



T-39.09

**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-220
100V	0.6Ω	4.0A	IRF510
60V	0.6Ω	4.0A	IRF511
100V	0.8Ω	3.5A	IRF512
60V	0.8Ω	3.5A	IRF513

**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
- 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.

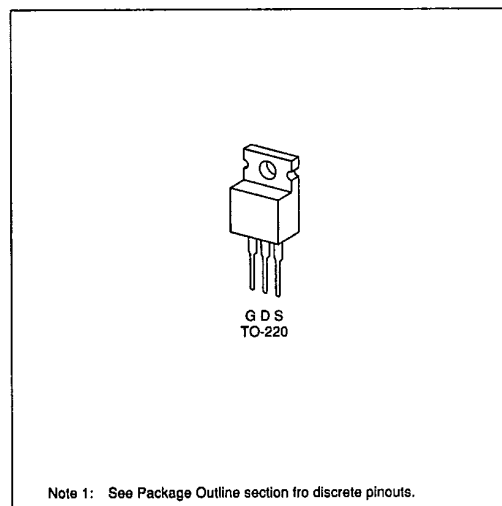
Supertex Vertical DMOS Power FETs are ideally suited to a wide range of switching and amplifying applications where high breakdown voltage, high input impedance, low input capacitance, and fast switching speeds are desired.

**Applications**

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

**Package Options**

(Note 1)



**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.

**Thermal Characteristics**

T-39-09

Package	$I_D$ (continuous)*	$I_D$ (pulsed)*	Power Dissipation @ $T_C = 25^\circ\text{C}$	$\theta_{JC}$ °C/W	$\theta_{JA}$ °C/W	$I_{DR}$	$I_{DRM}$ *
IRF510	4.0A	16.0A	20W	80	6.4	4.0A	16.0A
IRF511	4.0A	16.0A	20W	80	6.4	4.0A	16.0A
IRF512	3.5A	14.0A	20W	80	6.4	3.5A	14.0A
IRF513	3.5A	14.0A	20W	80	6.4	3.5A	14.0A

\* $I_D$  (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	IRF510, IRF512 100			V	$V_{GS} = 0, I_D = 250\mu\text{A}$
		IRF511, IRF513 60				
$V_{GS(th)}$	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	$V_{GS} = \pm 20\text{V}, V_{DS} = 0$
$I_{DSS}$	Zero Gate Voltage Drain Current			250	$\mu\text{A}$	$V_{GS} = 0, V_{DS} = \text{Max Rating}$
				1000		$V_{GS} = 0, V_{DS} = 0.8 \text{ Max Rating}$ $T_C = 125^\circ\text{C}$
$I_{D(ON)}$	ON-State Drain Current	IRF510, IRF511	4.0		A	$V_{GS} = 10\text{V}$
		IRF512, IRF513	3.5			$V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max Rating
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance	IRF510, IRF511		0.6	$\Omega$	$V_{GS} = 10\text{V}, I_D = 2.0\text{A}$
		IRF512, IRF513		0.8		
$G_{FS}$	Forward Transconductance	1.0	1.5		$\text{S}$	$V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max Rating $I_D = 2.0\text{A}$
$C_{ISS}$	Input Capacitance			150	pF	$V_{GS} = 0, V_{DS} = 25\text{V}$ $f = 1 \text{ MHz}$
$C_{OSS}$	Common Source Output Capacitance			100		
$C_{RSS}$	Reverse Transfer Capacitance			25		
$t_{d(ON)}$	Turn-ON Delay Time			20	ns	$V_{DD} = 0.5BV_{DSS}$ $I_D = 2.0\text{A}$ $R_S = 50\Omega$
$t_r$	Rise Time			25		
$t_{d(OFF)}$	Turn-OFF Delay Time			25		
$t_f$	Fall Time			20		
$V_{SD}$	Diode Forward Voltage Drop	IRF510, IRF511 IRF512, IRF513		2.5 2.0		
$t_{rr}$	Reverse Recovery Time		230		ns	$T_J = 150^\circ\text{C}, I_{SD} = 4.0\text{A},$ $di_{F/dt} = 100\text{A}/\mu\text{S}$

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**

