Atlas SCT Barrel Harness Production Testing

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Overview

① **Project description**

   ✪ *Component descriptions*

   ✪ *Harness description*

② **Testing overview**

   ☆ *Individual components*

   ☆ *Component tests*

   ☆ *Harness tests*

③ **Testing schedule**

④ **Conclusions**

Project Description

❖ **What is a Barrel Harness?**

  ✓ *Provides power, clock and command to silicon modules and allows readout*

  ✓ *Consists of several components*

    ⇨ *Opto-package (GEC-Marconi development as baseline)*

    ⇨ *Driver ASIC: VDC*

    ⇨ *Receiver ASIC: DORIC*

    ⇨ *Flex-rigid interconnection piece: Dog-leg*

    ⇨ *Al-Kapton Power Tape*

❖ **Why test them?**

  ✓ *Need to populate barrels with working units*

  ✓ *Need to assure assemblies function within specifications over operational temperature range*

Opto-package

N.b.
*Not pigtailed
by GMMT
(lids separate)*
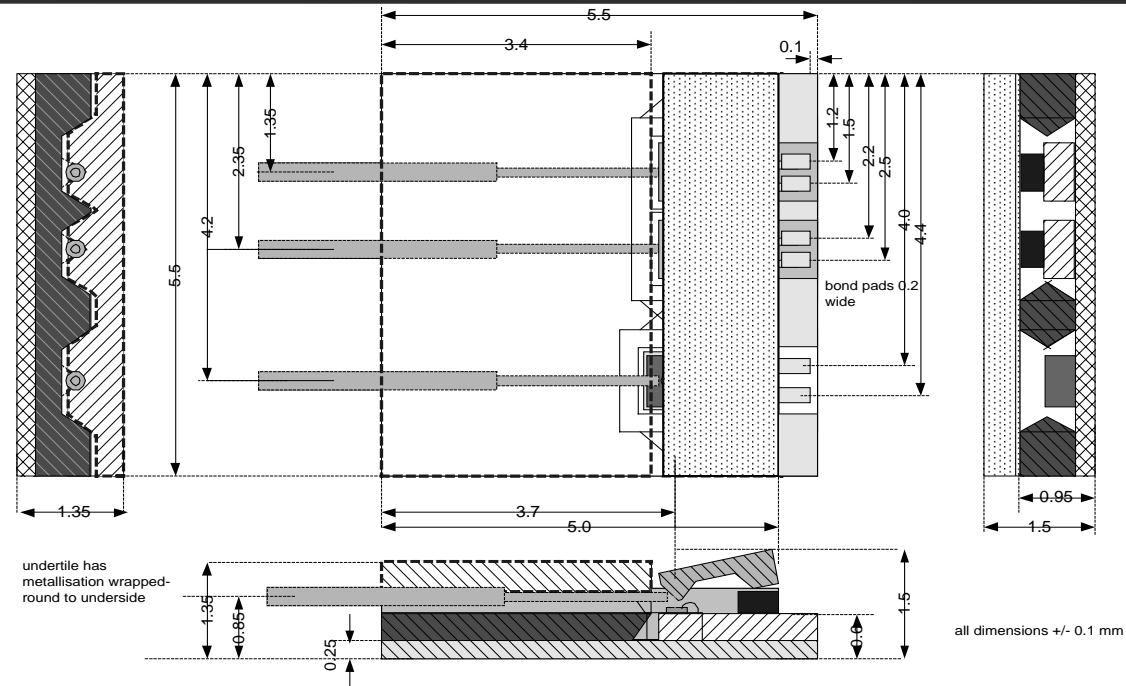
Silicon packaged VCSEL-PIN unit - schematic showing proposed key dimensions - prepared by J. Hall 25.3.99 - Marconi Materials Technology, Caswell

❖ **Custom development by GEC-Marconi (GMMT)**

❖ **Silicon undertile carries:**

    ⇨ *2 VCSELs (Mitel as baseline)*

    ⇨ *1 Epitaxial Silicon p-i-n photodiode (Centronics as baseline)*

ASICs

❖ VCSEL Driver Chip (VDC)

⇨ *Provides a constant bleed current to pre-bias the VCSEL*

⇨ *Takes LVDS input from the module and converts it into a current pulse to drive the VCSEL*

⇨ *Allows adjustment of output signal height*

❖ Digital Optical Receiver Integrated Circuit (DORIC)

⇨ *Amplifies clock and command signals received by p-i-n photodiode*

⇨ *Decodes the bi-phase mark encoded signals into separate clock and command data-streams*

⇨ *Outputs clock and command data-streams as LVDS signals to the module (and its nearest neighbour)*

Dog-leg

Module Connector

VDC   DORIC

Opto-package
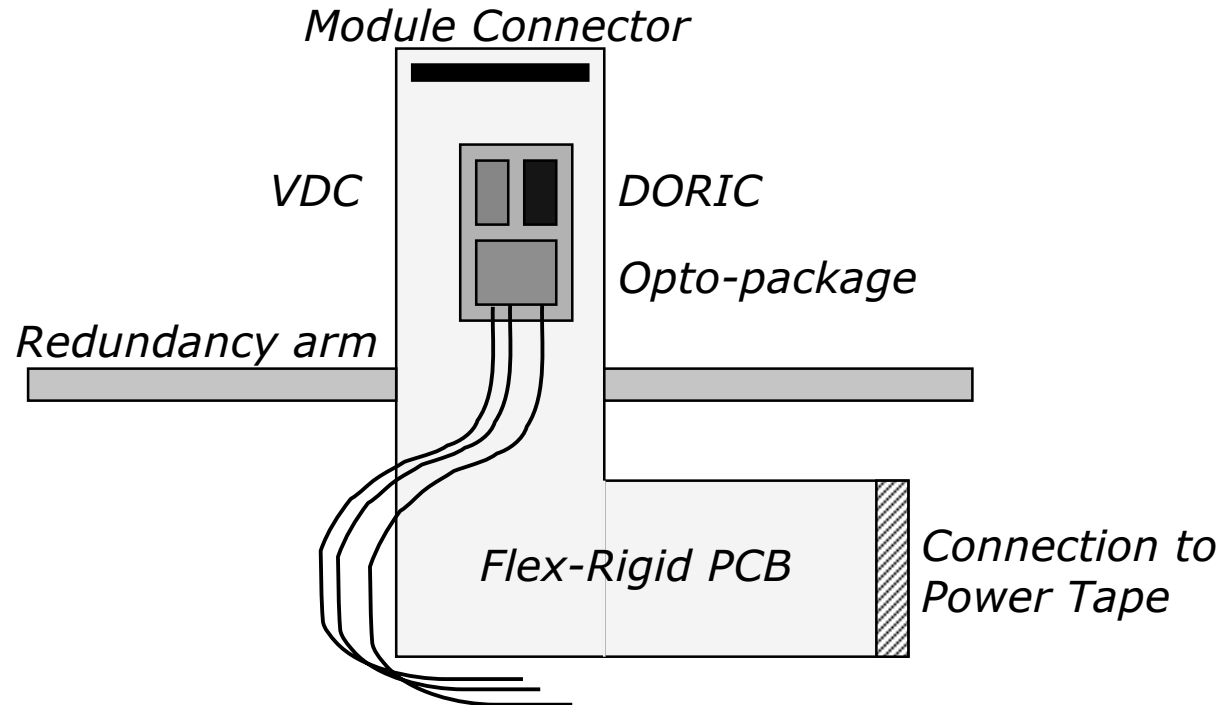
Redundancy arm

N.b.
*Design still
under evaluation*

Flex-Rigid PCB   Connection to
Power Tape

- ❖ **Makes 90° turn of power tape to allow connection to module**
- ❖ **Carries Opto-package, VDC and DORIC**
- ❖ **Solder connection to Al/Kapton power tape**
- ❖ **Solder connection to nearest neighbours for redundancy**

INSTRUMENTATION

Barrel Harness

❖ **Covers one half of a barrel and provides control, readout and power to six modules**

❖ **Two types of connection**

   ① *Electrical (Power Tapes)*

   ② *Optical (Optical Fibre Ribbon)*

❖ **Per harness**

   ⇨ *6x Power Tapes*

   ⇨ *1x 12-way fibre ribbon (Readout Data)*

   ⇨ *1x 6-way fibre ribbon (Clock and Command signals)*

Testing Overview

❖ **Assure testing occurs to verify in-spec operation of all components over the range of operating conditions (V,L,T)**

❖ **Electrical tests**

⇨ *Continuity*

⇨ *Voltage drop & Breakdown*

⇨ *Power Cycling*

❖ **Opto-electronic tests**

⇨ *Bit Error Rate (BER)*

⇨ *Minimum received optical power to ensure operation (S-curve)*

❖ **Temperature tests**

⇨ *Soak test at realistic operating temperatures*

⇨ *Temperature cycle between room temperature and low temperature*
   Number of times foreseen during Atlas lifetime

Testing Opto-packages

❖ **Component Test and Burn-in**

   ✓ *Carried out by manufacturer (Mitel & Centronics)*

❖ **Whole package will undergo DC test at GMMT before delivery**

❖ **In-house testing required?**

   ✓ *Wait until lids mounted*

Testing Dog-legs

❖ **Individual Dog-legs tested by manufacturer**

   ✓ *Visual inspection*

   ✓ *Continuity*

   ✓ *Resistivity & Voltage drop*

❖ **Solder to Al/Kapton power tape**

   ⇨ *Re-measure*

      ✓ *Continuity*

      ✓ *Voltage Drop*

❖ **Mount Opto-package, VDC and DORIC**

Testing Harnesses

❖ **More comprehensive acceptance test required**

❖ **Detailed test of functionality in both data channels and clock & command channel**

  ⇨ *Minimum optical power required for operation (S-curve)*

  ⇨ *BER test at nominal power*

❖ **Soak test at room- and low-temperature**

  ⇨ *Constant (nominal) PSU output*

  ⇨ *Vary PSU output within specifications*

❖ **Cycle temperatures and repeat test**

  ⇨ *Power off during cycling*

Preliminary Schedule

- ❖ **Preliminary design review (testing schedules defined)**
  - ⇨ *Late July 1999*

- ❖ **Installation of test system**
  - ⇨ *November 1999*

- ❖ **Test system with small number of channels (enough for one harness)**
  - ⇨ *Start 2000*

- ❖ **Full system available for production testing**
  - ⇨ *April 2000*

Conclusions

✓ **SCT Barrel harness testing is becoming better defined**

✓ **Design of test system (and components) is being started**

❖ **Testing is closely linked to final designs of components being established**

  ➪ *Ideas are converging*

✓ **Testing scenarios are sufficiently flexible to allow re-definition should it become necessary**

INSTRUMENTATION