N-Channel Depletion-Mode Vertical DMOS FETs

Features

- Very low gate threshold voltage
- Design to be source-driven
- Low switching losses
- Low effective output capacitance
- Design for inductive load
- Well matched for low second harmonic

Applications

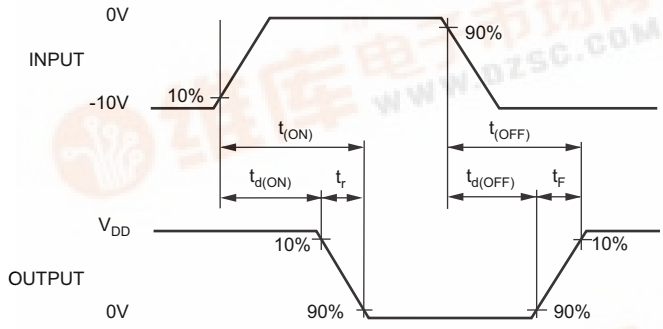
- Medical ultrasound beamforming
- Ultrasonic array focusing transmitter
- Piezoelectric transducer waveform drivers
- High speed arbitrary waveform generator
- Normally-on switches
- Solid state relays
- Constant current sources
- Power supply circuits

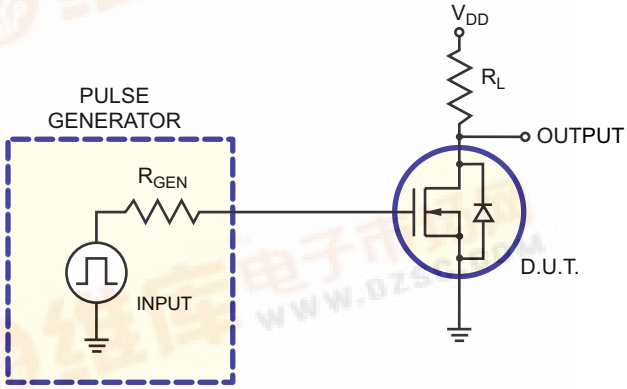
General Description

The Supertex DN2625 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.

Switching Waveforms and Test Circuit





Thermal Characteristics

Package	I_D (continuous)[1] (A)	I_D (pulsed) (A)	$R_{\theta jA}$[2] ($^oC/W$)	$R_{\theta jC}$ ($^oC/W$)	I_{DR}[1] (A)	I_{DRM} (A)
D-PAK	1.1	3.3	50	5.5	1.1	3.3
14-Lead QFN			45	4.0		

Notes:

1. I_D (continuous) is limited by Max. T_J

2. 4-layer, 1oz, 3x4inch PCB, with 20-via for drain pad.

Ordering Information

Device	Package Options		BV_{DSX}/ BV_{DGX} (V)	$V_{GS(OFF)}$ (max V)	I_{DS} (V_{GS}=0.9V) (min A)
	TO-252 (D-PAK)	14-Lead QFN 5x5mm body, 1.0mm height (max), 1.27mm pitch			
DN2625	DN2625K4-G	DN2625K6-G	250	-2.1	3.3

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

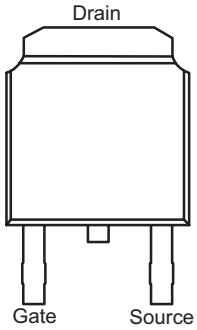
Absolute Maximum Ratings

Parameter	Value
Drain-to-source voltage	250V
Drain-to-gate voltage	250V
Gate-to-source voltage	±20V
Operating and storage temperature	-55°C to +150°C
Soldering temperature*	300°C

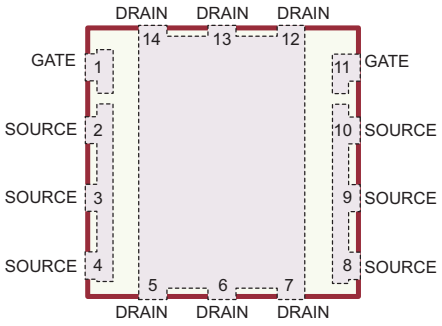
Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. Continuous operation of the device at the absolute rating level may affect device reliability. All voltages are referenced to device ground.

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

Pin Configurations



TO-252 D-PAK
(top view)



14-Lead QFN
(top view)

Product Marking

YY = Year Sealed
WW = Week Sealed
L = Lot Number
_____= "Green" Packaging

TO-252 D-PAK

L = Lot Number
YY = Year Sealed
WW = Week Sealed
A = Assembler ID
C = Country of Origin
_____= "Green" Packaging

14-Lead QFN

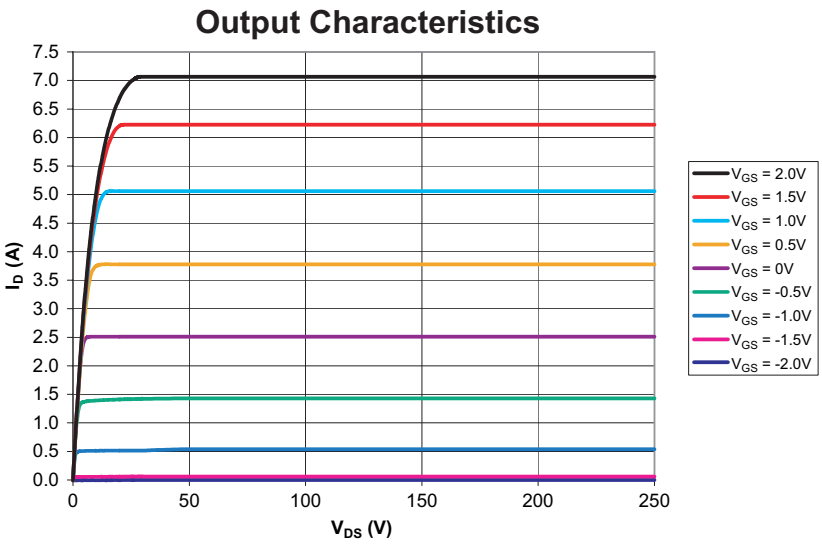
Electrical Characteristics *@25°C unless otherwise specified*

Symbol	Parameter	Min	Typ	Max	Units	Conditions
BV_{DSX}	Drain-to-source breakdown voltage	250	-	-	V	V_{GS} = -2.5V, I_D = 50µA
BV_{DGX}	Drain-to-gate breakdown voltage	250	-	-	V	V_{GS} = -2.5V, I_D = 50µA
$V_{GS(OFF)}$	Gate-to-source OFF voltage	-1.5	-	-2.1	V	V_{DS} = 15V, I_D = 100µA
$\Delta V_{GS(OFF)}$	Change in $V_{GS(OFF)}$ with temperature	-	-	4.5	mV/°C	V_{DS} = 15V, I_D = 100µA

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

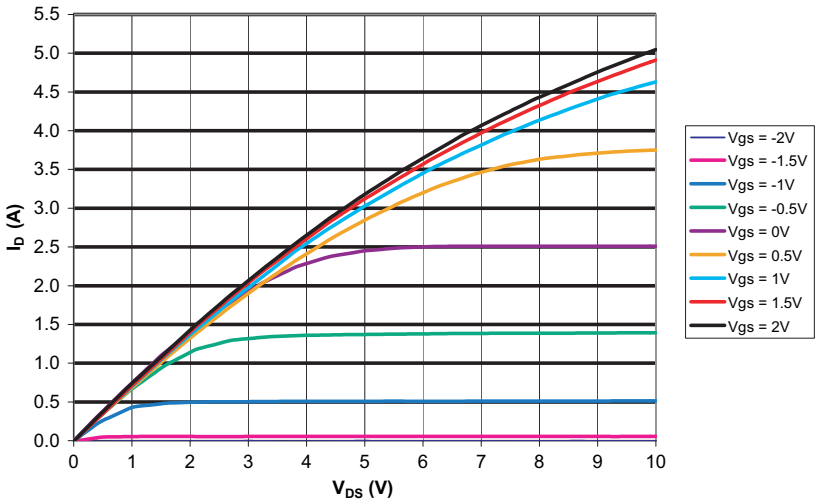
Symbol	Parameter	Min	Typ	Max	Units	Conditions
I_{GSS}	Gate body leakage current	-	-	100	nA	V_{GS} = ±20V, V_{DS} = 0V
$I_{D(OFF)}$	Drain-to-source leakage current	-	-	1.0	µA	V_{DS} = 250V, V_{GS} = -5.0V
		-	-	200	µA	V_{DS} = 250V, V_{GS} = -5.0V, T_A = 125°C
I_{DSS}	Saturated drain-to-source current	1.1	-	-	A	V_{GS} = 0V, V_{DS} = 15V
$I_{DS(PULSE)}$	Pulsed drain-to-source current	3.1	3.3	-	A	V_{GS} = 0.9V, V_{DS} = 15V with duty cycle of 1%
$R_{DS(ON)}$	Static drain-to-source ON resistance	-	-	3.5	Ω	V_{GS} = 0V, I_D = 1.0A
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with temperature	-	-	1.1	%/°C	V_{GS} = 0V, I_D = 200mA
G_{FS}	Forward transconductance	1.0	-	-	mmho	V_{DS} = 10V, I_D = 150mA
C_{ISS}	Input capacitance	-	800	1000	pF	V_{GS} = -2.5V, V_{DS} = 25V, f = 1.0MHz
C_{OSS}	Common source output capacitance	-	70	210		
C_{RSS}	Reverse transfer capacitance	-	18	70		
$t_{d(ON)}$	Turn-ON delay time	-	-	10	ns	V_{DD} = 25V, I_D = 150mA, R_{GEN} = 3.0Ω, V_{GS} = 0v to -10V
t_r	Rise time	-	-	20		
$t_{d(OFF)}$	Turn-OFF delay time	-	-	10		
t_f	Fall time	-	-	20		
V_{SD}	Diode forward voltage drop	-	-	1.8	V	V_{GS} = -2.5V, I_{SD} = 150mA

Typical Performance Curves

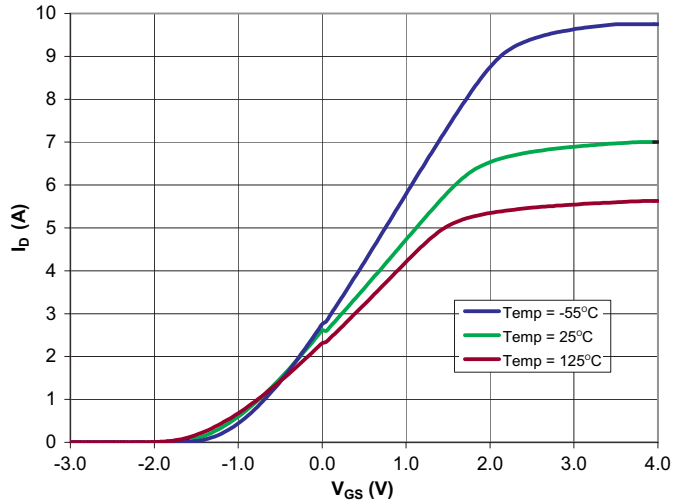


Typical Performance Curves *(cont.)*

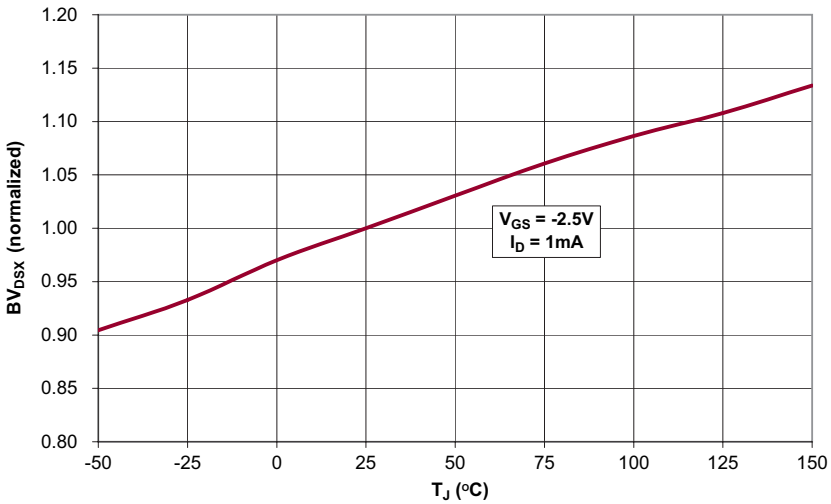
Saturation Characteristics



Transfer Characteristics

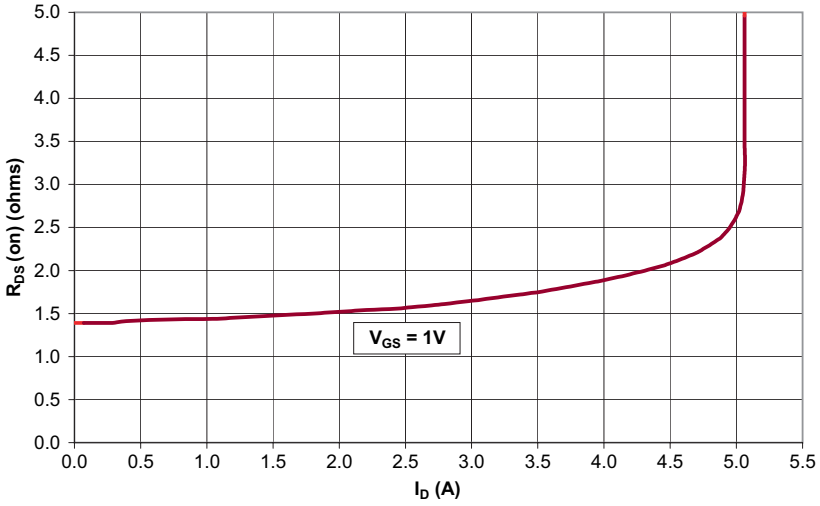


BV_{DSX} Variation With Temperature

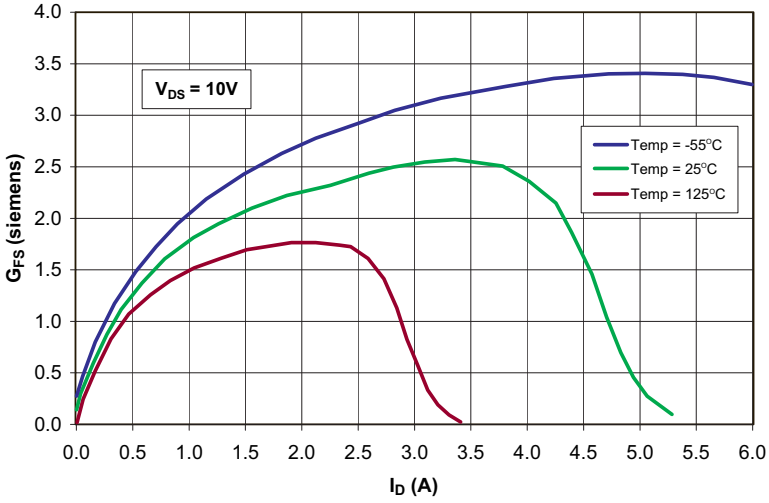


Typical Performance Curves *(cont.)*

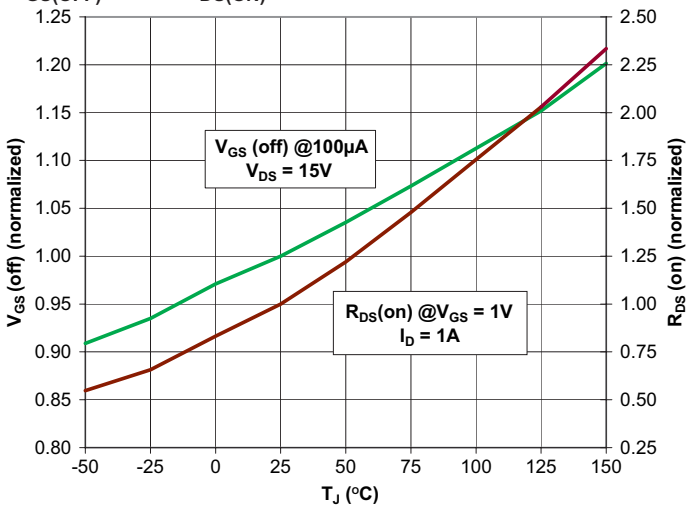
On-Resistance vs Drain Current



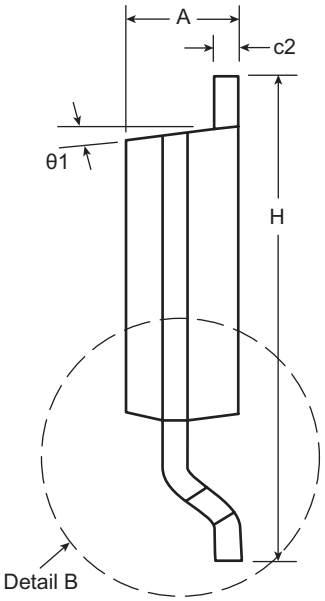
Transconductance vs Drain Current



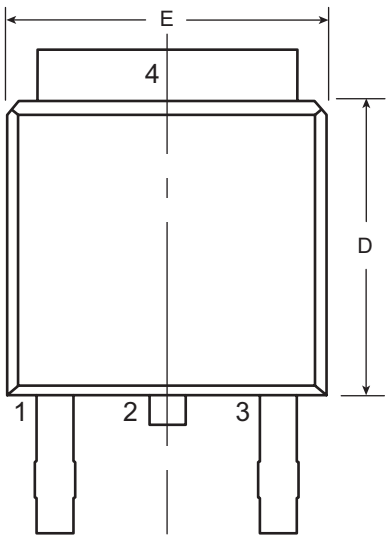
$V_{GS(OFF)}$ and $R_{DS(ON)}$ Variation With Temperature



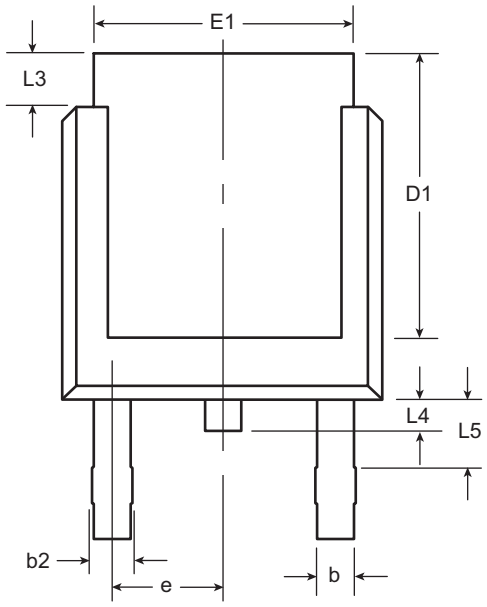
3-Lead TO-252 D-PAK Package Outline (K4)



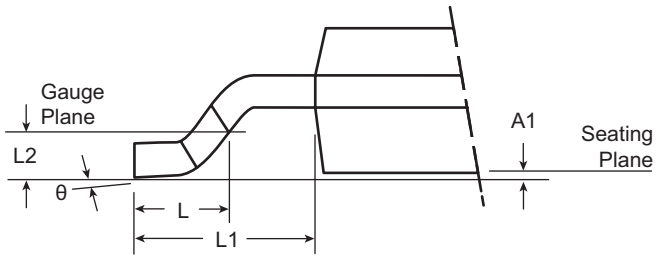
Side View



Front View



Rear View



Detail B

Notes:

1. 4 terminal locations are shown, only 3 are functional. Lead number 2 was removed.

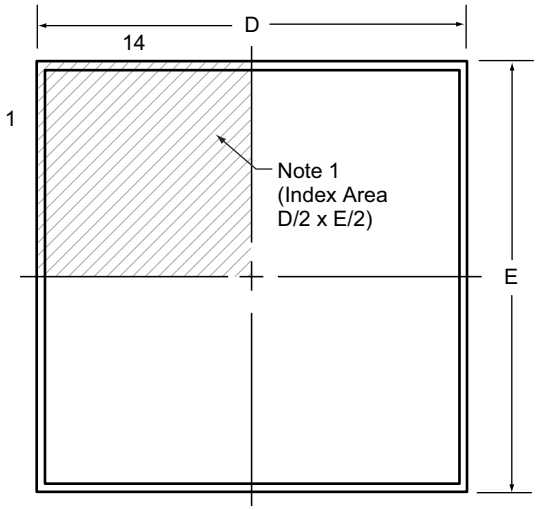
Symbol		A	A1	b	b2	c2	D	D1	E	E1	e	H	L	L1		L3	L4	L5	θ	θ1
Dimension (inches)	MIN	.086	-	.025	.030	.018	.235	.205	.250	.170	.090 BSC	.370	.055	.108 REF	.020 BSC	.035	-	.045	0°	0°
	NOM	-	-	-	-	-	.240	-	-	-		-	.060			-	-	-	-	-
	MAX	.094	.005	.035	.045	.035	.245	-	.265	-		.410	.070			.050	.040	.060	10°	15°

JEDEC Registration TO-252, Variation AA, Issue E, June 2004.

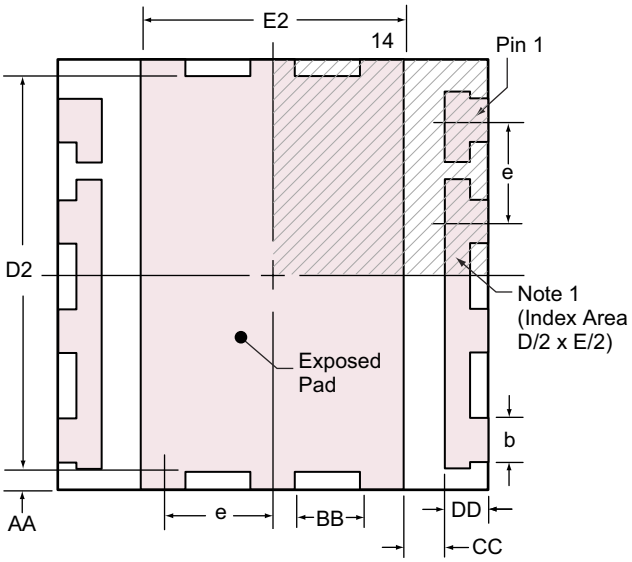
Drawings not to scale.

14-Lead QFN Package Outline (K6)

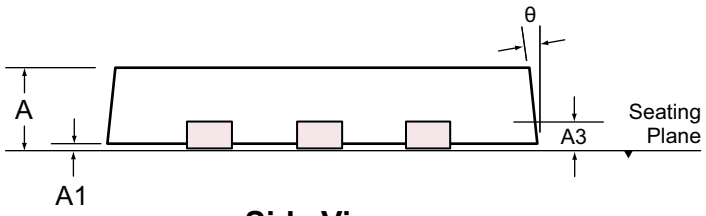
5x5mm body, 1.0mm height (max), 1.27mm pitch



Top View



Bottom View



Side View

Notes:

1. Details of Pin 1 identifier are optional, but must be located within the indicated area. The Pin 1 identifier may be either a mold, or a marked feature.

Symbol		A	A1	A3	b	D	D2	E	E2	e	AA	BB	CC	DD	θ
Dimension (mm)	MIN	0.80	0.00	0.20 REF	0.46	4.85	4.45	4.85	2.52	1.27 BSC	0.152	0.473	0.66	0.456	0°
	NOM	0.90	0.02		0.51	5.00	4.50	5.00	2.57		0.252	0.523	0.71	0.506	-
	MAX	1.00	0.05		0.58	5.15	4.55	5.15	2.62		0.352	0.583	0.77	0.566	14°

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