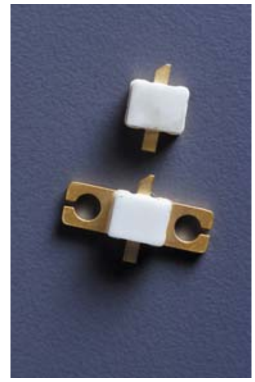
10 W SiC RF Power MESFET

PRELIMINARY

CASE STYLE 001
CRF-22010-001



CASE STYLE 101
CRF-22010-101

Angled lead = Gate
Non-angled lead = Drain
Case/Flange = Source

Features

- 12 dB Small Signal Gain
- 10 W Minimum P_{1dB}
- 48 V Operation
- High Breakdown Voltage
- High Temperature Operation
- Up to 3 GHz Operation
- High Efficiency

Applications

- Class A, AB Amplifiers
- TDMA, EDGE, CDMA, and W-CDMA
- Broadband Amplifiers
- CATV Amplifiers
- MMDS

Description

Cree's CRF-22010 is a silicon carbide (SiC) RF power Metal-Semiconductor Field-Effect Transistor (MESFET). SiC has superior properties compared to silicon or gallium arsenide, including higher breakdown voltage, higher saturated electron drift velocity, and higher thermal conductivity. SiC MESFETs offer greater power density and increased reliability compared to Si and GaAs transistors.

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

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DSS}	120	VDC
Gate-Source Voltage	V_{GS}	-25, +3	VDC
Total Device Dissipation	P_D	62.5	W
Storage Temperature	T_{STG}	-40, 150	°C
Operating Junction Temperature	T_J	250	°C
Thermal Resistance, Junction to Case	$R_{\theta JC}$	3.6	°C/W
Soldering Temperature	T_S	250	°C

Electrical Characteristics (T_C = 25°C)

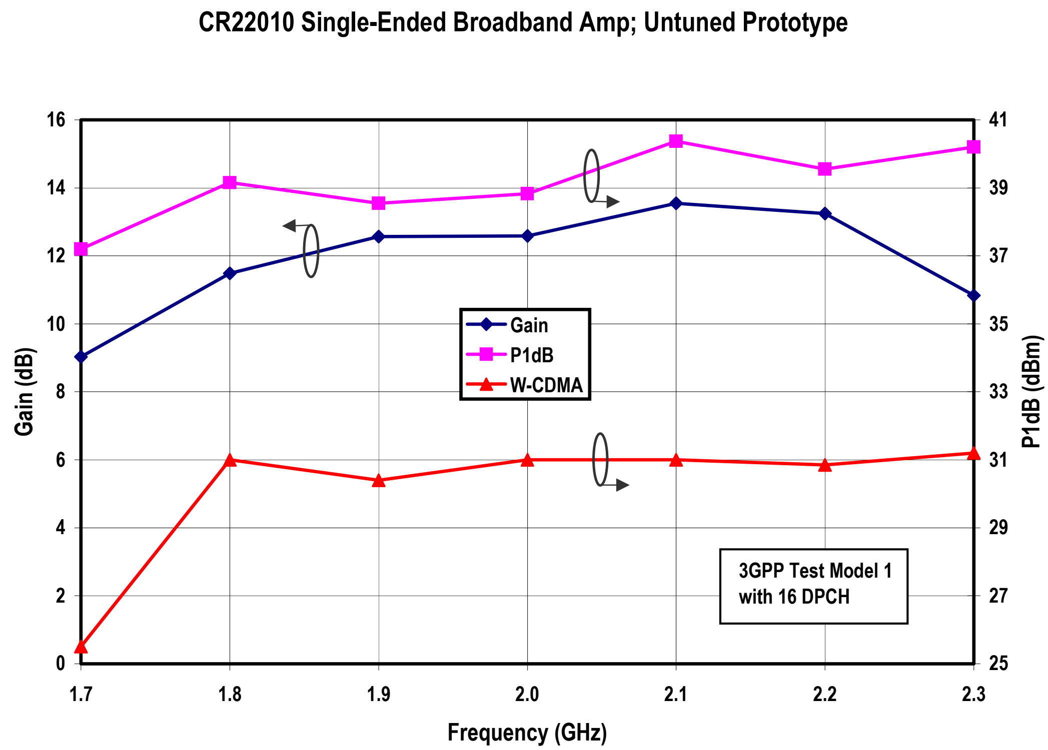
Characteristic	Symbol	Min	Typ	Max	Units	Conditions
DC CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(th)}$	-12	-10	-	VDC	V_{DS} = 10 V, I_D = 0.5 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	-	-6	-	VDC	V_{DS} = 48 V, I_D = 500 mA
Zero Gate Voltage Drain Current	I_{DSS}	1.1	1.5	1.8	A	V_{DS} = 10 V, V_{GS} = 0 V
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	100	110	120	VDC	V_{GS} = -26 V, I_D = 3 mA
Forward Transconductance	g_m	-	150	-	mS	V_{DS} = 48 V, I_D = 500 mA
Case Operating Temperature	T_C	-30	-	120	°C	
Screw Torque (101 Style Package)	T	0.33	-	0.37	ft·lb	
RF CHARACTERISTICS						
Gain	G_{SS}	10	12	-	dB	V_{DD} = 48 V, I_{DQ} = 500 mA, f = 2000 MHz
Power Output at 1 dB Compression	P_{1dB}	10	12	-	W	V_{DD} = 48 V, I_{DQ} = 500 mA, f = 2000 MHz
Drain Efficiency[1, 2]	η	40	45	-	%	V_{DD} = 48 V, I_{DQ} = 500 mA, f = 2000 MHz, P_{OUT} = P_{1dB}
Intermodulation Distortion	IMD_3	-	-30	-	dBc	V_{DD} = 48 V, I_{DQ} = 500 mA, f_1 = 2000.0 MHz, f_2 = 2000.1 MHz, P_{OUT} = 10 W PEP

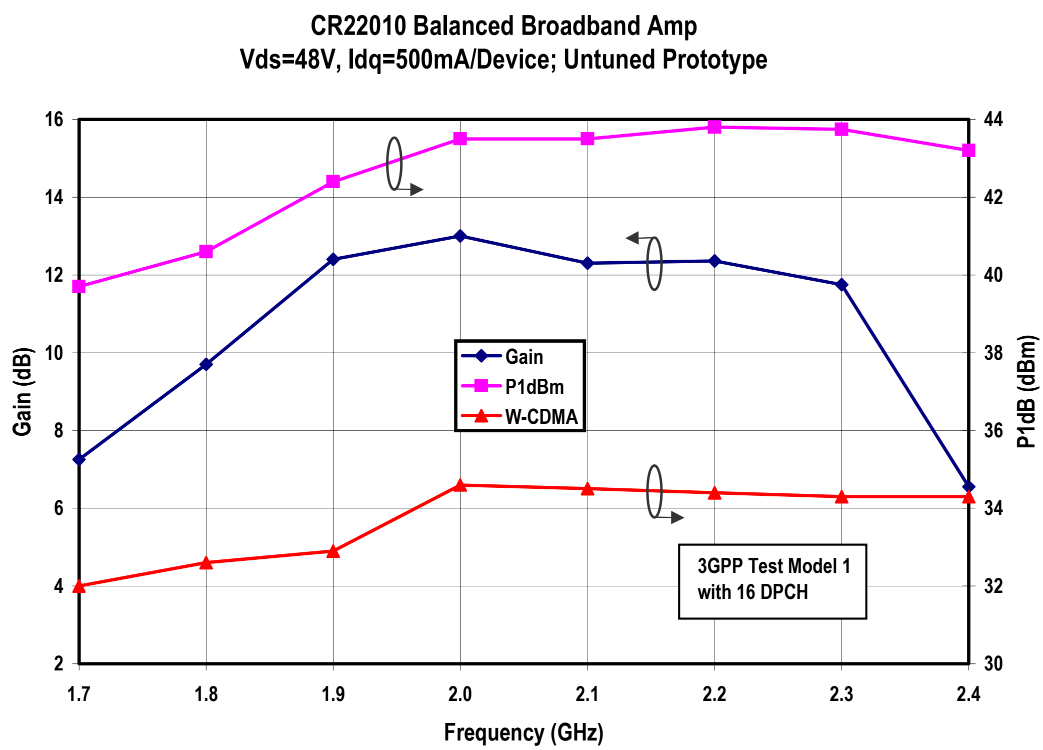
Notes:

[1] Drain Efficiency = P_{OUT}/P_{DC}

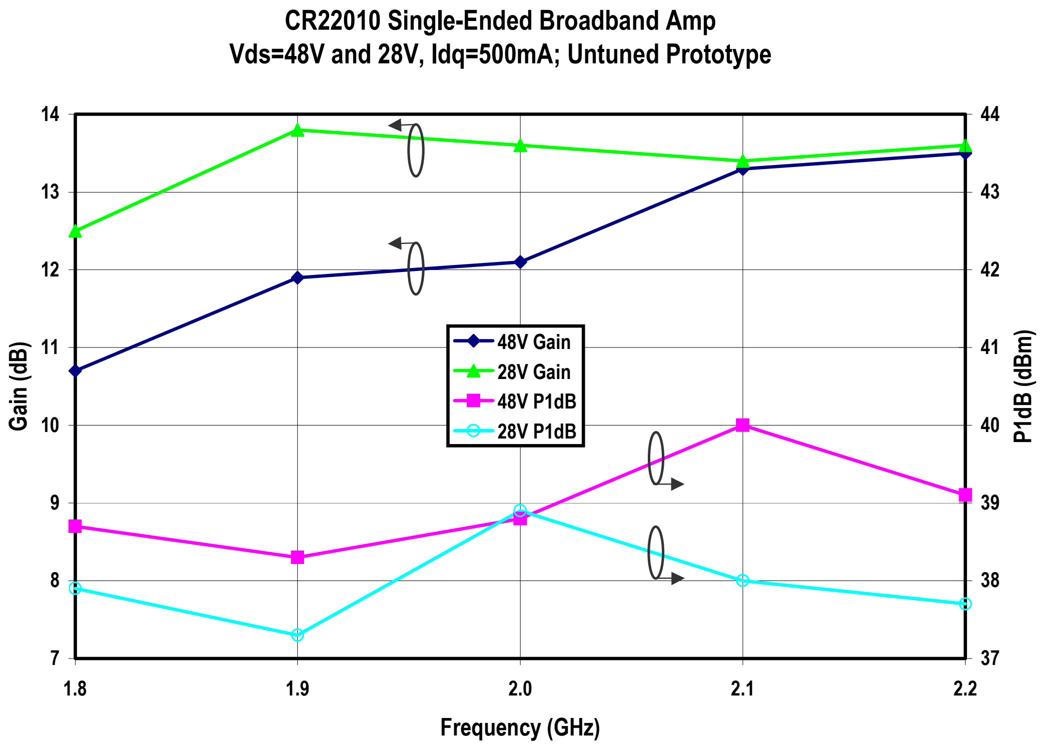
[2] Power Added Efficiency (PAE) = $(P_{OUT} - P_{IN})/P_{DC}$

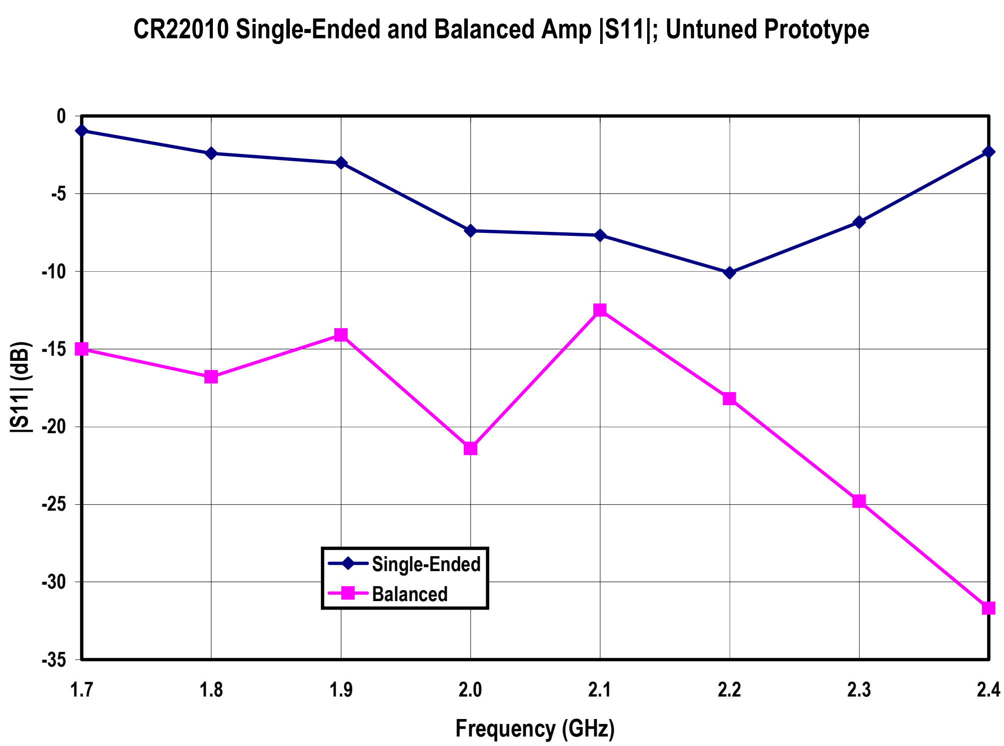
Typical Broadband Performance (T_C = 25°C, V_{DS} = 48 V, I_{DQ} = 500 mA)





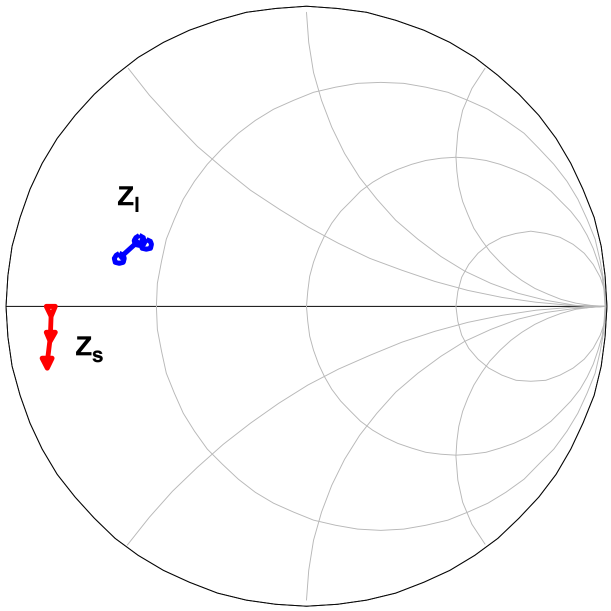
Typical Broadband Performance (T_C = 25°C, V_{DS} = 48 V, I_{DQ} = 500 mA)

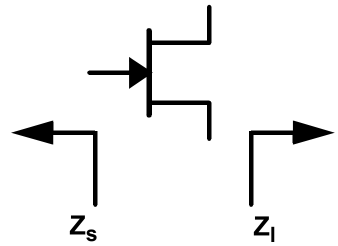




Typical Scattering Parameters (Small Signal Class A, V_{DS}=48 V, I_{DQ} = 500 mA, ang in deg)

freq	S(1,1)	S(1,2)	S(2,1)	S(2,2)
100.0MHz	0.992 / -24.815	0.022 / 75.220	8.534 / 164.613	0.222 / -38.721
200.0MHz	0.972 / -47.553	0.041 / 61.737	7.928 / 150.522	0.260 / -68.263
300.0MHz	0.948 / -67.048	0.056 / 50.220	7.153 / 138.396	0.299 / -88.841
400.0MHz	0.925 / -83.140	0.066 / 40.689	6.372 / 128.258	0.332 / -103.288
500.0MHz	0.907 / -96.226	0.074 / 32.845	5.664 / 119.807	0.357 / -113.709
600.0MHz	0.893 / -106.865	0.079 / 26.326	5.053 / 112.682	0.376 / -121.434
700.0MHz	0.882 / -115.585	0.082 / 20.818	4.535 / 106.568	0.391 / -127.302
800.0MHz	0.874 / -122.815	0.085 / 16.078	4.099 / 101.223	0.403 / -131.859
900.0MHz	0.868 / -128.889	0.087 / 11.925	3.730 / 96.466	0.413 / -135.472
1.000GHz	0.864 / -134.057	0.088 / 8.226	3.416 / 92.163	0.423 / -138.389
1.100GHz	0.860 / -138.512	0.089 / 4.884	3.148 / 88.219	0.431 / -140.787
1.200GHz	0.858 / -142.398	0.090 / 1.826	2.916 / 84.559	0.439 / -142.792
1.300GHz	0.856 / -145.826	0.091 / -1.003	2.714 / 81.130	0.447 / -144.496
1.400GHz	0.854 / -148.880	0.091 / -3.644	2.538 / 77.890	0.454 / -145.970
1.500GHz	0.853 / -151.628	0.091 / -6.129	2.383 / 74.807	0.461 / -147.264
1.600GHz	0.852 / -154.123	0.092 / -8.483	2.245 / 71.857	0.468 / -148.418
1.700GHz	0.852 / -156.406	0.092 / -10.726	2.122 / 69.019	0.475 / -149.464
1.800GHz	0.852 / -158.512	0.092 / -12.874	2.011 / 66.278	0.482 / -150.425
1.900GHz	0.852 / -160.468	0.092 / -14.939	1.912 / 63.621	0.489 / -151.320
2.000GHz	0.852 / -162.297	0.092 / -16.932	1.822 / 61.038	0.495 / -152.164
2.100GHz	0.852 / -164.018	0.092 / -18.863	1.741 / 58.520	0.502 / -152.968
2.200GHz	0.852 / -165.647	0.092 / -20.737	1.667 / 56.060	0.509 / -153.743
2.300GHz	0.853 / -167.196	0.092 / -22.562	1.599 / 53.651	0.515 / -154.496
2.400GHz	0.853 / -168.678	0.092 / -24.342	1.537 / 51.289	0.521 / -155.233
2.500GHz	0.853 / -170.102	0.092 / -26.083	1.480 / 48.968	0.528 / -155.958
2.600GHz	0.854 / -171.477	0.092 / -27.787	1.427 / 46.686	0.534 / -156.675
2.700GHz	0.854 / -172.809	0.092 / -29.460	1.379 / 44.439	0.540 / -157.389
2.800GHz	0.855 / -174.106	0.092 / -31.103	1.334 / 42.223	0.546 / -158.100
2.900GHz	0.855 / -175.372	0.091 / -32.720	1.293 / 40.035	0.552 / -158.811
3.000GHz	0.856 / -176.613	0.091 / -34.313	1.255 / 37.874	0.557 / -159.525
3.100GHz	0.856 / -177.833	0.091 / -35.884	1.219 / 35.738	0.563 / -160.241
3.200GHz	0.857 / -179.037	0.091 / -37.437	1.186 / 33.622	0.568 / -160.962
3.300GHz	0.857 / 179.772	0.091 / -38.972	1.155 / 31.527	0.573 / -161.688
3.400GHz	0.857 / 178.591	0.091 / -40.492	1.127 / 29.450	0.578 / -162.421
3.500GHz	0.858 / 177.416	0.091 / -41.999	1.100 / 27.389	0.583 / -163.160
3.600GHz	0.858 / 176.245	0.091 / -43.494	1.075 / 25.342	0.588 / -163.906
3.700GHz	0.858 / 175.074	0.091 / -44.979	1.052 / 23.309	0.592 / -164.661
3.800GHz	0.859 / 173.902	0.091 / -46.456	1.031 / 21.286	0.597 / -165.424
3.900GHz	0.859 / 172.726	0.092 / -47.927	1.011 / 19.273	0.601 / -166.196
4.000GHz	0.859 / 171.543	0.092 / -49.393	0.993 / 17.267	0.605 / -166.977





Z_s - Input match from gate

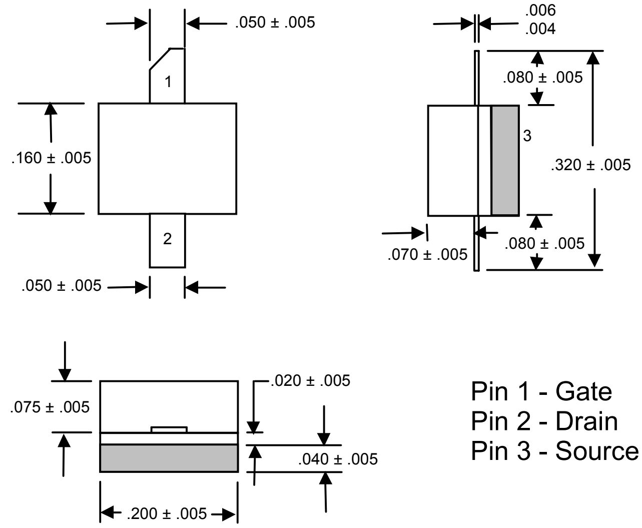
Z_l - Output match from drain

10 W Class A Impedance Data, V_{DS} = 48 V, I_{DQ} = 500 mA, 101 Style Package

Frequency	Z_s (ohms)		Z_l (ohms)	
MHz	R	jX	R	jX
1805	4.0	-0.5	14	8.7
1990	3.8	-3.0	13	9.0
2170	3.1	-5.4	11	6.0

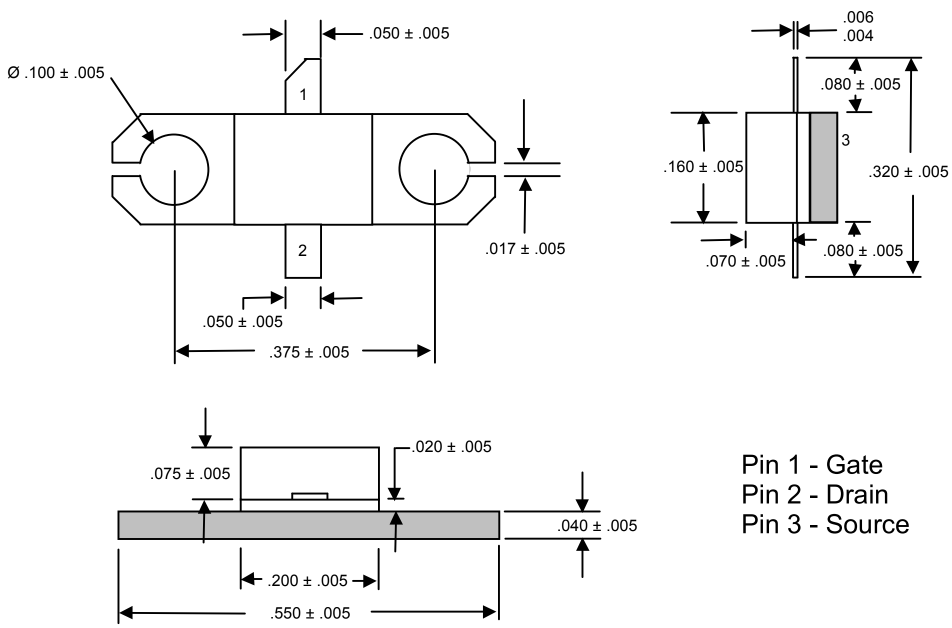
PACKAGE DIMENSIONS (UNITS IN INCHES)

STYLE 001



Pin 1 - Gate
Pin 2 - Drain
Pin 3 - Source

STYLE 101



Pin 1 - Gate
Pin 2 - Drain
Pin 3 - Source

All products conform to the listed mechanical specifications within the tolerances shown.

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