

# N-Channel Enhancement-Mode Vertical DMOS FET

## Features

- ▶ Free from secondary breakdown
- ▶ Low power drive requirement
- ▶ Ease of paralleling
- ▶ Low  $C_{ISS}$  and fast switching speeds
- ▶ Excellent thermal stability
- ▶ Integral source-drain diode
- ▶ High input impedance and high gain

## Applications

- ▶ Motor controls
- ▶ Converters, amplifiers, and switches
- ▶ Power supply circuits
- ▶ Drivers (relays, hammers, solenoids, lamps, memories, displays, bipolar transistors, etc.)

## Ordering Information

Part Number	Package Options	Packing
VN2450N3-G	TO-92	1000/Bag
VN2450N3-G P002	TO-92	2000/Reel
VN2450N3-G P003	TO-92	2000/Reel
VN2450N3-G P005	TO-92	2000/Reel
VN2450N3-G P013	TO-92	2000/Reel
VN2450N3-G P014	TO-92	2000/Reel
VN2450N8-G	TO-243AA (SOT-89)	2000/Reel

-G denotes a lead (Pb)-free / RoHS compliant package  
 Refer to 'P0xx' Tape & Reel Specs for P002, P003, P005, P013, and P014 TO-92  
 Taping Specifications and Winding Styles  
 Contact factory for Wafer / Die availability.  
 Devices in Wafer / Die form are lead (Pb)-free / RoHS compliant.

## Absolute Maximum Ratings

Parameter	Value
Drain-to-source voltage	$BV_{DSS}$
Drain-to-gate voltage	$BV_{DGS}$
Gate-to-source voltage	$\pm 20V$
Operating and storage temperature	$-55^{\circ}C$ to $+150^{\circ}C$

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.

## Typical Thermal Resistance

Package	$\theta_{ja}$
TO-92	$132^{\circ}C/W$
TO-243AA (SOT-89)	$133^{\circ}C/W^*$

\* Mounted on FR5 Board, 25mm x 25mm x 1.57mm

## General Description

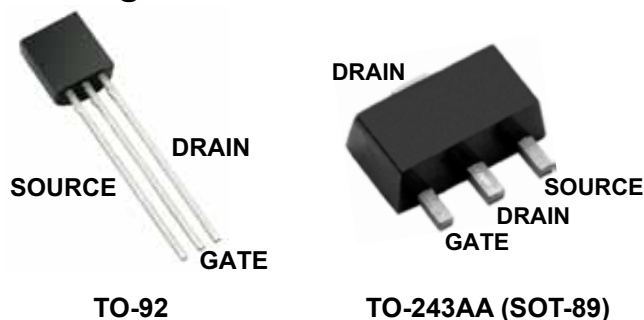
This enhancement-mode (normally-off) transistor utilizes a vertical DMOS structure and Supertex's well-proven silicon-gate manufacturing process. This combination produces a device with the power handling capabilities of bipolar transistors and with the high input impedance and positive temperature coefficient inherent in MOS devices. Characteristic of all MOS structures, this device is 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 Summary

$BV_{DSS}/BV_{DGS}$	$R_{DS(ON)}$ (max)	$I_{D(ON)}$ (min)
500V	$13\Omega$	500mA

## Pin Configuration



## Product Marking

SiVN	YY = Year Sealed
2 4 5 0	WW = Week Sealed
YYWW	_____ = "Green" Packaging

Package may or may not include the following marks: Si or TO-92

VN4EW	W = Code for week sealed
_____	_____ = "Green" Packaging

Package may or may not include the following marks: Si or TO-243AA (SOT-89)

## Thermal Characteristics

Package	$I_D$ (continuous) <sup>†</sup>	$I_D$ (pulsed)	Power Dissipation @ $T_A = 25^\circ\text{C}$	$I_{DR}$ <sup>‡</sup>	$I_{DRM}$
TO-92	200mA	650mA	1.0W	200mA	650mA
TO-243AA (SOT-89)	250mA	750mA	1.6W <sup>‡</sup>	250mA	750mA

### Notes:

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

<sup>‡</sup> Mounted on FR5 Board, 25mm x 25mm x 1.57mm.

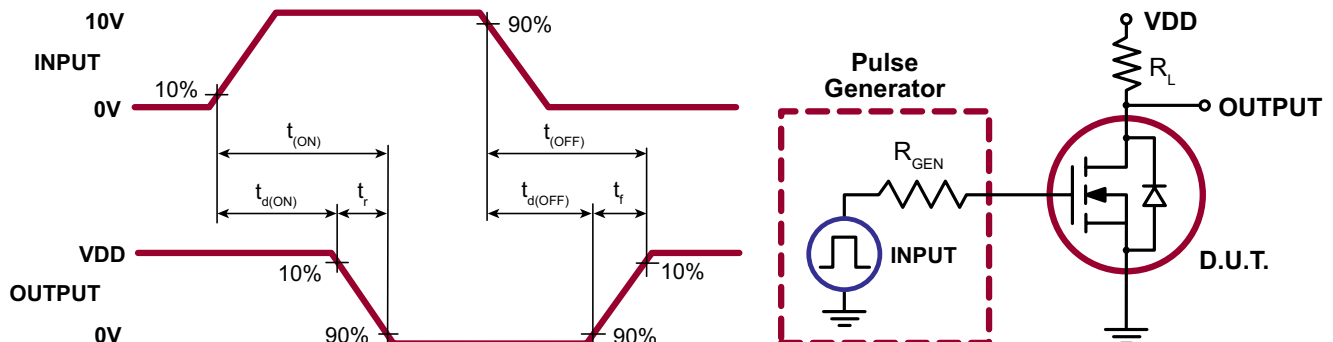
## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise specified)

Sym	Parameter	Min	Typ	Max	Units	Conditions
$BV_{DSS}$	Drain-to-source breakdown voltage	500	-	-	V	$V_{GS} = 0V, I_D = 2.0mA$
$V_{GS(th)}$	Gate threshold voltage	1.5	-	4.0	V	$V_{GS} = V_{DS}, I_D = 1.0mA$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with temperature	-	-	-5.5	mV/°C	$V_{GS} = V_{DS}, I_D = 1.0mA$
$I_{GSS}$	Gate body leakage current	-	-	100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
$I_{DSS}$	Zero gate voltage drain current	-	-	10	$\mu\text{A}$	$V_{GS} = 0V,$ $V_{DS} = \text{Max Rating}$
		-	-	1.0	mA	$V_{DS} = 0.8 \text{ Max Rating},$ $V_{GS} = 0V, T_A = 125^\circ\text{C}$
$I_{D(ON)}$	On-state drain current	0.5	-	-	A	$V_{GS} = 10V, V_{DS} = 25V$
$R_{DS(ON)}$	Static drain-to-source on-state resistance	-	-	20	$\Omega$	$V_{GS} = 4.5V, I_D = 100mA$
		-	-	13		$V_{GS} = 10V, I_D = 400mA$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with temperature	-	-	1.7	%/°C	$V_{GS} = 10V, I_D = 400mA$
$G_{FS}$	Forward transconductance	50	-	-	mmho	$V_{DS} = 25V, I_D = 200mA$
$C_{ISS}$	Input capacitance	-	-	150	pF	$V_{GS} = 0V,$ $V_{DS} = 25V,$ $f = 1.0MHz$
$C_{OSS}$	Common source output capacitance	-	-	50		
$C_{RSS}$	Reverse transfer capacitance	-	-	25		
$t_{d(ON)}$	Turn-on delay time	-	-	10	ns	$V_{DD} = 25V,$ $I_D = 250mA,$ $R_{GEN} = 25\Omega$
$t_r$	Rise time	-	-	10		
$t_{d(OFF)}$	Turn-off delay time	-	-	25		
$t_f$	Fall time	-	-	20		
$V_{SD}$	Diode forward voltage drop	-	-	1.5	V	$V_{GS} = 0V, I_{SD} = 400mA$

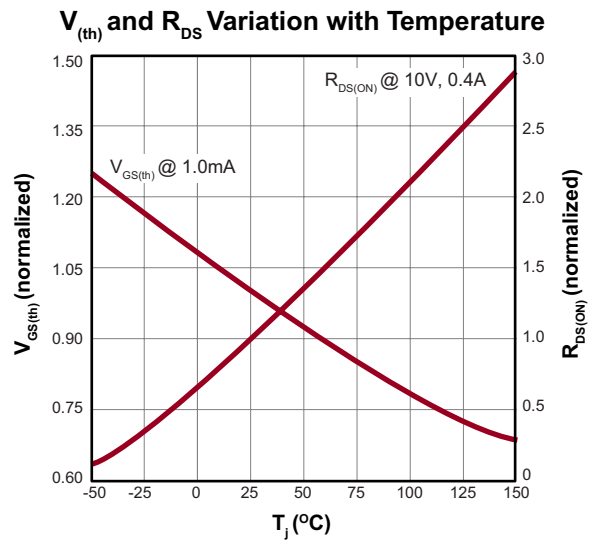
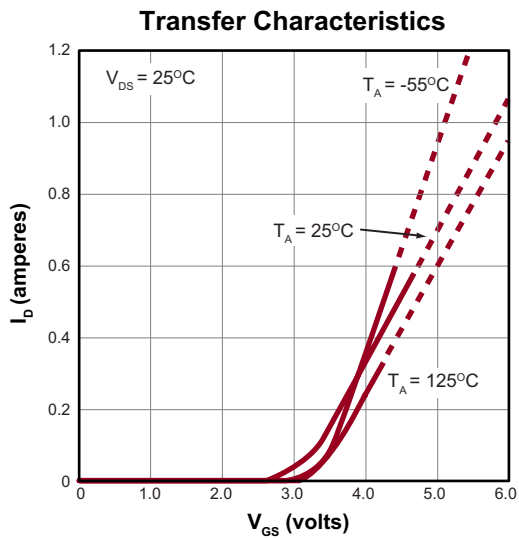
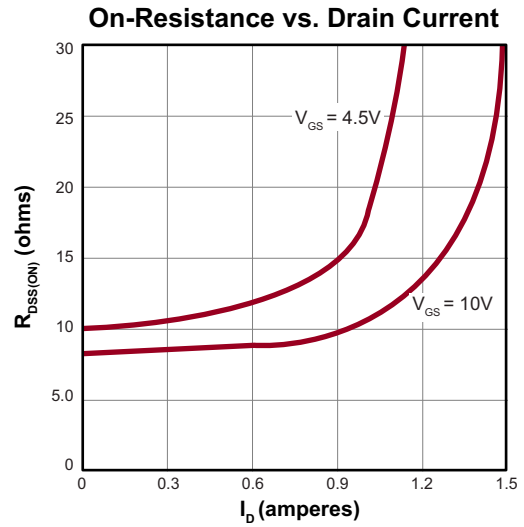
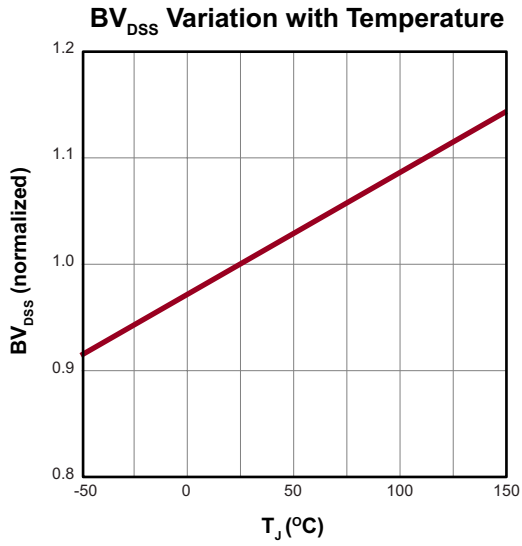
### Notes:

- 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.

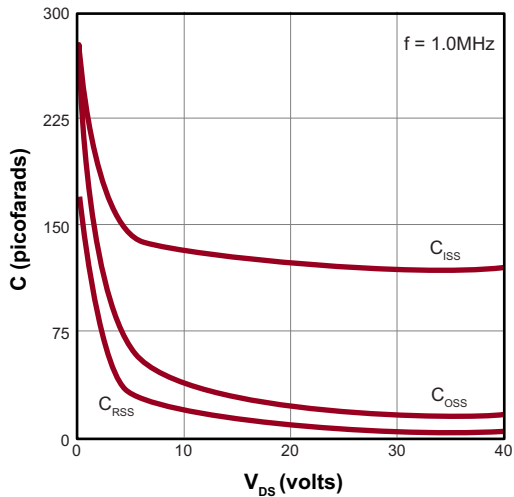
## Switching Waveforms and Test Circuit



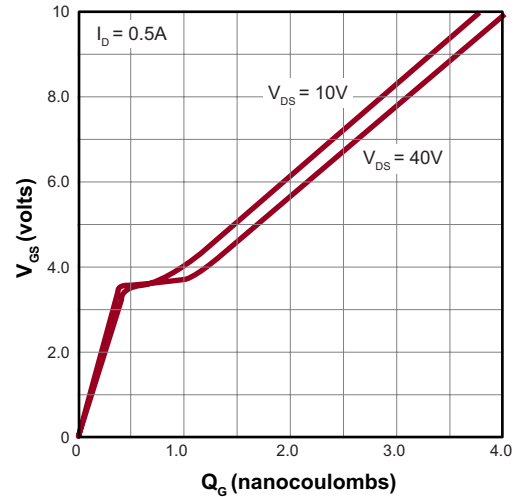
# Typical Performance Curves



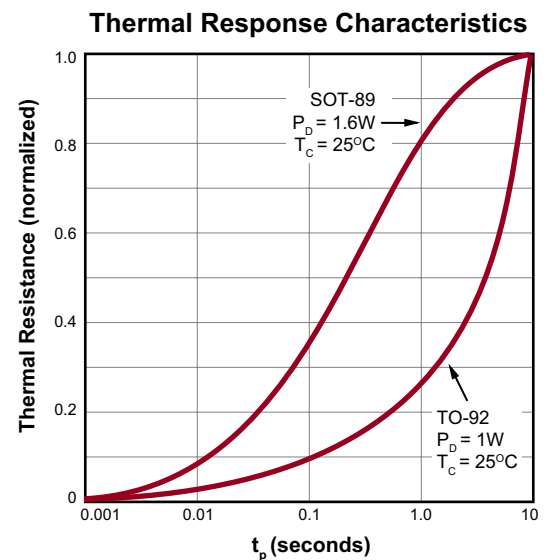
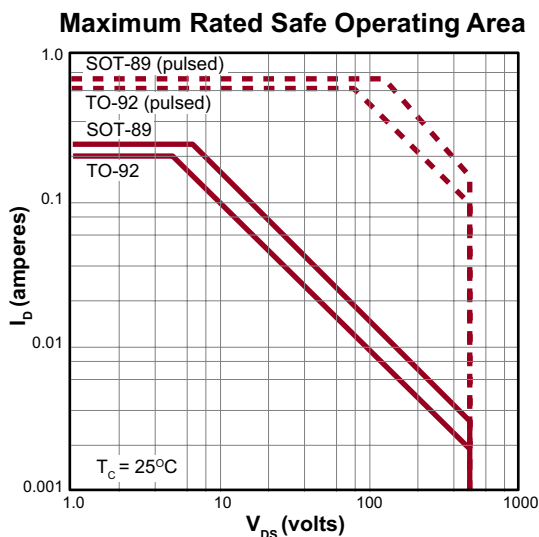
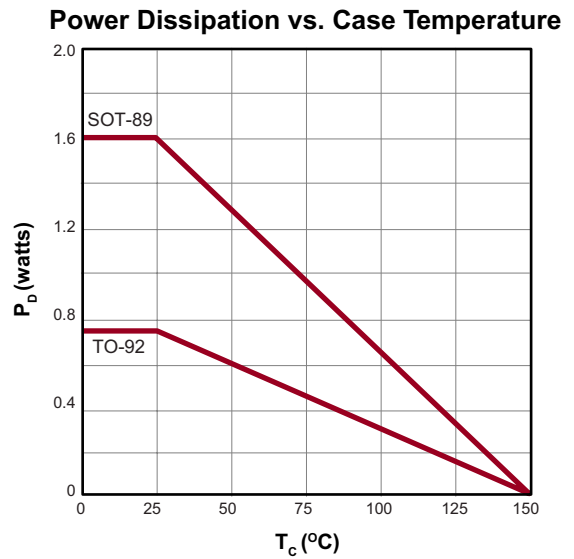
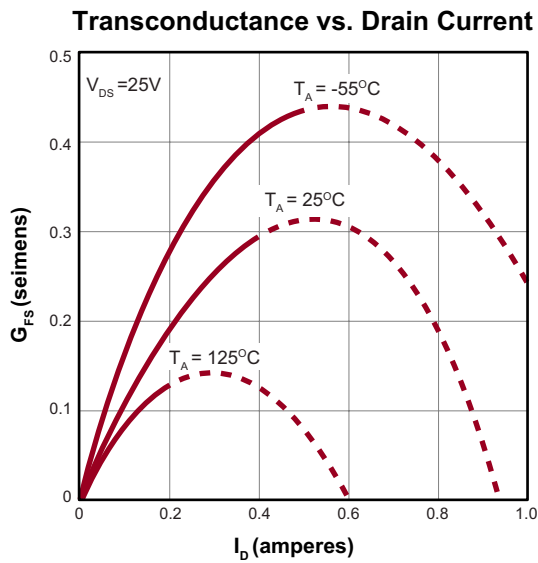
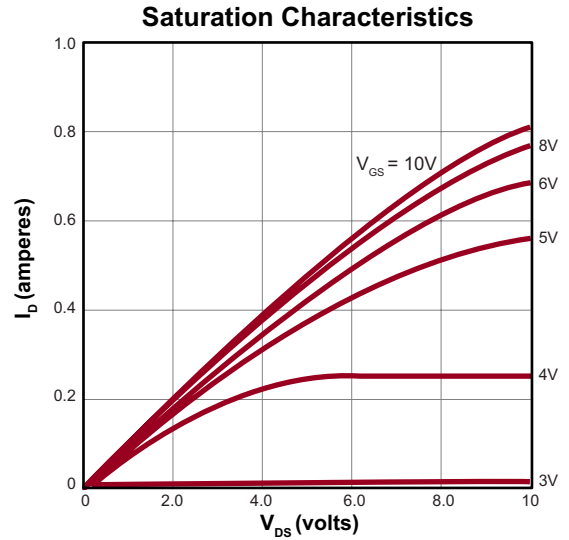
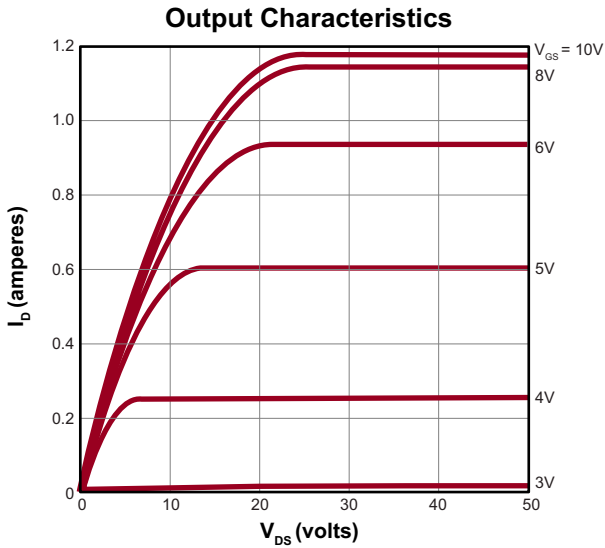
### Capacitance vs. Drain-to-Source Voltage



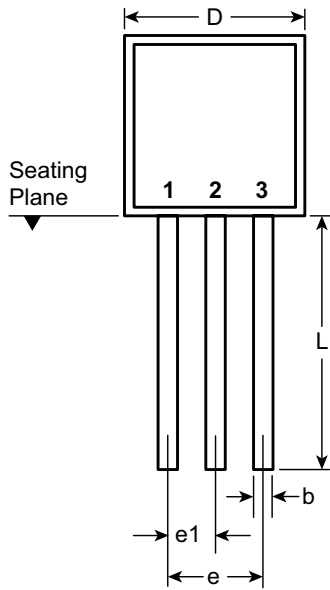
### Gate Drive Dynamic Characteristics



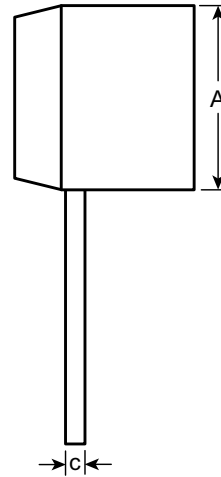
Typical Performance Curves (cont.)



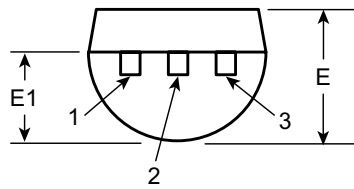
### 3-Lead TO-92 Package Outline (N3)



**Front View**



**Side View**



**Bottom View**

Symbol	A	b	c	D	E	E1	e	e1	L	
Dimensions (inches)	MIN	.170	.014†	.014†	.175	.125	.080	.095	.045	.500
	NOM	-	-	-	-	-	-	-	-	-
	MAX	.210	.022†	.022†	.205	.165	.105	.105	.055	.610*

JEDEC Registration TO-92.

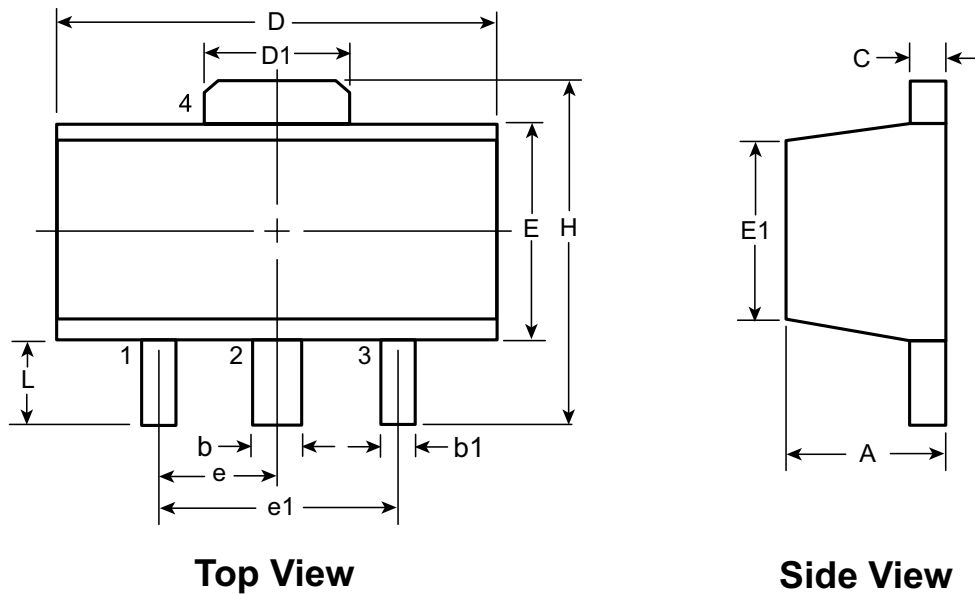
\* This dimension is not specified in the JEDEC drawing.

† This dimension differs from the JEDEC drawing.

Drawings not to scale.

Supertex Doc.#: DSPD-3TO92N3, Version E041009.

### 3-Lead TO-243AA (SOT-89) Package Outline (N8)



Symbol		A	b	b1	C	D	D1	E	E1	e	e1	H	L		
Dimensions (mm)	MIN	1.40	0.44	0.36	0.35	4.40	1.62	2.29	2.00 <sup>†</sup>	1.50 BSC	3.00 BSC	3.94	0.73 <sup>†</sup>		
	NOM	-	-	-	-	-	-	-	-			-	-	-	-
	MAX	1.60	0.56	0.48	0.44	4.60	1.83	2.60	2.29			4.25	1.20		

JEDEC Registration TO-243, Variation AA, Issue C, July 1986.

<sup>†</sup> This dimension differs from the JEDEC drawing

**Drawings not to scale.**

Supertex Doc. #: DSPD-3TO243AAN8, Version F111010.

(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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