tL a a a . T tL tL tL tL a tL -
a tL tL tL tL tL a . I
S Pb a , Pb tL a tL tL tL tL tL -
tL (165 °C). tL tL tL tL
tL b tL tL tL tL tL tL -
a b tL tL a Pb tL a , a S
tL tL tL tL tL a a b
Pb . I S A , S tL a tL . tL
tL tL a S tL A 3S tL tLa -
. E tL S a a tL tL tL
tL a a a tL tL a .
C a tL a UBM WLP tL tL tL a tL WLP
tL tL , tL a tL tL tL tL tL
I a UBM tL , tL tL tL tL
tLa tL a b , tL tL a a tL tL tL UBM
a . W a tL WLP tL tL , tL -
tL a b PCB .

σ_H ... $\sigma_H = (\sigma_{xx} + \sigma_{yy} + \sigma_{zz})/3$, ... σ_{xx}, σ_{yy} ... σ_{zz} ...

... $\vec{J}$, ... T, ... T, ...

$$\rho = \rho_0 [1 + \alpha (T - T_0)]$$

tL tL tL PCB (F . 5b). S tL tL tL

F . 8. (a) F tL tL tL tL -b A a B; (b) tL A (tL b 1 a 2); ( ) tLa A; ( ) tL B (tL b 3 a 4) a ( ) tLa B.

A tL a tLa a b tL tL tL C tLa tL PCB , tL a tL a 1.7 a ( ) a tL tL C tLa tL . T tL b tL a tL tL tL tL . T a b tL tL tL tL tL tL tL tL 50 °C, tL b a tL tL a b tL tL tL a b tL a . T tL tL a - tL 20 W/ ² °C.

T tL tL a a tL S A C b a tL Tab 1 [3,9 14] E_A a tL tL , Z - tL a b , D_0 - tL, Q tL - tL a tL, ρ_0 tL a tL a tL tL , α tL tL - tL tLa , Ω tL , B tL a tLa tL K_B 1.380662 23 tL tL a e 1.60219 19, a tL tL tL T_0 303.

T a a tL a tL a tL a tL Tab 2. T tL a tL tL tL PCB a a a tL b a

Tab e 1
E tL tL ba a a tL [3,9 14].

Pa a tL	U tL	Va
E_A	V	0.8
Z		23
D_0	²/	0.027
Q	V	0.0094
ρ_0	Ω	13.3 8
α	1/K	2.8 3
Ω	³/ tL	2.72 29

Tab e 2
MatL a tL a a a .

MatL a	MatL a tL		
	S tL (J/ K)	T a tL tL (W/ K)	E tL a tL tL (Ω)
PCB		1.7	1 10
S (SAC)	219	57.26	13.3 8(1 + 2 3ΔT)
S		150	4.4
C	385.2	393	1.58 8(1 + 4.3 3ΔT)
E	2185	1.2	1 17

b b tL tL tL a tL tL tL tL tL .

5. Re

5.1. Current density

T tL , a a tL a, tL a a tL tL - tL . F . 9 tL tL tL tL b tL tL - b tL tL tL -b tL . F tL , tL a b tL tL tL tL a tL tL tL tL tL a tL b . S tL a tL tL tL tL - tLa b tL , a F . 2. T tL tL tL a tL tL a tL a tL tL tL b . T tL b

tL ¦tL tL b tL a a ¦tL ¦ tL
0.139 9 A/ 2.
F . 10 tL ¦tL ¦ tL tL b tL ¦ tL
¦ tL -b tL ¦ . S ¦ tL ¦tL ¦tL tL
b tL tL ¦ tL b ,tL ¦tL ¦ tL
¦ a¦tL ¦ tL ¦ . T a¦ b a
¦ tL tL tL ¦ F . 10

F . 11. C ... B.

Tab e 3

P ... a ...

	C ... (A/ ^{2})
E ...	0.139 9
P ... B	0.113 9
% D ... a	18.71

Tab e 4

P ... 2 b ...

	C ... (A/ ^{2})
E ...	0.139 9
P ... A	0.95 8
% D ... a	31.65

... F . 12. Tab 4 ... 31.65% ... D ... A.

5.2. Temperature distribution

F . 13 ... 391.6 K ... 392.8 K, ... 392.9 K ... 394.2 K, ... B ...

5.3. Mesh dependency

S ... Tab 5 ... F ... B ... H ...

F . 12. C ... A (2 ... b).

5.4. Divergence analysis

E tL tL a tL , Ma 31 J 3, FL, USA, 2005.
[11] Na JW, R F, T KN. E tL aL Pb tL b btLaL . A P L tL 2006;99:023520.
[12] La YS, C KM, Ka CL. E tL aL S 37Pb a S 3A 1.5C /S 3A 0.5C tL - b tL T /N (V)/C b tLa . M tL R ab 2006;48:811 24.