Low Threshold 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
- Complementary N and P-channel devices

Applications

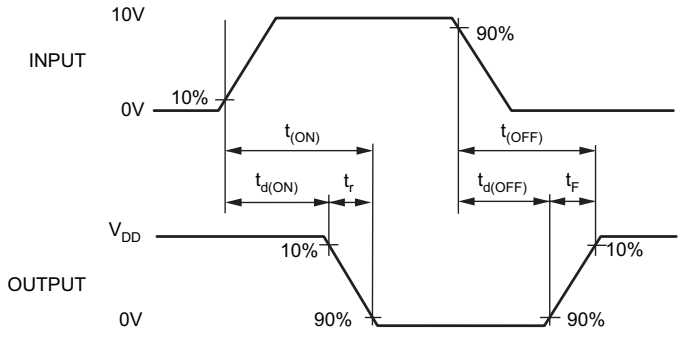
- Logic level interfaces — ideal for TTL and CMOS
- Solid state relays
- Battery operated systems
- Photo voltaic devices
- Analog switches
- General purpose line drivers
- Telecom switches

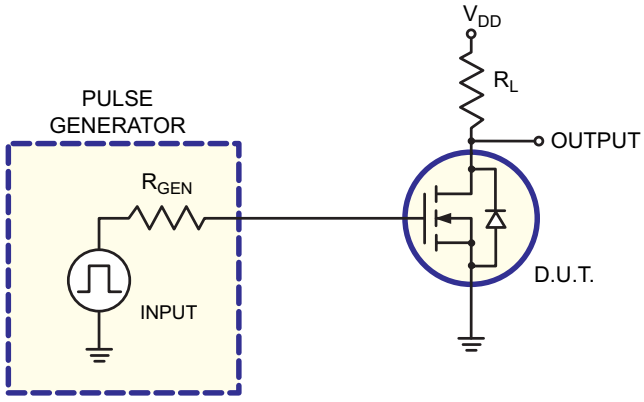
General Description

The Supertex TN2540 is a low threshold enhancement-mode transistor that utilizes an advanced 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.

Switching Waveforms and Test Circuit



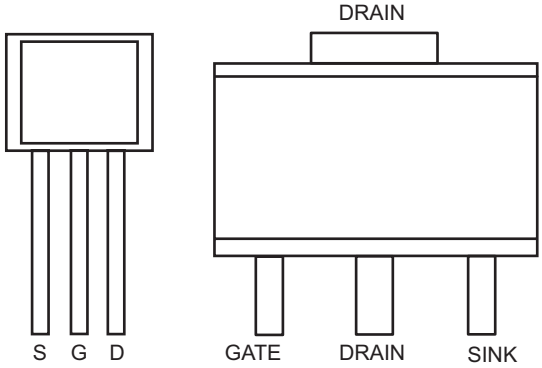


Ordering Information

Device	Package Options			BV_{DSS}/BV_{DGS} (V)	$R_{DS(ON)}$ (max) (Ω)	$V_{GS(th)}$ (max) (V)	$I_{D(ON)}$ (min) (A)
	TO-92	TO-243AA (SOT-89)	Die*				
TN2540	TN2540N3-G	TN2540N8-G	TN2540ND	400	12	2.0	1.0

-G indicates package is RoHS compliant ('Green')
** MIL visual screening available.*

Pin Configuration



TO-92 *(front view)*

TO-243AA (SOT-89) *(top view)*

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
Soldering temperature*	300°C

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

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 Marking

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

TO-92 (N3)

W = Code for week sealed

TO-243AA (SOT-89) (N8)

Thermal Characteristics

Package	I_D (continuous) (mA)	I_D (pulsed) (A)	Power Dissipation @T_A = 25°C (W)	θ_{jc} (°C/W)	θ_{ja} (°C/W)	I_{DR} † (mA)	I_{DRM} (A)
TO-92	175	2.0	1.0	125	170	175	2.0
TO-243AA (SOT-89)	260	1.8	1.6‡	15	78‡	260	1.8

Notes:
† I_D (continuous) is limited by max rated T_J.
‡ Mounted on FR5 board, 25mm x 25mm x 1.57mm.

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

Symbol	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
$\Delta V_{GS(th)}$	$V_{GS(th)}$ change with temperature	-	-2.5	-4.0	mV/°C	V_{GS} = V_{DS}, I_D = 1.0mA
I_{GSS}	Gate body leakage current	-	-	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 transconductance	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

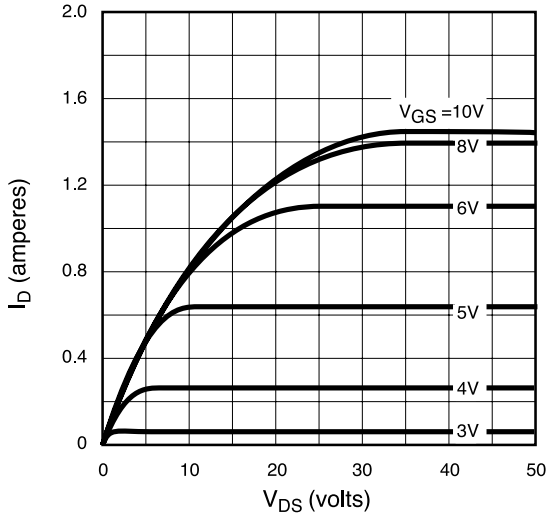
Notes:

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

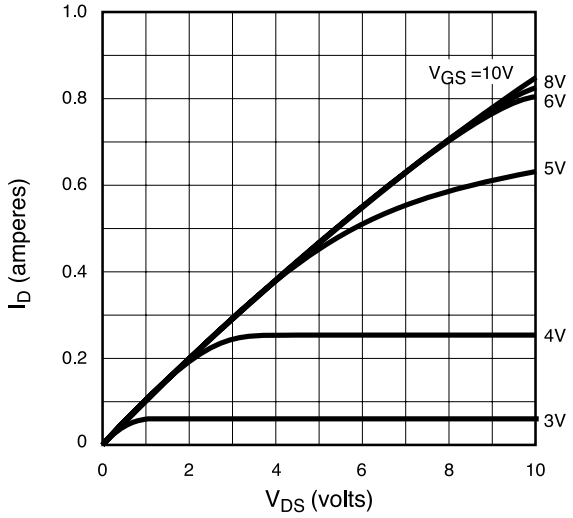
2.All A.C. parameters sample tested.

Typical Performance Curves

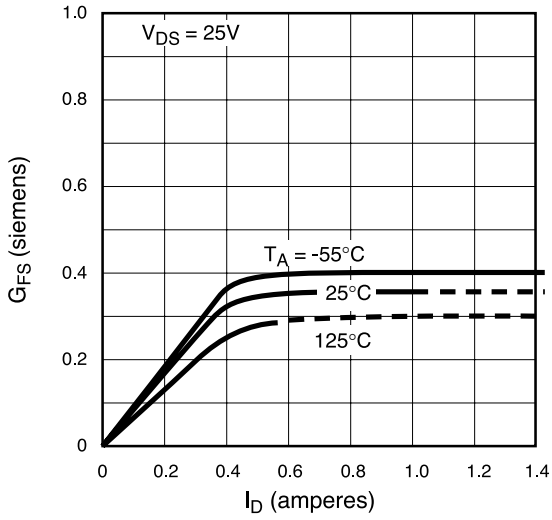
Output Characteristics



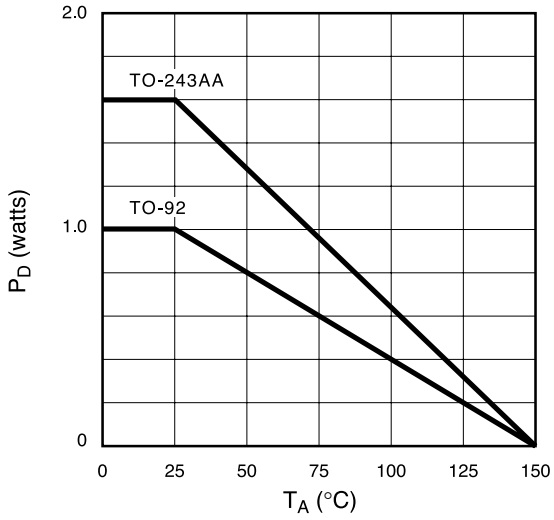
Saturation Characteristics



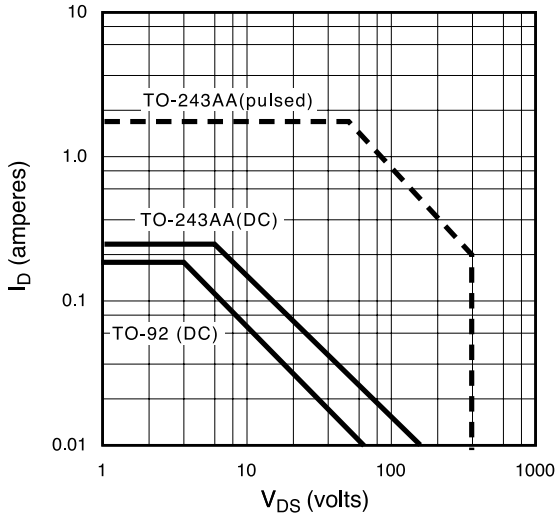
Transconductance vs. Drain Current



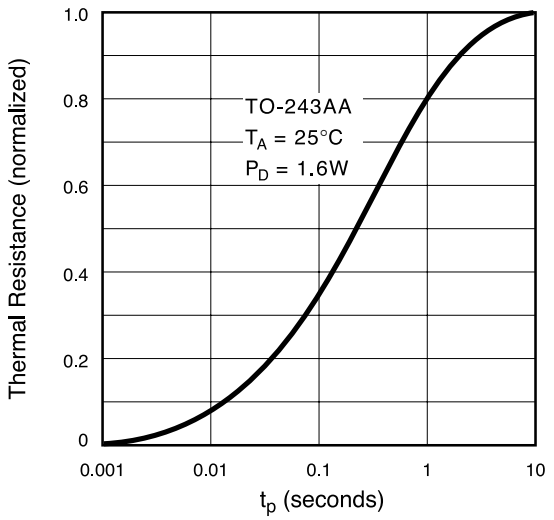
Power Dissipation vs. Ambient Temperature



Maximum Rated Safe Operating Area

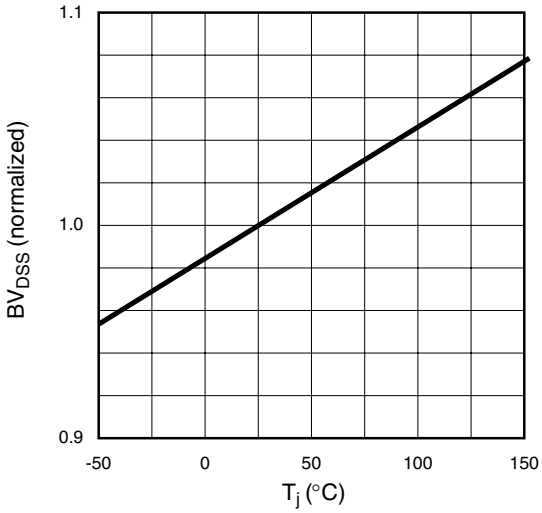


Thermal Response Characteristics

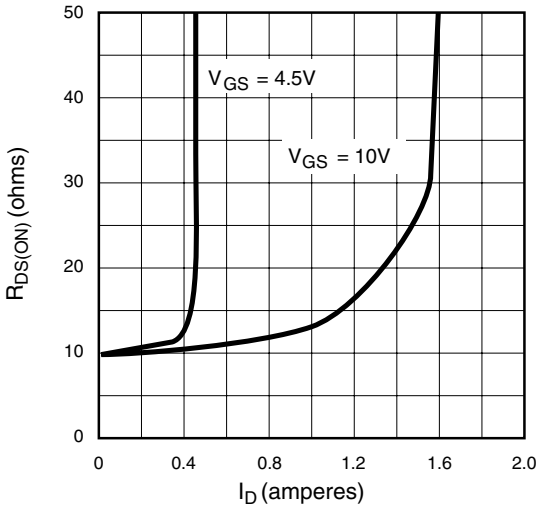


Typical Performance Curves *(cont.)*

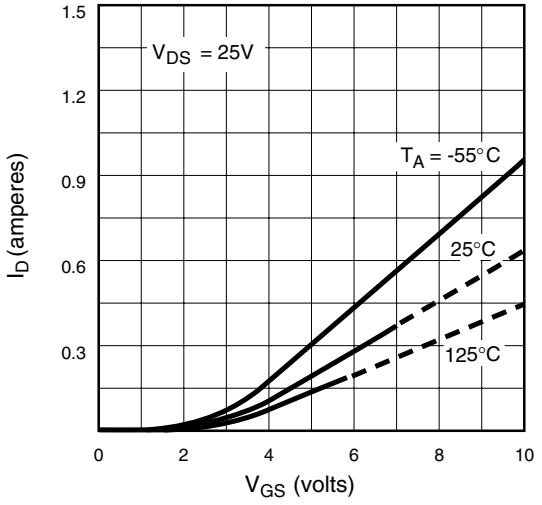
BV_{DSS} Variation with Temperature



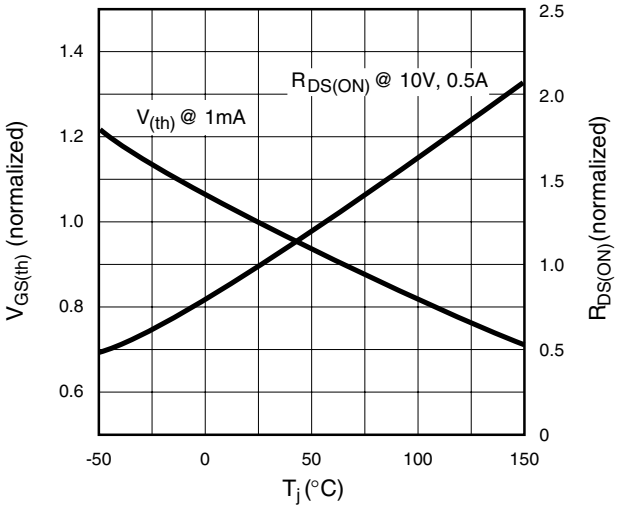
On-Resistance vs. Drain Current



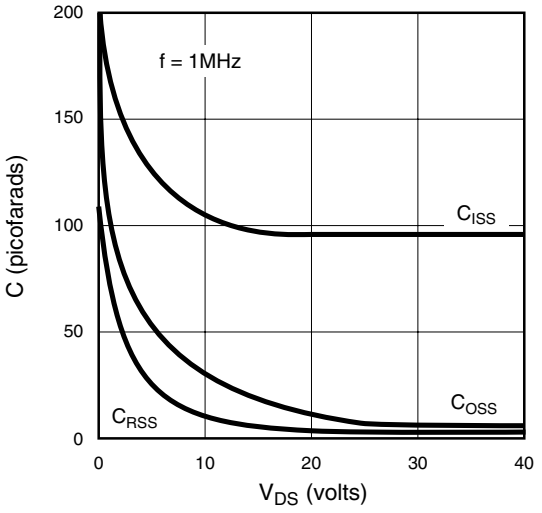
Transfer Characteristics



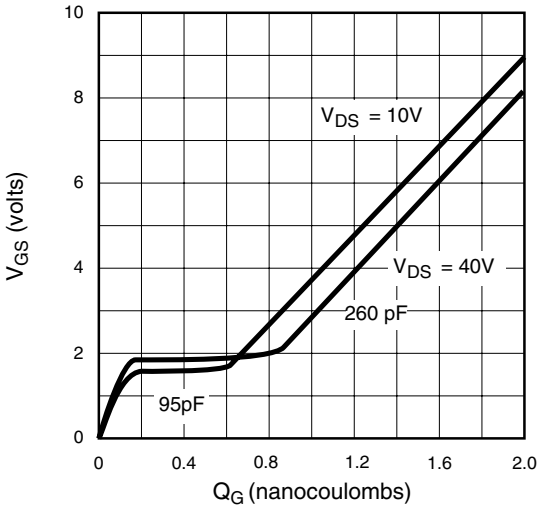
$V_{(th)}$ and R_{DS} Variation with Temperature



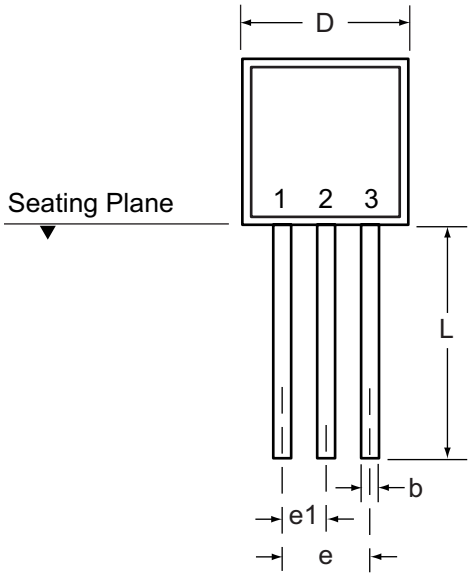
Capacitance vs. Drain-to-Source Voltage



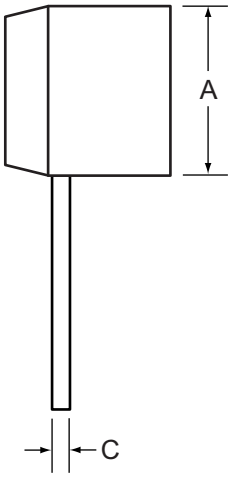
Gate Drive Dynamic Characteristics



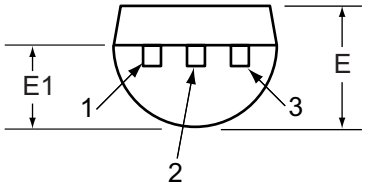
3-Lead TO-92 Package Outline (N3)



Front View



Side View

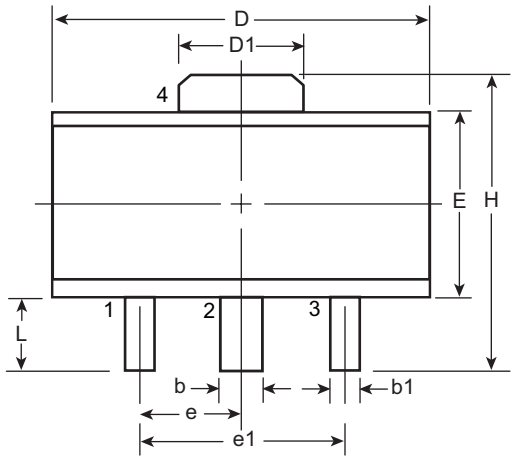


Bottom View

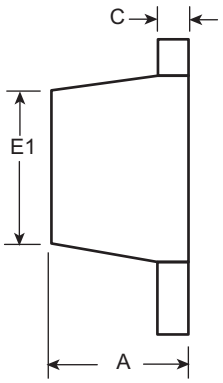
Symbol		A	b	C	D	E	E1	e	e1	L
Dimension (inches)	MIN	.170	.014	.014	.175	.125	.800	.095	.045	.500
	NOM	-	-	-	-	-	-	-	-	-
	MAX	.210	.022	.022	.205	.165	.105	.105	.055	-

Drawings not to scale.

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	2.13	1.50 BSC	3.00 BSC	3.94	0.89
	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.
***Drawings not to scale**.*

(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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