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# IRF120-123/IRF520-523 MTP10N08/10N10 N-Channel Power MOSFETs, 11 A, 60-100 V

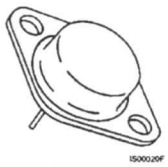
Power And Discrete Division

## Description

These devices are n-channel, enhancement mode, power MOSFETs designed especially for high speed applications, such as switching power supplies, converters, AC and DC motor controls, relay and solenoid drivers and other pulse circuits.

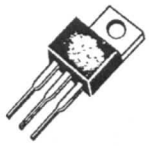
- **Low $R_{DS(on)}$**
- **$V_{GS}$ Rated at ±20 V**
- **Silicon Gate for Fast Switching Speeds**
- **$I_{DSS}$, $V_{DS(on)}$, Specified at Elevated Temperature**
- **Rugged**
- **Low Drive Requirements**
- **Ease of Paralleling**

**TO-204AA**



**IRF120**
**IRF121**
**IRF122**
**IRF123**

**TO-220AB**



**IRF520**
**IRF521**
**IRF522**
**IRF523**
**MTP10N08**
**MTP10N10**

## Product Summary

| Part Number | $V_{DSS}$ | $R_{DS(on)}$ | $I_D$ at $T_C$ = 25°C | $I_D$ at $T_C$ = 100°C | Case Style |
|---|---|---|---|---|---|
| IRF120 | 100 V | 0.30 Ω | 8.0 A | 5.0 A | TO-204AA |
| IRF121 | 60 V | 0.30 Ω | 8.0 A | 5.0 A | |
| IRF122 | 100 V | 0.40 Ω | 7.0 A | 4.0 A | |
| IRF123 | 60 V | 0.40 Ω | 7.0 A | 4.0 A | |
| IRF520 | 100 V | 0.30 Ω | 8.0 A | 5.0 A | TO-220AB |
| IRF521 | 60 V | 0.30 Ω | 8.0 A | 5.0 A | |
| IRF522 | 100 V | 0.40 Ω | 7.0 A | 4.0 A | |
| IRF523 | 60 V | 0.40 Ω | 7.0 A | 4.0 A | |
| MTP10N08 | 80 V | 0.33 Ω | 10 A | 6.4 A | |
| MTP10N10 | 100 V | 0.33 Ω | 10 A | 6.4 A | |

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

NJ Semi-Conductors reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by NJ Semi-Conductors is believed to be both accurate and reliable at the time of going to press. However, NJ Semi-Conductors assumes no responsibility for any errors or omissions discovered in its use. NJ Semi-Conductors encourages customers to verify that datasheets are current before placing orders.

**Quality Semi-Conductors**

**Maximum Ratings**

| Symbol | Characteristic | Rating IRF120/122 IRF520/522 MTP10N10 | Rating MTP10N08 | Rating IRF122/123 IRF522/523 | Unit |
|---|---|---|---|---|---|
| $V_{DSS}$ | Drain to Source Voltage[1] | 100 | 80 | 60 | V |
| $V_{DGR}$ | Drain to Gate Voltage[1] $R_{GS}$ = 20 kΩ | 100 | 80 | 60 | V |
| $V_{GS}$ | Gate to Source Voltage | ±20 | ±20 | ±20 | V |
| $T_J$, $T_{stg}$ | Operating Junction and Storage Temperatures | −55 to +150 | −55 to +150 | −55 to +150 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering Purposes, 1/8″ From Case for 5 s | 275 | 275 | 275 | °C |

**Maximum Thermal Characteristics**

| | | IRF120-123/IRF520-523 | MTP10N08/10 | |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 3.12 | 1.67 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 30/80 | 80 | °C/W |
| $P_D$ | Total Power Dissipation at $T_C$ = 25°C | 40 | 75 | W |
| $I_{DM}$ | Pulsed Drain Current[2] | 20 | 32 | A |

**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] IRF120/122/520/522/ MTP10N10 | 100 | | V | $V_{GS}$ = 0 V, $I_D$ = 250 μA |
| | MTP10N08 | 80 | | | |
| | IRF121/123/521/523 | 60 | | | |
| $I_{DSS}$ | 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 IRF120-123 IRF520-523/MTP10N08/10 | | ±100 ±500 | nA | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V |

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

| Symbol | Characteristic | Min | Max | Unit | Test Conditions |
|---|---|---|---|---|---|
| **On Characteristics** | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | | | V | |
| | IRF120-123/IRF520-523 | 2.0 | 4.0 | | $I_D$ = 250 μA, $V_{DS}$ = $V_{GS}$ |
| | MTP10N08/10N10 | 2.0 | 4.5 | | $I_D$ = 1 mA, $V_{DS}$ = $V_{GS}$ |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance[2] | | | Ω | $V_{GS}$ = 10 V |
| | IRF120/121/520/521 | | 0.30 | | $I_D$ = 4.0 A |
| | MTP10N08/10N10 | | 0.33 | | $I_D$ = 5.0 A |
| | IRF122/123/522/523 | | 0.40 | | $I_D$ = 4.0 A |
| $V_{DS(on)}$ | Drain-Source On-Voltage[2] MTP 10N08/10N10 | | 4.0 | V | $V_{GS}$ = 10 V; $I_D$ = 10.0 A |
| | | | 3.3 | V | $V_{GS}$ = 10 V, $I_D$ = 5.0 A $T_C$ = 100°C |
| $g_{fs}$ | Forward Transconductance | 1.5 | | S (℧) | $V_{DS}$ = 10 V, $I_D$ = 4.0 A |
| **Dynamic Characteristics** | | | | | |
| $C_{iss}$ | Input Capacitance | | 600 | pF | $V_{DS}$ = 25 V, $V_{GS}$ = 0 V f = 1.0 MHz |
| $C_{oss}$ | Output Capacitance | | 400 | pF | |
| $C_{rss}$ | Reverse Transfer Capacitance | | 100 | pF | |
| **Switching Characteristics** ($T_C$ = 25°C, *Figures 1, 2*)[3] | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | | 40 | ns | $V_{DD}$ = 50 V, $I_D$ = 4.0 A $V_{GS}$ = 10 V, $R_{GEN}$ = 50 Ω $R_{GS}$ = 50 Ω |
| $t_r$ | Rise Time | | 70 | ns | |
| $t_{d(off)}$ | Turn-Off Delay Time | | 100 | ns | |
| $t_f$ | Fall Time | | 70 | ns | |
| $Q_g$ | Total Gate Charge | | 15 | nC | $V_{GS}$ = 10 V, $I_D$ = 10 A $V_{DD}$ = 50 V |

| Symbol | Characteristic | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Source-Drain Diode Characteristics** | | | | | |
| $V_{SD}$ | Diode Forward Voltage IRF120/121/520/521 | | 2.5 | V | $I_S$ = 8.0 A; $V_{GS}$ = 0 V |
| | IRF122/123/522/523 | | 2.3 | V | $I_S$ = 7.0 A; $V_{GS}$ = 0 V |
| $t_{rr}$ | Reverse Recovery Time | 280 | | ns | $I_S$ = 4.0 A; $dI_S/dt$ = 25 A/μS |

**Notes**
1. $T_J$ = +25°C to +150°C
2. Pulse width limited by $T_J$
3. Switching time measurements performed on LEM TR-58 test equipment.