

## P-Channel Enhancement Mode Vertical DMOS FETs

### Features

- ▶ Low threshold
- ▶ High input impedance
- ▶ Low input capacitance
- ▶ Fast switching speeds
- ▶ Low on-resistance
- ▶ Free from secondary breakdown
- ▶ Low input and output leakage

### Applications

- ▶ Logic level interfaces
- ▶ Solid state relays
- ▶ Linear amplifiers
- ▶ Power management
- ▶ Analog switches
- ▶ Telecom switches

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

### Ordering Information

Device	Package Option	$BV_{DSS}/BV_{DGS}$ (V)	$R_{DS(ON)}$ (max) ( $\Omega$ )	$V_{GS(th)}$ (max) (V)	$I_{D(ON)}$ (min) (mA)
	TO-243AA (SOT-89)				
TP2435	TP2435N8-G	-350	15	-2.4	-800

-G indicates package is RoHS compliant ("Green")



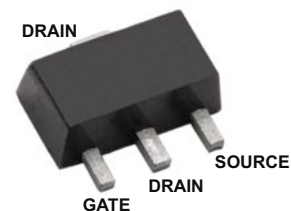
### Absolute Maximum Ratings

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 $+150^{\circ}C$
Soldering temperature*	$300^{\circ}C$

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.

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

### Pin Configuration



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

### Product Marking

**TP4SW** W = Code for week sealed  
 \_\_\_\_\_ = "Green" Packaging

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

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

**Thermal Characteristics**

Package	$I_D$ (continuous) <sup>†</sup> (mA)	$I_D$ (pulsed) (A)	Power Dissipation @ $T_A = 25^\circ\text{C}$ (W)	$\theta_{jc}$ ( $^\circ\text{C}/\text{W}$ )	$\theta_{ja}$ ( $^\circ\text{C}/\text{W}$ )	$I_{DR}$ <sup>‡</sup> (mA)	$I_{DRM}$ (A)
TO-243AA (SOT-89)	-231	-1.1	1.6	15	78 <sup>‡</sup>	-231	-1.1

<sup>†</sup>  $I_D$  (continuous) is limited by max rated  $T_J$ .  
<sup>‡</sup> Mounted on FR5 board, 25mm x 25mm x 1.57mm.

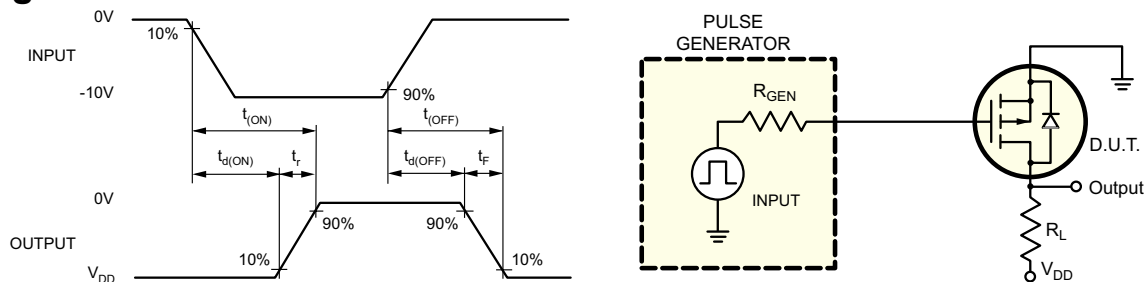
**Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise specified)

Sym	Parameter	Min	Typ	Max	Units	Conditions
$BV_{DSS}$	Drain-to-source breakdown voltage	-350	-	-	V	$V_{GS} = 0\text{V}, I_D = -250\mu\text{A}$
$V_{GS(th)}$	Gate threshold voltage	-1.0	-	-2.4	V	$V_{GS} = V_{DS}, I_D = -1.0\text{mA}$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with temperature	-	-	4.5	mV/ $^\circ\text{C}$	$V_{GS} = V_{DS}, I_D = -1.0\text{mA}$
$I_{GSS}$	Gate body leakage	-	-	-100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
$I_{DSS}$	Zero gate voltage drain current	-	-	-10	$\mu\text{A}$	$V_{GS} = 0\text{V}, V_{DS} = \text{Max Rating}$
		-	-	-1.0	mA	$V_{DS} = 0.8 \text{ Max Rating}, V_{GS} = 0\text{V}, T_A = 125^\circ\text{C}$
$I_{D(ON)}$	On-state drain current	-0.3	-	-	A	$V_{GS} = -4.5\text{V}, V_{DS} = -25\text{V}$
		-0.8	-	-		$V_{GS} = -10\text{V}, V_{DS} = -25\text{V}$
$R_{DS(ON)}$	Static drain-to-source on-state resistance	-	-	15	$\Omega$	$V_{GS} = -3.0\text{V}, I_D = -20\text{mA}$
		-	-	15		$V_{GS} = -4.5\text{V}, I_D = -150\text{mA}$
		-	-	15		$V_{GS} = -10\text{V}, I_D = -500\text{mA}$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with temperature	-	-	1.7	%/ $^\circ\text{C}$	$V_{GS} = -10\text{V}, I_D = -150\text{mA}$
$G_{FS}$	Forward transconductance	125	-	-	mmho	$V_{DS} = -25\text{V}, I_D = -350\text{mA}$
$C_{ISS}$	Input capacitance	-	-	200	pF	$V_{GS} = 0\text{V}, V_{DS} = -25\text{V}, f = 1.0 \text{ MHz}$
$C_{OSS}$	Common source output capacitance	-	-	70		
$C_{RSS}$	Reverse transfer capacitance	-	-	25		
$t_{d(ON)}$	Turn-on delay time	-	-	15	ns	$V_{DD} = -25\text{V}, I_D = -250\text{mA}, R_{GEN} = 25\Omega$
$t_r$	Rise time	-	-	20		
$t_{d(OFF)}$	Turn-off delay time	-	-	25		
$t_f$	Fall time	-	-	50		
$V_{SD}$	Diode forward voltage drop	-	-	-1.5	V	$V_{GS} = 0\text{V}, I_{SD} = -750\text{mA}$
$t_{rr}$	Reverse recovery time	-	300	-	ns	$V_{GS} = 0\text{V}, I_{SD} = -750\text{mA}$

**Notes:**

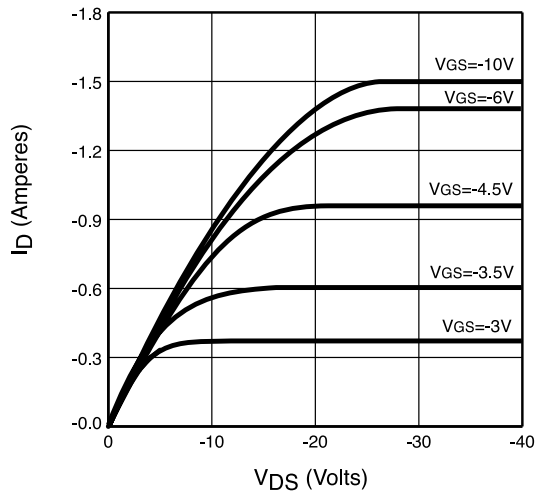
- All D.C. parameters 100% tested at  $25^\circ\text{C}$  unless otherwise stated. (Pulse test: 300 $\mu\text{s}$  pulse, 2% duty cycle.)
- All A.C. parameters sample tested.

**Switching Waveforms and Test Circuit**

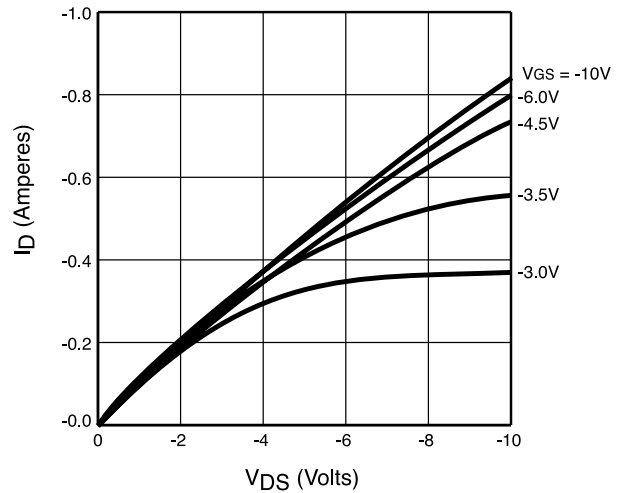


# Typical Performance Curves

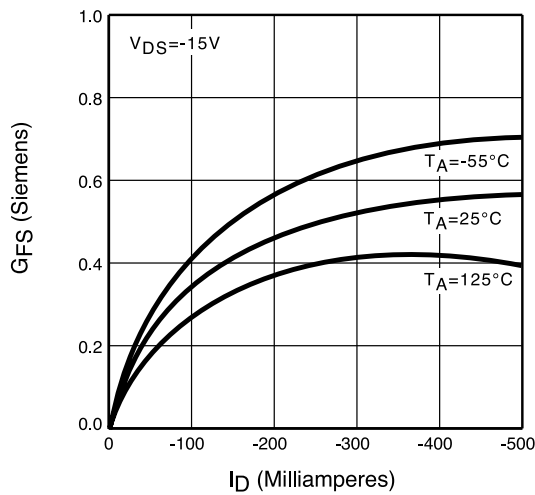
Output Characteristics



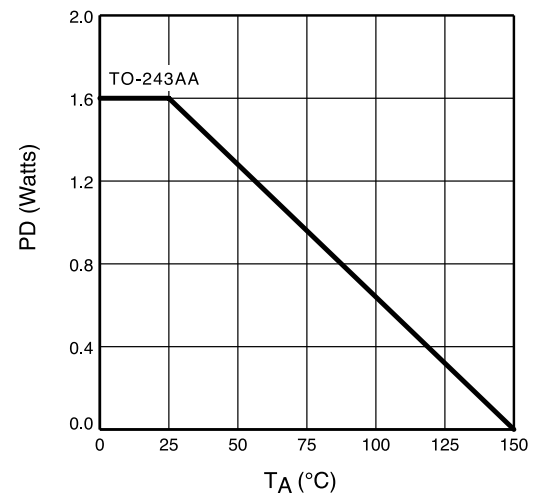
Saturation Characteristics



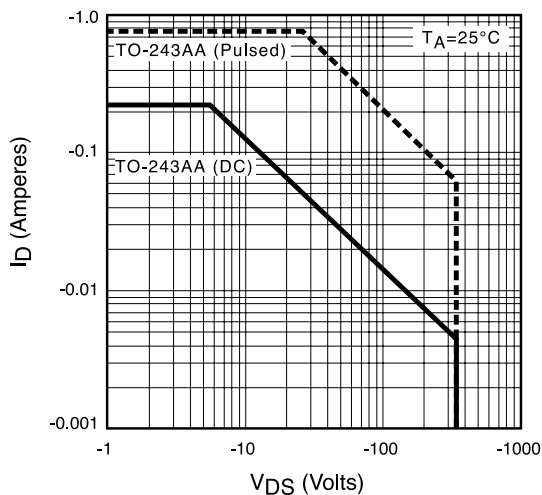
Transconductance vs. Drain Current



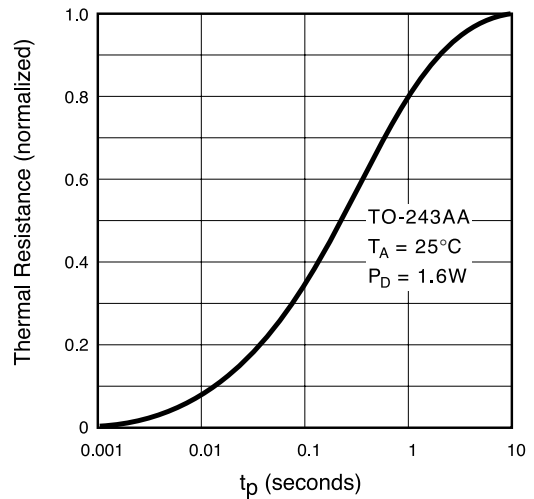
Power Dissipation vs. Ambient Temperature



Maximum Rated Safe Operating Area

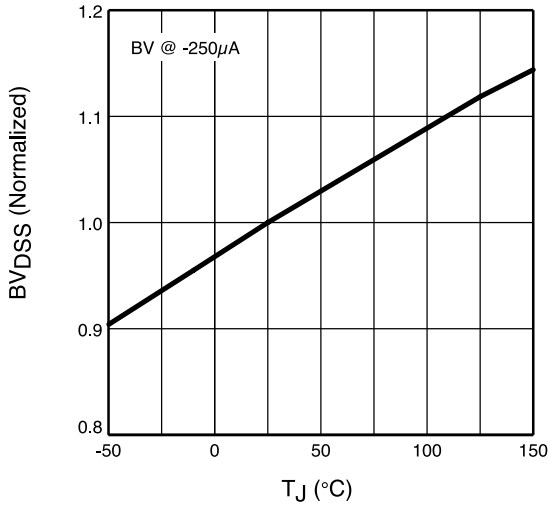


Thermal Response Characteristics

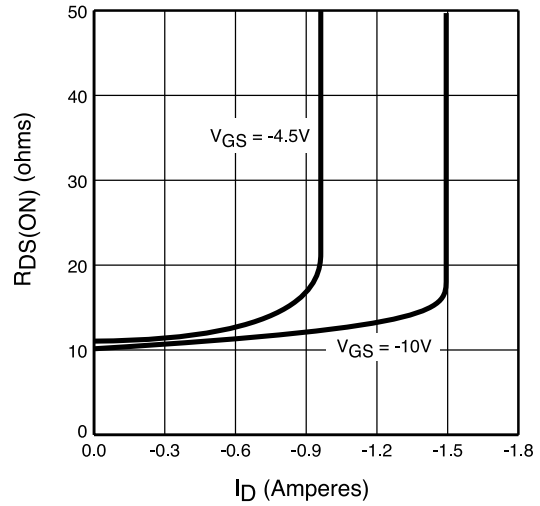


Typical Performance Curves (cont.)

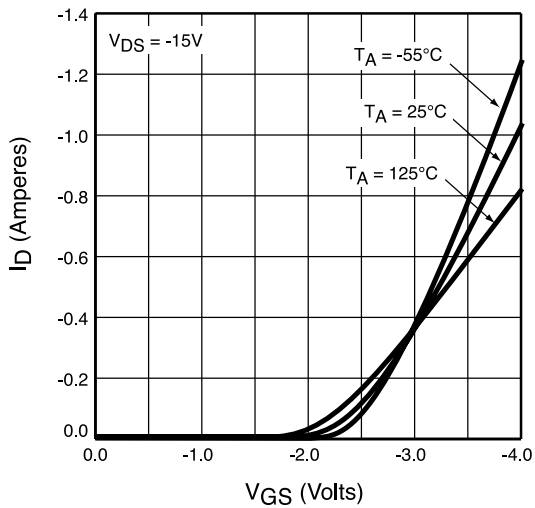
BV<sub>DSS</sub> Variation with Temperature



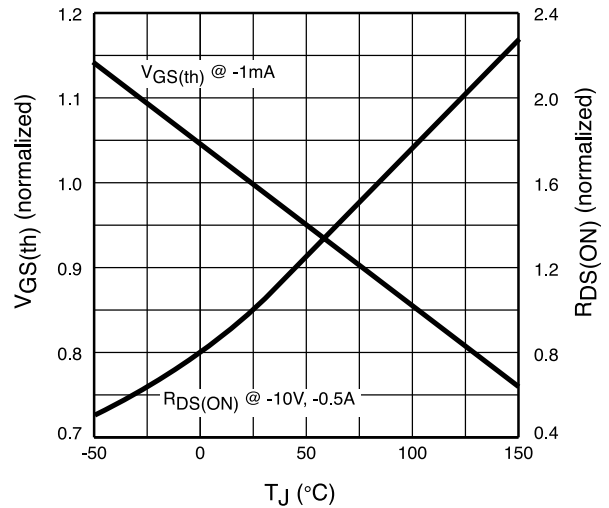
On Resistance vs. Drain Current



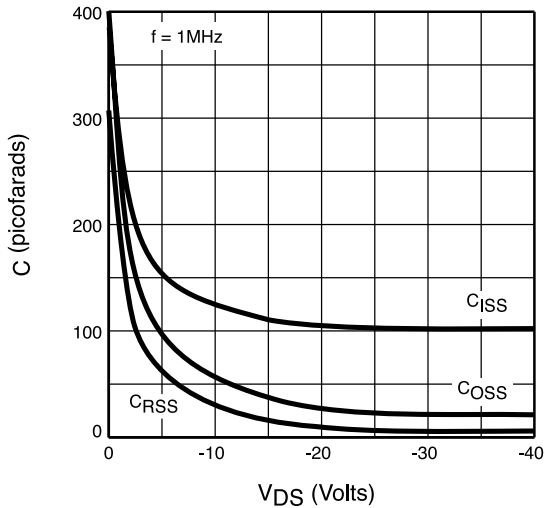
Transfer Characteristics



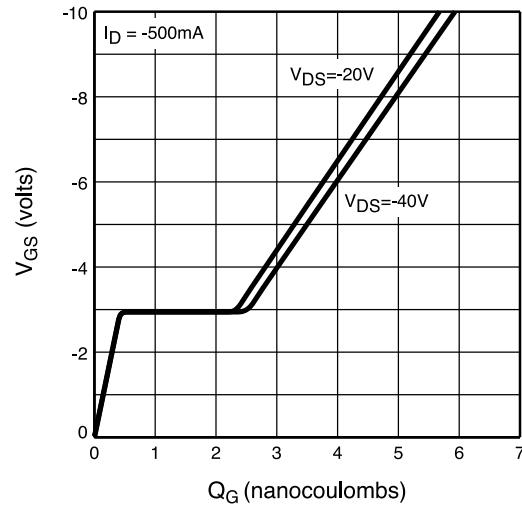
V<sub>GS(TH)</sub> and R<sub>DS(ON)</sub> w/ Temperature



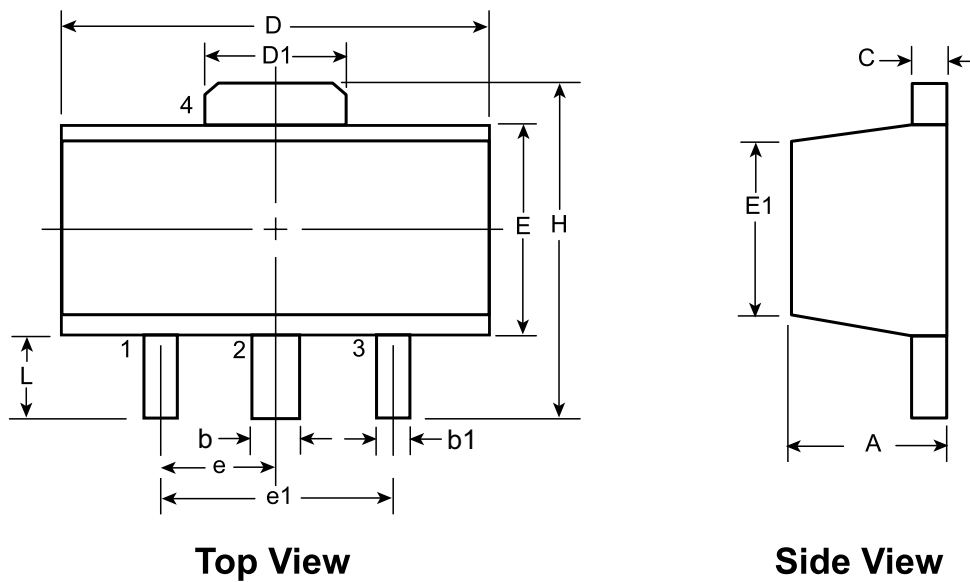
Capacitance vs. Drain Source Voltage



Gate Drive Dynamic Characteristics



### 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	2.13	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.

Supertex Doc. #: DSPD-3TO243AAN8, Version D070908.

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