APPLICATION BRIEF

RF & Microwave Wireless Applications

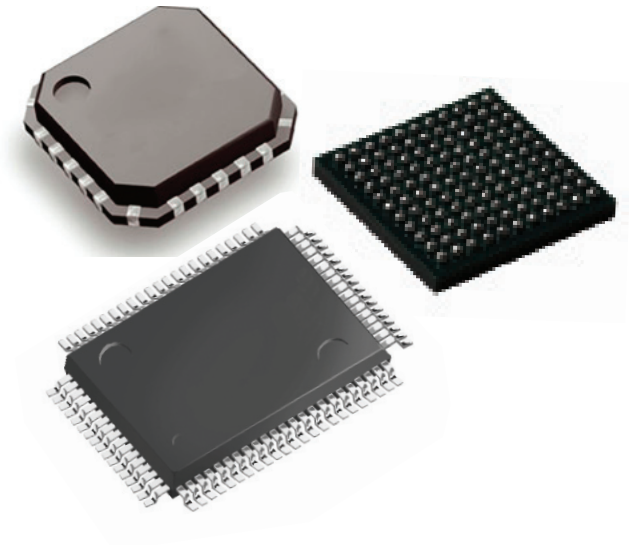
Keep Pace. Perform at the Highest Possible Test Level for Today's Mobile RF & Microwave Technologies

Mobile RF communications systems using 3G, 4G, or microwave technologies are driving increased demand for RFIC devices. As these ICs become more sophisticated, so do their analog and digital testing requirements. Test equipment performance needs to keep pace, and all test system components - including Test Contactors, or sockets - must perform to the highest possible level. Johnstech provides proven Contactor products and offers comprehensive services that reduce engineering risk and move products to market faster.

RF and Microwave IC Device Types and Tests

RFIC devices are critical in both mobile and fixed communications systems. Mobile communications systems are migrating to 2.5G and 3G, delivering higher data rates for faster and more complex applications like streaming video. These third generation UMTS and cdma2000 systems will soon be augmented by 4G wireless systems based on LTE and WiMAX standards, with data rates extending beyond 100 Mbps, depending on the degree of mobility and network conditions.

RFICs are also vital to fixed communications systems, such as WiFi networks, providing users access to PC-based web and email. They also are integral to Bluetooth technology, which provide wireless connectivity from PCs to printers and from mobile phones to headphone and microphone sets.



RF and microwave wireless systems require optimal performance from IC devices such as power amplifiers, down-converters, up-converters, transceivers, switches, and digital IF sections. The frequency range and other performance specifications depend on whether the device comprises an RF or microwave system, whether it is a fixed or mobile system, and the range the system covers. RF devices are available in multiple package types, including SOIC/QFPs, QFN/DFNs, and array (BGA/LGA).

RFICs require high-performance testing to verify their specifications – and analog and digital testing may both be required. Analog tests of RF amplifiers include spectrum analyzer measurements such as intermodulation, harmonic distortion, and spurious testing. Network analyzer 'S' parameter measurements include insertion loss, gain, output power, 1 dB gain compression, return loss, and crosstalk. Other analog measurements include receiver noise figure and switch isolation. Digital testing includes bit error rate (BER), intersymbol interference (ISI), and error vector magnitude (EVM). Adjacent channel power ratio (ACPR) is also performed on many devices with complex modulation.

Contactor Performance

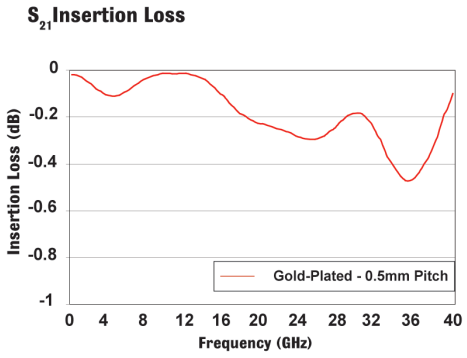
When RFICs are tested in a Test Contactor, the goal is to be as close to 'solder-to-board' performance as possible. The performance of the Test Contactor and test load board must meet rigorous electrical, mechanical, and thermal requirements. Johnstech Contactor performance is stable and repeatable, allowing the test engineer to set tighter guard bands in test programs, which enables faster measurements and the potential to up-bin parts based on device performance.

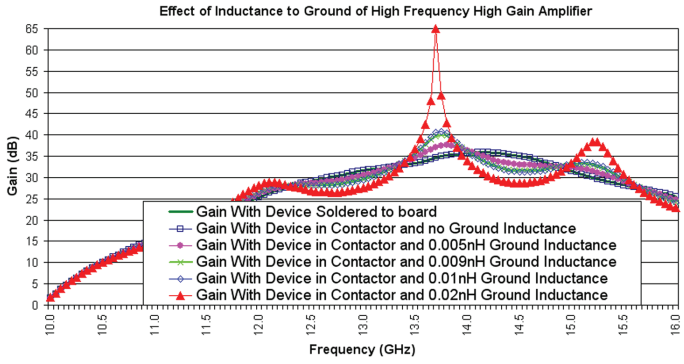
Electrical

- The Contactor 'S' parameters of insertion loss, return loss, and crosstalk must meet the performance of the RFIC. The 1 dB insertion loss frequency and the 20 dB return loss and crosstalk frequencies should be as high as possible to minimize any loss through the Contactor. Harmonics of the fundamental frequency also need to be considered when selecting the Contactor. (Pad ROL™100A Series graph shown)

- The inductance (L) is also important, especially for high-gain, high-frequency devices such as amplifiers. The self-inductance of the perimeter and ground contacts as well as the ground inductance of the ground insert should be as low as possible to avoid unwanted circuit resonances. (Electrical modeling shows the effect of ground inductance on amplifier gain.)

- Rise time is not a Contactor specification per se, but is closely related to the 'S' parameters and inductance. For example, if a digital device has a rise time of 20 picoseconds, the bandwidth of the Contactor needs to be at least 17 GHz. To measure the second harmonic, a bandwidth of 34 GHz is required.

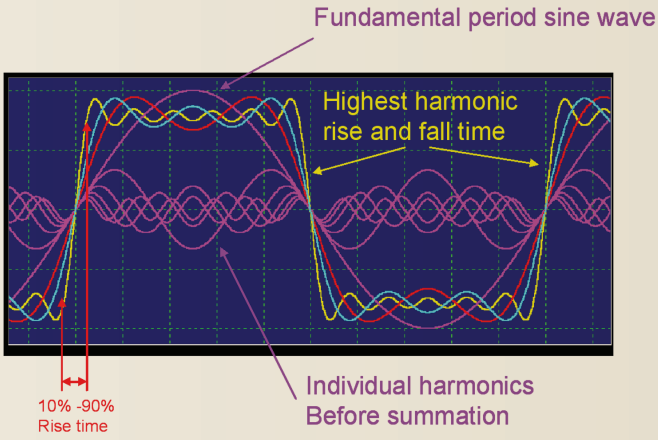




(electrical continued)

- Contact resistance (CRes) is an electrical parameter related to the mechanical performance of the Contactor. Oxides that reside on device pads or leads can cause the CRes to rise and/ or vary as the number of insertions increases. Johnstech contacts have a self-cleaning wipe that produces stable, repeatable CRes and extend the interval between cleanings.

- The electrical performance of the test system is dependent on both the Contactor and load board. Optimizing the load board-to-Contactor interface will produce the highest frequency and lowest inductance interface to the device. Optimum performance is achieved when this interface has an impedance as close as possible to 50 ohms.



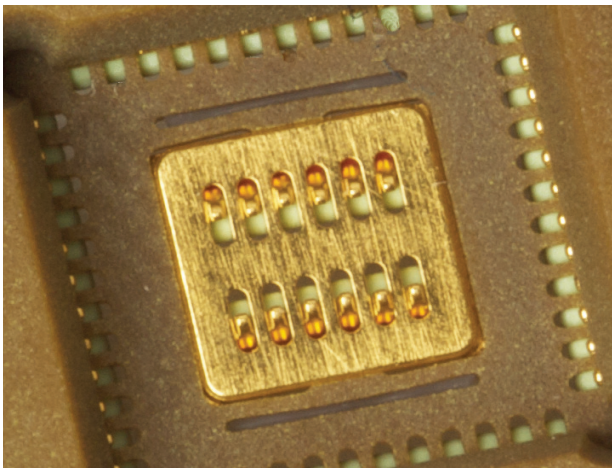
Production Test

Johnstech Contactors provide the mechanical reliability and repeatability for production testing of IC devices necessary for maintaining higher First Pass Yields (FPY), higher overall equipment efficiency (OEE), longer mean time between assists (MTBA), and higher device throughput.

- When using multi-site handlers, Johnstech provides excellent site-site Contactor repeatability, which further enhances OEE and minimizes downtime compared to competing test socket technologies.

- Overall test performance is enhanced with repeatable Contactor performance and with an optimized handler-to-Contactor interface.

- Johnstech's worldwide support and services are available to help you achieve optimum production test performance results.



Johnstech's grounding for a
Pad ROL™100A Series Contactor.

Thermal and High Current

- Johnstech contacting technology utilizes solid metal contacts. The current carrying capability (CCC) is superior to non-solid contacting technologies such as spring pins. For example, even at 100% duty cycle, the ROL™200 contacts can handle over 4A continuous for a temperature rise of 20° C.

- Device ICs often need to dissipate several Watts of power. It is important that Contactors provide adequate thermal grounding solutions. Johnstech provides grounding solutions that include contacts-in-housing (STH, RTH), solid metal ground inserts (CI, EI), and metal inserts (SCI, RCI) with contacts installed.

Johnstech Services

Johnstech offers a full line of technical services to assist you in achieving the highest level of performance. One of the services that is particularly powerful and effective for RFIC testing is Johnstech's use of HFSS and ADS software to model the electrical performance of the Contactor and the interface to the device and load board pads. This provides direction to select the best Contactor ground configuration for the application and to design the optimal load board trace layout, which are both vital to optimizing the overall system electrical performance. Johnstech's test floor services will help you enhance your yields, increase your performance and maintain an efficient test floor.

Contact Johnstech

To learn more about Johnstech's patented solutions and services that maximize your RFIC testing performance, reduce your engineering risk, and provide repeatable production test results, contact your local Johnstech Sales Representative. Also learn about Johnstech parts and services at www.johnstech.com.

Johnstech Contactors for QFN/DFN Packages

		2mm	ROL™ 200	ROL™ 100A
Inductance	Self:	0.50 nH	0.42 nH	0.23 nH
	Mutual:	0.07 nH	0.24 nH	0.14 nH
Capacitance:	Ground:	0.50 pF	0.22 pF	0.16 pF
	Mutual:	0.031 pF	0.13 pF	0.05 pF
S21 Insertion Loss		-1dB @ 11 GHz	-1dB @ 24 GHz	-1dB @ 40+ GHz
S11 Return Loss		-20dB @ 9 GHz	-20dB @ 5 GHz	-20dB @ 14.5 GHz
S41 Crosstalk		-20dB @ 14 GHz	-20dB @ 22 GHz	-20dB @ 32 GHz
Current Carrying Capability:		5.20 A	4.15 A	3 A
Contact Compliance:		0.20 mm	0.20 mm	0.175 – 0.20 mm
Testing Scenario:		Engr/LVM	Engr/HVM	Engr/HVM
Device Platings		SnPb/Mtin	SnPb/Mtin/NiPdAu	SnPb/Mtin/NiPdAu
Grounding Types		STH, SCI, EI, CI	RTH, RCI, CI, EI	RTH, RCI, CI

Johnstech Contactors for SOIC/QFP Packages

		2mm	4mm	ROL™ 200	ROL™ 400
Inductance	Self:	0.47 nH	0.61 nH	0.42 nH	0.75 nH
	Mutual:	0.20 nH	0.27 nH	0.16 nH	0.33 nH
Capacitance:	Ground:	0.34 pF	0.92 pF	0.23 pF	0.83 pF
	Mutual:	0.15 pF	0.36 pF	0.14 pF	0.30 pF
S21 Insertion Loss		-1dB @ 15.3 GHz	-1dB @ 4.6 GHz	-1dB @ 20.7 GHz	-1dB @ 5.6 GHz
S11 Return Loss		-20dB @ 5.4 GHz	-20dB @ 1.1 GHz	-20dB @ 4.4 GHz	-20dB @ 1.6 GHz
S41 Crosstalk		-20dB @ 33.9 GHz	-20dB @ 3.0 GHz	-20dB @ 16.7 GHz	-20dB @ 4 GHz
Current Carrying Capability:		6.50 A	5.70 A	6.70 A	5.70 A
Contact Compliance:		0.20 mm	0.23 mm	0.20 mm	0.23 mm
Testing Scenario:		Engr/LVM	Engr/LVM	Engr/HVM	Engr/HVM
Device Platings		SnPb/Mtin	SnPb/Mtin	SnPb/Mtin/NiPdAu	SnPb/Mtin/NiPdAu
Grounding Types		STH, SCI, CI	STH	RTH, RCI, CI	RTH

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