Multi Chip Arrays

High density, light weight solutions for power and small signal circuits
High Density
TT Electronics’ MCAs achieve very high density by integrating many discrete devices and/or technologies in one compact package. Manufactured under the Semelab brand, our existing designs use up to twelve devices in a single circuit or several separate circuits.

Light Weight
- Twelve TO18 packaged devices weigh 3.6g; 12 LCC1 packaged devices weigh 0.48g.
- The equivalent circuit in MCA weighs less than 0.3g – less than two thirds of the LCC1 equivalent and only 10% of the TO18 weight.

Easy Interconnection
Up to 24 external connections are available on the Power MCA, and up to 28 on small signal MCAs. Because many connections are made within the MCA, PCB design is simpler and quicker.

Limited NRE
MCAs use standard package outlines and employ fixed islands to create interconnections. NRE charges may be invoked when assembly or test procedures are outside of our standard internal design parameters.

Low Cost
In designs completed to date TT Electronics’ MCA solutions have reduced component costs by an average of 30% compared to the discrete design.

Fast Turnaround
Using standard die solutions were are able to provide a fast turnaround time for volume high reliability product (lead-times subject to the availability of piece-parts).

Customers’ Circuits and Standard Designs
TT Electronics’ can take customers’ current designs and advise the best implementation in MCA in most cases. Many standard designs are also available - a selection is shown on inner pages.

Improved Reliability
Using MIL-HDBK-217F Notice 2, calculations for a circuit of twelve 2N2222A transistors operating in an inhabited airborne fighter environment, with a case temperature of 60°C, show the failure rate $\lambda_p$ as follows:

- Plastic discrete transistor system:
  $\lambda_p = 6.49$ failures/$10^6$ operating hours

- Hermetic discrete system:
  $\lambda_p = 0.81$ failures/$10^6$ operating hours

- MCA system:
  $\lambda_p = 0.22$ failures/$10^6$ operating hours

MTBF is enhanced by a factor of approximately 3.6 by using an MCA instead of hermetic discretes, and by a factor of 29 compared to using plastic discrete components.

Full details of the calculation are available from TT Electronics.
Integrated Discrete Components
Multi Chip Arrays (MCAs) integrate several semiconductor die or other components into one package to provide a light and improved-reliability alternative to discrete circuits.

Space Saving
- High density
- Light
- High integration
- Easy interconnection

Cost Effective
- Limited NRE
- Low cost
- Fast turnaround

Flexible
- Customers' circuit implemented
- Any device technology - active, passive or mixed
- Standard circuits available
- Products for small signal and power
- Proven package technology

Enhanced Performance
- 29 x MTBF of discrete plastic equivalent
- Improved electrical characteristics
- Better thermal matching

Screened
- In accordance with ESA and MIL-PRF-19500, or as required by customers
- TT Electronics holds approvals from ISO, DSCC, ESA and BSI

Ultra-High Reliability In Discrete Circuits

MCA Applications
- Space equipment - includes Immarsat, Smart1, ISS, METOP and SIREL
- Civil aircraft (flight-critical systems)
- Undersea systems
- Transportation systems
- Military equipment
- Other harsh environments

Typical MCA Circuits
- Current mirror applications
- Analog interfacing
Small Signal MCA.

- 18, 20 and 28 pad/lead packages
- Proven packages
- Ultra reliable
- Cost-effective
- Leaded package options available

Examples of Standard Designs

18 Pin Package

18, 20 and 28 pad/lead packages
- Proven packages
- Ultra reliable
- Cost-effective
- Leaded package options available
Surface Mount Power MCA.

- Hermetic $\text{Si}_3\text{N}_4$ metal package (Silicon Nitride)
- Rugged via hole technology
- Removes the need for standard feed through leads
- Improved thermal performance and reliability