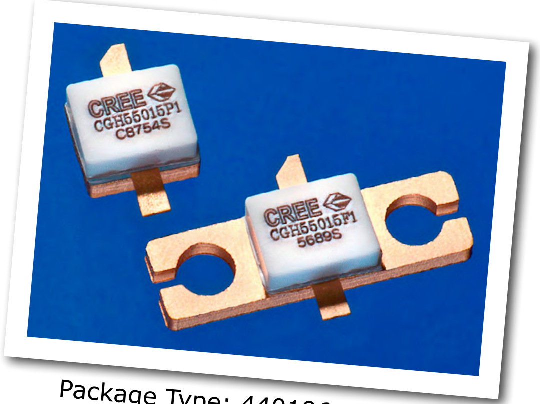
CGH55015F1 / CGH55015P1

15 W, 5500-5800 MHz, GaN HEMT for WiMAX

Cree's CGH55015F1/CGH55015P1 is a gallium nitride (GaN) high electron mobility transistor (HEMT) designed specifically for high efficiency, high gain and wide bandwidth capabilities, which makes the CGH55015F1/CGH55015P1 ideal for 5.5-5.8 GHz WiMAX and linear amplifier applications. The transistor is available in both screw-down, flange and solder-down, pill packages. Based on appropriate external match adjustment, the CGH55015F1/CGH55015P1 is suitable for 4.9 - 5.5 GHz applications as well.



Package Type: 440196 & 440166
PN: CGH55015P1 & CGH55015F1

Typical Performance 5.5-5.8GHz (T_C = 25˚C)

Parameter	5.50 GHz	5.65 GHz	5.80 GHz	Units
Small Signal Gain	10.7	11.0	10.7	dB
EVM at P_{AVE} = 23 dBm	1.9	1.8	2.0	%
EVM at P_{AVE} = 33 dBm	1.5	1.5	1.7	%
Drain Efficiency at P_{AVE} = 33 dBm	25	25	25	%
Input Return Loss	11.5	14.5	10.5	dB

Note:
Measured in the CGH55015-TB amplifier circuit, under 802.16 OFDM, 3.5 MHz Channel BW, 1/4 Cyclic Prefix, 64 QAM Modulated Burst, 5 ms Burst, Symbol Length of 59, Coding Type RS-CC, Coding Rate Type 2/3, PAR = 9.8 dB @ 0.01 % Probability on CCDF.

Features

RoHS COMPLIANT

- 5.5 - 5.8 GHz Operation
- 15 W Peak Power Capability
- >10.5 dB Small Signal Gain
- 2 W P_{AVE} < 2.0 % EVM
- 25 % Efficiency at 2 W Average Power
- Designed for WiMAX Fixed Access 802.16-2004 OFDM Applications
- Designed for Multi-carrier DOCSIS Applications

Large Signal Models Available for SiC & GaN

Absolute Maximum Ratings (not simultaneous) at 25˚C Case Temperature

Parameter	Symbol	Rating	Units	Conditions
Drain-Source Voltage	V_{DSS}	84	Volts	25˚C
Gate-to-Source Voltage	V_{GS}	-10, +2	Volts	25˚C
Power Dissipation	P_{DISS}	7	Watts	
Storage Temperature	T_{STG}	-65, +150	˚C	
Operating Junction Temperature	T_J	225	˚C	
Maximum Forward Gate Current	I_{GMAX}	4.0	mA	25˚C
Maximum Drain Current[1]	I_{DMAX}	1.5	A	25˚C
Soldering Temperature[2]	T_S	245	˚C	
Screw Torque	τ	60	in-oz	
Thermal Resistance, Junction to Case[3]	$R_{\theta JC}$	8.0	˚C/W	85˚C
Case Operating Temperature[3]	T_C	-40, +150	˚C	30 seconds

Note:
[1] Current limit for long term, reliable operation.
[2] Refer to the Application Note on soldering at www.cree.com/products/wireless_appnotes.asp
[3] Measured for the CGH55015 at P_{DISS} = 7W.

Electrical Characteristics (T_C = 25˚C)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics[1]						
Gate Threshold Voltage	$V_{GS(th)}$	-3.8	-3.0	-2.3	V_{DC}	V_{DS} = 10 V, I_D = 3.6 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	–	-2.7	–	V_{DC}	V_{DS} = 28 V, I_D = 115 mA
Saturated Drain Current	I_{DS}	2.9	3.5	–	A	V_{DS} = 6.0 V, V_{GS} = 2.0 V
Drain-Source Breakdown Voltage	V_{BR}	120	–	–	V_{DC}	V_{GS} = -8 V, I_D = 3.6 mA
RF Characteristics[2,3] (T_C = 25˚C, F_0 = 5.65 GHz unless otherwise noted)						
Small Signal Gain	G_{SS}	8.5	11.0	–	dB	V_{DD} = 28 V, I_{DQ} = 115 mA
Drain Efficiency[4]	η	20.6	25	–	%	V_{DD} = 28 V, I_{DQ} = 115 mA, P_{AVE} = 2.0 W
Error Vector Magnitude	EVM	–	2.0	2.5	%	V_{DD} = 28 V, I_{DQ} = 115 mA, P_{AVE} = 2.0 W
Output Mismatch Stress	VSWR	–	–	10 : 1	Ψ	No damage at all phase angles, V_{DD} = 28 V, I_{DQ} = 115 mA, P_{AVE} = 2.0 W
Dynamic Characteristics						
Input Capacitance	C_{GS}	–	4.5	–	pF	V_{DS} = 28 V, V_{gs} = -8 V, f = 1 MHz
Output Capacitance	C_{DS}	–	1.3	–	pF	V_{DS} = 28 V, V_{gs} = -8 V, f = 1 MHz
Feedback Capacitance	C_{GD}	–	0.2	–	pF	V_{DS} = 28 V, V_{gs} = -8 V, f = 1 MHz

Notes:
[1] Measured on wafer prior to packaging.
[2] Measured in the CGH55015-TB test fixture.
[3] Under 802.16 OFDM, 3.5 MHz Channel BW, 1/4 Cyclic Prefix, 64 QAM Modulated Burst, 5 ms Burst, Symbol Length of 59, Coding Type RS-CC, Coding Rate Type 2/3, PAR = 9.8 dB @ 0.01 % Probability on CCDF.
[4] Drain Efficiency = P_{OUT} / P_{DC}.

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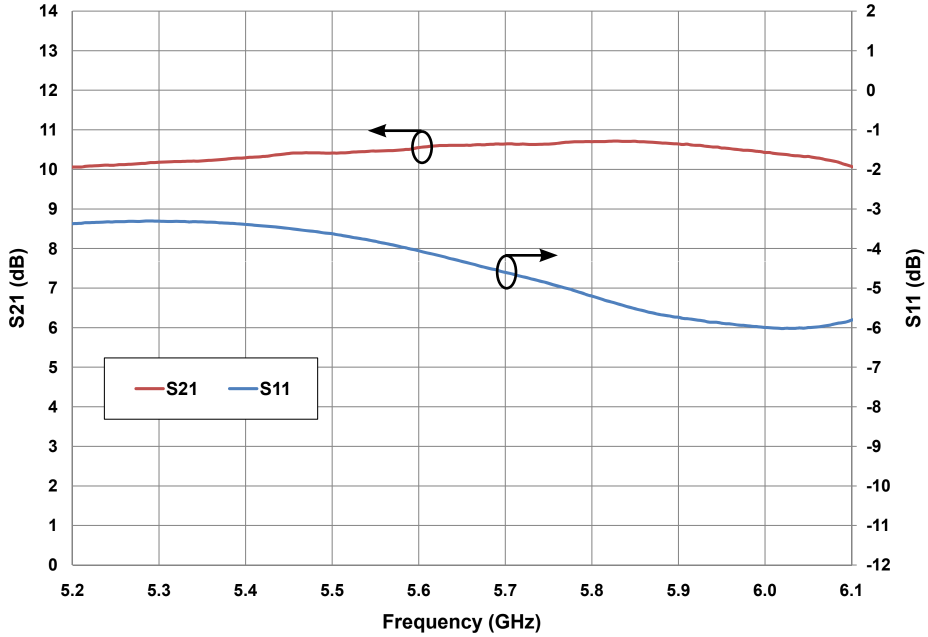
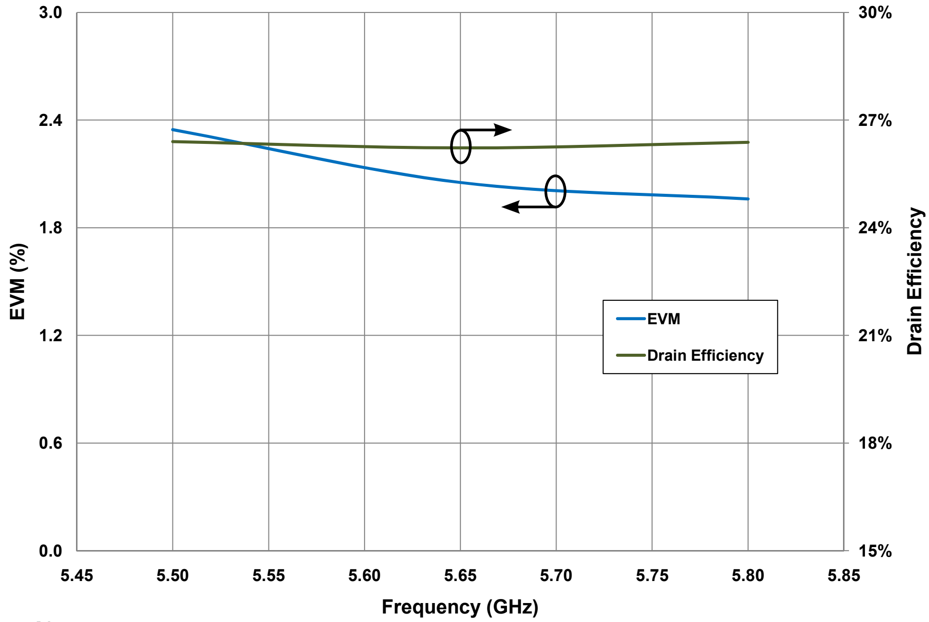
Typical WiMAX Performance

Small Signal S-Parameters vs Frequency of CGH55015 in the CGH55015-TB
V_{DD} = 28 V, I_{DQ} = 115 mA



EVM and Efficiency of CGH55015 vs. Frequency in the CGH55015-TB
V_{DD} = 28 V, I_{DQ} = 115 mA, P_{OUT} = 2.5 W



Note:
Under 802.16 OFDM, 3.5 MHz Channel BW, 1/4 Cyclic Prefix, 64 QAM Modulated Burst, Symbol Length of 59, Coding Type RS-CC, Coding Rate Type 2/3, PAR = 9.8 dB @ 0.01 % Probability on CCDF.

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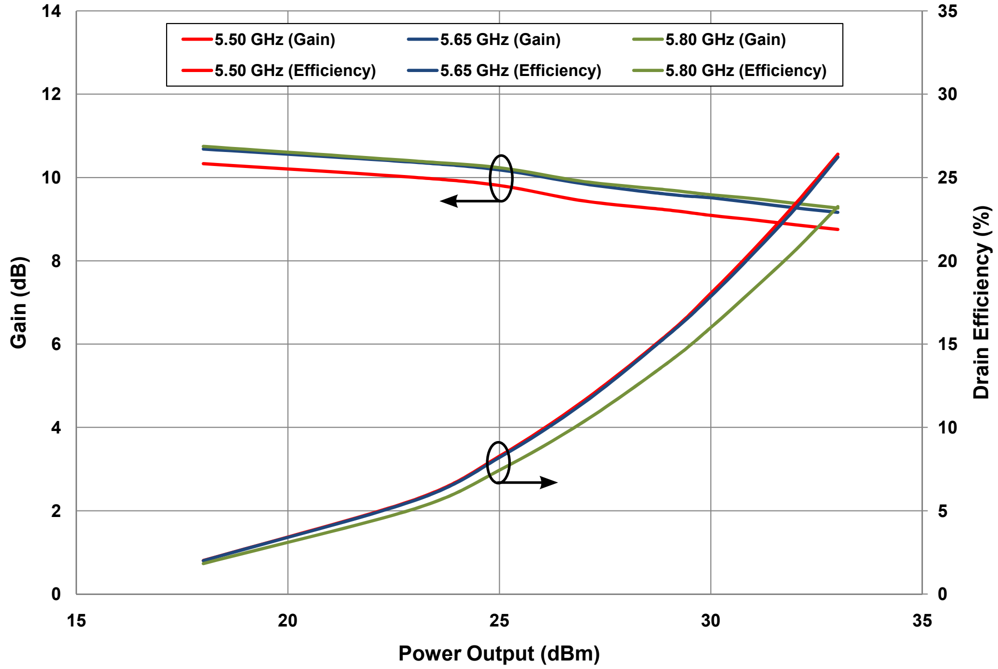
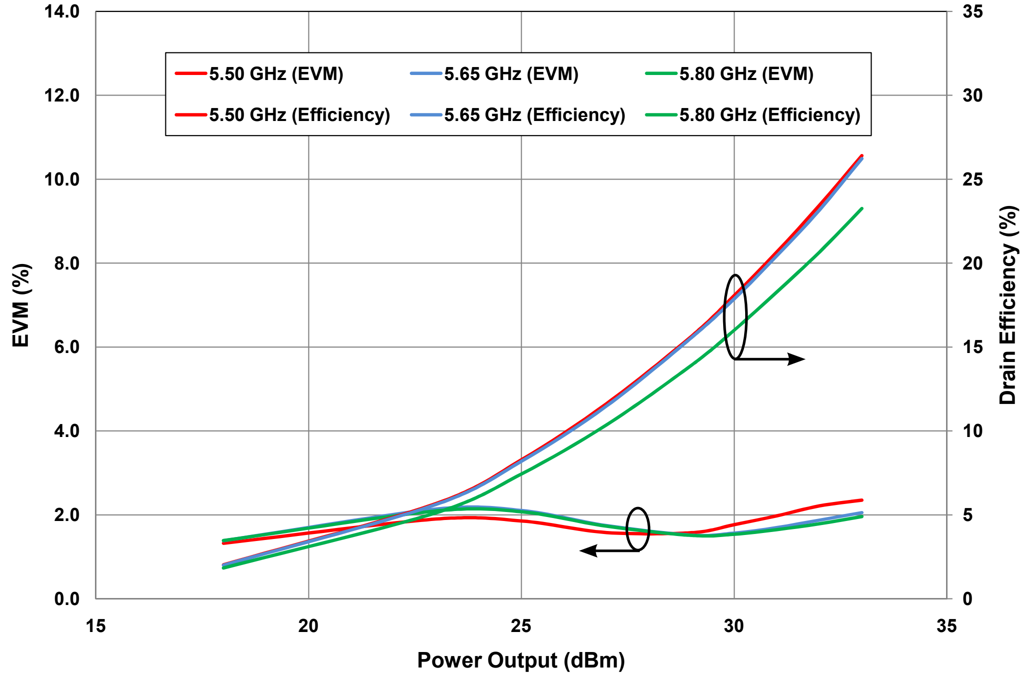
Typical WiMAX Performance

Drain Efficiency and Gain vs Power Output of the CGH55015 in the CGH55015-TB
V_{DD} = 28 V, I_{DQ} = 115 mA, 802.16-2004 OFDM, PAR = 9.8 dB



Typical EVM and Drain Efficiency vs Output Power of CGH55015 in the CGH55015-TB at 5.50 GHz, 5.65 GHz, 5.80 GHz, 802.16-2004 OFDM, PAR=9.8 dB



Note:
Under 802.16 OFDM, 3.5 MHz Channel BW, 1/4 Cyclic Prefix, 64 QAM Modulated Burst, Symbol Length of 59, Coding Type RS-CC, Coding Rate Type 2/3, PAR = 9.8 dB @ 0.01 % Probability on CCDF.

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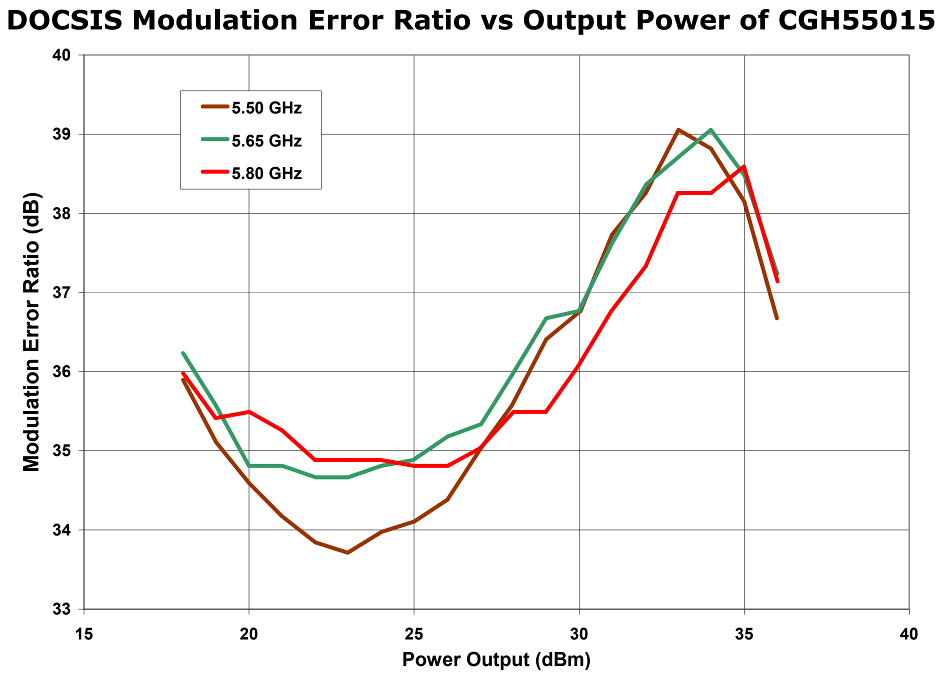
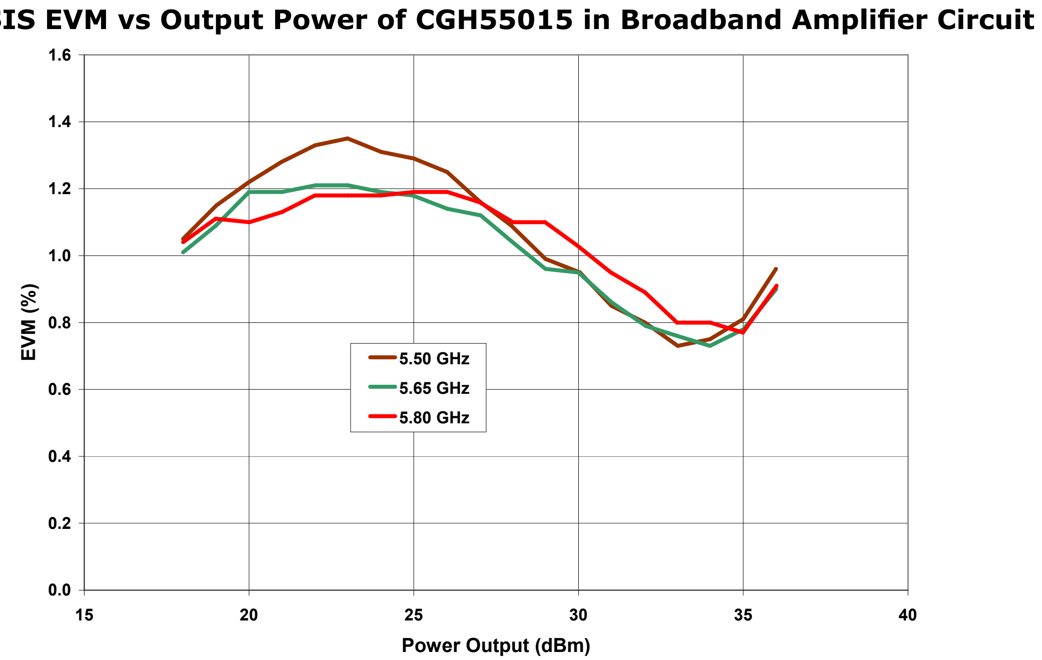
Typical DOCSIS Performance



Note:
MER is the metric of choice for cable systems and can be related to EVM by the following equation: EVM(%) = 100 x 10 ^ -((MERdB + MTAdB)/20). MTA is the "maximum-to-average constellation power ratio" which varies with the modulation type: MTA = 0 for BPSK and QPSK; 2.55 for 16QAM and 8QAM-DS; 3.68 for 64QAM and 32QAM-DS; 4.23 for 256QAM and 128QAM-DS



Note:
Under DOCSIS, 6.0 MHz Channel BW, 64 QAM, PN23, Filter Alpha 0.18, PAR = 6.7dB.

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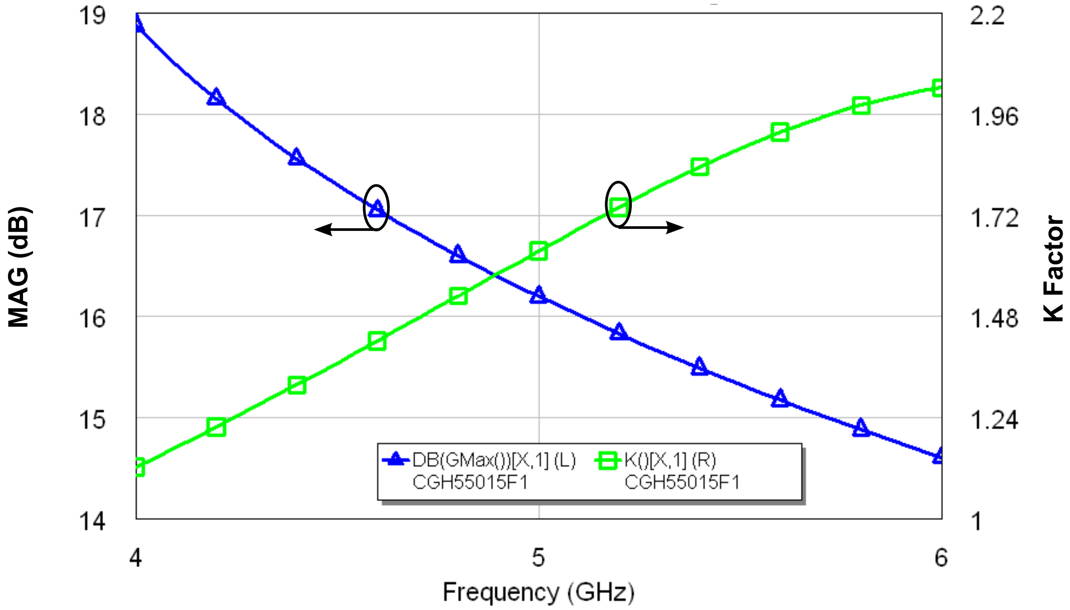
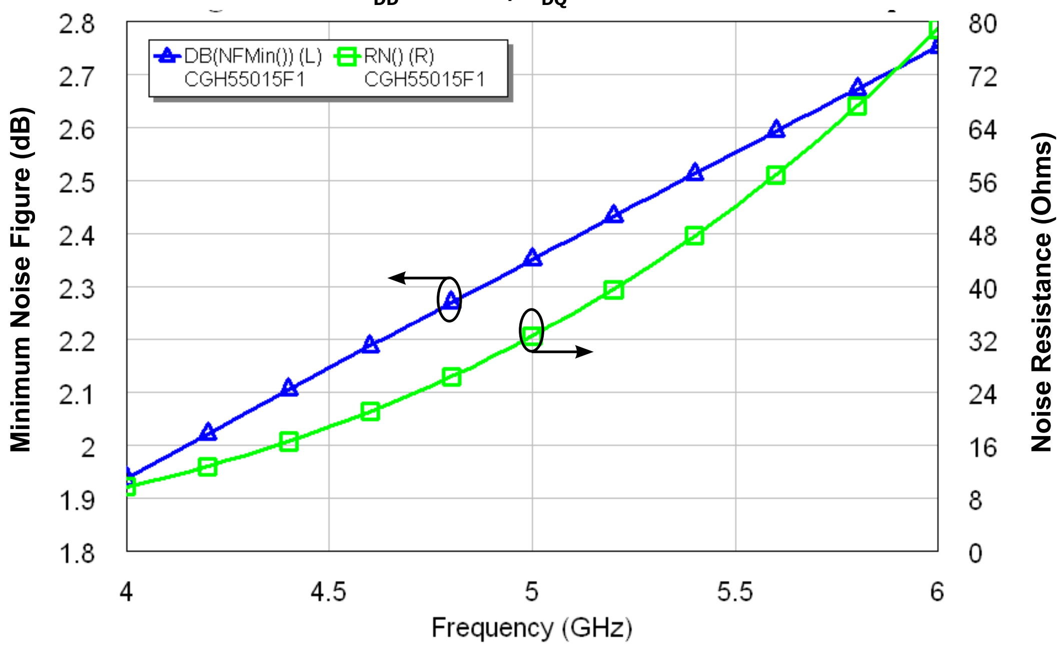
Typical Performance

Simulated Maximum Available Gain and K Factor of the CGH55015F1/P1
V_{DD} = 28 V, I_{DQ} = 115 mA



Typical Noise Performance

Simulated Minimum Noise Figure and Noise Resistance vs Frequency of the CGH55015F1/P1
V_{DD} = 28 V, I_{DQ} = 115 mA



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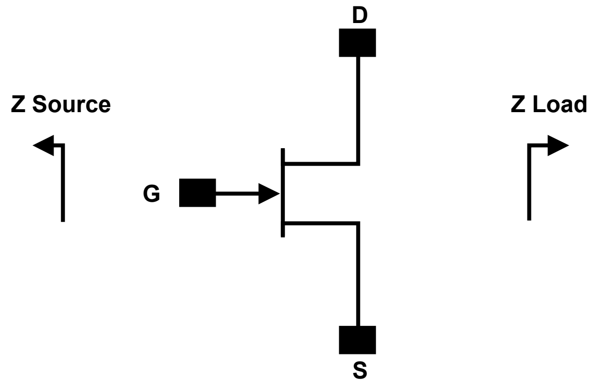
Source and Load Impedances



Frequency (MHz)	Z Source	Z Load
5500	8.7 – j30.2	21.6 – j4.7
5650	10.2 – j26.9	24.2 - j5.5
5800	12.3 – j24.3	26.5 - j7.5

Note 1. V_{DD} = 28V, I_{DQ} = 115 mA in the 440166 package.
Note 2. Impedances are extracted from the CGH55015-TB demonstration amplifier and are not source and load pull data derived from the transistor.

Electrostatic Discharge (ESD) Classifications

Parameter	Symbol	Class	Test Methodology
Human Body Model	HBM	1A > 250 V	JEDEC JESD22 A114-D
Charge Device Model	CDM	1 < 200 V	JEDEC JESD22 C101-C

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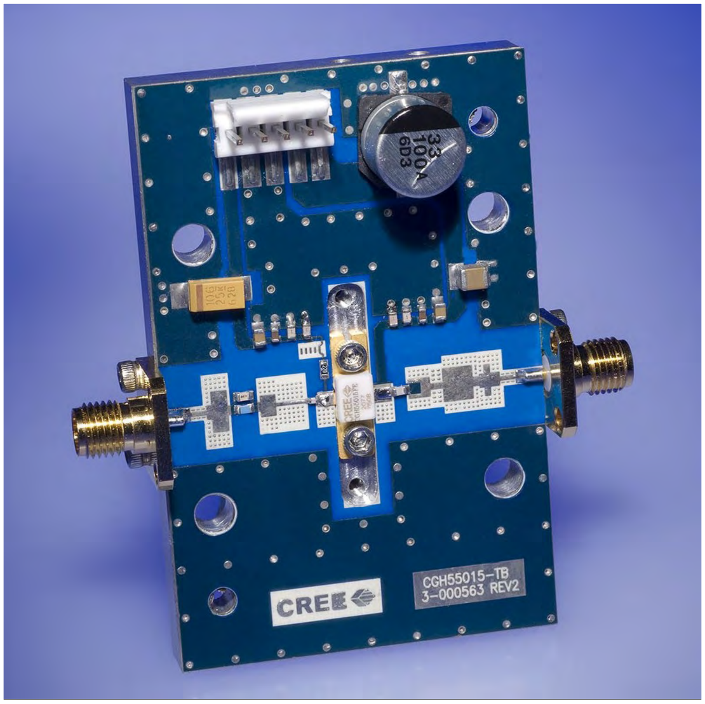
CGH55015-TB Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
C1	CAP, 1.2pF, +/-0.1 pF, 0603, ATC 600S	1
C2	CAP, 0.3pF, +/-0.05 pF, 0402, ATC 600L	1
C9	CAP, 0.5pF,+/-0.05pF, 0603, ATC 600S	1
C4,C11	CAP, 18pF, +/-5%, 0603, ATC 600S	2
C5,C12	CAP, 39pF +/-5%, 0603, ATC 600S	2
C6,C13	CAP, CER, 180pF, 50V, +/-5%, C0G, 0603	2
C7,C14	CAP, CER, 0.1UF, 50V, +/-10%, X7R, 0805	2
C8	CAP, 10UF, 16V, SMT, TANTALUM	1
C15	CAP, 1.0UF ±10%, 100V, 1210, X7R	1
C16	CAP, 33UF, 100V, ELECT, FK, SMD	1
R1	RES, 1/16W, 0603, 1%, 562 OHMS	1
R2	RES, 1/16W, 0603, 1%, 22 OHMS	1
J1	HEADER RT> PLZ .1 CEN LK 5 POS	1
J3,J4	CONN, SMA, FLANGE	2
-	PCB, RO4350B, Er = 3.48, h = 20 mil	1
-	CGH55015	1

CGH55015-TB Demonstration Amplifier Circuit



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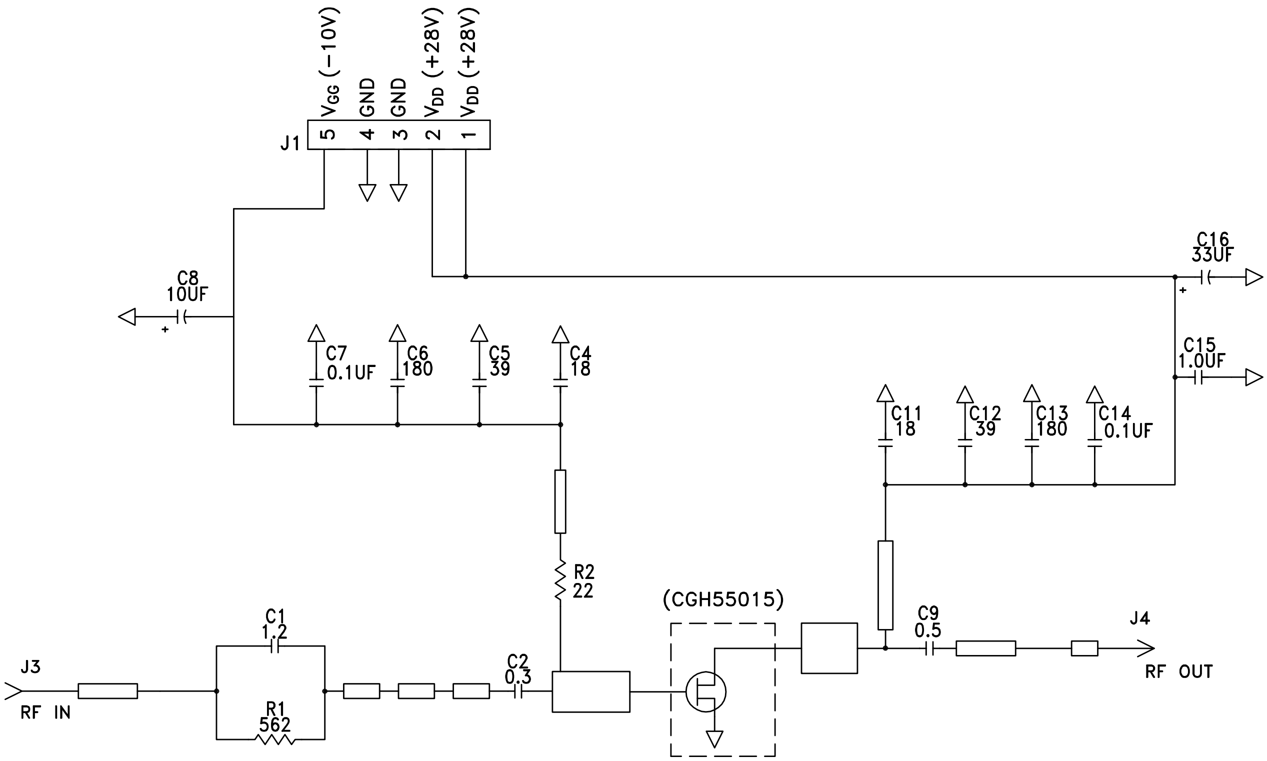
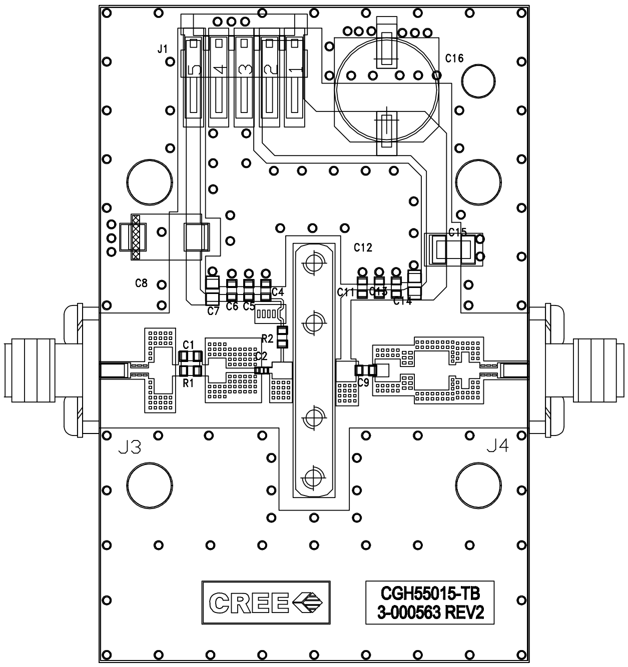
CGH55015-TB Demonstration Amplifier Circuit Schematic



CGH55015-TB Demonstration Amplifier Circuit Outline



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Typical Package S-Parameters for CGH55015
(Small Signal, V_{DS} = 28 V, I_{DQ} = 115 mA, angle in degrees)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
500 MHz	0.909	-125.16	17.56	107.52	0.026	20.86	0.330	-95.81
600 MHz	0.903	-134.72	15.15	101.24	0.027	15.25	0.318	-103.71
700 MHz	0.898	-142.24	13.28	95.96	0.027	10.66	0.312	-109.87
800 MHz	0.895	-148.34	11.79	91.38	0.027	6.76	0.309	-114.77
900 MHz	0.893	-153.43	10.58	87.30	0.028	3.37	0.310	-118.75
1.0 GHz	0.891	-157.78	9.59	83.58	0.028	0.34	0.312	-122.07
1.2 GHz	0.889	-164.93	8.06	76.89	0.028	-4.92	0.320	-127.35
1.4 GHz	0.888	-170.72	6.94	70.90	0.027	-9.46	0.332	-131.53
1.6 GHz	0.888	-175.64	6.08	65.34	0.027	-13.51	0.347	-135.09
1.8 GHz	0.888	-179.99	5.41	60.10	0.027	-17.20	0.362	-138.30
2.0 GHz	0.889	176.04	4.86	55.09	0.026	-20.60	0.378	-141.33
2.2 GHz	0.889	172.35	4.42	50.24	0.025	-23.76	0.394	-144.27
2.4 GHz	0.890	168.84	4.05	45.53	0.025	-26.70	0.410	-147.16
2.6 GHz	0.891	165.46	3.73	40.93	0.024	-29.44	0.426	-150.04
2.8 GHz	0.891	162.16	3.46	36.41	0.024	-31.97	0.441	-152.92
3.0 GHz	0.892	158.90	3.23	31.95	0.023	-34.32	0.455	-155.81
3.2 GHz	0.893	155.67	3.03	27.55	0.022	-36.45	0.469	-158.73
3.4 GHz	0.893	152.43	2.85	23.19	0.021	-38.38	0.482	-161.68
3.6 GHz	0.894	149.18	2.70	18.85	0.021	-40.07	0.494	-164.66
3.8 GHz	0.894	145.89	2.56	14.53	0.020	-41.52	0.506	-167.68
4.0 GHz	0.894	142.54	2.44	10.22	0.019	-42.71	0.516	-170.74
4.1 GHz	0.895	140.85	2.38	8.07	0.019	-43.19	0.521	-172.29
4.2 GHz	0.895	139.14	2.33	5.91	0.019	-43.59	0.526	-173.85
4.3 GHz	0.895	137.40	2.28	3.75	0.018	-43.92	0.530	-175.43
4.4 GHz	0.895	135.65	2.23	1.58	0.018	-44.16	0.535	-177.02
4.5 GHz	0.895	133.88	2.18	-0.59	0.018	-44.32	0.539	-178.62
4.6 GHz	0.895	132.08	2.14	-2.77	0.017	-44.38	0.543	179.75
4.7 GHz	0.895	130.26	2.10	-4.96	0.017	-44.35	0.546	178.11
4.8 GHz	0.895	128.41	2.06	-7.15	0.017	-44.23	0.550	176.45
4.9 GHz	0.895	126.53	2.03	-9.36	0.017	-44.02	0.553	174.77
5.0 GHz	0.895	124.63	1.99	-11.58	0.016	-43.71	0.556	173.07
5.1 GHz	0.895	122.69	1.96	-13.81	0.016	-43.30	0.559	171.35
5.2 GHz	0.895	120.72	1.93	-16.05	0.016	-42.81	0.561	169.60
5.3 GHz	0.895	118.73	1.90	-18.31	0.016	-42.22	0.564	167.83
5.4 GHz	0.895	116.70	1.87	-20.59	0.016	-41.56	0.566	166.04
5.5 GHz	0.895	114.63	1.84	-22.89	0.016	-40.83	0.568	164.21
5.6 GHz	0.895	112.53	1.81	-25.20	0.016	-40.05	0.570	162.36
5.7 GHz	0.895	110.39	1.79	-27.53	0.016	-39.22	0.572	160.47
5.8 GHz	0.895	108.22	1.77	-29.89	0.016	-38.35	0.574	158.55
5.9 GHz	0.895	106.00	1.74	-32.27	0.016	-37.48	0.575	156.60
6.0 GHz	0.895	103.75	1.72	-34.67	0.016	-36.62	0.576	154.61

Download this s-parameter file in ".s2p" format at http://www.cree.com/products/wireless_s-parameters.asp

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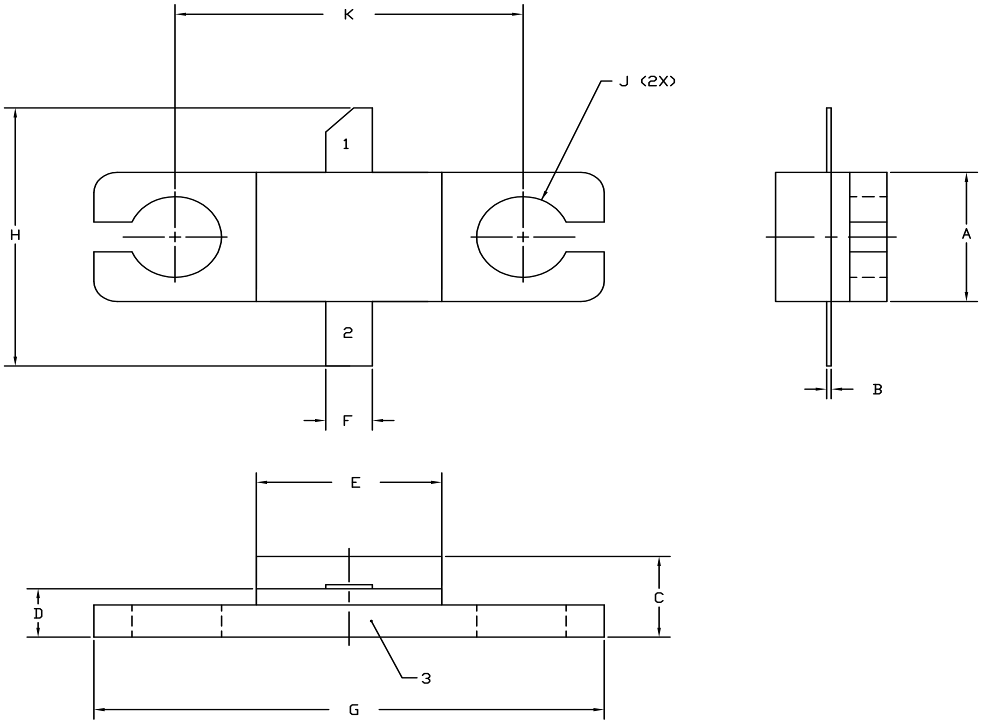
Product Dimensions CGH55015F1 (Package Type — 440166)



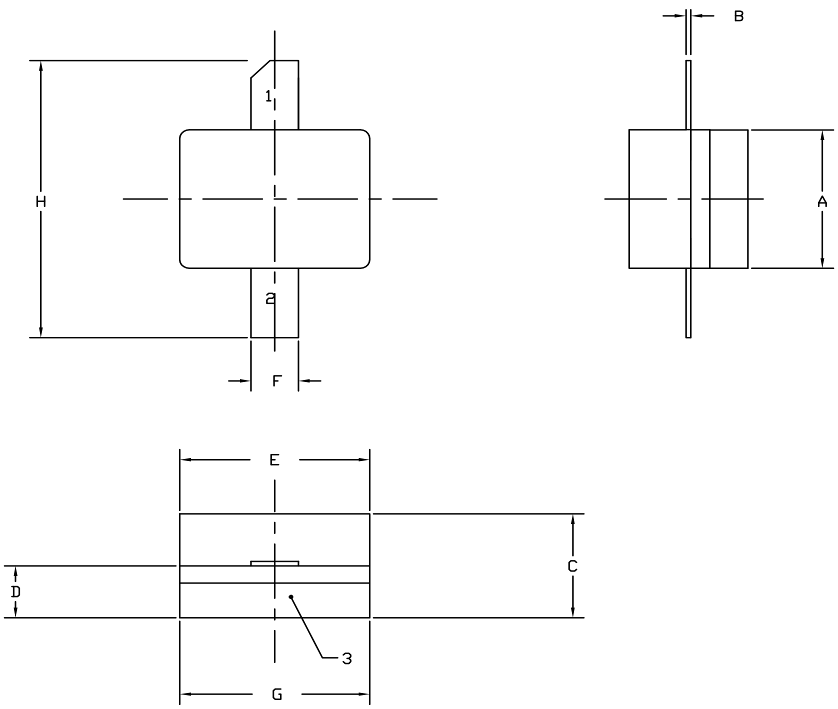
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF 0.020" BEYOND EDGE OF LID.
4. LID MAY BE MISALIGNED TO THE BODY OF THE PACKAGE BY A MAXIMUM OF 0.008" IN ANY DIRECTION.
5. ALL PLATED SURFACES ARE NI/AU

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.155	0.165	3.94	4.19
B	0.004	0.006	0.10	0.15
C	0.115	0.135	2.92	3.43
D	0.057	0.067	1.45	1.70
E	0.195	0.205	4.95	5.21
F	0.045	0.055	1.14	1.40
G	0.545	0.555	13.84	14.09
H	0.280	0.360	7.11	9.14
J	ø .100		2.54	
K	0.375		9.53	

PIN 1. GATE
PIN 2. DRAIN
PIN 3. SOURCE

Product Dimensions CGH55015P1 (Package Type — 440196)



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DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.155	0.165	3.94	4.19
B	0.003	0.006	0.10	0.15
C	0.115	0.135	2.92	3.17
D	0.057	0.067	1.45	1.70
E	0.195	0.205	4.95	5.21
F	0.045	0.055	1.14	1.40
G	0.195	0.205	4.95	5.21
H	0.280	0.360	7.11	9.14

PIN 1. GATE
PIN 2. DRAIN
PIN 3. SOURCE

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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» (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).

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