

Features

- GaN on SiC Depletion-Mode Transistor Technology
- Internally Matched
- Common-Source Configuration
- Broadband Class AB Operation
- RoHS* Compliant and 260°C Reflow Compatible
- +50 V Typical Operation
- MTTF = 600 Years ($T_J < 200^\circ\text{C}$)

Applications

- L-Band pulsed radar.

Description

The MAGX-001214-650L0x is a gold-metalized matched Gallium Nitride (GaN) on Silicon Carbide (SiC) RF power transistor optimized for pulsed L-Band radar applications. Using state of the art wafer fabrication processes, these high performance transistors provide high gain, efficiency, bandwidth, and ruggedness over a wide bandwidth for today's demanding application needs. High breakdown voltages allow for reliable and stable operation under more extreme mismatch load conditions compared with older semiconductor technologies.

MAGX-001214-650L00



Ordering Information

Part Number	Description
MAGX-001214-650L00	GaN Transistor
MAGX-L21214-650L00	1200-1400 MHz Evaluation Board

Typical RF Performance Under Standard Operating Conditions, $P_{OUT} = 650\text{ W (Peak)}$

Freq. (MHz)	P_{IN} (W)	Gain (dB)	I_D (A)	Eff. (%)	RL (dB)	Droop (dB)	+1dB OD (W)	VSWR-S (3:1)
1200	8.7	18.8	21.3	61.0	-13.9	0.2	717	S
1250	8.5	18.9	22.0	58.9	-13.8	0.3	726	S
1300	8.0	19.1	22.4	57.8	-13.5	0.3	724	S
1350	7.0	19.7	21.8	59.7	-15.8	0.3	723	S
1400	7.0	19.7	21.1	61.4	-15.0	0.2	697	S

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

GaN on SiC HEMT Pulsed Power Transistor
650 W Peak, 1200-1400 MHz, 300 μ s Pulse, 10% Duty

Rev. V3

Electrical Specifications: Freq. = 1200 - 1400 MHz, $T_A = 25^\circ\text{C}$

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
RF Functional Tests						
Peak Input Power	$V_{DD} = 50\text{ V}$, $I_{DQ} = 500\text{ mA}$ Pulse Width = 300 μ s, Duty Cycle = 10% $P_{OUT} = 650\text{ W Peak (65 W avg.)}$	P_{IN}	-	7.5	10.3	W
Power Gain		G_P	18	19.5	-	dB
Drain Efficiency		η_D	55	60	-	%
Pulse Droop		Droop	-	0.3	0.6	dB
Load Mismatch Stability		VSWR-S	-	2:1	-	-
Load Mismatch Tolerance		VSWR-T	-	3:1	-	-

Electrical Characteristics: $T_A = 25^\circ\text{C}$

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
DC Characteristics						
Drain-Source Leakage Current	$V_{GS} = -8\text{ V}$, $V_{DS} = 175\text{ V}$	I_{DS}	-	1.7	33	mA
Gate Threshold Voltage	$V_{DS} = 5\text{ V}$, $I_D = 90\text{ mA}$	$V_{GS(TH)}$	-5	-2.9	-2	V
Forward Transconductance	$V_{DS} = 5\text{ V}$, $I_D = 21\text{ mA}$	G_M	16.2	21.7	-	S
Dynamic Characteristics						
Input Capacitance	Not applicable - Input matched	C_{ISS}	N/A	N/A	N/A	pF
Output Capacitance	$V_{DS} = 50\text{ V}$, $V_{GS} = -8\text{ V}$, Freq. = 1 MHz	C_{OSS}	-	55	-	pF
Reverse Transfer Capacitance		C_{RSS}	-	5.5	-	pF

Absolute Maximum Ratings^{1,2,3}

Parameter	Limit
Drain Voltage (V_{DD})	+65 V
Gate Voltage (V_{GG})	-8 to 0 V
Drain Current (I_{DD})	27 A
Input Power ⁴ (P_{IN})	P_{IN} (nominal) + 3 dB
Operating Junction Temperature ⁵	250°C
Peak Pulsed Power Dissipation at 85°C	700 W
Operating Temperature Range	-40 to +85°C
Storage Temperature Range	-65 to +150°C
ESD Min. - Charged Device Model (CDM)	1300 V
ESD Min. - Human Body Model (HBM)	4000 V

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation near these survivability limits.
- For saturated performance it is recommended that the sum of $(3 * V_{DD} + |V_{GG}|) < 175$ V.
- Input Power Limit is +3 dB over nominal drive required to achieve $P_{OUT} = 650$ W.
- Operating junction temperature is measured with infrared (IR) microscope. Junction temperature directly affects a device's MTTF and should be kept as low as possible to maximize lifetime.
 - MTTF = 5.3×10^6 hours ($T_J < 200^\circ\text{C}$)
 - MTTF = 6.8×10^4 hours ($T_J < 250^\circ\text{C}$)

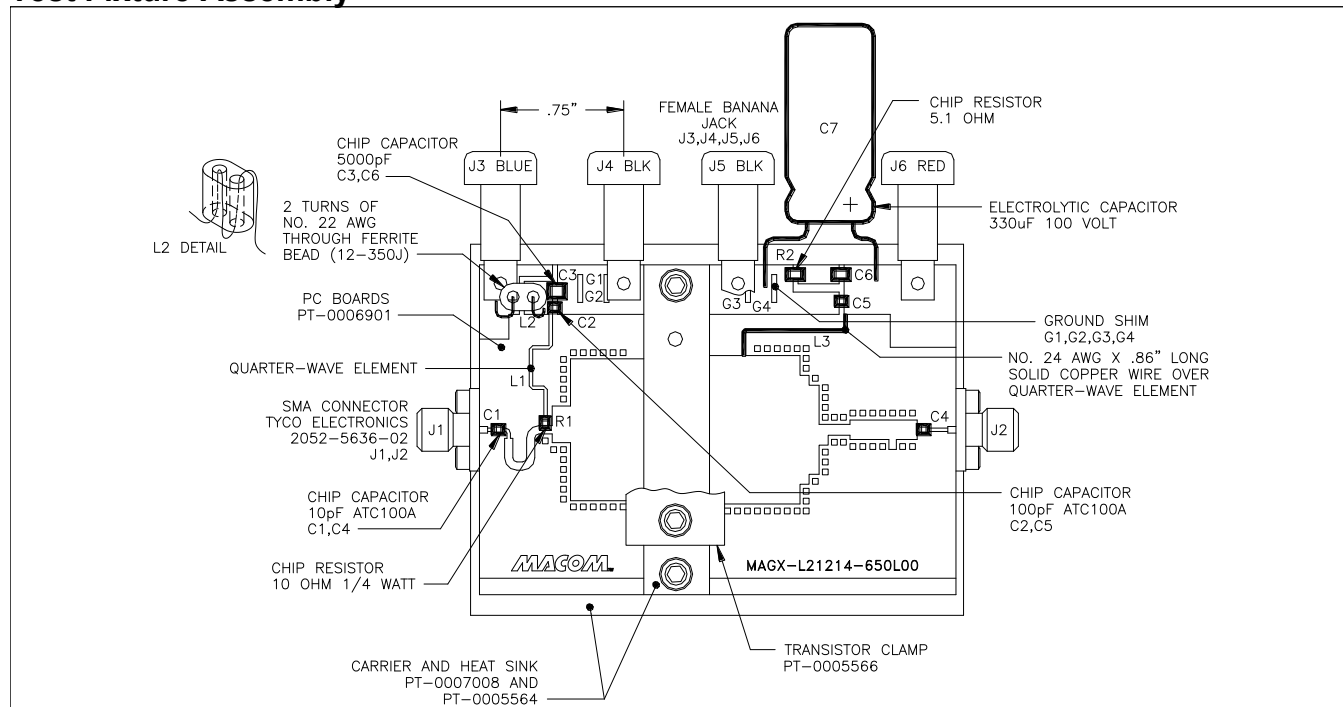
Thermal Characteristics

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance	$T_C = 70^\circ\text{C}$, $V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{OUT} = 650$ W Pulse Width = 300 μ s, Duty Cycle = 10%	Θ_{JC}	0.25	$^\circ\text{C}/\text{W}$

GaN on SiC HEMT Pulsed Power Transistor 650 W Peak, 1200-1400 MHz, 300 μ s Pulse, 10% Duty

Rev. V3

Test Fixture Assembly



Contact factory for gerber file or additional circuit information.

Test Fixture Impedances

F (MHz)	Z _{IF} (Ω)	Z _{OF} (Ω)
1200	0.8 - j0.9	1.4 + j0.2
1250	0.8 - j0.7	1.4 + j0.2
1300	0.7 - j0.6	1.4 + j0.1
1350	0.7 - j0.4	1.2 + j0.1
1400	0.7 - j0.2	1.1 + j0.2

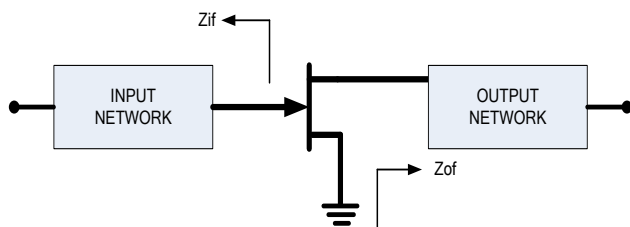
Correct Device Sequencing

Turning the device ON

1. Set V_{GS} to the pinch-off (V_P), typically -5 V.
2. Turn on V_{DS} to nominal voltage (50 V).
3. Increase V_{GS} until the I_{DS} current is reached.
4. Apply RF power to desired level.

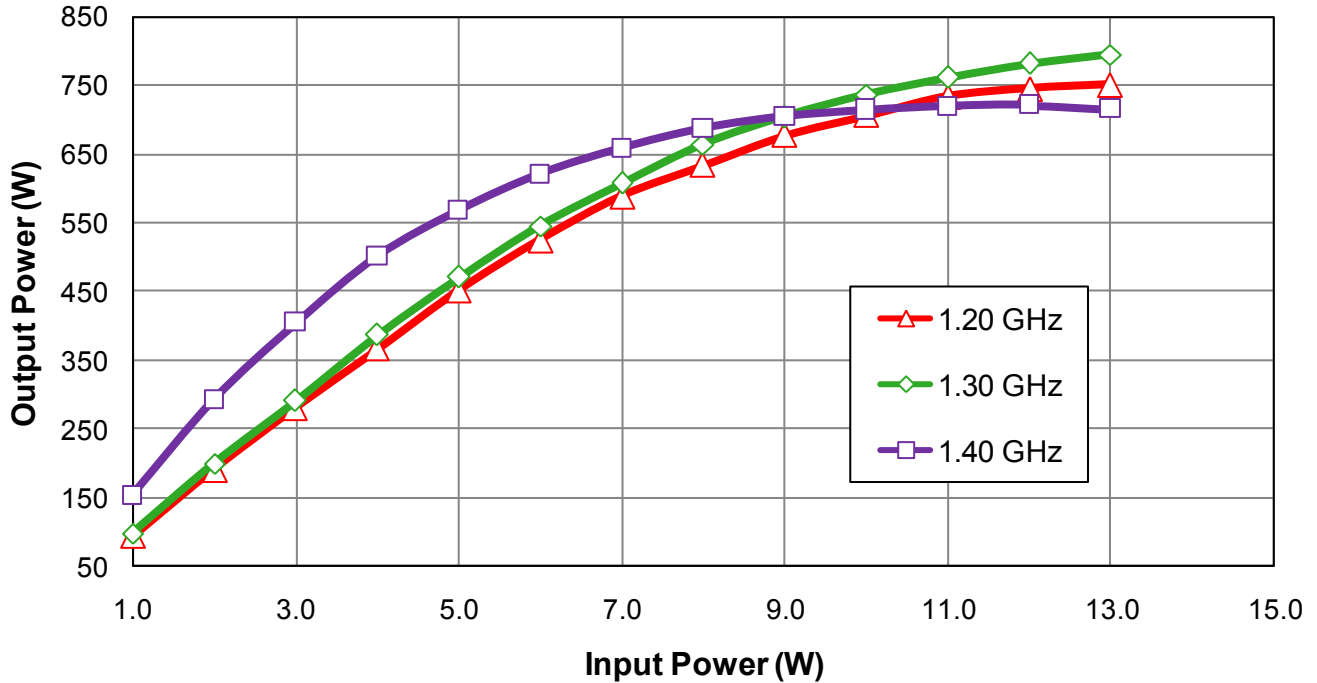
Turning the device OFF

1. Turn the RF power off.
2. Decrease V_{GS} down to V_P .
3. Decrease V_{DS} down to 0 V.
4. Turn off V_{GS} .

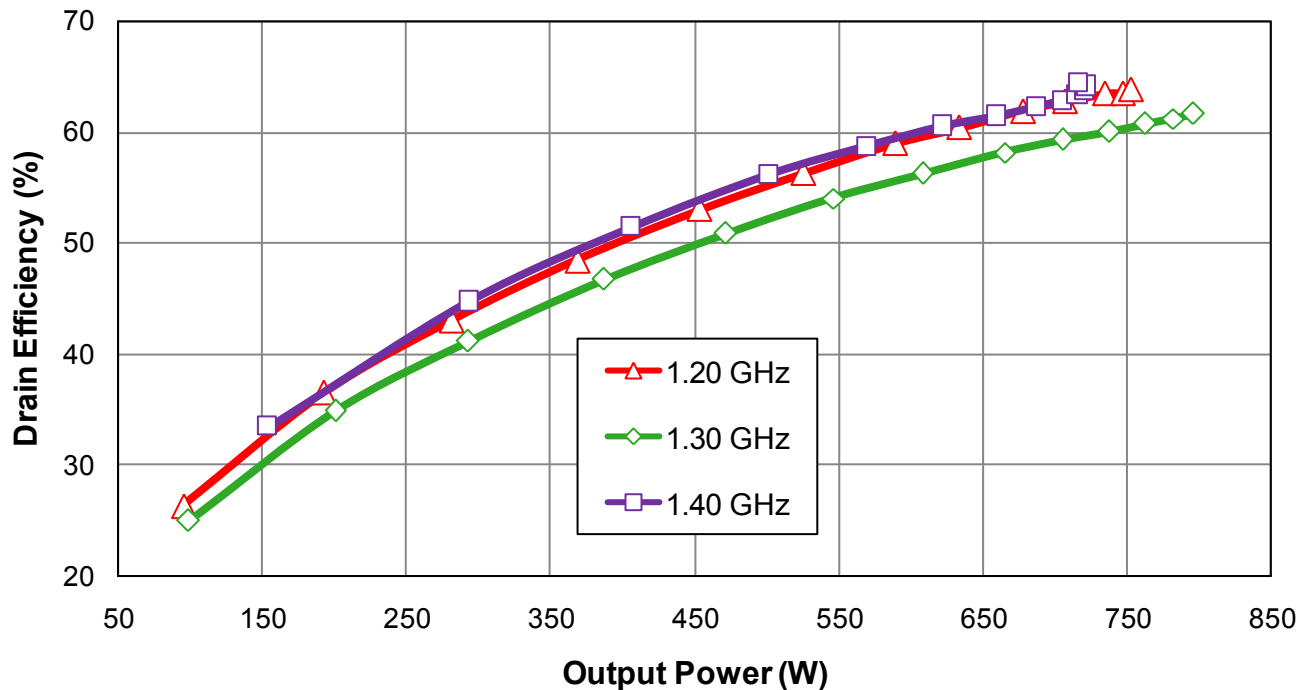


Contact factory for gerber file or additional circuit information.

RF Power Transfer Curve (Output Power vs. Input Power)



RF Power Transfer Curve (Drain Efficiency vs. Output Power)



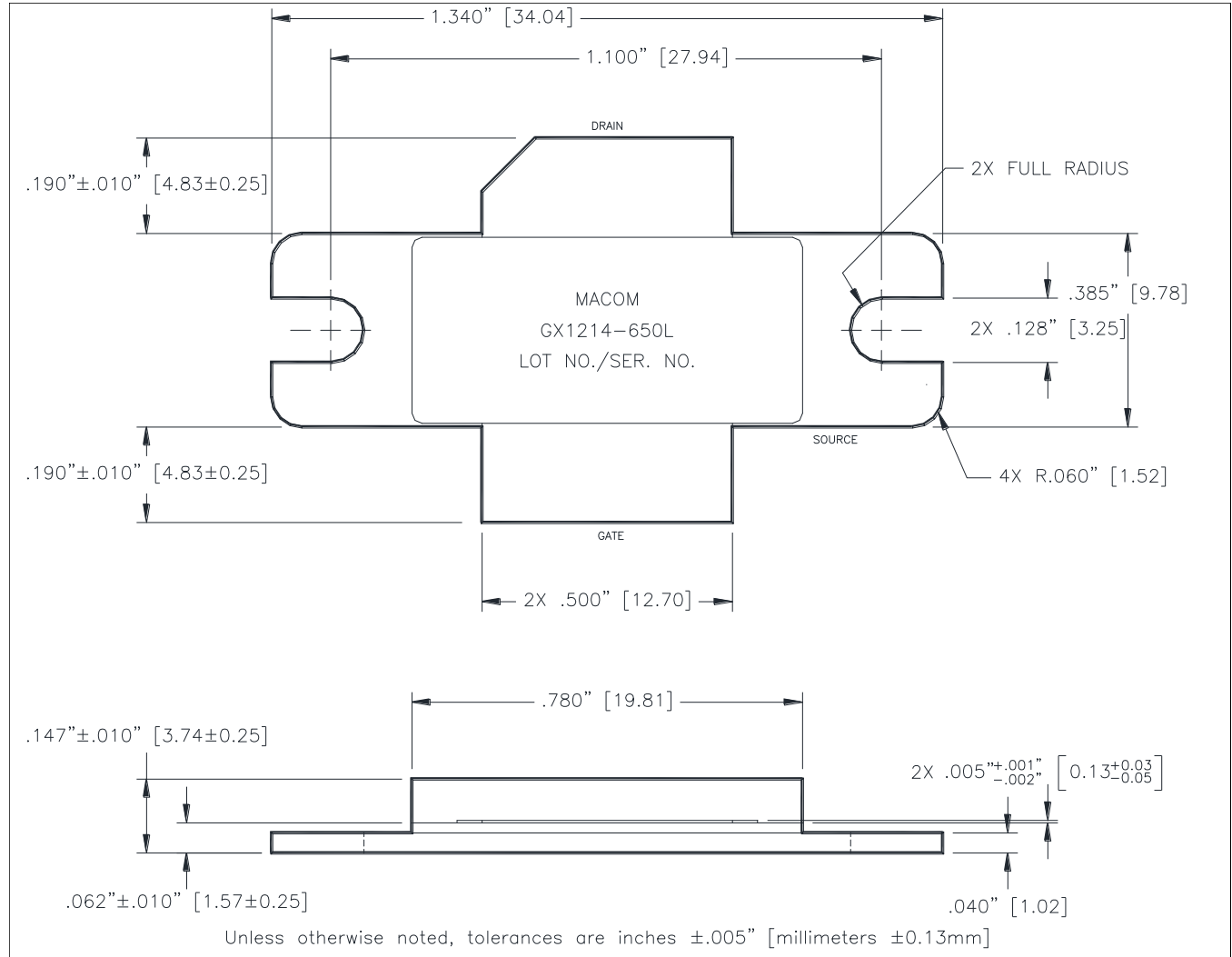
MAGX-001214-650L0x



GaN on SiC HEMT Pulsed Power Transistor
650 W Peak, 1200-1400 MHz, 300 μ s Pulse, 10% Duty

Rev. V3

Outline Drawing MAGX-001214-650L00



M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.

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

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А