N-Channel Depletion-Mode Vertical DMOS FET

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
- Battery operated systems
- Telecom

General Description

The DN2470 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 FET is 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

BV_{DSX}/BV_{DGX}	$R_{DS(ON)}$ (max)	I_{DSS}(min)	Package Options
			TO-252 (D-PAK)
700V	42Ω	500mA	DN2470K4-G

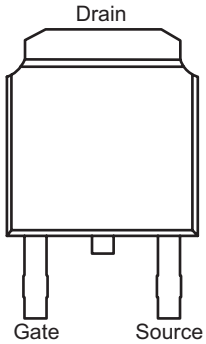
Absolute Maximum Ratings

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
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.*

Package Option



TO-252 (D-PAK)
(top view)

Thermal Characteristics

Package	I_D (continuous)[1]	I_D (pulsed)	Power Dissipation @T_A = 25°C	Θ_{jc} (°C/W)	Θ_{ja} (°C/W)	I_{DR}[1]	I_{DRM}
TO-252	170mA	500mA	2.5W[2]	6.25	50[2]	170mA	500mA

Notes:

1. I_D (continuous) is limited by max rated T_j.

2. Mounted on FR4 board, 25mm x 25mm x 1.57mm

Electrical Characteristics

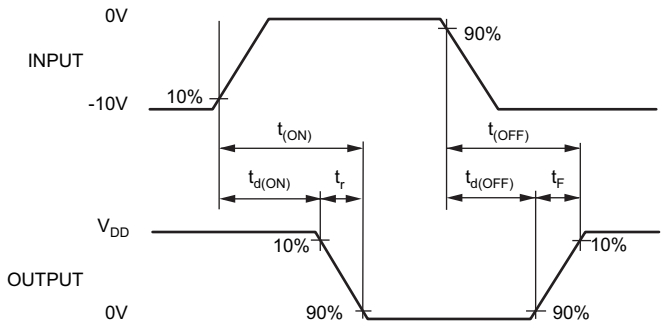
Symbol	Parameter	Min	Typ	Max	Units	Conditions
BV_{DSX}	Drain-to-source breakdown voltage	700	-	-	V	V_{GS} = -5.0V, I_D = 100µA
$V_{GS(OFF)}$	Gate-to-source OFF voltage	-1.5	-	-3.5	V	V_{DS} = 25V, I_D = 10µA
$\Delta V_{GS(OFF)}$	Change in $V_{GS(OFF)}$ with temperature	-	-	4.5	mV/°C	V_{DS} = 25V, I_D = 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} = -10V
		-	-	1.0	mA	V_{DS} = 0.8 Max Rating, V_{GS} = -10V, T_A = 125°C
I_{DSS}	Saturated drain-to-source current	-	500	-	mA	V_{GS} = 0V, V_{DS} = 25V
$R_{DS(ON)}$	Static drain-to-source ON-state resistance	-	-	42	Ω	V_{GS} = 0V, I_D = 100mA
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with temperature	-	-	1.1	%/°C	V_{GS} = 0V, I_D = 100mA
G_{FS}	Forward transconductance	100	-	-	mmho	V_{DS} = 10V, I_D = 100mA
C_{ISS}	Input capacitance	-	-	540	pF	V_{GS} = -10V, V_{DS} = 25V, f = 1MHz
C_{OSS}	Common source output capacitance	-	-	60		
C_{RSS}	Reverse transfer capacitance	-	-	25		
$t_{d(ON)}$	Turn-ON delay time	-	-	30	ns	V_{DD} = 25V, I_D = 100mA, R_{GEN} = 25Ω,
t_r	Rise time	-	-	45		
$t_{d(OFF)}$	Turn-OFF delay time	-	-	45		
t_f	Fall time	-	-	60		
V_{SD}	Diode forward voltage drop	-	-	1.8	V	V_{GS} = -5.0V, I_{SD} = 200mA
t_{rr}	Reverse recovery time	-	800	-	ns	V_{GS} = -5.0V, I_{SD} = 200mA

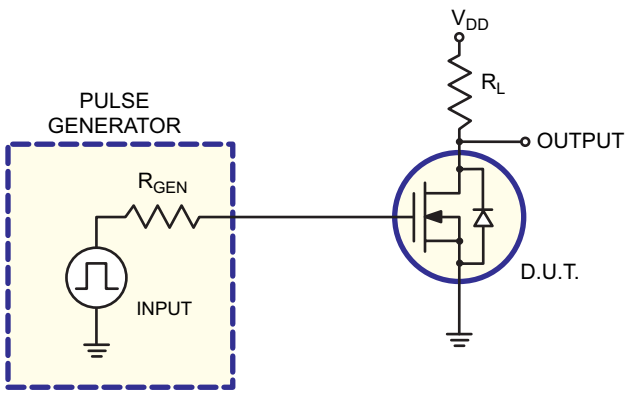
Notes:

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

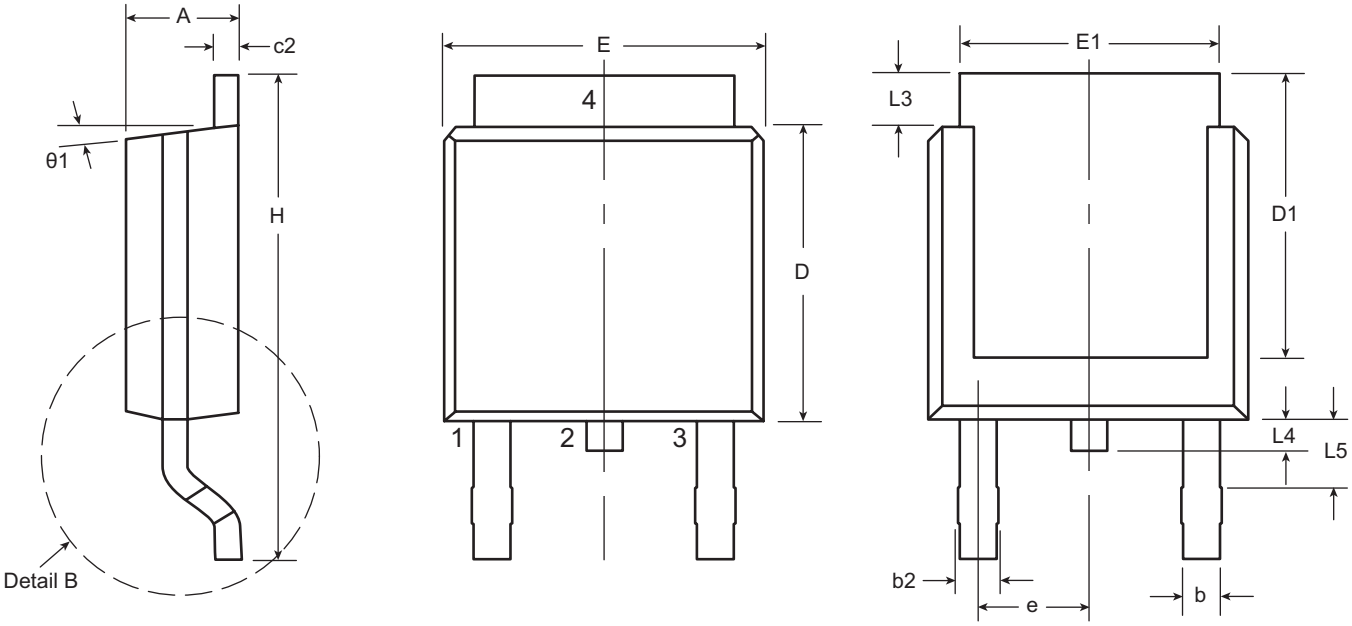
2.All A.C. parameters sample tested.

Switching Waveforms and Test Circuit

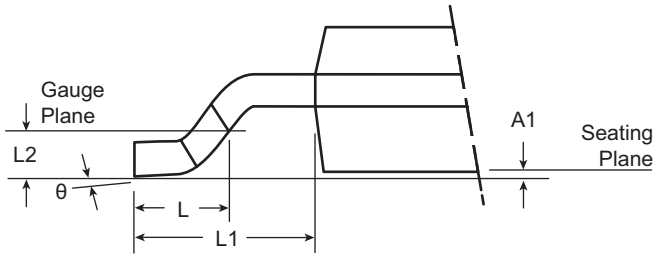




3-Lead TO-252 D-PAK Package Outline (K4)



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	L2	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.

(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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