# N-Channel Depletion-Mode Vertical DMOS FETs

## Ordering Information

| $BV_{DSX}$ / $BV_{DGX}$ | $R_{DS(ON)}$ (max) | $I_{DSS}$ (min) | Order Number / Package | |
|---|---|---|---|---|
| | | | TO-92 | TO-243AA* |
| 300V | 12Ω | 200mA | DN2530N3 | DN2530N8 |

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

**Product marking for TO-243AA:**

DN5T✳

Where ✳ = 2-week alpha date code

## Features

- ❏ High input impedance
- ❏ Low input capacitance
- ❏ Fast switching speeds
- ❏ Low on resistance
- ❏ Free from secondary breakdown
- ❏ Low input and output leakage

## Applications

- ❏ Normally-on switches
- ❏ Solid state relays
- ❏ Converters
- ❏ Linear amplifiers
- ❏ Constant current sources
- ❏ Power supply circuits
- ❏ Telecom

## Advanced DMOS Technology

**Not recommended for new designs. Please use DN3535 or DN3545 instead.**

These depletion-mode (normally-on) transistors utilize an advanced 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.

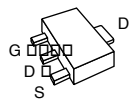
Supertex's vertical DMOS FETs are ideally suited to a wide range of switching and amplifying applications where high breakdown voltage, high input impedance, low input capacitance, and fast switching speeds are desired.

## Absolute Maximum Ratings

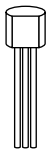
| | |
|---|---|
| Drain-to-Source Voltage | $BV_{DSX}$ |
| Drain-to-Gate Voltage | $BV_{DGX}$ |
| Gate-to-Source Voltage | ± 20V |
| Operating and Storage Temperature | -55°C to +150°C |
| Soldering Temperature* | 300°C |

* Distance of 1.6 mm from case for 10 seconds.

## Package Options




TO-243AA
(SOT-89)




TO-92

**Note**: See Package Outline section for dimensions.

12/13/01

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# Thermal Characteristics

| Package | $I_D$ (continuous)* | $I_D$ (pulsed) | Power Dissipation @ $T_A$ = 25°C | $\theta_{jc}$ °C/W | $\theta_{ja}$ °C/W | $I_{DR}$* | $I_{DRM}$ |
|---|---|---|---|---|---|---|---|
| TO-92 | 175mA | 500mA | 0.74W | 125 | 170 | 175mA | 500mA |
| TO-243AA | 200mA | 500mA | 1.6† | 15 | 78† | 200mA | 500mA |

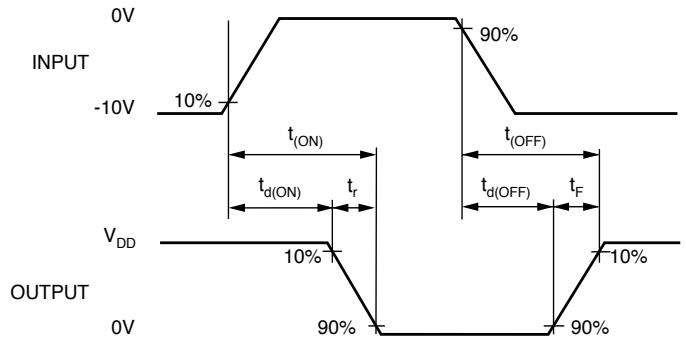
* $I_D$ (continuous) is limited by max rated $T_j$.
† Mounted on FR4 board, 25mm x 25mm x 1.57mm. Significant $P_D$ increase possible on ceramic substrate.

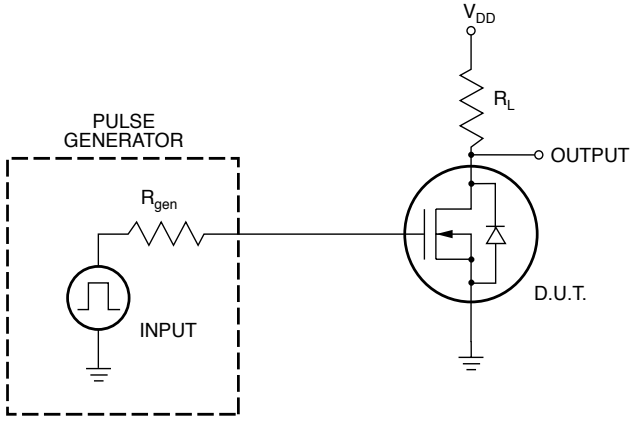
# Electrical Characteristics (@ 25°C unless otherwise specified)

| Symbol | Parameter | Min | Typ | Max | Unit | Conditions |
|---|---|---|---|---|---|---|
| $BV_{DSX}$ | Drain-to-Source Breakdown Voltage | 300 | | | V | $V_{GS}$ = -5V, $I_D$ = 100μA |
| $V_{GS(OFF)}$ | Gate-to-Source OFF Voltage | –1.0 | | –3.5 | V | $V_{DS}$ = 25V, $I_D$= 10μA |
| $\Delta V_{GS(OFF)}$ | Change in $V_{GS(OFF)}$ with Temperature | | | 4.5 | mV/°C | $V_{DS}$ = 25V, $I_D$= 10μA |
| $I_{GSS}$ | Gate Body Leakage Current | | | 100 | nA | $V_{GS}$ = ± 20V, $V_{DS}$ = 0V |
| $I_{D(OFF)}$ | Drain-to-Source Leakage Current | | | 10 | μA | $V_{GS}$ = -10V, $V_{DS}$ = Max Rating |
| | | | | 1 | mA | $V_{GS}$ = -10V, $V_{DS}$ = 0.8 Max Rating $T_A$ = 125°C |
| $I_{DSS}$ | Saturated Drain-to-Source Current | 200 | | | mA | $V_{GS}$ = 0V, $V_{DS}$ = 25V |
| $R_{DS(ON)}$ | Static Drain-to-Source ON-State Resistance | | | 12 | Ω | $V_{GS}$ = 0V, $I_D$ = 150mA |
| $\Delta R_{DS(ON)}$ | Change in $R_{DS(ON)}$ with Temperature | | | 1.1 | %/°C | $V_{GS}$ = 0V, $I_D$ = 150mA |
| $G_{FS}$ | Forward Transconductance | 300 | | | m℧ | $I_D$ = 150mA, $V_{DS}$ = 10V |
| $C_{ISS}$ | Input Capacitance | | | 300 | pF | $V_{GS}$ = -10V, $V_{DS}$ = 25V f = 1 MHz |
| $C_{OSS}$ | Common Source Output Capacitance | | | 30 | | |
| $C_{RSS}$ | Reverse Transfer Capacitance | | | 5 | | |
| $t_{d(ON)}$ | Turn-ON Delay Time | | | 10 | ns | $V_{DD}$ = 25V, $I_D$ = 150mA, $R_{GEN}$ = 25Ω |
| $t_r$ | Rise Time | | | 15 | | |
| $t_{d(OFF)}$ | Turn-OFF Delay Time | | | 15 | | |
| $t_f$ | Fall Time | | | 20 | | |
| $V_{SD}$ | Diode Forward Voltage Drop | | | 1.8 | V | $V_{GS}$ = -10V, $I_{SD}$ = 150mA |
| $t_{rr}$ | Reverse Recovery Time | | 600 | | ns | $V_{GS}$ = -10V, $I_{SD}$ = 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.

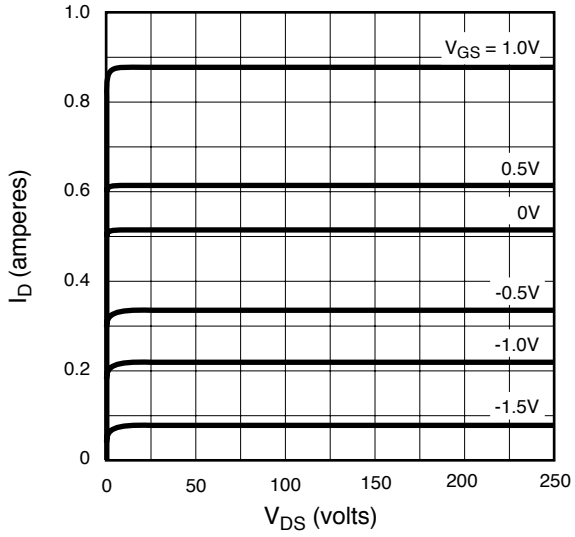
# Switching Waveforms and Test Circuit



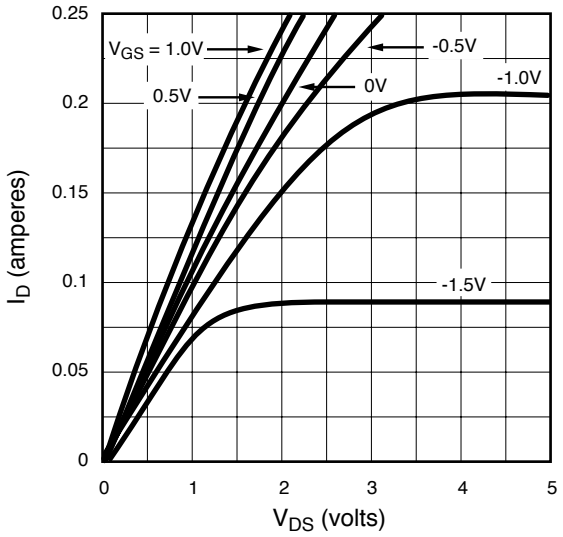



# Typical Performance Curves

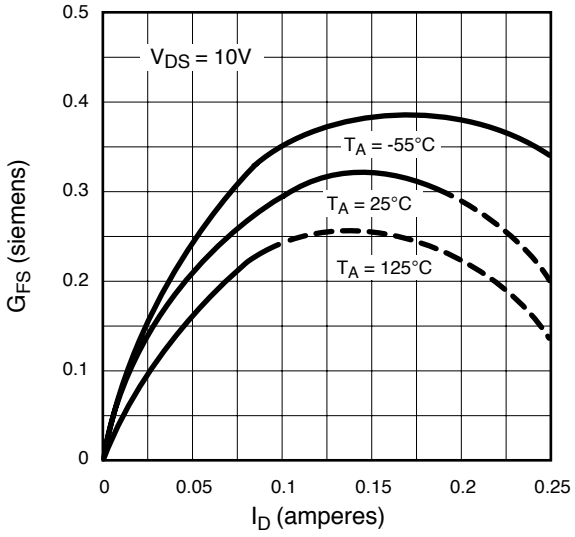
Output Characteristics



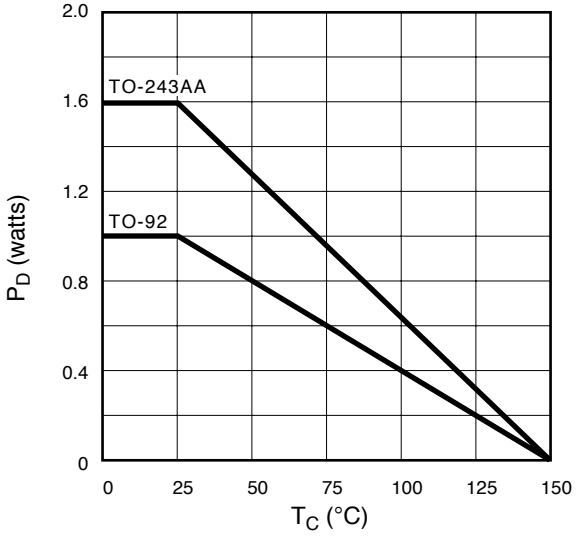

Saturation Characteristics



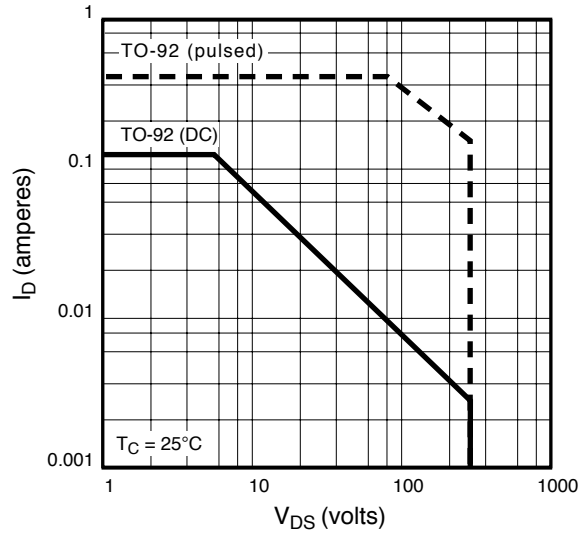

Transconductance vs. Drain Current



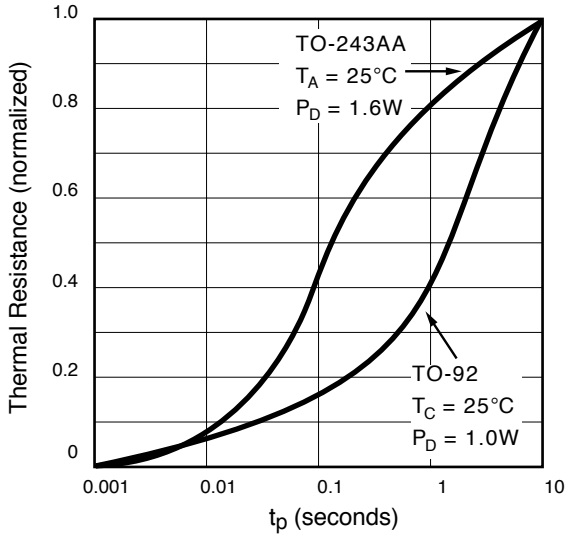

Power Dissipation vs. Case Temperature




Maximum Rated Safe Operating Area

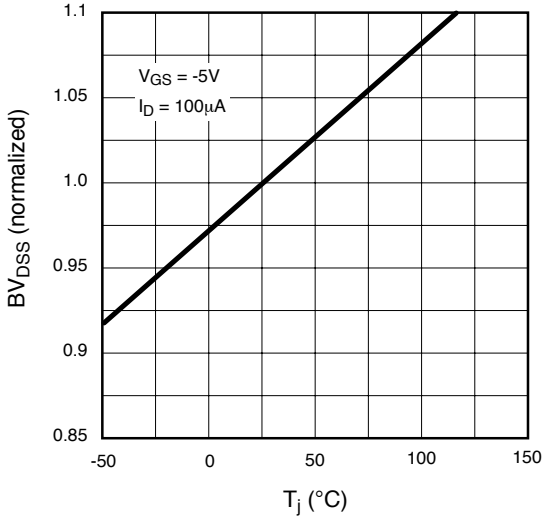



Thermal Response Characteristics

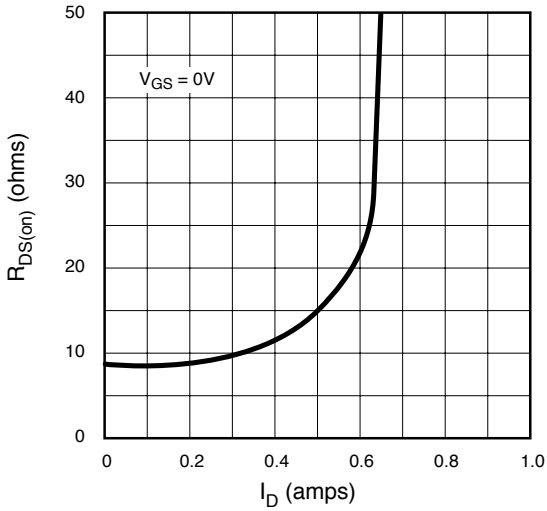


# Typical Performance Curves

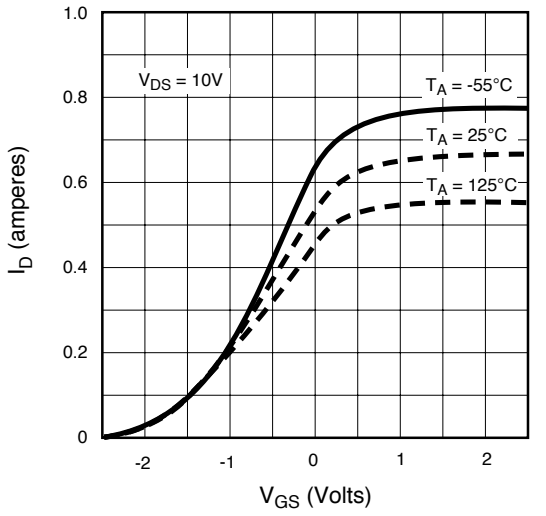
$BV_{DSS}$ Variation with Temperature



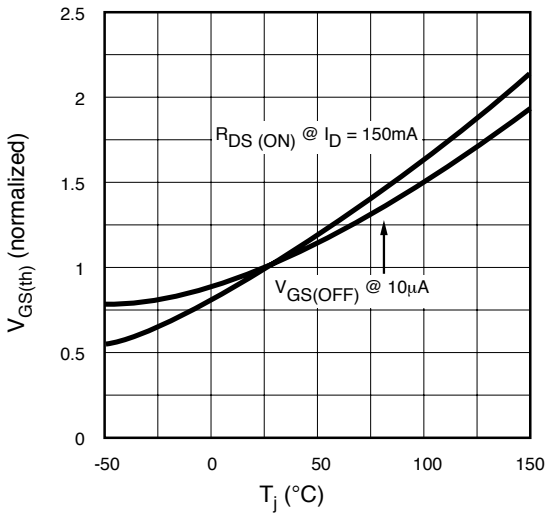

On-Resistance vs. Drain Current



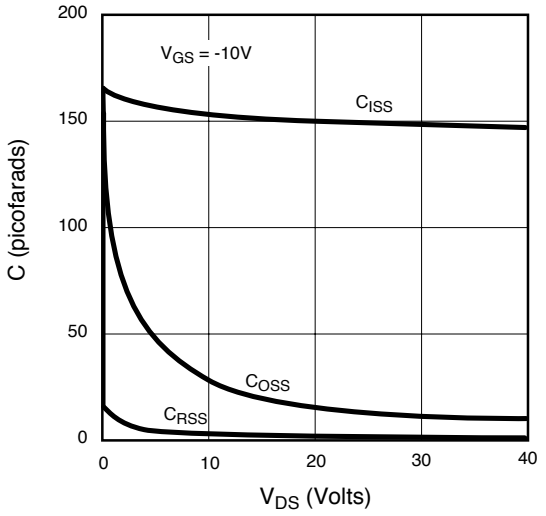

Transfer Characteristics



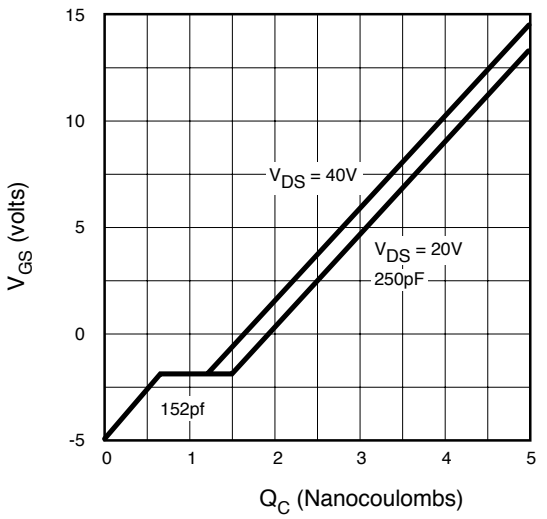

$V_{GS}$ (Off) and $R_{DS}$ Variation with Temperature




Capacitance Vs. Drain-to-Source Voltage




Gate Drive Dynamic Characteristics






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