N-Channel Depletion-Mode Vertical DMOS FETs

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

The Supertex DN2535 and DN2540 are low threshold depletion-mode (normally-on) transistors utilizing 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.

Product marking for TO-243AA:

DN5D✳

where ✳ = 2-week alpha date code

Ordering Information

BV_{DSX}/ BV_{DGX}	$R_{DS(ON)}$ (max)	I_{DSS} (min)	Package Options		
			TO-92	TO-220	TO-243AA[1]
350V	25Ω	150mA	DN2535N3	DN2535N5	DN2535N8
			DN2535N3-G	DN2535N5-G	DN2535N8-G
400V	25Ω	150mA	DN2540N3	DN2540N5	DN2540N8
			DN2540N3-G	DN2540N5-G	DN2540N8-G

-G indicates package is RoHS compliant ('Green')
[1]Same as SOT-89.

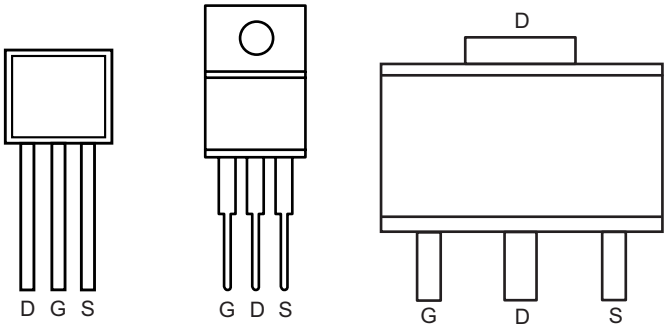
Absolute Maximum Ratings

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.*

Pin Configurations



TO-92 *(front view)*

TO-220 *(front view)*

TO-243AA *(top view)*

Thermal Characteristics

Package	I_D (continuous)[1]	I_D (pulsed)	Power Dissipation @T_C = 25°C	Θ_{jc} (°C/W)	Θ_{ja} (°C/W)	I_{DR}[1]	I_{DRM}
TO-92	120mA	500mA	1.0W	125	170	120mA	500mA
TO-220	500mA	500mA	15W	8.3	70	500mA	500mA
TO-243AA	170mA	500mA	1.6W[2]	15	78[2]	170mA	500mA

Notes:

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

2. Mounted on FR4 board, 25mm x 25mm x 1.57mm. T_A = 25°C.

Electrical Characteristics

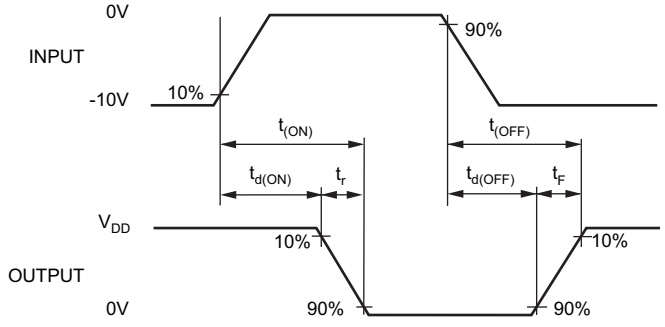
Symbol	Parameter		Min	Typ	Max	Units	Conditions
BV_{DSX}	Drain-to-source breakdown voltage	DN2535	350	-	-	V	V_{GS} = -5.0V, I_D = 100µA
		DN2540	400				
$V_{GS(OFF)}$	Gate-to-source OFF voltage		-1.5	-	-3.5	V	V_{DS} = 25V, I_D = 10µA
$\Delta V_{GS(OFF)}$	Change in $V_{GS(OFF)}$ with temperature		-	-	4.5	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		-	-	10	µA	V_{DS} = Max rating, V_{GS} = -10V
			-	-	1.0	mA	V_{DS} = 0.8 Max Rating, V_{GS} = -10V, T_A = 125°C
I_{DSS}	Saturated drain-to-source current		150	-	-	mA	V_{GS} = 0V, V_{DS} = 25V
$R_{DS(ON)}$	Static drain-to-source ON-state resistance		-	17	25	Ω	V_{GS} = 0V, I_D = 120mA
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with temperature		-	-	1.1	%/°C	V_{GS} = 0V, I_D = 120mA
G_{FS}	Forward transconductance		-	325	-	mmho	V_{DS} = 10V, I_D = 100mA
C_{ISS}	Input capacitance		-	200	300	pF	V_{GS} = -10V, V_{DS} = 25V, f = 1MHz
C_{OSS}	Common source output capacitance		-	12	30		
C_{RSS}	Reverse transfer capacitance		-	1	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} = 120mA
t_{rr}	Reverse recovery time		-	800	-	ns	V_{GS} = -10V, I_{SD} = 1.0A

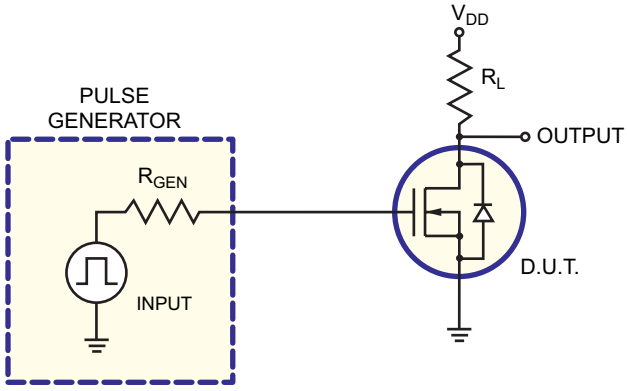
Notes:

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.

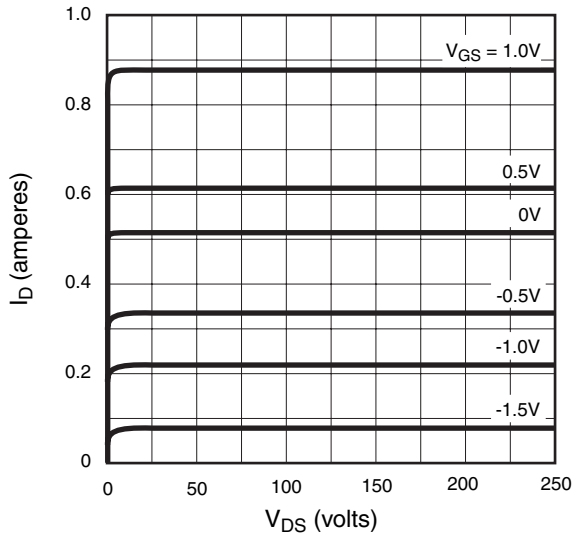
Switching Waveforms and Test Circuit



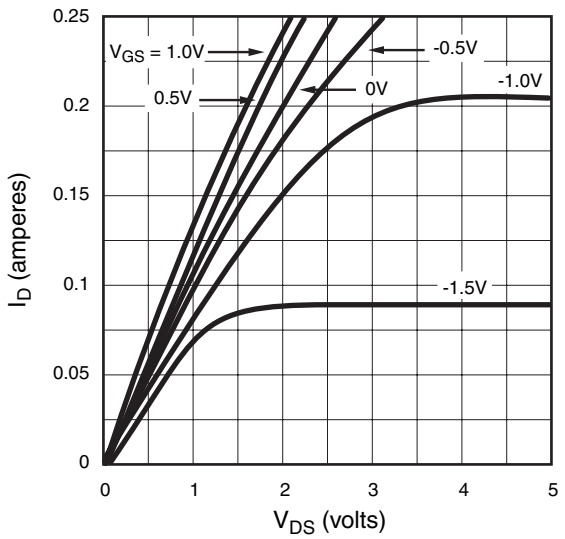


Typical Performance Curves

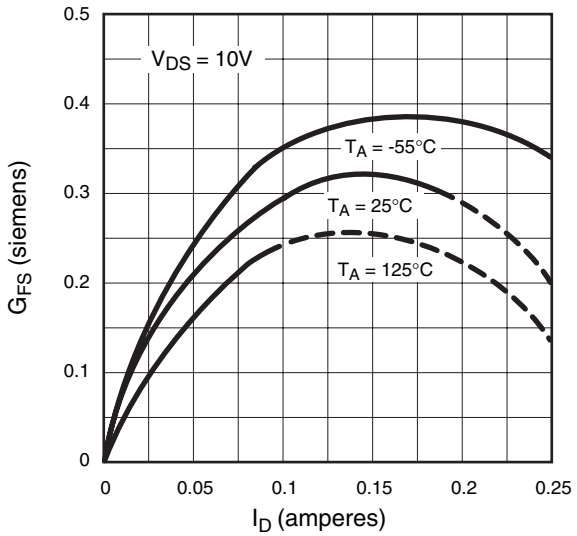
Output Characteristics



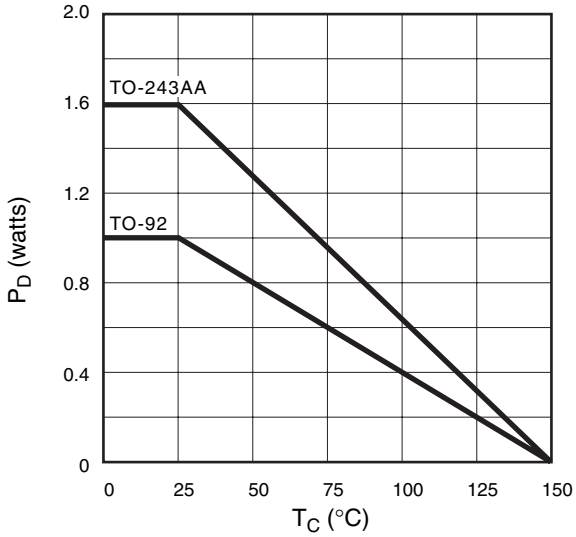
Saturation Characteristics



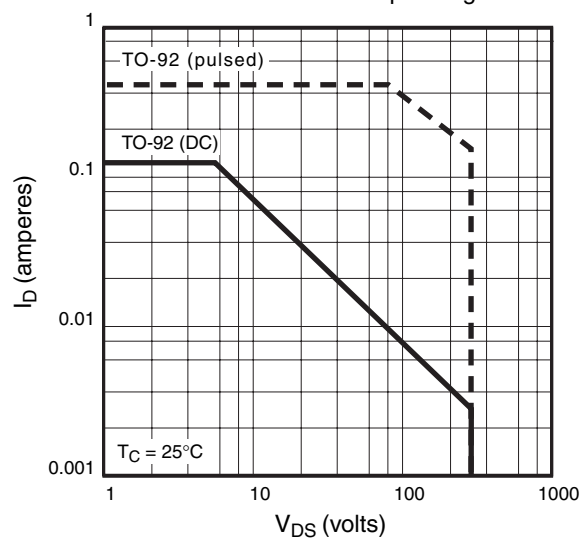
Transconductance vs. Drain Current



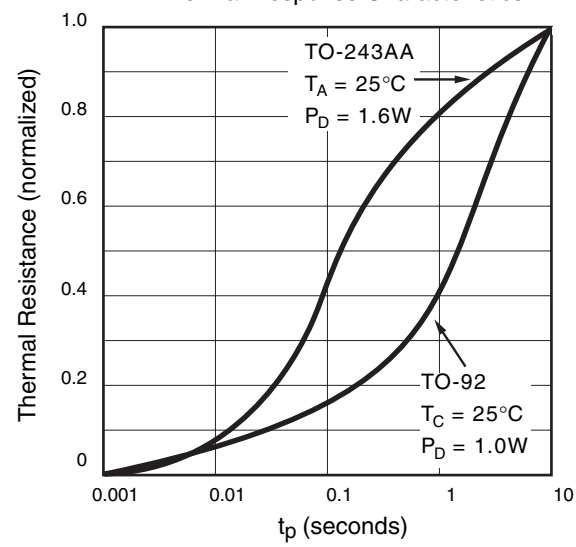
Power Dissipation vs. Case Temperature



Maximum Rated Safe Operating Area

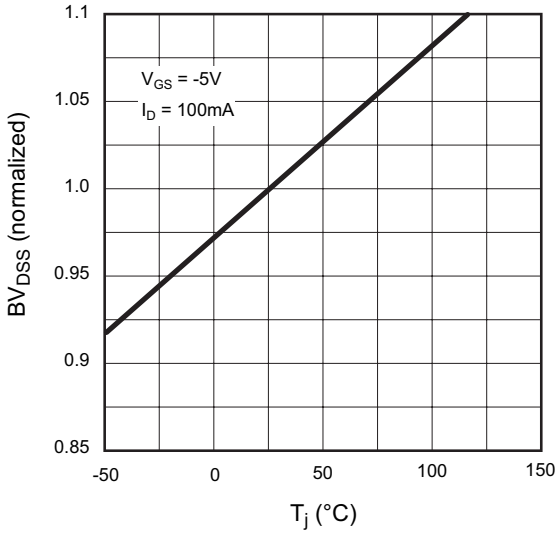


Thermal Response Characteristics

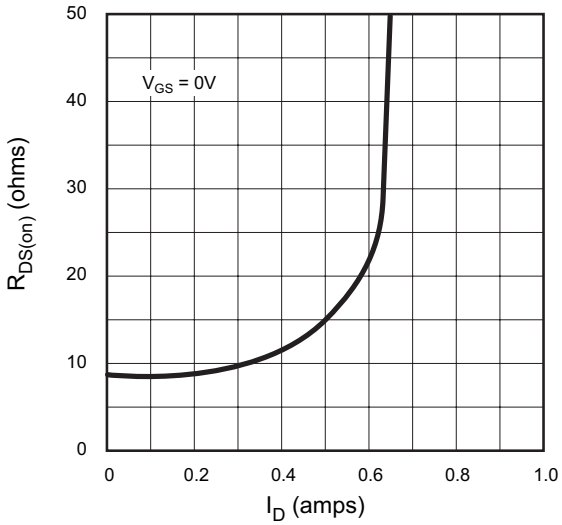


Typical Performance Curves (cont.)

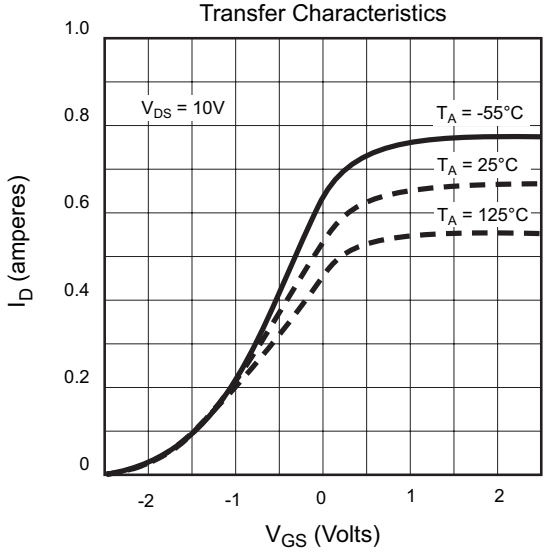
BV$_{DSS}$ Variation with Temperature



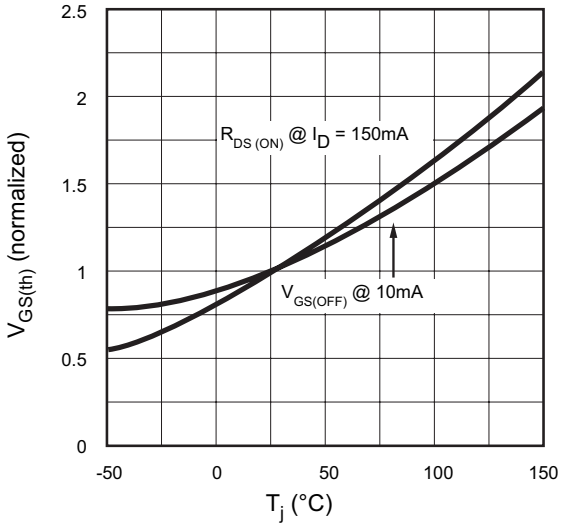
On-Resistance vs. Drain Current



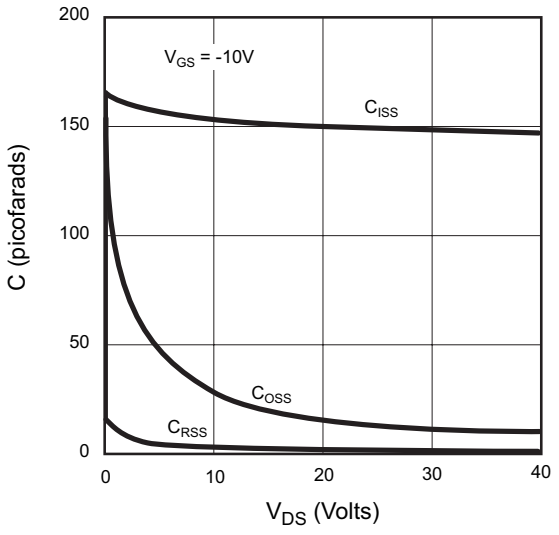
Transfer Characteristics



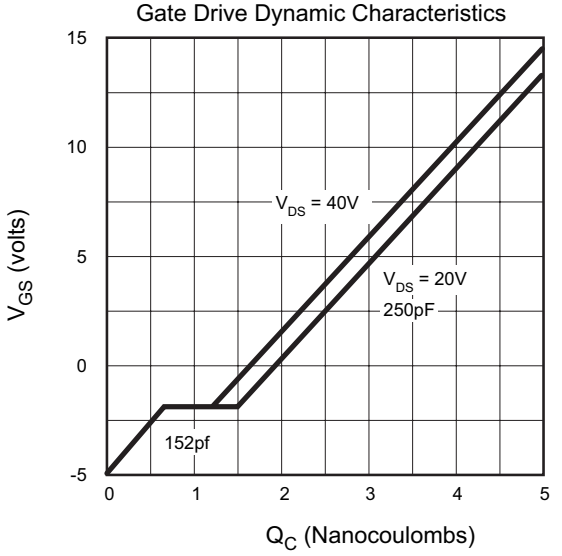
V_{GS} (Off) and R_{DS} Variation with Temperature



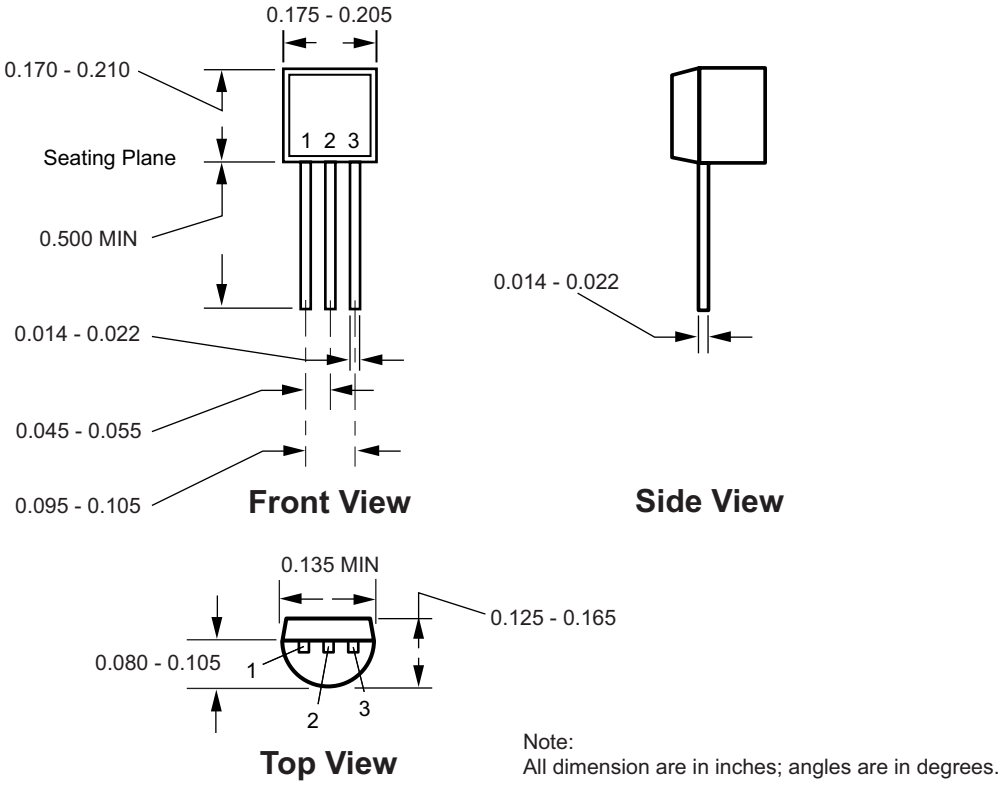
Capacitance Vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics

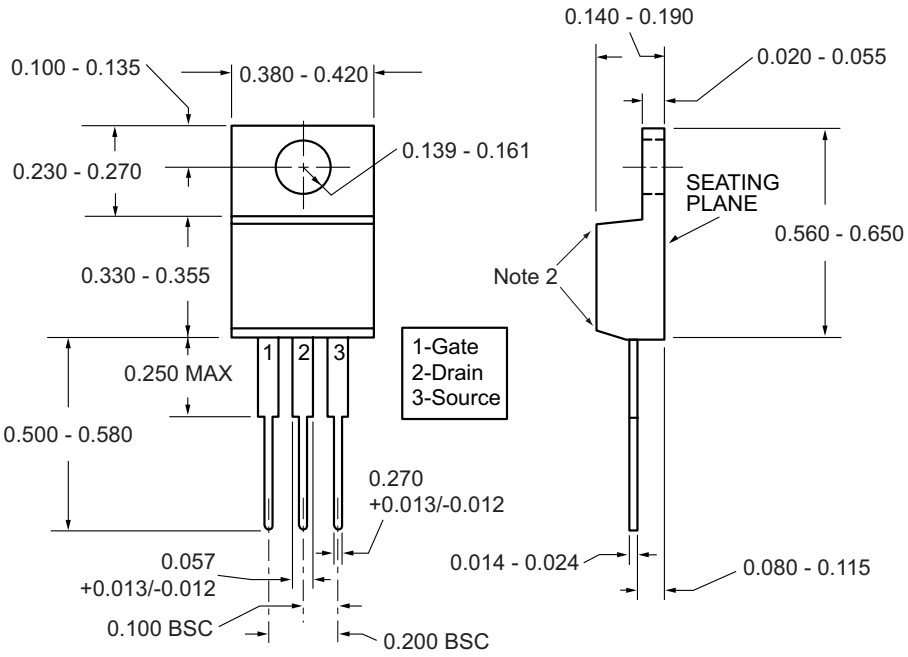


3-Lead TO-92 Package Outline (N3)



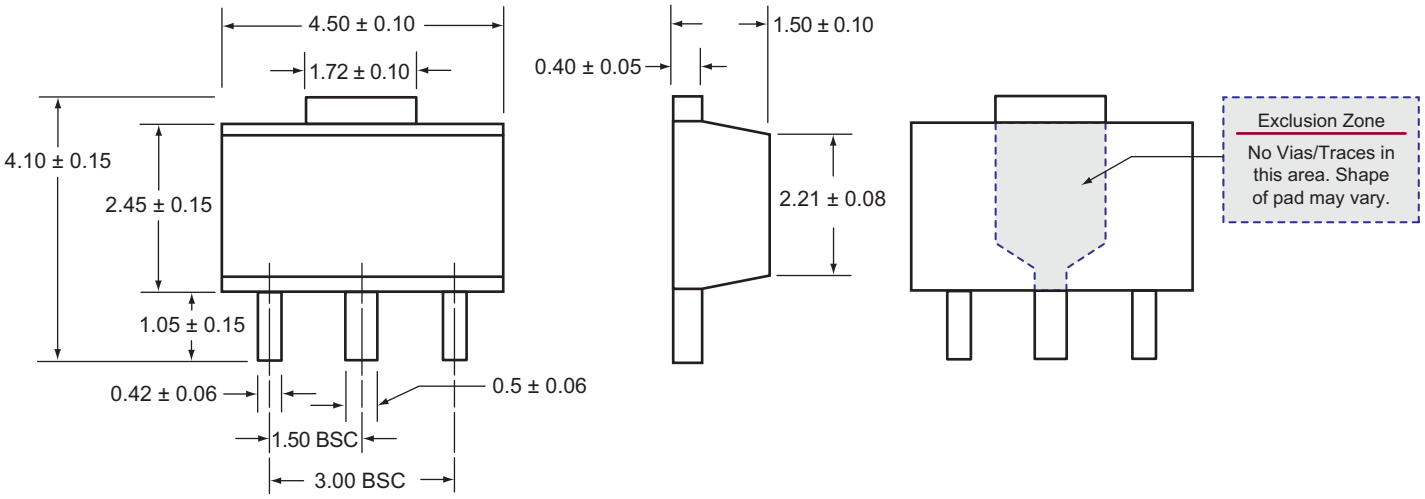
Note:
All dimension are in inches; angles are in degrees.

3-Lead TO-220 Package Outline (N5)



Notes:
1. All dimensions in inches; angles in degrees
2. Corner shape may differ from drawing
3. Lead 2 electrically connected to mounting tab

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



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

Notes:

1. 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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