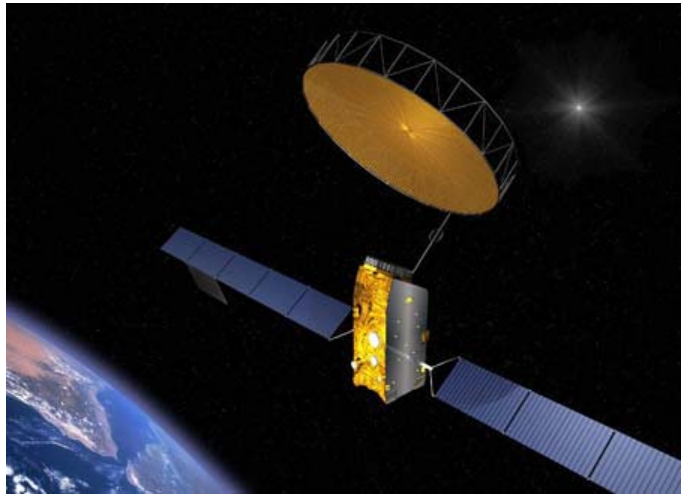
DC/DC Converter portfolio for Space Application



Alcatel ETCA

1963 - 2005

More than 40 years

of

Experience in Space

ALCATEL

DC/DC converter portfolio for Space Application

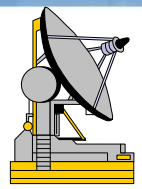
- Contain -

1. Heritage
2. Low Power Low Cost converter (LPLC)
3. µBuck
4. Standard Hybrid FB/FWD Controller
5. µconverter
6. Schedule

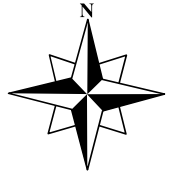
1. HERITAGE

Application Heritage

- SSPA Power Supply
- Star Trackers



Telecommunication



Gyroscope Mechanisms

- GyroLaser Drive
- Gyro Control

- Power Interface Unit
- On Board Data Handling

Housekeeping

Earth Observation

- Camera Power Supply
- Main Auxiliary Supply

- Solar Panel Drive Supply
- Antenna Drive Supply

Motor Drive

DC/AC Application

- Plasma Thruster Auxiliary supply

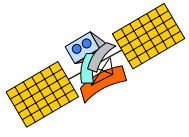
- Safety Control Equipment
- Pyrotechnic Control

Launchers

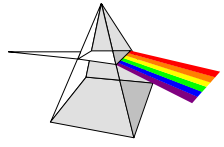
High Voltage Operation

- Laser Emitter

- Advanced SAR



Synthetic Aperture Radar

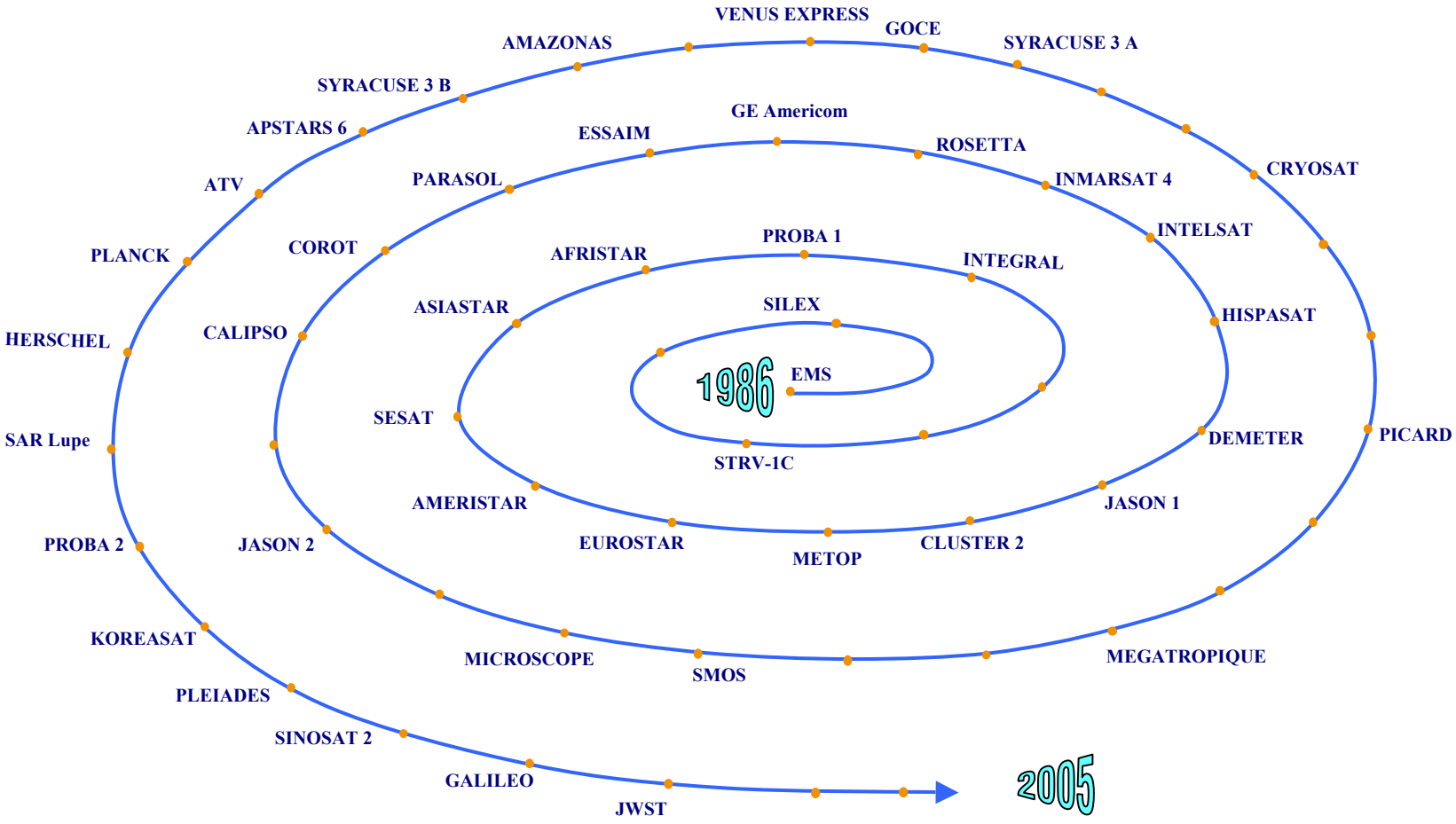


Scientific Experiments

- Magnetosphere Measurement Supply
- Grid Spectrometer

ALCATEL

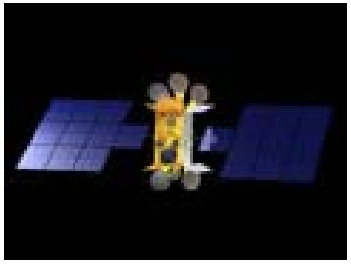
Program Heritage



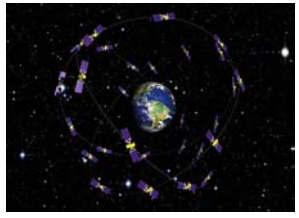
Program Heritage

IMMARSAT

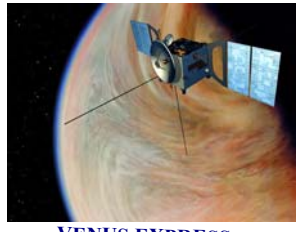
HELLAS



ALPHABUS



GALILEO



VENUS EXPRESS

AEOLUS

ISS

PLEIADES

ARIANE 5

ATV

MILITARY

Main Customers

Contraves | Space

SYDERAL

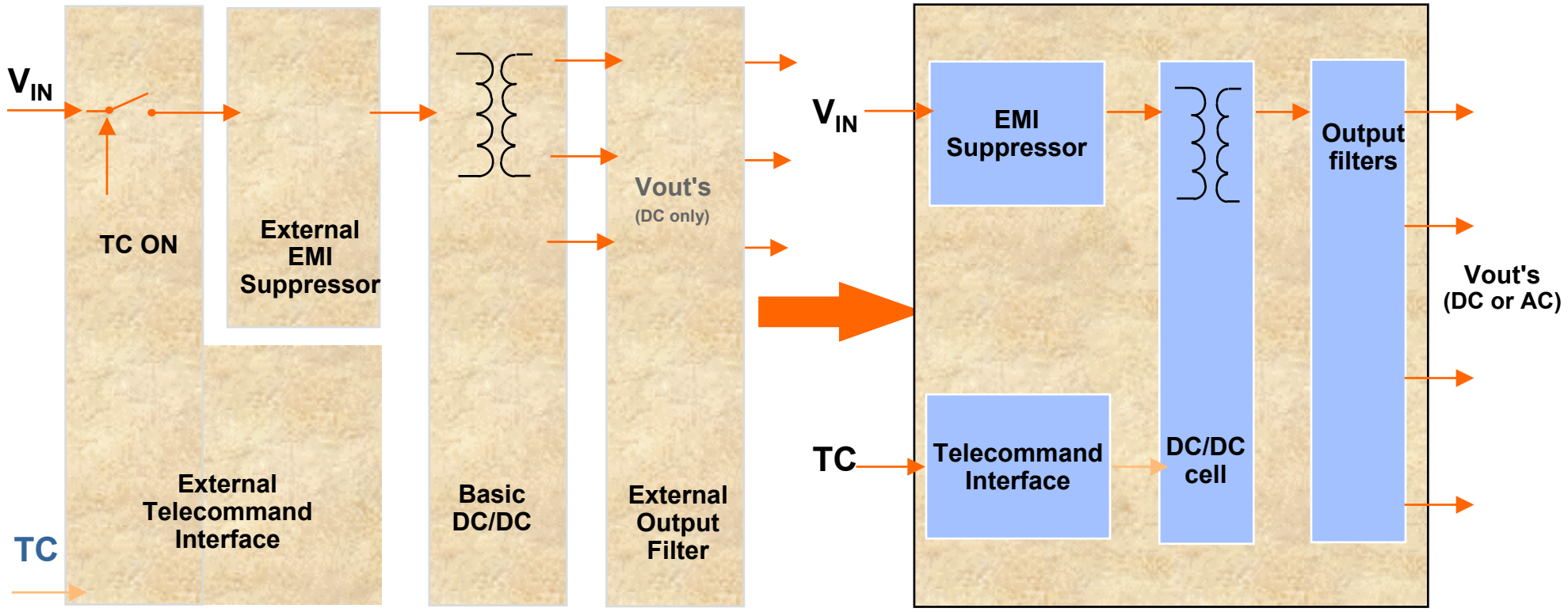
ALCATEL

2. Low Power Low Cost (LPLC)

Basic or Integrated Solutions ?

Basic Solution

Integrated Solution



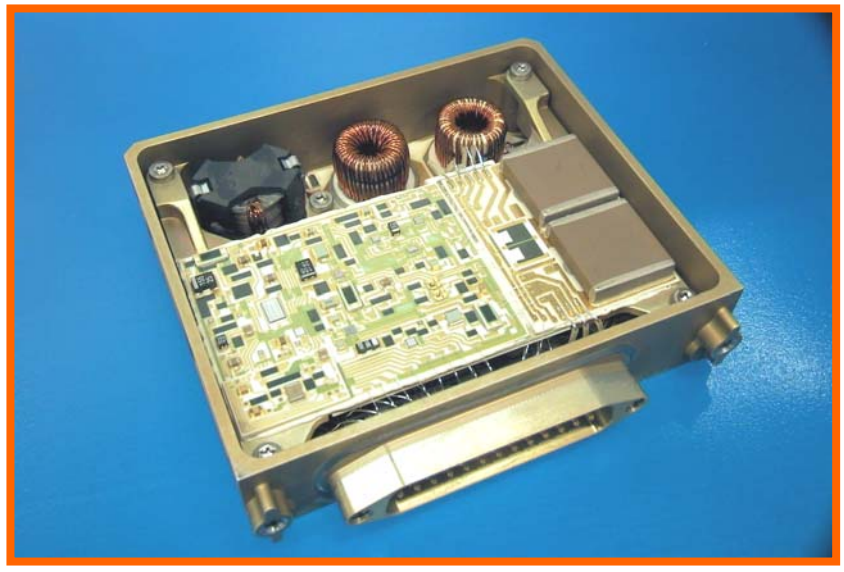
The LPLC includes all the function requested in any space application. .... Not less, not more .....

Targets

- **Based on our heritage : ETCA has focused its development on the following technical targets** :
  - flexibility related to input bus voltage,
  - flexibility related to output voltage number / values,
  - output voltage accuracy better than ± 5% in any case,
  - flexibility related to output power demand up to 30W.
- **In addition** :
  - limited NRE efforts
  - competitive recurring cost to potential external suppliers.

Technology

- SCPH technology : thick film hybrid packaged in hermetic aluminium structure
  - High mechanical, thermal and radiative tolerance
  - High power density
  - Low mass and volume
  - Full ESA qualification (ESA-PSS-01-608)



Product Range

Type		V_{IN} range	P_{OUT}	Outputs	Size	Remark
20 to 50V Series	ETC 2050-15	20 - 50 V_{DC}	15 W	DC and/or AC	A	
	ETC 2050-30		30 W	DC and/or AC	A	
	ETC 2050-40		40 W	Single DC output	A	Ext. settability ±5%
50 to 100V Series	ETC 50100-15	50 - 100 VDC	15 W	DC and/or AC	A	
	ETC 50100-30		30 W	DC and/or AC	A	
Other series	ETC 4050-40	40-50 V_{DC}	40 W	DC and/or AC	A	
	ETC 25100-10	25-100V_{DC}	10 W	DC and/or AC	A	

Outputs	#	Size A :≤ 4	Customisable, DC and/or AC
Size	A	85 x 77 x 20 mm³	195 grs

- More than 40 different variants exist today -

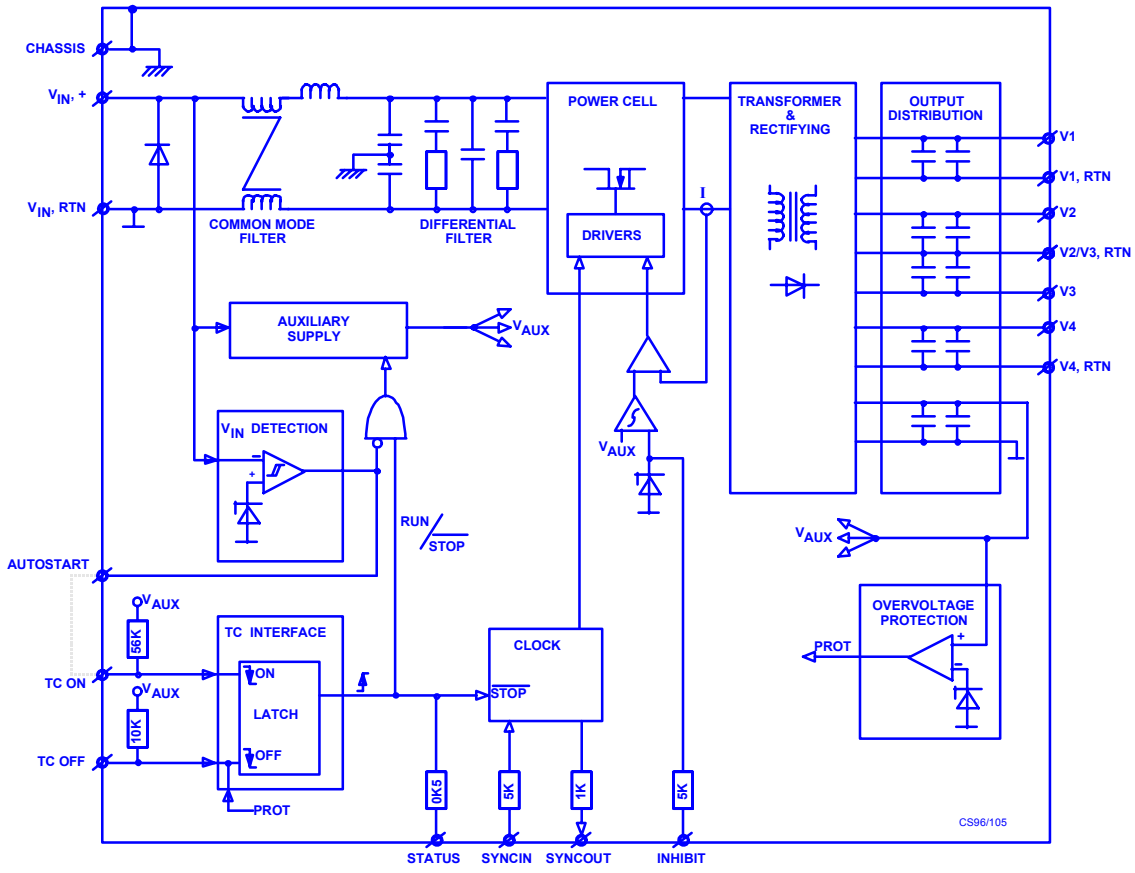
Functional Characteristics

Performances

- P_{OUT} up to 30 W
- VIN up to 126 V
- 4 + 1 Outputs
- Each output DC or AC square, -100 to +100 V
- All EMI filters included

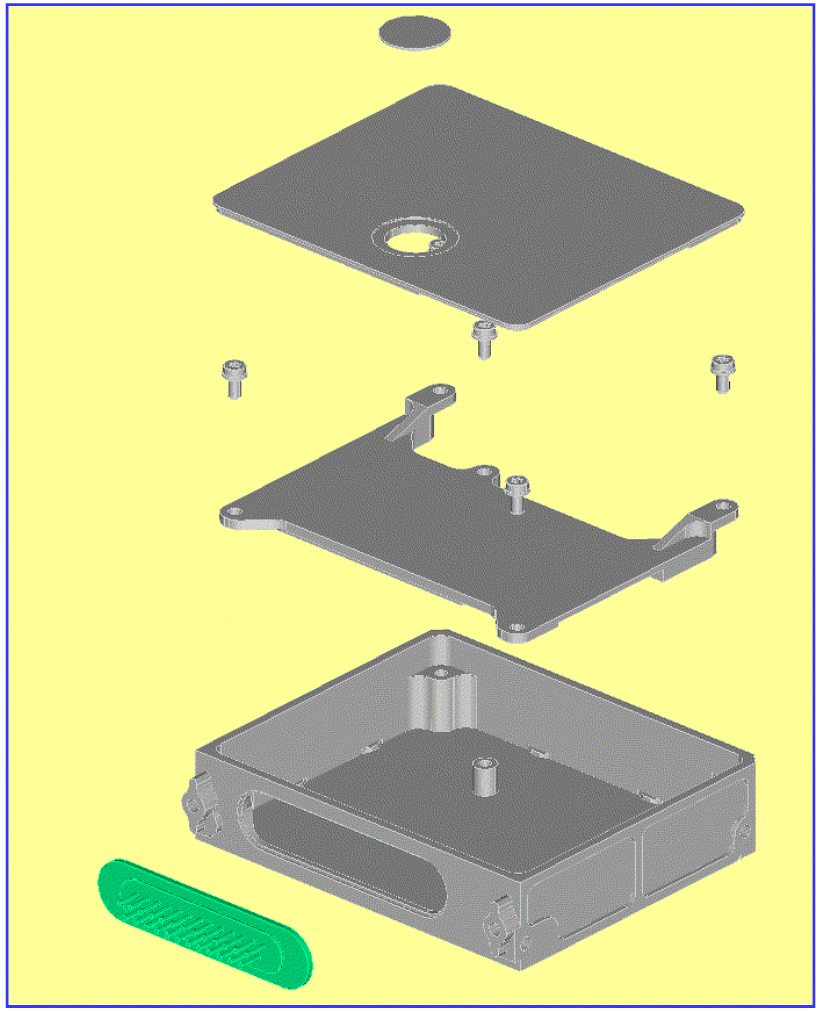
User Control Interface

- ON/OFF Telecommand
- ON/OFF Status
- Selectable Automatic Start
- Inhibit Input
- Synchronisable
- Synchro OUT Signal (for Slave Equipment)



Our products are fully qualified following ESA rules

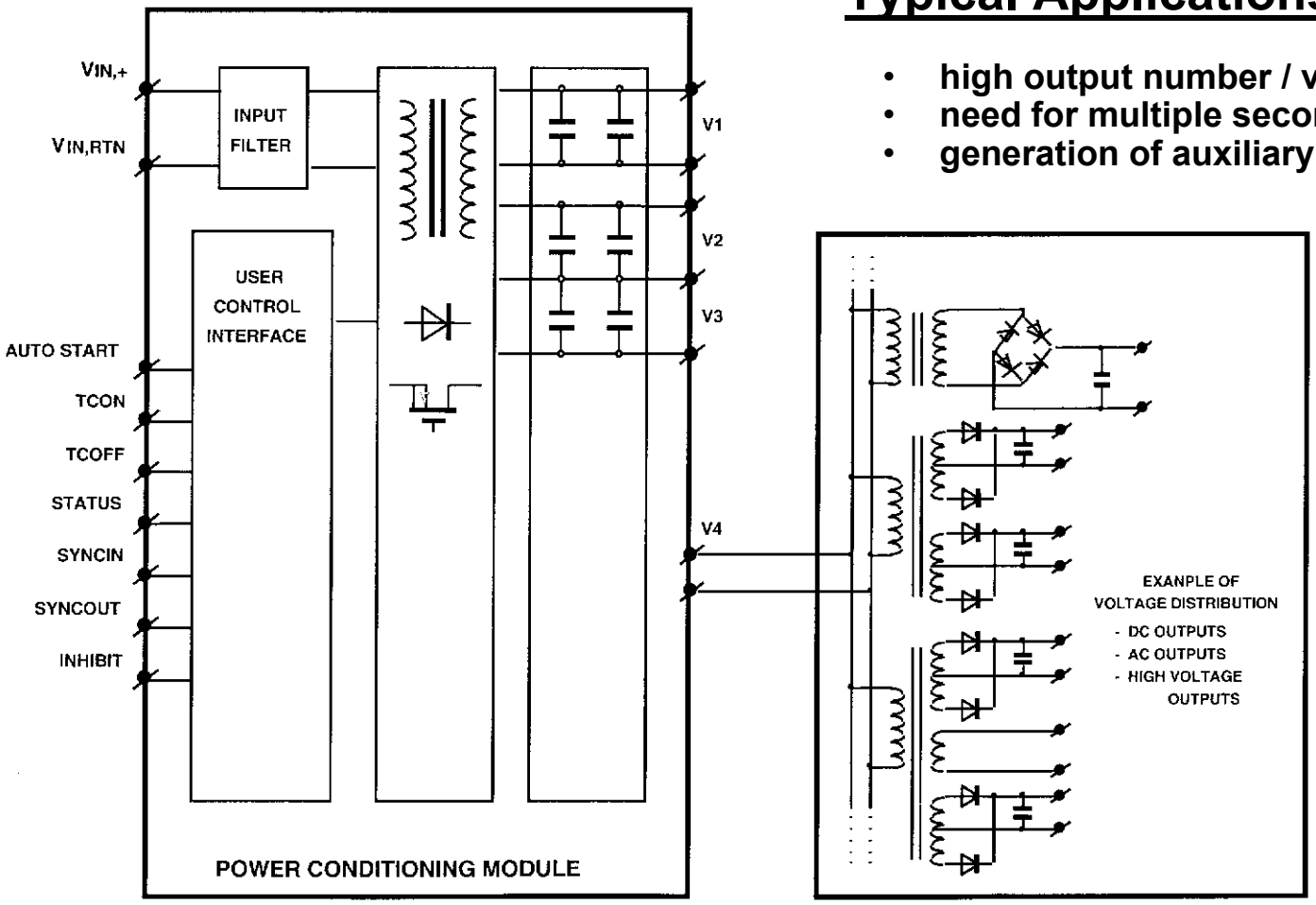
LPLC Package



Distributed Voltage Application

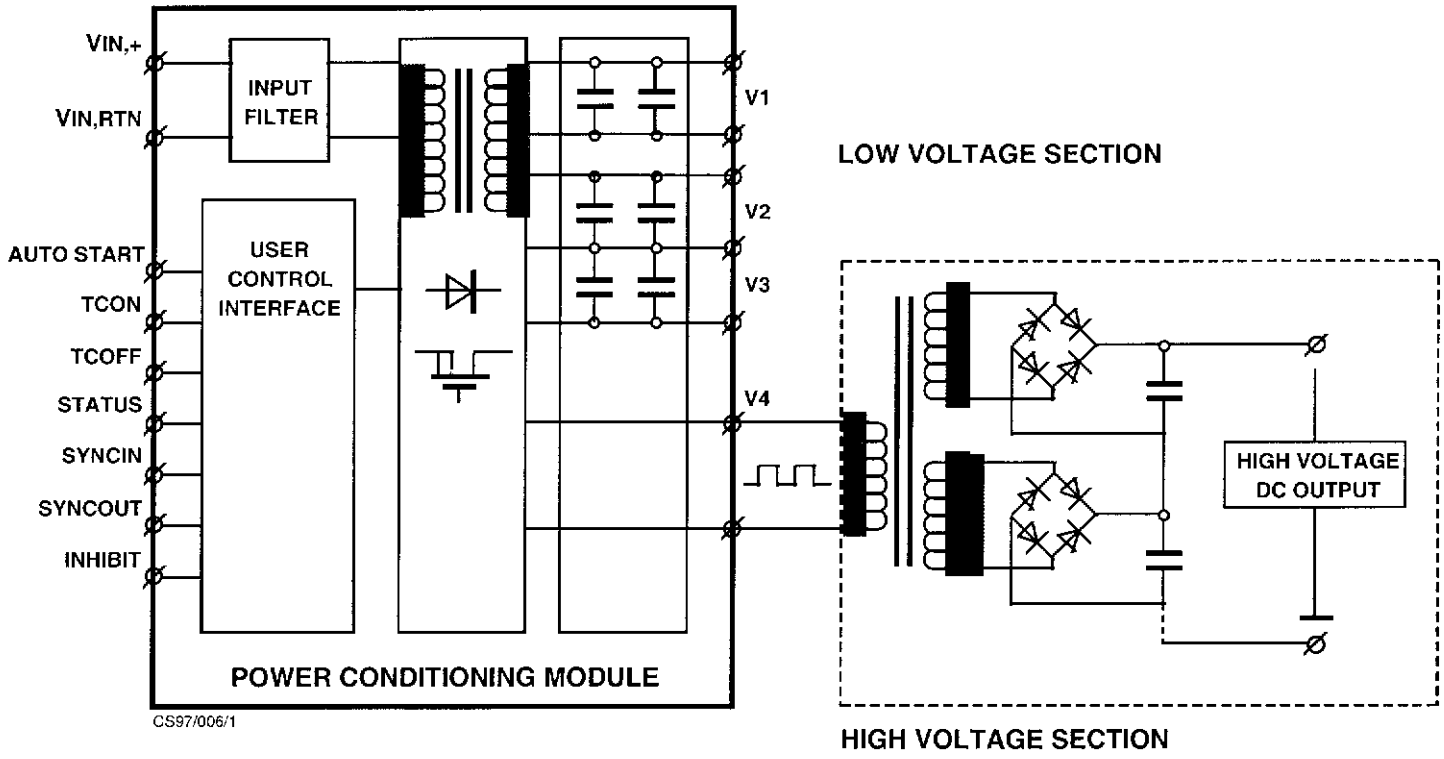
Typical Applications :

- high output number / values required
- need for multiple secondary grounds
- generation of auxiliary buses



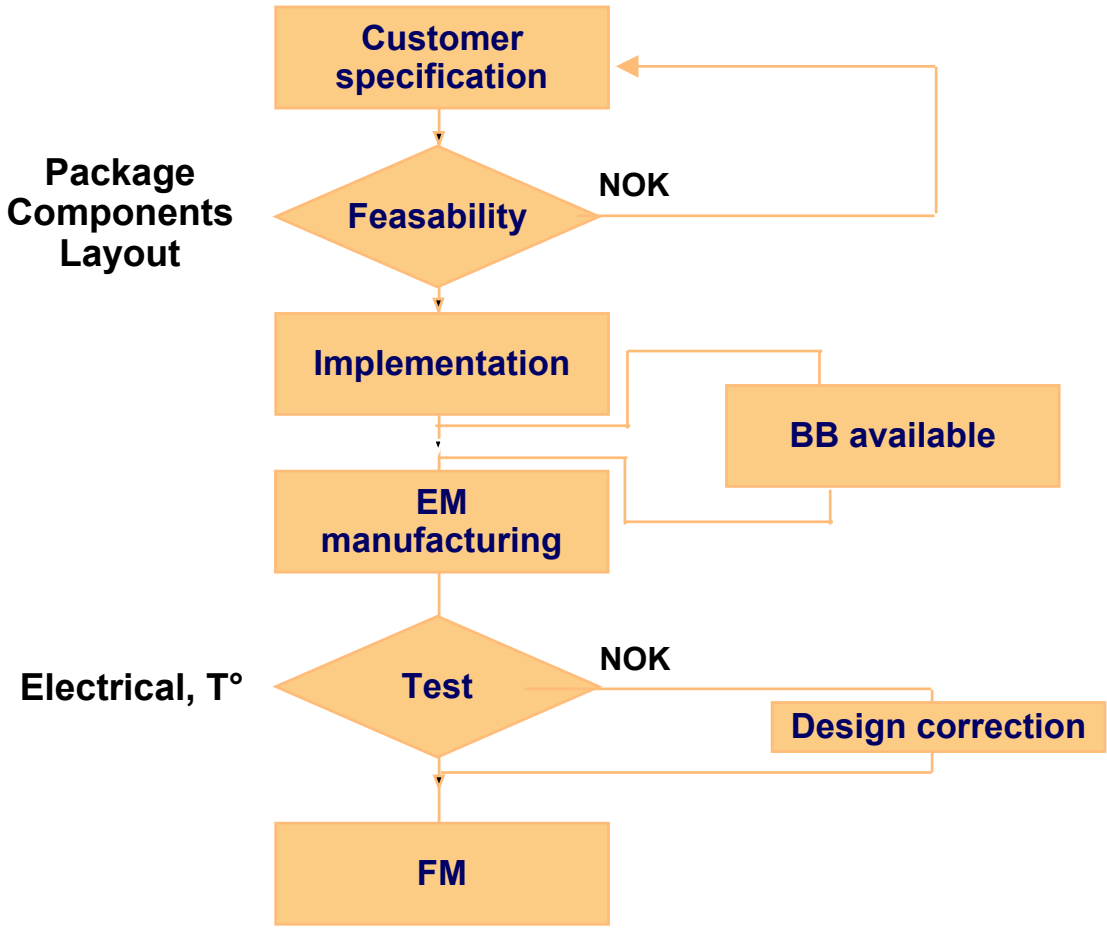
The LPLC is the easy way to manage complex voltage distribution

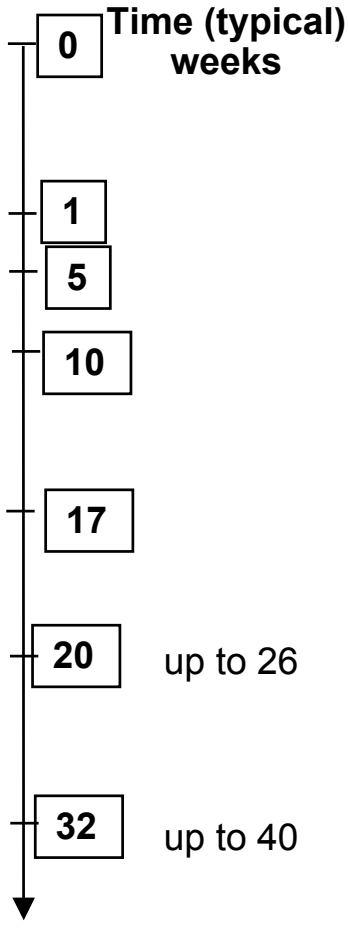
High Voltage Application



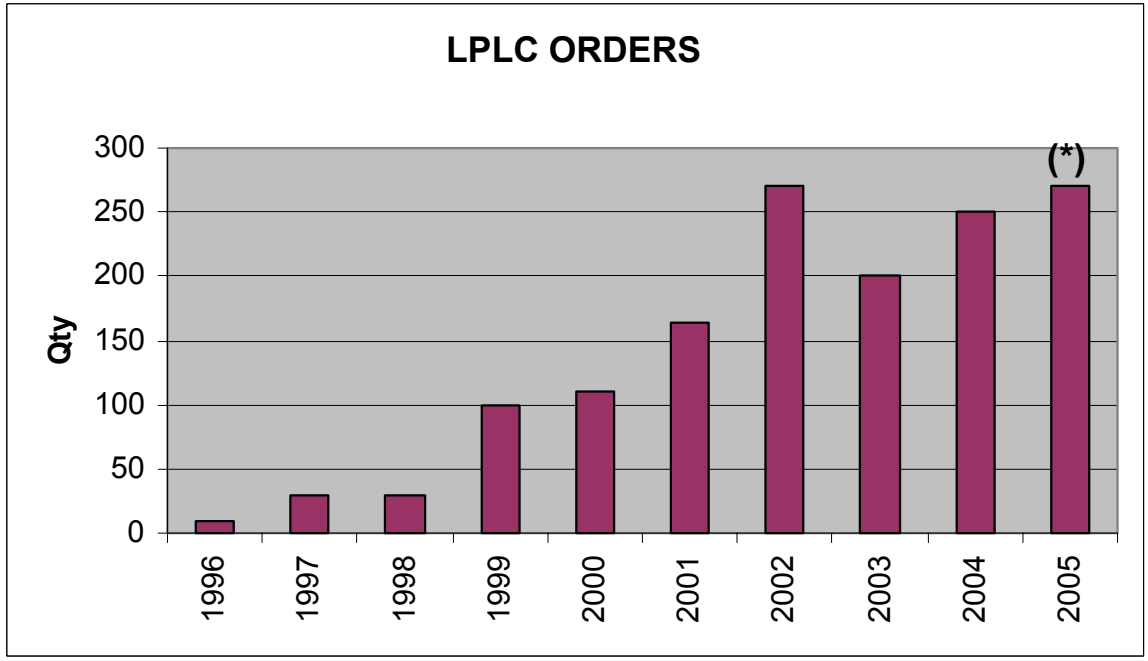
The LPLC is the easy way to mix low and high voltage applications

Program Organisation & lead times





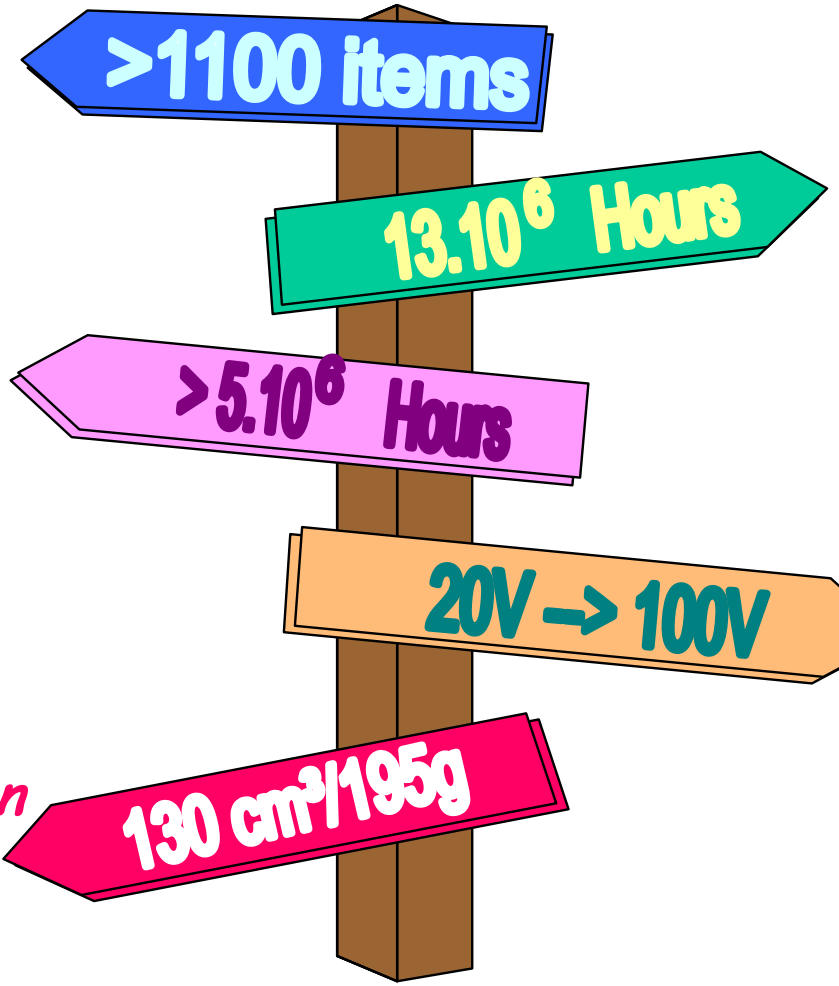
Orders



(*) forecast

Key Figures (2004)

LPLC ordered over the world



MTBF

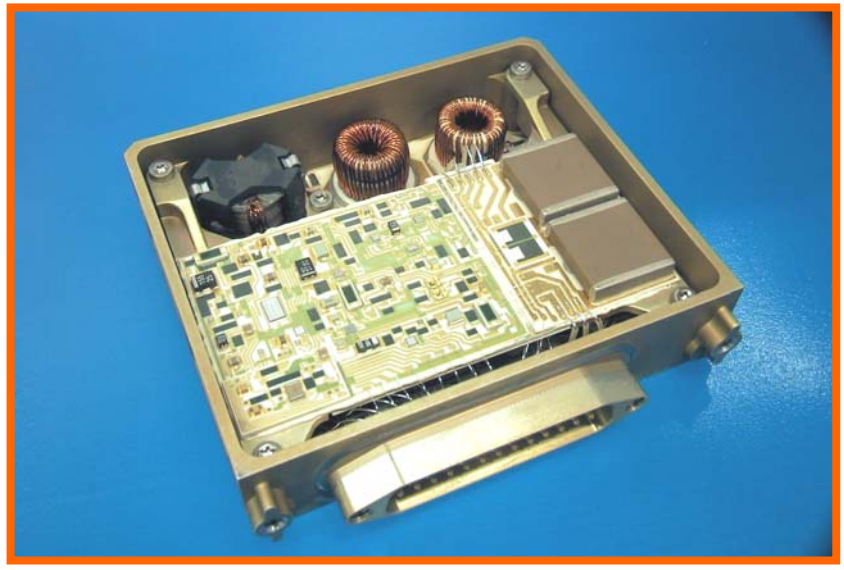
Flight Heritage (without failure)

Input bus voltage flexibility

Volume/mass for integrated solution (4 outputs @ 30W)

LPLC Summary

- Hybrid Technology.
- Integrated solution (filters, I/F TC, …).
- Multi output (≅ 30W).
- Flexibility : Vin, Vout, protection.
- Improved design.
- High reliability.
- Well adapted to GEO mission.
- No RadHard component



3. µBuck

Introduction

- The goal is to cover the low voltage need requested by the technological evolution of some components (ASIC, FPGA, µP).
- The products must be easily mountable on PCB very close to the user (dI/dt).
- Need of innovative Technology : → 3D+

Preliminary Electrical Performances

Input Voltage = 10V → 15V.

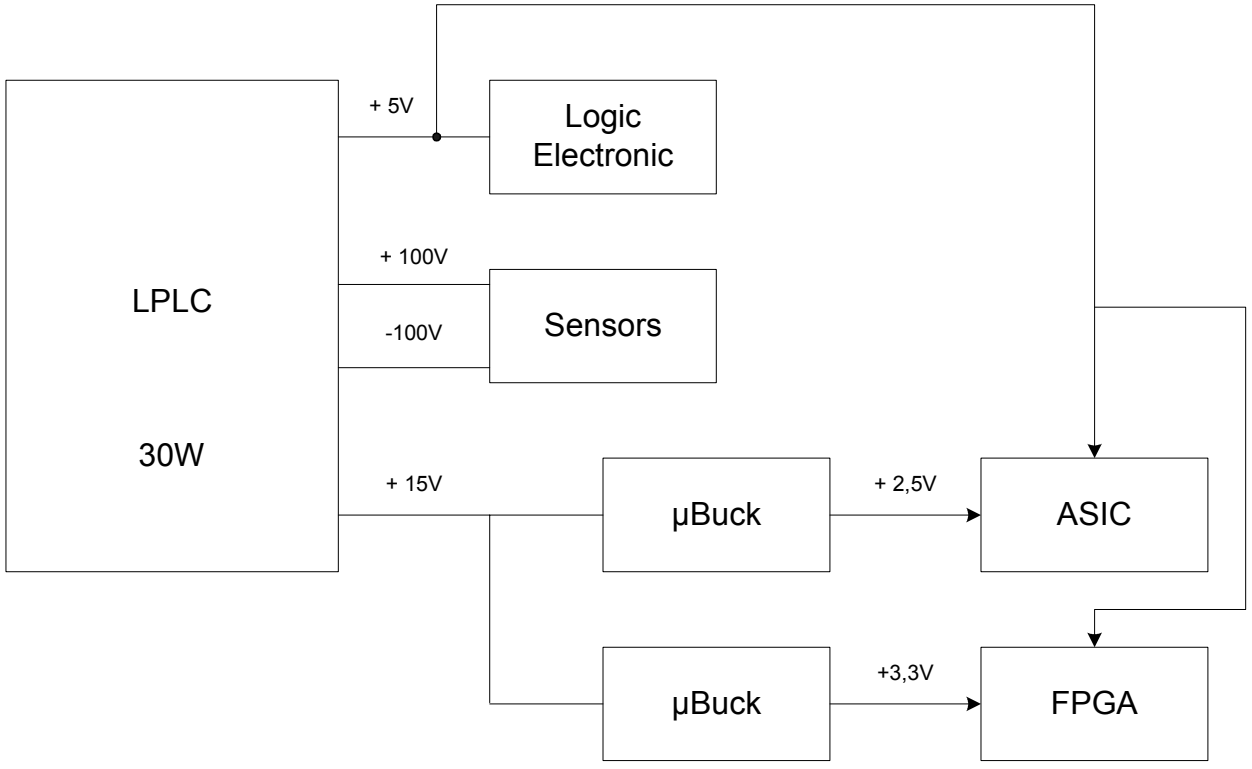
Output voltage : - single output
- selectable 1,8V or 2,5V or 3,3V
- non isolated from input
- accuracy better than ± 2% (EOL)

Output current : 0A → 5A.

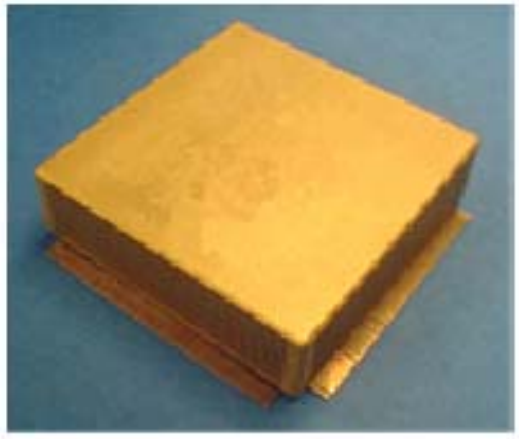
Package : Mass < 20 grs.
Dimensions : 30 X 30 X 11 mm³

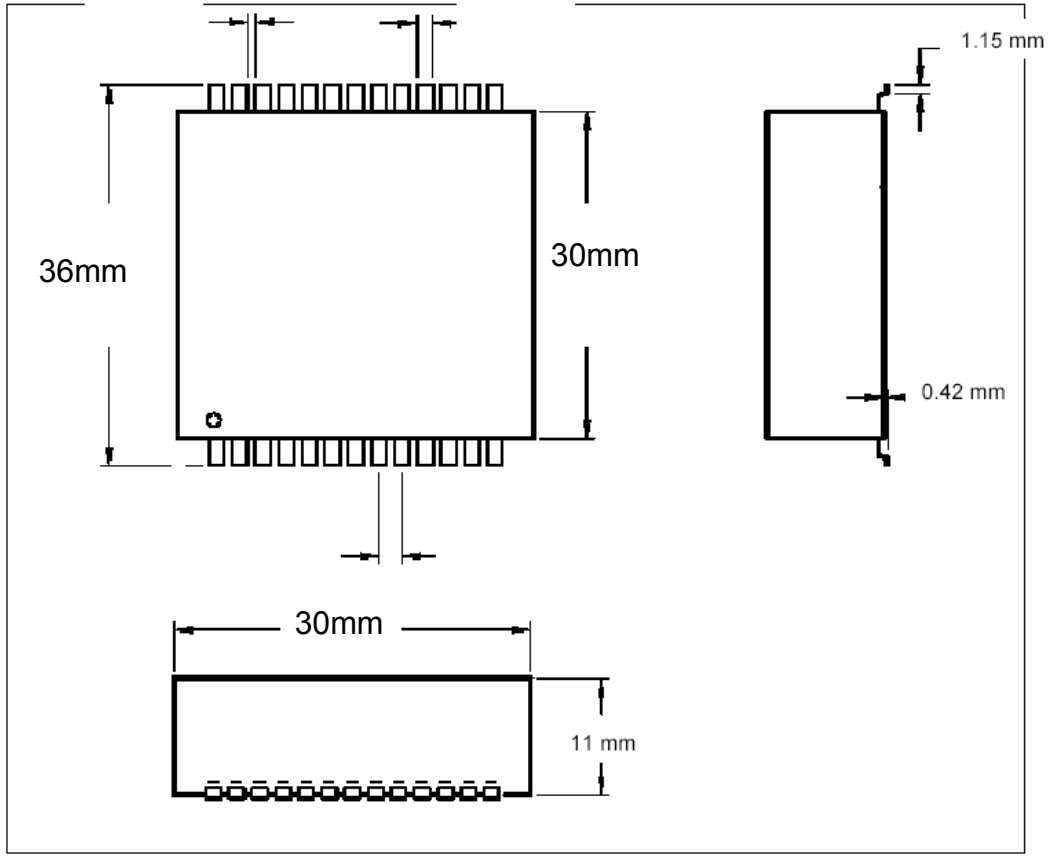
Efficiency : > 90%.

Example of application



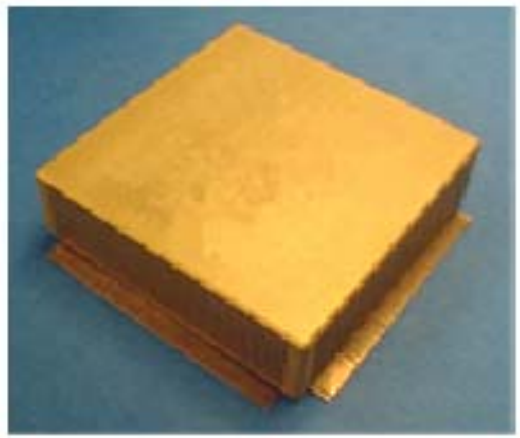
Preliminary Package





µBuck Summary

- 3D Technology.
- Selectability of output voltages (1,8V → 3,3V).
- Good voltage regulation (± 2%).
- Easy implementation on PCB.
- Low mass and size.
- High efficiency to facilitate the thermal management



4. Standard Hybrid FB/FWD Controller

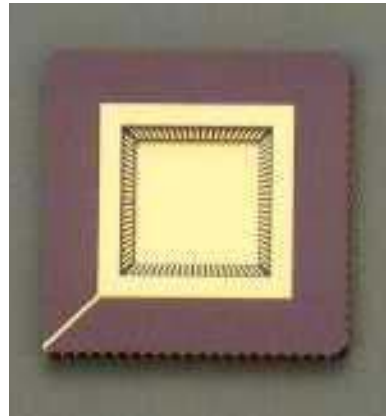
Standard FB/FWD Controller

Target Features :

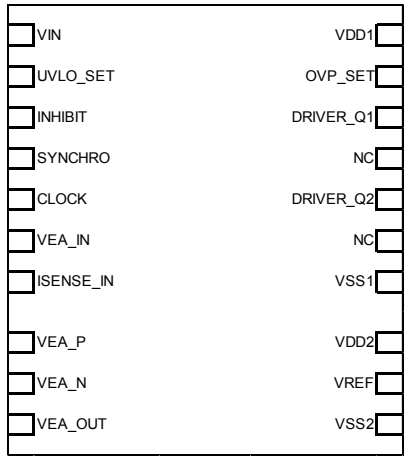
- Compatible with flyback and forward topologies
- 75kRad at component level
- 20V to 110V input voltage range
- Includes all major features :
  - adjustable UVD
  - inhibit & synchronisation input
  - VEA and PCC loops
  - complementary drivers
- SMD mounting
- Minimum external components → limited essentially to power elements

Development status :

- EM's available end 2005



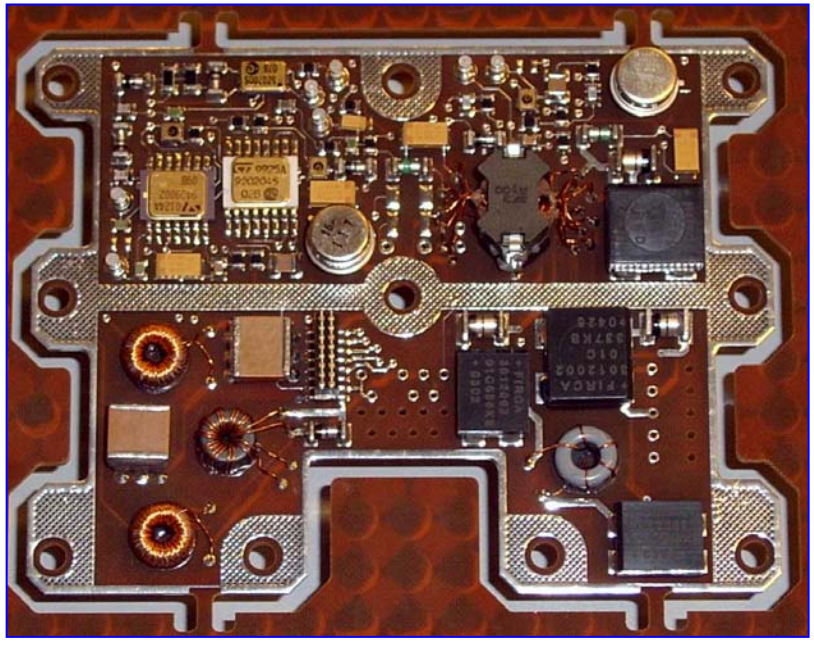
* Target dimensions : 1'' x 1'' x 5mm



5. µConverter

µConverter existing version

- Main characteristics
  - Complete DC/DC including input and output, CM and DM filters
  - Full power operation from 20 V to 52 V or 40 V to 105 V
  - Primary or secondary to structure isolation (1 MOhm / 100 V)
  - INHIBIT interface
  - Bus under-voltage protection
  - Output over-voltage protection
  - Output over-load protection
  - Mass : 85 gr ± 5%
  - PCB dimensions : 100mm X 75mm.



→ Application Digital Sun Sensor TNO

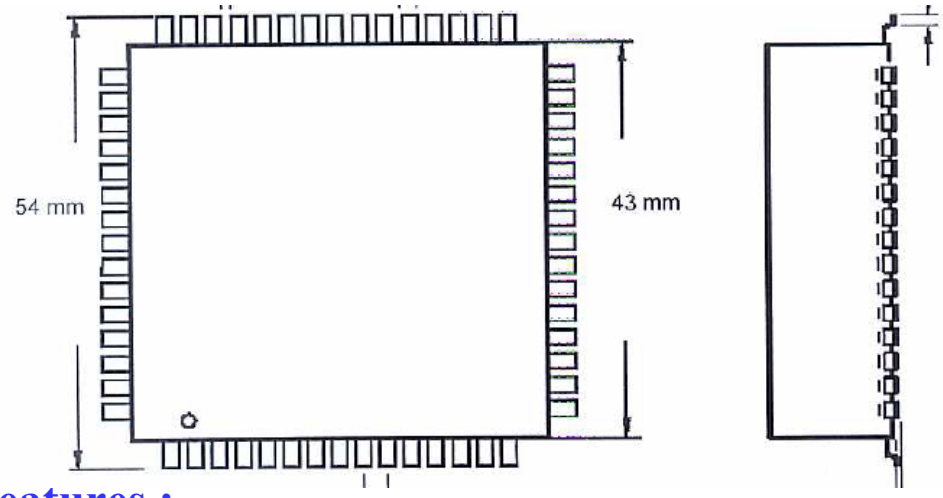
Standard 5W µCVT proposed development

Example Specification :

		Min	Typ	Max
Input Voltage				
Low Voltage		20		55
High Voltage		40		110
Outputs				
Pout				5.25W
Out1	V I	+4.75V 40mA	+5V	+5.25V 200mA
Out2 *	V I	-5.25V 20mA	-5V	-4.75V 100mA
Out3	V I	+14.25V 30mA	+15V	+15.75V 150mA
Out4 *	V I	-15.75V 20mA	-15V	-14.25V 100mA
Efficiency		75%		
Mass			80g	
Dimensions		54 x 54 x 21 mm3		

* Can be replaced by optional +1.8V / +2.5V / +3.3V / 250mA output

Preliminary ICD :



Features :

- Rad-hard and rad-tolerant versions
- PCB mounted / flexible product
- Input CE : MIL-STD-461-C/E
- Can be externally trimmed over range of 15%

6. Schedule

Schedule