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N-Channel Enhancement-Mode Vertical DMOS FETs

Features

- Free from secondary breakdown
- Low power drive requirement
- Ease of paralleling
- Low C_{ISS} and fast switching speeds
- Excellent thermal stability
- Integral source-drain diode
- High input impedance and high gain

Applications

- Motor controls
- Converters
- Amplifiers
- Switches
- Power supply circuits
- Drivers (relays, hammers, solenoids, lamps, memories, displays, bipolar transistors, etc.)

General Description

The Supertex 2N7000 is an enhancement-mode (normally-off) transistor that 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

Part Number	Package Option	Packing
2N7000-G	TO-92	1000/Bag
2N7000-G P002	TO-92	2000/Reel
2N7000-G P003	TO-92	2000/Reel
2N7000-G P005	TO-92	2000/Reel
2N7000-G P013	TO-92	2000/Reel
2N7000-G PO14	TO-92	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_{DGS}	$R_{DS(ON)}$ (max)	$I_{D(ON)}$ (min)
60V	5.0Ω	75mA

Pin Configuration



TO-92

Absolute Maximum Ratings

Parameter	Value
Drain-to-Source voltage	BV_{DSS}
Drain-to-Gate voltage	BV_{DGS}
Gate-to-Source voltage	±30V
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.

Product Marking



YY = Year Sealed
WW = Week Sealed
_____ = "Green" Packaging

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

TO-92

Typical Thermal Characteristics

Package	θ_{ja}
TO-92	132°C/W

** Mounted on FR4 board; 25mm x 25mm x 1.57mm*

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Thermal Characteristics

Package	I_D (continuous)†	I_D (pulsed)	Power Dissipation @T_C = 25°C	I_{DR}†	I_{DRM}
TO-92	200mA	500mA	1.0W	200mA	500mA

Notes:

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

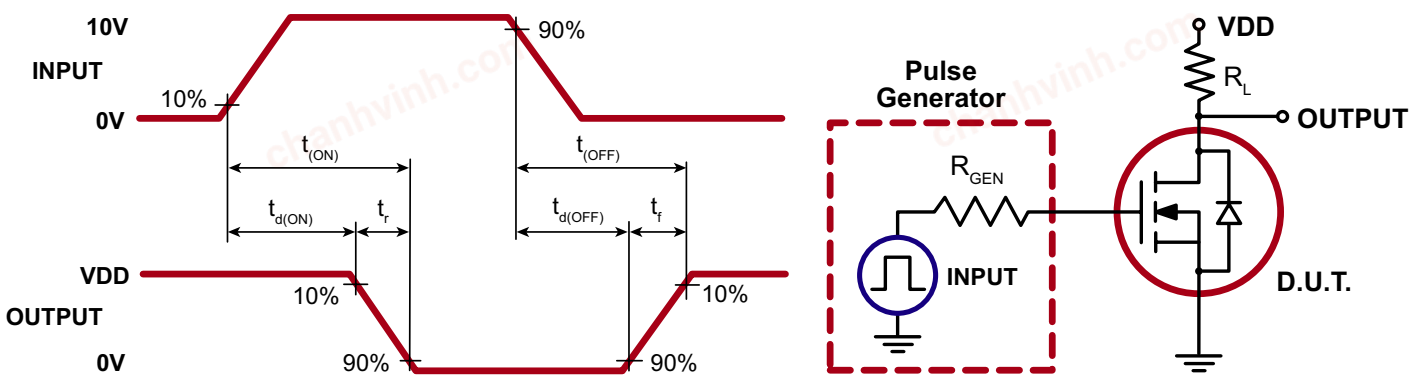
Electrical Characteristics *(T_A = 25°C unless otherwise specified)*

Sym	Parameter	Min	Typ	Max	Units	Conditions
BV_{DSS}	Drain-to-Source breakdown voltage	60	-	-	V	V_{GS} = 0V, I_D = 10µA
$V_{GS(th)}$	Gate threshold voltage	0.8	-	3.0	V	V_{GS} = V_{DS}, I_D = 1.0mA
I_{GSS}	Gate body leakage current	-	-	10	nA	V_{GS} = ±15V, V_{DS} = 0V
I_{DSS}	Zero Gate voltage drain current	-	-	1.0	µA	V_{GS} = 0V, V_{DS} = 48V
		-	-	1.0	mA	V_{GS} = 0V, V_{DS} = 48V, T_A = 125°C
$I_{D(ON)}$	On-state drain current	75	-	-	mA	V_{GS} = 4.5V, V_{DS} = 10V
$R_{DS(ON)}$	Static Drain-to-Source on-state resistance	-	-	5.3	Ω	V_{GS} = 4.5V, I_D = 75mA
		-	-	5.0		V_{GS} = 10V, I_D = 500mA
G_{FS}	Forward transconductance	100	-	-	mmho	V_{DS} = 10V, I_D = 200mA
C_{ISS}	Input capacitance	-	-	60	pF	V_{GS} = 0V, V_{DS} = 25V, f = 1.0MHz
C_{OSS}	Common Source output capacitance	-	-	25		
C_{RSS}	Reverse transfer capacitance	-	-	5		
$t_{(ON)}$	Turn-on time	-	-	10	ns	V_{DD} = 15V, I_D = 500mA, R_{GEN} = 25Ω
$t_{(OFF)}$	Turn-off time	-	-	10		
V_{SD}	Diode forward voltage drop	-	0.85	-	V	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.*

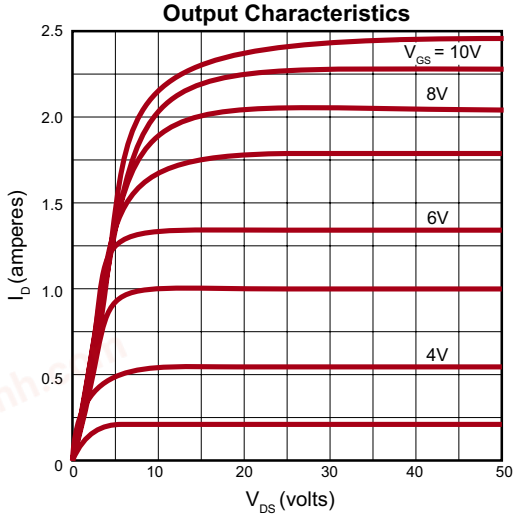
Switching Waveforms and Test Circuit



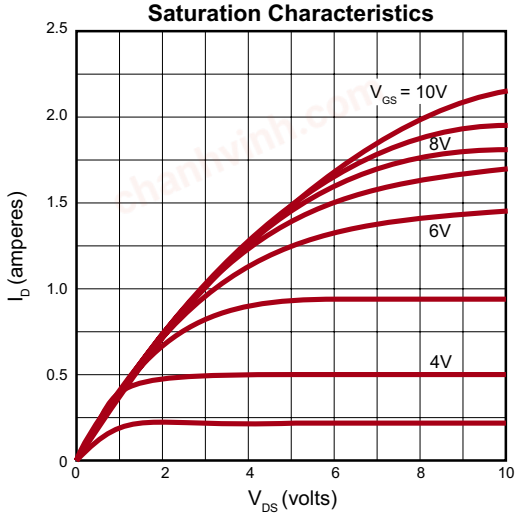
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Typical Performance Curves

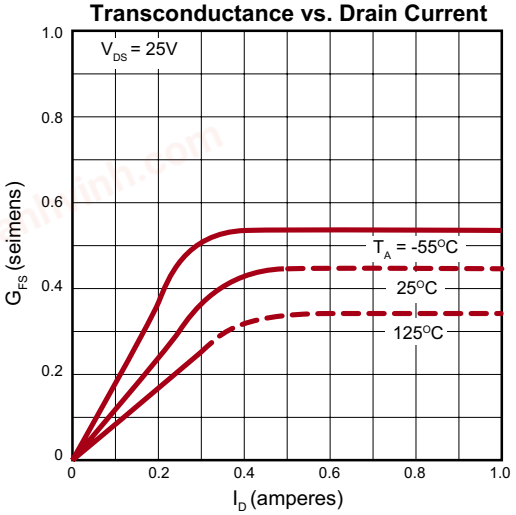
Output Characteristics



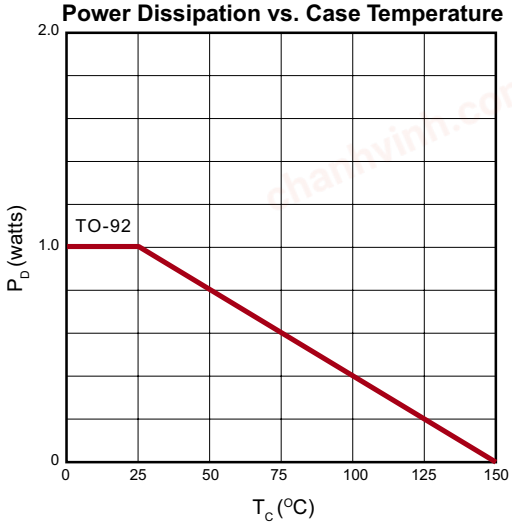
Saturation Characteristics



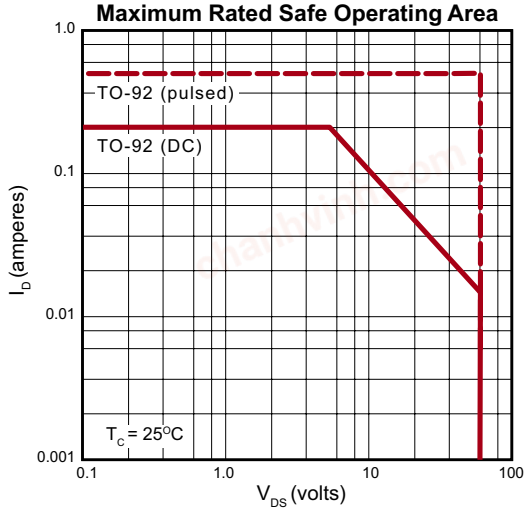
Transconductance vs. Drain Current



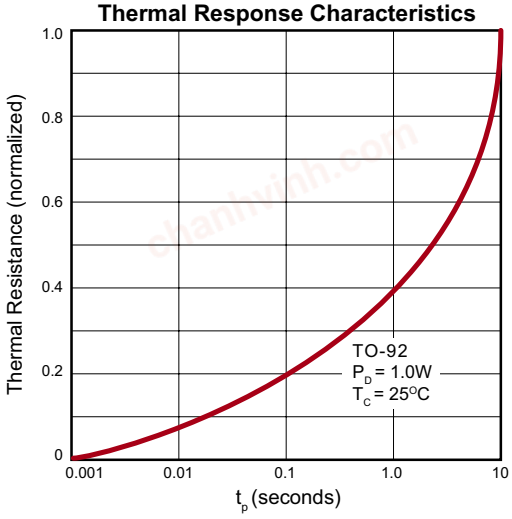
Power Dissipation vs. Case Temperature



Maximum Rated Safe Operating Area



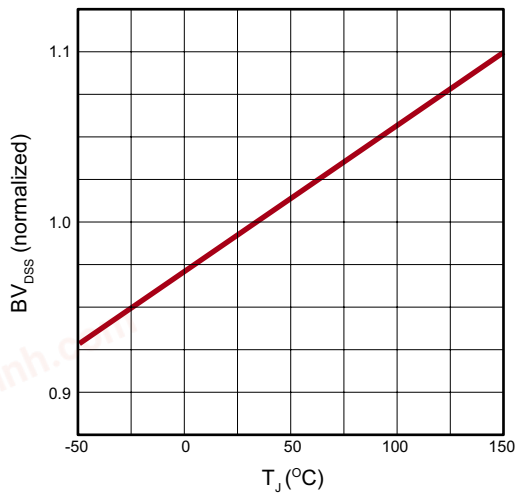
Thermal Response Characteristics



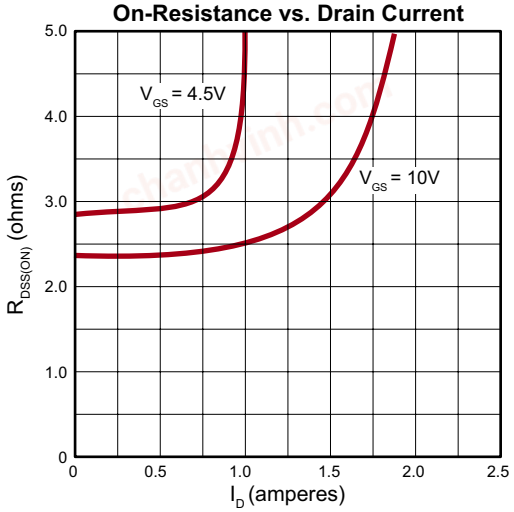
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Typical Performance Curves *(cont.)*

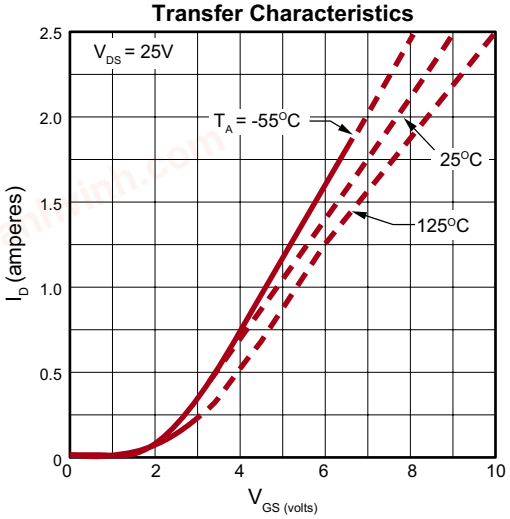
BV_{DSS} Variation with Temperature



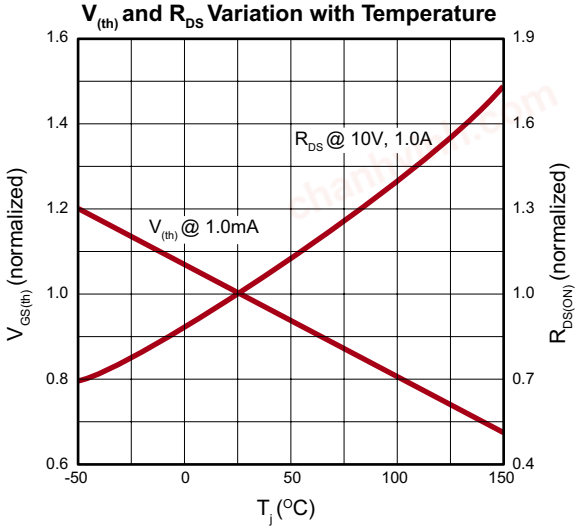
On-Resistance vs. Drain Current



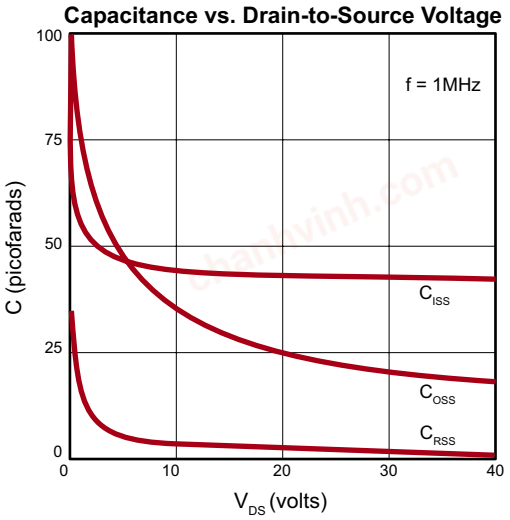
Transfer Characteristics



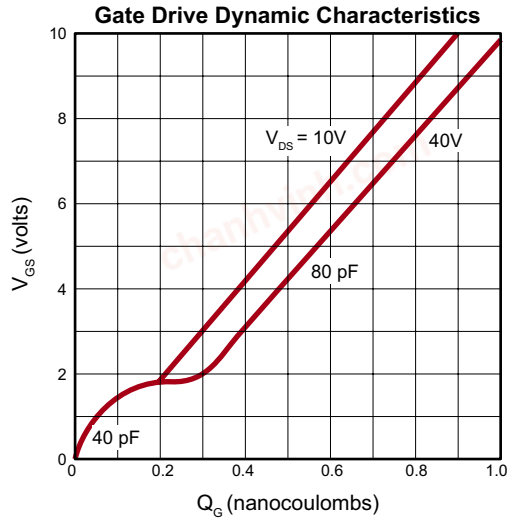
$V_{(th)}$ and R_{DS} Variation with Temperature



Capacitance vs. Drain-to-Source Voltage

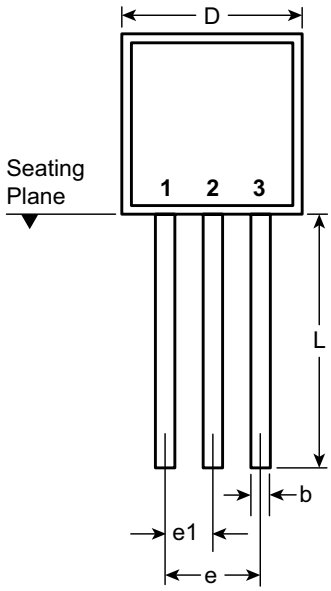


Gate Drive Dynamic Characteristics

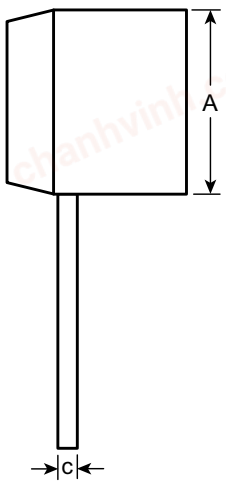


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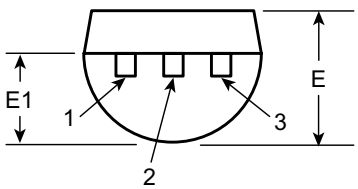
3-Lead TO-92 Package Outline (N3)



Front View



Side View



Bottom View

Symbol		A	b	c	D	E	E1	e	e1	L
Dimensions (inches)	MIN	.170	.014†	.014†	.175	.125	.080	.095	.045	.500
	NOM	-	-	-	-	-	-	-	-	-
	MAX	.210	.022†	.022†	.205	.165	.105	.105	.055	.610*

JEDEC Registration TO-92.
** This dimension is not specified in the JEDEC drawing.*
† This dimension differs from the JEDEC drawing.
Drawings not to scale.
***Supertex Doc.#:** DSPD-3TO92N3, Version E041009.*

(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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