



P-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
-160V	16 Ω	0.75A	VP0216N2	VP0216N3	VP0216N5
-200V	16 Ω	0.75A	VP0220N2	VP0220N3	VP0220N5

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

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.

Applications

- ☐ Motor control
- ☐ Convertors
- ☐ Amplifiers
- ☐ Switches
- ☐ Power supply circuits
- ☐ Driver (Relays, Hammers, Solenoids, Lamps, Memories, Displays, Bipolar Transistors, etc.)

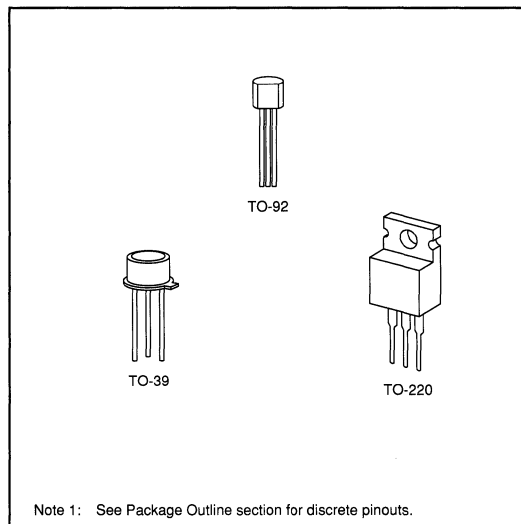
Absolute Maximum Ratings

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.

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-39	-0.35A	-1.0A	4W	32	125	-0.35A	-1.0A
TO-92	-0.2A	-1.0A	1W	125	170	-0.2A	-1.0A
TO-220	-0.8A	-2.5A	27W	4.7	70	-0.8A	-2.5A

* I_D (continuous) is limited by max rated T_J

Electrical Characteristics (@ 25°C unless otherwise specified)

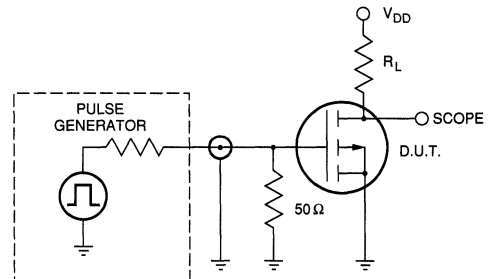
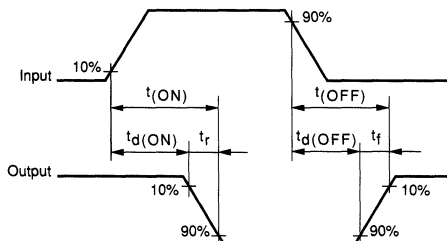
(Notes 1 and 2)

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	VP0220 -200 VP0216 -160			V	$V_{GS} = 0, I_D = -2.5\text{mA}$
$V_{GS(th)}$	Gate Threshold Voltage	-1.0		-3.5	V	$V_{GS} = V_{DS}, I_D = -2.5\text{mA}$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature		-4.5	-6.0	mV/ $^\circ\text{C}$	$V_{GS} = V_{DS}, I_D = -2.5\text{mA}$
I_{GSS}	Gate Body Leakage			-100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0$
I_{DSS}	Zero Gate Voltage Drain Current			-25	μA	$V_{GS} = 0, V_{DS} = \text{Max Rating}$
				-2	mA	$V_{GS} = 0, V_{DS} = 0.8 \text{ Max Rating}$ $T_A = 125^\circ\text{C}$
$I_{D(ON)}$	ON-State Drain Current	-0.25 -0.75	-0.4 -0.85		A	$V_{GS} = -5\text{V}, V_{DS} = -25\text{V}$ $V_{GS} = -10\text{V}, V_{DS} = -25\text{V}$
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance		9 7	16 16	Ω	$V_{GS} = -5\text{V}, I_D = -0.1\text{A}$ $V_{GS} = -10\text{V}, I_D = -0.25\text{A}$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature		0.5	1.2	%/ $^\circ\text{C}$	$V_{GS} = -10\text{V}, I_D = -0.25\text{A}$
G_{FS}	Forward Transconductance	0.1	0.2		S	$V_{DS} = -25\text{V}, I_D = -0.25\text{A}$
C_{ISS}	Input Capacitance		85	150	pF	$V_{GS} = 0, V_{DS} = -25\text{V}$ $f = 1 \text{ MHz}$
C_{OSS}	Common Source Output Capacitance		60	85		
C_{RSS}	Reverse Transfer Capacitance		10	35		
$t_{d(ON)}$	Turn-ON Delay Time		8	10	ns	$V_{DD} = -25\text{V}$ $I_D = -1.0\text{A}$ $R_S = 50\Omega$
t_r	Rise Time		10	15		
$t_{d(OFF)}$	Turn-OFF Delay Time		15	20		
t_f	Fall Time		10	15		
V_{SD}	Diode Forward Voltage Drop		-1.2	-1.8	V	$V_{GS} = 0, I_{SD} = -0.5\text{A}$
t_{rr}	Reverse Recovery Time		400		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 μs pulse, 2% duty cycle.)

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

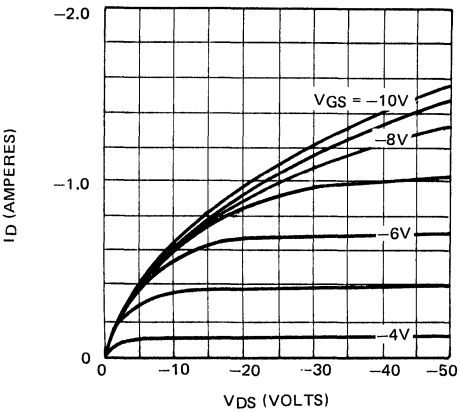
Switching Waveforms and Test Circuit



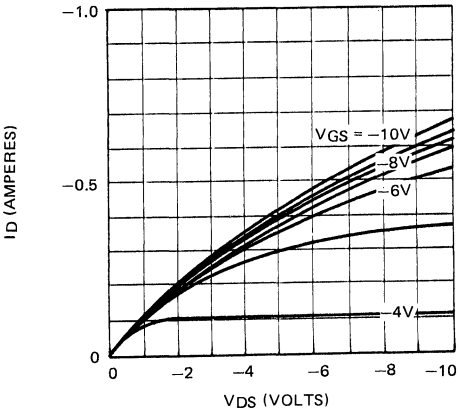
Typical Performance Curves

VP02C

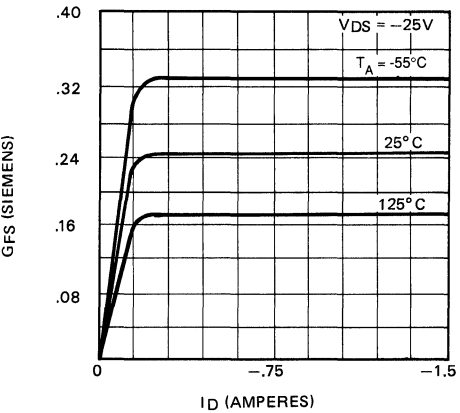
Output Characteristics



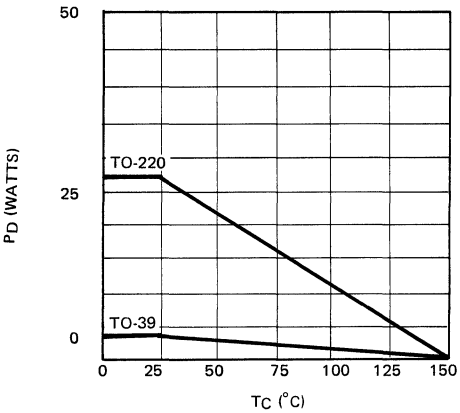
Saturation Characteristics



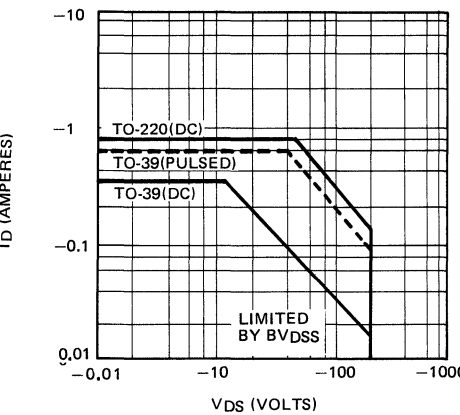
Transconductance Vs. Drain Current



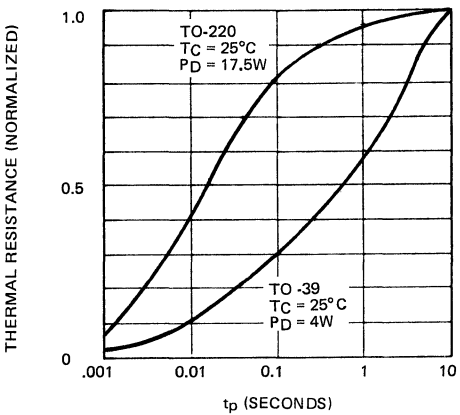
Power Dissipation Vs. Case Temperature



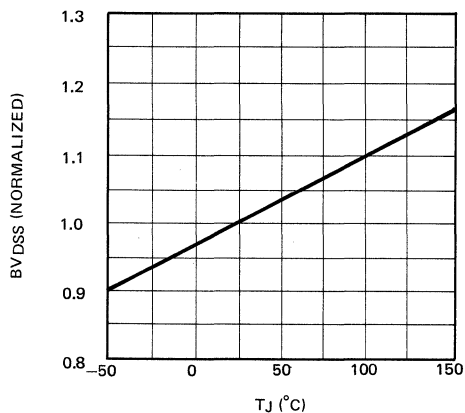
Maximum Rated Safe Operating Area



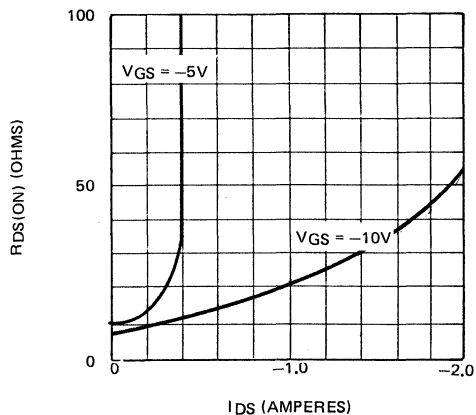
Thermal Response Characteristics



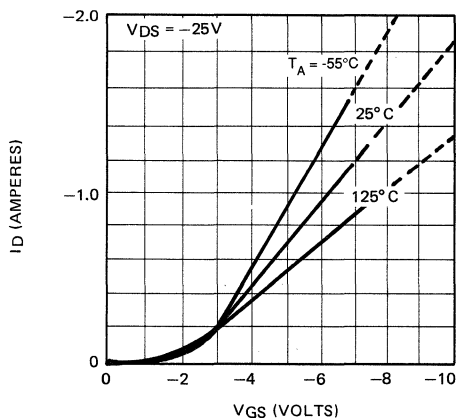
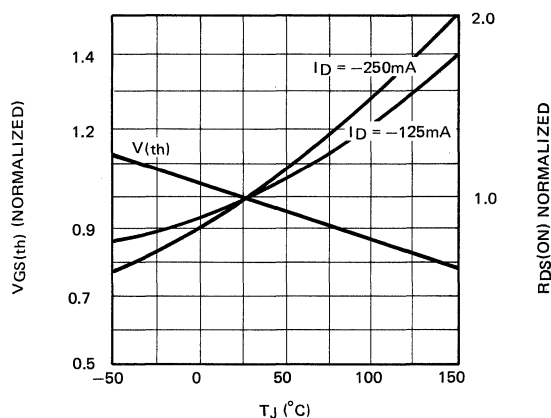
BVDSS Variation with Temperature



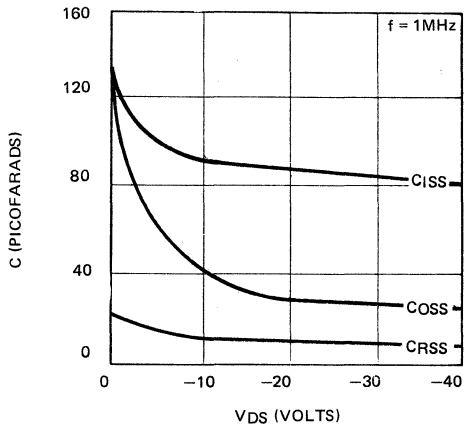
ON-Resistance Vs. Drain Current



Transfer Characteristics

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

Capacitance Vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics

