


**N-Channel Enhancement-Mode  
Vertical DMOS FETs**
*T-35-25*
**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-92	Dice†
40V	0.35Ω	8A	VN2204N3	VN2204ND
60V	0.35Ω	8A	VN2206N3	VN2206ND
100V	0.35Ω	8A	VN2210N3	VN2210ND

† MIL visual screening available

**Features**

- Free 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 positive 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 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.

**8**
**Package Options**

(Notes 1)



TO-92

Note 1: See Package Outline section for discrete pinouts.

# Thermal Characteristics

T-35-25

Package	$I_D$ (continuous)*	$I_D$ (pulsed)	Power Dissipation @ $T_C = 25^\circ\text{C}$	$\theta_{JA}$ $^\circ\text{C/W}$	$\theta_{JC}$ $^\circ\text{C/W}$	$I_{DR}^*$	$I_{DRM}$
TO-92	1.2A	8.0A	1.0W	170	125	1.2A	8.0A

\*  $I_D$  (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	VN2204	40		V	$V_{GS} = 0, I_D = 10\text{mA}$
		VN2206	60			
		VN2210	100			
$V_{GS(th)}$	Gate Threshold Voltage	0.8		2.4	V	$V_{GS} = V_{DS}, I_D = 10\text{mA}$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature		-4.3	-5.5	mV/ $^\circ\text{C}$	$V_{GS} = V_{DS}, I_D = 10\text{mA}$
$I_{GSS}$	Gate Body Leakage		1	100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0$
$I_{DSS}$	Zero Gate Voltage Drain Current			50	$\mu\text{A}$	$V_{GS} = 0, V_{DS} = \text{Max Rating}$
				10	mA	$V_{GS} = 0, V_{DS} = 0.8 \text{ Max Rating}$ $T_A = 125^\circ\text{C}$
$I_{D(ON)}$	ON-State Drain Current	3	4.5		A	$V_{GS} = 5\text{V}, V_{DS} = 25\text{V}$
		8				$V_{GS} = 10\text{V}, V_{DS} = 25\text{V}$
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance		0.4	0.5	$\Omega$	$V_{GS} = 5\text{V}, I_D = 1\text{A}$
			0.27	0.35		$V_{GS} = 10\text{V}, I_D = 4\text{A}$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature		0.85	1.2	%/ $^\circ\text{C}$	$V_{GS} = 10\text{V}, I_D = 4\text{A}$
$G_{FS}$	Forward Transconductance	1.5	2.0		$\text{S}$	$V_{DS} = 25\text{V}, I_D = 2\text{A}$
$C_{ISS}$	Input Capacitance			500	$\text{pF}$	$V_{GS} = 0, V_{DS} = 25\text{V}$ $f = 1 \text{ MHz}$
$C_{OSS}$	Common Source Output Capacitance			200		
$C_{RSS}$	Reverse Transfer Capacitance			65		
$t_{d(ON)}$	Turn-ON Delay Time		10	15	ns	$V_{DD} = 25\text{V}$ $I_D = 4\text{A}$ $R_S = 50\Omega$
$t_r$	Rise Time		10	15		
$t_{d(OFF)}$	Turn-OFF Delay Time		30	50		
$t_f$	Fall Time		30	50		
$V_{SD}$	Diode Forward Voltage Drop		1.0	1.6		
$t_{rr}$	Reverse Recovery Time		500		ns	$V_{GS} = 0, I_{SD} = 1\text{A}$

**Notes:**

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

# Switching Waveforms and Test Circuit

