Supertex inc.

VP02C

T-39-19

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	16Ω	0.75A	VP0216N2	VP0216N3	VP0216N5
-200V	16Ω	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.

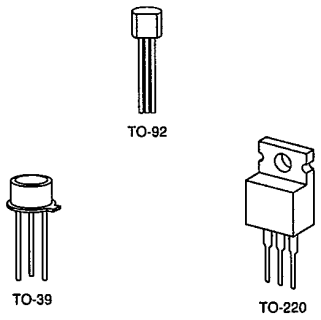
Supertex Vertical DMOS Power FETs are ideally suited to a wide range of switching and amplifying applications where high breakdown voltage, high input impedance, low input capacitance, and fast switching speeds are desired.

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Applications

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

Package Options (Note 1)



Note 1: See Package Outline section for discrete pinouts.

Absolute Maximum Ratings

Drain-to-Source Voltage	BV_{DSS}
Drain-to-Gate Voltage	BV_{DGS}
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.

Thermal Characteristics

Package	I_D (continuous)*	I_D (pulsed)*	Power Dissipation @ T_C = 25°C	θ_{jc} °C/W	θ_{ja} °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

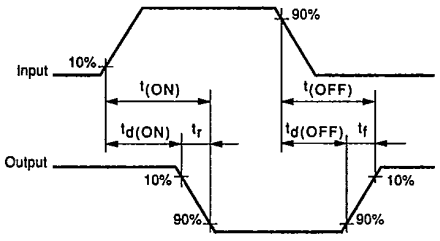
Electrical Characteristics (@ 25°C unless otherwise specified)

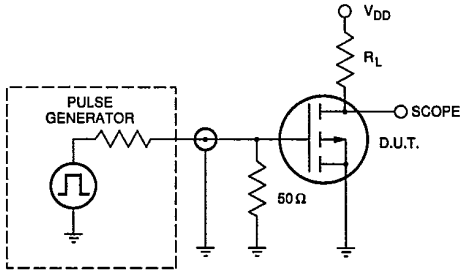
(Notes 1 and 2)

Symbol	Parameter		Min	Typ	Max	Unit	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	VP0220	-200			V	V_{GS} = 0, I_D = -2.5mA
		VP0216	-160				
$V_{GS(th)}$	Gate Threshold Voltage		-1.0		-3.5	V	V_{GS} = V_{DS}, I_D = -2.5mA
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature			-4.5	-6.0	mV/°C	V_{GS} = V_{DS}, I_D = -2.5mA
I_{GSS}	Gate Body Leakage				-100	nA	V_{GS} = ±20V, V_{DS} = 0
I_{DSS}	Zero Gate Voltage Drain Current				-25	µA	V_{GS} = 0, V_{DS} = Max Rating
					-2	mA	V_{GS} = 0, V_{DS} = 0.8 Max Rating, T_A = 125°C
$I_{D(ON)}$	ON-State Drain Current		-0.25	-0.4		A	V_{GS} = -5V, V_{DS} = -25V
			-0.75	-0.85			V_{GS} = -10V, V_{DS} = -25V
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance			9	16	Ω	V_{GS} = -5V, I_D = -0.1A
				7	16		V_{GS} = -10V, I_D = -0.25A
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature			0.5	1.2	%/°C	V_{GS} = -10V, I_D = -0.25A
G_{FS}	Forward Transconductance		0.1	0.2		℧	V_{DS} = -25V, I_D = -0.25A
C_{ISS}	Input Capacitance			85	150	pF	V_{GS} = 0, V_{DS} = -25V, f = 1 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} = -25V, I_D = -1.0A, R_S = 50Ω
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} = -0.5A
t_{rr}	Reverse Recovery Time			400		ns	V_{GS} = 0, I_{SD} = -0.5A

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

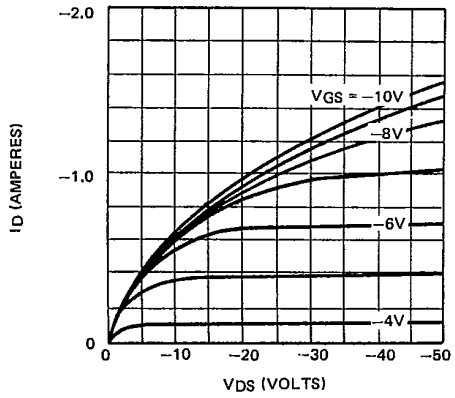




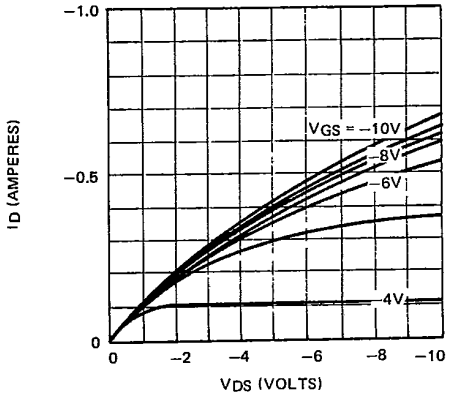
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Typical Performance Curves

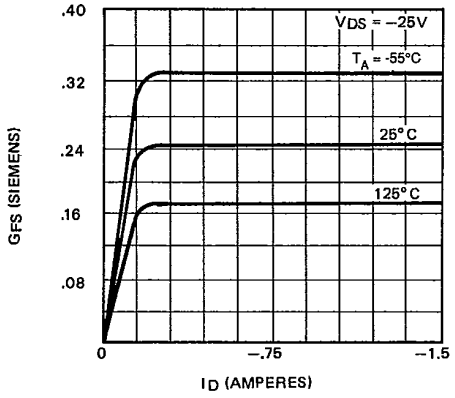
Output Characteristics



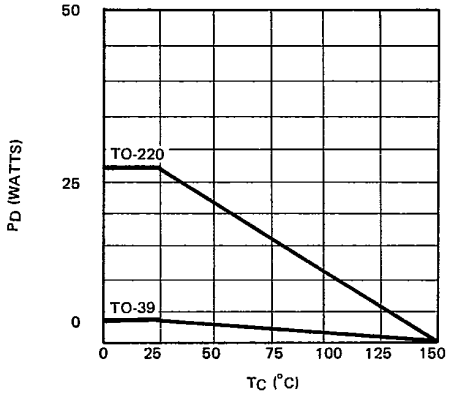
Saturation Characteristics



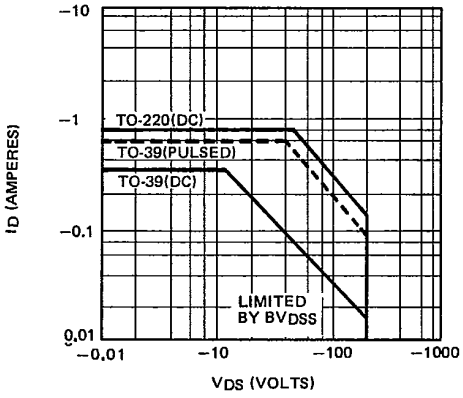
Transconductance Vs. Drain Current



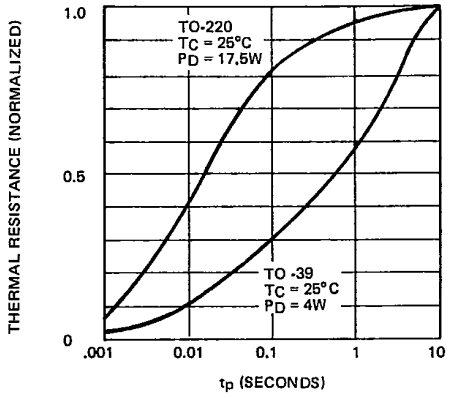
Power Dissipation Vs. Case Temperature



Maximum Rated Safe Operating Area

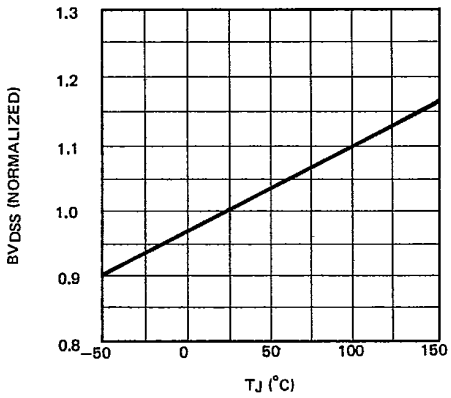


Thermal Response Characteristics

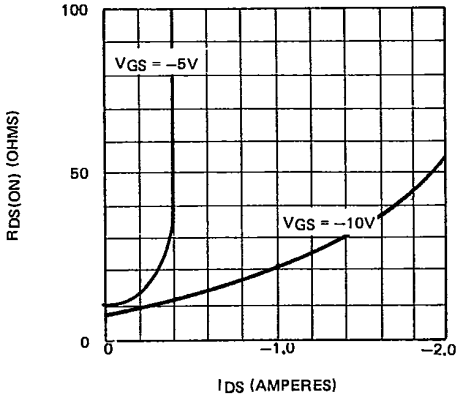


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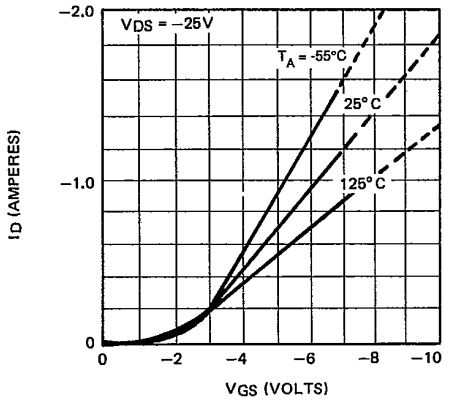
BVDSS Variation with Temperature



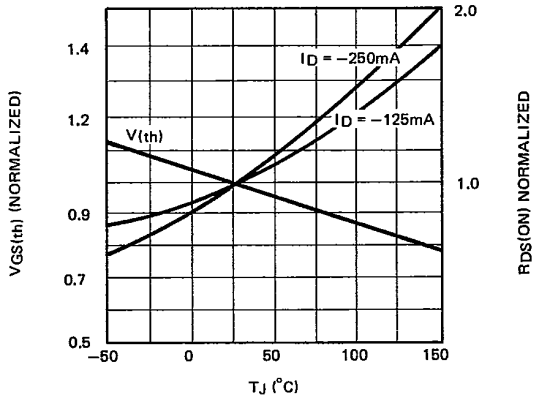
ON-Resistance Vs. Drain Current



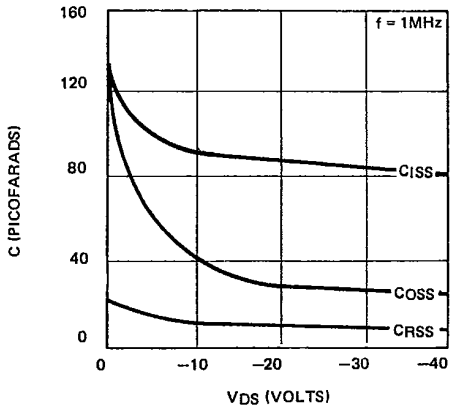
Transfer Characteristics



V(th) and RDS Variation with Temperature



Capacitance Vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics

