Development Status of DC/DC Converter Control H-IC

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Power supply is an important factor in all of space equipment. JAXA had been developing a DC/DC converter and POL.

Variety of needs for Power Supply! Output voltage, Current, accuracy

POL: Point of Load (JAXA2020/0101DBCR**)
Corresponding to the various Power Supply

Various output voltages: +5V, +15V, -15V, +29V, etc.

Various topologies: forward, push-pull

Miniaturization of power Supply board

JAXA is developing the PWM Control IC

Control H-IC has built-in PWM Control IC and common circuit.

The user can be assembled on the power supply board using the Control H-IC.
Study of Control H-IC

DC/DC Converter Functional Block Diagram

Vin

RTN

EMI Filter

Current Transformer

MOS FET

Synchronous Rectifier

Inductor

+5V

RTN

Inductor

+15V

RTN

Inductor

-15V

RTN

+29V

RTN

ON/OFF Circuit

PWM Control-IC

Start up circuit

Capacitor Resister

Main Transformer

Inductor

Regulator

Inductor

Regulator

Regulator

Inductor

Regulator

Control H-IC

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Configure the Power supply board using a Control H-IC, MOS FET, Capacitors, etc (JAXA Qualified parts).

- PWM control IC
- Startup circuit
- Capacitor, Resister
- ON/OFF circuit

Printed Circuit Board (JAXA Qualified)

Stacking Capacitor (Under development)

Control H-IC (Under development)

MOS FET (JAXA Qualified)
PWM Control IC is the key device of Control H-IC

PWM Control IC is based on the PWM IC developed for the POL DC/DC converter (JAXA qualified).

JAXA have been coordinate views on control H-IC with the user.

- Device process : CDMOS
- SEL/SEU target value : LET=64MeV/(mg/cm²)
- SET target value : LET=40MeV/(mg/cm²)
- TID target value : 1kGy(Si) (100krad(Si))

SEL : Single Event Latch-up
SEU : Single Event Upsets
SET : Single Event Transient
TID: Total Ionizing Dose
Target Specification

- For isolated DC/DC converter
- Two driver output
- Compatible with voltage or current mode topologies
- Switching frequency 100kHz to 300kHz
- Input voltage: 28V to 52V (PWM Control IC: 9V to 30V)

**Function**
- Enable input, Soft start, External on/off control, External synchronizing, Switching frequency control

**Protection**
- Under-voltage lockout with hysteresis (PWM Control IC: 8.4V)
- Current limit, Over-voltage protection
- Hermetic Flat-Package, size: 19 x 15 x 4.3 mm (typ.)
- Operating temperature range: -55°C to 125°C (Tc)
- Shock: 1500G, Vibration: 20G
- Radiation hardened TID: 1kGy(Si) (100krad(Si))
Package Outline

19.0

15.0

15.25

1.27

18.2

14.2

4.25

unit: mm

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## Development schedule

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Summary

- **PWM Control IC**
  - Control IC is developing for space-qualified isolated DC/DC converter.

- **DC/DC Converter Control H-IC**
  - Control H-IC is developing for space-qualified power supply board.
  - Two driver output
  - Compatible with voltage or current mode topologies