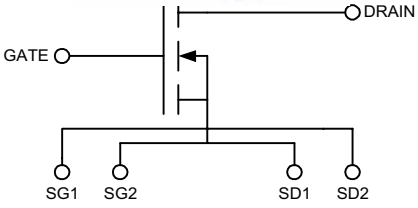
DE275-102N06A
RF Power MOSFET

N-Channel Enhancement Mode
Low Q_g and R_g
High dv/dt
Nanosecond Switching

V_{DSS}	=	1000 V
I_{D25}	=	8 A
$R_{DS(on)}$	=	1.6 Ω
P_{DC}	=	590 W

Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C	1000	V
V_{DGR}	T_J = 25°C to 150°C; R_{GS} = 1 MΩ	1000	V
V_{GS}	Continuous	±20	V
V_{GSM}	Transient	±30	V
I_{D25}	T_c = 25°C	8	A
I_{DM}	T_c = 25°C, pulse width limited by T_{JM}	48	A
I_{AR}	T_c = 25°C	6	A
E_{AR}	T_c = 25°C	20	mJ
dv/dt	$I_S \le I_{DM}$, di/dt ≤ 100A/μs, $V_{DD} \le V_{DSS}$, $T_j \le 150°C$, R_G = 0.2Ω	5	V/ns
	I_S = 0	>200	V/ns
P_{DC}		590	W
P_{DHS}	T_c = 25°C Derate 2.0W/°C above 25°C	300	W
P_{DAMB}	T_c = 25°C	3.0	W
R_{thJC}		0.25	C/W
R_{thJHS}		0.50	C/W



Features

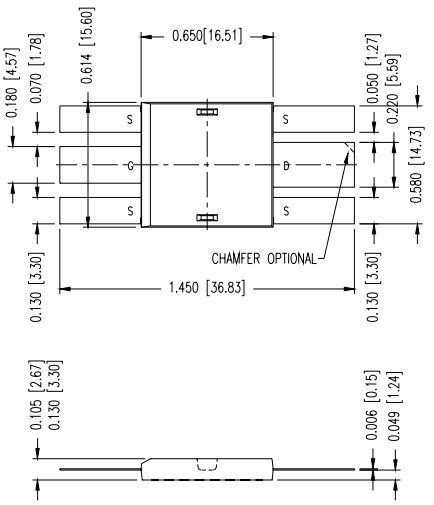
- Isolated Substrate
  - high isolation voltage (>2500V)
  - excellent thermal transfer
  - Increased temperature and power cycling capability
- IXYS advanced low Q_g process
- Low gate charge and capacitances
  - easier to drive
  - faster switching
- Low $R_{DS(on)}$
- Very low insertion inductance (<2nH)
- No beryllium oxide (BeO) or other hazardous materials

Advantages

- Optimized for RF and high speed switching at frequencies to 100MHz
- Easy to mount—no insulators needed
- High power density

Symbol	Test Conditions Characteristic Values T_J = 25°C unless otherwise specified	min.	typ.	max.	
V_{DSS}	V_{GS} = 0 V, I_D = 3 ma	1000			V
$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 4 ma	2.5		5.5	V
I_{GSS}	V_{GS} = ±20 V_{DC}, V_{DS} = 0			±100	nA
I_{DSS}	V_{DS} = 0.8 V_{DSS} T_J = 25°C V_{GS} = 0 T_J = 125°C			50 1	μA mA
$R_{DS(on)}$	V_{GS} = 15 V, $I_D = 0.5I_{D25}$ Pulse test, t ≤ 300μS, duty cycle d ≤ 2%			1.6	Ω
g_{fs}	V_{DS} = 15 V, $I_D = 0.5I_{D25}$, pulse test	2	7.5		S
R_{thJHS}			0.50		C/W
T_J		-55		+175	°C
T_{JM}			175		°C
T_{stg}		-55		+175	°C
T_L	1.6mm (0.063 in) from case for 10 s		300		°C
Weight			2		g

Symbol	Test Conditions	Characteristic Values (T_J = 25°C unless otherwise specified) min.	typ.	max.	
R_G			0.3		Ω
C_{iss}			1800		pF
C_{oss}	V_{GS} = 0 V, V_{DS} = 0.8 $V_{DSS(max)}$, f = 1 MHz	13	0		pF
C_{rss}		25			pF
C_{stray}	Back Metal to any Pin	21			pF
$T_{d(on)}$		3			ns
T_{on}	V_{GS} = 15 V, V_{DS} = 0.8 V_{DSS} I_D = 0.5 I_{DM}	2			ns
$T_{d(off)}$	R_G = 0.2 Ω (External)	4			ns
T_{off}		5			ns
$Q_{g(on)}$		50			nC
Q_{gs}	V_{GS} = 10 V, V_{DS} = 0.5 V_{DSS} I_D = 0.5 I_{D25}	20			nC
Q_{gd}		30			nC



RF Characteristics in Class C 13.56MHz Fixture (Figure 1. Page 3)

Symbol	Test Conditions	min.	typ	max.	
G_{PS}	V Supply = 250V, f=13.56MHz, Pout = 600W	15	17		dB
η (Eff)	V Supply = 250V, f=13.56MHz, Pout = 600W	82	85		%
ψ (Ruggedness)	VSWR 10:1			no degradation in output power	

Source-Drain Diode

Symbol	Test Conditions	min.	typ.	max.	
I_S	V_{GS} = 0 V		6		A
I_{SM}	Repetitive; pulse width limited by T_{JM}		48		A
V_{SD}	I_F = I_S, V_{GS} = 0 V, Pulse test, t ≤ 300 μs, duty cycle ≤ 2%		1.5		V
T_{rr}			200		ns
Q_{RM}	I_F = I_S, -di/dt = 100A/μs, V_R = 100V		0.6		μC
I_{RM}			4		A

For detailed device mounting and installation instructions, see the "*DE-Series MOSFET Mounting Instructions*" technical note on IXYS RF's web site at www.ixysrf.com/Technical_Support/App_notes.html

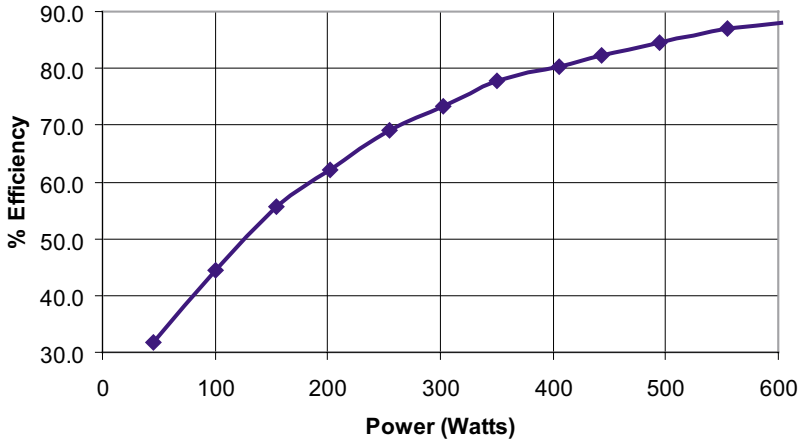


Figure 3. Reference Circuit in Figure 1.

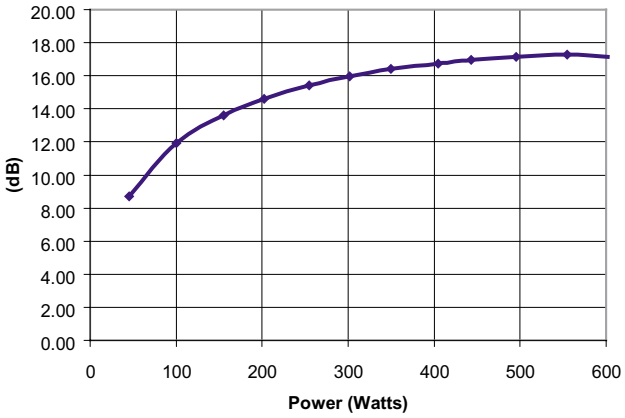


Figure 4. Reference Circuit in Figure 1.

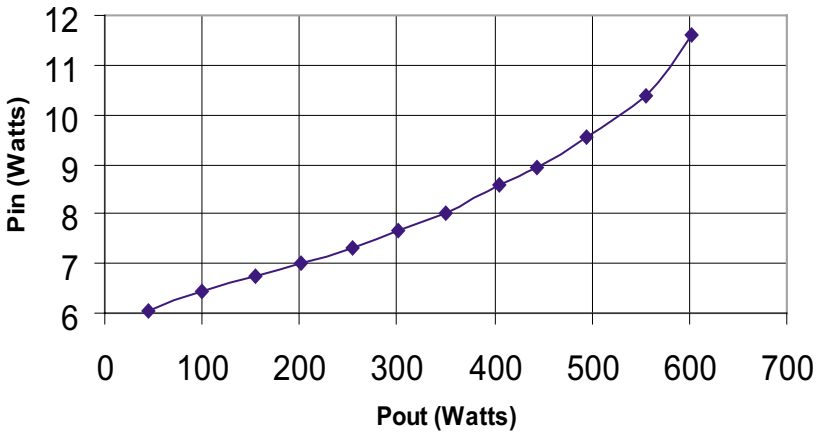


Figure 5. Reference Circuit in Figure 1.

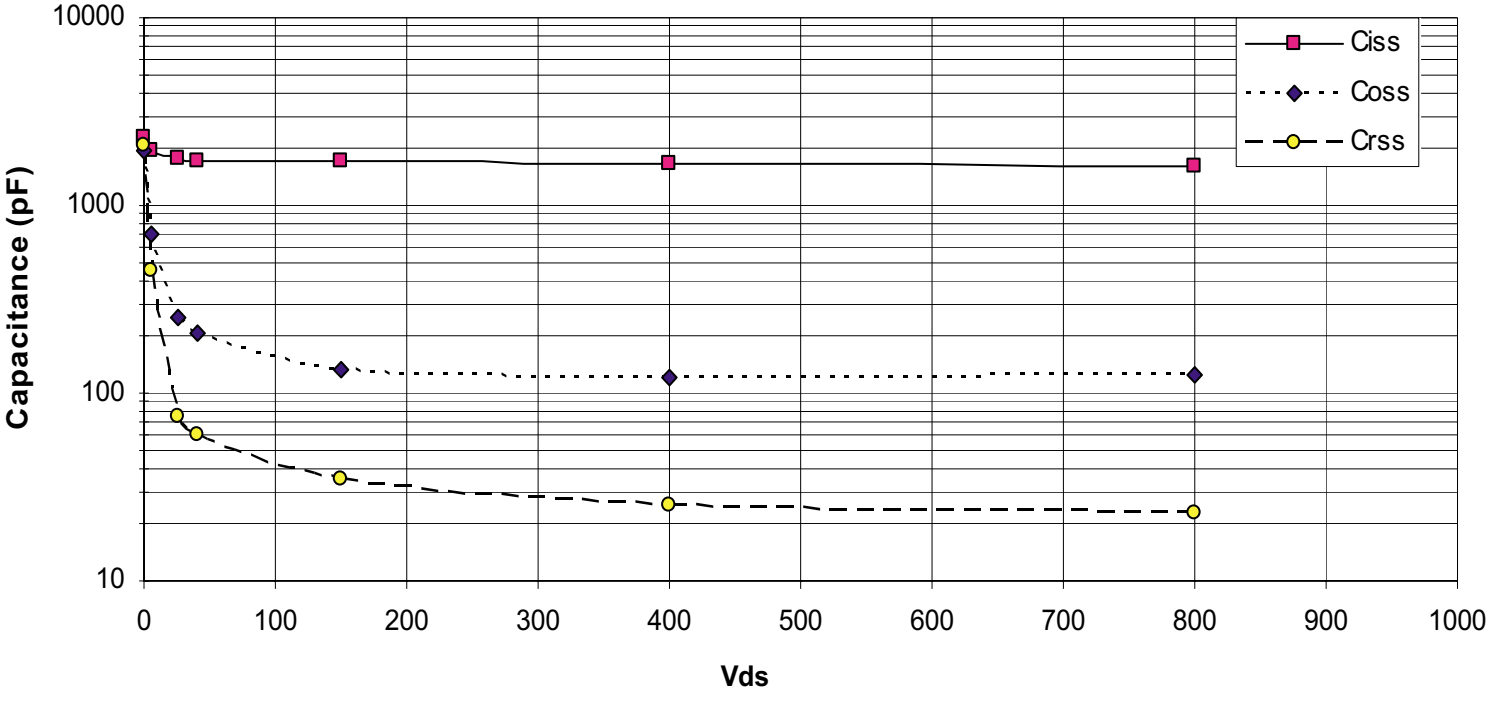


Figure 6. Capacitance vs Vds

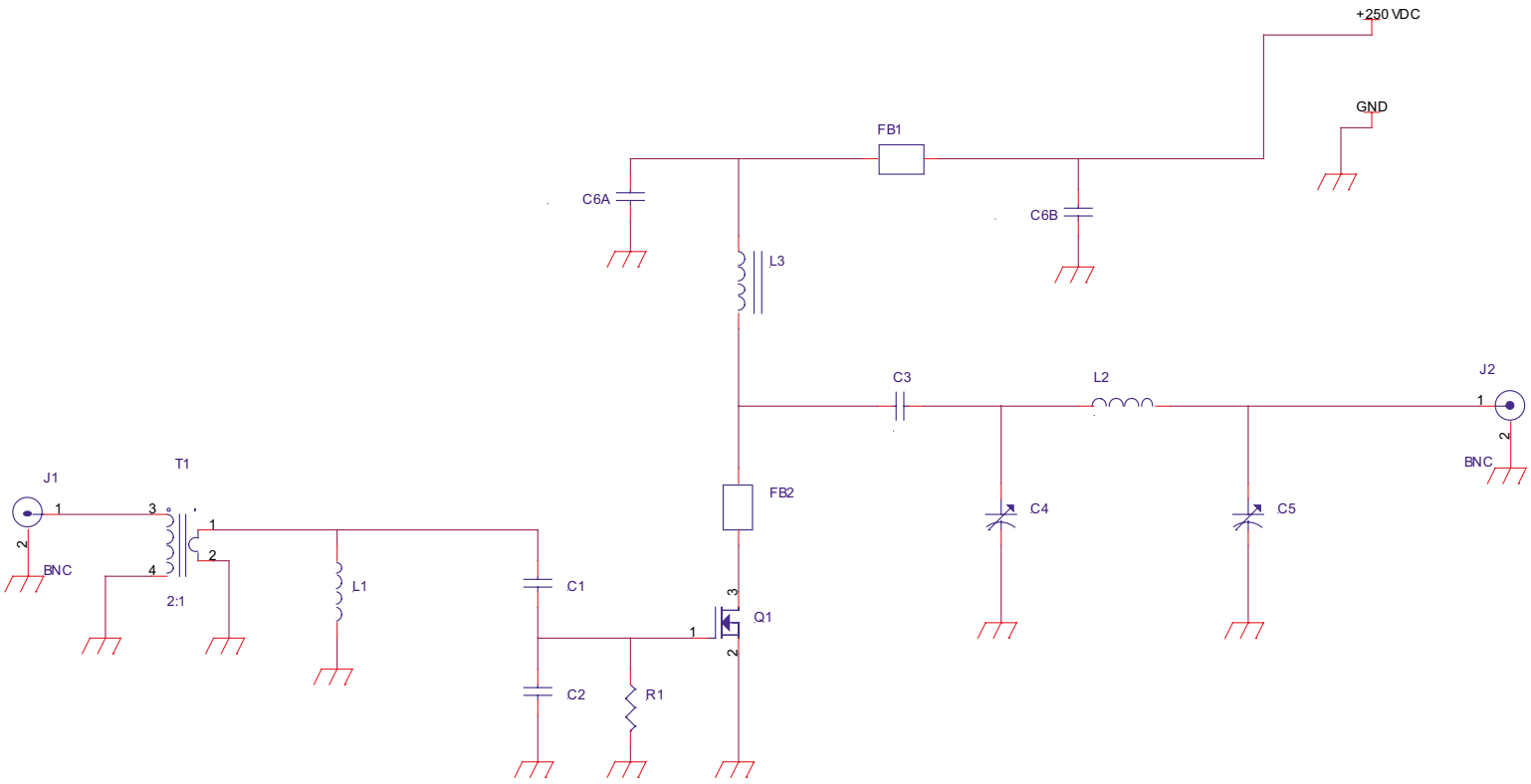


Figure 1. 13.56MHz Class C RF Test Fixture

1. T1 - 2:1 Turns ratio, Ferronics binocular core P/N 12-365-J,
a. Primary - 2 turns of 26 AWG, single strand Teflon Wire.
b. Secondary - 1 turn of braid with the primary wire run inside of it.
2. L1 - < 90nH, 5 turns, 0.25" id, 18 AWG single strand magnet wire, 0.55" long.
3. C1 - 3000pf, 3 x 1000pf, ATC capacitors, P/N 102KW.
4. C2 - 470pf, ATC capacitor, P/N 471JW.
5. R1 - 3.3 ohm, 3 x 10 ohm Caddock resistors, P/N MP850-10-10.
6. Q1 - DE275-102N06A
7. C3 - 5nf, 5 x .001uf, ceramic disc capacitors,
8. C4 - 60pf - 100pf air variable capacitor
9. L2 - 800nH, 6 turns, 1" id, 12 AWG single strand magnet wire, 0.85" long.
10. C5 - 250pf - 480pf mica compression capacitor, Sprague Goodman GME90901.
11. L3 - 5.4uH, 20 turns, 18 AWG single strand magnet wire, Micrometals core T-106-2, powered iron core.
12. C6A - 0.02uf, 2 x 0.01uf ceramic disc capacitors.
13. C6B - 0.08uf, 8 x 0.01uf ceramic disc capacitors.
14. FB1 - 3 x 900mu ferrite beads on 18 AWG buss wire.

102N06A DE-SERIES SPICE Model

The DE-SERIES SPICE Model is illustrated in Figure 1. The model is an expansion of the SPICE level 3 MOSFET model. It includes the stray inductive terms L_G, L_S and L_D. Rd is the $R_{DS(ON)}$ of the device, Rds is the resistive leakage term. The output capacitance, C_{OSS}, and reverse transfer capacitance, C_{RSS} are modeled with reversed biased diodes. This provides a varactor type response necessary for a high power device model. The turn on delay and the turn off delay are adjusted via Ron and Roff.

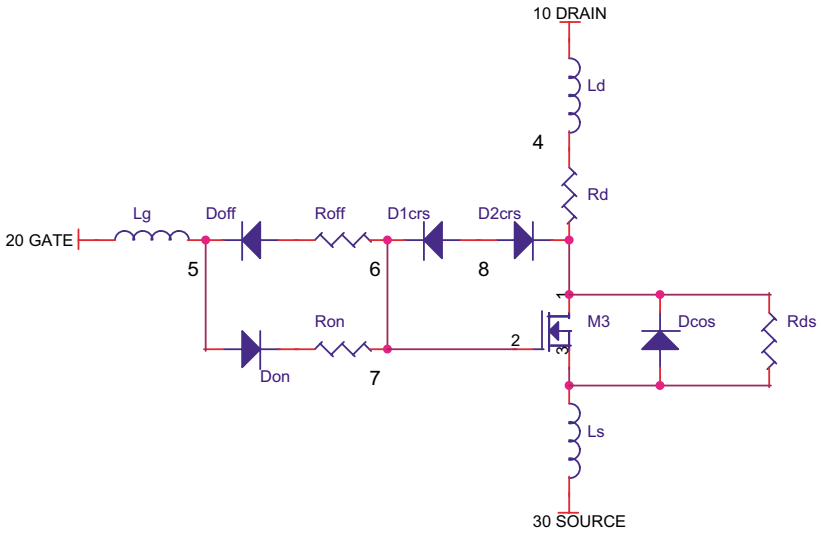


Figure 1 DE-SERIES SPICE Model

This SPICE model may be downloaded as a text file from the DEI web site at www.directedenergy.com/spice.htm

Net List:

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*SYM=POWMOSN
.SUBCKT 102N06A   10 20 30
*     TERMINALS:  D  G  S
*  1000 Volt  6 Amp  1.6 Ohm  N-Channel Power MOSFET
M1   1  2  3  3  DMOS L=1U W=1U
RON  5 6 .5
DON  6 2  D1
ROF  5 7  1.0
DOF  2 7  D1
D1CRS 2 8  D2
D2CRS 1 8 D2
CGS  2 3  1.9N
RD   4 1  1.6
DCOS 3 1  D3
RDS  1 3  5.0MEG
LS  3 30 .5N
LD  10 4  1N
LG  20 5  1N
.MODEL DMOS NMOS (LEVEL=3 VTO=4 KP=2.3)
.MODEL D1 D (IS=.5F CJO=10P BV=100 M=.5 VJ=.2 TT=1N)
.MODEL D2 D (IS=.5F CJO=400P BV=1000 M=.6 VJ=.6 TT=1N RS=10M)
.MODEL D3 D (IS=.5F CJO=400P BV=1000 M=.35 VJ=.6 TT=400N RS=10M)
.ENDS
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