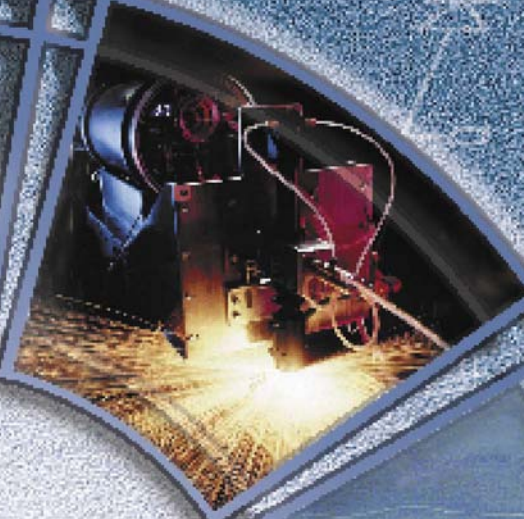


 **ADVANCED  
POWER  
TECHNOLOGY RF®**



***RF Power Products  
2005***



**TECHNOLOGY TO THE NEXT POWER**



## ABOUT ADVANCED POWER TECHNOLOGY RF

Advanced Power Technology RF (APT-RF) was formed in 2002 after the acquisition and merger of GHz Technology Inc, Microsemi RF and the addition of the RF products already existing within APT. This organization offers products featuring Bipolar, VDMOS, and LDMOS technologies. All of the products are based on silicon and span the frequency range from 1MHz to 3.5GHz using supplies from as low as a few volts to as high as 300V.

APT-RF facilities are located in Santa Clara, California, Montgomeryville, Pennsylvania and Bend, Oregon. In addition to our internal wafer fab and assembly, products are assembled in facilities operated by our production partner in Malaysia. APT-RF produces products that are ISO9001 registered, space qualified, and Mil Standard approved. Our automated assembly and final RF Test lines are among the most modern in the world, assuring consistent quality and repeatable performance.

Advanced Power Technology RF makes continuing investments in new technology and product development. Our product roadmaps in Broadcast, ISM, Avionics, L-Band Radar, S-Band Radar, and pulsed LDMOS applications are structured to provide products that set the performance standard in each of these market niches.

## OUR MISSION AND GOALS

The mission of APT-RF is to be the world leader in high power silicon RF & microwave power transistors for applications in Avionics, Broadcast, Communications, ISM, and Radar. Our combined RF & Microwave talent positions APT-RF as a technology leader in the markets we serve. We will continue to push the performance envelope with the new products we introduce.

Our goal is to provide the customer with products that meet all specified requirements, with performance that is consistent from lot to lot while meeting the reliability requirements over the life of the program. This ensures that the customer achieves the optimum system performance and the lowest total cost of ownership.

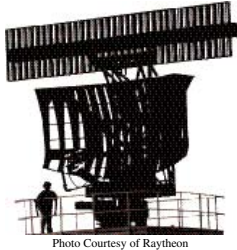
## PRODUCT FEATURES

- Bipolar, LDMOS and VDMOS Transistors designed for specific CW or Pulsed applications
- Gold Metalization for longest lifetime
- Automated Assembly for tightest production control and lot to lot consistency
- Internal pre-match for best performance over the entire operating frequency range
- Automated RF testing over the operating band to ensure specified performance
- Custom parts are optimized for the application and tested in correlated fixtures to agreed upon specifications
- APT-RF supports the FULL PRODUCT LIFE CYCLE, from legacy to new designs
- Hi Rel screening performed to selected levels: JAN, JAN-TX, JAN-TXV, JAN-S

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# RADAR



- Products designed for each of the systems operating:  
UHF 400 – 450 MHz, P-Band 700 – 900 MHz, L-Band 1.2 – 1.4 GHz, S-Band 2.7 – 2.9 GHz, 2.9 – 3.1GHz and 3.1 – 3.4 GHz.
- Characterized to meet the system signal format on parameters such as: rise and fall time, pulse droop, gain spread, short pulse, long pulse and combinations, gain change vs. frequency, power saturation.
- Offering bipolar transistors for existing designs with the potential for LDMOS in the near future.

	Pout Min (W)	Pin Max (W)	Gain Min (dB)	Vcc (V)	$\eta$ Typ (%)	Pulse Width ( $\mu$ s)	Duty Cycle (%)	VSWR Load	$\theta_{jc}$ ( $^{\circ}$ C/W)	Case Style	Part Number
UHF: 400-450 MHz, Class C, Common Emitter-Pulsed	10	1.2	9.2	28	50	CW	CW	--	3.00	M105	SD1511-08
	300	33	9.6	40	50	250	10	20:1	0.20	M106	MS2176
	400	80	7.0	40	50	60	2	20:1	0.15	M119	MS2177
	500	54	9.7	40	50	250	10	20:1	0.15	M102	MS2200
UHF: 600-700 MHz, Class C, Common Base	30	4.2	8.5	28	50	10	1	--	2.60	M218	MS2226
	70	13	7.3	50	35	10	1	--	0.60	M222	AM0608-70
	220	30	8.7	50	40	10	1	--	0.20	M218	MS2091
	445	90	6.9	50	40	10	1	--	0.13	M216	MS2092
UHF: 750-950 MHz, Class C, Common Base	300	40	8.8	50	40	10	10	--	0.22	M216	AM0710-300
L-Band 1200-1400 MHz, Class C, Common Base-Pulsed	5.5	0.55	10.0	28	47	1000	10	5:1	9.00	M222	MS2216
	14.5	2	8.6	28	48	1000	10	5:1	4.00	M222	MS2222
	30	6	7.0	28	48	2000	20	3:1	2.00	55AW-1	1214-30
	30	5	7.4	28	45	1000	10	2:1	2.40	M222	MS2217
	32	5.3	7.8	36	45	5000	20	3:1	2.30	55AW-1	1214-32L
	55	12.3	6.5	28	45	2000	20	3:1	1.00	55AW-1	1214-55
	55	12	6.6	28	50	1000	10	30:1	1.40	M218	MS2218
	100	25	6.0	28	50	100	10	3:1	0.55	M216	MS2231
	140	27	7.15	36	48	5000	20	3:1	0.55	55ST-1	1214-150L
	270	42.7	8.0	50	45	100	10	3:1	0.22	55KT-1	1214-300
	270	63	6.3	50	40	50	4	15:1	0.24	M222	MS2221
	300	40	8.75	40	50	150	10	3:1	0.25	55ST-1	1214-300M
	325	75	6.4	45	38	13	2	15:1	0.10	M216	MS2233
350	58	8.0	48	45	250	10	3:1	0.25	55ST-1	1214-350M	
L-Band 1400-1600 MHz, Class C, Common Base-Pulsed	35	6	7.6	28	50	5	15	10:1	0.60	55AT-1	1617-35
S-Band 2700-2900 MHz, Class C, Common Base-Pulsed	125	17.6	8.5	36	55	100	10	2:1	0.30	55KS-1	2729-125
	170	24	8.5	36	55	100	10	2:1	0.23	55KS-1	2729-170
S-Band 2900-3100 MHz, Class C, Common Base-Pulsed	150	21.7	8.3	38	50	50	4	2:1	0.30	55KS-1	2931-150

# AVIONICS



- Separate designs for each application: DME, IFF, JTIDS, MODE-S, TACAN, TCAS
- Full series of parts for each application – low power to highest power available on the market.
- Highest Power Output to minimize number of transistors required for the final stage.
- Driver transistors with power gain per stage that is set to minimize the number of stages required in the system.
- Structured to meet the system signal signature on parameters such as:  
rise and fall time, pulse droop, pulse burst uniformity, power gain change versus frequency.
- Tested under the full set of RF operating conditions to insure full compliance within customer final power amplifier with minimum factory tune up.
- Offering both Bipolar for existing designs and LDMOS for newer designs.

	Pout Min (W)	Pin Max (W)	Gain Min (dB)	Vcc (V)	$\eta$ Typ (%)	Pulse Width ( $\mu$ s)	Duty cycle (%)	VSWR Load	$\theta_{jc}$ ( $^{\circ}$ C/W)	Case Style	Part Number
Transponder / Interrogator, 1030/1090 MHz, Class C, Common Based, Pulsed	150	25	7.80	50	40	10	1	30:1	0.30	M138	MS2393
	175	25	8.50	50	40	10	1	30:1	0.45	55CT-1	TPR175
	400	75	7.30	50	40	10	1	20:1	0.20	55CT-1	TPR400
LDMOS: Transponder/Interrogator, 1030/1090 MHz, Class AB Common Source	<i>110</i>	<i>5.5</i>	<i>13.00</i>	<i>32</i>	<i>50 *</i>	<i>32</i>	<i>2</i>	<i>3:1</i>	<i>0.38</i>	<i>55QZ</i>	<i>1011LD110</i>
	<i>200</i>	<i>10</i>	<i>13.00</i>	<i>32</i>	<i>50 *</i>	<i>32</i>	<i>2</i>	<i>3:1</i>	<i>0.195</i>	<i>55QX</i>	<i>1011LD200</i>
	<i>300</i>	<i>15</i>	<i>13.00</i>	<i>32</i>	<i>50 *</i>	<i>32</i>	<i>2</i>	<i>3:1</i>	<i>0.13</i>	<i>55QM</i>	<i>1011LD300</i>
Transponder / 1090 MHz, Class A, Common Emitter	0.20	0.02	10.00	18	--	CW	--	30:1	25.00	M115	MS2290
	0.60	0.05	10.90	18	--	CW	--	30:1	35.00	M220	MS2203
	0.60	0.05	10.90	18	--	CW	--	30:1	25.00	M115	MS2204
Transponder / 1090 MHz, Class C, Common Base, Pulsed	2	0.25	9.00	28	35	10	1	--	10	M220	MS2201
	4	0.4	10.00	28	35	10	1	--	35	M115	MS2206
	5	0.35	11.50	50	35	10	1	30:1	8.00	M105	SD1527-08
	15	1.5	10.00	50	30	10	1	--	2.00	M115	MS2322
	35	5.6	8.00	50	30	10	1	--	2.00	M115	MS2341
	75	13	7.60	50	--	10	1	--	0.80	M115	MS2361
	95	10	9.70	40	40	10	1	--	0.60	M210	MSC1100
	300	70	6.30	35	50	10	1	--	0.20	M138	MS2422
	300	70	6.30	50	40	10	1	20:1		M218	MSC1300M
	350	70	6.90	50	40	10	1	20:1		M218	MSC1350M
	450	90	7.00	50	40	10	1	25:1	0.12	M216	MSC1450M
	500	70	8.50	50	40	32	2	3:1	0.11	M198	MS2208
	500	150	5.20	50	35	10	1	10:1	0.10	55CT-1	TPR500
	500	150	5.20	50	35	10	1	10:1	0.10	55KT-1	TPR500A
	550	150	5.60	55	35	10	1	25:1	0.09	M216	MSC1550M
	600	150	6.70	50	35	10	1	25:1	0.09	M216	MSC1600M
	600	150	6.00	50	35	10	1	30:1	0.06	M112	MS2473
700	150	6.70	50	35	10	1	10:1	0.08	55KT-1	TPR700	
720	150	6.80	50	35	10	1	20:1	0.06	M216	MS2475	
1000	208	6.80	50	43	10	1	9:1	0.06	55KV-1	TPR1000	
Interrogator / 1030 MHz, Class C, Common Base, Pulsed	1000	158	8.00	50	45	1	1	4:1	0.08	55SW-1	ITC1000
	1000	100	10.00	50	50	1	1	4:1	0.08	55SW-1	ITC1100
TCAS 1090 MHz, Class C, Common Base - Pulsed	70	15	6.70	28	45	100	2	10:1	1.10	M214	MS2223
	75	9.4	9.00	50	48	32	2	10:1	0.86	M214	MS2228
	400	63	8.00	50	45	32	2	15:1	0.17	M216	MS2207
	500	70	8.50	50	40	32	2	3:1	0.11	M198	MS2208
TCAS 1030 MHz, Class C, Common Base - Pulsed	450	100	6.50	45	35	32	2	10:1	0.06	55KT-1	TCS450
	800	100	9.00	45	45	32	1	4:1	0.09	55SM-1	TCS800
	1200	150	9.00	50	45	32	2	4:1	0.02	55TU-1	TCS1200
MODE S, 1030 MHz, Class C, Common Base, Pulsed  +1090 MHz Operation As Well	400	90	6.50	45	35	32	1	10:1	0.15	55KT-1	MDS400
	500	70	8.50	50	45	32	2	4:1	0.12	55ST-1	10500
	500	70	8.50	50	45	32	2	4:1	0.12	55SM-1	10502+
	800	100	9.00	50	40	128**	2	4:1	0.12	55ST-1	MDS800+
	1000	115	9.40	50	40	128**	2	4:1	0.02	55TU-1	MDS1100

\* Idq for 1011LD110 = 250 mA, Idq for 1011LD200 = 500 mA, Idq for 1011LD300 = 750 mA

\*\* 0.5 us on/0.5us off x 128, repeated at 6.4 ms

\*\*\*32us on/18us off x 48, repeated at 23 ms

# AVIONICS (CONTINUED)

	Pout Min (W)	Pin Max (W)	Gain Min (dB)	Vcc (V)	$\eta$ typ (%)	Pulse Width ( $\mu$ s)	Duty cycle (%)	VSWR Load	$\theta_{jc}$ ( $^{\circ}$ C/W)	Case Style	Part Number
DME/TACAN 960-1215 MHz, Class C, Common Base - Pulsed	7.0	1.0	8.50	50	25	10	1	10:1	3.50	55CT-1	0912-7
	15	1.5	10.00	50	30	10	1	20:1	2.00	M105	MS2321
	25	3.5	8.50	50	45	10	1	10:1	1.40	55CT-1	0912-25
	45	7.0	8.10	50	45	10	1	10:1	0.80	55CT-1	0912-45
Air DME 1025-1150 MHz, Class A, Common Emitter , CW	0.60	0.05	10.80	18	--	CW		10:1	33.00	55FW-2	1000MP
Air DME 1025-1150 MHz, Class C, Common Base - Pulsed	2	0.25	9.00	35	40	10	1	10:1	10.00	55FW-1	1002MP
	2	0.25	9.00	35	35	10	1	20:1	10.00	M115	MS2202
	4	0.5	9.00	35	35	10	1	20:1	7.00	55FW-1	1004MP
	4	0.5	9.00	28	35	10	1	20:1	5.00	M220	MS2205
	5	0.5	10.00	28	50	10	1	20:1	8.00	M210	MS2557
	5	0.55	9.50	28	--	10	1	20:1	8.00	M115	SD1526-01
	15	1.5	10.00	50	35	10	1	10:1	2.00	M105	1015MP
	15	1.5	10.00	50	--	--	--	--	--	M115	MSC1015MP
	35	3.5	10.00	50	45	10	1	10:1	1.00	55FW-1	1035MP
	35	3	10.60	50	43	10	1	20:1	1	M220	MS2553
	35	3	10.70	50	48	10	1	20:1	1.00	M115	MS2575
	75	12	7.80	50	45	10	1	10:1	0.80	55FW-1	1075MP
	75	13	7.60	50	--	--	--	--	1.00	M115	MSC1075MP
	75	13	7.50	50	--	10	1	20:1	0.80	M105	MS2362
	90	14	8.10	50	45	10	1	10:1	0.80	55FW-1	1090MP
	90	13	8.40	50	--	10	1	20:1	0.60	M115	SD1536-03
	90	13	8.40	50	--	10	1	20:1	0.60	M105	SD1536-08
	150	25	7.80	50	40	10	1	20:1	0.60	55AY-1	DME150
	150	25	7.80	50	40	10	1	20:1	0.30	M218	MSC1150M
	175	30	7.60	50	40	10	1	20:1	0.30	M218	MSC1175M
	250	60	6.20	50	40	10	1	20:1	0.20	M218	MS2554
	300	70	6.30	50	35	10	1	30:1	0.20	M103	MS2421
	375	85	6.40	50	40	10	1	30:1	0.20	55AT-1	DME375A
	400	90	6.50	50	--	10	1	30:1	0.12	M112	MS2441
	400	90	6.50	50	40	10	1	25:1	0.12	M216	MSC1400M
	500	125	6.00	50	35	10	1	10:1	0.10	55KT-1	DME500
	550	150	5.60	50	--	10	1	30:1	0.06	M122	MS2472
	800	100	9.00	50	40	10	1	5:1	0.05	55ST-1	DME800
JTIDS 960-1215 MHz, Class C Common Base-Pulsed	6	0.7	9.30	28	45	6.4	21	5:1	7.00	M222	MS2211
	15	2.3	8.10	28	45	10	21	20:1	3.00	M222	MS2212
	25	5.0	7.00	36	40	10	40	5:1	1.80	55AT-1	JTDB25
	30	5	7.80	35	40	6.4	21	15:1	2.20	M214	MS2213
	50	10	7.00	36	40	10	22	10:1	0.80	55AT-1	JTDA50
	75	15	7.00	36	40	10	40	3:1	0.80	55AT-1	JTDB75
	85	15	7.50	35	40	6.4	21	5:1	0.75	M218	MS2214
	145	25	7.60	36	45	7	22	3:1	0.50	55KT-1	JTDA150A
	150	26.7	7.50	35	45	7	21	--	0.57	M216	MS2215
TACAN 960-1215 MHz, Class C Common Base-Pulsed	15	3.0	7.00	40	40	20	5	10:1	1.00	55LT-1	TAN15
	75	12	8.00	50	40	20	5	30:1	0.60	55AZ-1	TAN75A
	90	13	8.40	50	38	10	10	--	0.80	M218	MS2209
	150	30	7.00	50	38	20	5	10:1	0.30	55AT-1	TAN150
	250	60	6.20	50	40	20	5	5:1	0.30	55AT-1	TAN250A
	250	40	8.00	50	38	20	5	--	0.28	M214	MS2267
	300	60	7.00	50	38	10	10	15:1	0.16	M216	MS2210
	300	60	7.00	50	45	20	5	5:1	0.15	55KT-1	TAN300
	350	60	7.60	50	38	10	10	15:1	0.16	M216	MS2272
	350	70	7.00	50	40	10	10	3:1	0.12	55ST-1	TAN350

JTIDS Burst = 6.4 us on, 6.6 us off repeated for 2.1 millisecond, overall duty as stated.

High Voltage MOSFETS can be used (see page 12)



## HF/ VHF/ UHF COMMUNICATIONS

**HF INDUSTRIAL/COMMUNICATIONS:** Single ended or balance transistors for Class AB/C operation from 2-175 MHz. Devices from 1 to 300 watts CW or pulsed with operating voltages of 12.5, 28 and 50 VDC. Supporting applications such as mobile and base station FM/SSB radios, high power amplifiers, industrial and medical RF power supplies.

**VHF COMMUNICATIONS:** Single ended and balanced transistors for common emitter Class C operation from 50-175 MHz. Devices from 1 to 150 Watts CW with Vcc of 12.5, 28 and 50 VDC for AM/FM mobile and base station applications.

**UHF COMMUNICATIONS:** Single ended and balanced transistors for common emitter Class C operation from 450 - 512 MHz. Devices from 1 to 45 Watts CW with Vcc of 12.5 VDC for FM mobile radio applications. Single ended and balanced transistors for common base Class C operation from 806 to 960 MHz. Devices from 1 to 60 Watts CW with Vcc of 24 VDC for FM base station applications. Single ended and balanced transistors for common emitter Class AB operation from 860 to 960 MHz. Devices from 1 to 150 Watts PEP with Vcc of 24 VDC for linear cellular base station applications.

**MILITARY COMMUNICATIONS:** Single ended and balanced transistors for common emitter Class A, AB, and C operation from 100-500 MHz. Devices from 1 to 125 Watts CW with Vcc of 28 VDC for aircraft, mobile, and base station applications.

	Pout Min (W)	Pin Max (W)	Gain Typ (dB)	$\eta$ Typ (%)	Vdd Typ (V)	Cob Type (pF)	VSWR Load	$\theta_{jc}$ (°C/W)	Case Style	Part Number
VDMOS, 2-175 MHz Class AB, Common Source	30	1.00	15	50	50	35	30:1	1.5	M113	VRF148A
	150	6.00	14	50	50	220	30:1	0.6	M174	VRF151
	300	6.00	14	50	50	220	30:1	0.35	M208	VRF151G
	150	15.00	10	50	50	240	30:1	0.6	M174	VRF150
	150	7.24	13	50	28	420	30:1	0.6	M174	VRF141
	300	7.24	13	50	28	420	30:1	0.35	M208	VRF141G
HF 2-50 MHz, Class C, Common Emitter	20	0.65	15	60	12.5	100	20:1	2.20	M113	MS1227
	30	0.48	18	60	28	--	20:1	2.20	M113	MS1226
	70	7.00	10	50	12.5	300	20:1	1:05	M113	MS1253
	75	3.80	14	60	12.5	350	20:1	2.20	M174	MS1001
	75	3.00	14	60	50	100	20:1	0.36	M135	MS1006
	125	4.00	15	60	28	250	20:1	0.65	M174	MS1000
	175	3.50	17	65	50	180	30:1	0.65	55HX-2	S175-50
	200	12.00	12	60	50	300	30:1	0.65	55HX-2	S200-50
VHF 100-175 MHz, Class C, Common Emitter	0.75	0.015	17	--	12.5	4	--	125.00	SO-8	SRF4427
	1	0.10	10	50	12.5	4	--	175.00	TO-39	2N4427
	1.4	0.10	12	50	7.5	6.0	20:1	35.00	M123	MS1403
	1.5	0.10	12	55	12.5	12	--	25.00	Pwr Macro	MRF553
	1.75	0.125	12	50	12.5	15	--	35.70	TO-39	MRF607
	2.5	0.20	11.5	50	7.5	19	20:1	11.60	M123	MS1401
	2.5	0.25	10	50	28	10	--	25.00	TO-39	MS1409
	3	0.50	8	50	12.5	15	--	35.00	TO-39	2N6255
	4	0.25	12	50	12.5	20	--	22.00	TO-39	SD1127
	6	0.75	9	55	12.5	20	20:1	8.75	M113	SD1012-03
	10	0.10	10	--	12.5	45	20:1	8.75	M135	SD1143
	10	0.10	10	--	12.5	45	20:1	8.75	M113	SD1143-01
	10	1.00	10	55	28	15	20:1	13.50	M135	SD1013
	10	1.00	10	55	28	15	20:1	13.50	M113	SD1013-03
	13.5	3.50	5.8	70	28	--	--	7.60	M137	SD1070
	15	1.00	12	60	12.5	45	20:1	8.75	M122	MS1261
	15	3.50	6.3	60	12.5	10	20:1	5.6	M135	SD1014-02
	15	3.50	6.3	60	12.5	10	20:1	5.6	M113	SD1014-06
	20	3.00	8.2	55	28	35	--	5.83	M113	MS1408
	20	3.00	8.2	60	28	35	20:1	5.80	M135	MS1406
	30	3.00	10	55	13.5	95	20:1	1.20	M135	MS1504
	30	3.00	10	--	12.5	120	10:1	1.20	M135	MS1336
	30	3.00	10	--	12.5	120	10:1	1.20	M113	MS1337
	30	10.60	5	55	13.5	150	20:1	1.70	M130	SD1019
	30	3.00	10	--	28	250	--	4.40	M135	SD1015
	30	3.00	10	55	13.5	95	20:1	1.20	M113	MS1505
40	7.00	7.6	60	28	65	20:1	2.90	M135	SD1224	

# HF/ VHF/ UHF COMMUNICATIONS

	Pout Min (W)	Pin Max (W)	Gain Typ (dB)	$\eta$ Typ (%)	Vcc (V)	Cob Type (pF)	VSWR Load	$\theta_{jc}$ (°C/W)	Case Style	Part Number
VHF 100-175 MHz, Class C, Common Emitter	40	5	9	55	13.6	--	--	2.50	M135	MS1252
	40	5	9	55	13.6	95	20:1	1.20	M135	MS1506
	40	5	9	--	13.6	95	--	1.2	M113	MS1507
	40	14	4.5	70	12.5	200	10:1	2.20	M135	SD1018
	40	14	4.5	70	12.5	200	--	2.20	M113	SD1018-06
	40*	4	10	65	27	25	30:1	3.50	55HT-2	VAM40
	45	10	6.5	50	12.5	135	20:1	1.20	M111	MS1251
	60	12	7	55	28	80	20:1	2.30	M135	MS1329
	80*	10	9	65	27	75	30:1	2.00	55HT-2	VAM80
	100	25	6	50	28	150	--	0.75	M174	SD1019-05
	100	25	6	50	28	150	--	0.75	M174	MS1204
	100	25	6	--	12.5	390	10:1	0.65	M111	MS1003
	100	20	7.0	60	28	220	30:1	0.65	55HV-2	VMIL100
	120*	20	7.8	65	27	240	30:1	1.20	55HT-2	VAM120
	125	15	9.2	55	28	--	--	0.65	M111	MS1009
150	18	9.5	70	28	150	20:1	0.75	M174	MS1281	
* Peak Power (1kHz, 50%)										
UHF 225-400 MHz, Class C, Common Emitter	1.0	0.1	10.0	65	28	3.5	30:1	35	55FU-2	C1-28
	3.0	0.2	11.7	60	28	6.0	30:1	16	M111	SD4012
	3.0	0.2	11.8	60	28	4.5	30:1	16	55FT-2	UMIL3
	10	0.65	12	50	28	12	--	6.4	M123	MS1642P
	10	1.0	10	60	28	11.5	30:1	6.3	55FT-2	UMIL10
	10	1.0	10	50	28	11.5	10:1	6.3	55FU-2	UMIL10P
	25	3.2	8.9	50	28	22	5:1	2.5	55HV-2	UMIL25
	25	3.15	10	50	28	30	20:1	2.5	M111	MS1527
	60	8.0	8.8	60	28	70	5:1	1.25	55HW-2	UMIL60
	70	8.8	9.0	50	28	65	10:1	0.8	M111	SD1462
	70	10	8.5	50	28	65	20:1	0.8	M111	MS1511
	80	10	9.0	60	28	80	5:1	0.8	55HV-2	UMIL80
	100	20	7.0	60	28	100	--	0.70	M111	MS1503
	100	19	7.2	55	28	120	5:1	0.7	55HV-2	UMIL100
	100	16	8.0	55	28	120	4.5:1	0.7	55JU-2	UMIL100A
125	25	8.5	60	28	70	5:1	0.65	55JT-2	0204-125	
125	25	7.0	60	28	125	10:1	0.65	M168	MS1508	
UHF 100-500 MHz, Class C, Common Emitter	50	7.0	8.5	55	28	52	5:1	1.25	55JT-2	0105-50
	100	24	6.2	50	28	140	5:1	0.65	55JT-2	0105-100
	100	28.2	5.5	55	28	100	5:1	0.67	M168	MS1509
UHF 470 MHz, Class C, General Purpose	1.5	0.12	11	60	12.5	5	--	25	Pwr Macro	MRF555
	2	0.2	10	--	12.5	10	--	35	M122	MS1402
	2	0.32	8	50	12.5	15	--	35	TO-39	SD1444
	3	0.34	9.5	50	12.5	12	--	35	TO-39	MS1649
	5	0.7	8.5	50	12.5	19	20:1	11.6	M122	MS1404
	5	0.5	10	60	12.5	15	--	7	M122	MS652
	5	0.5	10	60	12.5	15	--	11.6	M123	MS652S
	10	2	7	--	12.5	26	10:1	3.0	M122	MS1426
	10	2.5	6	--	12.5	30	--	4.7	M122	SD1146
	15	2.5	7.8	50	12.5	50	--	4.6	M122	MS1262
	15	2.5	7.8	50	12.5	50	--	4.6	M142	MS1263
	15	2.7	7.5	--	12.5	50	20:1	4.6	M111	SD1429-03
	25	6	6.2	--	12.5	70	20:1	2.5	M111	SD1422
	45	14	5	50	12.5	180	--	1	M111	MS1480
	50	15	5.2	50	12.5	180	--	1	M111	MS1490
UHF 836-960 MHz, Class C, General Purpose	0.5	0.08	8	50	12.5	3	--	50	Macro-X	MRF559
	0.75	0.12	8	60	12.5	3	--	45	SO-8	MRF8372
	1.5	0.24	8	60	12.5	6	--	25	Pwr Macro	MRF557
	45	15	4.7	--	12.5	100	20:1	1.2	M142	MS1455
	60	12	7	55	24	70	--	1	M169	MS1536
	60	10.6	7.5	50	24	70	--	0.9	M142	SD1496

# HF/VHF/UHF COMMUNICATIONS CLASS A/AB

Pout Min (W)	Pin Max (W)	Gain min (dB)	$\eta$ Typ (%)	Vcc (V)	Icq ( $\mu$ A)	VSWR Load	$\theta_{jc}$ ( $^{\circ}$ C/W)	Case Style	Part Number
100	7.9	11	50	12.5	150	20:1	0.6	M174	MS1051
130	8.2	12	50	28	150	20:1	1.0	M174	MS1077
130	8.2	12	50	28	150	20:1	1.0	M174	MS1078
220	13.9	12	50	28	750	20:1	0.7	M174	MS1076
150	6.0	14	50	50	100	20:1	0.75	M174	MS1007
150	6.0	14	50	50	100	20:1	0.75	M164	MS1008
220	11.0	13	50	50	150	20:1	0.7	M174	MS1079
250	10.0	14	50	50	150	20:1	0.4	M177	MS1004
250	10.0	14	50	50	150	20:1	0.4	M177	MS1011

HF 2-30 MHz, Class AB,  
Common Emitter

## BROADCAST / TV



**FM BROADCAST:** Single ended and balanced transistors for common emitter Class C operation from 88 to 108 MHz. Devices from 1 to 250 Watts CW with Vcc of 28 and 50 VDC.

**VHF TV BROADCAST:** Single ended and balanced transistors for common emitter Class A and AB operation from 50 to 225 MHz. Devices from 0.5 to 250 Watts  $P_{SYNC}$  with Vcc of 28 to 32 VDC.

**UHF TV BROADCAST:** Single ended and balanced transistors for common emitter Class A and AB operation from 470 to 860 MHz. Devices from 0.5 to 150 Watts  $P_{SYNC}$  with Vcc of 28 VDC.

Freq (MHz)	Pout Min (W)	Gain Min (dB)	Vcc (V)	Icq (A)	$\eta$ Typ (%)	IMD Typ (dB)	VSWR Load	$\theta_{jc}$ ( $^{\circ}$ C/W)	Case Style	Part Number	
VHF TV 174-225 MHz, Class A/AB, Common Emitter	225	14	14	28	2.5	--	-55	--	1.5	M111	MS1277
	225	20	8	25	2.5	--	-50	--	1.2	M130	MS1279
	225	20	7.5	28	3.5	--	-50	--	1.2	M164	MS1280
	225	100	11	28	0.2	--	-50	--	1.2	M168	MS1278
	225	200	11	32	1.0	--	-50	--	0.45	M175	SD1485
VHF TV 175-225 MHz, Class A, Common Emitter	225	7.5	10.0	25	1.2	33	-55	5:1	3.3	55HV-2	VTV075
	225	15.0	8.0	25	2.4	33	-55	3:1	1.8	55HV-2	VTV150
	225	30.0	6.0	25	5.0	30	-50	3:1	1.2	55HV-2	VTV300
UHF TV 470-860 MHz, Class A, Common Emitter	860	0.5	10.0	20	0.22	--	-60	30:1	22.0	55FT-2	UTV005
	860	1.0	10.0	20	0.44	--	-60	30:1	12.0	55FT-2	UTV010
	860	2.0	10.0	25	0.41	--	-60	30:1	10.0	55FT-2	UTV020
	860	4.0	8.5	25	0.85	--	-60	30:1	7.0	55FT-2	UTV040
	860	8.0	9.0	26.5	1.7	--	-58	3:1	2.5	55JV-2	UTV080
	860	12.0	8.9	26.5	1.7	--	-52	3:1	1.6	55JT-2	UTV120
	860	20.0	8.5	26.5	2.7	--	-48	3:1	1.2	55JV-2	UTV200
UHF TV 470-860 MHz Class AB, Common Emitter	860	100.0	8.5	28	0.3	55	--	5:1	0.6	55RT-2	UTV8100B
UHF 860-960 MHz Class A/AB, Common Emitter	860	0.50	9.5	20	0.22	--	-60	--	5.5	M122	MS1502
	860	1	10	20	0.44	--	-60	--	9	M122	MS1512
	860	2	8.5	25	0.45	--	-60	--	11	M122	MS1501
	860	4	7	25	0.85	--	-60	--	5.5	M122	MS1581
	860	14	8.5	25	1.65	--	-45	--	2.5	M156	MS1579
	860	25	9	25	3.2	--	-45	--	1.3	M173	MS1582
	860	30	7.5	24	0.06	50	-60	--	2.0	M142	MS1454
	860	100	9.5	28	0.2	--	--	--	1.0	M208	MS1576
	860	150	6.5	28	2x0.5	45	--	--	0.55	M175	MS1533
	960	0.9	9.5	24	0.125	--	--	--	20	M123	SD1420-01
	960	15	8	24	0.08	45	--	--	6.0	M142	MS1451
	960	30	7.5	24	0.15	--	--	--	3.0	M156	MS1452
	960	30	7.5	24	0.15	--	--	--	3.0	M142	MS1453



## MICROWAVE



- These transistors are industry standards for legacy systems and replacement parts for discontinued products made by other suppliers.
- Full series of parts covering low power to highest power output available.
- All use Gold metalization, glass passivation and in solder sealed packages for best reliability and long term operation.
- All products are functionally tested per the specification.

	Freq Range (MHz)	Pout Min (W)	Pin Max (W)	Gain Typ (dB)	$\eta$ typ (%)	Vcc (V)	Cob Typ (pF)	VSWR load	$\theta_{jc}$ ( $^{\circ}$ C/W)	Case Style	Part Number
2.0 GHz, Class C, Common Base	2000	1.0	0.125	9.5	40	28	4.0	30:1	35.0	55BT-1	2001
	2000	3.0	0.47	8.6	40	28	5.0	30:1	15.0	55BT-1	2003
	2000	3.0	0.50	7.8	35	28	9.5	--	8.0	M210	MS2003
	2000	5.0	0.80	8.5	40	28	7.5	30:1	8.5	55BT-1	2005
	2000	5.0	1.00	7.8	40	28	10	--	6.0	M210	MS3024
	2000	10.0	2.00	8.0	40	28	15.0	30:1	6.0	55BT-1	2010
2.3 GHz, Class C, Common Base	2300	1.5	0.24	8.5	40	20	4.0	30:1	31.0	55BT-1	2301
	2300	2.0	0.30	8.5	40	20	5.5	10:1	25.0	55BT-1	2302
	2300	4.0	0.63	8.5	40	20	7.0	10:1	17.0	55BT-1	2304
	2300	7.0	1.10	8.5	40	20	10.0	10:1	8.5	55BT-1	2307
3.0 GHz, Class C, Common Base	3000	1.0	0.20	8.5	30	28	4.0	30:1	35.0	55BT-1	3001
	3000	3.0	0.75	6.5	30	28	7.0	10:1	17.0	55BT-1	3003
	3000	1.0	0.20	7.0	33	28	3.5	--	25.0	M210	MS3383
	3000	4.5	1.59	4.5	30	28	7.5	30:1	8.5	M210	MS3302
	3000	5.0	1.60	5.5	30	28	--	9:1	7.0	55BT-1	3005
4.0 GHz, Class C, Common Base	4000	0.5	0.16	5.0	25	28	2.5	3:1	45	M210	MSC4000
	4000	1.0	0.32	5.0	25	28	3.6	3:1	25	M210	MSC4001
	4000	2.5	0.79	5.0	25	28	5.0	3:1	12.5	M210	MSC4003

## MICROWAVE BROADBAND



- Transistors available for all the standard operating frequency bands: 1.0 – 1.4 GHz, 1.7 – 2.0 GHz and 2.0 – 2.4 GHz.
- Full series of parts for each band – low power drivers to high power output transistors, including highest power available on the market.
- All Gold Metalization and glass passivation for long term operation.
- Each part functionally tested over the specified frequency band.

	Freq Range (MHz)	Pout Min (W)	Pin Max (W)	Gain Typ (dB)	$\eta$ typ (%)	Vcc (V)	Cob Typ (pF)	VSWR load	$\theta_{jc}$ ( $^{\circ}$ C/W)	Case Style	Part Number
1000 - 1400 MHz, 28V, Class C, Common Base	1000 - 1400	6.0	1.2	7.0	40	28	6.5	9:1	9.0	55LV-1	1014-6A
	1000 - 1400	12.0	2.5	7.3	40	28	12.0	30:1	4.5	55LT-1	1014-12
1600 - 2000 MHz, Class C, Common Base	1600 - 1800	35.0	7.0	7.5	40	28	--	10:1	1.3	55AW-1	1618-35
	1700 - 1800	32.0	7.0	7.0	40	24	--	3:1	1.5	55AW-1	1718-32L
	1700 - 1900	20.0	5.0	6.5	38	28	--	4:1	2.6	55AW-1	1719-20
	1725 - 1850	35.0	6.23	8.0	50	28	--	4.5:1	1.8	55AR-1	1719-35
	1850 - 1950	35.0	7.0	7.5	40	28	--	3:1	1.3	55AW-1	1819-35
2000 - 2400 MHz, Class C, Common Base	2000 - 2100	25.0	5.0	7.5	50	24	--	3:1	3.0	55AW-1	2021-25
	2100 - 2400	12.0	2.25	7.5	42	22	--	9:1	4.0	55AW-1	2124-12L
	2200 - 2300	1.7	0.25	8.5	35	22	--	10:1	24.0	55LV-1	2223-1.7
	2200 - 2300	18.0	4.0	6.5	40	24	--	--	3.0	M214	AM82223-018
	2200 - 2400	6.0	1.2	7.0	40	22	--	10:1	8.0	55LV-1	2224-6L
	2200 - 2500	3.5	0.5	8.5	40	24	7.0	10:1	17.0	55LV-1	2225-4L
	2300 - 2400	12.0	2.5	7.5	40	20	--	10:1	4.0	55AW-1	2324-12L
	2300 - 2400	20.0	4.0	7.5	40	24	--	10:1	3.0	55AW-1	2324-20
	2300 - 2400	25.0	5.0	7.0	35	24	--	3:1	2.5	55AT-1	2324-25
2400 - 2470	25.0	4.4	7.5	49	24	--	3:1	2.5	55AP-1	2425-25	

## GENERAL PURPOSE & SMALL SIGNAL



**POWER DEVICES:** Transistors for common emitter class A, B, and C operation up to 1 GHz. Devices with  $P_{GAIN} > 8\text{dB}$ ,  $P_{OUT}$  up to 4 W with  $V_{CC}$  of 7.5 and 12 VDC for hand held and mobile predriver amplifier applications. Package styles include thru-hole metal cans, plastic Macro, and SO-8. End use examples include PA stage for hand-held radios, low power amplifier stages to drive high power amplifiers (HPA).

**SMALL SIGNAL:** Transistors for common emitter class A operation up to 1 GHz. Devices with  $G_{max} > 10\text{dB}$ ,  $NF < 2.5\text{dB}$  with  $V_{CC}$  of 5, 7.5, 10, 12 and 15 VDC for hand held and mobile applications. Use includes gain blocks, low noise amplifiers, and oscillators. Package styles include thru-hole metal cans, plastic Macro, SO-8, SOT-23, and SOT-143. End use examples include land/mobile and FRS radios (receivers and synthesizers), "invisible fence" radio dog collars, wireless alarms, and keyless entry.

POWER DEVICES  
Up to 1 GHz, Class A, B, and C  
Common Emitter

Freq (MHz)	Supply (V)	Pout (W)	Gain (dB)	Case Style	Packing	Part Number
175	12.5	1	10	TO-39	500 Units Bulk	2N4427
175	12.5	1	17	SO-8	500 Units Bulk	SRF4427
175	12.5	1.5	11.5	Pwr Macro	500 Units Bulk	MRF553
175	12.5	1.75	11.5	TO-39	500 Units Bulk	MRF607
175	12.5	3	7.8	TO-39	500 Units Bulk	2N6255
175	12.5	4	12	TO-39	500 Units Bulk	SD1127
400	28.0	1	10	TO-39	500 Units Bulk	2N3866
400	28.0	1	10	TO-39	500 Units Bulk	2N3866A
400	28.0	1	10	SO-8	500 Units Bulk	MRF3866
470	12.5	1.5	11	Pwr Macro	500 Units Bulk	MRF555
470	12.5	3	10	TO-39	500 Units Bulk	MS1649
470	12.5	2	8	TO-39	500 Units Bulk	SD1444
870	12.5	0.75	8	SO-8	500 Units Bulk	MRF8372
870	12.5	0.75	8	Pwr Macro	500 Units Bulk	MRF837
870	12.5	1.5	8	Pwr Macro	500 Units Bulk	MRF557

SMALL SIGNAL,  
Up to 1 GHz, Class A  
Common Emitter

Freq (MHz)	Ftau (MHz)	GNF (dB)	VCE (V)	Ic (mA)	NF min (dB)	Case Style	Part Number
100	1500	20	6	5	4.5	TO-72	2N5179
200	1200	12	15	50	--	TO-39	2N5109
200	1300	18	12	50	--	SO-8	MRF4427
200	1400	-	6	1.5	4.5	SOT-23	MMBR5179LT1
250	1400	13.5	25	50	--	TO-39	MRF545
250	1500	13.5	25	50	--	TO-39	MRF544
300	1000	15	15	35	5.5	TO-39	MRF5943C
300	1300	15	15	35	3.4	SO-8	MRF5943
300	3000	12	15	40	--	TO-39	MRF586
300	3000	10	15	60	2.5	TO-39	MRF517
400	1200	12	6	1	--	TO-72	2N5031
500	1300	20	5	25	2.5	TO-72	BFY90
500	1400	14	10	14	5	TO-72	2N6304
500	1600	13	10	12	5.5	TO-72	2N2857
500	4500	-	1.5	3.0	3.0	SOT-23	BFR92ALTI
500	4500	15	10	15	2.5	TO-72	MRF914
500	5000	14.5	10	50	2.0	Macro T	BFR96
500	5000	15.5	12	50	2.5	Macro X	MRF581
500	5000	15.5	12	50	2.5	Macro X	MRF581A
500	5000	15.5	12	50	2.0	SO-8	MRF5812
500	5000	16	5	30	1.9	Macro T	BFR91
500	5000	18	5	14	2.5	Macro T	BFR90
1000	4000	7	10	15	1.5	TO-72	MRF904
1000	6000	11	10	10	2.9	SOT-23	MMBR911LT1

## LINEAR - CLASS A

- Class A driver transistors for applications ranging from 1 MHz to 2.3 GHz power levels from 0.25 Watts to 20 Watts
- All transistors utilize emitter ballasting and are tested under the full bias conditions for linearity, power gain and load mismatch tolerance.
- Many devices are in solder sealed packages for use in applications requiring high reliability

	Freq Range (MHz)	Pout Min (W)	Pin Max (W)	Gain Typ (dB)	Vcc (V)	Icq (A)	Cob Typ (pF)	VSWR load	$\theta_{jc}$ ( $^{\circ}$ C/W)	Case Style	Part Number
10-500 MHz, Class A, Common Emitter	1-500	0.5	.02	12	12.5	.25	-	30:1	33	55AZ-2	MPA201
500-1000 MHz, Class A, Common Emitter	1000	0.5	.08	9.0	20	.14	2.0	30:1	33	55ET-2	1A5
	1000	1.5	0.20	9.5	20	.22	3.8	30:1	29	55FT-2	10A015
	1000	3.0	0.50	9.0	20	.44	7.3	30:1	12.5	55FT-2	10A030
	1000	6.0	0.95	8.5	20	.88	10.8	10:1	8.3	55FT-2	10A060
500-1000 MHz, Class A, Common Emitter, Internal Prematch	1000	5.0	0.5	10.0	20	1.0	16.0	30:1	7.0	55CT-2	10AM05
	1000	20	3.0	8.0	20	2.8	40	30:1	1.5	55AT-2	10AM20
1.0-2.0 GHz, Class A, Common Emitter - (Operational from DC to 2.0 GHz)	2000	0.11	0.012	9.0	18	.05	2.5	20:1	45	S011	MSC80064
	2000	0.5	0.10	7.0	20	.14	2.0	30:1	33	55ET-2	2A5
	2000	0.8	0.15	7.0	20	.18	2.0	30:1	33	55EU-2	2A8
	2000	1.0	0.20	7.0	18	.22	5.0	15:1	17	M210	MS3011
2.0-2.3 GHz, Class A, Common Emitter - (Operational from DC to 2.3 GHz)	2300	0.3	0.03	10.0	15	.10	2.5	9:1	45	55BT-2	23A003
	2300	0.5	0.07	9.5	20	.12	2.4	30:1	35	55BT-2	23A005
	2300	0.8	0.14	9.5	20	.14	3.0	10:1	35	55BT-2	23A008
	2300	1.7	0.34	7.6	20	.27	4.8	30:1	16	55BT-2	23A017
	2300	2.5	0.60	6.5	20	.42	6.5	10:1	11	55BT-2	23A025
	2300	1.0	0.16	10.0	15	.20	3.4	30:1	30	55BT-2	80143

## COMMUNICATIONS LINEAR



- Broadband, High Power Class AB – linear transistor
- Highest power output covering the full range 500 – 1000 MHz.

	Freq Range (MHz)	Pout Min (W)	Pin Max (W)	Gain Typ (dB)	Vcc (V)	Icq (A)	$\eta$ Typ (%)	VSWR Load	$\theta_{jc}$ ( $^{\circ}$ C/W)	Case Style	Part Number
500 - 1000 MHz, Class AB, Common Emitter	1000	50	10	7.0	28	0.1	50	30:1	1.4	55AV-2	0510-50A

## BIAS DEVICES

- Designed for use in the biasing of high power silicon transistors
- Feature excellent thermal tracking to provide the highest performance over the entire operating temperature range.

Bias Current	Resistance (Ohm)	Case Style	Part Number	Bias Current	Resistance (Ohm)	Case Style	Part Number
0.35	1.0	55FV	BYI-1	0.35	1.0	55FU	BYI-1Z
0.35	1.0	55GV	BYI-1F	0.35	1.0	55LU	BYI-1T
TO 0.35	1.0	55GV	Z0-28F				



## HIGH VOLTAGE MOSFETS

### Industrial, Scientific, Medical (ISM) & HF Communications

APT RF Power MOSFETs are optimized for high voltage power applications up to 150 MHz. The die geometry has been optimized for high RF power efficiency and gain.

The special RF Power TO-247 package uses an internal isolation substrate to create a common source configuration. The source is directly connected to the center pin and heatsink tab; no insulator is needed. This provides maximum thermal efficiency without the expense and assembly problems of drain isolation. Symmetric wire bonding schemes inside insure that both pin-out versions of each device are perfect mirror image pairs. This configuration facilitates the layout of push-pull and parallel pairs for circuit board symmetry and separation of input and output sections.

New Packages... The ARF473 and ARF520 are a new series of higher frequency high voltage parts in industry standard Gemini and .5" SOE packages.

Highest Voltage Operation... Historically, all RF Power MOSFETs were operated at supply voltages of 50V or less. This limitation has been removed by combining our high voltage MOSFET technology with RF-specific die geometries. RF amplifier operation is now possible from 50 to 300 volts.

Why Higher Voltage... Higher  $V_{dd}$  means higher load impedance. For 150W output from a 50V supply the load impedance is only 8 ohms. At 125V, the load impedance is 50 ohms. The higher impedance allows simpler transformers and combiners. Paralleled devices can still operate into reasonable and convenient impedances. Increasing the operating voltage also lowers the DC current required for any given power output, reducing the size, weight and cost of other system components.



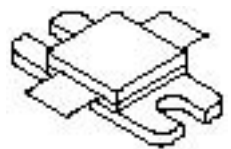
Pout (W)	Freq. (MHz)	$V_{DD}/BV_{DSS}$ (V)	$\theta_{JC}$ ( $^{\circ}C/W$ )	Package Style	Part Number	Class of Operation
85	100	125V/500V	0.76	TO-247CS	ARF449A/B	C-E
100	100	125V/500V	0.70	TO-247CS	ARF463A/B	A-E
115	65	250V/1kV	0.55	TO-247CS	ARF446	C-E
	65	250V/1kV	0.55	TO-247CS	ARF447	C-E
	65	125V/500V	0.55	TO-247CS	ARF448A/B	C-E
125	60	125V/500V	0.50	TO-247CS	ARF460A/B	A-E
	60	250V/1kV	0.50	TO-247CS	ARF461A/B	A-E
	65	300V/1.2kV	0.50	TO-247CS	ARF465A/B	A-E
150	100	125V/500V	0.70	M174	ARF520	A-E
	150	100V/300V	0.70	M174	ARF525	A-E
300	130	125V/500V	0.35	M175	ARF473	A-E
	130	100V/300V	0.35	M175	ARF475	A-E
750	40	125V/500V	0.12	T1	ARF1500	C-E
	40	250V/1kV	0.12	T1	ARF1501	C-E
750	30	300V/1.2kV	0.12	T1	ARF1505	A-E

## Part Number Reference

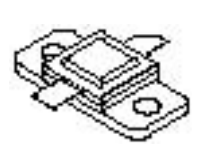
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0105-50	7	2A5	11	MRF544	10	MS1454	8	MS2362	5	SD1536-08	5
0204-125	7	2A8	11	MRF545	10	MS1455	7	MS2393	4	SD4012	7
0510-50A	11	2N2857	10	MRF553	10	MS1480	7	MS2421	5	SRF4427	10
0912-25	5	2N3866	10	MRF553	6	MS1490	7	MS2422	4	SRF4427	6
0912-45	5	2N3866A	10	MRF555	10	MS1501	8	MS2441	5	TAN15	5
0912-7	5	2N4427	10	MRF555	7	MS1502	8	MS2472	5	TAN150	5
10500	4	2N4427	6	MRF557	10	MS1503	7	MS2473	4	TAN250A	5
10502	4	2N5031	10	MRF557	7	MS1504	6	MS2475	4	TAN300	5
1000MP	5	2N5109	10	MRF559	7	MS1505	6	MS2553	5	TAN350	5
1002MP	5	2N5179	10	MRF581	10	MS1506	7	MS2554	5	TAN75A	5
1004MP	5	2N6255	10	MRF5812	10	MS1507	7	MS2557	5	TCS1200	4
1011LD110	4	2N6255	6	MRF581A	10	MS1508	7	MS2575	5	TCS450	4
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1011LD300	4	3001	9	MRF5943	10	MS1511	7	MS3024	9	TCS800	4
1014-12	9	3003	9	MRF5943C	10	MS1512	8	MS3302	9	TPR1000	4
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1015MP	5	80143	11	MRF607	6	MS1533	8	MS652	7	TPR400	4
1035MP	5	AM0608-70	3	MRF837	10	MS1536	7	MS652S	7	TPR500	4
1075MP	5	AM0710-300	3	MRF8372	10	MS1576	8	MSC1015MP	5	TPR500A	4
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1214-30	3	ARF460A/B	12	MS1006	6	MS2091	3	MSC1450M	4	UMIL60	7
1214-300	3	ARF461A/B	12	MS1007	8	MS2092	3	MSC1550M	4	UMIL80	7
1214-300M	3	ARF463A/B	12	MS1008	8	MS2176	3	MSC1600M	4	UTV005	8
1214-32L	3	ARF465A/B	12	MS1009	7	MS2177	3	MSC4000	9	UTV010	8
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1618-35	9	ARF525	12	MS1077	8	MS2203	4	S175-50	6	UTV120	8
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1719-35	9	BFR92ALTI	10	MS1204	7	MS2206	4	SD1013	6	VAM120	7
1819-35	9	BFR96	10	MS1226	6	MS2207	4	SD1013-03	6	VAM40	7
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2010	9	BYI-1Z	11	MS1261	6	MS2211	5	SD1018-06	7	VRF148A	6
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23A017	11	MMBR5179LT1	10	MS1408	6	MS2272	5	SD1485	8		
23A025	11	MMBR911LT1	10	MS1409	6	MS2290	4	SD1496	7		
2425-25	9	MPA201	11	MS1426	7	MS2321	5	SD1511-08	3		
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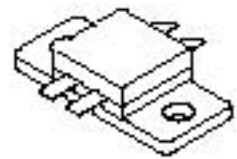
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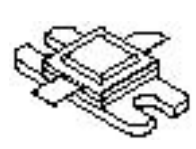
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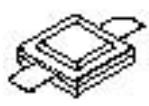
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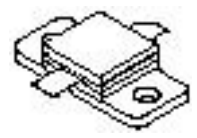
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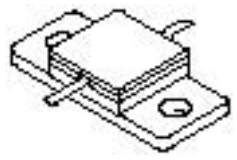
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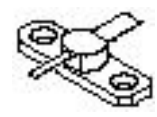
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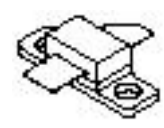
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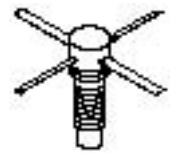
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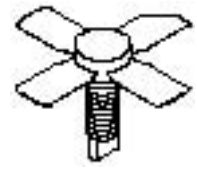
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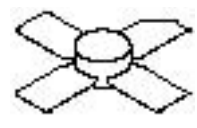
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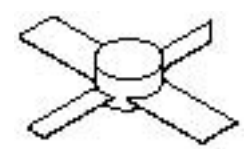
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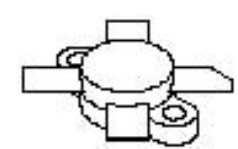
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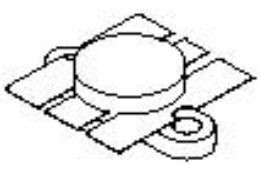
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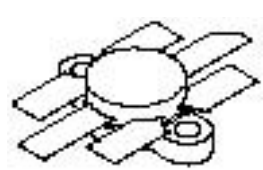
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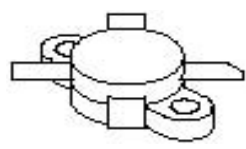
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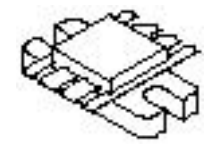
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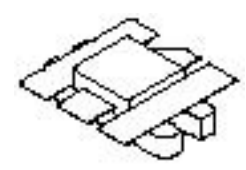
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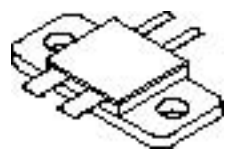
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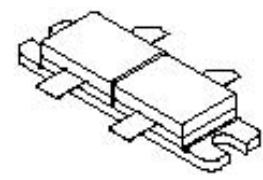
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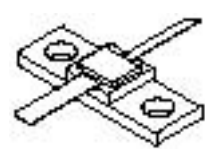
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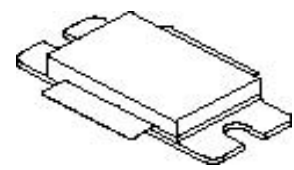
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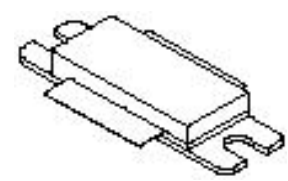
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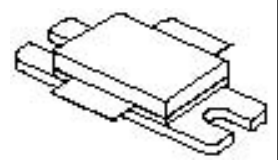
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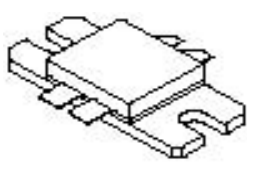
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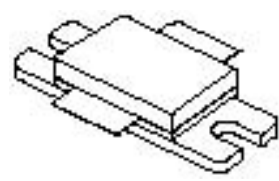
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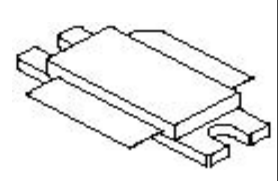
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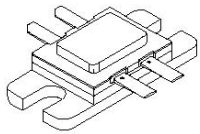


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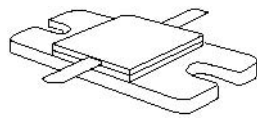


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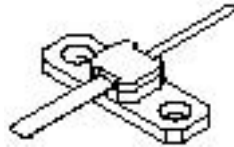




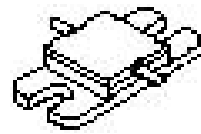
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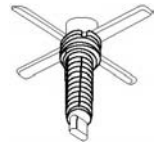
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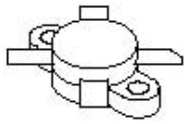
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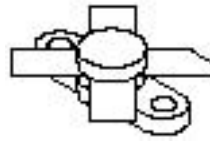
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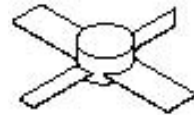
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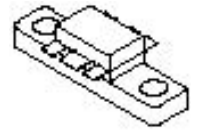
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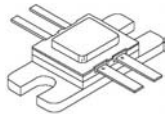
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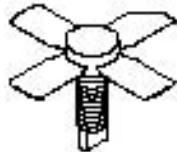
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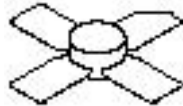
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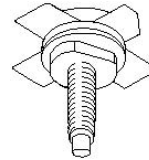
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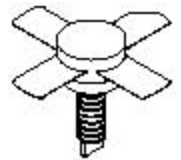
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M123



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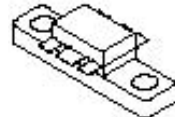
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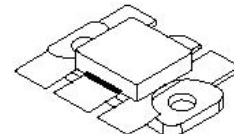
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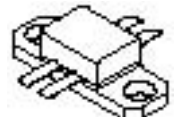
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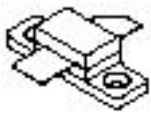
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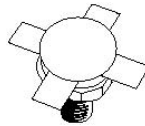
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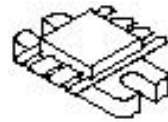
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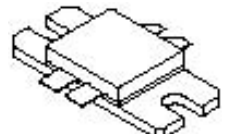
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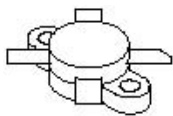
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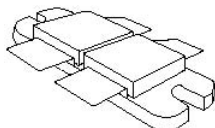
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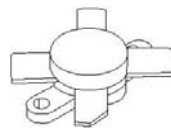
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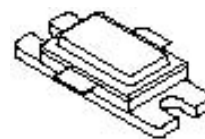
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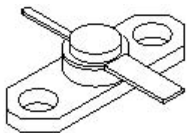
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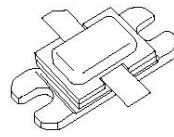
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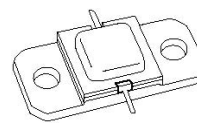
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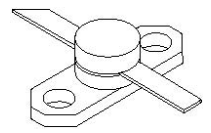
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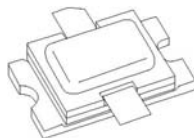
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M220



M222



M226



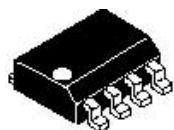
Macro T



Macro X



Power Macro



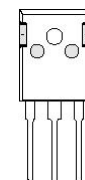
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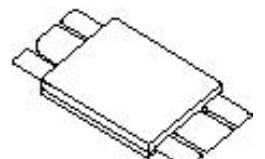
TO-39



TO-72



TO-247



T1



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Fax: (408) 986-8120

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