# Supertex inc.

## P-Channel Enhancement-Mode Vertical DMOS FETs

#### **Ordering Information**

BV <sub>DSS</sub> /	R <sub>DS(ON)</sub>	I <sub>D(ON)</sub>	Order Number / Package			
BV <sub>DGS</sub>	.,		TO-92	Die <sup>†</sup>		
-40V	8.0Ω	-0.5A	VP0104N3	—		
-60V	8.0Ω	-0.5A	VP0106N3			
-90V	8.0Ω	-0.5A	VP0109N3	VP0109ND		

#### 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 controls
- Converters
- □ Amplifiers
- Switches
- Dever supply circuits
- Drivers (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.

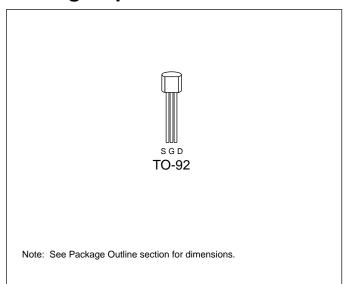
#### 07/08/02

### 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's 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 Option**



Supertex Inc. does not recommend the use of its products in life support applications and will not knowingly sell its products for use in such applications unless it receives an adequate "products liability indemnification insurance agreement." Supertex does not assume responsibility for use of devices described and limits its liability to the replacement of devices determined to be defective due to workmanship. No responsibility is assumed for possible omissions or inaccuracies. Circuitry and specifications are subject to change without notice. For the latest product specifications, refer to the Supertex website: http://www.supertex.com. For complete liability information on all Supertex products, refer to the most current databook or to the Legal/Disclaimer page on the Supertex website.

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D.U.T.

RL

-> OUTPUT

### **Thermal Characteristics**

Package	I <sub>D</sub> (continuous)*	I <sub>D</sub> (pulsed)	Power Dissipation @ T <sub>C</sub> = 25°C	$^{ heta_{jc}}$ °C/W	θ <sub>ja</sub> °C/W	I <sub>DR</sub> *	I <sub>DRM</sub>
TO-92	-0.25A	-0.8A	1.0W	125	170	-0.25A	-0.8A

\* I<sub>D</sub> (continuous) is limited by max rated T<sub>j</sub>.

#### **Electrical Characteristics** (@ 25°C unless otherwise specified)

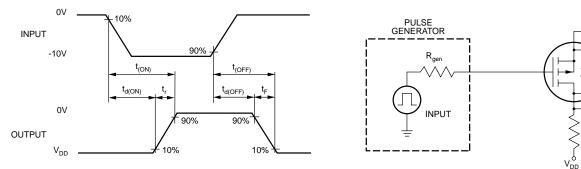
Symbol	Parameter		Min	Тур	Max	Unit	Conditions	
<b>BV</b> <sub>DSS</sub>	Drain-to-Source	VP0109	-90					
	Breakdown Voltage	VP0106	-60	İ		V	I <sub>D</sub> = -1.0mA, V <sub>GS</sub> = 0V	
		VP0104	-40					
V <sub>GS(th)</sub>	Gate Threshold Voltage		-1.5		-3.5	V	$V_{GS} = V_{DS}, I_D = -1.0 \text{mA}$	
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature			5.8	6.5	mV/°C	$I_D = -1.0 \text{mA}, V_{GS} = V_{DS}$	
I <sub>GSS</sub>	Gate Body Leakage			-1.0	-100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$	
I <sub>DSS</sub>	Zero Gate Voltage Drain Curre	ent			-10	μΑ	$V_{GS} = 0V, V_{DS} = Max Rating$	
					-1	mA	$V_{GS} = 0V, V_{DS} = 0.8 \text{ Max Rating}$ $T_A = 125^{\circ}\text{C}$	
I <sub>D(ON)</sub>	ON-State Drain Current		-0.15	-0.25		Α	$V_{GS} = -5V, V_{DS} = -25V$	
			-0.50	-1.2			$V_{GS} = -10V, V_{DS} = -25V$	
R <sub>DS(ON)</sub>	DS(ON) Static Drain-to-Source ON-State Resistance			11	15	Ω	$V_{GS} = -5V, I_{D} = -0.1A$	
				6.0	8.0		$V_{GS} = -10V, I_{D} = -0.5A$	
$\Delta R_{DS(ON)}$	Change in R <sub>DS(ON)</sub> with Temperature			0.55	1.0	%/°C	$V_{GS} = -10V, I_{D} = -0.5A$	
G <sub>FS</sub>	Forward Transconductance		150	190		۳۵	$V_{DS} = -25V, I_{D} = -0.5A$	
C <sub>ISS</sub>	Input Capacitance			45	60	pF	$V_{GS} = 0V, V_{DS} = -25V$ f = 1 MHz	
C <sub>OSS</sub>	Common Source Output Capacitance			22	30			
C <sub>RSS</sub>	Reverse Transfer Capacitance			3	8			
t <sub>d(ON)</sub>	Turn-ON Delay Time			4	6			
t <sub>r</sub>	Rise Time			3	10	ns	$V_{DD} = -25V$	
t <sub>d(OFF)</sub>	Turn-OFF Delay Time			8	12		I <sub>D</sub> = -0.5A R <sub>GEN</sub> = 25Ω	
t <sub>f</sub>	Fall Time			4	10	]	IGEN - 2002	
V <sub>SD</sub>	Diode Forward Voltage Drop			-1.2	-2.0	V	I <sub>SD</sub> = -1.0A, V <sub>GS</sub> = 0V	
t <sub>rr</sub>	Reverse Recovery Time			400		ns	I <sub>SD</sub> = -1.0A, V <sub>GS</sub> = 0V	

Notes:

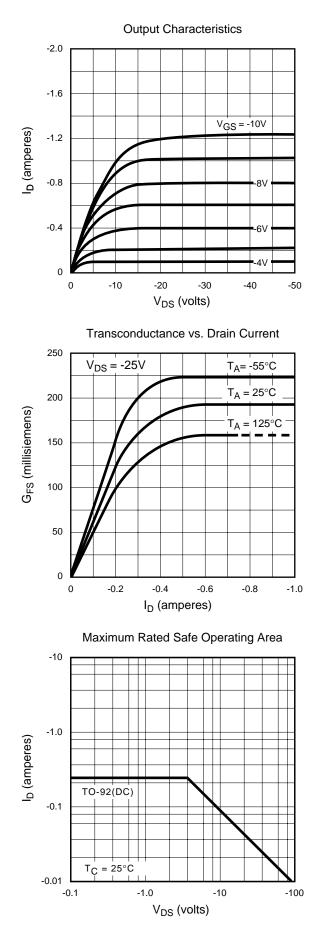
1. All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300µs pulse, 2% duty cycle.)

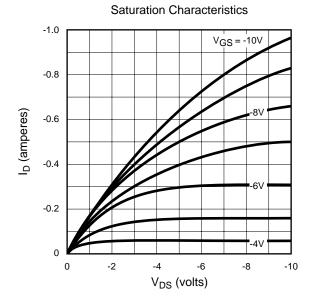
2. All A.C. parameters sample tested.

#### **Switching Waveforms and Test Circuit**

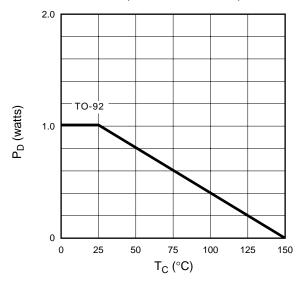


#### **Typical Performance Curves**

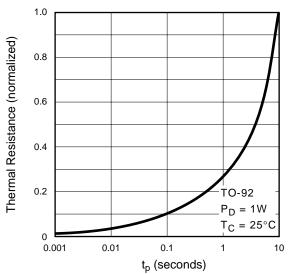




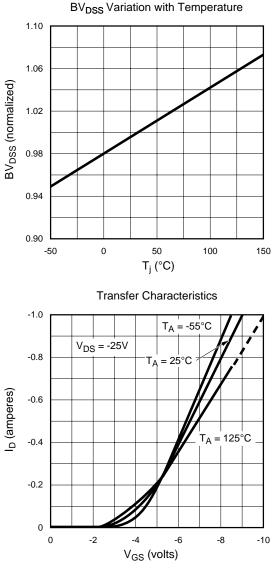
Power Dissipation vs. Case Temperature



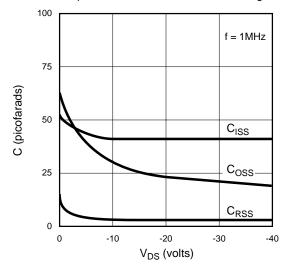
**Thermal Response Characteristics** 

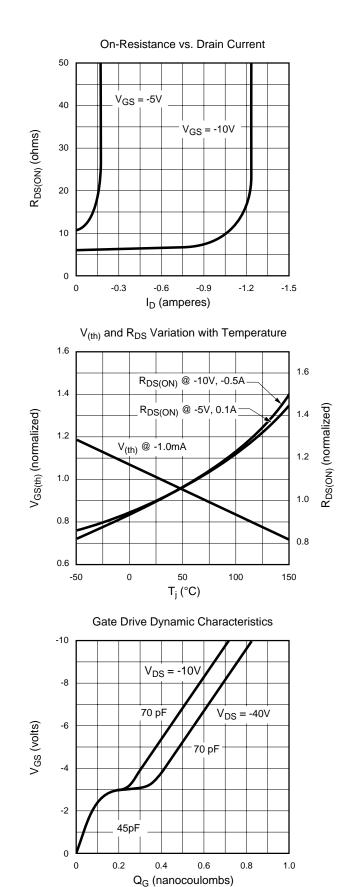


#### **Typical Performance Curves**



Capacitance vs. Drain-to-Source Voltage





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