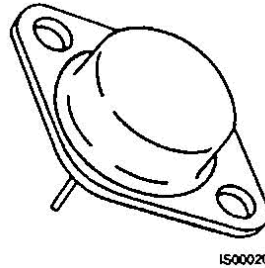


Description

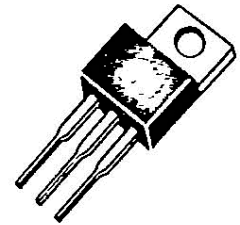
These devices are n-channel, enhancement mode, power MOSFETs designed especially for high voltage, high speed applications, such as off-line switching power supplies, UPS, AC and DC motor controls, relay and solenoid drivers.

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

TO-204AA



TO-220AB



IRF440
 IRF441
 IRF442
 IRF443
 MTM7N45
 MTTM7N50

IRF840
 IRF841
 IRF842
 IRF843

Maximum Ratings

| Symbol | Characteristic | Rating IRF440/442 IRF840/842 MTM7N50 | Rating IRF441/443 IRF841/843 MTM7n45 | Unit |
|----------------|--|---|---|------|
| V_{DSS} | Drain to Source Voltage | 500 | 450 | V |
| V_{DGR} | Drain to Gate Voltage $R_{GS}=20k\ \Omega$ | 500 | 450 | V |
| V_{GS} | Gate to Source Voltage | ± 20 | ± 20 | V |
| T_J, T_{stg} | Operating Junction and Storage Temperature | -50 to +150 | -50 to +150 | |
| TL | Maximum Lead Temperature for Soldering Purposes, 1/8" From Case for 5S | 275 | 275 | |

Maximum On-State Characteristics

| | | IRF440/441 IRF840/841 | IRF442/443 IRF842/843 | MTM7N45 MTM7N50 | |
|--------------|--------------------------------------|--------------------------|--------------------------|--------------------|----------|
| $R_{DS(on)}$ | Static Drain-to-Source On Resistance | 0.85 | 1.1 | 0.8 | Ω |
| I_D | Drain Current | | | | A |
| | Continuous | 8 | 7 | 7 | |
| | Pulsed | 32 | 28 | 40 | |

Maximum Thermal Characteristics

| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 1.0 | 1.0 | 0.83 | /W |
|-----------------|---|-----|-----|------|----|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 60 | 60 | 60 | /W |
| P_D | Total Power Dissipation at $T_c=25$ | 125 | 125 | 150 | W |

Notes

For Information concerning connection diagram and package outline, refer to Section 7.



IRF440-443/IRF840-843
MTM7N45/7N50
N-Channel Power MOSFETs
8A, 450V/500V

Electrical Characteristics (Tc=25 unless otherwise noted)

| Symbol | Characteristic | Min | Max | Unit | Test Conditions |
|--|-------------------------------------|-----|------|------|--|
| Off Characteristics | | | | | |
| V _{(BR)DSS} | Drain Source Breakdown Voltage1 | | | V | V _{GS} =0V, I _D =250μA |
| | IRF440/442/840/842 | 500 | | | |
| | IRF441/443/842/843 | 450 | | | |
| I _{DSS} | Zero Gate Voltage Drain Current | | 250 | μA | V _{DS} =Rated V _{DSS} , V _{GS} =0V |
| | | | 100 | μA | V _{DS} =0.8 x Rated V _{DSS} , V _{GS} =0V, Tc=125 |
| I _{GSS} | Gate-Body Leakage Current | | | nA | V _{GS} =±20V, V _{DS} =0V |
| | IRF440-443 | | ±100 | | |
| | IRF840-843 | | ±500 | | |
| On Characteristics | | | | | |
| V _{GS(th)} | Gate Threshold Voltage | 2.0 | 4.0 | V | I _D =250μA, V _{DS} =V _{GS} |
| R _{DS(on)} | Static Drain-Source On-Resistance 2 | | | Ω | V _{GS} =10V, I _D =4.0A |
| | IRF440/441/840/841 | | 0.85 | | |
| | IRF442/443/842/843 | | 1.10 | | |
| g _{fs} | Forward Transconductance | 4.0 | | S(Ω) | V _{DS} =10V, I _D =4.0A |
| Dynamic Characteristics | | | | | |
| C _{iss} | Input Capacitance | | 1600 | pF | V _{DS} =25V, V _{GS} =0V f=1.0MHz |
| C _{oss} | Output Capacitance | | 350 | pF | |
| C _{rss} | Reverse Transfer Capacitance | | 150 | pF | |
| Switching Characteristics (Tc=25, Figure 9, 10) | | | | | |
| t _{d(on)} | Turn-On Delay Time | | 35 | ns | V _{DD} =220V, I _D =4.0A V _{GS} =10V, R _{GEN} =4.7 Ω |
| t _r | Rise Time | | 15 | ns | |
| t _{d(off)} | Turn-Off Delay Time | | 90 | ns | R _{GS} =4.7 Ω |
| t _f | Fall Time | | 30 | ns | |
| Q _g | Total Gate Charge | | 60 | nC | V _{GS} =10V, I _D =12A V _{DD} =400V |
| Symbol Characteristic | | | | | |
| Symbol | Characteristic | Typ | Max | Unit | Test Conditions |
| Source-Drain Diode Characteristics | | | | | |
| V _{SD} | Diode Forward Voltage | | 2.0 | V | I _S =8.0A; V _{GS} =0V |
| | IRF440/441/840/841 | | 1.9 | V | I _S =7.0A; V _{GSA} =0V |
| | IRF442/443/842/843 | | | | |
| t _{rr} | Reverse Recovery Time | 700 | | ns | I _S =8.0A; dI _S /dt=100A/μs |

Notes

- T_J=+25 to +150
- Pulse test: Pulse width ≤80μs, Duty cycle ≤ 1%



IRF440-443/IRF840-843
MTM7N45/7N50
N-Channel Power MOSFETs
8A, 450V/500V

Electrical Characteristics (Tc=25 unless otherwise noted)

| Symbol | Characteristic | Min | Max | Unit | Test Conditions |
|--|---|-----|------|------|---|
| Off Characteristics | | | | | |
| V _{(BR)DSS} | Drain Source Breakdown Voltage1 MTM7N50 MTM7N45 | | | V | V _{GS} =0V, I _D =5.0mA |
| | | 500 | | | |
| | | 450 | | | |
| I _{DSS} | Zero Gate Voltage Drain Current | | 0.25 | mA | V _{DS} =0.85 x Rated V _{DSS} , V _{GS} =0V |
| | | | 2.5 | mA | V _{DS} =0.85 x Rated V _{DSS} , V _{GS} =0V, Tc=100 |
| I _{GSS} | Gate-Body Leakage Current | | ±500 | nA | V _{GS} =±20V, V _{DS} =0V |
| On Characteristics | | | | | |
| V _{GS(th)} | Gate Threshold Voltage | 2.0 | 4.5 | V | I _D =1.0mA, V _{DS} =V _{GS} |
| | | 1.5 | 4.0 | V | I _D =1.0mA, V _{DS} =V _{GS} T _C =100 |
| R _{DS(on)} | Static Drain-Source On-Resistance2 | | 0.8 | Ω | V _{GS} =10V, I _D =3.5A |
| V _{DS(on)} | Drain-Source On-Voltage2 | | 2.8 | V | V _{GS} =10V, I _D =3.5A |
| | | | 7.0 | V | V _{GS} =10V, I _D =7.0A |
| | | | 5.6 | V | V _{GS} =10V, I _D =3.5A Tc=100 |
| g _{fs} | Forward Transconductance | 4.0 | | S(Ū) | V _{DS} =10V, I _D ≈4.0A |
| Dynamic Characteristics | | | | | |
| C _{iss} | Input Capacitance | | 1800 | pF | V _{DS} =25V, V _{GS} =0V f=1.0MHz |
| C _{oss} | Output Capacitance | | 350 | pF | |
| C _{rss} | Reverse Transfer Capacitance | | 150 | pF | |
| Switching Characteristics (Tc=25, Figure 9,10) ³ | | | | | |
| t _{d(on)} | Turn-On Delay Time | | 60 | ns | V _{DD} =25V, I _D =3.5A V _{GS} =10V, R _{GEN} =50 Ω R _{GS} =50 Ω |
| t _r | Rise Time | | 150 | ns | |
| t _{d(off)} | Turn-Off Delay Time | | 200 | ns | |
| t _f | Fall Time | | 120 | ns | |
| Q _g | Total Gate Charge | | 60 | nC | V _{GS} =10V, I _D =12A V _{DD} =400V |

Notes

1. T_J=+25 to +150
2. Pulse test: Pulse width ≤ 80μs, Duty cycle ≤ 1%
3. Switching time measurements performed on LEM TR-58 test equipment

Typical Performance Curves

Figure 1 Output Characteristics

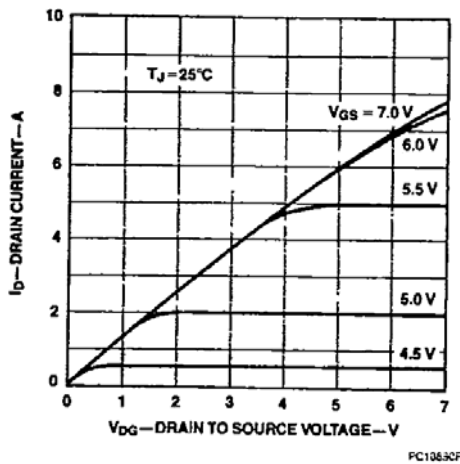


Figure 2 Static Drain to Source Resistance vs Drain Current

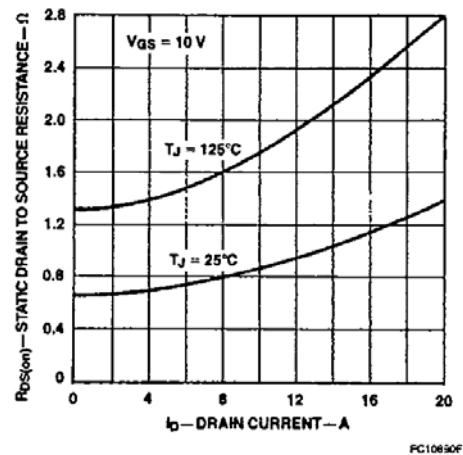


Figure 3 Transfer Characteristics

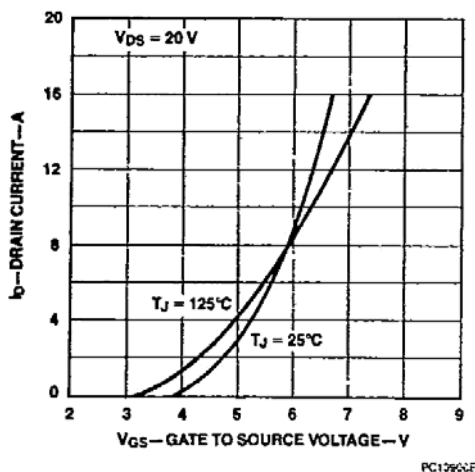


Figure 4 Temperature Variation of Gate to Source Threshold Voltage

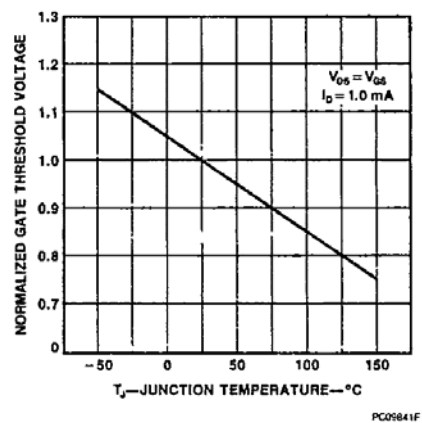


Figure 5 Capacitance vs Drain to Source Voltage

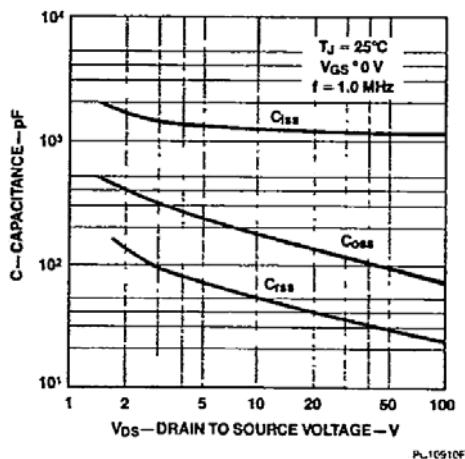
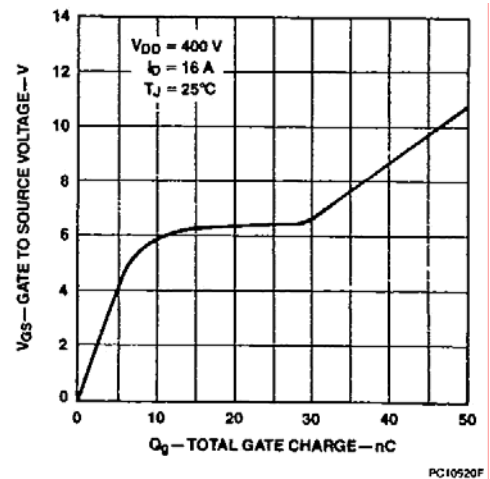


Figure 6 Gate to Source Voltage vs Total Gate Charge



Typical Performance Curves (Cont.)

Figure 7 Forward Biased Safe Operating Area Curves

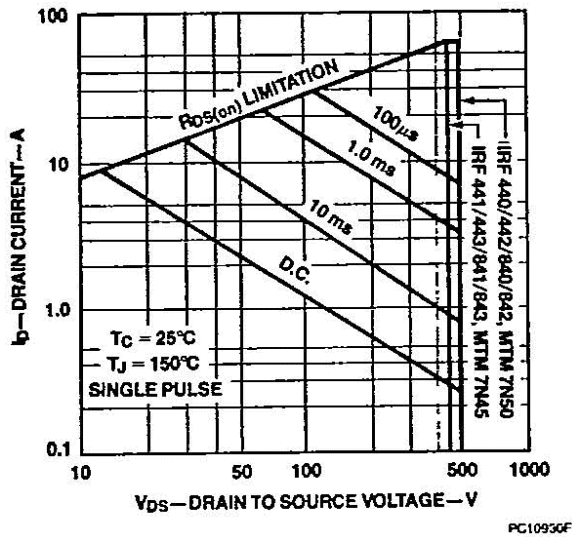
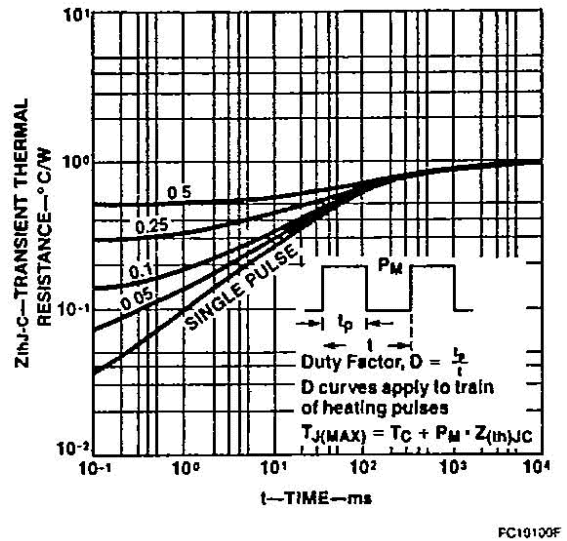


Figure 8 Transient Thermal Resistance vs Time



Typical Electrical Characteristics

Figure 9 Switching Test Circuit

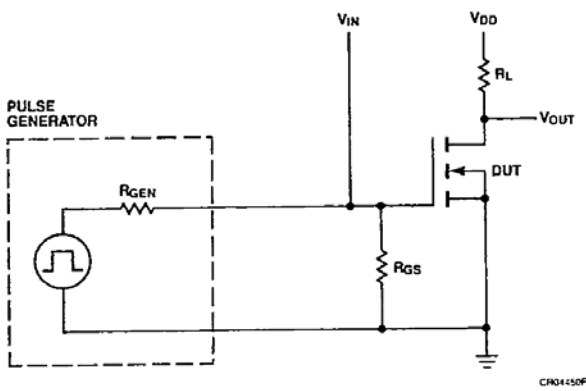


Figure 10 Switching Waveforms

