 $\mu$ m (45a, 45b)가 10 15 $\mu$ m , 1 2 (46a, 46b) 가 1

0 15 $\mu$ m (impedance) (45a, 45b), (4

6a, 46b) (45a, 45b) 10 15 $\mu$ m 150 30 90

1b (46a, 46b) (Void) (+) (44a, 44b)

(46a, 46b) (45a, 45b) (+) (+)

(-)

3a 3f 3a 3c (Ceramic filled photo-dielectric resin) 가 US6,349,456

1 (12) (10) (14)

2 ( 3a ). (14) (16) ( 3b ). ,

18 (copper etching resist) (16) (Tin)

(sacrificial layer)  
 3 (16) (20) (18) (18)  
 4 (20) (20) (14) (14) (22) (3)  
 d (20) (20) (14) (14) (photomask) (3)  
 5 (22) (12) (24) (3e)  
 6 (26) (30) (10) 1 5 (32)  
 (TH) (3f) (LBVH)  
 (32)  
 (20) (24) (14)  
 (12) (+) 가 (14)  
 (14) (16) (20) (16) (14)  
 (14) (14) 가 (14) (photosensitive agent)  
 (14) 가  
 (12) (24) (14)  
 4a 4c  
 1 (62) (63) US5,079,069 US5,261,153 US5,800,575  
 (Copper Coated Laminate; 61)  
 (4a). (62, 63)  
 2 (61) 1 (64a, 64b)  
 3 (65a, 65b) (4b).  
 (PTH) (LBVH)  
 (68a, 68b)  
 (4c). 67a 67b  
 4a 25 $\mu$ m 10 50 $\mu$ m  
 50 $\mu$ m FR-4 FR-4 4 5  
 (0.5 1nF/in<sup>2</sup>) 가 (100)  
 nF/in<sup>2</sup>) 가 (+) 가  
 FR-4 가 가  
 가 가 5  
 5

18 35μm (92) (93) (G) (F) 8 10μm (91)

$$C = \epsilon_r \epsilon_0 \left( \frac{A}{D} \right)$$

ε<sub>r</sub> (dielectric constant), ε<sub>0</sub> 8.855 × 10<sup>-8</sup>, A  
 D 가  
 (Bimodal) 가 10μm 5 7nF/cm<sup>2</sup>  
 , 3M US6,274,224 (Polyimide) (Composite) BaTiO<sub>3</sub>  
 3 10μm (Thin Film Type) (10nF/in<sup>2</sup>) 8

PCB

가

(Copper clad FR-4) (photo resist dry film) ) FR-4

; )  
 ; )

; )

가

(De-coupling)

(Signal matching)

(screen printing)  
 (Oven) 150 170 30

가 1,000 10,000

BaTiO<sub>3</sub>

(Bimodal) , 0.9μm  
 80 90

60nm

BaTiO<sub>3</sub>  
 3:1 5:

1

(ceramic buff) 2 3 $\mu$ m  
 가  
 (Electroless copper plating) ; 10 15 $\mu$ m 1 2 $\mu$ m  
 (Resin Coated Copper; RCC) (micro-via hole) (through hole)  
 RCC - (Build-up)  
 (Laser drill) (micro-via hole) ;  
 (Mechanical drill) (through hole) ;  
 p) RCC 가 (IC Chi  
 Copper clad FR-4); b) ; a) FR-4 ( ; c) ;  
 e) ; d) ;  
 가  
 6  
 6 (104a 104d) (103)가  
 (103) , FR-4 (101) (104a 104d)  
 (105a 105d) , 1 6 , 2 5  
 7a 7i  
 7b (103)가 (102a 102d) (104a 104d) (103) ;  
 (104a 104d) (105a 105d) 1 2  
 (104a 104d) (Dk:1,000 10,000) BaTiO<sub>3</sub> 가  
 BaTiO<sub>3</sub> (Unimodal) (Bimodal)  
 0.9 $\mu$ m 60nm 3:1 5:1  
 80 90  
 7b 102a 102d 가  
 (ceramic buff) (104a 104d) (104a 10  
 4d) 2 3 $\mu$ m (Electroless copper plating) 0.5 1 $\mu$ m (Elec  
 tro copper plating) 12 15 $\mu$ m (105) 15 18 $\mu$ m (copper)  
 (104a 104d) (105a 105d)

104a 104d) 가 , 가 (

FR-4 가

6 1 (102a+104a+105a) EMI (filter) (signal

matching) (102d+104d+105d) (10 100pF (VCC) (GND)), 2 4 ((102b+104b+105b)

10 100nF

7a 7i

7a 7i

1 가 (dielectric resin) FR-4 (Copper clad FR-4)(101)

(photo resist dry film)

(102a 102d) ( 7a ). (102a 102d) (De

-coupling) (102b, 102c, 102d) (Signal matching) (

102a)

2 가 (102a 102d) (103) (103)

(102b, 102c, 102d) (Signal matching) (De-coupling)

(102a) (F)

3 ( 7c ). (103)가 (104a 104d)

(Oven) (screen printing) (104a 104d)

150 170 , 30 (ceramic buff)

(104a 104d) 2 3 $\mu$ m

4 (104a 104d) (103) (105)

(Electroless plating) 1 2 $\mu$ m (103) (105)

( 7d ). 15 $\mu$ m (105)

5 (105) (photo resist dry film)(106a 106d)

(105) (106a 106d)

(105) (104a 104d) (1a

nd) ( 7e ).

6 (105a 105d) (102a 102d) (104a 104d)가

( 7f ).

7 (105a 105d) - (Build-up)

(Resin Coated Copper; RCC)(107a+108a, 107b+108b) ( 7g ).

8 (107a+108a, 107b+108b) (Laser drill)

(110) (Mechanical drill) (109)

(110) (109) (110) (105a 105d)

(109) (102a 102d) ( 7h ).

9 가 가 (107a+108a, 107b+108b) (116)

(IC Chip)(111 115) (105a 105d) (102a

102d) (102a 102d) ( 1 ) ( 2, 3, 4 )

( 7i ). 1 4 (104a 104d), (105a 105d) (10

2a 102d) 117 (111 115)

FR-4(Dk 4.5)

(Dk 70 90)

10 $\mu$ m 가 350 400pF/cm<sup>2</sup> ( 10 $\mu$ m ) 5 7nF/cm<sup>2</sup>( 가

12 16

(RF) (104a) (104b, 104c, 104d)

(103) 가  
 (104a 104d)  
 (104a 104d)  
 (110) (105a 105d) (104a 104d)가 (10  
 (Land)  
 4a 104d)가  
 (110) (103) PCB  
 (laser drilling) 6 1 2

PCB

가

가

(57)

1.

) FR-4 (Copper clad FR-4) (photo resist dry film)

) ;  
 ) ;  
 ) ;  
 ;  
 ) ;  
 )

가

2.

1 )

3.

1 ) (De-coupling) (S  
 ignal matching)

4.

1 ) ;  
 (screen printing) ;  
 (Oven) 150 170 30

5.

1 ) ;  
 가 1,000 10,000 BaTiO<sub>3</sub>

6.

1 ) ;  
 60nm BaTiO<sub>3</sub> (Bimodal) 0.9μm  
 3:1 5:1 80 90

- 1 7. , 가 (land)
- 1 8. ) , (ceramic buff) 가 2 3μm
- 1 9. , ) , 1 2μm (Electroless plating)
- 10 10. ; 10 15μm
- 1 ) , (Resin Coated Copper; RCC) ;  
 ) RCC (micro-via hole) (through hole) ,  
 가
- 10 11. RCC , - (Build-up)
- 10 12. , ,
- 10 13. , ) ,  
 (Laser drill) (micro-via hole) ;  
 (Mechanical drill) (through hole) ;
- 10 14. , 가 (IC Chip)
- ) RCC , 가
- 15 15. (Copper clad FR-4);  
 a) FR-4 ;  
 b) 가 ;  
 c) 가 ;  
 d) ;  
 e) ,  
 가
- 15 16. ,
- 1 17. , ,
- 15 18. ,

가 1,000 10,000

BaTiO<sub>3</sub>

19.  
15  
60nm

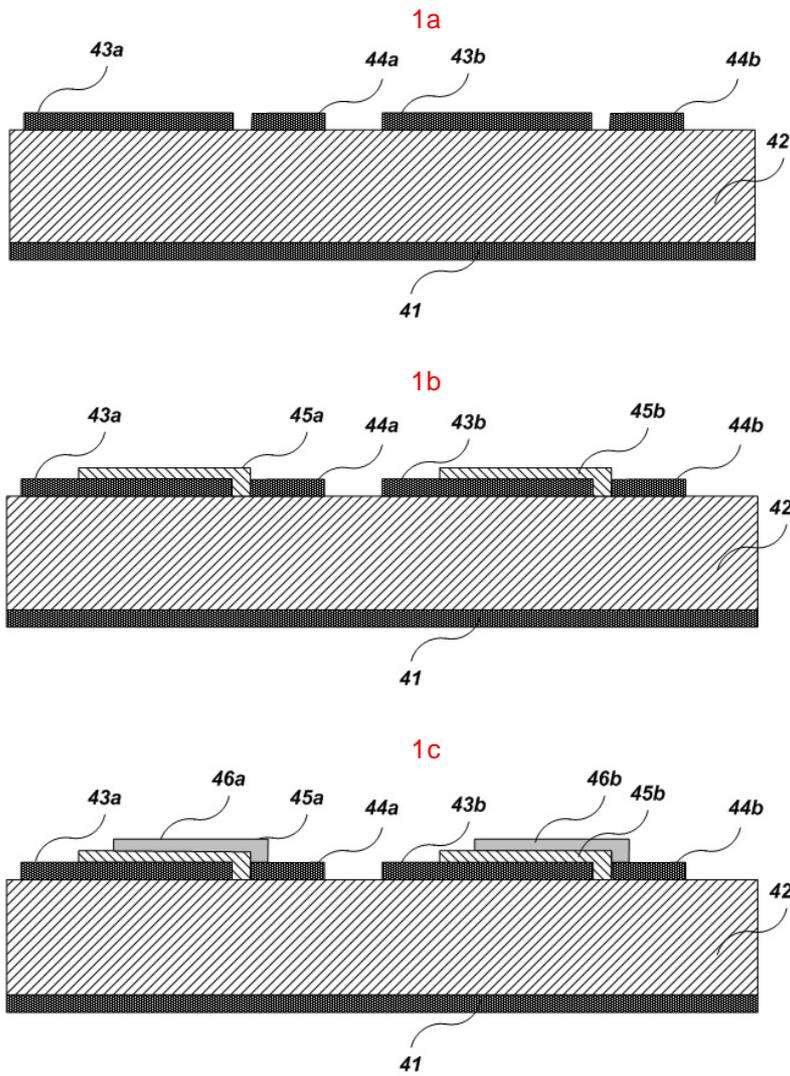
BaTiO<sub>3</sub>  
3:1 5:1

(Bimodal)

0.9μm  
80 90

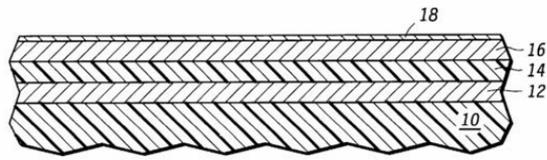
20.  
15

가

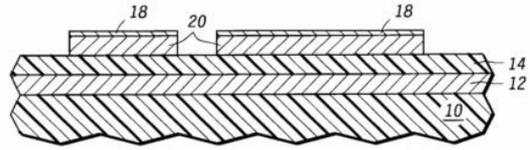




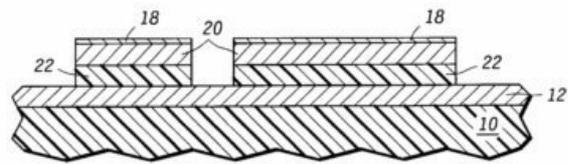
3b



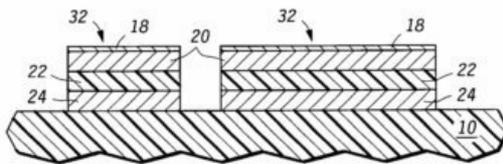
3c



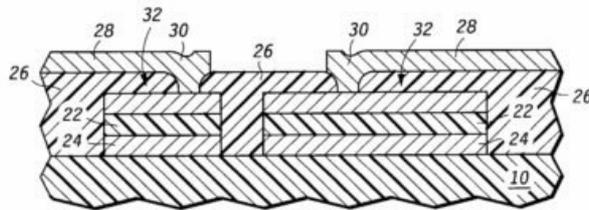
3d



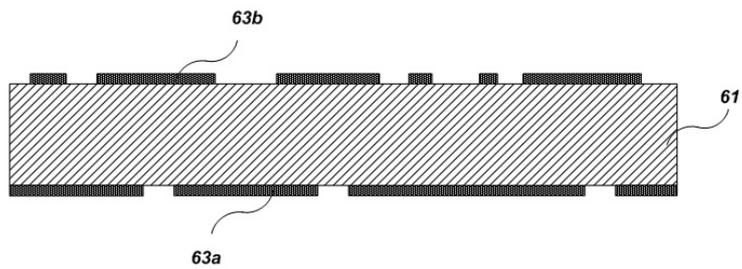
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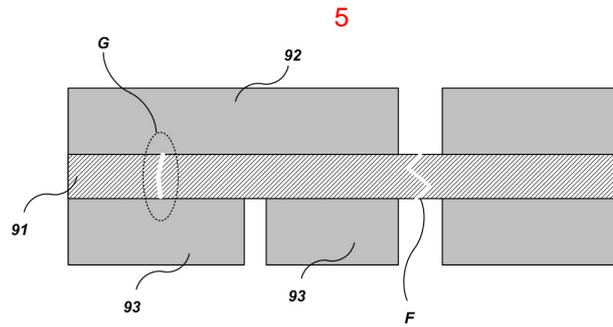
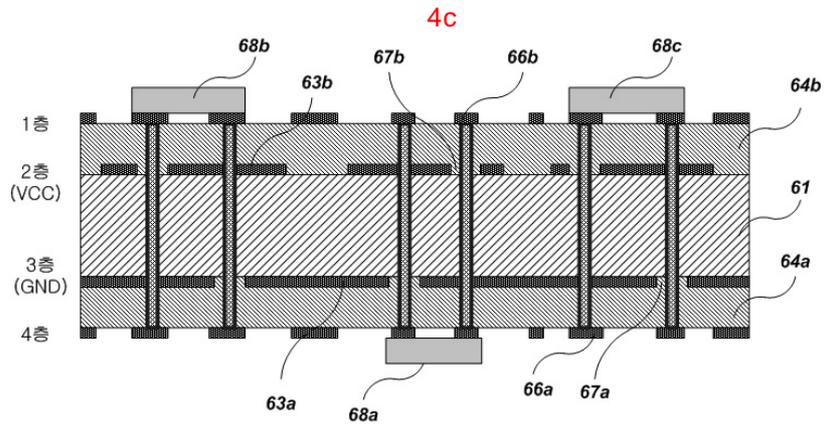
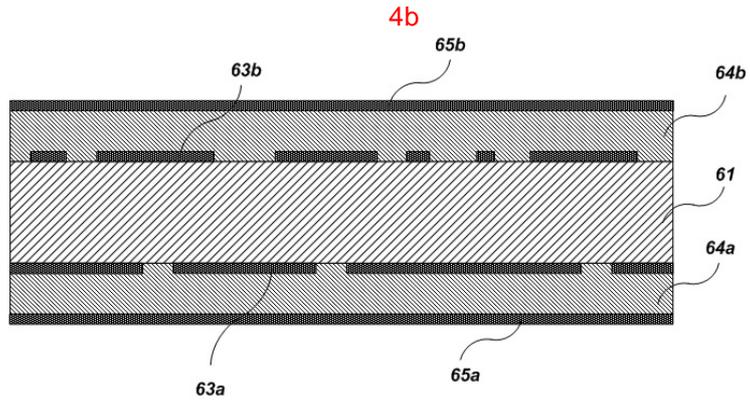


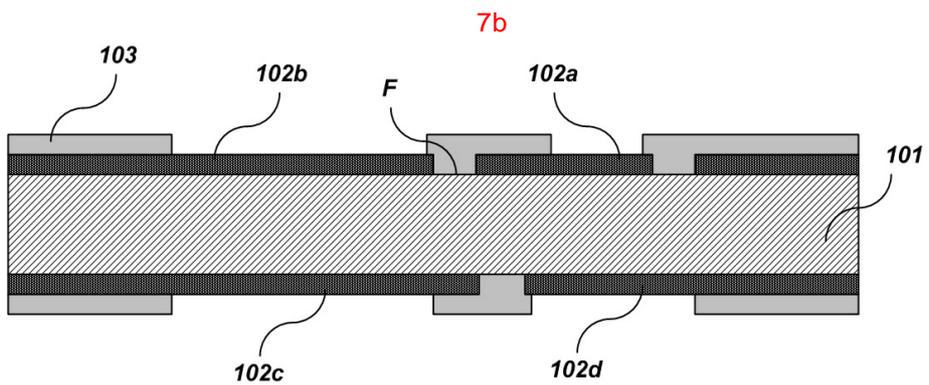
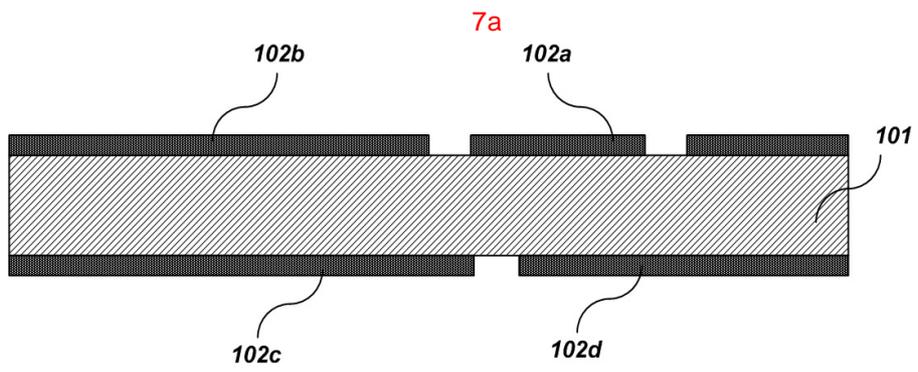
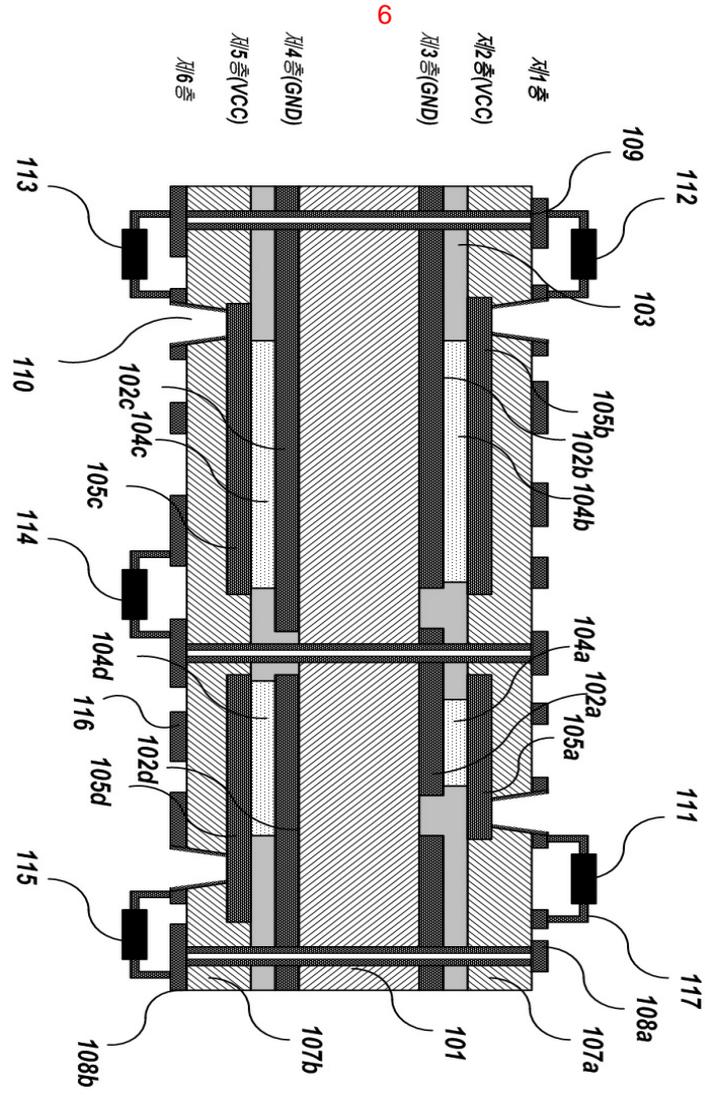
3f

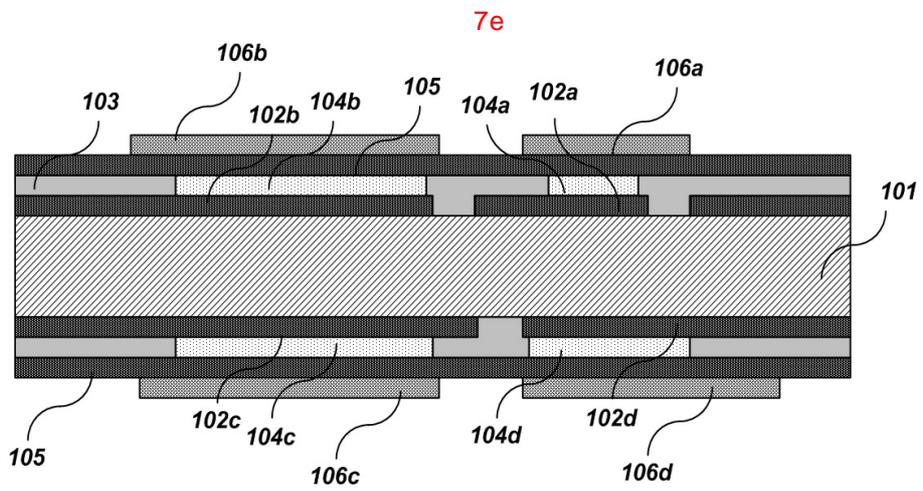
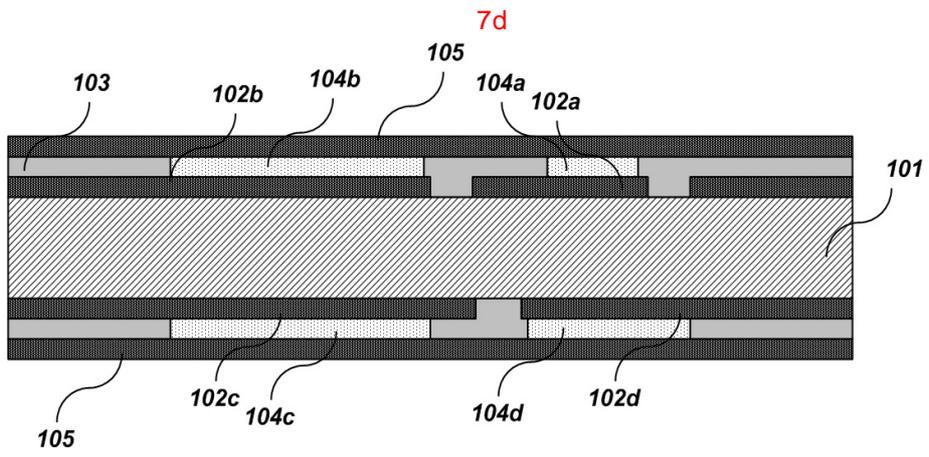
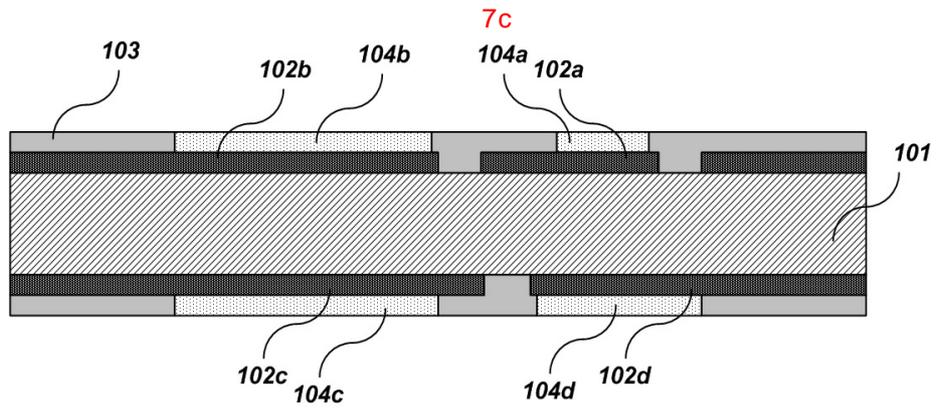


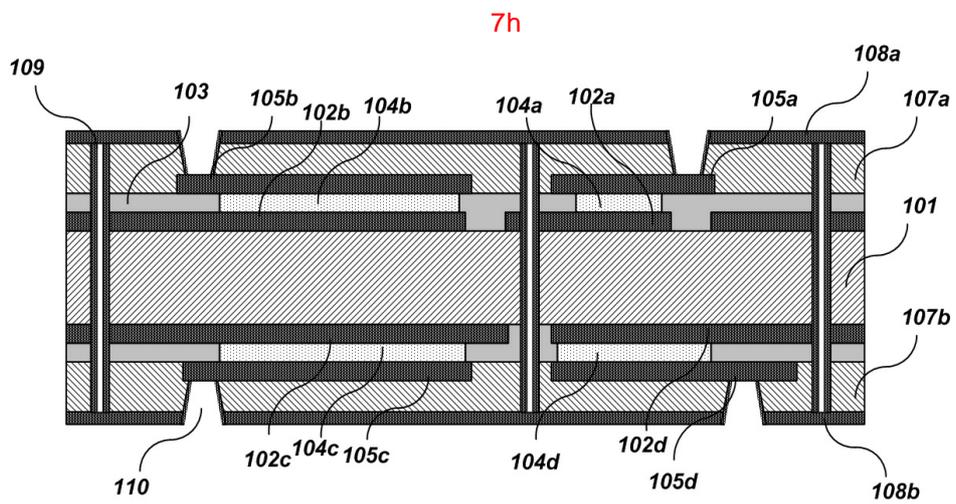
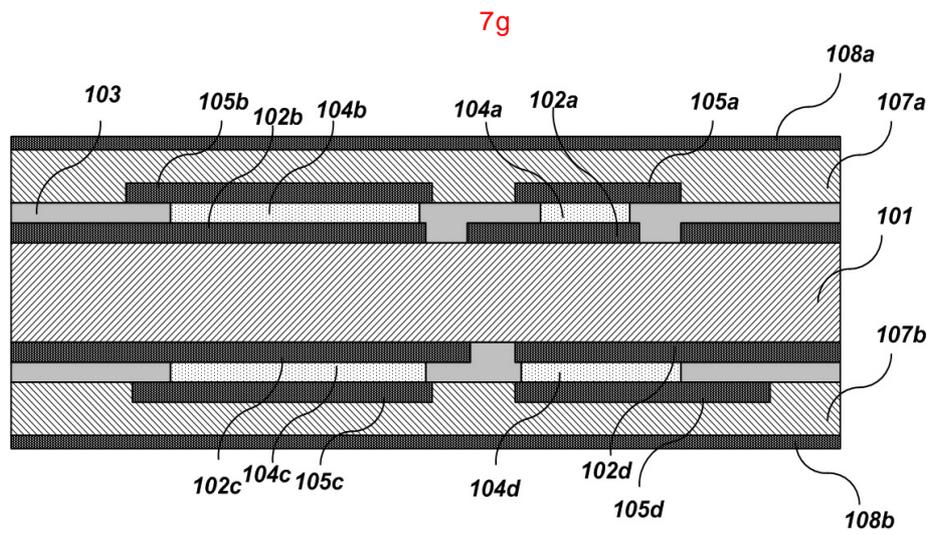
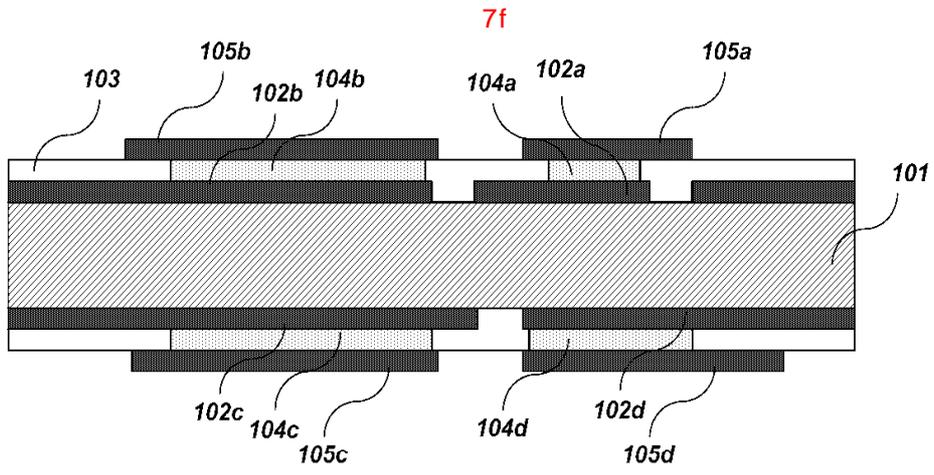
4a











7i

