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Supertex inc.

IRF510 IRF511 IRF512 IRF513

T-39-09

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-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_{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.

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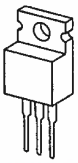
Applications

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

Package Options (Note 1)



G D S
TO-220

Note 1: See Package Outline section fro 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.

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T-39-09

Thermal Characteristics

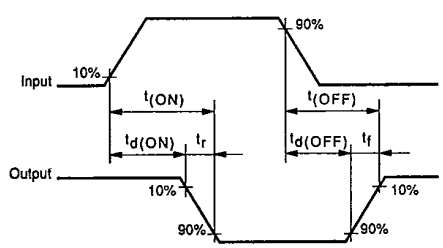
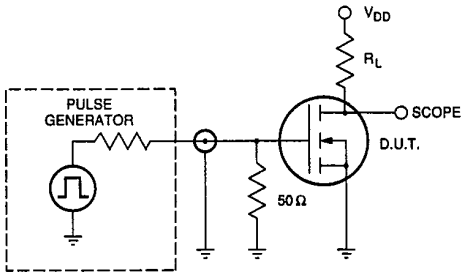
Package	I_D (continuous)*	I_D (pulsed)*	Power Dissipation @ T_C = 25°C	θ_{jc} °C/W	θ_{ja} °C/W	I_{DR}	I_{DRM}*
IRF510	4.0A	16.0A	20W	80	6.4	4.0A	16.0A
IRF511	4.0A	16.0A	20W	80	6.4	4.0A	16.0A
IRF512	3.5A	14.0A	20W	80	6.4	3.5A	14.0A
IRF513	3.5A	14.0A	20W	80	6.4	3.5A	14.0A

*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 = 250µA
		IRF511, IRF513	60				
$V_{GS(th)}$	Gate Threshold Voltage		2.0		4.0	V	V_{GS} = V_{DS}, I_D = 250µA
I_{GSS}	Gate Body Leakage				500	nA	V_{GS} = ± 20V, V_{DS} = 0
I_{DSS}	Zero Gate Voltage Drain Current				250	µA	V_{GS} = 0, V_{DS} = Max Rating
					1000		V_{GS} = 0, V_{DS} = 0.8 Max Rating T_C = 125°C
$I_{D(ON)}$	ON-State Drain Current	IRF510, IRF511	4.0			A	V_{GS} = 10V V_{DS} > $I_{D(ON)}$ x $R_{DS(ON)}$ Max Rating
		IRF512, IRF513	3.5				
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance	IRF510, IRF511			0.6	Ω	V_{GS} = 10V, I_D = 2.0A
		IRF512, IRF513			0.8		
G_{FS}	Forward Transconductance		1.0	1.5		℧	V_{DS} > $I_{D(ON)}$ x $R_{DS(ON)}$ Max Rating I_D = 2.0A
C_{ISS}	Input Capacitance				150	pF	V_{GS} = 0, V_{DS} = 25V f = 1 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 = 2.0A R_S = 50Ω
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			2.5	V	V_{GS} = 0, I_{SD} = 4.0A
		IRF512,IRF513			2.0		V_{GS} = 0, I_{SD} = 3.5A
t_{rr}	Reverse Recovery Time			230		ns	T_j = 150°C, I_{SD} = 4.0A, $dI_{F/dt}$ = 100A/µS

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