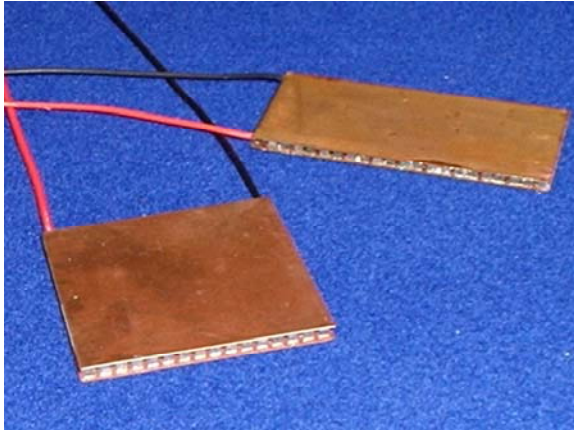


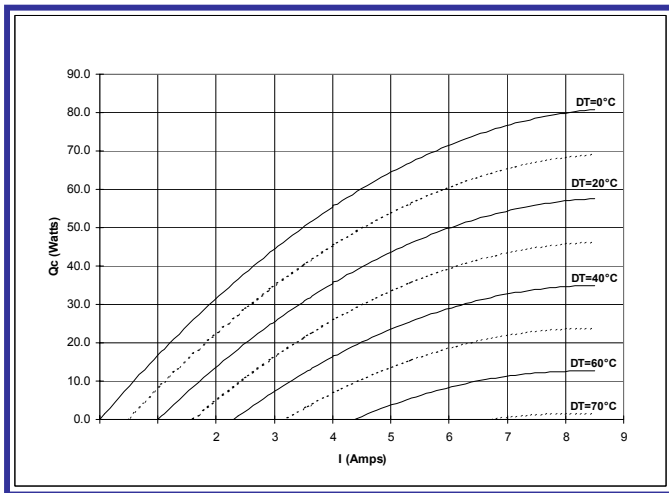
## THERMOELECTRIC MODULES WITH THIN-FILM SUBSTRATES



Ferrotec's new line of thermoelectric modules with thin-film substrates was specifically developed to offer greater design flexibility for users without sacrificing performance. Ferrotec thin-film substrate modules can be rapidly prototyped in nearly any shape. Features such as internal thermistors or custom external metallization patterns can be easily added. The high performance polymer substrate enables a wide range of sizes to be produced from very small, mini-modules to large module sizes not generally possible with ceramic-based substrates. Ferrotec thin-film substrate thermoelectric modules tend to be thinner, lighter and are more resistant to thermal cycling stresses than standard ceramic-based modules. Thin-film substrate modules can also be designed to mate with non-flat surfaces, e.g. cylinders. The external copper metallization on these modules facilitates easy attachment with conventional solders or other interface compounds.

### Performance:

#### Cooling Capacity (Qc) vs. Current (Iin) Curves



### Specifications:

**I<sub>max</sub> Range:** 1.2 amps to 24 amps

**V<sub>max</sub> Range:** less than 1.0 volt to greater than 48 volts per module

**Q<sub>c</sub>-max Range:** 0.5 watts to greater than 300 watts per module

**Maximum Processing Temp:** 200°C

**Standard Module Height Tolerance:** ± 0.025mm (± 0.001 in)

**Sealing Options:** electronic grade RTV

**Customization:** custom shapes, sizes and specifications are available

### Advantages of new Ferrotec Modules with Thin-film Substrates:

- Greater size range
- Irregular shapes available
- Easy prototyping
- High performance
- Thinner profile
- Lighter weight
- Attachment flexibility
- Competitively priced
- Hermetic sealing option

Patent Protected  
U.S. No. 6,410,971