

- Compact DIP-24 plastic case
- I/O isolation 5000 VAC rated for 250 VAC working voltage
- IEC 60601-1 certification for 2 x MOPP
- Risk management process according to ISO 14971 incl. risk management file
- Acceptance criteria for electronic assemblies acc. to IPC-A-610 Level 3
- Low leakage current <2 µA
- Operating temperature –40°C to 90°C
- EMC compliance to IEC 60601-1-2 4th edition and EN55032 class A
- 5-year product warranty



ES 60601-1 IEC 60601-1

The THM 6 series is a range of medical 6 Watt DC/DC converters in DIP-24 plastic package with wide 2:1 input voltage range. They provide a reinforced isolation system for 5000 VAC and a very low leakage current of less than 2 µA. The units are approved to IEC/EN/ES 60601-1 3rd ed. for 2 x MOPP and come along with an ISO 14971 risk management file. Design and production conform to the quality management system ISO 13485. With a high efficiency of up to 89% and highest grade components the converters can reliably operate in an ambient temperature range of –40°C up to +90°C. They constitute a reliable solution not only for medical equipment but also for demanding ranges of application such as transportation, control & measurement or IGBT drivers.

| Models     |                              |          |                  |          |                  |                 |
|------------|------------------------------|----------|------------------|----------|------------------|-----------------|
| Order Code | Input Voltage Range          | Output 1 |                  | Output 2 |                  | Efficiency typ. |
|            |                              | Vnom     | I <sub>max</sub> | Vnom     | I <sub>max</sub> |                 |
| THM 6-0510 | 4.5 - 9 VDC<br>(5 VDC nom.)  | 3.3 VDC  | 1'800 mA         |          |                  | 82 %            |
| THM 6-0511 |                              | 5 VDC    | 1'200 mA         |          |                  | 86 %            |
| THM 6-0512 |                              | 12 VDC   | 500 mA           |          |                  | 86 %            |
| THM 6-0513 |                              | 15 VDC   | 400 mA           |          |                  | 88 %            |
| THM 6-0515 |                              | 24 VDC   | 250 mA           |          |                  | 87 %            |
| THM 6-0521 |                              | +5 VDC   | 600 mA           | –5 VDC   | 600 mA           | 84 %            |
| THM 6-0522 |                              | +12 VDC  | 250 mA           | –12 VDC  | 250 mA           | 87 %            |
| THM 6-0523 |                              | +15 VDC  | 200 mA           | –15 VDC  | 200 mA           | 88 %            |
| THM 6-1210 | 9 - 18 VDC<br>(12 VDC nom.)  | 3.3 VDC  | 1'800 mA         |          |                  | 84 %            |
| THM 6-1211 |                              | 5 VDC    | 1'200 mA         |          |                  | 86 %            |
| THM 6-1212 |                              | 12 VDC   | 500 mA           |          |                  | 89 %            |
| THM 6-1213 |                              | 15 VDC   | 400 mA           |          |                  | 89 %            |
| THM 6-1215 |                              | 24 VDC   | 250 mA           |          |                  | 89 %            |
| THM 6-1221 |                              | +5 VDC   | 600 mA           | –5 VDC   | 600 mA           | 85 %            |
| THM 6-1222 |                              | +12 VDC  | 250 mA           | –12 VDC  | 250 mA           | 89 %            |
| THM 6-1223 |                              | +15 VDC  | 200 mA           | –15 VDC  | 200 mA           | 88 %            |
| THM 6-2410 | 18 - 36 VDC<br>(24 VDC nom.) | 3.3 VDC  | 1'800 mA         |          |                  | 83 %            |
| THM 6-2411 |                              | 5 VDC    | 1'200 mA         |          |                  | 86 %            |
| THM 6-2412 |                              | 12 VDC   | 500 mA           |          |                  | 89 %            |
| THM 6-2413 |                              | 15 VDC   | 400 mA           |          |                  | 89 %            |
| THM 6-2415 |                              | 24 VDC   | 250 mA           |          |                  | 89 %            |
| THM 6-2421 |                              | +5 VDC   | 600 mA           | –5 VDC   | 600 mA           | 85 %            |
| THM 6-2422 |                              | +12 VDC  | 250 mA           | –12 VDC  | 250 mA           | 89 %            |
| THM 6-2423 |                              | +15 VDC  | 200 mA           | –15 VDC  | 200 mA           | 89 %            |
| THM 6-4810 | 36 - 75 VDC<br>(48 VDC nom.) | 3.3 VDC  | 1'800 mA         |          |                  | 83 %            |
| THM 6-4811 |                              | 5 VDC    | 1'200 mA         |          |                  | 87 %            |
| THM 6-4812 |                              | 12 VDC   | 500 mA           |          |                  | 88 %            |
| THM 6-4813 |                              | 15 VDC   | 400 mA           |          |                  | 89 %            |
| THM 6-4815 |                              | 24 VDC   | 250 mA           |          |                  | 88 %            |
| THM 6-4821 |                              | +5 VDC   | 600 mA           | –5 VDC   | 600 mA           | 85 %            |
| THM 6-4822 |                              | +12 VDC  | 250 mA           | –12 VDC  | 250 mA           | 88 %            |
| THM 6-4823 |                              | +15 VDC  | 200 mA           | –15 VDC  | 200 mA           | 87 %            |

## Options

|                                                               |                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>on demand</b><br>(backorder with MOQ<br>non stocking item) | <ul style="list-style-type: none"> <li>- Optional models with alternative pinning</li> <li>- Optional models with adjustable output</li> <li>- Optional models with remote-control function</li> <li>- Optional models with adjustable output and remote-control function</li> </ul> |
|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Input Specifications

|                        |              |                                                                                                                                                                                                                                                                     |
|------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Current          | - At no load | 5 Vin models: <b>20 mA typ.</b><br>12 Vin models: <b>10 mA typ.</b><br>24 Vin models: <b>6 mA typ.</b><br>48 Vin models: <b>4 mA typ.</b>                                                                                                                           |
| Surge Voltage          |              | 5 Vin models: <b>16 VDC max.</b> (3 s max.)<br>12 Vin models: <b>25 VDC max.</b> (3 s max.)<br>24 Vin models: <b>50 VDC max.</b> (3 s max.)<br>48 Vin models: <b>100 VDC max.</b> (3 s max.)                                                                        |
| Under Voltage Lockout  |              | 5 Vin models: <b>3 VDC min. / 4 VDC typ. / 4.4 VDC max.</b><br>12 Vin models: <b>7 VDC min. / 8 VDC typ. / 8.8 VDC max.</b><br>24 Vin models: <b>15 VDC min. / 16 VDC typ. / 17.5 VDC max.</b><br>48 Vin models: <b>31.5 VDC min. / 33 VDC typ. / 34.5 VDC max.</b> |
| Recommended Input Fuse |              | 5 Vin models: <b>2'500 mA</b> (slow blow)<br>12 Vin models: <b>1'250 mA</b> (slow blow)<br>24 Vin models: <b>630 mA</b> (slow blow)<br>48 Vin models: <b>315 mA</b> (slow blow)                                                                                     |
| Input Filter           |              | <b>Internal Pi-Type</b>                                                                                                                                                                                                                                             |

## Output Specifications

|                                        |                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output Voltage Adjustment              |                                                                                                              | -10% to +20% (By external trim resistor) (15 & 24 VDC single output models)<br>±10% (By external trim resistor) (other models)<br>(Only for optional models with adjustable output)<br>See application note: <a href="http://www.tracopower.com/overview/thm6">www.tracopower.com/overview/thm6</a><br>Output power must not exceed rated power!                                                                                                                                                     |
| Voltage Set Accuracy                   |                                                                                                              | <b>±1% max.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Regulation                             | - Input Variation (Vmin - Vmax)<br>- Load Variation (0 - 100%)<br>- Cross Regulation (25% / 100% asym. load) | single output models: <b>0.2% max.</b><br>dual output models: <b>0.5% max.</b><br>single output models: <b>0.2% max.</b><br>dual output models: <b>1% max. (Output 1)</b><br><b>1% max. (Output 2)</b><br>dual output models: <b>5% max.</b>                                                                                                                                                                                                                                                         |
| Ripple and Noise<br>(20 MHz Bandwidth) | - single output<br>- dual output                                                                             | 3.3 Vout models: <b>30 mVp-p typ.</b> (with 10 µF X7R)<br>5 Vout models: <b>30 mVp-p typ.</b> (with 10 µF X7R)<br>12 Vout models: <b>40 mVp-p typ.</b> (with 10 µF X7R)<br>15 Vout models: <b>40 mVp-p typ.</b> (with 10 µF X7R)<br>24 Vout models: <b>50 mVp-p typ.</b> (with 4.7 µF X7R)<br>5 / -5 Vout models: <b>30 / 30 mVp-p typ.</b> (with 10 µF X7R)<br>12 / -12 Vout models: <b>40 / 40 mVp-p typ.</b> (with 10 µF X7R)<br>15 / -15 Vout models: <b>40 / 40 mVp-p typ.</b> (with 10 µF X7R) |

All specifications valid at nominal voltage, full load and +25°C after warm-up time unless otherwise stated.

|                           |                          |                                                                                                                                                                                                                                                                                                               |
|---------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Capacitive Load           | - single output          | 3.3 Vout models: 2'100 µF max.<br>5 Vout models: 1'500 µF max.<br>12 Vout models: 260 µF max.<br>15 Vout models: 210 µF max.<br>24 Vout models: 75 µF max.                                                                                                                                                    |
|                           | - dual output            | 5 / -5 Vout models: 860 / 860 µF max.<br>12 / -12 Vout models: 150 / 150 µF max.<br>15 / -15 Vout models: 110 / 110 µF max.                                                                                                                                                                                   |
|                           | Minimum Load             | Not required                                                                                                                                                                                                                                                                                                  |
|                           | Temperature Coefficient  | ±0.02 %/K max.                                                                                                                                                                                                                                                                                                |
|                           | Start-up Time            | 30 ms typ.                                                                                                                                                                                                                                                                                                    |
|                           | Short Circuit Protection | Continuous, Automatic recovery                                                                                                                                                                                                                                                                                |
| Output Current Limitation |                          | 150% typ. of Iout max.                                                                                                                                                                                                                                                                                        |
| Overvoltage Protection    |                          | 112 - 152% of Vout nom.<br>(depending on model)<br>3.7 - 5 VDC (3.3 VDC model)<br>5.6 - 7 VDC (5 VDC model)<br>13.5 - 16 VDC (12 VDC model)<br>18.3 - 22 VDC (15 VDC model)<br>29.1 - 34.5 VDC (24 VDC model)<br>5.6 - 7 VDC (±5 VDC model)<br>13.5 - 18.2 VDC (±12 VDC model)<br>17 - 22 VDC (±15 VDC model) |
| Transient Response        | - Response Time          | 250 µs typ. (25% Load Step)                                                                                                                                                                                                                                                                                   |

## Safety Specifications

|                       |                           |                                                                                             |
|-----------------------|---------------------------|---------------------------------------------------------------------------------------------|
| Safety Standards      | - Medical Equipment       | EN 60601-1<br>IEC 60601-1<br>ANSI/AAMI ES 60601-1<br>2 x MOPP (Means Of Patient Protection) |
|                       | - Certification Documents | <a href="http://www.tracopower.com/overview/thm6">www.tracopower.com/overview/thm6</a>      |
| Pollution Degree      |                           | PD 2                                                                                        |
| Over Voltage Category |                           | OVC II                                                                                      |

## EMC Specifications

|                           |                       |                                                                                                                                                                                                                                                            |
|---------------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EMI Emissions             | - Conducted Emissions | EN 60601-1-2 edition 4 (Medical Devices)<br>EN 55011 class A (internal filter)<br>EN 55011 class B (with external filter)<br>EN 55032 class A (internal filter)<br>EN 55032 class B (with external filter)<br>FCC Part 18, class A<br>FCC Part 18, class B |
|                           | - Radiated Emissions  | EN 55011 class A (internal filter)<br>EN 55011 class B (with external filter)<br>EN 55032 class A (internal filter)<br>EN 55032 class B (with external filter)<br>FCC Part 18, class A<br>FCC Part 18, class B                                             |
| External filter proposal: |                       | <a href="http://www.tracopower.com/overview/thm6">www.tracopower.com/overview/thm6</a>                                                                                                                                                                     |

All specifications valid at nominal voltage, full load and +25°C after warm-up time unless otherwise stated.

|              |                             |                                                                      |
|--------------|-----------------------------|----------------------------------------------------------------------|
| EMS Immunity | - Electrostatic Discharge   | Air: EN 60601-1-2 edition 4 (Medical Devices)                        |
|              | - RF Electromagnetic Field  | Contact: EN 61000-4-2, $\pm 15$ kV, perf. criteria A                 |
|              | - EFT (Burst) / Surge       | EN 61000-4-3, $\pm 8$ kV, perf. criteria A                           |
|              |                             | EN 61000-4-3, 10 V/m, perf. criteria A                               |
|              |                             | EN 61000-4-4, $\pm 2$ kV, perf. criteria A                           |
|              |                             | EN 61000-4-5, $\pm 2$ kV, perf. criteria A                           |
|              |                             | Ext. input component: 5 Vin models: KY 1000 $\mu$ F // Vishay V10P45 |
|              |                             | 12 Vin models: KY 470 $\mu$ F                                        |
|              |                             | 24 Vin models: KY 470 $\mu$ F                                        |
|              |                             | 48 Vin models: KY 330 $\mu$ F                                        |
|              | - Conducted RF Disturbances | EN 61000-4-6, 10 Vrms, perf. criteria A                              |
|              | - PF Magnetic Field         | Continuous: EN 61000-4-8, 100 A/m, perf. criteria A                  |
|              |                             | 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A                        |

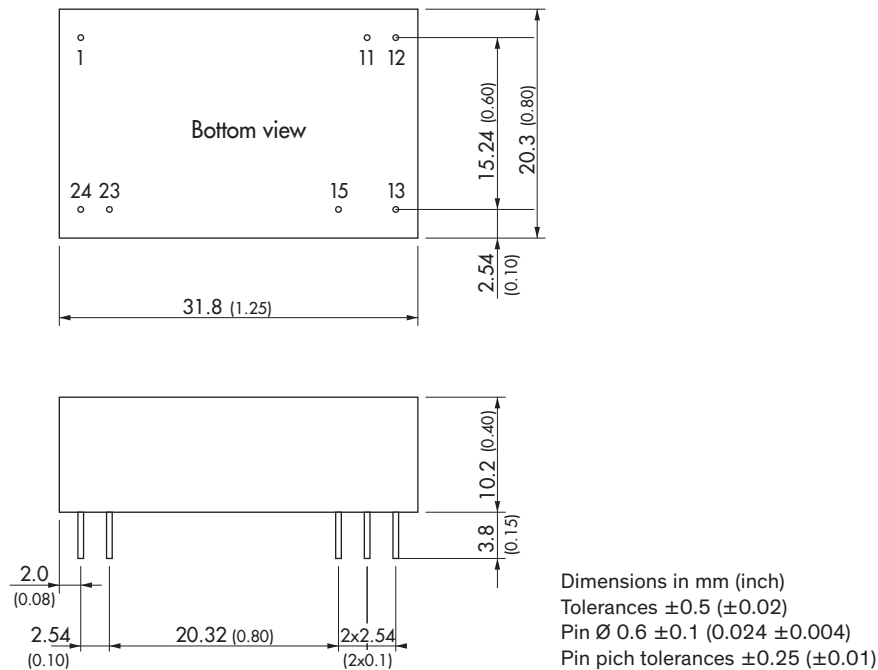
| General Specifications    |                                 |                                                                                                                  |
|---------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------|
| Relative Humidity         |                                 | 95% max. (non condensing)                                                                                        |
| Temperature Ranges        | - Operating Temperature         | -40°C to +95°C                                                                                                   |
|                           | - Approved Ambient Temp.        | +70°C max. (to comply with EN 60601-1)                                                                           |
|                           | - Case Temperature              | +105°C max.                                                                                                      |
|                           | - Storage Temperature           | -55°C to +125°C                                                                                                  |
| Power Derating            | - High Temperature              | 5.26 %/K above 86°C                                                                                              |
| Cooling System            |                                 | Natural convection (20 LFM)                                                                                      |
| Remote Control            | - Voltage Controlled Remote     | On: 0 to 1.2 VDC or open circuit                                                                                 |
|                           |                                 | Off: 2.2 to 12 VDC                                                                                               |
|                           |                                 | Refers to 'Remote' and '-Vin' Pin                                                                                |
|                           | - Off Idle Input Current        | 2.5 mA typ.                                                                                                      |
|                           | - Remote Pin Input Current      | -0.5 to 1.0 mA                                                                                                   |
|                           |                                 | (Only for optional models with remote-control)                                                                   |
| Altitude During Operation |                                 | 5'000 m max.                                                                                                     |
| Switching Frequency       |                                 | 225 - 275 kHz (PWM)                                                                                              |
|                           |                                 | 250 kHz typ. (PWM)                                                                                               |
| Insulation System         |                                 | Reinforced Insulation                                                                                            |
| Isolation Test Voltage    | - Input to Output, 60 s         | 5'000 VAC                                                                                                        |
| Creepage                  | - Input to Output               | 8 mm min.                                                                                                        |
| Clearance                 | - Input to Output               | 8 mm min.                                                                                                        |
| Isolation Capacitance     | - Input to Output, 100 kHz, 1 V | 12 pF typ.                                                                                                       |
|                           |                                 | 17 pF max.                                                                                                       |
| Leakage Current           | - Earth Leakage Current         | 2 $\mu$ A max. (240 VAC, 60 Hz)                                                                                  |
| Reliability               | - Calculated MTBF               | 4'700'000 h (MIL-HDBK-217F, ground benign)                                                                       |
| Environment               | - Vibration                     | MIL-STD-810F                                                                                                     |
|                           | - Thermal Shock                 | MIL-STD-810F                                                                                                     |
| Housing Material          |                                 | Non-conductive Plastic (UL94 V-0 rated)                                                                          |
| Base Material             |                                 | Non-conductive Plastic (UL 94 V-0 rated)                                                                         |
| Potting Material          |                                 | Silicone (UL 94 V-0 rated)                                                                                       |
| Soldering Profile         |                                 | 265°C / 10 s max.                                                                                                |
| Connection Type           |                                 | THD (Through-Hole Device)                                                                                        |
| Weight                    |                                 | 14 g                                                                                                             |
| Thermal Impedance         |                                 | 18 K/W                                                                                                           |
| Environmental Compliance  | - Reach                         | <a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> |
|                           | - RoHS                          | <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a>   |

| Supporting Documents                     |                                                                                        |
|------------------------------------------|----------------------------------------------------------------------------------------|
| Overview Link (for additional Documents) | <a href="http://www.tracopower.com/overview/thm6">www.tracopower.com/overview/thm6</a> |

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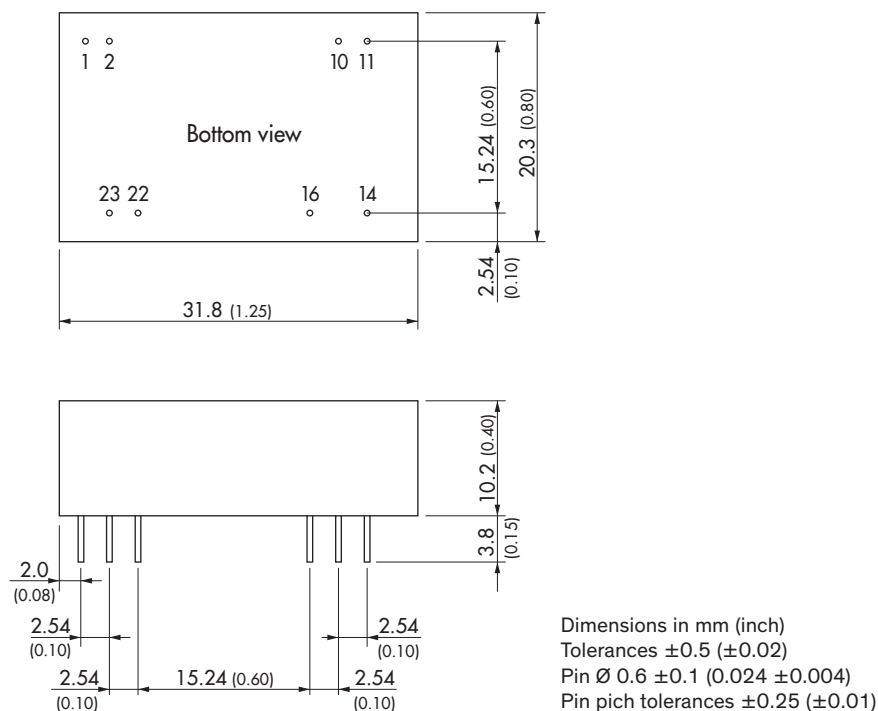
### Outline Dimensions

#### Standard pinning



| Pinout |               |             |
|--------|---------------|-------------|
| Pin    | Single Output | Dual Output |
| 1      | +Vin (Vcc)    | +Vin (Vcc)  |
| 11     | No pin        | Common      |
| 12     | -Vout         | No pin      |
| 13     | +Vout         | -Vout       |
| 15     | No pin        | +Vout       |
| 23     | -Vin (GND)    | -Vin (GND)  |
| 24     | -Vin (GND)    | -Vin (GND)  |

#### Optional models with alternative pinning, adjustable output and/or remote-control function



| Pinout |                |                |
|--------|----------------|----------------|
| Pin    | Single Output  | Dual Output    |
| 1      | No pin*/Remote | No pin*/Remote |
| 2      | -Vin (GND)     | -Vin (GND)     |
| 10     | No pin*/Trim   | No pin*/Trim   |
| 11     | No pin/NC **   | -Vout          |
| 14     | +Vout          | +Vout          |
| 16     | -Vout          | Common         |
| 22     | +Vin (Vcc)     | +Vin (Vcc)     |
| 23     | +Vin (Vcc)     | +Vin (Vcc)     |

NC: No connection

\* If Remote or Trim is not selected there is no pin on corresponding number.

\*\* If Trim is selected there is no pin on the corresponding pin number.

Remark:

No optional pinning for 5 Vin models. Corresponding parts are with THM 6WI series by default.

see [www.tracopower.com/overview/thm6wi](http://www.tracopower.com/overview/thm6wi)



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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