FAIRCHILD
A Schlumberger Company

# IRF350-353
# N-channel Power MOSFETs, 15 A, 350 V/400 V

T-39-13

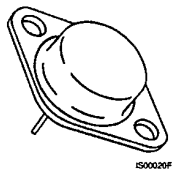
Power And Discrete Division

## Description

These devices are n-channel, enhancement mode, power MOSFETs designed especially for high voltage, high speed applications, such as off-line switching power supplies, UPS, AC and DC motor controls, relay and solenoid drivers.

- **$V_{GS}$ Rated at ±20 V**
- **Silicon Gate for Fast Switching Speeds**
- **$I_{DSS}$, $V_{DS(on)}$, SOA and $V_{GS(th)}$ Specified at Elevated Temperature**
- **Rugged**

**TO-204AA**



IS00020F

**IRF350**
**IRF351**
**IRF352**
**IRF353**

## Maximum Ratings

| Symbol | Characteristic | Rating IRF350/352 | Rating IRF351/353 | Unit |
|---|---|---|---|---|
| $V_{DSS}$ | Drain to Source Voltage | 400 | 350 | V |
| $V_{DGR}$ | Drain to Gate Voltage $R_{GS}$ = 1.0 MΩ | 400 | 350 | V |
| $V_{GS}$ | Gate to Source Voltage | ±20 | ±20 | V |
| $T_J$, $T_{stg}$ | Operating Junction and Storage Temperatures | −55 to +150 | −55 to +150 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering Purposes, 1/8″ From Case for 5 s | 275 | 275 | °C |
| **Maximum On-State Characteristics** | | | | |
| | | **IRF350/351** | **IRF352/353** | |
| $R_{DS(on)}$ | Static Drain-to-Source On Resistance | 0.3 | 0.4 | Ω |
| $I_D$ | Drain Current<br>Continuous<br>Pulsed | <br>15<br>60 | <br>13<br>52 | A |
| **Maximum Thermal Characteristics** | | | | |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 0.83 | 0.83 | °C/W |
| $P_D$ | Total Power Dissipation at $T_C$ = 25°C | 150 | 150 | W |

**Notes**
For information concerning connection diagram and package outline, refer to Section 7.

# IRF350-353

T-39-13

**Electrical Characteristics** ($T_C$ = 25°C unless otherwise noted)

| Symbol | Characteristic | Min | Max | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Off Characteristics** | | | | | |
| $V_{(BR)DSS}$ | Drain Source Breakdown Voltage[1] | | | V | $V_{GS}$ = 0 V, $I_D$ = 250 μA |
| | IRF350/352 | 400 | | | |
| | IRF351/353 | 350 | | | |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | | 250 | μA | $V_{DS}$ = Rated $V_{DSS}$, $V_{GS}$ = 0 V |
| | | | 1000 | μA | $V_{DS}$ = 0.8 x Rated $V_{DSS}$, $V_{GS}$ = 0 V, $T_C$ = 125°C |
| $I_{GSS}$ | Gate-Body Leakage Current | | ±100 | nA | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V |
| **On Characteristics** | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | 4.0 | V | $I_D$ = 250 μA, $V_{DS}$ = $V_{GS}$ |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance[2] | | | Ω | $V_{GS}$ = 10 V, $I_D$ = 8.0 A |
| | IRF350/351 | | 0.3 | | |
| | IRF352/353 | | 0.4 | | |
| $g_{fs}$ | Forward Transconductance | 8.0 | | S (℧) | $V_{DS}$ = 10 V, $I_D$ = 8.0 A |
| **Dynamic Characteristics** | | | | | |
| $C_{iss}$ | Input Capacitance | | 3000 | pF | $V_{DS}$ = 25 V, $V_{GS}$ = 0 V, f = 1.0 MHz |
| $C_{oss}$ | Output Capacitance | | 600 | pF | |
| $C_{rss}$ | Reverse Transfer Capacitance | | 200 | pF | |
| **Switching Characteristics** ($T_C$ = 25°C, *Figures 9, 10*) | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | | 35 | ns | $V_{DD}$ = 180 V, $I_D$ = 8.0 A, $V_{GS}$ = 10 V, $R_{GEN}$ = 4.7 Ω, $R_{GS}$ = 4.7 Ω |
| $t_r$ | Rise Time | | 65 | ns | |
| $t_{d(off)}$ | Turn-Off Delay Time | | 150 | ns | |
| $t_f$ | Fall Time | | 75 | ns | |
| $Q_g$ | Total Gate Charge | | 120 | nC | $V_{GS}$ = 10 V, $I_D$ = 16 A, $V_{DD}$ = 400 V |

| Symbol | Characteristic | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Source-Drain Diode Characteristics** | | | | | |
| $V_{SD}$ | Diode Forward Voltage | | | | |
| | IRF350/351 | | 1.6 | V | $I_S$ = 15 A; $V_{GS}$ = 0 V |
| | IRF352/353 | | 1.5 | V | $I_S$ = 13 A; $V_{GS}$ = 0 V |
| $t_{rr}$ | Reverse Recovery Time | 600 | | ns | $I_S$ = 15 A; $dI_S/dt$ = 100 A/μS |

**Notes**
1. $T_J$ = +25°C to +150°C
2. Pulse test: Pulse width ≤ 80 μs, Duty cycle ≤ 1%

## Typical Performance Curves

**Figure 1 Output Characteristics**

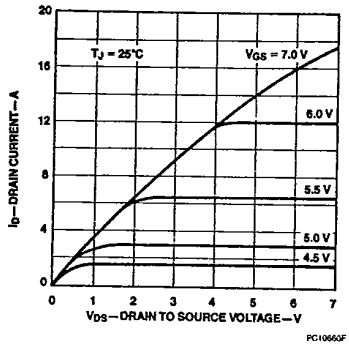



**Figure 2 Static Drain to Source On Resistance vs Drain Current**

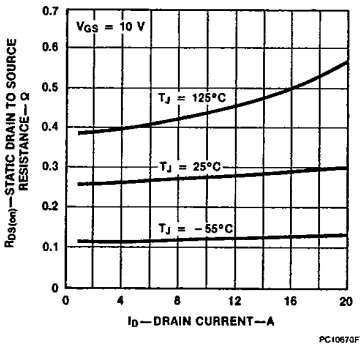



**Figure 3 Transfer Characteristics**

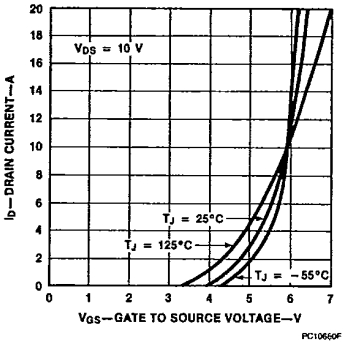



**Figure 4 Temperature Variation of Gate to Source Threshold Voltage**

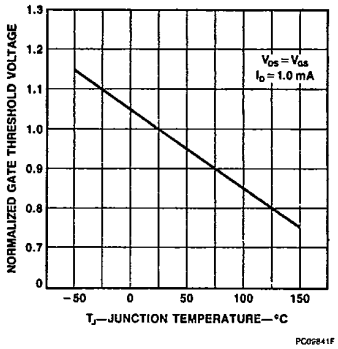



**Figure 5 Capacitance vs Drain to Source Voltage**

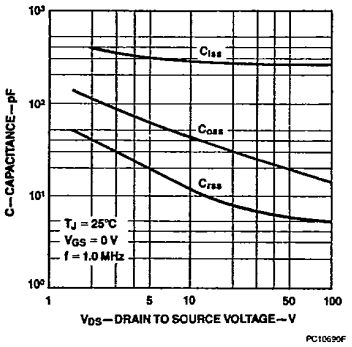
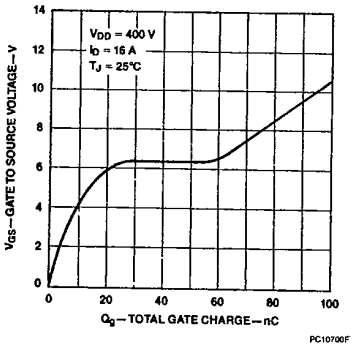



**Figure 6 Gate to Source Voltage vs Total Gate Charge**



## Typical Performance Curves (Cont.)

**Figure 7 Forward Biased Safe Operating Area**

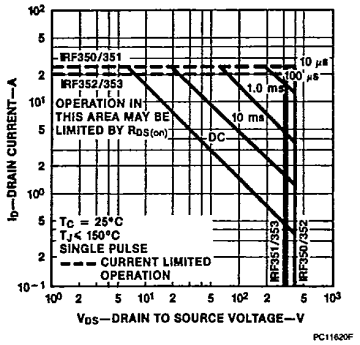
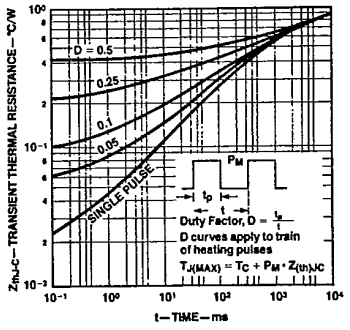



**Figure 8 Transient Thermal Resistance vs Time**




## Typical Electrical Characteristics

**Figure 9 Switching Test Circuit**

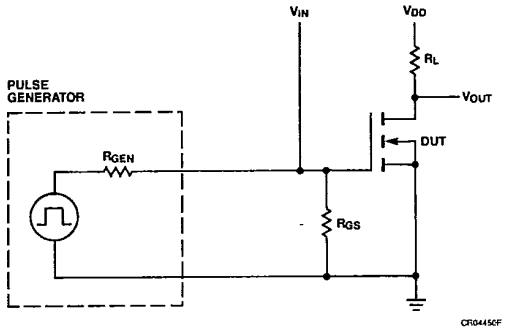
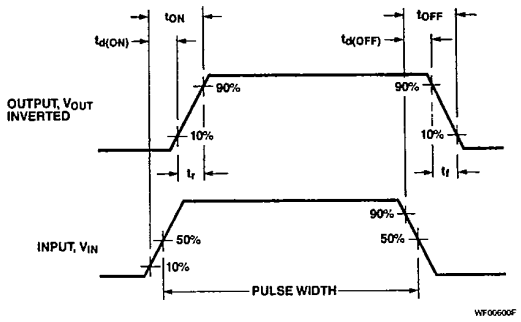



**Figure 10 Switching Waveforms**



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