



## N-Channel Enhancement-Mode Vertical DMOS FETs

### 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
- ▶ Complementary N- and P-Channel devices

### Applications

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

### General Description

The Supertex VN0550 is an enhancement-mode (normally-off) transistor that 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) (mA)
VN0550N3	TO-92	500	60	150
VN0550N3-G				

-G indicates package is RoHS compliant ('Green')



### Absolute Maximum Ratings

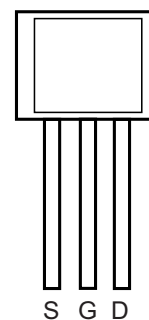
Parameter	Value
Drain to source voltage	$BV_{DSS}$
Drain to gate voltage	$BV_{DGS}$
Gate to source voltage	$\pm 20V$
Operating and storage temperature	$-55^{\circ}C$ to $+150^{\circ}C$
Soldering temperature <sup>1</sup>	$+300^{\circ}C$

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.

**Notes:**

1. Distance of 1.6mm from case for 10 seconds.

### Pin Configuration



**TO-92**  
(front view)

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

Symbol	Parameter	Min	Typ	Max	Units	Conditions
$BV_{DSS}$	Drain-to-source breakdown voltage	500	-	-	V	$V_{GS} = 0V, I_D = 1.0\text{mA}$
$V_{GS(th)}$	Gate threshold voltage	2.0	-	4.0	V	$V_{GS} = V_{DS}, I_D = 1.0\text{mA}$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with temperature	-	-3.8	-5.0	mV/°C	$V_{GS} = V_{DS}, I_D = 1.0\text{mA}$
$I_{GSS}$	Gate body leakage current	-	-	100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
$I_{DSS}$	Zero gate voltage drain current	-	-	10	$\mu\text{A}$	$V_{GS} = 0V, V_{DS} = \text{Max Rating}$
		-	-	1.0	mA	$V_{GS} = 0V, V_{DS} = 0.8 \text{ Max Rating}, T_A = 125^\circ\text{C}$
$I_{D(ON)}$	ON-state drain current	-	100	-	mA	$V_{GS} = 5.0V, V_{DS} = 25V$
		150	350	-		$V_{GS} = 10V, V_{DS} = 25V$
$R_{DS(ON)}$	Static drain-to-source ON-state resistance	-	45	-	$\Omega$	$V_{GS} = 5.0V, I_D = 50\text{mA}$
		-	40	60		$V_{GS} = 10V, I_D = 50\text{mA}$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with temperature	-	1.0	1.7	%/°C	$V_{GS} = 10V, I_D = 50\text{mA}$
$G_{FS}$	Forward transconductance	50	100	-	mmho	$V_{DS} = 25V, I_D = 50\text{mA}$
$C_{ISS}$	Input capacitance	-	45	55	pF	$V_{GS} = 0V, V_{DS} = 25V, f = 1.0\text{MHz}$
$C_{OSS}$	Common source output capacitance	-	8.0	10		
$C_{RSS}$	Reverse transfer capacitance	-	2.0	5.0		
$t_{d(ON)}$	Turn-ON time	-	-	10	ns	$V_{DD} = 25V, I_D = 150\text{mA}, R_{GEN} = 25\Omega$
$t_r$	Rise time	-	-	15		
$t_{d(OFF)}$	Turn-OFF time	-	-	10		
$t_f$	Fall time	-	-	10		
$V_{SD}$	Diode forward voltage drop	-	0.8	-	V	$V_{GS} = 0V, I_{SD} = 500\text{mA}$
$t_{rr}$	Reverse recovery time	-	300	-	ns	$V_{GS} = 0V, I_{SD} = 500\text{mA}$

### 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.

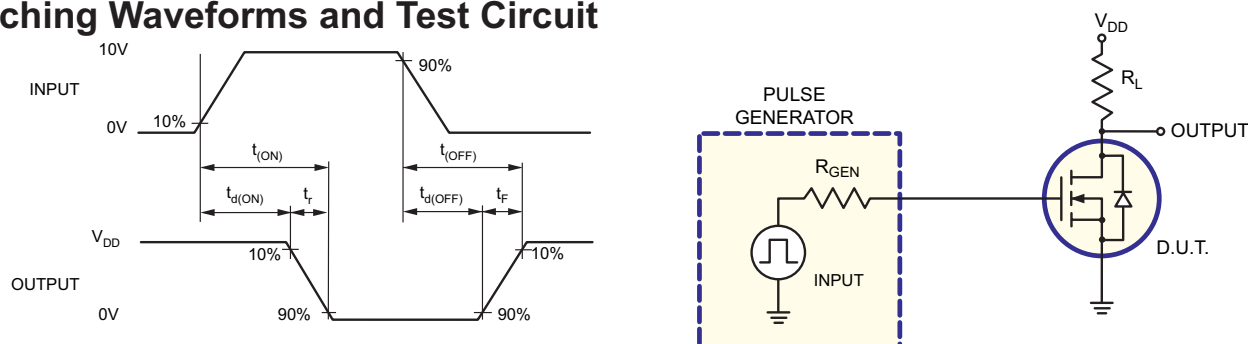
## Thermal Characteristics

Device	Package	$I_D$ (continuous) <sup>*</sup> (mA)	$I_D$ (pulsed) (mA)	Power Dissipation @ $T_c = 25^\circ\text{C}$ (W)	$\theta_{JC}$ (°C/W)	$\theta_{JA}$ (°C/W)	$I_{DR}^*$ (mA)	$I_{DRM}$ (mA)
VN0550	TO-92	50	250	1.0	125	170	50	250

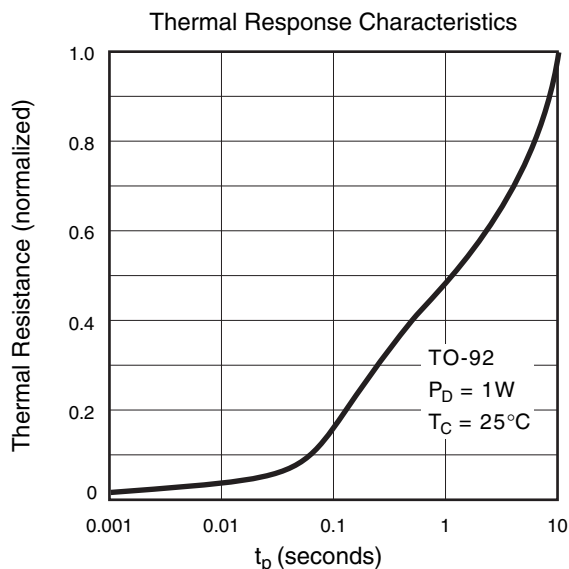
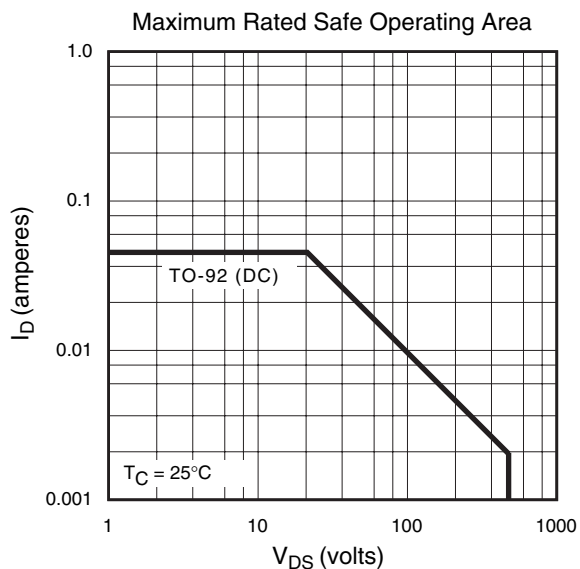
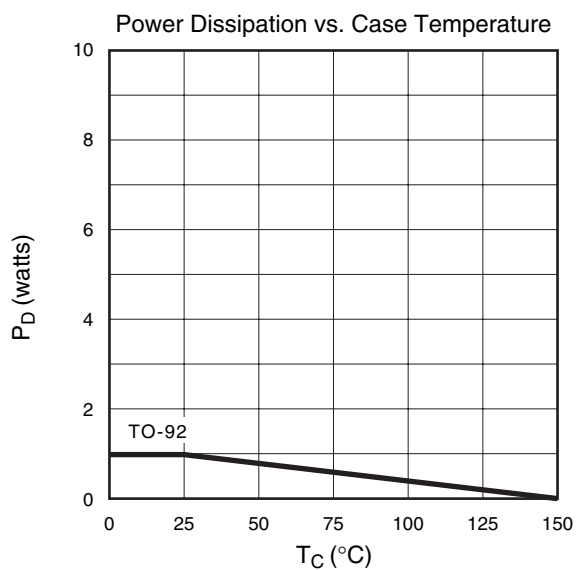
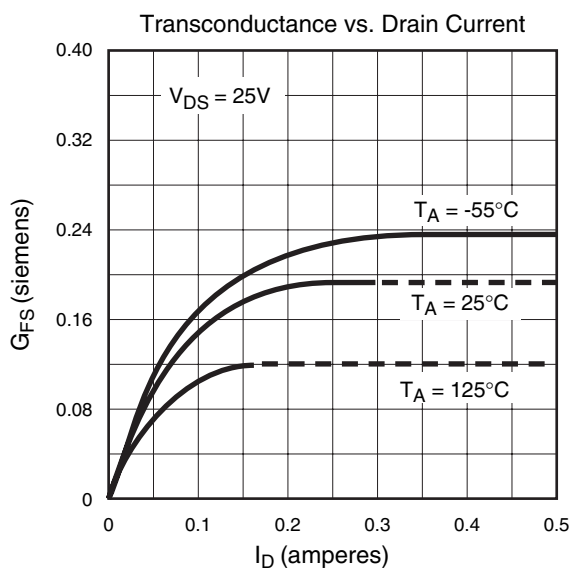
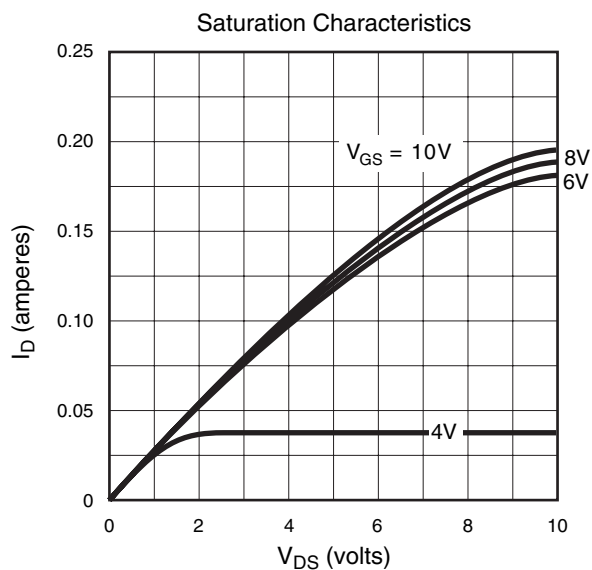
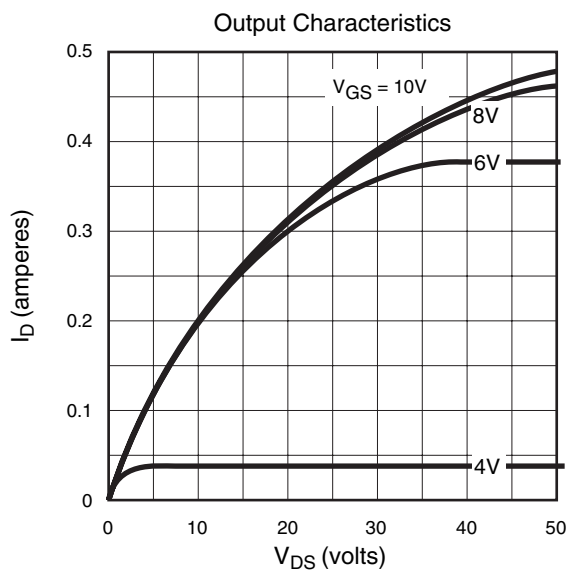
### Notes:

\*  $I_D$  (continuous) is limited by max rated  $T_J$ .

## Switching Waveforms and Test Circuit

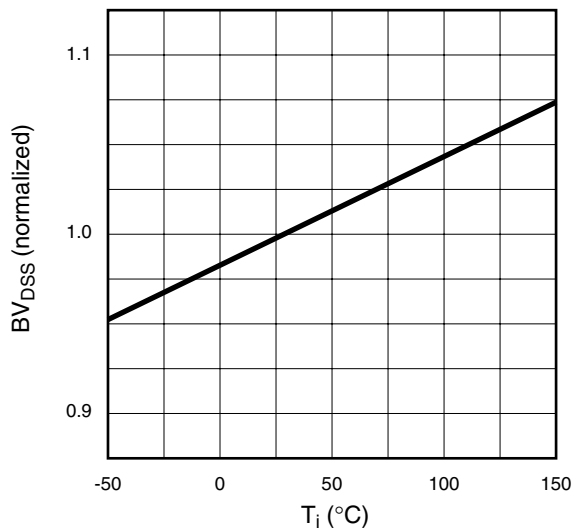


## Typical Performance Curves

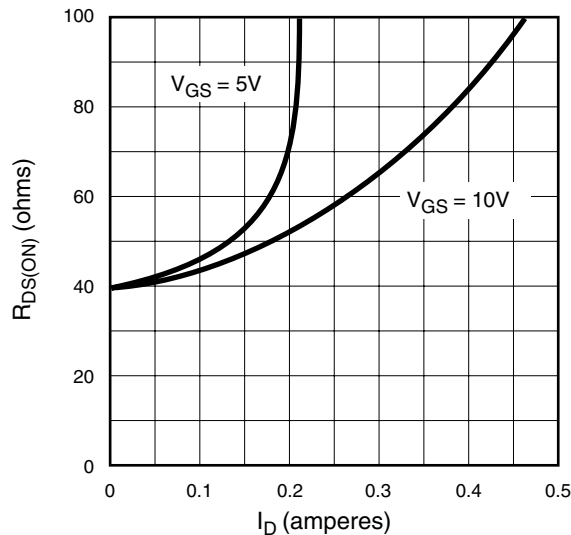


Typical Performance Curves (cont.)

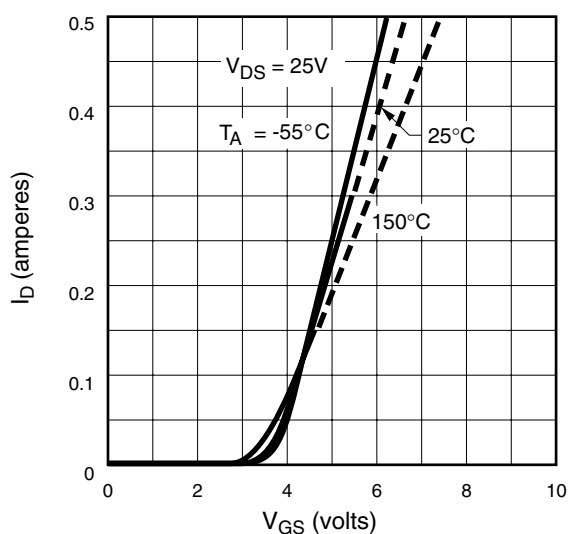
BV<sub>DSS</sub> Variation with Temperature



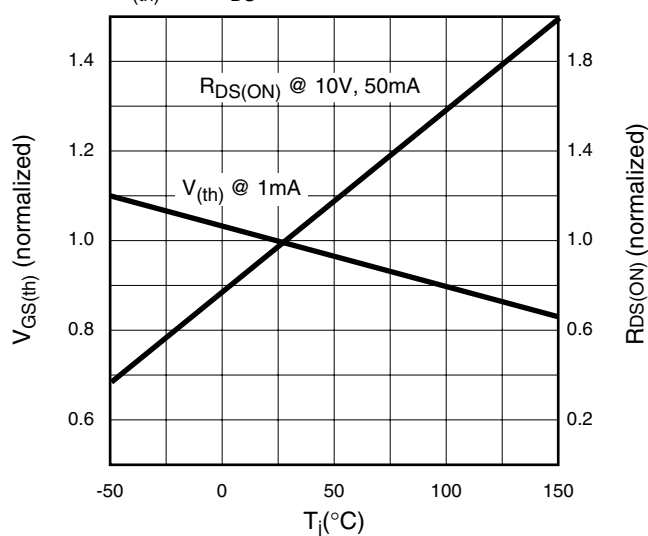
On-Resistance vs. Drain Current



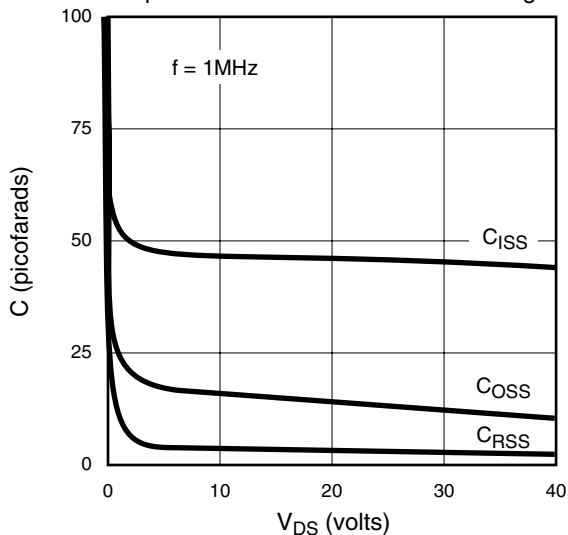
Transfer Characteristics



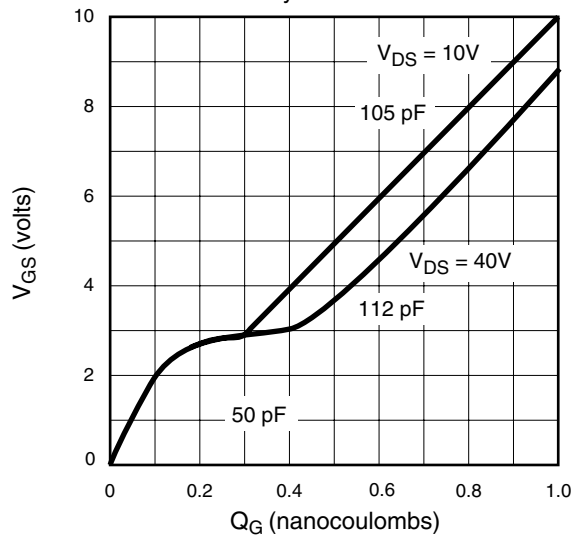
V<sub>(th)</sub> and R<sub>DS</sub> Variation with Temperature



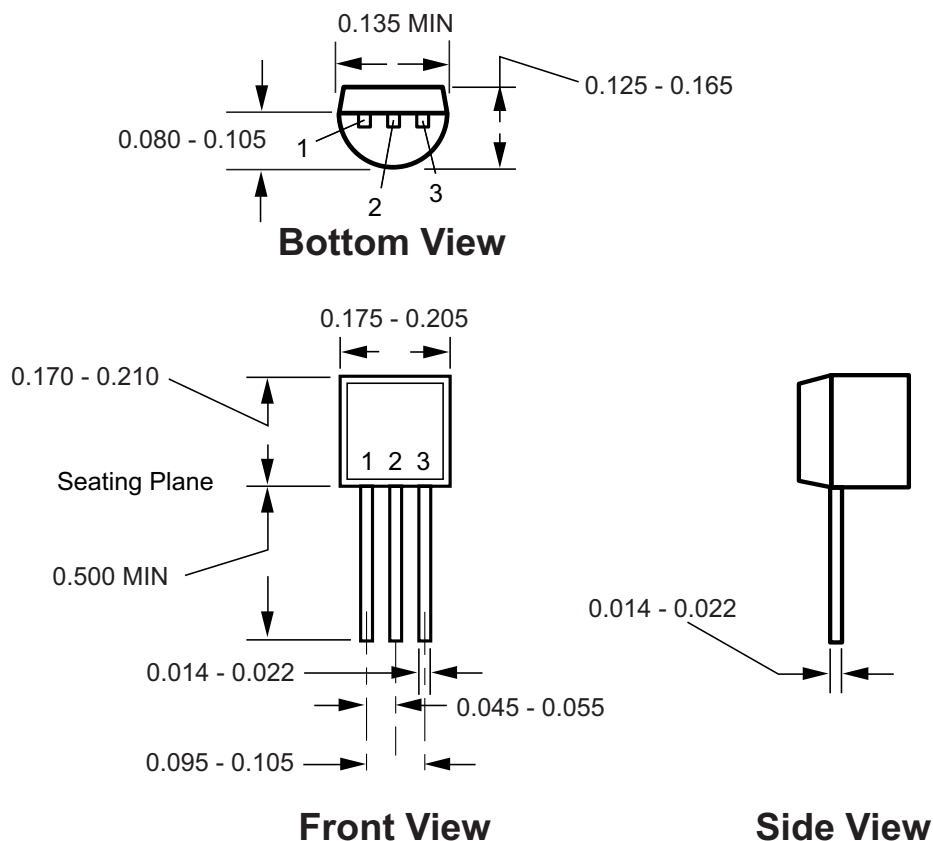
Capacitance vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics



TO-92 Package Outline



**Notes:**

All dimensions are in millimeters; all angles in degrees.

(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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