



## P-Channel Enhancement-Mode Vertical DMOS FETs

### Ordering Information

BV <sub>DSS</sub> / BV <sub>DGS</sub>	R <sub>DS(ON)</sub> (max)	I <sub>D(ON)</sub> (min)	Order Number / Package			
			TO-39	TO-92	TO-220	DICE†
-160V	25Ω	-100mA	VP0116N2	VP0116N3	VP0116N5	VP0116ND
-200V	25Ω	-100mA	VP0120N2	VP0120N3	VP0120N5	VP0120ND

†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<sub>ISS</sub> 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
- Driver (relays, hammers, solenoids, lamps, memories, displays, bipolar transistors, etc.)

### Absolute Maximum Ratings

Drain-to-Source Voltage	BV <sub>DSS</sub>
Drain-to-Gate Voltage	BV <sub>DGS</sub>
Gate-to-Source Voltage	± 20V
Operating and Storage Temperature	-55°C to +150°C
Soldering Temperature*	300°C

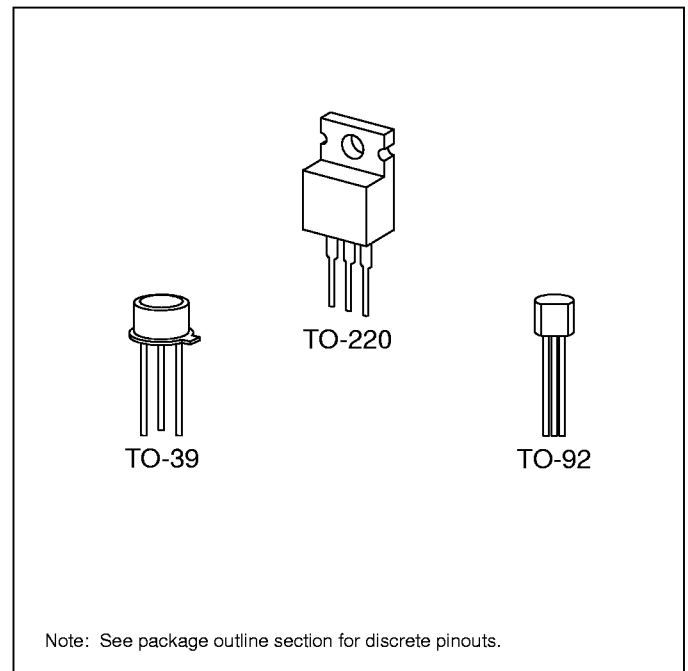
\* Distance of 1.6 mm from case for 10 seconds.

### Advanced DMOS Technology

These enhancement-mode (normally-off) 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: See package outline section for discrete pinouts.

## Thermal Characteristics

Package	$I_D$ (continuous)*	$I_D$ (pulsed)	Power Dissipation @ $T_C = 25^\circ\text{C}$	$\theta_{ja}$ $^\circ\text{C/W}$	$\theta_{jc}$ $^\circ\text{C/W}$	$I_{DR}^*$	$I_{DRM}$
TO-39	-0.2A	-0.65A	3.5W	125	35	-0.2A	-0.65A
TO-92	-0.1A	-0.35A	1.0W	170	125	-0.1A	-0.35A
TO-220	-0.425A	-1.0A	15.0W	70	8.3	-0.425A	-1.0A

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

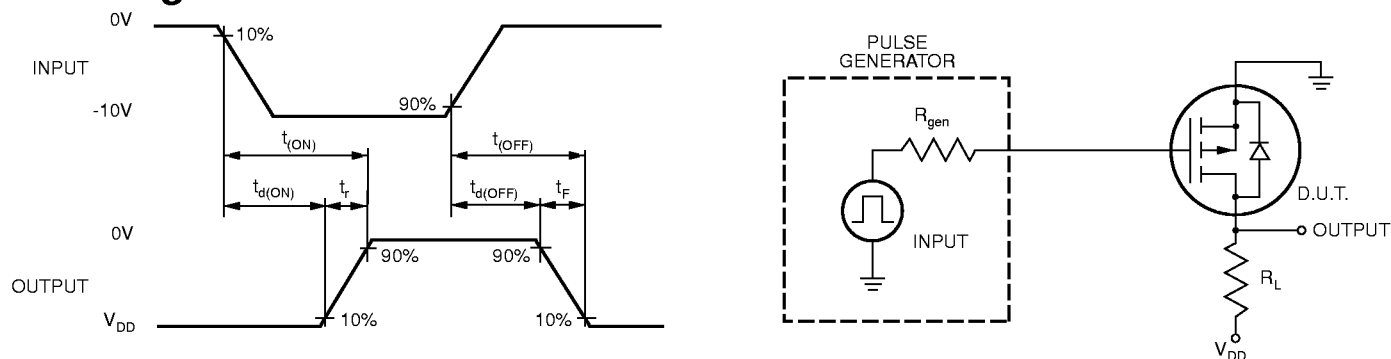
## Electrical Characteristics (@ $25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
$BV_{DSS}$	Drain-to-Source Breakdown Voltage	VP0120	-200			$I_D = -1.0\text{mA}$ , $V_{GS} = 0\text{V}$
		VP0116	-160			
$V_{GS(th)}$	Gate Threshold Voltage	-1.5		-3.5	V	$V_{GS} = V_{DS}$ , $I_D = -1.0\text{mA}$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature		6.0		mV/ $^\circ\text{C}$	$I_D = -1.0\text{mA}$ , $V_{GS} = V_{DS}$
$I_{GSS}$	Gate Body Leakage			-100	nA	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$
$I_{DSS}$	Zero Gate Voltage Drain Current			-10	$\mu\text{A}$	$V_{GS} = 0\text{V}$ , $V_{DS} = \text{Max Rating}$
				-1	mA	$V_{GS} = 0\text{V}$ , $V_{DS} = 0.8 \text{ Max Rating}$ $T_A = 125^\circ\text{C}$
$I_{D(ON)}$	ON-State Drain Current	-100	-400		mA	$V_{GS} = -5\text{V}$ , $V_{DS} = -25\text{V}$
		-350	-750			$V_{GS} = -10\text{V}$ , $V_{DS} = -25\text{V}$
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance		25	40	$\Omega$	$V_{GS} = -5\text{V}$ , $I_D = -50\text{mA}$
			15	25		$V_{GS} = -10\text{V}$ , $I_D = -100\text{mA}$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature		0.6		%/ $^\circ\text{C}$	$I_D = -100\text{mA}$ , $V_{GS} = -10\text{V}$
$G_{FS}$	Forward Transconductance	50	70		m $\Omega$	$V_{DS} = -25\text{V}$ , $I_D = -100\text{mA}$
$C_{ISS}$	Input Capacitance		50	60	pF	$V_{GS} = 0\text{V}$ , $V_{DS} = -25\text{V}$ $f = 1 \text{ MHz}$
$C_{OSS}$	Common Source Output Capacitance		10	30		
$C_{RSS}$	Reverse Transfer Capacitance		5	10		
$t_{d(ON)}$	Turn-ON Delay Time		4	10	ns	$V_{DD} = -25\text{V}$ $I_D = -350\text{mA}$ $R_{GEN} = 25\Omega$
$t_r$	Rise Time		4	10		
$t_{d(OFF)}$	Turn-OFF Delay Time		4	10		
$t_f$	Fall Time		4	11		
$V_{SD}$	Diode Forward Voltage Drop		-1.0		V	$I_{SD} = -0.5\text{A}$ , $V_{GS} = 0\text{V}$
$t_{rr}$	Reverse Recovery Time		500		ns	$I_{SD} = -0.5\text{A}$ , $V_{GS} = 0\text{V}$

### Notes:

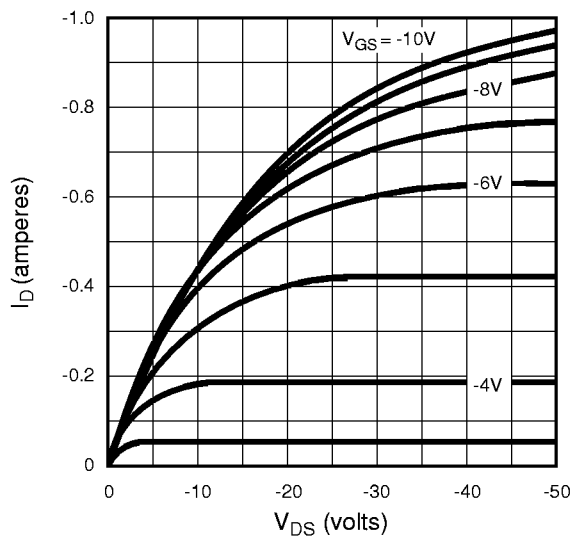
- All D.C. parameters 100% tested at  $25^\circ\text{C}$  unless otherwise stated. (Pulse test: 300 $\mu\text{s}$  pulse, 2% duty cycle.)
- All A.C. parameters sample tested.

## Switching Waveforms and Test Circuit

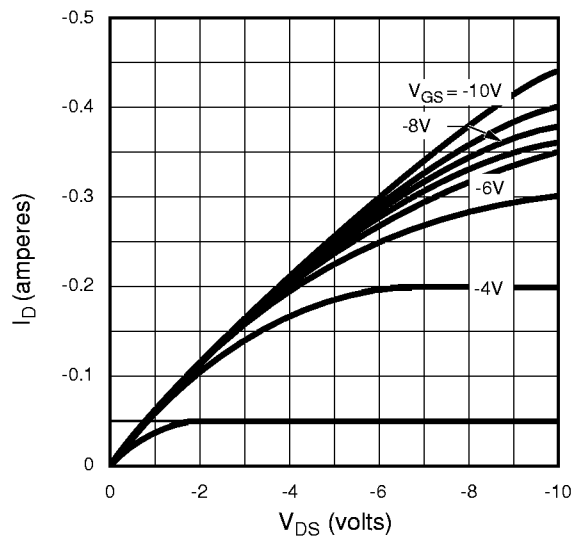


# Typical Performance Curves

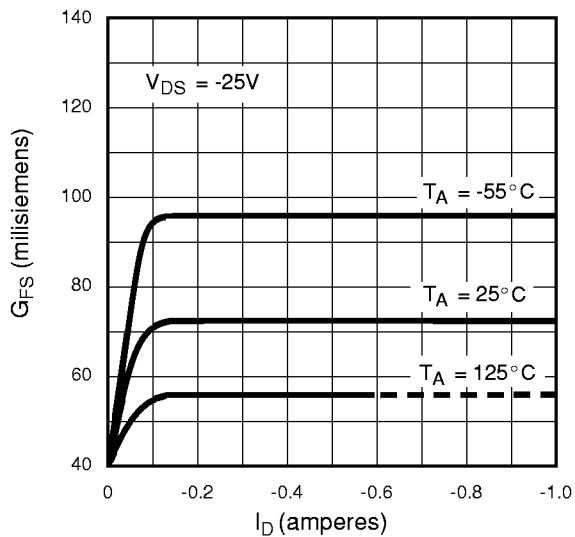
Output Characteristics



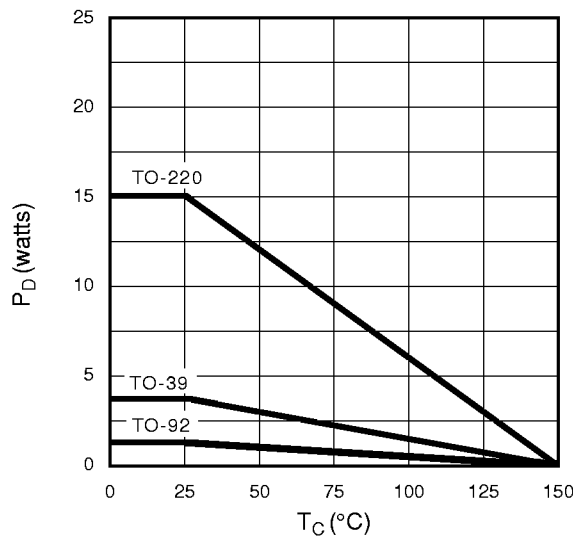
Saturation Characteristics



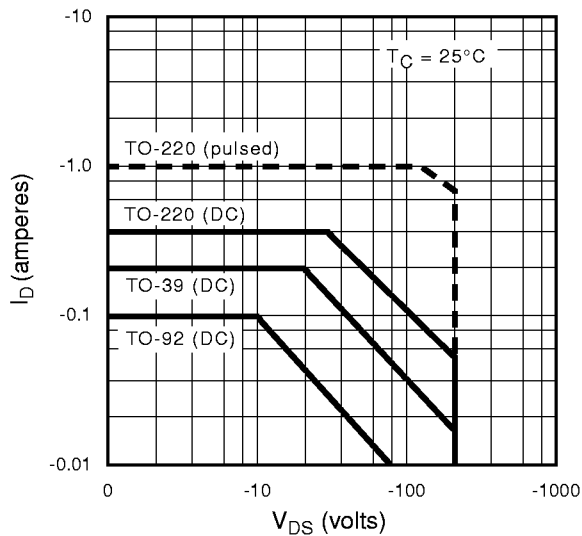
Transconductance vs. Drain Current



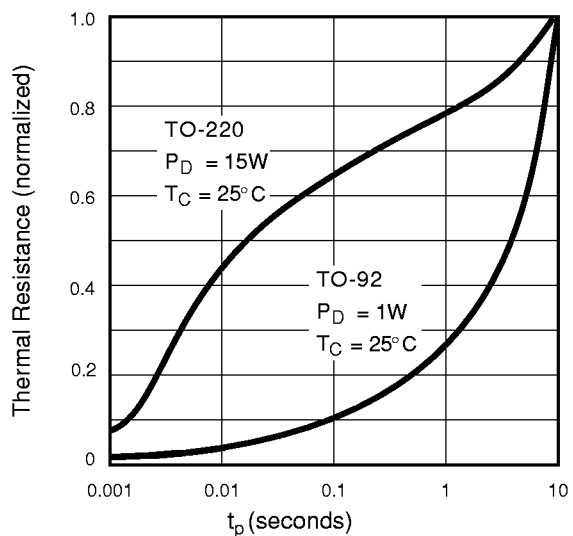
Power Dissipation vs. Case Temperature



Maximum Rated Safe Operating Area

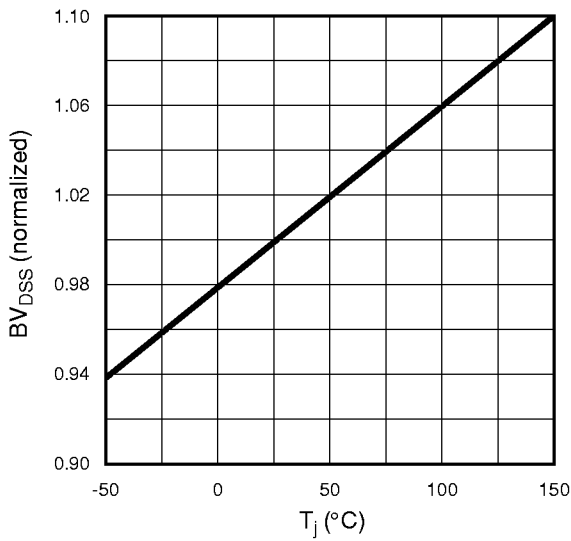


Thermal Response Characteristics

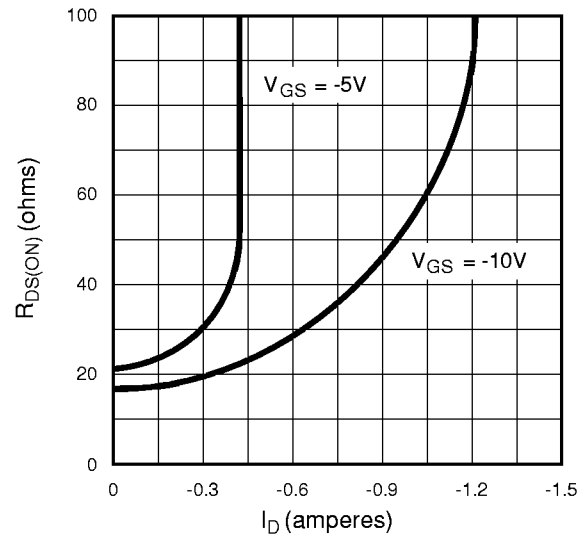


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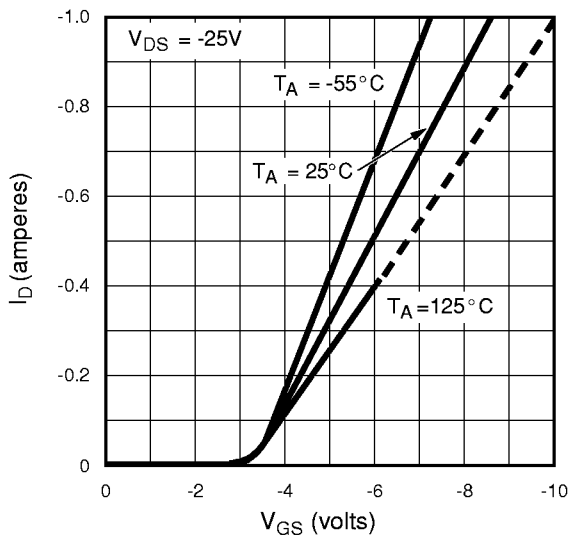
BV<sub>DSS</sub> Variation with Temperature



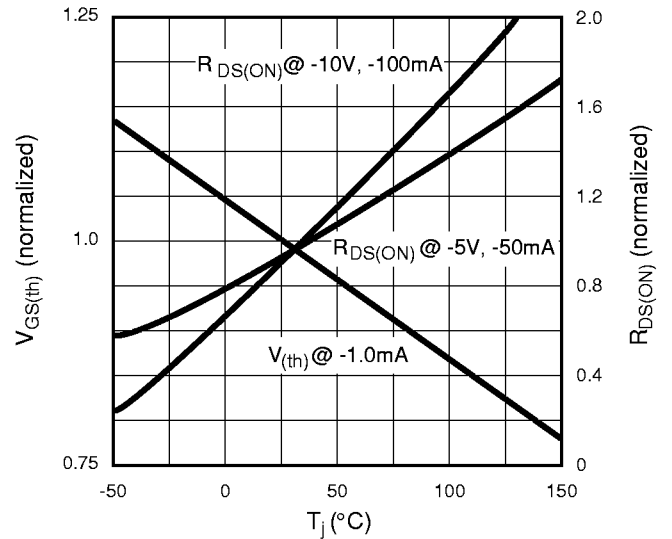
On-Resistance vs. Drain Current



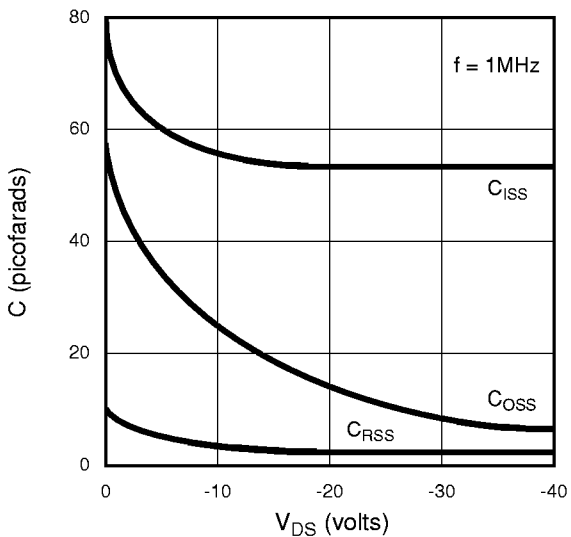
Transfer Characteristics



V<sub>(th)</sub> and R<sub>DS</sub> Variation with Temperature



Capacitance vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics

