

# The RF Line

## NPN Silicon

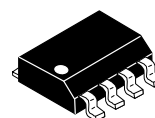
### RF Low Power Transistor

# MRF4427R2

Designed for amplifier, frequency multiplier, or oscillator applications in industrial equipment constructed with surface mount components. Suitable for use as output driver or pre-driver stages in VHF and UHF equipment.

- Low Cost SORF Plastic Surface Mount Package
- Guaranteed RF Specification —  $|S_{21}|^2$
- S-Parameter Characterization
- Low Voltage Version of MRF3866
- Tape and Reel Packaging Available.  
R2 suffix = 2,500 units per reel

1.0 W, 175 MHz  
HIGH-FREQUENCY  
TRANSISTOR  
NPN SILICON



CASE 751-05, STYLE 1  
SORF  
(SO-8)

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	20	Vdc
Collector-Base Voltage	$V_{CBO}$	40	Vdc
Emitter-Base Voltage	$V_{EBO}$	2.0	Vdc
Collector Current — Continuous	$I_C$	400	mAdc
Total Device Dissipation @ $T_C = 75^\circ\text{C}$ Derate above $75^\circ\text{C}$	$P_D$	1.67 22.2	Watts mW/ $^\circ\text{C}$
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	45	$^\circ\text{C/W}$

#### DEVICE MARKING

MRF4427 = 4427

#### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Collector-Emitter Sustaining Voltage ( $I_C = 5.0$ mAdc, $I_B = 0$ )	$V_{(BR)CEO}$	20	—	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 5.0$ mAdc, $R_{BE} = 10$ ohms)	$V_{(BR)CER}$	40	—	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 100$ $\mu$ Adc)	$V_{(BR)EBO}$	2.0	—	—	Vdc
Collector Cutoff Current ( $V_{CE} = 12$ Vdc, $I_B = 0$ )	$I_{CEO}$	—	—	20	$\mu$ Adc

NOTE:

1. Case temperature measured on collector lead immediately adjacent to body of package.

(continued)

**ELECTRICAL CHARACTERISTICS — continued** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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**ON CHARACTERISTICS**

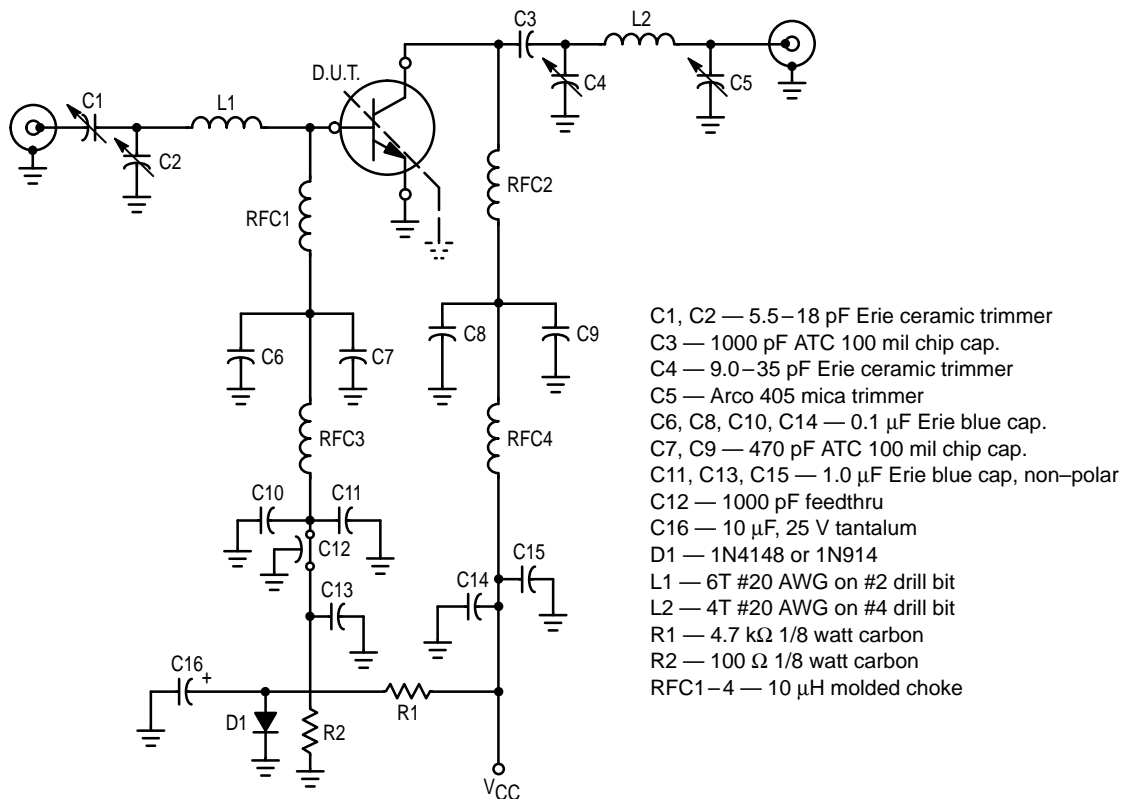
DC Current Gain ( $I_C = 100\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ ) ( $I_C = 360\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ )	$h_{FE}$	10 5.0	50 —	200 —	—
Collector–Emitter Saturation Voltage ( $I_C = 100\text{ mA}$ , $I_B = 20\text{ mA}$ )	$V_{CE(sat)}$	—	60	—	mVdc

**DYNAMIC CHARACTERISTICS**

Current–Gain — Bandwidth Product ( $I_C = 50\text{ mA}$ , $V_{CE} = 12\text{ Vdc}$ , $f = 200\text{ MHz}$ )	$f_T$	—	1600	—	MHz
Output Capacitance ( $V_{CB} = 12\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{ob}$	—	—	3.0	pF

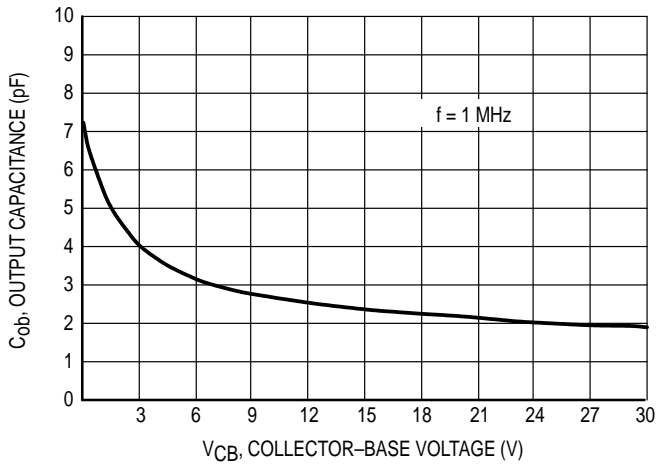
**FUNCTIONAL TESTS**

Common–Emitter Amplifier Power Gain ( $P_{in} = 15\text{ mW}$ , $V_{CC} = 12\text{ Vdc}$ , $f = 175\text{ MHz}$ )	$G_{pe}$	—	18	—	dB
Collector Efficiency (Figure 1) ( $P_{out} = 1.0\text{ W}$ , $V_{CC} = 12\text{ Vdc}$ , $f = 175\text{ MHz}$ )	$\eta$	—	60	—	%
Insertion Gain ( $V_{CE} = 12\text{ Vdc}$ , $I_C = 50\text{ mA}$ , $f = 200\text{ MHz}$ )	$ S_{21} ^2$	14	16.4	—	dB

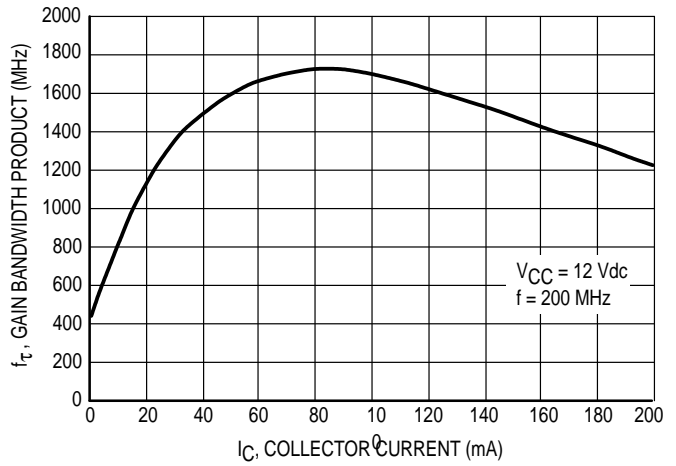


**Figure 1. 175 MHz RF Amplifier Circuit for Functional Tests**

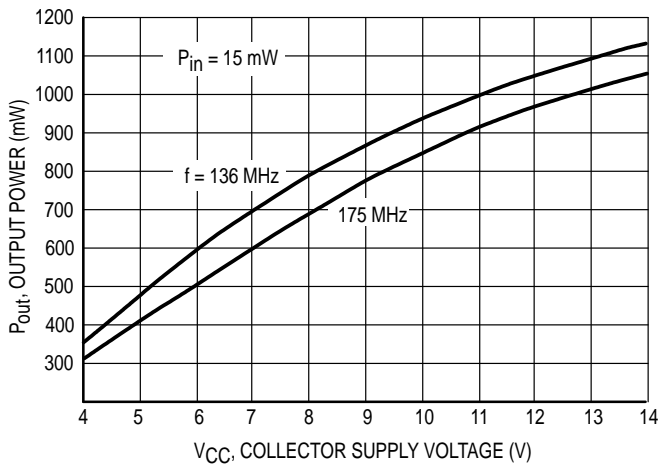
## TYPICAL CHARACTERISTICS



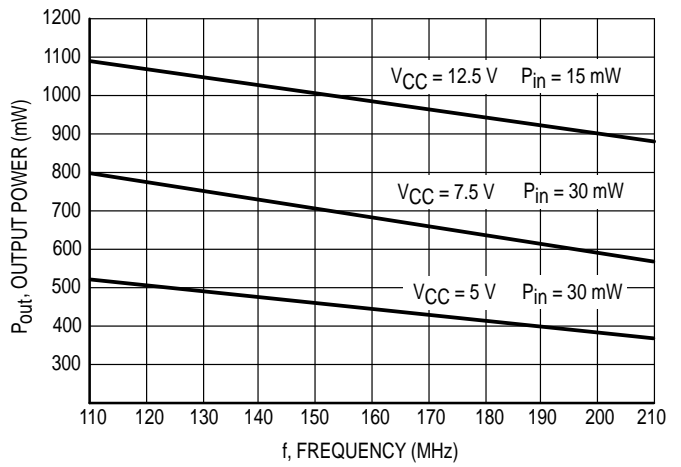
**Figure 2. Collector-Base Capacitance versus Voltage**



**Figure 3. Gain Bandwidth Product versus Collector Current**



**Figure 4. Output Power versus Voltage**



**Figure 5. Output Power versus Frequency**

V <sub>CE</sub> (Volts)	I <sub>C</sub> (mA)	f (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
			S <sub>11</sub>	∠φ	S <sub>21</sub>	∠φ	S <sub>12</sub>	∠φ	S <sub>22</sub>	∠φ
5.0	5.0	50	0.82	-104	10.3	125	0.05	38	0.68	-34
		100	0.83	-141	6.1	103	0.06	26	0.51	-40
		200	0.81	-165	3.2	85	0.07	21	0.44	-46
		500	0.80	169	1.3	57	0.07	32	0.49	-73
		750	0.79	156	0.8	42	0.08	49	0.58	-94
		1000	0.76	144	0.6	30	0.11	61	0.65	-114
	25	50	0.77	-151	19	107	0.02	36	0.35	-75
		100	0.79	-168	9.9	94	0.03	37	0.21	-87
		200	0.79	-180	5.0	82	0.04	49	0.16	-97
		500	0.78	163	2.0	61	0.07	62	0.22	-106
		750	0.77	152	1.3	48	0.10	66	0.31	-115
		1000	0.74	141	0.9	36	0.13	66	0.37	-127
	50	50	0.77	-163	21.1	103	0.02	37	0.29	-98
		100	0.79	-174	10.7	92	0.02	50	0.19	-119
		200	0.79	177	5.4	82	0.03	62	0.16	-134
		500	0.78	162	2.2	62	0.07	67	0.20	-131
		750	0.77	151	1.4	50	0.10	69	0.26	-130
		1000	0.74	140	1.1	38	0.13	67	0.32	-139
12	5.0	50	0.83	-97	11	129	0.04	46	0.75	-26
		100	0.82	-135	6.8	107	0.05	29	0.61	-29
		200	0.81	-162	3.6	88	0.05	24	0.54	-34
		500	0.79	171	1.4	60	0.06	37	0.47	-57
		750	0.78	157	0.9	44	0.07	55	0.64	-76
		1000	0.75	145	0.7	32	0.09	68	0.70	-95
	25	50	0.73	-143	22.1	111	0.02	38	0.43	-52
		100	0.76	-164	11.7	96	0.02	39	0.29	-52
		200	0.77	-177	6.0	84	0.03	48	0.22	-53
		500	0.76	165	2.4	63	0.06	64	0.27	-69
		750	0.75	154	1.6	49	0.08	67	0.35	-84
		1000	0.72	143	1.1	38	0.11	69	0.42	-98
	50	50	0.73	-156	25.5	106	0.02	41	0.32	-67
		100	0.75	-171	13.1	94	0.02	49	0.20	-69
		200	0.76	59	6.6	83	0.03	60	0.15	-71
		500	0.75	164	2.6	64	0.06	69	0.20	-81
		750	0.74	153	1.7	51	0.09	70	0.27	-92
		1000	0.71	142	1.2	38	0.12	70	0.34	-104

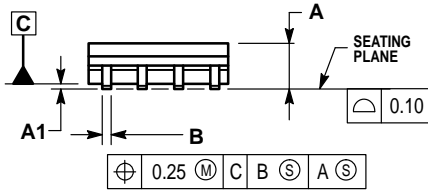
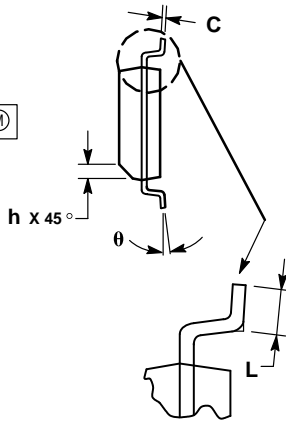
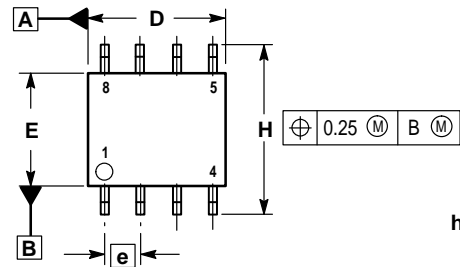
Table 1. Common Emitter S-Parameters

Freq. (MHz)	P <sub>in</sub> (mW)	P <sub>out</sub> (mW)	V <sub>CC</sub> (Volts)	Z <sub>in</sub> (Ohms)	Z <sub>OL</sub> * (Ohms)
136	15	—	12.5	6.2 - j11.6	—
175	15	—	12.5	4.6 - j10.4	—
136	—	1000	12.5	—	47.7 + j41.7
175	—	1000	12.5	—	47.4 - j34.4
136	30	—	7.5	5.65 - j12.6	—
175	30	—	7.5	6.25 - j12.2	—
136	—	650	7.5	—	27.6 - j32.4
175	—	650	7.5	—	27.9 - j27.6
136	30	—	5.0	6.1 - j13.3	—
175	30	—	5.0	5.9 - j12.22	—
136	—	450	5.0	—	24.8 - j22.8
175	—	450	5.0	—	28.3 - j29.3

Z<sub>OL</sub>\* = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.

Table 2. Series Input/Output Impedances

# PACKAGE DIMENSIONS




**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE MOLD PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
B	0.35	0.49
C	0.18	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.25
θ	0°	7°

- STYLE 1:
- PIN 1. EMITTER
  2. COLLECTOR
  3. COLLECTOR
  4. EMITTER
  5. EMITTER
  6. BASE
  7. BASE
  8. EMITTER

**CASE 751-05  
ISSUE S**

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