



P-Channel Enhancement-Mode Vertical DMOS FETs

Ordering Information Standard Commercial Devices

BV _{DSS} / BV _{DGS}	R _{DS(ON)} (max)	I _{D(ON)} (min)	Order Number / Package		
			TO-39	TO-92	DICE†
-40V	0.9Ω	-4A	VP2204N2	VP2204N3	VP2204ND
-60V	0.9Ω	-4A	VP2206N2	VP2206N3	VP2206ND
-100V	0.9Ω	-4A	VP2210N2	VP2210N3	VP2210ND

† MIL visual screening available

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 control
- Converters
- Amplifiers
- Switches
- Power supply circuits
- Driver (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

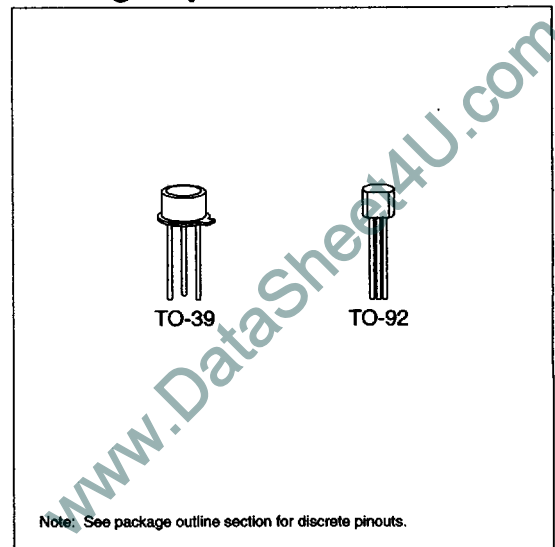
* Distance of 1.6 mm from case for 10 seconds.

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 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



Note: See package outline section for discrete pinouts.

Thermal Characteristics

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Package	I_D (continuous)*	I_D (pulsed)	Power Dissipation @ $T_C = 25^\circ\text{C}$	θ_{JA} $^\circ\text{C/W}$	θ_{JC} $^\circ\text{C/W}$	I_{DR}^*	I_{DRM}
TO-39	-1.6A	-8.0A	6.0W	125	20	-1.6A	-8.0A
TO-92	-0.65A	-4.0A	1.0W	170	125	-0.65A	-4.0A

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

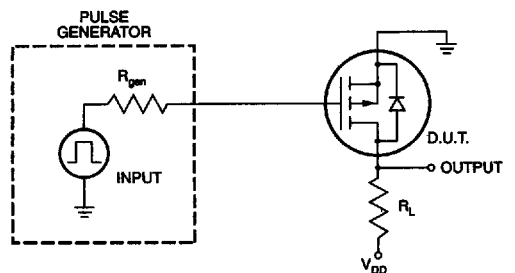
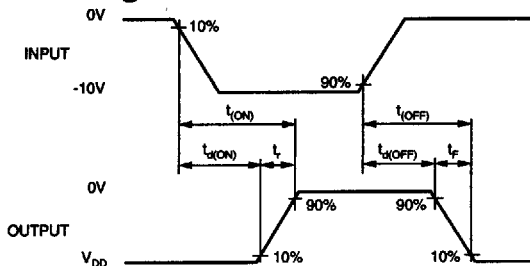
Electrical Characteristics (@ 25°C unless otherwise specified)

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	VP2204	-40		V	$V_{GS} = 0V, I_D = -10mA$
		VP2206	-60			
		VP2210	-100			
$V_{GS(th)}$	Gate Threshold Voltage	-1.0		-3.5	V	$V_{GS} = V_{DS}, I_D = -10mA$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature		-4.3	-5.5	mV/ $^\circ\text{C}$	$V_{GS} = V_{DS}, I_D = -10mA$
I_{GSS}	Gate Body Leakage		-1	-100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
I_{DSS}	Zero Gate Voltage Drain Current			-50	μA	$V_{GS} = 0V, V_{DS} = \text{Max Rating}$
				-10	mA	$V_{GS} = 0V, V_{DS} = 0.8 \text{ Max Rating}$ $T_A = 125^\circ\text{C}$
$I_{D(ON)}$	ON-State Drain Current	-1.5	-2		A	$V_{GS} = -5V, V_{DS} = -25V$
		-4	-9			$V_{GS} = -10V, V_{DS} = -25V$
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance		1.3	1.5	Ω	$V_{GS} = -5V, I_D = -1A$
			0.75	0.9		$V_{GS} = -10V, I_D = -3.5A$
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature		0.85	1.2	$\% / ^\circ\text{C}$	$V_{GS} = -10V, I_D = -3.5A$
G_{FS}	Forward Transconductance	0.8	1.4		S	$V_{DS} = -25V, I_D = -2A$
C_{ISS}	Input Capacitance		325	450	pF	$V_{GS} = 0V, V_{DS} = -25V$ $f = 1 \text{ MHz}$
C_{OSS}	Common Source Output Capacitance		125	180		
C_{RSS}	Reverse Transfer Capacitance		30	40		
$t_{d(ON)}$	Turn-ON Delay Time		4	10	ns	$V_{DD} = -25V$ $I_D = -4A$ $R_{GEN} = 10\Omega$
t_r	Rise Time		16	30		
$t_{d(OFF)}$	Turn-OFF Delay Time		16	30		
t_f	Fall Time		22	40		
V_{SD}	Diode Forward Voltage Drop	-1.1	-1.6			
t_{rr}	Reverse Recovery Time		500		ns	$V_{GS} = 0V, I_{SD} = -1A$

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

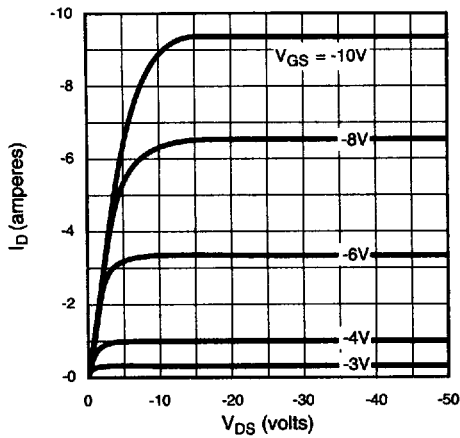
Note 2: All A.C. parameters sample tested.

Switching Waveforms and Test Circuit

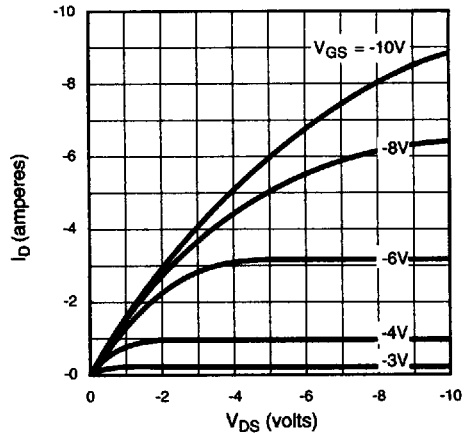


Typical Performance Curves

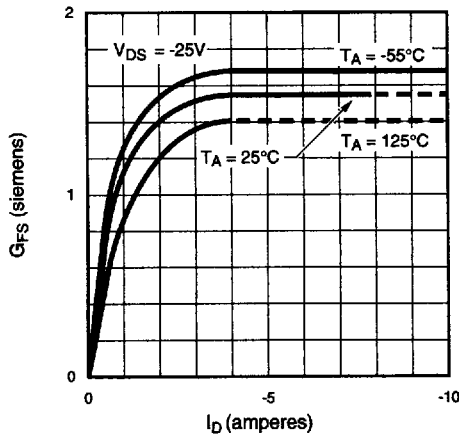
Output Characteristics



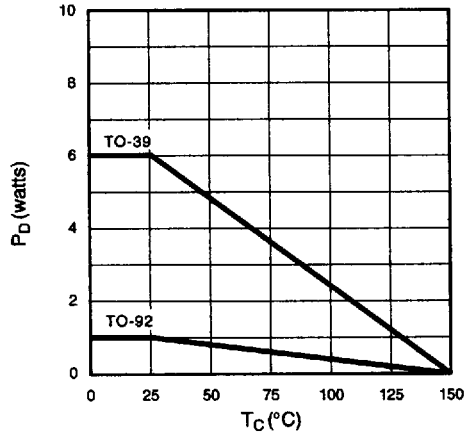
Saturation Characteristics



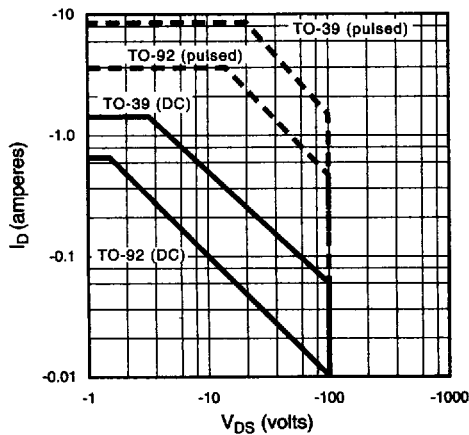
Transconductance vs. Drain Current



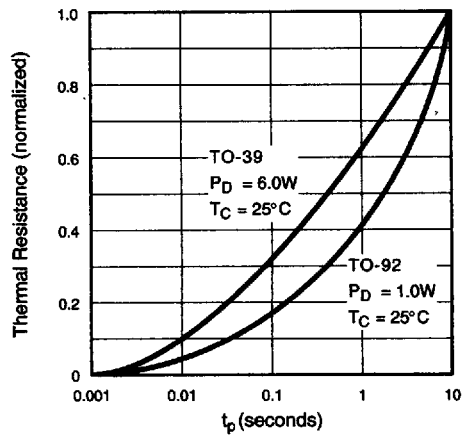
Power Dissipation vs. Case Temperature



Maximum Rated Safe Operating Area

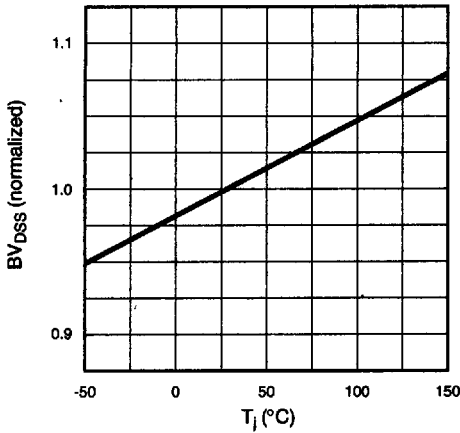


Thermal Response Characteristics

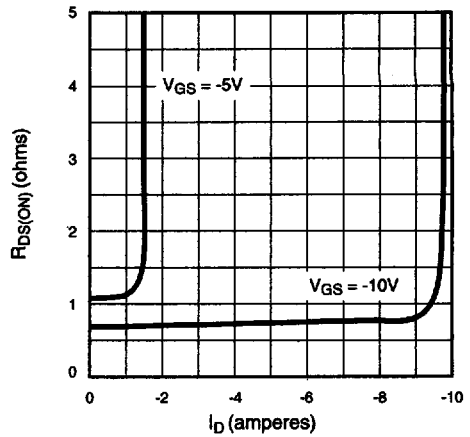


Typical Performance Curves

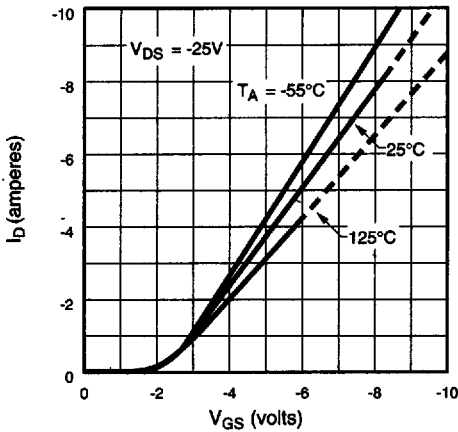
BV_{DSS} Variation with Temperature



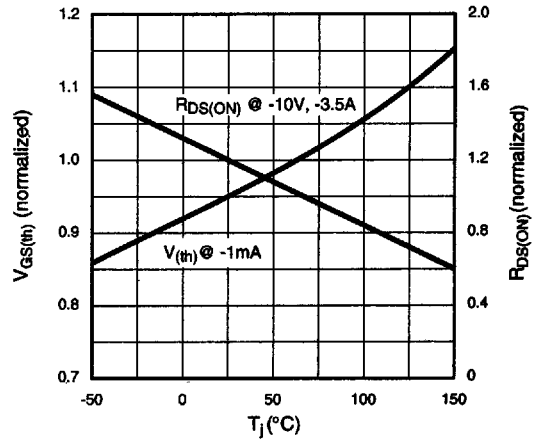
On-Resistance vs. Drain Current



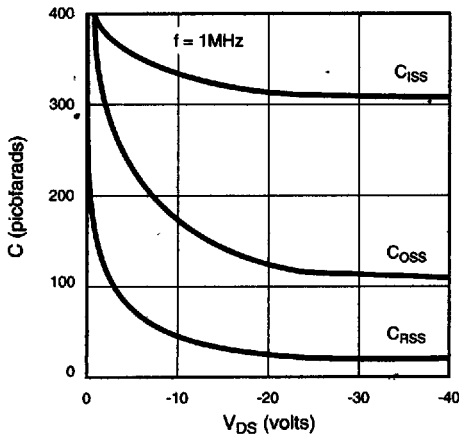
Transfer Characteristics



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



Capacitance vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics

