N-Channel Depletion-Mode Vertical DMOS FET

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

General Description

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.

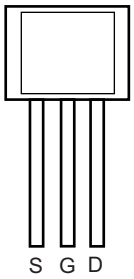
Absolute Maximum Ratings

Parameter	Value
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

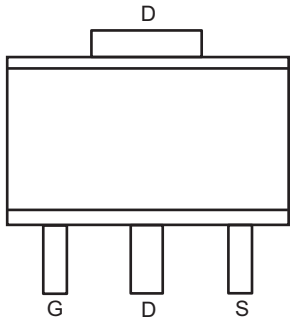
Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. Continuous operation of the device at the absolute rating level may affect device reliability. All voltages are referenced to device ground.

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

Package Options



TO-92
(front view)



TO-243AA
(top view)

Ordering Information

BV_{DSX}/ BV_{DGX}	$R_{DS(ON)}$ (max)	I_{DSS} (min)	Package Options	
			TO-92	TO-243AA (SOT-89)
450V	20Ω	200mA	DN3545N3	DN3545N8
			DN3545N3-G	DN3545N8-G

-G indicates package is RoHS compliant ('Green')

Thermal Characteristics

Package	I_D (continuous)[1]	I_D (pulsed)	Power Dissipation @T_A = 25°C	θ_{jc} °C/W	θ_{ja} °C/W	I_{DR}[1]	I_{DRM}
T0-92	136mA	550mA	0.74W	125	170	136mA	550mA
TO-243AA	200mA	550mA	1.6W[2]	15	78[2]	200mA	550mA

Notes:

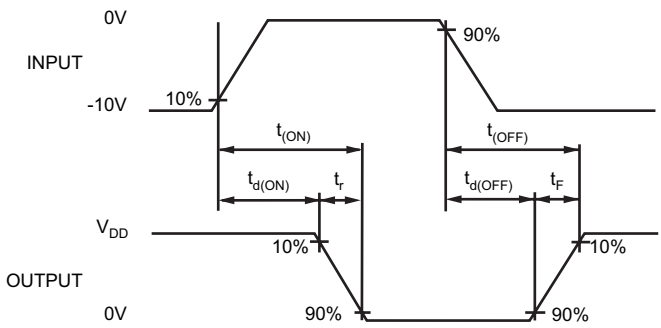
1. I_D (continuous) is limited by max rated T_j.

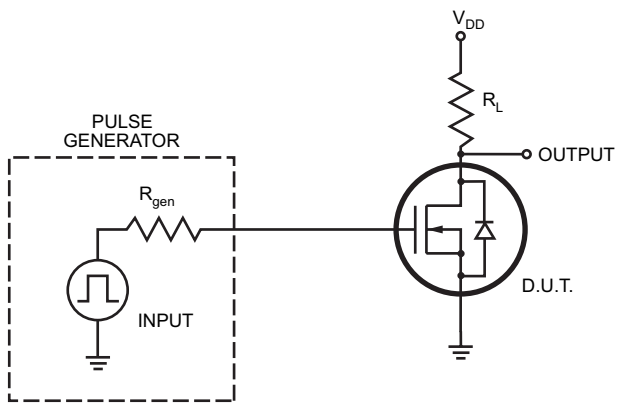
2. Mounted on FR4 board, 25mm x 25mm x 1.57mm. Significant P_D increase possible on ceramic substrate.

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

Symbol	Parameter	Min	Typ	Max	Units	Conditions
BV_{DSX}	Drain-to-source breakdown voltage	450	-	-	V	V_{GS} = -5V, I_D = 100µA
$V_{GS(OFF)}$	Gate-to-source OFF voltage	-1.5	-	-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	-	-	1.0	µA	V_{GS} = -5V, V_{DS} = Max Rating
		-	-	1.0	mA	V_{GS} = -5V, V_{DS} = 0.8 Max Rating T_A = 125°C
I_{DSS}	Saturated drain-to-source current	200	-	-	mA	V_{GS} = 0V, V_{DS} = 15V
$R_{DS(ON)}$	Static drain-to-source on-state resistance	-	-	20	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 transductance	150	-	-	m℧	I_D = 100mA, V_{DS} = 10V
C_{ISS}	Input capacitance	-	-	360	pF	V_{GS} = -5V, V_{DS} = 25V, f = 1MHz
C_{OSS}	Common source output capacitance	-	-	40		
C_{RSS}	Reverse transfer capacitance	-	-	15		
$t_{d(ON)}$	Turn-ON delay time	-	-	20	ns	V_{DD} = 25V, I_D = 150mA, R_{GEN} = 25Ω, V_{GS} = 0V to -10V
t_r	Rise time	-	-	30		
$t_{d(OFF)}$	Turn-OFF delay time	-	-	30		
t_f	Fall time	-	-	40		
V_{SD}	Diode forward voltage drop	-	-	1.8	V	V_{GS} = -5V, I_{SD} = 150mA
t_{rr}	Reverse recovery time	-	800	-	ns	V_{GS} = -5V, I_{SD} = 150mA

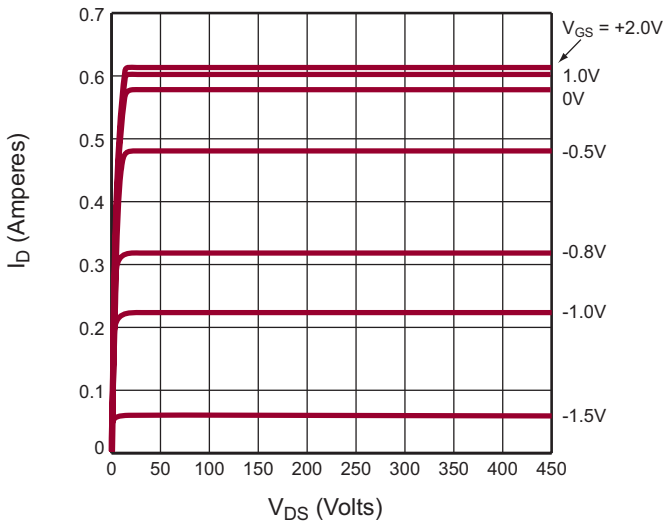
Switching Waveforms and Test Circuit



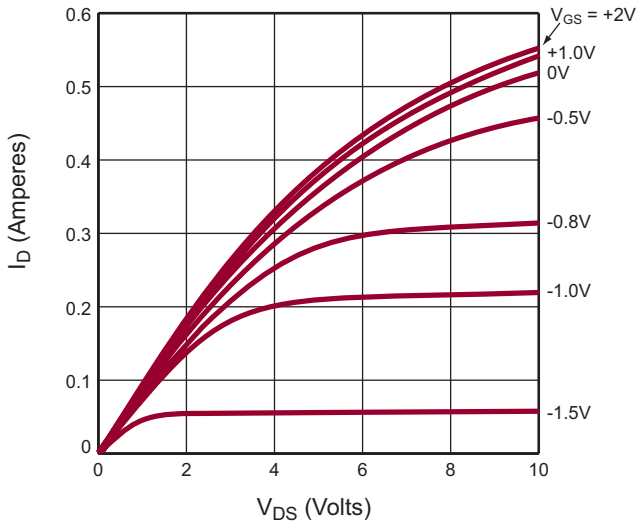


Typical Performance Curves

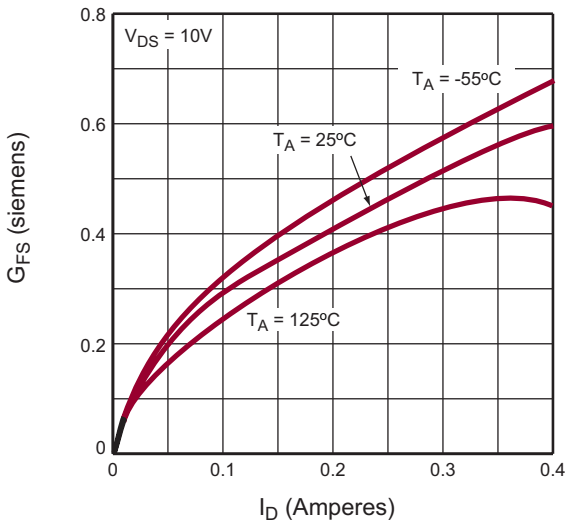
Output Characteristics



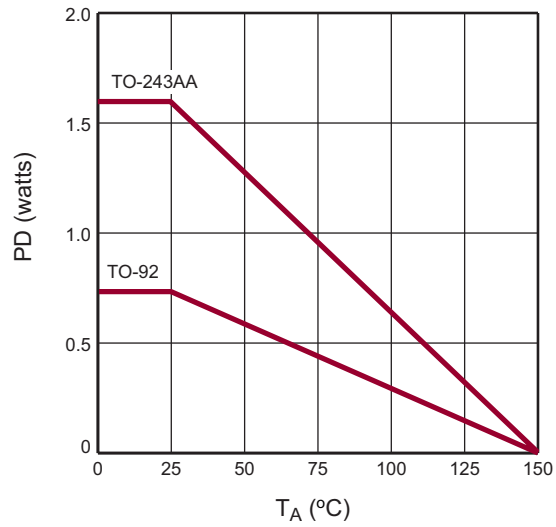
Saturation Characteristics



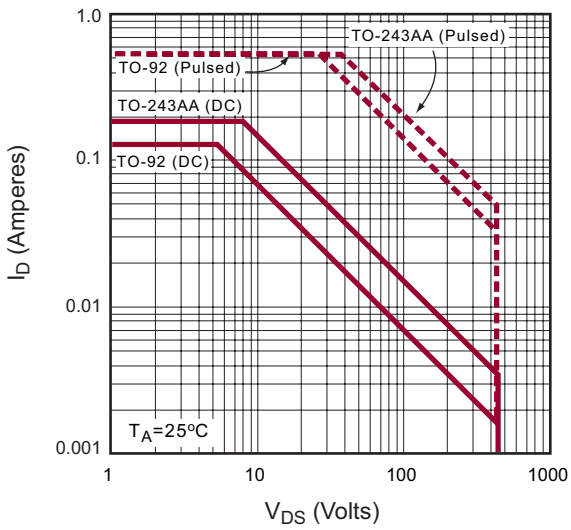
Transconductance vs. Drain Current



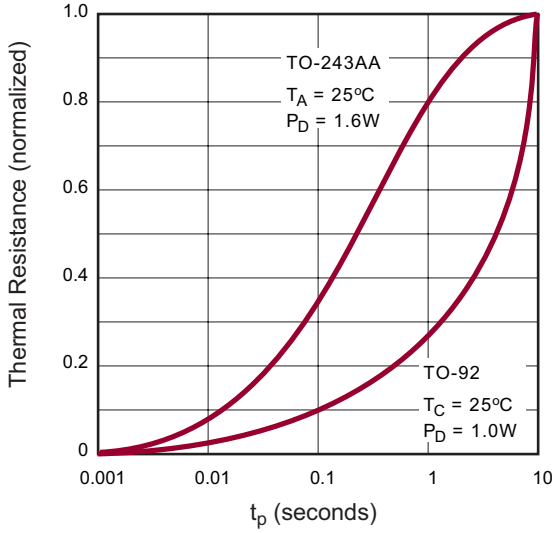
Power Dissipation vs. Ambient Temperature



Maximum Rated Safe Operating Area

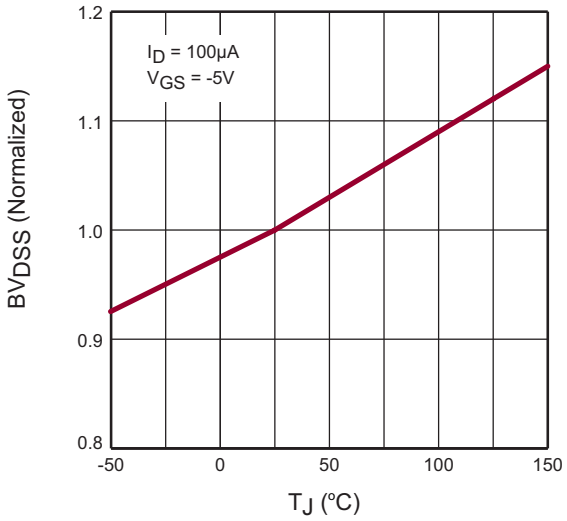


Thermal Response Characteristics

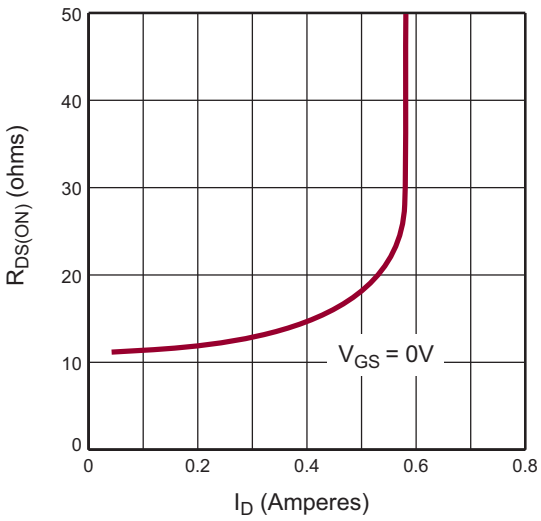


Typical Performance Curves (cont.)

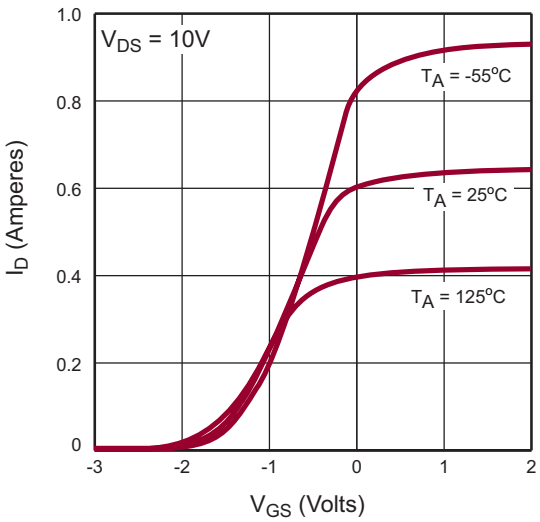
BVDSS Variation with Temperature



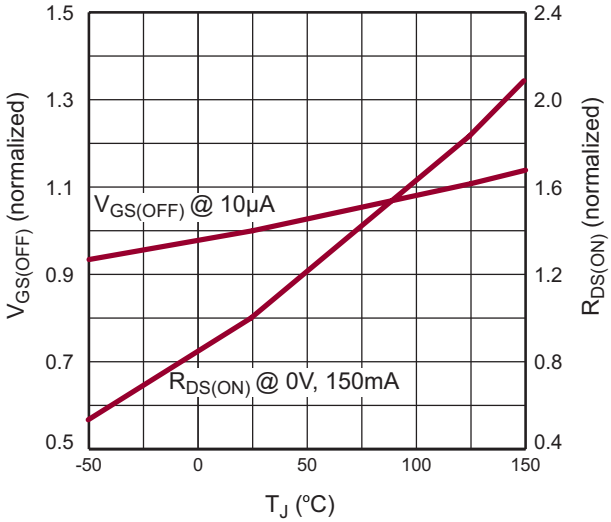
On Resistance vs. Drain Current



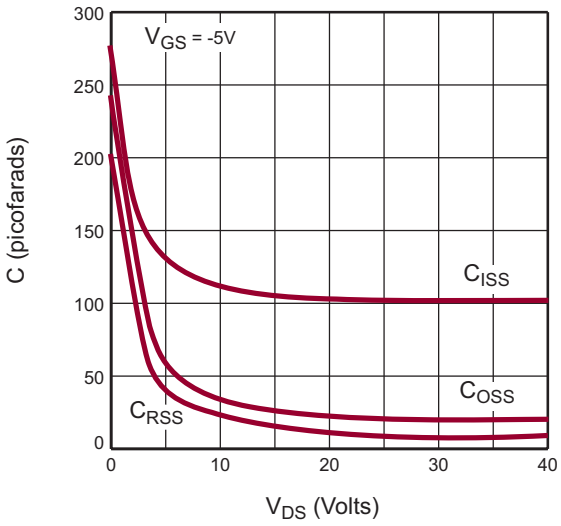
Transfer Characteristics



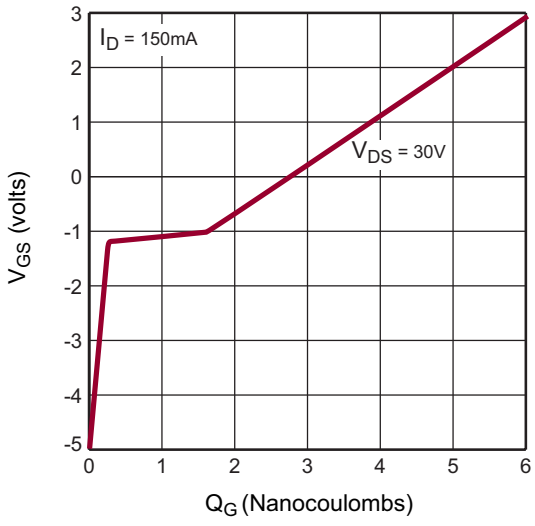
VGS(OFF) and RDS(ON) w/ Temperature



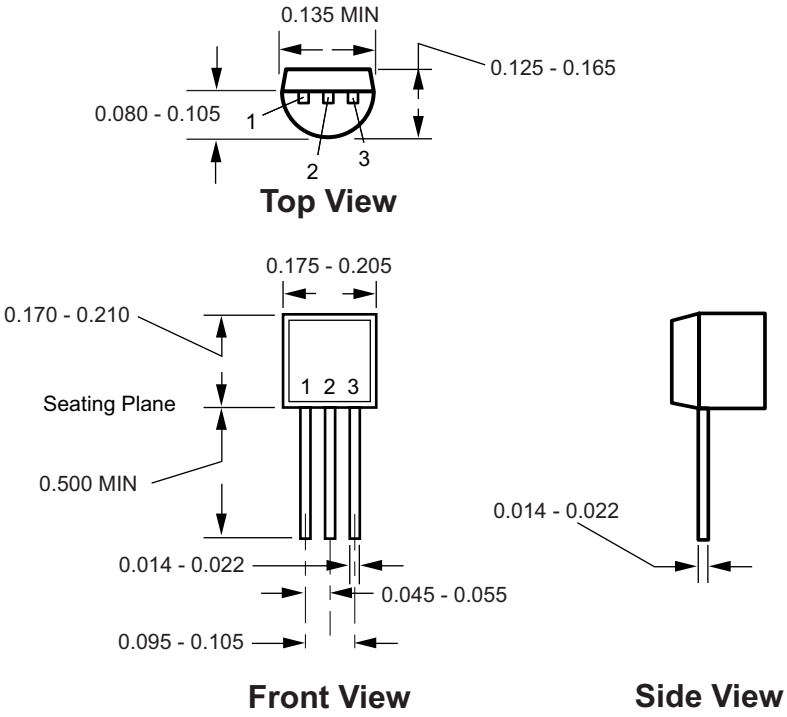
Capacitance vs. Drain Source Voltage



Gate Drive Dynamic Characteristics

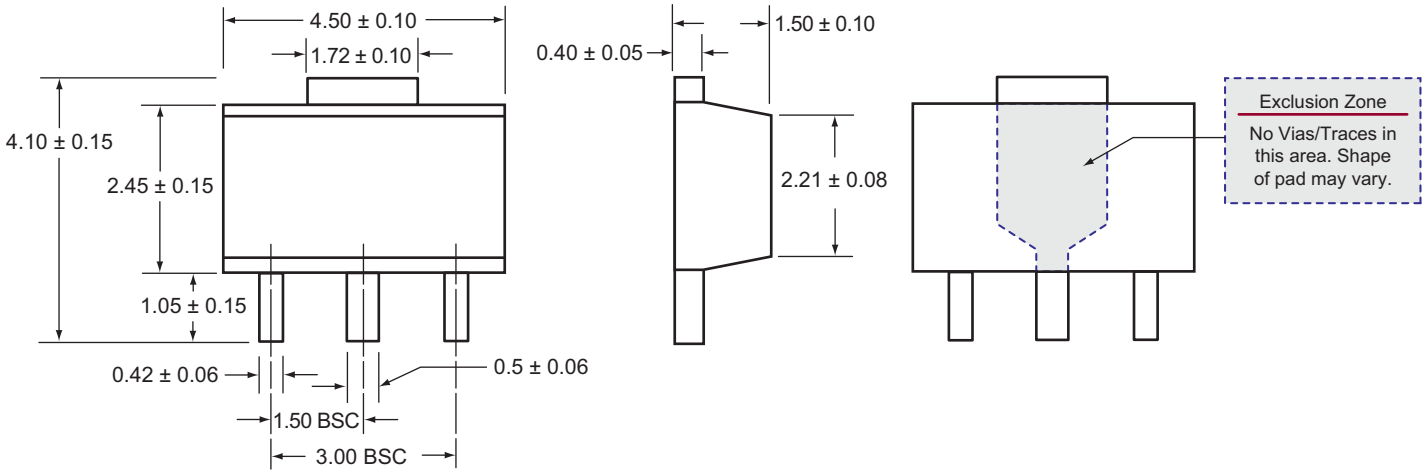


3-Lead TO-92 Surface Mount Package (N3)



Notes:
All dimensions are in millimeters; all angles in degrees.

3-Lead TO-243AA (SOT-89) Surface Mount Package (N8)



Top View **Side View** **Bottom View**

Notes:
All dimensions are in millimeters; all angles in degrees.

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to http://www.supertex.com/packaging.html.)

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