Supertex inc.

N-Channel Enhancement-Mode Vertical DMOS Power FETs

Ordering Information

BV_{DSS} / BV_{DGS}	$R_{DS(ON)}$ (max)	$I_{D(ON)}$ (min)	Order Number / Package			
			TO-39	TO-92	TO-220	Dice
550V	20Ω	0.25A	VN0655N2	VN0655N3	VN0655N5	VN0655ND
600V	20Ω	0.25A	VN0660N2	VN0660N3	VN0660N5	VN0660ND

Features

- ☐ Freedom 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

Advanced DMOS Technology

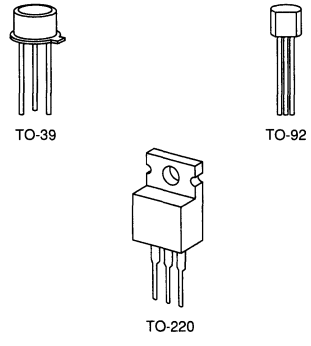
These enhancement-mode (normally-off) power transistors utilize a vertical DMOS structure and Supertex's well-proven silicon-gate manufacturing process. This combination produces devices with the power handling capabilities of bipolar transistors and with the high input impedance and negative temperature coefficient inherent in MOS devices. Characteristic of all MOS structures, these devices are free from thermal runaway and thermally-induced secondary breakdown.

Supertex Vertical DMOS Power 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.

Applications

- ☐ Motor control
- ☐ Converters
- ☐ Amplifiers
- ☐ Switches
- ☐ Power supply circuits
- ☐ Drivers (Relays, Hammers, Solenoids, Lamps, Memories, Displays, Bipolar Transistors, etc.)

Package Options (Note 1)



Note 1: See Package Outline section for discrete pinouts.

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.

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	0.15A	0.5A	1W	125	170	0.15A	0.5A
TO-39	0.35A	1.0A	6W	21	125	0.25A	1.0A
TO-220	0.75A	1.0A	25W	3.1	70	0.6A	1.0A

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

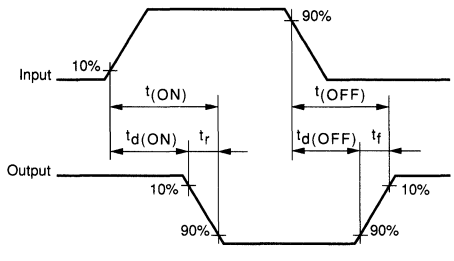
Electrical Characteristics (@ 25°C unless otherwise specified)

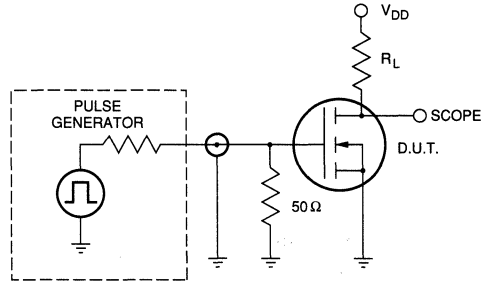
(Notes 1 and 2)

Symbol	Parameter		Min	Typ	Max	Unit	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	VN0655	550			V	V_{GS} = 0, I_D = 2mA
		VN0660	600				
$V_{GS(th)}$	Gate Threshold Voltage		2		4	V	V_{GS} = V_{DS}, I_D = 2mA
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature				-4.5	mV/°C	V_{GS} = V_{DS}, I_D = 2mA
I_{GSS}	Gate Body Leakage				100	nA	V_{GS} = ± 20V, V_{DS} = 0
I_{DSS}	Zero Gate Voltage Drain Current				10	µA	V_{GS} = 0, V_{DS} = Max Rating
					1	mA	V_{GS} = 0, V_{DS} = 0.8 Max Rating, T_A = 125°C
$I_{D(ON)}$	ON-State Drain Current			700		mA	V_{GS} = 5V, V_{DS} = 25V
			250	900			V_{GS} = 10V, V_{DS} = 25V
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance			19		Ω	V_{GS} = 5V, I_D = 100mA
				15	20		V_{GS} = 10V, I_D = 100mA
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature				0.75	%/°C	V_{GS} = 10V, I_D = 100mA
G_{FS}	Forward Transconductance		50			m℧	V_{DS} = 25V, I_D = 100mA
C_{ISS}	Input Capacitance			85	130	pF	V_{GS} = 0, V_{DS} = 25V, f = 1 MHz
C_{OSS}	Common Source Output Capacitance			50	75		
C_{RSS}	Reverse Transfer Capacitance			10	20		
$t_{d(ON)}$	Turn-ON Delay Time				10	ns	V_{DD} = 25V, I_D = 0.1A, R_S = 50Ω
t_r	Rise Time				10		
$t_{d(OFF)}$	Turn-OFF Delay Time				20		
t_f	Fall Time				10		
V_{SD}	Diode Forward Voltage Drop				1.8	V	V_{GS} = 0, I_{SD} = 100mA
t_{rr}	Reverse Recovery Time			300		ns	V_{GS} = 0, I_{SD} = 100mA

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

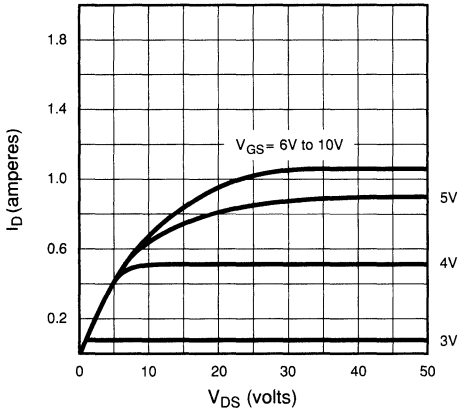
Switching Waveforms and Test Circuit



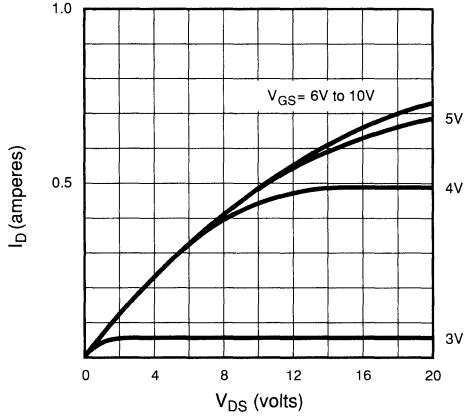


Typical Performance Curves

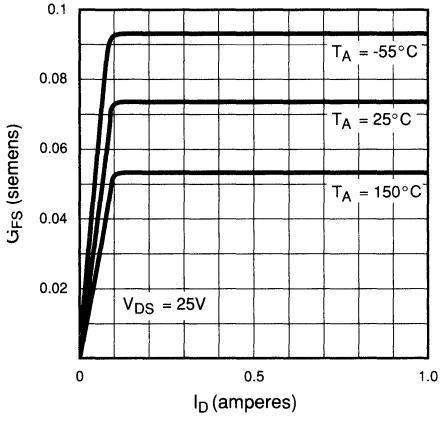
Output Characteristics



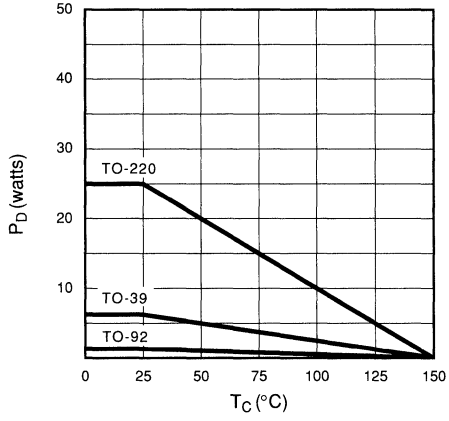
Saturation Characteristics



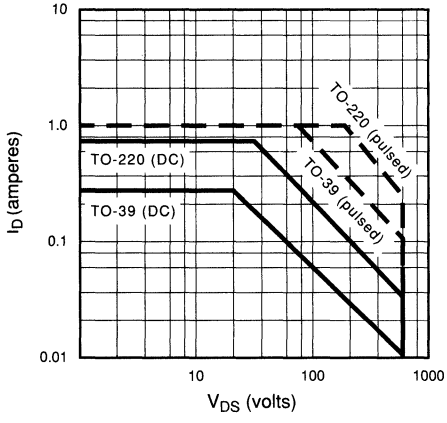
Transconductance vs. Drain Current



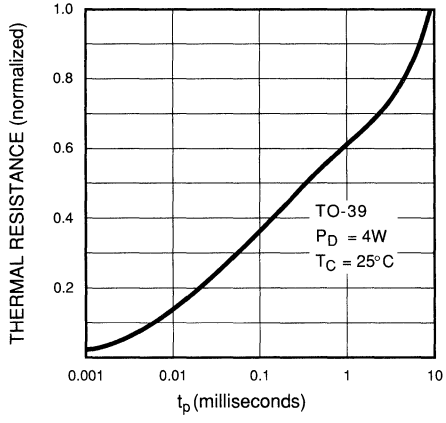
Power Dissipation vs. Case Temperature



Maximum Rated Safe Operating Area



Thermal Response Characteristics



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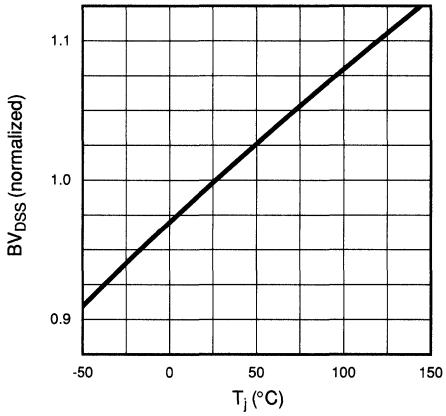
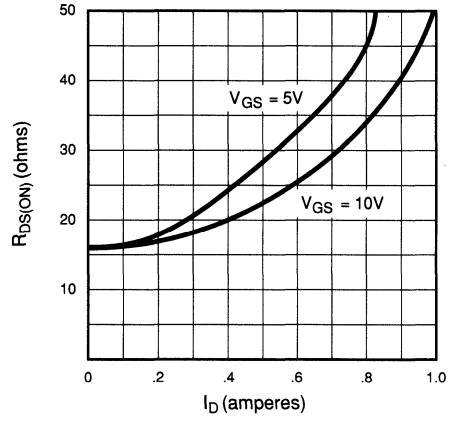
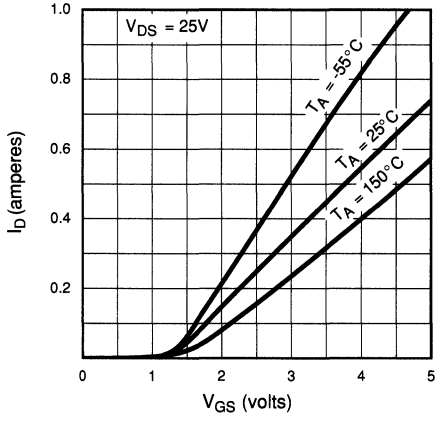
BV$_{DSS}$ Variation with Temperature



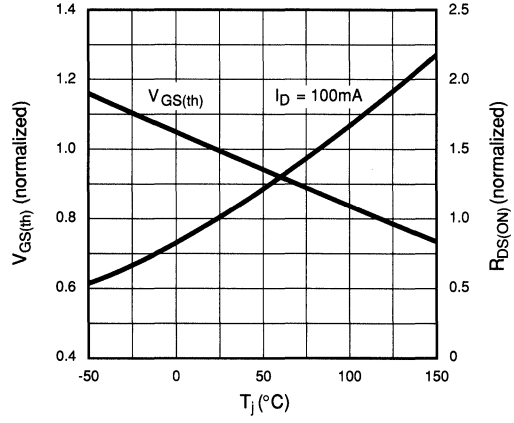
On-Resistance vs. Drain Current



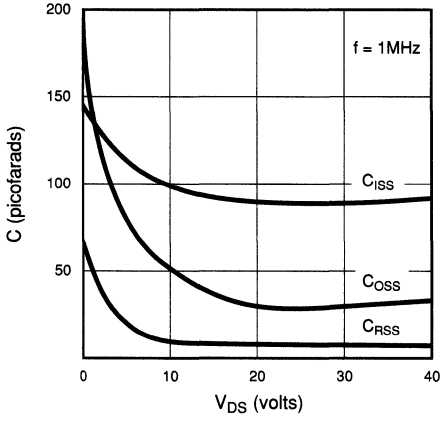
Transfer Characteristics



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



Capacitance vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics