N-Channel Enhancement-Mode Vertical DMOS FET

Features

- Low threshold
- High input impedance
- Low input capacitance
- 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 drives
- Analog switches
- General purpose line drivers
- 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 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 Options		BV_{DSS}/BV_{DGS} (V)	$R_{DS(ON)}$ (max) (Ω)	$I_{D(ON)}$ (min) (mA)	$V_{GS(th)}$ (max) (V)
	TO-236AB (SOT-23)	TO-243AA (SOT-89)				
TN5331	TN5335K1-G	TN5335N8-G	350	15	750	2.0

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

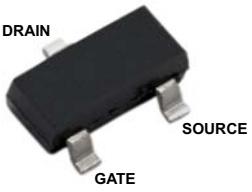
Absolute Maximum Ratings

Parameter	Value
Drain-to-source voltage	BV_{DSS}
Drain-to-gate voltage	BV_{DGS}
Gate-to-source voltage	±20V
Operating and storage temperature	-55°C to +150°C
Soldering temperature*	300°C

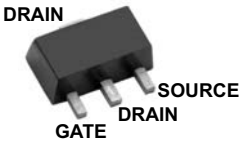
Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. Continuous operation of the device at the absolute rating level may affect device reliability. All voltages are referenced to device ground.

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

Pin Configurations



TO-236AB (SOT-23) (K1)



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

Product Marking

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

TO-236AB (SOT-23) (K1)

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

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-236AB (SOT-23)	110	0.8	0.36	200	350	110	0.8
TO-243AA (SOT-89)	230	1.3	1.6‡	15	78‡	230	1.3

Notes:

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

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

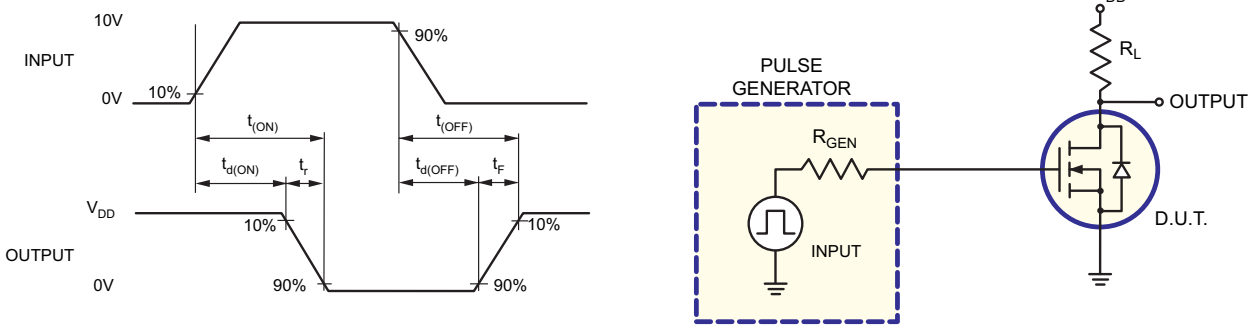
Electrical Characteristics *(T_A = 25°C unless otherwise specified)*

Sym	Parameter	Min	Typ	Max	Units	Conditions
BV_{DSS}	Drain-to-source breakdown voltage	350	-	-	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	-	-	-4.5	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	-	-	1.0	µA	V_{GS} = 0V, V_{DS} = 100V
		-	-	10		V_{GS} = 0V, V_{DS} = Max Rating
		-	-	1.0	mA	V_{DS} = 0.8 Max Rating, V_{GS} = 0V, T_A = 125°C
		-	-	5.0	nA	V_{GS} = 0V, V_{DS} = 330V
$I_{D(ON)}$	On-state drain current	300	-	-	mA	V_{GS} = 4.5V, V_{DS} = 25V
		750	-	-		V_{GS} = 10V, V_{DS} = 25V
$R_{DS(ON)}$	Static drain-to-source on-state resistance	-	-	15	Ω	V_{GS} = 3.0V, I_D = 20mA
		-	-	15		V_{GS} = 4.5V, I_D = 150mA
		-	-	15		V_{GS} = 10V, I_D = 200mA
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with temperature	-	-	1.0	%/°C	V_{GS} = 4.5V, I_D = 150mA
G_{FS}	Forward transductance	125	-	-	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	-	-	60		
C_{RSS}	Reverse transfer capacitance	-	-	22		
$t_{d(ON)}$	Turn-on delay time	-	-	20	ns	V_{DD} = 25V, I_D = 150mA, R_{GEN} = 25Ω
t_r	Rise time	-	-	15		
$t_{d(OFF)}$	Turn-off delay time	-	-	25		
t_f	Fall time	-	-	25		
V_{SD}	Diode forward voltage drop	-	-	1.8	V	V_{GS} = 0V, I_{SD} = 200mA
t_{rr}	Reverse recovery time	-	800	-	ns	V_{GS} = 0V, I_{SD} = 200mA

Notes:

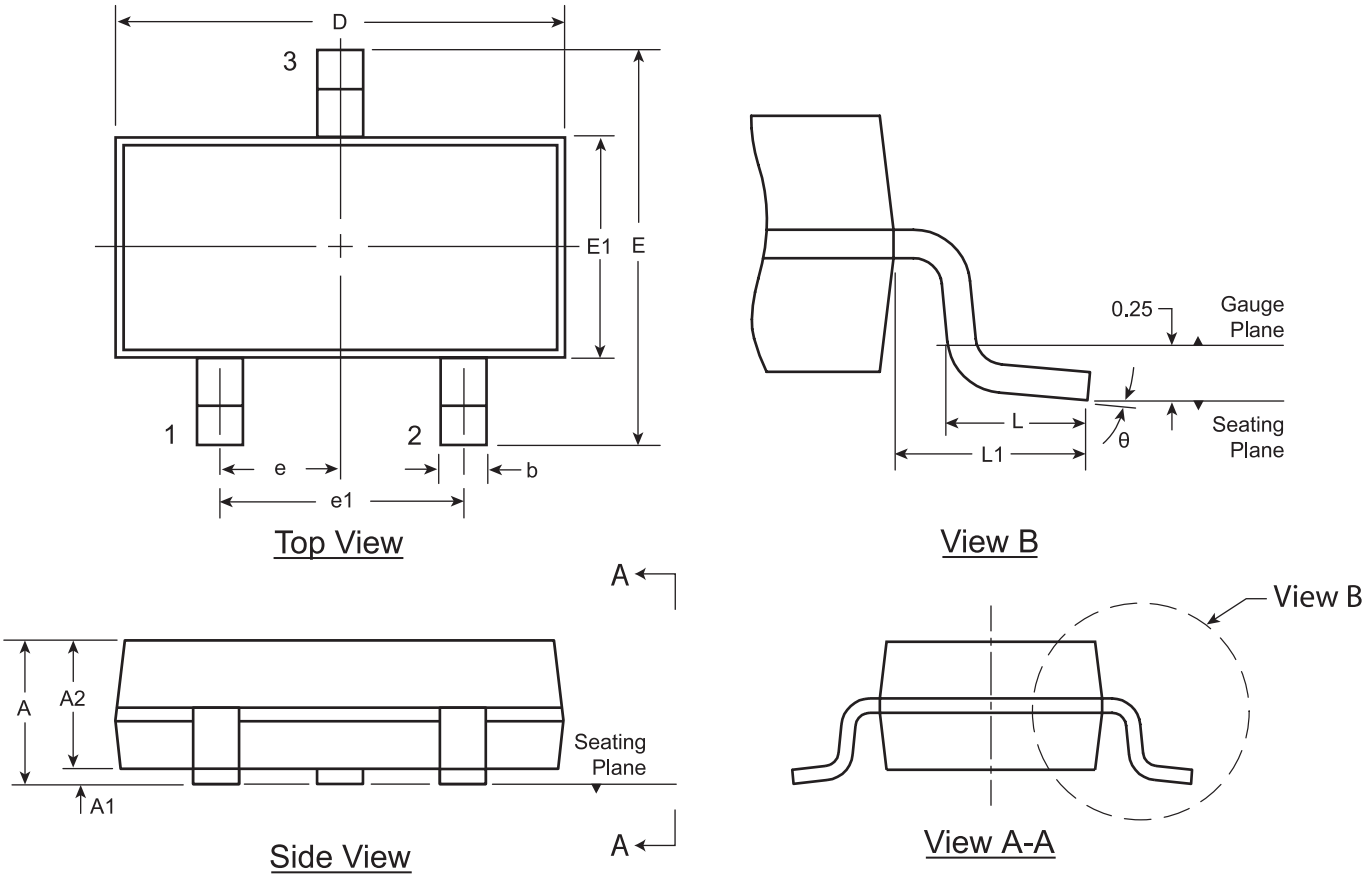
1. *All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300µs pulse, 2% duty cycle.)*
2. *All A.C. parameters sample tested.*

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

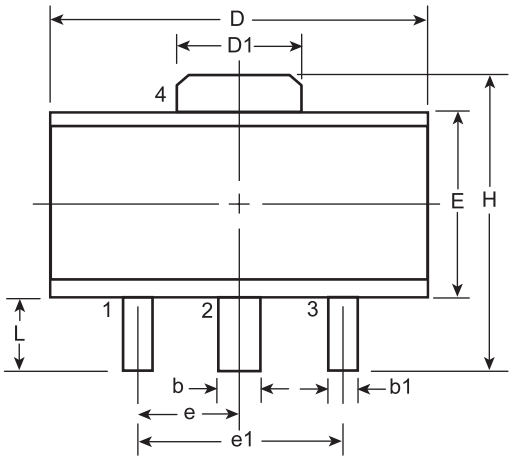


Symbol		A	A1	A2	b	D	E	E1	e	e1	L	L1	θ
Dimension (mm)	MIN	0.89	0.01	0.88	0.30	2.80	2.10	1.20	0.95 BSC	1.90 BSC	0.40	0.54 REF	0°
	NOM	-	-	0.95	-	2.90	-	1.30			0.50		-
	MAX	1.12	0.10	1.02	0.50	3.04	2.64	1.40			0.60		8°

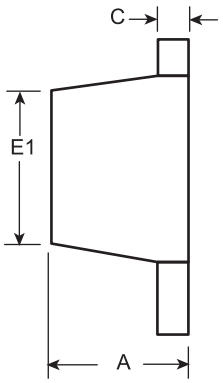
JEDEC Registration TO-236, Variation AB, Issue H, Jan. 1999.

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.)

Supertex inc.
1235 Bordeaux Drive, Sunnyvale, CA 94089
TEL: (408) 222-8888 / FAX: (408) 222-4895
www.supertex.com