



**N-Channel Enhancement-Mode Vertical DMOS Power FETs**

**Ordering Information**

BV <sub>DSS</sub> / BV <sub>DGS</sub>	R <sub>DS(ON)</sub> (max)	I <sub>D(ON)</sub> (min)	Order Number / Package		
			TO-39	TO-92	TO-220
160V	6Ω	1A	VN0216N2	VN0216N3	VN0216N5
200V	6Ω	1A	VN0220N2	VN0220N3	VN0220N5

**Features**

- Freedom from secondary breakdown
- Low power drive requirement
- Ease of paralleling
- Low C<sub>iss</sub> 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 control
- Converters
- Amplifiers
- Switches
- Power supply circuits
- Drivers (Relays, Hammers, Solenoids, Lamps, Memories, Displays, Bipolar Transistors, etc.)

**Absolute Maximum Ratings**

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
Soldering Temperature*	300°C

\*Distance of 1.6 mm from case for 10 seconds.

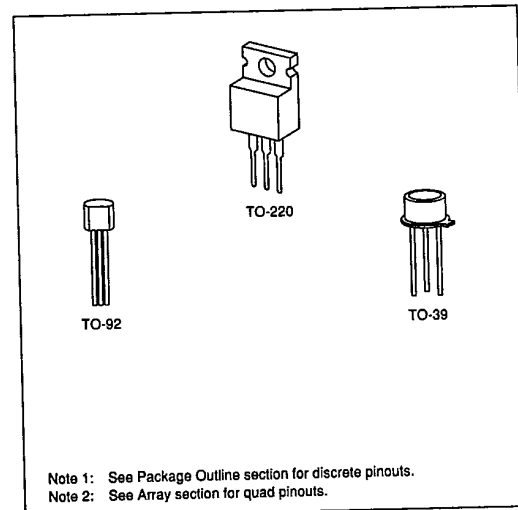
**Advanced DMOS Technology**

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

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

**Package Options**

(Notes 1 and 2)



Note 1: See Package Outline section for discrete pinouts.  
 Note 2: See Array section for quad pinouts.

**Thermal Characteristics**

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Package	$I_D$ (continuous)*	$I_D$ (pulsed)*	Power Dissipation @ $T_C = 25^\circ\text{C}$	$\theta_{JA}$ °C/W	$\theta_{JC}$ °C/W	$I_{DR}$	$I_{DRM}^*$
TO-39	0.7A	2.5A	4W	125	32	0.7A	2.5A
TO-92	0.4A	2.5A	1W	170	125	0.5A	2.5A
TO-220	1.5A	2.5A	28W	70	4.6	1.7A	2.5A

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

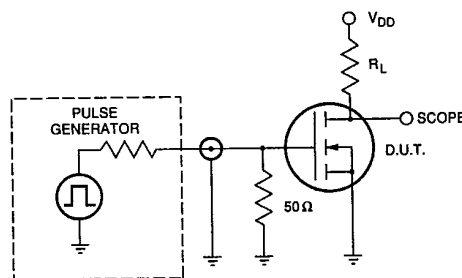
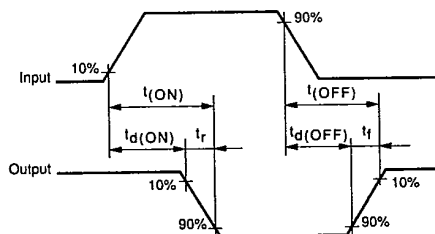
**Electrical Characteristics (@ 25°C unless otherwise specified)**

(Notes 1 and 2)

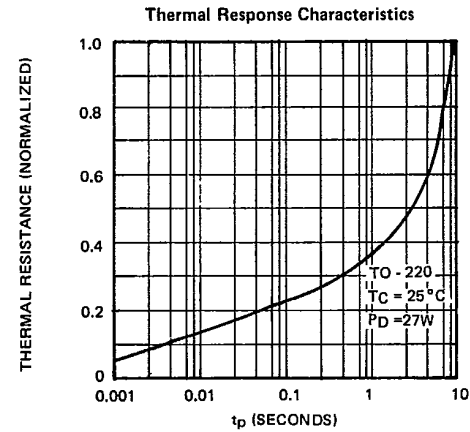
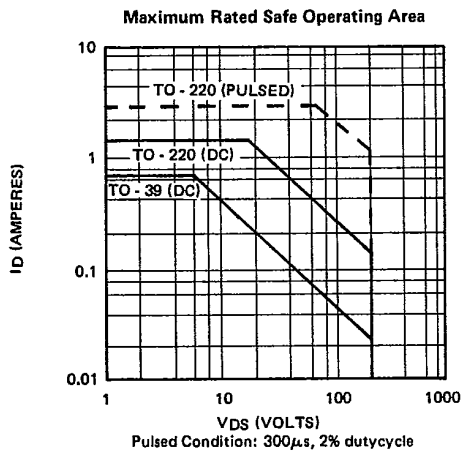
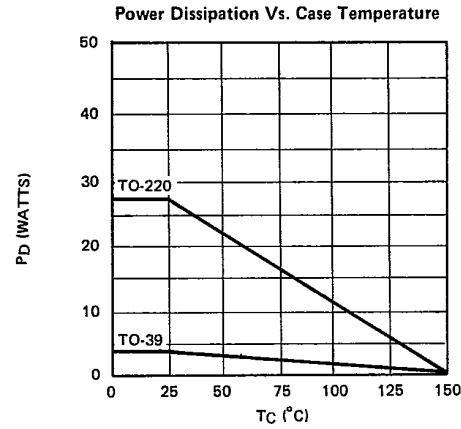
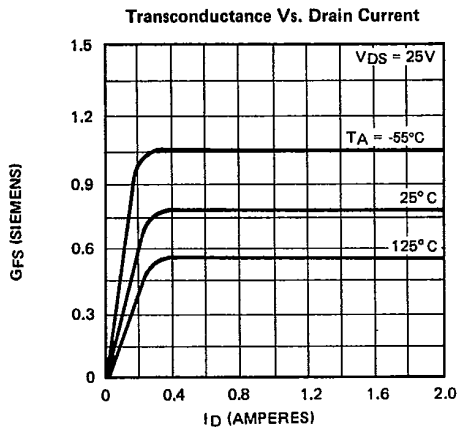
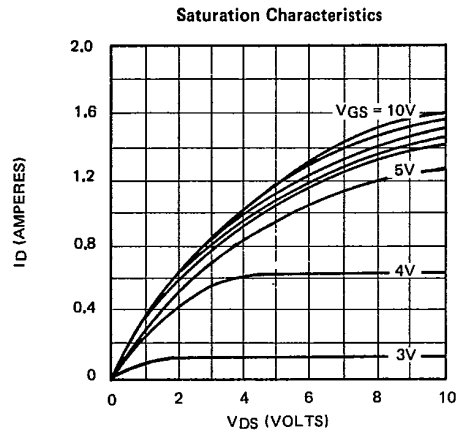
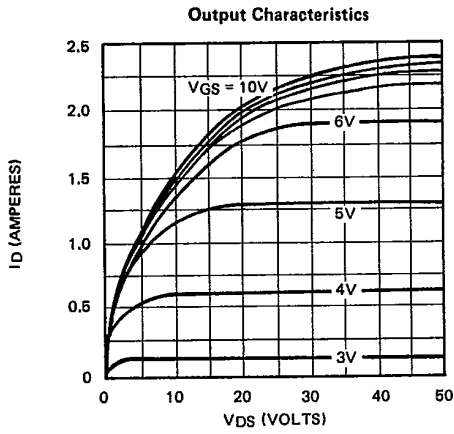
Symbol	Parameter	Min	Typ	Max	Unit	Conditions
$BV_{DSS}$	Drain-to-Source Breakdown Voltage	VN0216	160			$V_{GS} = 0, I_D = 2.0\text{mA}$
		VN0220	200			
$V_{GS(th)}$	Gate Threshold Voltage	0.75		3	V	$V_{GS} = V_{DS}, I_D = 2.0\text{mA}$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature		-4.6	-5.5	mV/°C	$V_{GS} = V_{DS}, I_D = 1.0\text{mA}$
$I_{GSS}$	Gate Body Leakage			100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0$
$I_{DSS}$	Zero Gate Voltage Drain Current			25	$\mu\text{A}$	$V_{GS} = 0, V_{DS} = \text{Max Rating}$
				2.5	mA	$V_{GS} = 0, V_{DS} = 0.8 \text{ Max Rating}$ $T_A = 125^\circ\text{C}$
$I_{D(ON)}$	ON-State Drain Current	0.5	1.3		A	$V_{GS} = 5\text{V}, V_{DS} = 25\text{V}$
		1.0	2.2			$V_{GS} = 10\text{V}, V_{DS} = 25\text{V}$
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance		5.0	8	$\Omega$	$V_{GS} = 5\text{V}, I_D = 0.5\text{A}$
			4.0	6		$V_{GS} = 10\text{V}, I_D = 0.5\text{A}$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature		0.8	1.4	%/°C	$V_{GS} = 10\text{V}, I_D = 500\text{mA}$
$G_{FS}$	Forward Transconductance	0.3	0.7		$\bar{S}$	$V_{DS} = 25\text{V}, I_D = 1\text{A}$
$C_{ISS}$	Input Capacitance		75	150	pF	$V_{GS} = 0, V_{DS} = 25\text{V}$ $f = 1 \text{ MHz}$
$C_{OSS}$	Common Source Output Capacitance		34	85		
$C_{RSS}$	Reverse Transfer Capacitance		15	35		
$t_{d(ON)}$	Turn-ON Delay Time			10	ns	$V_{DD} = 25\text{V}$ $I_D = 0.5\text{A}$ $R_S = 50\Omega$
$t_r$	Rise Time			10		
$t_{d(OFF)}$	Turn-OFF Delay Time			20		
$t_f$	Fall Time			20		
$V_{SD}$	Diode Forward Voltage Drop		1.2	1.8	V	$V_{GS} = 0, I_{SD} = 1\text{A}$
$t_{tr}$	Reverse Recovery Time		430		ns	$V_{GS} = 0, I_{SD} = 1\text{A}$

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

**Switching Waveforms and Test Circuit**



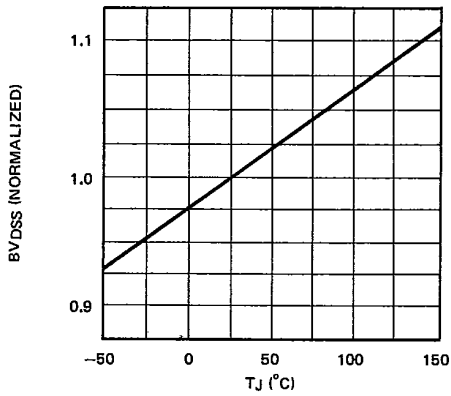
Typical Performance Curves



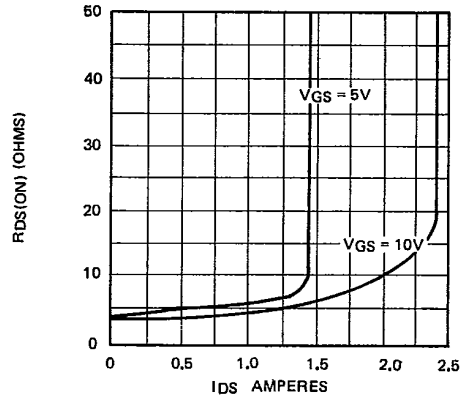
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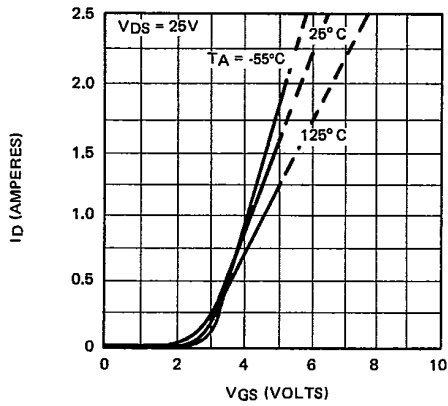
BVDSS Variation with Temperature



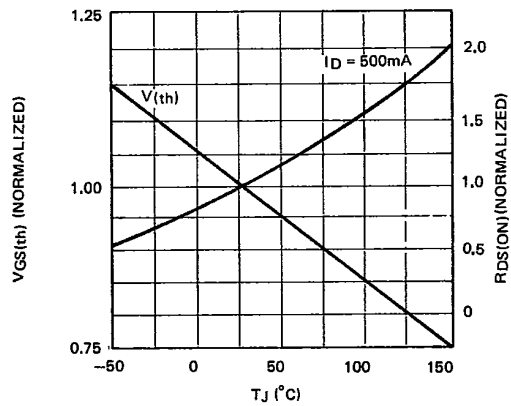
ON - Resistance Vs. Drain Current



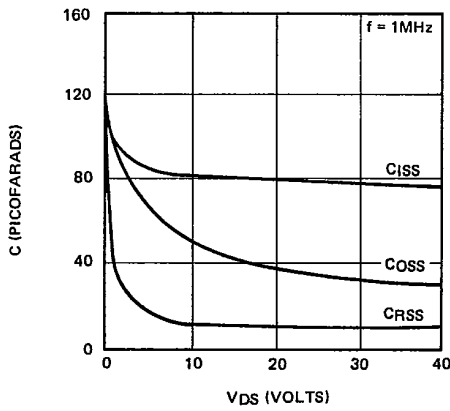
Transfer Characteristics



V(th) and RDS Variation with Temperature



Capacitance Vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics

