Supertex inc.

N-Channel Enhancement-Mode Vertical DMOS FETs

Ordering Information

BV$_{DSS}$ / BV$_{DGS}$	R$_{DS(ON)}$ (max)	I$_{D(ON)}$ (min)	Order Number / Package	
			TO-92	**Die[†]**
450V	60Ω	150mA	—	VN0545ND
500V	60Ω	150mA	VN0550N3	VN0550ND

[†] MIL visual screening available

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High Reliability Devices
See pages 5-4 and 5-5 for MILITARY STANDARD Process Flows and Ordering Information.

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

☐ Complementary N- and P-channel devices

Applications

☐ Motor controls

☐ Converters

☐ Amplifiers

☐ Switches

☐ Power supply circuits

☐ Drivers (relays, hammers, solenoids, lamps, memories, displays, bipolar transistors, etc.)

Absolute Maximum Ratings

|	
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

* Distance of 1.6 mm from case for 10 seconds.

Advanced DMOS Technology

These enhancement-mode (normally-off) transistors utilize a vertical DMOS structure and Supertex's well-proven silicon-gate manufacturing process. This combination produces devices 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, these devices are 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.

Package Options

S G D

TO-92

Note: See Package Outline section for dimensions.
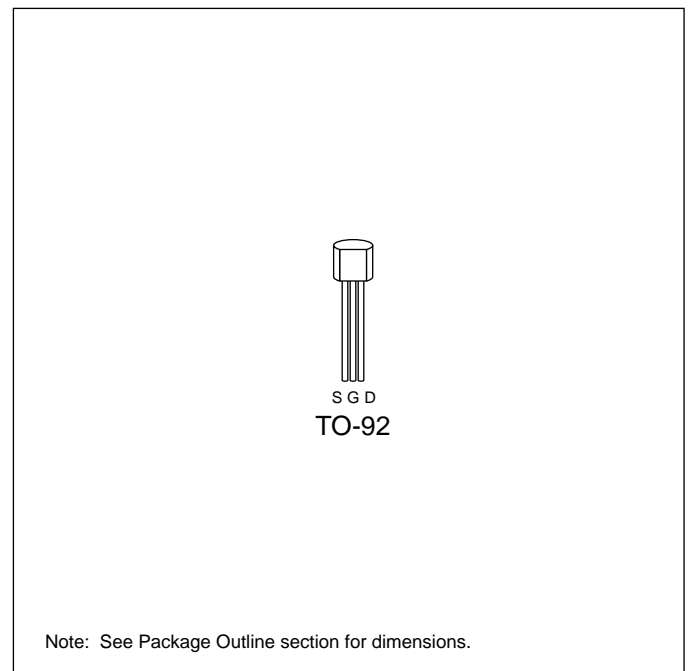
Thermal Characteristics

Package	I_D (continuous)*	I_D (pulsed)	Power Dissipation @ $T_C = 25°C$	θ_{jc} °C/W	θ_{ja} °C/W	I_{DR}*	I_{DRM}
TO-92	50mA	250mA	1.0W	125	170	50mA	250mA

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

Electrical Characteristics (@ 25°C unless otherwise specified)

Symbol	Parameter		Min	Typ	Max	Unit	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	VN0550	500			V	$V_{GS} = 0V$, $I_D = 1mA$
		VN0545	450				
$V_{GS(th)}$	Gate Threshold Voltage		2		4	V	$V_{GS} = V_{DS}$, $I_D = 1mA$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature			-3.8	-5.0	mV/°C	$V_{GS} = V_{DS}$, $I_D = 1mA$
I_{GSS}	Gate Body Leakage				100	nA	$V_{GS} = \pm20V$, $V_{DS} = 0V$
I_{DSS}	Zero Gate Voltage Drain Current				10	µA	$V_{GS} = 0V$, V_{DS} = Max Rating
					1	mA	$V_{GS} = 0V$, $V_{DS} = 0.8$ Max Rating $T_A = 125°C$
$I_{D(ON)}$	ON-State Drain Current			100		mA	$V_{GS} = 5V$, $V_{DS} = 25V$
			150	350			$V_{GS} = 10V$, $V_{DS} = 25V$
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance			45		Ω	$V_{GS} = 5V$, $I_D = 50mA$
				40	60		$V_{GS} = 10V$, $I_D = 50mA$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature			1	1.7	%/°C	$V_{GS} = 10V$, $I_D = 50mA$
G_{FS}	Forward Transconductance		50	100		m℧	$V_{DS} = 25V$, $I_D = 50mA$
C_{ISS}	Input Capacitance			45	55	pF	$V_{GS} = 0V$, $V_{DS} = 25V$ f = 1 MHz
C_{OSS}	Common Source Output Capacitance			8	10		
C_{RSS}	Reverse Transfer Capacitance			2	5		
$t_{d(ON)}$	Turn-ON Delay Time				10	ns	$V_{DD} = 25V$, $I_D = 150mA$, $R_{GEN} = 25Ω$
t_r	Rise Time				15		
$t_{d(OFF)}$	Turn-OFF Delay Time				10		
t_f	Fall Time				10		
V_{SD}	Diode Forward Voltage Drop			0.8		V	$V_{GS} = 0V$, $I_{SD} = 0.5A$
t_{rr}	Reverse Recovery Time			300		ns	$V_{GS} = 0V$, $I_{SD} = 0.5A$

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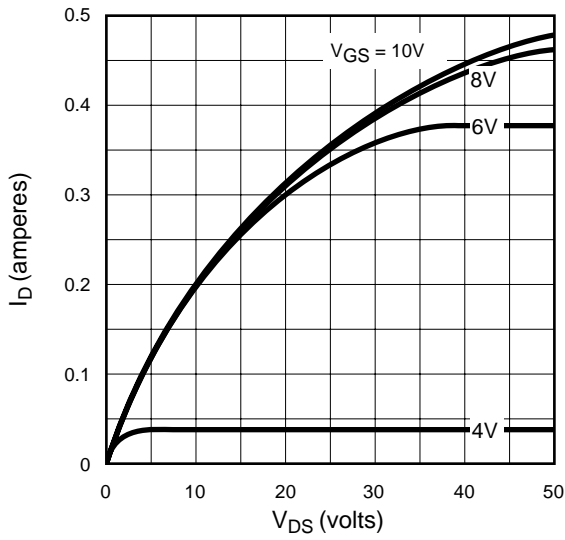1. All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300µs pulse, 2% duty cycle.)
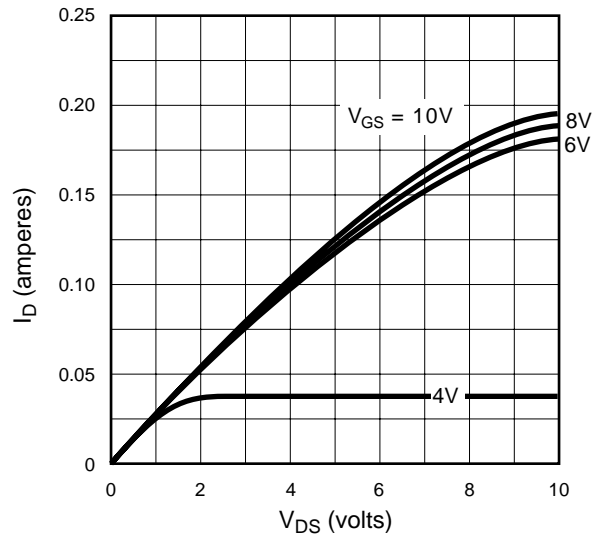2. All A.C. parameters sample tested.

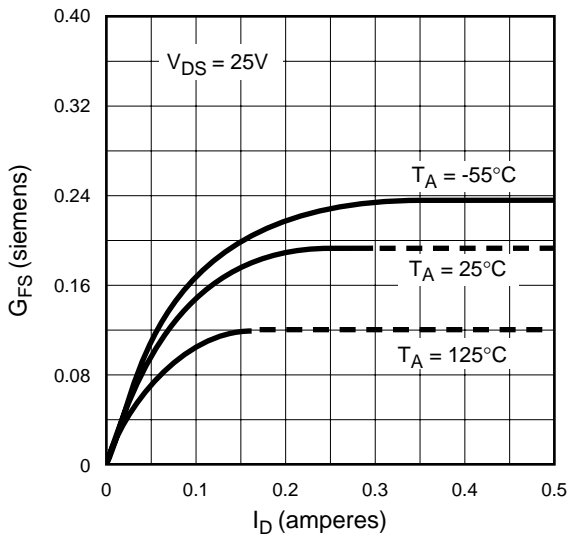# Switching Waveforms and Test Circuit
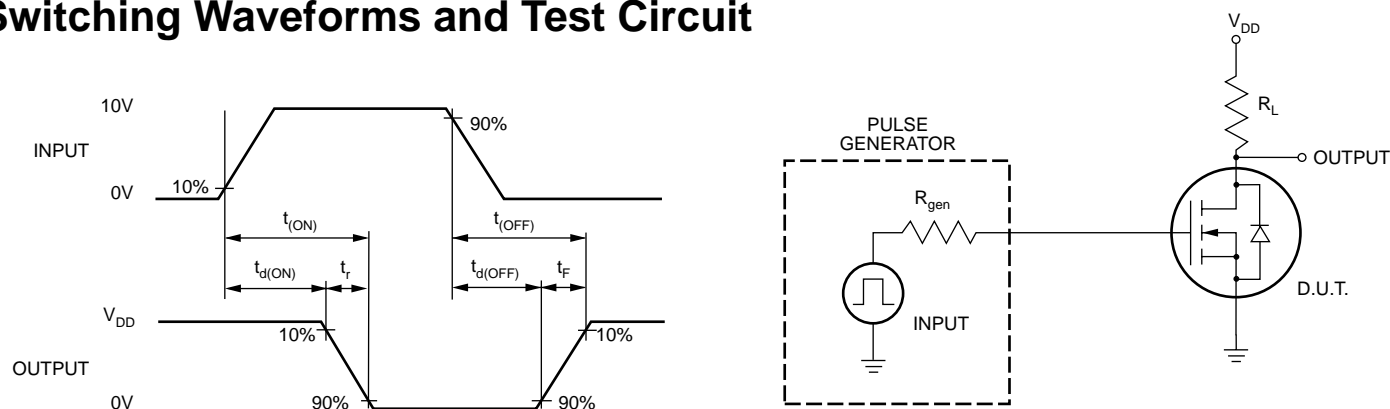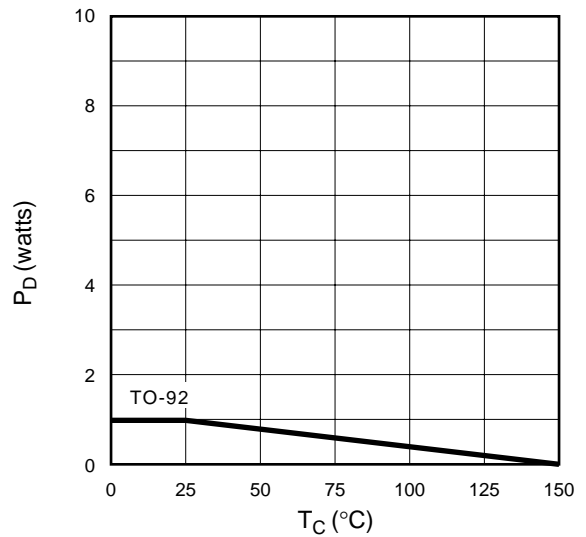
Typical Performance Curves

Output Characteristics

I_D (amperes) vs V_{DS} (volts)

$V_{GS} = 10V$
8V
6V
4V

Saturation Characteristics

I_D (amperes) vs V_{DS} (volts)

$V_{GS} = 10V$
8V
6V
4V

Transconductance vs. Drain Current

G_{FS} (siemens) vs I_D (amperes)

$V_{DS} = 25V$

$T_A = -55°C$
$T_A = 25°C$
$T_A = 125°C$

Power Dissipation vs. Case Temperature

P_D (watts) vs T_C (°C)

TO-92

Maximum Rated Safe Operating Area

I_D (amperes) vs V_{DS} (volts)

TO-92 (DC)

$T_C = 25°C$
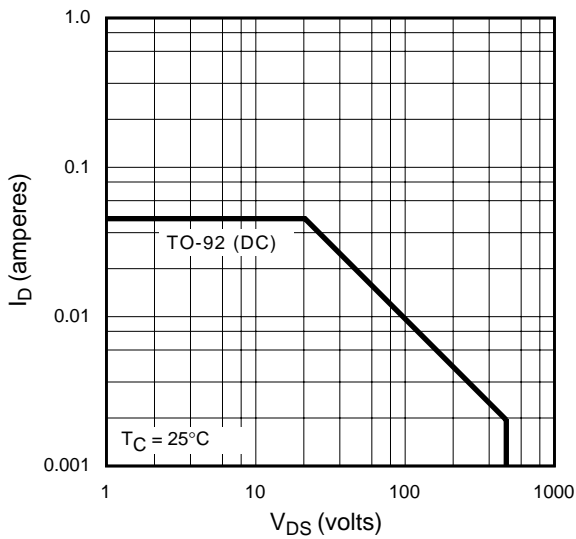
Thermal Response Characteristics

Thermal Resistance (normalized) vs t_p (seconds)
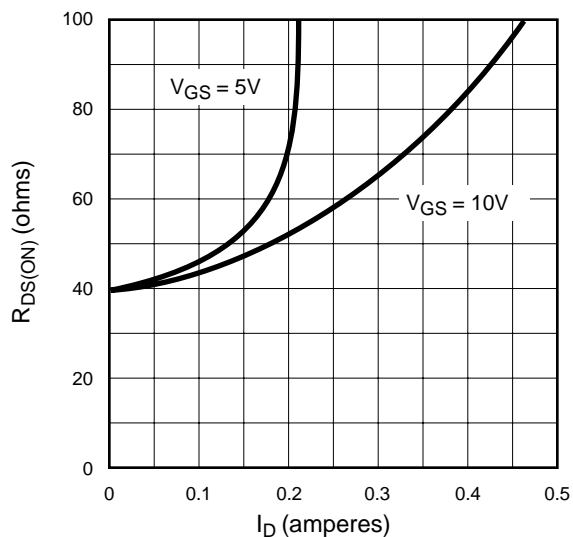
TO-92
$P_D = 1W$
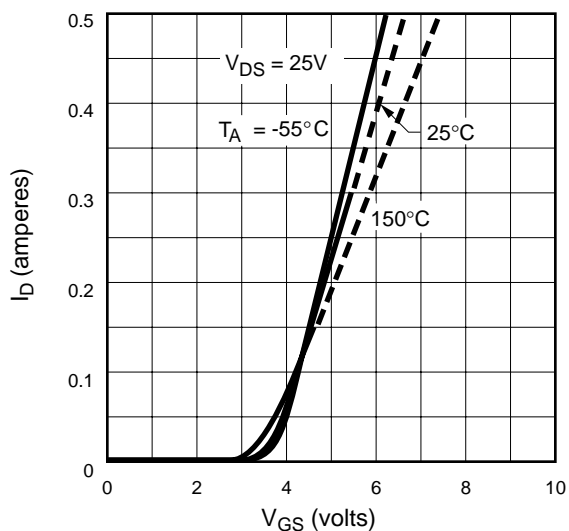$T_C = 25°C$

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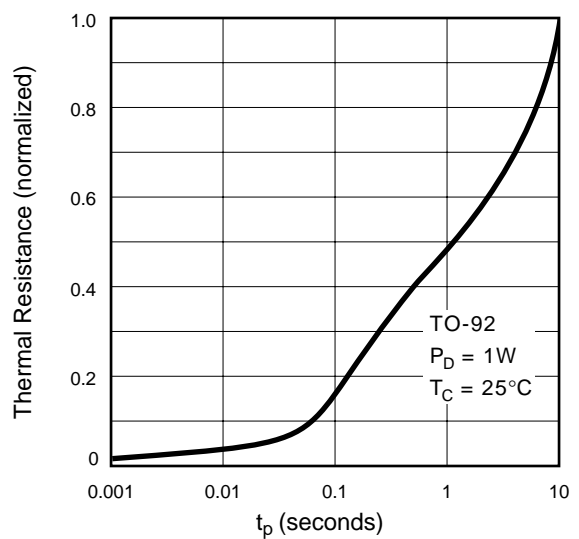
Typical Performance Curves

BV_DSS Variation with Temperature
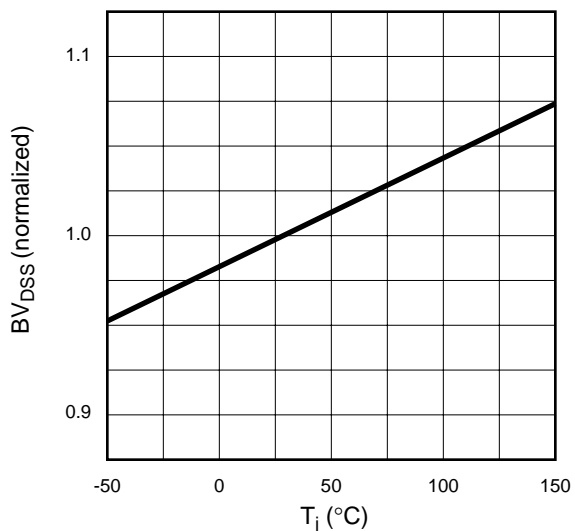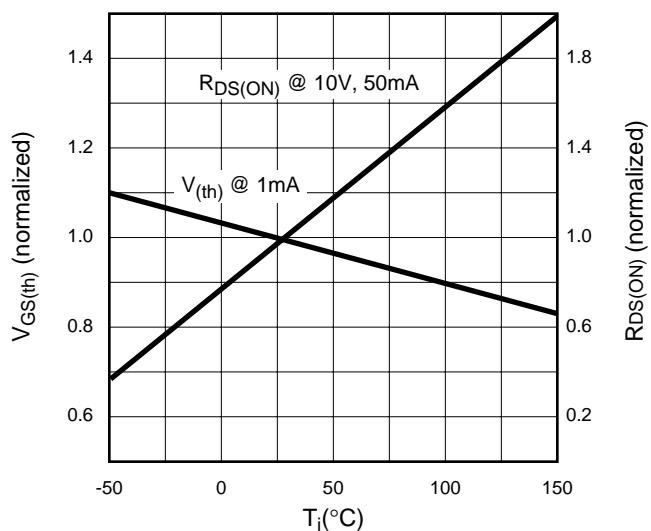

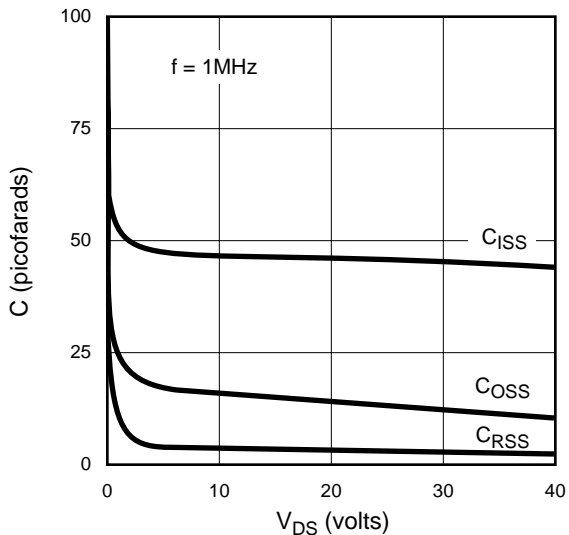### On-Resistance vs. Drain Current

Transfer Characteristics

V_(th) and R_DS Variation with Temperature

Capacitance vs. Drain-to-Source Voltage

Gate Drive Dynamic Characteristics