Directed Energy, Inc.
An IXYS Company

DE275X2-501N16A
RF Power MOSFET

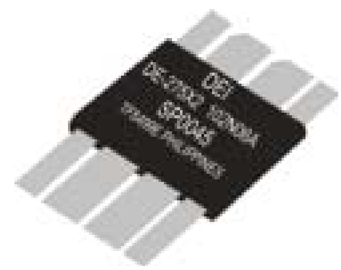
Preliminary Data Sheet

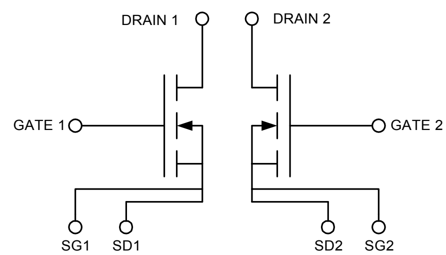
- **Common Source Push-Pull Pair**
- **N-Channel Enhancement Mode**
- **Low Q_g and R_g**
- **High dv/dt**
- **Nanosecond Switching**

V_{DSS}	=	500 V
I_{D25}	=	16 A
$R_{DS(on)}$	=	0.5 Ω
P_{DHS}	=	750 W

The DE275X2-501N16A is a matched pair of RF power MOSFET devices in a common source configuration. The device is optimized for push-pull or parallel operation in RF generators and amplifiers at frequencies to >65 MHz.

Unless noted, specifications are for each output device





Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C	500	V
V_{DGR}	T_J = 25°C to 150°C; R_{GS} = 1 MΩ	500	V
V_{GS}	Continuous	±20	V
V_{GSM}	Transient	±30	V
I_{D25}	T_c = 25°C	16	A
I_{DM}	T_c = 25°C, pulse width limited by T_{JM}	96	A
I_{AR}	T_c = 25°C	16	A
E_{AR}	T_c = 25°C	20	mJ
dv/dt	$I_S \le I_{DM}$, di/dt $\lesssim$ 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_{DHS} (1)	T_c = 25°C, Derate 6.0W/°C above 25°C	750	W
P_{DAMB} (1)	T_c = 25°C	5.0	W
R_{thJHS} (1)		0.17	K/W
T_J		-55…+150	°C
T_{JM}		150	°C
T_{stg}		-55…+150	°C
T_L	1.6mm (0.063 in) from case for 10 s	300	°C
Weight		4	g

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	500			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%			0.5	Ω
g_{fs}	V_{DS} = 15 V, I_D = 0.5I_{D25}, pulse test	2	6		S

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

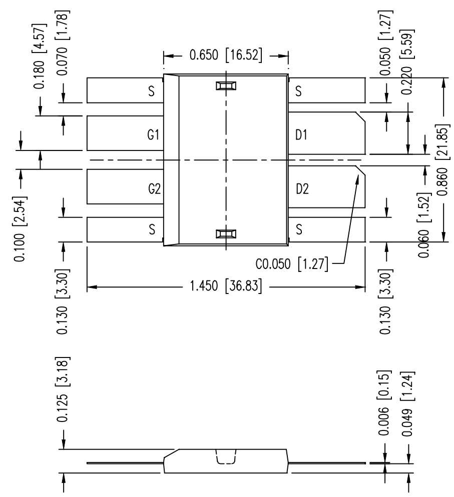
Advantages

- High Performance Push-Pull RF Package
- Optimized for RF and high speed switching at frequencies to >65MHz
- Easy to mount—no insulators needed
- High power density

Note: All specifications are per each transistor, unless otherwise noted.

(1) Thermal specifications are for the package, not per transistor

Symbol	Test Conditions	min.	typ.	max.	
			Characteristic Values (T_J = 25°C unless otherwise specified)		
R_G			0.3		Ω
C_{iss}	V_{GS} = 0 V, V_{DS} = 0.8 $V_{DSS(max)}$, f = 1 MHz		1800		pF
C_{oss}			150		pF
C_{rss}			45		pF
$T_{d(on)}$	V_{GS} = 15 V, V_{DS} = 0.8 V_{DSS}, I_D = 0.5 I_{DM}, R_G = 0.2 Ω (External)		3		ns
T_{on}			2		ns
$T_{d(off)}$			4		ns
T_{off}			5		ns
$Q_{g(on)}$	V_{GS} = 10 V, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}		50		nC
Q_{gs}			20		nC
Q_{gd}			30		nC



Source-Drain Diode

Characteristic Values
(T_J = 25°C unless otherwise specified)

Symbol	Test Conditions	min.	typ.	max.	
I_S	V_{GS} = 0 V			16	A
I_{SM}	Repetitive; pulse width limited by T_{JM}			96	A
V_{SD}	$I_F = I_S$, V_{GS} = 0 V, Pulse test, t ≤ 300 µs, duty cycle ≤ 2%			1.5	V
T_{rr}	$I_F = I_S$, -di/dt = 100A/µs, V_R = 100V		200		ns
Q_{RM}			0.8		µC
I_{RM}			6.5		A

(1) These parameters apply to the package, not individual MOSFET devices.

For detailed device mounting and installation instructions, see the "*DE-Series MOSFET Mounting Instructions*" technical note on DEI's web site at www.directedenergy.com/apptech.htm

DEI MOSFETS are covered by one or more of the following U.S. patents:

4,835,592	4,850,072	4,881,106	4,891,686	4,931,844	5,017,508
5,034,796	5,049,961	5,063,307	5,187,117	5,237,481	5,486,715
5,381,025	5,640,045				

501N16A 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.

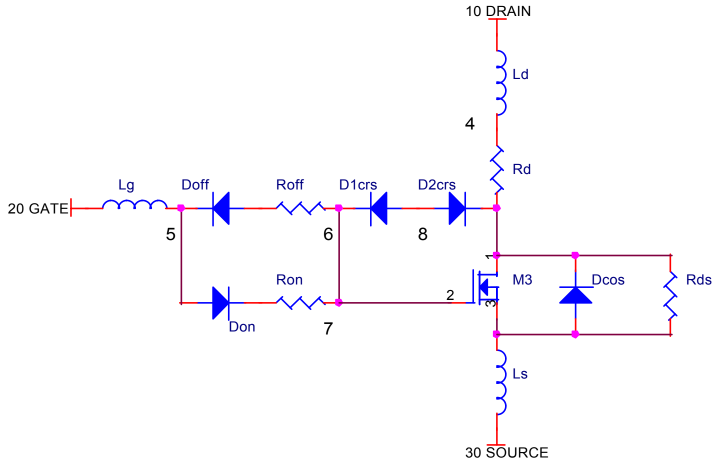


Figure 1 DE-SERIES SPICE Model

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 501N16A  10 20 30
* TERMINALS:  D  G  S
* 500 Volt  16 Amp  .5 ohm  N-Channel Power MOSFET
* REVA 6-15-00
M1   1 2  3  3  DMOS  L=1U W=1U
RON  5 6 .2
DON  6 2  D1
ROF  5 7 .2
DOF  2 7  D1
D1CRS 2 8 D2
D2CRS 1 8 D2
CGS  2 3  2.0N
RD   4 1  .5
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=3.0 KP=5.8)
.MODEL D1 D (IS=.5F CJO=10P BV=100 M=.5 VJ=.7 TT=1N RS=10M)
.MODEL D2 D (IS=.5F CJO=450P BV=500 M=.4 VJ=.6 TT=10N RS=10M)
.MODEL D3 D (IS=.5F CJO=900P BV=500 M=.3 VJ=.3 TT=400N RS=10M)
.ENDS
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