

**BTST THIN FILM SENSOR APPLICATION:
HEAT INDICATOR**

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UNIVERSITI MALAYSIA PERLIS
2007**

BTST THIN FILM SENSOR APPLICATION: HEAT INDICATOR

by

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Report submitted in partial fulfillment
of the requirements for the degree
of Bachelor of Engineering



MARCH 2007

ACKNOWLEDGEMENTS

Firstly, I would like to take this opportunity to thank Prof. Madya Dr. Johari Adnan for giving me a chance to do my Final Year Project and also for being a great and tolerant Supervisor. I have learnt a lot from him especially in aspect of proficiency and commitment. I also gain knowledge about of the fabrication process even though I am not a major in this field and learn a lot of electronic instrumentations including hardware and software. Beside that, I would like to thank him for supplying the electronics component needed for this project.

Secondly, I would like to express my appreciation and gratitude to Ms Nor Hayati Sabani, Assistant Researcher, for helping me in fabrication sensor's sample and also teaching me how it's produced.

Last but not least; I would like to thank to all my friends, for their helps in troubleshooting, testing method and advice.

THANK YOU...

Yours truly,

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APPROVAL AND DECLARATION SHEET

This project report titled BTST THIN FILM SENSOR APPLICATION: HEAT INDICATOR was prepared and submitted by Nur Faizah Binti Jaafar (Matrix Number: 031030384) and has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirement for the Bachelor of Engineering (Electronics Engineering) in Universiti Malaysia Perlis(UniMAP).

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March 2007

APLIKASI PENGESAN FILEM TIPIS BTST: ALAT PENUNJUK HABA

ABSTRAK

Laporan ini adalah hasil projek tahun akhir yang dijalankan sepanjang tahun empat untuk Ijazah Sarjana Muda bagi Kejuruteraan Elektronik di Universiti Malaysia Perlis. Kertas laporan ini adalah berdasarkan merekabentuk alat serta analisa mengenai alat penunjuk haba yang menggunakan pengesan filem tipis Barium Tantalum Strontium Titanate (BTST) di mana ia difabrikasikan di Makmal Bilik Bersih di Universiti Malaysia Perlis oleh sekumpulan penyelidik dari Universiti Malaysia Perlis. Projek ini bertujuan untuk melihat potensi pengesan itu sendiri. Secara keseluruhannya, projek ini terbahagi kepada dua bahagian iaitu bahagian perisian dan juga perkakasan. Selain itu, projek ini melibatkan tiga litar iaitu litar transduser, litar untuk penukaran isyarat analog ke isyarat digital, dan untuk isyarat aplikasi ialah litar kawalan mikro menggunakan litar terkamir PIC kawalan mikro . Maka, dengan itu untuk membuktikan litar berfungsi dengan sempurna, simulasi daripada isyarat aplikasi keluaran dari litar kawalan mikro perlu ditunjukkan. Secara asasnya, apabila haba dikenakan kepada litar transduser yang mengandungi pengesan filem tipis BTST, pengesan tersebut akan mengesan perubahan haba dan akan menukarkan isyarat yang diperolehi kepada elemen elektrik seperti rintangan. Kemudian, litar penyesuai akan memberi isyarat kepada litar kawalan mikro untuk memproses isyarat yang dihantar. Kemudian disalurkan kepada barisan penanda LED untuk menunjukkan sama ada persekitaran panas ataupun tidak.

BTST THIN FILM SENSOR APPLICATION: HEAT INDICATOR

ABSTRACT

This report contains an account of my final year project, which was carried out in the fourth year of the Electronic Engineering (B.Eng) degree at Universiti Malaysia Perlis. This paper is based on the design and analysis of heat indicator using Barium Tantalum Strontium Titanate (BTST) thin film sensor which was fabricated in Universiti Malaysia Perlis (UniMAP) Cleanroom by their researchers. This project was done to see the potential of the sensor itself. This project is divided into two parts namely software and hardware development. Also, it includes two circuits that need to be designed and developed, specifically analogue and digital part. Hence, to prove the circuit works, the simulation of the output need to be shown. This heat indicator consists of BTST thin film sensor and also PIC controller for data acquisition and conversion. When heat is applied to the sensor, the sensor will detect the heat by electrical characteristic which is the resistance that produced by sensor. The signal conditioning circuit and the microcontroller will indicate whether it's hot or not by how many LEDs light up.

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LIST OF SYMBOLS, ABBREVIATIONS OR NOMENCLATURE

Q	Thermal conduction
λ	Thermal conductivity
∇T	Gradient temperature
G	Constant for a given apparatus and depends on the geometric arrangement of the boundaries of the test sample
E	Voltage supply to the circuit
Ω	Ohm, unit of resistance
ΔR	Change in resistance
\neq	Not equal
k	kilo (10^3)
$^{\circ}\text{C}$	Degree Celcius (Unit of temperature)
ml	milliliter
AFM	Atomic Force Microscopic
CSD	Chemical Solution Deposition
DC	Direct Current
LED	Light Emitting Diode
LCD	Liquid Crystal Display
MOD	Metal Organic Decomposition
PVM	Physical Vapour Module