

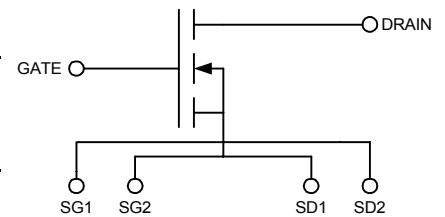
Preliminary Data Sheet

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

$$\begin{aligned} V_{DSS} &= 1000 \text{ V} \\ I_{D25} &= 1.5 \text{ A} \\ R_{DS(on)} &= 11 \Omega \\ P_{DHS} &= 80 \text{ W} \end{aligned}$$

Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	$T_J = 25^\circ\text{C}$ to 150°C	1000	V
V_{DGR}	$T_J = 25^\circ\text{C}$ to 150°C ; $R_{GS} = 1 \text{ M}\Omega$	1000	V
V_{GS}	Continuous	± 20	V
V_{GSM}	Transient	± 30	V
I_{D25}	$T_c = 25^\circ\text{C}$	1.5	A
I_{DM}	$T_c = 25^\circ\text{C}$, pulse width limited by T_{JM}	9	A
I_{AR}	$T_c = 25^\circ\text{C}$	1.5	A
E_{AR}	$T_c = 25^\circ\text{C}$	6	mJ
dv/dt	$I_S \leq I_{DM}$, $di/dt \leq 100 \text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DSS}$, $T_J \leq 150^\circ\text{C}$, $R_G = 0.2 \Omega$	3	V/ns
	$I_S = 0$	>200	V/ns
P_{DHS}	$T_c = 25^\circ\text{C}$ Derate $4.4 \text{ W}/^\circ\text{C}$ above 25°C	80	W
P_{DAMB}	$T_c = 25^\circ\text{C}$	3.5	W
T_J		-55...+150	$^\circ\text{C}$
T_{JM}		150	$^\circ\text{C}$
T_{stg}		-55...+150	$^\circ\text{C}$
T_L	1.6mm (0.063 in) from case for 10 s	300	$^\circ\text{C}$
Weight		2	g

Symbol	Test Conditions	Characteristic Values		
		$T_J = 25^\circ\text{C}$ unless otherwise specified		
		min.	typ.	max.
V_{DSS}	$V_{GS} = 0 \text{ V}$, $I_D = 3 \text{ ma}$	1000		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 4 \text{ ma}$	2.5		V
I_{GSS}	$V_{GS} = \pm 20 \text{ V}_{DC}$, $V_{DS} = 0$			$\pm 100 \text{ nA}$
I_{DSS}	$V_{DS} = 0.8 V_{DSS}$, $T_J = 25^\circ\text{C}$ $V_{GS} = 0$, $T_J = 125^\circ\text{C}$			50 μA 500 μA
$R_{DS(on)}$	$V_{GS} = 15 \text{ V}$, $I_D = 0.5 I_{D25}$ Pulse test, $t \leq 300 \mu\text{s}$, duty cycle $d \leq 2\%$			11 Ω
g_{fs}	$V_{DS} = 15 \text{ V}$, $I_D = 0.5 I_{D25}$, pulse test	0.8	1.5	S



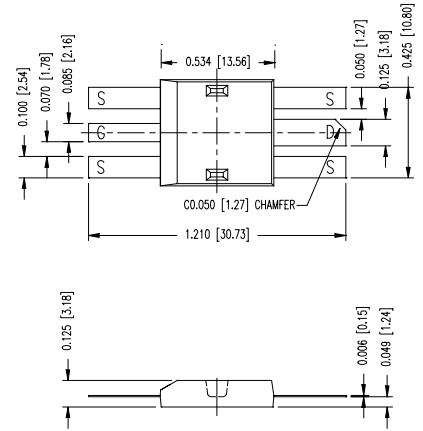
Features

- 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

- 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 ($T_J = 25^\circ\text{C}$ unless otherwise specified)		
		min.	typ.	max.
R_G				5 Ω
C_{iss}			500	pF
C_{oss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 0.8 V_{DSS(max)}$, $f = 1\text{ MHz}$		20	pF
C_{rss}			3	pF
$T_{d(on)}$			4	ns
T_{on}	$V_{GS} = 15\text{ V}$, $V_{DS} = 0.8 V_{DSS}$ $I_D = 0.5 I_{DM}$		4	ns
$T_{d(off)}$	$R_G = 0.2\text{ }\Omega$ (External)		4	ns
T_{off}			4	ns
$Q_{g(on)}$			23	nC
Q_{gs}	$V_{GS} = 10\text{ V}$, $V_{DS} = 0.5 V_{DSS}$ $I_D = 0.5 I_{D25}$		4.5	nC
Q_{gd}			14	nC
R_{thJHS}			1.5	K/W



Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$ unless otherwise specified)		
		min.	typ.	max.
I_S	$V_{GS} = 0\text{ V}$			1.5 A
I_{SM}	Repetitive; pulse width limited by T_{JM}			9 A
V_{SD}	$I_F = I_S$, $V_{GS} = 0\text{ V}$, Pulse test, $t \leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$			1.8 V
T_{rr}			710	ns

Directed Energy, Inc. reserves the right to change limits, test conditions and dimensions.
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				

102N02A 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 . R_d is the $R_{DS(ON)}$ of the device, R_{ds} 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 R_{on} and R_{off} .

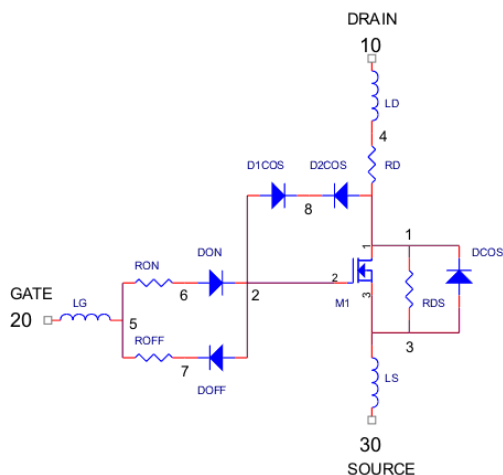


Figure 1 DE-SERIES SPICE Model

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 102N02A 10 20 30
*   TERMINALS: D G S
*   1000 Volt 1.5 Amp 11.0 ohm N-Channel Power MOSFET 10-30-2001
M1 1 2 3 3 DMOS L=1U W=1U
RON 5 6 4.0
DON 6 2 D1
ROF 5 7 2.0
DOF 2 7 D1
D1CRS 2 8 D2
D2CRS 1 8 D2
CGS 2 3 500Pf
RD 4 1 11
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 KP=.3)
.MODEL D1 D (IS=.5F CJO=10P BV=100 M=.5 VJ=.2 TT=1N)
.MODEL D2 D (IS=.5F CJO=100P BV=1000 M=.6 VJ=.6 TT=1N RS=10M)
.MODEL D3 D (IS=.5F CJO=150P BV=1000 M=.35 VJ=.6 TT=400N RS=10M)
.ENDS
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Directed Energy, Inc.

An IXYS Company

2401 Research Blvd., Suite 108

Fort Collins, CO USA 80526

970-493-1901 Fax: 970-493-1903

Email: deiinfo@directedenergy.com

Web: <http://www.directedenergy.com>