SEMINAR

Seminar 3 Sunday June 17, 2001

DESIGN WITH POWER SEMICONDUCTORS - PART I - BASICS

9:00am – 6:00pm

Instructors: Pierre Aloisi, Jean-Marie Peter, France

ABOUT THE INSTRUCTORS

Pierre Aloisi, Formerly Principal Staff Application Engineer in Motorola semiconductors, Toulouse, France. Specialist of power semiconductors, mainly working in power applications like motor control, power supplies, telecom, appliance, lighting and automotive. Author of more than 100 papers in various international conferences and magazines. He has written four books on semiconductors. Today power electronic professor in different French universities.

Jean-Marie Peter started as R&D Engineer with Thomson in the field of Servomechanisms and Magnetic Amplifiers. He developed the first solid state motor drives in France operating in the market at the beginning of 1960. After he worked in the design of High Power Electronic Converters. Later with SGS THOMSON he was responsible of power applications and finally director of the strategic industrial market. He is now PCIM Technical Conference Director.

CONTENTS

1.1 BASICS ABOUT POWER SEMICONDUCTORS IN SWITCHING MODE

Essentials about silicon for power applications

Bipolar components: Diode - Bipolar transistor - Thyristor - GTO - IGCT - Fast rectifier

MOS Components: MOSFET - IGBT - MCT

Max ratings definitions - Junction temperature - Influence of the rated voltage - Safe operating area - Drive

Power Integration. What is specific from power - Monolithic and hybrid technologies - System or improved component - Smartpower-limits - What can be integra-ted, what cannot be integrated today - Examples - Power modules - IMPs - Advantages and disadvantages of power integration

1.2 DATA SHEETS

Max ratings - Characteristics - Typical and maximal values

1.3 LOSSES

Conduction losses - Switching losses

Examples of losses calculation; (Diodes - MOSFET - IGBT - GTO) Typical and maximum values

1.4 THERMAL RESISTANCE AND IMPEDANCE

Component - Heatsink

1.5 EXAMPLES OF THERMAL CALCULATIONS

Case without and with heatsink - MOSFET for SMPS - IGBT for motor drives

1.6 PACKAGING AND RELIABILITY

WHO SHOULD ATTEND

This first part of the course is designed for all engineers (Designers - Quality responsibles - Component engineers - System engineers and technical managers) who want to refresh their knowledges in the state-of-the-art about power silicon components.