



- At present single stage modules with ceramic plates of 40 x 40 mm become one of the most usable in various thermoelectric devices. Such modules are especially widely spread in household and medical appliances: in car coolers, domestic compact coolers and other household goods.
 - However, single stage modules of 40 x 40 mm provide in a cooler chamber the cooling level only of up to $+5 \div +10$ °C. In many cases such temperature decrease is insufficient. Thus, The quality of such articles and goods is also insufficient.
 - Altec-011 module has been developed for thermoelectric products quality improvement. Altec-011 module has two stages. In this module has been reached maximum temperature decrease by 85 K from 300 K .
 - Ceramic plates dimensions of Altec-011 module is 40 x 40 mm as single stage modules have. But the bulge of the module is negligible. The module has not only similar with a single stage module dimensions of ceramic plates but similar supply voltage too. Despite of deep cooling Altec-011 module develops maximum cooling performance equal to maximum cooling performance of standard single stage modules. This allows simply to substitute single stage modules by Altec-011 modules and thus to improve the quality of thermoelectric goods.
 - The use of Altec-011 modules allows to develop thermoelectric coolers with a freezing chamber and temperature in freezing chambers is lower by 10-20 K in comparison with coolers having single stage modules. Thus, the use of Altec-011 modules allows to develop new competitive thermoelectric goods.
 - On the whole, the use of Altec-011 modules opens up the new phase for wide application of thermoelectric cooling for the development of various household appliances and thermoelectric devices of improved quality.
 - The module offers improved characteristics of reliability and stability to various effects.
 - The module has been designed on the basis of the latest technological achievements of the Institute of Thermoelectricity, National Academy of Science, Ukraine.
 - In designing the module use has been made of the latest theory of thermoelectric modules reliability developed in the Institute of Thermoelectricity, National Academy of Science, Ukraine.
 - In designing the module use has been made of the results of extensive reliability tests of modules conducted by the Institute of Thermoelectricity, National Academy of Science, Ukraine, during the recent 25 years.
 - Technologies of the Institute of Thermoelectricity were marked with the "International Golden Award for Technology and Quality".
 - The module utilizes high-quality Al_2O_3 ceramic plates.
 - The module utilizes commutating copper plates with anti-diffusion coatings.
 - The module utilizes high quality thermoelectric materials of own production based on *Bi-Te-Se-Sb*. The materials have small-angle controlled unit crystal disorientation that provides high figure of merit combined with increased mechanical strength.
 - The module utilizes multi-layer anti-diffusion barriers 25 μ m thick providing high reliability and long service life.

- The modules utilize plastic commutating solders with controlled thickness which provide high resistance to cyclic temperature effects.
- The modules utilize special configuration of ceramic plates providing high resistance to cyclic temperature effects.
- The modules utilize efficient technologies for leg material joining with anti-diffusion barriers. The engagement strength reaches the leg material strength.
- The modules utilize highly efficient silicone sealants which have undergone multi-year tests under conditions of outer space, elevated humidity, etc.
- Basic parameters of modules:
 - dimensions: $a = 40 \text{ mm}$; $b = 40 \text{ mm}$; $c = 6.7 \text{ mm}$ (See Fig.1);
 - max.operating voltage $U_{\max} = 15 \text{ V}$;
 - max. operating current $I_{\max} = 8,5 \text{ A}$;
 - operating temperature range 200-420 K;
 - max.cooling performance at 300 K $Q_o=50 \text{ W}$;
 - max.temperature difference at ceramics hot side temperature $T_h=300\text{K}$ is $\Delta T_{\max}=85\pm 2 \text{ K}$;
 - input leads length $l = 150 \text{ mm}$;
 - length of leads without insulation $l_o=10 \text{ mm}$.

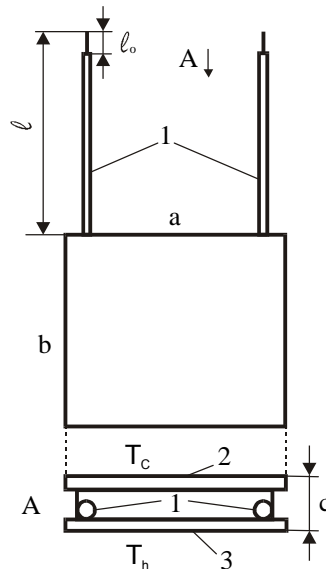


Fig.1.Diagram of a thermoelectric module

- 1 - electric leads; 2 - cold ceramics; 3 - hot ceramics;
- T_c - temperature of ceramic plate outside surface without leads I;
- T_h - temperature of ceramic plate outside surface with leads I;

• Additional module parameters and information about reliability is presented at customer's request.

- Prices for a module depending on the order volume are sent at customer's request.
- Module's characteristics are given in Fig.2.

Orders for modules and additional information:

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Additional information can be found on the page in Internet : <http://ite.cv.ukrtel.net/altec>

Contact phone (380 3722) 41909

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Characteristics of thermoelectric module Altec-011

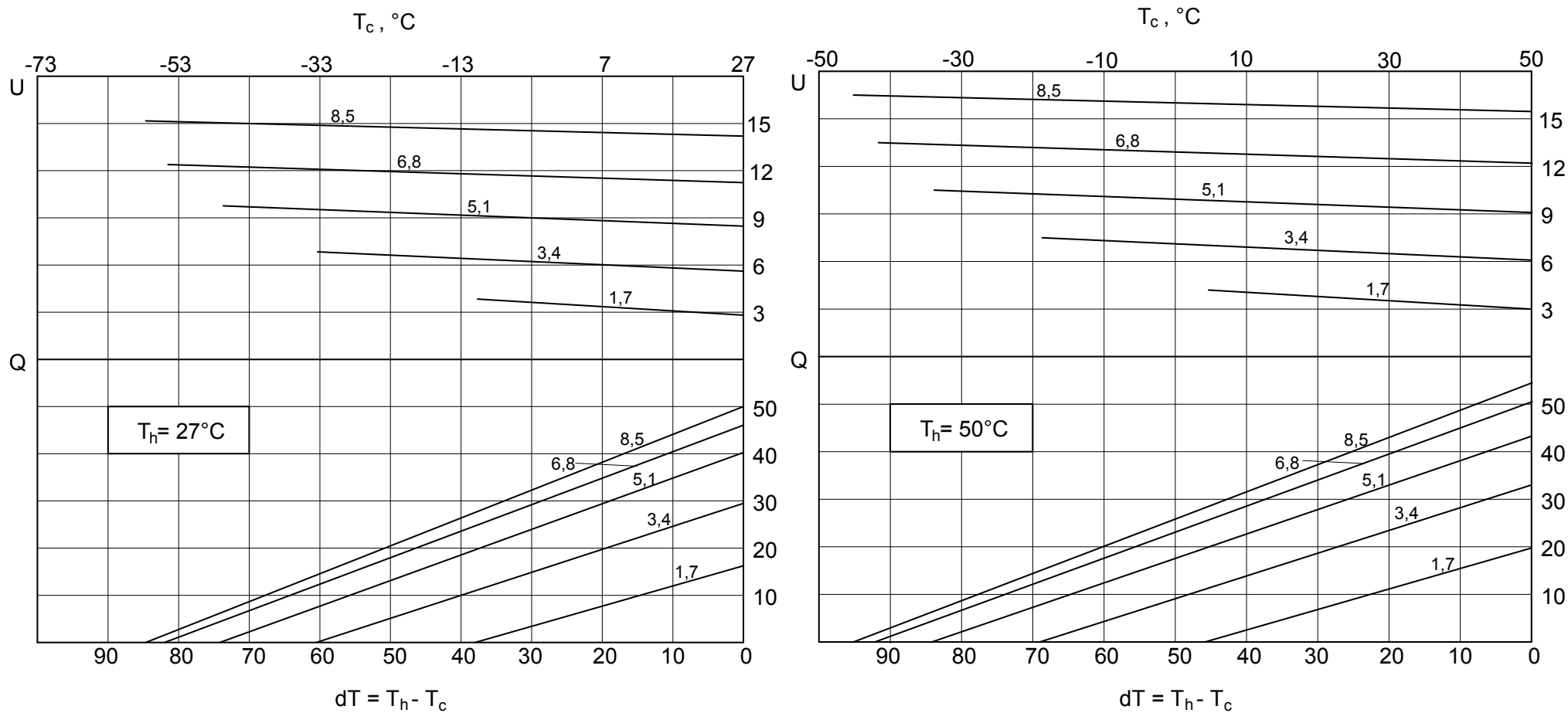


Fig. 2.