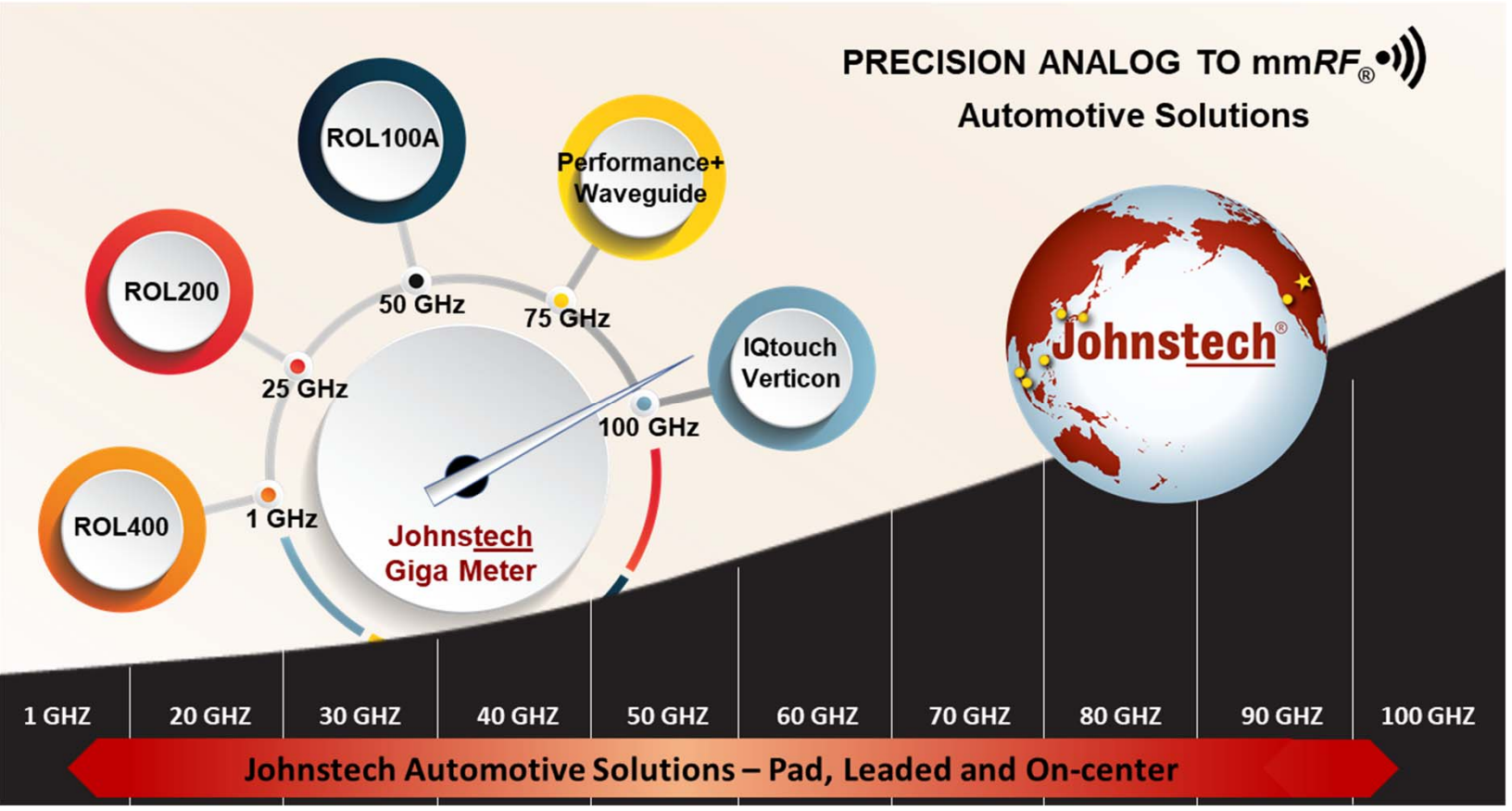
High Performance Test Solutions for Automotive Semiconductors

Application Brief: Johnstech Automotive Solutions

Automotive devices continue to grow in complexity which means their test solutions must live up to the tough challenges of the automotive industry. Johnstech is a leader in the test contactor industry providing innovative final test solutions that meet or exceed performance expectations as well as the test demands of customers world-wide. Our deep design knowledge and test expertise produce product performance that meets or exceeds the technology requirements of today and tomorrow. Whether the application is infotainment, under-the-hood or 77 GHz anti-collision radar, our product portfolio ensures customers are able to meet their rigorous test requirements under complex and varied test conditions which automotive customers demand.

www.Johnstech.com



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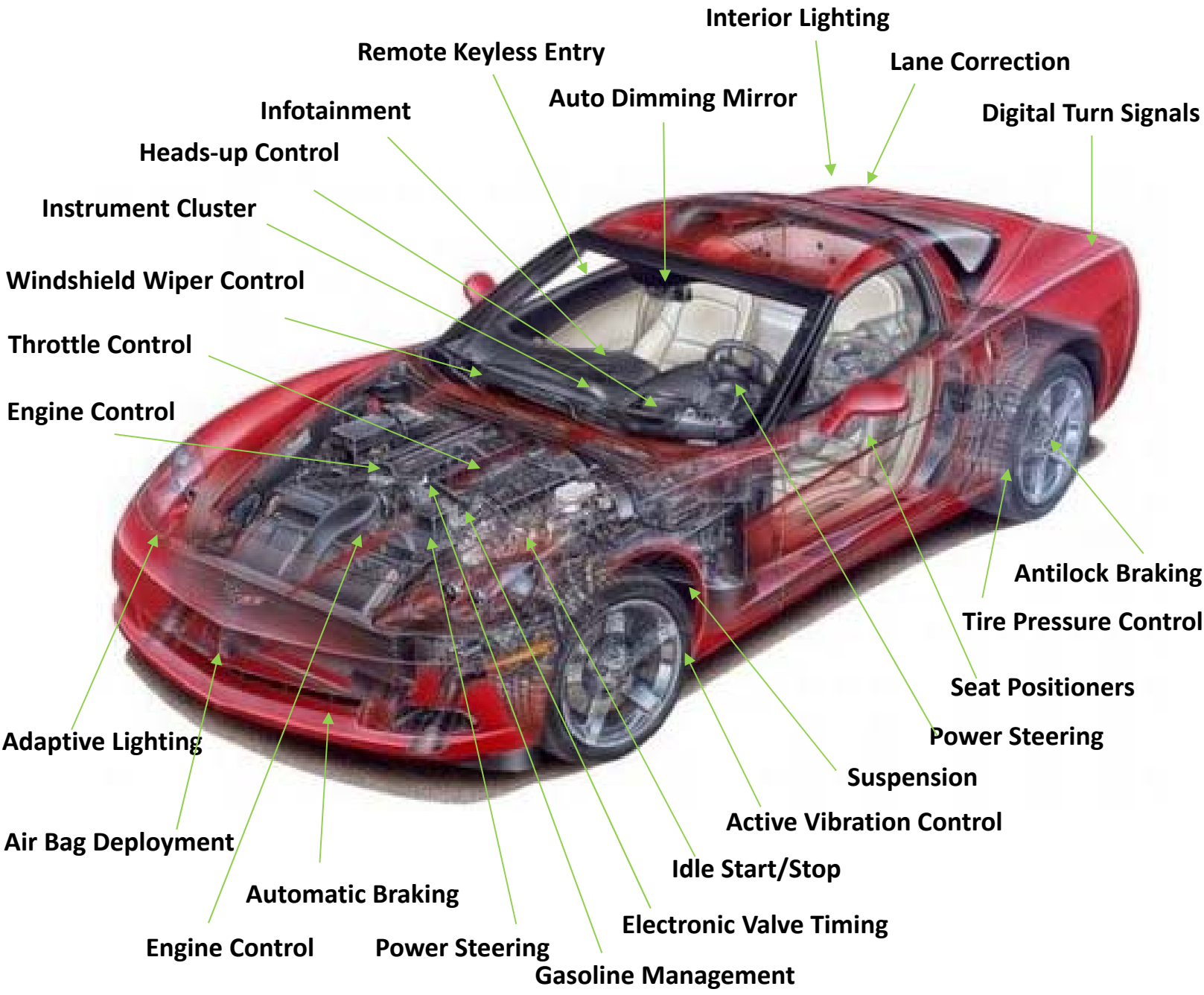
Electronics cost contribution of a car is 40-45%



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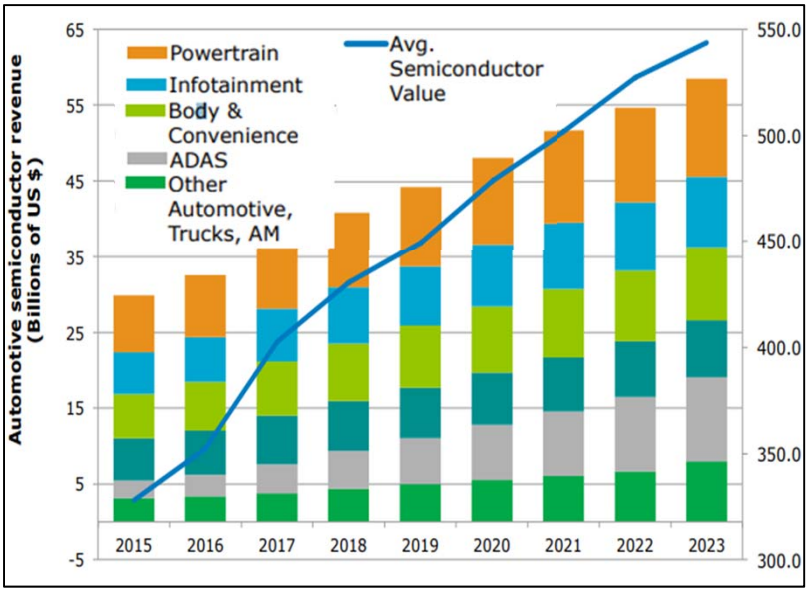
5G and Automotive - Connected Mobility

5G will be the ultimate platform that enables smart automotive features. Smart technology will provide comfortable and convenient driving experiences through the integration of infotainment, enhanced communications and artificial intelligence. Sensor technologies are intermixed with memory devices and microcontrollers to provide the high standard of safety which smart automotive requires. Government regulations drive safety, fuel efficiency and emission standards. Safety features have evolved from passive to active, for example, radar and vision systems. Enhancing the overall driving experience has led to the growth of better infotainment and other user convenience features.

The automotive semiconductor market is currently the strongest end-market for semiconductors

The automotive electronics segment is currently growing at an annual rate of 8%. This market accounts for nearly 10% of all semiconductor sales (almost $42b in 2018 with projections to double this within the next 5 years). There continues to be strong and increasing demand for electronic systems in automobiles. Apart from increasing safety, convenience and environmental features, the current focus includes autonomous vehicles, vehicle-to-vehicle communications and vehicle-to-infrastructure communications (think cars connected up to a smart-city).



Source: IHS, 2018

Automotive Market Components

- Processors
- Analog ICS
- Discrete Power Devices
- Sensors
- Memory Devices
- Lighting Devices

Top Market Players (as of June 2019)

1. Infineon Technologies
2. NXP Semiconductors N.V.
3. Renesas Electronics Corporation
4. Texas Instruments Inc.
5. STMicroelectronics
6. Robert Bosch GmbH
7. ON Semiconductor
8. Micron Technology, Inc.
9. Microchip Technology
10. Rohm

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Automotive Power Devices

Automotive power devices are subjected to rigorous tests that replicate extreme behavior of a vehicle's power supply rail to establish reliable functionality as required by the AEC-Q100 standard.

With a given load, the power supply must demonstrate acceptable voltage regulation under voltage sag conditions to ensure load functionality is not compromised. For load dump tests, a high input transient (load dump pulse) is applied to the power device input for a specified duration and similarly, this pulse energy must be absorbed and dissipated by the DUT without any detrimental effect on load regulation functionality. Both these tests require consistent and predicable I/O contact parameters such as CRES, jitter, Current Carrying Capacity, and thermal dissipation.

Johnstech Solutions

The capabilities of Johnstech contactor products, such as Pad ROL™ and Leaded ROL™ 200 Series, including Kelvin-Ready™ and XT™ are featured solutions for automotive power tests. These products ensure the required tests remain transparent and uncompromised to the DUT by providing the optimum material design, contact architecture, CRES consistency, and thermal dissipation properties.

Why Kelvin?

Why include Kelvin contactors in your test solution portfolio? Kelvin contactors help ensure that low resistance measurements can be made reliably by eliminating or compensating for contact resistance and other parasitic circuit elements from DC measurements. They are essential for high accuracy voltage force or measure. Typical measurements which require Kelvin contacts are R_{DSON} and V_{DO} in devices such as power management, data converters and amplifiers.

Recognizing Kelvin Requirements

R_{DSON} is a typical parameter which requires the use of Kelvin contacts. Measurements of a few ohms merit consideration but anything less than one ohm should use them. Accurate voltage measurements under high-current loading should also be considered for Kelvin contacts. When using Kelvin contactors, the sense contact can be used to monitor the force contact and insure the proper signal is being applied to the device-under-test.

Johnstech Solutions

Johnstech offers Kelvin-ready contactors for both pad and leaded packages. Refer to the product selection guide found later in this brief.

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Automotive Application Solutions

Johnstech automotive solutions combine robust, tri-temp testing stability using patented ROL™ contacts. Our contactors deliver industry-leading yield, lowest MBTA and excellent electrical performance. When combined with the versatility of configurable Kelvin-ready options, these solutions improve test results and lower overall cost-of-test.

Applications	Device Segments	AEC-Q100 Grade 0-1	AEC-Q100 Grade 2-4
Analog Mixed Signal	• MCE/ECU/GPU/LMU audio • Infotainment • ADC/DAC • Sensor	ROL 200XT	ROL 100A ROL 200 ROL 400
Connectivity	• Telematics cellular infotainment • Vehicle tracking	ROL 200XT	ROL 100A ROL 200 ROL 400
	• Collision avoidance radar	ROL 100A Perf. Plus Waveguide Verticon	ROL 100A Verticon
	• RF Power Amp - Mobile	ROL 200XT IQtouchMicro	ROL 200 IQtouchMicro
Power Management	• Point of load supply PMIC/LMU • Power FET/GaN FET digital isolator	ROL 200KR2 ROL 200XT	ROL 100A ROL 200 ROL 200KR2 ROL 400
High Speed Digital	• I/O controller SerDes	ROL 200XT	ROL 100A ROL 200 ROL 200KR2 ROL 400

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Key Product Attributes

- Self-cleaning wipe
- Kelvin-ready options, configurability
- Pin-to-pin, low Cres stability
- Custom air-flow channels on XT
- Extended temperature range

Leverage the Value we Provide

- Solid pin electrical performance (ROL)
- Cpk > 2
- Long MTBA and mechanical component life
- Low cost of ownership

Product Selection Guide

Product	Package	Performance
-40 C to 150 C		
Pad Rol 200 Pad ROL 200KR2	QFN/DFN	20 GHz, 3-5 A Kelvin-Ready
Leaded ROL 200 Leaded ROL 200KR	QFP/SOIC	20 Hz, 3-5 A Kelvin-Ready
Ocwype	QFN/DFN/QFP/SOIC	6 GHz, 3A
Leaded ROL 400	QFP/SOIC	5 GHz, 4-5 A
Pad ROL 100A Pad ROL 100A Performance+	QFN/DFN	40 GHz +, 0.25 nH 40 GHz +, <0.25 nH
Verticon 100 Verticon II	BGA	100 GHz +
IQtouch Micro	WLCSP	100 GHz +
-65 C to 175 C		
Pad ROL 200XT Pad ROL 200KR-XT	QFN/DFN	Extended Temperature Combo KR-XT
Leaded ROL 200XT Leaded ROL 200KR-XT	QFP/SOIC	Extended Temperature Combo KR-XT
Manual Actuators		
DL-VCMA Plus, ZMA, VMA	QFN/SOIC	-55 C to 155 C

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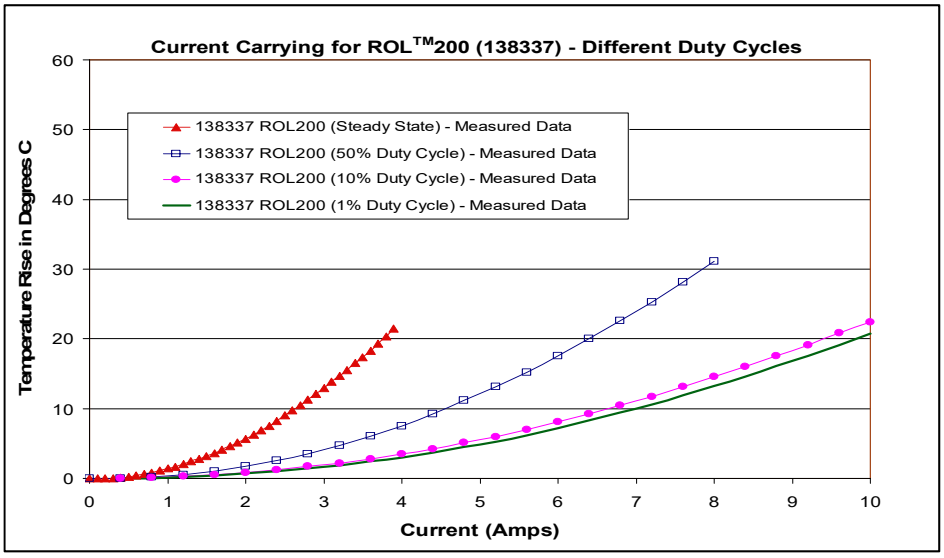
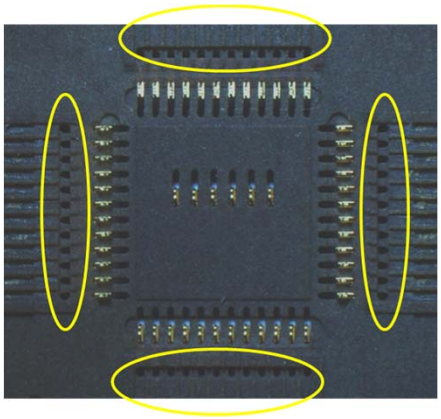
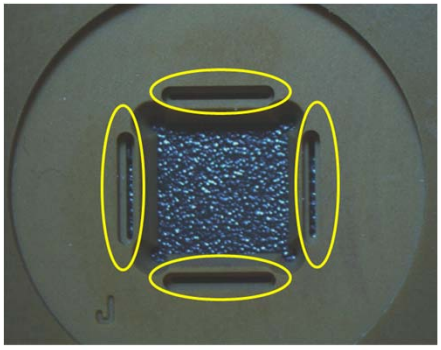
Johnstech Products – High Current, High/Low Temperature and High Reliability



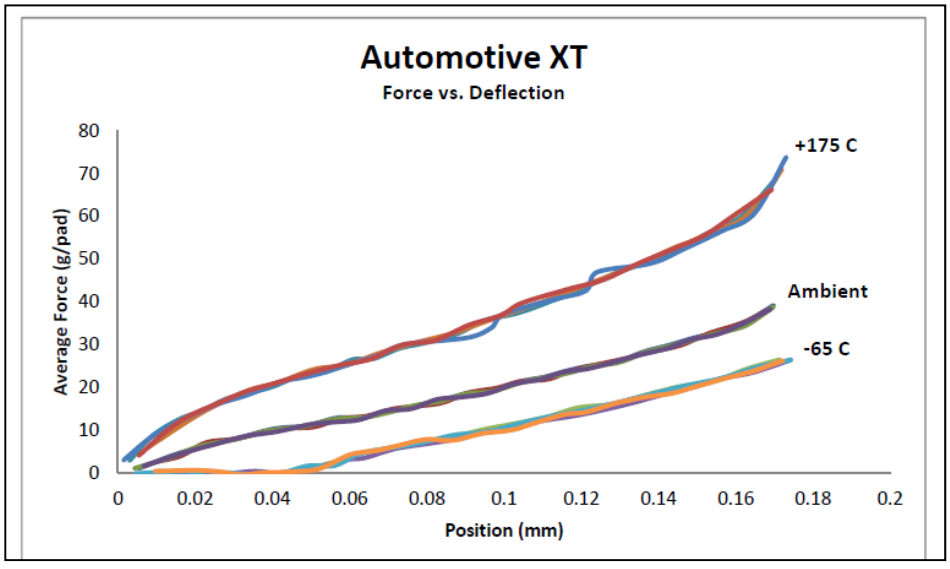
Current Carrying Capacity as a Function of Temperature Rise and Duty Cycle

ROL200 XT





Airflow Holes in the Housing and Alignment Plate



ROL200 XT Maintains Good Operating Force Over Extended Temperature Range Resulting in Stable and Repeatable Contact Resistance

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Solutions for Customer Success

Johnstech contactors include a family of test solutions that have been uniquely designed for consistent and stable testing of automotive devices. The XT contactors offer a solution for testing at temperatures between -65 C and 175 C. Kelvin-ready solutions provide customers with a field-configurable option for testing with or without kelvin sense.

Worldwide Support

Johnstech maintains a worldwide teams of Field Service Engineers, Application Engineers and Sales. They are available to support first-pass yield enhancement as wells as perform test floor audits and training.

Engineering Services

Johnstech offers a variety of engineering services, such as load board evaluation and testing, 3-D modeling, electrical performance analysis, PCB/contactor/device optimization, contactor S-parameter data, thermal conductivity analysis and advanced design system analysis.

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