Supertex inc.

VN0104
VN0106

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
40V	3.0Ω	2.0A	VN0104N3
60V	3.0Ω	2.0A	VN0106N3

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

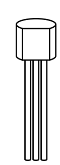
* Distance of 1.6 mm from case for 10 seconds.

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 Option



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TO-92

See Package Outline section for dimensions.

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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	350mA	2.0A	1.0W	125	170	350mA	2.0A

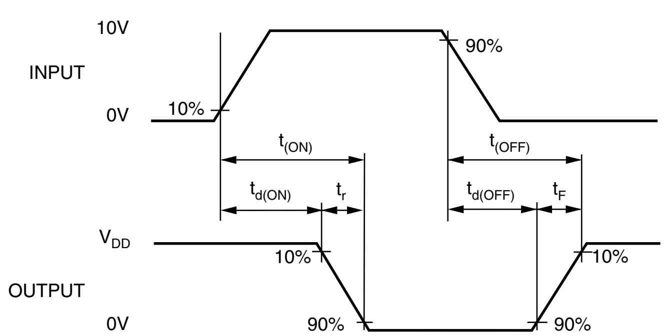
* I_D (continuous) is limited by max rated T_j.

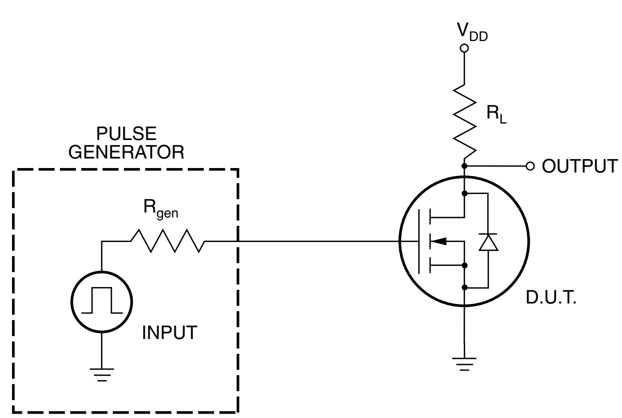
Electrical Characteristics (@ 25°C unless otherwise specified)

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage VN0106	60			V	V_{GS} = 0V, I_D = 1mA
	Drain-to-Source Breakdown Voltage VN0104	40			V	V_{GS} = 0V, I_D = 1mA
$V_{GS(th)}$	Gate Threshold Voltage	0.8		2.4	V	V_{GS} = V_{DS}, I_D = 1mA
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature		-3.8	-5.5	mV/°C	V_{GS} = V_{DS}, I_D = 1mA
I_{GSS}	Gate Body Leakage			100	nA	V_{GS} = ± 20V, V_{DS} = 0V
I_{DSS}	Zero Gate Voltage Drain Current			1	µA	V_{GS} = 0V, V_{DS} = Max Rating
				100	µA	V_{GS} = 0V, V_{DS} = 0.8 Max Rating T_A = 125°C
$I_{D(ON)}$	ON-State Drain Current	0.5	1.0		A	V_{GS} = 5V, V_{DS} = 25V
		2.0	2.5		A	V_{GS} = 10V, V_{DS} = 25V
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance		3.0	5.0	Ω	V_{GS} = 5V, I_D = 250mA
			2.5	3.0	Ω	V_{GS} = 10V, I_D = 1A
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature		0.70	1	%/°C	V_{GS} = 10V, I_D = 1A
G_{FS}	Forward Transconductance	300	450		m℧	V_{DS} = 25V, I_D = 0.5A
C_{ISS}	Input Capacitance		55	65	pF	V_{GS} = 0V, V_{DS} = 25V f = 1 MHz
C_{OSS}	Common Source Output Capacitance		20	25	pF	
C_{RSS}	Reverse Transfer Capacitance		5	8	pF	
$t_{d(ON)}$	Turn-ON Delay Time		3	5	ns	V_{DD} = 25V I_D = 1A R_{GEN} = 25Ω
t_r	Rise Time		5	8	ns	
$t_{d(OFF)}$	Turn-OFF Delay Time		6	9	ns	
t_f	Fall Time		5	8	ns	
V_{SD}	Diode Forward Voltage Drop		1.2	1.8	V	V_{GS} = 0V, I_{SD} =1.0A
t_{rr}	Reverse Recovery Time		400		ns	V_{GS} = 0V, I_{SD} =1.0A

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.

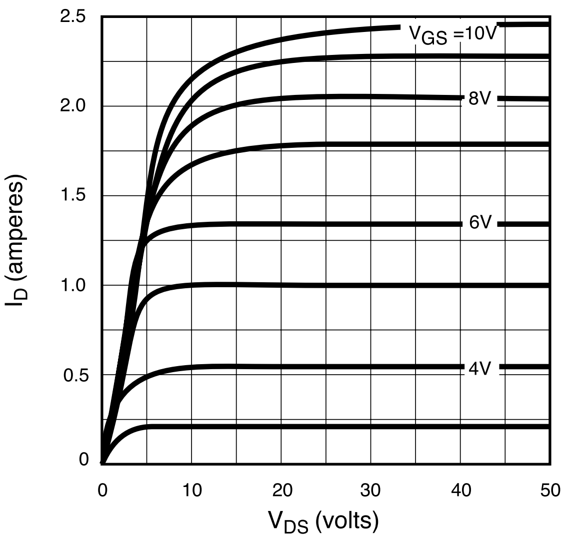
Switching Waveforms and Test Circuit



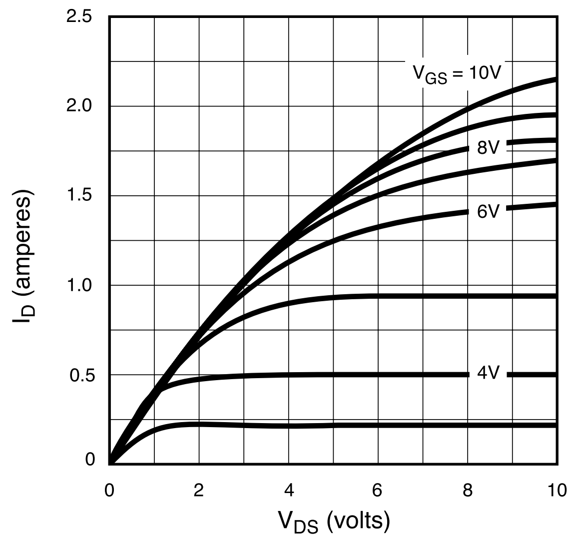


Typical Performance Curves

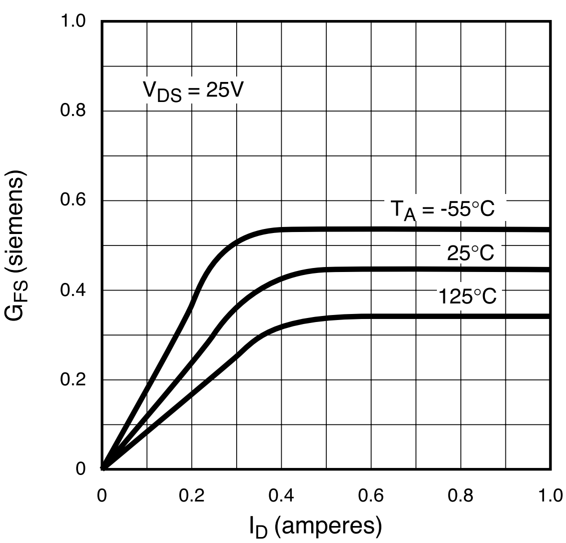
Output Characteristics



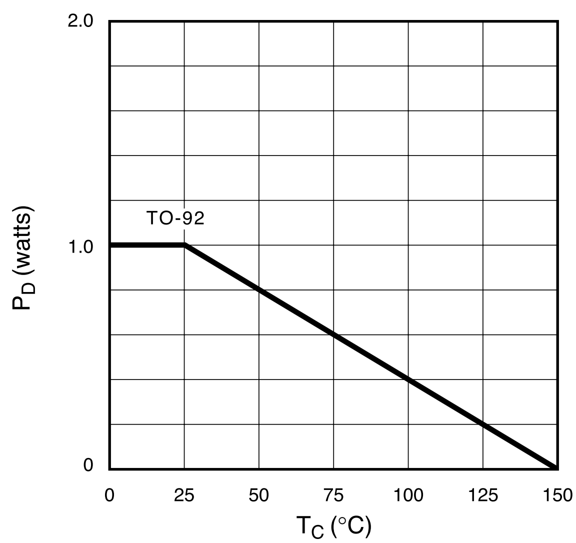
Saturation Characteristics



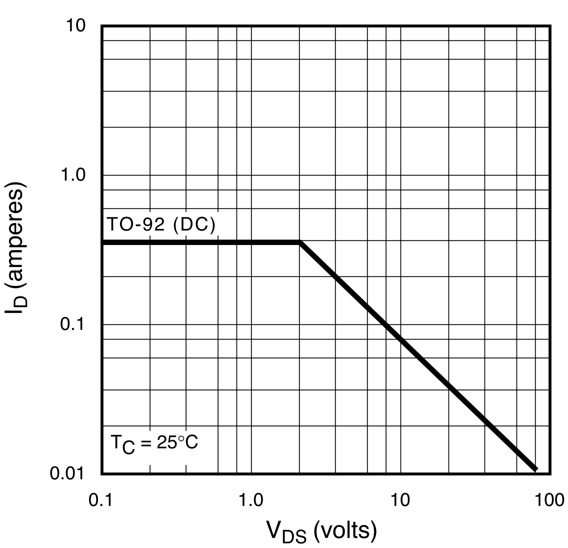
Transconductance vs. Drain Current



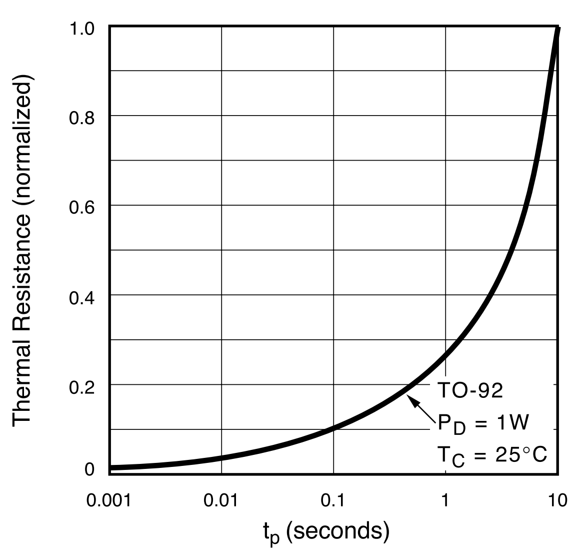
Power Dissipation vs. Case Temperature



Maximum Rated Safe Operating Area

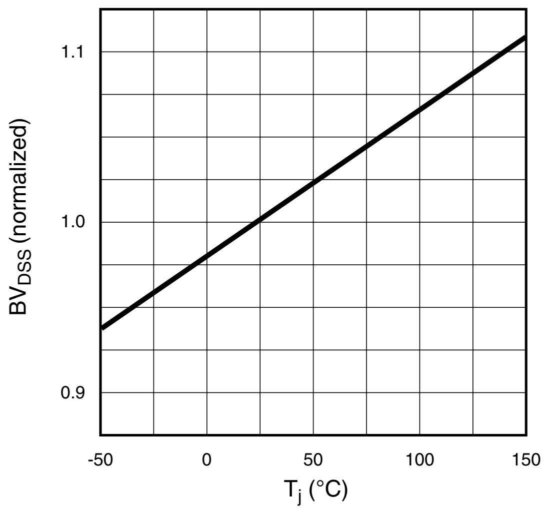


Thermal Response Characteristics

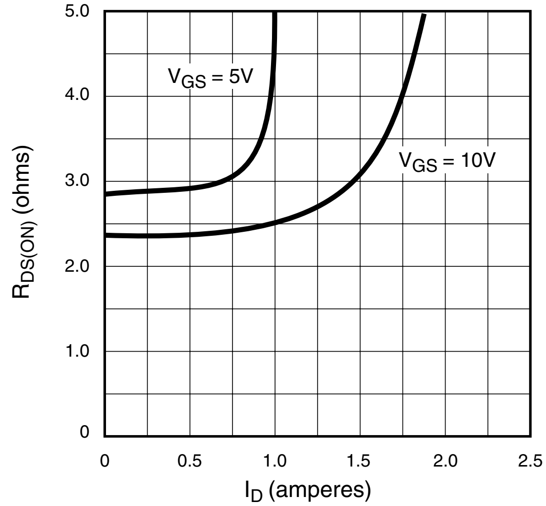


Typical Performance Curves

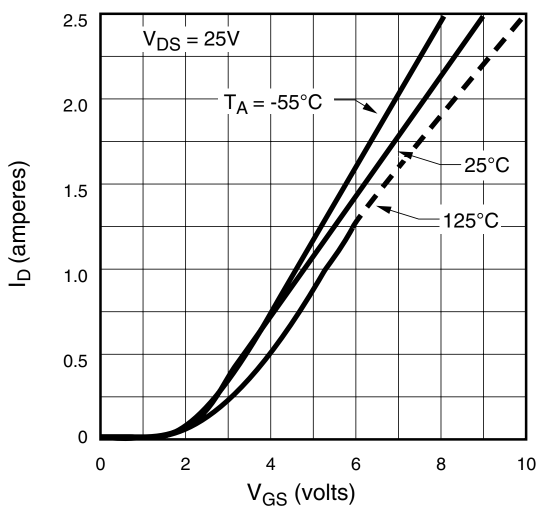
BV_{DSS} Variation with Temperature



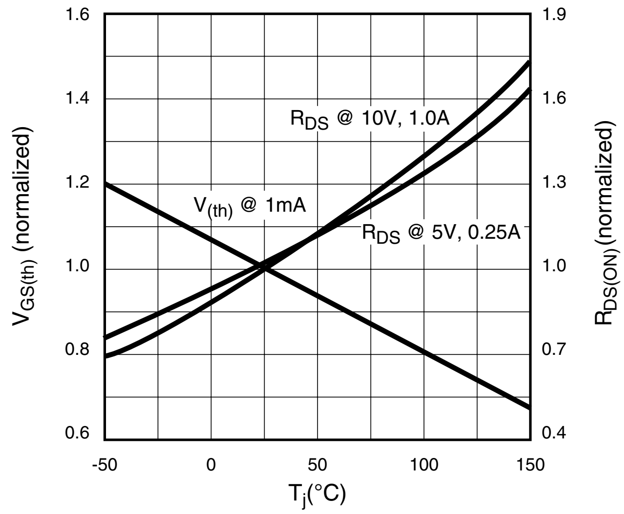
On-Resistance vs. Drain Current



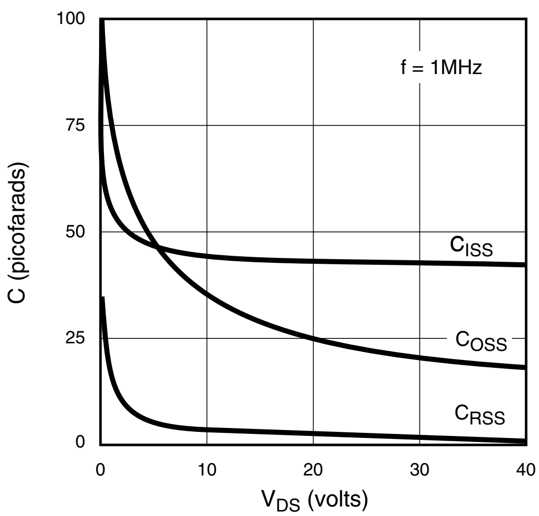
Transfer Characteristics



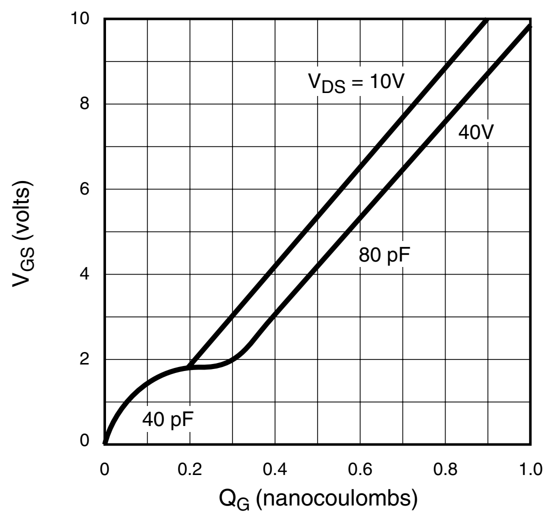
$V_{(th)}$ and R_{DS} Variation with Temperature



Capacitance vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics



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Supertex inc.

1235 Bordeaux Drive, Sunnyvale, CA 94089
TEL: (408) 744-0100 • FAX: (408) 222-4895
www.supertex.com