

**The IP&E
Specialist**

Medical Laboratory Automation and Equipment Application Guide

TTI, Inc., – A Berkshire Hathaway Company



The IP&E Specialist

The Specialist in Electronics Component Distribution

Founded in 1971, TTI has steadily grown to become a world leading specialist distributor of electronic components. The company was founded on the premise that passive component purchasing could be made more efficient by offering product specialization, customer-driven service and proprietary supply chain solutions.

Why TTI?

- **Technical Experts** TTI's European team of field-based Sales Engineers and local Product and Technical Specialists are here to support you; from understanding component trends, sustainable sourceability and new product roadmaps, to in depth technical support for your design from our technical engineering experts.

- **Value Added Services** Connector assembly is one of the most important value-added services at TTI, Inc. – Europe. We are specialized in distributing manufacturer controlled and certified connectors and interconnect solutions from globally leading suppliers. Thanks to a large inventory level of connector components, TTI, Inc. – Europe can serve any market requirements.

- **Global Distribution Centers** Our European headquarters is located just outside of Munich, Germany in Maisach-Gernlinden. In total, we have 45.000m² of dedicated warehouse space and local sales and technical support in over 40 locations across Europe. TTI has more than 195.000m² of automated warehousing in North America, Europe and Asia. All are linked into a global warehouse management system that provides superior customer service and overall business efficiencies. Wherever you are in the world, TTI can support you. Year after year, customers rate our inventory availability, on-time delivery and accuracy among the very best in the industry – contact us today to find out what a true specialist has to offer.

- **Quality and Reliability** TTI's global warehouses are all ISO-registered and have received certification to the ISO 9001 and ISO 14001 Standards. TTI Europe is also certified to EN9120/EN9100, IECQ-CECC and ISO/IEC 27001 Standards. Additionally, our European sales branches are ISO 9001 certified. TTI has one global documentation system that ensures that every TTI branch and warehouse in the world follows the same processes.





80+
Suppliers



45.000 m²
Warehousing Space



One of the largest Autostore systems in Europe



40
Sales Locations

24/7
Available to Order Online



www.ttieurope.com

Application Guide

With an increased R&D investment in the pharmaceutical industries and a growing demand for clinical diagnostics in the healthcare sector, the lab automation market is projected to grow rapidly over the coming years.

Within the Covid-19 pandemic, ensuring a shortened TAT (Turn Around Time) has become a priority, resulting in greater interest in automated pipetting, liquid handlers, microplate readers, analytical equipment, and automated workstations with lab robotics.

Also with significant investments in Genomics to personalise medical treatment, and the advancements in remote surgical robots and portable scanning equipment, the medical equipment of the future is becoming more accessible to the consumer and approaches a digital revolution.

Laboratory Automation

- Automated pipetting
- Analytical equipment
- Automated lab robot arms
- Genomics
- Virus testing
- Laboratory hoods
- Laboratory refrigerators

Medical Equipment

- Imaging equipment
(Ultrasound portable picture)
- Medical pumps and dialysis
- Surgical robotics
- Incubators
- Blood analysers
- Defibs
- Operating theatre/dental furniture



Automated
Pipetting



Analytical
Equipment



Medical
Laboratory



Imaging
Equipment



Surgical
Robotics



Operating Theatre/
Dental furniture





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|  | <p>Amphenol Advanced Sensors</p> | <p>Amphenol Advanced Sensors</p> | <p>Amphenol Advanced Sensors</p> |
| <p>DLHR Pressure Sensors</p> | <p>Type SC NTC Thermistors</p> | <p>NPA Pressure Sensor Series</p> | <p>Type 95 Series NTC Thermistors</p> |
| <ul style="list-style-type: none"> • High accuracy 0.25% TEB and 18bit resolution | <ul style="list-style-type: none"> • Precision, solid state temperature sensor • Epoxy filled sleeve for controlled diameter • Interchangeability down to $\pm .18V^{\circ}F$ ($\pm .10^{\circ}C$) | <ul style="list-style-type: none"> • Low pressure gauge and differential pressure sensors | <ul style="list-style-type: none"> • Precision, solid state temperature sensor • Interchangeability down to $\pm 0.18^{\circ}F$ ($\pm 0.1^{\circ}C$) • High reliability and stability over an interchangeable range • Resin-coated for good mechanical strength and resistance to solvents |
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| <p>Amphenol Advanced Sensors</p> | <p>Honeywell</p> | <p>Honeywell</p> | <p>Honeywell</p> |
| <p>NPI-19 Series Digital I2C</p> | <p>ABP2 Series Board Mount Pressure</p> | <p>I Series Gas – Analytical</p> | <p>700 Series Platinum Temperature Sensors</p> |
| <ul style="list-style-type: none"> • New NPI – Digital pressure sensor modules for medical equipment integration | <ul style="list-style-type: none"> • Small form factor good performance pressure sensors series for cost sensitive applications | <ul style="list-style-type: none"> • Integrated digital gas sensor • Small form factor • Multiple target gases in common package size • Feature rich sensor including end of life estimation | <ul style="list-style-type: none"> • High stability platinum temperature sensor elements for high stability accurate medical equipment applications |
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| <p>Honeywell</p> | <p>Honeywell</p> | <p>Honeywell</p> | <p>Honeywell</p> |
| <p>AWM Airflow Sensors Series</p> | <p>FMA MicroForce Sensors</p> | <p>Nanopower and Micropower Position Sensors</p> | <p>TruStability Board Mount Pressure</p> |
| <ul style="list-style-type: none"> • Digital airflow sensing +/- 30 SCCM - +/- 1000 SCCM • Fast response time • Low power consumption • Sensitivity to low flows | <ul style="list-style-type: none"> • Small form factor sensor 5mm x 5mm, for low/medium force measurements up to 25N in medical test equipment, SPI / I2C digital output options | <ul style="list-style-type: none"> • Omnipolar • Very low power requirements • Designed to work precisely in applications with large air gaps and small magnetic fields | <ul style="list-style-type: none"> • HSC/SSC/RSC series pressure sensors high performance low pressure and ultra low pressure applications e.g. ventilators |
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Sensors

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|  <p>muRata INNOVATOR IN ELECTRONICS</p> |  <p>muRata INNOVATOR IN ELECTRONICS</p> |  <p>muRata INNOVATOR IN ELECTRONICS</p> |  <p>muRata INNOVATOR IN ELECTRONICS</p> |
| <p>SCL3300 Inclinometer</p> | <p>SCHA63T Inertial Combi Sensors</p> | <p>NTC thermistors</p> | <p>AMR sensors</p> |
| <ul style="list-style-type: none"> • 3 axis inclinometer theatre table inclination measurement | <ul style="list-style-type: none"> • 6DOF IMU MRI,CAT Scanners • Operating theatre beds • Cetrifuges | <ul style="list-style-type: none"> • Small size 1608/1005 • Various resistance line up • Tighter resistance tolerance • High reliability | <ul style="list-style-type: none"> • High sensitivity • Low current consumption • Robust • Small package |
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|  <p>OMRON</p> |  <p>TE connectivity AUTHORIZED DISTRIBUTOR</p> |  <p>TE connectivity AUTHORIZED DISTRIBUTOR</p> |  <p>TE connectivity AUTHORIZED DISTRIBUTOR</p> |
| <p>2SMPP-03 MEMS Gauge Pressure Sensor</p> | <p>RTD PTF Series Platinum Temperature Sensors Elements</p> | <p>86BSD Pressure Sensor Modules</p> | <p>SMI9000 Ultra Low Digital Pressure</p> |
| <ul style="list-style-type: none"> • High accuracy, small size and low power consumption sensor for negative pressure wound therapy | <ul style="list-style-type: none"> • RTD PT100/PT1000 Platinum temperature sensor elements • High stability linear characteristic | <ul style="list-style-type: none"> • Digital media isolated pressure sensor modules • Integration into Medical OEM custom laboratory equipment | <ul style="list-style-type: none"> • Ultra low pressure sensors • Very high accuracy configurable options • Multiple package styles |
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|  <p>TE connectivity AUTHORIZED DISTRIBUTOR</p> |  <p>TE connectivity AUTHORIZED DISTRIBUTOR</p> |  <p>TE connectivity AUTHORIZED DISTRIBUTOR</p> | |
| <p>TSYS03 Digital Temperature Sensors</p> | <p>AD-102 High-Resolution Air Bubble Detector</p> | <p>LMI - Digital differential low-pressure sensors</p> | |
| <ul style="list-style-type: none"> • Digital PCB mount temperature sensor • Small form factor for internal temperature measurement of medical equipment | <ul style="list-style-type: none"> • Detect air-in-line (AIL) with a bubble resolution of 25% tubing inner diameter capable of reliably identifying interruptions in liquid flow | <ul style="list-style-type: none"> • Proof Pressure Range: 2 bar • Pressure Accuracy: $\pm 0.5\%$ F.S • Supply Voltage Range(V): 2.7 – 3.6 | |
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Connectivity – Antennas & Modules






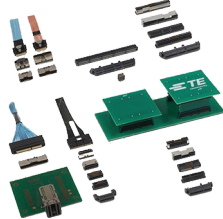

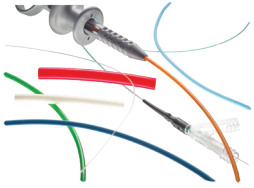
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| <p>1005392F0 Series – 4G/5G & Wi-Fi Combo Antennas</p> | <p>Type 2EA Tri-band Wi-Fi 6E + Bluetooth Module</p> | <p>PAN9520 Series Embedded Wi-Fi Modules</p> | <p>PAN9028 Series – Wi-Fi/Bluetooth Combo Modules</p> |
| <ul style="list-style-type: none"> • 4G/5G & Dual-band Wi-Fi flexible substrate Combo Antenna, cabled with SMA or MHF connectors | <ul style="list-style-type: none"> • Based on Infineon CYW55573 chipset • Supports 2x2 MIMO | <ul style="list-style-type: none"> • Wi-Fi 4 embedded module based on ESP32-S2 chipset • Stable crystal • Attractive size, low cost | <ul style="list-style-type: none"> • Wi-Fi 5 & BT 5.2 • Optional Power Management IC • Antenna design flexibility (integrated or RF pad) |
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| <p>PAN1780 Series BLE Modules</p> | <p>W3312B0100 ISM FPC Antennas</p> | <p>W90XX Series Mini Coax Jumper Cables</p> | <p>W1696-M 4G/5G Monopole Stick Antennas</p> |
| <ul style="list-style-type: none"> • High performance module • Supports BLE 5.1, Zigbee, Thread and NFC-A | <ul style="list-style-type: none"> • 868/915 ISM Flex Cabled Antenna, 75mm long | <ul style="list-style-type: none"> • Low loss SMA to U.FL jumper cable • Various cable lengths and connector types available | <ul style="list-style-type: none"> • Small form factor monopole antenna with IP65 rating covering 617-3800 MHz |
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| <p>TG.66.A113 5G Monopole external Antennas</p> | <p>GW55.A.07.B.001 Series 2x2 Wi-Fi MIMO Antennas</p> | <p>2195846 Series Compact FPC 5G Antennas</p> | <p>2108923 Series Wi-Fi 6 External Antennas</p> |
| <ul style="list-style-type: none"> • Super small form factor • Rotatable Hinged design • Available in Black or White | <ul style="list-style-type: none"> • 2 Wi-Fi antennas in one terminal enclosure • Compact Swivel mount Housing • Cables and Connectors customizable | <ul style="list-style-type: none"> • Wideband FPC antenna (80 mm long) covering 5G, Wi-Fi 6E and GNSS L1 bands • Several cable lengths available | <ul style="list-style-type: none"> • Wi-Fi 6 Triple Band external hinged antenna • Available in white or black |
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Connectivity

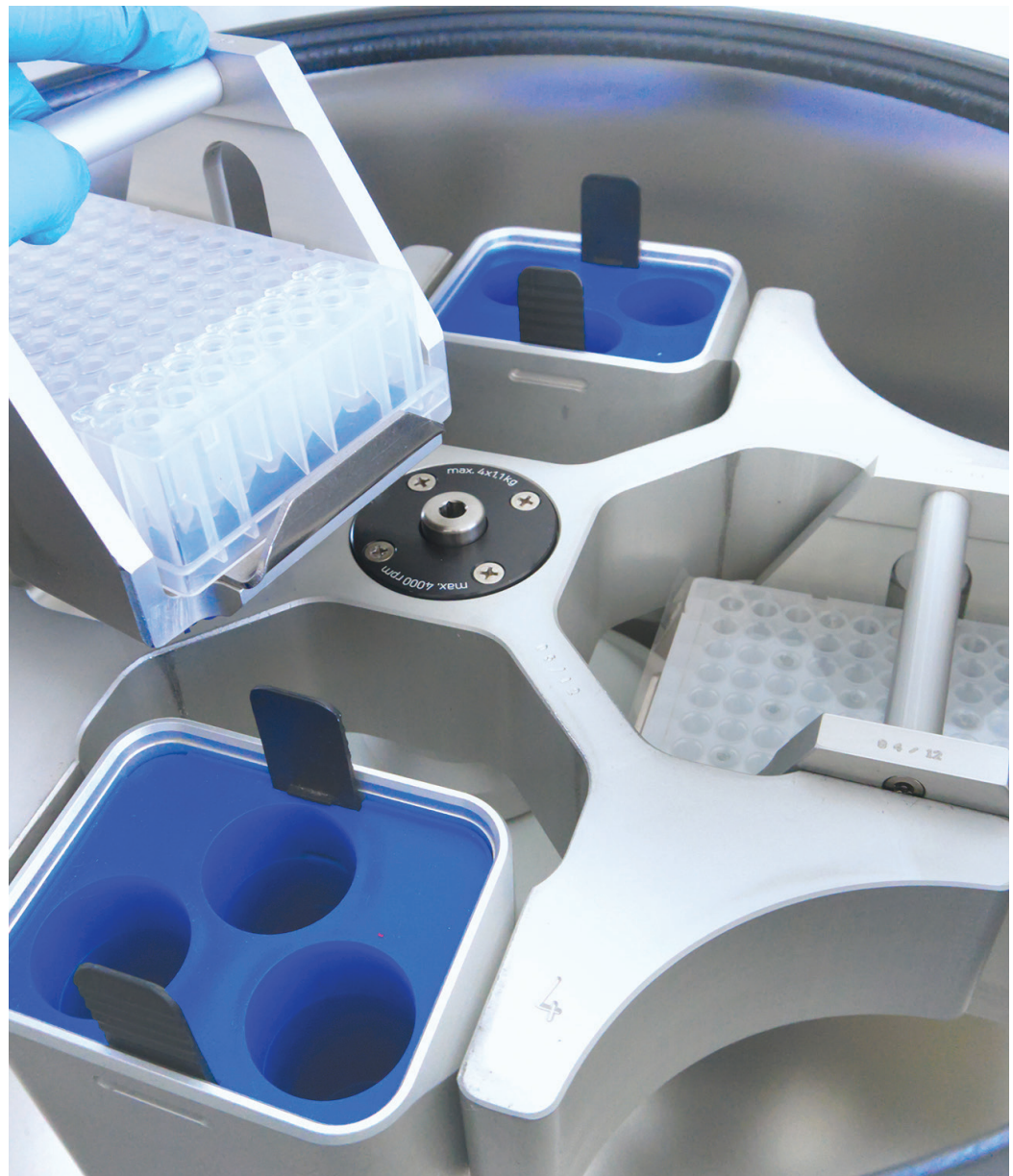


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| <p>Amphenol®</p> | <p>Amphenol®</p> | <p>Amphenol®</p> | <p>JAE</p> |
| <p>Rugged I/O Connectors</p> | <p>Minitek127® Connectors</p> | <p>PwrBlade+® Connectors</p> | <p>AX01 Floating Board-to-Board Connectors</p> |
| <ul style="list-style-type: none"> Standard interface connectors sealed to IP67. RJ45, D Sub and USB with die cast shells. Straight or Right-Angled PCB termination. Wide operating temperature range. | <ul style="list-style-type: none"> Extensive range of connectors for all types of wire/cable-to-board applications. Straight and right angle, surface mount and through hole, IDC version, available in up to 100 positions | <ul style="list-style-type: none"> Next generation AC/DC power system. Up to 58 Amps per Power contact. Supports multiple power and voltages. Vented housing for effective heat dissipation. | <ul style="list-style-type: none"> Floating tolerance +/- 0.5mm in X and Y Highly reliable contact design Low insertion force Key coding to prevent mismatching |
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| <p>molex</p> | <p>molex</p> | <p>molex</p> | <p>smths interconnect</p> |
| <p>Premo-Flex Cable Jumpers</p> | <p>Easy-On FFC/FPC Connectors</p> | <p>SlimStack Board-to-Board Connectors</p> | <p>Eclipta Connectors Series</p> |
| <ul style="list-style-type: none"> Shielded and un-shielded 0.25mm – 2.54mm pitch jumpers Various pitches, cable lengths, thicknesses, and formats Custom options including folded, notched and high temperature. | <ul style="list-style-type: none"> Dual contact points Vibration resistant Wide operating temperature range Mechanical reliability Broad range of sizes for design | <ul style="list-style-type: none"> Available in 0.35mm – 1.25mm pitch Vibration resistant 0.6mm – 16mm stack height 6 – 240 circuits Floating and latching options for improved assembly operations | <ul style="list-style-type: none"> Double-ended, edge card contact system Ideal for use with home healthcare devices and other disposable medical devices |
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| <p>smths interconnect</p> | <p>smths interconnect</p> | | |
| <p>D Series Quick Disconnect Plastic</p> | <p>HyperGrip User-Configurable Circular</p> | | |
| <ul style="list-style-type: none"> Ruggedised with Push Button latch Suitable for applications including patient monitors, infusion pumps and lab equipment | <ul style="list-style-type: none"> Colour coded and customer keyable with push/pull latching design allowing for one-hand disconnect designed to meet medical industry requirements | | |
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Connectivity & Accessories

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|  <p>AUTHORIZED DISTRIBUTOR</p> |  <p>AUTHORIZED DISTRIBUTOR</p> |  <p>AUTHORIZED DISTRIBUTOR</p> |  <p>AUTHORIZED DISTRIBUTOR</p> |
| <p>QSFP Connectors</p> | <p>Sliver High Speed Internal Interconnect</p> | <p>Z-Pack HM Backplane Connectors</p> | <p>Medical Grade Heat Shrink Tubing</p> |
| <ul style="list-style-type: none"> • Offers 4 channels (4x) of 10G, 32+ Gbps data rates • QSFP28/56 product supports 100 Gbps Ethernet (28 Gbps x 4), and 100 Gbps InfiniBand | <ul style="list-style-type: none"> • Low profile design allows top or side actuation • Low actuation force of 35 grams | <ul style="list-style-type: none"> • Specified backplane connector by PXI System Alliance • IEC 61076-4-101 • Modular 2mm pitch with flexible configuration | <ul style="list-style-type: none"> • Unique formulations for broad range of medical applications • Robust and chemical resistant • Stable in high temp. conditions • Compliant to RoHS and USP class VI biocompatibility |
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|  <p>AUTHORIZED DISTRIBUTOR</p> |
| <p>Specialty Heat Shrink Tubing</p> |
| <ul style="list-style-type: none"> • Various levels of resistance to flame, heat, chemicals and mechanical damage • Recognition by various testing agencies |
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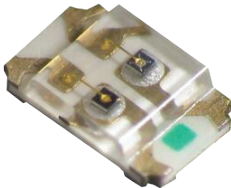

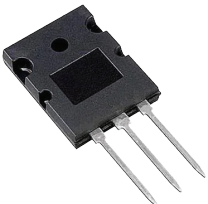




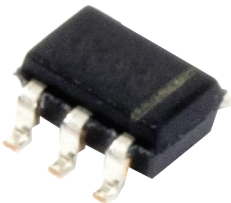

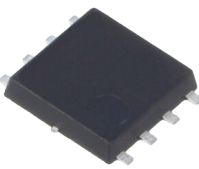
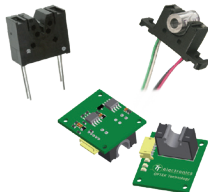




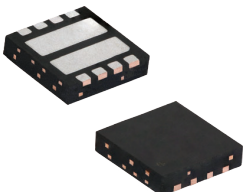
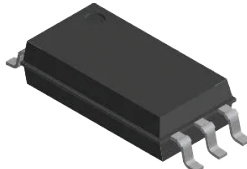
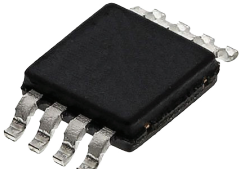
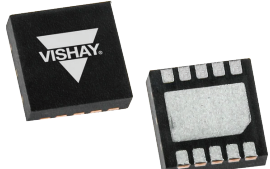
Relays, Switches & Power Supplies

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| <p>SPVS-Series</p> | <p>PBA Series</p> | <p>K12 Series</p> | <p>G3VM Series</p> |
| <ul style="list-style-type: none"> • Compact two-way operation detector switch available as Normal-Open and Normal-Close variety | <ul style="list-style-type: none"> • Bushing diameter 16 (.630), 19 (.748), 22 (.866) or 30mm (1.181) • Sealed to IP68 and IP69K (switches mounted on panel) | <ul style="list-style-type: none"> • Excellent tactile feel • Wide choice of LED colours, travel and actuator forces • High reliability/long life • Sealed version available | <ul style="list-style-type: none"> • Control PCB, redundancy circuit, switching probes • Ultrasound device, MRI, Diagnostic equipment, nurse call system |
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| <p>B3U Series</p> | <p>EVPAW Series</p> | <p>AGQ Series</p> | <p>DRA3 Series</p> |
| <ul style="list-style-type: none"> • Ultra-small Surface-mounting Tactile Switch with high contact reliability | <ul style="list-style-type: none"> • Sealed structure and IP67 level reliability • Clear tactile feeling even low profile | <ul style="list-style-type: none"> • 1,500v FCC, 2,500v Telcordia • High reliable twin contacts • 3,5A inrush type available | <ul style="list-style-type: none"> • Load voltage range of 48 – 510VAC • 3-Phase LED input status indicator AC or DC control • Built in overvoltage protection |
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|  <p>AUTHORIZED DISTRIBUTOR</p> |  |  |  |
| <p>IM / Signal Relay Series</p> | <p>LCM-3000</p> | <p>CS1000</p> | <p>CNS650-MU</p> |
| <ul style="list-style-type: none"> • Ultrasound equipment low coil power consumption • High mechanical shock resistance up to 50g functional | <ul style="list-style-type: none"> • Medical safety • 5v @ 2A housekeeping • Variable speed “Smart Fans” • V-Programming from 20% – 125% | <ul style="list-style-type: none"> • Fanless, 1U, High Efficiency, 1000w with natural convection cooling only • Analog/digital management - PMBus™ monitoring and control capability | <ul style="list-style-type: none"> • Medical approvals, 2xMOPP, Type BF ready • PMBus interface • Active current share with OR-ing FET • Less than 1U high |
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Power Supplies & Passive Components

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| <p>Coolx600</p> | <p>UltraVolt AEQ High Voltage DC-DC Converters</p> | <p>ME External Adapters</p> | <p>GSM220</p> |
| <ul style="list-style-type: none"> • Modular Power 600w with natural, convection cooling • High input surge protection • 24w-standby power • PMBus™ for digital communications and control | <ul style="list-style-type: none"> • Compact in size and modular, enabling easy installation • EN-62368 certified • High reliability and precision | <ul style="list-style-type: none"> • Medical Safety Approvals • Level VI Efficiency • Class I and Class II input versions • 5V and 48V Outputs, up to 240W | <ul style="list-style-type: none"> • 2x MOPP according to ANSI/AAMI and IEC/BS/EN • Extremely low leakage current • Class II • Energy efficiency level VI |
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| <p>LOP-200/300/400/500/600</p> | <p>MPM-45/65/90</p> | <p>PQU1000 Series</p> | <p>Power Solutions (KPS)</p> |
| <ul style="list-style-type: none"> • Ultra low profile • Passed international certifications in multiple fields (ITE/Medical/Industrial/Household) | <ul style="list-style-type: none"> • 2xMOPP level, low leakage current, suitable for type BF, EN55011 Class B • Fully potted, Class II • Safety standards: UL/UKCA/TUV/CB/EAC/CE | <ul style="list-style-type: none"> • 1000W 5" x 8" AC-DC "U" Channel Power Supply Converter • Up to 800W natural convection • High efficiency of 95% typical at 50% load | <ul style="list-style-type: none"> • These devices provide lower ESR, ESL and higher ripple current capability |
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| <p>XTREME-GUARD™ ESD Suppressors</p> | <p>Power Entry Modules & Cord Sets</p> | <p>SMD Power Inductors IHLP</p> | <p>TNPW High Stability Thin Film Flat Chip Resistors</p> |
| <ul style="list-style-type: none"> • Very small 0402 and 0603 suppress fast-rising ESD transients up to 30kV | <ul style="list-style-type: none"> • Designed acc. to IEC/UL 60601-1 • High IP protection and robust design • Protection class I or II • V-lock cord retention | <ul style="list-style-type: none"> • Very low DCR & Low core loss | <ul style="list-style-type: none"> • Perfect choice when high reliability and stability are requested |
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Discrete Semiconductors

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|  |  <small>Kingbright Electronic Europe GmbH</small> |  |  |
| TBU-CA Series TBU® High-Speed Protectors | KPHBM-2012LVSURKZGKC 0805 BiColor LED | SP1250 TVS Diode Array | IXFK94N50P2 500 V Polar2 HiPerFETs |
| <ul style="list-style-type: none"> • Bi-directional high speed circuit protection • Overcurrent and overvoltage protection • High-speed performance (<1us max) | <ul style="list-style-type: none"> • 2.0 mm x 1.25 mm SMD LED, .45 mm max. thickness • Low power consumption • Wide viewing angle • Ideal for backlight and indicator | <ul style="list-style-type: none"> • Lightning, 50A (8/20µs as defined in IEC 61000-4-5 2nd edition) • Low leakage current of .02µA (TYP) at 5v | <ul style="list-style-type: none"> • Fast intrinsic diode • Dynamic dv/dt rating • Avalanche rated • Low RDS(ON) and QG • Low package inductance |
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| SP3002 TVS Diodes Array | TLP2210 Dual-Channel Photocouplers | TPH1R306PL N-Channel Trench MOSFETs | OPB350 Tube Liquid Sensors |
| <ul style="list-style-type: none"> • High level of protection to electrostatic discharges • SP3002 Very low capacitance | <ul style="list-style-type: none"> • 5Mbit/s I75 – Very low supply and threshold input currents • SO8L package rated 5kV • UL, CSA recognized, CQC, EN 60747-5-5, EN62368-1 approved | <ul style="list-style-type: none"> • 1.3mOhm / 60V • Tch rated up to +175°C • SOP advance(N) 5x6mm² package | <ul style="list-style-type: none"> • Can identify if liquid is present in clear tubes • Opaque plastic housing enhances ambient light rejection • PCB mounting or AWG wires |
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| SIZ240DT – Integrated 40v MOSFETs Half-Bridge | VOL3120 IGBT and MOSFETs Driver | DG469 High Voltage Analog Switches | SiP32419 28v, 56mΩ Load Switches |
| <ul style="list-style-type: none"> • TrenchFET® Gen IV power MOSFETs • Integrated MOSFET half-bridge power stage | <ul style="list-style-type: none"> • 2.5 A minimum peak output current • 48 kV/µs minimum common mode rejection (CMR) at VCM = 1500v | <ul style="list-style-type: none"> • Low on resistance (3.6 Ω typical) • On resistance flatness (0.4 Ω typical) • 44v supply maximum rating • ± 15v analog signal range | <ul style="list-style-type: none"> • 6v – 28v operation voltage • 56mΩ typical on resistance • Programmable soft start • Programmable current limit |
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what a true specialist can offer.

Corporate Headquarters

TTI, Inc.
2441 Northeast Parkway, Fort Worth, Texas 76106 U.S.A.
T: +1 817 740 9000 | F: +1 817 740 9898
E: information@ttiinc.com

European Headquarters

TTI, Inc.
Ganghoferstr. 34, 82216 Maisach-Gernlinden Germany
T: +49 (0) 81 42 66 80 0 | F: +49 (0) 81 42 66 80 490
E: sales@de.ttiinc.com

European Sales Offices

Austria

Vienna
T: +43 (0) 18 79 85 90
E: sales.vienna@at.ttiinc.com

Belgium

Gent
T: +32 9 274 0670
E: sales.benelux@nl.ttiinc.com

Bulgaria

Varna
T: +359 52 51 10 59
E: sales.varna@bg.ttiinc.com

Czech/Slovak Republic

Brno
T: +420 541 126 714
E: sales.brno@cz.ttiinc.com

Denmark

Brøndby
T: +45 (0) 43 29 35 35
E: sales.copenhagen@dk.ttiinc.com
Risskov
T: +45 (0) 38 41 31 00
E: sales.copenhagen@dk.ttiinc.com

Estonia

Tallinn
T: +372 664 81 00
E: sales.estonia@ee.ttiinc.com

Finland & Baltic Region

Espoo
T: +358 98 94 65 200
E: sales.finland@fi.ttiinc.com

France

Brive
T: +33 (0) 5 55 92 92 93
E: sales.france@fr.ttiinc.com

Bron

T: +33 (0) 472 81 2030
E: sales.lyon@fr.ttiinc.com

Bruz

T: +33 (0) 2 99 77 60 84
E: sales.rennes@fr.ttiinc.com

La Ciotat

T: +33 (0) 442 84 4142
E: sales.marseille@fr.ttiinc.com

Montigny Le Bretonneux

T: +33 (0) 130 13 7380
E: sales.paris@fr.ttiinc.com

Germany

Berlin
T: +49 (0) 30 8877 40 200
E: sales.berlin@de.ttiinc.com
Dortmund
T: +49 (0) 2301 91 304 0
E: sales.dortmund@de.ttiinc.com
Frankfurt
T: +49 (0) 6102 5999 100
E: sales.frankfurt@de.ttiinc.com

Hanover

T: +49 (0) 5 11 7 80 59 0
E: sales.hannover@de.ttiinc.com

Munich

T: +49 (0) 81 42 66 80 110
E: sales.munich@de.ttiinc.com

Nuremberg

T: +49 (0) 911 9520 0
E: sales.BDG@de.ttiinc.com

Pforzheim

T: +49 (0) 7231 14788 0
E: sales.stuttgart@de.ttiinc.com

Hungary

Budapest
T: +36 1 40 22 111
E: sales.budapest@hu.ttiinc.com

Ireland

T: +44 (0)1494 460000
E: sales.ireland@ie.ttiinc.com

Israel/Ray-Q Ltd.

Airport City
T: +972 3 975 3333
E: sales@ray-q.com

Italy

Civitanova Marche
T: +39 0733 81 8655
E: sales.milan@it.ttiinc.com

Florence

T: +39 (0) 55 094 63 76
E: sales.milan@it.ttiinc.com

Milan

T: +39 02 822 521
E: sales.milan@it.ttiinc.com

Naples

T: +39 081 4245719
E: sales.milan@it.ttiinc.com

Padova

T: +39 049 7802311
E: sales.milan@it.ttiinc.com

Rome

T: +39 0774 57 1302
E: sales.rome@it.ttiinc.com

Netherlands

Eindhoven
T: +31 (0) 40 290 1616
E: sales.benelux@nl.ttiinc.com

Norway

Drammen
T: +47 (0) 92 66 87 66
E: sales.norway@no.ttiinc.com

Poland

Kwidzyn
T: +48 (0) 55 279 67 57
E: sales.poland@pl.ttiinc.com

Portugal

Vila Nova de Famalicao
T: +351 252 493084
E: sales.barcelona@es.ttiinc.com

Romania

Cluj Napoca
T: +40 (0) 733 339 002
E: sales.romania@ro.ttiinc.com

South Africa

Pretoria
T: +27 86 111 2844
E: sales.southafrica@za.ttiinc.com

Spain

Barcelona
T: +34 (0) 93 645 25 75
E: sales.barcelona@es.ttiinc.com

Madrid

T: +34 (0) 91 416 11 90
E: sales.madrid@es.ttiinc.com

Vizcaya

T: +34 (0) 94 623 25 80
E: sales.bilbao@es.ttiinc.com

Sweden

Gothenburg
T: +46 (0) 31 741 12 90
E: sales.gothenburg@se.ttiinc.com
Stockholm
T: +46 (0) 8 594 11 800
E: sales.stockholm@se.ttiinc.com

Switzerland

Baar
T: +41 (0) 41 76741 90
E: sales.swiss@ch.ttiinc.com

Algeria, Egypt & Tunisia

T: +216 (0) 71 862 693
E: sales.tunis@fr.ttiinc.com

Morocco

T: +33(0) 555 92 92 93
E: sales.morocco@de.ttiinc.com

Turkey

Istanbul
T: +90 (0) 216 688 91 75 76
E: sales.turkey@tr.ttiinc.com

United Kingdom

High Wycombe
T: +44 (0)1494 460000
E: sales.london@uk.ttiinc.com

Manchester

T: +44 (0)161 872 2019
E: sales.london@uk.ttiinc.com

Resellers or Distributors

TTI Connect - Europe
T: +49 8142 6680 168
E: service@tticonnect.com

TTI, Inc. Headquarters Europe



www.tuev-sued.de/ms-zert



IECQ-P BSI 14.0013 (Germany)
IECQ-P BSI 14.0013-02 (Basildon)
www.iecq.org