Supertex inc. – OBSOLETE –

P-Channel Enhancement-Mode Vertical DMOS FETs

Ordering Information

BV$_{DSS}$ / BV$_{DGS}$	R$_{DS(ON)}$ (max)	I$_{D(ON)}$ (min)	Order Number / Package		
			TO-39	TO-92	Die†
-350V	75Ω	-200mA	VP0535N2	VP0535N3	VP0535ND
-400V	75Ω	-200mA	—	VP0540N3	VP0540ND

† MIL visual screening available

7

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 controls

☐ Converters

☐ Amplifiers

☐ Switches

☐ Power supply circuits

☐ Drivers (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) 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 Options

TO-39
Case: DRAIN
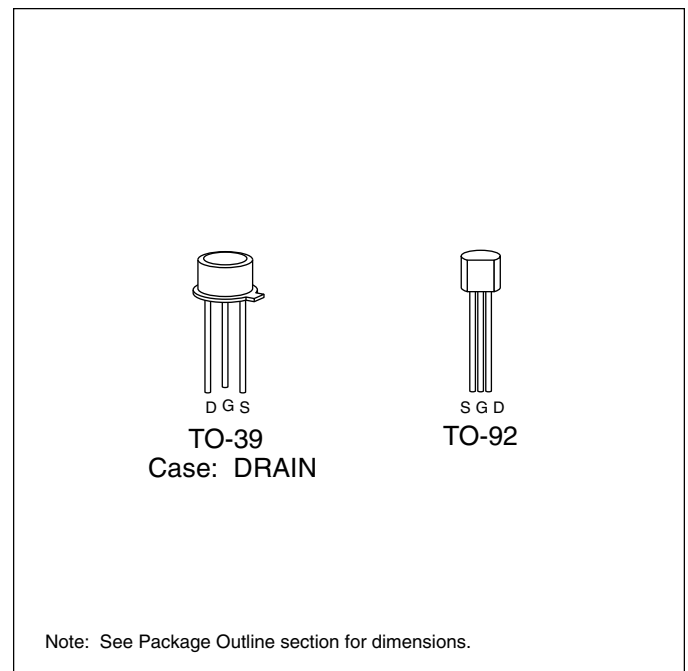
TO-92

Note: See Package Outline section for dimensions.

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	-0.2A	-0.5A	3.5W	35	125	-0.2A	-0.5A
TO-92	-0.1A	-0.5A	1.0W	125	170	-0.1A	-0.5A

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

Electrical Characteristics – OBSOLETE –

Symbol	Parameter		Min	Typ	Max	Unit	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	VP0540	-400			V	$V_{GS}= 0V$, $I_D =-1mA$
		VP0535	-350				
$V_{GS(th)}$	Gate Threshold Voltage		-2.5		-4.5	V	$V_{GS} = V_{DS}$, $I_D = -1mA$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature			3.5	6.0	mV/°C	$V_{GS} = V_{DS}$, $I_D = -1mA$
I_{GSS}	Gate Body Leakage				-100	nA	$V_{GS} = \pm20V$, $V_{DS} = 0V$
I_{DSS}	Zero Gate Voltage Drain Current				-10		$V_{GS} = 0V$, $V_{DS} = $ Max Rating
					-500	μA	$V_{GS} = 0V$, $V_{DS} = 0.8$ Max Rating $T_A = 125°C$
$I_{D(ON)}$	ON-State Drain Current			-80		mA	$V_{GS} = -5V$, $V_{DS} = -25V$
			-200	-350			$V_{GS} = -10V$, $V_{DS} = -25V$
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance			60		Ω	$V_{GS} = -5V$, $I_D = -10mA$
				45	75		$V_{GS} = -10V$, $I_D = -50mA$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature			0.8	1.5	%/°C	$V_{GS} = -10V$, $I_D = -50mA$
G_{FS}	Forward Transconductance		50	70		m℧	$V_{DS} = -25V$, $I_D = -50mA$
C_{ISS}	Input Capacitance			40	60		
C_{OSS}	Common Source Output Capacitance			11	20	pF	$V_{GS} = 0V$, $V_{DS} = -25V$ $f = 1$ MHz
C_{RSS}	Reverse Transfer Capacitance			3	5		
$t_{d(ON)}$	Turn-ON Delay Time				10		
t_r	Rise Time				10	ns	$V_{DD} = -25V$ $I_D = -200mA$ $R_{GEN} = 25Ω$
$t_{d(OFF)}$	Turn-OFF Delay Time				15		
t_f	Fall Time				15		
V_{SD}	Diode Forward Voltage Drop			-0.8	-1.5	V	$V_{GS} = 0V$, $I_{SD} = -0.1A$
t_{rr}	Reverse Recovery Time			200		ns	$V_{GS} = 0V$, $I_{SD} = -0.1A$

Notes:
1. All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300μs pulse, 2% duty cycle.)
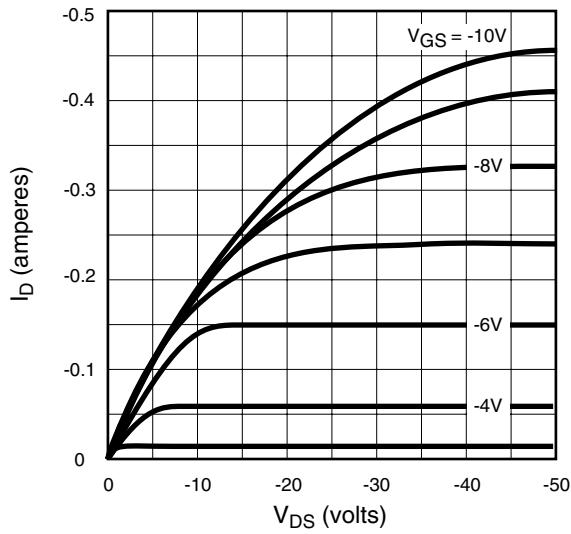2. All A.C. parameters sample tested.
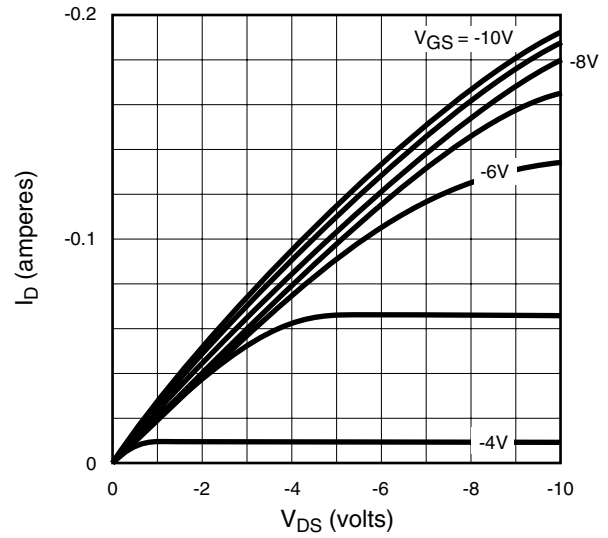
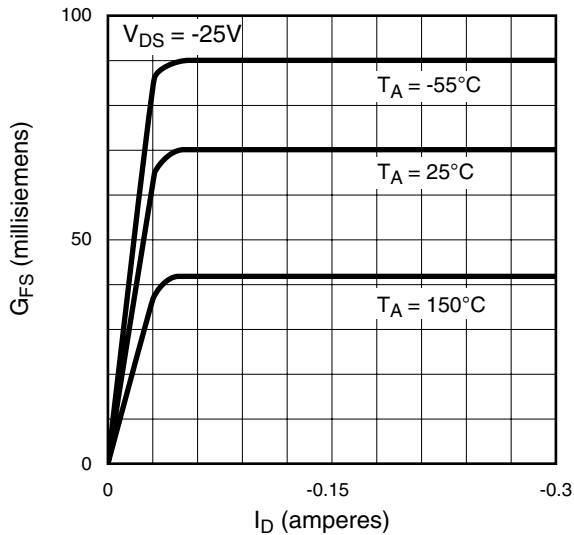## Switching Waveforms and Test Circuit
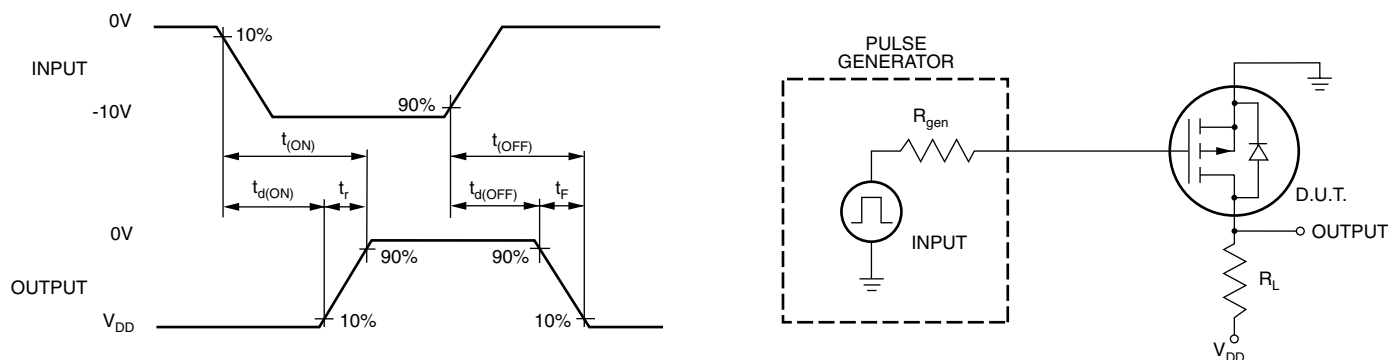
Typical Performance Curves

– OBSOLETE –
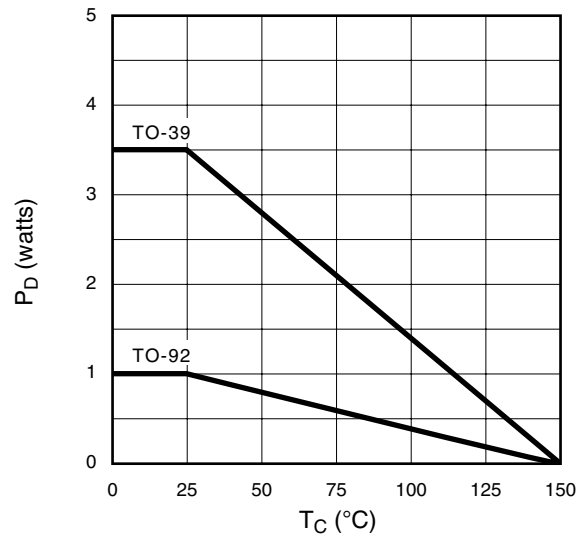
Output Characteristics
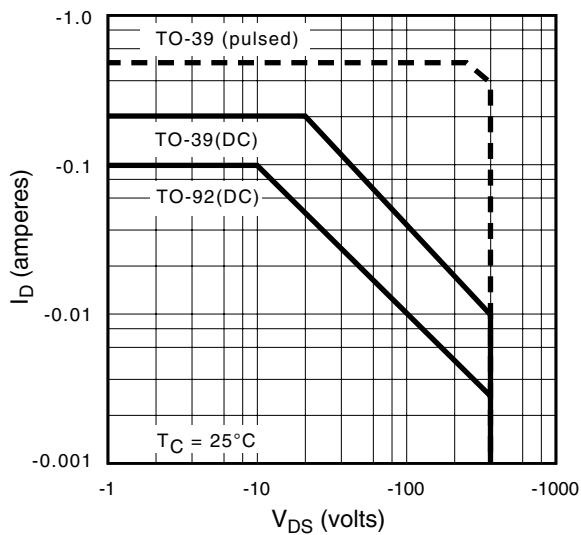

Saturation Characteristics

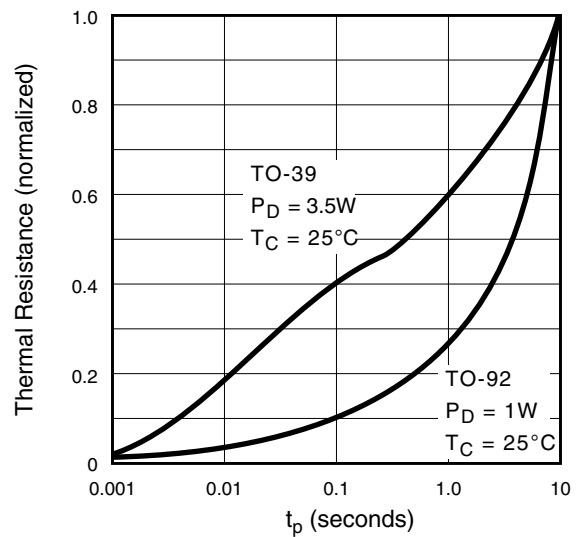### Transconductance vs. Drain Current

Power Dissipation vs. Case Temperature

Maximum Rated Safe Operating Area
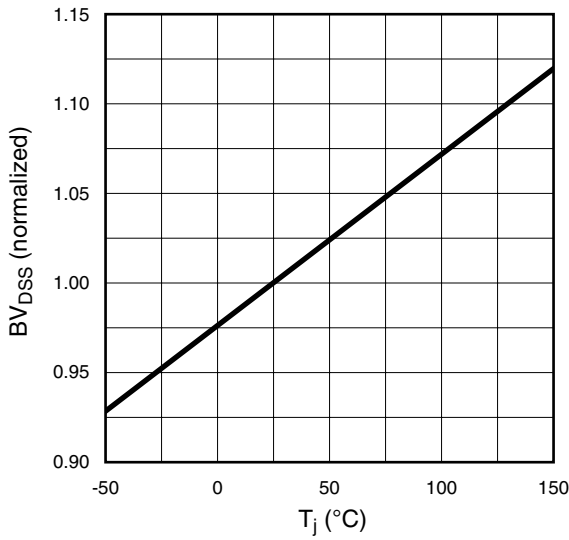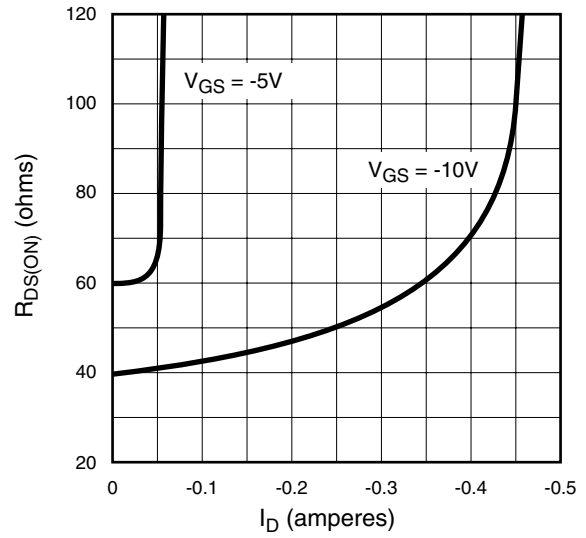

Thermal Response Characteristics
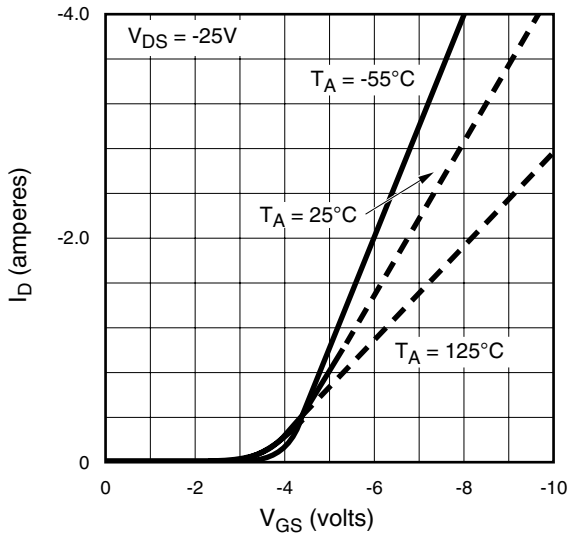

7

Typical Performance Curves

– OBSOLETE –

BV$_{DSS}$ Variation with Temperature

BV$_{DSS}$ (normalized)

T$_j$ (°C)

On-Resistance vs. Drain Current

V$_{GS}$ = -5V

V$_{GS}$ = -10V

R$_{DS(ON)}$ (ohms)

I$_D$ (amperes)

Transfer Characteristics

V$_{DS}$ = -25V

T$_A$ = -55°C

T$_A$ = 25°C

T$_A$ = 125°C

I$_D$ (amperes)

V$_{GS}$ (volts)

V$_{(th)}$ and R$_{DS}$ Variation with Temperature

R$_{DS(ON)}$ @ -10V, -50mA

V$_{(th)}$ @ -1mA

V$_{GS(th)}$ (normalized)

R$_{DS(ON)}$ (normalized)

T$_j$ (°C)
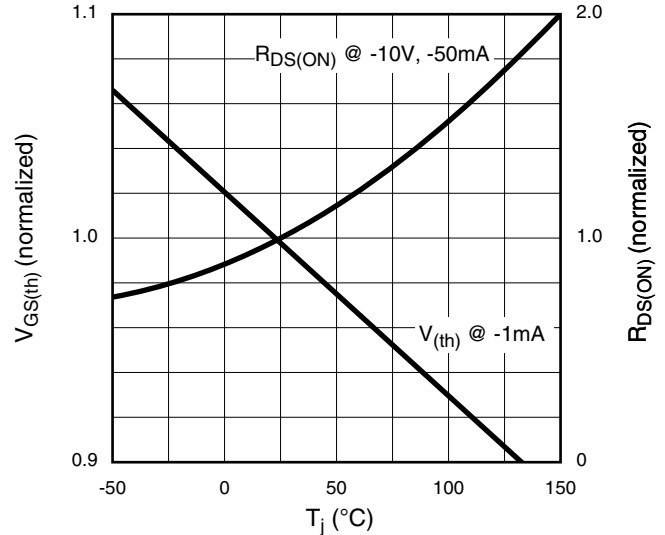
Capacitance vs. Drain-to-Source Voltage

f = 1MHz

C$_{ISS}$

C$_{OSS}$

C$_{RSS}$

C (picofarads)

V$_{DS}$ (volts)
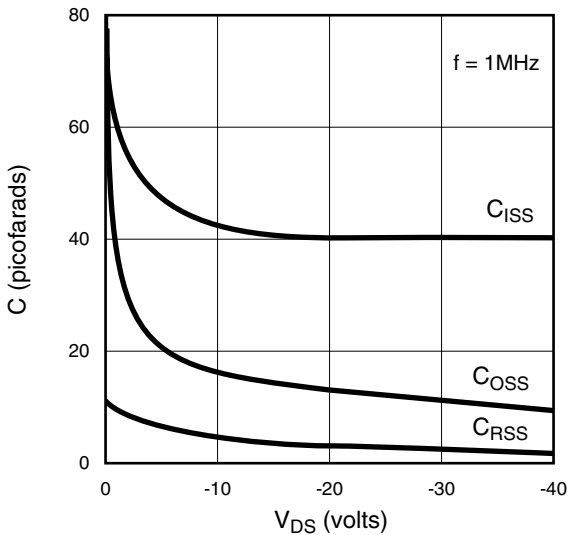
Gate Drive Dynamic Characteristics

V$_{DS}$ = -10V

V$_{DS}$ = -40V

150 pF

32pF

V$_{GS}$ (volts)

Q$_G$ (nanocoulombs)