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GaAs Solid-State Power Amplifiers for Commercial and Military Multi-Function System Design

Both commercial and military systems will continue to be developed throughout the entire electromagnetic spectrum. Twenty-year federal spectrum requirements for radar bands L through Ku bear out the need for this requirement. With five to ten times the power handling capability, solid-state power amplifiers, employing GaN devices, are ideal for such applications making them suitable replacements in systems where TWTs are currently employed.

Although the use of GaN technology in these applications is growing, CTT's GaAs-based power amplifiers continue to offer specific benefits in low-power low-voltage systems, as well as in those system applications demanding high linearity – GaAs having established a long record of reliability, low cost, wide availability and excellent overall performance.

The nature of continuingly emerging applications rely on the complexities made possible by advancements from the digital arena, requiring electronic systems of the future to incorporate faithfully amplified complex wave forms, with multiple modulation schemes and pulse patterns distributed over wide bandwidths.

Multi-function systems will have to transmit and receive with maximum flexibility across a wide bandwidth, sometimes in adjacent channels and/or within the same frequency and/or time slot.

This evolution points toward multiple use hardware to maximize versatility and minimize multi-function cost, size, weight and power. In one specific application this versatility proves its value by limiting a radar's succeptibility to jamming by operating in a frequency-agile mode. This forces any jamming effort to spread its power over the whole bandwidth, even though the radar is only using a very narrow instantaneous bandwidth.

More advanced systems will employ "look ahead" frequency agility wherein the system selects the next operating frequency and checks to see that it is unoccupied. If clear, that frequency is used. If not, another frequency selection is checked, then made.

20-Year Federal Spectrum Radar Requirement for Specific Bands

Band	Frequency	Usage
L	1215–1390 MHz	Air Traffic Control (ATC), Synthetic Aperture Radar (SAR), DoD early warning air defense, battlefield, shipborne long-range surveillance
S	2700–3100 MHz	ATC, maritime, weather, DoD shipborne, airborne, ground surveillance
S	3100–3650 MHz	DoD surveillance and air defenses (airborne, shipborne, land-based), ATC, SAR
C	5250–5925 MHz	NOAA weather, FAA TDWR; DoD surveillance and air defenses (airborne, shipborne, land-based)
X	8.5–10.55 GHz	Airborne and shipborne surveillance and navigation fire control, battlefield, maritime, weather, test range, airborne radio navigation, ATC, SAR
Ku	13.25–14.20 GHz	Airborne and shipborne search and acquisition Doppler, airborne weather, environmental research
Ku	15.40–17.30 GHz	Airborne and shipborne multi-mode search, battlefield, fire-control, precipitation, atmospheric research

CTT engineers have developed a proprietary open architecture/common platform which relies on advanced multi-octave combiner design and unique substrate material selection. The result is adaptable, modular amplifiers requiring only a single supply voltage.

Whether commercial or military, radar system power consumption is an increasingly important design criteria. CTT offers TTL-controlled main bias shut-off circuitry matched to the system's pulse operation. With the amplifier drawing much less power between pulses, both total power consumption and temperature rise is reduced.

In general, most pulse radars operate at a duty cycle of 10% or less. As such, CTT's pulsed power amplifiers are an attractive solution. Using a TTL control, by turning off the FETs (drain) the amplifier only consumes 100 to 200 mA for the logic and bias circuit. When the TTL is turned on, the unit will operate after a short rise time. During this "on time" the amplifier's power consumption is identical to that in CW operation. Thus, when the duty cycle is 10% or less, the unit will consume much less power. Therefore, the amplifier's heat sink and power supply can be significantly smaller.

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Power Amplifiers are CTT's forte. Over the past 20 years, the preponderance of our research and development has been devoted to this market segment. As a result, numerous proprietary, unique approaches to microwave power amplification have been incorporated in, both our narrow-band, and broad-band power amplifiers. For example, development in low-loss broad-band output stage power combiners allow CTT to deliver 6–18 GHz, 40 Watt amplifiers in volume – an industry first!

In narrow band applications, CTT's ability to deliver 1 Kilowatt at X-band and 200 Watts at C-band has allowed system designers to eliminate intermediate amplification stages formerly required; thus, improving overall system reliability as well as reducing cost.

CTT's most recent contribution to microwave power is focused on the automated production of power modules.

This capital investment has improved individual productivity by a factor of 3, and resulted in the introduction of more than 90 new power amplifiers!

These GaAs FET and GaN FET power amplifiers are available in narrowband (APN, ASN), wideband (APW, ASW), octave (APO, ASO), and multi-octave band (APM, ASM). Covering from 0.5 to 15 GHz, the AP series are designed to operate as linear amplifiers, to maximize third order

GaAs Power Amplifiers
Wideband 0.2 to 200 Watts

- **Solid-State Power Amplifiers from 0.2 to 100 Watts**
- **Frequency Coverage from 100 MHz to 40 GHz**
- **MIC Thin-Film Design for High Reliability**
- **Custom Engineered Options (CEOs)** (See page 36)
- **Replacements for Legacy GaAs Power Amplifiers**



Wideband Power Amplifiers

GaAs Power Amplifiers	Frequency Response (GHz)	Gain (dB)	Gain Flatness (±dB)	Noise Figure (dB)	P1dB (+dBm)	VSWR In/Out	Volts (DC)	DC Current (mA)	CTT Case Outline
Model Number	**Min**	**Min**	**Max**	**Max**	**Min**	**Max**	**Typ**	**Typ**	
APM/020-2416	0.5-2.0	16	1.00	8.0	24	2:1	15	280	HC2
APM/020-2425	0.5-2.0	25	1.00	4.5	24	2:1	15	330	HC2
APM/020-2435	0.5-2.0	35	1.25	4.5	24	2:1	15	380	HC2
APM/020-2715	0.5-2.0	15	1.00	8.5	27	2:1	15	450	HC2
APM/020-2724	0.5-2.0	24	1.25	5.0	27	2:1	15	520	HC2
APM/020-2733	0.5-2.0	33	1.50	4.5	27	2:1	15	580	HC2
APM/020-2746	0.5-2.0	46	1.75	4.5	27	2:1	15	680	HC4
APM/020-3010	0.5-2.0	10	1.00	8.5	30	2:1	15	550	HS2
APM/020-3027	0.5-2.0	27	1.25	6.0	30	2:1	15	720	HS4
APM/020-3036	0.5-2.0	36	1.50	4.5	30	2:1	15	800	HS4
APM/020-3045	0.5-2.0	45	1.75	4.5	30	2:1	15	900	HS4
APM/020-3326	0.5-2.0	26	1.25	8.0	33	2:1	15	1200	HPS6
APM/020-3335	0.5-2.0	35	1.50	5.0	33	2:1	15	1250	HPS6
APM/020-3344	0.5-2.0	44	1.50	5.0	33	2:1	15	1300	HPS6
APM/020-3532	0.5-2.0	32	1.50	6.0	35	2:1	15	2800	HDS8
APM/020-3542	0.5-2.0	42	2.00	5.0	35	2:1	15	2850	HDS8
APM/020-3635	0.5-2.0	35	1.50	5.0	36	2:1	15	3000	HDS8
APM/020-3644	0.5-2.0	44	2.00	5.0	36	2:1	15	3050	HDS8
APO/020-2724	1.0-2.0	24	1.00	5.0	27	2:1	15	520	HC2
APO/020-2733	1.0-2.0	33	1.25	4.5	27	2:1	15	580	HC4
APO/020-3027	1.0-2.0	27	1.25	5.5	30	2:1	15	720	HS4
APO/020-3046	1.0-2.0	46	1.50	5.0	30	2:1	15	830	HS6
APO/020-3327	1.0-2.0	27	1.25	8.0	33	2:1	15	1200	HPS6
APO/020-3336	1.0-2.0	36	1.50	5.0	33	2:1	15	1250	HPS6
APO/020-3345	1.0-2.0	45	1.50	5.0	33	2:1	15	1300	HPS6
APO/020-3535	1.0-2.0	35	1.50	5.5	35	2:1	15	2400	HPS8
APO/020-3545	1.0-2.0	45	2.00	5.0	35	2:1	15	2500	HPS8
APO/020-3735	1.0-2.0	35	1.50	5.0	37	2:1	15	3600	HPS10
APO/020-3745	1.0-2.0	45	2.00	5.0	37	2:1	15	3700	HPS10
APO/020-4040	1.0-2.0	40	1.50	8.0	40	2:1	15	7700	HDS14
APO/020-4050	1.0-2.0	50	1.50	8.0	40	2:1	15	7800	HDS14

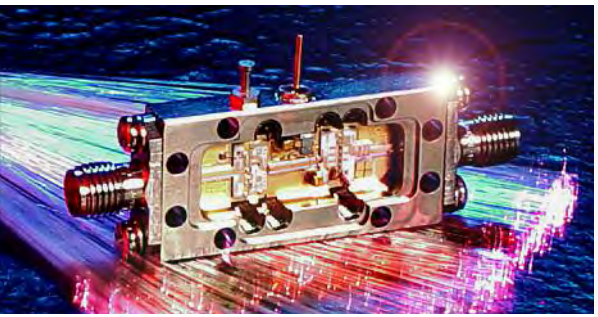
New Products

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intercept point. The AS series operate in the saturated mode to attain the maximum output power. The CW output power ranges from 3W to 100W. Special pulsed amplifiers can be ordered with even higher output power. CTT's unique MIC modules are designed to obtain higher output power, better VSWR and wider bandwidth. These MIC thin-film modules are eutectically attached to metal carriers and mechanically mounted to the aluminum housings. Many units now use the state-of-the-art internally matched power FETs for the final stages.

All units have built in regulator and/or sequential bias circuit for protection. The specifications shown are guaranteed at +25°C case temperature.

These units are ideally suitable for commercial, industrial, and military applications which need low maintenance, good performance, high reliability and quick delivery. They are most suitable for TWT replacement, IPA, driver amplifier, transmitter, radar, EW, RPV, UAV, point-to-point and datalink communications.



GaAs Power Amplifiers
Wideband 0.2 to 200 Watts

GaAs Power Amplifiers	Frequency Response (GHz)	Gain (dB)	Gain Flatness (±dB)	Noise Figure (dB)	P1dB (+dBm)	VSWR In/Out	Volts (DC)	DC Current (mA)	CTT Case Outline
Model Number	Min	Min	Max	Max	Min	Max	Typ	Typ	
APM/025-2724	0.8-2.5	24	1.25	5.0	27	2:1	15	520	HC2
APM/025-2733	0.8-2.5	33	1.50	5.0	27	2:1	15	580	HC2
APM/025-2746	0.8-2.5	46	1.75	5.0	27	2:1	15	680	HC4
APM/025-3027	0.8-2.5	27	1.25	6.0	30	2:1	15	720	HS4
APM/025-3036	0.8-2.5	36	1.50	5.0	30	2:1	15	800	HS4
APM/025-3045	0.8-2.5	45	1.75	5.0	30	2:1	15	900	HS4
APM/025-3326	0.8-2.5	26	1.25	8.0	33	2:1	15	1200	HPS6
APM/025-3335	0.8-2.5	35	1.50	5.0	33	2:1	15	1250	HPS6
APM/025-3344	0.8-2.5	44	1.50	5.0	33	2:1	15	1300	HPS6
APO/040-2724	2-4	24	1.00	5.5	27	2:1	15	450	HS4
APO/040-2738	2-4	38	1.00	4.0	27	2:1	15	520	HS4
APO/040-3033	2-4	33	1.25	4.0	30	2:1	15	870	HS6
APO/040-3045	2-4	45	1.50	4.0	30	2:1	15	950	HS6
APO/040-3330	2-4	30	1.25	5.5	33	2:1	15	1350	HPS6
APO/040-3345	2-4	45	1.50	4.0	33	2:1	15	1450	HPS6
APO/040-3525	2-4	25	1.50	8.0	35	2:1	15	2400	HPS8
APO/040-3540	2-4	40	1.50	4.0	35	2:1	15	2500	HPS8
APO/040-3730	2-4	30	1.50	8.0	37	2:1	15	4150	HPS10
APO/040-3737	2-4	37	1.50	5.5	37	2:1	15	4200	HPS10
APO/040-4032	2-4	32	1.75	8.0	40	2:1	15	8600	HDS14
APO/040-4047	2-4	47	2.00	4.0	40	2:1	15	8700	HDS14
APM/060-2720	2-6	20	1.00	5.5	27	2:1	15	450	HS4
APM/060-2730	2-6	30	1.25	4.5	27	2:1	15	500	HS4
APM/060-2736	2-6	36	1.50	4.5	27	2:1	15	580	HS6
APM/060-3027	2-6	27	1.25	4.5	30	2:1	15	900	HS6
APM/060-3032	2-6	32	1.50	4.5	30	2:1	15	1000	HS6
APM/060-3040	2-6	40	1.75	4.5	30	2:1	15	1050	HS6
APM/060-3335	2-6	35	1.50	4.5	33	2:1	15	1900	HPS6
APM/060-3342	2-6	42	1.50	4.5	33	2:1	15	2000	HPS6
APM/060-3636	2-6	36	1.75	6.0	36	2:1	15	3000	HPS10
APM/060-3646	2-6	46	2.00	4.5	36	2:1	15	3100	HPS10
APM/060-3932	2-6	32	1.75	6.0	39	2:1	15	5300	HDS12
APM/060-3944	2-6	44	2.00	4.5	39	2:1	15	5350	HDS12
APM/060-4148	2-6	48	2.00	4.5	41	2:1	15	10100	SP

New Products

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GaAs Power Amplifiers
Wideband 0.2 to 200 Watts (continued)

GaAs Power Amplifiers	Frequency Response (GHz)	Gain (dB)	Gain Flatness (±dB)	Noise Figure (dB)	P1dB (+dBm)	VSWR In/Out	Volts (DC)	DC Current (mA)	CTT Case Outline
Model Number	**Min**	**Min**	**Max**	**Max**	**Min**	**Max**	**Typ**	**Typ**	
APM/080-2419	2-8	19	1.50	5.0	24	2:1	15	350	HC4
APM/080-2430	2-8	30	1.50	4.5	24	2:1	15	400	HC4
APM/080-2440	2-8	40	1.50	4.5	24	2:1	15	460	HC4
APM/080-2724	2-8	24	1.50	5.5	27	2:1	15	700	HC6
APM/080-2734	2-8	34	1.50	5.5	27	2:1	15	750	HC6
APM/080-2740	2-8	40	1.50	5.5	27	2:1	15	830	HC6
APM/080-3021	2-8	21	1.50	6.0	30	2:1	15	1100	HC6
APM/080-3036	2-8	36	2.00	5.5	30	2:1	15	1250	HC8
APM/080-3326	2-8	26	1.50	6.5	33	2:1	15	1950	HPC8
APM/080-3334	2-8	34	2.00	6.0	33	2:1	15	2000	HPC8
APM/080-3343	2-8	43	2.00	6.0	33	2:1	15	2050	HPC8
APO/080-2430	4-8	30	1.00	4.5	24	2:1	15	400	HC4
APO/080-2440	4-8	40	1.25	4.5	24	2:1	15	460	HC4
APO/080-2724	4-8	24	1.25	5.0	27	2:1	15	700	HC6
APO/080-2734	4-8	34	1.25	5.0	27	2:1	15	750	HC6
APO/080-2740	4-8	40	1.25	5.0	27	2:1	15	830	HC6
APO/080-3021	4-8	21	1.25	6.0	30	2:1	15	1100	HC6
APO/080-3033	4-8	33	1.50	5.0	30	2:1	15	1250	HC8
APO/080-3045	4-8	45	1.50	5.0	30	2:1	15	1330	HC8
APO/080-3326	4-8	26	1.50	6.5	33	2:1	15	1950	HPC8
APO/080-3334	4-8	34	2.00	6.0	33	2:1	15	2000	HPC8
APO/080-3342	4-8	42	2.00	5.0	33	2:1	15	2050	HPC8
APO/080-3430	4-8	30	1.50	6.0	34	2:1	15	2700	HPC10
APO/080-3445	4-8	45	2.00	5.0	34	2:1	15	2800	HPC10
APO/080-3637	4-8	37	1.50	5.0	36	2:1	15	5300	HDC12
APO/080-3648	4-8	48	2.00	5.0	36	2:1	15	5400	HDC12
APO/080-3930	4-8	30	2.00	8.0	39	2:1	15	10.0A	HDC12
APO/080-3942	4-8	42	2.00	5.0	39	2:1	15	10.1A	HDC12
APM/120-2323	4-12	23	2.00	5.5	23	2:1	12	420	HX4
APM/120-2333	4-12	33	2.00	5.0	23	2:1	12	470	HX4
APM/120-2727	4-12	27	2.00	5.5	27	2:1	12	770	HPX6
APM/120-2736	4-12	36	2.00	5.0	27	2:1	12	820	HPX6
APO/120-2323	6-12	23	1.50	5.5	23	2:1	12	420	HX4
APO/120-2727	6-12	27	2.00	5.5	27	2:1	12	770	HPX6
APO/120-3030	6-12	30	2.00	5.5	30	2:1	15	1400	HPX8
APO/120-3040	6-12	40	2.00	5.0	30	2:1	15	1450	HPX8
APO/120-3434	6-12	34	2.00	5.5	34	2:1	15	3000	HPX10
APO/120-3444	6-12	44	2.00	5.0	34	2:1	15	3100	HPX10
APO/120-3637	6-12	37	2.00	5.5	36	2:1	15	5800	PDX
APO/120-3647	6-12	47	2.00	5.5	36	2:1	15	5900	PDX

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GaAs Power Amplifiers
Wideband 0.2 to 200 Watts (continued)

GaAs Power Amplifiers	Frequency Response (GHz)	Gain (dB)	Gain Flatness (±dB)	Noise Figure (dB)	P1dB (+dBm)	VSWR In/Out	Volts (DC)	DC Current (mA)	CTT Case Outline
Model Number	Min	Min	Max	Max	Min	Max	Typ	Typ	
APW/124-3433	8-12	33	2.00	8.0	34	2:1	12	3.3A	HPX10
APW/124-3740	8-12	40	2.50	8.0	37	2:1	12	7.6A	PDX
APW/124-3940	8-12	40	2.50	8.0	39	2:1	12	12.0A	PQX
APW/124-2420	8-12.4	20	1.25	5.0	24	2:1	12	500	HX4
APW/124-2430	8-12.4	30	1.50	4.5	24	2:1	12	550	HX4
APW/124-2439	8-12.4	39	1.50	4.5	24	2:1	12	600	HX6
APW/124-2733	8-12.4	33	1.50	6.0	27	2:1	12	900	HPX8
APW/124-2742	8-12.4	42	1.50	6.0	27	2:1	12	960	HPX8
APW/124-3034	8-12.4	34	1.75	6.0	30	2:1	12	1600	HPX8
APW/124-3043	8-12.4	43	1.75	6.0	30	2:1	12	1650	HPX8
APX/0218-2319	2-18	19	2.00	8.0	23	2:1	12	800	HX4
APX/0218-2324	2-18	24	2.50	8.0	23	2:1	12	900	HX4
APX/0218-2330	2-18	30	2.50	8.0	23	2:1	12	980	HX6
APX/0218-2718	2-18	18	2.00	8.0	27	2.2:1	15	1000	HPX6
APX/0218-2730	2-18	30	2.00	7.0	27	2.2:1	15	1050	HPX6
APX/0218-2742	2-18	42	2.50	7.0	27	2.2:1	15	1120	HPX6
APM/180-2324	6-18	24	1.50	6.0	23	2:1	12	600	HX4
APM/180-2335	6-18	35	1.75	6.0	23	2:1	12	700	HX6
APM/180-2623	6-18	23	2.00	8.0	26	2:1	12	770	HPX6
APM/180-2627	6-18	27	2.00	6.0	26	2:1	12	850	HPX6
APM/180-2639	6-18	39	2.00	6.0	26	2:1	12	950	HPX6
APM/180-2723	6-18	23	2.00	8.0	27	2:1	12	770	HPX6
APM/180-2727	6-18	27	2.00	6.0	27	2:1	12	850	HPX6
APM/180-2739	6-18	39	2.00	6.0	27	2:1	12	950	HPX6
APM/180-2930	6-18	30	2.00	6.0	29	2:1	12	1550	HDX8
APM/180-2936	6-18	36	2.00	6.0	29	2:1	12	1600	HDX8
APM/180-2941	6-18	41	2.00	6.0	29	2:1	12	1650	HDX8
APM/180-3030	6-18	30	2.00	6.0	30	2:1	12	1550	HDX8
APM/180-3036	6-18	36	2.00	6.0	30	2:1	12	1600	HDX8
APM/180-3041	6-18	41	2.00	6.0	30	2:1	12	1650	HDX8
APM/180-3333	6-18	33	2.00	8.0	33	2:1	12	3.3A	HPX10
APM/180-3338	6-18	38	2.00	8.0	33	2:1	12	3.4A	HPX10
APM/180-3640	6-18	40	2.50	8.0	36	2:1	12	7.6A	PDX
APM/180-3648	6-18	48	2.50	8.0	36	2:1	12	7.7A	PDX
APM/180-3832	6-18	32	2.50	8.0	38	2:1	12	11.9A	PQX
APM/180-3840	6-18	40	2.50	8.0	38	2:1	12	12.0A	PQX
ASM/180-4032	6-18	32	2.50	8.0	40*	2:1	12	12.0A	PQX
ASM/180-4040	6-18	40	2.50	8.0	40*	2:1	12	12.0A	PQX

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* = Saturated power.

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CTT can provide replacements for many hard to find amplification products including those formerly produced by Amplica, Avantek Inc., Celeritek, and Watkins-Johnson Company (WJ).

Amplica, Inc.

Avantek

CELERITEK

WATKINS-JOHNSON



GaAs Power Amplifiers
Wideband 0.2 to 200 Watts (continued)

GaAs Power Amplifiers	Frequency Response (GHz)	Gain (dB)	Gain Flatness (±dB)	Noise Figure (dB)	P1dB (+dBm)	VSWR In/Out	Volts (DC)	DC Current (mA)	CTT Case Outline
Model Number	Min	Min	Max	Max	Min	Max	Typ	Typ	
APX/0220-2219	2-20	19	2.50	8.5	22	2.2:1	12	720	HX4
APX/0220-2224	2-20	24	2.75	8.5	22	2.2:1	12	800	HX4
APX/0220-2230	2-20	30	3.00	8.5	22	2.2:1	12	880	HX6
APW/265-2317	18-26.5	17	2.50	8.0	23	2:1	12	470	GK4
APW/265-2322	18-26.5	22	2.50	7.5	23	2:1	12	530	GK6
APW/265-2328	18-26.5	28	2.50	7.0	23	2:1	12	600	GK6
APW/265-2524	18-26.5	24	2.50	7.5	25	2:1	12	850	HDK8
APW/265-2530	18-26.5	30	2.50	7.0	25	2:1	12	920	HDK8
APW/265-2536	18-26.5	36	2.50	7.5	25	2:1	12	980	HDK8
APW/265-2735	18-26.5	35	2.50	7.0	27	2:1	12	1300	HDK8
APW/265-2741	18-26.5	41	2.50	7.0	27	2:1	12	1360	HDK8
APW/265-3030	18-26.5	30	2.50	7.0	30	2:1	12	2000	GDK8
APW/265-3036	18-26.5	36	2.50	7.0	30	2:1	12	2050	GDK8
APW/320-3030	26.5-32.0	30	2.50	7.0	30	2:1	12	2000	GDK8
APW/320-3036	26.5-32.0	36	2.50	7.0	30	2:1	12	2050	GDK8
APW/400-2025	26.5-40.0	25	2.50	8.0	20	2.5:1	12	700	GPK6
APW/400-2030	26.5-40.0	30	2.50	8.0	20	2.5:1	12	780	GPK6
APW/400-2035	26.5-40.0	35	2.50	8.0	20	2.5:1	12	860	GPK6

New Products

Power Amplifier Comments:





1. Proper **heat sinking** is **REQUIRED** to keep the **CASE** temperature below +70°C. Otherwise, permanent damage or degradation may occur.
2. CTT can provide replacements for many hard to find products including those formerly produced by Amplica, Avantek, Celeritek, and Watkins-Johnson Company (WJ).
3. Noise figure will rise 0.015 dB/°C typically as the temperature increases.
4. P1dB will drop approximately 1 dB from +25°C to +70°C.
5. All units contain internal voltage regulators.
6. TTL control, pulsed amplification, monitor, detector and DC-DC power supplies are optional.
7. Consult the factory for additional gain, power, frequencies, temperature compensation or any special functions.
8. SP = Special Enclosure. Please contact the factory for outline drawing.
9. * = Saturated power (All AS Series amplifiers).





GaAs Power Amplifiers
Narrowband Up to 1 Kilowatt

Narrowband Power Amplifiers

GaAs Power Amplifiers	Frequency Response (GHz)	Gain (dB)	Gain Flatness (±dB)	Noise Figure (dB)	P1dB (+dBm)	VSWR In/Out	Volts (DC)	DC Current (mA)	CTT Case Outline
Model Number	Min	Min	Max	Max	Min	Max	Typ	Typ	
APW/027-3730	1.7-2.7	30	1.50	8.0	37	2:1	15	4150	HPS10
APW/027-3737	1.7-2.7	37	1.50	5.5	37	2:1	15	4200	HPS10
APW/027-4032	1.7-2.7	32	1.75	8.0	40	2:1	15	8600	HDS14
APW/027-4047	1.7-2.7	47	2.00	4.0	40	2:1	15	8700	HDS14
APW/032-3345	2.7-3.2	45	1.50	4.0	33	2:1	15	1450	HPS6
APW/032-3840	2.7-3.2	40	0.75	4.5	38	1.5:1	15	4500	HPS10
APW/032-4140	2.7-3.2	40	0.75	4.5	41	1.5:1	15	7300	HDS14
APW/035-2738	2.1-3.5	38	1.00	4.0	27	2:1	15	520	HS4
APW/035-3033	2.1-3.5	33	1.00	4.0	30	2:1	15	870	HS6
APW/035-3045	2.1-3.5	45	1.00	4.0	30	2:1	15	950	HS6
APW/035-3330	2.1-3.5	30	1.00	5.5	33	2:1	15	1350	HPS6
APN/035-3540	3.1-3.5	40	0.75	4.0	35	1.5:1	15	2500	HPS10
APN/035-3840	3.1-3.5	40	0.75	4.5	38	1.5:1	15	4500	HPS10
APN/035-4140	3.1-3.5	40	0.75	4.5	41	1.5:1	15	7300	HDS14
ASN/035-4343	3.1-3.5	43	0.75	4.5	43	1.5:1	15	12000	SP
ASN/035-4646	3.1-3.5	46	0.75	4.5	46	1.5:1	15	22500	SP
ASN/035-4040	3.1-3.5	40	0.75	4.5	40*	1.5:1	15	4500	HPS10
ASN/035-4240	3.1-3.5	40	0.75	4.5	42*	1.5:1	15	7400	HDS14
APN/042-3840	3.4-4.2	40	0.75	4.5	38	1.5:1	15	4500	HPS10
APN/042-4140	3.4-4.2	40	0.75	4.5	41	1.5:1	15	7300	HDS14
ASN/042-4040	3.4-4.2	40	0.75	4.5	40*	1.5:1	15	4500	HPS10
APN/050-3840	4.4-5.0	40	0.75	5.0	38	1.5:1	15	5300	HPC10
APN/050-4144	4.4-5.0	44	0.75	5.0	41	1.5:1	15	8500	HDC12
ASN/050-4040	4.4-5.0	40	0.75	5.0	40*	1.5:1	15	5500	HPC10
ASN/050-4245	4.4-5.0	45	0.75	5.0	42*	1.5:1	15	8500	HDC12
ASN/050-4652	4.4-5.0	52	0.75	5.0	46*	1.5:1	15	25000	SP
ASN/050-5050	4.4-5.0	50	0.75	5.0	50*	1.5:1	15	45000	SP
APN/055-3840	5.0-5.5	40	0.75	5.0	38	1.5:1	15	5300	HDC12
ASN/055-4040	5.0-5.5	40	0.75	5.0	40*	1.5:1	15	5500	HDC12
APN/058-4340	5.25-5.8	40	1.25	7.0	43	2.0:1	15	12400	SP
ASN/058-4747	5.25-5.8	47	1.50	7.0	47*	2.0:1	15	24000	SP

New Products

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* = Saturated power.

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GaAs Power Amplifiers
Narrowband Up to 1 Kilowatt (continued)

GaAs Power Amplifiers	Frequency Response (GHz)	Gain (dB)	Gain Flatness (±dB)	Noise Figure (dB)	P1dB (+dBm)	VSWR In/Out	Volts (DC)	DC Current (mA)	CTT Case Outline
Model Number	**Min**	**Min**	**Max**	**Max**	**Min**	**Max**	**Typ**	**Typ**	
APW/059-2730	3.4-5.9	30	1.00	4.5	27	2:1	15	500	HS4
APW/059-3032	3.4-5.9	32	1.00	4.5	30	2:1	15	1000	HS6
APW/059-3040	3.4-5.9	40	1.00	4.5	30	2:1	15	1050	HS6
APW/059-3335	3.4-5.9	35	1.00	4.5	33	2:1	15	1900	HPS6
APW/059-3342	3.4-5.9	42	1.00	4.5	33	2:1	15	2000	HPS6
APN/059-3840	5.3-5.9	40	0.75	5.0	38	1.5:1	15	5300	HPC10
APN/059-4042	5.3-5.9	42	1.00	7.0	40	1.5:1	15	8000	HDC12
APN/059-4340	5.3-5.9	40	1.00	7.0	43	1.5:1	15	12400	SP
APN/059-4638	5.3-5.9	38	1.25	7.0	46	1.5:1	15	25750	SP
ASN/059-3733	5.3-5.9	33	0.75	5.0	37*	1.5:1	15	2800	HPC10
ASN/059-4040	5.3-5.9	40	0.75	5.0	40*	1.5:1	15	5500	HDC12
APW/060-3746	4.0-6.0	46	2.00	4.5	37	2:1	15	3100	HPS10
APW/060-4044	4.0-6.0	44	2.00	4.5	40	2:1	15	5350	HDS12
APM/060-4248	4.0-6.0	48	2.00	4.5	41.8	2:1	15	10100	SP
CPN/064-4042	5.85-6.45	42	1.00	7.0	40	1.5:1	15	8000	SP
CPN/064-4340	5.85-6.45	40	1.00	7.0	43	1.5:1	15	12400	SP
CPN/064-4646	5.85-6.45	46	1.25	7.0	46	1.5:1	15	24000	SP
CPN/064-5050	5.85-6.45	50	1.25	7.0	50	1.5:1	15	45000	SP
APN/072-3740	6.4-7.2	40	1.00	5.5	37	1.5:1	15	5300	HPC10
APN/072-4040	6.4-7.2	40	1.00	5.5	40	1.5:1	15	8000	HDC12
APN/077-3035	7.1-7.7	35	0.50	6.0	30	1.5:1	15	1050	HPC8
APN/077-3334	7.1-7.7	34	0.75	6.0	33	1.5:1	15	2000	HPC8
APN/077-3740	7.1-7.7	40	1.00	5.5	37	1.5:1	15	5300	HPC10
APN/077-4040	7.1-7.7	40	1.00	5.5	40	1.5:1	15	8000	HDC12
APW/085-2734	5.9-8.5	34	1.00	5.0	27	2:1	15	750	HC6
APW/085-3033	5.9-8.5	33	1.00	5.0	30	2:1	15	1250	HC8
APW/085-3045	5.9-8.5	45	1.00	5.0	30	2:1	15	1330	HC8
APW/085-3334	5.9-8.5	34	1.00	6.0	33	2:1	15	2000	HPC8
APW/085-3342	5.9-8.5	42	1.00	5.0	33	2:1	15	2050	HPC8
APW/085-3737	6.4-8.5	37	1.50	5.0	37	2:1	15	5300	HDC12
APW/085-3748	6.4-8.5	48	2.00	5.0	37	2:1	15	5400	HDC12
APW/085-4042	6.4-8.5	42	2.00	5.0	40	2:1	15	10.1A	HDC12
APN/085-3737	7.7-8.5	37	1.00	5.5	37	1.5:1	15	5300	HPC10
APN/085-4040	7.7-8.5	40	1.00	5.5	40	1.5:1	15	8000	HDC12
APN/085-4340	7.7-8.5	40	1.00	7.0	43	1.5:1	15	15A	SP

New Products

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* = Saturated power.

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GaAs Power Amplifiers
Narrowband Up to 1 Kilowatt (continued)



GaAs Power Amplifiers	Frequency Response (GHz)	Gain (dB)	Gain Flatness (±dB)	Noise Figure (dB)	P1dB (+dBm)	VSWR In/Out	Volts (DC)	DC Current (mA)	CTT Case Outline
Model Number	**Min**	**Min**	**Max**	**Max**	**Min**	**Max**	**Typ**	**Typ**	
APN/096-3430	8.5-9.6	30	1.00	7.5	34	1.5:1	15	2800	HPX8
APN/096-3733	8.5-9.6	33	1.00	7.5	37	1.5:1	15	4350	SP
ASN/096-4040	8.5-9.6	40	1.25	8.0	40*	1.5:1	15	7000	SP
ASN/096-4242	8.5-9.6	42	1.25	8.0	42*	1.5:1	15	8500	SP
ASN/096-4444	8.5-9.6	44	1.25	8.0	44*	1.5:1	15	18A	SP
ASN/096-4646	8.5-9.6	46	1.25	8.0	46*	1.5:1	15	32A	SP
ASN/096-4848	9.0-9.6	48	1.25	8.0	48*	1.5:1	15	35A	SP
APN/100-2733	9.0-10.0	33	1.50	6.0	27	2:1	12	900	HPX8
APN/100-3034	9.0-10.0	34	1.75	6.0	30	2:1	12	1600	HPX8
APN/100-3438	9.0-10.0	38	2.00	8.0	34	2:1	12	2.5A	HPX10
APN/100-3740	9.0-10.0	40	2.50	8.0	37	2:1	12	5.0A	HDX8
APN/100-3940	9.0-10.0	40	2.50	8.0	39	2:1	12	7.0A	SP
ASN/100-4032	9.0-10.0	32	2.50	8.0	40*	2:1	12	7.0A	SP
ASN/100-4040	9.0-10.0	40	2.50	8.0	40*	2:1	12	7.0A	SP
ASN/100-4848	9.0-10.0	48	2.50	8.0	48*	2:1	12	36A	SP
APW/105-2730	8.5-10.5	30	2.00	5.5	27	2:1	15	770	HX6
APW/105-3032	8.5-10.5	32	2.00	5.0	30	2:1	15	1400	HPX8
APW/105-3042	8.5-10.5	42	2.00	5.0	30	2:1	15	1450	HPX8
APW/105-3335	8.5-10.5	35	2.00	5.5	33	2:1	15	2600	HPX10
APN/105-3430	9.5-10.5	30	1.00	7.5	34	1.5:1	15	2800	HPX10
APN/105-3733	9.5-10.5	33	1.00	7.5	37	1.5:1	15	4550	SP
ASN/105-4040	9.5-10.5	40	1.25	8.0	40*	1.5:1	15	7000	SP
ASN/105-4242	9.5-10.5	42	1.25	8.0	42*	1.5:1	15	8500	SP
ASN/105-4444	9.5-10.5	44	1.25	8.0	44*	1.5:1	15	18A	SP
ASN/105-4646	9.5-10.5	46	1.25	8.0	46*	1.5:1	15	32A	SP
APN/117-3733	10.7-11.7	33	1.00	7.0	37	1.5:1	15	4550	SP
APN/117-3940	10.7-11.7	40	1.00	7.0	39	1.5:1	15	7500	SP
APW/132-2727	10.5-13.2	27	2.00	5.5	27	2:1	12	770	HPX6
APW/132-3030	10.5-13.2	30	2.00	5.5	30	2:1	15	1400	HPX8
APW/132-3040	10.5-13.2	40	2.00	5.0	30	2:1	15	1450	HPX8
APW/132-3333	10.5-13.2	33	2.00	5.5	33	2:1	15	3000	HDX8
APN/132-3733	12.7-13.2	33	1.00	7.5	37	1.5:1	15	4750	SP
ASN/132-4040	12.7-13.2	40	1.25	8.0	40*	1.5:1	15	9000	SP

New Products

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GaAs Power Amplifiers
Narrowband Up to 1 Kilowatt (continued)

GaAs Power Amplifiers	Frequency Response (GHz)	Gain (dB)	Gain Flatness (±dB)	Noise Figure (dB)	P1dB (+dBm)	VSWR In/Out	Volts (DC)	DC Current (mA)	CTT Case Outline
Model Number	Min	Min	Max	Max	Min	Max	Typ	Typ	
ASN/140-3434	13.5-14.0	34	1.00	7.5	34*	1.5:1	15	3000	SP
ASN/140-3733	13.5-14.0	33	1.00	7.5	37*	1.5:1	15	5200	SP
APN/145-3636	14.0-14.5	36	1.00	7.5	36	1.5:1	15	5000	SP
APN/145-3940	14.0-14.5	40	1.00	7.5	39	1.5:1	15	8000	SP
APN/145-4040	14.0-14.5	40	1.00	8.0	40	1.5:1	15	12000	SP
APN/145-4242	14.0-14.5	42	1.00	8.0	42	1.5:1	15	15000	SP
APN/149-3740	14.4-14.9	40	1.25	8.0	37	2:1	12	5A	SP
APN/149-4040	14.4-14.9	40	1.25	8.0	40	2:1	12	10A	SP
APN/149-4343	14.4-14.9	43	1.50	8.0	43	2:1	12	19A	SP
APW/154-2730	13.0-15.4	30	2.00	5.5	27	2:1	12	850	HPX6
APW/154-3032	13.0-15.4	32	2.00	5.5	30	2:1	12	1550	HDX8
APW/154-3038	13.0-15.4	38	2.00	5.5	30	2:1	12	1600	HDX8
APW/154-3333	13.0-15.4	33	2.00	5.5	33	2:1	12	2550	HDX8
APW/154-3340	13.0-15.4	40	2.00	5.5	33	2:1	12	2600	HDX10
APN/154-3740	14.4-15.4	40	1.25	8.0	37	2:1	12	5A	SP
APN/154-4040	14.4-15.4	40	1.25	8.0	40	2:1	12	10A	SP
APN/154-4343	14.4-15.4	43	1.50	8.0	43	2:1	12	19A	SP
APN/162-2724	15.7-16.2	24	0.50	6.0	27	1.5:1	15	800	HPX8
APN/165-3030	15.7-16.2	30	0.75	7.0	30	1.5:1	15	1250	HPX10
APN/165-3333	15.7-16.2	33	0.75	7.0	33	1.5:1	15	3400	HDX10
APN/165-3540	15.7-16.2	40	1.00	7.0	35	1.5:1	15	4500	HQX12
APN/165-2724	16.0-16.5	24	0.50	6.0	27	1.5:1	15	800	HPX8
APN/165-3030	16.0-16.5	30	0.75	7.0	30	1.5:1	15	1250	HPX10
APN/165-3334	16.0-16.5	34	0.75	7.0	33	1.5:1	15	3400	HDX10
APN/165-3540	16.0-16.5	40	1.00	7.0	35	1.5:1	15	4500	HQX12
APN/177-2730	15.7-17.7	30	0.50	7.0	27	1.8:1	15	1000	HPX8
APN/177-3034	15.7-17.7	34	0.75	7.0	30	1.8:1	15	1350	HPX10
APN/177-3333	15.7-17.7	33	0.75	7.0	33	1.8:1	15	3400	HDX10
APN/186-3030	18.0-18.6	30	1.00	7.0	30	2:1	12	1500	HDX10
APN/186-3232	18.0-18.6	32	1.00	7.0	32	2:1	12	2550	HDX10
APN/186-3246	18.0-18.6	46	1.00	7.0	32	2:1	12	3400	SP
APN/195-3030	18.5-19.5	30	1.00	7.0	30	2:1	12	1700	SP
APN/195-3232	18.5-19.5	32	1.00	7.0	32	2:1	12	2550	HDX10
APN/195-3246	18.5-19.5	46	1.00	7.0	32	2:1	12	3400	SP
APN/197-2324	17.7-19.7	24	0.5	7.0	23	1.5:1	12	600	HX4
APN/197-2735	17.7-19.7	35	0.5	7.0	27	1.5:1	12	1050	HPX6

New Products

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Power Amplifier Comments:

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2. CTT can provide replacements for many hard to find products including those formerly produced by Amplica, Avantek, Celeritek, and Watkins-Johnson Company (WJ).

3. Noise figure will rise 0.015 dB/°C typically as the temperature increases.

4. P1dB will drop approximately 1 dB from +25°C to +70°C.

5. All units contain internal voltage regulators.

6. TTL control, pulsed amplification, monitor, detector and DC-DC power supplies are optional.

7. Consult the factory for additional gain, power, frequencies, temperature compensation or any special functions.

8. SP = Special Enclosure. Please contact the factory for outline drawing.

9. * = Saturated power (All AS Series amplifiers).

GaAs Power Amplifiers
Narrowband Up to 1 Kilowatt (continued)

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Model Number	**Min**	**Min**	**Max**	**Max**	**Min**	**Max**	**Typ**	**Typ**	
APW/240-2328	20.0-24.0	28	2.50	7.0	23	2:1	12	600	GK6
APW/240-2524	20.0-24.0	24	2.50	7.5	25	2:1	12	850	HDK8
APW/240-2530	20.0-24.0	30	2.50	7.0	25	2:1	12	920	HDK8
APW/240-2536	20.0-24.0	36	2.50	7.5	25	2:1	12	980	HDK8
APW/240-2735	20.0-24.0	35	2.50	7.0	27	2:1	12	1300	HDK8
APW/240-2741	20.0-24.0	41	2.50	7.0	27	2:1	12	1360	HDK8
APN/259-2427	23.3-25.9	27	1.00	6.0	24	1.8:1	12	600	GPK6
APN/259-2740	23.3-25.9	40	1.00	6.0	27	1.8:1	12	1200	GPK8
APN/259-3040	23.3-25.9	40	1.00	6.0	30	1.8:1	12	2000	GPK8
APN/259-3340	23.3-25.9	40	1.00	6.0	33	1.8:1	12	3000	GPK8
APN/265-2427	24.5-26.5	27	1.00	6.0	24	1.8:1	12	600	GPK6
APN/265-2740	24.5-26.5	40	1.00	6.0	27	1.8:1	12	1200	GPK8
APN/265-3040	24.5-26.5	40	1.00	6.0	30	1.8:1	12	2000	GPK8
APN/265-3340	24.5-26.5	40	1.00	6.0	33	1.8:1	12	3000	GPK8
APN/294-2327	27.5-29.4	27	1.00	6.0	23	1.8:1	12	690	GPK6
APN/294-2737	27.5-29.4	37	1.00	6.0	27	1.8:1	12	1200	GPK8
APN/294-3037	27.5-29.4	37	1.00	6.0	30	1.8:1	12	2000	GPK8
APN/294-3337	27.5-29.4	37	1.00	6.0	33	1.8:1	12	3000	GPK8
APN/313-2327	29.1-31.3	27	1.00	6.0	23	2.0:1	12	690	GPK6
APN/313-2737	29.1-31.3	37	1.00	6.0	27	2.0:1	12	1200	GPK8
APN/313-3037	29.1-31.3	37	1.00	6.0	30	2.0:1	12	2000	GPK8
APN/313-3237	29.1-31.3	37	1.00	6.0	32	2.0:1	12	3000	GPK8
ASN/310-3333	30.0-31.0	33	1.50	8.0	33*	2.0:1	12	2800	GPK8
ASN/310-3636	30.0-31.0	36	1.50	8.0	36*	2.0:1	12	3080	GPK8
ASN/310-3838	30.0-31.0	38	1.50	8.0	38*	2.0:1	12	4080	GPK8
APN/400-2026	38.0-40.0	26	1.50	7.0	20	2.0:1	12	810	GPK6
APN/400-2434	38.0-40.0	34	1.50	7.0	24	2.0:1	12	1800	GPK6
APN/400-2734	38.0-40.0	34	1.50	7.0	27	2.0:1	12	2500	GPK8
APN/400-3037	38.0-40.0	37	1.50	7.0	30	2.0:1	12	4000	GPK8

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