N-Channel Depletion-Mode Vertical DMOS FETs

Features

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

Applications

- Normally-on switches
- Solid state relays
- Converters
- Linear amplifiers
- Constant current sources
- Power supply circuits
- Telecom

General Description

The Supertex DN3135 is a low threshold depletion-mode (normally-on) 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
DN3135K1-G	TO-236AB (SOT-23)	3000/Reel
DN3135N8-G	TO-243AA (SOT-89)	2000/Reel

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

Product Summary

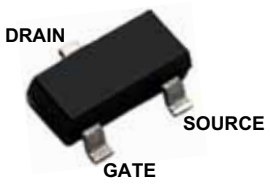
BV_{DSX}/BV_{DGX}	$R_{DS(ON)}$ (max)	I_{DSS} (min)
350V	35Ω	180mA

Absolute Maximum Ratings

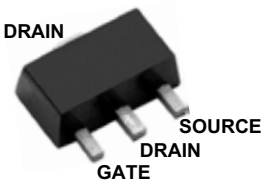
Parameter	Value
Drain-to-source voltage	BV_{DSX}
Drain-to-gate voltage	BV_{DGX}
Gate-to-source voltage	±20V
Operating and storage temperature	-55°C to +150°C

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.

Pin Configuration



TO-236AB (SOT-23)



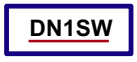
TO-243AA (SOT-89)

Product Marking

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

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

TO-236AB (SOT-23)



W = Code for week sealed
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Package may or may not include the following marks: Si or ⏚

TO-243AA (SOT-89)

Typical Thermal Resistance

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

Thermal Characteristics

Package	I_D (continuous)†	I_D (pulsed)	Power Dissipation @T_A = 25°C	I_{DR}†	I_{DRM}
TO-236AB	72mA	300mA	0.36W	72mA	300mA
TO-243AA	135mA	300mA	1.3W‡	135mA	300mA

Notes:

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

‡ *Mounted on FR4 board, 25mm x 25mmx 1.57mm.*

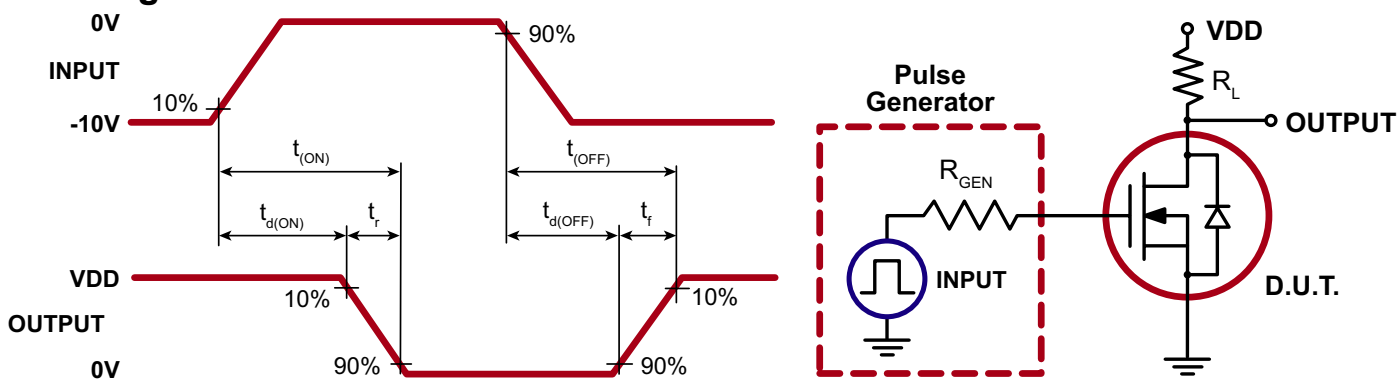
Electrical Characteristics *(T_A = 25°C unless otherwise specified)*

Sym	Parameter	Min	Typ	Max	Units	Conditions
BV_{DSX}	Drain-to-source breakdown voltage	350	-	-	V	V_{GS} = -5.0V, I_D = 100µA
$V_{GS(OFF)}$	Gate-to-source off voltage	-1.5	-	-3.5	V	V_{DS} = 15V, I_D = 10µA
$\Delta V_{GS(OFF)}$	Change in $V_{GS(OFF)}$ with temperature	-	-	-4.5	mV/°C	V_{DS} = 15V, I_D = 10µA
I_{GSS}	Gate body leakage current	-	-	100	nA	V_{GS} = ±20V, V_{DS} = 0V
$I_{D(OFF)}$	Drain-to-source leakage current	-	-	1.0	µA	V_{DS} = Max rating, V_{GS} = -5.0V
		-	-	1.0	mA	V_{DS} = 0.8 Max Rating, V_{GS} = -5.0V, T_A = 125°C
I_{DSS}	Saturated drain-to-source current	180	-	-	mA	V_{GS} = 0V, V_{DS} = 15V
$R_{DS(ON)}$	Static drain-to-source on-state resistance	-	-	35	Ω	V_{GS} = 0V, I_D = 150mA
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with temperature	-	-	1.1	%/°C	V_{GS} = 0V, I_D = 150mA
G_{FS}	Forward transconductance	140	-	-	mmho	V_{DS} = 10V, I_D = 100mA
C_{ISS}	Input capacitance	-	60	120	pF	V_{GS} = -5.0V, V_{DS} = 25V, f = 1.0MHz
C_{OSS}	Common source output capacitance	-	6.0	15		
C_{RSS}	Reverse transfer capacitance	-	3.0	10		
$t_{d(ON)}$	Turn-on delay time	-	-	10	ns	V_{DD} = 25V, I_D = 150mA, R_{GEN} = 25Ω, V_{GS} = 0v to -10V
t_r	Rise time	-	-	15		
$t_{d(OFF)}$	Turn-off delay time	-	-	15		
t_f	Fall time	-	-	20		
V_{SD}	Diode forward voltage drop	-	-	1.8	V	V_{GS} = -5.0V, I_{SD} = 150mA
t_{rr}	Reverse recovery time	-	800	-	ns	V_{GS} = -5.0V, I_{SD} = 150mA

Notes:

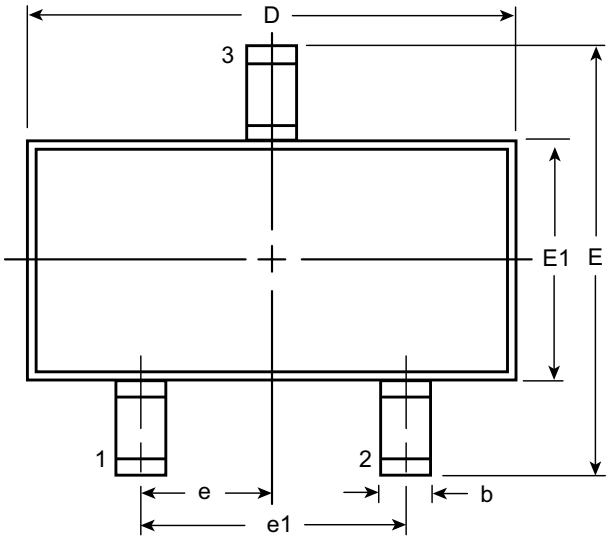
1. *All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300µs pulse, 2% duty cycle.)*
2. *All A.C. parameters sample tested.*

Switching Waveforms and Test Circuit

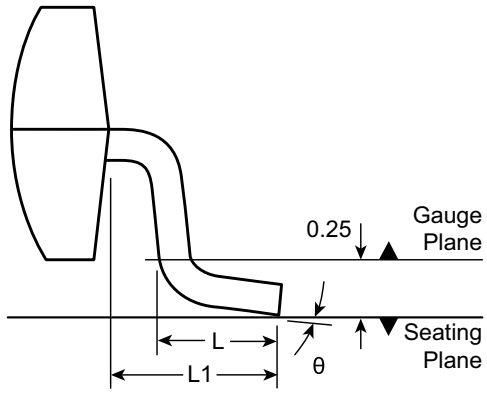


3-Lead TO-236AB (SOT-23) Package Outline (K1)

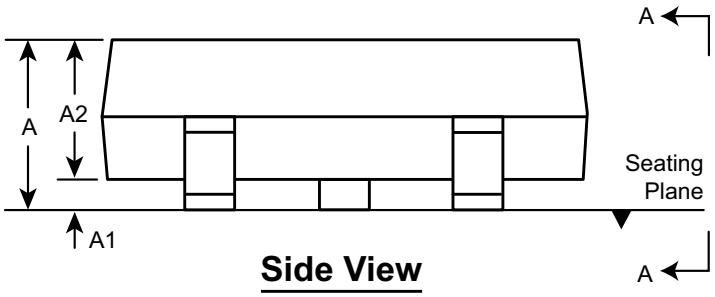
2.90x1.30mm body, 1.12mm height (max), 1.90mm pitch



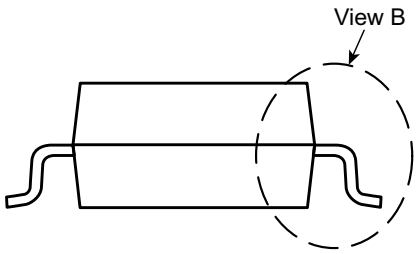
Top View



View B



Side View

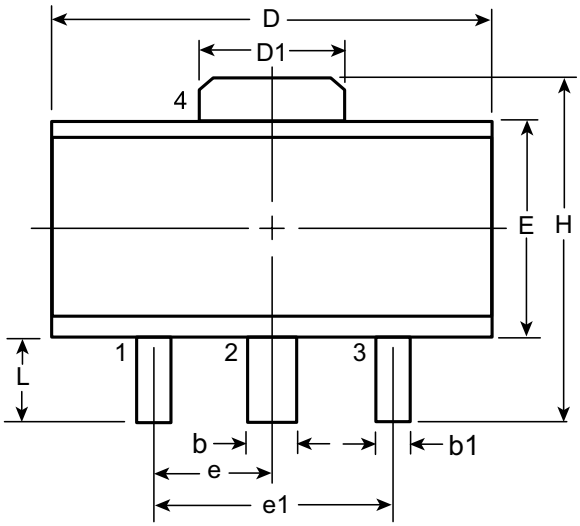


View A - A

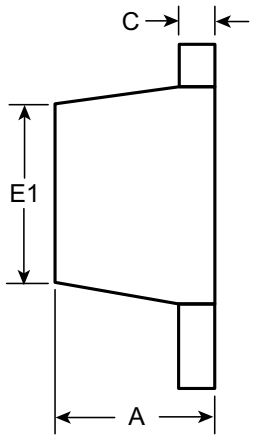
Symbol		A	A1	A2	b	D	E	E1	e	e1	L	L1	θ
Dimension (mm)	MIN	0.89	0.01	0.88	0.30	2.80	2.10	1.20	0.95 BSC	1.90 BSC	0.20†	0.54 REF	0°
	NOM	-	-	0.95	-	2.90	-	1.30			0.50		-
	MAX	1.12	0.10	1.02	0.50	3.04	2.64	1.40			0.60		8°

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



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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