

**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-92	Die [†]
-40V	8.0 Ω	-0.5A	VP0104N3	—
-60V	8.0 Ω	-0.5A	VP0106N3	—
-90V	8.0 Ω	-0.5A	VP0109N3	VP0109ND

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

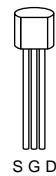
Advanced DMOS Technology

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.

Applications

- Motor controls
- Converters
- Amplifiers
- Switches
- Power supply circuits
- Drivers (relays, hammers, solenoids, lamps, memories, displays, bipolar transistors, etc.)

Package Option

TO-92

Note: See Package Outline section for dimensions.

Absolute Maximum Ratings

Drain-to-Source Voltage	BV_{DSS}
Drain-to-Gate Voltage	BV_{DGS}
Gate-to-Source Voltage	$\pm 20V$
Operating and Storage Temperature	-55°C to +150°C
Soldering Temperature*	300°C

* Distance of 1.6 mm from case for 10 seconds.

Thermal Characteristics

Package	I_D (continuous)*	I_D (pulsed)	Power Dissipation @ $T_C = 25^\circ\text{C}$	θ_{jc} °C/W	θ_{ja} °C/W	I_{DR}^*	I_{DRM}
TO-92	-0.25A	-0.8A	1.0W	125	170	-0.25A	-0.8A

* I_D (continuous) is limited by max rated T_j

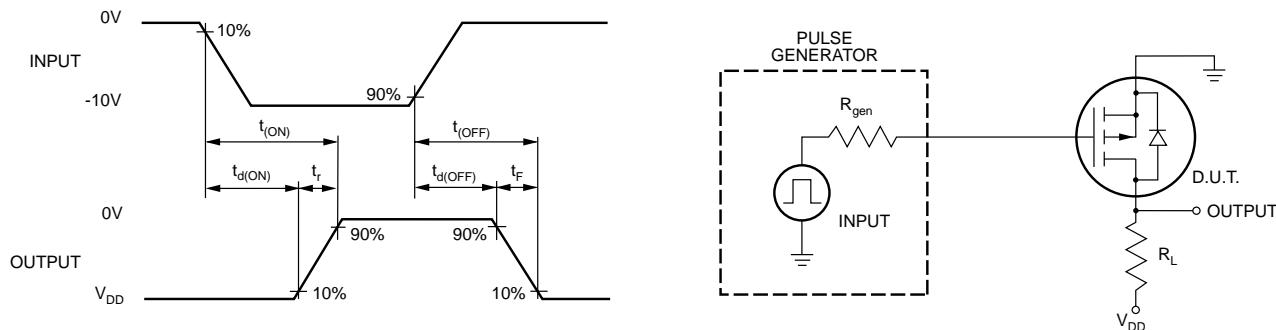
Electrical Characteristics (@ 25°C unless otherwise specified)

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

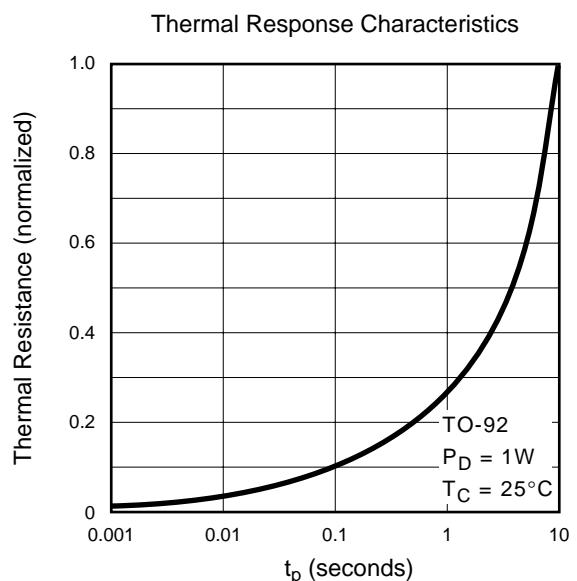
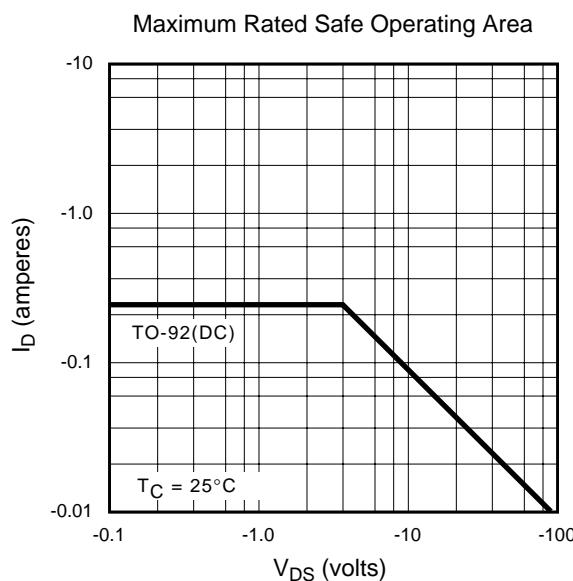
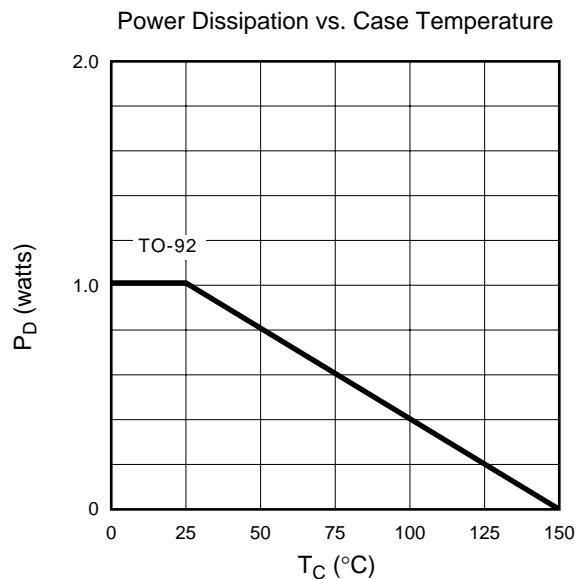
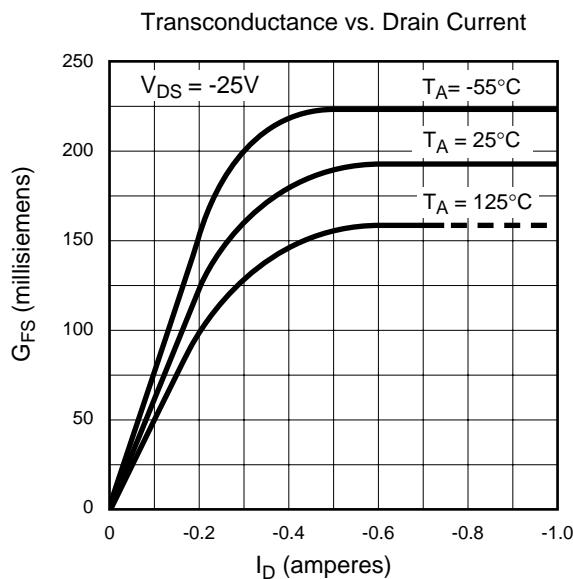
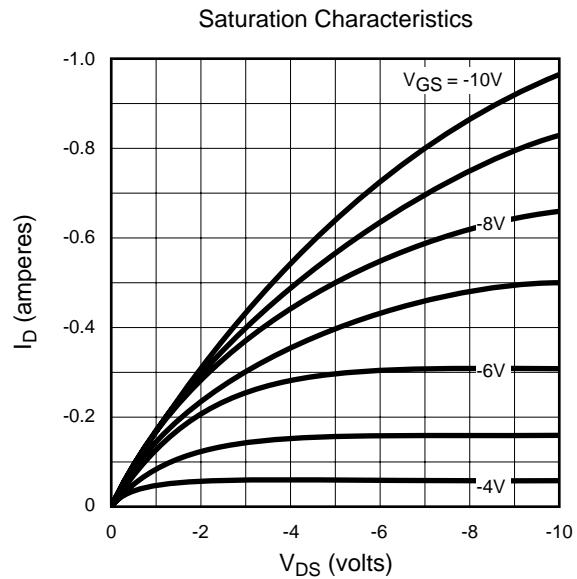
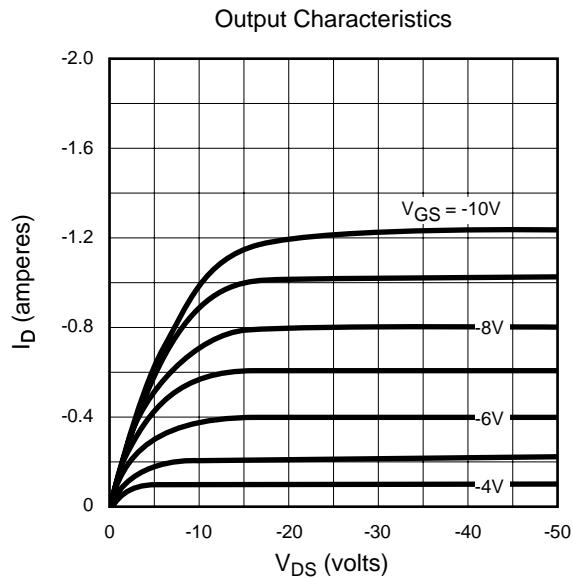
Notes:

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

Switching Waveforms and Test Circuit



Typical Performance Curves



Typical Performance Curves

