



## N-Channel Enhancement-Mode Vertical DMOS FETs

### Ordering Information

BV <sub>DSS</sub> / BV <sub>DGS</sub>	R <sub>DS(ON)</sub> (max)	Order Number / Package		
		TO-92	TO-236AB*	Die†
60V	4.0Ω	VN2106N3	—	—
100V	4.0Ω	—	VN2110K1	VN2110ND

Product marking for SOT-23:  

N1A\*

  
 where \* = 2-week alpha date code

†MIL visual screening available

\*Same as SOT-23. All units shipped on 3,000 piece carrier tape reels.

### Features

- Commercial and Military versions available
- Free from secondary breakdown
- Low power drive requirement
- Ease of paralleling
- Low C<sub>ISS</sub> and fast switching speeds
- High input impedance and high gain

### Applications

- Motor controls
- Amplifiers
- Power supply circuits
- Converters
- Switches
- 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.

### 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

TO-236AB  
(SOT-23)  
top view

TO-92

Note: See Package Outline section for dimensions.

11/12/01

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.

## Thermal Characteristics

Package	$I_D$ (continuous) <sup>†</sup>	$I_D$ (pulsed)	Power Dissipation* @ $T_C = 25^\circ\text{C}$	$\theta_{jC}$ $^\circ\text{C/W}$	$\theta_{jA}$ $^\circ\text{C/W}$	$I_{DR}^\dagger$	$I_{DRM}$
TO-92	0.3A	1.0A	1.0W	125	170	0.3A	1.0A
TO-236AB	0.2A	0.8A	0.36W ( $T_A = 25^\circ\text{C}$ )	200	350	0.2A	0.8A

<sup>†</sup> $I_D$  (continuous) is limited by max rated  $T_J$ .

\* Total for package.

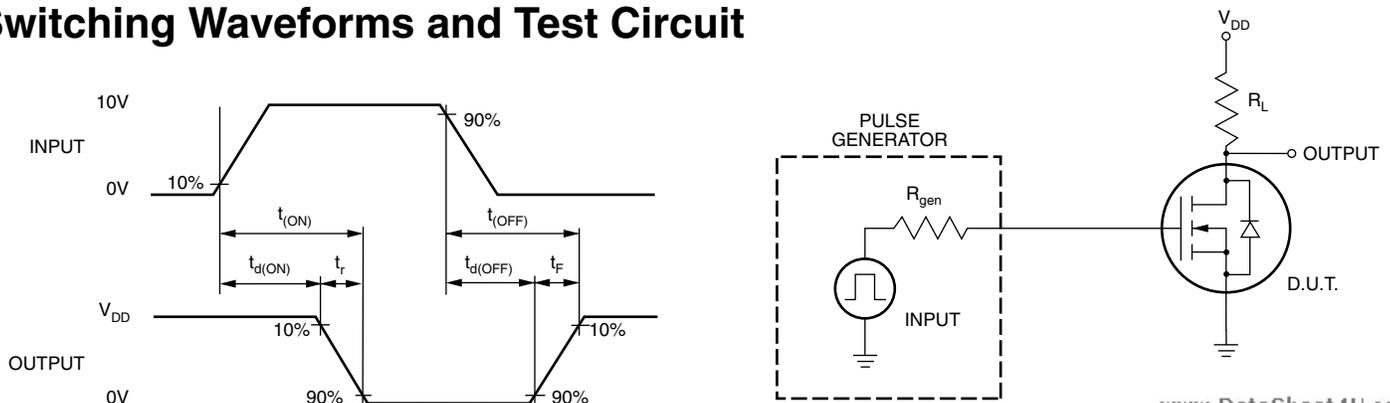
## Electrical Characteristics (@ $25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
$BV_{DSS}$	Drain-to-Source Breakdown Voltage	VN2110	100			$I_D = 1\text{mA}$ , $V_{GS} = 0\text{V}$
		VN2106	60			
$V_{GS(th)}$	Gate Threshold Voltage	0.8		2.4	V	$V_{GS} = V_{DS}$ , $I_D = 1\text{mA}$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature		-3.8	-5.5	mV/ $^\circ\text{C}$	$V_{GS} = V_{DS}$ , $I_D = 1\text{mA}$
$I_{GSS}$	Gate Body Leakage		0.1	100	nA	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$
$I_{DSS}$	Zero Gate Voltage Drain Current			1	$\mu\text{A}$	$V_{GS} = 0\text{V}$ , $V_{DS} = \text{Max Rating}$
				100	$\mu\text{A}$	$V_{GS} = 0\text{V}$ , $V_{DS} = 0.8 \text{ Max Rating}$ $T_A = 125^\circ\text{C}$
$I_{D(ON)}$	ON-State Drain Current	0.6			A	$V_{GS} = 10\text{V}$ , $V_{DS} = 25\text{V}$
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance		4.5	6.0	$\Omega$	$V_{GS} = 5\text{V}$ , $I_D = 75\text{mA}$
			3.0	4.0	$\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 500\text{mA}$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature		0.70	1.0	%/ $^\circ\text{C}$	$V_{GS} = 10\text{V}$ , $I_D = 500\text{mA}$
$G_{FS}$	Forward Transconductance	150	400		m $\Omega$	$V_{DS} = 25\text{V}$ , $I_D = 0.5\text{A}$
$C_{ISS}$	Input Capacitance		35	50	pF	$V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$
$C_{OSS}$	Common Source Output Capacitance		13	25		
$C_{RSS}$	Reverse Transfer Capacitance		4	5		
$t_{d(ON)}$	Turn-ON Delay Time		3	5	ns	$V_{DD} = 25\text{V}$ $I_D = 0.6\text{A}$ $R_{GEN} = 25\Omega$
$t_r$	Rise Time		5	8		
$t_{d(OFF)}$	Turn-OFF Delay Time		6	9		
$t_f$	Fall Time		5	8		
$V_{SD}$	Diode Forward Voltage Drop		1.2	1.8	V	$I_{SD} = 0.6\text{A}$ , $V_{GS} = 0\text{V}$
$t_{rr}$	Reverse Recovery Time		400		ns	$I_{SD} = 0.6\text{A}$ , $V_{GS} = 0\text{V}$

### Notes:

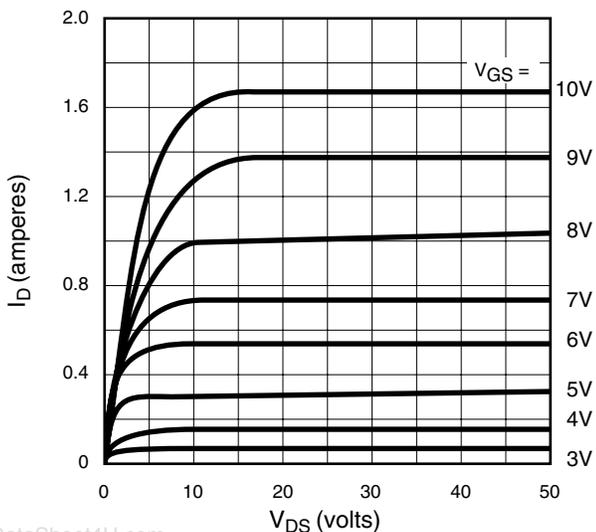
- All D.C. parameters 100% tested at  $25^\circ\text{C}$  unless otherwise stated. (Pulse test: 300 $\mu\text{s}$  pulse, 2% duty cycle.)
- All A.C. parameters sample tested.

## Switching Waveforms and Test Circuit

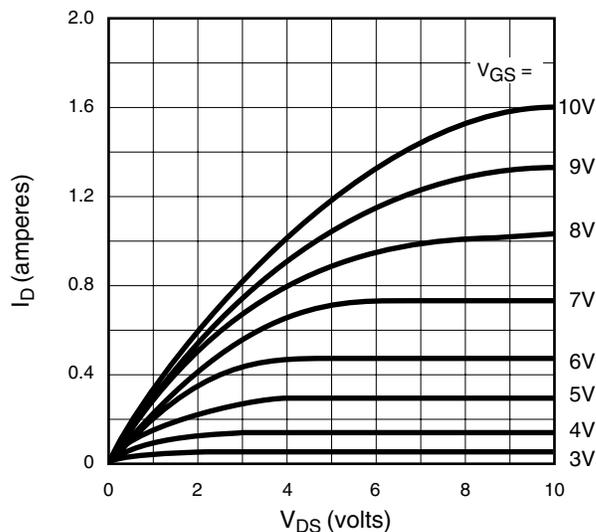


# Typical Performance Curves

Output Characteristics

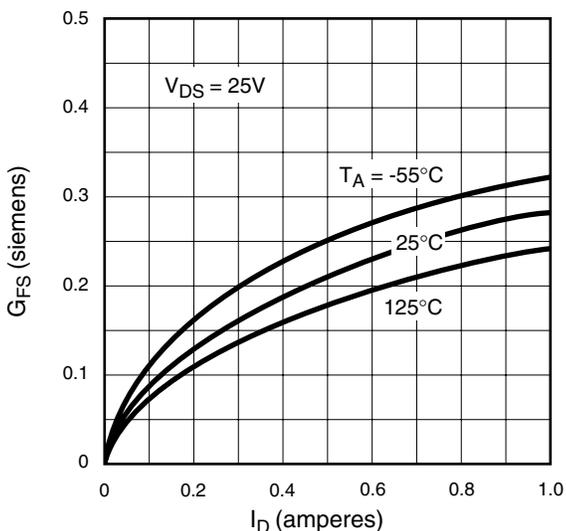


Saturation Characteristics

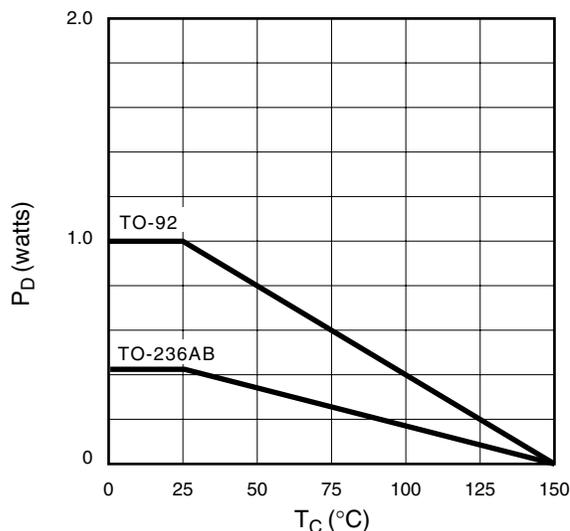


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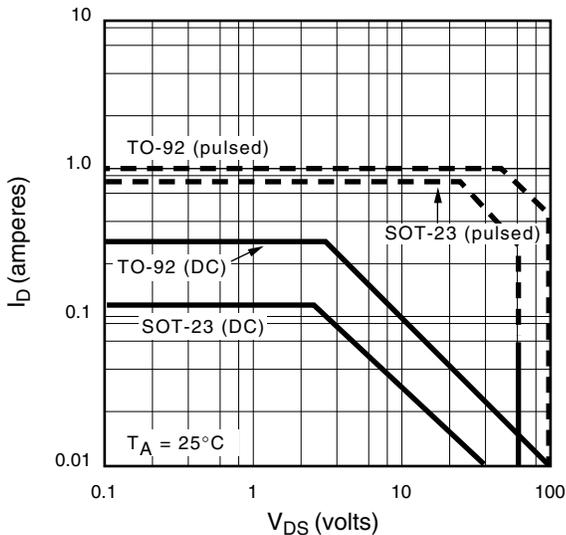
Transconductance vs. Drain Current



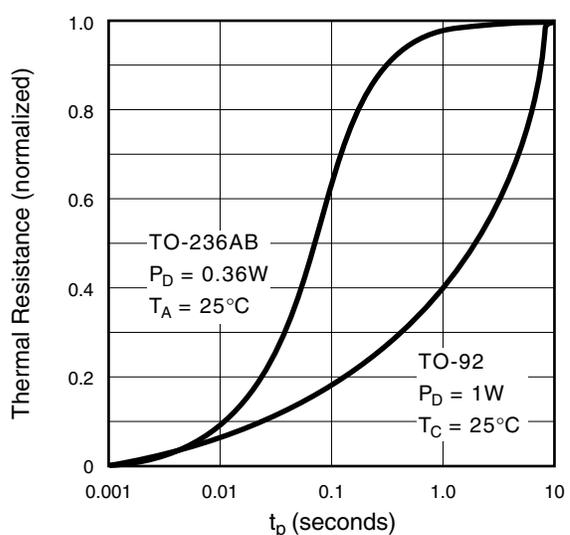
Power Dissipation vs. Case Temperature



Maximum Rated Safe Operating Area

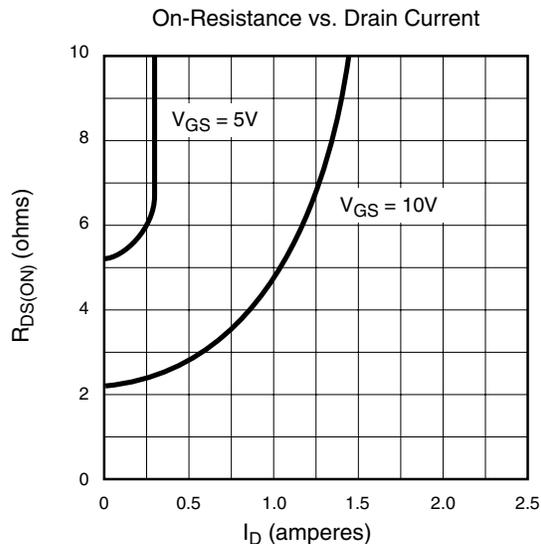
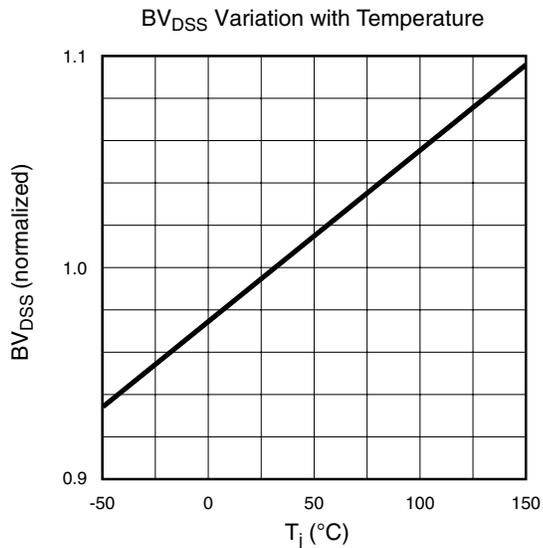


Thermal Response Characteristics



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# Typical Performance Curves



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