N-Channel Enhancement-Mode Vertical DMOS FET

Features

- Low threshold (2.0V max.)
- High input impedance
- Low input capacitance (125pF max.)
- Fast switching speeds
- Low on-resistance
- Free from secondary breakdown
- Low input and output leakage

Applications

- Logic level interfaces - ideal for TTL and CMOS
- Solid state relays
- Battery operated systems
- Photo voltaic drives
- Analog and Telecom switches
- General purpose line drivers

General Description

This low threshold, 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 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 very low threshold voltage, high breakdown voltage, high input impedance, low input capacitance, and fast switching speeds are desired.

Ordering Information

Part Number	Package Options	Packing
TN2540N3-G	TO-92	1000/Bag
TN2540N3-G P002	TO-92	2000/Reel
TN2540N3-G P003	TO-92	2000/Reel
TN2540N3-G P005	TO-92	2000/Reel
TN2540N3-G P013	TO-92	2000/Reel
TN2540N3-G P014	TO-92	2000/Reel
TN2540N8-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 availablity.
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	±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.

Typical Thermal Resistance

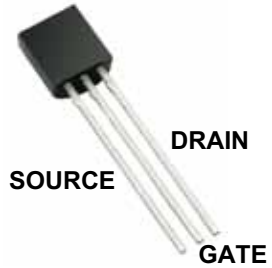
Package	θ_{ja}
TO-92	132°C/W
TO-243AA (SOT-89)	133°C/W*

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

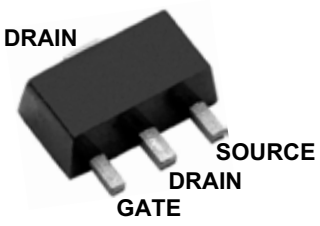
Product Summary

BV_{DSS}/BV_{DGS}	$R_{DS(ON)}$ (max)	$I_{D(ON)}$ (min)	$V_{GS(th)}$ (max)
400V	12Ω	1.0A	2.0V

Pin Configuration



TO-92



TO-243AA (SOT-89)

Product Marking

SiTN
2 5 4 0
YYWW

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

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

TO-92

TN5DW

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)†	I_D (pulsed)	Power Dissipation @T_A = 25°C	I_{DR}†	I_{DRM}
TO-92	175mA	2.0A	1.0W	175mA	2.0A
TO-243AA (SOT-89)	260mA	1.8A	1.6W‡	260mA	1.8A

Notes:

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

‡ Mounted on FR5 Board, 25mm x 25mm x 1.57mm.

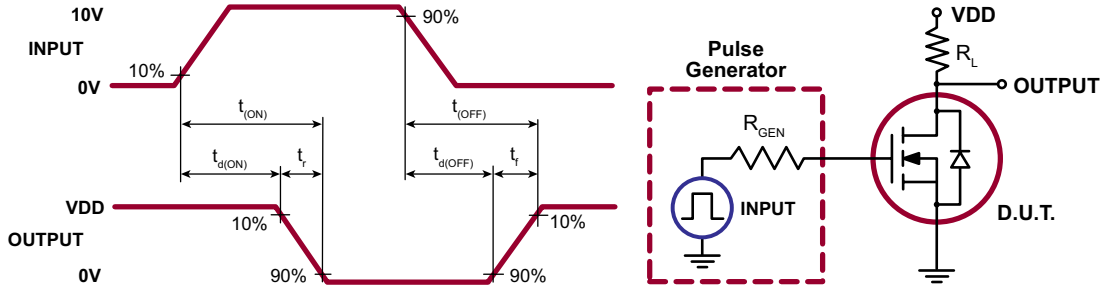
Electrical Characteristics *(T_A = 25°C unless otherwise specified)*

Sym	Parameter	Min	Typ	Max	Units	Conditions
BV_{DSS}	Drain-to-source breakdown voltage	400	-	-	V	V_{GS} = 0V, I_D = 100µA
$V_{GS(th)}$	Gate threshold voltage	0.6	-	2.0	V	V_{GS} = V_{DS}, I_D= 1.0mA
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with temperature	-	-2.5	-4.0	mV/°C	V_{GS} = V_{DS}, I_D= 1.0mA
I_{GSS}	Gate body leakage	-	-	100	nA	V_{GS} = ± 20V, V_{DS} = 0V
I_{DSS}	Zero gate voltage drain current	-	-	10	µA	V_{GS} = 0V, V_{DS} = Max Rating
		-	-	1.0	mA	V_{DS} = 0.8 Max Rating, V_{GS} = 0V, T_A = 125°C
$I_{D(ON)}$	On-state drain current	0.3	0.5	-	A	V_{GS} = 4.5V, V_{DS} = 25V
		0.75	1.0	-		V_{GS} = 10V, V_{DS} = 25V
$R_{DS(ON)}$	Static drain-to-source on-state resistance	-	8.0	12	Ω	V_{GS} = 4.5V, I_D = 150mA
		-	8.0	12		V_{GS} = 10V, I_D = 500mA
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with temperature	-	-	0.75	%/°C	V_{GS} = 10V, I_D = 500mA
G_{FS}	Forward transductance	125	200	-	mmho	V_{DS} = 25V, I_D = 100mA
C_{ISS}	Input capacitance	-	95	125	pF	V_{GS} = 0V, V_{DS} = 25V, f = 1.0MHz
C_{OSS}	Common source output capacitance	-	20	70		
C_{RSS}	Reverse transfer capacitance	-	10	25		
$t_{d(ON)}$	Turn-on delay time	-	-	20	ns	V_{DD} = 25V, I_D = 1.0A, R_{GEN} = 25Ω
t_r	Rise time	-	-	15		
$t_{d(OFF)}$	Turn-off delay time	-	-	25		
t_f	Fall time	-	-	20		
V_{SD}	Diode forward voltage drop	-	-	1.8	V	V_{GS} = 0V, I_{SD} = 200mA
t_{rr}	Reverse recovery time	-	300	-	ns	V_{GS} = 0V, I_{SD} = 1.0A

Notes:

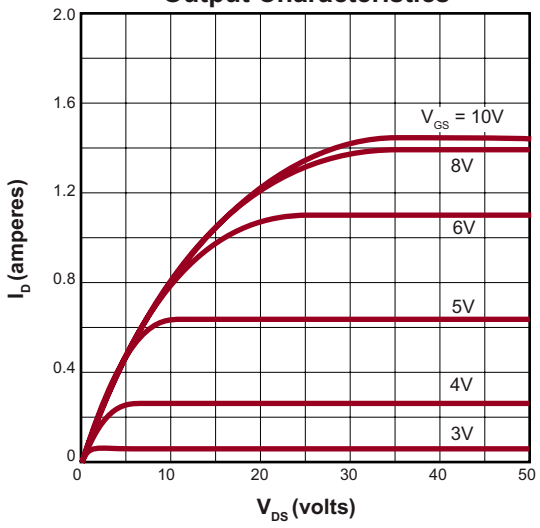
1. *All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300µs pulse, 2% duty cycle.)*
2. *All A.C. parameters sample tested.*

Switching Waveforms and Test Circuit

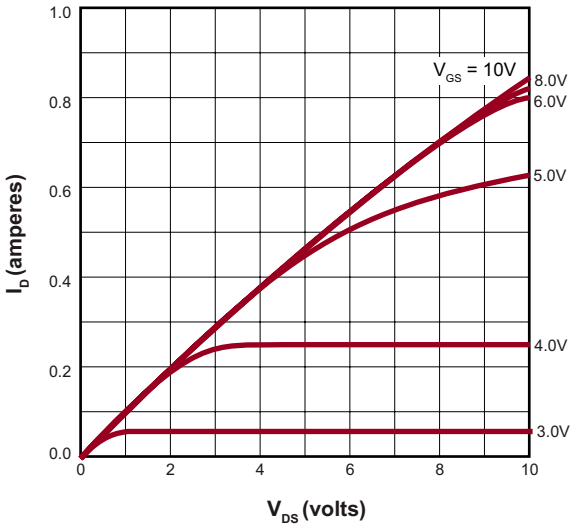


Typical Performance Curves

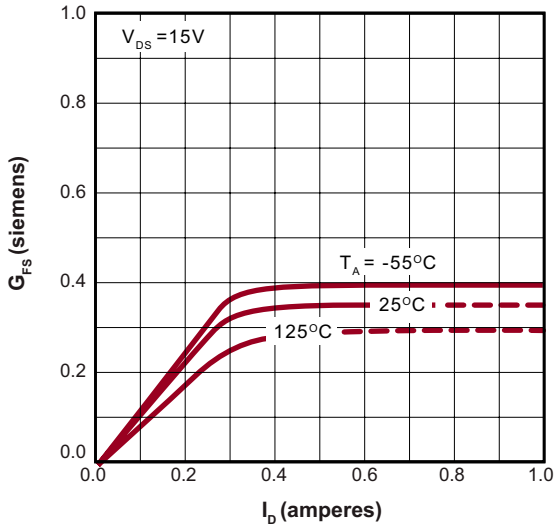
Output Characteristics



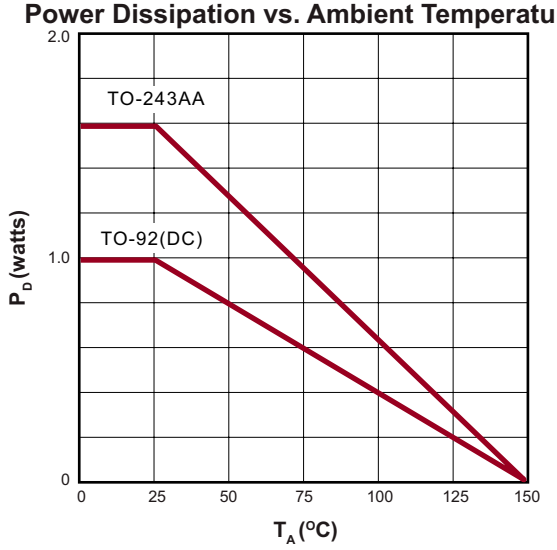
Saturation Characteristics



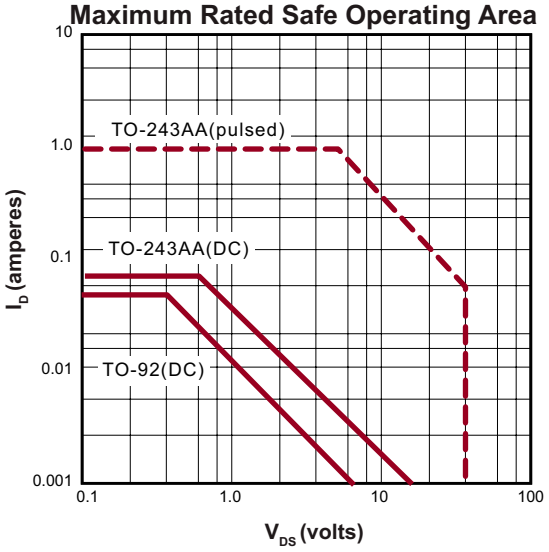
Transconductance vs. Drain Current



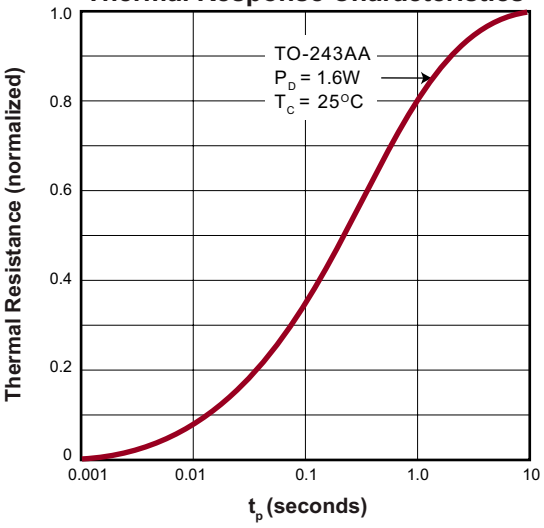
Power Dissipation vs. Ambient Temperature



Maximum Rated Safe Operating Area

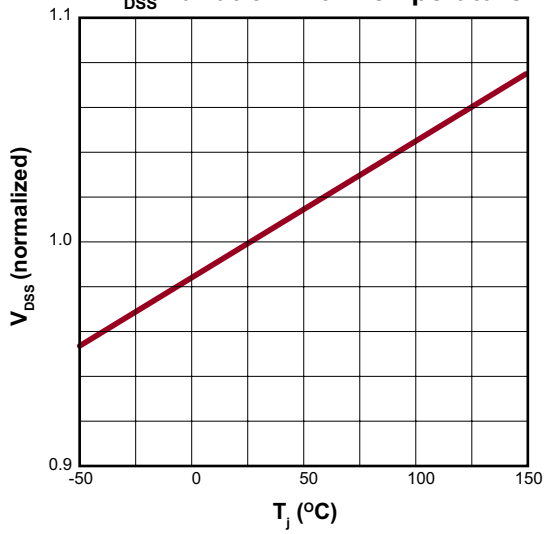


Thermal Response Characteristics

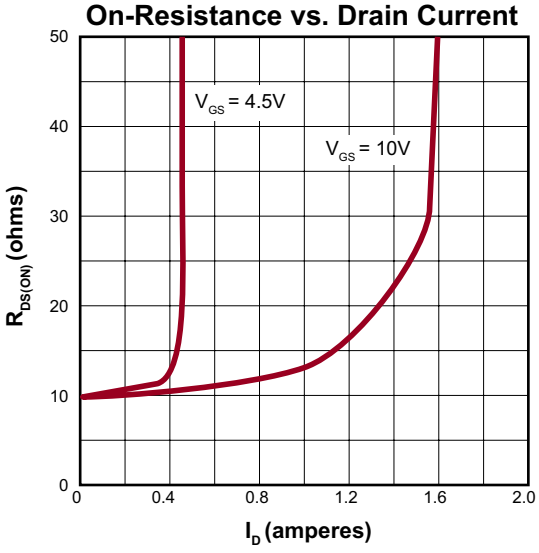


Typical Performance Curves *(cont.)*

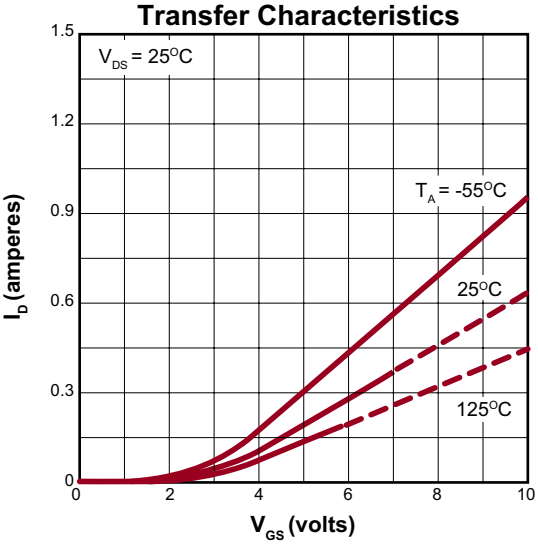
BV_{DSS} Variation with Temperature



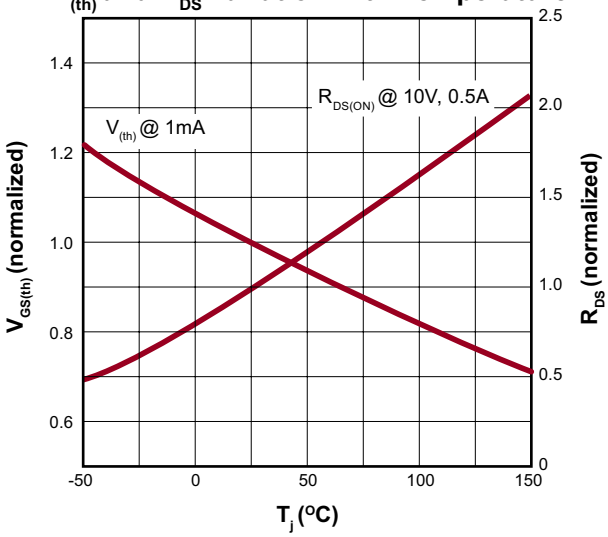
On-Resistance vs. Drain Current



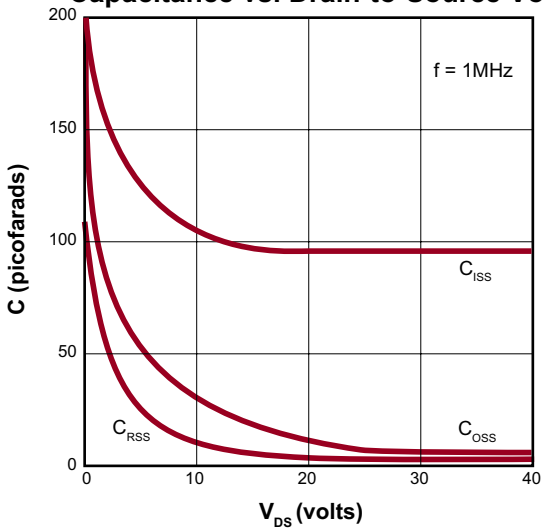
Transfer Characteristics



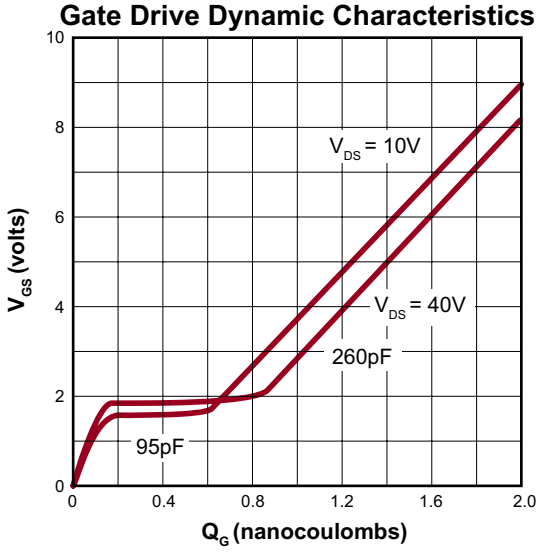
$V_{(th)}$ and R_{DS} Variation with Temperature



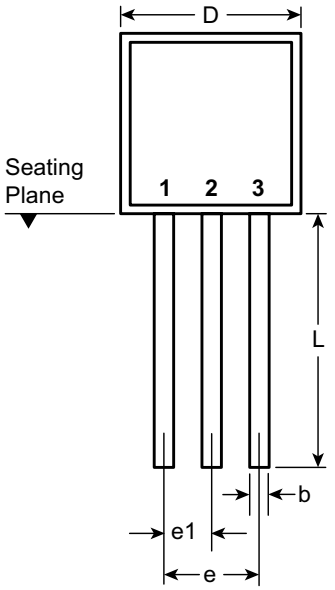
Capacitance vs. Drain-to-Source Voltage



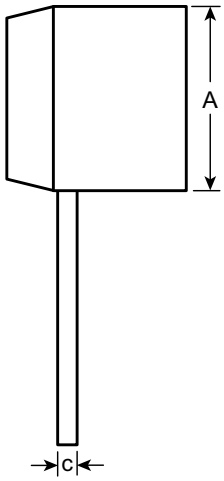
Gate Drive Dynamic Characteristics



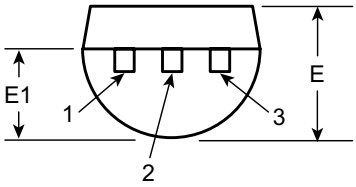
3-Lead TO-92 Package Outline (N3)



Front View



Side View

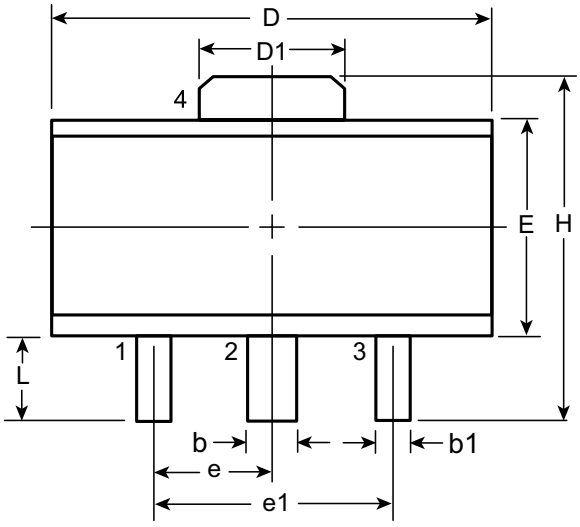


Bottom View

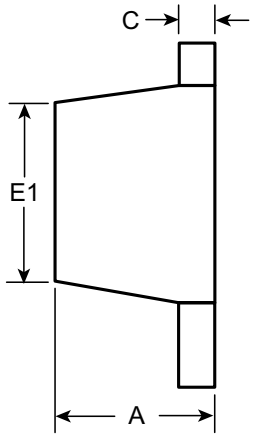
Symbol		A	b	c	D	E	E1	e	e1	L
Dimensions (inches)	MIN	.170	.014†	.014†	.175	.125	.080	.095	.045	.500
	NOM	-	-	-	-	-	-	-	-	-
	MAX	.210	.022†	.022†	.205	.165	.105	.105	.055	.610*

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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