N-Channel Enhancement-Mode Vertical DMOS FET

Ordering Information

BV$_{DSS}$ / BV$_{DGS}$	R$_{DS(ON)}$ (max)	I$_{D(ON)}$ (min)	Order Number / Package
			TO-92
60V	5.0Ω	75mA	2N7000

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	± 30V
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.
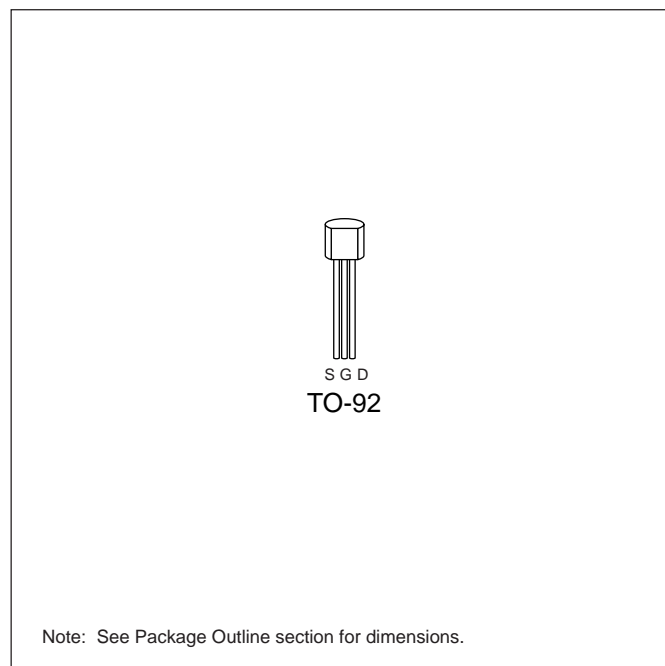
Thermal Characteristics

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	200mA	500mA	1W	125	170	200mA	500mA

* 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	60			V	I_D = 10μA, V_{GS} = 0V
$V_{GS(th)}$	Gate Threshold Voltage	0.8		3.0	V	V_{GS} = V_{DS}, I_D = 1mA
I_{GSS}	Gate Body Leakage			10	nA	V_{GS} = ±15V, V_{DS} = 0V
I_{DSS}	Zero Gate Voltage Drain Current			1	μA	V_{GS} = 0V, V_{DS} = 48V
				1	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
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance			5.0	Ω	V_{GS} = 10V, I_D = 0.5A
G_{FS}	Forward Transconductance	100			m℧	V_{DS} = 10V, I_D = 0.2A
C_{ISS}	Input Capacitance			60		
C_{OSS}	Common Source Output Capacitance			25	pF	V_{GS} = 0V, V_{DS} = 25V f = 1 MHz
C_{RSS}	Reverse Transfer Capacitance			5		
$t_{(ON)}$	Turn-ON Time			10	ns	V_{DD} = 15V, I_D = 0.5A,
$t_{(OFF)}$	Turn-OFF Time			10		R_{GEN} = 25Ω
V_{SD}	Diode Forward Voltage Drop		0.85		V	I_{SD} = 0.2A, V_{GS} = 0V

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.
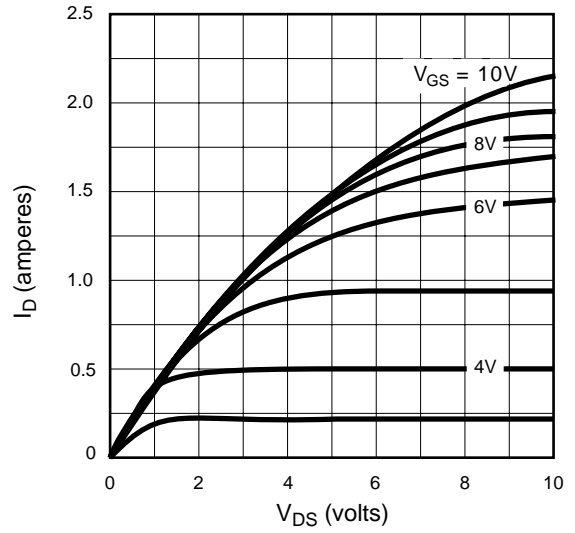
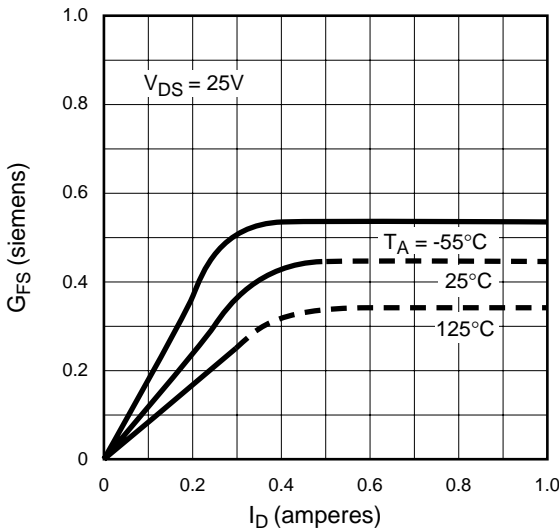# Switching Waveforms and Test Circuit
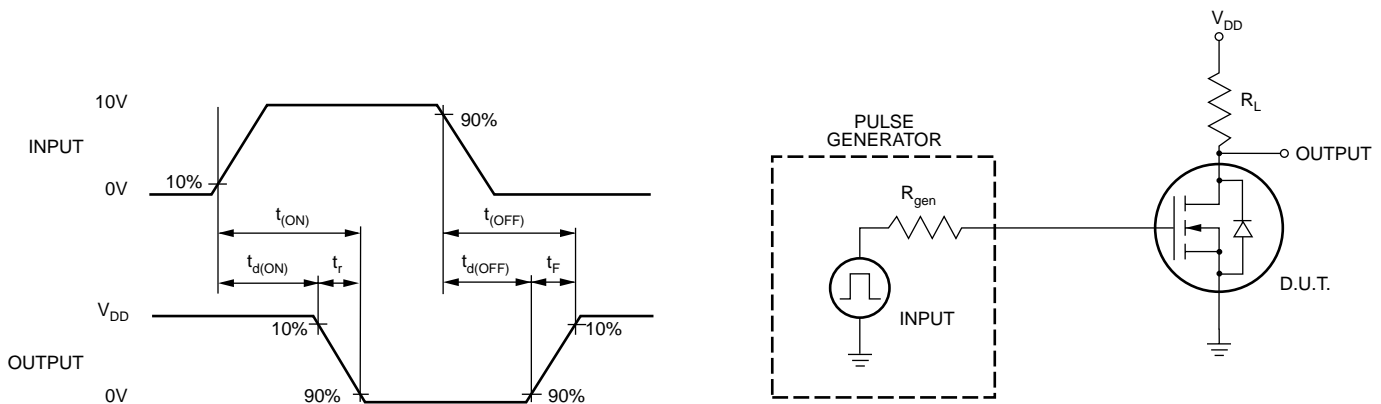
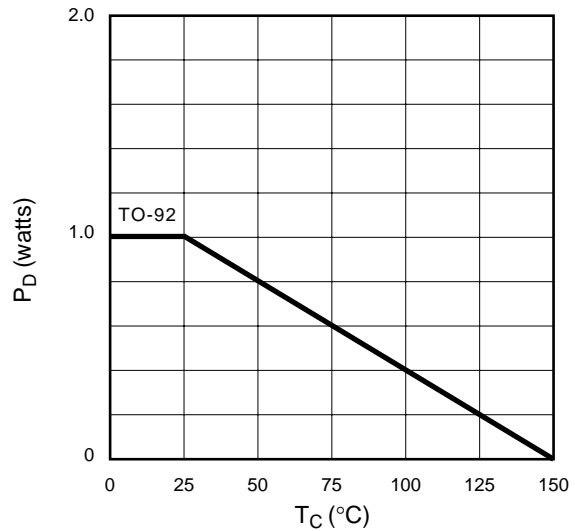# Typical Performance Curves

Output Characteristics
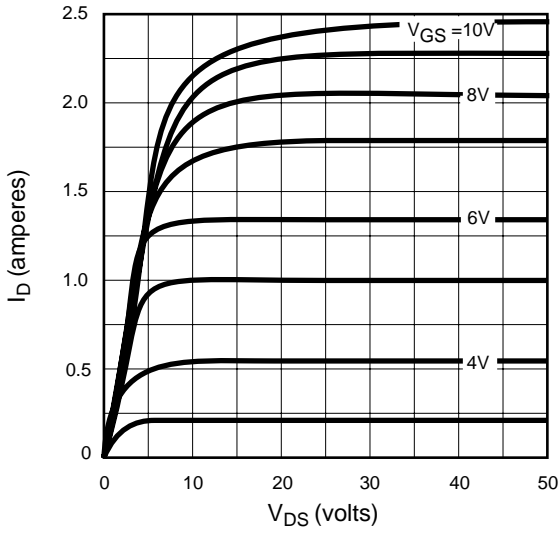
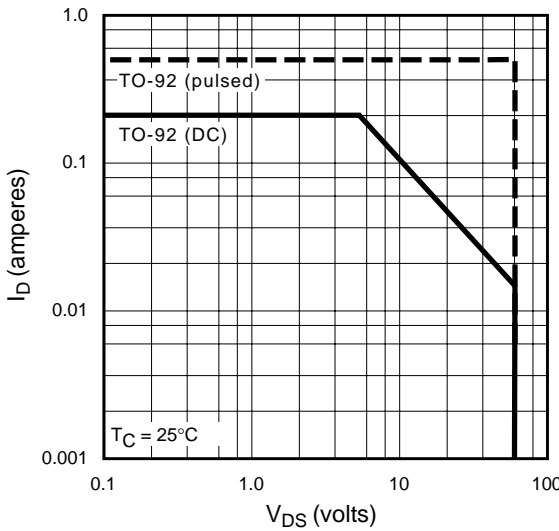### Saturation Characteristics
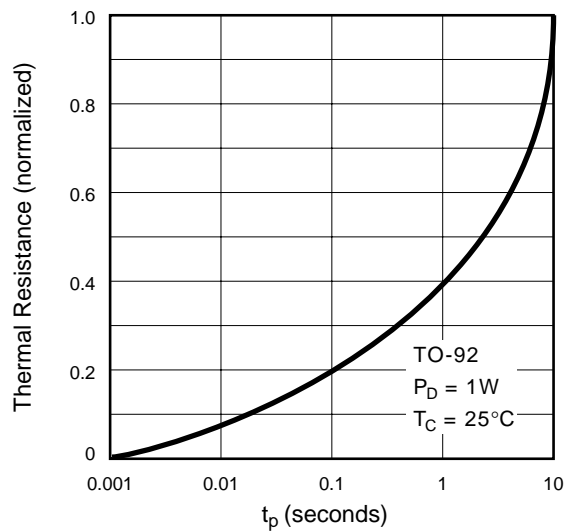

Transconductance vs. Drain Current

Power Dissipation vs. Case Temperature
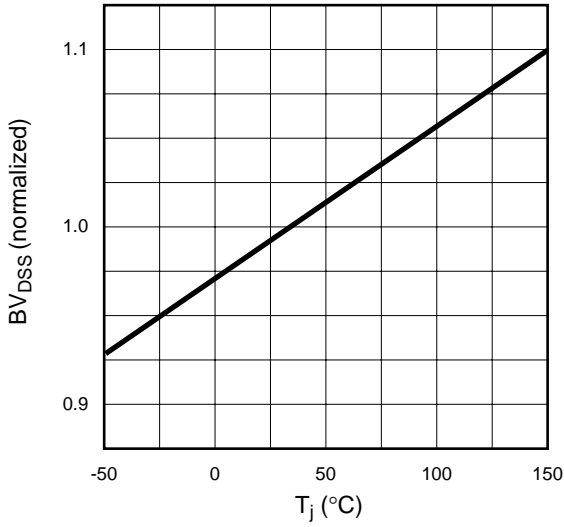

Maximum Rated Safe Operating Area
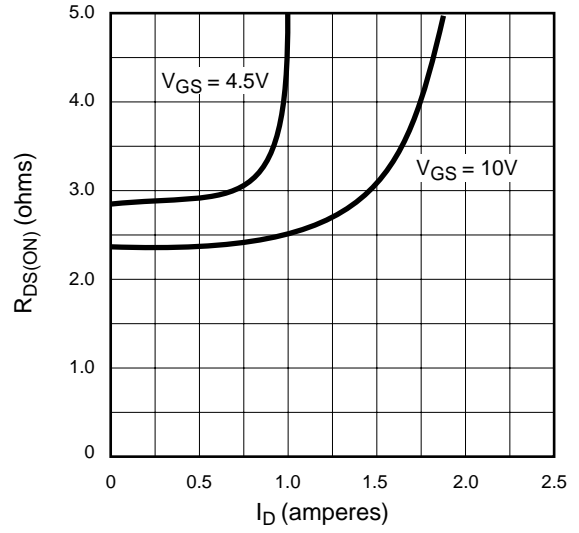

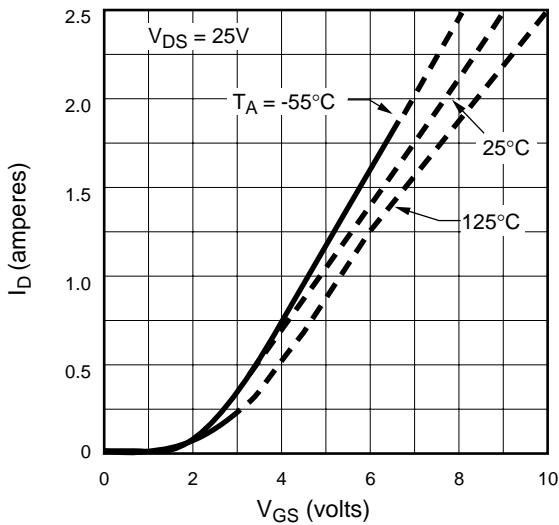### Thermal Response Characteristics

Typical Performance Curves

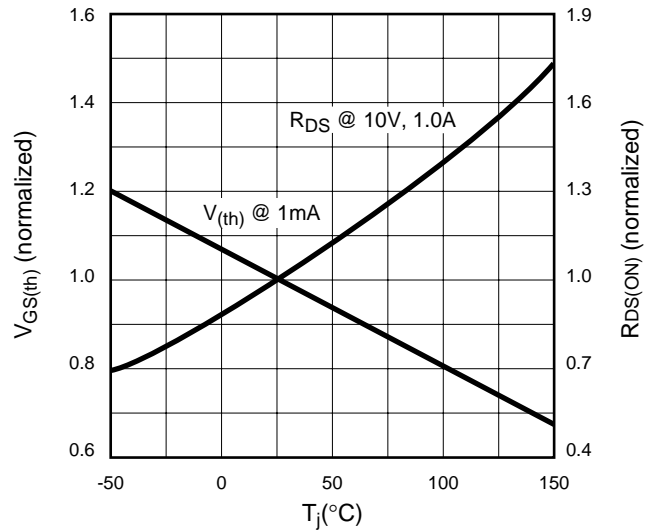### BV$_{DSS}$ Variation with Temperature

On-Resistance vs. Drain Current

Transfer Characteristics

V$_{(th)}$ and R$_{DS}$ Variation with Temperature

Capacitance vs. Drain-to-Source Voltage
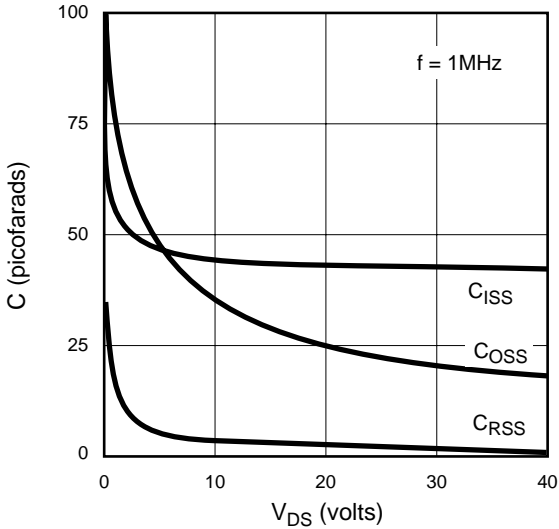
Gate Drive Dynamic Characteristics