



N-Channel Enhancement-Mode Vertical DMOS Power FETs

Ordering Information

BV_{DSS} / BV_{DGS}	$R_{DS(ON)}$ (max)	$I_{D(ON)}$ (min)	Order Number / Package			
			TO-39	TO-92	TO-220	Dice
350V	10 Ω	0.75A	VN0635N2	VN0635N3	VN0635N5	VN0635ND
400V	10 Ω	0.75A	VN0640N2	VN0640N3	VN0640N5	VN0640ND

Features

- ☐ Freedom 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 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_{DSS}
Drain-to-Gate Voltage	BV_{DGS}
Gate-to-Source Voltage	$\pm 20V$
Operating and Storage Temperature	-55°C to +150°C
Soldering Temperature*	300°C

*Distance of 1.6 mm from case for 10 seconds.

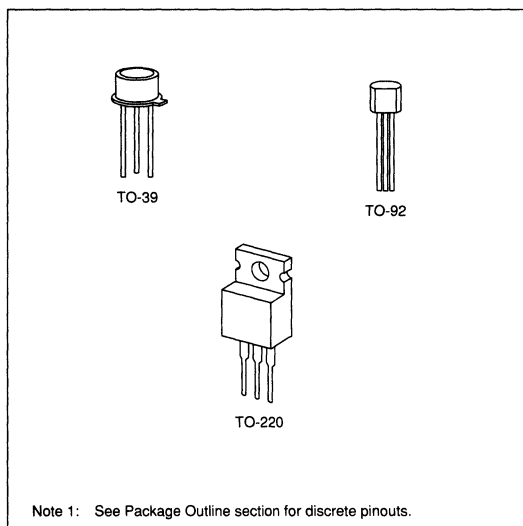
Advanced DMOS Technology

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

(Note 1)



Thermal Characteristics

Package	I_D (continuous)*	I_D (pulsed)*	Power Dissipation @ $T_C = 25^\circ\text{C}$	θ_{JC} $^\circ\text{C/W}$	θ_{JA} $^\circ\text{C/W}$	I_{DR}	I_{DRM}^*
TO-3	0.25A	1.5A	1W	125	170	0.25A	1.5A
TO-39	0.6A	2.5A	6W	21	125	.6A	2.5A
TO-220	1.6A	2.5A	28W	2.7	70	1.6A	2.5A

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

Electrical Characteristics (@ 25°C unless otherwise specified)

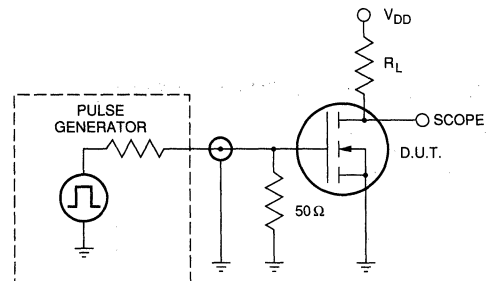
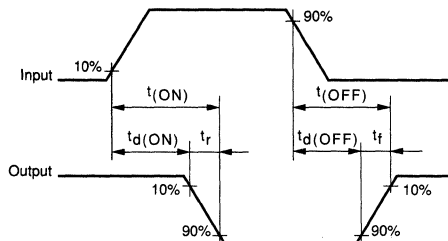
(Notes 1 and 2)

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	VN0635 350 VN0640 400			V	$V_{GS} = 0, I_D = 2\text{mA}$
$V_{GS(th)}$	Gate Threshold Voltage	2		4	V	$V_{GS} = V_{DS}, I_D = 2\text{mA}$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature			-4.0	mV/ $^\circ\text{C}$	$V_{GS} = V_{DS}, I_D = 2\text{mA}$
I_{GSS}	Gate Body Leakage			100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0$
I_{DSS}	Zero Gate Voltage Drain Current			10	μA	$V_{GS} = 0, V_{DS} = \text{Max Rating}$
				1	mA	$V_{GS} = 0, V_{DS} = 0.8 \text{ Max Rating}$ $T_A = 125^\circ\text{C}$
$I_{D(ON)}$	ON-State Drain Current		0.6		A	$V_{GS} = 5\text{V}, V_{DS} = 25\text{V}$
			0.75	1.3		$V_{GS} = 10\text{V}, V_{DS} = 25\text{V}$
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance		8		Ω	$V_{GS} = 5\text{V}, I_D = 100\text{mA}$
			8	10		$V_{GS} = 10\text{V}, I_D = 500\text{mA}$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature			0.75	%/ $^\circ\text{C}$	$V_{GS} = 10\text{V}, I_D = 500\text{mA}$
G_{FS}	Forward Transconductance	0.1			S	$V_{DS} = 25\text{V}, I_D = 500\text{mA}$
C_{ISS}	Input Capacitance		85	130	pF	$V_{GS} = 0, V_{DS} = 25\text{V}$ $f = 1\text{MHz}$
C_{OSS}	Common Source Output Capacitance		50	75		
C_{RSS}	Reverse Transfer Capacitance		10	20		
$t_{d(ON)}$	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			10		
V_{SD}	Diode Forward Voltage Drop			1.8	V	$V_{GS} = 0, I_{SD} = 0.5\text{A}$
t_{rr}	Reverse Recovery Time		300		ns	$V_{GS} = 0, I_{SD} = 0.5\text{A}$

Note 1: All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: $300\mu\text{s}$ pulse, 2% duty cycle.)

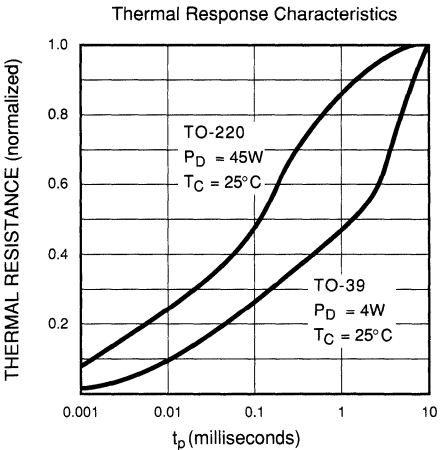
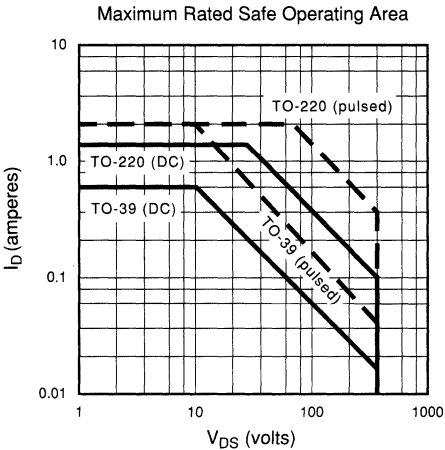
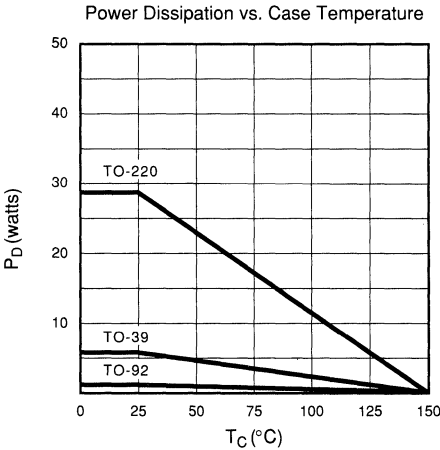
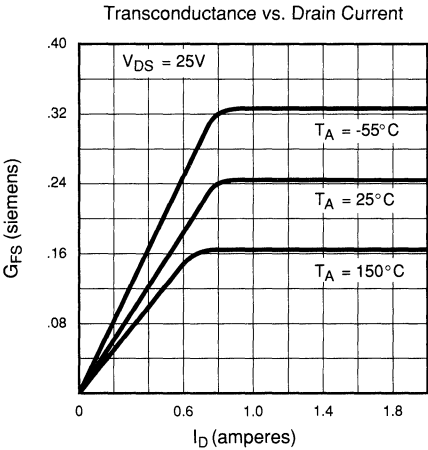
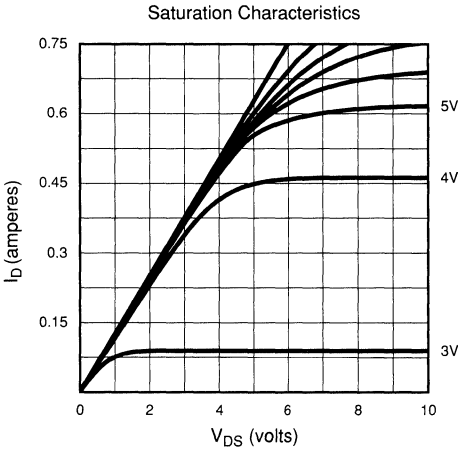
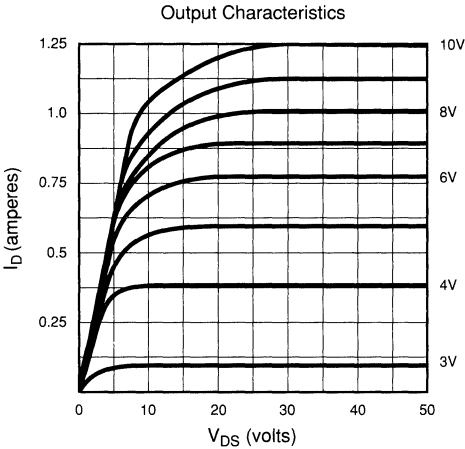
Note 2: All A.C. parameters sample tested.

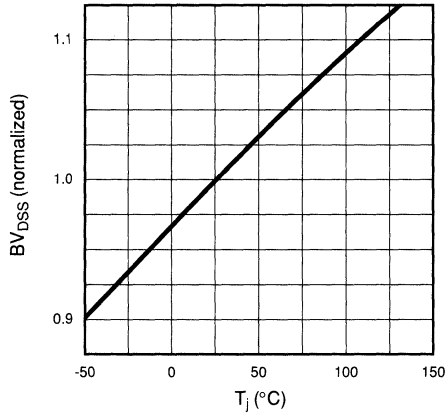
Switching Waveforms and Test Circuit



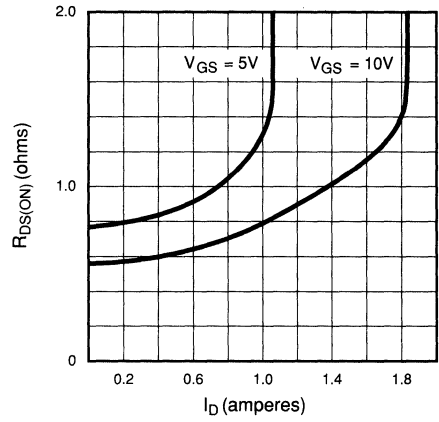
Typical Performance Curves

VN06D

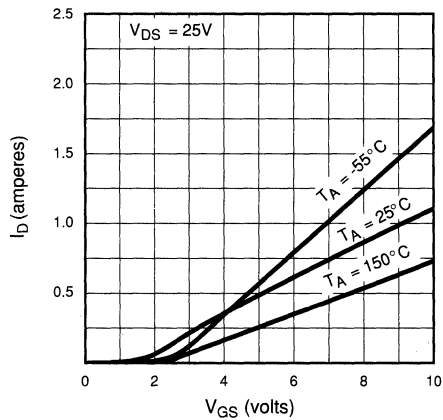
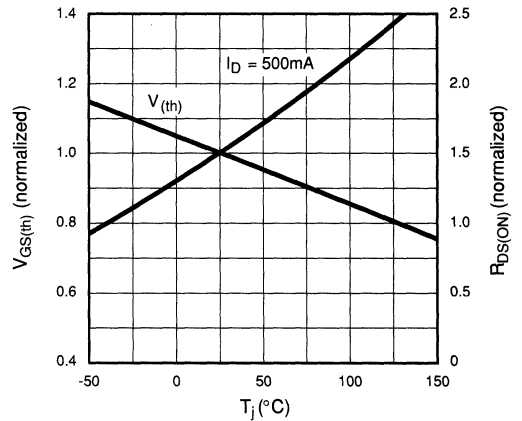


BV_{DSS} Variation with Temperature

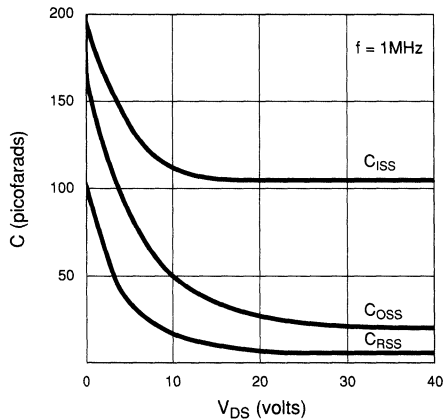
On-Resistance vs. Drain Current



Transfer Characteristics

V_(th) and R_{DS} Variation with Temperature

Capacitance vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics

