Supertex inc.

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-3	TO-39	TO-220	DICE
-160V	2.5Ω	-4.0A	VP1216N1	VP1216N2	VP1216N5	VP1216ND
-200V	2.5Ω	-4.0A	VP1220N1	VP1220N2	VP1220N5	VP1220ND

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

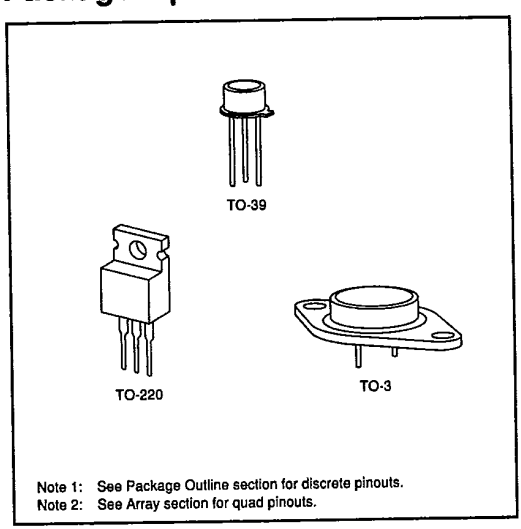
These enhancement-mode (normally-off) power transistors utilize a vertical DMOS structure and Supertex's well-proven silicon-gate manufacturing process. This combination produces devices with the power handling capabilities of bipolar transistors and with the high input impedance and negative temperature 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.)

Package Options (Notes 1 and 2)



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

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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-3	-4.5A	-8.0A	100W	30	1.25	-4.5A	-8.0A
TO-39	-2.0A	-4.5A	6.5W	125	20	-2.0A	-4.5A
TO-220	-3.5A	-6.0A	45W	70	2.75	-3.5A	-6.0A

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

Electrical Characteristics (@ 25°C unless otherwise specified)

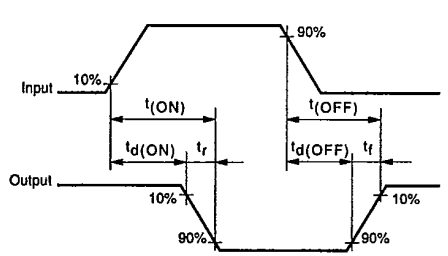
(Notes 1 and 2)

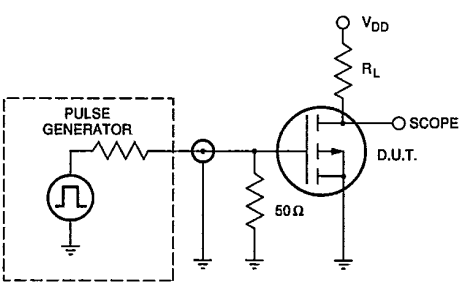
Symbol	Parameter		Min	Typ	Max	Unit	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	VP1220	-200			V	I_D = -10mA, V_{GS} = 0
		VP1216	-160				
$V_{GS(th)}$	Gate Threshold Voltage		-1.5		-3.5	V	V_{GS} = V_{DS}, I_D = -10mA
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature			-3.5	-4.5	mV/°C	V_{GS} = V_{DS}, I_D = -10mA
I_{GSS}	Gate Body Leakage				-100	nA	V_{GS} = ±20V, V_{DS} = 0
I_{DSS}	Zero Gate Voltage Drain Current			-1.0	-100	µA	V_{GS} = 0, V_{DS} = Max Rating
					-10	mA	V_{GS} = 0, V_{DS} = 0.8 Max Rating, T_A = 125°C
$I_{D(ON)}$	ON-State Drain Current		-.0.5	-1.0		A	V_{GS} = -5V, V_{DS} = -25V
			-4.0	-7.0			V_{GS} = -10V, V_{DS} = -25V
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance			2.0	4.0	Ω	V_{GS} = -5V, I_D = -0.5A
				1.6	2.5		V_{GS} = -10V, I_D = -1.0A
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature			0.5	1.0	%/°C	I_D = -1A, V_{GS} = -10V
G_{FS}	Forward Transconductance		0.8	1.2		℧	V_{DS} = -25V, I_D = -3.0A
C_{ISS}	Input Capacitance			600	650	pF	V_{GS} = 0, V_{DS} = -25V, f = 1 MHz
C_{OSS}	Common Source Output Capacitance			200	250		
C_{RSS}	Reverse Transfer Capacitance			20	30		
$t_{d(ON)}$	Turn-ON Delay Time			30	40	ns	V_{DD} = -15V, I_D = -2.0A, R_S = 50Ω
t_r	Rise Time			26	35		
$t_{d(OFF)}$	Turn-OFF Delay Time			45	90		
t_f	Fall Time			20	40		
V_{SD}	Diode Forward Voltage Drop			-1.4	-2.0	V	I_{SD} = -0.5A, V_{GS} = 0
t_{rr}	Reverse Recovery Time			500		ns	I_{SD} = -0.5A, V_{GS} = 0

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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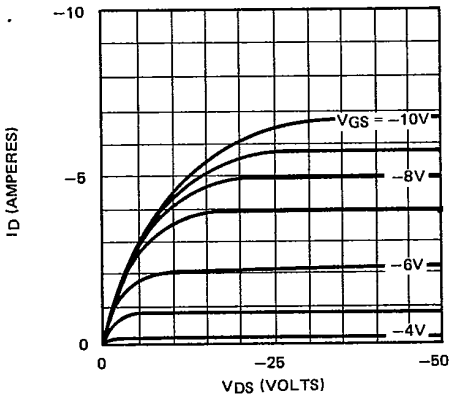
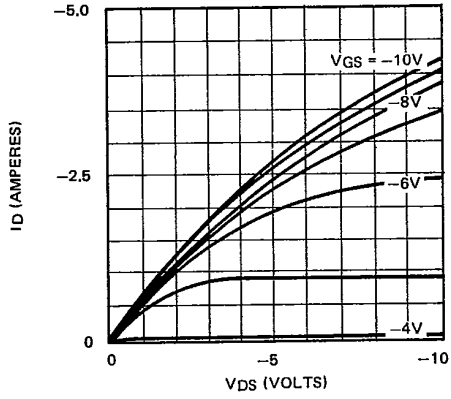
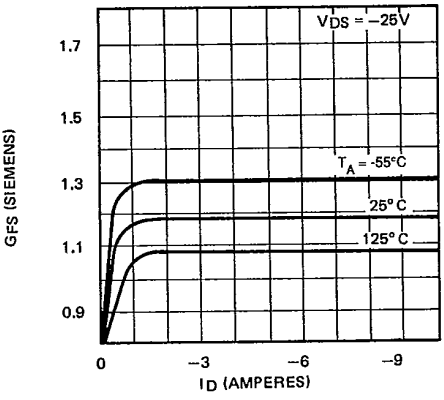
Output Characteristics



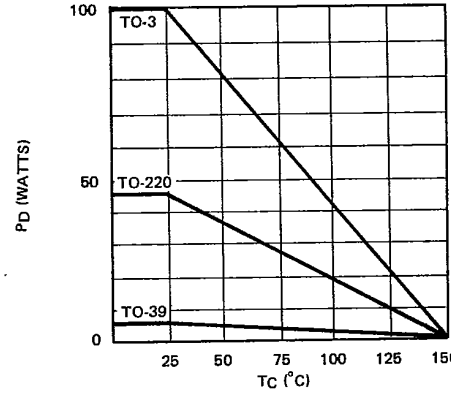
Saturation Characteristics



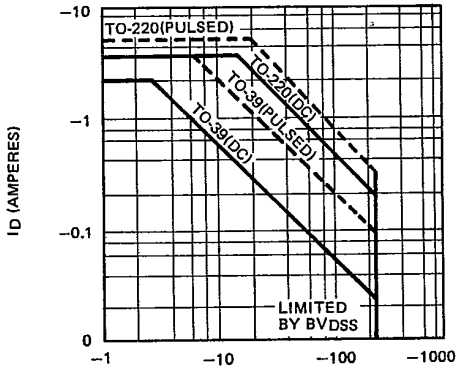
Transconductance Vs. Drain Current



Power Dissipation Vs. Case Temperature

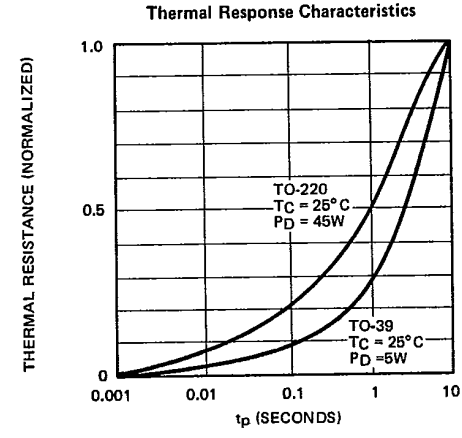


Maximum Rated Safe Operating Area

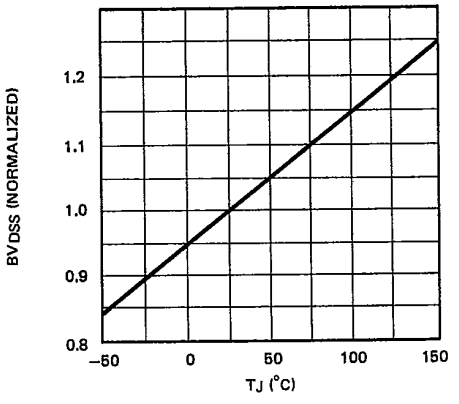


Pulse Condition: 300 μs,2% dutycycle.

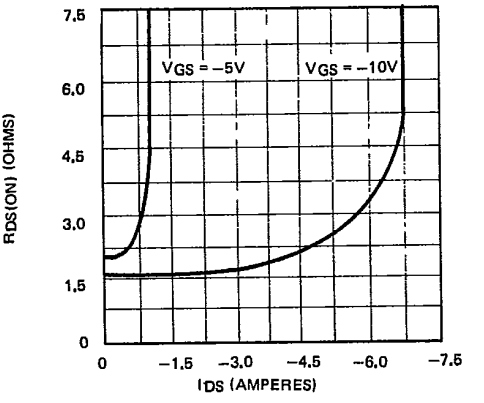
Thermal Response Characteristics



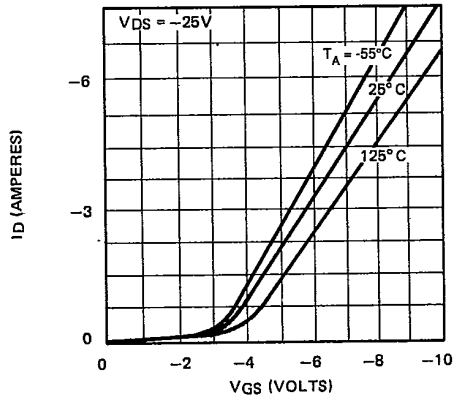
BVDSS Variation with Temperature



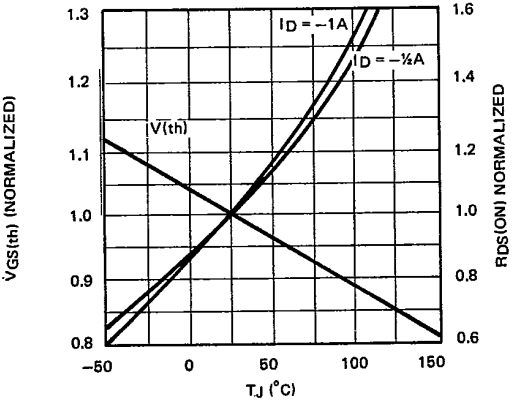
ON-Resistance Vs. Drain Current



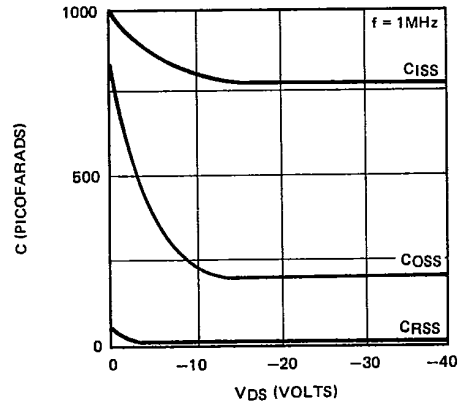
Transfer Characteristics



V(th) and RDS Variation with Temperature



Capacitance Vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics