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# P-Channel Enhancement-Mode Vertical DMOS FET

## Features

- ▶ High input impedance
- ▶ Low threshold (-2.4V max.)
- ▶ Low input capacitance (110pF max.)
- ▶ Fast switching speeds
- ▶ Low on-resistance
- ▶ Low input and output leakage
- ▶ Free from secondary breakdown

## Applications

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

## General Description

The Supertex TP5322 is a low threshold enhancement-mode (normally-off) transistor utilizing 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 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.

## Ordering Information

Part Number	Package Option	Packing
TP5322K1-G	TO-236AB (SOT-23)	3000/Reel
TP5322N8-G	3-Lead TO-92	2000/Reel

-G denotes a lead (Pb)-free / RoHS compliant package.  
Contact factory for Wafer / Die availability.  
Devices in Wafer / Die form are lead (Pb)-free / RoHS compliant.

## Product Summary

$BV_{DSS} / BV_{DGS}$	$R_{DS(ON)}$ (max)	$I_{D(ON)}$ (min)	$V_{GS(th)}$ (max)
-220V	12Ω	-700mA	-2.4V

## Absolute Maximum Ratings

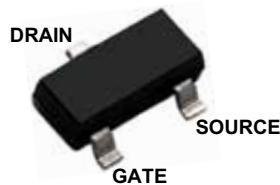
Parameter	Value
Drain-to-source voltage	$BV_{DSS}$
Drain-to-gate voltage	$BV_{DGS}$
Gate-to-source voltage	±20V
Operating and storage temperature	-55°C to +150°C

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.

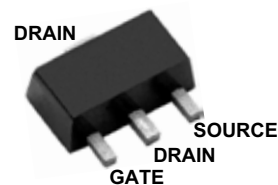
## Typical Thermal Resistance

Package	$\theta_{ja}$
TO-236AB (SOT-23)	203°C/W
TO-243AA (SOT-89)	133°C/W

## Pin Configuration



TO-236AB (SOT-23)



TO-243AA (SOT-89)

## Product Marking

**TP3CW** W = Code for week sealed  
\_\_\_\_\_ = "Green" Packaging

Package may or may not include the following marks: Si or   
TO-236AB (SOT-23)

**TP3CW** 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-236AB (SOT-23)	-120mA	-700mA	0.36W	-120mA	-700mA
TO-243AA (SOT-89)	-260mA	-0.90mA	1.6W <sup>‡</sup>	-260mA	-0.90mA

**Notes:**

- <sup>†</sup>  $I_D$  (continuous) is limited by max rated  $T_J$
- <sup>‡</sup> Mounted on FR4 board, 25mm x 25mm x 1.57mm.

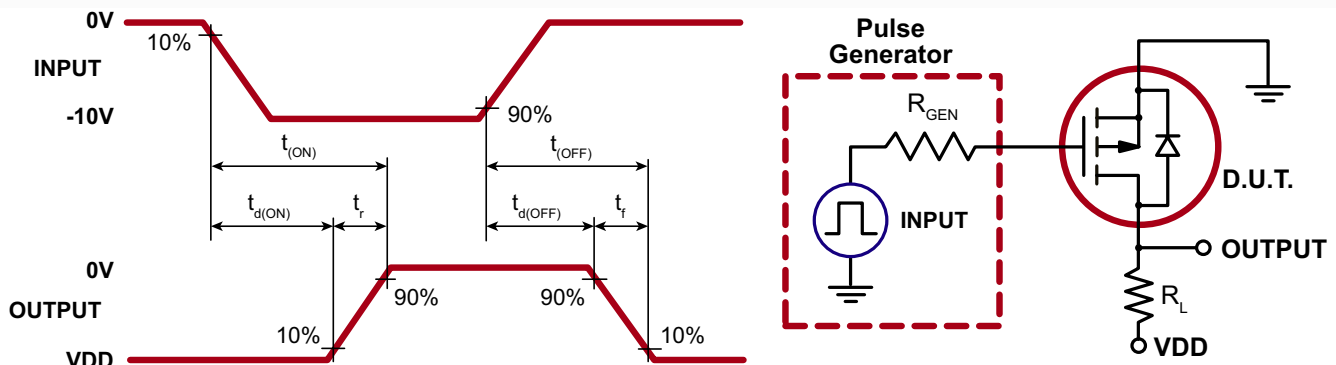
## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise specified)

Sym	Parameter	Min	Typ	Max	Units	Conditions
$BV_{DSS}$	Drain-to-source breakdown voltage	-220	-	-	V	$V_{GS} = 0V, I_D = -2.0mA$
$V_{GS(TH)}$	Gate threshold voltage	-1.0	-	-2.4	V	$V_{GS} = V_{DS}, I_D = -1.0mA$
$\Delta V_{GS(TH)}$	Change in $V_{GS(TH)}$ with temperature	-	-	4.5	mV/°C	$V_{GS} = V_{DS}, I_D = -1.0mA$
$I_{GSS}$	Gate body leakage current	-	-	-100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
$I_{D(SS)}$	Zero gate voltage drain current	-	-	-10	$\mu\text{A}$	$V_{DS} = \text{Max rating}, V_{GS} = 0V$
		-	-	-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	-0.7	-0.95	-	A	$V_{GS} = -10V, V_{DS} = -25V$
$R_{DS(ON)}$	Static drain-to-source on-state resistance	-	10	15	$\Omega$	$V_{GS} = -4.5V, I_D = -100mA$
		-	8.0	12		$V_{GS} = -10V, I_D = -200mA$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with temperature	-	-	1.7	%/°C	$V_{GS} = -10V, I_D = -200mA$
$G_{FS}$	Forward transconductance	100	250	-	mmho	$V_{DS} = -25V, I_D = -200mA$
$C_{ISS}$	Input capacitance	-	-	110	pF	$V_{GS} = 0V, V_{DS} = -25V, f = 1.0MHz$
$C_{OSS}$	Common source output capacitance	-	-	45		
$C_{RSS}$	Reverse transfer capacitance	-	-	20		
$t_{d(ON)}$	Turn-on delay time	-	-	10	ns	$V_{DD} = -25V, I_D = -700mA, R_{GEN} = 25\Omega,$
$t_r$	Rise time	-	-	15		
$t_{d(OFF)}$	Turn-off delay time	-	-	20		
$t_f$	Fall time	-	-	15		
$V_{SD}$	Diode forward voltage drop	-	-	-1.8	V	$V_{GS} = 0V, I_{SD} = -500mA$
$t_{rr}$	Reverse recovery time	-	300	-	ns	$V_{GS} = 0V, I_{SD} = -500mA$

**Notes:**

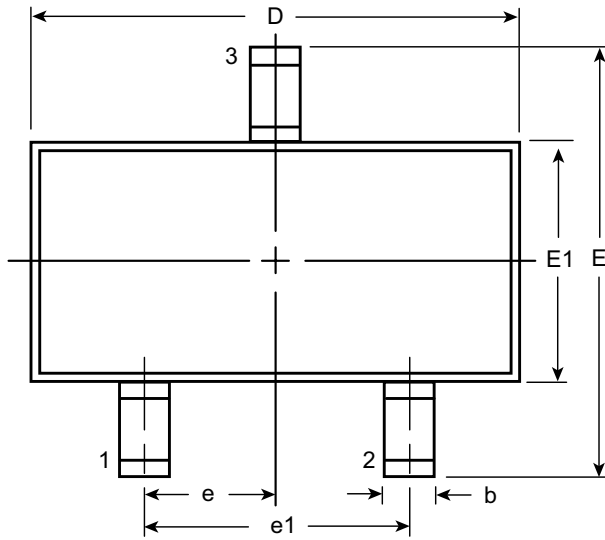
1. All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300µs pulse, 2% duty cycle.)
2. All A.C. parameters sample tested.

## Switching Waveforms and Test Circuit

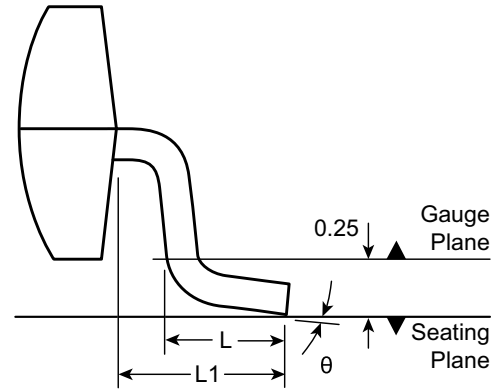


### 3-Lead TO-236AB (SOT-23) Package Outline (K1)

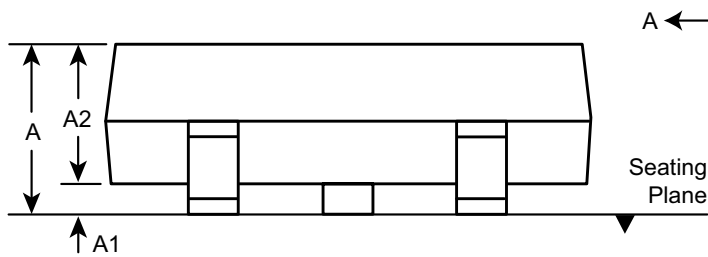
2.90x1.30mm body, 1.12mm height (max), 1.90mm pitch



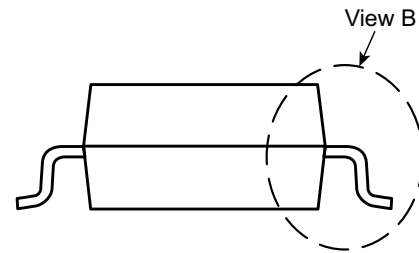
**Top View**



**View B**



**Side View**



**View A - A**

Symbol	A	A1	A2	b	D	E	E1	e	e1	L	L1	$\theta$	
Dimension (mm)	MIN	0.89	0.01	0.88	0.30	2.80	2.10	1.20	0.95 BSC	1.90 BSC	0.20 <sup>†</sup>	0.54 REF	0°
	NOM	-	-	0.95	-	2.90	-	1.30			0.50		-
	MAX	1.12	0.10	1.02	0.50	3.04	2.64	1.40			0.60		8°

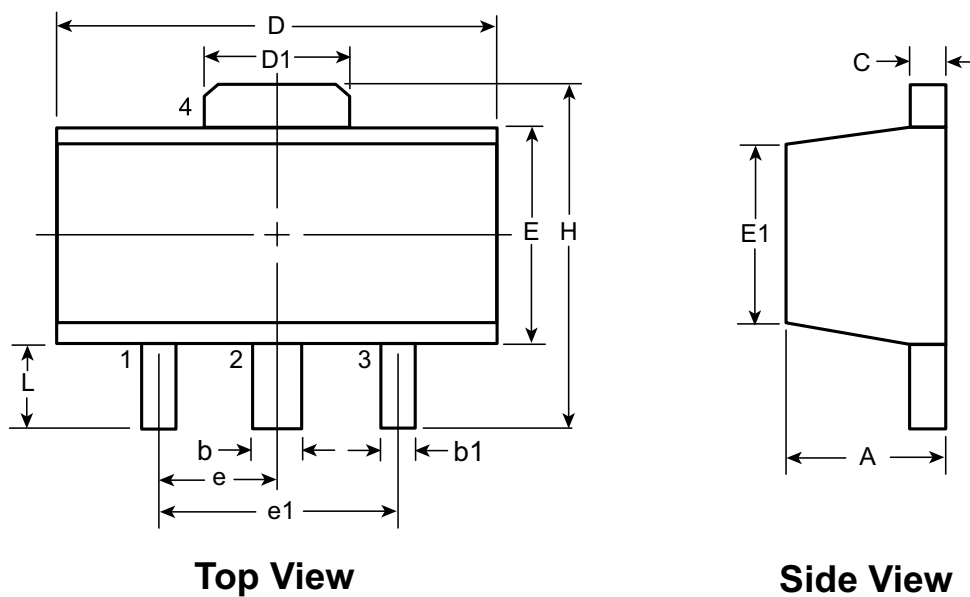
JEDEC Registration TO-236, Variation AB, Issue H, Jan. 1999.

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

Drawings not to scale.

Supertex Doc.#: DSPD-3TO236ABK1, Version C041309.

### 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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