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.

Ordering Information

Part Number	Package Options	Packing
SN3545N3-G	TO-92	1000/Bag
SN3545N3-G P002	TO-92	2000/Reel
SN3545N3-G P003	TO-92	2000/Reel
SN3545N3-G P005	TO-92	2000/Reel
SN3545N3-G P013	TO-92	2000/Reel
SN3545N3-G P014	TO-92	2000/Reel
SN3545N8-G	TO-243AA (SOT-89)	2000/Reel

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

Absolute Maximum Ratings

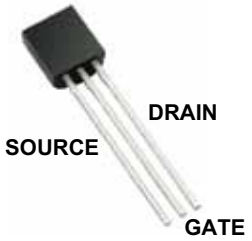
Parameter	Value
Drain-to-source voltage	BV_{DSX}
Drain-to-gate voltage	BV_{DGX}
Gate-to-source voltage	±20V
Operating and storage temperature	-55°C to +150°C

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.

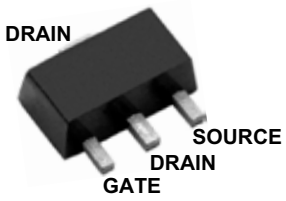
Product Summary

BV_{DSX}/BV_{DGX}	$R_{DS(ON)}$ (max)	I_{DSS} (min)
450V	20Ω	200mA

Pin Configuration



TO-92



TO-243AA (SOT-89)

Product Marking

YY = Year Sealed
WW = Week Sealed
_____ = "Green" Packaging

Package may or may not include the following marks: Si or

TO-92

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

Package may or may not include the following marks: Si or

TO-243AA (SOT-89)

Typical Thermal Resistance

Package	θ_{ja}
TO-92	132°C/W
TO-243AA (SOT-89)	133°C/W

Thermal Characteristics

Package	I_D (continuous)†	I_D (pulsed)	Power Dissipation @T_A = 25°C	I_{DR}†	I_{DRM}
T0-92 (D-PAK)	136mA	1600mA	0.74W	136mA	1600mA
TO-243AA	200mA	300mA	1.6W‡	200mA	300mA

Notes:

† I_D (continuous) is limited by max rated T_j.
‡ Mounted on FR4 board, 25mm x 25mm x 1.57mm.

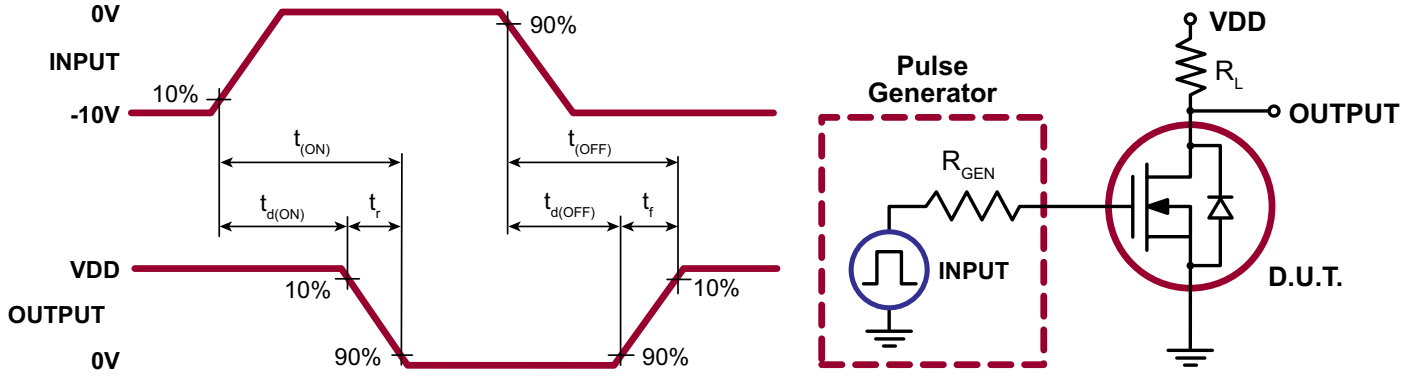
Electrical Characteristics (T_A = 25°C unless otherwise specified)

Sym	Parameter	Min	Typ	Max	Units	Conditions
BV_{DSX}	Drain-to-source breakdown voltage	450	-	-	V	V_{GS} = -5.0V, 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} = -5.0V, V_{DS} = Max Rating
		-	-	1.0	mA	V_{GS} = -5.0V, V_{DS} = 0.8Max 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	-	-	mmho	I_D = 100mA, V_{DS} = 10V
C_{ISS}	Input capacitance	-	-	360	pF	V_{GS} = -5.0V, V_{DS} = 25V, f = 1.0MHz
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} = -5.0V, I_{SD} = 150mA
t_{rr}	Reverse recovery time	-	800	-	ns	V_{GS} = -5.0V, I_{SD} = 150mA

Notes:

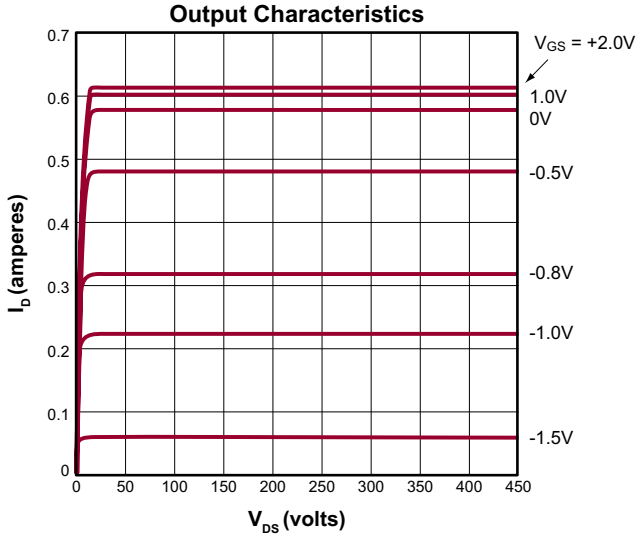
1. *All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300µs pulse, 2% duty cycle.)*
2. *All A.C. parameters sample tested.*

Switching Waveforms and Test Circuit

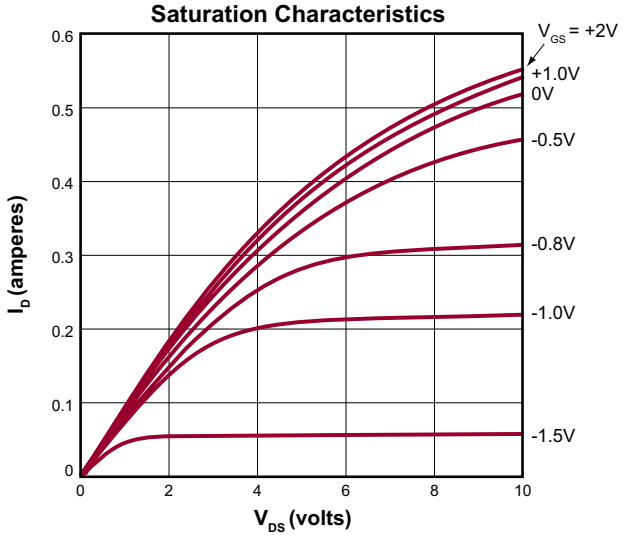


Typical Performance Curves

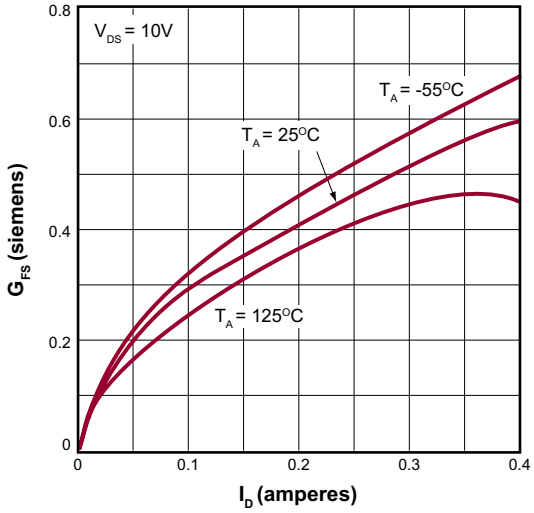
Output Characteristics



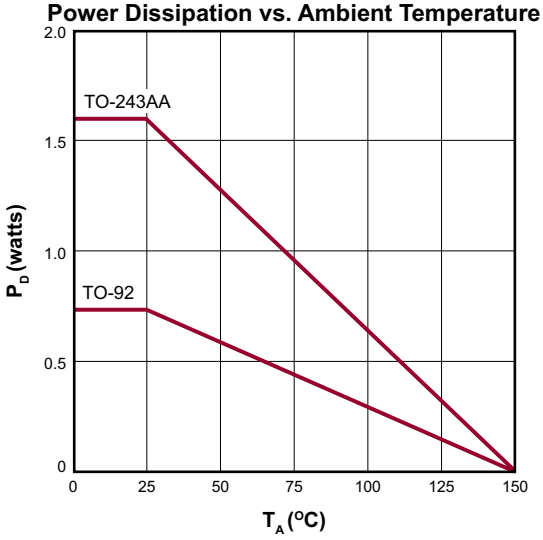
Saturation Characteristics



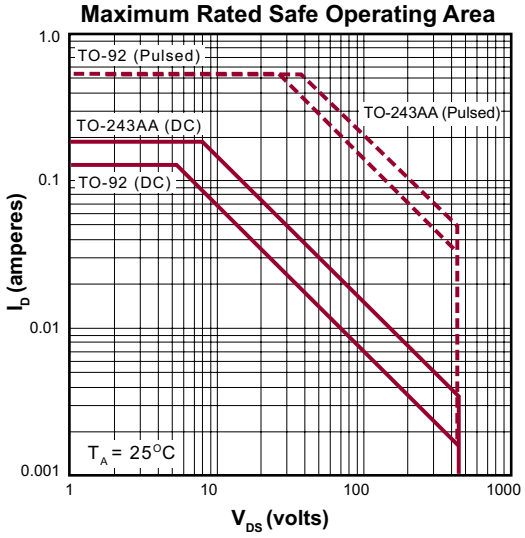
Transconductance vs. Drain Current



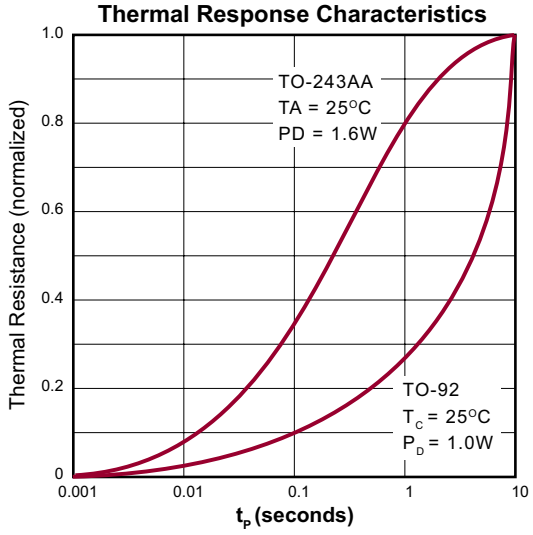
Power Dissipation vs. Ambient Temperature



Maximum Rated Safe Operating Area

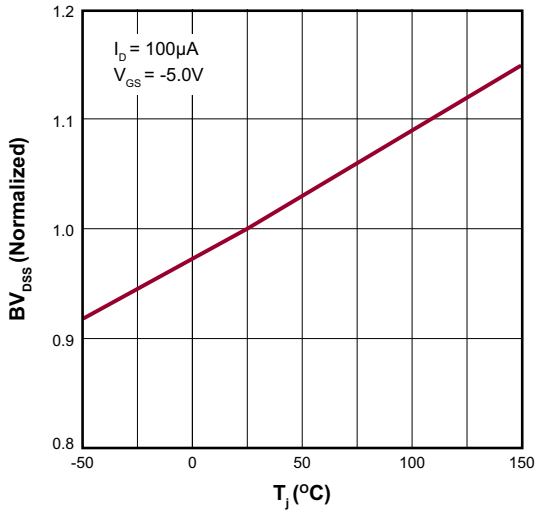


Thermal Response Characteristics

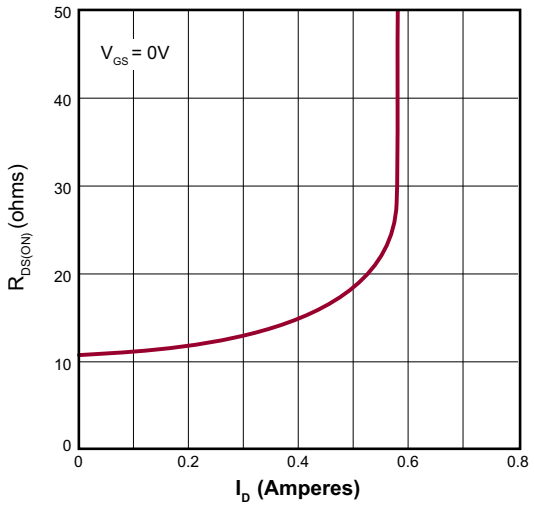


Typical Performance Curves *(cont.)*

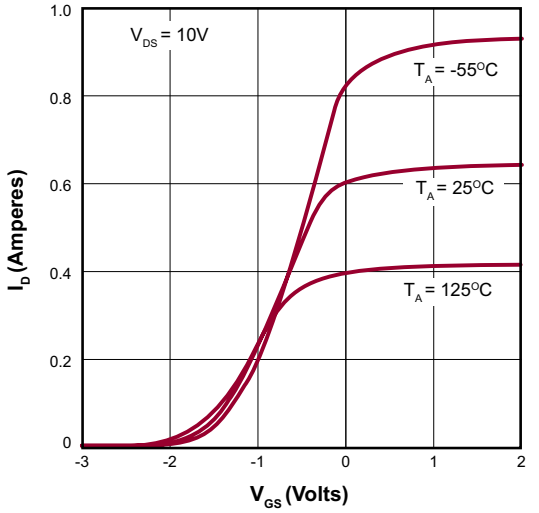
BV_{DSS} Variation with Temperature



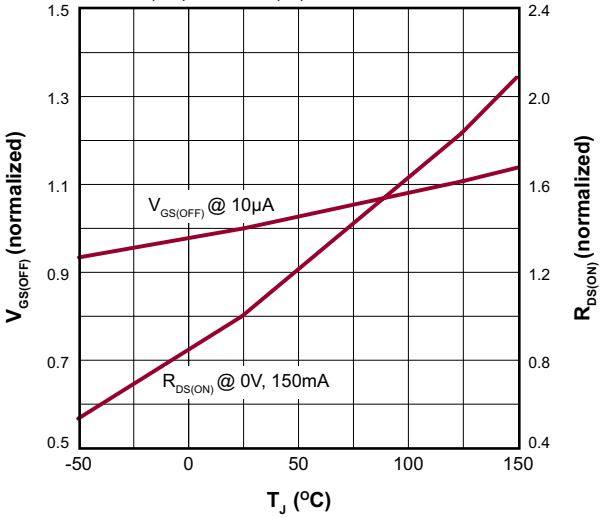
On Resistance vs. Drain Current



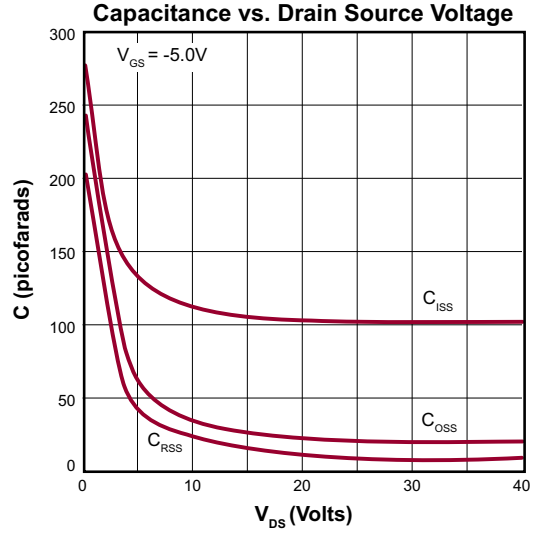
Transfer Characteristics



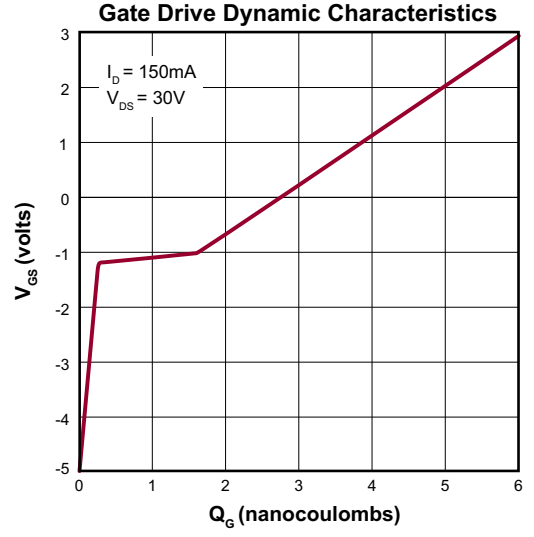
$V_{GS(OFF)}$ and $R_{DS(ON)}$ w/ Temperature



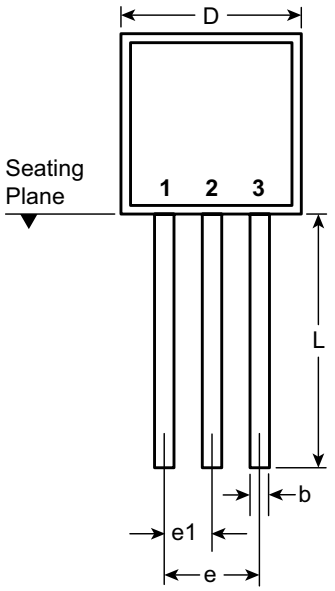
Capacitance vs. Drain Source Voltage



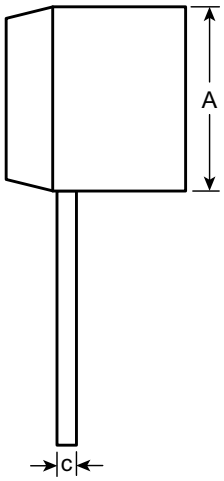
Gate Drive Dynamic Characteristics



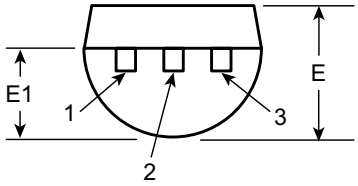
3-Lead TO-92 Package Outline (N3)



Front View



Side View

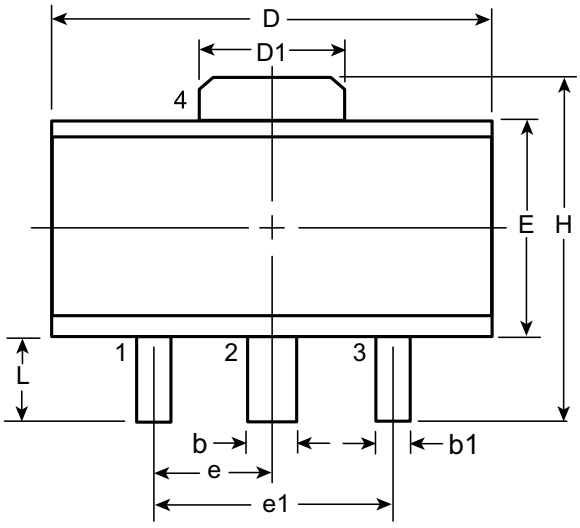


Bottom View

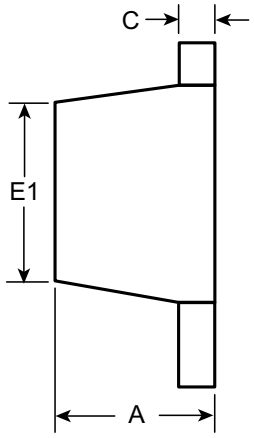
Symbol		A	b	c	D	E	E1	e	e1	L
Dimensions (inches)	MIN	.170	.014†	.014†	.175	.125	.080	.095	.045	.500
	NOM	-	-	-	-	-	-	-	-	-
	MAX	.210	.022†	.022†	.205	.165	.105	.105	.055	.610*

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)



Top View



Side View

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†	1.50 BSC	3.00 BSC	3.94	0.73†
	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.
† *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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