



**N-Channel Enhancement-Mode  
Vertical DMOS FETs**

**Ordering Information**

BV <sub>DSS</sub> / BV <sub>DGS</sub>	R <sub>DS(ON)</sub> (max)	V <sub>GS(th)</sub> (max)	I <sub>D(ON)</sub> (min)	Order Number / Package		
				TO-236AB	TO-243AA*	Wafer
350V	15Ω	2.0V	750mA	TN5335K1	TN5335N8	TN5335NW

\* Same as SOT-89. Product supplied on 2000 piece carrier tape reels.

**Features**

- Low threshold – 2.0V max.
- High input impedance
- Low input capacitance
- Fast switching speeds
- Low on resistance
- Free from secondary breakdown
- Low input and output leakage

**Product marking for SOT-23**

**N3S\***

Where \* = 2-week alpha date code

**Product marking for TO-243AA**

**TN3S\***

Where \* = 2-week alpha date code

**Applications**

- Logic level interfaces – ideal for TTL and CMOS
- Solid state relays
- Battery operated systems
- Photo voltaic drives
- Analog switches
- General purpose line drivers
- Telecom switches
- Modem hook switches

**Low Threshold DMOS Technology**

These low threshold 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.

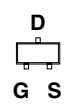
Supertex's vertical DMOS FETs are ideally suited to a wide range of switching and amplifying applications where very low threshold voltage, high breakdown voltage, high input impedance, low input capacitance, and fast switching speeds are desired.

**Absolute Maximum Ratings**

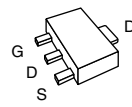
Drain-to-Source Voltage	BV <sub>DSS</sub>
Drain-to-Gate Voltage	BV <sub>DGS</sub>
Gate-to-Source Voltage	± 20V
Operating and Storage Temperature	-55°C to +150°C
Soldering Temperature*	300°C

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

**Package Options**



TO-236AB  
(SOT-23)  
top view



TO-243AA  
(SOT-89)

Note: See Package Outline section for dimensions.

## Thermal Characteristics

Package	$I_D$ (continuous)*	$I_D$ (pulsed)	Power Dissipation @ $T_A = 25^\circ\text{C}$	$\theta_{jc}$ $^\circ\text{C/W}$	$\theta_{ja}$ $^\circ\text{C/W}$	$I_{DR}^*$	$I_{DRM}$
TO-236AB	110mA	800mA	0.36W	200	350	110mA	800mA
TO-243AA	230mA	1.3A	1.6W <sup>†</sup>	15	78 <sup>†</sup>	230mA	1.3A

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

<sup>†</sup> Mounted on FR5 board, 25mm x 25mm x 1.57mm. Significant  $P_D$  increase possible on ceramic substrate.

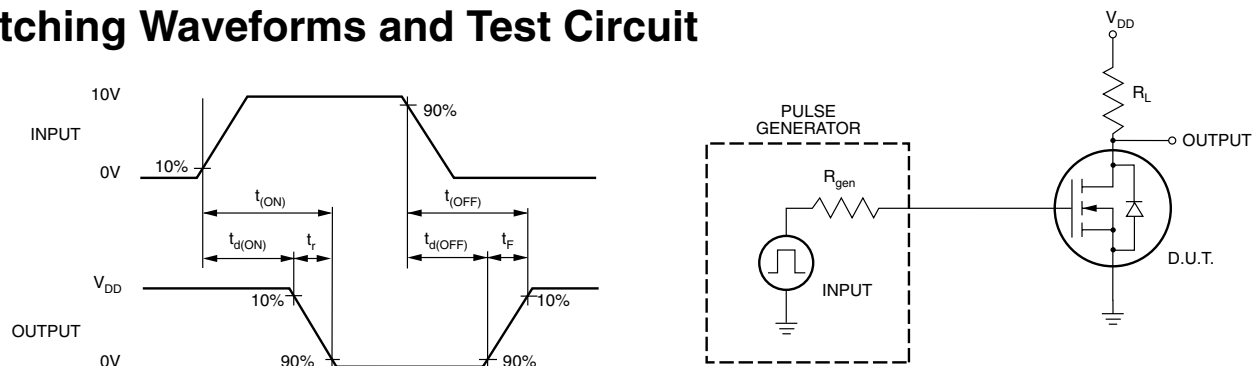
## Electrical Characteristics (@ $25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
$BV_{DSS}$	Drain-to-Source Breakdown Voltage	350			V	$V_{GS} = 0V, I_D = 100\mu\text{A}$
$V_{GS(th)}$	Gate Threshold Voltage	0.6		2.0	V	$V_{GS} = V_{DS}, I_D = 1\text{mA}$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature			-4.5	mV/ $^\circ\text{C}$	$V_{GS} = V_{DS}, I_D = 1\text{mA}$
$I_{GSS}$	Gate Body Leakage			100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
$I_{DSS}$	Zero Gate Voltage Drain Current			1.0	$\mu\text{A}$	$V_{GS} = 0V, V_{DS} = 100V$
				10	$\mu\text{A}$	$V_{GS} = 0V, V_{DS} = \text{Max Rating}$
				1.0	mA	$V_{GS} = 0V, V_{DS} = 0.8 \text{ Max Rating}$ $T_A = 125^\circ\text{C}$
				5.0	nA	$V_{GS} = 0V, V_{DS} = 330V$
$I_{D(ON)}$	ON-State Drain Current	300			mA	$V_{GS} = 4.5V, V_{DS} = 25V$
		750				$V_{GS} = 10V, V_{DS} = 25V$
$R_{DS(ON)}$	Static Drain-to Source On-State Resistance			15	$\Omega$	$V_{GS} = 3.0V, I_D = 20\text{mA}$
				15		$V_{GS} = 4.5V, I_D = 150\text{mA}$
				15		$V_{GS} = 10V, I_D = 200\text{mA}$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature			1.0	%/ $^\circ\text{C}$	$V_{GS} = 4.5V, I_D = 150\text{mA}$
$G_{FS}$	Forward Transconductance	125			m $\bar{S}$	$V_{DS} = 25V, I_D = 200\text{mA}$
$C_{ISS}$	Input Capacitance			110	pF	$V_{GS} = 0V, V_{DS} = 25V$ $f = 1\text{Mhz}$
$C_{OSS}$	Common Source Output Capacitance			60		
$C_{RSS}$	Reverse Transfer Capacitance			22		
$t_{d(ON)}$	Turn-ON Delay Time			20	ns	$V_{DD} = 25V,$ $I_D = 150\text{mA},$ $R_{GEN} = 25\Omega$
$t_r$	Rise Time			15		
$t_{d(OFF)}$	Turn-OFF Delay Time			25		
$t_f$	Fall Time			25		
$V_{SD}$	Diode Forward Voltage Drop			1.8	V	$V_{GS} = 0V, I_{SD} = 200\text{mA}$
$t_{rr}$	Reverse Recovery Time		800		ns	$V_{GS} = 0V, I_{SD} = 200\text{mA}$

### 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



11/12/01