

RF Power FETs

N-Channel Enhancement-Mode



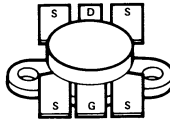
175 MHz 80W
28-35V 10dB

Other Devices in Series:
DV2805, DV2810, DV2820, DV2840, DV28120

FEATURES

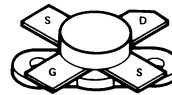
- Infinite VSWR
- No Thermal Runaway
- Broadband Capability
- Class A, B, C, D, E
- Low Noise Figure
- High Dynamic Range
- Simple Bias Circuitry
- S-Parameter Design

Package Type T



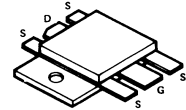
.500 J0 Flange

Package Type U



.500 SOE Flange

Package Type W



C-220

See Last Page For Dimensions

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Gate-Source Voltage	40V	Total Device Dissipation	160 W
Drain-Source Voltage	80V	Thermal Resistance, Junction to Case . .	1.1°C/W
Drain-Gate Voltage	80V	Junction Temperature	200°C
Drain Current (DC)	8 A	Storage Temperature	-65°C to 150°C

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

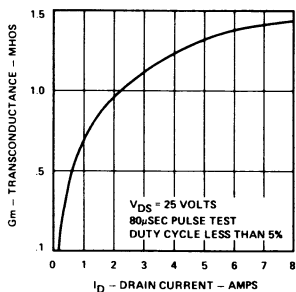
Symbol	Characteristics	Min	Typ	Max	Unit	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage	80			V	$V_{GS} = 0V, I_D = 20\text{ mA}$
I_{DSS}	Drain-Source Leakage Current			4	mA	$V_{GS} = 0V, V_{DS} = 30V$
I_{GSS}	Gate-Source Leakage Current			100	nA	$V_{GS} = 40V, V_{DS} = 0V$
g_m	D.C. Forward Transconductance	0.8	1.1		Mho	$V_{DS} = 10V, I_D = 4A, \Delta V_{GS} = 1.0V$
$I_{D(on)}$	On-State Drain Current		7		A	$V_{DS} = 30V, V_{GS} = 10V$
$V_{GS(th)}$	Gate Threshold Voltage	2		6	V	$V_{GS} = V_{DS}, I_D = 400\text{ mA}$
C_{iss}	Common-Source Input Capacitance			210	pF	$V_{GS} = 0V, V_{DS} = 30V, f = 1.0\text{ MHz}$
C_{oss}	Common-Source Output Capacitance			175	pF	$V_{GS} = 0V, V_{DS} = 30V, f = 1.0\text{ MHz}$
C_{rss}	Reverse Transfer Capacitance			25	pF	$V_{GS} = 0V, V_{DS} = 30V, f = 1.0\text{ MHz}$
G_{ps}	Common-Source Power Gain	10			dB	$V_{DD} = 28V, P_o = 80W, f = 175\text{ MHz}, I_{DQ} = 0.4A$
η	Drain Efficiency		65		%	$V_{DD} = 28V, P_o = 80W, f = 175\text{ MHz}, I_{DQ} = 0.4A$
VSWR	Load Mismatch Tolerance	30:1				$V_{DD} = 28V, P_o = 80W, f = 175\text{ MHz}, I_{DQ} = 0.4A$
N.F.	Noise Figure		4.0		dB	$V_{DS} = 28V, I_D = 0.4A, f = 175\text{ MHz}$

TYPICAL PERFORMANCE CURVES (25°C unless otherwise noted)

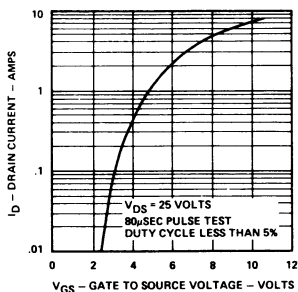


DV2880T DV2880U DV2880W

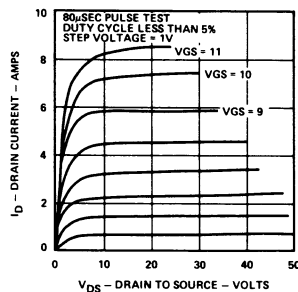
Transconductance vs Drain Current



Transfer Characteristics



Output Characteristics



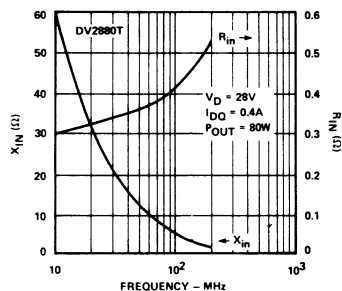
SMALL SIGNAL 2-PORT PARAMETERS

2-PORT Y-PARAMETER MATRIX IN MILLIHOS

Freq (MHz)	Y ₁₁		Y ₂₁		Y ₁₂		Y ₂₂	
	(Real)	(Imag)	(Real)	(Imag)	(Real)	(Imag)	(Real)	(Imag)
10	0	10.5	886	-47.6	0	-1.03	4.42	8.34
20	0.897	21.3	881	-37.5	0	-2.05	5.31	15.9
50	6.52	58.3	902	-106	.5	-5.65	7.61	42.5
100	20.1	128	1060	-294	2.13	-11.9	11.0	89.3
150	57.0	207	1220	-565	6.63	-19.8	21.4	134
200	125	322	1450	-964	12.8	-33.4	23.1	191
250	241	340	1230	-1.61	32.5	-48.7	14.9	226
300	520	219	215.5	-2.4	33.6	-96.9	-76.3	371
350	565	124	-243.2	-2.02	43.5	-123	-66.1	417
400	574	4.06	-695.7	-1.72	37.1	-166	-59.3	551
450	509	-35.6	-812.7	-1.35	30.2	-198	-17.0	644
500	477	-11.6	-800.4	-1.27	43.7	-258	-13.8	749

Condition: 28 V, 1.6 A

Equivalent Large Signal Series Input Impedance vs Frequency

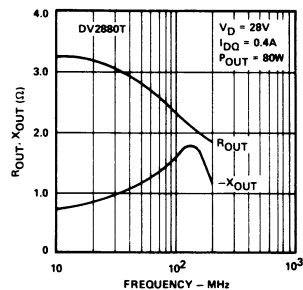


POLAR S-PARAMETERS IN 50.0 OHM SYSTEM

Freq (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	(Magn)	(Angr)	(Magn)	(Angr)	(Magn)	(Angr)	(Magn)	(Angr)
10	.798	-134°	25.1	106°	.00	18.4°	.691	-141°
20	.819	-154°	13.1	91.8°	.03	6.42°	.819	-157°
50	.839	-168°	4.51	71.8°	.03	-6.34°	.766	-166°
100	.884	-173°	1.95	51.1°	.02	-13.2°	.835	-169°
150	.921	-175°	1.04	40.4°	.016	-6.22°	.888	-172°
200	.943	-177°	.629	34.2°	.013	-1.27°	.917	-174°
250	.953	-179°	.436	28.3°	.013	24.5°	.939	-175°
300	.959	178°	.309	26.4°	.013	40.4°	.950	-176°
350	.962	178°	.234	24.4°	.015	50.7°	.954	-176°
400	.966	177°	.187	24.3°	.017	58.8°	.957	-177°
450	.963	176°	.157	25.9°	.020	65.5°	.958	-178°
500	.966	176°	.138	27.2°	.029	69.0°	.962	-178°

Condition: 28 V, 1.6 A

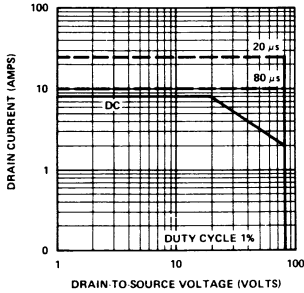
Equivalent Large Signal Series Output Impedance vs Frequency



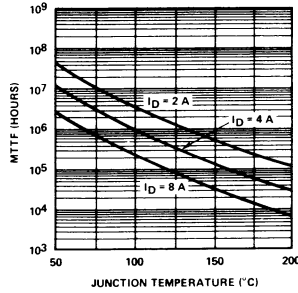
2

TYPICAL PERFORMANCE CURVES—CONTINUED (25° C unless otherwise noted)

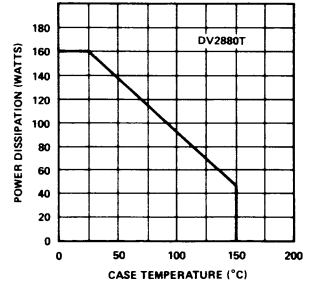
DC and Inductive Safe Operating Region
 $T_C = 25^\circ C$



MTTF vs Temperature

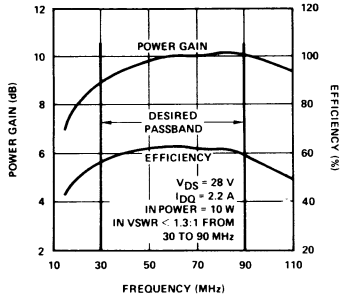


Power Dissipation vs Case Temperature

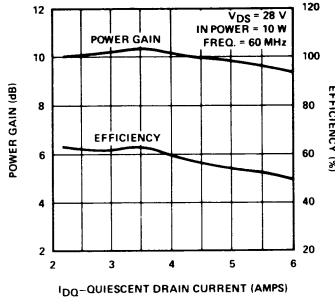


APPLICATIONS AND SYSTEMS DATA

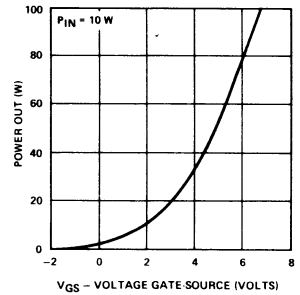
Power Gain and Efficiency vs Frequency



Efficiency vs I_{DQ}



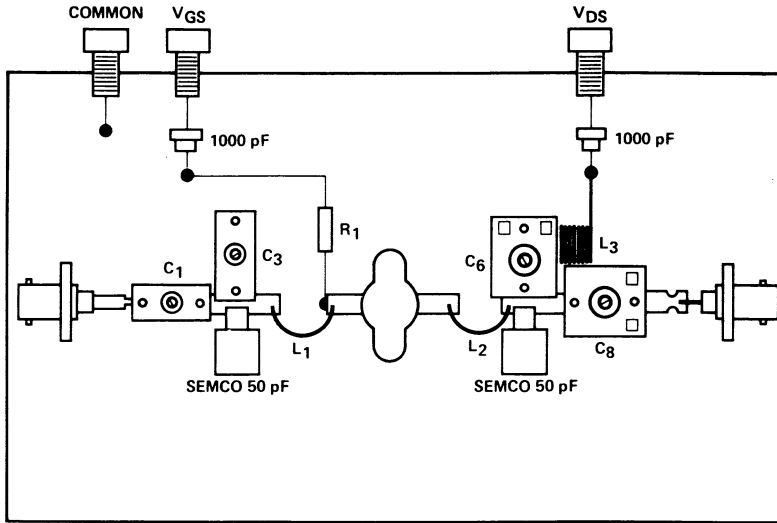
Output Power vs Gate-Source Bias



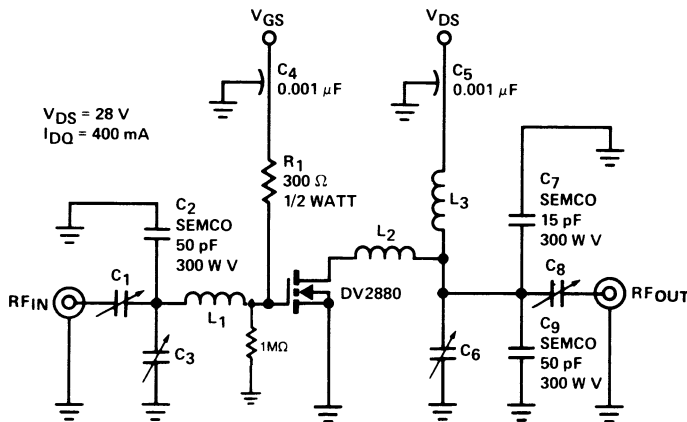
TEST FIXTURE



175 MHz Test Fixture

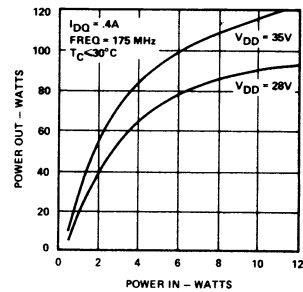


175 MHz DV2880 Schematic Diagram



All DV2880's are Tested in this Test Fixture

DV2880T Typical Output Power vs Input Power



PARTS LIST

- C₁, C₃, 4 to 40 pF ARCO #422 trimmer capacitors
- C₆, C₈, 9 to 180 pF ARCO #463 trimmer capacitors
- L₁, 1 3/16" length of #12 AWG (loop 1/2")
- L₂, 1" length of #12 AWG (loop 0.4")
- L₃, 8 turns #18 AWG enamel of 1/4" diameter, close wound
- R₁, 300 Ω 1/2 watt

DV2880T DV2880U DV2880W

RF Power FETs



Preliminary

**n-channel enhancement-mode
RF VMOS power FET
designed for...**

**Push-Pull
175 MHz 80W
28-35V 10dB**

**HF/VHF/UHF Amplifiers
Class A, B, or C**

High Dynamic Range Amplifier

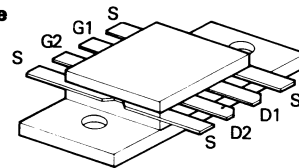
Benefits

**No Thermal Runaway
Withstands Infinite VSWR
Class A, B, or C Operation
Low Noise Figure
High Dynamic Range
Simple Bias Circuitry**

ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Source Voltage	40 V
Drain-Source Voltage	80 V
Drain-Gate Voltage	80 V
Drain Current	8 A
Total Device Dissipation @ 25° Case	160 W
θ_{jc}	1.1 °C/W
Storage Temperature	-65°C to 150°C
Max Junction Temp.	+200°C

V - Package



PUSH-PULL

Electrical Characteristics (25°C)

SYMBOL	CHARACTERISTIC	MIN	TYP	MAX	UNIT	TEST CONDITIONS
$P_{OUT(1)}$	POWER OUTPUT	80			W	$V_{DD} = 28 \text{ V}$, $I_{DQ} = 0.4 \text{ A}$ $P_{IN} = 8 \text{ W Max}$, $F = 175 \text{ MHz}$
$\eta(1)$	DRAIN EFFICIENCY	60			%	
$g_m(2)$	TRANSCONDUCTANCE		1.0 PARALLEL		Mho	$V_{DS} = 28 \text{ V}$, $I_D = 4 \text{ A}$
C_{oss}	OUTPUT CAPACITY		55 (Per Side)			
C_{rss}	REVERSE TRANSFER CAPACITY		8.0 (Per Side)		pF	$V_{DS} = 28 \text{ V}$, $V_{GS} = 0 \text{ V}$
C_{iss}	INPUT CAPACITY		70 (Per Side)			
NF(3)	SMALL SIGNAL NOISE FIGURE		7.5		dB	$V_{DS} = 28 \text{ V}$ $I_D = 0.4 \text{ A}$ $F = 100 \text{ MHz}$

© Siliconix incorporated

NOTES:

- (1) All devices 100% power tested in Siliconix test fixture No. RF 28175 [PP2].
- (2) Measured under pulsed condition with pulse width 300 μsec > 5% duty cycle.
- (3) Noise figure measured with amplifier source and load power matched at 80 watts output.

RF Power FETs

N-Channel

Enhancement-Mode



DV28120T DV28120U

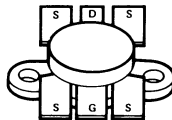
175 MHz **120 W**
20-35 V **10 dB**

Other Devices in Series:
 DV2805, DV2810, DV2820, DV2840, DV2880

FEATURES

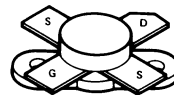
- Infinite VSWR
- No Thermal Runaway
- Broadband Capability
- Class A, B, C, D, E
- Low Noise Figure
- High Dynamic Range
- Simple Bias Circuitry

Package Type T



.500 J0 Flange

Package Type U



.500 SOE Flange

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Gate-Source Voltage	40V	Total Device Dissipation (@ 25°C Case . . .	240W
Drain-Source Voltage	80V	Thermal Resistance,	
Drain-Gate Voltage	80V	Junction to Case	0.73°C/W
Drain Current (DC)	12A	Junction Temperature	200°C
		Storage Temperature	-65°C to 150°C

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

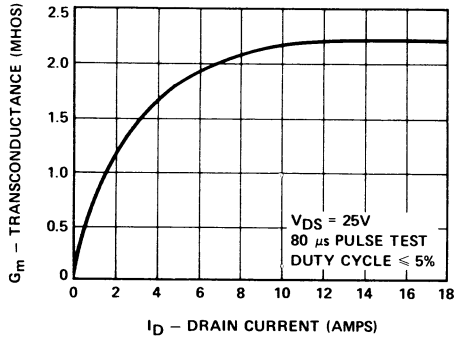
Symbol	Characteristics	Min	Typ	Max	Unit	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage	80			V	$V_{GS} = 0V, I_D = 30\text{ mA}$
I_{DSS}	Drain-Source Leakage Current			6	mA	$V_{GS} = 0V, V_{DS} = 30V$
I_{GSS}	Gate-Source Leakage Current			100	nA	$V_{GS} = 40V, V_{DS} = 0V$
g_m	D.C. Forward Transconductance	1.2	1.8		Mho	$V_{DS} = 10V, I_D = 6A, \Delta V_{GS} = 1.0V$
$I_{D(on)}$	On-State Drain Current		12		A	$V_{DS} = 30V, V_{GS} = 10V$
$V_{GS(th)}$	Gate Threshold Voltage	2		6	V	$V_{GS} = V_{DS}, I_D = 600\text{ mA}$
C_{iss}	Common-Source Input Capacitance			300	pF	$V_{GS} = 0V, V_{DS} = 28V, f = 1.0\text{ MHz}$
C_{oss}	Common-Source Output Capacitance			240	pF	$V_{GS} = 0V, V_{DS} = 28V, f = 1.0\text{ MHz}$
C_{rss}	Reverse Transfer Capacitance			35	pF	$V_{GS} = 0V, V_{DS} = 28V, f = 1.0\text{ MHz}$
G_{ps}	Common-Source Power Gain	28120T	10		dB	$V_{DD} = 28V, P_o = 120W, f = 175\text{ MHz}, I_{DQ} = 0.6A$
		28120U	9.0			
η	Drain Efficiency		65		%	$V_{DD} = 28V, P_o = 120W, f = 175\text{ MHz}, I_{DQ} = 0.6A$
VSWR	Load Mismatch Tolerance	30:1				$V_{DD} = 28V, P_o = 120W, f = 175\text{ MHz}, I_{DQ} = 0.6A$

2

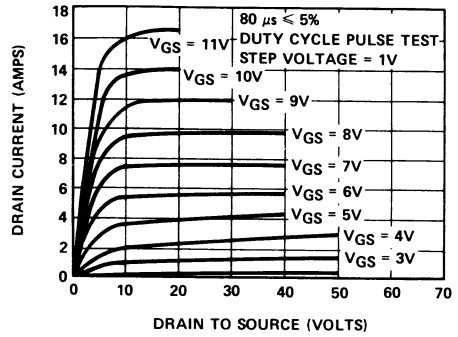
TYPICAL PERFORMANCE CURVES (25° C unless otherwise noted)



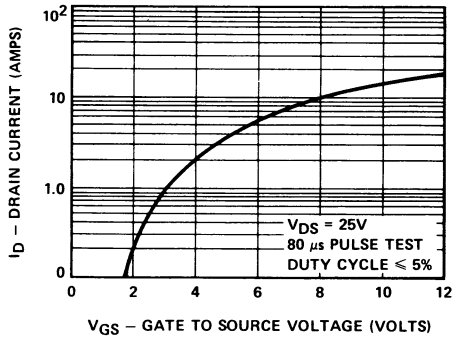
Typical Transconductance vs Drain Current



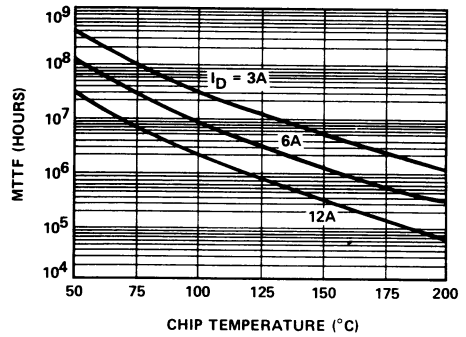
Typical Output Characteristics



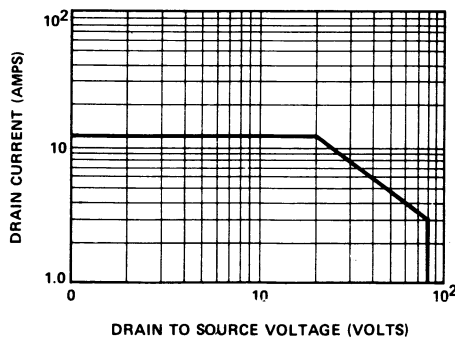
Typical Transfer Characteristics



MTTF vs Chip Temperature



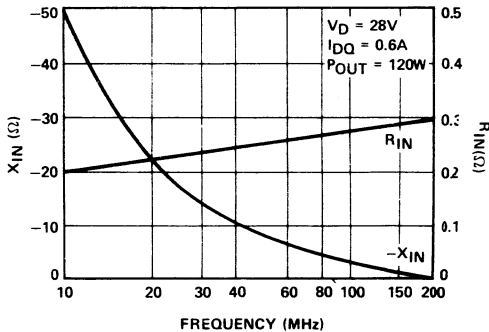
DC Safe Operating Region



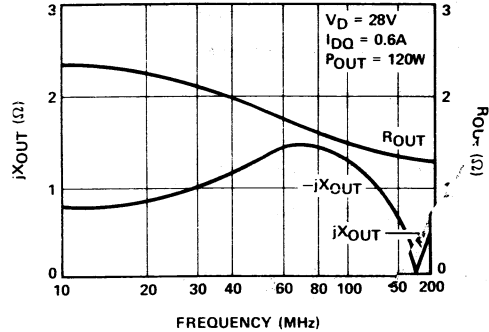


TYPICAL PERFORMANCE CURVES—CONTINUED
(25° C unless otherwise noted)

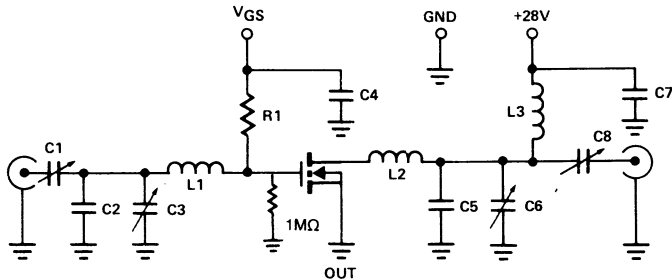
Equivalent Large Signal Series Input Impedance vs Frequency



Equivalent Large Signal Series Output Impedance vs Frequency



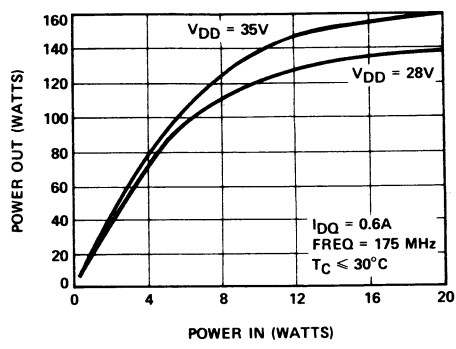
175 MHz RF TEST FIXTURE



PARTS LIST

- C1, C6 5–80 pF (ARCO 462)
- C2, C5 50 pF SEMCO
- C3 4–40 pF (ARCO 422)
- C4, C7 0.01 μF
- C8 9–180 pF (ARCO 463)
- L1 7/8" #12 AWG 0.4" Loop
- L2 7/8" #12 AWG 0.4" Loop
- L3 8 Turns #16 AWG 1/4" 1p
- R1 10K 1/4W

Power Out vs Power In



RF Power FETs



Preliminary

**n-channel enhancement-mode
RF VMOS power FET
designed for...**

**Push-Pull
175 MHz 120W
28-35V 10dB**

**HF/VHF/UHF Amplifiers
Class A, B, or C**

High Dynamic Range Amplifier

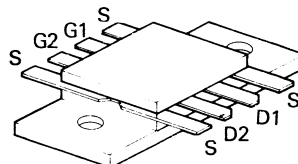
Benefits

- No Thermal Runaway**
- Withstands Infinite VSWR**
- Class A, B, or C Operation**
- Low Noise Figure**
- High Dynamic Range**
- Simple Bias Circuitry**

ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Source Voltage	40 V
Drain-Source Voltage	80 V
Drain-Gate Voltage	80 V
Drain Current	12 A
Total Device Dissipation @ 25° Case	240 W
θ_{jc}	.73° C/W
Storage Temperature	-65°C to 150°C
Max Junction Temp.	+200°C

V - Package



PUSH-PULL

Electrical Characteristics (25°C)

SYMBOL	CHARACTERISTIC	MIN	TYP	MAX	UNIT	TEST CONDITIONS
$P_{OUT}^{(1)}$	POWER OUTPUT	120			W	$V_{DD} = 28V, I_{DQ} = 0.6 A$ $P_{IN} = 12 W \text{ Max}, F = 175 \text{ MHz}$
$\eta^{(1)}$	DRAIN EFFICIENCY	60			%	
$g_m^{(2)}$	TRANSCONDUCTANCE		1.5 PARALLEL		Mho	$V_{DS} = 28 V, I_D = 6 A$
C_{oss}	OUTPUT CAPACITY		85 (Per Side)		pF	$V_{DS} = 28 V, V_{GS} = 0 V$
C_{rss}	REVERSE TRANSFER CAPACITY		12 (Per Side)			
C_{iss}	INPUT CAPACITY		105 (Per Side)			
NF ⁽³⁾	SMALL SIGNAL NOISE FIGURE		8.5		dB	$V_{DS} = 28 V$ $I_D = 0.6 A$ $F = 100 \text{ MHz}$

© Siliconix Incorporated

NOTES:

- (1) All devices 100% power tested in Siliconix test fixture No. RF 28175 [PP3].
- (2) Measured under pulsed condition with pulse width 300 μsec > 5% duty cycle.
- (3) Noise figure measured with amplifier source and load power matched at 120 watts output.