

# N-Channel Enhancement-Mode Vertical DMOS FET

#### **Features**

- ► Low threshold 2.0V max.
- High input impedance
- ► Low input capacitance 50pF typical
- Fast switching speeds
- Low on-resistance
- ▶ Free from secondary breakdown
- Low input and output leakage

#### **Applications**

- Logic level interfaces ideal for TTL and CMOS
- Solid state relays
- Battery operated systems
- Photo voltaic drives
- Analog switches
- General purpose line drivers
- Telecom switches

#### **General Description**

This low threshold, enhancement-mode (normally-off) transistor utilizes a vertical DMOS structure and Supertex's well-proven, silicon-gate manufacturing process. This combination produces a device with the power handling capabilities of bipolar transistors and the high input impedance and positive temperature coefficient inherent in MOS devices. Characteristic of all MOS structures, this device is free from thermal runaway and thermally-induced secondary breakdown.

Supertex's vertical DMOS FETs are ideally suited to a wide range of switching and amplifying applications where very low threshold voltage, high breakdown voltage, high input impedance, low input capacitance, and fast switching speeds are desired.

#### **Ordering Information**

Part Number	Package Option	Packing
TN0106N3-G	TO-92	1000/Bag
TN0106N3-G P002		
TN0106N3-G P003		2000/Reel
TN0106N3-G P005	TO-92	
TN0106N3-G P013		
TN0106N3-G P014		

<sup>-</sup>G denotes a lead (Pb)-free / RoHS compliant package.

Contact factory for Wafer / Die availablity.

Devices in Wafer / Die form are lead (Pb)-free / RoHS compliant.

## **Absolute Maximum Ratings**

Parameter	Value
Drain-to-source voltage	BV <sub>DSS</sub>
Drain-to-gate voltage	BV <sub>DGS</sub>
Gate-to-source voltage	±20V
Operating and storage temperature	-55°C to +150°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. Continuous operation of the device at the absolute rating level may affect device reliability. All voltages are referenced to device ground.

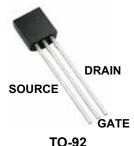
## Typical Thermal Resistance

<i>J</i> 1	
Package	$oldsymbol{ heta}_{ja}$
TO-92	132°C/W

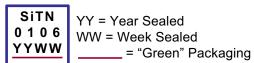
#### **Product Summary**

$BV_{DSS}/BV_{DGS}$ $R_{DS(ON)}$ (max)		l <sub>D(ON)</sub> (min)	V <sub>GS(th)</sub> (max)	
60V	3.0Ω	2.0A	2.0V	

## **Pin Configuration**



#### **Product Marking**



Package may or may not include the following marks: Si or n

**TO-92** 

#### **Thermal Characteristics**

Package	$I_{_{ m D}}$ (continuous) $^{t}$	l <sub>D</sub> (pulsed)	Power Dissipation @T <sub>c</sub> = 25°C	- '	
TO-92	350mA	2.0A	1.0W	350mA	2.0A

#### Notes:

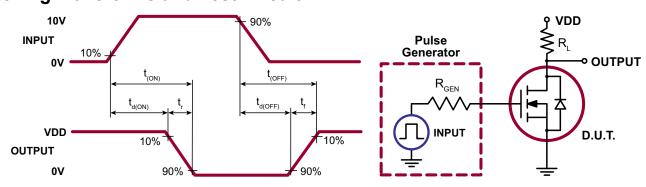
### **Electrical Characteristics** (T<sub>A</sub> = 25°C unless otherwise specified)

Sym	Parameter	Min	Тур	Max	Units	Conditions	
BV <sub>DSS</sub>	Drain-to-source breakdown voltage	60	-	-	V	$V_{GS} = 0V, I_D = 1.0mA$	
$V_{\rm GS(th)}$	Gate threshold voltage	0.6	ı	2.0	V	$V_{GS} = V_{DS}$ , $I_{D} = 0.5$ mA	
$\Delta V_{GS(th)}$	Change in V <sub>GS(th)</sub> with temperature	-	-3.2	-5.0	mV/°C	$V_{GS} = V_{DS}$ , $I_{D} = 1.0$ mA	
I <sub>GSS</sub>	Gate body leakage	-	-	100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$	
		-	-	10		$V_{GS} = 0V, V_{DS} = Max Rating$	
I <sub>DSS</sub>	Zero Gate voltage drain current		ı	500	μA	$V_{DS} = 0.8$ Max Rating, $V_{GS} = 0V, T_A = 125$ °C	
	On-state drain current	0.75	1.4	-	Α	$V_{GS} = 5.0V, V_{DS} = 25V$	
I <sub>D(ON)</sub>		2.0	3.4	-	A	$V_{GS} = 10V, V_{DS} = 25V$	
В	Static drain-to-source on-state resistance	-	2.0	4.5	Ω	$V_{GS} = 4.5V, I_{D} = 250mA$	
R <sub>DS(ON)</sub>		-	1.6	3.0		$V_{GS} = 10V, I_{D} = 500mA$	
$\Delta R_{DS(ON)}$	Change in R <sub>DS(ON)</sub> with temperature	-	0.6	1.1	%/°C	$V_{GS} = 10V, I_{D} = 500mA$	
G <sub>FS</sub>	Forward transductance	225	400	-	mmho	$V_{DS} = 25V, I_{D} = 500mA$	
C <sub>ISS</sub>	Input capacitance	-	50	60		$V_{GS} = 0V$ ,	
C <sub>oss</sub>	Common source output capacitance	-	25	35	pF	$V_{DS} = 25V$ ,	
C <sub>RSS</sub>	Reverse transfer capacitance	-	4.0	8.0		f = 1.0MHz	
t <sub>d(ON)</sub>	Turn-on delay time	-	2.0	5.0			
t <sub>r</sub>	Rise time	-	3.0	5.0	ns	$V_{DD} = 25V,$ $I_{D} = 1.0A,$	
t <sub>d(OFF)</sub>	Turn-off delay time	-	6.0	7.0	115	$R_{GEN} = 25\Omega$	
t <sub>f</sub>	Fall time	-	3.0	6.0		GEN	
$V_{\scriptscriptstyle{\mathrm{SD}}}$	Diode forward voltage drop		1.0	1.5	V	$V_{GS} = 0V$ , $I_{SD} = 500$ mA	
t <sub>rr</sub>	Reverse recovery time	-	400	-	ns	$V_{GS} = 0V, I_{SD} = 500mA$	

#### Notes:

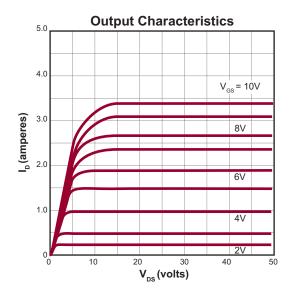
- 1. All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300µs pulse, 2% duty cycle.)
- 2. All A.C. parameters sample tested.

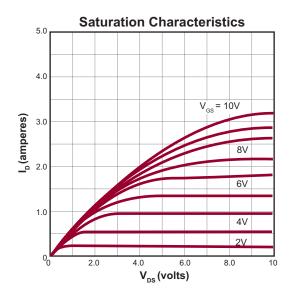
# **Switching Waveforms and Test Circuit**

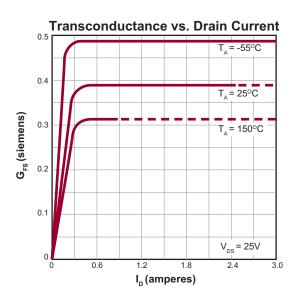


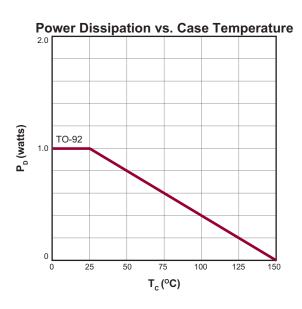
<sup>†</sup>  $I_D$  (continuous) is limited by max rated  $T_i$ .

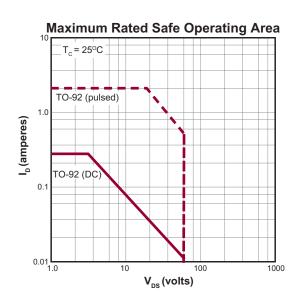
## **Typical Performance Curves**

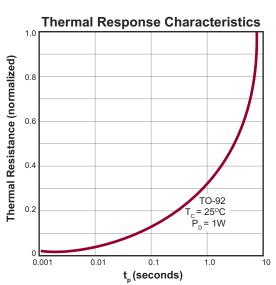




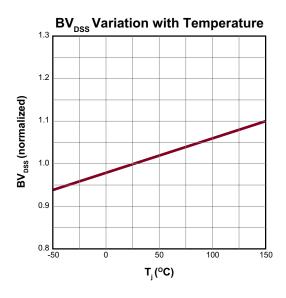


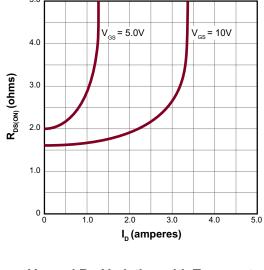




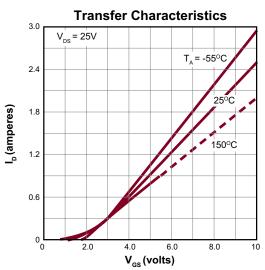


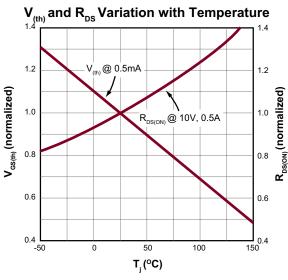
### Typical Performance Curves (cont.)

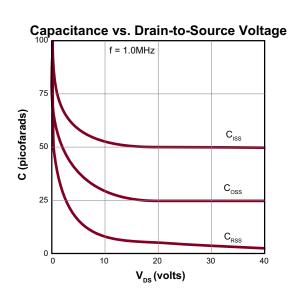


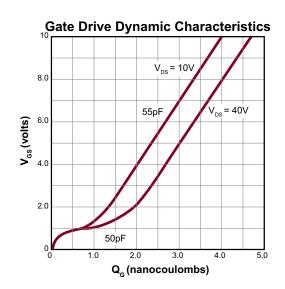


On-Resistance vs. Drain Current

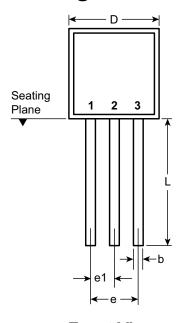


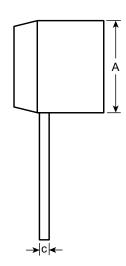






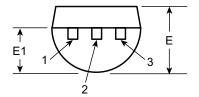
# 3-Lead TO-92 Package Outline (N3)





**Front View** 

Side View



**Bottom View** 

Symb	ol	Α	b	С	D	E	E1	е	e1	L
	MIN	.170	.014 <sup>†</sup>	.014 <sup>†</sup>	.175	.125	.080	.095	.045	.500
Dimensions (inches)	NOM	-	-	-	-	-	-	-	-	-
(51166)	MAX	.210	.022 <sup>†</sup>	.022 <sup>†</sup>	.205	.165	.105	.105	.055	.610*

JEDEC Registration TO-92.

Drawings not to scale.

Supertex Doc.#: DSPD-3TO92N3, Version E041009.

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to <a href="http://www.supertex.com/packaging.html">http://www.supertex.com/packaging.html</a>.)

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<sup>\*</sup> This dimension is not specified in the JEDEC drawing.

<sup>†</sup> This dimension differs from the JEDEC drawing.