



**P-Channel Enhancement-Mode
Vertical DMOS FETs**

T-39-01

**Ordering Information
Standard Commercial Devices**

BV _{DSS} / BV _{DGS}	R _{DS(ON)} (max)	I _{D(ON)} (min)	Order Number / Package		
			TO-39	TO-220	DICE†
-160V	2.5Ω	-4.0A	VP1216N2	VP1216N5	VP1216ND
-200V	2.5Ω	-4.0A	VP1220N2	VP1220N5	VP1220ND

† MIL visual screening available

High Reliability Devices

See pages 5-4 and 5-5 for MILITARY STANDARD Process Flows and Ordering Information.

Features

- Free 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
- 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	± 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

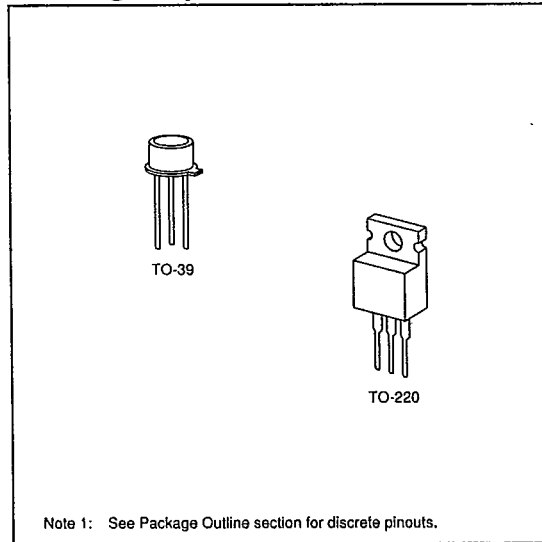
These enhancement-mode (normally-off) power transistors utilize a vertical DMOS structure and Supertex's well-proven silicon-gate manufacturing process. This combination produces devices with the power handling capabilities of bipolar transistors and with the high input impedance and positive temperature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



Package Options

(Note 1)



Note 1: See Package Outline section for discrete pinouts.

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Thermal Characteristics

Package	I _D (continuous)*	I _D (pulsed)	Power Dissipation @ T _C = 25°C	θ _{JA} °C/W	θ _{JC} °C/W	I _{DR} *	I _{DRM}
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

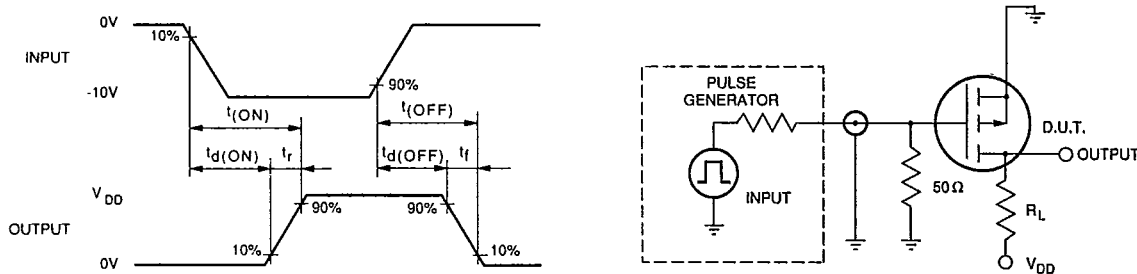
Electrical Characteristics (@ 25°C unless otherwise specified)

(Notes 1 and 2)

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
BV _{DSS}	Drain-to-Source Breakdown Voltage	VP1220	-200		V	V _{GS} = 0, I _D = -10mA
		VP1216	-160			
V _{GS(th)}	Gate Threshold Voltage	-1.5		-3.5	V	V _{GS} = V _{DS} , I _D = -10mA
ΔV _{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
ΔR _{DS(ON)}	Change in R _{DS(ON)} with Temperature		0.5	1.0	%/°C	V _{GS} = -10V, I _D = -1A
G _{FS}	Forward Transconductance	0.8	1.2		∅	V _{DS} = -25V, I _D = -3.0A
C _{ISS}	Input Capacitance		600	700	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		
t _{rr}	Reverse Recovery Time		500		ns	I _{SD} = -0.5A, V _{GS} = 0

- 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.

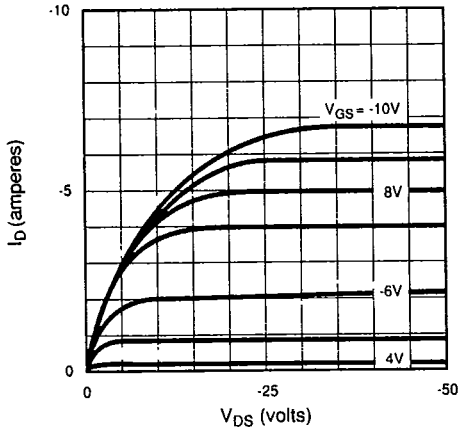
Switching Waveforms and Test Circuit



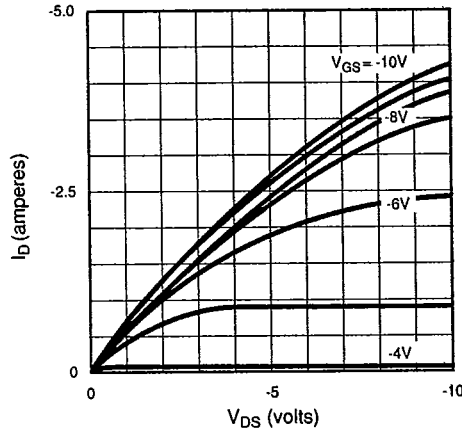
Typical Performance Curves

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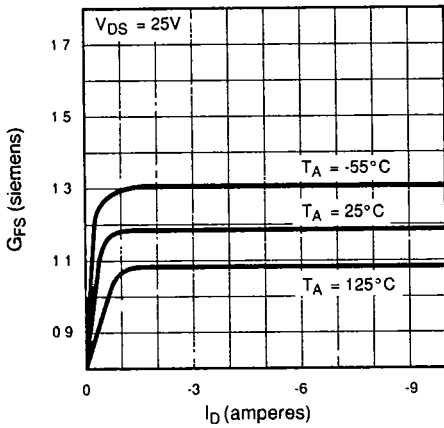
Output Characteristics



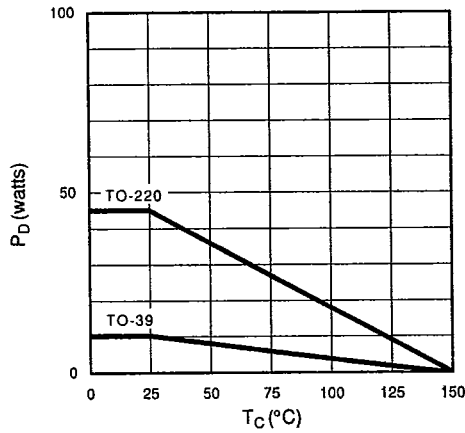
Saturation Characteristics



Transconductance vs. Drain Current

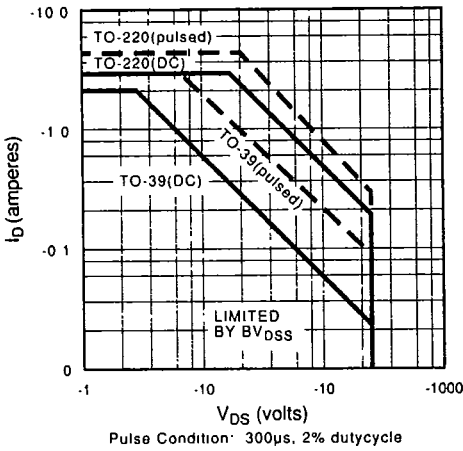


Power Dissipation vs. Case Temperature

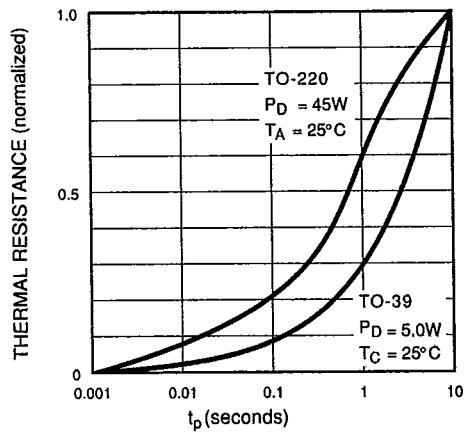


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Maximum Rated Safe Operating Area

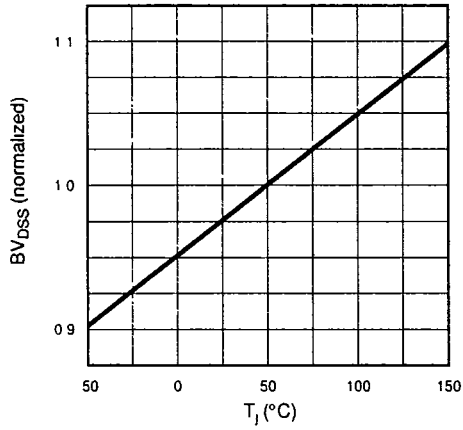


Thermal Response Characteristics

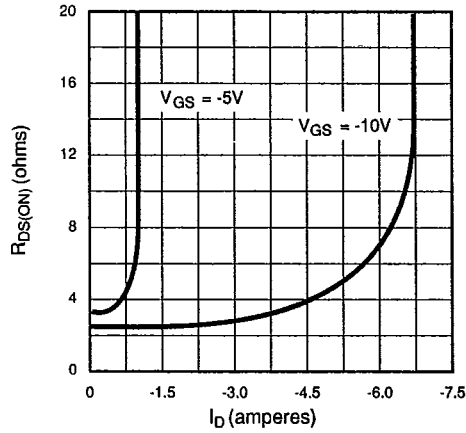


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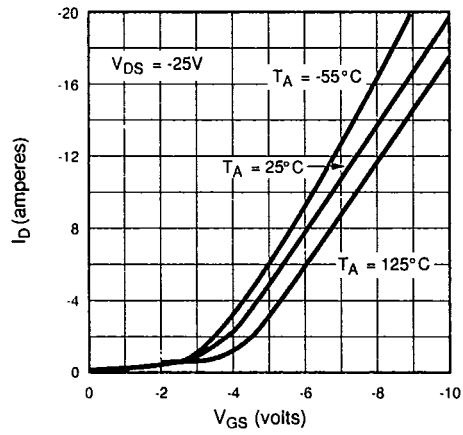
BV_{DSS} Variation with Temperature



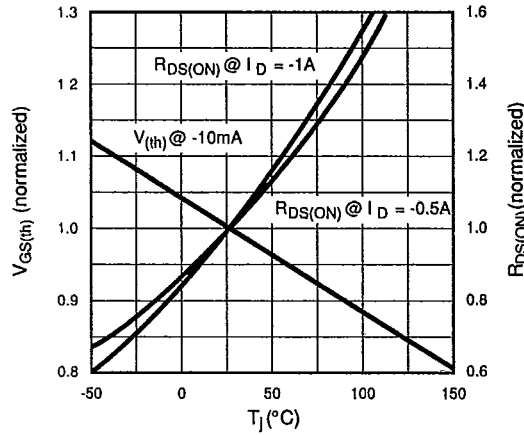
On-Resistance vs. Drain Current



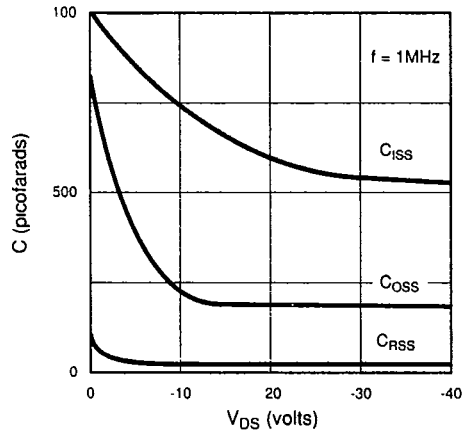
Transfer Characteristics



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



Capacitance vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics

