



## N-Channel Enhancement-Mode Vertical DMOS FET

### Features

- ▶ Free from secondary breakdown
- ▶ Low power drive requirement
- ▶ Ease of paralleling
- ▶ Low  $C_{iss}$  and fast switching speeds
- ▶ Excellent thermal stability
- ▶ Integral source-drain diode
- ▶ High input impedance and high gain

### Applications

- ▶ Motor controls
- ▶ Converters
- ▶ Amplifiers
- ▶ Switches
- ▶ Power supply circuits
- ▶ Drivers (relays, hammers, solenoids, lamps, memories, displays, bipolar transistors, etc.)

### General Description

This 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

Device	Package	$BV_{DSS}/BV_{DGS}$ (V)	$R_{DS(ON)}$ (max) ( $\Omega$ )	$I_{D(ON)}$ (min) (A)
	TO-92			
VN2406	VN2406L-G	240	6.0	1.0

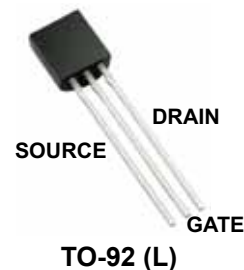
*For packaged products, -G indicates package is RoHS compliant ("Green").  
Consult factory for die / wafer form part numbers.  
Refer to Die Specification VF25 for layout and dimensions.*

### Absolute Maximum Ratings

Parameter	Value
Drain-to-source voltage	$BV_{DSS}$
Drain-to-gate voltage	$BV_{DGS}$
Gate-to-source voltage	$\pm 20V$
Operating and storage temperature	$-55^{\circ}C$ to $+150^{\circ}C$

*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.*

### Pin Configuration



### Product Marking



YY = Year Sealed  
 WW = Week Sealed  
 \_\_\_\_\_ = "Green" Packaging

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

**TO-92 (L)**

## Thermal Characteristics

Package	$I_D$ (continuous) <sup>†</sup> (mA)	$I_D$ (pulsed) (A)	Power Dissipation @ $T_c = 25^\circ\text{C}$ (W)	$\theta_{jc}$ ( $^\circ\text{C}/\text{W}$ )	$\theta_{ja}$ ( $^\circ\text{C}/\text{W}$ )	$I_{DR}$ <sup>†</sup> (mA)	$I_{DRM}$ (A)
TO-92	190	1.7	1.0	125	170	190	1.7

### Notes:

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

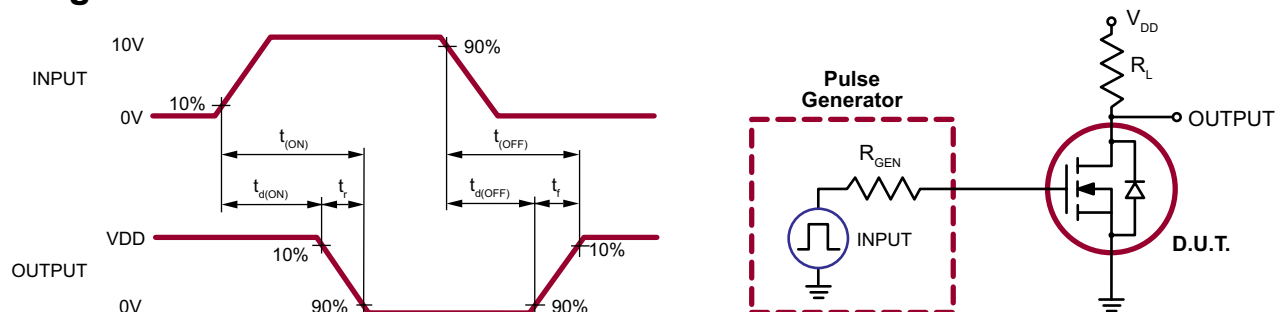
## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise specified)

Sym	Parameter	Min	Typ	Max	Units	Conditions
$BV_{DSS}$	Drain-to-source breakdown voltage	240	-	-	V	$V_{GS} = 0\text{V}$ , $I_D = 100\mu\text{A}$
$V_{GS(th)}$	Gate threshold voltage	0.8	-	2.0	V	$V_{GS} = V_{DS}$ , $I_D = 1.0\text{mA}$
$I_{GSS}$	Gate body leakage	-	-	100	nA	$V_{GS} = 20\text{V}$ , $V_{DS} = 0\text{V}$
$I_{DSS}$	Zero gate voltage drain current	-	-	10	$\mu\text{A}$	$V_{GS} = 0\text{V}$ , $V_{DS} = 120\text{V}$
		-	-	500		$V_{GS} = 0\text{V}$ , $V_{DS} = 120\text{V}$ , $T_A = 125^\circ\text{C}$
$I_{D(ON)}$	On-state drain current	1.0	-	-	A	$V_{GS} = 10\text{V}$ , $V_{DS} = 15\text{V}$
$R_{DS(ON)}$	Static drain-to-source on-state resistance	-	-	10	$\Omega$	$V_{GS} = 2.5\text{V}$ , $I_D = 100\text{mA}$
		-	-	6.0		$V_{GS} = 10\text{V}$ , $I_D = 500\text{mA}$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with temperature	-	1.0	1.4	%/ $^\circ\text{C}$	$V_{GS} = 10\text{V}$ , $I_D = 500\text{mA}$
$G_{FS}$	Forward transductance	300	-	-	mmho	$V_{DS} = 10\text{V}$ , $I_D = 500\text{mA}$
$C_{ISS}$	Input capacitance	-	-	125	pF	$V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1.0\text{MHz}$
$C_{OSS}$	Common source output capacitance	-	-	50		
$C_{RSS}$	Reverse transfer capacitance	-	-	20		
$t_r$	Rise time	-	-	8.0	ns	$V_{DD} = 60\text{V}$ , $I_D = 400\text{mA}$ , $R_{GEN} = 25\Omega$
$t_{d(ON)}$	Turn-on delay time	-	-	8.0		
$t_f$	Fall time	-	-	24		
$t_{d(OFF)}$	Turn-off delay time	-	-	23		
$V_{SD}$	Diode forward voltage drop	-	1.2	-	V	$V_{GS} = 0\text{V}$ , $I_{SD} = 800\text{mA}$

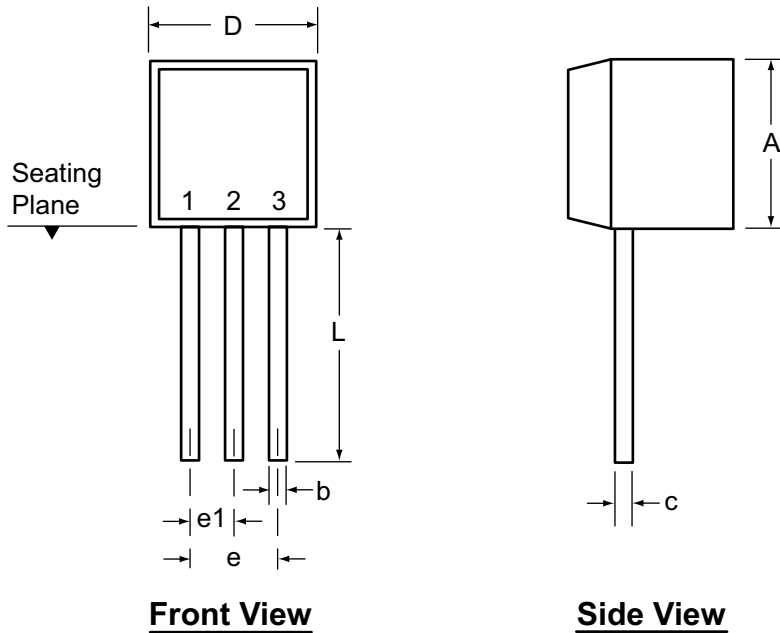
### Notes:

- All D.C. parameters 100% tested at  $25^\circ\text{C}$  unless otherwise stated. (Pulse test:  $300\mu\text{s}$  pulse, 2% duty cycle.)
- All A.C. parameters sample tested.

## Switching Waveforms and Test Circuit



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



Symbol	A	b	c	D	E	E1	e	e1	L
Dimensions (inches)	MIN	.170	.014 <sup>†</sup>	.175	.125	.080	.095	.045	.500
	NOM	-	-	-	-	-	-	-	-
	MAX	.210	.022 <sup>†</sup>	.022 <sup>†</sup>	.205	.165	.105	.105	.610*

JEDEC Registration TO-92.

\* This dimension is not specified in the JEDEC drawing.

† This dimension differs from the JEDEC drawing.

**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 <http://www.supertex.com/packaging.html>.)

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