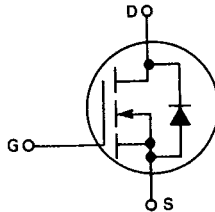


**IRF530**  
**IRF531**  
**IRF532**  
**IRF533**

**N-CHANNEL ENHANCEMENT-MODE SILICON GATE  
 TMOS POWER FIELD EFFECT TRANSISTOR**

These TMOS Power FETs are designed for low voltage, high speed power switching applications such as switching regulators, converters, solenoid and relay drivers.

- Silicon Gate for Fast Switching Speeds
- Rugged — SOA is Power Dissipation Limited
- Source-to-Drain Diode Characterized for Use With Inductive Loads



**MAXIMUM RATINGS**

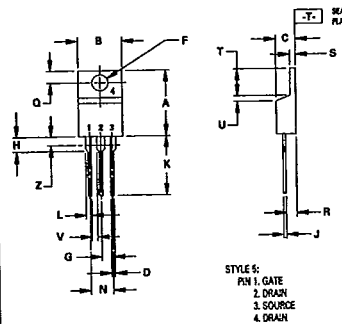
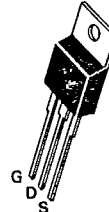
| Rating                                                                                   | Symbol         | IRF        |     |     |     | Unit          |
|------------------------------------------------------------------------------------------|----------------|------------|-----|-----|-----|---------------|
|                                                                                          |                | 530        | 531 | 532 | 533 |               |
| Drain-Source Voltage                                                                     | $V_{DS}$       | 100        | 60  | 100 | 60  | Vdc           |
| Drain-Gate Voltage<br>( $R_{GS} = 1.0 \text{ M}\Omega$ )                                 | $V_{DGR}$      | 100        | 60  | 100 | 60  | Vdc           |
| Gate-Source Voltage                                                                      | $V_{GS}$       | $\pm 20$   |     |     |     | Vdc           |
| Continuous Drain Current $T_C = 25^\circ\text{C}$                                        | $I_D$          | 14         | 14  | 12  | 12  | Adc           |
| Continuous Drain Current $T_C = 100^\circ\text{C}$                                       | $I_D$          | 9.0        | 9.0 | 8.0 | 8.0 | Adc           |
| Drain Current — Pulsed                                                                   | $I_{DM}$       | 56         | 56  | 48  | 48  | Adc           |
| Total Power<br>Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 75<br>0.6  |     |     |     | Watts<br>W/°C |
| Operating and Storage<br>Temperature Range                                               | $T_J, T_{stg}$ | -55 to 150 |     |     |     | °C            |

**THERMAL CHARACTERISTICS**

|                                                                            |                 |      |      |
|----------------------------------------------------------------------------|-----------------|------|------|
| Thermal Resistance<br>Junction to Case                                     | $R_{\theta JC}$ | 1.67 | °C/W |
| Junction to Ambient                                                        | $R_{\theta JA}$ | 62.5 | °C/W |
| Maximum Lead Temp. for Soldering<br>Purposes, 1/8" from case for 5 seconds | $T_L$           | 300  | °C   |

See the MTM12N10 Designer's Data Sheet for a complete set of design curves for this product.

| Part Number | $V_{DS}$ | $r_{DS(on)}$  | $I_D$ |
|-------------|----------|---------------|-------|
| IRF530      | 100 V    | 0.18 $\Omega$ | 14 A  |
| IRF531      | 60 V     | 0.18 $\Omega$ | 14 A  |
| IRF532      | 100 V    | 0.25 $\Omega$ | 12 A  |
| IRF533      | 60 V     | 0.25 $\Omega$ | 12 A  |



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIM Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

| DIM | MILLIMETERS |       | INCHES |       |
|-----|-------------|-------|--------|-------|
|     | MIN         | MAX   | MIN    | MAX   |
| A   | 14.48       | 15.75 | 0.570  | 0.620 |
| B   | 9.66        | 12.78 | 0.380  | 0.505 |
| C   | 4.67        | 4.82  | 0.180  | 0.190 |
| D   | 0.64        | 0.98  | 0.025  | 0.039 |
| E   | 3.61        | 3.77  | 0.142  | 0.147 |
| F   | 2.42        | 2.68  | 0.095  | 0.105 |
| G   | 2.80        | 3.83  | 0.110  | 0.155 |
| H   | 0.26        | 0.55  | 0.010  | 0.022 |
| J   | 12.75       | 14.27 | 0.500  | 0.562 |
| K   | 1.15        | 1.29  | 0.045  | 0.050 |
| L   | 4.83        | 5.33  | 0.190  | 0.210 |
| M   | 2.54        | 3.04  | 0.100  | 0.120 |
| N   | 2.04        | 2.29  | 0.080  | 0.110 |
| P   | 1.15        | 1.29  | 0.045  | 0.050 |
| Q   | 5.97        | 6.47  | 0.235  | 0.255 |
| R   | 0.60        | 1.27  | 0.020  | 0.050 |
| S   | 1.15        | —     | 0.045  | —     |
| T   | —           | 2.04  | —      | 0.080 |

**CASE 221A-04  
 TO-220AB**

ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

| Characteristic                                                                                                                                                                   | Symbol        | Min       | Typ | Max         | Unit |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------|-----|-------------|------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                       |               |           |     |             |      |
| Drain-Source Breakdown Voltage<br>( $V_{GS} = 0$ , $I_D = 250\ \mu\text{A}$ )                                                                                                    | $V_{(BR)DSS}$ | 100<br>60 | —   | —           | Vdc  |
| Zero Gate Voltage Drain Current<br>( $V_{GS} = 0$ V, $V_{DS} = \text{Rated } V_{DSS}$ )<br>( $V_{GS} = 0$ V, $V_{DS} = 0.8 \text{ Rated } V_{DSS}$ , $T_C = 125^\circ\text{C}$ ) | $I_{DSS}$     | —         | —   | 0.25<br>1.0 | mAdc |
| Forward Gate-Body Leakage Current<br>( $V_{GS} = 20$ V, $V_{DS} = 0$ )                                                                                                           | $I_{GSSF}$    | —         | —   | 100         | nAdc |
| Reverse Gate-Body Leakage Current<br>( $V_{GS} = -20$ V, $V_{DS} = 0$ )                                                                                                          | $I_{GSSR}$    | —         | —   | -100        | nAdc |

**ON CHARACTERISTICS\***

|                                                                            |              |          |   |              |      |
|----------------------------------------------------------------------------|--------------|----------|---|--------------|------|
| Gate Threshold Voltage<br>( $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$ ) | $V_{GS(th)}$ | 2.0      | — | 4.0          | Vdc  |
| On-State Drain Current<br>( $V_{DS} = 25$ V, $V_{GS} = 10$ V)              | $I_{D(on)}$  | 14<br>12 | — | —            | Adc  |
| Static Drain-Source On-Resistance<br>( $V_{GS} = 10$ V, $I_D = 8.0$ A)     | $r_{DS(on)}$ | —        | — | 0.18<br>0.25 | Ohm  |
| Forward Transconductance<br>( $V_{DS} = 15$ V, $I_D = 8.0$ A)              | $g_{FS}$     | 4.0      | — | —            | mhos |

**DYNAMIC CHARACTERISTICS**

|                              |                                                 |           |   |   |     |    |
|------------------------------|-------------------------------------------------|-----------|---|---|-----|----|
| Input Capacitance            | $(V_{DS} = 25$ V, $V_{GS} = 0$ , $f = 1.0$ MHz) | $C_{iss}$ | — | — | 800 | pF |
| Output Capacitance           |                                                 | $C_{oss}$ | — | — | 500 |    |
| Reverse Transfer Capacitance |                                                 | $C_{rss}$ | — | — | 150 |    |

**SWITCHING CHARACTERISTICS\* ( $T_J = 100^\circ\text{C}$ )**

|                     |                                                      |              |   |   |    |    |
|---------------------|------------------------------------------------------|--------------|---|---|----|----|
| Turn-On Delay Time  | $V_{DD} = 36$ V, $I_D = 8.0$ A<br>$Z_o = 15\ \Omega$ | $t_{d(on)}$  | — | — | 30 | ns |
| Rise Time           |                                                      | $t_r$        | — | — | 75 |    |
| Turn-Off Delay Time |                                                      | $t_{d(off)}$ | — | — | 40 |    |
| Fall Time           |                                                      | $t_f$        | — | — | 45 |    |

**SOURCE DRAIN DIODE CHARACTERISTICS\***

| Characteristic        | Symbol   | Typ                         | Unit |
|-----------------------|----------|-----------------------------|------|
| Forward On-Voltage    | $V_{SD}$ | 2.3                         | Vdc  |
| Forward Turn-On Time  | $t_{on}$ | Limited by stray inductance |      |
| Reverse Recovery Time | $t_{rr}$ | 360                         | ns   |

**INTERNAL PACKAGE INDUCTANCE (TO-220)**

| Symbol                                                                                                                                                       | Min   | Typ | Max        | Unit |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|------------|------|
| Internal Drain Inductance<br>(Measured from the contact screw on tab to center of die)<br>(Measured from the drain lead 0.25" from package to center of die) | $L_d$ | —   | 3.5<br>4.5 | nH   |
| Internal Source Inductance<br>(Measured from the source lead 0.25" from package to source bond pad.)                                                         | $L_s$ | —   | 7.5        | nH   |

\*Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\ \%$ .

FIGURE 1 — SWITCHING TEST CIRCUIT

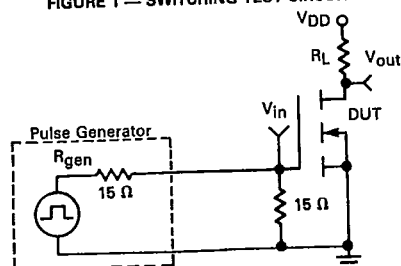


FIGURE 2 — SWITCHING WAVEFORMS

