



Preliminary

**N-Channel Enhancement-Mode Vertical DMOS Power FETs**

**Ordering Information**

BV <sub>DSS</sub> / BV <sub>DGS</sub>	R <sub>DS(ON)</sub> (max)	I <sub>D(ON)</sub> (min)	Order Number / Package	
			TO-39	TO-92
60V	0.18Ω	12.0A	IRF531	R531

**Features**

- Freedom from secondary breakdown
- Low power drive requirement
- Ease of paralleling
- Low C<sub>ISS</sub> and fast switching speeds
- Excellent thermal stability
- Integral Source-Drain diode
- High input impedance and high gain

**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**

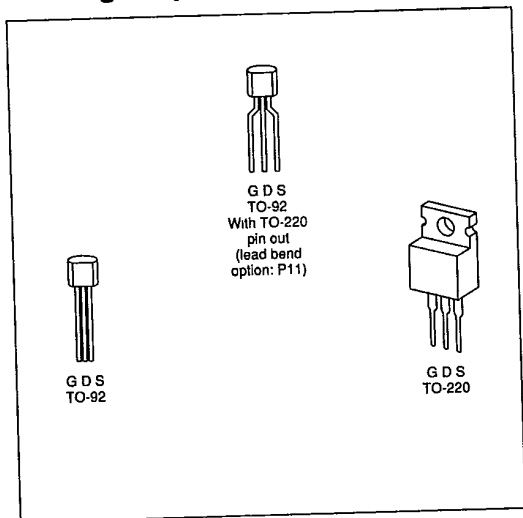
- Motor control
- Converters
- Amplifiers
- Switches
- Power supply circuits
- Drivers (Relays, Hammers, Solenoids, Lamps, Memories, Displays, Bipolar Transistors, etc.)

**Absolute Maximum Ratings**

Drain-to-Source Voltage	BV <sub>DSS</sub>
Drain-to-Gate Voltage	BV <sub>DGS</sub>
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.

**Package Options**



**Thermal Characteristics**

*T-35-25*

Package	$I_D$ (continuous)*	$I_D$ (pulsed)*	Power Dissipation @ $T_C = 25^\circ\text{C}$	$\theta_{JC}$ °C/W	$\theta_{JA}$ °C/W	$I_{DR}$	$I_{DRM}^*$
IRF531	14.0A	56.0A	75W	80	3.12	14.0A	56.0A
R531	1.5A	15.0A	1W	170	125	1.5A	15.0A

\* $I_D$  (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	60			V	$V_{GS} = 0, I_D = 250\mu\text{A}$
$V_{GS(th)}$	Gate Threshold Voltage	2.0		4.0	V	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$
$I_{GSS}$	Gate Body Leakage			500	nA	$V_{GS} = \pm 20V, V_{DS} = 0$
$I_{DSS}$	Zero Gate Voltage Drain Current			250	$\mu\text{A}$	$V_{GS} = 0, V_{DS} = \text{Max Rating}$
				1000		$V_{GS} = 0, V_{DS} = 0.8 \text{ Max Rating}$ $T_A = 125^\circ\text{C}$
$I_{D(ON)}$	ON-State Drain Current	12.0			A	$V_{GS} = 10V$ $V_{DS} > I_{D(ON)} \times R_{DS(ON)} \text{ Max Rating}$
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance			0.18	$\Omega$	$V_{GS} = 10V, I_D = 8.0A$
$G_{FS}$	Forward Transconductance	4.0			$\text{S}$	$V_{DS} > I_{D(ON)} \times R_{DS(ON)} \text{ Max Rating}$ $I_D = 8.0A$
$C_{ISS}$	Input Capacitance			800	$\text{pF}$	$V_{GS} = 0V, V_{DS} = 25V$ $f = 1 \text{ MHz}$
$C_{OSS}$	Common Source Output Capacitance			500		
$C_{RSS}$	Reverse Transfer Capacitance			150		
$t_{d(ON)}$	Turn-ON Delay Time			30	ns	$V_{DD} = 0.5BV_{DSS}$ $I_D = 4.0A$ $V_{DS} = 0.8 \text{ Max Rating}$
$t_r$	Rise Time			75		
$t_{d(OFF)}$	Turn-OFF Delay Time			40		
$t_f$	Fall Time			45		
$V_{SD}$	Diode Forward Voltage Drop			2.5 2.3		
$t_{rr}$	Reverse Recovery Time		360		ns	$T_J = 150^\circ\text{C}, I_F = 8.0A,$ $di_{F/dt} = 100A/\mu\text{S}$

Note 1: All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300 $\mu\text{s}$  pulse, 2% duty cycle.)

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

**Switching Waveforms and Test Circuit**

